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GreenTRAP™ 300

CARB Level 3 Verified DECS

for PM Control

Operation Manual

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Operation Manual

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1 GreenTRAP™ 300 Warranty

1.1 Your Warranty Rights and Obligations

Nett Technologies Inc., warrants that 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 manual. 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) as well as hoses, connectors, a control system, and other emission related assemblies. Where a warrantable condition exists, Nett Technologies Inc. will repair or replace your diesel emission control system at no cost to you including diagnosis, parts, and labor.

Table 1: Minimum Warranty Period

Engine Type	Engine Size	Warranty Period
Off-Road (Prime and Emergency Use Stationary Generator Sets and Pumps)	At or above 50 hp	5 years or 4,200 hours*

*Whichever comes first.

1.2 Warranty Coverage

For the engine size and applications listed above, the warranty period will be the corresponding years or 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, Nett Technologies Inc, will repair or replace the diesel emission control system, including parts and labor.

In addition, Nett Technologies Inc. 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. Nett Technologies Inc. may, at its option, instead pay the fair market value of the engine prior to the time the failure occurs.

1.3 Owner's Warranty Responsibility

As the equipment owner, you are responsible for performing the required maintenance described in your owner's manual. Nett Technologies Inc. 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, Nett Technologies Inc. may have grounds to deny warranty coverage. You are responsible for presenting your vehicle, equipment, or engine, and diesel emission control system to a Nett Technologies Inc. authorized 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 customer service at Nett Technologies Inc. at 1-800-361-6388 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

2 GreenTRAP™ 300 Installation Warranty

The installer must supply the owner with a copy of the following statements:

2.1 Your Warranty Rights and Obligations

Nett Technologies Inc. and its designated representatives or installers warrant that the installation of the GreenTRAP™ 300 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 Nett Technologies Inc. and its designated representatives or installers is the same as the warranty provided by the product manufacturer, and the same exclusions must apply.

2.2 Owner 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 Nett Technologies Inc. or its designated representatives or installers as soon as a problem with the installation is detected.

If you have questions regarding your warranty rights and responsibilities, you should contact Nett Technologies Inc. at 1-800-361-6388 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.

Under no circumstances should the vehicle operator or equipment owner attempt to re-install, repair, or modify the diesel emission control system without written prior approval from Nett Technologies as this may void warranty.

2.3 Warranty Registration

As an authorized installer or equipment owner, you are required to register your system with Nett Technologies to obtain Warranty coverage, and obtain certified training. The following form must be filled out and filed with Nett Technologies as soon as installation is completed (only page 1 is shown here). The full form can be downloaded from: http://www.nettinc.com/information/support-documents. A copy must be given to the equipment owner/end-user. This form must be filled out/submitted for each installation.

You will obtain a Certificate of Training after training completion.

Installation Training and Warranty Registration Form

(CA –TD)

PLEASE FILL OUT AND FAX BACK THIS FORM RIGHT AFTER INSTALLATION TO 1-905-672-5949 TO KEEP WARRANTY COVERAGE. ENSURE IT IS COMPLETE AND LEGIBLE. A COPY MUST BE GIVEN TO THE END USER. KEEP A COPY FOR YOUR RECORDS.

Customer Information

Dealer/Installer Company Name:	Dealer/Installer Address:	Dealer/Installer Contact (Name/Phone/Email):
Customer/End User Company Name:	Vehicle/Equipment Location:	Customer/End User Address/Contact (Name/Phone):

Vehicle/Equipment Information

Vehicle/Equipment Make and Year:	Vehicle/Equipment Model and Type:	Vehicle/Equipment Serial No.:
Vehicle/Equipment Voltage: ◯ 12 V ◯ 24 V	Engine Make:	Engine Year and Model:
Engine Serial No.:	Engine Family:	Engine Power (rated hp) and Displacement:
Engine Oil Used:	Diesel Fuel Used:	Service Interval (every x hours):

Emission Control Technology

Model:	Description:	Emission Control Technology Serial No.:
DPF Serial No.:	DOC Serial No.:	Executive Order No./Diesel Emission Control Strategy Family Name:
SCR Serial No.:	PT Log Serial No.:	Date of Installation:
Vehicle/Equipment Hours at Installation:	System Fully Functional ◯ Yes ◯ No	If no, list issues to correct before installation:

Installation Training Confirmation

Trainer Full Name:

I hereby confirm that _____ **from** _____**, has received, understood, and is**
(Trainee/Installer Full Name) (company)

ready to apply the following installation, setup and maintenance training:

- ☐ Review of pre-installation compatibility assessment criteria and their compliance (please fill out the checklist on page 5 of this form)
- ☐ Review of the effects of engine maintenance on the emission control strategy's performance
- ☐ Identification of all warning and/or fault alarms and appropriate end-user responses
- ☐ Cleaning and maintenance information for the emission control strategy
- ☐ Review of major components, system installation and setup

Installation Training Certificate

- ☐ I have obtained a Certificate of Training Completion from Nett Technologies

Obligations

- ☐ I understand my rights and obligations as an authorized installer as set out in 13 CCR § 2700-2711 requirements (see page 2-4 for more details)
- ☐ I have performed pre-installation assessment of the equipment/vehicle and can confirm that it meets all the required compatibility criteria for installation

Authorized Installer Signature:_____ **Date:**_____

3 Authorized Installer Requirements

3.1 Regulation Overview

As of October 1, 2013, California Air Resources Board (CARB) released an updated Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions for Diesel Engines in Title 13 of the California Code of Regulations (CCR) Sections 2700-2711. This code includes obligations and requirements for Diesel Emission Control Strategy (DECS) Manufacturers, Owners (End Users) as well as Authorized Installers/Distributors/Dealers. The Main obligations/requirements are presented in the following section.

3.2 Main Requirements

The following lists main requirements for Authorized Installers/Dealers and End Users pursuant to section 13 CCR § 2706(u):

1) The installer of the Nett Technologies diesel emission control strategy must be authorized and trained by the party that holds the verification, i.e., Nett Technologies, for the diesel emission control strategy. **The installer is also responsible to train the end user at the time of commissioning. The end user cannot use the system unless they have been trained**. The Owner's manual must be made available to the end user after installation.

2) The installer of the Nett Technologies diesel emission control strategy must comply with the pre-installation assessment requirements in 13 CCR § 2706(t).

In general, **the authorized installer** (i.e., the party conducting the pre-installation compatibility assessment) **must ensure that a candidate engine being considered for retrofit is compatible with the verified diesel emission control strategy** by ensuring that each candidate engine meets all the terms and conditions of the **Executive Order** prior to installation (see the Pre-Installation Compatibility Assessment Section). To determine the suitability, a smoke opacity limit, oil consumption limits, fuel inspection requirements, visual inspections, exhaust gas temperature requirement (see below) and other assessment criteria must be used to determine that the candidate engine is appropriate for use with the diesel emission control strategy and that the candidate engine is in a proper state of maintenance and operating within the engine manufacturers specifications. **The party performing the installation/ commissioning of the diesel emission control strategy must maintain a record of all documentation used to make the determination that the candidate engine was appropriate for use with the diesel emission control strategy (i.e., the pre-installation compatibility assessment and commissioning reports). These documents must be submitted to Nett Technologies and the end user. In addition, the installer must keep track of all future assessments and installations for future reporting purposes. In addition, the end-user is responsible for maintaining the engine such that it continues to meet the pre-installation compatibility assessment conditions identified in section 2706(t).**

Exhaust gas temperature requirement (as per ARB MSC 11-11 Mail-Out)

If the Executive Order for a Diesel Emission Control Strategy (DECS) specifies exhaust gas temperature requirements, then the following pre-installation compatibility assessment requirements must be completed prior to installation:

The exhaust gas temperatures must be measured and recorded from each candidate engine to determine if it meets the exhaust temperature requirements. As an alternative, representative sampling can be conducted for a group of engines that are similar. However, data from engines outside the group cannot be used to support retrofit of engines within the group. Representative sampling can occur under the following conditions:

a) The DECS is verified for only reducing diesel particulate matter (PM).
b) At least five representative engines or 10 percent of each group of similar engines, whichever is larger, must be data logged. All engines in a group comprised of 5 or fewer engines must be data logged. Specific conditions that determine which engines belong in a group follows and are defined in Section 2706(t)(1)(B) of the Procedure.
c) In cases where representative sampling is selected, the party conducting the pre-installation compatibility assessment is still responsible for ensuring that all installations comply with the terms and conditions of the EO and any other requirements specified by DECS manufacturer for that particular DECS.

Data Logging Procedures

Data must be logged according to the following procedures:

- The measured and recorded data must be representative of the actual duty cycle and operation of the candidate engine as best it can be anticipated at the time.
- The exhaust gas temperature must be measured at a point in the exhaust gas system that is within six inches of the proposed location of the inlet of the DECS.
- The data must be measured and recorded for a period long enough to determine the candidate engine's duty cycle but not less than 24 hours of representative, actual engine run time.
    - The data logging strategy must include a means to determine when the engine is actually running. This may include use of a data logging system that starts and stops automatically when the engine starts and stops, or a means to identify and remove data that correspond to the engine being off such as by simultaneously logging data from an engine revolutions per minute sensor or applying a temperature threshold that corresponds to a temperature just below the idle temperature of the engine.
    - The automatic exclusion of data logged during engine shutdown does not have to be integrated in the data logging system but before the data is assessed to determine compatibility, the data logged during engine shutdown must be excluded.
- At least 5 representative engines or 10 percent of each group of similar engines, whichever is larger, must be data logged. All engines in a group of 5 or fewer must be data-logged. Data from engines outside the group cannot be used to support retrofit of engines within the group. A group of engines is similar if:
    - All engines belong to the same common ownership fleet.
    - All engines have the same make and model.
    - All engines are certified to the same PM emissions standard.
    - The maximum power ratings of all engines fall within a range of 100 horsepower (e.g. all engines rated between 250 and 350 hp).
    - None of the engines have exhaust gas recirculation, or all of the engines have external exhaust gas recirculation, or all of the engines have internal exhaust gas recirculation.
    - All engines are installed in similar vehicles or equipment that perform a like function and have similar duty cycles.
    - The installer must keep a record of the data for the duration of the warranty period of the DECS and make the data available to the DECS manufacturer and ARB upon

request. The specific information that must be kept is specified in Section 2706(t)(3) of the Procedure.
    - Data logging completed prior to February 17, 2011 may be used provided it complies with the requirements of the DECS manufacturer.

Data Logging System Requirements

The exhaust temperatures must be measured and recorded using a stand-alone data logging system that is independent of the DECS that meets the following requirements:

- The recording accuracy must be within four degrees Celsius. The temperature sensor must have a range sufficient to accommodate the highest exhaust gas temperature measured plus 10 percent without exceeding the sensor's full scale rating while ensuring that 90 percent of the measured data are within 10 to 90 percent of the sensor's full scale rating.
- The memory of the data logging system must be of sufficient size that data are not overwritten prior to retrieval.
- All data must be recorded at a frequency of at least once every 5 seconds (0.2 Hertz).
- The data logging system must record the time and date for each data point.
- Data logging performed prior to February 17, 2011 must comply with the requirements of the DECS manufacturer.

3) All installations must strictly adhere to the requirements of the party that holds the verification for the diesel emissions control strategy, i.e., Nett Technologies, and **must not relocate the original equipment manufacturers exhaust system**:

- Over any occupied space (e.g., driver or passenger compartments); or
- That would result in any noncompliance with any applicable safety standards; or
- Any other location deemed unacceptable by Nett Technologies.

4) Any party that installs a diesel emission control strategy must offer a warranty pursuant to section 13 CCR § 2707(a)(2). See Section 2 of this manual for more details.

5) With respect to system labeling, pursuant to section 13 CCR § 2706(j), **the installer and end user must ensure that the DECS label is visible after installation**. In the event that the original strategy label is damaged, destroyed, or missing, Nett Technologies shall issue an ARB approved replacement. The end user must notify Nett Technologies in the event of a damaged, destroyed, or missing original strategy label. A sample label is shown below. Identical labels will be affixed on both the diesel emission strategy device and the engine.

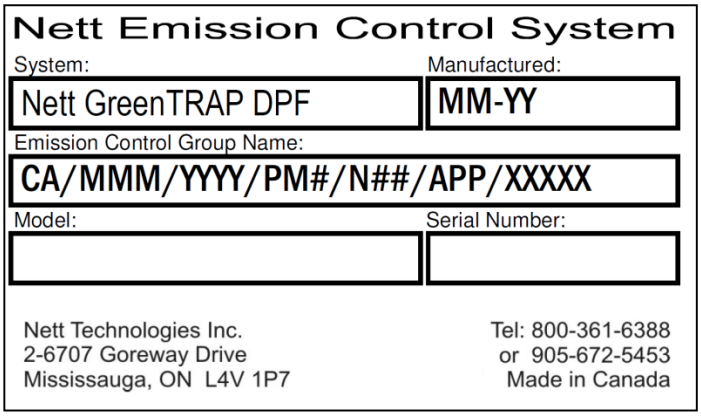


Figure 1: GreenTRAP™ Sample DECS Label

6) Proper engine maintenance is critical for the proper functioning of your diesel emission control strategy. **Failure to document proper engine maintenance by the installer and end user,** including oil consumption records, **may be grounds for denial of a warranty claim** for a failed component of a diesel emission control strategy. In addition, 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.

7) As an authorized installer, **you are required to track all Warranty Claims**. In addition, **you must report annually by March 1st to Nett Technologies and CARB an Installation Warranty Report** outlining all the installations of emission control technologies for the previous year, and any installation warranty claims for the previous year. See CARB memo ECAR-14-02 "Annual Reporting Format for Installers and Manufacturers of Diesel Emission Control Strategies" for more details (http://www.arb.ca.gov /msprog/mailouts/mouts_14.htm).

NOTE: This is a list of main requirements and obligations. For a full list of obligations, please see 13 CCR § 2700-2711. Consequences may arise if the installer does not comply with these regulations and has not gone through the certified training. In the case of failure, if the end user pursues a warranty claim, CARB will issue a Violation Notice and the party involved could be subject to fines and/or other penalties.

NOTE: The authorized installer/user must consult with, and obtain permission and instruction from Nett Technologies before removing the diesel emission control strategy from its original configuration and installing it on a different vehicle/equipment or swapping identical components in strategies that share the same strategy family name. Failure to do so will give Nett Technologies grounds for dismissal of the installer's authorization to install the diesel emission control strategy and deny Warranty coverage.

NOTE: Failure to comply with the above requirements and obligations will give Nett Technologies grounds to revoke the installer's authorization to install the diesel emission control strategy and deny Warranty coverage.

3.3 Main Reporting Documents

The following lists main reporting documentation requirements:

1) **Documents Installer must submit to Nett Technologies**:
   a. Pre-installation Compatibility Assessment for each installation (see Warranty Registration and Pre-installation Compatibility Assessment sections)
   b. Copy of the Commissioning Report
   c. Copy of Authorized Installer Annual Warranty Report submitted to CARB
2) **Documents Installer must submit to CARB**:
   a. Authorized Installer Annual Warranty Report by March 1 of each year (See CARB memo ECAR-14-02 "Annual Reporting Format for Installers and Manufacturers of Diesel Emission Control Strategies" for more details (http://www.arb.ca.gov/msprog/mailouts/mouts_14.htm).
3) **Documents Installer must submit to each equipment owner/End-user**:
   a. Pre-installation Compatibility Assessment (see Warranty Registration and Pre-installation Compatibility Assessment sections)
   b. A copy of the Warranty Registration form which includes the Pre-installation Compatibility Assessment section
   c. A copy of the Owner's Manual (Operation and Installation)

3.4 Pre-Installation Compatibility Assessment

3.4.1 General (Executive Order) Compatibility Requirements

The following checklist outlines the engine compatibility requirements as per the Executive Order (EO):

- ☐ The engine must be used in a stationary application associated with prime or emergency standby generators or pumps and rated greater than or equal to 50 hp
- ☐ The engine must be certified for use in California or certified by the US EPA and the engine must be in its original certified configuration
- ☐ The engine must be certified: 1) Tier 1, Tier 2 or Tier 3 with a rating at or above 50 hp; or 2) Tier 4i with a rated hp between 50-75 or over 750; or 3) Tier 4 Alt 20% NOx and PM, nonroad or stationary diesel engine, that meet the criteria listed herein
- ☐ The engine must be certified off-road engine meeting 0.2 g/bhp-hr diesel PM or less based on certification or in-use emissions testing (as tested on appropriate steady state certification cycle outlined in ARB off-road regulations - similar to ISO 8178 D2)
- ☐ The engine must be 4-stroke
- ☐ The engine can be turbocharged or naturally-aspired, mechanically or electronically controlled
- ☐ The engine must not employ exhaust gas recirculation (EGR)
- ☐ The engine must not have a pre-existing oxidation catalyst
- ☐ The engine must not have a pre-existing DPF
- ☐ The engine must not have a pre-existing SCR
- ☐ The product must not be operated with fuel additive(s), as defined in CCR, Title 13, Section 2701, unless explicitly verified for use with fuel additive(s)
- ☐ The product must not be used with any other systems or engine modifications without ARB and manufacturer approval

- ☐ The Manufacturer must review with the Installer/end-user the actual operation conditions (duty cycle, baseline emissions, exhaust temperature profiles and engine backpressure) and other pre-installation compatibility assessments (see the next section) prior to retrofitting the engine with the emission control system to ensure compatibility
- ☐ The engine must be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer
- ☐ The engine must operate at the load level required to achieve 400°C for a minimum of 30 minutes. Operation at lower temperatures is allowed, but only for a maximum of 300 consecutive minutes
- ☐ The fuel must be ULSD (less than or equal to 15ppm sulfur content) or biodiesel blend (biodiesel portion of the blend must comply with ASTM D6751, diesel portion with 13 CCR Sections 2281 and 2282 and the blend contains max. 20% biodiesel by volume)
- ☐ The filter has to be cleaned every 2000 hrs if ULSD is used
- ☐ The emission control strategy permits ten Cold Starts and ten 30 minute Idle Sessions before regeneration is required
- ☐ Any changes to the emission control device are not allowed without ARB approval
- ☐ The designated family name of the emission control strategy, **CA/NET/2009/PM3+/N00/ST/DPF01**, must be used in reference to this verification as part of the system labeling requirements. Labels attached to the system and the engine must be identical
- ☐ Proper engine maintenance is critical for the proper functioning of the diesel emission control strategy (DECS). The owner of the equipment on which the DECS is installed is strongly advised to adhere to al good engine maintenance practices. Failure to document proper engine maintenance, including keeping records of the engine oil consumption, may be grounds for denial of a warranty claim
- ☐ The terms and conditions of the EO must be satisfied regardless of where the system is sold in order for the system to be considered verified. Systems sold as verified, or which carry an ARB-approved label, must satisfy all the terms and conditions of the EO

3.4.2 Compatibility Requirements defined by Nett Technologies

Since the GreenTRAP™ 300 system is dependent on the exhaust temperature profile, the suitability of any candidate engine prior to retrofit requires exhaust temperature data logging.

The following list outlines the key technical aspects of a diesel retrofit candidate engine that must be checked prior to installation of a verified emission control device on a vehicle/equipment.

Table 2: Pre-installation check list

Engine Characteristics and Maintenance History	Yes	No
Do the candidate engine characteristics meet all terms and conditions of the verification letter (model year, engine family, engine configuration) for the retrofit device being considered?		
Does the candidate engine meet the exhaust gas temperature requirements for successful operation of the diesel emission control strategy?		
Does the diesel fuel used comply with terms and conditions of retrofit device verification letter (sulfur level, biodiesel specification, fuel additives)?		
Does the engine oil consumption rate exceed the limit given by the manufacturer?		
Is there a history of turbocharger replacements? More than two in past 3 years?		
Is there a history of fuel injector replacements? More than two in past 3 years?		
Is there a history of cylinder valve replacements? More than once in past 3 years?		
Visual Inspection	**Yes**	**No**
Are there any visual integrity problems in the exhaust system (exhaust leaks – manifold to tailpipe)?		
Are there any audible combustion problems?		
Is the intake air filter in good condition?		
Are there any indications of air intake system leaks (visible signs of leaks at seal connectors, visible cracks in the charge air cooler, audible turbo spooling problems, high tailpipe opacity)?		
Are there any visible signs of engine oil or diesel fuel present in exhaust system?		
Are there any visible signs of leaks from the turbocharger seals?		
Are there any visible signs of excessive crankcase vent tube emissions or dripping oil at the vent tube?		
Has the fuel pump and governor setting been tampered with?		
Does the Engine Control Module show any active error codes?		
Is there available space for the retrofit?		
Is the smoke level within the specification of the engine Tier level? Is it under 20%?***		
If any of the shaded boxes have been checked, the engine/vehicle fails the pre-assessment and should not be retrofit without further consultation with the diesel retrofit device manufacturer.		

***As a general rule of thumb, a Smoke Opacity test must be performed if black smoke is emitted at any time from the smoke stack during normal engine operation. The smoke test must be performed according to the SAE J1667 Standard. Please see http://www.arb.ca. gov/enf/hdvip/saej1667.pdf for more information. A list of Smoke Test Facilities recommended by CARB can be found in http://www.arb.ca.gov/enf/hdvip/smoketestlist.pdf.

3.5 Useful Reference Publications

The following is a list of reference publications from the ARB website. We encourage you to visit this site regularly for relevant updates.

1) MSC 11-11 – Pre-Installation Compatibility Assessment Requirements

   http://www.arb.ca.gov/msprog/mailouts/mouts_11.htm.

2) MSO 13-06 – Authorized DECS Installers, Pre-installation Compatibility Assessment and Training Requirements

http://www.arb.ca.gov/msprog/mailouts/mouts_13.htm.

3) MSO 13-07 – Installation and Maintenance of your DECS

http://www.arb.ca.gov/msprog/mailouts/mouts_13.htm.

4) ECAR 14-02 – Annual Warranty Report Format for Installers and Manufacturers of DECS

http://www.arb.ca.gov/msprog/mailouts/mouts_14.htm.

4 Introduction

Diesel particulate matter (PM) is a major exhaust emission component contributing to human health risk. Diesel particulate matter, as defined by the EPA regulations and sampling procedures, is a complex aggregate of solid and liquid material. Its origin is carbonaceous particles generated in the engine cylinder during combustion. The primary carbon particles form larger agglomerates and combine with several other, both organic and inorganic, components of diesel exhaust. Diesel particulates are very fine. The primary (nuclei) carbon particles have a diameter of 0.01 - 0.08 micron, while the agglomerated particles diameter is in the 0.08 to 1 micron range. As such, diesel particulate matter is almost totally respirable and has a significant health impact on humans. It has been classified by several government agencies as either "human carcinogen" or "probable human carcinogen". It is also known to increase the risk of heart and respiratory diseases.

Carbon monoxide (CO) and hydrocarbons (HC) are also emitted from the exhaust as the result of incomplete combustion of fuel or engine oil lube. CO can accumulate in the ambient atmosphere and cause headaches, dizziness and lethargy. HC can cause eye irritation and choking sensations. HC are also major contributors to the characteristic diesel smell and have a negative environmental effect, being an important component of smog.

Nett Technologies designed the GreenTRAP™ 300 DPF to effectively control PM emissions for prime and emergency standby stationary generators and pumps. In addition, due to the presence of catalyst coating, reductions in CO and HC emissions are also observed in the filter. In steady state operation the DPF provides the following reductions: CO = 98%, HC = 82%, and PM greater than 85% (85-99%). It also completely eliminates black smoke.

5 Passive DPF

5.1 What is a Passive DPF and How Does it Work?

The GreenTRAP™ Passive DPF's utilize ceramic (cordierite) wall-flow monoliths which physically capture the PM/soot emitted by the diesel engine. The cylindrical filter element of the device consists of many square parallel channels running in axial direction, separated by thin porous walls. A proprietary catalyst is wash-coated on the inner surfaces of the monolith channels. The catalyst lowers the PM (soot) oxidation temperature allowing filter to passively regenerate at lower temperatures. When the exhaust temperature is above 400 °C for more than 25% of the engine operating time, the DPF is passively regenerated. For the GreenTRAP™ 300 DPF, a typical regeneration event lasts between 30-90 minutes and occurs every 4-5 hours of engine operating time, depending on the engine and operating conditions.

5.2 Compatibility with Engine and Safety

5.2.1 Effect on Engine Backpressure

There is a relationship between the exhaust gas temperature and the filter pressure drop. Applications with higher exhaust temperatures regenerate better, accumulate less soot in the filter, and experience lower pressure drop. Nonetheless, the GreenTRAP™ 300 DPF is designed to add less than 30-40 in H_2O of exhaust back pressure at full load and 20 in H_2O at 50%. This level is within typical gen-set guidance.

5.2.2 Additional Load on the Engine

The GreenTRAP™ 300 DPF adds no additional load on the engine.

5.2.3 Effect on Fuel Consumption

The GreenTRAP™ 300 DPF has no effect on fuel consumption.

5.2.4 Engine oil Consumption Considerations

Excessive oil consumption might be a source of deactivation of the catalysts. It is not acceptable to burn crankcase oil or use crankcase oil burning systems. The engine should be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.

5.2.5 Discussion of Potential Safety Issues

Uncontrolled regeneration, although not desired, may occur when the PM load on the filter is excessive. This could happen if the DPF is not used in accordance with the conditions as set out in the Executive Order (See Section 3.4) or if the engine is not maintained properly and the warning messages from the Monitoring/Alarm system are ignored (see Monitoring System Section). In extreme cases, it may damage the filter by creating localized melting and/or cracking of the DPF core. This scenario is however unlikely to cause a safety incident.

If the engine is not maintained properly, the regeneration frequency may increase due to increased PM emissions from the engine. The regeneration frequency can also increase if scheduled maintenance for the GreenTRAP™ 300 DPF (DPF cleaning) is ignored (see the Maintenance section of this manual).

5.3 Passive DPF System Components

The major components of the GreenTRAP™ 300 DPF system including a full list of DPF filter models as are listed below.

Table 3: GreenTRAP™ 300 DPF Major System Components

Item	Description	Part Number	Quantity
1	Diesel Particulate Filter (DPF)	See Below for Model Numbers	1
2	PTLOG™ (see Monitoring System Section)	PT-00150-KT-PTLOG-00010 or PT-00270-KT-PTLOG-00060	1
3	Gaskets*	Call Nett	2
4	Clamps*	Call Nett	2

*Not covered under warranty.

Table 4: GreenTRAP™ 300 DPF Filter Model Numbers and Dimensions

Diameter (in.) x Length (in.)	Volume (L)	Model Numbers
5.66 x 6.00	2.47	SA502
7.50 x 8.00	5.79	SA705
7.50 x 12.00	8.69	SA709
9.00 x 12.00	12.5	SA913
10.50 x 12.00	17.0	SA1017
11.25 x 12.00	19.5	SA1120
11.25 x 14.00	22.8	SA1123
12.00 x 12.00	22.2	SA1222
12.00 x 15.00	27.8	SA1228
15.00 x 15.00	43.4	SA1543
20.00 x 15.00	77.2	SA2077
Square Side (in.) x Length (in.)	**Volume (L)**	**Model Numbers**
5.91 x 10	5.72	Call Nett
11.82 x 10 (filters only)	22.9	4-in-1(4 filters in one SS housing – Call Nett)

6 Nett GreenTRAP™ On-board Monitoring and Alarm System

6.1 PTLOG™ 150 Exhaust Backpressure Monitor & Alarm

6.1.1 PTLOG™ 150 System Overview

The Nett PTLOG™150 engine exhaust backpressure monitor and alarm system (see figure below) continuously checks the exhaust back-pressure level of vehicles equipped with a Nett diesel particulate filter. If the engine back-pressure exceeds the PTLOG™150's pre-set levels, yellow and red LEDs will light-up to warn the operator. The monitor also has relay triggers to operate additional relay-controlled indicator lights, audible alarms or other devices if the yellow or red LEDs illuminate.

Figure 2: PTLOG™ 150 Monitoring & Alarm System

An ignition switched +12V or +24V power source is required for the PTLOG™150 electronic control module. For more information, please see the GreenTRAP™ 300 Installation Manual.

6.1.2 PTLOG™ 150 System Components

The components included in the PTLOG™150 kit are listed in the following table:

Table 5: PTLOG™ 150 Items List

Item	Description	Part Number	Quantity
1	Technical Manual, PTLOG150		1
2	Control module, PTLOG150	119038	1
3	Wiring harness, PTLOG150	119039	1
4	Compression tube fitting, Adapter, 1/4" tube x1/8"NPT(M), brass	119029	1
5	Compression tube fitting, Adapter, 1/4" tube x1/8"NPT(F), brass	119035	1
6	3/16" hose to 1/8" NPT barbed hose fitting	119589	1
7	ø1/4" O.D. x 2' copper tube, PTLOG150	119040	1
8	Ø3/16" x 4" rubber hose, PTLOG150	119041	1
9	Water separator, assembly (optional), PTLOG150	119413	Call Nett

For more information, please see the GreenTRAP™ 300 Installation Manual.

6.1.3 PTLOG™ 150 System Operation and Troubleshooting

As explained before, the Nett PTLOG™150 backpressure monitor continuously measures the exhaust back-pressure level. If the engine back-pressure exceeds the pre-set levels, yellow and red LEDs will light-up to warn the operator. The engine exhaust pressure of a vehicle with a DPF installed will increase based on the amount of soot (particulates) trapped in the filter. The PTLOG™150's yellow and red LED's tell the operator the DPF is not regenerating properly and that the vehicle must be taken to a repair facility to have the filter serviced.

Yellow LED (Warning) - The Yellow LED is the first light to come on if exhaust temperatures are too low for proper filter regeneration. The yellow LED illuminates whenever the exhaust backpressure exceeds the pre-set "yellow level". If the yellow LED illuminates frequently, the vehicle should then be taken, at the next available opportunity, to a repair facility where the DPF can be serviced.

Red LED (Service) - The Red LED is the second light to come on under low exhaust temperature conditions. The Red LED illuminates when the backpressure exceeds the pre-set "red level" (20 "H_2O above the "yellow level") constantly for at least 20 seconds indicating an over-pressure condition. The vehicle must be taken immediately to a repair facility for filter service. Due to the soot load in the filter and the resulting high backpressure, drivability problems or filter damage may occur. As a result, it is recommended that the vehicle be towed or driven at a low speed to the repair facility.

WARNING! – Continuing to drive the vehicle while experiencing an over-pressure condition may cause serious structural damage to the filter.

The red LED remains on until the engine/system is turned off and back on again. The table below summarizes the LED conditions.

Table 6: PTLOG™ 150 LED Conditions

LED	Status	Description	Troubleshooting Tips
All	OFF	• Ignition is OFF	N/A (Normal)
Green	ON	• Ignition switch is ON and the PTLOG is ready • Backpressure currently below pre-set “yellow level” • Backpressure has not exceeded the pre-set “red level” for more than 20 seconds since the engine was started	N/A (Normal)
Yellow	ON	• The exhaust backpressure is currently exceeding the pre-set “yellow level” • If the pressure drops below the “yellow level", the LED will turn off • Backpressure has not yet exceeded the pre-set “red level” for more than 20 seconds since the engine was started	• DPF is becoming plugged by accumulated soot • Occasional illumination of the yellow LED may not be cause for alarm if it happens infrequently • Filter maintenance recommended
Red	ON	• Backpressure has exceeded the pre-set “red level” for more than 20 seconds since the engine was started • Red LED can be reset to OFF by turning ignition switch off and back on	• DPF is plugged by accumulated soot • Filter maintenance required immediately – reduce exhaust backpressure by reducing speed and/or load or by turning off engine

6.2 PTLOG™ 270 DPF Exhaust Backpressure & Temperature Monitor, Alarm & Logger System

6.2.1 PTLOG™ 270 DPF System Description and Features

The Nett PTLOG™ 270 DPF system is an engine exhaust backpressure and diesel particulate filter monitor, alarm and data logging device. It is a valuable tool to alert operators and passive DPF users to plugging problems and providing a method to diagnose errors and faults through logged data and error codes.

The core of the PTLOG™270 DPF is a 4.3” (109mm) backlit, daylight visible, color TFT LCD screen with integrated controller using the CAN J1939 standard communication protocol.

The PTLOG™270 DPF depicted in the figure below is capable of logging the DPF inlet, outlet temperatures and backpressure sensor. The system is also able to connect to the engine CAN network (if available) to record engine parameters in order to determine the DPF status under all operating conditions.

Figure 3: PTLOG™ 270 DPF Monitoring, Alarm and Logger System

The PTLOG™ 270 DPF is programmed to provide monitoring of DPF performance at all engine dynamic operating conditions. The display will provide information to the operator to schedule DPF cleaning ahead of critical failures to avoid unscheduled machine downtime. All warning and alarm messages are logged with date and time stamp.

The logging unit has 128 Mb (Megabytes) of memory sufficient to log operating and error messages every 5 sec for more than 750 operation hours. The data is easily downloadable via the USB Download Kit part number PT-00270-01-USBDK-00010 (supplied separately) onto a USB memory stick following the simple on screen instructions.

For more information, please see the GreenTRAP™ 300 Installation Manual.

6.2.2 PTLOG™ 270 DPF System Components

The components included in the PTLOG™ 270 DPF kit are listed in the following table:

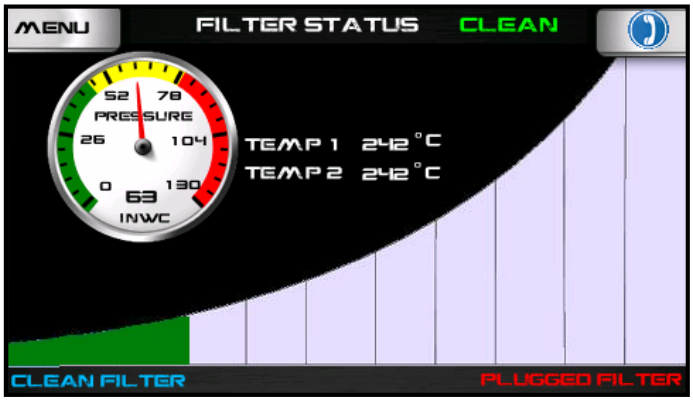
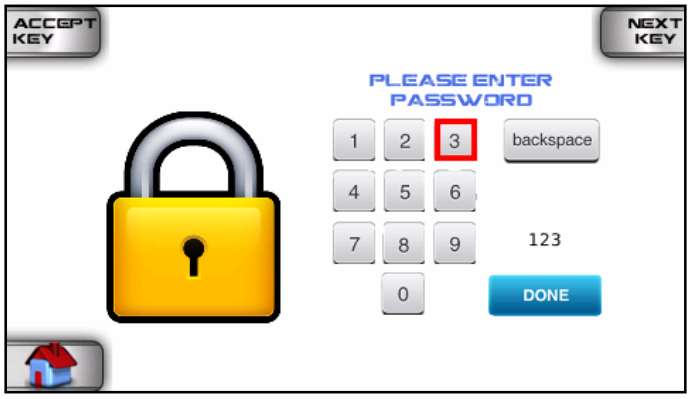
Table 7: PTLOG™ 270 DPF Items List

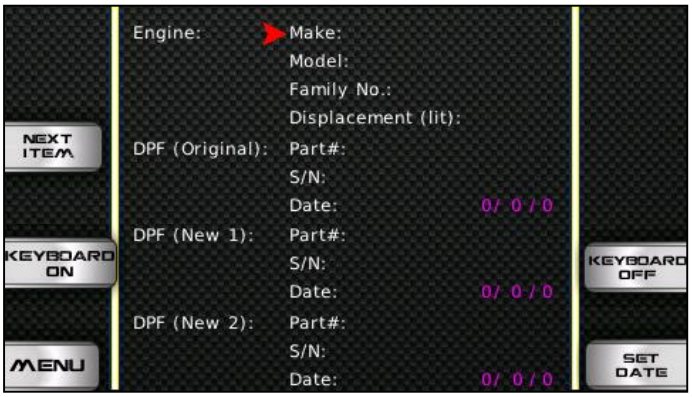
Item	Description	Part Number	Quantity
1	Logger Display, PTLOG	116005	1
2a	PT270DPF wiring harness-logger to disconnect	115991	1
2b	PT270DPF wiring harness-disconnect to sensors	116010	1
2c	Harness extension, 5 feet long	116006	1
3	Pressure sensor	111149	1
4	CAN Bus thermocouples	115985	1
5	5VDC sensor power supply	115986	1
6	USB utility cable set	115987	1
7	2 AMP ATC fuse	115993	1
8	Pressure line (rubber to stainless tube)	116002	1
9	1/4" NPT to 1/4" tube fitting	115647	1
10	Micro 4 gear clamp	116003	1
11	RAM display mount	115988	1
12	Deutsch connector plugged	116007	2
13	USB memory stick, 2Gb	116008	1
14	Dual Digital Output Kit	117577	1

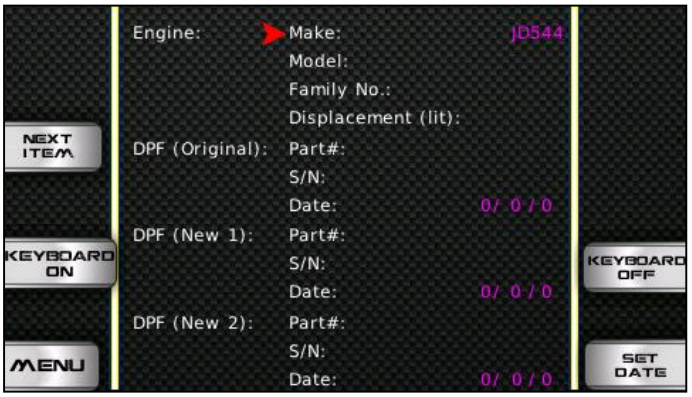
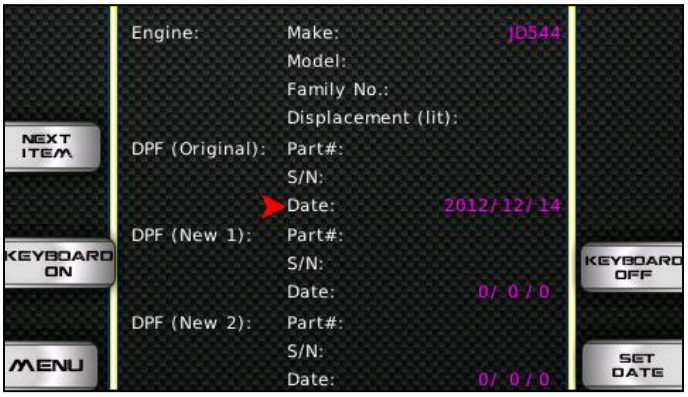
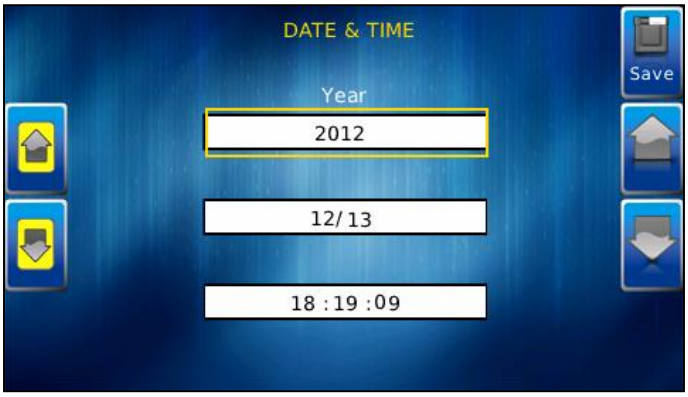
For more information, please see the GreenTRAP™ 300 Installation Manual.

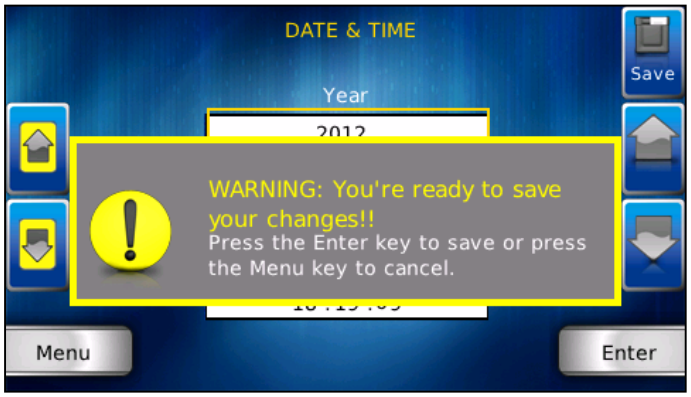
6.2.3 PTLOG™ 270 DPF System Operation

6.2.3.1 Initial System Setup

Screen	Description
	When the equipment ignition is turned on for the first time the start up screen appears.
	After several seconds, the main screen will appear indicating the DPF status.
	Press the “Menu” button to get to the password screen and access to the setup screen: • In the password screen, the numeric keyboard can be controlled using the “NEXT KEY” and “ACCEPT KEY” buttons. • Press the “NEXT KEY” button to advance the empty red square to the desired number. Press the ‘ACCEEPT KEY’ to make the selection. • The typed password (eg. 123 shown here) can be reviewed as shown in the figure. • After typing the password, the empty red square should be moved to the “DONE” key and the “ACCEPT KEY” selected. If the password is correct, the operator will be directed to the “Service Menu” page; otherwise the typed password is cleared and the operator should enter the password again.

Screen	Description
	In the “Service Menu” screen, the operator can interface with the system and perform/locate the following setup/options: • Find Part #, S/N and Kit # • Set the Date & Time • New & Replacement DPF Log Book • Downloading the data • Nett Technologies settings • Nett Technologies contact information • Filter cleaning logging
 	For the initial logger setup, press the “New Filter” button to get to the “New Filter” data screen: • Press “Next Item” button; bring down the red arrow to the next item that the operator wants to change. • The “Keyboard ON” and “Keyboard OFF” buttons turn the alpha numerical keyboard on and off. • When the keyboard is turned on, another three buttons of “Next Key”, “Previous Key” and “Accept Key” will appear on the display. • The “Next Key” and “Previous Key” buttons change the selected key highlighted with the blue empty square to the next or previous one while the “Accept Key” picks the selected number or letter and enters it into the information string. “Selecting the “backspace” key on the keyboard will delete the last entered letter or number from the string.
	• Type the required information (ex: JD544) which can be reviewed below the space key of the keyboard • When finished, move the blue empty square to the “DONE” key on the keyboard. By pressing the “Accept Key” button, the typed information will be transferred into the blank space in front of the item selected by the red arrow. • At this time the keyboard along with three buttons of “Accept Key”, “Next Key” and “Previous Key” are no longer shown.

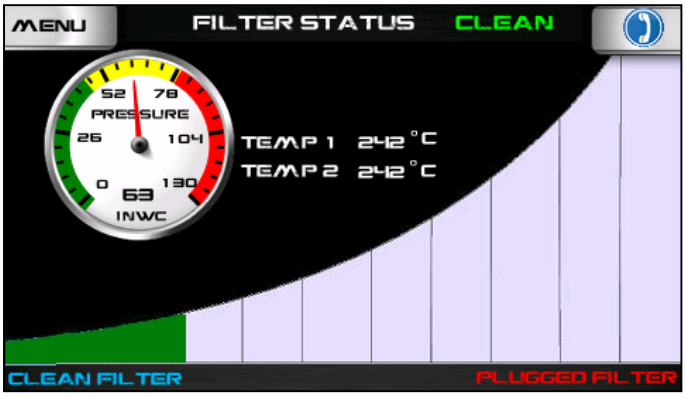
Screen	Description
	• A similar procedure should be repeated to fill the rest of the form if required. • In order to set the date for a new DPF installation, the “Set Date” button can be used instead of the keyboard and the default date is automatically replaced with the current date.
	• After the initial installation, this screen should be revisited only if the filter is replaced or if the system is installed on a different engine. • By pressing the “MENU” button, the operator can leave this page and go to the “SERVICE MENU” page. • Another setting which should be performed is the Time & Date setting. • To do this, press the time and date button at the bottom right hand corner of the “Service Menu” page. The ”Service Menu” page is replaced with the “Date & Time” page as shown below.
	• Setting of the Year, Month, Day, Hour, Minute and Second can be done using the up and down buttons on the left side of the display. • The value of the selected date and time parameter can be changed using the up and down buttons located on the right side of the display. • After setting the current date and time, the save button on the upper right corner of the display must be pressed. • A message will appear requesting confirmation. • Pressing “Menu” will allow the operator to modify the date and time setting again. Pressing the “Enter” button will save the set date and time and reboot the display.

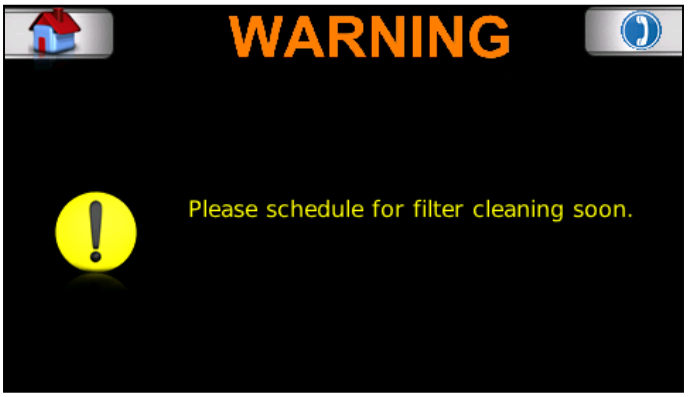
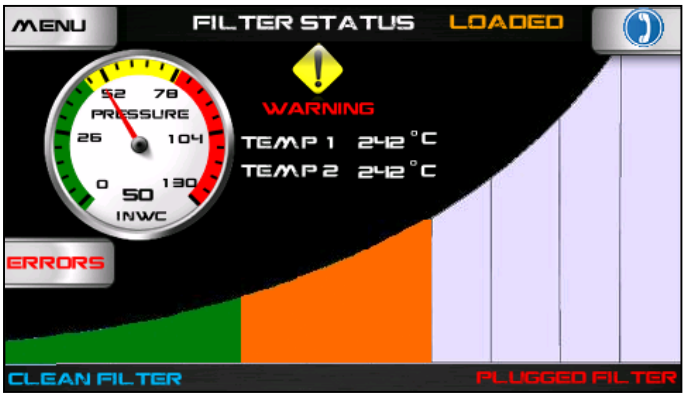
Screen	Description
	• Press “Enter” to save the settings. The PTLOG™270 now ready to use and is in operation mode.

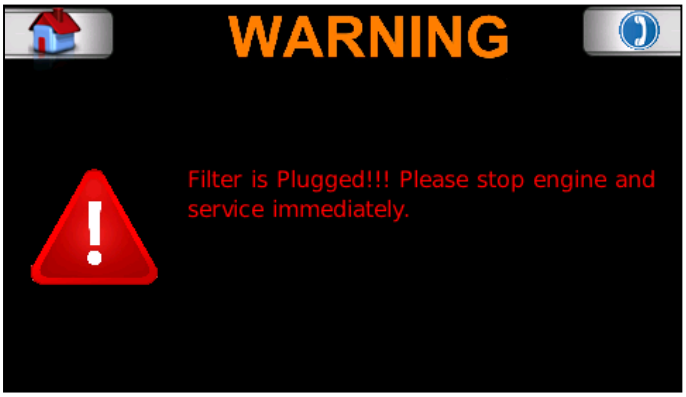
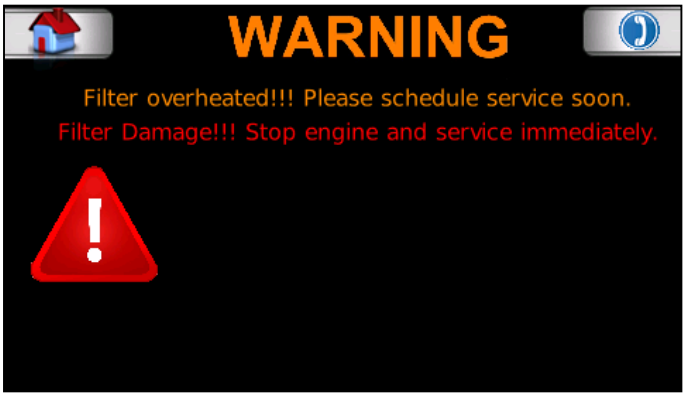
6.2.3.2 Operation & Monitoring

The PTLOG™270 continuously monitors the engine backpressure, particulate filter loading and the outlet temperature. The systems logs the filter upstream (T_1), downstream (T_2) temperatures, exhaust backpressure in inches of water column (WC) and any errors or warnings that occur during operation. To monitor the temperature, a pair of CAN-based thermocouples is used. To monitor the backpressure, an analog pressure sensor is used.

DPF Operation Monitoring

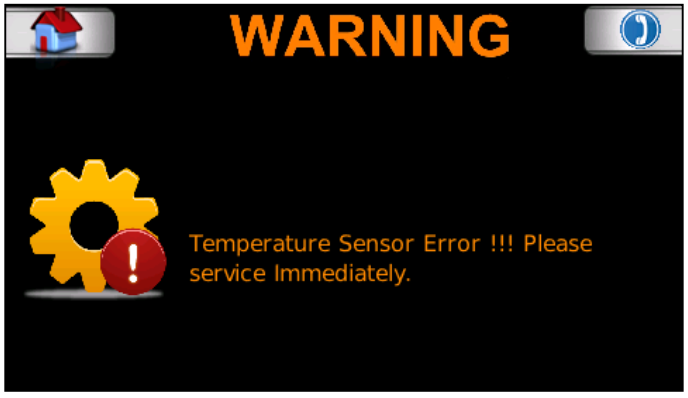
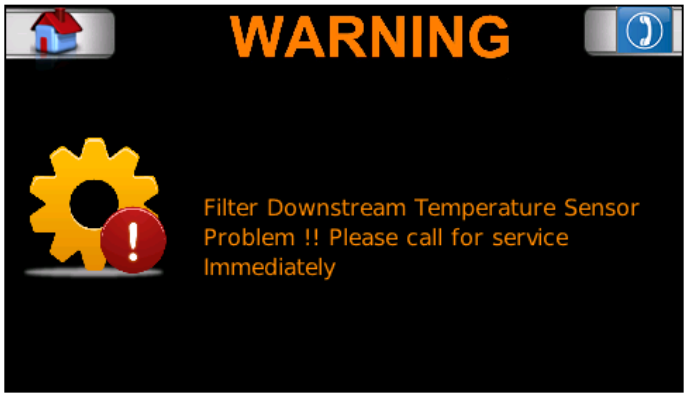
Screen	Description
	The filter is operating in the “green” zone and is within the acceptable backpressure range. It also denotes no errors in the system.

Screen	Description
	When the filter soot level reaches a certain point, a “WARNING” message will flash. The operator is requested to schedule filter cleaning. Please refer to your DPF supplier’s cleaning procedure. Press the home button to go back to the main screen.
	Pressing the home button will take you to the normal view for a period of 30 minutes. After that time the message will reappear. By pressing the phone button, the manufacturer contact information will be displayed.
	The operator can always return to the error view by pressing the “ERRORS” button on the HOME screen. If the filter cleaning is not performed, the filter loading continues until the following message appears.

Screen	Description
	When this screen appears, the operator should stop the engine as soon as possible and call for immediate service. Running the engine in this condition may lead to uncontrolled DPF regeneration which could result in a catastrophic filter failure or may damage the engine due to excessive exhaust backpressure. Please refer to the Maintenance section of this manual for the DPF servicing procedure. The operator can return to the normal view by pressing home button but the message will reappear after two minutes.
	If during operation, due to abnormally high exhaust temperature (above 560°C), the filter goes into an uncontrolled regeneration situation, the filter could be overheated (and reach temperatures above 800°C). This event is detected by PTLOG™270 and the operator is warned with the indicated message.
	If the number of uncontrolled regenerations occurs excessively, this warning screen will be displayed.

System Components and Sensors

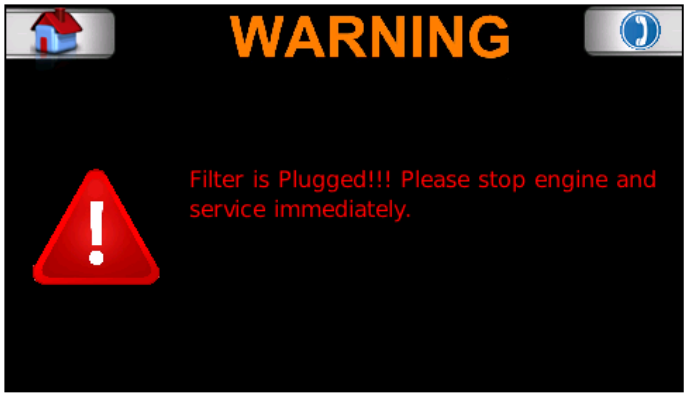
The PTLOG™ 270 is also responsible for monitoring the kit sensors, the CAN bus and wiring harness. If the CAN bus has a problem, the following message will appear.

Screen	Description
 	If any of the exhaust thermocouples read values outside the measurement range (<- 50 °C to >900°C), these warning messages will be displayed.
	If the signal from the pressure sensor is out of range, this warning message is displayed.

6.2.3.3 Troubleshooting

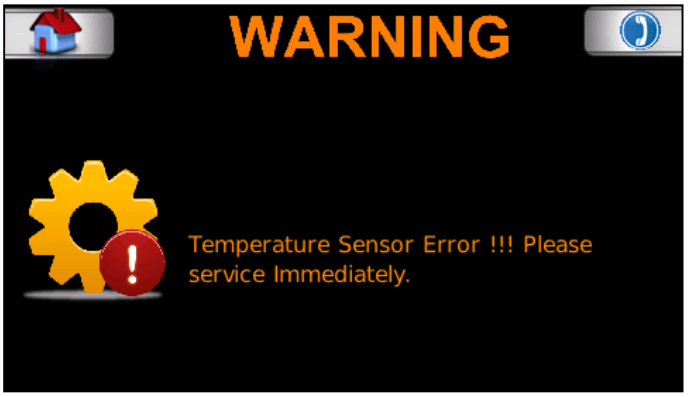
DPF Troubleshooting

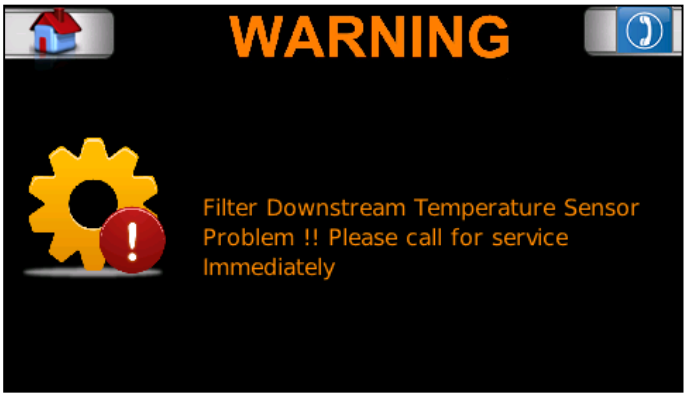
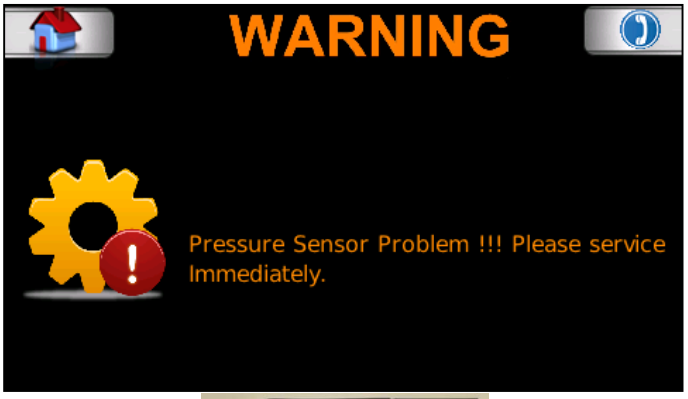
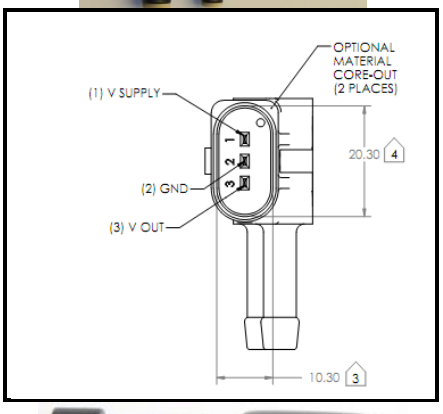
The following procedures are recommended in case any of the error/warning messages described in the previous section pop up.

Screen	Description
	**Loaded DPF Warning Message** If this warning occurs a few months (up to 300 engine hours) after filter installation, please contact Nett Technologies Inc. You will be requested to download the logged data and send it for analysis and investigation. If this warning occurs after 300 hours of DPF operation, schedule the filter for cleaning as soon as possible. For filter cleaning, please refer to the Maintenance section of this manual, which is usually provided by the DPF manufacturer. After DPF cleaning, the operator must go to the “Service Menu” and press the “FILTER CLEANED” button. Press the “DPF WAS JUST CLEANED” button. This will log the DPF cleaning date and also reset all of the errors and alarms.
	**Plugged DPF Warning Message** This warning occurs if the loaded DPF warning is ignored for a set time. If this warning appears, the operator should stop the engine as soon as possible (within an hour) and schedule a DPF service. For DPF servicing, please consult the DPF manufacturer/distributer. If the DPF is cleaned, the “DPF WAS JUST CLEANED” button should be pressed.
	**Overheated filter warning message** This message appears when the DPF downstream temperature (T2) exceeds 800°C. This is an indication that an uncontrolled regeneration occurred. Check the DPF filter outlet for any sign of discoloration, melting or soot traces (soot that has passed through the DPF). If soot traces are observed, the DPF must be cleaned or replaced according to the DPF manufacturer guidelines.

Screen	Description
	If the DPF is replaced, the operator must enter the new DPF information as per procedure described in the “Initial Setup” section.
	**Damaged filter warning message** This warning appears if multiple occurrences of overheating are detected over time. If this message appears, there is a high possibility of DPF failure. The engine should be stopped as soon as possible. Check the DPF filter outlet for any sign of discoloration, melting or soot traces (soot that has passed through the DPF). If soot traces are observed, the DPF must be cleaned or replaced according to the DPF manufacturer guidelines.

PTLOG™270DPF Components Diagnosis

Screen	Description
	**CAN-bus Error Message** The signals for CAN-based thermocouples are not being received. • Make sure that all the connectors on the display are properly connected. • Check that the thermocouple connectors are not loose. • Check the resistance between CAN-H and CAN-L wires which are connected to pins 2 and 3 of the wiring harness connector connected to plug B of the display. This should be done with the thermocouple connector unplugged from the harness connector. The resistance should be around 120 ohm. • If the resistance is >120 ohm, check the continuity of CAN-H and CAN-L wires from the thermocouples to the display. If there is no problem with wire continuity, a 120 ohm resistance must be placed somewhere in the harness between CAN-H and CAN-L wires and the system must be tested once again after reconnecting the unplugged connectors.

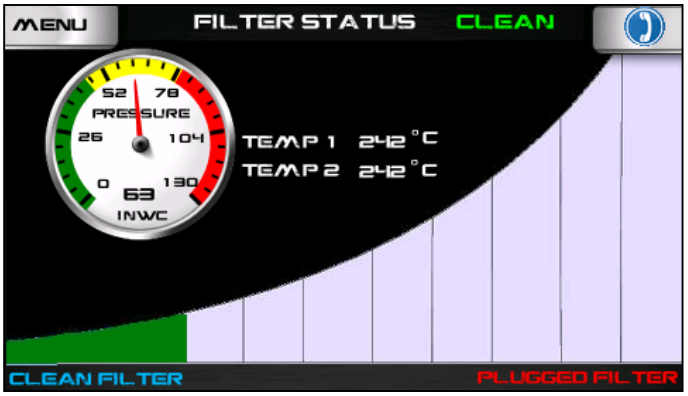
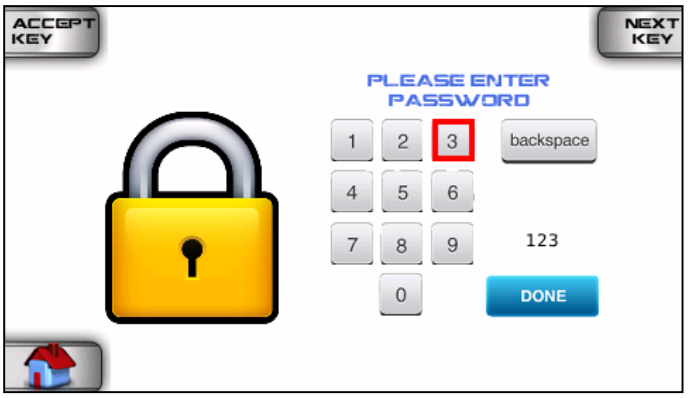
Screen	Description
	• The CAN-based thermocouple has failed and must be replaced.
	**Thermocouple Error Message** 1. Check thermocouple connections. 2. Replace thermocouple. 3. If replacement of the thermocouple doesn't correct the problem, please contact Nett Technologies Inc. for further assistance.
   	**Pressure Sensor Error Message** 1. Unplug the sensor from the harness. 2. Measure the voltage between pins 1 and 2. 3. If the voltage is not within 5±0.05 V, then check the voltage regulator. 4. The voltage regulator connector (three pin connector) must be unplugged. The voltage between pins 1 and 2 should be between 10 and 32 V. 5. If this check passes, the voltage between pins 1 and 3 must be measured. If the voltage is within 5±0.05 V, then the harness is defected; otherwise, the voltage regulator is defected. 6. Check that the voltage at the pressure sensor connector is within 5±0.05 V. 7. Check continuity of the pressure signal wire by measuring between pin 3 of the pressure sensor connector and pin 5 of plug C of the display. If there is no continuity, replace the harness. 8. If the harness has continuity, replaced the pressure sensor. 9. If changing the pressure sensor does not solve the problem, please contact Nett Technologies Inc. for further assistance.

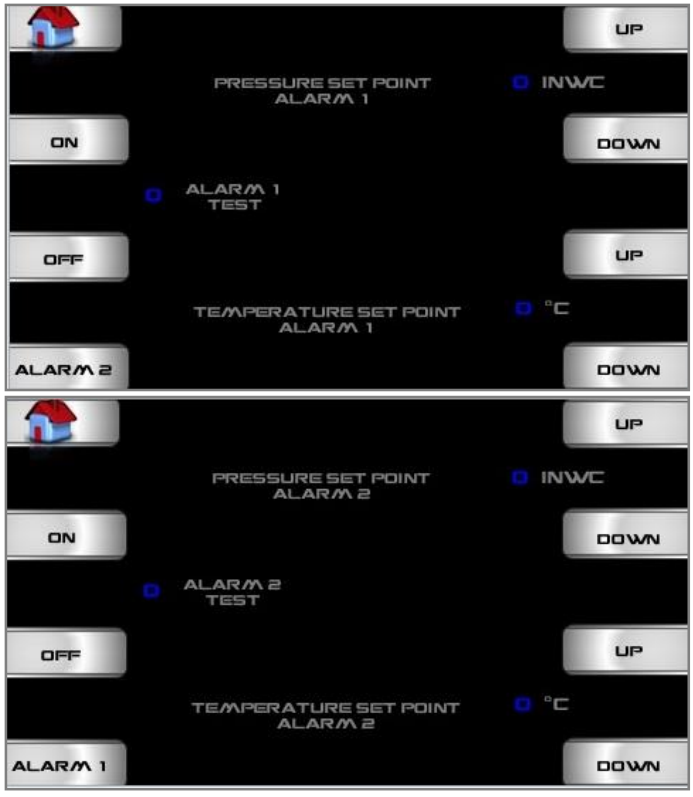
6.2.3.4 Dual Digital Output Kit

In addition to the alarm connection on the back of the PTLOG270 display which is being triggered in case of sensor problem or system failure, the dual digital output kit (call Nett for details) also provides two additional digital outputs (ON/OFF switch) which can be triggered through temperature and pressure set points adjustable by the user.

These digital outputs can be configured and used in order to alert the operator regarding the system critical condition (high pressure or temperature). The operator can then proceed with DPF cleaning or running the load bank on the system to passively regenerate the DPF and to avoid system failure.

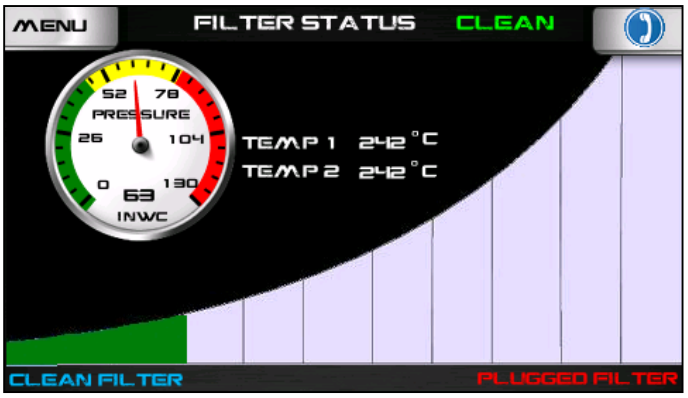
To configure the digital outputs, follow the steps below.

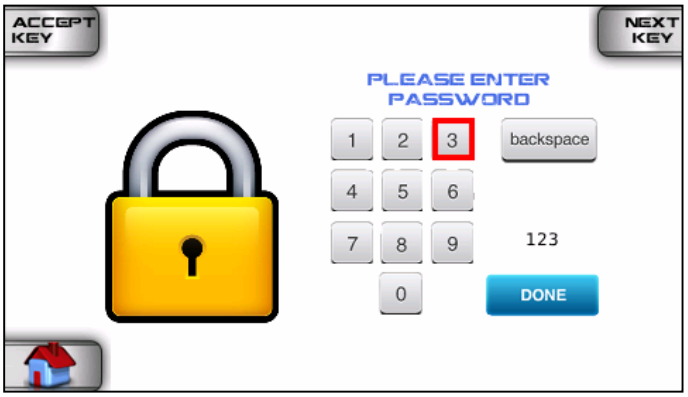
Screen	Description
	Press the “MENU” button on the upper left corner of the display while it is in the normal view.
	Enter the password for the “Setup Menu” page.
	In the “SETUP MENU” page, press on the “ALARM SET POINTS” button on the upper right corner of the display. This will direct the operator to the dual digital output set points page.

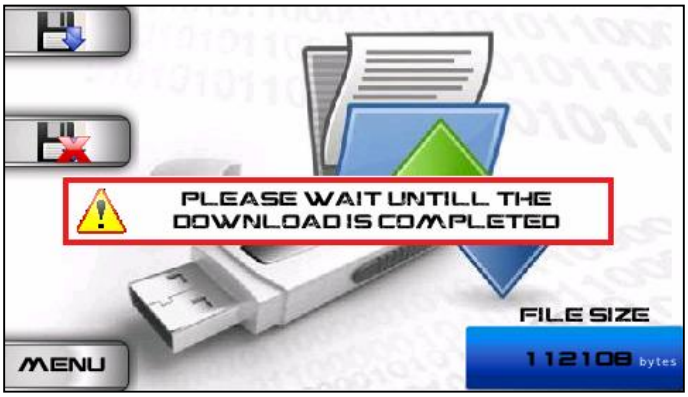
Screen	Description
	In the set points page, use the key on the bottom left corner of the display to switch between the two outputs. The operator can increase or decrease the pressure and temperature set points for each output using the up and down buttons respectively. The operator can also manually test the alarm outputs by turning the alarm ON/OFF on the left side of the screen. After adjusting the set points for each output, use the home button to return to the setup page.

6.2.3.5 Data Downloading

To download logged data, follow the steps below.

Screen	Description
	Press the “MENU” button on the upper left corner of the display while it is in the normal view.

Screen	Description
	Enter the password for the “Setup Menu” page.
	In the “SETUP MENU” page, press the download button on the upper left corner of the display. This will direct the operator to the download page.
 	In the download page, press the download button on the upper left corner of the display. The operator will be asked to ensure the USB flash memory stick is connected to the USB Harness KIT.

Screen	Description
	Answering “YES” will start the download procedure. You should wait until the download is complete before removing the USB data stick.
	After the download is completed, the following message is displayed on the bottom of the screen. You can return to the “SETUP MENU” page by pressing the button on the lower left corner of the display.
	If there is a problem with the data download, the following message will appear and the download procedure should be repeated. If the operator cannot download the data contact Nett Technologies for technical assistance.

7 Maintenance Requirements for GreenTRAP™ 300 DPF

As the equipment owner, you are responsible for performing the required maintenance described below on your Nett GreenTRAP™ 300 DPF. Nett Technologies recommends that you retain all maintenance records and receipts of maintenance expenses and urea purchases. If you do not keep your receipts or fail to perform recommended scheduled maintenance as listed below, Nett Technologies may have grounds to deny warranty coverage.

Table 8: Maintenance Requirements for GreenTRAP™ 300 DPF

Service Times	Action Required
Daily (while in operation)	• Observe the alarm/monitoring system for elevated backpressure (and temperature) • See Monitoring and Alarm System Operation section for recommended action
Every 2000 hrs	• Remove and inspect DPF outlet for any sign of soot • Perform DPF ash cleaning • Replace gaskets

Diesel particulate filters remove particulate matter and inorganic ash from the engine exhaust system. During this process the filter collects this material until the required heat is sufficient to burn the accumulated particulate matter. In normal operating conditions, the engine exhaust will have a small degree of inorganic ash from engine oil and lubricants. This ash will not burn away and instead begins to slowly accumulate in the filter. The filter needs to be routinely cleaned to remove ash, as shown in the above table.

NOTE: The DPF substrate is warranted for the full term as specified in Section 1 but requires ash cleaning every 2000 hrs and the service required to perform the cleaning is not covered under the warranty.

7.1 DPF Cleaning

To perform cleaning wear gloves, mask, and safety glasses. It is recommended that filter cleaning be performed by an authorized filter cleaning center (found at www.fsxinc.com); however, the end user may choose to carry out the cleaning in which case care should be taken not to damage the filter in the cleaning process. Allow the filter to cool for 60 minutes before cleaning and follow the procedure outlined below. Refer to your installation manual for instructions on removal of DPF core.

NOTE: Any damage caused by i) incorrectly performed cleaning or maintenance or ii) use of unapproved cleaning methods, other than those specified below, will void the filter warranty.

The following steps should be followed to clean the DPF:

(1) Remove the DPF from the engine/equipment (a filter weight before cleaning may be determined at this point but is not necessary).

(2) Before cleaning inspect the inlet (dirty side) and outlet (clean side) of the DPF and record the color of both surfaces. This step provides some indication if the filter is intact.

(3) Measurement of DPF pressure drop can be performed.

(4) Remove ash with a combination of pressurized dry air gun (e.g., 50-80 psi) on the clean side of the filter or with an industrial vacuum device [equipped with a HEPA (high-efficiency particulate air) or ULPA (ultra-low penetration air) filter] on the filter's dirty side that includes provisions for collecting the ash. This pressurized air/vacuum treatment should direct the pressurized air flow across all channels on the filters to make sure each channel is cleaned of ash. Total time for air cleaning will depend on the size of the filter but is typically 30-50 minutes. Cleaning can also be performed by a suitable subcontractor using a commercially available product such as the FSX TrapBlaster Air Knife Scanning Technology (www.fsxinc. com).

(5) Inspect the cleaned DPF by comparing pin gauge cell depths of both the clean and dirty side. A measurement of the DPF pressure drop can also be taken and should be in the range of 2.0-2.5 in H_2O. If the cell depths are not the same or the pressure drop measurement is out of range, go to step (6) as this may be an indication that soot is still present in the DPF.

(6) Perform thermal regeneration (oven cleaning) on the DPF by slowly ramping up the temperature to 550-600°C, holding it for a period of 3-4 hours, followed by a slow cool down process. Repeat steps (4) and (5) to remove the ash and confirm the DPF is clean.

Warning: Oven cleaning, when performed with overloaded filters and in ovens with high air circulation, might damage the filter and is not recommended for inexperienced users.

(7) Re-install the DPF on the engine/equipment using new gaskets. Since the DPF design is unidirectional, it prevents the system to be installed in the reverse position.

Care should also be taken when removing the DPF to check for oil deposits on the dirty side. If oil is present, additional thermal cleaning is required prior to ash cleaning. The temperature should be in the range of 250°C over a longer period of time (24-48 hours depending on the amount of oil) to ensure the DPF is not damaged during this process.

The ash collected from filter cleaning procedures consists primarily of oxides and sulfates of inorganic materials associated with lubricant additives and exhaust system corrosion. In some jurisdictions in California ash may be classified as a hazardous waste and can only be placed in landfill sites designated for hazardous waste.

Ash disposal must be handled in accordance with all applicable Federal, state, and local laws governing waste disposal. Under California law, it is the responsibility of the generator of the waste (ash) to determine whether their waste is hazardous or not. This, in general, would require a chemical analysis of the collected ash sample to determine the zinc content.

For information regarding ash disposal contact the California Department of Toxics Substances Control (DTSC) Regional Duty Officers at (800) 728-6942. If you have additional questions, DTSC's webpage can be accessed at: http://www.dtsc.ca.gov/HazardousWaste/index.cfm.

8 GreenTRAP™ 300 DPF Troubleshooting

The table below lists possible filter problems, their causes, and recommended actions. See the Monitoring and Alarm System section for more details on how to monitor the filter backpressure and/or temperature.

Table 9: Troubleshooting Steps for GreenTRAP™ 300 DPF

Problem	Possible Cause	Troubleshooting Step
High backpressure	Low exhaust temperature	Move engine to a heavier duty cycle. Avoid Idling. Periodically clean the filter
	High Engine soot emissions	Conduct engine maintenance (replace air cleaner, service fuel injectors, etc.)
	Prolonged presence of engine lube oil or coolant (antifreeze) in the exhaust	Catalyst may be irreversibly deactivated. Repair valves/rings /head. Replace DPF if damaged
Visible smoke	Uncontrolled regeneration	DPF may be damaged (cracked, melted) and needs replacement

9 Component Swapping

You may move filter component of the verified GreenTRAP™ DPF from the original installed configuration and transfer them on to other vehicles or equipment, provided the following provisions are met:

- Filters may only be swapped between diesel emission control strategies that share a common Executive Order number.
- Before any work is done, end user should receive written approval from Nett Technologies on proposed swapping.
- Recipient vehicles must be fitted with the same diesel emission control strategy. End user must verify that the new recipient vehicle is within the scope of the original verification.
- Donor vehicle/engine whose component has been moved must remain in compliance with the terms and conditions of the applicable Executive Order and have all diesel emission control strategy components present and functional.
- The swapping is done by Nett's authorized personnel.

Nett authorized personnel or dealers performing the swapping will acquire the following information and forward to Nett for record keeping: end user contact information, filter serial number, verified device model number (both donor and recipient), vehicle/equipment model and serial number (both donor and recipient), engine model and serial number (both donor and recipient), date of swapping, odometer reading and number of hours the filter had accumulated at the time of swapping.

For swapped components, Nett Technologies agrees to honor the original warranty and warranty period as per requirements of sections 2707, 2709, and 2702 (m) of the Procedure, respectively.

10 Re-designation

Nett Technologies Inc. authorizes end users to completely remove the verified GreenTRAP™ 300 DPF from the original installed configuration and install them on to other vehicles or equipment within the end user's commonly owned fleet, provided the following provisions are met:

- Before any work is done, end user should receive written approval from Nett Technologies on the proposed re-designation.
- The end user must verify that the new recipient vehicle is within the scope of the original verification.
- The re-designation is done by Nett's authorized personnel.
- Any party that removes the verified diesel emission control strategy from an engine/application must also remove the verified diesel engine control strategy engine label. If the engine label cannot be removed whole, it must be destroyed.
- Any party which re-designates a device to another engine/application which was never previously retrofit with that exact emission control strategy must obtain and install an appropriate emission control strategy engine label.
- Any party which removes a verified diesel emission control strategy from an engine/application must ensure the engine/application returns to its original factory configuration.
- Diesel emission control strategies which are more than 10 years old based on the month and year of manufacture listed on the device label, or devices of unknown age, are not legal candidate systems for re-designation to a new engine/application.
- A repower event, may retain the diesel emission control strategy on the same vehicle/application provided the replacement engine meets all the terms and conditions of the diesel emission control strategy Executive Order, the strategy is not more than 10 years old (based on month and date listed on device label), and the appropriate diesel emission control strategy engine label is installed on the replacement engine.

Nett authorized personnel or dealers performing the re-designation will acquire the following information and forward to Nett for record keeping: end user contact information, emission control device serial number, verified device model number, vehicle/equipment model and serial number (both donor and recipient), engine model and serial number (both donor and recipient), date of re-designation, odometer reading and number of hours the filter had accumulated at the time of re-designation.

For re-designated systems, Nett Technologies agrees to honor the original warranty and warranty period as per requirements of sections 2707, 2709, and 2702 (m) of the Procedure, respectively.

If the above provisions are not met, Nett Technologies will not be responsible for the unauthorized installation and will render any Warranty void.

11 Service Documents

11.1 Service Report

Location		
Customer Name:	Location:	Address:

Vehicle Information		
Equipment Make:	Equipment Model and Type:	Equipment Serial Number:
Engine Make:	Engine Model:	Engine Serial Number:

Emission Control Technology	
Model:	Description:
Date of Installation:	Comments:

Repair Description			
Date:			
Technician Name:			
Hour Meter Reading:		Error Code:	

Description of Problem

Corrective Action

Comments

11.2 Service Record

Location

Customer Name:	Location:	Address:

Vehicle Information

Equipment Make:	Equipment Model and Type:	Equipment Serial Number:
Engine Make:	Engine Model:	Engine Serial Number:

Emission Control Technology

Model:	Description:
Date of Installation:	Comments:

Log

Date:	Hour Meter Reading (Hrs):	Error Code:	Description of Problem:	Corrective Action Taken:	Comments: