



Installation Manual

System # V900062

**2001 - 2003 GENERAL MOTORS 2500HD - 3500
8.1L GAS ENGINE W/VOAC**



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Installation Manual 1930034

VR70 Underhood Air Compressor System Number V900062

Application: 2001-2003 General Motors HD2500 - 3500 with a 8.1 liter gas engine

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- 1900687 - Manual Document
- 1900687a - General Information
- 1900687b - Preparing for installation
- 1900687c - Installing the tank and lines
- 1900687d - Installing the cooler and main bracket
- 1900687e - Installing control components
- 1900687f - Illustrated parts list
- 1900030 - Warranty Registration

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General Information

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**2001-2003 GENERAL MOTORS
2500HD - 3500 (NOT 3500HD)
8.1 LITER GAS ENGINE**



UNDERHOOD AIR COMPRESSOR

General Information

Introduction

This book provides installation instructions for the VR70 Underhood Air Compressor. The information in this book should be read completely before attempting installation.

Installation steps

The installation procedures are divided into the following main steps:

- Part 1: Preparing for installation
- Part 2: Installing the tank and lines
- Part 3: Installing the cooler and main bracket
- Part 4: Installing the control components

Terms and symbols

This manual uses the following terms and symbols:

- OEM - Original Equipment Manufacturer
- HHCS - Hex Head Cap Screw (also called a hex bolt)
- SHCS - Socket Head Cap Screw (also called an Allen head bolt)



NOTE

This symbol indicates that there is additional information or special emphasis on a specific procedure.



WARNING

This symbol indicates that there is a possibility of personal injury or damage to the equipment if the indicated warning is not followed.

Installation notes

1. It is important that you complete all the installation steps before operating the system.
2. Follow all safety precautions for under-hood mechanical work.
3. Use Loctite 242 or equivalent on all engine-mounted fasteners.
4. All hoses, tubes and wires which are re-routed or shifted during installation must be secured so that they do not contact excessively hot areas or sharp edges. Where possible, follow the routing suggestions in this manual.

5. These installation instructions are intended as a general guide. In some instances, due to variations in vehicle manufacture or if prior modifications have been made to the vehicle, it may be necessary to carry out grinding, bending or rearranging operations for correct fit. These operations must follow sound, standard shop practices.
6. Left and right definitions in this manual are determined when sitting in the driver's seat, facing forward.
7. All fasteners must be of the correct size and torqued according to the specifications shown below. Torque specifications are in foot pounds (ft-lb). Always use manufacturers torque values for OEM fasteners.

STANDARD GRADE 8 NATIONAL COARSE THREAD								
Size	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4
Foot-pounds	9	18	35	55	80	110	170	280
STANDARD GRADE 8 NATIONAL FINE THREAD								
Size			3/8	7/16	1/2		5/8	3/4
Foot-pounds			40	60	90		180	320
METRIC CLASS 10.9								
Size	M8	M10	M12	M14	M16			
Foot-pounds	19	41	69	104	174			

Table 1 - Torque values

The above fastener torque values are applicable when Loctite is used.

Hose diameter	Color coded label	Part number prefix
1/4"	Yellow	173
5/16"	Orange	174
1/2" & 5/8"	Blue	175 & 176
3/4" & 1"	Green	177 & 178

Table 2 - Color codes for hoses

Table 2 above illustrates the color code used by VMAC to define the different hose diameters.

Ordering parts

To order parts, contact your local VMAC dealer.

Please quote the VMAC part number, the description and the quantity.

Warranty

The VMAC warranty form is located at the back of this manual. This warranty form must be completed and mailed or faxed to VMAC at the time of installation for any subsequent warranty claim to be considered valid.

The enclosed System Identification Number Plate must be attached to the vehicle at the time of installation. Locate the plate as shown in Figure 1. Drill the two hole locations using a 7/64" drill bit. Attach the plate with the two supplied #6 pan head self tapping screws.



NOTE

This plate provides information, which allows VMAC to assist in customer inquiries and the ordering of parts. It is important that this plate is affixed to the vehicle.



Figure 1 Location of System Identification Number Plate

Changes and improvements

These products and documents are subject to changes or improvements without notice.

Special installation notes

If you intend to use an auxiliary air receiver with this system you must observe the following installation procedure (Figure 2) . Failure to observe this procedure will result in damage to the system.

1. The line from the **VR70** tank to the auxiliary air receiver must have an auxiliary valve installed to prevent blowback from the auxiliary tank and to prevent moisture from entering the **VR70** tank.
2. The line to the auxiliary tank must not be installed in the bottom of the tank, but must be installed as high as possible to prevent water from clogging the line.

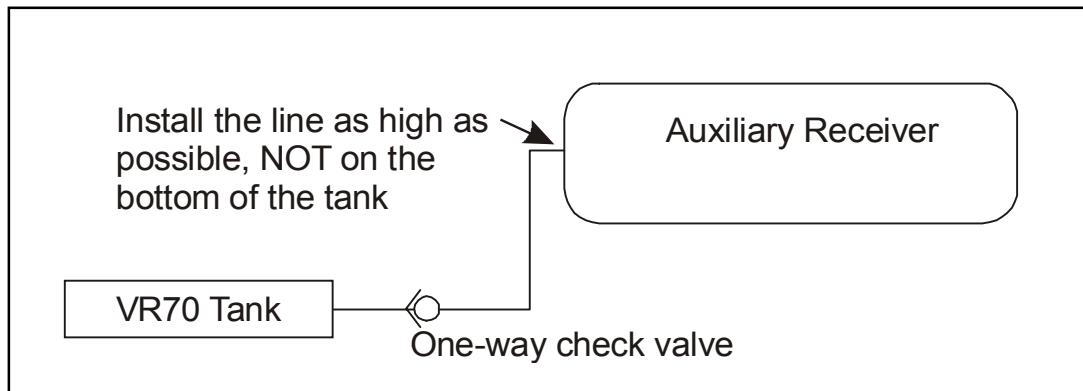


Figure 2

Part 1

Preparing for Installation

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UNDERHOOD AIR COMPRESSOR

1. Disconnect the ground and positive cables from the batteries.
2. Drain the coolant into a suitable container.
3. Remove the plastic engine cover. (Figure 1)
4. Remove the two 6mm bolts and remove the Automatic Control Module, (ATCM) mounted on the driver side upper radiator cowl. Disconnect wiring plugs from the ATCM (Figure 2)

**WARNING**

Unplug and handle connectors carefully. All batteries must be fully disconnected while handling this or any other electronic module or damage could result.

**Figure 1****Figure 2**

5. Remove the air intake duct from the air cleaner to the engine.
6. Disconnect the MAF sensor wire.
7. Remove the air cleaner assembly. Pull up on the MAF sensor end. (Figure 4)
8. Remove the four (4) 6mm bolts locating the air cleaner mounting plate. Remove the mounting plate. (Figure 5)

**Figure 3**

9. Remove the 6mm OEM bolt holding the coolant expansion bottle to the air cleaner support bracket. Then remove the air cleaner mounting plate support bracket from the front upright. Remove the plate.
10. Remove the upper radiator hose.
11. Remove the upper fan shroud.
12. Remove the fan.
13. Remove the fan shroud.
14. Remove the OEM belt and discard.
15. Remove the OEM belt tensioner.
16. Remove the 5/8 heater return coolant hose from the passengers side of the radiator.
17. Remove the coolant expansion hose from the coolant bottle to the radiator.. (Figure 7)
18. Disconnect the 1 inch coolant bottle fill hose from the coolant bottle. (Figure 7)
19. Remove lower radiator hose. (Figure 7)
20. Disconnect the 5/8 inch heater coolant supply hose from the engine coolant crossflow casting. (Figure 8)



Figure 4



Figure 5



Figure 6

21. Remove the 5/8 inch hose barb from the coolant cross flow casting. (Figure 8)
22. Remove the bolts locating the OEM heater hose support bracket and discard the bracket and bolts. (Figure 9)
23. Remove the OEM 16mm crank pulley center bolt and discard. Keep the OEM thick washer.
24. Disconnect the wiring plug connection to the alternator. Also disconnect the fusible link wire from the alternator.
25. Remove the two OEM bolts locating the red fusible link box to the cast alternator bracket. Let the box hang down out of the way.
26. Remove the two OEM 10mm bolts locating the alternator and remove the alternator.
27. Remove the OEM drive belt back idler from the alternator bracket and discard.
28. Remove the power steering pulley using a suitable puller. (Figure 10)



Mark the position of the pulley on the shaft before removal.

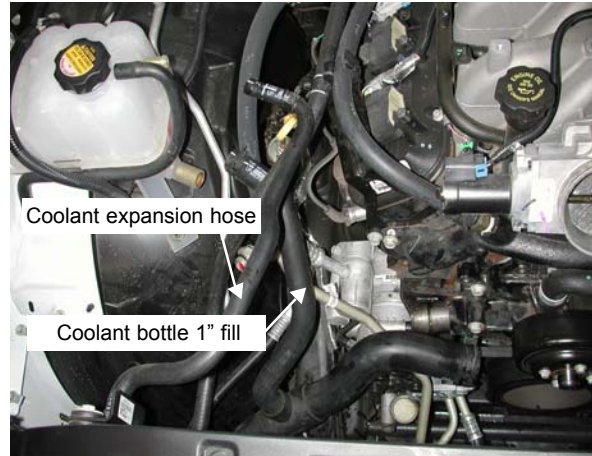


Figure 7

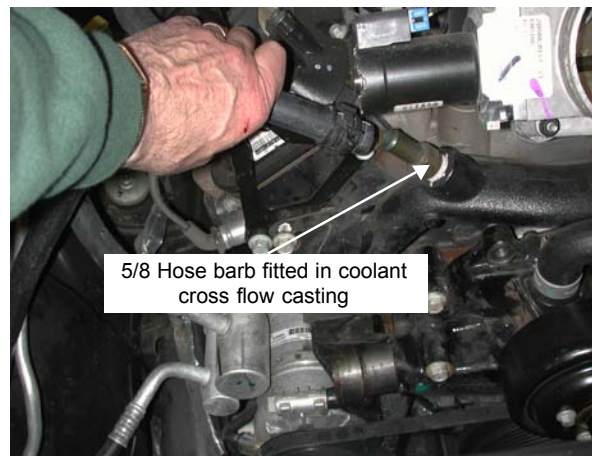


Figure 8



Figure 9

29. Undo the three (3) OEM 10mm bolts locating the power steering pump to the front of the cast OEM bracket. Discard bolts. (Figure 11).
30. Loosen the rear power steering pump bracket at the engine block and the rear of the pump. There is no need to remove the bracket.
31. Remove the five (5) 10mm bolts holding the cast alternator and power steering pump bracket to the engine. Discard bracket and bolts. (Figure 12).
32. Remove the 10mm OEM mounting stud from the cylinder head that located the bracket.
33. Remove the 6mm OEM bolts locating the number one cylinder coil to the driver side valve cover. Then remove the lower 6mm OEM bolt on the lower fixing of the NO. 3 cylinder coil. (Figure 13)
34. Disconnect the wiring harness connections to the throttle position sensor and the throttle servo motor on the throttle body.
35. Remove the one OEM bolt and OEM 6mm nut locating the plastic wiring harness channel to the driver side valve cover. Cut the ties holding the harness to the channel. (Figure 14)
36. Cut the cast web material from the front coil mount on the drive side valve cover as shown. (Figure 15)



Figure 10

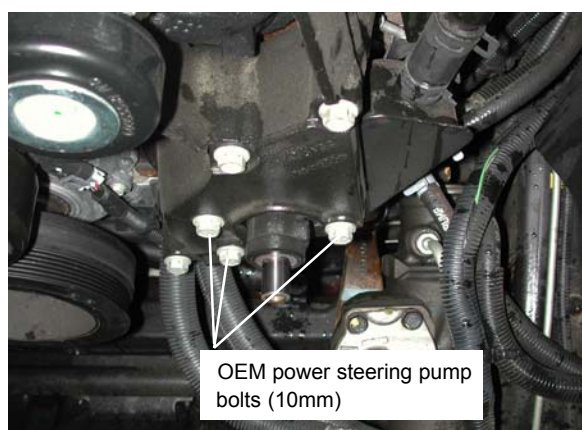


Figure 11



Figure 12

37. Remove the five (5) OEM bolts and remove the OEM rock guard from under the front of the vehicle. Discard the rock guard but keep the OEM bolts.

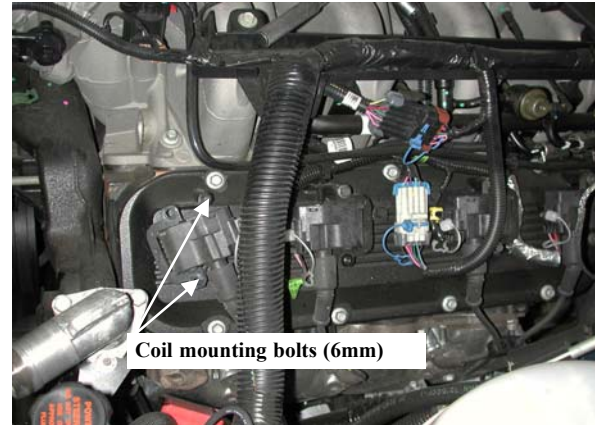


Figure 13



Figure 14



Figure 15

Part 2

Installing the Tank and

Lines

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2500HD - 3500 (NOT 3500HD)
8.1L GAS ENGINE W/VOAC



UNDERHOOD AIR COMPRESSOR

2.1 Installing the Cables and Straps

1. Clean the passenger side frame rail back from the front cab mount (Figure 1).
2. Measure 9- 3/4 inches from the back edge of the front cab mount and mark the location on the frame rail (Figure 1).
3. Measure 26-1/2 inches from the back edge of the front cab mount and mark that location on the frame rail.
4. Remove OEM heat shield on the inside of the frame rail (if fitted), where rear tank mount backing strap is fitted at the 26-1/2 inch mark. Cut out the sections shown and refit the heat shield. (Figure 2)

**NOTE**

On the 2500HD Model fit the supplied 1/2 inch spacer over the cables. Slide over the shoulder on the stop ends. (Use both inboard upper holes on the backing straps)

5. Insert a tank mount cable through one of two tank mount backing straps inboard of the two hoses. Pull the cable through until the stop end is against the strap.
6. Place the cable over the frame rail with the backing strap on the inside of the rail so that the cable hangs over the top outer edge of the frame rail. (Figure 3)



Figure 1



Figure 2



Figure 3

7. Position the cable at the 8 inch mark. Tuck the backing strap behind the rear end of the heat shield. (Figure 3)
8. Insert the other cable through the outboard hole on the remaining bracket and pull the cable through until the stop end is against the strap. See also note above.
9. Position this cable at the 26-1/2 inch mark. Backing strap should sit flat on the inside rail. (Figure 12).



Figure 4

2.2 Installing the C-clamps

1. Remove the rockguard loosely attached to the front of the tank with three (3) 3/8 screws.
2. Remove the two 1/4 inch NC pinch bolts and nut from the two tank C-clamps.
3. Slide C-clamps over the front of the tank.
4. Place the flat edges of the C-clamps so that they face towards the frame rail (sight glass side of the tank) (Figure 5 & 6).



Figure 5



You may find it easier to set the flat edges of the C-clamps on a work bench and rotate the tank to the correct position.



Figure 6

5. Position the rear C-clamp 21 inches from the front of the tank. Set the C-clamp so the flats are vertical and are parallel with the “UP” arrow on the tank. (Figure 5)
6. Position the front C-clamp 4-3/4 inches from the front of the tank. (Figure 5)
7. Insert the 1/4 inch pinch bolts from the top, thread on the 1/4 inch nuts and tighten them just enough so that the C-clamps grip the tank. (Figure 6)



Figure 7

2.3 Installing the L-brackets

1. Attach the two C-clamps to the tank mount L-brackets with the horizontal part facing away from the tank and at the top (Figure 7).
2. Thread a 5/16 NC x 1/2 inch cap screw with 5/16 flat washer into each of the two lower threaded holes in the L-brackets and tighten them just enough to hold the tank in position. Use Loctite on the threads.
3. Thread a 5/16 NC x 1/2 inch cap screw into each of the two upper holes. For adjustment purposes, do not use any flat washers and do not tighten or use Loctite at this time.



Figure 8

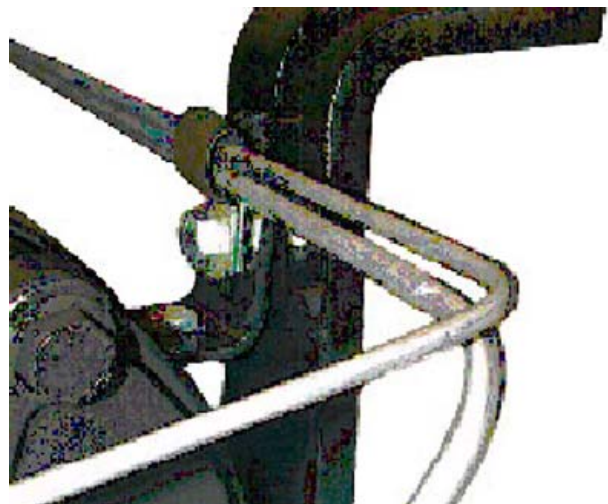


Figure 9

2.4 Installing the P-clips

1. Insert the threaded end of the 5/16 inch scavenge line into the fitting at the bottom rear of the tank. Run the steel pipe section down the inside (frame rail side) of the tank (Figure 8 & 9).
2. Insert the threaded end of the 1/4 inch pressure control line into the fitting at the top rear of the tank. Run the steel pipe section down the inside (frame rail side) of the tank and under the 5/16 inch scavenge line (Figure 8 & 9).
3. Place the two supplied P-clips over both the 1/4 inch and 5/16 inch tubes.
4. Remove each of the top 5/16 NC x 1/2 inch cap screws from the L-brackets and attach the P-clips in these positions. Use Loctite on the threads.
5. Test fit tank on frame rail and check adjustments required to L brackets to enable tank to sit level. Most likely, it will be necessary to slide the front L-bracket down as far as it will go in the slots of the C-clamp. Tighten all four cap screws.
6. Fit required connections to the rear of the tank before installation of the tank (3/4-90 degree elbow fits best). Apply Loctite PST sealant to the fitting. (Figure 8)



Figure 10



Figure 11



Figure 12



Note the angle of the fitting on the end of the tank.

2.5 Installing the Tank

1. Lift the tank and support it in position so the tops of the two L-brackets fit over the top of the passenger's frame rail. Make sure that there is adequate clearance at the front and rear of the tank (Figures 10 and 11).
2. Route the 1/4 inch pressure control line flex hose and the 5/16 inch scavenge line flex hose (attached to the steel tubes) over the cab mount and over the frame rail into the engine compartment.
3. Wrap the two tank mount cables around the L-brackets. Make sure that they fit in the upper and lower cut-outs of the L-brackets (Figure 11).
4. Insert the threaded end of the cable through the lower hole on the backing straps.



Select correct holes in the backing strap to suit your chassis style.

5. Place the thick 5/16 flat washers over the threaded ends of the cables.



Figure 13



Figure 14



Figure 15

6. Check the tank to make sure that it is level and that the front of the tank is 5-1/2 inches back from the front of the cab mount. Adjust the positioning as required. (Figure 14 & 15)
7. Thread a nut onto each of the cable ends and tighten them securely.
8. Thread a second jam-nut onto each cable and tighten them against the first nut to lock them in place.



Figure 16

2.6 Attaching Lines to the Tank

1. Remove the oil filter from the tank
2. Thread the 1/2 inch SAE 90 degree elbow onto the lower fitting on the front of the tank.
3. Tighten the fitting until it is in the 2 o'clock position when viewed from the front of the tank (Figure 13).



Figure 17



Useful Tip! Leave oil filter off until after filling system with oil.

4. Attach the straight end of the longest 1/2 inch oil return hose to the 90 degree elbow and tighten the fitting. Use two wrenches when tightening to avoid twisting the hose.



Figure 18

5. Route the hose over the cab mount.
6. Route the 3/4 inch main air hose over the cab mount and thread the straight end onto the 45 degree elbow and tighten using two wrenches to prevent the hose from turning.
7. Tighten the fitting until it is in the 2 o'clock position when viewed from the front of the tank (Figure 14).

Part 3

Installing the Cooler and Main Bracket

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8.1L GAS ENGINE W/VOAC**



UNDERHOOD AIR COMPRESSOR

3.1 Installing the VR70 Crank Pulley

1. Clean the center boss on the OEM crank pulley and place the **VR70** crank pulley in position with the protusion on the rear of the VR pulley located in the OEM crank pulley.
2. Rotate the **VR70** pulley counter clockwise until the three (3) roll pins sit against the three spokes of the OEM pulley. Fit the supplied M16 x 80mm hex head cap screw center bolt into the crankshaft, using the thick OEM washer. Use Loctite on the threads. (Figure 1)
3. Torque the crank pulley center bolt to specifications.

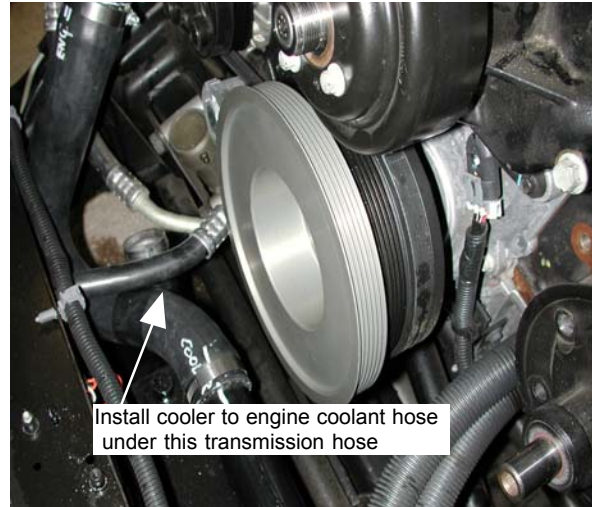


Figure 1

3.2 Installing the Cooler

1. Remove the coolant hose attached to the oil cooler when supplied.
2. Install the cooler to rock guard with the long tube at the top. Mount to the longest section so the coolant hose connections face the passenger side when rock guard is installed. Attach the cooler to the rock guard using the 5/16 NC x 1/2 inch hex head cap screws and flat washer supplied. Use Loctite on the bolts. The spigot on the end of the cooler should sit between the two transmission lines. (Figure 3)

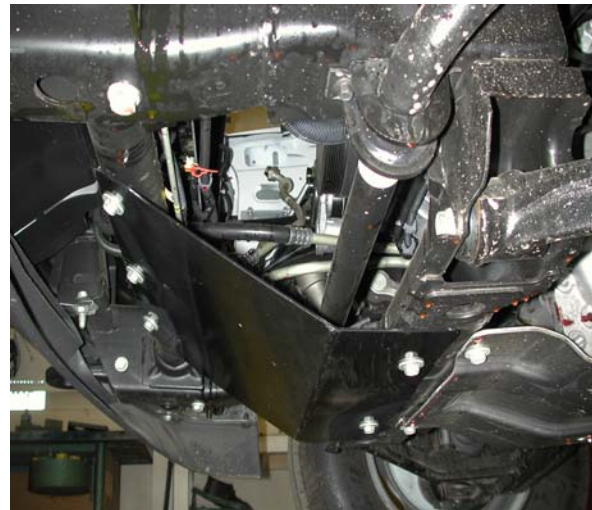


Figure 2



Figure 3

3. Refit the coolant hose assembly to the cooler “j” tube. Route the coolant hose assembly under the steel OEM transmission line. (Figure 1 & 4)
4. Connect the other end to the engine water pump. Loosen the coolant hose clamps to turn hoses on the connector for best clearance fit without any kinks then re-tighten all clamps.

**WARNING**

Make sure that you route the hose so that it is clear of all belts, steering components and suspension parts. Final adjustments to the hose routing will be required after installing the lower fan shroud.

3.3 Installing the Alternator Mounting Bracket and the Alternator.

1. Fit the 1/2 inch NPT 45 degree street elbow fitting to engine coolant crossflow casting. Install the 5/8 OEM hose barb fitting into the street elbow and angle the assembly slightly rearwards. Use PST sealant and the threads. (Figure 5).
2. Install the alternator mounting bracket to the right hand cylinder head using three (3) supplied M10 x 30mm hex head cap screws. Install three (3) 3/8 inch flat washers and apply Loctite and fit through the rear head plate (Figure 6).



Figure 4



Figure 5



Figure 6

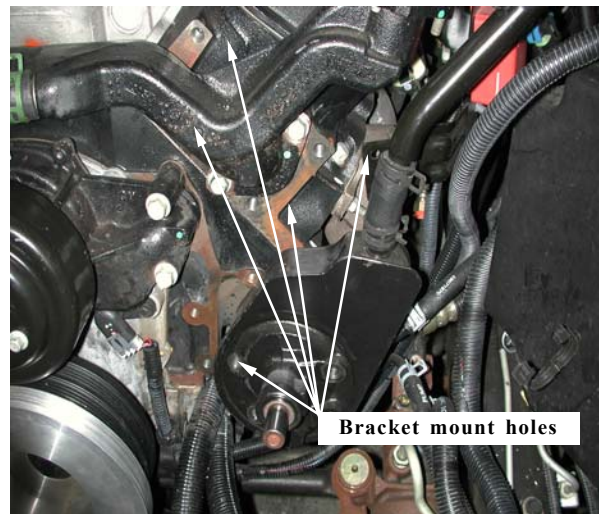
**NOTE**

When fitting the bracket make sure that the rear head plate is sitting flat and not obstructed by the castings of the coolant cross pipe or the block.

3. Apply Loctite and install the two (2) M10 x 65mm hex head cap screws with 3/8" washers through the bracket front plate into the former OEM tensioner mounting holes on the water pump. Torque all bolts to specifications.

**Figure 7**

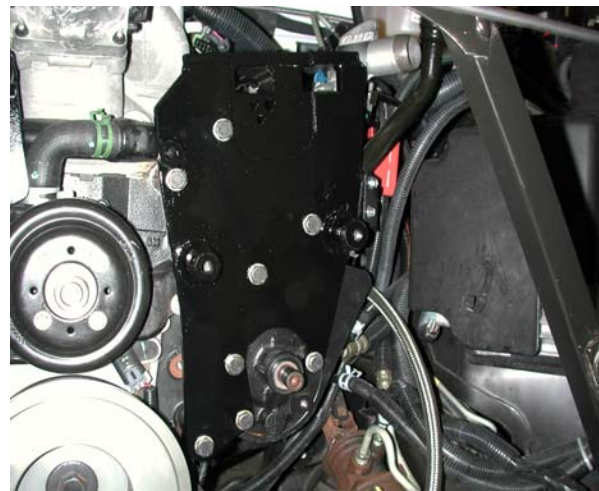
4. Fit the OEM auto belt tensioner to the two remaining threaded holes on the machined surface of the bracket. Use the two(2) original OEM cap screws with Loctite applied. (Figure 7)
5. Install the alternator into position on the top of the bracket using the supplied bolts, tighten bolts drawing in the bushings to clamp the alternator. (Figure 7)

**Figure 8**

6. Refit Idlers to their correct location on the alternator bracket, use Loctite and torque to specifications. Ensure that the machined bolt is fitted to the ribbed idler.

3.4 Installing the Main Bracket and Compressor

1. Clean the surface area on the front left cylinder head and the left lower front engine block. Ensure the bracket mounting area is clear of all flashing or protrusions. (Figure 8)

**Figure 9**

2. Remove the two ribbed idlers, the back idler and the auto belt tensioner from the VR70 mounting bracket. (Figure 9)
3. Insert the five (5) supplied M10 x 115mm long hex head cap screws with Loctite added, through the **VR70** mounting bracket and bolt into position on in the four (4) left front cylinder head and the lower most front engine block, 10mm threaded bolt holes (Figure 9).
4. Hand tighten all five (5) 10mm mounting bolts and check bracket is sitting flat to the engine. Tighten and torque to specification.
5. Fit the power steering pump into position on the **VR70** mounting bracket and install the two (2) supplied M10 x 35mm hex head cap screws in the holes with the spacers and one (1) M10 x 30 hex head cap screw in the remaining pump bolt hole. (Figure 9)
6. Tighten the rear power steering pump bolts locating the pump to the engine block.
7. Refit the OEM power steering pump pulley and align with marks when removed earlier. (Figure 10)

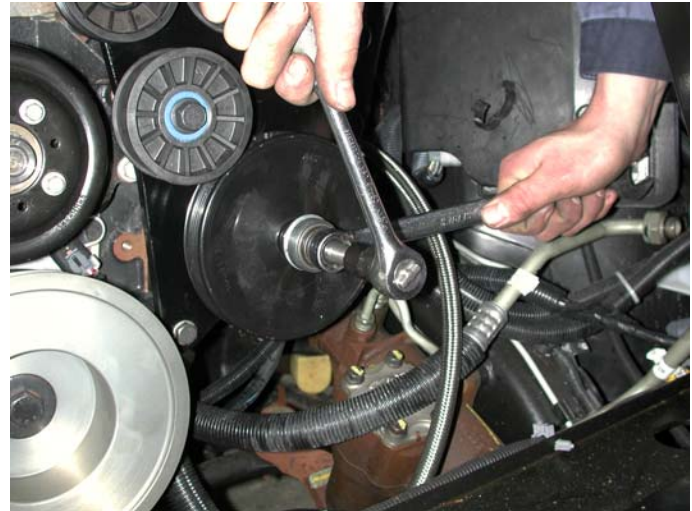


Figure 10

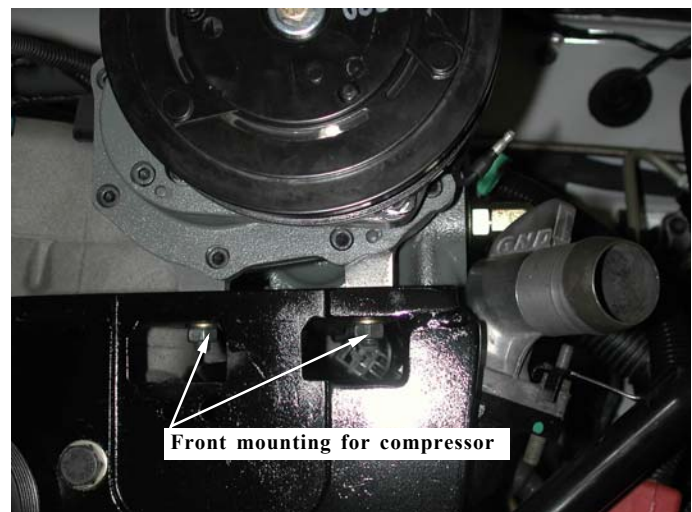


Figure 11

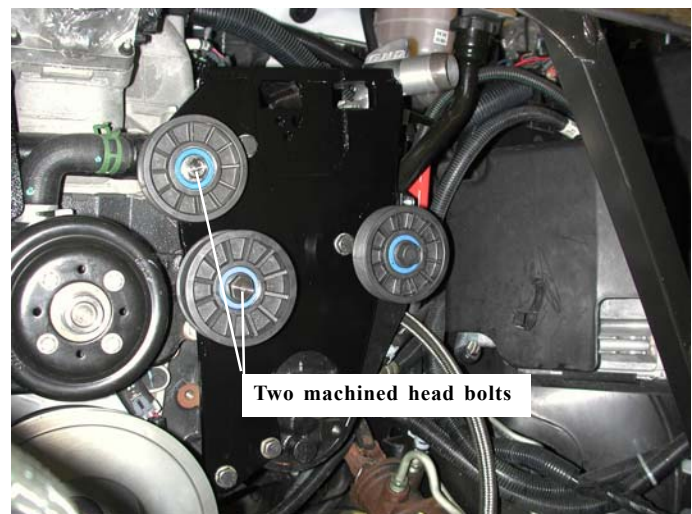


Figure 12



Re-alignment of Power Steering Pulley is important

NOTE

8. Fit the three (3) supplied 8mm x 38mm studs to the bottom of the **VR70** compressor. Install the burred end of the stub into the compressor.
9. Install the **VR70** compressor into position on the mounting bracket. Apply Loctite and fit three (3) 5/16 flat washers and 8mm nuts to the compressor. Torque to specifications. (Figure 11).

**NOTE**

Ensure the compressor wires do not become trapped between the engine and the compressor.

10. Re-install the three idlers to their correct locations on the **VR70** bracket. Fit the machined cap screw to the correct idler. Use Loctite and torque the cap screws. (Figure 12).
11. Refit the **VR70** auto belt tensioner with flat washer and 10mm nylock nut and flat washer supplied and tighten. Ensure that the locking pin is seated in the hole in the bracket. (Figure 13).

3.5 Installing the Drive Belts and other components

1. Install the replacement OEM serpentine drive belt (1650317), following the routing diagram shown. (Figure 14). (See also diagram on page 39).



Figure 13

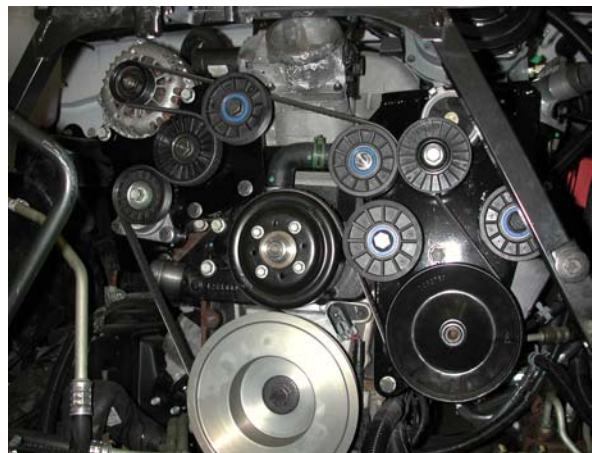


Figure 14



Figure 15

2. Install the **VR70** serpentine drive belt (5060895), as shown in the diagram. (Figure 15). (See also diagram on page 39).
3. Connect the red fusible link box and bracket to the two threaded 6mm holes in the side of the **VR70** mounting bracket using the OEM 6mm bolts.
4. Remove the OEM bolt locating the lower fixing point of number two (2) ignition coil to the valve cover. (Figure 16).
5. Fit the supplied coil locating bridge bracket to the lower fixing hole on number one (1) Coil and bridge across to the lower mounting point on number two (2) cylinder coil. Use the supplied M6 x 40 bolt and 6mm nylock nut on the number one coil and the other M6 x 40 bolt to fix to the OEM location for number two coil (Figure 16).

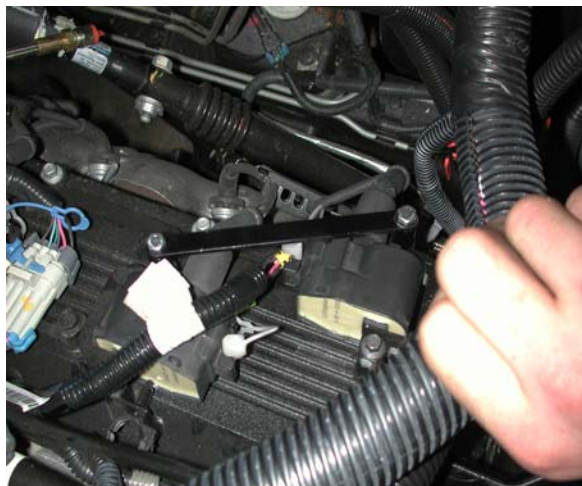


Figure 16

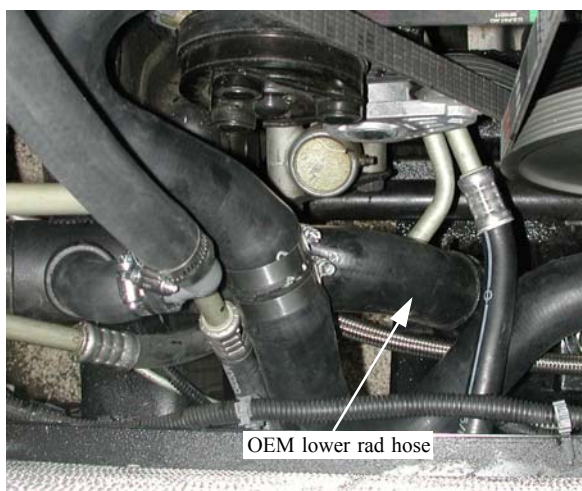


Figure 17

6. Mount the number one cylinder ignition coil, upper - most mounting hole onto the previous lower mounting position on the valve cover. Use OEM bolt (Figure 16).

3.6 Installing the Radiator and Hoses

1. Install the OEM lower radiator hose to the radiator and swivel the engine end down and fit to the end spigot on the cooler. (Figure 17)



Figure 18

2. Mark the lower bottom fan shroud inner lip as shown and cut away the marked section with sharp knife or zip wheel. (Figure 18)
3. Lower the bottom fan shroud into position and clip into place. Some slight adjustments may be required to the coolant hoses arrangement and the transmission oil lines to clear the shroud and the steering idler.



Engine lower coolant hose must have good clearance from A/C belt and fan

4. Fit the supplied fan spacer washer to the water pump fan thread.
5. Re-fit the fan and tighten.
6. Reconnect the OEM heater return hose to the radiator.
7. Mark the OEM 1 inch diameter coolant fill hose 1- 1/2 inches after the 90 degree bend where it joins the lower radiator hose (Figure 19).
8. Cut the hose at this point, slide on a supplied hose clamp and fit the supplied 90 degree plastic connector elbow to the radiator hose end. (Figure 20).



Figure 19

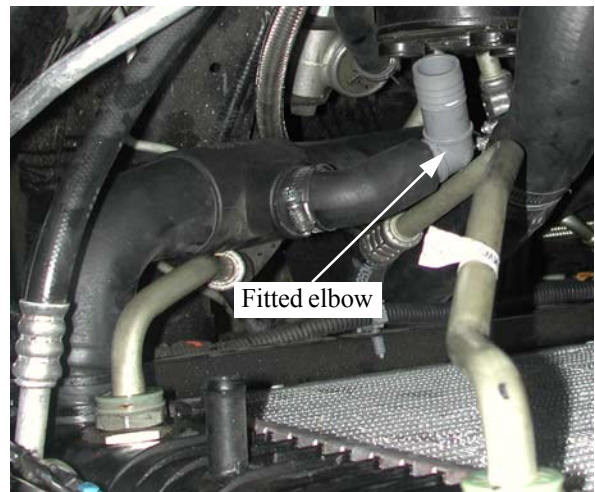


Figure 20



Figure 21

9. Fit the supplied 21 inch length of 1 inch coolant hose to the other end of the plastic elbow. Slide on two hose clamps and connect the other end to the spigot on the coolant bottle.
10. Align the hose and elbow for best fit and tighten all hose clamps.
11. Cut four (4) inches from the engine end of the OEM 5/8 inch heater supply hose and refit the hose barb in the engine coolant crossflow casting. Use the OEM clamp (Figure 21).
12. Re-fit the OEM hose from the coolant expansion bottle to the radiator.
13. Re-fit the top radiator hose.
14. Re-fit the upper fan shroud and the ATCM unit. Plug in the electrical connections to the ATCM.



Use caution when reconnecting the ATCM. ALL batteries must be fully disconnected while handling this or any other electronic module or damage could result.

15. Fill the cooling system with the recommended coolant.

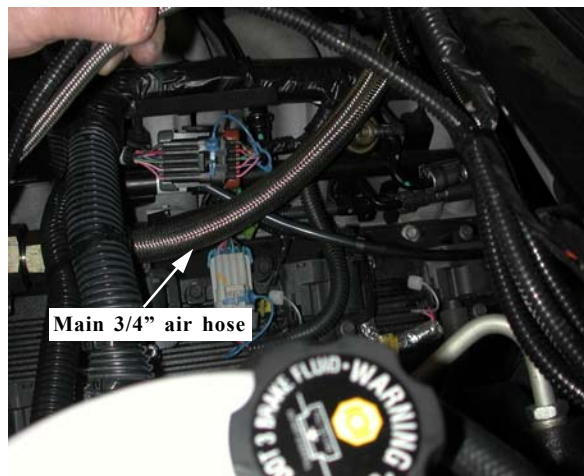


Figure 22

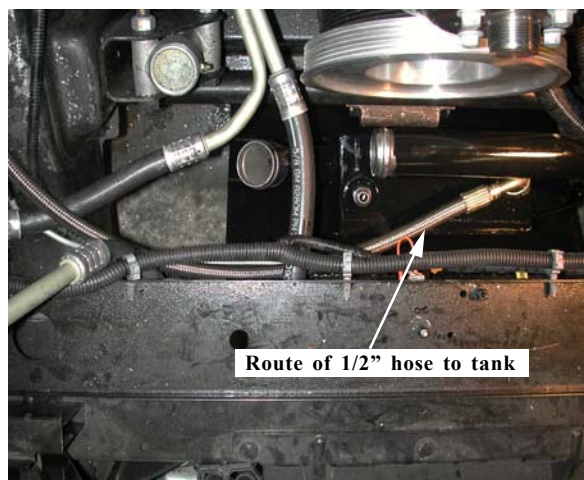


Figure 23

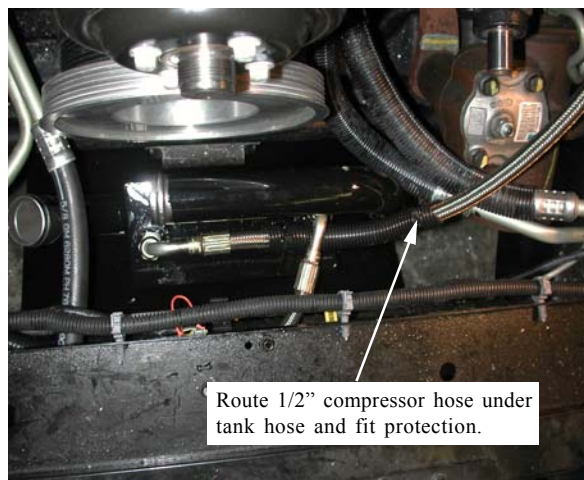


Figure 24

3.7 Connecting the VR70 system hoses.

1. Route the 3/4 main air hose up along the rear fire-wall. Run the hose along the valve cover to the VR70 compressor. Route the air hose under the main wiring harness and connect to 3/4 fitting at the rear of the compressor. (Figure 22).
2. Run the 1/2 inch oil return hose fitted to the front of the tank along the passengers side frame rail. Connect the 90 degree fitting on the end of the 1/2 inch oil return hose to the cooler connection on the driver side. Angle the fitting to run under the front radiator cross beam. (Figure 23).
3. Tighten the fitting on the tank using two (2) wrenches to prevent twisting the hose. Tighten fitting at the cooler end.
4. Fit the shorter 1/2 oil return hose 90 degree end fitting to the fitting on the oil cooler on the passenger side. Route the furring under the other 1/2 inch oil return hose and up behind the power steering pump. Connect to the 90 degree fitting on the left side of the compressor. (Figure 24 & 25).
5. Route 5/16 oil scavenge line from the tank over the cab mount and along with the 3/4 inch main air hose. Connect the fitting on the end of the hose to the 5/16 - 90 degree elbow fitting on the left side of the compressor inlet valve. Tighten the fitting. (Figure 26).



Figure 25

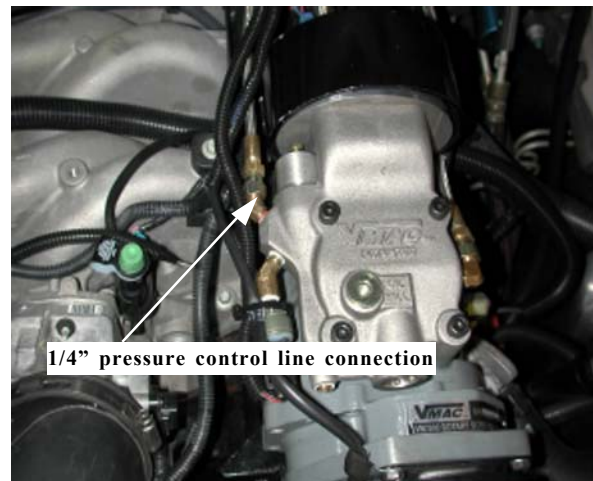


Figure 26

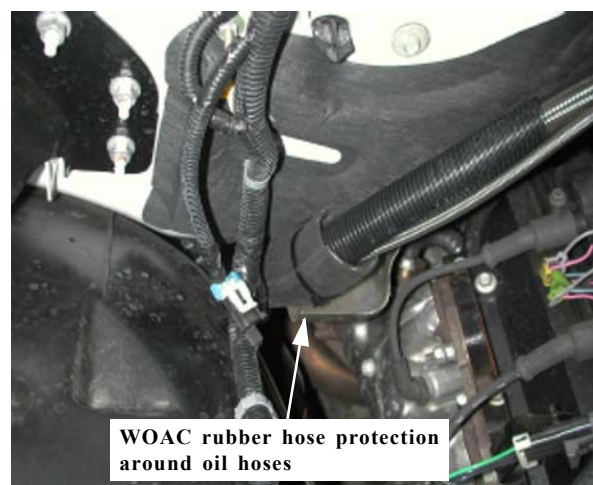


Figure 27

6. Run the 1/4 pressure control line from the tank in tandem with 5/16 scavenge line and connect the end to the 1/4 inch fitting on the right side of the compressor inlet valve. Tighten the fitting. (Figure 26).
7. Vehicles not fitted with A/C, wrap the three (3) **VR70** hoses with the supplied section of split rubber hose to prevent chaffing on the heat shield. (Figure 27).
8. Tie wrap hoses in place securely using the plastic loom for protection. Use the steel ties to secure hoses to the frame and plastic ties for the hoses along the fire-wall.

3.8 Completing the installation

1. Mark the plastic wiring channel and cut out the sections as shown. (Figure 28).
2. Rotate the plastic fuel line to the cold start injector to run under the plastic wiring channel behind the front OEM locating bolt. (Figure 29).



NOTE

Take care not to kink the fuel line and ensure it is not in contact with the hot compressor

3. Re-fit the plastic wiring channel to the top of the engine.



Figure 28



Figure 29

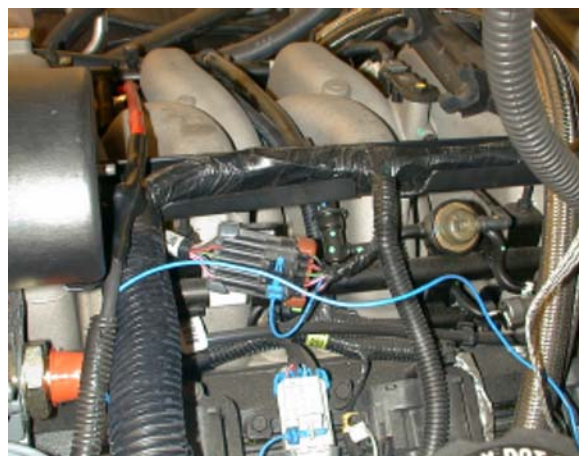


Figure 30

4. Re-locate the main wiring harness behind the VR70 air filter and through the new cut out section of the wiring channel. Fit the harness up on the harness mount on the installed coil bridge bracket and tie wrap in place. (Figure 30).



Figure 30

5. Re-connect the wiring harness to the throttle body servo motor and throttle position sensor

6. Connect the supplied alternator wiring extension cable with male and female plugs between the alternator and the alternator IEM harness. Route the harness through the plastic wiring channel where possible.



Figure 31

7. Remove the rubber cover from the alternator end of the main red alternator cable. Install the rubber cover over one end of the main red alternator extension cable supplied

8. Join the extension cable to the OEM alternator cable using the supplied 1/4 NC x 1/2 inch bolt, flat washer, and nylock nut included. Tighten the connection and slide on the heat shrink insulator over the connection and heat to secure. (Figure 31).



Figure 32

9. Route the extension cable under the plastic wiring channel. Connect the alternator extension cable to the alternator and re-fit the rubber cover.

10. Locate the OEM fusible link box to the tab on the edge of the compressor mounting bracket using the OEM 6mm bolts.
11. Mark the plastic engine cover in the two places shown. Cut out the two sections with a sharp knife or zip wheel. (Figure 32).
12. Re-fit the engine plastic top cover. Ensure that the harness and fuel line does not become trapped.
13. Fit the OEM air cleaner mounting plate support bracket to the upright on the right side of the radiator. Use the OEM bolts and re-fit the plastic clip to the plastic inner fender.
14. Fit the air cleaner mounting plate using the OEM bolts.
15. Fit the air cleaner in position on the mounting plate. Reconnect the MAF sensor wiring plug.
16. Carefully mark the air intake trunking around the round center section, (allow 1/2 inch clearance from the fluted section) engine side of the resonator chamber, then cut through the section.



Figure 33

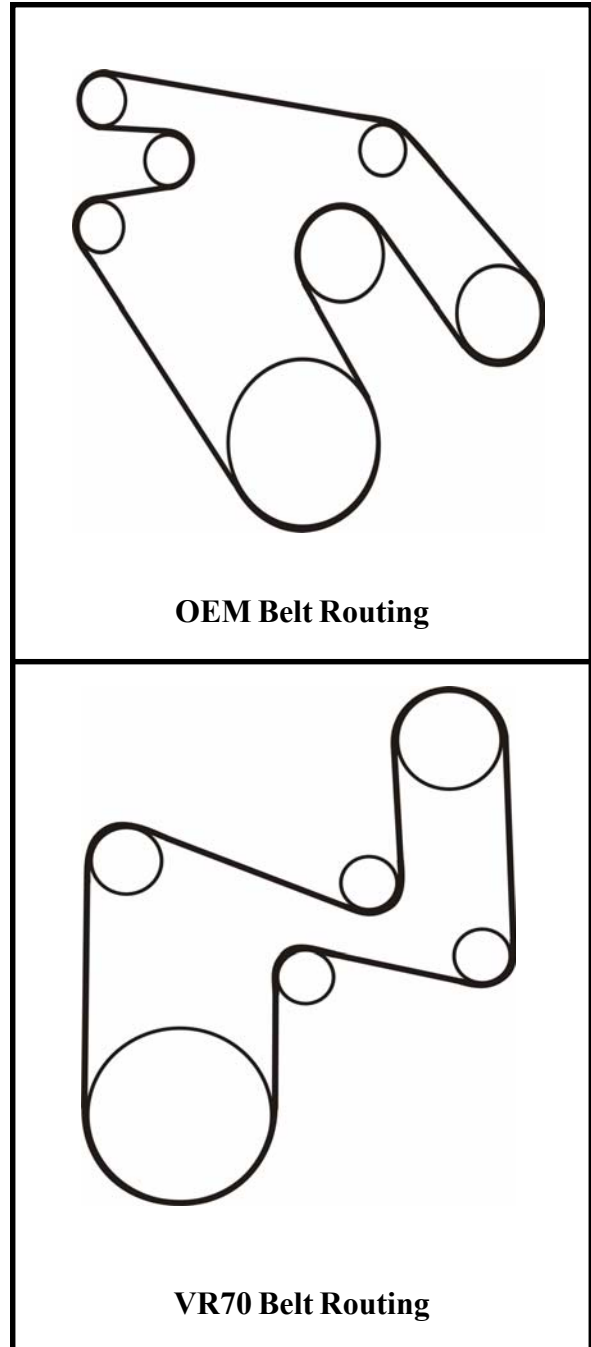


Figure 34



Figure 35

17. Fit the resonator half of the intake tube to the air cleaner and rotate the resonator chamber to the horizontal position and tighten the clamp (Figure 33).
18. Fit the supplied 4 inch ID 45 degree rubber hose elbow with the two(2) supplied hose clamps to the resonator end of the intake tube. Push hose elbow on so the intake tube is in the middle of the hose.
19. Connect the remaining section of the air intake tube to the throttle body and the four inch rubber elbow. Push intake tube in to the middle of the hose. Adjust and rotate the intake tube to clear the alternator. Ensure that the resonator is clear of hitting the air cleaner. (Figure 34).
20. Tighten all hose clamps on the intake tube. Ensure that there is a good air-tight seal at the joints.



YOU MUST USE ONLY THE OIL THAT IS SUPPLIED IN THIS KIT, AS IT HAS BEEN SELECTED TO MEET THE REQUIREMENTS OF THE SYSTEM. USING OTHER OIL MAY CAUSE SYSTEM DAMAGE AND WILL VOID THE WARRANTY.



21. Remove the compressor oil filler plug and pour 6 liters (1.6 US gallons) of oil into the compressor while rotating the compressor clockwise using the clutch center bolt.
22. Install the fill plug.
23. Check that the oil level at the sight glass is correct
24. Apply a smear of compressor oil around the VR70 oil filter and fit to the front of the tank. Hand tighten the filter and then tighten a further 1/4 turn.
25. Fit the supplied rock guard to the front of the tank using the three (3) 3/8 inch bolts supplied.

**CONDUCT ONE FINAL CHECK
TO ENSURE THAT ALL HOSES
ARE TIGHT AND CLEAR OF
HOT SURFACES OR SHARP
EDGES.**

**Before operating the VR70
system, run the engine to
operating temperature to
remove all air locks from the
cooling system.**

**Refer to the owners manual for
the set up procedure before
operating the VR70 system.**

Part 4

Installing the Control Components

System #V900062

**2001-2003 GENERAL MOTORS
2500HD - 3500
8.1 LITER GAS ENGINE**



UNDERHOOD AIR COMPRESSOR

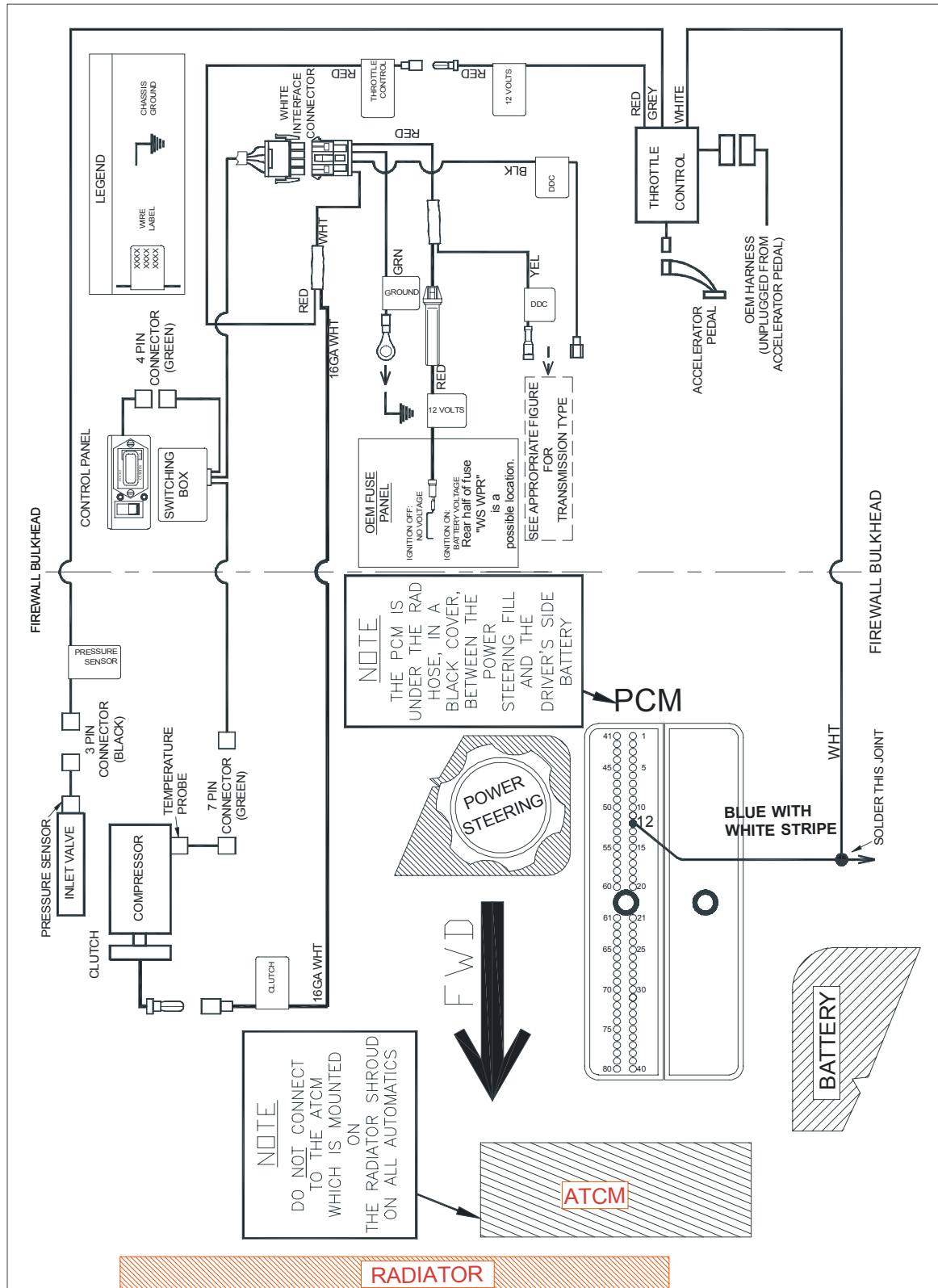


Figure 1

4.1 Installing the Control Unit



Refer to Figure 1 for electrical layout drawing.

1. Locate a suitable location for the control unit where it will be accessible but will not be subject to damage.



Recommended locations include the side panel just behind the door opening or under the dash below the steering column (Figures 1 and 2).

2. Tighten the two side brackets on the control unit and position it in the selected mounting location.
3. Mark the position of the mounting holes and drill two (2) 7/32 inch holes for the brackets.
4. Mount the control unit with the wire harness coming out from the bottom or the back of the unit.



If the controller is mounted to the dash, route the wiring under the dash and secure the excess wiring out of the way using plastic ties.



Figure 2



Figure 3



NOTE

If the controller is mounted to the body panel, remove the plastic door trim and route the wiring along the body panel under the trim and up under the dash.

4.2 Installing the Switching Box

1. Mount the switching box under the dash using the supplied plastic ties.



NOTE

Make sure that it does not interfere with other parts.

2. Connect the grey cable from the control unit to the shortest of the two grey cables on the switching box and plug them together.
3. Connect the two white interface connectors together.
4. Route the white wire from the interface connector and the grey cable for the compressor temperature sensor from the switching box through a suitable opening in the firewall (Figure 4).



Figure 4

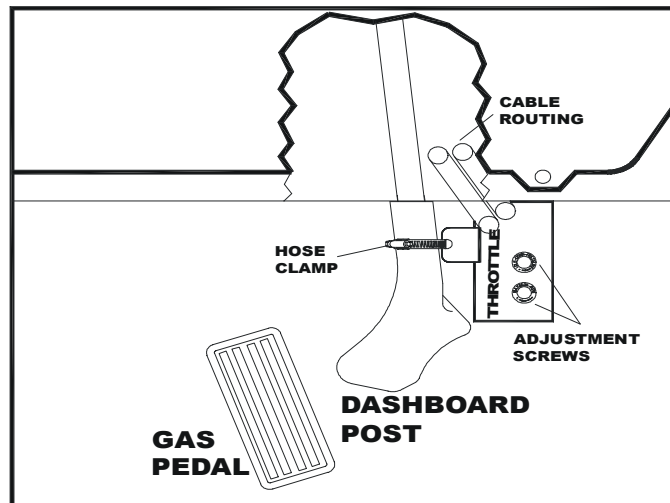


Figure 5

4.3 Installing the Throttle Control



NOTE

Make sure you have the correct throttle for the model year of the truck. For 2003 model year: A700095
For 2001 - 2002 model years: A700096



Figure 6

1. Mount the throttle control under the dash . Ensure that the harness connectors on the throttle control will reach the OEM accelerator connectors. (Figure 5) for suggested mounting.
2. Unplug the OEM cable from the accelerator pedal and plug it into the male connector on the throttle control (Figure 6).
3. Plug the cable from the throttle control with the female connector into the connector on the accelerator pedal. Connect the green wire to a good ground.
4. Route the white wire and the gray pressure sensor cable through a suitable opening in the firewall through to the engine compartment (Figure 4).
5. Route the gray pressure sensor cable to the VR70 compressor and connect it to the pressure sensor. Cover the wire with the supplied 1/4 inch plastic loom.
6. Remove the black plastic cover from the Powertrain Control Module (PCM), between the power steering fill cap and driver side battery (Figure 7). On an automatic, you may wish to remove the Automatic Transmission Control Module (ATCM) cover from the fan shroud to get more room. Unclip the PCM and rotate the connectors to the top. Remove the grey cover on the connector nearest the power steering fill cap (Figures 8 & 9).

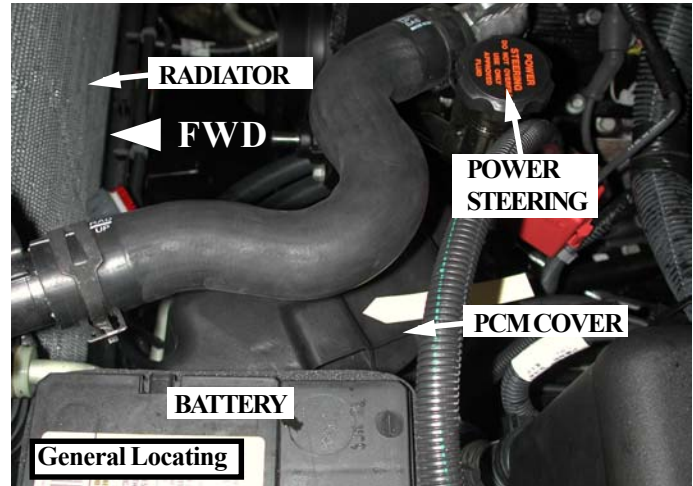


Figure 7

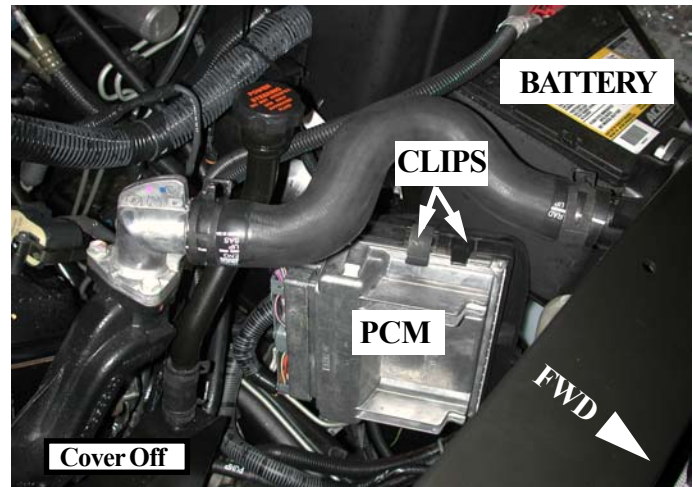


Figure 8

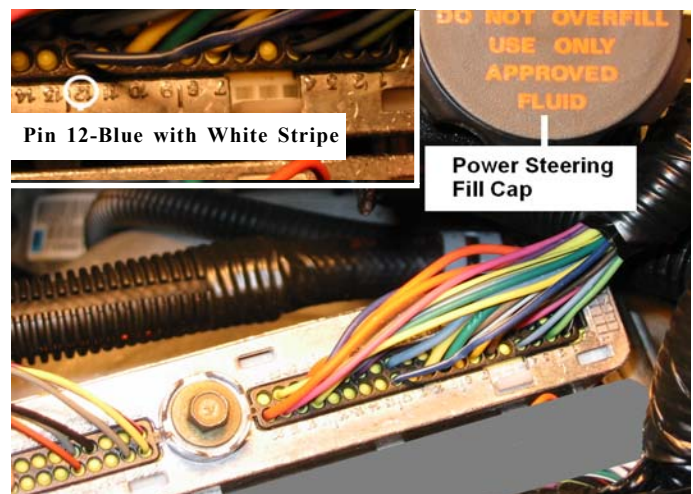


Figure 9



Make sure you are connecting to the PCM and NOT the ATCM, (Figure 7 & 8). Refer to Figure 1 for a drawing of the electrical connection and PCM location.



Handle wires and harness carefully. All batteries must be fully disconnected while handling this or any other electronic module or damage could result.

7. Locate the blue wire with the white stripe at location 12 on the connector (Figure 9). Pull back the loom to access the wire away from the PCM.



There can be more than one blue with white stripe wire in the harness.

8. Route the white wire from the throttle control to the blue with white stripe wire. Solder and seal this connection. See Appendix A for instructions.



Greater reliability will be achieved by soldering and heat shrinking this connection. A T-tap quick connect has been provided if this is not practical.

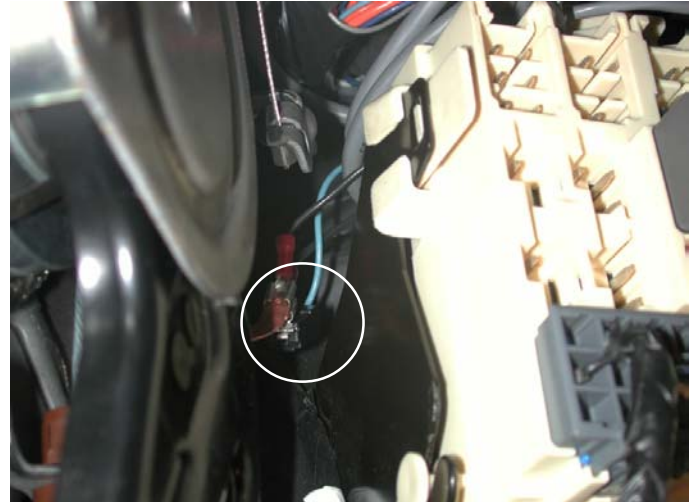


Figure 10

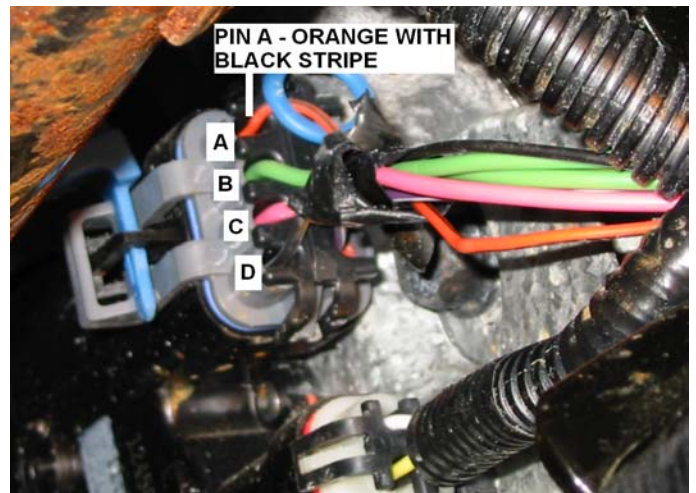


Figure 11



FAILURE TO PROPERLY INSTALL AND VERIFY FUNCTION OF THIS SAFETY INTERCONNECT FEATURE CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH

If the vehicle has an automatic transmission, the throttle control must be connected so as to be inoperable unless the transmission is in park or neutral.

If this important safety interconnect is not already provided, VMAC DDC (Drive Disable Circuit) P/N 3550666 will accomplish this.

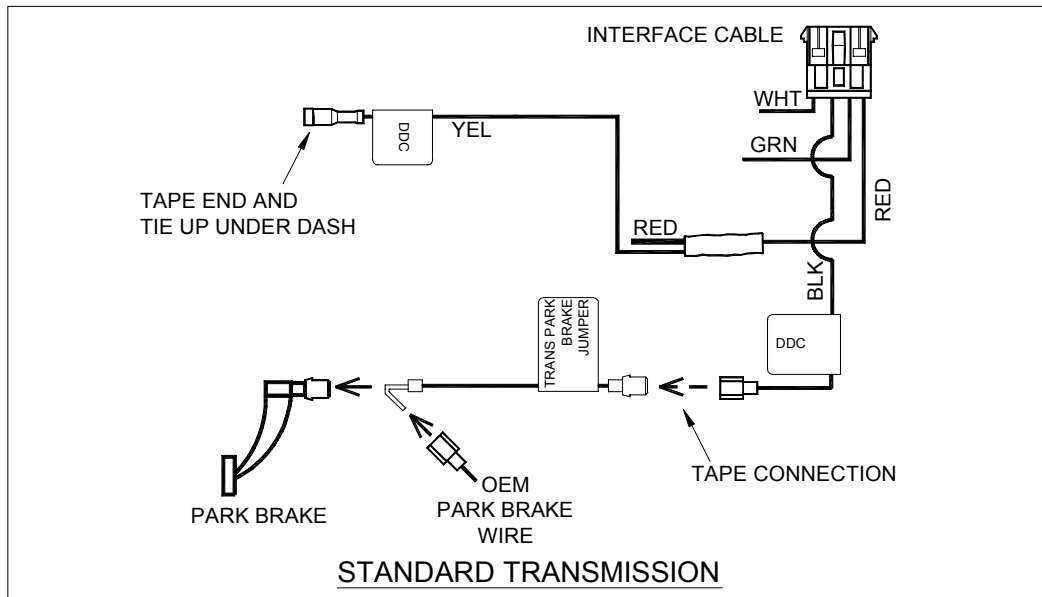


Figure 12

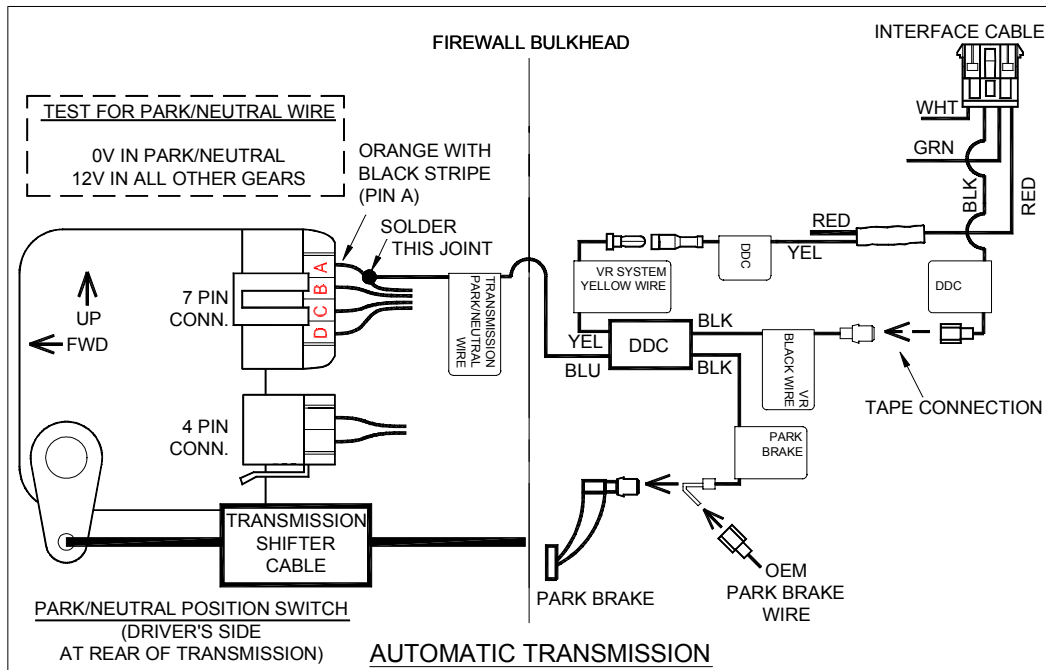


Figure 13

5.4 Connecting the Drive Disable Circuit, (DDC).

Manual Transmission

1. Connect the black DDC wire on interface cable to the black park brake jumper wire.
2. Disconnect OEM park brake wire from the park brake switch and plug onto piggyback connector jumper wire (Figures 10 & 12).
3. Plug assembly into park brake switch.

Automatic Transmission

1. Locate the Park/Neutral Position Switch on the driver's side of the transmission near the rear (Figure 11 & 13). The top connector is a 7pin connector labelled "A to G".
2. Locate the orange/black wire on pin "A" of the top connector on the transmission (Figures 11 & 13).
3. Pull back the loom to access the wire away from the connector.
4. Route the blue "Transmission Park/ Neutral" wire from the DDC to the orange with black stripe wire at pin "A". Solder and seal this connection. See Appendix A for instructions.



Figure 14



Figure 15



Figure 16

**NOTE**

Greater reliability will be achieved by soldering and heat shrinking this connection. A T-tap quick connect has been provided if this is not practical.

5. Connect the black DDC wire on the interface cable to the black VR70 wire on the DDC.
6. Disconnect the OEM park brake wire from the park brake switch and plug onto the piggyback connector on the black park in brake wire on the DDC.
7. Plug the assembly into the park brake switch (Figure 10).
8. Connect the yellow wire on the interface cable to the yellow wire on the DDC.
9. Cover the blue and white wires with the supplied 1/4 inch plastic loom from the firewall to the PCM and transmission. Use the supplied nylon ties to keep the wires from contacting moving parts and hot areas.



Figure 17



Figure 18

4.5 Connecting the Wire Harnesses

1. Locate a fuse in the fuse panel on the driver side of the dash, that provides power only when the ignition switch is in the "ON" position (Figures 14 & 15). Fuse labelled "WS WPR" is one possibility.

2. Route the red wire from the interface connector, (with the inline fuse) to the fuse panel.
3. Remove the chosen fuse from the fuse panel and connect the fuse tap to one side of the fuse. (Figure 16).
4. Plug the fuse with the fuse tap back into the empty fuse socket. Make sure that the side with the fuse tap is in the hot side of the panel. (Figure 17).
5. Route the white wire from the interface connector to the VR70 compressor.
6. Connect the white wire to the matching clutch connection.
7. Route the 18 gauge red wire from the interface connector to the throttle control.
8. Connect it to the red wire from the throttle control.
9. Connect the temperature sensor wire from the switching box to the matching connector at the compressor.
10. Connect the green wire from the interface connector (with the ring connector) to a good ground.
11. Check the routing and security of all wiring. Fasten all wiring into position using nylon ties so that they do not contact moving parts or hot areas (Figure 18).

5.6 Testing the safety circuit

Use the following procedure to test the operation of the safety circuits:

1. For safety, place the vehicle in a safe operating position, and block the vehicle wheels. Ensure that there are no other people around the vehicle.
2. Sit in the driver's seat, with the transmission in "Park" and the park brake fully engaged.
3. Start the vehicle engine and wait for the idle to stabilize. Engine operating temperature should be in the normal operating range.
4. Test the operation of the VR system. Momentarily activate the system by turning it "On" then "Off" quickly, the engine should start to idle up, and the clutch should engage.
5. Firmly apply the vehicle's foot brake and hold it down.
6. Release the park brake and momentarily activate the system as before. The engine should not idle up and the clutch should not engage.
7. Apply the park brake and firmly apply the vehicle's foot brake and hold it down.
8. For Automatic Transmissions – Place the gear selector in any position other than "Park" or "Neutral".
9. Momentarily activate the system as before. The engine should not idle up and the clutch should not engage.
10. Place the transmission in "Park" and shut-down the vehicle's engine.



NOTE

If the vehicle fails either in park brake test (step 6) or the gear selector test (steps 8 & 9), check your wiring to make sure that all the connections are correct and secure. If you require additional assistance, please contact your local VMAC dealer.

Appendix A - Generic soldering instructions

1. Cut the OEM wire, and strip approx. 1/2" from each end and from the VR wire (Figure A1).



Figure A1

2. Slide the heat shrink provided onto one OEM wire and the VR Wire. Twist the 3 wires together (Figure A2).



Figure A2

3. Heat all 3 wires at the joint with a soldering gun/pen, then apply the provided solder. Ensure the solder "flows" into the joint to bond the wires together (Figure A3).



Figure A3

4. Slide the heat shrink over the joint, and shrink onto the joint using a heat gun. Make sure the shrink is heated until the liner melts and makes a good seal (Figure A4)



Figure A4

Part 5

Illustrated Parts List

System #V900062

**2001-2003 GENERAL MOTORS
2500HD - 3500 (NOT 3500HD)
8.1 LITER GAS ENGINE**



UNDERHOOD AIR COMPRESSOR



2001-2003 GENERAL MOTORS 2500HD - 3500 (NOT 3500HD) 8.1 LITER GAS ENGINE

ASSY.	ITEM	UNIT	QTY	PART#	DESCRIPTION
1.0					Main bracket assembly
	1.1	ea	1	1100140	Main bracket
	1.2	ea	3	1300008	Idler, ribbed
	1.3	ea	5	1400051	Idler bolt spacer
	1.4	ea	3	1500403	Bolt, machined, idler, ½ x 1 ¼"
	1.5	ea	2	1500051	Bolt, HHCS, idler, ½ x 1 ¼"
	1.6	ea	1	OEM	OEM Washer
	1.7	ea	2	1500048	Washer, flat 7/16
	1.8	ea	1	1520090	Bolt, HHCS, NC G10.9 M10x1.5x30
	1.9	ea	2	1300025	Idler, back
	1.10	ea	1	3300020	Adjustor
	1.11	ea	1	1300007	Idler, back
	1.12	ea	1	1200290	Alternator bracket
	1.13	ea	1	1800163	Crank pulley assembly
	1.14	ea	1	1520524	Bolt, M16 x 1.5 x 80 HHCS
	1.15	ea	1	1650296	VR70 Belt
	1.16	ea	1	1650348	OEM Belt
2.0					Compressor assembly
	2.1	ea	1	P120061	VR70 compressor
	2.2	ea	1	5000112	Elbow Brass Street, 45°
	2.3	ea	1	5000085	Connector, brass, pipe-tube 45°
	2.4	ea	1	1500519	Rod, threaded, ¼ x 2.62
	2.5	ea	1	3600066	Cap, air filter
	2.6	ea	1	1570038	Washer, flat SAE, ¼
	2.7	ea	1	1550029	Nut, Nylock, NC ¼
	2.8	ea	1	3600037	Paper filter element
	2.9	ea	1	5000081	Connector, brass, pipe – tube
	2.10	ea	1	2200097	Cable clamp ¼
	2.11	ea	1	5830004	3 1/8" ID x 1/8" wide o-ring, Viton
	2.12	ea	1	4900002	Elbow, steel JIC/O-ring, ½ x ¾ - 16
	2.13	ea	1	1570481	¾" o-ring washer
	2.14	ea	1	5830072	5/8" ID x 1/16" wide o-ring, Viton
	2.15	ea	1	P200035	Clutch, complete
	2.16	ea	1	3530682	Temperature probe cable assembly
	2.17	ea	1	9200212	Inlet valve, integrated regulator
	2.18	ea	1	3500288	Pressure transducer



2001-2003 GENERAL MOTORS 2500HD - 3500 (NOT 3500HD) 8.1 LITER GAS ENGINE

ASSY.	ITEM	UNIT	QTY	PART#	DESCRIPTION
3.0					Tank Assembly
	3.1	ea	1	9200234	Main tank body
	3.2	ea	1	5000089	3/8" NPT to 1/2" SAE brass connector
	3.3	ea	1	3200227	Ring, window
	3.4	ea	1	4900035	3/4-16 Threaded nipple
	3.5	ea	1	9200039	VR70 oil filter
	3.6	ea	1	1500385	Retaining ring
	3.7	in	1	3600077	Sight glass window
	3.8	ea	1	5830008	O-ring, 1 15/16" ID x 3/32" wide, Viton
	3.9	ea	1	3600054	Relief valve
	3.10	ea	1	4900033	3/4" NPT x 3/4" JIC steel connector
	3.11	ea	1	5830066	O-ring, 4 3/4" ID x 1/8" wide, Viton
	3.12	ea	1	5840068	Compression spring
	3.13	ea	1	3600036	Coalescing filter element
	3.14	ea	1	3600064	Rear tank cap seal
	3.15	ea	1	5840069	Scavenge spring
	3.16	ea	1	3600090	Scavenge screen barb assembly
	3.17	ea	1	9200364	Blowdown cap
	3.18	ea	1	4900047	Elbow, steel, SAE, 1/2- 1/2
	3.18	ea	1	5830104	O-ring, Viton, 1 3/8"ID x 1/16"
	3.19	ea	1	5830055	O-ring, Viton 1 5/16"ID x 3/32"
	3.20	ea	1	3200231	Cover, sight glass
4.0					Hose Kit
	4.1	ea	1	1752078	Hose, crimped 1/2" x 78"
	4.2	ea	1	1771070	Hose, crimped 3/4" x 70"
	4.3	ea	1	1752042	Hose, crimped 1/2" x 42"
	4.4	ea	1	1730102	Hose, crimped 1/4" x 102"
	4.5	ea	1	1740111	Hose, crimped 5/16" x 111"
	4.6	ea	1	5300030	Elbow, hose barb PVC, 1"
	4.7	ea	3	2200047	Clamp, hose, HS16
	4.8	in	21	1700034	Hose, 1" rubber
	4.9	ea	1	1720530	Elbow, air cooler, modified
	4.10	ea	2	2200140	Clamp, hose HS72
5.0					Throttle Control Assembly
					Please refer to the appropriate accessory pack
6.0					Tank Bracket Assembly
	6.1	ea	2	2200105	Mounting bracket 6" C-Clamp
	6.2	ea	2	2200133	Insulated double-tube clamp
	6.3	ea	2	1200236	Tank strap mount
	6.4	ea	2	2200120	Tank cable strap
	6.5	ea	2	2200137	Tank strap flat bar
	6.6	ea	2	1400051	Spacer



2001-2003 GENERAL MOTORS 2500HD - 3500 (NOT 3500HD) 8.1 LITER GAS ENGINE

ASSY.	ITEM	UNIT	QTY	PART#	DESCRIPTION
7.0					Cooler Assembly
	7.1	ea	1	4800282	Cooler assembly
	7.2	ea	1	1200287	Cooler skid plate
	7.3	ea	1	1710534	Hose, radiator, modified
	7.4	ea	1	1720243	Connector, hose
	7.5	ea	1	1710525	Hose, radiator, modified
	7.6	ea	4	2200026	Clamp, hose
8.0					Electrical Assembly
	8.1	ea	1	3500620	Interface cable
	8.2	ea	1	3500404	Low profile control panel
	8.3	ea	1	3500412	Switching box
	8.4	ea	1	3500632	Extension, alternator
	8.5	ea	1	3550651	Cable, alternator control
	8.6	ea	1	3550666	DDC
9.0					Misc.
	9.1	ea	1	1200289	Bracket, coil, mount assembly