

**III PAC BRAKE®**

# Installation MANUAL



## **P-80C** **ENGINE BRAKE**

**P-80C APPLICATION:**  
12.7 and 14 Liter On Highway Series 60 Engines with EGR  
and DDEC IV and DDEC V Applications  
Built After September 30<sup>th</sup>, 2002 ONLY

## VERY IMPORTANT APPLICATION INFORMATION

Please read carefully as incorrect application will cause engine damage.

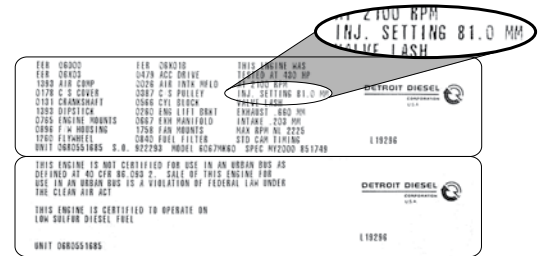
### 1 BEFORE STARTING

Use the following information to determine the correct Pacbrake for your application.

Engine Year	Identification Characteristic	Pacbrake Model
1999	Roller for master piston on injector rocker arm	P-63C
2000	Pocket for master piston on injector rocker arm <b>81.0 mm</b> injector setting	P-80
2001	Pocket for master piston on injector rocker arm <b>82.1 mm</b> injector setting	P-80A
2002 post Sept 30 <sup>th</sup>	Pocket for master piston on injector rocker arm <b>82.1 mm</b> injector setting	P-80C

**Check the engine serial number and engine build date PRIOR to installing this Pacbrake engine brake.**

- \*P-80 model fits engines manufactured 12/15/99 to 8/10/00
- \*P-80 model fits Freightliner engines above 06R566178
- \*P-80 model fits OEM engines above 06R566302
- \*P-80A model fits engines manufactured 8/10/00 to 9/30/02
- \*P-80A model fits engines with 82.1mm injector lash
- \*P-80C Model fits 12.7 and 14 liter on highway truck engines with the letter "E" as the suffix - sample 6067MK6E



**NOTE:** DDEC IV engines are identified by the letter "K" and DDEC V by a "V" as the 6th digit of the engine model. See step 3.

\*These new 2000 model year engines are built starting late December 1999 and differ from the 1999 model year engine by the elimination of the engine brake's dedicated roller on the injector rocker arm. The 2000 model year engine has a machined pocket in the injector rocker arm to replace the roller. Installing the incorrect engine brake will cause engine and engine brake failure.

**Check the engine's option label on the valve cover for injector setting information.** Injector settings relate to the engines camshaft. The only way to visually confirm which camshaft the engine has is by checking the injector setting on the options label. See above. Misapplication will cause engine damage. If unsure please contact Pacbrake Factory @ 1-800-663-0096.

**DDEC IV and DDEC V Applications:** The engine ECU has an optional circuit to control the engine brake. Use a ProLink diagnostic tool to determine if the circuit is turned on. If the circuit is not turned on for engine brake enable, it can be reprogrammed by a Detroit Diesel Dealer for a service charge.

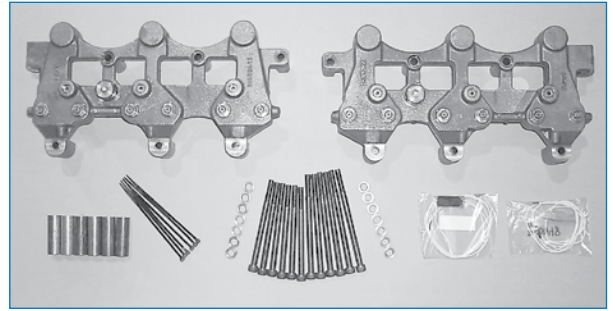
**DDEC IV** - When using this activation circuit, if no under cover wiring exists, use Pacbrake Kit P80156

**DDEC V** - When using this activation circuit, Pacbrake Kit P80157 is required. The kit includes a replacement injector harness which includes the engine brake wiring. This version can be identified by a 10 pin connector in the injector harness located above the starter motor and below the intake manifold.

P80157 kit must be ordered separately.

**2** Before starting, check that the kit contains everything shown in this photo.

**CAUTION:** Care should be taken when handling housing. Dropping housing could cause leg damage/failure which is not covered under warranty.



**Tools Required**

3/8 Drive ratchet_____	General use
1/2 Drive ratchet_____	General use
Inch/pound torque wrench_____	Valve cover bolts
3/8 Torque wrench accurate @ 25 lb. ft._____	Paclash adjustment
1/2 Torque wrench accurate @ 100 lb. ft._____	Hold down capscrews
Speeder handle_____	Housing capscrews & nuts
1/2 Breaker bar or flex bar_____	Rocker shaft capscrews removal
36mm Socket_____	Rotate engine
18mm Deep socket 1/2 drive_____	Rocker shaft capscrews
10mm Socket 3/8 drive_____	Valve cover capscrews
10mm Hex driver_____	Pacbrake housing capscrews
#1 Phillips screw driver_____	Solenoid terminal
5/32 (4mm) Allen wrench_____	Paclash adjustment
3/4" Box End wrench_____	Paclash adjustment
9/16" Box End wrench_____	Paclash adjustment
3/4" Crows foot_____	Torque paclash
3/8" Extension 3"_____	With crows foot
3/8" Extension 6"_____	Valve cover capscrews
3/16" Extension 6"_____	Valve cover capscrews
Flat blade screw driver_____	Breather tube hose clamp
Wire cutters_____	Tie straps
Compressed air/air nozzle or suitable device_____	Blowing out bolt holes
Threebond liquid gasket PN# 1217F_____	Valve cover sealant at bearing caps if required.

**Additional tools for engines which are not factory wired:**

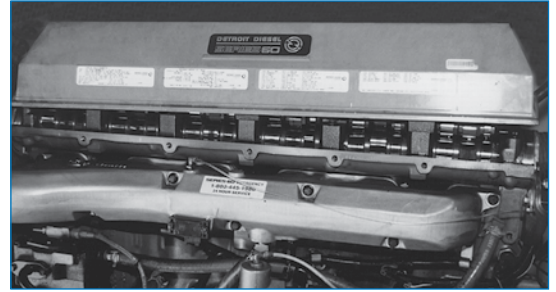
13 mm Socket_____	Cylinder head wiring connector
Needle nose pliers_____	Removal of plugs in connector

**3** Stamped on the side of the engine block is the engine serial number and model number (sample 6067MK6E). The first letter in the engine model number indicates displacement. The second letter indicates the type of electronic control system. If unsure, attain the engine serial number and contact Pacbrake factory at 1-800-663-0096



- 4** Thoroughly clean the top of the engine and remove the valve cover.

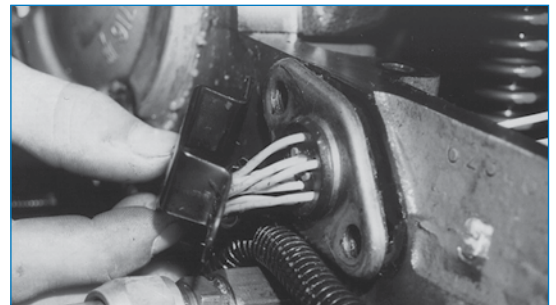
**NOTE:** The valve cover is installed with a silicone adhesive on both sides of the front and rear bearing caps. Take care not to stretch the gasket when removing the cover. (See page 3 for sealing material if required). If your engine is prewired, locate the three dedicated wires and omit the following steps 5 through 15.



- 5 Engine Is Not Prewired**

**DDEC IV INSTALLATIONS** (see schematic on page 12)  
(DDEC V Proceed to Step 16)

Remove the wiring harness mounting flange from the rear of the cylinder head.



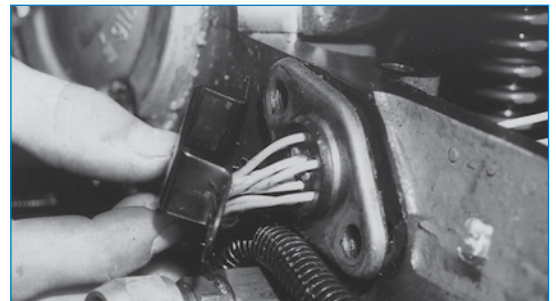
- 6** There are four spare holes through the harness grommet which are sealed with plastic plugs. Pulling outward, remove any two of these plugs.

(DDEC V Versions DO NOT have the spare holes in the grommet to add the engine brake harness).



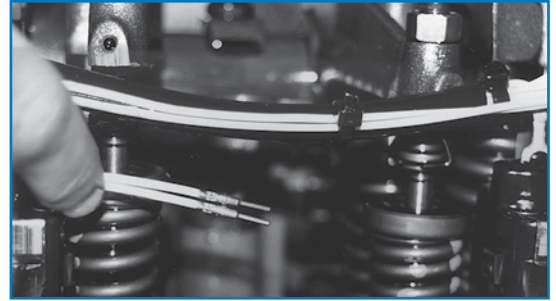
- 7** Insert both wires of the Pacbrake 'through head harness' through the grommet from the outside.

**NOTE:** In trucks with limited access at the rear of the cylinder head, it may be easier to slide the grommet out of the head.





- 8** Route the wires alongside the Electronic Unit Injector (EUI) harness and adjust the length so the terminal ends are between cylinders 5 and 6.



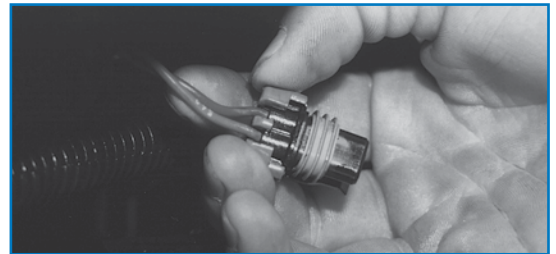
- 9** Insert the two engine brake wires in the convoluted conduit and replace the harness mounting flange. Secure with the tie straps provided.



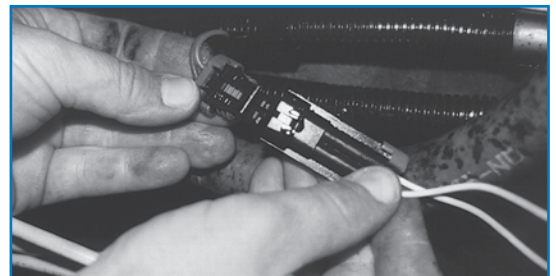
- 10** Bury the wires within 1" of the Weather Pack connector and tape around the conduit to keep in place.
- NOTE:** By using this same connector and wire positions, the Pacbrake harnesses are completely compatible with the Detroit Diesel engine harness and the VOEMs vehicle harness.
- NOTE:** If installing a P60163 kit, follow the instructions provided in the P60163 kit.



- 11** **DDEC IV ENGINES  
WITH ENABLE CIRCUIT TURNED ON ONLY**
- Locate the red (561) and orange (562) wires terminating in the Metri-Pack plug. This is located in the harness on the drivers side of the engine just below the intake manifold, above the starter.

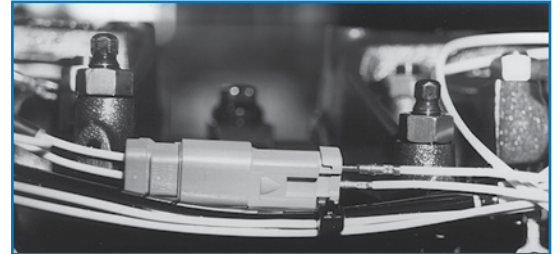


- 12** **DDEC IV ENGINES  
WITH ENABLE CIRCUIT TURNED ON ONLY**
- Remove the black protective cap and connect to Pacbrake harness previously installed in step 7.



### 13 DDEC IV INSTALLATIONS WITHOUT FACTORY WIRING

The through head harness must now be connected to the under cover harness, P/N P60153. As both halves of the connector are preassembled, simply insert the plain white wire into the hole on the same side as the other plain white wire. The remaining wires both have black shrink tube markings.



### 14 DDEC IV INSTALLATIONS WITHOUT FACTORY WIRING

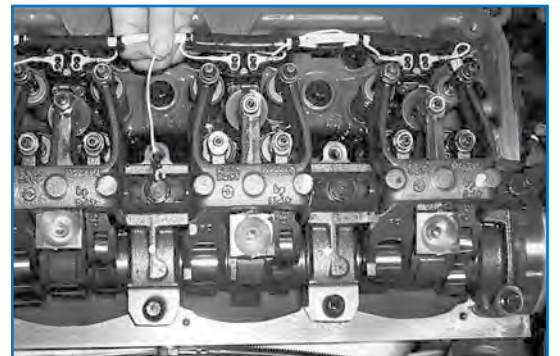
This connector is polarized and may now be parted and reconnected without losing correct brake sequencing.



### 15 DDEC IV INSTALLATIONS

Secure the complete Pacbrake harness to the EUI harness with plastic ties.

**NOTE:** Use only the ties supplied in the kit which are temperature stabilized and will not deteriorate due to heat.



### 16 DDEC V INSTALLATIONS (see schematic on page 13)

Replace the factory wiring harness with a new injector/engine brake harness, Pacbrake Part# P80157. Remove the tie-strap fasteners from the threaded holes in the cylinder head and discard. **Once the hold down capscrews are torqued in step 25 secure the replacement harness to the engine brake support tubes, with the tie-straps provided.**

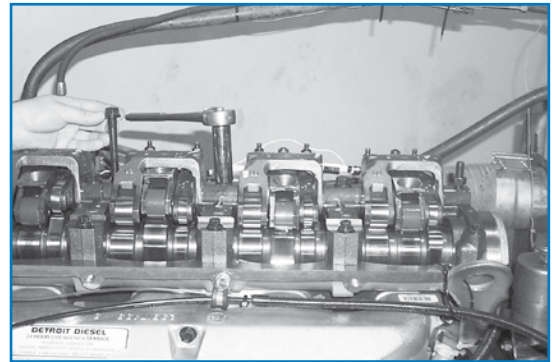
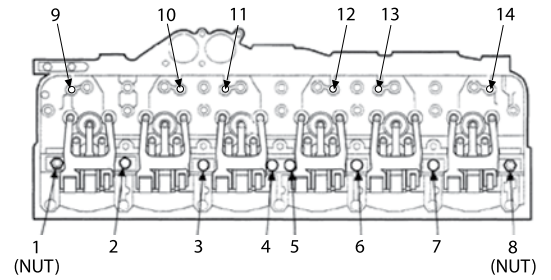


## 17 Brake Housing Installation

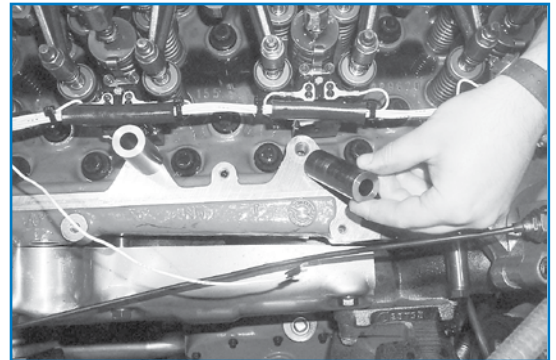
Evenly remove the three rocker shaft capscrews and nut for each rocker shaft assembly as shown in the illustration numbered 1, 2, 3 and 4 then number 5, 6, 7 and 8. Discard the capscrews and save the nuts for reuse later.

**NOTE:** It is recommended procedure to check torque on the studs #1 and #8. Once nuts are removed torque to 101-116 N•m (75-96 ft-lbs) as per DDC procedure.

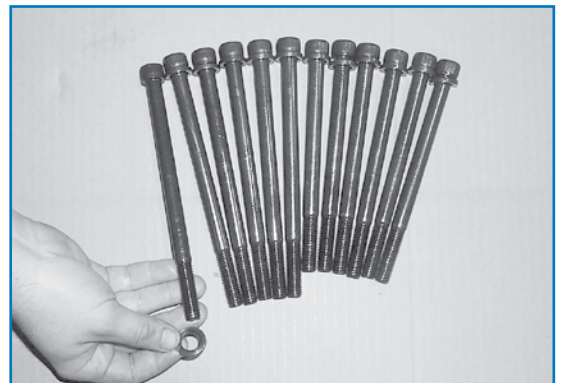
**CAUTION:** Using air pressure or a suitable suction device remove trapped oil from mounting holes 2 through 7 and 9 through 14.



18 Place the 6 spacer tubes on the exhaust manifold side of the engine in locations 9 through 14 on previous diagram.

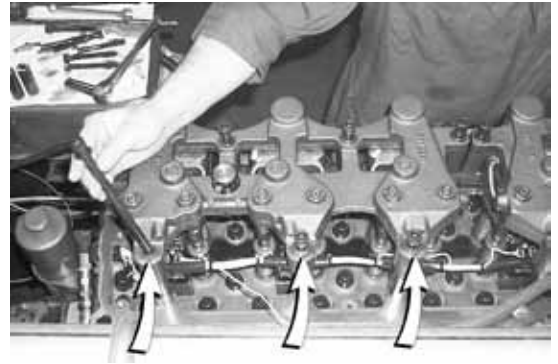


19 Place the special hardened washers on each of the 12 Pacbrake capscrews supplied.

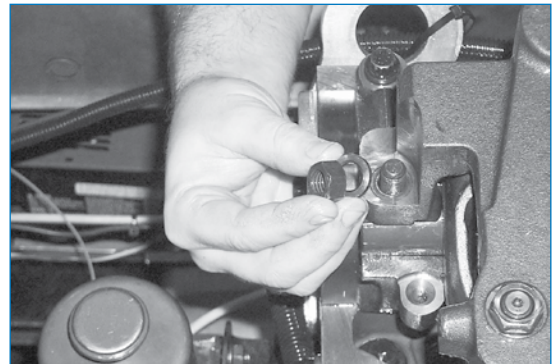




- 20** Locate the 6 longer capscrews, these go through the center positions of the housing to secure the housing and rocker shaft. Lubricate and install three of these allen head capscrews through the center holes in each housing. Carefully position the front engine brake housing over cylinders 1, 2 and 3 using the front Detroit stud as a guide. Repeat on the rear housing using the rear stud as a guide.



- 21** Install Pacbrake washers on the Detroit rocker studs then loosely install the two rocker hold-down nuts removed earlier.



- 22** Loosely install the six shorter allen head capscrews on the turbocharger side of the Pacbrake housing.



**NOTE:** Ensure that each master piston link is located over its rocker arm socket.

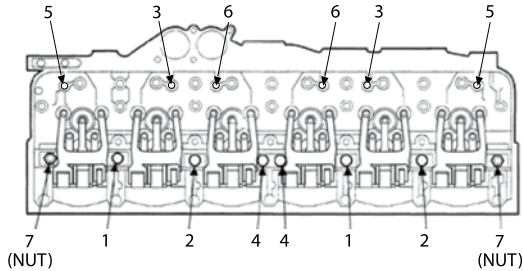


- 23** Carefully run the capscrews and nuts down evenly in the torque sequence below using hand tools only. Do not use an impact wrench as the housings must be tightened down evenly.



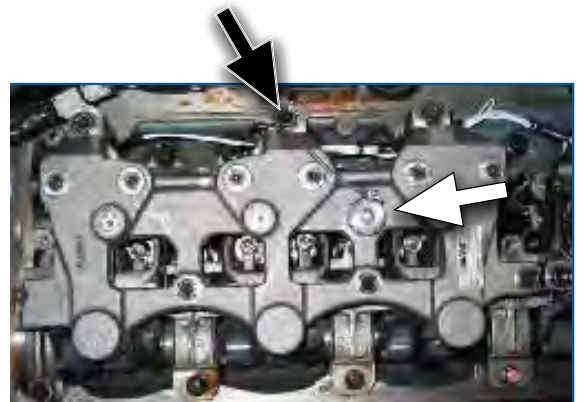


- 24** Torque the hold-down cap screws and nuts to 55 N•m (40 ft-lbs) in the sequence shown below. Then to 108 N•m (80 ft-lbs). Double check all bolt torques.



- 25** Attach the two wires to the solenoids. Using the plastic ties provided secure the harness away from all moving parts. Wires may be tied to spacer tubes. Use only the ties provided as they are temperature stabilized and will not deteriorate due to heat.

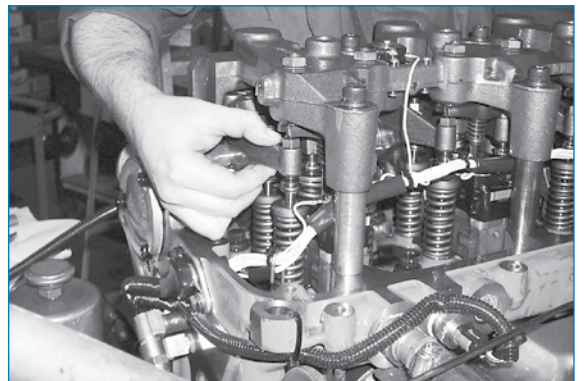
**CAUTION:** Route wires on front housing as shown by arrow.



**26 Slave Piston Adjustment**

Loosen all twelve slave piston adjusting screws and locknuts. Determine which cylinders have clearance between exhaust rocker arm adjusting screws and valve stems, indicating that the exhaust valves are fully closed. There are usually four cylinders in this condition regardless of the crankshaft position.

**NOTE:** Both screws on each cylinder having closed valves may be adjusted.



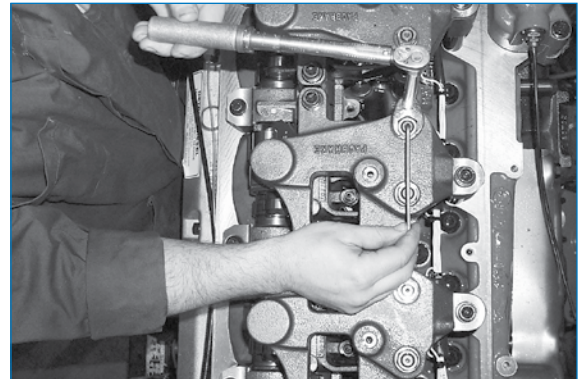
- 27** P-80C engine brakes require the slave piston lash to be set at .020". Slave lash may be adjusted on all cylinders which have clearance between the exhaust rocker arm adjusting screw and valve stems. Insert a .020" feeler gage between the slave pistons contact surface with the exhaust valve adjusting screw. The feeler gage must be inserted from the sides to clear the slave bridge. The lash adjustment must be performed on both slave piston adjusting screws on each cylinder.

**NOTE:** Do not insert the feeler gage between the valve stem and the exhaust valve adjustment screw foot, incorrect lash will result.



- 28** Once the correct lash of .020" is achieved torque the lock-nut to 25 ft-lbs, adjust the second slave piston adjusting screw on that cylinder, again torque the lock-nut to 25 ft-lbs. Once all the cylinders with clearance between the exhaust rocker arm adjusting screws and valve stems are done rotate the engine to approximately one revolution and adjust the slave lash on the remaining cylinders. Double check that all 12 slave pistons have been adjusted and torqued to 25 ft-lbs.

**CAUTION:** Do not overtorque slave adjusting screw locknut. Double check all torques and wiring prior to reinstalling the valve cover. Use Threebond sealant at front and rear bearing caps at valve cover installation. Torque valve cover bolts to 150 in-lbs as per DDC service manual.



- 29** Engines using P60163, follow the instructions provided in the P60163 kit.

### Control System DDEC IV

#### ENGINES WITH ENABLE CIRCUIT TURNED ON ONLY

Some DDEC IV engines have the engine brake wiring installed at the factory. If not, follow the instructions below. Locate the 30 pin connector at the rear end of the DDEC IV ECM. This is the Vehicle Interface Harness (VIH).

**NOTE:** Some DDEC IV engines may not have the ECM programmed for engine braking. This may be verified using a Diagnostic Data Reader. If any of the ECM input switches; K2, K3, S3 or T3 read NONE, then the vehicle should be taken to a DDC dealer to have these switches enabled.



- 30** Note the color and/or number of the two wires originating at the K2 and K3 terminals of the VIH connector. They are both on the top row, K2 is in the center and K3 is the closest one to the engine. These two wires terminate behind the dash and may be grouped with a third wire connected to battery ground.



### 31 DDEC IV AND DDEC V INSTALLATION

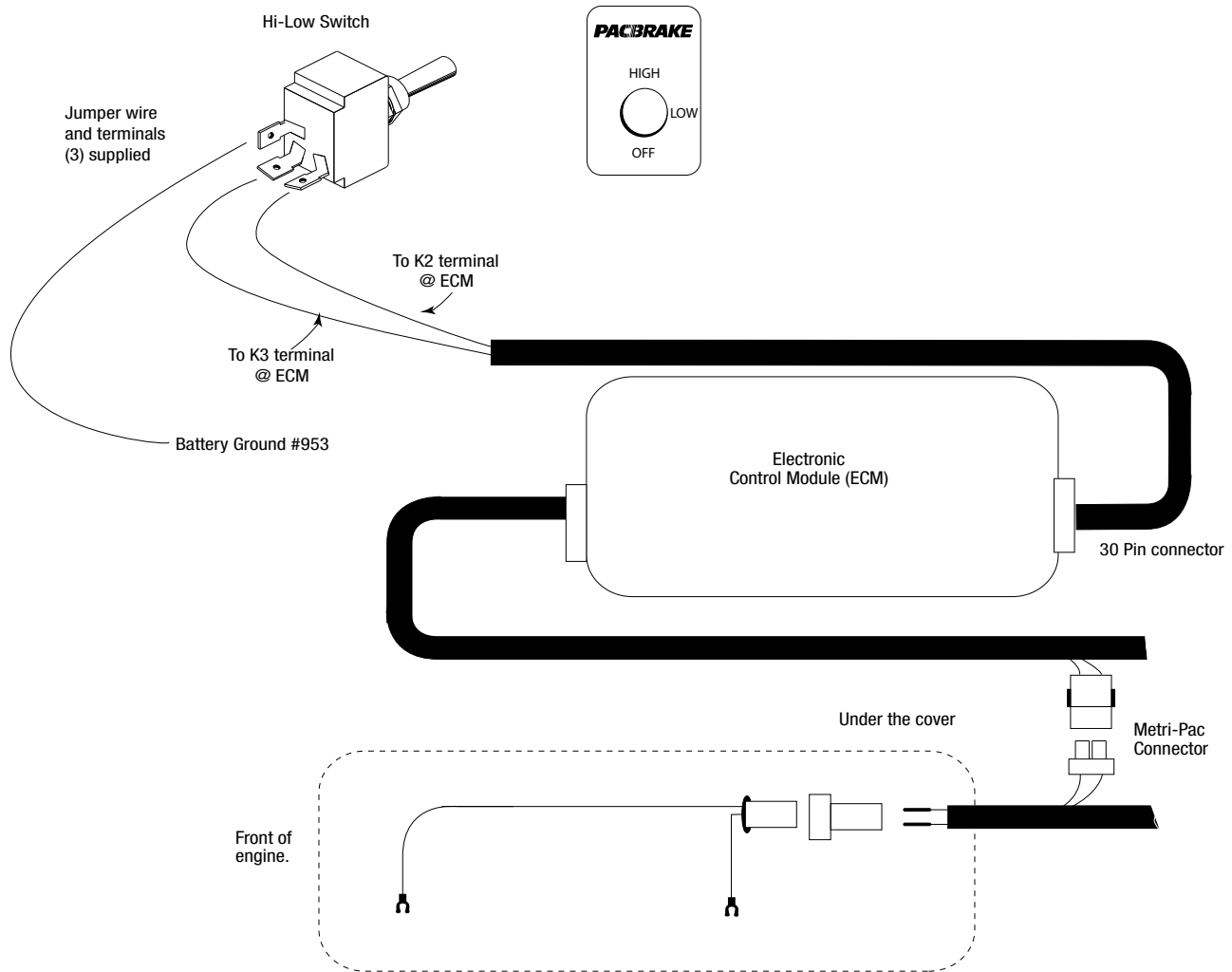
Mount the two dash switches and connect the three wires as shown in the wiring schematic.

**CAUTION:** Ensure that ONLY the negative ground side of the electrical system is input to terminals K2 and K3 via the dash switches OR DAMAGE TO THE ENGINE ECM WILL RESULT.





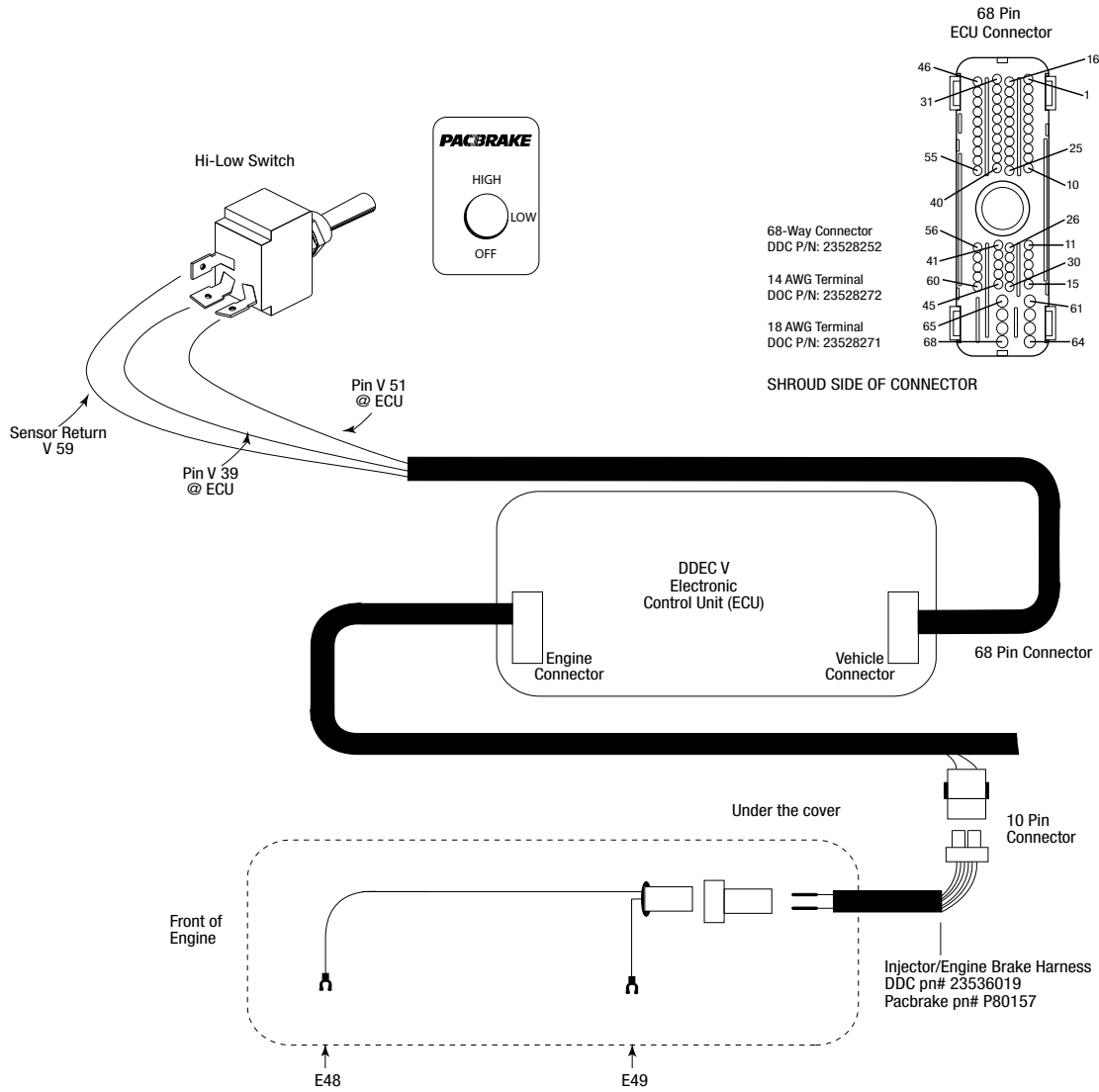
**DDEC IV Wiring Schematic - P-80C  
WITH ENABLE CIRCUIT TURNED ON ONLY**



**NOTES:**

- One of the features of the DDEC IV control system provides a progressive brake feature which is used when the vehicle is in cruise control
- The level of engine brake (low, high) selected via the dash switches will be the maximum amount of engine brake the ECM allows
- Also, using the foot brake or clutch during this procedure disables cruise control and progressive engine brake feature

### DDEC V Wiring Schematic - P-80C WITH ENABLE CIRCUIT TURNED ON ONLY



**NOTES:**

- One of the features of the DDEC V control system provides a progressive brake feature which is used when the vehicle is in cruise control
- The level of engine brake (low, high) selected via the dash switches will be the maximum amount of engine brake the ECM allows
- Also, using the foot brake or clutch during this procedure disables cruise control and progressive engine brake feature