

APACHETM

AS720

2015 Operator'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** 

FORM #580000112
COPYRIGHT 2014
EQUIPMENT TECHNOLOGIES

Apache Sprayer Information

The password for the locked screens on the ET Pilot Touchscreen is "2201".

Dealer: _____

Main Phone # _____

Service Contact: _____

Phone # _____

Parts Contact: _____

Phone# _____

Shop Contact: _____

Phone # _____

Sales Rep: _____

Phone # _____

Precision Rep: _____

Phone # _____

ET / Apache Phone #: _____

Guidance Width/Inches: _____

of Sections: _____

Boom 1 Cal: _____

Boom 2 Cal: _____

Boom 3 Cal: _____

Boom 4 Cal: _____

Boom 5 Cal: _____

Boom 6 Cal: _____

Boom 7 Cal: _____

Boom 8 Cal: _____

Boom 9 Cal: _____

Product Control:

Speed Cal#: _____

Valve Cal#: _____

Meter Cal#: _____

Valve Advance: _____

Valve Delay: _____

Section Control:

On Look Ahead: _____

Off Look Ahead: _____

Machine Model: _____

Machine Serial #: _____

Engine Serial #: _____

Rate Controller Model: _____

Aux Controller/Display: _____

GPS Antenna Model: _____

GPS Source: _____ GPS Satellite: _____

Height Control: _____

Software Version: _____

Offset: LH Outer: _____ LH Inner: _____

Center: _____ RH Inner: _____

RH Outer: _____

Sensitivity: _____ Speed: _____ Stability: _____

Autosteer: _____ Module Orientation: _____

Software Version: _____

Implement Offsets:

Fore/Aft: _____ Height: _____

Wheelbase: _____

Low Limit/ Minimum Flow:

Nozzle Size/Color/Rate _____ = _____

Nozzle Size/Color/Rate _____ = _____

Nozzle Size/Color/Rate _____ = _____

Nozzle Size/Color/Rate _____ = _____

**To maintain minimum spray pattern adjust when changing nozzle rate.*

Foam Marker Mixing Ratio:

Soap : _____ open

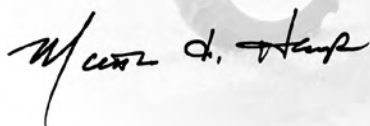
Water: _____ open

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 Apache Sprayer exceeds your expectations, and gives you years of satisfaction. We invite you to visit us at www.etsprayers.com or in person at our plant in Mooresville, Indiana.

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

Yours Faithfully,

A handwritten signature in black ink, appearing to read "Matthew F. Hays". The signature is fluid and cursive, with the first name being the most prominent.

Matthew F. Hays
Chief Executive Officer

NOTICE

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

1. Check all settings and calibrations in your Envizio Pro II™, Viper 4®, or FmX® field computers:
 - Swath Width
 - Boom Section Calibration
 - Receiver Fore/Aft Settings
 - Valve Calibration
 - Flow Meter Calibration
 - Rate Calibration
 - Low Limit Setting
 - Valve Advance and Delay
2. Please review your Autoboom® and Accuboom™ settings, if equipped.
3. Calibrate the SmarTrax™ and Autopilot™ autosteer, if equipped. SmarTrax™ and Autopilot™ calibration must be performed on a large, flat, and open area. Make sure all settings are entered properly, and that calibration is performed in its entirety. This includes driving on an A-B line for roughly 20 minutes after automatic calibration is completed to allow the yaw sensor to learn how to acquire the line properly.

Trademark Information

Caterpillar®

- Cat® TO-4

Cummins®

Raven Industries

- AccuBoom™
- AutoBoom®
- Envizio Pro II™
- FlowMax™
- SmarTrax™
- Viper 4®

Equipment Technologies (ET)

- Apache™

Lucas® Oil Products

SiriusXM™

Trimble®

- FmX®
- Field IQ™
- AutoPilot™

Michelin®

Goodyear®

APACHE™

TABLE OF CONTENTS

Chapter 1: General Information	
2015 AS720 Specifications	1-1
Apache AS720 Fluids, Filters and Capacities	1-2
AS720 Optional Equipment	1-3
Chapter 2: Safety	
Safety Symbols, Signal Word and Statements	2-1
Safety Precautions	2-2
Pre-Operation Hazards	2-2
Fire and Explosion Hazards	2-2
Burn Hazards	2-3
Lifting Hazards	2-3
Exposure Hazard	2-3
Entanglement / Sever Hazard	2-3
Alcohol and Drug Hazard	2-3
Exhaust Emissions Safety	2-4
Environmental Precautions	2-4
Safety Belt	2-4
Safety Decals	2-5
Exterior Decal Locations	2-6
Interior Decal Locations	2-8
Chapter 3: Operation	
Pre-Operation Checks	3-1
Cab Overview	3-2
Cab Access Ladder	3-3
Steering Column	3-3
ET Pilot System	3-4
ET Pilot System Touch Screen	3-5
Diagnostics Page 1	3-6
Diagnostics Page 2, 3, and 4	3-7
Vehicle Settings Page 1 and 2	3-8
Vehicle Settings Page 3	3-9
Light Buttons	3-9
Apache Sprayer Lighting	3-10
AM/FM Radio with Weather Band	3-10
SiriusXM Satellite Radio Activation Information	3-11
Seat Adjustment	3-12
Joystick and Envizio Pro II	3-13
Starting and Stopping Engine	3-14
Warm-up	3-15
Stopping	3-15
Apache Sprayer Direction and Speed	3-16
Neutral	3-16
Forward	3-17
Shifting Forward Gears	3-17
Reverse	3-18
Foot Throttle	3-19
Cruise Control	3-19
Towing	3-20
Hood Tilt Latch	3-21
Hood Panel Removal	3-21
Side	3-21
Front	3-22
Top	3-22
Battery	3-23
Cabin Power Distribution Module	3-23
Firewall Distribution Module	3-23
Axle Adjustment (Manual)	3-24
Front	3-24
Rear	3-24
Axle Adjustment (Optional) (Adjust-On-The-Go)	3-25
Adjust-On-The-Go Calibration	3-25
Front	3-26
Rear	3-27
Adjustable Powered Mirrors	3-27
Vehicle Dynamics	3-28
Climate Controls	3-28
Precision Equipment	3-29
Antenna Mounting Plate	3-29
Raven Radar Gun	3-29
Rear Camera	3-30
Jumpstarting The Engine	3-31
Chapter 4: Wet System Operation	
Wet System Overview	4-1
Fill Station	4-2
Product Pump and Valves	4-2
Sump Valve	4-3
Foam Tank	4-3
Flow Control	4-3
Electronic Boom Valves	4-4
Envizio Pro II Monitor	4-4
Field Computer Options	4-5
Side Console	4-6
Joystick	4-7
Filling Product Tank	4-7
Tank Fill Monitor	4-8
Product Tank Sight Gauge	4-9
Filling Rinse Tank	4-9
Filling Foam Marker Tank	4-9

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
Valve Advance and Valve Delay	4-15
Optional Fence Row Nozzle	4-16
Operating Foam Marker.	4-16
Auto Foam	4-17
LandMark Injection Foam Marker.	4-17
Flushing Product Tank.	4-21
Flushing Booms.	4-22
Cleanload Chemical Eductor.	4-23
Startup	4-23
Loading Liquid or Powdered Chemical into Hopper.	4-23
Chapter 5: Lubrication and Maintenance	
Maintenance Precautions	5-1
Environmental Precautions	5-3
Non-Apache Equipment Maintenance.	5-3
Cleaning Guidelines.	5-4
Mechanical Parts	5-4
Electrical Parts	5-4
Body and Cab Exterior	5-4
Apache Sprayer Service Interval Chart	5-5
Before Initial Use	5-6
After First 10 Hours	5-6
Adjust Boom	5-6
As Required.	5-8
Daily.	5-9
Grease Boom	5-9
Grease Pommier Boom	5-11
Flush Wet System.	5-13
Check Tire Pressure.	5-13
Check Engine Oil Level	5-14
Check Cooling System	5-15
Cycle Fan Reverser	5-15
Check Transmission Fluid Level.	5-16
Check Hydraulic Fluid Level.	5-16
Adjust Poly Tank Straps	5-17
Every 40 Hours	5-17
Torque Lug Nuts.	5-17
Grease Rear Suspension	5-17
Grease Steering Components	5-18
Grease Front Strut and King-pins.	5-19
Grease Axle Components	5-20
Torque Boom Lead Bolts	5-20
Check Differential Fluid Level.	5-21
Check Rear Differential for Leaks.	5-21
After First 100 Hours	5-21

Every 100 Hours	5-21
Grease Driveline Components.	5-21
Torque Axle Extension Brace Bolts	5-23
Change Fuel Filter	5-24
Change Fuel Separator Filter.	5-24
Clean Fuel Tank Strainer	5-25
Every 250 Hours	5-26
Clean or Change Engine Primary Air Filter	5-26
Change Differential Fluid	5-26
Change Hydraulic Fluid Filter.	5-27
Clean Hydraulic Fluid Strainer	5-27
Every 500 Hours or Yearly	5-29
Inspect Front Accumulator and Suspension Cylinder	5-29
Check Front Suspension Cylinder Fluid Level	5-29
Check Accumulator Charge	5-29
Change Engine Oil and Filter.	5-30
Change Transmission Fluid and Filter and Clean Strainer	5-31
Recalibrate Raven Radar Gun.	5-32
Inspect and Repack Wheel and Inter-Flex Bearings	5-32
Change Final Drive Fluid	5-33
Change Cab Charcoal Filter.	5-34
Every Year.	5-35
Adjust Toe-In (Standard 120" Axles)	5-35
Adjust Toe-In (120" to 160" Adjustable Axles)	5-36
Change Engine Safety Air Filter.	5-37
Winterize Wet System	5-38
Every 1000 Hours or Yearly	5-40
Change Hydraulic Fluid	5-40
Chapter 6: Torque Value Charts	
Fittings.	6-1
Torque Value Chart	6-2
Bolts.	6-2
Metric Bolts	6-3
Chapter 7: Troubleshooting	
Apache Sprayer Troubleshooting Symptoms and Solutions.	7-1
Chapter 8: Electrical System	
Firewall Power Distribution Module Chart.	8-1
Cabin Power Distribution Module	8-3
Chapter 9: Warranty	
Equipment Technologies Warranty Policy For all 2015 Model Year	9-1
Chapter 10: Maintenance Log	

APACHE™

CHAPTER 1

GENERAL INFORMATION

The graphics and text in this manual generally describe the AS720 Apache Sprayer. 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 it.

2015 AS720 Specifications

	AS720
Tank Capacity	750 gallons [2839 liters]
Engine	160 hp [119.3 kW] Tier III Cummins
Transmission	ITL/JCB Power shift 4-speed, torque converted
Speed Ranges	1st 0-5 mph [0-8.04 km/h], 2nd 0-9 mph [0-14.5 km/h], 3rd 0-16 mph [0-25.7 km/h], 4th 0-28 mph [0-45 km/h]
Brakes	Internal, wet disc, self adjusting
Suspension	Front Axle: Center oscillating with independent hydraulic, accumulated struts. Rear Axle: Patented hydraulic load suspension with compensating anti-sway control, self-adjusting for diminishing/increasing load.
Cab	ET custom pressurized cab
Crop Clearance	42 in. [106.6 cm] or 50 in. [127 cm]
Axles	120 in. [304.8 cm] Fixed Width Axle (Standard) 120 to 160 in. [304.8 to 406.4 cm] Adjustable Axle Width with Optional Hydraulic Adjust (50 in. clearance only)
Final Drive	ITL/JCB planetary gearset (42 in. [106.6 cm] CC); JCB all gear drop box (50 in. [127 cm] CC)
Weight	19,200 lb [7892.5 kg] dry weight
Fuel Capacity	100 gallons [379 liters]
Width	12 ft [3.6 m]
Length	24 ft [7.3 m]
Height	144 in. [365.7 cm]
Wheel Base	15 ft [4.6 m]
Turning Radius	17 ft [5.1 m]
Standard Tires	Front: 380/80R38 and Rear: 380/90R46
Booms	80 ft [24.3 m], 90 ft [27.4 m], 100 ft [30.4 m], 120 ft [36.6 m], 132 ft [40.2 m], 60 / 80 ft [18.2 / 24.3 m], 60 / 90 ft [18.2 / 27.4 m]
Boom Height	18 to 89 in. [45.6 to 226.1 cm] (42 in. CC [106.6 cm] CC): 26 to 97 in. [66 to 246.4 cm] (50 in. CC [127 cm] CC)
Product Pump	Hypro 9306C HM1C, hydraulically driven centrifugal pump
Roto-Flush	Pump pressured

Apache AS720 Fluids, Filters and Capacities

Component	Lubrication	Capacity Quarts [Liters]	Filter Part Number
Engine Oil	Lucas 15W-40 Magnum Motor Oil	16 [15]	201450241
Engine Coolant	KostGuard Universal Antifreeze 50/50	24 [22.7]	----
Engine Primary Air Filter	----	----	201300116
Engine Safety Air Filter	----	----	201300117
Transmission	Lucas Universal Hydraulic Fluid	16 [15]	300000101
Differential (Rear Axle)	Lucas Universal Hydraulic Fluid	11.9 [11.26]	----
Planetary	Lucas 80/90 Gear Oil	2.9 [2.7]	----
Rear Drop Box	Lucas 80/90 Gear Oil	21 [20]	----
Engine Fuel	Diesel	100 Gallons [379 Liters]	Filter: 201450303 Separator/Filter: 211000000 Tank Strainer: 201450001
Hydraulic System	Lucas Universal Hydraulic Fluid	40 Gallons [151.42]	Filter: 880000026 Strainer: 840000010 Hydraulic Filter Kit: K65000209 Hydraulic Filter Kit with Oil: K65000210
Front Suspension	Lucas Universal Hydraulic Fluid	as required	----
A/C System	R134a	2.8 lbs	----
Cab Filter	----	----	Charcoal Filter: 490003651
NOTE: Any oil and fluid substitutions must meet or exceed recommended fluid specifications.			

Michelin Tire Pressure (Cold)

320/85R38.....	46 psi [3.17 bar]
380/80R38.....	29 psi [2.0 bar]
380/90R46.....	42 psi [2.9 bar]
480/70R34.....	20 psi [1.38 bar]
620/70R42.....	35 psi [2.83 bar]
800/65R32.....	23 psi [1.59 bar]

Goodyear Tire Pressure (Cold)

320/85R38	35 psi [2.41 bar]
320/90R50	67 psi [4.62 bar]

Lug Nut Torque

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

Wet System Capacities

Product Tank.....	750 gallons [2839 liters]
Rinse Tank.....	100 gallons [379 liters]

Hydraulic Pump Output.....	2400 psi [165 bar]
----------------------------	--------------------

AS720 Optional Equipment

The following chart lists optional kits available for all 2015 Apache Sprayers including the AS720. Please note that some of the kits are machine model specific. The kits include all parts, brackets and mounting hardware needed for installation.

Part Number	Description
K65000171	KIT, FENCE ROW NOZZLE ONE-SIDE 60/80 OR 80' BOOM
K65000172	KIT, FENCE ROW NOZZLE ONE-SIDE 60/90, 90', OR 100' BOOM
K65000197	KIT, FOAM MARKER COMBO BOOM 60/80 OR 60/90
K65000198	KIT, FOAM MARKER STRAIGHT 80', 90' OR 100' BOOM
K65000202	KIT, FRONT FENDERS 42" & 50" CC
K65000203	KIT, REAR FENDER 42" CC
K65000204	KIT, REAR FENDERS 50" CC
K65000209	KIT, HYDRAULIC FILTER WITHOUT OIL
K65000210	KIT, HYDRAULIC FILTER WITH OIL
K65000212	KIT, RAVEN 2" FLOWMAX FLOWMETER
K65000213	KIT, AUTOBOOM WHEELS W/ MOUNT
K65000218	KIT, DUAL EXTENSION, TITAN NARROW TIRES
K65000243	KIT, STANDARD DUAL EXTENSION, TITAN TIRES
K65000254	KIT, 3" QUICK FILL POLY TANKS
K65000255	KIT, 3" QUICK FILL SS TANKS
K65000257	KIT, POWER GLIDE AUTOBOOM
K65000258	KIT, ULTRAGLIDE AUTOBOOM 3 EYE
K65000259	KIT, ULTRAGLIDE AUTOBOOM W/WHEELS
K65000260	KIT, ULTRAGLIDE W/ 5-EYES
K65000261	KIT, POWER GLIDE W/CENTER EYE
K65000289	KIT, FENCE ROW NOZZLE ONE-SIDE POMMIER 120' BOOM
K65000290	KIT, FENCE ROW NOZZLE ONE-SIDE POMMIER 132' BOOM
K65000291	KIT FOAM MARKER POMMIER 120' & 132' BOOM
K65000292	KIT, 2014 CAB FILTERS
K65000293	KIT, 2014 SPRAY SURVIVAL AS720, AS1020 & AS1220
K65000294	KIT, 2014 YEARLY SERVICE FILTER AS720
K65000295	KIT, 2014 YEARLY SERVICE FILTER AS1020 & AS1220
K65000296	KIT, 2014 YEARLY SERVICE FILTER AS1025
K65000297	KIT, 2014 SPRAY SURVIVAL AS1025
K65000298	KIT, RAVEN 3" FLOWMAX FLOWMETER
K65000299	KIT, FLOWMETER AND DISPLAY 2"
K65000300	KIT, FLOWMETER AND DISPLAY 3"
K65000301	KIT, 2014 ADJUST ON THE GO
K65000302	KIT, ENVIZIO PRO II CONSOLE WITH SCALABLE GPS

Part Number	Description
K65000303	KIT, VIPER 4 CONSOLE
K65000304	KIT, 2014 AUTO STEER SMARTRAX
K65000305	KIT, CHEMICAL EDUCTOR, POLY TANK 2014
K65000306	KIT, CHEMICAL EDUCTOR, SS TANK 2014
K65000307	KIT, CONVERSION PG TO UG ISO
K65000308	KIT, ISO POWER GLIDE AUTOBOOM
K65000309	KIT, ISO POWER GLIDE W/CENTER EYE
K65000310	KIT, ISO ULTRAGLIDE AUTOBOOM 3 EYE
K65000311	KIT, ISO ULTRAGLIDE AUTOBOOM 3 EYE W/WHEELS
K65000312	KIT, ISO ULTRAGLIDE AUTOBOOM 5 EYE
K65000313	KIT, TRIMBLE AUTOPILOT AUTO GUIDANCE 2014
K65000314	KIT, TRIMBLE FMX CONSOLE
K65000315	KIT, ISO CONNECTION FOR DEERE 2630
K65000316	KIT, ISO CONNECTION FOR CASE 700
K65000317	KIT, ISO CONNECTION FOR AG LEADER INTEGRA
K65000318	KIT, DUAL EXTENSION, MICHELIN NARROW TIRES
K65000319	KIT, STANDARD DUAL EXTENSION, MICHELIN TIRES
K65000320	KIT, ISO ULTRAGLIDE AUTOBOOM 5-EYE
K65000325	KIT, REAR 620" FLOATS WHITE RIMS MICHELIN MEGAXBIB 620/70R42
K65000326	KIT, REAR 800" FLOATS WHITE RIMS MICHELIN MEGAXBIB 800/65R32
K65000327	KIT, FRONT 320" NARROW WHITE RIMS GOODYEAR TIRES 320/85 R38
K65000328	KIT, REAR 320" NARROW WHITE RIMS GOODYEAR TIRES 320/90 R50
K65000332	KIT, REAR 620" FLOATS BLACK RIMS MICHELIN MEGAXBIB 620/70R42
K65000333	KIT, REAR 800" FLOATS BLACK RIMS MICHELIN MEGAXBIB 800/65R32
K65000334	KIT, FRONT 320" NARROW BLACK RIMS GOODYEAR TIRES 320/85 R38
K65000335	KIT, REAR 320" NARROW BLACK RIMS GOODYEAR TIRES 320/90 R50

APACHE™

CHAPTER 2

SAFETY

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

Safety, Symbols, Signal Words and Statements

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



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

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

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

messages and information contained in this manual and on the Apache Sprayer to prevent personal injury and ensure safe reliable Apache Sprayer operation.



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



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



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

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

Safety Precautions

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

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

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

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



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

Pre-Operation Hazards



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

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

Fire and Explosion Hazards



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

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

Burn Hazards



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

Lifting Hazards

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

Exposure Hazard



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

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

Entanglement / Sever Hazard



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



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

Alcohol and Drug Hazard

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

Exhaust Emissions Safety

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

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

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



WARNING! Exhaust Gas Exposure Hazards

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

Environmental Precautions

The safety messages that follow have NOTICE level hazards.

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

Safety Belt



WARNING! Impact Hazards.

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

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

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

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

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

Safety Belt (ctnd.)

WARNING! Impact Hazard.

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

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

Safety Decals

CAUTION!

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

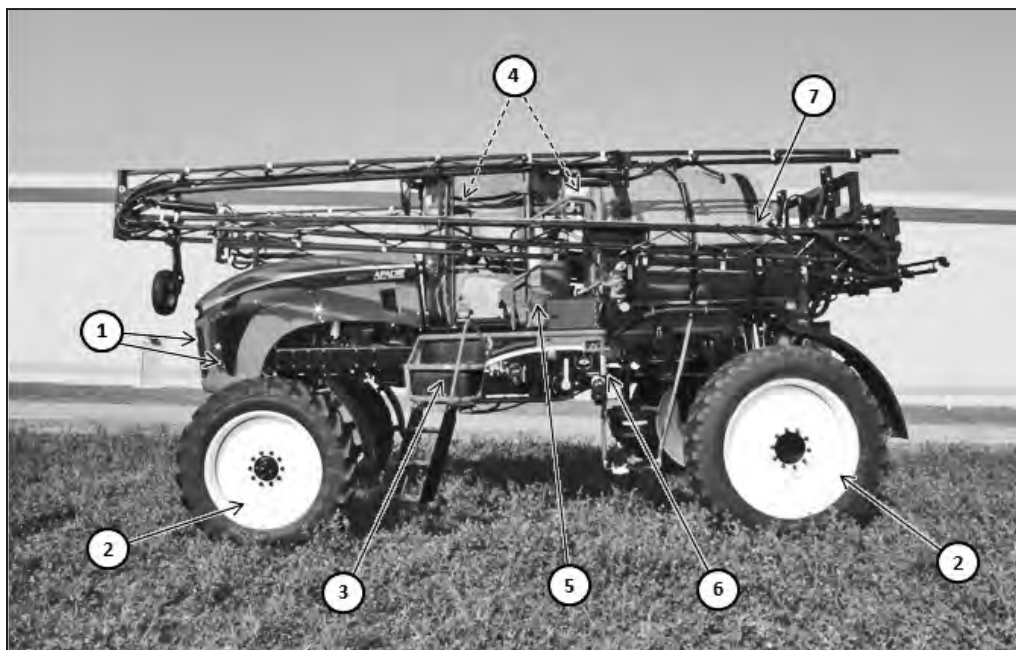
Safety decals are used to explain and inform you of potential personal injury hazards and provide precautionary instructions. Read, understand and follow all safety decals on the Apache Sprayer to prevent personal injury and ensure safe reliable Apache Sprayer operation.

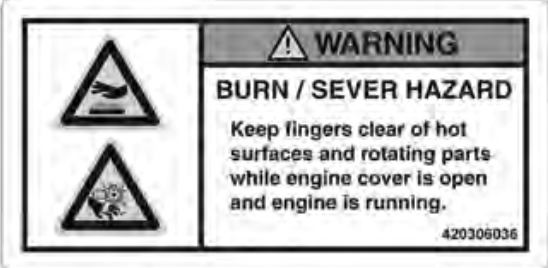

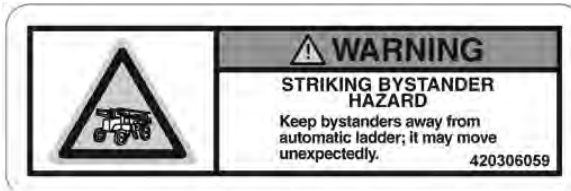
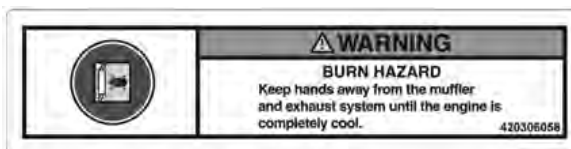
NOTICE: Prevent safety decals from becoming dirty or damaged and replace them immediately should they become damaged or are missing. Should an Apache Sprayer part that has a decal attached to it need replacement, obtain a new decal with the new part.

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

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

Exterior Decal Locations



1. 
2. 
3. 
4. 

5.

	⚠ DANGER ELECTROCUTION HAZARD <ul style="list-style-type: none"> This machine is not insulated. Death or serious injury will result from contact with or inadequate clearance to electrical power lines and apparatus. Maintain safe clearances from electrical power lines in accordance with applicable government regulations such as OSHA 1910.269. This machine does not provide protection from contact with or proximity to an electrically charged power line.
	⚠ WARNING STRIKING OBJECT OR BYSTANDER HAZARD Do not fold or unfold booms while sprayer is moving.
	⚠ WARNING OPERATIONS HAZARDS <ul style="list-style-type: none"> Do not operate sprayer on public highways with fluid in product tank. Always drain and flush tank prior to transport. Do not exceed 40 mph unloaded.
	⚠ WARNING OPERATIONS HAZARDS <ul style="list-style-type: none"> Read and understand operator's manual before operating, servicing or repairing the tractor. Follow all safety rules and instructions. Manuals are available from dealer. Only operate tractor from operator's seat with seat belt securely fastened. Before leaving the operator's workplace gear shift in neutral position, apply parking brake, stop engine and remove the key. Do not allow children or untrained persons to operate the equipment. Reduce speed when turning or operating around hazards, on rough ground or steep slopes. Use flashing warning lights on highways unless prohibited by law.
	⚠ WARNING FALLING HAZARD Never allow riders on the machine.
	NOTICE Use a charcoal element when replacing the cab air filter and cab recirculating air filter. (A) Cab Recirculating Air Filter - P/N 420000001 (B) Cab Charcoal Air Filter - P/N 490003551
	NOTICE <ol style="list-style-type: none"> Tighten bolts on each tank strap without pulling the top of the tank down or bending the bolts or tank skid. Tighten tank straps evenly side-to-side. Fill the tank with water. Drive tractor. Allow tank to settle. Retighten straps. Repeat for first three tank loads. After the first three tank loads, readjust tank straps every 100 hours.
	NOTICE <ul style="list-style-type: none"> Do not run product pump (A) dry. Seal damage will occur. Do not intentionally dead-head the pump with high pressure. Seal damage will occur.
	NOTICE All fluids must meet or exceed Equipment Technology recommendations. Refer to the operator's manual or call (1-777-334-4000) for the following fluids when new/110g spray. <ul style="list-style-type: none"> • Differential: SAE 85W-90GLW gear lube w/ Hy-Gard, 3.08 • Hydraulic system: ISO VG 46 • Brake System: Hydraulic Oil • Planetary / Drive Shaft: SAE 30W-80GLW gear lube • PTO, PTO/PTT Transmission: PowerShift™ transmission oil (find nearest John Deere CAT dealer) • 24 The transmission: ISO VG 46 • Engine: John Deere 500 hours • Differential: John Deere 500 hours • Hydraulic system: John Deere 500 hours • Planetary / Drive Shaft: John Deere 500 hours • Transmission: John Deere 500 hours
	NOTICE BATTERY DISCONNECT PROCEDURE <ul style="list-style-type: none"> Wait 70 seconds to disconnect machine battery power post engine shut-down.

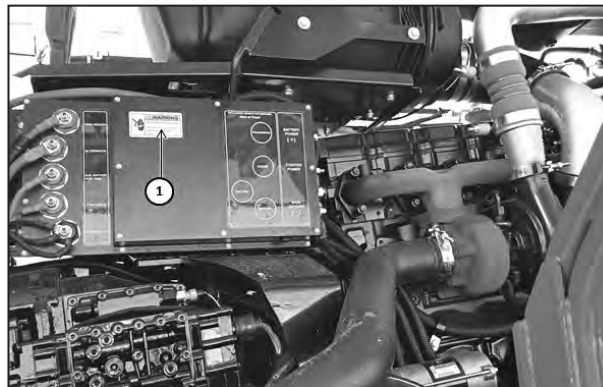
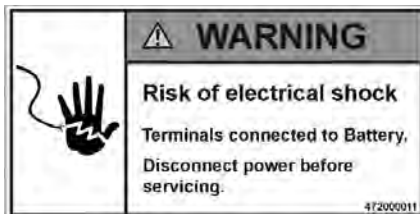
6.

	⚠ WARNING BATTERY TERMINAL POSTS HAZARD These battery terminals are for low amperage charging and accessory power only. Do not jump or boost machine from terminals.
	⚠ WARNING HIGH-PRESSURE FLUID HAZARD High-pressure hydraulic fluid leaks can penetrate skin resulting in serious injury, gangrene or death. <ul style="list-style-type: none"> Check for leaks with cardboard, never use your hand. Before you touch a fitting: <ul style="list-style-type: none"> Loosen tank. Release pressure. Make sure hydraulic fluid is cool. Consult physician immediately if skin penetration occurs.
	⚠ WARNING EXPOSURE HAZARD Agricultural chemicals can be dangerous. <ul style="list-style-type: none"> Improper selection or use can seriously injure persons, animals, plants, soil or other property. Select the correct chemical for the job. Handle the chemicals with care. Follow the instructions on the container label and instructions from the equipment manufacturer.
	⚠ WARNING NON-POTABLE WATER HAZARD This water is for rinsing or washing purposes only. Do not drink it. It may be contaminated by sprayer chemicals. Fill with clean water only.
	⚠ WARNING ENTANGLEMENT HAZARD Keep body parts away from rotating driveshaft.
	NOTICE <ul style="list-style-type: none"> Fill the rinsing, foam or product tank slowly. Rapidly filling or overfilling any of these tanks may cause them to rupture.

7.

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

1.



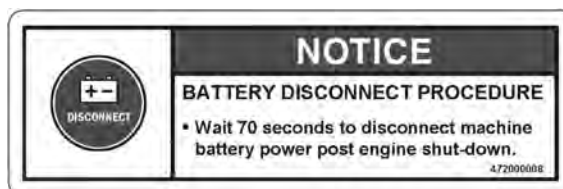
Interior Decal Locations



1.



2.



APACHE™

CHAPTER 3

OPERATION

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



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



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



WARNING! Roll-Over Hazards

- **DO NOT** operate on steep slopes.
- **DO NOT** drive across a slope. Drive up and down slopes.
- **DO NOT** turn down a slope.
- **Slow down** when turning.
- **Keep booms** as close to the ground as possible.
- **Drive slowly** across rough ground.
- **DO NOT** operate on public roads or highways with product in the product tank.
- **ALWAYS** use 4 way flashers on public roads or highways
- **ALWAYS** come to a complete stop before reversing directions.

Pre-Operation Checks

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

- Read and understand this manual before operating the Apache Sprayer.
- Read and follow all safety messages and safety decal instructions in this section. See "Safety" on page 2-1.

- Check the condition of all safety decals. Replace if damaged.
- Check that all shields and guards are properly installed and in good working condition. Replace if damaged.
- Check all hardware for proper installation and torque. See "Torque Value Charts" on page 6-1.
- Check the operating area for bystanders and obstruction before operating.
- Check that all hydraulic hoses and fittings are in good condition and not leaking. Make sure the hoses are routed to prevent damage, not twisted, sharply bent, kinked, frayed, or pulled tight or rubbing, before starting the Apache Sprayer. Replace any damaged hoses or fittings immediately.
- Check the operation and condition of the seat belt. Immediately repair or replace the seat belt if damaged or if it does not operate properly.
- Check tires for proper inflation pressure according to tire manufacturer's recommendations. Specifications are also provided on the back cover of this manual. See "Check Tire Pressure" on page 5-13.
- Check engine oil level and add oil as needed. See "Check Engine Oil Level" on page 5-14.
- Check transmission fluid level and add fluid as needed. See "Check Transmission Fluid Level" on page 5-16.
- Check differential, gearboxes and/or planetaries fluid levels and add fluid as needed. See "Check Differential Fluid Level" on page 5-21.
- Check coolant level and add coolant as needed. See the engine manufacturer's manual for details.
- Check hydraulic reservoir fluid level and add fluid as needed. See "Check Hydraulic Fluid Level" on page 5-16.

Cab Overview



1. Air Vents
2. Steering Column
3. Steering Wheel
4. Joystick
5. ET Pilot System

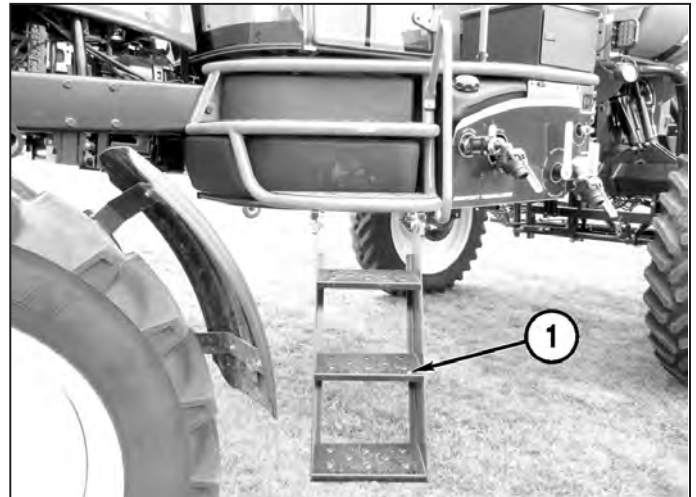
6. Arm Rest
7. Brake Pedal(s)
8. Air Seat
9. Fire Extinguisher
(left of seat)

Cab Access Ladder

1. Access Ladder

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

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



Steering Column

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

1. Steering Column Tilt Adjustment Lever

- Lift up on the lever.
- Adjust the tilt to the desired position.
- Release the lever to lock the column.

2. Steering Wheel

3. Steering Wheel Telescope Adjustment Knob

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

4. Horn Button

- Push to sound horn.

5. Turn Signal Lever

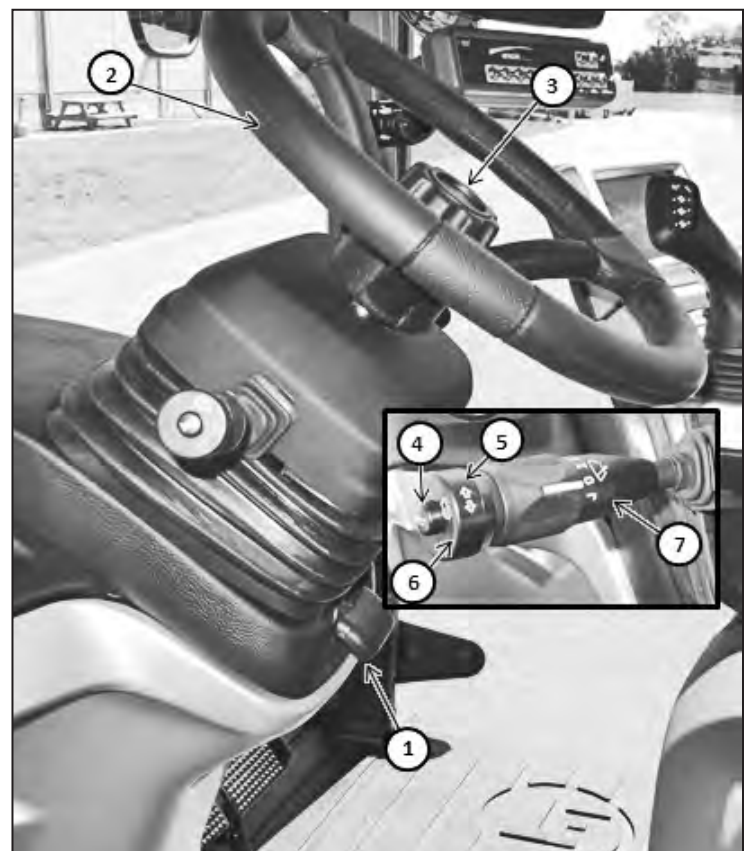
- Push lever up for right turn signal.
- Push lever down for left turn signal.

6. Windshield Washer

- Push ring to operate washer.

7. Windshield Wiper Switch

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



ET Pilot System

1. Engine RPM
2. MPH Readout
3. Temperature Gauge
4. Fuel Gauge
5. Direction and Gear Indicator
6. Stylus/Pen
(The eraser end can be used to touch the screen.)
7. Climate Control Readout
8. Fault Code Indicator
9. Cruise Control Indicator



10. Cruise Control Buttons
11. Agitate and Product Pump Buttons
12. Boom Fold/Unfold Buttons
13. Climate Control Buttons
14. Engine Start/Stop Button
15. Park Brake Button



ET Pilot System Touch Screen

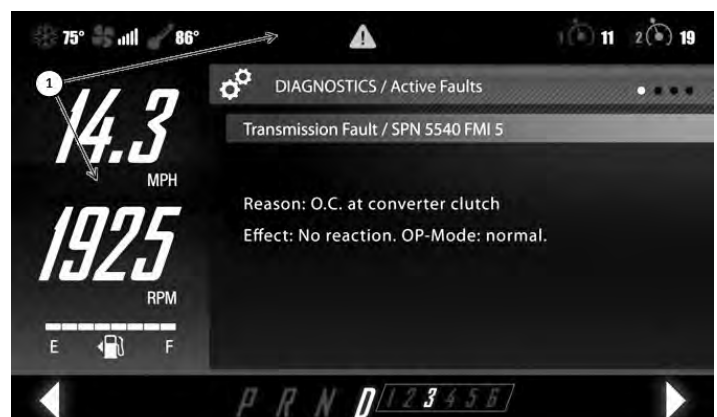
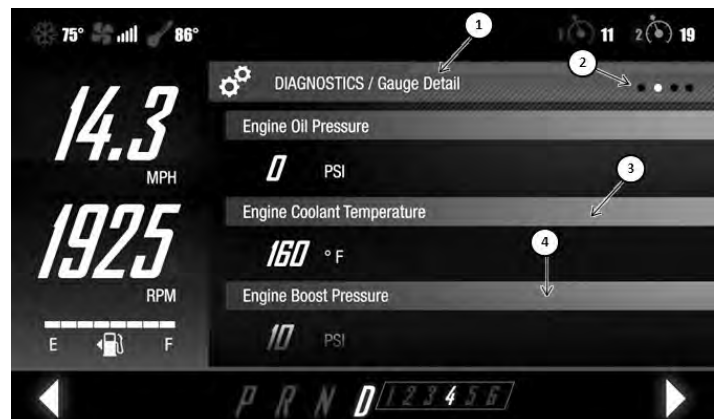
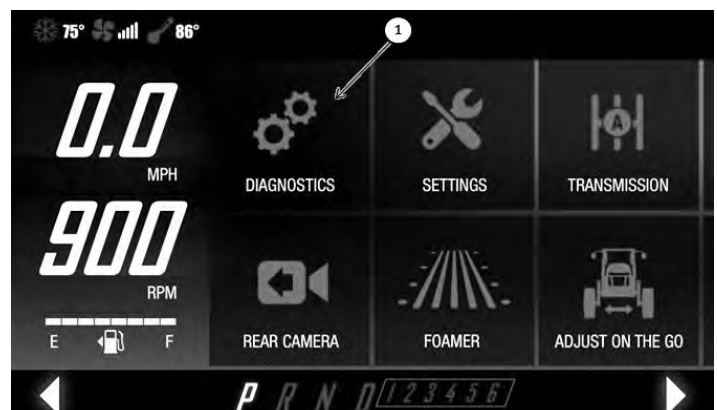
To use the screen there are a few things to know.

To change the items inside the gauges, touch the RPM or MPH icons (1) to display different options such as: Average GPH, Torque, MPH and RPM. To move to the App Screen, swipe left, anywhere in the middle of the screen (2) except for inside the gauges (1).

To select an App, just touch the desired icon (1) on the screen to move to the selected screen.

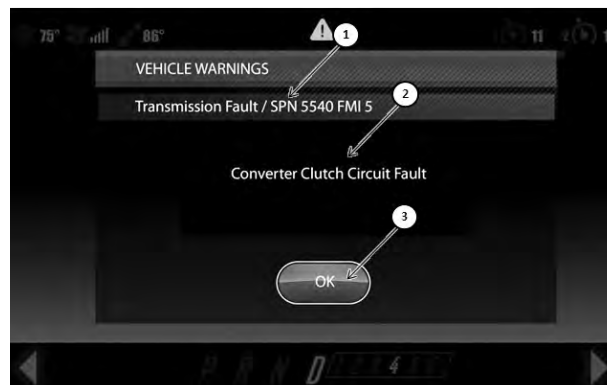
Once in an App screen, there are a few options to choose from. To return to the App Screen, swipe the header bar (1) to the right. To see what page you are within the App, look at the page indicator (2). To move from page to page, swipe left or right in the middle of the screen (3). To scroll the page, swipe the middle of the screen up or down (4).

To return to the Home Screen, swipe the screen to right from the top or the left side (1). This will work on any of the screens.

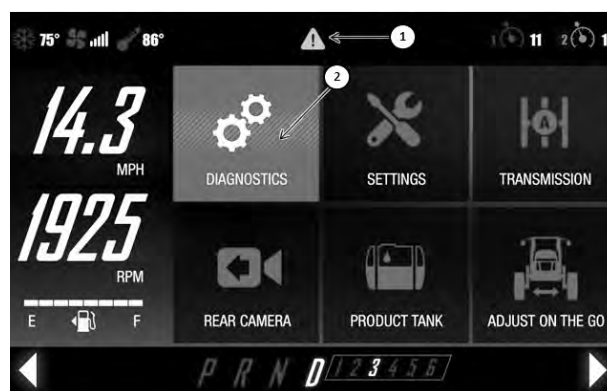


Diagnostics Page 1: Vehicle Warnings

When a new vehicle warning happens, the touchscreen will display a warning screen. It will indicate the fault code (1) and general description of that code (2). Touch the OK icon (3) to close the screen.



To access the Active Faults screen, either touch the fault indicator (1) at the top of the screen or touch the Diagnostics App icon (2).



This page will display any active fault types and the corresponding fault codes. To expand for more detail, click on the individual fault bar (1).



Once the information has expanded, the page will display more detail. This will include the Reason and Effect (1) on the machine.

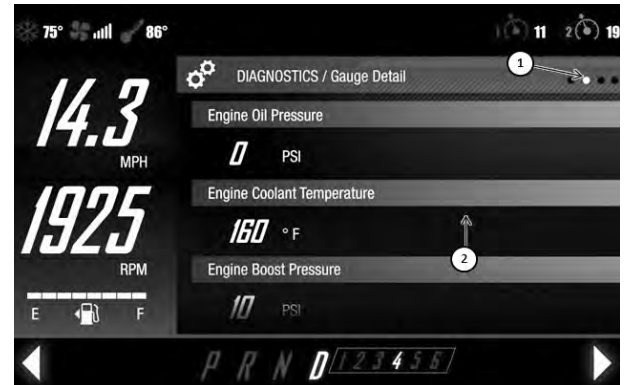


Diagnostics Page 2: Gauge Detail

To verify that you are on page 2, look at the page indicator (1) to see where the white dot is located. To view all the information on that page, swipe the screen up (2).

Information included on page 2:

- Engine Oil Pressure
- Engine Coolant Temperature
- Engine Boost Pressure
- Cabin Air Temperature
- Battery Voltage
- Transmission Temperature
- Hydraulic Temperature
- Water Valve Duty Cycle



Diagnostics Page 3: Fan Control

The Apache is equipped with a fan reverser. This function can be used to reverse the airflow through the radiator and coolers in order to remove dust and debris.

While the engine is running, touch the icon (1) to turn the fan reverse on. It will run approximately for 20 seconds and then return to normal operation.



The fan reversal has Auto Mode as an option. Touch the icon (1) to activate. Use the slider icon (2) to set how frequent the fan will reverse. The fan reversal can still be manually turned on (3) while in Auto Mode.



Diagnostics Page 4: Engine Info

For more engine information, swipe to page 4.

Information included on page 4:

- Total Engine Hours
- Total Idle Hours
- Average Fuel Rate



Vehicle Settings Page 1:

To activate these settings, touch the white circle (1). This will allow you to make adjustments to those settings by using the slider (2). Touch the red icon in the slider and swipe left or right to increase or decrease the value. To access the remaining options on this page, swipe the screen up (3).



Same applies for this screen. Touch the white circle (1) to activate and use the slider (2) to change the values. To continue to the next Vehicle Settings page, swipe the screen (3) to the left.



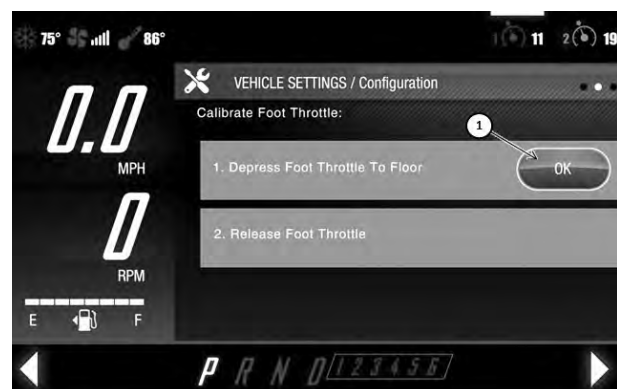
Vehicle Settings Page 2: Foot Throttle Calibration

*****To be able to continue to the next page, a passcode is needed. This is a warning that the changes that are going to be made, will effect the machine's function.***

Enter the code "2201" by touching the number icons (1). To cancel and return to the previous screen, touch the cancel icon (2). To delete a previous typed number, touch the back-space icon (3).

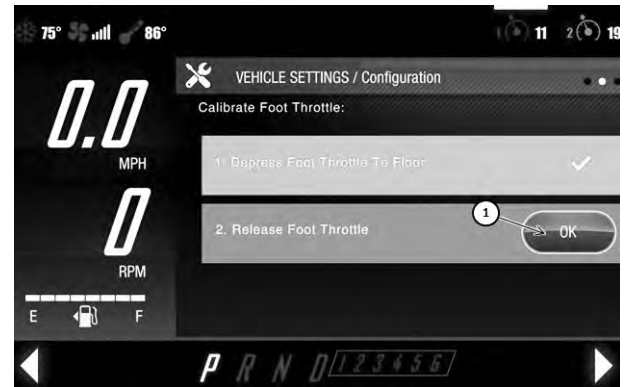


To calibrate the foot throttle, depress the foot throttle to the floor. Then touch OK (1) while holding the foot throttle down.



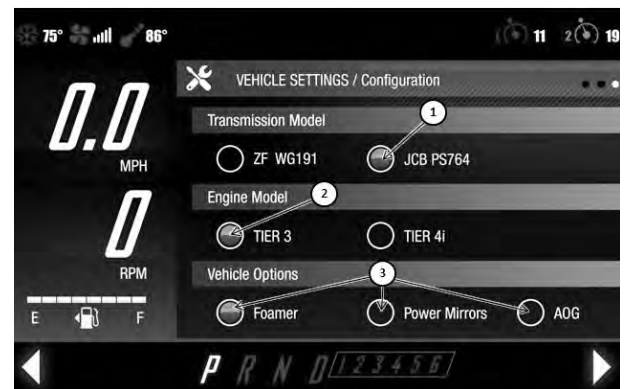
Foot Throttle Calibration (Continued)

Step 2: Release the foot throttle, then touch OK (1) to complete the calibration process.



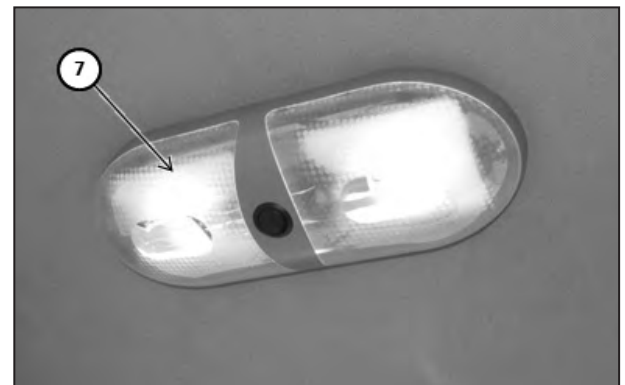
Vehicle Settings Page 3: Configuration

The selection for Transmission Model, must be the JCB PS764 (1). The selection for the Engine Model, must be Tier 3 (2). The Vehicle Options (3) should only be selected if the option is equipped on the machine.



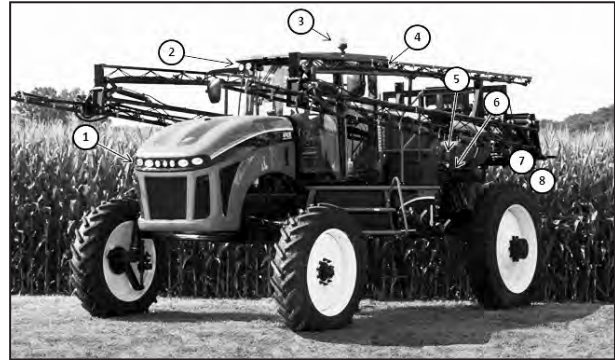
Light Buttons

1. **Cab Front Lights**
 - Press the button to turn on the cab-mounted, front-facing work lights.
 - Press the button again to turn off the lights.
2. **Beacon Light**
 - Press the button to turn on the roof-mounted beacon light.
 - Press the button again to turn off the light.
3. **Cab Rear Lights**
 - Press the button to turn on the cab-mounted, rear-facing work lights.
 - Press the button again to turn off the lights.
4. **Headlights**
 - Press the button to turn on the hood-mounted headlights, marker lights and tail lights.
 - Press the button again to turn off the lights.
5. **Hazard Lights**
 - Press the button to turn on flashing hazard lights.
 - Press the button again to turn off the lights.
6. **Boom Lights**
 - Press the button to turn on the dual beam boom lights.
 - Press the button again to turn off the lights.
7. **Dome Light**
 - Press the switch to turn the light on and off.



Apache Sprayer Lighting

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



Turn Signal and Hazard Light Function:

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

Turn Signal Function:

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

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

AM/FM Radio with Weather Band, and Streaming Player

1. **AM/FM, SiriusXM-Ready™, USB Playback, Bluetooth Streaming Audio, and NOAA Weatherband Tuner with Alerts.**

For further detailed instructions visit the manufacturers website:

<http://asaelectronics.com/manuals-guides>

2. **Equipment Technologies is pleased to provide you with 3-months of free Sirius Satellite Radio! See Activation Information on the next page or find the instructions at the bottom of page 2 of the quick reference guide of your Apache's Polk audio system.**



Accessories

(Located behind the right-side arm rest on the back wall.)

1. USB and 1/8" Jack radio input.
2. Accessory power.
3. Lighter.



SiriusXM® Satellite Radio Activation Information

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



Activating your SiriusXM® Subscription

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

1. With the radio power ON, press the MODE button to enter SiriusXM Ready mode. After displaying the SiriusXM logo, the receiver may update the SiriusXM software.
2. Once the update is complete, the display will change to "Call 1-866-635-2349 to Subscribe" and will show the Preview Channel on channel 1. You will not be able to tune to any other SiriusXM Radio channels until you activate your subscription.
3. You will need to access your SiriusXM Radio ID, which is displayed on channel 000. Press and hold the Encoder Knob on the radio to enter Direct Tuning mode. Rotate the knob to 0 and press to enter. Once tuned to channel 0 it will display your unit's unique 8-digit SiriusXM Radio ID.
4. Write the Radio ID number down and have your credit card handy.
5. For subscriptions in the United States please visit www.siriusxm.com/activatenow or call SiriusXM Listener Care at 1-866-635-2349. For subscriptions in Canada, please visit www.siriusxm.ca/activatexm or call XM Listener Care at 1-877-438-9677.

Renewal Information

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

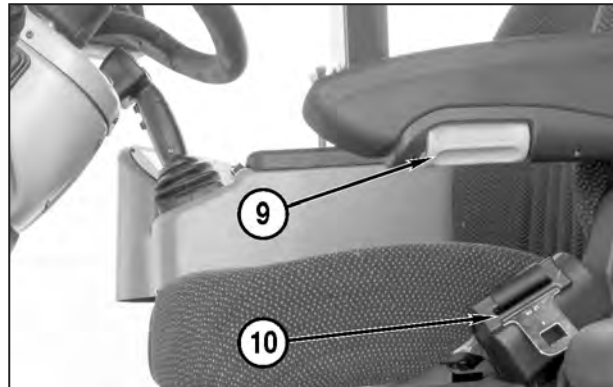
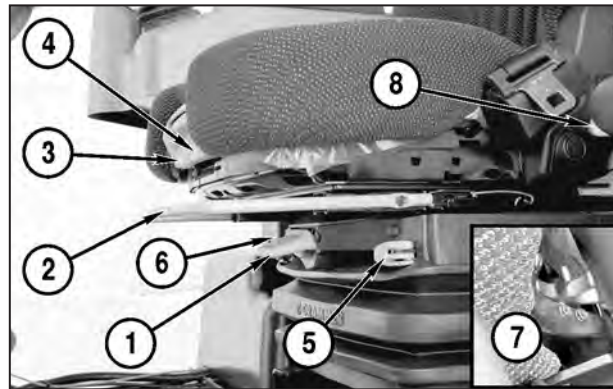
Channel Information

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

Enjoy!

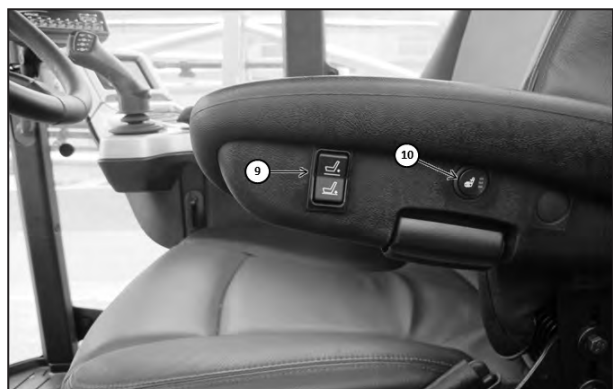
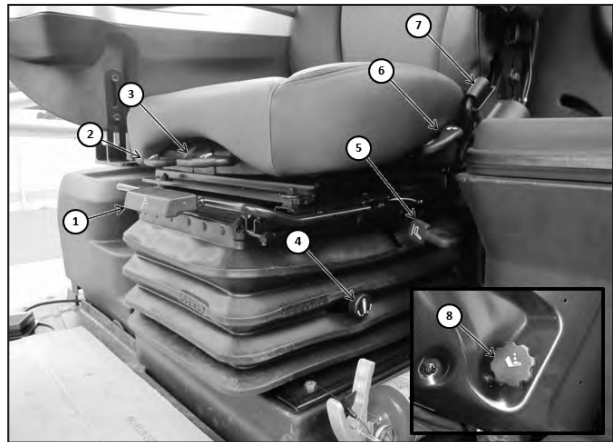
Seat Adjustment

- 1. Height**
 - Lift lever to raise the seat.
 - Push the lever down to lower the seat.
- 2. Fore-Aft Position of Whole Seat**
 - Pull lever up to adjust seat forward or backward.
- 3. Fore-Aft Position of the Seat Cushion Only**
 - Pull lever up to adjust seat cushion forward or backward.
- 4. Seat Cushion Tilt**
 - Pull lever up to tilt seat cushion up or down.
- 5. Fore-Aft Isolator**
 - Turn the lever to the left to allow front-to-back movement of the seat.
 - Return the lever to the right to lock-out movement.
- 6. Ride Firmness**
 - Turn the knob counter-clockwise for firm ride.
 - Turn the knob clockwise for soft ride.
- 7. Lumbar Support**
 - Turn the knob counter-clockwise for more lumbar support.
 - Turn the knob clockwise for less lumbar support.
- 8. Backrest**
 - Lift the lever.
 - Position the backrest.
 - Release the lever.
- 9. Armrest**
 - Turn knob to adjust armrest angle.
- 10. Seat Belt**



Leather Seat (option)

- 1. Slide Release Lever:**
 - Pull, hold and slide forward or rearward.
 - Release to stop slide.
- 2. Fore-Aft Position of the Seat Cushion Only**
 - Pull up and hold to adjust, release to stop.
- 3. Seat Cushion Tilt:**
 - Pull up and hold to adjust, release to stop.
- 4. Ride Firmness:**
 - Turn the knob counter-clockwise for soft ride.
 - Turn the knob clockwise for firm ride.
- 5. Fore-Aft Isolator:**
 - Turn the lever to the left to allow front-to-back movement of the seat.
 - Return the lever to the right to lock-out movement.
- 6. Backrest:**
 - Lift the lever.
 - Position the backrest.
 - Release the lever.
- 7. Seat Belt**
- 8. Lumbar Support:**
 - Turn the knob counter-clockwise for more lumbar support.
 - Turn the knob clockwise for less lumbar support.
- 9. Height:**
 - Lift lever to raise the seat.
 - Push the lever down to lower the seat.
- 10. Heated Seat:**
 - Press the button to activate, there are three levels.



Joystick and Envizio Pro II Console



1. **Joystick**
See "Apache Sprayer Direction and Speed" on page 3-16 for complete operations.
2. **Envizio Pro II Console (option)**
3. **Boom Switch Box**
4. **Left Boom Tilt**
Press to tilt the left boom up or down.
5. **Right Boom Tilt**
Press to tilt the right boom up or down.
6. **Boom Rack**
Press to move the boom rack up or down.
7. **Auto Steer Engage Button**
(If equipped)
8. **Master Spray Button**
9. **Transmission Forward Direction Trigger Button**
10. **Transmission Reverse Direction Trigger Button**
The reverse button must be held in to move.

Starting and Stopping the Engine



WARNING! Impact Hazard. ALWAYS fasten your seat belt when operating the Apache Sprayer. The safety belt must be worn properly by the driver anytime the Apache Sprayer is in motion. Refer to Safety Belt on page 3-12.



WARNING! Sudden Movement Hazards. ALWAYS start the engine from the operator's seat. ALWAYS set the parking brake (1) before starting the engine. ALWAYS fasten your seat belt before starting the engine.



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



Starting

1. Press the Battery Disconnect button (1) to allow power to the machine.
2. Press Start/Stop Button (2) to turn auxillary power on. The Start/Stop Button will turn red.
3. While in auxillary power mode, the machine will go through a series of system checks. After the checks have been completed, the Start/Stop Button will turn green. Once the Start/Stop Button turns green and the touch screen displays "Depress Brake To Start" (3), the machine will be ready to start.
4. Depress and hold the brake while pressing and holding the Start/Stop Button (4) to crank the engine.
5. When the engine starts, release the Start/Stop button.



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

Notice: If the engine stalls under load, immediately stop the Apache Sprayer and shift the transmission into NEUTRAL. Restart the engine immediately to avoid damaging the turbo-charger.

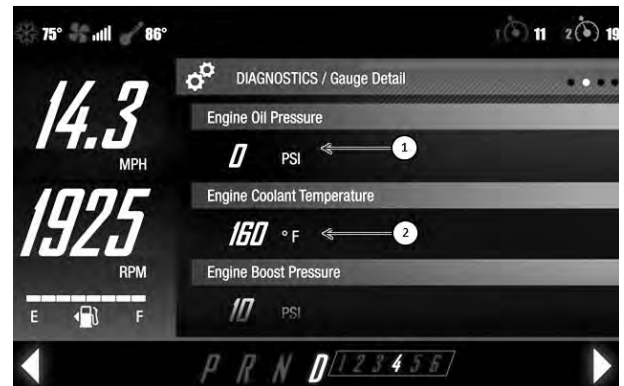
- If the engine does not start after four attempts, see the Troubleshooting section in the engine manufacturer's service manual or contact your dealer.
- After the engine is started, check all gauges for normal engine operation. If the gauges indicate a problem, stop the engine and determine the cause.

Warm-up

Check the engine oil pressure (1) as soon as the engine starts. To do this, access the App Screen and choose the Diagnostics App. Swipe left to page two.

- If the oil pressure reading 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 temperature (2), which is located on the same Diagnostics screen.

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

Stopping

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

To stop the Apache Sprayer:

- Lower the engine rpm.
- Bring the Apache Sprayer to a complete stop.
- Shift the transmission to NEUTRAL by squeezing either trigger button on the joystick (1).
- Apply the parking brake (2).
- Press and hold engine Start/Stop button (3) to shutoff the machine.



Apache Sprayer Direction and Speed



WARNING! Sudden Movement Hazards

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

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

Neutral

At start-up, the Apache Sprayer transmission is reset to **NEUTRAL** and will be indicated at the bottom of the touch screen (1).



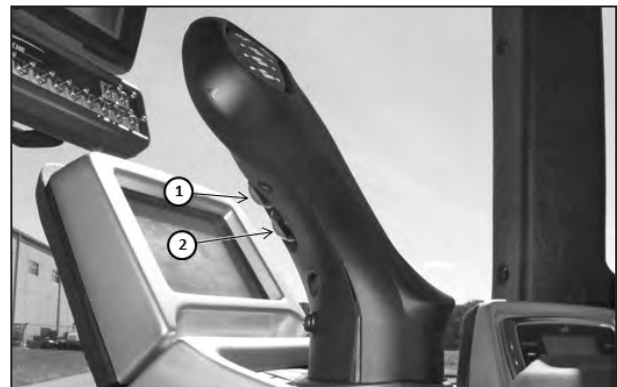
Squeeze and hold either one of the trigger buttons to put into gear.

- Use the top button (1) for **FORWARD** and the bottom button (2) for **REVERSE**.
- Once the transmission is in gear, the gear indicator will show the current gear.

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

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

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



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

Forward

To move the Apache Sprayer forward:

Apply the foot brakes and release the parking brake.

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

To move forward:

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

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

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



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

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

Shifting Forward Gears

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

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

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

Upshifting:

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

Downshifting:

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

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

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



Reverse

To move the Apache Sprayer in REVERSE:

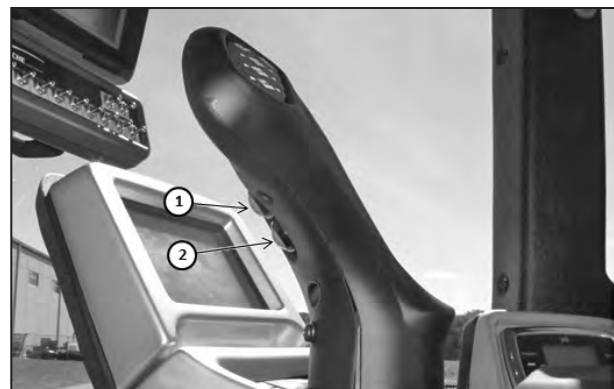
NOTE: The transmission will not shift if the parking brake is applied.

- Apply the foot brakes.
- Release the parking brake.

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

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

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

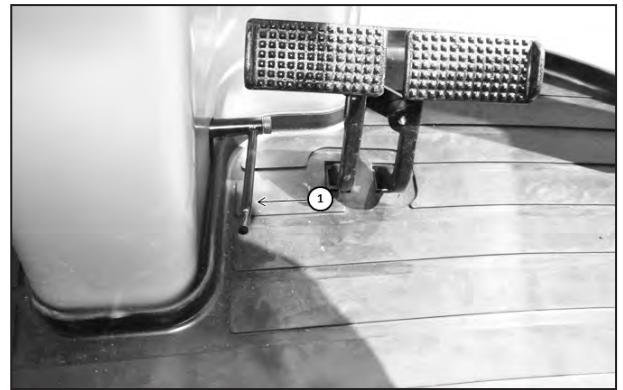


NOTE: The joystick will not shift the transmission into NEUTRAL. To obtain NEUTRAL from a REVERSE gear, release the bottom trigger button (2) on the joystick.

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

Foot Throttle

The foot throttle can be used to override the joystick throttle. There will be a delay until the foot throttle reaches the same RPM as the joystick. Once the foot throttle is released, the engine RPM will return to the joystick's last RPM position.



Cruise Control

The Apache offers the ability to set two cruise control points. To use the cruise control function, the machine must be in gear to operate. Press the master cruise button (1) to enable. Next, select cruise: one or two (2) on the control pad. To adjust the set speed, click the up and down arrow buttons (3). It will adjust in one mile per hour increments. Once the speed points are set, they will remain at those positions until they have been readjusted. The cruise control will only operate between 6 and 20 mph.



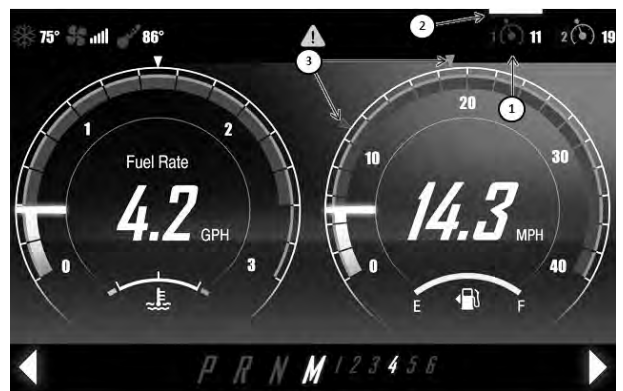
Cruise control will disengage when:

- RPM's are decreased or increased manually
- Brake has been pressed
- Master cruise button has been disabled
- The selected cruise button has been pressed

To resume the cruise control: select the desired set point one or two (2) on the control pad. Using the foot throttle can be beneficial in areas that you might want more rpm's. This will not disengage the cruise control, but will return to the chosen set speed after use.

Note: Once cruise control has been disengaged, speed and throttle will become manual. The rpm/throttle position will remain at the same position when cruise control was disengaged.

When the speed point icons (1) are visible, this indicates that the cruise master has been enabled. It will also indicate the set speed points for cruise one and two. There will be a white bar (2) located over the speed point icons when the cruise control is engaged. There are also two additional indicators (3) located around the speedometer.



Towing

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

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

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

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

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

NOTICE: DO NOT tow the Apache Sprayer if the:

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

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

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

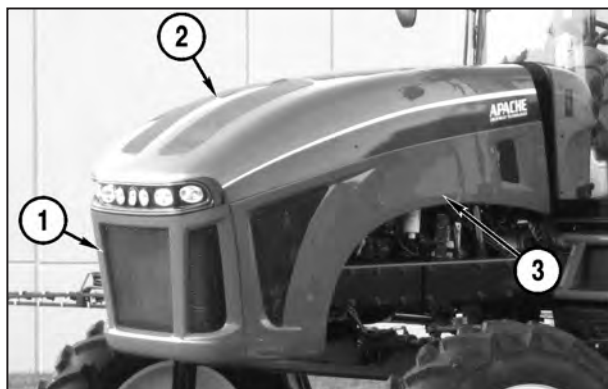
Hood Tilt Latch

To raise the hood, pull the latch (1) down while pulling the front of the hood down.



Hood Panel Removal

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



Side

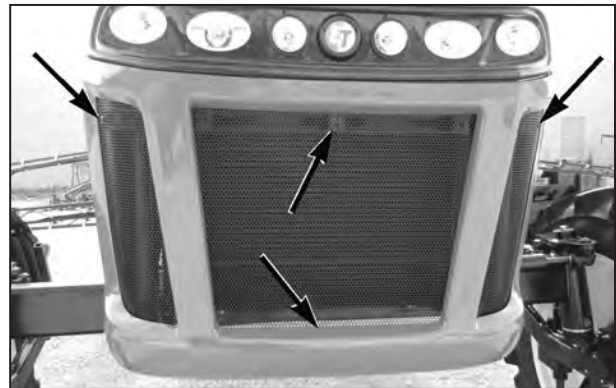
To remove the side panel, remove the 2 screws in the front of the side panel, the 2 screws on the underside of the panel, and 2 screws at the back of the side panel.



Front

Remove the 4 screws on the front of the grill.

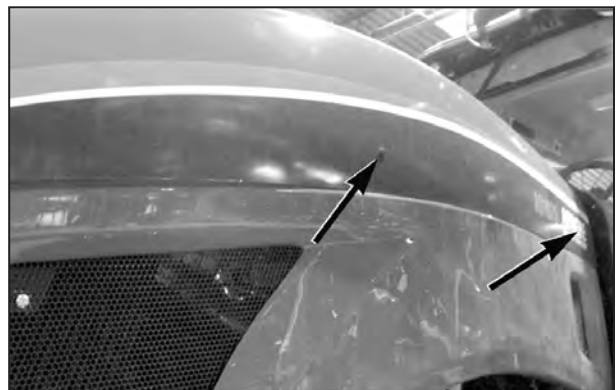
Once the screws are removed, the front panel can be removed to access the radiator.



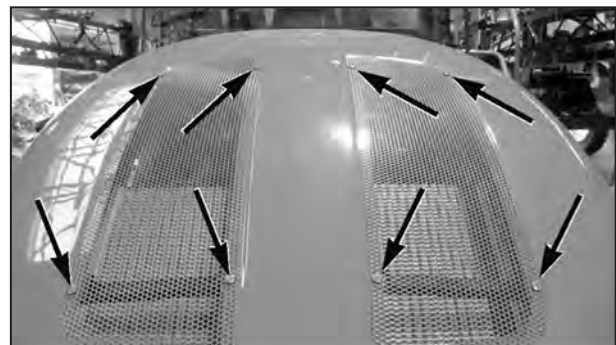
Top

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

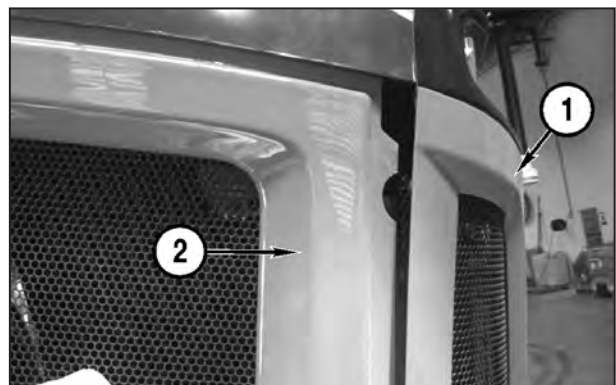
Remove the 2 screws along each side of the hood.



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



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



Battery

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



The Apache Sprayer features a battery disconnect button, located in the cab on the post above the light buttons.

Only turn the battery disconnect button off when working on the machine. It will automatically shutoff when the battery voltage reaches 12.4 volts.

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



The Cabin Power Distribution Module

Located beneath the armrest, the module includes a circuit board, relays, and fuses that power the cabin's operations.

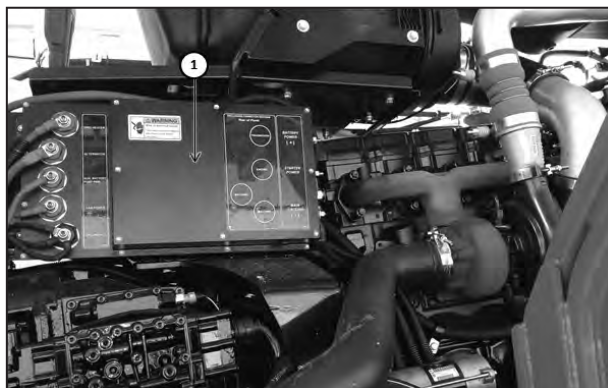
See "Cabin Power Distribution Module Chart" on page 8-3 for more information.



The Firewall Distribution Module

Located on the right-side, above the transmission, the module includes a circuit board, relays, and fuses that supply power the cab and control chassis operations.

See "Firewall Power Distribution Module Chart" on page 8-1, 8-2, and 8-3, for more information.



Axle Adjustment (Manual)

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

Front

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

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

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

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

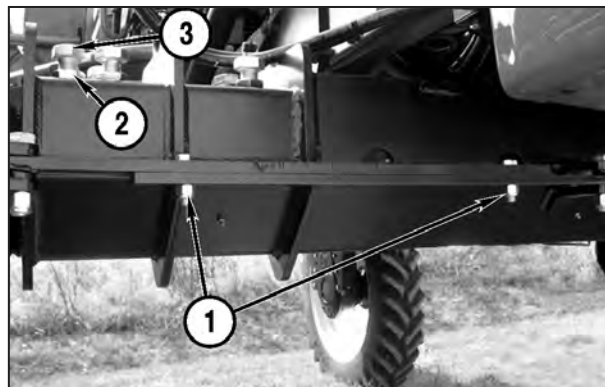
Manually slide the wheel to the desired width, making sure the locking bar holes are aligned.

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

Tighten the jam nuts (2).

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

Repeat the steps to adjust the other front axle.



Rear

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

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

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

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

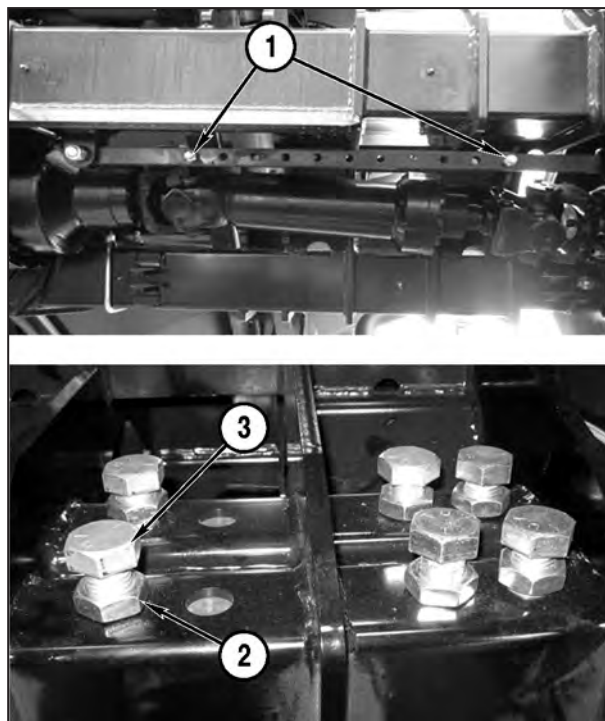
Manually slide the wheel to the desired width, making sure the locking bar holes are aligned.

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

Tighten the twelve jam nuts (2).

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

Repeat the steps to adjust the other rear axle.



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

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

NOTE: The Adjust-On-The-Go system will not allow the axle to be adjusted beyond 160 in. [406.6cm].

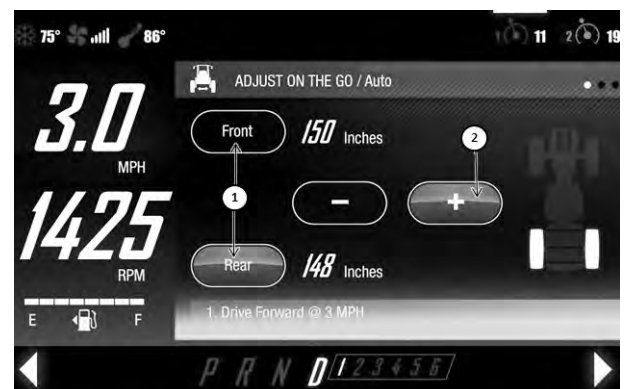
To adjust the axles:

While the engine is idling, select the Adjust-On-The-Go icon (1) from the main screen.

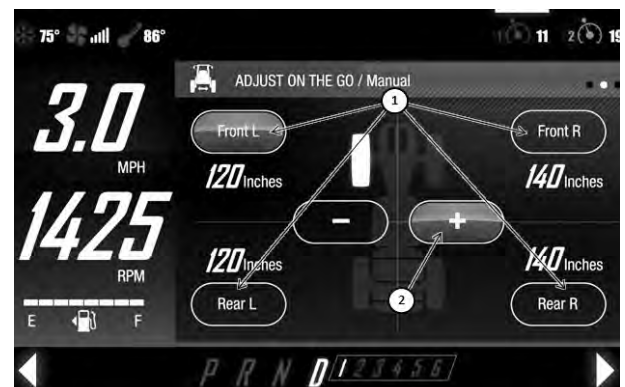


For automatic mode, select front, rear, or both axles at the same time (1).

Begin driving forward at least 3 mph and press the (+) or (-) icon (2) to adjust the axles in or out.



Manual mode allows for individual wheel adjustment. Select one wheel, or any combination to adjust (1). Begin driving forward at least 3 mph and press the (+) or (-) icon (2) to adjust the axles in or out.



Adjust-On-The-Go Calibration

To calibrate adjust Adjust-On-The-Go, access the third screen by swiping the screen to the left. Follow the on screen instructions.

Click begin (1) to fully collapse the axles while moving at least 3 mph (2).



Adjust-On-The-Go Calibration (ctnd.)

Once finished click done (1).



Repeat the process to fully extend the axles. Click begin (1) while still moving at least 3 mph. Once finished, click done for the process to be completed (2).

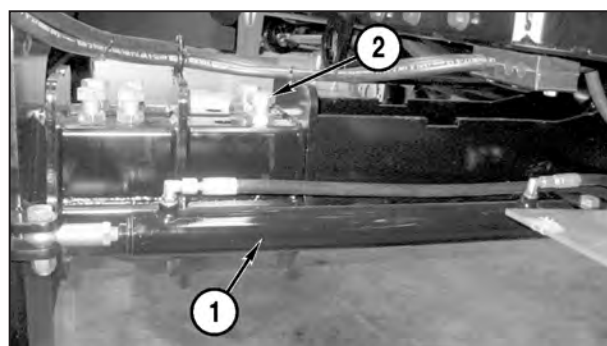


Front Axle

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

NOTICE: The bolts (2) should be torqued to 22 lb-ft [30 N-m] at all times. Check and adjust the torque weekly. See "Adjust-On-The-Go Axles" on page 5-23.

NOTE: Grease the axles daily when using the Adjust-On-The-Go feature. See "Grease Axle Components" on page 5-20.

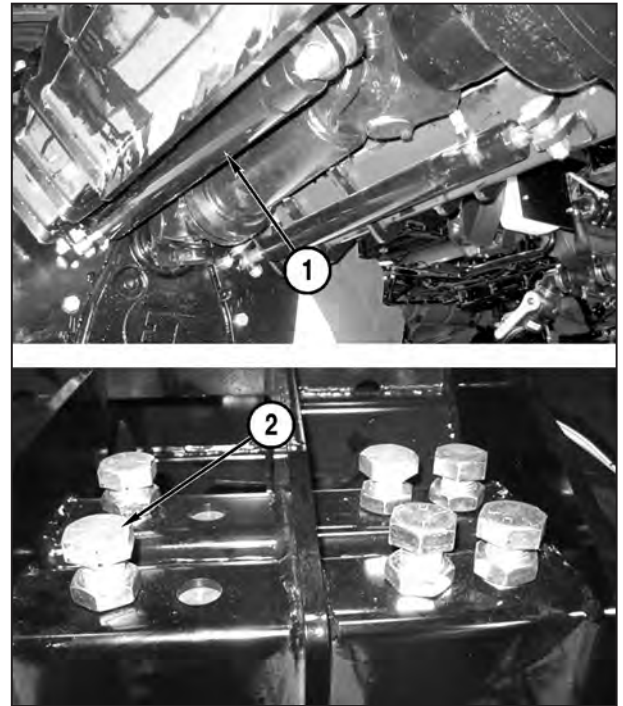


Rear Axle

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

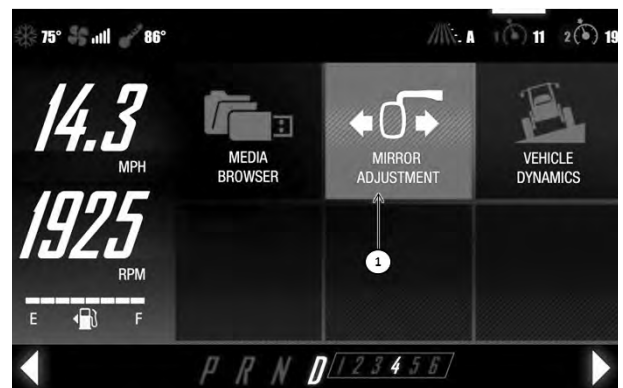
NOTICE: The bolts (2) should be torqued to 22 lb-ft [30 N•m] at all times. Check and adjust the torque weekly. See “Adjust On The Go Axles” on page 5-23.

NOTE: Grease the axles daily when using the Adjust On The Go feature. See “Grease Axle Components” on page 5-20.



Adjustable Powered Mirrors (optional)

The Apache Sprayer has optional power adjust mirrors. If equipped select the Mirror Adjustment icon on the second page of the Apps Screen.



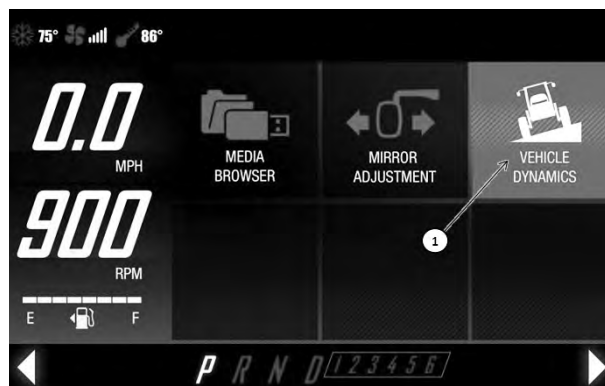
Next, touch either the Left or Right icon (1) to select which mirror to adjust.

Use the arrow pad (2) to adjust the selected mirror.



Vehicle Dynamics

To access the vehicle dynamics data, swipe to the second APP page. Touch the Vehicle Dynamics icon (1).



The Vehicle Dynamics screen will show the Degrees or Percentage of grade that the machine is on. To change between Degrees and Percentage, touch the screen on either value (1) to make the change.



To calibrate the Vehicle Dynamics, swipe the screen to the left to advance to the second page. Park the Apache Sprayer on a level surface, then touch the Calibrate icon (1).



Climate Controls

1. **Temperature Buttons.**
 - Sets the desired temperature.
2. **Vent Selection Buttons.**
 - Selects which vents are on.
3. **Auto Climate Control.**
 - Automatically controls the fan.
4. **A/C Activation Button.**
 - Turns A/C on.
5. **Manual Fan Controls.**
 - Controls fan speed.



Climate Controls (ctnd.)

Located at the top of the touch screen are the climate control indicators. When raising or lowering the desired temperature (1), it will be reflected in the top left corner. The fan speed (2) will be reflected in the center fan icon. The outside temperature (3) will be reflected on the right of the fan icon.



Precision Equipment

The following are factory installed precision sprayer control options.

- Raven Envizio Pro II (field computer)
- Raven Viper 4 (field computer)
- Raven SmarTrax (integrated autosteer)
- Raven AccuBoom (sectional spray control)
- Raven AutoBoom (boom height control)
- Trimble FmX (field computer)
- Trimble Autopilot (integrated autosteer)
- Trimble Field IQ (sectional spray control)

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

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

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

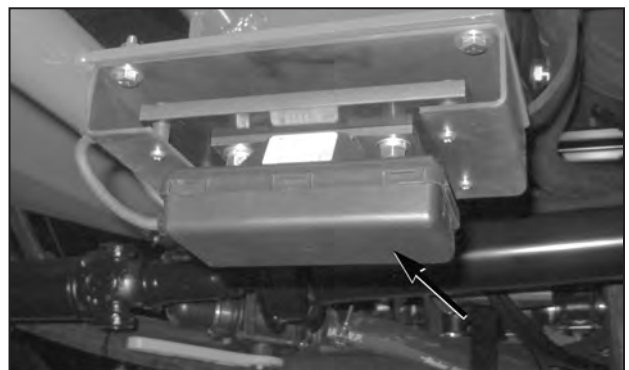
Antenna Mounting Plate

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



Raven Radar Gun

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

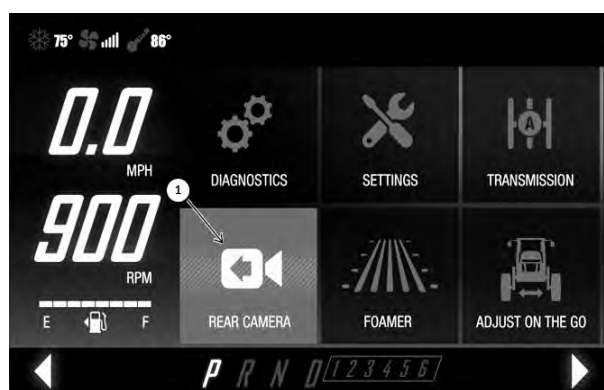


Rear Camera

If the rear camera is enabled, the full screen image will display when the sprayer is in reverse.



To manually access the camera, press the Rear Camera App icon (1).



The rear camera will display as well as the left information panel, regardless which direction the sprayer is moving. The camera will remain on the screen until a different function is chosen.

To access the Settings screen, slide the screen to the left.



The Rear Camera Settings screen allows the operator to turn On and Off the Automatic Reverse Camera (2). Also, the image can be reversed by turning On the Mirrored Camera button (3).



Jumpstarting The Engine

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



WARNING! Fire Hazard. NEVER start the engine by SHORTING ACROSS the starter terminals.

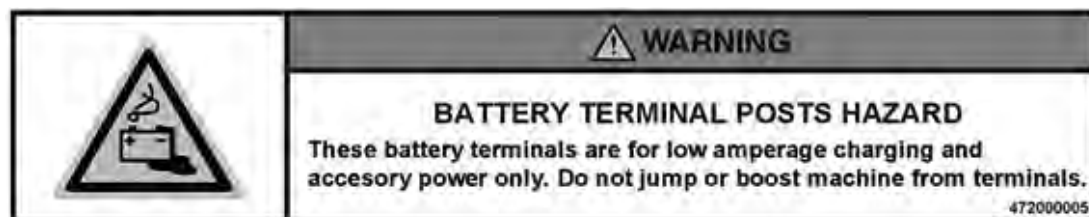


WARNING! Safety Hazard. NEVER exceed 125 amps if boosting / charging a machine through the Fill Station battery terminal posts.



WARNING! Fire Hazard. NEVER exceed 125 amps if boosting / charging a machine through the Fill Station battery terminal posts.

NOTE: Boosting / charging the battery through the Fill Station battery terminals is not the recommended method of Jumpstarting the engine. Doing so poses safety risks to the operator and can potentially damage the machine if the electrical current exceeds 125 amps. If boosting / charging from this location take all necessary safety precautions and make certain the amperes are within the limit.



WARNING! Impact Hazard. ALWAYS fasten your seat belt when operating the Apache Sprayer. The safety belt must be worn properly by the driver anytime the Apache Sprayer is in motion. Refer to Safety Belt on page 3-12.



WARNING! Sudden Movement Hazards

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

ET recommends Jumpstarting the engine through the starter terminals, using a Booster Battery.

- The Starter is located on the engine's right-hand side and can be accessed within the front, right wheel well.
- Connect one jumper cable to the positive (+) terminal on the booster battery. Connect the other end to the starter's positive terminal (+).

- Connect the second jumper cable to the negative (-) terminal on the booster battery. Connect the other end to the starter's negative terminal (-).
- Connect the battery via the battery disconnect switch.
- Set the parking brake.
- Engage the ignition.



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

- If the starter motor still operates slowly, check the jumper connections to make sure they have good metal-to-metal contact.
- Once the engine is running, disconnect the negative cable from the starter, then from the booster battery. Disconnect the positive cable from the starter, then from the booster battery.
- 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.
- If the engine fails to start after several attempts, check connections and retry or contact your dealer.

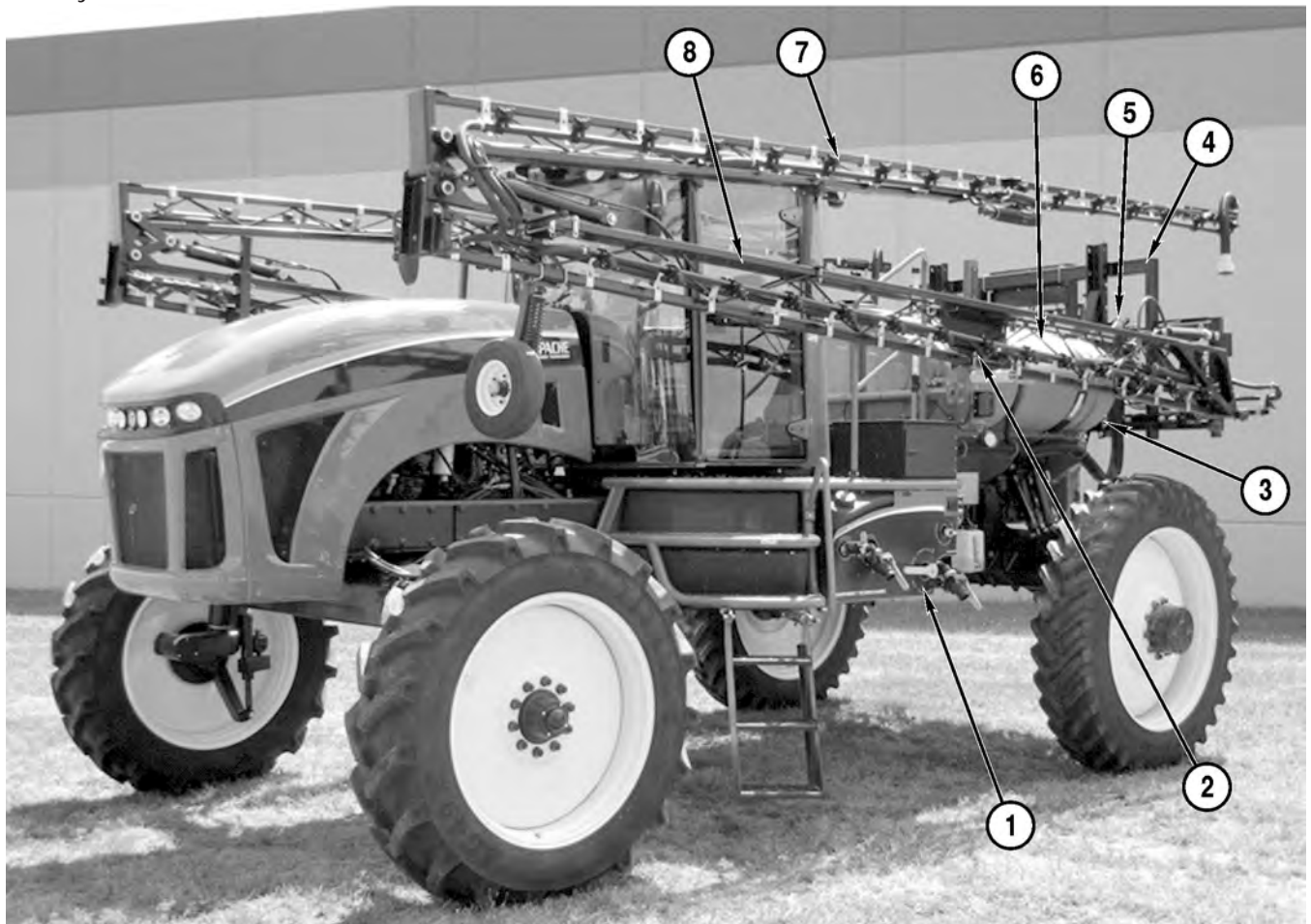
APACHE™

Chapter 4

WET SYSTEM OPERATION

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

Wet System Overview



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

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

Fill Station

1. Hand Rinse Valve

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

2. Rinse Tank Quick Fill**3. Product Valve (shown in CLOSED position)**

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

4. Product Tank Quick Fill**5. Roto-Flush/Agitate Valve**

Directs flow between the roto-flush and agitation.

6. Fill Station Light Switch**7. Remote Product Pump Switch**

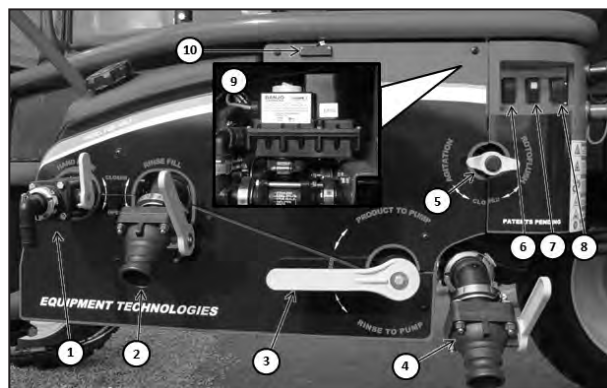
This switch turns the product pump while outside of the cab.

8. Increase/Decrease Agitation Switch

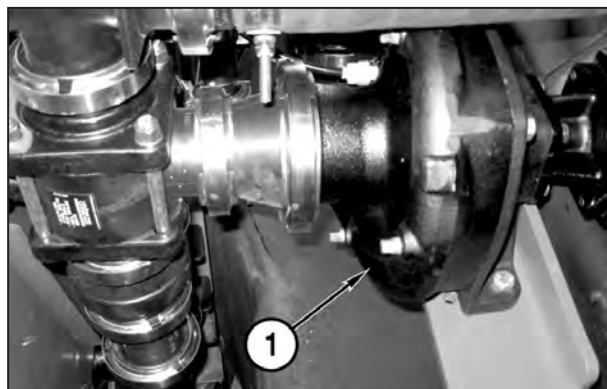
Used to increase or decrease agitation from the fill station. Must hold down while adjusting.

9. Agitation Valve

During normal spraying operation, this valve is electronically actuated and controlled by buttons on the console keypad in the cab.

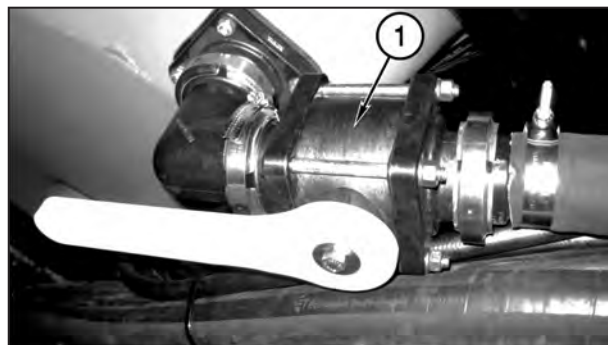
10. Fill Station Light

Product Pump and Valves

1. Product Pump

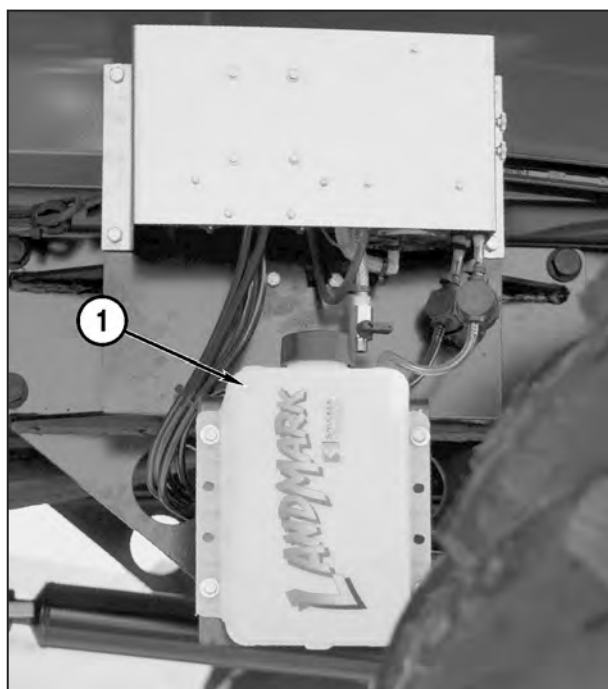
Sump Valve

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



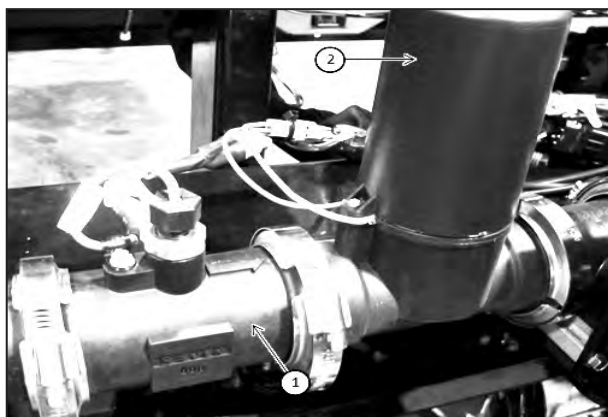
Foam Tank

1. **Foam Concentrate Bottle**



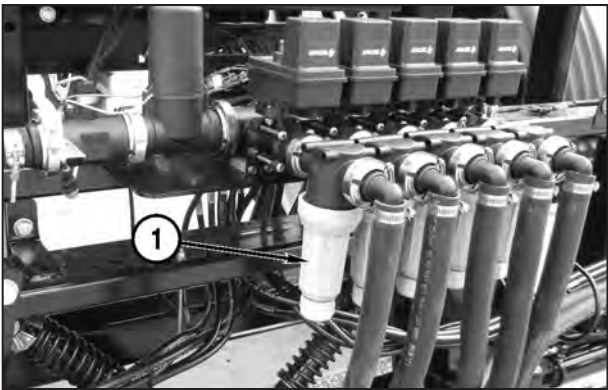
Flow Control

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



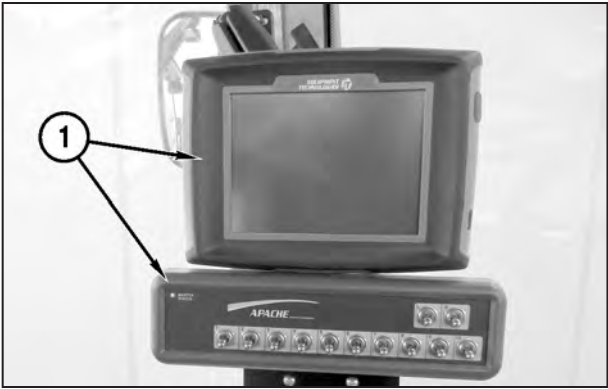
Electronic Boom Valves

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



Envizio Pro II Monitor

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



Monitor Calibration Information
(for all Raven built monitors)

- Valve cal2123
- Speed cal (radar gun equipped).....606
- Speed cal (GPS for speed)..... 1000
- Meter calSee tag on the flowmeter, located on the rear boom rack.
- Boom calThe boom cal numbers are specific for each sprayer and are dependent on the boom width, number of sections and nozzle spacing.

NOTE: All console calibration numbers should be recorded in the Apache owner’s manual for future reference.

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

NOTE: The radar gun is not factory-calibrated. See the manufacturer’s instructions, provided with the Apache Sprayer, for proper calibration.

The Envizio Pro II and Viper 4 are the two Raven field computer options.

Envizio Pro II



Viper 4



The FmX is the Trimble field computer option.

FmX



Side Console



- | | |
|---------------------------------------|---------------------------|
| 1. Envizio Pro II Controller (option) | 7. Left/Right Tip Buttons |
| 2. Switchbox | 8. Agitate Up Button |
| 3. Master Spray Button | 9. Product Pump Button |
| 4. Boom Tilt/ Rack Buttons | 10. Agitate Down Button |
| 5. Left/Right Wing Buttons | 11. Foamer App Screen |
| 6. Fold/Unfold Buttons | |

Joystick

1. Boom Center Rack Up/Down

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

2. Left Boom Tilt

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

3. Right Boom Tilt

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

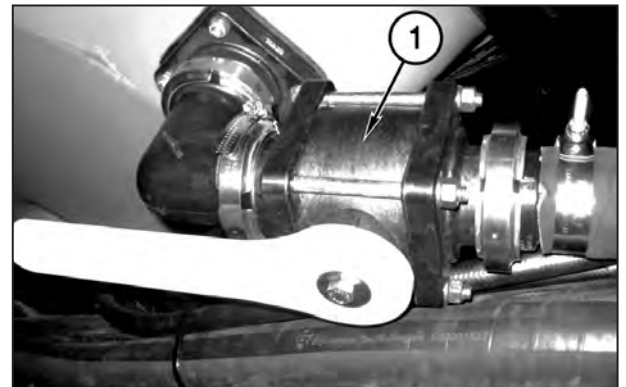
4. Master Spray Button

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



Filling Product Tank

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

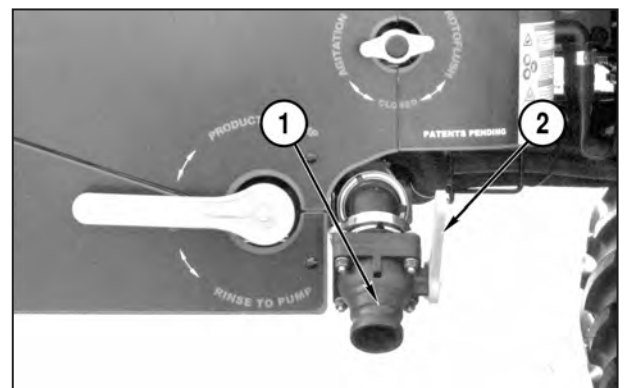


Remove the cap from the product quick fill inlet (1) and connect the hose from the nurse tank to the inlet.

Open the product fill valve (2), shown in the CLOSED position, and fill tank to desired level. There is a product tank sight gauge on the front of the tank.

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.



Tank Fill Monitor (optional)

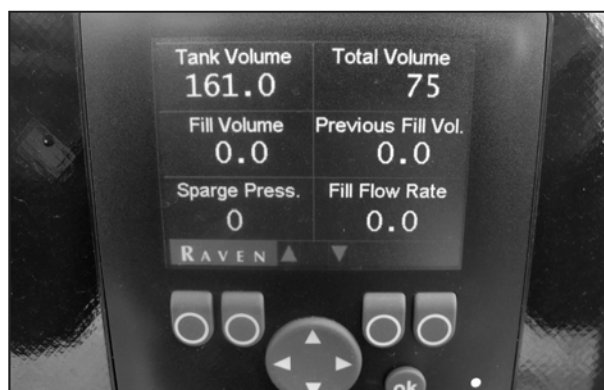
Screen 1:

The first screen shows the Tank volume and fill Volume in larger text. The two buttons on the bottom right (+1, +10) can be used to increment the tank and fill volume. The purpose of this is to add chemical to the tank that is not added through the secondary flow meter.



Screen 2:

The second screen is for information. It has Tank Volume, Total Volume, Fill Volume, Previous Fill Volume, Sparge Pressure and the flow rate.



Screen 3:

The third screen is for entering the meter cal for the fill line flow meter. Use the buttons (+1, +10, +100 and +1000) to increment the meter cal value. The meter cal must be entered for the flow through this flow meter to be added to the tank volume.



Screen 4:

The fourth screen is just a node information screen. It has the Product Controller node information and fill meter display information.

Once calibrated, the flow through the secondary flow meter will automatically be added and subtracted to the tank volume.



Product Tank Sight Gauge

The product tank sight gauge is located on the product tank, located between the tank and the cab. The gauge indicates the amount of product in the tank, beginning at 100 gallons.

The scale on the left side (1) of the gauge indicates the product amount when aligned with the top of the red float cap.

The scale on the right side (2) of the gauge indicates the product amount when aligned with the top of the liquid that is visible in the gauge.

NOTE: Ignore the white cap (3) at the bottom of the float tube. This does not indicate anything.

The product tank sight gauge shut off valve is located under the sprayer, on the front left corner of the product tank.



Filling Rinse Tank

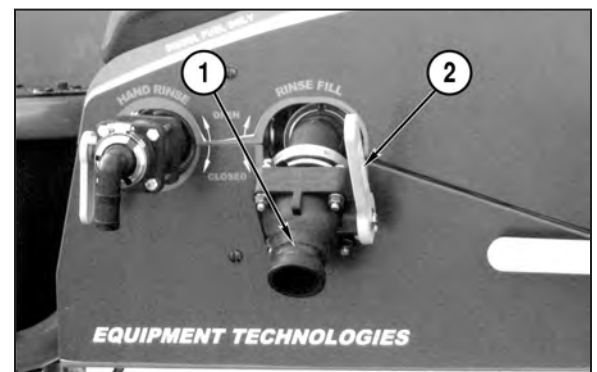
Remove the cap from the foam/rinse quick fill inlet (1) and connect the hose from the nurse tank to the inlet.

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

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

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

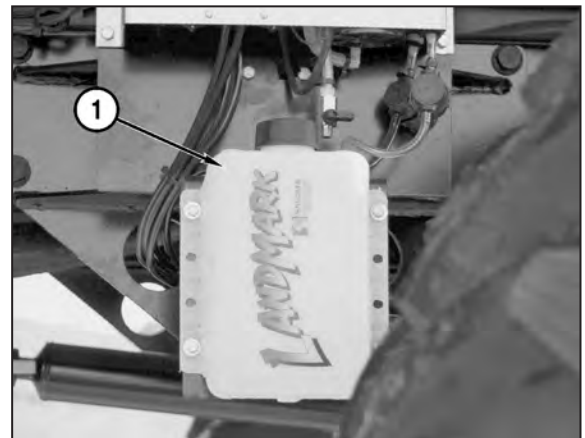
Disconnect the hose from the inlet and install the quick fill inlet cap.



Filling Foam Marker Tank

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

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



Operating Booms

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



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



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

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

Tilt to Remove Boom from the Cradle

All Boom Sizes

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



Unfold Boom Wings

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

On the console keypad, press the Unfold button (1) to activate. Then press and hold the Left and Right Wing buttons, (2) until the boom wings are fully extended. After the boom wings are fully extended, the boom tips can be unfolded.



Unfold Boom Tips

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

On the console keypad, make sure the Unfold button (1) is still activated. Then press and hold the Left and Right Tip buttons (2) until the boom tips are fully extended.



Height Adjustment

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

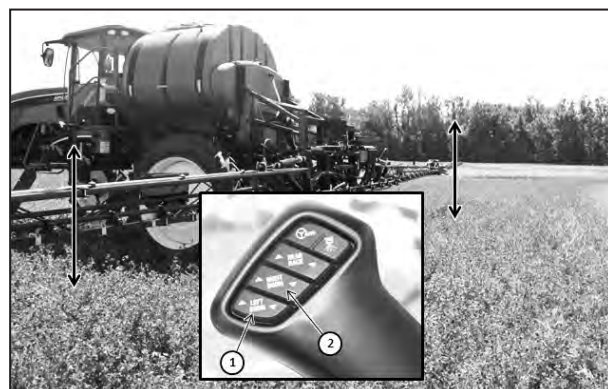
Press the top of the button to raise the boom rack.



Tilt to Level Boom

On the joystick, use the Left (1) and/or Right (2) boom tilt raise/lower buttons to adjust the booms to level.

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



Fold Boom Tips

On the console keypad, press the Fold button (1) to activate. The press and hold the Left and Right Tip buttons (2) until the boom tips are fully folded.

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



Fold Boom Wings

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

On the console keypad, make sure the Fold button (1) is activated. Then, press and hold the Left and Right Wing buttons (2) until the boom wings are fully folded.



Tilt to Return Boom to Cradle

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

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



Spraying

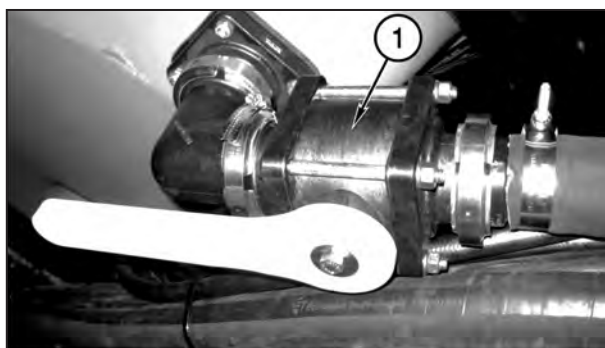
Make sure the product, rinse, and foam marker tanks are filled. See "Filling Rinse Tank" on page 4-9. See "Filling Product Tank" on page 4-7. See "Filling Foam Marker Tank" on page 4-9.

Level the booms and boom tips using the tilt and unfold buttons. See "Operating Booms" on page 4-10.

Set the boom height using the boom rack button. See "Height Adjustment" on page 4-11.

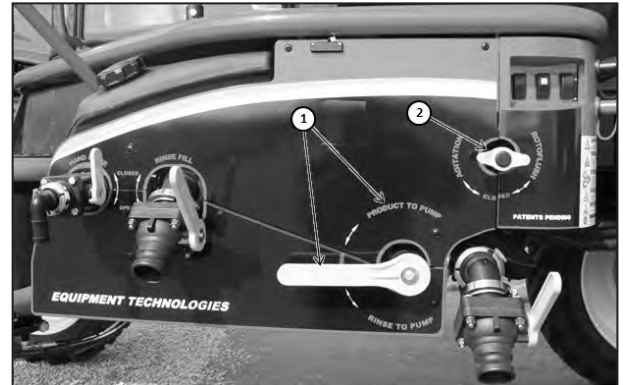
Open the sump valve (1) on the underside of the product tank.

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



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

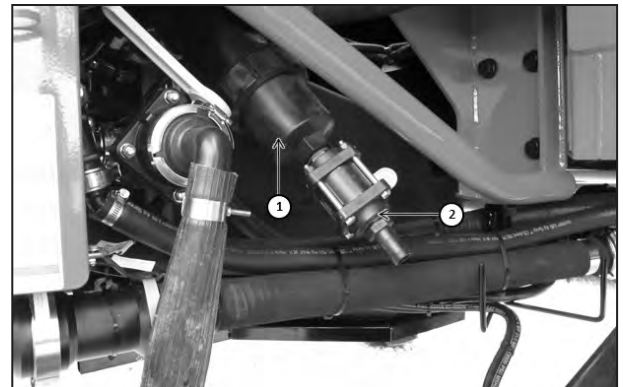
Set rotoflush/agitation knob (2) to **AGITATION**.



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

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

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



Power up the Envizio Pro II, Viper 4, or FmX field computer (Envizio Pro II is shown) and check the settings.

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



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

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

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

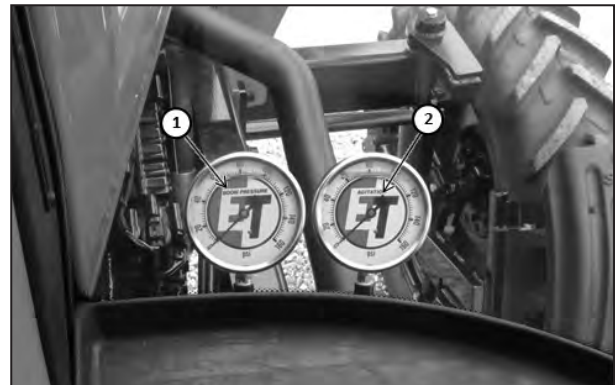


The boom pressure (1) and agitation (2) gauges are mounted outside at the lower right of the cab.

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

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

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



Select an appropriate gear for the desired Apache Sprayer speed during spraying. See "Shifting Forward Gears" on page 3-17. Under typical operating conditions, second or third gear is recommended.

Use the master spray on/off button on the joystick to start and stop spraying.

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

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



Valve Advance and Valve Delay

There are two settings that are available in the Raven controllers that will help with valve settings. The settings are called Valve Advance and Valve Delay.

Valve Advance

The valve advance feature allows the user to set the amount of time (in seconds) in which the valve will be opened upon all boom sections being turned OFF and control in automatic mode. A value of 1-9 means an advance of 1-9 seconds respectively. A value of 0 means no advance. This setting will open the control valve back up for "X" seconds after all boom sections have been turned off; resulting in quicker turn. For example, you have entered your headlands area to make a turn and switched the Master Button OFF, the Valve Advance setting will now open the control valve back up for the amount of time you have entered into the controller to build up pressure for when the Master Button is turned on.

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

To set Valve Advance in the Envizio Pro II:

Start by selecting the "Product Control" menu, then choose the "Valve" box. Inside the "valve Calibration" menu choose "Valve Advance" and enter a number of "2".

To set Valve Advance in the Viper 4:

Start by selecting the "Node" icon with gears. Slide the screen to the second page. Click "Product Control". Click the second tab at the top. This will now be the "Valve Control" screen. Select "Valve Advance" icon and enter a number of "2".

NOTE: Valve Advance is preset from Equipment Technologies at "0".

Valve Delay

The Valve Delay feature allows the user to set a delay between the time the booms are turned on and when the console begins to control the flow rate. A value of 1-9 means a delay of 1-9 seconds respectively. A value of 0 means there is no delay. This delay is active if the time between turning OFF and turning ON the booms is less than 30 seconds. For example, when turning around on headlands this will leave the control valve at a fixed setting for the allotted time.

To set Valve Delay in the Envizio Pro II:

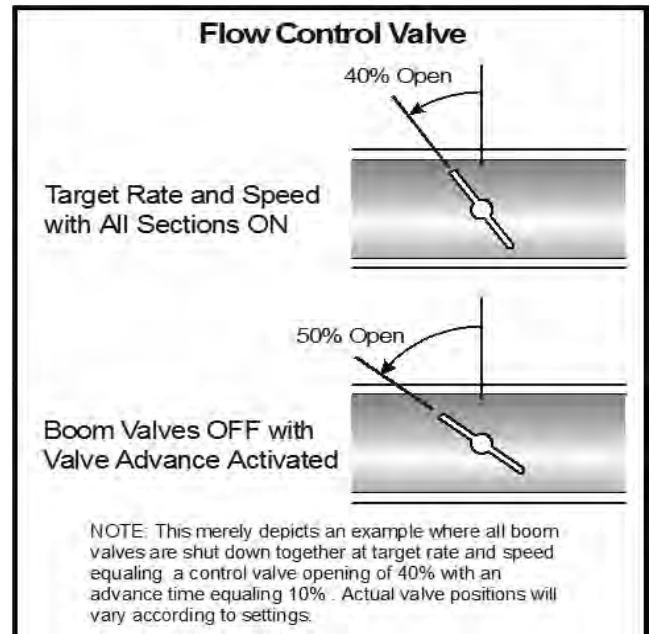
Start by selecting the "Product Control" menu, then choose the "Calibration Settings" box. Inside the Calibration Settings menu, choose the "Valve Delay" box and enter a number of "1".

To set Valve Delay in the Viper 4:

Start by selecting the "Node" icon with gears. Slide the screen to the second page. Click "Product Control". Click the second tab at the top. This will now be the "Valve Control" screen. Select "Valve Delay" icon and enter a number of "1".

NOTE: Valve Delay is preset from Equipment Technologies at "0".

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

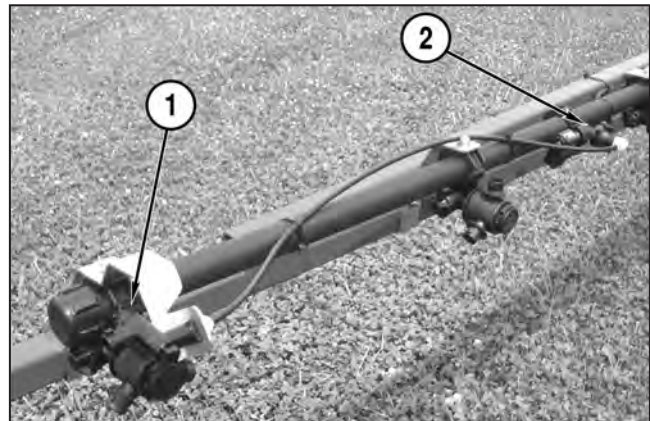


Optional Fence Row Nozzle

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

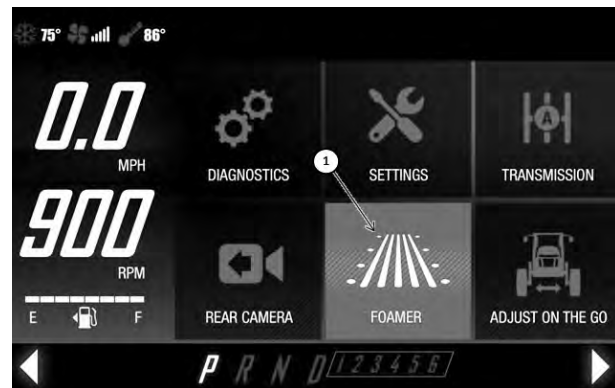
To operate the left fence row nozzle, boom section 1 and boom section L must both be switched on.

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



Operating Foam Marker

To turn on the foam marker, touch the Foamer App icon (1) to access the foam marker page.



To turn on, touch the OFF icon to activate to the ON (1) position.

- Touch the Foam Left icon (2) to drop foam on the left.
- Touch the Foam Right icon (2) to drop foam on the right.

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



Auto Foam

To use the Auto Foam feature, turn on the Foam Master icon (1), then turn on the Foam Auto icon (2). Foam will drop from whichever side was used last (3).

When the boom section switches are turned on or off with the Master Spray button on the joystick, the foam will switch from left to right.

NOTE: The Master Spray button on the joystick must be turned on before the Auto Foam is activated.

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

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



LandMark Foam Marker

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

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

Foam Marker Operation Instructions

See page 4-20 for injection marker feature parts locations.

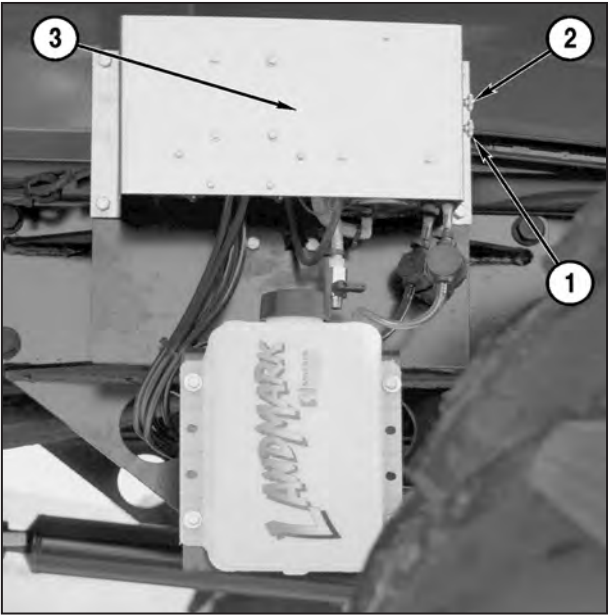
Turn on the injection marker and allow the liquid pump to prime. If the liquid pump does not prime, open the priming valve until liquid begins to flow, then close the priming valve.

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

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

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

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



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

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

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

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

Optional Combo Boom Drops

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

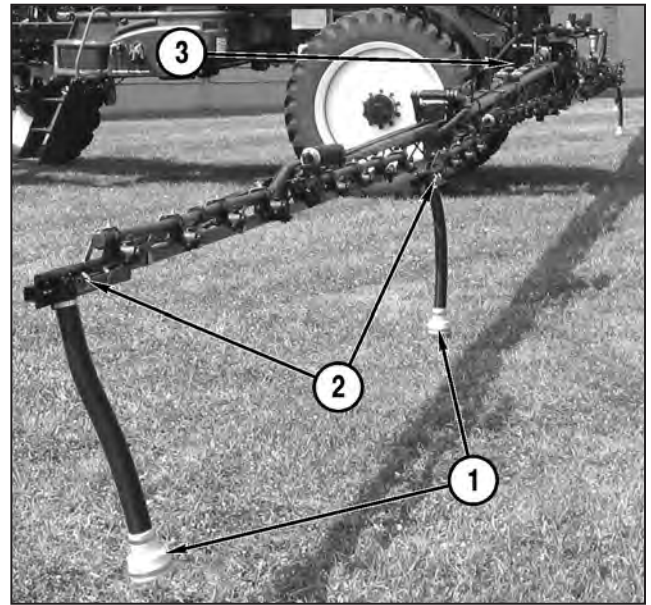
If your Apache Sprayer is equipped with the LandMark injection foam marker, then the boot is located near the end of each boom.

2. **Foam Marker Mixing Chamber**

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

3. **Combo Boom Diverter Valves**

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



Maintenance

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

Freezing

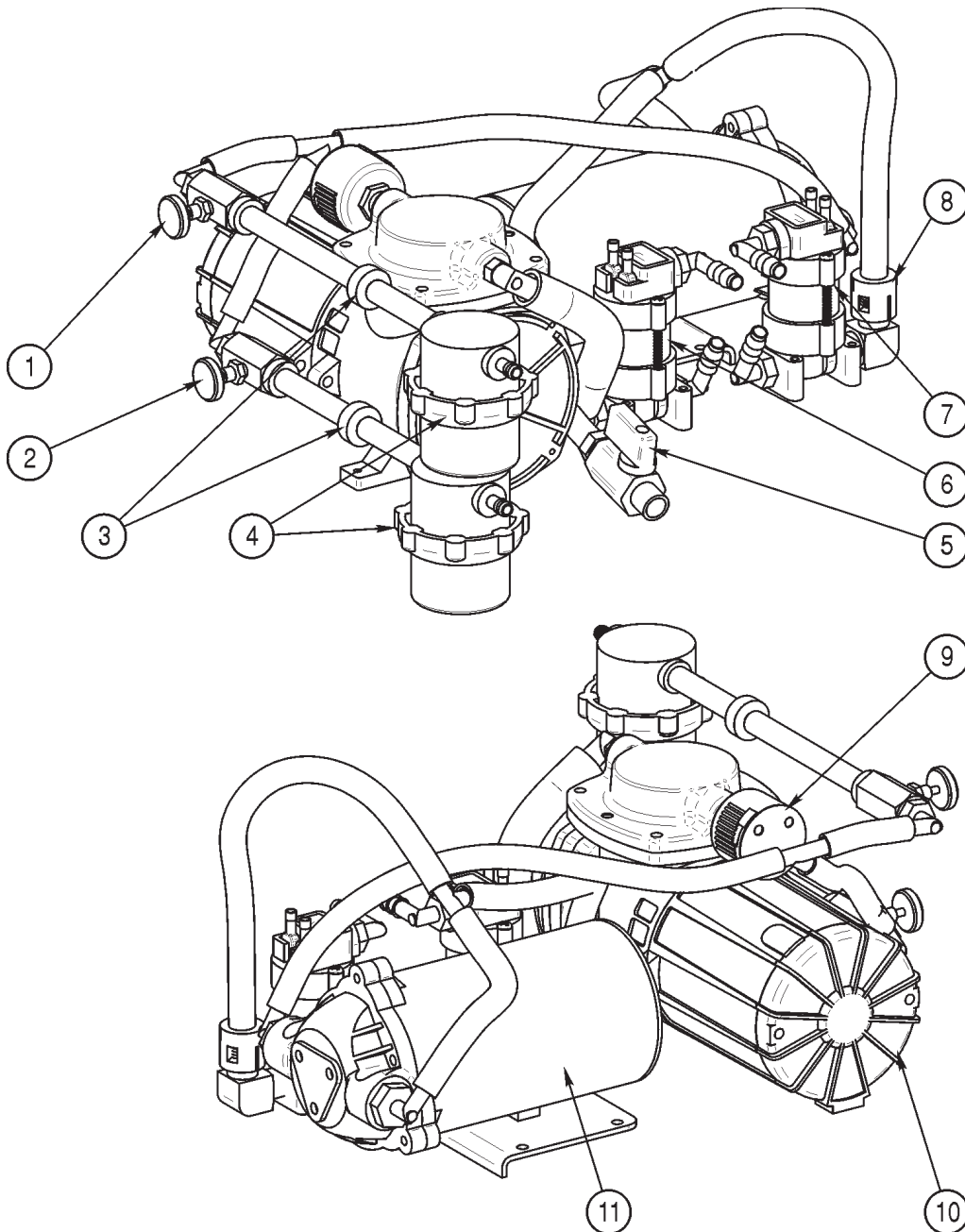
When operating in temperatures at or below freezing, ethylene-glycol based antifreeze may be added to the water and soap tanks.

If the system will be exposed to freezing temperatures overnight:

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

For long-term storage:

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

**1. Output Valve**

Labeled "More Foam Less Foam"

2. Soap Injection Valve**3. Check Valve****4. Strainer****5. Priming Valve****6. Air Solenoid****7. Soap Solenoid****8. Check Valve****9. Compressor Breather****10. Thomas Air Compressor****11. Liquid Pump**

Flushing Product Tank

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

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

Fill the rinse tank with clean, fresh, water. See “Filling Rinse Tank” on page 4-9.

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

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

Start the engine.

Set the product pump switch (3) to the ON position and increase the engine speed to approximately 1200 rpm.

NOTICE: 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:

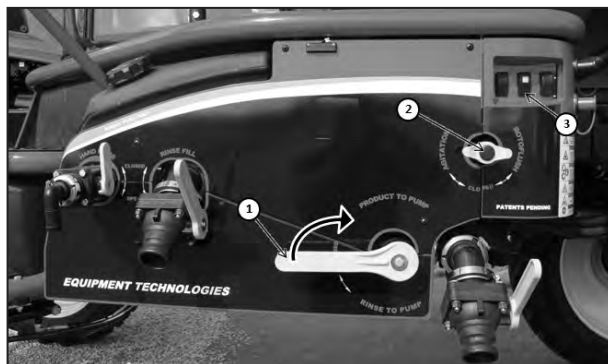
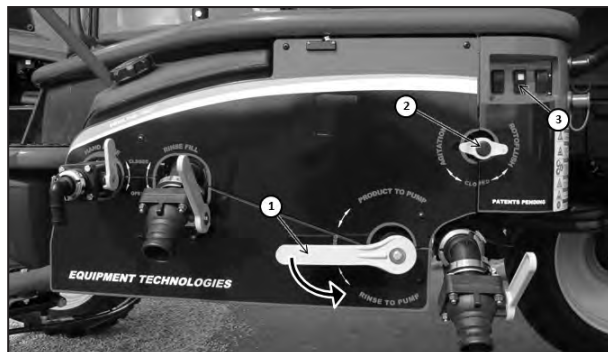
Return the engine to IDLE.

Set the product pump switch (3) to OFF.

Turn the product lever (1) to PRODUCT TO PUMP.

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

Drain tank safely through the Product Tank Fill Valve.



Flushing Booms

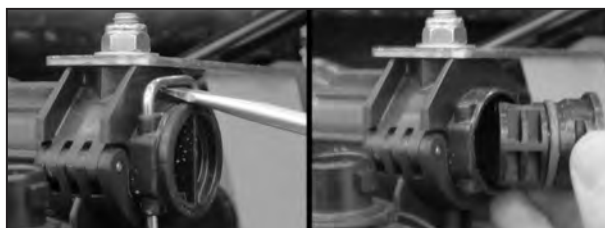
NOTICE: Read and follow chemical labels for proper usage, flushing, disposal and protective clothing requirement instructions. ALWAYS dispose of chemicals and contaminated rinse water in a safe location in accordance with chemical label recommendations and local laws.

NOTICE: Some chemicals may require multiple tank flushings.

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

To flush the booms:

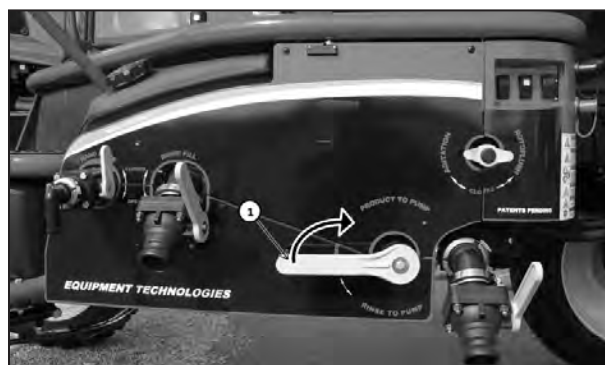
- Unfold the booms
- Set the product valve (1) to RINSE TO PUMP.
- Remove Hypro Express Endcaps.
- Increase engine speed to 1200 RPM.
- Switch to Manual Spray in the field Computer.
- Turn the Product Pump switch to the ON position.
- Press the Master Spray Button to flush.



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

After the booms are flushed:

- Turn OFF Master Spray Button
- Return the engine speed to IDLE.
- Set the product pump switch to OFF.
- Set the product valve (1) to PRODUCT TO PUMP.
- Replace the Hypro Express Endcaps
- Fold the booms, and turn off the engine.



Cleanload Chemical Eductor

The eductor assembly is automatically lowered and raised with the use of the park brake button. When the park brake is activated, the eductor is lowered. When the park brake is deactivated, the eductor is raised.

Startup

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

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

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



Loading Liquid or Powdered Chemical into Hopper

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

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

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

NOTE: The eductor hoses are flexible and may be kinked while in the up position. This is normal and will not cause any damage to the hoses or equipment. Make sure that the inlet valve (3) behind the fill station has been shutoff before raising the eductor.

NOTES

APACHE™

CHAPTER 5

LUBRICATION AND MAINTENANCE

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

Maintenance Precautions

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



WARNING! Exposure Hazards

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



WARNING! Entanglement Hazards

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



WARNING! Piercing Hazards

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

**WARNING! Flying Object Hazard**

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

**WARNING! Crush Hazards**

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

**WARNING! Fire/Explosion Hazards**

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

**WARNING! Explosion Hazard**

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

**WARNING! Exposure Hazard**

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

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

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



WARNING! Shop Equipment Hazards

- ***ALWAYS check before starting the engine that any tools or shop rags used during maintenance have been removed from the area.***
- ***ALWAYS use tools appropriate for the task at hand and use the correct size tool for loosening or tightening machine parts.***
- ***ALWAYS use the proper tools and equipment for servicing the Apache Sprayer. Ensure the tools are rated and approved for use with this Apache Sprayer.***
- ***If an Apache sprayer is to be operated with test equipment connected, precautions must be taken to ensure that all equipment and related components are securely attached to prevent movement and interference.***
- ***Before performing any maintenance procedure, have all the correct tools you need to perform the required tasks.***
- ***Ensure that the work area is adequately illuminated. ALWAYS install wire cages on portable safety lamps.***

Environmental Precautions

The safety messages that follow have NOTICE level hazards.

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

Non-Apache Equipment Maintenance

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

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

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

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

Cleaning Guidelines

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

**WARNING! Fire Hazard**

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

**WARNING! Exposure Hazard**

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

The safety messages that follow have NOTICE level hazards.

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

Mechanical Parts

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

Electrical Parts

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

Body and Cab Exterior

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

Apache Sprayer Service Interval Chart

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

Before Initial Use

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

- Grease Boom. See "Grease Boom" on page 5-9.
- Torque Lug Nuts. See "Torque Lug Nuts" on page 5-17.
- Torque Boom Lead Bolts. See "Torque Boom Lead Bolts" on page 5-20.
- Grease Steering Components. See "Grease Steering Components" on page 5-18.
- Grease Axle Components. See "Grease Axle Components" on page 5-20.
- Grease Driveline. See "Grease Driveline Components" on page 5-21.
- Adjust Poly Tank Straps. See "Adjust Poly Tank Straps" on page 5-17.
- Adjust Boom. See "Adjust Boom" on page 5-6.

After First 10 Hours

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

- Torque Lug Nuts. See "Torque Lug Nuts" on page 5-17.
- Torque Boom Lead Bolts. See "Torque Boom Lead Bolts" on page 5-20.
- Adjust Poly Tank Straps. See "Adjust Poly Tank Straps" on page 5-17.

Adjust Boom

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

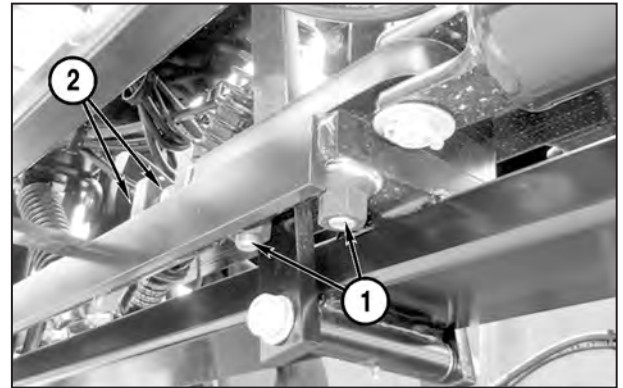
Boom Lead

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



To adjust the boom lead:

1. Loosen the boom lead bolts (1) near the bottom of the boom rack.
2. Turn the jam nuts (2) toward the end of the boom to increase boom lead.
3. Turn the jam nuts (2) toward the center of the boom rack to reduce boom lead.
4. Tighten the jam nuts and lead bolts after correct lead is set.
5. Torque the boom lead bolts to 420 lb-ft [569 N•m]
6. Repeat the steps for the remaining boom, as required.



Boom Breakaway

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

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

To adjust the breakaway:

1. Loosen the jam nut (1) and turn the adjusting screw (2) to align the booms.
2. Tighten the jam nut.
3. Repeat the steps for the remaining breakaways, as required.



Boom Stabilizer

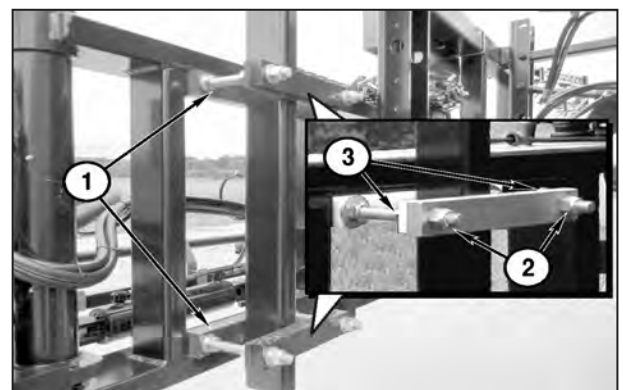
There are four boom stabilizers mounted on the boom rack. The upper and lower right-side stabilizers (1) are shown.

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

To adjust the gap:

1. Loosen both lock nuts (2) on the stabilizer and equally adjust the jam nuts (3) until the gap is correct.
2. Tighten the lock nuts (2)
3. Repeat the steps for the other stabilizers, as required.

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



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

The boom tips should be level with the main boom.

The left boom tip is shown.

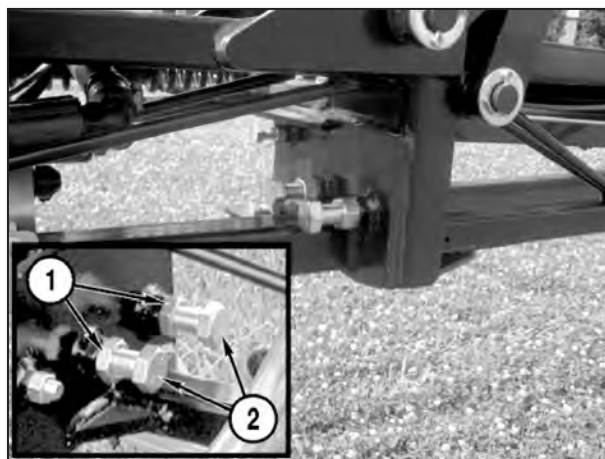
To adjust the boom tip level:

1. Loosen the jam nuts (1) on the leveling bracket.
2. Turn the leveling bolts (2) clockwise to raise the boom tip or counterclockwise to lower the boom tip.

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

NOTE: Adjust the bolts equally for best performance.

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

**As Required**

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

- Adjust Boom. See "Adjust Boom" on page 5-6.
- Grease Axle Components. See "Grease Axle Components" on page 5-20.
- Check Axle Extension Bolt Torque. See "Torque Axle Extension Brace Bolts" on page 5-23.
- Adjust Toe-In. See "Adjust Toe-In (Standard 120" Axles)" on page 5-35.
- Clean or Change the Primary Engine Air Filter. See "Clean or Change Engine Primary Air Filter" on page 5-26.
- Change Engine Safety Air Filter. See "Change Engine Safety Air Filter" on page 5-37.

NOTICE: When operating in severe conditions, the primary air filter should be cleaned after every 40 hours of use or if indicated by the console display. Filter usage should not exceed 250 hours.

- Winterize Wet System. See "Winterize Wet System" on page 5-38.
- Change Cab Air Filters. See "Change Cab Charcoal Filter" on page 5-34.
- Flush Wet System. See "Flushing Booms" on page 4-22.
- Inspect Front Accumulator. See "Inspect Front Accumulator and Suspension Cylinder" on page 5-29.
- Clean the Fuel Tank Strainer. See "Clean Fuel Tank Strainer" on page 5-25.

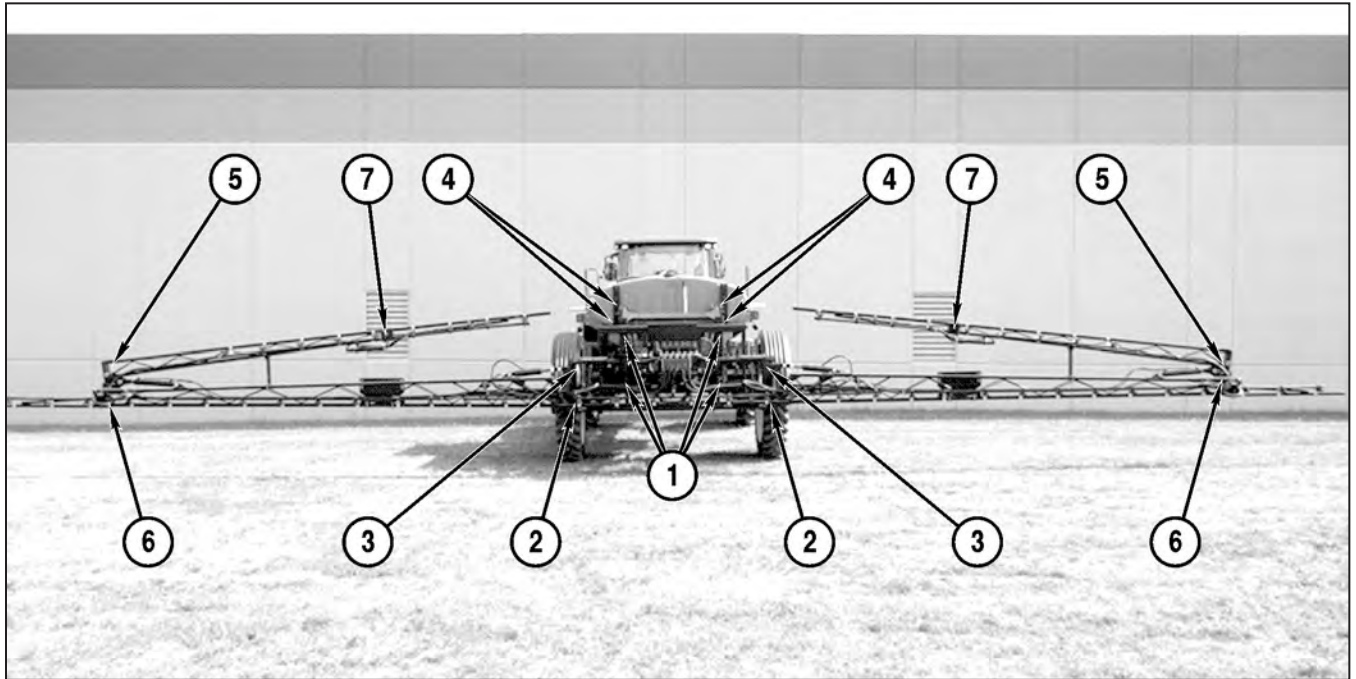
Daily

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

- Clean or Change Primary Engine Air Filter as needed. See “Clean or Change Engine Primary Air Filter” on page 5-26.

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

Grease Boom



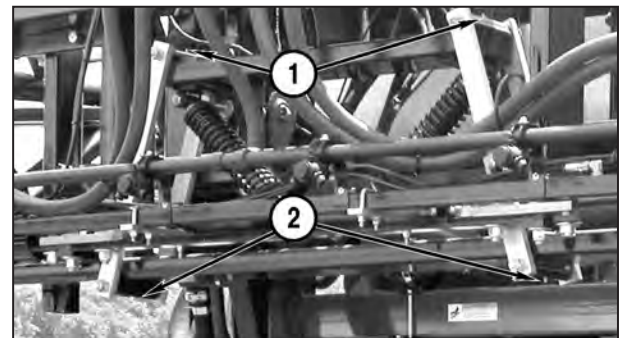
The boom is equipped with seven sets of grease fittings. Apply an ample amount of lithium grease through each of the grease fittings.

1. Boom Stabilizer
2. Boom Tilt
3. Boom Fold
4. Boom Rack

5. Boom Tip
6. Boom Inner Breakaway
(if equipped)
7. Boom Outer Breakaway

Boom Stabilizer

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



Boom Tilt

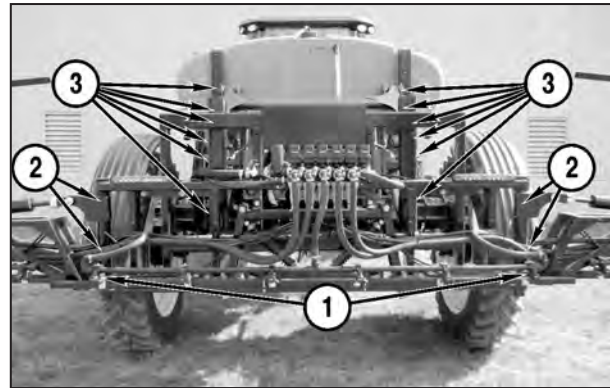
There are two boom tilt grease fittings (1).

Boom Fold

There are four boom fold grease fittings (2).

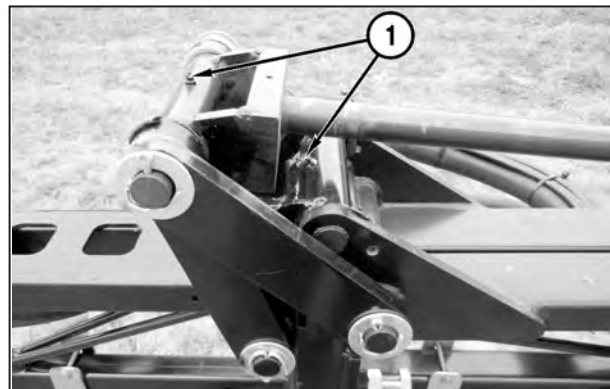
Boom Rack

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



Boom Tip

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



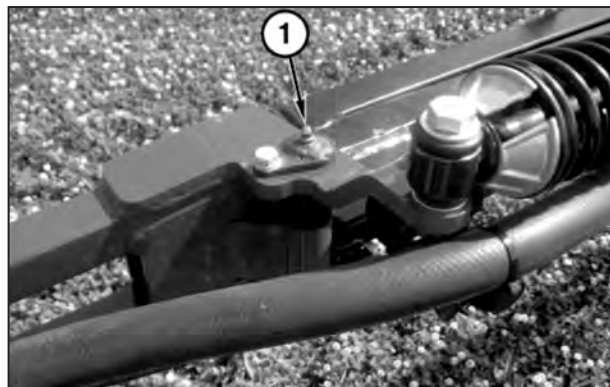
Boom Inner Breakaway (if equipped)

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



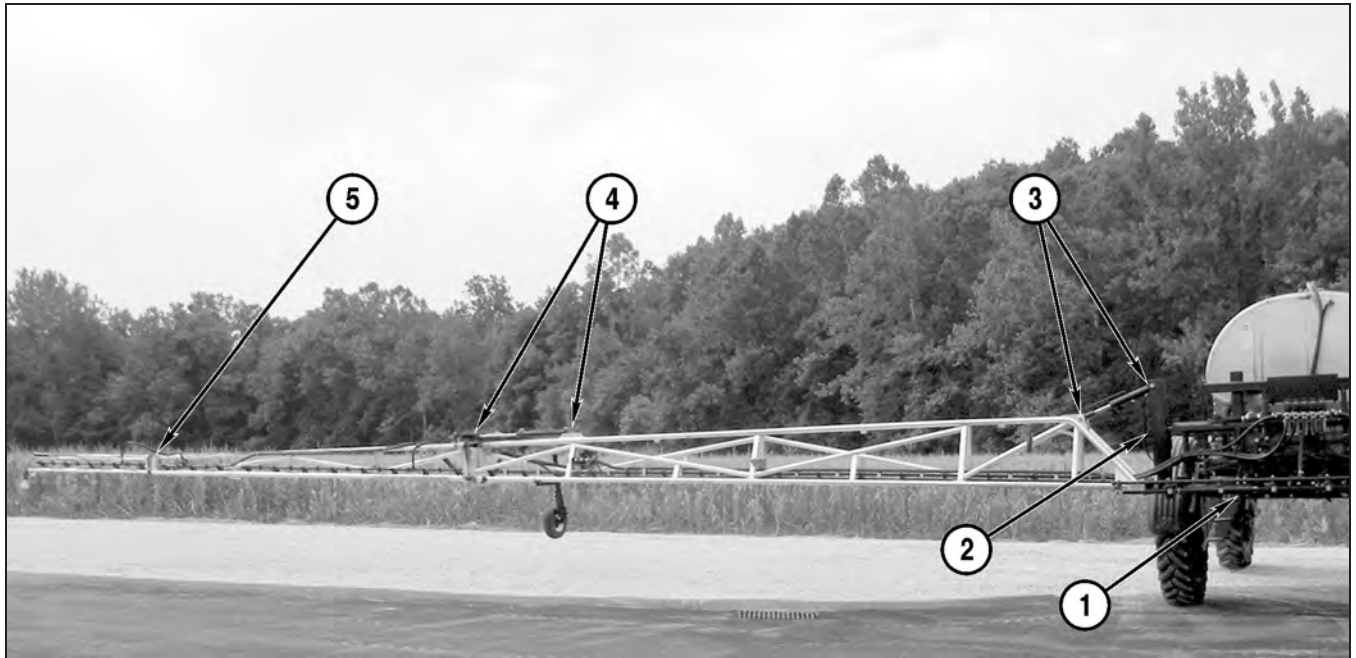
Boom Outer Breakaway

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



Grease Pommier Boom

(Optional Equipment)

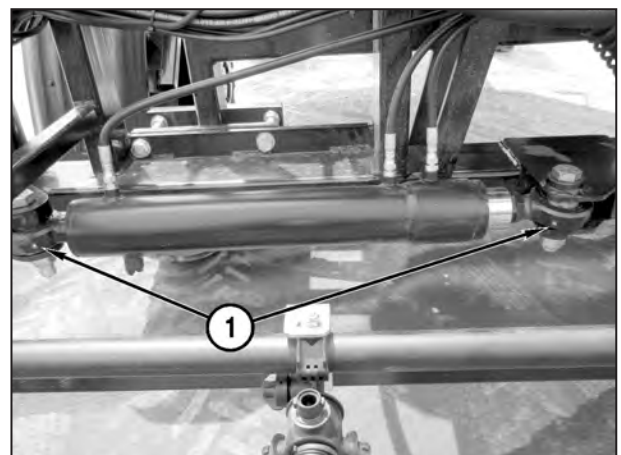


The Pommier boom is equipped with five sets of grease fittings. Apply an ample amount of lithium grease through each of the grease fittings.

- | | |
|------------------------------------|-------------------------------|
| 1. Boom Fold Cylinder (2 fittings) | 4. Boom Tip Fold (7 fittings) |
| 2. Boom Hinge (4 fittings) | 5. Boom Breakaway (1 fitting) |
| 3. Tilt Cylinder (2 fittings) | |

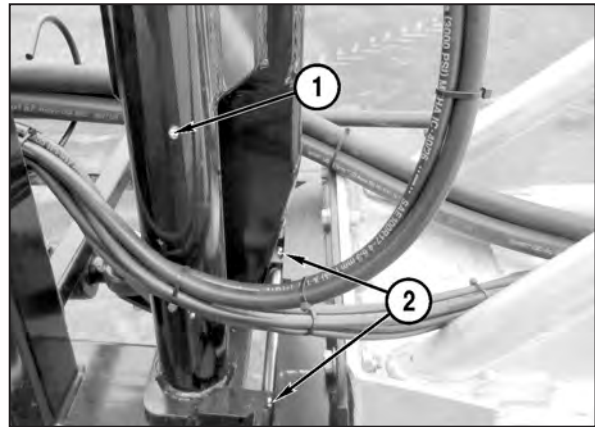
Boom Fold Cylinder

There are two grease fittings (1) on each boom fold cylinder. The left side is shown.

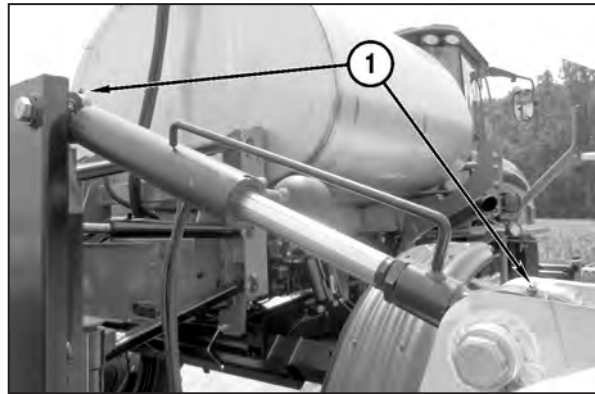


Boom Hinge

There are two grease fittings (1) on each pivot upright and two grease fittings (2) on each of the hinge pin tabs. The left side is shown.

**Tilt Cylinder**

There are two grease fittings (1) on each tilt cylinder. The right side is shown.

**Boom Tip Fold**

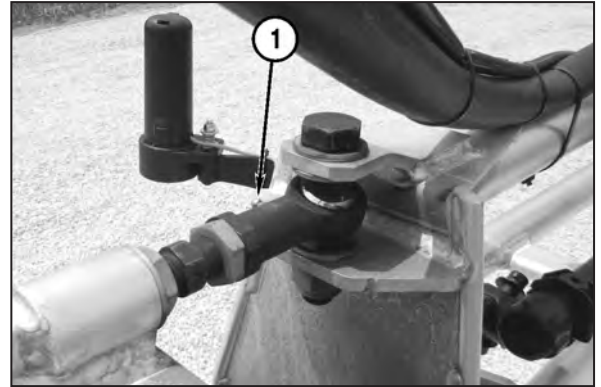
There are seven grease fittings in the boom tip fold area of each boom. The left side is shown.

NOTE: The booms must be placed in the open position to access some fittings and in the folded position to access the remaining fittings.

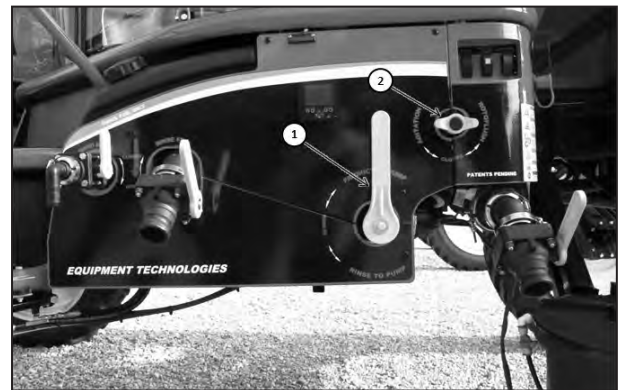


Boom Breakaway

There is one grease fitting (1) on each boom breakaway. 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 4-21. See "Flushing booms" on page 4-22.

**Check Tire Pressure**

Perform the following:

- Check the tires for damage. Replace tires that have cuts or bubbles.
- Check the tires for proper inflation pressure. Inflate tires according to the tire manufacturer's recommendations. Tire pressures are listed on page "1-2" of this manual.
- Check the rims for cracks and other damage. Replace damaged rims.



Check Engine Oil Level

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

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

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

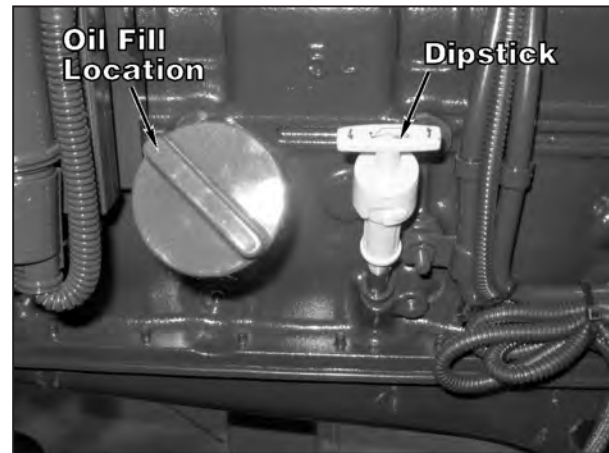
The oil level should be within the hatched area on the dipstick.

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

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

Replace the dipstick.

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



Check Cooling System



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



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



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

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

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

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

Install the radiator cap.



WARNING! Burn Hazard.

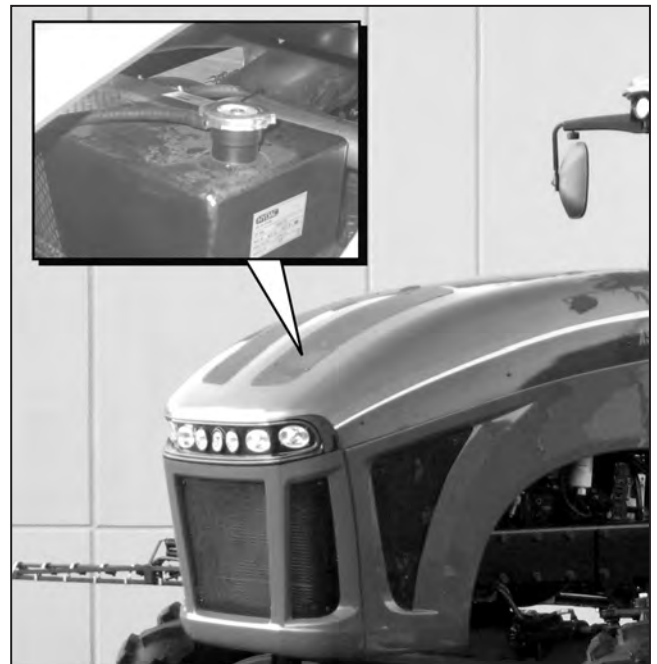
ALWAYS tighten the radiator cap securely after checking the coolant. Steam can spray out during engine operation if the cap is loose.

Inspect the cooling system components for damage and debris.

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

Cycle Fan Reverser

Operate this function until the radiator and coolers are free of dust and debris. For operation instructions see "Diagnostics Page 3: Fan Control" on page 3-7.



Check Transmission Fluid Level

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

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

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

Turn the dipstick handle counterclockwise to loosen.

Remove the dipstick and check the transmission fluid level.

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

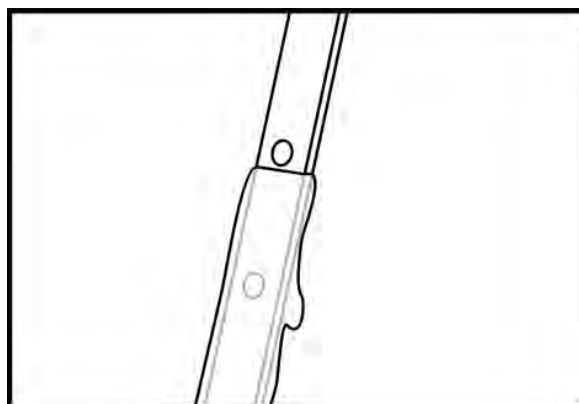
NOTICE: DO NOT overfill the transmission fluid. Overfilling can damage the transmission or cause the transmission to malfunction or overheat.

NOTICE: Use only Lucas Universal Hydraulic Fluid or equivalent.

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

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

Replace the dipstick and turn the handle clockwise to tighten.



Check Hydraulic Fluid Level

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

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

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

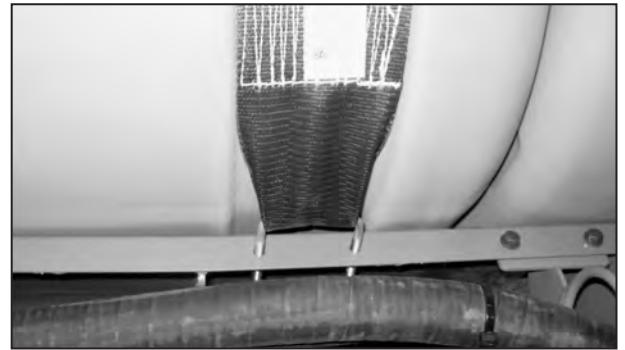
If no fluid is visible in the sight glass, remove the fill cap (2) and add Lucas Universal Hydraulic Fluid, or equivalent, until fluid is visible in the bottom of the sight glass.

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



Adjust Poly Tank Straps

Check the poly tank straps while the tank is at least 50% full. If the straps feel or appear loose, tighten them evenly from side to side without deforming the tank, bolts, or the tank cradle.



Every 40 Hours

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

- Clean or Change Primary Engine Air Filter as needed. See “Clean or Change Engine Primary Air Filter” on page 5-26.

Torque Lug Nuts

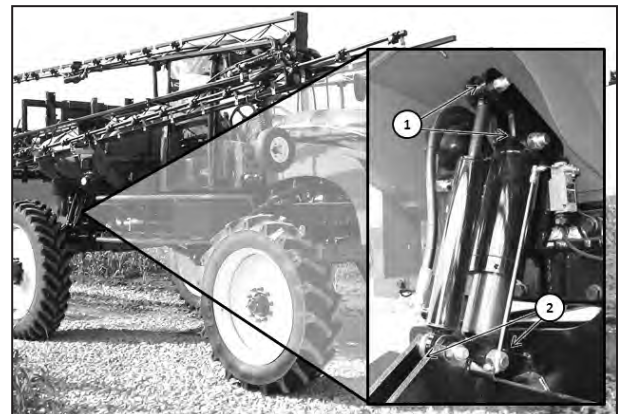
Torque all the wheel lug nuts to:

- 420 lb-ft [569 N•m]

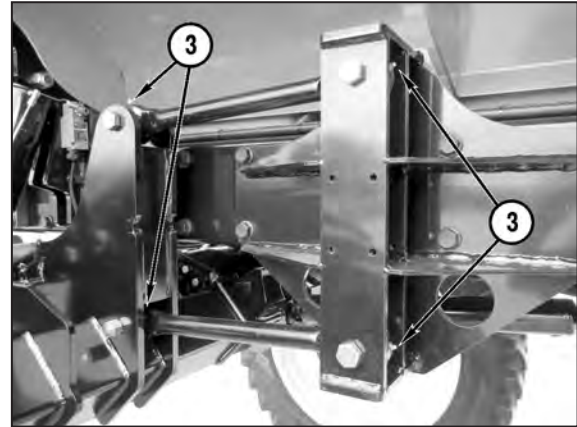


Grease Rear Suspension

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



Also apply Lucas lithium grease or equivalent to the grease fittings on each end of the trailing arms.



Grease Steering Components

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

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

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



Grease Front Strut and King-pins

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

Each steering cylinder has two king-pin grease fittings (1), two ball joint grease fittings (2), one inter-flex bearing grease fitting (3), and one hub grease fitting (4). The right wheel is shown.

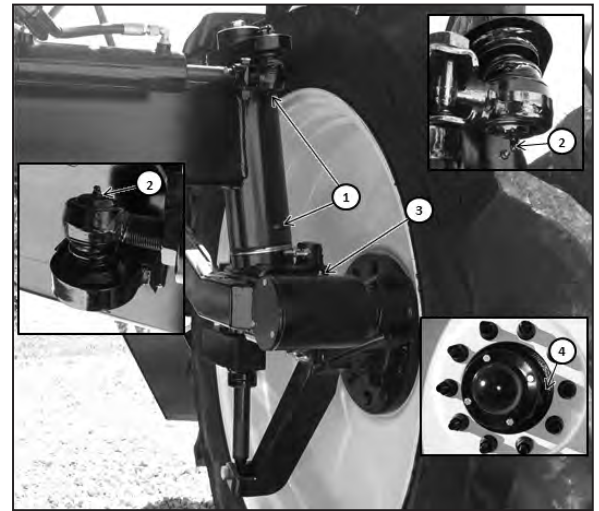
Apply lithium grease through the two king-pin grease fittings (1).

Apply lithium grease through the two ball-joint grease fittings (2) on the tie rod ends.

NOTE: The inter-flex (3) and hub (4) bearing are sealed chambers and once greased require very little grease to maintain.

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

Apply lithium grease through the hub bearing grease fitting (4).



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

Apply Lucas lithium grease or equivalent through each grease fitting.

Repeat these steps for the other front wheel.

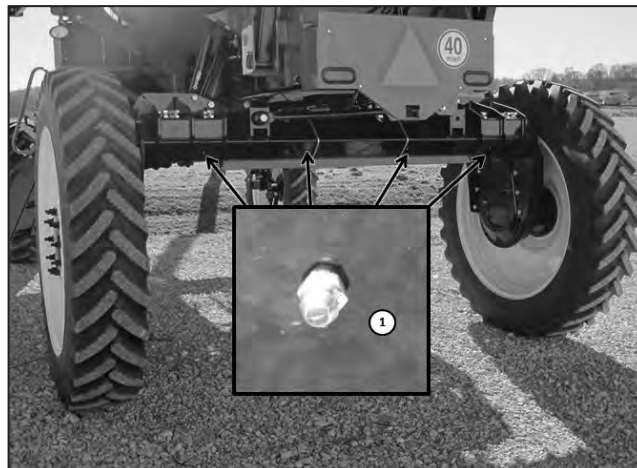


Grease Axle Components

The rear axle is equipped with 24 grease fittings, installed in two square-tube axle extension assemblies. Eight fittings point downward from the bottom faces of each square tube. Shown are the four rear-most fittings (1).

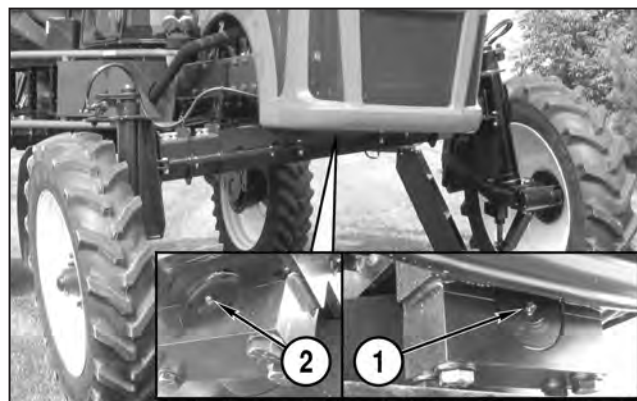
The front axle is equipped with 12 grease fittings.

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



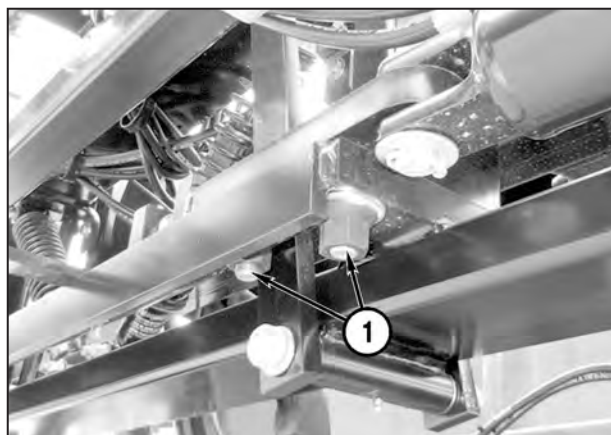
An axle pivot is located under the vehicle on the front axle. The pivot is equipped with a grease fitting on front (1) and rear (2) of the front axle.

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



Torque Boom Lead Bolts

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



Check Differential Fluid Level

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

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

Install the plug and tighten.



Check Rear Differential for Leaks

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

After First 100 Hours

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

- Adjust Poly Tank Straps. See “Adjust Poly Tank Straps” on page 5-17.
- Change Differential Fluid. See “Change Differential Fluid” on page 5-26.
- Change Hydraulic Fluid Filter. See “Change Hydraulic Fluid Filter” on page 5-27.
- Change Engine Oil and Filter. See “Change Engine Oil and Filter” on page 5-30.
- Change Transmission Fluid and Filter. See “Change Transmission Fluid and Filter and Clean Strainer” on page 5-31.

Every 100 Hours

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

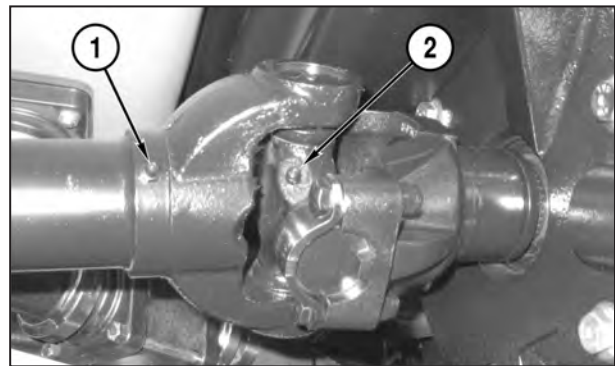
Grease Driveline Components

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

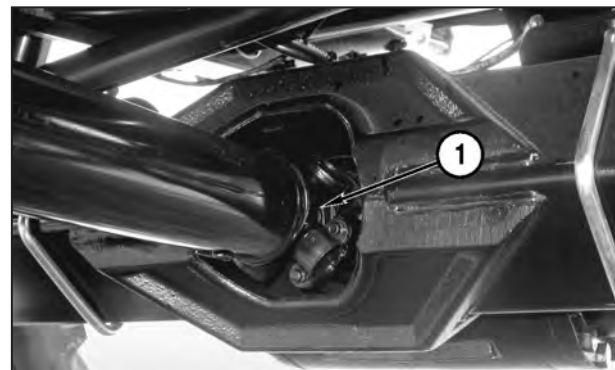
Apply an ample amount of Lucas lithium grease or equivalent through each of the fittings.

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

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



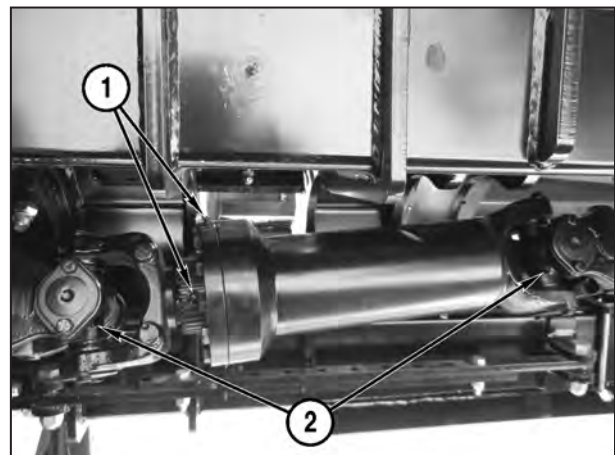
A U-joint fitting (1) is located at the differential input.



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

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

The left axle is shown.



Torque Axle Extension Brace Bolts

NOTICE: There are different axle brace bolt torque values for manual and Adjust-On-The-Go axles. Follow the instructions for your application. Also, it is recommended to thread all bolts down until they make contact with the wedge blocks, verify the slider tube is centered, then tighten in a cross pattern similar to wheel lug nuts.

Manual Adjust Axles

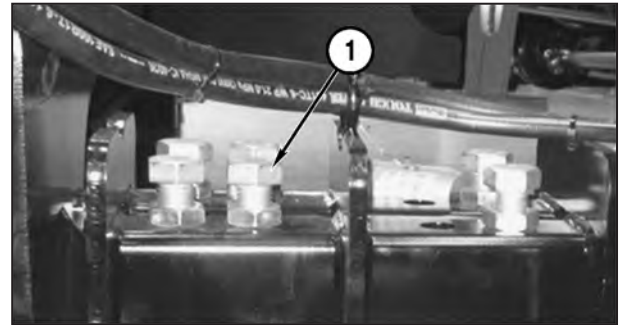
There are six axle brace bolts (1) on each front brace.

Loosen all the jam nuts.

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

Tighten the jam nuts.

Repeat the process for the other front axle.



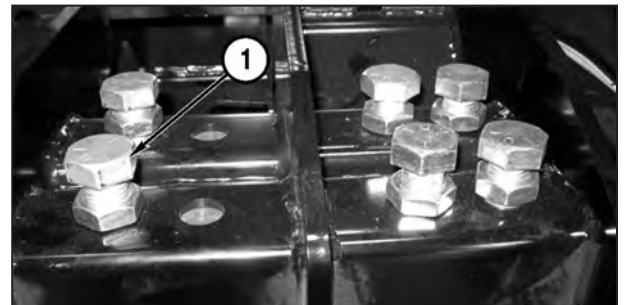
There are twelve axle brace bolts (1) on each rear brace.

Loosen all the jam nuts.

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

Tighten the jam nuts.

Repeat the process for the other rear axle brace.



Adjust-On-The-Go Axles

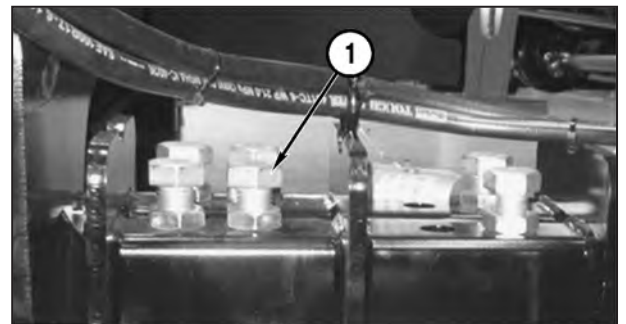
There are six axle brace bolts (1) on each front brace.

Loosen all the jam nuts.

Tighten the axle brace bolts (1) to 22 lb-ft [30 N•m].

Tighten jam nuts.

Repeat the process for the other front axle brace.



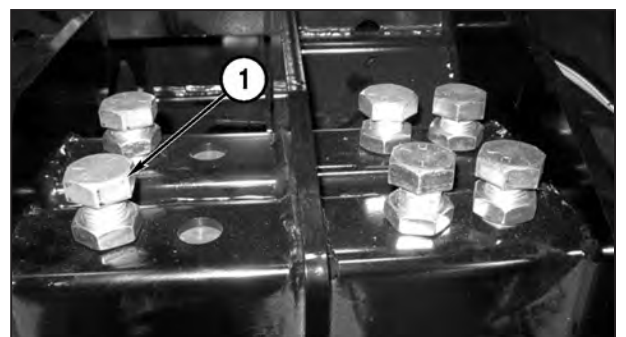
There are twelve axle brace bolts (1) on each rear brace.

Loosen all the jam nuts.

Tighten the bolts (1) to 22 lb-ft [30 N•m].

Tighten the jam nuts.

Repeat the process for the other rear axle brace.



Change Fuel Filter

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



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

Turn the filter counterclockwise to remove. Dispose of the filter properly.

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

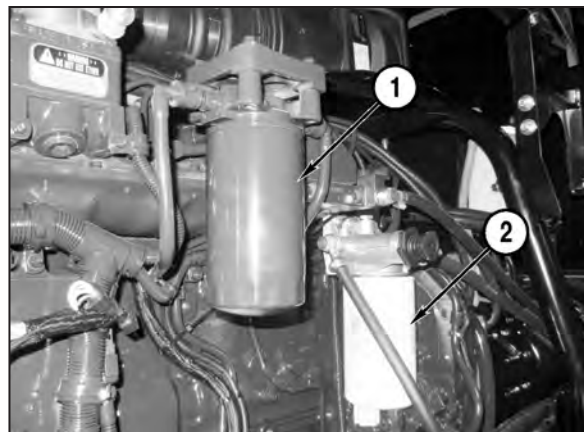
- Fuel Filter Part Number: 201450243

Fill the new filter with diesel fuel before installing.

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

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

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



Change Fuel Separator Filter

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

Turn the filter counterclockwise to remove.

Dispose of the filter properly.

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

- Fuel Separator Filter Part Number: 201450242

Fill the new filter with diesel fuel before installing.

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

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

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

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

Clean Fuel Tank Strainer

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

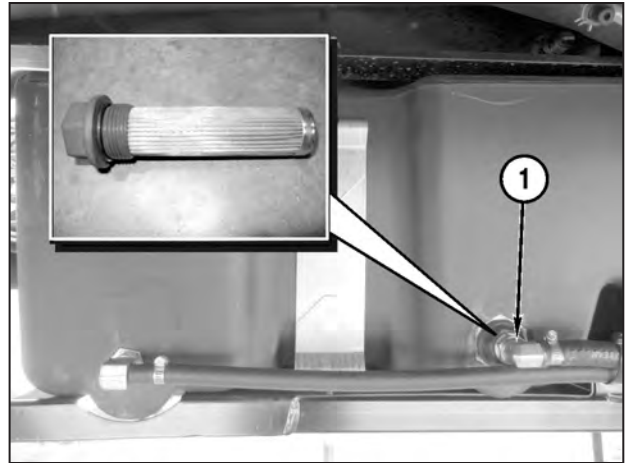
The best time to clean the fuel tank strainer is when the fuel level is low.

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

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

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

- Fuel Strainer Part Number: 201450001



Every 250 Hours

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

Clean or Change Engine Primary Air Filter

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

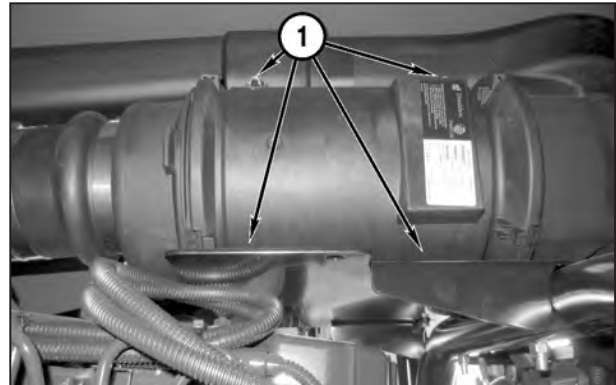
NOTICE: If a "Change Air Filter" fault is indicated on the touch screen display, stop immediately and remove and clean or replace the primary air filter as needed.

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

Clean the outside of the air cleaner assembly.

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

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



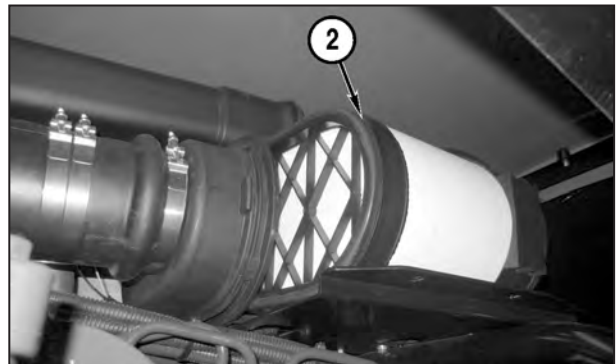
Use a rocking motion to release the primary air filter (2) from the assembly.

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

If installing a new primary engine air filter:

- Primary Engine Air Filter Part Number: 201300116

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



Change Differential Fluid

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

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

Install the drain plug and tighten.

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

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

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

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



Change Hydraulic Fluid Filter

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

Remove the cover (1) from the filter housing.

Remove the filter from the assembly.

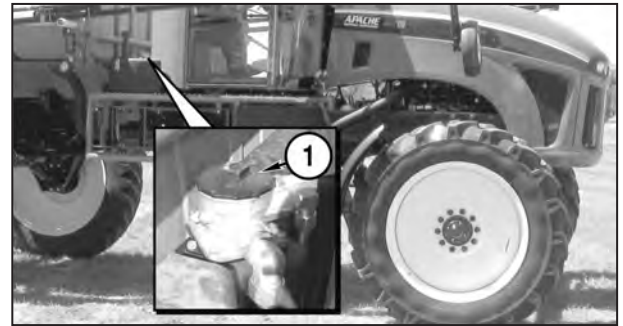
Discard the filter into an appropriate container.

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

Install the filter into the filter housing.

Install and tighten the filter housing cover.

Use the sight glass to check the fluid level. See "Check Hydraulic Fluid Level" on page 5-16.

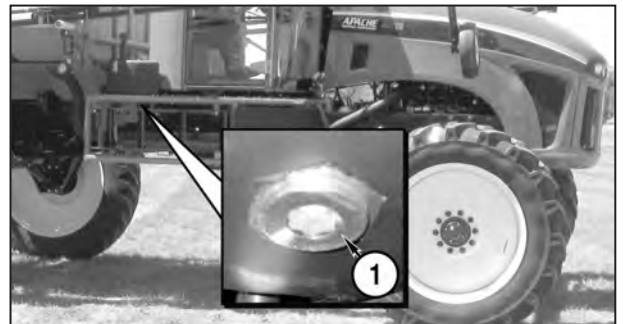


Clean Hydraulic Fluid Strainer

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

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

Install the drain plug.



Remove the hydraulic fluid line (1).

Remove the strainer (2).

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

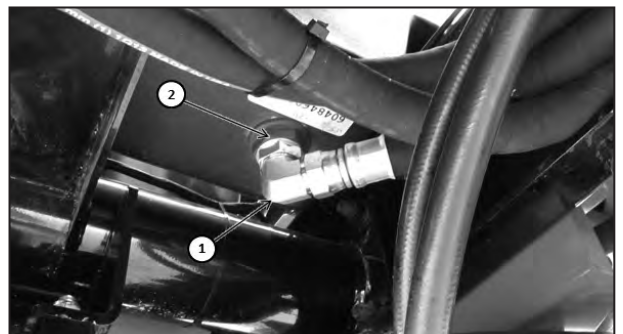
Dispose of the fuel properly.

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

Install the hydraulic fluid strainer (2).

Hydraulic Fluid Strainer Part Number: 840000010.

Install the hydraulic line (1).

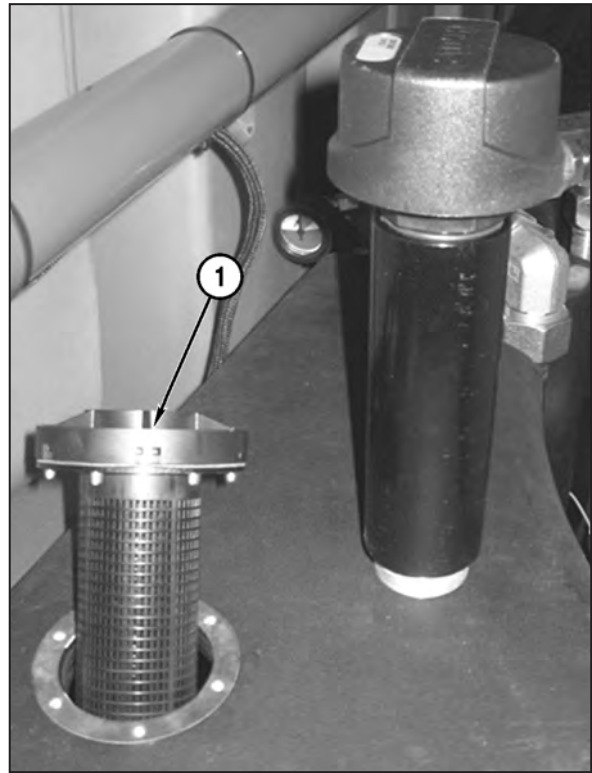


NOTICE: Use only Lucas Universal Hydraulic Fluid, or equivalent, for the Apache Sprayer hydraulic system.

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

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

Use the sight glass to check the fluid level. See “Check Hydraulic Fluid Level” on page 5-16.



Every 500 Hours or Yearly

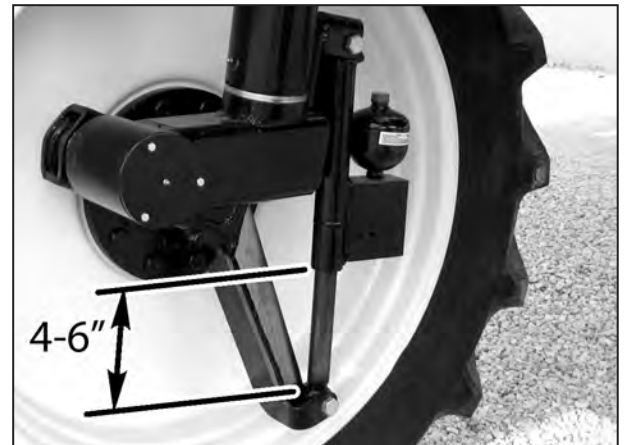
NOTE: Some services at this interval were performed at the “After First 100 Hours” interval. If the service was performed as prescribed, measurement of 500 hours should begin at the 100 hour mark.

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

Inspect Front Accumulator and Suspension Cylinder

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

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



Check Front Suspension Cylinder Fluid Level

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

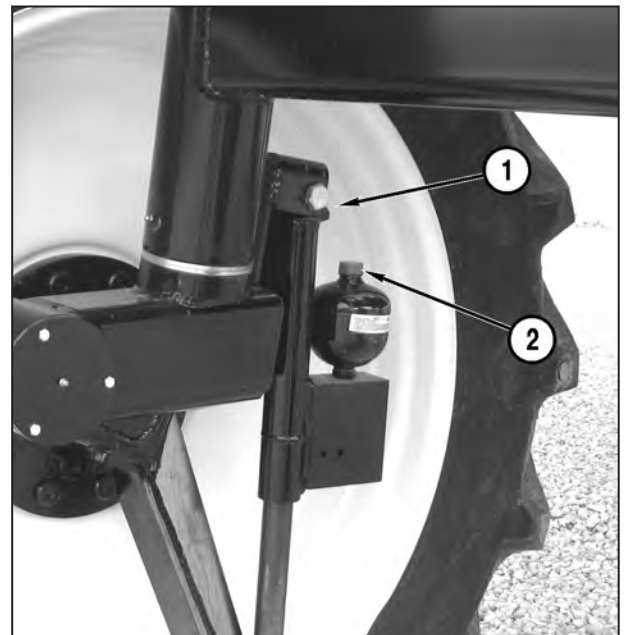
Remove the plug (1) from the front of each front suspension cylinder and check the fluid level. The fluid should be level with the bottom of the fill hole.

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

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

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

Install the plug (1) and tighten.



Check Accumulator Charge

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

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

Open the valve and check the nitrogen pressure.

AS720 Accumulator Nitrogen Pressure: 800 psi [55.2 bar]

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

Change Engine Oil and Filter



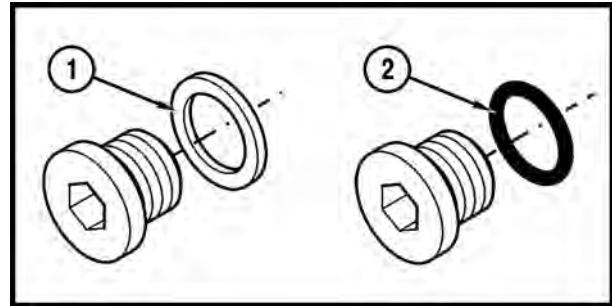
WARNING! Burn Hazard. If you must drain the engine oil while it is still hot, stay clear of the hot engine oil to avoid being burned. ALWAYS wear eye protection.

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

The engine oil drain plug is located on the bottom 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 counterclockwise to remove. Dispose of the filter properly.

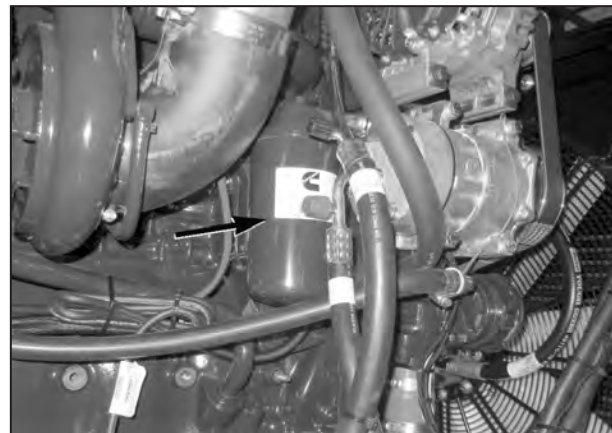
NOTICE: DO NOT overtighten the filter. Damage to the seal can result.

Lubricate the seal on the engine oil filter.

- Engine Oil Filter part Number: 201450241.

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

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



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

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

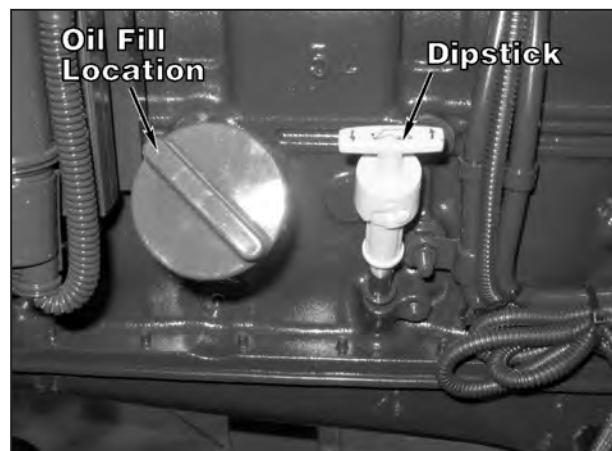
Add oil as needed to bring the level to the hatched area on the dipstick.

Install the dipstick.

Operate the engine and check for leaks.

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

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



Change Transmission Fluid and Filter and Clean Strainer

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

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

Install the drain plug (1)

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

Install the strainer and cover plate (2).

- Transmission Fluid Strainer
Part Number: 300000095

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

Turn the filter counterclockwise to remove. Dispose of the filter properly.

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

Lubricate the seal on the transmission fluid filter.

Transmission Fluid Filter Part Number: 300000101

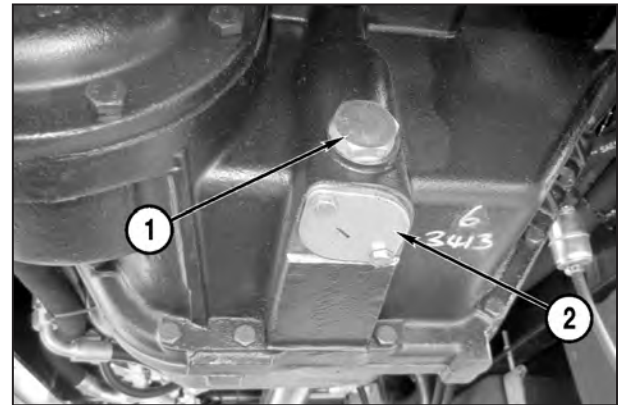
Install and tighten the filter, by hand, 3/4 to 1-1/4 turns after the seal contacts the filter housing.

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

NOTICE: Use only Lucas Universal Hydraulic Fluid or equivalent.

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

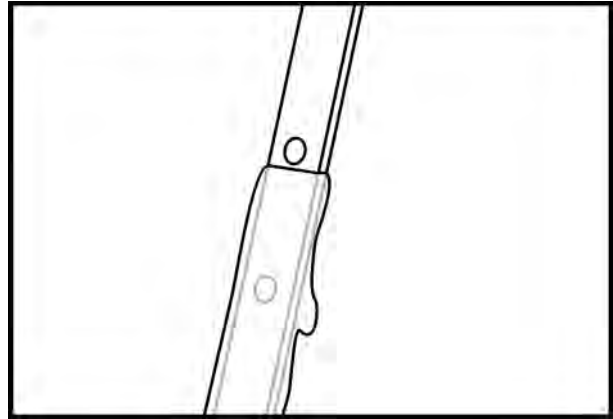
- Transmission Fluid Capacity: Approximately 16 quarts [15 liters].



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

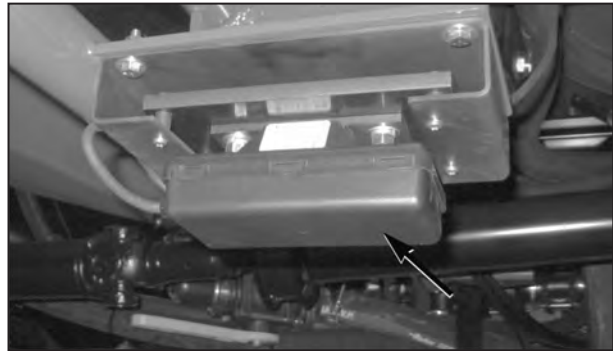
The fluid level should be between the two dots on the dipstick.

Install the dipstick and turn the handle clockwise to tighten.



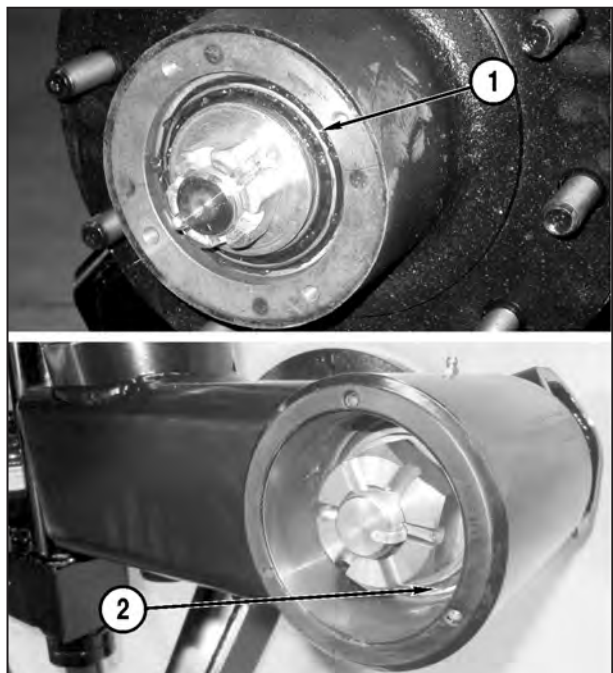
Recalibrate Raven Radar Gun

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



Inspect and Repack Wheel and Inter-Flex Bearings

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



Change Final Drive Fluid

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

Drop Box

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

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

Install the drain plug (1).

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

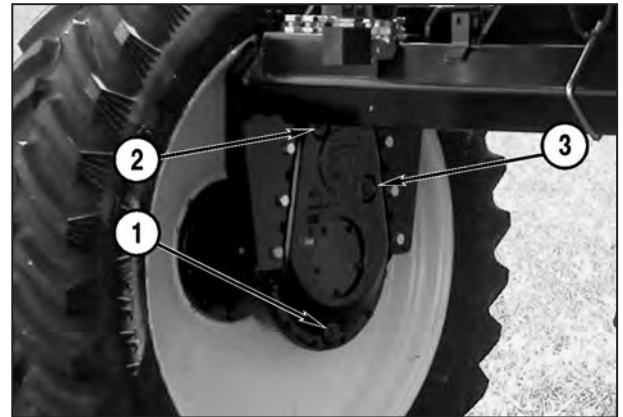
Remove the drop box fill plug (2) and level plug (3).

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

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

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

Repeat the steps for the other drop box.



Planetary

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

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

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

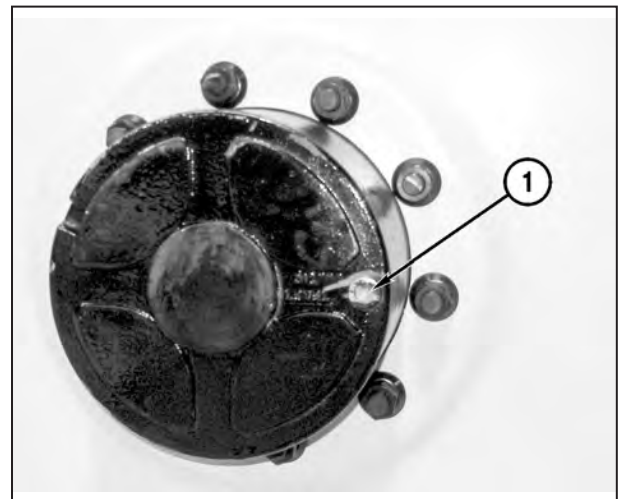
To fill the planetary fluid, position the wheel so the plug on the planetary is in the 3 o'clock position.

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

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

- Planetary Fluid Capacity: Approximately 2.9 quarts [2.7 liters].

Install the plug (1) and tighten.



Change Cab Charcoal Filter

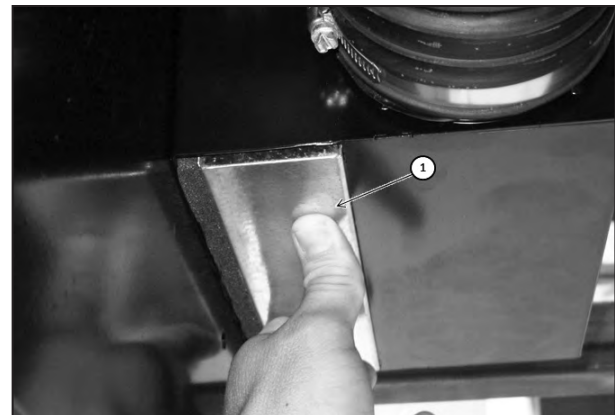
NOTICE: DO NOT attempt to clean the old cab air filter.
ALWAYS replace with a new filter.

The charcoal air filter is located under the cab, connected to the A/C box.

Remove the knob screw (1) by turning to the left to loosen.



Remove and discard the filter (1) by sliding it out.



Insert the new filter into the frame with the air-flow arrow pointing toward the A/C box.

- Charcoal Air Filter
Part Number: 490003651

Close the cover and install the knob screw by turning to the right to tighten.



Every Year

The following services must be performed every year.

Adjust Toe-In (Standard 120" Axles)

Measure Toe-In

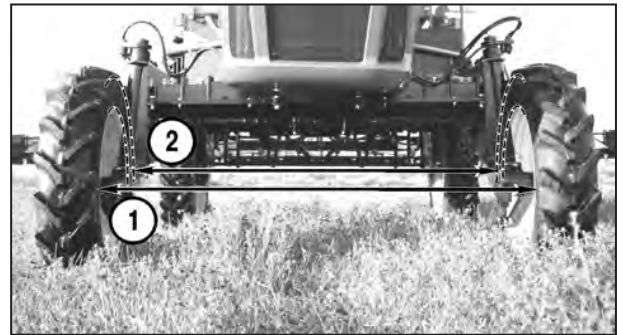
Safely lift the front of the Apache Sprayer so the front tires are slightly off the ground.

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

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

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

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



Adjust Toe-In

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

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

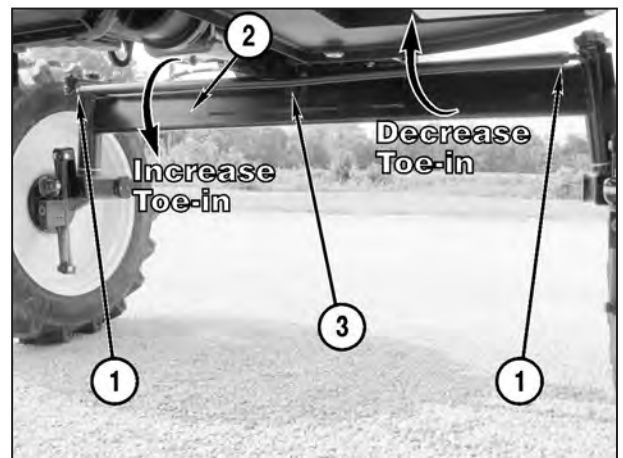
Turn the tie rod counterclockwise (as viewed from the left side) to decrease toe-in.

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

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

Turn the wheels all the way to the right and measure the distance between the right strut tower (1) and axle tube (2).

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



To adjust the steering cylinder rod:

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

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

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



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

NOTICE: On adjustable axle machines, the steering must be re-phased before measuring or adjusting the toe-in.

Rephase the Steering

NOTE: This process will be easier with warm oil.

Lift the front wheels off the ground.

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

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

Measure Tie Rods

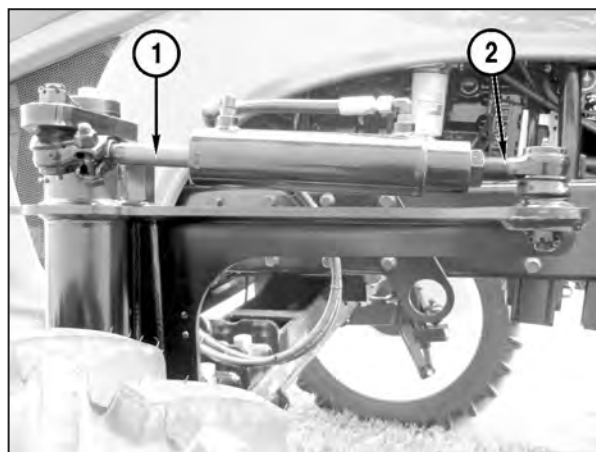
Measure the rear tie rod ends (2) on the left and right steering cylinder. The measurements must be equal and between 4.125 in. [104.7 mm] and 4.5 in. [114.3 mm]. Adjust the tie rods if necessary.

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

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

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

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



Measure Toe-In

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

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

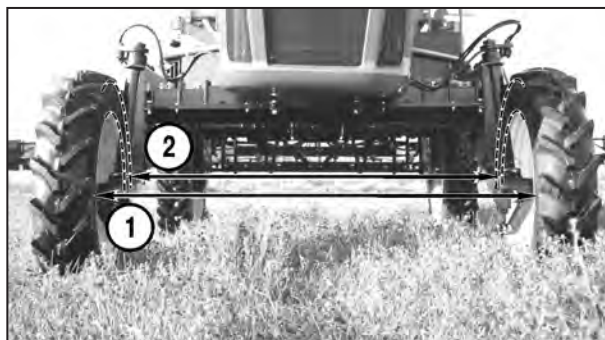
Measure and note the distance (1) from the center of the right hub to the front of the left rim.

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

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

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

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

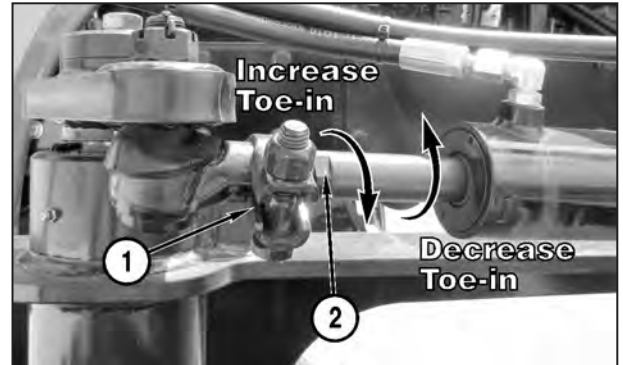


Adjust Toe-In

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

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

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



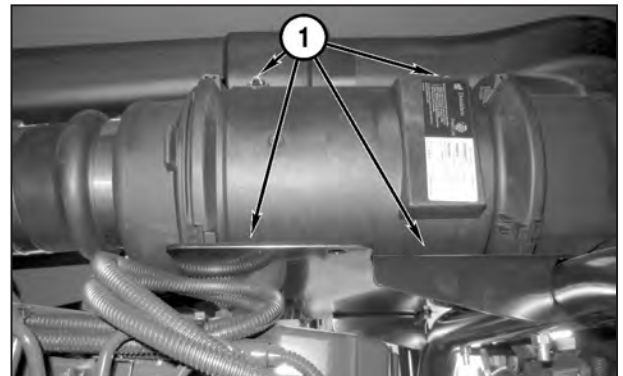
Change Engine Safety Air Filter

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

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

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

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

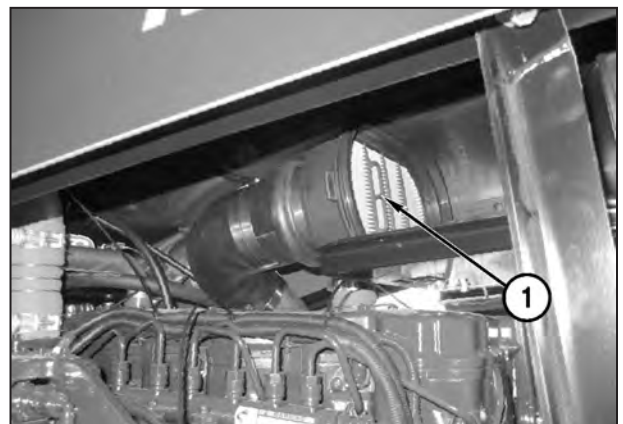


Use a rocking motion to remove the engine safety air filter (1) and discard the old filter.

Install the new engine safety air filter.

- Engine Safety Air Filter Part Number: 201300117.

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



Winterize Wet System

The product tank and wet system must be flushed before winterizing. See “Flushing Product Tank” on page 4-21.

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.

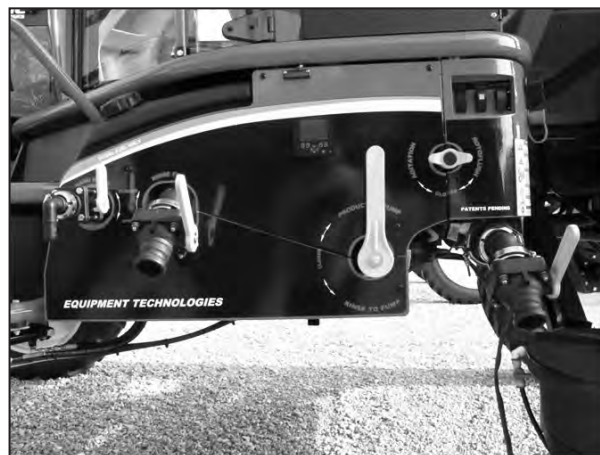
Set all boom section switches to the ON position and press the agitation decrease button to turn agitation off.

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

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

Disconnect the air line and close the product fill valve.

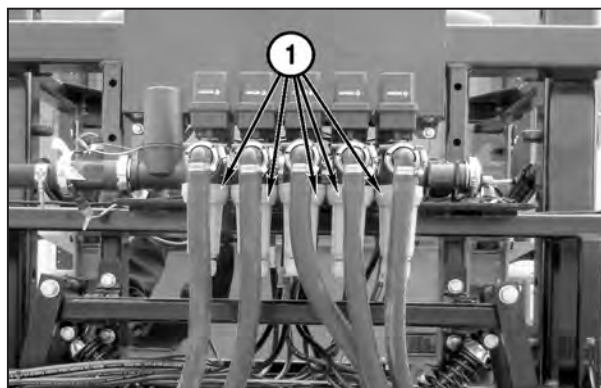
NOTICE: Drain the rinse tank and foam tank to prevent damage during storage.



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

Reinstall the strainer bowls.

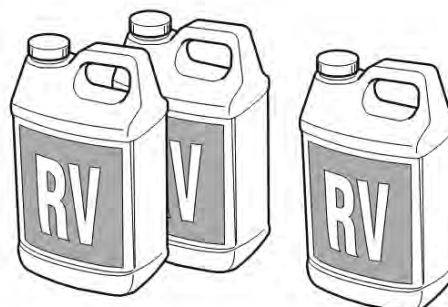
Store the strainers in a warm, dry location.



Pour approximately 20 gallons [76 liters] of RV antifreeze into the product tank.

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

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



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

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

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

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

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

Start the engine.

Unfold and lower the booms as far as possible.

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

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

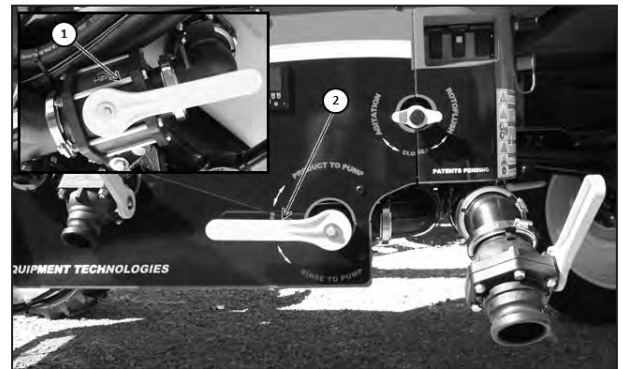
Press the agitation decrease button (3) to turn agitation off. One at a time, set the boom section switches (2) to the ON position until antifreeze flows from the open nozzle in each boom section.

Turn the boom section switches (2) to OFF.

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

NOTE: Excess antifreeze may be left in the sprayer.

Winterize the foamer. See "Freezing" on page 4-19.



Every 1000 Hours or Yearly

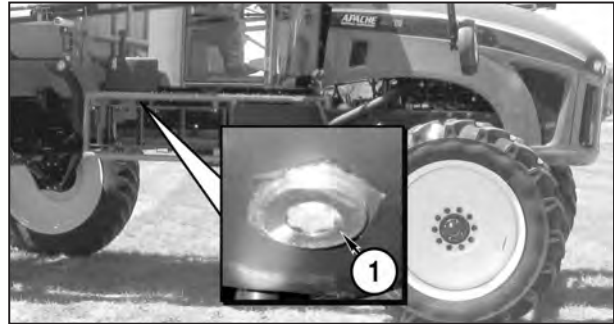
The following services must be performed after every 1000 hours of operation or yearly.

Change Hydraulic Fluid

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

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

Install the drain plug (1).



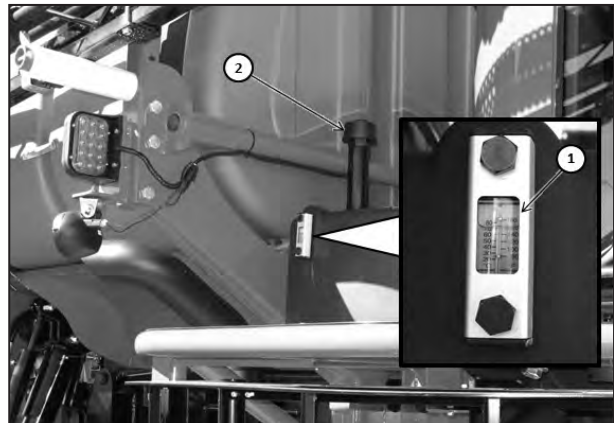
NOTICE: Use only Lucas Universal Hydraulic Fluid, or equivalent, for the Apache Sprayer hydraulic system.

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

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

Use the sight glass (1) to check the fluid level. See “Check Hydraulic Fluid Level” on page 5-16.

NOTE: The sight glass also shows hydraulic fluid temperature.



APACHE™

Chapter 6

TORQUE VALUE CHARTS

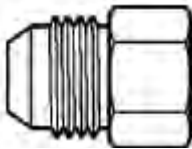
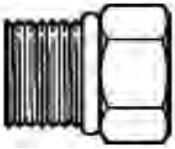
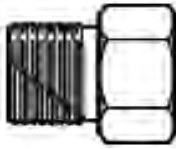
Fittings

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	----

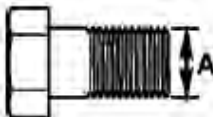
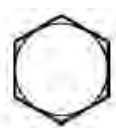


Torque Value Chart

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	----	----	----	----







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

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

Metric Series Torque Value Chart

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

NOTES

APACHE™

Chapter 7

TROUBLESHOOTING

Apache Sprayer Troubleshooting Symptoms and Solutions

If your issue was not resolved by using the troubleshooting guide, contact your dealer for more help.

SYMPTOM	SOLUTION
Parking brake will not engage.	Check electrical coil on hydraulic junction block, under cab, for power. Check hose connections to brake canister on transmission.
Apache Sprayer will not move forward or backward.	Parking brake is engaged. Check electrical connections on parking brake and transmission.
Constant alarm sounds when Apache Sprayer moves forward or backward.	Check transmission fluid level. Check wire connection at sending unit. Check transmission temperature sensor.
Apache Sprayer will not move forward.	Check driveshaft. Check transmission fluid level. Check electrical connections on transmission.
Apache Sprayer will not move backward.	Check driveshaft. Check transmission fluid level. Check electrical connections on transmission.

SYMPTOM	SOLUTION
Engine will not start.	<p>Confirm battery disconnect switch is "ON".</p> <p>Check diesel fuel level.</p> <p>Check neutral safety relay.</p> <p>Confirm Start/Stop Engine button is "Green".</p> <p>Check the brake sense switches.</p>
Apache Sprayer steering does not work.	<p>Check hydraulic fluid level.</p> <p>Check for hydraulic fluid leaks.</p> <p>Check steering column coupling on steering motor.</p>
Transmission will not shift gears.	Check transmission fluid level.
Apache Sprayer brakes do not work.	<p>Check brake hoses for leaks.</p> <p>Check push rods on master cylinder.</p>
No power to console in the cab.	Check electrical connections in right rear corner of cab, near fuse box.
Road and service lights do not work.	<p>Confirm light buttons are "ON".</p> <p>Check electrical connections to the light pad, cabin power distribution module and the firewall distribution module.</p> <p>Check for power at light bulbs.</p> <p>Check appropriate fuses.</p>
Turn signals and/or flashers do not work.	<p>Confirm lever/switch in "ON" position.</p> <p>Check electrical connections at light housings.</p> <p>Check for power at light housings.</p>
Booms will not fold or unfold.	<p>Confirm engine is running.</p> <p>Check hydraulic fluid level.</p> <p>Confirm booms are greased properly.</p> <p>Check for hydraulic fluid leaks.</p> <p>Check electrical connections in cab and at boom manifold.</p>
Booms will not tilt up or down.	<p>Confirm engine is running.</p> <p>Check hydraulic fluid level.</p> <p>Check for hydraulic fluid leaks.</p> <p>Check electrical connections in cab and at boom manifold.</p>

SYMPTOM	SOLUTION
Apache Sprayer will not spray.	<p>Confirm engine is running.</p> <p>Confirm product in product tank.</p> <p>Confirm ball valves from tank to product pump are open.</p> <p>Confirm product pump is turned on.</p> <p>Check ground speed on console controller display.</p> <p>Confirm boom valves are opening. If they are not, check the power module in the cab and back rack electrical connections.</p>
Product boom valves will not turn on.	<p>Unplug electric connection at valve for 20 seconds. Check electrical connections in cab.</p> <p>Check power module in cab.</p>
Product boom valves will not turn off.	<p>Check boom valves for operation.</p> <p>Check electrical connections at boom valves.</p> <p>Check electrical connections in cab.</p> <p>Check power module in cab.</p>
Seat will not raise or lower.	<p>Check power module in cab.</p> <p>Check wire connections at right of seat.</p> <p>Check for air leaks.</p>
Raven or Trimble monitor does not turn on.	<p>Check power module in cab.</p> <p>Check electrical connections at the monitor.</p>
Front suspension cylinder is flat.	<p>Lift tire off ground and check suspension cylinder fluid level. If fluid is foaming, the accumulator has failed. If fluid is low, fill to top of plug.</p> <p>Check operation.</p>
Rear suspension will not rise.	<p>Check hydraulic fluid level.</p> <p>Check electrical connections at suspension block and switches.</p>
Product pump will not turn on.	<p>Confirm product pump button is on and indicator is lit.</p> <p>Check electrical connections at hydraulic valve block.</p> <p>Check electrical connections in cab.</p>
A/C does not cool.	<p>Confirm A/C button is "ON".</p> <p>Confirm fan is "ON".</p> <p>Check belt to compressor.</p>

NOTES

APACHE™

Chapter 8

ELECTRICAL SYSTEM

Firewall Power Distribution Module

Source	Function	Circuit		
		Pwr Source	To	Circuit #
F1 (350A)	Alternator Pwr	Batt	Alternator Pwr	85
F2 (125A)	Aux Batt Post Pwr	Batt	Aux Batt Post Pwr	148
F3 (25A)	Starter Solenoid Pwr	K2 Relay	Starter Motor/Destroke at Start Coil	137
F4 (250A)	Cold Start Pwr	K4 Relay	Intake Grid Heater	128
F5 (2A)	Cab Batt Pwr	K3 Relay	Cabin Power Distribution Module	7
F6 (30A)	Engine ECU Pwr	K1 Relay	Engine ECU Pwr	12
F7 (5A)	Engine Ignition Pwr	K3 Relay	Engine Ignition Pwr	11
F8	Not Used	***	***	***
F9	Not Used	***	***	***
F10	Not Used	***	***	***
F11	Not Used	***	***	***
F12	Not Used	***	***	***
F13	Not Used	***	***	***
F14 (2A)	Transmission Sensor Pwr	K3 Relay	Transmission Sensor Pwr/ Speed Sensor Pwr	111/107AK
F15 (7.5A)	A/C Compressor	K8 Relay	A/C Compressor Pwr / Thermostat Out / A/C Pressure Binary Switch / A/C Compressor Solenoid	93 / 49A / 49B / 130
F16 (5A)	HVAC Ignition Pwr	K3 Relay	HVAC Water Valve	78
F17 (10A)	Fill Station Pwr	K3 Relay	Fuel Sender / Fill Station Light Switch	8
F18 (20A)	Foamer Compressor Pwr	K9 Relay	Smucker Injection Foam Marker/ SKS Foam Marker Connector	70
F19 (10A)	Chassis Ignition	K3 Relay		42
F20 (30A)	Boom Valve Pwr	K1 Relay	Boom Valve Pwr	77

Firewall Power Distribution Module

Source	Function	Circuit		
		Pwr Source	To	Circuit #
F21 (250A)	Cabin Batt Pwr	K1 Relay	Cabin Pwr Distribution Module	5
F22 (30A)	Headlight Pwr	K10 Relay	Headlight Pwr	33 GRN
F23 (20A)	Boom Light Pwr	K11 Relay	Left Boom Light / Right Boom Light	57
F24 (5A)	Rearview Light Pwr	K12 Relay	Rearview Light Pwr	79
F25 (5A)	Marker Light Pwr	K13 Relay	Ront Right Turn Marker Light / Front Left Turn Marker Light / Right Turn Stop Light / Left Turn Stop Light / Rear Right Turn Marker Light / Rear Left Turn Marker Light	69
K1 Relay	Batt Disconnect Pwr	Batt	F6, F11, F20, F20, F21, K2, K3, K4, K8, K9, K10, K11, K12, K13, Starter Pwr	12, 990, 77, 5, 137, 7, 42, 78, 11, 8, 111, 128, 93, 70, 33, 57, 79, 69, 149
K2 Relay	Starter Solenoid and Destroke Coil Pwr	K1 Relay	F3	137
K3 Relay	Machine On Pwr	K1 Relay	F5, F7, F14, F16, F17, F19, K7	7, 11, 111, 78, 8, 42, 900
K4 Relay	Cold Start Pwr	K1 Relay	F4	128
K5 Relay	Not Used	***	***	***
K6 Relay	Not Used	***	***	***
K7 Relay	Not Used	***	***	***
K8 Relay	A/C Compressor Pwr	K1 Relay	F15	93
K9 Relay	Foamer Compressor Relay	K1 Relay	F18	70
K10 Relay	Headlight Pwr	K1 Relay	F22	33
K11 Relay	Boom Light Pwr	K1 Relay	F23	57
K12 Relay	Rearview Light Pwr	K1 Relay	F24	79
K13 Relay	Marker Light Pwr	K1 Relay	F25	69

Firewall Power Distribution Module

Ground	Function
Gnd G1	Headlight Gnd
Gnd G2	Horn, Rearview Camera, Left and Right Brake Pedal Proximity Switch, Hydraulic Filter Restriction Switch, Rack Coil Gnd, Suspension Coil, Marker Light, Boom, Foamer, Adjust On the Go Option
Gnd G3	Destroke At Start Coil
Gnd G4	Fill Station, Smucker Injection Foam Option
Gnd G50	Park Brake Coil
Gnd G91	HVAC Blower Motor
Gnd G134	Alternator
Gnd 902	Not used ****
Gnd 995	Not used ****

Cabin Power Distribution Module

Source	Function	Circuit		
		Pwr Source	To	Circuit #
F1 (20A)	Cab Auxiliary Battery Pwr Stud	Cab Batt Pwr	Cab Auxiliary Battery Pwr Stud	***
F2 (20A)	Cab Auxiliary Ignition Pwr Stud	Cab Batt Pwr	Cab Auxiliary Pwr Stud	***
F3 (5A) Armrest Ignition Pwr	Armrest Ignition Pwr	K1 Relay	Armrest Keypad, Joystick, Display CPU	48
F4	Wiper High Speed	K8 Relay	Wiper High Speed	36
F5 (40A)	Front Worklight Pwr	K3 Relay	Front Left Outer Worklight, Front Left Inner Worklight, Front Right Inner Worklight, Front Right Outer Worklight	58
F6 (40A)	Rear Worklight Pwr	K4 Relay	Rear Left Inner Worklight, Rear Left Outer Worklight, Rear Right Inner Worklight, Rear Right Outer Worklight	59
F7 (10A)	Ceiling Pwr	Cab Batt Pwr	Dome Light, Wiper Motor	32
F8 (10A)	Beacon Light	K5 Relay	Beacon Light	100
F9 (10A)	Pwr Point Batt Pwr	Cab Batt Pwr	Pwr Point Batt Pwr	6
F10 (15A)	Radio Acc Pwr	Cab Batt Pwr	Radio Tuner	9
F11 (20A)	Seat Pwr	Cab Batt Pwr	Seat Pwr	14
F12 (40A)	Node High Current	Cab Batt Pwr	Node High Current Pwr	201

Cabin Power Distribution Module

Source	Function	Circuit		
		Pwr Source	To	Circuit #
F13 (25A)	Console Batt Pwr	Cab Batt Pwr	Console Batt Pwr	208
F14 (2A)	Raven Can Pwr	Cab Batt Pwr	Raven Can Pwr	204
F15 (5A)	Console Ignition Pwr	Cab Batt Pwr	Console Ignition Pwr	80
F16 (7.5A)	Master Spray Pwr	K6 Relay	Master Spray Pwr	51
F17 (5A)	Antenna Pwr	K7 Relay	Antenna Pwr	207
F18 (10A)	Trimble Switched Pwr	K7 Relay	Trimble Switched Pwr	539
F19 (20A)	Node Logic Pwr	K7 Relay	Node Logic Pwr	200
F20 (5A)	Armrest Batt Pwr	Cab Batt Pwr	Display CPU	43
F21 (10A)	Pwr Point Ignition Pwr	K1 Relay	Cigar Lighter, Ambient LED	10
F22 (10A)	Steering Column Ignition Pwr	K1 Relay	Upper / Defrost Vent Actuator, Lower / Defrost Vent Actuator, Wiper / Turn Lever	4

K1 Relay	Ignition Pwr	Cab Batt Pwr	F2, F3, F10, F15, F21, F22	48, 9, 80, 10, 4
K2 Relay	Not Used	***	***	***
K3 Relay	Front Worklight	Cab Batt Pwr	F5	58
K4 Relay	Rear Worklight	Cab Batt Pwr	F6	59
K5 Relay	Beacon Pwr	Cab Batt Pwr	F8	100
K6 Relay	Master Spray Pwr	Cab Batt Pwr	F16	51
K7 Relay	Precision Pwr	Cab Batt Pwr	F17, F18, F19	207, 539, 200
K8 Relay	Wiper High Speed	F4	Wiper High Speed	36
Gnd G5	Cab Roof Gnd	***	Wiper Motor, Dome Light, Beacon Light, Ambient Temp Sensor, All Cab Work Lights, AM/FM Antenna Shield	G5
Gnd G7	Cab Low Current Gnd	***	Defrost Upper and Lower Vent Actuator, Foot Throttle, Wiper/Turn Lever, Armrest Keypad, Joystick, Display CPU	G7
Gnd G8	Cab High Current Gnd	***	Seat, Radio Tuner, DC Pwr Point, Cigar Lighter, Ambient LED	G8
Precision Gnd	Node Logic Gnd	***	Node Logic Gnd	202
Precision Gnd	Node High Current Gnd	***	Node high Current Gnd	203
Precision Gnd	Raven CAN Gnd	***	Raven CAN Gnd	205
Ground Stud	Cab Auxiliary Gnd Stud	***	Cab Auxiliary Gnd Stud	***



Chapter 9

WARRANTY

Equipment Technologies Warranty Policy For all 2015 Model Year Apache Sprayers

NEW APACHE SPRAYER LIMITED WARRANTY POLICY

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

Components, systems, or accessories that are installed by the dealer and were not installed by ET when the machine was originally manufactured are not covered by this warranty.

First and Second Year- Limited warranty covers the total machine for the first two (2) years from the date of delivery to the original purchaser or one thousand (1000) hours whichever occurs first, for both parts and labor. Under no circumstances does this limited warranty cover any merchandise or component parts, which, in the opinion of ET, have been subject to negligence, misuse, improper storage, alteration, accident, or if repairs have been made with parts other than those manufactured, supplied, and/or authorized by ET. For engine, tire, and battery warranty please see below.

Years Three through Five- Limited warranty covers some power train and chassis components for parts only from the date of delivery to the original purchaser or two thousand (2000) hours whichever comes first. The following components are covered under years three through five of warranty. Transmission and its internal components (excludes park brake components, harness, electrical components, main drive shafts and u-joints), differential and its internal components, front axle assembly {excludes seals, bearings, wear pads, suspension cylinder (i.e. front strut), outer flex, hubs, accumulator, and steering cylinders}, frame rails, engine bolster, rear axle assembly (excludes wear pads, output drive shafts, and rear suspension components), planetaries and their internal components (excludes

bearings, seals, and o-rings), drop boxes and their internal components (excludes bearings and seals), 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, and all park brake components.

Engine Warranty- The limited engine warranty is covered by Cummins Inc. for two (2) years or two thousand (2000) hours from the date of delivery to the original purchaser, whichever comes first. ET does warranty the a/c compressor and alternator for the first two (2) years only. Cummins Inc. warrants all other bolt on and engine components. See engine warranty for complete details.

Tires- Warranty for Michelin tires will be handled through your local authorized Michelin dealer. Please contact ET if you have any questions.

Batteries- Batteries are warranted for eighteen (18) months for replacement and then another 18 months prorated through NAPA auto part stores.

ET's obligation under this limited warranty is limited to repairing or replacing free of charge to the original purchaser, at a location designated by ET, any part that in ET's sole judgment, shows evidence of defect or improper workmanship, provided that the part is returned to ET within thirty (30) days of the issue of an automatically or manually generated RMA. Parts must be returned through the authorized selling dealer, transportation charges prepaid. All returned parts must be clean from all chemicals and/or oils. Warranty claims must be filed within 60 days of the repair date.

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

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

This machine must be registered to both ET and Cummins Inc. within fourteen (14) calendar days from the **date of delivery** to the original purchaser.

Time Line for ET / Apache Sprayer Warranty Projects

- Machine registrations should be submitted online within fourteen (14) calendar days of delivery to the end user. NOTE: Registration is not needed for dealer inventory units, only retailed units.
- Warranty claims must be properly filed (including having proper registration and owner information) within 60 days of the repair date or the claim will be denied. NOTE: Registration is not needed for dealer inventory unit, only retailed units.
- Warranty parts being returned to ET should be returned within 30 days of the issue of an automatically generated RMA or within 30 days of a manually generated RMA. If the parts are not returned within the proper time frame, the claim will be denied.

- ET approved updates are to be completed within 12 months of being released. Updates completed after that time are subject to approval by ET's warranty group and may be denied.
- Warranty work done as a result of information contained in a Service Information Bulletin must be completed within 12 months of the bulletin being released. Repair work done after that time is subject to approval by ET's warranty group and may be denied.

**All inquiries about this warranty policy should be addressed to:
Warranty Department • 455 Merriman Road • Mooresville, IN • 46158
Telephone: 317-834-4500**

Apache Sprayer Machine Warranty Registration

All machines must be registered online at www.etdealer.com within 14 days of delivery to the customer.

Engine Warranty Registration

There are two ways to register the engine warranty for Cummins. The first is a mail-in warranty registration card. In the cab of each new Apache Sprayer with the engine book is a warranty registration card. This card needs to be completed and mailed or fax to the engine manufacture as directed on the card. The second registration method is to go online and register the engine for warranty. To register the Cummins engine for warranty online: go to www.cummins.com, click on "product registration" and read the terms and conditions, if you agree with the terms and conditions, then click on "I accept", and follow the instructions to register.

NOTES

APACHE™

Chapter 10

MAINTENANCE LOG

_____ Season

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

	Check front suspension cylinders for leaks around the seal and oil level in cylinder.
	Grease the front axle assembly including all king-pins, ball joints, and center pivot pin. Check all front axle bolts for proper torque.
	Check adjustment of all hood panels and make sure all screws are present and tightened. Clean radiator and cooling package of all debris, check all radiator and cooling package hoses to make sure they are tight and not leaking.
	Change engine oil and replace filters.
	Service fuel system and replace filters.
	Service transmission; change oil and replace filter, remove suction screen, clean and inspect for damage.
	Replace cab filters with new.
	Remove and replace engine air filters, check intake clamps to make sure they are tight.
	Grease the U-joints on all driveshafts and inspect each U-joint for wear and missing caps. Inspect carrier bearing on the front driveshaft for wear and damaged rubber.
	Service rear differential and bleed brake system.
	Grease the rear axle assembly and check all rear axle bolts for proper torque.
	Service the hydraulic system oil, replace return filters, remove suction screens, clean and inspect for damage.
	Remove all product screens from strainers, clean and inspect for damage. Replace as needed. Flush the wet system with clean water, remove inspection plug from product pump and inspect impeller for damage. Turn on pump and dead-head the pressure and check at gauge outside of cab, increase and decrease agitation and check gauge for operation. Fold booms out and adjust and grease.

[illegible]

_____ Season

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

	Check front suspension cylinders for leaks around the seal and oil level in cylinder.
	Grease the front axle assembly including all king-pins, ball joints, and center pivot pin. Check all front axle bolts for proper torque.
	Check adjustment of all hood panels and make sure all screws are present and tightened. Clean radiator and cooling package of all debris, check all radiator and cooling package hoses to make sure they are tight and not leaking.
	Change engine oil and replace filters.
	Service fuel system and replace filters.
	Service transmission; change oil and replace filter, remove suction screen, clean and inspect for damage.
	Replace cab filters with new.
	Remove and replace engine air filters, check intake clamps to make sure they are tight.
	Grease the U-joints on all driveshafts and inspect each U-joint for wear and missing caps. Inspect carrier bearing on the front driveshaft for wear and damaged rubber.
	Service rear differential and bleed brake system.
	Grease the rear axle assembly and check all rear axle bolts for proper torque.
	Service the hydraulic system oil, replace return filters, remove suction screens, clean and inspect for damage.
	Remove all product screens from strainers, clean and inspect for damage. Replace as needed. Flush the wet system with clean water, remove inspection plug from product pump and inspect impeller for damage. Turn on pump and dead-head the pressure and check at gauge outside of cab, increase and decrease agitation and check gauge for operation. Fold booms out and adjust and grease.
	Inspect booms for cracks, breaks, and worn hinge points.
	Inspect boom plumbing for worn hoses and bad nozzles.
	Inspect all hydraulic hoses for rubs, worn spots, and leaks.
	Inspect all hydraulic cylinders for leaks and proper operation.

[illegible]

_____ Season

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

	Check front suspension cylinders for leaks around the seal and oil level in cylinder.
	Grease the front axle assembly including all king-pins, ball joints, and center pivot pin. Check all front axle bolts for proper torque.
	Check adjustment of all hood panels and make sure all screws are present and tightened. Clean radiator and cooling package of all debris, check all radiator and cooling package hoses to make sure they are tight and not leaking.
	Change engine oil and replace filters.
	Service fuel system and replace filters.
	Service transmission; change oil and replace filter, remove suction screen, clean and inspect for damage.
	Replace cab filters with new.
	Remove and replace engine air filters, check intake clamps to make sure they are tight.
	Grease the U-joints on all driveshafts and inspect each U-joint for wear and missing caps. Inspect carrier bearing on the front driveshaft for wear and damaged rubber.
	Service rear differential and bleed brake system.
	Grease the rear axle assembly and check all rear axle bolts for proper torque.
	Service the hydraulic system oil, replace return filters, remove suction screens, clean and inspect for damage.
	Remove all product screens from strainers, clean and inspect for damage. Replace as needed. Flush the wet system with clean water, remove inspection plug from product pump and inspect impeller for damage. Turn on pump and dead-head the pressure and check at gauge outside of cab, increase and decrease agitation and check gauge for operation. Fold booms out and adjust and grease.
	Inspect booms for cracks, breaks, and worn hinge points.
	Inspect boom plumbing for worn hoses and bad nozzles.
	Inspect all hydraulic hoses for rubs, worn spots, and leaks.
	Inspect all hydraulic cylinders for leaks and proper operation.

[illegible]

_____ Season

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

	Check front suspension cylinders for leaks around the seal and oil level in cylinder.
	Grease the front axle assembly including all king-pins, ball joints, and center pivot pin. Check all front axle bolts for proper torque.
	Check adjustment of all hood panels and make sure all screws are present and tightened. Clean radiator and cooling package of all debris, check all radiator and cooling package hoses to make sure they are tight and not leaking.
	Change engine oil and replace filters.
	Service fuel system and replace filters.
	Service transmission; change oil and replace filter, remove suction screen, clean and inspect for damage.
	Replace cab filters with new.
	Remove and replace engine air filters, check intake clamps to make sure they are tight.
	Grease the U-joints on all driveshafts and inspect each U-joint for wear and missing caps. Inspect carrier bearing on the front driveshaft for wear and damaged rubber.
	Service rear differential and bleed brake system.
	Grease the rear axle assembly and check all rear axle bolts for proper torque.
	Service the hydraulic system oil, replace return filters, remove suction screens, clean and inspect for damage.
	Remove all product screens from strainers, clean and inspect for damage. Replace as needed. Flush the wet system with clean water, remove inspection plug from product pump and inspect impeller for damage. Turn on pump and dead-head the pressure and check at gauge outside of cab, increase and decrease agitation and check gauge for operation. Fold booms out and adjust and grease.
	Inspect booms for cracks, breaks, and worn hinge points.
	Inspect boom plumbing for worn hoses, and bad nozzles.
	Inspect all hydraulic hoses for rubs, worn spots and leaks.
	Inspect all hydraulic cylinders for leaks and proper operation.

[illegible]

