

Jacobs Engine Brake[®]

OPERATOR'S MANUAL

Jacobs Vehicle Systems[®]



Engineered for the road ahead

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Introduction

Congratulations! Your vehicle is equipped with the genuine Jacobs Engine Brake®. The Jacobs Engine Brake (also known as the “Jake 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 conservation results in reduced service brake maintenance, shorter trip times, and lower total cost of ownership.

Safety Precautions

The following symbols in this manual signal conditions potentially dangerous to the mechanic or equipment. Be aware that these conditions can exist, then take the necessary steps to protect personnel as well as equipment.



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.

NOTE:

Statements marked with this symbol indicate an operation, procedure or instruction that is important for correct service.

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.

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 will remain cool and ready to provide their maximum stopping power when needed.



Driver Controls

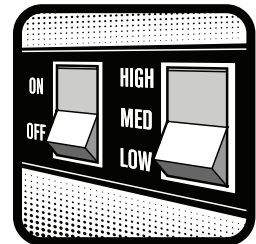
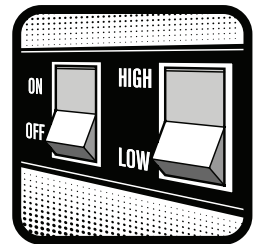
It is important to familiarize yourself with the Jacobs Engine Brake controls in your vehicle. As discussed below, the controls will vary slightly depending on the engine brake configuration and cab design. However, basic operator controls will be similar for all models. All vehicles with manual transmissions (for automatic or automatic manual transmissions, refer to Pg. 5) will allow the driver to turn the engine brake on and off and select the desired level of braking. Below are illustrations of the 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 by the vehicle manufacturer (physical appearance varies but function should not).*

Low/High Switch: The “Low” setting provides approximately half of the braking horsepower. The “high” setting provides full braking horsepower.

Low/Med/High Switch: The “Low” setting provides approximately one-third of the total braking horsepower. When the “Medium” setting is selected, approximately two-thirds braking horsepower will activate. The “High” setting will activate, providing full braking horsepower.

Other configurations besides the dash switch may be offered to give you control of the on/off function of the Jacobs Engine Brake. Options may include a foot-operated pedal, a steering wheel mount, or a shift lever switch.



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.

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. This will vary depending on the vehicle and engine configuration and is intended to prevent the engine from stalling. On vehicles equipped with mechanical engine controls and manual transmissions, depress the clutch pedal at low speeds to prevent the engine from stalling. Alternatively, a low-speed cutoff control may be installed to ensure deactivation of the engine brake at low vehicle speeds.

Jacobs Engine Brake Operation

The Jacobs Engine Brake depends on the free flow of engine oil for operation, so be sure to let the engine reach a minimum operating temperature of 40°C/104°F 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 poor weather conditions. Refer to Pg. 10 for specific operating instructions.



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

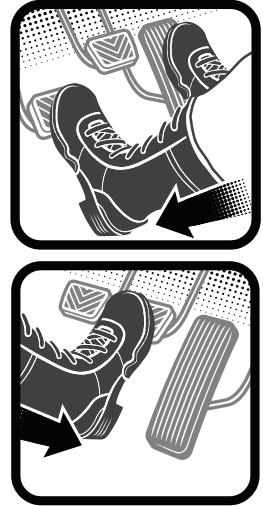


When you apply pressure to the throttle, the Jacobs Engine Brake is deactivated.



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

Note: *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 as long as the clutch is not depressed at the same time.*



ABS (Anti-Lock Braking System)

Vehicles equipped with ABS have the ability to turn the engine brake off should a wheel slip condition occur. The engine brake will automatically be turned back on when a wheel slip is no longer detected.



Be sure to turn off the engine brake 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 or automatic manual transmission, operation of the Jacobs Engine Brake functions essentially in the same manner as 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 Jake Brake when the engine speed falls below approximately 1000 rpm, or when the vehicle slows down to a pre-set speed. It may also occur when the transmission shifts from lock-up to converter operation (usually about 10-25 mph or 16-40 km/h, depending on the transmission type).

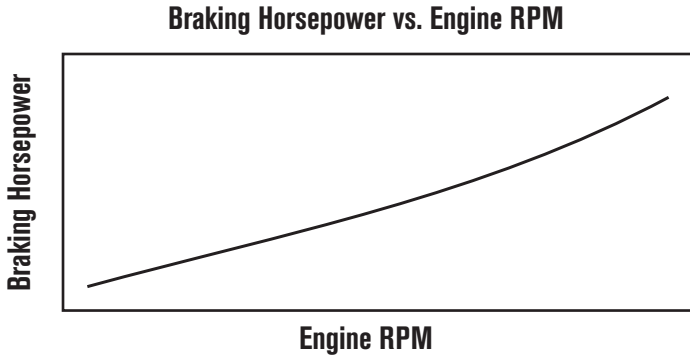
NOTE: *With “Autoshift” type transmissions, the engine brake may actuate to help the transmission upshift. This is done automatically through the transmission control module and can happen even if the engine brake switch is in the “off” position.*

Cruise Control

There are several types of cruise control systems, and the operation of the Jacobs Engine Brake in those vehicles 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 or 1/2 km/h above cruise control set speed. Refer to the vehicle's operator's manual for additional information as this may vary by make and model.

Driving with Your Jacobs Engine Brake

Since the engine brake is most effective at higher engine speeds, gear selection is very important. **To obtain maximum retarding power, use the lowest possible gear without exceeding the recommended engine speed for engine braking.** Best retarding performance is obtained at engine speeds between 2100 rpm and high idle. Below 1700 rpm, retarding power may be significantly reduced.



The Jacobs Engine Brake master switch must be turned on in order to operate. Once turned on, release the clutch pedal and remove your foot from the throttle. The Jacobs Engine Brake will then activate, providing retarding power to the vehicle. Apply the service brakes when it is time to come to a complete stop.

Flat, Dry Pavement

If you are driving on flat, open stretches with a light load and greater slowing power is not 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 have the desired Jake Brake retarding power.



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.



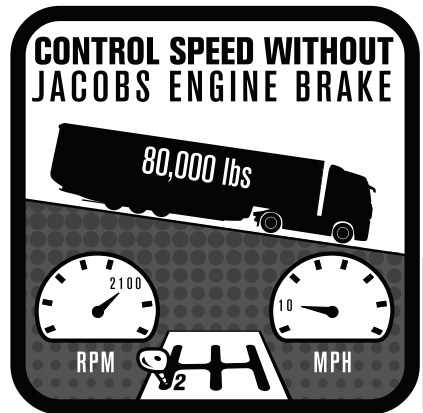
Descending a Grade

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.

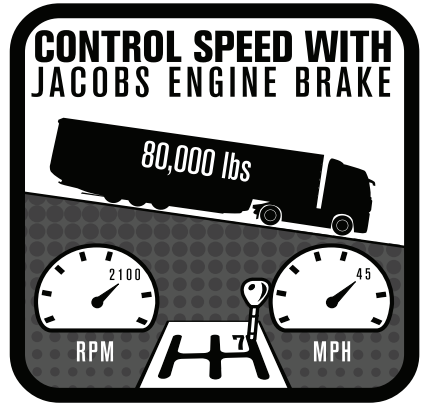
An explanation of “control speed” is helpful in understanding how to use the Jacobs Engine Brake while descending a grade. Control speed is the constant speed at which the forces pushing the vehicle forward on a grade are equal to the forces holding it back. Or in other words, the speed the vehicle will 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, you may be able to descend a 6% grade safely at 10 mph or 16 km/h by using the service brakes alone.



With the Jacobs Engine Brake set to the “High” position, you might be able to descend that same grade at 45 mph or 72 km/h 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.



Note: There are several variables that apply to a controlled speed, including but not limited to: rolling resistance, air resistance, and grade.

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 over-speeding of the engine and to keep the vehicle at a safe speed.



Frequent use of the service brakes will cause them to heat up, reducing their stopping ability. This can result in 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 over-speed the engine. You may toggle between the different brake retarding levels to increase or decrease your road speed as desired.

Like any product, the Jacobs Engine Brake can be abused. For instance, the above example of the 6% grade, which you could descend under control only at 10 mph or 16 km/h without an engine brake but at 45 mph or 72 km/h with an engine brake. You could not descend that same hill at 65 mph or 104 km/h 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 that you have plenty of stopping distance before testing your service brakes or Jacobs Engine Brake.

The operation of the ABS (Anti-lock Braking System) will not be affected by the operation of The Jacobs Engine Brake. The ABS systems should deactivate the engine brake when a 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.



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. Additionally, make sure that the vehicle is maintaining traction and stability by 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 do not 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.

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 you happen to experience issues with your Jacobs Engine Brake, promptly cease use and call your local service center for maintenance.

Maintain your Jacobs Engine Brake with genuine Jacobs replacement parts. Use of unapproved parts may result in reduced performance, serious engine damage, and/or loss of warranty protection.

Recommended Preventive Maintenance Schedule

The service intervals presented on the next page 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.

Severe driving conditions and 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.

Recommended Preventive Maintenance Schedule

Part	100,000 miles 3,000 hours	300,000 miles 9,000 hours	500,000 miles 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 Cap		I	I
Injector/Exhaust Rocker Arm 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

Warranty Coverage and Procedures

The unrivaled reliability of the Jacobs Engine Brake makes it unlikely that you will need to file a warranty claim. Jacobs Vehicle Systems, Inc. and the engine manufacturers back the Jacobs Engine Brake with limited warranty coverage. Refer to the appropriate section of your engine manufacturer's warranty for specific engine brake warranty information. The Jacobs Engine Brake warranty is administered through vehicle or engine dealers as an engine component.

For More Information

If you would like more information or have specific questions, please ask your local vehicle or engine dealer, or visit us at www.jacobsvehiclesystems.com.

Or visit us on our Social Media Pages:



[Facebook.com/jacobsvehiclesystems](https://www.facebook.com/jacobsvehiclesystems)



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[YouTube.com/jacobsvehiclesystems](https://www.youtube.com/jacobsvehiclesystems)

Notes

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00-011390 Rev. E 8/2015