

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-263-1  
Relating to Exemptions Under Section 27156  
of the Vehicle Code

RIGHETTI ENTERPRISES  
RE-2 ANEROID SYSTEM

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the RE-2 Aneroid System manufactured by Righetti Enterprises, 1627 E. Channel Street, Stockton, California, 95205, has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for all 855 cubic inch displacement Cummins turbocharged heavy-duty diesel engines equipped with a Cummins PTG non-Air Fuel Control (AFC) style fuel pump.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the vehicle manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Marketing of this device using an identification other than that shown in this Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

**THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF RIGHETTI ENTERPRISES' RE-2 ANEROID SYSTEM.**

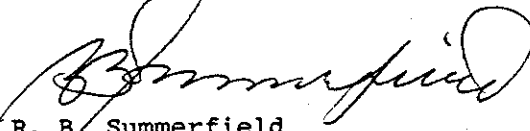
Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 25<sup>th</sup> day of January, 1993.



R. B. Summerfield  
Assistant Division Chief  
Mobile Source Division

State of California  
AIR RESOURCES BOARD

EVALUATION OF RIGHETTI ENTERPRISES' RE-2 ANEROID SYSTEM  
FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE  
SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF  
THE CALIFORNIA CODE OF REGULATIONS

January 1993

State of California  
AIR RESOURCES BOARD

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CALIFORNIA CODE OF REGULATIONS

by

Mobile Source Division  
State of California  
Air Resources Board  
9528 Telstar Avenue  
El Monte, CA 91731-2990

(This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.)

### SUMMARY

Righetti Enterprises, of 1627 East Channel Street, Stockton, California, 95205 has applied for an exemption from the prohibitions in Section 27156 of the California Vehicle Code (VC) for their RE-2 Aneroid System. The RE-2 Aneroid System is designed for installation on all 855 cubic inch displacement heavy-duty turbocharged Cummins diesel engines equipped with a Cummins PTG non-Air Fuel Control (AFC) style fuel pump.

Righetti Enterprises has submitted a completed application and all the required information. Based on an engineering evaluation of the application materials, it was determined that the RE-2 Aneroid System does not have any adverse effects on emissions.

The staff recommends that Righetti Enterprises be granted exemption as requested and that Executive Order D-263-1 be issued for the RE-2 Aneroid System.

## TABLE OF CONTENTS

|                                                  | <u>Page Number</u> |
|--------------------------------------------------|--------------------|
| SUMMARY                                          | i                  |
| CONTENTS                                         | ii                 |
| I. INTRODUCTION                                  | 1                  |
| II. CONCLUSION                                   | 1                  |
| III. RECOMMENDATION                              | 1                  |
| IV. DEVICE DESCRIPTION                           | 1                  |
| V. RE-2 ANEROID SYSTEM EVALUATION AND DISCUSSION | 2                  |
| APPENDIX                                         | 3                  |
| APPENDIX A: INSTALLATION INSTRUCTIONS            | A-1                |
| APPENDIX B: DRAWINGS                             | A-2                |

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I. INTRODUCTION

Righetti Enterprises, of 1627 East Channel Street, Stockton, California, 95205 has applied for an exemption from the prohibitions in Section 27156 of the California Vehicle Code (VC) for their RE-2 Aneroid System. The RE-2 Aneroid System is designed for installation on all 855 cubic inch displacement heavy-duty turbocharged Cummins diesel engines equipped with a Cummins PTG non-AFC style fuel pump.

Righetti Enterprises has submitted a completed application and all the required information.

II. CONCLUSION

Based on an engineering evaluation of the operating principles of the Righetti Enterprises' RE-2 Aneroid System, the staff concludes that the installation of the Righetti Enterprises' RE-2 Aneroid System will not adversely affect exhaust emissions from vehicles for which an exemption is requested.

III. RECOMMENDATION

The staff recommends that Righetti Enterprises be granted exemption as requested and that Executive Order D-263-1 be issued for the RE-2 Aneroid System.

IV. DEVICE DESCRIPTION

The RE-2 Aneroid System decreases fuel flow to the engine during low intake manifold air pressure conditions such as rapid throttle opening. The device may be installed on all 855 cubic inch displacement Cummins turbocharged engine equipped with Cummins PTG non-AFC style fuel pump. The RE-2 is similar

to the Cummins optional aneroid which is no longer available and the Righetti Enterprises' RE-1 Aneroid exempted under Executive Order (EO) D-263. The RE-2 is a 6061 T6 billet aluminum valve body with three drilled passages (see drawings in Appendix B). Four hose connections are provided with the device. The fuel is plumbed from the outlet of the existing fuel pump to the inlet of the aneroid fuel passage. The aneroid fuel passage outlet is routed to the injectors. The aneroid leak-off line connects the plunger passage with the existing fuel tank return lines. The air signal line connects the aneroid cover with the intake manifold.

V. RE-2 ANEROID SYSTEM EVALUATION AND DISCUSSION

Upon initiation of rapid acceleration, the turbocharger cannot increase the intake manifold pressure to supply sufficient air for the proper air/fuel mixture. The resulting rich mixture causes emission of thick smoke.

During periods of low manifold pressures, such as during rapid acceleration, the aneroid reduces the fuel charge to each cylinder by restricting the fuel flow rate - lowering the fuel rail pressure. As the turbocharger increases the intake manifold pressure, the fuel flow rate increases to rated pump calibration volume and pressure. According to the manufacturer, the system, if properly adjusted, reduces the smoke opacity while not affecting performance.

Previously, a snap-idle test procedure was conducted to evaluate the emissions impact of the RE-1 Aneroid System. The RE-2 Aneroid System performs an identical function utilizing a different, equally effective, mechanical arrangement. Therefore, the emissions effects resulting from use of the RE-2 would be similar to the RE-1; i.e. no adverse effect on emissions.

## APPENDIX

**APPENDIX A:**

R I G H E T T I                      E N T E R P R I S E S  
1627 E. CHANNEL ST.,              STOCKTON, CA. 95205  
PH. (209) 464-8306              FAX (209) 474-4739

INSTALLATION AND OPERATING INSTRUCTIONS

RIGHETTI ENTERPRISES RE-2 ANEROID SYSTEM

Intended Application

Any Cummins turbocharged NT series engine equipped with a ptg fuel pump not already outfitted with an air fuel control device (AFC) or aneroid system.

Intended Operation

The Righetti RE-2 aneroid system is intended to reduce fuel pump delivery to the engine (and thus reduce exhaust smoke) during low air intake manifold pressure conditions, ie onset of throttle application.

Theory of Operation

During the initiation of acceleration of a diesel engine, turbocharger lag deprives the engine of sufficient air to allow clean combustion of all of the fuel delivered to the cylinders. The aneroid system (modulating system) reduces fuel delivery to the engine as a function of manifold air pressure, allowing a controlled delivery of fuel to the engine, minimizing formation of exhaust smoke. As exhaust energy increases, accelerating turbocharger wheel speed, manifold air pressure rises. The Righetti RE-2 aneroid system tracks the rising manifold pressure and allows an increasing fuel rate to be delivered to the engine, up to the full delivery of the fuel pump at about 7-10 psig depending on engine CPL and fuel pump calibration code.

In simplest terms, the Righetti RE-2 Aneroid system only effects the formation of smoke during periods of acceleration accompanied by low manifold pressure. Formation of exhaust smoke at intake manifold pressures above 7-10 psig are strictly a function of engine configuration and condition.

Installation (Ref Righetti Enterprises Drawing RE-2-1)

Mount the RE-2 aneroid via the included mounting bracket on the side of the engine approximately 12" behind the fuel pump. The NT series engine has several 1/2" NF thread bosses which will accommodate this mounting configuration.

Disconnect and remove the existing fuel pump delivery line which runs from the fuel pump shut-off valve to the cylinder head fuel inlet port.

Plumb the fuel pump shut-off valve delivery port (5/16" inverted flair) to the aneroid inlet (also 5/16" inverted flair) port as indicated. 5/16" ID tubing or #5 Stratoflex line minimum is required.

Plumb the Aneroid discharge port (5/16" inverted flair) to the cylinder head fuel inlet port (also 5/16" inverted flair).

Plumb the air signal line from the engine intake manifold to the aneroid air sensing port as indicated. The intake manifold is equipped with a 1/8" fpt connection as is the aneroid air sensing port. Use minimum Stratoflex #4 or equivalent.

Plumb the aneroid leak-off port to the fuel return system as indicated. Stratoflex size #4 minimum or equivalent is required.

#### Adjustment

Start the engine and allow a warm up period. Note: air which entered the fuel system plumbing during installation will cause hard starting. The fuel system may have to be purged before starting the engine.

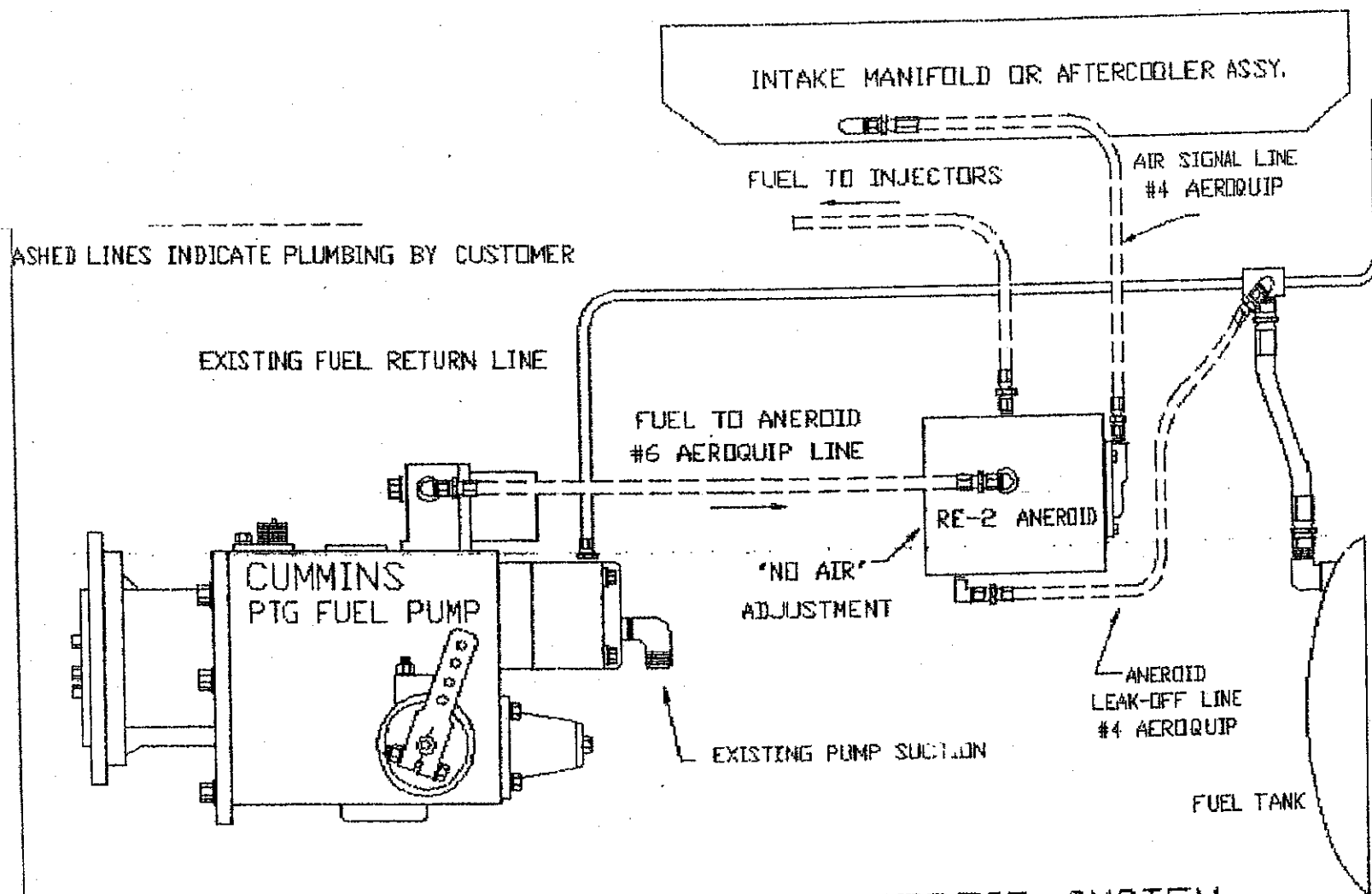
After the engine starts, and idles, cycle the throttle to make sure all air is purged from the fuel system. Next, perform a snap idle test. (Three snaps for clean-out, then record three). It is recommended that an opacity meter which meets the requirements of SAE 1243 be used to conduct this test. Currently, 55% opacity is the legal limit for class 8 commercial rigs manufactured prior to 1991. We are advised that consideration is currently being given to lower this level in the near future. For this reason, we suggest that adjustment to 35% to 38% should be considered. It has been our experience that unless something is wrong with the engine, 35% to 38% opacity should still allow reasonably good acceleration.

Adjustment of the valve to compliment the exact engine configuration may be achieved by manipulation of the "no-air" screw on the side of the aneroid valve body. Loosen the 7/16" jam nut, and back the adjusting screw out for more fuel. Adjust the screw in for less fuel. Adjustments of 1/4 turn can make significant changes in the exhaust opacity. When close to the desired opacity level, adjustments of 1/8 turn will suffice. When final adjustment is reached, lock the jam nut (be careful that the adjusting screw is held

steady while locking) and seal the no air screw location with the name tag provided with the valve.

When complete, check the installation to make sure all of the lines are secure and not leaking. Also make sure the lines and valve have been located carefully so as to not obstruct throttle linkage movement.

**APPENDIX B:**



## RIGHETTI ENTERPRISES RE-2 ANEROID SYSTEM

| RIGHETTI ENTERPRISES<br>1627 E CHANNEL ST<br>STOCKTON, CA. 95205<br>(209) 464-8306 | DATE    | REV. | DESCRIPTION          |
|------------------------------------------------------------------------------------|---------|------|----------------------|
|                                                                                    | 6-18-92 |      | INSTALLATION DETAILS |
|                                                                                    |         |      |                      |
|                                                                                    |         |      |                      |
|                                                                                    |         |      |                      |