

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

## **A5510 & A5710**

### **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, Inc.**  
2201 Hancel Parkway  
Mooresville, IN 46158  
Tel: (317) 834-4500  
Fax: (317) 834-4501

FORM # 580000024  
COPYRIGHT 2005  
EQUIPMENT TECHNOLOGIES INC



## INTRODUCTION

---

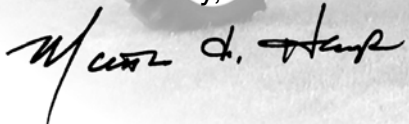
A large, dark-colored Apache sprayer machine is parked on a grassy area in front of a long, light-colored building with a series of windows. The machine has a complex frame with multiple nozzles and a large tank. It has four large, treaded tires. The background is slightly blurred, emphasizing the machine.

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, which appears to read "Matthew F. Hays". The signature is stylized and fluid.

Matthew F. Hays  
Chief Executive Officer





## SPECIFICATIONS

	AS510	AS710
Tank Capacity	500 gallons	750 gallons
Engine	140 hp Tier II John Deere 367 ft-lb @ 1400 rpm	155 hp Tier II John Deere 409 ft-lb @ 1400 rpm
Transmission	ITL/JCB Powershift 4-speed, torque converted	
Speeds	1st 0-5 mph 2nd 0-9 mph 3rd 0-16 mph 4th 0-28 mph	
Brakes	Internal, wet disc self-adjusting	
Suspension	Front Axle Center oscillation with independent hydraulic accumulation. Rear Axle Patented hydraulic load suspension with compensating anti-sway control, self-adjusting for diminishing/increasing load.	
Crop Clearance	31"	42"
Axles	90" Fixed	120" Fixed
Final Drive	ITL/JCB Model PD70	Standard: ITL/JCB planetary gear set
Cab	ET custom	ET custom
Weight	15,100 lbs. (approximate) Dry weight with poly tank.	15,900 lbs. (approximate) Dry weight with poly tank.
Width	144" (12')	
Length	27'	27'
Height	129" (10'9")	142" (11'10")
Booms	60', 75', 80' 90', 100' 60/80, 60/90	
Boom Height	10" to 58" (approximate)	14" to 74"
Wheel Base	162" (13'6")	162" (13'6")
Tires	Front: 12.4x28 Rear: 380/90R46 Rear: 320/90R50 (optional)	Front: 12.4x28 Rear: 380/90R46 Rear: 320/90R50 (optional)
Turning Radius	175" (14'7")	201" (16'9")
Fuel Capacity	100 gallons	
Product Pump	Ace 244 gpm, hydraulically driven centrifugal pump	

## **General Information**

The graphics and text in this manual generally describe the AS510 and AS710 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.

---

# CONTENTS

---

## Chapter 1: Safety Rules

Safety Signals	1-1
Safety Rules	1-1
Training	1-1
Preparation	1-1
Starting	1-1
Seat Belt	1-1
Operation	1-2
Entanglement	1-2
Protective Equipment	1-2

## Chapter 2: Safety Decals

Left-Side Decals	2-1
Cab-Mounted Decals	2-2
Engine-Mounted Decals	2-2
Chassis-Mounted Decals	2-3
Tank-Mounted Decals	2-4

## Chapter 3: Vehicle Operation

General Guidelines	3-1
Pre-operation Check List	3-1
Cab Overview	3-2
Cab Access Ladder	3-2
Steering Column	3-3
Steering Column Lamps	3-3
Apache Console	3-4
Raven 4400 Controller and T-Handle	3-5
Fuse Block	3-6
Climate Control and Light Switches	3-6
Vehicle Lighting	3-7
AM/FM Radio with Weather Band	3-7
CB Radio Knockout	3-7
Seat Adjustment	3-8
Starting and Stopping the Engine	3-9
Starting	3-9
Warm-up	3-10
Stopping	3-10
Vehicle Direction and Speed	3-11
Neutral	3-11
Forward	3-11
Shifting Gears	3-12
Reverse	3-13
Cruise Control	3-13
Towing	3-14
Transmission Fluid Temperature	
Warning	3-14
Hydraulic Fluid Temperature Warning	3-15
Hood Release	3-15
Battery	3-15
Antenna Mounting Plate	3-16
Raven Drive Shaft Speed Sensor (Optional)	3-16

Raven Radar Gun (Optional)	3-16
Raven Smart Trax and Auto Boom	
Control Box	3-17
Raven Smartrax Controller Quick Start Guide	3-18
Raven Smartbar Quick Start Guide	3-19

## Chapter 4: Wet System Operation

Wet System Overview	4-1
Fill Station	4-1
Product Pump and Valves	4-2
Sump Valve	4-2
Rinse and Foam Tank	4-2
Second Rinse Tank (Optional)	4-3
Flow Control	4-3
Standard Flow	4-3
Electronic Boom Valves	4-3
Raven 4400 Monitor	4-4
Side Console	4-5
T-Handle	4-6
60' Boom	4-7
80' and 90' Boom	4-7
Filling Product Tank	4-8
Filling Rinse Tank	4-8
Operating Booms	4-10
Tilt to Remove Boom from Cradle	4-10
Unfold Booms	4-10
Unfold Boom Tips	4-10
Height Adjustment	4-11
Tilt to Level Boom	4-11
Fold Boom Tips	4-11
Fold Booms	4-12
Tilt to Return Boom to Cradle	4-12
Spraying	4-12
Operating Foam Marker	4-15
Auto Foam	4-15
LandMark Injection Foam Marker	4-16
Flushing Product Tank	4-19
Flushing Booms	4-20
Flushing Wet System	4-21
Cleanload Chemical Eductor	4-23
Startup	4-23
Loading Liquid or Powdered Chemical into Hopper	4-23
Loading Liquid and/or Powdered Chemical with Suction Lance	4-24
Shutdown	4-24
Optional Raven Auto Boom Height Control	4-25
Raven Auto Boom Wheel for G1 Systems	4-25

---

Raven Industries Autoboomb Calibration	
Guide for G1 Systems . . . . .	4-25
Introduction . . . . .	4-25
Monitor Description . . . . .	4-26
Calibration Procedure G1 Monitor . .	4-27
Troubleshooting System Problems .	4-30
Boom Balancing . . . . .	4-30
Operation . . . . .	4-31
Disclaimer . . . . .	4-32

## **Chapter 5: Lubrication and Maintenance**

General Information . . . . .	5-1
Apache Sprayer Service Interval Chart .	5-2
Before Initial Use . . . . .	5-3
After First 10 Hours . . . . .	5-3
Adjust Boom . . . . .	5-3
As Required . . . . .	5-5
Inspect Front Accumulator . . . . .	5-5
Daily . . . . .	5-6
Grease Boom . . . . .	5-6
Flush Wet System . . . . .	5-8
Check Tire Pressure . . . . .	5-8
Check Engine Oil Level . . . . .	5-8
Check Cooling System . . . . .	5-9
Check Brake Fluid Level . . . . .	5-9
Check Transmission Fluid Level . . .	5-10
Check Hydraulic Fluid Level . . . . .	5-10
Check A/C Compressor Belt . . . . .	5-11
Every 40 Hours . . . . .	5-12
Torque Lug Nuts . . . . .	5-12
Grease Axle Components . . . . .	5-13
Check Differential Fluid Level . . . . .	5-13
Check Rear Differential for Leaks . .	5-13
After First 100 Hours . . . . .	5-14
Every 100 Hours . . . . .	5-14
Grease Driveline Components . . . .	5-14
Every 250 Hours . . . . .	5-16
Replace Engine Oil and Filter . . . . .	5-16
Clean or Replace Engine Primary	

Air Filter . . . . .	5-17
Replace Differential Fluid . . . . .	5-18
Replace Hydraulic Fluid Filter . . . . .	5-18
Clean Hydraulic Fluid Strainers . . . . .	5-19
Replace Fuel/Water Separator Filter	5-20
Every 500 Hours or Yearly . . . . .	5-21
Adjust Poly Tank Straps . . . . .	5-21
Check Accumulator Fluid Level . . . .	5-21
Replace Fuel Pre-Filter . . . . .	5-22
Replace Planetary Fluid . . . . .	5-22
Replace Transmission Fluid	
and Filter . . . . .	5-23
Inspect and Repack Wheel and	
Inter-Flex Bearings . . . . .	5-24
Adjust Toe-In (AS510 & AS710) . . .	5-25
Winterize Wet System . . . . .	5-26
Replace Cab Recirculating Air Filter	5-28
Replace Cab Charcoal Air Filter . . .	5-29
Every 1000 Hours or Yearly . . . . .	5-30
Clean Transmission Fluid Strainer. .	5-30
Replace Hydraulic Fluid . . . . .	5-30

## **Chapter 6: Torque Value Charts**

Fittings . . . . .	6-1
Bolts . . . . .	6-2

## **Chapter 7: Troubleshooting**

Apache Sprayer Troubleshooting Symptoms	
and Solutions . . . . .	7-1

## **Chapter 8: System Schematics**

Hydraulic System . . . . .	8-1
Electrical System (Sheet 1 of 5) . . . . .	8-2
Electrical System (Sheet 2 of 5) . . . . .	8-3
Electrical System (Sheet 3 of 5) . . . . .	8-4
Electrical System (Sheet 4 of 5) . . . . .	8-5
Electrical System (Sheet 5 of 5) . . . . .	8-6

## **Chapter 9: Warranty**

Equipment Technologies Inc. . . . .	9-1
-------------------------------------	-----

## SAFETY RULES

---

### Safety Signals

Safety is a primary concern in the design and manufacturing of our products. Throughout this manual and on the machine potential hazards are identified by the “Safety Alert Symbol” followed by a “Signal Word” which indicates the degree of hazard. The three degrees of hazard are “Danger”, “Warning”, and “Caution”



“Danger” indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.



“Warning” indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed.



“Caution” indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.

### Safety Rules

#### Training

Carefully read and understand this manual and all safety decals. If the manual or safety decals become damaged or misplaced, replacements may be obtained from your dealer or by calling (317) 834-4500.

Carefully read and understand all non-Apache 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 Educator Manual, Product Pump Instructions, and other optional equipment.

Do not allow anyone to operate this equipment without proper instruction.

If you do not understand any part of this manual and need assistance, see your dealer.

### Preparation

Check all hardware, tighten to torque chart specifications in this manual. See “Torque Value Charts” on page 6-1.

Check all hydraulic hoses and fittings for leaks and make sure they are in good working condition prior to starting the machine. Replace any worn or damaged fittings or hoses. Check hose routing to prevent damage during machine operation.

Check tires for proper inflation pressure according to tire manufacturers recommendations.

### Starting

Start engine only from operator’s seat, with transmission in neutral and the parking brake set.

Never start engine by shorting across starter terminals.

### Seat Belt

Periodically inspect seat belt and seat belt mounting for damage. Inspect belt for cuts, frays, wear, discoloration, or abrasion. Replace any damaged parts (see your dealer).

Never operate equipment without seat belt properly installed.

## **SAFETY RULES**

---

### **Operation**

Reduce the chance of machine roll-over:

- 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.

Do not fold or unfold booms near power lines.

Do not fold or unfold booms while moving.

Secure any loose items in cab. Items that are unsecured may cause injury in case of a vehicle roll-over.

Do not allow riders in the cab or on the Apache Sprayer.

### **Entanglement**

Keep hands, feet, hair, and clothing away from all moving parts. Wear relatively tight and belted clothing while operating or repairing machine.

### **Protective Equipment**

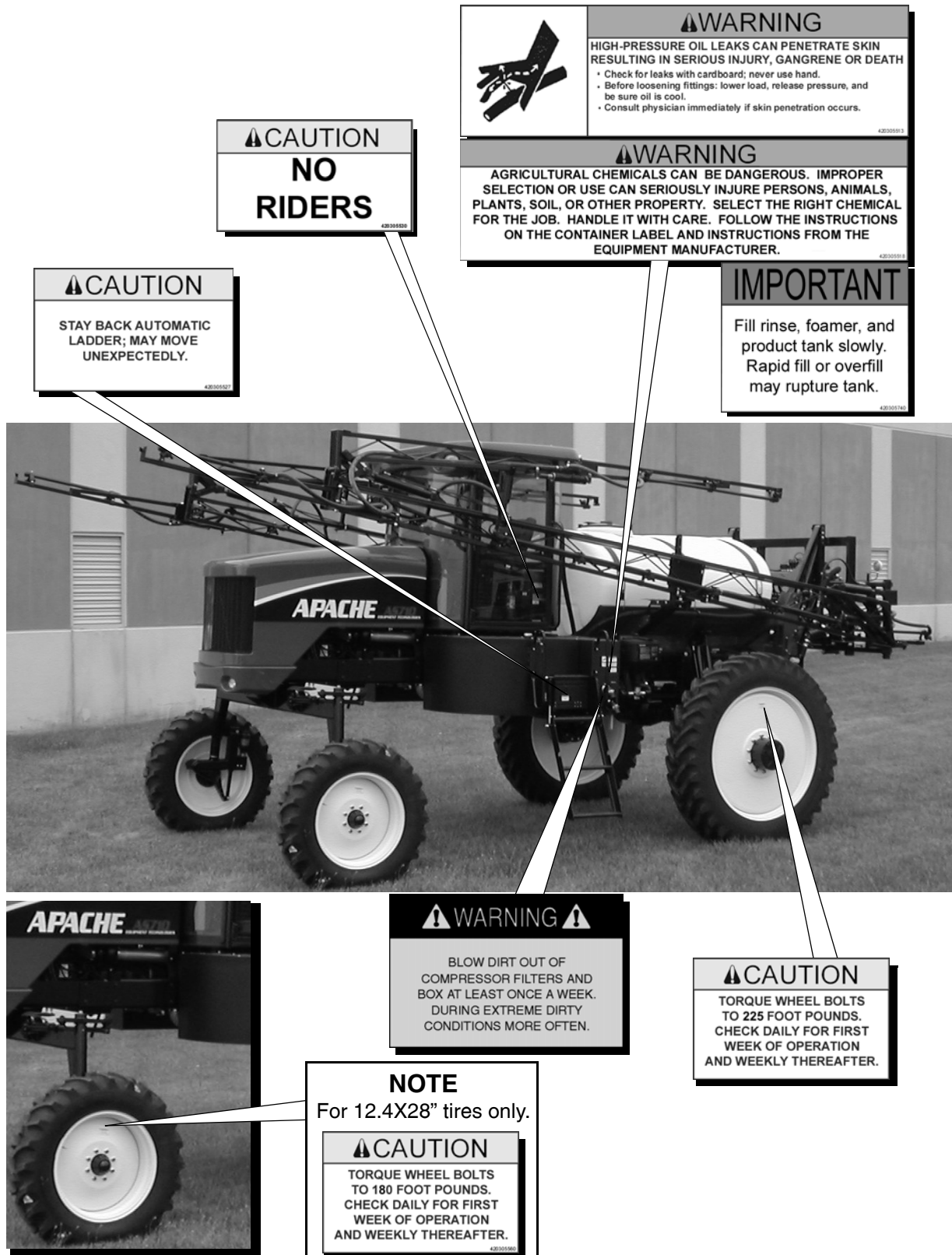
Always wear clothing appropriate to the job.

When handling chemicals wear long sleeves and pants, goggles, and gloves. If necessary wear a respirator when handling chemicals. Remove or clean contaminated clothing before entering the cab.

Always wear safety glasses when repairing machine.

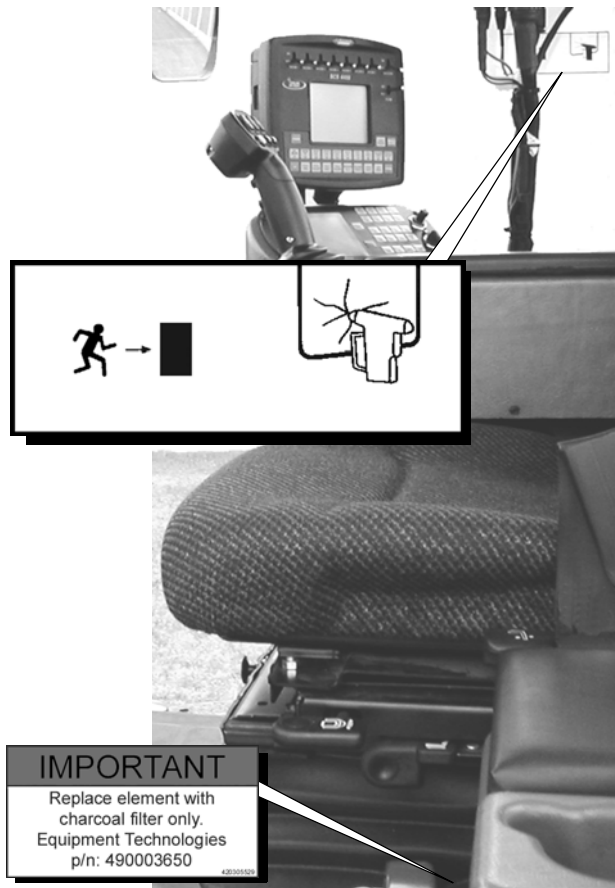
# SAFETY DECALS

## Left-Side Decals

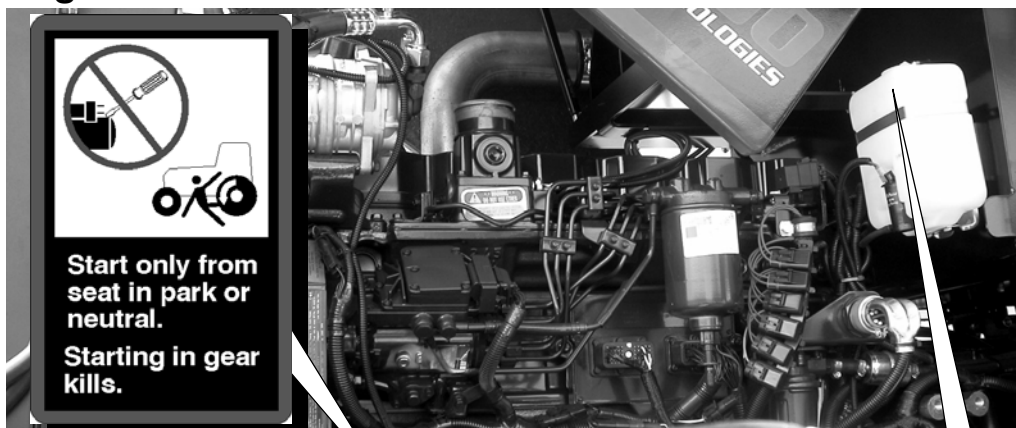


## SAFETY DECALS

### Cab-Mounted Decals



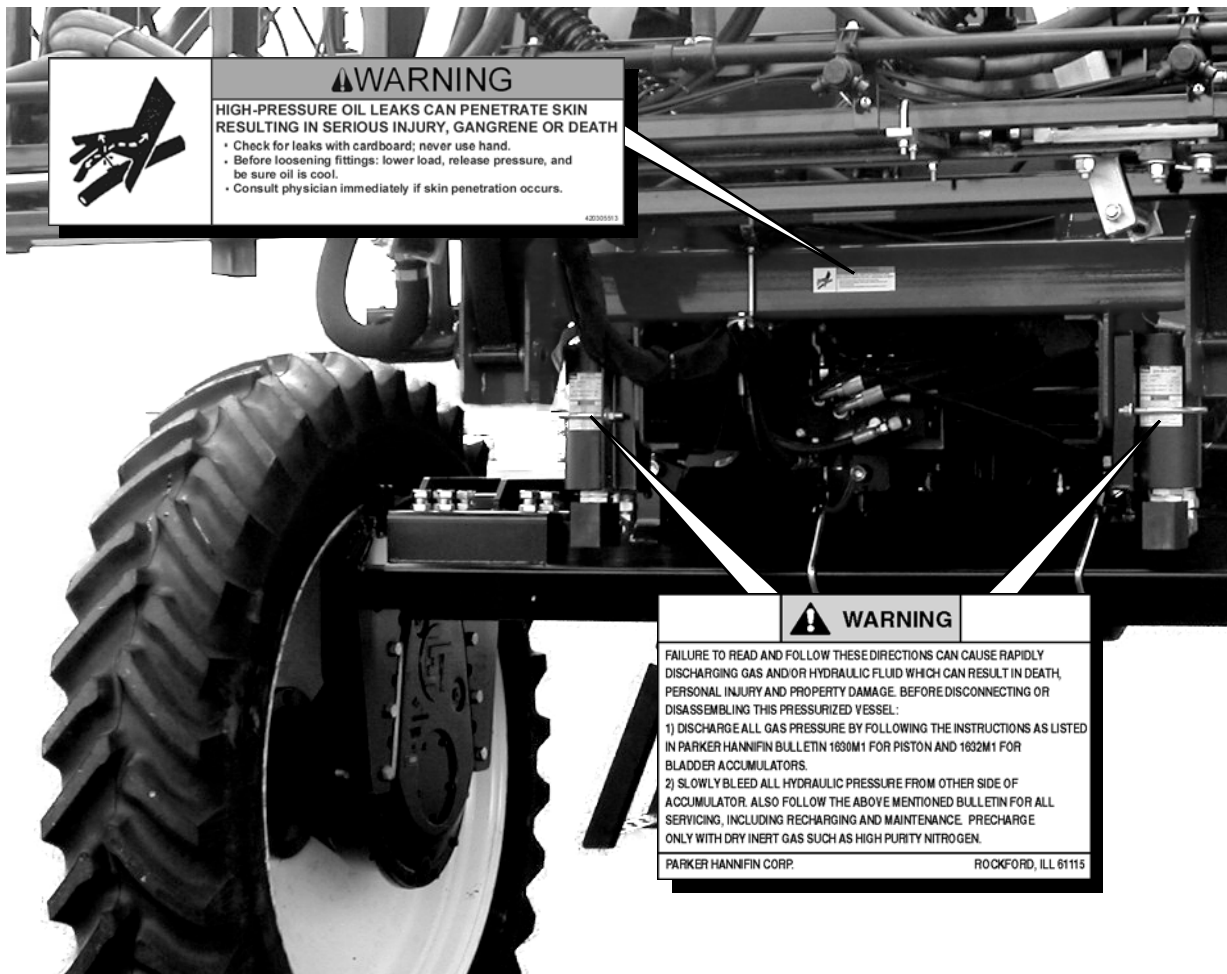
### Engine-Mounted Decals





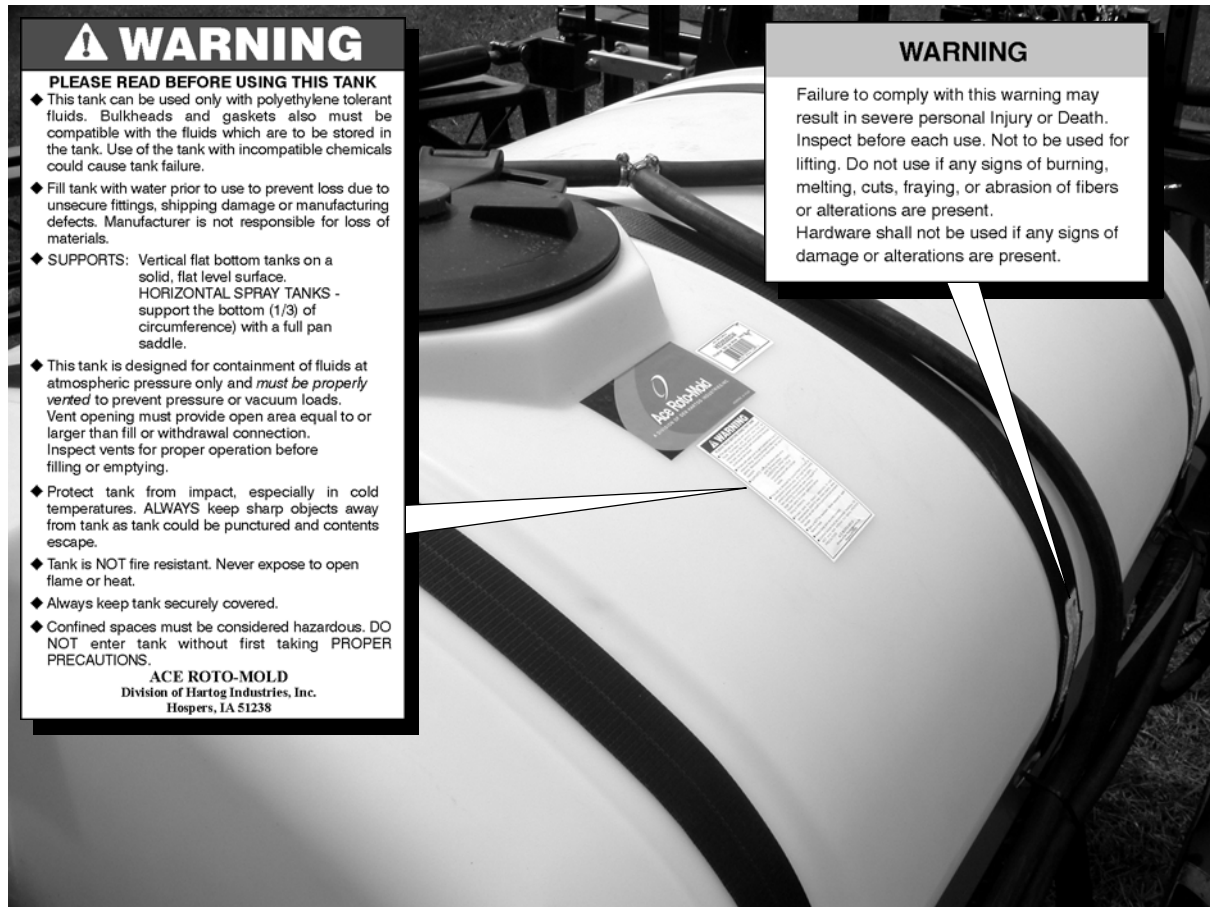
## SAFETY DECALS

### Chassis-Mounted Decals



## SAFETY DECALS

### Tank-Mounted Decals



## VEHICLE OPERATION

---

### General Guidelines

Carefully read and understand this manual and all safety decals. If the manual or safety decals become damaged or misplaced, replacements may be obtained from your dealer or by calling (317) 834-4500.

Do not allow anyone to operate this equipment without proper instruction.

If you do not understand any part of this manual and need assistance, see your dealer.

### Pre-operation Check List

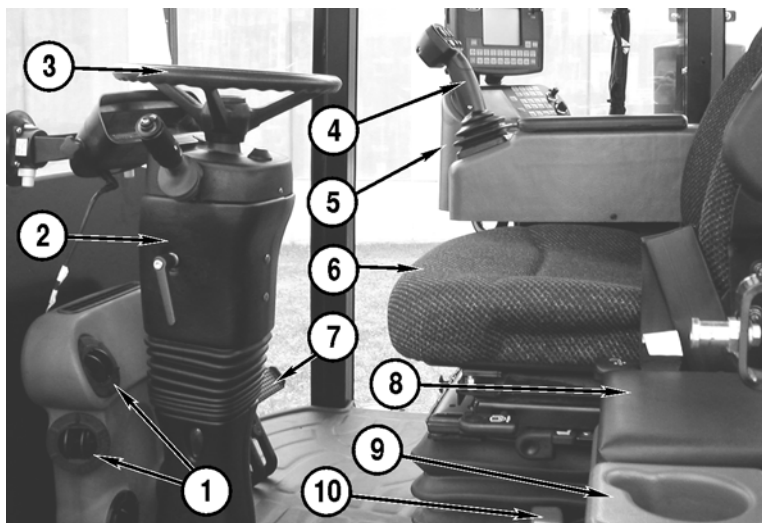
- Read and understand the owner's manual before operating the Apache Sprayer.
- Review and follow all safety rules and safety decal instruction. See "Safety Rules" on page 1-1 See "Safety Decals" on page 2-1
- Check that all safety decals are installed and in good condition. Replace if damaged.
- Check that all shields and guards are properly installed and in good working condition. Replace if damaged.
- Check that all hardware is properly installed and secured.
- Check area for bystanders and obstruction before operating.
- Check that all hydraulic hoses and fittings are in good condition and not leaking before starting the vehicle.
- Check that hoses are not twisted, sharply bent, kinked, frayed, or pulled tight and are not rubbing. Replace any damaged hoses immediately.
- Make sure seat belt is in good condition.
- Check tires for proper inflation according to specifications on the back cover of this manual. See "Check Tire Pressure" on page 5-8
- Check oil level in engine prior to starting. Add oil as needed according to specifications on back cover of this manual. See "Check Engine Oil Level" on page 5-8
- Check fluid level in transmission. Add fluid as needed according to specifications on back cover of this manual. See "Check Transmission Fluid Level" on page 5-10
- Check fluid level in differential, gearboxes, and/or planetaries prior to starting. Add fluid as needed according to specifications on back cover of this manual. See "Check Differential Fluid Level" on page 5-13
- Check coolant level. Add coolant as needed according to specifications on back cover of this manual. See the engine manufacturer's manual for details.
- Check hydraulic fluid level in the reservoir. See "Check Hydraulic Fluid Level" on page 5-10

## VEHICLE OPERATION

---

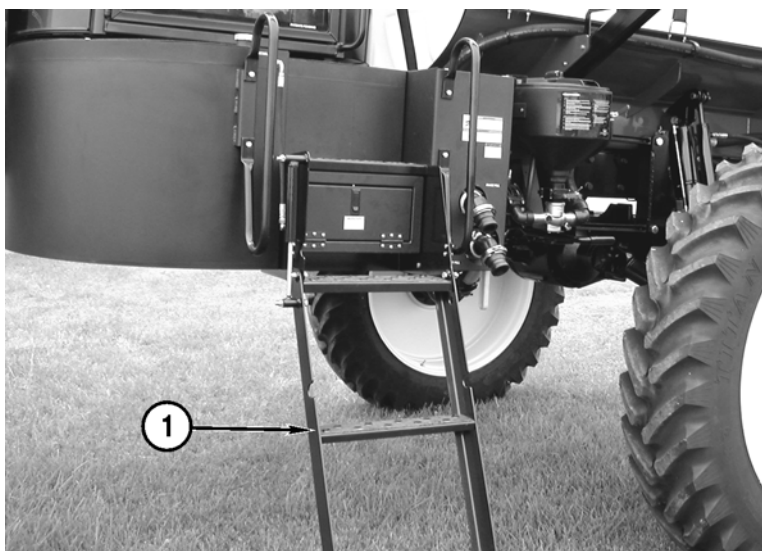
### Cab Overview

1. Air vents
2. Steering Column
3. Steering Wheel
4. T-Handle
5. Side Console
6. Air Seat
7. Vehicle Brakes
8. Padded Storage Unit
9. Cup Holder
10. Fire Extinguisher



### Cab Access Ladder

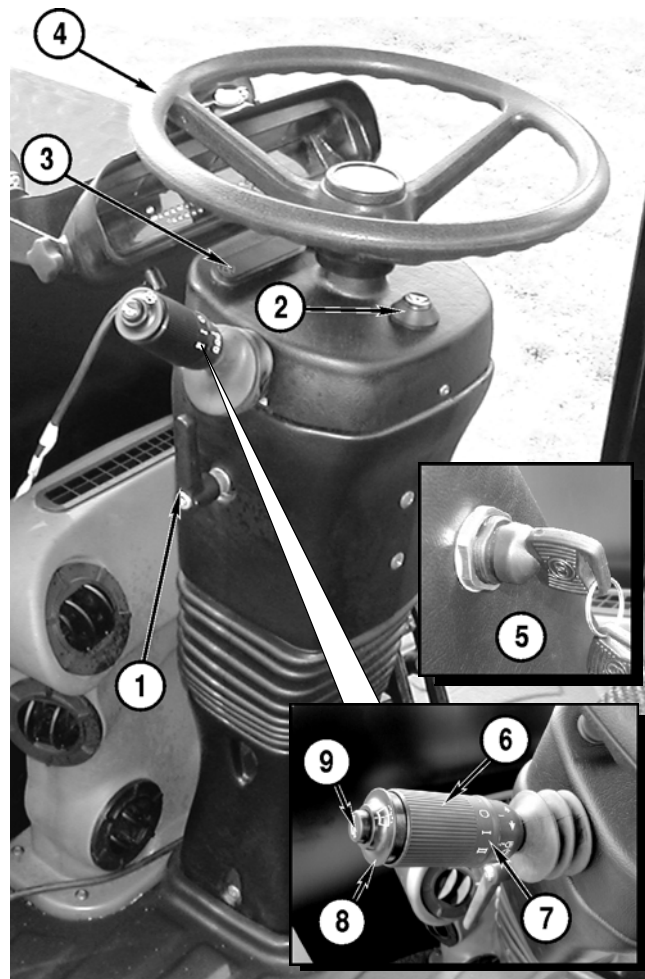
1. Access Ladder  
The cab access ladder is automatically actuated by the parking brake switch. When the parking brake is applied, the ladder folds down. When the parking brake is released, the ladder folds up.



## VEHICLE OPERATION

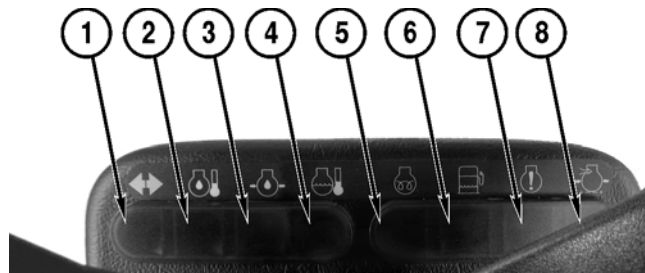
### Steering Column

- 1. Adjustment Lever**  
Turn the lever counter-clockwise to release the column. Set the tilt and telescope to the desired position. Turn the lever clockwise to lock the column.
- 2. Hazard Flasher Button**
- 3. Turn Signal Indicator and Warning Lamps**  
Warning lamps are explained below.
- 4. Steering Wheel**
- 5. Key Switch**  
Shown in "OFF" position. See Starting and Stopping the Engine for more details.
- 6. Turn Signal Lever**  
Push lever up for right turn signal, push down for left turn signal.
- 7. Windshield Wiper Switch**  
Turn lever to the "I" position for low speed wiper. Turn lever to the "II" position for high-speed wiper.
- 8. Windshield Washer**  
Push ring to operate washer.
- 9. Horn Button**  
Push to sound horn.



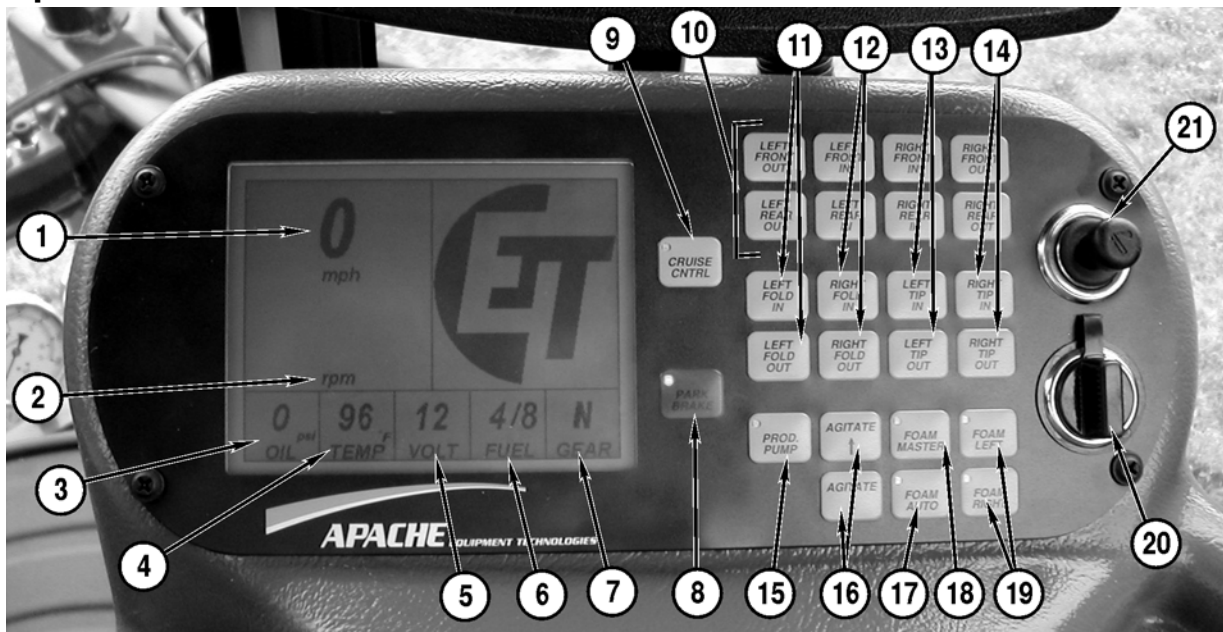
### Steering Column Lamps:

- 1. Turn Signal Indicator**  
Indicates a turn signal is flashing.
- 2. Hydraulic Fluid Temperature**  
Indicates the hydraulic fluid temperature is above 200°F [93.3°C]
- 3. Engine Oil Pressure**  
Indicates the engine oil pressure is not within normal operating range.
- 4. Engine Coolant Temperature**  
Indicates the engine coolant temperature is not within normal operating range.
- 5. Wait-To-Start**  
Indicates the operator should wait to start the engine when the key is first turned to the "ON" position. When the lamp is off, the engine is ready to start.
- 6. Not Used**
- 7. Check Engine Light**
- 8. Engine Air Filter**  
Indicates the air filter requires service.



## VEHICLE OPERATION

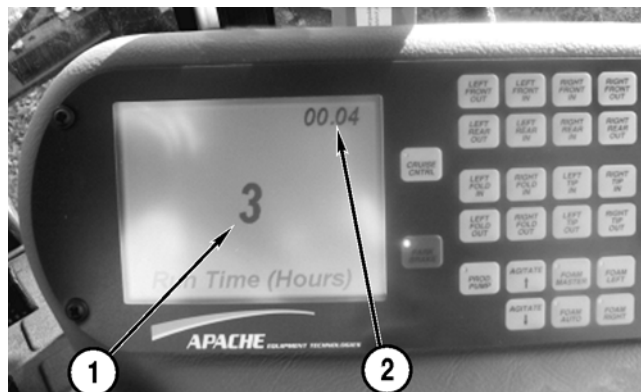
### Apache Console



- |                                  |  |
|----------------------------------|--|
| 1. MPH Readout                   | 12. Right Boom Fold In & Fold Out                |
| 2. Engine RPM                    | 13. Left Boom Tip In & Fold Out                  |
| 3. Engine Oil Pressure           | 14. Right Boom Tip In & Fold Out                 |
| 4. Engine Water Temperature      | 15. Product Pump On/Off Switch                   |
| 5. Voltage Level                 | 16. Agitation Pressure Increase & Decrease       |
| 6. Fuel Level                    | 17. Foam Master On/Off Switch                    |
| 7. Gear Indicator                | 18. Foam Auto On/Off                             |
| 8. Park Brake Switch             | 19. Turn Foam Drop On for Right Side & Left Side |
| 9. Cruise Control Master Switch  | 20. Auxillary Power Outlet                       |
| 10. Not Used on AS510 or AS710   | 21. Cigarette Lighter                            |
| 11. Left Boom Fold In & Fold Out |  |

The console displays the machine hours and software revision when the key is in the ON position and for five seconds at startup.

1. Number of hours on machine
2. Software revision number.



## VEHICLE OPERATION

### Raven 4400 Controller and T-Handle



1. **Raven 4400 Controller**
2. **Boom Rack**  
Press to move the boom rack up or down.
3. **Left Boom Tilt**  
Press to tilt the left boom up or down.
4. **Right Boom Tilt**  
Press to tilt the right boom up or down.
5. **Master Spray Switch**  
Press to turn all five spray sections on or off.
6. **Resume Button for Cruise**  
Press to resume cruise control.
7. **Set Button for Cruise**  
Press to set cruise control.
8. **Forward Trigger Button**
9. **Reverse Trigger Button**
10. **T-Handle**  
See "Vehicle Direction and Speed" on page 3-11 for complete operations.

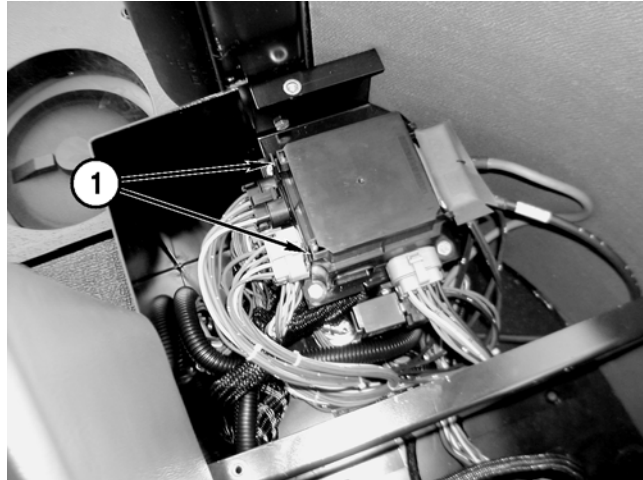
## VEHICLE OPERATION

### Fuse Block

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

Remove the thumbscrews and cover to access the fuse block.

Press the two tabs (1) to access the fuses.



### Climate Control and Light Switches

#### 1. Cab Temperature Control

Turn the switch toward blue (counter-clockwise) for cool. Turn the switch toward red (clockwise) for warm.

#### 2. Blower Fan Control

Turn the switch counter-clockwise for "OFF" and clockwise for "ON".

#### 3. Cab Front Lights

Press the switch down to turn "ON" and up to turn "OFF" the cab-mounted, front-facing, work lights.

#### 4. Cab Rear Lights

Press the switch down to turn "ON" and up to turn "OFF" the cab-mounted rear-facing, work lights.

#### 5. Driving Lights

Press the switch down to turn "ON" and up to turn "OFF" the bumper-mounted driving lights.

#### 6. Future Field Lights

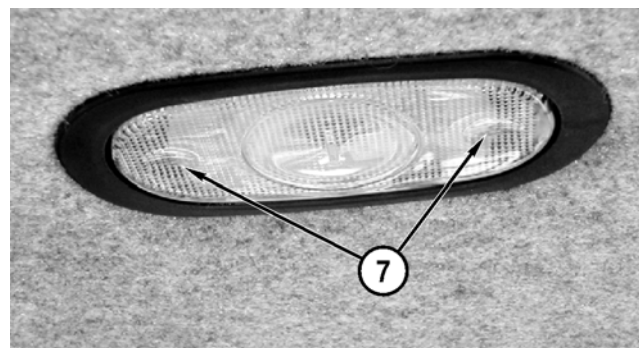
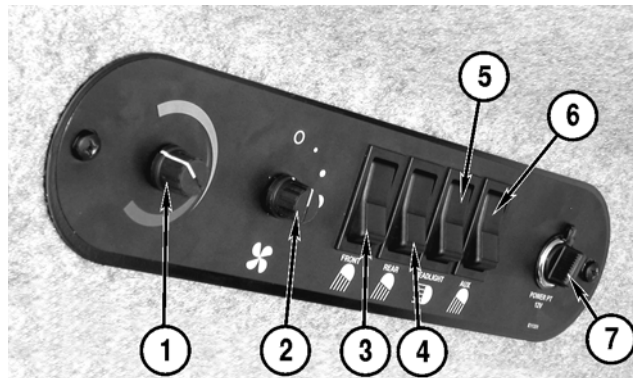
Light switch for future use. The supplied power wire (#34, white) is bundled with the flasher wires on the boom rack.

#### 7. Auxillary Power Outlet

#### 8. Dome Light

Press the dome light lens to turn the light on and off.

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



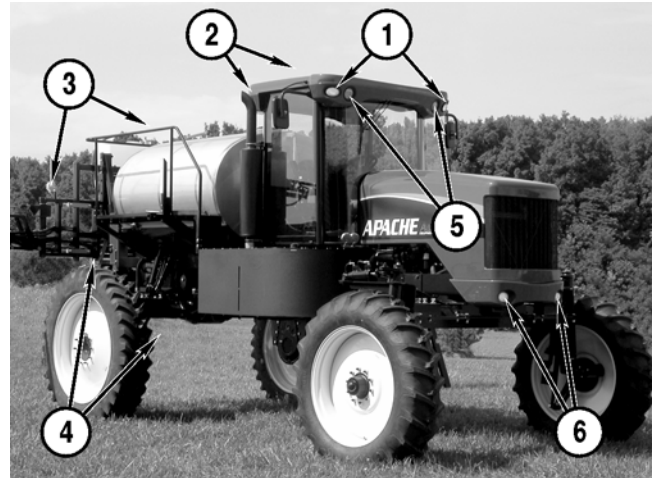


## VEHICLE OPERATION

---

### Vehicle Lighting

1. Cab Front Work Lights
2. Cab Rear Work Lights
3. Rear Hazard and Turn Signal Lights
4. Rear Hazard, Rear Turn Signal, and Tail Lights
5. Front Hazard and Turn Signal Lights
6. Driving Lights



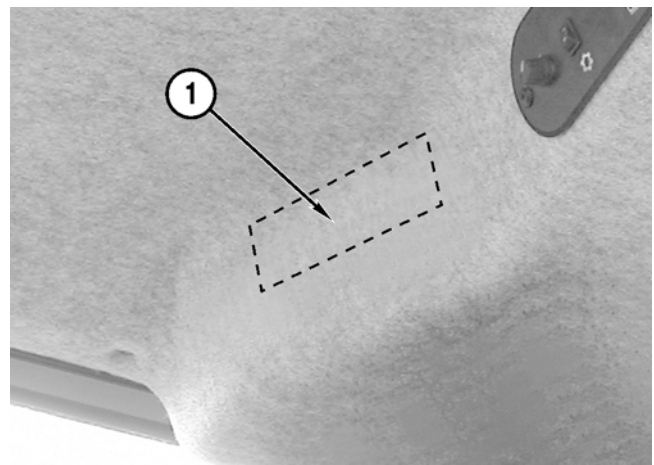
### AM/FM Radio with Weather Band

1. AM/FM Radio with Weather Band  
See manufacturer instructions for operation.



### CB Radio Knockout

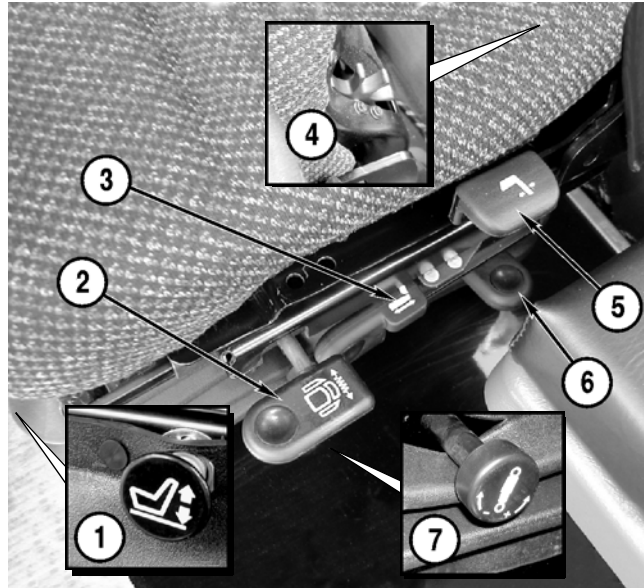
1. CB Radio Knockout  
The cab features an available knockout and power supply behind the headliner. The knockout location is in the upper left of the cab, mirrored from the AM/FM Radio location.



## VEHICLE OPERATION

### Seat Adjustment

1. **Height**  
Push the knob to raise the seat. Pull the knob to lower the seat.
2. **Lateral Isolator**  
Lift to allow side-to-side movement of the seat. Press to lock-out movement.
3. **Fore-Aft Position**  
Pull lever out to adjust seat forward or backward.
4. **Lumbar**  
Turn knob counter-clockwise for more lumbar support. Turn knob clockwise for less lumbar support.
5. **Backrest**  
Lift lever, position backrest, then release lever.
6. **Fore-Aft Isolator**  
Lift to allow front-to-back movement of the seat. Press to lock-out movement.
7. **Ride Firmness**  
Turn knob counter-clockwise for firm ride. Turn knob clockwise for soft ride.
8. **Armrest**  
Turn knob to adjust armrest angle.
9. **Seat Belt**



## VEHICLE OPERATION

### Starting and Stopping the Engine

#### Starting



## WARNING

**ALWAYS** start the engine from the operator's seat, the parking brake (1) applied, and seat belt fastened.

**DO NOT** attempt to start the engine by shorting across the starter terminals.



The key switch has 5 positions. Turn the key counter-clockwise as far as it will travel for the "ACC" position (1). The "ACC" position is not wired in the AS510 and AS710 Apache Sprayers. The first position clockwise is the "OFF" position (2). The next position clockwise is the "ON" position (3). The last position clockwise is the "START" position (5).

Turn the keyswitch to the "ON" position (3) and wait for the Wait-To-Start lamp on the steering column to go out.

Turn the key to the "START" position (5) and crank the engine. When the engine starts, release the key.

**IMPORTANT:** DO NOT crank the engine for more than 30 seconds at a time. Damage to the starter can occur. Allow two minutes for the starter to cool before cranking again.

If the engine does not start after four attempts, see the Troubleshooting section in the engine manufacturer's service manual or contact your dealer.

**IMPORTANT:** If the engine stalls under load, immediately place the T-handle in neutral and restart the engine. Failure to do so can cause damage to the turbocharger.

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.

**NOTE:** A constant warning tone will sound when the T-handle is moved from the neutral position if the transmission fluid temperature is too high. If this warning tone is heard, stop the engine and determine the cause.



## VEHICLE OPERATION

### 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

IMPORTANT: Before stopping an engine that has been operating under load, allow the engine to idle for 2 minutes to cool. Failure to do so can cause damage to the turbocharger.

Bring the vehicle to a complete stop. Shift the transmission to neutral (1), lower engine rpm and apply the parking brake (2).

Turn the key to the "OFF" position and remove the key.





## VEHICLE OPERATION

### Shifting Gears

The Apache Sprayer is equipped with a torque converter. This allows the Apache Sprayer to take off in any gear. Once the vehicle 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. Refer to the Gear Speed Range chart.

Gear Speed Ranges	
Gear	Speed (mph)
1st	0 to 5
2nd	0 to 9
3rd	0 to 16
4th	0 to 28

**Upshifting:** While the vehicle is in motion, bump and release the T-handle to the right to shift up to the next highest gear. Repeat this each time to upshift the transmission.

**Downshifting:** Pull back on the T-handle slightly to decrease engine rpm, apply brakes slightly, then bump and release the T-handle to the left once to downshift to the next lowest gear. When downshifting, make sure to bump and release the T-handle to the left to downshift 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 rpm's drop down to the appropriate speed range.

**IMPORTANT: DO NOT** shift the transmission into neutral while the vehicle is in motion. The transmission is only lubricated while in gear. "Coasting" will cause damage to the transmission.



## VEHICLE OPERATION

### Reverse

#### To move the Apache Sprayer in reverse:

Apply the vehicle brakes and release the parking brake.

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

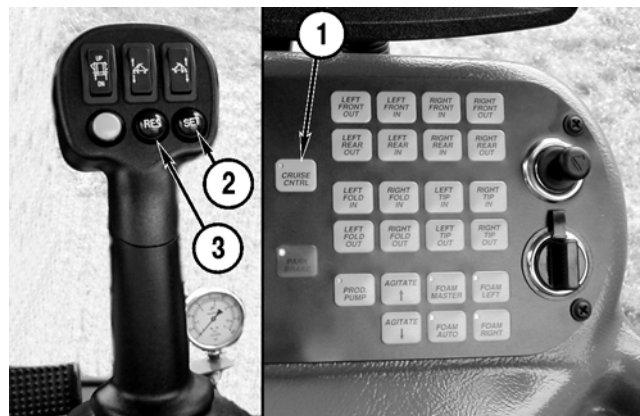
To shift into reverse from neutral, squeeze and hold the bottom trigger button (2) for 1.5 seconds on the T-handle until the transmission shifts into first gear reverse (the vehicle will begin rolling backward at this time). Push the T-handle forward to increase the engine rpm and ground speed. Pull the T-handle back to decrease the engine rpm.

NOTE: If the vehicle is moving in reverse and you squeeze either trigger button on the T-handle, the transmission will shift into neutral. Once the vehicle is below 1500 rpm and 3 mph, squeezing the top trigger button (1) on the T-handle and holding for 1.5 seconds until the machine shifts into forward will cause the transmission to revert to the previously selected forward gear.



### 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 T-handle. If the engine rpm's are decreased or increased, cruise control will stop. Press the resume (RES) button (3) on the joystick to return to the cruise control speed. If the transmission is up- or down-shifted, the cruise control will stop and lose its memory. Cruise control will operate between 4 and 20 mph. The RES button (3) increases speed by one mile per hour each time it is pressed while cruise control is set. The SET button (2) decreases speed by one mile per hour each time it is pressed while cruise control is set.



## VEHICLE OPERATION

---

### Towing

**IMPORTANT:** Towing a machine with driveshaft in place or with a damaged transmission may further damage the transmission.

**IMPORTANT:** DO NOT tow tractor if the rear differential has failed.

If the Apache Sprayer should become disabled and there is no engine, transmission, or differential failure, the vehicle may be towed for approximately 1 mile [1.6 km] at speeds less than 3 mph [4.8 km/h]. While towing the vehicle, 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, remove the drive shaft between the differential and the transmission. The vehicle may be towed up to 1 mile [1.6 km] at speeds less than 3 mph [4.8 km/h].

### Transmission Fluid Temperature Warning

A constant warning tone will sound if the transmission fluid temperature is too high. If the warning tone sounds, stop the vehicle immediately, shift the transmission to neutral and idle the engine at 900 to 1200 rpm. The transmission fluid temperature should drop and the warning tone will go off. If the temperature does not drop, stop the engine and determine the cause.

**NOTE:** Overheating generally occurs when operating the transmission in too high a gear or when the transmission fluid level is too low or too high. Check transmission fluid level or shift to a lower gear.



## VEHICLE OPERATION

### Hydraulic Fluid Temperature Warning

The warning lamp on the steering column will come on if the hydraulic fluid temperature is too high. If a warning lamp comes on, stop the vehicle immediately, switch the product pump to the “OFF” position, shift the transmission to neutral, and idle engine at 1800 to 2000 rpm. The hydraulic fluid temperature should drop and the warning lamp will go out. If the temperature does not drop, stop the engine and determine the cause.

NOTE: Overheating generally occurs when the hydraulic fluid level is too low.

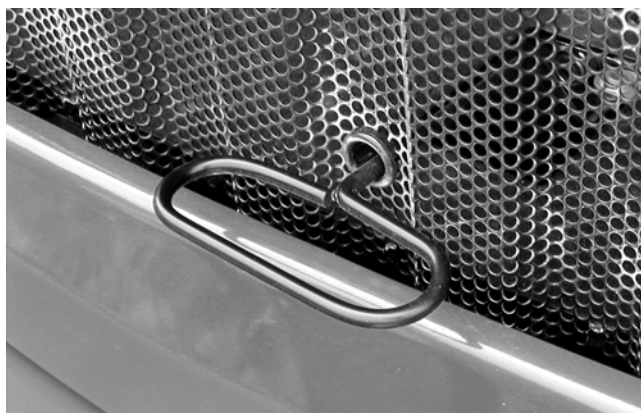


### Hood Release

IMPORTANT: Do not allow the engine compartment hood to swing open freely. Damage to the vehicle may result. Use the nylon strap under the hood to control the opening of the hood.

The engine compartment hood release is located on the front of the vehicle at the bottom of the grille.

Pull the lever to release the hood. Use the nylon strap under the hood to control the opening of the hood.

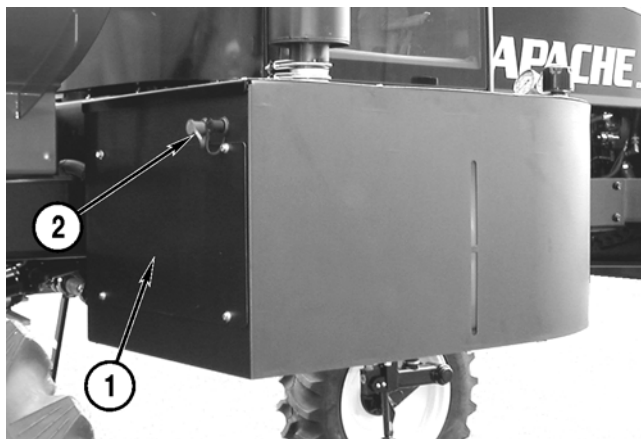


### Battery

The batteries are located in the battery box (1) on the right side of the vehicle.

Remove the four bolts and cover to access the batteries.

1. **Battery box**
2. **External positive and negative battery posts.**

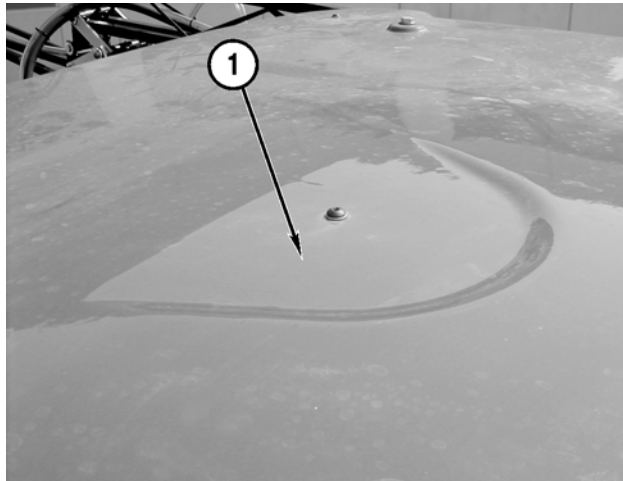


## VEHICLE OPERATION

---

### Antenna Mounting Plate

A steel plate is mounted under the recess in the roof of the cab (1) for magnetic base GPS and radio antennas.



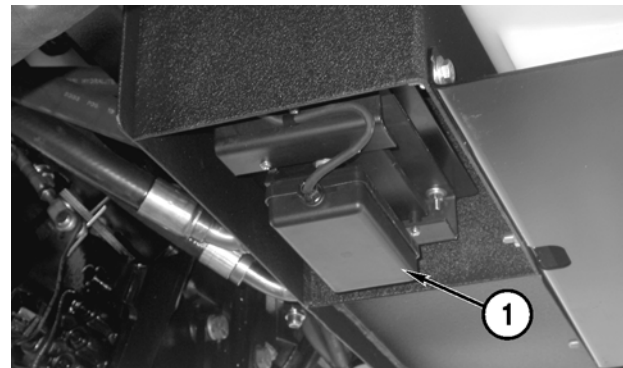
### Raven Drive Shaft Speed Sensor (Optional)

The optional Raven drive shaft speed sensor is located just behind the carrier bearing on the drive shaft.



### Raven Radar Gun (Optional)

The Raven radar gun is located on the right side of the vehicle, mounted under the battery box.



## VEHICLE OPERATION

---

### Raven Smart Trax and Auto Boom Control Box

**1. Optional Raven Smart Trax control box.**

This control box is located directly behind the Auto Boom control box on the right rear cab corner post. See the Raven Smart Trax operation book shipped with the Apache for complete operation, setup, and troubleshooting information.)

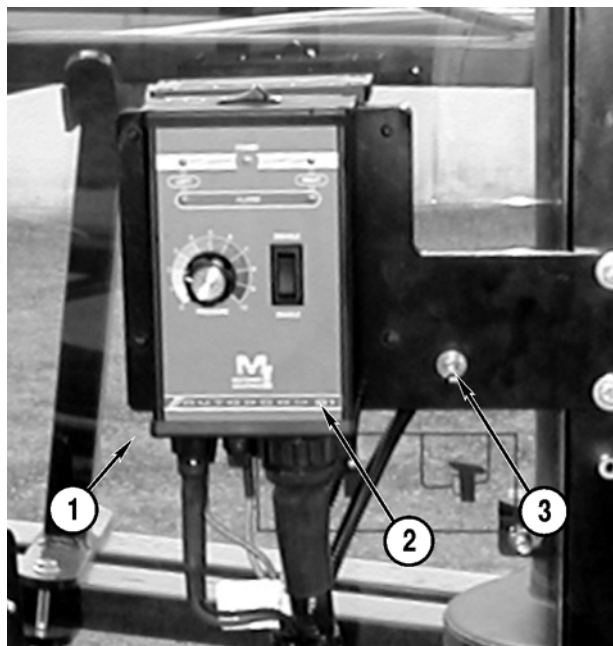
**2. Optional Raven Auto Boom Control Box**

See “Monitor Description” on page 4-26 for complete operation.

**3. On/Off switch for Raven Smart Trax.**

NOTE: The hydraulic control block for the Raven Smart Trax is located on the outside of the left frame rail directly behind the agitation valve.

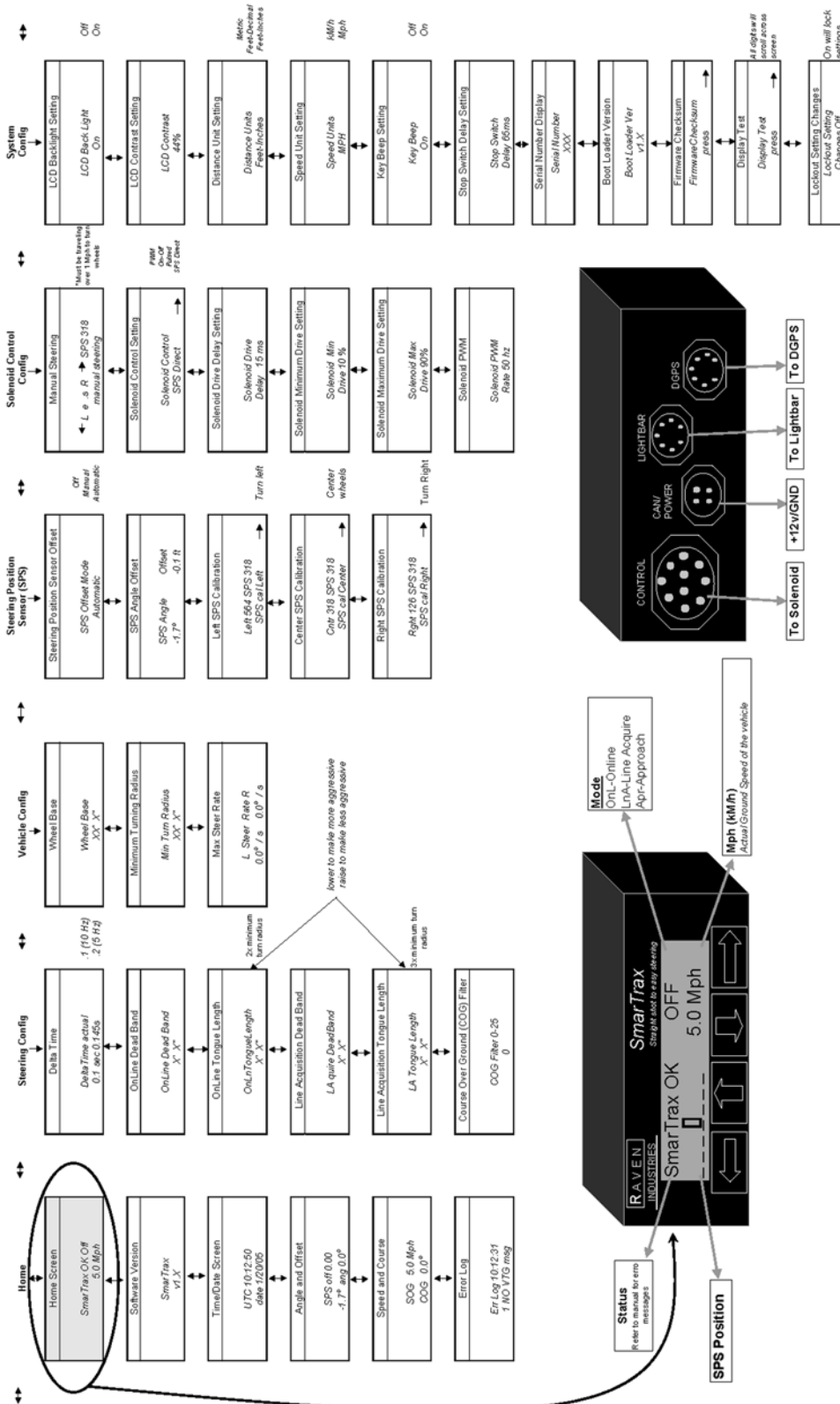
NOTE: The Raven Smart Trax is the only auto-steer option factory-installed on Apaches. If your Apache has a different auto-steer system, please contact your dealer.



# VEHICLE OPERATION

## Raven SmarTrax Controller Quick Start Guide

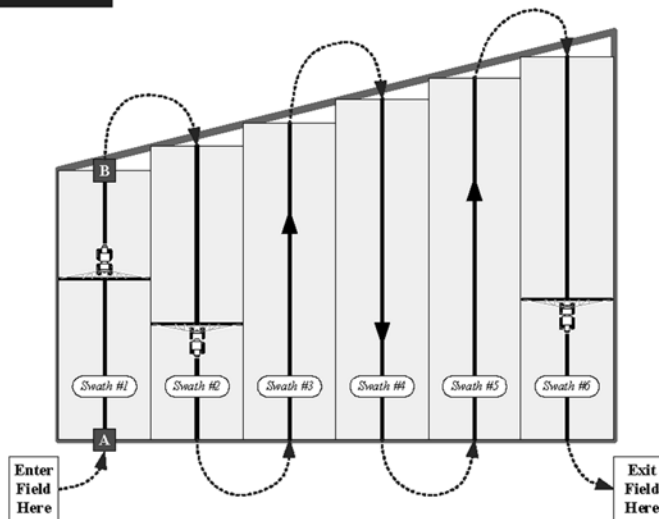
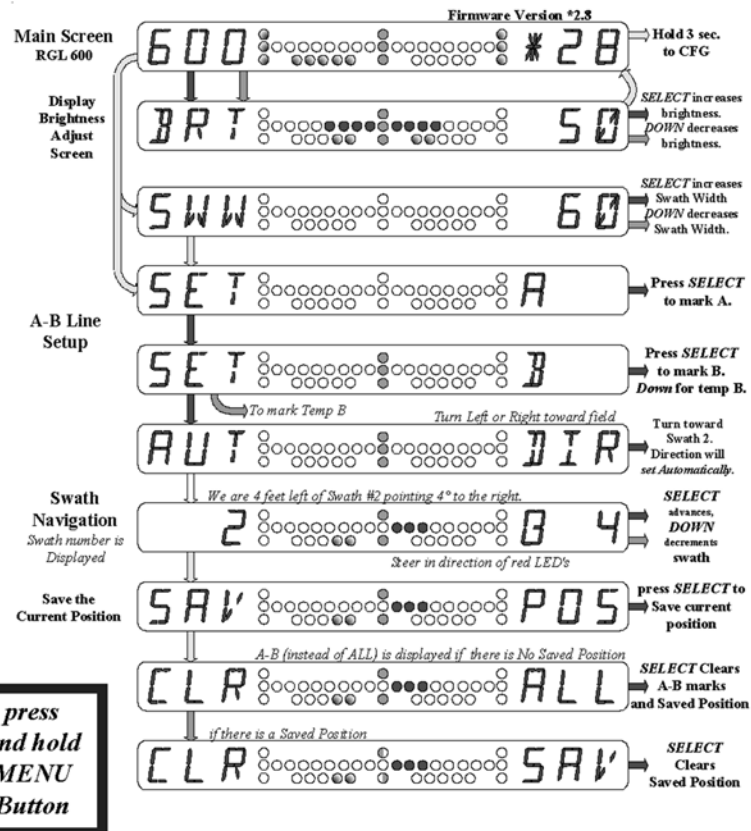
### SMARTRAX CONTROLLER



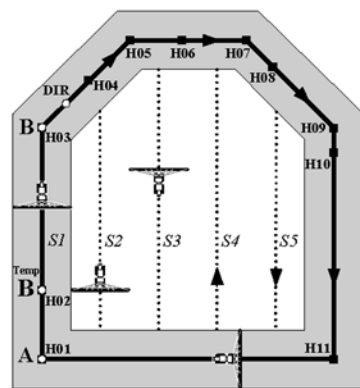
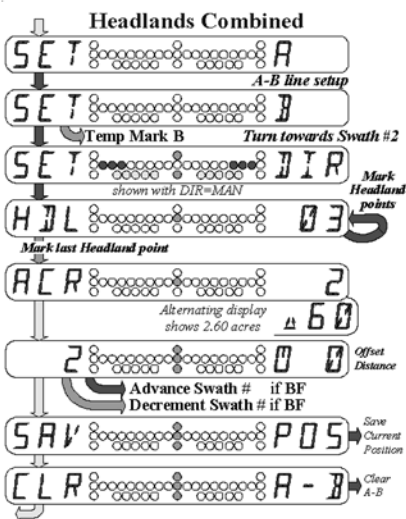
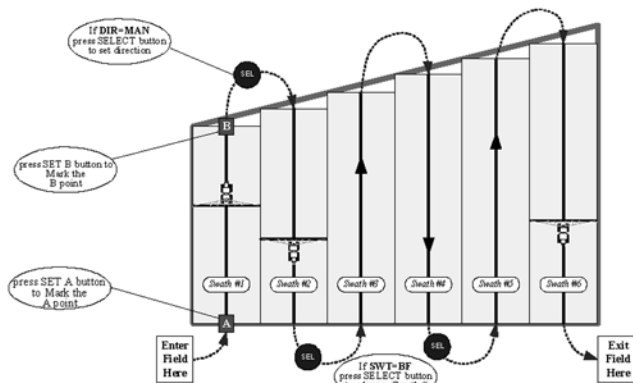
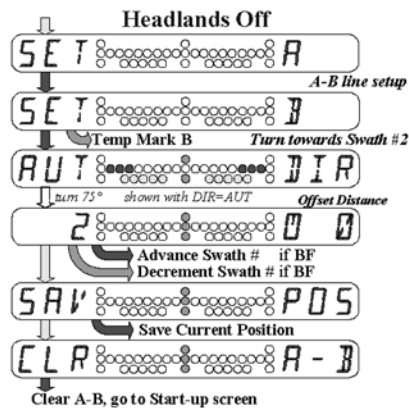
# VEHICLE OPERATION

## Raven Smartbar Quick Start Guide

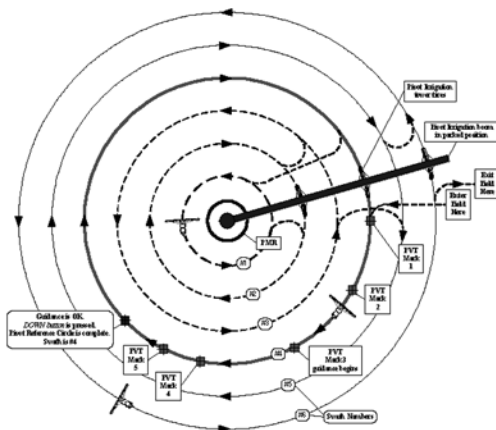
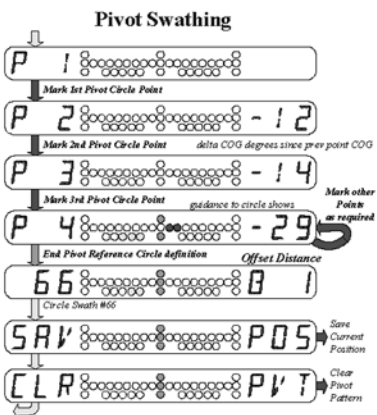
### RGL 600 Smartbar



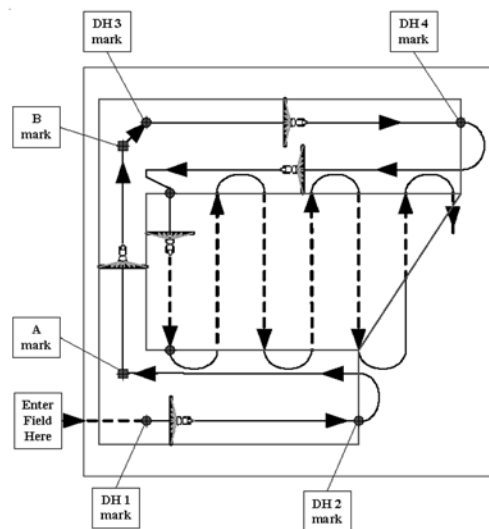
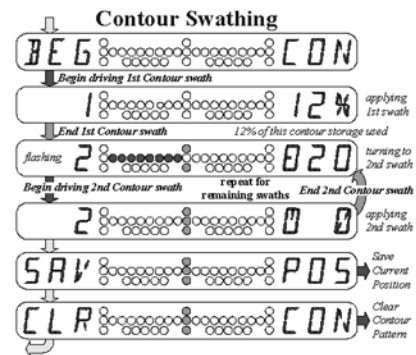
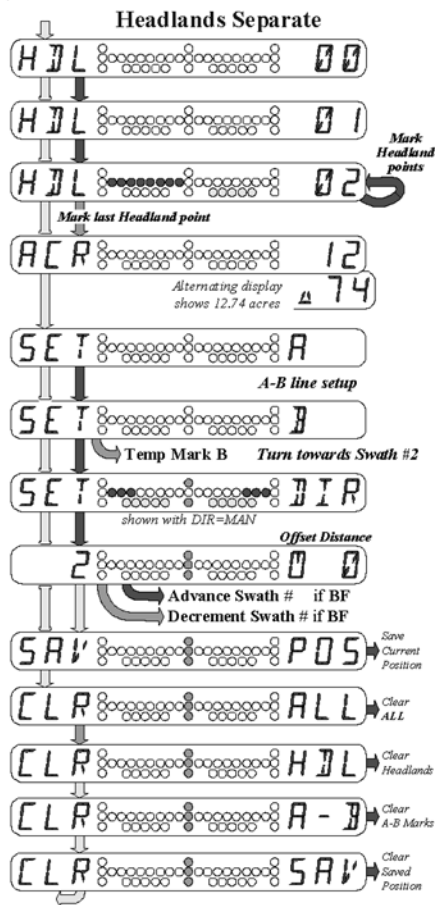
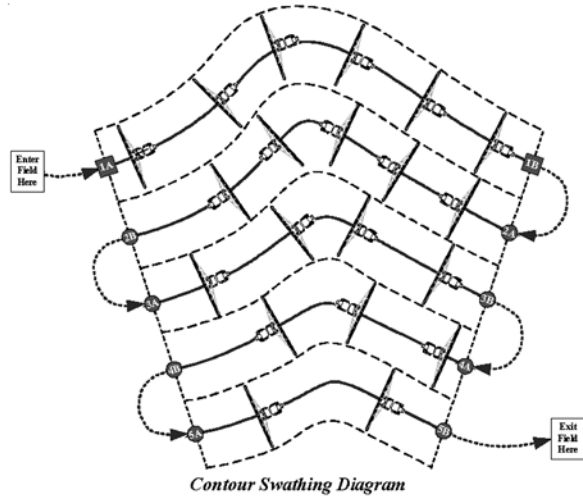
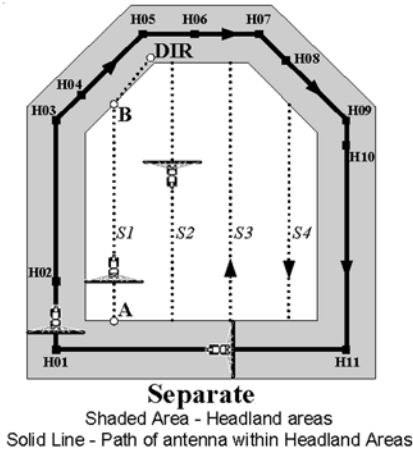
# VEHICLE OPERATION



**Combined**  
Shaded Area - Headland areas  
Solid Line - Path of antenna within headland Areas

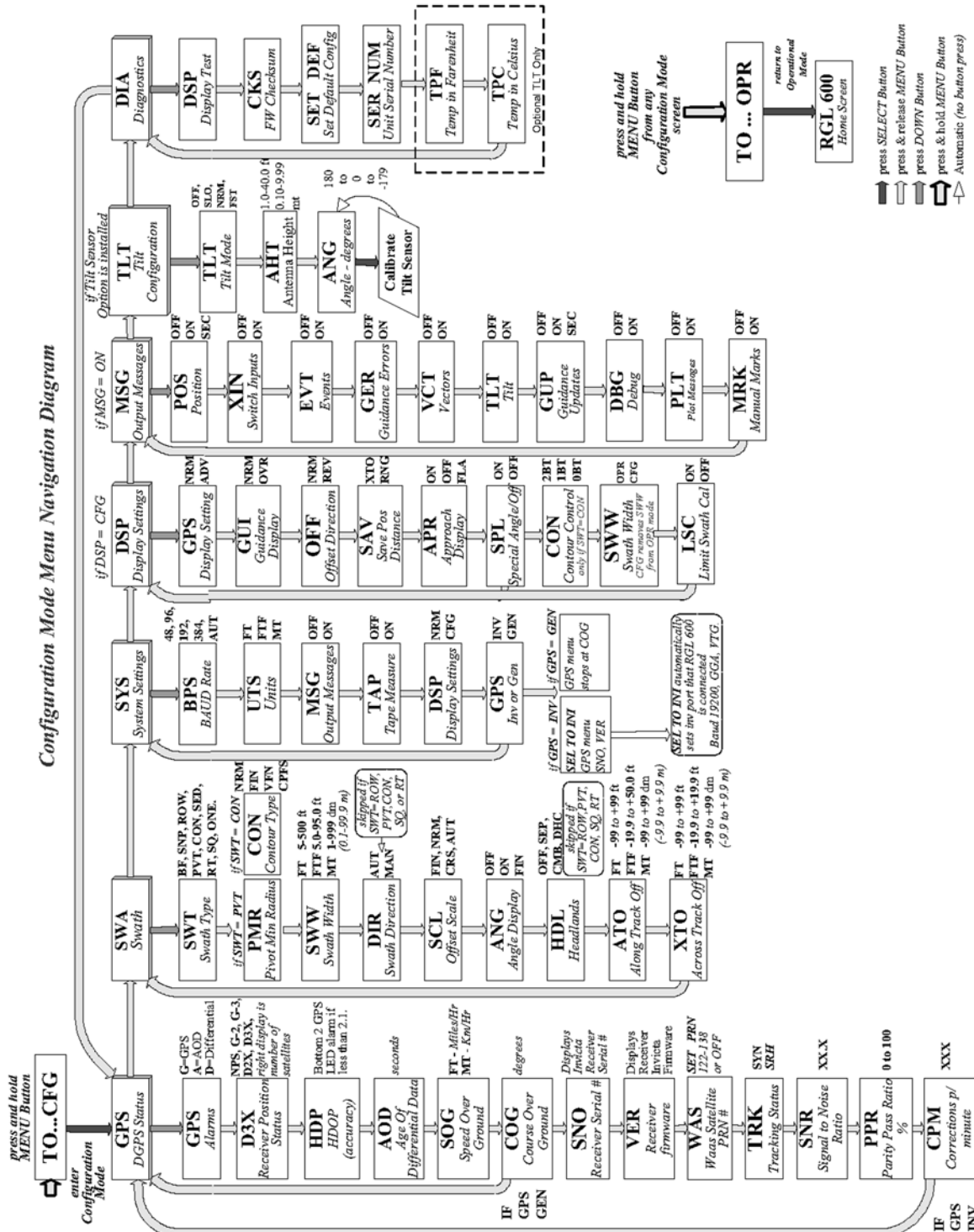


# VEHICLE OPERATION



# VEHICLE OPERATION

Configuration Mode Menu Navigation Diagram

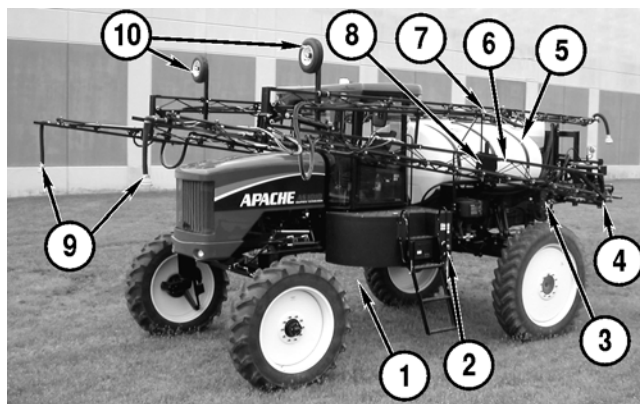




## WET SYSTEM OPERATION

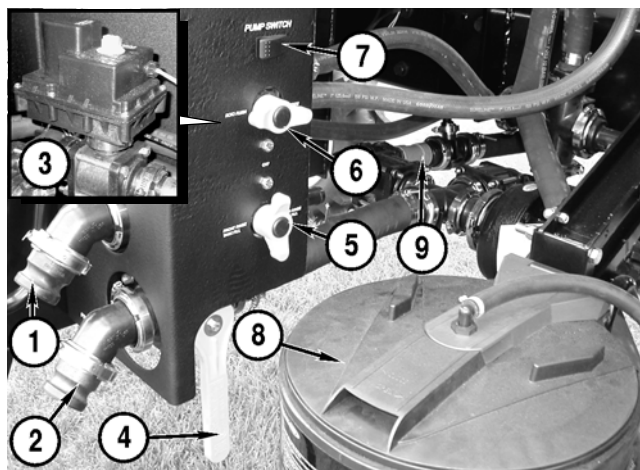
### Wet System Overview

1. Rinse Tank (mounted on opposite side)
2. Fill Station
3. Flowmeter
4. Boom Rack
5. Product Tank
6. Left Boom
7. Left Boom Tip
8. Boom cradle
9. Left and Right Foam Marker Nozzles
10. Auto Boom Wheels (if equipped)



### Fill Station

1. Rinse Tank Quick Fill
2. Product Tank Quick Fill
3. Agitation Valve  
This valve is electronically actuated and controlled by a switch on the side console in the cab.
4. Product Valve (shown in CLOSED position)
5. Rinse Tank Fill (shown in OFF position)
6. Roto-Flush/Agitate Valve (shown in Agitate position)  
Roto-Flush is optional on Apache sprayers.
7. Remote Product Pump Switch
8. Cleanload Chemical Educator
9. Check Valve for Rinse Tank

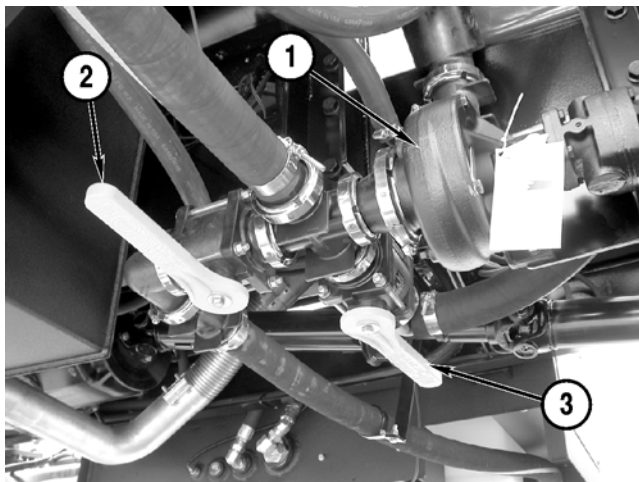


## WET SYSTEM OPERATION

---

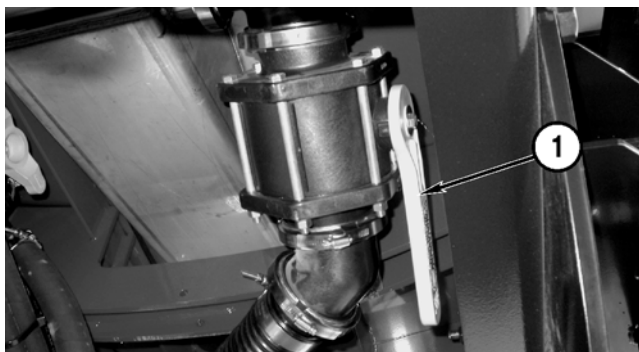
### Product Pump and Valves

1. **Product Pump**
2. **Rinse Tank Shutoff Valve**  
Shown in closed position.
3. **Product Tank Shutoff Valve**  
Shown in open position.



### Sump Valve

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



### Rinse and Foam Tank

1. **Rinse Tank**
2. **Foam Concentrate Bottle**



## WET SYSTEM OPERATION

---

### Second Rinse Tank (Optional)

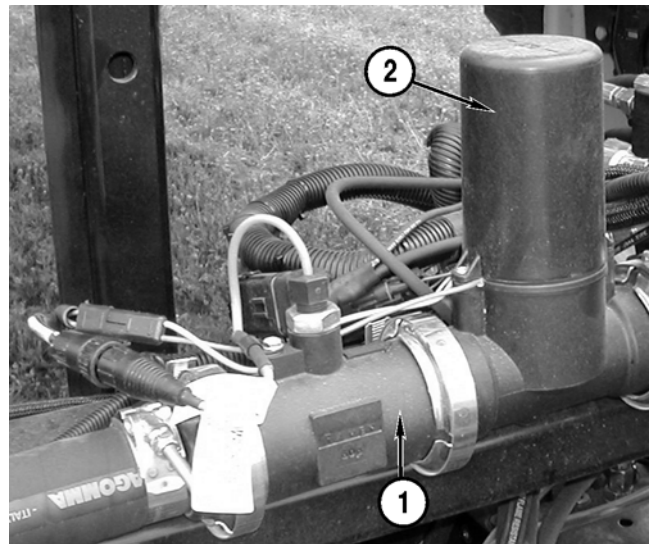
The second rinse tank is plumbed into the cross just above the product pump. This tank can be used to flush the product tank (with optional Roto-Flush) and/or the booms.



### Flow Control

#### Standard Flow

1. Raven Flowmeter
2. Raven Servo Valve



#### Electronic Boom Valves

The strainers (1) on the five electronic boom valves have 50mesh screens which must be cleaned periodically.



## WET SYSTEM OPERATION

### Raven 4400 Monitor

#### 1. Raven 4400 Monitor (optional)

On equipped Apache Sprayer models, the Raven 4400 Monitor is located on the right side console of the cab.

See the manufacturer's instructions, provided with the Apache Sprayer, for complete operating, calibration, and service information.

#### Monitor Calibration Information for the AS510 and AS710:

Valve cal - 2123

Speed cal - 615 (radar gun equipped)

Speed cal - 252 (drive shaft sensor)

Meter cal - See tag on the flowmeter, located on the rear boom rack. Record this number in a convenient location for future use.



NOTE: These are factory presets. All Raven controls must be calibrated before applying chemicals.

NOTE: The Raven radar gun, if equipped, is not factory calibrated. See the manufacturer's instructions, provided with the Apache Sprayer, for proper calibration.

NOTE: The Raven 4400 Monitor is the only console installed by Equipment Technologies, Inc. If your Apache Sprayer has a different console, please contact your Apache dealer for information.

## WET SYSTEM OPERATION

### Side Console



**1. Raven 4400 Controller**

The Master Switch must be in the OFF position to enable the yellow Master Boom switch on the T-handle.

**2. Cruise Control Master Switch**

**3. Left Boom Fold In and Out**

**4. Right Boom Fold In and Out**

**5. Left Boom Tip In and Out**

**6. Right Boom Tip In and Out**

**7. Not used on AS510 or AS710**

**8. Cigarette Lighter**

**9. Auxiliary Power Point**

**10. Foam Switch for Left and Right Side**

**11. Foam Master Switch**

**12. Foam Auto**

When switched on, foam can be switched from left to right using the yellow Master Switch on the T-handle.

**13. Agitate Increase and Decrease**

**14. Product Pump Switch**

**15. Parking Brake Switch**

A red light indicates when the parking brake is applied.

## WET SYSTEM OPERATION

---

### T-Handle

**1. Boom Master 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 all 5 spray sections on or off at the same time. This function requires that all five boom sections be turned ON and the Master Switch turned OFF on the Raven 4400 Controller.

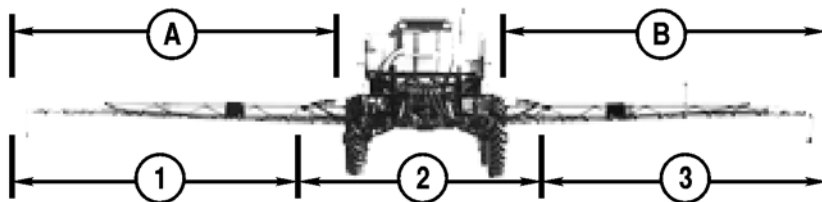


## WET SYSTEM OPERATION

---

### 60' Boom

As viewed from the rear of the vehicle.

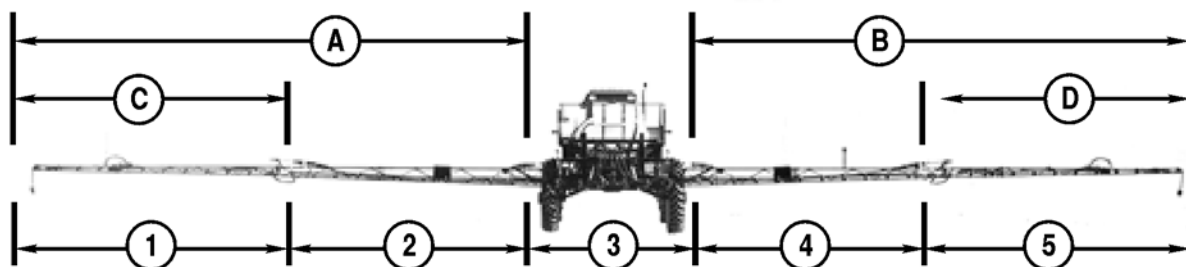


- A. Left Boom
- B. Right Boom

- 1. Sprayer Section 1
- 2. Sprayer Section 2
- 3. Sprayer Section 3

### 80' and 90' Boom

As viewed from the rear of the vehicle.



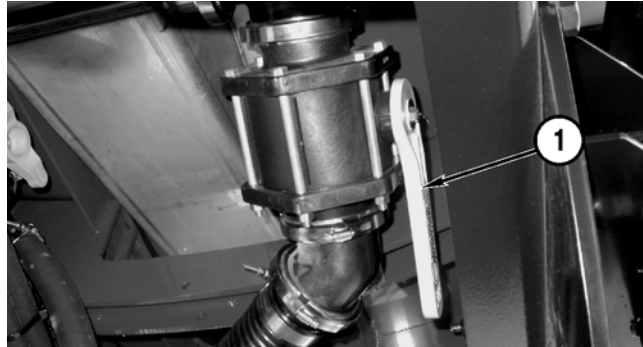
- A. Left Boom
- B. Right Boom
- C. Left Boom Tip
- D. Right Boom Tip

- 1. Sprayer Section 1
- 2. Sprayer Section 2
- 3. Sprayer Section 3
- 4. Sprayer Section 4
- 5. Sprayer Section 5

## WET SYSTEM OPERATION

### Filling Product Tank

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



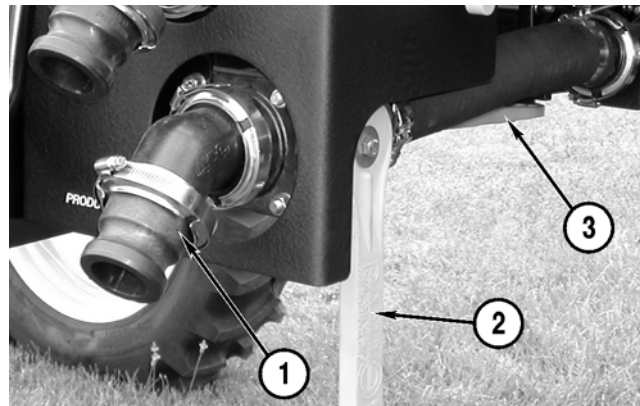
Remove the cap from the product quick fill inlet (1) and connect the hose from the nurse tank to the inlet.

Close the rinse tank valve (2).

Open the product fill valve (3), shown in the “OPEN” position, and fill tank to desired level.

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.

Set the rinse knob (2), shown in the “CLOSED” position, to “RINSE TANK FILL”.

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

Open the valve on the nurse tank and fill to desired level.

When filling is complete, close the valve on the nurse tank, then set the rinse knob (2) to “CLOSED”.

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





## WET SYSTEM OPERATION

---

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



**1. Optional Fence Row Nozzle**

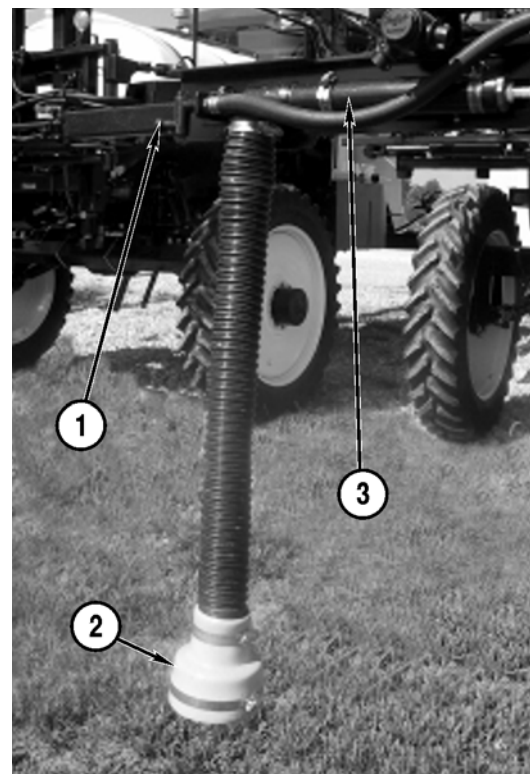
If your vehicle has optional fence row nozzles, they are located near the end of each boom. The electric control valve for nozzles is located on the rear boom tank.

**2. Optional Foam Marker Boot and Drop**

If your vehicle is equipped with the LandMark injection foam marker, then the boot is located near the end of each boom.

**3. Foam Marker Mixing Chamber**

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



# WET SYSTEM OPERATION

## Operating Booms

**IMPORTANT:** Do not fold or unfold the booms near power lines.

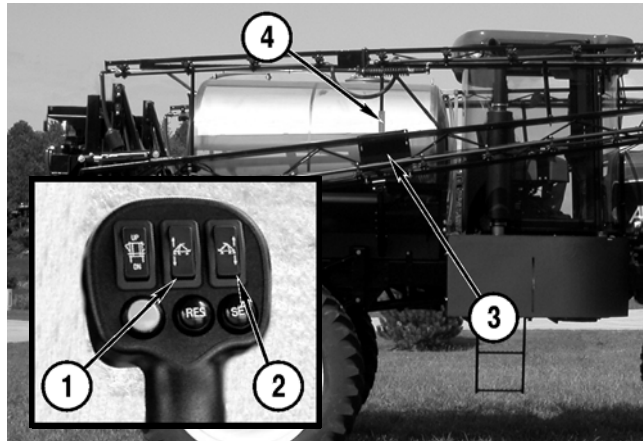
NOTE: Never fold or unfold the booms while the vehicle is moving.

NOTE: Never unfold the booms with the optional Auto Boom height control turned ON.

## Tilt to Remove Boom from Cradle

### All Boom Sizes

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



## Unfold Booms

**IMPORTANT:** Do not fold or unfold the booms near power lines.

NOTE: Never fold or unfold the booms while the vehicle is moving.

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

On the side console, press the top of the left and right boom fold switches (1) until the booms are fully extended. After the booms are fully extended, the boom tips can be unfolded.

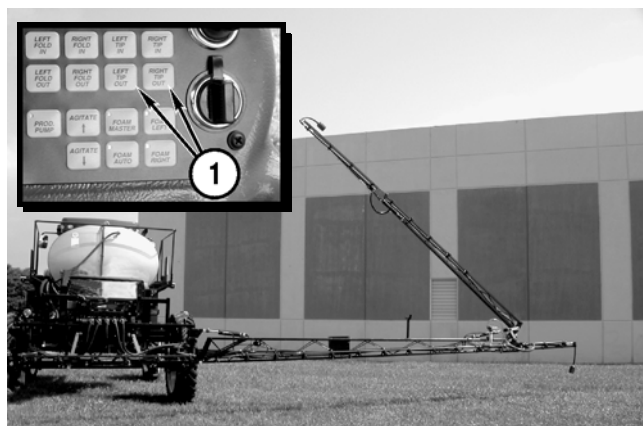


## Unfold Boom Tips

### All Boom Sizes

NOTE: The booms must be unfolded before the boom tips can be extended. The cab can be damaged if the booms are not unfolded properly.

On the side console, press the bottom of the left and right boom tip fold switches (1) until the boom tips are fully extended.

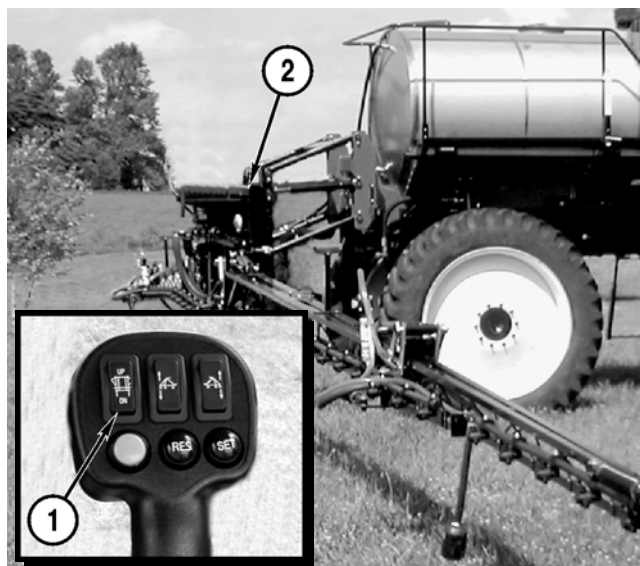


## WET SYSTEM OPERATION

### Height Adjustment

#### All Boom Sizes

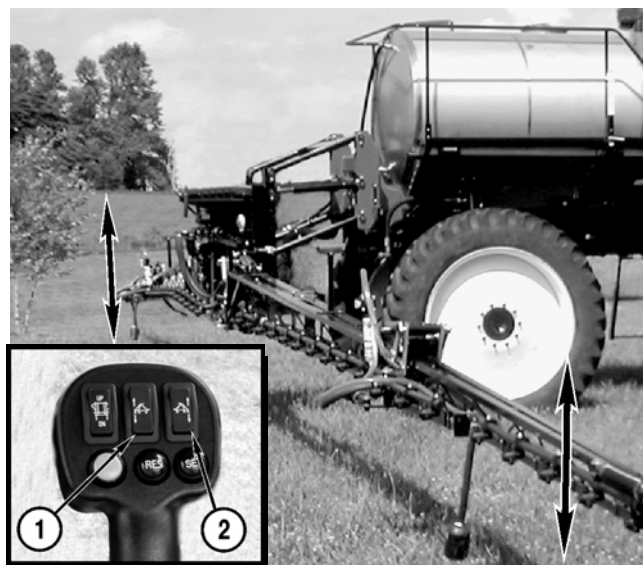
On the T-handle, press the bottom of the boom rack raise/lower switch (1) to lower the boom rack (2) to the desired height. Press the top of the switch to raise the boom rack.



### Tilt to Level Boom

#### All Boom Sizes

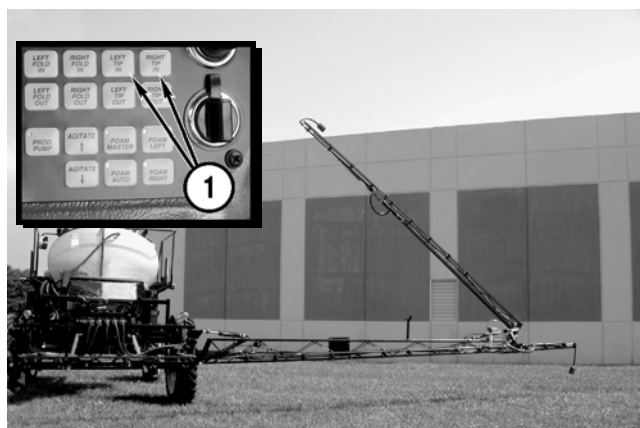
On the T-handle, use the left (1) and/or right (2) boom tilt raise/lower switches to adjust the booms to level. Press the top of the switches to tilt the boom up and the bottom of the switches to tilt the boom down.



### Fold Boom Tips

#### All Boom Sizes

On the side console, press the bottom of the left and right boom tip fold switches (1) until the boom tips are fully folded. After the boom tips are fully folded, the booms can be folded.



## WET SYSTEM OPERATION

### Fold Booms

**IMPORTANT:** Do not fold or unfold the booms near power lines.

**NOTE:** Never fold or unfold the booms while the vehicle is moving.

**NOTE:** Never fold the booms with the optional Auto Boom height control turned ON.

**NOTE:** 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.

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

**NOTE:** Tilt the booms up before folding.

### All Boom Sizes

On the side console, press the bottom of the left and right boom fold switches (1) until the booms are fully folded.

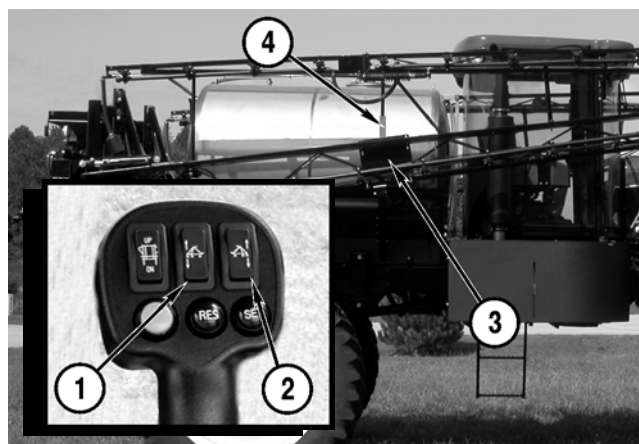


### Tilt to Return Boom to Cradle

#### All Boom Sizes

On the T-handle, 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.



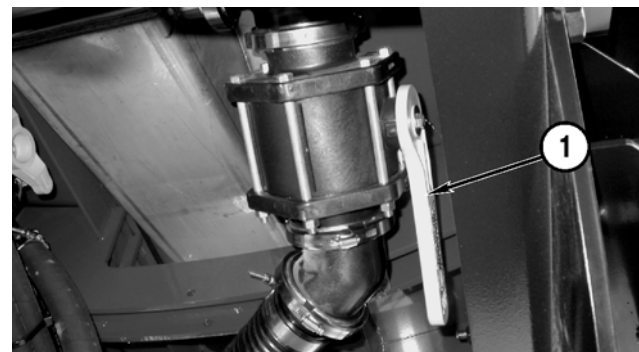
### Spraying

Make sure the product, rinse, and foam marker tanks are filled. See the appropriate tank filling instructions in this section.

Level the booms and boom tips using the tilt and unfold switches. See Boom Operation for details.

Set the boom height using the boom rack switch. See "Operating Booms" on page 4-10

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



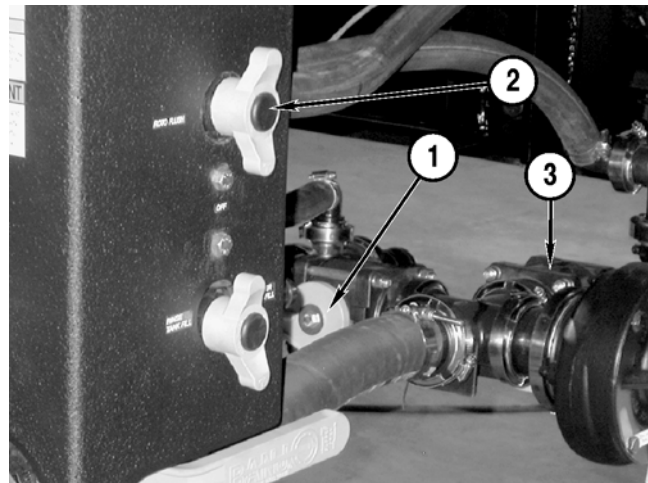
**IMPORTANT:** Always read and follow all chemical labels and follow all federal and state laws when applying chemicals.

## WET SYSTEM OPERATION

Close the rinse tank valve (1).

Set the flush/agitation knob (2), shown in the “CLOSED” position, to “AGITATION”.

Open the product valve (3).



The product strainer features a 50 mesh screen which should be checked and cleaned after every 50 hours of operation or as needed.

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



Set the Raven 4400 Monitor power switch to the “ON” position and check the settings. Select a saved flow rate or enter the desired rate. See the Raven Manual supplied with the Apache Sprayer for complete operating instructions.

NOTE: The Raven 4400 Controller is the only factory-installed controller. If you have a different controller, contact your dealer for information.



## WET SYSTEM OPERATION

Set the Raven Sprayer Control master switch (1) to the “OFF” position.

Set the product pump switch (2) to the “ON” position.

Set the desired boom section switches (3) 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.**



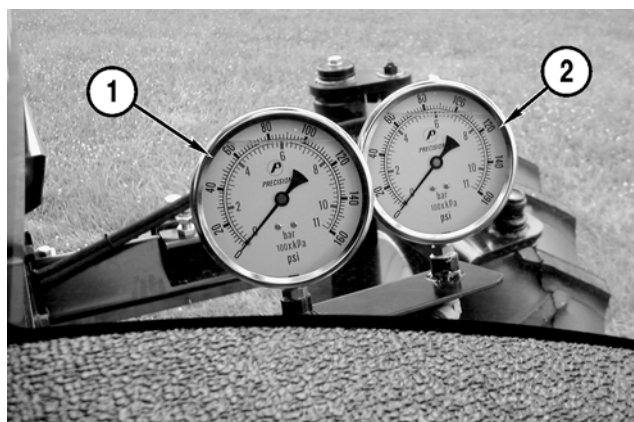
The agitation (1) and boom (2) pressure gauges are mounted outside at the lower right of the cab.

The agitation gauge reads pressure at the agitation valve.

The boom pressure gauge reads pressure from the five bank boom valves.

**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.



## WET SYSTEM OPERATION

Select an appropriate gear for the desired vehicle speed during spraying. See “Shifting Gears” on page 3-12 Under typical operating conditions, second or third gear is recommended.

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

Use the Raven Sprayer Control boom switches (2) to start and stop product flow to individual boom sections. The Raven Sprayer Control will automatically adjust the product flow for the remaining sections.

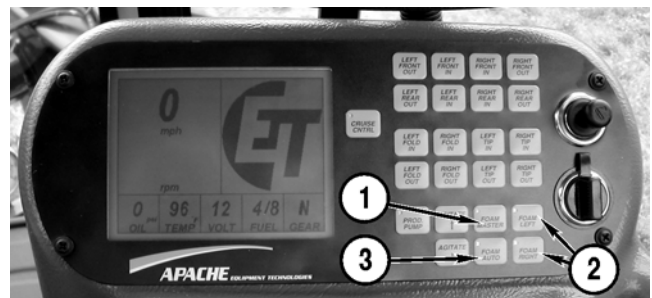


### Operating Foam Marker

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 split 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.

NOTE: When the foam marker is turned ON, foam will drop from the left side until the right side is chosen.



### 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 you turn the boom section switches on or off with the yellow master spray switch on the T-handle, the foam will switch from left to right.

NOTE: The yellow master spray switch on the T-handle must be turned OFF before the Auto Foam feature is activated.

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

NOTE: After filling the foam tank, the foam marker may need to run for one to two minutes before the foam begins.

## WET SYSTEM OPERATION

### 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.

**IMPORTANT:** 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

Reference the diagram on the following page.

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.

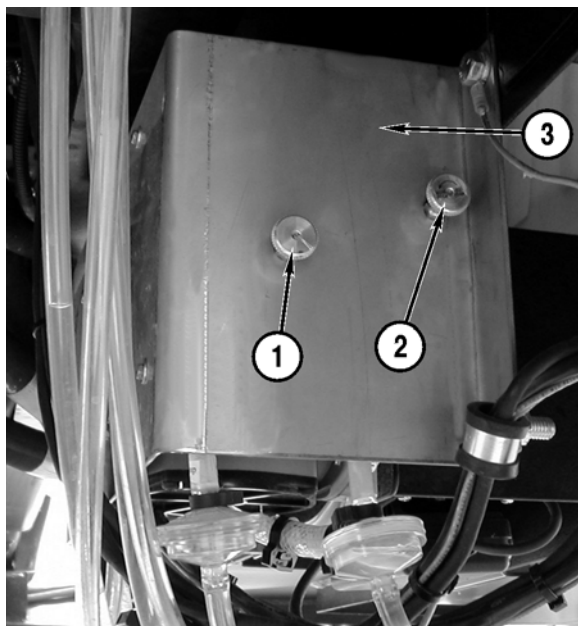
To adjust the total foam output, open the “output valve” (2) by turning the knob counterclockwise. Adjust as needed.

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

**NOTE:** The water pump and air compressor are located behind this panel (3), on the back side of the hydraulic tank.

When the foam marker is set properly, quality foam will be produced at 60 drops per minute (see chart on the following page). This foam should stick to your hand when turned upside down.

**NOTE:** The foam marker pulls water from the rinse tank on the right side of the vehicle to create foam.





## WET SYSTEM OPERATION

---

Output (gpm)	Drops per Minute (based on a 3" boot)	Foam Spacing @ 5 mph	Foam Spacing @ 10 mph	Foam Spacing @ 15 mph
5	62	7.1 ft	14.2 ft	21.3 ft

### 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:

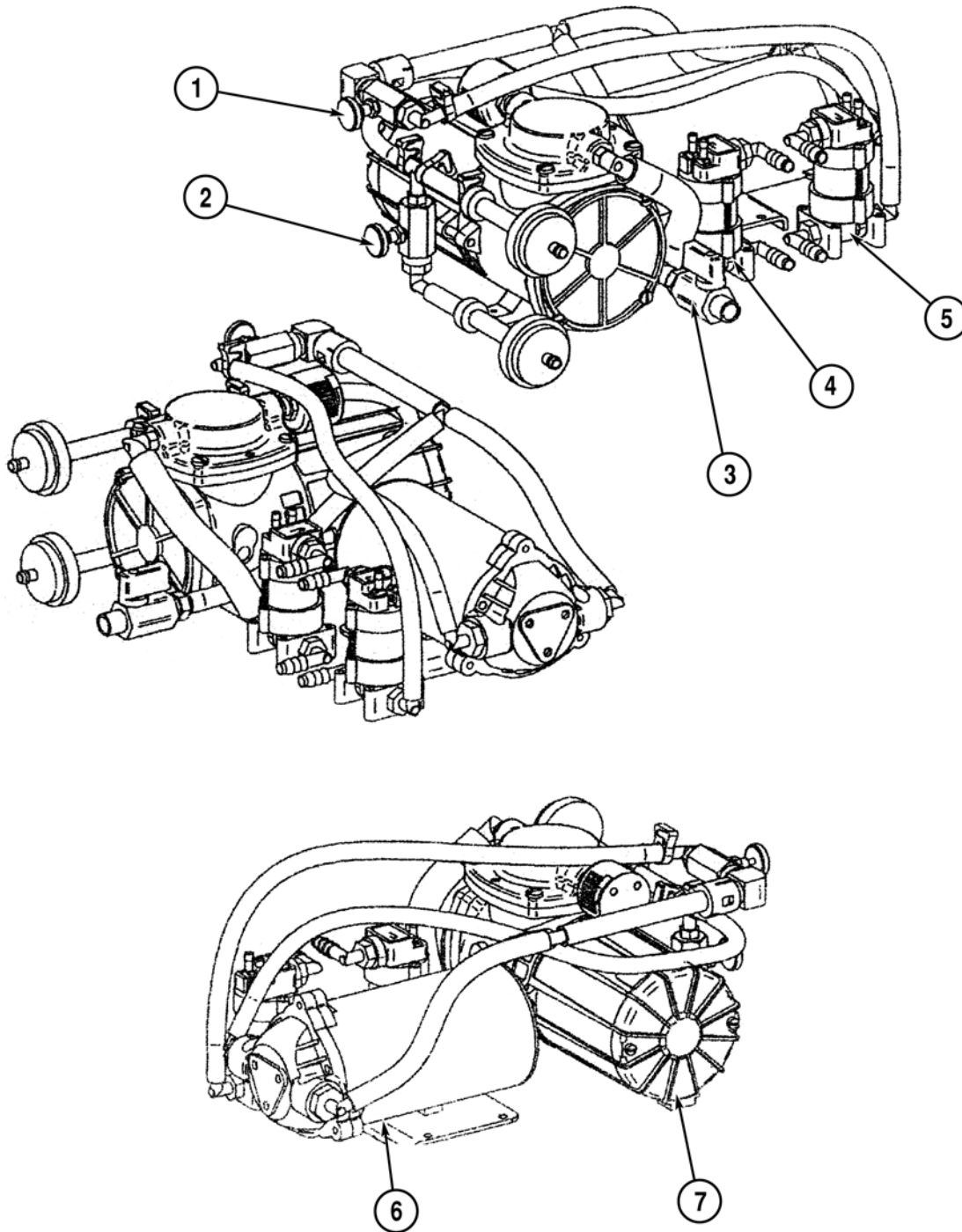
1. Pull the suction tube out of the tank and expose it to the air.
2. Close the soap valve and run the system for 10 to 15 seconds to clear the foam solution from the pump and solenoids.

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.

## WET SYSTEM OPERATION

---



**1. Output Valve**  
Labeled "More Foam Less Foam"

**2. Soap Injection Valve**

**3. Priming Valve**

**4. Ail Solenoid**

**5. Soap Solenoid**

**6. Liquid Pump**

**7. Thomas Air Compressor**

## WET SYSTEM OPERATION

### Flushing Product Tank

(with optional Roto-Flush)

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

**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.**

Fill the rinse tank with clean, fresh, water. See “Filling Rinse Tank” on page 4-8

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

Turn the Agitate/Roto-Flush knob to “ROTO-FLUSH” (1).

Start the engine.

Use the Agitation switch on the side console to increase agitation to its highest level.

Set the product pump switch to the “ON” position.

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

After the tank is rinsed, return the T-handle to “IDLE”, set the product pump switch to “OFF”, close the rinse tank valve (2), and turn the Agitate/Roto-Flush knob (1) to “OFF”.



## WET SYSTEM OPERATION

---

### Flushing Booms

Open the product valve (1), set the product pump switch to the “ON” position, increase engine speed to 1800 rpm, unfold the booms, turn the agitate/roto-flush knob to “ROTO-FLUSH”, and set the boom section switches to the “ON” position.

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

**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.**

After the booms are flushed, return the engine speed to “IDLE”, set the boom section switches to “OFF”, set the product pump switch to “OFF”, close the rinse tank valve (2), set Agitate/Roto-Flush knob to “AGITATE”, return agitate switch to original setting, fold the booms, and turn off the engine.



### CAUTION

CAUTION: Spray contaminated rinse water in a safe location in accordance to chemical label recommendations and local laws.

Follow chemical labels for proper rinsing procedure. Some chemicals may require multiple tank flushings.

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

## WET SYSTEM OPERATION

---

### Flushing Wet System

(without optional Roto-Flush)

#### CAUTION

CAUTION: Spray contaminated rinse water in a safe location in accordance to chemical label recommendations and local laws.

Follow chemical labels for proper rinsing procedure. Some chemicals may require multiple tank flushings

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

**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.**

Fill the rinse tank with clean, fresh, water. See "Filling Rinse Tank" on page 4-8

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

Start the engine. Decrease the agitation to off using the switch on the side console.

Unfold the booms and boom tips and lower the boom rack as far as possible.

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



## WET SYSTEM OPERATION

Set the Raven Sprayer Control master switch (1) to the “OFF” position.

Set the product pump switch (2) to the “ON” position.

Set all the boom section switches (3) to the “ON” position.

Press the master spray button on the T-handle to begin spraying.

**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.**

After the booms are flushed, set the boom switches to “OFF”, set the product switch to “OFF”, fold the booms, and return all valves to spraying positions.



## WET SYSTEM OPERATION

### Cleanload Chemical Eductor

#### Startup

1. All Cleanload valves must be closed prior to starting: inlet ball valve (1), knife valve (2), and hopper rinse ball valve.
2. Open lid to check for foreign objects which may hinder performance or contaminate the system.
3. Close and lock lid by turning cover clockwise.
4. Divert pump flow to the Cleanload inlet line. A pressure of 30 PSI minimum and 150 PSI maximum must be used. Highest 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 knife valve (2), located on the bottom of hopper, by pushing the red handle in toward the eductor.
7. Unlock and open the lid slowly by turning the cover counterclockwise.

#### Loading Liquid or Powdered Chemical into Hopper

8. Pour required amount of chemical into the hopper. Avoid splashing liquids or powdered chemicals outside of the hopper.
9. 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.
10. Rinse the Cleanload hopper. Close and lock the lid by turning the cover clockwise. Release the safety locking band on the hopper rinse ball valve (1) and open the valve for 20 seconds. Close the ball valve (1) and return the locking band to the locked position.
11. Open the lid and inspect for chemical residue. Repeat step 10 as necessary.
12. Close the knife valve (2) by pulling the red handle out towards you. Turn inlet (yellow handle) off.



## WET SYSTEM OPERATION

---

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 maximum).

8. Insert lance body with o-ring into eductor until the o-ring is sealed.
9. Use the free end of the lance to pierce bag or container to vacuum powdered or liquid chemical.
10. Rinse lance. Place lance end into a clean container of water to rinse lance assembly.
11. Remove lance body from eductor and drain any remaining fluid into hopper.
12. Close knife valve (red handle). Turn inlet valve (yellow handle) off.

### Shutdown

1. Ensure that:
  - All valves are closed. Be sure to close knife valve first. (Close by pulling red handle out towards you.)
  - 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.

NOTE: Do not store a contaminated lance in the Apache Sprayer cab.



## WET SYSTEM OPERATION

---

### Optional Raven Auto Boom Height Control

The Raven auto boom height control box (1) is located on the right rear corner post of the cab. See "Troubleshooting System Problems" on page 4-30.

**NOTE:** The hydraulic control block of the auto boom is located on the rear boom rack.

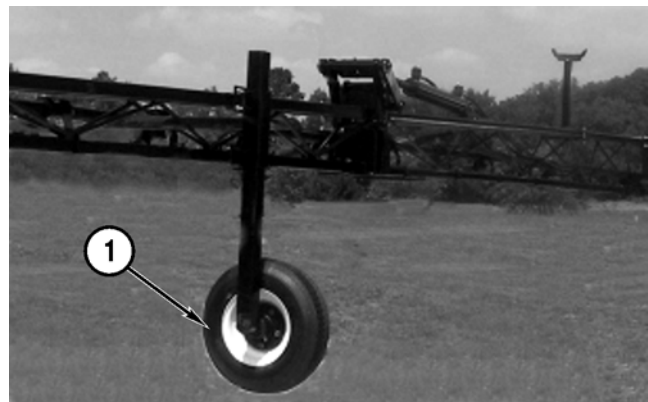
**NOTE:** The Raven auto boom height control is factory-installed. If your vehicle has a different height control system, contact your dealer.



### Raven Auto Boom Wheel for G1 Systems

The Raven auto boom wheel (1) is located on the intermediate section of both booms.

Adjust the wheel height according to the ground clearance needed.



## Raven Industries Autoboom Calibration Guide for G1 Systems

### Introduction

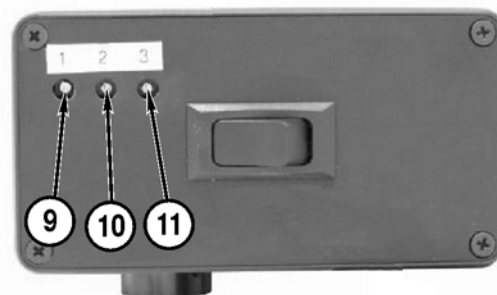
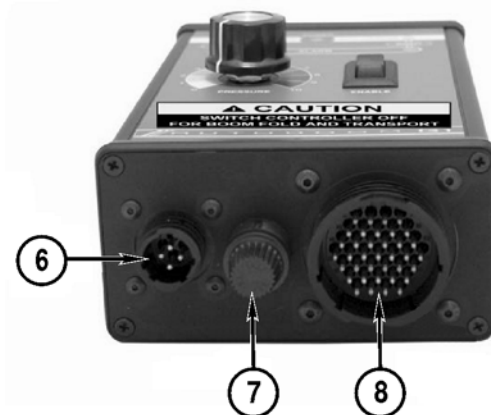
The Raven Autoboom system is designed to provide worry-free operation of your hydraulically controlled booms. Once set up the system is very easy to use and requires almost no attention. When first installed the system needs to be calibrated. This is accomplished with a system that has been warmed up and has its hydraulic oil at normal operating temperature. If you fail to warm the system may not perform correctly. Also it is important to make sure that the machine has been throttled up sufficient engine speed to ensure the hydraulic pump is able to supply full flow to the system.

**NOTE:** For open center hydraulic models all calibration procedures should be done at full engine rpm.

## WET SYSTEM OPERATION

### Monitor Description

1. **ON/OFF Power Switch**
2. **Left & Right Auto Pressure “ON” Lights**
3. **Left & Right Pressure Alarm Lights**  
Indicates when the weight on the wheels, sensed by reading pressure, is higher than normal. It is also a reminder to the operator to enable the system. Failure to do so can result in boom damage.
4. **Pressure Control Dial**  
Adjusts the pressure to the boom cylinders. Allows a setting of weight on the wheels from minimum (zero position) to maximum (ten position).
5. **Enable/Disable Switch**  
Use to engage or disable the system.
6. **12 VDC Power Cable Connection**
7. **20 Amp Replaceable Fuse**
8. **Main System Cable Connector**
9. **Alarm Set Screw**  
Use to set the alarm for high pressure. Turning the screw counterclockwise increases the pressure that will trigger the alarm when exceeded. See number 3 for the description of the alarm.
10. **Maximum Boom Pressure Set Screw**  
Use to set the maximum weight felt on the wheels. Turning the screw counterclockwise increases the system pressure which reduces the weight of the wheels on the ground.
11. **Minimum Boom Set Screw**  
Use to set the minimum weight felt on the wheels. Turning the screw clockwise increases the system pressure which reduces the weight of the wheels on the ground.



## WET SYSTEM OPERATION

**NOTE:** It is very important to follow these steps in order. The system can be calibrated incorrectly resulting in poor system performance or boom damage.

### Calibration Procedure G1 Monitor

#### 1. System Preparation

- Insure installation of Autoboom is complete. If not, complete installation instructions before proceeding with calibration.
- Warm the system to normal operating temperatures.
- Adjust the engine rpm up to a level to allow full hydraulic capacity from the hydraulic system.
- Unfold the booms and set the wheels on the ground.
- Turn the pressure dial (4) on the controller to zero.

#### 2. System Calibration: Test for Proper Installation.

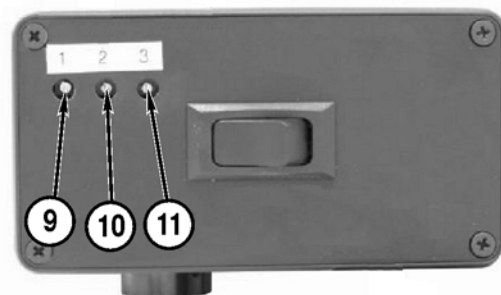
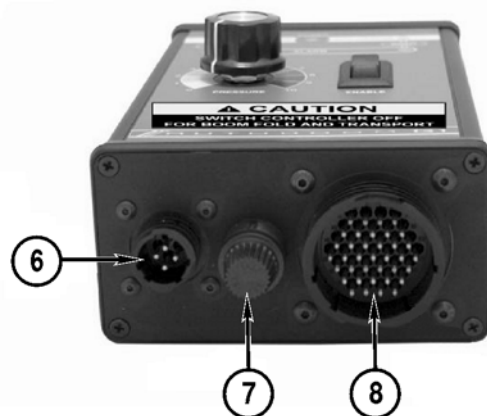
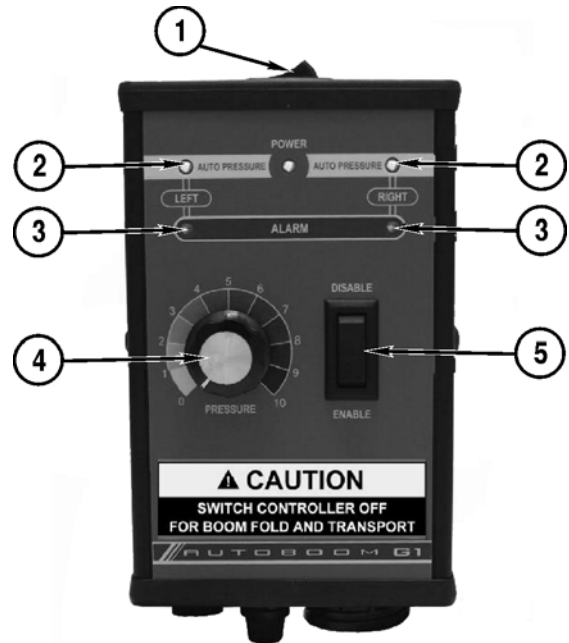
- Turn the power switch on (1).
- For pull-type sprayers with no joystick control, press the rocker switch (5) to “enable”.
- For sprayers with a joystick control, tap the left and right boom down switches.
- The two green Auto Pressure Lights (2) must illuminate; if they do not, check the interconnect wires on the main valve solenoids for correct wiring. See “Troubleshooting System Problems” on page 4-30 for wiring problems.

#### 3. Set Minimum Wheel Weight: Adjust weight on wheels so that boom begins to float (no weight) when the pressure dial is set to zero.

- Set the pressure control dial (4) to zero.
- Turn the Minimum Boom Set Screw (11) clockwise until the booms are just creeping up.
- NOTE:** If the pressure alarm sounds momentarily, turn the Alarm Set Screw (9) counterclockwise to silence the alarm.

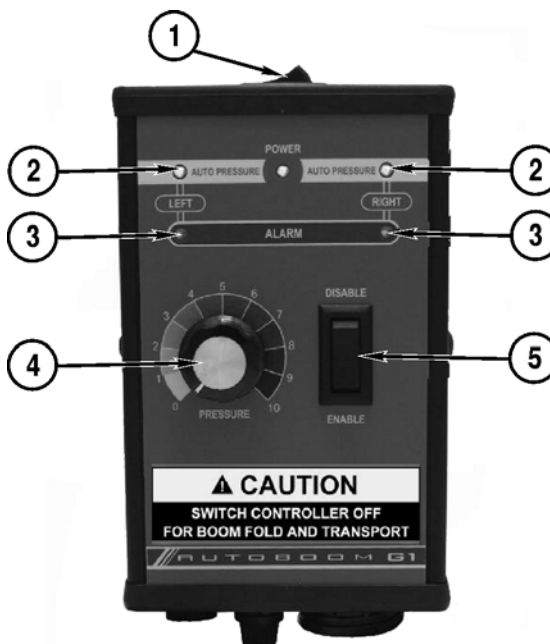
#### 4. Set Maximum Wheel Weight: Set maximum weight on wheels.

- Set the pressure control dial (4) to ten.
  - The booms should go full up with the pressure control dial at 10. If the booms fail to rise, adjust the Maximum Boom Pressure Set Screw (10) clockwise to raise the booms before continuing.

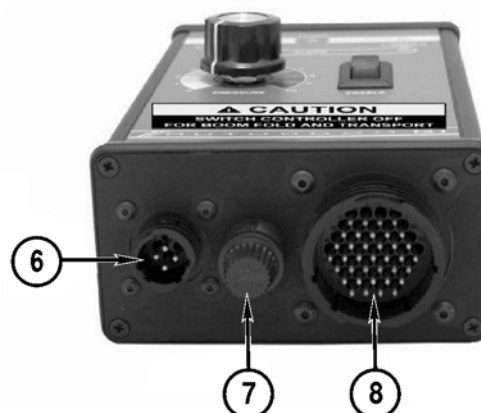


## WET SYSTEM OPERATION

- ii. Take note of which wheel lifts first. This is the lighter of the two booms. **Make all adjustments based on the performance of the lighter boom.**
- b. Turn the Maximum Boom Pressure Set Screw (10) counterclockwise until the lighter boom begins to fall.
  - i. Adjust the timing with the lighter boom. Test both booms for proper operation.
  - ii. NOTE: Correct down speed is roughly a short three to four count from full up to full down. You may notice a slight difference in drop time. The boom that drops the slowest is the lighter boom and should be the one used for adjustments.



- c. Retest down speed and boom weight.
  - i. To test the down speed, raise either the left or right boom fully up.
  - ii. Tap the boom down switch. If the boom speed is too slow, turn the Maximum Boom Pressure Set Screw (10) counterclockwise to increase the drop speed.
  - iii. After the boom drop speed is achieved, physically lift each boom to establish 50 to 100 pounds of lift force. Lift the boom at a location approximately four feet outboard of each wheel.



### 5. Set Pressure Alarms: Maximum weight on wheels before alarm sounds.

- a. If the alarms are on, turn the Alarm Set Screw (9) counterclockwise until the alarms cease.
- b. Turn the Alarm Set Screw (9) one half to one full turn further.
- c. If the alarms are not on, turn the Alarm Set Screw (9) clockwise until the alarms sound, then turn the screw counterclockwise until they cease.
- d. Turn the Alarm Set Screw (9) one half to one full turn further.
- e. NOTE: This procedure sets the maximum wheel pressure which you have established by lifting the boom and setting the 50 to 100 pounds of lift force. More importantly, if the operator turns on the monitor power and forgets to tap down on the boom switches, the alarms will sound indicating that wheel pressure is greater than 100 pounds, which can damage the booms.



## WET SYSTEM OPERATION

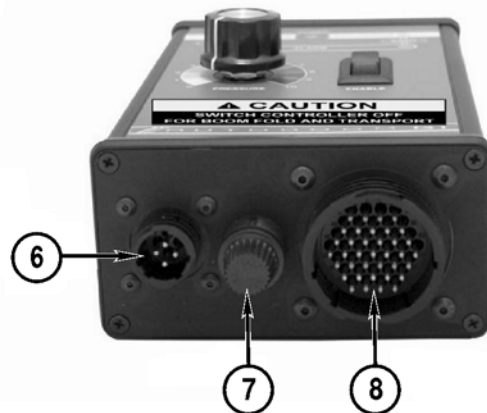
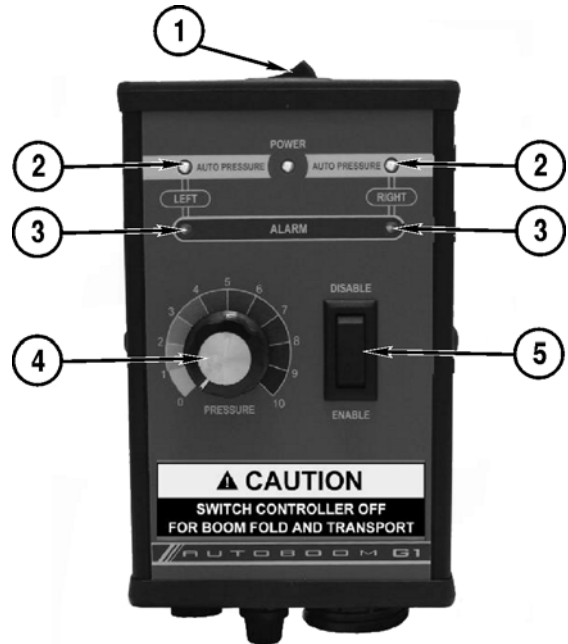
### 6. Test Alarm

- a. With the Autoboom on and the wheels on the ground, press the Enable/Disable Switch (5) to disable the system. The two green Auto Pressure Lights (2) should go out. Have someone attempt to lift the boom. The alarm should sound. If the alarm fails to sound, go back to step 5 (Set Pressure Alarms).
- b. With Autoboom on and the wheels on the ground, press the Enable/Disable Switch (5) to enable the system. The two green Auto Pressure Lights (2) should come on. With the Pressure Control Dial (4) set to ten, raise the center rack approximately four feet. Press the Enable/Disable Switch (5) to disable the Autoboom system, the green Auto Pressure Lights (2) should go out. With the ON/OFF power switch (1) still on, lower the center rack to apply pressure to the tires. The alarm should sound. If the alarm fails to sound, go back to step 5 (Set Pressure Alarms).

**NOTE: Only apply enough pressure to get the alarms to sound. Watch the booms and try not to put excessive pressure on either. It should not take much pressure on the booms to cause the alarm to sound.**

### 7. Final System Testing: Assumes system is turned on and enabled.

- a. Turn the Pressure Control Dial (4) to ten. The booms should be on the ground. The boom weight should be between 50 and 100 pounds.
- b. Set the Pressure Control Dial (4) to zero. The booms should be inching up or stopped just above ground.
- c. Raise the booms off the ground with the manual boom height adjustment. Both Auto Pressure Lights (2) should be off.
- d. Depending on your system, either press the rocker switch (5) to “enable” or tap left and right boom down switches on the joystick. The Auto Pressure Lights (2) should come back on. The booms should stay in the up position.
- e. Turn the Pressure Control Dial (4) slowly toward five. By the time five is reached, both booms should be moving toward the ground. If only one boom drops, calibration may have been made using the heavy boom instead of the light boom.



## WET SYSTEM OPERATION

### Troubleshooting System Problems

Problem: Auto Pressure Lights (2) do not light by tapping left or right on the boom down switches.

Solution: Check the interface wiring on the main boom solenoid valves for proper hook up.

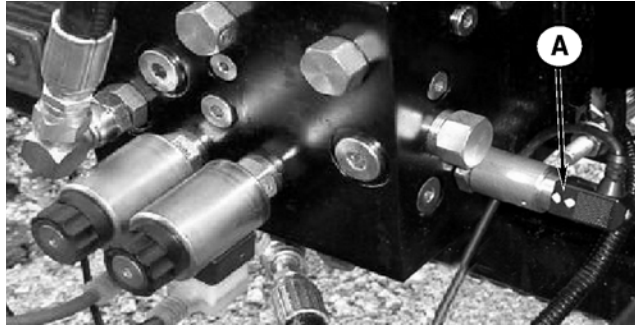
“Left Up” = **White**, “Left Down” = **Red**, “Right Up” = **Green**, “Right Down” = **Black**

Problem: Left Auto Pressure Lift (2) illuminates when the Right Boom Down button is pressed (or vice versa).

Solution: The left and right solenoid sense lines are reversed. Check the wiring and correct.

Problem: Can not get the Pressure Alarm (3) to clear during initial calibration even after adjusting the Alarm Set Screw (9).

Solution: Check the pressure transducers connectors. Make sure the white dots (A) are aligned.



### Boom Balancing

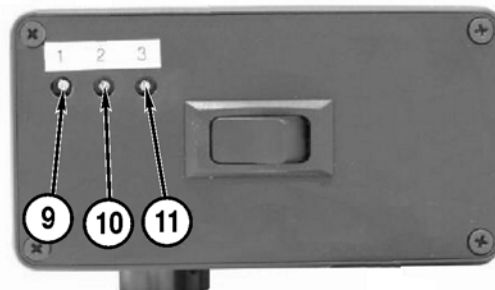
How to test for the lighter boom:

With a fully calibrated system, turn the Pressure Control Dial (4) from zero to ten. The first boom to move to the top is the lighter boom.

Most sprayers have booms that respond slightly differently. Most of the time, the differences in lift speed are due to slight weight differences between the left and right booms. For small differences, it is not necessary, but is optional, to have the booms balanced. For large differences, first check to make sure all other parts of the system are operating correctly. If they are, you may need to balance the booms.

How to balance the boom:

The easiest method is by moving the wheel mounts. If the heavy side wheel is moved in and the lighter side is moved out a little, this may be enough to balance the booms. If this does not achieve balance, you may need to add weight to the lighter boom.



## WET SYSTEM OPERATION

### Operation

**NOTE:** Calibration should be completed before using the system for normal operation. Failure to properly calibrate the system could result in severe damage to the booms.

#### Startup and Initial Operation Test

With the Autoboom off, unfold the sprayer as described in Operating Booms. Set the booms on the wheels. Power on the controller with the On/Off Power Switch (1). Touch the left and right down switches on the sprayer boom control. The Auto Pressure Lights (2) will illuminate. Adjust the Pressure Control Dial (4) clockwise until the boom begins to slowly fall. Tap the left and right up switch and the Auto Pressure Lights (2) will stop illuminating. This confirms that the system is functioning normally.

Always keep the wheels light. Keep just enough weight on the wheels to follow the terrain. High speeds with big hills require more weight on the wheels (towards 10). At Low speeds or on flat land, the wheel weight can be decreased (towards zero).

Remember more weight on the boom wheels means the booms are more responsive and follow the ground more closely. Too much weight and boom damage or an abrupt impact can occur. Only keep as much weight as needed to keep the booms responsive to ground changes.

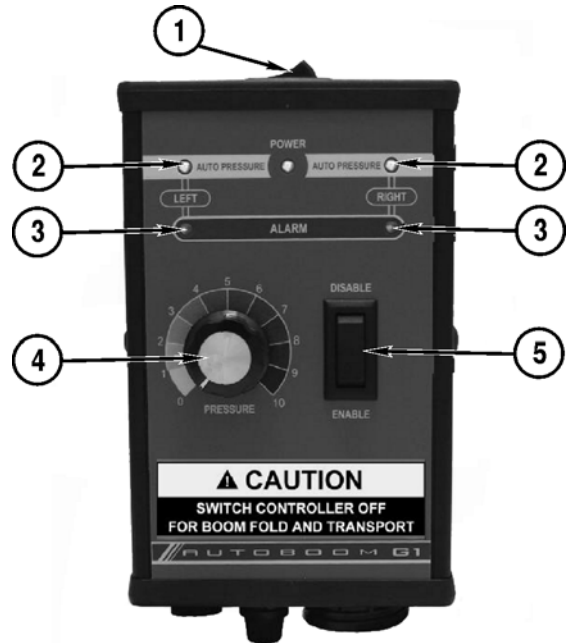
Pressure Control Dial (4) adjustments should be very slight.

**IMPORTANT:** Always have the wheels on the ground when initially activating the Autoboom.

To activate with the power on, tap the left and right down buttons. To override the Autoboom system, tap the left or right up switch. Left or right automatic mode disengages and if the sprayer boom control up switches are kept depressed, the boom will rise as usual. One touch of the sprayer boom control down switches reactivates the Autoboom system and returns the booms to automatic control.

Always lift the inside boom slightly when making sharp turns (headland, etc.). Touch left or right boom control down switches to reset. This prevents the wheel from skidding during sharp turns.

**IMPORTANT:** Never adjust the system pressure unless the Autoboom system has been activated. Failure to do so can result in severe damage to the sprayer booms.



## WET SYSTEM OPERATION

---

### **Disclaimer**

While every effort has been made to ensure the accuracy of this document, Raven Industries assumes no responsibility for omissions or errors. Neither is any liability assumed for damages resulting from the use of information contained herein. Raven Industries shall not be held responsible or liable for the effects of atmospheric conditions and sunspot activity on the performance of our products. Raven Industries cannot guarantee the accuracy, integrity, continuity, or availability of the GPS signal from the Department of Defense/ NAVSTAR GPS Satellites, the OmniSTAR correction service, or the WAAS correction service. Raven Industries accepts no responsibility for the use of the signal for other than the stated purpose. Raven Industries shall not be responsible or liable for incidental or consequential damages or a loss of anticipated benefits, profits, work stoppage, or loss or impairment of data arising out of the use or inability to use SmarTrax or any of its components.



## LUBRICATION AND MAINTENANCE

---

### General Information

**IMPORTANT:** Some components on the Apache Sprayer have additional maintenance requirements as outlined in the manufacturers manuals provided with the vehicle. These include, but are not limited to, the Engine Owner's Manual, Sprayer Monitor System Manual, Chemical Eductor Manual, Product Pump Instructions, and other optional equipment. Be sure to perform maintenance procedures for OEM equipment in addition to procedures for the Apache Sprayer.

## LUBRICATION AND MAINTENANCE

### 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	○	○			●						
Grease Steering Components	○				●						
Grease Axle Components	○		○		●						
Grease Driveline	○						●				
Adjust Poly Tank Straps	○	○				○			●		
Adjust Boom	○	○	○								
Inspect Front Accumulators			○							●	
Clean/Replace Primary Engine Air Filter			○					●			
Adjust Toe-In			○							●	
Replace Secondary Engine Air Filter			○							●	
Winterize Wet System			○							●	
Replace Cab Filters			○							●	
Flush Wet System (including product pump)			○	●							
Check Tire Pressure				●							
Check Oil Engine Level				●							
Check Coolant Level, Cooling Package, and Hoses				●							
Check Brake Fluid Level				●							
Check Transmission Fluid Level				●							
Check Hydraulic Fluid Level				●							
Check A/C Compressor Belt				●							
Check Differential Fluid Level					●						
Check Differential for Leaks					●						
Replace Engine Oil and Filter						○		●			
Replace Differential Fluid						○		●			
Replace Hydraulic Fluid Filter (Immediately if indicator is red.)						○		●			
Clean Hydraulic Fluid Strainer								●			
Replace Fuel/Water Separator Filter								●			
Check Accumulator Fluid Level									●		
Replace Fuel Pre-Filter									●		
Replace Planetary Fluid									●		
Replace Transmission Fluid and Filter						○			●		
Recalibrate Raven Radar Gun									●		
Inspect and Repack Wheel Hub and Flex Bearings									●		
Clean Transmission Fluid Strainer											●
Replace Hydraulic Fluid											●

## LUBRICATION AND MAINTENANCE

---

### 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.

- Grease Boom. See “Grease Boom” on page 5-6.
- Torque Lug Nuts. See “Torque Lug Nuts” on page 5-12.
- Grease Steering Components. See “AS510 and AS710” on page 5-12.
- Grease Axle Components. See “Grease Axle Components” on page 5-13.
- Grease Driveline. See “Grease Driveline Components” on page 5-14.
- Adjust Poly Tank Straps. See “Adjust Poly Tank Straps (if equipped)” on page 5-21.

### 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.

- Torque Lug Nuts. See “Torque Lug Nuts” on page 5-12.

### Adjust Boom

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

#### Boom Lead

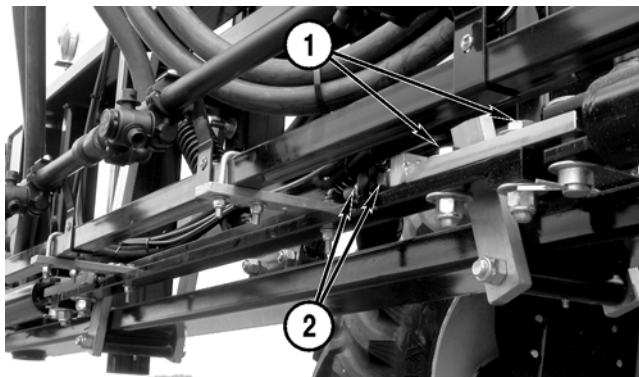
The outermost tip of the booms should lead the boom center section by three to four inches.



To adjust the boom lead, loosen the boom lead bolts (1) near the bottom of the boom center section. Turn the jam nuts (2) toward the end of the boom increase boom lead and turn the jam nuts (2) toward the boom center section to reduce boom lead.

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

Repeat the steps for the remaining boom, as required.



## LUBRICATION AND MAINTENANCE

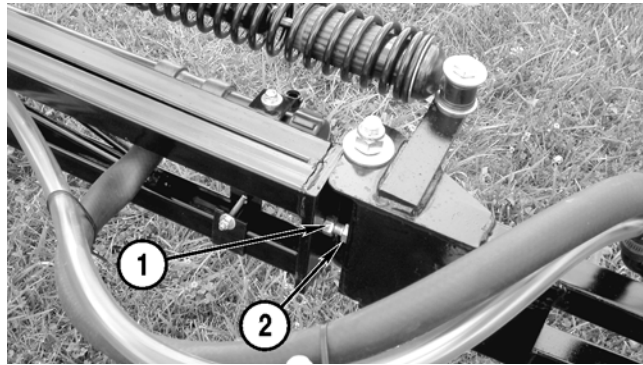
### Boom Breakaway

Each left and right boom is equipped with one or two boom breakaways depending on boom configuration. A right, outer 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 center section.

To adjust the breakaway, loosen the jam nut (1) and turn the adjusting screw (2) to align the booms. Tighten the jam nut. The right boom tip breakaway is shown.

Repeat the steps for the remaining breakaways, as required.



### Boom Stabilizer

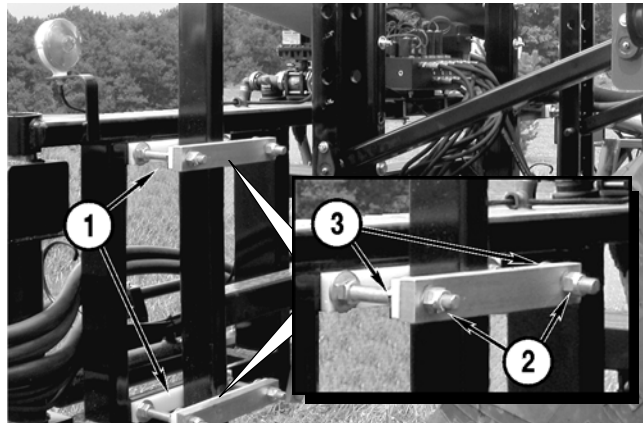
There are four boom stabilizers mounted the boom rack. The upper and lower right-side stabilizers (1) are shown.

The gap between the nylon wear pads and the steel frame should be 1/8" to 3/32" 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 1/8" to 3/32" gap.

### Boom Tip

#### (80', 90', and 100' Booms)

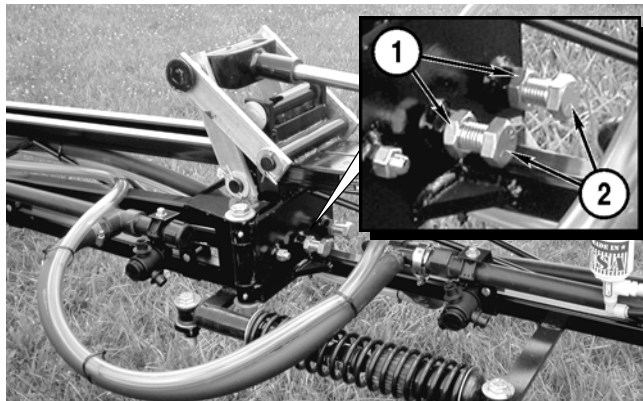
The boom tips should be level with the main boom.

To adjust the boom tip level, loosen the jam nuts (1) on the leveling bracket and turn the leveling bolts (2) clockwise to raise or counter-clockwise to lower the boom tip. The left boom tip is shown.

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: The bolts must be adjusted equally for best performance.

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



## LUBRICATION AND MAINTENANCE

---

### As Required

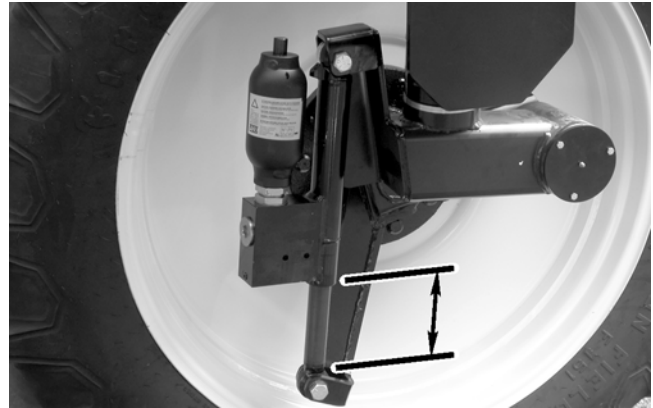
The following services will be required at various intervals depending on vehicle use and environmental conditions. Repeat these services as prescribed by the Apache Sprayer Service Interval Chart.

- Grease Axle Components. See “Grease Axle Components” on page 5-13.
- Clean or Replace Primary Engine Air Filter. See “Clean or Replace Engine Primary Air Filter” on page 5-17.
- Replace Secondary Engine Air Filter. See “Replace Engine Secondary Air Filter” on page 5-26.
- Winterize Wet System. See “Winterize Wet System” on page 5-26.
- Replace Cab Air Filters. See “Replace Cab Recirculating Air Filter” on page 5-28.
- Flush Wet System. See “Flushing Wet System” on page 4-21.

### Inspect Front Accumulator

Inspect the accumulators and cylinders for hydraulic leaks and correct operation. Typically, the cylinder should have 4” to 6” of the cylinder ram showing while the vehicle 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.



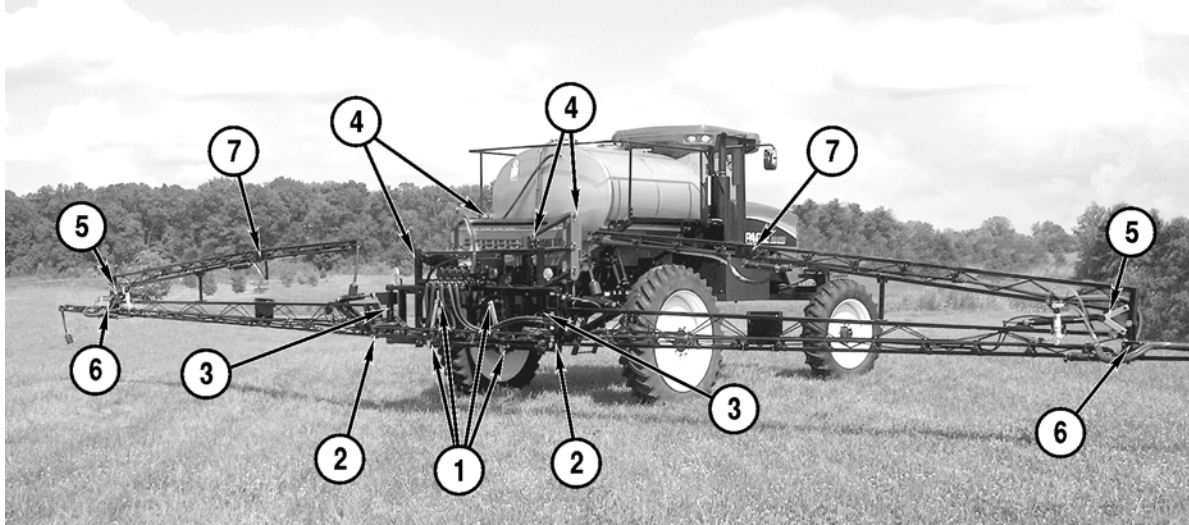
## LUBRICATION AND MAINTENANCE

---

### Daily

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

### Grease Boom

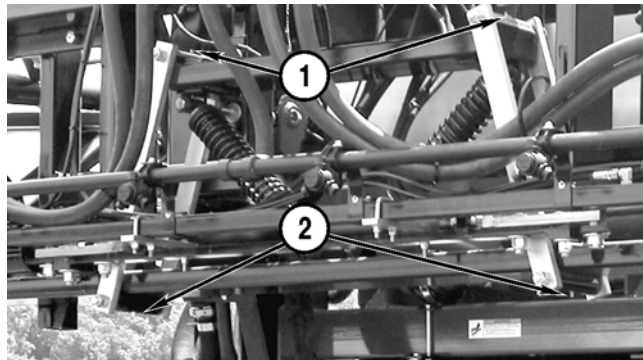


The boom is equipped with seven sets of grease fittings. Apply an ample amount of lithium grease through each of the grease fittings.

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

### Boom Stabilizer

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



## LUBRICATION AND MAINTENANCE

---

### Boom Tilt

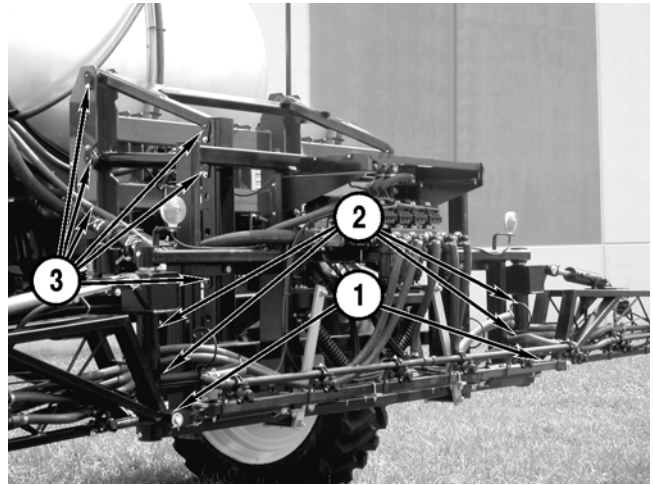
There are two boom tilt grease fittings (1).

### Boom Fold

There are four boom fold grease fittings (2).

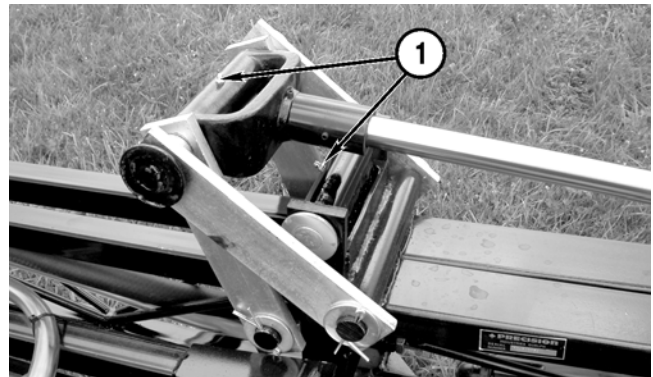
### Boom Rack

There are two sets of six boom rack, flag-pin style, grease fittings. The six left side fittings (3) are shown. The six right side fittings are in the same orientation on the right side of the boom rack.



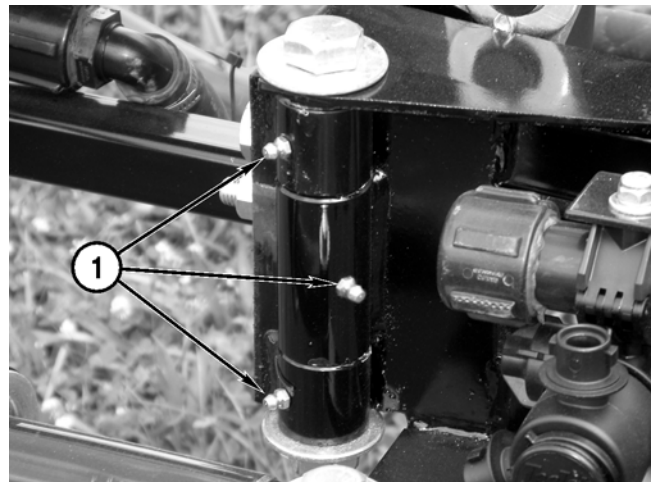
### Boom Tip

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



### Boom Inner Breakaway

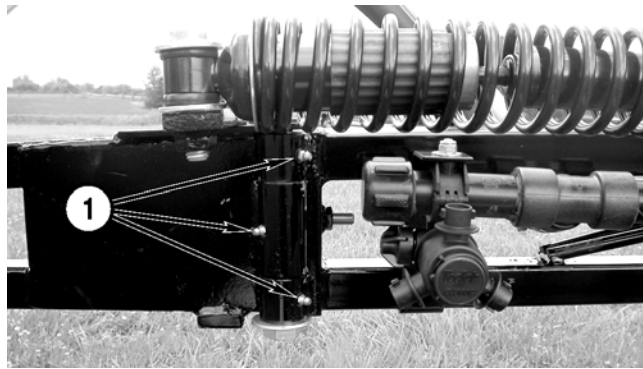
There are six boom inner breakaway grease fittings (1), three on each boom. The left side is shown.



## LUBRICATION AND MAINTENANCE

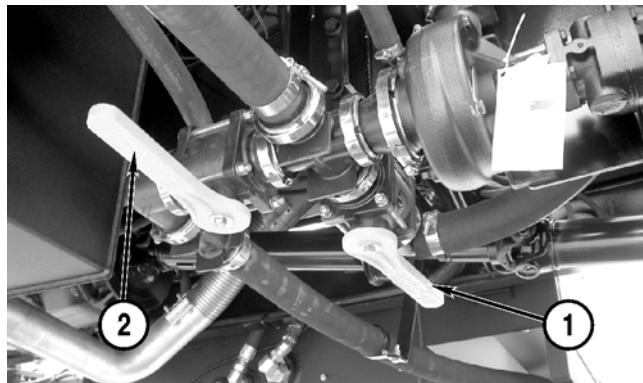
### Boom Outer Breakaway (if equipped)

There are six boom outer breakaway grease fittings (1), three 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 4-19. See “Flushing Wet System” on page 4-21.



### Check Tire Pressure

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

Check the rims for cracks and other damage. Replace damaged rims.

The AS710 is shown.



### Check Engine Oil Level

NOTE: 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.

Remove the dipstick and check the oil level.

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





## LUBRICATION AND MAINTENANCE

If the oil level is below the “ADD” mark, add high quality 15W-40 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

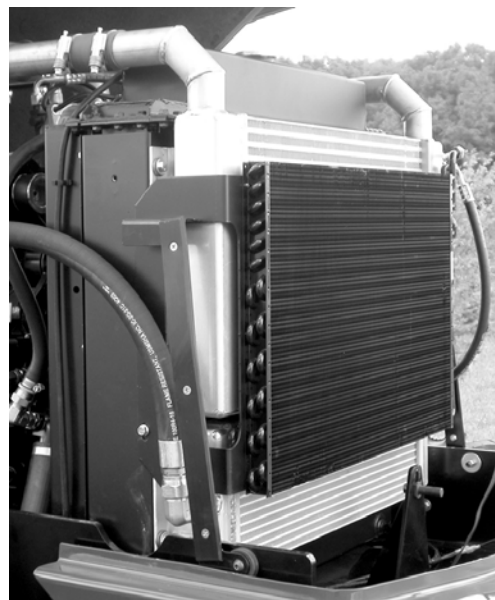
#### CAUTION

**DO NOT** remove the radiator cap when the engine is hot. Stop the engine and wait until the engine has cooled.

Remove the radiator cap. The coolant level should be level with the bottom of the fill neck.

Add coolant as necessary. See the engine manufacturer’s manual for coolant requirement and additional cooling system information.

Inspect the cooling package 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 Brake Fluid Level

The brake fluid reservoir is located in the engine compartment, on the right side of the engine, toward the cab.

**NOTE:** Check the brake fluid level while the fluid is cold.

The reservoir is marked with “FILL” and “LOW” level indicators. Maintain the fluid level between these two marks.

If the brake fluid level drops to the “LOW” level, remove the reservoir cap and add Chevron 1000 THF to raise the fluid level to the “FILL” mark. Replace the cap.

**NOTE:** To reduce the possibility of air entering the brake lines, do not allow the fluid level to drop below the “LOW” level.



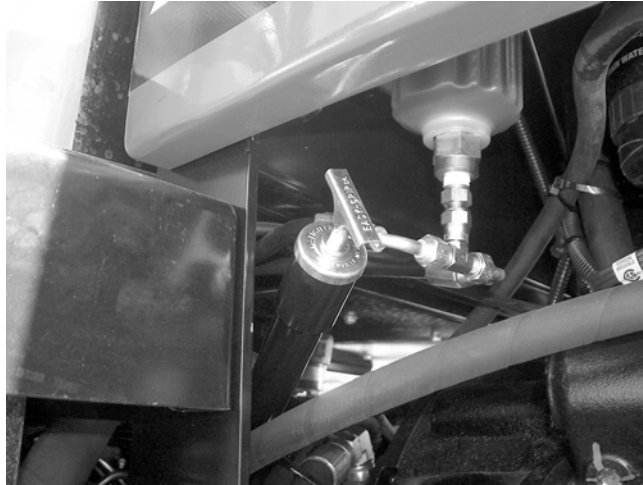
## LUBRICATION AND MAINTENANCE

### Check Transmission Fluid Level

**NOTE:** 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 right side of the engine, toward the cab.

Turn the 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.

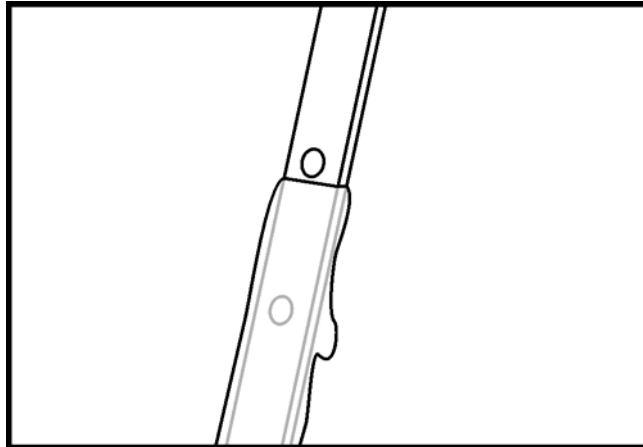
**IMPORTANT:** DO NOT overfill the transmission fluid. Overfilling can damage the transmission or cause the transmission to malfunction or overheat.

**IMPORTANT:** Use only Dexron III ATF transmission fluid.

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

Add Dexron III ATF to bring the level between the dots on the dipstick.

Replace the dipstick and turn the handle clockwise to tighten.



### Check Hydraulic Fluid Level

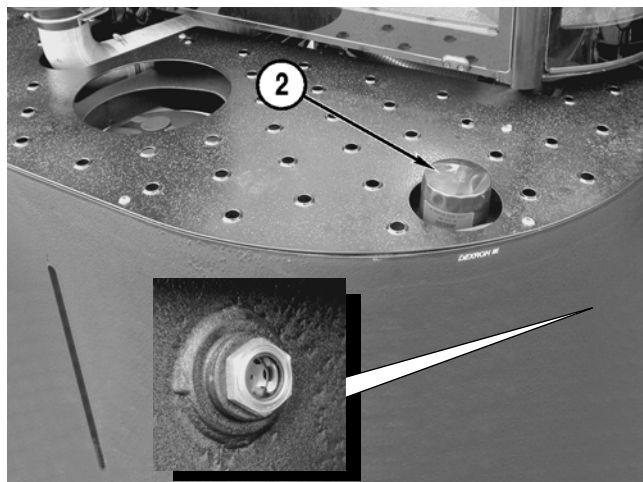
**IMPORTANT:** The booms must be folded and in the transport position for an accurate hydraulic fluid level reading.

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

**IMPORTANT:** Use only Dexron III ATF transmission fluid for the Apache Sprayer hydraulic system.

If no fluid is visible in the sight glass, remove the fill cap (2) and add Dexron III ATF until fluid is visible in the bottom of the sight glass.

**NOTE:** Do not fill more than 3/4 up on the sight glass.



## LUBRICATION AND MAINTENANCE

---

### Check A/C Compressor Belt

#### Inspect

Check the A/C compressor belt (1) for wear and damage. Replace as necessary.

Check the belt deflection at a point mid-way between two pulleys. The correct belt deflection is 3/4" to 1". If the deflection is greater than one inch, adjust the belt.

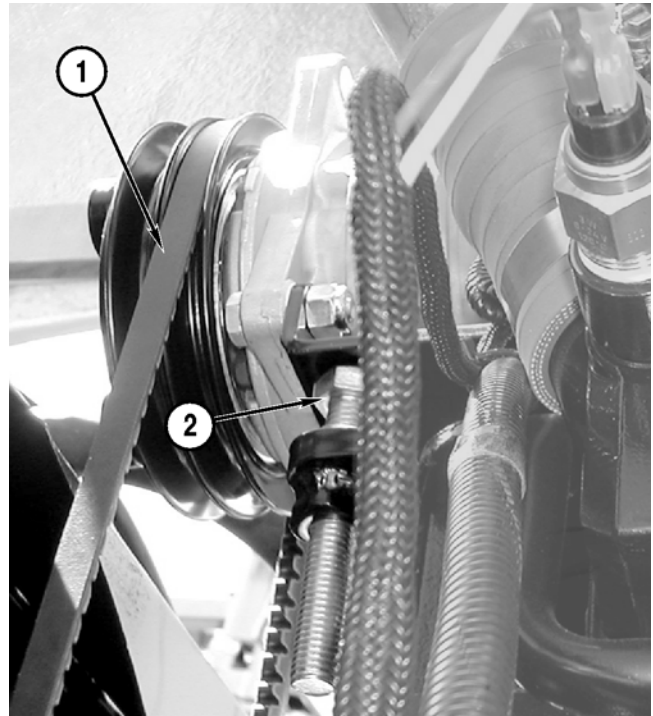
#### Replace

To remove the compressor belt, loosen the mounting and adjusting hardware. Turn the adjustment screw (2) until the belt can be removed.

To install the new compressor belt, turn the adjustment screw (2) until the belt deflection is 3/4" to 1". Tighten the mounting and adjusting hardware.

#### Adjust

To adjust the A/C compressor belt, loosen the mounting and adjusting hardware. Turn the adjusting screw (2) to tighten or loosen the belt as needed. The correct belt deflection is 3/4" to 1". When adjustment is complete, tighten the mounting and adjusting hardware.



## LUBRICATION AND MAINTENANCE

---

### Every 40 Hours

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

### Torque Lug Nuts

#### AS510 and AS710

Torque the front wheel lug nuts to 180 lb-ft [176 N•m].

Torque the rear wheel lug nuts to 225 lb-ft [542 N•m].

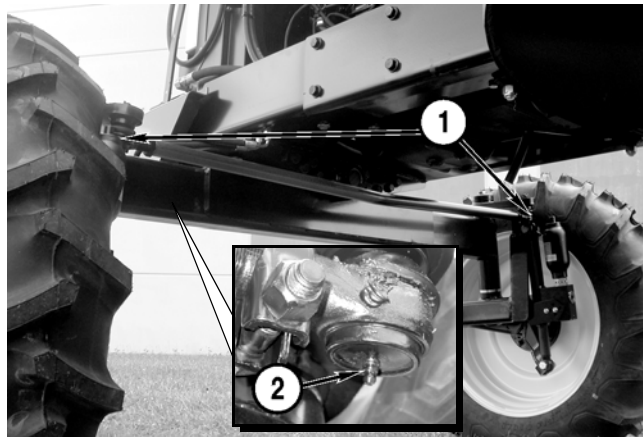


#### AS510 and AS710

**IMPORTANT:** Do not over-grease the ball-joints. Damage to the dust cover will result.

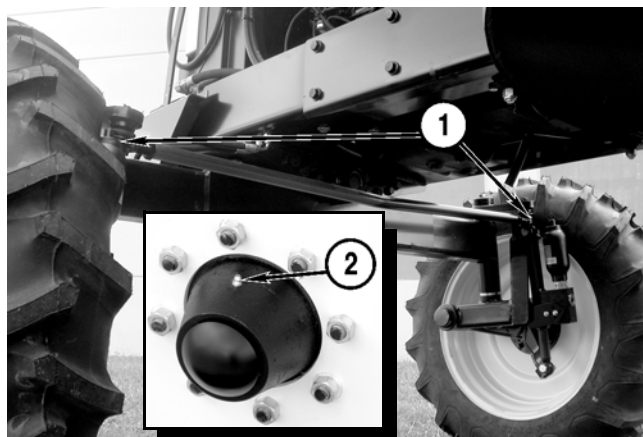
The AS510 and AS710 have four ball-joint grease fittings, four king-pin grease fittings, and two hub grease fittings.

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



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

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



## LUBRICATION AND MAINTENANCE

---

### Grease Axle Components

#### AS510 & AS710

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

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



### Check Differential Fluid Level

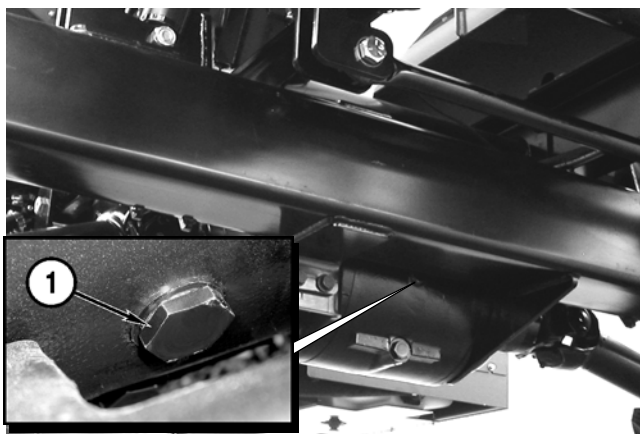
The differential is located under the vehicle, on the rear axle. The fill/level plug is directly above the drain plug on the rear of the differential. The AS510 is shown, the AS710 location is similar.

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.

**IMPORTANT:** Use only Chevron 1000 THF for the differential fluid.

If required, add Chevron 1000 THF 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.

## LUBRICATION AND MAINTENANCE

---

### 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.

- Replace Engine Oil and Filter. See “Replace Engine Oil and Filter” on page 5-16.
- Replace Differential Fluid. See “Replace Differential Fluid” on page 5-18.
- Replace Hydraulic Fluid Filter. See “Replace Hydraulic Fluid Filter” on page 5-18.
- Replace Transmission Fluid and Filter. See “Replace Transmission Fluid and Filter” on page 5-23.

### Every 100 Hours

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

#### Grease Driveline Components

##### AS710

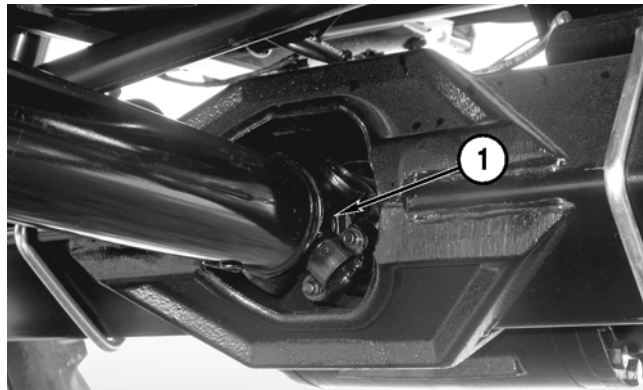
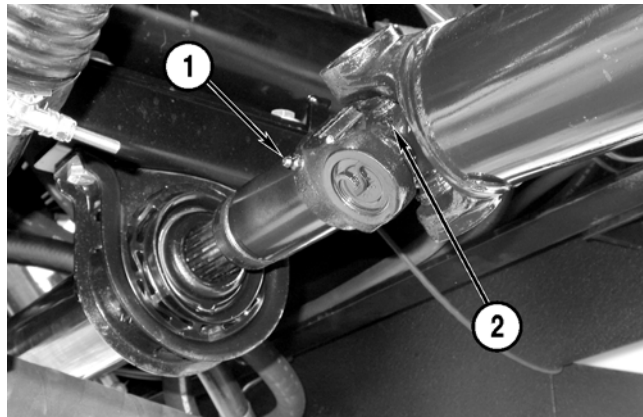
The Apache Sprayer AS710 has a total of ten driveline grease fittings. Three of these fittings are slip joint fittings and seven are U-joint fittings.

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

One slip joint grease fitting (1) is located under the vehicle, 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.

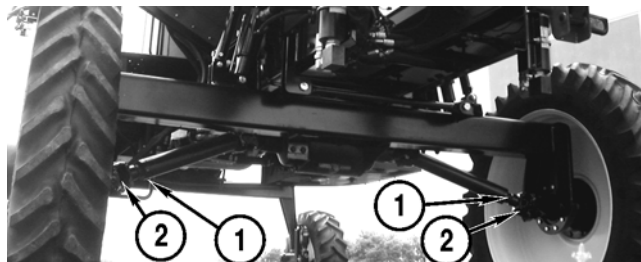
Another U-joint fitting (1) is located at the differential input.



##### AS710 Only

The other two slip joint grease fittings (1) are located under the vehicle, between the differential and each planetary U-joint.

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



## LUBRICATION AND MAINTENANCE

---

### AS510

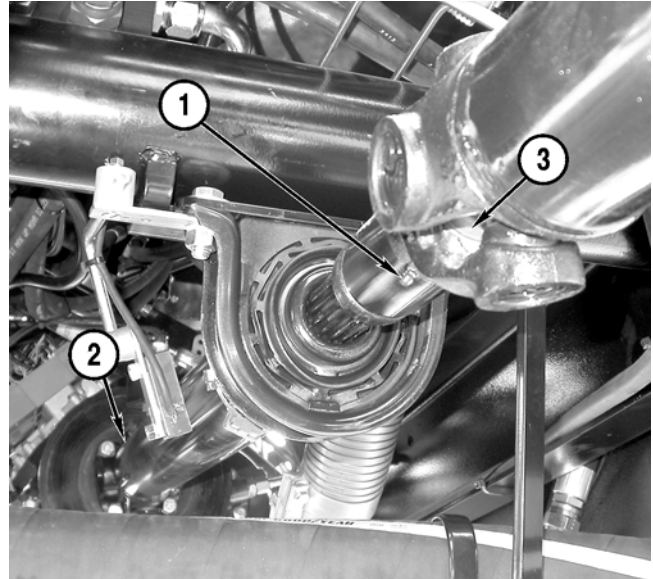
The Apache Sprayer AS510 has a total of four driveline grease fittings. One of these is a slip joint fitting and three are U-joint fittings.

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

The slip joint grease fitting (1) is located under the vehicle, between the transmission and the rear axle.

The U-joint fittings are located on drive shaft at the transmission output (2) and next to the slip joint.

The remaining U-joint grease fitting is on the differential input U-joint on the rear axle (not shown).



## LUBRICATION AND MAINTENANCE

### Every 250 Hours

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

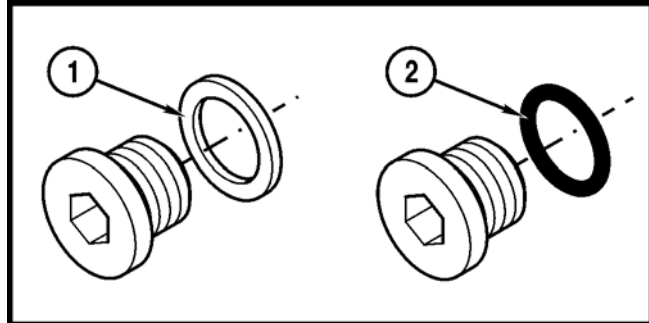
#### Replace Engine Oil and Filter

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.

**IMPORTANT:** Do not overtighten the filter. Damage to the seal can result.

Lubricate the seal on the engine oil filter, Part Number 201450300, and install. Tighten the filter, by hand, 3/4 to 1-1/4 turns after the seal contacts the filter housing.



**NOTE:** Crankcase oil capacity can vary. ALWAYS use the dipstick to determine if the engine oil is to the appropriate level.

**IMPORTANT:** Do not overfill the engine oil.

Fill the engine with high quality 15W-40 motor oil at the oil fill location on top of the engine. The engine oil capacity is approximately 20.1 quarts [19 liters].





## LUBRICATION AND MAINTENANCE

---

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

Replace the dipstick.

Operate the engine and check for leaks.

Shut off the engine and wait ten 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.



### Clean or Replace Engine Primary Air Filter

**IMPORTANT:** When operating in severe conditions, the primary air filter should be cleaned after every 40 hours of use or when indicated by the lamp on the steering column.

**NOTE:** If the air filter indicator lamp on the steering column comes on, stop immediately to remove and clean the primary air filter. Replace if necessary.

The primary air filter is mounted in the engine compartment, towards the cab.

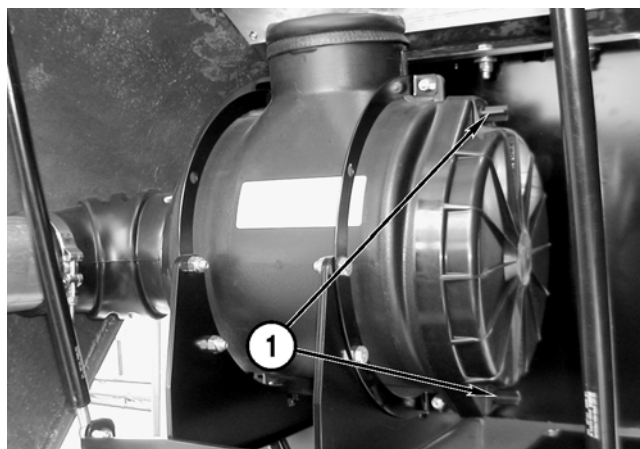
Clean the outside of the air cleaner and surrounding area to keep dust from entering the cleaner assembly.

Remove the two thumb screws (1) and cover from the air cleaner assembly.

Use a rocking motion to remove the primary air filter from the assembly.

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

If installing a new primary engine air filter, use Part Number 201300078. Install the filter, the air cleaner cover, and thumb screws.



## LUBRICATION AND MAINTENANCE

---

### Replace Differential Fluid

The differential is located under the vehicle, on the rear axle. The fill/level plug (1) is directly above the drain plug on the rear of the differential. The AS710 is shown, the AS510 location is similar.

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

Install the drain plug and tighten.

**IMPORTANT:** Use only Chevron 1000 THF for the differential/planetary fluid.

Remove the differential fill/level plug (1). Add fluid until it is level with the bottom of the fill/level hole. The differential capacity is approximately 26.4 quarts [25 liters].

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

**NOTE:** Differential fluid in the AS510 can flow to the planetaries. The planetary fluid level should be checked after differential fluid replacement. See "Replace Planetary Fluid (If Equipped)" on page 5-22.



### Replace Hydraulic Fluid Filter

The hydraulic fluid filter is located under the vehicle, between the rear axle and fill station, on the left side. Shown is the AS710, the AS510 location and configuration is similar.

**IMPORTANT:** An indicator bar is on top of the filter head. If the indicator is red, replace the filter immediately.

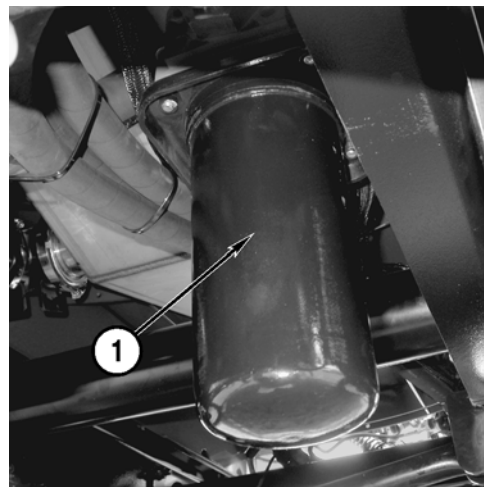
Remove the four mounting bolts from the filter head and lower the filter canister (1).

Remove the filter and canister o-ring from the canister. Remove the spring and metal plate from the filter. Discard the filter and fluid into an appropriate container. Rinse the canister with diesel fuel.

Install the spring and metal plate onto the new filter and install the filter into the canister. Install the o-ring on the canister and lubricate with clean Dexron III ATF.

Install the canister onto the filterhead and tighten the four bolts.

Use the sightglass to check the fluid level. See "Check Hydraulic Fluid Level" on page 5-10.

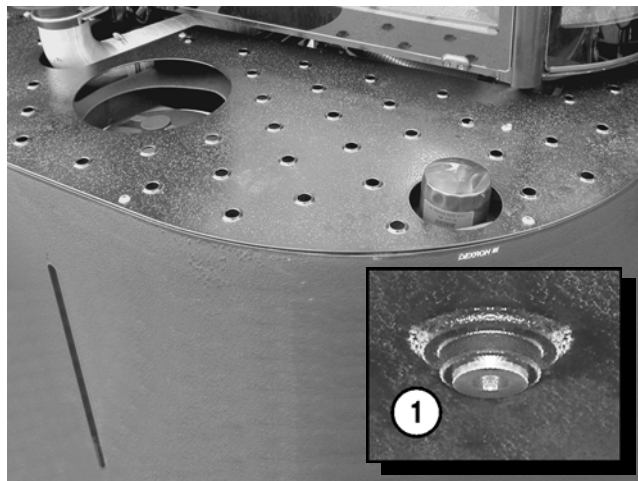


## LUBRICATION AND MAINTENANCE

### Clean Hydraulic Fluid Strainers

The hydraulic fluid strainers are located under the vehicle, on the side of the hydraulic fluid reservoir. The strainers are in line with the hydraulic fluid lines.

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 30 gallons [113.5 liters]. Install the drain plug.



Remove the hydraulic fluid lines (1) and (2).

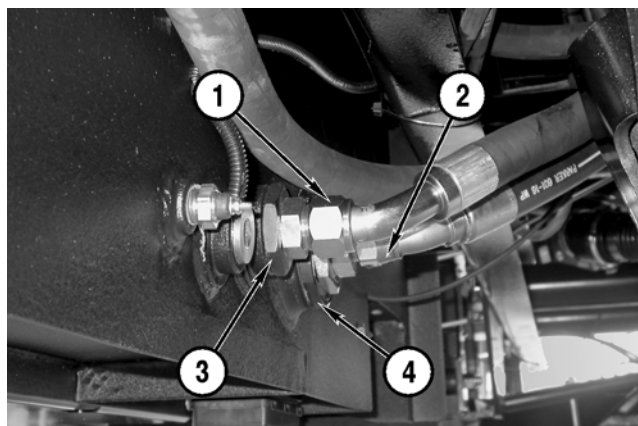
Remove the strainers (3) and (4).

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

If the strainers cannot be cleaned or have holes in the screen, replace with new strainers.

Install the small diameter hydraulic fluid strainer (3), Part Number 840000010. Install the large diameter hydraulic fluid strainer (4), Part Number 840000011.

Install the hydraulic lines (1) and (2).

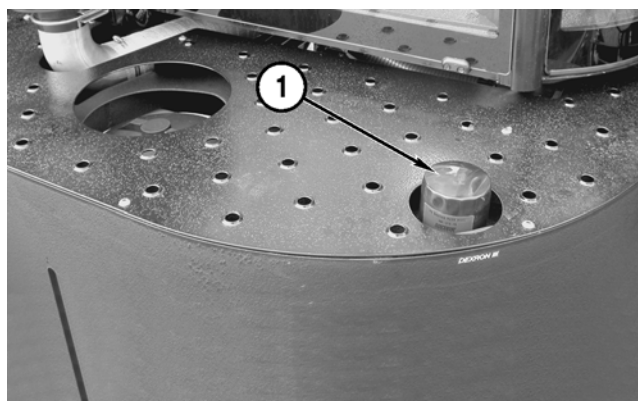


**IMPORTANT:** Use only Dexron III ATF transmission fluid for the Apache Sprayer hydraulic system.

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

Fill the hydraulic fluid reservoir with Dexron III ATF. The reservoir capacity is approximately 30 gallons [113.5 liters].

Use the sightglass to check the fluid level. See “Check Hydraulic Fluid Level” on page 5-10.



## LUBRICATION AND MAINTENANCE

---

### Replace Fuel/Water Separator Filter

The fuel/water separator filter is located in the engine compartment on the right side of the engine.

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

Fill the new filter with clean diesel fuel and install.

Turn the collar at the top of the filter clockwise to fasten.

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.



## LUBRICATION AND MAINTENANCE

---

### 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.

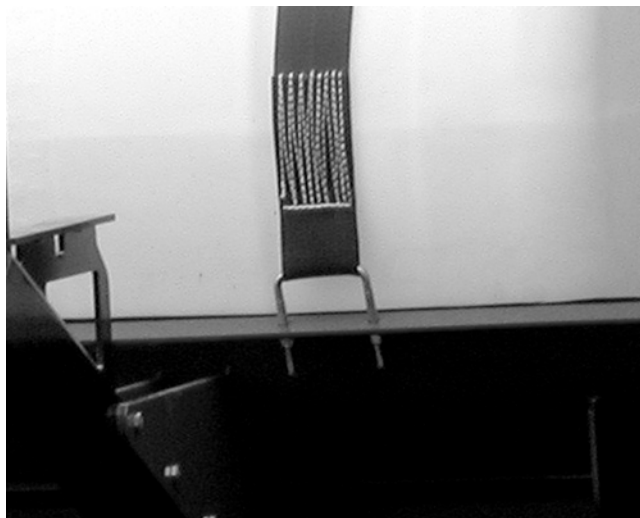
The following services must be performed after every 500 hours of operation or yearly.

#### Adjust Poly Tank Straps (if equipped)

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 vehicle and check the straps. Adjust if necessary.

Check the strap adjustment after the first three loads.



#### Check Accumulator Fluid Level

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

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

NOTE: If the fluid is foamy, the accumulator has failed. Contact your dealer for repair.

IMPORTANT: Use only Chevron 1000 THF for the accumulator fluid.

If required, add Chevron 1000 THF to fill the accumulator to the bottom of the fill hole.

Install the plug and tighten.

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

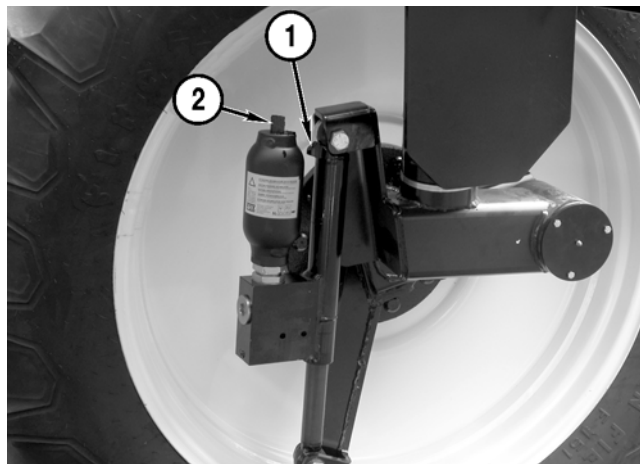
Remove the cap (2) and install a nitrogen valve and gauge on the accumulator.

Open the valve and check the nitrogen level.

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

AS510: 800 psi

AS710: 850 psi



## LUBRICATION AND MAINTENANCE

---

### Replace Fuel Pre-Filter

The fuel prefilter is located in the engine compartment on the right side of the engine.

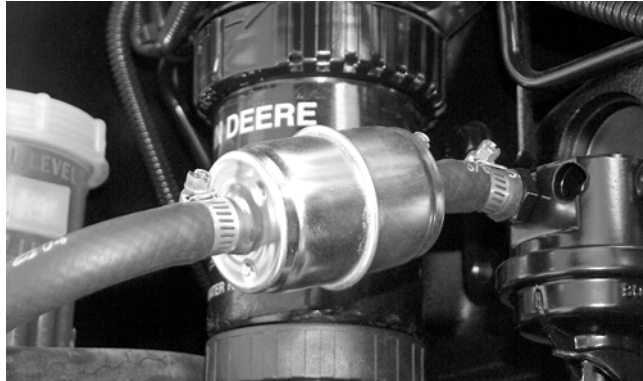
**NOTE:** Fuel will spill from the prefilter and fuel lines. Use a suitable container to collect the fuel and dispose of properly.

Loosen the hose clamps and remove the fuel prefilter.

Install a new prefilter, Part Number 201450290, with the flow arrows pointing toward the engine and tighten the hose clamps.

**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.



### Replace Planetary Fluid (If Equipped)

The planetaries are located on each rear wheel. The plug (1) on the planetary serves as the drain and fill location. The AS510 is shown.

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

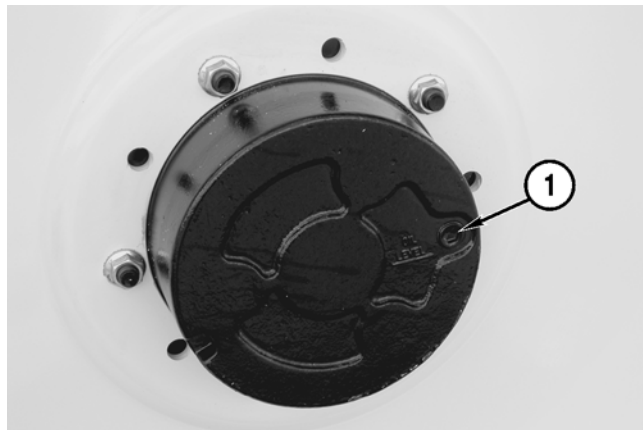
To fill the planetary fluid, position the wheel so the plug on the planetary is in the 3 o'clock position.

**IMPORTANT:** Use only Chevron 1000 THF for the planetary fluid.

Fill each planetary with Chevron 1000 THF to the bottom of the fill hole. The planetary capacity is approximately 2.2 quarts [2.0 liters].

**NOTE:** Filling the planetaries through the differential is possible on the AS510, but the fluid flows slowly. To reduce filling time, add planetary fluid at the planetary fill hole. The total planetary and differential fluid capacity is approximately 30.8 quarts [29.1 liters].

Install the plug (1) and tighten.



## LUBRICATION AND MAINTENANCE

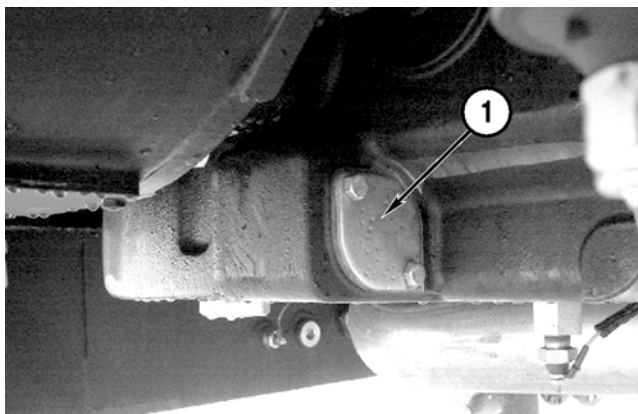
---

### Replace Transmission Fluid and Filter

The transmission fluid drain cover (1) is located under the vehicle at the front of the transmission fluid pan.

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

Install the drain cover and capscrews.



The transmission fluid filter is located on the left side of the transmission.

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

**IMPORTANT:** Do not overtighten the filter. Damage to the seal can result.

Lubricate the seal on the transmission fluid filter, Part Number 300000100, and install. Tighten the filter, by hand, 3/4 to 1-1/4 turns after the seal contacts the filter housing.



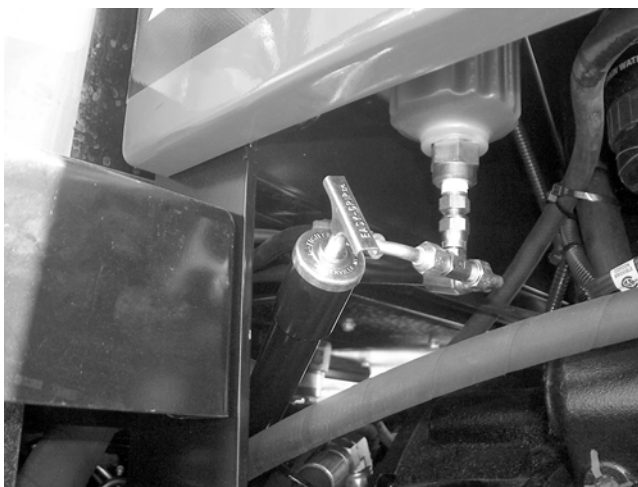
The fluid capacity of the transmission is approximately 12 quarts [11.3 liters].

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

**IMPORTANT:** Use only Dexron III ATF transmission fluid.

**NOTE:** Fill slowly to allow trapped air to escape.

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



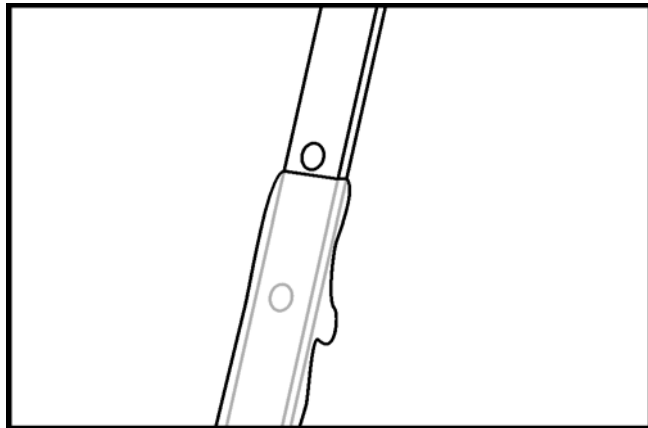
## LUBRICATION AND MAINTENANCE

---

NOTE: Check the transmission fluid level with the engine turned OFF and the oil at normal operating temperature.

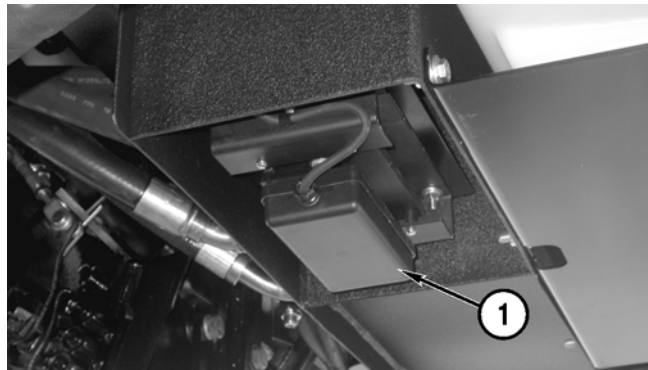
The fluid level should be between the two dots on the dipstick.

Replace the dipstick and turn the handle clockwise to tighten.



### Recalibrate Raven Radar Gun

The Raven radar gun (1) 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.





## LUBRICATION AND MAINTENANCE

### Adjust Toe-In (AS510 & AS710)

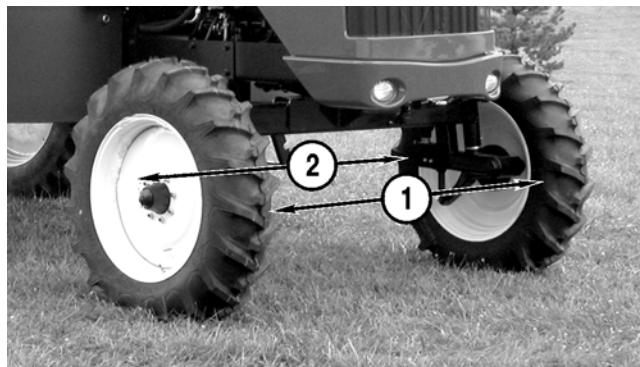
#### Measure Toe-in

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.

Measure and note the distance between the left and right front 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  $\frac{1}{4}$ " less than the distance at the back (2) of the tires.

If the toe-in is not approximately  $\frac{1}{4}$ ", the toe-in must be adjusted.

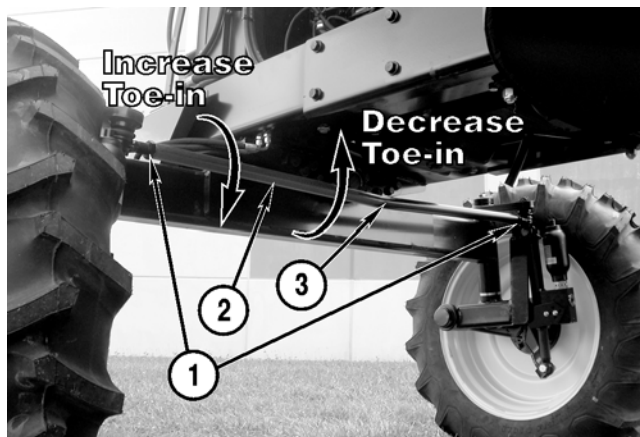


#### Adjust Toe-in

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

Turn the tie rod (2) clockwise (as viewed from the left side) to increase toe-in. Turn the tie rod (2) counter-clockwise (as viewed from the left side) to decrease toe-in.

Position the tie rod (2) so the bend (3) is pointing downward and tighten the jam nuts (1).



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). The left front wheel is shown prior to turning the wheels. 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.



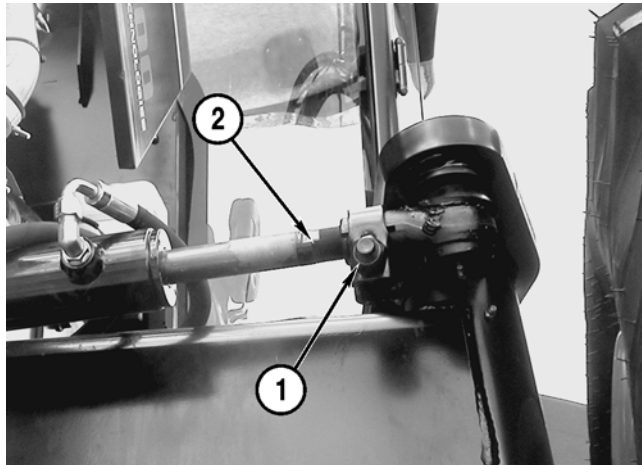
## LUBRICATION AND MAINTENANCE

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 counter-clockwise (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).



### Replace Engine Secondary Air Filter

**IMPORTANT:** Do not attempt to clean the secondary engine air filter. Always replace with a new filter.

The secondary engine air filter is mounted in the engine compartment, towards the cab.

Remove the two thumb screws and cover from the air cleaner assembly. Use a rocking motion to remove the primary air filter and set aside.

Use a rocking motion to remove the secondary air filter and discard the old filter. 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.

Install the new secondary engine air filter, Part Number 201300079.

Install the primary filter, air cleaner cover, and thumb screws.



### Winterize Wet System

The product tank and wet system must be flushed before winterizing. See "Flushing Product Tank" on page 4-19. See "Flushing Wet System" on page 4-21.

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.



## LUBRICATION AND MAINTENANCE

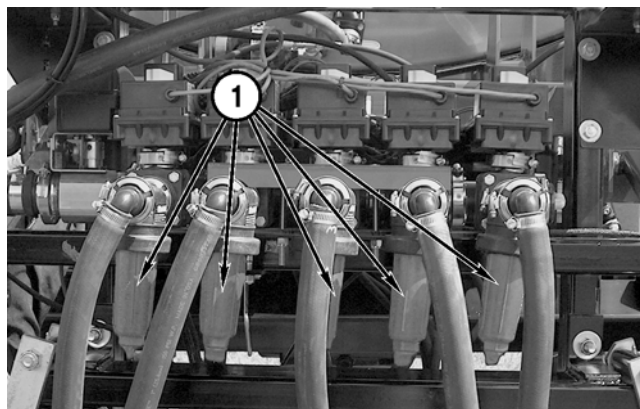
Connect a compressed air line to the main fill valve (1). Apply compressed air at 40 psi to blow out the wet system and booms. Cycle the boom section switches (2) off and on several times to purge water from around the valves.

Disconnect the air line and close the product fill valve.

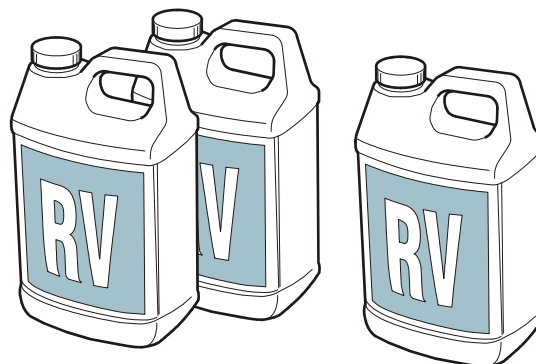
NOTE: Remember to drain the rinse tank and foam tank.



Remove all boom section strainers (1) and the product strainer. Replace the strainer bowls. Store the strainers in a warm, dry location.



Pour approximately 20 gallons [76 liters] of RV antifreeze into the product tank. Boom lengths over 60' will require more antifreeze. Pour 1 gallon [4 liters] of RV antifreeze into the rinse tank.

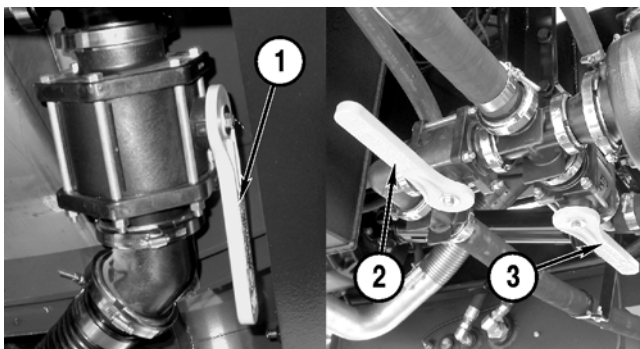


Repeatedly open and close the sump valve (1), rinse tank valve (2), and product valve (3), to allow the antifreeze to surround the ball valves.

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.



## LUBRICATION AND MAINTENANCE

**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.

Start the engine. Unfold and lower the booms as far as possible. Set all boom section switches to the “OFF” position and press the agitation increase button. Set the product pump switch (4) to the “ON” position.

Press the the agitation decrease button (1) to turn agitation off. One at a time, set the boom section switches (3) to the “ON” position until antifreeze flows from the open nozzle in each boom section, then turn the boom sections to “OFF” (3). Set the product pump switch (4) to the “OFF” position.

Excess antifreeze may be left in the sprayer.

Winterize the foamer. See “Freezing” on page 4-17.



### Replace Cab Recirculating Air Filter

**IMPORTANT:** Do not attempt to clean the old cab air filters. Always replace with a new filter.

The recirculating air filter (1) is mounted in the cab, behind the driver's seat.

Grasp the edge of the filter and slide the old air filter up and out of the frame. Discard the old filter.

Insert a new filter, Part Number 490006660 into the frame with the air flow arrow pointing toward the driver's seat.



## LUBRICATION AND MAINTENANCE

---

### Replace Cab Charcoal Air Filter

The charcoal cab air filter is mounted in the cab, to the left of the driver's seat. The cover is shown removed for clarity.

Remove the two thumb screws and air filter cover. Slide the old air filter out of the frame and discard.

**IMPORTANT:** Do not allow old cab filters to stay in the cab. Once removed, dispose of the filters immediately.

**IMPORTANT:** Do not attempt to clean the old cab air filter. Always replace with a new filter.

Insert a new filter, Part Number 490003650, into the frame with the air flow arrow pointing toward the driver's seat.

Replace the cover and thumb screws.



---

## LUBRICATION AND MAINTENANCE

---

### Every 1000 Hours or Yearly

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

#### Clean Transmission Fluid Strainer

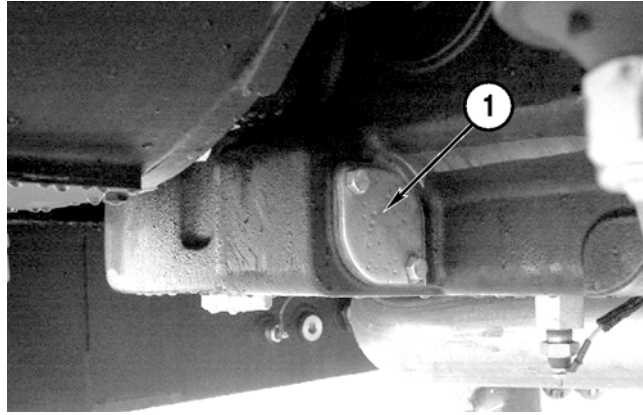
The transmission fluid strainer is located behind the transmission drain cover, under the vehicle, at the front of the transmission fluid pan.

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

Remove the strainer and clean with diesel fuel. Dispose of the fuel properly.

Install the strainer, drain cover and capscrews.

Fill the transmission to the appropriate level. See "Check Transmission Fluid Level" on page 5-10.



#### Replace Hydraulic Fluid

The hydraulic fluid drain plug (1) is located under the vehicle, on the bottom of the hydraulic fluid reservoir. The hydraulic fluid fill location (2) is on top of the reservoir.

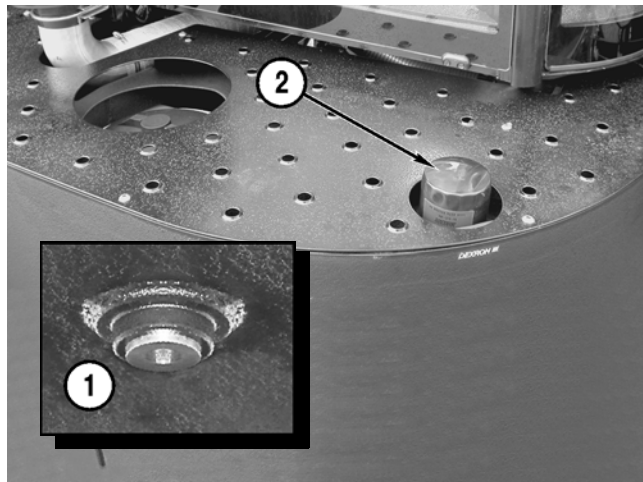
Remove the hydraulic fluid drain plug and drain the fluid into a suitable container with a capacity of approximately 30 gallons [113.5 liters]. Dispose of the fluid properly.

Install the drain plug.

**IMPORTANT:** Use only Dexron III ATF transmission fluid for the Apache Sprayer hydraulic system.

Fill the hydraulic fluid reservoir with Dexron III ATF. The reservoir capacity is approximately 30 gallons [113.5 liters].

Use the sightglass to check the fluid level. See "Check Hydraulic Fluid Level" on page 5-10.



## TORQUE VALUE CHARTS

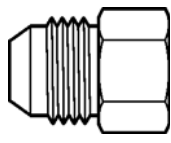
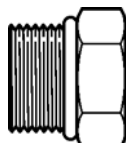
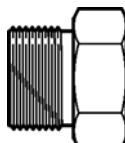
### Fittings

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

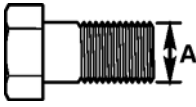
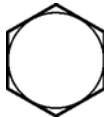


SAE Dash Size	TORQUE					
	SAE 37° Flare		O-ring Straight Thread		Face Seal	
	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m
2	4	5	4	5	----	----
3	8	11	9	12	----	----
4	12	16	16	22	18	25
5	15	20	22	30	---	---
6	18	25	35	48	27	37
8	37	50	60	82	40	54
10	48	65	105	143	63	86
12	74	100	140	190	92	125
14	88	120	184	250	----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

## TORQUE VALUE CHARTS







### 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>		 SAE Grade 2 (No Markings)		 SAE Grade 5 (3 Radial Dashes)		 SAE Grade 8 (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 & Thread Pitch (Millimeters)		  Metric Grade 8.8	  Metric Grade 10.9	  Metric Grade 8.8	  Metric Grade 10.9					  Diameter & Thread Pitch (Millimeters)
	Wrench Size	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



## TROUBLESHOOTING

---

### Apache Sprayer Troubleshooting Symptoms and Solutions

#### SYMPTOM

#### SOLUTION

Parking brake will not engage.

Check brake pads for wear.

Check electrical coil, on hydraulic junction block under the cab, for power.

Check hose connections to brake canister on brake disc.

Vehicle 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 vehicle moves forward or backward.

Check transmission fluid level.

Check wire connection at sending unit.

Contact your dealer.

Vehicle will not move forward.

Check driveshaft.

Check transmission fluid level.

Check electrical connections on transmission.

Contact your dealer.

Vehicle 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, under T-handle

Vehicle steering does not work.

Check hydraulic fluid level.

Check for hydraulic fluid leaks.

Check steering column coupling on steering motor.

## TROUBLESHOOTING

---

SYMPTOM	SOLUTION
Transmission will not shift gears.	Check transmission fluid level. Contact your dealer.
Vehicle brakes do not work.	Check brake fluid level. Tighten brake fluid reservoir cap. Check differential fluid level. 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.

## TROUBLESHOOTING

---

### SYMPTOM

### SOLUTION

Apache 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 Raven 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.

Raven monitor does not turn on.

Check fuse in back of console.

Front suspension cylinder is flat.

Lift tire off ground and check accumulator fluid. 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 switch in "ON" position.  
Check electrical connections at hydraulic valve block.  
Check electrical connections in cab.

A/C does not cool.

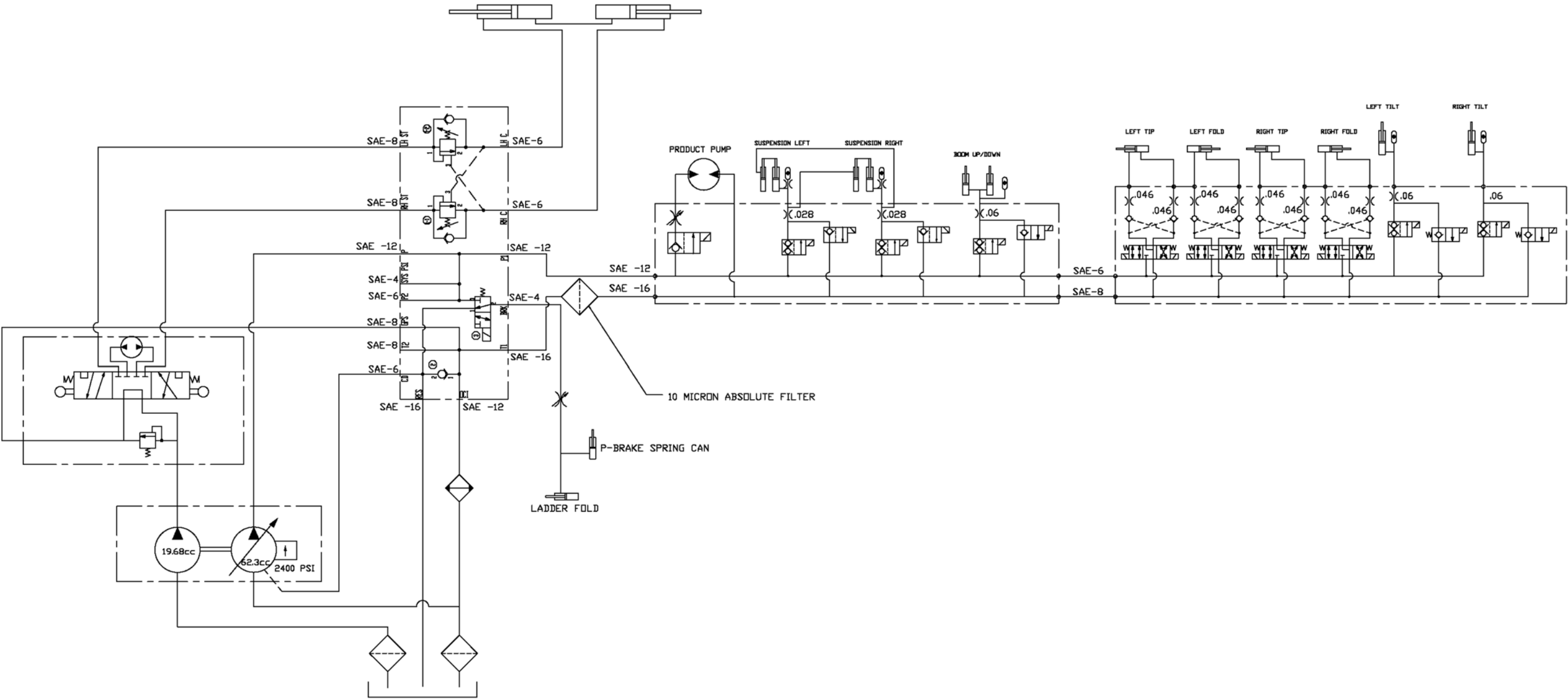
Confirm A/C switch in "ON" position.  
Confirm fan in "ON" position.  
Check belt to compressor.  
Contact your dealer.

## TROUBLESHOOTING

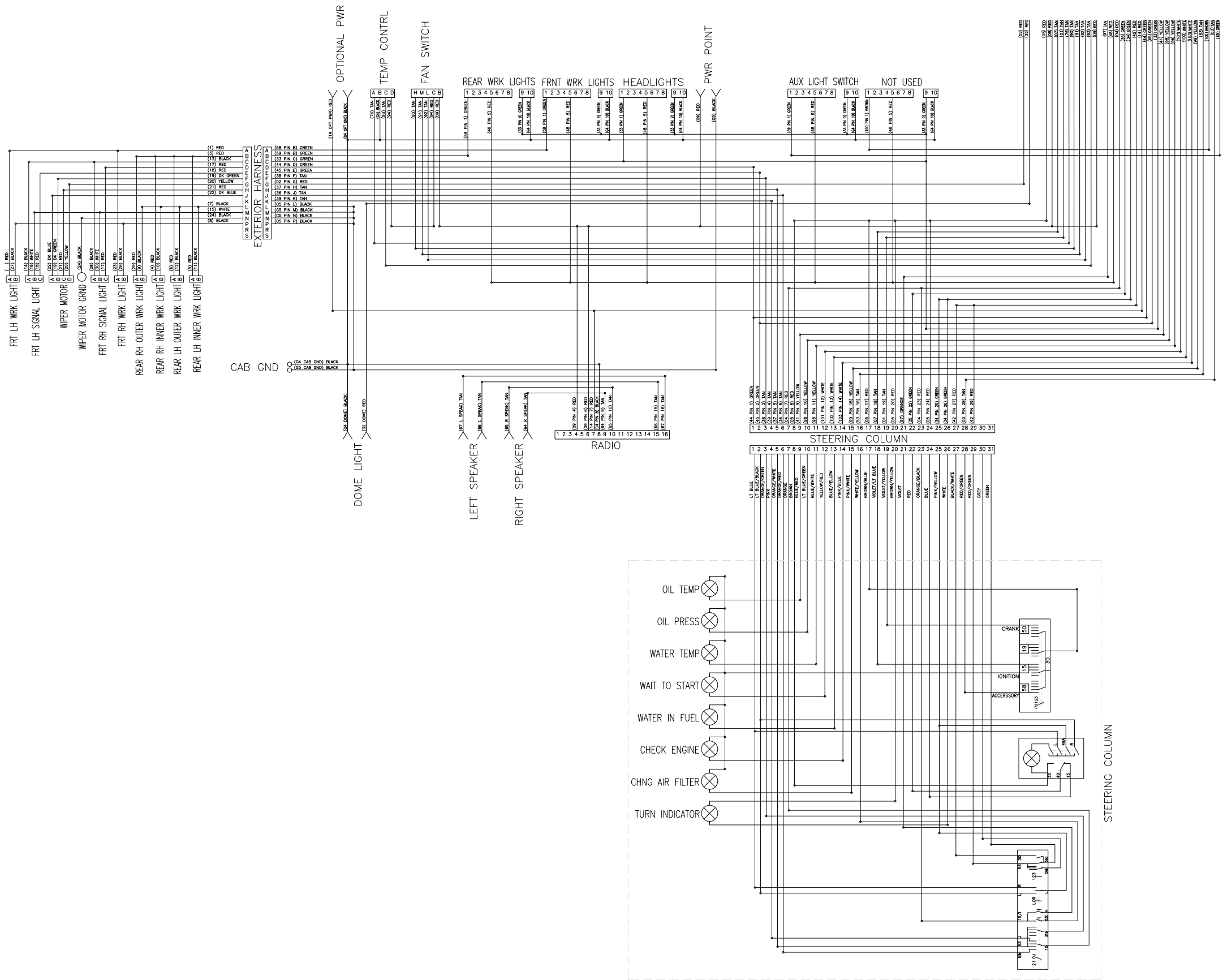
---

SYSTEM SCHEMATICS

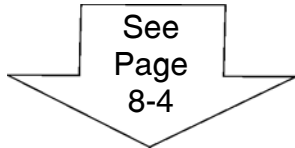
Hydraulic System



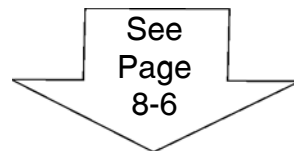
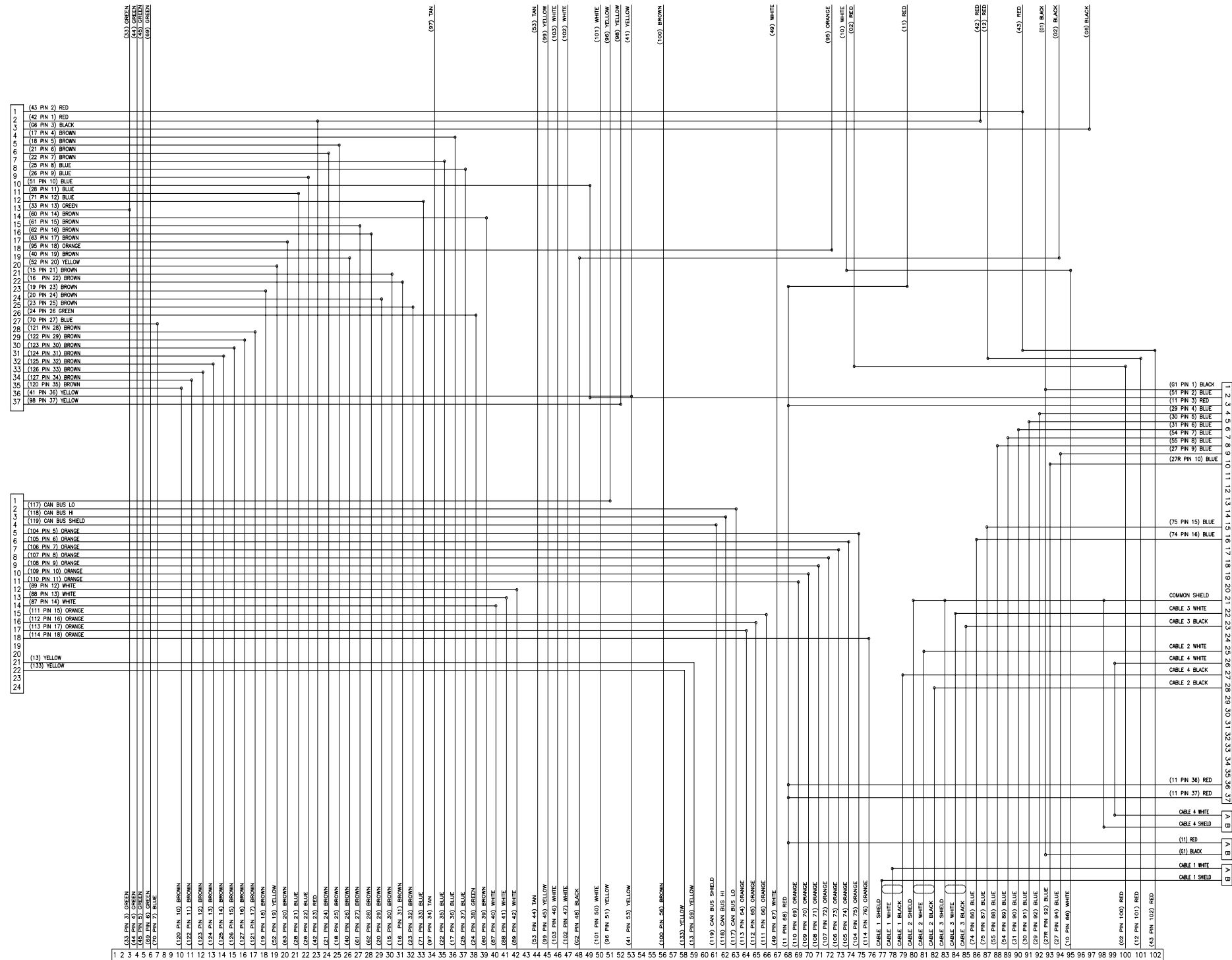
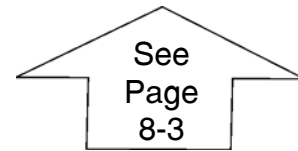
See  
Page  
8-3



See  
Page  
8-2

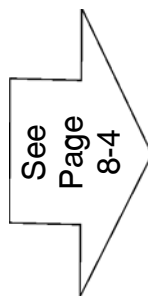
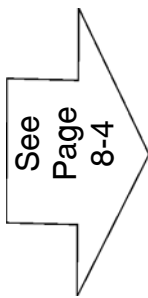


## Electrical System (Sheet 3 of 5)

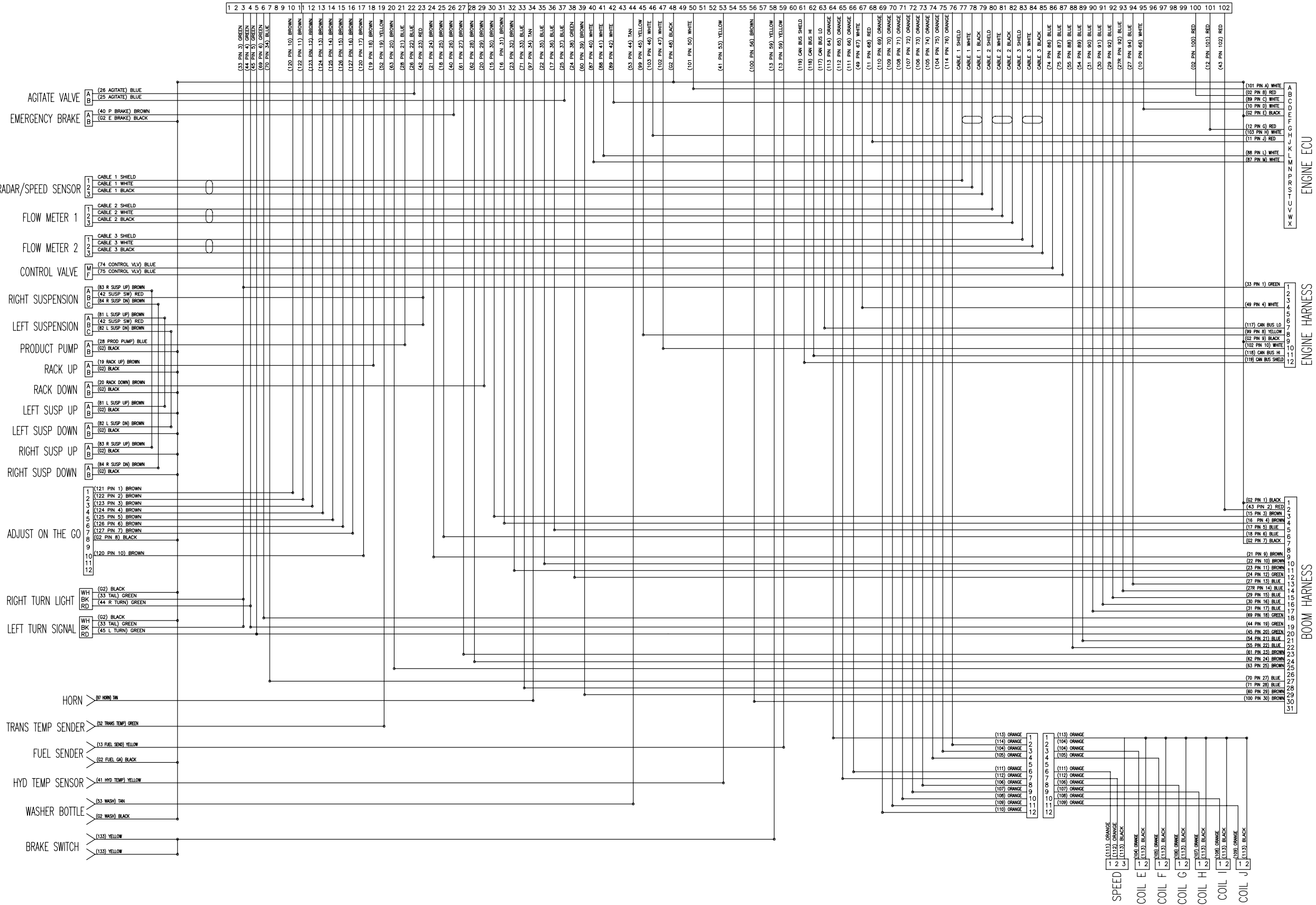




(19) BROWN  
(20) BROWN  
(42) RED  
(15) BROWN  
(16) BROWN  
(23) BROWN  
(24) BROWN  
CRUISE SET/COAS  
CRUISE RESUME/  
(51) BLUE  
REVERSE  
FORWARD  
THROTTLE INCREA  
THROTTLE DECREA  
GEAR SHIFT UP  
POWER (+5VDC)  
GEAR SHIFT DOWN  
GROUND



See  
Page  
8-4



See  
Page  
8-3

See  
Page  
8-3

# WARRANTY

---

## Equipment Technologies Inc.

### 2003 AND NEWER APACHE LIMITED WARRANTY POLICY

Equipment Technologies Inc. (hereinafter called ETI) 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 ETI, 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 ETI. 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 ETI, 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 ETI. 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 it's internal components, rear differential and it's 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 year's three through five of warranty. Transmission and it's internal components, rear differential and it's 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 the engine manufacturer for two (2) years or two thousand (2000) hours from the date of delivery to the original purchaser, whichever comes first. ETI does warranty the a/c compressor, a/c belt, 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 covers the tire warranty. Contact your local authorized dealer for complete warranty details.

**Batteries** - Batteries are warranted for thirty (30) months. Batteries are warranted through any authorized Interstate battery retailer. If you have no authorized Interstate battery retailer contact ETI for warranty replacement information.

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

## **WARRANTY**

---

ETI'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. ETI 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 ETI's behalf. This limited warranty is void if ETI's limited warranty policy maintenance standards are violated.

ETI makes NO warranty of merchantability or fitness for a particular purpose. This machine must be registered with ETI 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 AS510

Component	Lubrication	Capacity Quarts [Liters]	Filter Part Number
Engine Oil	15w-40 Motor Oil	14.3 [13.5]	201450300
Engine Coolant	Chevron Supreme	23 [21.8]	----
Engine Primary Air Filter	----	----	201300078
Engine Secondary Air Filter	----	----	201300079
Transmission	Dexron III ATF	12 [11.3]	300000100
Rear Axle	Chevron 1000 THF	26.4 [25]	----
Planetary	Chevron 1000 THF	2.2 [2]	----
Brake Reservoir	Chevron 1000 THF	as required	----
Engine Fuel	Diesel	100 Gallons [379 Liters]	Engine Mounted: 201450301 In-Line: 201450290
Hydraulic System	Dexron III ATF	30 Gallons [113.5 Liters]	Filter: 840000013 Strainer: 840000010** Strainer: 840000011**
Front Suspension	Chevron 1000 THF	as required	----
A/C System	R134a	3 Lbs.	----
Cab Charcoal Filter	----	----	490003650
Cab Recirculating Filter	----	----	490006660
** - The hydraulic fluid strainers are mounted in the hydraulic reservoir and may be cleaned and reused. See "Clean Hydraulic Fluid Strainers" on page 5-19. NOTE: Any oil and fluid substitutions must meet or exceed recommended fluid specifications.			

### Tire Pressure (Cold)

12.4 x 28"	30 psi [207 kPa]
14.9 x 46"	35 psi [241 kPa]
320/90 R90	38 psi [262 kPa]

### Lug Nut Torque

Front	180 lb-ft [244 N•m]
Rear	225 lb-ft [305 N•m]

### Wet System Capacities

Product Tank	750 gallons [2839 liters]
Rinse Tank	50 gallons [189 liters]

### Hydraulic Pump Output

	2400 psi [165 bar]
--	--------------------

### Raven Controller Numbers

Valve CAL #	2123
Speed CAL # w/ Radar Gun (approximate)	615
Speed CAL # w/ Drive Shaft Sensor (approximate)	252

## Apache AS710

Component	Lubrication	Capacity Quarts [Liters]	Filter Part Number
Engine Oil	15w-40 Motor Oil	20.1 [19]	201450300
Engine Coolant	Chevron Supreme	23 [21.8]	----
Engine Primary Air Filter	----	----	201300078
Engine Secondary Air Filter	----	----	201300079
Transmission	Dexron III ATF	12 [11.3]	300000100
Rear Axle	Chevron 1000 THF	26.4 [25]	----
Planetary	Chevron 1000 THF	2.2 [2]	----
Brake Reservoir	Chevron 1000 THF	as required	----
Engine Fuel	Diesel	100 Gallons [379 Liters]	Engine Mounted: 201450302 In-Line: 201450290
Hydraulic System	Dexron III ATF	30 Gallons [113.5 Liters]	Filter: 840000013 Strainer: 840000010** Strainer: 840000011**
Front Suspension	Chevron 1000 THF	as required	----
A/C System	R134a	3 Lbs.	----
Cab Charcoal Filter	----	----	490003650
Cab Recirculating Filter	----	----	490006660
<b>** - The hydraulic fluid strainers are mounted in the hydraulic reservoir and may be cleaned and reused. See "Clean Hydraulic Fluid Strainers" on page 5-19.</b> <b>NOTE: Any oil and fluid substitutions must meet or exceed recommended fluid specifications.</b>			

### Tire Pressure (Cold)

12.4 x 28"	30 psi [207 kPa]
14.9 x 46"	49 psi [338 kPa]
320/90 R90	58 psi [400 kPa]

### Lug Nut Torque

Front (12.4 x 28" tire)	180 lb-ft [244 N•m]
Rear	225 lb-ft [305 N•m]

### Wet System Capacities

Product Tank	750 gallons [2839 liters]
Rinse Tank	50 gallons [189 liters]

### Hydraulic Pump Output

	2400 psi [165 bar]
--	--------------------

### Raven Controller Numbers

Valve CAL #	2123
Speed CAL # w/ Radar Gun (approximate)	615
Speed CAL # w/ Drive Shaft Sensor (approximate)	252



**Equipment Technologies, Inc.**  
**2201 Hancel Parkway**  
**Mooreville, IN 46158**  
**Tel: (317) 834-4500**  
**Fax: (317) 834-4501**

Your Apache Dealer: