



Self Propelled Alley Vac OPERATOR'S/SAFETY MANUAL

2019

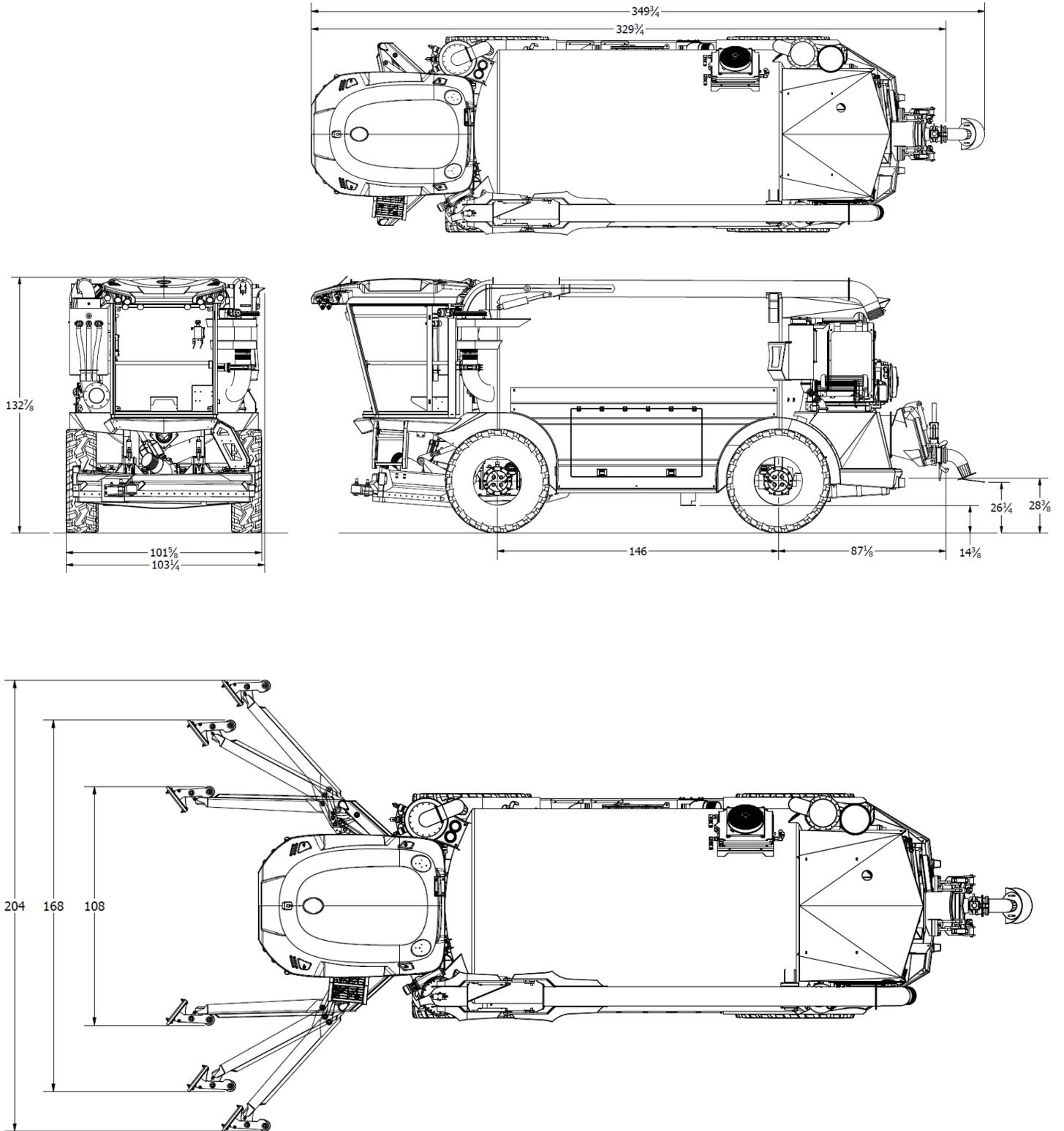


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1. Introduction

1.1. After-Sales Service

It is the owner's responsibility to ensure that the Alley Vac receives proper maintenance at various service intervals.

Your primary contact for the After-Sales Service is your local Nuhn dealer. If further assistance is needed, you can contact Nuhn Industries. Specific maintenance on the engine should be performed by an authorized Caterpillar dealer.

1.2. Warranty

The warranty section contains detailed information about the warranties made by Nuhn Industries and your obligations under these warranties.

The Owner's Manual contains additional information pertaining to proper use and maintenance of your new Nuhn Alley Vac.

2. Control Screen

Drive Control

Engine Warnings

Icon Cluster



Menu Buttons

2.1. Drive Controls

Park Brake Icon

When the parking brake is active, the parking brake icon will be illuminated.

Park Button

When the alley vac is in park, the park button will be illuminated.

Neutral Icon

When the alley vac is in neutral, the neutral button will be illuminated.

Reverse Icon

When the alley vac is in reverse, the reverse button will be illuminated. The back up camera will also automatically pop up in the display.

Forward – 1

When the alley vac is in forward 1, the F1 button will be illuminated. For general operation, the F1 option should be used.

Forward – 2

When the alley vac is in forward 2, the F2 button will be illuminated. F2 should only be used when moving the alley vac long distances. When in F2, rear steering is disabled.

2.2. Engine Warnings

Severe Engine Warning (Red)

Engine Warning (Yellow)

Engine Oil Pressure

DEF System Error

Wait to Start

2.3. Icon Cluster

High Pressure Hydraulic Filter Clog

If this light is illuminated, then the high-pressure filter located on the side of the alley vac is clogged. You must change the filter immediately.

Return Hydraulic Filter Clog

If this light is illuminated, then the hydraulic in-tank return filter is clogged. It must be changed immediately.

Low Hydraulic Oil Level

If this light is illuminated, then the hydraulic oil level in the hydraulic oil tank is low. You must top up the hydraulic oil tank to be within the acceptable level in the sight mark.

Steering Mode

If this light is red, then the alley vac is in 4-wheel steering mode. If it is green then it is in 2-wheel steering mode. If it is flashing then it is in the process of transitioning between steering modes.

Hydraulic Oil Cooling Fan Status

If this light is illuminated, then the hydraulic oil cooler fan is on meaning the hydraulic oil level reached a temperature higher than 120°F. The operator should monitor the hydraulic oil temperature to ensure that the temperature is maintained or decreasing. If the temperature continues to rise then the hydraulic oil cooler is not working.

Low DEF Level

If the low DEF level light is illuminated, then the DEF level on the alley vac is low. The DEF tank must be filled.

Low Fuel Level

If the low fuel level light is illuminated, then the fuel level on the alley vac is low. The fuel tank should be filled with low sulphur diesel.

2.4. Gauge Cluster

Battery Voltage

Displays the battery voltage level in V.

Engine Oil Pressure

Displays the engine oil pressure in PSI.

Engine Temperature

Displays the engine's coolant temperature in °F.

Engine RPM

Displays the engine's speed in RPM.

Tank Vacuum/Pressure Level

The Tank Vacuum/Pressure Level gauge indicates the vacuum level/pressure level inside the alley vac.

The vacuum side of the gauge is measured in inch-Hg, and the pressure side is measured in PSI.

While vacuuming, it is recommended to start the tank with vacuum around -20 in-HG. For tank life longevity it is recommended to not exceed this level of vacuum. There is a vacuum relief valve located on the side of the secondary trap. **It is recommended that it be adjusted to automatically relieve around this vacuum level to avoid collapsing the tank in.**

On pressure, it is recommended not to go over 10 PSI for tank longevity. **The pressure relief valves located on the side of the secondary trap should be adjusted so that the tank cannot go over this pressure.**

Engine Hour Meter

This displays the number of hours the engine has been ran.

Hydrostat Pressure

This gauge displays the pressure level of the vehicle's propulsion hydrostat. Ensure that the pressure never goes over 6000 PSI. If this pressure is exceeded, contact your local Nuhn dealer for further assistance.

Hydraulic Pump 1 Pressure

This gauge displays the pressure level of the hydraulic pump 1 circuit. Hydraulic pump 1 circuit runs the vacuum pump 1 (vacuum mode or pressure mode), steering, and all valves. When there aren't any functions are being ran, the stand-by pressure on this circuit should be around 400 PSI. When a function is being 'dead-headed' then the max pressure this circuit should be set at is around 2700 PSI. If the actual pressure values vary from these, contact your local Nuhn dealer for further assistance.

Hydraulic Pump 2 Pressure

This gauge displays the pressure level of the hydraulic pump 2 circuit. Hydraulic pump 2 runs the vacuum pump 2 (vacuum mode only), and the auger. When these functions are not activated, the stand-by pressure should be less than 200 PSI. When operating these pressures should not exceed 2700 PSI. If the actual pressure values vary from these, contact your local Nuhn dealer for further assistance.

Hydraulic Oil Temperature

This gauge displays the temperature of the hydraulic oil. The hydraulic oil during normal operation should be between 80°F to 140°F. If the hydraulic oil temperature is below 40°F, operation of the alley vac should be limited. Throttle should also be limited to 1000 RPM at this oil temperature.

During normal operation, if the hydraulic oil temperature reaches 120°F the hydraulic oil cooler fan will come on. When the oil drops to 110°F, the cooler will turn off. If the oil keeps climbing above 120°F,

then there is an issue with either the cooling radiator electrical fan or the cooler is plugged. **Do not operate the machine if hydraulic oil temperature has exceeded 200°F**

2.5. Boom Mode

If equipped with a boom, this button is used to cycle between boom operation and normal blade operation.

When not selected, the joystick operates the blade functions. When selected, the boom button will be highlighted yellow and the joystick will now operate the boom.

Boom Operation

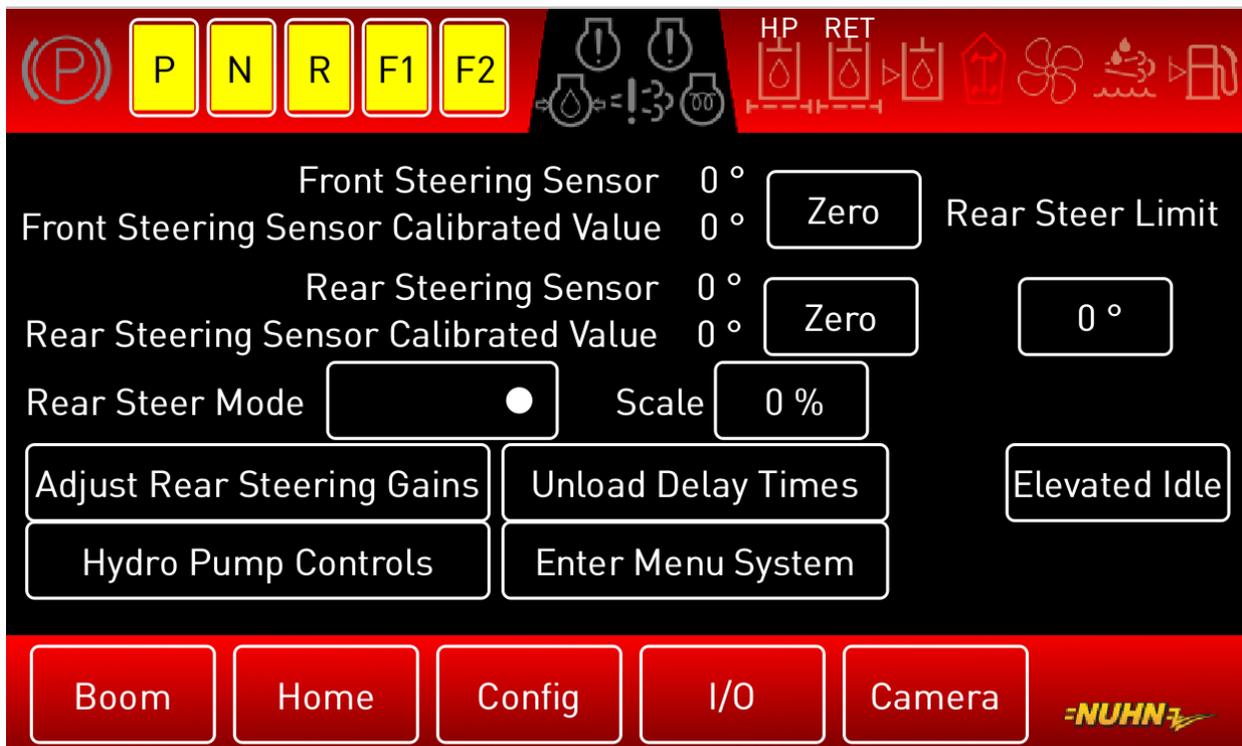
Pull back on joystick to raise boom. Pushing forward on joystick will lower the boom. Moving the joystick left or right will move the boom left and right respectively. The Blade Inlet Open and Blade Inlet Close buttons will not operate the boom inlet valve. In this mode the actuate the Boom Valve.

2.6. Home

The home button navigates to the main home screen. The main home screen shows all of the pertinent information for operating the alley vac. The engine values, hydraulic values and tank vacuum/pressure level are shown on this screen.

2.7. Config

The configuration screen is used for fine tuning the Alley Vac. On the configuration screen the user has access to adjusting the front and rear axle alignment, setting the foot pedal control settings, changing steering behaviour and accessing the Menu Settings System. It is advised not to go into the Menu Settings System screen without a Nuhn rep's assistance.



Steering Sensor

The Front Steering Sensor number shows the currently measured value on the steering transducer. The Calibrated Value shows what the Alley Vac has 0° saved to. For example, when the alley vac is steered straight ahead, the calibrated value will read 0°, whereas the actual value can vary.

Calibrating the Steering

If it feels like the alley vac is 'dog tracking', then it could be necessary to adjust the steering alignment. To tune the steering, start by steering the front wheels until they appear to be perfectly straight ahead. When they are straight ahead, press the 'Zero' button by the Front Steering Sensor value. The Front Steering Sensor Calibrated Value will now read 0°. Now turn the steering wheel in order to get the rear axle steered perfectly straight. NOTE – the front wheels will more than likely be steered to the left or right and not perfectly straight – this is OK! You are only setting the rear axles value. Once the rear axle is lined up perfectly straight then press the 'Zero' button for the rear axle.

Now to check that the procedure has been done correctly, use the steering wheel and steering modes to steer the axles until both the calibrated values are at 0°. In this position both axles should be perfectly straight. Repeat the calibrating procedure for the desired axle if it appears to be off.

Steering Modes

1:1

In this mode, the rear axle will steer the same angle as the front axle.

Scale

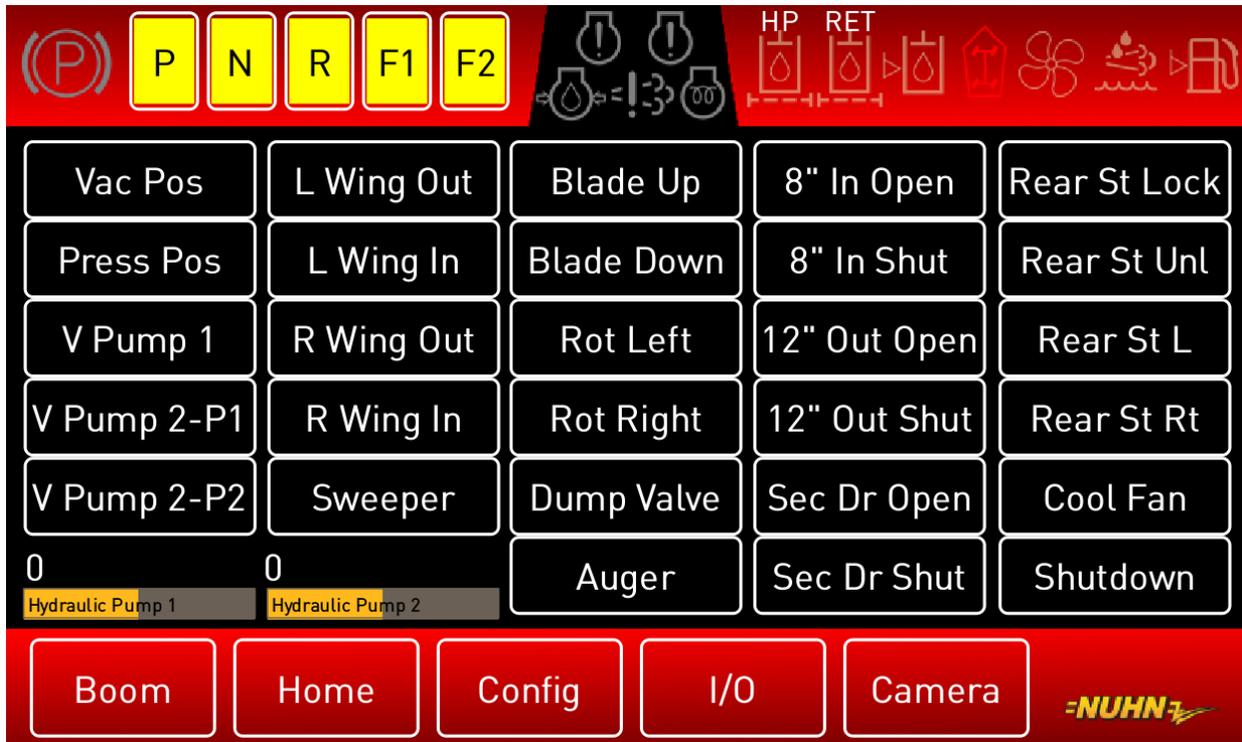
In this mode, the rear axle will steer X% of what the front axle has steered. The Scale in % determines what ratio to steer the rear axle vs the front axle. To change select the scale value by touching the box. +/- Buttons will appear, adjust the value accordingly.

Rear Steer Limit

The Rear Steer limit can be used to set a max point at which the axle can steer. This can be useful if the alley vac is used in a very tight alley where the tail swing needs to be restricted. To change select the scale value by touching the box. +/- Buttons will appear, adjust the value accordingly.

2.8. I/O

The I/O screen is used for initial Alley Vac setup. It is also used for troubleshooting outputs to see if it is an output error, or an input error.



| I/O | Description |
|---------------|---|
| Vac Pos | Extends the hydraulic cylinder on the vacuum pumps to vacuum position |
| Press Pos | Extends the hydraulic cylinder on the vacuum pumps to the pressure position |
| V Pump 1 | Fires the output on the DPX160 for vacuum pump 1 |
| V Pump 2 – P1 | Fires the output on the DPX160 for vacuum pump 2 |
| V Pump 2 – P2 | Fires the output on the pump 2 circuit for vacuum pump 2 |
| L Wing Out | Low pressure circuit for left wing out |
| L Wing In | Low pressure circuit for left wing in |
| R Wing Out | Low pressure circuit for right wing out |
| R Wing In | Low pressure circuit for right wing in |
| Sweeper | Output for running the spinner motors on the blade |
| Blade Up | Output for raising the blade |
| Blade Down | Output for lowering the blade |
| Rot Left | High pressure output for left blade in |
| Rot Right | High pressure output for right blade in |
| Dump Valve | Dump valve output off of the DPX for firing D03 solenoid valve circuit |
| Auger | Output for auger control from pump 2 circuit |
| 8" In Open | Output for opening the 8" inlet valve on the blade |
| 8" In Shut | Output for closing the 8" inlet valve on the blade |
| 12" Out Open | Output for opening the rear door on the Alley Vac |
| 12" Out Shut | Output for closing the rear door on the Alley Vac |

| | |
|--------------|--|
| Sec Dr Open | Output for opening the secondary drain gate valve located behind the cab |
| Sec Dr Shut | Output for closing the secondary drain gate valve located behind the cab |
| Rear St Lock | Extends the hydraulic cylinder located on the rear axle for locking out |
| Rear St Unl | Retracts the hydraulic cylinder located on the rear axle for locking out |
| Rear St L | Steers the rear axle left |
| Rear St R | Steers the rear axle right |
| Cool Fan | Output for turning on the hydraulic oil cooler electric fans |
| Shutdown | Output for shutting off the motor |

2.9. Camera

The camera page shows the backup camera on the Alley Vac. When in reverse, the backup camera page comes up by default.

3. Cab Controls

Listed below is a brief overview of the operator controls in the cab. Refer to the Operation section for more detailed instructions on how to effectively use these features to efficiently and effectively vacuum an alley.

Alley Vac Propulsion Controls

| | | |
|--|---|--|
| | Drive Neutral Reverse Throttle Increase Throttle Decrease Start/Stop | Puts the Alley Vac in forward gear Releases the parking brake Puts the Alley Vac in reverse gear Incremental increase in engine's RPM Incremental decrease in engine's RPM Starts the motor while not running, and stops the motor while engine is running. |
|--|---|--|

Alley Vac Operation Functions

| | | |
|--|--|--|
| | Vacuum Pressure Unload Secondary Drain Drain Tank 2-Way Steer | Puts the tank under vacuum Puts the tank under pressure Opens rear door and turns on auger Operates the drain valve on the secondary trap Operates all of the valves on the alley vac Changes Alley Vac steering mode |
|--|--|--|

Blade Control Joystick

| | | |
|--|--|--|
| | Left Wing Toggle Right Wing Toggle 8" Valve Open (L) 8" Valve Close (R) Joystick Back Joystick Forward Joystick Left Joystick Right | Operates the left wing on low pressure Operates the right wing on low pressure Opens the blade inlet valve Closes the blade inlet valve Raises the blade Puts blade into float High pressure right wing in High pressure left wing in |
|--|--|--|

4. Operation

4.1. Startup

To start the alley vac, insert the key into the ignition and turn ahead one position. This will power up the display and electronic display. The display should display the "Nuhn" splash page for a few seconds and then go to the main home page.

In the top center of the screen, there are 5 icons. The bottom left is the *Wait to Start*. Wait for this light to go out and then you are able to start the motor. The start/stop button is the bottom right button in the transmission button cluster in the side arm rest.

Push and hold this *Push to Start* button until you hear the motor fire.

It is important before operating the alley vac to wait for engine and hydraulic oil to come to temperature. Engine temperature should be at least 40°F, and hydraulic oil temperature should be at least 60°F.

4.2. Setting Engine RPM

When the motor and the hydraulic oil are at minimum operating temperatures, you may set the Engine RPM. The top left, and middle left button on the transmission button cluster are for setting the engine RPM. You can press and hold, or press repeatedly the throttle up, or throttle down button to set the motor at the desired engine RPM. If you need to slowly maneuver the machine, it is ok to leave the engine speed around 800 RPM. The engine RPM is displayed on the touch screen display; it is the bar on the left closest to the center of the display.

For normal operating conditions, the recommended engine speed is anywhere between 1600 RPM to 2000 RPM. In wetter conditions, a lower engine RPM can be used. In drier, sandy conditions where higher vac air flow is required then 2000 RPM should be used.

4.3. Generic Control Information

The Nuhn Alley Vac has a simple operating platform. A lot of the functions are streamlined to operate behind the scene with a simple push of the button. When a button is not active, it is red. When a button is active, it is yellow. When a button is in the process of operating, or switching position it will flash yellow.

4.4. Gear Selection

To drive the alley vac, you must select your gear. This can be done in two places: the top left bar on the touch screen or the transmission button cluster in the armrest.

Forward 1

To drive forward, you can either hit the F1 button in the top screen or hit the D button on the armrest. These both disengage the park-brake and activate the first forward gear.

Forward 2

To drive forward in second gear, you only have the option to hit F2 on the top screen bar. F2 is a password protected function to prevent unnecessary speed around the operation. When in F2, it will automatically switch the steering mode to 2-Wheel Steering and lock the rear axle straight.

Reverse

To drive in reverse, you can either hit the R button in the top left bar on the screen, or hit the R button on the arm rest pod.

Neutral

To go into neutral, you can either hit the N on the top bar of the screen or the N on the arm rest pod.
NOTE – N does not engage the parking brake. Naturally with a hydrostat, there is a pretty good natural brake; however, if you plan on leaving the machine it is better to put into Park.

Park

To put the Alley Vac into park, simply hit the P button on the top left bar of the screen. This will engage the parking brake and turn on the parking brake light which is on the top left corner of the screen. The parking brake on the Nuhn Alley Vac is a spring applied, hydraulic release style brake so when driving or in neutral, hydraulic pressure is releasing the parking brake and when in park or the machine is off, the parking brake is automatically applied by a spring.

4.5. Function States on Start Up

At this point you will notice that when you started the machine, the *2-Way Steer* button was flashing for about 10 seconds but is now red, but the *Secondary Drain* and *Drain Tank* buttons are flashing yellow.

The 2-Way Steer button was flashing because the machine on start-up automatically shifts to all wheel steer mode. The alley vac does not know when you shut down which position the rear axle was in, so by default, even if it was already in all-wheel steer mode, it will make the shift anyways.

Similarly, the alley vac does not know if you drained then tank and left all the valves open when you shut down last. Therefore, the alley vac is prompting you to push Drain Tank in order to close the inlet valve, the discharge valve, and the secondary drain. By default, on start up, you should make a habit of hitting drain tank to close all of the valves.

Warning!

Before hitting Unload button, check the backup camera to ensure no one is near the 12" valve. Closing the rear discharge valve on someone can result in serious injury, amputation, or even death!

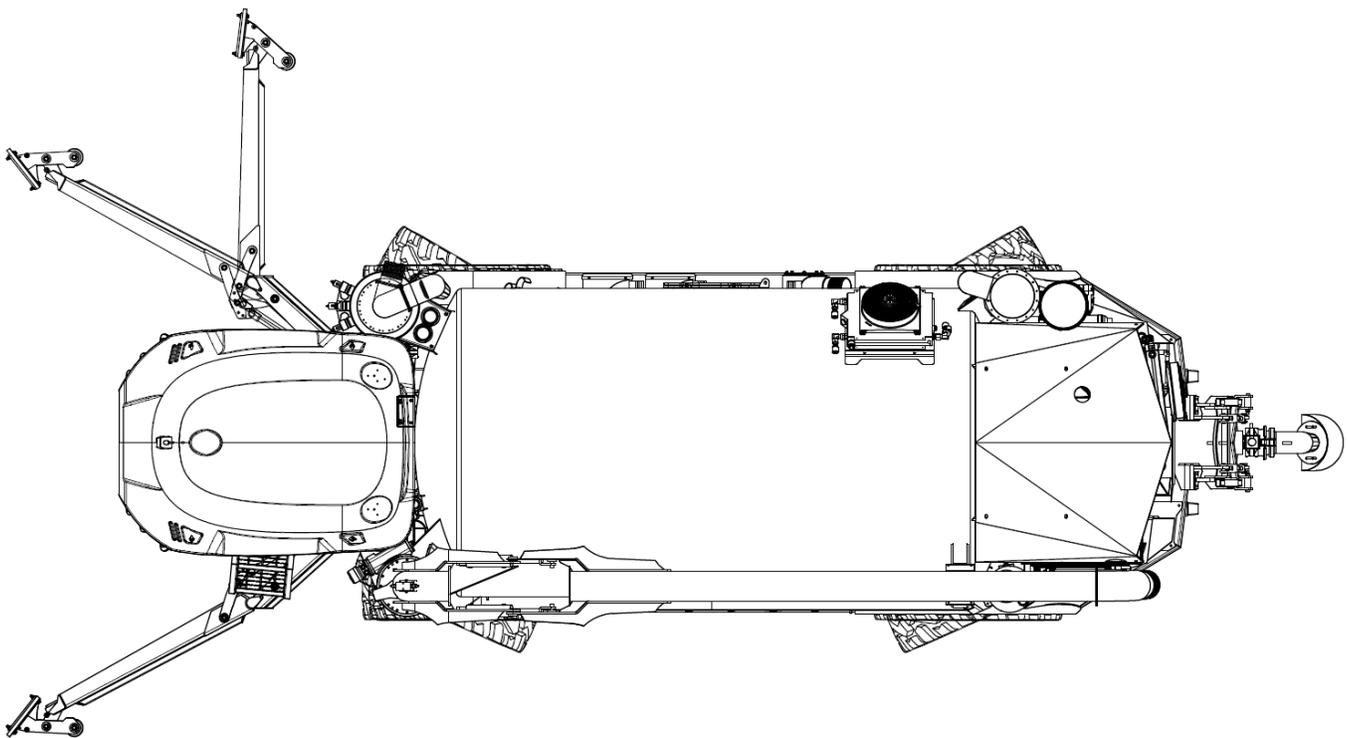
4.6. Steering

The steering wheel steers the front axle left or right. When 2-Way Steer is active, the rear axle will be locked and only the front axle will steer. When 2-Way Steer is not active, the rear axle will mimic the opposite angle as the front axle.

When switching 2-Way steer on and off, the button will flash for about 10 seconds to make the transition. During this process, the rear axle steers to either centered or steered depending on the mode, and the rear axle safety locks will engage or disengage.

⚠ Warning!

Make sure no one is around the wheel, or wheel well when steering or switching between steering modes as the wheel can steer unexpectedly. Serious injury, or even death can occur!



4.7. Blade Control

All of the blade controls are on the joystick. These functions are the left wing, right wing, blade height, and inlet valve position.

Blade Height

The blade height is controlled by pushing the joystick ahead or back. To raise the blade, simply pull back on the joystick. The blade will raise as you pull back on the joystick. To stop raising the blade, simply stop pulling back on the joystick.

To lower the blade, all you have to do is push forward on the joystick once. This will let the oil out of the lift cylinder and the blade will fall. You only have to push forward once to drop the blade, you do not need to keep the joystick pushed forward.

Warning!

If the blade is raised, and the engine is OFF, but the key is still in the on position; if the joystick is pushed ahead the blade will still fall. If this is pushed ahead while someone is near the blade or under the blade serious injury can occur, or even death!

Left and Right Wings

There are two different hydraulic pressures for the wings – a high pressure side for bringing the wings in, and a low-pressure side for pushing the wings in or out.

The horizontal toggle switches on the joystick control the wings in and out with low pressure. The left toggle is the left wing, and the right toggle is the right wing. To push the right wing out, simply push the right wing out toggle. This toggle will latch out. The same goes for moving out the left wing.

The purpose of the latch is to create a slight outward push against the concrete curb while cleaning the alley. When sucking up the manure, it is important to leave the wing latched out as this will allow the wing to move in and out freely as you drive up the alley. **If you are driving up the alley and don't have the wings latched, they will become fixed and lock in that position.** If the operator moves side to side in the alley with the wings locked; **they will break.**

Clicking the toggle the other way will move the wings in with high pressure, as well as turns off the latch that is pushing the wings out.

The joystick left/right motions will move the blades in using high pressure hydraulics. If you move the joystick to the right, it will bring the left-wing in. If you move the joystick to the left, it will bring the right-wing in. The reason for this motion is if you are making the turn at the end crossover in the barn, you move the joystick the same way that you are steering the wheel. This prevents the wing from folding back and potentially getting caught on the curb.

Note – the joystick left and right movements are proportional. Therefore, the further you move the joystick away from center, the faster it will move the blade wings.

Inlet Valve Control

The two red buttons on the joystick are the blade inlet valve controls. The red button on the left opens the inlet valve, and the red button on the right closes the inlet valve.

These are momentary buttons; meaning the function only operates while holding the button. If the valve is fully closed, you will have to press and hold the button for a few seconds to allow the valve time to fully open. The same goes for closing the valve. If you simply press the button, it will not fully cycle



the valve position; it will only move the position of the valve for the amount of time you pressed the button.

This can be helpful for when sucking up very dry manure that is clumpy. You can tap the close button a few times to slightly block off the inlet valve so you don't suck as much air.

When the tank is full, or the operator is done sucking up the aisle, you should shut the inlet valve to prevent the material from running out of the tank onto the ground.

4.8. Operation Functions

The top button panel relates to the operation of the Alley Vac.

Vacuum

Press the vacuum button once to start creating vacuum in the tank. It takes a few seconds before the pumps turn on after hitting the button; this is because the diverter valve on top of the vacuum pumps is switching to vacuum position before the vacuum pumps turn on. The vacuum button will flash yellow while switching position and then turn yellow when the pumps are on.



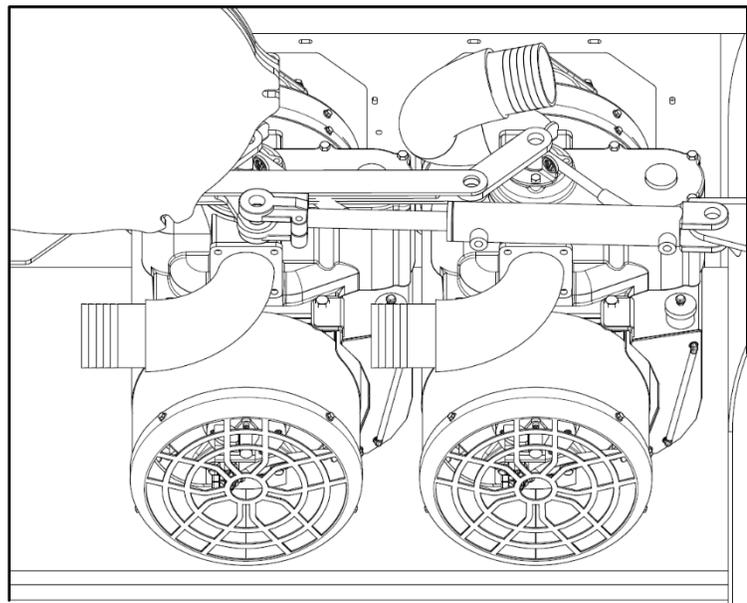
When operating the vacuum pumps, the minimum RPM of the engine should be 1600 RPM. It is important to not run the pumps too slowly as the pumps use centrifugal force to keep the vanes to the outside of the housing. If the pumps are running too slowly then this can create "wash-boarding" effect in the pumps and cause premature failure.

To have high performance in the alley, it is recommended to put a pre-vac on the tank. You can put vacuum on the tank as you drive to the alley, and then when you start driving in the alley and get some material in the blade open the front inlet valve.

To stop the vacuum pumps, hit the vacuum pump button again. The button should go back to red.

Pressure

Press the pressure button once to start pressurizing the tank. It takes a few seconds before the vacuum pumps switch on as the vacuum pump air diverter valve is switching position to pressure. The yellow light on the pressure button will flash during this procedure. Once they are in position the button will turn yellow and the pumps will turn on.



PRESSURE: CYLINDER EXTENDED

It is ok to put a pre-charge on the tank. That being said, it is advised not to go over 10 PSI. There are pressure relief valves to automatically stop the tank from building too much pressure, but in the event of a relief valve failure the pressure of the tank should always be monitored.

To stop the pumps from pressurizing the tank, hit Pressure again. The button will go red.

Unload

To unload the tank, press the unload button. When you press unload, the rear door will open, and the auger will turn on. The unload button will turn yellow. It is advised to turn on the backup camera to see when you are empty.

To turn the auger off and close the rear valve, press the unload button again to turn it back to red in colour.

Warning!

Before hitting Unload button, check the backup camera to ensure no one is near the 12" valve. Closing the rear discharge valve on someone can result in serious injury, amputation, or even death!

Secondary Drain

The secondary trap is the canister to the right rear of the cab. This is a secondary check ball catch tank to help prevent manure from getting into the vacuum pumps. Over time it will fill up with manure.

Depending on how often the alley vac is used, it should be a general practice to drain the secondary trap regularly to prevent manure from entering the vacuum pumps.

Make sure the alley vac is in an area where manure can be dumped on the ground from draining the secondary trap.

Press the Secondary Drain button to open the secondary trap. The button will turn yellow meaning the secondary drain valve is open.

Press the Secondary Drain button again to close the drain valve. The button will turn back to red meaning the drain valve is closed.

Drain Tank

Opens/closes the inlet valve, the discharge valve, and the secondary drain at the same time for when starting/finished use of the machine.

Refer to Section 4.5, where the Drain Tank function was explained earlier in the Startup section.

2-Way Steer

The 2-Way Steer button is used to control the alley vac's steering mode. By default when starting the alley vac, the alley vac will shift two 4-wheel steering. The 2-Way Steer button will flash yellow for approximately 10 seconds while it shifts to this steering mode, then turn red.

To go into front-wheel only steering mode, hit 2-Way Steer. The button will flash for 10 seconds while the rear axle is centered and the axle steering locks are applied. The button will stay lit yellow when in the 2-Way steering mode.

To go back to 4 wheel steering, simply press the 2-Way Steer mode button. It will flash for 10 seconds while retracting the steering locks and go into 4 wheel steering, then turn red.

2-Way Steer mode will also be activated by default when in F2 drive for added stability.

4.9. Refueling

Use low sulphur diesel fuel, dyed or not dyed.

There is one central fuel tank on the alley vac. Shut the engine off first. In cold weather conditions, add diesel anti-freeze. If you run out of fuel, always prime the engine before restarting by turning on the key twice before cranking.

4.10. DEF System (Tier 4 Engine)

DEF Fluid

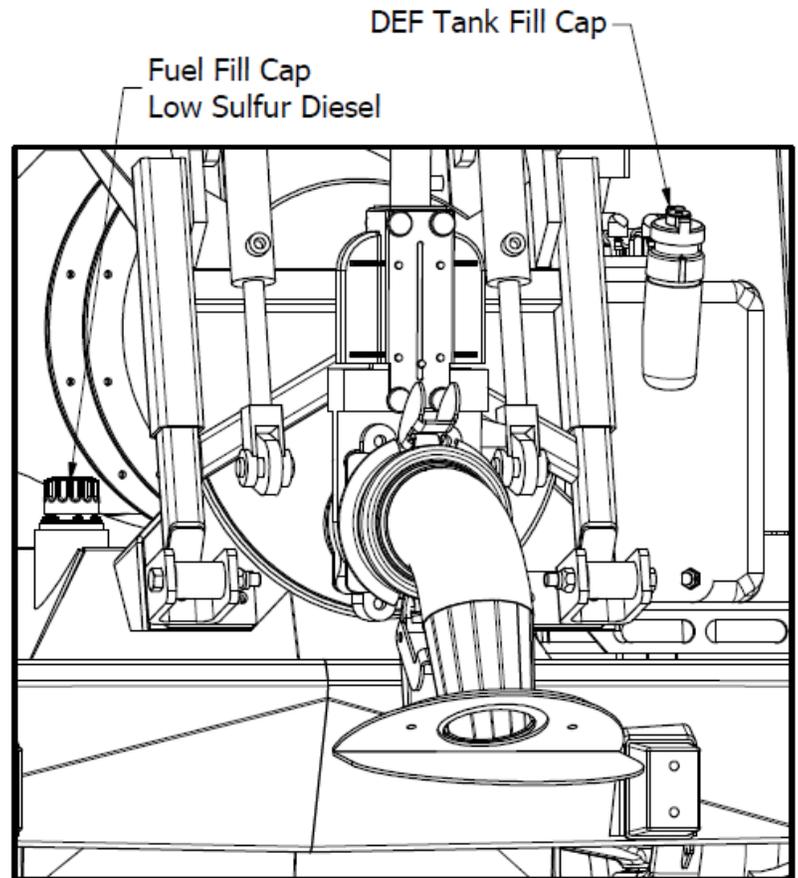
Add DEF during refueling to avoid interruptions during operation.

Adding DEF Fluid

The DEF Fluid Tank is a separate plastic tank with a blue cap, located to the right of the fuel tank.

4.11. HVAC Controls

See attached two pages at the end of the document.



5. Maintenance

5.1. General Safety Measures

All maintenance should be carried out while the engine is off, and the electrical disconnected!

Take the time to read and understand all maintenance schedules. Please contact Nuhn Industries if you have any questions.

Work in an area that is dry, well lit, ventilated, and free from clutter, loose tools, parts, ignition sources and hazardous substances. Be aware of hazardous conditions that can exist.

Always wear protective glasses and protective shoes when working.

Rotating parts can cause cuts, mutilation, or strangulation.

Do not wear loose-fitting or torn clothing. Remove all jewelry when working.

Disconnect the battery (negative cable first) and discharge any capacitors before beginning any repair work. Disconnect the air starting motor if equipped to prevent accidental engine starting. Put a "Do Not Operate" tag in the operator's compartment or on the controls.

Use **ONLY** the proper engine barring techniques for manually rotating the engine. Do not attempt to rotate the crankshaft by pulling or prying on the fan. This practice can cause serious personal injury, property damage, or damage to the fan blade(s) causing premature fan failure.

If an engine has been operating and coolant is hot, allow the engine to cool before slowly loosening the filler cap to relieve the pressure from the cooling system.

Always use blocks or proper stands to support the product before performing any service work. Do not work on anything that is supported **ONLY** by lifting jacks or a hoist.

Relieve all pressure in the air, oil, fuel, and cooling systems before any lines, fittings, or related items are removed or disconnected. Be alert for possible pressure when disconnecting any device from a system that utilizes pressure. Do not check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.

To reduce the possibility of suffocation and frostbite, wear protective clothing and **ONLY** disconnect liquid refrigerant (Freon) lines in a well-ventilated area. To protect the environment, liquid refrigerant systems must be properly emptied and filled using equipment that prevents the release of refrigerant gas (fluorocarbons) into the atmosphere. Federal law requires capturing and recycling refrigerant.

To reduce the possibility of personal injury, use a hoist or get assistance when lifting components that weigh 23kg (50lb) or more. Make sure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct capacity. Make sure hooks are positioned correctly. Always use a spreader bar when necessary. The lifting hooks must not be side-loaded.

Corrosion inhibitor, a component of SCA and lubricating oil, contains alkali. Do not get the substance in your eyes. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. Avoid prolonged or repeated contact with skin. In case of contact, immediately wash skin with

soap and water. Do not swallow internally. In the event that substance is ingested, IMMEDIATELY CALL A PHYSICIAN. KEEP OUT OF REACH OF CHILDREN.

Naptha and Methyl Ethyl Ketone (MEK) are flammable materials and must be used with caution. Follow the manufacturer's instructions to provide complete safety when using these materials. KEEP OUT OF REACH OF CHILDREN.

To reduce the possibility of burns, be alert for hot parts on products that have just been turned off, exhaust gas flow, and hot fluids in lines, tubes, and compartments.

Always use tools that are in good condition. Make sure you understand how to use the tools before performing any service work. Always use the same fastener part number (or equivalent) when replacing fasteners. Do not use a fastener of lesser quality if replacements are necessary.

When necessary, the removal and replacement of any guards covering rotating components, drives, and/or belts should only be carried out by a trained technician. Before removing any guards, the engine must be turned off and any starting mechanisms must be isolated. All fasteners must be replaced on re-fitting the guards.

Do not perform any repair when fatigued or after consuming alcohol or drugs that can impair your functioning.

Some state and federal agencies in the USA have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapours, ingestion, and prolonged contact with used engine oil.

Do not connect the jumper starting or battery charging cables to any ignition or governor control wiring. This can cause electrical damage to the ignition or governor.

Always torque fasteners and fuel connections to the required specifications. Over tightening or under tightening can allow leakage. This is critical to the natural gas and liquefied petroleum gas fuel and air systems.

Always test for fuel leaks as instructed, as odorant can fade. Close the manual fuel valves prior to performing maintenance and repairs, and when storing the vehicle inside.

Coolant is toxic. If not reused, dispose of in accordance with local environmental regulations.

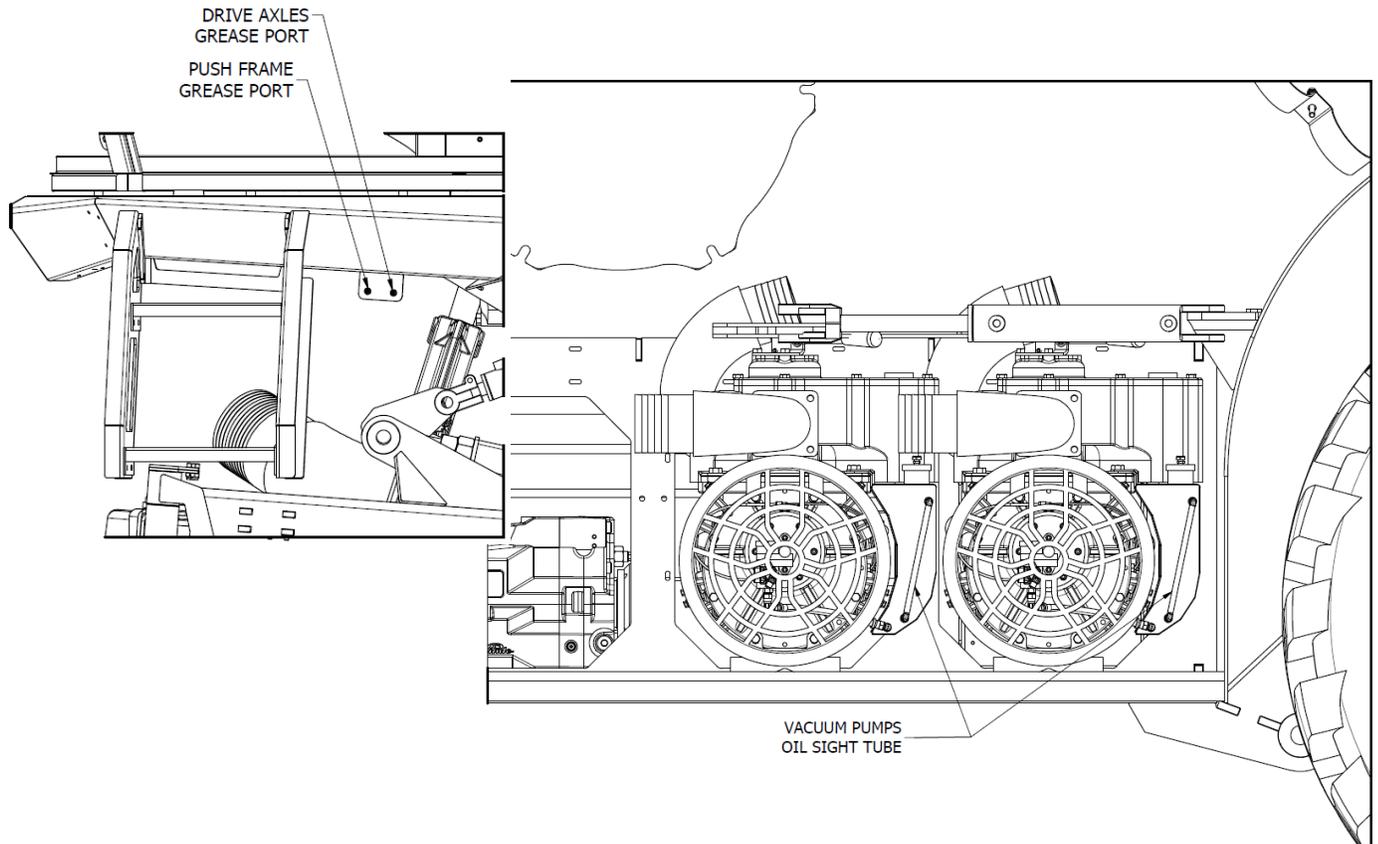
The catalyst reagent contains urea. Do not get the substance in your eyes. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. Avoid prolonged contact with skin. In case of contact, immediately wash skin with soap and water. Do not swallow internally. In the event the catalyst reagent is ingested, contact a physician immediately.

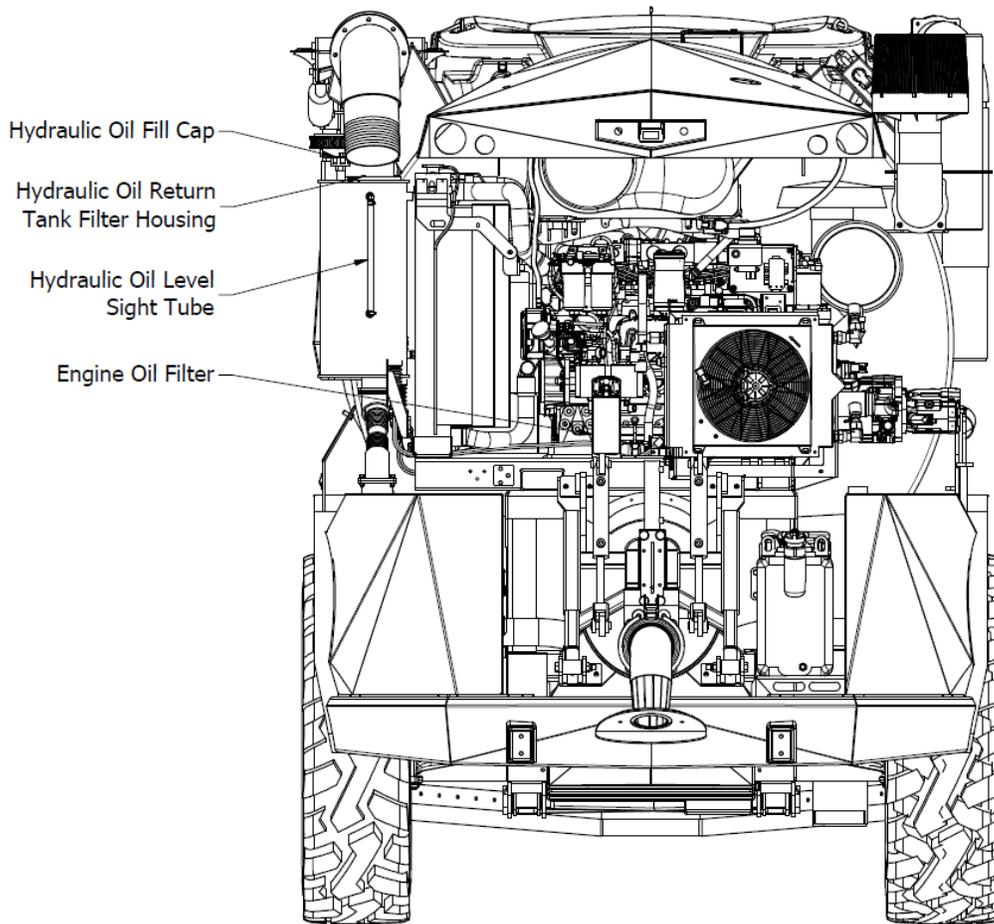
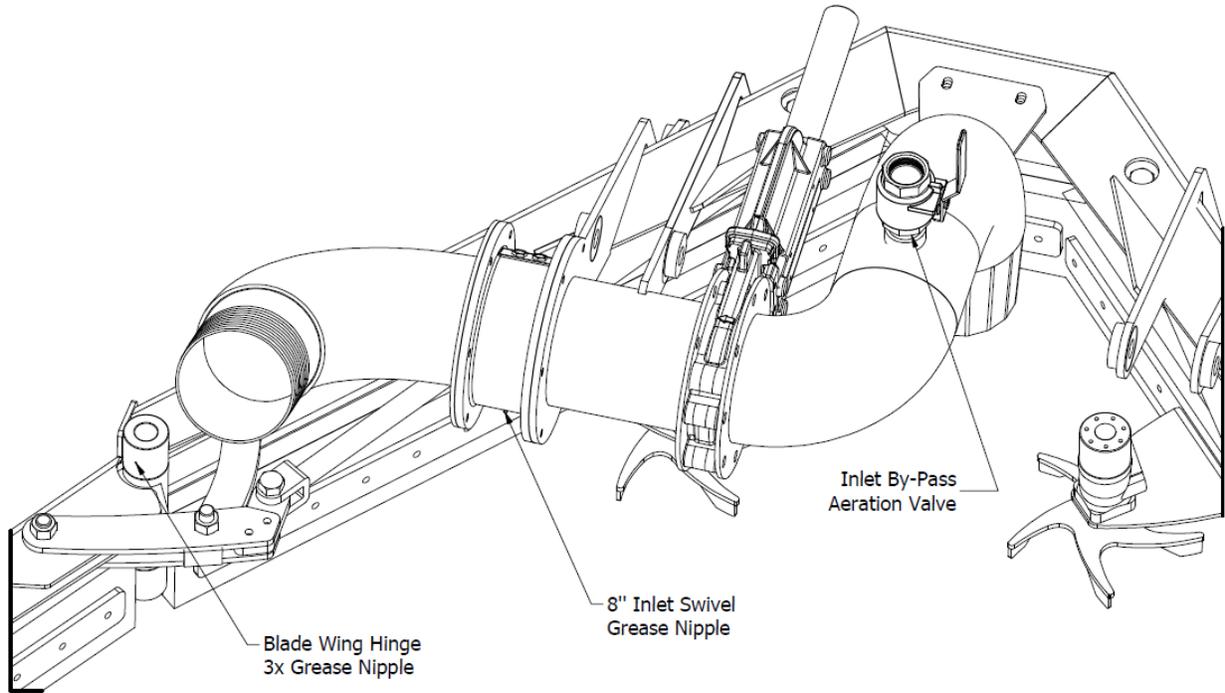
The catalyst substrate contains Vanadium Pentoxide. Vanadium Pentoxide has been determined by the State of California to cause cancer. Always wear protective gloves and eye protection when handling the catalyst assembly. Do not get the catalyst material in your eyes. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. Avoid prolonged contact with skin. In case of contact, immediately was skin with soap and water.

It is the owner's responsibility to ensure that the proper maintenance is performed on the Alley Vac.

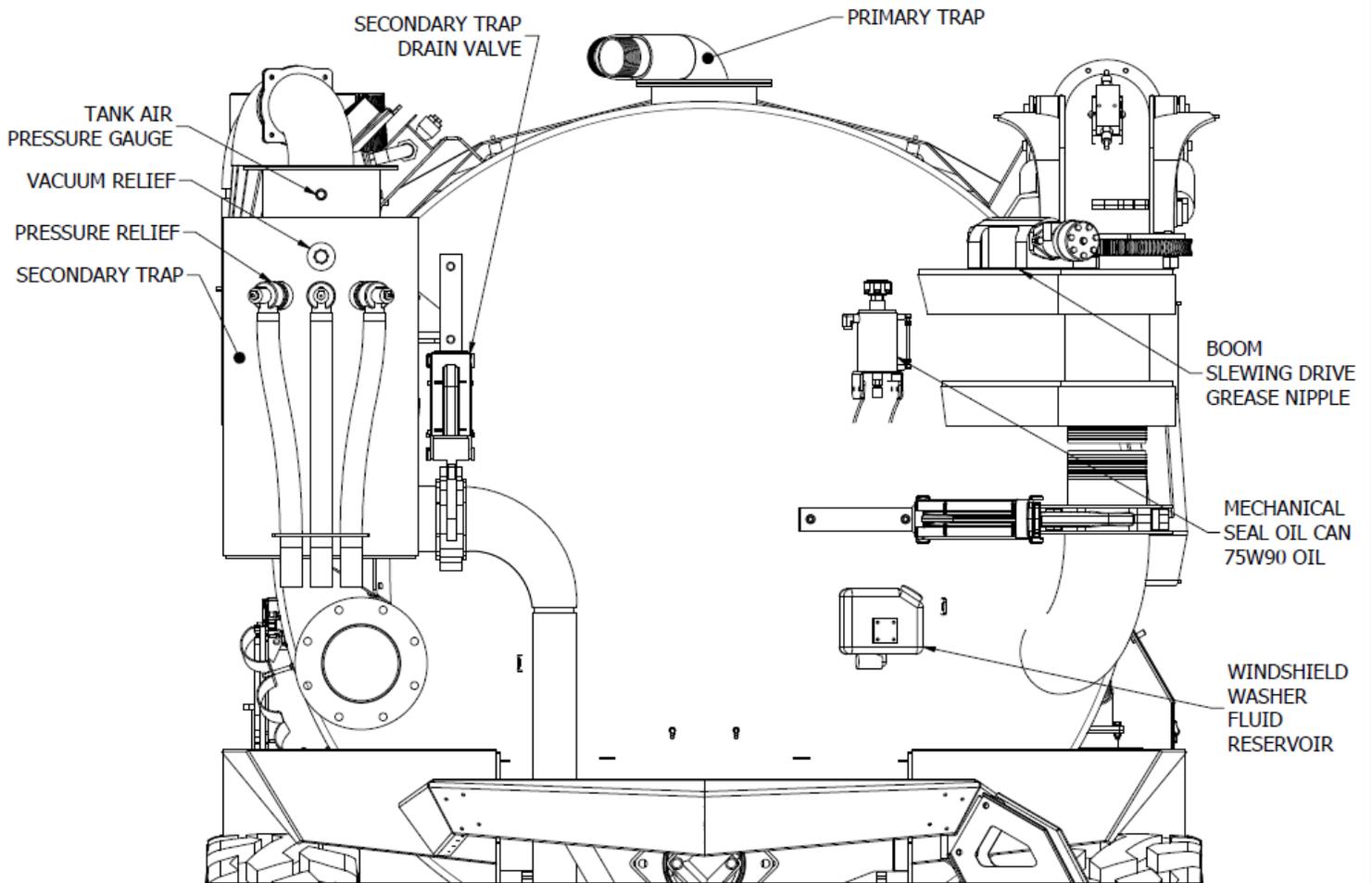
5.2. Lubrication

| Component | Lubricant | Interval |
|-------------------------|------------------------------------|---|
| Vacuum Pump | ISO 46 Non-Detergent Anti-Wear Oil | Inspect before each use. Do not start running pump if oil level is below ¼ tank |
| Hydraulic Oil | UTF | Monitor oil level sensors |
| DANA Axles Differential | 85W90 GL5 Synthetic | Check Monthly. Replace Initially after 100 hrs, Then Annually or every 700 hrs |
| DANA Axles Wheel Drive | 85W90 GL5 Synthetic | Check every 200 hrs. Replace initially after 100 hrs, then Annually or every 1000 hrs |
| Driveshaft | Grease | Monthly |
| DANA Axle Grease | #2-3 Grease w/ Moly | Daily – 5 pumps on grease bank |
| Blade Push Frame | Grease | Daily – 5 pumps on grease bank |
| Blade Wing Bushings | Grease | Daily |
| 8" Inlet Swivel | Grease | Weekly |
| Auger Mechanical Seal | 75W90 Synthetic | Initially after 50 hrs, then every 200 hrs |
| Boom | Grease | Monthly |





5.3. Preventative Maintenance Procedures



Before each use, check all machine fluid levels.

Draining the Secondary Trap

It is recommended to drain the secondary trap every 10 hrs, and weekly.

Vacuum Pump Oil Level

The vacuum pump oil level should be checked every 10 hrs, and weekly.

Flushing the Vacuum Pumps

Weekly, it is recommended to flush the vacuum pumps. With the engine speed at 1200 RPM, run the Alley Vac on vacuum mode. Mix 1 quart of diesel and vacuum pump oil for each vacuum pump to create the flushing fluid. Slowly pour this mixture into the flush port of each vacuum pump while the vacuum mode is running. When all of the flushing fluid is in the vacuum pump close the flushing port. Leave the vacuum pumps running for 5 minutes for the flushing fluid to evacuate the vacuum pumps.

Pressurizing the Tank

Daily, it is recommended to run the tank in pressure mode to purge the vacuum hoses of manure if the tank is not normally pressurized.

First, drain the secondary trap of any liquid. Once drained, close the secondary drain valve. Open the blade valve approximately ¼ open. Then run the pressure function for approximately 5 minutes. This will blow air through the 4" vacuum hoses and flush the lines of any manure that has passed the primary traps and secondary traps. Monitor the pressure gauge on the tank that it does not go over 10 PSI.

Checking Hydrostat Charge Pressure

Weekly, it is recommended to check the hydrostat charge pressure. The charge pressure gauge is located on the hydrostat on the right side of the machine. While the engine is running, the charge pressure should be approximately 350-450 PSI. If it is above or below this value, shut off the machine and contact your local Nuhn rep immediately.

Inspecting the Blade Rubber

Weekly, the blade rubber should be inspected weekly to ensure the rubber has not worn down to the point where the metal blade is wearing on the concrete.

Inspecting the Wing Tips

Weekly, check that blade end guides are able to move in and out freely. The rollers should also be able to turn freely. If they don't move freely, inspect the wear bushings in the roller, and pivot. Replace if necessary.

Checking Wheel Torque

Retorque 10 hrs after rim install, then check weekly. The wheel torque should be 500 ft-lbs.

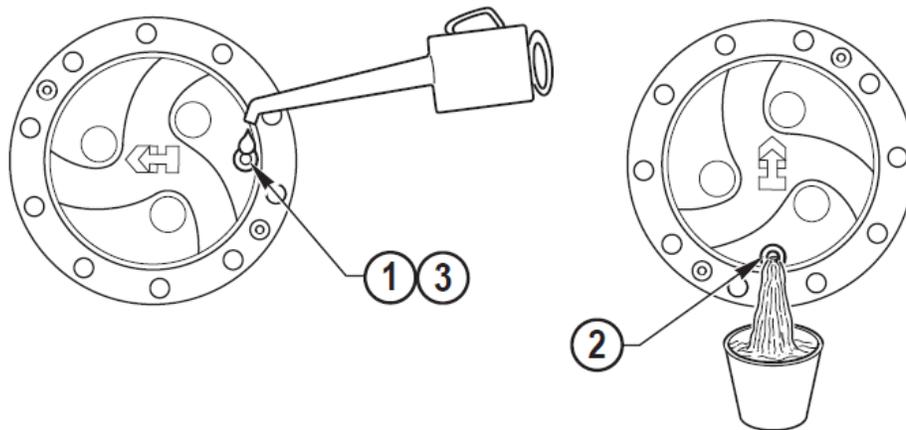
5.4. Axle Maintenance

Adjustments and Checks

| Component | Task | Interval |
|----------------|------------|--|
| Negative Brake | Adjustment | Initially 100 hrs, then Every 1000 hrs |
| Service Brake | Adjustment | Every 500 hrs |
| Brake Wear | Check | Monthly |

Refer to DANA Axle Service Manual for Brake Adjustment and Checking Procedures.

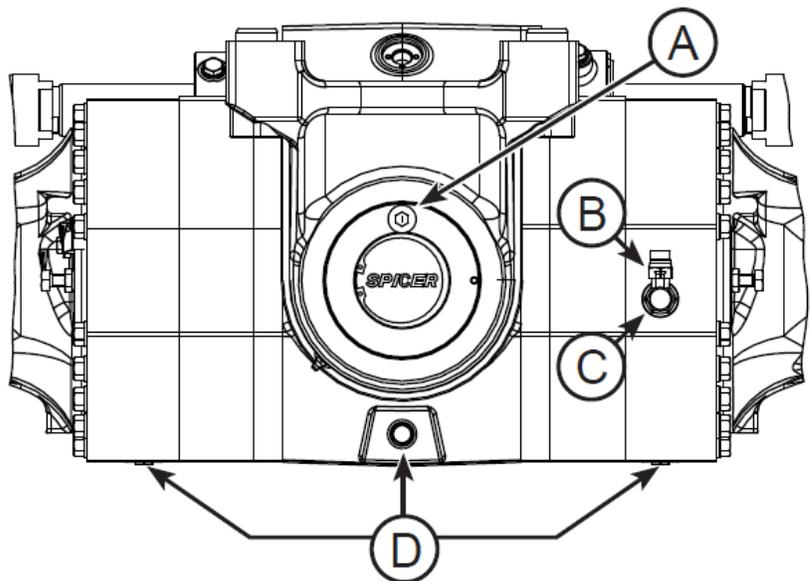
Wheel Planetary Drive Oil Change



1. Drain Wheel Drives (right), and move it to shown position (Left)
2. Fill with 85W90 GL5 Synthetic oil to the level of the port
3. Replace Plug and torque to 40 ft-lb (55N-m)

Differential Oil Change

1. Remove Plug A to relieve any air pressure.
2. Remove Center Drain Plug (D) to empty the central axle area of oil.
3. Replace Drain Plug (D) and tighten to 40 ft-lb (55N-m)
4. Fill up with 85W90 GL5 Synthetic oil level to Plug A Port
5. Wait 15 minutes for oil to seep through brake assembly to outer arms.
6. Top up oil level to Plug A Port
7. Replace and tighten Fill Plug A to 40 ft-lb (55N-m)



6. Troubleshooting

6.1. Suction

If the alley vac has poor vacuuming performance, it could be due to air leaks, incorrect suction (inlet) setting or poor vacuum pump performance.

Checking for Air Leaks

Close all of the valves on the Alley Vac. Then put the tank under vacuum. Once it hits about -15inHG turn the vacuum pumps off. Monitor the vacuum level of the tank, it should remain relatively constant. If it goes down rapidly then there is an air leak on the tank.

Possible air leaks could be a lose bolted flanged connection, or a faulty gate valve. Another cause could be debris packed in the base of a gate valve.

Check Time to Reach -20inHG

If the tank maintains vacuum, the operator should time how long it takes to go from 0 to -20inHg. This should take approximately 1 minute. If it takes considerably longer to do this then there could be an issue with the vacuum pumps.

Inlet Settings

If the tank is air tight, and the vacuum pumps have good performance, then the problem could be incorrect inlet settings. If you are attempting to suck up very dry material, the air inlet by-pass valve located on the blade inlet should be opened. Adding air to the inlet will allow you to clean the alleys at a much higher rate of speed. The spinners located on the blade should also be inspected to make sure they are turning properly and guiding the material to the center of the blade

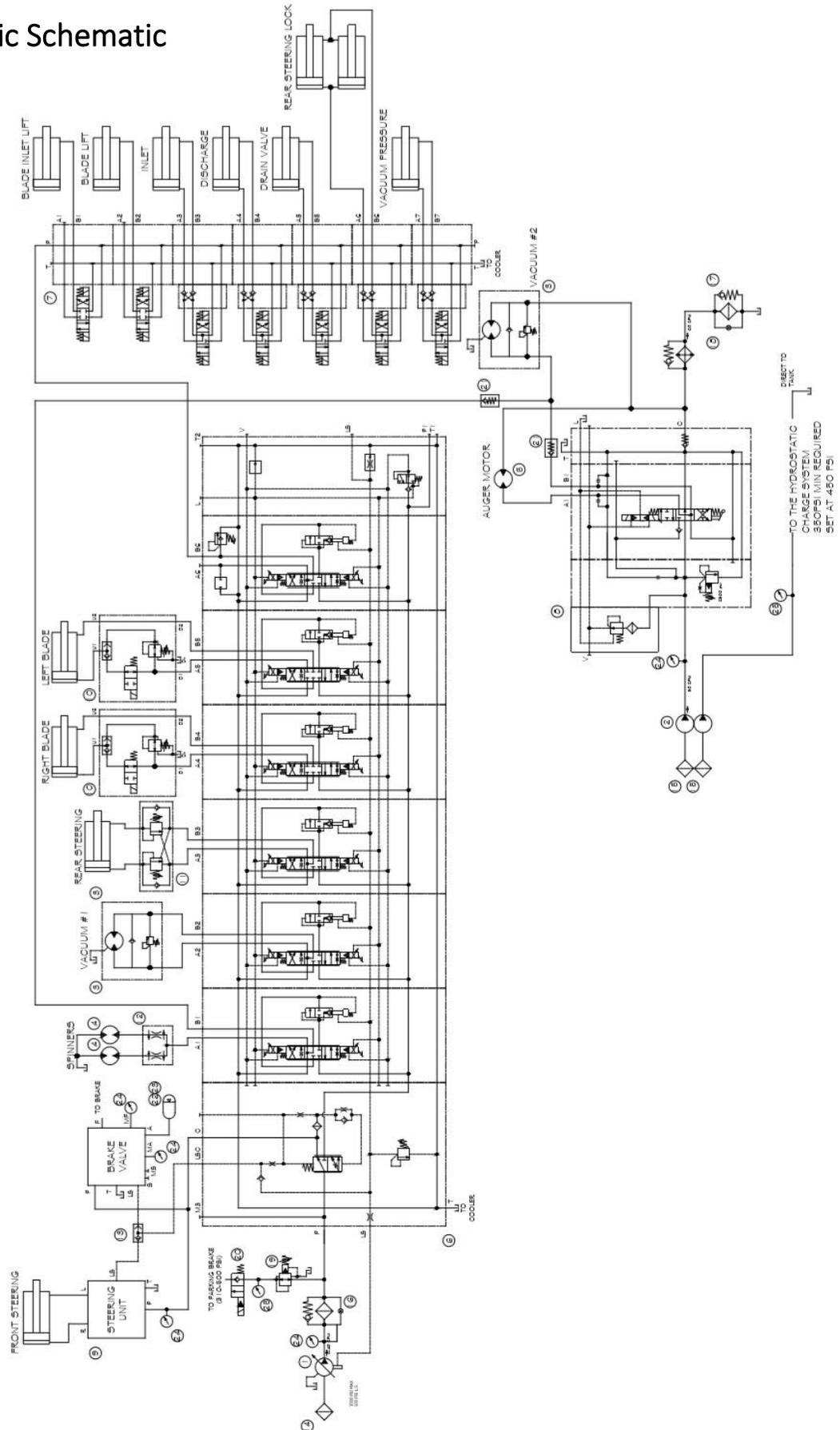
6.2. Alley Vac Drives Slowly

The input settings of the alley vac foot pedal could have been adjusted. Go into the Hydro Foot Pedal page which is accessed through the Config menu page. While in Park, put the foot pedal to the floor. When in this position, press the 'Set Hydro Foot Pedal to 100%' button to save the max foot pedal position.

6.3. A Function is Not Operating

If a function is not firing, it could be either the ECU is not seeing the input, or a bad connection on the output. The simplest method to try is to check the outputs operation through the I/O screen. If it properly functions from the I/O screen then it could be an issue with a bad connection from the input control. If it does not fire from the I/O screen, then it is an issue with the output whether it is electrical or hydraulic. Refer to the hydraulic/electrical schematic for further information.

7. Hydraulic Schematic



8. Electrical System

8.1. Battery Disconnect

The Battery Disconnect is located on the Electronics Bracket behind the cover panel.

 **Warning!**

Do not switch off the Main Battery Disconnect until the Red Light beside it has turned off. FAILURE TO DO THIS VOIDS YOUR ENGINE WARRANTY. The red light turns off when the DEF lines have successfully been purged.

8.2. Battery

Keep battery posts free from corrosion. There are two 12-volt batteries connected in parallel. This is 12-volt system. Maintain the acid levels in the batteries.

Replacing the Battery

Replacement batteries must be rated for 1250 cranking amps.

Charging the Battery

Any 12-volt charger will charge the battery. Do not charge with the battery charger set to engine crank. Connect the cables to a single battery.

8.3. Servicing Electrical System

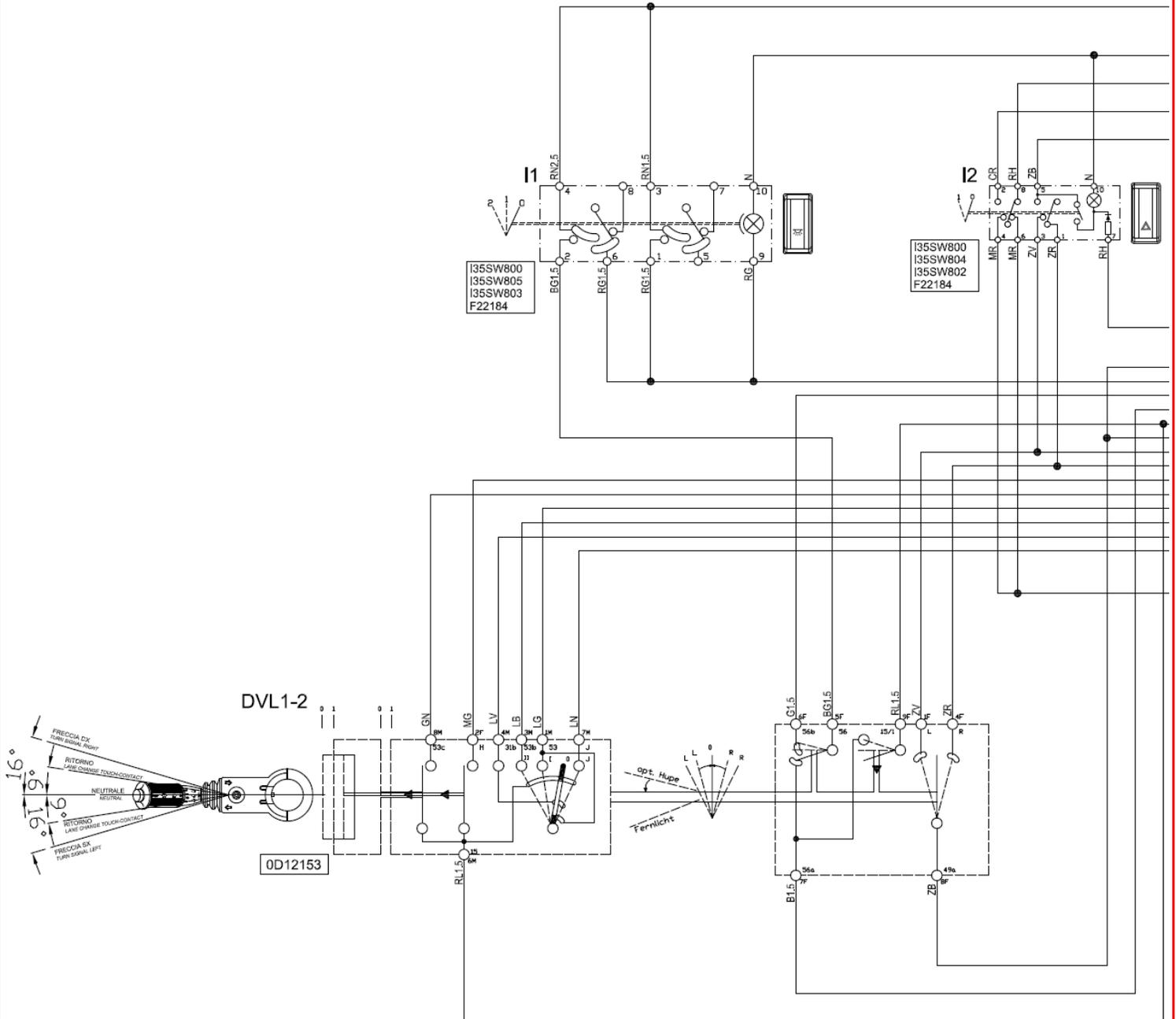
Twice annually:

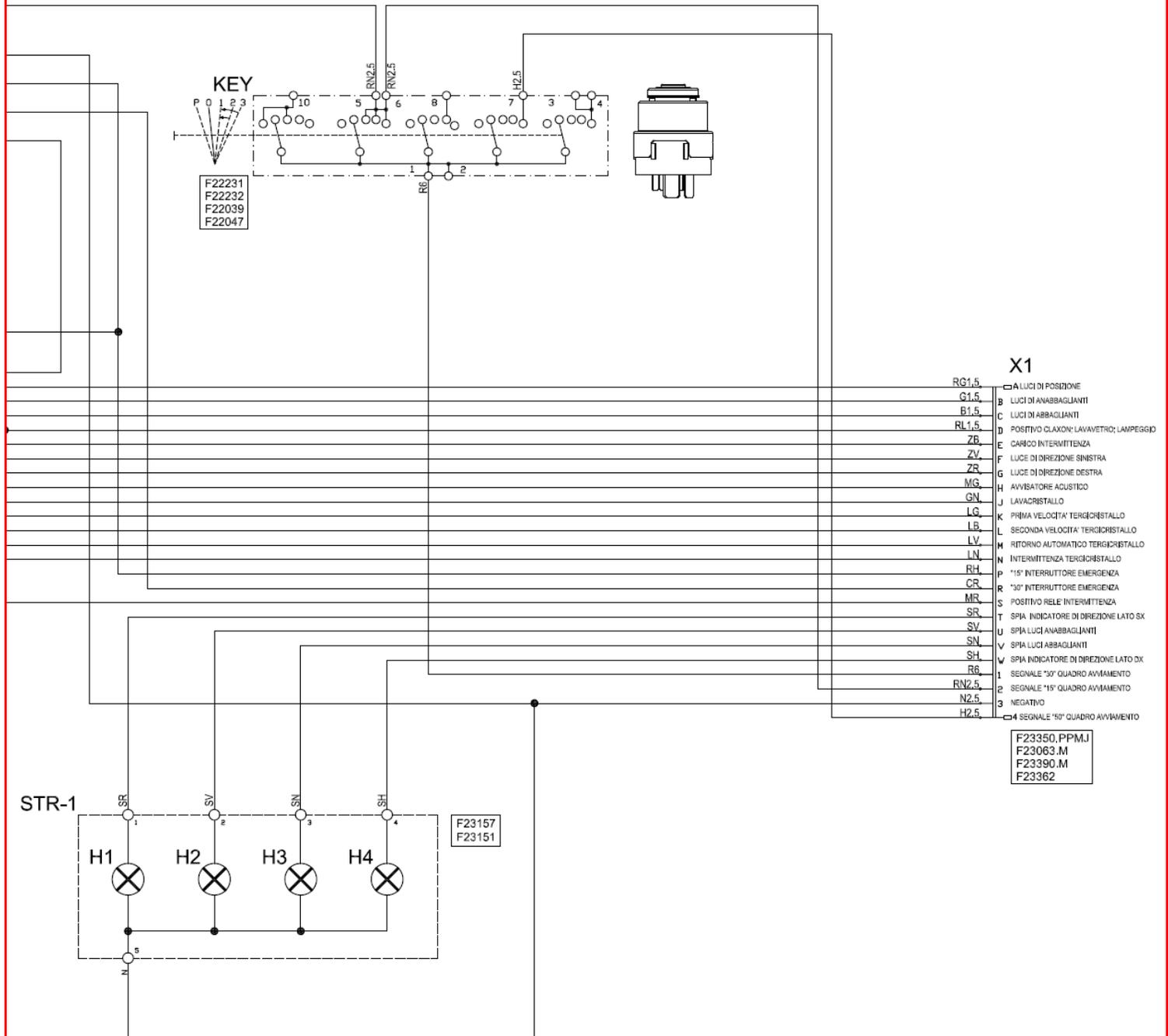
- Open electrical box and remove any moisture
- Spray a generous coating of electrical safe corrosion inhibitor, dielectric grease on all terminals, relays and fuses
- Pull each solenoid magnet off (one at a time) and clean stems and spray with corrosion inhibitor then reinstall the magnet.
- Remove the solenoid DIN connectors, one at a time, and spray with corrosion inhibitor and reconnect them.

8.4. Electrical Schematics

Cab Accessories and HVAC

STEERING COLUMN

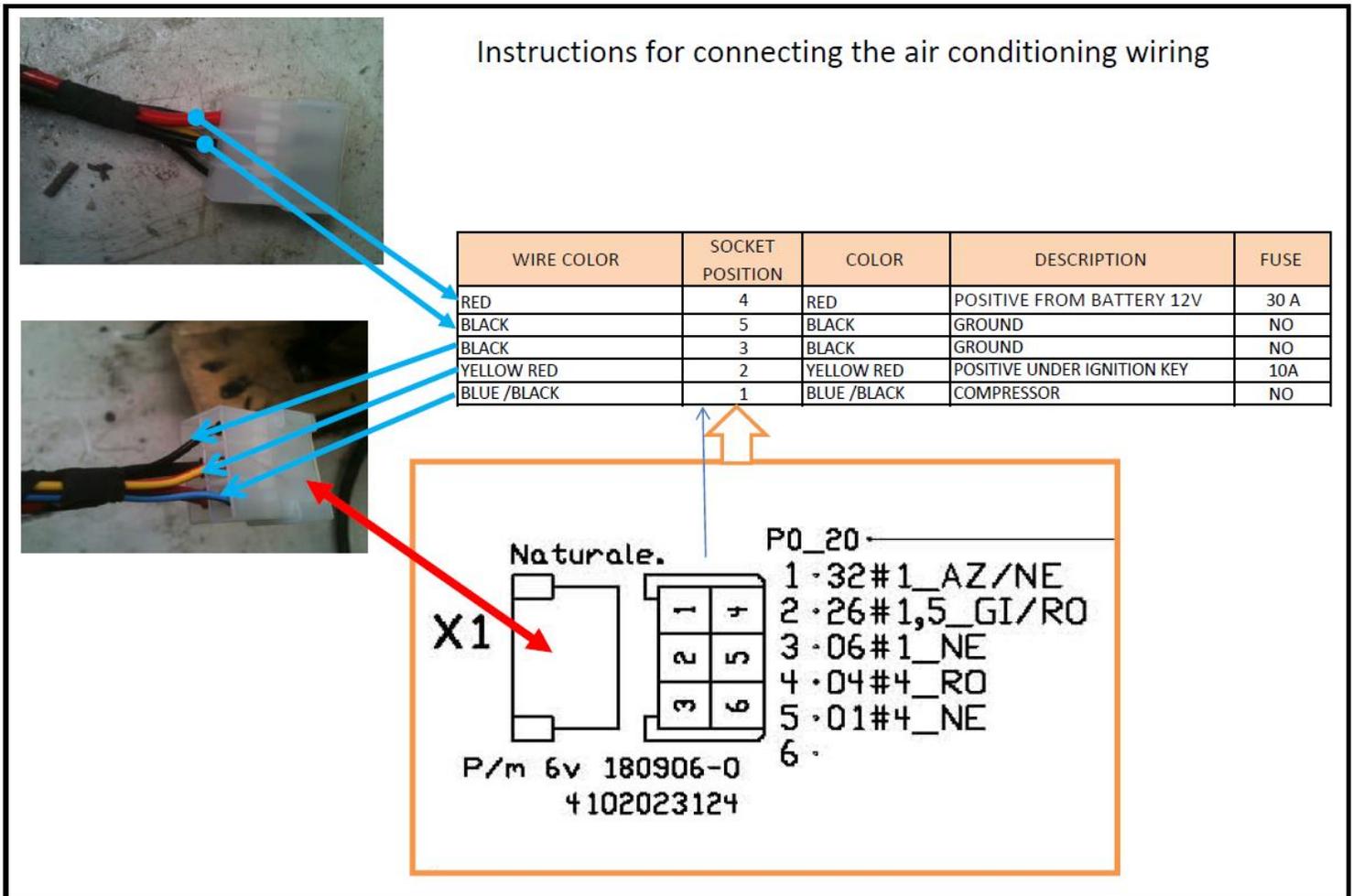
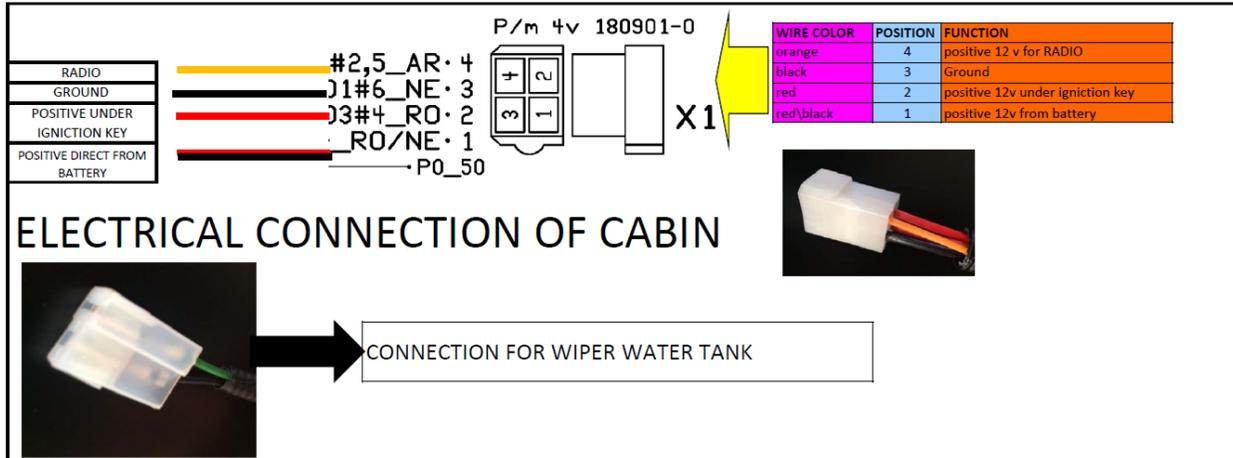




X1

- RG1.5 □ LUCI DI POSIZIONE
- G1.5 B LUCI DI ANABBAGLIANTI
- B1.5 C LUCI DI ABBAGLIANTI
- RL1.5 D POSITIVO OLAXON: LAVAVETRO; LAMPEGGIO
- ZB E CARICO INTERMITTENZA
- ZV F LUCE DI DIREZIONE SINISTRA
- ZR G LUCE DI DIREZIONE DESTRA
- MG H AVVISATORE ACUSTICO
- GN J LAVACRISTALLO
- LG K PRIMA VELOCITA' TERGICRISTALLO
- LB L SECONDA VELOCITA' TERGICRISTALLO
- LV M RITORNO AUTOMATICO TERGICRISTALLO
- LN N INTERMITTENZA TERGICRISTALLO
- RH P 15' INTERRUITTORE EMERGENZA
- CR R 30' INTERRUITTORE EMERGENZA
- MR S POSITIVO RELE INTERMITTENZA
- SR T SPIA INDICATORE DI DIREZIONE LATO SX
- SV U SPIA LUCI ABBAGLIANTI
- SN V SPIA LUCI ABBAGLIANTI
- SH W SPIA INDICATORE DI DIREZIONE LATO DX
- R6 1 SEGNALE 30' QUADRO AVVAMENTO
- RN2.5 2 SEGNALE 15' QUADRO AVVAMENTO
- N2.5 3 NEGATIVO
- HZ.5 □ 4 SEGNALE 10' QUADRO AVVAMENTO

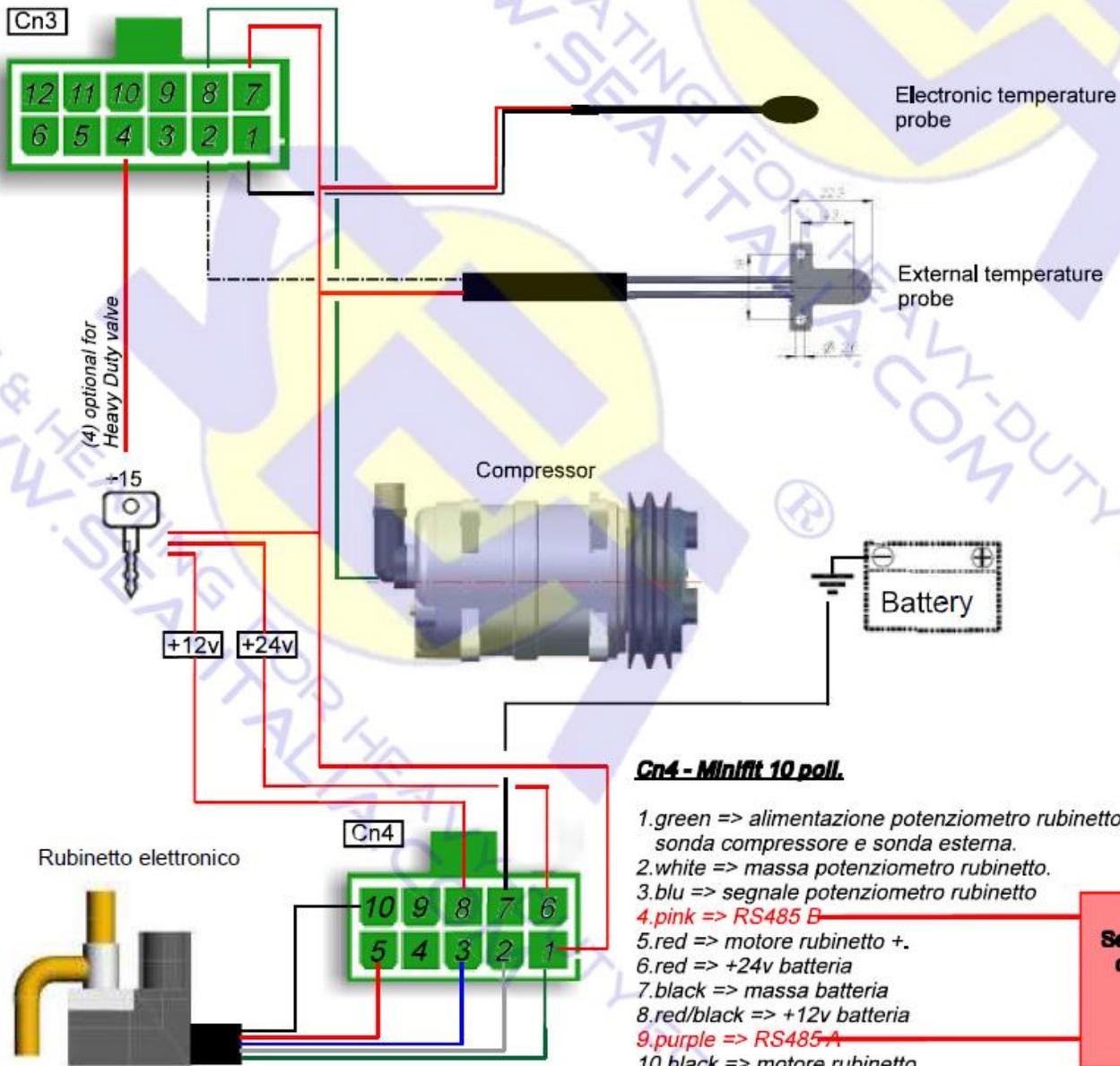
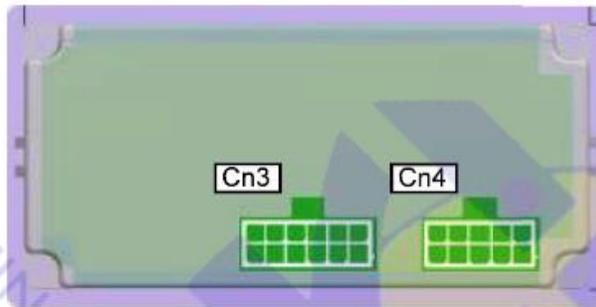
- F23350, PPMJ
- F23063.M
- F23390.M
- F23362



Controls connectors

Cn3 - Minifit 12 poles.

1. white/black => Thermostat probe.
2. brown/white => External probe.
3. nc
4. selection valve type
5. nc
6. nc
7. black/greenc => ommon compressor
8. green => normally opened compressor
9. nc
10. nc
11. nc
12. nc

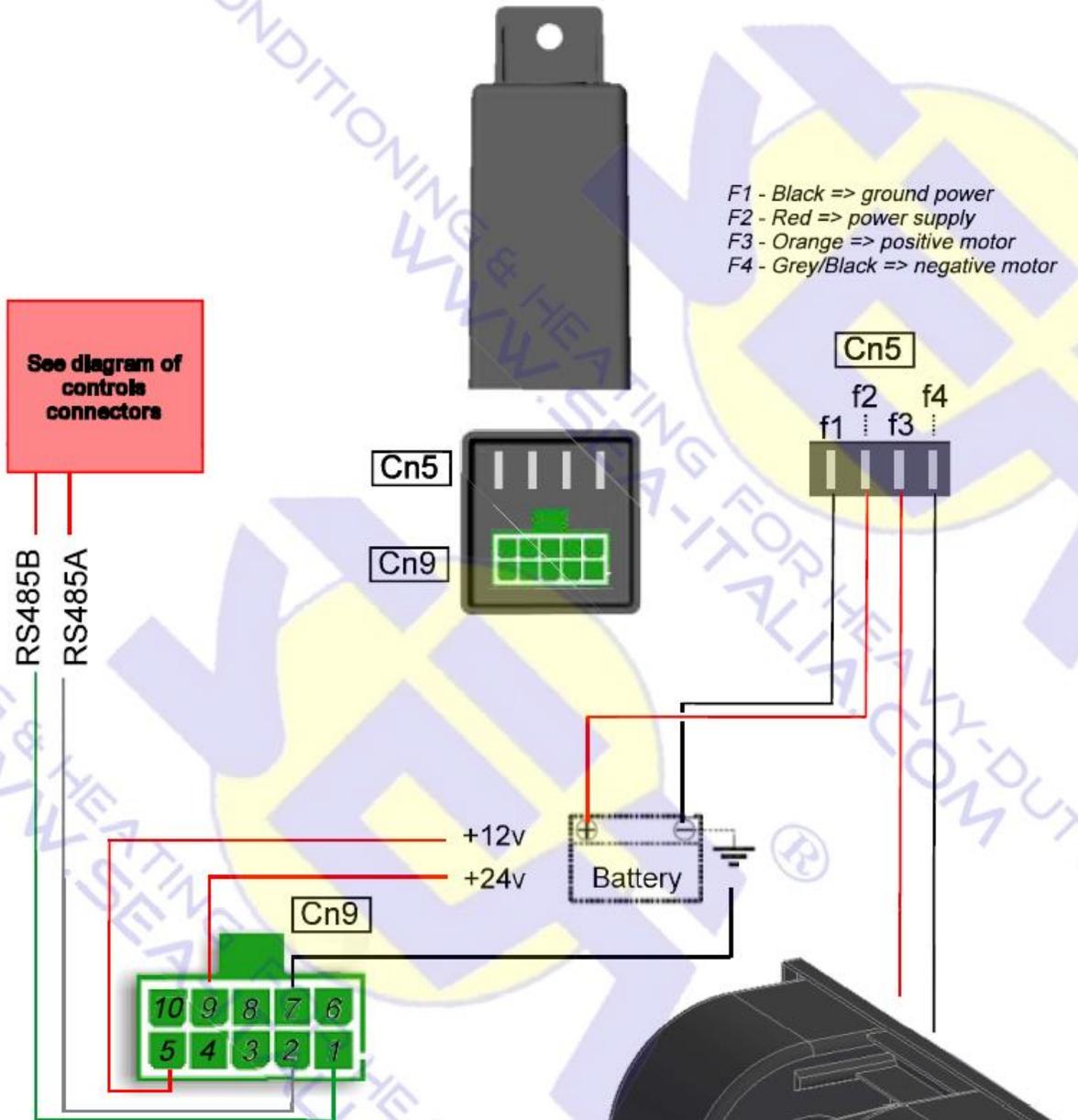


Cn4 - Minifit 10 poll.

1. green => alimentazione potenziometro rubinetto, sonda compressore e sonda esterna.
2. white => massa potenziometro rubinetto.
3. blu => segnale potenziometro rubinetto
4. pink => RS485 B
5. red => motore rubinetto +.
6. red => +24v batteria
7. black => massa batteria
8. red/black => +12v batteria
9. purple => RS485 A
10. black => motore rubinetto

See fan motor connection diagram

Fan motor connection diagram



Cn9 - Minifit 10 poles.

- 1 - Pink => RS485 B.
- 2 - Purple=> RS485 A.
- 3.n.c.
- 4.n.c.
- 5 - red/black => +12v battery.
- 6.n.c.
- 7 - Black => ground
- 8.n.c
- 9 - Red => +24v battery.
- 10.n.c

9. Warranty

9.1. Nuhn Warranty

The warranty described in this section is provided by Nuhn Industries to the original Purchasers of Products purchased from Nuhn Industries or the Dealer. Under this warranty, Nuhn Industries will repair or replace, at its option, any part covered under this warranty which is found to be defective in material or workmanship under normal use and service during the applicable Warranty Term. Nuhn Industries' obligations under this warranty are limited to repairing or replacing as the company may elect, free of charge, and without charge for installation, any parts that prove, in the company's opinion, to be defective in workmanship and material within 1 year, or 1,000 hours of use after delivery to the original purchaser, and still owned by the original purchaser.

The Product carries a structural warranty of one year, or 1,000 hours of use. The Warranty Term begins on the date of delivery of the Products to the Purchaser. It is a condition of this warranty that the original purchaser must fill out and return the warranty sheet provided by Nuhn Industries immediately. In the event that the owner's sheet has not been returned to Nuhn Industries, the warranty is void.

It is a condition of this warranty that within the aforesaid period of time (one year or 1,000 hours) the equipment, product or parts as alleged to be defective by the original purchaser are to be returned to Nuhn Industries either directly or through a dealer/distributor of Nuhn Industries, with transportation prepaid, or this warranty shall be of no effect and shall be waived by the purchaser. The Purchaser shall be responsible for any service call or transportation of Products to and from the authorized dealer's place of business, or for any service or maintenance not directly related to any defect covered under this warranty. If Nuhn Industries shall find that such returned parts are defective and that such defects are included in and covered by said warranty, then such defective parts shall promptly be replaced without charge to the purchaser, FOB Nuhn Industries.

9.2. No Implied Warranty, Representation of Condition

The foregoing warranty shall constitute Nuhn Industries' sole liability and the Purchaser's sole remedy and is in lieu of all other warranties and conditions written or verbal, statutory, express or implied. To the extent permitted by law, fundamental terms, representations, promises, conditions and warranties, express or implied, including implied or statutory conditions or warranties, of merchantability and fitness, quality, performance, freedom from defect, are excluded. The Dealer has no authority to make any representation or promise on behalf of Nuhn Industries or to modify the terms or limitations of this warranty in any way.

9.3. Warranty Not Covered by Nuhn

Pursuant to the terms of this warranty, Nuhn Industries is not responsible for the following:

- i. Used Products;
- ii. Tires, which are warranted under separate warranty documents provided by the manufacturer of such tires;
- iii. Engines, which are warranted under separate warranty documents provided by the manufacturer of such engines (see owner's manual and details below);
- iv. Any products that have been altered or modified in ways not approved by Nuhn Industries;
- v. Replacement parts for items subject to excessive wear;

- vi. Depreciation or damage caused by normal wear, lack of reasonable and proper maintenance, failure to follow operating instructions or recommendations, misuse, lack of proper protection during storage, vandalism, the elements or collision or accident; or
- vii. Normal maintenance parts and/or service.

9.4. CAT Engine Registration

It is the responsibility of the end user to register their engine for Warranty with CAT.

To register visit the CAT Website <https://www.cat.com/> and select your region

At the bottom of the page under SUPPORT click "Protect Your Investment"

On the "Protect Your Investment" page click "**Register Your Engine Now**" under **Engine Warranty Registration**

| PRODUCTS | INDUSTRIES | COMPANY | CONNECT WITH CAT® |
|---|--------------------------------|---------------------------------|---------------------------|
| New | | Caterpillar.com | Facebook |
| Equipment | SUPPORT | Careers | LinkedIn |
| Power Systems | Financing & Insurance | Corporate Press Releases | Twitter |
| Attachments | Technology & Solutions | Caterpillar Brands | YouTube |
| Parts | Protect Your Investment | Investors | Instagram |
| Rental | Operate Efficiently and Safely | NEWS AND EVENTS | All Social Media Accounts |
| Rental Equipment - CatRentalStore.com | Maintenance & Support | Product & Service Announcements | Cat Kids |
| Used | Find Dealer | Press Kits | |
| Used Equipment - CatUsed.com | Contact Us | Trade Shows & Events | |
| Cat® Merchandise | Safety Services | Customer Stories | |
| Home & Outdoor | Job Site Solutions | | |

10. Liability

The Dealer, Nuhn Industries, their officers, directors, agents and servants and their affiliates and their respective officers, directors, agents and servants shall not be liable to the Purchaser nor to any other party for any liability, including, without limitation, strict liability, including liability for loss or damages, whether direct, indirect, special, incidental, consequential, punitive or aggravated, whether in contract, tort or otherwise, due to occurrences or consequences arising out of or related to the manufacture, sale, delivery, resale, repair, replacement or use of the Products or part thereof, whether or not supplied pursuant to this Agreement, except as specifically provided in the warranty provisions herein.

The Dealer, Nuhn Industries, their officers, directors, agents and servants and their affiliates and their respective officers, directors, agents and servants shall not be liable for any injuries, loss of profits, rental of substitute equipment, other commercial or personal loss or damages arising as a result of a fundamental breach or breach of a fundamental term of this Agreement by the Purchaser.

The Purchaser acknowledges and agrees that they are solely responsible for reasonably and properly operating, maintaining, repairing and servicing the Products in accordance with all manuals, warning decals, manufacturer's operating instructions and recommendations, as well as all state, provincial and local statutes, rules and regulations. The Purchaser acknowledges that a failure to do so may result in injuries, damage to property, loss of profits and other commercial or personal loss, together with the cancellation of any warranty coverage provided for herein.

A Nuhn Alley Vac should only be operated by trained professionals. Contact your local Nuhn dealer to obtain training. By operating this Alley Vac, you are acknowledging that you have been trained in the operation of this equipment. The operator understands that this is not a passenger or riding vehicle. Be mindful of surrounding people and property.

Manure gases can cause injury or death. Never enter an Alley Vac as such actions can result in serious injury or death.

The operator must operate this product in accordance with all surrounding conditions. The following are the complete responsibility of the owner / operator:

- Damage to the equipment
- Harm to the environment
- Harm to property or possessions
- Harm to people or animals

LIABILITY NOTES:

(1) *Extended Meanings:* Words importing the singular number include the plural and vice versa and words importing gender include all genders.

(2) This contract shall be construed and governed according to the laws of Ontario and Canada.

(3) *Severability*: The invalidity or unenforceability of any provision of this agreement shall not affect the validity or enforceability of any other provision hereof.

(4) *Waiver*: No waiver, alteration or modification of these provisions shall be binding upon Nuhn unless made in writing and signed by a duly authorized representative of Nuhn.

12. Warranty Card

THIS WARRANTY CARD MUST BE FULLY COMPLETED AND RETURNED TO NUHN INDUSTRIES LTD.

Nuhn Industries Ltd
PO Box 160, 4816 Line 34
Sebringville, Ontario, N0K 1X0
Fax: 1-519-393-5104
Email: nuhnind@nuhn.ca

Date: _____ / _____ / _____
MM DD YY

Delivery Date: _____ / _____ / _____
MM DD YY

Model: _____

Serial No: _____

Owner / Purchaser: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone No: _____

Dealership: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone No: _____

I hereby acknowledge:

1. That I have read, understand and accept the nature, extent, limitations, and exclusions of the manufacturer's warranty and liability statements.
2. That I have received no other representations or warranties, either express or implied from Nuhn Industries Ltd., the Dealership or any other person.
3. That I have read and understand the Operator's / Safety Manual.
4. That I have received instruction regarding maintenance, operational procedure, and safety function for this equipment.
5. That I and / or any employees are qualified to operate this equipment following the instructions we have received and guidance from the Operator's / Safety Manual.

Dealer Signature

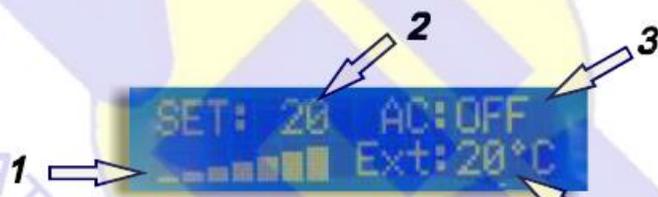
Owner Signature

PANEL OPERATION

Cod. P02500011

**•STEP 1 - SWITCH ON**

Press the selection button and hold it for two seconds. the display will light up and the screen will be as follows:



- 1 - Ventilation speed indicator
- 2 - H/C blending ratio
- 3 - Air conditioning ON or OFF
- 4 - External temperature

Turn the knob to adjust ventilation. Turn left to decrease and turn right to increase ventilation.

•STEP 2 - ADJUST THE RATIO OF H/C BLENDING

Press the button once to select the indicative blending ratio (two arrows appear next the number). Select the desired ratio by turning the knob to the left to decrease and to the right to increase it.



- 2 - H/C blending ratio

FUNZIONAMENTO DEL PANNELLO**•STEP 3 - SWITCH ON AIR CONDITIONING**

Press the knob twice. The cursor with the two arrows will move to the right. By turning the knob to the left, the air conditioning will switch off and AC:OFF will appear on display. By turning the knob to the right, the air conditioning will switch on and AC:ON will appear on display.



2 - H/C blending ratio
3 - Air conditioning ON or OFF

•STEP 3 - SWITCH OFF

Press the knob until reaching the initial screen (no arrows appear on display) and hold it for three seconds. The control and the panel will switch off.

•VISUALIZED ERRORS

E2 = Valve motor error.
E5 = Thermostat probe.
E7 = Serial error Rs485 (fan communication).