

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-147  
Relating to Exemptions under Section 27156  
of the Vehicle Code

STAGLO EFFICIENCY SYSTEMS, INC.  
STAGLO G2e UNIT

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 Staglo G2e Unit manufactured by Staglo Efficiency Systems, Inc. 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 1984 and older model-year water-cooled diesel-powered vehicles.

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 device 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.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale, or advertise any component of a kit as an individual device.

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 THE STAGLO G2e UNIT.

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.

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 19<sup>th</sup> day of September, 1984.



K. D. Drachand, Chief  
Mobile Source Division

State of California  
AIR RESOURCES BOARD

EVALUATION OF THE STAGLO EFFICIENCY SYSTEMS, INC.'S STAGLO G2e UNIT FOR  
EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE  
WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE.

September 1984

Issue Date: September 1984

EVALUATION OF THE STAGLO EFFICIENCY SYSTEMS, INC.'S STAGLO G2e UNIT FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE.

By

Mobile Source Division

State of California  
Air Resources Board  
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El Monte, California 91731

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

## SUMMARY

Staglo Efficiency Systems, Inc. of 411 S. Main Street, Osceola, Iowa 50213, submitted an application for exemption from the prohibitions in Section 27156 of the California Vehicle Code for the corporate's "Staglo G2e Unit" device. The applicant has requested that exemption be granted for installation of this device on all 1984 and older model-year water-cooled diesel-powered motor vehicles.

The device is a simple heat exchanger utilizing engine coolant and an electrical heater to heat up the fuel supply to the engine for easy start up in cold weather.

The staff, based on engineering principle, evaluated the device and determined that the installation of a fuel heater in series with the diesel engine fuel system will not adversely affect the performance of factory equipped emission control systems. The staff recommends that the Air Resources Board (ARB) exempt the "Staglo G2e Unit" device from the prohibitions in Vehicle Code Section 27156 and that Executive Order D-147 be issued, allowing the installation of the "Staglo G2e Unit" device on all 1984 and older model-year water-cooled diesel-powered vehicles.

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AIR RESOURCES BOARD

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I. INTRODUCTION

Staglo Efficiency Systems, Inc. of 411 S. Main Street, Osceola, Iowa 50213, submitted an application for exemption from the prohibitions in Section 27156 of the California Vehicle Code for the corporate's "Staglo G2e Unit" device. Vehicle Code Section 27156 prohibits the installation of any device or mechanism which reduces the effectiveness of required emission control systems on any California certified vehicles. This code also authorizes the Air Resources Board (ARB) to exempt a device from the prohibitions if it can be demonstrated that the device, upon installation on the engine, will not adversely affect the performance of existing emission control systems. The applicant has requested that the exemption be granted for the installation of this device on all 1984 and older model-year water-cooled diesel-powered vehicles.

II. CONCLUSION

The staff evaluated the device and found that the "Staglo G2e Unit" device will not have a significant adverse effect on emissions from 1984 and older model-year water-cooled diesel-powered motor vehicles. The applicant has agreed to the request of the ARB to remove the claims of "Cuts Emissions By Up To 78%" in the company's sales brochures. The ARB also advised the applicant that the company should be prepared to substantiate the increased fuel economy claims by valid laboratory tests.

### III. RECOMMENDATION

Based upon engineering evaluation made on a sample device, production blue-prints, and technical data submitted by the applicant, the staff recommends that the ARB exempt the "Staglo G2e Unit" device from the prohibitions of Vehicle Code Section 27156 and that Executive Order D-147 be issued, allowing the installation of the "Staglo G2e Unit" device on all 1984 and older model-year water-cooled diesel-powered motor vehicles in California.

### IV. SYSTEM DESCRIPTION AND OPERATION

The "Staglo G2e Unit" device is a heat exchanger manufactured from a 5/8" diameter x 15'-0" long copper tubing helically coiled in a 4" x 4" x 16" case made of mild steel. Attached to each end of the case, is a 5/8" hose fitting to accommodate the circulation of engine coolant through the case. Also, two 5/8" compression fittings are mounted on one of the end plates to hold the coiled copper tubing in place and at the same time work as fuel inlet and outlet connectors. On the other end plate, a single phase electrical heater rated at 300-Watts, 110-Volts and 60-hertz is installed for overnight fuel heating as a quick-starting aid. Two pairs of half-brackets with rubber pads are used to secure the device in the engine compartment.

Figure 1 (Appendix A) shows a typical flow diagram. The device is mounted between the fuel tank and the fuel filter. Installation of this device in a fuel system of a diesel-engine equipped vehicle is done by connecting the inlet and outlet fittings to the hot engine coolant supply line and back to the engine line. Temperature of the incoming engine coolant is determined by the engine thermostat rating (about 180°F). The two ends of the copper coil of the device are connected, such that one to the fuel supply coming from the storage tank and the other to the fuel filter lines.



Without the "Staglo G2e Unit" device the temperature of the fuel supplied to the engine is dependent upon the ambient temperature. If the vehicle is exposed to sub-zero weather temperature, then the fuel stored in the fuel storage tank will be at the same sub-zero temperature. Diesel-fuel at this temperature tends to congeal. Very poor engine starting will result causing more unburned fuel to be blown out of the exhaust pipe. For cold starts with the "Staglo G2e Unit" device, the diesel-fuel from the fuel tank is routed into the heat exchanger where it absorbs heat energy from an electrical heater rated at 300-Watts, 110-Volts and 60-Hertz which is inserted in the device for overnight fuel heating.

V. DISCUSSION

The applicant submitted several customer testimonials including a copy of laboratory particulate test results on their "Staglo G2e Unit" conducted by Corning Laboratories, Inc. of Cedar Falls, Iowa 50613. The testimonials are very subjective; they were not used in the ARB's evaluation of the device.

The Staff, based on engineering principles, evaluated the device and determined that the installation of a fuel heater, such as the "Staglo G2e Unit" device in series with the diesel engine fuel system will not adversely affect the performance of factory equipped emission control systems.

APPENDIX

# Installation Instructions for StaGlo Fuel Saver

Installation of the StaGlo Fuel Saver unit is relatively simple if you follow instructions carefully.

## 1. Location of the Unit

- A For single filter systems, mount the StaGlo G2E Fuel Saver between the fuel tank and the fuel filter, but as close as possible to the fuel filter.
- B For dual filter systems, the StaGlo Fuel Saver should be located as near the closest fuel filter to the pump as possible.
- C The StaGlo Fuel Saver's out-going fuel line should be well insulated to eliminate cold weather clogging of the fuel filter.
- D Be sure to allow adequate space for visual spot checking of the lines.
- E Also, in choosing a mounting location, take other maintenance requirements into account. Be sure to mount the unit so as not to restrict normal maintenance access.

Single Filter System



Dual Filter System

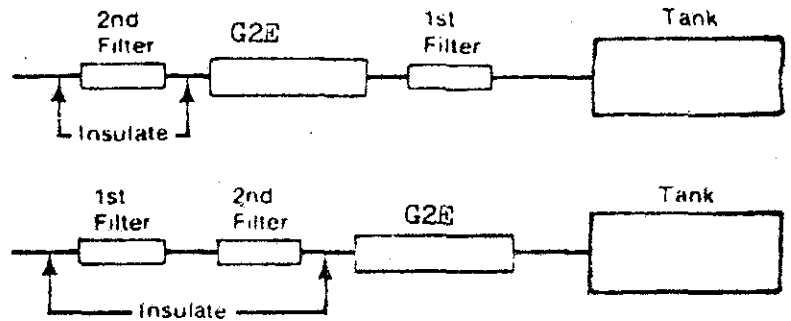


FIG. 1

## 2. Mounting the StaGlo G2E unit

- A The StaGlo G2E unit can be bolted directly to the body of the frame with a 1/4" 20 machine bolts with lock washer and nut.
- B If necessary, a separate mounting bracket or plate (not included) can be designed to permit special location advantages. Be sure to consult maintenance personnel who will be required to work around the unit if using this option.
- C While welding the unit has its advantages, it is not recommended.
- D Before placing the StaGlo G2E unit in the mounting brackets, apply the foam tape padding to brackets as shown.

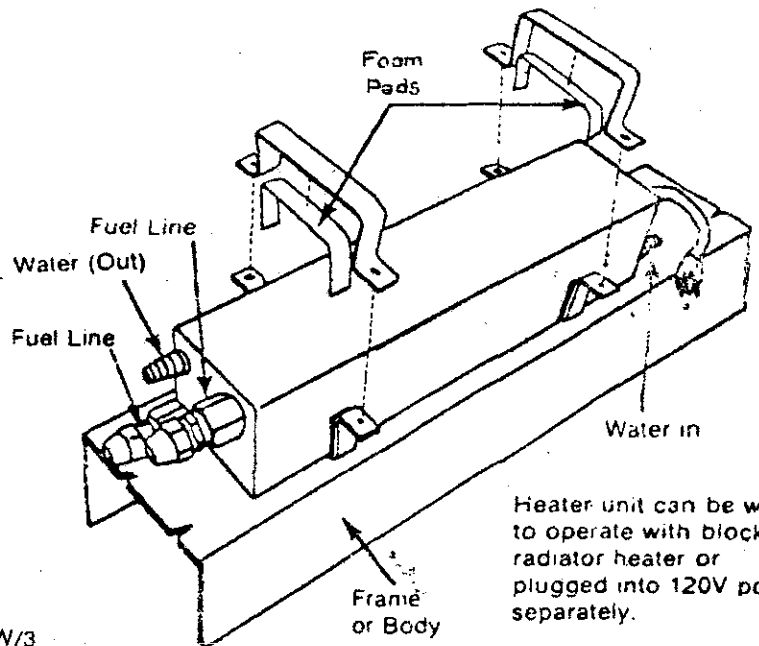
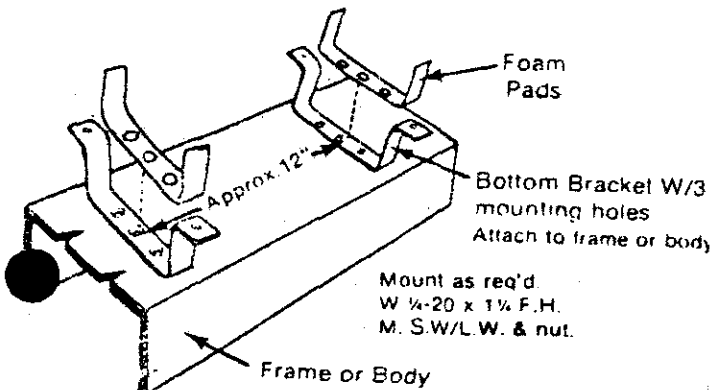


FIG. 2

## APPENDIX A

### 3. Water Lin Connections

The StaGlo Fuel Saver unit accepts standard 1/2" pipe thread fittings (supplied with unit).

**Note:** You must be drawing 180 F water into the unit. Water temperatures must be constant.

- A First, connect the high water jacket line to the engine cooling system. Be sure to connect on the side of the thermostat. (A "Y" fitting (not supplied) can be used if required.)
- B Be sure to insulate this line to retain maximum heat from the engine to the StaGlo G2E Fuel Saver unit. Be careful to avoid line contact damage from the exhaust manifold or other disassociated parts.
- C Connecting the StaGlo Fuel Saver water outlet to the low side of the water jacket (this line need not be insulated).

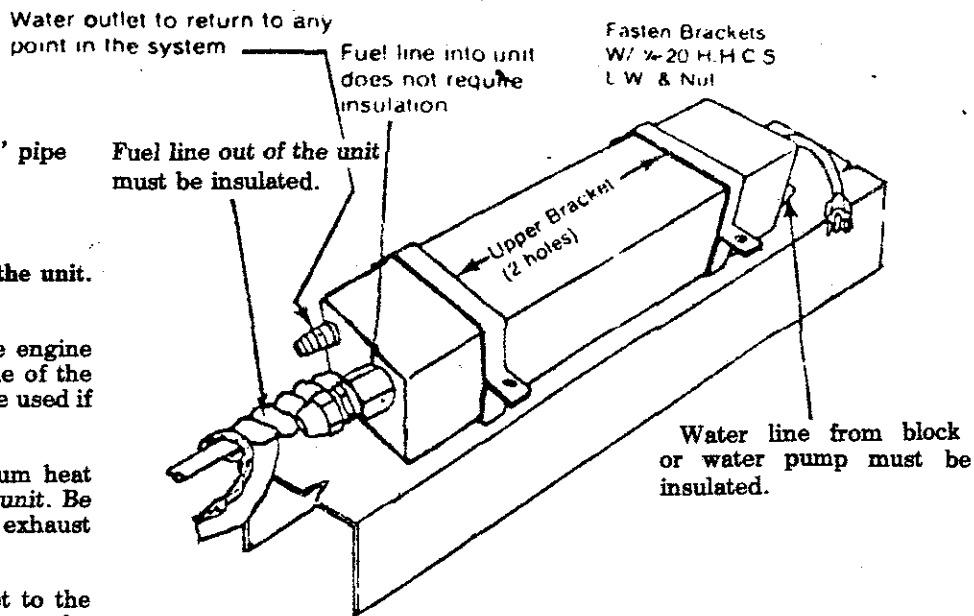


FIG. 3

### 4. Fuel Line Connection

Do not remove or adjust fittings. They are pressure tested.

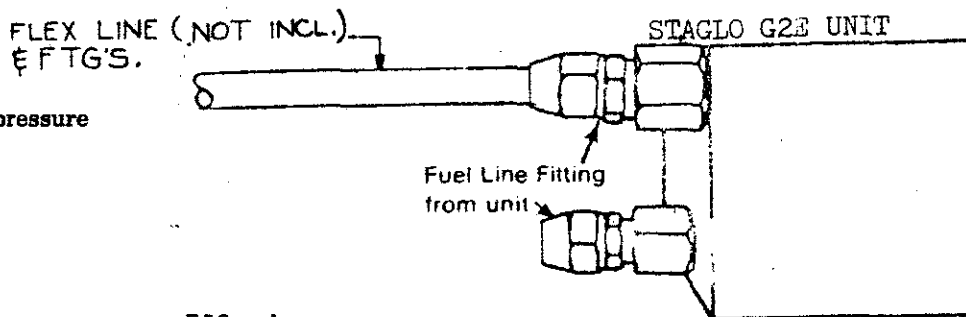
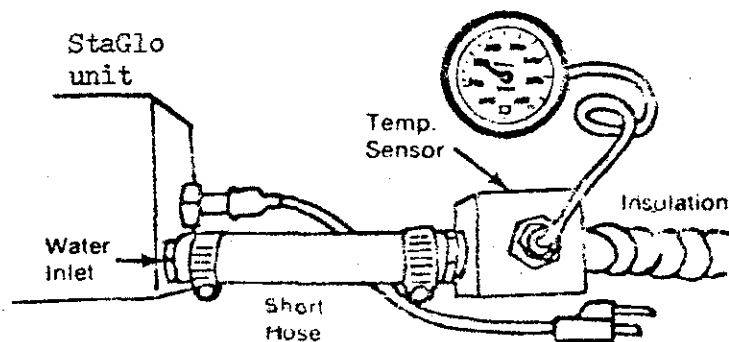


FIG. 4

### 5. Priming the StaGlo G2E unit

- A Do not remove any lines between the pump and the filter.
- B Allow the engine to run at 1600 RPM for 10 to 20 minutes.
- C Loosen the fitting between the filter and the G2E StaGlo unit and pressurize the primary tank.
- D A manual pump attachment to the StaGlo G2E unit will draw fuel through the unit.



- E It is recommended that a water temperature sensor and gauge be utilized during the priming process to be sure that the G2E unit water temperature is correct.

FIG. 5