



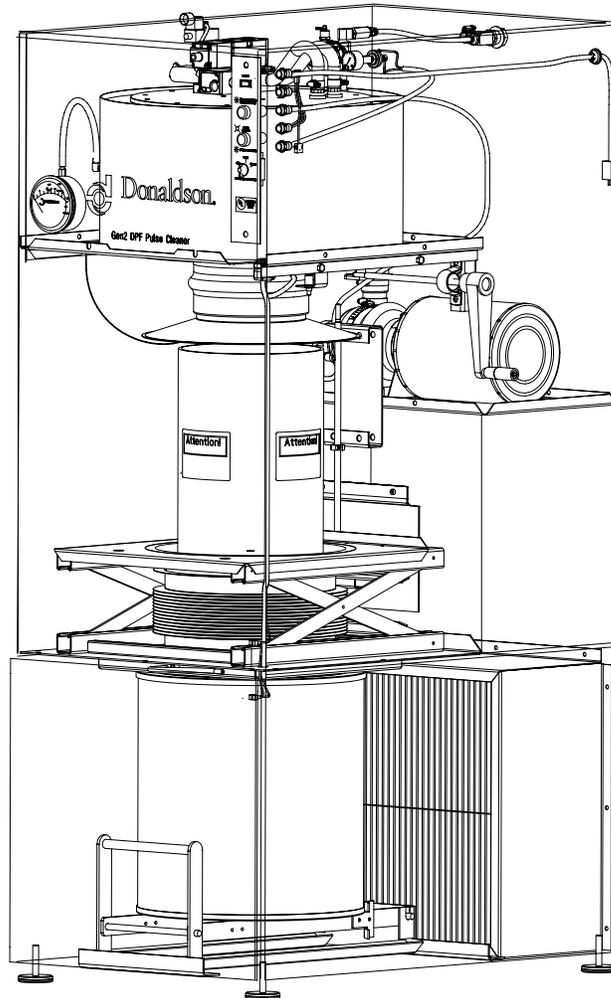
Donaldson
FILTRATION SOLUTIONS

OWNER'S MANUAL

Installation, Operation and Maintenance Information

RETROFIT EMISSIONS GEN2 DPF PULSE CLEANER X009981

Manual Number P487308 Rev 1



Note: Do not make any system modifications or adjustments that would alter the original retrofit installation. Modifications may not meet regulatory requirements, be considered illegal devices and may result in denial of warranty coverage.

Consult your Donaldson certified emissions dealer if you have questions regarding the installation, operation, maintenance or warranty.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

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Thank you for purchasing the Donaldson Gen2 DPF Pulse Cleaner!

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Introduction

Donaldson offers a two-stage approach for the routine cleaning and regeneration of filter-based mufflers. The Donaldson Gen2 DPF Pulse Cleaner removes accumulated ash and particulate matter using a high-velocity, low-pressure air pulse. If more thorough cleaning is required, use the DPF Thermal Regenerator to remove any hydrocarbons (HC) and unburned particulate matter remaining in the filter. After a filter goes through the thermal regenerator cycle, it needs to be pulse cleaned a second time to remove any ash freed during the thermal regeneration.

The Donaldson Gen2 DPF Pulse Cleaner provides vehicle maintenance facilities an enclosed, automated unit that quickly and efficiently pulse cleans filters (in ~15 minutes). The unit uses a standard electrical connection (120V 15 amp) and accommodates Donaldson, OEM and retrofit type filters.

The Donaldson Gen2 Pulse Cleaner

Enhancements to this unit compared to our original unit include:

- 15% more air tank volume and fast acting valve
- 1.5 times more air pressure on face of filter (from 8 to 12 psi)
- Adapter that forces all of the pulse through the filter
- 12.5% improvement on cleaning efficiency
- Donaldson DMF filters require cleaning, this unit can also be used to pulse clean Donaldson DMF partial-flow filters.

Pulse cleaning a filter is required in one of two situations: during routine service as required by your filter-based muffler manufacturer's warranty, or as indicated by your on-board Emissions Device Monitor (EDM) or other filter service monitor.

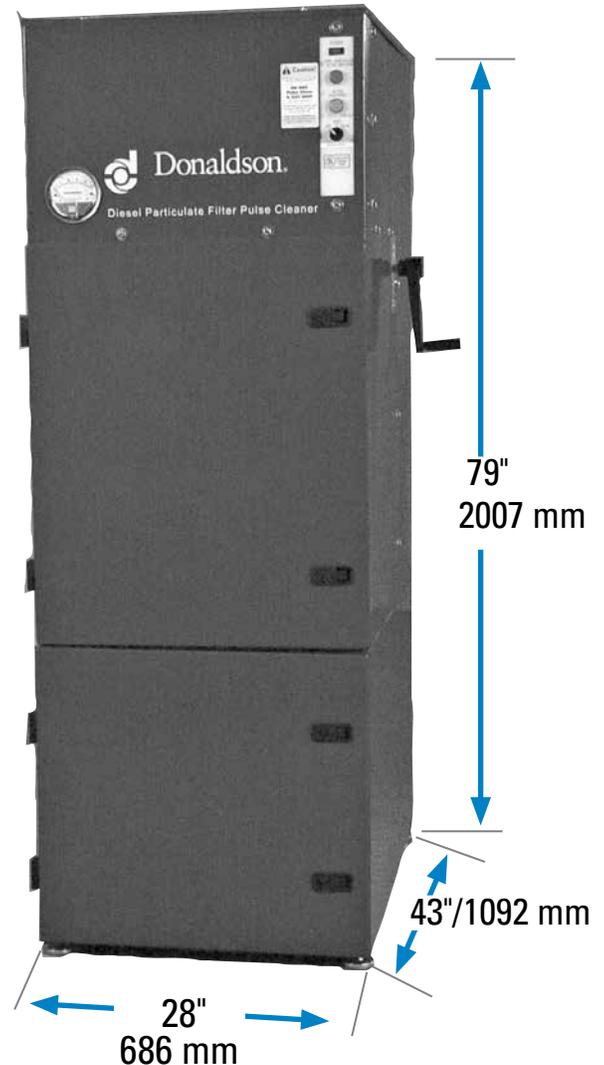
Donaldson retrofit filter-based mufflers must be cleaned once every year, 50,000 miles or 1,800 hours of operation, whichever comes first, or as indicated by the EDM; whichever comes first.

Consult a certified emissions dealers for questions regarding the installation, operation and maintenance of this unit

Available Accessories

Adapters are available to clean non-Donaldson filters. Contact your certified emissions dealer for more information.

Dimensional Footprint



Cabinet Dimensional Footprint:
 28" W x 43" D x 79" H
 686 mm W x 1092mm D x 2007 mm H

Clearance Requirement:
 Right side: 12" for crank handle
 Back side: 12" for filter service
 Left side: 4"

Filter Limits:
 (1) 11"-15" dia.
 (2) 13"-20" length

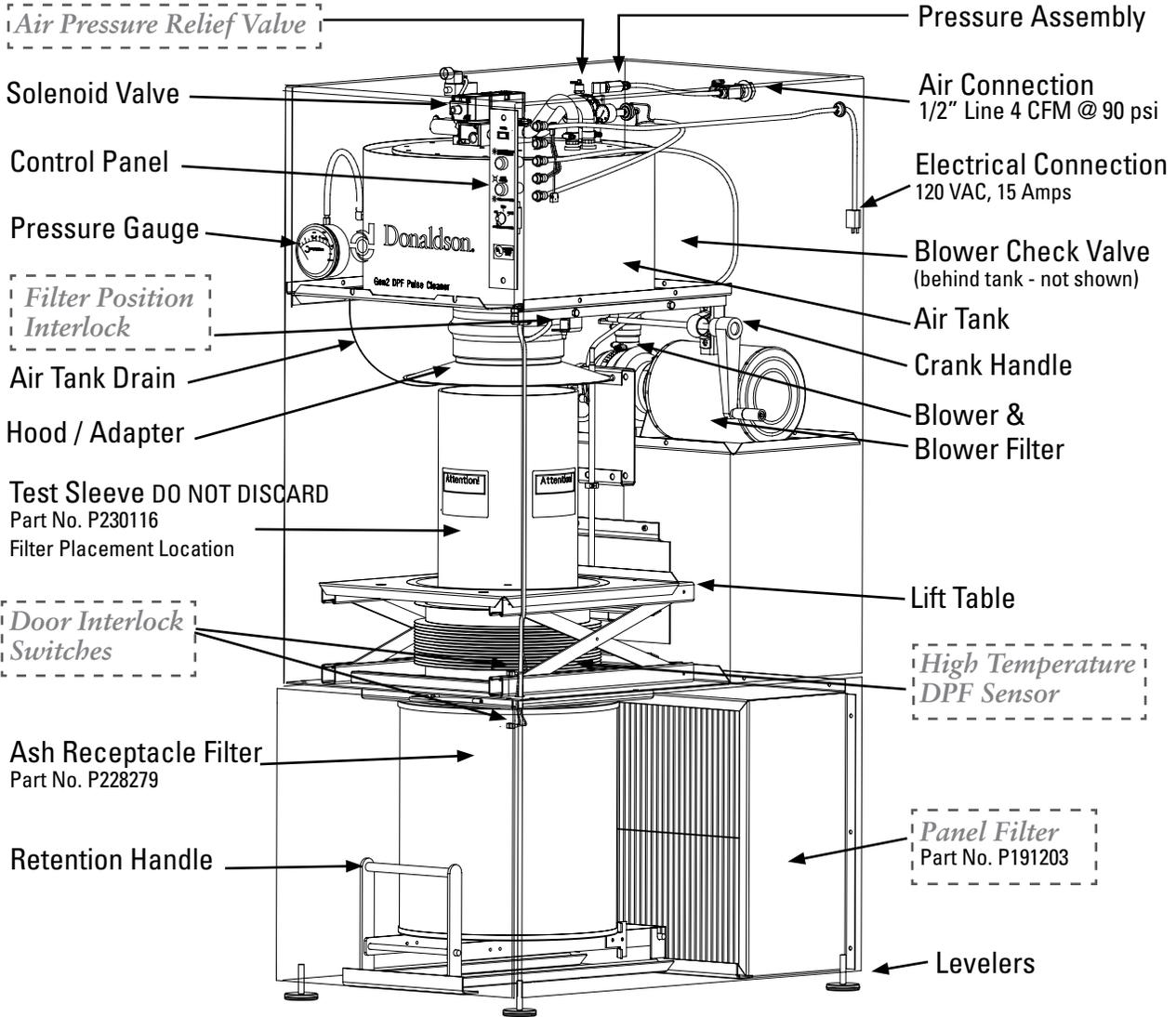
Unit Weight: 700 lbs.

	CAUTION! Cabinet is TOP HEAVY!
The pulse cleaner cabinet is top heavy. Be extra careful to properly balance all sides when positioning or moving the cabinet to avoid personal injury or damage to the unit.	

Donaldson Gen2 DPF Pulse Cleaner

Safety Features

Air Pressure Relief Valve



Pressure Assembly

Air Connection
1/2" Line 4 CFM @ 90 psi

Electrical Connection
120 VAC, 15 Amps

Blower Check Valve
(behind tank - not shown)

Air Tank

Crank Handle

Blower &
Blower Filter

Lift Table

*High Temperature
DPF Sensor*

*Panel Filter
Part No. P191203*

Levelers

Control Panel



Power Switch
Turns Power On(Reset)/Off

High Temperature Filter Shutdown
Flashes when sensor detects HOT filter and shuts down.

Filter Positioned Indicator
Illuminates when the filter is properly positioned. The light will flash when PULSE cycle complete.

Operation Selector Switch
TEST - Used to determine the relative restriction of the filter and ash receptacle filter.
PULSE - Starts the pulse cleaning cycle.

Pressure Gauge

The pressure gauge, located on the front top panel of the Donaldson Gen2 DPF Pulse Cleaner, is your primary indicator for determining filter cleanliness and the service life of the ash receptacle filter. The pressure gauge measures restriction from 0-25" H₂O.



A clean filter will measure 1-3" H₂O restriction depending its size.

The Ash Receptacle Filter should be replaced when test reading is > 2" H₂O.

Package Contents

The Donaldson Gen2 DPF Pulse Cleaner X009981 unit includes the following package contents:

Qty. Description

- 1 X009981 Donaldson Gen2 Pulse Cleaner
- 1 Documentation package that includes this owner's manual, a warranty registration worksheet, and an F115119 installation and training DVD for maintenance departments.

Note: Electrical Wiring Schematic detailed in this manual.

Pulse Cleaner Location

Consider the following when choosing a location for the Donaldson Gen2 Pulse Cleaner:

- Install indoors only and on a hard flat surface
- Unit weight: 700 lbs.

	CAUTION! Cabinet is TOP HEAVY!
The pulse cleaner upper cabinet is top heavy. Be extra careful to properly balance all sides when you position or move the cabinet to avoid personal injury or damage to the unit.	

- Unit rests on foot levelers
- Consider placing near a Donaldson DPF Thermal Regenerator (requirement for passive DPF filter maintenance)

Pre-Installation

Inspection

Thoroughly inspect the Pulse Cleaner for damage that may have occurred during shipping. Any damage should be noted and reported to the freight carrier immediately.

To protect and prevent movement of internal components during shipping, the cabinet will arrive with a test sleeve secured between the hood and the lift table. **DO NOT DISCARD** this sleeve! The test sleeve is required to test the service life of the ash receptacle filter.

NOTE	DO NOT DISCARD the Test Sleeve! It is required to test and service the ash receptacle filter.
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Pre-installation Requirements

- Space requirement (including clearance) for proper operation: minimum 44" wide x 55" deep x 79" high
- The crank handle on right side of cabinet used to raise and lower the lift table must be easily accessible
- The upper and lower cabinet doors must be able to open completely
- Dedicated clean, dry, filtered compressed air source: 90 PSI minimum shop air at 4 CFM (3/4" minimum air line)

	CAUTION! Use Clean, Dry Air Supply
An appropriate clean, dry, filtered compressed air supply source is required to ensure proper pulse cleaner operation and prevent premature component failure. DO NOT use same source air as Donaldson Thermal Regenerator.	

- Power Supply: 120VAC electrical outlet/15 amp
- Disposal Plan: Contact your local disposal company for proper ash disposal regulations and procedure.

Installation

1. Position the pulse cleaner on a solid, level surface with recommended clearances.
 - a. Allow 4" clearance on left side, 12" clearance on back and right sides.
2. Adjust the leg levelers until cabinet is level.

	CAUTION! Cabinet is TOP HEAVY!
The pulse cleaner upper cabinet is top heavy. Be extra careful to properly balance all sides when you position or move the cabinet to avoid personal injury or damage to the unit.	

3. Connect a clean, dry compressed air supply (90psi@4scfm) to the pulse cleaner air connection (use 3/4" line with 3/8" NPT adapter coupling). Be sure to install a dryer/filter assembly at the unit.

	CAUTION! Air Supply Must be Less than 110 psi.
Excessive air pressure can damage the pressure regulator. Excessive air pressure can damage the pressure regulator and make the unit inoperable.	

**CAUTION!**
DO NOT Exceed Factory Air Pressure Regulator Settings

The air pressure regulator is factory preset to 14.5 PSI. The pressure switch for pulse control is factory set to 13 PSI. DO NOT exceed either setting. The air tank has a 20 PSI Air Pressure Relief Valve. DO NOT remove or tamper with the Air Pressure Relief Valve OR damage to equipment or filter may result.

4. Connect the electric supply. The Donaldson Gen2 Pulse Cleaner requires 120VAC, 15 amp electrical service. Work with a qualified electrician and follow local codes.

Activate the Warranty

Donaldson Company requires the installer/dealer to complete and submit the warranty for the equipment owner on our web site at <http://pwww.donaldson.com>.

A Warranty Registration Worksheet is included in the documentation packet. Register the new installation within 30 days using our on-line warranty registration site at: <http://pwww.donaldson.com>

Initial Start-Up

1. Turn the front panel POWER switch to RESET (on). The switch will illuminate.
2. Make sure the test sleeve that was shipped in the unit is still in place.
3. Turn the OPERATION SELECTOR switch to TEST to verify the blower operates.
4. Close/latch door.
5. Turn the OPERATION SELECTOR switch to PULSE for one pulse. There is a 1-1/2 minute delay (temperature sensing) before the first pulse occurs.
6. Turn the OPERATION SELECTOR switch to OFF after one pulse. Do not pulse more than once or damage to the Ash Receptacle Filter may occur.
7. Remove (and retain) the test sleeve after the preliminary startup check out.

Operation

Intended Use

The Pulse Cleaner efficiently removes and collects ash and particulate matter from a filter-based component (i.e., DPF, DMF center body). The cabinet's unique design accommodates and cleans most round filters with non-keyed flanges. Keyed flanges may be accommodated with adapters.

Safety Features

The Donaldson Gen2 DPF Pulse Cleaner safety features are interspersed through the manual. Key features include:

- A *High Temperature Filter Sensor* to prevent operation if the filter is hot
- *Door Interlock Switches* prevent operation if the doors are not closed
- A *Filter Position Interlock* prevents operation if the filter is not properly positioned
- A *Panel Filter* captures and contains contaminant from exiting the cabinet during operation
- An *Air Pressure Relief Valve* that releases pressure in the tank in case of pressure regulator malfunction



Hot DPF Label

**CAUTION!**
DO NOT Disable Safety Mechanisms

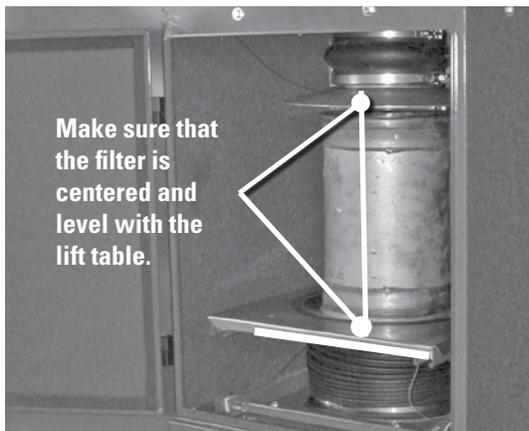
DO NOT disable any safety interlocks. Disabling the safety interlocks may result in personal injury or damage to the unit.

Filter Cleaning Procedure

The following procedure explains how to clean a filter using the Donaldson Gen2 DPF Pulse Cleaner.

	CAUTION! DO NOT Pulse Clean a HOT Filter or an Oil Soaked Filter
<p>The filter inlet/outlet surface must be below 150°F (65°C) before placing into the unit. Pulse cleaning a HOT Filter may result in fire leading to personal injury or property damage. Pulse cleaning an oil soaked filter will cause the ash receptacle filter to load prematurely and fail.</p>	

1. Turn the POWER Switch to RESET (ON)
2. Turn the crank handle counter-clockwise to lower the lift table until the filter will fit between the hood/adaptor and lift table.
3. Center the filter on the lift table with the dirty side facing down. Visually check that the flange/face of the filter is horizontally level for proper sealing against the hood/adaptor.



4. Raise the lift table by turning the crank handle clockwise until the DPF makes contact with the hood/adaptor and the FILTER POSITIONED light is illuminated (green). For a proper seal, continue turning the crank handle approximately one more turn clockwise until you feel resistance.

NOTE	<p>DO NOT rotate the handle more than one turn after the filter contacts the hood or damage to the machine or filter may occur.</p>
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5. To insure a proper seal, turn the OPERATION SELECTOR switch to the TEST position and check for air leaks where the filter face/flange makes contact with the hood/adaptor and lift table. Reposition filter if necessary.
6. Close and latch the upper door.

	CAUTION! DO NOT Disable Safety Mechanisms
<p>The pulse cleaner has door interlocks to prevent the system from pulsing if the filter is not securely in place or if either of the upper or lower cabinet doors are not closed. DO NOT disable the door interlocks and secure the doors before operating the Pulse Cleaner. Disabling the door interlocks may result in damage or personal injury.</p>	

7. While in the TEST position, record the filter restriction from pressure gauge prior to cleaning. Record and save the reading for comparison after the PULSE cycle is complete to determine filter cleanliness.
 - a. The blower will start and the pressure gauge will indicate the relative restriction of the filter in inches of water.
 - b. A High Temperature Filter Sensor checks the filter temperature. If too hot (200°F or greater), the HIGH TEMPERATURE FILTER SHUTDOWN light will flash and shut down the unit. Turn the switch back to the OFF position and restart the process after the filter has cooled.
8. Turn the OPERATION SELECTOR switch to the PULSE position.
 - a. The Pulse Cleaner will pulse after 1-1/2 minute delay and continue to pulse automatically about every 45 seconds for 20 pulses. There will be a loud, intermittent sound generated during the air pulse operation. The sound level meets OSHA's indoor sound standards.
9. When the PULSE cycle is complete, the blower will turn off and the CYCLE COMPLETE light will flash. Turn the OPERATION SELECTOR switch back to the TEST position. Make note of the pressure gauge reading and compare the new relative restriction level to the reading from the TEST mode in Step 7.
10. Bake the DPF in the Donaldson Thermal Regenerator. Please refer to the Thermal Regenerator Installation, Operation and Maintenance document for more information.
11. After a successful regeneration, pulse the DPF a final time to remove leftover ash/soot.

12. Turn the OPERATION SELECTOR switch to the OFF position. Open the upper door. Turn the crank handle counter-clockwise until the filter can be removed from the lift table.
13. Reinstall the filter in the vehicle per the manufacturer's instructions.

NOTE	Operating Conditions That Increase Filter Cleaning Frequency
<p><u>Extended idling.</u> Extended engine idling will plug filters prematurely and the contaminant is difficult to remove with a pulse cleaner. The filter may need to be cleaned with a thermal regenerator.</p>	
<p><u>Engine failures.</u> Engine turbo or injector failures or other engine faults may lead to increased Filter service.</p>	
<p><u>Cool engine operation.</u> If the engine operates with an exhaust gas temperature below the emissions device recommended duty cycle, the filter may plug prematurely and require more frequent cleaning.</p>	
<p><u>Unresolved engine issues.</u> Engine maintenance issues that create excess soot.</p>	

Routine Maintenance

Filter Replacement

This section provides the recommendations and procedures for filter replacement (refer to the cabinet schematic for location). There are three filters in the Donaldson Gen2 DPF Pulse Cleaner: a round, cartridge-style ash receptacle filter (ARF); a panel filter; and (c) a blower filter..

	CAUTION! Wear Respiratory Protection
<p>Wear respiratory protection when replacing the filters. Change the Ash receptacle filter in an area with neutral airflow. Cap the Ash receptacle filter immediately upon removal to avoid a spill and airborne particulate.</p>	

Properly dispose of the filters in accordance with your local laws and regulations.

Ash Receptacle Filter Replacement

The Ash Receptacle Filter (ARF) is expected to last from 10 to 30 cleaning cycles, although the actual service life will vary depending on the amount of ash/soot present in the filters being cleaned. Due to the life variability, we recommend that you keep an extra Ash Receptacle Filter in stock.

Donaldson recommends testing the ash receptacle every five (5) filter cleanings. The Ash Receptacle Filter must be replaced when the pressure gauge reading is above 2" of H₂O using the test sleeve.

Life Test Procedure

Checking the life of the ash receptacle filter is accomplished by a pressure test using the test sleeve that was shipped with the unit. DO NOT DISCARD the test sleeve.

1. Install the coned hood / adapter if another adapter is in place.
2. Make sure the POWER switch is in the RESET (ON) position.
3. Turn OPERATION SELECTOR Switch to OFF
4. Turn the crank handle counter-clockwise to lower the lift table until the test sleeve will fit between the hood and lift table.
5. Center sleeve on the cone shaped lift table. Visually check that the sleeve is horizontally level.
6. Raise the lift table by turning the crank handle clockwise until the sleeve makes contact with the hood and the FILTER POSITIONED light is illuminated (green), then rotate the crank handle one additional revolution for a proper seal.
7. Turn the OPERATION SELECTOR switch to the TEST position, check for air leaks, and observe the pressure. If the test pressure is above 2" of H₂O on the pressure gauge, replace the ash receptacle filter. If not, the Ash Receptacle Filter does not need to be replaced.

Service Procedure

1. Turn the POWER switch OFF.
2. Open the carton containing the replacement Ash Receptacle Filter. Remove and save the white styrofoam cap installed in the inner diameter of the new Ash Receptacle Filter.

NOTE	DO NOT Dispose of Cap!
<p>Retain the cap from the new Ash Receptacle Filter packaging to contain the contaminant in the old Ash Receptacle Filter.</p>	

3. Open the bottom cabinet door.
4. Pull the retention handle outward, releasing the Ash Receptacle Filter.
5. Remove the Ash Receptacle Filter carefully and cover the opening with the cap to contain the contaminant during handling.

- Place a new Ash Receptacle Filter, open side up, on the retention lift. Make sure the filter is pushed all the way back to the two stops on the lift.

NOTE	Check Position of New Ash Receptacle Filter
<p>The Ash Receptacle Filter gasket is a critical seal to ensure that ash/soot don't escape into the lower cabinet during pulse cycles. The critical seal is formed when the new Ash Receptacle Filter is pushed back to both stops on the back of the retention lift.</p>	

- Lift the retention handle towards the Ash Receptacle Filter, locking the new unit into place.
- Package and dispose of the old filter (using the box from the new Ash Receptacle Filter) according to local regulations.



- Close bottom cabinet door.

NOTE	DO NOT Clean or Reuse the Ash Receptacle Filter!
<p>The ash receptacle filter cannot be cleaned or reused. A dirty ash receptacle filter will negatively affect the pulse cleaning and may cause ash to leak.</p>	

Panel Filter Replacement

There is one large panel filter in the lower cabinet accessible from the back side. The panel filter collects particulate if the ash receptacle filter leaks or if the DPF is incorrectly installed. Under normal operation, the panel filter will not need to be replaced. If the panel filter is damaged or comes into contact with particulate it must be replaced. Access filter through the rear side of the pulse cleaner.

- Turn the POWER switch OFF.
- Remove the bolts and retainer clips on the back panel of the cabinet.
- Remove the old panel filter and replace with new panel filter. Make sure panel filter is installed properly - refer to the directional air flow arrows on the filter label.
- Reinstall the retainer clips and bolts.
- Move the cabinet back into place (if moved for service).
- Dispose of filter according to your local ordinances.

Blower Filter Replacement

The blower filter should be changed at every 200 filter cleanings. To replace, follow these steps

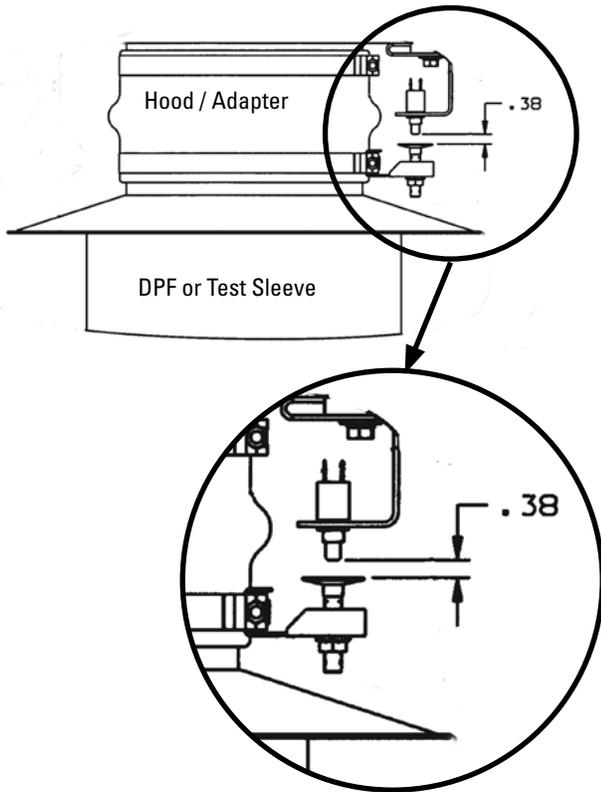
- Turn POWER switch to OFF, unplug electrical and disconnect the compressed air line from the unit.
- Remove the upper cabinet cover (top) by removing the eight (8) screws.
- Loosen the blower filter clamp and slide clamp off filter inlet.
- Remove old filter and install new filter.
- Slide old clamp over filter inlet and tighten to 60 in. lbs.
- Replace upper cabinet cover (top) and tighten the eight screws.
- Reconnect compressed air line, plug electrical back in.

Drain Condensate in Air Tank

The air tank has a integral condensate drain. On a monthly basis, drain the internal air tank by pulling on the cable located in the upper compartment. Pull the cable to drain a small amount of air. If condensate is present, your air supply may need service.

Filter Position Switch Alignment

The illustration below shows the proper alignment of the Filter Position Switch. If the FILTER POSITIONED Light does not illuminate when the filter is in position, use this as a guide to check for proper alignment. There should be a 3/8" gap between the switch button and contact bolt when there is no filter positioned on the lift table.



Trouble Shooting Guide

Before making any repairs or replacements unplug the unit and disconnect the air connection. After fixing or repairing any remedy in the guide, you must switch to OFF and restart.

Trouble	Possible Cause	Remedy
POWER switch does not illuminate	POWER switch is OFF	Turn POWER switch to RESET (ON)
	No power to unit	Check the electrical connection
Blower does not come on with OPERATION SELECTOR switch in TEST position	Failed switch	Repair or replace the Control Panel Assembly
	Blower disconnected or failed	Repair or replace blower
	Blower check valve failure	Replace the blower
Blower comes on, but no pressure reading on gauge	Blower filter plugged	Replace the blower
	Pressure gauge failed	Repair or replace the pressure gauge
Air leak	Pressure relief valve discharging	Adjust pressure regulator to 14.5 psi
	Failed solenoid	Replace solenoid
	Failed tank sealing plate	Replace tank sealing plate
DPF lift table does not operate smoothly	Right angle drive damaged or lift table bearing mis-aligned or damaged	Repair or replace lift table mechanism
FILTER POSITIONED light does not illuminate when DPF is raised	<i>Filter Position Interlock</i> mis-aligned or mis-adjusted (bracket bent)	Check the <i>Filter Position Interlock</i> . There should be a 3/8" gap between the switch button and contact bolt when there is no filter installed (see image on page 10)
High Temperature Filter Shutdown light flashing when switch is in TEST or PULSE position	DPF too hot to pulse clean	Turn OPERATION SELECTOR switch to OFF and wait for filter to cool (below 150° F skin temperature)
	Thermocouple disconnected or failed	Repair or replace thermocouple
Unit does not pulse with OPERATION SELECTOR switch in PULSE position	Lack of compressed air	Check compressed air supply for 90psi minimum
	Improper pressure regulator setting	Adjust to 14.5 PSI
	Filter not positioned properly	FILTER POSITIONED light should be on. If not, turn crank slowly until light illuminates
	Doors not closed properly	Check <i>Door Interlock Switches</i>
	Door opened during cleaning process	Close door. Turn POWER OFF and RESET
	<i>Door Interlock Switches</i> and <i>Filter Position Interlock</i> are not adjusted properly	Readjust and position switches properly
	Temperature sensing not complete	Wait 1-1/2 minutes
	Filter is too hot to pulse clean	Turn OPERATION SELECTOR switch to OFF and wait for DPF to cool (below 150° F skin temperature)
	Failed air solenoid valve	Replace air solenoid valve
	Failed pressure assembly	Replace pressure assembly
Less than one pulse/minute	Inadequate or restricted air supply	Check air supply and pressure regulator in-line sintered filter for plugging
	Air leak	Check for leaks around the tank, tank sealing plate and air connections.
Only one pulse	Pressure assembly mis-adjusted?	Adjust pressure switch to 13.5 or pressure regulator to 14.5 psi
Muffled pulses	Ash Receptacle Filter plugged	Replace
Particulate in upper cabinet	Filter improperly installed	Reposition filter
	Lift table bellows or hose clamps may be damaged or loose	Repair or replace
	Filter flanges are bent, damaged or keyed.	Replace filter unit if bent or damaged. For keyed filter, make sure you're using proper filter adapters.
Particulate in lower cabinet	Ash Receptacle Filter improperly installed, plugged, or damaged	Reposition or replace
	Ash Receptacle Filter is full or plugged	Replace Ash Receptacle Filter

Spare Parts List

Description	Part No.	Note
Ash Receptacle Filter	P228279	Use box from new filter to dispose of the used filter
Panel Filter	P191203	
Blower Filter	B085011	
Blower Check Valve	P228025	
Solenoid Valve	P233369	
Control Panel Assembly	P230113	
Test Sleeve	P230116	Required to test ash receptacle filter
Lift Table Top Plate	P230122	Top plate with urethane seal
Lift Mechanism Rebuild Kit	X009719	
Bellows Rebuild Kit	X009720	Bellow + two clamps
Hood Replacement	X010930	Hood, adapter and clamps(2) replaces Part No. P230110
Blower Assembly	P228093	Replaces Part No. P230119
Pressure Assembly	P231595	For air tank
Tank Sealing Plate Assembly	P233362	For air tank
Thermocouple	P228775	
Door Rebuild Kit	X009716	Latches and hinge replacement
Door Interlock Switch	P228028	
Door Flap Kit	P231616	Replaces small panel filter. Part No. P228498

Warranty

Donaldson warrants to the original purchaser that the major structural components of the goods will be free from defects in materials and workmanship for two (2) year from the date of shipment, if properly installed, maintained and operated under normal conditions. Donaldson warrants all other Donaldson built components and accessories including the diesel particulate filter lift table, filter retention mechanism, air tank and air tank diaphragm and heater assembly for twelve (12) months from date of shipment.

Donaldson does not warrant against damage due to corrosion, abrasion, normal wear and tear, product modification, or product misapplication. Donaldson also makes no warranty whatsoever as to any goods manufactured or supplied by others including electric motors, solenoid valves, switches and control components. After Donaldson has been given adequate opportunity to remedy any defects in material or workmanship, Donaldson retains the sole option to accept the return of the goods, with freight paid by the purchaser, and to refund the purchase price for the goods after confirming the goods are returned undamaged and in usable condition. Such a refund will be in the full extent of Donaldson's liability. Donaldson shall not be liable for any other costs, expenses or damages whether direct, indirect, special, incidental, consequential or otherwise. The terms of this warranty may be modified only by a special warranty document signed by a Director, General Manager or Vice President of Donaldson. THERE EXIST NO OTHER REPRESENTATIONS, WARRANTIES OR GUARANTEES EXCEPT AS STATED IN THIS PARAGRAPH AND ALL OTHER WARRANTIES INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHETHER EXPRESS OR IMPLIED ARE HEREBY EXPRESSLY EXCLUDED AND DISCLAIMED.

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Donaldson.
FILTRATION SOLUTIONS

Donaldson Company, Inc.
Minneapolis, MN 55440-1299
www.donaldsonexhaust.com

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Technical Support 866-817-8733
emissions@donaldson.com

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