

APACHETM

HS1100

2024 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 # 580724000
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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 _____ = _____

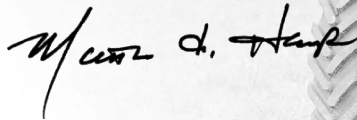
** To maintain minimum spray pattern adjust when changing nozzle size.*

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,



Matthew F. Hays
Chief Executive Officer

NOTICE

Before operating your Apache Sprayer, please check and calibrate the following precision agricultural equipment depending on the machine configuration. Always operate the Apache within the state and local guidelines and regulations.

1. Check all settings and calibrations in your Viper® 4+, field computers:
 - Swath Width
 - Boom Section Calibration
 - Receiver Fore/Aft Settings
 - Valve Calibration
 - Flow Meter Calibration
 - Rate Calibration
 - Low Limit Setting
2. Please review your AutoBoom® and AccuBoom™ settings, if equipped.
3. Please review your Raven Boom Recirculation™ settings, if equipped.
4. Calibrate the autosteer if equipped. RS1® autosteer 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

Ag Leader®

- InCommand™
- SteerCommand Z2™

CapstanAg®

- EVO™
- PinPoint® III

Caterpillar®

- Cat® TDTO 30

Cummins®

Equipment Technologies (ET)

- Apache™

Goodyear®

John Deere®

- Autotrac™

Lucas® Oil Products

Michelin®

Raven Industries

- AccuBoom™
- AutoBoom®
- FlowMax™
- Raven Boom Recirculation™
- RS1® Autosteer
- Viper® 4+

SiriusXM™

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[illegible]

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CHAPTER 1

GENERAL INFORMATION

The graphics and text in this manual generally describe the HS1100 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.

2024 HS1100 Specifications

	HS1100
Tank Capacity	1120 gallons [4240 liters]
Engine	Cummins QSB6.7 T4F, 300 hp
Transmission	Hydrostat
Speeds	Road mode: 34 mph [55 km/h] Field mode: 22 mph [km/h]
Brakes	Hydrostatic with back up wet disc
Suspension	4 wheel independent pneumatic
Cab	Siac custom pressurized cab
Crop Clearance	60 in. [152] to 70 in. [178 cm]
Axles	120 to 160 in. [304.8 to 406.4 cm] Adjustable Axle Width
Final Drive	Planetary gearset
Weight	28,225 lbs [12800 kg] dry weight
Fuel Capacity	110 gallons [416.4 liters]
Width	13 ft [4 m]
Length	31 ft [9.45 m]
Height	12 ft [3.66 m]
Wheel Base	14 ft 7 in. [4.45 m]
Turning Radius	Two wheel steer: 24 ft [7.3 m] Four wheel steer: 13 ft [3.96 m]
Standard Tires	Standard Front and Rear: 380/90R46
Booms	100 ft [30.4 m], 120 ft [36.6 m], 132 ft [40.2 m]
Boom Height	18 in [45.7 cm] to 90 in [228.6 cm] at minimum machine height
Product Pump	ACE 205F-HYD-304, hydraulically driven centrifugal pump
Rotoflush	Pump pressured

Apache HS1100 Fluids, Filters and Capacities

Component	Lubrication	Capacity	Filter Part Number
Engine Oil	Lucas 15W-40 Magnum Motor Oil	17.6 quarts [16.7 liters]	201450305
Engine Coolant	KostGuard Universal Antifreeze 50/50	24 quarts [22.7 liters]	----
Engine Primary Air Filter	----	----	201300116
Engine Safety Air Filter	----	----	201300117
Final Drive (Planetary)	Mobilgear™ SHC XMP 220 Shell Spirax S4 CX 50	1.0 quarts [0.95 liters]	----
Engine Fuel	Diesel	110 gallons [416.4 liters]	Primary: 261000003 Secondary: 211000000
Diesel Exhaust Fluid (DEF) Supply Module Filter	----	15 gallons [56.8 liters]	Module Filter: 241000009 Suction Screen: 241000008
Hydraulic System	Lucas Universal Hydraulic Fluid	37 gallons [140 liters]	880000026
A/C System	R134a	3.2 lbs	----
Charcoal Filter	----	----	490006662
Hydrostatic Cartridge	----	----	842000000
NOTE: Any oil and fluid substitutions must meet or exceed recommended fluid specifications.			

Michelin Tire Pressure (Cold)

380/90R46 42 psi [5.9 bar]

Lug Nut Torque

All Wheels 420 lb-ft [570 N•m]

Wet System Capacities

Product Tank 1120 gallons [4240 Liters]

Rinse Tank 110 gallons [416.4 Liters]

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CHAPTER 2

SAFETY

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

Safety Symbols, Signal Words and Statements

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



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

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

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

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



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



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



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

*The italicized **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.

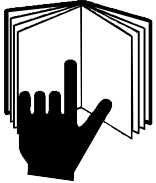
Keep this manual and all included literature in a safe and convenient location. Contact your Apache dealer or Apache at (800) 861-2142 to obtain replacement owner's manuals and safety decals.

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

WARNING

The safety messages that follow have WARNING level hazards.

Pre-Operation Hazards



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

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

Fire and Explosion Hazards



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

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

Burn Hazards



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

Lifting Hazards

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

Exposure Hazard



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

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

Entanglement / Sever Hazard



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

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

Alcohol and Drug Hazard

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

Exhaust Emissions Safety

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

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

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



WARNING! Exhaust Gas Exposure Hazards

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

Environmental Precautions

The safety messages that follow have NOTICE level hazards.

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

Safety Belt



WARNING! Impact Hazards.

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

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

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



WARNING! Impact Hazard

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

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

Safety Decals



CAUTION!

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

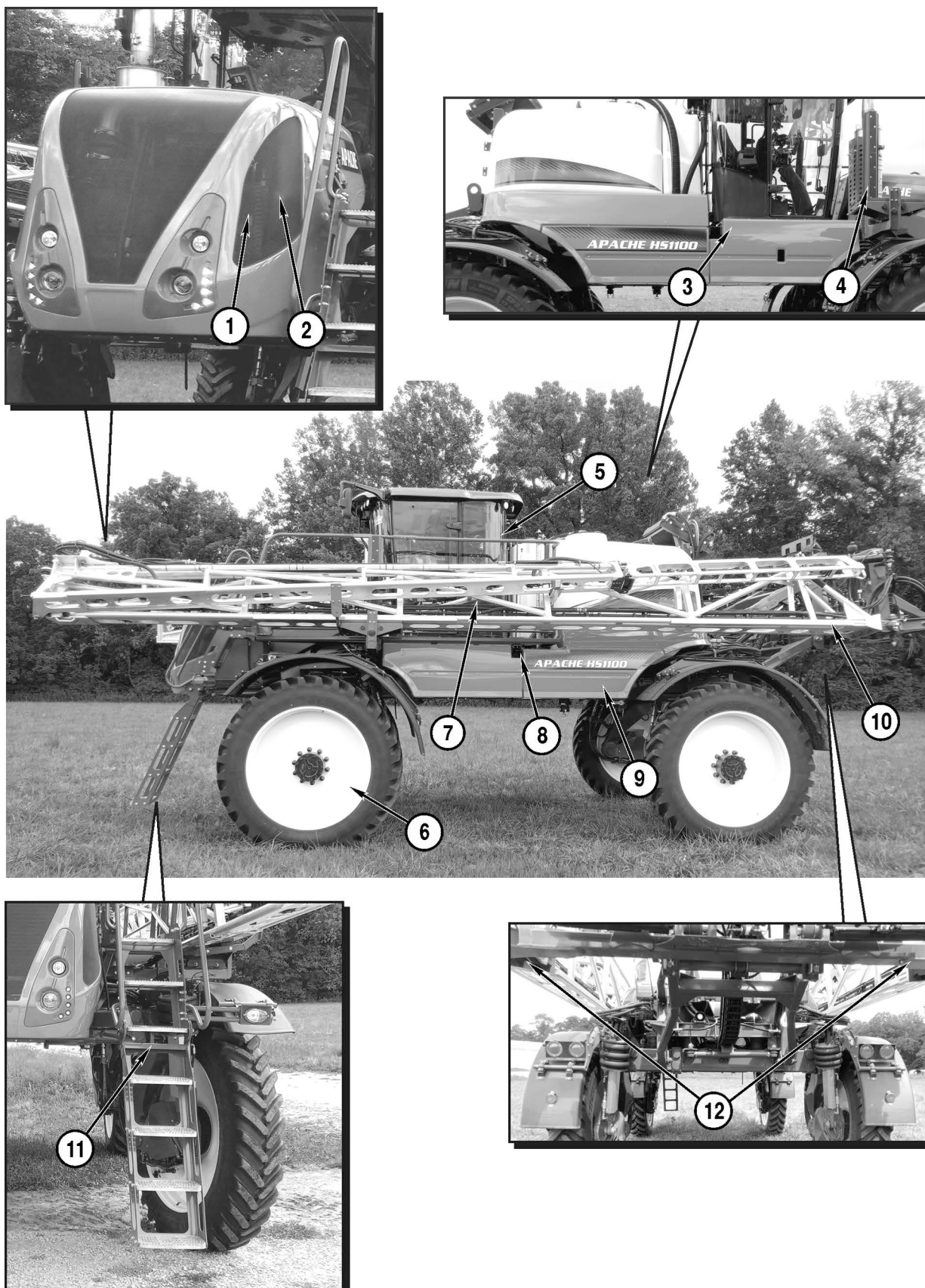
Safety decals are used to explain and inform you of potential personal injury hazards and provide precautionary instructions. Read, understand and follow all safety decals on the Apache Sprayer to prevent personal injury and ensure safe reliable Apache Sprayer operation.

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

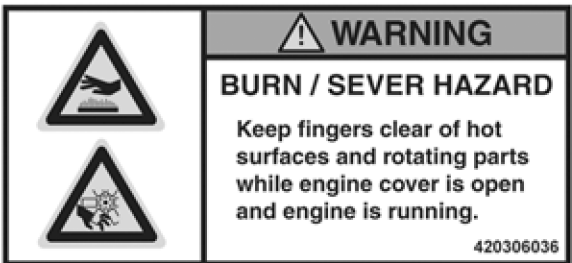
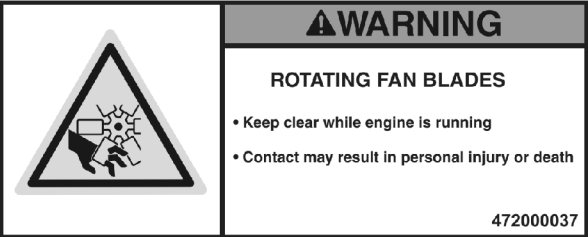
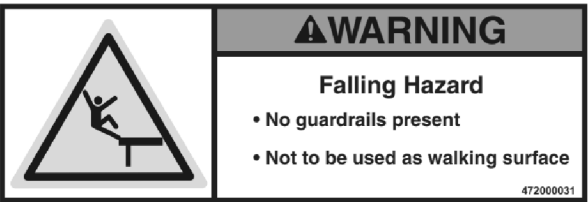
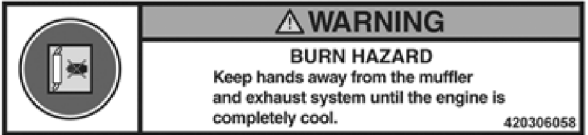
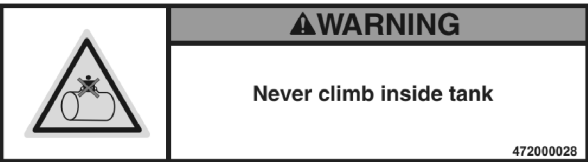


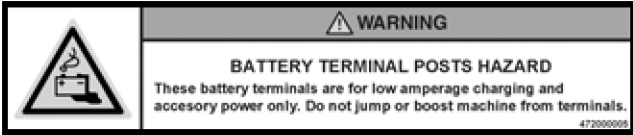

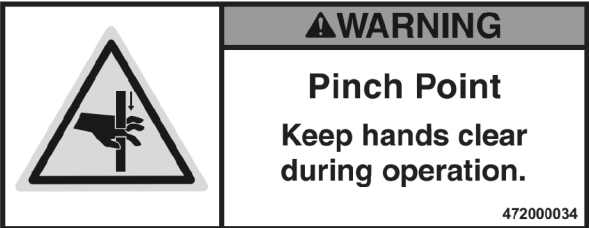
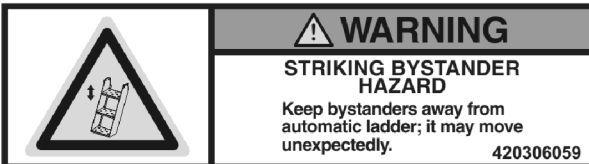
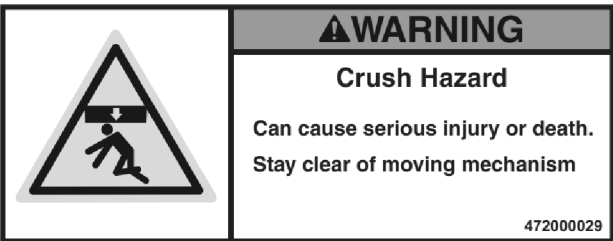
Contact your Apache dealer or Apache at (800) 861-2142 to obtain replacement safety decals.

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

Decal Locations



Decal Locations (continued)

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 
12. 

[illegible]

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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 5-11
- Check engine oil level and add oil as needed. See "Check Engine Oil Level" on page 5-12
- 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 5-14

Cab Overview



1. **Steering Column**
2. **Steering Wheel**
3. **Joystick**
4. **ET Pilot System**
5. **Arm Rest**
6. **Brake Pedal**

7. **Air Seat**
8. **Fire Extinguisher**
(left of seat)
9. **Cooler**
(under seat)
10. **Air vents**
(multiple points on cab roof - not shown)

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 into the plastic of the steering column, or alter in any way.

1. Steering Wheel

2. Steering Wheel Telescope Adjustment Lever

- Pull the lever to unlock.
- Position the steering wheel to desired height.
- Release the lever.

3. Steering Column Lower Tilt Adjustment Lever

- Depress the foot lever.
- Tilt column to the desired position.
- Release the foot lever.

4. Steering Column Upper Tilt Adjustment Knob

- Pull the knob to unlock.
- Tilt the upper column to the desired position.
- Release the knob to lock.

5. Hazard Light Switch

6. Parking Brake Switch

7. Horn Button

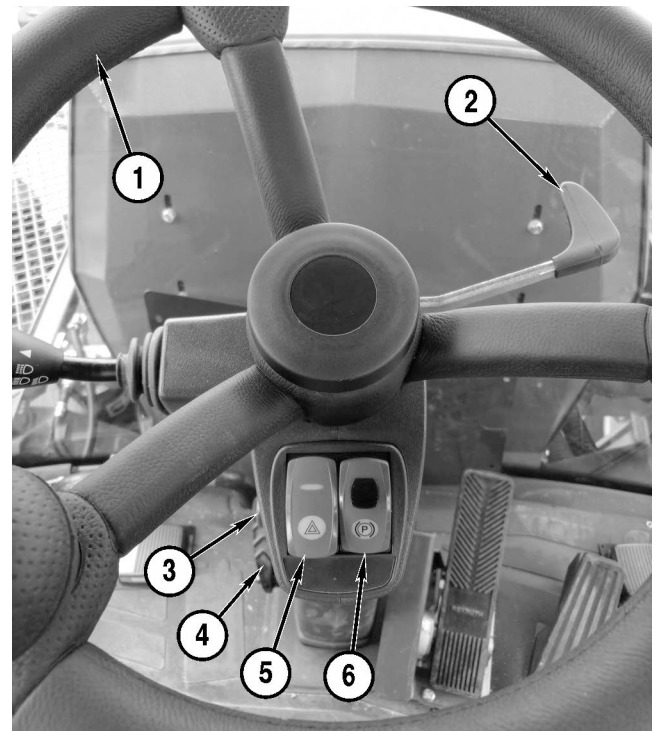
Push to sound horn.

8. Turn Signal Lever

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

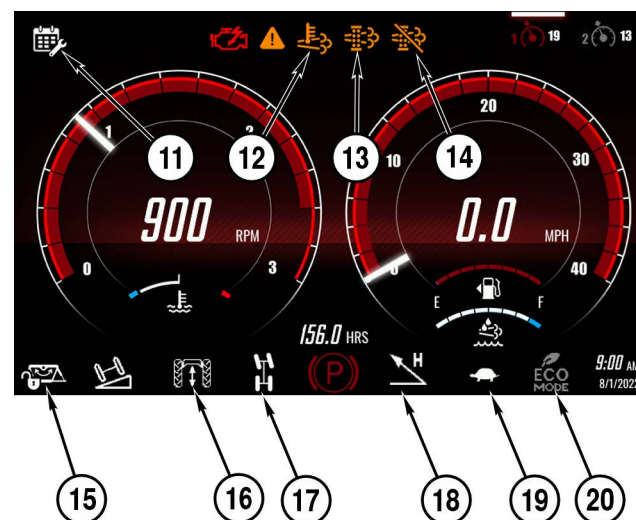
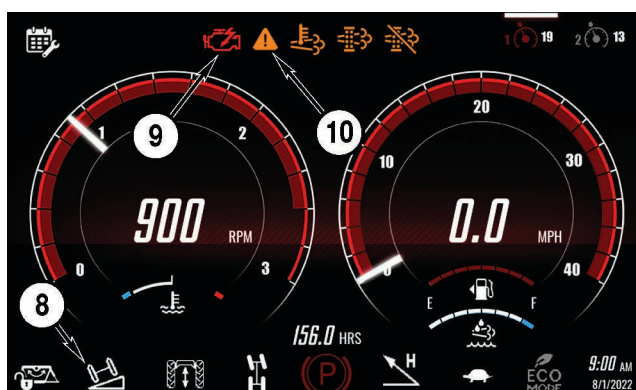
9. Headlights

- Pull the lever up to activate high beams.
- Pull the lever up again to deactivate high beams.



ET Pilot System

1. Temperature Gauge
2. Engine RPM and MPH Readout
3. Engine Hours
4. Cruise Control Indicators
5. Fuel and DEF Gauge
6. Date and Time Indicator
7. Park Brake Indicator
8. Slope Control
9. Engine Fault Indicator
10. General Warning Indicator
11. Scheduled Maintenance Icon
(Appears only when there is Scheduled Maintenance required.)
12. High Exhaust Temperature Lamp
13. Exhaust System Cleaning in Progress
14. Exhaust Cleaning Disabled
15. Boom Rack Lock
16. Machine Height Adjustment
17. Steer Mode
18. Hard/Soft Mode
19. Driving Mode
20. Engine ECO Mode



ET Pilot System (continued)

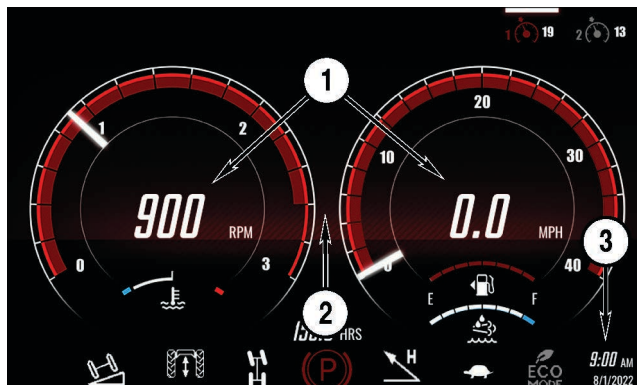
1. Throttle Wheel
2. Cruise Control Buttons
3. Agitate and Product Pump Buttons
4. Boom Fold/Unfold Buttons
5. Customizable Button
6. Rack Lock Button



ET Pilot System Touch Screen

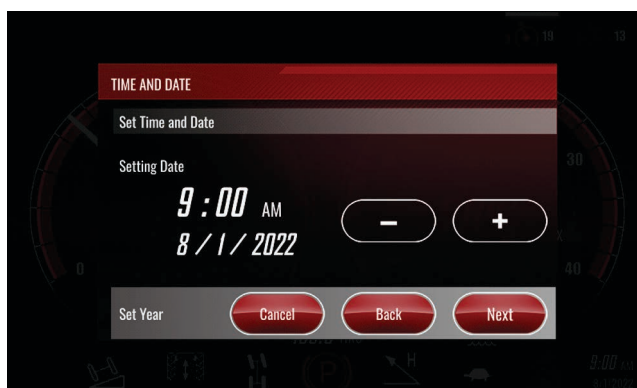
To use the ET pilot system touch screen:

- Touch the RPM or MPH icons (1) to display different options such as Average GPH, Torque, MPH, and RPM.
- Except inside the gauges (1), swipe left in the middle of the screen (2) to move to the App Screen
- Touch the date and time (3) for date and time settings.

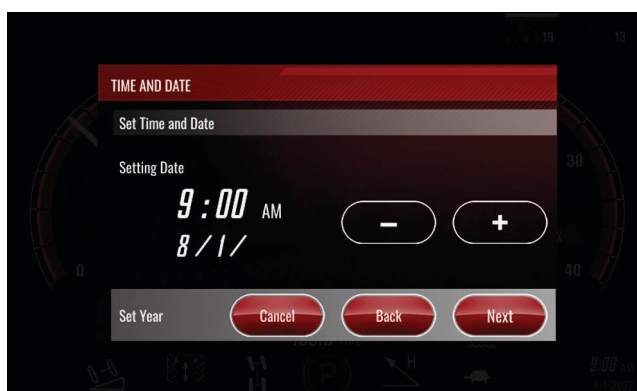


To change the date and time setting, tap the Date and Time indicated by (3) above.

This screen will appear. Use the plus and minus signs to change up or down. Use the Back and Next buttons to move among hours, minutes, date, etc. Cancel to return to the Home Screen.

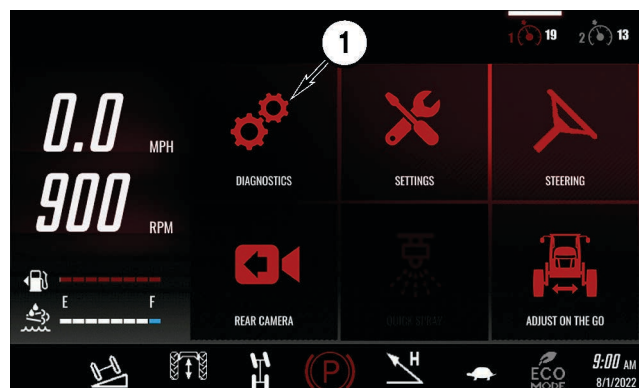


Adjust as needed, then click OK to Save your changes and return to Home Screen.

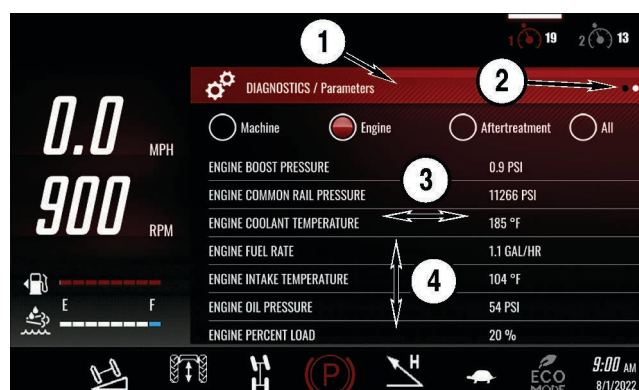


ET Pilot System Touch Screen (continued)

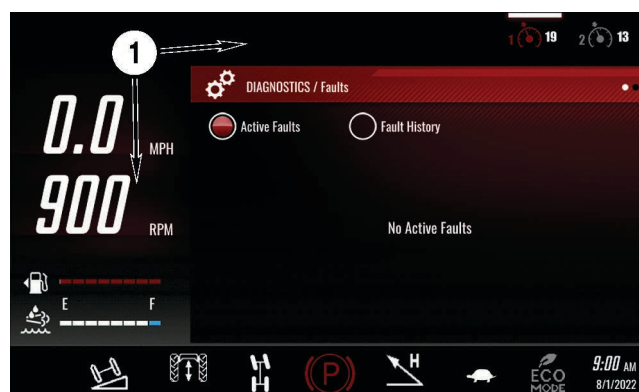
After moving to the App Screen (by swiping left, anywhere in the middle of the home screen, except for inside the gauges) select an App, by touching the desired icon (1) on the screen to move to the selected screen.



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).

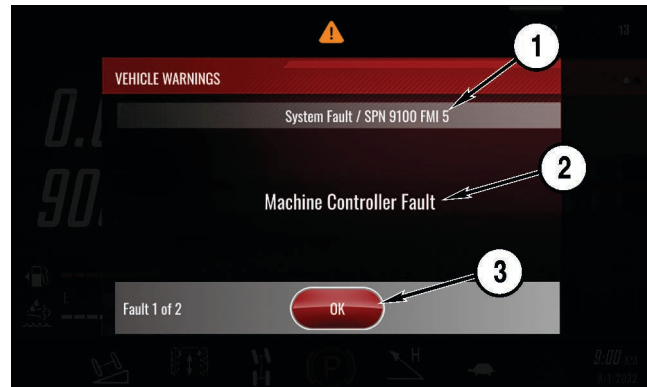


To return to the Home Screen, swipe the screen to the right from the top or the left side (1). This will work on any of the screens.

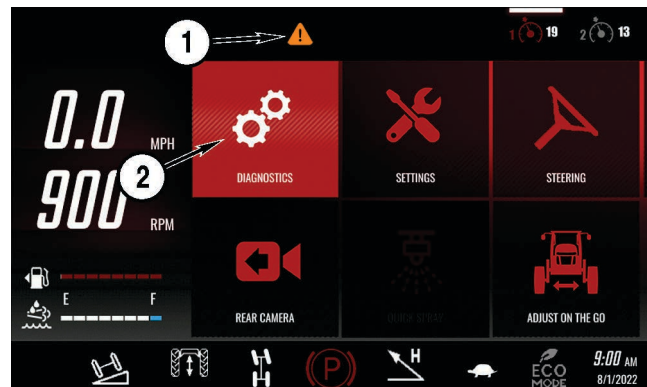


Diagnostics Page 1: Vehicle Warnings

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).

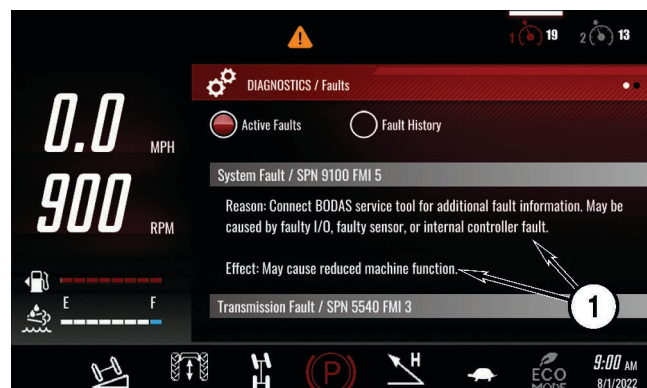


Active Faults

This page will display the option to choose active faults or fault history (1). Choose active faults. Then touch the fault information bar (2) to expand for further detail.



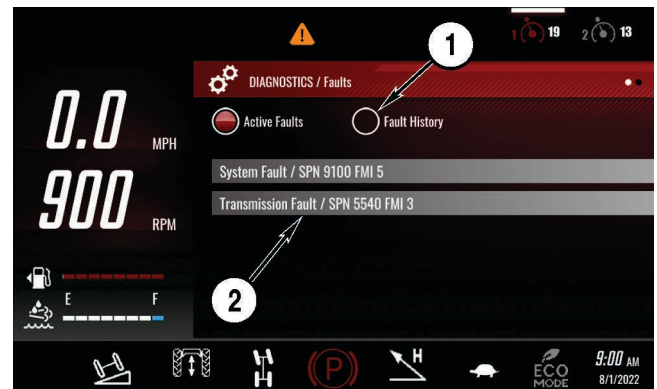
Once the information has expanded, the page will display more detail. This will include the Reason and Effect (1) on the machine.



Fault History

This page will display the option to choose active faults or fault history.

Choose fault history (1). Then touch the fault information bar to expand for further detail (2).



Once the information has expanded, the page will display more detail.

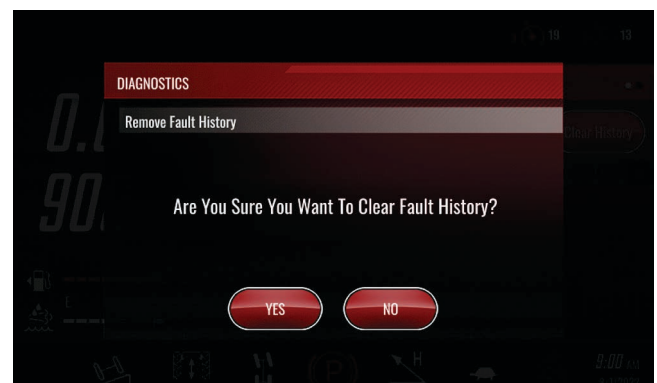
This includes the Reason and Effect (1), and the last hours when the fault was last active on the machine (2).



Press the Clear History (1) button to clear all saved history.



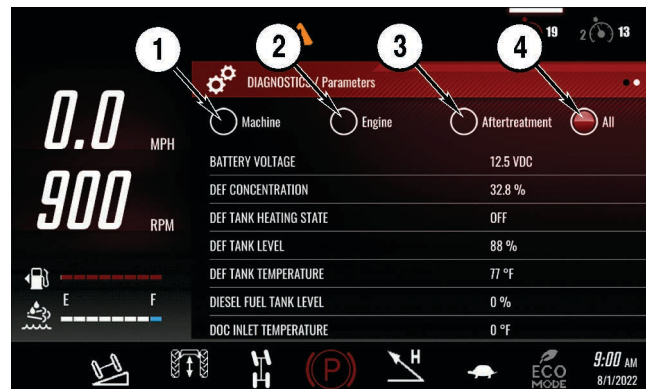
A prompt will appear to confirm you want to clear fault history.



Diagnostics Page 2: Parameters

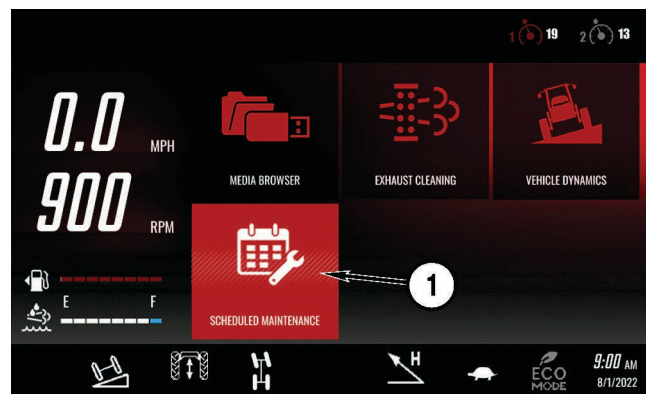
To filter for Machine Parameters only, select Machine button (1). To filter for Engine Parameters only, select Engine button (2). To filter Aftertreatment Parameters, select Aftertreatment button (3). To view All Parameters select All (4).

To view all the information on that page, swipe the screen up.



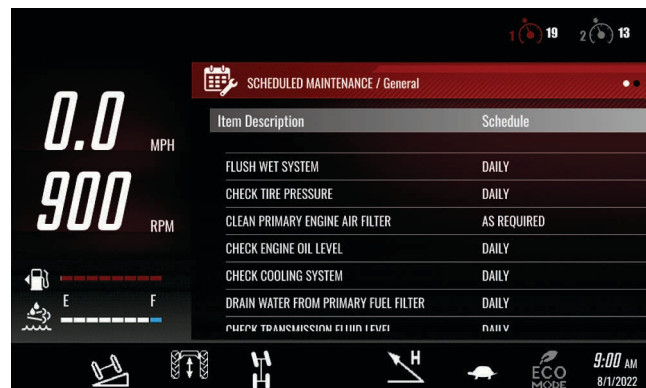
Scheduled Maintenance App

The scheduled maintenance app is used to provide maintenance information and reminders. The app icon is located in the app menu (1). This app can also be opened via a maintenance reminder icon on the bottom row (2).



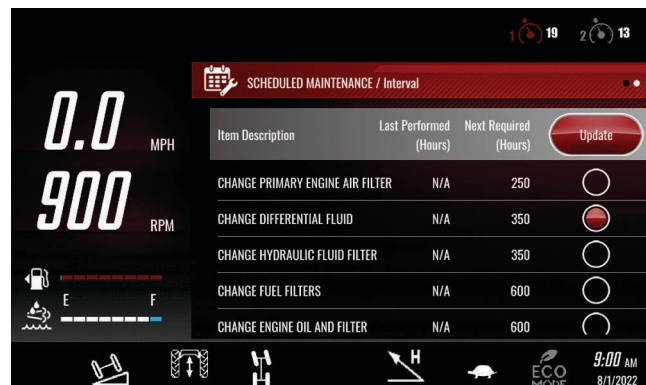
General Maintenance App Page

The first page of the General Maintenance app is a table showing general maintenance items and recommended schedule.



Interval Maintenance App Page

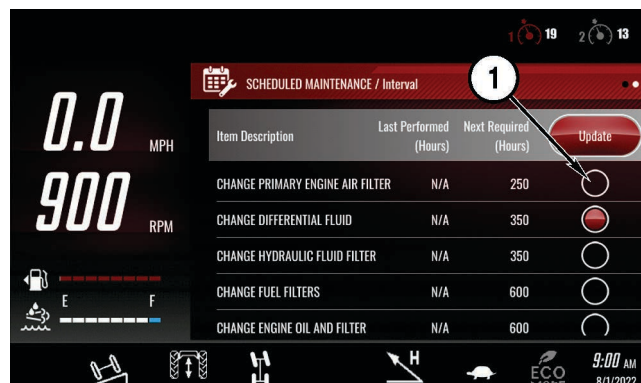
The second page of the app is a list of key maintenance items that run on engine hour based intervals. The list shows the description, last time performed, and the next required maintenance. The last time performed is initially populated with "N/A", then the next time required is calculated assuming that maintenance was performed on schedule up and to the current engine hours.



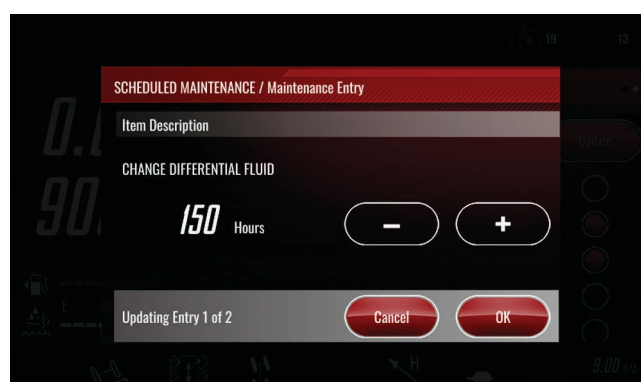
Scheduled Maintenance App (continued)

Maintenance Entry

Alongside each item on the interval maintenance page is a button that allows the user to enter a maintenance event for that item (1).

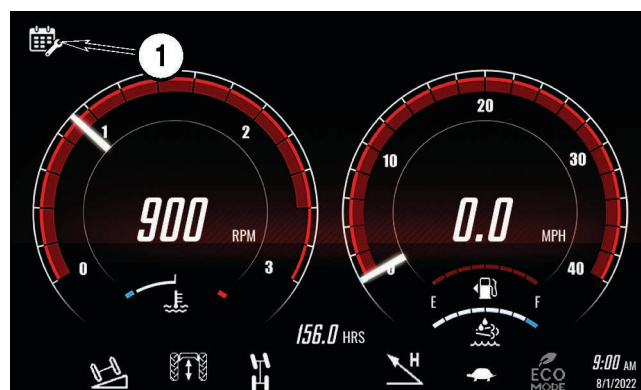


Selecting the entry button opens a dialog that asks the user if they would like to add a maintenance entry for that item description. Selecting OK opens the screen shown on right as (2). This shows the current engine hours as well as up and down arrows. Click OK to indicate maintenance performed. (or change hours to if needed, then select OK.) Selecting Cancel closes the window and exits to the app page.

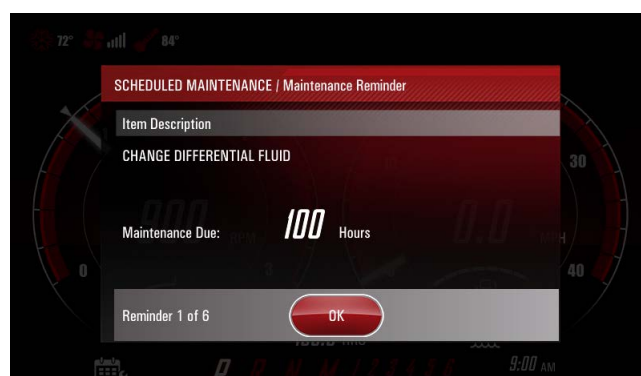


Maintenance Reminders

When required maintenance is within 10 hours of the current engine hours, a maintenance icon is shown (1). Pressing the icon takes you directly to the interval maintenance app page.



A maintenance reminder pop up is shown whenever there are scheduled items. You must press OK to clear the screen.



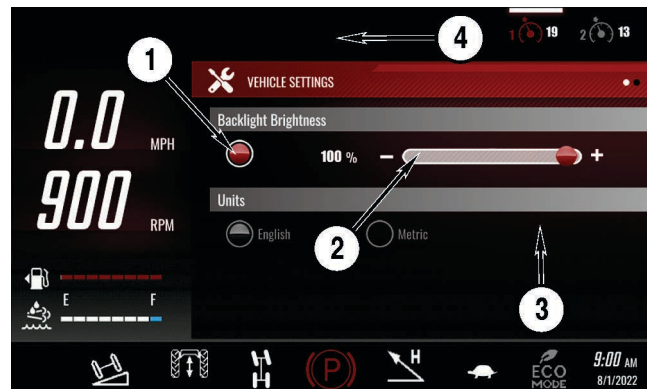
Vehicle Settings Page 1:

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).

To continue to the next Vehicle Settings page, swipe the screen to the left (4).



Vehicle Settings Page 2: Version Information

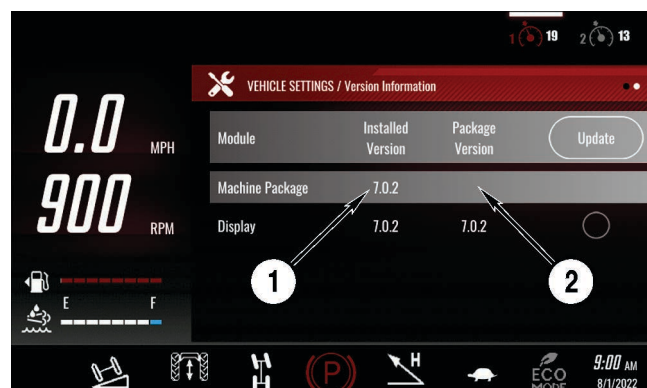
****To be able to continue to the next page, a pass code is needed. This is a warning that the changes that are going to be made, will effect the machine's function.**

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 backspace icon (3).



This screen will display the current version of the machines software (1). It will also display the new version if there is a machine software USB drive loaded (2). (none in this picture)

****Please consult with your dealership about any updates.****



Fan Control

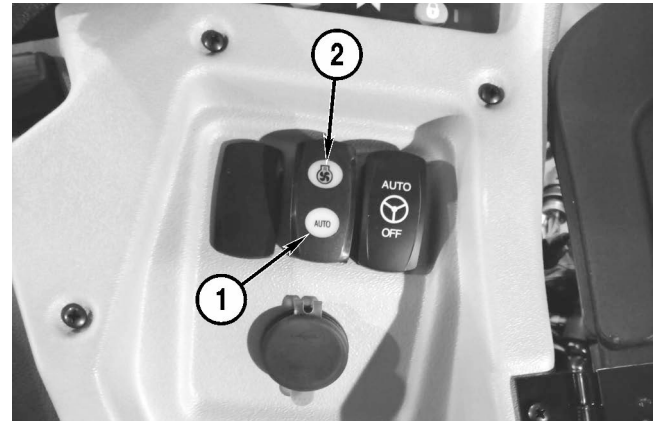
The Apache is equipped with a fan reverser. This function can be used to reverse the airflow through the radiator and coolers in order to remove dust and debris.

The switch for reversing the fan is located under the armrest, above the 12v USB power supply.

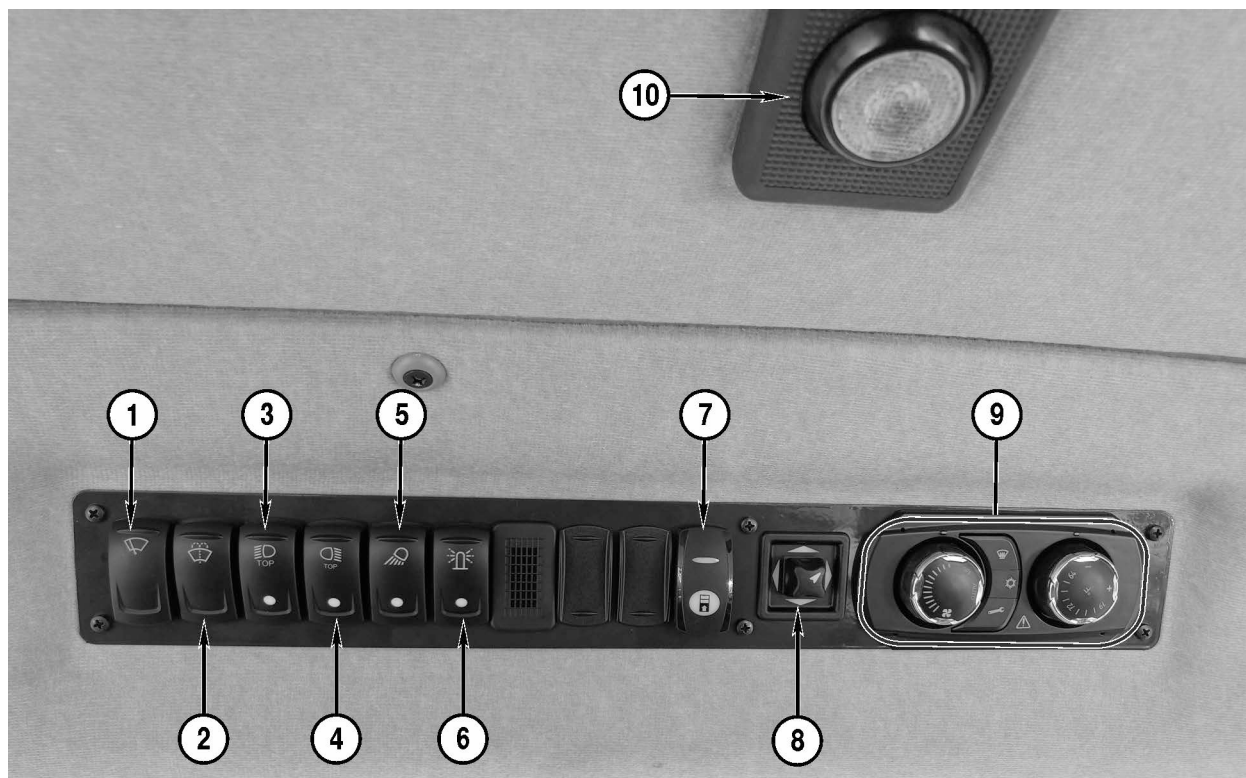
The fan can reverse automatically when the switch is set to 'Auto' (1).

The fan can be manually reversed when the fan symbol (2) switch is pressed.

The manual reversal will be disabled if the fan has been reversed within the last 20 minutes.

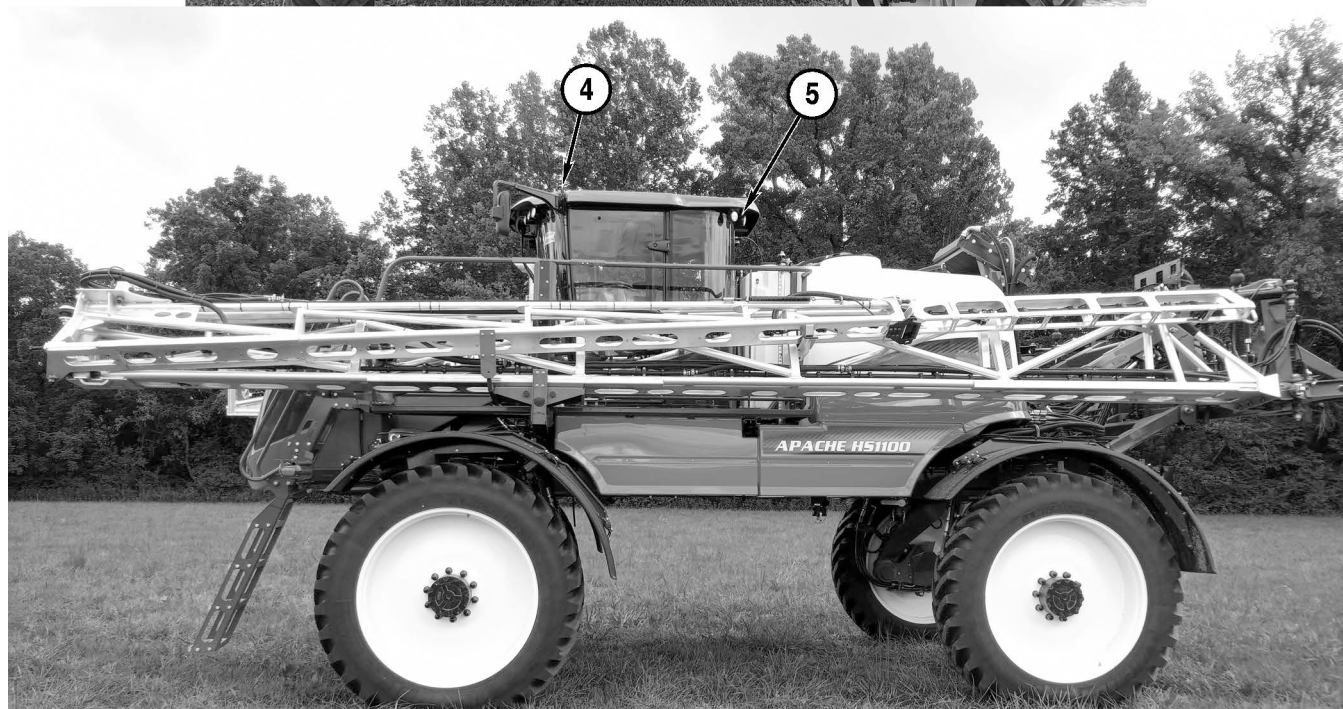
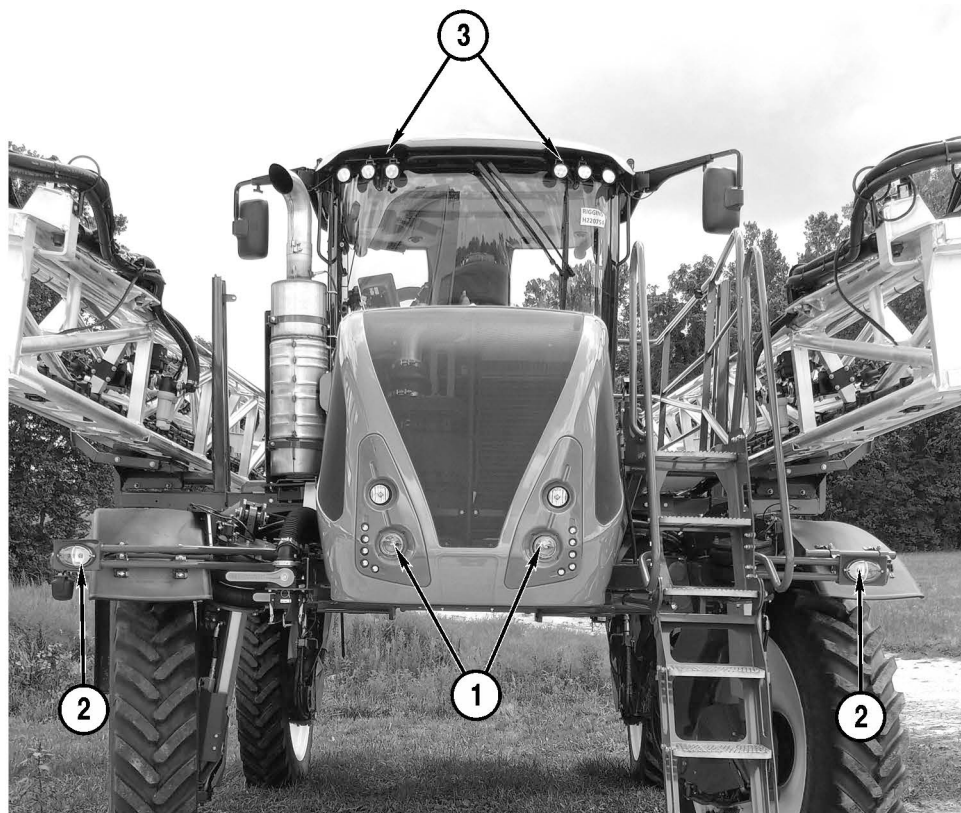


Light Buttons and Adjustable Powered Mirrors



- | | |
|----------------------------|--|
| 1. Windshield Wiper Blade | 7. Hood Open/Close |
| 2. Windshield Washer Fluid | 8. Adjustable Powered Mirrors |
| 3. Cab Front Outer Lights | 9. Climate Controls |
| 4. Cab Front Inner Lights | 10. Dome Light |
| 5. Cab Rear Lights | • Press the switch to turn the light on and off. |
| 6. Beacon Light | |

Apache Sprayer Lighting



- 1. Headlights
- 2. Front Hazard and Turn Signal Lights
- 4. Cab Front Work Lights

- 4. Beacon Light
- 5. Cab Rear Work Lights

6. Rear Hazard, Turn Signal, and Brake Lights (Mounted at rear tire/fender)

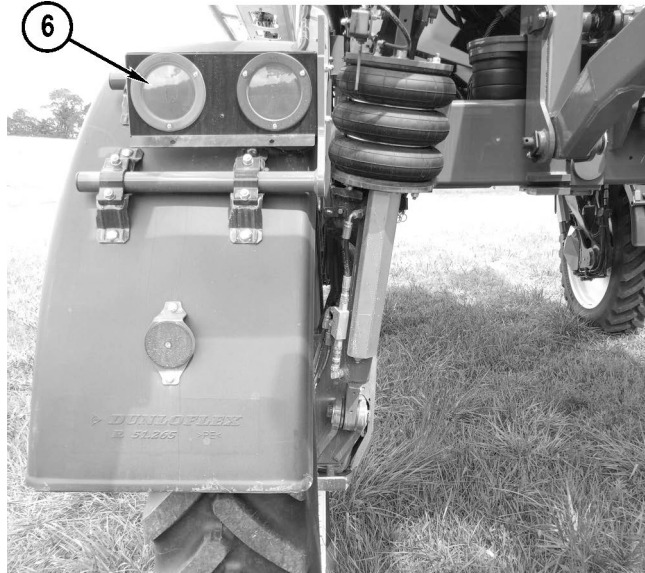
Turn Signal and Hazard Light Function:

- When the hazard lights are turned on, light sets #2 and #7 will flash.

Turn Signal Function:

- When the left turn signal is turned on, the left side of light sets #2 and #7 will flash.
- When the right turn signal is turned on, the right side of light sets #2 and #7 will 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

- AM/FM
- Bluetooth Streaming Audio
- NOAA Weatherband Tuner with Alerts

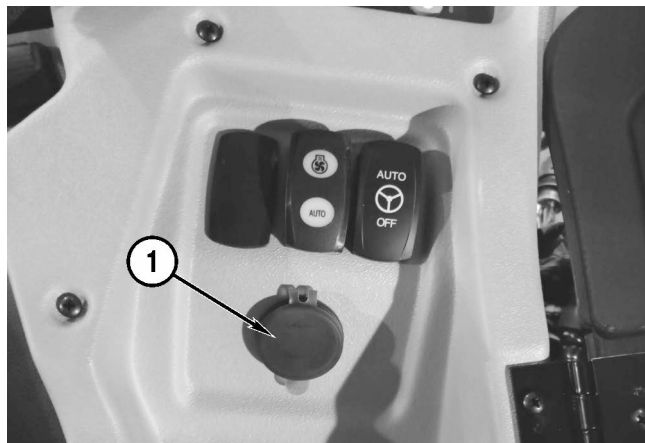
For detailed instructions visit the manufacturer's web-site:

<http://asaelectronics.com/manuals-guides> -- search for model number JHD62.



Accessories

USB accessory power (1) is located under the armrest pad.



Seat Adjustment

Leather Seat

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

9. Height:

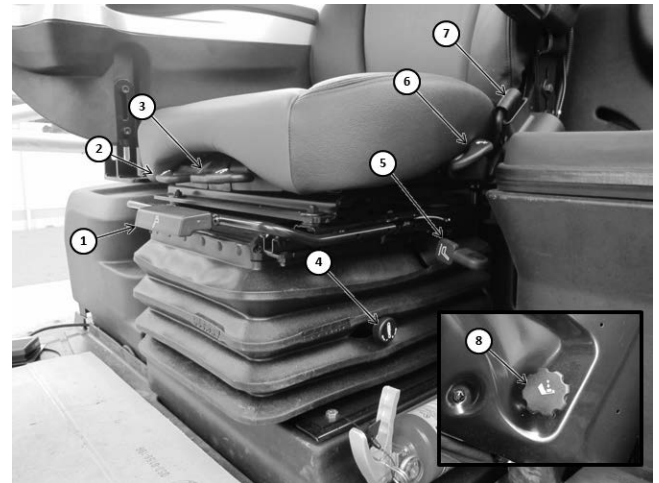
- Lift lever to raise the seat.
- Push the lever down to lower the seat.

10. High/Low/Off Button for Seat Cooling/Heat

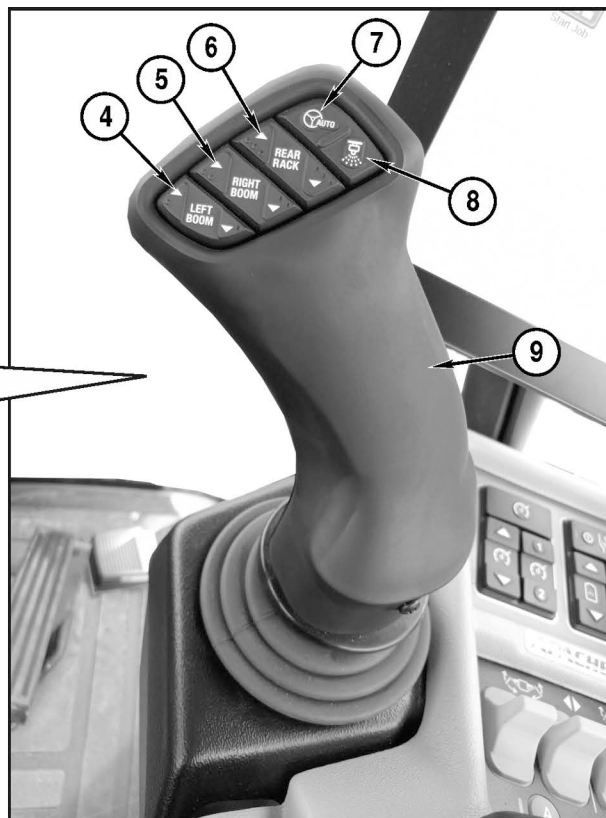
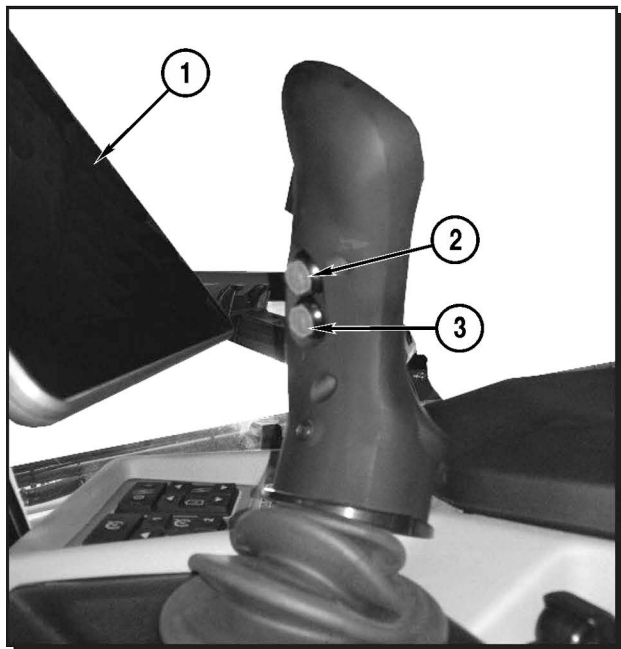
- Top position is high, Center position is off, Bottom position is low.

11. Activate Seat Heat/Cool Button:

- Select fan to activate cooling. Select Seat with lines to activate heat.



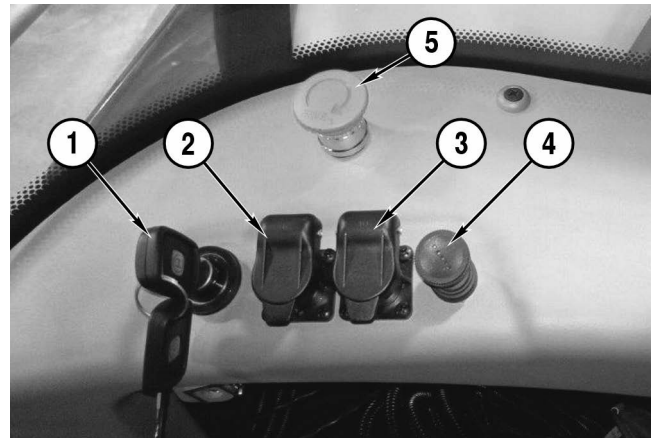
Joystick and Universal Terminal Console



1. **Universal Terminal Console (option)**
2. **Road Mode Trigger Button**
3. **Field Mode Trigger Button**
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. **Z-Gate Joystick**
See "Drive Modes" on page 3-22.

Wall Console (behind seat)

1. **Key Switch**
See "Starting and Stopping the Engine" on page 3-20.
2. **Auxiliary Power**
3. **Auxiliary Power**
4. **Air Dump Valve**
Push to drain all suspension air bags.
Pull to refill air bags.
5. **Master Disconnect Switch**
Push to disconnect battery power.
Twist to reconnect.



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. See "Safety Belt" on page 2-4



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

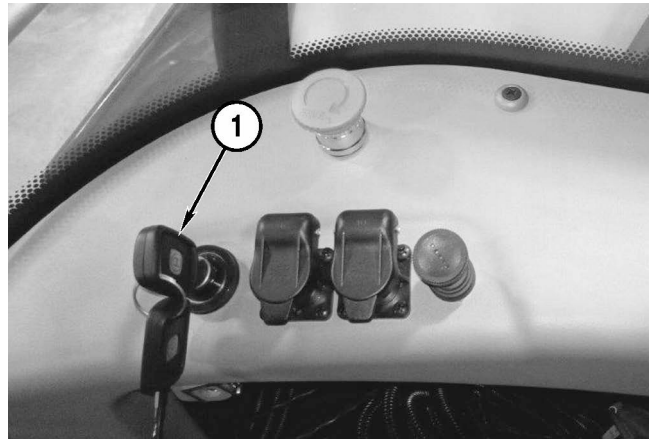
NOTICE: Verify the joystick is in NEUTRAL or central position before starting. If the joystick is in the FORWARD or REVERSE positions, the machine will display an error and will be in a limp mode. The machine must then be cycled off and on again to resume normal operation.

1. Turn the key (1) until it clicks once. This will turn auxiliary power on.
2. While in auxiliary power mode, the machine will go through a series of system checks. After the checks have been completed the machine will be ready to start.
3. Turn the key and hold to crank the engine.
4. When the engine starts, release the key.

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

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

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



Warm-up

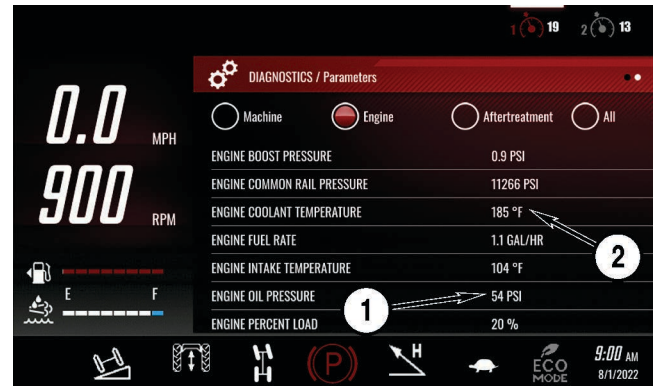
Check the engine oil pressure gauge (1) as soon as the engine starts. To do this, access the App Screen and choose the Diagnostics

- If the oil pressure reading does not reach the minimum pressure of 15 psi [103.4 kPa], stop the engine and determine the cause.

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.

- Thermostat opening 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.



Drive Modes

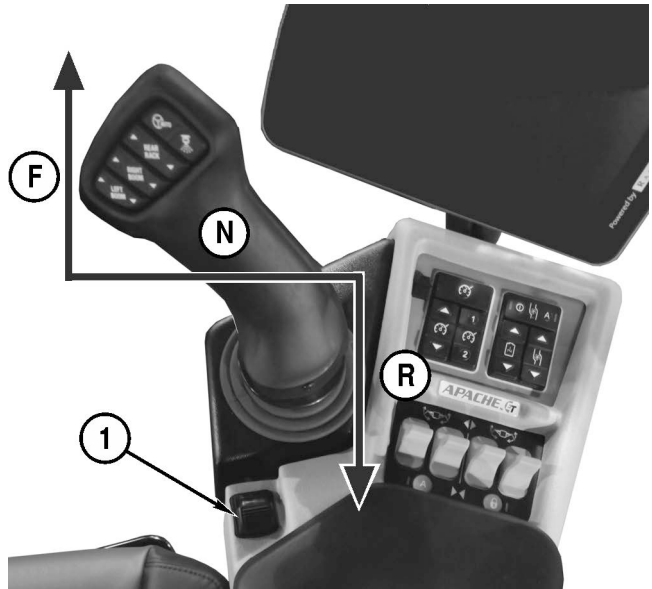


NEVER leave the operator's seat or cab when the Apache Sprayer is in gear. ALWAYS stop the Apache Sprayer, shift into NEUTRAL and then apply the parking brake before exiting the cab.

This Apache Sprayer is equipped with different drive modes to suit different driving styles and needs. Become familiar with all driving modes before operating the Apache Sprayer.

Driving with Joystick Mode

1. Change the engine speed to idle using the throttle wheel (1) near the joystick.
2. Place the joystick in the NEUTRAL position (N).
3. Select ROAD or FIELD mode.
4. Release the parking brake.
5. Select the desired maximum engine speed using the throttle wheel (1).
6. Move the joystick forward (F) to advance the machine, or backward (R) to reverse.



Driving with Foot Pedal

1. Change the engine speed to idle.
2. Place the joystick in the NEUTRAL position (N).
3. Select ROAD or FIELD mode.
4. Release the parking brake.
5. Select the base engine speed using the throttle wheel (1).
6. Select direction and max travel speed with the joystick.
7. Press the foot pedal to attain the desired speed.

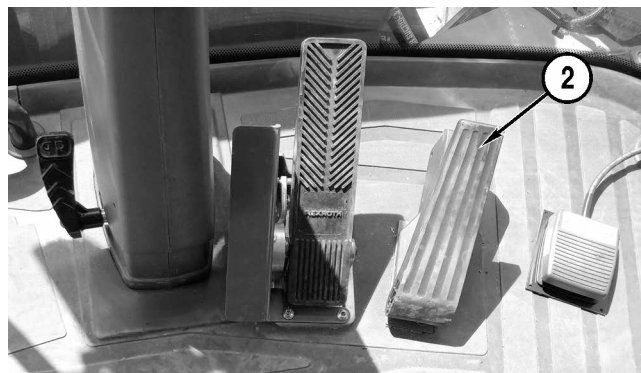
Driving with ECO Mode and Joystick

To enable Eco Mode see "Economy (ECO) Mode" on page 3-47.

1. Place the joystick in the NEUTRAL position (N).
2. Select ROAD or FIELD mode.
3. Release the parking brake.
4. Move the joystick forward (F) to advance the machine, or backward (R) to reverse the machine. The speed of the vehicle depends on the lever position.

Driving with ECO Mode and Foot Pedal

1. Place the joystick in NEUTRAL position (N).
2. Select ROAD or FIELD mode.
3. Release the parking brake.
4. Use the joystick to select the direction and maximum travel speed.
5. Press the foot pedal (2) to attain the desired speed. The speed of the vehicle depends on the position of the foot pedal.



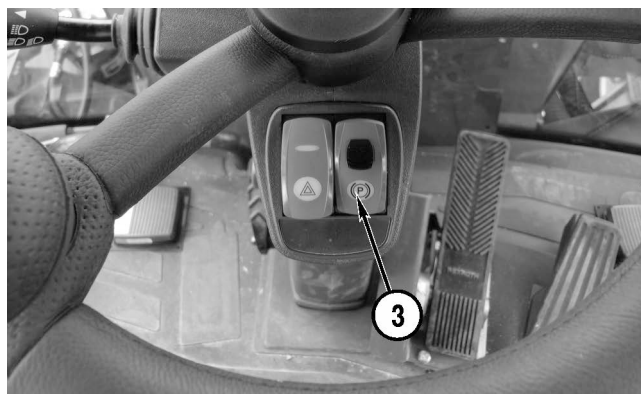
Stopping

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

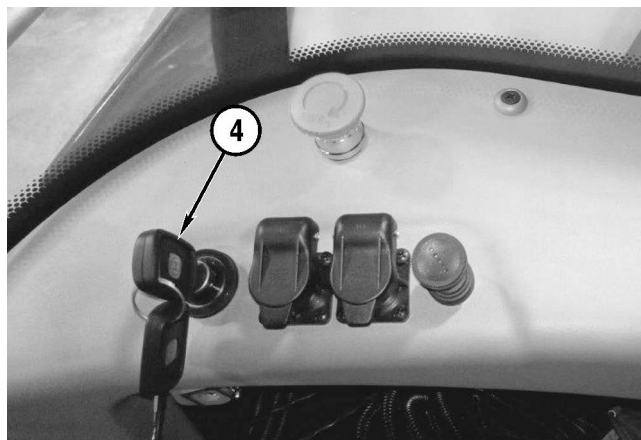
To stop the Apache Sprayer:

- Slowly bring the machine to NEUTRAL by moving the joystick to the center position.

NOTE: When the joystick is returned to the NEUTRAL position while the vehicle speed is greater than 23 mph [40km/h], the deceleration of the vehicle will be 'severe'. In case of emergency use the brake pedal and return the joystick to the NEUTRAL position



- Bring the Apache Sprayer to a complete stop.
- If controlled by the throttle wheel, lower the engine RPM to idle.
- Apply the parking brake (3).
- Turn the keyswitch (4) counterclockwise to shut off the machine.



Brake Function

The combination brake system used is composed of a hydrostatic component and a mechanical component. Mechanical braking works independent of the drive control software during the final part of brake pedal stroke. Thus, the brake pedal is divided into two operating ranges:

Deceleration with High Level Braking (HLB) and without mechanical brakes, pedal stroke 0-60%

Deceleration with High Level Braking (HLB) and with mechanical brakes, pedal stroke 60-100%

The brake pedal position is detected by an angle sensor and is processed by the drive control. In addition to the activation of the hydrostatic brake, a hydraulic brake pressure is generated for the mechanical friction brake. The hydrostatic brake is achieved by the pressure relief valves of the driving pump and by the engine drag torque. The pump is set to a defined displacement, which corresponds to the maximum possible drag torque of the engine at maximum system pressure. The displacement of hydraulic motors is set according to the brake pedal position to achieve the desired deceleration torque. Below a certain machine speed, conventional hydrostatic deceleration using engine drag torque is used instead. This allows smooth adjustment of deceleration at low machine speed.

If brake pedal is released before vehicle comes to a standstill, the machine will re-accelerate to the drive speed set by the operator. If the operator brakes to a standstill and releases the brake pedal, the machine will remain stopped until throttle is reapplied.

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. With cruise engaged, the joystick will control the vehicle speed from 0 mph (joystick all the way back) to the selected set speed (joystick all the way forward). The cruise control will only operate up to 30 mph.

Cruise control will disengage when:

- Master cruise button has been disabled
- The selected cruise button has been pressed

Cruise control will disengage temporarily when:

- Brake has been pressed
- Transmission is put in neutral or reverse

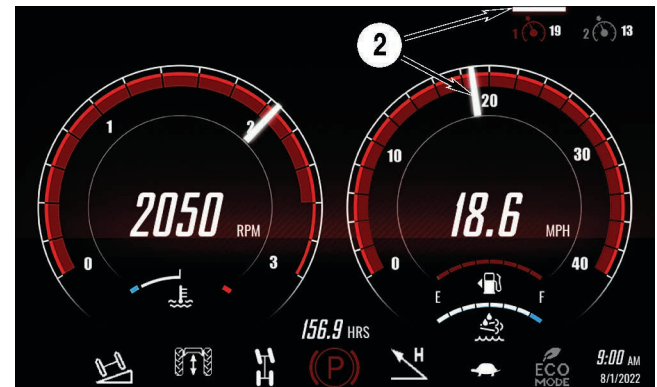
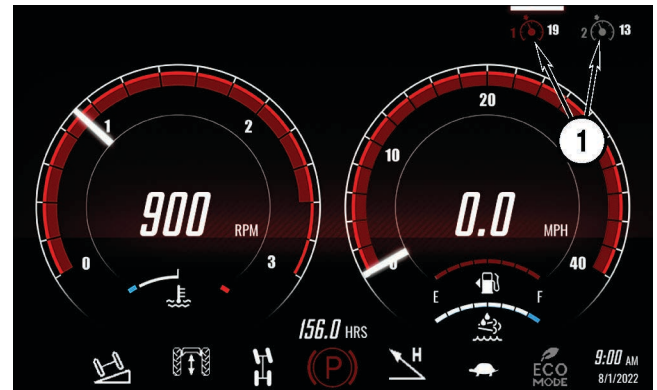
To resume the cruise control: select the desired set point one or two on the control pad (2). Using the foot throttle can be beneficial in areas that you might want more RPMs. This will not disengage the cruise control, but will return to the chosen set speed after use.

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. The joystick must be pulled back to the current engine rpm to reengage normal throttle control.



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.



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.

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

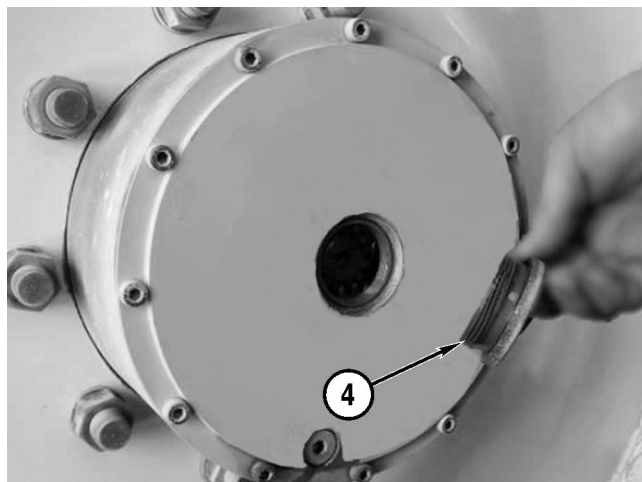
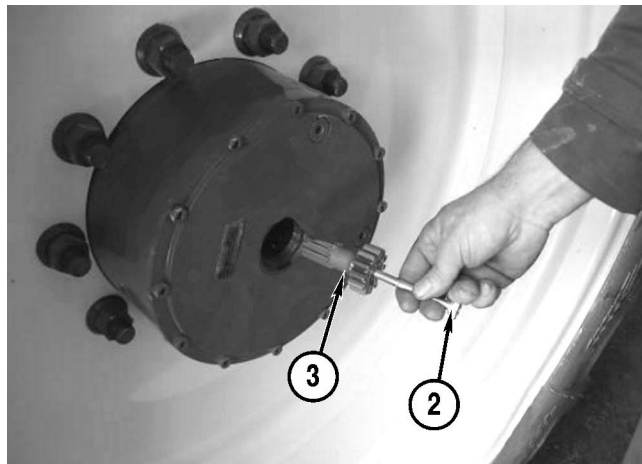
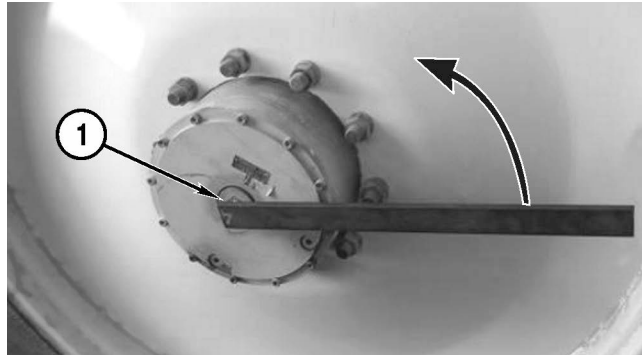
NOTICE: DO NOT use the Apache Sprayer as a tow vehicle.

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.

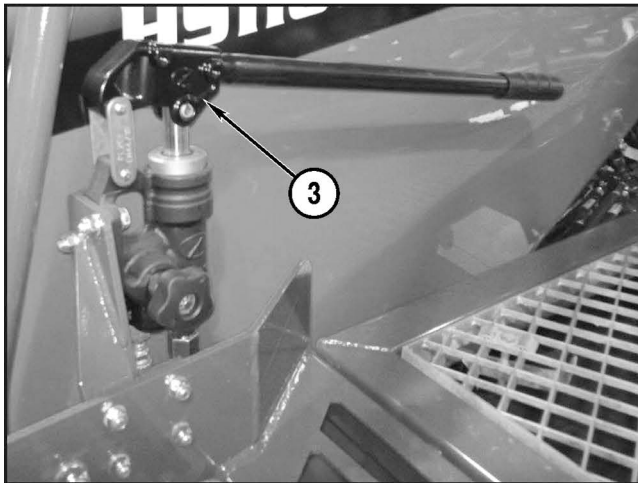
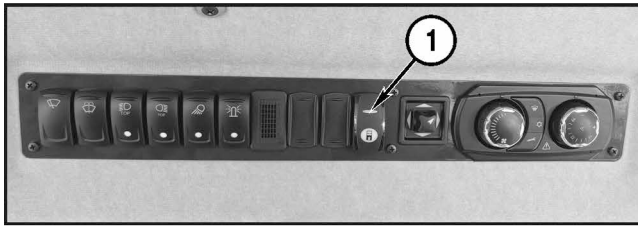
To tow the Apache sprayer, remove the reduction gears from each wheel:

1. Connect the Apache sprayer to the towing vehicle.
2. Clean the reduction gear area.
3. Remove plug (1). Oil may seep out.
4. Use a screw (2) to remove the shaft (3) from the planet gear of the reduction gear.
5. Reinstall the plug (4).

After towing is complete, reinstall the reduction gears before disconnecting the Apache sprayer from the towing vehicle.



Hood



Raise Hood

Hydraulically

1. Press the hood switch located on the cab roof switch panel (1).

Manually

1. Locate the tube with a handle on the cab post by the door (2).
2. Insert the handle into the hydraulic jack point (3).
3. Turn the knob on the hood jack cylinder clockwise until it is screwed all the way in.
4. Pump the handle until the hood is lifted open.

Lower Hood

Hydraulically

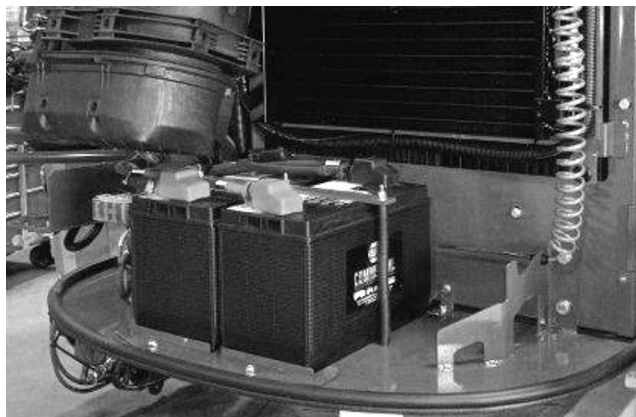
1. Press the top portion of the hood switch on the cab roof switch panel (1).

Manually

1. Confirm people and objects are clear of the hood's range of motion.
2. Slowly turn the knob on the jack cylinder counterclockwise to unscrew and relieve pressure on the hood cylinder. The hood will drop down.

Battery

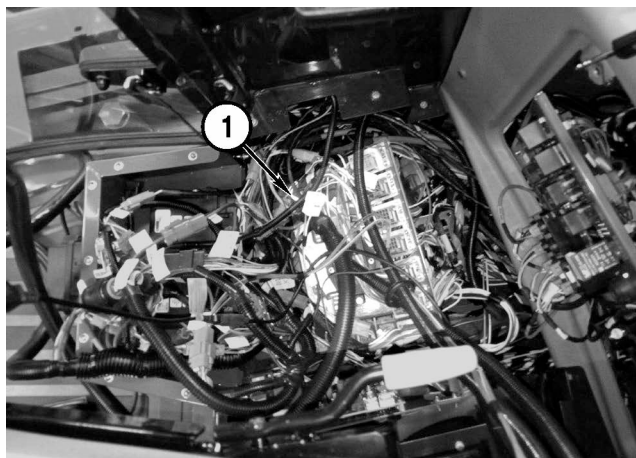
The batteries are located under the hood, between the radiator and the front of the hood.



Cabin Power Distribution Modules

Located under the armrest on the back wall of the cab, the module includes a circuit board, relays, and fuses that power cabin operations.

For more information, see "Cab Board Fuses" on page 8-1.



Other Power Distribution Modules

There are miscellaneous power fuses and relays located around the machine including:

- Battery fuses: Located next to the batteries under the hood.
- Air conditioning fuses: Located in the cab next to the cab power distribution.
- Fan fuses: Located under the cab roof.
- Engine start relays: Located on the right side of the engine.

Axle Adjustment

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).

The illustration shows the adjustment devices located on each axle side. All four axle slides are identical.

The cross pieces of the axle should be cleaned before performing adjustments.

Safely lift the front of the machine until the wheels are slightly off the ground.

Remove the protective plug (4).

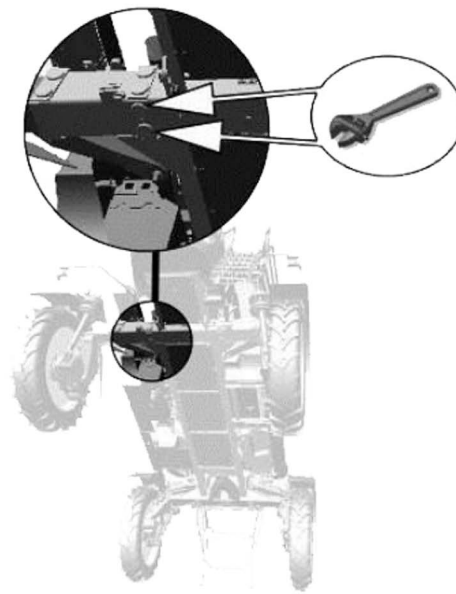
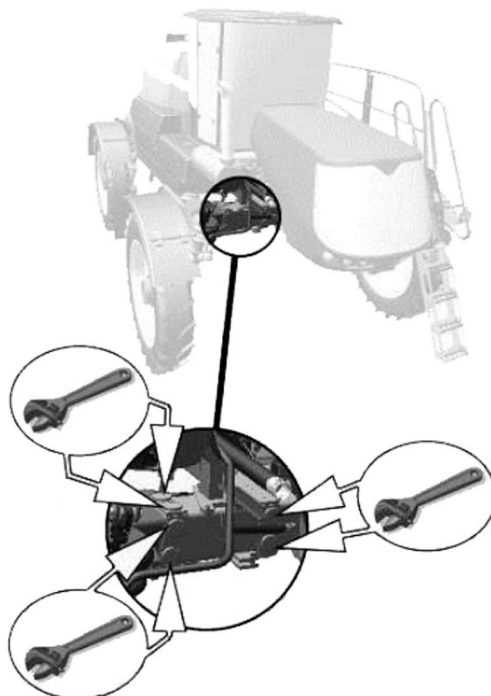
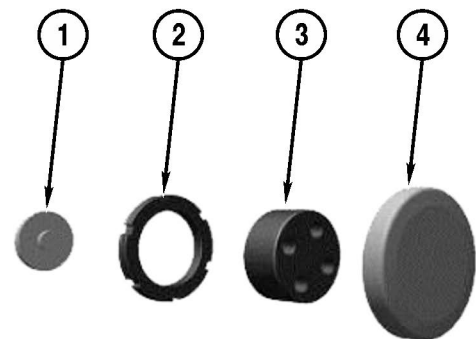
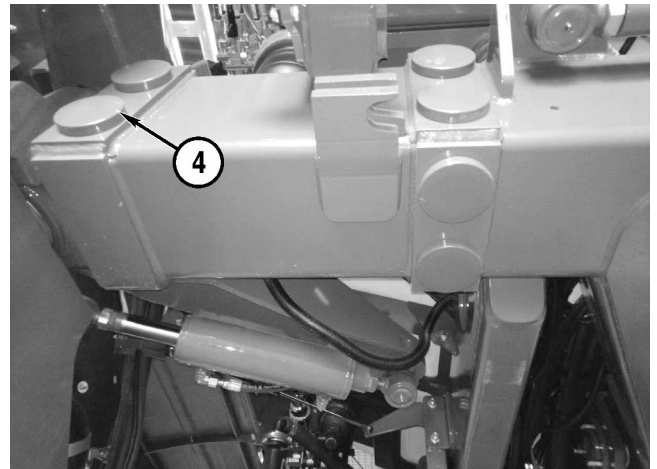
Loosen the locknut (2).

Tighten the screw (3) until the guide disc (1) makes contact with the half cross piece.

Loosen the screw (3) by ½ turn.

Moderately tighten the screw (3) until the guide disc (1) is in contact with the half cross piece.

Re-tighten the locknut (2).



Adjust On The Go

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

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

NOTE: Road mode will be disabled when axles are positioned at a distance greater than 3 m [120 in].

To adjust the axles:

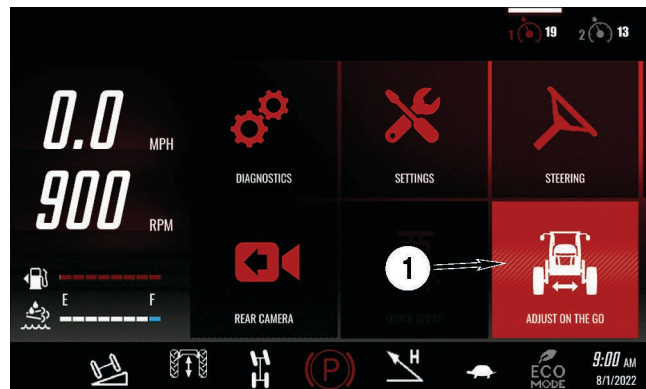
While the engine is idling, select the Adjust-On-The-Go icon (1) from the main screen.

There are three presets for axle width adjustment.

The 'Road' preset is set at 3 m [120 in] for front and rear axles.

The other two presets are fully customizable. To set each preset, swipe the screen to the left to enter the 'Field 1' or 'Field 2' preset values. Select 'Front' to adjust the front axle width. Select 'Rear' to adjust the rear axle width. Use the plus button to increase the axle width. Use the minus button to decrease the axle width.

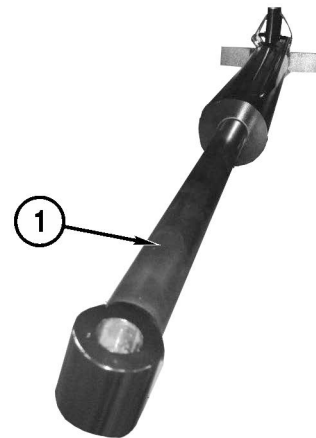
Once axle widths are adjusted, swipe the screen right to go back to the 'Adjust On The Go' main screen. The 'Field 1' and 'Field 2' presets will now display the axle widths that were set. Select the desired preset and begin driving forward at least 3 mph to allow the axles to adjust to the preset.



Front and Rear Axles

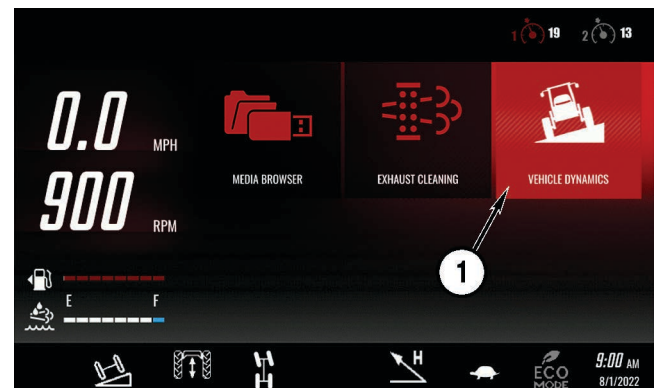
When activated, the Adjust-On-The-Go cylinder (1) adjusts the axle inward or outward as desired. The wheels/axles are actuated by one cylinder per wheel. The left front Adjust-On-The-Go axle is shown.

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

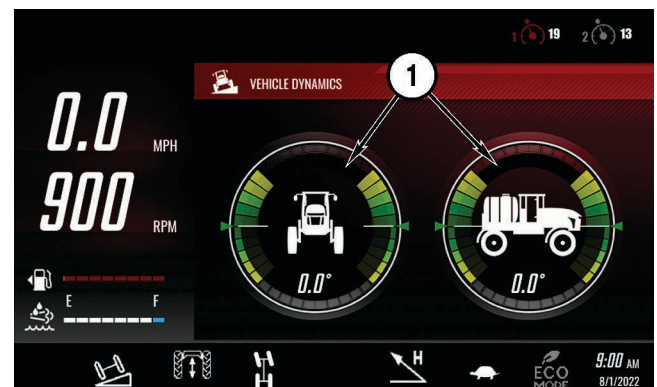


Vehicle Dynamics

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).



Climate Controls

1. Manual Fan Controls

- Controls fan speed.

2. Vent Selection Button

- Selects which vents are on.

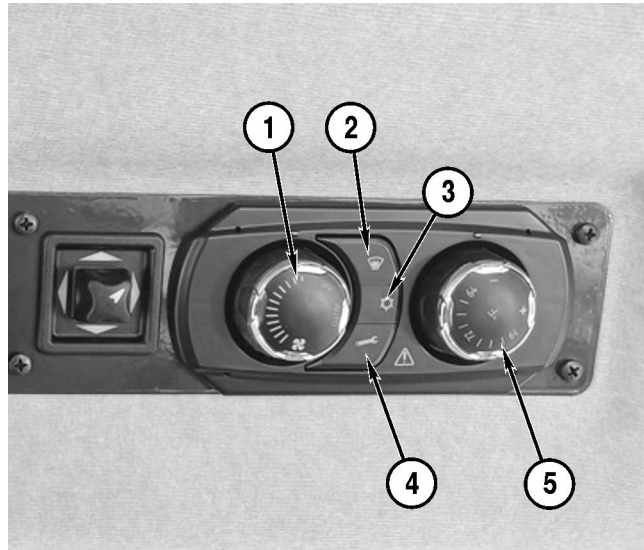
3. A/C Activation Button

- Turns A/C on.

4. Cab Pressure Maintenance

5. Temperature Knob

- Sets the desired temperature.



Precision Equipment

The following are factory installed precision sprayer control options.

- Raven Viper® 4+ (field computer)
- Raven RS1® Autosteer (integrated autosteer)
- Raven AccuBoom™ (section spray control)
- Raven Hawkeye™ Gen 2 (nozzle control system)
- CapstanAG™ (nozzle control system)
- CapstanAG™ PinPoint III
- Raven AutoBoom® XRT (boom height control)
- Raven Boom Recirculation™ (plumbing cleaning system and waste reduction)
- John Deere® AutoTrac™ (integrated autosteer)
- Ag Leader® InCommand™ (plumbing cleaning system and waste reduction)
- Ag Leader® SteerCommand Z2™ (autosteer)

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.

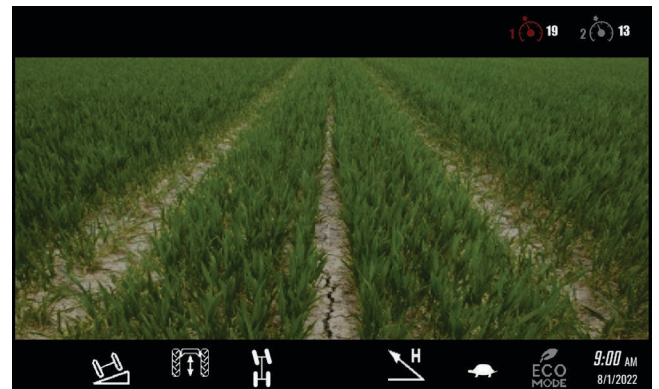
Antenna Mounting Plate

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.

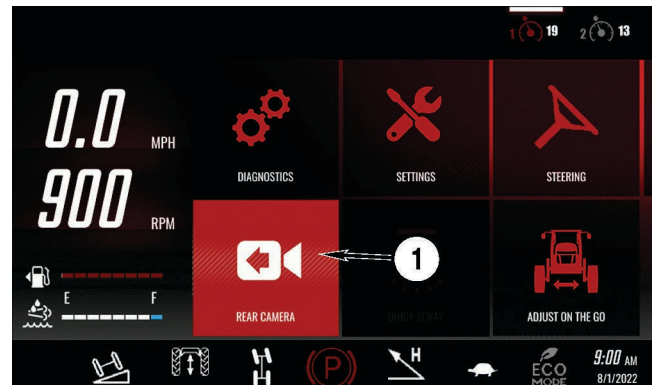


Rear Camera

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).

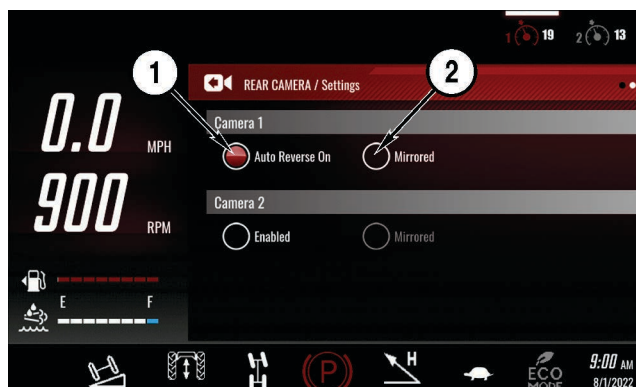
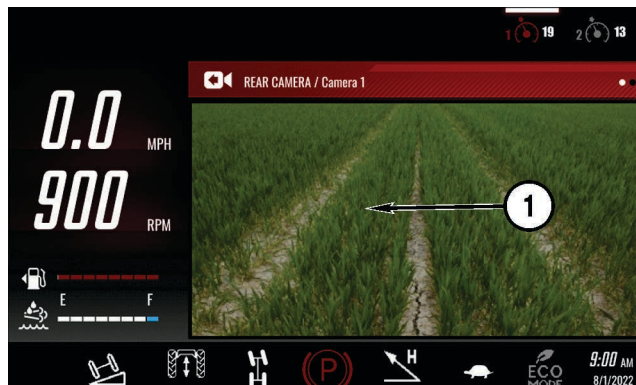


The rear camera will display as well as the left information panel, regardless which direction the sprayer is moving. The camera will remain on the screen until a different function is chosen.

To access the Settings screen, slide the screen to the left (1).

The Rear Camera Settings screen allows the operator to turn On and Off the Automatic Reverse Camera (1). Also, the image can be reversed by turning On the Mirrored Camera button (2).

If additional cameras are installed they may be enabled in the Camera 2 settings.



Jump-starting 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.

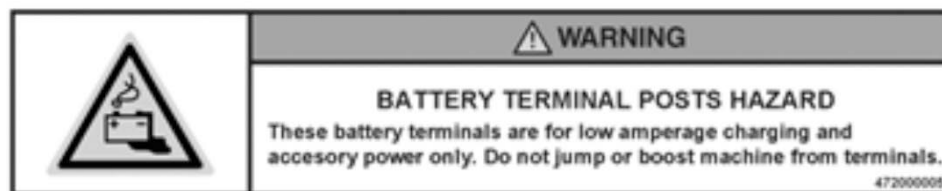


WARNING! Safety Hazard. NEVER exceed 80 amps if boosting / charging a machine through the Fill Station battery terminal posts.



WARNING! Fire Hazard. NEVER exceed 80 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 jump-starting the engine. Doing so poses safety risks to the operator and can potentially damage the machine if the electrical current exceeds 80 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.

See "Safety Belt" on page 2-4

WARNING! Sudden Movement Hazards

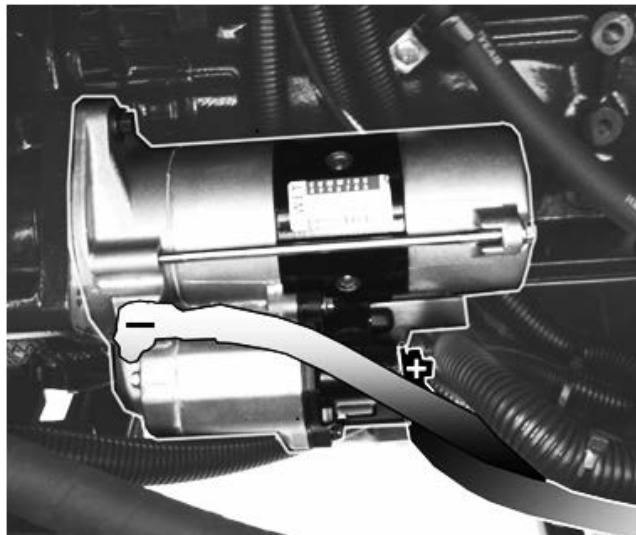


- ALWAYS start the engine from the operator's seat.
- ALWAYS set the parking brake before starting the engine.
- ALWAYS fasten your seat belt before starting the engine.

ET recommends jump-starting 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 button.
- 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.

Exhaust Cleaning

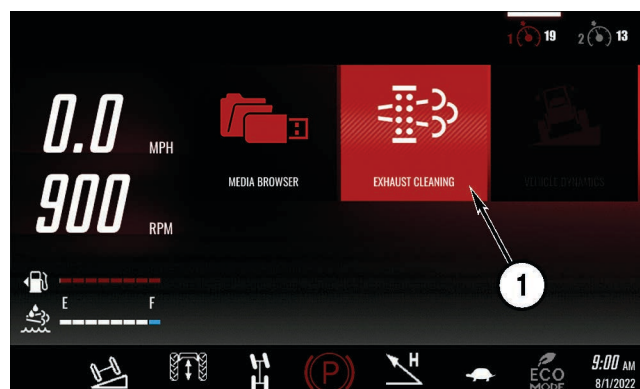


Warning! During exhaust system cleaning operations, the engine may run at elevated idle and hot temperatures for an extended period of time. Exhaust gases and exhaust system components reach temperatures hot enough to burn people, or ignite or melt common materials. Keep machine away from people, animals, or structures which may be susceptible to harm or damage from hot exhaust gases or components. Avoid potential fire or explosion hazards from flammable materials and vapors near the exhaust. Keep exhaust outlet away from people and anything that can melt, burn, or explode.

Closely monitor machine and surrounding area for smoldering debris during and after exhaust filter cleaning.

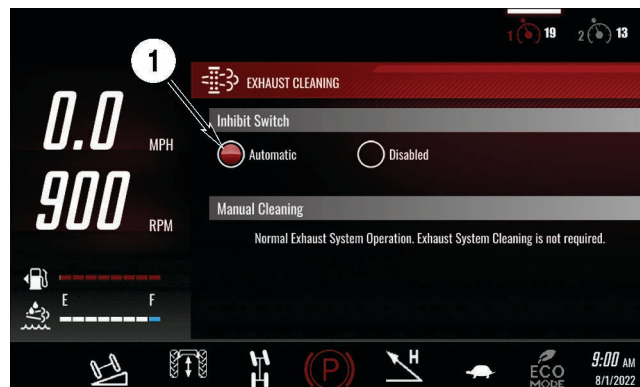
Automatic Cleaning

To access the Exhaust Cleaning app, slide the main screen to the left until the Exhaust Cleaning app is visible. Touch the app icon (1) to continue to the next screen.



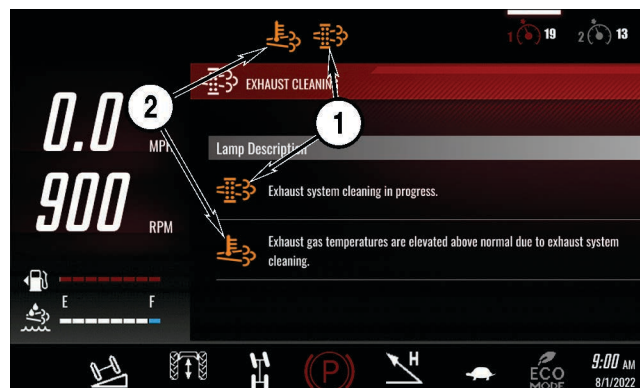
The button (1) will be filled in when in Automatic Mode. This will allow the machine to perform the exhaust cleaning when needed.

This is the recommended procedure for exhaust cleaning.



When the exhaust cleaning is in progress, the cleaning lamp (1) will be flashing. Also, the high exhaust temperature lamp (2) will be on.

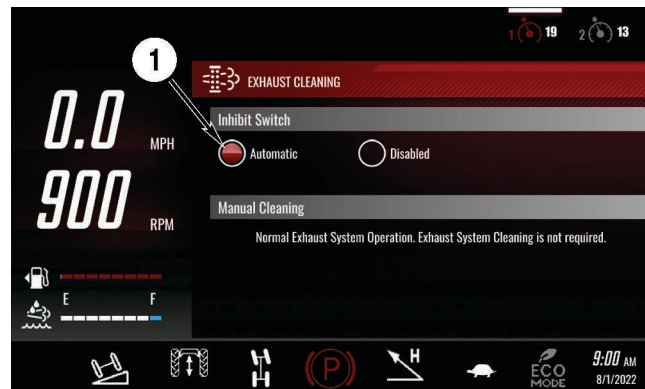
Both lamps will be indicated at the top of the screen as well as under the Lamp Description section of the Exhaust Cleaning app.



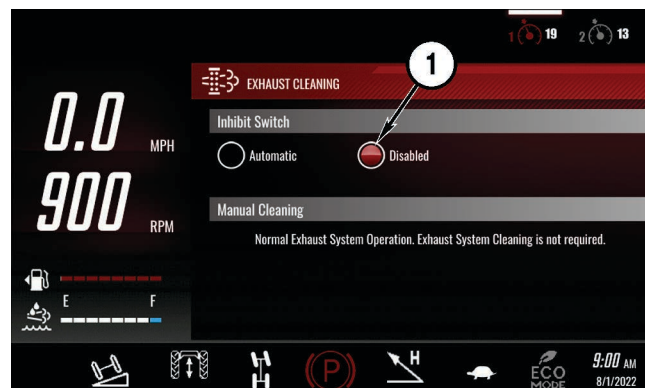
Disabled Mode

To access Disabled Mode, slide the main screen to the left until the Exhaust Cleaning app (1) is visible.

Touch the Exhaust Cleaning icon to continue to the next screen.



To change from Automatic mode to Disabled mode, touch the Disabled radial button (1). In this mode, the exhaust cleaning will not take place until it has been switched back to Automatic or activated manually.



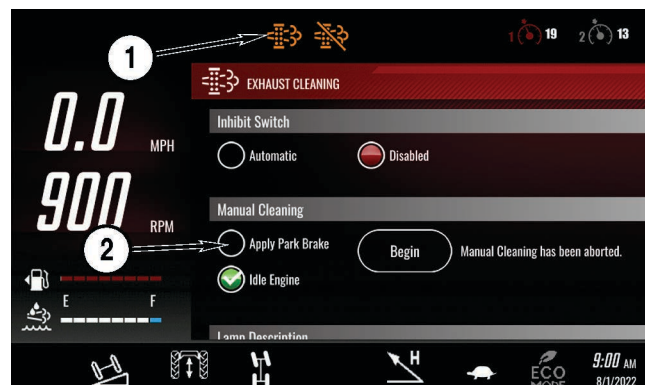
The Cleaning Inhibit Switch lamp (1) will be indicated at the top of the screen as well as under the Lamp Description section of the Exhaust Cleaning app.

It is recommended to switch to Disabled Mode if the machine will be running in confined locations such as a shop for maintenance.

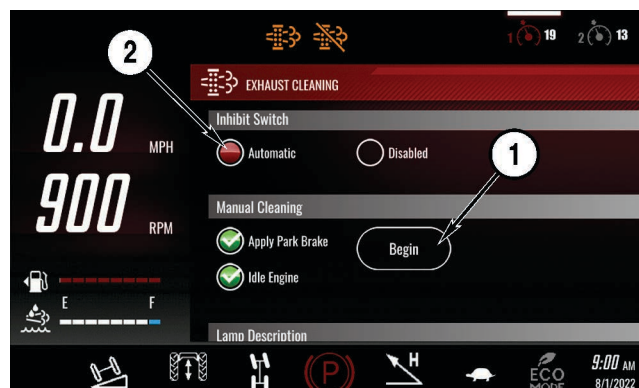


Manual Cleaning

When the machine Exhaust Cleaning is disabled, the machine will determine when it is time to perform a cleaning. It will be indicated at the top of the screen with the Cleaning Required lamp (1). The manual cleaning option will then be available. Once the two criteria are met, Apply Park Brake and Idle Engine (2), the Begin button will be active to start the process.



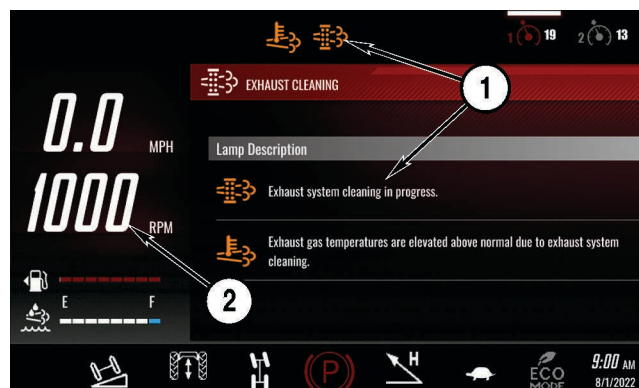
Press the Begin button (1) to start the Exhaust Cleaning procedure. After the Begin button (1) has been pressed, the Inhibit Switch will be changed to Automatic (2). This will revert back to Disabled once the cleaning is complete.



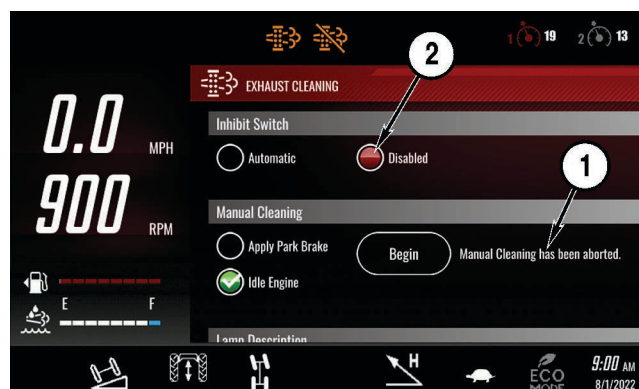
After the Begin button has been pressed, there will be a circle icon (1) that indicates that the process has begun. It will take a few seconds as the systems begin to communicate before the mechanical items begin to run through the steps of cleaning.



As the process moves to the next steps, the lamps will appear at the top of the screen as well as in the Exhaust Cleaning app screen. The Cleaning lamp will begin to flash along with the solid High Exhaust Temperature lamp (1). The RPM's will also increase to 1000 (2) to assist in elevating the exhaust temperature.



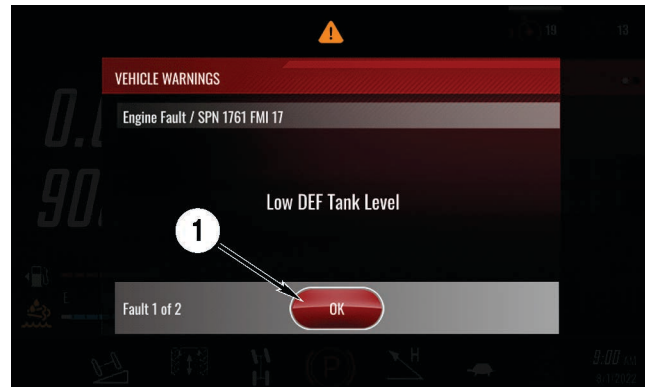
If the Park Brake is released or the Engine Idle is manually changed, the Exhaust Cleaning process will be aborted (1). Once the process has been aborted, the Inhibit Switch will revert back to Disabled (2). The process can be started again, once the criteria has been met.



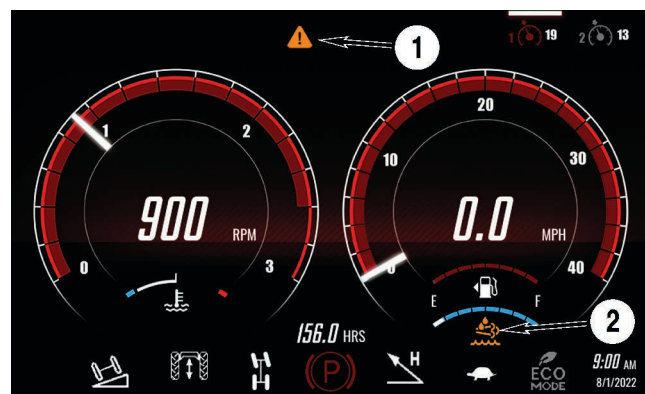
Low DEF Fluid

10% DEF fluid level:

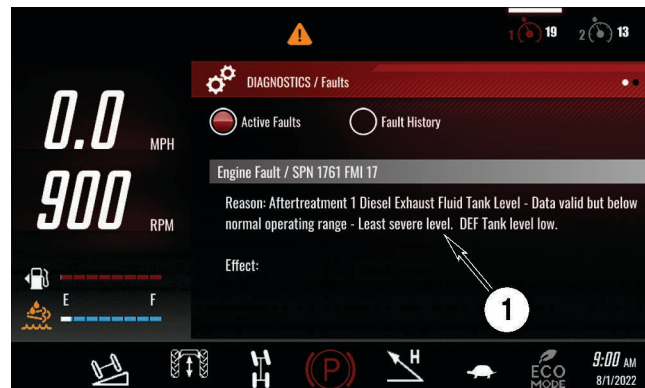
A vehicle warning will pop up on the screen with the engine fault code and a brief explanation of the fault. Click on the OK button (1) to return to the main screen.



The Yellow warning lamp (1) and the Amber DEF lamp (2) will be on. Both lamps will remain in this state until DEF fluid is added. To view a full description of the warning, press the Yellow warning lamp (1).

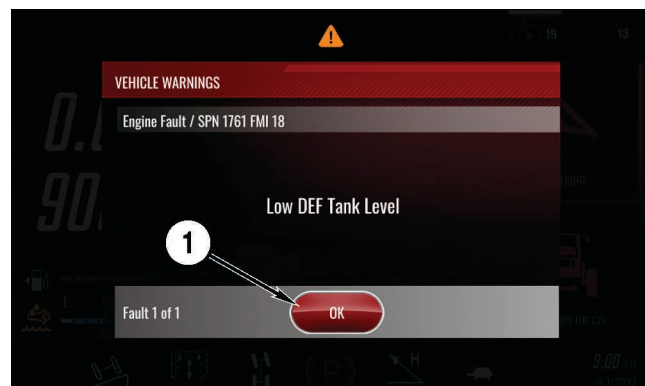


The Diagnostics/Faults page will give a full description of the warning (1).



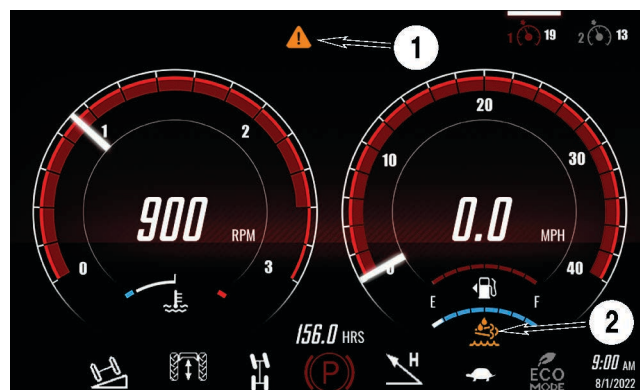
5% DEF fluid level:

A vehicle warning will pop up on the screen with the engine fault code and a brief explanation of the fault. Click on the OK button (1) to return to the main screen.

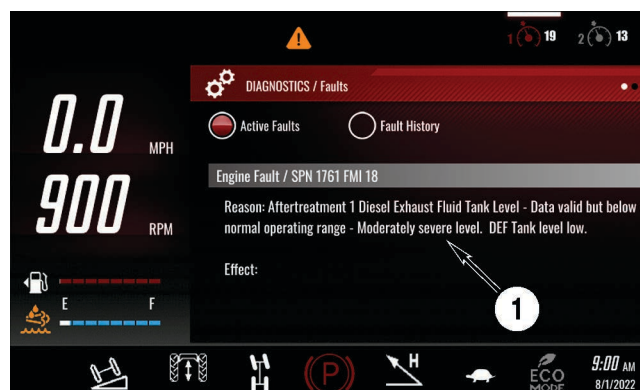


The Yellow warning lamp (1) and the flashing Amber DEF lamp (2) will be on. Both lamps will remain in this state until DEF fluid is added.

To view a full description of the warning, press the Yellow warning lamp (1).

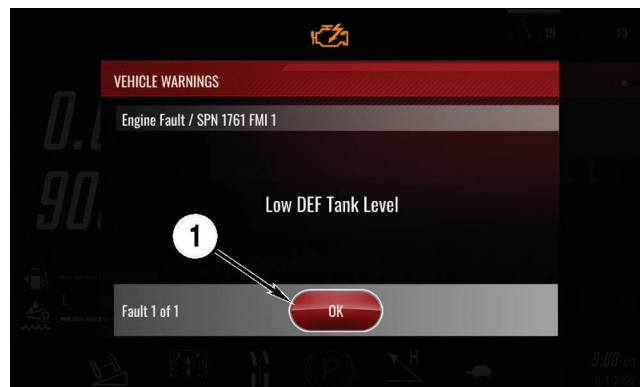


The Diagnostics/ Faults page will give a full description of the warning (1).



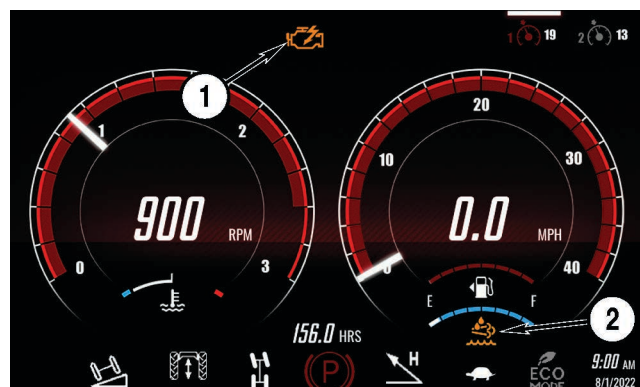
2.5% DEF fluid level:

A vehicle warning will pop up on the screen with the engine fault code and a brief explanation of the fault. Click on the OK button (1) to return to the main screen.

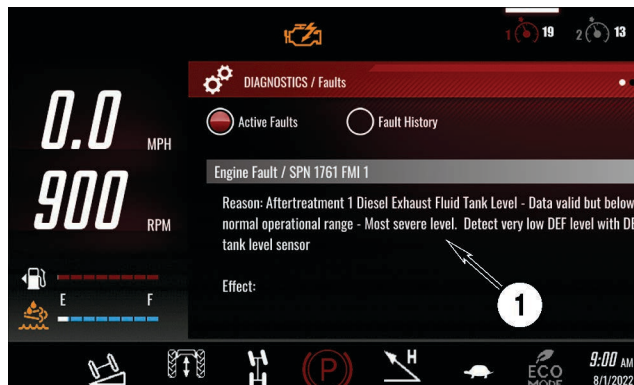


The Amber Engine Warning lamp (1) and the Flashing Amber DEF lamp (2) will be on. Both lamps will remain in this state until DEF fluid is added. **The first induce-ment derate will become active.**

To view a full description of the warning, press the Amber Engine Warning lamp (1).



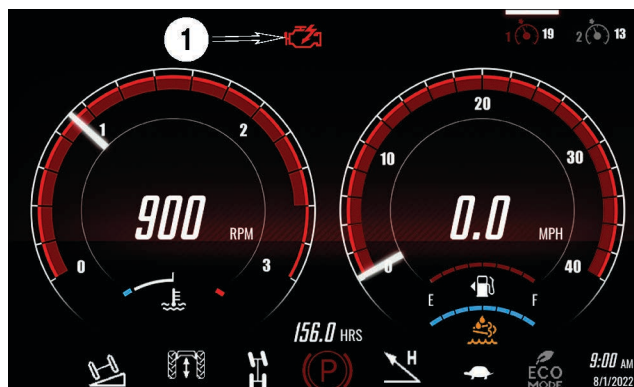
The Diagnostics/ Faults page will give a full description of the warning (1).



0% DEF fluid level:

Soon after the fluid is depleted, the Amber Engine lamp (1) will change to Red Stop Engine Warning.

The final inducement derate will be applied (Engine torque derate, Low Idle lock).



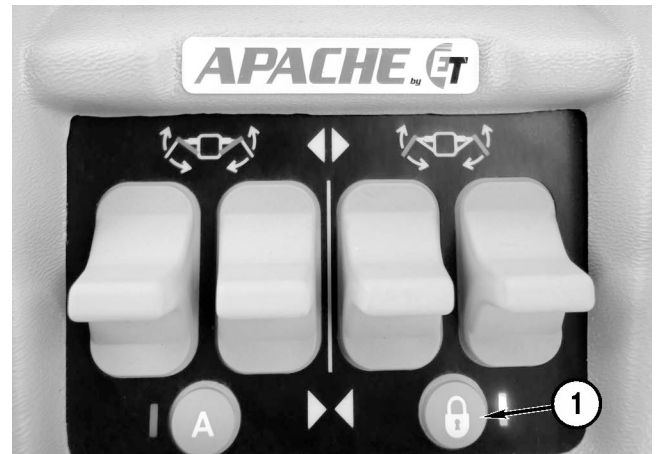
Rack Lock

This machine may be equipped with a rack locking feature.

Note: The rack should only be locked to fold, unfold, or transport the machine. The rack should not be locked while spraying.

To lock the rack press the padlock button on the keypad console. When the rack is locked a light will illuminate next to the padlock.

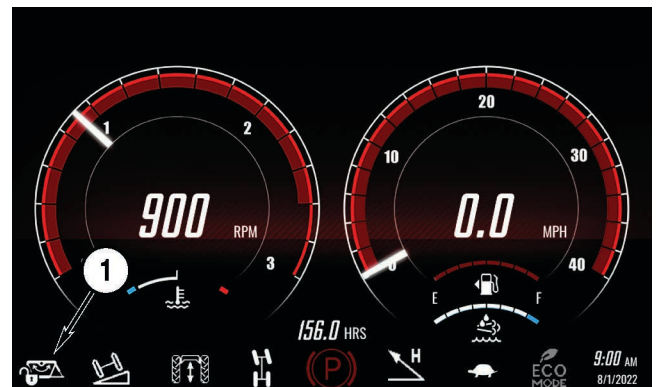
Press the padlock button (1) again to unlock the rack.



The rack can also be locked/unlocked from the main screen. The rack lock icon (1) is located in the bottom left of the screen. Press the icon to lock/unlock the rack.

When the rack is unlocked the icon will be white and the padlock will be open.

When the rack is locked the icon will turn orange and the padlock will be closed.



Steering Modes

The Machine is equipped with 3 modes of steering. To choose the steering mode, locate the STEERING app on the app screen pages (1). Additionally, the steering icon (2) can be pressed on the display main screen.

NOTE: Four-wheel steering modes are only available when machine is in Field mode. They are disabled when in Road mode.



Two-Wheel Drive

This steering mode is the default mode of steering. The front two wheels will turn when turning the steering wheel and the rear wheels will remain stationary. Press the radio button next to '2-wheel' (1) for this option.



Four-Wheel Drive

This steering mode will turn all 4 wheels to assist in making tight turns. This will greatly reduce the machines turning radius. Press the radio button next to '4-wheel' (1) for this option.



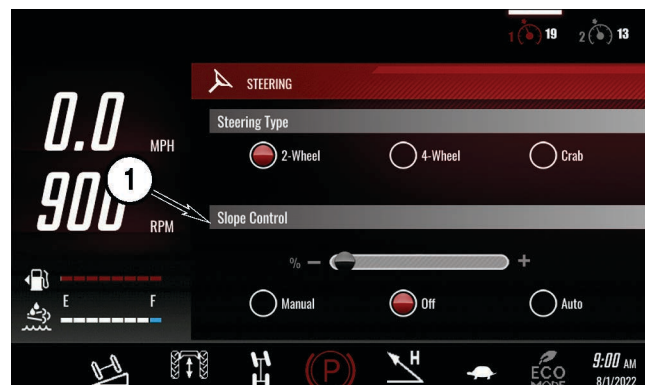
Four-Wheel Crab Drive

This steering mode will turn all 4 wheels in the same direction. This will move the machine left or right while keeping the front of the machine heading in the same direction. Press the radio button next to 'Crab' (1) for this option.



Four-Wheel Steering Slope Balancing Control

The slope balancing control re-aligns the rear axle (counter steering) in order to keep the machine from drifting or sliding along a hill. The slope control settings (1) can be found in the STEERING app below the 2-wheel and 4-wheel steering mode options.



Manual

The steering correction potentiometer determines the desired rear axle steering angle. The steering direction is detected automatically by the inclinometer. The rear axle steers uphill in proportion to the potentiometer value.

Automatic

The inclinometer determines the current roll angle and steering direction. The rear axle steers uphill in proportion to the roll angle. A configurable characteristic defines the relation between roll angle and rear axle steering angle. Additionally, the operator can adjust the automatic control with the steering correction potentiometer depending on external conditions, such as terrain, load, or speed.

Four-wheel slope balancing control will be disabled if machine is in one of the other two four-wheel steer control modes.

Driving Modes

This machine is equipped with separate driving modes, hard mode and soft mode. These modes affect the acceleration/deceleration parameters of the machine.

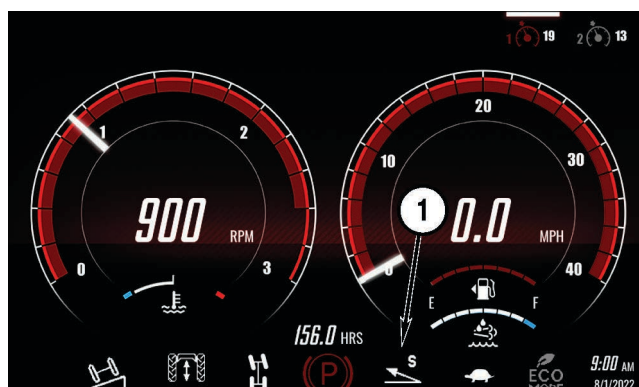
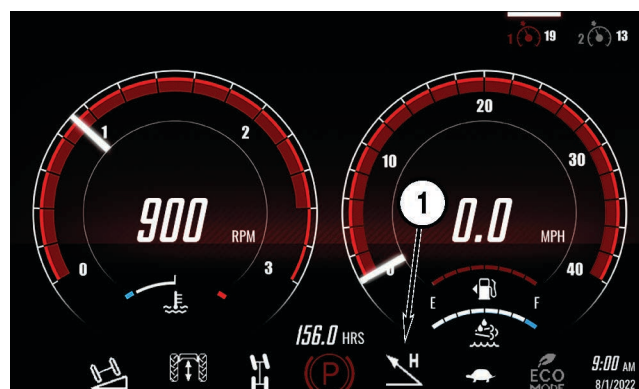
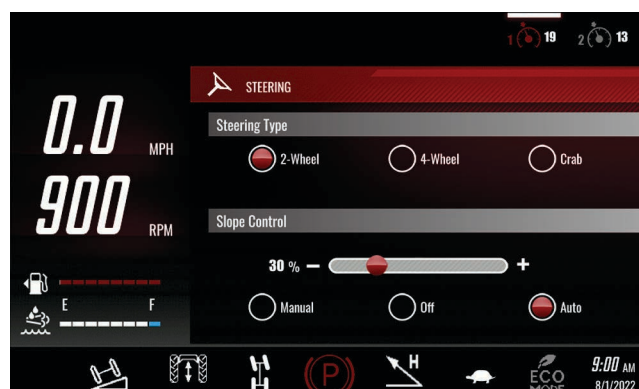
NOTE: Be cautious when changing between these driving modes and know which mode you are in while driving.

Hard Mode

This mode will decrease the response time to changes in throttle positions. The machine will accelerate and decelerate faster and more aggressively. Touch the arrow icon in the bottom bar until you see the letter 'H' above it (1).

Soft Mode

This mode will increase the response time to changes in throttle positions. The machine will accelerate and decelerate slower and less aggressively. Touch the arrow icon in the bottom bar until you see the letter 'S' above it (1).



Speed Range Modes

Two speed range modes are available for this machine.

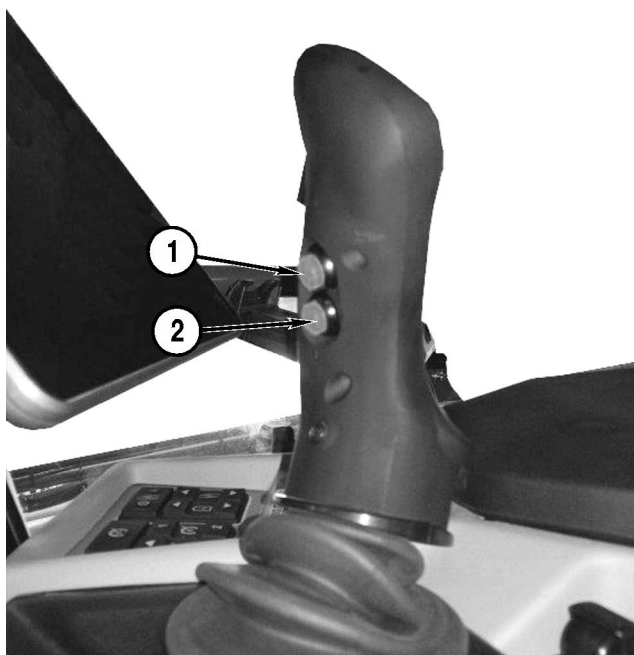
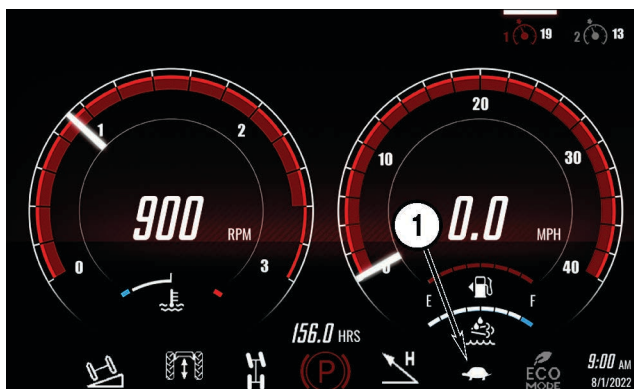
Road mode is the default speed mode. This allows the machine to reach max speeds of 34 mph (55 km/h). When in Road mode, four-wheel steer options, axle width adjustments, and clearance height adjustments are disabled.

Field mode limits the speed the machine can reach to approximately 22 mph (35 km/h).

The speed range selection can be changed by touching the rabbit or turtle icon at the bottom of the display screen. The icon displayed is the speed range mode the machine is in (1).

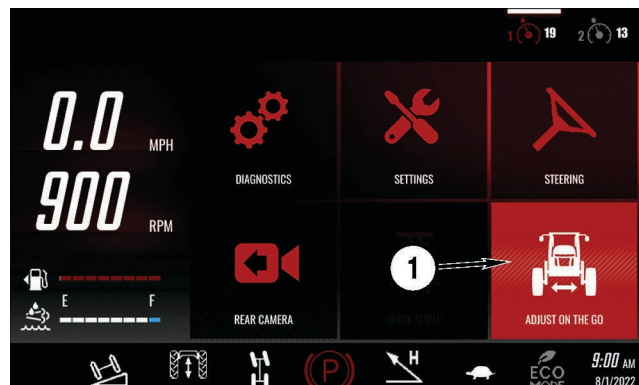
The speed range mode can also be toggled by the buttons on the back of the joystick.

The top button (1) puts the machine in Road mode, and the bottom button (2) puts the machine in Field mode.



Machine Ground Clearance Height Adjustment

The ground clearance height of the machine can be adjusted, if necessary, from 60" to 70". The machine must be in Field mode and the parking brake disengaged for ground clearance control to function. Additionally ground height adjustment may only be allowed within a certain machine speed range. The ground clearance height can be changed using the 'ADJUST ON THE GO' application. Locate the ADJUST ON THE GO app within the app pages (1). Touch the app icon to enter the application.



To increase the machine clearance height, touch or touch and hold the 'Increase' button (1). To decrease the machine clearance height, touch or touch and hold the 'Decrease' button (2).

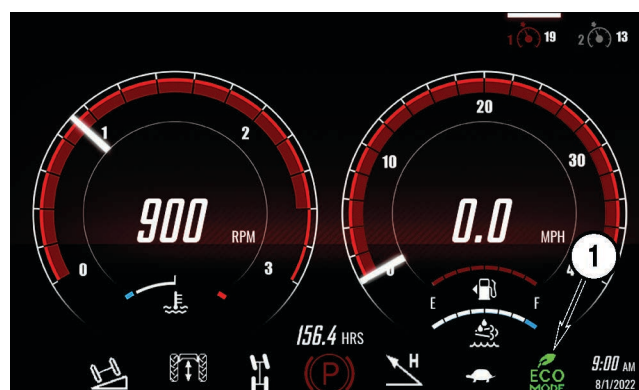
NOTE: Machine can transition to Road mode while machine is higher than minimum clearance height. Make sure the machine is stable when set higher than the minimum clearance height.



Economy (ECO) Mode

This machine is equipped with an ECO mode. The ECO mode lowers engine speed when possible to conserve energy. If parking brake is not released, the engine remains at idle speed, regardless of drive pedal and joystick position. Manual throttle can still be used to override ECO mode to set a minimum engine speed.

An icon at the bottom of the main display screen (1) will turn green when ECO mode is applied.



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

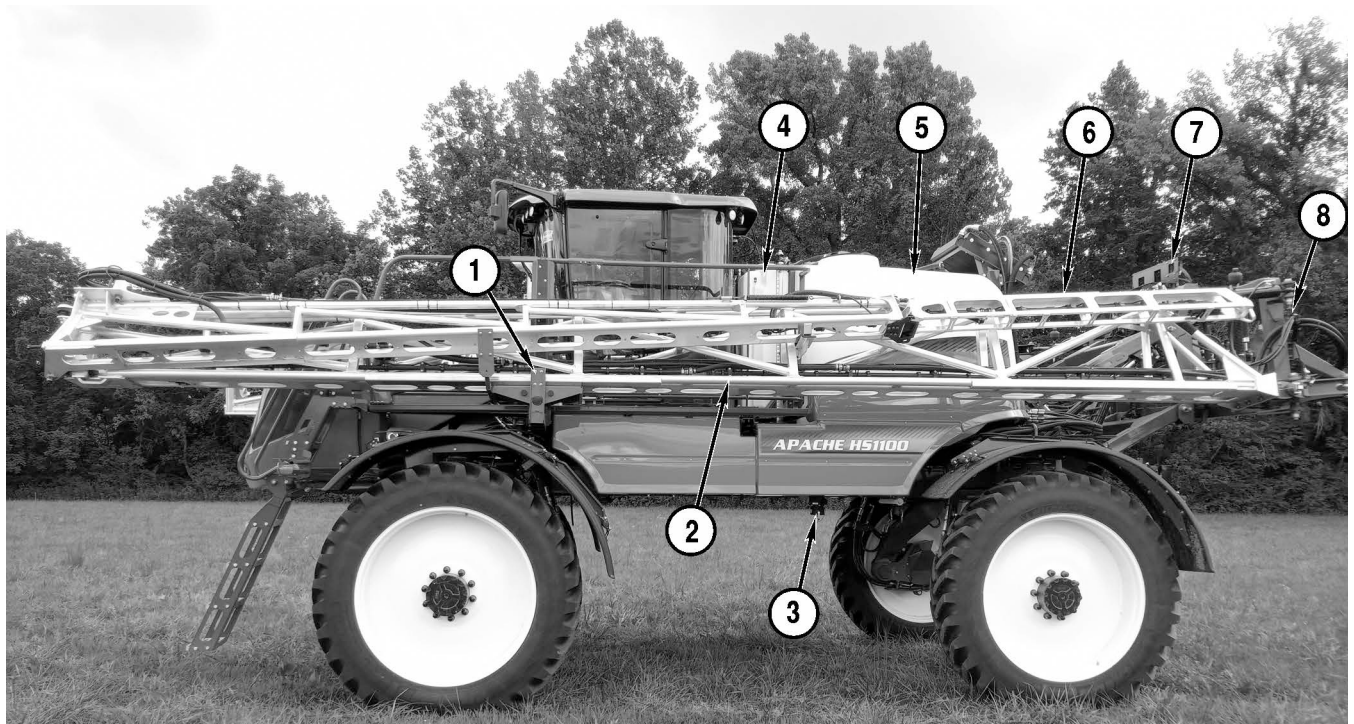
APACHE™

CHAPTER 4

WET SYSTEM OPERATION

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

Wet System Overview

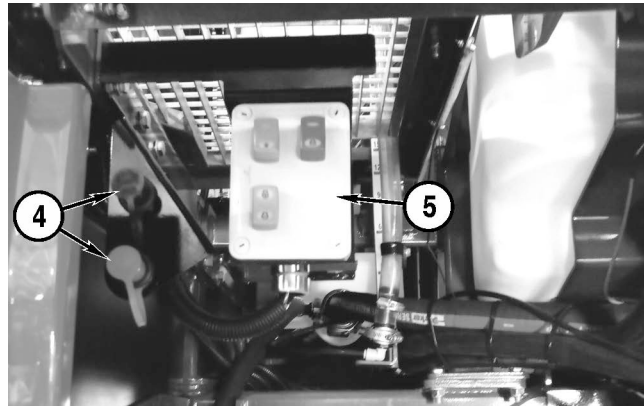
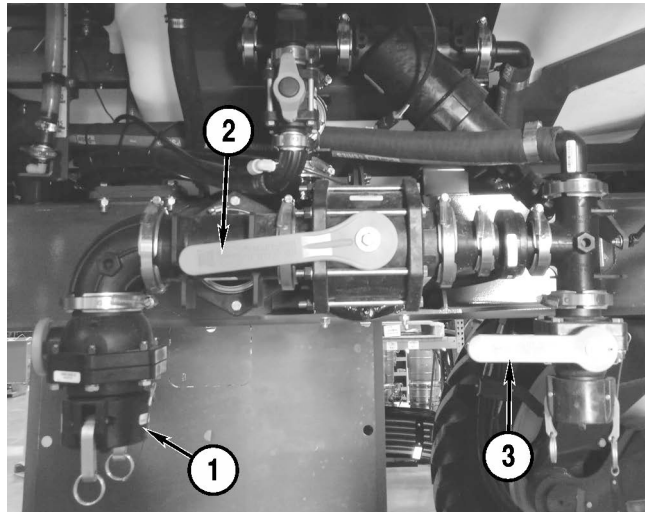


- 1. Boom Cradle
- 2. Left Boom Wing
- 3. Fill Station
- 4. Rinse Tank

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

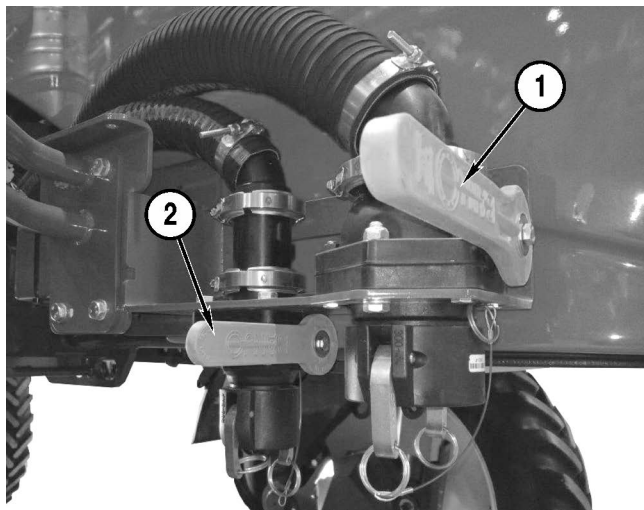
Fill Station

1. **Product Tank Fill**
2. **Product Valve**
This valve directs flow from the product tank to the pump or from the rinse tank to the pump.
3. **Rinse Tank Fill**
4. **Battery Terminals**
Can be used for external pump fill.
5. **Engine Shut Off, Engine RPM, and Product Pump Switches**
6. **Hand Rinse Valve** (not shown)
This valve releases water from the rinse tank and is located below the fuel tank.



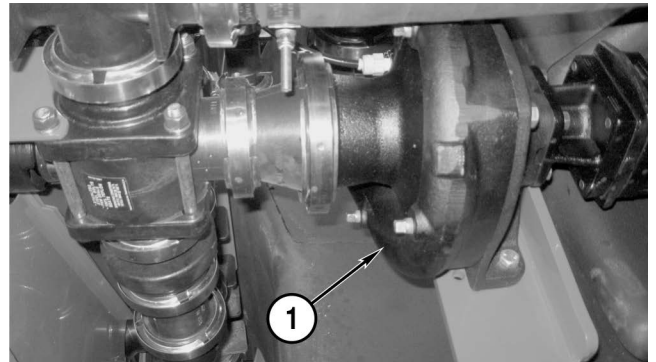
Front Fill

1. **Product Tank Fill**
2. **Rinse Tank Fill**



Product Pump and Valves

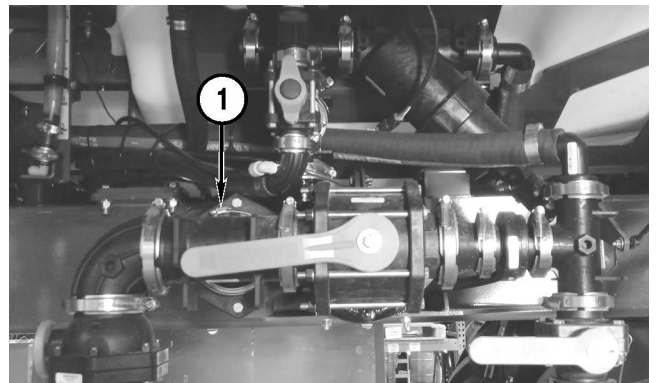
1. Product Pump



Sump Valve

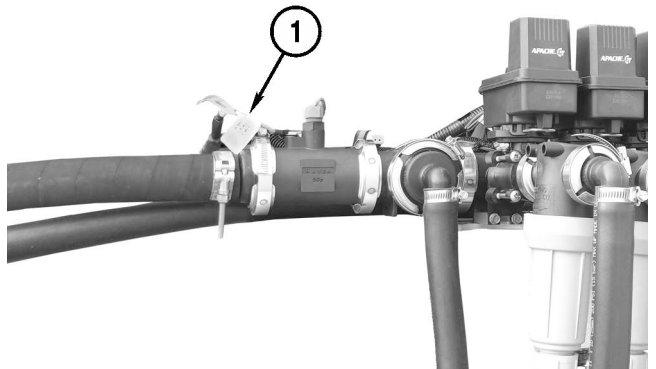
1. Product Tank Sump Valve

Located behind product tank fill valve.

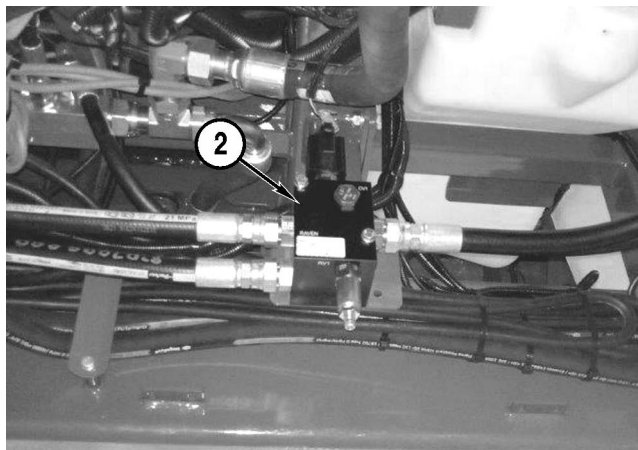


Flow Control

1. Raven Flowmeter

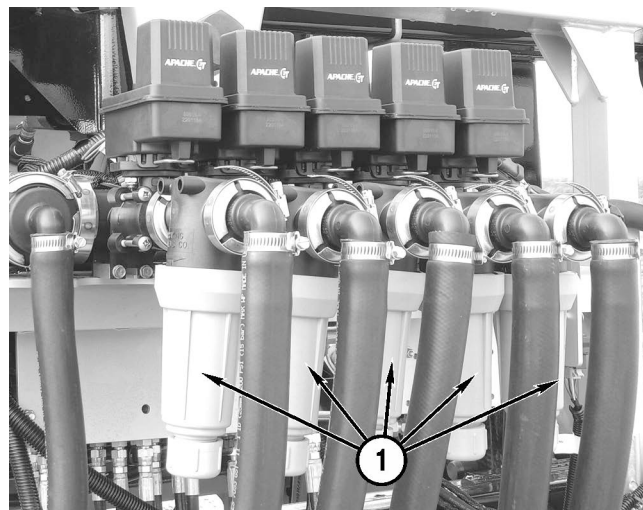


2. PWM Valve



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.



Viper® 4+ Monitor

Viper® 4+ Monitor is the Raven field computer option.

This monitor is built for Equipment Technologies by Raven. 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)

Speed cal (GPS for speed)1000

Meter cal.....See tag on the flowmeter, located on the rear boom rack.

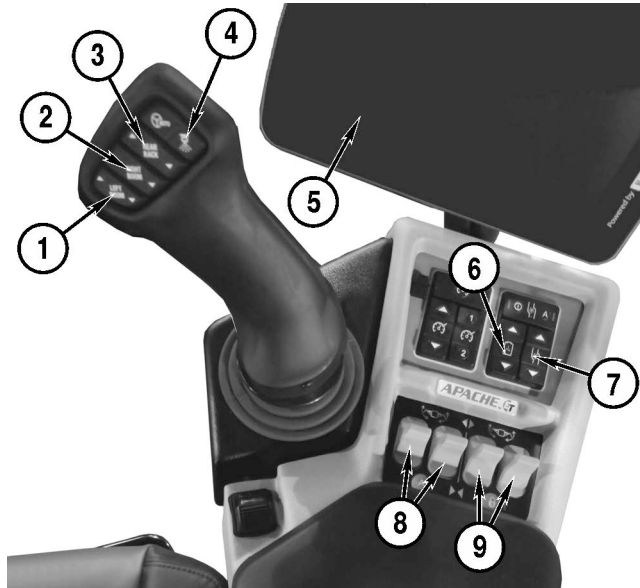
Boom calThe boom cal numbers are specific for each sprayer and are dependent on the boom width, number of sections and nozzle spacing.

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.

Side Console

1. Left Boom Tilt Up/Down Buttons
2. Right Boom Tilt Up/Down Buttons
3. Rack Up/Down Buttons
4. Master Spray Button
5. Universal Terminal Controller (option)
6. Product Pump Button
7. Agitate Up/Down Buttons
8. Left/Right Wing Fold/Unfold Buttons
9. Left/Right Tip Fold/Unfold Buttons



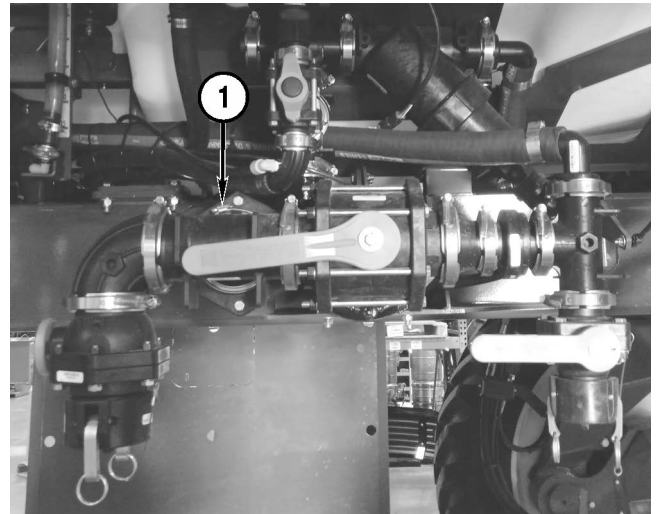
Joystick

- 1. 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.
- 2. 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.
- 3. 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.
- 4. Master Spray Switch**
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) located behind the product tank fill valve.

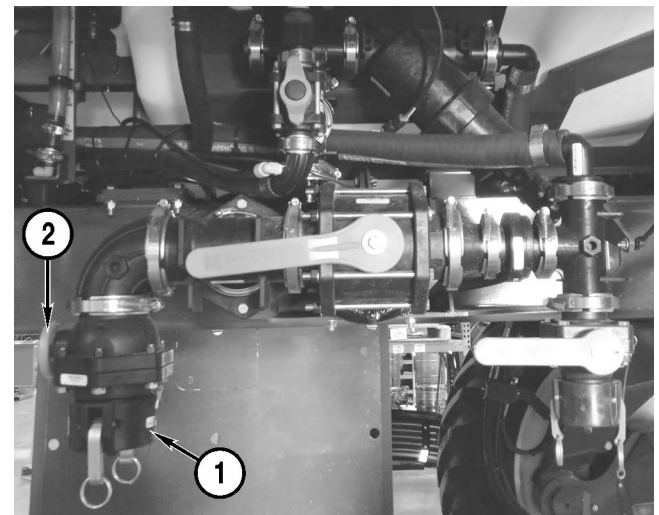


Remove the cap from the product fill inlet (1) and connect the hose from the nurse tank to the inlet.

Open the product fill valve (2), 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.

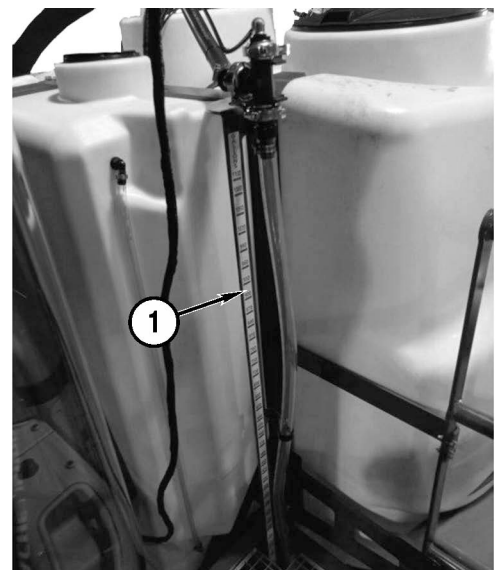
Disconnect the hose from the inlet and install the quick fill inlet cap.



Product Tank Sight Gauge

The product tank sight gauge is located in front of the product tank on the walking surface. The gauge (1) indicates the amount of product in the tank up to the maximum level (1100 gal).

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

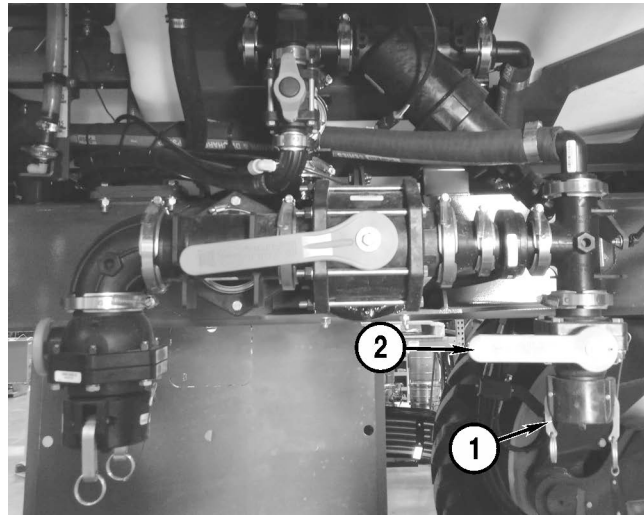
Remove the cap from the rinse fill inlet (1) and connect the hose from the nurse tank to the inlet.

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.

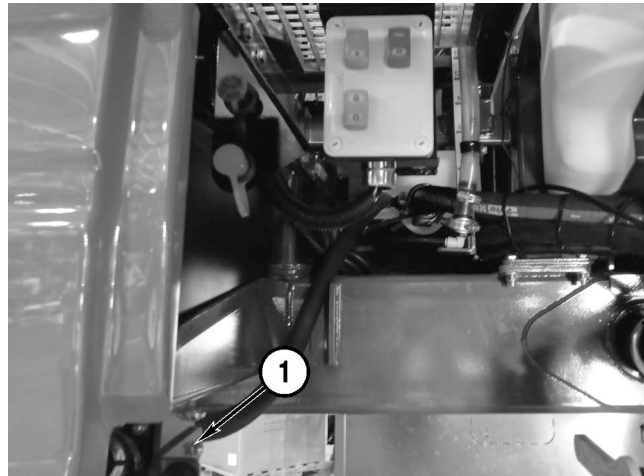
Disconnect the hose from the inlet and install the fill inlet cap.



Hand Rinse

The hand rinse valve is located below the fuel tank (1). The hand rinse water comes from the main rinse tank.

IMPORTANT: Rinse tank water is **NOT** potable water.



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

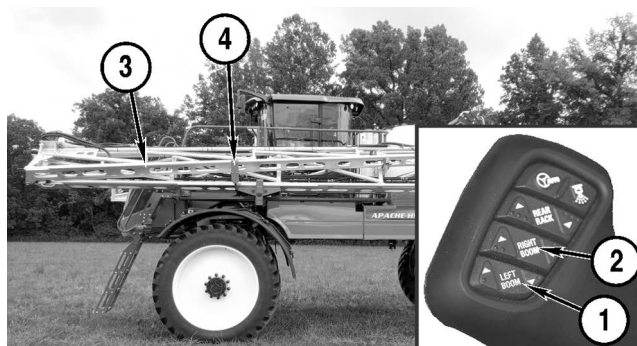


WARNING! Control Hazard. NEVER fold or unfold the booms while the Apache Sprayer is moving over 5 mph [8.04 km/h] or with the optional Auto Boom height control turned ON.

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 switches to raise the booms (3) off of the boom cradles (4).



Unfold Boom Wings

NOTICE: Lock boom rack before unfolding. Rack movement could cause damage or injury.

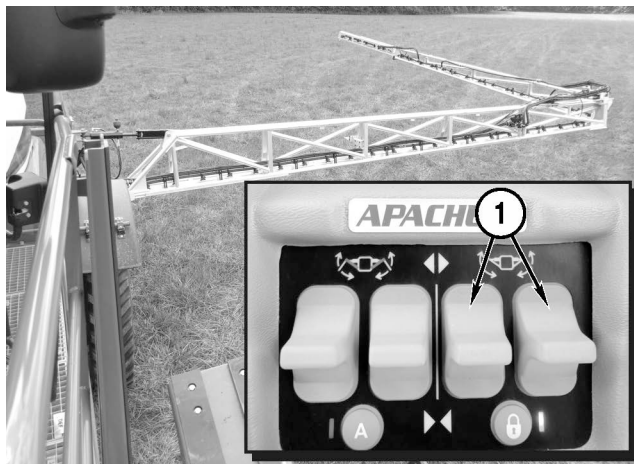
On the console keypad, press and hold the left and right wing switches (1) until the boom wings are fully extended. After the boom wings are fully extended, the boom tips can be unfolded.



Unfold Boom Tips

NOTICE: The machine can be damaged if the booms are not unfolded properly.

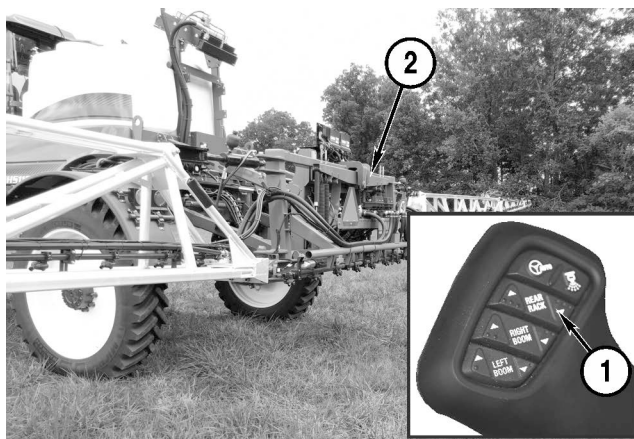
On the console keypad, press and hold the Left and Right Tip buttons (1) until the boom tips are fully extended.



Height Adjustment

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

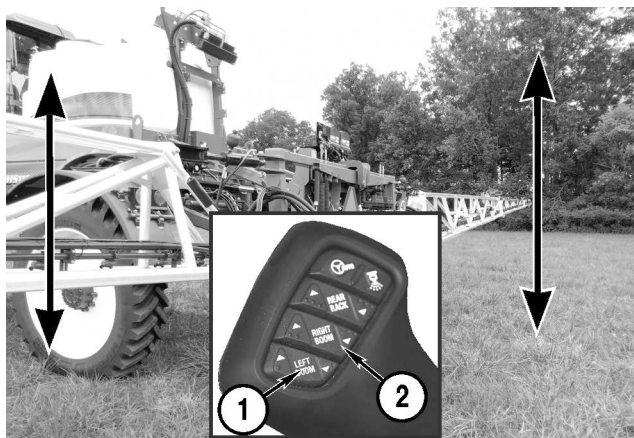
Press the top of the switch to raise the boom rack.



Tilt to Level Boom

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

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

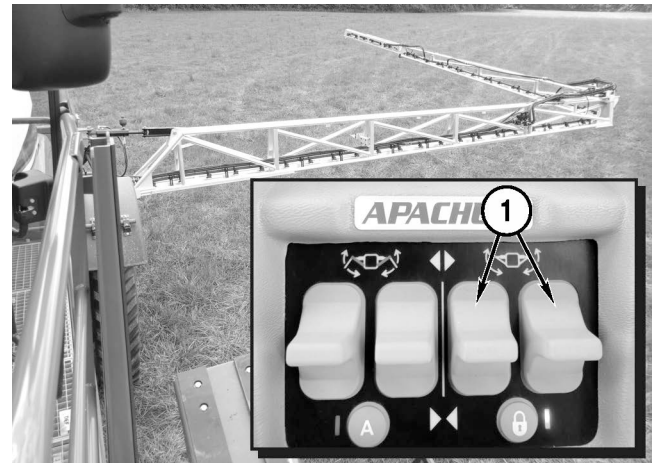


Fold Boom Tips

NOTICE: Lock boom rack before folding. Rack movement could cause damage or injury.

On the console keypad, press and hold the left and right tip buttons (1) until the boom tips are fully folded.

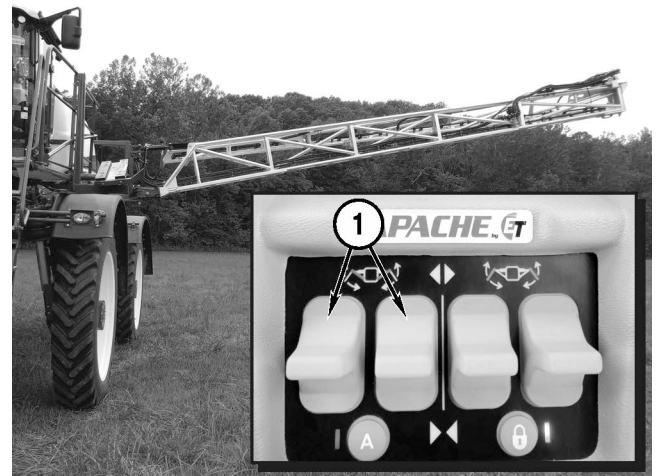
After the boom tips are fully folded, the boom wings can be folded.



Fold Boom Wings

NOTICE: ALWAYS raise the rack completely and level the boom wings before folding the booms.

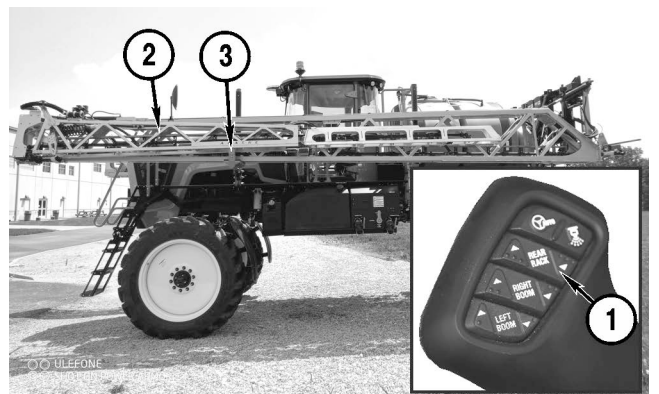
On the console keypad, press and hold the left and right wing buttons (1) until the boom wings are fully folded.



Boom to Cradle

On the joystick press the rack down switch (1) to lower the rack until the booms (2) are resting in the cradles (3).

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



AutoFold Option

The AutoFold function is accessed in the touch screen. The icon is located below the speedometer and to the left of the gear indicator.

Supplemental AutoFold information is in the Raven Viper 4+ screen. Refer to the Raven manual for additional information.

The AutoFold option is only available with the XRT package, but is not standard. The icon appears on the touch screen once AutoFold is unlocked and calibrated through the viper 4+.

NOTE: Booms can always be operated with the standard Unfold/Fold functions on the joystick and keypad. Using these buttons will abort the AutoFold function.

NOTE: The Unfold/Fold process will 'time-out' when an electrical process is taking too long. The screen will return to the start screen.

NOTE: The end user climate can impact AutoFold performance if it is considerably different from the climate of calibration. Contact dealer if you suspect this performance issue.

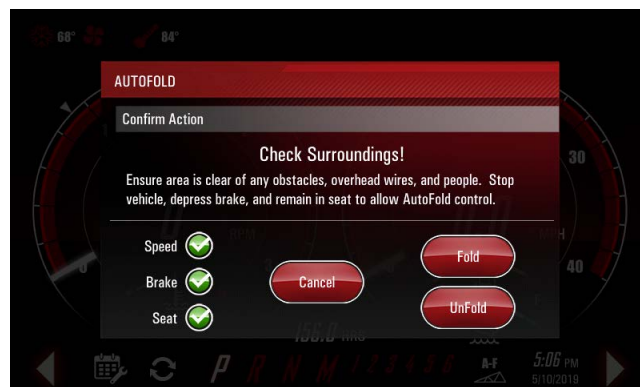
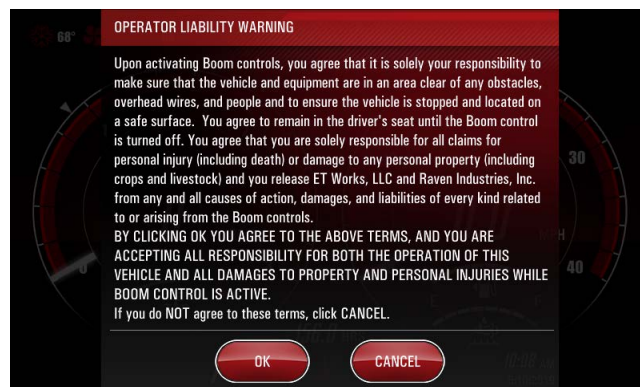


Unfold

1. Touch the AutoFold icon on the touch screen or press and hold the unfold/fold button on keypad for 3 seconds.
2. When the Operator Liability screen appears, read and understand the liability warnings. Touch OK to accept the liability agreement.
3. The Safety Check screen appears next. In order for AutoFold to function the following safety requirements must be met:
 - Speed is zero
 - Brakes are engaged
 - Operator is sitting in seat
 A check mark confirms the requirement has been met.
4. Touch and release the Unfold button. The booms will tilt and unfold automatically.

NOTICE: If any of the three safety requirements are not met during unfold or if any boom button is pressed, the function will be aborted.

The unfold function can be reengaged by once again meeting the three safety requirements and touching the Unfold button.



Fold

1. Touch the AutoFold icon on the touch screen or press and hold the unfold/fold button on keypad for 3 seconds.
2. The Safety Check screen appears next. In order for AutoFold to function the following safety requirements must be met:
 - Speed is zero
 - Brakes are engaged
 - Operator is sitting in seat
 A check mark confirms the requirement has been met.
3. Touch and release the Fold button.

The booms will fold and return to cradles automatically.

NOTICE: If any of the three safety requirements are not met during fold or if any boom button is pressed, the function will be aborted.

The fold function can be reengaged by once again meeting the three safety requirements and touching the Fold button.

Spraying

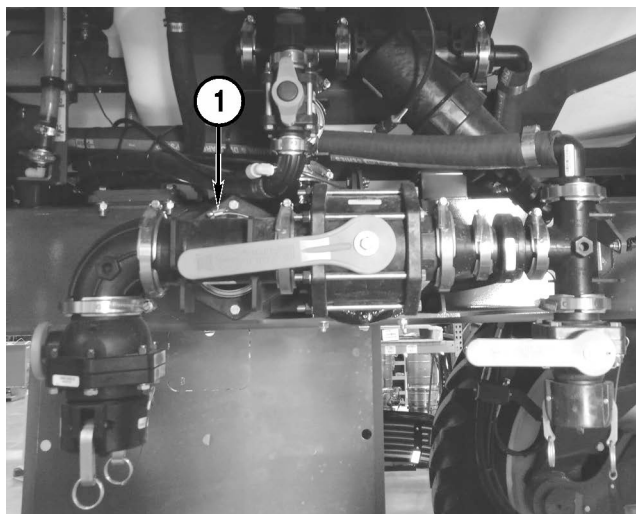
Make sure the product and rinse tanks are filled. See “Filling Rinse Tank” on page 4-8. See “Filling Product Tank” on page 4-7.

Level the booms and boom tips using the tilt and unfold switches. See “Operating Booms” on page 4-9

Set the boom height using the boom rack switch. See “Height Adjustment” on page 4-10.

Open the sump valve (1) located behind the product tank fill valve.

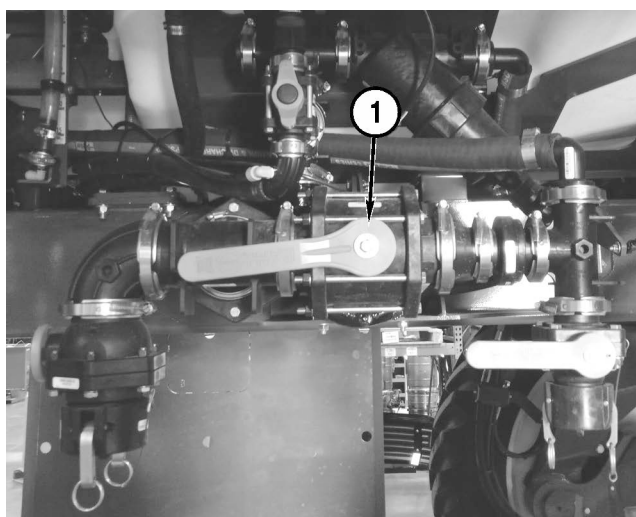
NOTICE: *ALWAYS read and follow all chemical labels and follow all federal and state laws when applying chemicals.*



3 Inch Fill

Turn the product valve (1) to point toward the product tank fill valve.

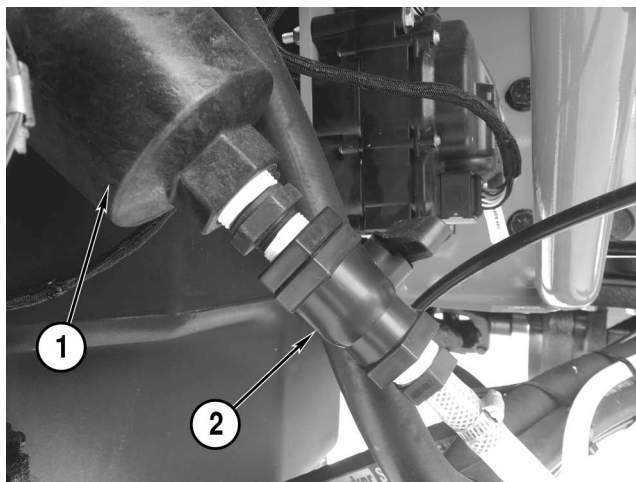
Turn the agitate/rotoflush knob counterclockwise to point toward the agitation valve.



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 or more fine strainer. See the chemical manufacturer's instructions for complete details.



Power up the universal terminal 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.

Using the universal terminal, set the desired boom section 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.



Select an appropriate gear for the desired Apache Sprayer speed during spraying.

Under typical operating conditions, third or fourth gear is recommended.

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

Use the Viper 4 to control boom sections 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 Viper 4 to control the two optional fence row sections.



Quick Spray Mode

Quick Spray Mode is a simple spraying function that does not use the Viper 4+.

Note: Quick Spray will only work if the Viper 4+ is OFF or is set to Manual mode.

From the main start screen, swipe left once.

1. Select Quick Spray on the touch screen to go to the parameters screen.
2. The plus (+) and (-) buttons allow the operator to increase or decrease the pump **PWM** by 0.5% increments. Touching and holding the button will allow the value to change quickly.
3. **Boom Pressure**, (psi) as measured by the Raven product controller.
4. **Application Rate**, (gallons/acre) as calculated by the Raven product controller.
5. **Spurge Pressure**, (psi) as measured by the Raven product controller. This can be manipulated by the agitate buttons on the pilot system.
6. **Manual Section Control**, the nine boom sections can be controlled by the corresponding nine triangles when the Viper 4+ display is OFF or in Manual mode. Each triangle can be pressed to toggle that section valve on/off. Make sure the Master Spray on the joystick is pushed on. The valve status is indicated by color.

OFF = Gray

ON = Blue (both Master Spray and section valve)

NOTE: If Viper 4 + display is ON or in Automatic mode, the triangle icons **cannot** be used to toggle the valves. Color still indicates status of the valve being on or off.

NOTE: The fence row nozzle cannot be controlled with Quick Spray.

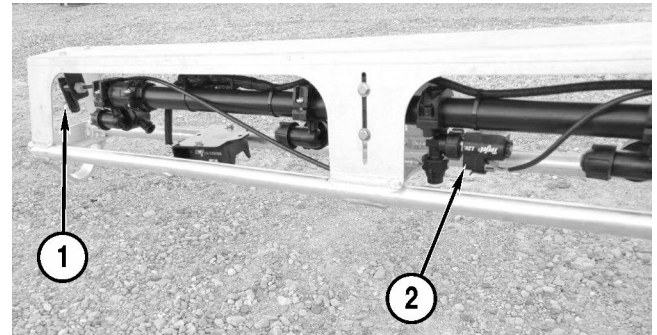
Optional Fence Row Nozzle with Switchbox

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.

NOTE: For fencerow nozzles without a switchbox, consult Viper manual.



Flushing Product Tank

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

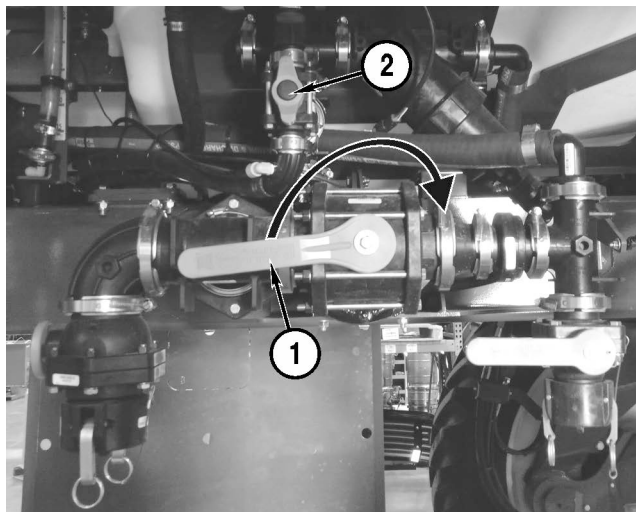
NOTICE: DO NOT run the product pump dry. Damage to the pump seals will result. DO NOT intentionally dead-head the pump with high pressures. Damage to the pump seals will result.

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

Turn the product valve (1) to point toward the rinse tank fill valve.

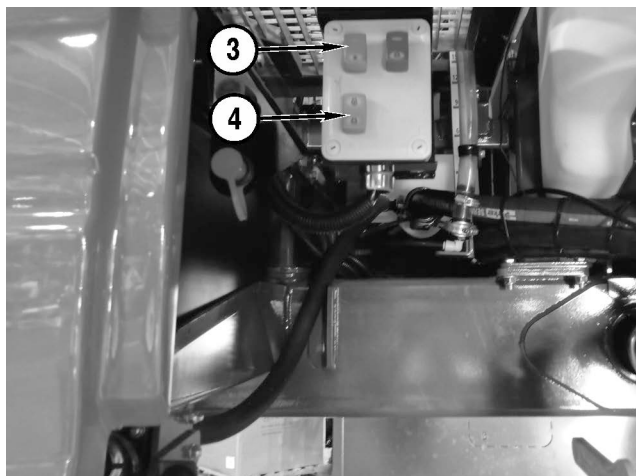
Turn the agitate/rotoflush knob (2) clockwise toward the rotoflush hose.

Start the engine.



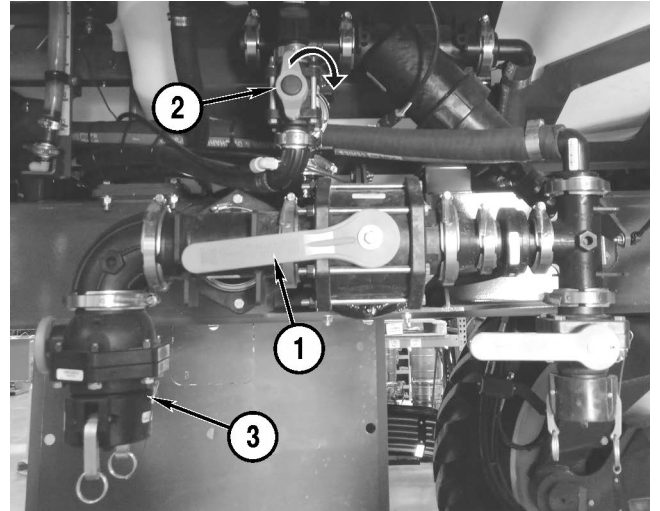
Push the product pump button (3) to turn on the product pump. Increase the engine speed to approximately 1200 RPM using the RPM raise/lower switch (4).

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.
- Turn off product pump.
- Turn product valve handle (1) toward product tank fill valve.
- Turn agitate/rotoflush knob (2) to off position (knob horizontal).
- Drain tank safely through the product tank fill valve (3).



Flushing Booms

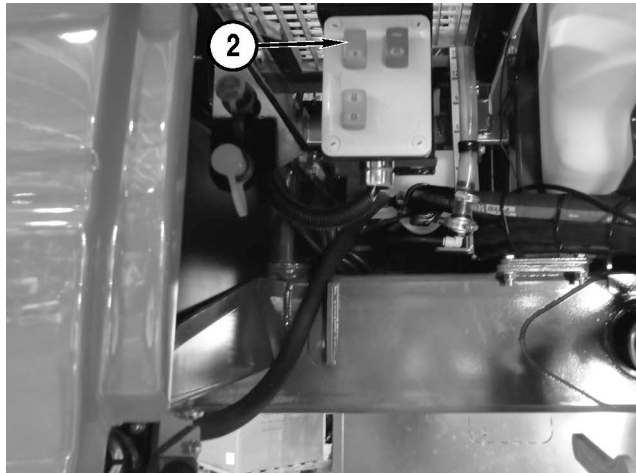
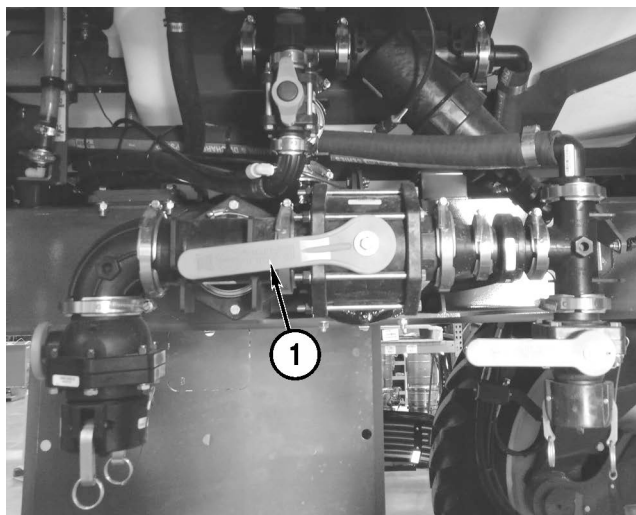
NOTICE: Read and follow chemical labels for proper usage, flushing, disposal and protective clothing requirement instructions. ALWAYS dispose of chemicals and contaminated rinse water in a safe location in accordance with chemical label recommendations and local laws.

NOTICE: Some chemicals may require multiple tank flushings.

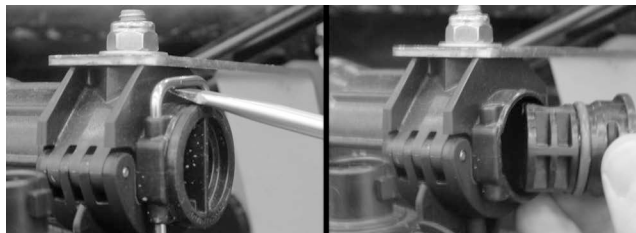
NOTICE: DO NOT run the product pump dry. Damage to the pump seals will result. DO NOT intentionally dead-head the pump with high pressures. Damage to the pump seals will result.

To flush the booms:

- Unfold the booms.
- Turn the product valve handle (1) toward the rinse tank fill valve.
- Remove Hypro Express Endcaps.
- Increase engine speed to 1200 rpm.
- Switch to Manual Spray in the field Computer.
- Turn the product pump on using the product pump switch (2).
- Press the master spray button to flush.

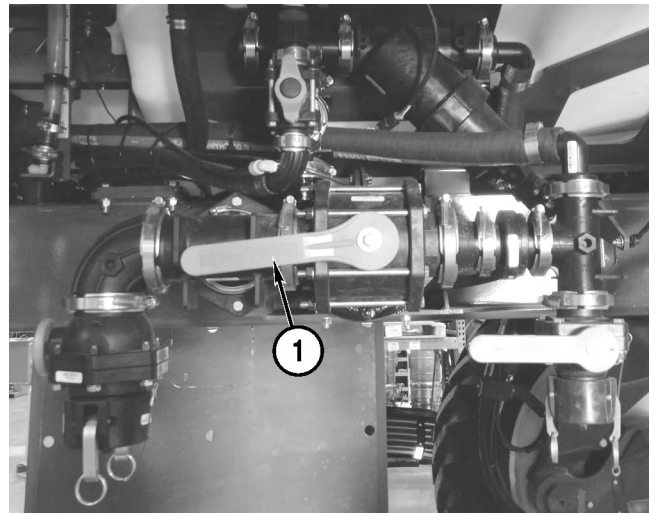
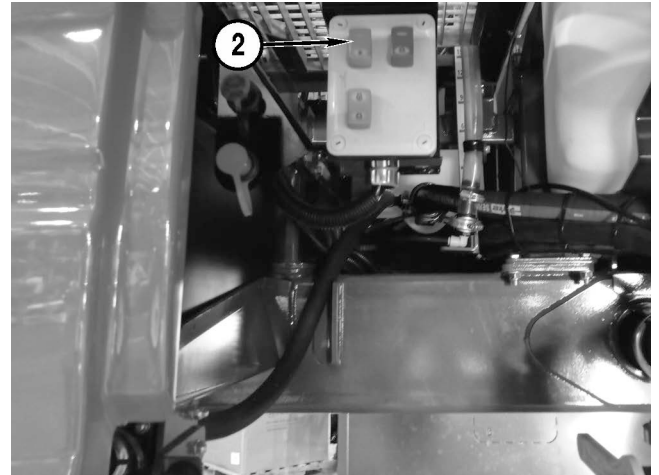


NOTE: If the Apache Sprayer is equipped with an optional chemical eductor, flush the eductor at the same time as the booms.



After the booms are flushed:

- Turn OFF Master Spray Button
- Return the engine speed to IDLE.
- Turn off product pump (2).
- Turn the product valve handle (1) toward the product tank fill valve.
- Replace the Hypro Express Endcaps
- Fold the booms and turn off the engine.



Chemical Eductor (Optional Equipment)

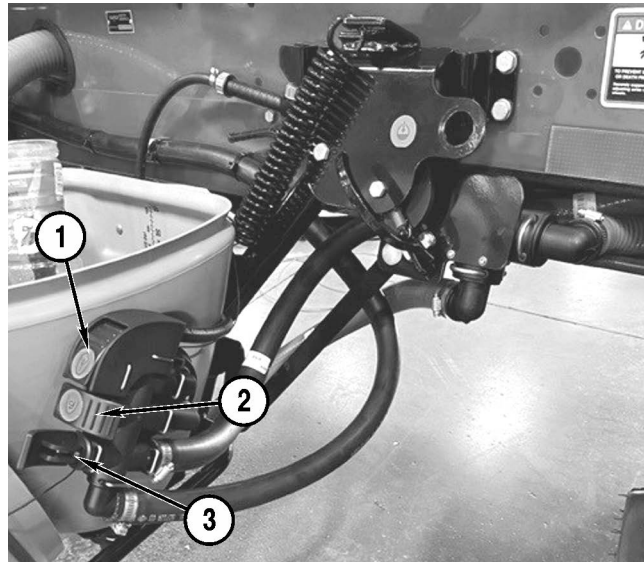
The eductor assembly is automatically lowered and raised with the use of the park brake button. When the park brake is activated, the eductor is lowered. When the park brake is deactivated, the eductor is raised.

Startup

1. All eductor valves must be closed prior to starting. Close the inlet valve (1) and the hopper 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.
4. Divert pump flow to the eductor inlet line by turning 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 inlet valve (1) to the open position.
6. Open the hopper valve (2).
7. Unlock and open the lid slowly.
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.
5. Open the eductor 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 valve (2). Turn the inlet valve (1) 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.

Boom Recirculation (Optional Equipment)

If equipped, the sprayer will have boom recirculation plumbing installed allowing for continuous flow of product throughout the boom plumbing.

Operation

When the recirculation system is active, the spray system is not spraying, nozzle control valves (NCVs) are off, and the electric return valve (1) is fully open. The main pump circulates the spray liquid from the main tank through the existing supply plumbing to the section valves.

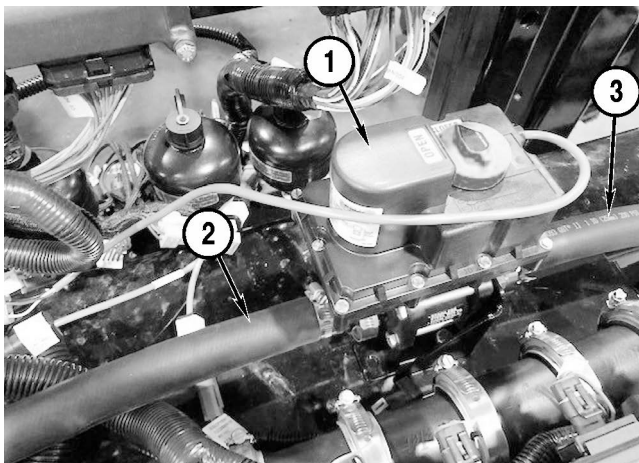
Section valves open in pairs, starting with the outermost left and right sections and progressing inward.

The section valves turn on and off to circulate fluid for a user-defined auto-operation time for each section of the spray system. This keeps the liquid circulating, allowing the system to purge any air, break up chemical deposits, and agitate any separated chemicals through the system without the need to spray out of the nozzles.

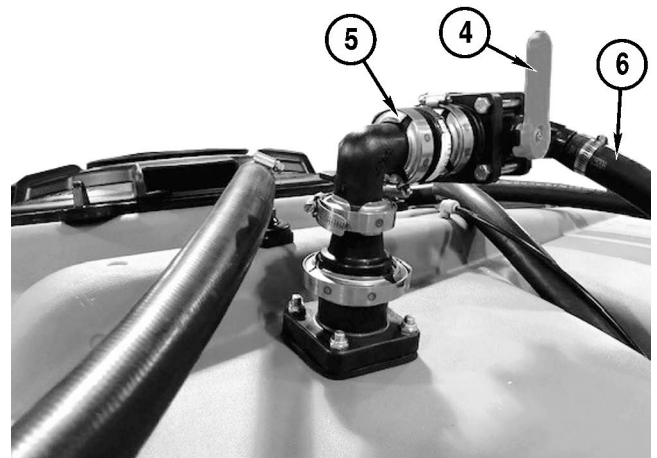
Product returns through the manual throttling valve (4) and electric return valve (1) until spraying resumes.

The manual throttling valve is used to dampen the pressure spike effects of the electric return valve closing when spraying resumes. The individual recirculation hand valves should be used to separate sections when not using nozzle control valves (NCVs) and to isolate boom plumbing sections if maintenance is required or damage has occurred.

NOTE: It is recommended to rinse the system with the boom unfolded to prevent circulating with pinched supply hoses.



1. Electric Return Valve
2. Hose to Product Tank
3. Hose from Boom Plumbing



4. Manual Throttling Valve
5. Check Valve
6. Return Hose.

Required Conditions for Recirculation

The following conditions are required to initiate the boom recirculation feature:

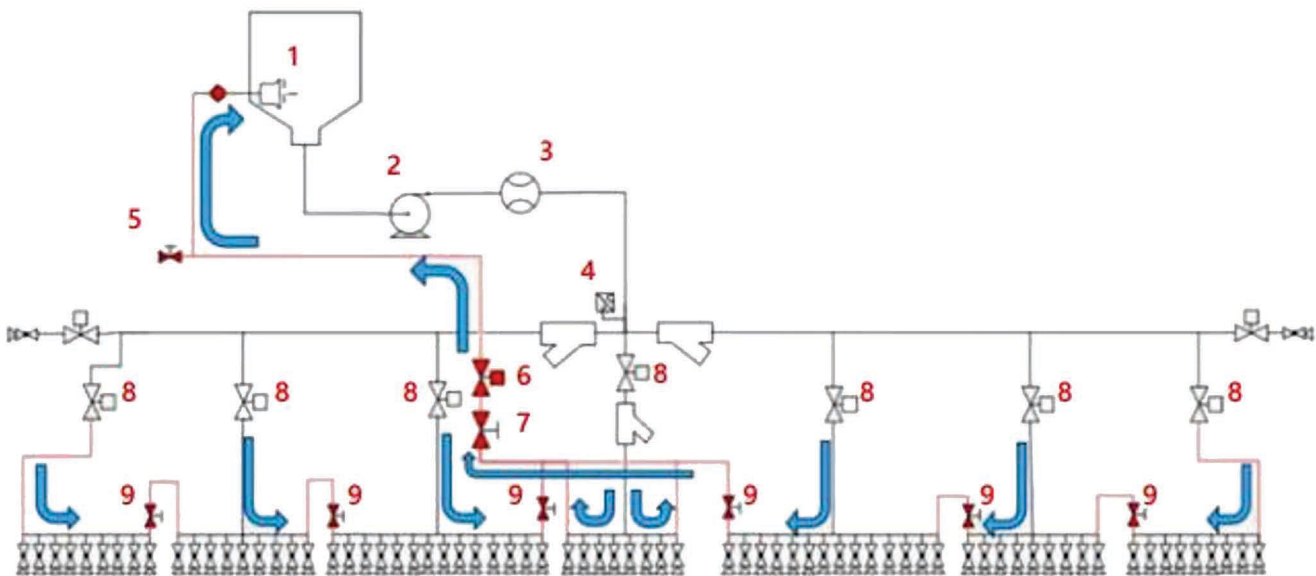
- Confirm the Boom Recirculation feature is enabled.
- Ensure the tank fill feature is not enabled.
- Toggle the product pump on.
- Ensure all boom sections are toggled on.
- Ensure the active spray width is zero.
- Recirculation hand valves between sections must be open.
- Either enable the Auto Recirculate feature or manually initiate recirculation by selecting the Recirculation soft key on the universal terminal (UT).

Auto-Recirculation

The auto recirculate option allows the system to automatically start the recirculation sequence when the active section application width is zero (all sections turned off). If the auto recirculate feature is not enabled, the operator must activate recirculation manually using a button on the universal terminal (UT).

NOTE: Whether set for manual or automatic recirculation, recirculation will automatically turn off when spraying resumes.

General Boom Recirculation Diagram



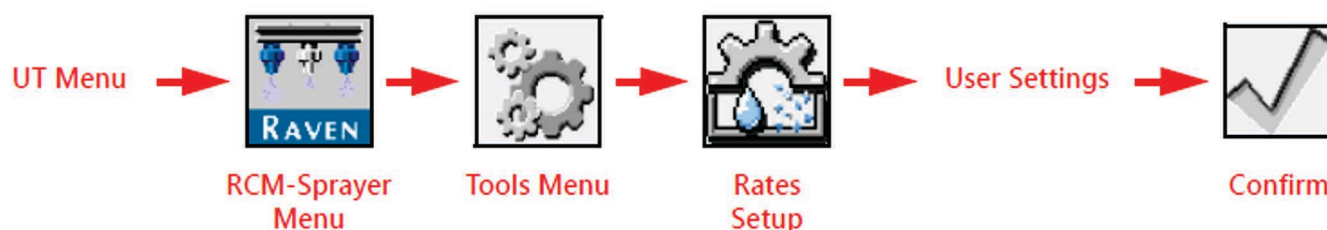
- | | |
|-----------------------------|-------------------------------|
| 1. Main Tank | 6. Electric Return Valve |
| 2. Main Pump | 7. Throttling Valve |
| 3. Main Flow Meter | 8. Section Valves |
| 4. Boom Pressure Transducer | 9. Recirculation Hand Valves. |
| 5. Drain Valve | |

Setup (Raven Boom Recirculation Specific)

To turn on main product recirculation:

1. Open the universal terminal (UT) menu and select the RCM-Sprayer menu button.
2. Select the Tools menu soft key along the right side of the display.
3. Select the Rates Setup tab along the top of the display.
4. Select the User Settings tab and select the Next button in the lower, right corner twice to display the Boom Recirculation check box option.
5. Enable the Boom Recirculation feature.

Setup Enable Main Product Recirculation



NOTE: The system will display a prompt for the operator to confirm that the plumbing of the system will support boom recirculation features. Once confirmed, the Boom Recirculation soft key will be displayed on the home page.

6. Enable the Auto Recirculate feature to allow the system to automatically initiate the recirculation system any-time the system is not spraying.

NOTE: Recirculation will always stop automatically when normal spraying is initiated, when tank fill operations are started, when the main product is turned off, or when a direct injection product is turned on. The operator may also manually stop recirculation by selecting the Recirculation soft key on the home page. Pressing this button disables the Auto Recirculation feature and returns the system to Manual Recirculation Mode.

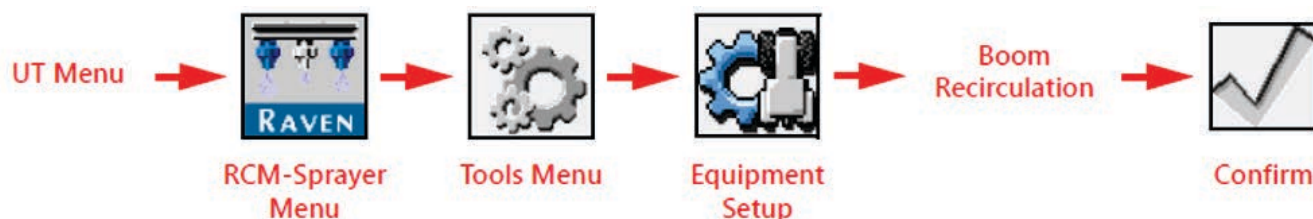
7. The Boom Recirculation soft key will be displayed on the universal terminal (UT) home page.



Adjust Recirculation Times

To adjust the time allowed for recirculating each section:

1. Open the universal terminal (UT) menu and select the RCM-Sprayer menu button.
2. Select the Tools menu soft key along the right side of the display.
3. Select the Equipment Setup tab along the top of the display.
4. Use the next button to access the Section Auto-Operation Times page.
5. This page allows the operator to adjust the section recirculation times for the specific application system or current chemical suspension.



What To Expect While Recirculation Is Active

NOTE: When operating in Auto Recirculation Mode, it is recommended to adjust the Standby PWM% value so that recirculation pressure is close to the application pressure used during application.

When recirculation is active:

- Nozzle Control Valves (NCVs) will remain off.
- The main product pump runs at the “Standby PWM%” value.
- Section valves will cycle “On” sequentially in pairs from the outermost to innermost sections for the user defined recirculation time.
- The system will continue to monitor the main flow meter to ensure product is circulating. If the product recirculation is less than the low limit of the flow meter, the system will display an alert, but recirculation will continue.
- The boom pressure transducer is monitored to ensure the system pressure stays within the minimum and maximum allowable pressures. The main product pump will shut down if the boom pressure exceeds the minimum (2 PSI) or maximum (150 PSI) pressure.
- Section valves will continue to cycle sequentially unless spraying or shutdown conditions are met.
- The drain valve will be used to drain out any product in the recirculation line when rinsing the boom.

See Raven operation manuals for more information.

Setup (CapstanAg PinPoint III Boom Recirculation Specific)

To enable boom recirculation:

Tap Wrench > Pressure > Pump Setup > 2nd Page

Option 13: Recirculation

- OFF - Boom Recirculation will be inactive
- MANUAL - Manually turn on recirculation. Recirculation will turn off automatically when sections turn on
- AUTO - Recirculation automatically turns on when all sections are off
- AUTO DELAY 30s - Automatically turns on after all sections have been off for 30 seconds

Option 14: Recirculation Valve - Ensure this is set to 'Normally Closed'.

The screenshot shows the 'Pump Setup' screen with a list of 15 options. The settings are as follows:

Option	Setting
9	Min Pressure 15 PSI
10	Max Pressure 100 PSI
11	Max Flow 0 Gal/Min
12	Pump Power Up Status OFF
13	Recirculation Auto Delay 30s
14	Recirculation Valve Normally Closed
15	Cycle Boom Valves Enable

Navigation icons are visible: a back arrow at the top left, an up arrow on the right side, and a down arrow at the bottom right.

[illegible]

APACHE™

CHAPTER 5

LUBRICATION AND MAINTENANCE

The Scheduled Maintenance Icon will illuminate when maintenance is required.

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

Maintenance Precautions

- Parts found defective during 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 Educator Manual, Product Pump Instructions and other optional equipment manuals.

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

Cleaning Guidelines

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

**WARNING! Fire Hazard**

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

**WARNING! Exposure Hazard.**

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

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

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

Mechanical Parts

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

Electrical Parts

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

Body and Cab Exterior

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

Apache Sprayer Service Interval Chart

Perform and repeat the prescribed maintenance at each interval ○ = Conditional Service ● = Regular Service ▲ = Required 100 Hour Service NOTE: DO NOT overlook the "At 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 or Yearly	Every 500 Hours or Yearly	Every Year	Every 1000 Hours or Yearly	Every 4500 Hours or 3 Years	Every 5 Years
Grease Boom	○			●									
Torque Lug Nuts	○	○			●								
Grease Steering Components	○				●								
Grease Axle Components	○				●								
Grease Cylinders	○				●								
Adjust Boom	○	○	○										
Clean Primary Engine Air Filter			○										
Change Engine Safety Air Filter			○							●			
Adjust Toe-In			○							●			
Bleed Air Reservoir			○										
Flush Wet System (including product pump)			○	●									
Check Tire Pressure				●									
Check Oil Engine Level				●									
Drain Water from Primary Fuel Filter				●									
Check Coolant Level, Cooling Package, and Hoses				●									
Check Hydraulic Fluid Level				●									
Check/Drain Air Filter Outlet Valve				●									
Grease Rear Suspension					●								
Check Final Drive Fluid Level					●								
Check Final Drives for Leaks					●								
Change Hydraulic Fluid Filter (Immediately if indicated by console screen)						▲		●					
Change Primary Fuel Filter						▲			●				
Change Secondary Fuel Filter						▲			●				
Change Engine Oil and Filter						▲			●				
Change Final Drive Fluid						▲			●				
Change Hydrostatic Cartridge							●						
Change Primary Engine Air Filter								●					
Bleed Air Bags								●					
Check Brake Accumulators									●				
Change Cab Filter (charcoal filter)									●				
Winterize Wet System										●			
Change Hydraulic Fluid											●		
Change DEF Tank Filter											●		
Change DEF Supply Module Filter												●	
Change Brake Accumulators													●

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 5-16.
- Grease Steering Components. See “Grease Axles” on page 5-16.
- Grease Axle Components. See “Grease Axles” on page 5-16.
- Grease Cylinders. See “Grease Cylinders” on page 5-18.
- 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.

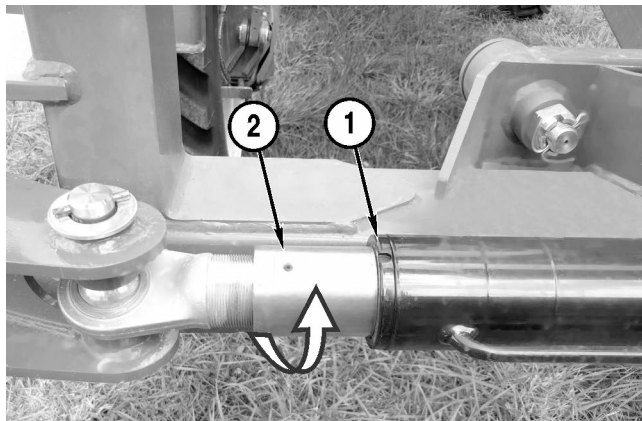
- Torque Lug Nuts. See “Torque Lug Nuts” on page 5-16.

Adjust Boom

NOTICE: Before adjusting boom lead, verify cylinders are adjusted correctly in the folded state. To do this, fold booms in as usual. The boom inner wings barely make contact with the boom side supports. If the booms strike the supports with force, unfold the booms, screw in the rod ends to reduce the amount of thread showing, then fold the booms in. Repeat if necessary until booms fold correctly.

Boom Lead Adjustment

1. Unfold the boom wings and boom tips, then lower the back rack.
2. Loosen the jam nut (1) on the fold cylinder cushion rod.
3. Rotate the fold cylinder cushion rod (2) to adjust the boom lead. Decreasing the number of visible threads on the fold cylinder clevis will reduce the boom lead. Increasing the number of visible threads on the fold cylinder clevis will increase the boom lead.
4. After adjusting the boom lead so that the tips are even with the back rack, tighten the jam nuts (1).



5. To check the boom lead adjustments, raise the back rack and fold the booms all the way in. Then repeat the unfold process and recheck the boom lead. Readjust if needed.



Boom Stabilizer

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

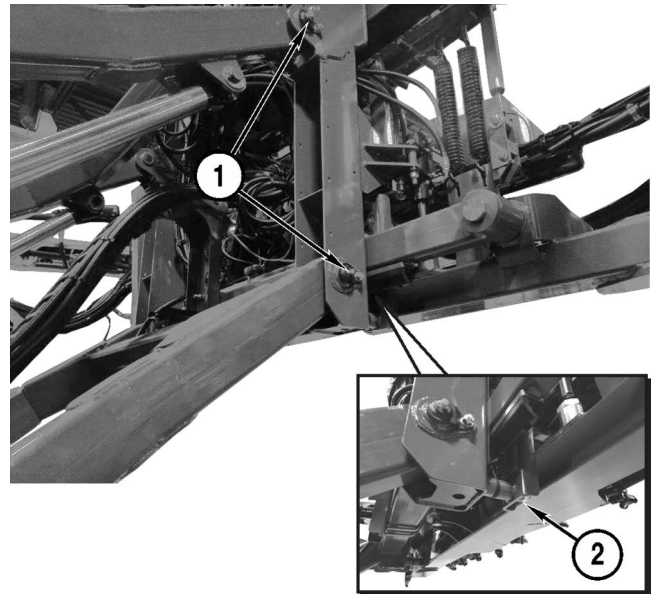
The gap between the nylon wear pads and the steel frame should be 0.039 to 0.079 in. [1 to 2 mm] with the booms unfolded.

To adjust the gap:

1. Tighten or loosen both lock nuts (2) equally until the gap is correct.
2. Repeat for the other stabilizer, as required.

NOTE: For best performance, the jam nuts must be adjusted so the stabilizer halves are parallel and provide the recommended gap.

NOTE: If significant or uneven wear is found on wear pads, replace the pads and readjust when installed.



As Required

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

- Adjust Boom. See “Adjust Boom” on page 5-6.
- Adjust Toe-In. See “Measure and Adjust Toe-In” on page 5-28.
- Clean the Primary Engine Air Filter. See “Clean or Change Engine Primary Air Filter” on page 5-22.

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.

- Change Engine Safety Air Filter. See “Change Engine Safety Air Filter” on page 5-28.

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

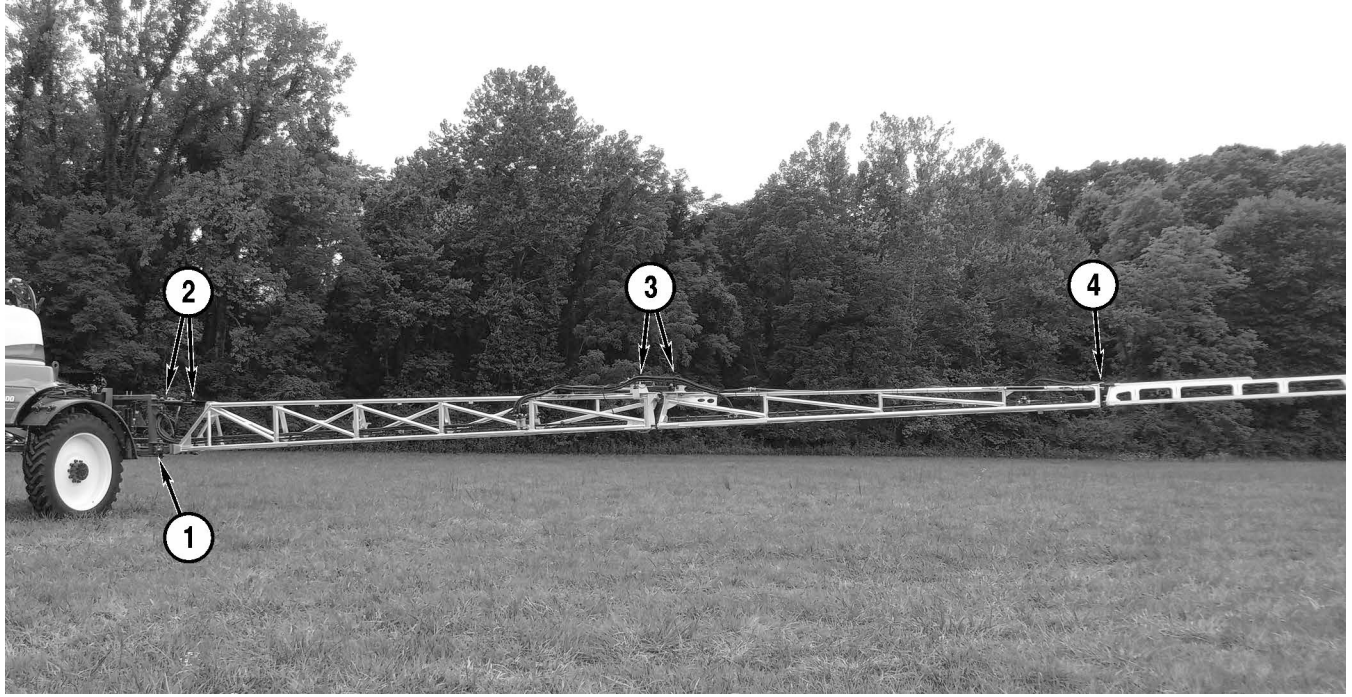
- Flush Wet System. See “Flushing Booms” on page 4-20.
- Bleed Air Reservoir. See “Bleed Air Reservoir” on page 5-15.

Daily

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

Grease Boom

(Optional Equipment)

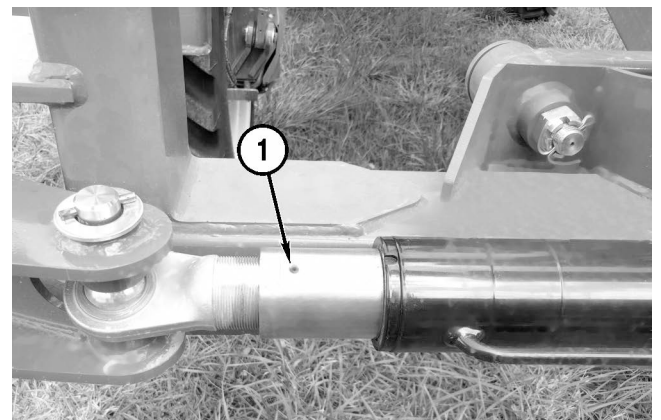


Both aluminum and steel booms are equipped with four sets of grease fittings. Apply an ample amount of lithium grease through each of the grease fittings.

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Boom Fold Cylinder <ul style="list-style-type: none"> • 2 fittings 2. Tilt Cylinder <ul style="list-style-type: none"> • 2 fittings | <ol style="list-style-type: none"> 3. Boom Tip Fold <ul style="list-style-type: none"> • 7 fittings [aluminum] • 8 fittings [steel] 4. Boom Breakaway <ul style="list-style-type: none"> • 1 fitting |
|---|---|

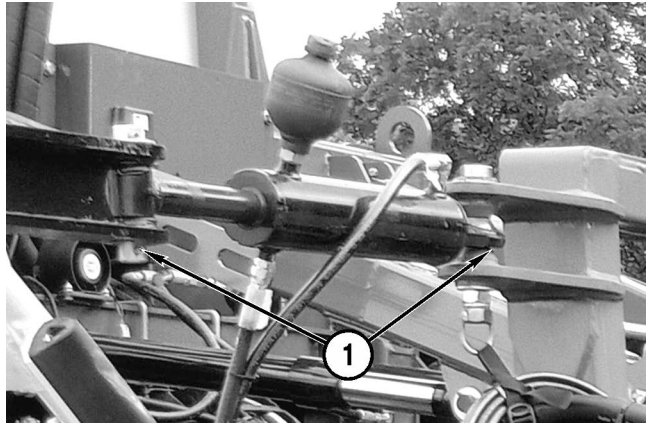
Boom Fold Cylinder

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



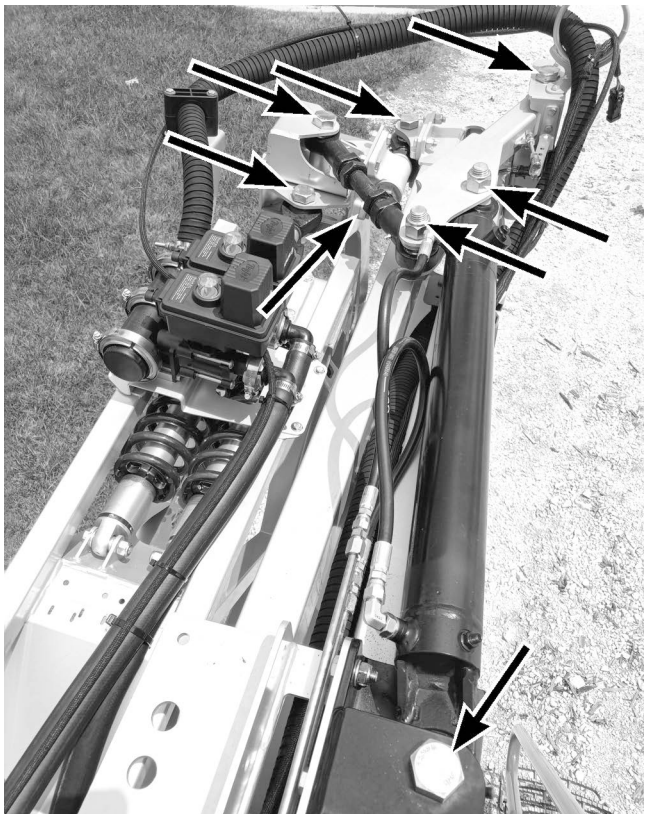
Tilt Cylinder

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

**Boom Tip Fold**

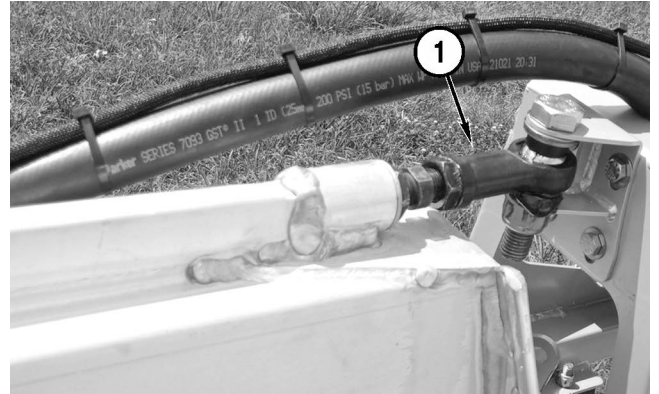
There are seven aluminum grease fittings (upper image) or eight steel grease fittings (lower image) in the boom tip fold area of each boom. The left side is shown.

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



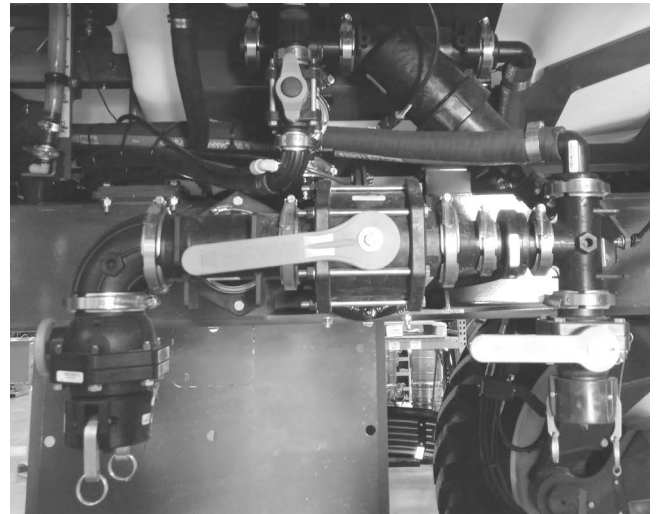
Boom Breakaway

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 4-18. See “Flushing Booms” on page 4-20.



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. See “Apache HS1100 Fluids, Filters and Capacities” on page 1-2.
- Check the rims for cracks and other damage. Replace damaged rims.



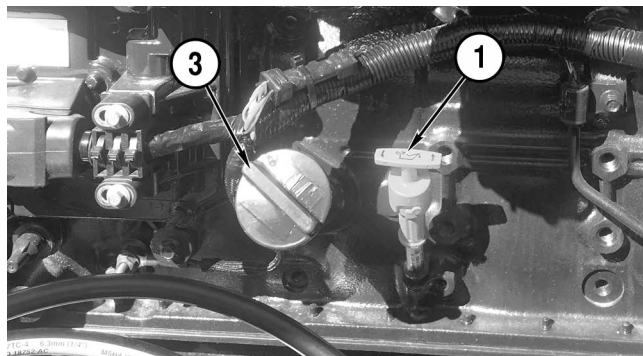
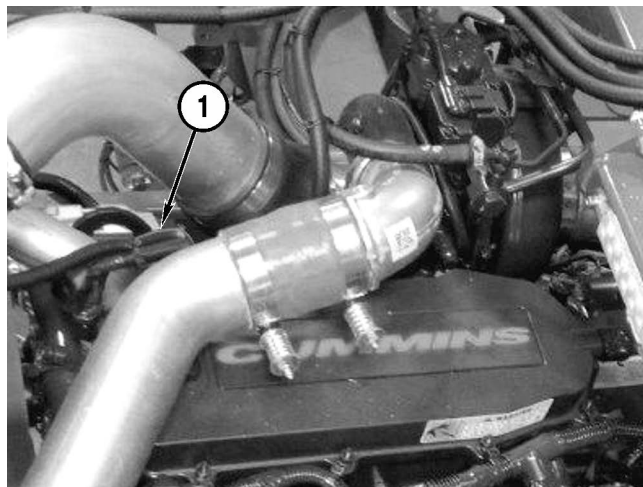
NOTICE: If the engine has been running, shut off and wait 10 minutes before checking oil level.

While parked on level ground, remove the dipstick (1) and check the oil level.

If the oil level is below the ADD mark, add high quality Lucas 15W-40 Magnum motor oil at the oil fill location (2) on top of the engine, just after the radiator expansion tank.

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.



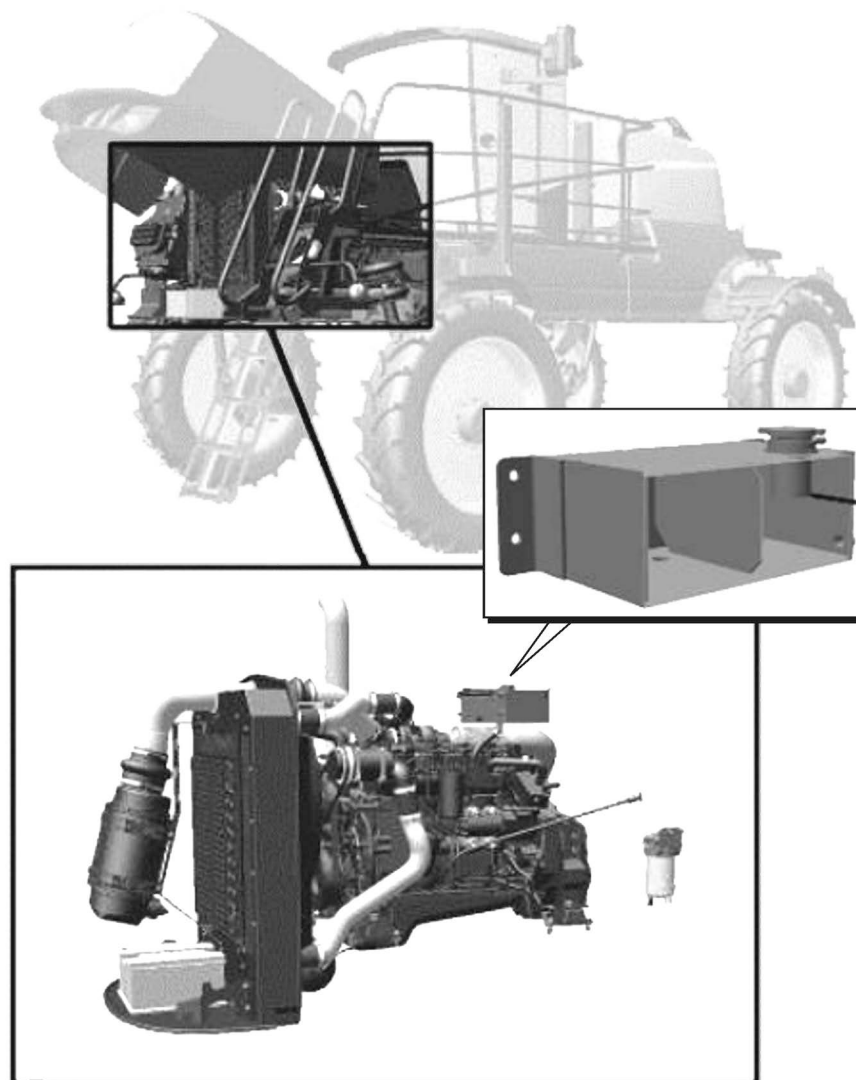
WARNING! Burn Hazard. **NEVER** remove the radiator cap if the engine is hot. Steam and hot engine coolant will spray out and seriously burn you. Allow the engine to cool down before you attempt to remove the cap.

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.**

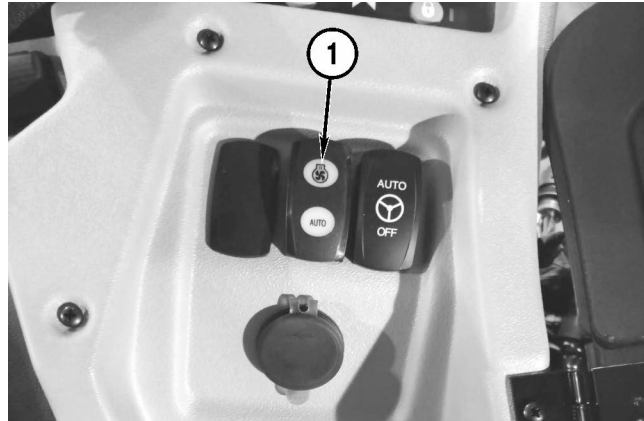
ALWAYS tighten the radiator cap securely after checking the coolant. Steam can spray out during engine operation if the cap is loose.

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 the cycle fan reverser (1) until the radiator and coolers are free of dust and debris. See “Fan Control” on page 3-13.

**Check Hydraulic Fluid Level**

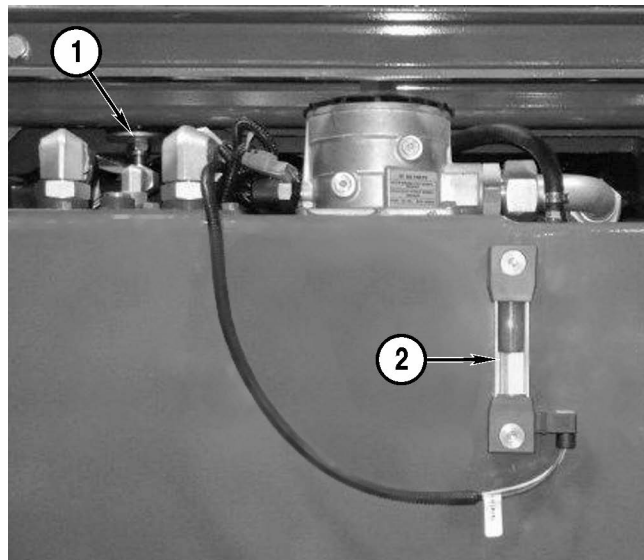
NOTICE: The machine must be on level ground with the booms folded and in the transport position for an accurate hydraulic fluid level reading.

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

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: Oil should be topped off after the oil in reservoir is at operating temperature to avoid overfill. DO NOT fill more than 3/4 up on the sight glass.



Drain Primary Fuel Filter

Drain the water from the primary fuel filter by opening the valve (1).

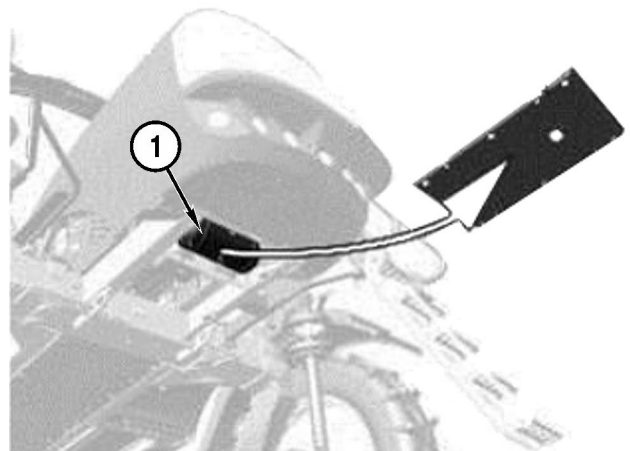
Close the valve after draining.

Use the priming pump (2) to prime the filter.



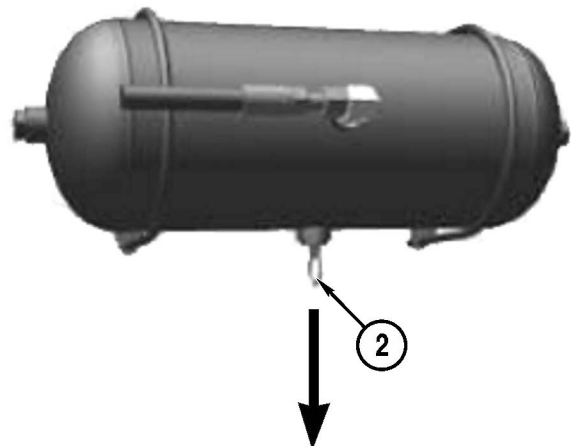
Bleed Air Reservoir

The air reservoir is located beneath the engine in front of the machine. Release the belly pan access panel (1) and locate the air reservoir.



Pull the drain pin (2) at the bottom of the tank to drain any water.

Release the drain pin and replace the access panel.



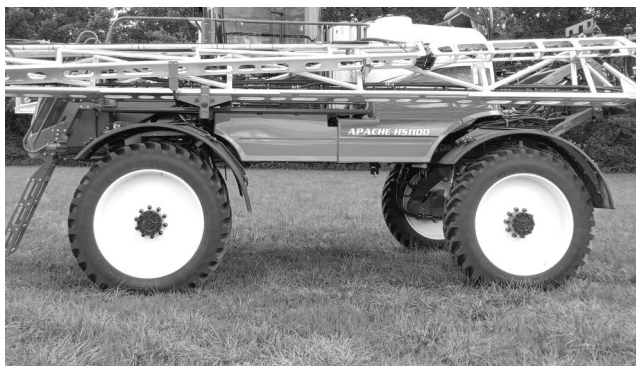
Every 40 Hours

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

Torque Lug Nuts

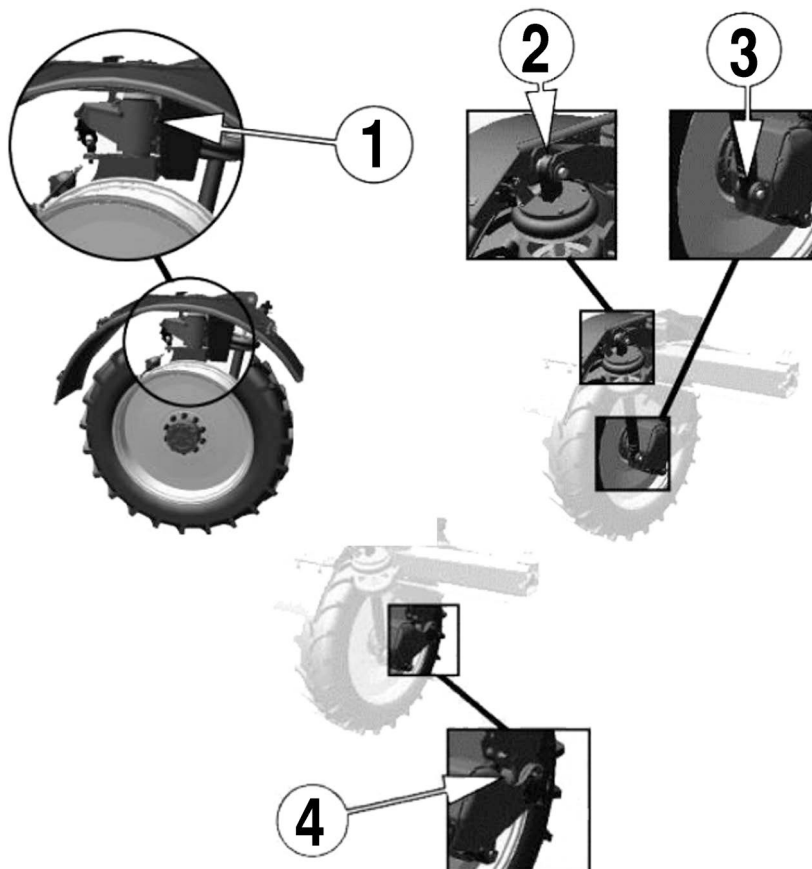
Torque wheel lug nuts to:

- 500 lb-ft [678 N•m]



Grease Axles

Each axle has two suspension grease points, one on the swingarm, two at the steer cylinder, one at the pivot axes, as well as the faces of the axle slider.



One fitting is located at the top of the kingpin at the steering pivot (1).

One fitting is located at the swingarm below the suspension (2 and 3).

Two fittings are located at the suspension cylinder: one at the top and one at the bottom (4).

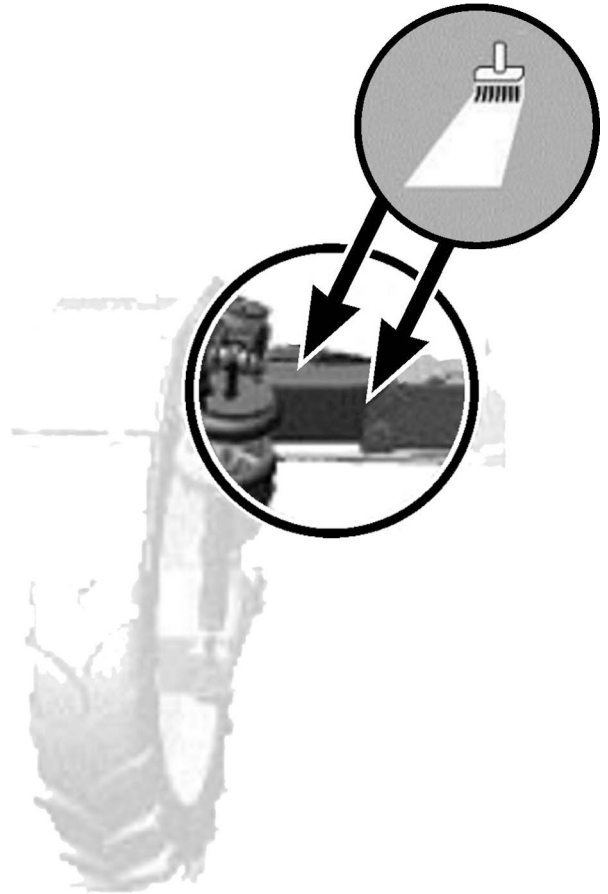
Apply Lucas lithium grease, or equivalent, through these fittings.

Move the axle sliders out to expose the entire length of the axle slider tube.

Clean the slider faces before applying grease.

Lubricate all four faces of the slider tube. Use a brush to spread the lubricant across the faces.

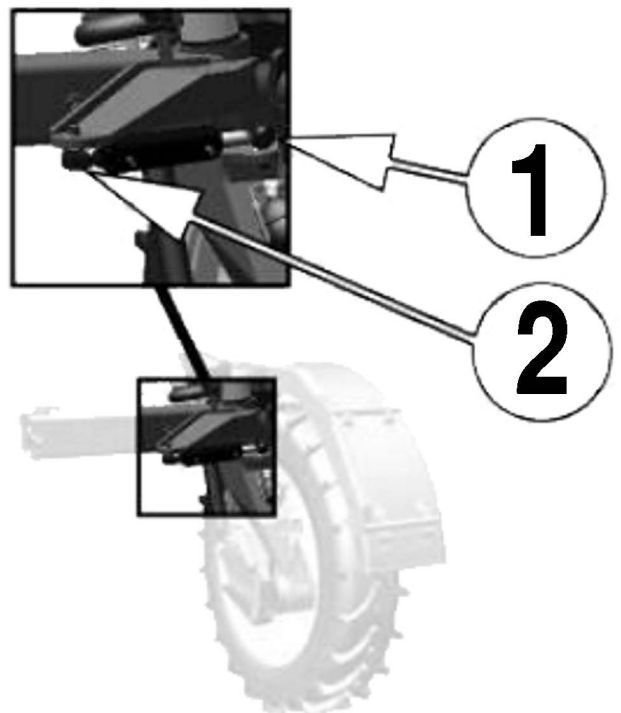
Repeat this process for each axle slider.



Grease Rod End

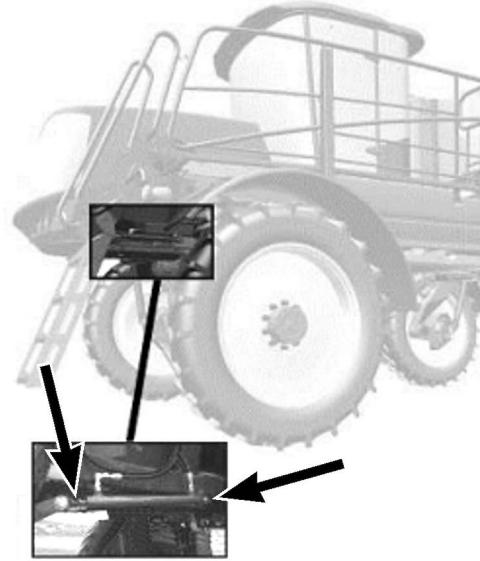
The axle has a grease fitting (1 and 2) on each rod end near the steering arm.

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



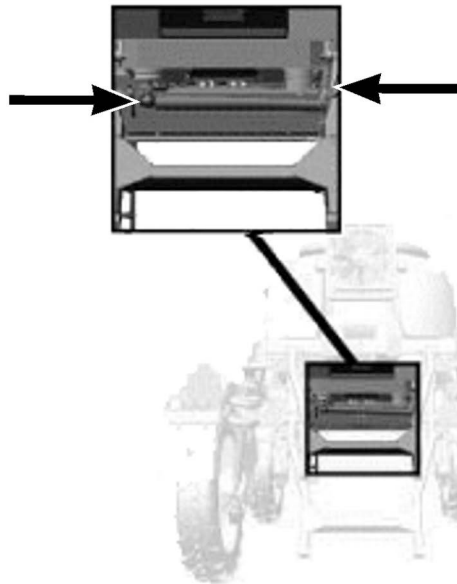
Grease Cylinders

The ladder cylinder has two grease fittings.

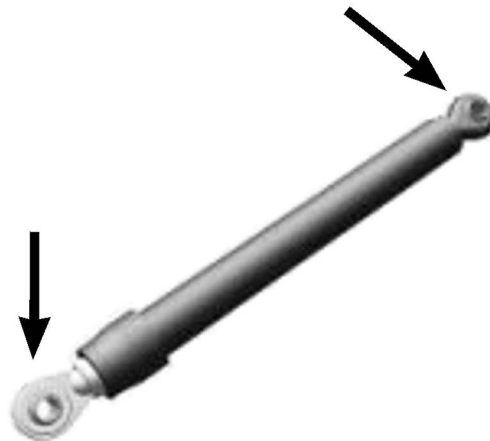


The parallel arms holding the back rack have four grease fittings.

The rack up/down cylinders have two grease fittings.



Apply an ample amount of Lucas lithium grease, or equivalent, through each fitting.



Check Final Drive (Planetary) Fluid

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

To check the level of the planetary fluid, position the wheel so the plug on the planetary is 40 mm [1.57 in] below the center horizontal axis of the housing, as shown. The plug will be roughly at the 4 o'clock position.

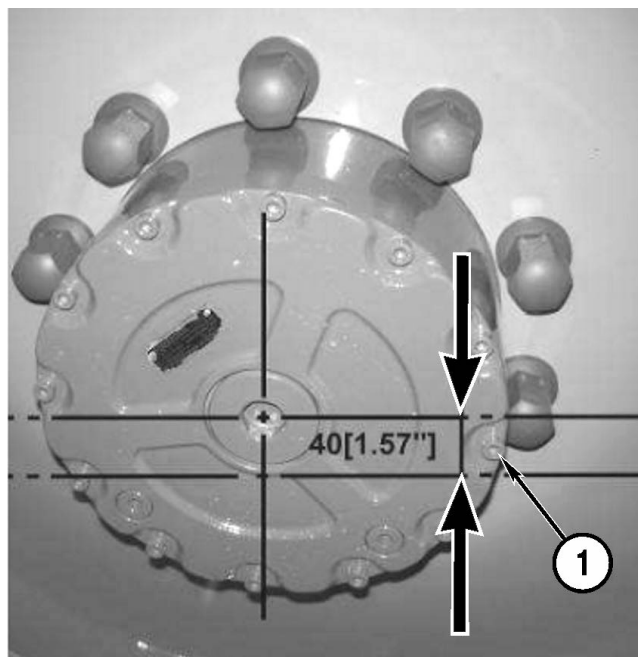
Remove the plug in the planetary and observe if the fluid is at the bottom of the fill hole. If the level is good, then install and tighten the plug (1).

NOTICE: Use only Mobiltrans HD50 Gear Oil or equivalent to the bottom of the fill hole.

If level is low, fill each planetary with Mobiltrans HD50 Gear Oil or equivalent to the bottom of the fill hole.

NOTE: Planetary Fluid Capacity: Approximately 0.24 quarts [0.9 liters].

Install the plug (1) and tighten.



Check Planetaries for Leaks

Inspect the planetary for leaks around the housing and the plug.

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.

- Change Primary Fuel Filter. See “Change Primary Fuel Filter” on page 5-24.
- Change Secondary Fuel Filter. See “Change Secondary Fuel Filter” on page 5-24.
- Change Hydraulic Fluid Filter. See “Change Hydraulic Fluid” on page 5-32.
- Change Engine Oil and Filter. See “Change Engine Oil and Filter” on page 5-25.
- Change Final Drive (Planetary) Fluid. See “Change Final Drive (Planetary) Fluid” on page 5-20.
- Change Hydrostatic Cartridge. See “Change Hydrostatic Cartridge” on page 5-21.

Every 100 Hours

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

Change Final Drive (Planetary) Fluid

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

To drain the planetary fluid, position the wheel so the plug on the planetary is in the 6 o'clock position (1).

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

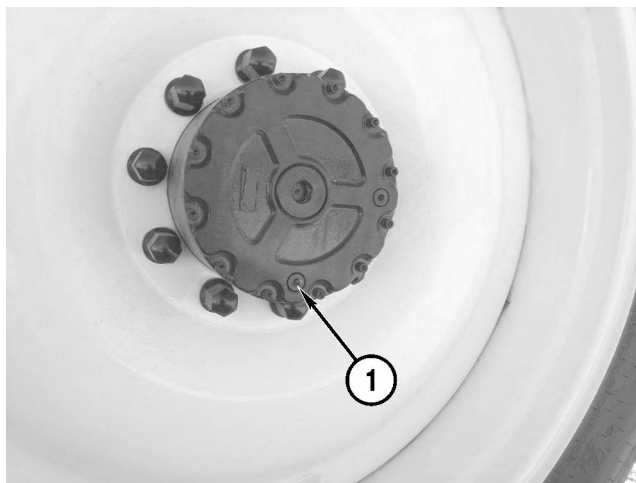
To fill the planetary fluid, position the wheel so the plug on the planetary is 40 mm [1.57 in] below the center horizontal axis of the housing. The plug will be roughly at the 4 o'clock position.

NOTICE: Use only Mobiltrans HD50 Gear Oil or equivalent for the planetary fluid.

Fill each planetary with Mobiltrans HD50 Gear Oil or equivalent to the bottom of the fill hole.

- Planetary Fluid Capacity:
Approximately 0.24 quarts [0.9 liters]

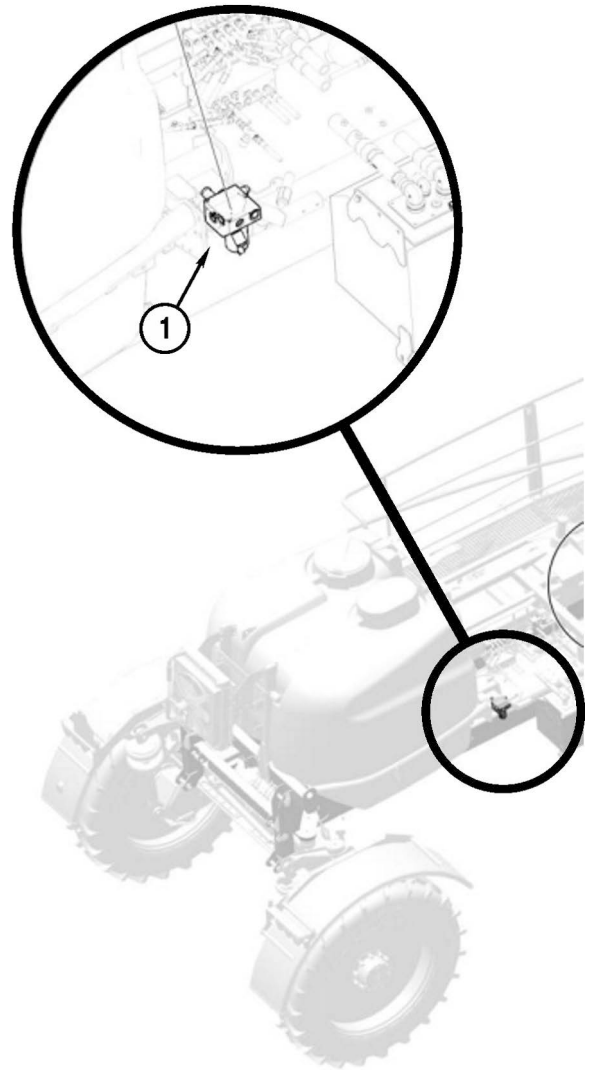
Install the plug (1) and tighten.



Change Hydrostatic Cartridge

Locate the regulating block (1) within the frame rails just behind the hydraulic tank.

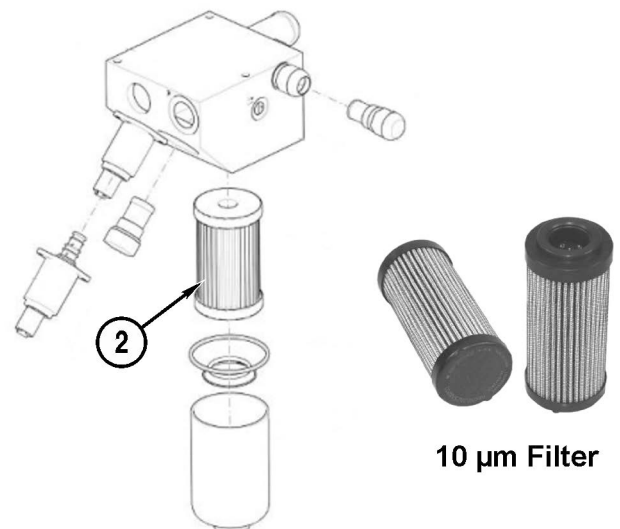
Unscrew and remove the steel housing. Keep the o-ring.



Remove the filter (2) and replace it with a new filter.

Replace the o-rings and tighten the filter housing.

- Hydrostatic Cartridge Part Number:
842000000



Every 250 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 250 hours should begin at the 100 hour mark.

The following services must be performed after every 250 hours of operation or yearly.

Clean or Change Engine Primary Air Filter

NOTICE: When operating in severe conditions, the primary air filter should be cleaned 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, in front of the engine and radiator.

Clean the outside of the air cleaner assembly.

Release the two latches (1) and remove the cover from the air cleaner assembly (2).

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

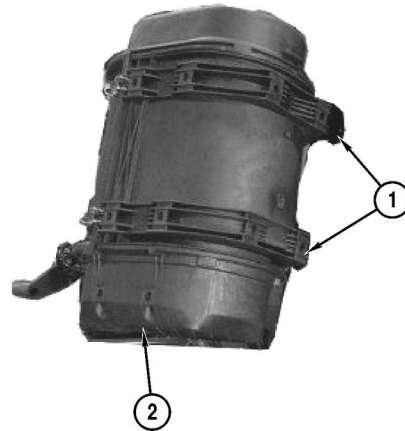
Use a rocking motion to release the primary air filter from the assembly.

Clean the filter using compressed air. A blower hose is located on the machine next to the air cleaner housing. The blower hose uses air from the suspension system air tank. 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 Hydraulic Fluid Filter

The hydraulic fluid filter is located on the right side out-rigger under the service platform.

Remove the service platform above the tank (1).



Remove the cover (1) from the filter housing.

Remove the filter from the assembly.

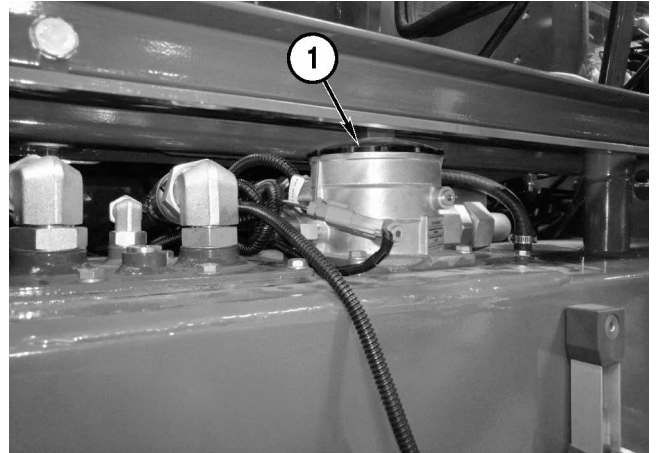
Discard the filter into an appropriate container.

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 5-14.



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 service must be performed after every 500 hours of operation or yearly.

Change Primary Fuel Filter

The primary fuel filter is located under the walking surface after the boom support (1).



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.

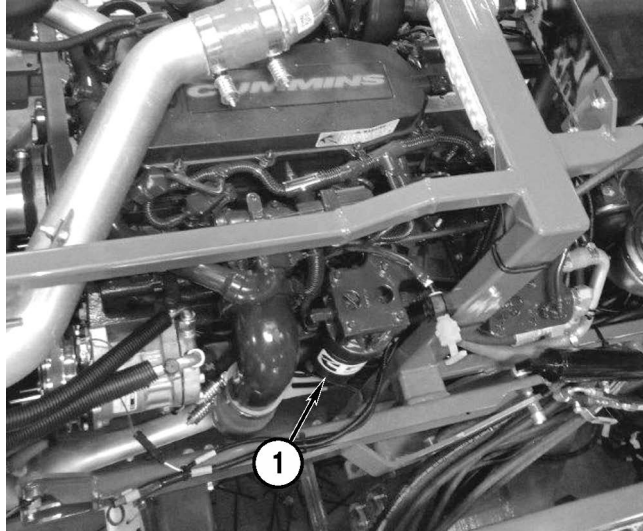
- Primary Fuel Filter Part Number: 261000003.

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 Secondary Fuel Filter

The secondary fuel filter (2) is located under the walking surface in front of the fuel tank and to the left side of the engine.

Turn the filter counterclockwise to remove.

Dispose of the filter properly.

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

- Secondary Fuel Filter Part Number: 211000000.

Fill the new filter with diesel fuel before installing.

NOTICE: DO NOT over-tighten 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.

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* over-tighten the filter. Damage to the seal can result.

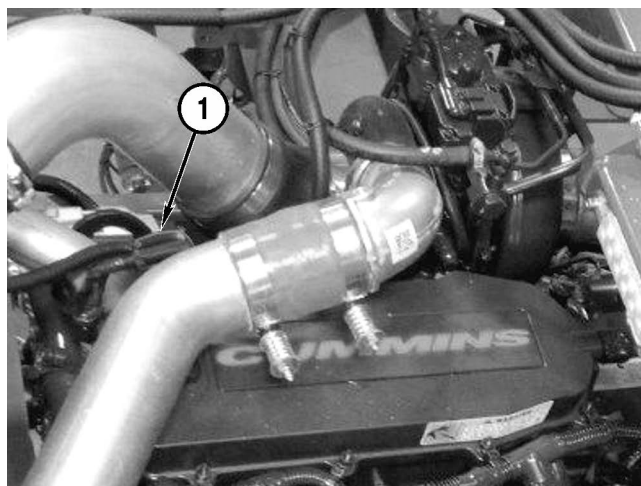
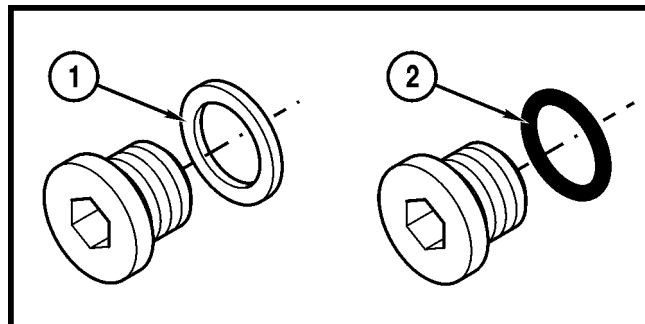
Lubricate the seal on the engine oil filter.

- Engine Oil Filter Part Number: 201450305.

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

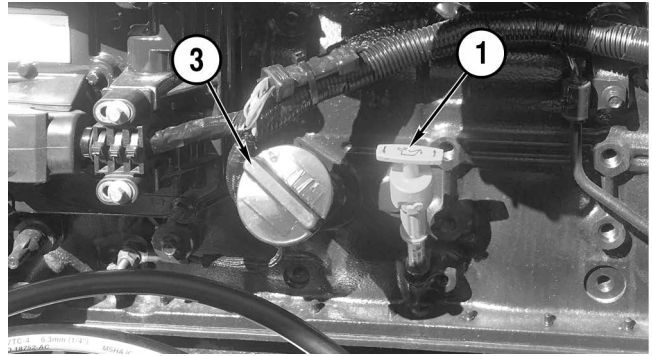
NOTICE: *DO NOT* overfill the engine oil. Crankcase oil capacity can vary. **ALWAYS** use the dipstick to determine if the engine oil is to the appropriate level.

Fill the engine with high quality Lucas 15W-40 Magnum motor oil or equivalent at the oil fill location (2) on the top side of the engine, in front of the radiator reservoir.



The dipstick (1) is located in the engine compartment, on the left side of the engine.

An auxiliary oil fill location (3) is next to the dipstick on some machines.

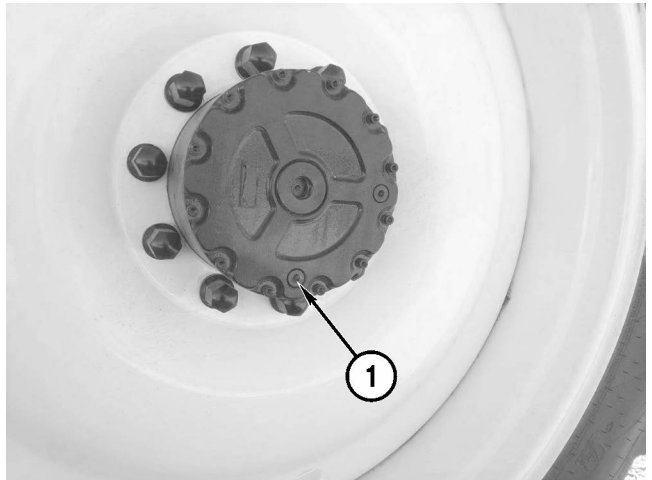


Change Final Drive (Planetary) Fluid

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

To drain the planetary fluid, position the wheel so the plug on the planetary is in the 6 o'clock position (1).

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



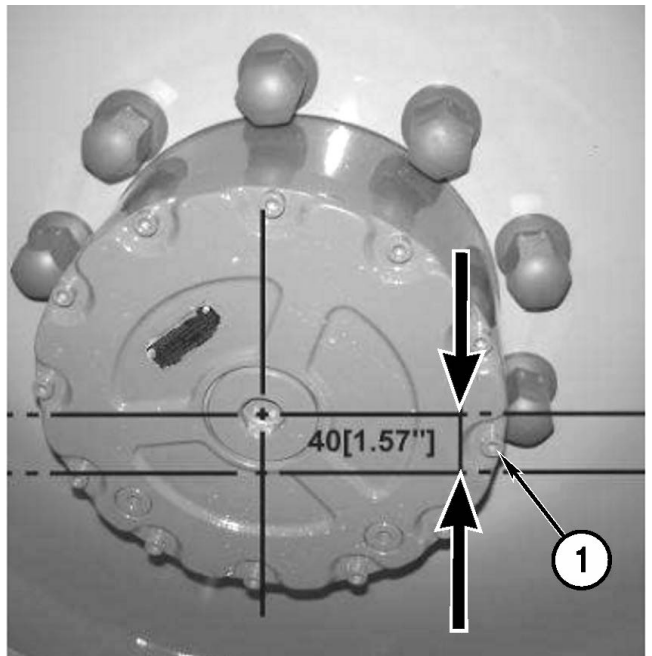
To fill the planetary fluid, position the wheel so the plug on the planetary is 40 mm [1.57 in] below the center horizontal axis of the housing, as shown. The plug will be roughly at the 4 o'clock position (1).

NOTICE: Use only Mobiltrans HD50 Gear Oil or equivalent for the planetary fluid.

Fill each planetary with Mobiltrans HD50 Gear Oil or equivalent to the bottom of the fill hole.

- Planetary Fluid Capacity:
Approximately 0.24 quarts [0.9 liters]

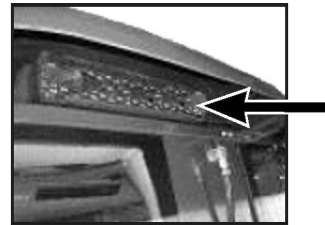
Install the plug (1) and tighten.



Change Cab Charcoal Filter

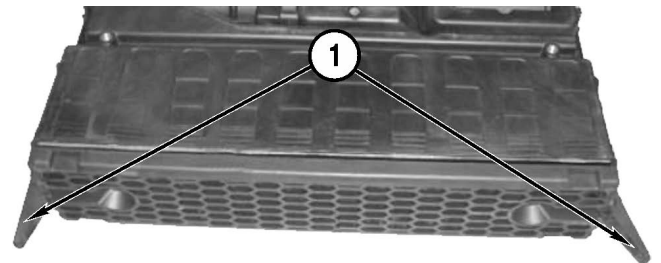
NOTICE: *DO NOT attempt to clean the old cab air filter. ALWAYS replace with a new filter.*

The charcoal air filter is located at the top rear of the cab, below the roof.



Release the two fasteners (1) and remove the cover.

Remove and discard the filter by sliding it out.

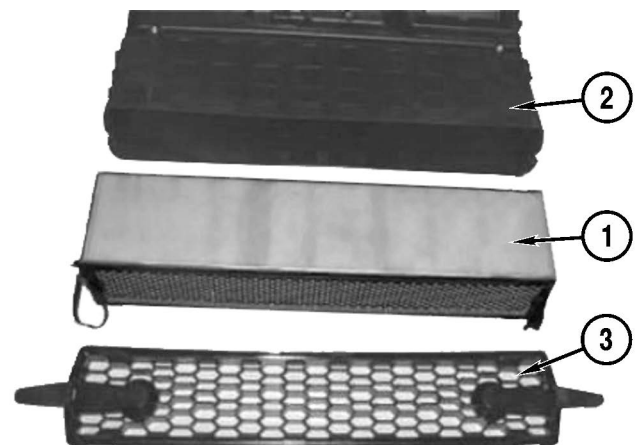


Insert the new filter (1) into the frame (2).

- Charcoal Air Filter
Part Number: 490006662

Close the cover (3) and replace the two fasteners.

After working on the cab air filtration system, check that the indicator light and pressurization system are working properly.



Every Year

The following services must be performed every year.

Measure and Adjust Toe-In

Consult your local dealer for toe-in procedure.

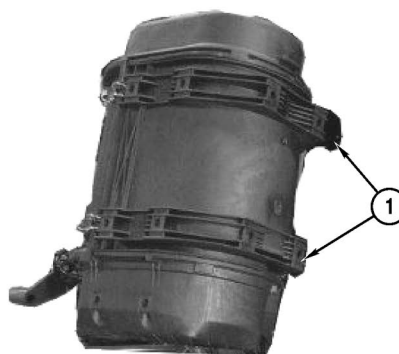
Change Engine Safety Air Filter

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.

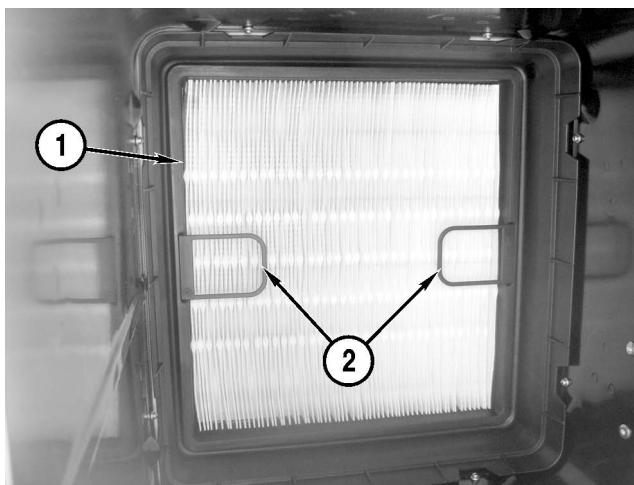


Use the pull tabs (2) to remove the engine safety air filter (1) and discard the old filter.

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.



Check Brake Accumulator

Verify brake accumulator pressure is 870 psi [60 bar].

Accumulators allow for six brake actuations after engine shut off.



Winterize Wet System

The product tank and wet system must be flushed before winterizing. See “Flushing Product Tank” on page 4-18.

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

Close the rinse tank valve, and sump valve.

Remove end caps and set all boom sections to the ON position.

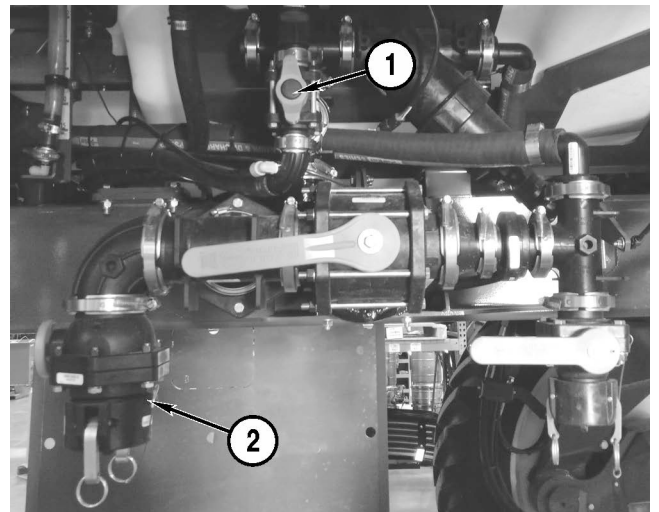
Turn agitation OFF by turning agitate/rotoflush knob (1) to the horizontal position.

Connect a compressed air line to the main fill valve (2). Apply compressed air at 40 psi [2.7 bar] to blow out the wet system and booms.

Use the Viper 4 to cycle the boom sections off and on several times to purge water from around the valves.

Disconnect the air line and close the product fill valve.

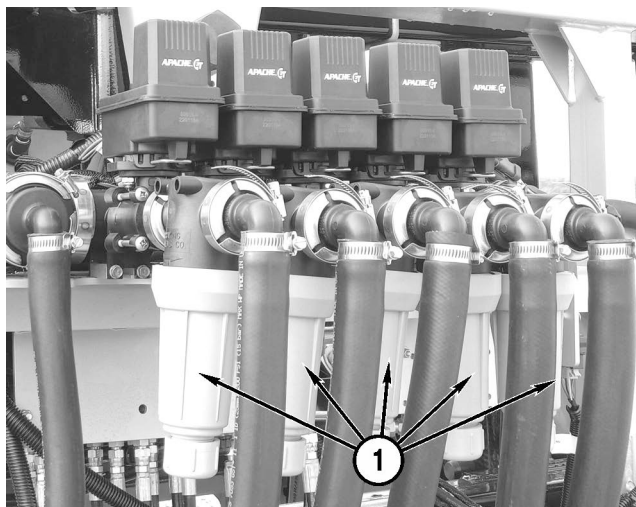
NOTICE: Drain the rinse tank, hand rinse tank, and injection tank, if equipped, to prevent damage during storage.



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

Reinstall the strainer bowls.

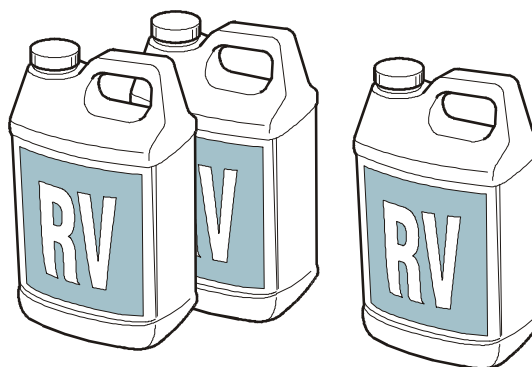
Store the strainers in a warm, dry location.



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

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

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

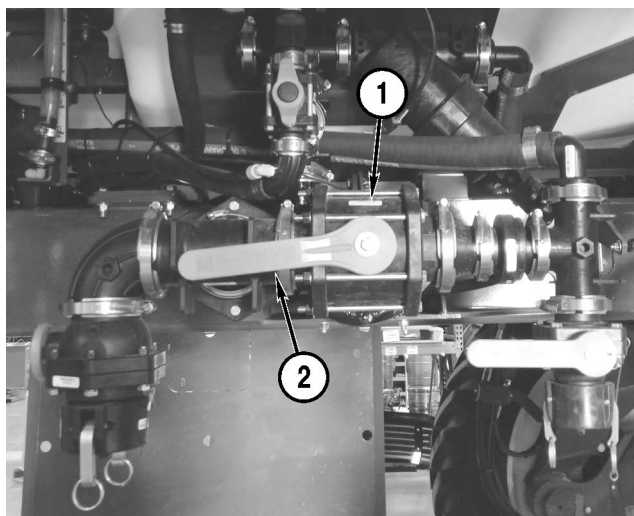


Repeatedly open and close the sump valve (1) and rinse tank/product valve (2), to allow the antifreeze to surround the ball valves.

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

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

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



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

Start the engine.

Unfold and lower the booms as far as possible.

Using the universal terminal monitor, set all boom sections to the OFF position and press the agitation increase button (1).

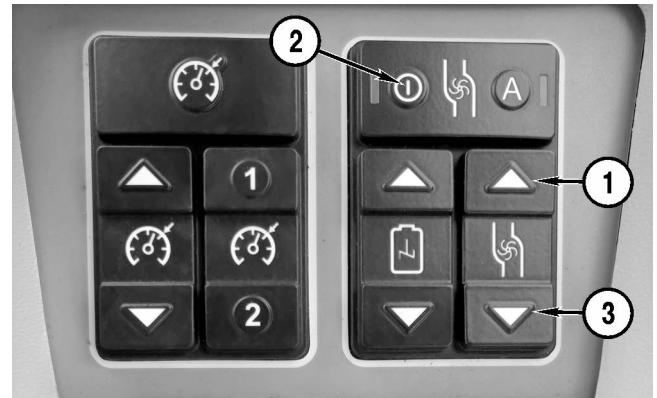
Set the product pump switch (2) to the ON position.

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

Turn the boom sections OFF.

Set the product pump switch (2) to the OFF position.

NOTE: Excess antifreeze may be left in the sprayer.



Every 1000 Hours or Yearly

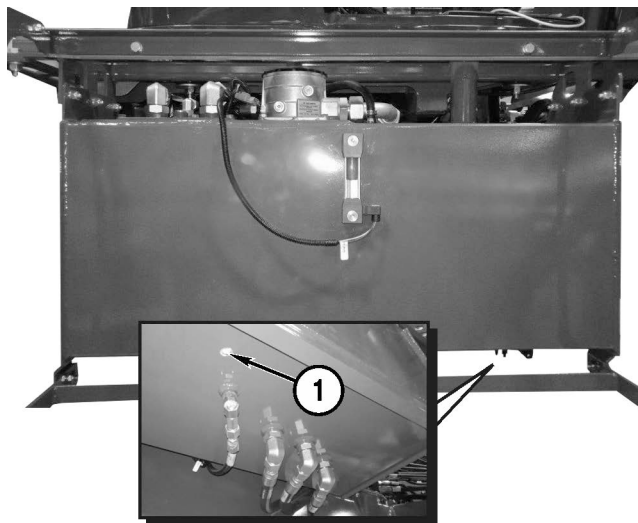
The following services must be performed after every 1000 hours of operation or yearly.

Change Hydraulic Fluid

The hydraulic fluid drain plug (1) is located on the bottom of the hydraulic fluid reservoir on the right side of the machine.

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 37 gallons [140 liters]. Dispose of the fluid properly.

Install the drain plug (1).



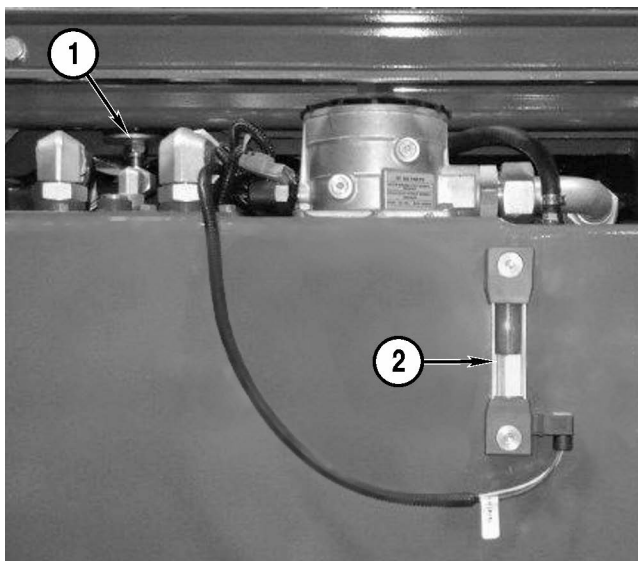
NOTICE: Use only Lucas Universal Hydraulic Fluid or equivalent for the Apache Sprayer hydraulic system.

Remove the hydraulic fluid reservoir cap (1) and fill with Lucas Universal Hydraulic Fluid or equivalent.

- Hydraulic Fluid Reservoir Capacity:
37 gallons [140 liters]

Use the sight glass (2) to check the fluid level. See “Check Hydraulic Fluid Level” on page 5-14.

NOTE: The sight glass also shows hydraulic fluid temperature.



Change DEF Suction Filter

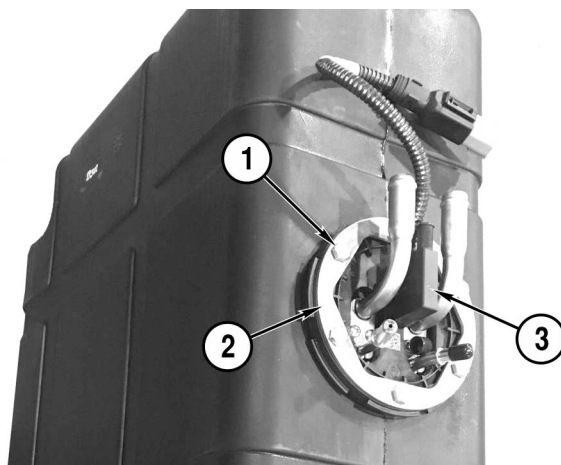
The DEF suction filter is located in the DEF tank which is located under the walking surface in front of the fuel tank.

To reduce the possibility of injury from hot coolant spray, turn the engine off and, with locking pliers, pinch the DEF heater hoses closed. The heater hoses are a larger diameter hose and connect to the larger fittings on the unit.

Note hose location for assembly.

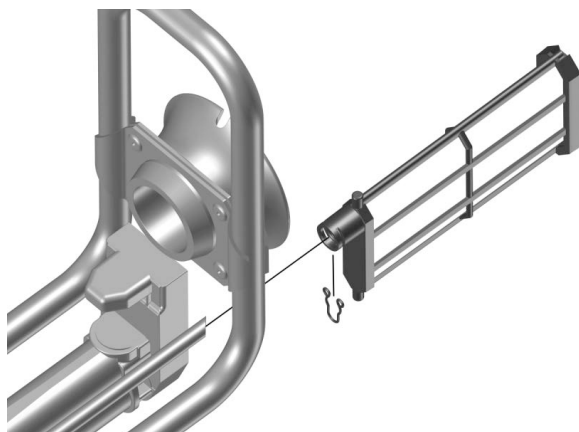
Disconnect all the hoses and drain the fluids into a suitable container. Dispose the fluids properly.

Remove the six bolts (1) and retaining ring (2) that hold the DEF level/temperature unit (3) in place.



Lift the unit out of the tank and remove the clip from the inlet port of the DEF filter.

Remove the DEF filter and inspect. If dirty or any cracks are present, discard and replace.



Install the o-ring (1) in its notch on the DEF tank pickup tube.

Insert DEF tank filter inlet port into the pickup tube.

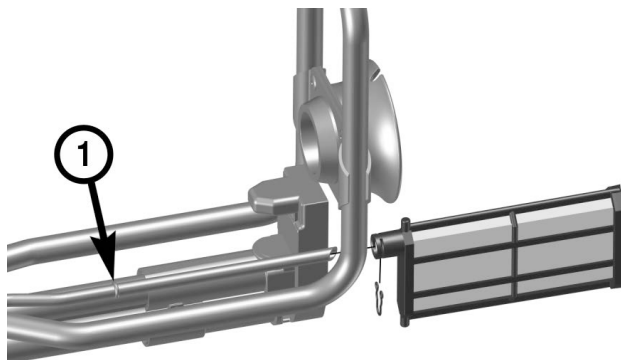
Install the clip over the notch on the filter inlet port.

NOTICE: Consult Cummins parts service for 40 micron filter and o-ring replacement.

Place the DEF level/temperature unit back into the tank and orient the hose barbs as they were originally.

Install the retaining ring and mounting screws. Tighten the bolts to 80 in-lb [9 N•m]

Connect the hoses and release to clamps on the heater hoses.



Every 4500 Hours or 3 Years

The following services must be performed after every 4500 hours or 3 years of operation.

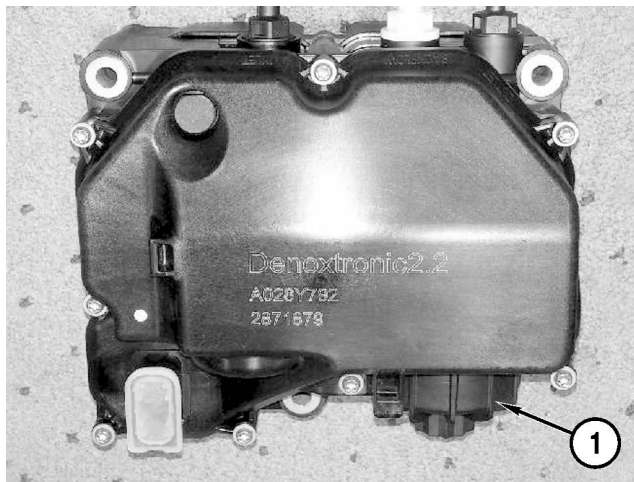
Change DEF Supply Module Filter

Locate the DEF supply module mounted between the frame rail and the utility box on the right side of the machine.

Remove the DEF filter cap (1) and filter from the supply module.

Install the new filter and replace the cap.

- DEF Supply Module Filter
Part Number: 241000009



Every 5 Years

Replace Brake Accumulators

Verify the new brake accumulators are set to the correct pressure.

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CHAPTER 6

TORQUE VALUE CHARTS

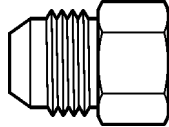
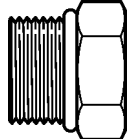
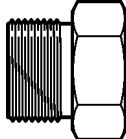
Fittings

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	----


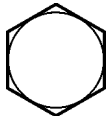

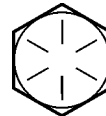
Fitting Torque Value Chart

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






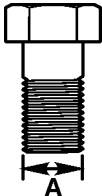
Bolts

ALWAYS tighten bolts to the values below unless a different torque value is specified. Fasteners must ALWAYS be replaced with the same grade. Make sure bolt threads are clean and threads are engaged properly. All torque values are derived from Machinery's Handbook, Mechanical Engineering Design, 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 Diam. (In) and thread pitch	Wrench Size	FASTENER COATING								
		SAE Grade 2 Torque lb-ft [N•m]			SAE Grade 5 Torque lb-ft [N•m]			SAE Grade 8 Torque lb-ft [N•m]		
		Dry	Zinc Plated	Lubri- cated	Dry	Zinc Plated	Lubri- cated	Dry	Zinc Plated	Lubricated
1/4-20	7/16"	6 [8]	5 [7]	4 [5]	8 [11]	7 [9]	6 [8]	12 [17]	11 [15]	9 [12]
1/4-28	7/16"	6 [8]	5 [7]	4 [5]	10 [13]	9 [12]	7 [9]	14 [18]	12 [17]	10 [13]
5/16-18	1/2"	11 [15]	10 [13]	8 [11]	17 [23]	15 [20]	13 [18]	25 [34]	22 [30]	18 [24]
5/16-24	1/2"	12 [17]	11 [15]	9 [12]	19 [26]	17 [23]	14 [19]	27 [37]	24 [32]	20 [27]
3/8-16	9/16"	20 [27]	18 [24]	15 [20]	31 [42]	28 [38]	23 [31]	44 [60]	39 [53]	38 [52]
3/8-24	9/16"	23 [31]	20 [27]	17 [23]	35 [47]	31 [42]	26 [35]	49 [67]	44 [60]	37 [50]
7/16-14	5/8"	32 [43]	29 [39]	24 [32]	49 [66]	44 [60]	37 [50]	70 [95]	63 [85]	61 [83]
7/16-20	5/8"	36 [48]	32 [43]	27 [37]	55 [75]	50 [68]	41 [56]	78 [106]	70 [95]	58 [79]
1/2-13	3/4"	49 [66]	44 [60]	37 [50]	75 [102]	68 [92]	57 [77]	106 [144]	96 [130]	93 [126]
1/2-20	3/4"	55 [75]	49 [66]	41 [56]	85 [115]	76 [103]	64 [87]	120 [163]	108 [146]	105 [142]
9/16-12	13/16"	70 [95]	63 [85]	55 [75]	110 [149]	100 [136]	80 [108]	150 [203]	130 [176]	110 [149]
9/16-19	13/16"	78 [106]	70 [95]	60 [81]	121 [164]	110 [149]	90 [122]	171 [232]	157 [213]	130 [176]
5/8-11	15/16"	97 [131]	87 [118]	73 [99]	150 [203]	135 [183]	113 [153]	212 [287]	191 [259]	159 [216]
5/8-18	15/16"	110 [149]	99 [134]	82 [111]	170 [230]	153 [207]	127 [172]	240 [325]	216 [293]	180 [244]
3/4-10	1 1/8"	172 [233]	155 [210]	129 [175]	267 [362]	240 [325]	200 [271]	376 [510]	339 [460]	282 [382]
3/4-16	1 1/8"	192 [261]	173 [235]	144 [195]	297 [403]	267 [362]	223 [302]	420 [570]	378 [513]	315 [427]
7/8-9	1 5/16"	167 [226]	150 [203]	125 [169]	429 [582]	386 [523]	322 [437]	606 [822]	545 [739]	455 [627]
7/8-14	1 5/16"	184 [250]	165 [224]	138 [187]	474 [642]	426 [578]	355 [481]	669 [907]	602 [816]	677 [918]
1/8	1 1/2"	250 [339]	225 [305]	187 [254]	644 [873]	579 [785]	483 [665]	909 [1232]	818 [1109]	681 [923]
1-12	1 1/2"	274 [371]	246 [334]	205 [278]	722 [979]	634 [860]	528 [716]	1020 [1383]	895 [1213]	746 [1011]

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

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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.
Apache Sprayer will not move forward or backward.	Parking brake is engaged. Check electrical connections on parking brake.
Constant alarm sounds when Apache Sprayer moves forward or backward.	Check wire connection at sending unit.
Apache Sprayer will not move forward.	Check if parking brake is engaged. Put machine in neutral, set parking brake, release parking brake and return to forward. Check wire connections at hydrostat coils.
Apache Sprayer will not move backward.	Check if parking brake is engaged. Put machine in neutral, set parking brake, release parking brake and return to reverse. Check wire connections at hydrostat coils
Engine will not start.	Confirm battery disconnect button is "ON". Check diesel fuel level. Check neutral safety relay.
Apache Sprayer steering does not work.	Check hydraulic fluid level. Check for hydraulic fluid leaks. Check steering column coupling on steering motor.
Apache Sprayer brakes do not work.	Check brake hoses for leaks. Check electrical connections at brake pedal.

SYMPTOM	SOLUTION
No power to console in cab.	Check electrical connections in right rear corner of cab, near fuse box.
Road and service lights do not work.	<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>
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 appropriate fuses and back rack electrical connections.</p>
Product boom valves will not turn on.	<p>Unplug electric connection at valve for 20 seconds.</p> <p>Check electrical connections in cab.</p> <p>Check fuse block 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>

SYMPTOM	SOLUTION
Seat will not raise or lower.	Check power module in cab. Check wire connections at right side of seat. Check for air leaks.
Raven monitor does not turn on.	Check power module in cab. Check electrical connections at the monitor.
Suspension will not rise.	Check air tank for pressure. Check compressor. Check electrical connections at suspension block and switches.
Product pump will not turn on.	Confirm product pump button is on and indicator is lit. Check electrical connections at hydraulic valve block. Check electrical connections in cab.
A/C does not cool.	Confirm A/C button is "ON". Confirm fan is "ON". Check belt to compressor.
Cab pressurize fan does not work	Connect fan directly to power supply. Check wire harness, fuse, and control relay.
Cab pressurize fan is on but warning light is on.	Check cabin filter. Close cab door. Check and open diffusers. Check for blockage in ductwork. Check the seals around the cab. Check pressure sensor. Check air flow sensor.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

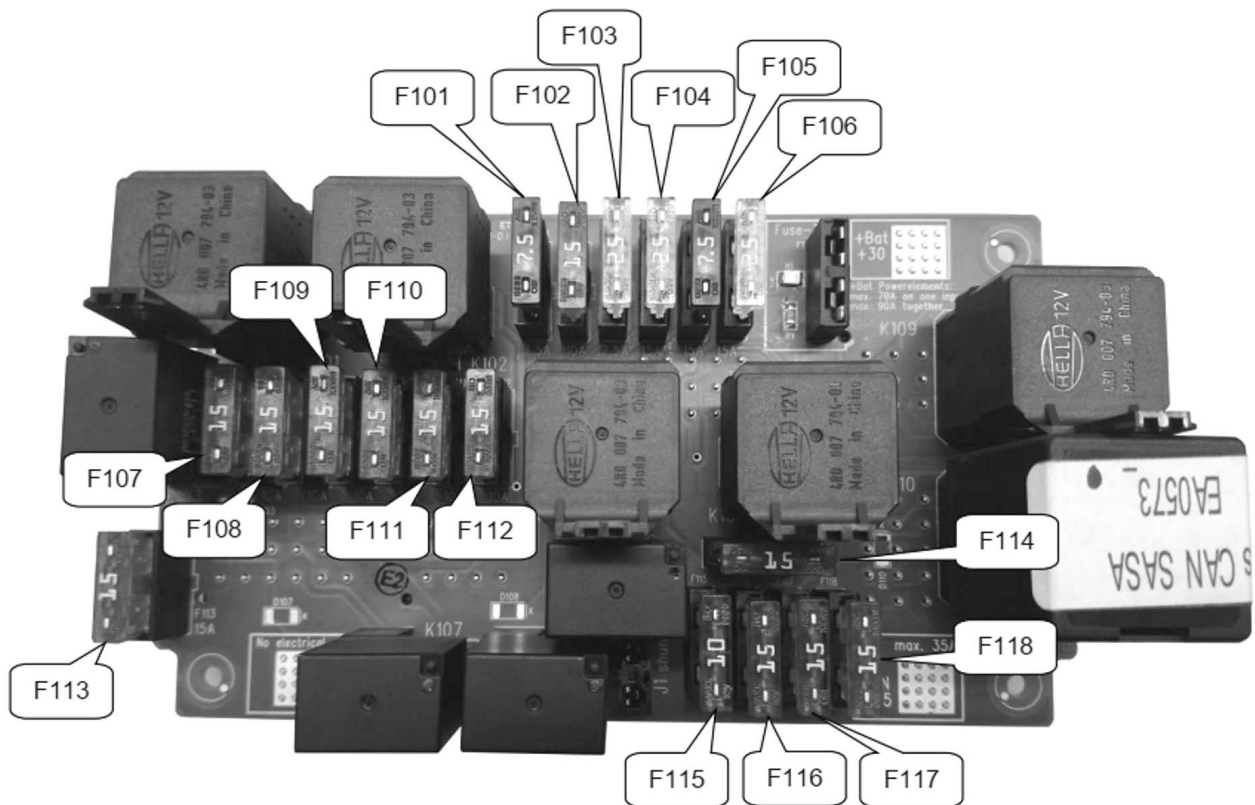
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CHAPTER 8

ELECTRICAL SYSTEM

Cab Board

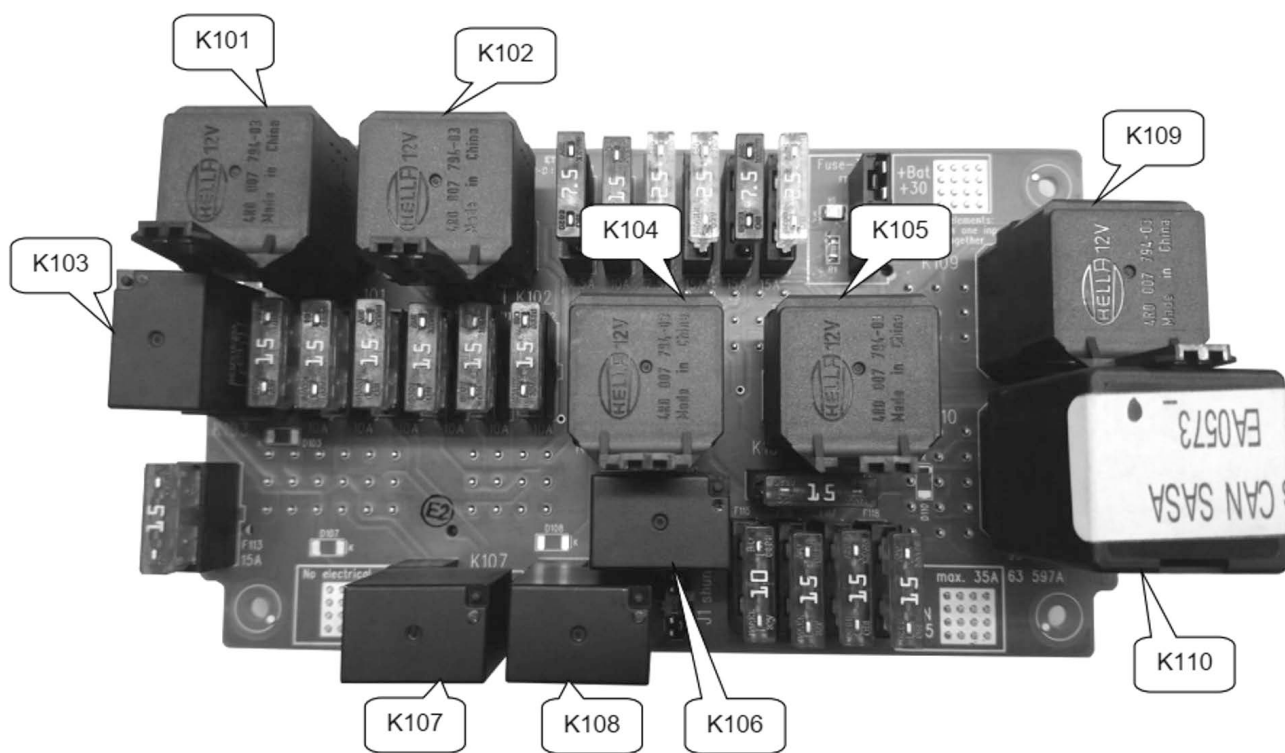
Cab Board Fuses



Cab Board Fuse List

FUSE #	TYPE	PART #	DESCRIPTION
F101	7.5A	EA0115	Supply Beacon Switch, Working Lights Control Power Supply
F102	15A	EA0116	Beacons
F103	25A	EA0118	Dome Light, Radio Post-Ignition, Rear View Mirrors
F104	25A	EA0118	Cigarette Lighter (2)
F105	7.5A	EA0115	Auxiliary Plug Post-Ignition
F106	25A	EA0118	Air Conditioning
F107	15A	EA0116	2 Working Lights (at top right of the cab)
F108	15A	EA0116	2 Working Lights (at top left of the cab)
F109	15A	EA0116	Working Lights (rear left of the cab)
F110	15A	EA0116	Working Lights (rear right of the cab)
F111	15A	EA0116	Working Lights (at center top of the cab)
F112	15A	EA0116	Hood Working Lights
F113	15A	EA0116	Windscreen Wipers, Washer Fluid
F114	15A	EA0116	Platform Working Lights
F115	10A	EA0114	Boom Working Lights
F116	15A	EA0116	PC, Auxiliary 1 Before Ignition, After Battery Shut-off
F117	15A	EA0116	PC, Auxiliary 2 Before Ignition, After Battery Shut-off
F118	15A	EA0116	Seat

Cab Board Relays

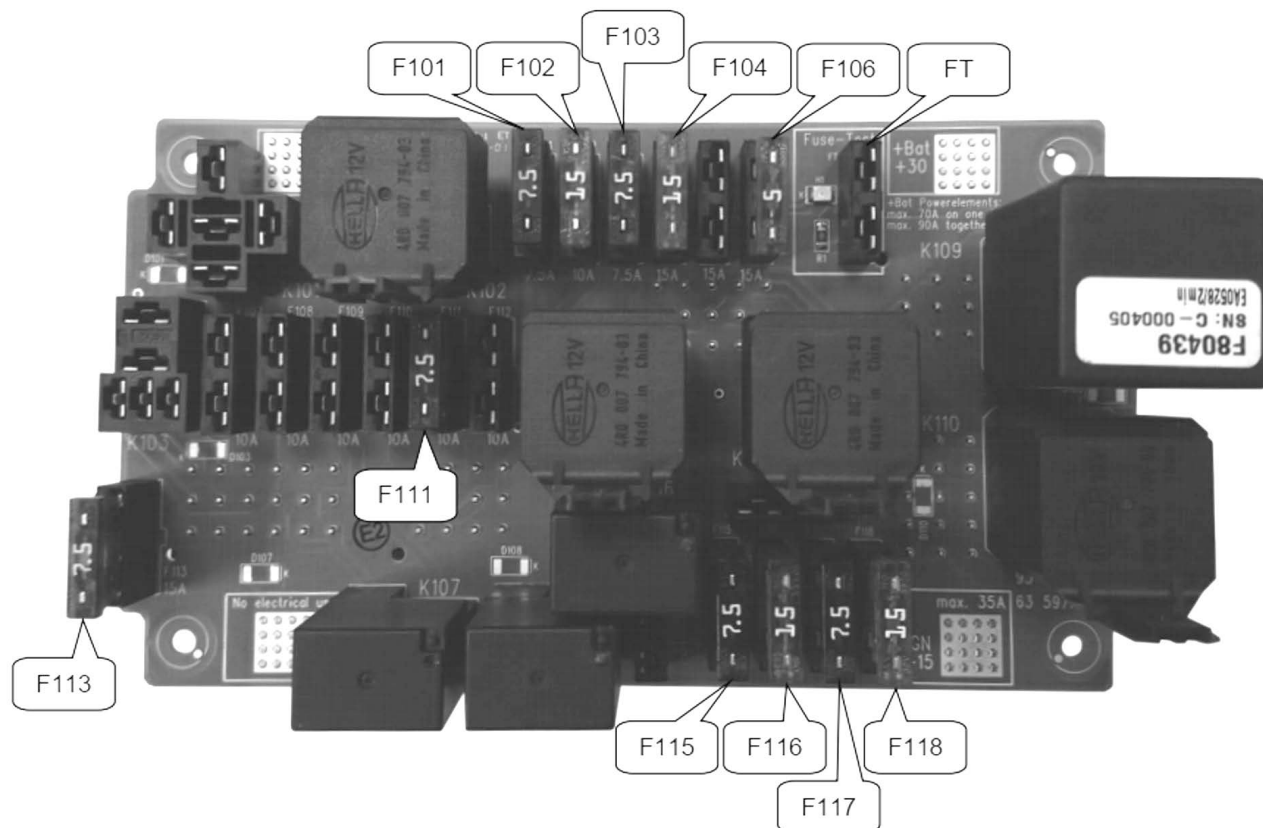


Cab Board Relay List

RELAY #	PART #	DESCRIPTION
K101	EA0033	2 Working Lights (at rear of the cab)
K102	EA0033	Working Lights (at center top of the cab), Hood
K103	EA0726	4 Working Lights (top cab)
K104	EA0033	Cigarette Lighter (2)
K105	EA0033	Platform Working Light
K106	EA0726	Boom Working Lights
K107	EA0726	Beacons
K108	EA0726	Dome Light, Radio Post-Ignition, Rear View Mirrors
K109	EA0033	Working Lights Interruption in High Speed Range
K110	EA0573	CAN Relay (information from the SASA sensor for the auto-steering option)

Frame Board

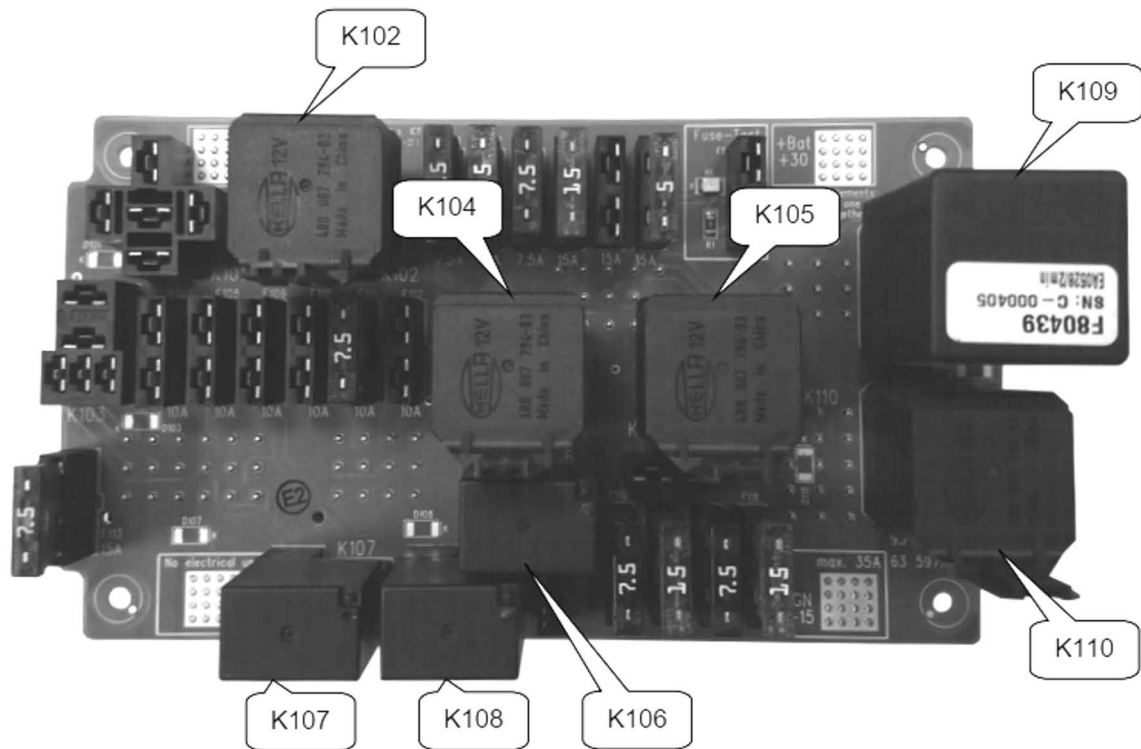
Frame Board Fuses



Frame Board Fuse List

FUSE #	TYPE	MODEL #	DESCRIPTION
F101	7.5A	EA0115	REXROTH Post-Ignition (240)
F102	15A	EA0116	Low Beam
F103	7.5A	EA0115	Brake Lights
F104	15A	EA0116	High Beam
F106	5A	EA0119	Outside Engine Stop Post-Ignition
F111	7.5A	EA0115	Backward Buzzer
F113	7.5A	EA0115	Steering Column Switch (Commodo)
F115	7.5A	EA0115	48P Pre-Ignition
F116	15A	EA0116	Radio Memory
F117	7.5A	EA0115	Pre-Ignition Battery Shut-Off, Key-Operated Ignition
F118	15A	EA0116	Blinker Pre-Ignition
FT	Test		Fuse Test

Frame Board Relay



Frame Board Relay List

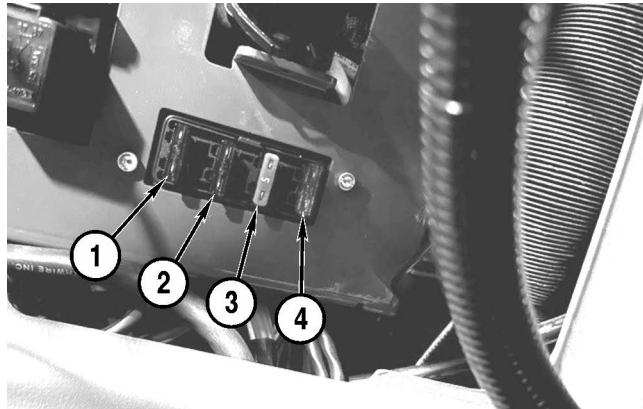
FUSE #	MODEL #	DESCRIPTION
K102	EA0033	Backward Buzzer
K104	EA0033	High Beam
K105	EA0033	Engine Start Security
K106	EA0726	48P (Temporized) Pre-Ignition
K107	EA0726	Low Beam
K108	EA0726	Brake Lights
K109	EA0528	Battery Shut-Off Tempo (2 min)
K110	EA0033	High Speed Range Information

Air Conditioning Fuses

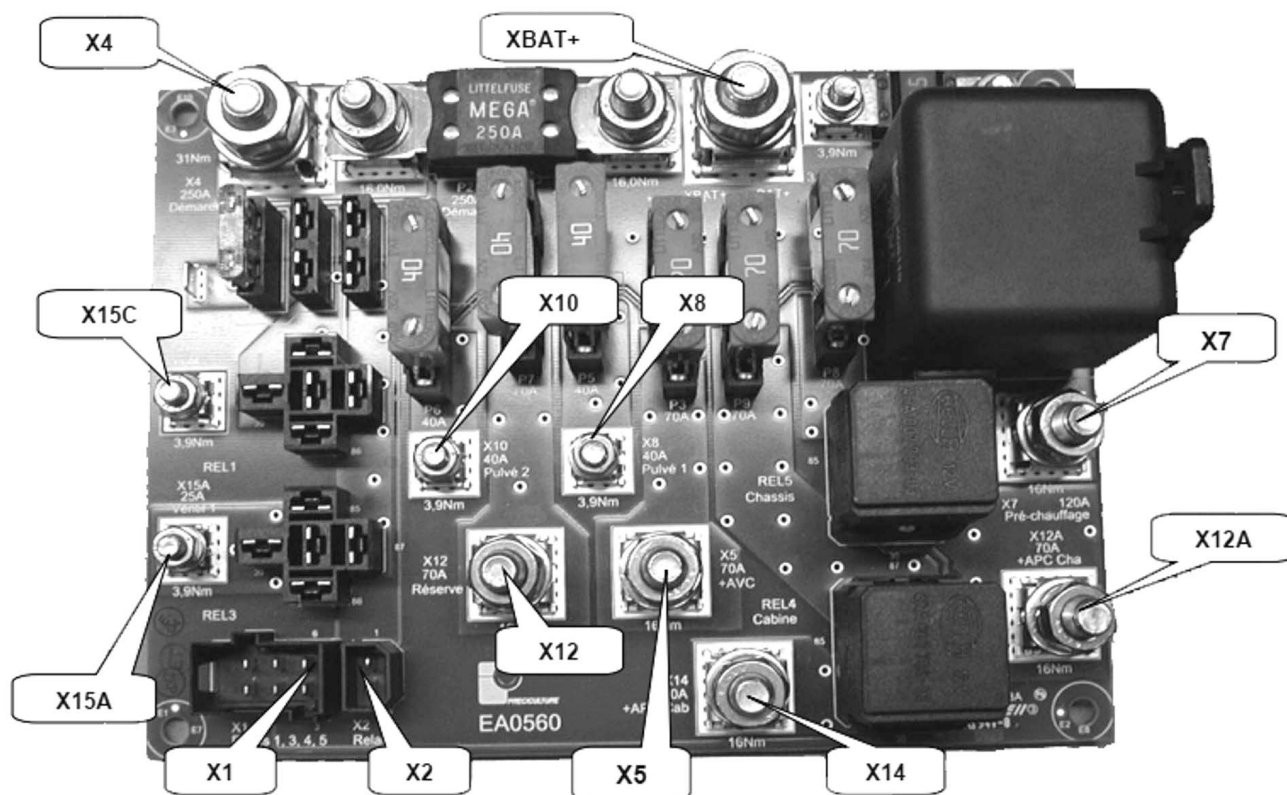
Air Conditioning fuses can be found on the back wall of the cab, behind the seat.

Variant:

1. 7.5A Air Conditioning Compressor Clutch
2. 7.5A Booster
3. 5A Heating Valve
4. 10A PCK Regulator



Power Board



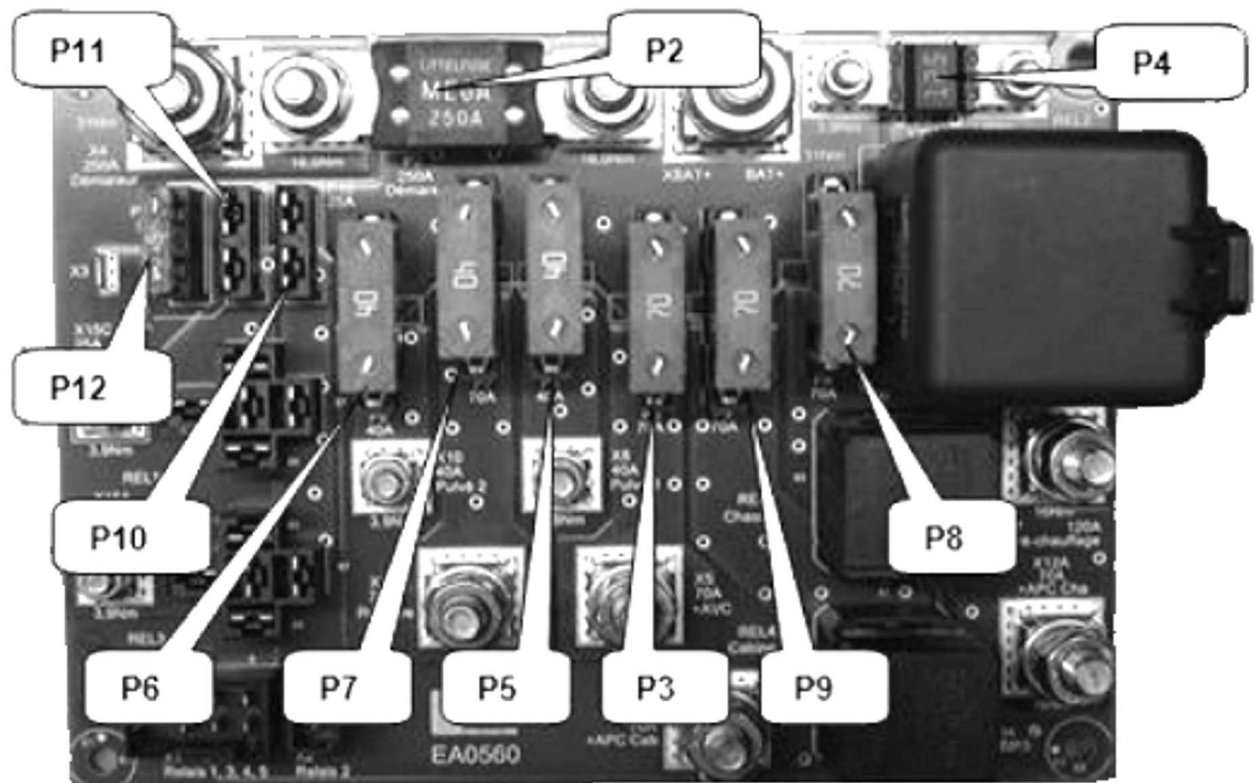
Power Board List

#	DESCRIPTION	WIRING
XBAT+	Power Supply / + Battery Line	Wiring EA0604-08 (+) Battery Shut Off
X1	Relay Control (Toward Cab Board)	Wiring EA0604-22 (PUI X1) POWER RELAY CONTROL
X2	Preheating Relay Control (Engine Wiring Harness)	Wiring EA0604-21 (2) Preheating Control
X4	Starter Power	
X5+	+ Before Ignition	Wiring EA0604-15 (Power X5) Before Ignition Cab
X7	Preheating Plus Power Supply	Wiring EA0604-12 (Glow Card) Preheating
X8	Supply + Sprayer 1	
X10	Supply + Sprayer 2	
X12	Not used	
X12A	Supply + After Ignition + Frame Card	Wiring EA0604-13 (POWER X12A) After Ignition FRAME
X14	Supply + After Ignition - Cab Card	Wiring EA0604-14 (POWER X14) After Ignition CAB
X15A	Supply Electric Hydraulic Cooling Fan 1	
X15C	Supply Electric Hydraulic Cooling Fan 2	

A detailed photograph of the EA0560 control panel. The panel is populated with numerous electronic components. Twelve callout boxes, labeled P1 through P12, point to specific parts: P1 points to a 10-pin connector; P2 points to a 250A fuse; P3 points to a 10-pin connector; P4 points to a 10-pin connector; P5 points to a 10-pin connector; P6 points to a 10-pin connector; P7 points to a 10-pin connector; P8 points to a 10-pin connector; P9 points to a 10-pin connector; P10 points to a 10-pin connector; P11 points to a 10-pin connector; and P12 points to a 10-pin connector. The panel also features several relays (REL1, REL2, REL3, REL4), a large black component (P8), and various other electronic components like capacitors and resistors. The model number EA0560 is visible at the bottom.

FUSE #	TYPE	DESCRIPTION
P2	25A	Board Protection (no longer used)
P3	70A	“ + “ Pre-Ignition
P4	125A	Preheating
P5	40A	Spray 1
P6	40A	Spray 2
P7	40A	Reserved
P8	70A	“ + “ Post-Ignition for Frame Card
P9	70A	“ + “ Post-Ignition for Cab Board
P10	(25A)	Free (Pre-equipped for Sprayer Manufacturer)
P11	(25A)	Free (Pre-equipped for Sprayer Manufacturer)
P12	5A	+RC 28 Temporized

Power Board Relays

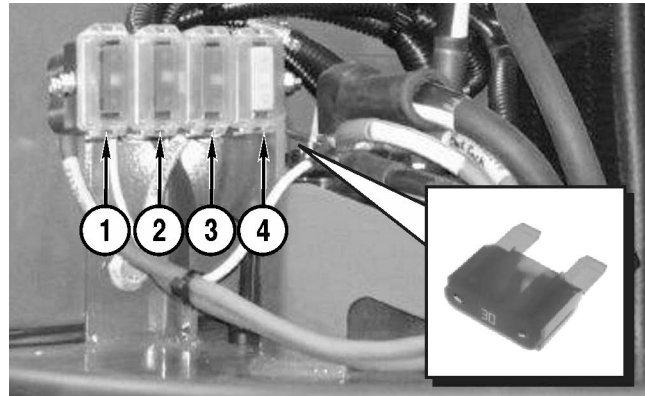


Power Board Relay List

RELAY #	DESCRIPTION
REL1	Free (Pre-equipped for Sprayer Manufacturer)
REL2	Preheating 12V / 120A
REL3	Free (Pre-equipped for Sprayer Manufacturer)
REL4	Cab Card (Start)
REL5	Frame Card (Start)

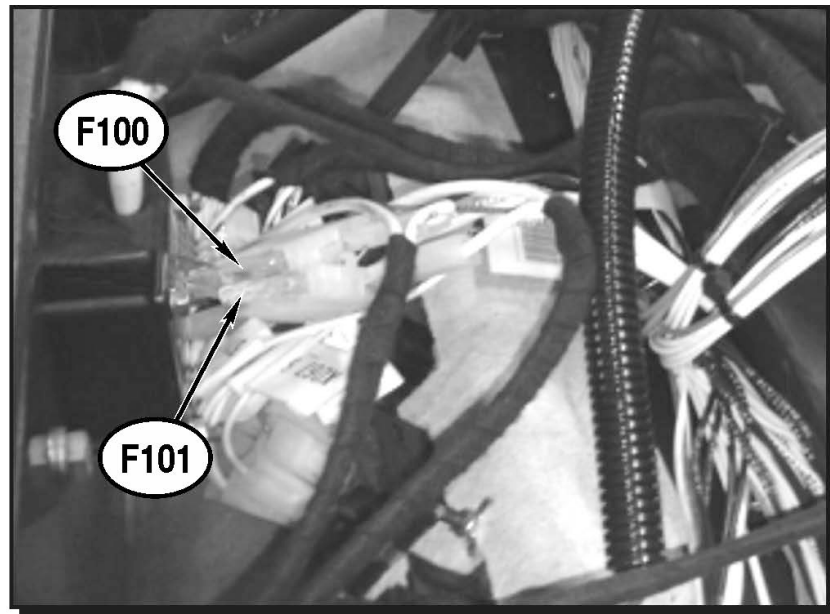
Battery Fuses

1. 30A Power Supply After Battery Shut Off (Engine Management)
2. 30A Power Supply + Battery Direct (Before Ignition, Before Battery Shut Off)
3. 30 A Fill Station 12V Power
4. 80 A Back Rack Power



Cab Roof

Cab Roof Fuses

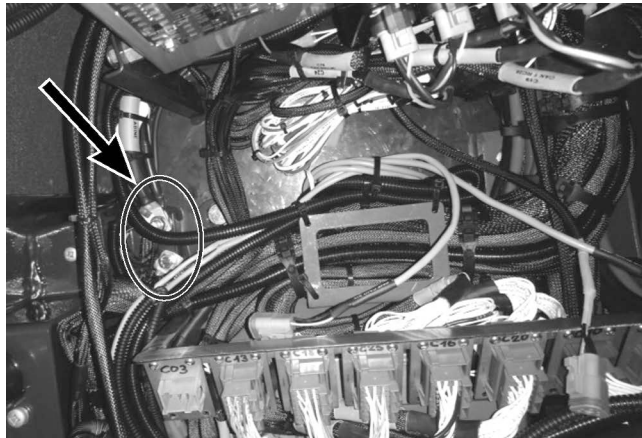


Cab Roof Fuse List

FUSE #	DESCRIPTION
F100	25A Fan 1
F101	25A Fan 2

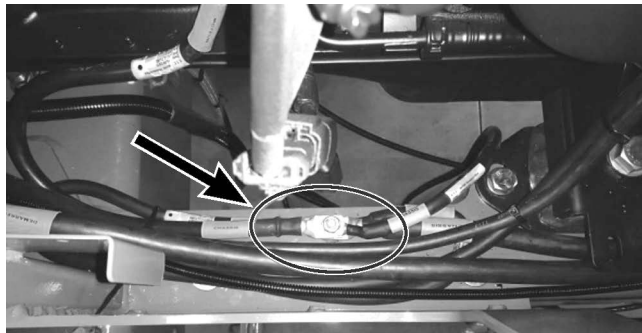
Harness Grounds

1. The harness grounds are located in the cab on the right, behind the RC28 ECU.



Engine Grounds

1. The engine grounds are located on the right side on the frame of the engine.



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CHAPTER 9

WARRANTY

Apache Sprayer Warranty Registration and Policy For all 2024 Model Year

Apache Sprayer Machine Warranty Registration

This is performed by the selling Apache Sprayer dealer and must be completed within fourteen (14) calendar days from delivery to end user.

Apache Sprayer Engine Warranty Registration

This is performed by the selling Apache Sprayer dealer: To register the Cummins engine for warranty first have the engine serial number, then go to www.cummins.com click on "product registration" read the terms and conditions. If you agree with the terms and conditions, then click on "I accept", and follow the instructions to register. This must be completed within fourteen (14) calendar days from delivery to end user. (When registering the sprayer on www.etdealer.com, a link is provided to the Cummins website and all of the customer information auto-fills from the etdealer.com registration form.)

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 warranty start date, 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 years from warranty start date or one thousand (1000) hours whichever occurs first, for parts, labor, and mileage. 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. 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 warranty start date 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), planetary and its 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 warranty start date, whichever comes first. ET does warrant the a/c compressor and alternator for first and second year. 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 thirty (30) months 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) calendar 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.

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.

All inquiries about this warranty policy should be addressed to:

Warranty Department • 455 Merriman Road • Mooresville, IN • 46158

Telephone: 317-834-4500

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.

	Grease the front axle assembly including all king-pins. Check all front axle bolts for proper torque.
	Change engine oil and replace filters.
	Service fuel system and replace filters.
	Replace cab filters.
	Remove and replace engine air filters, check intake clamps to make sure they are tight.
	Grease the rear axle assembly and check all rear axle bolts for proper torque.
	Service the hydraulic system. Check the oil, check the filter and replace if needed.
	Remove all product screens from strainers, clean and inspect for damage. Replace as needed.
	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.
	Fill and flush the wet system with clean water. Check boom pressure and agitation to validate functionality.
	Inspect all hydraulic hoses for rubs, worn spots and leaks.
	Inspect all hydraulic cylinders for leaks and proper operation.
	Inspect wiring harnesses for rub points.
	Verify Raven Controller calibrations:
	Flow Meter

[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.

	Grease the front axle assembly including all king-pins. Check all front axle bolts for proper torque.
	Change engine oil and replace filters.
	Service fuel system and replace filters.
	Replace cab filters.
	Remove and replace engine air filters, check intake clamps to make sure they are tight.
	Grease the rear axle assembly and check all rear axle bolts for proper torque.
	Service the hydraulic system. Check the oil, check the filter and replace if needed.
	Remove all product screens from strainers, clean and inspect for damage. Replace as needed.
	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.
	Fill and flush the wet system with clean water. Check boom pressure and agitation to validate functionality.
	Inspect all hydraulic hoses for rubs, worn spots and leaks.
	Inspect all hydraulic cylinders for leaks and proper operation.
	Inspect wiring harnesses for rub points.
	Verify Raven Controller calibrations:
	Flow Meter
	Boom Sections
	Control Valve
	Speed Cal
	Check A/C operation.
	Inspect frame for cracks and loose bolts.
	Inspect section valves for operation and wear.

[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.

	Grease the front axle assembly including all king-pins. Check all front axle bolts for proper torque.
	Change engine oil and replace filters.
	Service fuel system and replace filters.
	Replace cab filters.
	Remove and replace engine air filters, check intake clamps to make sure they are tight.
	Grease the rear axle assembly and check all rear axle bolts for proper torque.
	Service the hydraulic system. Check the oil, check the filter and replace if needed.
	Remove all product screens from strainers, clean and inspect for damage. Replace as needed.
	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.
	Fill and flush the wet system with clean water. Check boom pressure and agitation to validate functionality.
	Inspect all hydraulic hoses for rubs, worn spots and leaks.
	Inspect all hydraulic cylinders for leaks and proper operation.
	Inspect wiring harnesses for rub points.
	Verify Raven Controller calibrations:
	Flow Meter
	Boom Sections
	Control Valve
	Speed Cal
	Check A/C operation.
	Inspect frame for cracks and loose bolts.
	Inspect section valves for operation and wear.

[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.

	Grease the front axle assembly including all king-pins. Check all front axle bolts for proper torque.
	Change engine oil and replace filters.
	Service fuel system and replace filters.
	Replace cab filters.
	Remove and replace engine air filters, check intake clamps to make sure they are tight.
	Grease the rear axle assembly and check all rear axle bolts for proper torque.
	Service the hydraulic system. Check the oil, check the filter and replace if needed.
	Remove all product screens from strainers, clean and inspect for damage. Replace as needed.
	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.
	Fill and flush the wet system with clean water. Check boom pressure and agitation to validate functionality.
	Inspect all hydraulic hoses for rubs, worn spots and leaks.
	Inspect all hydraulic cylinders for leaks and proper operation.
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	Verify Raven Controller calibrations:
	Flow Meter
	Boom Sections
	Control Valve
	Speed Cal
	Check A/C operation.
	Inspect frame for cracks and loose bolts.
	Inspect section valves for operation and wear.

List any major repair work this season and date it was performed:



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