cleaire

ADVANCED EMISSION CONTROLS®

Allmetal®

Owner's Manual

MADE IN CALIFORNIA

The instructions, specifications, and recommendations in this manual are based on current information when this manual was released. Cleaire Advanced Emission Controls, LLC reserves the right to make changes at any time without obligation. If you find differences between your system and the information in this manual, contact your Cleaire dealer or call Cleaire at 1-800-308-2111.

This page intentionally left blank

Cleaire Allmetal Owner's Manual
Table of Contents

GENERAL INFORMATION

Cautions

Please study this manual and understand the requirements for the Cleaire Allmetal system before operating your vehicle.

Do not idle for more than 5 minutes in a row. If the engine has been idling for more than 5 minutes, turn it off. (In some states it is illegal to idle for more than 5 minutes.) Long idle times could lead to an excessive build up of soot which could later lead to damage of the system under certain operating conditions. Damage to the system caused by excessive idle could be the basis for denying a warranty claim.

The pictures and descriptions in this manual are for a typical Allmetal system. Some parts, components and configurations for your particular system may vary from those shown here depending on the engine and application.

The use of parts which are materially different than the verified retrofit parts or systems may void the verification and the warranty.

The owner's obligations, routine observations and periodic maintenance requirements are described in this manual. Contact a Cleaire-authorized dealer if you need further assistance.

Safety Warnings

- **The Allmetal stays hotter longer than a stock muffler will after operating under heavy load and after the engine is turned off. All surfaces could be hot and may cause burns.**

- **After operating under heavy load, be very careful about operating or idling near any combustible material such as dry grass or trash. The Allmetal retains heat longer than a muffler will which makes it possible for very hot exhaust gases to exit the tailpipe for several minutes and be a potential source of ignition for combustible material.**

- **Do not allow combustible material from the working environment to come in contact with the Allmetal (for example, paper, trash, sawdust).**

Owner's Legal Obligations

Use of any alternative diesel fuels and or fuel additives not specifically listed in the CARB verification Executive Order (E.O.) is illegal and strictly prohibited. Operating with an unapproved alternative diesel fuel or fuel additive violates the E.O., negates the verification for that engine, and removes compliance status for the vehicle. The end-user must meet other requirements in the E.O. for the Allmetal which is provided in this manual beginning on page

30. The E.O. for the Allmetal may also be obtained from the CARB website at http://www.arb.ca.gov/diesel/verdev/level3/level3.htm

The installation of the Allmetal is based on the owner's understanding that adding a new part to or altering an original part of a certified configuration could be considered a violation of the tampering prohibition of the Clean Air Act. The owner understands that the installation of the Allmetal will not violate tampering provisions of the Act, at the time of installation, because of the testing performed under the verification process—provided that the owner adheres to all installation instructions and meets all operating and maintenance requirements for the Allmetal.

- **Specific events that require action by the owner or operator are given in the "Owner's Obligations" section on page 25.**
- **If any of these events occur, it is the owner's obligation to take the appropriate action. Failure to do so may be the basis for denying a warranty claim.**

Contact Information

Contact a Cleaire-authorized dealer for any sales or service support for your Allmetal system. The tables below for contact information are provided for the customer to complete at their convenience. For more information, contact your local Cleaire product support representative, call Cleaire at 800-308-2111, or visit www.cleaire.com.

Dealer	
Address	
Contact person	
Contact person's phone	
Contact person's fax	
Contact person's email	

Name of local Cleaire product support representative	
Local Cleaire representative's phone	
Local Cleaire representative's email	

Installation

Cleaire recommends that a Cleaire-authorized technician installs the Allmetal system. The complete installation procedures are described in the Allmetal Installation Manual. Copies of the manual are available upon request from your dealer. The installation warranty (page 29) is the responsibility of the dealer that installs the Allmetal system.

Attention:

A Cleaire-certified technician must commission the system;
otherwise, that may be the basis for denying a warranty claim.
Warranty registration is submitted by the Cleaire-authorized dealer.

System Re-Designation

CARB defines re-designation as the movement of a used verified Diesel Emissions Control System (DECS) from an appropriate engine/application (donor) and installation on another engine/application (recipient) meeting the terms and conditions of the DECS Executive Order (E.O.) within the same common ownership fleet. At some point in the future, the customer may want to remove the Cleaire DECS from the current vehicle and have it installed on a different vehicle. There could be a variety of reasons such as retiring the current vehicle from service. To avoid violation of the governing ARB Executive Order, violation of anti-tampering laws, not complying with a fleet rule, and putting warranty coverage in jeopardy, the customer should get approval from Cleaire for re-designation prior to movement.

Cleaire only allows the dealer to implement a re-designation; the customer must work through the dealer if they want a DECS re-designated. Cleaire has a detailed process approved by CARB for re-designating a DECS. In summary, the process involves:

- Pre-authorization (dealer collects information and submits it to Cleaire)
- Review (Cleaire confirms the recipient vehicle is compatible with the DECS)
- Notification (Cleaire notifies the dealer that the re-designation has been approved)
- DECS removed by the dealer from the donor application
- DECS installed by the dealer on the new approved application (and is fully commissioned)
- Warranty (Cleaire activates the warranty on the new application with the remaining warranty life)

Engine Repower

A DECS installed on a vehicle that is repowered may remain installed provided:

- The replacement engine meets all the terms and conditions of the governing Executive Order or conditional verification letter,
- The DECS is not more than ten years old (based on the date of manufacture), and
- The appropriate DECS engine label is affixed to the replacement engine in a visible location.

Acronyms

BP	backpressure
CARB	California Air Resources Board
CO	carbon monoxide
DECS	Diesel Emissions Control System
DOC	diesel oxidation catalyst
HC	hydrocarbons
LED	light emitting diode (system indicator light)
MDPF	metal diesel particulate filter
MLC®	the electronic controller in the Allmetal system
MLinC	the software program used to communicate with the MLC
OEM	original equipment manufacturer
PM	particulate matter (diesel soot)
TC	thermocouple
ULSD	ultra-low sulfur diesel fuel
VDC	volts direct current

ALLMETAL SYSTEM DESCRIPTION

Product Summary

The Allmetal has been verified by the California Air Resources Board to capture over 85% of the particulate matter (PM) from diesel engine exhaust ("Level 3 plus"). Features include:

- Stainless steel construction
- Rugged sintered metal diesel particulate filter (MDPF)
- Modular design to facilitate installation, service and maintenance
- Passive regeneration
- Cleaire MLC® (the system controller)
- Sound attenuation eliminating the need for a muffler or silencer

The Allmetal (Figure 1) consists of the PM filter assembly and the control system:

- The MDPF captures over 85% of the particulate matter (soot) from the diesel engine exhaust while the engine is operating.
- The DOC enables regeneration of the MDPF when the engine is operating under load.
- The control system monitors the Allmetal and engine during operation. The control system also alerts the operator if service is required.

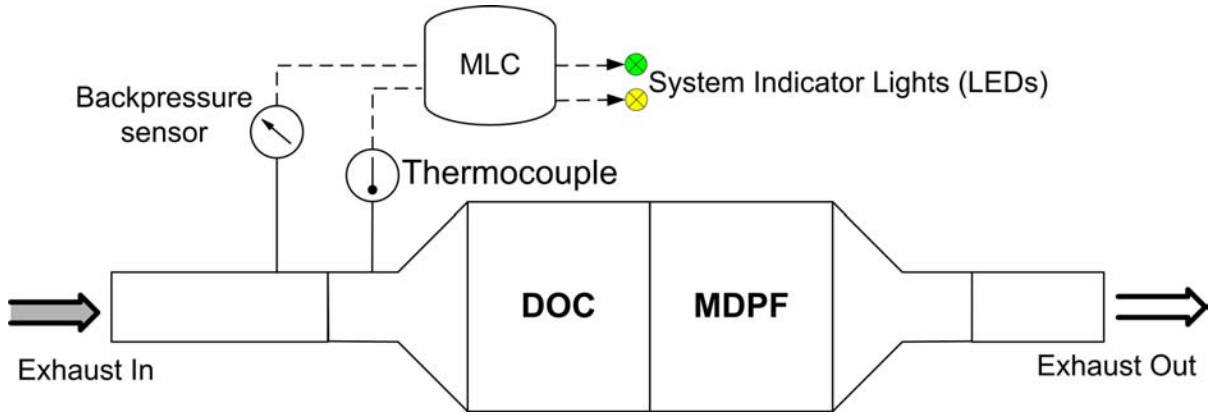


Figure 1: Allmetal system schematic drawing.

PM Filter Assembly

The PM filter assembly (Figure 2) is the core of the Allmetal system and it usually will replace the muffler. The assembly has important features listed below:

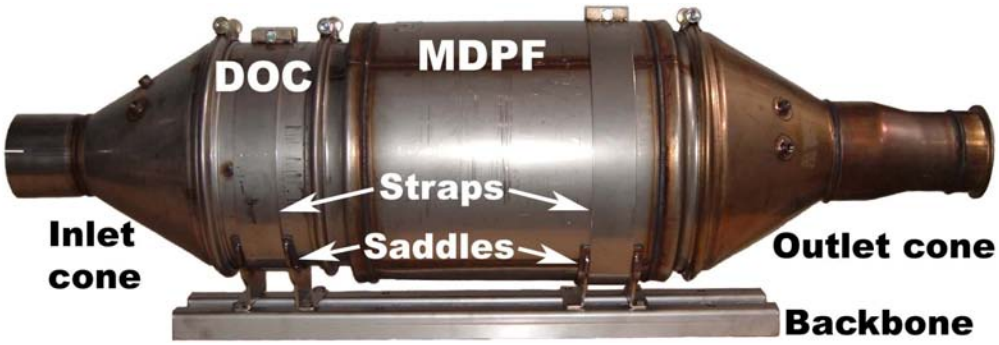


Figure 2: PM filter assembly.

Cleaire provides a mounting assembly specifically designed for the Allmetal. **Although the PM filter assembly replaces the stock muffler, it is important to note that the PM filter assembly is heavier than a typical muffler.**

The MDPF requires the following care and handling:

1. Do not drop or hammer.
2. Use appropriate equipment when lifting.
3. Protect from water intrusion.
4. Protect from accidental impacts.
5. Do not weld.
6. Protect flanges during transport (use the foam shipping covers).

Attention:
Handle with care!

Allmetal system and engine displacement

Depending on the engine displacement, the corresponding Allmetal system is shown in the table below.

Allmetal Systems and Engine Displacements

Engine Displacement	Allmetal System
up to 19 liters	Pending verification
6.7 to 18.2 liters	F Series
down to 4.5 liters	Pending verification

The PM filter assembly creates backpressure on the engine

In the process of removing over 85% of the soot and ash from the exhaust, the Allmetal creates backpressure on the engine. At times, the backpressure from the Allmetal system may be higher than the backpressure caused by a muffler. The actual amount of backpressure from the Allmetal varies instantaneously depending on the engine speed and load and the soot and ash loading in the MDPF. Passive regeneration removes the carbonaceous part of the soot and thereby lowers the backpressure.

Control System

The MLC and some electrical components are housed in the Controls Box. The MLC monitors the Allmetal when the engine is operating. The MLC also continually logs operating data and records instances of unusual conditions.

The MLC controls the system indicator lights (also referred to as the LED's). The meaning of each light and the appropriate actions for the operator to take are described in the "Operations" section of this manual starting on page 10.

CARB-Verification Labels

The Allmetal is provided with two CARB-verification labels. One is installed on the engine (Figure 3) and the other one is attached to the wiring harness at the Allmetal's Controls Box (Figure 4). If either one is missing, order a replacement label from a Cleaire-authorized dealer and be sure to order the correct label for your application (see the table below the pictures).

Figure 3: Example of CARB-verification label installed on engine. (Example is from a Horizon system.)

Figure 4: CARB-verification label attached to wiring harness at Controls Box. (Example is from a Longview system.)

Product	Application	Verification Family Name	Label Part Number
Allmetal	Off-road	CA/CLE/2009/PM3+/N00/OF/DPF02	CUH-729

OPERATIONS

Pay Attention to the System, Engine and Vehicle

The owner or operator should observe the Allmetal, engine and vehicle's operation on a regular basis. See the "System Indicator Lights" section on page 11 for a detailed description of each light's meaning and the appropriate response. Use the Troubleshooting Table (page 20) if you suspect the engine or Allmetal are not operating properly. Contact a Cleaire-authorized dealer (or a properly trained technician under the owner's control) when needed.

1. Do not idle for more than 5 minutes in a row. If the engine has been idling for more than 5 minutes, turn it off. (In some states it is illegal to idle for more than 5 minutes.)
2. The operator should observe the green and amber lights regularly during normal operation and respond accordingly.
3. During engine operation, there should not be soot emissions from the Allmetal clamps or tailpipe. Notify a Cleaire-authorized dealer (or the owner's technician) if any unusual exhaust emissions are observed.
4. Periodically inspect the exhaust system for integrity. Note anything abnormal and make repairs as warranted. For vertical exhaust stacks, **make sure the turn out stack or rain cap is in place** and functioning properly. Contact a Cleaire-authorized dealer as needed.

System Indicator Lights

The operator must observe the Allmetal system indicator lights on a regular basis and respond accordingly.

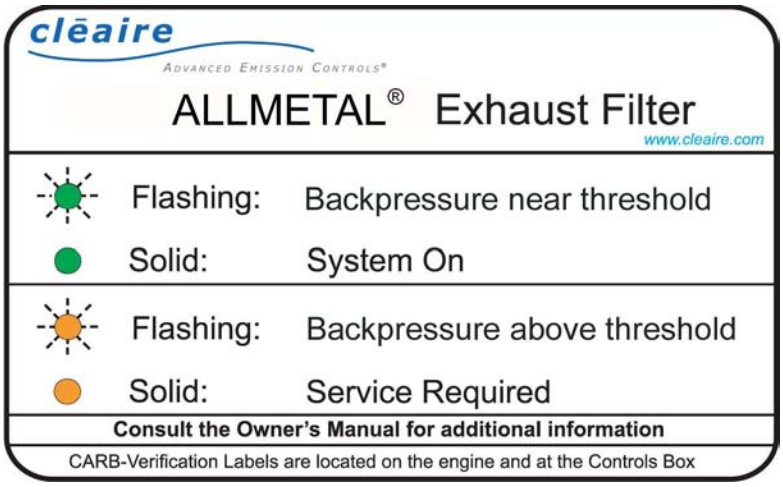


Figure 5: Label for system indicator lights (LED's).

The label placed next to the lights (Figure 5) provides a brief description of each light's meaning.

The light meanings are summarized in the table below (and are explained in greater detail after the table).

Condition	Meaning	Action
1. Green LED is off (while engine is on)	Allmetal needs service	Contact a Cleaire-authorized dealer for service.
2. Green LED is on solid	MLC® is on	No action required (unless indicated by the amber light).
3. Green LED flashing	System is operating near its backpressure threshold	If the system has been installed for less than one month, contact your Cleaire-authorized dealer. See the "Green Light Flashing" discussion below for possible causes.
4. Amber LED flashing	System is operating above its backpressure threshold	Safely remove the equipment from operation and arrange for service by a Cleaire-authorized technician. Do not exceed 8 hours of engine run time without express approval from a Cleaire-authorized dealer.
5. Amber LED on solid	Allmetal needs service	Safely remove the equipment from operation and arrange for service by a Cleaire-authorized technician. Do not exceed 8 hours of engine run time without express approval from a Cleaire-authorized dealer.

Green Light Flashing

A flashing green light indicates that the Allmetal is approaching its backpressure threshold. Avoid continuous idle anytime the green (or amber) LED is flashing. If the engine has been idling for more than 1 minute, Cleaire recommends turning it off. Continuing to idle while the green LED is flashing could allow an uncontrolled regeneration and damage the MDPF.

Possible causes of the flashing green LED are given in the list below. Consult a Cleaire-authorized dealer as needed.

- MDPF is approaching its ash removal requirement
- MDPF is capturing soot at a higher-than-expected soot loading, possibly caused by:
    - Improper or contaminated fuel
    - Engine malfunction (such as leaky injectors or blown turbo)
    - Extended idle time followed by appreciable high-load operation

If the elevated backpressure condition is temporary, the green LED will automatically stop flashing once the backpressure drops below the backpressure threshold for a period of time.

Amber Light Flashing

A flashing amber light indicates that the Allmetal is causing backpressure above the threshold. Safely remove the equipment from operation and contact a Cleaire-authorized dealer for service. It is likely that the MDPF needs cleaning. Do not exceed 8 hours of engine run time without express approval from a Cleaire-authorized dealer.

If the high backpressure condition is temporary, the amber LED will automatically stop flashing once the backpressure drops below the backpressure threshold for a period of time.

Amber Light on Solid

A solid amber light indicates a broken sensor, disconnected sensor or system fault. Contact a Cleaire-authorized dealer (or a properly trained technician under the owner's control) as soon as practical. Do not exceed 8 hours of engine run time without express approval from a Cleaire-authorized dealer.

ATTENTION:

A solid amber light indicates that service is required.

Verify that all the wiring harness connections are properly attached. If the amber light stays on, have the system serviced as soon as possible. For some faults, the solid amber light can only be turned off by connecting the service computer to the MLC and performing software operations with the *MLinC* program.

The amber light will turn on solid for a few seconds after the engine starts. This allows the operator to confirm that the LED itself is good.

Conditions That May Damage the Allmetal

The operator should be aware of conditions that could result in damage or failure of the PM filter assembly or other parts of the system. If any of these events occur, it is the owner's responsibility to have the Allmetal inspected and, if necessary, repaired.

See the owner's legal requirements under the Clean Air Act and CARB regulations in the "Owner's Legal Obligations" section on page 2.

Mechanical damage can occur if any system component is mishandled or accidentally impacted. Internal damage to the PM filter assembly can occur from various forms of engine failure such as losing a turbo or head gasket. These events would cause foreign debris to enter the exhaust gas and then impact the PM filter assembly, likely causing some damage. Furthermore, losing a turbo, a failed injector, or a major oil leak could result in excessively high temperatures in the PM filter assembly. If the engine loses the turbo, the operator should move the vehicle to a safe location as soon as possible and shut the engine off.

Excessive idle can cause a buildup of soot in the MDPF which could lead to excessive temperatures in the MDPF during higher load operations resulting in damage to the MDPF. If the engine has been idling for more than 5 minutes, turn it off. Extended idle may lead to damage of the Allmetal and may be the basis for denying a warranty claim.

Engine oil consumption has an impact on the operation and maintenance of the Allmetal. If engine oil consumption exceeds the engine manufacturer's specification, the engine should be repaired. Failure to do so may damage the Allmetal and may be the basis for denying a warranty claim. High oil consumption will increase the rate of ash accumulation in the MDPF and will lead to more frequent maintenance. The "Engine Oil Consumption and Lube Oil Ash" section on page 22 explains the impacts of oil consumption and ash content on the operations and maintenance of the system.

Power washing the vehicle should not be a problem for the PM filter assembly. Avoid pointing the high-power wash at any Allmetal system components or connectors. However, depending on the power washing technique, it may be possible to loosen an electrical connector. If a connector comes loose, the amber LED might turn on. If the amber light comes on, follow the procedures in the Troubleshooting Table (page 20).

Turn out stacks or rain caps are required on vertical stacks to avoid water intrusion. Be sure the turn out or rain cap is in place and functioning properly. It is important that water does not enter the exhaust pipe where it could migrate to the PM filter assembly. Avoid low hanging branches or other obstacles that could knock off the rain cap.

MAINTENANCE AND REPAIR

Your Right to Maintenance Information

The Air Resources Board requires that Cleaire 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 Cleaire at 1-800-308-2111.

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.

Maintenance Schedule

Cleaire recommends that a Cleaire-authorized technician or a properly trained technician under the owner's control perform the maintenance and repair of an Allmetal. Preventative maintenance is required once a year, every 2,000 operating hours, or every 50,000 miles (whichever comes first) to ensure that the system is maintained in good operating condition; however, the MDPF may require cleaning more often than that depending on the engine's oil consumption rate. See the "Engine Oil Consumption and Lube Oil Ash" section on page 22 for more information.

The owner is legally required to keep the Allmetal in good operating condition in order to comply with the Clean Air Act and CARB regulations (for systems operating in California). See the "Owner's Legal Obligations" section on page 2.

Failure to have the preventative maintenance performed may be the basis for denying a warranty claim. Maintenance or repairs done by anyone other than a Cleaire-authorized technician is the responsibility of the person or organization performing the work. The cost of

parts and labor for preventative maintenance are not included in the purchase price of the Allmetal system. The parts and labor included in preventative maintenance are listed in the "Preventative Maintenance Labor and Parts" section below.

Preventative Maintenance Labor and Parts

The preventative maintenance by a Cleaire-authorized technician includes:

- Inspect the Controls Box and components.
- Download data from the MLC and review the Instant Report.
- Confirm the system indicator lights are functioning properly.
- Inspect the BP sensor and sensor breather. Clean out BP tubing and ports.
- Inspect and clean the MDPF.
- Inspect exhaust tubing.
- Reinstall the PM filter assembly and confirm it is properly mounted.
- Inspect the sensors and wiring harness.
- Upgrade the MLC program if necessary.
- Check CARB-verification labels.
- Make repairs (if any of the above inspections showed repairs are needed).
- Perform comprehensive tests of the system's operations.

MDPF Maintenance

It may be necessary to periodically clean the MDPF (in addition to the cleaning during preventative maintenance) depending on the engine's duty cycle and the ash content of the diesel fuel and lube oil. The collection of inorganic ash results in an increase in backpressure from the MDPF over time. If ash in the MDPF results in high backpressure then the amber light will flash. Note: higher than normal oil consumption will increase the rate of ash accumulation in the MDPF, and thus may require more frequent maintenance.

Cleaire recommends the use of low-ash engine oils (CJ-4 oil). These products have been specifically designed for use with diesel particulate filters, and can significantly reduce the buildup of ash in the MDPF and extend the filter cleaning interval. See the "Engine Oil Consumption and Lube Oil Ash" section on page 22. Depending on which size MDPF is used, Cleaire recommends cleaning the MDPF according to the engine oil consumption table below.

MDPF Cleaning Interval Based on Engine Oil Consumption

Oil Type	F-Series Allmetal	E-Series Allmetal
CJ-4	72 quarts	72 quarts
CI-4	48 quarts	48 quarts

A Cleaire-authorized dealer can clean the MDPF. They also will ensure that the collected material (ash and soot) is properly disposed in accordance with all applicable Federal, State and local laws governing waste disposal.

The MDPF is unidirectional and it processes exhaust flow in only one direction. If the MDPF is removed for cleaning, it may only be reinstalled in the proper flow direction because the inlet and outlet flanges are different sizes. There is also a flow arrow on the part tag (see Figure 7 on page 19).

Also, for horizontal installations when reinstalling the MDPF after cleaning make sure the MDPF part tag is on top and the metal plates point up and down as shown in Figure 6.

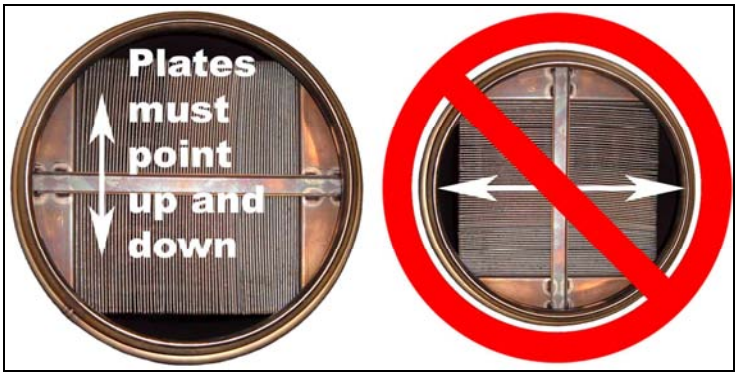


Figure 6: MDPF plates must point up and down for horizontal installations.

Exhaust Tubing and Components

All tubing connections between the engine and the PM filter assembly should be gas-tight and leak-free. Also, all tubing between the engine and PM filter assembly must be in good condition. This requirement includes any other components such as exhaust brakes. Aluminized mild steel tubing or rusty tubing could flake off into the exhaust stream. If flaking occurs, the DOC or MDPF may plug, resulting in high backpressure and engine power loss. Cleaire recommends using stainless steel tubing between the turbo and the PM filter assembly. **It is the engine owner or operator's responsibility to ensure that all tubing in this critical area be maintained in good condition.**

Service Calls

The MLC® controls the green and amber indicator lights to provide system status as described in the "System Indicator Lights" section (page 11). However, not all conditions will be detected by the MLC® (for example, a traffic accident that physically damages the PM filter assembly). Therefore, it is important that the owner and/or operator routinely observe the engine and Allmetal operations in addition to watching the indicator lights. See the "Operations" section (page 10) for routine observations that the operator and/or owner should perform and the "Owner's Obligations" section on page 25.

Upon any indication of a malfunction, promptly contact a Cleaire-authorized dealer (or the owner's technician). See the "Contact Information" section on page 3. Please be prepared with the following information:

1. Fault information and descriptions in as much detail as possible.
2. The data plate part numbers and serial numbers (see Figure 7 and Figure 8).

Figure 7: MDPF part tag and flow arrow.

Figure 8: DOC part tag.

Parts List

A complete parts list was provided with the system. Contact your Cleaire-authorized dealer if you need a replacement list. The major parts are listed in the table below.

Allmetal System Major Parts List

Item #	Qty	Part Number	Description
1	1	CJF-30__-_-_-_-_	Diesel Particulate Filter Assembly, Unidirectional
2	1	CJD-2_-_0	Diesel Oxidation Catalyst (DOC)
3	1	CMA-4	Sensor, Thermocouple
4	1	CMKM-5.0__ or CMKM-6.0__	MLC® (electronic control unit)
5	1	CUE-45	Sensor, Backpressure
6	1	CJ___-_-AP___	Cone, inlet
7	1	C____-_	Cone, outlet (as applicable)
8	1	CUE-300	LED, Green
9	1	CUE-301	LED, Amber
10	1	CUH-730	Label, LED, Allmetal

Spaces represent variables depending on specific configuration and application.

Troubleshooting Table

Use the table below to diagnose and resolve potential Allmetal operating problems. See the "System Indicator Lights" section on page 11 for additional information.

Condition	Probable Cause	Remedy
1. Green LED off (while engine is on)	• No power to the MLC • Loss of MLC program (if amber on and green off) • Faulty LED or wiring	• Check fuse, wires and power source (battery). • Contact a Cleaire-authorized dealer for repair.
2. Unusual exhaust noises	• Loose tubing connection(s) • Loose clamp(s) • Crack in exhaust tube • Crack in the MDPF • Engine turbo problem	• Tighten connection(s). • Replace damaged tube. • Contact a Cleaire-authorized dealer for repair.
3. White smoke during startup	• Normal condensation inside the MDPF	• No action required.
4. Light soot dusting in exhaust tube	• Normal condition	• No action required.
5. Visible emissions (white or black smoke during normal operations)	• Engine problem resulting in oil or coolant loss • MDPF failure • Normal at first start up after cleaning	• Contact a Cleaire-authorized dealer for repair. • None required (if only visible at first start up after cleaning).
6. Engine surges or has power loss	• Engine malfunction (most likely cause) • Overloaded MDPF (amber LED will have been flashing for some time if this is the cause of engine surging or low power)	• Repair the engine. • If the engine passes all its diagnostic tests, then contact a Cleaire-authorized dealer for service. (MDPF will likely need cleaning.)

There is additional troubleshooting information in the Allmetal and LongMile Service and Troubleshooting Manual. This manual is for trained technicians.

Repair and Maintenance Clarifications

The warranty (page 27) includes a section titled “Owner’s Warranty Responsibility” which clarifies that the owner or operator is responsible for making sure that the maintenance described in this owner’s manual is performed. In addition to the scheduled preventative maintenance, the amber light is another indicator that maintenance or repair is required.

ATTENTION:

The amber light indicates that service is required.

Cleaning the MDPF is a maintenance item and is not covered under warranty. If a repair is required, it may be covered under the installation or product warranty depending on the cause.

The table below provides a summary of service types (maintenance or repair) and what organization is responsible for the cost of the service.

Service Type (and subtype)		**Definition/Example**	**Cost Responsibility**
Maintenance	(unplanned)	High backpressure from MDPF overloaded with ash.	Owner
	(regularly planned)	High backpressure from MDPF overloaded with ash.	Owner
	(comprehensive preventative maintenance)	Clean out ash from the MDPF. Perform multi-step complete system check out.	Owner
Repair	(warrantable)	System or component fails in normal application.	Cleaire
	(warrantable)	System or component failed because it was installed improperly.	Installer
	(non-warrantable)	System or component damaged through abuse, neglect, or misapplication. Warranty period has lapsed.	Owner

Engine Oil Consumption and Lube Oil Ash

MDPFs are designed to capture all solid particles coming from the tailpipe. While most of the captured material can be readily regenerated (oxidized) inside the filter, the MDPF will accumulate incombustible materials, collectively called “ash,” which cannot be regenerated and must be removed through offline cleaning.

The majority of the ash comes directly from oil consumed during engine operation, though small amounts of ash also come from the fuel and engine wear. Most of the ash that accumulates in the MDPF is part of the lube oil additive package, and since the MDPF will capture all solid materials coming from the engine exhaust, all the ash from oil consumption will ultimately end up in the MDPF. Thus, the ash content of the lube oil and the oil consumption rate become critical factors in determining the rate of ash accumulation in the filter.

Pre-2007, CI-4 oil typically contains between 1.2 and 1.5% ash by weight. The new CJ-4 oils, designed especially for diesel engines with diesel particulate filters, contain approximately 1.0% ash, and will therefore result in a lower filter loading for a given amount of oil consumption. Depending on which size MDPF is used, Cleaire recommends cleaning the MDPF according to the engine oil consumption table below.

MDPF Cleaning Interval Based on Engine Oil Consumption

Oil Type	F-Series Allmetal	E-Series Allmetal
CJ-4	72 quarts	72 quarts
CI-4	48 quarts	48 quarts

Factors like engine duty cycle, soot composition, ash composition and others can also have an impact on the filter cleaning interval. Furthermore, if there are long periods of operation where the engine does not meet the temperature requirements for regeneration or if there are excessive soot emissions (from a failed injector for example), the filter may need to be cleaned more often. Customers can extend their filter cleaning interval by:

- Maintaining their engines to minimize oil consumption
- Switching to low ash oils

SPECIFICATIONS

Allmetal System	
PM Filter Assembly Weight	140 to 150 pounds
Materials of Construction	304 stainless steel
Diesel Fuel Type (same as engine fuel)	Any diesel fuel allowed for in the Allmetal verification

Cleaire MLC®	
Voltage	12 V or 24V nominal
Real time clock	Battery-backed
Diagnostic and Programming I/O	9-pin DBF Serial (RS-232) (adapter from harness required)
Inputs	
PM filter assembly Inlet Temperature	Type K thermocouple, ungrounded
Engine Electrical Power (Battery Voltage)	12 VDC or 24 VDC nominal
PM filter assembly Backpressure Sensor	0 – 5 VDC
Outputs	
Two Power Output Lines	5 VDC
MDPF cleaning required indicator	Amber LED flashing
Allmetal system service indicator	Amber LED on solid

A typical CJD-20-20 and CJF-301 system dimensional drawing is provided in Figure 9 below.

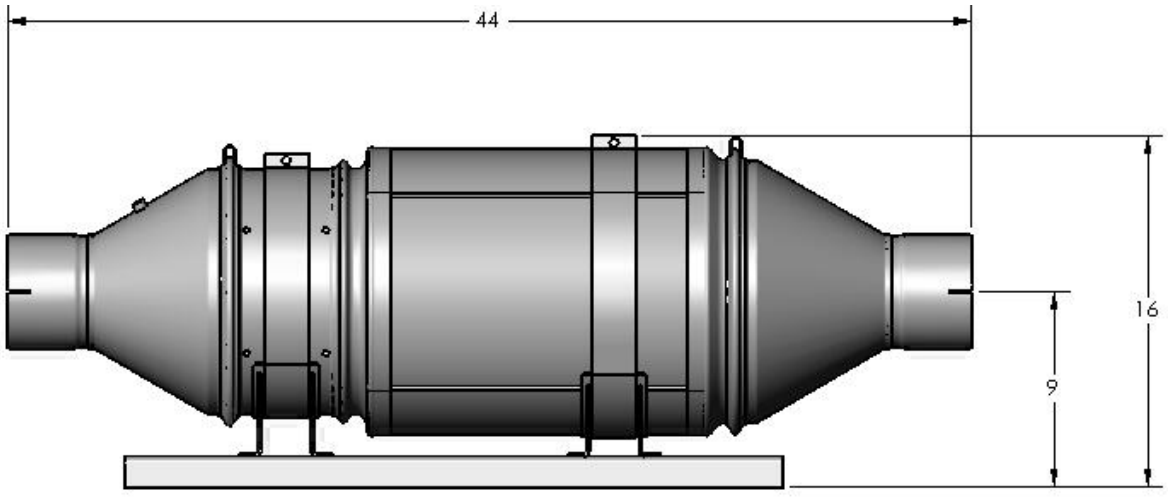


Figure 9: Typical CJD-20-20 + CJF-301 system dimensions (inches).

OWNER'S OBLIGATIONS

The owner's actions in the table below are mandatory for proper system operation. Failure to do the required action(s) could be the basis for denying a warranty claim or a fine by CARB.

Event or Symptom	Owner's Action Item	Manual Section
Initial installation of Allmetal system.	Review this manual and know the requirements for the Allmetal system. Be sure that operators and maintenance staff understand each item in the "Operations" section.	This entire manual. "Operations" (page 10).
Flashing amber light (MDPF may need to be cleaned)	Contact a Cleaire-authorized dealer or a properly trained technician to investigate the cause of the flashing amber light and clean the MDPF if needed.	"System Indicator Lights" (page 11).
Solid amber light (bad sensor or system fault).	Contact a properly trained technician as soon as practical.	"System Indicator Lights" (page 11).
Engine malfunction (such as turbo failure, injector failure, excess oil consumption, or leaky head gasket).	If the turbo fails, park in a safe place ASAP and shut the engine off. Contact a properly trained technician promptly. (System components may be damaged from foreign material.)	"Conditions That May Damage the Allmetal" (page 14).
Debris or other object impacts Allmetal system or components.	Contact a properly trained technician promptly since system components may be damaged, including hidden damage to internal components.	"PM Filter Assembly" (page 7) and "Conditions That May Damage the Allmetal" (page 14).
Tubing or exhaust component between the engine and the PM filter assembly is removed, replaced or in poor condition.	Ensure that the tubing or component is installed properly and that no debris could enter the exhaust stream. (Debris or foreign matter in the exhaust stream can damage the PM filter assembly or system components. Also, exhaust leaks may result in poor system performance and safety hazards.)	"Exhaust Tubing and Components" (page 18).
For a vertical exhaust stack, the rain cap or turn out stack is knocked off or somehow missing.	Replace the rain cap or turn out stack as soon as practical. If any water entered the exhaust pipe then contact a properly trained technician.	"PM Filter Assembly" (page 7) and "Conditions That May Damage the Allmetal" (page 14).
Oil consumption is more than the engine manufacturer's specification.	Monitor and keep accurate records of the engine's oil consumption rate. If oil consumption exceeds the specification, repair the engine so that oil consumption is within the manufacturer's specification.	"Conditions That May Damage the Allmetal" (page 14) and "Engine Oil Consumption and Lube Oil Ash" (p. 22).
Engine has been idling for more than 5 minutes.	Turn the engine off.	"Cautions" (page 2), "Operations" (page 10), and "Conditions That May Damage the Allmetal" (page 14).

WARRANTY

Product Warranty

YOUR WARRANTY RIGHTS AND OBLIGATIONS

Cleaire Advanced Emission Controls (Cleaire) warrants 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 in Table 1, 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, Cleaire will repair or replace your diesel emission control system at no cost to you including diagnosis, parts, and labor.

Table 1: Warranty Period

Engine Type	Engine Size	Warranty Period
On-Road	Light heavy-duty, 70 to 170 hp, Gross Vehicle Weight Rating (GVWR) less than 19,500 lbs.	5 years or 150,000 miles
	Medium heavy-duty, 170 to 250 hp, GVWR from 19,500 lbs. to 33,000 lbs.	
	Heavy heavy-duty, exceeds 250 hp, GVWR exceeds 33,000 lbs.	
	Heavy heavy-duty, exceeds 250 hp, GVWR exceeds 33,000 lbs., and the truck is: 1. Typically driven over 100,000 miles per year, and 2. Has less than 300,000 miles on the odometer at the time of installation.	2 years, unlimited miles
Off-Road (includes portable engines), Stationary, Marine, Locomotives, TRU and APU	Under 25 hp, and for constant speed engines rated under 50 hp with rated speeds greater than or equal to 3,000 rpm	3 years or 1,600 hours
	At or above 25 hp and under 50 hp	4 years or 2,600 hours
	At or above 50 hp	5 years or 4,200 hours

WARRANTY COVERAGE

For an engine used in an application listed in Table 1, the warranty period will be the years or hours or miles of operation shown in Table 1, 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, Cleaire will repair or replace the diesel emission control system, including parts and labor.

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

OWNER'S WARRANTY RESPONSIBILITY

As the vehicle, engine, or equipment owner, you are responsible for performing the required maintenance described in your owner's manual. Cleaire 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, Cleaire may have grounds to deny warranty coverage. You are responsible for presenting your vehicle, equipment, or engine, and diesel emission control system to a Cleaire 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 Cleaire at 1-800-308-2111 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.

Installation Warranty

YOUR WARRANTY RIGHTS AND OBLIGATIONS

The installer 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 the installer must be the same as the warranty provided by Cleaire, and the same exclusions 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 the installer as soon as a problem with the installation is detected.

If you have questions regarding your warranty rights and responsibilities, you should contact the installer or Cleaire at 1-800-308-2111 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.

Cleaire Warranty Clarifications

(Which do not limit or modify the provisions of the Product Warranty or Installation Warranty in any way)

The product warranty above is the sole warranty made by Cleaire Advanced Emission Controls, LLC. There are no other warranties, expressed or implied, of merchantability or fitness for a particular purpose.

For the purpose of the product warranty and installation warranty, abuse or neglect includes vehicle accidents, ignoring the system indicator lights, blending lubricating oil with fuel, or any engine failure or condition that are not proximately caused by the diesel emission control system that allows excess lubricating oil, coolant, contaminants or debris to enter the exhaust system. The owner shall not use any fuel additive or lube oil additive that is not approved by EPA or CARB for use in diesel engines equipped with catalytic mufflers.

Cleaire recommends that the verified diesel emissions control strategy be installed and serviced by Cleaire authorized personnel. Improper installation or service by unauthorized or untrained personnel may result in a denial of coverage under the product warranty or installation warranty.

CARB EXECUTIVE ORDER FOR THE ALLMETAL

Air Resources Board

Mary D. Nichols, Chairman
9480 Telstar Avenue, Suite 4
El Monte, California 91731 www.arb.ca.gov

Linda S. Adams
Acting Secretary for Environmental Protection

Edmund G. Brown Jr.
Governor

January 18, 2011

Reference No.: 10-661-719

Ms. Ellen Garvey
Cleaire Advanced Emission Controls
14775 Wicks Boulevard
San Leandro, California 94577

Dear Ms. Garvey:

Using the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* ("Procedure," Title 13, California Code of Regulations (CCR), Sections 2700-2710), Air Resources Board (ARB) staff reviewed your application for conditional verification of the Allmetal™ system for use with off-road diesel engines. Based on an evaluation of the data provided, and pursuant to the terms and conditions specified below, the Executive Officer of ARB hereby finds that the Allmetal™ system reduces emissions of diesel particulate matter (PM) consistent with a Level 3 plus device (greater than or equal to an 85 percent reduction and meets the 2009 nitrogen dioxide emissions limit) (Title 13, CCR, Sections 2702 (f) and 2708). The Executive Officer also finds that the Allmetal™ system satisfactorily completed 33 percent of the durability demonstration period. Accordingly, the Executive Officer determines that the system merits conditional verification and, subject to the terms and conditions specified below, classifies Cleaire's Allmetal™ system as a Level 3 plus system for off-road vehicles and portable equipment using engines from the engine families listed in Attachment 1.

The aforementioned conditional verification is subject to the following terms and conditions:

- Cleaire submitted the data required for full verification, as specified in the letter 09-661-357, prior to the December 21, 2010, deadline. The Allmetal™ system will remain conditionally verified while ARB reviews the submittal.
- Conditional verification is equivalent to verification for the purposes of satisfying the requirements of in-use emission control regulations.
- Only one filter may be installed per engine.

- The engine must not be in an auxiliary power unit for on-road trucks, transport refrigeration unit, gantry crane, stationary application, marine vessel, or locomotive.
- The engine must be originally manufactured from model year 1996 through 2010 and have an engine family name listed in Attachment 1.
- The engine must not be certified as having exhaust gas recirculation.
- For engines certified to a PM emission level of at most 0.2 grams per brake horsepower-hour (g/bhp-hr) and greater than 0.01 g/bhp-hr, the application must have a duty cycle with an exhaust temperature profile greater than or equal to:
    - 300 degrees Celsius for at least 80 percent of the time, or
    - 400 degrees Celsius for at least 25 percent of the time.
    - Engines for which one of these criteria must be met are listed in Table 1 of Attachment 1. Engines listed in Table 2 of Attachment 1 must either meet these criteria or the alternative criterion described below.
- For engines certified to a PM emissions level of at most 0.15 g/bhp-hr, and greater than 0.01 g/bhp-hr, the application may alternatively have a duty cycle with an exhaust temperature profile greater than or equal to 260 degrees Celsius for at least 55 percent of the time. Engines for which this alternative criterion applies are listed in Table 2 of Attachment 1.
- The engine must have a maximum power output rating of at least 150 horsepower and at most 600 horsepower.
- The engine displacement must be between 6.7 and 18.2 liters, inclusive.
- The engine may or may not have a pre-existing oxidation catalyst from the original equipment manufacturer (OEM).
- The engine must not have a pre-existing OEM diesel particulate filter (DPF).
- The engine must be in its original certified configuration, except that if an OEM oxidation catalyst is present, it may be removed if the Allmetal™ system is installed. Should the Allmetal™ system be removed, the OEM oxidation catalyst must be re-installed, returning the engine to its original certified configuration.
- The engine must have a four-stroke combustion cycle.
- The engine may be turbocharged or naturally aspirated.
- The engine may be mechanically or electronically controlled.
- The engine must be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
- Lube oil, or other oil, must not be mixed with the fuel.
- The engine must be operated on fuel that has a sulfur content of no more than 15 parts per million (ppm) by weight.
- The Allmetal™ system must not be operated with fuel additives, as defined in Section 2701 of Title 13, CCR, unless explicitly verified for use with fuel additive(s).

- The Allmetal™ system must not be used with any other systems or engine modifications without ARB and manufacturer approval.
- The system must be installed with a backpressure monitor to notify the operator when the backpressure limit is reached. The notification must occur and be clearly visible to the operator while the vehicle or equipment is in use.
- The system may be re-designated in its entirety to other vehicles or equipment within a common ownership fleet if authorized by Cleaire. A system re-designation must be performed in accordance with Section 2706, Title 13, CCR and the policy document found here: http://www.arb.ca.gov/diesel/verdev/swap/swap.htm
- The other terms and conditions specified below.

It is also ordered and resolved that installation of the Allmetal™ system, manufactured by Cleaire Advanced Emissions Controls of 14775 Wicks Boulevard, San Leandro, California 94577, has been found not to reduce the effectiveness of the applicable vehicle pollution control system, and therefore the Allmetal™ system is exempt from the prohibitions in Sections 38390 and 38391 of the Vehicle Code for installation on off-road vehicles using engines listed in Attachment 1.

This exemption is only valid provided the engines meet the aforementioned conditions.

The Allmetal™ system consists of the following major system components, listed in order from exhaust inlet to outlet as they are arranged within the exhaust system of the vehicle: one inlet cone, one diesel oxidation catalyst (DOC), one sintered metal DPF, and one outlet cone. The Allmetal™ system also includes a backpressure monitor and warning system. The major components of the Allmetal™ system are identified in Attachment 2. Schematics of the approved product and engine labels are shown in Attachment 3.

The Allmetal™ system is comprised of a single DOC and a single sintered metal DPF designed to filter the exhaust from a single engine. Allmetal™ systems with multiple DPFs and/or multiple DOCs, including designs with two or more filter components canned together or multiple individually-canned filter components in parallel or in series (or any combination thereof), are not valid under this Executive Order. Channeling exhaust from a single engine through multiple Allmetal™ systems, deployed in parallel or in series or any combination thereof, is also not valid under this Executive Order. This conditional verification letter is valid provided that installation instructions for the Allmetal™ system do not recommend tuning the vehicle to specifications different from those of the vehicle manufacturer.

Changes made to the design or operating conditions of the Allmetal™ system, as exempted by ARB, which adversely affect the performance of the vehicle's pollution control system, invalidates this conditional verification.

No changes are permitted to the device. ARB must be notified, in writing, of any changes to any part of the Allmetal™ system. Any changes to the device must be evaluated and approved in writing by ARB. Failure to do so invalidates this conditional verification.

Cleaire must ensure that the installation of the Allmetal™ conforms to all applicable industrial safety requirements.

Marketing of the Allmetal™ system using identification other than that shown in this conditional verification letter or for an application other than that listed in this conditional verification letter is prohibited unless prior written approval is obtained from ARB.

Identification must include both device and engine labels consistent with the requirements of Title 13, CCR, Section 2706 and Attachment 3 of this conditional verification letter. Changes or modifications to the label or label placement are prohibited without prior written approval from ARB.

This conditional verification does not apply to any Allmetal™ system advertised, offered for sale, sold with, or installed on a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

A copy of this conditional verification letter must be provided to the ultimate purchaser at the time of sale.

As specified in the Procedure, ARB assigns each diesel emission control strategy a family name. The designated family name for the conditional verification as outlined above is:

CA/CLE/2009/PM3+/N00/OF/DPF02.

As stated in the Procedure, Cleaire is responsible for recordkeeping requirements (Section 2702), honoring the required warranty (Section 2707), and conducting in-use compliance testing (Section 2709).

Proper engine maintenance is critical for the proper functioning of the diesel emission control strategy. The owner of the vehicle on which the diesel emission control strategy is installed is strongly advised to adhere to all good engine maintenance practices.

Failure to document proper engine maintenance, including keeping records of the engine's oil consumption, may be grounds for denial of a warranty claim.

This conditional verification is valid provided that the diesel fuel used in conjunction with the device complies with Title 13, CCR, Sections 2281 and 2282, and if biodiesel is used, the biodiesel blend must be 20 percent or less subject to the following conditions:

- The biodiesel portion of the blend complies with the American Society for Testing and Materials specification D6751 applicable for 15 ppm sulfur content; and
- The diesel fuel portion of the blend complies with Title 13, CCR, Sections 2281 and 2282.

Other alternative diesel fuels such as, but not limited to, ethanol diesel blends and water emulsified diesel fuel are excluded from this conditional verification.

In addition to the foregoing, ARB reserves the right in the future to review this conditional verification letter and the exemption provided herein to assure that the exempted and conditionally verified add-on or modified part continues to meet the standards and procedures of Title 13, CCR, Section 2222, et seq and Title 13, CCR, Sections 2700 through 2710.

Systems conditionally verified in this letter must conform to all applicable California emissions regulations.

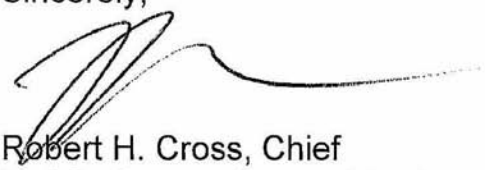
This conditional verification does not release Cleaire from complying with all other applicable regulations.

Violation of any of the above conditions is grounds for revocation of this conditional verification.

This conditional verification letter supersedes the conditional verification letter 09-661-358, dated December 21, 2009.

Thank you for participating in ARB's diesel emission control strategy verification program. If you have any questions or comments, please contact Ms. Shawn Daley, Manager, at (626) 575-6972 or by email at sdaley@arb.ca.gov.

Sincerely,



Robert H. Cross, Chief
Mobile Source Control Division

Attachment 1: ARB-Approved Engine Families for the Cleaire Allmetal System
Attachment 2: Parts List for the Cleaire Allmetal System
Attachment 3: Label for the Cleaire Allmetal System

cc: Ms. Shawn Daley, Manager
Heavy-Duty Diesel In-Use Strategies Branch

Cleaire Advanced Emission Controls, LLC
14333 Wicks Blvd.
San Leandro, CA 94577-6719
1-800-308-2111