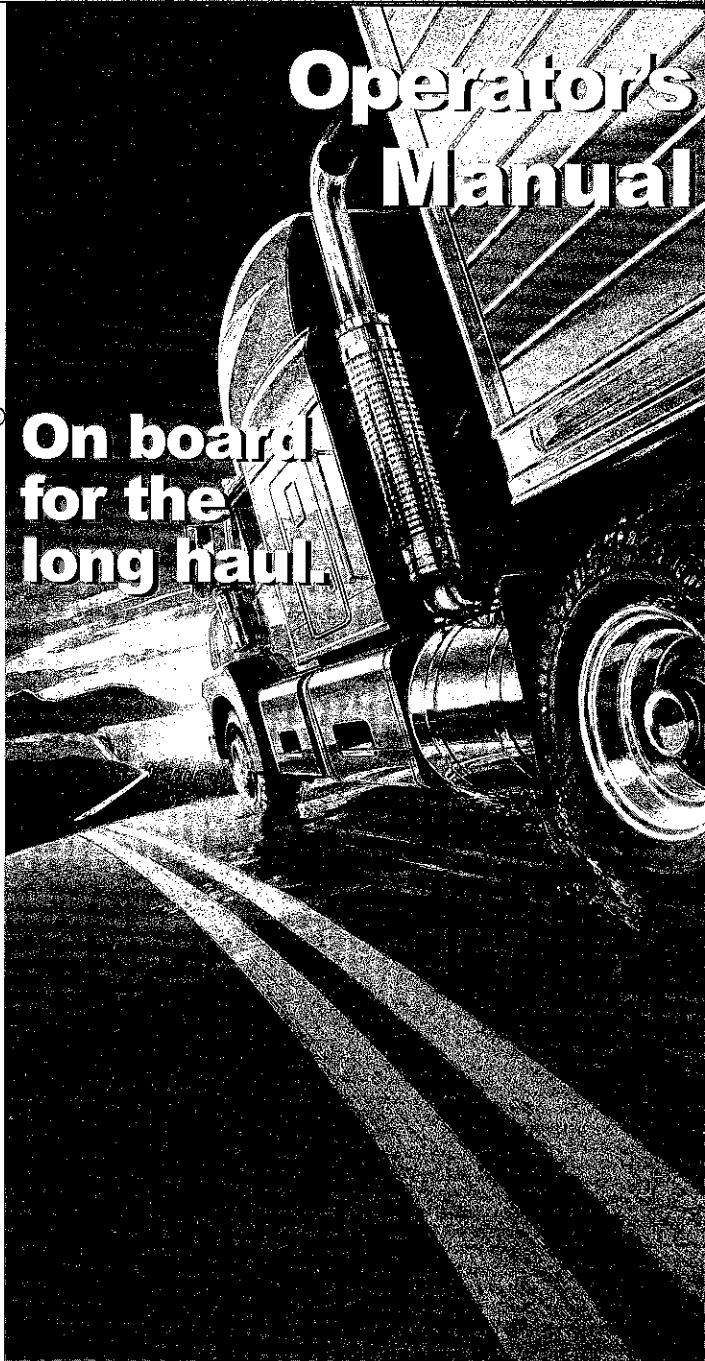


Jacobs Engine Brake™

**Jake
Brake®**

**On board
for the
long haul.**

**Operator's
Manual**



Jacobs Vehicle Systems™

Introduction

Congratulations! Your vehicle is equipped with the original Jacobs Engine Brake™. The Jacobs Engine Brake (also known as the “Jake Brake® engine brake”) is widely recognized throughout the trucking industry for its quality, reliability and performance. This manual contains useful information on the operation and maintenance of your Jacobs Engine Brake. Read this manual thoroughly and fully understand the engine brake system before you drive your Jacobs Engine Brake-equipped vehicle.

The Jacobs Engine Brake is a diesel engine retarder that uses the engine to aid in slowing and controlling the vehicle. When activated, the engine brake alters the operation of the engine’s exhaust valves so that the engine works as a power-absorbing air compressor. This provides a retarding, or slowing, action to the vehicle’s drive wheels, enabling you to have improved vehicle control without using the service brakes. This results in reduced service brake maintenance, shorter trip times, and lower overall operating costs.



Statements marked with this symbol indicate potentially dangerous conditions including the possibility of personal injury.



Statements marked with this symbol are important for the safe use and care of the Jacobs Engine Brake.

Please refer to the operator’s manual provided by the manufacturer of your vehicle for additional information and operations that may differ from those described in this manual.

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Using Your Jacobs Engine Brake™

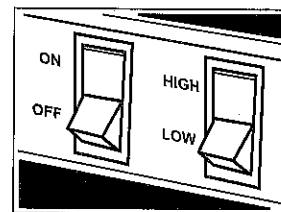


The Jacobs Engine Brake™ is a vehicle-slowng device, not a vehicle-stopping device. It is not a substitute for the service braking system. The vehicle's service brakes must be used to bring the vehicle to a complete stop. However, by appropriately using the engine brake for your slowing needs, the service brakes remain cool and ready to provide their maximum stopping power.

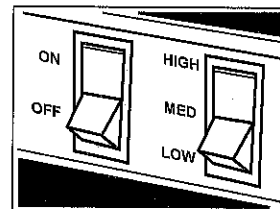
Driver Controls

It is important to familiarize yourself with the Jacobs Engine Brake controls in your vehicle. The controls will vary slightly depending on the engine brake configuration and cab design, as discussed below. However, basic operator controls will be similar for all models. All vehicles with manual transmissions will allow the driver to turn the engine brake on and off and select a level of braking. Below are illustrations of the various types of switches that you may find in your vehicle. **Note:** Switches supplied by Jacobs Vehicle Systems may be different from the ones installed in your vehicle (physical appearance varies but function should not).

The operations tied to these switches are as follows (for a typical in-line 6 cylinder engine):



Low/High Switch: The “low” setting activates three cylinders, yielding approximately 50% braking horsepower. The “high” setting will activate all six cylinders, providing full braking horsepower.



Low/Med/High Switch: The “Low” setting activates two cylinders, yielding approximately one-third total braking horsepower. The “Medium” setting activates four cylinders, yielding approximately two thirds braking horsepower. The “high” setting will activate all six cylinders, providing full braking horsepower.

Additionally, a foot-operated switch may be offered to give you control of the on/off function of the Jacobs Engine Brake. Some vehicle manufacturers offer a gear lever selector switch for the engine brake.

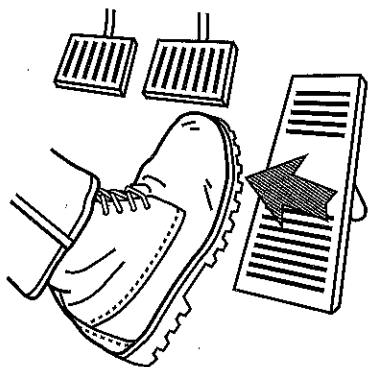
Engine Controls

All Jacobs Engine Brakes have two additional controls: one activated by the position of the clutch pedal, and the other by the position of the throttle. The two controls can provide for fully automatic operation of the Jacobs Engine Brake™.

Jacobs Engine Brake Operation

CAUTION The Jacobs Engine Brake depends on the free flow of engine oil for operation, so **be sure to let the engine reach full operating temperature before switching on the engine brake.** Normally, the engine brake is then left in the "On" position whenever you are driving. The exception is when roads are slippery due to bad weather conditions. Refer to the section entitled "Slippery Pavement" for specific operating instructions.

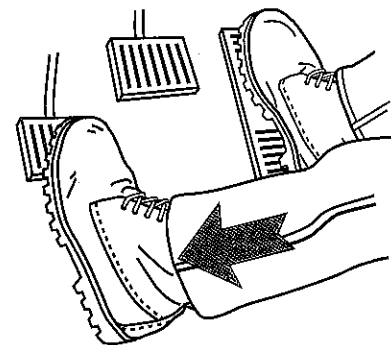
The operation of the Jacobs Engine Brake is fully automatic, once it is turned on. When your foot is off the clutch and you remove your foot completely from the throttle, the engine brake is automatically activated. (There are some systems that will activate only once the brake pedal is depressed.)



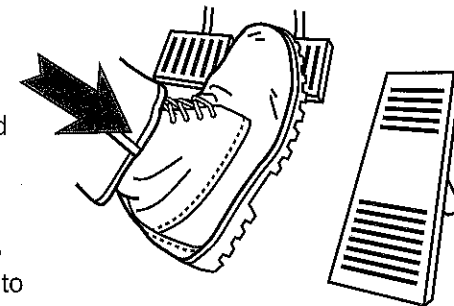
When you apply pressure to the throttle, the Jacobs Engine Brake is deactivated.

While shifting gears, the engine brake is automatically deactivated when you depress the clutch pedal.

CAUTION If the engine brake is on, shifting without using the clutch or double-clutching (to use the engine brake to reduce engine rpm--also known as "Jake Shifting") is strongly discouraged. Serious powertrain damage or engine stalling/loss of vehicle control can result.



Note that the Jacobs Engine Brake™ will also remain activated after the brake pedal has been depressed, giving the combined power of both the engine brake and the service brakes to the drive wheels.



ABS (Anti-Lock Braking System) equipped vehicles have the ability to turn the engine brake off if a wheel slip condition is detected. The engine brake will automatically be turned back on when wheel slip is no longer detected.

On vehicles equipped with electronic engine controls, the controls will deactivate the engine brake when engine speed falls below approximately 1000 rpm or when the vehicle slows down to a pre-set speed, which varies depending on the vehicle and engine configuration. This prevents stalling the engine. On vehicles equipped with mechanical engine controls and manual transmissions, depress the clutch pedal at low speeds to prevent stalling the engine. (Alternatively, a low-speed cutoff control may be installed to ensure deactivation of the engine brake at low vehicle speeds.)

CAUTION Be sure to turn off the engine brake dashboard switch when you shut the engine down. This will prevent the switch from being in the "on" position at engine cold start.

Automatic Transmissions

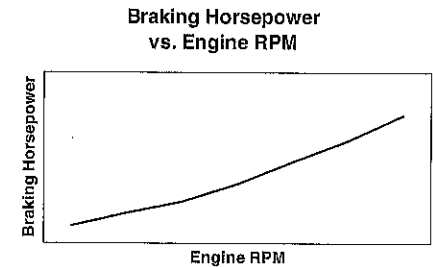
If you have an automatic transmission, operation of the Jacobs Engine Brake™ functions basically in the same manner for vehicles with manual transmissions. The engine brake is activated when you move your foot off the throttle, and deactivated when you apply pressure to the throttle. A pressure-sensing switch (or the electronic engine controls) will deactivate the Jacobs Engine Brake when the engine speed falls below approximately 1000 rpm, or when the transmission shifts from lock-up to converter operation (usually about 10-25 mph, depending on the transmission type). **NOTE: With “Autoshift” type transmissions, the engine brake may actuate to help the transmission upshift. This is done automatically through the transmission control module, and can happen even if the engine brake dash switch is in the “off” position.**

Cruise Control

There are several types of cruise control systems, and operation of the Jacobs Engine Brake in vehicles equipped with cruise control will depend on the engine and options provided by the vehicle manufacturer. Some cruise controls are specifically designed to operate in conjunction with the Jacobs Engine Brake. It may be possible to program activation of the engine brake during cruise control operation. When enabled, the system activates the engine brake when the vehicle exceeds the cruise control set speed. The engine brake will operate until the vehicle has slowed to 1/2 mph above cruise control set speed. Refer to the vehicle operator's manual for additional information.

Driving with Your Jacobs Engine Brake™

Since the engine brake is most effective at higher engine speeds, gear selection is very important. **You obtain maximum retarding power when you use the lowest possible gear without exceeding the recommended engine speed for engine braking.** Best retarding performance is obtained at engine speeds between 1800 rpm and high idle. Below 1700 rpm, retarding power may be significantly reduced.

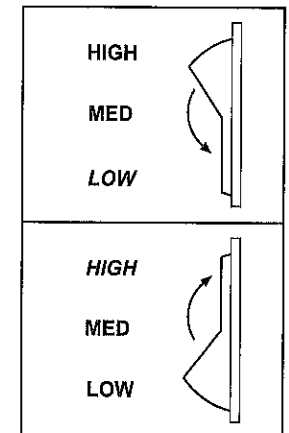


The Jacobs Engine Brake must be turned on at the dash switch in order to operate. Once it is turned on, merely take your foot off the throttle to slow your vehicle. The Jacobs Engine Brake goes into action, providing retarding power to the vehicle. Apply the service brakes when it's time to come to a complete stop. See the sections below for driving procedures for specific conditions.

Flat, Dry Pavement

If you are driving on flat, open stretches with a light load and greater slowing power isn't required, place the progressive braking switch in the “Low” position. If you find that you are still using the service brakes, move the switch to a higher position until you do not need to use the service brakes.

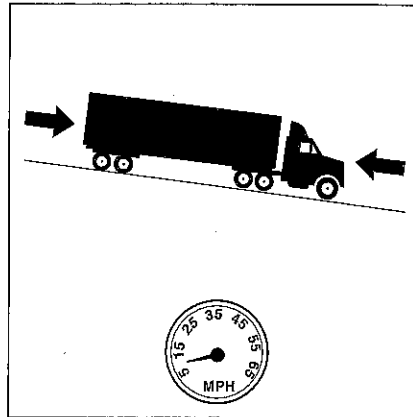
When you are carrying a heavier load or descending a grade, and the pavement is dry and traction is good, your progressive braking switch should be in the “High” position.



Descending a Grade

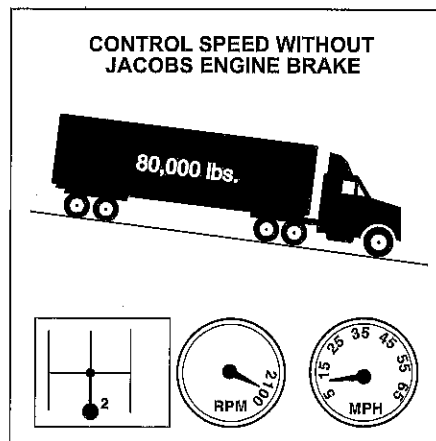
Before beginning a long, steep descent, determine if your Jacobs Engine Brake™ is operating properly. This can be done by lifting your foot briefly off the throttle. You will feel the Jacobs Engine Brake activate.

An explanation of “control speed” is helpful in understanding how to use the Jacobs Engine Brake while descending a grade. Control speed is the constant speed at which the forces pushing the vehicle forward on a grade are equal to the forces holding it back, without using the service brakes. In other words, the speed the vehicle will maintain without using the service brakes or the throttle.

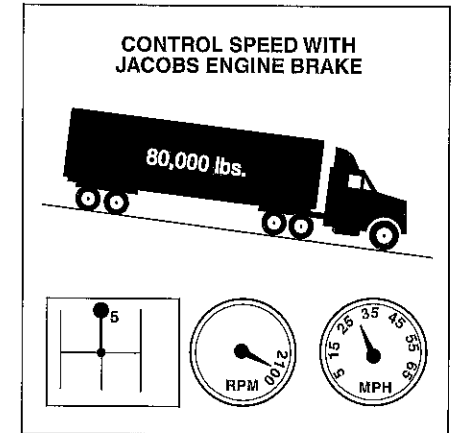


Note: The following road speeds and grades are given as examples only! Actual conditions and engine braking performance will vary.

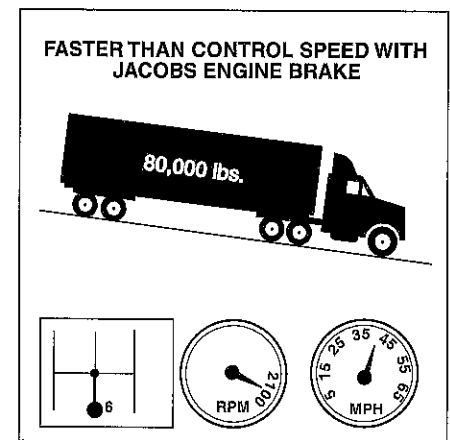
Depending on road and load conditions, without using your service brakes you may be able to descend a 6% grade safely at 10 mph without a Jacobs Engine Brake.



With the Jacobs Engine Brake™ set to the “High” position, you might be able to descend that same grade at 25 mph, and still remain under control without using your service brakes. The engine brake can be kept on for as long as needed without any risk of engine overheating or damage.



Under some circumstances, you may want to come down a grade at a faster rate than the control speed. This can be done by selecting a higher gear, or a lower position on the progressive braking switch. However, you may have to apply your service brakes intermittently to prevent overspeeding the engine and to keep the vehicle at a safe speed.



WARNING Frequent use of the service brakes will cause them to heat up, reducing their stopping ability. The result can be dangerous brake fade.

There may be circumstances in which you might want to descend a grade at a rate slower than the control speed. This is done by selecting a lower gear, one that will not overspeed the engine. You may have to apply the service brakes to obtain the desired lower speed.

Like any product, the Jacobs Engine Brake can be abused. Take, for instance, the above example of the 6% grade, which you could descend under control only at 10 mph without an engine brake, but at 25 mph with an engine brake. You could not descend that same hill at 50 mph and still expect to remain under control. Get to know how much slowing power your engine brake can provide. **Never exceed a safe control speed.**

Slippery Pavement

Since the operation of any vehicle under slippery conditions is unpredictable, be sure you have plenty of distance when testing service brakes or your Jacobs Engine Brake™.

The Jacobs Engine Brake will not affect the operation of ABS (Anti-lock Braking System) on vehicles so equipped. The ABS systems should deactivate the engine brake when wheel slip occurs and traction is lost, and will reactivate the engine brake when the ABS system has disengaged.

If the Jacobs Engine Brake is new to you, it is recommended that you do not attempt to use it on slippery roads until you have some experience with it on dry pavement. When you have that experience, you may use the following operation sequence as a guideline.



WARNING

Do not use the Jacobs Engine Brake when bobtailing or pulling an empty trailer on wet or slippery pavement, especially when operating a single drive axle vehicle.

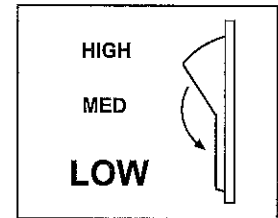
Slippery Pavement Driving Procedures

When driving on wet or icy pavement, start with the master switch in the "Off" position and use the same gear you would normally use under these conditions.

Before activating the engine brake, be sure that you have plenty of distance between your vehicle and other vehicles and that traffic conditions allow for testing of vehicle braking. Also make sure that the vehicle is maintaining traction and stability using the natural retarding of the engine alone. If the retarding of the engine alone without the engine brake causes any loss of traction, do not attempt to use the engine brake until road conditions improve.

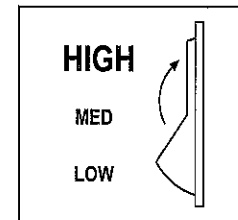
If the vehicle is maintaining traction, you may then activate the Jacobs Engine Brake™ by turning the switch to the "Low" position.

If the tractor drive wheels begin to lock or there is a fishtail motion, immediately turn the switch off and don't turn the Jacobs Engine Brake on until road conditions improve.



If there was no tendency for the drive wheels to lose traction and you desire greater slowing power, move the braking switch to the next highest position.

If the drive wheels tend to lock or there is a fishtail motion, immediately switch the engine brake into the low position. Do not attempt to use a higher position until road conditions improve.



WARNING

Check your progressive braking switch for proper position often, since road conditions can change quickly. Remember: never skip a step when operating the progressive braking switch. Always go from off to low position and then to a higher position.

On single trailers or combinations, a light air application of the trailer brakes may be desirable to help keep the trailer stretched out. Follow the manufacturer's recommended operating procedure when using your trailer brakes.

If your tractor is equipped with tandem axles and a power divider, the Jacobs Engine Brake will not change the normal usage of this equipment on icy roads. See the manufacturer's recommendations for the proper use of this equipment.

Maintenance and Service

Jacobs Engine Brakes are recognized as one of the most reliable components on today's diesel-powered vehicles. However, inspections and routine maintenance are necessary to ensure proper operation. In addition, periodic service will help reduce maintenance costs, unscheduled service and downtime. With every routine engine maintenance, have your engine brake inspected and serviced. If, for some reason, the engine brake will not shut off when your foot is on the throttle, immediately pull off the road and call for service.

Maintain your Jacobs Engine Brake™ with genuine Jacobs replacement parts. Use of other than Jacobs approved parts may result in reduced performance, serious engine damage and loss of warranty protection.

Recommended Preventive Maintenance Schedule

The service intervals presented here are intended as a guide for establishing a routine of Jacobs Engine Brake™ inspection and maintenance in conjunction with scheduled engine maintenance. Reference your engine manufacturer's service manual for specific maintenance intervals.

Part	100,000 miles	300,000 miles	500,000 miles
	3,000 hours	9,000 hours	15,000 hours
Wiring, Terminal Connections	I	I	I
Clutch/Throttle/Buffer Screw	A	A/R	A/R
Lash Adjusting Screw	A/I	A/I	A/R
Solenoid Valves		I	R
Crosshead/Bridges/Valve Stem Caps		I	I
Injector/Exhaust Rocker Arms Screws	I	I	I
Master Piston/Fork Assembly		I	I
Slave Pistons			I
External Hose Assembly	I	I	I
Housings		I	I
Fuel Pipes	I	I	I
Hold Down Bolts		I	R
Accumulator Springs*		R	
Solenoid Harness*		R	I
Solenoid Seal Rings*		R	I
Control Valve Springs*		R	I
Control Valves*		R	I
Oil Seal Rings*	I	R	I
Master Piston Return Springs*	I	R	I
Terminal Lead Out*	I	R	I
Crosshead Pin Assembly*	I	R	I

I = Inspect and replace as required A = Adjust R = Replace
*contained in tune-up kits

Severe driving conditions, types of roads and driving areas will affect the length of time between scheduled maintenance. Engine brakes which are exposed to severe applications and operating environments may require more frequent preventive maintenance.