KRAFT
The power of performance.

Kraft Power Corporation
4039 Millennium Blvd. SE
Massillon, OH 44646
(330) 830-4158
(330) 830-5196

Fax Transmission

To:	Jina Logue	From:	Rob Hounwer
Company:	Peaker	E-Mail:	@kraftpower.com
Fax:		Pages:	
Phone:	815-301-3150	Date:	
Re:		CC:	

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

Comments:

18 inches H_2O = .65 PSI

2 PSI = TO Rich

EXHAUST CONNECTIONS INSTALLATION - GSI/GL

1. Install two exhaust outlet brackets with four nuts, lock washers and washers (see Figure 5.35-13 and Figure 5.35-14).

2. Install exhaust outlet connection and heat shields on exhaust outlet brackets with six capscrews and lock washers.

3. Position retaining rings, exhaust outlet flange seals, outlet flanges, and gaskets between exhaust out connections and turbochargers.

4. Install 24 stainless steel capscrews and lock washers to secure parts to turbochargers.

5. Install exhaust connection on exhaust outlet connection with V-Band coupling.

6. Install flexible exhaust connection on exhaust connection with V-Band coupling.

WASTEGATES

WASTEGATES - BLEEDING AIR

⚠ CAUTION **Trapped air in the auxiliary cooling water circuit leads to overheating that can result in wastegate damage and premature engine failure. Disregarding this information could result in product damage and/or personal injury.**

Air bleed the auxiliary cooling water circuit at least once each day. Always air bleed the circuit after refilling or topping off the cooling system. Open and close air bleed petcocks in the order listed below, starting at the lowest petcocks in the system and ending at the highest. Bleed one petcock at a time. The number of air bleed petcocks and their locations are as follows in Table 5.35-1:

Table 5.35-1. Air Bleed Petcocks - Auxiliary Cooling Water Circuit

NUMBER OF PETCOCKS	LOCATION
4	Intercooler water inlet/outlet piping (piping above bonnets)
4	Intercooler water inlet/outlet bonnets (top of bonnets)
2	Wastegate water return tubes (right and left bank)

⚠ WARNING

Always wear protective clothing when bleeding the cooling system on a heated engine. Slowly loosen the air bleed petcock to relieve any excess pressure. Escaping steam and/or hot water could result in severe personal injury or death.

1. **Initial Bleed:** open air bleed petcock prior to engine startup. A hissing sound often accompanies escape of trapped air. Close petcock when the hissing stops and water begins to flow out in a solid steady stream.

2. **Check Bleed:** start engine and reopen petcock. Close petcock when hissing stops and water begins to flow out in a solid steady stream.

3. **Final Bleed:** once temperature of jacket water circuit has stabilized (as indicated by temperature gauge), reopen petcock. Close petcock when water begins to flow out in a solid steady stream.

WASTEGATE REMOVAL

⚠ WARNING

Always wear protective clothing when draining the cooling systems on a heated engine. Slowly loosen the drain petcocks to relieve any excess pressure. Escaping steam and/or hot water can result in severe burns or death.

NOTE: *Drain the jacket water system until the level of the coolant drops below level of wastegates. It is not necessary to drain entire cooling system.*

1. Refer to *VHP 6, 12 And 16 Cylinder Operation And Maintenance Manual Form 6277* to drain coolant until the level of the coolant drops below level of wastegates.

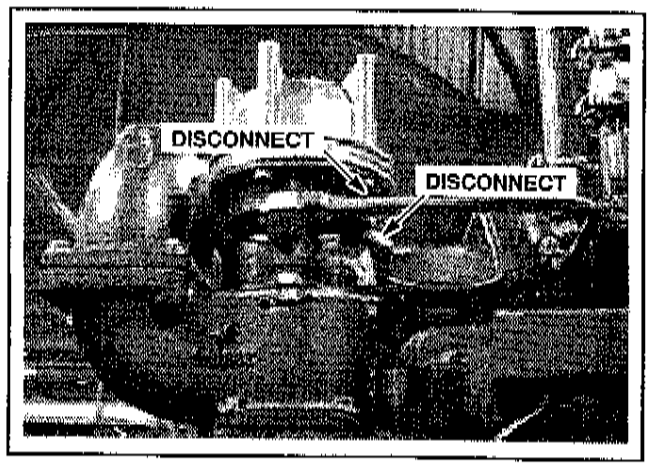


Figure 5.35-15. Wastegate Tubes

2. Loosen ferrule nuts (9/16 in. hex) to detach compressor discharge pressure sensing tubes from "Air" port at side of each wastegate (see Figure 5.35-15).

3. Loosen ferrule nuts (11/16 in. hex) to detach two water return tubes from wastegate water outlet ports.

NOTE: *The word "Water" appears just above the wastegate base flange between the water inlet and outlet port.*

4. Loosen ferrule nuts (11/16 in. hex) to detach two water supply tubes from wastegate water inlet ports.

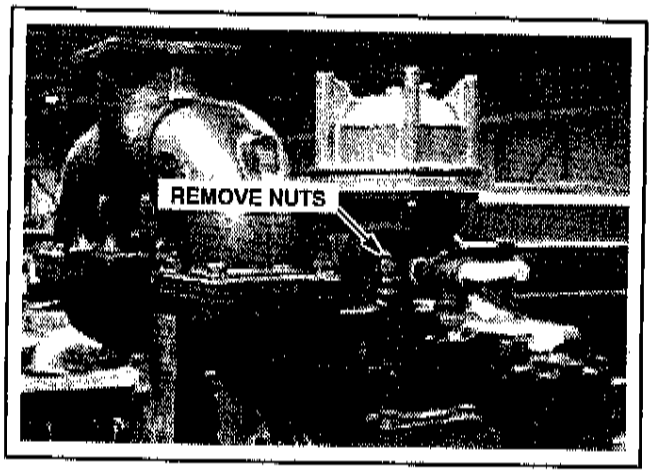


Figure 5.35-16. Remove Wastegate

5. Alternately loosen and remove four 3/8 inch stainless steel lock nuts (thin) from wastegate mounting studs.

6. Alternately loosen and remove four 3/8 in. stainless steel hex nuts (thick) from mounting studs. Remove stainless steel lock washers.

7. Remove wastegates from mounting studs.

8. Remove elbows and fittings as necessary.

⚠ CAUTION **Exercise care to keep the gasket material out of the turbo exhaust inlet elbow. Allowing gasket material to enter the turbo exhaust inlet elbow could result in product damage and/or personal injury.**

9. Remove gaskets from turbo exhaust inlet elbows or wastegate base flanges.

WASTEGATE DISASSEMBLY

1. Remove breather vent plug from center of wastegate cover (see Figure 5.35-17).

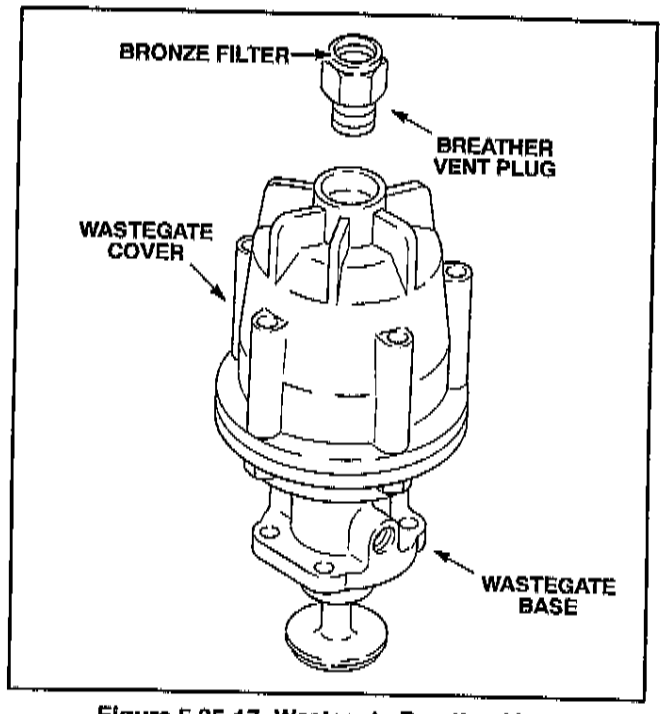


Figure 5.35-17. Wastegate Breather Vent

2. Position wastegate in a suitable press. Use two rest blocks to properly support base flange (see Figure 5.35-18).

3. Center a piece of flat stock on wastegate cover to evenly distribute pressing force on cover surface area.

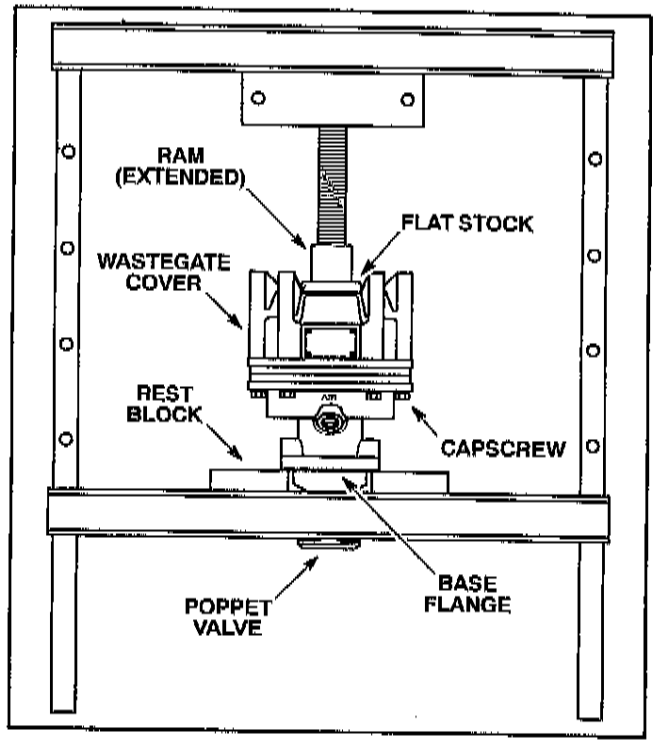


Figure 5.35-18. Wastegate Disassembly

⚠ CAUTION **To avoid damage to the wastegate cover, use just enough ram pressure to hold the cover while relaxing the valve spring. Disregarding this information could result in product damage and/or personal injury.**

4. Lower ram until it makes contact with flat stock on wastegate cover.

⚠ WARNING

The wastegate cover compresses a powerful spring. Wear proper eye protection. Exercise caution to avoid severe personal injury or death.

5. Remove five wastegate cover capscrews and lock washers.

NOTE: *If a press is not readily available, remove only two of the five wastegate cover capscrews (see Figure 5.35-19). Leave three capscrews in place, so that the cover does not cock as it is raised. Alternately loosen each remaining capscrew 1/4 in. until the valve spring is completely relaxed.*

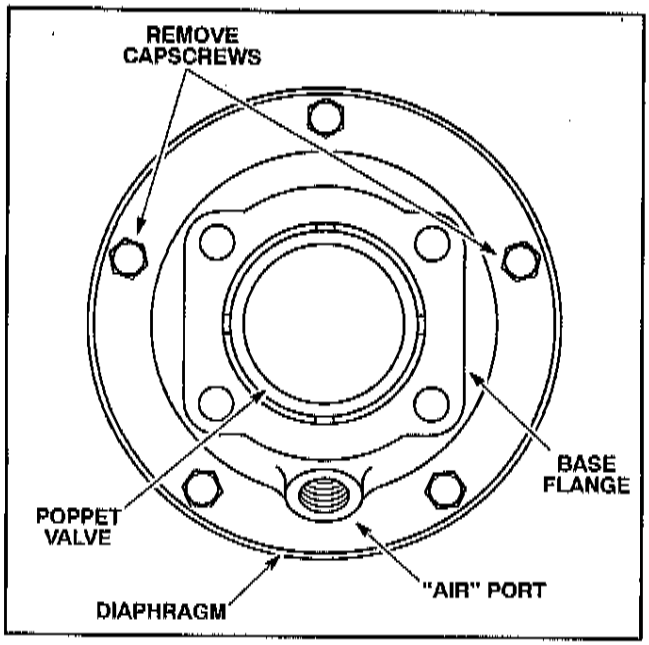


Figure 5.35-19. Wastegate - P/N Series 208372 - Bottom View

6. Slowly raise ram. Wastegate cover will separate from base assembly as internal springs become completely extended. Remove wastegate from press.

7. Remove wastegate cover from base assembly. Remove spacers, spring and shims (see Figure 5.35-20). Count and record number of spacers, springs and shims to ensure proper assembly.

8. Remove castle nut from tip of poppet valve stem.

9. Remove diaphragm retainer, plate and flat washer from end of poppet valve stem. Remove diaphragm from retainer and discard.

10. Slide poppet valve from base assembly.

WASTEGATES - CLEANING AND INSPECTION

⚠ WARNING

Compressed air can pierce the skin and could result in severe personal injury or death. Never use your hand to check for leaks or to determine air flow rates. Wear safety glasses to shield your eyes from flying dirt and debris.

1. Clean all parts of assembly in a non-volatile cleaning solution or solvent. Dry with moisture free compressed air.

2. Replace breather vent plug if damaged or missing.

3. Inspect valve stem nut, flat washer, diaphragm retainer and plate. Inspect springs, spacers, shims and cover (see Figure 5.35-20). Replace any part that is damaged or excessively worn.

4. Inspect valve guide bore to verify that it is smooth and not worn. The bore ID must measure between 0.456 and 0.459 in. (11.58 - 11.66 mm). If the ID is out of specification, press old guide out in a downward direction. Press in a new guide from top until top of guide is flush with top of base.

5. Inspect valve stem for straightness, scoring or excessive wear. Check valve shoulder for wear. Check valve face for pitting, scoring or scuffing.

6. Clean poppet valve. Measure outside diameter of stem to verify that it is within specification, 0.4485 in. (11.39 mm) and 0.451 in. (11.45 mm).

7. Replace the poppet valve if damaged, excessively worn or out of specification.

Breather Vent Cleaning

Clean and inspect filter in wastegate breather vent once each year.

1. Remove brass vent plug in center of wastegate cover (see See Figure 5.35-21).

2. Carefully inspect bronze filter for any accumulation of dirt.

EXHAUST SYSTEM

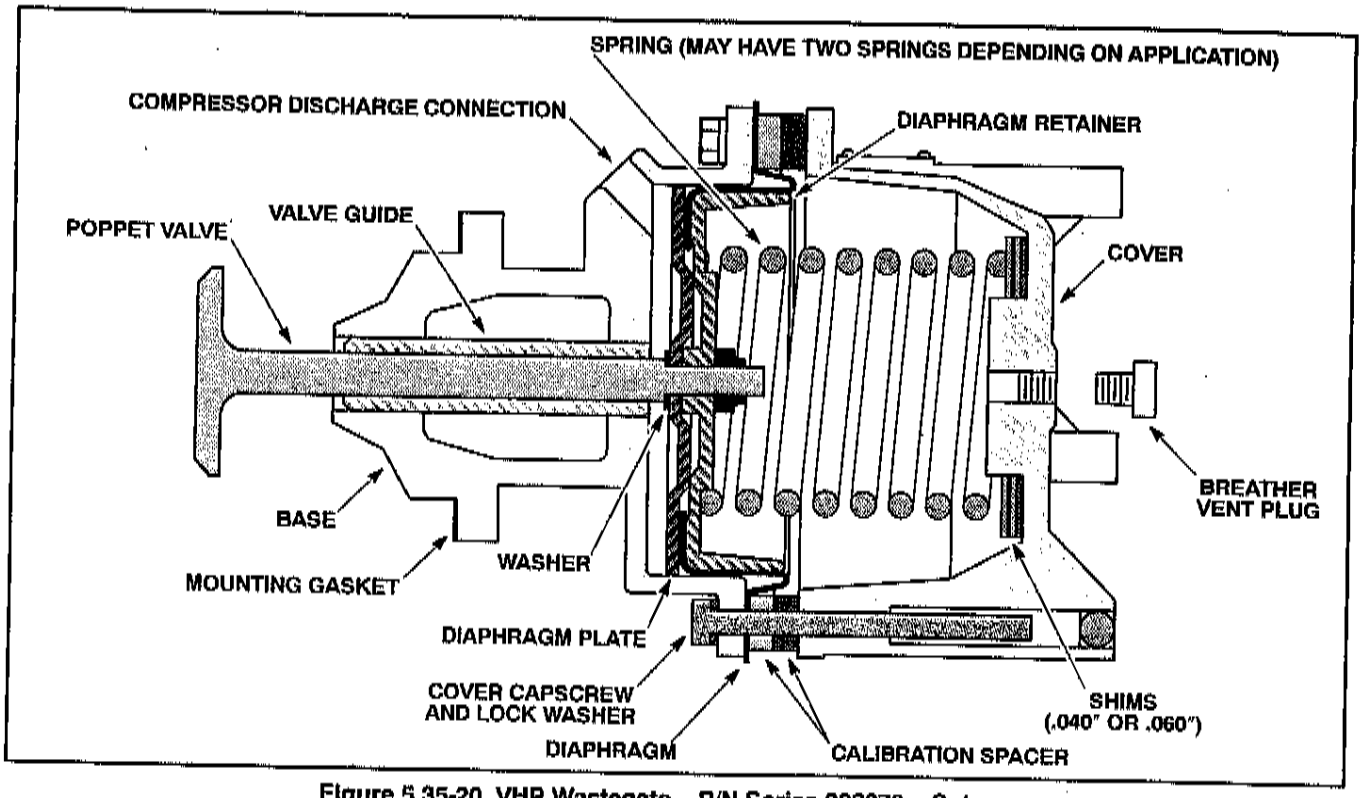


Figure 5.35-20. VHP Wastegate - P/N Series 208372 - Cutaway

⚠ WARNING

Compressed air can pierce the skin and could result in severe personal injury or death. Never use your hand to check for leaks or to determine air flow rates. Wear safety glasses to shield your eyes from flying dirt and debris.

3. Soak plug in a non-volatile cleaning solution or solvent. Dry with low pressure compressed air.

4. Replace breather vent plug if damaged or missing (see Figure 5.35-21).

⚠ CAUTION **Do not operate the engine without a breather vent plug installed or with a clogged breather vent. Air must pass through the vent to maintain atmospheric pressure at the top of the wastegate diaphragm. The filter element in the plug prevents dirt and dust from entering the upper wastegate assembly. Any accumulation of dirt may damage the diaphragm or reduce its service life. Operating the engine without a breather plug could result in product damage and/or personal injury.**

5. Install vent plug in center of wastegate cover.

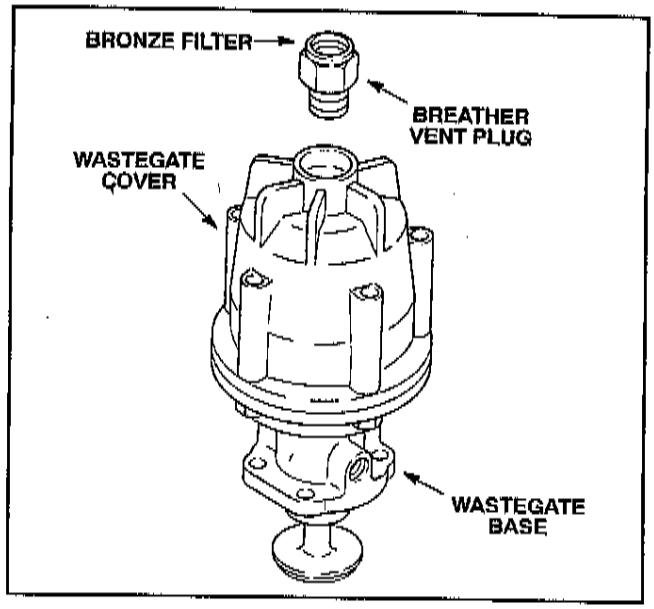


Figure 5.35-21. Wastegate Breather Vent

Tube Connections Inspection

1. Inspect wastegate compressor discharge pressure sensing tubes and water supply/return tubes. Look for cracks, cuts, dents, holes or other damage. Replace tubes, if necessary.

2. Inspect tube connections for tightness.

WASTEGATE ASSEMBLY

1. Insert threaded end of poppet valve stem into valve guide bore at bottom of base assembly (see Figure 5.35-22).

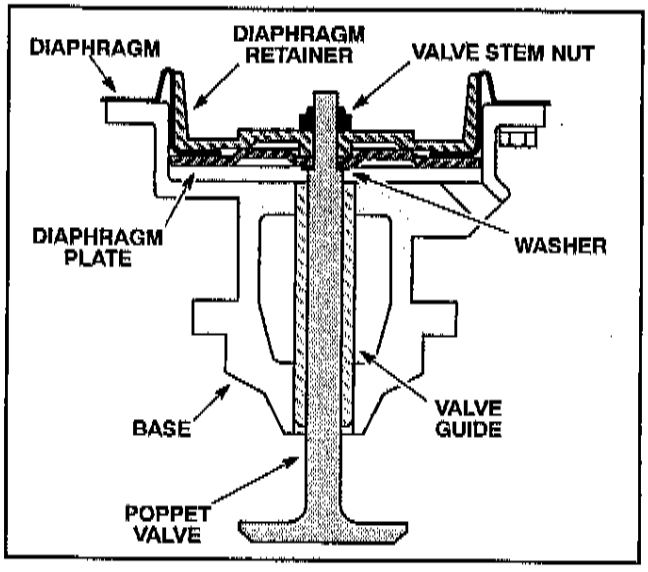


Figure 5.35-22. Wastegate Assembly

2. Slide flat washer over threaded end of valve stem until it contacts valve shoulder.

3. Slide recessed side of diaphragm plate over valve stem until upraised area around valve stem hole contacts washer.

4. Place diaphragm retainer (open side up) into hollowed side of a new diaphragm.

5. With bowl facing upward opposite base assembly, slide diaphragm retainer over valve stem until it contacts plate.

6. Finger tighten valve stem nut.

⚠ CAUTION **Install a pair of brass jaw inserts in the vise to avoid damage to the valve. Disregarding this information could result in product damage and/or personal injury.**

7. Place base assembly upright in vise and apply enough pressure to valve face to prevent stem from turning.

8. Torque valve stem nut to 100 - 120 in-lb (11.5 - 13.5 N·m).

9. Place shims over valve spring seat centered inside wastegate cover (see Figure 5.35-20). Be sure number of shims installed is same as number removed at time of disassembly. If any shims are replaced, be sure to use correct size (see Table 5.35-2).

10. Place valve spring over valve spring seat inside wastegate cover.

⚠ WARNING

To avoid severe personal injury or death, exercise caution when compressing the valve spring(s). Wear proper eye protection.

11. Position wastegate base assembly in a suitable press. Use two rest blocks to properly support base flange.

12. Align holes in diaphragm with those in flange of base assembly.

13. Position spacers on flange of base assembly. Align holes in spacers with those in diaphragm. Be sure number of spacers installed equals number of spacers removed.

⚠ WARNING

The wastegate cover compresses a powerful spring. Wear proper eye protection. Exercise caution to avoid severe personal injury or death.

14. Position wastegate cover over base assembly. Holding spring against wastegate cover to retain shims, slide free end of spring over valve stem nut until it rests against spring seat in diaphragm retainer.

15. Center a piece of flat stock on wastegate cover to evenly distribute pressing force on cover surface area. Rotate cover to align holes with those in base assembly.

16. Lower ram until it makes contact with flat stock on wastegate cover.

⚠ CAUTION **To avoid damage to the wastegate cover, use only enough ram pressure to compress the valve spring(s). Disregarding this information could result in product damage and/or personal injury.**

17. Lower ram until wastegate cover makes contact with spacers on upper flange of base assembly.

18. Install and tighten five wastegate cover capscrews and lock washers.

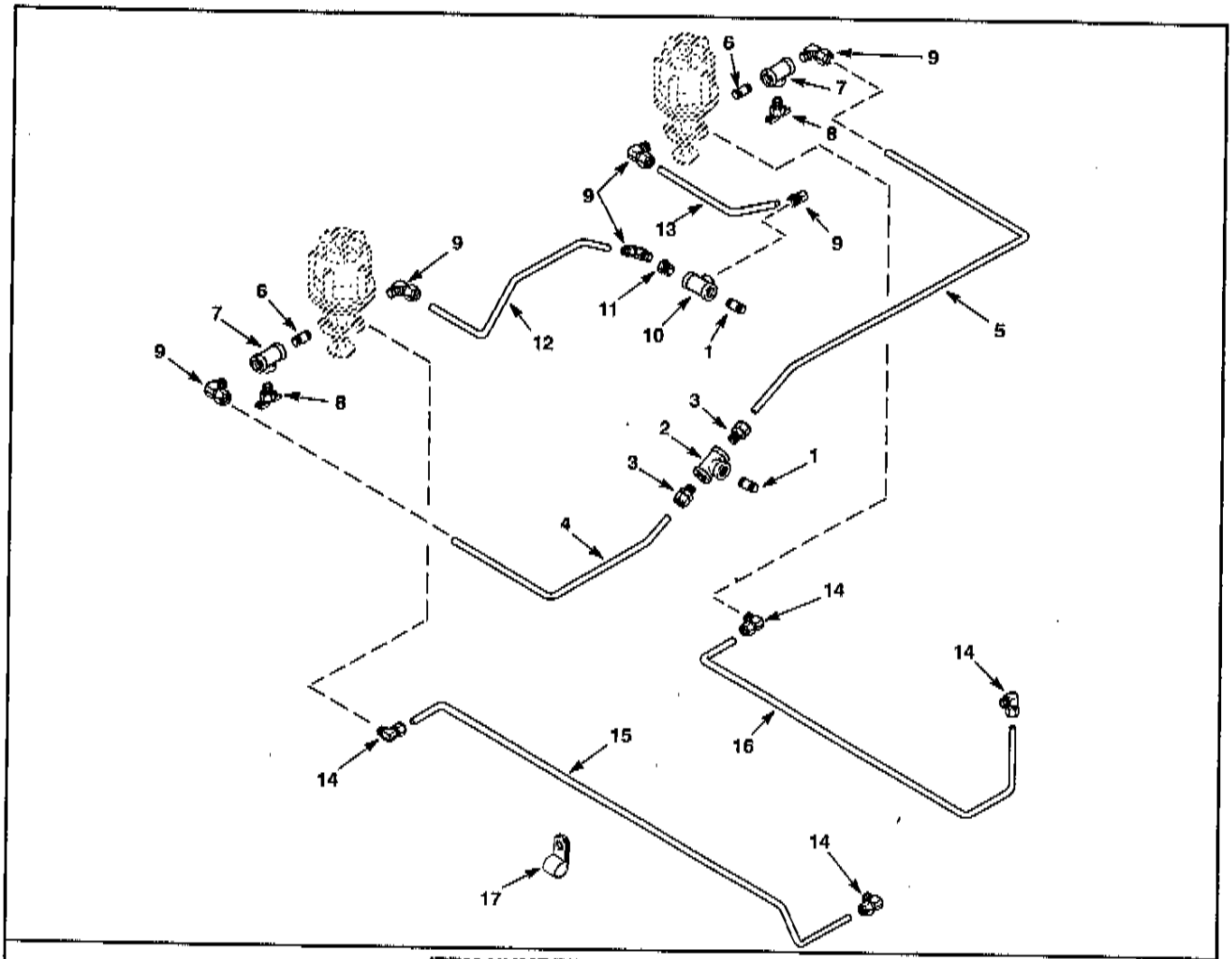
NOTE: *If a press is not readily available, start only three of five wastegate cover capscrews (see Figure 5.35-19). To prevent the cover from cocking, alternately tighten each capscrew 1/4 inch until the internal valve spring is compressed and the wastegate cover is tight. Install the two remaining capscrews.*

19. Alternately torque wastegate cover capscrews to 40 - 70 in-lb (4.5 - 8.0 N·m).

20. Release ram pressure and remove wastegate from press.

⚠ CAUTION **Do not operate the engine without a breather vent plug installed. The filter element in the plug prevents dirt and dust from entering the upper wastegate assembly. Any accumulation of dirt may damage the diaphragm or reduce its service life. A plugged or clogged breather vent could result in product damage and/or personal injury.**

21. Install breather vent plug in center of wastegate cover.



ITEM NUMBER AND DESCRIPTION							
1	Nipple, Pipe, 1/2" x 1-1/8"	6	Nipple, Pipe, 3/8" x 1-1/2"	11	Bushing, Reducing, Galvanized, 1/2" to 3/8"	16	Tube, Wastegate Sensing - L.B.
2	Tee, Reducing, Galvanized 1/2" to 3/8"	7	Tee, Pipe, 3/8"	12	Tube, Wastegate Water, Return	17	Clip, Tube
3	Connector, Male	8	Cock, Drain	13	Tube, Wastegate Water, Return		
4	Tube Wastegate Water, Supply	9	Elbow, Male	14	Elbow, Male		
5	Tube Wastegate Water, Supply	10	Tee, Reducing 1/2" to 3/8"	15	Tube, Wastegate Sensing - R.B.		

Figure 5.35-23. Wastegate Water Connections

WASTEGATE CALIBRATION

Test wastegate before installation. If test results do not conform to specification, then wastegate must be recalibrated and then retested.

⚠ CAUTION **Do not modify wastegates. Any type of wastegate conversion can result in serious engine damage. Do not rebuild wastegates using spare parts of unknown origin. Disregarding this information could result in product damage and/or personal injury.**

NOTE: *The calibration procedure is only intended for those wastegates using original components or the specified replacement parts.*

Wastegate Calibration Test Preparation

Obtain the following equipment see Figure 5.35-24 and Figure 5.35-25:

- Air supply pressure, 50 psi minimum.
- Air Pressure Regulator, range 0 psi to shop supplied air pressure maximum.
- Air Pressure Gauge, range 0 - 30 psi in 0.1 psi increments. The best gauge will include measurement in inches of mercury ("Hg).
- Tubes and fittings (1/4 inch minimum) pressure rated at or above shop air supply pressure maximum.
- Dial indicator, 0.001 inch accuracy, 1 inch of travel.
- Wastegate calibration tool.

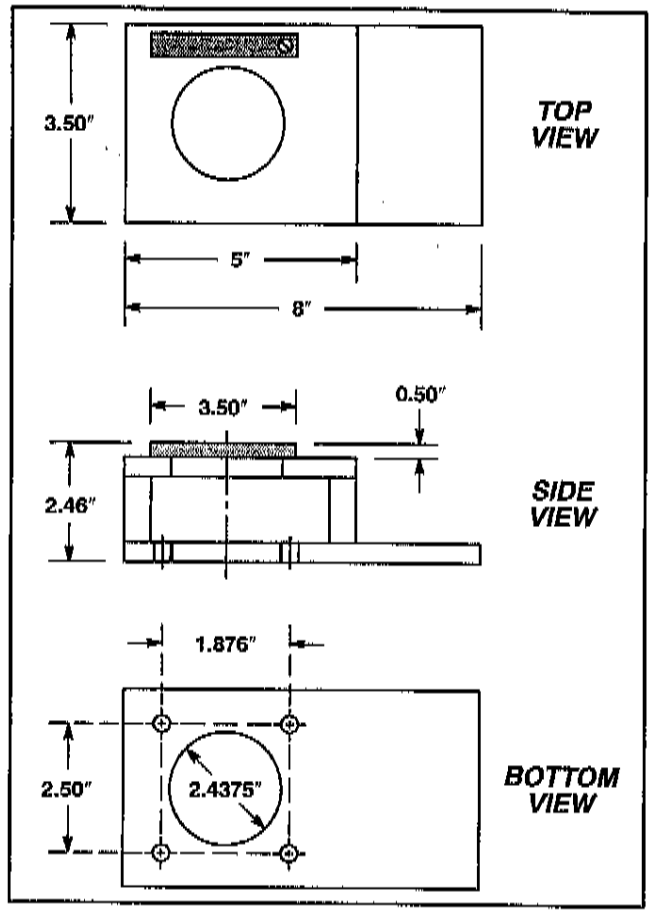


Figure 5.35-24. P/N Series 208372 Wastegate Calibration Tool

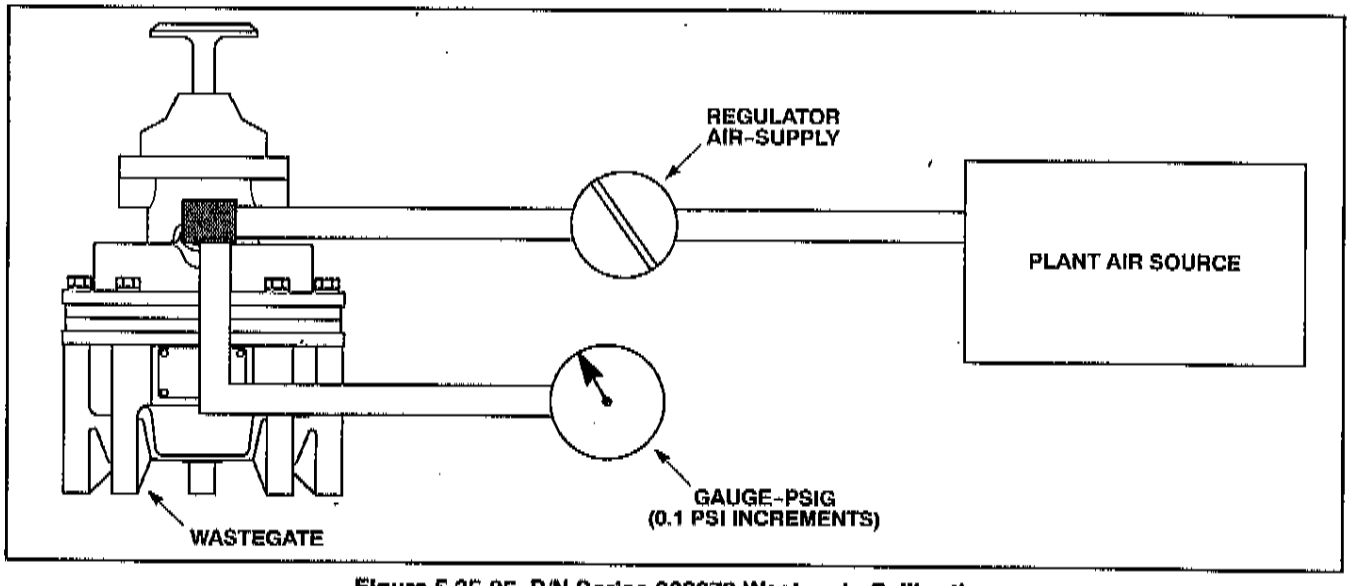


Figure 5.35-25. P/N Series 208372 Wastegate Calibration

1. Loosen set screw and slide gauge block beneath dial indicator (see Figure 5.35-26). Tighten set screw.

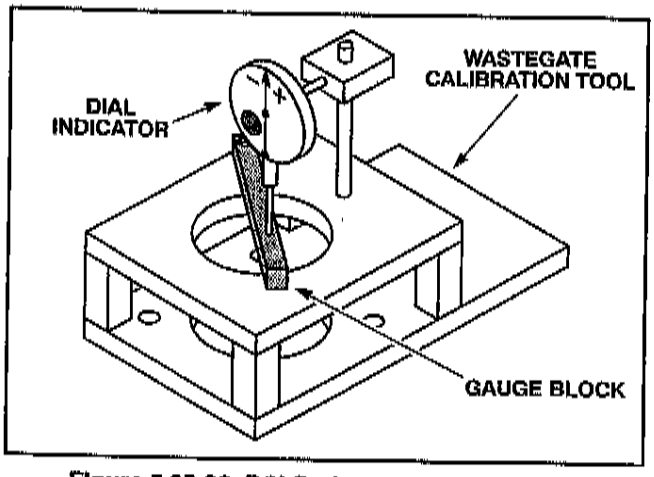


Figure 5.35-26. P/N Series 208372 Wastegate Calibration Tool

2. Zero outer dial (hundredths) on dial indicator. Record reading of tenths indicator with gauge block in place. The preload indicated by tenths indicator gives you nominal wastegate test height (see Figure 5.35-27).

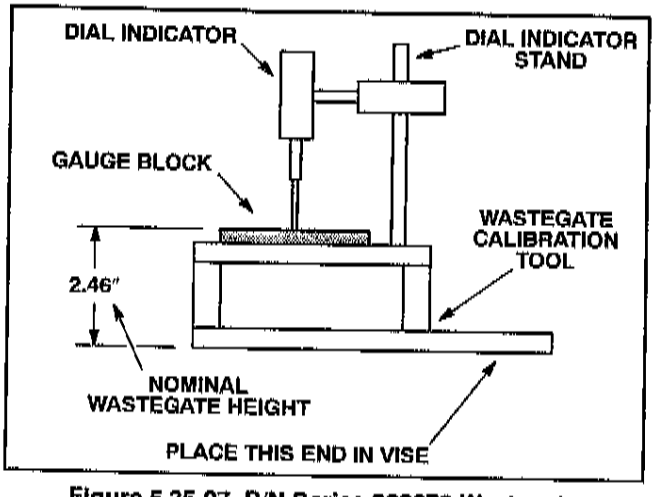


Figure 5.35-27. P/N Series 208372 Wastegate Calibration Setup

3. Loosen set screw, return gauge block to side of calibration tool and tighten set screw.

4. Place extension at bottom of calibration tool in a vise (see Figure 5.35-26). Verify that unit is level and tighten vise to secure calibration tool against movement.

5. Bolt wastegate in calibration tool using an alternating pattern (see Figure 5.35-28). Verify that tip of dial indicator is placed near center of poppet valve face.

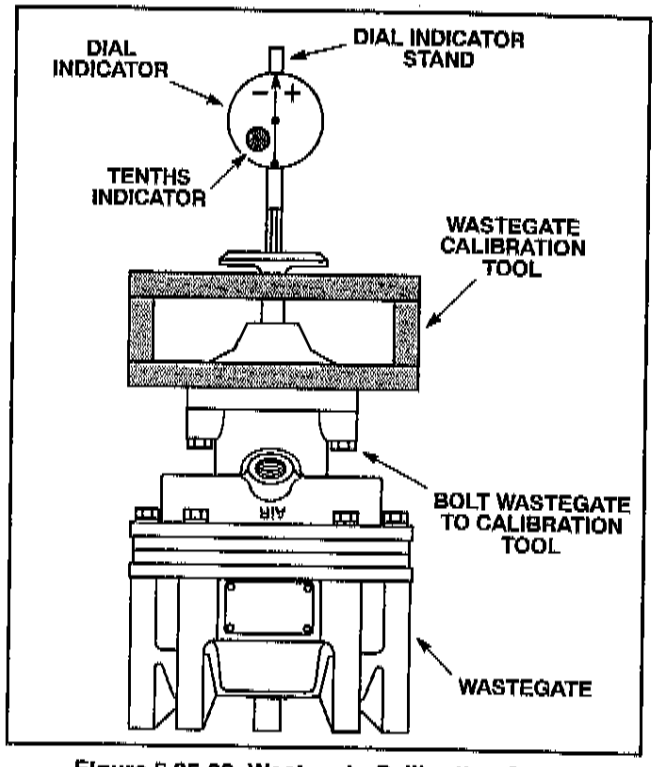


Figure 5.35-28. Wastegate Calibration Setup

Wastegate Calibration Testing

1. To ensure that test produces correct valve height measurement, tap on wastegate housing with a wrench to prevent poppet valve from sticking.

2. Slowly increase air supply pressure to wastegate until dial indicator reaches "zero height." The "zero height" is value that was recorded on tenths indicator when outer dial (hundredths) was zeroed in Step 2 of "Wastegate Calibration Test Preparation" in this section.

3. Record reading of air pressure gauge while poppet valve is at "zero height."

Wastegate Calibration Adjustment

Alter size of shim pack to bring nominal pressure within specification (see Table 5.35-2).

1. If reading of air pressure gauge is below lower limit listed in Wastegate Calibration Chart, then the pressure must be increased. Remove the wastegate cover and add the correct number of shims to the shim pack. Repeat the test procedure.

2. If air pressure gauge reading is greater than upper limit listed in Table 5.35-2, then pressure must be reduced. Remove shims from shim pack as necessary. Repeat test procedure.

3. Remove the gasket from the wastegate mounting face (see Figure 5.35-29).

Table 5.35-2. Nominal Pressure For P/N Series 208372 Wastegate Calibration Test

WASTEGATE P/N	NOMINAL CALIBRATION PRESSURE ("HG)	SPACER(S)	SHIMS*
208372-H	17.5 - 17.8	2	0.125
208372-M	23.1 - 23.5	2	0.125
208372-N	54.7 - 55.5	1	-
208372-P	53.5 - 54.3	1	0.188

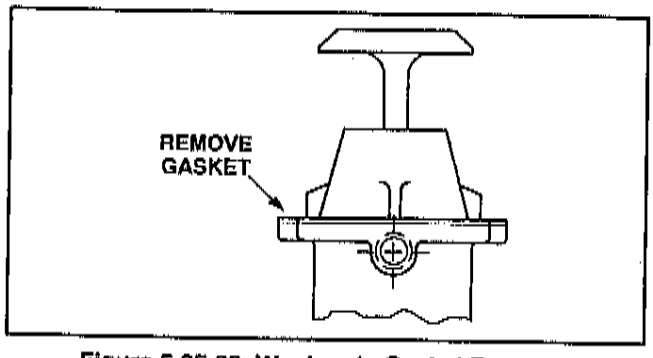


Figure 5.35-29. Wastegate Gasket Removal

4. Mount the wastegate in a vise with the axis/centerline vertical and the valve poppet up.

NOTE: *Connect the gauge at the compressor discharge connection to insure accurate gauge readings.*

5. Connect the air source, regulator and gauge to the compressor discharge pressure sensing connection with the necessary tubing.

6. Slowly increase the air pressure to the wastegate by adjusting the regulator. Use minimal air pressure (dependent on specific wastegate) to force the poppet valve through its entire range of travel. When the valve is moving, watch the valve for smooth operation through its range of motion. If the valve sticks, the related components must be checked.

7. Release the pressure from the wastegate completely and let the valve return to its seated position. Apply pressure per Step 2 above and confirm that the valve travels to the same 2.46 in. (62.484 mm) dimension. Readjust if necessary and tighten the jam nut.

8. If the valve does not return to 2.46 in. (62.484 mm) dimension, it is an indication that valve is sticking and not working freely. If slight vibration or tapping of the assembly returns valve to the 2.46 in. (62.484 mm) dimension, the wastegate can be used. If slight tapping or vibration does not return valve to the 2.46 inch (62.484 mm) height, the wastegate is not operational and should be repaired or returned to the supplier.

9. Stamp the proper wastegate WED P/N on the wastegate name plate per Table 5.35-2, after the control pressure has been set.

10. Install the gasket to the wastegate mounting face (see Figure 5.35-29).

WASTEGATE INSTALLATION

1. If removed, apply Perma Loc® heavy duty pipe sealant to threads of fittings (see Figure 5.35-23).

2. Install elbows and fittings as necessary.

3. Position gaskets on turbo exhaust inlet elbows and mounting studs.

4. Position wastegates on mounting studs.

5. Alternately tighten four 3/8 in. stainless steel hex nuts (thick) on wastegates and mounting studs.

6. Alternately tighten 3/8 in. stainless steel lock nuts (thin) wastegates and mounting studs.

7. Attach two water supply tubes on wastegate water inlet ports and tighten ferrule nuts.

8. Attach compressor discharge pressure sensing tubes to "Air" port at side of each wastegate (see Figure 5.35-30) and tighten ferrule nuts.

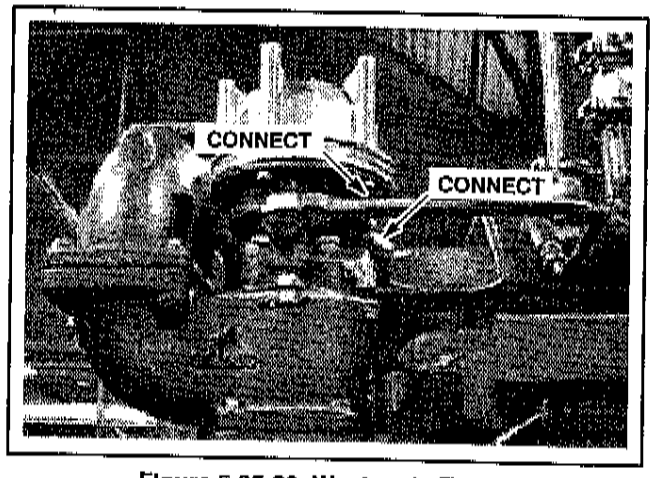
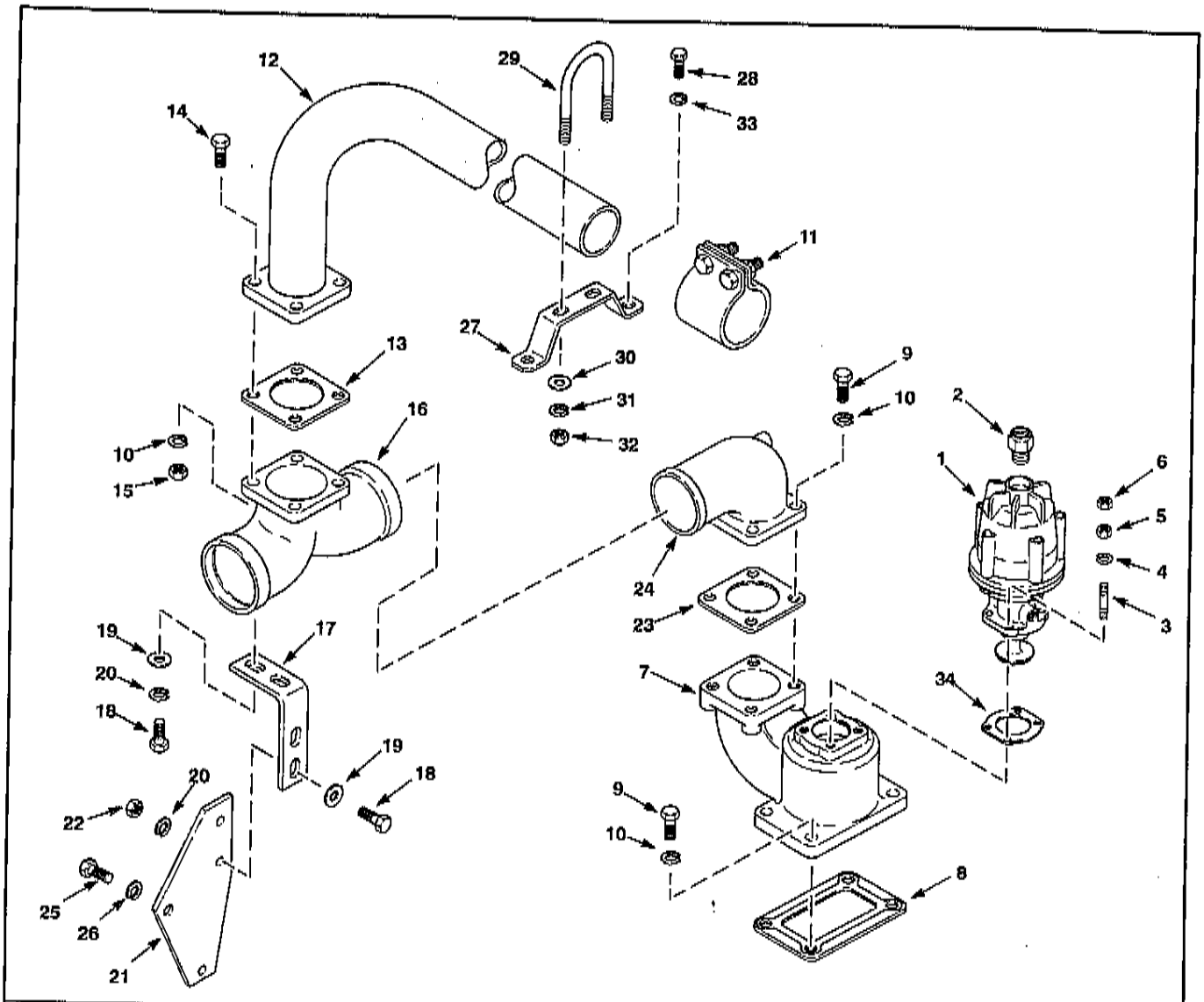


Figure 5.35-30. Wastegate Tubes

9. Attach two water return tubes to wastegate water outlet ports.

10. Refer to *VHP 6, 12 And 16 Cylinder Operation And Maintenance Manual Form 6277* to fill coolant system.

EXHAUST SYSTEM



ITEM NUMBER AND DESCRIPTION							
1	Wastegate	10	Washer, Lock, Stainless Steel, 3/8"	19	Washer, 3/8"	28	Capscrew, Hex Head, 5/16" - 18 x 2-1/4"
2	Fitting, Vent	11	Clamp, Seal	20	Washer, Lock, 3/8"	29	U-Bolt
3	Stud	12	Tube Exhaust Bypass	21	Bracket, Support	30	Washer, 1/4"
4	Washer, Lock, Stainless Steel, 3/8"	13	Gasket, Exhaust Bypass Tube	22	Nut, Hex, 3/8" - 16	31	Washer, Lock, 1/4" - 20
5	Nut, Hex, Stainless Steel, 3/8" - 24	14	Capscrew, Hex Head, 3/8" - 16 x 1-1/2"	23	Gasket, Wastegate Elbow	32	Nut, Hex, 1/4" - 20
6	Nut, Thin Hex, Stainless Steel, 3/8" - 24	15	Nut, Hex, Stainless Steel, 3/8" - 16	24	Elbow, Wastegate	33	Washer, Lock, 5/16"
7	Housing, Wastegate	16	Tee, Exhaust Bypass	25	Capscrew, Hex Head, 1/2" - 13 x 1-3/4"	34	Gasket, Wastegate
8	Gasket, Wastegate Housing	17	Brace, Exhaust Bypass Tee	26	Washer, Lock, Stainless Steel, 1/2"		
9	Capscrew, Hex Head, 1/2" - 16 x 1-1/8"	18	Capscrew, Hex Head, 3/8" - 16 x 1.0"	27	Support, Exhaust Bypass		

Figure 5.35-31. Wastegate Exhaust Bypass

WASTEGATE EXHAUST BYPASS REMOVAL

1. Refer to "Wastegate Removal" in this section and remove wastegates.

2. Loosen capscrews on seal clamp and slide seal clamp back on exhaust bypass tube (see Figure 5.35-31).

3. Remove two nuts, lock washers, capscrews, four washers, U-bolt and exhaust bypass support from exhaust bypass tube.

4. Remove four stainless steel nuts, lock washers capscrews, gasket and exhaust bypass tube from exhaust bypass tee.

5. Remove eight stainless steel capscrews, lock washers, wastegate elbows and gaskets from wastegate housings and exhaust bypass tee.

6. Remove four capscrews, lock washers, washers and exhaust bypass tee from exhaust bypass tee braces.

7. Remove capscrews, lock washers and support brackets.

8. If necessary, remove four nuts, lock washers, washers, capscrews and exhaust bypass tee braces from support braces (see Figure 5.35-32).

NOTE: *Note orientation of gasket for reference during assembly.*

9. Remove four stainless steel capscrews, lock washers wastegate housings and gaskets from exhaust manifolds.

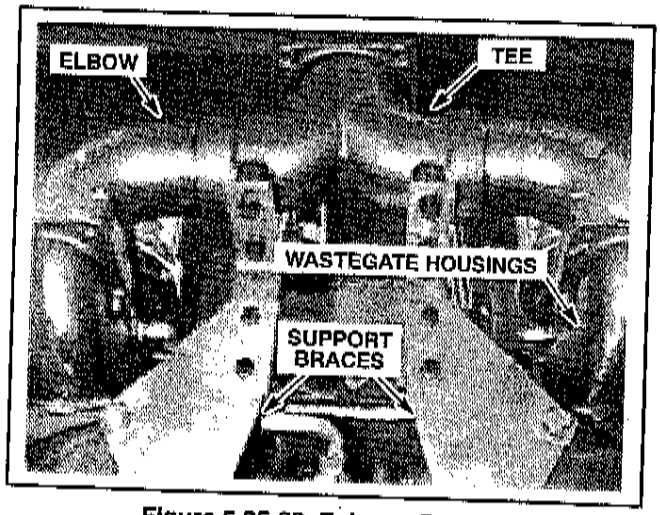


Figure 5.35-32. Exhaust Bypass

WASTEGATE EXHAUST BYPASS INSTALLATION

NOTE: *The folded lips of the stainless steel gasket should face upwards during installtion.*

1. Install wastegate housings and gaskets on exhaust manifolds with four stainless steel capscrews and lock washers.

2. If removed, install exhaust bypass tee braces on support braces with four capscrews, nuts, lock washers and washers.

3. Install support brackets with capscrews and lock washers.

4. Install exhaust bypass tee on exhaust bypass tee braces with four capscrews, lock washers and washers.

5. Install wastegate elbows and gaskets on wastegate housings and exhaust bypass tee, with eight stainless steel capscrews and lock washers.

6. Install gasket and exhaust bypass tube on exhaust bypass tee with four stainless steel nuts, lock washers and capscrews.

7. Install U-bolt and exhaust bypass support on exhaust bypass tube, with two nuts, lock washers, capscrews and four washers.

8. Slide seal clamp in position and tighten capscrews on seal clamp to connect exhaust bypass tube.

9. Refer to "Wastegate Installation" in this section and install wastegates.