

Los Angeles City Fire Department

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JACOBS ENGINE BRAKE

“JAKE BRAKE”

INTRODUCTION

Jacobs Engine Brakes are now being provided on all new diesel- powered heavy apparatus are being retrofitted on older diesel powered heavy apparatus in the Department's fleet. Advantages for apparatus equipped with "Jake Brakes" include increased performance, safety, versatility, and cost-effectiveness. Significant reduction in brake wear can be anticipated through the proper training and use of "Jake Brakes" on apparatus so equipped.

Familiarization with the operational characteristics and precautions is necessary by all members for the Department to fully benefit from the Jake Brakes' capabilities.

THEORY OF OPERATION

Diesel engines have substantially less retarding effect upon vehicles than a gasoline engine. This is due to lack of restriction in the diesel intake manifold. The gasoline engine has a butterfly in the carburetor which creates a vacuum and subsequent engine braking.

The Jacobs Engine Brake is a hydraulic engine attachment that, when energized, alters the engine exhaust valve operation which converts the diesel engine into an air compressor. This is accomplished by prematurely opening the exhaust valves near the top of the compression stroke releasing the compression pressure to exhaust.

The engine brake may be used for descending grades, in city traffic, when approaching stop lights and, in general, whenever vehicle retarding is required.

There is no time limit with respect to the operation of your JACOBS BRAKE. The engine's cooling system will continually absorb and dissipate the heat generated by its continual use.

The engine brake reacts quickly. It will activate or deactivate in less than 1/4 of a second.

JAKE BRAKE OPERATION

The Department uses three (3) different Diesel Engine/Transmission combinations in its fleet. Each combination of engine/transmission has a specific Jake Brake operating procedure. The following is a description of the operating procedure for each combination.

1. CUMMINS DIESEL WITH MANUAL TRANSMISSION

The Jake Brake switches used on an apparatus equipped with a manual shift transmission and a Cummins Diesel engine, will be an on-off switch mounted on the gear shift lever. A three (3) position switch controlling the amount of retarding power desired, mounted on the dash board, and two (2) additional switches, one mounted on the clutch pedal and the other mounted on the throttle pedal. These switches de-activate the Jake Brake if either pedal is depressed.

JAKE BRAKE OPERATING INSTRUCTIONS

1. Start engine.
2. Engine should be fairly warm before engaging JAKE BRAKE. Engine preheater water temperature is sufficient.
3. Turn on the JAKE BRAKE "On-Off" switch located on gear shift lever.
4. Move dash mounted multi-position switch to one of the following anticipated retarding requirements.

- A. Minimum engine retarding (#1 position on switch)
 - B. Moderate engine retarding (#2 position on switch)
 - C. Maximum engine retarding (#3 position on switch)
5. Selector switch position can be changed at the discretion of the operator, at any time, without the fear of damaging any of the engine components.

2. **CUMMINS DIESEL WITH AUTOMATIC TRANSMISSION**

The Jake Brake switches on an apparatus equipped with an automatic transmission and a Cummins Diesel engine, will be on ON/OFF switch mounted on the dash board. A three position switch controlling the amount of retarding power desired, mounted on the dash board, a throttle pedal switch which de-activates the jake brake if depressed, and a pressure sensing switch mounted on the transmission to de-activate the jake brake at low speeds.

JAKE BRAKE OPERATING INSTRUCTIONS

1. Start engine.
2. Engine should be fairly warm before engaging JAKE BRAKE. Engine preheater water temperature is sufficient.
3. Turn on the JAKE BRAKE "On-Off" switch located on dash board.
4. Move dash mounted multi-position switch to one of the following anticipated retarding requirements.
 - A. Minimum engine retarding (#1 position on switch)
 - B. Moderate engine retarding (#2 position on switch)
 - C. Maximum engine retarding (#3 position on switch)
5. Selector switch position can be changed at the discretion of the operator, at any time, without the fear of damaging any of the engine components.

3. **DETROIT DIESEL (V-8 or V-6) WITH AUTOMATIC TRANSMISSION**

The Jake Brake switches used on an apparatus equipped with an automatic transmission and a Detroit Diesel engine, will be a single, three position switch, off-low-high, mounted on the dash board. This switch will turn on and off the jake brake and also will control the amount of retarding power desired. There is also a throttle pedal switch which de-activates the Jake Brake when depressed, and a pressure sensing switch mounted on the transmission to de-activate the Jake Brake at low speeds.

JAKE BRAKE OPERATING INSTRUCTIONS

1. Start engine.
2. Engine should be fairly warm before engaging Jake Brake. Engine preheater water temperature is sufficient.
3. Turn on the Jake Brake by moving the switch from the off position to the retarding power desired.
 - A. Minimum engine retarding ("LO" position on switch)
 - B. Maximum engine retarding ("HI" position on switch)
4. Selector switch position can be changed at the discretion of the operator, at any time, without the fear of damaging any of the engine components.

FREEWAY OPERATION

USE OF THE JAKE BRAKE ON FREEWAY OR SIMILAR OPEN ROAD SHOULD BE DICTATED BY TRAFFIC CONDITIONS AND THE OPERATOR'S GOOD JUDGEMENT. DESIRABLE COAST OF APPARATUS IS ELIMINATED BY JAKE BRAKE RETARDATION.

USAGE GUIDE

LIGHT TRAFFIC CONDITION:

Minimum Jake Brake switch setting

MEDIUM TRAFFIC CONDITION:

Minimum to moderate Jake Brake switch setting

HEAVY TRAFFIC CONDITION AND EMERGENCY RESPONSES:

Maximum Jake Brake switch setting

JAKE BRAKE "CAUTIONS"

WET STREET OPERATION:

DO NOT ENGAGE THE JAKE BRAKE ON WET STREETS. THE ADDITIONAL BRAKING EFFORT ON THE DRIVE WHEELS (DUALS) CAN CAUSE THEM TO LOCK UP WHICH COULD RESULT IN AN UNCONTROLLABLE SKID.

DO NOT ENGAGE THE JAKE BRAKE DURING PUMPING OR AERIAL OPERATIONS. This practice causes undesirable retardation, possible engine and component damage, and engine stalling.

Additional cautions apply specifically to manual transmission equipped apparatus as follows:

DO NOT ENGAGE JAKE BRAKE WHEN UPSHIFTING GEARS. When accelerating the apparatus, DO NOT UPSHIFT using the Jake Brake. (i.e. shift from first gear to second gear, second to third gear, etc.) This could cause abnormal stresses and shock loads to the engine and may lead to engine damage.

DO NOT RIDE THE CLUTCH PEDAL TO DISENGAGE THE JAKE BRAKE. This will cause premature wear to the throw-out bearing, clutch, and thrust bearing on the crankshaft.

DO NOT ENGAGE THE JAKE BRAKE AT IDLE OR LOW ENGINE SPEED. This will cause the engine to stall. To avoid stalling, depress the throttle or clutch pedal, or deactivate the Jake Brake by the ON/OFF switch.