
Engine - Exhaust - Brake

The engine's Exhaust Back Pressure Valve (EBPV) is a butterfly type valve located on the outlet of the turbocharger, between the turbine and the downpipe. It is controlled by the Powertrain Control Module (PCM), and activated by engine oil pressure. Its purpose is to decrease engine warm up time in cold weather by restricting exhaust flow out of the engine. It can be very easily and very inexpensively converted into an engine exhaust brake by adding some simple wiring and a switch.

This method is for vehicles having a manual transmission. For vehicles with automatic transmissions, use this diagram.

By using a 3 position switch, the EBPV will function normally (only for engine warm up), when the switch is in the center OFF position. With the switch in the "B" ON position, the EBPV will close whenever the brake pedal is pressed, and will open when the pedal is released. In the "A" ON position, the EBPV closes and remains closed until the switch is turned OFF. Its effectiveness can be compared to the braking force gained by downshifting one gear while descending a hill. It is most effective between 2500 and 3000 rpm, and loses its effectiveness below 2000 rpm. Because there is a 2-3 second lag for the exhaust valve to close, when using it in the "B" ON position push the pedal and hold it down with steady pressure. Because the exhaust brake receives its power via the brake light circuit, pumping the brakes causes the valve to open every time the pedal is released, with a loss of engine braking force. I touch and hold my pedal just hard enough for the brake lights to come on; then, when I hear the EBPV close (it makes a distinct hissing), I begin applying pressure to the pedal. You can reduce your braking pressure anytime, without losing exhaust braking force, if you maintain enough pedal pressure to keep the brake lights on. By using the switch indicator lights, you know whether it is activated or not.

MATERIALS:

(1) ON-OFF-ON type Heavy Duty Double-Pole Double-Throw (DPDT) toggle switch. It will have connections for 6 wires on the back, and the switch will have 3 positions UP=ON, CENTER=OFF, DOWN=ON. RS (Radio Shack)# 275-1533A \$2.49 or 275-710 \$2.99

25'-30' of 18 gauge wire. 5'-7' each of 4 different colors is best.

(10-12) Ring or Spade terminals for wire connections. 18-22 gauge are red. RS# 64-3032A or 64-3033A \$1.49

(4-6) Butt connectors for wires. 18-22 gauge are red. RS# 64-3037A \$1.49

(2) Rectifier Diodes. A diode is the equivalent on an electrical check valve, allowing current to flow in only one direction. RS# 276-1114



(2) Mini Indicator lamps. Optional. RS# 276-085A (red) 276-084A (green) \$1.99 each

10' Split loom for protecting wires. RS# 278-1264 \$3.99

(10) Wire ties.

(1) Inline fuse holder. RS# 270-1213 \$1.99

Electrical tape. I recommend Liquid Electrical Tape as being better for almost everything.

Tape and Marker to label wires with.

TOOLS:

Wire cutters/strippers

Screw Drivers

Drill w/ bits up to 7/16"

Volt/Ohm Meter, or at least a test light.

Soldering Iron is recommended but not essential.

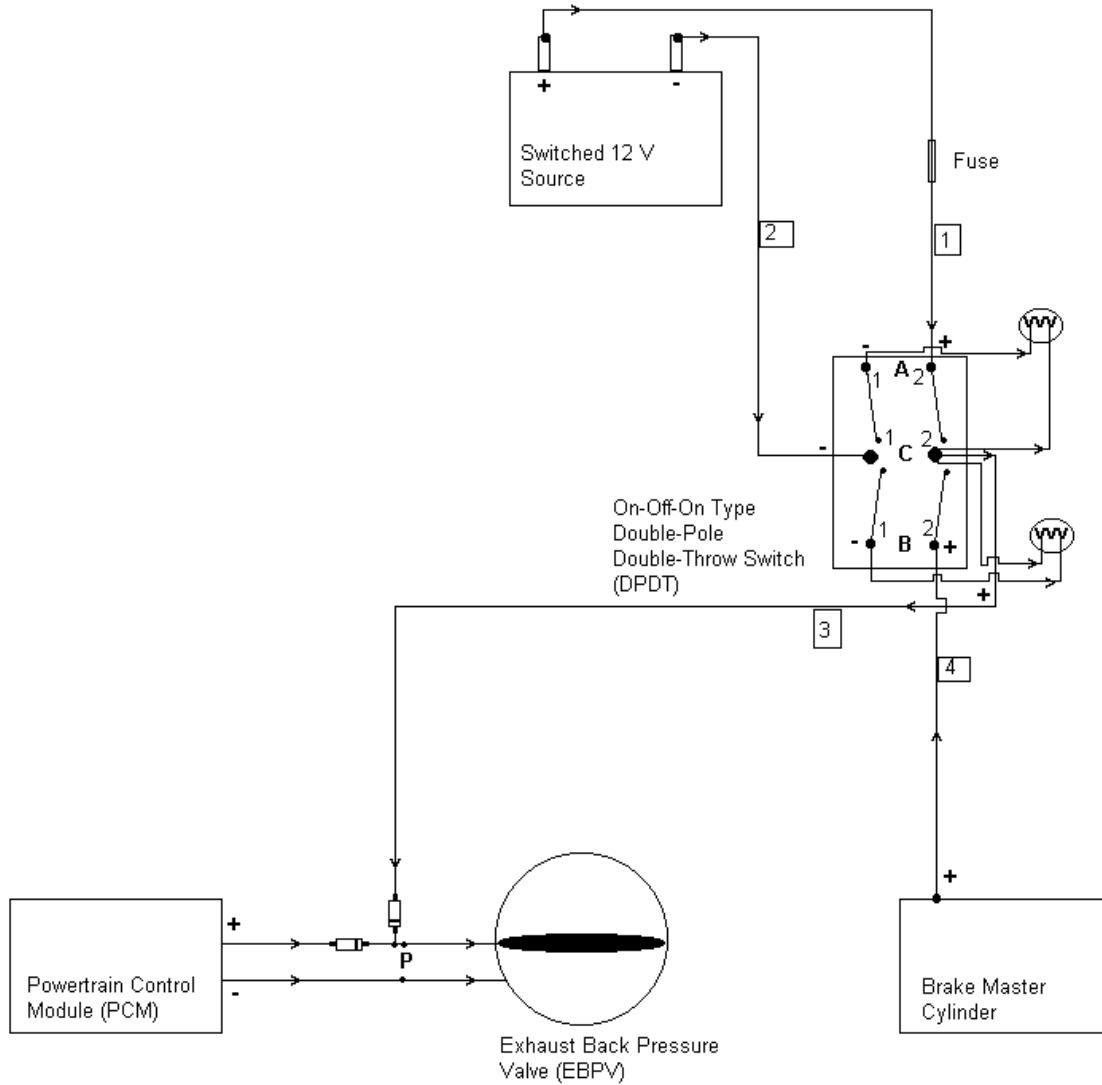
Torx bits &/or 1/4" drive metric sockets to remove dashboard trim to install switch.

PROCEDURE:

Decide where in the dash you want to install the switch. I put mine in the black panel just to the right of the "Wait to Start" light. There is room for 2-3 switches there.

Remove the necessary trim and moulding around the steering column / instrument panel to access the back side of where you want the switch, drill a 1/2" hole, and install the switch. Reinstall the moulding to make sure it fits with the switch, and then remove it and the switch for ease of access while wiring.

Engine Exhaust Back Pressure Valve Brake. Activated by brake pedal or by manual switch, with indicator lights.
 By Swamp Donkey (Jonathan Ryan) 12-9-01



- Inline fuse holder
- Direction of current flow
- Light bulb
- Wires do NOT connect
- Wires connect
- Positive current
- Negative current
- Plug in wiring harness
- Rectifier Diode
- Wire number

Wire [#1] Decide what you will use for a positive power source. Make sure it is one that is "On" only when the key is on. I recommend the 8 ga. grey/yellow wire in the bundle under the steering column. You can also use a tap to a fuse in the fuse panel. Run a wire [#1] from the source to the switch, connecting it to terminal A2. I numbered the terminals as viewed from the back of the switch. Install the inline fuse holder on this line. Make sure to leave 6"-12" or more of slack on all the wires. You can always bundle them up later.

Wire [#2] Decide what you will use for a negative power source or ground, and run a wire from this to the switch, connecting it to terminal C1.

Connect one light to terminals A1 and C2; this is light A. Connect the other light to terminals B1 and C2; this is light B. Drill holes for the lights just above and below the switch. Install the lights with B in the top hole, and A in the bottom. This is because when the switch is down, contact is made between A+C; when the switch is up, contact is between B+C. For simplicity, the diagram does not show the lights "crossed" like this.

Remove the black hinged cover from over the fuel filter area in the engine compartment.

Wire [#3 & #4] Run two wires from the switch through the fire wall into the engine compartment. Connect one [#3] to terminal C2 and run it to the front of the engine. Connect the other [#4] to terminal B2 and run it to the brake master cylinder. If you have a horizontal diamond shaped plate about 2.5" wide just to the passenger's side of the clutch cylinder, remove the screws and run the wires through it. Otherwise, you may need to drill a hole. I always find that running the wires is the hardest part of any wiring project.

There should be a green wire by the driver's side of the master cylinder in the group of 4 marked "Center High Mount Stop Lamp Feed" which does not connect to anything. This wire is energized only when the brake lights come on. Connect wire [#4] to this one. If you do not have this wire, using a volt meter or test light find a wire that is hot only when the brake lights are on and connect to it instead.

Locate the wires that go from the PCM to the EBPV. This is a 2-wire plug just under the turbo compressor where the air comes out, attached to the pedestal the turbo mounts on. Disconnect this plug, and remove the loom (protective plastic shielding) on the plug side away from the turbo, all the way until it joint to a larger bundle of wires, to expose the wires inside. One wire is black w/grey, the other grey w/red.

The diodes will have a silver band around one end. Twist the wires from the "silver" ends together making a "Y", with the "black" ends at the top and the silver ends at the bottom of the "Y". Cut the grey w/red wire 2"-3" before the plug, strip the insulation back 1/2" or so, and solder the black end on one diode to the end of the cut wire that does NOT go into the plug; solder the black end on the other diode to wire [#3]; solder the two silver ends to the grey w/red wire that goes into the plug. The diodes are necessary to prevent the brake lights from coming on when the PCM operates the EBPV, and to prevent the PCM from receiving a 12v signal from wire [#1]. If you don't have a soldering iron, you can use crimp connectors.

Coat all the wire connections with several coats of Liquid Electrical Tape, then wrap them with regular electrical tape, and replace the loom. Cover wires [#3 & #4] with loom also, all the way to the switch. Bundle up any excess wire with wire ties; also secure them all to prevent chafing. Install the switch in its hole, and replace the dash trim.

To test, start the engine. With the switch up, the upper light should come on when you press the brake pedal, and you should hear a distinct hissing or swooshing sound when the EBPV closes, after 2-3 seconds. With the switch down, the bottom light should come on and stay on, and the EBPV will close.

I find no advantage to using the EBPV brake during normal driving while unloaded. When I am hauling a heavy load, however, it is worth its weight in gold. During normal hauling, I leave it in the up position, so I will have extra braking power when I need it. For exit ramps and long or steep down-grades, I put it in the down position and leave it on as long as necessary. In the down position it is also useful as an anti-theft device, because you can't go much over 33 mph with it on. This is also very useful for very fast warmups in winter.