



Designed for the **7.3L** Powerstroke

# 1994-1997 Ford Powerstroke BD Turbo Mount Vacuum Exhaust Brake

**Part# 2033143**

Serial # \_\_\_\_\_

Date Purchased \_\_\_\_\_

Purchased from \_\_\_\_\_

Installed by \_\_\_\_\_

**OWNER'S MANUAL – LEAVE IN GLOVE BOX**  
Installation Manual Part # I2033143



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**WELCOME**

Thank you for purchasing a BD Engine Exhaust Brake. Your kit should have the items mentioned for your installation. Please check to make sure that you have everything. This manual is to aid you with your installation and operation of your braking unit. We strongly suggest that you fill out the information below and retain this manual for any future reference.

**\* Please fill out and mail registration card as soon as possible. \***

**KIT CONTENTS****2033143 – Ford 7.3L Powerstroke Exhaust Brake**

Part #	Qty.	Description
<b>2133043</b>	1	Valve Assembly
<b>1230043</b>	1	Control Kit
<b>1230430</b>	1	Vacuum Spool Valve Kit
<b>1321039</b>	1	DFIV Application Kit

**OPTIONS**

Description	Part #
Manual Transmission Shifter Switch Kit	<b>1300240 / 1030910</b>
AutoLoc Convertor Lock-up Kit	<b>1030390</b>
Brake Pressure Gauge Kit	<b>1030551</b>
Exhaust Temperature (Pyrometer) Gauge Kit	<b>1030512</b>
Boost Pressure Gauge Kit	<b>1030570</b>
Transmission Gauge Kit	<b>1030585</b>

BD Engine Brake Inc.

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U.S. Shipping Address: 88-446 Harrison St, Sumas, WA 98295 U.S. Mailing Address: P.O. Box 231, Sumas, WA 98295

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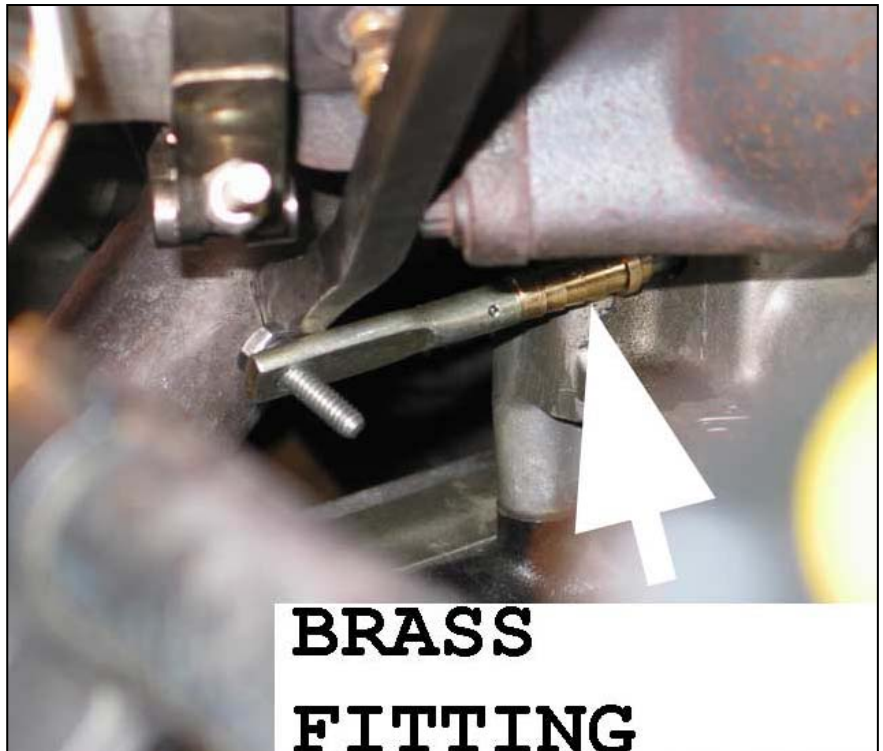
## EXHAUST BRAKE INSTALLATION

### VALVE INSTALLATION

Disconnect the negative terminals on both of the vehicle's batteries, and then disconnect the positive terminals. Remove the passenger side battery.

Remove the top cover housing of the engine and locate the engine-lifting eye by the turbo outlet and remove. Remove and retain the turbo exhaust clamp between the turbo and exhaust pipe. Loosen the 17mm nuts of the turbo down pipe (under cab) and push the pipe out of the way.

Remove the three mounting bolts of the outlet housing on the turbo. **NOTE:** The bottom-rear bolt, which cannot be seen, will require a 5/16" 12pt. half-moon wrench to loosen it, then taken out with the use of a swivel socket.



Disconnect the actuation rod from the bottom of the outlet housing by sliding back the ball joint cover and remove the turbo outlet housing. **NOTE:** The clip that holds the rod to the outlet housing is similar to that found on carburetors.

To prevent the rod from hanging, which can cause the rod seal to leak due to vibration, install the supplied rod support fitting.

This is a brass fitting that has a cut in it, which fits around the rod and holds the rod securely.

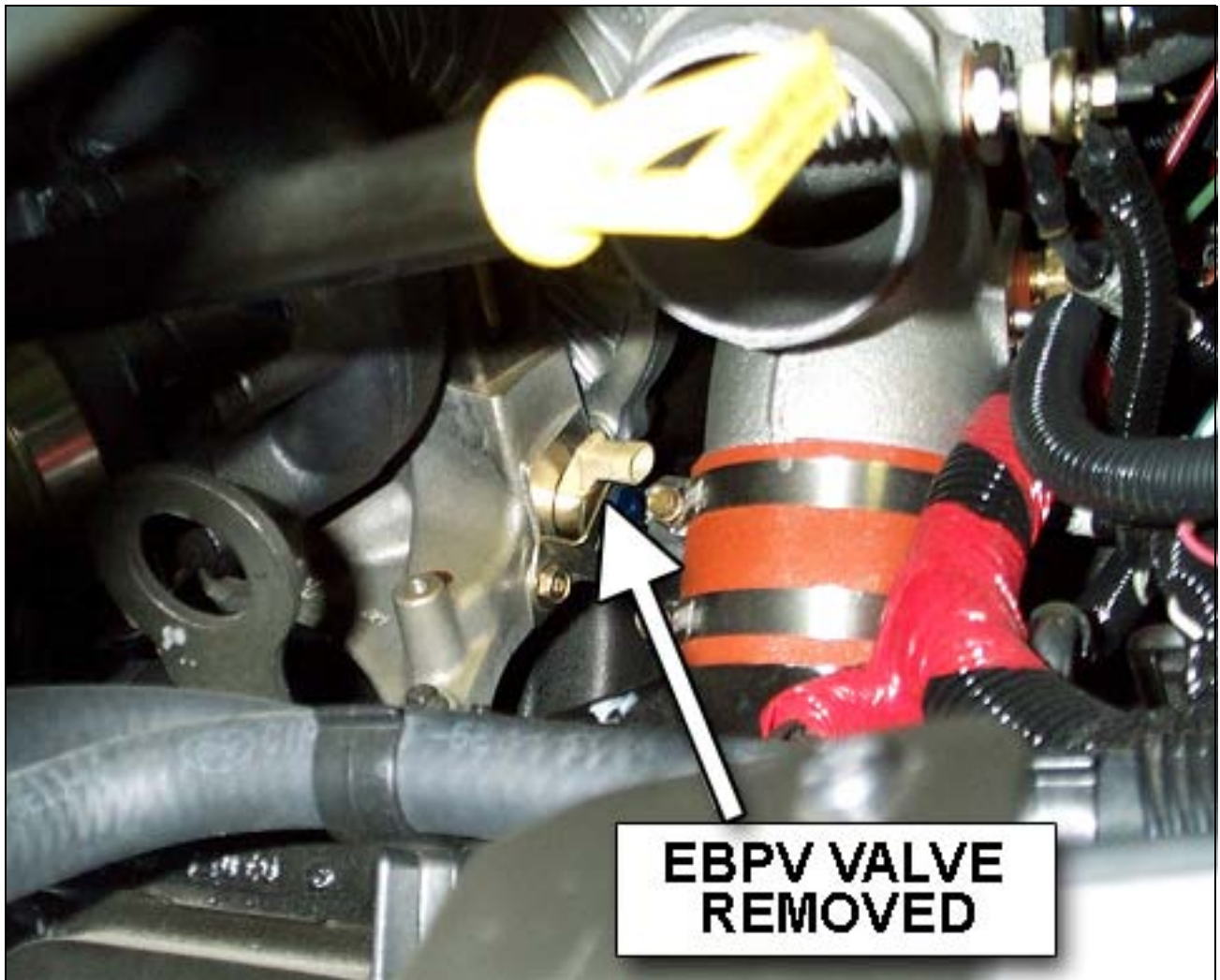
The EBP Valve will not be required with the installation of the BD Exhaust Brake. It is recommended that the EBP Valve wiring harness be disconnected to prevent the actuator rod from moving to protect the seal.

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**NOTE: ON CALIFORNIA MODEL VEHICLES THE EBP VALVE WIRING MUST BE CONNECTED TO ENSURE THE ECM DOES NOT SET AN ENGINE TROUBLE CODE.**

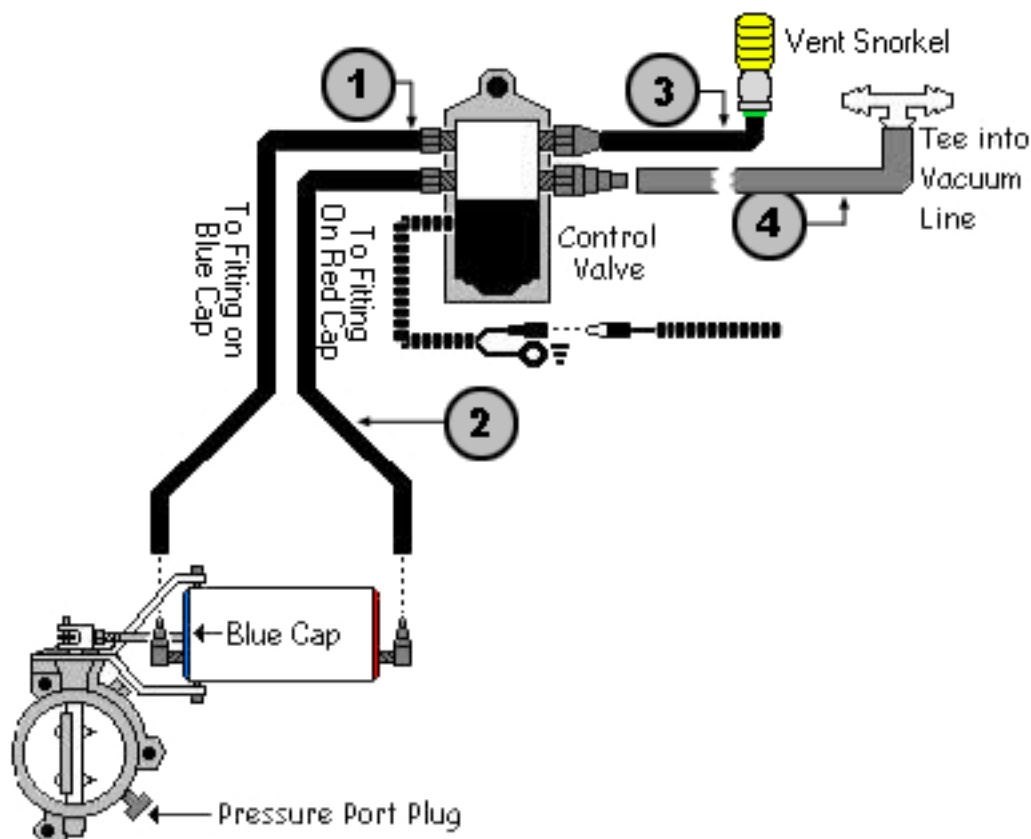
Install the BD Brake Valve Assembly on the turbo using the original mounting bolts, first threading in the front bolt, then the top bolt and the bottom rear bolt last, and tightening all bolts.

Using the turbo exhaust clamp, secure the exhaust pipe to the Brake Valve and tighten the lower 17mm nuts of the down pipe, and then re-connect the sensor hose and wire connector from the MAP sensor.

## CONTROL (SPOOL) VALVE INSTALLATION

Remove the lower right bolt on the wiper motor and install the supplied stud in its place, with the long pointing end going in the hole. Mount the Control Valve Assembly onto the stud, using the supplied lock nut, with the Control Valve wire w/stud (eye-hole) connector under the nut.

The Control Valve Assembly has two hoses attached to it; it is very easy to confuse these two so please pay close attention to the diagram below. Insert the first hose (marked on the diagram as #1) onto the quick connect fitting on the front blue cap of the Vacuum Cylinder on the Brake Valve Assembly, and the other hose (#2) onto the front quick connect fitting on the red cap. Make sure the hoses are out of the way of any moving or heated items on the engine.



Find the hose running from the vacuum pump to the hydraulic brake booster. Cut this hose just before the vacuum manifold and install the 3/8" plastic tee (w/hose attached) to the two pieces of hose. Attach the free end of the hose (w/plastic tee) to the unused barb fitting on the Control Valve (#4).

There is a loose section of plastic hose that came included with the spool valve kit with a yellow plastic vent filter on it. Attach this to the spool valve (#3) and run to a dry location inside your cab. This vent prevents moisture from entering inside the control (spool) valve.

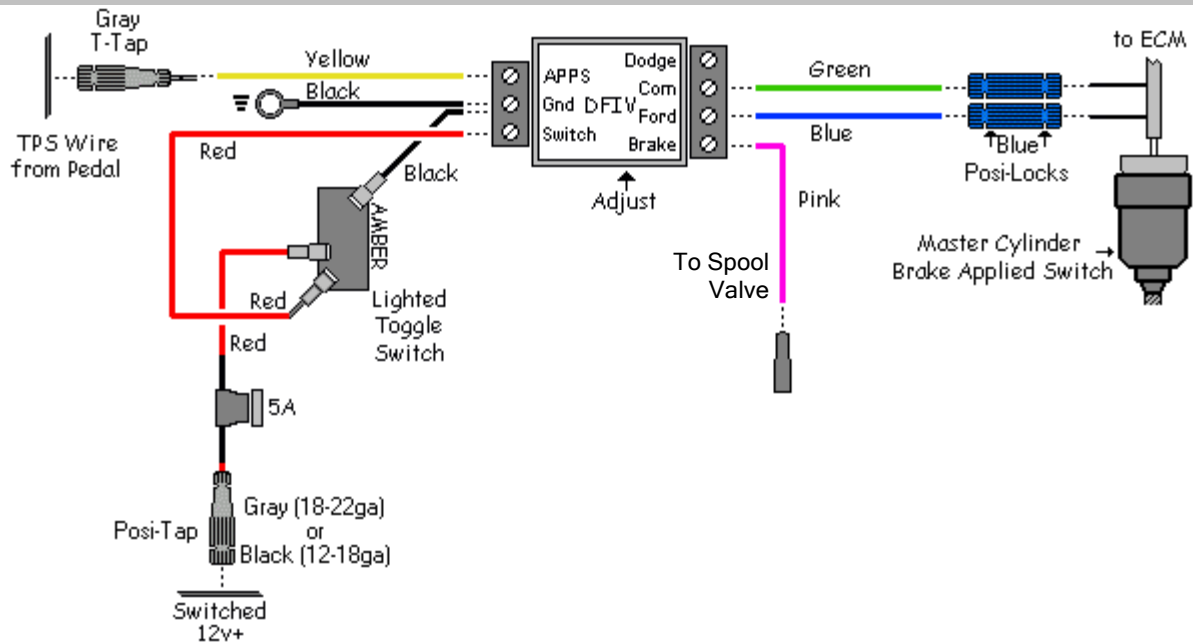
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## WIRING DIAGRAM



**CAUTION:** Before installing any wiring modifications or equipment ensure to disconnect the battery Ground (Negative) terminals on all the vehicle batteries as damage to the vehicle's ECU and/or installed components may result.

Remove the lower section of the dash under the steering column, and mount the DFIV module to the cross member under the steering column. Connect the Black wire from the DFIV module to a good ground.

Locate the Gray w/Yellow tracer wire connected to pin #17 of the fuse panel as a source of ignition power.

Locate the **Throttle Position Sensor (TPS)** at the throttle pedal and use a gray Posi-Tap connector to attach the Yellow wire from the DFIV module to the Gray/White tracer wire on the TPS.

Ensure the Green wire is connected to the 'COM' terminal of the DFIV module, the Blue wire is connected to the 'FORD' terminal of the DFIV module, and the Pink wire is connected to the 'BRAKE' terminal of the DFIV module. Also check to ensure all other wires at the DFIV module are secure.

**NOTE:** If the vehicle does not have Cruise Control, remove the Green and Blue wire from the install and discard.

Run the other end of these wires through a grommet on the firewall making sure all wires are secured and away from moving objects and heat sources.

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## *OPTIONAL SHIFTER SWITCH*

To install the optional Manual Shifter Switch Kit, mount the switch onto the shift lever using the clamp supplied. Run the cable down the shifter shaft, securing the cable with zip-ties or electrical tape, and run under the carpet to the firewall and under the dash to the relays, leaving enough slack for proper shifting of the transmission lever and to prevent any rubbing of wire.

At the end of the cable, cut off any excess and strip away about 1 to 2 inches of the black rubber covering, exposing the black and white (or Green) wires then strip the insulation from the ends of the two wires.

Connect the White (or Green) wire to the "Switch" terminal on the DFIV Module.



Attach a male blade connector to the Black wire. Remove the fused Red wire from the toggle switch (the toggle switch and remaining Red and Black wire attached to the switch will no longer be needed) and attach to the Black wire from the optional switch to the female connector of the fused Red wire.

Locate one of the ignition switched red/black tracer wires under the steering column (one is 10/12ga and the other is 14/16ga) and connect an appropriate Posi-Tap connector to it (green for 10/12ga and black for the 14/16ga wire) then connect the fused Red wire to this Posi-Tap.



### CRUISE CONTROL DISCONNECT WIRING (IF EQUIPPED)

**NOTE:** If the vehicle does not have Cruise Control, remove the Green and Blue wire from the install and discard. Jump to the Control Wiring section.

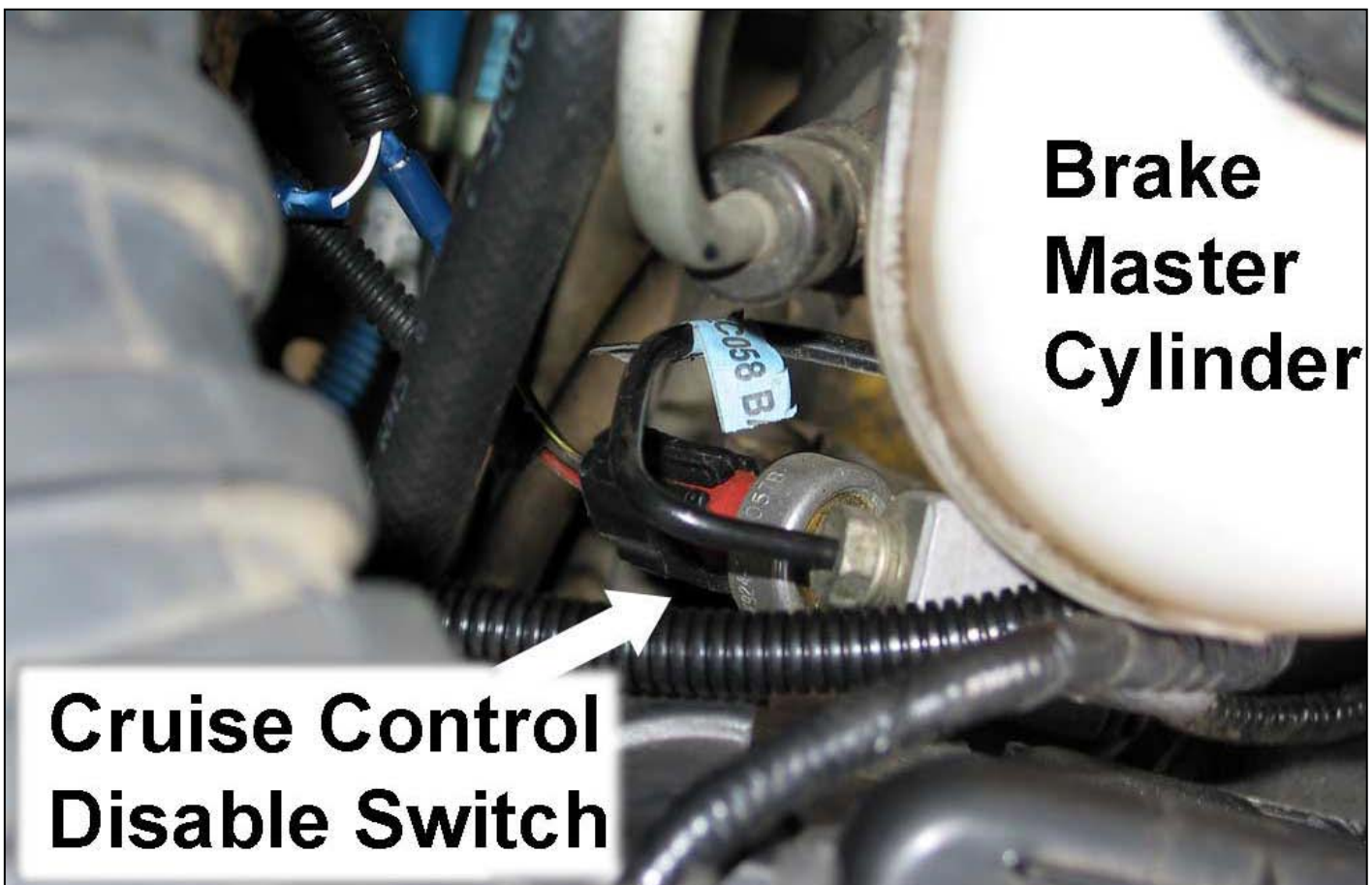
Consult the wiring diagram for proper connections and locate the Brake Applied Switch on top the hydraulic brake booster.

Locate the Black w/Yellow wire at the Cruise Control Disable (Brake Applied) switch located on the brake master cylinder and expose the wiring approximately 4 to 6 inches from the switch to allow for a good length to work with.

**NOTE:** This wire may be a different color in various applications. If there is no Black w/Yellow wire going to this switch, use a test light to check which wire changes state (power to no power) when the brake pedal is applied.

Cut the black wire w/yellow tracer (BK/Y), and attach a blue Posi-Lock connector to one end of the wire. Run the green and blue wires that were brought through the firewall to the Brake Applied Switch at the brake booster and cut off any excess.

Attach a blue Posi-Lock connector to one end of the wire. Connect this to the connector just attached to the Black wire w/Yellow tracer.



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## CONTROL WIRING

Run the pink wire that came through the firewall with the other two wires to the Exhaust Brake Control (Spool) Valve and trim off any excess. Strip away some of the insulation and install a female bullet connector then plug the connector on the free Control (Spool) Valve wire. Secure all wires and hoses to ensure they are out of the way of moving and heated items.

## BATTERY REINSTALL

Reinstall the passenger side battery. Reconnect the positive terminals on both batteries then reconnect the negative terminals.

## DFIV CALIBRATION

Ensure the connections of the corresponding wires to the DFIV Control Module are correct as shown in the wiring diagram.

To achieve the correct setting for the activation of the exhaust brake in relation to the throttle pedal the DFIV Module must be calibrated for your vehicle.

Connect one end of a test light to the "BRAKE" terminal of the DFIV module and the other end to a good ground.



With the throttle at idle, start the engine and turn on brake switch. Then, using a small flat bladed screwdriver, turn the small adjusting screw in the DFIV Module counterclockwise or clockwise until the test light JUST turns on.

**CAUTION:** THE ADJUSTING SCREW IS A MICRO-SWITCH THAT IS VERY DELICATE, SO TURN USING SMALL ADJUSTMENTS.

Test by revving up the engine to approximately 1200 RPM and releasing the throttle. As the accelerator pedal is applied the test light should turn off just before the engine starts to rev, indicating proper calibration of the DFIV Module with the APPS.

Then the test light should activate again when the throttle pedal returned to idle. If not, readjust the DFIV Module so that it does. Reinstall lower dash cover.

## TESTING

Start the engine and turn the Exhaust Brake on. Press down on the Accelerator Pedal to rev-up the engine to approximately 1200 R.P.M. and let go. The brake should have disengaged then activated again when the engine returns to idle.

While driving, turn Cruise Control on, then try to activate brake, which the activation of brake should disconnect cruise. Turn brake off and activate cruise again, this time pressing down on the hydraulic brake pedal to check for cruise disconnects during that operation.

The brake will need to be adjusted for the vehicle. If more holdback performance is required with the vehicle loaded, adjust the rod on the Vacuum Cylinder to close off the valve tighter. (**NOTE:** Only slight adjustments are required to gain desired effect, and, all adjustments should be done with vehicle turned off.)

It is required that a standard pressure gauge be used to make the necessary adjustments to the brake valve. Adjust the brake to reach approximately 10-12 lb. while the engine is at idle. **NOTE:** Over the two weeks, the back pressure at idle may rise due to initial carbon build up, which the brake valve will need to be adjusted again.

Check for any exhaust leaks and recheck all connections and hoses for security and interference from moving or heated items. After about 100 miles (160 km), re-torque the turbo exhaust clamp and flange bolts.

## MAINTENANCE & TROUBLE SHOOTING

To extend life of the valve assembly, do not operate your vehicle for extended periods of time without activating the brake. On a twice-yearly interval, check and adjust the brake pressure to 10-12lbs. while the engine is at idle. The hoses, wires, fittings and clamps should be inspected on a regular basis for any deterioration, damage or leaks.

If the brake ceases to work, then push in the black button on the top of the control (spool) valve while the engine is running. If the brake engages, then check that there is power at the fuse, all electrical connectors are firmly connected, all grounds are good, and that there is power output at the yellow wire coming through the fire wall, connecting to the control assembly, when the throttle pedal is at rest.

If the brake failed to engage with black button pressed in while the engine is running, check for vacuum pump operation and check for leaks. Check for smooth operation when manually pulling and pushing of the lever on the brake valve (with

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the engine turned off). The control (spool) valve may have to be taken apart and cleaned.

Following the diagrams in this manual, tracing hoses and wiring, checking continuity through electric components, or checking for any lines that are disconnected, should solve any problems that may arise.

## *MEASURING IDLE BRAKE PRESSURE*

As mentioned in the installation instructions for this BD Exhaust Brake, the brake pressure has to be measured and adjusted when the vehicle is at idle. In the instructions, the brass plug on the brake valve had to be removed to take this measurement with a typical pressure gauge. For easier hook up of the gauge, the pressure can be measured by removing the Ford back pressure switch located behind the belt idler pulley on the front of the engine and plumb the gauge onto the pressure tube.

## *SPOOL VALVE MAINTENANCE*

### *DISASSEMBLY*

- Remove the two coil screws.
- Remove the two rear plate screws.
- Pop out the white and black bumpers, springs, and O-rings.
- Remove the spool and sleeve assembly from the valve body with a plastic or wooden rod approximately the same size as the outside diameter of the sleeve.

### *CLEANING*

- Clean the spool and sleeve with some WD40 and compressed air.
- Inspect the spool and sleeve for any damage and inspect O-rings.
- The spool should move freely within the sleeve.

### RE-ASSEMBLY

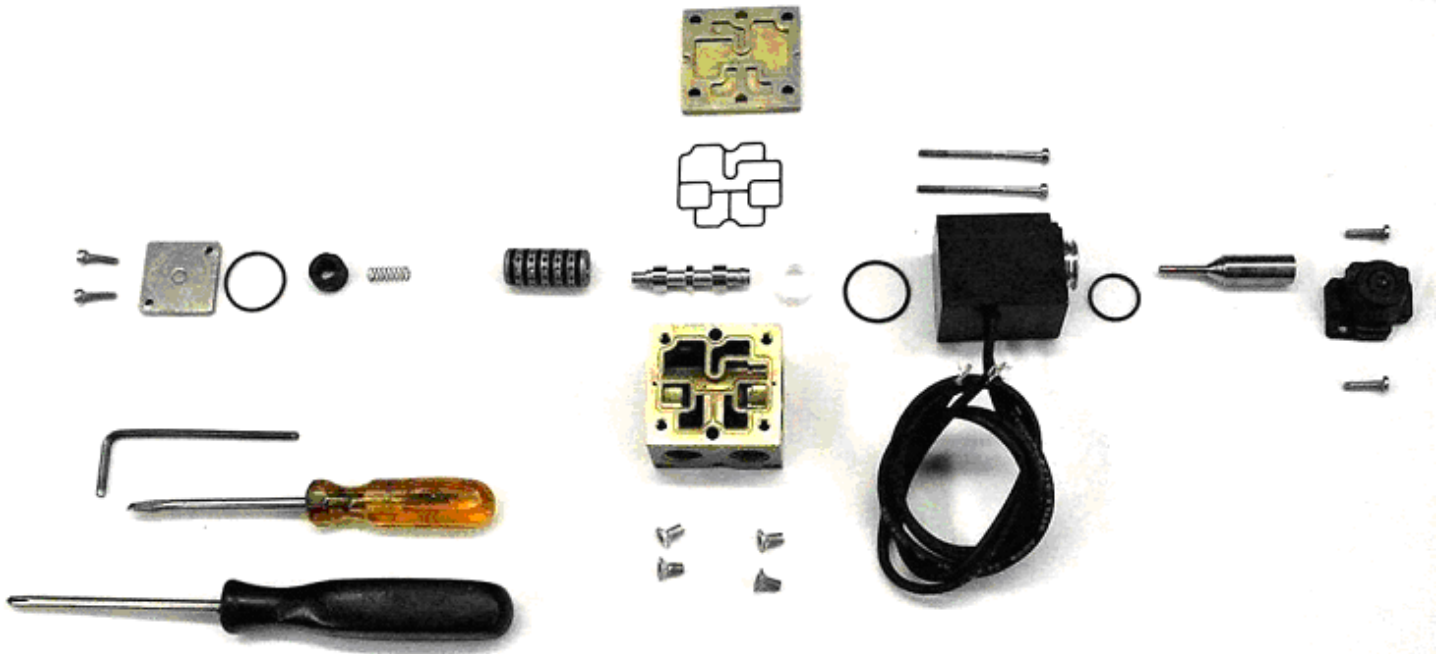
- Reinstall the rear plate, O-ring, and black bumper onto the body.
- Gently slide the sleeve into the body cavity by pushing and turning at the same time.
- Drop the spring into the sleeve.
- Gently insert the spool into the sleeve with a slow, turning action.
- NOTE: The residual WD40 should be enough lubricant for assembly.
- Check to ensure that there is very little resistance felt when it's inserted. NOTE: If any resistance or binding is noted, remove the spool and try again.
- Once the spool is inserted and moving freely, reattach the coil, white bumper, and O-ring.

### TESTING

- After reassembly is completed, push and release the manual override button. The spool should move and return freely.
- If you have an air compressor, blow low-pressure (20-30 psi) air into Port #1, then push the override button. There should be a transfer of flow from Port #2 to Port #4.
- Re-install the valve on the engine, hook up the disconnected vacuum lines and wiring, then check for correct operation of Brake, PressureLoc, etc.

### HELPFUL HINTS

- Make sure all parts are spread out on a clean, lint-free surface while servicing valve.
- **\*\*CAUTION\*\*** Do NOT use heavy grease or oils on the spool, sleeve, or O-rings. (Oil based lubricants will swell and distort rubber O-rings).
- Do not use any abrasive compounds on the spool or the sleeve.
- Make sure all of the O-rings are re-installed and are in good condition by checking for nicks, scoring, or other damage.



## *OPERATING GUIDELINES*

Thank you for taking interest in the BD Engine Exhaust Brake. As a driver, you probably already know the need for extra braking power that your vehicle requires on the hills and long grades. With loads being towed behind you, the extra push when slowing down or maintaining speed on downward grades can prove to be a great strain on your vehicles hydraulic braking system, even to a point of “burn-up”.

These guidelines were designed to offer you a better understanding of the benefits of exhaust brakes and are partly based upon material developed by the U.S. Department of Transportation National Highway Traffic Safety Administration.

The emphasis on today’s vehicles is to give the consumer a product that can give them usable power with fuel efficiency. But, in the transition, the vehicles have lost their natural braking power, making it more easy for the vehicle to continue to roll and harder to stop. Of course, this gets more noticeable with the increase of weight, on or behind the vehicle.

This is where an exhaust brake becomes a useful tool in increasing the driveline drag of the vehicle without the use of the hydraulic brakes; A tool that with maximum use or even occasional use, can reduce wear on hydraulic braking parts and at the same time increase safety.

The BD Exhaust Brake can be used to help maintain a controlled vehicle speed on a downward grade, as well as slowing the vehicle down for such times as turns or exit ramps, without using your hydraulic brakes. **But, the exhaust brake cannot be used as a parking brake or will not bring your vehicle to a complete stop.**

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When you ride your hydraulic brakes, make hard stops or have poorly adjusted brakes, it creates high temperatures and as your brakes get hotter, there is more chance for brake fading and/or complete failure.

By using a BD Exhaust Brake, the life and effectiveness of your hydraulic brakes will increase. This is because of the decreased use of the hydraulic brakes in situations like hills, the wear factor is reduced and there is less opportunity for your hydraulic brakes to heat up which would reduce the efficiency.

With terrain that is a series of up and down grades, the BD Exhaust Brake will aid in reducing exhaust valve warpage. Because of the power needed to pull your vehicle and load up a hill, this generates a lot of heat. When you have reached the crest of the hill and are now coasting down the other side, the heated valves are too quickly cooled. With the exhaust brake engaged, the heat loss to the valves will be reduced, which can prevent valve warpage.

When the toggle switch is turned to the "On" position, the valve is activated every time the driver takes his foot off of the throttle pedal. When the driver puts pressure back on the throttle pedal, the relay is activated and the valve opens again. Exhaust brakes are designed to operate with the throttle at idle, not to be used in conjunction with cruise controls, and not designed to aid in gear shifting. Such cases could cause damage to engine and/or the exhaust brake. The vehicle may require shifting down to achieve the necessary retarding force.

Automatic transmissions with lock-up clutches in the converters can achieve the best retarding force with the use of a clutch control device (i.e. AutoLoc). During cold weather engine start up, turn the brake on at idle while warming up the vehicle. This brings up the engine to normal operating temperature in much less time.

Incorporated with the BD Exhaust Brake, there is a pressure regulating system that will control the created backpressure. If the backpressure reaches the set limit, the exhaust valve will open slightly to relieve the excess pressure.

**The brake pressure, at idle, is required to be checked and adjusted at time of installed, two weeks after installed, and on a regular twice a year interval.**

Use a standard pressure gauge and the pressure port on the exhaust valve, the brake pressure at idle must be set between 10 and 12lbs.

The best scenario for exhaust braking is when going down hill, select a gear that lets you maintain a constant speed with little or no use of the hydraulic brakes, or, the same gear that would be used to go up the same grade of hill. This also depends on the weight, load or road conditions that the vehicle will come upon.

So, in summary, by using the BD Exhaust Brake, you reduce the need for use of your hydraulic brakes in situations where you need to slow down or maintain (i.e. hills, off ramps, corners, approaching speed changes or traffic lights). By reducing the use of your hydraulic brakes in these situations, this will reduce the heat build up as well as wear and damage to linings and drums.

When you reduce these factors you save your hydraulic brakes for when you really need them (i.e. for stopping or emergencies). The BD Exhaust Brake is not a substitute for your hydraulic brakes and, cannot correct or compensate for poorly maintained or misadjusted brakes. But, when you need to slow down or maintain a constant speed, the BD Exhaust Brake will be a valuable and effective tool. Exhaust Brakes are more efficient at preventing than correcting an over-speed condition.

**To increase the life of your exhaust brake we recommend daily operation. This could simply be switching it on and off a couple times a day. This will prevent the butterfly from sticking due to carboning up.** Thank you and happy motoring.

## *QUESTIONS?*

Thank you for purchasing the BD Exhaust Brake, please check out our web site at [www.bd-power.com](http://www.bd-power.com) for other products such as BD PressureLoc, BD TowLoc or for info on our Performance Transmissions and components please call, fax or E-mail our **BD Technical Service or Sales Department**, 8:30am to 4:30pm Pacific Time, Monday to Friday.

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