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July 17, 1997

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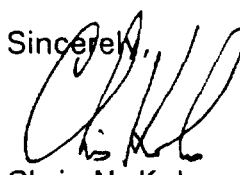
Re: ***Anne M. Tinker, Executrix of the Estate of Timothy W. Tinker, Deceased
vs. A.E. Clevite, et al.*** Ontario County Index No. 83778.

Dear Mr. Lipman:

My letter of July 2, 1997 was not quite right. Enclosed please find what truly is the final production to be made by Mack Trucks, Inc. in response to paragraphs 7 and 11 of Plaintiff's Request for Production.

If you have any questions regarding the above, please do not hesitate to contact me.

Sincerely,



Chris N. Kolos

CNK:jo
Enclosures

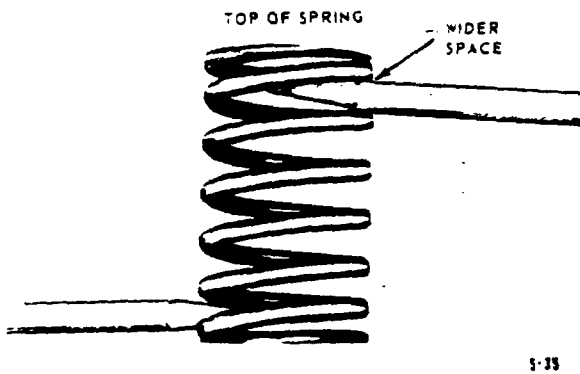


Figure 2-12. Valve Spring

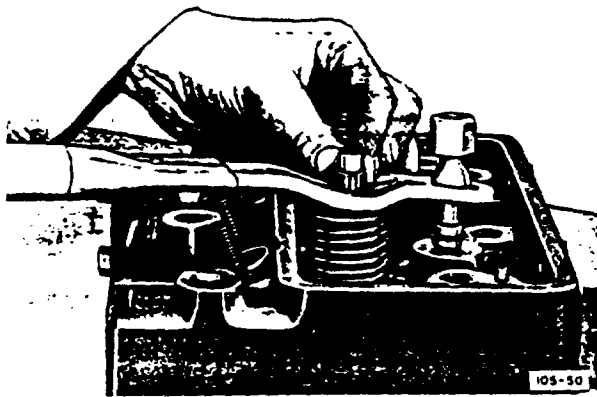


Figure 2-13. Installing Valve Keys

Installing Cylinder Heads

New cylinder head gaskets are installed on the cylinder block with "Top" markup. Check cylinder head studs for secureness in the block; also threads for damage that may cause binding of the stud nuts. Fit cylinder heads over studs lowering on to cylinder head gasket carefully to avoid damage. Install cylinder head stud washers and nuts. Torque nuts in sequence shown with a calibrated torque wrench in progressive steps of 50, 100 and finally 140 lb. ft. (Stud threads oiled). See Figure 2-14.

Install the two water connection flanges, with gaskets, to cylinder head (connecting heads together to permit cooling water circulation through the three cylinder heads), and install thermostat housing (outlet) and gasket to the front head. A blank plate and gasket are used at the rear head.

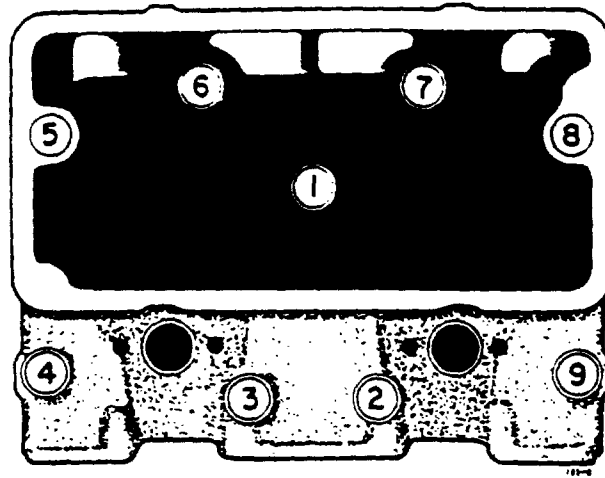


Figure 2-14. Torquing Sequence

Valve Rocker Arm and Shaft Assembly

The valve rocker arm features a bushing. When the bushing is installed, the split must locate on the horizontal plane and face the slipper side of the arm. See Figure 2-15.

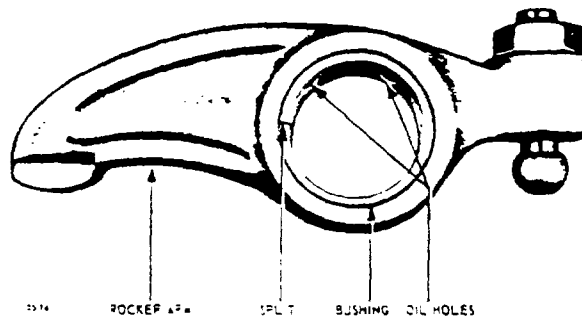


Figure 2-15. Rocker Arm Assembly

Press the bushing in so that it will come flush with the side of the hub which contacts the rocker arm shaft bracket. Two oil holes must be drilled in the bushing. They must be in alignment with the two oil holes provided on top of the arm to feed the slipper and the rocker arm to pushrod adjusting screw with lube oil. Ream bushing I. D. 0.8661 to 0.8669 in., to allow for proper running clearance with a new rocker arm shaft diameter. Check shaft O. D. at unworn area for size, before reaming new bushings to be used with old shaft. Running clearance, 0.0005 to 0.0015 in.

The valve rocker arm shaft is hollow. Two large holes are drilled through the shaft, vertically, at locations where the bracket-to-cylinder head screws are installed. Four positions on the shaft are drilled through the shaft from one side to the other, on a horizontal plane. This provides eight oil feed holes, two for each of four rocker arms. They feed the bushing with lube oil at the 3 and 9 o'clock positions.

The valve rocker arm and shaft assembly must be installed only after the cylinder heads have been properly torqued down.

The valve lifters must be installed with the camshaft in place. The pushrods must then be installed. See Figure 2-16.

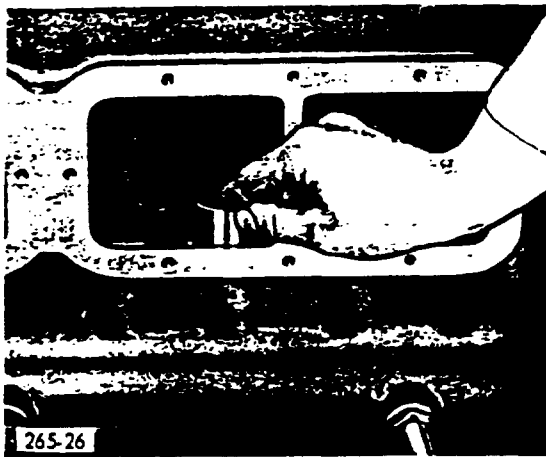


Figure 2-16. Installing Valve Lifter

The rocker arms, shaft, springs and brackets are assembled and secured at each end with large hex head type plugs. The two bracket-to-cylinder head bolts must also be in place before installing the assembly to the head. The bolts are drilled up through the center, and a feed hole drilled on side of the bolt locates inside the rocker arm shaft, on the assembly, to admit lube oil which originates (under pressure) from a passage directed to the bottom of the tapped hole (in the cylinder head) to feed the bracket bolt.

A heavy paper disc type gasket is used between the brackets and cylinder head to prevent oil leakage. Before installing new gaskets, remove any part of the old gaskets that may be adhering to the bracket or head to assure solid seating.

Tighten the bolts equally and finally torque to 40 lbs. ft. maximum. See Figure 2-17.

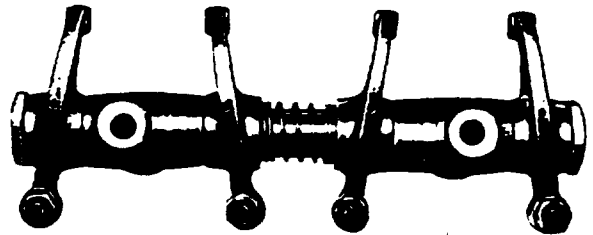


Figure 2-17. Rocker Arm and Shaft Assy.

When the rocker arm and shaft assembly is installed on the engine, carefully check outer rocker arms for possible binding between bracket and hex head plug. Rap opposite end of shaft with hammer to free.

Naturally Aspirated Diesel (END475)

Adjust valve clearance (cold engine setting); inlet valve, 0.014 in. and exhaust valve, 0.018 in.

Turbocharged Diesel (ENDT475)

Inlet valve, 0.014 in. and exhaust valve 0.028 in. Squirt engine oil over valve mechanism and at valve stems for initial protection.

NOTE

As soon as engine is running, observe to be sure lubricating oil is flowing from all rocker arms.

CYLINDER BLOCK

Description

The cylinder and upper crankcase is an integral casting of alloy cast iron. See Figure 2-18. It features replaceable wet-type cylinder sleeves flanged at the top to fit in the counterbores on the cylinder block deck. Three O-ring type seals are employed to seal the lower areas of the sleeve at the water jacket. The O-rings are resistant to oil and heat.

The standard cylinder sleeve I. D. is 4.527. This is the only size available. A worn or scored sleeve must be replaced with a new sleeve because the piston and piston rings are also only available in standard size. Cylinder sleeves may be removed by using puller J-21376 and sleeve puller shoe J-21587. See Figure 2-19.

to 1.457 inch (37mm) is 147.34 lbs. (660N). See Figure 2-19.

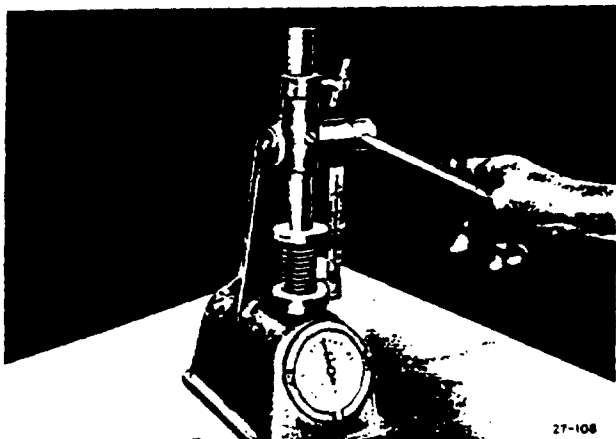


Figure 2-19. Checking Valve Springs

Position inner and outer valve springs over the inlet and exhaust valve stems and install washers, valve stem keys and caps using a suitable spring compressing tool. See Figure 2-20.

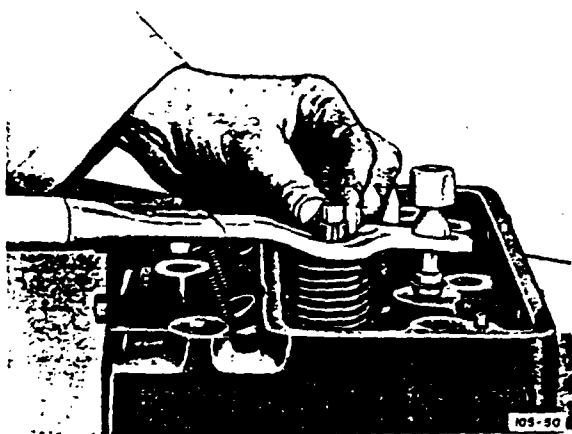


Figure 2-20. Installing Valve Keys

Installing Cylinder Heads

NOTE

A fire ring is formed in the cylinder head gasket when the cylinder head is torqued on the cylinder block; therefore, a new gasket must be used when installing the cylinder head. See Figure 2-21.

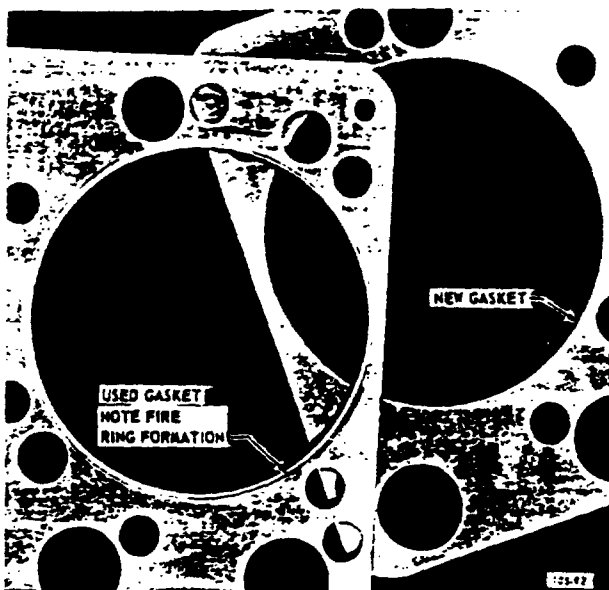


Figure 2-21. Cylinder Head Gasket
(Note: Fire Ring Formed in Left Gasket)

1. Clean the cylinder block deck thoroughly.
2. Check cylinder sleeve height above the deck. (See Figure 2-31.) Install new cylinder head gasket on deck.

NOTE

Do not use a sealing compound or soak cylinder head gasket.

3. Check gasket position. Be sure that all passages are open and not blocked by the gasket. See Figure 2-22.

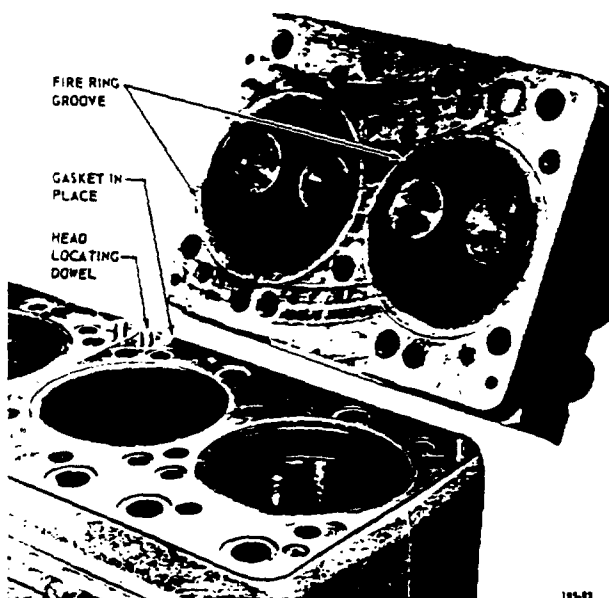


Figure 2-22. Gasket and Cylinder Head Over Cylinder Block

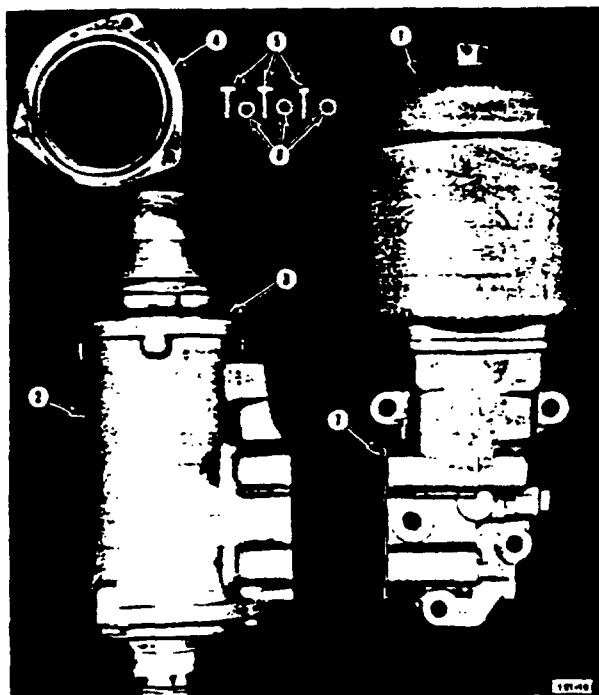
2. Install strainer (6) on bottom plate (4) and insert assembly in rotor cover.
3. Place washer (2) on top of rotor and firmly hand tighten rotor nut (1).
4. Install rotor assembly (Item 4, Figure 2-68) in filter housing. Check rotation - the rotor assembly must rotate easily.
5. Install new O-ring on body cover and attach to filter housing.
6. Firmly hand tighten top "T" handle locknut.

Oil Cooler

The oil cooler does not normally require any form of maintenance. If leakage is suspected, the cooler should be pressure tested. Water side 58 psi (399.9 kPa) oil side 145 psi (999.7 kPa). In case of possible water leakage past the O-ring seals, they must be replaced.

Replacing O-Ring Seals

1. Remove cooler assembly from oil filter (1). See Figure 2-72.



- | | |
|-------------------------------|----------------|
| 1. Oil Filter | 4. End Plate |
| 2. Oil Cooler | 5. Capscrews |
| 3. O-Ring Seal | 6. Lockwashers |
| 7. Oil Cooler Mounting Gasket | |

Figure 2-72. Removing Cooler Assembly from Oil Filter

NOTE

Numbers in () refer to Figure 2-72.

2. Remove capscrews (5) and lockwashers (6).
3. Remove end plates (4).
4. Press element out of housing far enough to expose the O-ring seal (3).
5. Remove O-ring seal (3).
6. Reverse oil filter (1) and remove opposite O-ring seal (3).
7. Place the new O-ring seals (3) in oil for a few minutes.
8. Oil the O-ring seal groove and install new O-ring seal (3) in position.
9. Press core in cooler housing (2) far enough to expose the opposite O-ring seal (3) groove.
10. Lubricate groove and install opposite O-ring Seal (3).
11. Center core in housing and secure by installing end plates (4), capscrews (5), and washers (6).

Turbocharger Oil Filter

The turbocharger oil filter is provided to insure only filtered oil is directed to the turbocharger. See Figure 2-73.

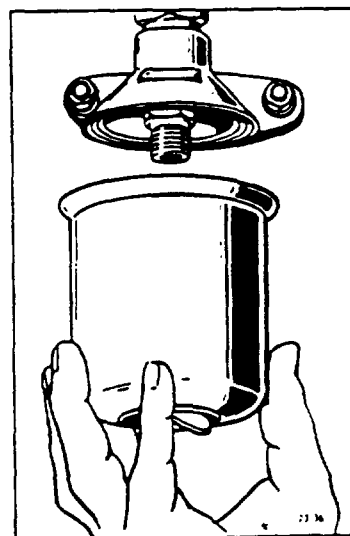


Figure 2-73. Turbocharger Oil Filter

This filter is a spin-on disposable unit. It has an adapter with internal oil passages into and from the filter element.

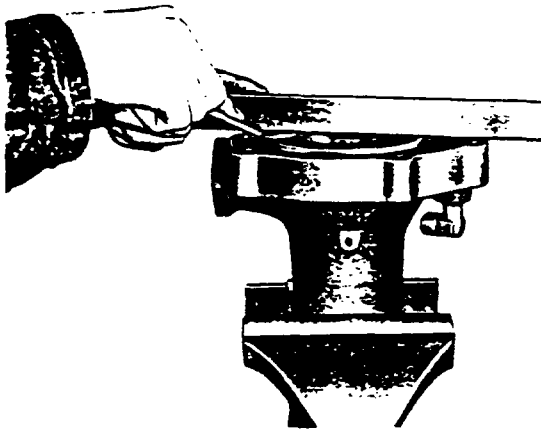


Figure 2-90. Checking Impeller Clearance

9. Install impeller lockwasher and nut and secure.

THERMOSTAT

The thermostat is located above and to the right of the injection pump. See Figure 2-91.

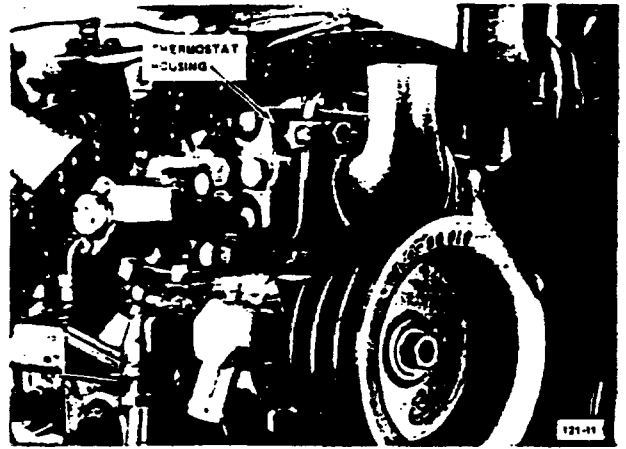


Figure 2-91. Thermostat Housing Location

Removal

To remove the thermostat, first drain the coolant and then remove the outlet housing. See Figure 2-92.

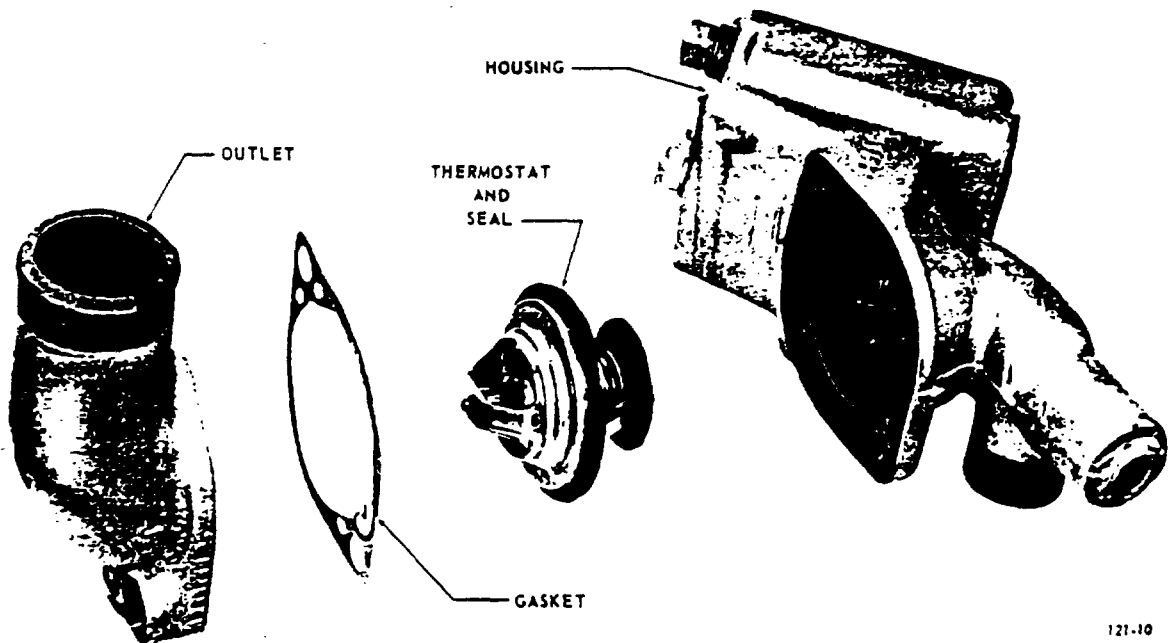


Figure 2-92. Thermostat Housing Exploded View

TURBOCHARGER

Preliminary

Inspect external and visible internal areas for contamination or damage before installing the unit on the engine. Check the condition of the turbine and exhaust manifold mating flanges for uneven surfaces. The

smooth surface is required to assure good gasket clamping for dependable sealing and for longer gasket life.

Make certain that the air cleaner and air tubes are clean, to avoid restricted air flow. New hose connections and dependable clamps should be used and properly secured.

Insert the proper timing gear cover alignment sleeve in the cover, (J-26583 for 4.250 inch nominal O.D. oil seal, and J-24230, with handle J-8092, for 4.00 inch nominal O.D. seal). The sleeve also protects the seal when installing the timing gear cover.

Install two suitable guide studs and position the timing gear cover on the engine using a new gasket.

Install two timing gear cover screws, finger tight. Then tap the cover with a soft-faced hammer, using a straight edge to align the timing cover with the oil pan rail. See Figure 2-129.

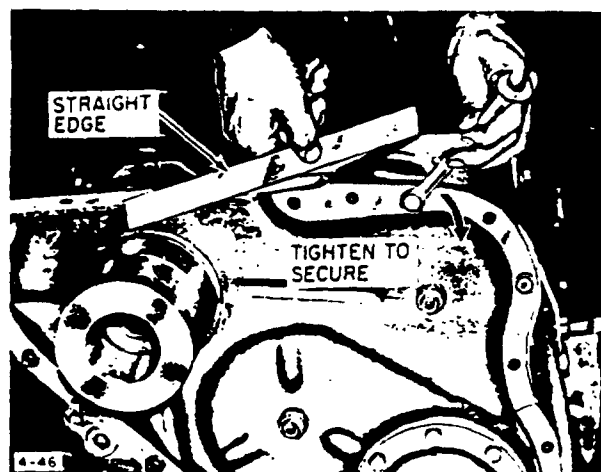


Figure 2-129. Aligning Timing Gear Cover

After timing gear cover has been aligned, remove the guide studs. Install the remaining capscrews and torque to specifications.

To adjust the thrust button, rotate the button clockwise until it is snug against the shaft, (camshaft and auxiliary shaft). Then back out the thrust button 1/4 turn and tighten jam nut. The resulting end-play will then be within specifications. See Figure 2-130.

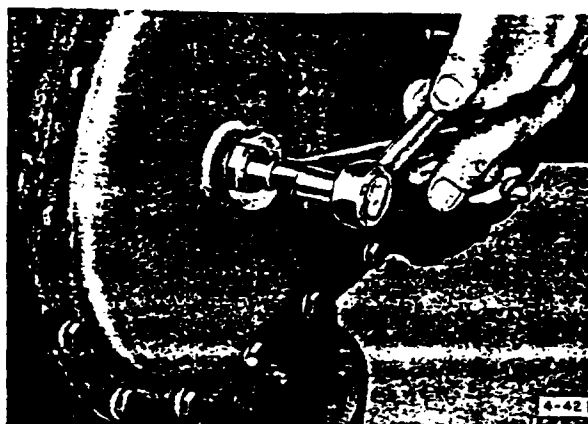


Figure 2-130. Positioning Thrust Button

After thrust buttons have been adjusted, remove the centering sleeve.

Lubricate oil pump drive and driven gears and mount the oil pump assembly to engine. See Figure 2-150.

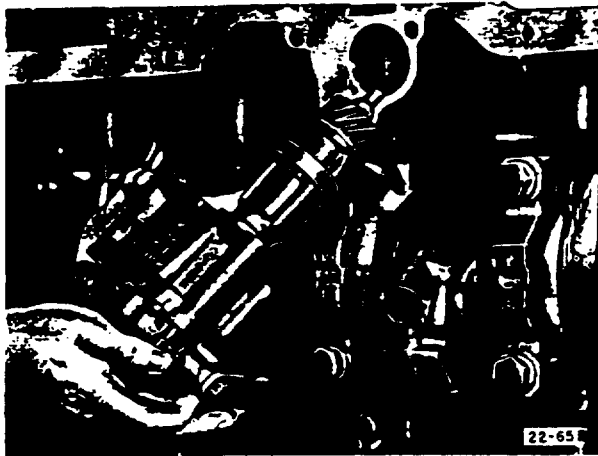


Figure 2-150. Assembly of Oil Pump to Engine

Assemble the oil pump mounting screws and torque to specifications. Check

back lash between gears to make certain that gears are not tight.

Place new gasket on oil pump inlet tube flange and assemble to oil pump. See Figure 2-151.



Figure 2-151. Assembling Oil Pump Inlet Tube

To assist in readily identifying the different cap and spring combinations, refer to Table 4.

TABLE 4

OIL PRESSURE RELIEF VALVE CAP AND SPRINGS
(In Oil Pump)

TYPE OF FILTERING SYSTEM	RELIEF VALVE CAP *	RELIEF VALVE SPRING	SPRING INSPECTION LIMITS
By-Pass Filter	226GB121	572GC11	25.0 lbs. $\pm$ 1.8 lbs. at 2-3/4 in.
Full-Flow By-Pass (Pre-ESI)	226GB122	572GC114	40.0 lbs. $\pm$ 4.0 lbs. at 3-5/64 in.
ESI (With 100 PSI Oil Pressure Gage in Cab)	226GB147	572GC114	40.0 lbs. $\pm$ 4.0 lbs. at 3-5/64 in.
ESI (With 150 PSI Oil Pressure Gage in Cab)	226GB122	572GC114	40.0 lbs. $\pm$ 4.0 lbs. at 3-5/64 in.
ESI Plus	226GB122	572GC114	40.0 lbs. $\pm$ 4.0 lbs. at 3-5/64 in.

* The last three digits of the part number (such as "121") are stamped on the end of the cap for identification.

OIL PAN

Inspect oil pan mounting flange surface for flatness. Correct as required. See Figure 2-152.

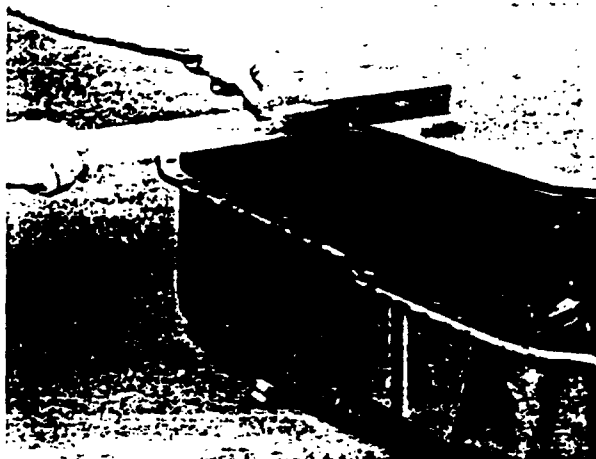


Figure 2-152. Checking Oil Pan Mounting Flange for Flatness

Install new gasket and assemble pan to engine. Assemble capscrews and torque to specifications.

There are three types of oil pans in use on Mack engines. These are "Original Production", "ESI Engines", and "ESI-Plus Engines."

Original Production

Original production engines were built with a 19 quart capacity oil pan. See Figure 2-153.



81-1

Figure 2-153. Original Production Oil Pan (19 Quart Capacity)

ESI Engines

The oil pan capacity was then increased to 28 quarts for use with the ESI (Extended Service Interval) engines. See Figure 2-154.



81-1

Figure 2-154. Oil Pan for ESI Engines (28 Quart Capacity)

ESI Plus Engines

Oil pans for ESI-Plus engines have been made deeper and have an additional increase in oil capacity to 51 quarts. See Figure 2-155.

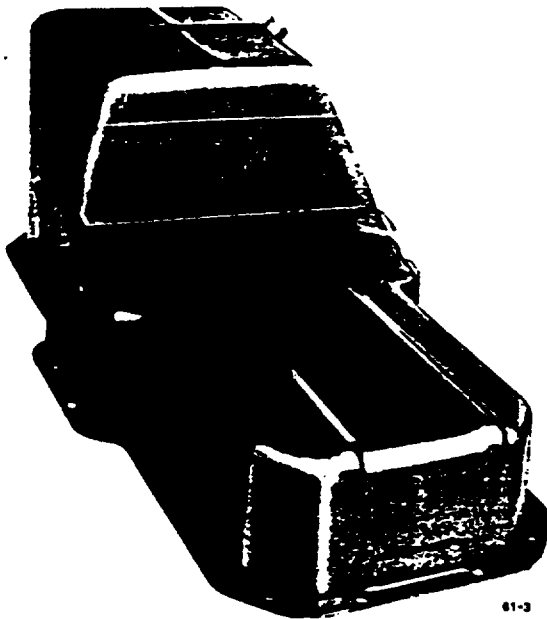


Figure 2-155. Oil Pan for ESI-Plus Engines (51 Quart Capacity)

NOTE

Because of the low mileage normally incurred with on and off highway type vehicles, and also because of ground clearance problems, the new "ESI-Plus" engines are not used in models such as the DM600 or 800, DMM, RD, RM and MB.

Basic Engine Assembly - Oil Pan Applications

Current Basic Engine Assemblies (for Service) are built with the 28 quart capacity oil pan which is required for ESI engines. When this assembly is used to replace an engine not having ESI features, it is recommended that the ESI retrofit kit be installed.

If the original oil filter arrangement is retained, there are two options:

1. Use the new oil pan and add 9 quarts of oil to provide proper oil level in the 28 quart pan.
2. Use oil pan from replaced engine, (19 quart capacity).

If an "ESI-Plus" engine is being replaced, the 28 quart capacity oil pan on the new assembly must be replaced by a 51 quart capacity oil pan.

CYLINDER HEAD

Make certain that cylinder head assembly is in satisfactory condition. (Refer to "Cylinder Head Reconditioning Procedure" on Page 2-225.)

Assemble the correct type of cylinder head gasket to engine. The "folded-steel" type gasket is used with the "flat-flange" type cylinder liner, and the "Maxidyne" type is used with the beaded-flange type liner. See Page 2-155.

All gaskets are pre-coated and do not require any type of sealing compound.

Assemble gasket in cylinder block locating gasket over guide pins. Make certain that surface of gasket marked "Top" is on the top side. With the "Maxidyne" type gasket, carefully fit a new fire ring over the circular bead on each cylinder liner flange. See Figure 2-156.

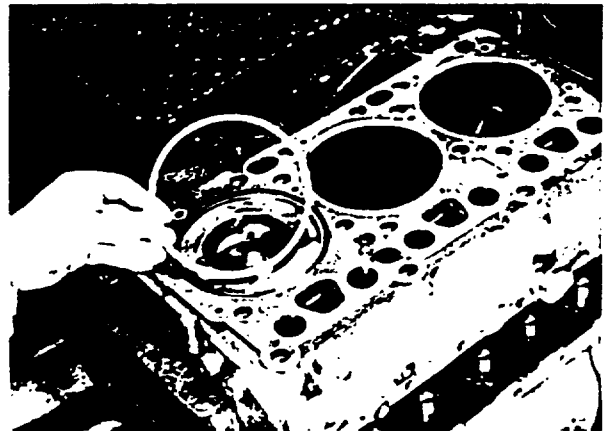


Figure 2-156. Installing Maxidyne Fire Ring

Position the cylinder heads (completely assembled) over the cylinder block, locating the guide holes in the head over the pins in the cylinder block. See Figure 2-157.

If engine has cylinder head studs, check for condition of threads and straightness of shank. Apply a light coat of lubricating oil to threads of studs and install them in cylinder block finger tight, then back off 1/3 turn. Apply a light coat of oil to cylinder head stud washers and nuts and install in position and hand tighten.

6. Continuing adjusting valve lash for the remaining cylinders. in firing order, placing each piston at TDC with respective turning of the engine crankshaft.

NOTE

Engines equipped with the Mack Dynatard® engine brake system will have hydraulic valve lash adjusters in the exhaust rocker arms. Adjust exhaust lash (cold static) using special exhaust valve adjusting tool MVT-36-6. When using tool press downward with hand on exhaust valve adjuster so that the internal clearance in the adjuster is eliminated. Failure to press down on the adjuster will result in unsatisfactory engine performance and unsatisfactory performance of the engine brake.

The MVT-36-6 Exhaust Valve Adjusting Tool is available from:

Automatic Aids
1618 Willow Avenue
La Mott, Philadelphia,
Pennsylvania 19126

For a detailed explanation of the engine brake operation, refer to "Dynatard Engine Brake" section.

CYLINDER HEAD COVER

Check cylinder head covers to make certain that mounting surfaces are flat and clean. Also make certain that gasket surfaces are dry and free from dust.

Apply a thin layer of "Scotch Grip" 3M Co., No. 1711, (or equivalent) contact-type cement to both cover mounting surface and gasket. Let stand for several minutes then assemble adhesive side of gasket to cover.

Allow several minutes for gasket to bond to cover, then assemble covers to engine. Torque capscrews to specifications. See Figure 2-167.

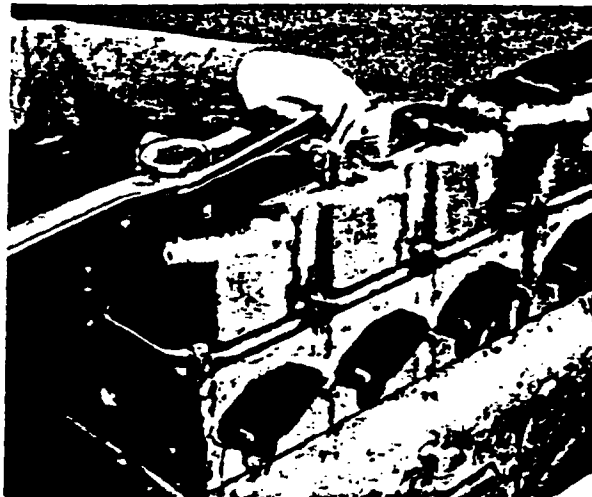


Figure 2-167. Torquing Cylinder Head Cover Capscrews

NOTE

Use of the adhesive between the cover and the gasket will prevent the gasket from squeezing out from under the cover.

Cylinder Head Cover (with Mack Dynatard Engine Brake)

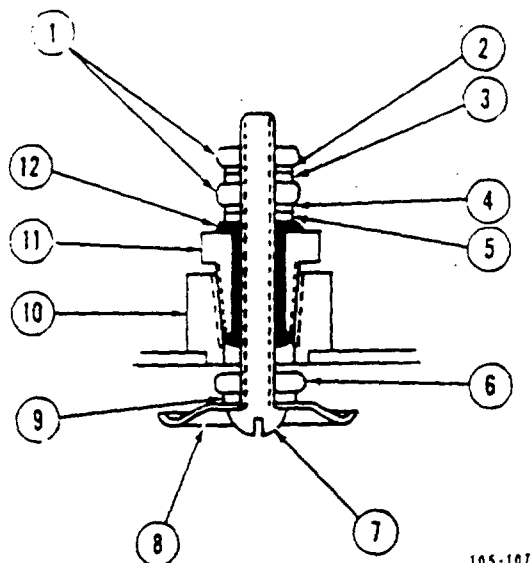
There are two types of terminals assembled to the cylinder head cover. Type No. 1 has a spring steel strip (approximately 3/8 inch wide) which contacts the terminal on the center valve rocker arm shaft bracket. Type No. 2 has a circular contactor spring (approximately 1-5/16 inch in diameter). The circular spring eliminates the need to position the contactor in the horizontal plane.

Type No. 1 Assembly (Non-Current)

1. Assemble insulating washers and/or insulating adapter in terminal hole in cylinder head. See Figure 2-168.

2. Position strip on terminal in cylinder head toward center of engine so that it will come in contact with terminal on center valve rocker arm shaft bracket. Use Loctite and torque nut as specified in Figure 2-168.

3. Loosen nuts holding center screw and adjust screw to obtain dimension shown in Figure 2-168.



105-107

- | | |
|-------------------|------------------------------|
| 1. Nut | 8. Contactor Spring |
| 2. Lock Washer | |
| 3. Terminal Blade | 9. Lock Washer |
| 4. Lock Washer | 10. Cylinder Head Cover Boss |
| 5. Plain Washer | 11. Adapter (Brass) |
| 6. Nut | 12. Insulator (Nylon) |
| 7. Screw | |

Figure 2-171. Engine Brake Terminal Parts Arrangement
Current

To assemble terminal, proceed as follows:

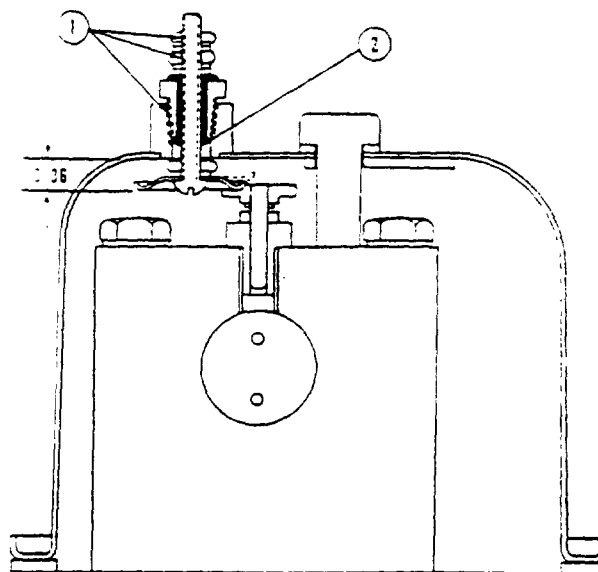
1. Assemble contactor spring to screw with lock washer and nut. Tighten nut.

2. Install the adapter into the cylinder head cover boss, using sealant as specified in Figure 2-172.

3. Assemble screw through the adapter insulator, using sealant. Adjust to dimension as shown in Figure 2-172.

4. Assemble flat washer, lock washer and nut (with sealant) on top side of screw to lock screw at dimension shown in Figure 2-172. Tighten nut.

5. Assemble terminal blade, lock washer, and nut (with sealant), as shown in Figure 2-172. Tighten nut.



105-108

1. Apply one drop of Loctite 290 in threads after assembly. (Three Places).
2. Apply Permatex No. 2 to joint between nylon insert and screw.

Figure 2-172. Engine Brake Terminal Assembly Arrangement (End View)
Current

VALVE LIFTER COVER

Check valve lifter covers for flatness. Use new gaskets and assemble front and rear valve lifter covers. See Figure 2-173.



Figure 2-173. Assembling Valve Lifter Covers

NOTE

If any instruction plates are fastened to the original valve lifter cover, make certain that they are replaced when rebuilding engines.

TACHOMETER DRIVE ASSEMBLY

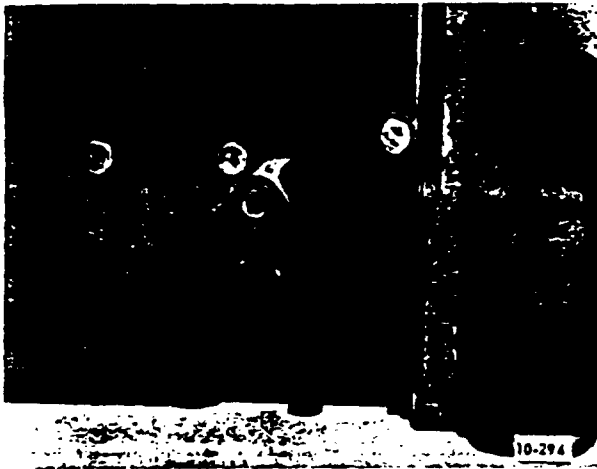


Figure 2-183. Fuel Transfer Pump Mounted to Injection Pump

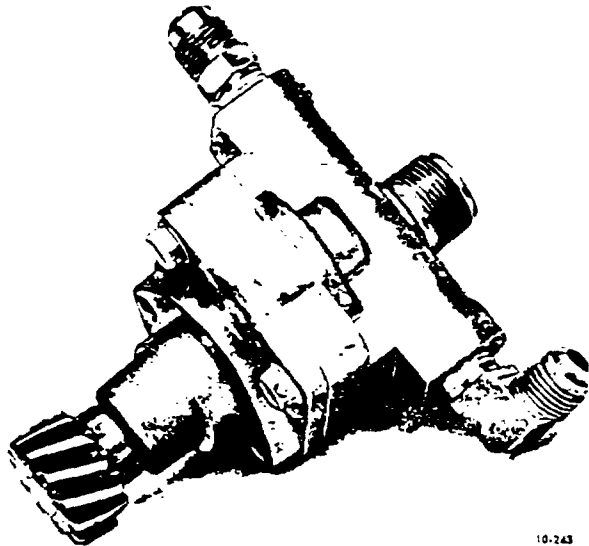


Figure 2-184. Combination Fuel Transfer Pump and Tachometer Drive

This unit is assembled at the tachometer drive hole location. Lubricate shaft and gear. Always use a new gasket when installing pump. Use flat washers and capscrews for securing pump to block. Tighten capscrews.

Assemble fuel inlet line to transfer pump inlet.

NOTE

For complete details on the two types of transfer pumps, refer to the "Fuel Section" in this manual.

There are two types of tachometer drive assemblies in use. One assembly is used solely to drive the tachometer, while the other is a combination fuel transfer pump and tachometer drive. (The combination drive assembly is covered in the preceding section of this manual.)

Lubricate tachometer shaft and gear. Install tachometer drive assembly in cylinder block, using new gaskets and flat washers under mounting capscrews. Tighten capscrews. See Figure 2-185.

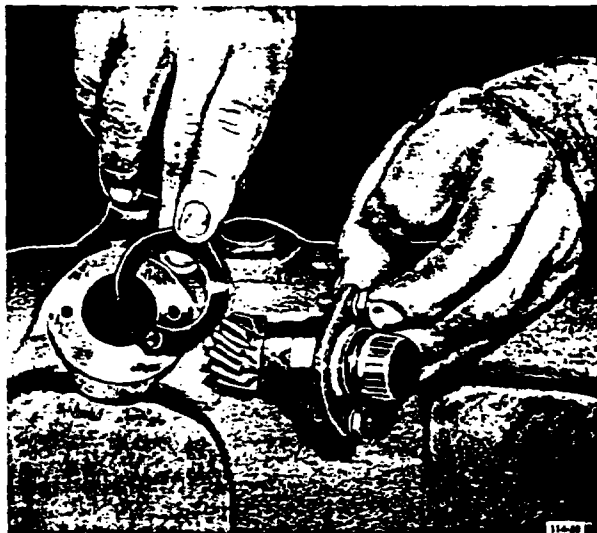


Figure 2-185. Installing Tachometer Drive Assembly

EXHAUST, INLET AND WATER MANIFOLDS

Exhaust Manifold

After checking exhaust manifold for restrictions, cracks or wear, assemble on cylinder head exhaust manifold mounting studs, using new gaskets. Position plain washer and nut locking tab over studs, and assemble nuts to studs. Torque nuts to specifications. See Figure 2-190.



Figure 2-190. Torquing Exhaust Manifold Stud Nuts

After nuts are torqued, bend locking tab to secure nut. One-half of tab is bent against flat on nut and the other half is bent against side of manifold flange.

Inlet Manifold

Check inlet manifold to make certain flanges are flat and there are no cracks or foreign material in manifold.

NOTE

On engines equipped with turbochargers, assemble turbo oil feed line to oil filter adapter before assembling inlet manifold.

CAUTION

If turbocharger oil feed check valve is in system on ESI engines, it should be removed, since field tests indicate it is not required.

Position lockwasher on capscrew and insert in flange holes. Using new gaskets, assemble manifold to engine. Tighten capscrews to specifications.

NOTE

Some installations use a "Patch-Lock" capscrew for mounting the inlet manifolds. With these screws, lockwashers are not required.

On Charge Air Cooling engines, assemble rear half of inlet manifold after charge air cooler header is in position. Use new gaskets and rubber hose connection. Tighten capscrews to specifications. Tighten hose clamps.

Water Manifolds

Non-Charge Air Cooling

Inspect the water manifolds for restrictions, cracks, and flange wear. Assemble hose and clamps at center section of front inlet manifold. Using lockwashers, proper length capscrews, and new gaskets, assemble manifold to engine. Assemble rear water manifold to engine and tighten all capscrews. Position hose to suitable cover front and rear section for proper clamping area. Tighten hose clamps.

Charge Air Cooling

On these engines assemble rear section of water outlet manifold after charge air cooler manifold is in position. Use new gaskets and rubber hose connection. Tighten capscrews to specifications. Tighten hose clamps. See Figure 2-191.

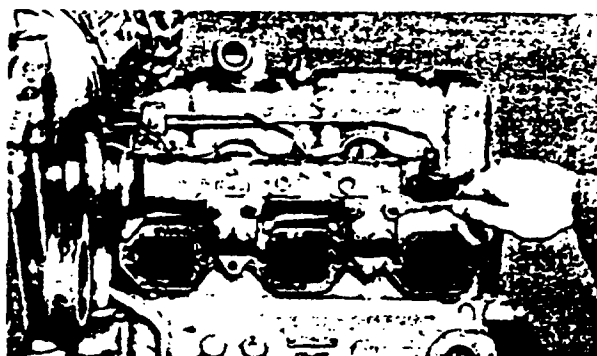


Figure 2-191. Installing Rear Water Outlet Manifold

OIL COOLER

Make certain that oil cooler is in satisfactory condition. (Refer to "Oil Cooler Rebuild" Sub-Heading.)

Assemble the oil cooler and oil filter lube oil fitting to the oil cooler, using a new O-ring gasket. Snug capscrews.

Assemble thermostat by-pass tube, hoses, and clamps, at the oil cooler water inlet fitting.

Assemble oil cooler to engine using new gasket between cooler inlet fitting and water pump. Snug capscrews. See Figure 2-192.



Figure 2-192. Assembling Oil Cooler to Engine

Assemble oil cooler oil inlet tube to cooler, using new O-ring. Before fastening inlet tube to cooler, lubricate O-ring in oil filter fitting and insert tube into fitting. Snug capscrews.

NOTE

The snugged capscrews are tightened when the oil pressure relief valve housing is assembled to the engine. This will permit alignment of all connecting parts.

WATER PUMP

Make certain that water pump is in satisfactory condition. (Refer to Sub-Heading "Water Pump Rebuild".)

Assemble water pump to cylinder block using new gasket. Install capscrews and lockwashers, and torque to specifications. See Figure 2-193.

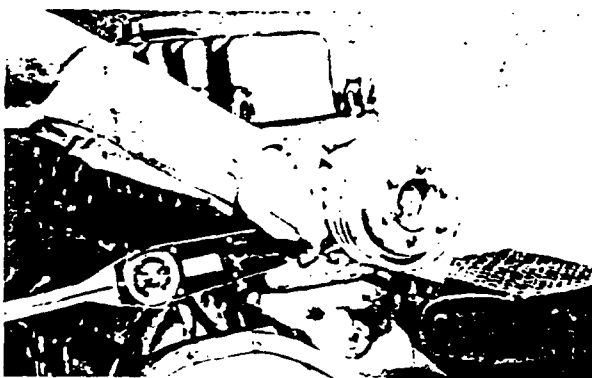


Figure 2-193. Water Pump Installation

OIL PRESSURE RELIEF VALVE

Refer to Sub-Heading "Lubrication System" for correct oil pressure relief valve housing.

Align gasket on mounting flange of relief housing to ensure that the proper gasket is used. See Figure 2-194.

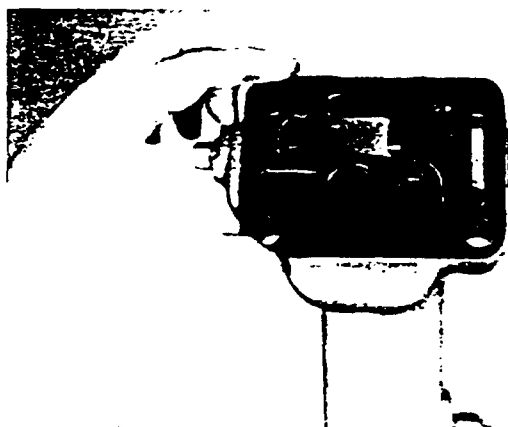


Figure 2-194. Checking Oil Pressure Relief Valve Housing Gasket

CAUTION

Failure to use proper gasket could result in insufficient oil pressure, and cause engine damage.

THERMOSTAT

Install new thermostat seal in water outlet fitting using tool J-26637. See Figure 2-205.

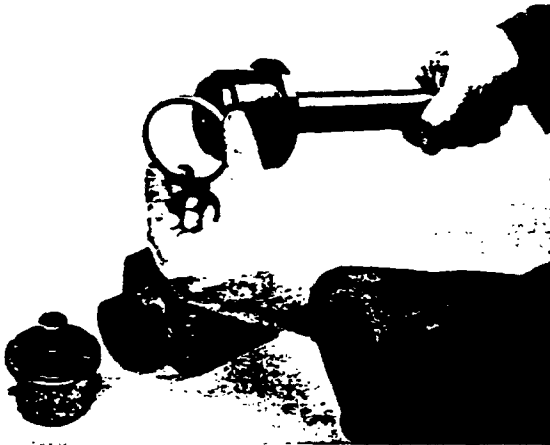


Figure 2-205. Installing Thermostat Seal

Using new thermostat and gasket, assemble fitting to water outlet manifold.

Attach hose from thermostat by-pass tube to water outlet fitting and tighten hose clamps.

COOLANT CONDITIONER

There are two basic types of coolant conditioner arrangements in use.

Type I. - Engines equipped with 150°F. (or 170°F.) thermostats having a higher opening temperature shutterstat.

Type II. - Engines equipped with a 170°F. thermostat and no shutterstat or a lower opening shutterstat.

Type I

With this arrangement, two ball check valves are assembled in the coolant conditioner adapter. The direction of the coolant flow into the adapter is indicated by cast arrows shown on top of the adapter. See Figure 2-206.

Take note of the direction of the arrows so that check valves can be properly installed. The open end of

the valve should be located in the direction of the arrows. The ball checks are located so that they are unseated by the direction of coolant flow.



Figure 2-206. Coolant Conditioner Adapter

Type II

Engines equipped with the 170°F. thermostat and no shutterstat (or an optional shutterstat which operates at a lower temperature), have an external coolant feed line. This system eliminates the inlet check valve that was in the adapter. Instead, the inlet check valve is included with the water inlet fitting which is assembled into the adapter.

When assembling adapter to thermostat housing, always use new O-ring in check valve counterbore. See Figure 2-207.



Figure 2-207. Assembling Coolant Conditioner Adapter

Before assembling coolant conditioner to adapter, apply a film of oil to the sealing gasket. Tighten conditioner one full turn after gasket contacts adapter.

OIL COOLER REBUILD

Oil Cooler Disassembly

1. Remove water inlet and outlet end caps. See Figures 2-287 and 2-288.



Figure 2-287. Removing Water Inlet End Cap

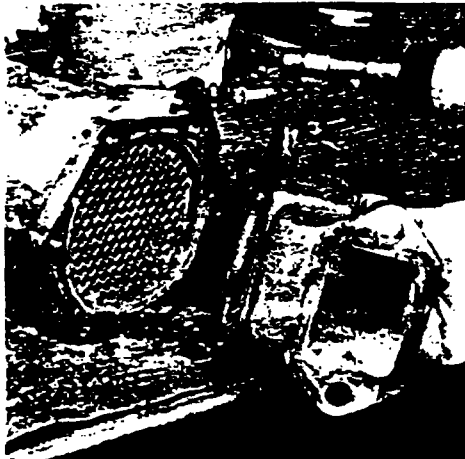


Figure 2-288. Removing Water Outlet End Cap

2. Remove bundle from housing. See Figure 2-289.

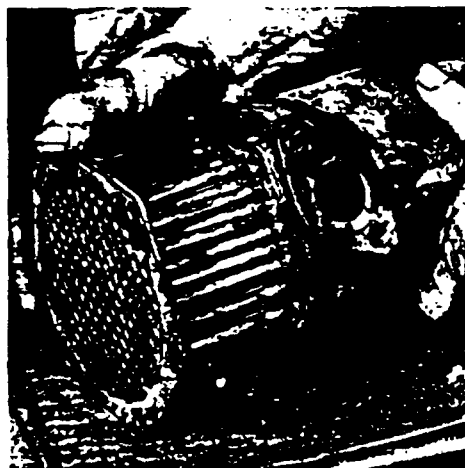


Figure 2-289. Removing Bundle

3. Scrape off end cover gaskets. See Figure 2-290.



Figure 2-290. Scraping End Cover Gasket

4. Remove oil supply line gasket. See Figure 2-291.

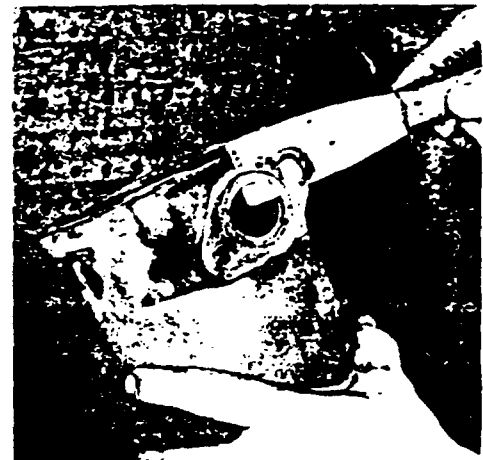


Figure 2-291. Scraping Oil Supply Line Gasket

5. Remove O-ring from housing. See Figure 2-292.



Figure 2-292. Removing O-Ring

NOTE

Visually inspect the housing for cracks which could lead to a leak. If the housing is damaged, replace with new.

6. The oil cooler bundle should be checked for leaks by pressurizing with 80 PSI air pressure and submerging in water. If leaks develop, replace bundle with new. See Figure 2-293.



Figure 2-293. Water Testing Bundle

Oil Cooler Assembly

1. Lubricate O-ring. See Figure 2-294.



Figure 2-294. Lubricating O-Ring

2. Install O-ring in groove at water outlet end of the oil cooler. See Figure 2-295.

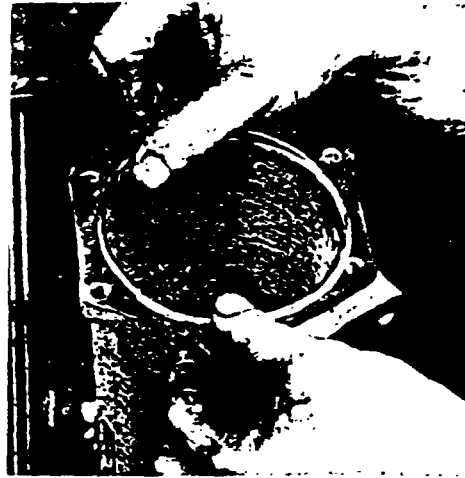


Figure 2-295. Installing O-Ring

3. Spread Perma-Tex gasket sealer on inlet water flange before installing gasket. See Figure 2-296.



Figure 2-296. Applying Gasket Sealer to Housing

4. Install gasket on water inlet end of housing. See Figure 2-297.



Figure 2-297. Installing Gasket

5. Spread Perma-Tex gasket sealer on top of gasket. See Figure 2-298.



Figure 2-298. Applying Gasket Sealer on Gasket

6. Install bundle. Tap last 1/2 inch with a soft-faced hammer to seat bundle past O-ring. See Figures 2-299 and 2-300 .

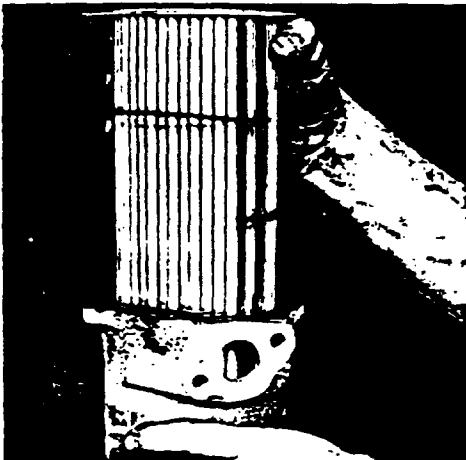


Figure 2-299. Installing Bundle



Figure 2-300. Tapping Bundle into Housing

7. Spread Perma-Tex gasket sealer on bundle end. See Figure 2-301.



Figure 2-301. Applying Gasket Sealer on Bundle

8. Place gasket on bundle end. See Figure 2-302.

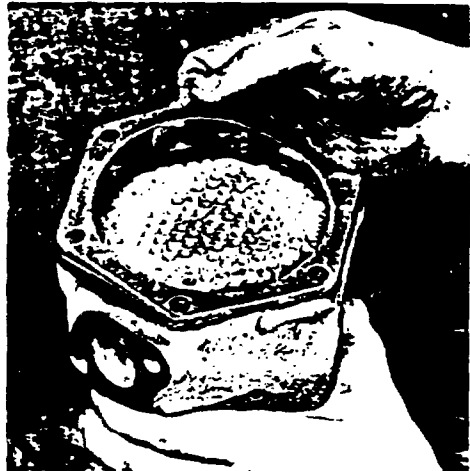


Figure 2-302. Placing Gasket on Bundle

9. Spread Perma-Tex gasket sealer on top of gasket before installing the end cap. See Figure 2-303.



Figure 2-303. Applying Gasket Sealer on Gasket

10. Install water inlet end cap. See Figure 2-304.

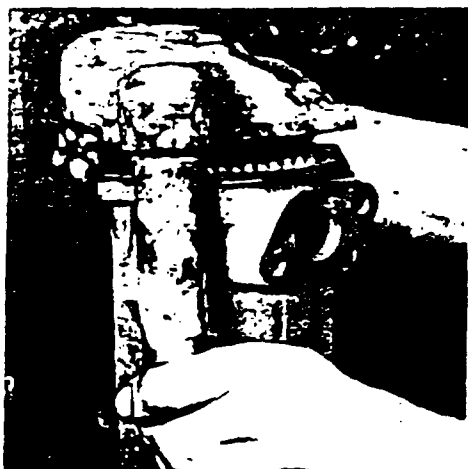


Figure 2-304. Installing Inlet End Cap

11. Torque inlet end cap capscrews to 13 lb.ft. See Figure 2-305.

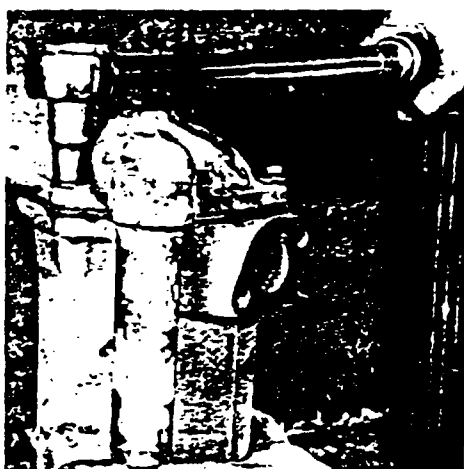


Figure 2-305. Torquing Inlet End Cap Capscrews

NOTE

To install the water outlet end cap, spread Perma-Tex gasket sealer on housing flange. Place the gasket on the sealer then put seal on top of the gasket. Install the end cap and torque capscrews to 13 lb. ft.

Pressure Test Oil Cooler Assembly

1. Install a steel plate with a rubber gasket and an air line fitting on the oil inlet opening. See Figure 2-306.

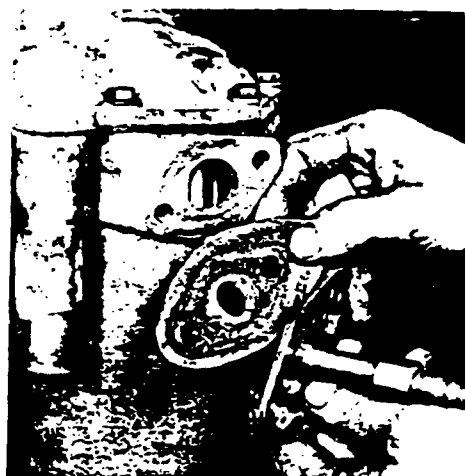


Figure 2-306. Installing Oil Inlet Plate

2. Install a steel plate with a rubber gasket on the oil outlet opening. See Figure 2-307.

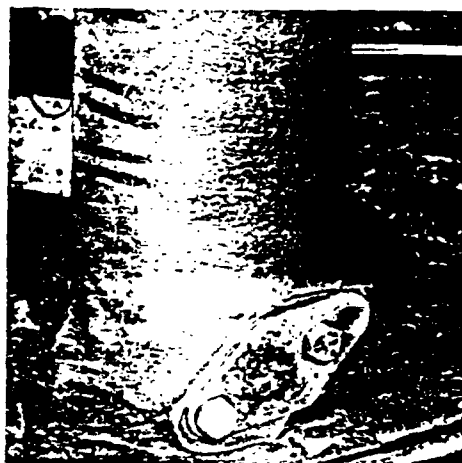


Figure 2-307. Installing Oil Outlet Plate

3. Connect air line and pressurize to 80 psi. Submerge in water to check for leaks. See Figure 2-308.



Figure 2-308. Pressure Testing Completed Assembly

18. Torque pulley nut to 100 lb.ft.
See Figure 2-334.

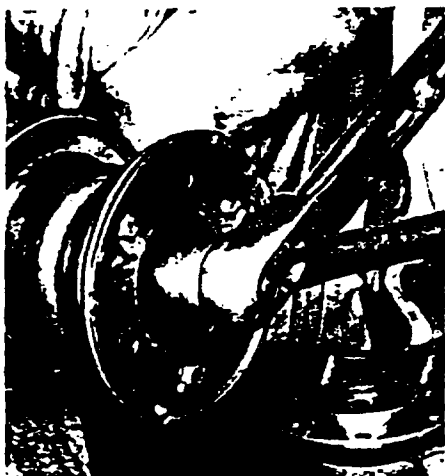


Figure 2-334. Torquing Pulley Nut

20. Place gasket on sealer making
sure to line up the holes. See
Figure 2-336.



Figure 2-336. Applying Gasket

21. Position housing cover assembly
over housing. See Figure 2-337.



Figure 2-337. Positioning Housing
Cover

19. Place gasket sealer on the gasket
seating surface of the housing. See
Figure 2-335.



Figure 2-335. Applying Gasket Sealer

22. Coat housing cover capscrew
threads with sealing compound and
tighten. See Figure 2-338.

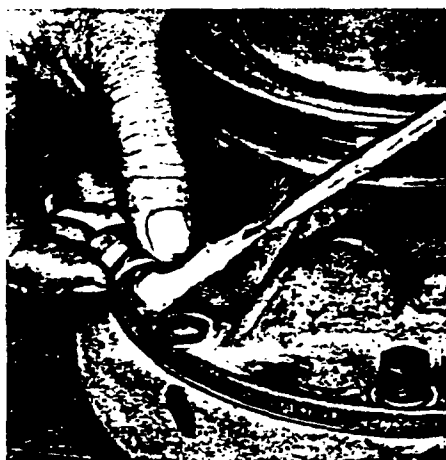
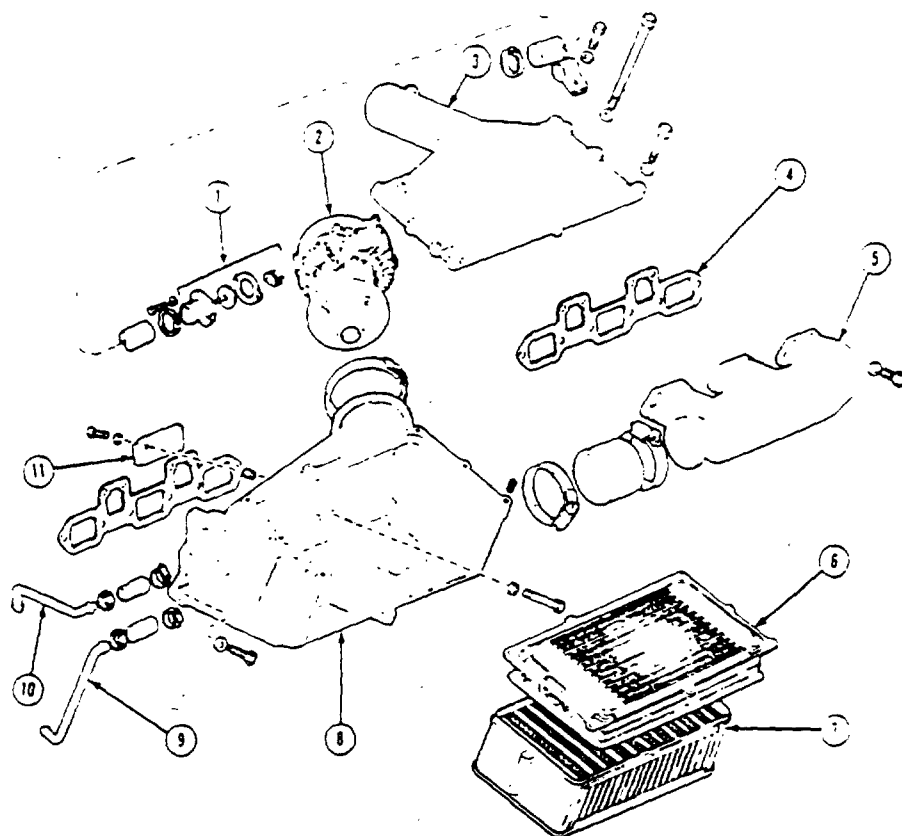


Figure 2-338. Applying Sealer to
Capscrews



107-2

- | | | |
|--------------------------|------------------------|------------------------------|
| 1. Air Valve Assembly | 5. Rear Inlet Manifold | 9. Water Outlet Tube |
| 2. Tip Turbine Fan | 6. Water-to-Air Core | 10. Water Inlet Tube |
| 3. Header Plate | 7. Air-to-Air Core | 11. Housing Mounting Bracket |
| 4. Inlet Manifold Gasket | 8. Housing | |

Figure 2-357. Exploded View of Series Charge Air Cooling Arrangement

Series Charge Air Cooling

The two stage, or series, charge air cooling arrangement combines a water-to-air heat exchanger with an air-to-air heat exchanger. The combination of these two units lowers the temperature of the air coming from the turbocharger to the inlet manifolds by about 180 degrees F. [100 degrees C.] See Figure 2-357.

The coolant for the water-to-air heat exchanger is drawn off the top of the water pump, circulated through the core and returned to the cooling system via the oil cooler end cap. See Figure 2-357.

Assembly Charge Air Cooling Arrangement

1. To install the charge air cooling housing and intake manifold, place two locating guide pins in the cylinder head to help in positioning the manifold. Assemble gasket over guide pins and position manifold over pins. Install mounting capscrews (patch-lock) and torque to 35-45 lb.ft.

2. Install the thermostat housing. See Figure 2-381.

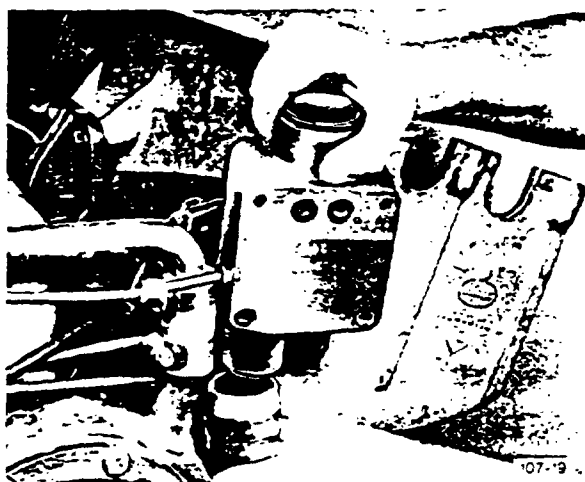


Figure 2-381. Installing Thermostat Housing

3. Install the lower two capscrews in the thermostat housing. Torque to 12-14 lb.ft. See Figure 2-382.

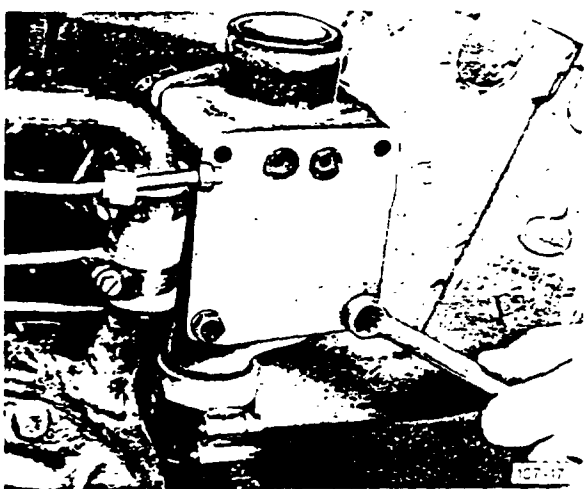


Figure 2-382. Lower Capscrews Location

4. Position the hose clamps and tighten. See Figure 2-383.

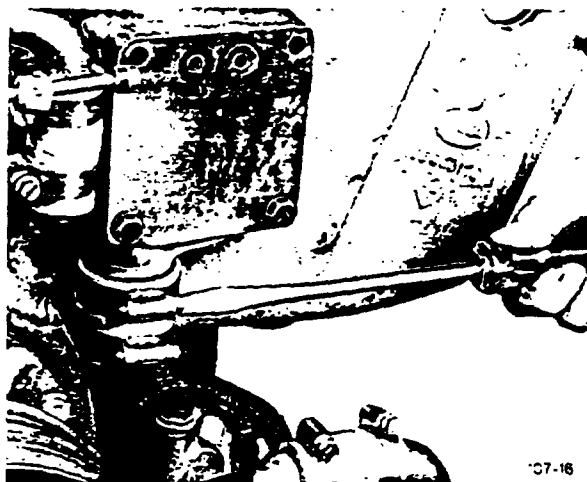


Figure 2-383. Clamps Locations

5. Install the coolant conditioner mounting plate and torque capscrews to 12-14 lb.ft. [8.85-10.32 Nm]. See Figure 2-384.



Figure 2-384. Installing Mounting Plate

6. Install coolant conditioner by hand. Tighten conditioner 3/4 turn after the gasket comes in contact with the mounting plate.

7. Install the coolant conditioner inlet line. See Figure 2-385.

12. Connect and tighten the turbo-charger oil feed line. See Figure 2-390.



Figure 2-390. Connecting Oil Line

13. Install the air-to-air core in the housing. Then install the water-to-air core being careful not to damage the ends that extend through the housing.

NOTE

Wipe housing or gasket surfaces with talcum powder or Dow Corning 44 silicone grease before installing in housing to prevent gasket sticking.

14. Install the header plate and capscrews. Torque capscrews to 23 lb. ft. See Figure 2-391



Figure 2-391. Installing Headplate Capscrews

15. Position and tighten the tip turbine fan bleed line clamps. See Figure 2-392.



Figure 2-392. Clamp Locations

16. Series Charge Air Cooling Only - Place the water inlet and outlet tubes into the water-to-air core.

17. Series Charge Air Cooling Only - Tighten clamps at both ends of the water tubes. See Figure 2-393.

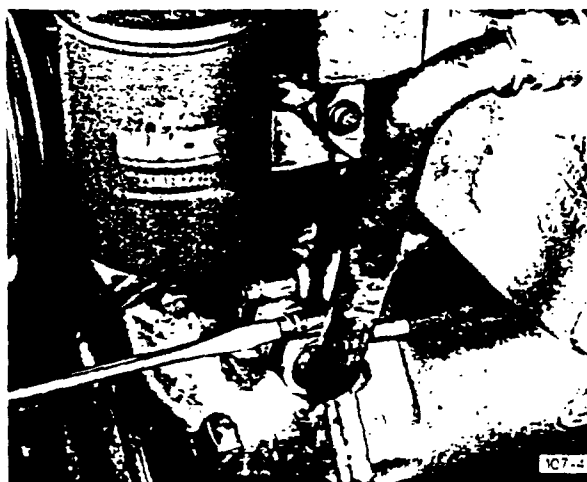


Figure 2-393. Clamp Locations

18. Position and tighten the turbo-charger crossover tube connecting sleeve clamps. See Figure 2-394.

AIR-TO-AIR HEAT EXCHANGER

Cleaning the Air-to-Air Heat Exchanger

NOTE

The cleaning procedure and the gasket replacing procedure is the same for both the air-to-air heat exchanger and the air-to-air portion of the series heat exchanger. This can be done by either one of two methods.

1. Steam cleaning.

CAUTION

Steam pressure exceeding 40 psi and/or temperatures exceeding 400 degrees F. can damage core and gaskets.

2. Detergent cleaning.

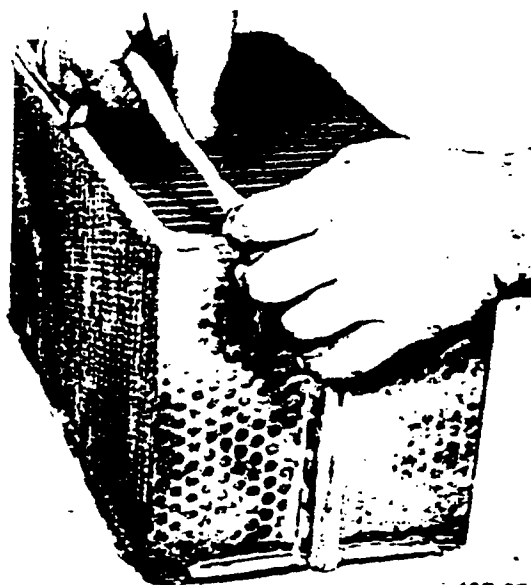
Use a solution of household laundry detergent. Flush through the core several times followed by a rinse with warm water. Use low pressure air to blow dry.

CAUTION

Do NOT under any circumstances use strong caustic solutions such as "Oakite" or acids such as bowl cleaners, hydrochloric acid, etc. as they will corrode the core and damage the gaskets. Also, do NOT use shop solvents to clean the core as they will damage the gaskets.

Gasket Removal

1. Pull off old gaskets. See Figure 2-395.



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Figure 2-395. Pulling Gasket

2. Using a razor blade or a sharp knife, cut away the excessive bonding material. See Figure 2-396.

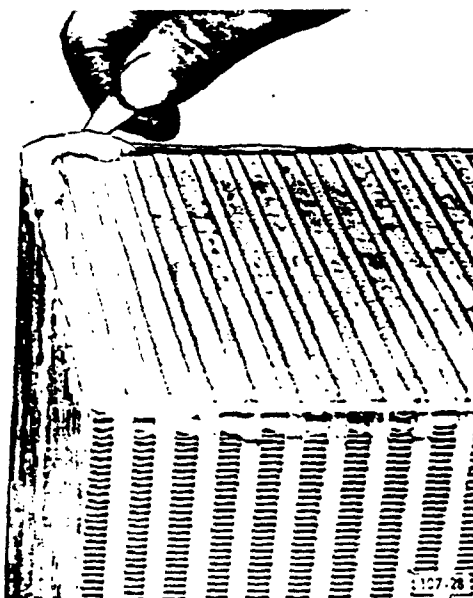


Figure 2-396. Cutting Material

NOTE

It is not necessary to remove all the bonding material out of the depressed areas since the new gasket will seal perfectly to the slightly uneven old gasket surface.

3. Remove all loose shavings and cuttings.

Gasket Installation

NOTE

The unit must be clean and dry before installing the new gaskets.

1. Place the unit on a flat workbench with the gasket surface up. (The turbocharger air flow arrow pointing up or down.)

2. Soak a clean rag with alcohol and wipe the old gasket surface and the new gasket to remove all oily residue.

3. Run a bead of silicone rubber bonding agent on the corners of the core. See Figure 2-397.

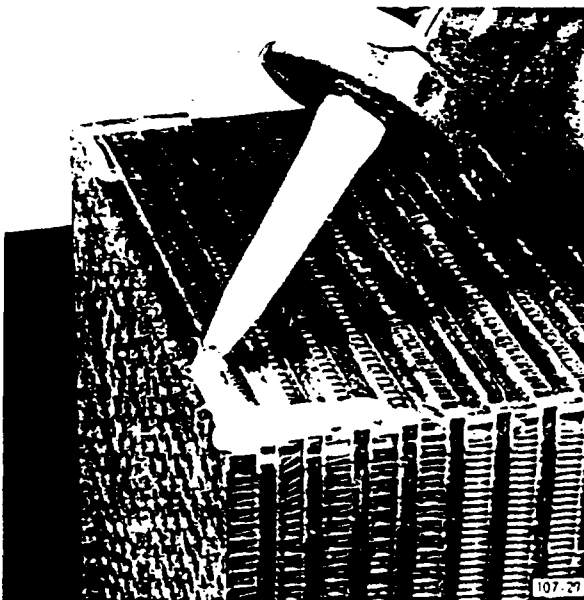


Figure 2-397. Applying Agent to Core

4. Run a bead of silicone rubber bonding agent on the four sides of the new gasket. See Figure 2-398.

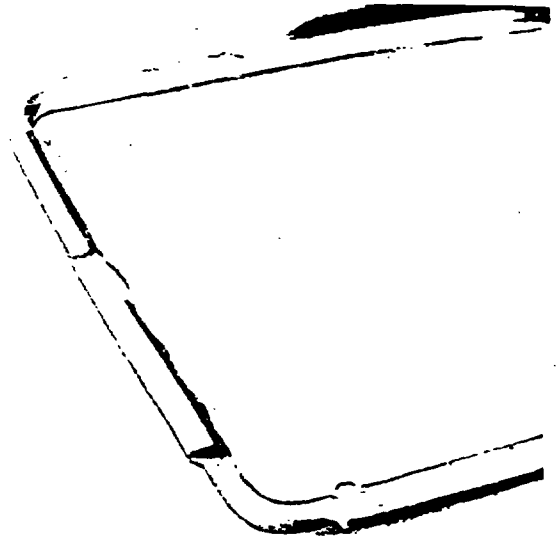


Figure 2-398. Applying Agent to Gasket

5. Place gasket on core and adjust into place. See Figure 2-399.



Figure 2-399. Placing Gasket

CAUTION

Refer to diagrams on gasket shipping container for proper installation position.

6. Invert the core and repeat steps 3 through 5 for the second gasket.

NOTE

If the end gaskets are damaged, proceed with steps 7 through 10; otherwise, omit these steps and proceed with step 11.

7. Remove the old end gasket. See Figure 2-400.

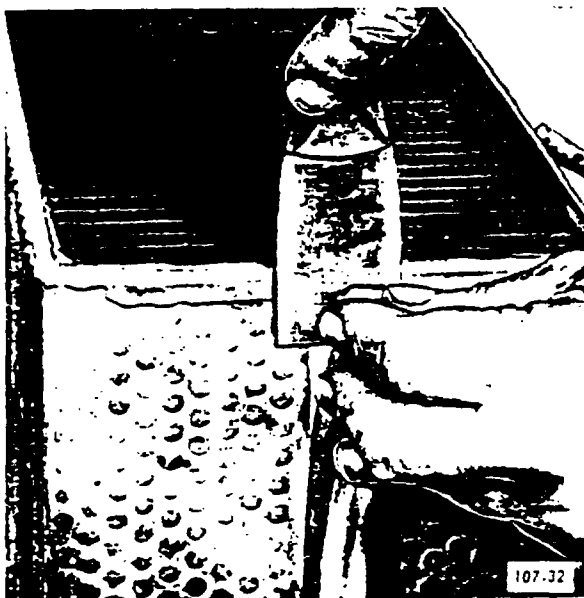


Figure 2-400. Removing End Gasket

8. Soak a clean rag with alcohol and wipe the old gasket surface and the new gasket to remove all oily residue.

9. Run a bead of silicone rubber bonding agent on the flat side of the new gasket. See Figure 2-401.

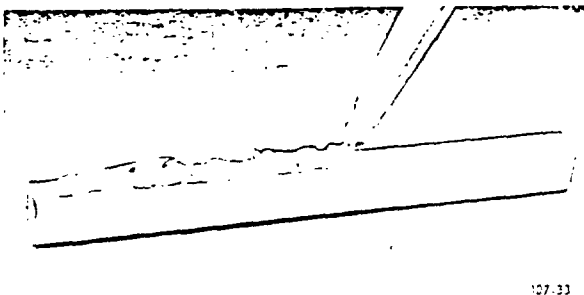


Figure 2-401. Applying Agent to End Gasket

10. Place new gasket into position. See Figure 2-402.

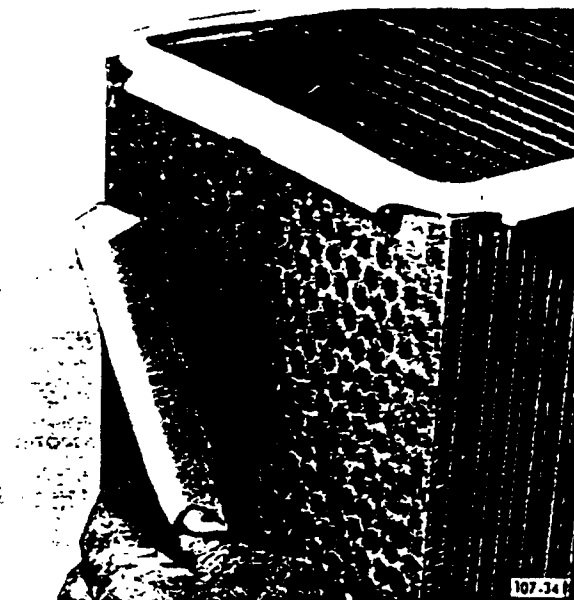


Figure 2-402. Placing Gasket

NOTE

Hold the end gaskets in position with string or tape wrapped around the entire unit until the bonding agent takes a set.

11. Check all the gaskets to make sure they have not shifted during handling.

NOTE

The gaskets may be adjusted during the first five minutes while the silicone rubber bonding agent is curing.

12. Let the entire unit stand undisturbed for 1 to 1-1/2 hours minimum before installing.

13. Visually inspect the bond after curing to make sure that the gasket is firmly attached all the way around. Gaps that are found should be filled with additional silicone rubber bonding agent. Let cure.

CYLINDER HEAD GASKETS

Two (2) types of cylinder head gaskets are currently being used during engine rebuild. The "folded-steel" type gasket (see Figure 11) is used with the "flat-flange" type cylinder liner (see Figure 12).

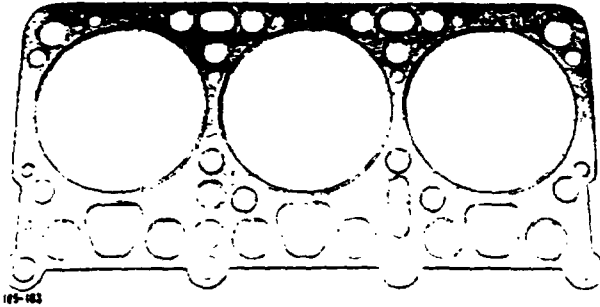


Figure 11. Folded-Steel Type Gasket

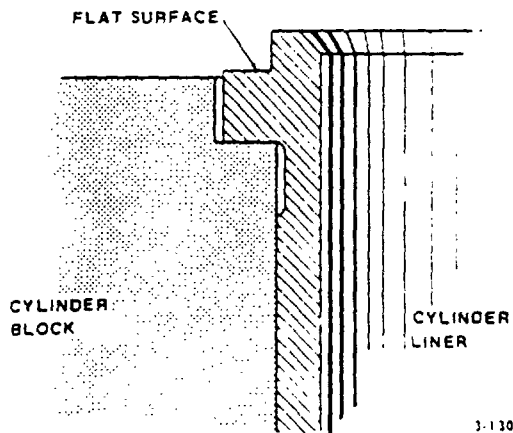


Figure 12. Flat-Flange Type Cylinder Liner

The "Maxidyne-Type" gasket (consisting of a one-piece composition gasket and three (3) fire rings as shown in Figure 13) must be used with the beaded-type liners as shown in Figures 14 and 15.

NOTE

Before assembly of cylinder head, always check the circular grooves in the head surface directly opposite the liner bead. They must be 0.008 in. deep and absolutely clean to assure a good fire ring seal.

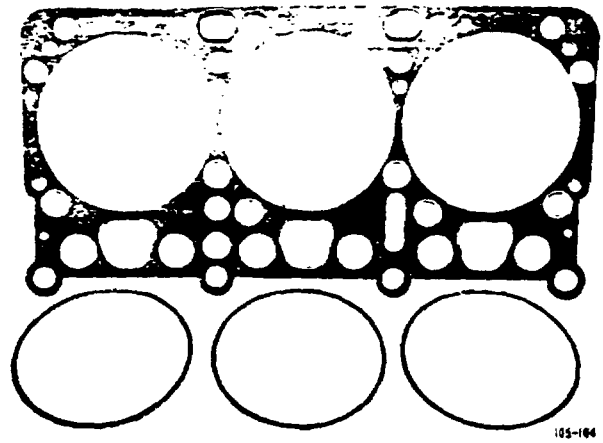


Figure 13. Maxidyne-Type Gasket (with Fire Rings)

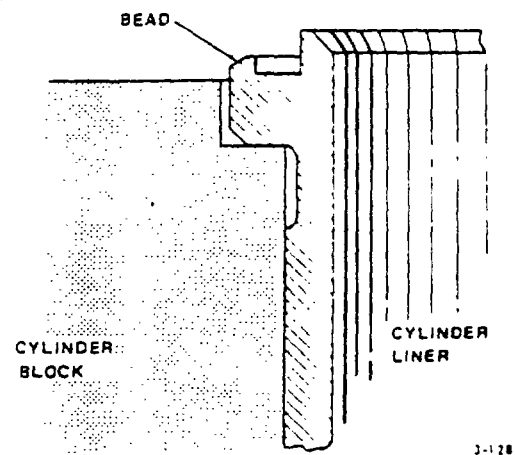


Figure 14. Beaded-Type Cylinder Liner (4-7/8 In. Bore)

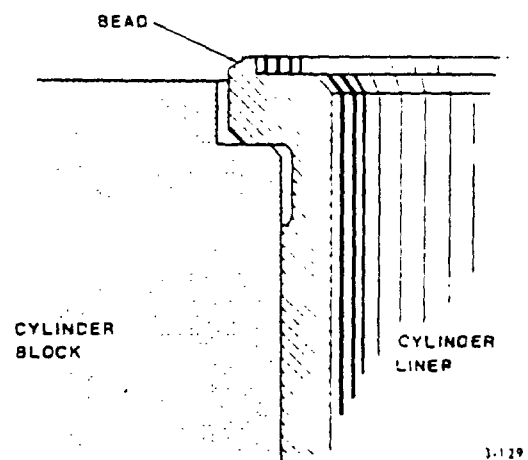


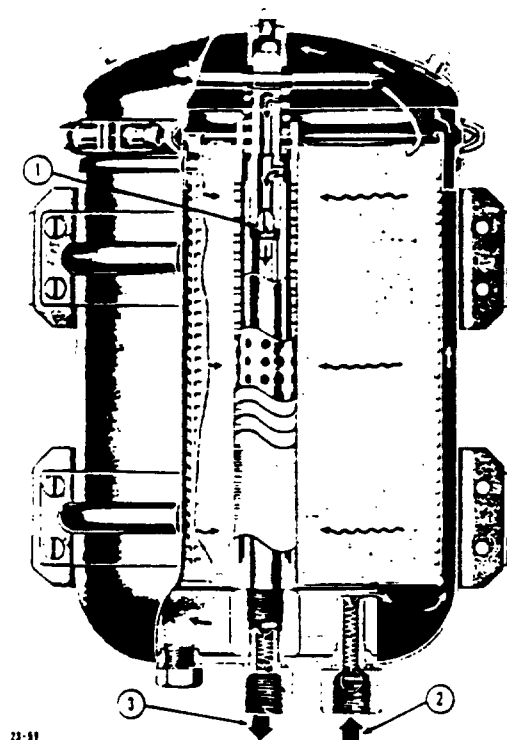
Figure 15. Beaded-Type Cylinder Liner (5 In. Bore-END707 and END711 Engines)

CAUTION

Always use new gaskets and fire rings when assembling engines.

OIL FILTERS

Early engine models had by-pass type oil filters. The quantity of oil going through this type of filter is controlled by a metering orifice. See Figure 65.

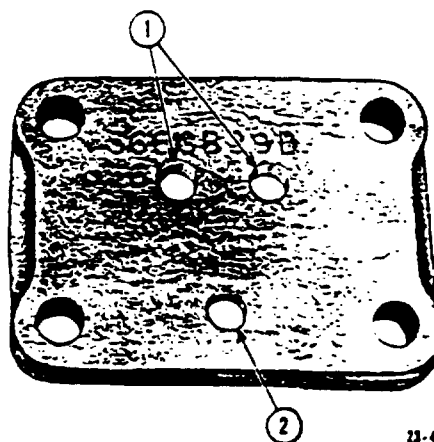


1. Metering Orifice
2. Oil Inlet
3. Oil Outlet

Figure 65. By-Pass Type Filter

This filter used flexible lines for oil supply to filter and oil return to engine. The oil lines are connected to a cover which is assembled to the oil filter pad on the left-hand side of the engine.

Because of revisions that have been made to the cast contours of the pad on the current cylinder blocks, oil filter pad cover, 368GB29D, and gasket, 590GB1152B, must be used with a by-pass filter installation. See Figures 66, 67, and 68.



1. Oil Pressure Feed Holes
2. Oil Drain Hole

Figure 66. Top View of Oil Filter Pad Cover

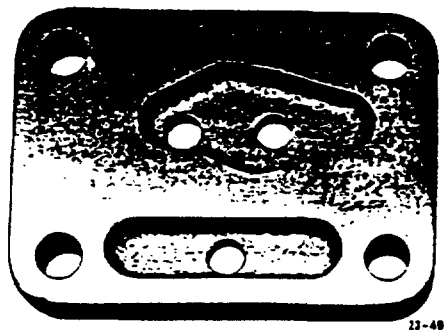


Figure 67. Bottom View of Oil Filter Pad Cover

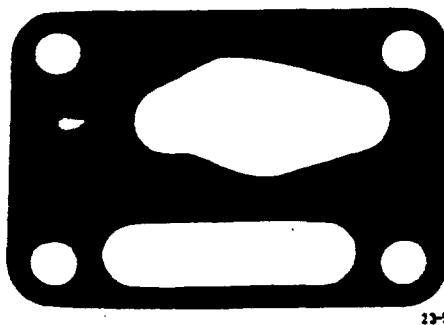


Figure 68. Oil Filter Pad Cover Gasket

CAUTION

Failure to use the correct cover and gasket, on current cylinder blocks, will result in low oil pressure and possible engine damage.

If the replaced engine has a full-flow by-pass type of filter, as shown in Figure 69 or a spin-on type filter, as shown in Figure 70, use the adapters or housings from the original engine.

OIL PRESSURE RELIEF VALVE
HOUSING GASKET

Since service gasket kits include different types of gaskets to cover the various oil pressure relief valve housing designs, it is important that the correct gasket be used.

Although these gaskets are similar in appearance, they are not interchangeable. Identification of the correct gasket can be made by comparing with the following illustrations, which are full size. See Figures 73, 74, 75 and 76.

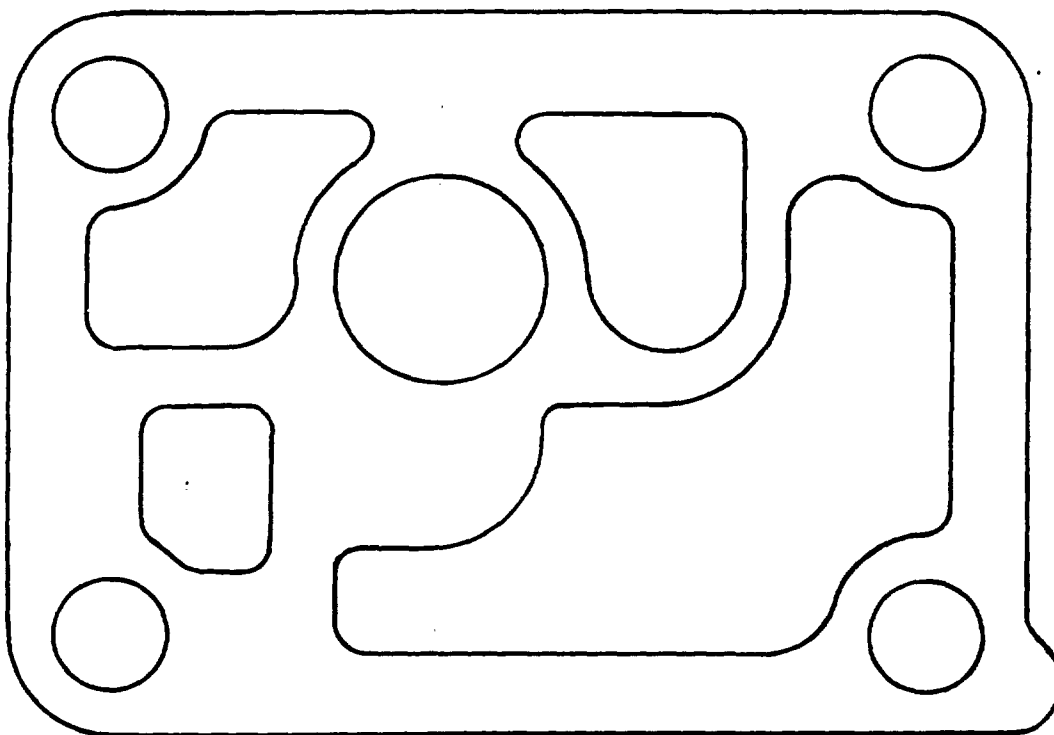


Figure 73. Oil Pressure Relief Valve Housing Gasket 590GB1298B

Gasket Part No.	Application	Oil Pressure Relief Valve Housing
590GB1298B (See Figure 73)	All ESI and ESI Plus Six Cylinder Engines. Piston Cooled and Non-Piston Cooled	766GB269-P1,P2.&P3 (Non-Piston Cooled Engines)
		766GB51-P1.P2 & P3 (Piston Cooled Engines)

NOTE

The "B" version of the above gasket includes a tab at the bottom right corner, which will indicate at a glance whether the gasket is properly installed.

Provisions have been made on both sides of the case to install buttress screws which fit into the main bearing cap. The buttress screws are used on both sides of all main bearing caps. They must be removed in order to remove the main bearing caps.

Block Preparation

1. Check the cylinder block deck surface for warpage. If warpage is excessive be sure that the maximum amount of material removal limit is not exceeded.

CAUTION

The piston travel above the cylinder block deck is critical and must be checked during assembly to insure proper clearance of piston with cylinder head and valve.

2. Remove all core plugs and fittings from the cylinder block and remove any accumulation of rust and sludges.
3. Check block for cracks, the condition of threaded holes and the straightness of the mating flanges.
4. Thoroughly inspect the upper edge of the cylinder sleeve counterbore in the block for signs of pitting or erosion. Rework as required. Shims are available to obtain correct sleeve height at reassembly.
5. Blow all passages thoroughly with compressed air.
6. Coat new O-ring with sealant, place on core plugs and install plugs in block.
7. Install all oil gallery plugs and gaskets using Permatex sealant or equivalent to insure positive sealing.

Cylinder Sleeve

The cylinder sleeves are wet type, centrifugal cast iron and are available in standard size. A bead is provided around top of seating flange for using a fire ring type cylinder head gasket. Clean sleeve flanges using a brass wire rotary brush to be sure of effective fire ring sealing. Check cylinder sleeve for out-of-round and taper. Use tool J5347-01 and measure each sleeve I.D. See Figure 2-9. Take readings in two directions at each of three levels: top, center, and bottom.

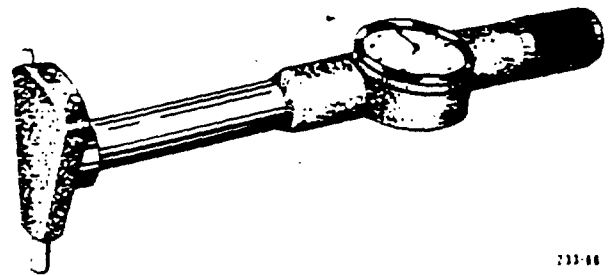


Figure 2-9 Cylinder Sleeve Bore Measuring Tool

Check the sleeve height above the cylinder block deck. Use gage J26948. See Figure 2-10.

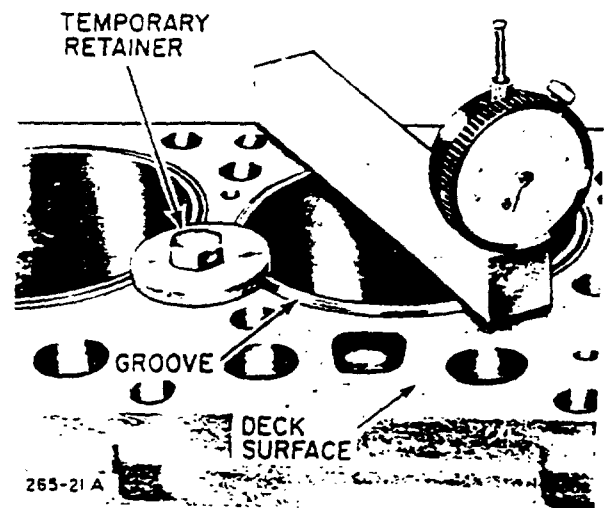


Figure 2-10. Checking Sleeve Height Above Block Deck

Honing

If sleeve bore when in place does not exceed out-of-round and taper limit, clean up I.D. with a suitable hone, 150 to 220 grit, to produce a diamond criss-cross pattern surface finish of 25 to 40 micro-inch rms.

Wash liner bore with a solution of household laundry detergent and air blow dry. Wipe liner bore with a clean oil soaked cloth.

Sleeve Rebore

If sleeve exceeds out-of-round and taper limit, the sleeve may be resized using boring bar equipment to receive the next applicable oversize piston. After re-sizing, hone 150 to 220 grit to produce a diamond criss-cross pattern surface finish of 25 to 40 micro-inch rms.

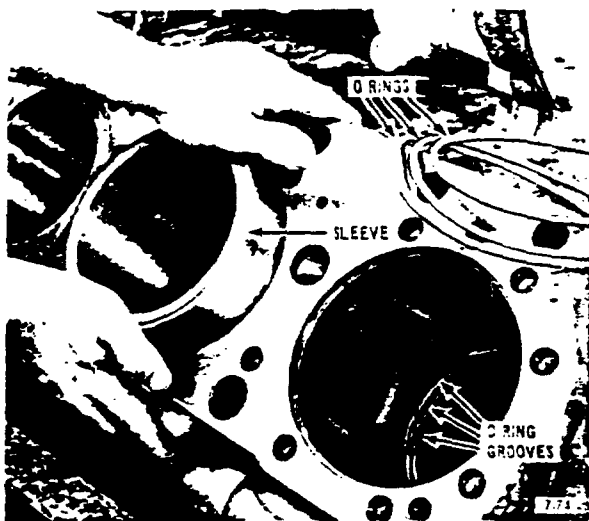


Figure 2-13. Installing Cylinder Sleeve

CAUTION

If for any reason the sleeve is backed out even as little as 1/8 inch, it may roll the top seal over the relief edge damaging the seal. Remove sleeve and replace seals.

8. Secure cylinder sleeve in pairs using keeper washer and capscrew at center cylinder head capscrew hole until pistons, rings and cylinder heads are installed.

Camshaft Bushings

There are two camshaft bushing widths. The front camshaft bushing is the wider bushing; the remaining bushings are of a narrower width. All bushings are located at set distances measured from the forward machined surface of the camshaft thrust washer recess to the forward edge of subsequent bushings. Use special tool kit J-21428 to install or remove bushings. Coat outer surface of the bushings with engine oil before installation. The oil supply hole in the bushing should be located to the right as viewed from above and standing to the rear of the engine. The camshaft bushing interlocking split should be installed upward. See Figure 2-14.

NOTE

The rear camshaft bushing can be removed, using special tool J-21385, without removing the flywheel housing.

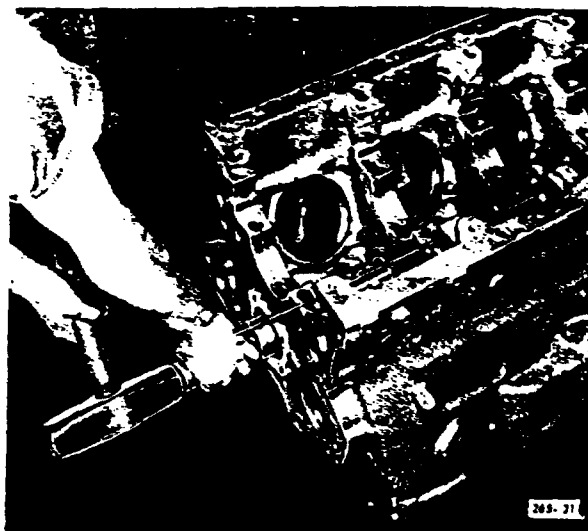


Figure 2-14. Installing Camshaft Bushing

Expand the front oil gallery plug to offer resistance upon entering bore. The front oil gallery plug is further secured by installing the camshaft thrust washer which partially covers the plug. Patchlock countersunk Allenhead capscrews are used to secure the thrust washer in place. It is imperative that the mating surfaces be clean and new Patchlock screws are used. See Figure 2-15.



Figure 2-15. Installing Camshaft Thrust Washer

Apply a coat of Permatex to the rear oil gallery plug and gasket and install in rear oil gallery. See Figure 2-16.

4. Remove front bearing retainer and drive front bearing and spacer from housing out through the front.

5. Reverse housing and drive rear bearing from housing out through the rear.

Inspection

1. Inspect the water pump drive gear for wear pattern and condition of teeth.

2. Inspect and check shaft for journal wear and condition of internal spline.

3. Inspect and check condition of the bearings.

Assembly

1. Install front bearing (double row ball bearing) in housing from the front.

2. Install retaining ring, tapered side outward, in housing groove.

3. Start water pump drive gear and shaft assembly into the bearing bore. Do not completely install.

4. Rotate gear and tap with a soft face hammer until gear rotates concentric with the bearing.

5. Press gear and shaft assembly into bearing until it bottoms on shoulder on shaft.

6. Invert housing and gear and install spacer.

7. Install rear bearing with seal side outward in housing.

8. Clamp assembly in a suitable clamping fixture to hold gear and install water pump drive shaft screw. Tighten to recommended torque. 50 lb. ft.

9. Install O-ring in the groove on outer periphery of the housing.

10. Lubricate O-ring seal generously and install drive assembly in cylinder block recess with flat side of housing toward camshaft gear.

NOTE

It is important to generously lubricate O-ring seal before installing in block. This will prevent the O-ring from rolling on upper surface and restricting oil supply to the water pump bearings.

11. Install three water pump housing capscrews securing assembly in position. Tighten to recommended torque. 26 lb. ft.

TIMING GEAR COVER

Inspection

Inspect timing gear cover for dents, condition of threaded holes and straightness of flanges.

Installation

1. Install crankshaft front oil seal into the cover using tool J-21375.

2. Install the adjustable camshaft thrust button from the inside and position the washer and jam nut on the outside of the cover.

3. Adjust camshaft thrust button to its retracted position.

4. Install six guide studs. Two guide studs are used at the lowest point, highest point and one adjacent to the water pump drive and the final stud adjacent to the drive provision directly opposite the water pump drive.

5. Install the timing gear gasket over guide studs.

6. Install the timing gear cover over the guide studs and push cover into position.

7. Install all cover capscrews loosely.

8. Install water pump drive alignment tool J-21382 and crankshaft oil seal alignment tool J-21381. Torque all capscrews.

CRANKSHAFT VIBRATION DAMPER AND HUB

Inspection

1. Inspect crankshaft vibration damper hub for scoring, condition of flange, threaded holes and keyway.

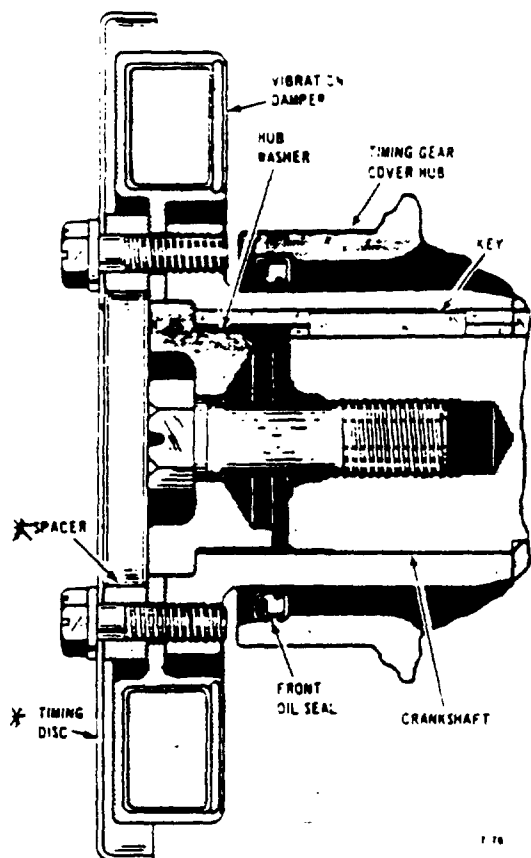
2. Inspect the vibration damper for general condition, mounting threaded holes and housing.

Installation

1. Position crankshaft keyway UP and install key.

2. Heat crankshaft vibration damper hub in hot oil to 250 degrees F.

3. Align crankshaft hub on key and install hub. See Figure 2-49.



* Not required on Current Production Engines

Figure 2-49. Vibration Damper and Hub Arrangement

4. Install hub washer and retaining screws. Torque screws.

5. Install vibration damper, spacer and timing disc on crankshaft hub: the holes will only line up one way.

6. Install retaining capscrews securing assembly.

NOTE

When all parts are assembled on the crankshaft, keyway up, the scribe mark on the damper rim must be up. The TDC mark must align with the timing indicator 30 degrees to the left of the engine centerline.

OIL PAN

Inspection

1. Inspect oil pan for dents, cracks and condition of flange.

2. Inspect and check the bolt holes for elongation and baffle for security.

3. Inspect and check drain hole for condition of threads.

Installation

1. Position gasket on oil pan and position oil pan on cylinder block.

2. Install and tighten oil pan retaining capscrews evenly to prevent oil leakage.

AUXILIARY DRIVE ASSEMBLY
NON-CURRENT (Figure 2-50) Prior to following:

Engine	Serial Number
ENDT(B)865	TB865 5F 9380
ENDT(B)865C	T865C 5M 5045
ENDT(B)866	T866 5F 8981
ENDT(B)866C	T866C 5M 4357

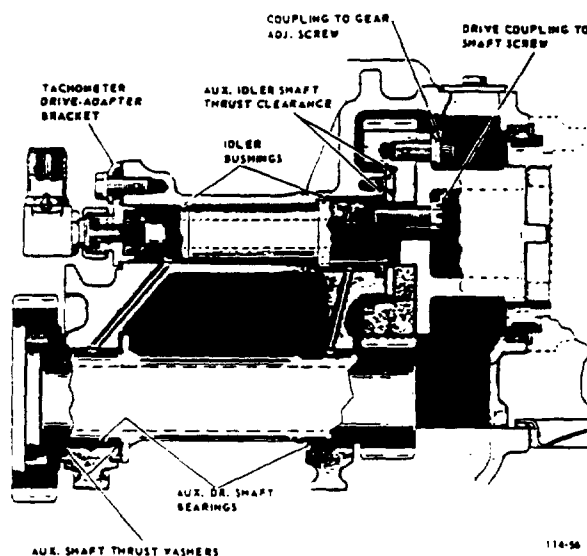


Figure 2-50. Auxiliary Drive Assembly

Description

The auxiliary drive is a complete unit sub-assembly located between the cylinder heads on the front of the engine. The auxiliary drive consists of a drive housing, idler shaft and gear assembly and drive shaft. It is gear driven from the camshaft.

DRIVE HOUSING

Description

The auxiliary drive housing is an alloy casting and supports the drives for the injection pump, air compressor, tachometer drive and hydraulic steering pump.

Installation

1. Time auxiliary drive to camshaft gear. Install both push rods in No. 6 cylinder location. Bar engine over until movement is felt in both push rods simultaneously and the timing indicator pointer indicates TDC for No. 1 and 6 cylinders. The single punch mark on the camshaft gear will be in the upright position.
2. Install O-ring in oil passage port at right hand front top edge of cylinder block.
3. Apply a bead of 243SX32 gasket compound or equivalent to mating surfaces of the auxiliary drive housing.
4. Place auxiliary housing assembly on top of the block carefully.

NOTE

Be sure timing gear cover gasket is properly positioned and the single timing mark on the camshaft gear aligns with the single timing mark on the auxiliary drive gear.

5. Install all nine capscrews and washers hand tight.
6. Torque the two lower timing gear cover to auxiliary housing capscrews.
7. Torque all auxiliary housing to cylinder block capscrews.
8. Release the torque on the two timing gear cover to auxiliary housing capscrews then retorque the same capscrews.

NOTE

This procedure will align auxiliary housing to front face of the cylinder block and permit block surface to butt fully to mating surface of auxiliary housing.

9. Check backlash between camshaft gear and auxiliary drive gear. If backlash is not within limits, loosen auxiliary housing capscrews and reposition housing by tapping with a soft faced mallet. Retorque capscrews and recheck backlash.

NOTE

Care must be taken at this time to have all pipe plugs in the auxiliary drive oil gallery passages. Access to these plugs becomes increasingly difficult at later assembly points.

VALVE LIFTER COVERS

The center valve lifter cover is a steel stamping and requires a new gasket at assembly. The rear valve lifter cover is cast aluminum. At assembly apply a bead of gasket compound 243SX32 to the cover and cylinder block mating area.

INJECTION PUMP

Installation

1. Bar engine over in the normal direction of rotation until the No. 1 cylinder piston is at TDC, as indicated by the timing indicator, and the timing marks on the auxiliary drive shaft gear aligns with the timing mark on the auxiliary drive idler. The pin hole location will be at the five o'clock position and the coupling tangs are at 12 degrees 36 minutes off the horizontal. See Figure 48.

2. Bar engine back approximately 40 degrees.

3. Bar engine over in the normal direction of rotation until timing indicator reads the B.T.C. setting as specified on the injection pump name plate. In this position the tangs on the drive coupling will be approximately horizontal and the drive coupling pin hole will be approximately at the 4:30 o'clock position. The gear marks will be approximately 15 degrees 30 minutes to the right. See Figure 2-55.

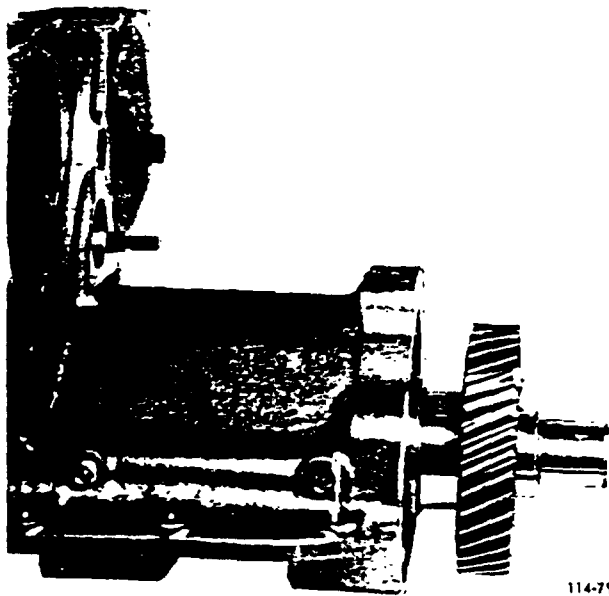


Figure 2-79. Auxiliary Drive Gear

13. Install auxiliary drive gear retaining ring. See Figure 2-80.

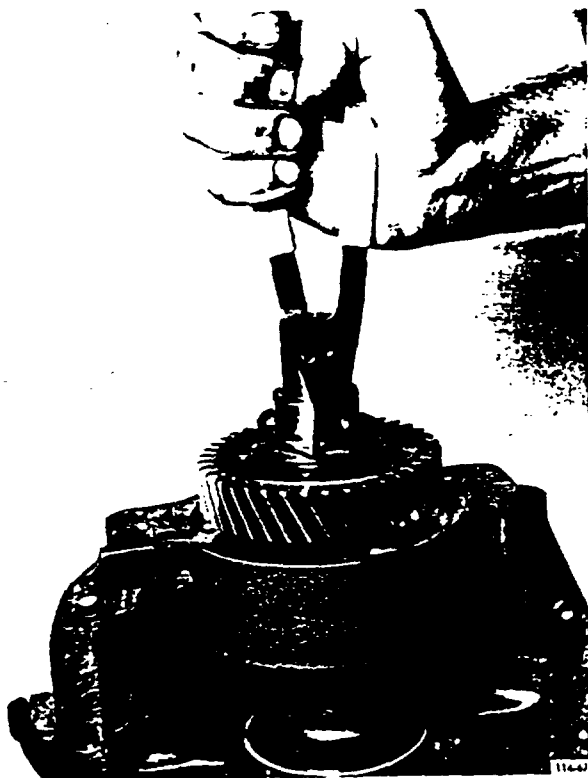


Figure 2-80. Installing Retaining Ring

14. Place the auxiliary housing on end and check end play with a dial indicator.

NOTE

End play is controlled by the drive shaft thrust washers. Check the following if the end play does not fall within the correct specification. Make corrections as required.

1. Worn thrust washers.
2. Worn thrust journals.
3. Shaft bushings not properly installed.

INSTALLATION

1. Thoroughly clean the auxiliary housing mounting surface on the engine block and remove the exposed portion of the timing gear cover gasket.
2. Carefully cut a new timing gear cover gasket to the exact size of the removed portion and install on the timing gear cover using a good grade gasket sealer.

NOTE

Apply an extra bead of gasket sealer where the new gasket meets the old gasket.

3. Install a new O-ring seal in the engine block to auxiliary oil supply port.
4. Apply a bead of Silastic to the mounting surface of the block. Use extreme care not to allow the Silastic to enter/block the oil supply port. See Figure 2-81.

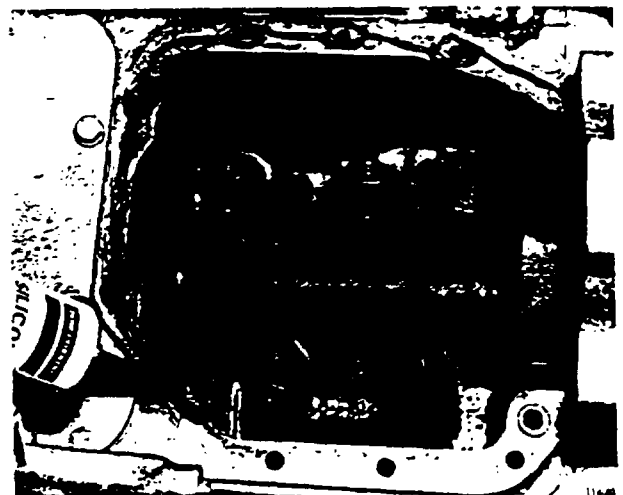


Figure 2-81. Applying Silastic

5. Install the auxiliary housing on the engine block.

CYLINDER HEAD INSTALLATION

NOTE

New cylinder head gaskets and fire rings must be installed each time cylinder heads are removed.

1. Clean the cylinder block deck thoroughly.
2. Install new cylinder head gasket on deck. Position of gasket is determined by guide pins in the upper deck.

NOTE

Do not use a sealing compound or soak cylinder head gaskets. They are all pre-coated.

3. Install new fire ring carefully fitted over circular bead on cylinder sleeve flange. See Figure 2-102.

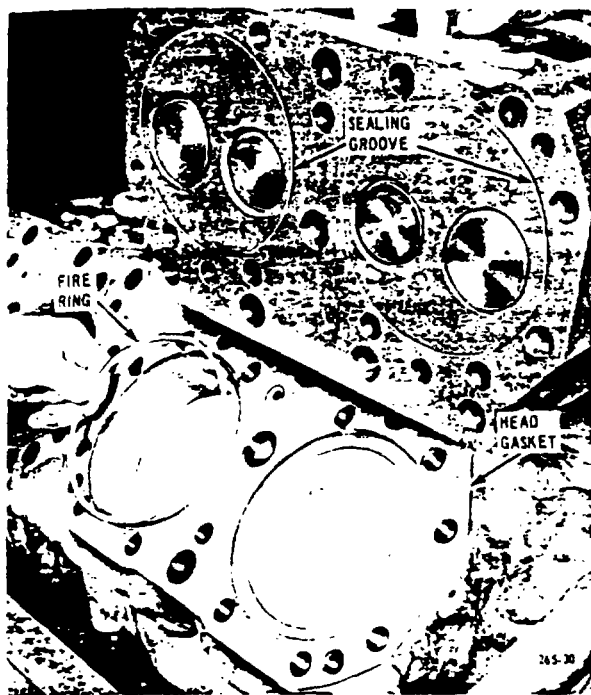


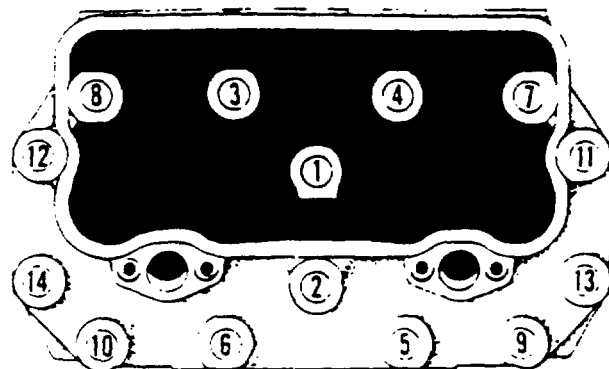
Figure 2-102. Cylinder Head Installation

4. Clean the surface of the cylinder head and circular groove for the fire ring.
5. Carefully position the cylinder head assembly over the cylinder block deck aligning the guide pins in the block with the guide holes in cylinder head.

6. Install cylinder head on block.

7. Install fourteen cylinder head capscrews.

8. Torque capscrews on each head progressively in steps of 50 to 100 to 175, and finally to 225 lb. ft. in sequence as shown. See Figure 2-103.



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Figure 2-103. Cylinder Head Tightening Sequence

PUSH RODS

Description

The push rods for the intake and exhaust valve rocker arms are tubular steel with spherical ends. Engines not fitted with the Dynatard engine brake feature identical 1/2 inch O.D. x 14-17/64" push rods; however, when the engine is fitted with the Dynatard engine brake system the exhaust valve rocker arm push rod is a solid steel rod 5/8 inch O.D. x 14 inches long.

Inspection

1. Inspect and check the push rods for length and straightness. Replace any that are bent.
2. Inspect and check the spherical surfaces for wear and tightness to tube.

Installation

Apply a light coat of lubricating oil to the spherical ends and install the push rods in the valve lifters.

4. Continue adjusting valve lash for the remaining cylinder pistons in firing order placing each cylinder piston at TDC with respective 1/4 turns of the engine crankshaft.

5. Properly secure adjusting screw locknut after each cylinder piston valve lash adjustment.

INLET MANIFOLD

Inspection

1. Inspect and check the inlet manifolds for restrictions.
2. Inspect and check mounting flanges for erosion, cracks and straightness.

Installation

1. Place new gaskets between the inlet manifold and cylinder head.
2. Install right and left hand inlet manifolds and lifting eyes. Secure to cylinder head by installing attaching capscrews and tighten to the recommended torque.
3. Place a new inlet manifold fitting gasket on the top of each inlet manifold and install inlet manifold inlet fitting.
4. Install tee fitting and complete inlet manifold assembly.

WATER OUTLET MANIFOLD

Inspection

1. Inspect water outlet manifold for restrictions.
2. Inspect and check mounting flanges for cracks and straightness.

Installation

1. Place new gasket between right bank and left bank water manifold and the mating cylinder heads.
2. Install and tighten attaching capscrews to the proper torque.
3. Install thermostats in the right and left bank water manifolds.
4. Install thermostat gaskets, water outlet fittings, thermostat seals and water outlet by-pass elbows.
5. Secure assembly to the water manifold by installing the attaching capscrews.

EXHAUST MANIFOLD

Inspection

1. Inspect and check the exhaust manifold for restrictions.
2. Inspect and check the mounting flanges for erosion, cracks and straightness.

Installation

1. Place new gaskets between exhaust manifold and cylinder head.
2. Install and tighten the attaching capscrews and washers to the proper torque.

CYLINDER HEAD COVERS

Inspection

1. Inspect and check the cylinder head covers for cleanliness, dents and straightness of flange.

2. Inspect and check breather in cover, if applicable, to be sure it is not plugged.

Installation

1. Cement a new gasket to the mounting flange of the cylinder head cover.
2. Position the cylinder head cover over rocker arms.
3. Install and torque cover retaining capscrews.

TURBOCHARGER

Description

The turbocharger is an exhaust gas driven air compressor. See Figure 2-106. The purpose of the turbocharger is to increase the supply of air to the cylinders and thus burn more fuel which in turn produces more power.

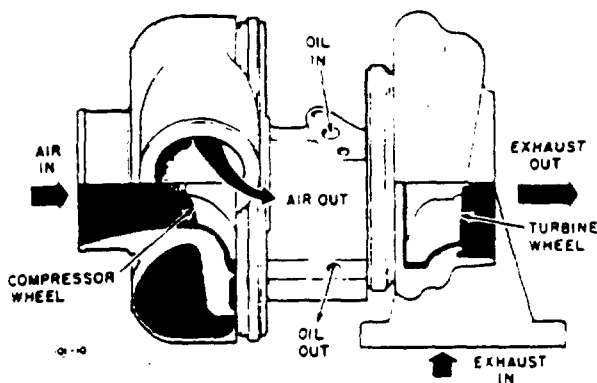


Figure 2-106. Exhaust Driven Turbocharger

The turbocharger consists of three main parts; the turbine housing, the bearing housing and the compressor housing. The turbine housing is located at one end of the bearing housing and the compressor housing is located at the other end. A common shaft connects the turbine wheel and compressor wheel.

The turbine end of the turbocharger uses exhaust gas energy normally discharged to the atmosphere. The exhaust gas enters the turbocharger through the flange connection on the exhaust manifold. The exhaust gas

flows around the turbine housing and radially inward causing the turbine wheel to rotate. The exhaust gas is then discharged through the center of the turbine housing into the exhaust pipe.

The bearing housing contains the through-shaft, bearings, seals, and oil passages.

The bearings are of the floating sleeve type and are pressure lubricated from the engine oil supply system. Piston ring type oil seals are used at each end of the shaft to effectively seal off the oil.

The compressor housing contains the compressor wheel and air enters at the center of the compressor wheel and flows radially outward into the compressor wheel and flows radially outward into the compressor housing. The air leaves through a tangential outlet on the outside of the compressor housing and is ducted to the inlet manifold.

Checks Before Removal

If turbocharger malfunction is suspected, make the following checks before removal of turbocharger from the engine.

1. Start engine and check for unusual noise or vibration from turbocharger. This will indicate out-of-balance, rubbing or damage to compressor or turbine wheels.
2. Check for leaks in the air system from turbocharger to intake manifold and from intake manifold to cylinder block. Be sure all bolts, clamps and connections are tight and gaskets are not blown and are in proper location.
3. Check air cleaner and air intake system, from the air cleaner to turbocharger, for restrictions to air flow or leaks.
4. Check exhaust system from cylinder block to turbocharger for exhaust leaks. Be sure all bolts, clamps and connections are tight and gaskets are not blown and are in proper location.
5. Check exhaust system from turbocharger to outlet for restrictions.

Reassembly

Install oil seal ring in groove in housing and position bearing and shaft assembly in housing. Place housing assembly on a suitable press, using a bucking bar through the plug hole to back up shaft and bearing assembly, and press fan pulley on shaft. See Figure 2-107. Install bearing retainer using suitable pliers. Be sure retainer is properly seated in groove. Pack grease compartment 1/3 full with Alvania No. 3 water insoluble lithium soap petroleum grease or equivalent. Install plug.

Installation

1. Press a new oil seal in support housing.
2. Install a new gasket and position support housing over auxiliary shaft extension and secure with capscrews. Be sure oil seal is properly positioned over shaft before tightening capscrews.
3. Place key in slot of auxiliary shaft extension and align and install driving pulley.
4. Secure with bolt and washer.
5. Position fan pulley housing in support housing and secure loosely with capscrews and washers. Install adjustment nut "D" loosely on stud. See Figure 2-107.
6. Install the two fan belts. Make adjustment with nut "D" until the fan belts are properly tensioned. Refer to Fan Belts for procedure. Tighten lock plate screws.

Extension Driven Type Disassembly

Remove fan belt and fan. Remove housing retaining capscrews and remove housing.

NOTE

One capscrew cannot be completely removed due to interference with pulley hub.

Place housing on a suitable adapter (scrap auxiliary drive extension) in vise and remove fan hub retaining lock nut and washer. Remove fan hub using a suitable puller in threaded holes of inner hub. Remove key from shaft. Remove bearing retainer snap ring using pliers.

Place housing, rear side down, on adapter and press shaft from housing. Invert housing and press front bearing from housing. Remove grease compartment vent. Wash parts in suitable solvent and air blow dry.

Inspect all parts and replace as required.

Reassembly

1. Install front (large) bearing in housing, shielded side of bearing facing outward.
2. Install Tru-arc bearing retainer ring with taper facing out. Bottom retainer ring in groove.
3. Install short key at flange end of fan driveshaft.
4. Install fiber coupling on shaft with face inside of coupling seating against shaft flange. Install coupling spacer washer against coupling.
5. Install rear (small) bearing on shaft against coupling with sealed side toward coupling.
6. Install bearing spacer on shaft.
7. Pack housing 1/3 full with Alvania No. 3 water insoluble lithium soap petroleum grease or equivalent.
8. Place fan drive housing nose down on press base and install shaft with coupling, bearing and spacer in housing and through large bearing. Press shaft assembly into housing using suitable plug. See Figure 2-109.

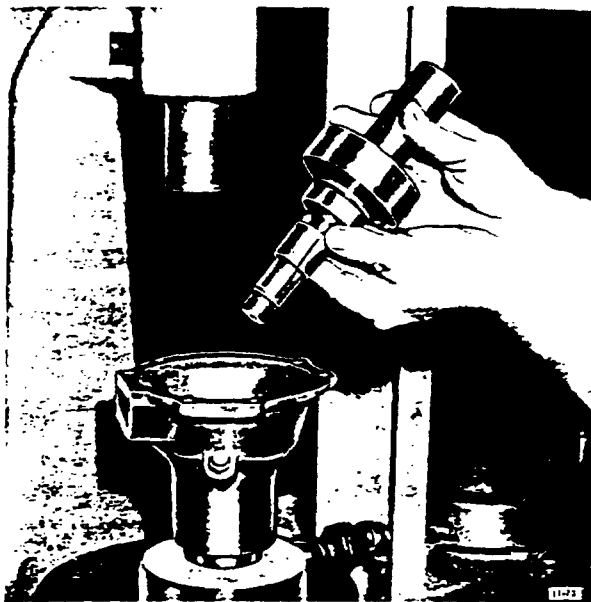


Figure 2-109. Installing Fan Drive Shaft
V-8 Series

9. Invert housing on press stand and support coupling end of shaft on press base. Install long housing capscrew and lockwasher before installing fan drive pulley.

10. Install long key in shaft, align, and using a suitable tool to engage inner part of hub, press hub on shaft. See Figure 2-110.

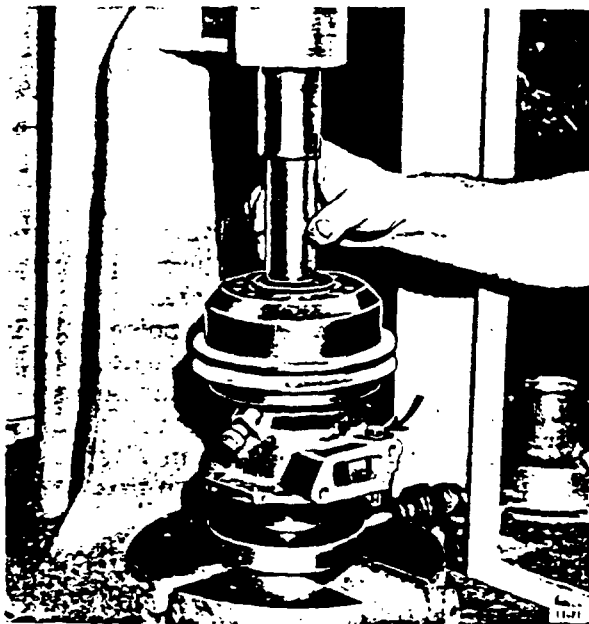


Figure 2-110. Installing Fan Drive Hub

11. Place housing assembly on a suitable adaptor in vise and install hub retaining washer and locknut. See Figure 2-111.

12. Install grease vent. (Install auxiliary driveshaft extension, if removed).

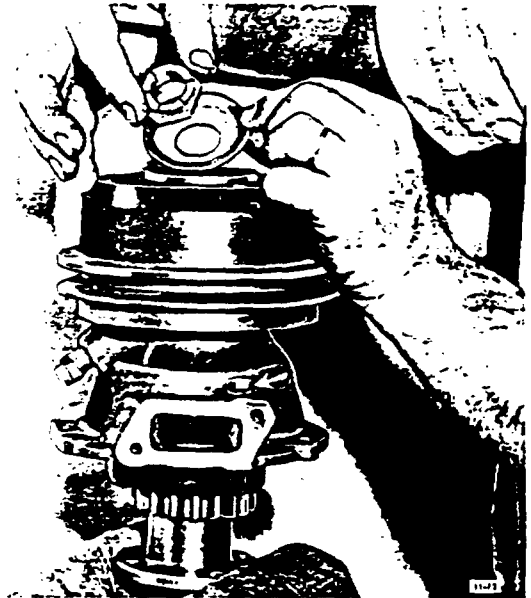


Figure 2-111. Installing Hub Retaining
Washer and Locknut

Installation

1. Place new gasket on housing and install housing, grease vent at top, aligning coupling with auxiliary driveshaft extension.

2. Assemble fan to hub. Be sure bolts are proper length, 3/8-16 x 7/8 inch.

CAUTION

Longer bolts will engage inner member and cancel out vibration absorbing effect of elastic insulator and shorten service life of fan drive assembly.

3. Install fan belt. Refer to Fan Belts for proper tensioning.

Oil Pump Inlet Tube



Figure 119. Installing Oil Pump Inlet Tube

Assemble gaskets, capscrews, and washers to oil pump inlet tube fitting flange and mount to oil pump. See Figure 119.

Oil Pump Outlet Tube



Figure 120. Installing Oil Pump Outlet Tube

Assemble oil pump outlet tube fitting at cylinder block and hold in position by installing capscrews and washers. Do not tighten until complete assembly is completed. Assemble "O"-ring to oil pump outlet tube. See Figure 120. Lubricate "O"-ring and insert tube into fitting at cylinder block. Mount to oil pump using capscrews and washers. Torque all screws to specifications.

NOTE

Gaskets are not used between fitting and block and between fitting and oil pump.

Piston Cooling Tubes

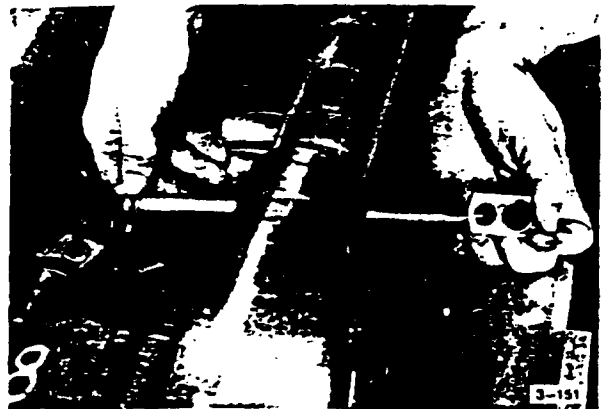


Figure 121. Piston Cooling Cross-Over Tube (Front)

Assemble "O"-ring over end of tube and into flange counterbore. See Figure 121. Lubricate "O"-rings. (Coating "O"-ring which fits in counterbore with a little grease will aid in holding it in place.)

Assemble screw and washer in flange end and mount to cylinder block. Tighten screws to specifications.



Figure 122. Piston Cooling Cross-Over Tube (Rear)

Assemble "O"-rings into flange counterbore at both ends of tube. See Figure 122. Use a light coating of grease in "O"-rings to aid in holding them in place.

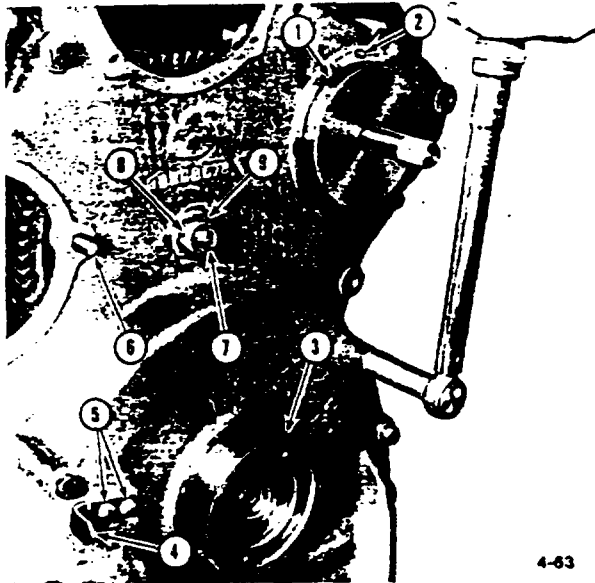
Position cross-over tube on cylinder block.

TIMING GEAR COVER AND OIL PAN

Inspection

Inspect the timing gear cover mounting surface for flatness of flanges and condition of threaded holes.

Timing Gear Cover Installation



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1. Timing Gear Cover Alignment Tool (at Water Pump Location)
2. Water Pump Locating Pin
3. Timing Gear Cover Alignment Tool (at Crankshaft Location)
4. Timing Indicator
5. Timing Indicator Mounting Pins
6. Alternator Drive Cover Stud
7. Camshaft Thrust Screw
8. Camshaft Thrust Screw Nut
9. Camshaft Thrust Screw Nut Washer

Figure 124. Timing Gear Cover Installation

Install the adjustable camshaft thrust screw from the inside of the timing cover. Position washer and nut on outside of cover and adjust thrust screw to the retracted position. See Items 7, 8 and 9 in Figure 124.

Thread alternator drive cover stud into timing gear cover. Apply Loctite 271 before installing stud. See Item 6 in Figure 124. Then install gasket, cover and tighten capscrews and nut.

Install water pump locating pin in cover. Height of pin above mounting surface should be 0.250 - 0.200 inches. See Item 2 in Figure 124.

Place timing indicator over locating holes in timing gear cover and drive pins into holes to secure indicator. See Items 4 and 5 in Figure 124.

Install six guide studs in the cylinder block. Two guide studs are used at the lowest point, two at the highest point, and one adjacent to the water pump drive location and the final stud on the side opposite the water pump drive location.

Install the timing gear cover gasket over the guide studs.

Install timing gear cover over guide studs and push cover into position.

Install all cover capscrews loosely.

Install timing gear cover alignment tool J-29287, at water pump location. See Item 1 in Figure 124.

Install timing gear cover alignment tool J-29288, over crankshaft stub end. See Item 3 in Figure 124.

Make certain that timing gear cover lower edge is aligned with the oil pan mounting surface on the cylinder block.

After timing gear cover is properly aligned, remove the guide studs. Install the remaining capscrews and torque to 42 lb. ft.

The timing gear cover gasket will extend below the cover and the block by approximately 1/8 inch. This excess gasket material should be trimmed flush with the cover and block.

Check capscrew holes for elongation.

cylinder block.

Check drain hole for condition of threads.

If oil pan is satisfactory, position new gasket on oil pan and assemble to

Install and tighten oil pan retaining capscrews evenly and to specifications. This will prevent distortion of mounting flange and possible leakage problems.

NOTE

If the auxiliary housing is being installed on a block that does not have a new timing gear cover gasket, proceed as follows:

1. Before installing auxiliary housing on the engine block, remove the exposed portion of the timing gear cover gasket.
2. Carefully cut a new timing gear cover gasket to the exact size as the removed portion and install on the timing gear cover using a good grade gasket sealer.
3. Apply an extra bead of gasket sealer where the new gasket meets the old gasket.

Install the auxiliary housing on the cylinder block. Assemble the auxiliary housing to cylinder block capscrews and lockwashers. Make certain that the front face of the auxiliary drive housing is in line with the front face of the cylinder block within 0.005 inches. Snug capscrews, but do not tighten.

Assemble capscrews through timing gear cover and into auxiliary drive housing. Tighten capscrews to specifications. Then tighten auxiliary drive housing mounting capscrews.

NOTE

Disregard timing marks that appear on the auxiliary drive shaft gear. Timing of the auxiliary drive shaft gear to the camshaft is not required for assembly of this short drive auxiliary housing.

Check the backlash between the auxiliary drive shaft gear to camshaft gear. Should be 0.0037 to 0.0088 inches.

Engine Breather

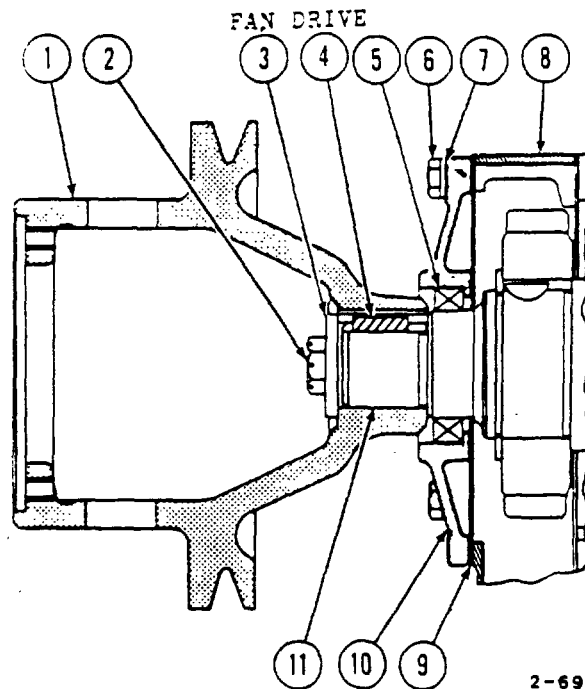
Assemble four breather tube studs to valve lifter cover using Loctite 271. See Figure 185, Items 3 and 12.

Assemble breather cover and filter in valve lifter cover. See Figure 185, Items 10 and 11.

Assemble new gasket over studs, and fasten breather tube with plain washers and nuts. See Figure 185. Items 1, 2, 4, and 5.

Oil Filler Tube (or Cover Plate)

Thread oil filler tube flange stud (or cover plate stud) to valve lifter cover, using Loctite 271. Apply FIPG compound to mounting surface on cover. Assemble flange (or cover) to valve lifter cover and tighten the mounting stud nut and capscrew.



1. Fan Pulley
2. Fan Pulley Screw
3. Fan Pulley Screw Washer
4. Fan Pulley Key
5. Auxiliary Drive Shaft Seal
(at Fan Drive Housing)

- 2-69
6. Fan Drive Housing Screw
 7. Fan Drive Housing Screw Washer
 8. Timing Gear Cover
 9. Fan Drive Housing Gasket
 10. Fan Drive Housing
 11. Auxiliary Drive Shaft

Figure 186. Fan Drive Arrangement

The fan drive is mounted on the front end of the auxiliary drive shaft. See Figure 186.

Inspection

Inspect fan drive housing to make certain that mounting flange is flat and free of defects.

Installation

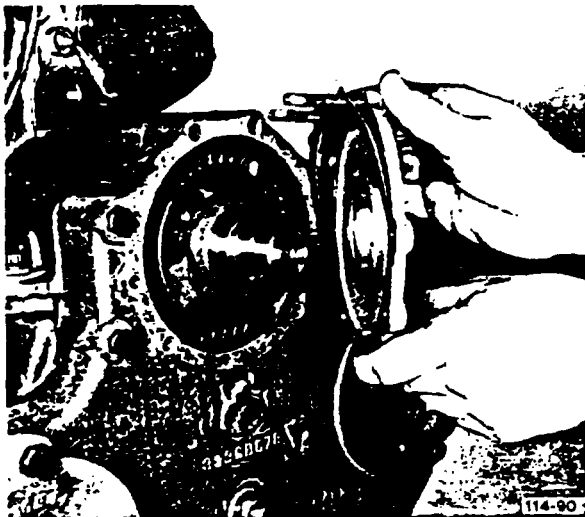


Figure 187. Installing Fan Drive Housing

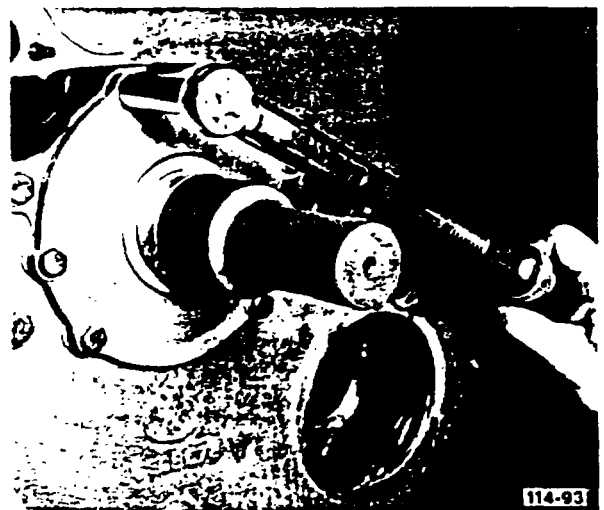


Figure 188. Aligning Fan Drive Housing

Before tightening fan drive housing screws, install alignment tool J29304 in seal counterbore. See Figure 188.

Cylinder Head Gasket Installation

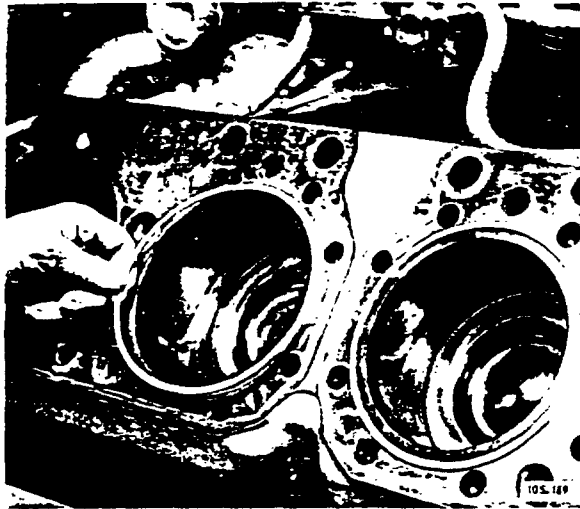


Figure 256. Assembling Fire Ring

Assemble fire ring over shoulder on cylinder sleeve. See Figure 256.

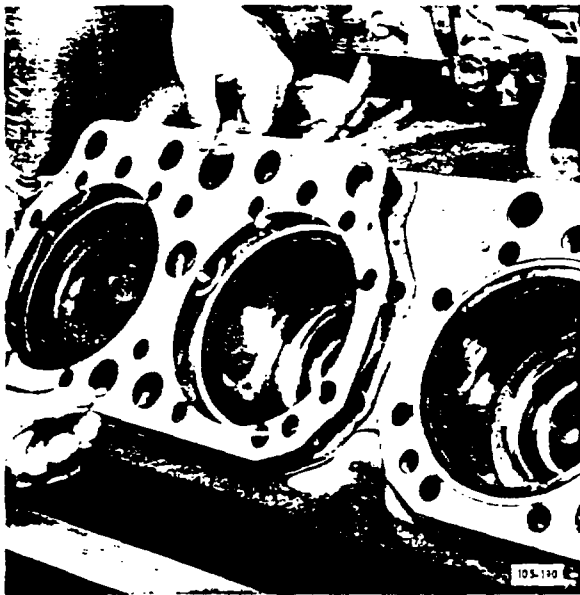


Figure 257. Assembling Cylinder Head Gasket

Assemble gasket on cylinder block. Locating gasket over guide pins and making certain that fire ring is within gasket opening. Surface of gasket marked "TOP" should be on the top side. See Figure 257.

All gaskets are pre-coated and do not require any type of sealing compound.

Cylinder Head Installation

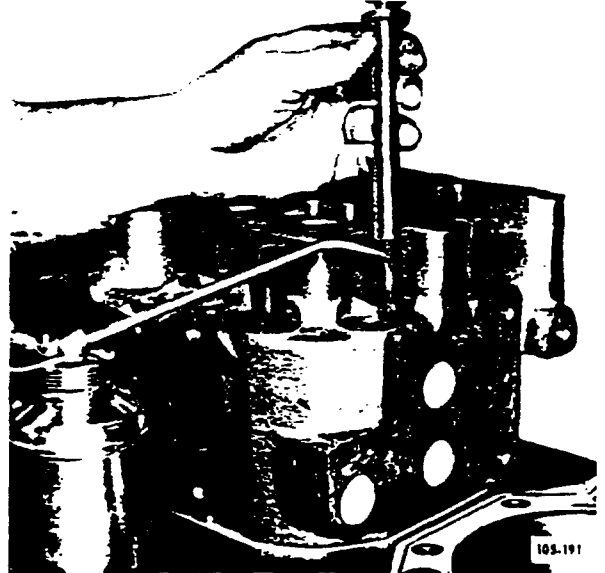


Figure 258. Lubricating Cylinder Head Capscrew Threads

Position cylinder heads over cylinder block, locating guide holes in head over pins in block. Lubricate cap-screw threads. See Figure 258.

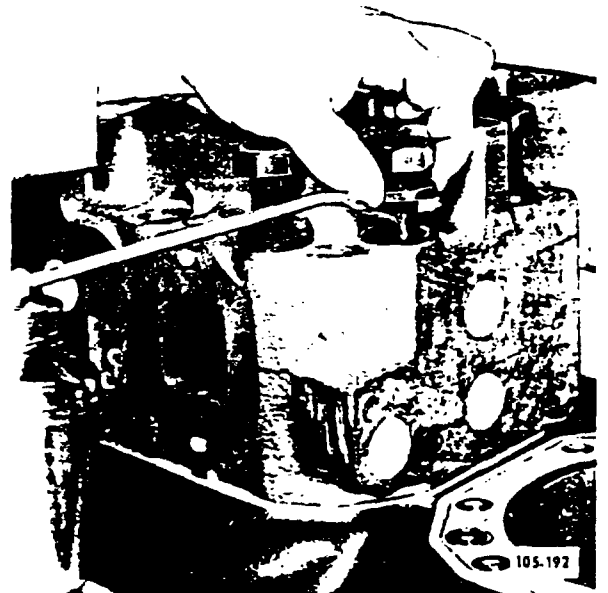


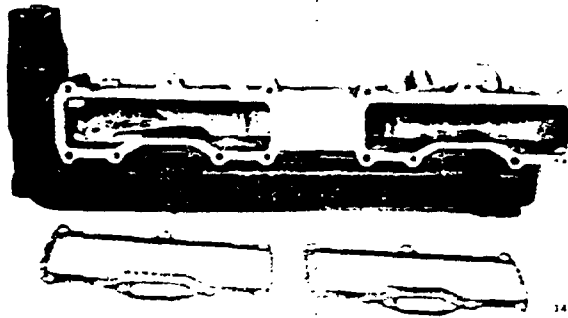
Figure 259. Lubricating Underside of Capscrew Head and Washer

Lubricate underside of cap screw and washer. See Figure 259.

Assemble all cap screws in cylinder head.

Snug cap screws lightly.

INLET, EXHAUST AND WATER MANIFOLDS

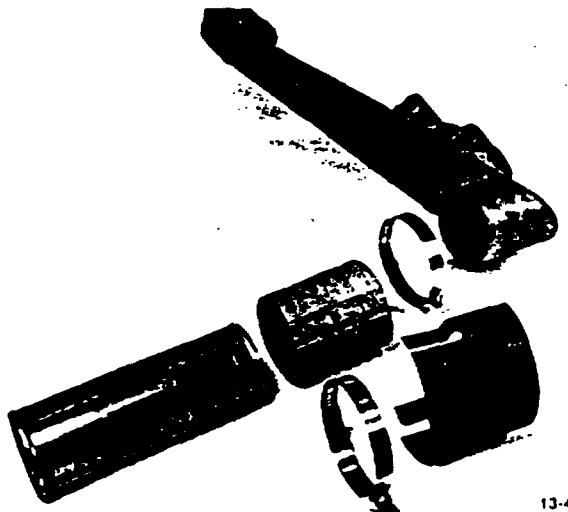


1. Inlet Manifold
2. Water Outlet Manifold

Figure 269. Inlet and Water Manifolds
An integral gasket is used for the water and air manifold. See Figure 269.

Assemble screws and washers to the inlet, and the water outlet manifold. Position gasket over screws and assemble manifolds to cylinder head. Tighten all screws.

Water Manifold Crossover Tube



1. Crossover Tube Shield
2. Crossover Tube Hose Clamp
3. Crossover Hose
4. Crossover Tube
5. Water Manifold

Figure 270. Water Manifold Crossover Tube

Slide hoses and clamps over crossover tube. See Figure 270.

Place crossover tube between water manifold and slide hose over water manifold. Tighten hose clamp at water manifold.

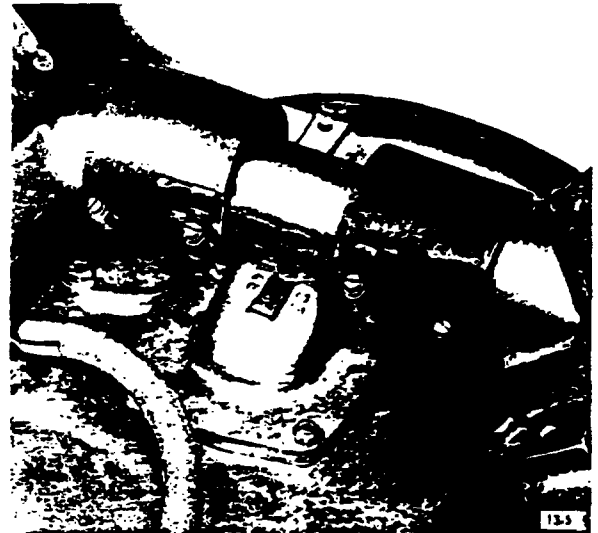


Figure 271. Assembly of Crossover Tube Shield

Assemble shields over hoses with slots in shields pointing towards middle of engine. See Figure 271. Assemble inner hose clamps over shields, clamping the hoses and the shield to crossover tube.



Figure 272. Positioning Crossover Tube Shield

Shields are used over the crossover tube hoses to protect them from the heat given off by the turbocharger. Position shields to provide maximum hose coverage. Cut out in shield should be as close to engine as possible, and still not interfering with adjacent parts. See Figure 272.

When the check valve is properly installed, the open end will be at the mounting surface, and the ball check will be towards the center of the adapter. See Figure 279.

CAUTION

If check valve is improperly assembled, no coolant will flow through the conditioner.

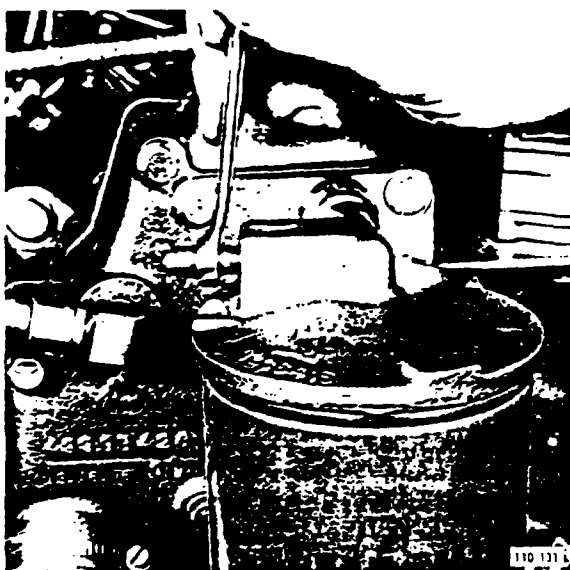


Figure 280. Installing Inlet Check Valve Fitting

Install the inlet check valve in the adapter. See Figure 280. This valve can only be assembled one way since one side has a 1/8 NDT thread which is assembled to the adapter. The other end has a 1/2 - 24 straight thread.

Install feed line from water pump to inlet check valve fitting.

Conditioner Installation and Removal

Apply film of oil to sealing gasket. Install conditioner and turn one full turn after gasket contacts base. (check for leaks when engine is started) To remove, use tool J24783 or equivalent.

EXHAUST MANIFOLD



Figure 281. Assembling Rear Exhaust Manifold

Position new gaskets in place, and assemble exhaust manifolds to engine using capscrews, washers and locks.

NOTE

When assembling the rear exhaust manifolds, the long boss should be on the upper side. See Figure 281.

Assemble exhaust manifold to turbo-charger tee fitting on flywheel housing. Assemble exhaust fittings and sleeves at rear of engine. Use new gasket between fitting and rear exhaust manifold.

After manifold, fittings, and sleeves are aligned at the rear of the engine, tighten the capscrews at the turbocharger fitting on the flywheel housing.

Assemble drain tube to turbocharger, using new gasket. Assemble screws and lock washers. Tighten screws to specifications.

CAUTION

The flange on the drain tube is mounted at an angle to provide clearance between the bellows and the turbocharger mounting flange. See Figure 333. Failure to mount the tube properly will result in an interference between the bellows and flange, causing bellows to wear and possibly result in oil leakage.

Assemble from turbocharger mounting studs to tee fitting. See Figure 331, Item 4.

Position new gasket over mounting studs. See Figure 331, Item 5.



Figure 334. Assembling Turbo Oil Drain Hose Into Cylinder Block

Assemble flexible hose to oil feed fitting at cylinder head. Assemble turbocharger oil inlet tube to turbocharger using new gasket. Install washers and screws and tighten to specifications. Assemble 90 degree elbow fitting to inlet tube. See Figure 331, Item 9. Assemble flexible hose to fitting. See Figure Item 1. Tighten all connections.

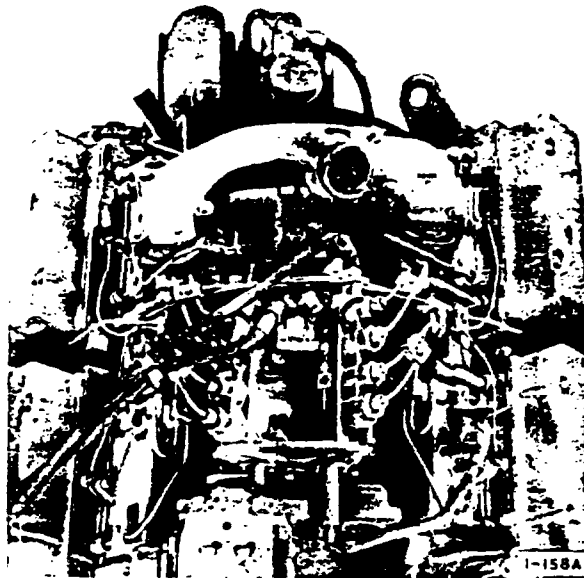
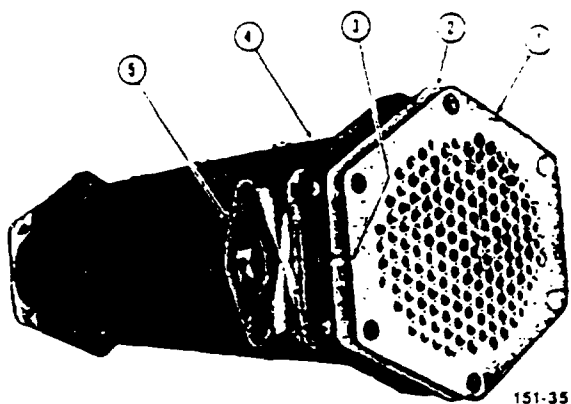


Figure 335. Inlet Manifold Crossover Fitting.

After turbocharger is assembled, position crossover fitting between inlet manifolds. See Figure 335. Assemble fitting with new gaskets. Install capscrews and washers and tighten to specifications.

Assemble O-Ring seal to turbo drain tube. See Figure 332, Item 4. At the same time position turbocharger mounting flange over studs in tee fittings. See Figure 331. Assemble washers and nuts to studs, and tighten to specifications.

Install new O-ring seal at rear side of housing. See Figure 337. Lubricate surface of O-ring with clean lubricating oil.



1. Oil Inlet Port
2. Notch in Bundle Flange

Figure 338. Installation of Bundle into Housing

Assemble new gasket to flanged end of bundle and insert bundle into oil cooler housing. The notch in the bundle flange must be assembled in line with the oil inlet in oil cooler. See Figure 338.

NOTE

Use correct gasket between bundle flange and housing. This is an elastomer coated gasket, and is black in color. Failure to use correct gasket could result in oil leakage in this area.

After gasket and bundle are in position, push bundle into housing, past O-ring.

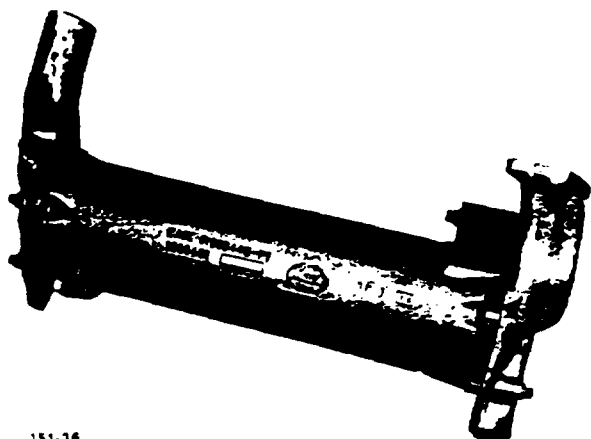
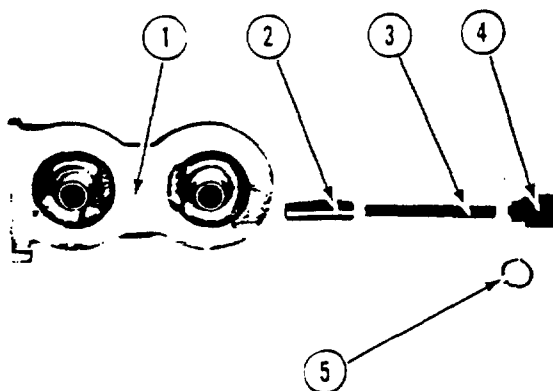


Figure 339. Oil Cooler Assembly with Water Inlet Fitting and Rear Bracket

Assemble gaskets and water inlet fitting and rear bracket to oil cooler assembly. Assemble screws and tighten to specifications. See Figure 339.

Oil Filter Pressure Relief Valve



1. Oil Filter Adapter (Rear)
2. Oil Filter Adapter Pressure Relief Plunger
3. Oil Filter Adapter Pressure Relief Plunger Spring
4. Oil Filter Adapter Pressure Relief Cap
5. Oil Filter Adapter Pressure Relief Cap Washer

151-37

Figure 340. Oil Pressure Relief Valve Arrangement

Check plunger and spring to make certain they are in satisfactory condition. Install plunger, spring, washer, and cap, in adapter. See Figure 340. Torque cap to 100 lb. ft.

NOTE

The oil filter pressure relief valve opens when the pressure restriction across the element exceeds 42 to 50 psi. Oil then by-passes the filters and goes directly into the main oil gallery.

CLUTCH REMOVAL

1. Mark clutch cover and flywheel with a center-punch before removing clutch to facilitate reinstalling clutch in same position.

2. Use three spring retention tools (J26450 for CL-28, 40 and 50 series, J26451 for CL-47 series) or retaining cups as shown in Figure 4-1, when removing a clutch assembly from the flywheel.

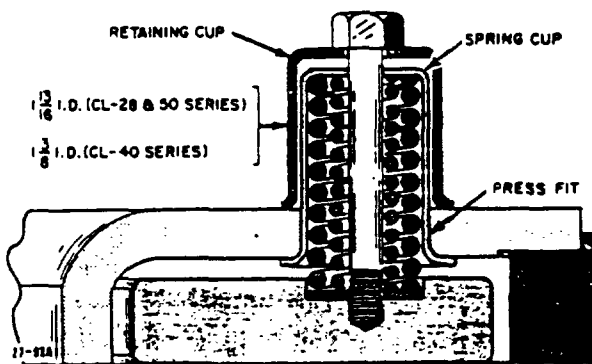


Figure 4-1. Retaining Cups

To use spring retention tools, bottom screws in tapped holes in pressure plate. Set tool nuts up snugly against tool bracket. Tighten tool nuts evenly to relieve spring tension on pressure plate. Not used on CL-58 Series.

3. Remove two clutch-to-flywheel capscrews with lockwashers at the ten o'clock and two o'clock positions of the flywheel and install two long headless guide studs to support the clutch assembly during removal of the remaining attaching capscrews.

4. After removal of all capscrew fasteners, carefully remove heavy clutch and disc assembly from flywheel counterbore and place on bench. Be careful not to drop driven disc assembly which is now free. Also remove the temporary guide studs from flywheel.

CLUTCH INSTALLATION

1. Using spring retention tools, bottom screws in tapped holes in pressure plate. Set tool nuts up snugly against tool bracket. Not used on CL-58 Series.

NOTE

Three retaining cups and screws are used to hold a new clutch assembly together until it is installed on the flywheel. Spring cups are pressed into the clutch cover hence the retaining cups are necessary to prevent spring cups loosening and slipping out of the cover during handling. Retaining cups and screws must be removed after the clutch is assembled to the flywheel. A tag is attached to new clutches (CL-28, 40 and 50 Series) calling attention to this fact and cups and screws are painted red for ready identification.

2. Engage splined end of clutch disc aligning mandrel or a spare main driving pinion with hub splines of driven disc from rear of long hub side. Then position driven disc assembly in flywheel so that spigot end of shaft engages inner race of clutch pilot bearing mounted in flywheel. This arrangement positions the disc assembly in proper alignment until clutch is completely assembled and secured in flywheel.

3. Install two long guide studs in the ten and two o'clock positions in flywheel rim. Mount clutch assembly on guide studs and push unit into flywheel bore until clutch cover flange enters counterbored pilot provided. Be careful not to disturb disc aligning mandrel.

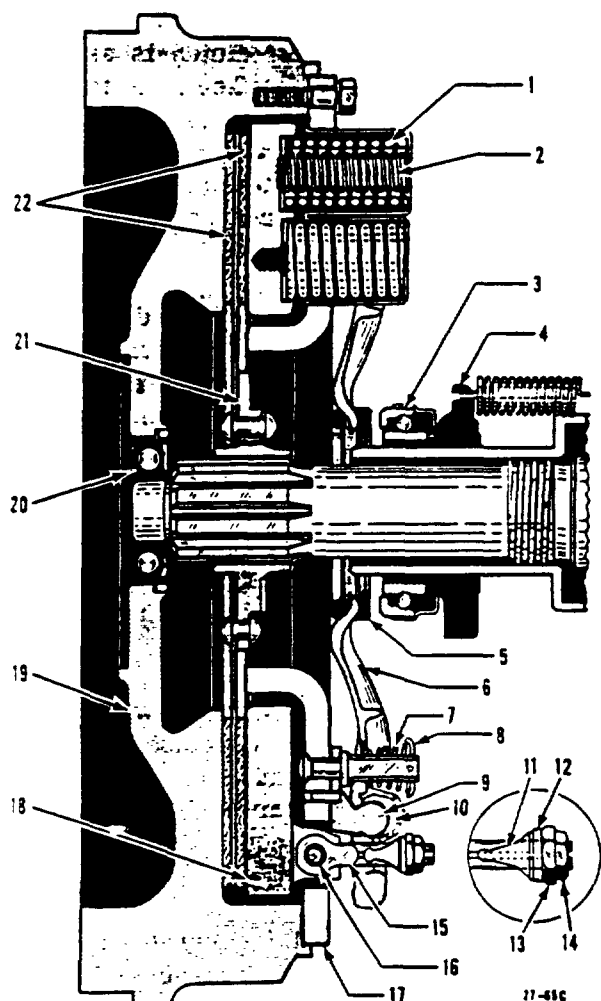
4. Lubricate and install cover-to-flywheel capscrews with their lockwashers. Tighten capscrews a few turns at a time so that cover will not be misaligned and forced into flywheel pilot by the tightening of the capscrews. Remove the two guide studs and replace with capscrews and their lock washers. Remove aligning mandrel.

CL-28 and 40 SERIES

Description

CL-28, -40 Series assemblies are single plate, dry disc pusher type clutches. They consist of a pressure plate, a cover, and a driven disc which is splined to the transmission main driving pinion shaft. When

engaged, the driven disc is clamped between the pressure plate and the flywheel by the pressure of coil springs which are mounted in cups on the cover. Drive is transmitted to the pressure plate by pressure plate lugs which fit in the cover openings. Six release levers have ball pivots and are linked to the pressure plate by eyebolts. The inner ends of the levers are held by the notched release thrust washer. See Figure 4-2.



- | | |
|--------------------------------------|----------------------------|
| 1. Clutch Spring (outer) | 12. Washer |
| 2. Clutch Spring (inner, where used) | 13. Fulcrum Adjustment Nut |
| 3. Release Bearing | 14. Lock Nut |
| 4. Release Collar | 15. Eyebolt |
| 5. Thrust Washer | 16. Eyebolt Pin |
| 6. Release Lever | 17. Cover Plate |
| 7. Lever Spring | 18. Pressure Plate |
| 8. Spring Washer | 19. Flywheel |
| 9. Lever Pivot | 20. Pilot Bearing |
| 10. Lever Bushing | 21. Driven Disc Assembly |
| 11. Eyebolt Fulcrum | 22. Driven Disc Facings |

Figure 4-2. Sectional View of CL-28, 40 Series Clutch

Disassembly

1. Before disassembly of the various parts, mark these parts with a center-punch, so that at reassembly, they can be reassembled in their original positions. This is necessary in order not to disturb the dynamic balance of the clutch.

2. Before removing the three spring retention tools, compress clutch release lever springs, remove washer pins, then remove washers and release lever springs. Pry off snap ring from thrust washer. Remove eyebolt nuts, fulcrums, and clutch release levers.

CAUTION

If retaining cups are used instead of tool (J26450), clamp the cover in a press before removing the cups. This is necessary because the screw used does not have sufficient thread length to completely release the spring load before coming out of the pressure plate.

3. While holding spring retention tool screws, back off tool nuts alternately making one turn at a time. When spring is entirely relieved, back out the three tool screws.

4. Remove clutch cover and springs. If heat-insulating washers are removed from pressure plate spring pockets, retain them for reassembly. The eyebolts need not be removed unless inspection reveals distortion or loose fit on pins.

Inspection and Repair

1. Remove all traces of dirt and oil with a suitable safety solvent. Inspect parts carefully for cracks, distortion or excessive wear as described in the following steps.

2. If cover is cracked or distorted, replace. Tack-weld loose spring cups (on covers having this construction) replace worn or loose ball-fulcrums. Replace loose or bent pin rivets.

2. Equally space three steel blocks $\frac{3}{8}$ inch thick, on bed of arbor or drill press.
3. Place clutch with pressure plate side down, on blocks. (This is done in order to raise clutch to permit disassembly).
4. Place a block of wood, such as a two by four, across cover plate in a position that does not interfere with tips of release levers, as shown in Figure 4-10. Compress clutch assembly slightly, removing lever adjusting screw locknuts.

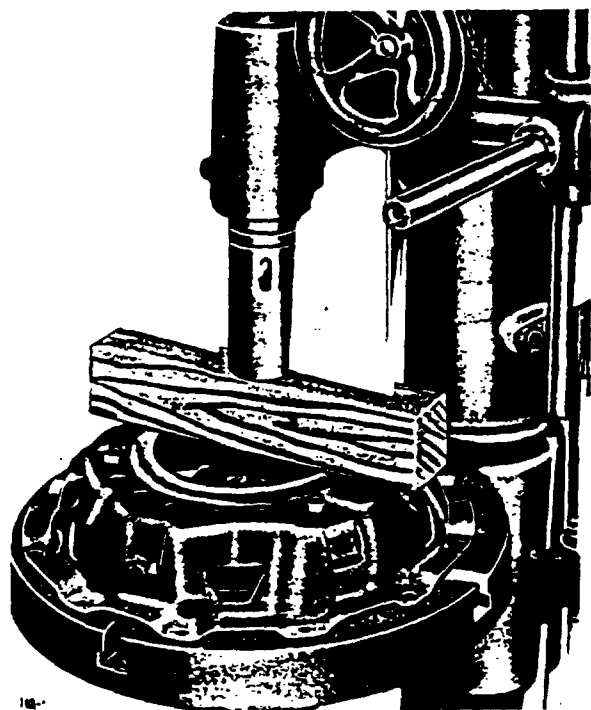


Figure 4-10. Compressing Clutch

5. Turn each lever adjusting screw down (clockwise), a few turns with a screwdriver, releasing spring tension a small amount. Repeat operation until all lever adjusting screws are entirely free of cover plate. Release remaining spring tension, and lift cover plate off pressure springs.
6. Pressure springs may now be removed. After extracting cotter pins and lever pins, remove release levers.

Inspection and Repair

1. Clean all parts thoroughly with a suitable safety solvent. Inspect carefully for excessive wear, distortion, or cracks as described in the following steps.

2. Check cover plate for distortion, excessive wear at indentations which register between drive bosses on pressure plate, and for stripped threads in holes accommodating release lever adjusting screws. If the above mentioned conditions are apparent, replacement of cover plate is required.
3. Replace springs if cracked or defective. Check all springs on a spring tester. Replace all that do not meet specifications.
4. Replace release levers that are badly worn on tips (this is an indication of a sticking release bearing), worn threads on lever adjusting screws and nuts, or where binding appears to be present, which retards free back and forth movement.

NOTE

Release levers are serviced as a subassembly only, and consist of lever, adjusting screw, roller, roller block, lever spring and spring retaining pin.

5. If pressure plate shows signs of scoring, excessive wear at lever pin holes, inside of drive bosses, heat checking, or if warped more than 0.020 inch, plate must be refaced or replaced. (When refacing pressure plate, remove only sufficient metal to obtain a smooth flat surface.) When pressure plate thickness becomes less than 1.141 inch, replacement is necessary.
6. If flywheel is warped or heat checked and surface is refinished, maintain the 1.188 inch dimension between disc surface and bolting face for proper release lever adjustment. No more than 0.070 inch maximum may be removed by grinding.
7. Inspect driven disc assembly for cracks, loose rivets, worn splines, warped or dished condition. If cracked, or hub splines are worn excessively, replace disc assembly.

If facings are worn down nearly even with countersunk, facing-retaining rivet heads and provided assembly is in otherwise good condition, it may be rebuilt.

8. Pilot bearing should be removed, cleaned and checked each time clutch or engine is removed. Discard bearing if balls or races are chipped or scored. After inspection, hand-pack bearing with clutch pilot bearing grease and install bearing in flywheel. Tap into place with shielded side toward clutch.

Use only the recommended pilot bearings specified. These bearings will function without premature failure where slight misalignment exists between engine and transmission.

After bearing is properly installed, pack the entire cavity in back of the bearing with the same specified clutch pilot grease.

CAUTION

To prevent damage to the bearing seal when the transmission is assembled to the engine, the space occupied by the main driving pinion pilot must not be filled with grease. See Figure 4-11.

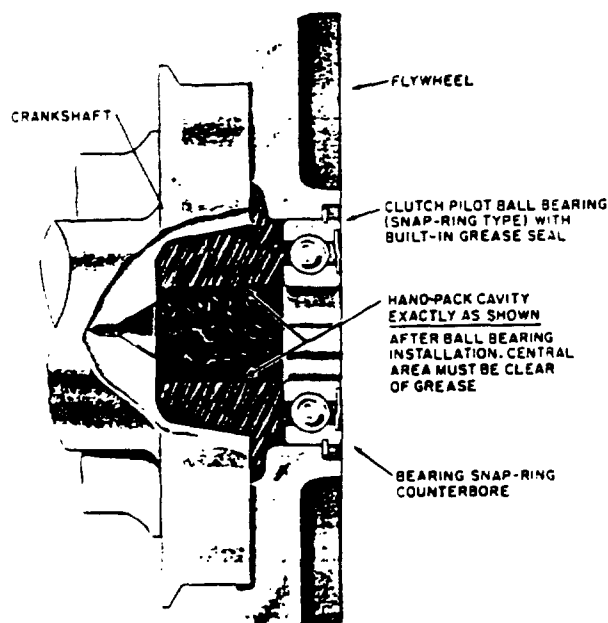


Figure 4-11. Cut-away View of Clutch Pilot Bearing Grease Reservoir Correctly Packed

Reassembly

1. Mount release lever assemblies on pressure plate. Set pressure plate assembly on three equally spaced steel blocks 3/8 inch thick, on bed of arbor or drill press, plate side down.

2. Place pressure springs in position on pressure plate, as shown in Figure 4-12.

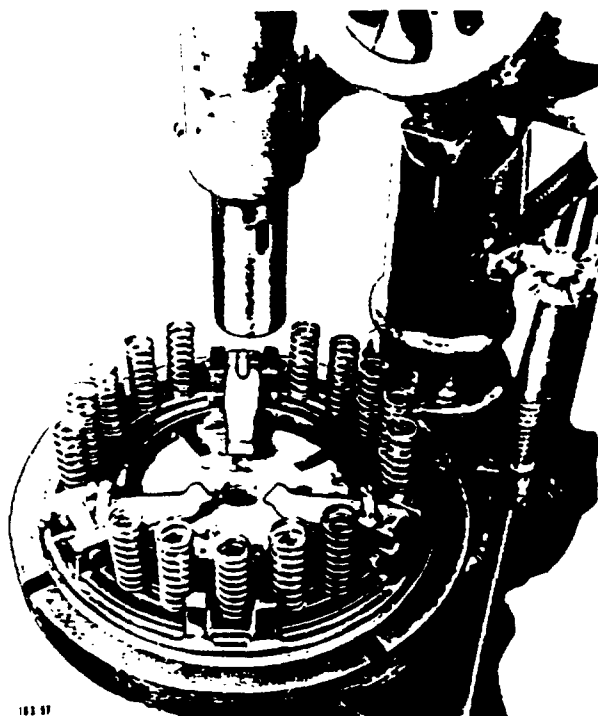


Figure 4-12. Assembling Clutch

3. Lay cover plate over springs, being sure that all springs are seated on bosses of pressure plate, and around indentations on inside of cover.

4. If pressure plate was refaced, it will be necessary at assembly, to add shims under each pressure spring equal to total metal removed.

5. Compress assembly slowly, aligning lever adjusting screws with threaded holes in cover plate. (The indentations inside cover, should enter the spaces between drive bosses on pressure plate freely.) With screwdriver, thread ends of adjusting screws into cover evenly, until screws protrude about 1/2 inch. Hold assembly compressed, while placing locknuts in position, but do not tighten.

6. To facilitate installation on flywheel, place wood blocks approximately 3/8 inch thick, between the tops of release levers and inner rim of cover plate. (Be sure these stay in position as all tension is released).

7. Insert the three spring retention tools (J26451), through cover and bottom in tapped holes in pressure plate (center hole of each five series in cover). With pres-

3. While holding spring retention tool screws, back off tool nuts alternately, making one turn at a time. When spring is entirely relieved, back out the three tool screws.

4. Remove clutch cover and springs. If heat-insulating washers are removed from pressure plate spring pockets, retain them for reassembly. The eyebolts need not be removed, unless inspection reveals distortion or loose fit on pins.

Inspection and Repair

1. Remove all traces of dirt and oil with a suitable safety solvent. Inspect parts carefully for cracks, distortion or excessive wear as described in the following steps.

2. If cover is cracked or distorted, replace. Tack-weld loose spring cups (on covers having this construction) replace worn or loose ball-fulcrums. Replace loose or bent release lever spring pins.

3. Replace springs if cracked or defective. Check all springs on a spring tester. Replace all that do not meet specifications.

4. Replace thrust washer if worn, bent or defective.

5. Replace worn release levers, springs and ball seats. Check levers with a straight-edge and 11/16 inch ball (J26453) as illustrated, in Figure 4-14 and if bent so that dimension (1) is more 11/32 inch when measured at a point where distance (2) is 2-1/2 inch, replace the lever.

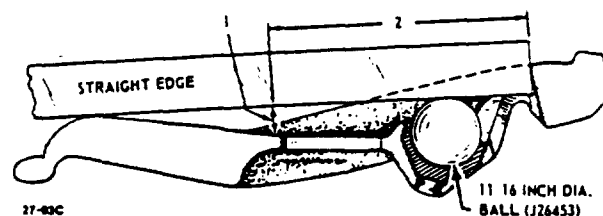


Figure 4-14. Checking Release Lever for Bend

6. If pressure and intermediate plates are scored, heat checked, or warped more than 0.020 inch, they must be replaced or re-faced. Remove only enough metal to obtain a smooth flat surface. Finish with a light cut and polish with emery cloth. When thickness (1) becomes less than the worn limit given in specifications, the plate must

be replaced. Measure at outer spring pocket as shown in Figure 4-15. Measuring at inner pocket is not accurate if pressure plate is dished. If cleft lugs are worn, cracked or distorted, replace the plate. The intermediate plate features a double set of drive slots for increased service life. At clutch installations after rebuild, it is recommended that the set with less wear be used. Replace eyebolts if they are distorted, have worn threads or keyways.

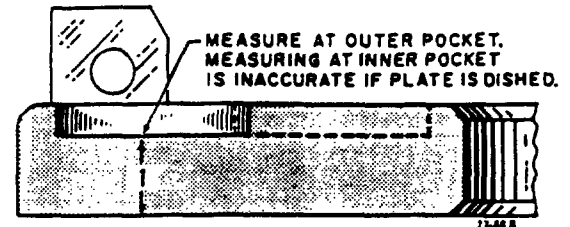


Figure 4-15. Pressure Plate Thickness Dimension

7. If flywheel is warped or heat checked and surface is refinished, maintain the 2.797 inch dimension between disc surface and bolting face for proper release lever adjustment. See Figure 4-16. No more than 0.070 inch maximum may be removed by grinding.

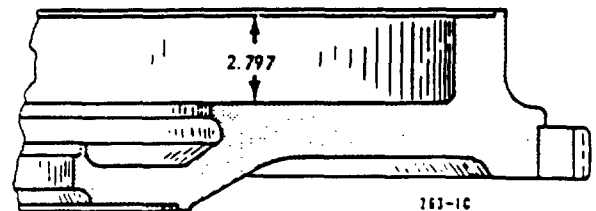


Figure 4-16. Flywheel Rubbing Surface-to-Clutch Cover Bolting Surface Dimension

Intermediate plate drive pins should be inspected for abnormal wear.

When pins have been removed to permit flywheel machining, or require replacement, squareness between flywheel friction and pin drive faces must be maintained at installation. A positioning tool will assist in establishing necessary alignment.

Suitable for this purpose, will be a slotted steel block 4 inches long, 2-1/2 inches wide and 1-1/2 inches thick. One 2-1/2 inches x 4 inches face should be ground for maximum flatness, as it will constitute the major working surface. A 3/16 inch x 45 degree chamfer along all edges of this face will tend to prevent burrs that would affect accuracy. See Figure 4-17.

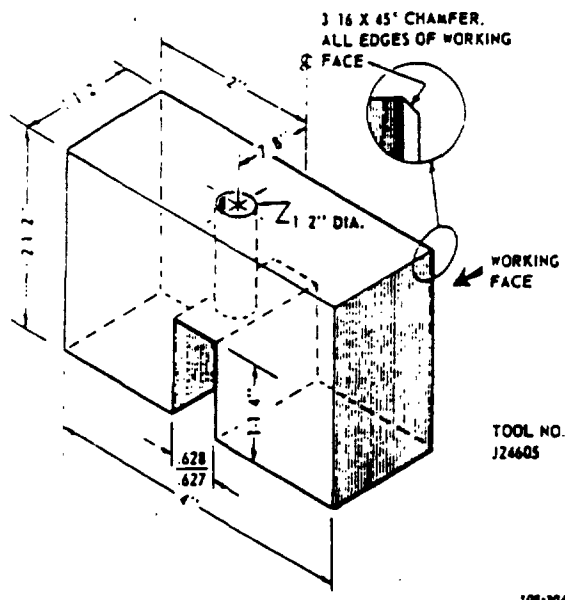


Figure 4-17. Drive Pin Positioning Tool

Midway between ends of the 4 inch length, a 0.627 to 0.628 inch wide slot $1\frac{1}{4}$ inch deep should be machined through the $1\frac{1}{2}$ inch thickness. The slot must be exactly square with the ground face for it will determine flywheel to drive pin head alignment. A half -inch drift pin clearance hole, drilled from the side opposite, and intersecting with, the slot will complete the tool. Hole centerline should be $\frac{7}{8}$ inch from the ground face, so that driving force will be centered over the head. Magnetizing the block will minimize movement during driving and lessen possibility of marring flywheel face.

In use, the threaded portion of the pin is inserted in the flywheel hole. The positioning tool slot is placed over the drive head. with the ground surface held flat against the flywheel friction face. The pin is then driven until fully seated.

8. Inspect driven disc assembly for cracks, loose rivets, worn splines, warped or dished condition. If cracked, or hub splines are worn excessively, replace disc assembly. If facings are worn down nearly even with countersunk facing-retaining rivet heads and assembly is in otherwise good condition, it may be rebuilt.

9. Pilot bearing should be removed, cleaned and checked each time clutch or engine is removed. Discard bearing if balls or races are chipped or scored. After inspection, hand-pack bearing with clutch pilot bearing grease and install bearing in fly-

wheel. Tap into place with shielded side toward clutch and snap ring seated in counterbore.

All current Mack-made engine flywheels have been manufactured by boring the clutch pilot bearing hole straight-through and counterboring a recess to provide proper positioning for the snap ring type pilot bearings now in use. Old bearings without a snap ring cannot be used in new through-bored flywheels.

CAUTION

Do not install a new snap ring bearing in an old flywheel without removing the snap ring and discarding. In old flywheels without the counterbore, the snap ring would position the bearing too far rearward, which would result in early bearing failure and considerable damage to costly components. Use only the recommended snap ring type bearings specified. These bearings will function without premature failure where slight misalignment exists between engine and transmission.

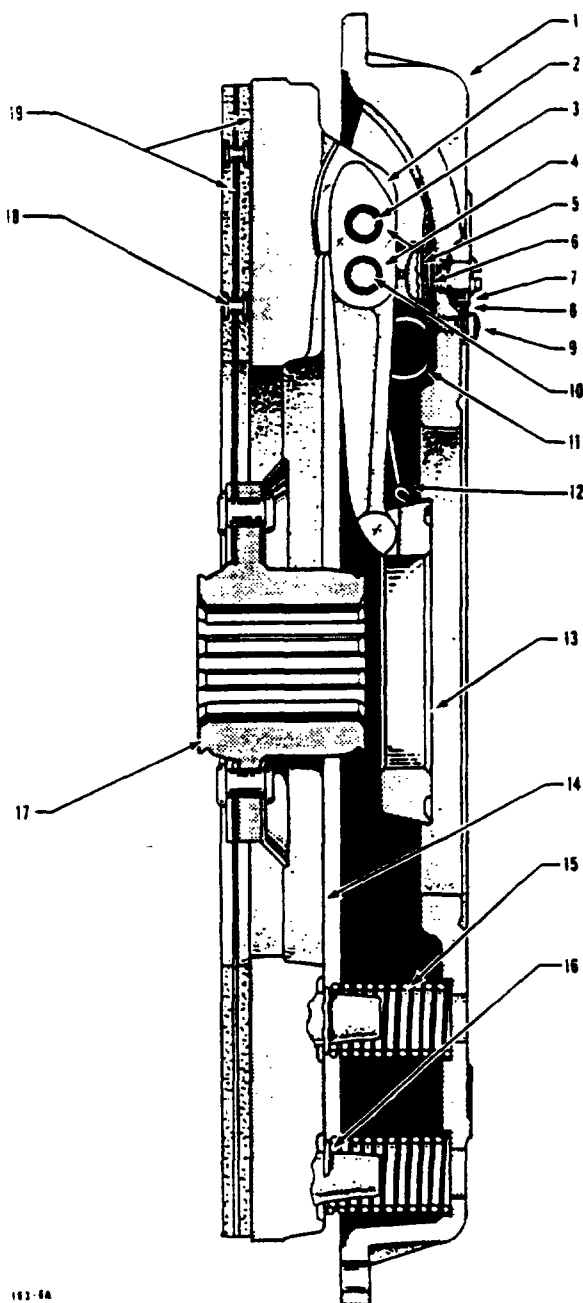
After bearing is properly installed, pack the entire cavity in back of the bearing with the same specified clutch pilot grease.

CAUTION

To prevent damage to the bearing seal when the transmission is assembled to the engine, the space occupied by the main driving pinion pilot must not be filled with grease. See Figure 4-18.

Before assembling the clutch, a positive wear check should be made to insure that it will provide maximum disc wear. This check will uncover any interference that might prevent full release lever travel and allow corrections to be made before the clutch is assembled.

Place the pressure plate assembly and cover (without springs) into position as shown in Figure 4-19, making sure that shims of the correct thickness (0.250) are inserted



103-14

- | | |
|---------------------|--------------------|
| 1. Clutch Cover | 11. Double Torsion |
| 2. Release Cover | Anti-Rattle Spring |
| 3. Release Lever | 12. Thrust Washer |
| Pin | Clamp |
| 4. Needle Bearings | 13. Lever Thrust |
| 5. Release Lever | Washer Ring |
| Yoke | 14. Pressure Plate |
| 6. Yoke Leaf | 15. Helical, Main |
| Spring | Spring |
| 7. Lever Adjust- | 16. Heat Insulator |
| ing Nut | Ring |
| 8. Adjusting Nut | 17. Driven Disc |
| Lock Plate | Assembly |
| 9. Lock Plate Lock | 18. Facing Rivet |
| Screw | 19. Driven Disc |
| 10. Yoke Clevis Pin | Facings |

Figure 4-21. Sectional View of CL-58 Series Clutch

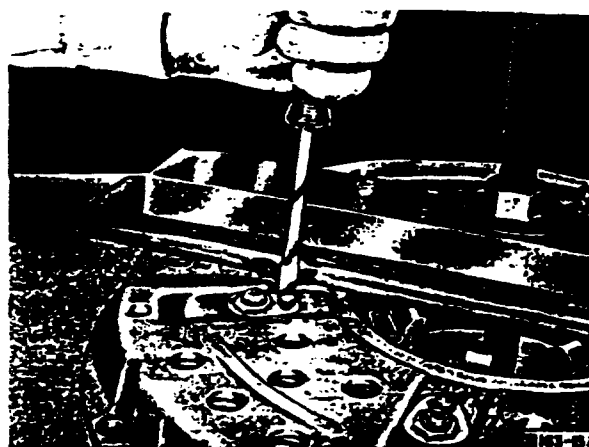


Figure 4-22. Removing Lever Adjusting Nut Lock Plates

main spring insulator washers from pressure plate bosses.

NOTE

Do not remove the six lever anti-rattle springs from the cover unless replacement is necessary.

4. Lay pressure plate on bench and with a soft metal drift, drive hardened lever pins out of pressure plate drive lugs to free release levers. With a pair of pliers, remove cotter pin from each lever yoke clevis pin and then press out each yoke clevis pin by hand.

CAUTION

When removing levers from pressure plate drive lugs and lever yoke, be very careful not to lose any of the small uncaged needle rollers.

Inspection and Repair

Remove all traces of dirt and oil with a suitable safety solvent. Inspect parts carefully for cracks, distortion or excessive wear as described in the following steps.

1. Replace springs if cracked or defective. Check all springs on a spring tester. Replace all that do not meet specifications.

2. If pressure plate is scored, heat checked, or warped more than 0.025 inch, it must be replaced or refaced. Remove only enough metal to obtain a smooth flat surface. No more than 0.070 inch maximum may be removed by grinding.

3. Inspect clutch release lever tips and clevis pin holes for excessive wear. Make sure levers are not bent. Replace where necessary.

4. Inspect release lever yokes for condition of threads. Slight thread damage may be cleaned up with a three-cornered Swiss file. Replace lever yokes if clevis pin holes are elongated.

5. Check clevis pins and lever pins for wear. Replace if wear is excessive. Check lever slotted thrust washer ring for excessive wear. Replace if slots are excessively worn.

6. Check lever needle roller bearings for wear. If flats are such that rollers slide rather than roll, replace rollers.

7. Inspect driven disc assembly for cracks, loose rivets, worn splines, warped or dished condition. If cracked, or hub splines are worn excessively, replace disc assembly.

If facings are worn down nearly even with countersunk facing-retaining rivet heads and provided assembly is in otherwise good condition, it may be rebuilt.

8. If flywheel is warped or heat checked and surface is refinished, maintain dimensions shown in Figure 4-23 between disc surface and bolting face for proper release lever adjustment. No more than 0.070 inch maximum may be removed by grinding.

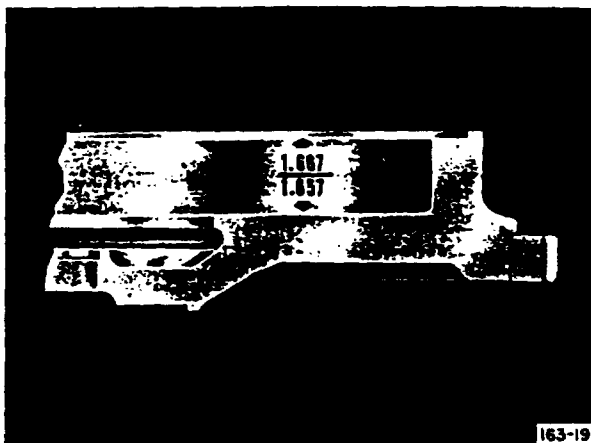


Figure 4-23. Flywheel Rubbing Surface-to-Clutch Cover Bolting Surface Dimension

9. Pilot bearing should be removed, cleaned and checked each time clutch or engine is removed. Discard bearing if balls or races are chipped or scored. After inspection,

hand-pack bearing with clutch pilot bearing grease specified and install bearing in flywheel. Tap into place with shielded side toward clutch and snap ring seated in counterbore.

Use only the recommended snap ring type bearings. These bearings will function without premature failure where slight misalignment exists between engine and transmission.

After bearing is properly installed, pack the entire cavity in back of the bearing with the same specified clutch pilot grease.

CAUTION

To prevent damage to the bearing seal when the transmission is assembled to the engine, the space occupied by the main driving pinion pilot must not be filled with grease. See Figure 4-24.

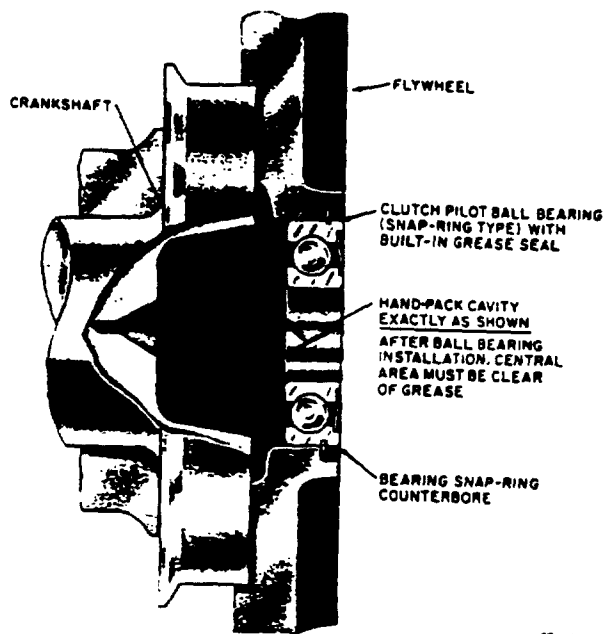
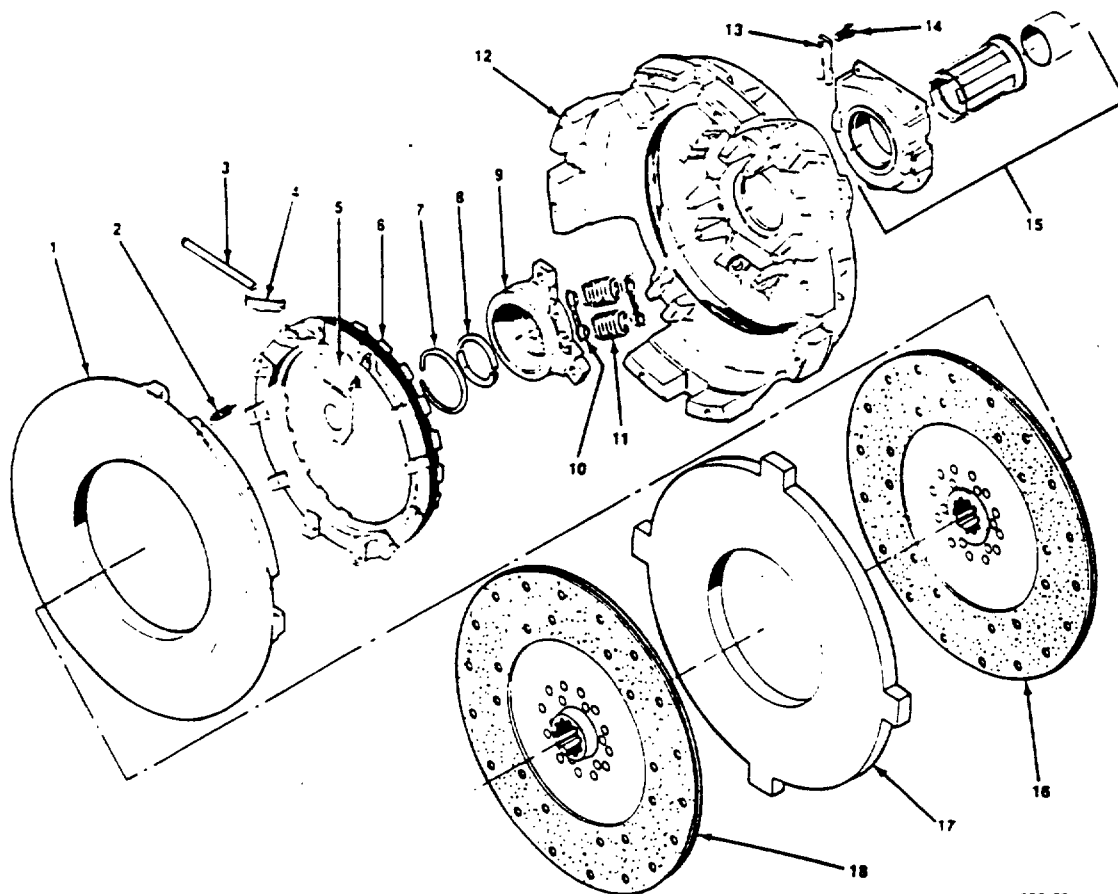


Figure 4-24. Cut-away View of Clutch Pilot Bearing Grease Reservoir Correctly Packed

Reassembly

1. Apply a light coat of clutch lever grease on the loose needle bearings and install rollers in each pin hole of levers. When bearings are installed, apply additional grease to each assembled bearing group.

2. Spread a thin coat of lever grease on the two rubbing flats of each lever and on all yoke rubbing surfaces. Center lever



163-50

- | | |
|----------------------------|------------------------------------|
| 1. Pressure Plate | 10. Spring Pivot |
| 2. Return Spring | 11. Pressure Spring |
| 3. Pivot Pin | 12. Flywheel Ring |
| 4. Spring Clip | 13. Adjusting Ring Lock |
| 5. Lever | 14. Bolt & Lock Washer Assy |
| 6. Adjusting Ring | 15. Release Bearing & Bearing Assy |
| 7. Snap Ring | 16. Driven Rear Disc |
| 8. Release Sleeve Ring | 17. Intermediate Plate |
| 9. Release Sleeve Retainer | 18. Driven Front Disc |

Figure 4-33. Exploded View AS-1550 Series Clutch Assembly

Removal and Disassembly

A suitable "sling" or transmission jack should be used to properly support and maintain the engine/transmission alignment when removing or installing a transmission on an engine. DO NOT let the rear end of the transmission drop down and hang unsupported in the splined hubs of the clutch discs to avoid bending or distorting the friction discs. Disconnect the external linkage from the clutch release arm to permit the release yoke to turn up and pull free of the release bearing thrust pads.

1. Prior to actual clutch removal, assemble a clutch disc aligning tool to the driven disc and release bearing assembly.

It is important that two 3/4 inch blocks of wood as shown in Figures 4-34 and 4-35 be inserted between the clutch release bearing housing and clutch flywheel ring as the clutch mounting bolts are loosened around the flywheel. These blocks will relieve the heavy internal spring load, preventing cocking and bending within the clutch and insure easy removal of remaining mounting bolts.

2. When all bolts have been removed, slide clutch assembly back and off using caution to keep aligning tool in place to retain discs and intermediate plate.

3. Carefully remove aligning tool, rear disc, intermediate plate and front disc.

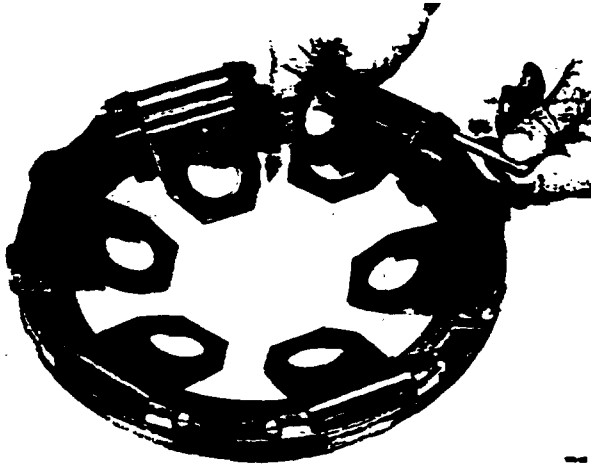


Figure 4-43. Removing Retainer Clip

Inspection and Repair

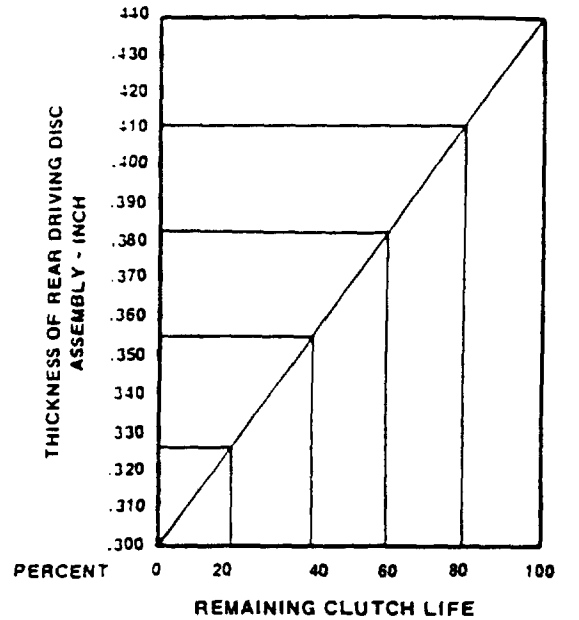
Clean all parts thoroughly with a suitable safety solvent.

Many clutches are replaced as a preventative maintenance item at low mileage during repairs of the transmission or engine. Before the Clutch Assembly is replaced, the unit should be inspected for the following items:

1. Heat cracks in the pressure plate.
2. Excessive wear in all drive slots.
3. Broken springs.
4. Dry or damaged release bearing.
5. Broken intermediate plate.
6. Excessive driven disc hub spline wear.
7. Burned facings.
8. Excessive wear on drive pins or intermediate plate slots.

If the preceding inspection shows clutch parts to be in good condition, use the following chart to determine the approximate remaining clutch life (by measuring the thickness of the rear driven disc assembly).

Find thickness of rear disc on column to left; follow curve on right, then drop this point down to read percent of clutch life remaining.



163.76

Driven Discs

Inspect disc assembly for cracks, loose rivets, worn splines, warped or dished condition. Re-straighten if dished or warped beyond 0.015 inch maximum runout. Replace if hub is cracked, or splines are worn excessively.

Replace facings if they are glazed, scored, worn down to rivet heads, burned, or if contaminated with grease or oil.

The driven discs use high-quality asbestos facings riveted to the steel disc. They may be furnished as rigid type disc or damper type. Used discs can be reworked in the field by drilling out the rivets to remove old facings. Use the correct size drill when removing old rivets to avoid enlarging holes in disc. Use proper facings and a star set anvil to reline used discs.

Ceramic friction material, a combination of metal and ceramic, is used in producing round or trapezoidal buttons which are riveted to steel discs. These clutch

discs, available with either rigid or damper hubs, offer many advantages for heavy-duty applications. Reworking these discs in the field is not recommended because the ceramic buttons must be assembled and ground to hold thickness as well as squareness with splines.

Super-duty discs have six trapezoidal ceramic buttons and are available with rigid or damper hubs. These discs are thinner than standard discs while the intermediate plate is thicker. This combination of more ceramic buttons and thicker intermediate plate provides longer life and increased torque capacity.

A super-duty kit consisting of two driven discs and an intermediate plate is available for converting a standard Angle-Spring clutch into a super-duty clutch. It is very important that the kit be installed as a unit and that its components never be intermixed with standard components.

Flywheel Ring

Inspect the flywheel ring for cracks. Replace if cracks are visible. Check slots for indentation caused by wear of pressure plate driving lugs. See Specification Chart for slot limits.

Inspect bolt circle face and pilot for nicks and burrs due to removal or handling. Remove burrs with file to insure proper seating and squareness when clutch is mounted to flywheel.

Adjusting Ring

Check pivot pin holes for wear. Clearance may not exceed 0.010 inch between pin and hole. Inspect for cracks; replace if cracks are visible.

Pressure Plate

Inspect fulcrum for wear. If wear exceeds 0.015 inch, remachine. See Specification Chart for maximum rework.

Inspect friction surface of pressure plate for scoring, burning, heat checking or distortion. If friction surface is badly scored, heat checked, warped or dished in excess of 0.010 inch, resurface or replace with new

pressure plate. Smooth and flat pressure plate surfaces must be used for satisfactory clutch life.

Check drive lugs for wear per Specification Chart.

Intermediate Plate

Inspect friction surfaces of intermediate plate for heat checks, scoring or distortion. If friction surface is badly scored, heat checked, warped or dished in excess of 0.010 inch, resurface or replace with new intermediate plate. Smooth and flat intermediate plate surfaces must be used for satisfactory clutch life. Inspect driving slots of intermediate plate for wear per Specification Chart.

Release Levers

Inspect levers for excessive wear at points of contact with pressure plate, release sleeve retainer, and pivot pin. If levers are bent or worn, replace with new levers. It is good preventive maintenance to replace levers during clutch rebuild.

Release Sleeve Retainer

Inspect for wear in lever groove and internal splines. Refer to specifications for driving slot clearance between flywheel ring drive slots and release sleeve retainer drive lugs.

Spring Pivots

Inspect for cracks; if visible, replace.

Release Sleeve Sub-Assembly

Check bushing for excessive wear. Check bearing diameter for tight fit. Refer to Specifications Chart and replace if necessary.

Release Bearing and Sleeve Assembly

It is recommended that the release bearing and sleeve assembly be replaced as a unit at the time of clutch rebuild. Assemblies are available as service replacement items.

Disc Brakes

No manual adjustment required. Brakes adjust automatically during braking operation. The square-cut piston seal is distorted when pressure is applied to piston. When braking pressure is released, the seal returns to its normal condition and pulls the piston away from the lining. This action, plus some slight rotor lateral runout ("wobble"), considered normal, provides adequate running clearance.

Disassembly and Assembly

When brakes are relined or disassembled for other repairs, all parts should be inspected for wear and worn parts should be replaced as required.

Cam Brakes - (See Figure 8-37)

Disassembly

1. Remove shoe return spring.
2. Remove lock rings, retainers, and felts from brake shoe anchor pins.
3. Cut lock wire and remove anchor pin lock screws.
4. Remove anchor pins and shoe assemblies.
5. Remove brake shoe roller retaining clip (or screw) and remove roller.
6. Remove slack adjuster lock ring and spacing washers.
7. Remove camshaft, washer, and felt seal (if used).
8. Remove nylon bushings if replacement is necessary. Use suitable tool for both removal and installation of bushing. See Figure 8-44.

NOTE

On brakes where lip type seals are used, these will have to be removed and replaced if nylon bushings are replaced.

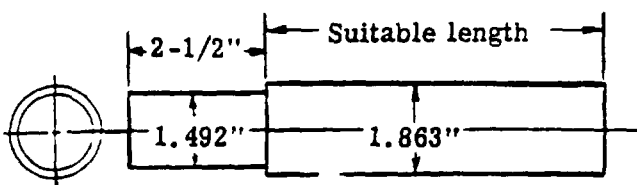


Figure 8-44. Bushing Removal and Installation Tool

Assembly

1. Install new nylon bushings, if required, using suitable tool. (Install new lip type seal if used.)
2. Install brake shoe rollers and retainers. Make certain rollers are of proper size. See instructions relative to brake shoe "Cam Roll-Over."
3. Install camshaft, washer, and felt seals. (if used.)
4. Position brake shoe assembly over spider and tap anchor pin into position with brass punch, "flat" in line with lock screw hole.
5. Install lock screws, tighten securely and thread with lockwire.
6. Position felts, retainers, and lock rings on anchor pins.
7. Install shoe return spring. New springs should be used with each brake reline. Tension loss occurs from normal use and heat build up. New springs will ensure that shoes are returned to fully relaxed position, and not in contact with drum, which would cause premature wear.
8. Assemble slack adjuster on splined end of camshaft; using spacers and washers on each side of adjuster to obtain .030-.060 end play.

Wedge Brakes - (See Figure 8-39)

Disassembly

1. Remove shoe return springs. Use brake spring pliers. (Do Not use screwdriver.)
2. Remove brake shoe assembly.
3. Remove plunger guide screws and gaskets from plunger housing. If brake is automatic adjusting, remove hollow capscrew, gaskets, spring and adjusting pawl. It may be necessary to use a magnet to remove the adjusting pawl.
4. Using a suitable screwdriver, pry the seals loose and remove anchor (solid) plungers, adjusting plungers, adjusting sleeves (actuators) and adjusting bolts.
5. Thoroughly inspect and clean all parts including the housing plunger and seal bores and shoe rest pads. DO NOT solvent clean any rubber parts (plunger seals or gaskets).

4. Lift the caliper off the hub and rotor. See Figure 8-50.



Figure 8-50. Removing Caliper

NOTE

It is not necessary to remove the hydraulic line when replacing shoe and lining assemblies. However, do not let the caliper hang on the hydraulic line. Lay the caliper on the suspension.

Removing Shoe and Lining Assembly

1. Remove the inner shoe and lining assembly from the anchor plate.

2. Remove outer shoe and lining hold-down spring, pin and cup. See Figure 8-51.



Figure 8-51. Removing Spring, Pin, and Cup.

3. Remove outer shoe and lining assembly. See Figure 8-52.



Figure 8-52. Remove Outer Shoe and Lining Assembly.

Inspecting Caliper

1. Check the inside of caliper for hydraulic fluid leak. If evidence of fluid leak is noted, the caliper should be overhauled.

2. Wipe the inside of the caliper, clean and check the dust boots for cuts, cracks or other damage. If damage is noted the caliper should be overhauled. See Figure 8-53.

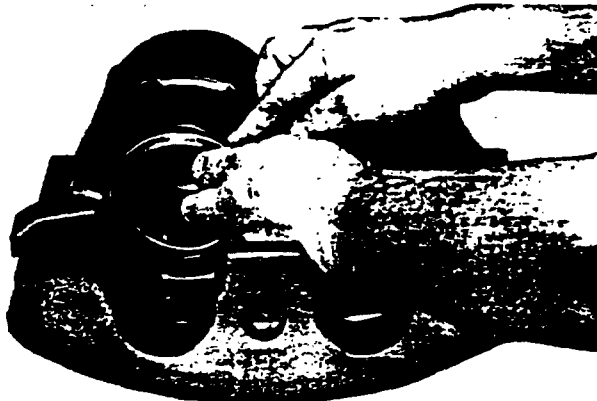


Figure 8-53. Inspecting Boots for Cracks and Cuts.

Assembly

Installing Shoe and Lining Assemblies

1. Install new inner shoe and lining assembly into anchor plate.

2. Push the pistons to the bottom of the piston bore. This is done by taking a small block of wood and placing it over the pistons and boots. With a "C" clamp, push the pistons to the bottom of the piston bores.

3. This will provide clearance for the caliper to fit over the hub and rotor when new shoe and linings are installed. See Figure 8-54.

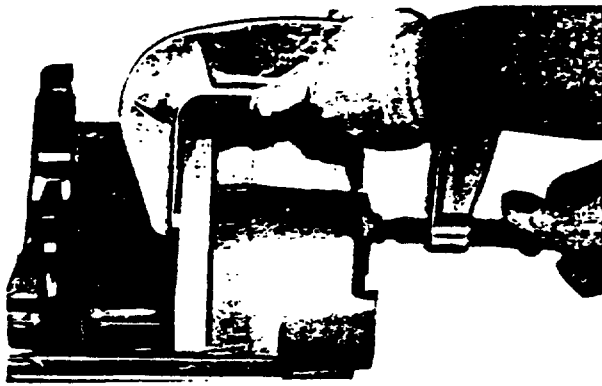


Figure 8-54. Pushing Pistons back into Caliper.

4. Install outer shoe and lining into caliper and install shoe hold-down spring and pin. See Figure 8-55.

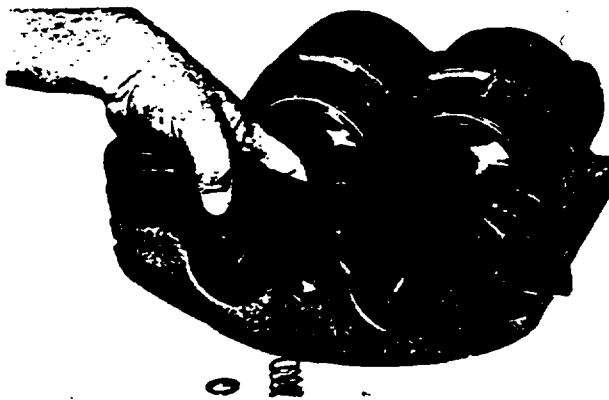


Figure 8-55. Installing Outer Shoe and Lining Assembly.

5. Install caliper assembly over the hub and rotor and position into grooves in anchor plate.
6. Install the caliper hold-down assemblies and tighten bolts to 40 lb. ft. torque. See Figure 8-49.
7. Add brake fluid to bring level to 1/4 inch from top of reservoir.
8. If any hydraulic fluid lines have been disconnected, bleed the hydraulic brake system. Pump the brake pedal several times to make sure brake shoes are adjusted.
9. Install the front wheels and lower vehicle.

Caliper Overhaul

Always use denatured alcohol or brake fluid to clean caliper parts.

CAUTION

Do not use mineral base cleaning solvents such as gasoline, kero-

sene, carbon tetrachloride, acetone or paint thinner to clean the caliper. It will cause rubber parts to become soft and swollen in extremely short time.

1. Remove caliper assembly as previously described in this section.
2. Disconnect the hydraulic hose and cap or tape the fitting to prevent dirt from entering the hydraulic line.
3. Check the brake hose for worn spots, cracks or other signs of deterioration. Discard the hose if damaged.
4. Drain brake fluid from caliper.
5. Thoroughly clean the exterior of caliper.
6. Place a small block of wood under caliper piston. (Approximately 2 inches thick) Pad the exterior of the caliper with a clean shop towel. Remove the piston by directing air into the caliper fluid inlet. See Figure 8-56.

CAUTION

Use just enough air pressure to ease the pistons out of bore. If the pistons are blown out, even with padding provided, it may be damaged.

WARNING

Do not place your fingers in front of the piston in an attempt to catch or protect it when applying compressed air. This could result in serious injury.

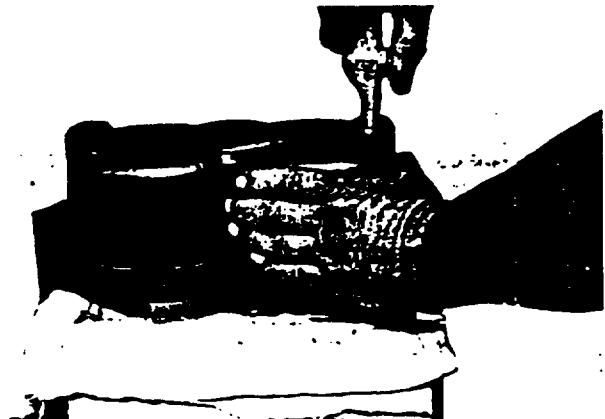


Figure 8-56. Removing Pistons from Caliper Bore.

7. Remove and discard the piston boots.

19. Install new shoe and lining assemblies, and caliper as previously described.

20. Connect the brake hose to the caliper.

21. Bleed the system. Allow the caliper to fill with brake fluid. After all air bubbles have escaped and fluid runs clear from bleeder, close the bleeder screw. Replenish the brake fluid in the hydraulic fluid reservoir.

22. "Pump" the brake pedal several times to actuate the piston seals and position the shoe and lining assemblies.

23. Check for fluid leakage at all connections under maximum pressure. Refill fluid reservoir as necessary.

24. Install front wheels and lower vehicle.

25. Always check the hub and rotor braking surface for deep scores, cracks, and heat checks. See Figure 8-61.

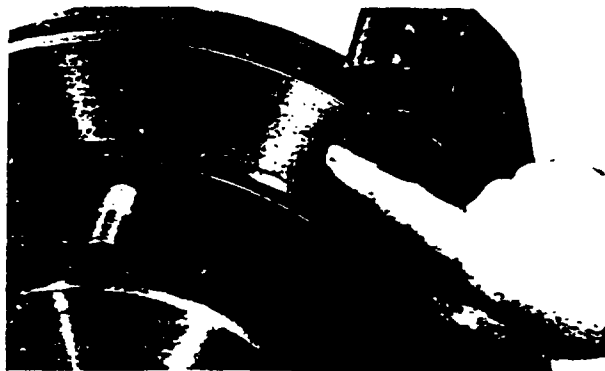


Figure 8-61. Checking Rotor Surface

26. Always check hub and rotor lateral run-out ("wobble"). Lateral runout must not exceed 0.008 inch.

leading to the bottom of the container. The air then rises through the alcohol and passes into the line to the compressor, carrying alcohol in the form of vapor with it. The alcohol, thus introduced into the air system acts as an anti-freeze.



Figure 8-82. Alcohol Evaporator

Preventive Maintenance

Every 1,000 Miles or as Determined by Actual Usage

Check alcohol level and if necessary replenish with 188 proof methanol alcohol. In cold weather, alcohol level should be at least $\frac{2}{3}$ full.

NOTE

If alcohol is not being consumed, it indicates the evaporator is inoperative and should be inspected.

Every Mack C and D Inspection

Remove strainer if present in bottom of evaporator body and clean thoroughly in solvent.

Every Mack C and D Inspection

Disassembly evaporator unit and clean thoroughly. Inspect all parts for cracks and be sure evaporator tube is not clogged with dirt. Replace all gaskets and rubber parts.

Inspection

When the compressor is compressing air, air bubbles should be passing through the alcohol. If air bubbles are not present when the compressor is compressing air, then the alcohol evaporator is not functioning properly.

Check to be sure all connections are tight. Check condition of filler cap gasket and cover gasket.

RELINING & RECONDITIONING

Drum-Type Brakes

After supporting the axle on stands, cage the springs in the spring brake chambers. Remove the tires, wheels, and drums as an assembly, and inspect drums for heat checks, cracks, distortion or other damage.

Close inspection of all worn brake parts may lead to clues for corrective action to improve lining life and future drum damage.

Scored Drum

Only the tops of the ridges will contact brake lining. Since a small percentage of the brake lining is required to do all the work, hard pedal and fade will result. A scored drum must be reconditioned in a lathe. See Figure 8-83.

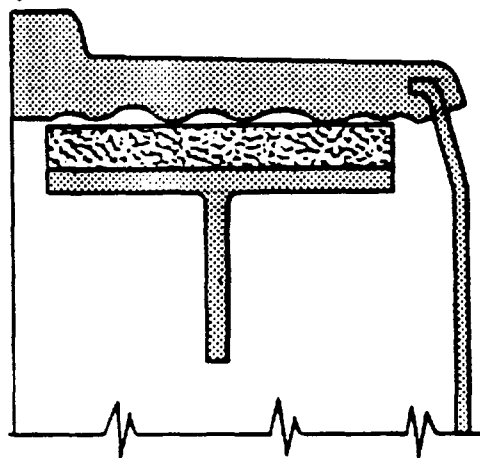


Figure 8-83. Scored Drum

Hard Spots

Hard spots are "islands" of steel in the cast iron surface. They result from a change in metallurgy caused by the heat of braking. Hard spots must be ground out or brake performance will be poor and erratic. See Figure 8-84.

Bell-Mouthed Drum

If a drum is bell-mouthed or flared, full lining to drum contact cannot be achieved. Fade and noise can be expected. A bell-mouthed drum must be trued in a lathe in order to procure full lining to drum contact. See Figure 8-85.

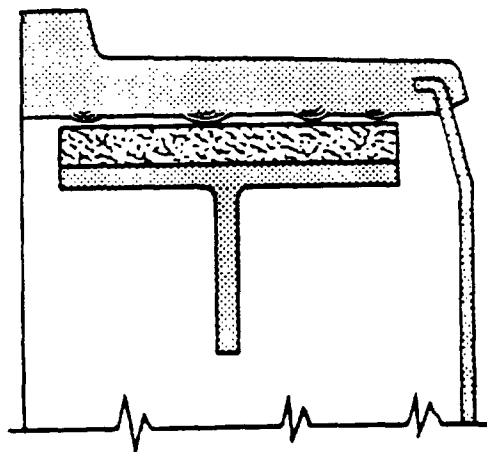


Figure 8-84. Hard Spots

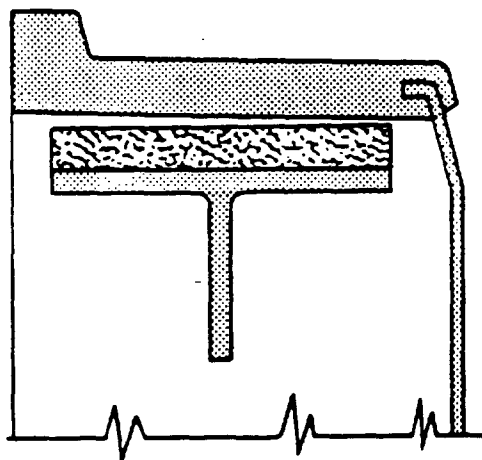


Figure 8-85. Bell Mouthed Drum.

Heat checking and discoloration, if only superficial, can be corrected by resurfacing the drum, otherwise replace drum.

Drums having more than .010" out of round, or any of the conditions described above should be resurfaced. Use only those drums which produce a satisfactory surface finish.

CAUTION

Drum manufacturer and state vehicle inspection laws (where applicable) govern the amount of drum diameter increase allowed when resurfacing. Most drums are stamped by manufacturers as to maximum oversize allowable.

Excessive removal of drum material could result in drum failure or unsatisfactory brake performance and is illegal in some states.

NOTE

When reconditioning brakes, it is important that the brake assemblies on each side of the same axle be serviced in exactly the same manner. This will avoid unequal braking performance. (Drums on the same axle should be resurfaced within .010 of each other.

Cam Roll-Over

Increasing the drum diameter will permit the cam to rotate beyond its maximum lift when the lining becomes worn. To prevent cam "Roll-Over," oversize roller cam followers are available.

Standard (1.250" O. D.)

Standard rollers are used when installing standard linings with standard drums, "X" lining (1/16 oversize) with 1/16 oversize drums, and "XX" lining (1/8 oversize) with 1/8 oversize drums.

1/8" Oversize (1.375")

1/8" oversize rollers are to be used with the installation of standard linings with worn or trued drums which are 1/32" oversize. 1/8" oversize rollers should be installed and the liners circle ground a few thousandths less than drum diameter.

1/4" Oversize (1.500")

Where "X" linings have been installed with 1/16" oversize drums and standard rollers, these rollers should be removed and 1/4" oversize installed before the lining becomes worn to a point where the brake cam is no longer effective with the standard rollers.

1/2" Oversize (1.750")

Where "XX" linings and 1/8" oversize drums have been used, the standard rollers should be removed when the linings become approximately 50% worn and 1/2" oversize rollers installed.

Brake Linings

Linings must be the correct material for a specific application, and the same type lining should be used for each wheel on the same axle.

Handle lining carefully to prevent grease, oil, or any other type of contamination to come in contact with lining surface.

SERVICE BULLETIN

JAN. 9, 1970

No. Q-539 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

BRAKE LINING KITS SWD592, 5921, 595, 5951, RAD703, 705 (DM & R Models, As Applicable)

PURPOSE To furnish service brake lining kit numbers for replacement of all previously approved lining kits for noted units.

INFORMATION Although originally conceived for applications considered off-highway by nature, the units affected have increasingly been operated at highway speed in dumper/mixer use. The replacement linings will provide increased brake effectiveness to meet these more demanding field operating conditions.

Unit application, brake size and respective kit part numbers are as tabulated.

Unit	Brake Size	Lining Kit No.
SWD592, 595 RAD703, 705	17-1/4 x 6	202SMH171
SWD5921, 5951	17-1/4 x 7	202SMH172

Each kit contains material for relining the brakes on a single axle. Both kits listed have FORWARD and REVERSE blocks of the same mix.

Due to the different characteristics of the new lining it is not interchangeable on an individual wheel basis with that of the previous type. Where a single drive axle is employed and one wheel brake assembly requires relining, both assemblies must be serviced with the new linings. In the case of dual axle drive bogies, good maintenance practice dictates replacement of all linings at the same period. Along with other important factors, this will help to achieve the brake balance necessary for maximum braking performance.

In extreme circumstances, where replacement of linings on all four wheel assemblies is not possible, it is absolutely essential that both ends of the same axle receive the same type linings.

RECOMMENDATION When brake relining becomes necessary on affected units, use only those kits listed for increased brake effectiveness. Do not mix linings on any single axle or bogie.

Parts are available now.

PRINTED IN U.S.A.

SERVICE BULLETIN

JAN. 28, 1970 **No. Q-540** under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

AIR PRESSURE WARNING SWITCHES

All Mack Western Models
(FL, FS, RL, RS Series)

PURPOSE To direct attention to the possibility of incorrect installation of air pressure switches in subject chassis.

INFORMATION The switches involved actuate the low air pressure warning buzzer and auxiliary spring brake warning light. Nominally 70 psi, 1MR1318-P2 has an operating range of 68 to 75 psi and actuates the low air pressure warning buzzer.

1MR1318-P1 is a 60 psi switch with an operating range of 58 to 65 psi and actuates auxiliary spring brake warning light.

Both switches are identical in appearance except that the outer terminal nut on the P2 is color coded blue. The P1 has no color identification.

INSPECTION PROCEDURE

To check the proper placement and operating condition of these switches, build up truck air system to governor cut-out pressure. Slowly bleed air from system.

The switches should operate in the following sequence:

1. When air pressure reaches nominal 70 psi range, the low pressure warning buzzer should operate.
2. Further reduction in pressure to 60 psi range should then actuate the auxiliary brake warning light.

If these devices operate in reverse order, then air pressure switches will have to be reversed in their location.

Where air switches do not operate in their specified operating range, install a test air gage in the air system to verify that the truck air pressure gage is correct. Any switch that does not function within given range, or gage that does not register properly, should be replaced.

Inspections should be conducted at next scheduled service period, as part of routine maintenance. No allowance for checking is granted. However, if the switches were improperly installed, a maximum of one hour labor may be recovered via standard RWR procedure.

RECOMMENDATION All Mack Western models released prior to 2/10/69 were subject to possible improper switch installation. Relocate low air pressure buzzer and auxiliary spring brake warning light switches that do not operate in correct sequence.

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SERVICE BULLETIN

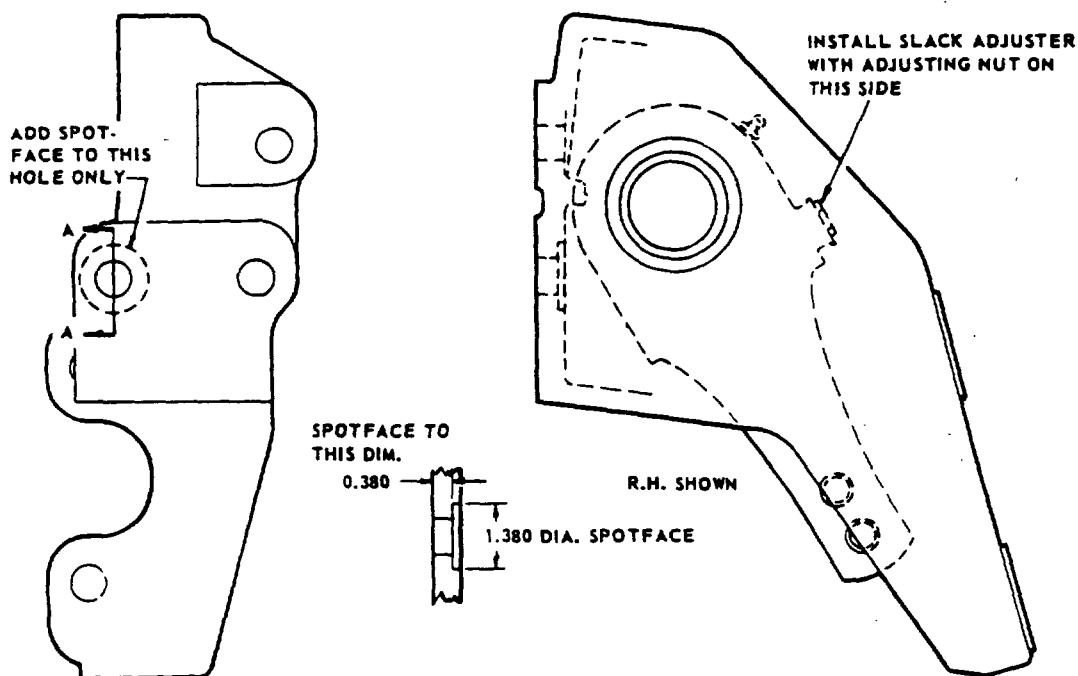
MAY 19, 1970 No. Q541 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

SLACK ADJUSTERS F, R, U and MB Models with (RAD606 and RAD704 Axles)

PURPOSE To provide means of extending service life of slack adjusters on RAD606 and RAD704 axles.

INFORMATION Service life of the slack adjusters on RAD606 and RAD704 axles can be increased by replacing type 20 slack adjusters, original service equipment, with type 30 slack adjusters. Direct replacement of slack adjusters cannot be completed until the lower bolt hole on the air chamber mounting bracket is spotfaced to 1.380 in. dia. x 0.380 in. See illustration.



The air chamber mounting bracket modification is necessary to provide required slack adjuster clearance.

Parts required:

Qty.	Part No.	Description	Removed Parts
2	25QDA334	Slack Adjuster Complete	25QDA118A

RECOMMENDATION Installation of type 30 slack adjusters on RAD606 and RAD704 axles institutes a product improvement and is available at customers option and expense. Parts are available now.

SERVICE BULLETIN

JULY 23, 1971

No. Q543 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated JAN. 18, 1971)

BRAKE LINING CRACKING

(All Models with SWD Bogies and 16-1/2 x 6 in. Brakes)

PURPOSE To advise field of attaching part improvement made in the 202SMH185 "Velvetouch" brake lining kit.

INFORMATION All steel attaching parts have replaced brass capscrews and elastic stopnuts. This change was made to provide a secure and rigid assembly. The lining kit part number 202SMH185 was not affected by this change.

Qty.	Part No.	Description	Replaces
32	21AX812**	Locknut	21AX801
32	3AX527	Capscrew	5AX120

* Quantity shown is for one axle.

** Torque 21AX812 locknut 25 to 28 lb. ft. Refer to Service Bulletin Q542 under BRAKES for latest cast iron drum information.

RECOMMENDATION Use lining kit 202SMH185 and improved attaching parts to correct brake lining cracking problems. Complaints of loose, previously installed 202SMH185 lining can be corrected by replacing brass capscrews and elastic stopnuts with steel capscrews and locknuts. Parts will be available by August 9, 1971.

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SERVICE BULLETIN

FEB. 18, 1972

No. Q544 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated Dec. 2, 1971)

BRAKE CHATTER CORRECTION

(DM, F, MB, R and U with SWD56, 57 and 75 Bogie
Using Six or Seven Inch Brake Shoes)

PURPOSE To provide information correcting brake chatter complaints.

INFORMATION Some reports of brake chatter have been received. Investigation revealed brake chatter was eliminated by replacing wear plate type brake shoes with roller type brake shoes on front bogie axle, only. This is a direct parts replacement requiring removal of existing brake shoe parts and installation of parts as listed.

Parts required:

Six Inch Brakes

* Qty.	Part No.	Description
4	2QD4158	Brake Shoe (malleable iron)
4	55MX111-P1	Roller
4	7AX71	Screw
4	31AX436	Pin
4	80AX744	Bushing
4	31AX506	Pin, Return Spring

* Quantity for one axle.

NOTE

It is recommended 202SMH173 Brake Lining be used in conjunction with six inch brake shoes.

Seven Inch Brakes

* Qty.	Part No.	Description
2	2QD4153-P1	Brake Shoe RH (malleable iron)
2	2QD4154-P1	Brake Shoe LH (malleable iron)
4	55MX111-P1	Roller
4	7AX71	Screw
4	31AX436	Pin
8	80AX744	Bushing
4	31AX506	Pin, Return Spring

* Quantity for one axle.

2QD4153-P1 is used on RH lower and LH upper.
2QD4154-P1 is used on LH lower and RH upper.

(Continued Over)

NOTE

It is recommended 202SMH174 Brake Lining be used in conjunction with seven inch brake shoes.

Apply grease to roller and pin at assembly. Stake roller pin lock screw with prick punch to lock in place.

When converting from aluminum type brake shoes to malleable iron type brake shoe, on either six or seven inch brakes, return spring 58AX96 must replace existing spring 58AX117 because of length differences.

RECOMMENDATION Brake chatter is to be corrected as described herein, using roller type brake shoe on front bogie axle, only. Field handling will be based on normal warranty. Warranty coverage will be based on first report of problem.

SERVICE BULLETIN

MAR. 3, 1972

No. Q547 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

BRAKE SPIDER REPLACEMENT

(Mack Western Chassis with Rockwell Standard "P" Series Brakes)

PURPOSE To announce release of a replacement brake spider for subject chassis.

INFORMATION A replacement 8-mounting hole brake spider has been made available for use on subject chassis fitted with square tube style axle housing only, and 16-mounting hole brake spider. The 8-mounting hole brake spider is directly interchangeable and, therefore, requires no special service modification instructions. The 8-mounting hole brake spider is recommended as a replacement part for any damaged 16-mounting hole brake spider as applied on subject chassis.

Parts required:

Qty. *	Part No.	Description
1	8235-A3211N2224	Brake Spider (left front wheel and rear right wheel)
1	8235-A3211M2223	Brake Spider (right front wheel and left rear wheel)
8	43RU1590-P17	Bolt
16	35AX1367	Flat Washer (hardened)
8	21AX792	Stop Nut

* The quantities as listed are for one wheel brake spider replacement requiring either one 8235-A3211N2224 brake spider or one 8235-A3211-M2223 brake spider.

Place one 35AX1367 flat washer under the head and one on the nut end of 43RU1590-P17 bolt prior to securing the 8-mounting hole brake spider. Torque bolt 225 lb. ft.

RECOMMENDATION If replacement of 16-mounting hole brake spider is required, use 8-mounting hole brake spider as described herein. Normal brake warranty will apply.

Parts are available now.

SERVICE BULLETIN

APRIL 12, 1973

No. Q550 under

BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

BRAKE ARRANGEMENT IMPROVEMENTS (All Chassis Models with FA532C, FA535C, FA600C, FA601C, FA703C or FA704C Front Axle)

PURPOSE To inform field of various brake arrangement improvements on subject front axles.

INFORMATION Design changes have been made with respect to the brake spider and brake anchor pins. The brake spider flange thickness was increased to provide for heavy duty use. The brake anchor pins are designed with integral groove for snap rings, providing positive pin retention. These changes were made to improve the operational efficiency on Rockwell-Standard air brake assemblies.

Parts required:

FA532C and FA535C Front Axles

Qty.	Part No.	Description	Replaces
*Ref.	1QDA4165A (RH)	Brake Assembly Complete	1QDA4165 (RH)
*Ref.	1QDA4166A (LH)	Brake Assembly Complete	1QDA4166 (LH)
2	8235-A-3211-H-2400	Spider Service Assembly	8235-A-3211-H-2244
2	8235-A1-3211-H-2400	** Spider	8235-3211-H-2244
4	8235-1225-N-378	** Spider and Brkt. Bushing	8235-1225-N-378
2	344SZ95	** Spider and Brkt. O-ring	344SZ95
2	8235-1705-D-290	** Spider and Brkt. Retainer	8235-1705-D-290
2	8235-1779-J-1024	** Spider and Brkt. Seal	- - - - -
2	8235-1225-U-827	** Spider and Brkt. Bushing (Anchor Pin)	- - - - -
4	8235-1259-Q-251	Anchor Pin	301SM86
8	342SQ26	Retainer	342SQ26
4	361SZ679	Lockscrew	- - - - -
2	8235-LW-1912	Lockwire (obtain locally)	- - - - -

* Complete brake assembly listed for reference and the parts as listed are only included parts affected by design changes.

** Parts included in spider service assembly.

(Continued Over)

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Marb

FA600C and FA601C Front Axles

Qty.	Part No.	Description	Replaces
*Ref.	1QDA4167A-P1 (RH)	Brake Assembly Complete	1QDA4167-P1 (RH)
*Ref.	1QDA4168A-P1 (LH)	Brake Assembly Complete	1QDA4168-P1 (LH)
2	8235-A-3211-J-2402	Spider Service Assembly	8235-A-3211-F-2242
2	8235-A1-3211-J-2402	** Spider	8235-3211-F-2242
4	8235-1225-N-378	** Spider and Brkt. Bushing	8235-1225-N-378
2	344SZ95	** Spider and Brkt. O-ring	344SZ95
2	8235-1705-D-290	** Spider and Brkt. Retainer	8235-1705-D-290
2	8235-1779-J-1024	** Spider and Brkt. Seal	- - - - -
4	8235-1225-U-827	** Spider and Brkt. Bushing (Anchor Pin)	- - - - -
4	8235-1259-Q-251	Anchor Pin	301SM86
8	342SQ26	Retainer	342SQ26
4	361SZ679	Lockscrew	- - - - -
2	8235-LW-1912	Lockwire (obtain locally)	- - - - -

* Complete brake assembly listed for reference and the parts as listed are only included parts affected by design change.

** Parts included in spider service assembly.

FA703C and FA704C Front Axles

Qty.	Part No.	Description	Replaces
*Ref.	1QDA4167A-P2 (RH)	Brake Assembly Complete	1QDA4167-P2 (RH)
*Ref.	1QDA4168A-P2 (LH)	Brake Assembly Complete	1QDA4168-P2 (LH)
2	8235-A-3211-J-2402	Spider Service Assembly	8235-3211-F-2242
2	8235-A1-3211-J-2402	** Spider	8235-3211-F-2242
4	8235-1225-N-378	** Spider and Brkt. Bushing	8235-1225-N-378
2	344SZ95	** Spider and Brkt. O-ring	344SZ95
2	8235-1705-D-290	** Spider and Brkt. Retainer	8235-1705-D-290
2	8235-1779-J-1024	** Spider and Brkt. Seal	- - - - -
2	8235-1225-D-828	** Spider and Brkt. Bushing (Anchor Pin)	- - - - -
2	8235-1259-Q-251	Anchor Pin	301SM86
8	342SQ26	Retainer	342SQ26
4	361SZ679	Lockscrew	- - - - -
4	8235-LW-1912	Lockwire (obtain locally)	- - - - -

* Complete brake assembly listed for reference and the parts as listed are only included parts affected by design change.

** Parts included in spider service assembly.

APRIL 12, 1973

No. Q550

under BRAKES
(Sheet #2)

NOTE

New complete brake assemblies will service old.
New spiders will service old with the addition of new anchor pins with new snap rings and anchor pin set screws.
New anchor pins (with new snap rings) will service old.

RECOMMENDATION This bulletin is issued to inform the field of various brake arrangement improvements as applied on subject front axles. Use improved design parts when service is required.

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Over-haul Room	
Shop Office	

SERVICE BULLETIN

JUNE 15, 1973

No. Q549 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY. (Supersedes Bulletin dated MAR. 30, 1973)

CAM BRAKE ASSEMBLY IMPROVEMENTS

(All Chassis with SW76C, SW56C, SW57C, SW571C, SW573C, SW59C and SW68C Series Bogies)

PURPOSE To inform field personnel of improvements made to brake assemblies on subject bogies.

INFORMATION The improvements consist of changes to anchor pin and spider designed to improve the operational efficiency, retention of pin in spider and to facilitate removal of pin after long service. New anchor pins are used which have a flat that the set screw engages to more securely lock pin in spider. In addition, the snapping grooves are of rectangular cross section and are used with new rectangular section snap rings for better retention. To prevent anchor pin becoming "frozen" in spider due to corrosion, the new spiders incorporate a stainless steel bushing in anchor pin bore.

Brake assemblies incorporating these improvements are identified by a raised part number as shown in parts lists. Note that two types of assemblies are required; one for the right hand front rear axle or left hand rear rear axle and one for left hand front rear axle or right hand rear rear axle. Grade 8 mounting bolts and hardened flat washers are used for all new assemblies.

Time allowance to change one brake assembly is 3.5 hours for all bogies.

NOTE

Service kits are available for SWS56 and SWS57 series bogies only. These kits provide all necessary parts to convert existing brake assemblies to improved design. Each kit will service one wheel.

SW76C, SW56C, SW57C, SW571C and SW573C

To convert these brake assemblies to improved design, it will be necessary to order one kit for each wheel to be serviced. Two types of kit are available; one for right hand front rear axle and one for left hand rear rear axle. Brake assemblies involved are shown in following list:

<u>New Assy. No.</u>	<u>Description</u>	<u>Replaces</u>
1QDA4159A-P1	Air Brake Assy. (RH Front & LH Rear)	1QDA4159-P1
1QDA4159A-P2	Air Brake Assy. (LH Front & RH Rear)	1QDA4159-P2
1QDA4159A-P3	Air Brake Assy. (RH Front & LH Rear)	1QDA4159-P3
1QDA4159A-P4	Air Brake Assy. (LH Front & RH Rear)	1QDA4159-P4

(Continued Over)

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

Parts required (quantity shown is for one wheel) :

Qty.	Part No.	Description	Replaces
1	8235-MPS-1984	Brake Service Kit (RH Front & LH Rear)	- - -
1	8235-MPS-1985	Brake Service Kit (LH Front & RH Rear)	- - -
8	3AX1810	Bolt, Brake Spider Mtg.	3AX1299
8	* 35AX682	Washer, Brake Spider Mtg.	- - -
8	21AX718	Nut, Brake Spider Mtg. Bolt	20AX7

NOTE: Torque spider mounting bolts 290 to 320 lb. ft.

The brake service kit consists of following parts. Except for the brake spider assemblies, parts listed are common to both kits.

Qty.	Part No.	Description	Replaces
1	8235-A-3211-N-2406	Brake Spider Assy. (Kit 8235-MPS-1984 RH Rear & LH Front)	8235-A-3211-N-2224
1	8235-A-3211-P-2408	Brake Spider Assy. (Kit 8235-MPS-1985 LH Rear & RH Front)	8235-A-3211-M-2223

Following parts are common to both kits:

2	8235-1259-Q-251	Anchor Pin	1759-E-31 or 301SM86
4	228SM16	Snap Ring	1218-M-13 or 364SQ21
2	6AX813	Cap Screw	- - - -
1	8235-LW-1912	Lockwire (obtain locally)	- - - -
1	** 364SM27	Return Spring	364SM27

* If not available use washer 35AX1252

** No change in part number. Identification is by color only. Old return spring is black, new return spring is green.

SW59C Series Bogies

Parts required to update these brake assemblies must be ordered individually as shown in "Parts required" list. Brake assemblies affected are shown in following list for reference purposes.

New Assy. No.	Description	Replaces
1QDA4180A-P1	Air Brake Assy. (RH Front & LH Rear)	1QDA4180-P1
1QDA4180A-P2	Air Brake Assy. (LH Front & RH Rear)	1QDA4180-P2

JUNE 15, 1973

No. Q549

under BRAKES

(Sheet #2)

Parts required (quantity shown is for one wheel):

Qty.	Part No.	Description	Replaces
1	8235-A-3211-A-2419	Spider Service Assy. (RH Front & LH Rear)	8235-A-3211-D-2240
1	8235-A-3211-Z-2418	Spider Service Assy. (LH Front & RH Rear)	8235-3211-C-2239
2	***8235-1259-R-252	Anchor Pin	8235-1259-G-241
4	***228SM16	Snap Ring	364SQ21
2	6AX813	Capscrew	- - - -
1	8235-LW-1912	Lockwire (obtain locally)	- - - -
1	#8235-2258-H-528	Return Spring	8235-2258-H-528
2	3AX1456	Brake Spider Mtg. Bolt	3AX1447
6	3AX1811	Brake Spider Mtg. Bolt	3AX1751
8	36AX9	Lockwasher	36AX9

NOTE: Torque spider mounting bolts 365 to 470 lb. ft.

*** These parts must be used to obtain full benefit of new arrangement.

See illustration for means of identifying new spring.

Following parts are included in spider service assemblies and listed here for reference. Except for spider, parts are same on both assemblies.

Qty.	Part No.	Description	Replaces
1	8235-A-3211-A-2419	Spider Assy. (RH Front & LH Rear)	8235-3211-D-2240
1	8235-A-3211-Z-2418	Spider Assy. (LH Front & RH Rear)	8235-3211-C-2239

Following parts are common to both assemblies:

1	8235-1225-N-378	Bushing	8235-1225-N-378
1	344SZ95	O-ring	3780-A-131 or 344SZ95
1	8235-1705-D-290	Retainer	1705-D-290
1	8235-1779-J-1024	Seal	1779-J-1024
2	8235-1225-U-827	Bushing, Anchor Pin	- - - -

SW68C Series Bogies

Parts required to update these brake assemblies must be ordered individually as shown in "Parts required" list. Brake assemblies affected are shown in following list for reference purposes.

<u>New Assy. No.</u>	<u>Description</u>	<u>Replaces</u>
1QDA4160A-P1	Air Brake Assy. (RH Front & LH Rear)	1QDA4160-P1
1QDA4160A-P2	Air Brake Assy. (LH Front & RH Rear)	1QDA4160-P2

Parts required (quantity shown is for one wheel) :

Qty.	Part No.	Description	Replaces
1	8235-A-3211-X-2416	Spider Service Assy. (RH Front & LH Rear)	8235-A-3211-U-2231
1	8235-A-3211-Y-2417	Spider Service Assy. (LH Front & RH Rear)	A-3211-V-2232X
2	%8235-1259-R-252	Anchor Pin	- - - - -
4	%228SM16	Snap Ring	- - - - -
2	6AX813	Capscrew	- - - - -
1	8235-LW-1912	Lockwire (obtain locally)	- - - - -
1	@8235-2258-H-528	Return Spring	8235-2258-H-528
8	3AX1809	Brake Spider Mtg. Bolt	3AX1299 or 3AX1770
8	21AX718	Brake Spider Mtg. Bolt Nut	21AX718
8	35AX682	Washer	- - - - -
8	36AX7	Lockwasher	- - - - -

NOTE: Torque spider mounting bolts 290 to 320 lb. ft.

% These parts must be used to obtain full benefit of new arrangement.

@ See illustration for means of identifying new spring.

Following parts are included in spider service assemblies and are listed here for reference. Except for spider, parts are same for both assemblies.

<u>Qty.</u>	<u>Part No.</u>	<u>Description</u>	<u>Replaces</u>
1	8235-A-3211-X-2416	Spider Assy. (RH Front & LH Rear)	- - - - -
1	8235-A-3211-Y-2417	Spider Assy. (LH Front & RH Rear)	3211-V-2232X

JUNE 15, 1973

No. Q549

under BRAKES
(Sheet #3)

Following parts are common to both assemblies:

<u>Qty.</u>	<u>Part No.</u>	<u>Description</u>	<u>Replaces</u>
2	8235-1225-N-378	Bushing	1225-N-378
1	344SZ95	O-ring	3780-A-131
1	8235-1705-D-290	Retainer	1705-D-290
1	8235-1779-J-1024	Seal	1779-J-1024
2	8235-1225-U-827	Bushing, Anchor Pin	- - -

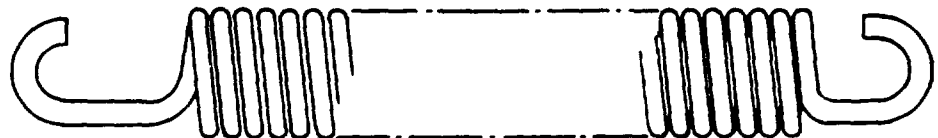
RECOMMENDATION This bulletin describes the brake arrangement improvements for subject bogies. Use improved parts to correct field failures on affected parts.

Warranty: An extended warranty program has been issued "WDPL #27".

Parts are available now.



OLD RETURN SPRING
35 COILS WITH IDENTICAL ENDS



NEW RETURN SPRING
33 COILS, UNEQUAL LENGTH ENDS AND 180° HOOKS

RETURN SPRING IDENTIFICATION
SWS59 and SWS68C SERIES BOGIES

SERVICE BULLETIN

JULY 30, 1973

No. Q549a under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

BRAKE SHOE SUPPORT (SW56, 76, 57, 571 and 573 Series Bogies with Cam Brakes)

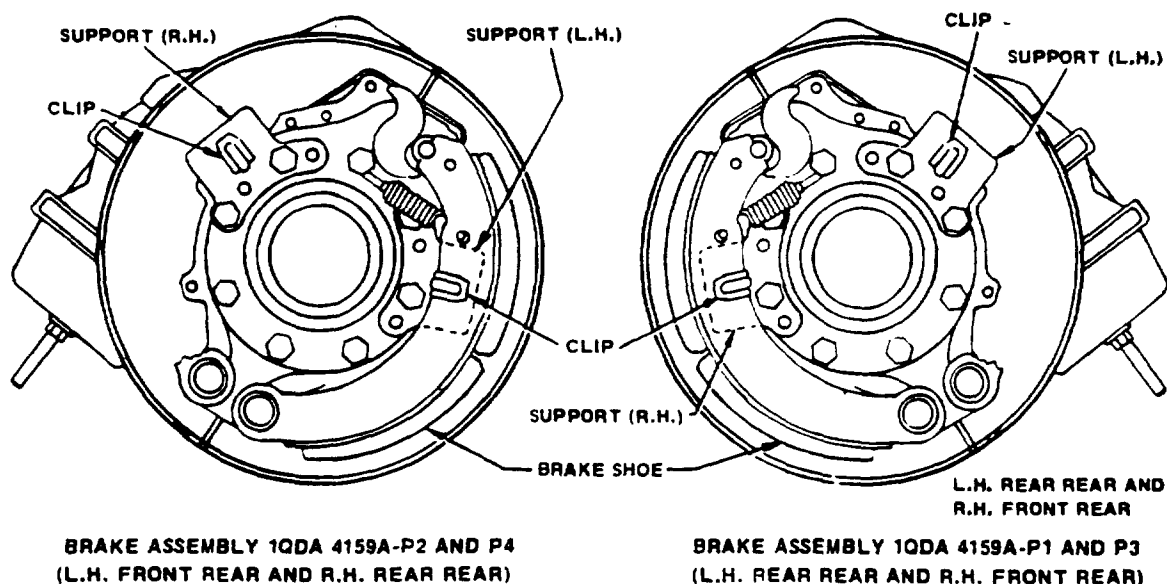
PURPOSE To advise of a brake shoe support which can be installed on existing brake assemblies to extend service life.

INFORMATION Current production brake assemblies have a support which stabilizes the brake shoe and extends life of shoe and spider anchor pin bore and camshaft splines and bushing. The support consists of a spring clip mounted on a separate bracket which grips the brake shoe and holds it in alignment. See following illustration for arrangement. The support is attached with spider mounting bolts and can be installed on brake assemblies now in service.

Brake assemblies affected are 1QDA4159 or 1QDA4159A-P1, P2, P3 and P4. Parts required to add the shoe supports to existing assemblies are available in kit form. Kit number is:

Qty.	Kit Number	Description
*	8235-MPS2008	Brake Shoe Support Kit

* Each kit services one axle (2 wheels)



(Continued Over)

The kit consists of following parts:

Qty.	Part Number	Description
2	8235-3280-W-6081	Support, LH
2	8235-3280-Z-6136	Support, RH
8	8235-2203-L-6798	Washer, 1/4" Spacer
8	8235-2203-K-6797	Shim, 1/16"
8	8235-2203-J-6796	Shim, 1/32"
4	45SM15	Clip
4	1AX374	Capscrew
4	20AX1	Nut
4	36AX1	Lockwasher

Instructions are furnished with each kit; however, they are reproduced in this bulletin for informational purposes. Note that two procedures are given. One applies to non-current spiders with 1/2 inch thick flange and the other to current spiders with 3/4 inch thick flange. Also note that two of the four support mounting holes are not used.

NOTE

Refer to Service Bulletin Q549 under BRAKES for other improvements made to these brake assemblies. It is recommended that these improvements be incorporated along with the shoe supports to provide maximum brake life with minimum time and expense.

RECOMMENDATION Install brake shoe supports at time of regular brake service, especially in cases where short life of spider or shoe anchor pin bore is experienced or if camshaft endplay or bushing wear is a problem.

Warranty: An extended warranty program has been issued per WDPL #27.

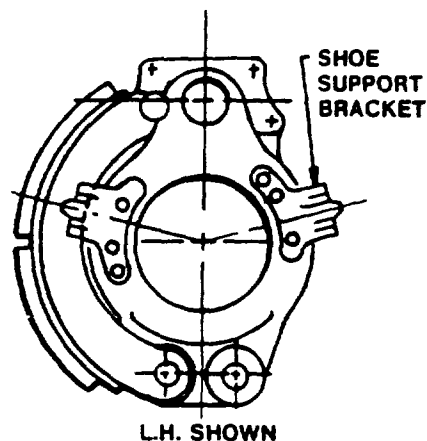
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MACK 34, 38, and 44,000 Lb. Bogie (Mack SW-56C, 57C, 76C, 571C & 573C)

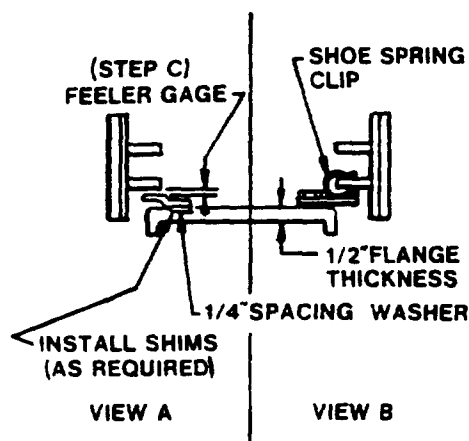
INSTALLATION INSTRUCTIONS:

1. With 1/2 inch thick brake spider flange
 - a. Remove four (4) mounting bolts shown.
 - b. Select and position 1/4 inch spacer washer.

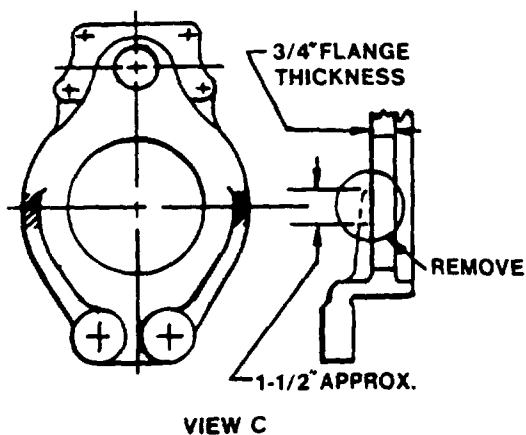


For L.H. Brake
3280-W-6081 Shoe Support Pad

For R.H. Brake
3280-Z-6136 Shoe Support Pad



- c. Use feeler and measure clearance between shoe web and shoe support bracket. (See View A).
- d. Select proper thin shim washers as measured. Install shim washer under support pad at the mounting bolt to nearest .032.
- e. Retorque mounting bolts to 210-270 ft.lb.
- f. Bolt shoe spring clip to brackets with 1/4 inch diameter capscrew, lockwasher and nut provided. (See View B).
- g. Position shoe in proper working position under spring clip. Clip should provide approximately 65 lbs. lateral support force against the shoe support bracket. Check for free return at brake shoe against camhead by normal shoe return spring action. Lubricate if necessary.



2. With 3/4 inch thick brake spider flange
 - a. Remove cast spider material shown in View C flush with mounting face both sides shown shaded.
 - b. Follow steps a through g above but do not use 1/4 spacer washer.

SAMPLE INSTRUCTION

SHEET

SERVICE BULLETIN

OCT. 9, 1973

No. Q551 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

SLACK ADJUSTER CLEARANCE (RL, RS, FL, FS)

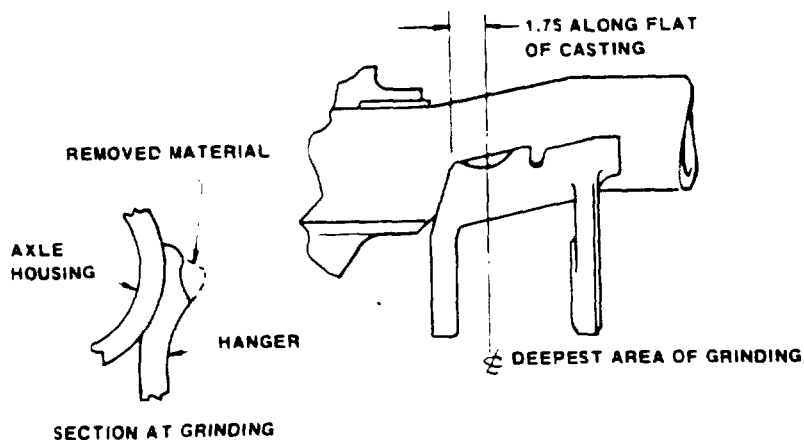
PURPOSE To provide slack adjuster clearance on subject models.

INFORMATION Due to a possible interference between the right hand slack adjuster and the beam hanger on all Mack SWH 56/57 (Hendrickson suspension) and SWV 56/57 (vendor suspension other than Hendrickson) bogies using cam brakes 1QDA39301/302, the beam hangers must be ground in the area of the slack adjusters as illustrated.

Procedure:

1. Remove clevis pin at slack adjuster.
2. Remove snap ring and washer from upper end of slack adjuster.
3. Remove slack adjuster.
4. Grind off bracket as sketch indicates.
5. Install slack adjuster.
6. Install washer and snap ring at upper end.
7. Install clevis pin at lower end.

RECOMMENDATION This should be undertaken only in the event of a possible interference. Normal warranty shall apply.



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SERVICE BULLETIN

MAY 31, 1974

No. Q552 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated JAN. 4, 1974)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

BRAKE CHAMBER
(All with SWW69W Bogie)

PURPOSE To inform the field of an improved method for locking brake chamber to plunger housing.

INFORMATION Brake assemblies 1QDA4161-P1 and P2 and 1QDA-4162-P1 and P2 now incorporate a collet nut to lock the brake chamber in plunger housing. This arrangement replaces the setscrew and nylon pellet originally used as a locking device.

The collet nut can be installed on brake assemblies originally equipped with a setscrew if improved locking ability is required. A new non-pressure housing is required for this installation because original housing has insufficient threads to accept nut.

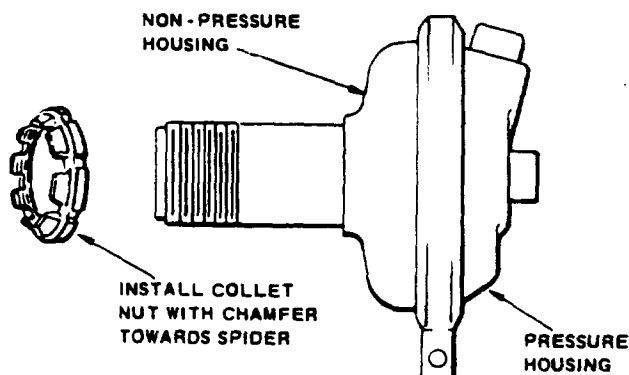
Parts required:

Qty.	Part Number	Description
8	8235-1227-H-762	Collet Nut
4	8235-A3780-X-414	Non-pressure Housing (Short)
4	8235-A3780-Z-416	Non-pressure Housing (Long)
*	8235-A3711-D-1408	Spider, R.H.
*	8235-A3711-E-1409	Spider, L.H.

* Required only if threads in existing spider are worn or damaged.

Procedure

1. Cage the spring brakes, using vehicle air to compress spring. Disconnect air lines. Remove setscrew and nylon pellet from plunger housing, then remove chamber assembly.
2. Remove existing non-pressure housing and reassemble chamber with new housing. Do not tighten clamp ring. Install collet nut on non-pressure housing with chamfered side towards spider end of tube. See illustration.



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3. Apply non-hardening sealer to first three threads of non-pressure housing. Using standard assembly procedure, screw chamber assembly into plunger housing until it bottoms. Be sure collet nut is loose. Align pressure housing ports with air lines and tighten clamp ring. Connect air lines and uncage spring brake.
4. Apply brakes and maintain full pressure while tightening collet nut. Seat nut against plunger housing by hand then, using a hammer and drift, tighten nut 1-1/2 notches (3/16 turn).
5. Plug setscrew hole in plunger housing. If a suitable plug is not available, cut end off of original setscrew and reinstall it.

RECOMMENDATION Install collet nut and new non-pressure housing if the setscrew does not provide satisfactory retention of brake chamber. Normal warranty will apply. All parts available September, 1974.

SERVICE BULLETIN

SEPTEMBER 5, 1974

No. Q537 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated NOV. 25, 1968)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

HAND CONTROL VALVE

Brake vs. Spring Brake Piping Arrangement
(All 4 & 6 Wheel Models (Except Tractors))

PURPOSE To outline air piping modification that may be necessary when hand control valves are used in conjunction with auxiliary spring brakes.

INFORMATION Original piping of some vehicles with auxiliary spring brakes and hand control valve, permitted compounding of braking force on rear axle brake parts. This occurred when hand control valve was used after spring brakes were already applied.

If damage such as broken brake drums, slack adjusters, camshafts, etc., is noted, the brake system should be checked for possibility of compounding and modified if necessary. The piping arrangement described in this bulletin will release the spring brakes when hand control valve is actuated.

NOTE: There are two exceptions to the need for this modification: Tractors and other vehicles equipped with either Rockwell-Standard Failsafe units or Bendix-Westinghouse model DD3 safety actuators.

To ascertain whether piping modification is required, proceed as follows:

1. Apply auxiliary spring brake.
2. With piggy-back type, remove air line at spring brake side of chamber.

NOTE: This step is not necessary with frame mounted units as standard brake application and spring brake release can be observed visually.

3. Apply hand control valve. Air should expel from open line or, in case of frame mounted units, movement of parts should be observed. Release hand control valve.
4. Apply foot brake and check as in previous step.

If action is not evident as explained in Steps 3 & 4, piping modification will be necessary.

Preliminary to any work being performed, block wheels to prevent vehicle movement. Open reservoir drain cocks and fan brake pedal until air gage reads 0 psi. Close drain cock.

All necessary precautions and workmanlike practices are to be followed in the repiping. Keep dirt from entering lines, do not make sharp bends, pitch lines to drain back to reservoir and avoid possible chafe points.

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(Continued Over)

Service Operations, Allentown, Pa. U.S.A.

Mack

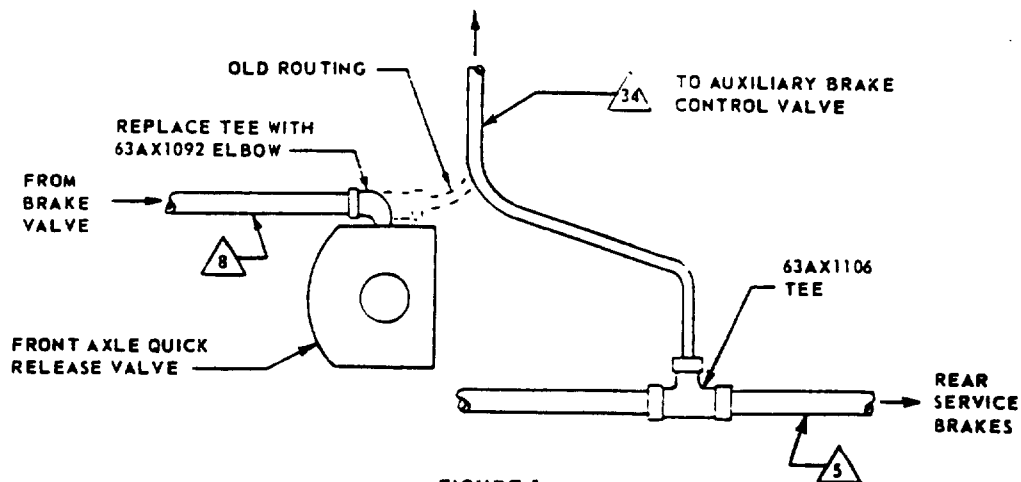


FIGURE 1
AUXILIARY BRAKE CONTROL VALVE PIPING
R MODELS - TYPICAL

At front axle quick release valve, disconnect tee connection joining lines 8 & 34. Replace tee with 63AX1092 elbow. Connect line 8 to elbow. Install 63AX1106 tee at convenient location in line 5 and re-route line 34 to connect as shown in Figure 1. Recharge air system and check for leaks. Follow steps for initial system inspection.

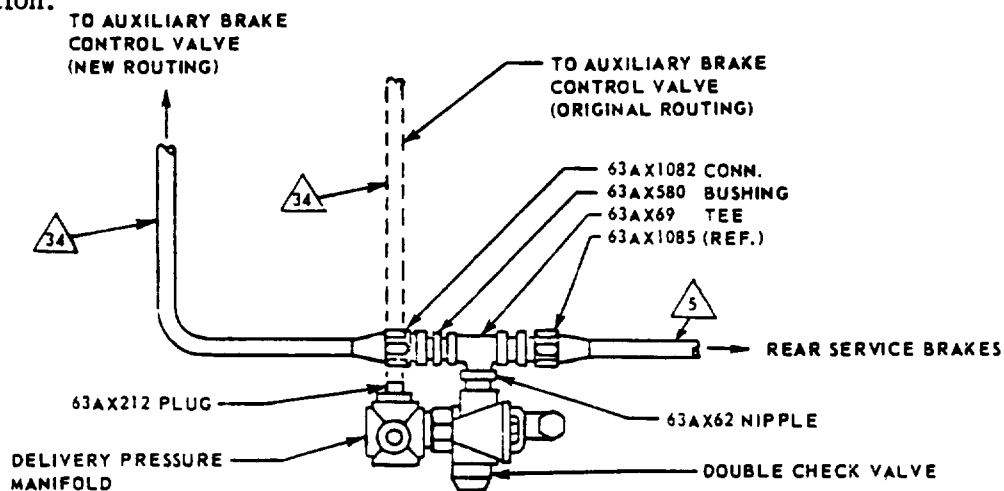


FIGURE 2
AUXILIARY BRAKE CONTROL VALVE PIPING
U & DM MODELS - TYPICAL

Disconnect rear service brake line 5 at double check valve. Remove elbow. Add 63AX62 nipple and 63AX69 tee as shown in Figure 2. Reconnect line 5. At manifold, as shown for original routing, disconnect line 34 connection. Plug port uncovered with 63AX212 plug. Reroute free end of auxiliary brake control valve line 34 to 63AX69 tee and connect. Figure 2 indicates hardware necessary. Recharge air system and check for leaks. Follow steps given for initial system inspection.

Disconnect rear service brake line 5 at double check valve and stoplight switch. Add 63AX1316 tee at port uncovered. Reconnect line 5 as shown in Figure 3. Disconnect auxiliary brake control valve line 34 at brake valve. Plug uncovered port with 63AX107. Reroute line 34 to connect with 63AX1316 tee as shown. Figure 3 indicates hardware necessary. Recharge system and check for leaks. Follow steps given for initial system inspection.

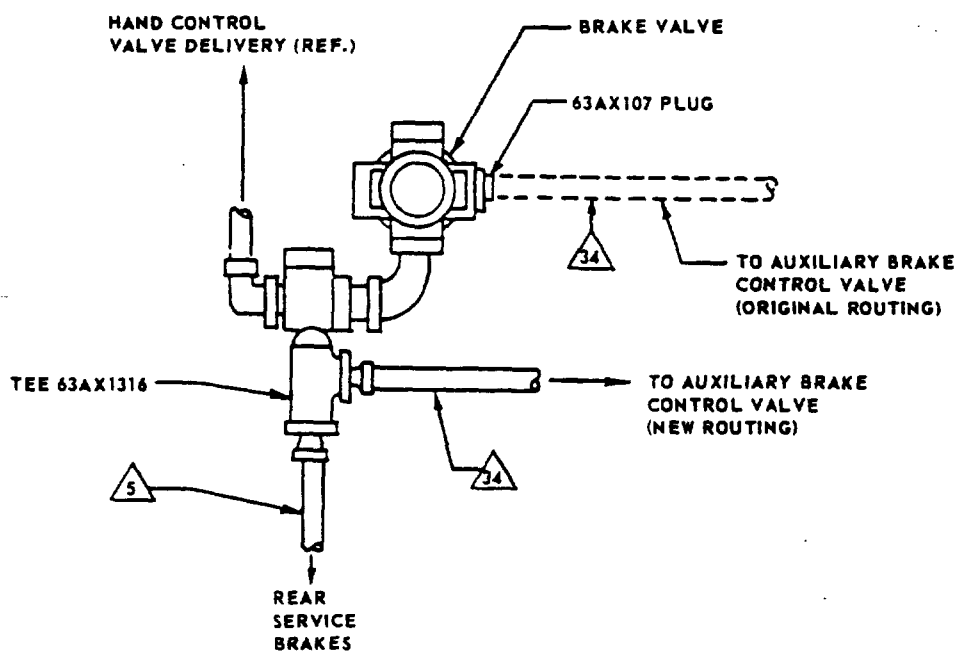


FIGURE 3
AUXILIARY BRAKE CONTROL VALVE PIPING
MB MODELS - TYPICAL

RECOMMENDATION The modification should be made on a customer convenience basis. Re-emphasize to operators that the hand control valve should not be used to hold the brakes applied when the vehicle is being parked unattended.

Parts are available now.

SERVICE BULLETIN

APRIL 7, 1975

No. Q553 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated January 7, 1975)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒

BRAKE CAM ROTATION CHANGE (SWS681C Bogie - Eaton 18 x 7 Brakes)

PURPOSE To request that a campaign to change both brake assemblies on the forward bogie axle to prevent possibility of brake "chatter". This condition can damage the brake assembly.

INFORMATION Brake chatter on front bogie axle is eliminated by having the cam rotate in same direction as forward wheel rotation when making a brake application. Up to the present time, brakes on the forward axle have been arranged so that cam rotation is opposite wheel rotation and chatter has been experienced under some conditions. Future production brake assemblies will incorporate the "cam and wheel rotation same" feature and all bogies in service are to be changed over to this configuration.

Brake assemblies that require modification can be recognized by the position of the air chamber. On assemblies requiring changeover, the chamber points down and forward. On assemblies with the desired cam rotation, the chamber points up and forward. See Figure 1.

Basically, the modification consists of interchanging existing spiders and air chamber brackets from side to side and installing new, longer barrel assemblies and camshafts. The longer parts are required to maintain tire clearance when the air chambers are installed in their new position.

All parts required for the changeover are contained in Eaton kit, part number 2719-1001305. The kit contains two barrel assemblies, two camshafts, a grease fitting and attaching hardware. Inspect all other brake assembly parts and replace any found damaged. Pay particular attention to anchor pins, retaining springs and rollers.

Procedure: To be performed on forward bogie axle only.

1. Cage spring brakes, disconnect air lines and remove air chamber from bracket.
2. Remove wheel and drum assemblies.
3. Remove slack adjusters, shoes, rollers and pins keeping shoes and linings on the same side as before.
4. Remove air chamber bracket. Discard bolts but retain washers. Also remove camshaft, camshaft barrel and spider. Retain bolts, nuts and washers. Remove pipe plugs from camshaft barrels and retain.

NOTE

This conversion requires that original left hand spider and air chamber bracket be installed on right side and the right hand spider and bracket on the left side. As these parts are removed, transfer them to the opposite side in preparation for reassembly.

(Continued Over)

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5. Mount spider on axle, interchanging left and right hand parts as explained in note.

Left Side - Install spider so that camshaft bore is to front of axle, approximately at 9:30 o'clock. (8° to 10° above horizontal)

Right Side - Install spider so that camshaft bore is to front of axle, approximately at 2:30 o'clock. (8° to 10° above horizontal)

6. Mount barrel assembly on the spider. Attach with 1/2-13 x 1-3/4 bolts supplied in kit and the original washers. Tighten bolts to 110 lb. ft. torque.

Left Side - Use barrel assembly 2719-1001272. See Figure 2.

Right Side - Use barrel assembly 2719-1001273. See Figure 3.

7. Attach air chamber bracket to barrel assembly using 1/2-13 x 3-1/4 bolts and nuts furnished in kit. Use washer under nut and head of bolt. Use eight existing washers and the eight new ones supplied in kit. Tighten nuts to 110 lb. ft. torque.

Left Side - Use air chamber bracket with forging number 1000265.

Right Side - Use air chamber bracket with forging number 1000266.

8. Install new camshaft into barrel assembly. See Figure 4.

Left Side - Use camshaft 363SM87.

Right Side - Use camshaft 363SM86.

9. Install slack adjusters, washers and secure with new snap rings.
10. Install grease fitting from kit into one of the barrel assemblies. Pressure lubricate the assembly through this fitting until grease appears next to slack adjuster. Remove fitting and replace with plug from original assembly. Repeat procedure on other side.
11. Complete assembly of brake. Install shoes and drum on same side as originally used on.
12. Connect air lines to air chambers.

Left Side - Use the lines from right chamber.

Right Side - Fabricate new lines locally. They must be approximately one foot longer than originals.
13. Adjust both brakes, then uncage spring brake. Check slack adjusters to be sure they do not strike axle housing during a brake application.

RECOMMENDATION This is a campaign. Convert all SWS681C bogies in your area with Eaton brake assemblies incorporating cam rotation opposite wheel rotation on front bogie axle to cam rotation same as wheel rotation. Reimbursement for parts and labor is to be made through normal RWR procedures. Maximum labor time allowed is six hours. All work performed under this program must be completed no later than June 30, 1975.

Disposition of removed parts - Ship old camshafts and barrels collect to:

Eaton Corporation
Brake Division
21220 West Eight Mile Road
Southfield, Michigan 48075
Attn: Ray Johnston

(Continued on Sheet #2)

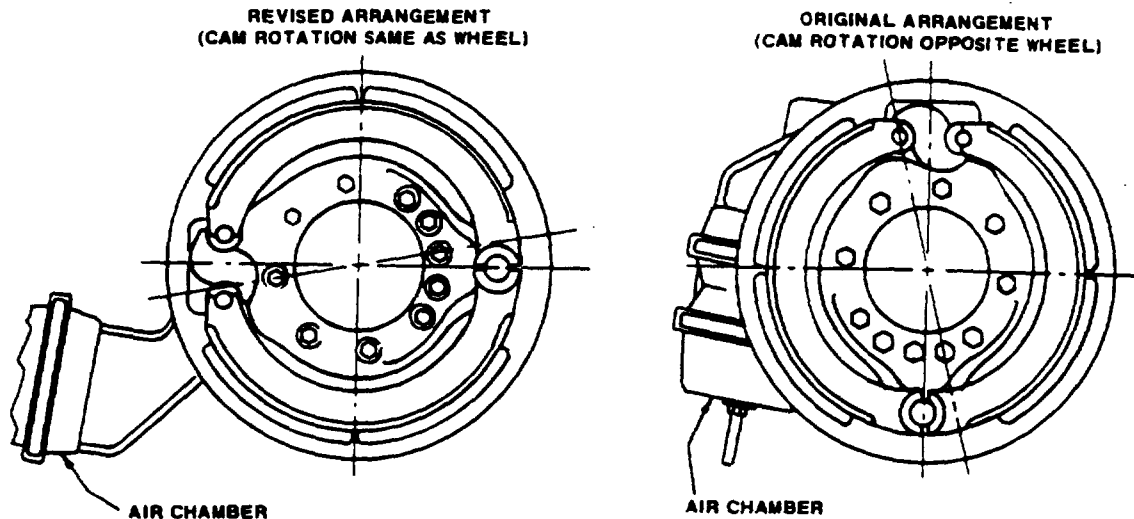


FIGURE 1
SWS681C FORWARD AXLE BRAKE ASSEMBLIES
L.H. SHOWN

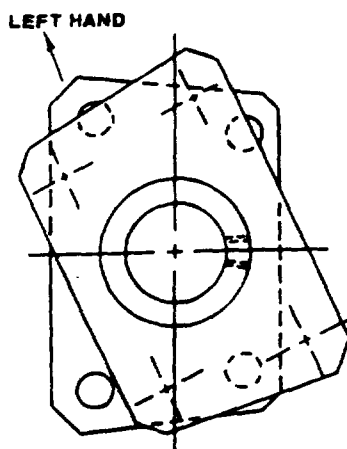


FIGURE 2

Looking into the short end of the camshaft barrel (where the camshaft spline will be), and with the grease fitting hole pointing to 3 o'clock (horizontal), the top of flange closest to the observer will point to the hand of the assembly, as indicated by the arrow.

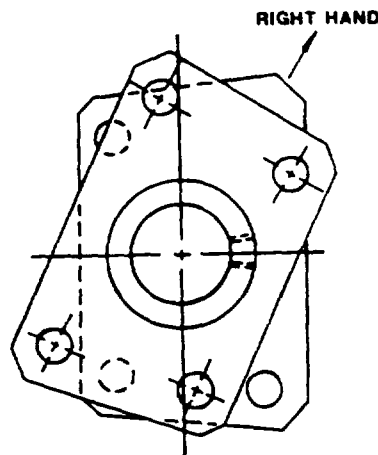


FIGURE 3

Looking into the short end of the camshaft barrel (where the camshaft spline will be), and with the grease fitting hole pointing to 3 o'clock (horizontal), the top of flange closest to the observer will point to the hand of the assembly, as indicated by the arrow.

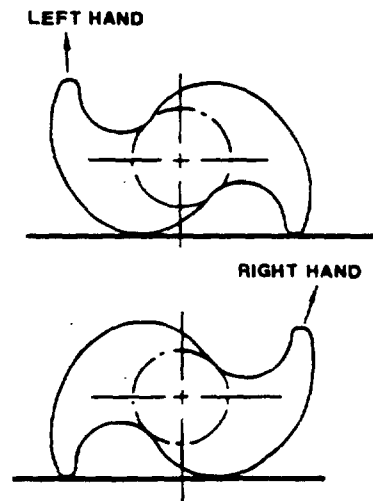


FIGURE 4

Looking into the head of the camshaft in the position shown, the hand of the camshaft is indicated by the arrow.

WHEELS AND AXLES**1. Changing Axles or Springs on Reclass Changeover**

Changing axles or springs is possible but once again the GAWR certification must be changed accordingly. For example, if lighter springs are used, the Gross Axle Weight Rating (GAWR) which is governed by lightest component in assembly, will be lowered. Conversely, if heavier springs are used, all other front axle components (brakes, axle beam, knuckle) may require upgrading to allow heavier front axle loadings.

2. Tire or Rim Changeovers on Steering Axle

Tires or rims on the steering axle may be changed to a lower load capacity which lowers the Gross Axle Weight Rating (GAWR) certification accordingly. Tire size, ply rating and rim design all are important factors in determining these capacities. If the operator does not limit front axle loading to the new rating, weight transfer during panic type stops may cause control problems.

WHEELBASE CHANGES

Wheelbase changes can be made within the following guidelines. The wheelbase can be shortened if air line sizes are not reduced or restrictive type fittings are not installed. Wheelbase on a vehicle shall not be reduced below that shown in the current sales Data Book (presently 120 inches). Care must be exercised on straight trucks that the center of gravity wheelbase guidelines outlined in SED letter 585-75 are allowed.

Lengthening the wheelbase from the standard minimum up to 220 inches can be made without adding additional air valving or plumbing. From 220 to 300 inches each axle controller must be fitted with an individual supply line, not smaller than 5/8 inch O. D. tubing. See Figure 3. Any lengthening of the chassis platform by welding additional platform length to the existing frame is not recommended or approved. If the platform is lengthened by welding or other means, it is the sole responsibility of the person or persons doing such work.

NOTE

It is not permissible to splice air line. If longer lines are required it will be necessary to install a complete new line.

CHANGE OF APPLICATION OF STOCK CHASSIS

In the past, it has not been uncommon to modify, say, a tractor chassis (in stock) to be used in a truck application. This will no longer be economically feasible because of changes in brake system components and possible axle and spring changes required to meet weight transfer under the required stopping distance of MVSS 121. These changes required due to difference in weight transfer, may also involve frame modifications.

TRACTOR OR TRAILER STOPLIGHT CIRCUIT OVERLOAD

Caution must be exercised when adding extra stoplights to either tractor or trailer such that the stoplight circuit in either is not overloaded. The anti-wheel lock control that would be mounted on a trailer receives its current source through the stoplight electrical circuit. Should this circuit be overloaded by addition of stoplights on either the tractor or trailer, it could render the anti-wheel lock on the trailer inoperative.

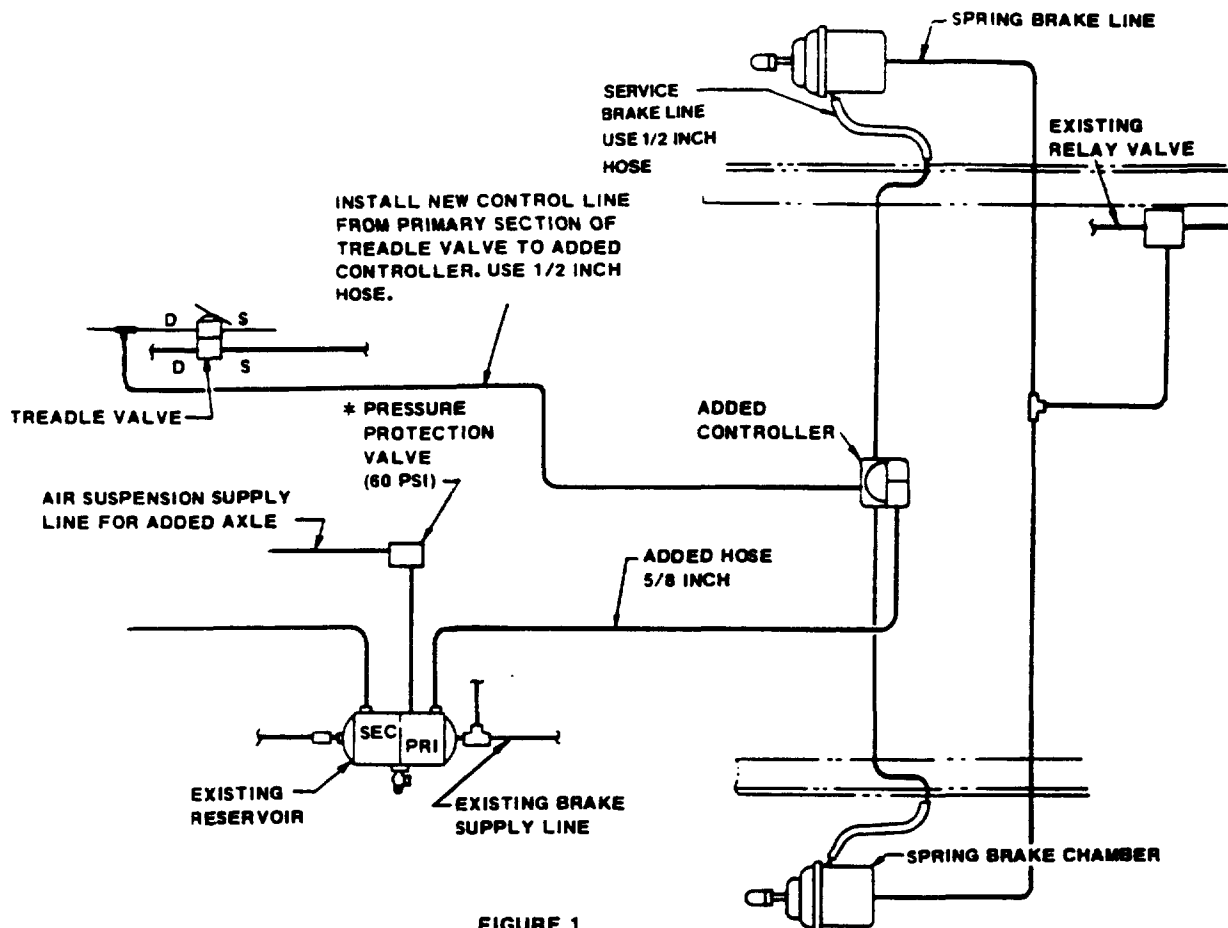


FIGURE 1
PIPING FOR ADDED AXLE ON DM MODELS

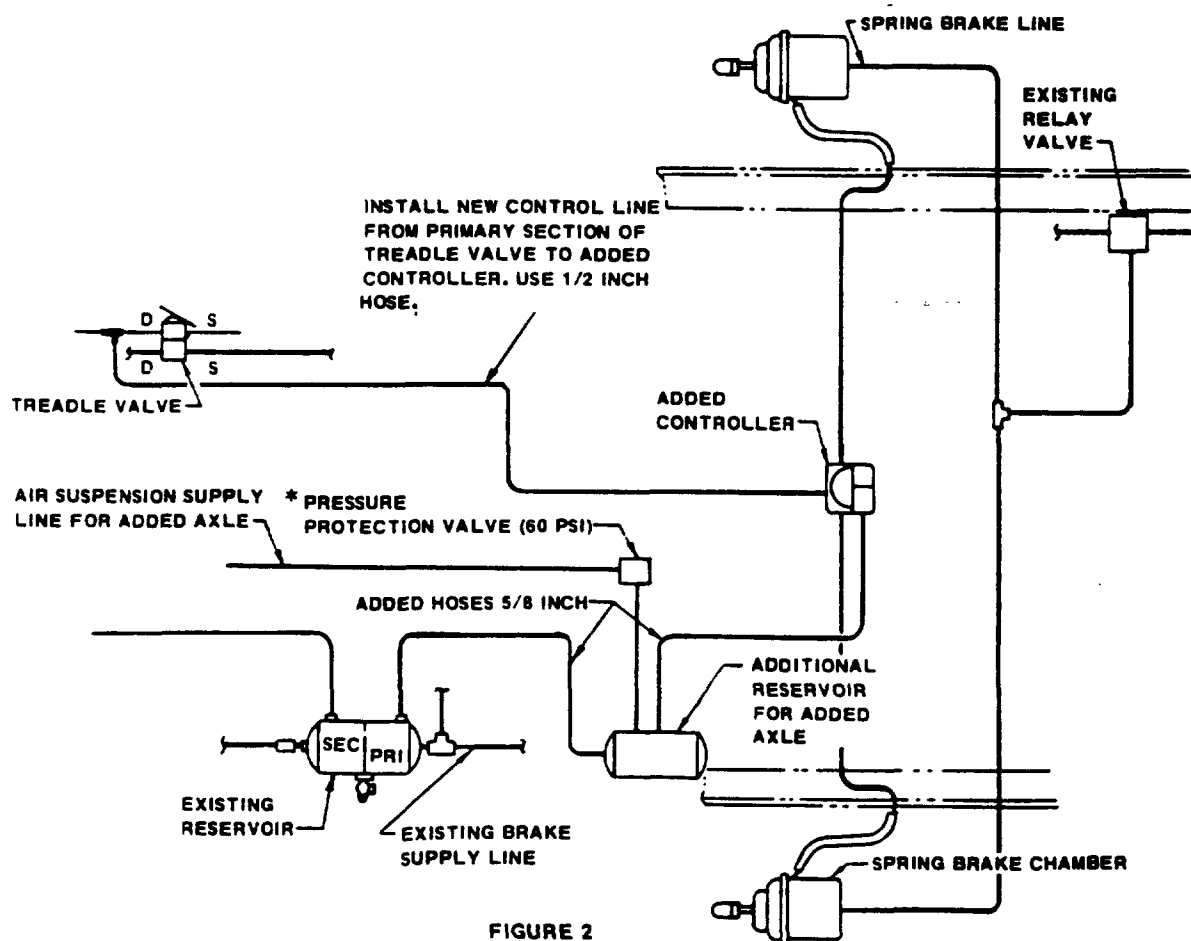


FIGURE 2
PIPING FOR ADDED AXLE
ON ALL EXCEPT DM MODELS

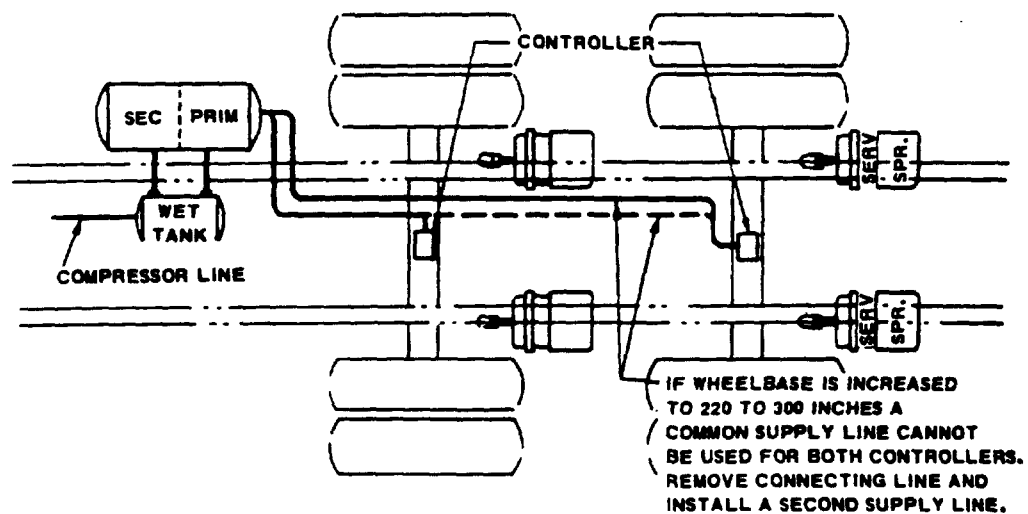


FIGURE 3
ADDING SEPARATE CONTROLLER
SUPPLY LINE ON EXTENDED WHEELBASE

SERVICE BULLETIN

JANUARY 22, 1976

No. Q549c under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

BRAKE RETURN SPRING
(All with SW59C and SW68C Series Bogies)

PURPOSE To advise of an alternate return spring available for service replacement.

RECOMMENDATION Install the spring recommended below if short service life is experienced with standard spring. Normal warranty will apply.

INFORMATION The return spring supplied with brake assemblies for subject bogies may not have adequate service life in all operations. Field experience indicates that in these cases the spring shown in following chart will provide longer life.

New Service Part	Description	Replaced Part
58AX55	Brake Return Spring	8235-2258-H-528

NOTE

In Service Bulletin Q549 under BRAKES, mark parts list for SW59C and SW68C (sheet 2, front and back) to show the new spring as replacement for the original spring.

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SERVICE BULLETIN

MARCH 9, 1976

No. Q556 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☐ HAYWARD ☒ OAKVILLE ☐

BRAKE CHAMBER

Increasing Clearance at Cab Tilt Cylinder
(WL and WS with FAW536C, 537C Front Axles and Cam Brakes)

PURPOSE To inform the field of procedure for eliminating possible interference between front brake chambers and cab tilt cylinder.

RECOMMENDATION Check for subject condition and, if found, reposition brake chamber as instructed in bulletin. Normal warranty will apply.

INFORMATION Additional clearance can be obtained by installing a new brake chamber mounting bracket which rotates the existing chamber 40 degrees to the rear. See illustration

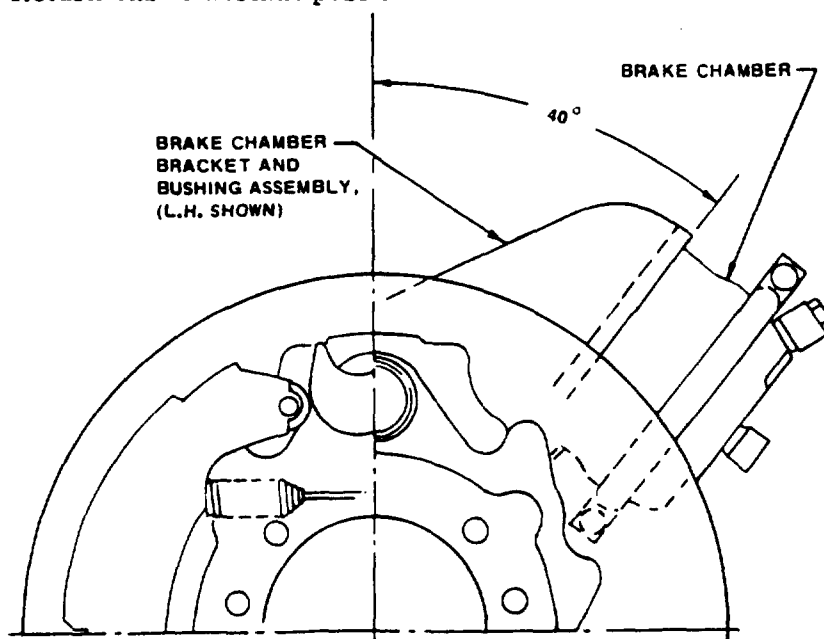
New parts required:

Qty.	Part Number	Description
1	8235-D48-3299-R1552	Brake Chamber Brkt. and Bush. Ass'y., L. H.
1	8235-D48-3299-S1553	Brake Chamber Brkt. and Bush. Ass'y., R. H.

Parts available May.

Procedure:

1. Tilt Cab for accessibility.
2. Remove front brake chambers.
3. Take off "C" clip that retains slack adjusters on camshaft, then remove slack adjusters.
4. Remove four bracket mounting bolts and slide bracket off spider.
5. Install new bracket using existing retaining bolts.
6. Reinstall slack adjusters and brake chambers.
7. Return cab to normal position.



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March

SERVICE BULLETIN

APRIL 12, 1976

No. Q552 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒

ANTI-WHEEL LOCK WIRING

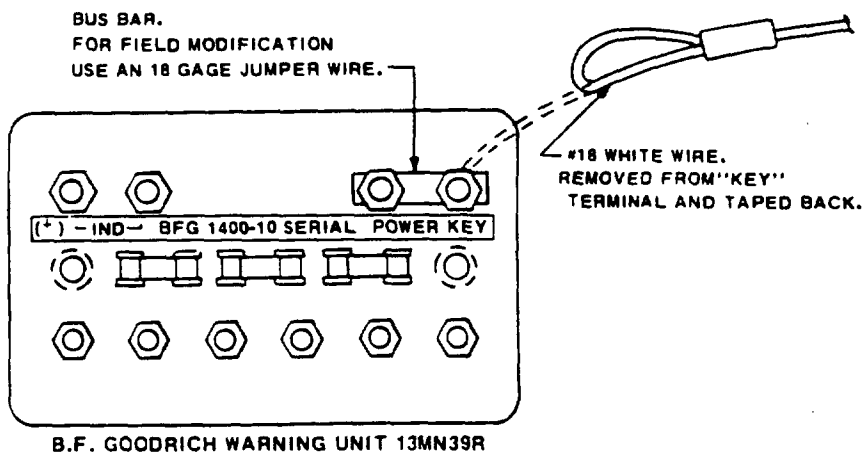
(All with B. F. Goodrich Anti-Wheel Lock System)

PURPOSE To inform the field of a possible cause for the anti-lock warning light remaining on after start up although there is no malfunction in the system.

RECOMMENDATION Revise the B. F. Goodrich anti-lock warning unit wiring as described herein if this condition occurs. Normal warranty will apply.

INFORMATION The brake controller is sensitive to a time delay between energizing of the warning unit's KEY and POWER terminals. In some cases the delay to the POWER terminal, caused by the time required for the accessory relay to close, is long enough to be interpreted as a power failure by the controller. When this occurs, the anti-lock warning light will not go out even though the system is functioning normally.

To prevent this condition, the warning unit wiring has been changed at the factory to insure simultaneous energization of these terminals. The modification, shown in following illustration, consists of removing existing wire from KEY terminal and connecting KEY and POWER terminals with a bus bar. For field modifications a jumper wire can be used in place of the bus bar.



CAUTION

Be sure to remove the wire from the KEY terminal, not POWER terminal. This is important because the KEY terminal wire is not heavy enough to carry combined load of both circuits.

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March

SERVICE NOTE

The original controller, 3355-1800-2 is terminated and future service requirements will be met with an improved controller 7MN31R. This controller incorporates revised circuitry that prevents possibility of the false failure indication described herein. An additional improvement involves use of different sizes for the power/warning and wheel sensor connectors. This feature eliminates possibility of making an incorrect connection at these points. An adapter harness 41MR3516-P1 is available to permit connecting the improved controller to old style leads Valve and controller assemblies incorporating controller 7MN31R are part number 5MN35R, replacing 5MN33R

Service installation of controller 7MN31R (or assembly 5MN35R) can be accomplished as follows:

1. It is permissible to intermix current and non-current controllers on a single chassis; however if at least one controller is of non-current type the warning unit must be wired as described previously.
2. When all controllers on a vehicle are of improved type 7MN31R, the revised wiring shown in the illustration is not required. Vehicles that are wired in this manner should be changed back to standard wiring if, at any time, all controllers are changed to 7MN31R. This is accomplished by removing the bus bar (or jumper wire) from warning unit and reconnecting the KEY terminal wire.

SERVICE BULLETIN

JUNE 15, 1976

No. Q554 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY. (Supersedes Bulletin dated JANUARY 8, 1976)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

MVSS 121 PRECAUTIONS (All Vehicles So Equipped)

PURPOSE To inform branch and distributor personnel of certain precautions regarding chassis modifications on MVSS 121-equipped vehicles that could adversely affect braking performance and require recertification to comply with MVSS 121.

RECOMMENDATION It is strongly recommended that vehicles subject to MVSS 121 requirements not be modified in any way that would jeopardize their certification. If for any reason, such modification is considered necessary, be sure to observe the guide lines presented in the preceding discussion. However, bear in mind that this is only a guide; the party making the installation is ultimately responsible for the vehicles compliance with all regulations.

The following SED letters provide additional details on MVSS 121 requirements:

577-75 FMVSS Equipped Chassis 520-73 Braking Requirements
555-74 MVSS 121 Air Brake Standard 585-75 Center of Gravity vs. Wheelbase
550-74 Elimination of Short Wheelbase

INFORMATION If any modifications affecting braking performance are performed, it will be the responsibility of the facility making the modification to recertify that the vehicle meets all requirements of FMVSS 121. These requirements cover (but are not limited to) the following:

- (1) Air compressor pressure build-up time
- (2) Air reservoir volume
- (3) Service brake stopping distance
- (4) Brake actuation time
- (5) Brake release time
- (6) Parking brake grade holding
- (7) Emergency brake stopping distance

BRAKE SYSTEM

1. Relocation of Chassis Air Reservoirs

This has often been done in the past to provide clearance for installation of bodies and other special equipment. This is no longer acceptable if the relocation requires changing length of any hoses or changing any hose connecting fittings. For example, if relocation would require a change from a straight fitting to an elbow fitting, then this could adversely affect brake application times or air compressor build-up time and would not be acceptable.

Minor air reservoir relocation that does not require changing line diameter, lengthening lines or addition of restrictive fittings would be acceptable.

(Continued Over)

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2. Removing Front Brakes

Our tests disclose that the front brakes are required to meet the minimum stopping distance requirements of MVSS 121.

3. Reclass Changeover of Brake System Components

This has been done in the past in certain instances to satisfy customer requirements for a particular brand name brake system component. This practice will no longer be permitted, unless the installer making the changeover is prepared to recertify that the chassis so modified meets all MVSS 121 requirements. This necessity comes as a result that the chassis, as was originally certified by Mack Trucks, was so certified based on the performance of entire braking system being considered on a system basis. To change a component, even though that component may be used in an MVSS 121 brake system for some other model or application, could result in the affected brake system failing to meet requirements. Alcohol evaporators and after coolers may be field installed.

4. Local Installation of Tag or Pusher Axles

This has often been done in the past (prior to MVSS 121) on new chassis to satisfy customer request. As a result of the recertification requirement in MVSS 121, the installation of either a tag or pusher axle will require the installer to recertify that the chassis meets all MVSS 121 requirements. It is suggested that both distributors and branches refrain from making any such installation at this time as a result of the expense that could be incurred in the event that the recertification was challenged by D.O.T. This would result in the installer, at his expense, having the vehicle tested to assure compliance.

Adding the third axle requires installation of an additional reservoir and in most cases a larger air compressor. Based on use of type 30 brake chambers, minimum additional reservoir size is 2160 cubic inches. Vehicles equipped with a TU-FLO 501 air compressor will require a TU-FLO 600 compressor to provide adequate capacity. We highly recommend, although not specifically required by MVSS 121, that adequate spring brake chambers be installed on the third axle to ensure the chassis will meet parking and emergency stopping requirements.

It is also necessary to add anti-wheel lock equipment to a third axle under most conditions.

4-Wheel Truck - An additional axle, either tag or pusher, liftable or non-liftable must have anti-lock device.

6-Wheel Truck A non-liftable tag axle must be equipped with anti-lock. To meet the performance requirements of MVSS121 we recommend that any additional axle installed whether liftable or non-liftable, in the tag or pusher position be equipped with anti-lock.

Another consideration when adding a third axle is weight transfer. The additional axle and consequent higher gross loads may increase forward weight transfer. This condition can decrease braking ability and possibly damage front axle components. Additional information regarding weight transfer is given in Sales Engineering letter 585-75.

The accompanying diagrams of a third axle piping arrangement is offered as a guide for cases where it has been decided to make such an installation. See Figures 1 and 2. However, use of these arrangements should not be construed as a guarantee that a vehicle so modified will meet any or all MVSS 121 requirements.

SERVICE BULLETIN

JULY 16, 1976

No. Q555 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY. (Supersedes Bulletin dated OCTOBER 27, 1975)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒ BRAKE CONTROLLER AND MASTER CYLINDER RESERVOIR

Component Relocation
(R, RD, DM and U Models)

PURPOSE To outline procedure for relocating subject components if required to permit installation of special bodies, improve accessibility etc.

RECOMMENDATION If it is necessary to relocate brake master cylinder or front axle controller, follow procedure outlined in bulletin.

INFORMATION Early production of MVSS121 equipped vehicles had the front axle brake controller mounted on the engine front support crossmember. It has since been relocated to a frame crossmember to improve engine accessibility, line routing and brake operation. The brake reservoir of DM400, 600 all R and RD vehicles equipped with disc brakes has been relocated to engine side of dash panel to eliminate interference with body components.

Parts required:

Brake Reservoir Mounting Parts

Chassis	Qty.	Part Number	Description
DM400 DM600	1	24QE3197	Bracket, Reservoir Mounting
	1	*42QEA40400-P122	Flex Hose Assembly
	2	1AX111	Bolt, 3/8-24 X 3/4
	2	20AX3	Nut, 3/8-24 Hex
	2	36AX3	Lockwasher
R, RD w/ Fiber- glass Hood (W/O Air Susp. Cab.)	1	24QE3198	Bracket, Reservoir Mounting
	1	*42QEA40400-P120	Flex Hose Assembly
	1	83AX629	Clamp, Hose
	1	239AX331	Screw, #10-16 X 1/2, Self drilling
R, RD w/ Fiberglass Hood and Air Susp. Cab.	1	24QE2397	Bracket, Reservoir Mounting
	1	*42QEA40400-P120	Flex Hose Assembly
	1	83AX629	Clamp, Hose
	1	239AX331	Screw, #10-16 X 1/2, Self drilling
	2	4AX22	Bolt, 1/4-20 X 1
	2	36AX1	Lockwasher, 1/4
R, RD w/ Sheetmetal Hood	2	#1AX445	Bolt, 1/4-28 X 2-5/8
	1	24QE2397	Bracket, Reservoir Mounting
	1	*42QEA40400-P120	Flex Hose Assembly
	1	83AX629	Clamp, Hose
	2	4AX22	Bolt, 1/4-20 X 1
	2	36AX1	Lockwasher
	2	#1AX445	Bolt, 1/4-28 X 2-5/8

* Make from 973AX130FT25 hose and (2) 63AX1720 fittings

Purchase locally.

(Continued Over)

CIRCULATION

Service Manager	
Shop Foreman	
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Inspector Leadman	
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Controller Mounting Parts

Chassis	Qty.	Part Number	Description
All w/ Eaton Controller & Channel Type cross- member	AR	101AX126RF50	Hose (1/2 O. D.)
	AR	101AX127RF50	Hose (5/8 O. D.)
	1	26QB2241	Controller Mounting Bracket
	1	26QB2305	Ratio Valve Mounting Bracket
	2	1AX63	Bolt, 5/16-24 X 2
	1	1AX6	Bolt, 5/16-24 X 1-3/4
	2	1AX114	Bolt, 5/16-24 x 1
	5	20AX2	Nut
	5	36AX22	Lockwasher
	2	37AX68	Flatwasher
	3	35AX1027	External Tooth Lockwasher
with Eaton Controller & I-beam Cross- member	AR		Hose
	1	26QB2239	Controller Mounting Bracket
	2	1AX60	Bolt, 1/2-20 x 1-1/2
	3	1AX6	Bolt, 5/16-24 x 2
	5	20AX5	Nut
	2	36AX5	Lockwasher
	3	36AX22	Lockwasher
	3	35AX1027	External Tooth Lockwasher
with Goodrich Controller	3	1AX13	Bolt, 3/8-24 x 1-1/2
	3	20AX3	Nut
	3	36AX3	Lockwasher
	3	35AX916	External Tooth Lockwasher

Relocating Brake Reservoir

Refer to following illustrations for the reservoir location and mounting instructions.

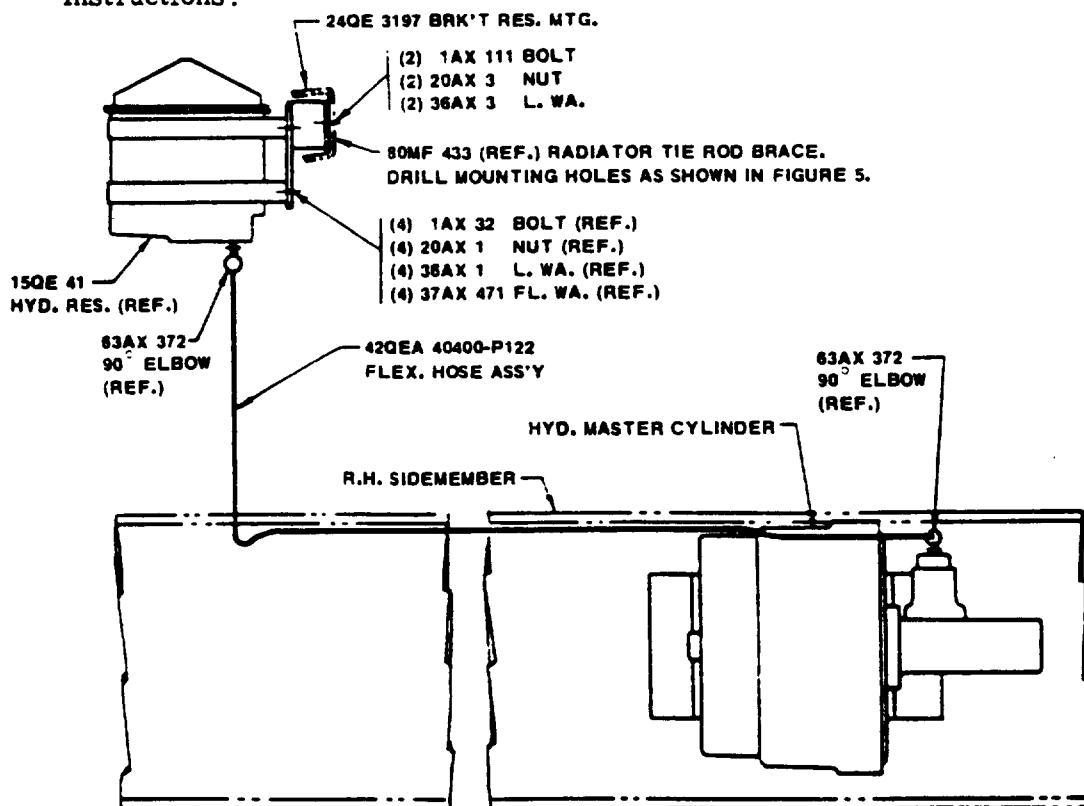


FIGURE 1
BRAKE RESERVOIR MOUNTING, DM

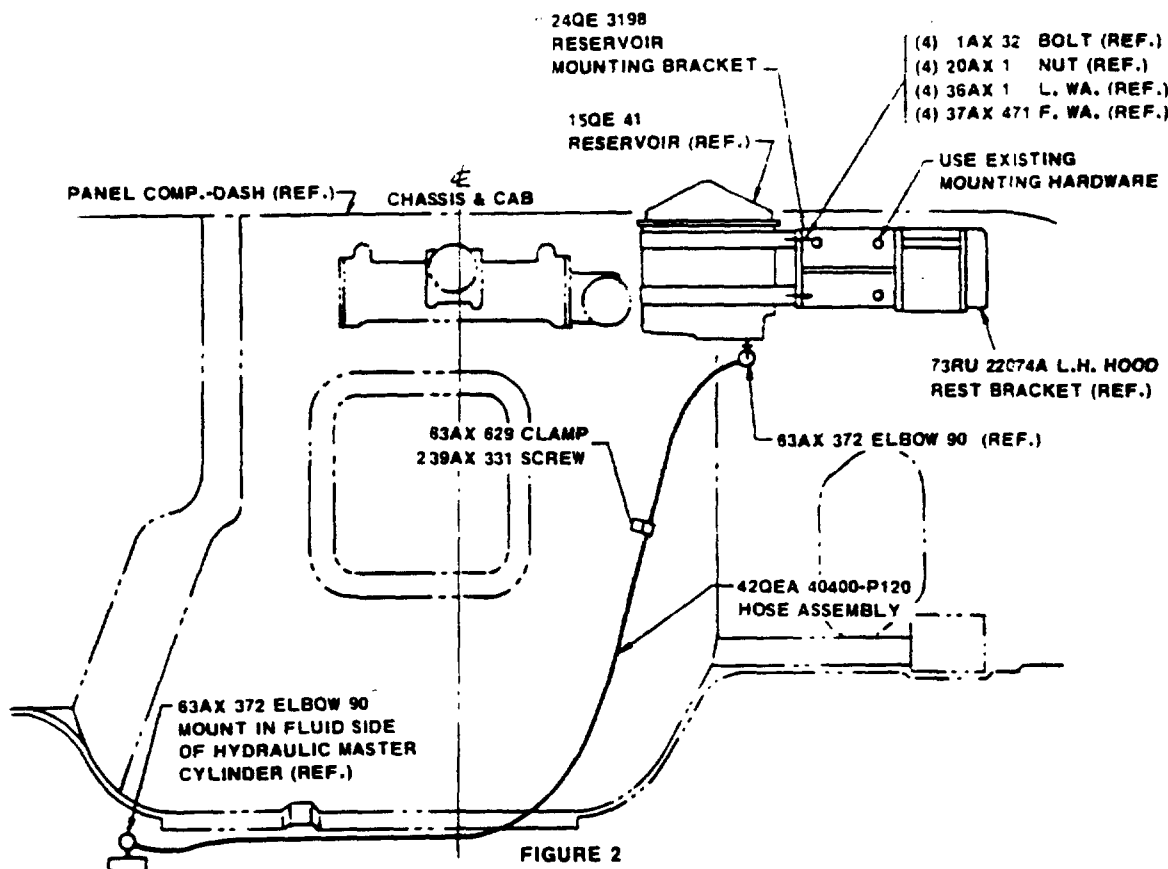


FIGURE 2
BRAKE RESERVOIR MOUNTING ARRANGEMENT,
R AND RD SERIES WITH FIBERGLASS HOOD
AND STANDARD CAB MOUNTING

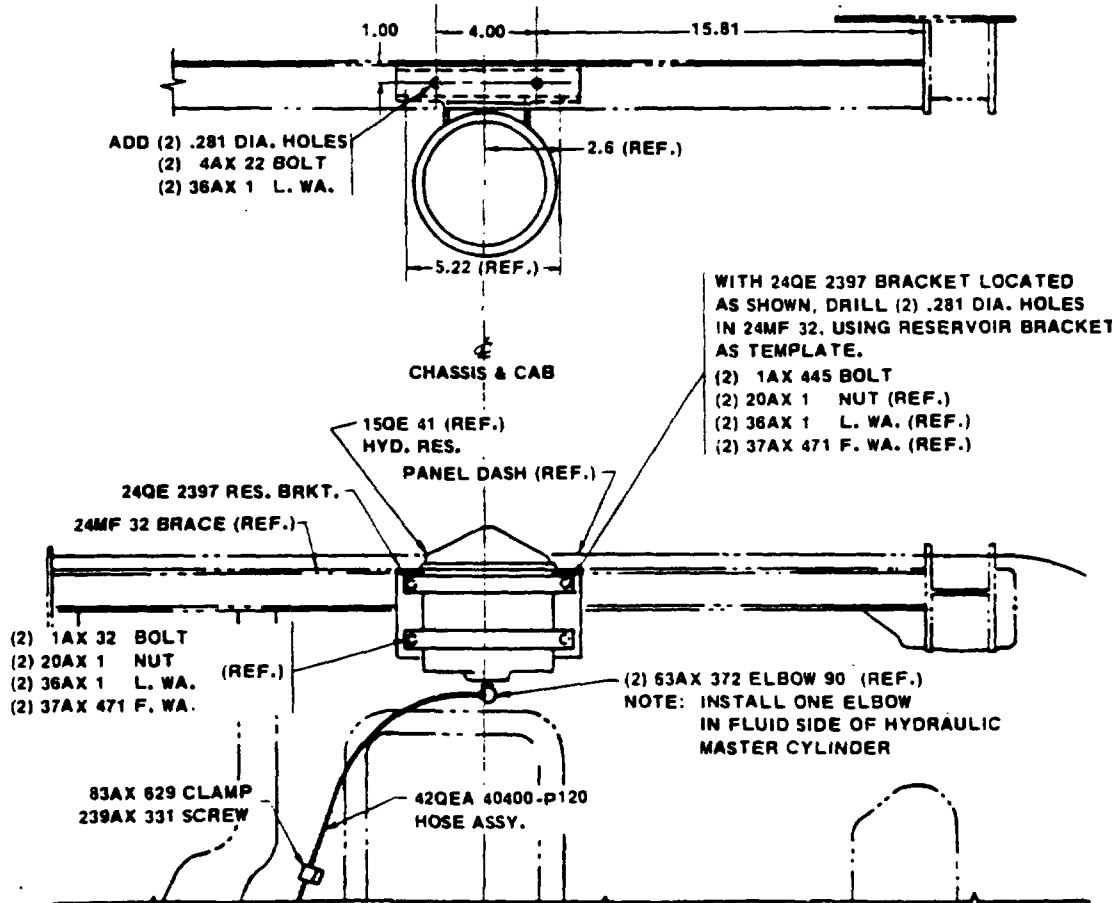


FIGURE 3
BRAKE RESERVOIR MOUNTING ARRANGEMENT,
R AND RD SERIES WITH FIBERGLASS HOOD
AND AIR SUSPENDED CAB

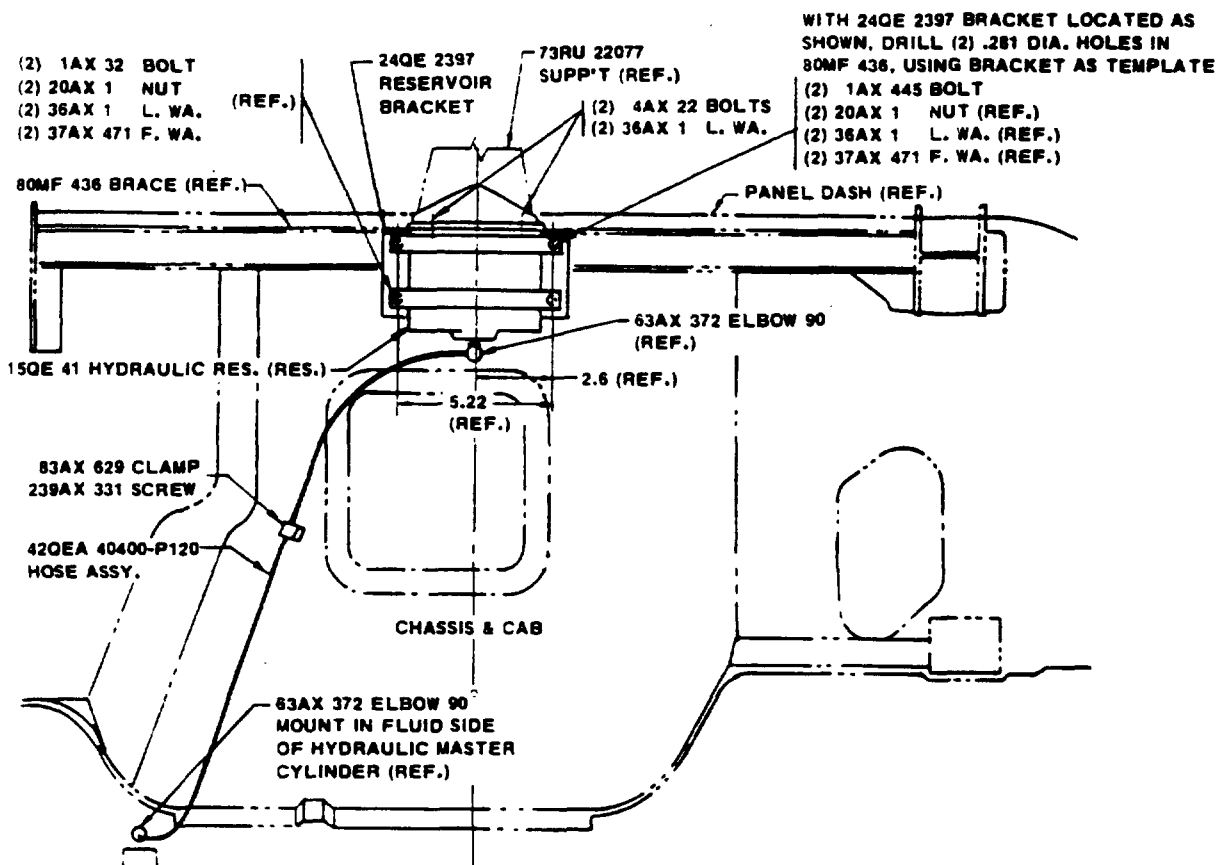


FIGURE 4
BRAKE RESERVOIR MOUNTING ARRANGEMENT,
R AND RD SERIES WITH
SHEET METAL FRONT END

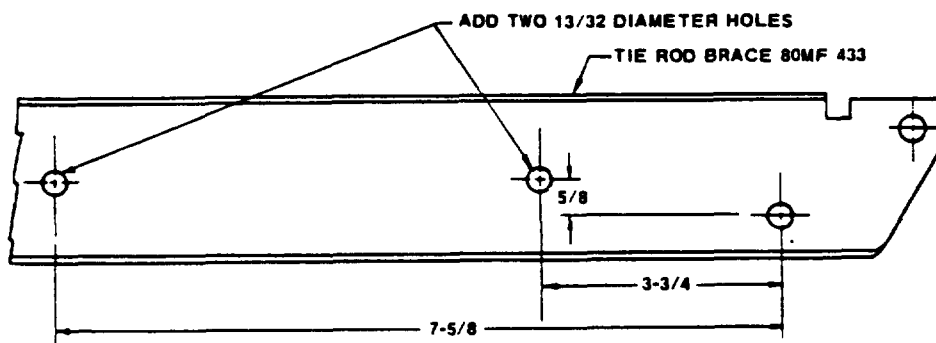


FIGURE 5
BRAKE RESERVOIR MOUNTING HOLES

Master Cylinder

CAUTION

If the master cylinder must be relocated, maintain the hydraulic fluid supply port in the top or upright position.

Hydraulic System Bleeding

Whenever brake system hydraulic components have been relocated, it is necessary to bleed the system of air. First bleed the master cylinder at the bleed vent then bleed each front wheel caliper. Use a pressure bleeder or bleed the system manually. After bleeding replenish the brake fluid in the hydraulic reservoir.

Relocating Front Axle Controller

Eaton Controller - Mount on the frame crossmember located immediately behind cab. Locate approximately as shown in Figure 6. Be sure controller clears frame, crossmember and any adjacent chassis equipment before drilling mounting holes. Shift controller as necessary to provide adequate clearance. Note that two mounting arrangements are used, depending on type of crossmember. See Figures 6 and 7.

NOTE

To conform with current production, the ratio valve is relocated along with the controller.

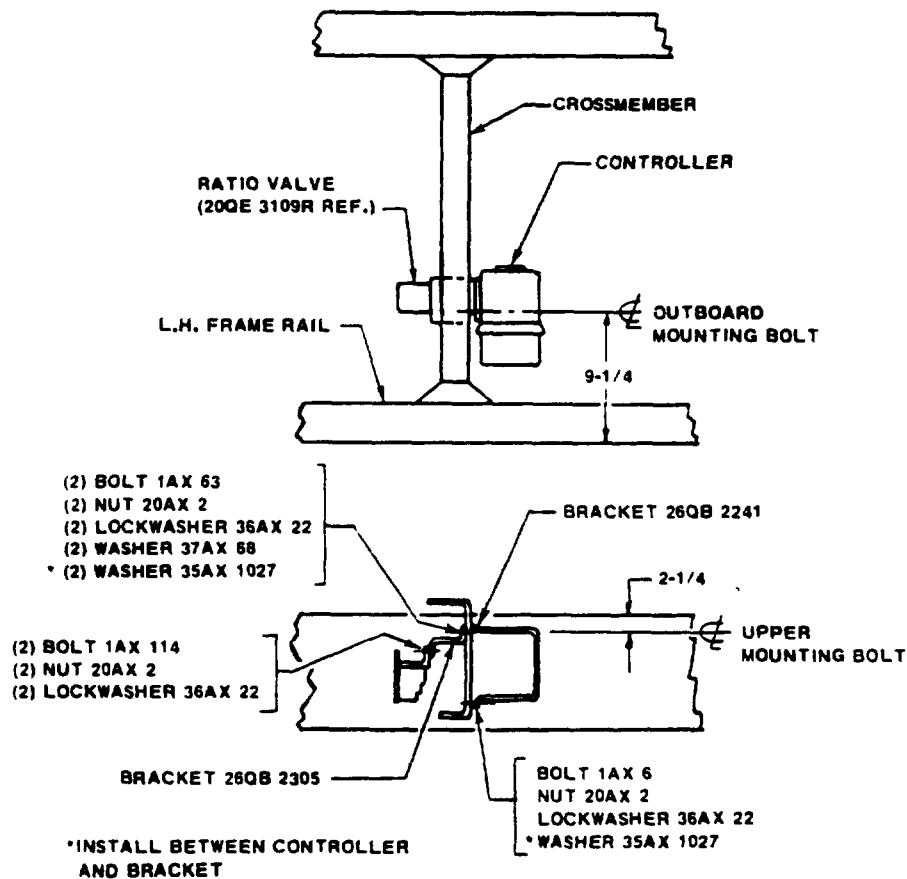


FIGURE 6
MOUNTING EATON CONTROLLER ON
CHANNEL TYPE CROSSMEMBER

(Continued Over)

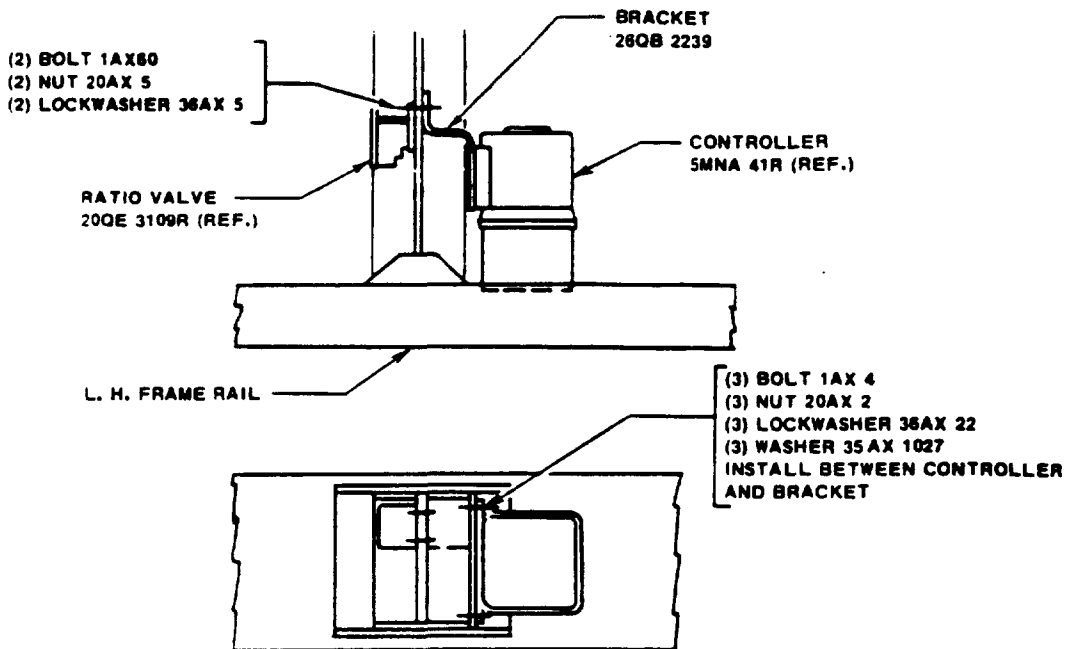


FIGURE 7
INSTALLING EATON CONTROLLER ON
I-BEAM CROSSMEMBER

Goodrich Controller - Mount on inside of left hand frame rail, close to the cab crossmember as shown in Figure 8. Air and electrical lines routed along the frame rail may have to be raised or lowered in this area to clear the controller.

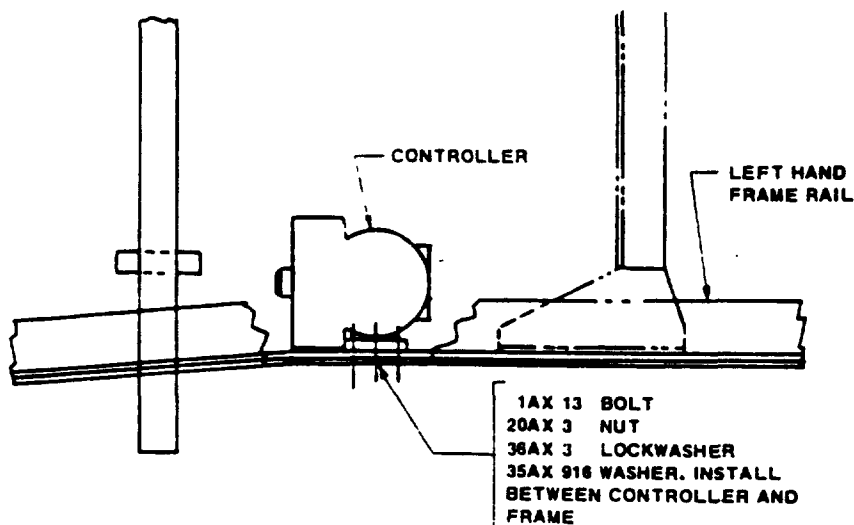


FIGURE 8
MOUNTING GOODRICH CONTROLLER

Repipe the relocated components as shown in Figure 9. Use same size air lines as original installation and be sure to use non-restrictive fittings. If possible, reuse original fittings. Do not splice air lines. Use a complete new hose if a longer line is required.

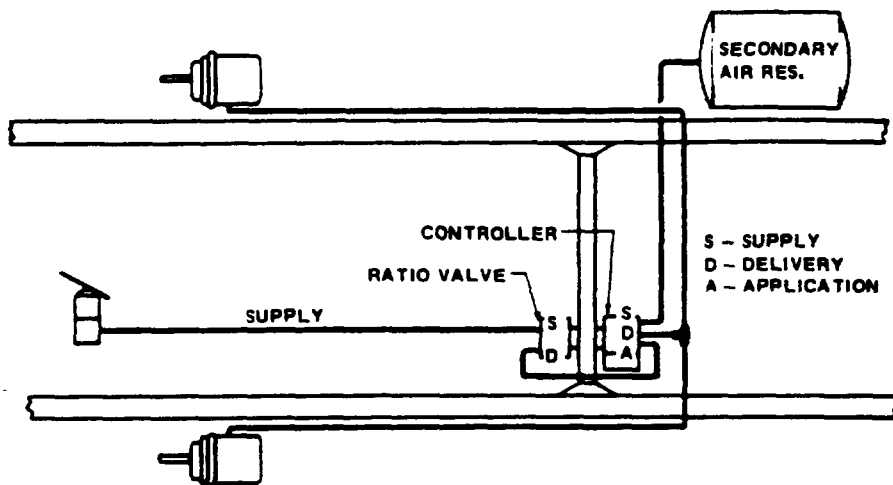


FIGURE 9
PIPING CONTROLLER AND RATIO VALVE

SERVICE BULLETIN

JULY 29, 1976

No. Q559 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☐ HAYWARD ☒ OAKVILLE ☐

FRONT BRAKE CHAMBER

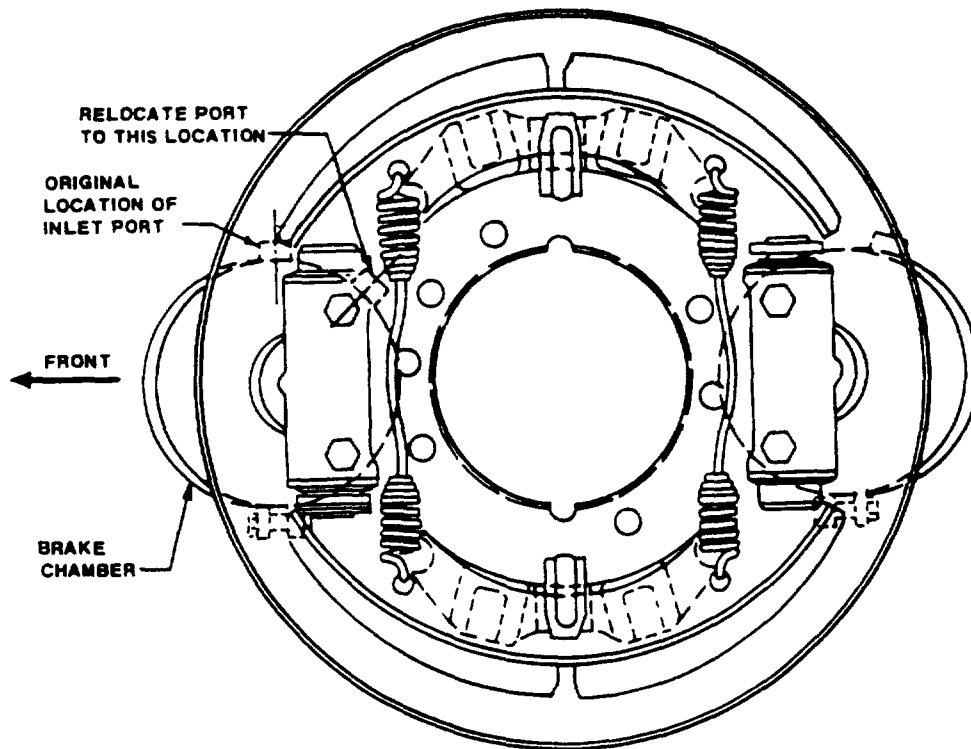
Increasing Clearance with Power Steering Gear
(WL and WS with FAW536W, FA537W, FF931W Front Axle and Wedge Brakes)

PURPOSE To provide procedure for eliminating possible interference between air inlet fitting and power steering gear.

RECOMMENDATION Revise brake chamber on all chassis equipped with power steering gear if originally built with non-current inlet port orientation. Normal warranty will apply.

INFORMATION The inlet fitting on forward, left hand air brake chamber can interfere with the power steering gear if it is not correctly positioned. Vehicles with this condition can be re-certified by rotating the chamber cover to properly orient the fitting.

To reposition the cover, disconnect air line from chamber. Loosen chamber clamp and rotate cover to position inlet port as shown in illustration. Tighten clamp.



The air line connecting front and rear chambers will have to be shortened to suit the new port location of front chamber. Reposition air line fittings to provide best routing with the shorter hose.

CIRCULATION

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SERVICE BULLETIN

AUGUST 27, 1976

No. Q560 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☐ HAYWARD ☒ OAKVILLE ☐

TRACTOR PROTECTION VALVE MOUNTING

(Mack Western Models WL and WS)

PURPOSE To inform the field of an improved mounting arrangement for subject valve.

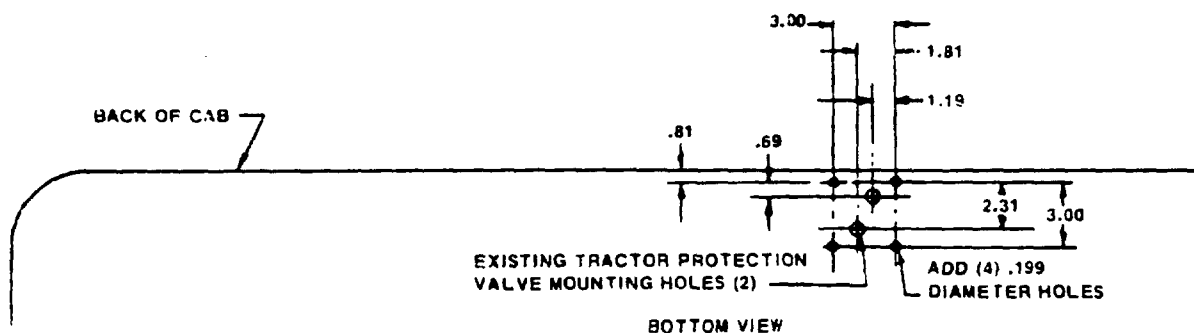
RECOMMENDATION Install the new reinforcement on all vehicles not so equipped.
Normal warranty will apply.

INFORMATION The improved mounting arrangement consists of a reinforcement plate installed between the tractor protection valve and cab floor.

Parts required:

Quantity	Part Number	Description
1	50QW29310	Reinforcement Plate
4	27AX370	Rivet

To install the plate, remove tractor protection valve and drill four mounting holes in cab floor using the reinforcement plate as a template. Position template by using 5/16-24 bolts installed in tractor protection valve mounting nut-serts. Refer to illustration for hole layout and size. Install reinforcement plate using rivets shown in parts list. Reinstall tractor protection valve using existing hardware.



NOTE

The nut-sert flanges are larger than the 1/2 inch diameter mounting bolt holes in the reinforcement plate and will prevent the plate from seating flush against cab floor. Do not enlarge holes in plate to provide clearance. The plate must support the nut-serts.

CIRCULATION

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SERVICE BULLETIN

FEBRUARY 3, 1978

T

No. Q561 under

BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒
DOUBLE CHECK VALVE AND STOP LIGHT SWITCH
 (All Highway Models)

PURPOSE To announce availability of a separate double check valve and stop light switch to replace the combination valve and switch.

RECOMMENDATION Install the new check valve and stop light switch arrangement if the combination valve and switch requires replacement.

INFORMATION The separate valve and switch arrangement provides easier servicing of the stop light switch. The switch screws into the check valve body and can be replaced without disturbing any air lines. A separate valve and switch can be used to service the combination unit.

Parts required:

Qty.	New Part	Description	Replaces
1	20QE2199R	Double Check Valve	20QE3120R
1	* 1MRA2325R	Stoplight Switch	-----

* Includes boot 8MY266

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CIRCULATION

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SERVICE BULLETIN

MARCH 16, 1978

T

No. Q564 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒

BRAKE ASSEMBLY DUST SHIELD

(DM, F, MB, R, RD, U and R Fire Apparatus With
FAW536C, 537C Front Axles and 16 1 2 x 5 Cam Brakes)

PURPOSE To announce availability of a one-piece dust shield.

RECOMMENDATION Install the one-piece shield if water or dirt entering the brake is a problem.

INFORMATION Air brake assemblies 1QDA4225R (R. H.) and 1QDA4226R (. L. H.), formerly supplied with two-piece dust shields, now have one-piece shields. The new shield provides better protection against entry of water than the previous part. Water in the brake assembly can cause erratic brake performance, such as pulling to one side.

One-piece shield, part number 8235-3236-K-2065, can be used as a replacement for the two-piece shield, if desired.

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CIRCULATION

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SERVICE BULLETIN

JULY 20, 1978

No. Q566 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

AUTOMATIC SLACK ADJUSTER (RAS512C and RAD529C Rear Axles on Chassis Equipped with Disc Brakes)

PURPOSE To provide instructions for installing automatic slack adjusters on rear wheel brake assemblies.

RECOMMENDATION Install automatic slack adjusters if service life of disc brake lining is unsatisfactory.

INFORMATION Rapid wear of disc type front brakes has been traced, in many cases, to incorrect adjustment of the rear wheel brake slack adjusters. This condition occurs because the disc brakes, being self-adjusting, always provide braking action, whereas incorrectly adjusted rear wheel brakes do not provide their normal share of the braking action under light braking conditions. Installation of automatic slack adjusters will maintain the rear brakes at correct operating clearance at all times thereby equalizing wear on front and rear brakes.

NOTE

In addition to the slack adjusters, it is recommended to replace the front wheel brake ratio valve with metering valve 20QE2191R. Refer to Service Bulletin Q95 under BRAKES for details.

Parts required:

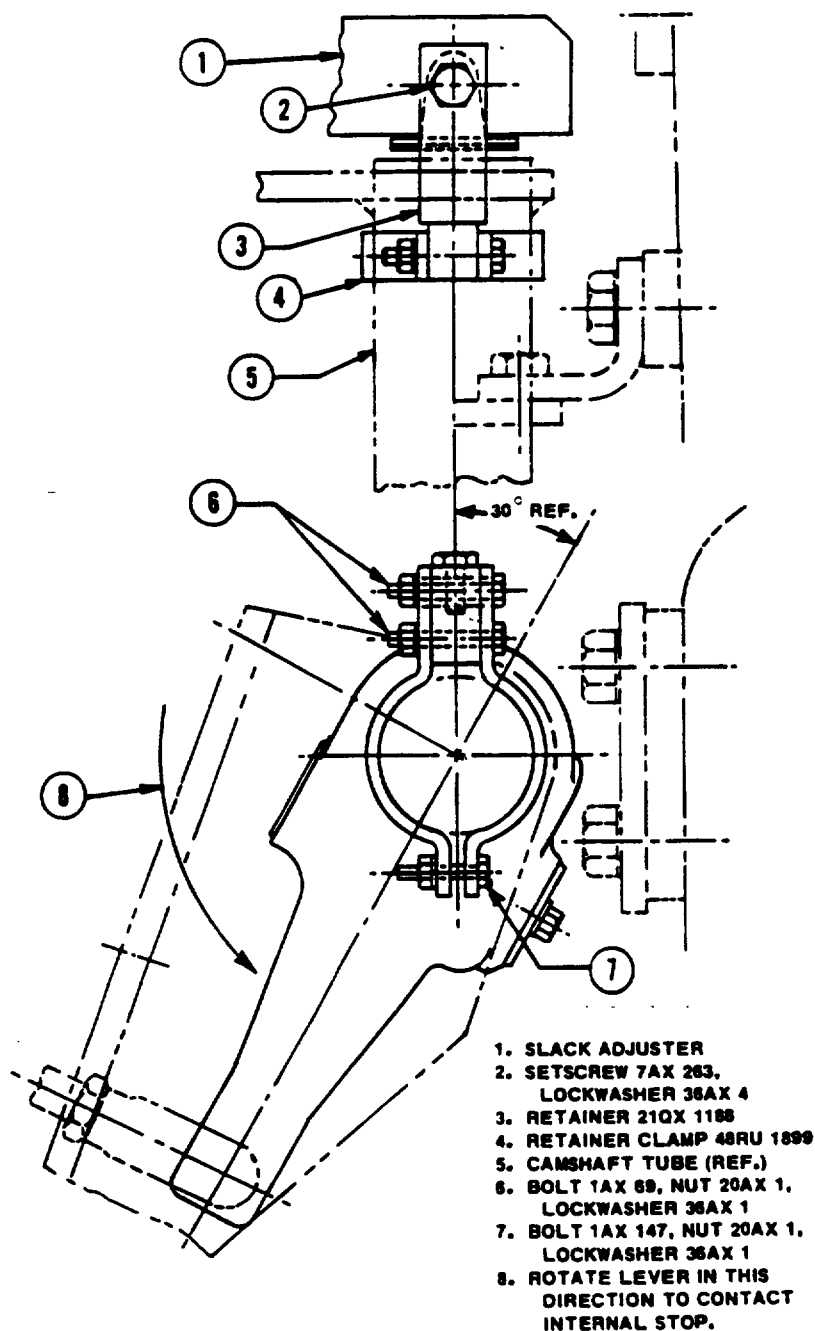
Qty.	Part Number	Description
2	25QDA335-P8	Slack Adjuster
2	21QX1188	Slack Adjuster Retainer
4	48RU1899	Retainer Clamp
2	7AX263	Setscrew
2	1AX147	Bolt, 1/4-28 x 1-1/4
4	1AX69	Bolt, 1/4-28 x 1-5/8
6	20AX1	Nut, 1/4 - 28
6	36AX1	Lockwasher
2	36AX4	Lockwasher

CIRCULATION

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Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

(Continued Over)

Procedure - See illustration.



1. Cage spring brakes if used.
2. Remove existing slack adjusters from brake assembly.
3. Install new slack adjuster on camshaft. Be sure arrow on adjuster points in the direction of a brake application.
4. Install clamps 48RU1899 and retainer on camshaft tube. Do not

JULY 20, 1978

No. Q566 under BRAKES
(Sheet 2)

5. Align clevis pin hole in adjuster arm with clevis by turning worm adjustment nut clockwise, and install clevis pin.
6. Move slack adjuster control arm by hand in direction shown in illustration to make sure it is in contact with the internal stop. Proper operation depends on control arm being correctly positioned against stop.
7. Install control arm setscrew as shown in illustration, then tighten retainer clamp screw. Be sure control arm does not move when clamp is tightened.
8. Check operation of slack adjuster by operating brakes and observing if adjusting nut rotates. The nut should rotate until brake linings are at normal operating clearance. If operation is satisfactory, uncage spring brakes, if used.

SERVICE BULLETIN

OCTOBER 12, 1978

T

No. Q567 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒
(Mack Fleet Service Facts No. Q2001)

BRAKE SHOE RETURN SPRING

(DM, DMM, F, RD, RM, MB and HMM Models With FA(W)617C Front Axle)

PURPOSE To inform the field of correct return spring for the cam brakes used on this front axle.

RECOMMENDATION Check for use of correct brake shoe return spring at time of overhaul or if short life of return springs is experienced.

INFORMATION Interference between the brake shoe return spring and hub of spoke wheels has been noted on some vehicles.

The return spring recommended for this application is 8235-2258-E-525. This spring has the coils located closer to the shoes to provide increased clearance in the hub area. It is painted yellow for identification.

Any brake assembly equipped with the superseded spring (painted green) should be changed over to the yellow spring.

END

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
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SERVICE BULLETIN

OCTOBER 16, 1978

OH

T

No. Q563 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated FEBRUARY 27, 1978)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒

SPECIAL INSTRUCTIONS: This is a Mandatory Product Improvement campaign to be done on a no-charge basis to customer. A list of affected chassis is not available; therefore it will be necessary to visually inspect each chassis to determine need for modification. Maximum labor allowance is two hours per chassis.

BRAKE SYSTEM MODIFICATION (All M Model Off-Highway Trucks)

PURPOSE To inform the field of a modification that will provide early "M" model vehicles with an improved dual circuit brake system.

RECOMMENDATION Modify the braking system of older vehicles as outlined here as a product improvement.

INFORMATION Current production off-highway truck brake systems are piped so that No. 3 reservoir is charged from No. 1 reservoir. This arrangement prevents loss of air from No. 3 reservoir, which supplies air for the brakes on one axle, from affecting the No. 2 reservoir which supplies air for the brakes on the other axle.

On non-current chassis which are piped as shown in Figure 1, No. 3 reservoir is charged from No. 2 reservoir. With this arrangement loss of air from one reservoir could possibly drain the other reservoir, resulting in loss of all brakes. By changing the piping to the arrangement shown in Figure 2, loss of air from one reservoir will not affect the other one.

The modification generally involves changing only one air line, item 3, Figures 1 and 2. Remove the line from No. 2 reservoir (shown in Figure 1) and connect it to No. 1 reservoir as shown in Figure 2. Due to the many different arrangements in use, specific details regarding parts and installation procedure are not provided here. Air line size and length, fittings etc. will have to be worked out locally to suit the particular chassis.

CAUTION

Be sure air for No. 3 reservoir is taken from No. 1 reservoir and not directly from compressor. If No. 3 reservoir is charged directly from the compressor, moisture will accumulate that could cause a brake malfunction during freezing weather.

CIRCULATION

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Shop Foreman	
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Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
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Shop Office	

OCTOBER 16, 1978

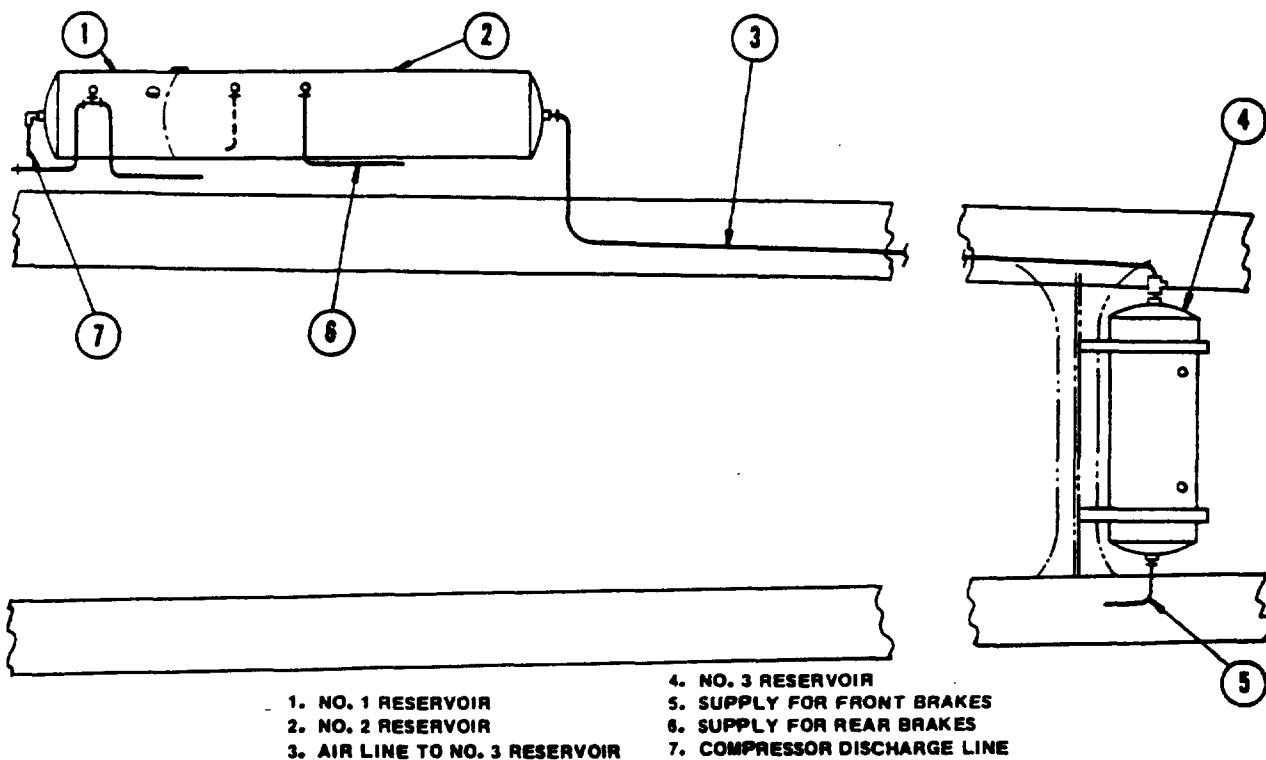


FIGURE 1
TYPICAL NON-CURRENT ARRANGEMENT

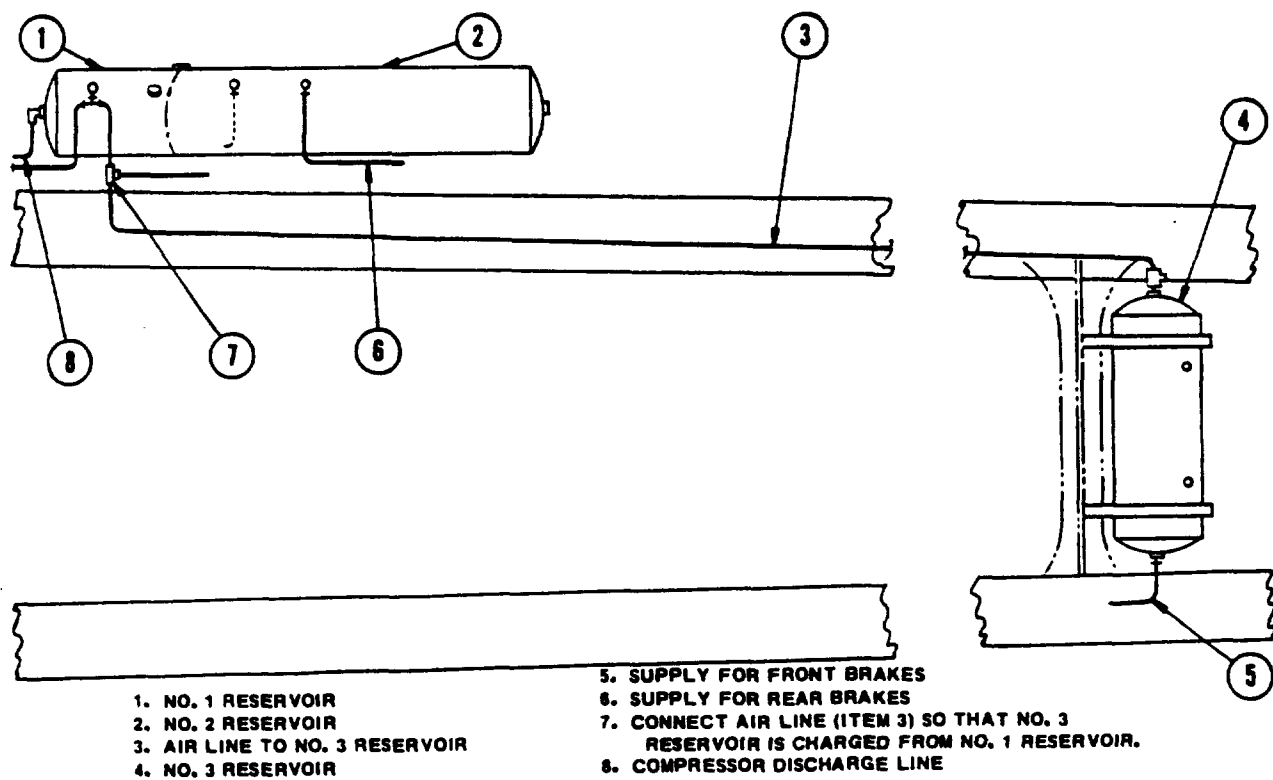


FIGURE 2
MODIFIED ARRANGEMENT

END

SERVICE BULLETIN

NOVEMBER 3, 1978

T

No. Q562a under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

FRONT BRAKE RATIO VALVE

(All Allentown "SX" Models and Mack Western 6-Wheel Dump or Mixer Truck Models)

PURPOSE To inform the field that, in some cases, improved life of rear brakes can be obtained by removing subject valve.

RECOMMENDATION Remove the ratio valve if premature wear of bogie brake linings and drums is experienced.

INFORMATION Under severe operating conditions, bogie brakes on vehicles equipped with a ratio valve (20QE2148R or 20QE3109R), wear faster than the front axle brakes. This condition is caused by the ratio valve limiting front axle braking force at certain performance levels. Removal of the ratio valve will allow the front brakes to provide a larger share of the braking force and thereby equalize front and rear brake life.

The ratio valve is connected in series between the brake valve and front axle brake quick release valve or anti-wheel lock controller. After the ratio valve is removed it will be necessary to fabricate a new line to connect these components. Do not splice existing lines.

On vehicles having the ratio valve and quick release valve connected by an air line, the existing tube fittings can be reused. On Allentown vehicles having the valves connected by a pipe nipple, use existing fitting at brake valve end and 90 degree elbow 63AX51094R (1/2 in. Tube x 1/2 NPTF) at quick release valve inlet port. Use plastic tubing 101AX126RF-50 (1/2 in. O. D.) for the new air line. Figures 1 and 2 are typical Allentown arrangements. Mack Western is similar except ratio valve is mounted on underside of floor (RL, RS) or engine support (WL, WS).

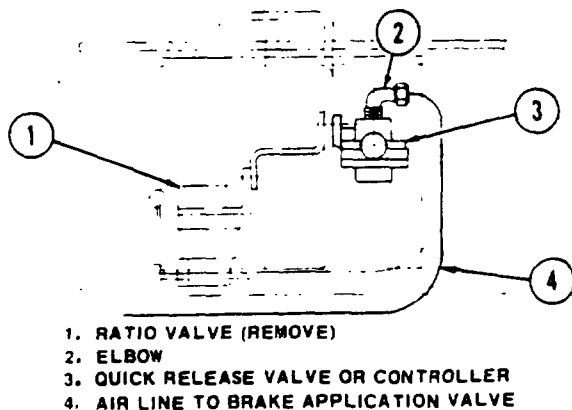


FIGURE 1
VALVES MOUNTED SEPARATELY

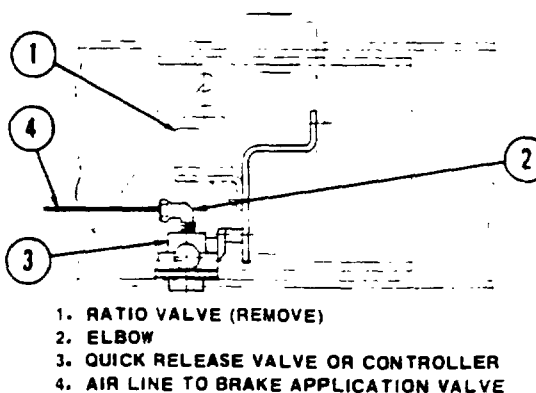


FIGURE 2
VALVES MOUNTED TOGETHER

CIRCULATION

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Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

END

Service Operations, Allentown, Pa., U.S.A.

MACK

SERVICE BULLETIN

NOVEMBER 6, 1978

No. Q562b under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

DISC TO DRUM BRAKE CHANGEOVER

(Highway Vehicles with FA536D, 537D, 616D, 617D,
or 619D Disc Brake Equipped Front Axles)

PURPOSE To inform the field that drum brakes can legally be installed on vehicles originally equipped with disc brakes.

RECOMMENDATION Refer to the Service Sales Merchandising letter mentioned herein if a customer wants to convert his vehicle from disc to drum brakes. This work is to be done at the customer's option and expense.

INFORMATION Revisions to MVSS121 specify less stringent stopping and performance requirements for trucks. This makes it permissible to change from air-over-hydraulic disc brakes to cam or wedge type brakes if the customer desires.

All parts required for this changeover are listed in Service Sales Merchandising letter No. 78-121, dated October 11, 1978. Refer to this publication if a disc to drum brake conversion is planned. It is recommended that this changeover be made when the disc brakes require relining or other service in order to minimize the expense involved.

END

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
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Shop Office	

SERVICE BULLETIN

FEBRUARY 13, 1980

T

No. Q557 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated MARCH 26, 1976)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒

COMBINATION BRAKE LINING (Eaton and Rockwell 18 x 7 Cam Brakes)

PURPOSE: To announce the availability of special lining kits for service use which provide longer life than the standard lining.

RECOMMENDATION: Install a service or heavy-duty lining kit, if extended lining life is desired.

INFORMATION: The "service" lining kit for SWS681C and SS58C bogies is a combination type consisting of one organic and one semi-metallic block for each shoe. All blocks in the "heavy-duty" kits are semi-metallic.

NOTE

Semi-metallic blocks contain no asbestos and therefore may be ground to fit if required, without danger of creating asbestos dust.

Part numbers of the standard lining kits and corresponding service and heavy-duty lining kits are shown in following chart.

Bogie	Brake Type	Standard Lining Kit	Service Lining Kit	Heavy-Duty Lining Kit
SWS681L, SS58C	Eaton	202SMH218	*202SMM218	**202SMH230
SWS592C, SS65C	Rockwell	202SMH208	-----	**202SMH229

* Combination organic and semi-metallic blocks

** Semi-metallic blocks

Install lining blocks of combination kits as shown in following illustration. Note that semi-metallic blocks are shown shaded.

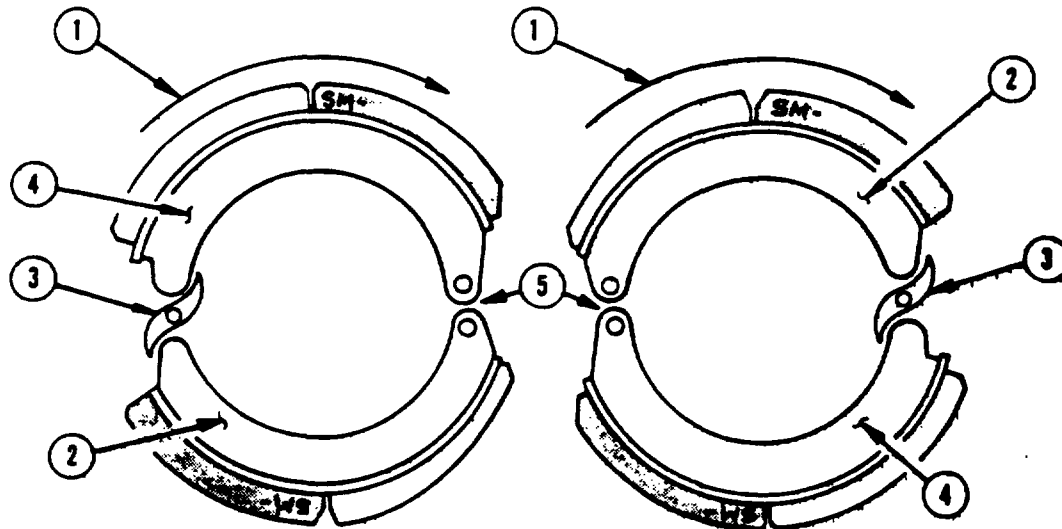
CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

FEBRUARY 13, 1980

NOTE

Semi-metallic brake blocks can be identified by the letters "SM" preceding the block identification number.



SEMI-METALLIC BLOCK



ORGANIC BLOCK

- | | |
|-----------------------------|---------------------------|
| 1. DIRECTION OF ROTATION | 3. BRAKE CAM |
| 2. REVERSE (SECONDARY) SHOE | 4. FORWARD (PRIMARY) SHOE |
| 5. BRAKE ANCHOR | |

**BRAKE BLOCK INSTALLATION FOR COMBINATION KITS -
RIGHT SIDE SHOWN**

The forward and reverse shoes may be in either position, depending on location of the cam. With cam facing toward front of vehicle, the forward shoe is at bottom. With cam at rear of vehicle, the forward shoe is at top. See illustration.

END

SERVICE BULLETIN

APRIL 7, 1980

No. Q562 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated FEBRUARY 3, 1978)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

(Mack Fleet Service Facts No. Q2002)

BRAKE SYSTEM CHANGES (All With MVSS121 Brake System)

PURPOSE To announce changes in MVSS121 brake system requirements and to advise of improvement that can be made to existing systems.

RECOMMENDATION Be sure all vehicles subject to MVSS121 requirements are not modified or altered in anyway except as specified in this bulletin.

INFORMATION Recent changes to Motor Vehicle Safety Standard (MVSS)121 have resulted in less stringent performance requirements in some areas. Vehicles built prior to release of the revised standards can be modified to current standards if desired. Changes which affect Mack vehicles include the following:

- a. * Removal of anti-wheel lock equipment from front (steering) axle.
 - b. Brake chambers on front (steering) axle of FA536C, 537C reduced from type 24 to type 20.
 - c. Reduced chamber size to type 24 on 44,000 lb. bogies and single rear axle of 23,000 lbs. or less.
 - d. Lower friction brake lining on front (steering) axle. Reduce coefficient of friction from GG to EE.
 - e. Smaller air lines for supply and control functions provides better timing between tractor and trailer.
 - f. Less stringent stopping requirements that eliminate need for disc brakes on the larger front axles; cam or wedge brakes are adequate.
- * **CAUTION:** Removal of anti-lock from the steering axle cannot safely be accomplished without item d.

If an operator wishes to take advantage of these changes to bring his vehicle in conformity with current regulations he may do so. However, due to the many brake arrangements involved and the need to insure that changes are in compliance with regulations, the part numbers required are not given in this bulletin. Mack branches or distributors can obtain those part numbers by consulting axle arrangements on micro-fiche cards for chassis built after June, 1976.

CIRCULATION

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Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
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Shop Office	

APRIL 7, 1980

Various improvements have been made to MVSS121 brake systems that can be applied to existing systems at time of overhaul or to correct an operational problem. These improvements are listed below and installation instructions are provided.

- a. Drum brake linings.
- b. Front brake ratio valve.
- c. Metering valve for disc brake systems.
- d. Relocating front axle controller.
- e. Relocating disc brake intensifier reservoir.
- f. Lower ratio intensifier for disc brakes.
- g. Automatic slack adjusters on rear axle with automatic adjusting front brakes.

I. Drum Brake Linings

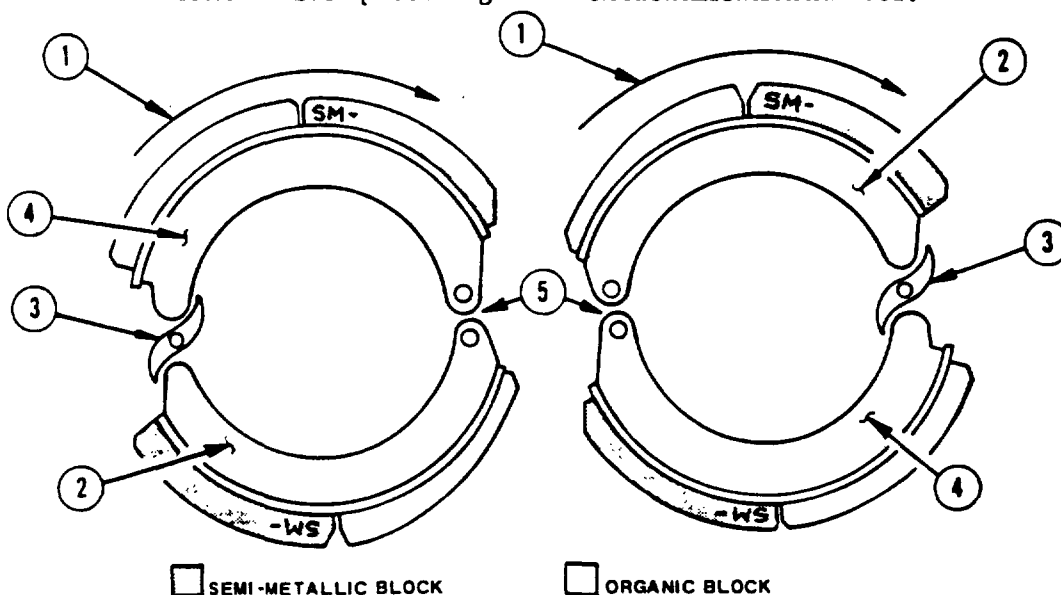
Brake linings listed in the accompanying charts apply to all highway models equipped with cam or wedge actuated brakes. The lining mix has been changed due to increased stopping distance. The new lower friction lining will provide increased lining and drum life while maintaining overall brake performance. Due to the different characteristics of the new mix, it is not interchangeable on an individual wheel basis with linings of previous type.

Where a single drive axle is employed and one wheel brake assembly requires relining, both assemblies must be serviced with the new mix linings. Similarly, in the case of dual axle drive bogies, all four assemblies must be serviced with the new mix linings when any relining is required. Failure to observe these precautions will have an adverse effect on brake balance and brake stability may be jeopardized.

Some lining kits are combination type consisting of one organic and semi-metallic block per shoe. Instructions for installing these kits follows.

NOTE

Semi-metallic brake blocks can be identified by the letters "SM" preceding the block identification number.



- | | |
|-----------------------------|---------------------------|
| 1. DIRECTION OF ROTATION | 3. BRAKE CAM |
| 2. REVERSE (SECONDARY) SHOE | 4. FORWARD (PRIMARY) SHOE |
| 5. BRAKE ANCHOR | |

FIGURE 1

BRAKE BLOCK INSTALLATION FOR COMBINATION KITS -
RIGHT SIDE SHOWN

The forward and reverse shoes may be in either position, depending on location of the cam. With cam facing toward front of vehicle, the forward shoe is at bottom. With cam at rear of vehicle, the forward shoe is at top. See illustration.

**DRUM BRAKE SERVICE LINING
ALLENTOWN AND OAKVILLE CHASSIS**

Axle or Bogie	Brake Type	Brake Assy. No. 1QDA -	Size	Lining Kit No.	Fasteners
FA535W, 532W	Wedge	323A, 324A	15 x 4	202SMH167	①
FAW536W, 537W		343R, 344R	15 x 5	202SMH191	②
FAW536C, 537C	Cam	4260R, 4261R	16 1/2 x 5	202SMM207	②
FA(W)617C		4239, 4240	16 1/2 x 5	202SMH207	
FA703C		4167A, 4168A	16 1/2 x 5	202SMH207	
RAS512W, RAD529W	Wedge	551A, 552A	15 x 7	202SMH159	②
L155W		568R, 569R	15 x 7	202SMH159	
R170W		568R, 569R	15 x 7	202SMH159	
RAD529C	Cam	* 4231R, 4232R	16 1/2 x 7	202SMH204-P2	②
RAS512C		* 4231R, 4232R	16 1/2 x 7	202SMH204-P2	②
RAS512C, RAD529C		4171A, 4172A	16 1/2 x 7	202SMM204	④
RAD530C		* 4233R, 4234R	16 1/2 x 7	202SMH204-P2	②
RAD608C, 707C, 708C		* 4169A, 4170A	16 1/2 x 7	202SMH204-P2	②
R170C		* 4247R, 4248R	16 1/2 x 7	202SMH204-P2	②
L155C		4241R, 4242R	16 1/2 x 7	202SMH204	②
SW56, 57W	Wedge	551A, 552A	15 x 7	202SMH159	②
SW56, 57W		568R, 569R	15 x 7	202SMH159	
SW56C, 57C	Cam	4216	16 1/2 x 7	202SMM204	②
SW56C, 57C		4224R	16 1/2 x 7	202SMH204	②
SW561C		4228R	16 1/2 x 7	202SMH220	③
SW571, 573C		4217	16 1/2 x 7	202SMH204	②
SW571, 573C		* 4227R	16 1/2 x 7	202SMH210	②
SW5711, 5731C		* 4228R	16 1/2 x 7	202SMH220-P2	③

* These assemblies use combination brake linings. Assemble as shown in Figure 1. Combination linings have been effective in many instances in eliminating noise and complaints of short lining life.

- ① Bolt 8235-15X882, Nut 20 AX1, Lockwasher 36AX1. Install per Bulletin Q72 under BRAKES.
- ② Rivet 341SZ158
- ③ Rivet 341SZ151
- ④ Rivet 341SZ110-P2

APRIL 7, 1980

**DRUM BRAKE LINING
MACK WESTERN CHASSIS**

AXLE OR BOGIE	BRAKE TYPE	BRAKE ASSEMBLY NO. 1QDA	SIZE	LINING KIT NO.	FAST-ENERS
FAW536C, 537C	Cam	49333/334R-P5 (R) 49333/334R-P6 (W)	16 1/2 x 5	202SMM207	①
FAW536W, 537W	Wedge	49319/320R-P1* 49319/320R-P2** 49319/320R-P3***	(14 ⁰ x 12") (12 ⁰ x 12") 15 x 5 (14 ⁰ x 9")	202SMH159	①
FAW536/537W	Wedge	49355/356R	15 x 4	202SMM225	②
FF-9311	Wedge	49345/346R(R)	15 x 4	202SMM225	②
FF-9311	Wedge	49357/358R(W)	15 x 4	202SMM225	②
FF-9311	Wedge	49345/346R-P2(RW)	15 x 4	202SMM225	②
FF-931-C	Cam	49335/336R-P3	16 1/2 x 5	202SMM225	①
FF-931-W	Wedge	49337/338R-P1* 49337/338R-P2** 49337/338R-P3***	(14 ⁰ x 12") (12 ⁰ x 12") 15 x 5 (14 ⁰ x 9")	202SMH191	①
FL931W	Wedge	39323/324R-P1	15 x 6	202SM139-P2	①
RAD-529-C	Cam	4231/4232R	16 1/2 x 7	202SMH204	①
R-170-C	Cam	49317/318R-P13+ 49317/318R-P15++	16 1/2 x 7	202SMH204	①
R-170-W	Wedge	49319-320R-P9 49319/320R-P12	(12 ⁰) (10 ⁰) 15 x 7	202SMH159	①
SWS56/57/76C	Cam	49317/318R-P11	16 1/2 x 7	202SMH204	①
SWS56/57/76W	Wedge	49319/320R-P10	(12 ⁰) 15 x 7	202SMH159	①
SWS71/573C	Cam	49317/318R-P12	16 1/2 x 7	202SMH210#	①
SL, SQ(C)	Cam	49317/318R-P17FWD+ 49317/318R-P18RR+ 49317/318R-P19FWD++ 49317/318R-P20RR++	16 1/2 x 7	202SMH204	①
SL, SQ(W)	Wedge	49319/320R-P11	15 x 7	202SMH159	①
SSHD(C)	Cam	49317/318R-P13FWD+ 49317/318R-P14RR+	16 1/2 x 7	202SMH204	①
SSHD(C)	Cam	49317/318R-P15FWD++ 49317/318R-P16RR++	16 1/2 x 7	202SMH204	①

* 4 x 2 Tractors Over 120 W/B
 ** 4 x 2 Trucks & Tractors 120 W/B & Under
 *** All 6 x 4
 ① Rivet 341SZ158
 ② Rivet 8235-RV3108

+ Standard Suspension
 ++ Neway Suspension
 # Combination Lining

II. Front Brake Ratio Valve

An improved ratio valve 20QE3166R that provides more reliable cold weather performance is available. The non-current valve may malfunction due to cold weather freeze-up. Some modifications are required to install the new valve as a service replacement for old. Instructions are provided herein.

A ratio valve can be installed on chassis not originally equipped with one for improved brake performance. A ratio valve delays air pressure to the front brakes until pressure at rear brakes exceeds 10 psi. Above 10 psi and up to approximately 75 psi the valve maintains a pressure differential between front and rear brakes with the front brakes operating at the lower pressure. The pressure differential becomes progressively less as braking pressure approaches 75 psi and above 75 psi front and rear brake application pressure is equal. Procedure for installing a ratio valve on vehicles not so equipped is also provided.

CAUTION

It is illegal to install or use a manual front wheel limiting valve on a vehicle equipped with MVSS 121 brake system.

Parts involved are shown in following list. Actual requirements will depend on vehicle model, existing brake equipment and whether previously equipped with a ratio valve.

Qty.	Part Number	Description
1	20QE3166R	Ratio Valve
1	*26QB2305	Bracket, Ratio Valve Mounting (R, RD, DM, U)
1	*29QE2218	Bracket, Ratio Valve Mounting (F)
**	101AX126R	Tube, Plastic, 1/2" O.D.
2	63AX51085R	Connector (F Model)
2	63AX163	Connector (F Model)
3	63AX51093R	Elbow(R, U, DM)
2	1AX19	Bolt, Valve Mntg., 5/16-24 x 7/8
2	1AX114	Bolt, Valve Mntg., 5/16-24 x 1
2	1AX36	Bolt, Brkt. Mntg., 5/16-24 x 1 1/4
2	1AX400	Bolt, Brkt. Mntg., 5/16-24 x 1 1/2
2	1AX33	Bolt, Brkt. Mntg., 3/8-24 x 7/8
2	20AX2	Nut, 5/16-24
2	20AX3	Nut, 3/8-24
2	36AX3	Lockwasher, 3/8 I.D.
2	36AX22	Lockwasher, 5/16 I.D.
2	37AX68	Flat Washer, 11/32 I.D.

* Not required if originally equipped with ratio valve.

**As required.

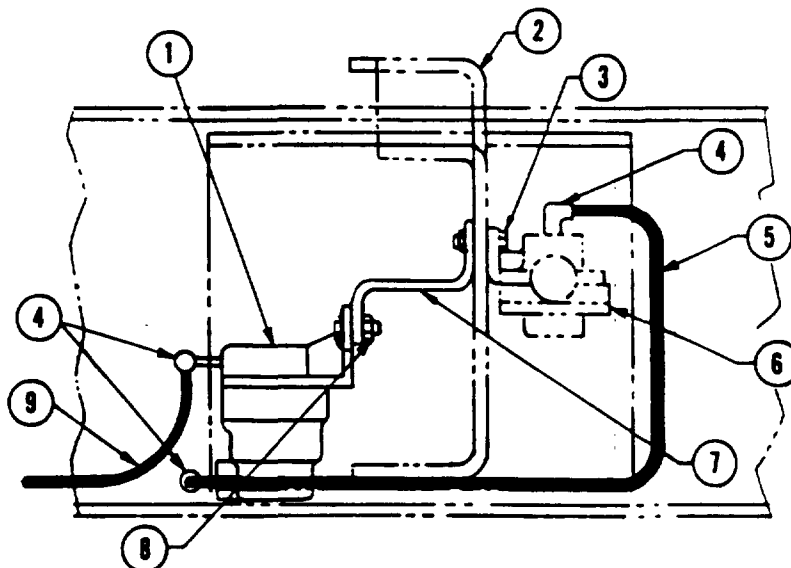
NOTE

On Mack Western chassis, reuse existing brackets by elongating mounting holes as required.

Procedure

1. Vehicles not originally equipped with ratio valve (no anti-wheel lock).
 - a. Install ratio valve bracket on chassis. Use quick release valve mounting holes for R, U (Figure 2) and RD, DM (Figure 3). Use alcohol evaporator mounting holes for F models (Figure 4). Mount ratio valve on bracket (except MB). A separate bracket is not required for the MB.
 - b. On MB models the ratio valve is installed on outboard side of accessory mounting plate. This plate is located adjacent to and outboard of the right-hand tilt bracket. Install valve with inlet port facing up.

- c. Pipe the ratio valve as shown in Figures 2, 3 or 4. (MB not shown; pipe as shown in Figure 4 for F models). Basically this involves connecting the line from brake application valve, that originally went to the quick release valve, to the supply (input) port of the ratio valve. The ratio valve's output port is then connected to the quick release valve. In effect, the ratio valve is inserted into the application valve-to-quick release valve line.
2. Vehicles equipped with ratio valve 20QE3109R or 20QE2148R can be changed over to new valve 20QE3166R as follows:
- a. Disconnect two air lines from old valve and unbolt valve from mounting bracket.
 - b. Install new valve on bracket with inlet port facing up. Use existing fasteners.
 - c. Replace fittings on ratio valve hoses to match changed thread size if original valve is 20QE3109R
 - d. Pipe system as shown in Figures 2, 3 or 4 except that the line shown going to quick release valve is connected to signal port of the anti-wheel lock controller/valve assembly. A separate quick release valve is not used with anti-wheel lock systems.



- | | |
|----------------------------|--|
| 1. RATIO VALVE 20QE3166R | 5. AIR LINE - QUICK RELEASE VALVE TO RATIO VALVE |
| 2. CROSSMEMBER | 6. QUICK RELEASE VALVE (REFERENCE) |
| 3. BOLT 1AX 38, NUT 20AX 2 | 7. BRACKET 26QB 2305 |
| LOCKWASHER 36AX 22. | 8. BOLT 1AX 114, NUT 20AX 2, LOCKWASHER 36AX 22 |
| FLATWASHER 37AX 88 | 9. AIR LINE - RATIO VALVE TO BRAKE APPLICATION VALVE |
| 4. ELBOW 83AX 51093P | |

FIGURE 2
R AND U MODELS

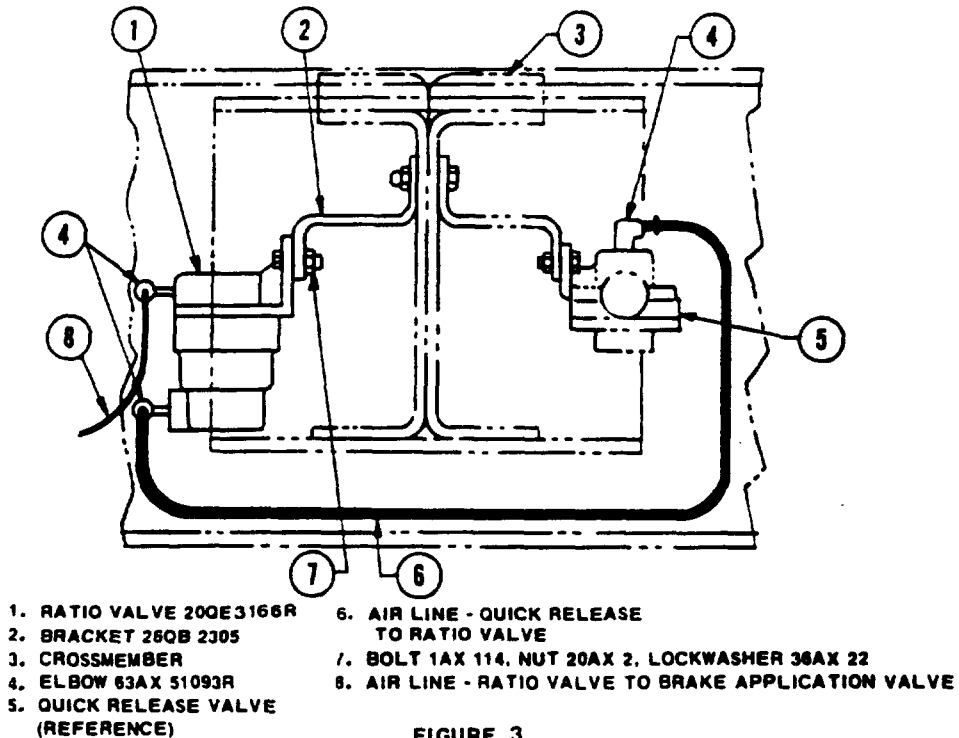


FIGURE 3
RD AND DM MODELS

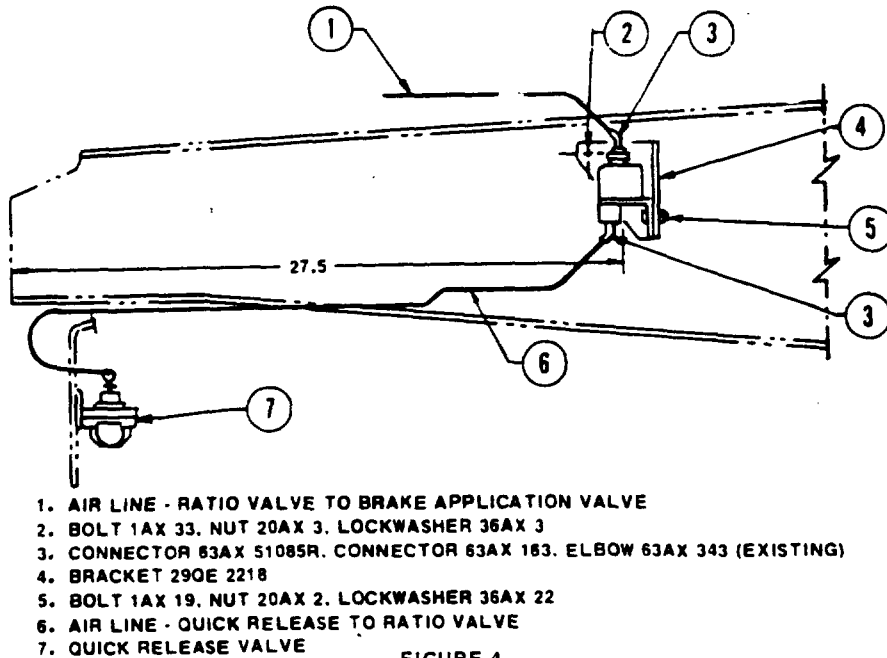
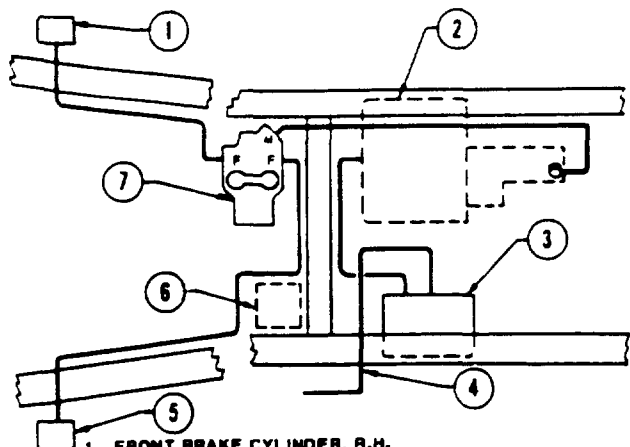


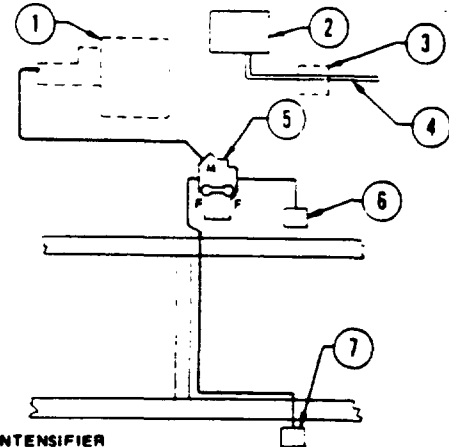
FIGURE 4
F MODELS



1. FRONT BRAKE CYLINDER, R.H.
2. INTENSIFIER
3. FRONT BRAKE CONTROLLER
4. AIR LINE - CONTROLLER TO BRAKE APPLICATION VALVE
5. FRONT BRAKE CYLINDER, L.H.
6. RATIO VALVE - REMOVE
7. METERING VALVE 20QE 2181R

FIGURE 5

R, U AND DM MODELS



1. INTENSIFIER
2. FRONT BRAKE CONTROLLER
3. RATIO VALVE - REMOVE
4. AIR LINE - CONTROLLER TO BRAKE APPLICATION VALVE
5. METERING VALVE
6. FRONT BRAKE CYLINDER, R.H.
7. FRONT BRAKE CYLINDER, L.H.

FIGURE 6

MB MODELS

2. Installing low ratio intensifier.

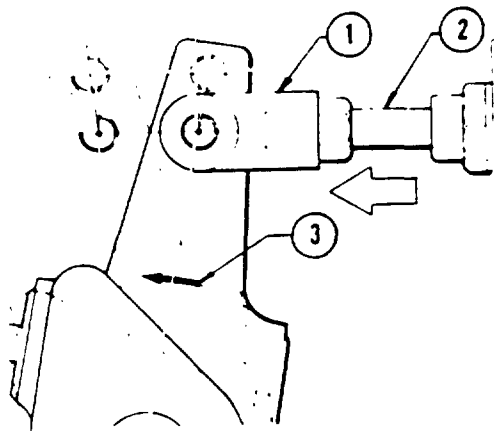
- a. The 17:01 intensifier is directly interchangeable with the 23:1 unit.

Parts required

New Part	Description	Replaces
8QE429R(17:1)	Brake Intensifier	8QE430R(23:1)

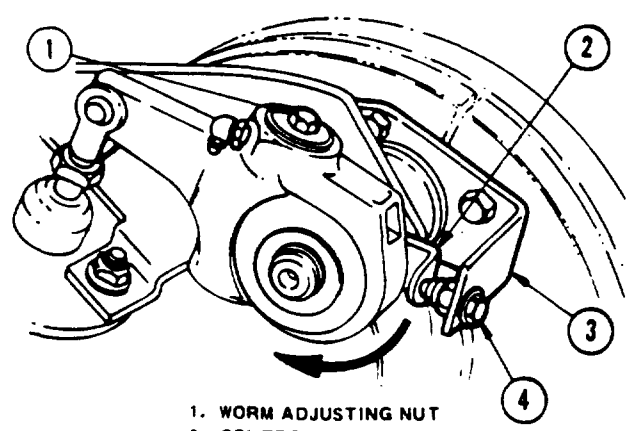
3. Installing automatic slack adjusters on SW56, 57, 571, 573 and 76 series bogies.

- a. Remove existing slack adjusters.
- b. Install new slack adjuster on brake camshaft. Be sure arrow on adjuster points in direction unit rotates for a brake application. See Figure 7.
- c. Install slack adjuster retainer bracket on brake assembly using existing spider mounting bolts as shown in Figure 8. Do not tighten the bolts. Align clevis pin hole in slack adjuster with push rod clevis by turning worm adjusting nut clockwise and install clevis pin.



1. CLEVIS
2. PUSH ROD
3. DIRECTION OF BRAKE APPLICATION

FIGURE 7



1. WORM ADJUSTING NUT
2. CONTROL ARM
3. RETAINER BRACKET
4. SETSCREW

FIGURE 8

- d. Move slack adjuster control arm in direction shown in Figure 8 to be sure it is in contact with the internal stop. Proper operation depends on control arm being correctly positioned against stop.
- e. Install control arm setscrew as shown in Figure 8 and tighten retainer bracket screws. Be sure control arm does not move when retainer screws are tightened.

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Parts required:

Qty.	Part Number	Description
*	4891-09726602	Kit, Boot and Seal
**	4891-09906101	Kit, Shoe and Lining
***	4891-09829401	Piston
*	4891-0929501	Lining Holddown Kit

- * Services one caliper
- ** Service two calipers
- *** As required

IV. Relocating Front Brake Controller

Early production R, RD, DM and U models with MVSS121 brake systems had the anti-wheel lock controller mounted on the engine front support crossmember. Current production vehicles have the controller mounted on a frame crossmember. The controller was relocated to improve engine accessibility; line routing and brake operation.

Chassis	Qty.	Part Number	Description
All w/ Eaton Controller & Channel Type cross- member	AR	101AX126RF50	Hose (1/2 O. D.)
	AR	101AX127RF50	Hose (5/8 O. D.)
	1	26QB2241	Controller Mounting Bracket
	1	26QB2305	Ratio Valve Mounting Bracket
	2	1AX63	Bolt, 5/16-24 X 2
	1	1AX6	Bolt, 5/16-24 X 1-3/4
	2	1AX114	Bolt, 5/16-24 x 1
	5	20AX2	Nut
	5	36AX22	Lockwasher
	2	37AX68	Flatwasher
	3	35AX1027	External Tooth Lockwasher
with Eaton Controller & I-beam Cross- member	AR		Hose
	1	26QB2239	Controller Mounting Bracket
	2	1AX60	Bolt, 1/2-20 x 1-1/2
	3	1AX6	Bolt, 5/16-24 x 2
	5	20AX5	Nut
	2	36AX5	Lockwasher
	3	36AX22	Lockwasher
	3	35AX1027	External Tooth Lockwasher
with Goodrich Controller	3	1AX13	Bolt, 3/8-24 x 1-1/2
	3	20AX3	Nut
	3	36AX3	Lockwasher
	3	35AX916	External Tooth Lockwasher

Eaton Controller - Mount on the frame crossmember located immediately behind cab. Locate approximately as shown in Figure 10. Be sure controller clears frame, crossmember and any adjacent chassis equipment before drilling mounting holes. Shift controller as necessary to provide adequate clearance. Note that two mounting arrangements are used, depending on type of crossmember. See Figures 10 and 11.

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Goodrich Controller - Mount on inside of left hand frame rail, close to the cab crossmember as shown in Figure 12. Air and electrical lines routed along the frame rail may have to be raised or lowered in this area to clear the controller.

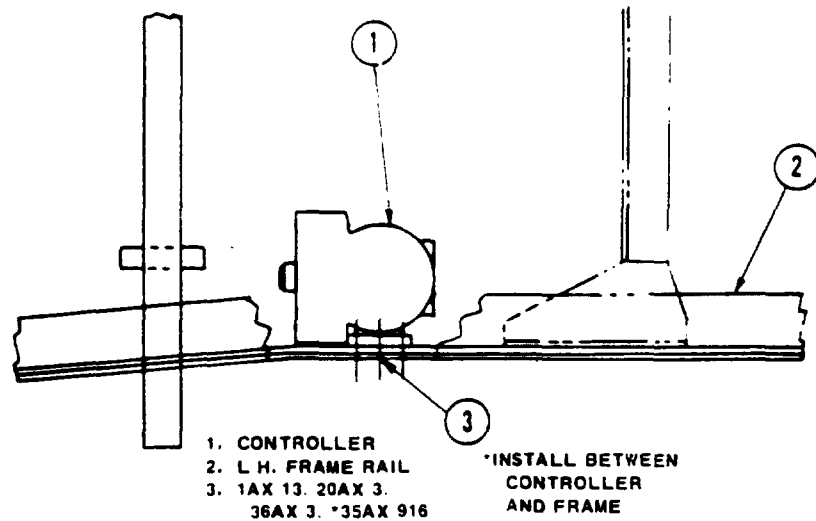


FIGURE 12
MOUNTING GOODRICH CONTROLLER

Repipe the relocated components as shown in Figure 13. Use same size air lines as original installation and be sure to use non-restrictive fittings. If possible, re-use original fittings. Do not splice air lines. Use a complete new hose if a longer line is required.

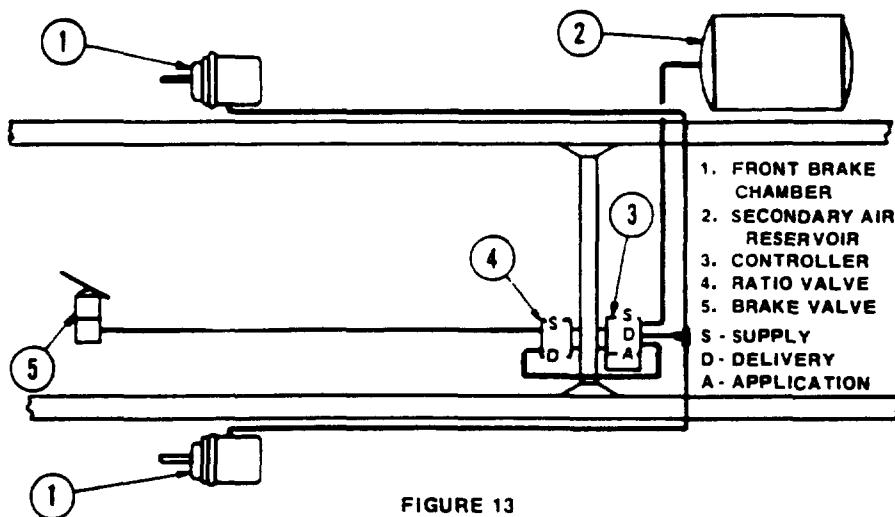


FIGURE 13
PIPING CONTROLLER AND RATIO VALVE

V. Relocating Intensifier Reservoir

The brake intensifier is a combination air chamber and hydraulic master cylinder. It utilizes brake system air pressure to develop hydraulic pressure in the master cylinder. Hydraulic pressure is used to operate the disc brakes.

A reservoir is required to contain a reserve supply of brake fluid. On early production R, RD and DM models the reservoir was mounted on the cab support crossmember. It has since been relocated to engines side of dash panel to eliminate possible interference with body components. The reservoir can be relocated per following procedure. Note that parts required vary with chassis model.

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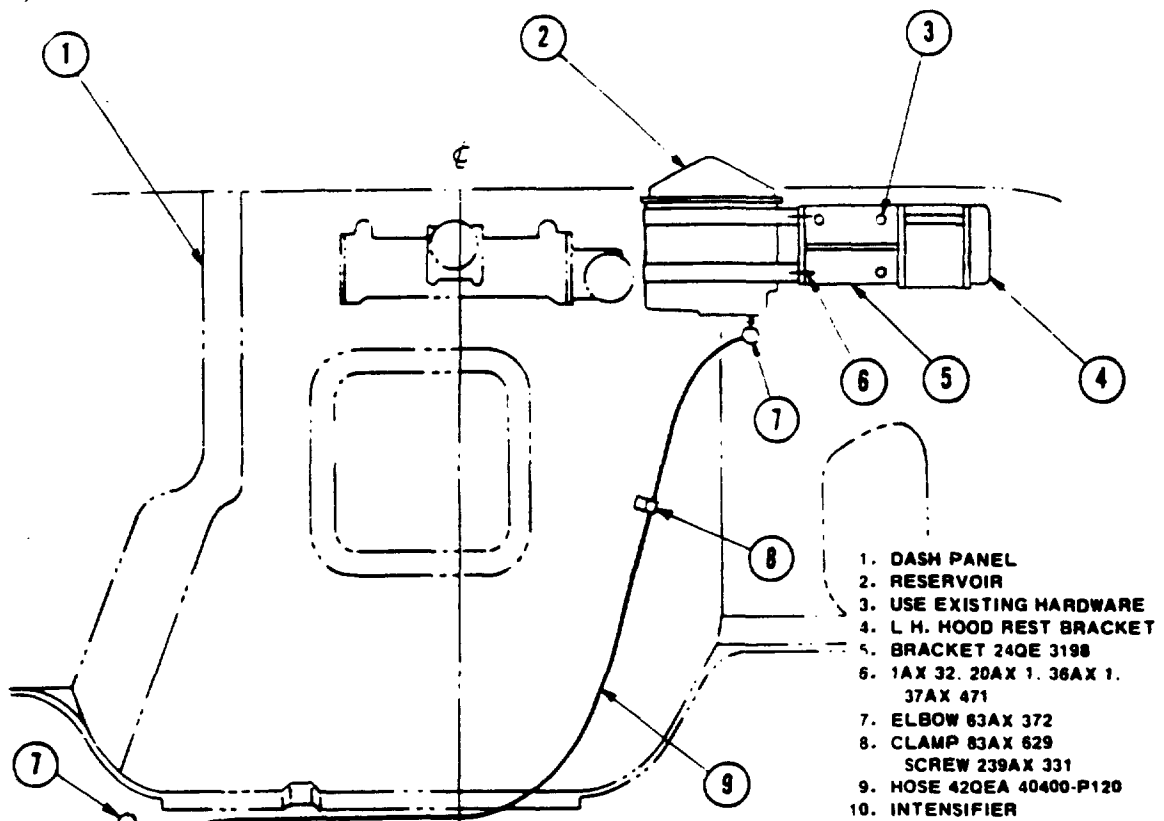


FIGURE 15
BRAKE RESERVOIR MOUNTING ARRANGEMENT.
R AND RD SERIES WITH FIBERGLASS HOOD
AND STANDARD CAB MOUNTING

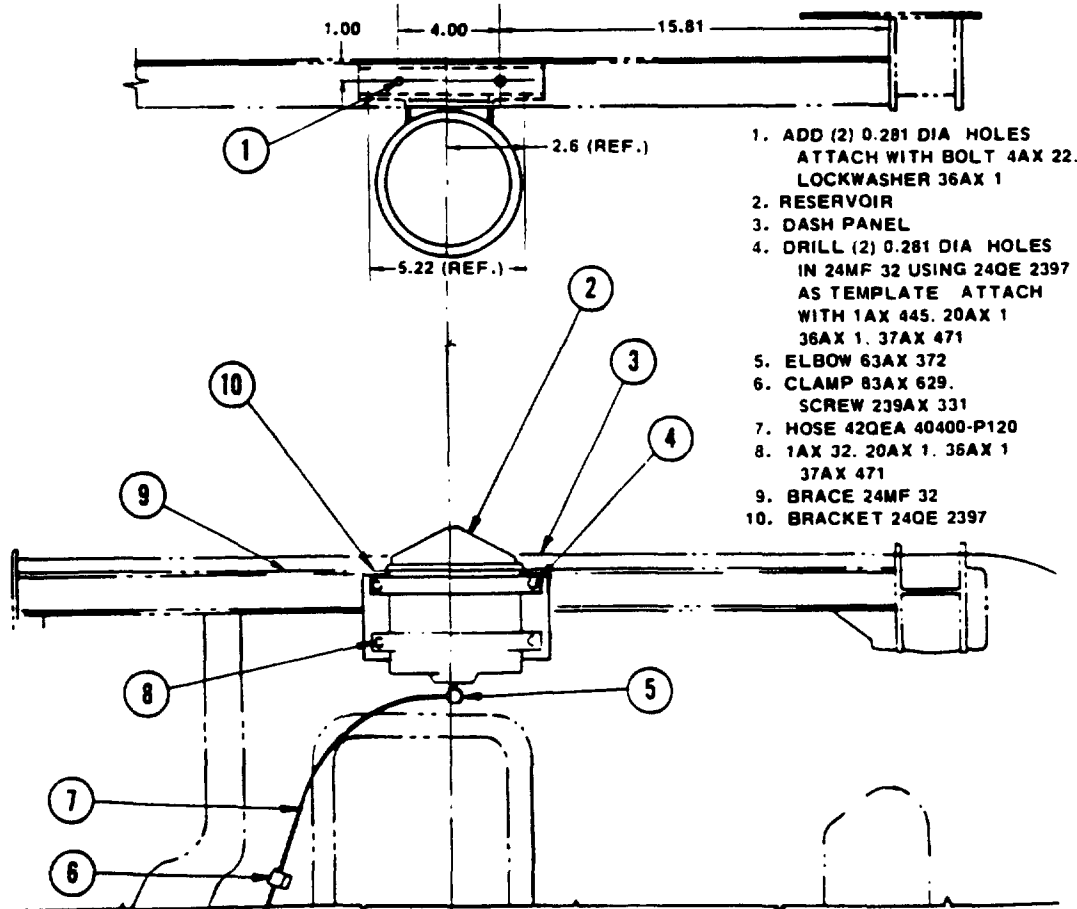


FIGURE 16
BRAKE RESERVOIR MOUNTING ARRANGEMENT.
R AND RD SERIES WITH FIBERGLASS HOOD

APRIL 7, 1980

VI. Low Ratio Intensifier

The intensifier used to generate hydraulic pressure for disc type front brakes is available in two ratios, 17:1 and 23:1. The ratio indicates hydraulic pressure in relation to air pressure. For example, at an application pressure of 100 psi in the air brake system, 1700 psi will be developed in the hydraulic system with the 17:1 intensifier, or 2300 psi with the 23:1 intensifier.

If an operator has a vehicle equipped with the 23:1 unit and desire to reduce front wheel braking force, the 17:1 ratio intensifier can generally be installed. This modification is permissible on highway vehicles equipped with a bogie rated at 55,000 pound or less. Part number of the 17:1 intensifier is 8QE429R; part number of 23:1 intensifier is 8QE430R.

END

SERVICE BULLETIN

MAY 2, 1980

No. Q568 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

BRAKE ADJUSTMENT PROCEDURE

(All with B.F. Goodrich Air Disc Brake)

PURPOSE To provide the field with alternate methods for adjusting these brakes.

RECOMMENDATION Inform users of subject brake that alternate adjustment procedures are available.

INFORMATION Attached to this bulletin is a copy of B.F. Goodrich Service Bulletin HDB-3 which explains two alternate methods of adjusting the full air disc brake. These methods do not require any special tools or gages. The preferred method of adjustment, as given in B.F. Goodrich Maintenance and Overhaul Manual OH275, requires use of adjustment gage ESD-78-HB-1.

Correct brake adjustment is necessary for best performance and life. Inadequate lining clearance can cause overheating, leading to reduced lining and disc life. Excessive clearance will necessitate more frequent adjustment.

END

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadmen	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 8-10-01 BY 60322
CENTENNIAL, PENNSA. 12103

SERVICE BULLETIN

DECEMBER 18, 1975

No. Q1011 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☐

MANDATORY SAFETY CAMPAIGN

REF: SCO67

BRAKE TREADLE VALVE PIPING

(R. RD. RM. U. DM. DMM. F and MB with MVSS121 Dual Brake System)

PURPOSE To advise of possibility that some chassis may have the primary and secondary supply line connections reversed at the brake treadle valve or air junction block. In the event of air loss in either primary or secondary system the service brakes would not function on these chassis.

RECOMMENDATION Inspect all affected chassis as outlined in bulletin and correct treadle valve piping if required. Complete the campaign as quickly as possible to assure safe operation of these vehicles and comply with Federal safety regulations.

INFORMATION Reversed supply piping at the treadle valve will not affect braking if both primary and secondary reservoirs are charged; however it will render both primary and secondary service brake systems inoperative if air pressure is lost in either supply system. Should this occur, the spring brakes must be applied manually to stop the vehicle.

Approximately 1200 vehicles built between September 2, 1974 and March 31, 1975 may have this condition. Branches and distributors will be supplied with a list of affected chassis that will include known owners names.

Procedure:

1. Drain the secondary reservoir. Disconnect control line at steering axle brake controller. Make a treadle valve application and check for air at the disconnected line. If air is discharged, the treadle valve is piped wrong.

NOTE

The secondary reservoir can be identified by following features.

- (a) On most combination reservoirs, there is plate showing which is primary and secondary section.
- (b) On combination reservoirs without identification plates, locate secondary section as follows. Start at steering axle brake controller and trace the 5/8 inch supply line to the secondary reservoir.
- (c) If separate reservoirs are used the secondary is the smaller one; however do not confuse it with supply (wet) tank.

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Over-haul Room:	
Shop Office	

(Continued Over)

Service Operations, Allentown, Pa., U. S. A.

Mack

SERVICE BULLETIN

JANUARY 12, 1976

No. Q1010 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated DECEMBER 17, 1975)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒

MANDATORY SAFETY CAMPAIGN

REF: SC066

BRAKE ANTI-WHEEL LOCK WIRING

(R, RD, U and DM with MVSS121 Anti-Lock System)

PURPOSE To advise of the requirement for inspection and possible correction of front axle brake controller wiring connections. If the controller is connected incorrectly, the front brakes could lock during a panic stop.

RECOMMENDATION Check front axle brake controller connections on all affected chassis and correct as required. Complete the campaign as soon as possible to insure safe operation of these vehicles and compliance with Federal safety regulations.

INFORMATION On some vehicles, the wires from cab power/warning harness to front axle controller were connected to one of the controller wheel sensor leads instead of the controller power/warning leads. When connected in this manner, the controller is not powered, resulting in loss of anti-wheel lock capability on the front brakes and failure of the warning light to indicate this malfunction. Under this condition, the front brakes operate in the fail-safe mode, but without anti lock control and therefore could lock during a panic stop.

Approximately 3400 chassis built from September 1974 through July 17, 1975 could have this condition. A list of these vehicles will be supplied to all affected branches and distributors.

Procedure:

Check wiring color coding at the harness connections at front axle controller. If they are as shown in Figure 1, no further inspection or correction is required.

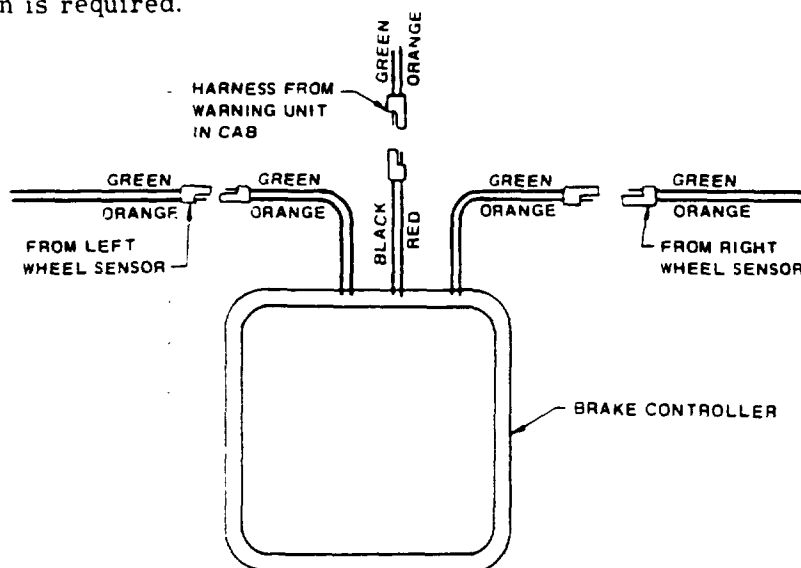


FIGURE 1
HARNESS CONNECTIONS AT BRAKE CONTROLLER
CORRECT

(Continued Over)

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

SERVICE BULLETIN

FEBRUARY 16, 1976

No. Q1012 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☐

MANDATORY SAFETY CAMPAIGN

REF: SC038

TRACTOR TRAILER PARK VALVE PIPING

(F Models with MVSS121 Brake System)

PURPOSE To inform the field of possibility that some park valves were piped incorrectly, causing an automatic spring brake application in the event of air loss in primary system. When this occurs it is necessary to release the spring brakes manually.

RECOMMENDATION Complete the campaign as quickly as possible to insure safe operation of these vehicles and compliance with Federal safety regulations.

INFORMATION On current F model chassis there are two brake system air manifolds located inside the console, above the engine compartment. The forward manifold has a line connected to the double check valve located on right hand frame rail near the air reservoir (see Figure 1) and the rear manifold has a line connected to the treadle valve. On some chassis, these lines were interchanged at the manifolds, resulting in the primary air system becoming the sole source of air to the park valve. When piped this way, loss of primary air will cause automatic application of the spring brakes and, because there is no secondary air available, the brakes must be released manually.

Total of 596 chassis, built between September 2, 1974 and July 30, 1975 may have this condition. A list of these chassis will be supplied to all affected branches and distributors.

Procedure:

To check for subject condition, proceed as follows:

1. Chock wheels so truck will not roll, then release parking brake.
2. With both primary and secondary reservoirs fully charged, drain primary reservoir.
3. While primary tank is draining, observe rear brakes and note whether or not spring brakes apply.
 - a. If spring brakes do not apply, after primary reservoir is fully drained, system is piped correctly and no further inspection or correction is necessary.
 - b. If spring brakes apply, system is piped incorrectly and must be corrected according to instructions in following steps.

NOTE

The primary reservoir can be recognized by the following features:

- a. Identification plate stating "PRIMARY" if combination tank.
- b. If plate is missing, determine which end of tank is connected to the rear axle brake controller(s). This will be the primary reservoir.
- c. If vehicle has two reservoirs, the primary reservoir is the larger of the two.

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Over-haul Room	
Shop Office	

(Continued Over)

Service Operations, Allentown, Pa., U.S.A.

Mack

SERVICE BULLETIN

APRIL 9, 1976

No. Q1013 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY

CHASSIS AFFECTED ALLENTOWN ☐ HAYWARD ☒ OAKVILLE ☐
MANDATORY SAFETY CAMPAIGN

SC072

FRONT WHEEL SPEED SENSOR ROTOR

(Mack Western Models RL, RS, WL and WS with Anti-wheel Lock System)

PURPOSE To notify the field that the front wheel rotors must be replaced on certain of these vehicles. Some rotors have been damaged by internal interference, thereby causing malfunction or failure of the front axle anti-wheel lock system.

RECOMMENDATION Replace front wheel rotors on all chassis involved and replace pickups as required. Complete the campaign as quickly as possible to insure safe operation of these vehicles. Parts will be available approximately April 26, 1976.

INFORMATION Vehicles subject to this condition are those equipped with Rockwell International FF-931 and FL-931W front axles having aluminum hubs for 10 hole disc type wheels and Eaton anti-wheel lock system. Wheel speed rotors used on these chassis may be incorrect. The incorrect rotors extend out too far from the brake drum and create a potential interference condition with the sensor pickup. Damage to these parts will occur if the pickup lacks adequate adjustment range to compensate for the oversize rotor.

If interference occurs, malfunctions ranging from a temporary disabling to a complete failure of the front axle anti-lock may result, depending on degree of interference. Failure of both sensors will result in loss of anti-wheel lock capability but the warning light will not be activated.

Approximately 350 vehicles built between March 18, 1975 and December 11, 1975 are involved in this campaign. A list of these vehicles will be supplied to all affected branches and distributors.

Parts

Two front wheel rotors are required for each vehicle campaigned. In addition, if a pickup is damaged it must be replaced also. Order parts on an emergency requisition. Include only parts required for the campaign on this requisition.

Parts required:

Qty.	Part Number	Description
2	12MN39302A-P1	Wheel Speed Sensor Rotor
*	8MNA41-P15	Wheel Speed Sensor and Brkt. Ass'y. (FF-931)
*	8MNA39301-P1	Wheel Speed Sensor and Brkt. Ass'y. (FL-931W)

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Over-haul Room	
Shop Office	

* Order only if original parts are damaged.
(Continued Over)

Service Operations, Allentown, PA., U.S.A.

Mack

3. Loosen screw packs and slide pickup to it's maximum outboard position on mounting bracket. Retighten screw packs 40 to 45 in. lbs. This applies to both new and used assemblies and is necessary to assure that the correct operating clearance will be established with the new rotor.
4. Connect pickup leads (if new pickup was installed) and install wheel and drum assembly.

NOTE

Rotor-to-pickup operating clearance is established automatically when the wheel is installed. Avoid "rocking" the wheel as it approaches the installed position as this can push the pickup too far inboard and adversely affect the sensor signal. Use the bearing adjusting nut to draw the wheel into position.

Reimbursement

All expenses incurred in this campaign are to be recovered through RWR procedures as instructed in Service Bulletin AJ1000 under POLICY. The usual \$25.00 minimum for claims is waived and an RWR must be submitted for each chassis campaigned. Include following information on the RWR form.

Under

Enter

Description of failure - - - - Service Bulletin Q1013 under BRAKES
Failed Part Number - - - - - SC072
Part Name - - - - - Rotor

Maximum labor allowance is 1.5 hours per chassis.

Removed parts - Hold removed parts, pending instructions for return.

SERVICE BULLETIN

JULY 28, 1976

Vol. Q1014 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY

CHASSIS AFFECTED ALLENTOWN ☐ HAYWARD ☒ OAKVILLE ☐

MANDATORY SAFETY CAMPAIGN

REF: SC076

FRONT BRAKE CHAMBER RELOCATION

(WL and WS with FAW536C, 537C Front Axles and Cam Brakes)

PURPOSE To notify the field that the brake chamber mounting arrangement on subject chassis equipped with FAW536C and 537C must be changed to eliminate possible interference between brake chamber and cab tilt cylinder. This interference could cause chamber damage with potential reduction in braking ability.

RECOMMENDATION Relocate brake chambers on all affected chassis as instructed herein. Complete the campaign as quickly as possible to insure safe operation of these vehicles.

INFORMATION The brake chamber/tilt cylinder interference occurs under extreme front axle articulation. To provide greater clearance at this point, the brake chambers must be repositioned to the rear by use of a new mounting bracket. See Figure 1.

Approximately 400 vehicles built between December 16, 1974 and September 9, 1975 may have this condition. A list of these vehicles is provided in this bulletin and will also be included in the campaign package supplied to all affected Branches and Distributors.

Parts

Order parts on an emergency requisition from the parts distribution center normally serving your location. Include only parts required for the campaign. State on the requisition that the parts are for a mandatory safety campaign per Service Bulletin Q1014 under BRAKES.

Quantity	Part Number	Description
1	8235-F33299-R1552	Brake Chamber Brkt. and Bush. Assy., L.H.
1	8235-F33299-S1553	Brake Chamber Brkt. and Bush. Assy., R.H.
2	8MY130	Brake Chamber Boot
2	73RU22022	Boot Retainer Plate

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Over-haul Room	
Shop Office	

(Continued Over)

8. Install brake chamber on bracket.
9. Loosen brake chamber clamp and rotate cover until side port is at twelve o'clock (top) position, then tighten clamp. See Figure 1.
10. Install the elbow in side port of the brake chamber and plug the center port. Position elbow so it points towards front of chassis. See Figure 1.
11. Reinstall brake chamber air hoses. Existing hoses can be reused if at least 18" long after positioning elbow port per Step 10.
12. Adjust slack adjusters.

Reimbursement

All expenses incurred in this campaign are to be recovered through RWR procedures as instructed in Service Bulletin AJ1000 under POLICY. The usual \$25.00 minimum for claims is waived and an RWR must be submitted for each vehicle campaigned. Show the following information on the RWR form.

<u>Under</u>	<u>Enter</u>
Description of Failure - - - - -	Service Bulletin Q1014 under BRAKES
Failed Part Number - - - - -	SC076
Part Name - - - - -	Brake Chamber
Maximum labor allowance —	2.5 hours per chassis
Removed parts —	Hold until advised of disposition.

SERVICE BULLETIN

APRIL 13, 1978

No. Q1015 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated AUGUST 18, 1977)

CHASSIS AFFECTED ALLENTOWN ☐ HAYWARD ☒ OAKVILLE ☐

MANDATORY SAFETY CAMPAIGN

REF: SCO84

FRONT BRAKE ASSEMBLY

(Mack Western Models WL and WS With Rockwell International FF931C Front Axle and "P" Series Cam Brakes)

PURPOSE To request the inspection and possible modification or replacement of subject brake assemblies to overcome failure of the brake spider. Failure of a spider results in brake pull to the direction opposite the broken spider or wheel lock-up on the wheel with the broken spider, resulting in impaired vehicle control.

INFORMATION AND RECOMMENDATION It has been determined that Rockwell "P" cam brake assemblies, when assembled with brake cam rotation opposite wheel rotation (rotation being defined when the chassis is going forward), are subject to a "chatter" condition that could lead to failure of the brake spider. On vehicles with manual steering the brake assemblies must be checked and if found to have camshaft in opposite rotation they must be removed and reassembled so cam and wheel rotation is same, after Magnafluxing the spiders for cracks.

On vehicles with power steering, an interference condition exists such that the present "P" cam brake assembly cannot be used with the brake assembled for cam rotation same as wheel. On these chassis it will be necessary to install alternate assemblies, either the Rockwell "T" series cam brake or Rockwell wedge brake. The brake to be used depends on chassis application as described later in this bulletin.

Approximately 570 vehicles built between January 6, 1975 and December 10, 1976 are involved. A list of these vehicles will be sent to the affected branches and distributors.

Procedure

There are three chassis configurations involved and the corrective action varies for each. The differences are in steering type, i.e. manual or power, and rear axle configuration and are as follows:

NOTE

The following instructions must be strictly adhered to to assure compliance with current requirements of Federal Motor Vehicle Safety Standard 121. If not followed, you could be subject to fine.

- All with manual steering (Refer to item 1).
- Tandem tractors with power steering (Refer to item 2).
- Single axle tractors and truck-trailers with power steering (Refer to item 3).

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

(Continued Over)

- c. Transfer spiders, camshafts and brake chambers to the side opposite the one they were originally installed on. Be sure cam and chamber are oriented as shown in Figure 3. Complete the assembly using a new inner wheel seal.

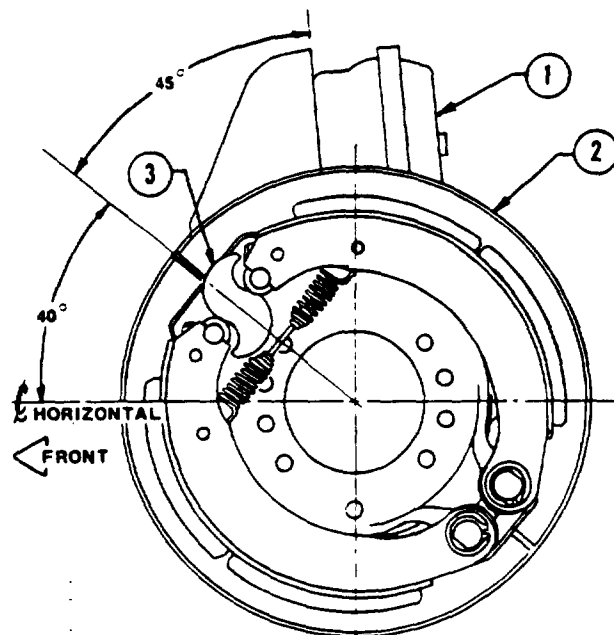
Torque brake assembly mounting bolts 268 to 296 lb. ft.

Torque spoke wheel clamp stud nuts 122 to 135 lb. ft.

Torque disc wheel stud nuts 450 to 500 lb. ft.

NOTE

Do not transfer brake drums and shoes. These parts must remain on same side as originally installed and shoes must also be installed in same position, (i.e. primary & secondary).



1. BRAKE CHAMBER
2. BRAKE ASSEMBLY, 16-1/2 X 5 CAM (L.H. SHOWN)
3. BRAKE CAMSHAFT

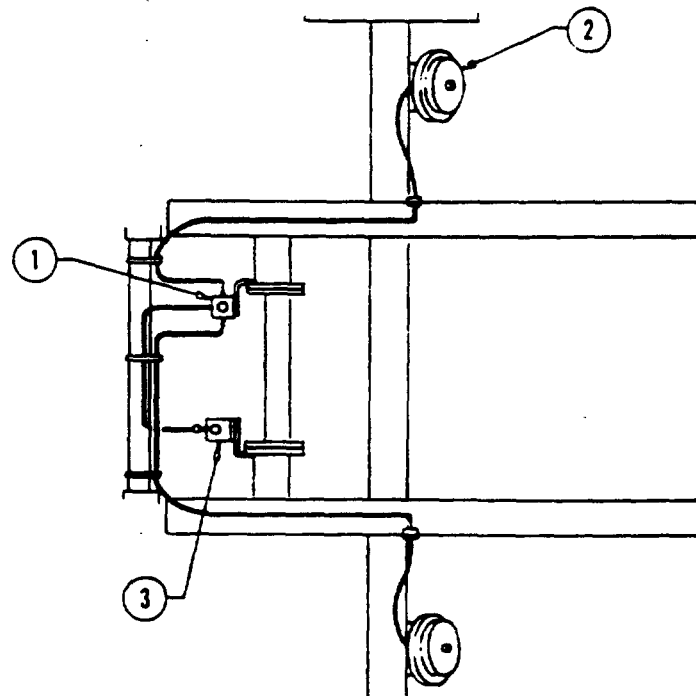
FIGURE 3

- d. After installing the wheel assembly and adjusting the wheel bearing, check for correct operation of anti-wheel lock system as follows. Spin wheel at approximately five mph. (40 rpm) and check voltage at sensor lead; it should be 0.3 to 0.5 volt AC. If less, readjust sensor to rotor clearance.
- e. Burnish brake linings using following procedure. Brake vehicle from 40 mph to 20 mph. a minimum of 20 times. Allow one half mile between brake applications to prevent overheating the brakes. Readjust brakes when burnishing operation is completed.

(Continued Over)

- c. Install quick release valve 20QE291 on engine front support in same location from which the front wheel controller was removed. Mount on bracket shown in parts list using existing fasteners for the bracket and new fasteners for the valve. This valve is required to perform the quick release function formerly provided by the front axle controller.

Pipe the valve as shown in Figure 6. Remove line originally used to connect controller supply port to secondary reservoir and plug tank opening. This line is not required.



1. QUICK RELEASE VALVE 20QE 291
2. BRAKE CHAMBERS
3. EXISTING RATIO VALVE
FIGURE 6

- d. Install a jumper between the front axle terminal and W2 terminal of the failure warning unit located in cab. This step is necessary with removal of the front axle controller, to prevent a false failure indication. See Figure 7.

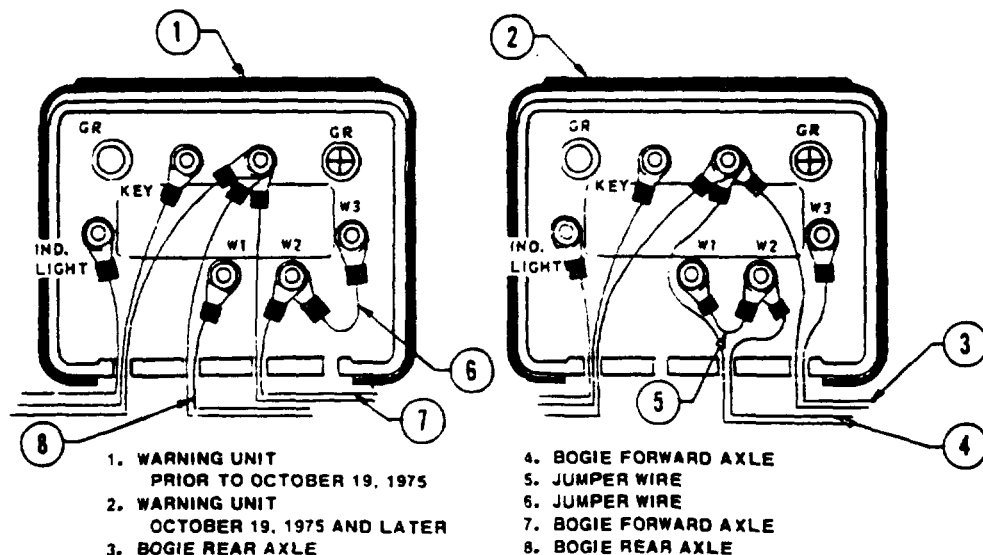


FIGURE 7

(Continued Over)

APRIL 13, 1978

No. Q1015 under BRAKES
(Supersedes Sheet dated AUGUST 18, 1977)(Sheet 4)

List B - Parts required for tandem tractors equipped with disc wheels and power steering

Quantity	Part Number	Description
1	1QDA49357R	Brake Assembly, R.H. (15 x 4 cam)
1	1QDA49358R	Brake Assembly, L.H. (15 x 4 cam)
2	17QJ39337	Brake Drum
1	5QJA39344	Hub Assembly, R.H.
1	5QJA39345	Hub Assembly, L.H.
10	9872-84527	Wheel Stud, R.H.
10	9872-84528	Wheel Stud, L.H.
1	5QJA39340	Drum & Hub Assembly, R.H.
1	5QJA39341	Drum & Hub Assembly, L.H.
2	7843-3434095	Hub Cap
2	121SR19	Hub Cap Gasket
14	3AX1809	Bolt, Brake Mounting, 5/8-18 x 2
2	341SR52	Seal, Wheel Inner
1	20QE291	Quick Release Valve
1	29QE39304-P2	Quick Release Valve Bracket(except with Cummins)
1	29QE39304-P1	Quick Release Valve Bracket (with Cummins)
2	1AX13	Bolt, Quick Release Valve Mntg.
4	37AX38	Washer, Quick Release Valve Mntg.
2	21AX783	Lock Nut, Quick Release Valve Mntg.
2	8235-A22-3275-G-501	Slack Adjuster

List C - Parts required for tandem tractors equipped with spoke wheels and power steering

Quantity	Part Number	Description
1	1QDA49357R	Brake Assembly, R.H. (15 x 4 cam)
1	1QDA49358R	Brake Assembly, L.H. (15 x 4 cam)
2	17QJ39336	Brake Drum
14	3AX1809	Bolt, Brake Mounting, 5/8-18 x 2
2	341SR52	Seal, Wheel Inner
1	20QE291	Quick Release Valve
1	29QE39304-P2	Quick Release Valve Bracket (except w/Cummins)
1	29QE39304-P1	Quick Release Valve Bracket (with Cummins)
2	1AX13	Bolt, Quick Release Valve Mntg.
4	37AX38	Washer, Quick Release Valve Mntg.
2	21AX783	Lock Nut, Quick Release Valve Mntg.
2	8235-A22-3275-G-501	Slack Adjuster

List D - Parts required for trucks and 4 x 2 tractors with disc wheels and power steering

Quantity	Part Number	Description
1	1QDA49353R-P3	Brake Assembly, R.H. (15 x 5 Wedge)
1	1QDA49354R-P3	Brake Assembly, L.H. (15 x 5 Wedge)
2	17QJ39310	Brake Drum
2	341SR52	Seal, Wheel Inner
2	63AX69	Tee Fitting
*	144SX22FT25	Hose
2	92RU19317-P3	Hose Fitting
2	92RU19313-P4	Hose Fitting

* 50 inches required per vehicle

(Continued Over)

SERVICE BULLETIN

JULY 20, 1978

No. Q1017 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☐ HAYWARD ☒ OAKVILLE ☐

MANDATORY SAFETY CAMPAIGN

REF: SCO99

AIR DRYER PIPING

(Mack Western Models RL, RS, W and WS With Anchorlok Air Dryer)

PURPOSE To notify the field of need to revise the air dryer piping on subject models to prevent possibility of moisture freezing in the relief valve or air compressor governor control line. Should this condition occur, air system damage may result that will cause automatic application of the spring brakes and possible loss of vehicle control.

INFORMATION AND RECOMMENDATION The original piping for Anchorlok air dryers has low points that permit any moisture which passes through the dryer to collect in relief valve and compressor governor control line. If this moisture freezes it will, in some cases, cause excessive brake system pressure. This high pressure can cause failure of brake system hoses and valves which, in turn, causes automatic application of the spring brakes. These events can occur without prior warning to the operator.

Approximately 400 vehicles, built from December 1975 through January 1978, require modification to the air dryer piping. A list of these vehicles will be supplied to the affected branches and distributors.

Procedure

Basically, the piping revision consists of relocating the relief valve and governor control line to eliminate low points. To accommodate this change it is necessary to relocate the primary reservoir line and, if used, the air starter line.

Figure 1 shows piping as originally installed. This arrangement must be revised.

Figure 2 shows piping arrangement that must be followed for this campaign.

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

(Continued Over)

Service Operations, Allentown, Pa., U.S.A.

MACK

SERVICE BULLETIN

AUGUST 16, 1978

No. Q1019 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

MANDATORY SAFETY CAMPAIGN

REF: SC 100

ANTI-WHEEL LOCK CONTROLLER

(Models R, RD, U, DM, DMM, DML, F, MB, HMM, RM
RL, RS, WL and WS With Eaton Anti-Wheel Lock System)

PURPOSE To notify the field of need to recall certain of these vehicles to inspect and where necessary replace the controller. An electrical malfunction in these controllers can cause a "no brake condition" on the axle being controlled by the affected anti-wheel lock controller.

INFORMATION AND RECOMMENDATION The Eaton Corporation has informed Mack Trucks, Inc. that some controllers manufactured prior to March, 1976 may not be to specifications. This coupled with the failure of certain other electronic devices within the controller can cause the valve solenoid to be constantly energized. A constantly energized solenoid will prevent application of brakes on the axle monitored by that controller. No other axle will be affected.

Due to the nature of this malfunction, the warning light is not always activated and, therefore, the driver may not be aware of the condition.

Chassis manufactured between October 1974 and March 1976 (May 1976 for Hayward chassis) will be recalled for the inspection and possible replacement of controllers. A list of the chassis involved will be sent to affected branches and distributors.

Procedure

Corrective action consists of replacing certain Model 21 controllers with controllers of current production design (Model EAL1201N). Controllers that must be replaced can be identified by the manufacturing date code. The date code has a series of characters. On suspect controllers the third from last is "M" and the last two digits are 26 or lower. Controllers with a date code in this range must be replaced.

Example: P2 02775 M14 - Replacement required
P2 360 75 M26 - Replacement required
P2 310 76 M27 - OK - No Replacement required
P2 099 75 S10 - OK - No Replacement required

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

(Continued Over)

Service Operations, Allentown, Pa., U.S.A.

MACK

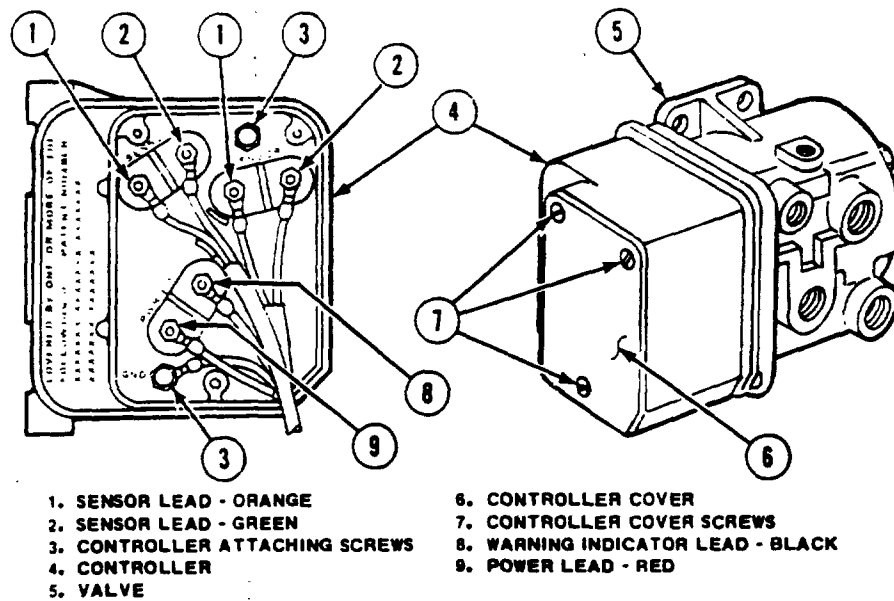


FIGURE 2
 MODEL 1200 CONTROLLER/VALVE ASSEMBLY

Parts

Order parts on an emergency requisition from the parts distribution center normally serving your area. State on the requisition that the parts are for a mandatory safety campaign per Service Bulletin Q1019 under BRAKES. Do not include parts not required for the campaign on this requisition.

Parts required:

Qty.	Part Number	Description
AR	2719-640048	Anti-Wheel Lock Controller, Pos. Grd.
AR	2719-640049	Anti-Wheel Lock Controller, Neg. Grd.

Reimbursement

All expenses incurred in this campaign are to be recovered through RWR procedures as instructed in Service Bulletin AJ1000 under POLICY. Submit an RWR for each vehicle campaigned. Show following information on RWR form.

Description of Failure ----- Service Bulletin Q1019 under BRAKES

Failed Part Number ----- SC 100

Part Name ----- Controller

Maximum Labor Allowance: Inspection ----- .3 hr.

Replacement (per controller) ----- .3 hr.

RWR must include - Completed Campaign Questionnaire

Return parts carrier name and shipper's Bill of Laden number

(Continued Over)

CAMPAIGN QUESTIONNAIRE

Complete one for each controller replaced w/duplicate (cut in half and use carbon).
Attach original to RWR and duplicate to be used as packing slip for removed controller.

If no controller replacement is required, complete only ONE copy and attach to RWR.

Branch/Distributor Name _____ Location _____

Repair Order Number _____ Date _____

Chassis Model & Serial Number (VIN) _____ Mileage _____

Controller Identification No. (removed controller) _____

Removed from: (Circle one) Steering Axle
Bogie Front Axle
Bogie Rear Axle
Other _____

Was Anti-Wheel Lock Warning Light Operative -

(1) As Received	_____	Yes	_____	No
(2) After Controller Replacement (if required)	_____	Yes	_____	No
(3) As Released to Customer	_____	Yes	_____	No

If Anti-Wheel lock system inoperative after controller campaign inspection and/or replacement (as required), show name of individual (customer or customer representative) whom you notified that system was inoperative and that additional repairs were required _____.

THIS COPY MUST ACCOMPANY RWR

(cut here)

Branch/Distributor Name _____ Location _____

Repair Order Number _____ Date _____

Chassis Model & Serial Number (VIN) _____ Mileage _____

Controller Identification No. (removed controller) _____

Removed from: (Circle one) Steering Axle
Bogie Front Axle
Bogie Rear Axle
Other _____

Was Anti-Wheel Lock Warning Light Operative -

(1) As Received	_____	Yes	_____	No
(2) After Controller Replacement (if required)	_____	Yes	_____	No
(3) As Released to Customer	_____	Yes	_____	No

If Anti-Wheel lock system inoperative after controller campaign inspection and/or replacement (as required), show name of individual (customer or customer representative) whom you notified that system was inoperative and that additional repairs were required _____.

THIS COPY TO BE USED AS PACKING SLIP

SERVICE BULLETIN

OCTOBER 30, 1978

No. Q1020 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

MANDATORY SAFETY CAMPAIGN

REF: SC106

BOGIE ANTI-WHEEL LOCK SYSTEM

(F, R, U, DM, DMM, RM, MB, MR, MC, RD, WL, WS, RL, RS,
RWL and RWS Having a Single Bogie Controller)

PURPOSE To notify the field that the electrical portion of this system must be disconnected to prevent a possible "no brake" condition.

INFORMATION AND RECOMMENDATION The vehicles involved in this recall may experience a delay of up to two seconds from the time the brake treadle is actuated until the bogie brakes apply. This condition is caused by defects in the wheel speed sensor wiring. The increased braking time occurs without prior warning to the driver and could result in an accident.

This "no brake" condition can occur in vehicles built between October, 1977, and September, 1978, and is restricted to vehicles which have one anti-wheel lock controller to monitor both bogie axles. Branches and distributors will be notified of the vehicles affected.

Procedure

As a temporary measure, the electrical portion of the bogie anti-wheel lock system must be disconnected. This procedure will remove all anti-lock capabilities of the bogie brakes and they will function as normal pre-FMVSS-121 brakes. Drivers must be advised that the bogie wheels can now be locked up and greater care must be exercised when operating on slippery roads to avoid skidding.

1. Disconnect the anti-wheel lock system power lead at the circuit breaker. Tape wire back. Location of the circuit breaker strip and means of identifying the affected wire is shown in the following chart.

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

OCTOBER 30, 1978

NOTICE

**The Wheel Anti-Lock System
on this Vehicle has been made
Inoperative by Disconnecting
the Power Supply. The Brakes
are Fully Driver Controlled.**

4 MR 1452

Reimbursement

Submit an RWR to recover expenses incurred in disconnecting the bogie anti-wheel lock system. Follow procedures given in Service Bulletin AJ1000 under POLICY. The standard \$25.00 minimum for claims is waived and an RWR is to be submitted for each vehicle campaigned. Show the following information on RWR form.

<u>Under</u>	<u>Enter</u>
Description of Failure	Service Bulletin <u>Q1020</u>
Failed Part Number	SC106
Part Name	Controller

Maximum Labor Time -- 0.3 hour per vehicle

END

SERVICE BULLETIN

DECEMBER 21, 1978

No. Q1021 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒

CHIEF ENGINEER RECEIVING FULL CONTROL OF THE VEHICLE. IF VEHICLES ALL ARE AFTER IN AFFECTED, IF NOT, NOTIFY KNEE OF PROBLEM, PROTOTYPE CONTACT WILL BE MADE. LIST OF OTHER INITIAL TERMINALS ATTACHED.

MANDATORY SAFETY CAMPAIGN

REF: SC108

BENDIX ANTI-WHEEL LOCK CONTROLLER

(F, R, U, DM, DMM, RM, MB, MR, MC, RD, Having Axle-By-Axle Controller)

PURPOSE To notify the field that the electrical portion of this system must be disconnected to prevent a possible "no brake" condition.

INFORMATION AND RECOMMENDATION The Heavy Vehicle Systems Group of the Bendix Corporation has notified Mack Trucks, Inc. that defects exist in certain anti-wheel lock controllers that could cause brakes on the rear axle(s) to be inoperative. This defect involves a zener diode which may fail and allow current to continue flowing to the controller solenoid when no brake modulation is required. When the solenoid is energized, brake system air cannot pass through the controller to actuate the brakes.

This "no brake" condition can occur when the solenoid is activated, either by the system self-check when the key switch is turned on or during an actual anti-wheel lock cycle. This condition will occur without a visual warning to the vehicle operator.

Approximately 1065 vehicles built from August 1977 through September 1978 are affected. A list of these vehicles will be sent to those branches and distributors that received vehicles requiring correction.

NOTE

This campaign (SC108) does not duplicate campaign SC106 which was announced in Service Bulletin Q1020 under BRAKES. Campaign SC106 covers six-wheel chassis using one controller for both axles of the bogie. Campaign SC108 covers either four or six-wheel chassis using a separate controller for each rear axle.

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

DECEMBER 21, 1978

NOTE

The anti-wheel lock warning light will remain on after the disconnection.

IMPORTANT WARNING

BE SURE THE NOTICE LABEL SUPPLIED TO YOU IS AFFIXED TO THE INSTRUMENT PANEL IN FULL VIEW OF THE VEHICLE DRIVER.

NOTICE

The Wheel Anti-Lock System on this Vehicle has been made Inoperative by Disconnecting the Power Supply. The Brakes are Fully Driver Controlled.

4 MR 1452

Reimbursement

Submit an RWR to recover expenses incurred in disconnecting the anti-wheel lock system. Follow procedures given in Service Bulletin AJ1000 under POLICY. The standard \$25.00 minimum for claims is waived and an RWR is to be submitted for each vehicle campaigned. Show the following information on RWR form.

Under

Enter

Description of Failure	Service Bulletin Q1021
Failed Part Number	SC108
Part Name	Controller

Maximum Labor Time -- 0.3 hour per controller

END

SERVICE BULLETIN

MARCH 23, 1979

No. Q1016 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated JULY 7, 1978)

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒

MANDATORY SAFETY CAMPAIGN

REF: SCO95

BRAKE FITTING TEE BRACKET

(F, R and U Models With SW56 and SW57 Series Bogies In On-Highway Service)

PURPOSE To request the recall of subject vehicles for the purpose of replacing the brake fitting tee bracket. Bracket failure and subsequent air line damage can cause an automatic application of the spring brakes, thereby creating a potential traffic hazard.

INFORMATION AND RECOMMENDATION The brake fitting tee bracket mounted on the front carrier is subject to failure caused by vibration. A bracket failure leaves the tee fitting unsupported and can result in a broken hose or connector fitting. Should this occur, loss of air pressure will cause the spring brakes to apply automatically. This condition occurs without prior warning to the operator.

Approximately 33,000 vehicles, manufactured between March 1, 1975 and February 1, 1978 are involved in this recall. A list of these vehicles will be sent to all affected branches and distributors.

Procedure

Remove existing tee bracket and install new bracket. The bracket is located on the forward axle carrier and uses the carrier mounting bolts for attachment. See Figure 1. Tighten the attaching bolts 134 to 148 lb. ft. torque at installation of new bracket.

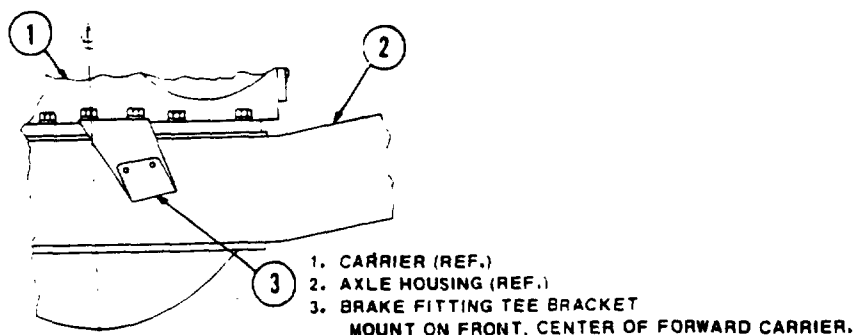


FIGURE 1
BRACKET INSTALLATION

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

SERVICE BULLETIN

APRIL 11, 1979

No. Q1018 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

(Supersedes Bulletin dated SEPTEMBER 13, 1978)

CHASSIS AFFECTED ALLENTOWN ☐ HAYWARD ☒ OAKVILLE ☐

MANDATORY SAFETY CAMPAIGN

REF: SCO98

AIR START RESERVOIR

(Mack Western Models FL, FS, RL, RS, WL and WS
With Aluminum Reservoir)

PURPOSE To notify the field that the aluminum air start reservoir used on certain of these vehicles must be replaced. The reservoirs presently installed are subject to failure which can cause personal injury.

INFORMATION AND RECOMMENDATION We have determined the aluminum air start reservoir does not have adequate strength because of an inherent design deficiency. Should a reservoir fail, the resultant explosive force could propel metal fragments in all directions with sufficient velocity to injure people in the area.

We will recall approximately 268 vehicles, built between January 3, 1974 and December 31, 1977 for replacement of affected reservoir. A list of these vehicles will be furnished at a later date to affected branches and distributors.

Procedure

Check part number of existing reservoir located on the identification and test plate before starting installation of a new one. Some chassis appearing on campaign chassis listing may have been built with air start reservoir 22QE39319P1. These are satisfactory and DO NOT require change.

If the vehicle is equipped with suspect reservoir 22QE39309, install new, re-designed reservoir 22QE39320. No piping changes are required, however, the new reservoir has a larger outside diameter which affects the mounting. To permit use of the standard mounting straps, an extension adapter is required. The adapter attaches to end of strap and is secured with a jam nut.

NOTE

Some 22QE39309 reservoirs may have been misstamped 22QE39303; these are also to be changed on a campaign basis.

Drain pressure from air system and air start reservoir. Disconnect air lines and remove reservoir from chassis. Install new reservoir and reconnect air lines. Charge system and check for leaks.

Page 1 (Continued Page 2)

Service Operations, Allentown, Pa., U.S.A.

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Over-haul Room	
Shop Office	

MACK

SERVICE BULLETIN

JULY 9, 1979

No. Q1021a under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☐ OAKVILLE ☒

MANDATORY SAFETY CAMPAIGN

REF: SC108

BENDIX ANTI-WHEEL LOCK CONTROLLER

(CF, F, R, U, DM, DMM, RM, MB, MR, MC and RD Having Axle-By-Axle Anti-Wheel Lock System)

PURPOSE To advise that improved controllers are available.

INFORMATION AND RECOMMENDATION An improved controller is now available to replace the ones subject to failure. These controllers are to be installed on vehicles originally equipped with controllers having a serial number from 001000 through and including 012958 and on which the anti-wheel lock electrical system was disconnected per Service Bulletin Q1021 under BRAKES.

NOTE

Due to the Federal Court decision affecting brake performance standards, an anti-wheel lock system is not required to meet current requirements. If the customer so desires, the system can be left disconnected.

Procedure

1. Disconnect wheel speed sensor leads and ground wire and unfasten existing controller(s) from valve(s). Do not remove valve(s) from chassis.
2. Transfer controller leads from old controller to new one. Be sure the connections are correct for the vehicle ground. The same controller is used for positive and negative ground systems, the only difference being in the ground and continuity wire connections. See Figure 1 for negative ground systems and Figure 2 for positive ground systems.

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

Page 1 (Continued Page 2)

Service Operations, Allentown, Pa., U.S.A.

MACK

JULY 9, 1979

If these events occur, the system is functioning normally and the vehicle can be returned to service. If not, check the anti-wheel lock system using normal trouble shooting procedures.

New Parts

Order parts on an emergency requisition from the parts distribution center normally serving your area. State on the requisition that the parts are for a mandatory safety campaign per Service Bulletin Q1021a under BRAKES. Do not include any parts on this requisition that are not required for the campaign.

Parts required:

Qty.	Part Number	Description
AR	745-289359	Anti-Wheel Lock Controller (Bendix-Pos. & Neg. Grd)

Removed Parts

Prepare a FO-42 Form as described in Paragraph G Section IV of the Warranty Administration Manual. Under cause of failure list SC-108. Attach hard copy of this tag and the removed controller and ship it prepaid to the Bendix branch serving your location. Be sure a copy of your FO-42 and shipping document is attached to the RWR.

Reimbursement

All expenses incurred in this campaign are to be recovered through RWR procedures as instructed in Service Bulletin AJ1000 under POLICY. Submit an RWR for each vehicle campaigned. Show following information on RWR form.

<u>Under</u>	<u>Enter</u>
Description of Failure -----	Service Bulletin Q1021a under BRAKES
Failed Part Number -----	SC108
Part Name -----	Controller

Maximum labor time: .3 hour Inspection per Controller
 .7 hour Replacement per Controller

END

SERVICE BULLETIN

JULY 17, 1979

No. Q1020a under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

MANDATORY SAFETY CAMPAIGN

REF: SC106

BOGIE ANTI-WHEEL LOCK SYSTEM

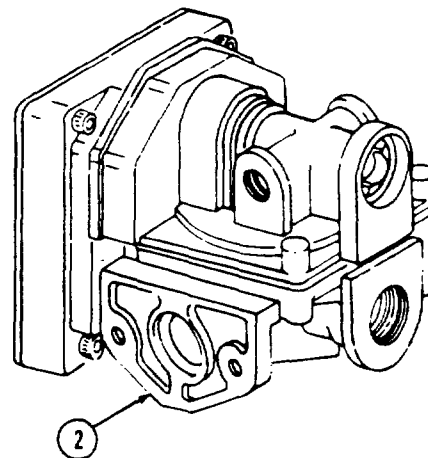
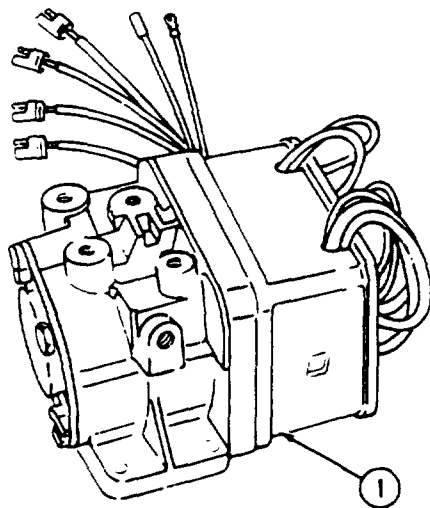
Converting Single Bogie Controller System to Axle-by-Axle System
(F, R, U, DM, DMM, RM, MB, MR, MC, RD, WL, WS, RL, RS, RWL and RWS)

PURPOSE To provide instructions for converting vehicles originally equipped with a single bogie controller system to an axle-by-axle system and installing wheel speed sensors with larger gauge wires. This modification is the correction for controller malfunctions covered by Mandatory Safety Campaign SC106 and described in Service Bulletin Q1020 under BRAKES.

INFORMATION AND RECOMMENDATION Owners of vehicles affected by this campaign, who so desire, may have this modification performed at no charge. Because of a recent court ruling which negates the requirement for anti-wheel lock systems, it is the owner's option whether or not to have the anti-wheel lock system installed.

Procedure

Two systems, Eaton and Bendix are involved. With Eaton systems, two complete new valve/controller assemblies are used. With Bendix systems, only one new valve/controller assembly is required and a new controller is to be installed on present valve. Figure 1 illustrates the two types of valve/controller assemblies



1. EATON VALVE/CONTROLLER ASSEMBLY
2. BENDIX VALVE/CONTROLLER ASSEMBLY

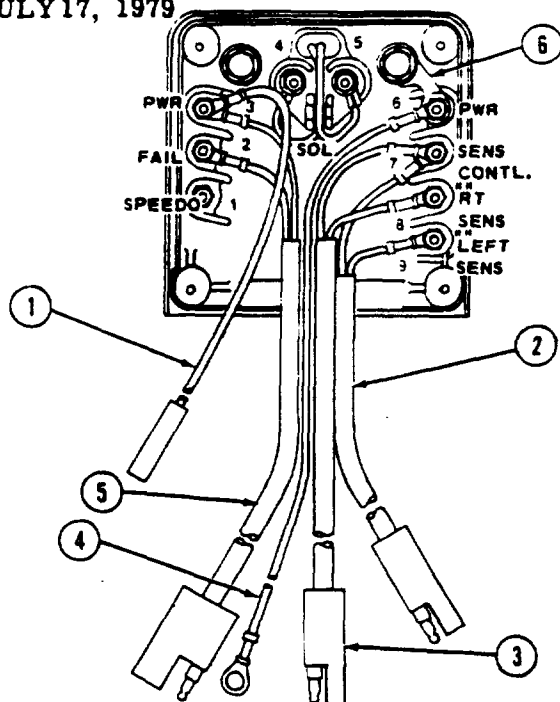
FIGURE 1
IDENTIFYING VALVE/CONTROLLER ASSEMBLIES

Page 1 (Continued Page 2)

CIRCULATION

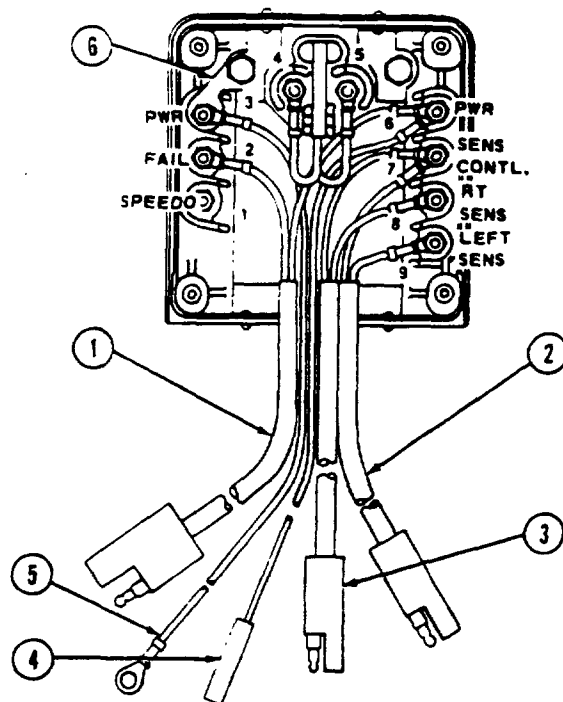
Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

JULY 17, 1979



1. CONTINUITY WIRE (RED)
2. WHEEL SPEED SENSOR LEAD, L.H.
3. WHEEL SPEED SENSOR LEAD, R.H.
4. GROUND WIRE (WHITE)
5. POWER/WARNING LEAD (LARGE CONNECTOR)
6. GROUND LINK

FIGURE 3
BENDIX CONTROLLER CONNECTIONS -
TWO-SENSOR UNIT WITH NEGATIVE GROUND
EATON SYSTEM



1. POWER/WARNING LEAD (LARGE CONNECTOR)
2. WHEEL SPEED SENSOR LEAD, L.H.
3. WHEEL SPEED SENSOR LEAD, R.H.
4. CONTINUITY WIRE (RED)
5. GROUND WIRE (WHITE)
6. GROUND LINK

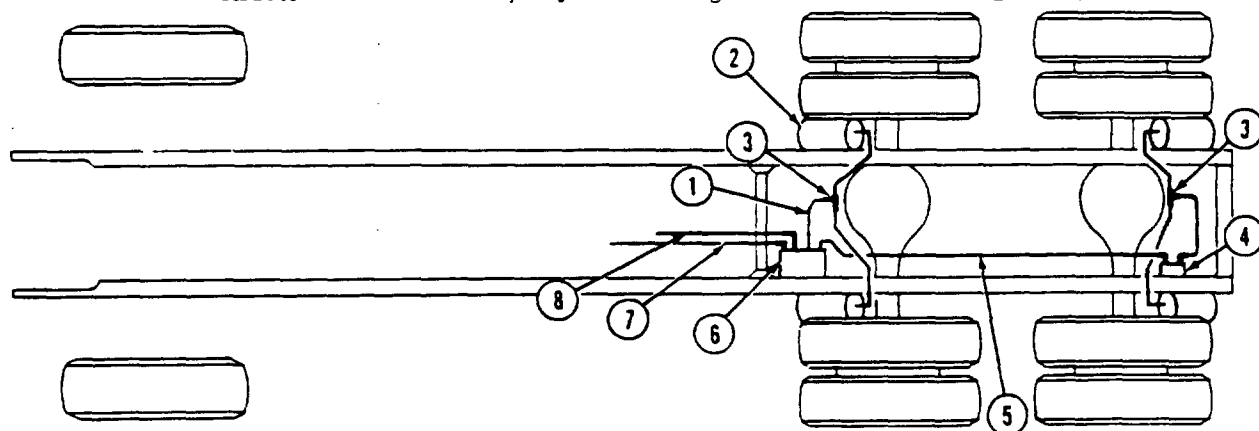
FIGURE 4
BENDIX CONTROLLER CONNECTION -
TWO-SENSOR UNIT WITH POSITIVE GROUND

If equipped with Eaton system, remove existing valve/controller assembly completely and install a new one. Reuse existing air supply line and power/warning lead.

BENDIX AND EATON SYSTEMS

1. Controller Installation

- a. On both systems, remove and discard delivery line manifold fitting. It is mounted on left hand frame rail, adjacent to bogie rear axle. See Figure 5, Item 4.

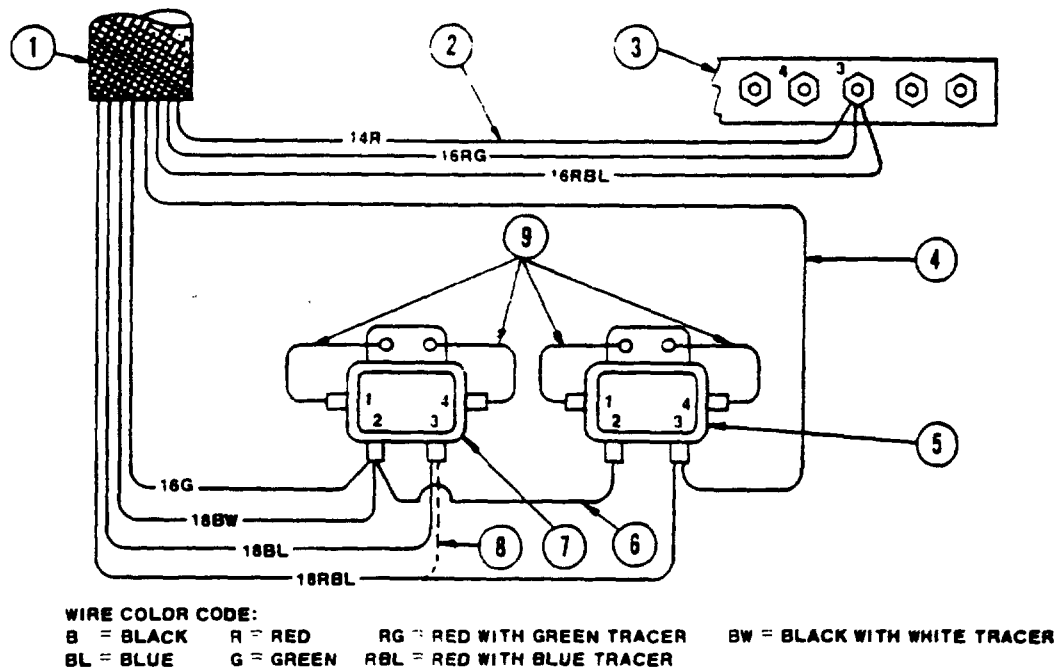


1. DELIVERY LINE FOR BOGIE FORWARD AXLE BRAKES
2. BRAKE CHAMBER (4)
3. TEE FITTING
4. MANIFOLD
5. DELIVERY LINE FOR BOGIE REAR AXLE BRAKES
6. CONTROLLER
7. SUPPLY LINE FROM RESERVOIR
8. APPLICATION LINE FROM BRAKE VALVE

FIGURE 5
PIPING SCHEMATIC - BOGIE CONTROLLER SYSTEM
(TO BE REMOVED)

7-1000-1 (Continued Page 4)

JULY 17, 1979



WIRE COLOR CODE:

B = BLACK R = RED RG = RED WITH GREEN TRACER BW = BLACK WITH WHITE TRACER
BL = BLUE G = GREEN RBL = RED WITH BLUE TRACER

1. CAB WIRING HARNESS
2. THIS WIRE REMOVED PER SERVICE BULLETIN Q1020 UNDER BRAKES. IT MUST BE RECONNECTED TO NO. 3 CIRCUIT BREAKER TERMINAL.
3. CIRCUIT BREAKER STRIP
4. #18 BLACK WIRE - PART OF CAB WIRING HARNESS. THIS WIRE IS NOT USED WITH SINGLE BOGIE CONTROLLER.
5. ADDED WARNING LIGHT RELAY
6. NO. 14 JUMPER WIRE (ADDED)
7. ORIGINAL WARNING LIGHT RELAY
8. REMOVE FROM ORIGINAL RELAY AND CONNECT TO ADDED RELAY
9. GROUND TO MOUNTING SCREWS.

FIGURE 7
RELAY WIRING DIAGRAM

Relay location is as follows:

R, RD, RM, DM, DMM and U models - On right hand side of dash panel inside cab, behind glove compartment.

F models - In front of riders seat, underneath the defroster duct.

MB models - Behind electrical component access panel, in front of driver.

MC and MR models - In electrical equipment compartment on passenger side of engine cover, behind access panel.

WL and WS models - Behind access panel on passenger side of instrument panel, adjacent to the circuit breakers.

RL, RS, RWL and RWS models with Evans heater/air conditioner - Cab side of dash panel, below glove compartment.

RL, RS, RWL and RWS models with Red Dot heater/air conditioners - In center of cab above transmission tunnel.

JULY 17, 1979

- c. Connect continuity cables as follows: See Figure 10.

Use existing cable for forward controller. Disconnect it from the cab harness (at dash panel), rotate 180 degrees and reconnect it, using male side of cab harness connector. Female side of cab connector is left open.

- d. Run a new continuity cable, 41MR3527-P11 from rear controller forward to the cab harness at dash panel. Note from the illustration that the female side of the new continuity cable is to be connected to the female side of cab harness. To make this connection, it is necessary to fabricate an adapter cable having bullet type connectors at both ends. Make the cable from 14 gage wire (approximately 18 in. long) and two 0.180 diameter, SAE J928 connectors.

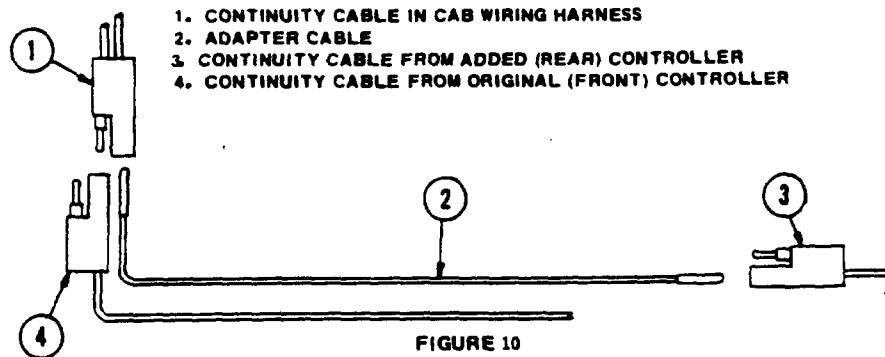
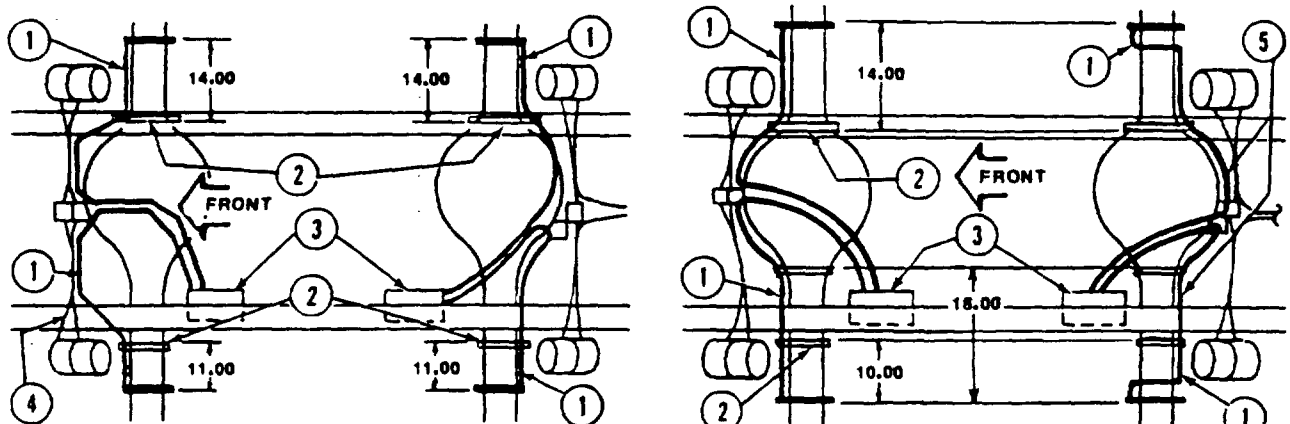


FIGURE 10
CONTINUITY CABLE CONNECTION

- e. Connect the new relay into the circuit as shown in Figure 7. This includes reconnecting the wire removed per Service Bulletin Q1020 under BRAKES. In addition a jumper wire (14 gage) must be added to connect the No. 2 terminal of original relay to No. 2 terminal of the added relay.

- f. Remove existing wheel speed sensors and replace with the new ones shown in parts list. These sensors have longer leads than original ones, eliminating need for the intermediate sensor harness. The harness should be discarded. Exercise caution when routing and clamping sensor wires to avoid damage caused by relative motion of axle and frame. See Figure 11.



S-34, 56, 38, 44, 57, 592 AND 65 SERIES BOGIE

S-50, 58, 68 AND 681 SERIES BOGIE

1. WHEEL SPEED SENSOR LEAD
2. SECURE SENSOR LEADS TO AXLE HOUSING WITH TIE BANDS
3. VALVE/CONTROLLER ASSEMBLY
4. SECURE SENSOR LEADS TO BRAKE HOSES WITH TIE BANDS (MAX. 6 IN. SPACING)
5. ROUTE SENSOR LEADS UNDER AXLE HOUSING (S-50, 58, 68 & 681 ONLY)

FIGURE 11
WHEEL SPEED SENSOR LEAD ROUTING

JULY 17, 1979

New Parts

Order campaign parts on Emergency/Breakdown Parts Requisition form XG10 and process through the Service Parts Distribution Center normally serving your area. Prefix the requisition number you assign with "Z". This will insure parts so ordered will not be cancelled. Also, show "DO NOT CANCEL" on face of the requisition used to order parts for safety campaign corrections. Do not include parts on this requisition that are not required for the campaign.

NOTE

Order either Eaton or Bendix valve/controller assemblies, depending on type originally installed.

Qty.	Part Number	Description
2	5MN401R	Valve and Controller Assembly (Eaton-Neg. Grd.)
1	+ 5MN400R	Valve and Controller Assembly (Bendix-Neg. Grd.)
1	+ 5MN402R	Valve and Controller Assembly (Bendix-Pos. Grd.)
1	745-289359	Controller (Bendix-Pos. or Neg. Grd.)
1	41MR3516-P9	Power/Warning Lead (Tractor)
or 1	41MR3516-P13	Power/Warning Lead (Truck under 220 in. W.B.)
or 1	41MR3516-P15	Power/Warning Lead (Truck - over 220 in. W.B.)
1	41MR3527-P11	Continuity Cable
4	9MN32-P2	Wheel Speed Sensor
1	2MR240-P2	Relay
1	* 63AX53267R	Tee, 1/2 O.D. Tube x 3/8 O.D. x 3/8 NPT(App. Port)
1	* 63AX51599R	Tee, 5/8 O.D. Tube x 1/2 NPTF (Supp. Port)
or 1	** 63AX353	Tee, Flared Type, 3/8 NPTF X 1/2 O.D. Tube(App. Port)
or 1	** 63AX1799	Tee, Flared Type, 1/2 NPTF x 5/8 Tube (Supp. Port)
1	63AX1251	Bushing, 1/2 NPT x 3/4 NPT (Bendix only)
2	43MR21-P4	Connector, Bullet
-	550AX	Wire, 14 Gage Black

* Use with Synflex tubing

** Use with Wire Braid hose

+ See Note Page 2

Removed Parts

Hold all removed parts for possible return.

Removed material disposition instructions will be provided with the credit memo copy of the RWR when returned.

Reimbursement

Submit an RWR to recover expenses incurred in making this installation, following procedure given in Service Bulletin AJ1000 under POLICY. Show following information on RWR form.

* RWR MUST SHOW SERIAL NUMBER FOR BENDIX CONTROLLER REMOVED.

<u>Under</u>	<u>Enter</u>
Description of Failure -----	Service Bulletin Q1020a under BRAKES
Failed Part Number -----	SC106
Part Name -----	Anti-Wheel Lock

Maximum Labor Time ----- 10.6 hours

END

SERVICE BULLETIN

AUGUST 16, 1979

No. Q1022 under BRAKES

FOR BRANCHES AND DISTRIBUTORS ONLY.

CHASSIS AFFECTED ALLENTOWN ☒ HAYWARD ☒ OAKVILLE ☒

MANDATORY SAFETY CAMPAIGN

REF: SC113

ANTI-WHEEL LOCK VALVE

(R, RD, RM, DM, DMM, F, MB, HMM, U, RL, RS, WL and WS Models With Eaton System)

PURPOSE To provide a procedure for either repairing or permanently disabling the anti-wheel lock section of the anti-wheel lock valve. Some valves may malfunction and prevent application of the brakes on affected axle.

INFORMATION AND RECOMMENDATION Accumulation of fluid contaminants in the valve, generally caused by poor maintenance practices, can cause the anti-wheel lock valve piston to swell and possibly bind. During an anti-wheel lock cycle, it is possible for the anti-wheel lock piston to bind in a position where no air will be delivered to the brake chambers served by that valve on subsequent service brake applications. If this condition should occur, the reduced braking power would result in increased stopping distances without prior warning to the driver.

Approximately 37,607 vehicles manufactured between October 1, 1974 and September 1, 1977 were equipped with the suspect valves. Valves affected are those bearing date codes 274-74 through 244-77 (See Figure 1). A list of these vehicles will be sent to affected branches and distributors.

NOTE

A small quantity of valves were shipped with a slightly modified body that should not be rebuilt. These valves carry date codes (Julian) 231-75 through 241-75, which are stamped on the outer edge of the top end cover. If one of the above mentioned valves is found to require repair, please call the nearest Eaton Truck Components branch, which will provide an exchange valve.

Northcentral (Kalamazoo, MI) - 616/385-5400
Northeast (Allentown, PA) - 215/797-7583
Southeast (Charlotte, NC) - 704/372-5840
Southwest (Tulsa, OK) - 918/622-0880
Western (San Leandro, CA) - 415/562-7555
Canadian (Toronto, Ontario) - 416/678-2497

Procedure

Two courses of action are available to correct this possible condition. The method used is at the vehicle owner's choice. They are as follows:

1. Repair valve using an approved rebuilt kit with piston of improved material. Refer to Section A.
2. Disable the anti-wheel lock capability of the valve. Refer to Section B.

NOTE

Method 2 cannot be used on vehicles equipped with high-torque front (steering) axle brakes unless the brakes are modified to be compatible with a non-anti-lock system. Brake modifications are to be made at customers expense and prior to any Mack Branch or Distributor disabling the anti-lock system.

CIRCULATION

Service Manager	
Shop Foreman	
Night Foreman	
Night Foreman	
Inspector Leadman	
Inspector Leadman	
Inspector Leadman	
Unit Overhaul Room	
Shop Office	

AUGUST 16, 1979

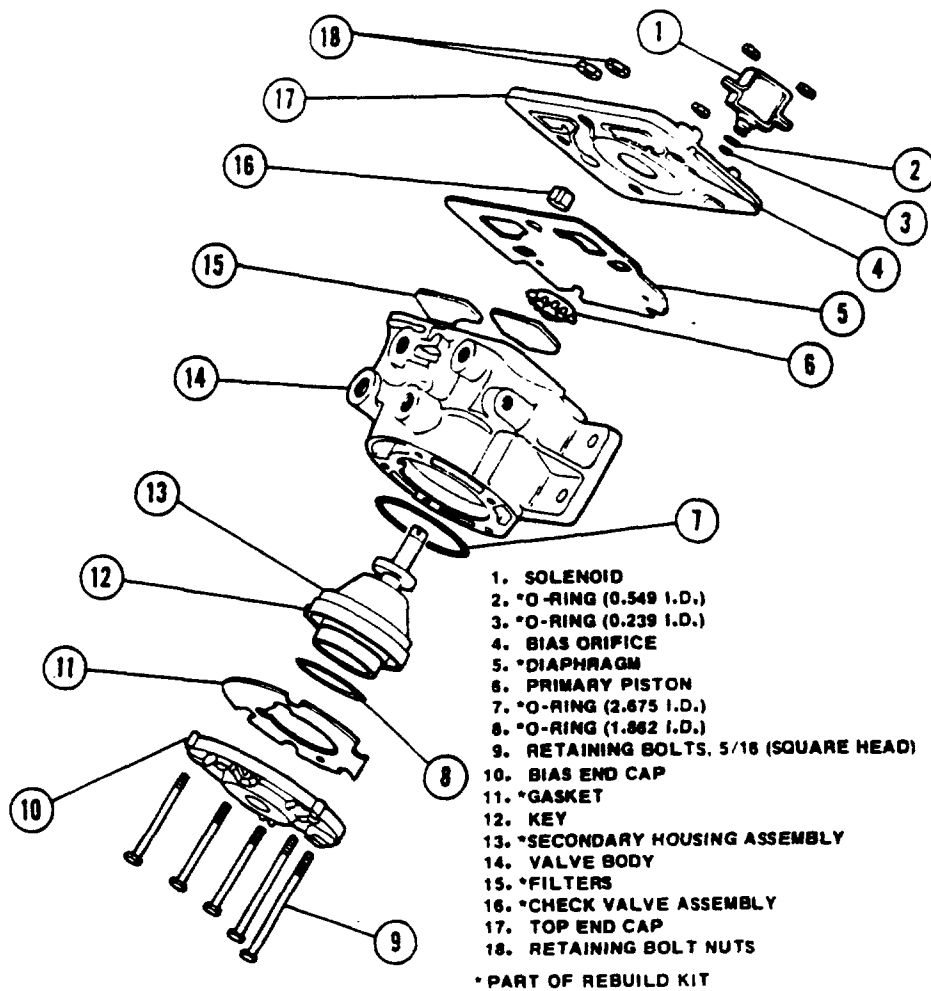


FIGURE 2
INSTALLING REBUILD KIT

Cleaning and Inspection

1. Wash all metal parts in good grade commercial cleaning solvent and dry thoroughly. Care will be necessary to see that sealing ridges on both end caps are not damaged through handling or reassembling.
2. Inspect all metal castings for cracks or breakage which may have occurred during operation. Threaded ports and valve seats should also be examined for damage. Do not use valves with damaged castings for rebuilding. If damage is evident, replace the valve.
3. Small amounts of adhesive were used to attach diaphragm and gasket to end caps during assembly. Any dried adhesive scale should be scraped from end caps. Care must be taken not to gouge surface area, to eliminate the possibility of leakage after reassembly.
4. Those used parts for which replacements are provided in the repair kit should be discarded.

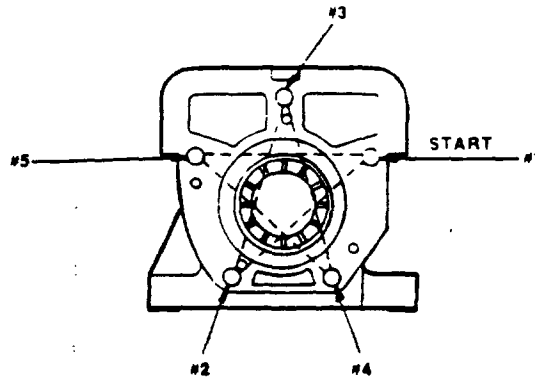


FIGURE 3
NUT TIGHTENING SEQUENCE

Test Procedure

Upon completion of the anti-wheel lock control valve rebuild procedure, the skid control valve should be given a full operational and leakage test. This can be done by reinstalling the valve on the vehicle or using a fabricated test fixture. An accurate pressure gauge with a minimum 2" face is recommended for checking delivery pressures. Additional gauges for reservoir pressure and application pressure are required for fixture testing.

1. After mounting the air valve, minus the controller, connect only the supply port to the line from the air supply reservoir for the first test.
2. Apply a soap solution at the exhaust port, completely covering the exhaust port round rubber baffle with the soap solution. Also place the soap solution around the edges of both the diaphragm and bias gasket.
3. Charge system reservoir pressure which feeds the valve supply port to approximately 100 p. s. i. Then check the soap solutioned areas to be sure there is no excessive leakage (1" bubble permitted in 3 seconds). If leakage exceeds this rate, check for damaged or displaced "O" rings and/or foreign material under supply valve seat. Reassemble and retest.
4. Connect application port to the application line coming from treadle valve. Connect delivery port so that the 2" air gauge is inserted into (a) an extra port in the service chamber, (b) a tee placed in the delivery line, or (c) an unused valve delivery port. This gauge is used for test procedure only, and is to be removed prior to operation of vehicle.
5. Again apply soap solution as in Step 2, plus at fitting ports and at the exhaust port. Proceed to next step.
6. Make a full application to the service brake system. Check soap solutioned areas to again be sure there is no excessive leakage (1" soap bubble in 3 seconds is the acceptable industry leakage rate allowance).
7. Release application pressure after completing leakage test. Reapply full service brake rapidly and observe air gauge in the delivery line. The delivery pressure is to rise to within 10 p. s. i. of reservoir in less than 1 second.
8. When making a quick release of the application pressure (treadle valve), the delivery pressure should drop to zero p. s. i. in less than 1 second.
9. To check the skid control function of the relay valve, fully apply and hold brakes, and then apply 12 volts D. C. to the air valve solenoid terminal blades. This should fully exhaust the brakes within 1-2 seconds.

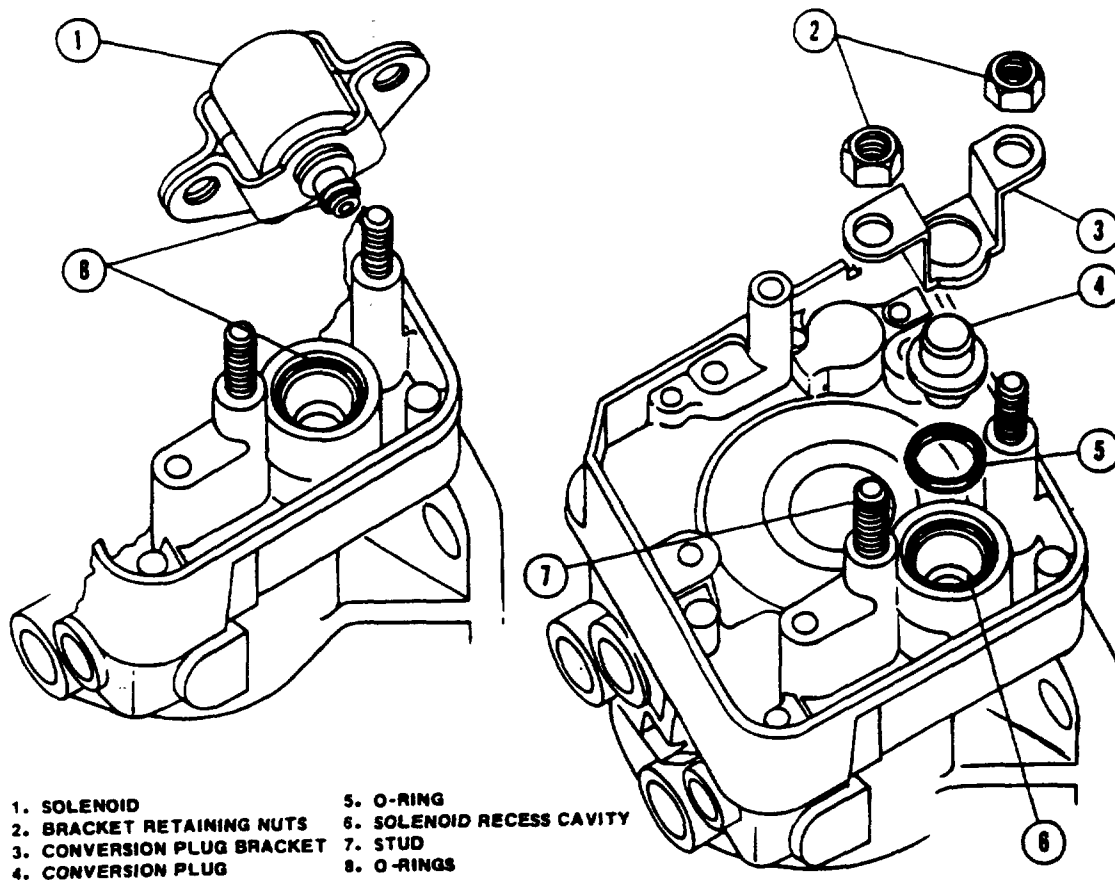


FIGURE 4
INSTALLING ANTI-WHEEL LOCK DISABLING KIT

1. After detaching the controller from the air valve assembly, remove the two 5/16 in. nuts (2) using a 1/2" socket or wrench, holding the solenoid on the mounting studs (7). Save the two 5/16 in. nuts for reuse.
2. Carefully remove the solenoid (1) from its stud mounted position by lifting it straight up. If both "O" rings (8) do not come out with the solenoid, inspect the solenoid recess cavity to find them. Remove and discard them along with the solenoid.
3. Prior to installing the new "O" ring (5), clean the solenoid recess cavity of any dirt, grease or foreign material.
4. Lubricate the conversion plug "O" ring (5), with silicone grease and place it on the conversion plug (4).
5. Install the conversion plug (4) in the solenoid recess cavity with the "O" ring down.
6. Place the conversion bracket (3) onto the solenoid mounting studs (7).
7. Install the two 5/16 in. nuts (2) on the studs (7) and tighten to 125-150 lbs. in. torque.
8. Check the conversion kit for leakage by applying and holding a full brake pedal application while covering the area around the conversion plug with soap and water. No leakage is permitted.

AUGUST 16, 1979

Reimbursement

All expenses incurred in this campaign are to be recovered through RWR procedures as instructed in Service Bulletin AJ1000 under POLICY. Submit an RWR for each vehicle campaigned. Include following information on RWR form.

<u>Under</u>	<u>Enter</u>
Description of Failure -----	Service Bulletin Q1022 under BRAKES
Failed Part Number -----	SC113
Part Name -----	Anti-Wheel Lock Valve
Maximum labor allowance:	
Installing rebuild kit -----	1.6 hours
Installing disable kit -----	0.4 hours

END