INSTALLATION PROCEDURE

Installing a CDS into 2016-19 Chevy Van

Part Numbers Affected: Various | Date Changes Take Affect: 2016

*****COMPLETELY READ ALL INSTRUCTIONS BEFORE STARTING INSTALLATION!*****

This document is a guide for installing a CDS 4.8.

UPON RECEIVING THE CDS

Open the crates and packaging carefully and examine all components. In the event that damage does occur during shipping, it is the responsibility of the customer to immediately notify the carrier and to file a damage claim.

INSTALLATION GUIDELINES

- Quality of the fit and finish of the CDS system depends solely on the installer. While HydraMaster provides all parts and instructions necessary, it is up to installers to use their own craftsmanship to provide a clean, safe and quality installation that the customer will be satisfied with. Please follow sound, standard shop practices.

- In some cases, due to prior vehicle modifications, it may be necessary to modify the vehicle to continue installation.

- **Dry fit all equipment before securing.**

- During installation, make sure that the Recovery Tank lid clears the van's ceiling.

- Always verify clearances before drilling holes through floor or anywhere else on the van.

- All hoses and wires that are installed or re-routed during the installation must be secured away from all rotating parts, sharp edges, and excessively hot areas.

- Torque all nuts and bolts as noted.

The HydraMaster "CDS" system is compatible with the following Chevrolet / GMC makes and engine sizes:

2008 - 2017 --- 4.8 liter
2008 - 2019 --- 6.0 liter

Note: we currently do not offer conversions for the V6, V10, or Diesel equipped vans
Note: not compatible with any passenger vans

Figure 1 shows some major components that are shipped with the standard CDS 4.8:

1. Yaw Sensor Cooling Assembly
2. Power Pack (Pump, Blower and Frame) Assembly
3. CDS 4.8 Tank Assembly, which includes the instrumentation panel
4. Pass Through Assembly

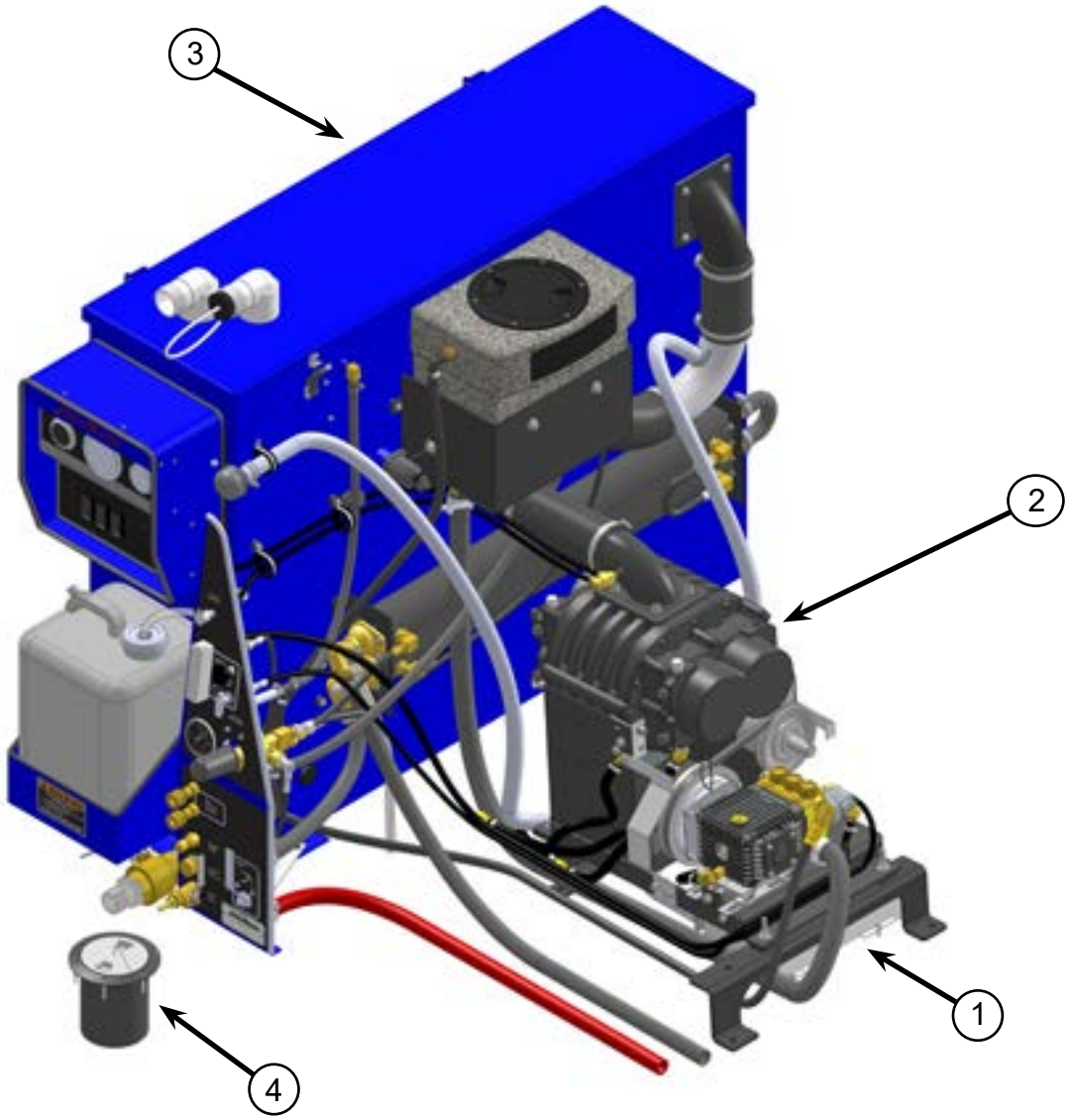


Figure 1. Standard CDS 4.8

NOTICE

This is the suggested order in which assemblies and kits should be installed:
PLEASE INSTALL THE YAW SENSOR COOLING ASSEMBLY FIRST.

Refer to Table 1 during installation for hose routings and hose part numbers.

⚠WARNING

To prevent serious personal injury, ensure that the major components of the CDS 4.8 are well secured to the floor of the vehicle with the hardware supplied.

NOTICE

Prior to installing any assembly or drilling holes, dry fit all assemblies first to ensure a proper fit.

NOTICE

After the CDS has been completely installed, follow the set up and calibration procedure starting on page 42 of this document.

Table 1. CDS Standard Hose Routings

Part Number	Description	From	To
000-068-092	Hose, 3/8" X 15" Teflon w/ 3/8" JIC End	Dual Heat Exchanger	By-Pass Valve
000-068-1037	Hose, 3/8" I.D. X 39" Lg., Clr w/Braid	Chemical Jug	Chemical Meter
000-068-1038	Hose, 3/8" I.D. High Temp X 72" Lg.	Chemical Pump	Chemical Meter
000-068-1039	Hose, 3/8" I.D. Rubber X 31" Lg.	By-Pass Valve	Recovery Tank
000-068-196	Hose, 3/8" I.D. X 11" Lg w/ 3/8" MPT and 3/8" JIC End	By-Pass Valve	Dual Heat Exchanger
000-068-203	Hose, 3/16" X 34" Teflon 1/4" F JIC X 1/4" F JIC	Water Box	Hi-PSI Manifold
000-068-385	Hose, 3/4" I.D. X 18 ft - Green Stripe - Cut to Fit	Dual Heat Exchanger	Van Cooling System
000-068-588	Hose, 3/8" X 52" Lg. Throb	Pump	Hi PSI Manifold
000-068-706	Hose, 3/16" X 70" Lg. Teflon w/ Fem JIC Ends	Pump	By-Pass Valve
000-068-734	Hose, 1/2" X 42.5 Lg w/ 3/8" NPT and 3/8" SAE F Ends	Water Box	Water Outlet
000-068-777	Hose, 1" X 65" Lg. Suction	Pump	Water Box
000-068-940	Hose, 3/8" I.D. Rubber X 17" Lg.	Hi-PSI Manifold	Dual Heat Exchanger
000-068-977	Hose, 5/32" I.D. Vacuum X 52" Lg.	Pressure Gauge	Blower Outlet
000-068-978	Hose, 5/32" I.D. Vacuum X 82" Lg.	Lube Port	Blower
000-068-991	Hose, 1/2" I.D. Rubber X 42" Lg.	Water Box	By-Pass Valve

TOOL LIST

Tools and other items you will need include:

3-¼" Hole Saw 4 ½" Hole Saw with jobber length pilot drill bit (minimum of 6" long)	Dex-cool Antifreeze
Wire Strippers/Crimpers/Cutters	Common Metric & Standard Drivers, Nut Drivers; Wrenches/Sockets
Reciprocating Saw	Drill ; Long 3/8" Drill Bit; #16 or #17 Bit; can also use 11/64" Bit; 13/64" Bit
Ratchet	Torque Wrench
Die Grinder	Razor Utility Knife, Box Knife or Hose Cutter
Tape Measure	Clear 100% Silicon Sealant (temperature range –60 to +300 degrees F, cured)
Loctite® 242 or equivalent; Loctite 545	White chalk/marker
Pipe Thread Sealant (temperature range - up to +500 degrees F)	
Personal protective equipment (PPE) such as gloves, safety glasses and shoes, and earplugs or muffs.	

PREPPING VEHICLE FOR INSTALLATION

1. Remove both driver and passenger seats. Remember to unplug and unfasten the seat belt sensor wires.
2. Remove the dog house engine cowling.
3. Remove the cup holder assembly from the engine cowling.

NOTICE

The cup holder assembly will not be reused.

Figure 2. Plastic Dash Covers

4. Carefully remove the plastic dash covers on the driver and passenger sides (see Figure 2). Remove the two bolts on the underside of each side, then remove the top portion by carefully pulling straight out. The dash cover on the driver side needs to be modified for clearance of the CDS cowling.
5. Remove the engine cowling.

NOTICE

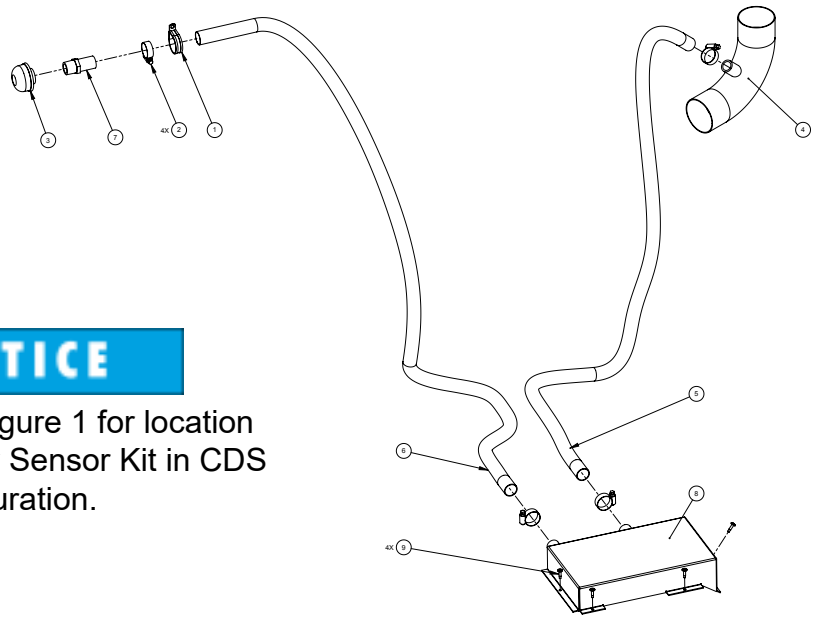
Set cowling aside for now. It will need to be modified later during the installation.

6. Carefully remove the floor mat. DO NOT disconnect any of the underlying wires or cables. Pay special attention to the areas around the air pressure bag sensor, lying directly behind the van electrical fuse box (which was under the driver's seat).
7. Locate the yaw sensor cover in the center of the floor, immediately behind the dog house, and between the seats.

INSTALLING YAW SENSOR AND SENSING DIAGNOSTIC MODULE (SDM) KIT

Parts included in the Yaw Sensor and SDM Kit are listed here and shown in Figure 3.

Item	Part Number	Description	Qty
1	000-033-053	Clamp, 1-1/2" Cushion Loop	1
2	000-033-029	Clamp, Size #12 Hose	4
3	000-049-020	Filter Screen - Medium	1
4	000-052-034	Fitting, Yaw Sensor Cooling	1
5	000-068-829	Hose, 1" Vacuum - Gray W - 72"	1
6	000-068-828	Hose, 1" Vacuum - Gray W - 84"	1
7	000-052-908	Insert 3/4 X 1 Hose w/o Barb	1
8	000-041-323	Cover, Yaw Sensor and SDM Weld	1
9	000-143-058	Screw, #8 TEK X 3/4" Lg.	4



NOTICE

See Figure 1 for location of Yaw Sensor Kit in CDS configuration.

Figure 3. Yaw Sensor and SDM Kit Assembly

1. Remove and discard the plastic cover provided by manufacturer (see Figure 4).
2. Align and fit the new cover over the Sensing Diagnostic Module (SDM) and yaw sensor (see Figure 5).

Figure 4. Remove and Discard Plastic Cover

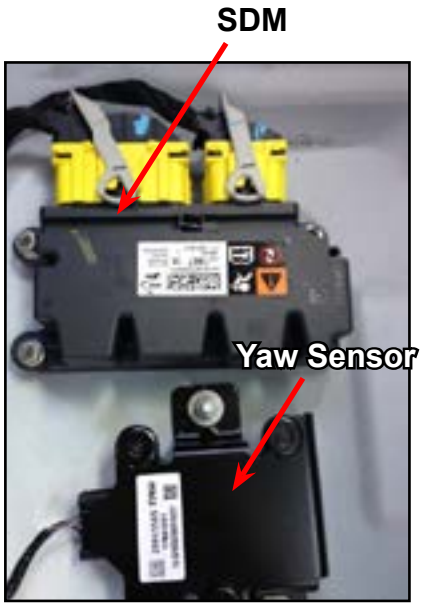


Figure 5. Fit New Cover over SDM and Sensor

3. Ensure the dam is positioned between the SDM and yaw sensor; route the wires through the two wire exits on the cover, and apply silicone to the flanges liberally (see Figure 6).

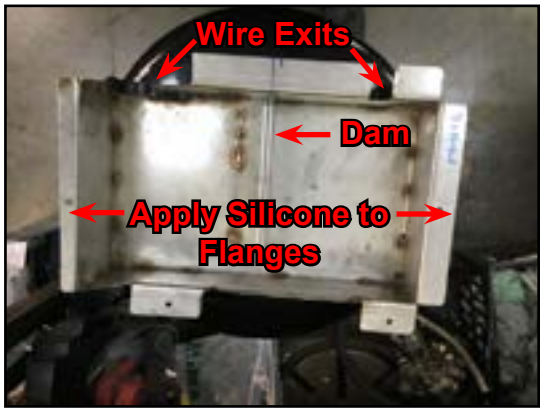


Figure 6. Route Wires through Two Exits

Figure 7. Lower New Cover over SDM and Sensor

4. Lower the cover, make sure it is as flush as possible with the van's floor and fasten the unit to the floor with the self-tapping screws provided (see Figure 7).
5. Apply silicone to the exposed edges and around the wire exits to seal the unit.

CAUTION

Clean the wire exits with a file, if necessary, to remove the burrs and nicks that can result in damage to wires. This type of damage is not covered in the warranty.

CAUTION

It is important to seal the cover to the van floor to ensure proper air and water protection for the yaw sensor.

CAUTION

Insufficient protection of the wires can result in damage to vehicle electronics.

1. Connect the two 1" flex hoses to the new cover over the yaw sensor. Use the provided hose clamps to secure the hoses (see Figure 8).

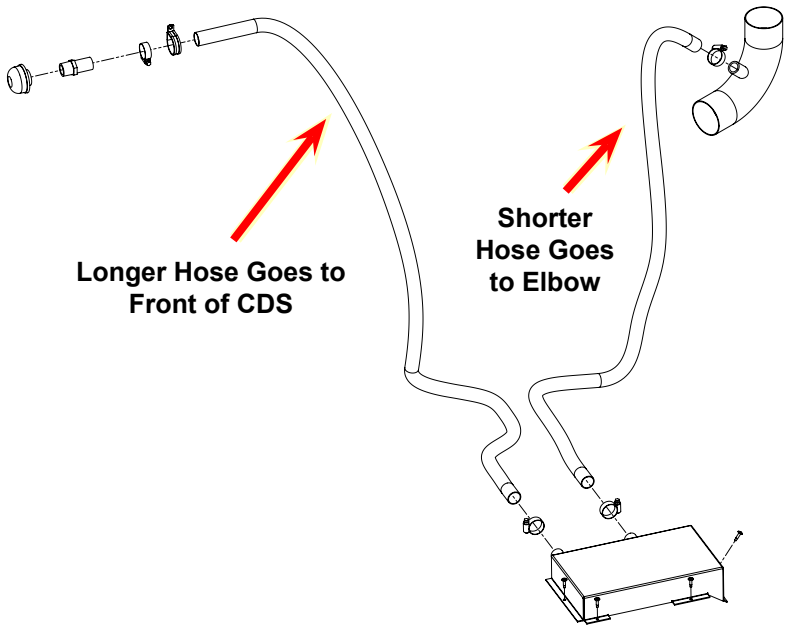


Figure 8. Route and Connect 2 Flex Hoses

NOTICE

The longer hose will run from the passenger side of the cover to the front of the CDS unit, which will be pointing out of the passenger's side cargo door. The shorter hose will run from the cover (driver's side) to the Recovery Tank elbow joining the Recovery Tank to the Blower (refer to page 30).

2. Install the hose insert and filter screen onto the end of the longer hose (see Figure 9).

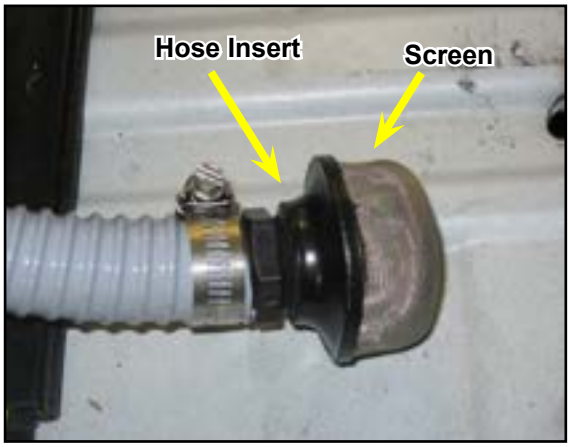


Figure 9. Install Hose Insert and Filter Screen on Longer (Passenger-Side) Hose

Figure 10. Remove Batting from Floor Mat

3. Cut off the batting in a swath as wide as the cover of the yaw sensor and the entire length, front to back, of the mat (see Figure 10). This will allow the routing of the 1" hose under the Blower for proper cooling of the yaw sensor.

CAUTION

When removing the batting, DO NOT cut the van floor mat. This will ruin the water seal value of the mat and put the sensor and all underlying electrical components, including the air bag sensor, in serious risk of failure from a leaking pump or accident.

4. Replace the van floor mat being sure to route the two 1" diameter hoses side-by-side and straight back toward the cargo area of the van (see Figure 11).

Figure 11. Route Hoses Straight Back Toward Cargo Area

NOTICE

The final assembly will have a 1" diameter hose attached to the Blower elbow and a 1" diameter hose routed toward the front of the CDS side panel (see Figure 3).

Secure the hose away from all rotating pulleys and off the Blower using the nylon tie wraps and clamps as necessary.

NOTICE

The Power Pack front and rear spacers allow routing of the two 1" hoses, seen in Figure 11, under the Power Pack, up to the Recovery Tank and behind the front panel of the CDS.

Figure 12. Finish Yaw Sensor with front mat reinstalled

FRONT END INSTALLATION

1. Open hood and disconnect negative battery cable at the battery.

⚠WARNING

Ensure that the negative battery cable is disconnected. If it is not disconnected, personal injury or death could result from electrical shock.

2. Disconnect the wiring plug at the air cleaner, then remove air cleaner and tube assembly down to the throttle body. Use a shop rag to cover the intake of the throttle body.
3. Remove radiator over-flow container.
4. Remove the main engine drive belt. If van is equipped with air conditioning, the compressor is driven by a separate belt and does not need to be removed.

PREPPING FRONT END CLUTCH ASSEMBLY

⚠WARNING

Ensure that the negative battery cable is disconnected. If it is not disconnected, personal injury or death could result from electrical shock.

1. Locate the engine alternator.

NOTICE

The alternator will need to be removed and installed on the clutch bracket provided. Moving the alternator over to the right provides room for the clutch and drive shaft assembly. The two small wires (gray and orange) with the wiring plug need to be extended along with the battery lead cable.

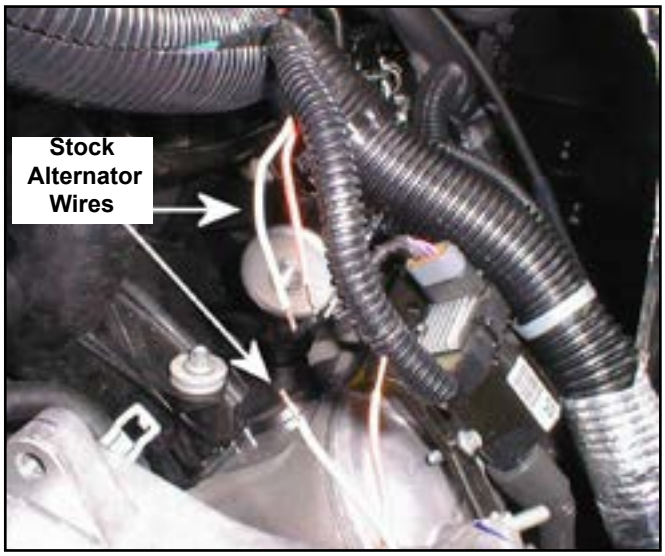


Figure 13. Routing Extended Wires

2. At the rear of the alternator, the wires and cable must be extended. First unplug the wiring connector and then remove the battery cable. Modify the harness and cable as follows:
   a. First remove the tape and plastic split loom back to expose gray and orange wires. Cut the wires approximately 2” from the plug and install the orange and gray extension wires with the pink butt connectors provided in the kit. The extended wires can be routed inside the main Chevy wire harness that runs forward (see Figure 13).

b. Second remove the 6-gauge red battery cable by pulling the boot back and then loosen the nut to remove the cable.

3. Remove the 2 bolts that mount the alternator.
4. Remove the alternator from the bracket.
5. Assemble the alternator into the clutch housing using the hardware provided. The clutch housing is designed to accommodate either a standard or heavy-duty alternator.
6. Move the 2 brackets to the appropriate set of holes depending on which alternator you are using. The bottom 4 holes are for the standard alternator and the top 4 holes are for the hi amp alternator. The alternator will need to be rotated so that the stud is on the bottom (see Figure 14).
7. Use Loctite 242 on the 4 screws that secure the brackets to the clutch housing.
8. Torque alternator bolts to 30 ft lbs.
9. Attach the new battery cable extension lead provided in this kit to the back of the alternator (see Figure 15). The end with the red boot will attach to the alternator stud (see Figure 14).
10. Before you install the clutch and alternator assembly, secure the engine wiring harness that is located directly behind the stock alternator location so that the harness will clear the drive shaft.
11. Remove the plastic clamp used to secure harness to the intake. This allows the drive shaft knuckle clearance.
12. Cable tie the harness to allow the shaft knuckle to clear the harness.

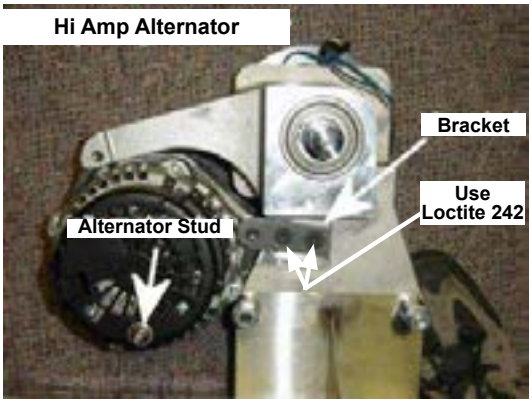


Figure 14. Assembled Clutch Assembly before Installation

Figure 15. Attach New Battery Cable

CAUTION

Failure to do this may cause serious damage to the equipment.

CAUTION

Do not attach the harness to the fuel rail. Doing so could cause the fuel injectors to leak.

13. Secure the breather, located at the rear of the driver's side valve cover, to the metal tubes just below it with the provided tie wraps.

MODIFYING CLUTCH HOUSING MOUNT CRADLE BRACKET

1. You will need to grind off the corner of the stock bracket in order for the assembly to fit.
   a. Large case alternator will need to have a small portion or the bracket additionally ground down for clearance. Alternator and factory alternator bracket should NOT touch after installing HydraMaster clutch housing into alternator bracket.

⚠WARNING

Wear Personal Protective Equipment (PPE) such as safety glasses and earplugs before performing the next step. Failure to do so could result in personal injury.

   b. See the following figures to gauge the grinding of alternator bracket.
      1. Remove the top right corner of the bracket as shown in Figure 16.
      2. Mark the corner 1-1/8" in length and 3/8" deep as shown in Figure 17.
   c. Use a die grinder with a cut off wheel. Cut 3/8" into the bracket after marked on both ends of measured area. Hog out remaining material as shown in Figure 18.
   d. Use a 0.025" feeler gauge to verify the alternator/bracket clearance.

Figure 16. Remove Top Right Corner of Bracket

Figure 17. Mark Corner

INSTALL CLUTCH ASSEMBLY

1. Install the clutch and alternator bracket as one unit onto the cradle mount that was modified in the previous steps.
2. Use the supplied 10mm x 90mm Allen head screw on the right side and use the supplied modified bolt on the left side. The modified bolt has the head shaved down to allow clearance for the new drive belt. Figure 18. Tighten the bolts evenly and torque to 30 ft lbs.

Figure 18. Use Die Grinder to Cut into Bracket

INSTALLATION OF THE DRIVE BELT

1. Install the supplied drive belt using the routing diagram in Figure 20.

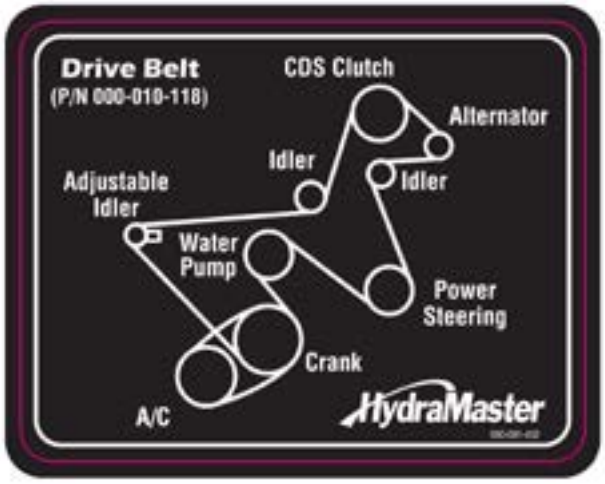


Figure 20. Routing Diagram for Drive Belt

INSTALLING FINISH KIT

To extend the alternator main battery charge cable, a 150 Amp terminal post, self-tapping screws and a 4 gauge battery extension cable is provided in the Finish Kit.

1. Mount the terminal block to the firewall. This eliminates the need to cut off the original ring connector or splice the wire (see Figure 21 for mounting).

NOTICE

Proper routing of this cable is critical.

2. The extended wire plug for the back of the alternator needs to be plugged in and the exposed wires covered with the provided ¼" split loom.

NOTICE

Verify that the pink butt connectors are properly secured to the wires.

3. Use the provided 1-½ cushion clamp and self-tapping screw to hold the main wire harness away from the CDS clutch (see Figure 22).

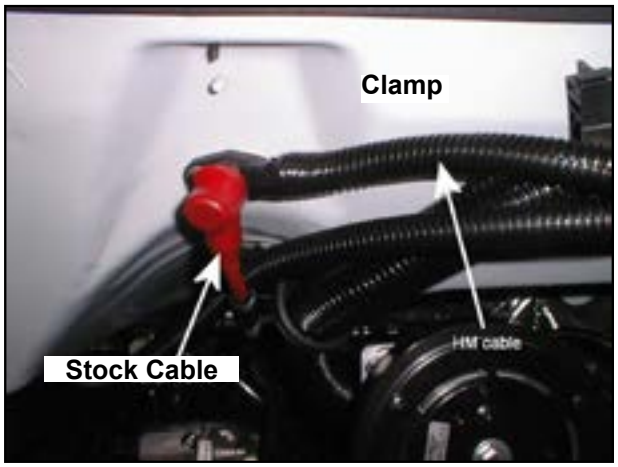


Figure 21. Mount Terminal Block to Firewall

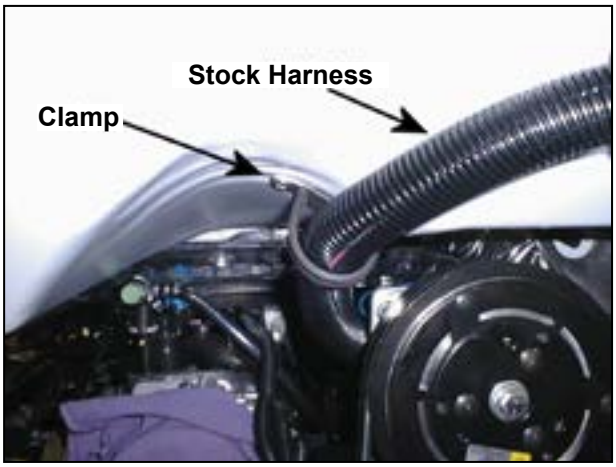


Figure 22. Hold Main Wire Harness Away from CDS Clutch

DRAINING ENGINE COOLANT

1. Drain the radiator coolant as follows:
   a. One method for recapturing the antifreeze is to insert a hose barb into the water pump hose to drain the coolant. This can be done by cutting a small 'x' in the ¾" water pump hose approximately 2.5" from the water pump housing. It is located on the passenger side of the water pump and thermostat housing (see Figure 23).
   b. Insert a barbed fitting with a hose attached so the coolant can now be drained into a proper container.
   c. Once the coolant has drained, the hose can be cut in half. The ¾" plastic tee can be installed as described later in these instructions.
   d. The other option is to cut the hose in half (at 2.5") and let the antifreeze drain. **HydraMaster does not recommend this especially on A/C equipped vans. Coolant will drain straight on top of the air compressor clutch and wiring, and then on to the cross member and the floor, making the coolant unusable.**

Figure 23. Cut Small 'x' in Water Pump Hose

⚠WARNING

WHEN DISPOSING OF USED ANTIFREEZE COOLANT: Follow local laws and regulation. If required, dispose at facilities licensed to accept household hazardous waste. If permitted, dispose in sanitary sewer systems. Do not discard into storm sewers, septic systems, or onto the ground.

⚠WARNING

ANTIFREEZE IS HARMFUL OR FATAL IF SWALLOWED. Do not drink antifreeze coolant or solution. If swallowed, induce vomiting immediately. Call a physician or local poison control hotline Contains Ethylene Glycol, which caused birth defects in animal studies. Do not store in open or unlabeled containers. KEEP OUT OF REACH OF CHILDREN AND ANIMALS.

INSTALL THE COOLANT HOSES AS FOLLOWS:

1. Locate the 1-3/8" upper radiator hose and cut in half just before the end of the fan shroud. Install the provided aluminum tee and clamps facing the passenger side.
2. Install the provided ¾" tee into the ¾" lower hose coming off the water pump (the same hose from which the coolant was drained).
3. Cut the hose in half and install the tee. The tee needs to be pointing up and slightly towards the front of the van (see Figure 24).
4. Leave the provided ¾" green stripe hose in its full length.
5. Feed the two ends, from the passenger compartment, over the passenger valve cover to the front of the van and attach to the tees.
6. Carefully route the hoses away from any moving parts, sharp edges or hot parts.
7. Secure the hoses with provided clamps (see Figure 25).

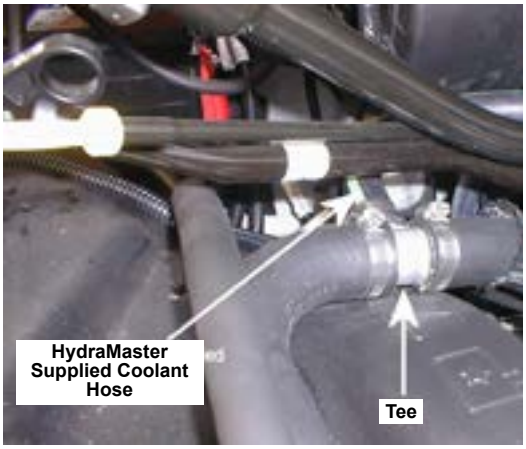
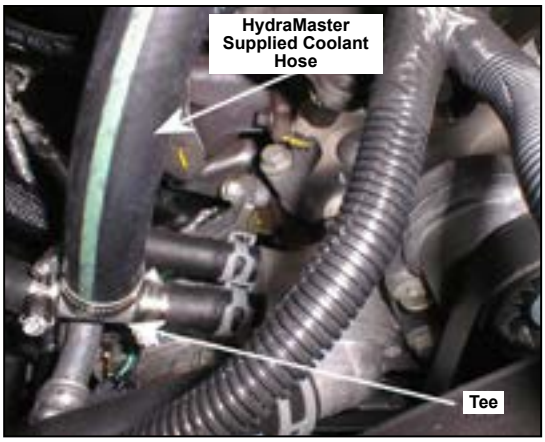


Figure 24. Cut Hose in Half and Install Tee

CAUTION

Improper installation of the coolant hoses may result in engine damage.



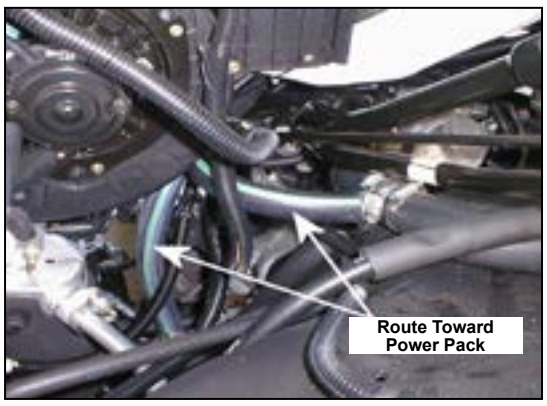


Figure 25. Secure Hoses with Provided Clamps

INSTALLING 3 SPEED THROTTLE CONTROL KIT

Parts in the 3 Speed Throttle Control kit include (See Kit Instructions) PN# 078-430

CAUTION

Electronic Throttle controllers need a keyed 12V ignition source and vehicle ground to work correctly. Do not apply constant battery voltage. Doing so may cause equipment damage.

⚠WARNING

Make sure the battery ground cable is disconnected prior to performing any work on vehicle electrical components. If it is not disconnected, personal injury or death could result from electrical shock.

INSTALLATION OF THE DRIVE SHAFT:

1. Install the safety ring (fly strap) to the back of the driver side head (see Figure 26). Use the original bolt in back of head and the provided 10mm bolt for mounting. Leave the top of the safety ring off until the drive shaft has been installed.
2. Install the drive shaft onto the back of the clutch. The spline end of the drive shaft will face the Blower Power Pack. Slide the yoke of the drive shaft onto the clutch shaft. The end of the clutch shaft needs to be flush with the inside of the yoke. Torque bolts to 35 ft lbs.
3. Temporarily rest the drive shaft on the safety ring until the Blower Power Pack is installed.
4. Install the top of the safety ring and secure using supplied bolts and nut.

Figure 26. Install Safety Ring

NOTICE

With the drive shaft attached to the clutch and resting in the center of the safety ring, check all clearances of the wire harness, breather tubes, throttle cable or anything that may rub on the drive shaft. Secure as necessary.

COMPLETION OF FRONT END

1. Re-installation of the air cleaner housing assembly
2. Re-install radiator overflow container.

AIR INTAKE RESONATOR MODIFICATION

1. Remove the clamp attaching the resonator (silencer) to the air intake unit (see Figure 27).
2. Dismount the resonator from the air intake unit by pulling the resonator up. The resonator is attached to the air intake unit with 2 rubber grommets (see Figure 28).
3. Do not damage the grommets; they will be used in a later step.
4. Slide the resonator off the hose that connects it to the air intake unit (see Figure 29). Carefully remove the unit from under the hood. Remove the rubber grommets from the mounting location on the resonator.

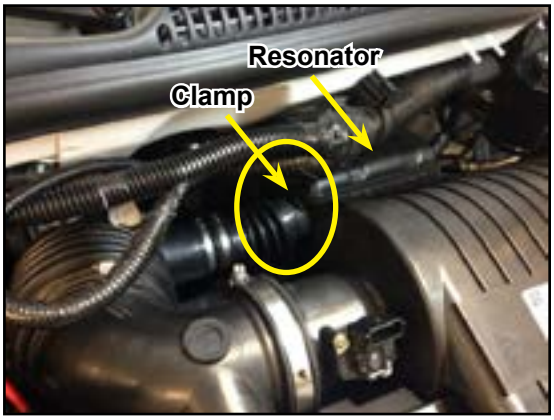


Figure 27. Remove Clamp from Air Intake Unit

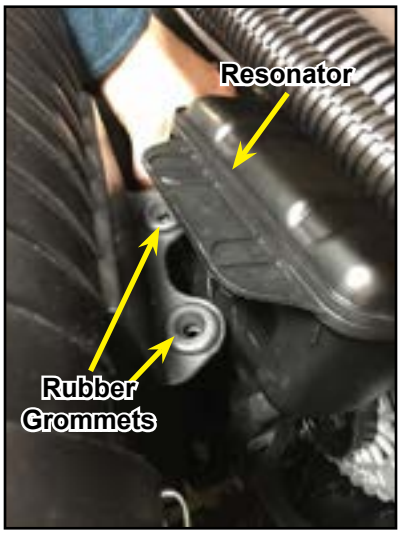


Figure 28. Pull the Silencer UP Vertically to Dismount

Figure 29. Slide Resonator Off Hose; Remove Resonator from under Hood

RE-INSTALLING RESONATOR

NOTICE

The following steps should take place after the clutch has been installed.

1. Mount the bracket onto the air cleaner housing, using 2 flat head bolts, 2 washers and 2 nuts, all provided in the kit. Refer to Figure 30 as a guide to the following component order (stackup is from the bottom, up):
   a. Flat head bolt
   b. Bracket
   c. Air intake unit mount
   d. Washer
   e. Nut

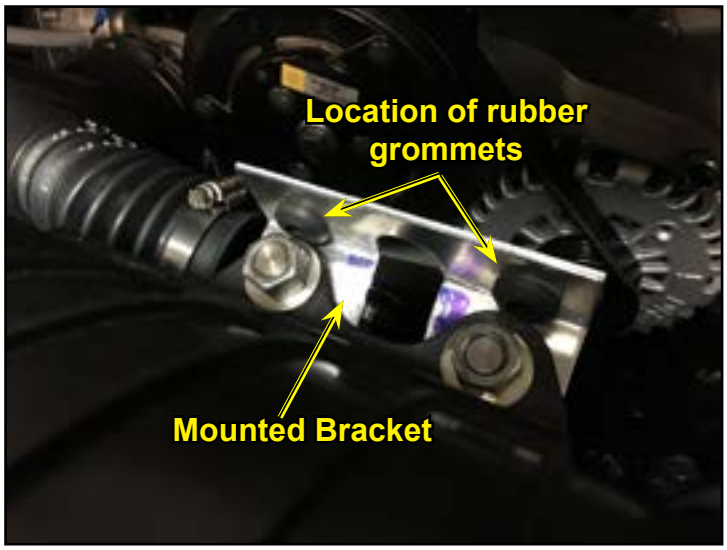


Figure 30. Mount Bracket Using Flat Head Bolts, Washer and Nuts

2. Place the grommets, which were removed in the procedure on page 18, in the holes adjacent to the nuts (see Figure 30).
3. Attach the resonator to the hose using the provided clamp.

4. Mount the resonator to the air intake unit via the rubber grommets.
5. Route the large tie wrap between the air intake unit and MAF sensor as seen in Figure 31.

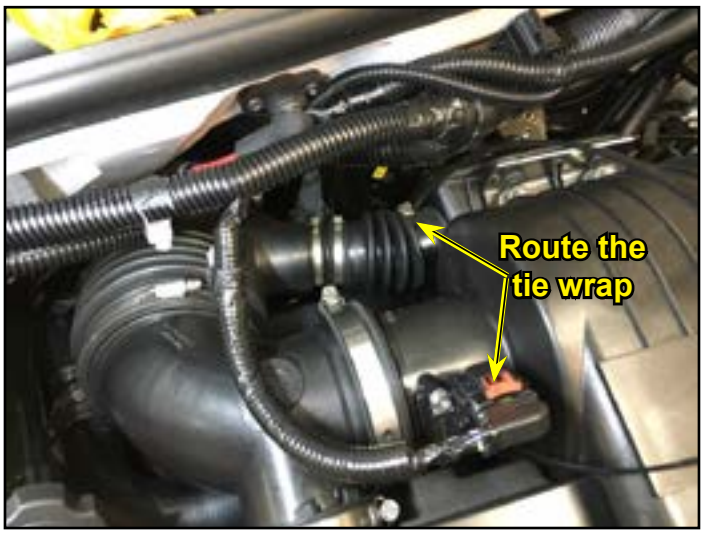


Figure 31. Route Tie Wrap Around Hose and Inlet

6. Tighten the tie wrap to minimize the resonator's movement.

Figure 32 and 33 shows photos of the finished installation. Note that there should be plenty of space between the resonator and the clutch.

Figure 32. Fully assembl

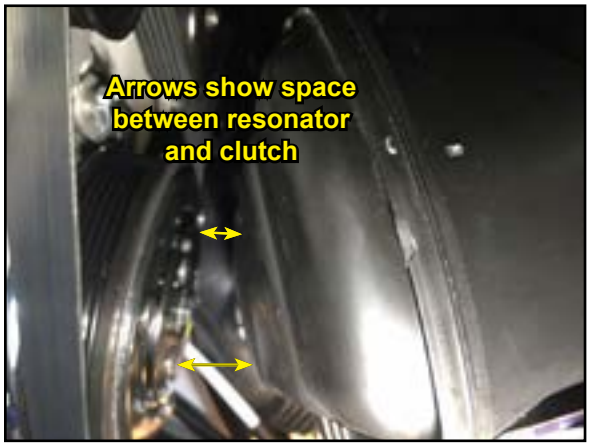


Figure 33. Note Space between Resonator and Clutch

INSTALLING POWER PACK ASSEMBLY

⚠WARNING

Use extreme caution when loading the Power Pack Assembly into the van. Always seek the assistance of a second person. If you attempt to load the Assembly by yourself, personal injury could result.

The Power Pack Assembly includes the Frame Assembly, the Blower Assembly and the Pump Assembly (see Figure 33).

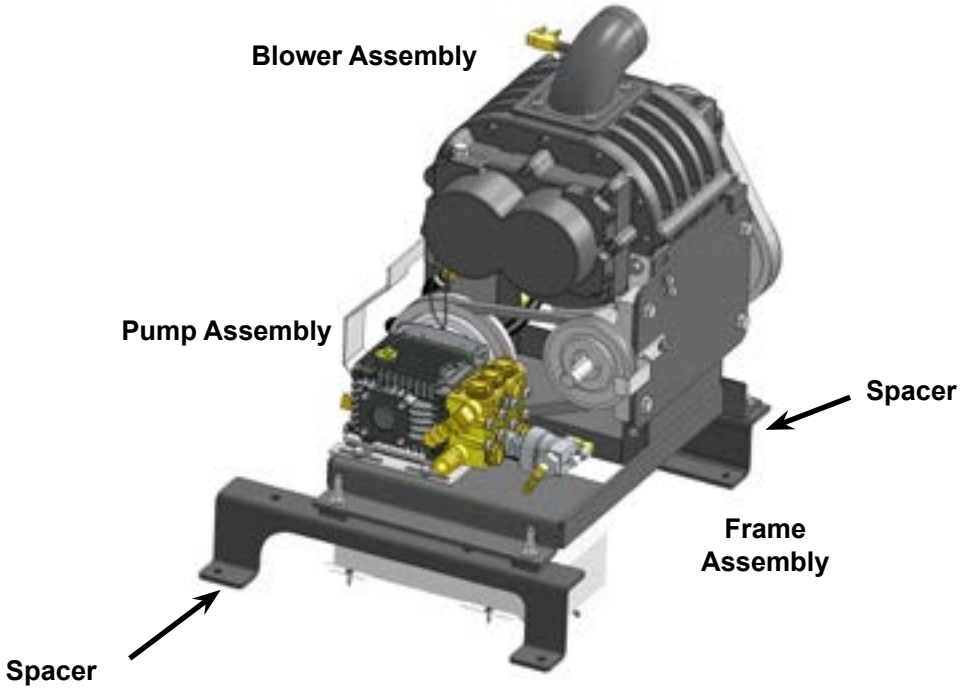


Figure 34. Power Pack

NOTICE

Prior to installing any assembly or drilling holes, dry fit the vehicle seats and assemblies to ensure a proper fit.

1. Use the blower spacers (PN: 000-174-204) to raise the front of the blower to be within 3% offset of the clutch's shaft. 2 on the left side, 2 on the right side. The rear spacer does not require any of the power pack spacers.

2. Place the driver side template (Marked with a **D**, PN: 000-105-791) on the driver seat studs on the floor of the van. Drill a hole for the left mounting hole on the front spacer.

Figure 35. Driver Side Template, Marked with a "D" on the Corner

3. Place the passenger side template (Marked with a **P**, PN: 000-105-792) on the passenger seat studs on the floor of the van. Drill a hole for the right mounting hole on the front spacer.

Figure 36. Passenger Side Template Marked with a "P" on the Corner

4. Use the blower templates to drill 3/8" diameter holes for the front blower spacer mounting feet PN: 000-105-791 & 000-105-792.

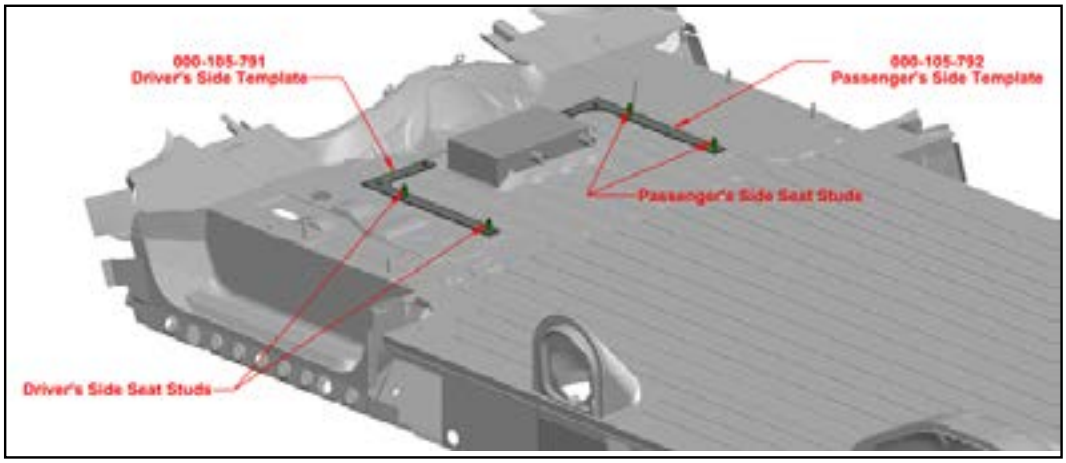


Figure 37. Power Pack Templates

MOUNTING POWER PACK TO THE VAN AND FRONT END ASSEMBLY

1. The frame spacers for the Power Pack get bolted down to the van floor and the Power Pack is bolted to the frame spacers. If there is a need to remove the Power Pack in the future, just unbolt it from the frame spacers.
2. Position the Power Pack with frame spacers (with the pump towards front of van) between the driver and passenger seat locations (see Figure 38).

Figure 38. Dry Fit Vehicle Seats and Power Pack

NOTICE

The drive shaft spline must be completely compressed before positioning the Power Pack. To do so, take the yoke at the end of the drive shaft and push towards the clutch.

3. Slide Power Pack up to the drive shaft. Hold the drive shaft in line with jack shaft.

4. Properly position the Power Pack as follows:
   a. Front to Back: Leave ¼" between the jack shaft and the drive shaft yoke. This will allow for future removal of the drive shaft. Slide yoke onto jack shaft but do not tighten bolt yet. (see Figure 38).

Figure 39. Slide Yoke into Drive Shaft

   b. Side-to-Side: Position as far as possible to the passenger side so the drive shaft does not contact the engines wire harness, throttle cable, breather tube or safety ring. Leave ¼" to ½" between any part of the engine and the drive shaft.
5. With the Power Pack set, place the driver seat in and check clearance. The backrest adjustment may be touching the Power Pack but it should not compress the handle. There should be enough room to slide the cowling between the seat and Power Pack.
6. Adjust the Power Pack as necessary.

NOTICE

Verify that the drive shaft yoke will slide off the jack shaft. Slide the yoke back onto the jack shaft and torque the bolt to 35 ft lbs. The exposed spline of the drive shaft should be no longer than 5".

7. Dry fit tank, seats and Salsa to make sure doors close and tank lids open all the way. Blower placement is the key to a good fit and finish.
8. With the Power Pack in place, drill 3/8" holes through the floor using the Blower frame spacer as a template.
9. Bolt the Power Pack down with the provided hardware.

NOTICE

The Power Pack frame spacers are designed to allow routing of the two 1" hoses under the Power Pack, and routing up to the Recovery Tank and behind the front panel of the CDS.

INSTALLING NON SALSA (HUSH SILENCER) ASSEMBLY

NOTICE

If you purchased a Salsa Assembly, skip this section and refer to the next section on page 26.

NOTICE

Dry fit the Hush Silencer Assembly behind the driver's seat location. Mark the location on the van's floor where the 3" adapter (P/N 000-001-026) will be inserted through the van floor (see Figure 41).

1. Pilot drill a hole. With a circular saw, cut a 3 1/2" diameter hole into the van floor at the marked location, behind the driver's seat position.

CAUTION

Many vans have critical components mounted directly below the van floor. Be careful when cutting through the van floor to avoid damaging components and causing potential equipment failure.

2. Connect one end of the 3" diameter fitting (P/N 000-052-334) to the outlet of the muffler (see Figure 41).
3. Connect the other end of the muffler to the 90 degree elbow fitting (P/N 000-052-322); connect the other end of the elbow fitting to the 7" long hose (P/N 000-068-617) and secure with a hose clamp.
4. Connect the other end of the 7" long hose to the Blower's outlet adapter.
5. From under the van's floor, slip fit the exhaust adapter (P/N 000-001-026) into the other end of the 3" diameter fitting, through the van floor.
6. Secure the fitting to the adapter with a muffler clamp (see Figure 41).
7. Connect the 30" hose assembly (P/N 000-068-187) to the other end of the adapter.
8. Connect the silencer to the hose assembly and secure with a hose clamp.

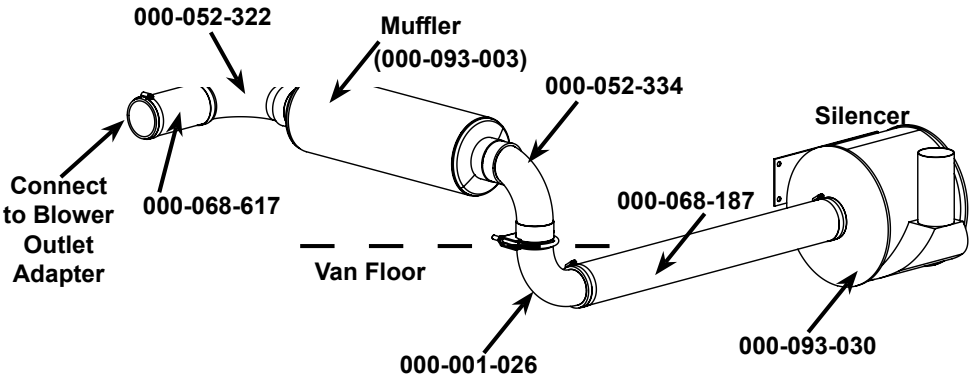


Figure 41. Install Non Salsa Assembly and Silencer

INSTALLING OPTIONAL SALSA ASSEMBLY

NOTICE

Dry fit the Salsa Heat Exchanger behind the driver's seat location. Mark the location on the van's floor where the 3" diameter rubber hose (P/N 000-052-674) will be inserted (see Figure 42).

1. Pilot drill a hole. With a circular saw, cut a 3 1/2" diameter hole into the van floor at the marked location, behind the driver's seat position.

CAUTION

Many vans have critical components mounted directly below the van floor. Be careful when cutting through the van floor to avoid damaging components and causing potential equipment failure.

2. Connect the 3" diameter rubber hose (P/N 000-052-674) on the outlet weldment of the Salsa, and route it through the hole in the van floor. Secure the hose to the Salsa outlet with a hose clamp (see Figure 42).
3. From under the van's floor, slip fit the 3" aluminum elbow (P/N 000-052-649) into the rubber hose protruding through the floor. Secure the elbow to the hose with a hose clamp (see Figure 42).
4. Connect the other 3" diameter rubber hose (P/N 000-052-674) to the Salsa inlet; route and connect the hose to the Blower outlet adapter, and secure with hose clamps on both ends.

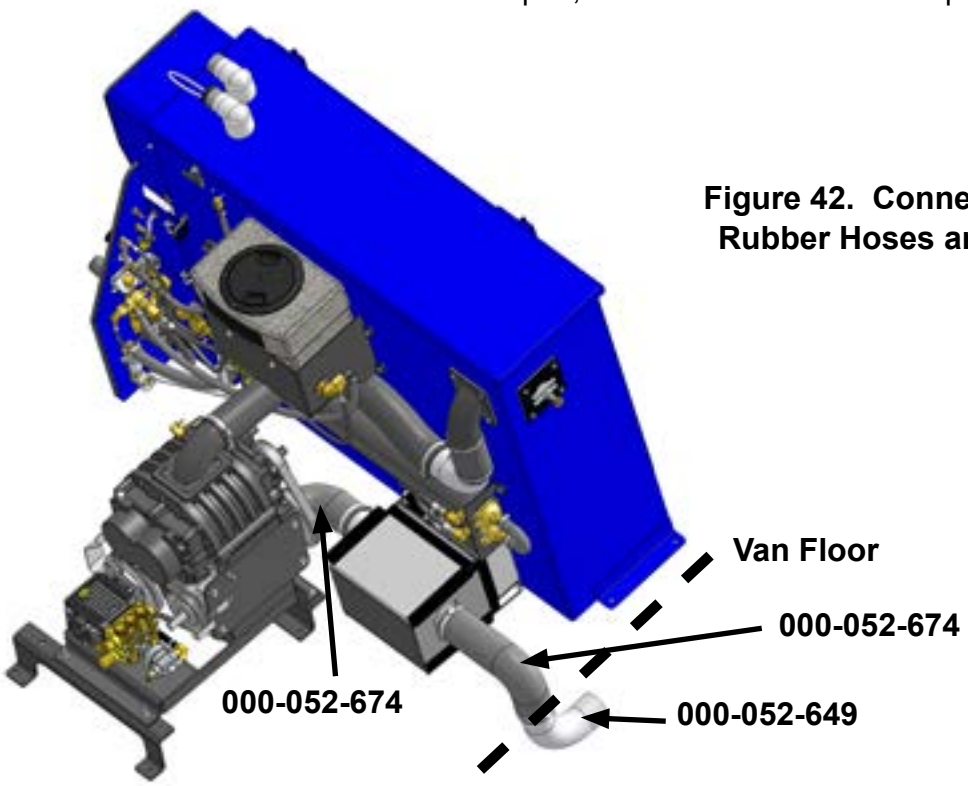


Figure 42. Connect Salsa's Rubber Hoses and Elbow

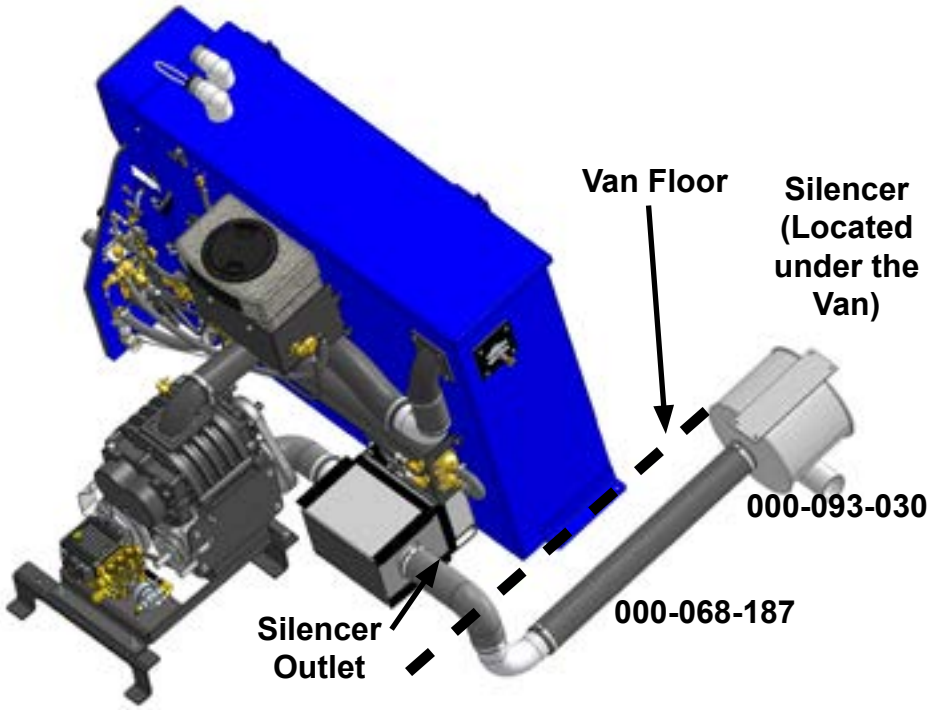


Figure 43. Attach Long End of Elbow to Hose Assembly

5. Install the 30" hose assembly (P/N 000-068-187) onto the elbow and then install the silencer (P/N 000-093-030) under the van (see Figure 43). Secure with hose clamps. Depending on the van model, the silencer may span the "rib" of the floor or bolt directly to the van floor.
6. Connect two 3/8" Teflon® hoses with JIC ends to the brass elbows on the Salsa (see Figure 44).
7. Route and connect the innermost 3/8" Teflon hose to the bottom elbow of the dual heat exchanger.
8. The other 3/8" hose connected to the outermost brass elbow on the Salsa will be connected to the pressure regulator on the rear of the instrument panel (see Figure 44).

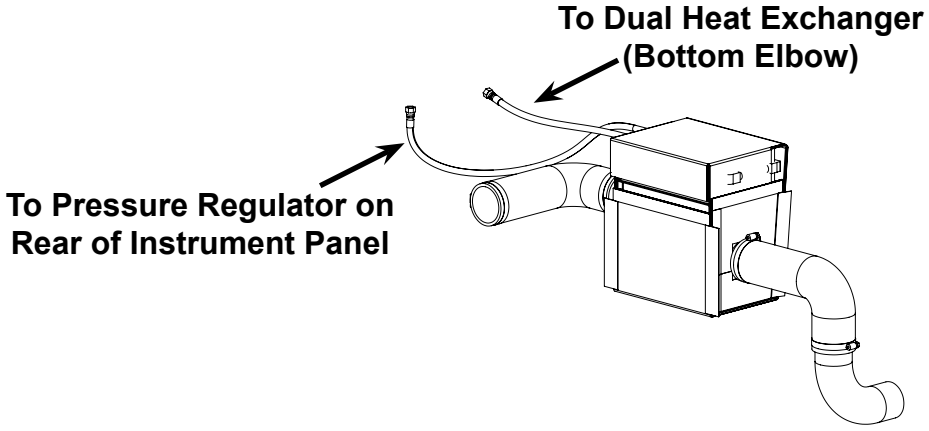


Figure 44. Connect 3/8" Teflon Hoses to Salsa Elbows and Route

INSTALLING PASS THROUGH ASSEMBLY

Dry fit the Pass Through Assembly (from P/N 000-078-381) on the van's step to help locate the Pass Through hole.

1. Remove the van's step liner to prepare for the cutting process.
2. Position the Pass Through Assembly on the step to help locate the hole. The recommended location for the Pass Through is just to the left side of the CDS unit. Make sure to leave enough room so that the backside of the step does not interfere with the Pass Through.
3. Trace an outline around the Pass Through (see Figure 45).
4. Locate the center of the cutout and drill a 1/4" pilot hole through the multiple layers of material. This hole will help guide the hole saw.
5. Using the 4-½" hole saw, cut through the multiple layers of the step. The number of layers of material will vary depending on the make and model of the van.
6. Re-install the step liner.
7. Using the 4-½" hole saw, drill through the step liner from underneath the van.
8. Apply silicone sealant around the Pass Through and place the Pass Through in the hole.
9. Align the Pass Through in the hole and secure it using the 6 supplied self-tapping screws (see Figure 46).
10. Thread on the cover.

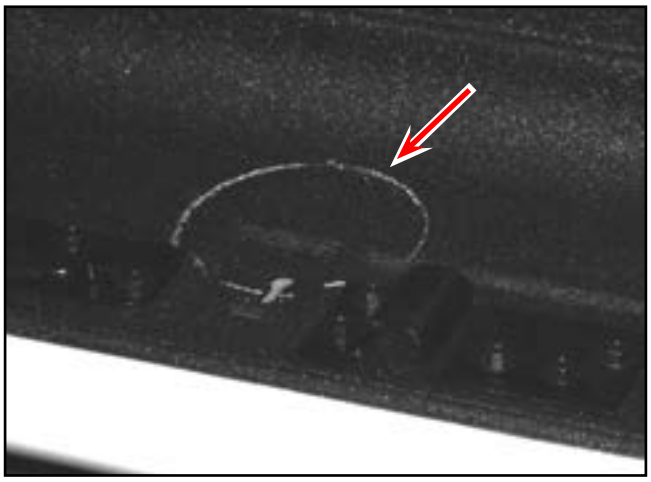


Figure 45. Trace an Outline Around Pass Through

Figure 46. Secure with 6 Self-Tapping Screws

INSTALLING RECOVERY TANK ASSEMBLY

⚠WARNING

Use extreme caution when loading the Recovery Tank into the van. Always seek the assistance of a second person. If you attempt to load the Recovery Tank by yourself, personal injury could result.

1. Remove the Recovery Tank from the pallet and load it into the van. The Recovery Tank placement will be determined by dry fitting. The flex hose allows you to attach the Tank to the Blower without clearance issues.

NOTICE

After dry fitting the Recovery Tank, make sure that the Recovery Tank lid can be fully opened and does not interfere with the van ceiling.

2. Mark the positions of the 4 Recovery Tank bracket holes (see Figure 47).
3. Drill the 4 holes through the van floor.
4. Use the 5 bolts from the kit to secure the Recovery Tank to the floor - 4 on the rear of the Recovery Tank (see Figure 47) and 1 towards the front of the tank (see Figure 48).

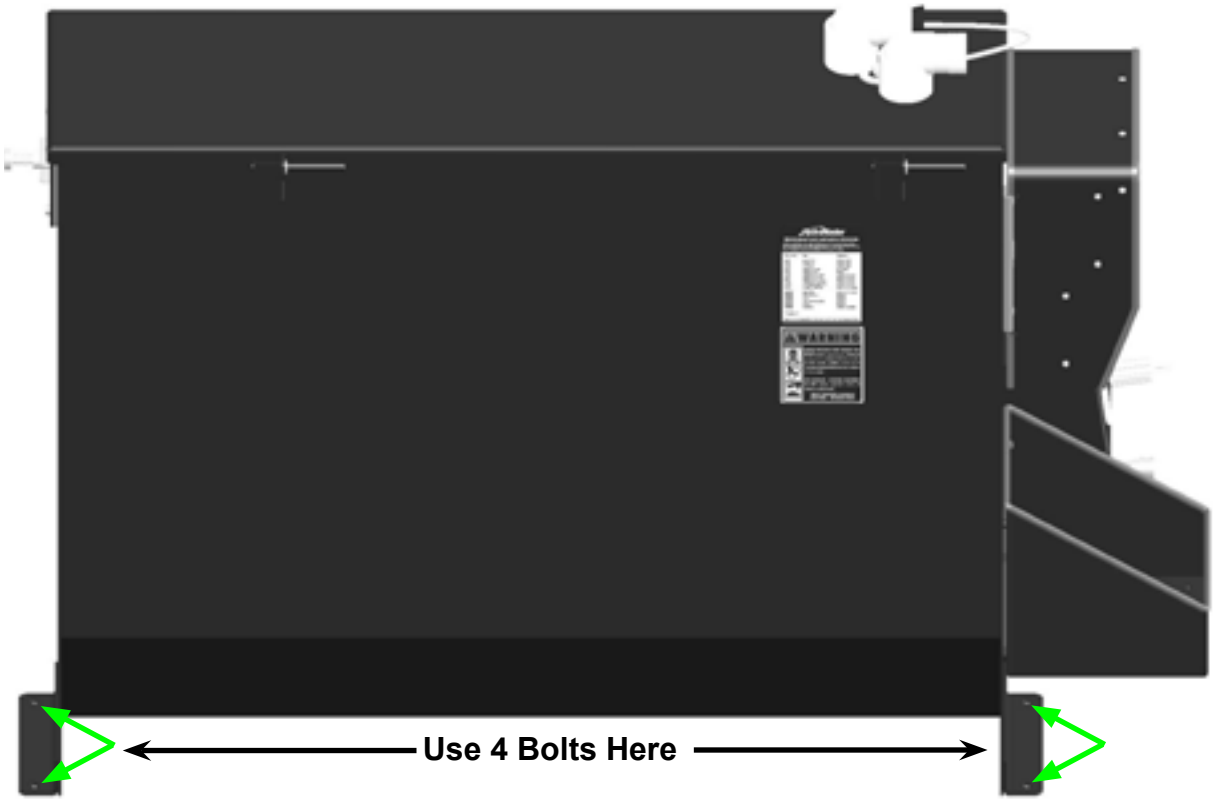


Figure 47. Mark Hole Locations for Recovery Tank - Rear of Tank

5. Connect these hoses and elbow as shown in Figure 49
   1. P/N 000-052-034 Elbow (from Yaw Sensor Cooling Kit)
   2. P/N 000-068-200 Hose
   3. P/N 000-068-884 Hose
6. Route and connect the 1” diameter hose (P/N 000-068-829 - see page 7) from the Yaw Sensor Cover to the Blower elbow (see Figure 8 and Figure 49).
7. Route the longer 1” diameter hose (P/N 000-068-828) from the Yaw Sensor Cover toward the CDS instrument panel (see Figure 8).
8. Secure the hoses away from all rotating pulleys and off the Blower using the nylon tie wraps and clamps as necessary.

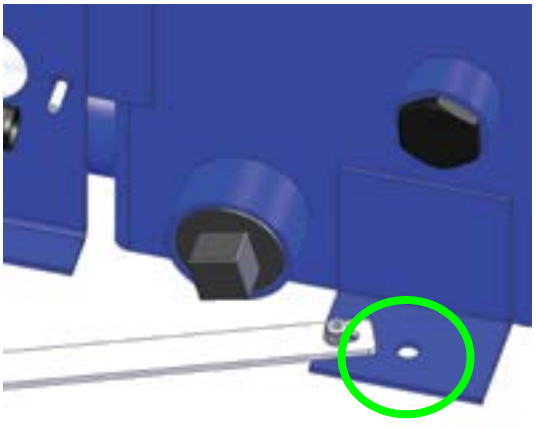


Figure 48. Mark Hole Location for Recovery Tank - Front of Tank

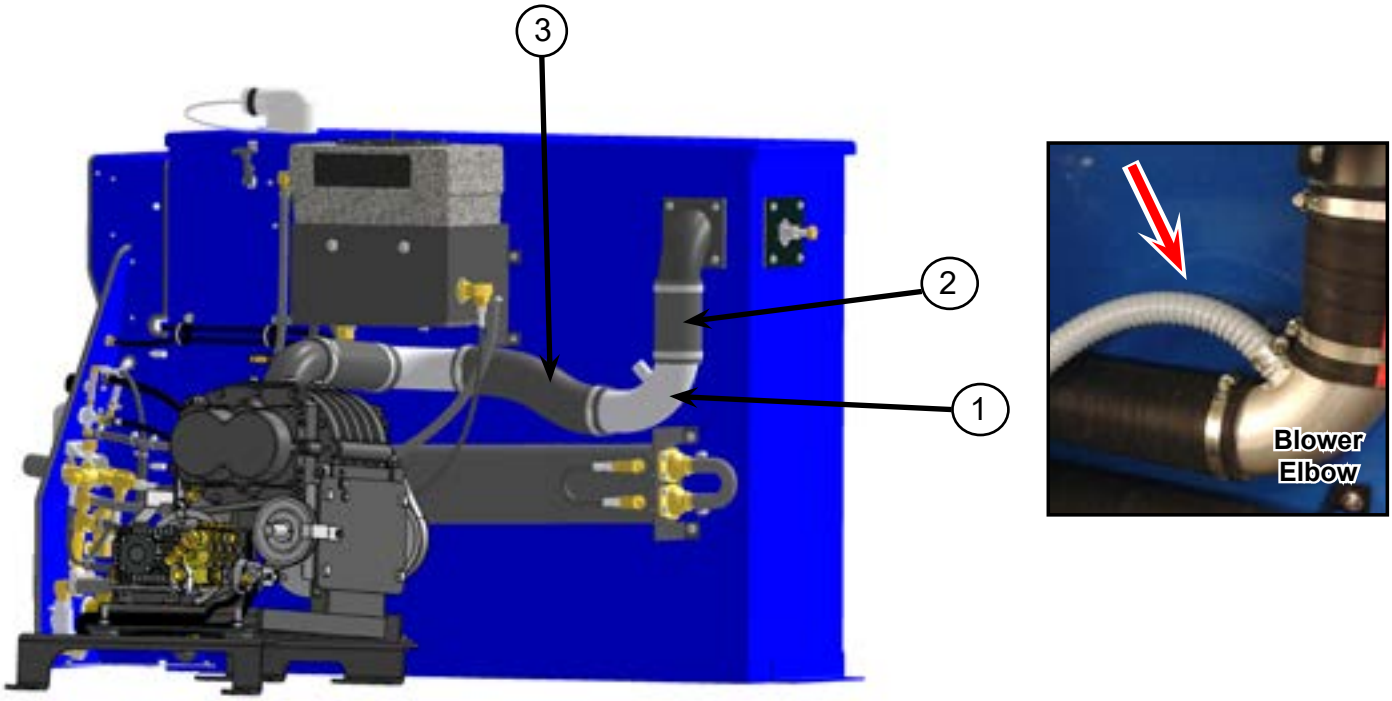


Figure 49. Connect Hoses and Elbow onto Recovery Tank; Attach Smaller Hoses onto Blower Elbow and CDS Instrument Panel

9. Route the coolant hoses from the back of the engine along the passenger side of the Power Pack to the dual heat exchangers mounted on the Recovery Tank.

NOTICE

Proper routing of the coolant is critical for optimum performance.

The inlet hose that comes from the upper radiator hose tee must be connected to the lower barb on the Hi-PSI Manifold (see Figure 50). The outlet hose routes from the upper insert on the Dual Heat Exchanger to the lower tee on the CDS's water pump.

10. Secure hoses using the provided clamps.
11. Route the 1" hose and the high pressure hose from the Blower down and next to the Blower and to the Recovery Tank. Tie Wrap every 8".

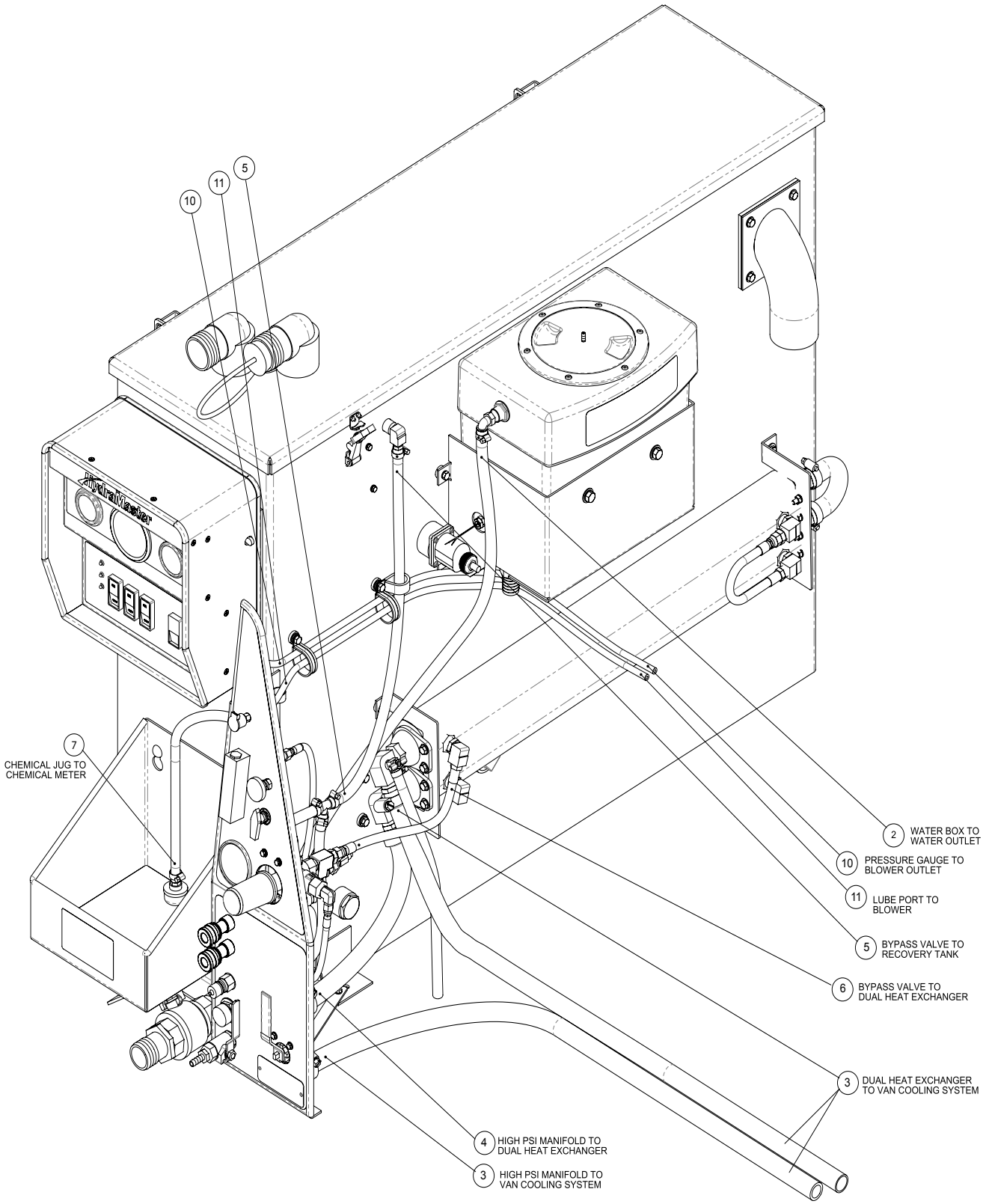


Figure 50. Recovery Tank Hose Routings

Recovery Tank Hose List

Item	Part Number	Description	Qty
1	000-068-991	Hose, 1/2” I.D. Rubber X 42” Lg.	1
2	000-068-734	Hose, 1/2” X 42.5 Lg w/ 3/8” NPT and 3/8” SAE F Ends	1
3	000-068-385	Hose, 3/4” I.D. X 18 ft - Green Stripe - Cut to Fit	1
4	000-068-940	Hose, 3/8” I.D. Rubber X 17” Lg.	1
5	000-068-1039	Hose, 3/8” I.D. Rubber X 31” Lg.	1
6	000-068-196	Hose, 3/8” I.D. X 11” Lg w/ 3/8” MPT and 3/8” JIC End	1
7	000-068-1037	Hose, 3/8” I.D. X 39” Lg., Clr w/Braid	1
8	000-068-092	Hose, 3/8” X 15” Teflon w/ 3/8” JIC End	1
9	000-068-203	Hose, 3/16” X 34” Teflon 1/4” F JIC X 1/4” F JIC	1
10	000-068-977	Hose, 5/32” I.D. Vacuum X 52” Lg.	1
11	000-068-978	Hose, 5/32” I.D. Vacuum X 82” Lg.	1

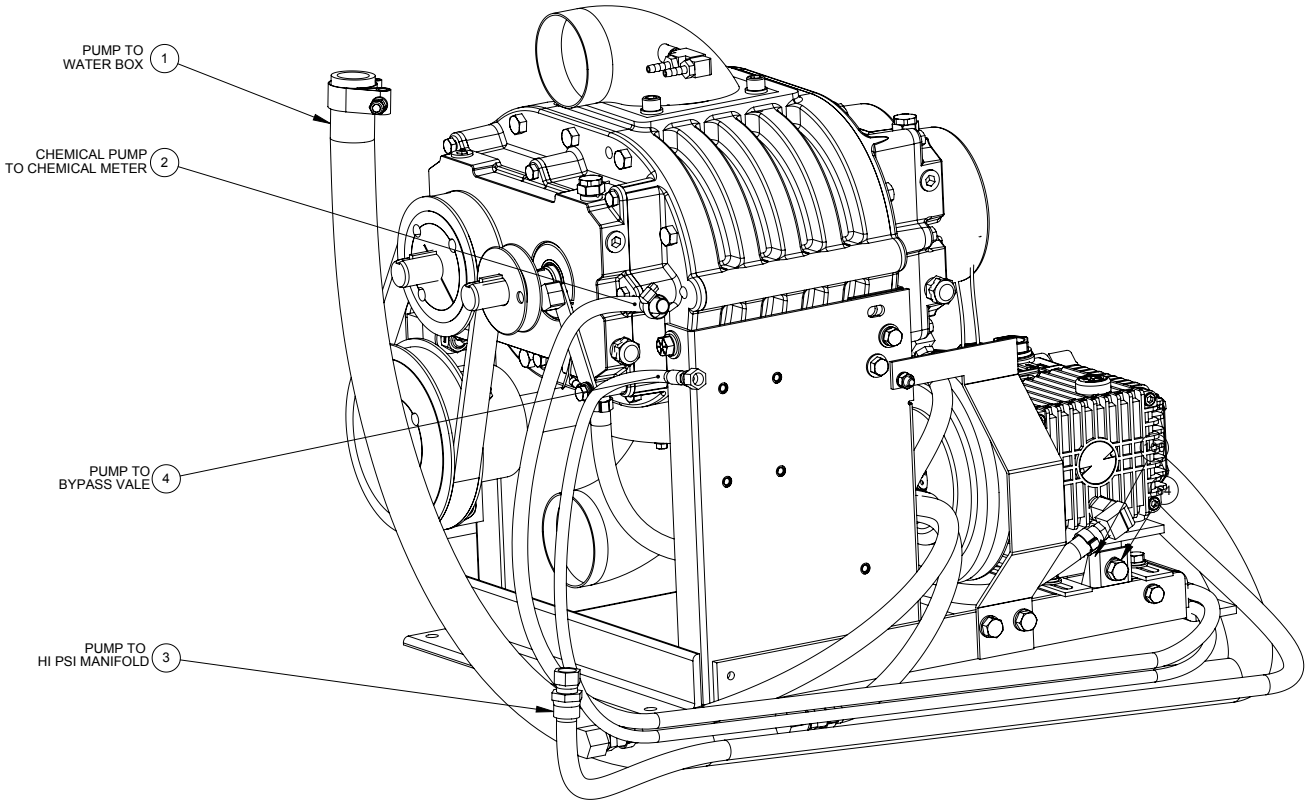


Figure 51. Power Pack Hose Routings

Power Pack Hose List

Item	Part Number	Description	Qty
1	000-068-777	Hose, 1” X 65” Lg. Suction	1
2	000-068-1038	Hose, 3/8” I.D. High Temp X 72” Lg.	1
3	000-068-588	Hose, 3/8” X 52” Lg. Throb	1
4	000-068-706	Hose, 3/16” X 70” Lg. Teflon w/ Fem JIC Ends	1

INSTALLING THE WIRE HARNESS

Harness wire colors and functions are:

Red	–	Main power (10 gauge)
White	–	Main ground (10 gauge)
Red	–	for AWDS if selected (16 gauge)
Green	–	Tachometer pick up on Blower
Black	–	Clutch, CDS
Blue	–	Pump clutch 4.8

1. Route the nonplugged end of the throttle cable from the CDS unit under the Power Pack and toward the steering column (see Figure 52).
2. Route the 3 Speed Throttle Cable under the driver's side floor mat to the controller (refer to Figure 52). Tie wrap or tape to the transmission shift cable, routing it up, under the dash.
3. Locate the 4 pole throttle control plug in the CDS wiring harness and connect the Throttle Control Harness to the plug. Refer to Figure 53.

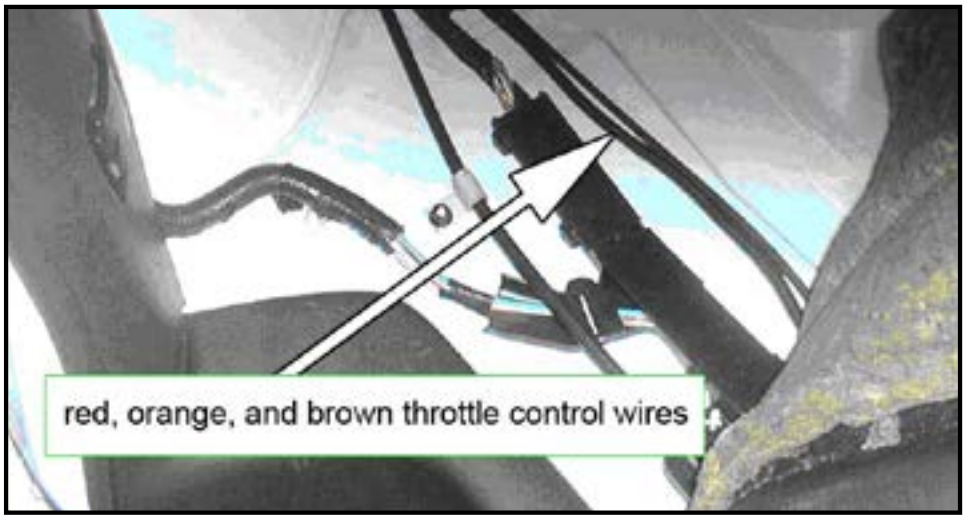


Figure 52. Route Throttle Cable to Controller

4. Plug the main harness into the Recovery Tank (behind the side dash panel).
5. Route main harness towards the passenger side of the Power Pack.
6. At the first "Y" in the harness, route the red wire along the Blower frame spacer to underneath the driver seat.

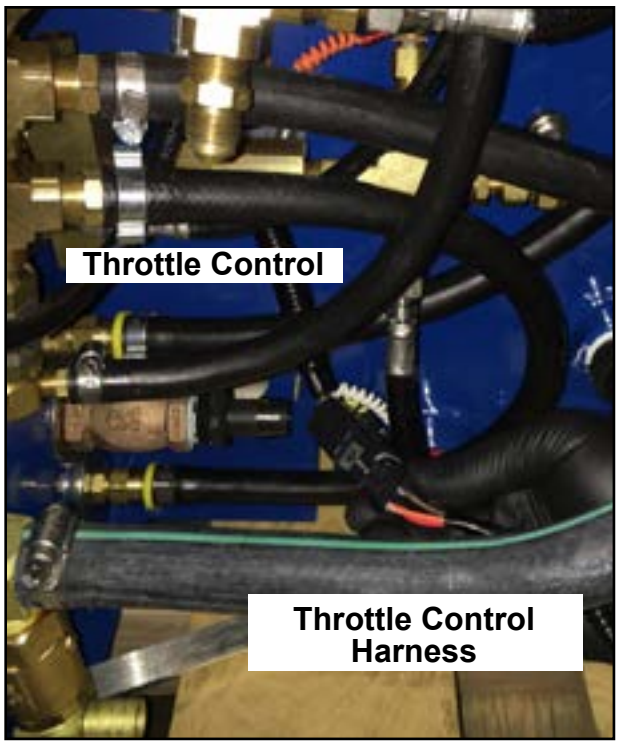


Figure 53. Connect Throttle Control Harness to 4 Pole Plug

NOTICE

The red wire connects to the provided inline fuse. The fuse connects to the power source under the seat. The fuse holder mounts to the top of the fuse box.

NOTICE

When re-installing the driver's seat, take care not to crush or pinch the wires.

7. Route the rest of the harness along the side of the Power Pack.
   a. The green wire attaches to the tachometer magnetic pickup (white wire, back side of Blower). The tachometer uses a single magnet on pulley.
   b. The white wires exiting the harness connect to the side of the Power Pack and provide a ground.
   c. The blue wire connects to the pump clutch.
8. Continue routing the harness up over the passenger side of the engine, along with the coolant hoses. The single white wire attaches to the back of the engine head. Use the stud that mounts the transmission fill tube.
9. Finally, route the rest of the harness up and over the air cleaner. The black wire attaches to the CDS clutch.

NOTICE

Make sure you keep the black wire away from the rotating clutch.

10. Cover all the exposed wires with the provided ¼" split loom for a clean, finished look.

FINISHING INSTALLATION

After the CDS 4.8 has been completely installed, confirm that:

1. **Van key switch is in OFF position.**
2. **CDS key switch is in OFF position.**
3. **All wires are secured to the Throttle Controller.**
4. **All hoses are connected and secured (see Table 1 for hose connection information.)**
5. **CDS is installed and ready for testing.**
6. **All chassis conditions are met.**
7. **Both vacuum ports on the Recovery Tank are open.**
8. **The AC/heater switch is in the OFF position.**

Modify Cowling

1. Secure the coolant hoses and wire harness into a clean bundle using provided tie wraps.

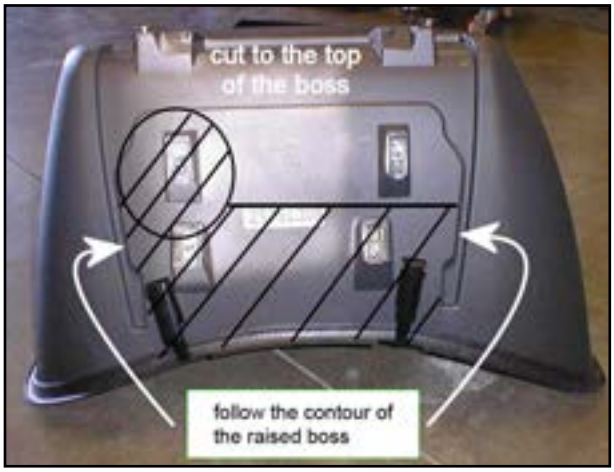


Figure 54. Cut to Top of Boss and Follow Contour

Figure 55. Fit Over Pump and Hoses

2. Cut the doghouse according to Figure 54 and Figure 55.

NOTICE

Only one large cut needs to be made in the doghouse. The piece that is cut out can be discarded. Clean the edges of the cut.

3. Re-install the doghouse into the van.

NOTICE

It will be a tight fit over the high pressure pump and hoses.

4. Install the doghouse seal as follows:
   a. Locate the Velcro strip on the back of the seal. Using rivets, install the strip to the metal lip of the van floor. This will help create a tight seal all the way around.
   b. Open the Velcro strips of the seal, and slide over the drive shaft and hose bundle. Position the seal as is shown in Figure 56. Close Velcro strips around shaft and hose bundle.
   c. With the seal square on the doghouse, drill 7/32" holes between the stitching around the perimeter of the seal and install the provided rivets.
5. Modify the driver's side dash cover, closest to the doghouse (see Figure 57).
6. Modify the passenger's side dash cover, closest to the doghouse as necessary.

Figure 56. Position Seal as Shown

7. Re-install the passenger dash cover.
8. Reconnect the positive battery cable.

Figure 57. Modify Driver's Side Dash Cover

NOTICE

Use Dex-cool Red GM antifreeze or equivalent.

9. Route petcock hose (mounted on heat exchanger) to a small drain pan and open to allow air to vent.
10. Fill the radiator with coolant. (GM recommends that you fill the antifreeze a small amount at a time):
    a. Fill the radiator until it is full and no bubbles appear, and then close the petcock.
    b. Start the vehicle and run for approximately 2 - 3 minutes. Monitor the engine temperature gauge the entire time.

NOTICE

The motor will heat up rapidly.

CAUTION

If the gauge starts to read more than 210 - 215 degrees F, turn the engine off. Failure do so may result in engine damage.

11. Allow the engine to sit until the antifreeze starts to bleed down.
12. Repeat this procedure until all the air is bled out of the petcock and the engine is operating at the normal temperatures.

NOTICE

Step 12 could take up to 2-3 hours to complete.

13. Close petcock and recheck that the engine is still operating at normal temperatures.

14. Place the cowling over the Power Pack.

NOTICE

It is best to do this before starting the CDS to avoid grease from flinging off the drive shaft.

15. Start the van and check for antifreeze leaks at the installed tees and heat exchangers.

NOTICE

NOTE: If the CDS has been installed with a Soft Start Controller completing step 16 and 17 is not necessary.

16. CDS clutch burnishing: Engage and disengage the clutch several times to ensure it is functioning properly. If full torque will be required immediately, the clutch should be properly burnished.
17. Energize the clutch three times a minute with no load for 50 cycles.
18. Install the warning label on the driver's side sun visor as shown in Figure 58.

Figure 58. Location of Warning Label on Sun Visor

SETUP AND CALIBRATION OF RPM

With the van's engine running and warmed up, turn the CDS key switch to the ON position.

NOTICE

The RPM on the CDS dash panel must not exceed 1,700 RPM. If it does, turn the key switch off immediately.

Adjustment of the RPM is done through the Throttle Controller using a 1/16" (1.6mm) or smaller flat blade screwdriver. To do this, locate the adjustable trim potentiometers (pots) RPM1, RPM2 and RPM3 on the controller (see Figure 59). Use a screwdriver to turn the trim pot clockwise to increase engine RPM. Each full turn is approximately 300 RPM.

Using the tachometer on the front of the CDS unit, make the following RPM adjustments:

On the Dash Switch, Adjust:	On the Controller, Adjust:
HI	RPM 1 = 1,500 RPM
MID	RPM 2 = 1,400 RPM
LO	RPM 3 = 1,300 RPM

Apply load and confirm each RPM. There may be a 50 -100 RPM fluctuation in RPM between load and no load conditions. Set vacuum relief to 14" Hg on the vacuum gauge.

NOTICE

After applying a load, RPM's may need to be re-adjusted. Adjust only with no vacuum load.

Operation Features

The Throttle Controller must meet certain "Chassis Ready" conditions to elevate the engine RPM, which are as follows:

1. Parking Brake is set
2. Gear shift is in "Park"
3. Foot is off Service Brake (brake pedal)
4. Foot is off Accelerator Pedal
5. Vehicle is stationary (no speed)
6. Engine is started and idling
7. The A/C / Heater switch is in off position

NOTICE

The Throttle Controller must be initialized anytime the DLC harness is disconnected from the Data Link Connector. To initialize the system switch ignition key to OFF position, plug in DLC harness, switch the ignition on, and then start the engine. This allows the Throttle Controller to read the PCM engine computer.

Make sure the operator of the CDS understands that the AC / Heat switch needs to be in the OFF position before activating the CDS unit.

Troubleshooting

On the Throttle Controller, there are LED lights with corresponding labels to provide status and problem detection information (see Figure 59).

Figure 59. Location of Controller's LED Lights with Labels and RPM Trim Potentiometers

See the Table 2 on page 44 for function codes.

Table 2. Throttle Controller Codes

LED	STATUS	INDICATION
BUSS	On Solid	Unit ON and functioning (harness connected to data link)
BUSS	Flashing	Unit ON, but a problem was detected
GEAR	On Solid	Transmission in PARK
GEAR	Flashing	Transmission NOT in Park
PK BRK	On Solid	Parking Brake Set
PK BRK	Flashing	Parking Brake is NOT set
SR BRK	On Solid	Service Brake is set (not being used)
SR BRK	Flashing	Service Brake is NOT set
VSPEED	On Solid	Vehicle is stationary
VSPEED	Flashing	Vehicle is moving
RPM1	On Solid	RPM1 mode selected, engine at fast idle
RPM1	Flashing	RPM1 mode selected, engine not at fast idle
RPM2	On Solid	RPM2 mode selected, engine at fast idle
RPM2	Flashing	RPM2 mode selected, engine not at fast idle
RPM3	On Solid	RPM3 mode selected, engine at fast idle
RPM3	Flashing	RPM3 mode selected, engine not at fast idle

NOTICE

The PCM engine computer will cause the engine speed to momentarily drop back to normal idle speed every time the air conditioner pump cycles on or off.

BEFORE OPERATING THE CDS ON THE JOB SITE

1. Locate the unit and equipment in a well-ventilated area.

⚠WARNING

The CDS unit generates toxic fumes. Position the vehicle so that the fumes will be directed away from the job site. Do not park where exhaust fumes can enter a building through open doors, windows, air conditioning units or kitchen fans.

2. Check the fuel tank to be certain there is adequate fuel to complete the job.
3. Position the wheel chocks on one of the front tires.
4. If using a water supply hose which has not been used recently or if using a customer's hose, first connect the hose to the faucet and flush out any debris which may be in the hose. Afterwards connect the hose to the unit.
5. Check the chemical jug to see if you have enough concentrated chemical to finish the job. If not, mix and fill a 5 gallon chemical jug.
6. Connect all required hoses.
7. When connecting the pressure hose to the pressure outlet connections at the front of the unit, go to the farthest area to be cleaned and connect to the cleaning tool. This ensures that you have the proper length of hose required to perform the cleaning.
8. Connect all required hoses.
9. When connecting the pressure hose to the pressure outlet connections at the front of the unit, go to the farthest area to be cleaned and connect to the cleaning tool. This ensures that you have the proper length of hose required to perform the cleaning.

CDS START UP AT THE JOB SITE

1. Make sure the vehicle's gear select lever is in the Park position and the emergency brake is set
2. Start the vehicle's engine.
3. Turn key on the CDS dash.
4. Select the cleaning speed appropriate for the cleaning job.

NOTICE

Starting in the low position is recommended due to the lower stress on the clutch during start up.

5. Turn on the PUMP CLUTCH switch. Adjust cleaning pressure to desired level.
6. Turn on the PUMP IN switch (if equipped).
7. Turn the heat control valve to 'MAX' only if you will be using water. Do not activate the heat exchanger during flood extraction work.
8. Turn the CHEMICAL SYSTEM valve to the 'PRIME' position to purge any air from the system.

NOTICE

The prime hose is plumbed into the Recovery Tank. Leaving the valve in the 'PRIME' position will cause excessive chemical usage.

   a. When the chemical begins to flow through the flowmeter, with the flow indicator reading maximum flow and the PRIME line pulsing, turn the CHEMICAL SYSTEM valve to 'ON'. Cap off vacuum if necessary.
   b. While spraying the solution from the cleaning tool, adjust the chemical flow by turning the CHEMICAL METERING CONTROL to the desired level.

9. Optional: Turn the APO switch 'ON' if using the Automatic Pump-Out feature.

NOTICE

The pump will not engage until the water level rises inside the Recovery Tank.

10. Now proceed with the cleaning operation.

NOTICE

The machine will automatically shut down when the Recovery Tank reaches its full capacity due to the float switch located inside the tank. When this occurs, turn the CDS key switch off and empty the Recovery Tank. Then, turn the unit back on and continue to clean.

CDS FLOOD RESTORATION WORK

When using equipment for flood damage, adjust the high pressure pump to zero. This will reduce the engine power load and save on fuel consumption.

CDS SHUT DOWN

1. Flush clear water through the chemical system for 10 seconds.
2. Open the water box drain and actuate the tool/wand valve to run fresh water through the water box, heat exchangers and cleaning tools.

NOTICE

If freeze guarding is necessary, perform the freeze guard procedure at this time. Draining the water box to ½ full or less is recommended to reduce spillage inside the vehicle.

NOTICE

Rinse the system with vinegar on a weekly basis. Rinse the entire system with descaler each month.

3. Lay vacuum hoses out in order for all moisture to be removed from the hoses. This prevents spillage of any dirty solution in your vehicle when storing the hoses.
4. Disconnect the hoses and put them away.
5. If you are using an outside water source, turn the water supply faucet off. Bleed pressure out of the supply hose by loosening the hose at the water supply. Unhook the water supply hose and store it in the vehicle
6. Allow the unit to run for a few minutes with the vacuum hose disconnected in order to remove all moisture from the vacuum pump.
7. Plug the vacuum inlets. Spray a Hydramaster-recommended lubricant (P/N 000-087-006) into the lube port for about 5 to 10 seconds while the unit is running. This will lubricate the vacuum pump and prevent it from rusting. (The lube port is located on the front panel above the pressure gauge).
8. Remove the inlet plugs, then turn the ignition 'OFF' before draining the Recovery Tank.
9. Turn the heat control valve to the 'OFF' position. This will help avoid engine overheat problems due to reduced coolant flow through the radiator.

10. Drain the Recovery Tank.

NOTICE

If your CDS is equipped with an AWDS, first connect a garden hose to the outlet on the front of the machine.

If your CDS is equipped without an AWDS, drain the Recovery Tank through the tank drain valve (located under the chemical jug tray).

NOTICE

Do not dump waste in any area which might violate local, state or federal law. If you have the optional AWDS system, drain the Recovery Tank into a sanitary drain system.

11. When the Recovery Tank is drained, lift the Recovery Tank lid and remove the filter basket.
12. Clean out any accumulated debris.
13. Rinse and re-install.
14. Check the corrugated Blower filter.
15. Clean out any accumulated debris.
16. Rinse and re-install.

NOTICE

When re-installing the Blower filter, ensure that it is fully seated against its mount so that debris cannot pass under it and into the Blower.

FREEZE GUARDING

When operating the CDS 4.8 during the colder months of the year, ensure that you properly freeze guard the system. No part of the CDS 4.8 System is covered by warranty if machine damage occurs because of freezing.

CAUTION

BE SURE YOUR MACHINE IS PROTECTED! Freezing will cause component damage.

The following precautions are recommended prior to and during cleaning jobs:

1. Run the machine before leaving for the first job to ensure nothing has frozen the night before, including hoses and tool/wand.
2. Insulate the solution hose from the cold ground by running it through an extra 1½" vacuum hose.
3. Leave vehicle doors closed until you begin cleaning; afterwards, open slightly.

NOTICE

In colder climates, insulating the vehicle walls and floor boards will help protect the unit.

4. Do not procrastinate during the cleaning operation or the hot water solution line will also freeze on the ground. The solution line should be insulated in extremely cold climates.
5. Whenever possible, store the van in a heated garage at night or over the weekend. If not possible, place a 1,500 Watt electric heater inside the vehicle, aimed directly at the machine.

⚠WARNING

Never use a propane heater. It causes excessive moisture on the vehicle ceiling and the possibility of it malfunctioning is therefore higher, which may cause bodily injury. If the machine and vehicle are left outside with a heater, drain water from the machine cleaning tools and hoses because they can be freeze-damaged also