



RETROFIT ↓

PROVENTIA EMISSION CONTROL CARB-VERIFIED, LEVEL 3 APU FILTER



Owners Manual:
Electrically Heated Diesel
Particulate Filter (EHDPF) System
For Thermo King Tripac model APU



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OPERATION AND MAINTENANCE REQUIREMENTS

The EHDPF system is approved for installation on Model Year 2007–11 Tripac with Yanmar TK270M engine.

- 1) Tripac must have “tractor integration” option.
- 2) Use Ultra Low Sulfur Diesel (ULSD) fuel (< 15ppm sulfur), which is the same fuel used for the main truck engine and the Tripac APU engine. ULSD fuel is mandated by the US EPA for on-highway use and available at all gas stations throughout the U.S.
- 3) Installer must confirm that the Tripac engine has a normal oil consumption rate of at least 50 hours per quart of oil.
- 4) There is no special specification for Tripac engine lubricating oil when using the EHDPF. Use the Tripac engine manufacturers recommendations for lube oil.
- 5) Avoid battery voltage losses. The EHDPF will regenerate and clean itself best when it has maximum voltage from the main truck vehicle batteries. If there are any loose, or corroded, battery cable connections anywhere between the vehicle batteries and the EHDPF filter, it will reduce the filter’s ability to clean itself properly.



- 6) Running the Tripac engine with the EHDPF filter system installed will have a 4% increase on the fuel consumption rate of the Tripac APU.
- 7) The EHDPF filter system can impose an exhaust backpressure on the Tripac engine of 2 psi under normal operating conditions and up to 3 psi during operation with a filter system failure.
- 8) Up to B20 biodiesel blend can be used with the Proventia EHDPF if it meets the onroad fuel sulfur specification of 15ppm maximum sulfur level. In addition, the blended biodiesel also must be confirmed to be a high quality, low ash fuel meeting ASTM D6751 Biodiesel Blendstock Specification.
- 9) Fuel additives are not allowed.
- 10) Replacement parts for the EHDPF system are available from the Proventia EHDPF distributor or call a Proventia representative at 800-609-7686.
- 11) Operator is responsible for checking to see if the DPF status light is blinking red, which indicates that service is required.
- 12) Proventia does not allow redesignation of the EHDPF from one Tripac to another or swapping of components.

PREINSTALLATION CHECKS

- 1) Tripac must be equipped with "Thermo King Tractor Integration Option" before installing EHDPF.
- 2) Installer must confirm oil consumption rate is less than one quart of oil in 50 hours of engine operation. Installer can confirm by checking Tripac service records or by monitoring oil consumption for at least 50 hours. If the customer does not have service records to confirm a normal oil consumption rate, the procedure for checking oil consumption rate is as follows:
 - Check oil level on Tripac dipstick with Tripac engine off, and truck parked on a level surface.
 - Add engine oil to Tripac until dipstick level is at full mark. Record Tripac hourmeter reading.
 - Run Tripac at least 50 hours. Tripac can be run under normal operation by customer.
 - Again add oil to Tripac until dipstick level is at full mark, keeping track of how many ounces of oil were added. Again record the Tripac hourmeter reading.
 - To calculate the oil consumption rate, divide ounces/number of hours run between oil checking.
 - Normal oil consumption rate is less than 32 ounces in 50 hours, which is less than .64 ounces/hour.

- Inspect engine for signs of poor maintenance including oil leaks, and repair as needed.
 - Inspect tailpipe for signs of oil residue.
 - Inspect exhaust plume for signs of high PM emissions and oil burning.
 - Consult the Tripac service manual to diagnose and repair an engine with high oil consumption rate.
- 3) Installer must confirm condition of main truck batteries. Installer can check the batteries as follows:
- Check battery voltage with truck engine and batteries above 40F using voltmeter at battery posts.
 - Start the main truck engine. If battery voltage drops below 10V during engine cranking, one or several of the batteries may need to be replaced.
 - To determine which battery(s) may need replacement, check batteries individually with cranking test again.
- 4) Visually inspect a fuel sample from the fuel tank for contamination (i.e., darkened by engine oil)

SAFETY PRECAUTIONS

- 1) High current connections: The filter element has an electrical circuit that is capable of operating up to 125 amps. The EHDPF has a 125 amp-fused connection to the Tripac alternator battery cable connection. If any portion of the high-current circuit becomes improperly insulated, there is a possibility for sparking and fire potential. Filter system has 125 Amp fuse protection in the event that greater than 125amp is applied. The battery cable is insulated and protected from rubbing against the Tripac frame with grommets and nylon corrugated sleeving according to automotive standards. This fused battery cable is a short length and runs between relay #1 (inside the filter housing) to the positive terminal on the Tripac alternator.
- 2) Hot surface temperature of filter body: The filter body surface temperature is similar to the surface temperature of the standard OEM muffler. However, the filter body surface temperature can remain hot, even after the engine shuts down, in the case where a regeneration sequence has begun. The filter body has an enclosed housing box around it to shield against the surface temperatures during regeneration.



- 3) Hot exhaust exiting tailpipe: The EHDPF exhaust temperature exiting the tailpipe is similar to the exhaust temperature with the standard OEM muffler, because electrical energy is not added to the exhaust stream when the engine is running.
- 4) Toxic chemicals from exhaust tailpipe: The EHDPF removes 85% of the PM from the exhaust stream, however HC, NOx and all other exhaust components continue to exit the exhaust tailpipe unchanged from the EHDPF filter system.

YOUR RIGHT TO MAINTENANCE INFORMATION

The Air Resources Board requires that Proventia Emission Control provide detailed maintenance information for the diesel emission control system upon delivery to the end-user pursuant to section 2706(h)(2), Title 13, California Code of Regulations, at no additional cost to the owner. If you do not already have this information, contact a Proventia Representative at 1-800-609-7686.

THE IMPORTANCE OF ENGINE MAINTENANCE

Proper engine maintenance is critical for the proper functioning of your diesel emission control strategy. Failure to document proper engine maintenance, including oil consumption records, may be grounds for denial of a warranty claim for a failed component of a diesel emission control strategy.

THE IMPORTANCE OF PROPERLY MAINTAINING A DIESEL EMISSION CONTROL STRATEGY

Proper maintenance is critical for the diesel emission control strategy to function as intended. Failure to document proper diesel emission control strategy maintenance, including cleaning and/or ash removal of the system, replacement of consumables, and replacement of broken/failed parts, may be grounds for denial of a warranty claim for a failed component of a diesel emission control strategy.



DOCUMENTS INSTALLER WILL PROVIDE TO EHDPF OWNER

- 1) EHDPF owner manual.
- 2) Executive Order for EHDPF system.

CHECK FOR PROPER INSTALLATION OF EHDPF SYSTEM

- 1) New installation takes 2 to 3 hours. Retrofit installation takes 3 to 4 hours.
- 2) In order to comply with CARB regulations, a label should be visible on Tripac engine, as shown.

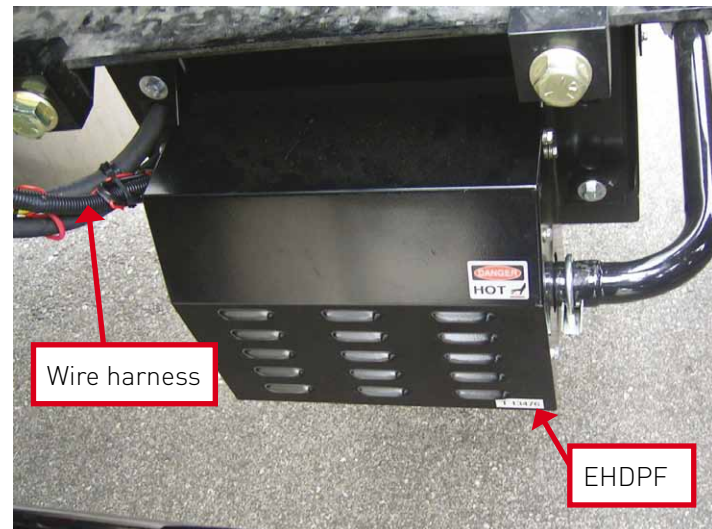




- 3) "Verified Clean APS" label should be permanently affixed to hood on driver's side, in an area within one foot by one foot from top and front edges of hood.
- 4) Arrow shows an alternative approved location for "Verified Clean APS" label.

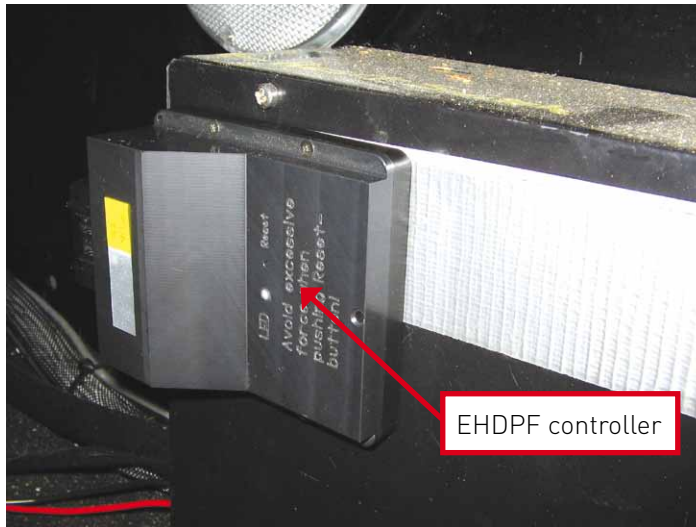


- 5) EHDPF will be installed on the back of the Tripac in place of the OEM muffler.
- 6) A wire harness runs from the EHDPF to the controller in the cab.

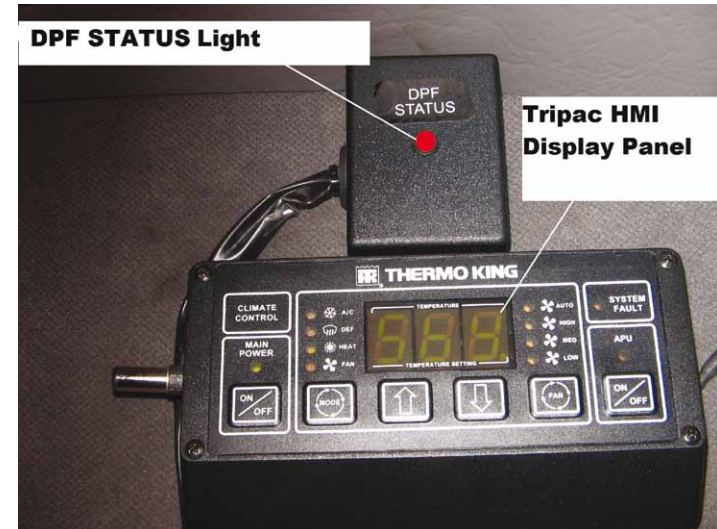




- 7) EHDPF controller will be mounted on or near the Tripac control box in the side compartment of the cab.



- 8) EHDPF status light will be located near the Tripac HMI display panel.





EHDPF OPERATION

TYPICAL FILTER OPERATION

The EHDPF filter collects soot from Tripac engine exhaust and burns soot using 12VDC electricity from the truck batteries. The EHDPF will collect soot for about 1–8 hours of engine operation and then will automatically shut off the Tripac for 7–9 minutes while the filter cleans itself (regeneration). After cleaning cycle is complete, Tripac will restart itself automatically, if needed, to provide air conditioning, heat, or battery charging. There is no action required from the operator for this cleaning of the filter. The EHDPF filter can detect problems and the “DPF STATUS” blinking red LED light will notify operator of problems.

The filter material that collects soot is fine-mesh, sintered metal fibers that can resist temperatures up to 2000F and collect over 85% of soot particles. This filter material is also used to burn the soot. The EHDPF controller periodically connects 12VDC directly to this filter material until it is red hot so that the soot (carbon) burns and is converted into carbon dioxide. There is also an air valve in the filter that opens during the 7–9 minute regeneration to provide the oxygen needed to convert soot into carbon dioxide. When

the air valve opens, air flows through the filter material by natural convection. The EHDPF regenerates while the Tripac is shut off and uses about 75 amps continuously from the 12VDC batteries during the 7–9 minute regeneration.

OPERATOR RESPONSIBILITY WHEN RUNNING EHDPF SYSTEM

No action is required from the operator for the regeneration (cleaning) cycle of the filter. The filter accumulates soot whenever the engine runs and will automatically begin regeneration when one of two situations occurs:

- 1) If Tripac engine is running AND operator starts main truck engine (which puts the Tripac into “standby”), the EHDPF controller will shut off the Tripac engine for 7–9 minutes and perform a regeneration. The “DPF STATUS” light will be **steady** red during the 7–9 minute regeneration, indicating normal operation.
- 2) If the Tripac engine has been running continuously (1 to 8 hours, depending on the engine load) the accumulation of soot inside the filter will increase the “backpressure” of the filter. When enough soot accumulates to cause a 2 psi backpressure, an electrical switch will be triggered and the EHDPF controller will

shut off the Tripac engine for 7–9 minutes and perform a regeneration. The DPF status light will be **steady** red during the regeneration, indicating normal operation. At the completion of the 7–9 minute regeneration, the Tripac will restart itself.

Regeneration time is determined by battery condition:

- If voltage > 12.5V, regeneration time = 7 minutes.
- If voltage is 11.7 to 12.5V, time = 8 minutes.
- If voltage < 11.7V, time = 9 minutes.

3) A blinking DPF status light notifies the operator of the following failures:

- low main truck battery voltage
- filter clogged with ash
- air valve failure
- pressure switch failure
- contactor failure
- hole in filter or filter circuit open

- 4) The DPF status light is located near the Tripac HMI display panel. If the DPF status light is blinking, call 800-609-7686 for nearest service.
- 5) Only a service technician can reset the blinking DPF status light. Contact a service technician as soon as possible.





PERIODIC MAINTENANCE

EVERY 1,000 HOURS

The Proventia EHDPF will regenerate best when the main truck battery voltage is highest. Every 1,000 hours, check for loose or corroded battery cable connections between main truck vehicle batteries and EHDPF filter:

- Battery to Tripac starter
- Tripac starter to alternator
- Alternator to contactor #1
- Contactor #1 to contactor #2
- Contactor #2 to EHDPF filter

EVERY 3,000 HOURS OR AS NEEDED

The filter will accumulate ash during normal engine operation. This ash will eventually fill up the filter and can shorten the time between regenerations to < 15 minutes.

If it is necessary to clean ash out of the EHDPF filter assembly, follow this procedure:

- 1) Shut Tripac off and disconnect =12VDC battery cables.
- 2) Disconnect flexible inlet exhaust pipe to filter.

- 3) Connect an industrial vacuum cleaner, with a HEPA filter, to inlet exhaust pipe. Vacuum flexible tube should be completely sealed around inlet exhaust pipe.
- 4) Remove tailpipe from exhaust outlet of filter. From a compressed air source, insert an air hose, not more than ¼" size, into exhaust outlet pipe. The compressed air pressure should not be more than 45 psi.
- 5) Turn vacuum cleaner on.
- 6) Turn compressed air on for 5 minutes.
- 7) During these 5 minutes, move compressed air hose in and out to cover length of filter.
- 8) Any accumulated ash will collect in vacuum cleaner.
- 9) Turn off compressed air source.
- 10) Turn off vacuum cleaner.
- 11) Reconnect inlet exhaust pipe.
- 12) Reconnect battery cables.
- 13) Ash handling during and after EHDPF cleaning: The ash material may be hazardous, and should be treated as hazardous material until it is confirmed to be not hazardous. Hazardous material must be handled in California in accordance with ash handling guidelines as defined by the California Code of Regulations.



Individuals who own, operate, or maintain diesel engines equipped with diesel particulate filters may need to manage hazardous ash waste generated by these devices. Follow ash handling guidelines as prescribed by CARB at www.arb.ca.gov/diesel/tru/documents/ashguide.pdf Individuals who handle hazardous materials are responsible for following federal, state, and local laws for the handling of this possibly hazardous material.

- 14) After completion of the ash cleaning procedure, reinstall flexible inlet exhaust pipe and tailpipe onto EHDPF.
- 15) Start the Tripac and run for at least one hour. If the Tripac does not shut down to regenerate during that hour, then it is confirmed that the ash cleaning procedure was successful.
- 16) If the filter is damaged during the ash cleaning procedure, the EHDPF controller will detect if the time between regenerations is greater than 10 hours and will shut off the Tripac until a service technician can replace the EHDPF filter body assembly.
- 17) Proventia does not allow swapping of components for the purpose of filter cleaning.

PARTS LIST

All parts in this list are covered by warranty.

PART #	DESCRIPTION	QTY
A001	EHDPF FILTER ASSEMBLY (INCLUDES FILTER, CONTACTORS, 2 PSI PRESSURE SWITCH, 3 PSI PRESSURE SWITCH AND AIR VALVE)	1
A002	EHDPF FILTER, WITH ELECTRICAL CABLES	1
A003	CONTACTOR	2
A004	2 PSI PRESSURE SWITCH	1
A005	3 PSI PRESSURE SWITCH	1
A006	AIR VALVE	1
A007	POWER SUPPLY CABLE, (4GA) FROM ALTERNATOR TO FILTER (INCLUDES 125A FUSE)	1
A008	GROUND CABLE, FROM Tripac FRAME TO EHDPF GROUND STUD	1
A009	WIRE HARNESS (INCLUDING DPF STATUS LIGHT)	1
A010	EHDPF CONTROLLER	1
A011	EXHAUST CLAMP, INLET PIPE	1
A023	SILICONE HOSE (INCLUDES 2 CLAMPS)	1



PRODUCT WARRANTY STATEMENT

YOUR WARRANTY RIGHTS AND OBLIGATIONS

Proventia Americas, LLC must warrant the diesel emission control system in the application for which it is sold or leased to be free from defects in design, materials, workmanship, or operation of the diesel emission control system which cause the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, for the periods of time listed below, provided there has been no abuse, neglect, or improper maintenance of your diesel emission control system, vehicle or equipment, as specified in the owner's manuals. Where a warrantable condition exists, this warranty also covers the engine from damage caused by the diesel emission control system, subject to the same exclusions for abuse, neglect or improper maintenance of your vehicle or equipment. Please review your owner's manual for other warranty information. Your diesel emission control system may include a core part (e.g., particulate filter, diesel oxidation catalyst, selective catalytic reduction converter) as well as hoses, connectors,

a back pressure monitor (if applicable), and other emission-related assemblies. Where a warrantable condition exists, Proventia Americas, LLC will repair or replace your diesel emission control system at no cost to you including diagnosis, parts, and labor.

WARRANTY COVERAGE

For a Yanmar TK270M engine used in an APU application, the warranty period will be 3 years or 1,600 hours of operation, whichever occurs first. If any emission-related part of your diesel emission control system is defective in design, materials, workmanship, or operation of the diesel emission control system thus causing the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, within the warranty period, as defined above, Proventia Americas, LLC will repair or replace the diesel emission control system, including parts and labor.

In addition, Proventia Americas, LLC will replace or repair the engine components to the condition they were in prior to the failure, including parts and labor, for damage to the engine proximately caused by the verified diesel

emission control strategy. This also includes those relevant diagnostic expenses in the case in which a warranty claim is valid. Proventia Americas, LLC may, at its option, instead pay the fair market value of the engine prior to the time the failure occurs.

INSTALLATION WARRANTY STATEMENT

OWNER'S WARRANTY RESPONSIBILITY

As the (vehicle, engine, equipment) owner, you are responsible for performing the required maintenance described in your owner's manual. Proventia Americas, LLC recommends that you retain all maintenance records and receipts for maintenance expenses for your vehicle, engine, or equipment, and diesel emission control system. If you do not keep your receipts or fail to perform all scheduled maintenance, Proventia Americas, LLC may have grounds to deny warranty coverage. You are responsible for presenting your vehicle, equipment, or engine, and diesel emission control system to a Proventia Americas, LLC dealer as soon as a problem is detected. The warranty repair or replacement should be completed in a reasonable amount

of time, not to exceed 30 days. If a replacement is needed, this may be extended to 90 days should a replacement not be available, but must be performed as soon as a replacement becomes available.

If you have questions regarding your warranty rights and responsibilities, you should contact Proventia Americas, LLC at 800-609-7686 or the California Air Resources Board at 9528 Telstar Avenue, El Monte, California 91731, or (800) 363-7664, or electronic mail: helpline@arb.ca.gov.

YOUR WARRANTY RIGHTS AND OBLIGATIONS

_____ must warrant that the installation of a diesel emission control system is free from defects in workmanship or materials which cause the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706. The warranty period and the extent of the warranty coverage provided by _____ must be the same as the warranty provided by the product manufacturer, and the same exclusions must apply.



OWNER'S WARRANTY RESPONSIBILITY

As the vehicle, engine, or equipment owner, you are responsible for presenting your vehicle, engine, or equipment, and diesel emission control system to _____ as soon as a problem with the installation is detected. If you have questions regarding your warranty rights and responsibilities, you should contact _____ or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731, or (800) 363-7664, or electronic mail: helpline@arb.ca.gov

