

Cooling Air (KLENZ™)

Section 05-03-01

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NOTICE

Values used in this document are subject to change without notice. Always check the latest version of schematics, troubleshooting charts, service information letters, service alerts, specifications, and all other appropriate documentation before performing any type of work on the equipment. Online documentation of values can be accessed through the local service center.

Scope of This Publication

This Section of the manual titled “COOLING AIR” provides service technicians with an operational overview and service instructions for (1) the loader's Central Air Blower System, and (2) the Engine Air Intake System with “KLENZ™” filtration system.

Safety

This publication contains special instructions that pertain to safety, operation, maintenance, and repair of the machine. Listed below are the signal words and symbols that precede these instructions and their meanings:



DANGER

- The danger label indicates a hazardous situation, which, if not avoided, will result in death or serious injury.



WARNING

- The warning label indicates a hazardous situation, which, if not avoided, could result in death or serious injury.



CAUTION

- The caution label, used with the safety alert symbol indicates a hazardous situation, which, if not avoided, could result in minor, or moderate injury (includes the safety alert symbol .

CAUTION

- The caution label (without safety alert symbol) is used to address practices not related to personal injury only equipment damage.

NOTICE

The NOTICE graphic is to indicate areas of importance to the reader that are not related to personal injury or machine damage.

Safety, Warnings, and Cautions

WARNING

INHALATION HAZARD

- Inhalation hazard exists inside the cab if spraying ether-starting aid into the air intake of the Komatsu Cartridge Filtration System (KLENZ™ system). The KLENZ system provides fresh air to the cab (and other components). Inhalation of ether fumes is dangerous and can render a person unconscious or cause death. Ether fumes are extremely flammable. Never use ether starting aid to start the engine. The use of ether is NOT recommended by Komatsu as an engine starting aid. Using ether starting aid in the engine intake can cause an inhalation hazard resulting in serious injury or death.

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FIRE HAZARD

- Fire hazard exists if lit cigarettes, burning objects, or foreign debris are put into the hood or ducting of the “KLENZ™” filtration system. Fire is possible. Never put anything into the hood or ducting of the KLENZ filtration system or into any of the cooling air ducting. No welding repairs should be performed inside the filtration unit, without fire protection. Failure to prevent burning objects from entering the KLENZ filtration system can cause a fire hazard resulting in serious injury or death.

CRUSH HAZARD

- Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine's SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.
- Crush hazards exist in machine pivot area and area between the tires. Do not enter these areas unless it is verified that the operator has control over the steering and that personnel locking the frame lock have good communication with the operator. Entering the pivot area and area between the tires while the machine is moving or pivoting (articulating) could cause crush hazards resulting in serious injury or death.
- Crush hazards exist if all personnel are not cleared from the bucket and lift arm area before using the hydraulic hoist and bucket hydraulic pressure bleed down valves to relieve pressure from the hoist and bucket circuit. Assembly must be used only when the engine is NOT running. Before using the Manual Bleed Valve Assembly, refer to “HYDRAULIC AND GREASE SYSTEMS”, “MANUAL BLEED VALVE ASSEMBLY”, in Section 04 of the Service Manual for additional operational and safety information. Operating the manual bleed valve may cause the lift arms and bucket to descend rapidly. All personnel around the bucket and lift arms area shall be removed from the area before operating hydraulic hoist and bucket hydraulic pressure bleed down valves.

Using the hydraulic bleed down valves could result in movement of the lift arms and bucket which could cause a crush hazard resulting serious injury or death.

- Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Be sure all personnel are secure and in safe positions prior to doing any testing. Place signs to alert other personnel to keep a safe distance from the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine's SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.

CRUSH, SHOCK, OR OTHER HAZARDS

- Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

FALL HAZARD

- Fall hazard exists when walking on walkways and stairs. To prevent falling, keep hold of the handrail and ensure sure footing. Failure to use handrails can cause fall hazards resulting in injury.

ELECTRICAL SHOCK HAZARD

- Electrical shock hazard exists inside the axle if axle access panel on either axle is removed without locking out the electrical system. Always verify the absence of bus voltage before removing the axle access panels and touching any electrified component inside the axle. Do NOT touch the electrical cable connections inside the axle when the key switch is ON, or the generator is primed, or until five minutes after the engine has been shut down and the absence of bus voltage is verified. To lockout the electrical system, and touching electrified components inside the axle could cause electrical shock which might result in serious injury or death.

HEARING DAMAGE OR EYE INJURY HAZARDS

- Hearing damage or eye injury hazard exists if the KLENZ™ Enable Switch is not turned to the OFF position before performing any service work to the machine. When the "KLENZ™" pulse valves activate, the sound is a sharp "boom" (actually a shock wave). The shock wave can cause injury to the eardrum. Wear the proper hearing protection during operational testing and when working around an operational system. Bleed air pressure to zero psig before performing any service or repair work to the KLENZ™ system or other components powered by the compressed air system. Failure to bleed the air pressure to zero in the compressed air system can cause hearing damage or eye injury from a sonic blast within the KLENZ system resulting in ear drum injury.
- Hearing damage or eye injury hazards exist when the "KLENZ™" pulse valves are activated. The sound is a sharp "boom" (actually a shock wave). The shock wave can cause injury to the ear drum. Wear hearing and eye protection during operational testing. Failure to wear proper hearing and eye protection can cause hearing damage and eye injury hazards resulting in injury.

FALL HAZARD OR STRUCK-BY HAZARD

- Fall hazard or struck-by hazard exists when opening the KLENZ door. If the loader is on a slight incline or in high wind, the door could quickly swing wide open. The door is heavy. Do not stand in front of the door when releasing the handle or latches. Stand on the opposite side of the door hinge when opening the door. Standing in front of the door can cause a fall or a struck-by injury that results in serious injury or death.

- Fall hazard or struck by foreign objects hazard is possible while climbing the hydraulic reservoir ladder near the KLENZ™ air filtration system. LINCS boots completely down after the machine key is turned to the OFF position. The purge cycle will continue until LINCS is booted completely down or until the compressed air system pressure drops below 90 psi (6.2 bar) (even if the machine key is in the OFF position and the engine is not running). The “KLENZ™” filtration system will emit a loud “boom” and blow dust from the bottom of the hopper during the purge cycle. This process may be startling and present a hazard to anyone climbing the ladder adjacent to the filtration system. Turn the KLENZ™ Enable Switch OFF before climbing the ladder. The loud “boom” could cause a person on the ladder to be startled and lose their grip, resulting in a fall. DO NOT climb the hydraulic reservoir ladder or stand near the bottom of the ladder of an operational machine unless the KLENZ™ Enable Switch is in the OFF position, except in an emergency situation. Serious injury from a fall or being struck by foreign objects is possible, resulting in serious injury or death.
- Fall hazard or struck-by hazard exists when opening the KLENZ™ door. If the loader is on a slight incline or in high wind, the door could quickly swing wide open. The door is heavy. Do not stand in front of the door when releasing the handle or latches. Stand on the opposite side of the door hinge when opening the door. Standing in front of the door can cause a fall or a struck-by injury that results in serious injury or death.

EXPLOSION HAZARDS EXIST

- Explosion hazards exist if spraying ether-starting aid into the air intake of the Komatsu Cartridge Filtration System (KLENZ™ system). Ether fumes are extremely flammable. Never use ether starting aid to start the engine. The use of ether is NOT recommended by Komatsu as an engine starting aid. The KLENZ system provides air to the engine turbos, generator, motors, and cab. Using ether starting aid in the engine intake can cause an explosion hazard resulting in serious injury or death.



CAUTION

EYE AND INHALATION HAZARDS

- Eye and inhalation hazards exist when conducting operational tests of the “KLENZ™” filtration system. Note the prevailing wind direction and be aware that fine dust will be emitted from the open housing of the “KLENZ™” system when the pulse valves are actuated. Do not stand “downwind” of the “KLENZ™” housing. Wear a respirator, eye protection and all other required personal protective equipment (PPE) during this test. Failure to wear respirator and eye protection can cause eye and inhalation hazards resulting in injury.

EYE INJURY HAZARD

- Eye injury hazard exists when working around the area of the “KLENZ™” filtration system. Never stand directly under the hopper of the “KLENZ™” filtration system. When activated the system will expel small debris capable of causing eye injury. Always wear safety glasses and any other required personal protective equipment (PPE) when working in the area. Failure to wear proper PPE can cause eye hazards resulting in injury.

Theory of Operation

Overview of Air System operations

Central Air Blower System

Cooling air is filtered by the Komatsu Cartridge Filtration System, also called the “KLENZ™” system. The “KLENZ™” unit is mounted on the right side of the rear frame.

Air is pulled into the inlet of the KLENZ™ filtration system, thru filters, by the blower wheel fan. That air is then directed to the different components of the system, through the ducting located throughout the machine.

The central air blower system provides a forced air supply of filtered air to the following areas of the machine:

- Compressor air intake
- Engine air intake
- Pressurized cab air
- Generator cooling air
- Traction motors (4) in the front and rear axles
- Electrical Cabinet

The Central Air Blower System fan is powered by a hydraulic motor that is driven by a pressure compensating axial piston pump located on the hydraulic pump gearbox. The blower fan housing that covers the fan wheel is located just above the generator.

Air pressure for purging dirt from the “KLENZ™” filters is provided by the Compressed Air System (for more information about the purging cycles, refer to Section “Compressed Air System”).

KLENZ™ Air System Operation

Air System Description

To obtain technical data about specific machine serial numbers, always refer to the appropriate machine "Air Systems (including Brake Controls) diagram located in the Parts Manual.

Usage of air components powered by the Compressed Air System	
Minimal air usage	- Hydraulic reservoir pressurization - Air horn - Cab cleanout (optional)
Medium air usage	- Service Brakes - Park Brakes
Greatest air usage	KLENZ™ System
Air Usage	
KLENZ™ burst duration	40 milliseconds (consuming 1.5 cfm per cycle)
KLENZ™ system pressure setting	90 psi (6.2 bar)
Orifice (before "KLENZ™" reservoir)	.062" (1.57 mm)
Orifice (after "KLENZ™" reservoir)	.125" (3.175 mm)

Table 1. Compressed air system technical data

Air System Circuits

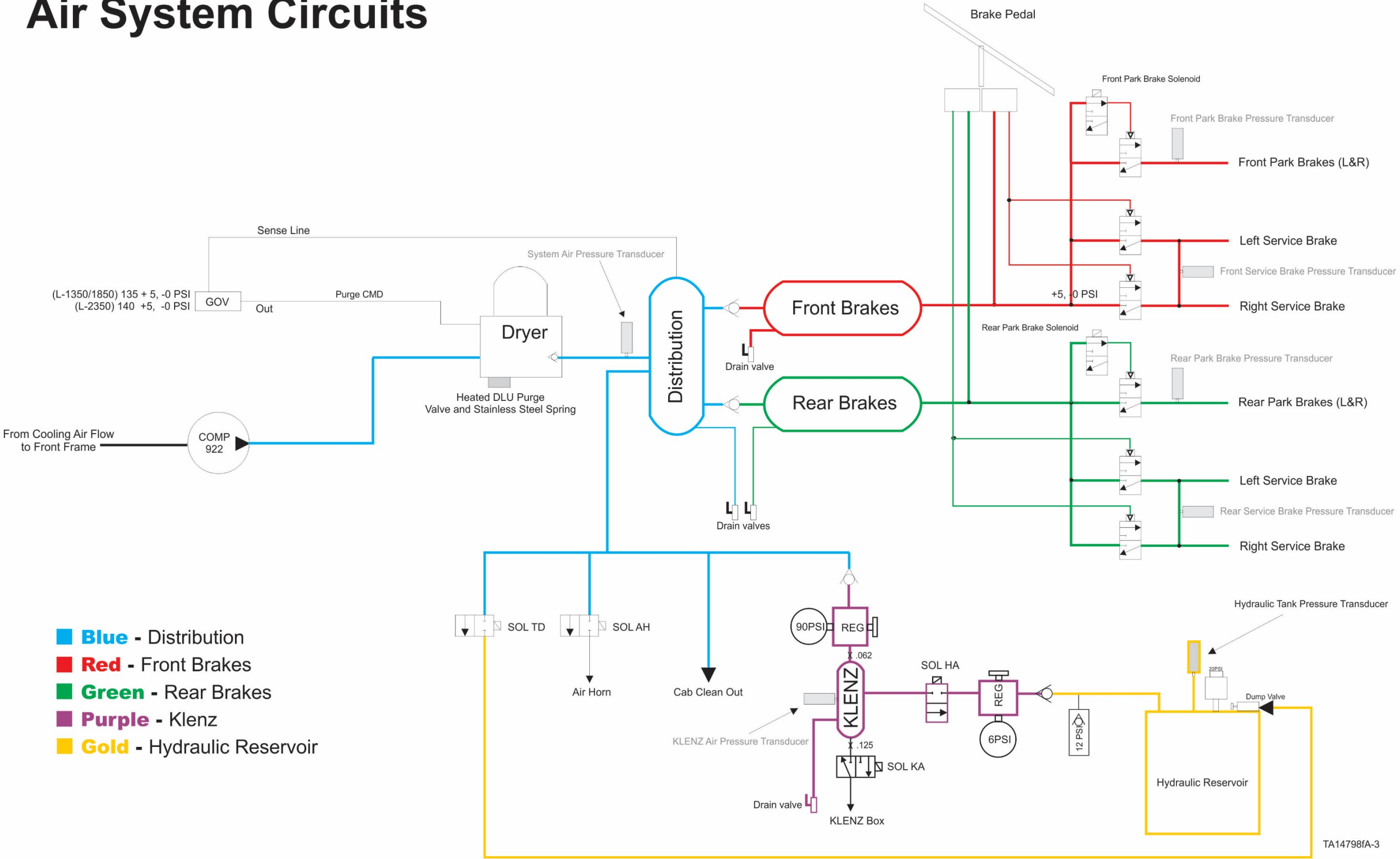


Figure 1. Simplified air system sections

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Component Description

Components

KLENZ™ Filtration System

The KLENZ™ filtration system is the component that filters outside air for the various systems of the machine. This system is self-cleaning to prolong the life of the air filter. Self-cleaning is achieved by the diaphragm pulse valves, discussed in the “Compressed Air System” section.

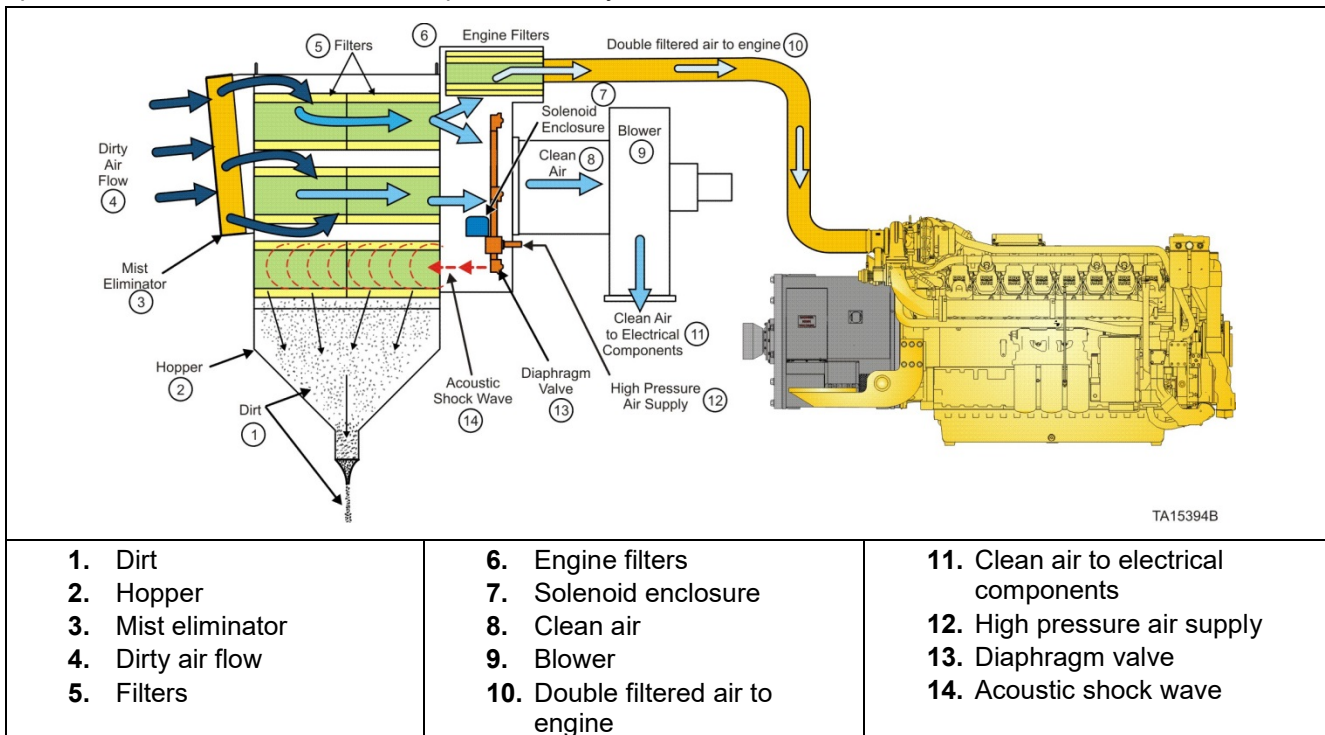


Figure 2. KLENZ™ System major components/air flow diagram

Air Inlet Door and Gasket

The air cleaning process begins with the air entering the structure through the mist eliminator baffles of the inlet door. The inlet door has hinges and gasket material that should be inspected and maintained, to ensure the flow of air is directed through the mist eliminators.

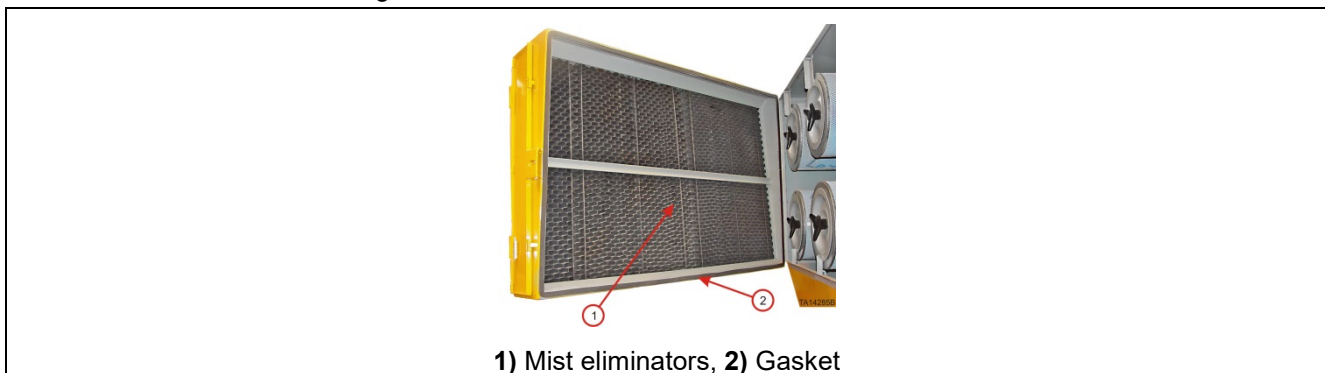
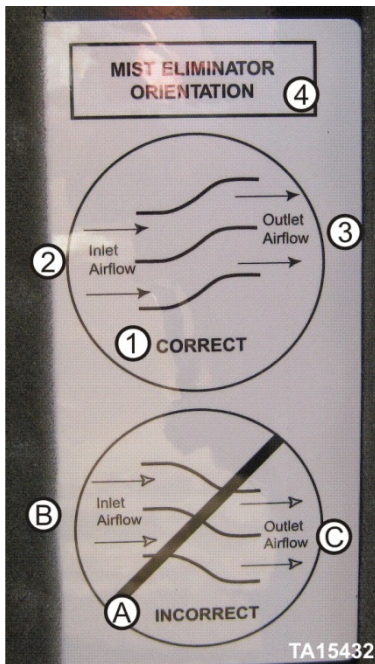


Figure 3. KLENZ™ Clean air system door

Mist Eliminator Baffles

The purpose of the mist eliminator baffles is to provide a momentary obstruction of airflow to allow water droplets to fall out of the inlet air. These baffles are constructed out of plastic, in a honeycomb pattern. They form an “S” channel as they enter the inlet of the KLENZ™ filter chamber. This formation provides a baffle for the water droplets to collect and flow down and out of the KLENZ™ inlet. It is very important to position the baffles properly. If installed wrong, the collection of water will flow into the KLENZ™ filter chamber causing damage to the filters. Install the baffles facing down and to the outside of the structure. Some models have multiple pieces that are interlocked together to span the required space. When installing multiple pieces, make sure they are properly interlocked.

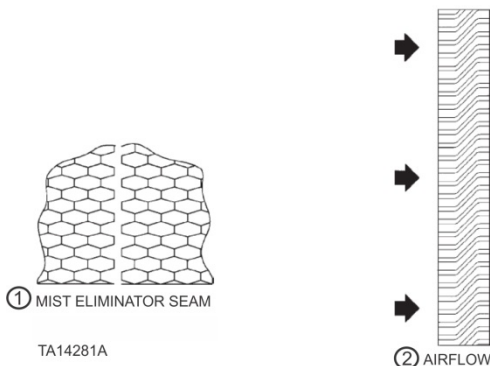


- 1) Correct, 2) Inlet airflow, 3) Outlet airflow,
4) Mist eliminator orientation,
A) Incorrect, B) Inlet airflow,
C) Outlet airflow

Diagram located inside mist eliminator door



baffles facing down and to the outside of the structure



- 1) Mist eliminator seam, 2) Airflow



Removing baffles

Figure 4. Mist eliminator-baffles and airflow diagram

Filters

After the air enters the KLENZ™ filter chamber; through the mist eliminator baffles, it passes thru the primary filters. This chamber has: 1350-six filter pairs, 1850/2350 seven filter pairs. Each filter has a flat mating surface on one end and a gasket on the other end. The filters are installed, double stacked, with the gasket ends toward the mounting flange at the back of the filter chamber. They are supported in place by “filter suspension yokes”. These are thin rod structures, which hold the filters in place. They also provide a sealing flange for the filter’s seal along with accommodating the filter end retaining cover. It is important to ensure the gasket is correctly installed on the cover and the wing nut is tight.

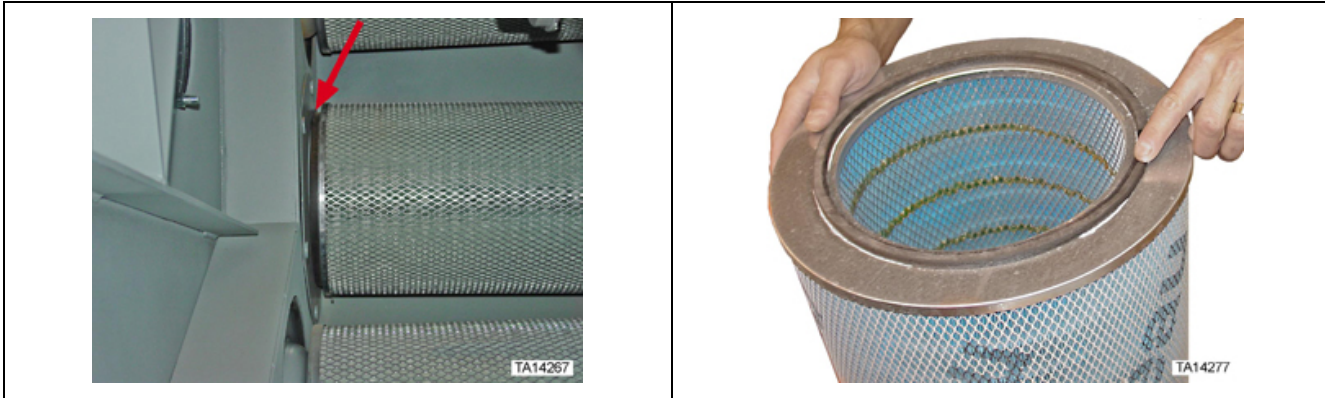


Figure 5. Gasket installed on filter end

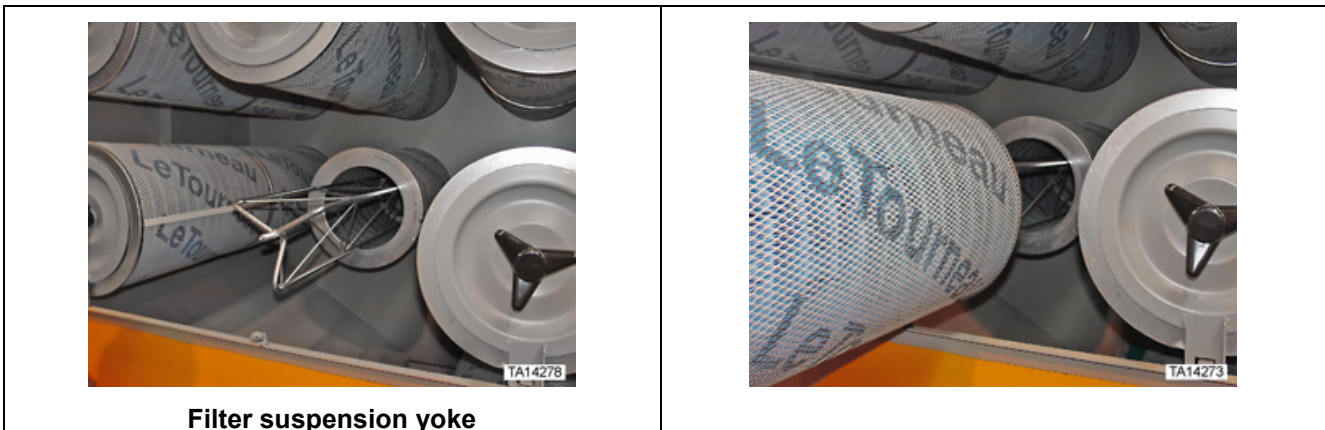


Figure 6. Filter suspension yoke

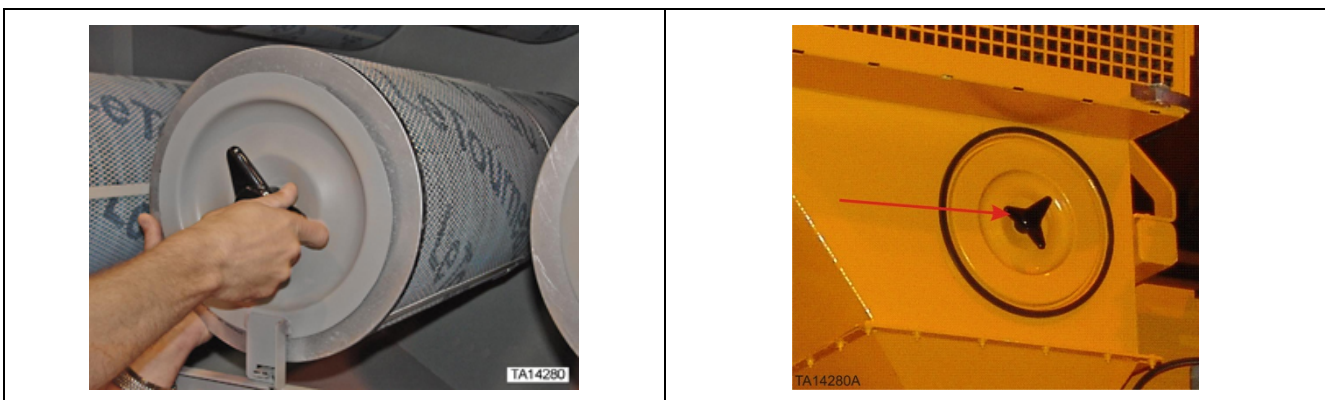


Figure 7. Filter cover and wing nut installation

The original filters, equipped in the KLENZ™ system, are designed to perform at the highest efficiency and longest service life. These filters have two layers of filter material. The first is the traditional media of cotton sateen polyester, conventional cellulose, etc. The Komatsu original equipment replacement filter has a layer of ultra-fine sub-micron diameter fibers bonded to conventional media. This ultra-fine mesh captures sub-micron particles on the surface of the filter rather than in the depths of the filter.

Particles held on the surface of the filter accommodates the automatic cleaning cycle of the KLENZ™ system.

Traditional media (cotton sateen polyester, conventional cellulose, etc.) have gaps of 12 60 microns (1 micron + 1/1000th of a millimeter = 1/25,400 inch) between the media fibers. Filtration efficiency is low when dust particles pass through these openings. Dust particles that are stopped deep in the media become trapped, plugging the filter. This accumulation cannot be dislodged during the collector's cleaning cycle. This will result in a steadily increasing pressure drop across the filter and decreasing system airflow. Filters need to be replaced when adequate airflow through the filter cannot be sustained.

Surface loading (rapid accumulation of particles on the filter surface) builds a permeable dust-stopping cake, ensuring consistently high filtration efficiency. The initial efficiency of the Komatsu original equipment filter cartridge is up to 10 times greater than conventional media under the same operating conditions. Surface loading eliminates premature filter plugging and facilitates releasing of the dust cake during the collector's cleaning cycle.

It is critically important to use only Komatsu original equipment replacement filters when servicing the KLENZ™® Air Filtration System. Other filters will not perform adequately in this application and will result in the KLENZ™® Air Filtration unit not performing as designed. This could result in serious damage to the engine, solid-state electronic components, and traction motors and a rapid build-up of dust on the cab air conditioner filters.

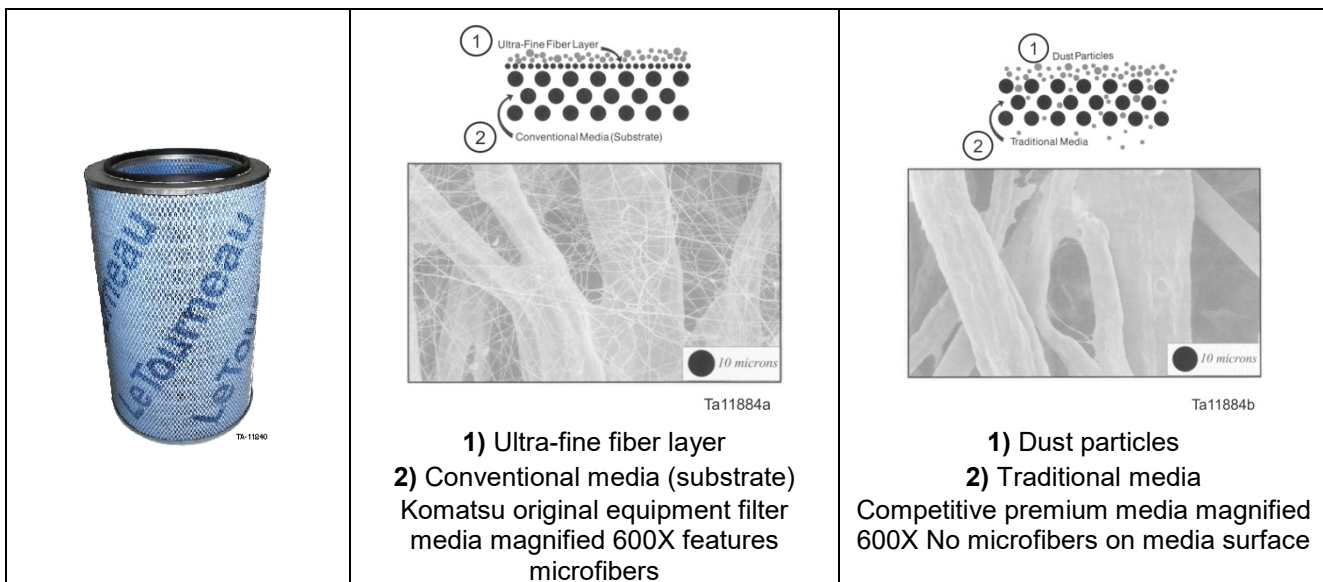


Figure 8. Filter media

Hopper

The bottom of the KLENZ™ filter chamber is tapered down to form a funnel hopper. It has an opening at the bottom for collection of the purged contaminants during the operation of the filter cleaning cycles. This opening is equipped with an EVAC valve, referred to as a “trickle valve”. The trickle valve is specifically designed to dump the material from the filter chambers hopper. This will happen when either a diaphragm pulse valve cycle creates enough pressure to push the material out, or the weight of the material becomes great enough to open the valve. The valve will re-close after the material is dumped.

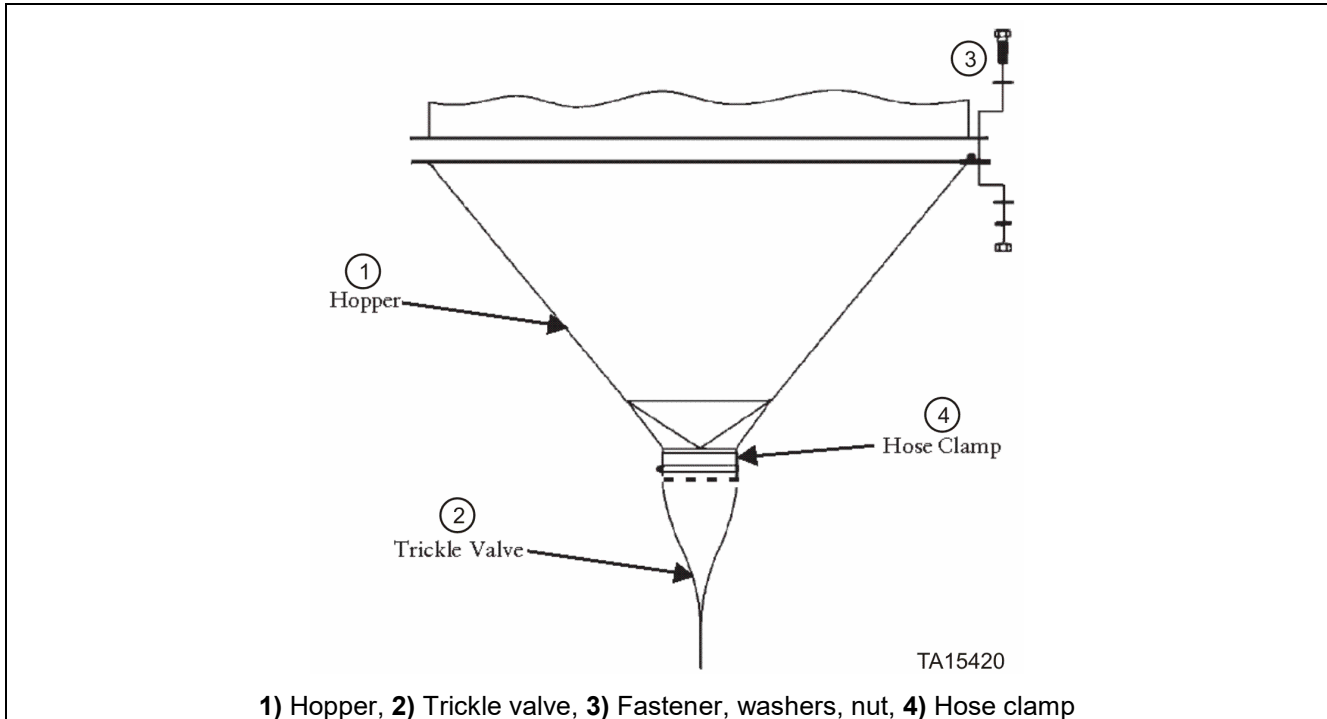


Figure 9. KLENZ™ Hopper and trickle valve (typical)



Trickle valves may be designed from two flat pieces of material, or from a round tube material.

Figure 10. Trickle valve designs

Clean Air Chamber

The clean air chamber access is equipped with a side access panel that has gasket material to prevent ingress of unfiltered air. The gasket material should be replaced if damaged. For more information about the components inside the clean air chamber, refer to the section named “Compressed Air System”.



Figure 11. KLENZ™ Clean air chamber access panel (typical)

After the air passes through the filter elements it enters the clean air side of the KLENZ™ system, clean air chamber. Air pressure in the clean air chamber is monitored and compared to the inlet air pressure in the KLENZ™ filter chamber. A manometer indicates whether the filters are restricted and have met the end of their service life. There are one or two monitoring devices used in this monitoring (depending on model):

- An analog manometer is used for manually monitoring air restriction (not installed on all models).
- An electronic manometer is used for monitoring by the machine's onboard monitoring/control system (LINCS).

Electronic Manometer for Checking Filter Restriction

The machine's control and onboard monitoring system (LINCS) uses an electronic manometer to monitor for adequate airflow thru the filters. The manometer is mounted inside the clean air chamber of the KLENZ™ unit. It is plumbed similar to the manual analog manometer, with one port being plumbed open to the clean air chamber and the other port being plumbed to the KLENZ™ filter chamber.

The restriction indication can be read from the LINCS II screen, from the channel browser.



Figure 12. Electronic manometer

When a restriction that is above “set point” is detected, two yellow Warnings or one Alarm can be generated:

- Yellow Warning KLENZ™ Filter Restriction Critically High: Medium and High Throttle will be disabled
- Yellow Warning KLENZ™ Filter Restriction High
- Red Alarm KLENZ™ Filter Restriction High At Low Throttle: occurs only at Low engine throttle speed

Event	Set Condition	Clear Condition
KLENZ™ Filter Restriction Critically High	> 12" (304 mm) for 10 sec	SEE NOTE, THIS TABLE
KLENZ™ Filter Restriction High	> 10" (254 mm) for 60 sec	> 8" (203 mm) for 0.05 sec
KLENZ™ Filter Restriction High At Low Throttle	> 10" (254 mm) for 1 sec	> 8" (203 mm) for 0.05 sec
NOTE: Once set, this warning will not clear until a reboot of LINCS occurs. When active, the machine will not be allowed to go to high or medium throttle. The machine can still be propelled in low throttle.		

Table 2. KLENZ™ Filter restriction parameters

Compressed Air Manifold

The compressed air manifold is a square manifold that accommodates the mounting of the diaphragm pulse valves solenoid enclosure, and provides a reserve volume of compressed air. The compressed air manifold receives a volume of compressed air from the KLENZ™ reservoir to operate the diaphragm pulse valves during the filter cleaning cycle.



Figure 13. Compressed air manifold

Diaphragm Pulse Valves

KLENZ™ systems are equipped with a valve housing made of die cast aluminum that are mounted on 1" pipe nipple "drops" off the manifold.. The inlet and outlet ports are machined to 1" NPT. The signal port is ¼" NPT.

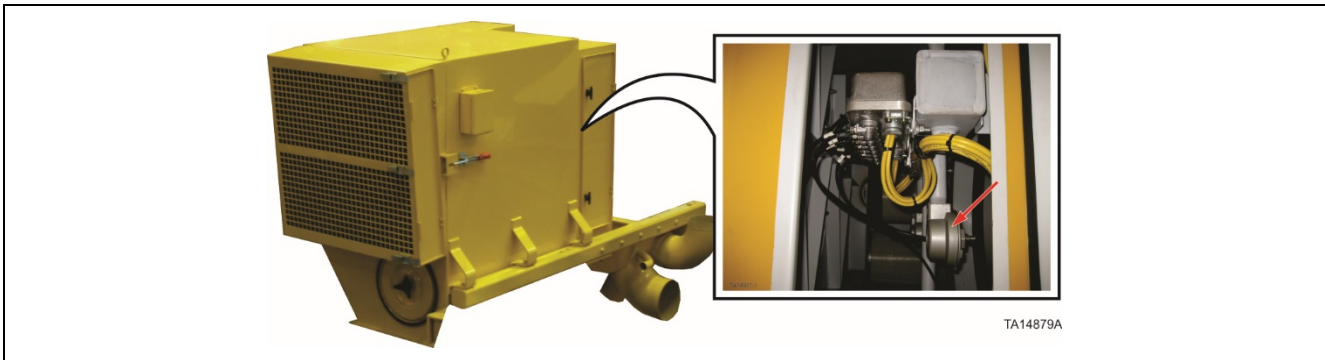


Figure 14. Diaphragm pulse valves

WARNING

Hearing damage or eye injury hazard exists if the KLENZ™ Enable Switch is not turned to the OFF position before performing any service work to the machine. When the "KLENZ™" pulse valves activate, the sound is a sharp "boom" (actually a shock wave). The shock wave can cause injury to the eardrum. Wear the proper hearing protection during operational testing and when working around an operational system. Bleed air pressure to zero psig before performing any service or repair work to the KLENZ™ system or other components powered by the compressed air system. Failure to bleed the air pressure to zero in the compressed air system can cause hearing damage or eye injury from a sonic blast within the KLENZ system resulting in ear drum injury.

Each KLENZ™ diaphragm pulse valve causes an acoustic wave that performs the cleaning cycle of a single primary air filtration element. The pulse valve accomplishes this by releasing compressed air in a rapid pulse and directing it inside a filter. The valve has an internal diaphragm that has a small volume of compressed air (signal air) on one side and a much larger volume (partial volume of the manifold) of compressed air on the other side. The compressed air pressure on both sides of the diaphragm is of equal PSI because of a connected internal passage with an orifice. A spring inside the valve holds the diaphragm closed (seated) until the signal air, on one side of the diaphragm, is rapidly released to atmosphere (by pilot signal solenoid valve). Releasing the signal air causes a pressure differential on one side of the diaphragm. This causes the diaphragm to unseat rapidly, releasing the larger volume of air (from the manifold side) which causes an acoustic cleaning wave inside each filter.

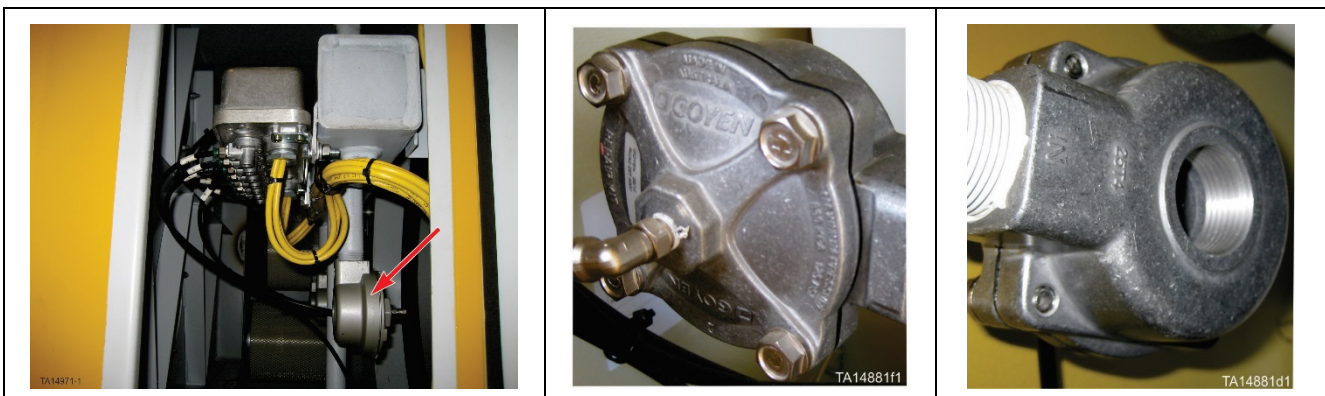


Figure 15. Current production diaphragm pulse valve

The original design of the pulse valve is not used on current production machines; however, the function and basic operation of the valve remains the same. The pulse valve assemblies are interchangeable and can be replaced individually in any air cleaner system. The rebuild kits provided in the Parts Manual are not interchangeable between designs.

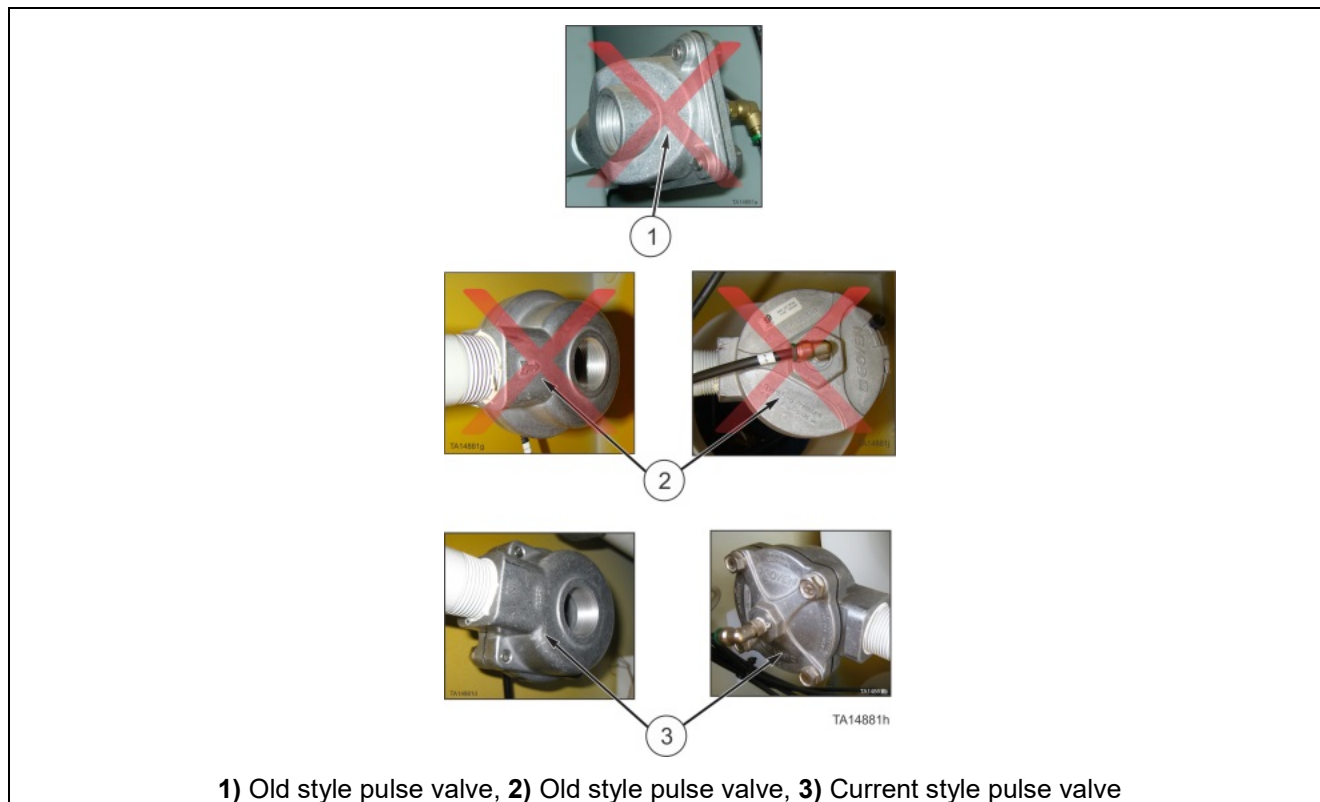


Figure 16. Diaphragm pulse valve

Solenoid Enclosure/Solenoid Valves

The solenoid enclosure houses the solenoid valves that control the pulsing of the diaphragm pulse valves. It has one solenoid valve for each diaphragm pulse valve. These solenoid valves receive a signal to pulse the diaphragm valve from the onboard monitor/control system (LINCS). There is a 24 VDC heater/thermostat inside the enclosure to help keep the solenoids from freezing in cold weather climates.

It is important that the solenoid be mounted so the solenoid's plunger is operating in the vertical direction. Do not mount the enclosure in any other position.



Figure 17. Solenoid enclosure-solenoid valves-mounting position

The diaphragm pulse valve and solenoid valves are connected by plastic tubing. This tubing will be either 1/4" or 3/8" diameter. The tubing and valves are paired together to operate the most efficiently. It is very important to keep the same size and length tubing when replacement is required. DO NOT alter diameter or length.



Figure 18. Solenoid valve tubing

KLENZ™ Solenoid Heater

The KLENZ™ solenoid housing (located inside the KLENZ™ box) on all machines with KLENZ™ have provisions for a 24V heater. The heater has an internal thermostat that actuates when the machine control system is booted. Various machine models have the same enclosure but may have a different number of solenoids (L-1350 GEN3, - 5 solenoids) or (L-1850/2350, - 7 solenoids). This heater keeps the solenoids from freezing in cold weather.

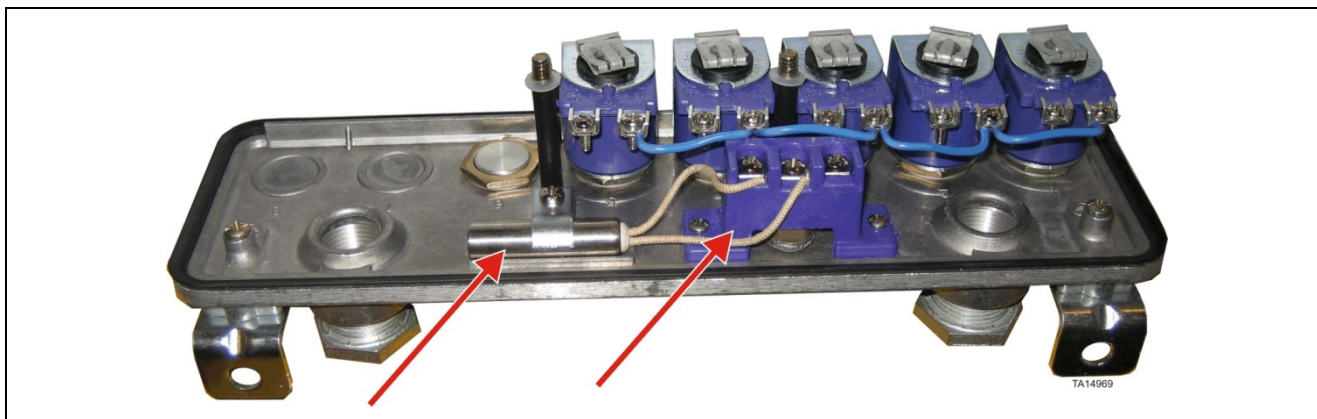


Figure 19. 24V KLENZ™ Solenoid heater and wiring

Engine Safety Filters (inner and outer)

The engine intake air is drawn from the clean air chamber through Engine Safety Filter Elements. These filters are located on both sides of the KLENZ™ structure beside the engine inlet ducting.

Machines are equipped with dual filter elements. Each machine model requires a different configuration of engine safety inner and outer filters. See Parts Manual for exact machine specific filter configuration.

Each filter set has one 10" engine safety outer filter and one 8" (203 mm) engine safety inner filter.

The outer 10" (254 mm) filter element is equipped with a sealing sleeve. When a restriction occurs, the 10" (254 mm) filter element must be changed. The 8" (203 mm) inner filter element's restriction indication wing nut indicator must be checked. When this filter is restricted, the indicator wing nut has a green indicator that disappears and a red indicator appears. If the green dot is not present in the indicator wing nut these filters must also be changed.

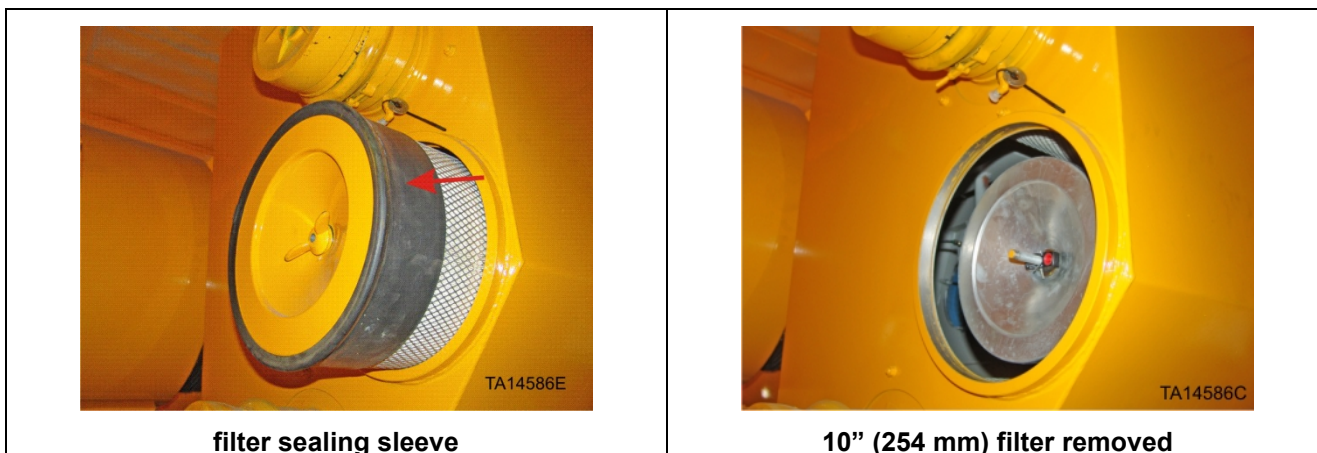


Figure 20. Removing engine filter

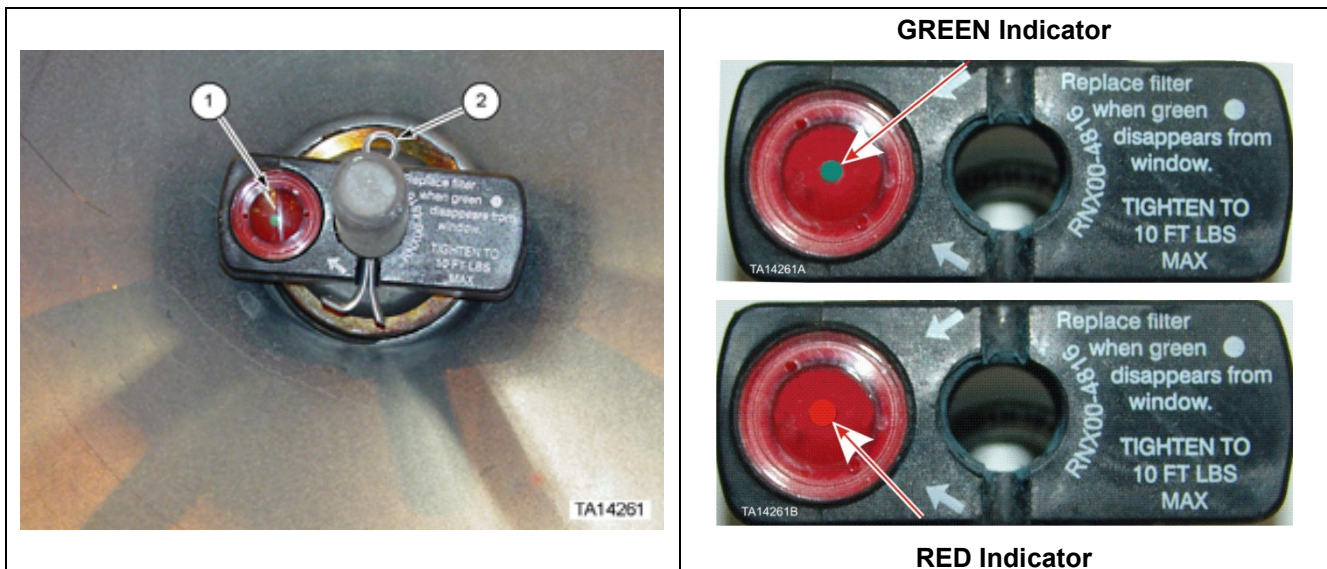


Figure 21. Engine filter restriction indicator

The engine safety filters are mounted in the KLENZ™ structure by a mounting flange and filter support rod. The mounting flange provides a flat sealing surface for the filter gasket. The back of the mounting flange is a connector for the engine inlet ducting.

The filter support rod is threaded at the end section for securing the filters against the filter flange.

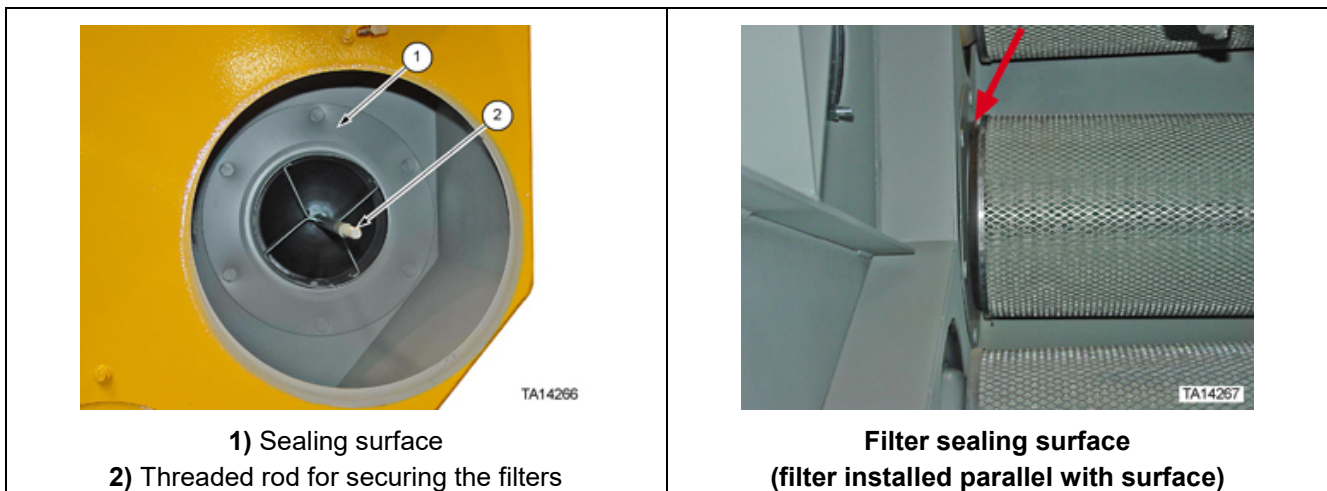


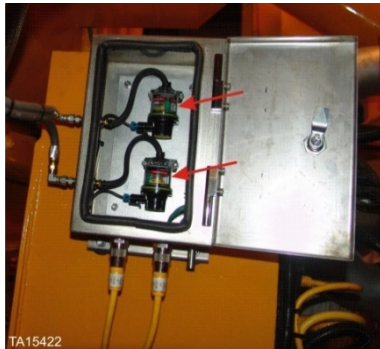
Figure 22. Filter support rod and sealing surface

Engine Air Restriction Gauges

The engine safety filters are monitored by two “Engine Air Restriction Indicators”. They are located inside a box assembly, mounted above the generator/below the KLENZ™ box.

These indicator restriction gauges provide both a visual monitoring point and an indication of restriction signal for the machine’s onboard monitoring/control system (LINCS). The indicator restriction gauge visually shows an indication of restriction in inches of water.

After new filters are installed, a clean filter reading of approximately 12” (304 mm) H₂O for Detroit engine and 15” (381 mm) H₂O for Cummins engine is typical. If the engine filters restriction reaches 20” (508 mm) H₂O, the restriction gauge has an internal switch that actuates, causing LINCS to generate a Red Alarm and send the engine into a timed shutdown sequence. A reset button is located on the bottom of each restriction gauge.



Some machines have four restriction gauges, depending on engine manufacturer

Figure 23. Engine filter restriction gauges



Typical machine shown

Figure 24. Engine filter restriction gauge location

The air restriction gauges must be reset after the filters are replaced. Press the reset button to cause the indicator to return to original position.

NOTICE

KLENZ™ filters should NEVER be cleaned and reused. Always replace filters with the correct Komatsu replacement filters.



Figure 25. Reset button located on bottom of restriction gauge

Engine Safety Adapter

The safety adapter is located between the restriction gauge intake hose and the KLENZ™ box structure engine intake tubing flange (typically threaded into the engine intake tubing flange). One restriction adapter is located on each engine filter turbo tube flange. Restriction of the adapter can prevent the engine safety filter alarm from alarming.



Figure 26. Engine filter safety adapter location

Blower Assembly

The blower assembly consists of several parts including the housing, the blower wheel, mounting plate, and blower motor assembly.

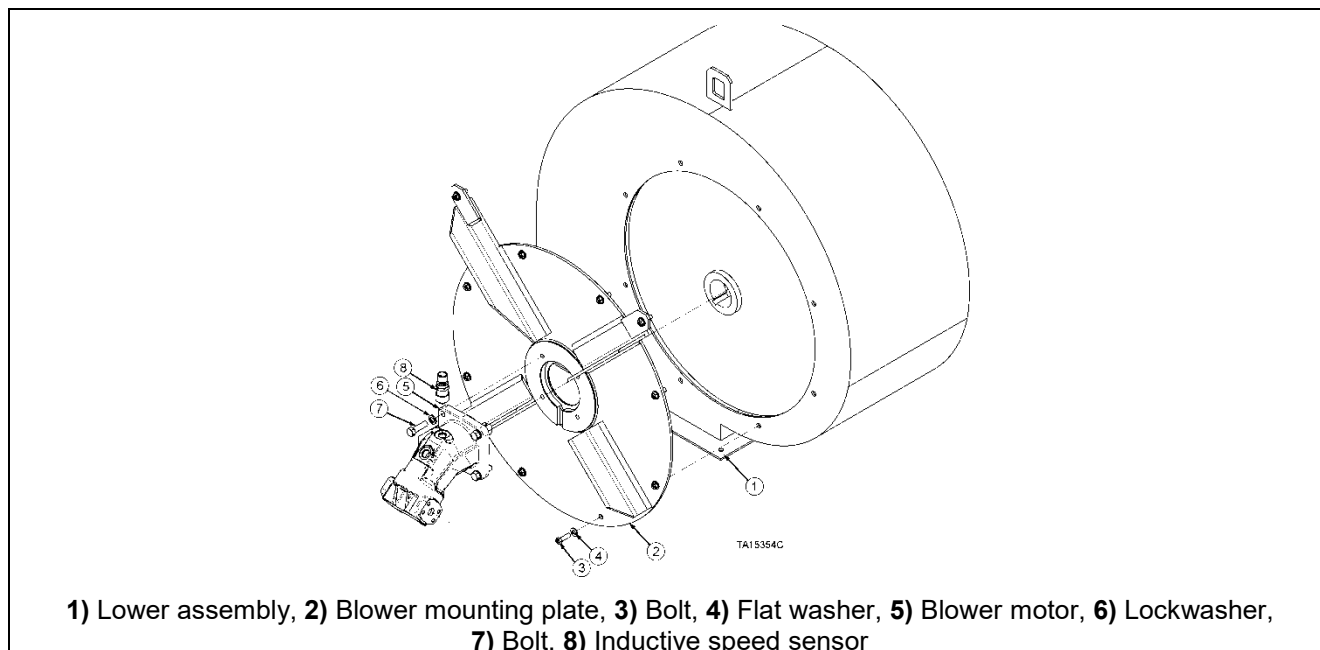


Figure 27. Typical blower assembly

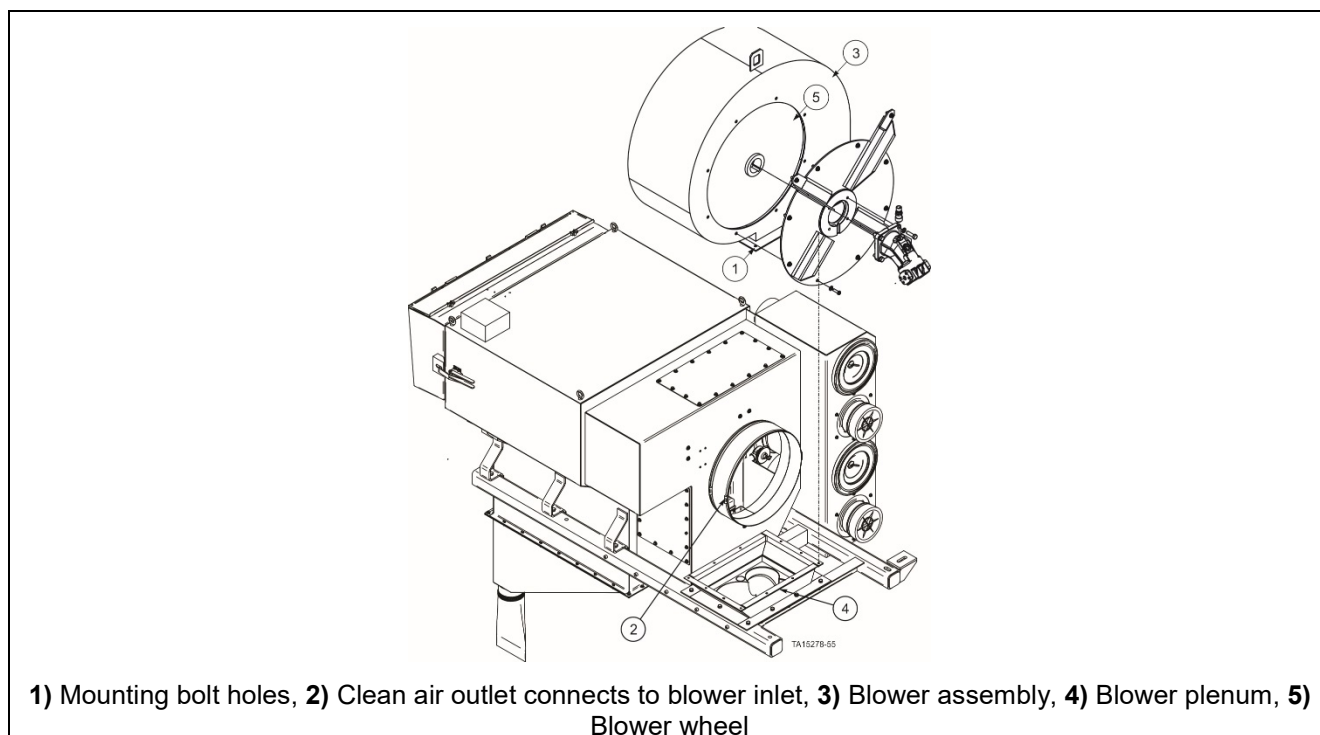


Figure 28. KLENZ™ Blower assembly (typical)

Blower Motor

The blower wheel is driven by a constant displacement bent axis piston motor. The motor is driven by a variable displacement piston pump that is mounted on the hydraulic pump drive gearbox (HPD).

Blower Mounting Plate

The blower mounting plate provides support for the hydraulic motor; along with the blower wheel.

Blower Wheel

The blower wheel draws air in from the KLENZ™ clean air box and pushes it out through the plenum.

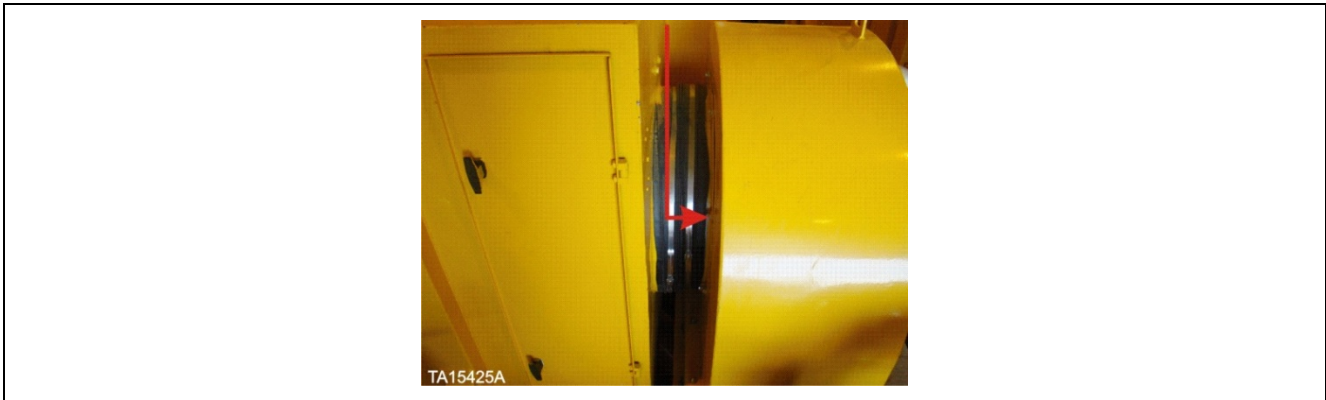


Figure 29. Air direction

The blower wheel is a Komatsu special CCW rotation fan. It is mounted onto the shaft of the blower motor assembly by a “Browning” taper lock hub and bushing. There are three retaining bolts that are torqued to 28.5 ft-lbs (126.7 N•m).

NOTICE

A special torque sequence is required

This blower wheel rpm is variable from ~900 to ~3,300 rpm. The speed is variable as controlled by LINCS, depending on cooling demands. This assembly is mounted to the blower mounting flange.

The blower fan wheel weighs 86 lbs. (39 kgs.).

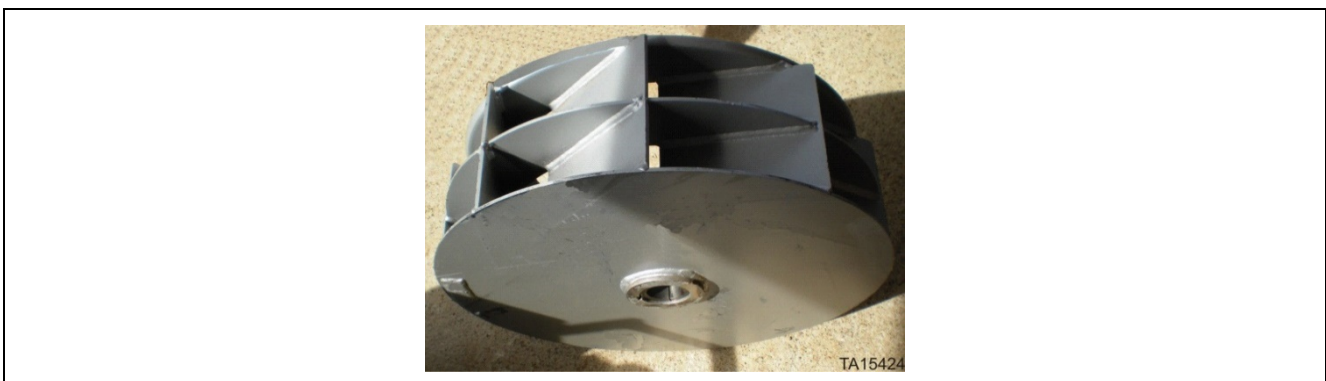


Figure 30. Blower wheel

Blower Housing

The Blower housing is a Komatsu special housing assembly. It is mounted onto the KLENZ™ support structure. The blower receives inlet air from the KLENZ™ filtration clean air chamber thru a 7" (17.78 cm) long section of 24" (60.96 cm) diameter flexible ducting.



Figure 31. Blower housing

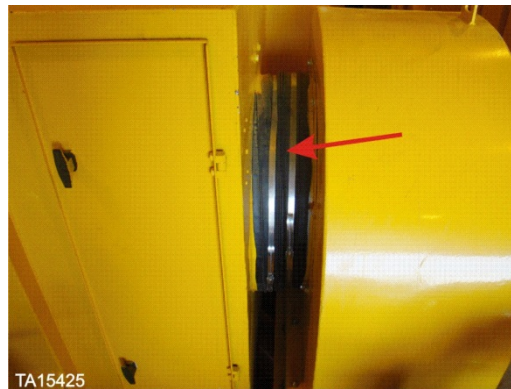


Figure 32. Flexible duct (24" [60.96 cm]) connecting blower and KLENZ™ air box

Speed Sensor

The speed of the blower fan wheel is monitored by a speed sensor. The speed sensor is mounted in the motor. The sensor reads the speed from a speed gear internal to the motor. This sensor provides a monitoring interface for the machine's monitor/control system (LINCS).

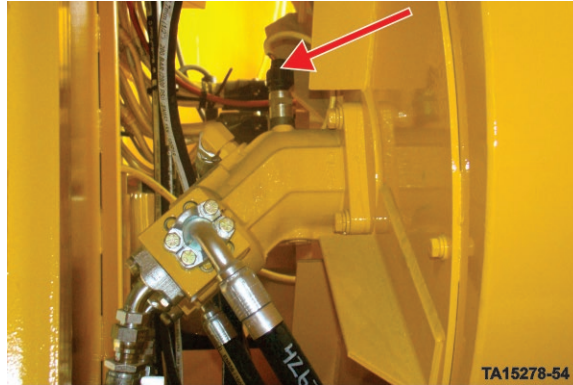
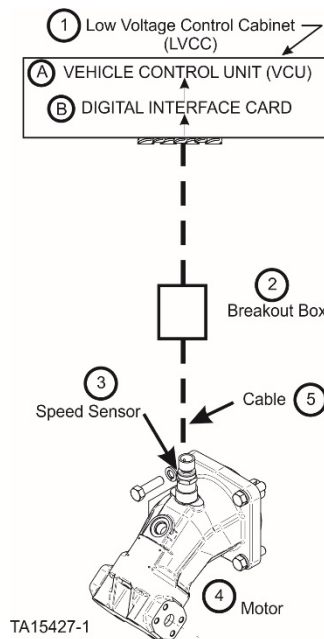


Figure 33. Blower speed sensor/cable

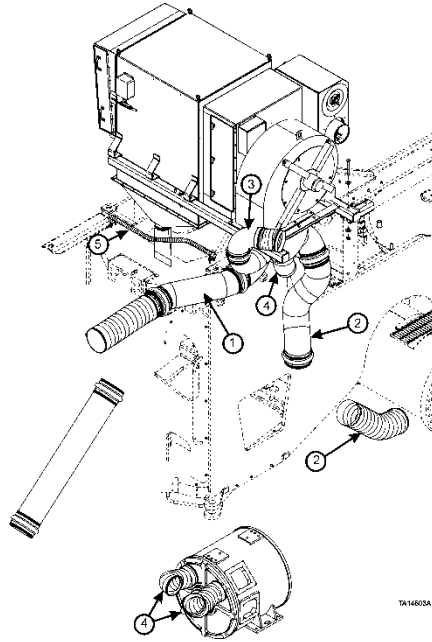


1) Vehicle control unit (VCU) (located inside the low voltage control cabinet (LVCC), 2) Breakout box, 3) Speed sensor, 4) Motor, 5) Cable, 6) Vehicle control unit, 7) Digital interface card

Figure 34. Speed sensor cable routing

Ducting

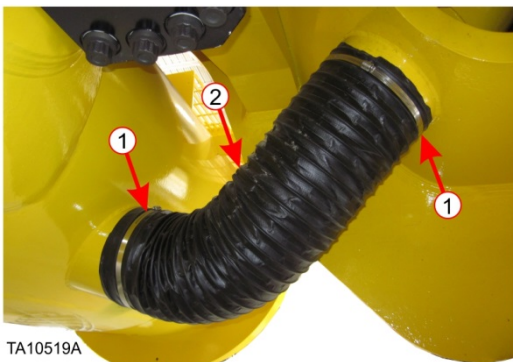
The blower directs the filtered cooling air into the ducting plenum; where it is directed to multiple locations on the machine; (1 front axle, 2 rear axle, 3 electrical converter cabinet, 4 generator, 5 cab. Filtered air is also supplied to the engine turbocharger's intake prior to the blower.



1) To front axle, 2) To rear axle, 3) To electrical cabinet, 4) To generator, 5) To air conditioner/heater

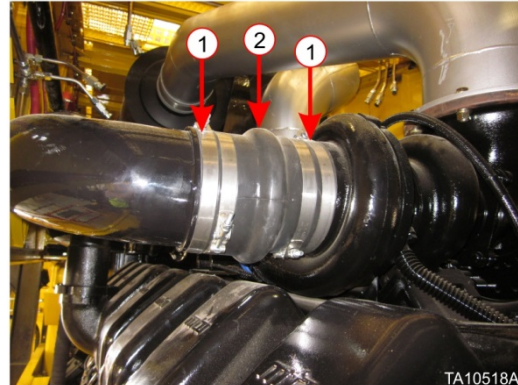
Figure 35. Blower ducting (typical)

This ducting network is made of metal tube structures and flexible ducting material. Some are referred to as “flex hoses” and other are referred to “hump hoses”. Flex hoses typically are a thinner, canvas type material with wire reinforcement. Hump hoses are typically thicker rubber type material that transitions from a larger cross section of ducting to a smaller cross section.



TA10519A

1) Clamp, 2) Flex hose



TA10518A

1) Clamp, 2) Hump hose

Figure 36. Flex hose and hump hose

Air Plenum

The housing receives air drawn in from the KLENZ™ system. It then directs the flow of cooling air to the machine's ducting plenum; for distribution to the various locations on the machine.

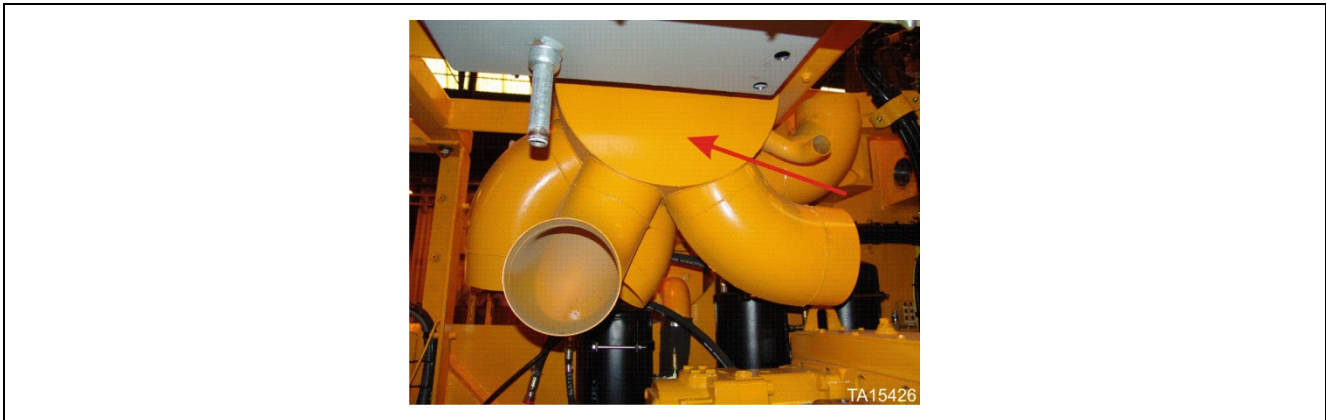


Figure 37. KLENZ™ Air plenum (typical)

Air Conditioner Ducting

The AC/Heating unit receives a filtered supply of forced air through a 2-1/4" flexible duct that connects the KLENZ™ clean air plenum to an angle pipe structure on the back wall of the cab. A 3/4" (18.288 mm) orifice fill hole is located in the angle pipe structure mount plate. The size of the orifice must not be changed, unless it is not 3/4" (18.288 mm). It is sized to provide a set amount of air flow/pressure into the cab. The flow of pressurized air is directed to the cabs climate control unit (AC and heater assembly). This forced air helps to keep the operators cab pressurized (positive pressure) and the cab air clean.

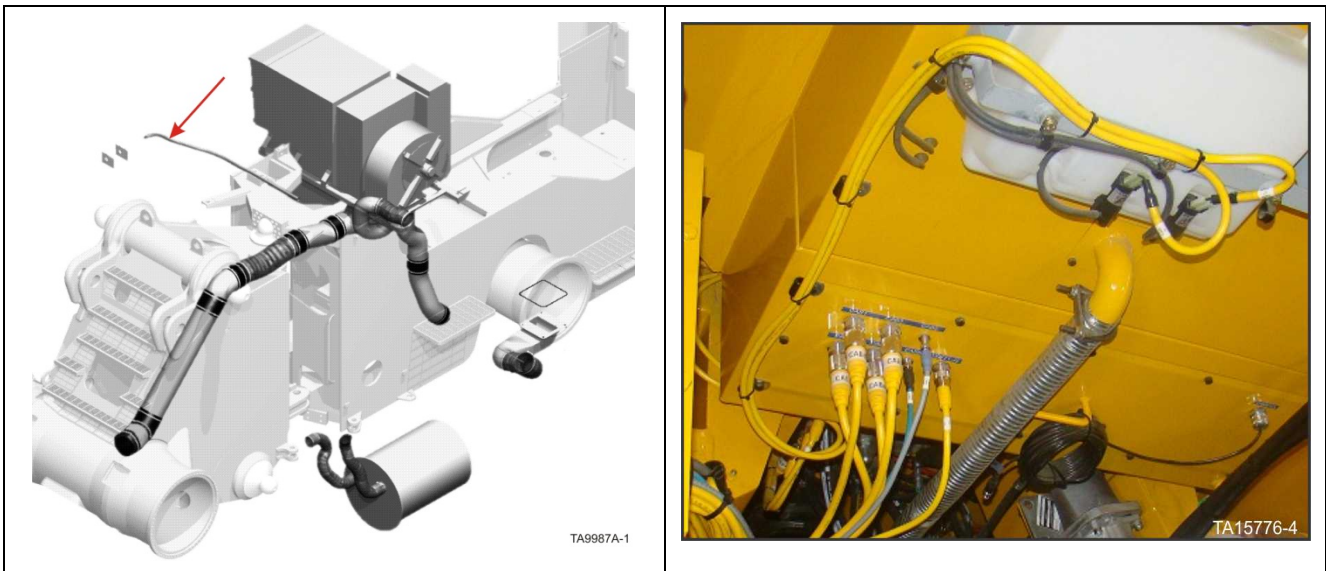


Figure 38. Air intake for air conditioner/heater (typical)

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Circuit Descriptions

KLENZ™ Filtration System Operation

During normal operation, dirty, and possibly moisture-laden, air enters the cartridge filter system through the side inlet area. It passes through the mist eliminator panels, where airborne water droplets are removed from the air stream. The air then moves through the filter cartridges, where dust is collected on the outside surfaces. The clean, filtered air flows through the center of the filter elements into the clean air plenum, where it exits through the clean air outlet. As long as Compressed Air System pressure is above 90 psi (6.2 bar), key switch "on" LINCS is booted up, the KLENZ™ Filter Purge switch is "ON" and the batteries are not disconnected, the system is designed to activate a sequence of air pulses, which purge the filters one at a time in preset time intervals.

- The "KLENZ™" purge cycle is controlled by LINCS.
- LINCS controls the timing interval to fire (energize) the air solenoids (sends a signal to create a purge action within "KLENZ™" system [loud boom]).
- As long as LINCS is booted up (machine key is on) and air pressure is above 90 psi (6.2 bar), the system will continue to purge.
 - LINCS stays booted for a few seconds (while it is booting down) after the machine key is turned off.
- The 3-way solenoid does not depressurize the "KLENZ™" manifold until LINCS has completed shut down.
 - Not hard wired to the machine key.
 - Is a software function of LINCS.
- During boot-down, the 24v supply is removed from the KLENZ™ air supply solenoid.
 - Removal of the 24v can take possibly 30-40 seconds after the machine key is placed in the OFF position.
- When de-energized, the solenoid that depressurizes the "KLENZ™" manifold vents the stored pressure from the pulse valve manifold inside the "KLENZ™" box.
 - The solenoid does NOT depressurize the "KLENZ™" reservoir (only depressurizes the manifold).
 - If LINCS is booted down, the "KLENZ™" will not purge (LINCS must be booted in order to cause a purge cycle).

CAUTION

If the last few seconds of any purge cycle falls within the 30-40 seconds while LINCS is shutting down, it is possible for the system to cause a purge cycle (a loud BOOM) even with the machine key turned off (because the manifold has not been drained and LINCS is still booted-at least partially).

During the purge cycle, LINCS automatically selects a pair of elements to be cleaned and activates a solenoid, which opens an air diaphragm valve. High-pressure air pulses directly into the center of the selected elements for 40 milliseconds pulse, blowing the collected dust off the filter elements. The dislodged dust collects in the hopper below. LINCS then waits the preset time and pulses the next element in line and the process is repeated until the end of the cycle. Air pressure used for this operation is regulated to 90 psi (6.2 bar).

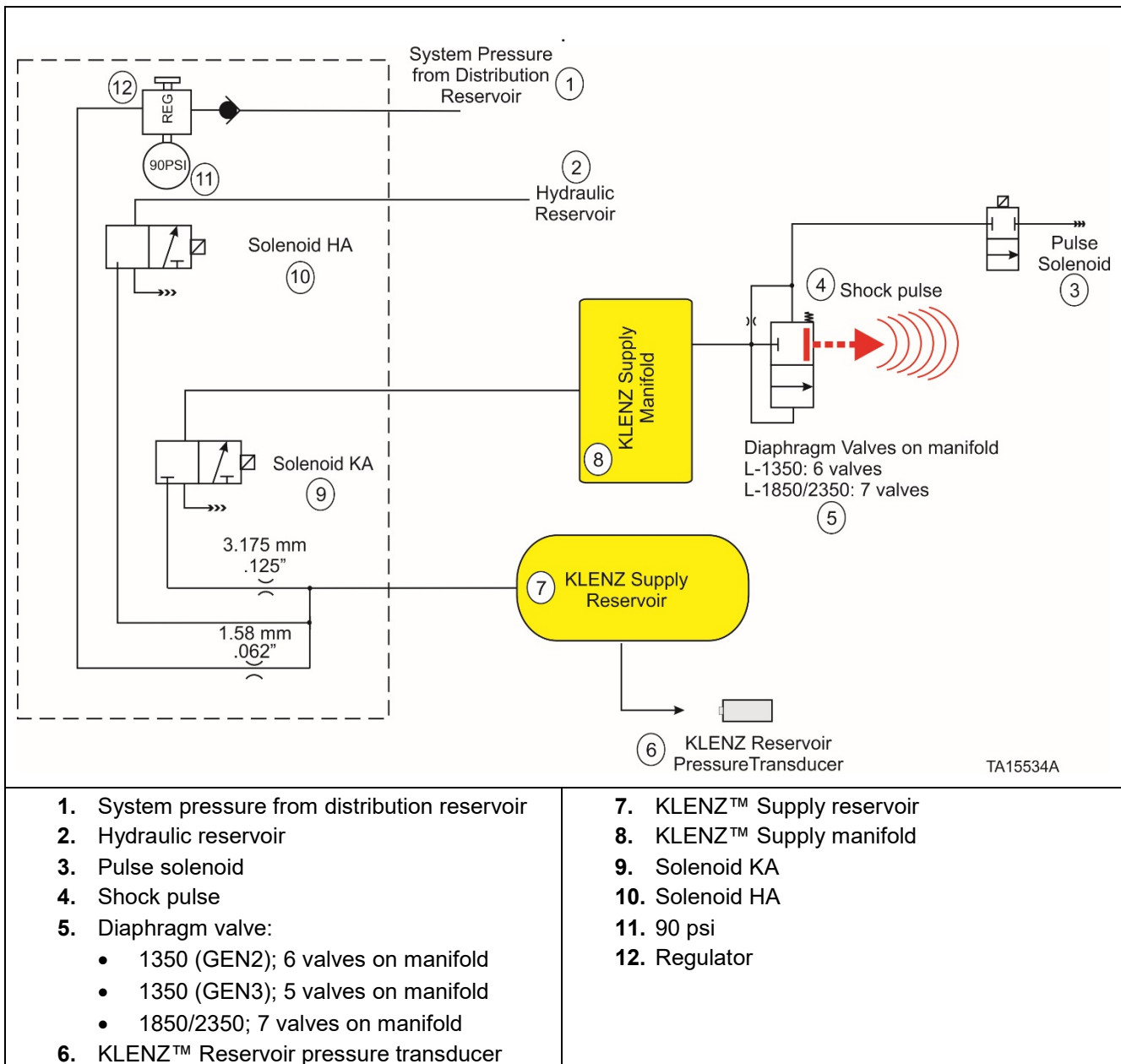


Figure 39. Simplified air system circuits

Settings and Adjustments

KLENZ™ Pulse Valve Time Intervals

The timing between KLENZ™ pulses can be changed within the LINC'S menu.

Refer to Section 06-04-05 "LINC'S, SETTINGS AND ADJUSTMENTS (NAVIGATION)".

Blower Speed

For information about setting the blower speed, refer to Section 04-01-05 "HYDRAULICS, SETTINGS AND ADJUSTMENTS".

Central Air Blower System Service Recommendations

Inspections and service of the Central Air Blower System should be performed as described below. Refer also to "Modular Preventive Maintenance Schedules", located in the Service Manual.

Cooling Air Blower System inspection and service procedures should include the following:

NOTICE

The procedure for setting the blower speed is located in "Hydraulic Powered Cooling Air Blower Speed Adjustment Procedure", located in the Hydraulic Section.

WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. **ANYONE** performing inspections or service procedures to the machine should be familiar with **ALL** instructions and procedures contained in the machine's **SERVICE MANUAL**. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.

WARNING



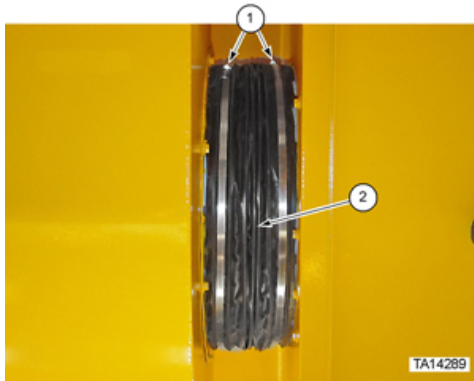
Electrical shock hazard exists inside the axle if axle access panel on either axle is removed without locking out the electrical system. Always verify the absence of bus voltage before removing the axle access panels and touching any electrified component inside the axle. Do **NOT** touch the electrical cable connections inside the axle when the key switch is **ON**, or the generator is primed, or until five minutes after the engine has been shut down and the absence of bus voltage is verified. To lockout the electrical system, and touching electrified components inside the axle could cause electrical shock which might result in serious injury or death.

- a. Every 500 hours of operation inspect the entire air cooling system ducting including:

- clamp condition and tightness
- hump hose and flex hose condition
- visible leaks
- blower fan housing condition
- Replace any damaged or deteriorated hoses or clamps immediately

NOTICE

Closely inspect a large diameter spiral-wrap hose between the “KLENZ™” Filtration System and the blower housing. Be sure the clamps are in proper position and secure, and the hose is good condition. This hose is further sealed with RTV Silicone Gasket Sealant. If replacing this hose, BE SURE to use RTV Silicone Gasket Sealant at each end.



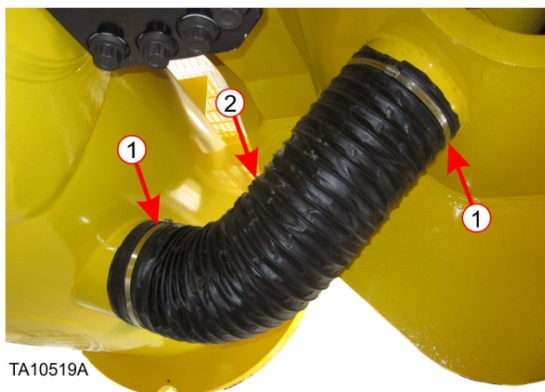
- 1.Clamps
2.Spiral-wrap hose

Figure 40. Spiral-wrap hose between blower and KLENZ™

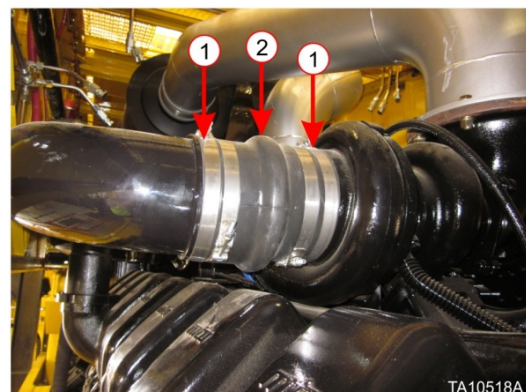
- b. Every 500 hours of operation inspect the axles, electrical cabinets and cab air conditioner filters for dust. Service Komatsu Cartridge Filtration System (KLENZ™ System) if dust is present.

NOTICE

Always clean around the breather filter before temporarily removing or before replacing it.



- 1) Clamp, 2) Flex hose
Flex hose installation across pivot area



- 1) Clamp, 2) Hump hose
Hump hose installation in ducting to electrical converter cabinet

Figure 41. Typical central air blower system flex and hump hose installation

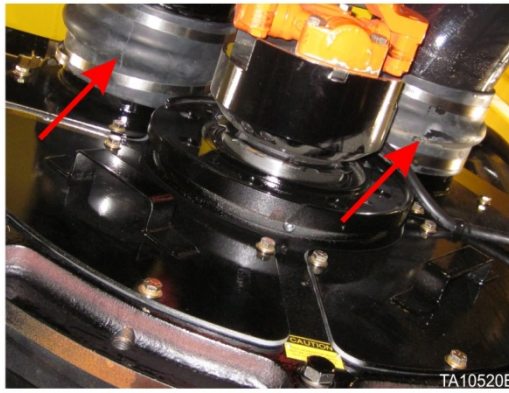


Figure 42. Hump hose installation at generator

NOTICE

The photographs in this figure show typical flex and hump hose installations. As shown in previous figures, these hose installations are found at various locations in the central air blower duct routing. It is essential to inspect each installation every 500 hours of operation for torn or deteriorated hoses and loose or improperly positioned clamps.

Removing/Installing the Blower Wheel onto the Motor Shaft

Safety Preparations

WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine's SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.

WARNING

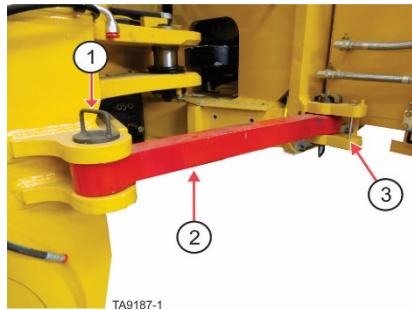
Fall hazard or struck-by hazard exists when opening the KLENZ door. If the loader is on a slight incline or in high wind, the door could quickly swing wide open. The door is heavy. Do not stand in front of the door when releasing the handle or latches. Stand on the opposite side of the door hinge when opening the door. Standing in front of the door can cause a fall or a struck-by injury that results in serious injury or death.

- a. Stop the wheel loader on flat level ground.
- b. Place wheel chocks in front and behind each wheel.

⚠ WARNING

Crush hazards exist in machine pivot area and area between the tires. Do not enter these areas unless it is verified that the operator has control over the steering and that personnel locking the frame lock have good communication with the operator. Entering the pivot area and area between the tires while the machine is moving or pivoting (articulating) could cause crush hazards resulting in serious injury or death.

- a. Move the frame lock to the locked position so that the frame cannot be steered.



- 1) Retaining pin for locked position, 2) Frame lock - shown in locked position,
- 3) Retaining pin bracket for un-locked position

Figure 43. Frame Lock

- b. Set bucket flat and level on the ground.
- c. Set the parking brakes.
- d. Shut off the engine.

⚠ WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- e. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.

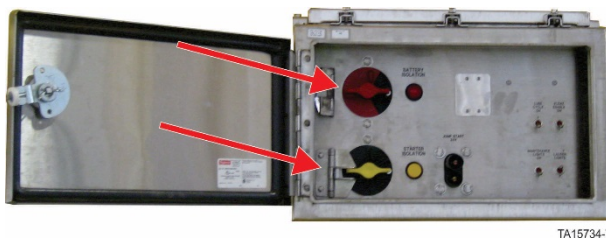


Figure 44. GEN 2 Battery Isolation Box – Battery isolation switch in OFF position with locks in place

- f. Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.
- g. Turn the handle to the up position as shown

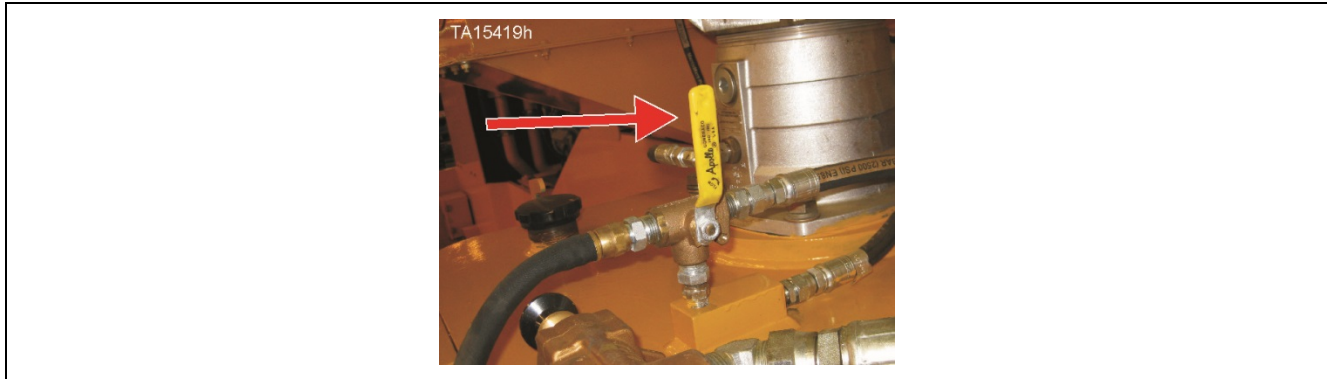


Figure 45. Hydraulic reservoir air valve handle UP

- h. Release the air from the various air storage reservoirs by opening all of the air bleed valves.

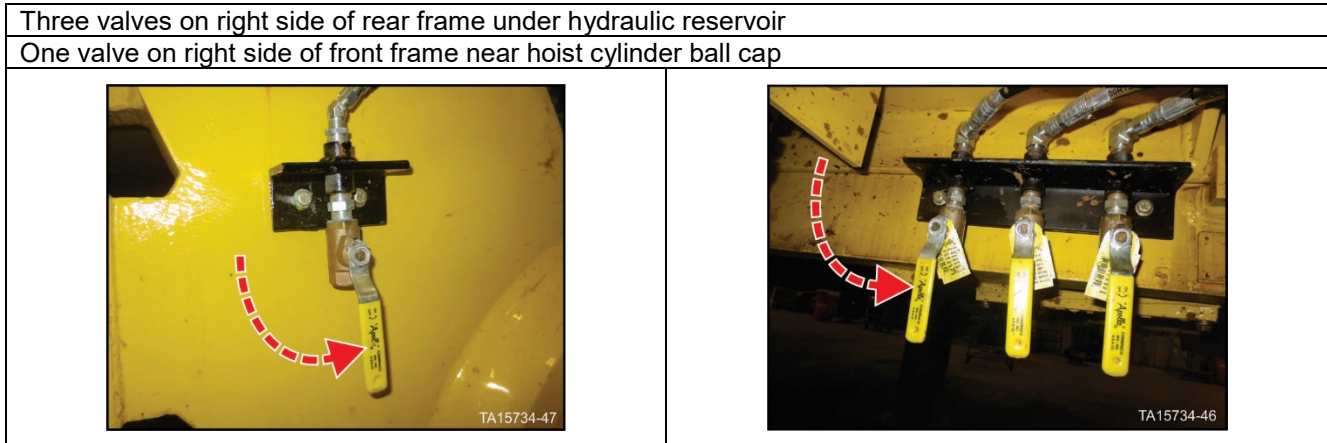


Figure 46. Open air reservoir bleed valves

⚠ WARNING

Crush hazards exist if all personnel are not cleared from the bucket and lift arm area before using the hydraulic hoist and bucket hydraulic pressure bleed down valves to relieve pressure from the hoist and bucket circuit. Assembly must be used only when the engine is **NOT** running. Before using the Manual Bleed Valve Assembly, refer to “HYDRAULIC AND GREASE SYSTEMS”, “MANUAL BLEED VALVE ASSEMBLY”, in Section 04 of the Service Manual for additional operational and safety information. Operating the manual bleed valve may cause the lift arms and bucket to descend rapidly. All personnel around the bucket and lift arms area shall be removed from the area before operating hydraulic hoist and bucket hydraulic pressure bleed down valves. Using the hydraulic bleed down valves could result in movement of the lift arms and bucket which could cause a crush hazard resulting serious injury or death.

- i. Use the hydraulic pressure bleed down valves located in the front frame underneath the HUSCO valves to bleed any stored pressure in the hoist and bucket cylinders.
- j. Turn each valve slowly counterclockwise as shown below and allow the pressure to bleed down.
- k. Open the valve completely and leave it open during the procedure.



Figure 47. Pressure bleed down valves

- I. Following all local environmental rules and regulations, drain the hydraulic reservoir and any residual fluid in the hydraulic lines.

Wheel Removal

Make sure all power to the fan is completely disconnected or “locked out” per appropriate procedures. Use appropriate procedure for ensuring the machine cannot be started or moved during this procedure.

- a. Secure the machine using mine specific rules and regulations.
- b. Depending on model and hood type, remove either the hood grating or the front hood section to gain access to the blower assembly.
- c. Remove the air from the hydraulic reservoir.
- d. Disconnect and cap the pressure, return and case drain hydraulic hoses at the blower motor. Disconnect the speed sensor cable from the speed sensor. Move the hydraulic hoses and speed sensor cables clear of the blower assembly.
- e. Remove the 24” flex ducting between the blower housing and the KLENZ™ box.

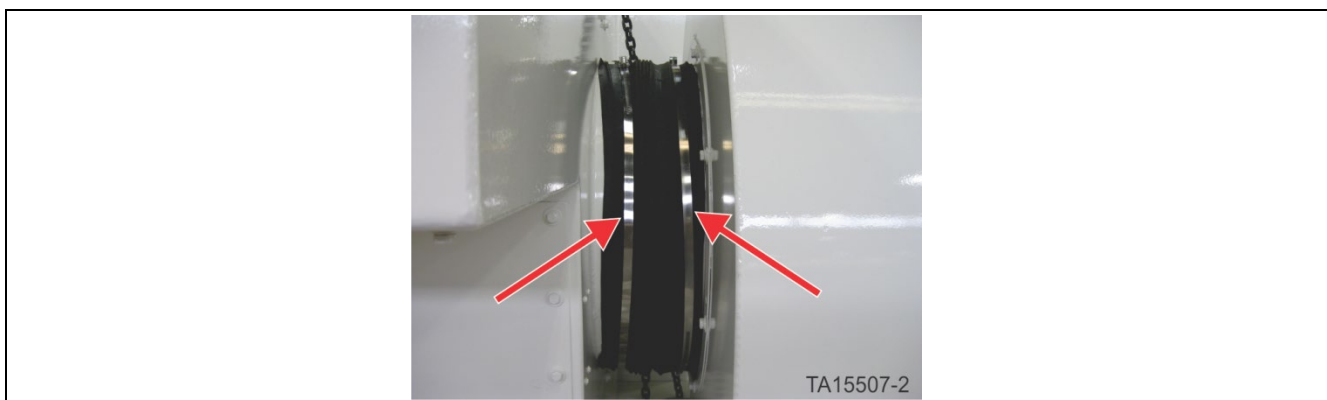


Figure 48. Flex ducting

- f. Attach a suitable lifting device to the lifting eye of the blower assembly.

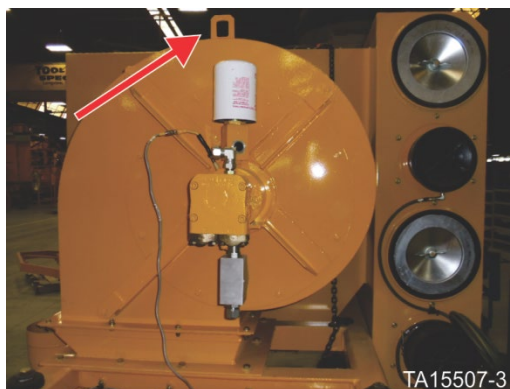


Figure 49. Lifting point

- g. Remove the mounting bolts at the bottom of the blower assembly.

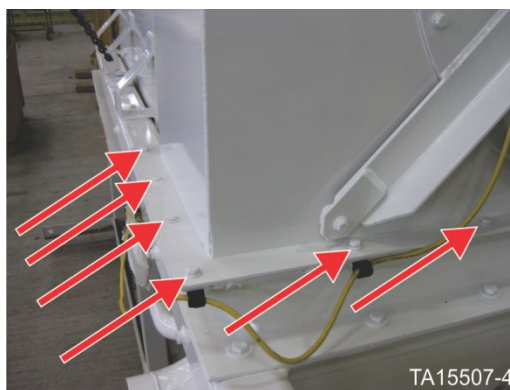


Figure 50. Typical blower mounting bolt locations (not all shown)

- h. Lift the blower from the machine and place in a suitable work area.

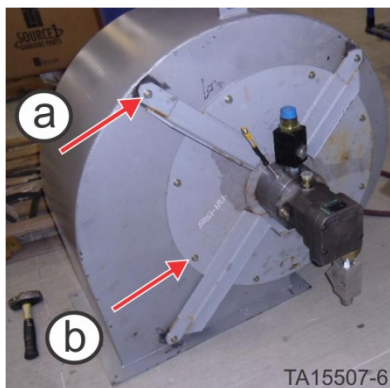


Figure 51. Blower removed and placed in work area

- i. Remove the original motor, mount plate, and blower wheel from the blower assembly. Remove the 11 bolts as indicated.

NOTICE

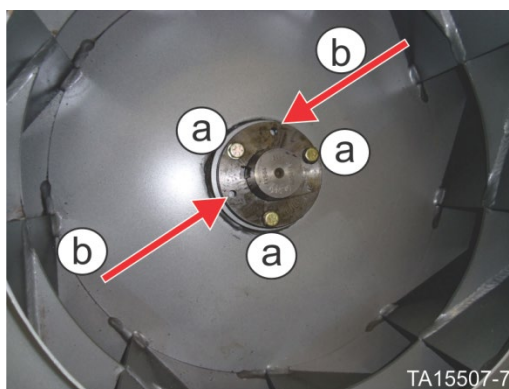
During original assembly, gasket material (silicon rubber) is inserted between the mount plate and the blower housing. The blower housing will need to be cleaned before re-assembly.



a) 3 Capscrews typical, b) 8 Capscrews typical

Figure 52. Mount plate bolt removal

- j. Remove the blower wheel from the motor shaft.
- k. To remove the split taper bushing:
 - Remove the three cap screws.
 - Insert two of them into the tapped holes in the bushing.
 - Tighten the cap screws alternately and gradually until the bushing disengages from the hub.



a) Cap screws, b) Tapped pusher holes

Figure 53. Blower wheel hub removal

- l. Clean the silicon rubber from the mating surface of the blower housing and motor mount plate.

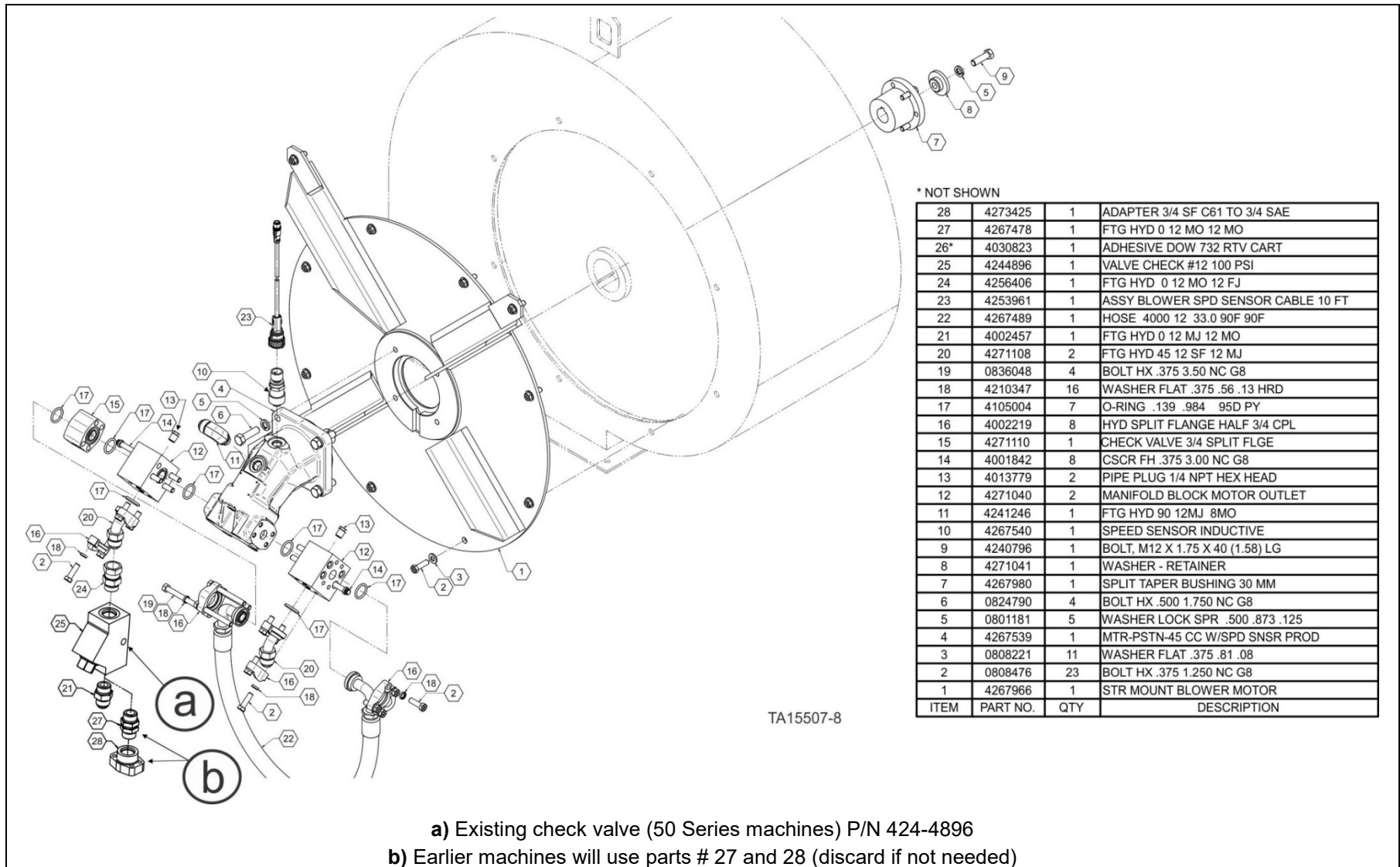


Figure 54. Bent axis blower motor

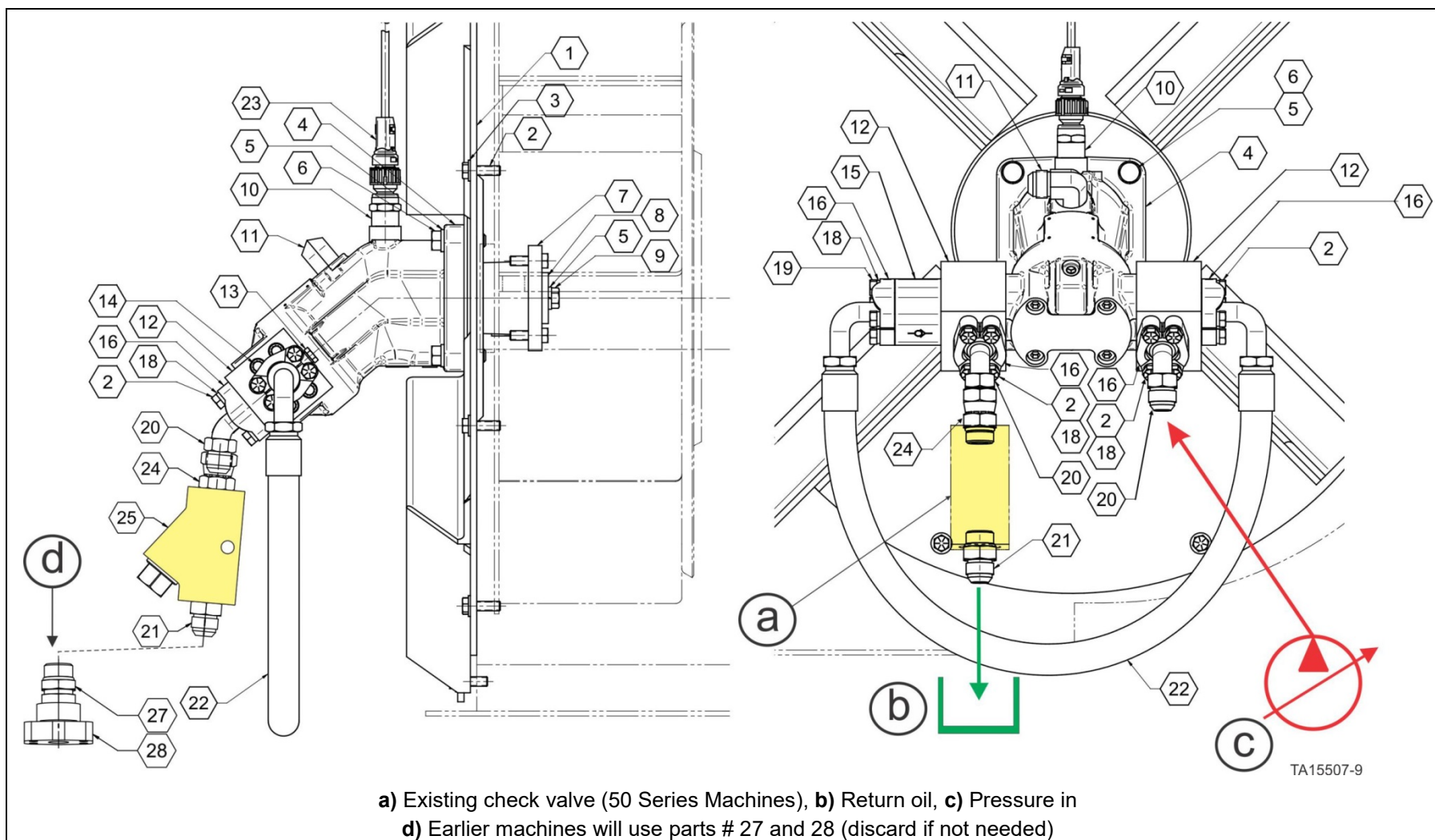


Figure 55. Bent axis blower motor

Blower Wheel Mounting

NOTICE

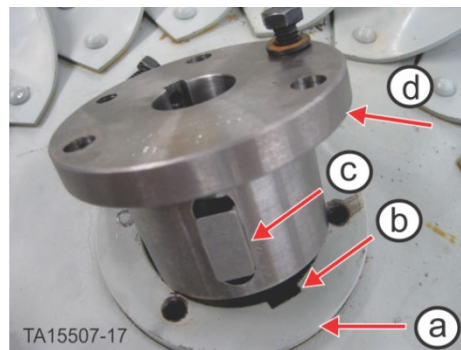
While the blower assembly is disassembled, a thorough crack inspection should be performed on the blower wheel, blower housing, and KLENZ™ structure. If cracks are found in the blower wheel, the wheel should be replaced. Cracks found in the blower housing or KLENZ™ structure should be repaired prior to re-installation.

- a. Install the bent axis motor onto the mounting plate.
- b. Install the blower wheel onto the motor shaft.
- c. Install the split taper bushing using the following procedure:

NOTICE

Photos in this portion were taken with an auxiliary oil cooler fan blade. However, the hub assembly is the same for the blower wheel.

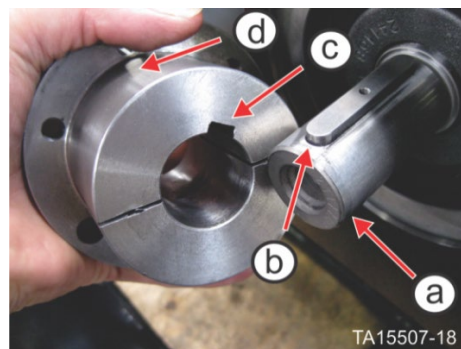
1. Check all surfaces are free of burrs, paint, etc.
2. Position the blower wheel hub so the keyway in the bore of the blower wheel is aligned with the external (barrel) key in the bushing.



a) Hub, b) Hub keyway groove, c) Bushing barrel key, d) Bushing

Figure 56. Bushing to hub installation

3. Align the shaft key seat with the bushing bore keyway and install the key.



a) Motor shaft, b) Shaft key, c) Bushing bore keyway, d) Bushing

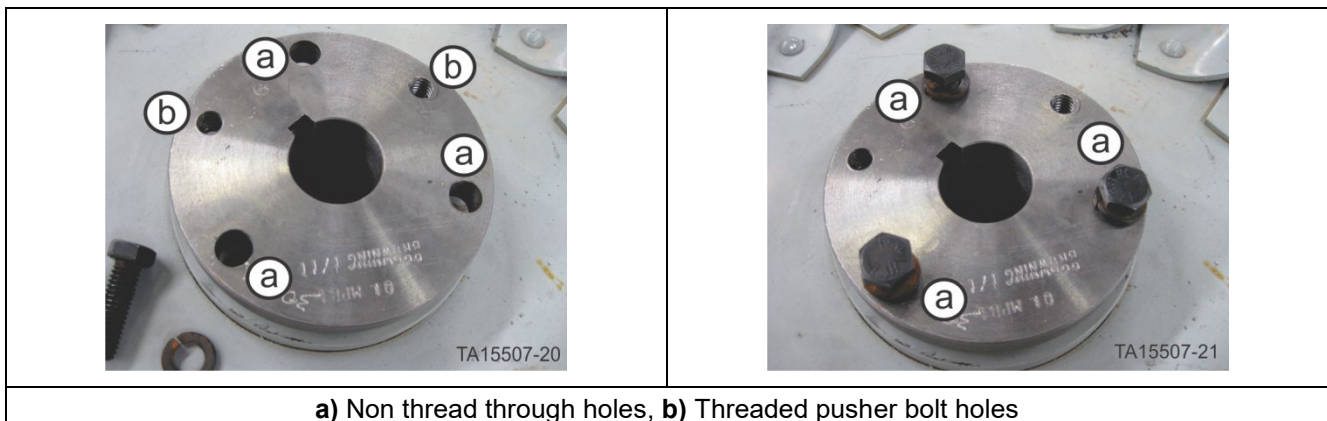
Figure 57. Blower wheel bushing installation (blower wheel removed for clarity)

4. Install the blower wheel capture bolt and washer. Torque the bolt to 50 ft-lbs lubed.



Figure 58. Blower wheel bushing capture bolt

5. Insert the cap screws through the non-threaded holes in the bushing flange and thread them by hand into the blower wheel. Turn them in three or four turns.



a) Non thread through holes, b) Threaded pusher bolt holes

Figure 59. Blower wheel bushing bolt locations

6. The blower wheel should be positioned with the bushing pulled tight against the capture bolt washer.
7. Using a torque wrench and appropriate socket, tighten the cap screws sequentially until each is tightened to 348 in-lbs (29 ft-lbs, 39.3 N•m). When the cap screw torque is at recommended torque, make at least two more sequential rounds to assure all cap screws are at the 348 in-lbs. torque value.

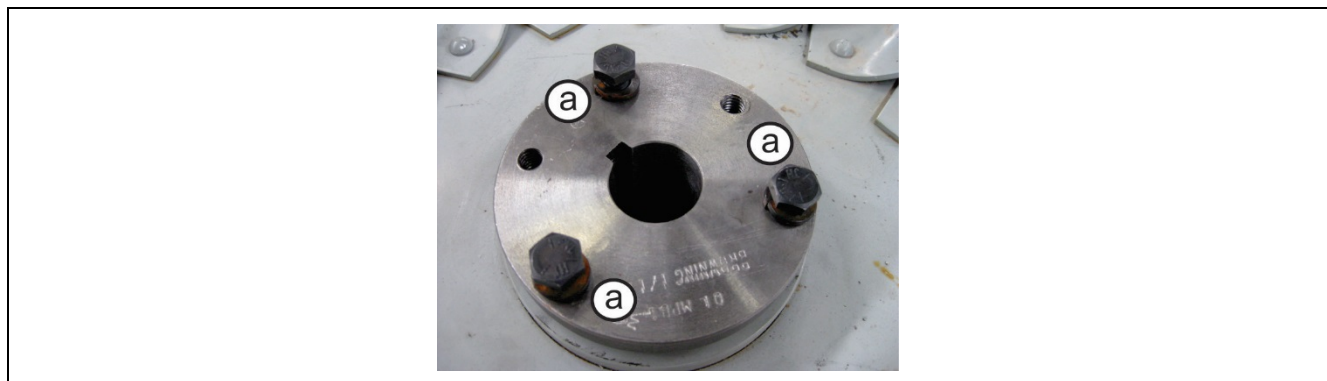


Figure 60. Blower wheel bushing bolts to torque

8. Verify that the blower wheel has clearance between the wheel and the motor mount plate. The clearance should be approximately 3/16 in. (4.75 mm)

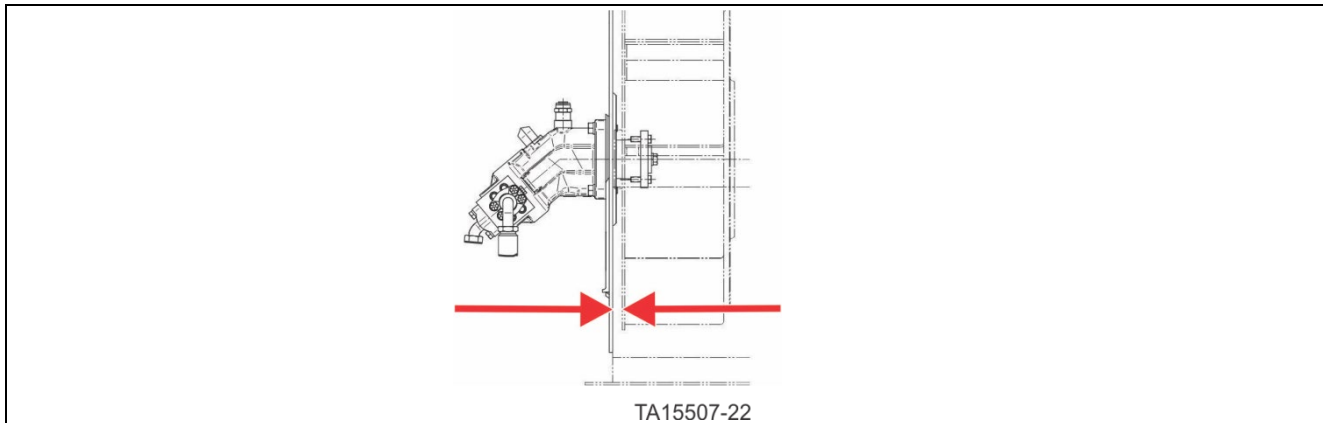
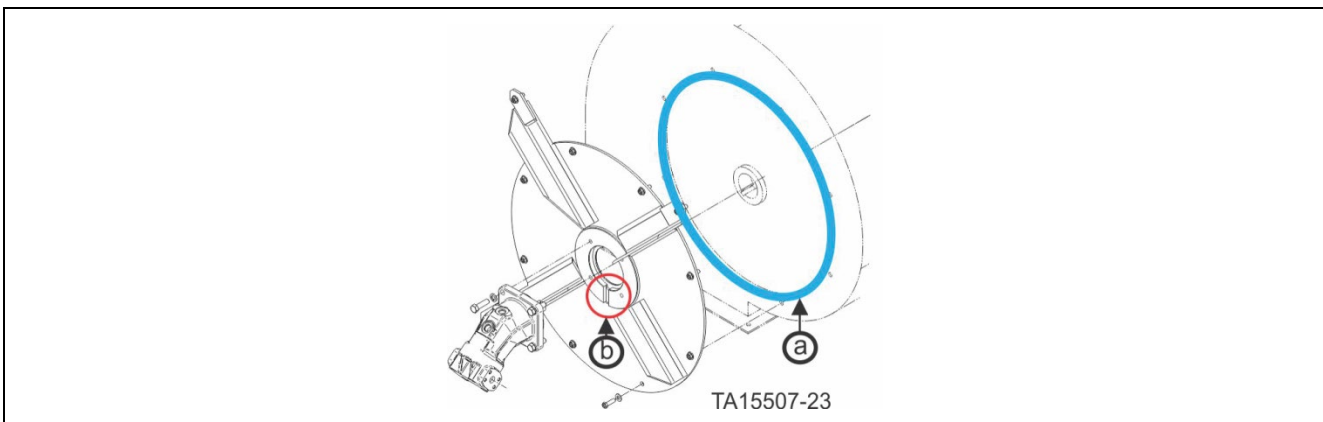


Figure 61. Blower wheel clearance

9. Check installation gap. There must be a gap ($> 1/16$ in. (1.5 mm)) between the bushing flange and the blower wheel hub. If there is no gap between them, disassemble the parts (following procedure in Wheel Removal Procedure) and determine the reason(s) for the faulty assembly.
10. Rotate the blower wheel and verify that the wheel does not rub on the motor mount plate.
11. Apply a bead of silicon rubber (P/N 403-0823 RTV Silicon Rubber Clear) on the blower housing where the motor mount plate mates to the housing. Apply sufficient silicon to provide a complete seal.

NOTICE

Do Not apply silicon rubber to the motor mount flange. In the event that the shaft seal on the motor leaks, the leaking oil will drain out the bottom of the mount plate through a machined groove. This groove must remain unblocked.



- a)** Bead of silicon rubber between blower housing and motor mount plate, **b)** Insure this area is unobstructed.

Figure 62. Silicon rubber placement

- d. Install the blower wheel, motor mount and motor to the blower housing. Secure with cap screws previously removed in Wheel Removal Procedure. Rotate the blower wheel and verify clearance between the wheel and the inlet plenum.
- e. Assemble hydraulic components.
- f. Apply a bead of silicon rubber (p/n 403-0823 RTV Silicon Rubber Clear) on the outlet flange of the blower housing. Apply sufficient silicon to provide a complete seal.

- g. Install the blower assembly onto the KLENZ™ structure on the machine.

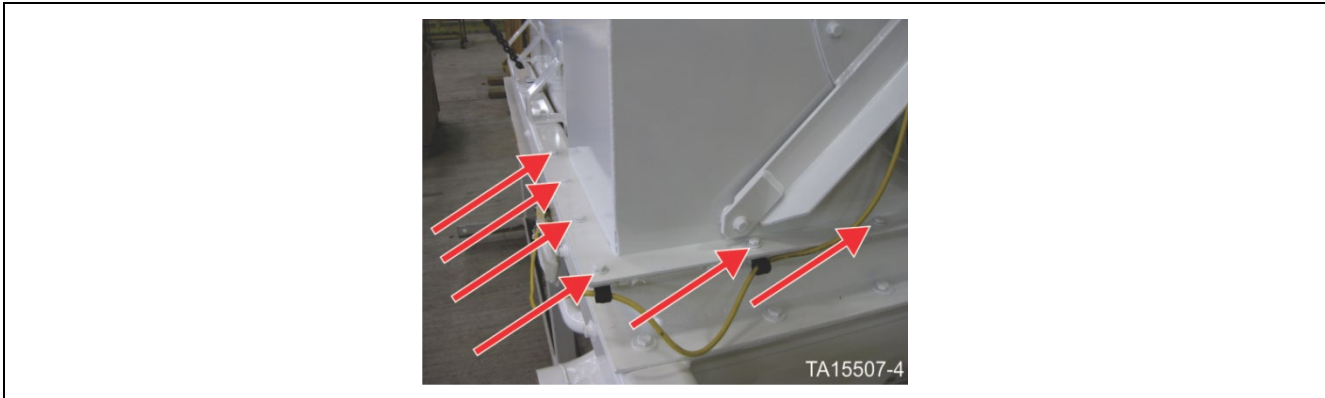


Figure 63. Typical blower mounting bolt locations (not all shown)

- h. Install the flexible ducting between the KLENZ™ box and the blower inlet plenum.

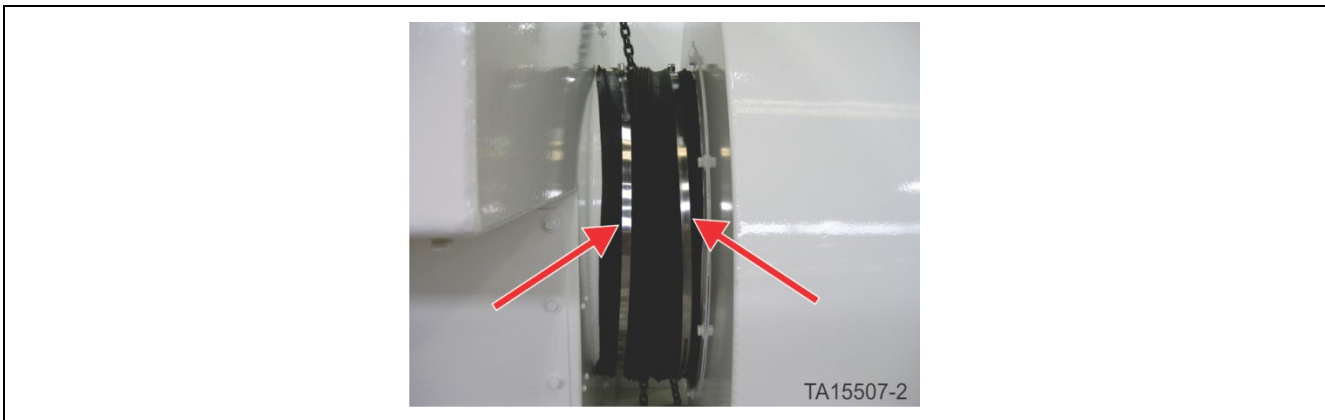


Figure 64. Flex ducting

- i. Connect all the hydraulic hoses.

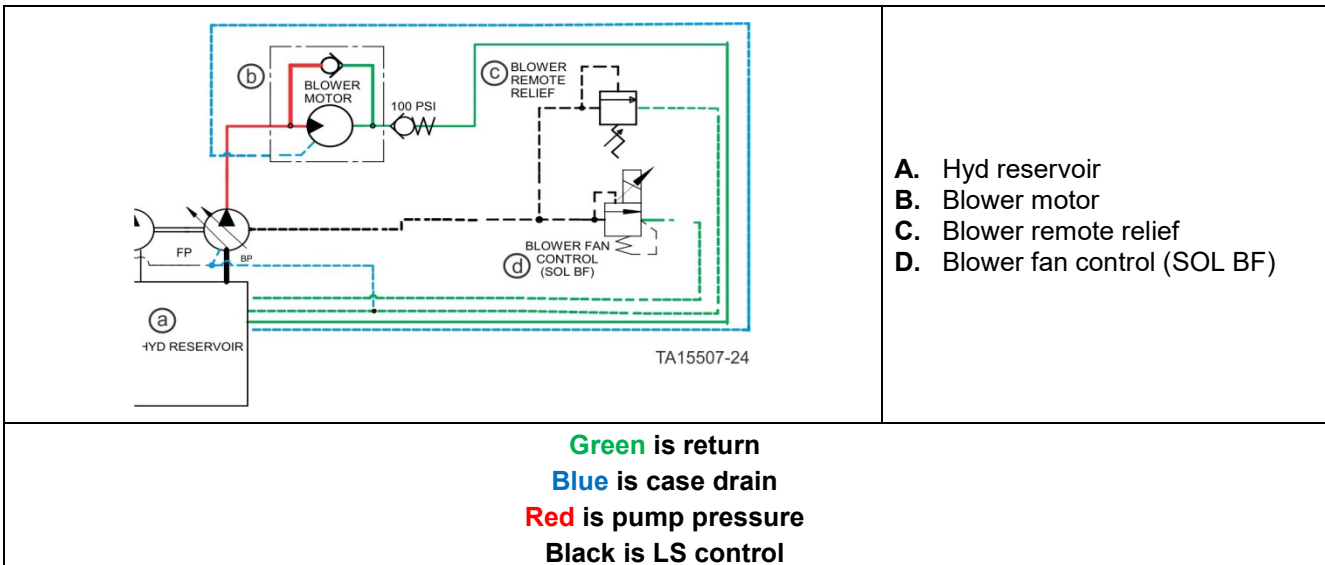


Figure 65. Blower motor hydraulic plumbing

NOTICE

The purpose of the check valve is to maintain back pressure on the blower motor so cavitation does not occur when the motor spins down.

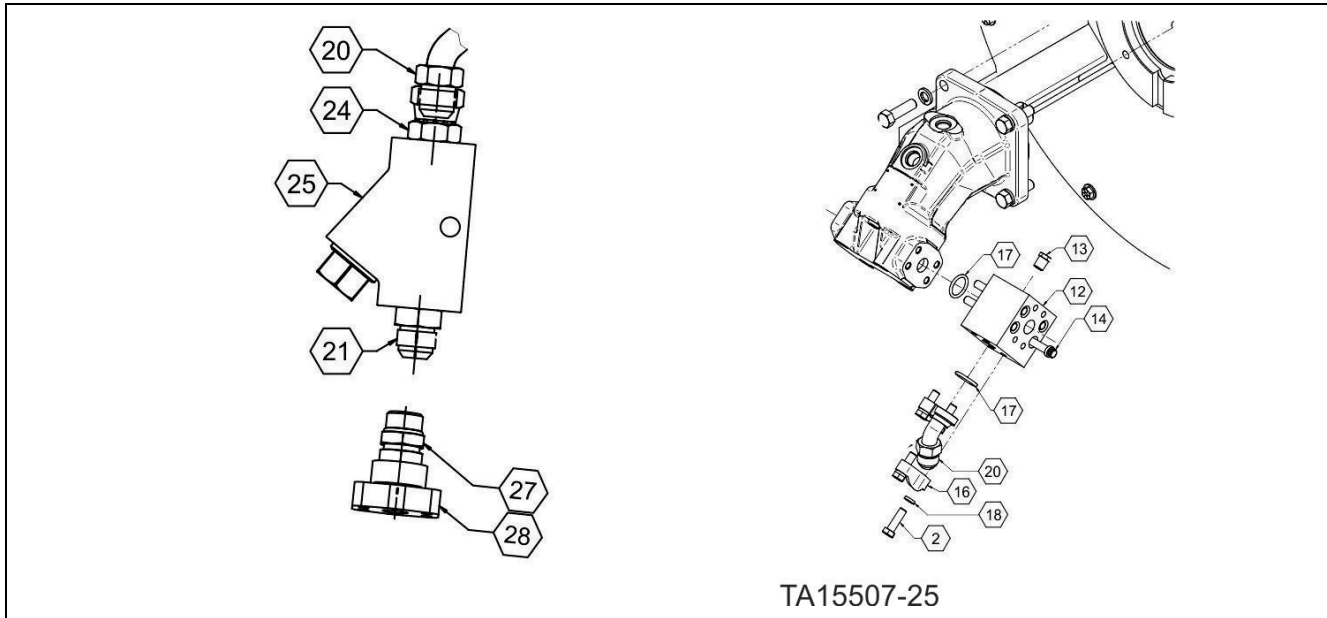


Figure 66. Hydraulic connection fittings (return and Inlet)

- j. Connect the blower motor speed sensor.

NOTICE

Calculate the blower fan speed with a multi-meter, use the following formula:

$$\text{Hz/x (60/45)} = \text{RPM}$$

- k. The speed sensor will simply be reconnected to the Turck break out box that the original cable was removed from.

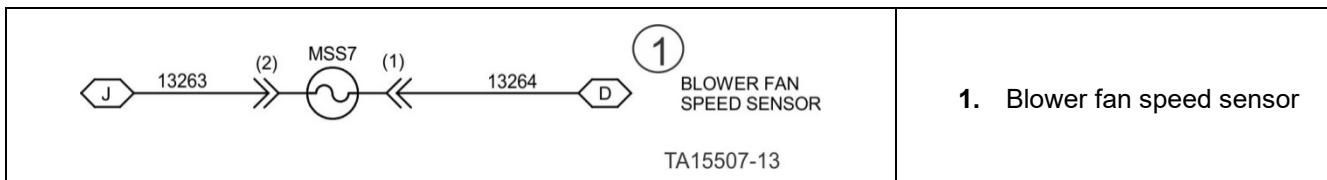


Figure 67. Standard schematic wiring (Turck)

- l. Install the hood or hood grating that was removed.

- m. Pressurize the hydraulic reservoir and bleed all the pumps. Bleed the case drain line on the blower motor.

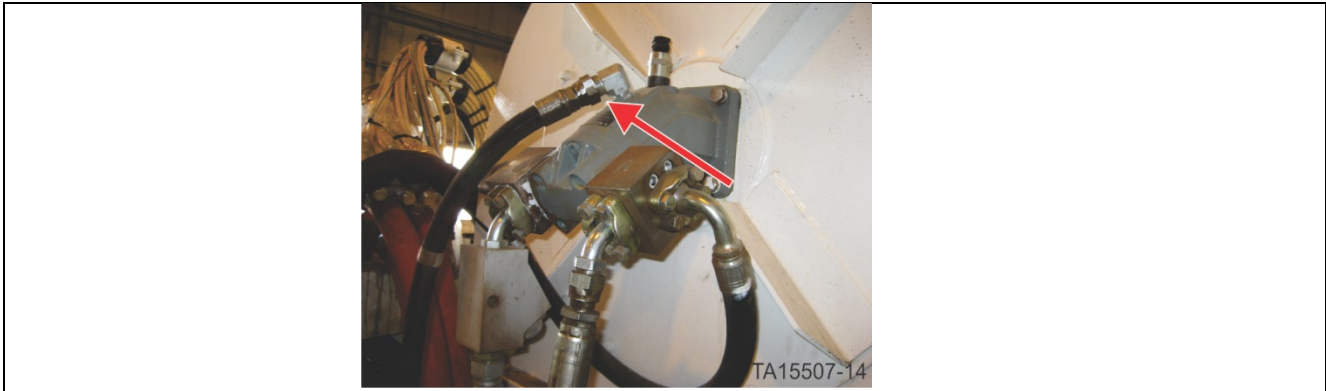


Figure 68. Motor case drain

- n. Start the machine using mine specific rules and regulations.
- o. Adjust the blower speed following the machine specific settings and adjustment procedures.
- p. Follow all local rules and regulations to return the machine back to service.

KLENZ™ Service Instructions Safety Precautions

OVER SERVICING of the “KLENZ™” filtration system is a common problem. The “KLENZ™” filters and the engine filters, when removed, expose the “clean” side of the system to the environment. The intent is to minimize this exposure by replacing the filters only when the monitoring systems indicate there is an increased level of restriction or damage is noted during routine inspection.

IMPROPER SERVICING of the “KLENZ™” filtration system is another common problem. The engine is highly vulnerable to abrasive dust contaminants during the servicing process. The most common cause of engine damage is due to careless servicing procedures. Following the steps on the following pages will aid in avoiding unnecessary dust contamination of the engine.

WARNING

Fire hazard exists if lit cigarettes, burning objects, or foreign debris are put into the hood or ducting of the “KLENZ™” filtration system. Fire is possible. Never put anything into the hood or ducting of the KLENZ filtration system or into any of the cooling air ducting. No welding repairs should be performed inside the filtration unit, without fire protection. Failure to prevent burning objects from entering the KLENZ filtration system can cause a fire hazard resulting in serious injury or death.

WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Be sure all personnel are secure and in safe positions prior to doing any testing. Place signs to alert other personnel to keep a safe distance from the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine’s starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine’s SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.



WARNING

Explosion hazards exist if spraying ether-starting aid into the air intake of the Komatsu Cartridge Filtration System (KLENZ™ system). Ether fumes are extremely flammable. Never use ether starting aid to start the engine. The use of ether is NOT recommended by Komatsu as an engine starting aid. The KLENZ system provides air to the engine turbos, generator, motors, and cab. Using ether starting aid in the engine intake can cause an explosion hazard resulting in serious injury or death.



WARNING

Inhalation hazard exists inside the cab if spraying ether-starting aid into the air intake of the Komatsu Cartridge Filtration System (KLENZ™ system). The KLENZ system provides fresh air to the cab (and other components). Inhalation of ether fumes is dangerous and can render a person unconscious or cause death. Ether fumes are extremely flammable. Never use ether starting aid to start the engine. The use of ether is NOT recommended by Komatsu as an engine starting aid. Using ether starting aid in the engine intake can cause an inhalation hazard resulting in serious injury or death.



WARNING

Hearing damage or eye injury hazard exists if the KLENZ™ Enable Switch is not turned to the OFF position before performing any service work to the machine. When the “KLENZ™” pulse valves activate, the sound is a sharp “boom” (actually a shock wave). The shock wave can cause injury to the eardrum. Wear the proper hearing protection during operational testing and when working around an operational system. Bleed air pressure to zero psig before performing any service or repair work to the KLENZ™ system or other components powered by the compressed air system. Failure to bleed the air pressure to zero in the compressed air system can cause hearing damage or eye injury from a sonic blast within the KLENZ system resulting in ear drum injury.



WARNING

Fall hazard exists when walking on walkways and stairs. To prevent falling, keep hold of the handrail and ensure sure footing. Failure to use handrails can cause fall hazards resulting in injury.



CAUTION

Eye injury hazard exists when working around the area of the “KLENZ™” filtration system. Never stand directly under the hopper of the “KLENZ™” filtration system. When activated the system will expel small debris capable of causing eye injury. Always wear safety glasses and any other required personal protective equipment (PPE) when working in the area. Failure to wear proper PPE can cause eye hazards resulting in injury.

CAUTION

Never disable or disconnect any of the restriction indicating systems, or operate the machine, if any of the indicating systems are inoperable. Serious damage to the engine and electronic components could occur.

CAUTION

When washing the machine, **DO NOT** spray high-pressure water through the moisture eliminator panel of the “KLENZ™” Filtration System, as component damage is possible. When washing machine, cover opening with tarpaulin, plywood, etc. Refer to Komatsu **CARTRIDGE FILTRATION SYSTEM INSTALLATION AND OPERATIONS MANUAL**, located in the **VENDOR LITERATURE** section of this manual.

Safety Preparations



WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. **ANYONE** performing inspections or service procedures to the machine should be familiar with **ALL** instructions and procedures contained in the machine's **SERVICE MANUAL**. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.



WARNING

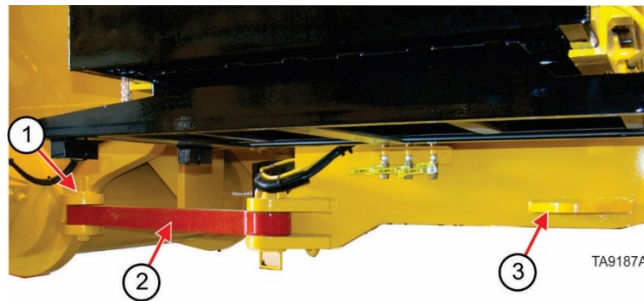
Fall hazard or struck-by hazard exists when opening the KLENZ door. If the loader is on a slight incline or in high wind, the door could quickly swing wide open. The door is heavy. Do not stand in front of the door when releasing the handle or latches. Stand on the opposite side of the door hinge when opening the door. Standing in front of the door can cause a fall or a struck-by injury that results in serious injury or death.

- a. Stop the wheel loader on flat level ground.
- b. Move the frame lock to the locked position so that the frame cannot be steered.
- c. Place wheel chocks in front and behind each wheel.



WARNING

Crush hazards exist in machine pivot area and area between the tires. Do not enter these areas unless it is verified that the operator has control over the steering and that personnel locking the frame lock have good communication with the operator. Entering the pivot area and area between the tires while the machine is moving or pivoting (articulating) could cause crush hazards resulting in serious injury or death.



Gen 1 Frame lock in locked position

- 1) Retaining pin for locked position, 2) Frame lock - shown in locked position,
3) Retaining pin bracket for un-locked position

Figure 69. Frame Lock

- d. Set bucket flat and level on the ground.
- e. Set the parking brakes.
- f. Shut off the engine.

⚠ WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- g. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.



Figure 70. GEN 2 Isolation and Control Switches assembly – Battery isolation switch in OFF position with locks in place

NOTICE

The GEN 2 battery and engine starter isolation box is shown in this document. GEN 1 machines will have a different type of switch and box. The lock out/tag out requirements are the same.

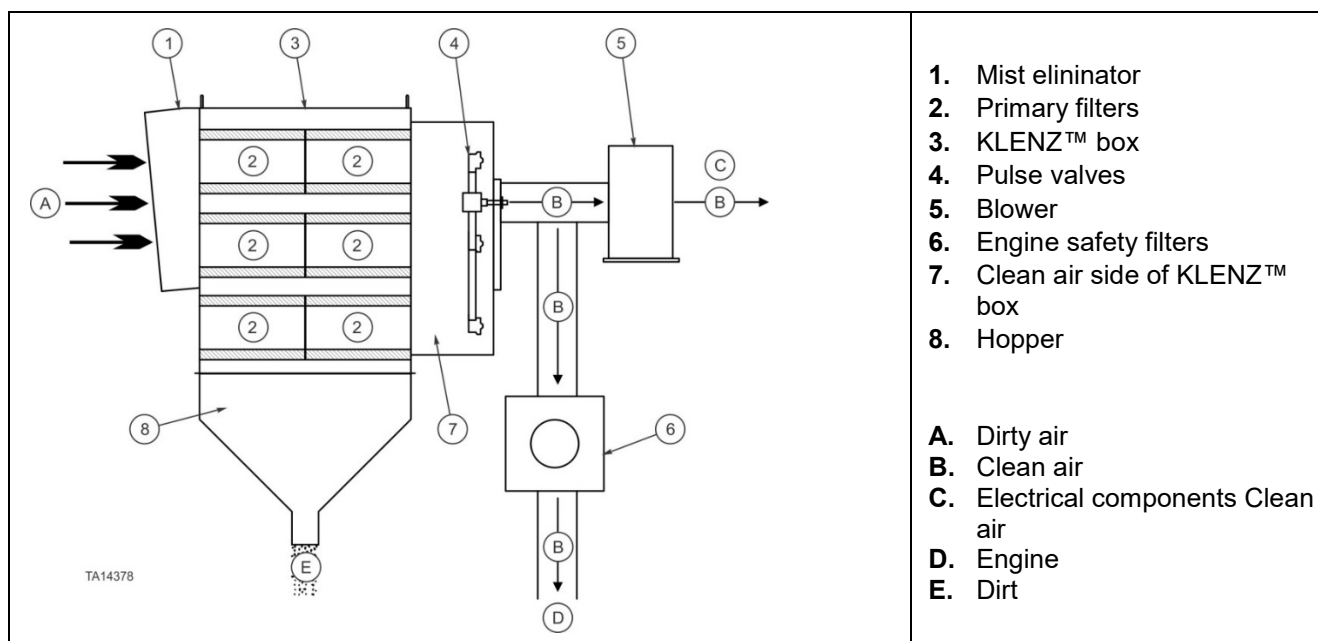


Figure 71. “KLENZ™” Air flow simplified illustration

KLENZ™ Enable Switch

The “KLENZ™” purge cycle will continue even with the engine not running (if the machine key is left ON and LINCS is booted). To prevent this from happening, the loader is equipped with a KLENZ™ Enable Switch. Turning this switch to the OFF position prevents the “KLENZ™” system from cycling, but does not depressurize the “KLENZ™” manifold or reservoir.

Unless turned OFF, the purge cycle will continue until compressed air system pressure drops below 90 psi (6.2 bar) or the LINCS system is completely booted down (See WARNING below). When a purge occurs, the filter will emit a loud “boom” and dirt will be blown from the hopper.

WARNING

Hearing damage or eye injury hazard exists if the KLENZ™ Enable Switch is not turned to the OFF position before performing any service work to the machine. When the “KLENZ™” pulse valves activate, the sound is a sharp “boom” (actually a shock wave). The shock wave can cause injury to the eardrum. Wear the proper hearing protection during operational testing and when working around an operational system. Bleed air pressure to zero psig before performing any service or repair work to the KLENZ™ system or other components powered by the compressed air system. Failure to bleed the air pressure to zero in the compressed air system can cause hearing damage or eye injury from a sonic blast within the KLENZ system resulting in ear drum injury.

WARNING

Fall hazard or struck by foreign objects hazard is possible while climbing the hydraulic reservoir ladder near the KLENZ™ air filtration system. LINCS boots completely down after the machine key is turned to the OFF position. The purge cycle will continue until LINCS is booted completely down or until the compressed air system pressure drops below 90 psi (6.2 bar) (even if the machine key is in the OFF position and the engine is not running). The “KLENZ™” filtration system will emit a loud “boom” and blow dust from the bottom of the hopper during the purge cycle. This process may be startling and present a hazard to anyone climbing the ladder adjacent to the filtration system. Turn the KLENZ™ Enable Switch OFF before climbing the ladder. The loud “boom” could cause a person on the ladder to be startled and lose their grip, resulting in a fall. DO NOT climb the hydraulic

reservoir ladder or stand near the bottom of the ladder of an operational machine unless the KLENZ™ Enable Switch is in the OFF position, except in an emergency situation. Serious injury from a fall or being struck by foreign objects is possible, resulting in serious injury or death.

The KLENZ™ Enable Switch (Filter Purge) is mounted in the “Isolation and Control Switches” assembly, mounted on the left side of the machine (rear area of rear frame). If this switch is left in the OFF position, a yellow Warning will be displayed on the LINCOS® screen when the engine is running. BE SURE to turn the KLENZ™ Enable Switch to the ON position before returning the machine to service.



KLENZ™ enable

Figure 72. Isolation and control switches assembly

Daily Inspection

Air Intake Screen

- a. Inspect the air intake screen daily for a build-up of dust or dirt. Clean with soap and water.

CAUTION

When washing the machine or cleaning the air intake screen, DO NOT spray high-pressure water through the mist eliminator panel of the “KLENZ™” air filtration system, as component damage is possible. When washing the machine, cover the air intake opening with a tarpaulin, plywood or such material.



Figure 73. “KLENZ™” air intake screen

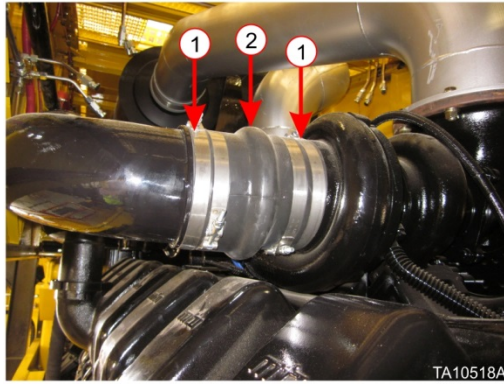
Engine Air Intake Tubing Inspection

On the left side of the engine bay:

- a. Check air inlet connections at the “KLENZ™” housing and record findings. Look for:
 - Loose or missing clamps
 - Cut, damaged, or indications of rubbing on the flexible hump hose connections
 - Signs of excessive movement between the duct and the “KLENZ™” housing
- b. Check air inlet connections at the turbocharger and record findings. Look for:
 - Loose or missing hose clamps
 - Cut, damaged, or indications of rubbing of the flexible hump hose connections
 - Indications of excessive movement between the ducting and the turbocharger
- c. Check air inlet ducting and mountings and record findings. Look for:
 - Loose or missing bolts or clamps retaining the ducting
 - Damage or cracking in the ducting
 - Loose or cracked supports for the ducting

On the right side of the engine bay:

- a. Check air inlet connections at the “KLENZ™” housing and record findings. Look for:
 - Loose or missing hose clamps
 - Cut, damage, or indications of rubbing on the flexible hump hose connections
 - Signs of excessive movement between the duct and the “KLENZ™” housing
- b. Check air inlet connections at the turbocharger and record findings. Look for:
 - Loose or missing hose clamps.
 - Cut, damaged, or indications of rubbing of the flexible hump hose connections
 - Indications of excessive movement between the ducting and the turbocharger
- c. Check air inlet ducting and mountings and record findings. Look for:
 - Loose or missing bolts or clamps retaining the ducting
 - Damage or cracking in the ducting
 - Loose or cracked supports for the ducting



1) Clamp, 2) Hump hose

Figure 74. Hump hose installation

NOTICE

The hump hoses are properly installed when clamped tightly against the lip, which is welded to the air tube. If the hump hose is not tightly secured against the lip, all the way around, it is an indication of movement. The hose must be positioned squarely against the lip to ensure no dust enters the engine. Each joint has two clamps at each hosing/tubing joint. The clamps slip joint must be oriented 180° from each other and torque to 70 in/lbs. These clamps must be secure for a proper seal.

It is also critically important to check all air intake tubing to ensure that no contact is made with any structural components. Contact with structural components can cause an opening in the tubing, resulting in dust entering the engine air intake causing engine failure.

Cleaning the Mist Eliminator

NOTICE

When the machine is used in wet conditions clean the mist eliminator.

The mist eliminator panel will require cleaning anytime the loader is used for several hours in wet conditions.

CAUTION

DO NOT attempt to clean the mist eliminator panel while installed in the unit as damage to the filter elements could result.

Safety Preparations



WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine's SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.



WARNING

Fall hazard or struck-by hazard exists when opening the KLENZ™ door. If the loader is on a slight incline or in high wind, the door could quickly swing wide open. The door is heavy. Do not stand in front of the door when releasing the handle or latches. Stand on the opposite side of the door hinge when opening the door. Standing in front of the door can cause a fall or a struck-by injury that results in serious injury or death.

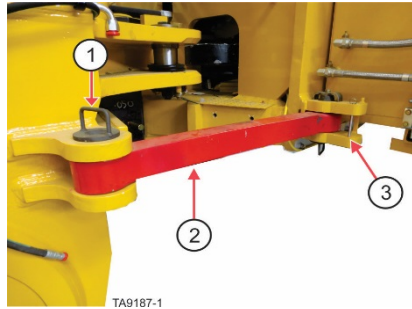


WARNING

Crush hazards exist in machine pivot area and area between the tires. Do not enter these areas unless it is verified that the operator has control over the steering and that personnel locking the frame lock have good communication with the operator. Entering the pivot area and area between the tires while the machine is moving or pivoting (articulating) could cause crush hazards resulting in serious injury or death.

- a. Stop the wheel loader on flat level ground.
- b. Place wheel chocks in front and behind each wheel.

- c. Move the frame lock to the locked position so that the frame cannot be steered.



- 1) Retaining pin for locked position, 2) Frame lock - shown in locked position,
3) Retaining pin bracket for un-locked position

Figure 75. Frame Lock

- a. Set bucket flat and level on the ground.
b. Set the parking brakes.
c. Shut off the engine.

WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- d. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.



Figure 76. GEN 2 Battery Isolation Box – Battery isolation switch in OFF position with locks in place

- e. Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.

- f. Turn the handle to the up position as shown

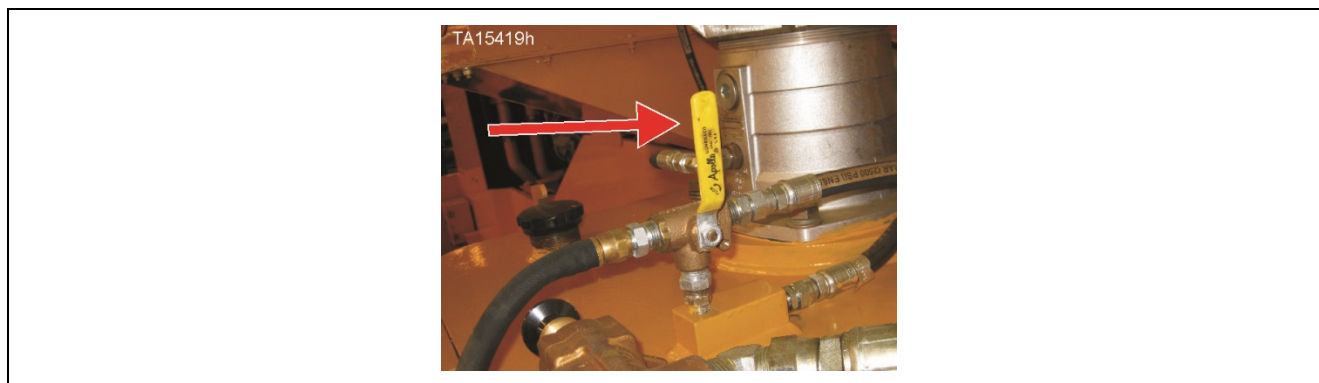


Figure 77. Hydraulic reservoir air valve handle UP

- g. Release the air from the various air storage reservoirs by opening all of the air bleed valves.

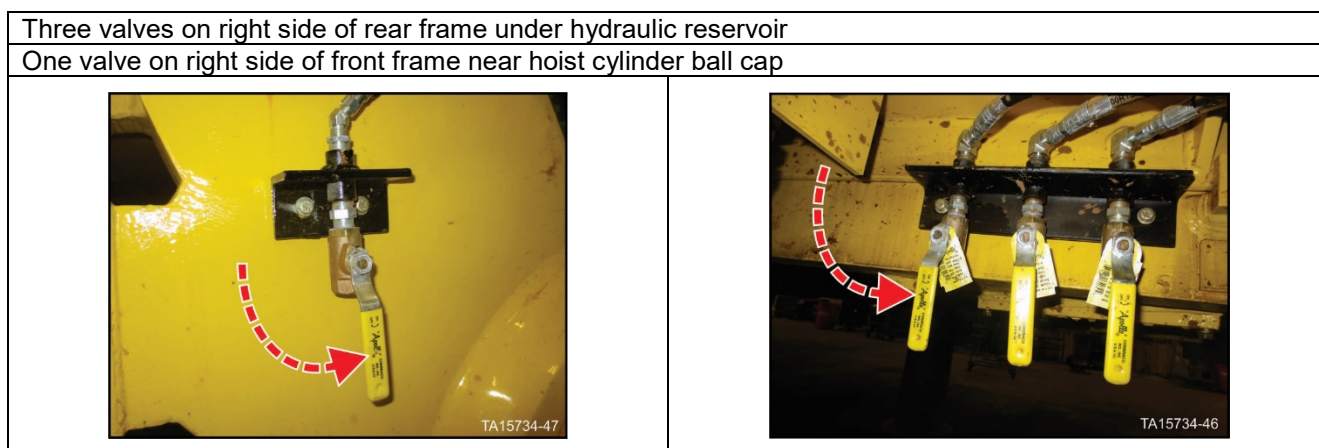


Figure 78. Open air reservoir bleed valves

- h. Remove the mist eliminator panels by sliding them out of the access door. Clean thoroughly as required.



Figure 79. Mist eliminator panel

- i. Reinstall the panels into the inlet door in the same orientation in which they were installed. BE SURE the panels interlock with each other to eliminate any openings to the filter chamber.

CAUTION

It is critically important the mist eliminator is installed in the “KLENZ™” inlet door so the baffles face down and to the outside. This directs water out of the unit. If they are placed with the baffles facing the inside of the “KLENZ™” unit, water will enter the filter chamber and damage will result.



Figure 80. Proper position of mist eliminator baffles

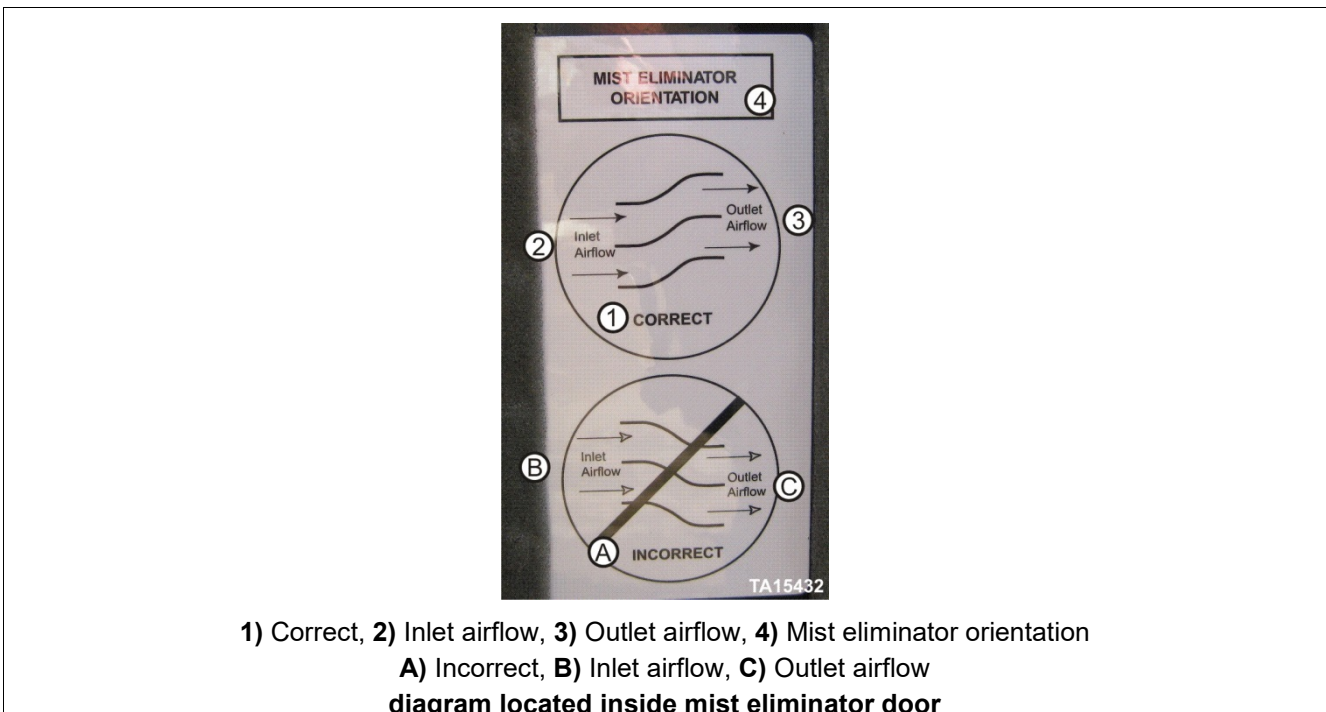


Figure 81. Label for proper position of mist eliminator baffles

- j. Close and latch the mist eliminator panel access door, sealing the mist eliminator.
- k. Follow all local rules and regulations to return the machine to service.

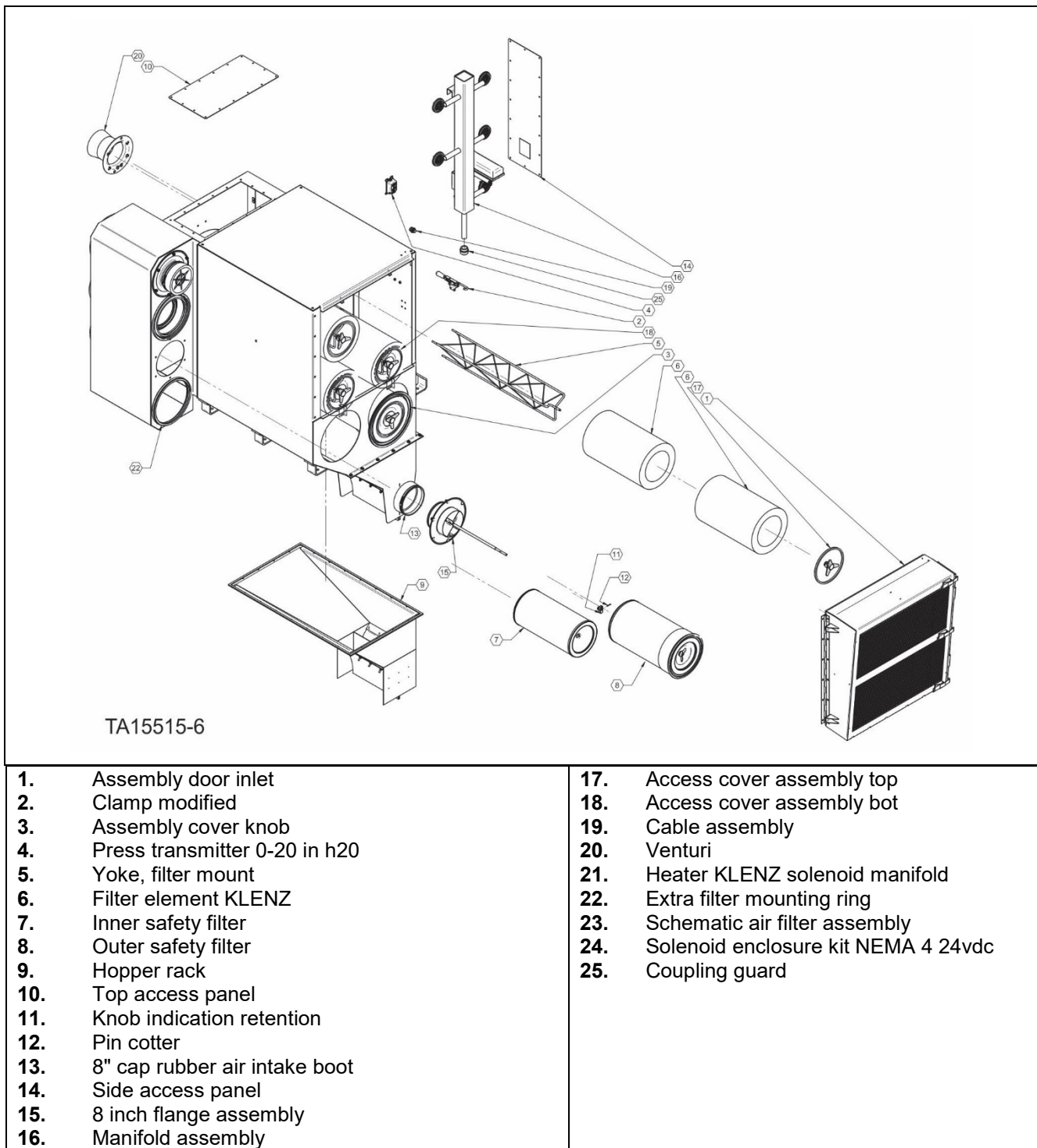
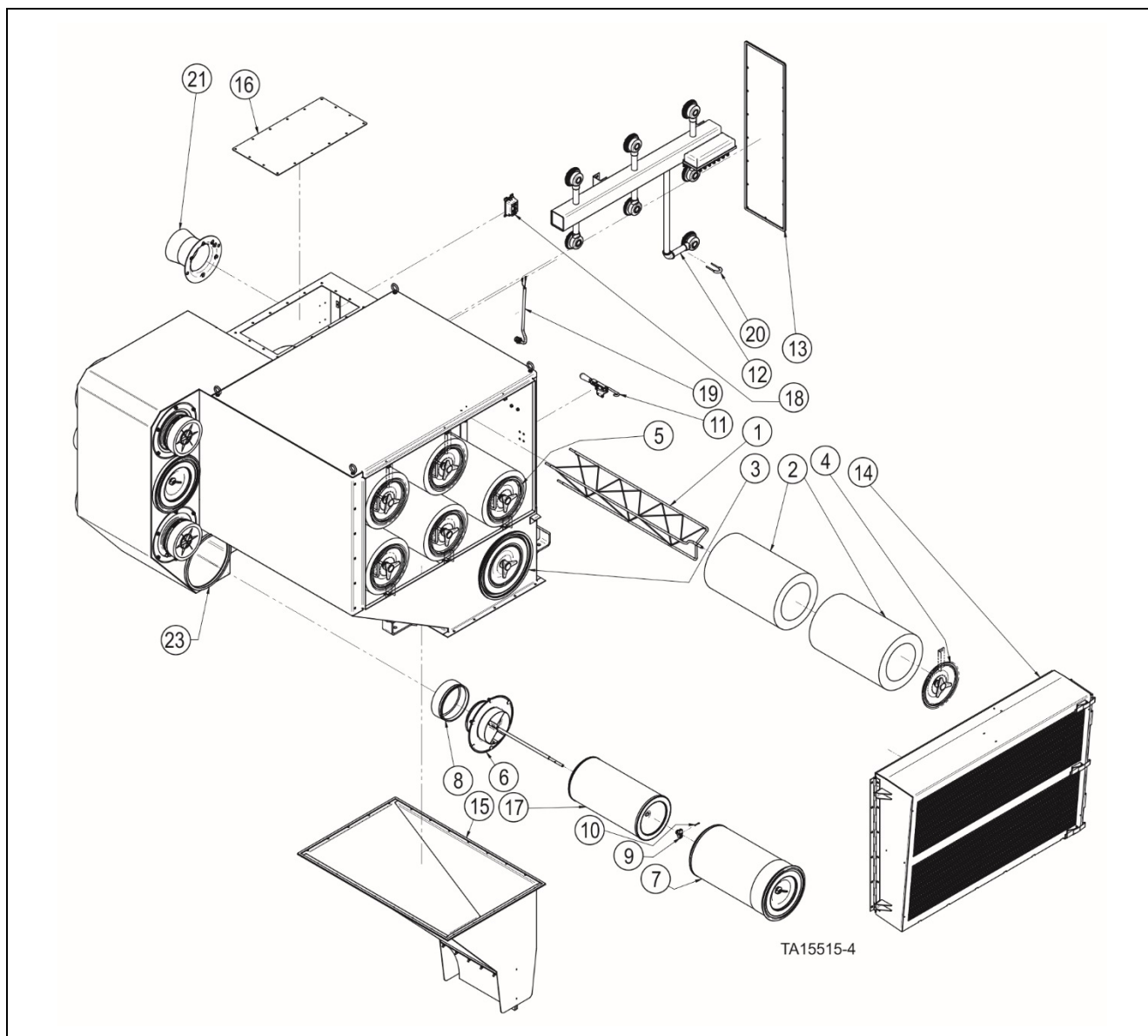


Figure 82. L-1350 GEN3 Komatsu cartridge filtration system (typical “KLENZ™” systems) exploded view



1. Filter mount yoke
2. KLENZ™ filter element
3. Knob cover assembly
4. Top access cover assembly
5. Bottom access cover assembly
6. Flange assembly 8"
7. Outer safety filter
8. Rubber cap air intake boot 8"
9. Indication retention knob
10. Cotter pin
11. Door latch
12. Manifold assembly
13. Side access panel assembly

14. Door inlet assembly
15. Hopper rack
16. Top access panel assembly
17. Inner safety filter
18. Transmitter press
19. Cable assembly
20. Pipe clamp
21. Venturi
22. KLENZ™ heater solenoid manifold
(not shown)
23. Extra filter mounting ring

Figure 83. L-1850 & L-2350 Komatsu cartridge filtration system (typical "KLENZ™" systems) exploded view

500-Hour Inspections and Service

NOTICE

The “KLENZ™” 500 Hour Inspections must be performed by a qualified technician with LINCS® service level access.

Use the “KLENZ™” and Air Intake System Inspection Record Sheet, provided with these instructions, to record data from the operational and non-operational inspections and tests.

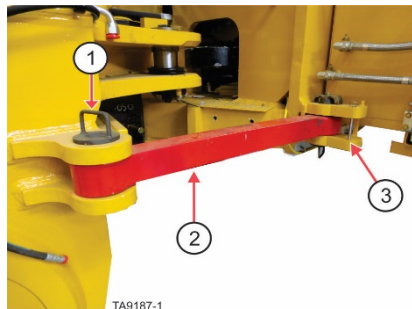
Operational Inspections

- a. Stop the wheel loader on flat level ground.
- b. Move the frame lock to the locked position so that the frame cannot be steered.
- c. Place wheel chocks in front and behind each wheel.



WARNING

Crush hazards exist in machine pivot area and area between the tires. Do not enter these areas unless it is verified that the operator has control over the steering and that personnel locking the frame lock have good communication with the operator. Entering the pivot area and area between the tires while the machine is moving or pivoting (articulating) could cause crush hazards resulting in serious injury or death.



- 1) Retaining pin for locked position, 2) Frame lock - shown in locked position,
3) Retaining pin bracket for un-locked position

Figure 84. Frame Lock

- d. Set bucket flat and level on the ground.
- e. Set the parking brakes.
- f. Shut off the engine.
- g. Go to the engine air filter restriction indicators, and record the reading for each indicator, then reset the indicator. (One graduation is 5" H2O) Record Value inches H2O.
- h. Restart the engine and engage high throttle before any other inspections are made.
- i. Record LINCS® restriction data by accessing the LINCS® computer system.
- j. Go to right-hand side of cab and open the “KLENZ™” inlet door.

⚠ WARNING

Fall hazard or struck-by hazard exists when opening the KLENZ door. If the loader is on a slight incline or in high wind, the door could quickly swing wide open. The door is heavy. Do not stand in front of the door when releasing the handle or latches. Stand on the opposite side of the door hinge when opening the door. Standing in front of the door can cause a fall or a struck-by injury that results in serious injury or death.

⚠ CAUTION

Eye and inhalation hazards exist when conducting operational tests of the “KLENZ™” filtration system. Note the prevailing wind direction and be aware that fine dust will be emitted from the open housing of the “KLENZ™” system when the pulse valves are actuated. Do not stand “downwind” of the “KLENZ™” housing. Wear a respirator, eye protection and all other required personal protective equipment (PPE) during this test. Failure to wear respirator and eye protection can cause eye and inhalation hazards resulting in injury.

⚠ WARNING

Hearing damage or eye injury hazards exist when the “KLENZ™” pulse valves are activated. The sound is a sharp “boom” (actually a shock wave). The shock wave can cause injury to the ear drum. Wear hearing and eye protection during operational testing. Failure to wear proper hearing and eye protection can cause hearing damage and eye injury hazards resulting in injury.

- k. Monitor “KLENZ™” pulses valves and observe that all “KLENZ™” filters are being pulsed correctly. Observe the filters and note that dust is ejected from each filter pair. Wait for two complete sequences, if necessary, to ensure all pulse valves are functioning. Record if the respective pulse valve system is functioning correctly for each filter.
- l. Return to the cab, shut the engine down, and isolate the machine.

NON-Operational Inspections and Service

- a. Recheck engine filter restriction indicators.
- b. Visually inspect the “KLENZ™” filters to see if any are damaged or wet etc. Record the condition of each filter and note if the filter was changed. Replace any filters that are damaged (torn, water ingress etc.).

If any of the “KLENZ™” filters need to be changed, refer to text “KLENZ Cooling Air and Engine Filter Replacement” for proper replacement procedures. Following replacement, repeat Step “d” under “Operational Inspections” to check KLENZ™ Filter Restriction Value. Record values as noted.



Figure 85. View inside typical filter chambers (number of filters might vary by machine model)

CAUTION

DO NOT remove the filter elements for inspection. The removal of the filters for inspection can do more harm to the engine than the good the inspection can do. Ridges of dirt on the gasket sealing surface can drop on the clean filter side when the gasket is released.

The filters should look dirty. Their dirty appearance is not reason to replace them. Do not replace the filters unless there is a LINCOS® alarm or warning of if a filter is damaged.

NEVER leave the “KLENZ™” system open longer than necessary. The open filtration system is a direct entry to the engine. If the “KLENZ™” primary filters will not be changed or reassembled immediately, cover the opening.

- c. Visually inspect the filter elements for uneven dirt patterns. Uneven dirt patterns are an indication of gasket leakage.

NOTICE

An improper gasket seal is one of the most common causes of engine contamination. Make sure that all hardened dirt ridges are completely removed, both on the housing and the inlet door and on all covers and all gasket sealing surfaces.

- d. Inspect the flange gasket around the perimeter of the inlet door to ensure it is clean and in good condition and will seal tightly around the entire mating surface of the “KLENZ™” box. Refer to illustration “INLET DOOR”. Repair or replace gasket or reposition door as required. Clean the gasket sealing surface of the housing.
- e. Inspect the inlet door hinges to ensure they are tight and the inlet door is properly positioned for the gasket to properly seal. Tighten or reposition as required.

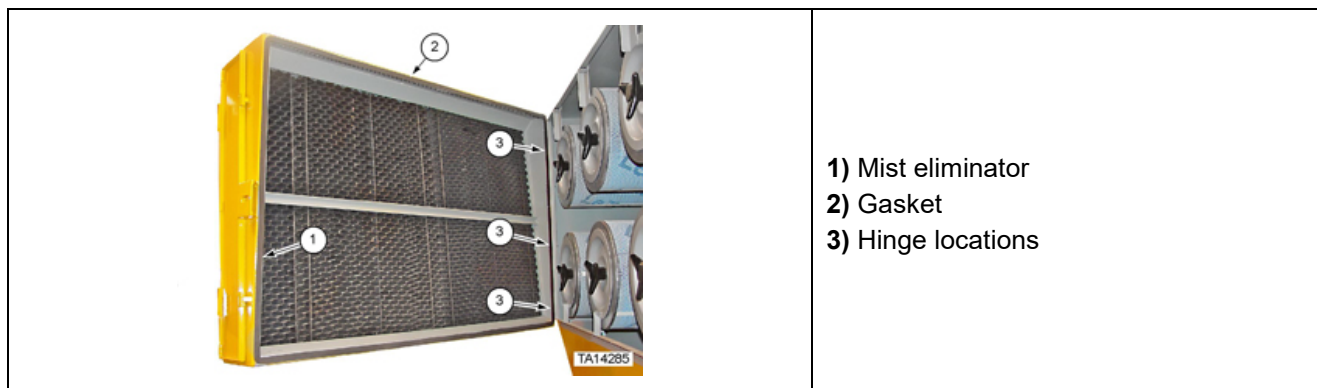


Figure 86. Inlet door

- f. Remove the mist eliminator, clean and reinstall in the inlet door. See mist eliminator cleaning above for additional information.
- g. Closely inspect the large diameter spiral-wrap hose between the “KLENZ™” filtration system and the blower housing. Be sure the clamps are in proper position and secure, and the hose is in good condition. This hose is further sealed with RTV Silicone Gasket Sealant. If replacing this hose, BE SURE to use RTV Silicone Gasket Sealant at each end.
- h. Open the side access panel and inspect the gasket and check to see that the panel is not warped. Replace panel if it is warped.
- i. Check the hinges to ensure they are tight and properly positioned for the panel to close and the gasket to seal properly. Tighten or reposition as required. If required, the spring-loaded latches can be adjusted to draw the panel tighter for a proper seal.

NOTICE

At minimum, annual replacement of ALL gaskets is recommended.

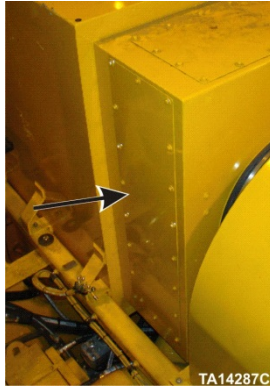
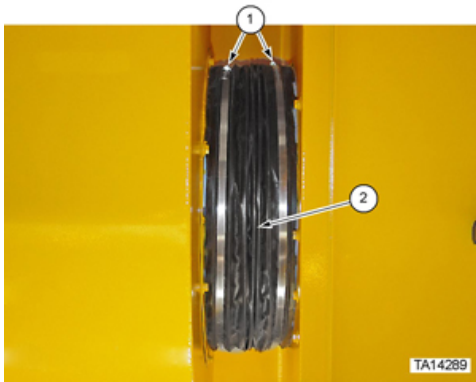
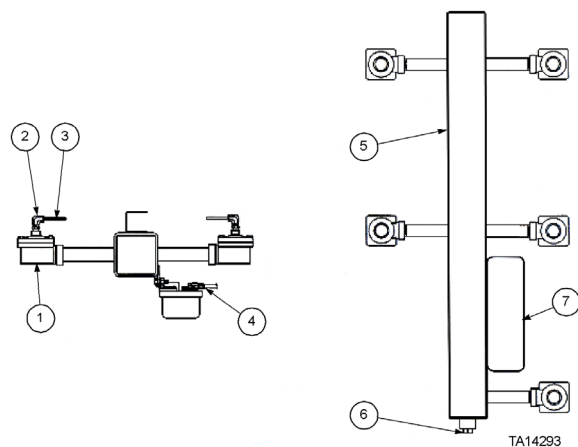


Figure 87. "KLENZ™ Side access panel



- 1) Clamps
- 2) Spiral-wrap hose

- j. Check the compressed air manifold for contamination, oil, and water ingress. Clean or drain if necessary. Open side access panel for access to these components.
- k. With the compressed air supply turned on, check the cleaning valves, solenoid valves, and tubing for leakage. Repair or replace as required. Open side access panel for access to these components.
- l. Clean and inspect the side access panel gasket to ensure it is in good condition.
- m. Clean the gasket mating surface of the housing.
- n. Check the access panel to ensure it is not warped. Replace the panel if warped.



1) Diaphragm valve, 2) Connector elbow, 3) Tubing poly, 4) Connector male, 5) Manifold weldment, 6) Plug, 7) Enclosure solenoid (Manifold appearance can vary by machine model)

Figure 88. Manifold assembly

KLENZ™ and Air Intake System

500 Hour Inspection and Service Record Sheet

Date	Time	Model	Serial No.	Hours				
Engine running checks before & after any filter changes (if not changing filter, record before only)								
Before & After Filter Change	KLENZ™ restriction (in H ₂ O)		Blower rpm		Inlet restriction indicators (in H ₂ O) high idle			
	Low Idle	High Idle	Low Idle	High Idle	#1 Top	#2 Mid Upper	#3 Mid Lower	#4 Bottom
BEFORE								
AFTER								
KLENZ™ pulse valves and solenoids							Pulse Timing	
KLENZ™ pulse valve operational checks do pulse valves function correctly? (YES NO)							LINCS® Time in Seconds	
Top Front	Top Middle	Top Rear	Center Front	Center Middle	Center Rear	Lower	Low Idle	High Idle
Primary Filter Inspection & Changes							<i>The "KLENZ™" Pulse Valves should emit a clearly audible "BOOM" whenever the LINCS® energizes the Solenoids.</i>	
KLENZ™ primary filter condition was filter changed (ok changed)								
Top Front	Top Middle	Top Rear	Center Front	Center Middle	Center Rear	Lower		
Engine Safety Inner and Outer Filter Inspection & Changes								
DO NOT REMOVE ANY SAFETY FILTER COVER UNLESS LINC'S ALARM IS ACTIVATED.					#1 Top	#2 Mid Upper	#3 Mid Lower	#4 Bottom
Safety Filter Indicator in Filter Retainer Nut Color (Red Green)								
Safety Filter Nut Cotter Pins Installed (Yes No)								
Safety Filter Changes								
Check Air Induction System Ducting and Mounts					Left Front	Left Rear	Right Front	Right Rear
KLENZ™ End Hose and Clamp Check (OK Damaged Repaired)								
Turbo End Hose and Clamp Check (OK Damaged Repaired)								
Air Inlet Ducting and Supports Check (OK Damaged Repaired)								
Parts Required, Action Required, Repairs Completed								
Comments								
Inspector's Name (Print)						Inspector's Signature		

KLENZ™ Cooling Air and Engine Filter Replacement

Determine the need for filter replacement

The “KLENZ™” Primary Filters and Engine Safety Filters should be replaced only when the monitoring systems indicate the need for replacement due to a level of restriction that is beyond the allowable limit by activating an alarm, or damage to the filters is noted during routine inspection.

KLENZ™ Primary filter replacement and inspections

WARNING

Fire hazard exists if lit cigarettes, burning objects, or foreign debris are put into the hood or ducting of the “KLENZ™” filtration system. Fire is possible. Never put anything into the hood or ducting of the KLENZ filtration system or into any of the cooling air ducting. No welding repairs should be performed inside the filtration unit, without fire protection. Failure to prevent burning objects from entering the KLENZ filtration system can cause a fire hazard resulting in serious injury or death.

CAUTION

Equipment damage is possible if foreign debris is put into the hood or ducting of the “KLENZ™” filtration system. Never put anything into the hood or ducting of the KLENZ filtration system or into any of the cooling air ducting. Failure to prevent foreign objects from entering the KLENZ filtration system can cause serious equipment damage.

CAUTION

Replace the “KLENZ™” primary filters only when a warning or alarm is activated by the LINC® computer system or damage to the filters is noted during routine inspection. This is to reduce the risk of ingress of dirt into the clean side of the system. Over servicing of the “KLENZ™” system can result in engine or electrical component damage due to dirt contamination.

CAUTION

It is critically important to use only Komatsu original equipment filters when servicing the “KLENZ™” air filtration system. Other “will fit” filters will not perform adequately in this application and will result in the “KLENZ™” air filtration system unit not performing as designed. This could result in serious damage to the engine, solid-state electronic components, and traction motors and a rapid buildup of dust on the cab air conditioner filters. Refer to the Service Parts List, in the Parts Manual, for the filter to meet your application.

NEVER substitute an incorrect element model number. Elements may look almost identical but can differ by a fraction of an inch in length. This could make attaining a firm seal impossible.

CAUTION

Eye and inhalation hazards exist when conducting operational tests of the “KLENZ™” filtration system. Note the prevailing wind direction and be aware that fine dust will be emitted from the open housing of the “KLENZ™” system when the pulse valves are actuated. Do not stand “downwind” of the “KLENZ™” housing. Wear a respirator, eye protection and all other required personal protective equipment (PPE) during this test. Failure to wear respirator and eye protection can cause eye and inhalation hazards resulting in injury.



WARNING

Hearing damage or eye injury hazards exist when the “KLENZ™” pulse valves are activated. The sound is a sharp “boom” (actually a shock wave). The shock wave can cause injury to the ear drum. Wear hearing and eye protection during operational testing. Failure to wear proper hearing and eye protection can cause hearing damage and eye injury hazards resulting in injury.

Safety Preparations



WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine's SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.



WARNING

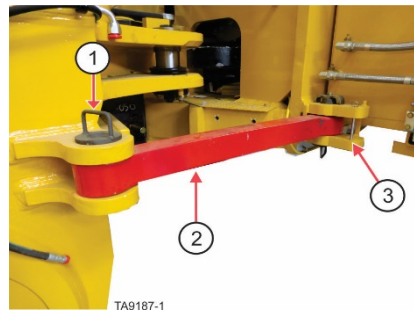
Fall hazard or struck-by hazard exists when opening the KLENZ door. If the loader is on a slight incline or in high wind, the door could quickly swing wide open. The door is heavy. Do not stand in front of the door when releasing the handle or latches. Stand on the opposite side of the door hinge when opening the door. Standing in front of the door can cause a fall or a struck-by injury that results in serious injury or death.

- a. Stop the wheel loader on flat level ground.
- b. Set bucket flat and level on the ground.
- c. Move the frame lock to the locked position so that the frame cannot be steered.
- d. Place wheel chocks in front and behind each wheel.



WARNING

Crush hazards exist in machine pivot area and area between the tires. Do not enter these areas unless it is verified that the operator has control over the steering and that personnel locking the frame lock have good communication with the operator. Entering the pivot area and area between the tires while the machine is moving or pivoting (articulating) could cause crush hazards resulting in serious injury or death.



- 1) Retaining pin for locked position, 2) Frame lock - shown in locked position,
3) Retaining pin bracket for un-locked position

Figure 89. Frame Lock

- e. Set the parking brakes.
- f. Shut off the engine.

WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- g. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.

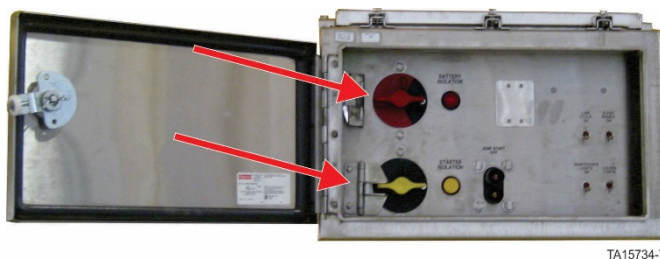


Figure 90. GEN 2 Battery Isolation Box – Battery isolation switch in OFF position with locks in place

- h. Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.

- i. Turn the handle to the up position as shown

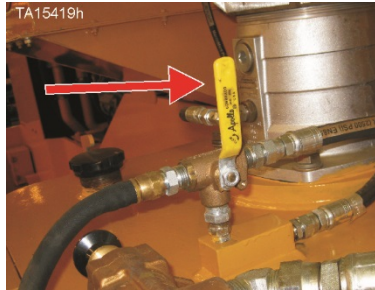


Figure 91. Hydraulic reservoir air valve handle UP

- j. Release the air from the various air storage reservoirs by opening all of the air bleed valves.

Three valves on right side of rear frame under hydraulic reservoir

One valve on right side of front frame near hoist cylinder ball cap

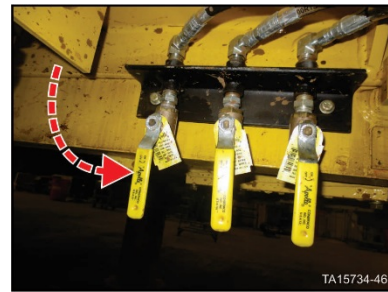
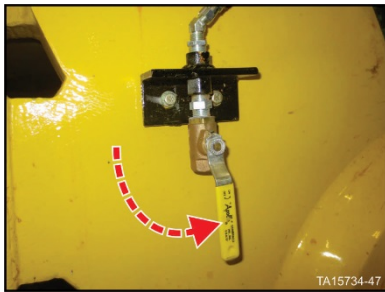


Figure 92. Open air reservoir bleed valves

- k. Turn off the KLENZ™ Filtration System by operating the KLENZ Enable Switch located in the Starter and Battery Isolation Box, on the left rear of the machine.

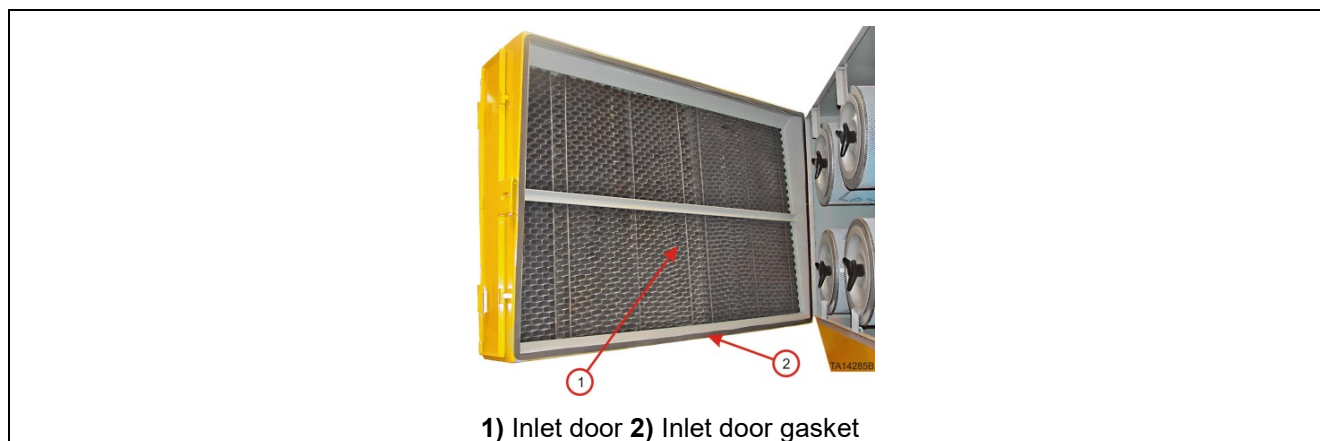


KLENZ™ enable

- l. Open the inlet door for access to the KLENZ filters.

WARNING

Fall hazard or struck-by hazard exists when opening the KLENZ door. If the loader is on a slight incline or in high wind, the door could quickly swing wide open. The door is heavy. Do not stand in front of the door when releasing the handle or latches. Stand on the opposite side of the door hinge when opening the door. Standing in front of the door can cause a fall or a struck-by injury that results in serious injury or death.



1) Inlet door 2) Inlet door gasket
Figure 93. KLENZ Inlet door



Figure 94. Komatsu original equipment replacement filter for "KLENZ™" system

- m. Inspect the old filter elements for uneven dirt patterns or damage such as tears or water ingress. Uneven dirt patterns are an indication of gasket leakage.

CAUTION

An uneven dust pattern on the clean side of the filter element is an indication that the old filter element was not firmly seated or that a dust leak exists. Make certain the cause of the leak is identified and corrected before replacing the filter element.

- n. Loosen the wing nut and remove the tabbed cover for the upper KLENZ filters. Remove the cover for the lower filters and remove the upper, then lower filters from the filter chamber.

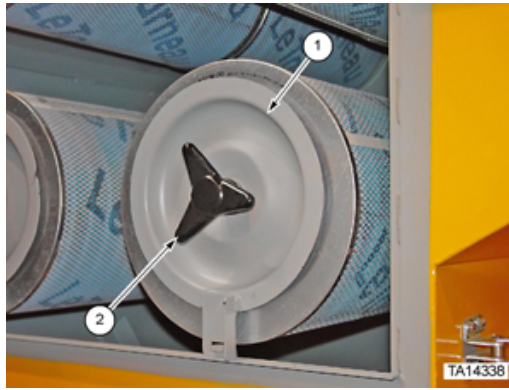
CAUTION

Change only one set of filters at a time to avoid dust ingress.

Remove filters from top to bottom to minimize contamination. ALWAYS install new filters before moving to next dirty filter.

Remove the old filters as gently as possible to reduce the amount of dust falling into the filter chamber.

Never blow out filters or use compressed air to clean filter.



1) Tabbed cover, 2) Wing nut

Figure 95. “KLENZ™” primary filter tabbed cover



NOTICE

In this and following photos, the top filters are not being removed. The photos are for illustration purposes only.

Always remove and replace the top filters before removing the bottom filters. This helps prevent dust ingress into the bottom filter openings.

Figure 96. Removal of “KLENZ™” filter tabbed cover



Figure 97. Removal of “KLENZ™” filters



Figure 98. “KLENZ™” filters support racking flange at rear of filter chamber that filters must seal against

- o. Thoroughly clean the flanges at the rear of the filter chamber to ensure the filters seal tightly against a clean surface.
- p. Check all connections and ducts for a leak-tight fit.
- q. Inspect the gaskets on the tabbed covers and the cover for the lower filter. Also, inspect these components for warping. NEVER reinstall a warped cover.

NOTICE

Tabbed filter covers are not interchangeable from top to bottom. The tab on the top tabbed filter cover is longer than the tab on the lower tabbed filter cover. They cannot be interchanged without damaging the yoke holding the filters.



Figure 99. Inspection of tabbed cover gasket



Figure 100. Check tabbed cover for warpage by placing against mating surface of new filter

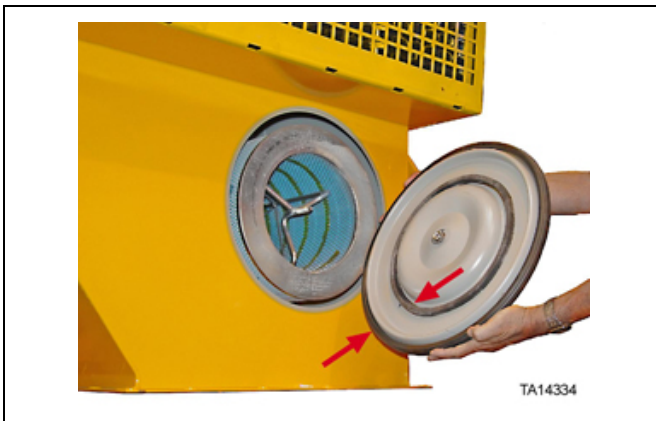


Figure 101. Inspection of gasket on lower KLENZ™ filter cover

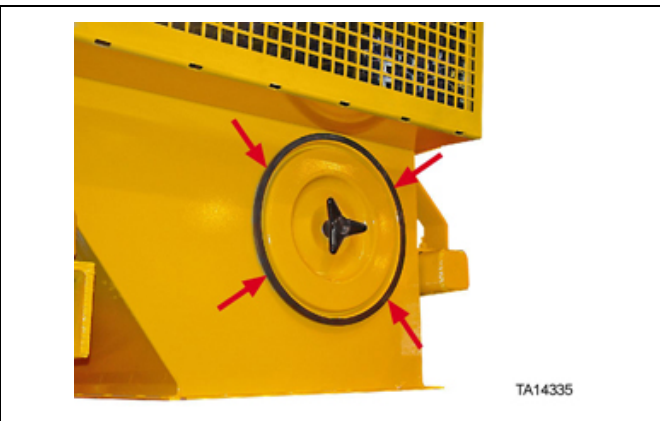


Figure 102. Inspection of gasket for proper seal all around perimeter of lower KLENZ™ filter cover

- r. Inspect the filter support racks to ensure they are secure in the housing. Tighten as required. Access to the retaining bolts and nuts is gained through the side access panel.

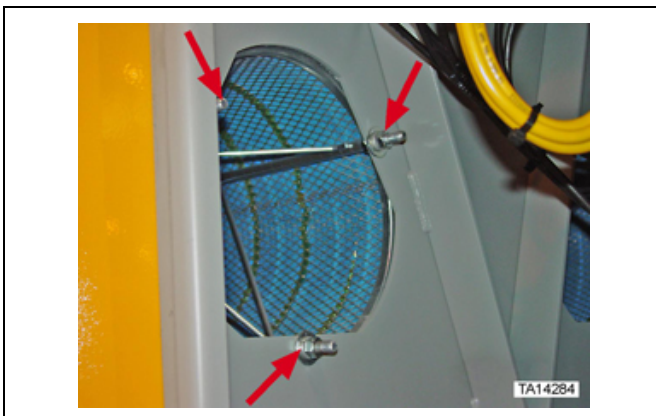


Figure 103. Mounting nuts for engine primary filters support rack

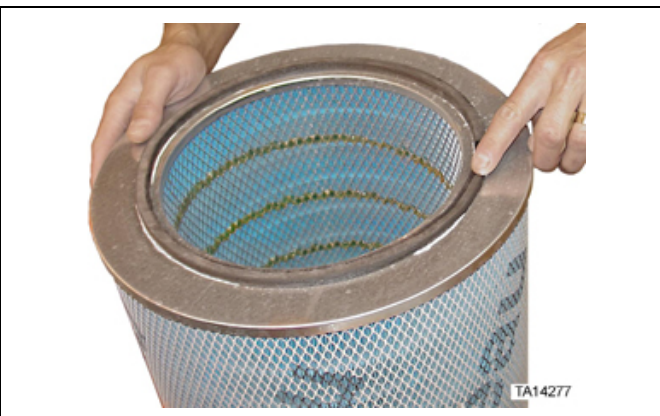


Figure 104. Gasket on “KLENZ™” air filters

- s. Closely inspect the replacement elements and gaskets for shipping or storage damage. Do not install damaged elements or those with bent flanges.

NOTICE

Press down on the gasket with your finger. It should be pliable and spring back to original shape. DO NOT install the filter if the gasket does not spring back.

- t. Install the replacement filters so the gasket on the inner filters fits against the flange at the rear of the filter chamber. The outer filters are installed so the gasket fits against the flat flange on the bottom of the inner filter.



Figure 105. View of inner “KLENZ™” filter installed with gasket against flange at rear of filter chamber



Figure 106. Installation of outer “KLENZ™” Filter



Figure 107. Installation of “KLENZ™” filter tabbed cover

- u. Closely inspect the filters to ensure the gaskets are properly seated against the flange at the rear of the filter chamber. Closely inspect the outer filters to ensure the gaskets are properly seated against the bottom of the inner filters. Inspect the gaskets on the tabbed cover and lower cover to ensure they are properly seated against the bottom of the outer filters. Reposition as required.
- v. Close and latch the inlet door and inspect to ensure the gasket is properly sealed around the perimeter of the door and case.



Left side view
Models may vary in appearance



Right side view
Models may vary in appearance

Figure 108. Inspection of inlet door to ensure proper gasket seal around entire perimeter of door

Engine Safety Inner and Outer Filter

Machines have a 10" (254 mm) filter element mounted over an inner 8" (203 mm) element. The cover is fitted into a rubber sleeve that is formed onto the top of the 10" (254 mm) filter element. It seals the cover against the housing when the wing nut is tightened.



The engine filters are accessible from both sides of the machine.

Figure 109. Engine filters

CAUTION

Replace the engine Secondary (Safety) filters only when a warning or alarm is activated by the LINCS® computer system or damage is noted during routine inspection. To reduce the risk of ingress of dirt into the clean side of the system, replace only the filters with high restriction. High restriction is indicated when the green dot in the indicator wing nut is not visible, and a red dot is visible. Over-servicing of the "KLENZ™" system can result in engine or electrical component damage due to dirt contamination.

NOTICE

DO NOT clean the engine safety filters and reinstall. They **MUST** be replaced.

- a. Remove the cover and the filter. Once the 10" (254 mm) engine safety outer filter element is removed, the 8" (203 mm) engine safety inner filter element with indicator wing nut will be visible.



Figure 110. Engine safety inner and outer filter cover

- b. Unscrew the wing nut and pull the Primary filter from the enclosure.

NOTICE

Remove the old Primary Filter as gently as possible to reduce the amount of dust falling into the filter chamber.

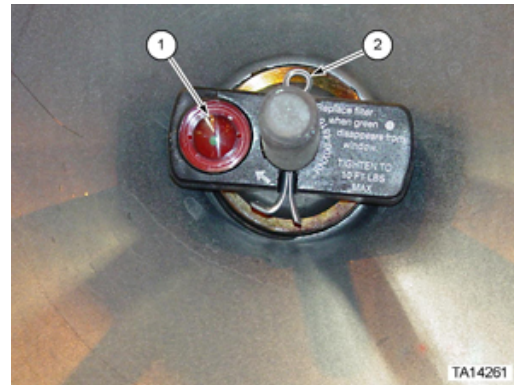


Figure 111. Engine safety outer filter rubber sleeve

- c. After removing the outer filter, check to see if the green dot on the Indicator Wing Nut on the inner filter is visible. **Replace only the High Restriction Filters; (green dot is not visible).** If the green dot is not visible, remove the cotter pin from the Indicator Wing Nut and remove the Indicator Wing Nut and filter element.



Figure 112. Inner 8" (203 mm) secondary (safety) filter element with indicator wing nut



1) Restriction Indicator Green Dot, 2) Cotter Pin
Figure 113. Engine secondary (safety) filter retaining nut

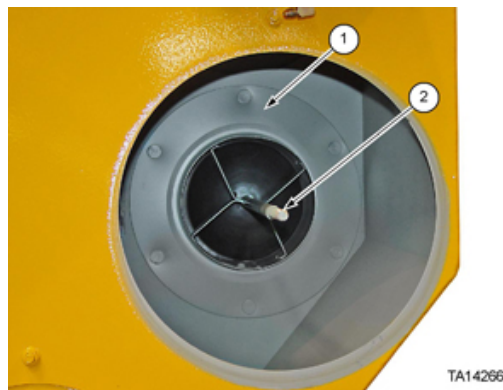


Figure 114. Removal of cotter pin from engine secondary (safety) filter indicator wing nut



Figure 115. Removal of engine secondary (safety) filter indicator wing nut

- d. Use a damp cloth to clean the flanges at the rear of the filter chamber. The filters must seal against a clean surface.
- e. Inspect the flange assembly to ensure it is tight in the housing. Tighten if required.



1) Flange, 2) Filter support rod

Figure 116. Engine secondary (safety) filter mounting flange assembly

- f. Check the covers for any warpage by placing it against the sealing surface of the filter element. NEVER reinstall a warped cover.
- g. Clean the sealing surface of the outer housing.
- h. Closely inspect the replacement elements and gaskets for shipping or storage damage. **Do not install damaged elements or those with bent flanges.**

NOTICE

Press down on the gasket with your finger. It should be pliable and spring back to original shape. DO NOT install the filter if the gasket does not spring back.

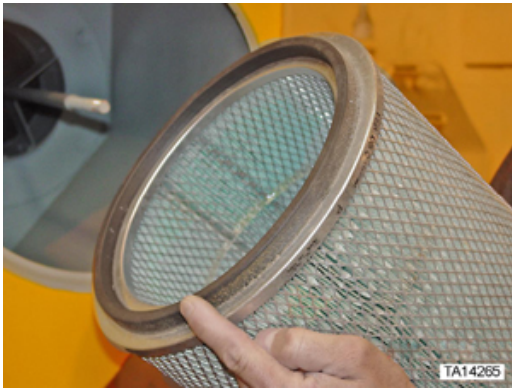


Figure 117. Gasket on engine secondary (safety) filter

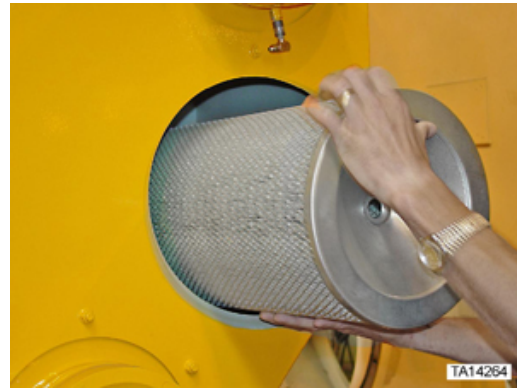


Figure 118. Installation of engine secondary (safety) filter assembly

- i. Install the replacement filters with the gasket against the flange at the rear of the filter chamber.
- j. Each time the engine Secondary (Safety) filters are replaced it is necessary to replace the Indicator Wing Nuts. Install the Indicator Wing Nuts and tighten until the pinhole aligns with the hole in the threaded rod. This ensures proper gasket seal compression. Tighten to a maximum of 10 ft. lbs. (13.5 N m).



Figure 119. Installation of engine safety filter retaining nut



Figure 120. Installation of cotter pin to retaining nut

- k. Re-install the cotter pins DO NOT use alternate types of retainers.

CAUTION

It is critically important to reinstall the cotter pins into the Indicator Wing Nut. If the cotter pins are not reinstalled, the filter gaskets will not be properly seated against the flanges and the retaining nuts will back off. This could result in serious engine damage.

- l. If possible, inspect the filters to ensure the gaskets are properly seated against the flange and the filter is properly aligned flush with the flange. The gasket should have about 50% compression.



View through clean air chamber external door

Figure 121. View of engine safety filter properly installed with gasket seated on flange

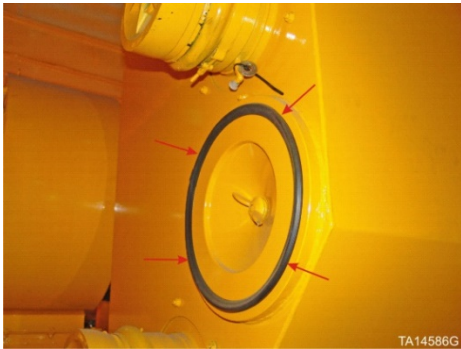
- m. Install 10" (254 mm) outer filter element over inner 8" (203 mm) inner filter element.



- n. Refit the outer covers and ensure the covers are sealed all around. Tighten the wing nut until the filter element gasket contacts the flange on the back Filter Support Flange Assembly. Continue tightening the wing nut about 2 to 3 turns. When properly tightened the gasket should have about ½ gasket thickness compression (normally 2 to 3 turns of the wing nut). The wing nut typically has about two threads extending past its surface after tightening.

NOTICE

It is critical that the covers are installed straight and are properly sealed against the housing.



Arrows indicate areas along entire perimeter of cover that must seal tightly against housing

Figure 122. Engine safety filter cover installation inspection



Two to three threads typically extend through the wing nut

Figure 123. Engine filter cover wing nut

- o. The engine air filter restriction gauge indicators must be reset following each replacement of the engine filter elements. The machine engine should be "Off" before resetting. The reset button is located on the bottom of the air filter restriction indicators. Push the yellow button in and hold until the plunger returns to bottom of glass cover. Resetting the gauge returns the internal indicator to zero and resets the internal switch if it has been actuated (a yellow Warning or red Alarm screen has appeared on the LINC screen).



Reset button Internal indicator with no restriction shown

Figure 124. Engine secondary (safety) filter restriction indicator reset button



The internal indicator is shown with about 1/2 restriction indicated



Typical machine shown

Figure 125. Engine filter restriction gauge location

Post Replacement Testing

Have a service technician with LINCOS® "service level access" perform the operational inspections using the LINCOS® computer system as listed on "KLENZ™ and Air Intake 500 Hour Inspections and Service Record Sheet" (above).