PREVOST®

Maintenance Manual

XL

PREVOST CAR INC.
Technical Publications
After Sales Service Department

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GENERAL

SAFETY NOTICE

This maintenance manual has been prepared in order to assist skilled mechanic's in the efficient repair and maintenance of PREVOST vehicles.

This manual covers only the procedures as of the manufacturing date.

Safety features may be impaired if other then genuine PREVOST parts are installed.

Torque w~~h~~rench tightening specifications must be strictly observed. Locking devices must be installed or replaced by new ones, where specified. If the efficiency of a locking device is impaired, it must be replaced.

This manual emphasizes particular information denoted by the wording and symbols:

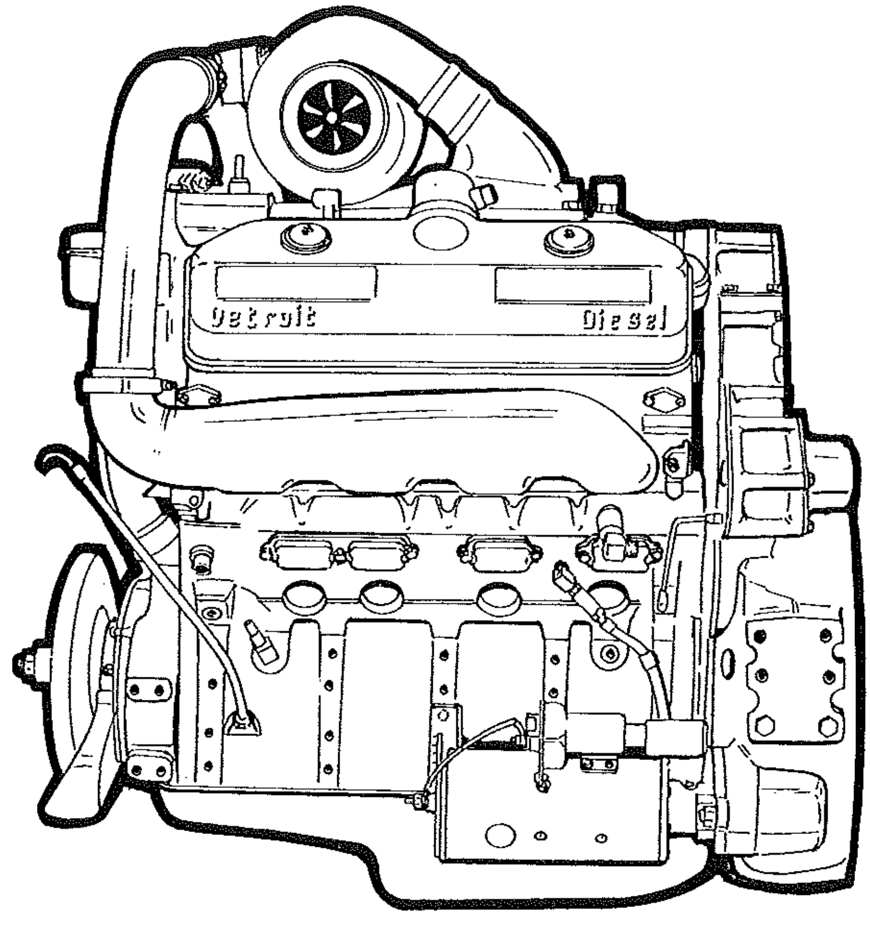
● **Warning:** Identifies an instruction which, if not followed, could cause personal injury.

■ **Caution:** Denotes an instruction which, if not followed, could severely damage vehicle components.

□ **Note:** Indicate supplementary information needed to fully complete an instruction.

Although, the mere reading of such information does not eliminate the hazard, your understanding of the information will promote its correct use.

ENGINE



ENGINE

DESCRIPTION

The engines that can be installed in Prevost vehicles are as follows:

DETROIT DIESEL — two cycle engines.
6V92T (turbo)
8V71N (natural aspiration)
8V92T (turbo)

Maintenance and repair information on the engine will be found in the current engine manufacturer maintenance manual. Engine controls, accessories and related components are covered in the applicable section of this manual.

REMOVAL AND REPLACEMENT:

The engine unit, including transmission, clutch air compressor and alternator may be removed from the vehicle as a unit for access to engine or related components.

Proceed as follows:
1- Drain the engine cooling system as explained in section 05 -COOLING then remove rear bumper.

2- Exhaust air pressure from belt tensioner then remove radiator fan gear box belt and A/C compressor belt.

3- Disconnect the propeller shaft as detailed in section 09 - PROPELLER SHAFT.

4- Exaust air from air system then disconnect transmission and clutch operating linkage. Disconnect throttle linkage.

5- Disconnect muffler joint to exhaust manifold (Refer to section 04 - EXHAUST).

6- Disconnect air lines to air compressor governor and fast idle air cylinder.

7- Disconnect electrical connection to speedometer unit, starting motor, starting motor solenoid, alternator, engine controls, tachometer, oil pressure and engine temperature sending units.

8- Disconnect and remove cooling system connections to radiator, surge tank, and vehicle heating system. Disconnect fuel supply and return lines. Remove connection between air filter and engine air inlet duct.

9- Remove bolts and nuts securing engine cradle on engine mounts.

10- Slightly raise the engine then pull it out of the engine compartment.

■ **Caution:** Due to a minimum of clearance between engine and engine compartment roof, extreme care should be taken to raise the engine.

11- To reinstall, the procedure is the reverse of the above.

Diesel lubricating oils general factors

All diesel engines require heavy-duty lubricating oils. Basic requirements of such oils are: Lubricating Quality, High Heat Resistance and Control of Contaminants.

Lubricating quality

The reduction of friction and wear by maintaining an oil film between moving parts is the primary requisite of a lubricant. Film thickness and its ability to prevent metal to metal contact of moving parts is related to oil viscosity. The optimums for diesel engines are SAE 40 or 30 Weight.

High heat resistance: Temperature is the most important factor in determining the rate at which deterioration or oxidation of the lubricating oil will occur. The oil should have adequate thermal stability at elevated temperatures, thereby precluding formation of harmful carbonaceous and/or ash deposits.

Control of contaminants: The piston and compression rings must ride on a film of oil to minimize wear and prevent cylinder seizure. At normal rates of consumption, oil reaches a temperature zone at the upper part of the piston where rapid oxidation and carbonization can occur. In addition, as oil circulates through the engine, it is continuously contaminated by soot, acids, and water originating from combustion. Until they are exhausted, detergent and dispersant additives aid in keeping sludge and varnish from depositing on engine parts. But such additives in excessive quantities can result in detrimental ash deposits. If abnormal amounts of insoluble form, particularly on the piston in the compression ring area, early engine failure may result.

Oil that is carried up the cylinder liner wall is normally consumed during engine operation. The oil and additives leave carbonaceous and/or ash deposits when subject to the elevated temperatures of the combustion chamber. The amount of deposits is influenced by the oil composition, additive content, engine temperature and oil consumption rate.

Diesel lubricating oil specifications

Oil quality is the responsibility of the oil supplier. (The term «oil supplier» is applicable to the refiners, blenders and

ENGINE

rebranders of petroleum products, and does not include distributors of such products).

There are hundreds of commercial crankcase oils marketed today. Obviously, engine manufacturers or users cannot completely evaluate the numerous commercial oils. The selection of a suitable lubricant in consultation with a reliable oil supplier, observance of his oil drain recommendations (based on used oil sample analysis and experience) and proper filter maintenance, will provide the best assurance of satisfactory oil performance.

API Letter Code Service Classification	Military Specification	SAE Grade*
CD/SC	MIL-L-2104C	40 or 30
CC/SE	MIL-L-46152	40 or 30
Numerous	Universal	40 or 30

Table 1: Lubricating Oil Recommendation

The engines have given optimum performance and experienced the longest service life with the following oil performance levels having the ash and zinc limits shown:

*SAE 40 grade oil is recommended in detroit diesel engines. Obviously the expected ambient temperatures and engine cranking capability must be considered by the engine owner operator when selecting the proper grade of oil. Only when the ambient temperatures and engine cranking capabilities result in difficult starting should SAE 30 grade oil be used.

Ash limit: The sulfated ash limit (ASTMD-874) of the above lubricants shall not exceed 1.000% by weight, except lubricants that contain only barium detergent-dispersant salts where 1.500% by weight is allowed.

Zinc content: The zinc content, as zinc diorganodithiophosphate, shall be a minimum of 0.07% by weight.

MIL-L-46167 Arctic lube oils for North slope & other extreme sub-zero operations

Lubricants meeting this specification are used in Alaska and other extreme sub-zero locations. Generally they may be described as 5W-20 Multigrade lubricants made up of synthetic base stock and manifesting low volatility characteristics. Although they have been used successfully in some severe cold region, they are not considered desirable as the use of SAE 40, or SAE 30 oils with auxiliary heating aids. For this reason, they should be considered only where engine cranking is a severe problem and auxiliary heating aids are not available on the engine.

Service and inspection intervals

Generally, operating conditions will vary for each engine application, even with comparable mileage or hours and, therefore, maintenance schedules can vary. A good rule of thumb for piston, ring and liner inspection however, would be at 45,000 mils (54,000 km) or 1500 hours for the first such inspection and at 30,000 miles (45,000 km) or 1,000 hour intervals thereafter.

A suggested preventive maintenance practice is a regularly scheduled testing of fuel and lubricating oils by either the oil supplier or an independent testing laboratory. Since the oil supplier knows the physical properties of his products best and maintains laboratories to determine practical oil drain intervals, take advantage of this service and request him to check drained oil samples frequently and report the results to you.

Engine mounts

The engine is mounted to the engine cradle by means of rubber mounts.

It is suggested that new rubber mounts be installed whenever the engine is removed from the coach.

Improper installation of the press fit type motor mounts can contribute to excessive engine vibration.

☐ **Note:** To properly insert the engine mounts only water should be used as a lubricant.

Insertion of the mounts into the socket using glycerine or any other lubricant, will result in the tail of the mounts flairing out with the rubber rupturing or a potential rupture after each installation.

Using water as the lubricant for inserting rubber mounts will achieve excellent results, in that, the tail of the mounts will go into compression when the assembly is draw up tight with the proper displacment bulge all the way around.

In no case should a lubricant be used which maintains lubricity after assembly and engine startup.

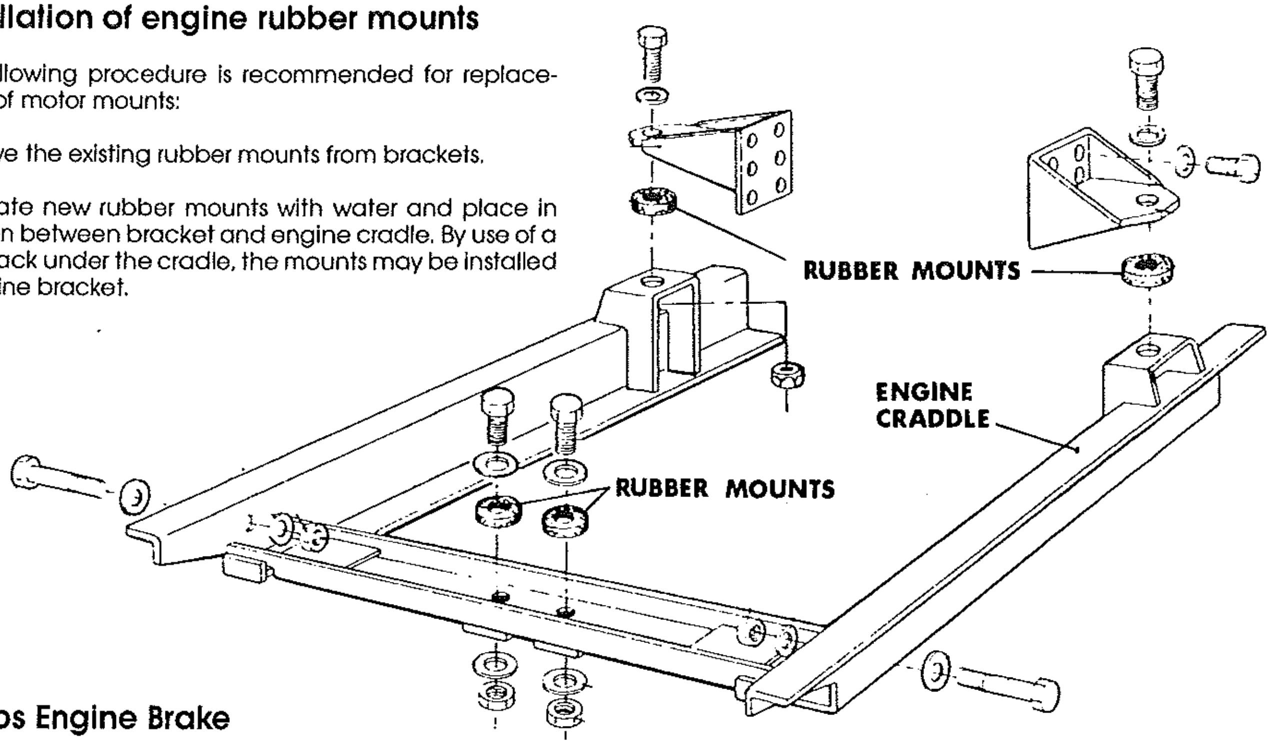
ENGINE

Installation of engine rubber mounts

The following procedure is recommended for replacement of motor mounts:

Remove the existing rubber mounts from brackets.

Lubricate new rubber mounts with water and place in position between bracket and engine cradle. By use of a small jack under the cradle, the mounts may be installed in engine bracket.



Jacobs Engine Brake

Operation

The energizing of the engine brake effectively converts a power producing diesel engine into a power absorbing air compressor. This is accomplished when desired by motion transfer through a master-slave piston arrangement which opens the cylinder exhaust valves-near the top of the normal compression stroke releasing the compressed cylinder charge to exhaust. The blowdown of compressed air to atmospheric pressure prevents the return of energy to the engine piston on the expansion stroke, the effect being a net energy loss since the work done in compressing the cylinder charge is not returned during expansion process.

Exhaust blowdown: Exhaust blowdown occurs as follows:

1. Energizing the solenoid valve permits engine lube oil to flow under pressure through the control valve to both the master piston and the slave piston.

2. Oil pressure causes the master piston and its extension to move down, coming to rest on the injector rocker clevis.

3. The injector rocker clevis begins upward travel (as in normal injection cycle) forcing the master piston upward and creating a high pressure oil flow to the slave piston. The ball check valve in the control valve imprisions high pressure oil in the master slave piston system.

4. The slave, piston under the influence of the high pressure oil flow moves down momentarily opening the exhaust valve while the engine piston is near its top dead center position releasing compressed cylinder air to the exhaust manifold.

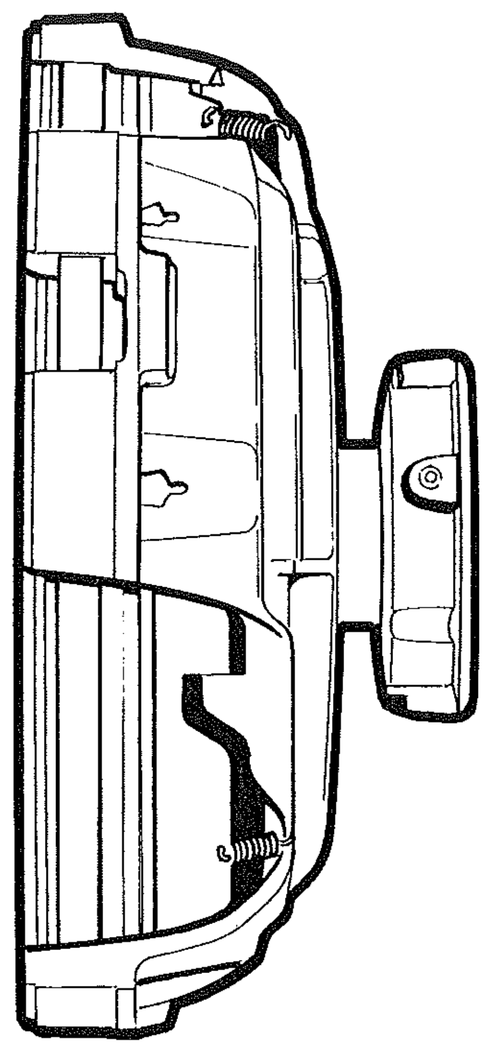
5. Compressed air escapes to atmosphere completing a compression braking cycle.

Method of driving coach equipped with Jacobs Engine Brake

The proper method of driving a coach equipped with a Jacobs Engine Brake will be simple for an operator to learn. In order to retard a coach on a down grade using the Jacobs Engine Brake, the operator selects a gear which will provide a balance between engine speed and road speed. If the engine speed exceeds maximum rated RPM, for a desired road speed, a lower gear can be selected, or intermittent use can be made of the vehicle service brakes. The selection of a lower gear will generally allow complete control of the vehicle by the Jacobs Engine Brake leaving the vehicle service brakes in reserve to be used for emergency stops.

After short practice most drivers will know what combination of gears will give the best results over a particular route.

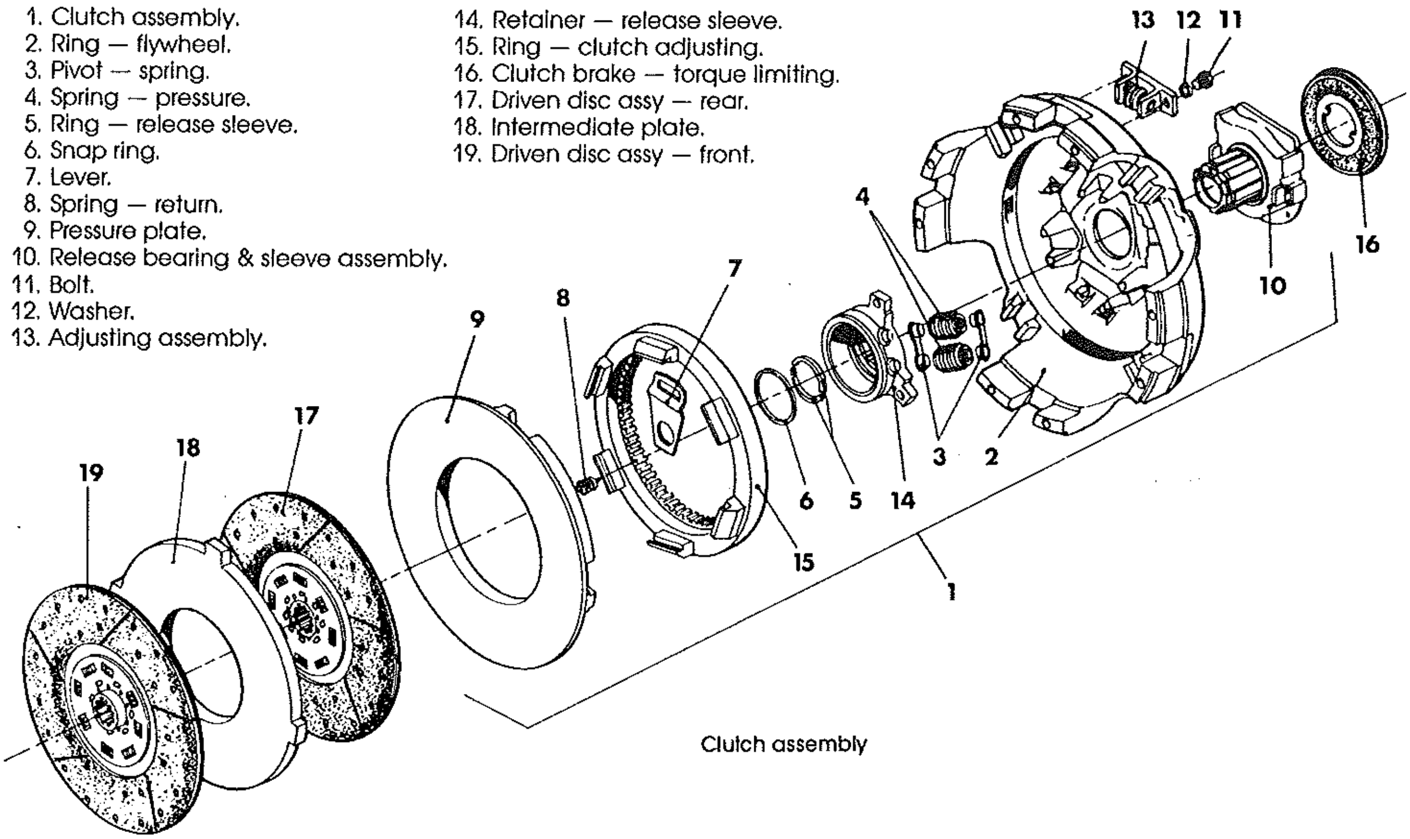
CLUTCH



CLUTCH

CLUTCH ASSEMBLY

1. Clutch assembly.
2. Ring — flywheel.
3. Pivot — spring.
4. Spring — pressure.
5. Ring — release sleeve.
6. Snap ring.
7. Lever.
8. Spring — return.
9. Pressure plate.
10. Release bearing & sleeve assembly.
11. Bolt.
12. Washer.
13. Adjusting assembly.
14. Retainer — release sleeve.
15. Ring — clutch adjusting.
16. Clutch brake — torque limiting.
17. Driven disc assy — rear.
18. Intermediate plate.
19. Driven disc assy — front.



Clutch assembly

REMOVAL AND DISASSEMBLY

Transmission removal:

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.

Clutch removal:

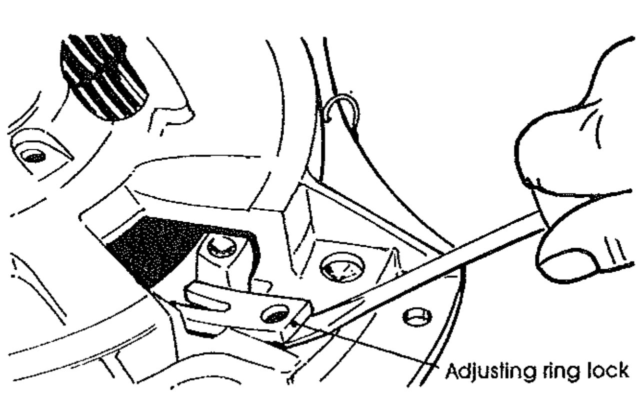
1. Prior to actual clutch removal, assemble a clutch disc aligning tool to the driven disc and release bearing assembly.

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.

4. See Inspection Section for checks of flywheel.

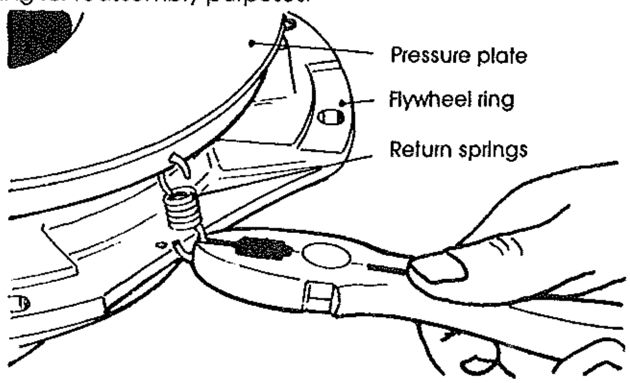
5. Remove bolt and lockwasher assembly and adjusting ring lock. Use screwdriver or similar wedge to remove adjusting ring lock.



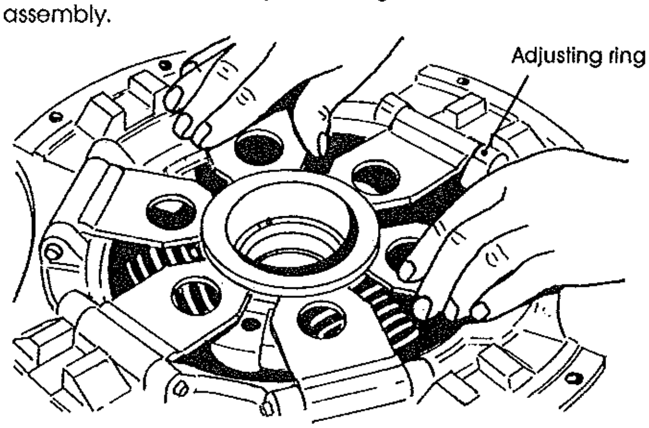
CLUTCH

6. Set clutch assembly (without driven discs and intermediate plate) upside down on a flat table or workbench. Unhook four return springs from flywheel ring and lift pressure plate off.

☐ **Note:** Mark pressure plate in relation to the flywheel ring for reassembly purposes.

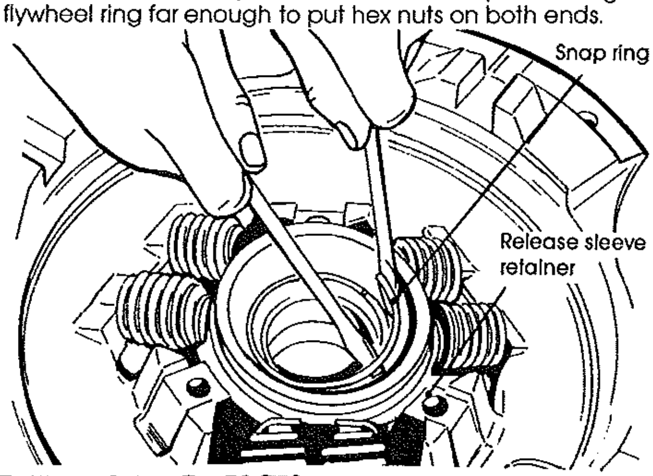


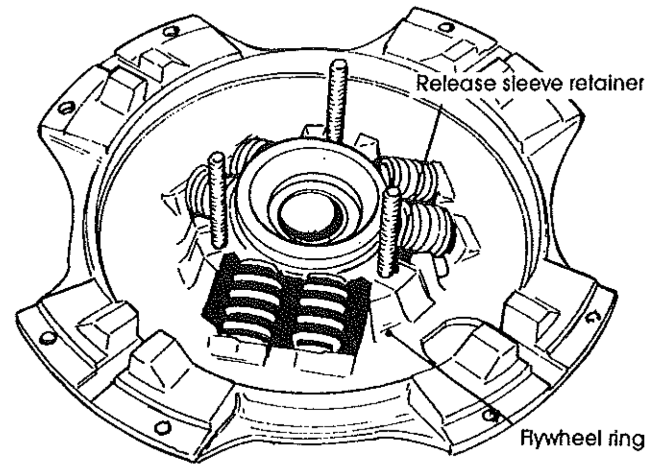
7. Turn the adjusting ring and lever assembly counterclockwise until free of flywheel ring. Then lift and remove assembly.



8. Remove snap ring from release sleeve retainer.

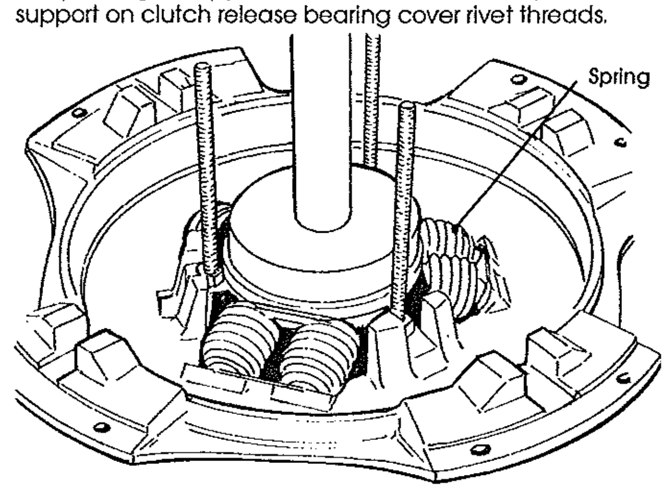
9. Install three 5/16" x 5" threaded rods through clearance holes in release sleeve retainer and into holes provided in flywheel ring. Threaded rod must pass through flywheel ring far enough to put hex nuts on both ends.



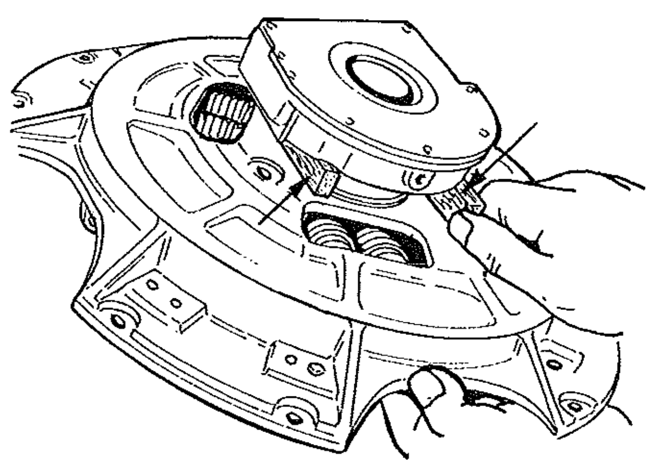


10. Place assembly on a arbor press with a piece of tubing supporting the release sleeve. Compress retainer until drive lugs bottom on flywheel ring and draw three hex nuts tightly against retainer.

☐ **Note:** Use a short piece of 2½" or 2¾" O.D. (63.5-69.9 mm) tubing to support release sleeve assembly. DO NOT support on clutch release bearing cover rivet threads.

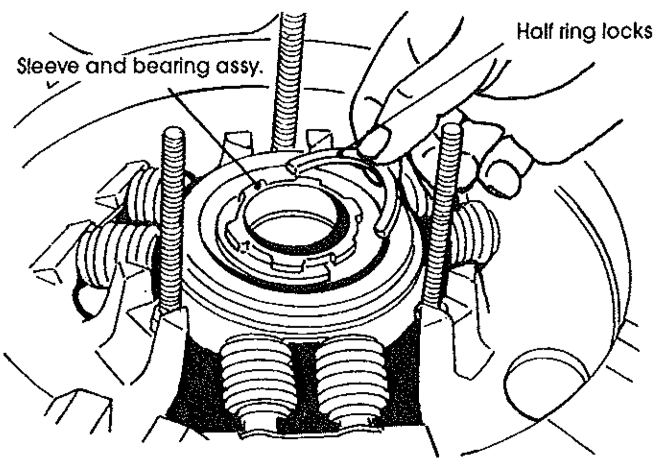


11. Raise arbor. Tilt assembly and remove wooden blocks.



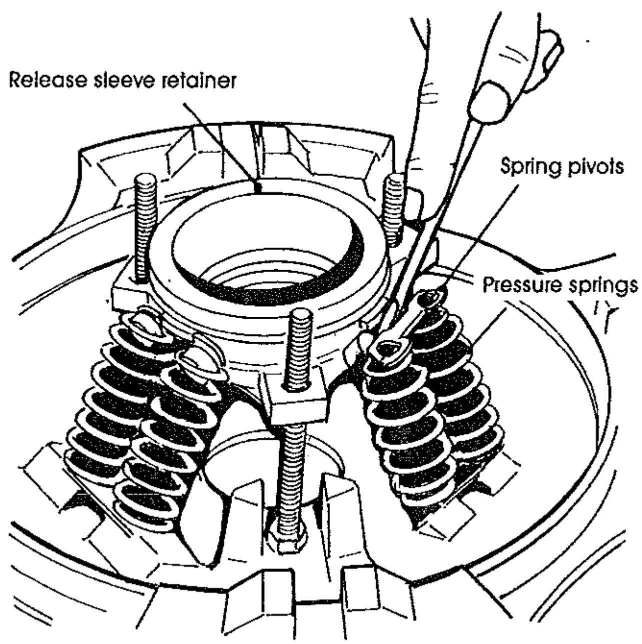
CLUTCH

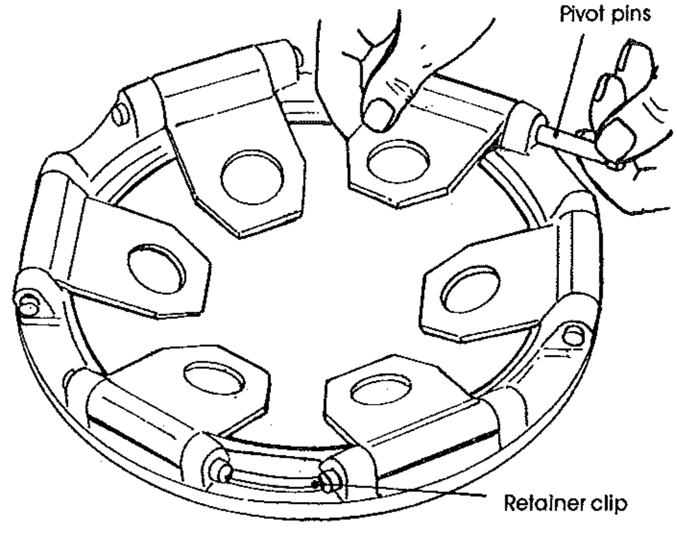
12. Again support release sleeve on tubing as in Step 10. Remove half ring locks. Now release sleeve and bearing assembly are free to slide through retainer toward rear of clutch.



13. To disassemble pressure springs and retainer, compress retainer to relieve load on hex nuts. Back off hex nuts and remove load on pressure springs. Remove pressure springs and spring pivots.

14. To complete disassembly, remove the retainer clip from pivot pins. And remove pins and levers.





☐ **Note:** All parts must be clean and dry for inspection.

Inspection

Release levers

Inspect levers for excess 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, and replace if necessary.

Release bearing and sleeve assembly

We recommend replacing the release bearing and sleeve assembly as a unit at the time of clutch rebuild.

CLUTCH

Adjusting ring

Check pivot pin holes for wear. Clearance may not exceed .010" (.254 mm) between pin and hole. Inspect for cracks; replace if cracks are visible.

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. Note Specifications 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.

Pressure plate

Inspect fulcrum for wear. If wear exceeds .015" (.381 mm), remachine. See Spec. for max. 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 .010" (.254 mm), 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 Specifications.

Intermediate plate

Inspect friction surfaces of intermediate plate for heat checks, scoring or distortion as noted in the above paragraph. Inspect driving slots of intermediate plate for wear. See Specifications.

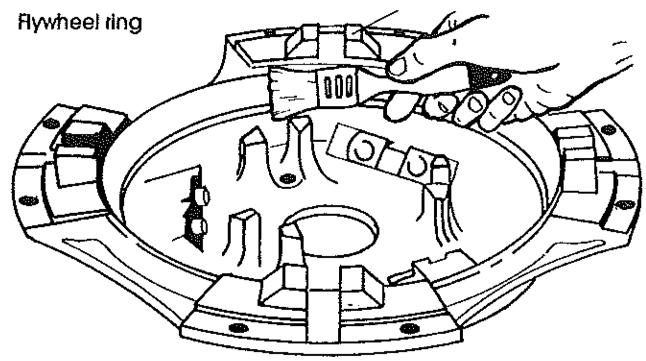
Driven discs

Inspect disc assembly for cracks, loose rivets, worn splines, warped or dished condition. Restraighten if dished or warped — .015" (.381 mm) maximum runout. Replace if hub is cracked, or splines are worn excessively.

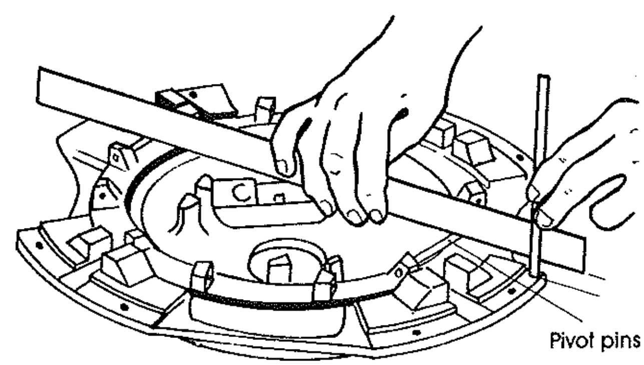
Replace facings if they are glazed, scored, worn down to rivet heads, burned, or if grease or oil are on them. Check Specifications for proper thickness of clutch discs and facings. Make sure facings used are of proper thickness. Proper riveting is essential. Use a star set anvil to spread the rivet so it contacts the teapered counterbore of the facing. DO NOT USE a roll or eyelet anvil (except with metallic facings).

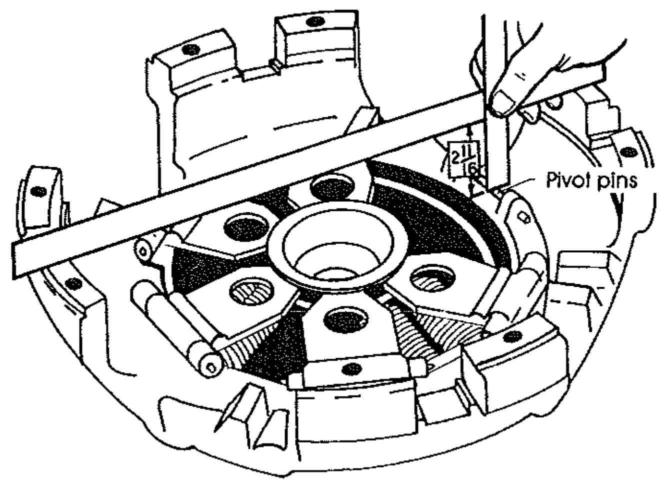
REASSEMBLY

1. Place flywheel ring upside down on a table or workbench. Use a small paint brush and coat threads of adjusting ring and internal threads of flywheel ring with Darina EP-1.



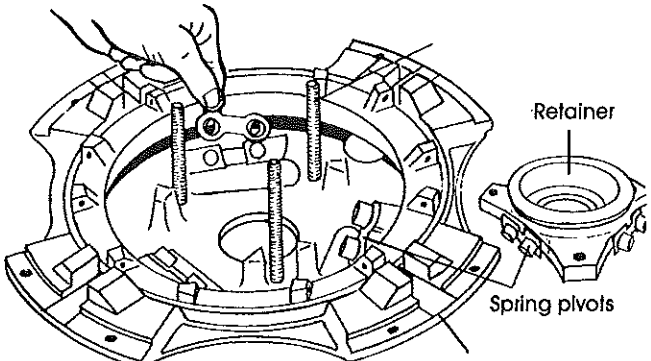
2. Assemble adjusting ring to flywheel ring with «notches» down. Preset adjusting ring by placing two pivot pins in adjusting ring bosses directly opposite each other. Dimension from flywheel ring mounting surface to straight edge to be approximately 2 11/16" (68.3 mm).



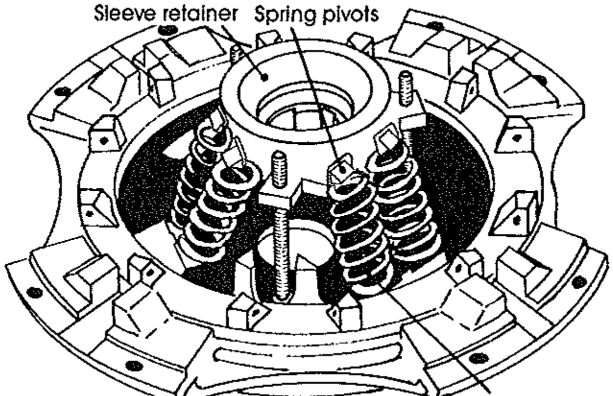


CLUTCH

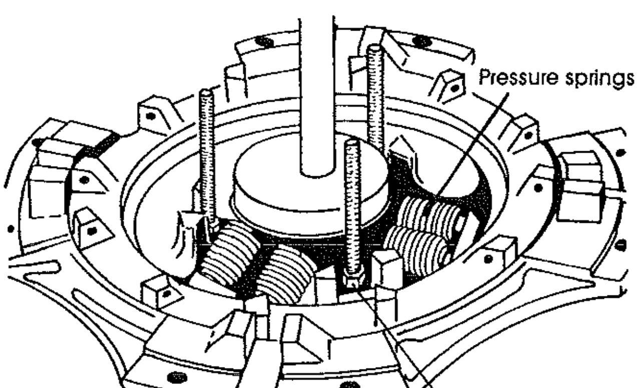
3. Install three threaded rods in holes provided in flywheel ring. Place hex nut on opposite side of flywheel ring and retainer.



4. Place release sleeve retainer in position, guided on threaded rods. Install pressure springs between spring pivots. Place hex nuts on three threaded rods and draw down enough to hold release sleeve retainer assembly in place.

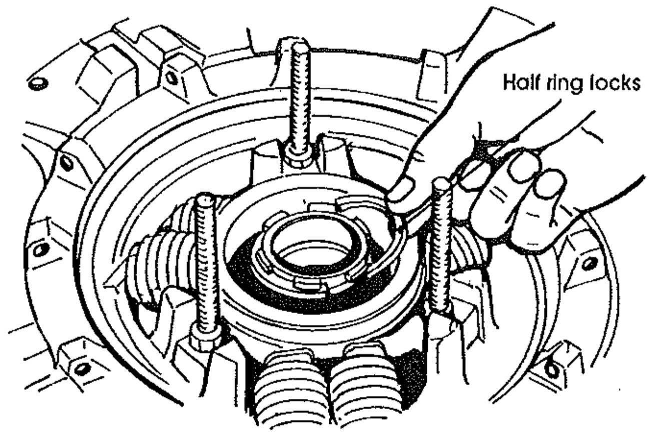


5. Place flywheel ring and release sleeve retainer assembly on an arbor press and depress retainer until it buttoms against flywheel ring. Draw tightly three hex nuts on threaded rod against retainer.



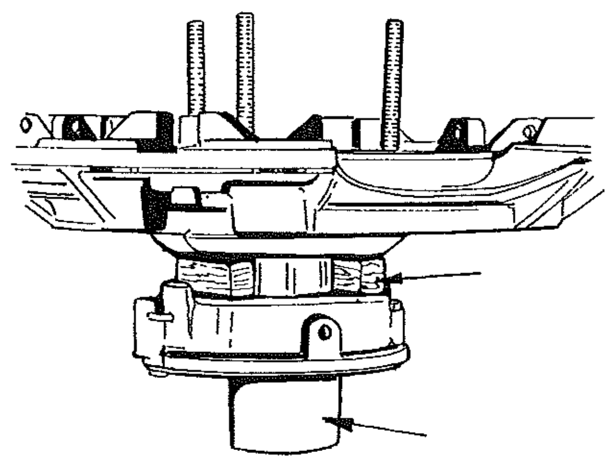
☐ **Note:** Visually check pressure springs to assure seating on spring pivots.

6. Install release sleeve and release bearing assembly through flywheel ring and release sleeve retainer. Place half ring locks in groove of release sleeve.



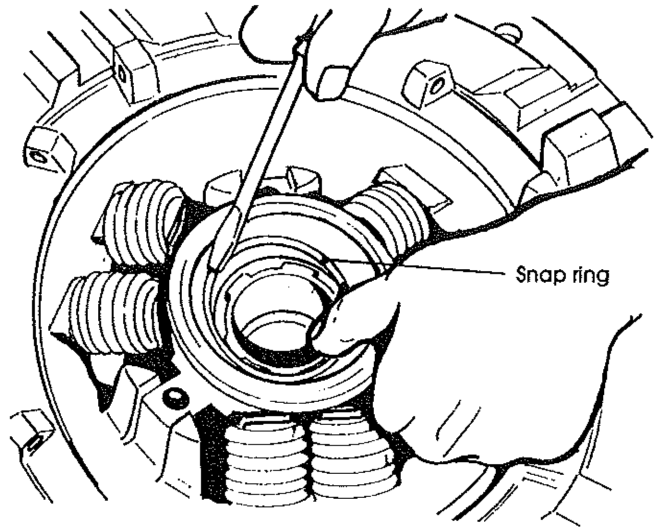
7. Install ¾" (19 mm) wooden blocks between flywheel ring and release bearing housing. Place assembly on arbor press, supporting sleeve on 2½" -2¾" O.D. (63.5-69.9 mm) tubing. Compress retainer to relieve load on hex nuts Remove threaded rods and release load against wooden blocks.

☐ **Note:** DO NOT support assembly on clutch release bearing cover rivet heads.

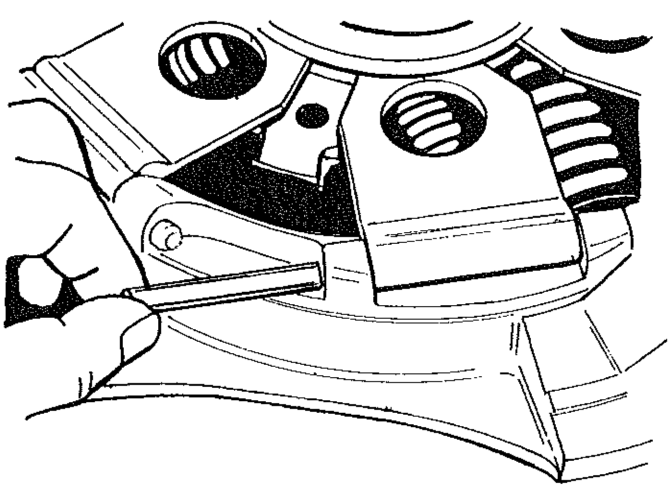


CLUTCH

8. Complete subassembly by placing snap ring in groove above the half-ring locks.

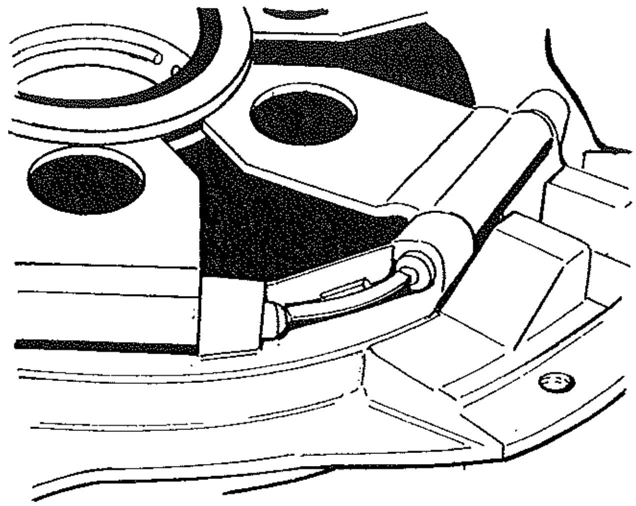


9. Return assembly to workbench and place levers between adjusting ring bosses with narrow end or «nose» in groove of release sleeve retainer. Lever fulcrum or raised area of lever MUST be facing pressure plate. Move adjusting ring either clockwise or counter-clockwise as necessary to insert pivot pins. Return adjusting ring to previously set position.



■ **Caution:** Spring clips must be installed so that one spring clip retains two pivot pins. Clips will only fit in every other opening because of casting interference.

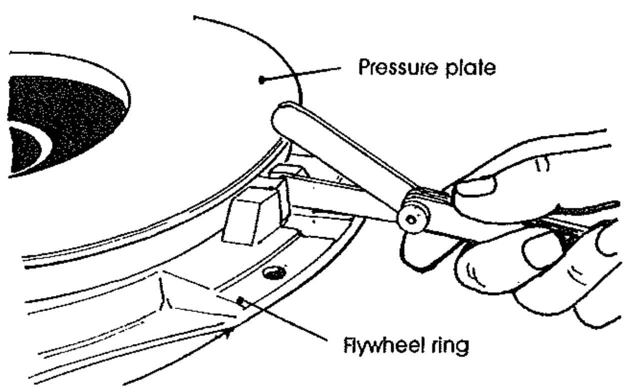
10. Place retainer clip into position and insert pivot pin thru clip hole into adjusting ring and lever holes until pin head snaps into position.



11. Place pressure plate in drive slots on flywheel ring. Check clearance between driving lugs on pressure plate and drive slots in flywheel ring. Clearance should be .004" to .008" (.102-.203 mm).

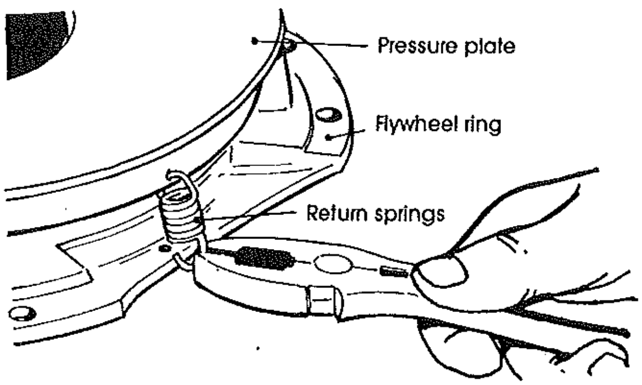
☐ **Note:** Pressure plate was marked in relation to the flywheel ring when removed. Reassemble in same slot location.

12. Install return springs as shown. Make sure they are completely seated in hole.

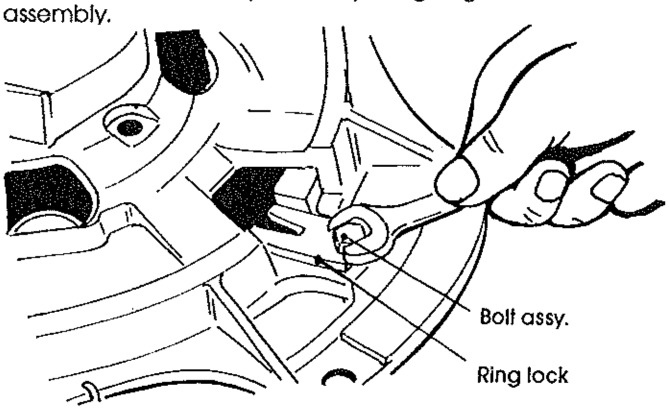


CLUTCH

☐ **Note:** Springs to be hooked from inside of pressure plate first. Then hook opposite end from outside of flywheel ring.



13. Complete reassembly by turning assembly on pressure plate side and replace adjusting ring lock and bolt assembly.



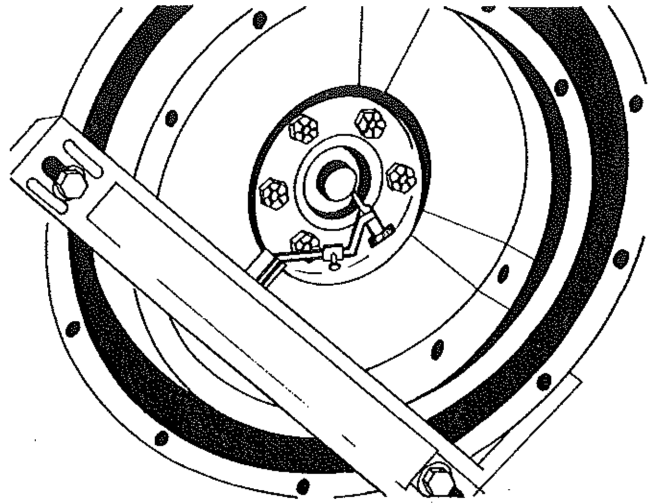
FLYWHEEL AND TRANSMISSION HOUSING ALIGNMENT

The engine and transmission must have a common axis. The following checks must be made to locate possible misalignment. Clean all surfaces thoroughly before taking readings or checking parts.

Follow procedure in applicable engine service manual to dial indicate flywheel housing face, flywheel housing bore and flywheel face.

Flywheel pilot bore:

Dial indicate pilot bearing bore of flywheel with indicator secured to flywheel housing, move gauge finger to contact pilot bearing bore surface. Turn flywheel and obtain readings. SAE maximum total runout for the pilot bearing bore is .005" (.127 mm).

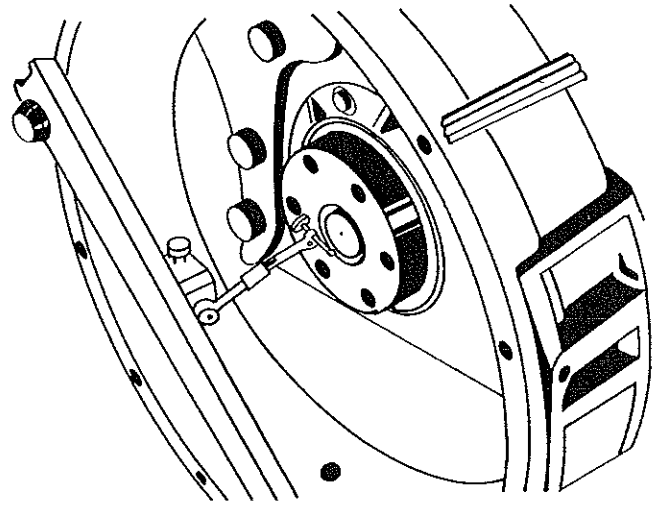


Transmission clutch housing:

The transmission clutch housing face and pilot can not be checked accurately in the field, unless you have a set of case bore plugs and shaft. This setup consists of plugs with very close fits that are tapped into front and rear bores of transmission case. A shaft fits through centers of plugs and extends to the front far enough to secure dial indicator and obtain reading on clutch housing. SAE maximum runout for the transmission clutch housing face and pilot is .008" (.203 mm) with No. 1 SAE housings.

Crankshaft face:

Dial indicate flywheel crankshaft face. Secure dial indicator to engine flywheel housing with gauge finger against camshaft face near the outer edge. Turn crankshaft to obtain readings. You are allowed .000" runout on face.



CLUTCH

INSTALLATION

Pre-installation checks:

Before installing any clutch, it is advisable to check the following items:

1. Inspect friction face of flywheel for smoothness, heat checks, scoring, excessive wear or runout on contact surface. The inspection for heat checks and scoring must be visual and based on experience; however, measure friction surface wear with straight edge and feelers. Replace or repair flywheel if wear is excessive. Refer to the manufacturer's recommendations concerning replacement or rebuilding.

2. If clutch is new, remove protective coating from pressure plate and intermediate plate.

3. A new pilot bearing should be used with a new or rebuilt clutch. If the old bearing is reused, clean and check the bearing thoroughly. Repack with lubricant.

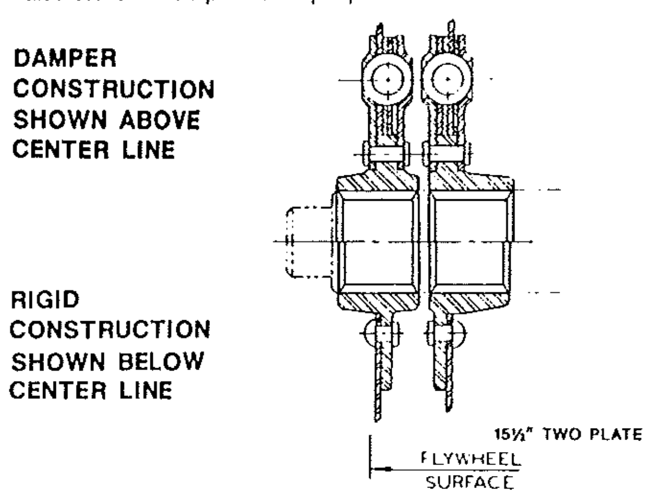
4. If the flywheel has been replaced, always indicate the face and pilot diameters to make sure total indicator runouts are within engine manufacturer's specifications.

5. Check fit of splined hubs of front and rear friction discs by sliding on main drive gear spline of transmission. Hubs must slide free if clutch is expected to release cleanly and properly.

Installing clutch on flywheel:

1. Insert two (2) 7/16" - 14 N.C. (5" long), guide studs into two upper mounting holes of the flywheel. Rotate flywheel if necessary to level guide studs.
2. Slide clutch disc aligning tool or drive gear stem, through release bearing sleeve and assemble rear disc on tool.

Place intermediate plate in clutch cover assembly. Align driving lug of plate with slots provided. Assemble front disc on tool. See photo for proper location of driven discs.



3. Position clutch assembly under flywheel and use a small chain hoist or jack to lift clutch assembly into position on the two assembly guide studs.

4. Slide clutch assembly forward and position in flywheel pilot. Start eight (8) retaining cap screws with lock washers and run in finger tight. Tap clutch disc aligning tool to make sure it has enterred and centered in pilot bearing.

5. Tighten the cap screws progressively and evenly to pull the clutch ring into its proper position in the flywheel pilot.

IMPORTANT: Don't try to pull the clutch into place by running one cap screw completely down with an impact wrench. This procedure can crack or break the pilot shoulders, causing eccentricity, offsquare mounting and out-of-balance conditions.

6. Remove the two guide studs and insert two remaining cap screws and lock washers. For the final check, progressively tighten all cap screws to 35-40 lbs. ft. torque. (47-54 Nm).

7. As the cap screws are tightened, the ¾" wooden shipping blocks should fall free. If they don't, remove blocks at this time. Likewise, the final tightening will clamp the front and rear driven disc in position, so remove the clutch disc aligning tool, at this time.

Installation of transmission to clutch & engine:

1. If a clutch brake is used with this transmission, see brake installation, on following pages.

2. Apply a light coating of «Never-Seez» compound or high temperature grease to the sides and bottom of the main drive gear splines. This will help prevent rust, fretting, corrosion, etc., while the clutch is in service and easier transmission removal at a later date.

Avoid the common practice of smearing a handful of grease over the splines of the drive gear. Most of this grease will be wiped off by the release bearing sleeve when the transmission is assembled to the clutch. Spread a small amount of grease inside the clutch release bearing.

3. Always check wear on clutch release yoke fingers and replace the yoke, if necessary.

4. Shift transmission into gear so that the main drive gear can be rotated during assembly to line up with clutch driven disc hub splines.

CLUTCH

5. Use a suitable sling or transmission jack to properly support and maintain the engine/transmission alignment when installing the transmission. Raise transmission and position it square to, and aligned with, engine.

6. Rotate top of clutch release yoke rearward and center the yoke on drive gear bearing cap. Yoke must be held in this position during early part of assembly. Enter main drive gear into clutch release bearing sleeve. Slide transmission forward slowly to pick up driven disc splined hub It may be necessary to rotate companion flange slowly to align the splines of drive gear and clutch discs.

7. Observing through handhole opening in bell housing, make certain release bearing assembly is vertical with flat section on top and clutch release yoke fingers tipped up and centered to pass over release pads of release bearing assembly.

■ **Caution:** Use care to avoid springing the driven discs when the transmission is being installed. Do not force the transmission into the clutch or flywheel housing if it does not want to enter freely. Don't let the transmission drop or hang unsupported in the driven discs.

8. As soon as the fingers of the clutch release yoke pass thrust pads of release bearing assembly, turn the release shaft to swing the yoke fingers down in front of release pads.

9. Enter pilot of clutch housing into flywheel housing and align cap screw holes. Start all cap screws and tighten progressively around housing.

10. Connect clutch release linkage and check for proper free pedal, release bearing travel, clutch brake squeeze, etc., as outlined under clutch adjustment.

11. Readjust clutch and linkage, if required at this time. If new clutch facings were used, it may be necessary to readjust clutch shortly after clutch is placed in service.

Lubrication instructions:

Remove the hand hole cover on the bottom of the clutch wheelhousing to gain access to clutch release bearing for lubricating purposes.

■ **Caution:** The release bearing housing has not been pre-packed with grease. It must be lubricated when the clutch is installed in the coach, otherwise premature failure will occur.

Only high temperature grease should be used. Chassis lube or all purpose lubricants are not recommended.

Add lubricant at each chassis lubrication period or more often if service is extreme.

Recommended lubricants:

SUPPLIER	PRODUCT
American Oil Co.	Amoco Lithium - M.P. Grease
City Service Co.	Citgo Premium Lithium Grease #2
Fiske Refinning Co.	Lubriplate 630-2
Keystone Lubricating Co.	#81 Light
Mobile Oil	Mobilegrease M.P.
Shell Oil Co.	Retinax A
Atlantic Richfield Co.	Arco M.P.
Texaco	Multifak #2
Humble Oil Co.	Lidok 2
Shell Oil Co.	Alvinia #2
Chevron Oil Co.	Teknifax BRB-2, S.R.1.

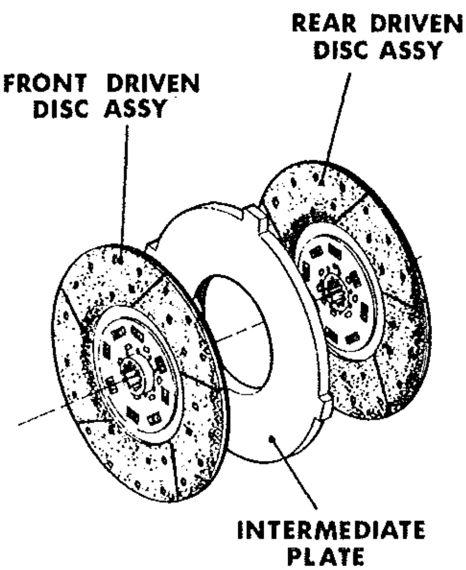
IMPORTANT: Interference of release yoke fingers with the clutch flywheel ring will prevent assembly of transmission or cause binding of release shaft if it is not rotated.

Pedal must be held down to move adjusting ring. Check free pedal with pedal up.

DRIVEN DISCS

Riveted non-asbestos facings:

These driven discs use high-quality facings riveted to the steel disc. This may be furnished with the rigid 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.



CLUTCH

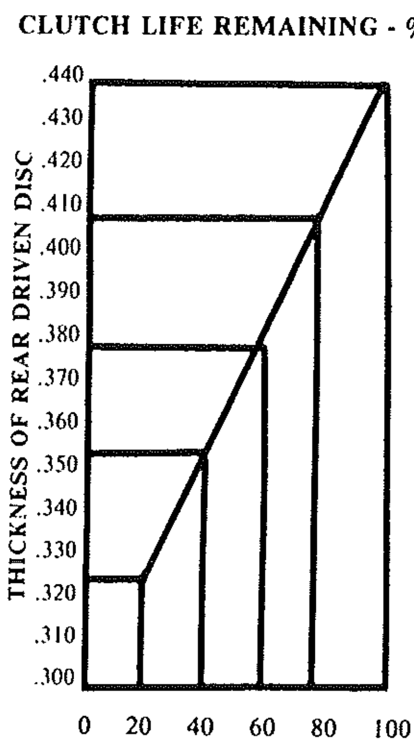
Remaining clutch life:

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.

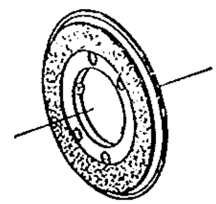
1. Heat cracks in the pressure plate.
2. Excessive wear in all drive slots.
3. Broken springs.
4. Dry or damaged release bearing.
5. Broken intermediate plate.
6. Excessive driven disc hub spline wear.
7. Burned facings.
8. Excessive wear on drive pins or intermediate plate slots.

If the above list has been inspected and looks to be in good condition, the following graph can be applied 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 then follow to curve on right then drop this point down to read % of clutch life remaining.



The new spicer torque-limiting clutch brake



The torque limiting feature is provided by internal Bellevilles which are driven by a hub. The Bellevilles react against the clutch brake covers with facing material positioned between each Belleville and cover. The hub and Belleville combination slips with respect to the covers after approximately a 25 to 30 ft. lb. (34-47 Nm) load has been exceeded.

Longer tang life is provided by the brake's ability to limit torsionally induced damage. Also, 5° of free play is provided between the hub and Bellevilles so that the inertia of the Bellevilles cannot load the hub directly. Inertia persent in the covers is allowed to load the hub only up to the 25 to 30 ft. lb. (34-47 Nm) load mentioned above. And, the tangs themselves are thicker to absorb what remaining torsionals do find their way to the hub.

There is no extra work on the driver's part to activate the brake. He just depresses the clutch pedal to the floorboard, beyond the normal clutch disengage position, causing the clutch release bearing to come in contact with the clutch brake. Because the brake is splined to the transmission main drive gear, the transmission is slowed down or stopped. The driver can then shift from first to reverse or from reverse to first without clashing or putting undue stain on the gears.

CLUTCH

SPECIFICATIONS

SUBJECT	15½-INCH Two-Plate
Disc & Facing Thickness — Standard	.487/.452" (12.4/11.5 mm)
Hub Spline Size (inches, No. splines)	1-¾-10 2-10
Disc. Assembly Max. Runout (T.I.R.)	.015" (.381 mm)
Disc. Assembly Max. Out-of-Flat	.020" (.508 mm)
Release Sleeve Bushing Dia. (new)	1.754/1.750" (44.552/44.45 mm) 2.010/2.008" (51.054/51.003 mm)
Intermediate Plates, driving lugs to slot clearance (new min.)	.006" (.152 mm)
Intermediate Plates, driving lugs to slot clearance (max. worn)	.015" to .021" (.381 mm to .533 mm)
Pressure Plates, driving lugs to slot clearance (new)	.003" to .010" (.076 mm to .254 mm)
Pressure Plates, driving lugs to slot clearance (max. worn)	.016/.021" (.406/.533 mm)
Intermediate Plates & Pressure Plates: Out-of-Flat	.000 to .004" (.102 mm) Concave
Scoring — Max. depth that can be re-used Regrind — Max. removal per side	.015" (.381 mm) .015" (.381 mm)
Fulcrum Wear (Max.) rework	.030" (.762 mm)
Release Sleeve Retainer, driving lugs to slot clearance (max. worn)	.020" (.508 mm)

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE
Over-Adjusting (Too much free pedal)	A. Check linkage for too much release travel.
Under-Adjusting (No free pedal)	A. Ball not in retainer hole. B. Broken or weak pedal return spring. C. Adjusting ring not free to rotate. D. Defective adjuster assembly. E. Check release travel — must be ½" (12.7 mm) plus about 1/8" (3.175 mm) free travel. Short travel linkage will not work with this mechanism. F. Clutch brake adjusted too high. Should be adjusted 1" (2,54 mm) from end of stroke. G. Total clutch adjustment has been used. (Remove and replace clutch).

CLUTCH

Common clutch servicing problems and suggested remedies

Poor release

POSSIBLE CAUSE	REMEDY
2. Pressure plate not retracting.	a. Check pressure plate drive lugs for proper clearance of .006 min. (.152 mm). b. Check pressure plate return springs for being bent or stretched. Replace if necessary. c. Insufficient amount of release travel. d. Lever nose out of groove in release sleeve retainer.
3. Driven disc distorted or warped.	a. Driven disc assembly must be straight within.015" (.381 mm) total indicator reading. Replace discs if they can't be straightened. b. Damage to driven disc can be caused by poor installation methods. Do not force transmission drive gear into disc hubs. This will distort or bend driven discs causing poor release.
4. Splines worn on main drive gear of transmission.	Replace drive gear and check driven disc hubs for excessive wear. If worn, replace disc. Check flywheel housing alignment of engine and transmission. Make sure driven discs slide freely on drive gear splines.
5. Internal clutch adjustment not correct.	Readjust clutch for standard release travel. Refer to adjusting instruction. Proper clutch adjustment must be maintained for good clutch release and proper brake squeeze.
6. Flywheel pilot bearing fitting too tightly in flywheel or on end of drive gear.	Free pilot bearing to a light push. Fit in flywheel and on drive gear pilot. If bearing is rough, replace.
7. Facings gummed with oil or grease.	Replace facings or entire driven disc assembly. Cleaning not recommended.
8. Damaged clutch release bearing.	Replace bearing. If bearing is grease type, lubricate.
9. Clutch release shaft projecting through release yoke.	Relocate release shaft so it does not project. Check bell housing bushing and release yoke for wear.
10. Release yoke contacting cover assembly at full release position.	Replace release yoke with proper yoke.
11. Release yoke will not align with release bearing properly.	Flywheel has been resurfaced more than the recommended .060 (1.524 mm) removal.
12. Broken intermediate plate.	Replace damaged intermediate plate driven disc assembly. This is caused by driver abuse or excessive heat. a. Holding vehicle on hill with the clutch. b. Overload. c. Starting off in the wrong gear. d. Wrong cover assembly installed allowing clutch to slip. e. Intermediate plate hanging allowing clutch to slip.

CLUTCH

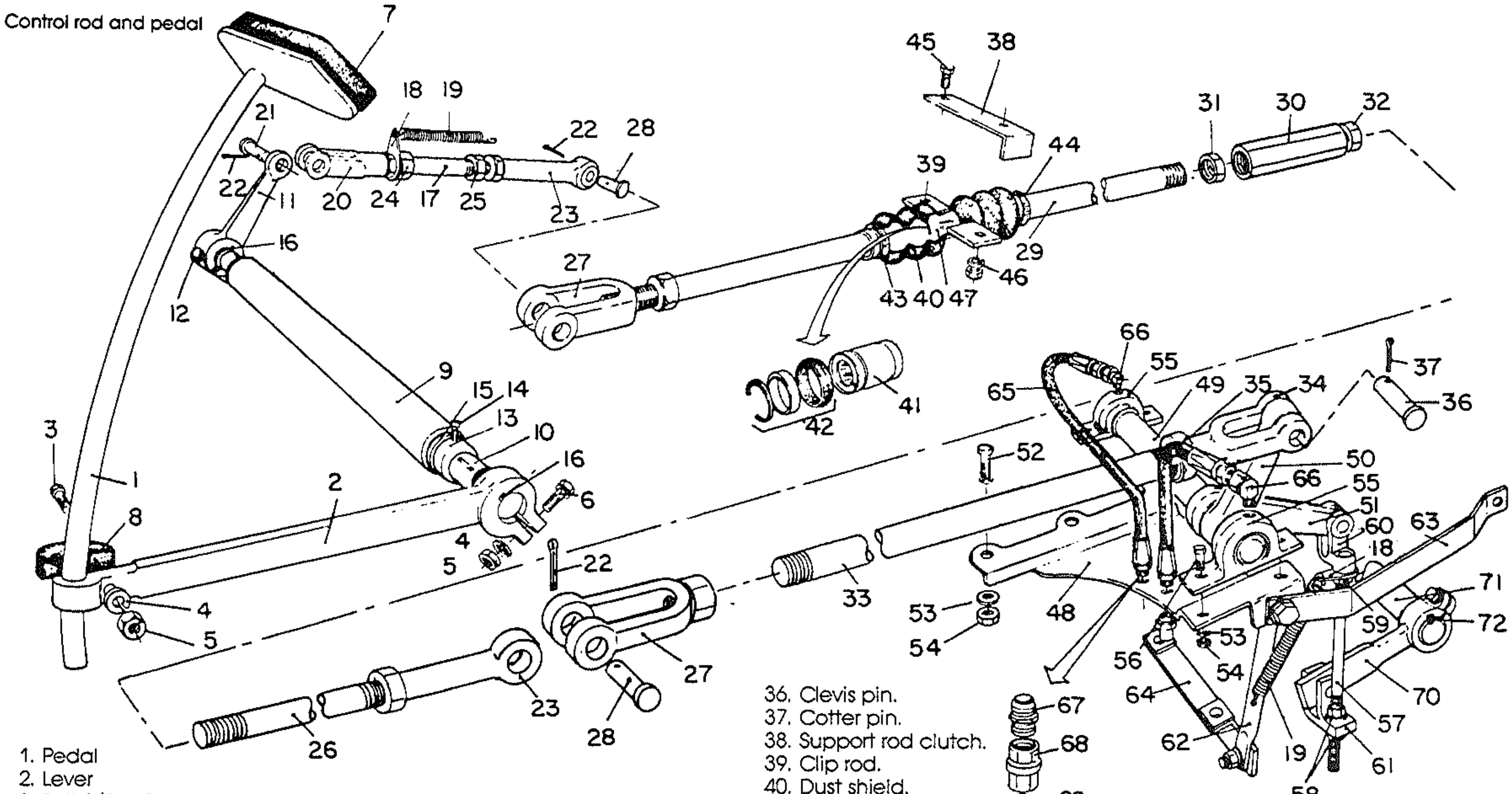
Clutch slippage

POSSIBLE CAUSE	REMEDY
1. Weak pressure springs.	Replace springs. See «REASSEMBLY».
2. No free pedal.	Readjust clutch. Refer to adjustment instructions.
3. Worn clutch facings.	Replace facings or complete driven disc assembly.
4. Release mechanism binding.	Free up mechanism and linkage, check clutch adjustment. Refer to adjustment instructions.
5. Grease or oil on facings.	Replace facings or complete driven disc assembly.

Noisy clutch

POSSIBLE CAUSE	REMEDY
1. Clutch release bearings dry or damaged.	Lubricate bearing, or replace.
2. Flywheel pilot bearing dry or damages.	Lubricate bearing, or replace.
3. Clutch release bearing housing striking flywheel ring.	Adjust clutch. Refer to adjustment instructions. Also check wear on cross shafts, bell housing bushings and release yoke fingers. If badly worn, replace parts.
4. Excessive clearance between drive slots and drive lugs on intermediate and pressure plates.	Check clearance as noted on wear limits. If above limits, replace parts.

CLUTCH

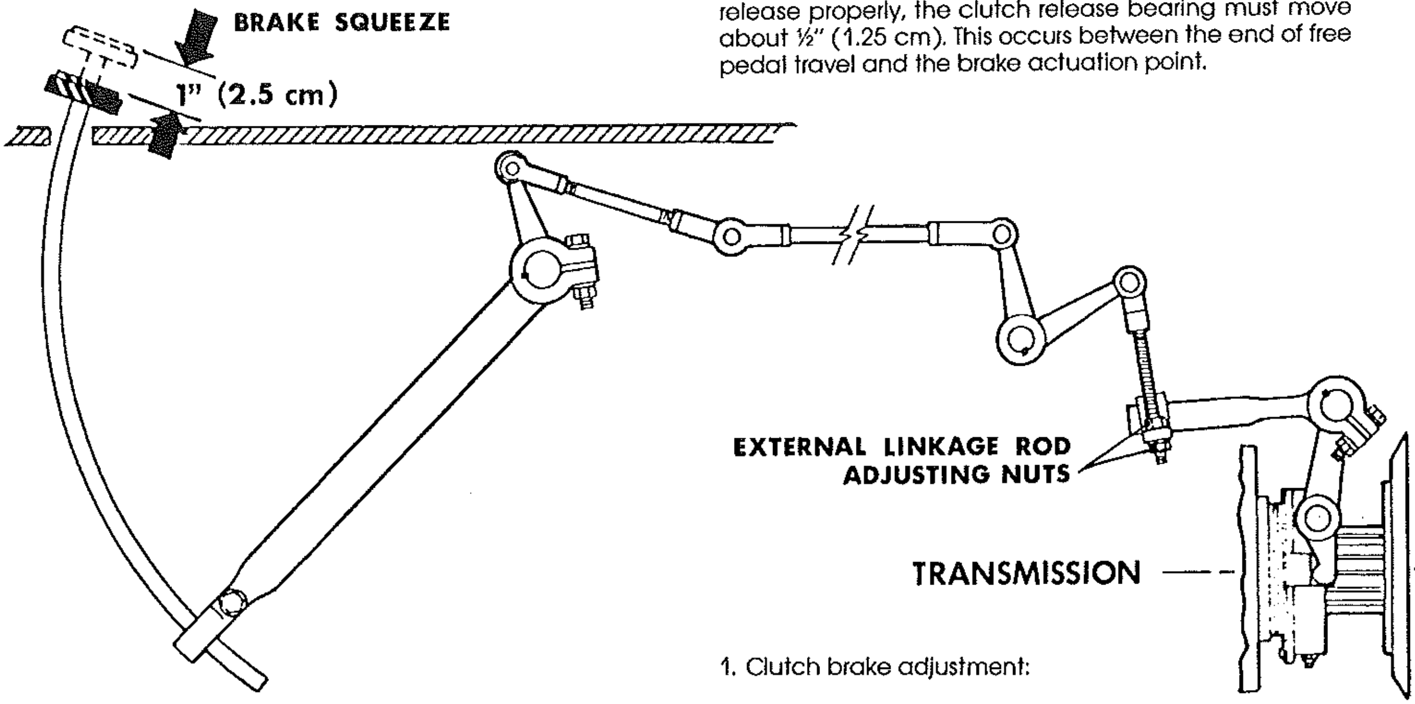


1. Pedal
2. Lever
3. Bolt 3/8" - 24 x 2" lg.
4. Lock washer 3/8" I.D.
5. Nut 3/8" - 24.
6. Bolt 3/8" - 24 x 1-½" lg.
7. Clutch pedal pad.
8. Stop rubber.
9. Clutch transfer tube.
10. Clutch transfer shaft.
11. Lever connecting rod.
12. Bolt 3/8" - 24 x 2" lg.
13. Collar sub-assy.
14. Set screw ¼" - 20 x 3/8.
15. Oilite flange bearing.
16. Key.
17. Rod 5/8" x 47-½" lg.
18. Hook spring.
19. Spring.
20. Yoke.
21. Clevis pin.
22. Cotter pin.
25. Rod end boss ball.
24. Nut jam ½" - 20.
25. Nut jam 5/8" - 18.
26. Rod 87-7/8" lg. (section 1° & 3°).
27. Yoke.
28. Clevis pin.
29. Rod 87-7/8" lg. (section 2°).
30. Coupling control rod.
31. Nut 5/8" - 18.
32. Nut 5/8" - 18 L.H.
    Rod 78" lg. (rear section) (Option 6V92T).
33. Rod 72-¼" lg. (rear section).
34. Yoke.
35. Jam nut 5/8" - 18.
36. Clevis pin.
37. Cotter pin.
38. Support rod clutch.
39. Clip rod.
40. Dust shield.
41. Ball bushing.
42. Ball bushing mount.
43. Clamp.
44. Clamp.
45. Bolt 5/16" - 24 x ¾" lg.
46. Lock washer 5/16"
46. Flat washer 5/16".
47. Nut 5/16" - 24.
48. Support transfert rear.
49. Shaft.
50. Lever 6".
51. Lever 5".
NS. Lever Key woodruff ¼" x 1¼" lg.
52. Bolt 3/8" - 24 x 2" lg.
53. Lock washer.
54. Nut 3/8" - 24.
55. Pillow block bearing.
56. Bolt 3/8" - 24 x 1½" lg.
57. Rod adjusting.
58. Nut ½" - 20.
59. Nut ½" - 20 stover lock.
60. Yoke.
61. Yoke lower end.
62. Brace.
63. Support brace.
64. Attachment plate.
65. Hose assy.
66. Elbow male.
67. Connector male.
68. Coupling.
69. Grease fitting.
70. Lever shaft clutch.
71. Shaft clutch 1" 0 x 11¼" lg.
72. Key square.

CLUTCH

ADJUSTING PROCEDURE

Any clutch will slip and burn up if there is no free pedal. To release properly, the clutch release bearing must move about ½" (1.25 cm). This occurs between the end of free pedal travel and the brake actuation point.



1. Clutch brake adjustment:

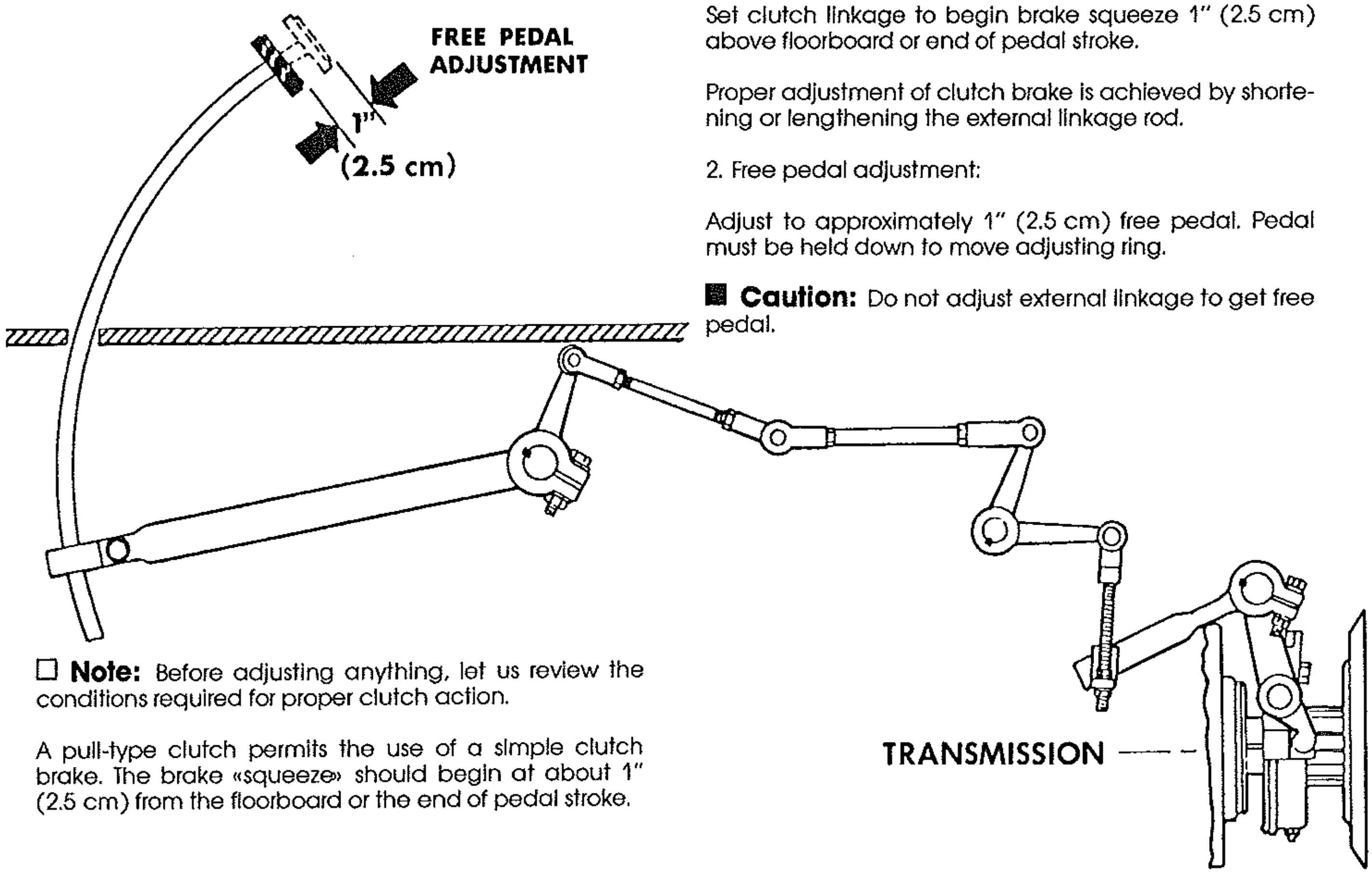
Set clutch linkage to begin brake squeeze 1" (2.5 cm) above floorboard or end of pedal stroke.

Proper adjustment of clutch brake is achieved by shortening or lengthening the external linkage rod.

2. Free pedal adjustment:

Adjust to approximately 1" (2.5 cm) free pedal. Pedal must be held down to move adjusting ring.

■ **Caution:** Do not adjust external linkage to get free pedal.



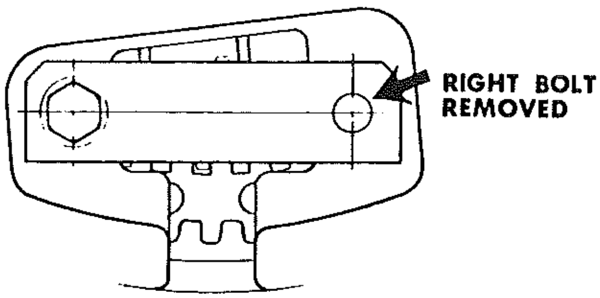
☐ **Note:** Before adjusting anything, let us review the conditions required for proper clutch action.

A pull-type clutch permits the use of a simple clutch brake. The brake «squeeze» should begin at about 1" (2.5 cm) from the floorboard or the end of pedal stroke.

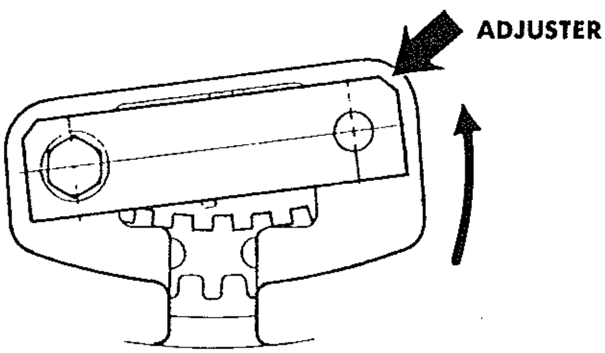
CLUTCH

To properly adjust free pedal, proceed as follows:

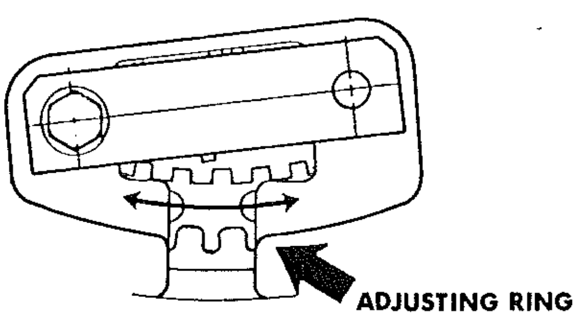
A. Remove right bolt. Loosen left bolt one turn.



B. Rotate adjuster upward. This will disengage worm gear from the adjusting ring to allow manual adjustment. Hold adjuster disengaged and tighten left bolt.

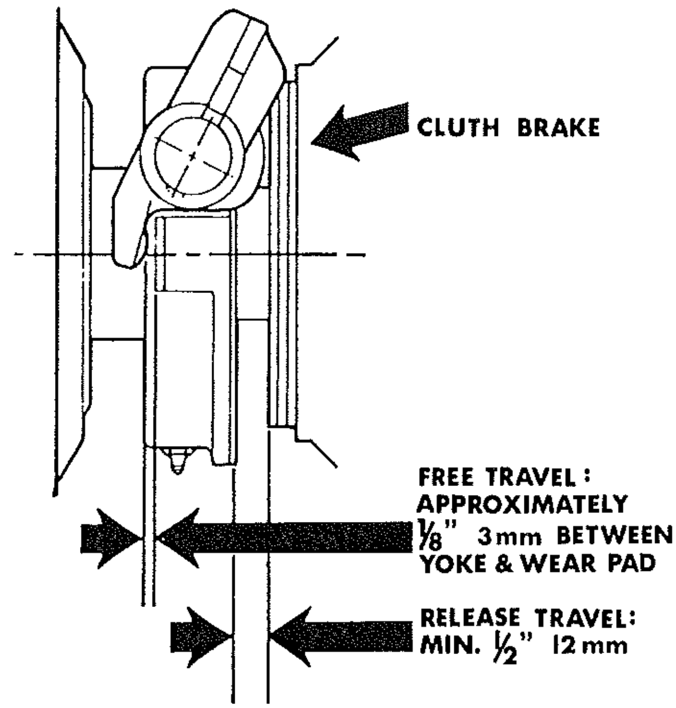


C. Clutch pedal must be down. Rotate adjusting ring until approximately 1" (2.5 cm) free pedal is acquired. Rotate clockwise to increase free pedal, counterclockwise to decrease.



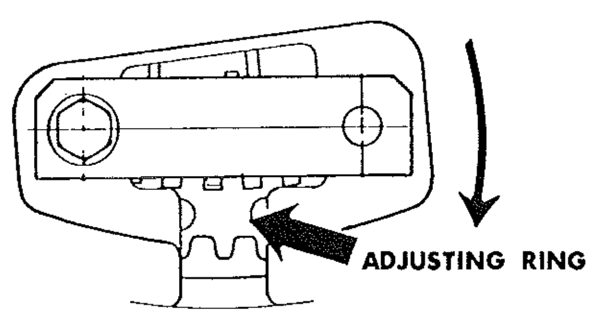
3. Visual inspection:

Visually check both free travel and release travel shown below.



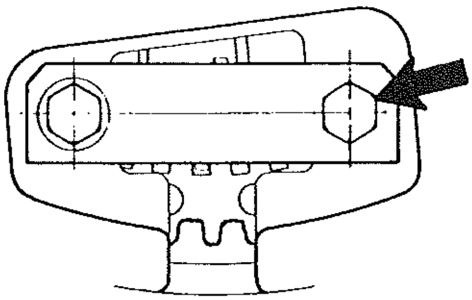
4. Reinstall lock strap:

A. Loosen left hand bolt, rotate adjuster assembly downward to engage worm and adjusting ring teeth. Adjusting ring may have to be rotated slightly to allow worm to mesh. Right hand bolt hole should be aligned.

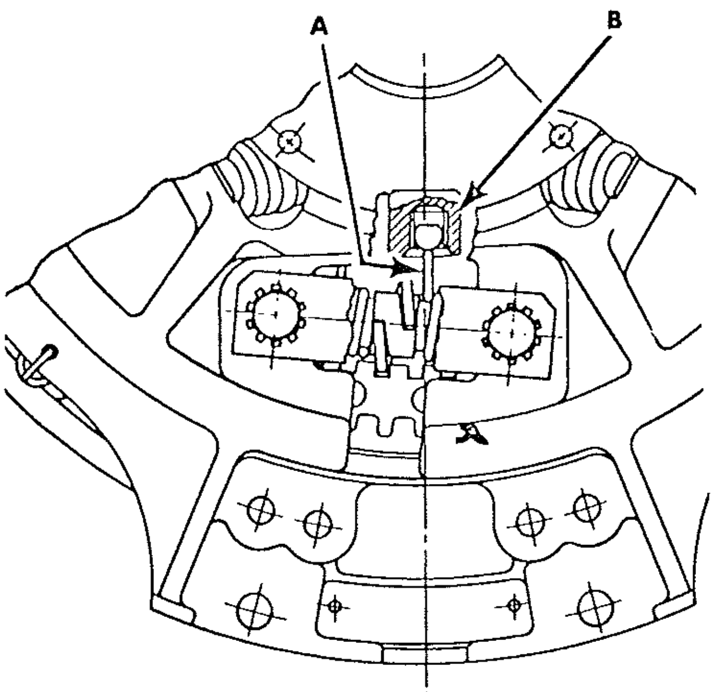


CLUTCH

B. Install right bolt and tighten both bolts at 30-35 ft. lbs. (41-46 N.m) torque.

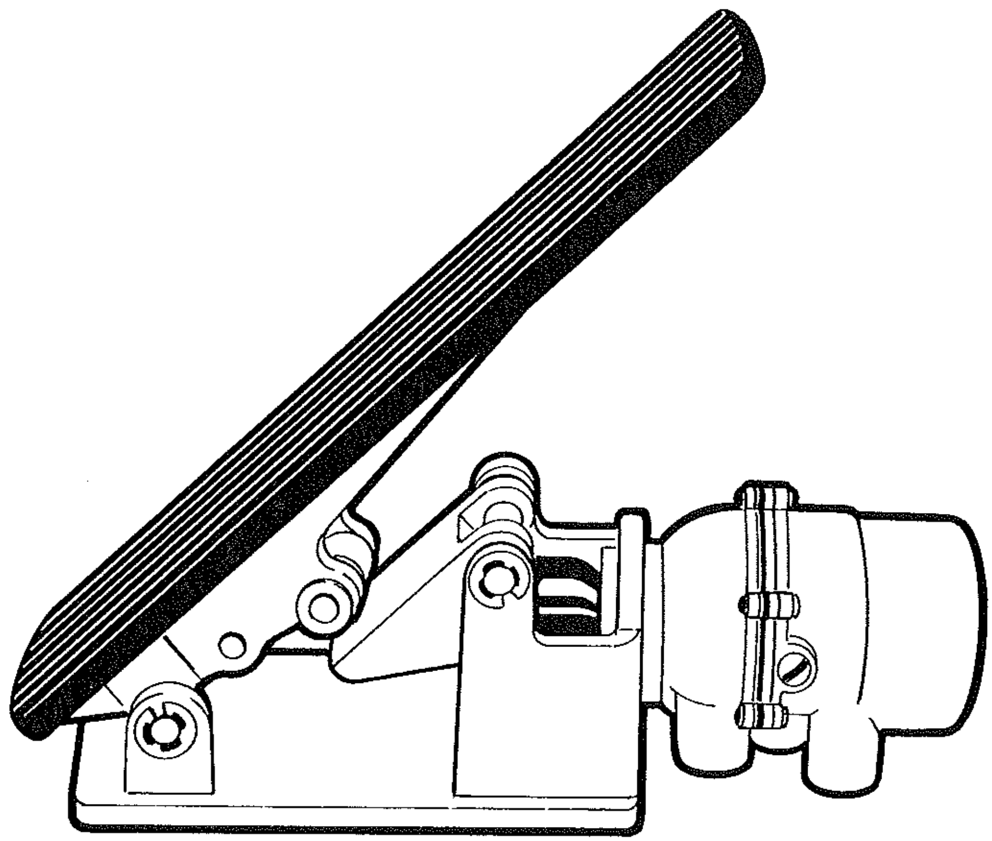


C. With pedal depressed, visually check to see if actuator arm (a) is inserted into release sleeve retainer (b). If adjusting assembly is installed properly, the adjuster assembely spring will move back and forth as pedal is stroked.

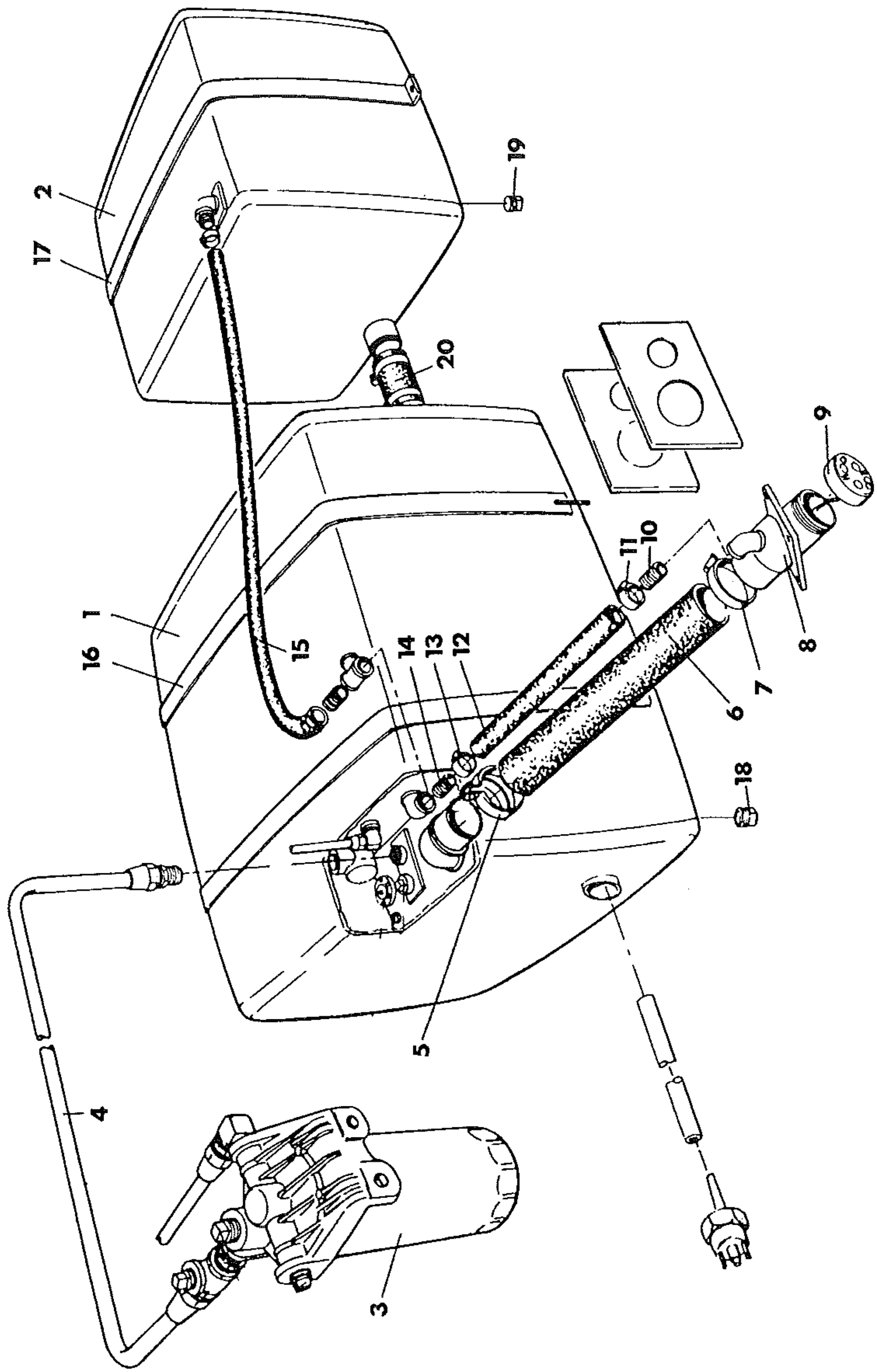


☐ **Note:** The clutch will not adjust if the actuator arm is not inserted into the release sleeve retainer, or release bearing travel is less than ½" 2.5 cm).

FUEL SYSTEM



FUEL SYSTEM



Fuel tank & mouting

FUEL SYSTEM

Fuel tank and mounting

1. Fuel tank — 160 gals U.S. (606 litres).
2. Auxiliary fuel tank — 90 gals U.S. (340 litres).
3. Fuel filter (primary).
4. Fuel line (from tank to filter).
5. Hose clamp.
6. Hose (filling system).
7. Hose clamp.
8. Filler neck.
9. Filler neck cap.
10. Insert.
11. Clamp.
12. Hose (vent system).
13. Clamp.
14. Insert.
15. Hose (auxiliary vent system).
16. Holding strap (main fuel tank).
17. Holding strap (auxiliary fuel tank).
18. Drain plug (main fuel tank).
19. Drain plug (auxiliary fuel tank).
20. Hose (auxiliary filling system).

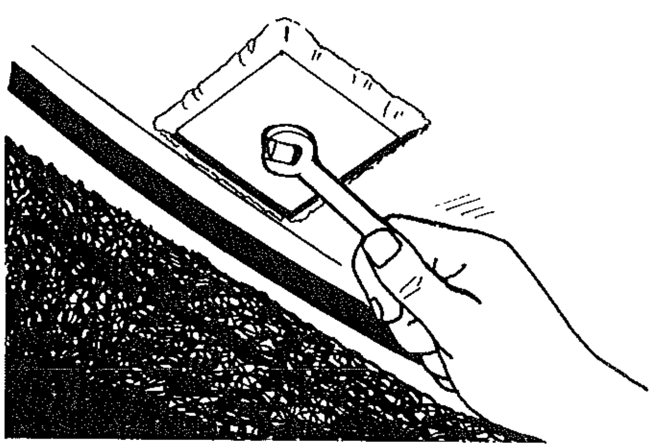
FUEL TANK DRAINING AND REMOVAL

(1) To remove the fuel tank, proceed as follows:

— Set battery main switch to «off» position.

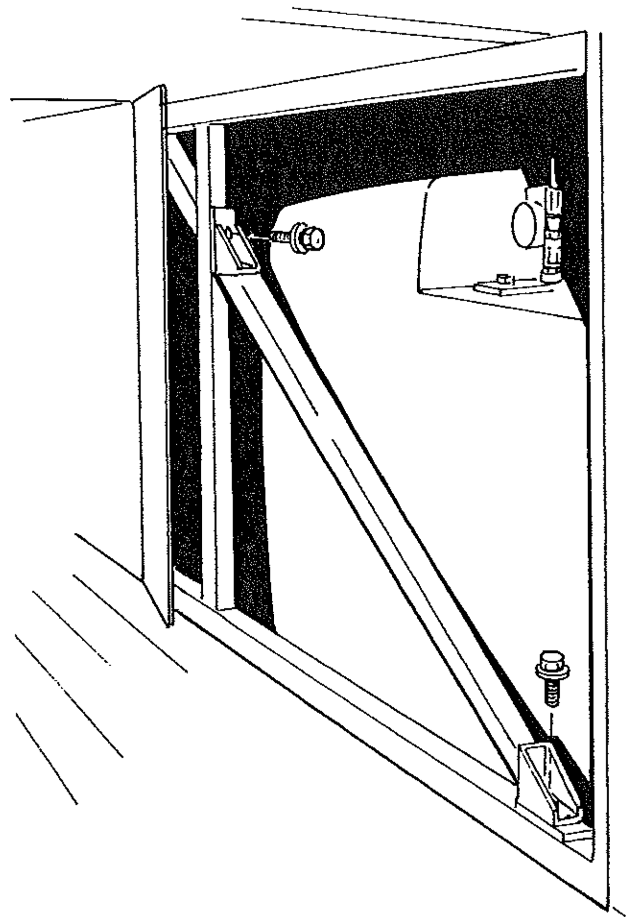
— From inside the last baggage compartment, remove the access panel facing the battery access door.

— Raise vehicle, then remove the drain plug (**18**) which is accessible directly from under the fuel tank.



— Vehicles equipped with an auxiliary fuel tank (**2**) remove the plastic cap which is located under the second baggage compartment then remove the drain plug (**19**) to drain the tank.

— Remove the structural bar which is fastened to the frame using two (2) bolts.



— From under the vehicle, loosen the holding strap screws (**16**) of the main fuel tank and from inside the second baggage compartment loosen the holding strap screws (**17**) of the auxiliary fuel tank if so equipped.

— Disconnect all piping and wiring which is connected to the main fuel tank and to the auxiliary fuel tank if so equipped.

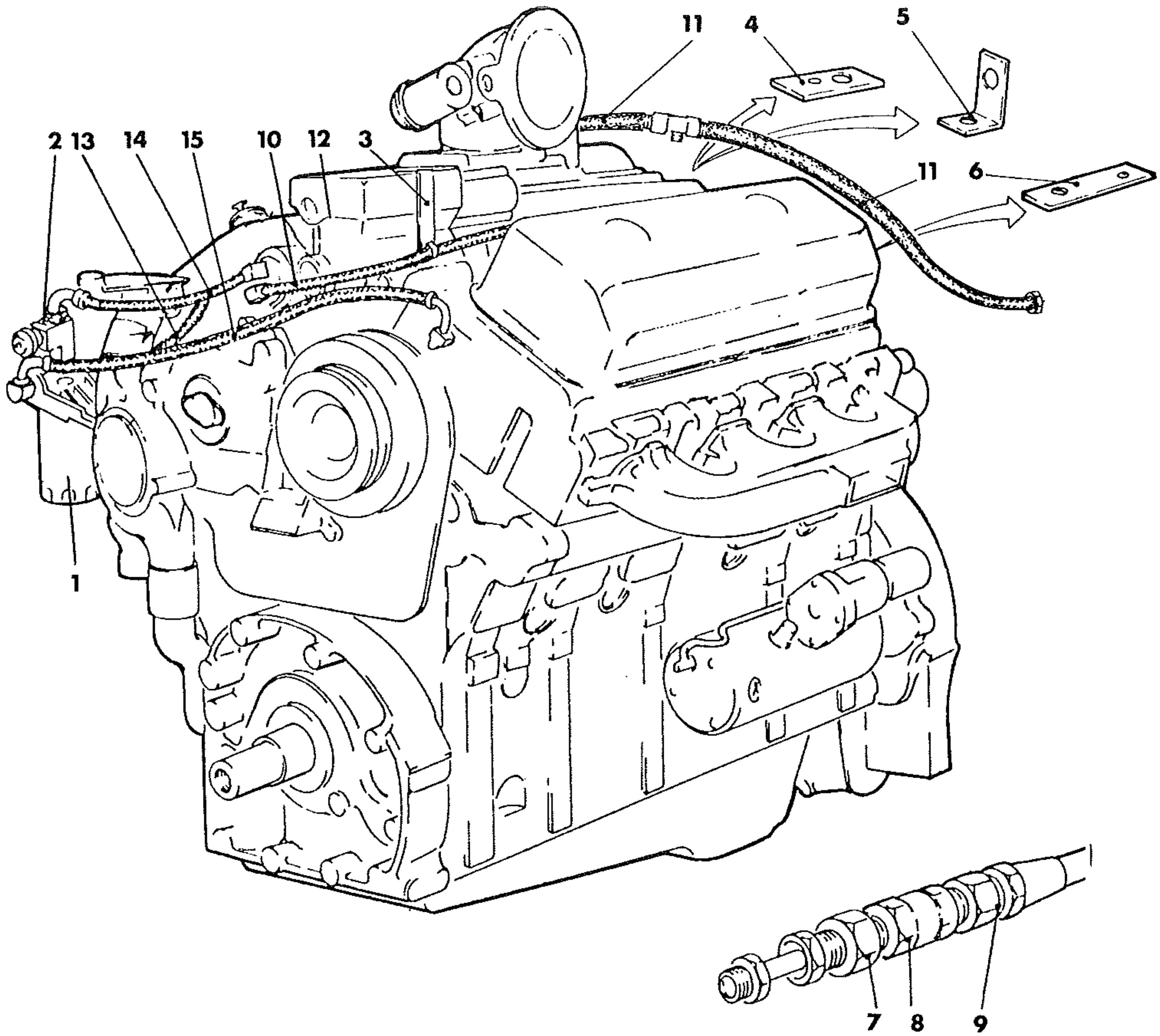
— Slightly lift then pull out the main fuel tank from inside the last baggage compartment.

■ **Caution:** Protective cushions or rags should be placed on the baggage compartment floor to prevent it from being scratched by the fuel tank while removing it.

— To remove the auxiliary fuel tank, if so equipped, slightly lift then pull out the auxiliary fuel tank using the same care as for the main fuel tank.

FUEL SYSTEM

Fuel lines installation



FUEL SYSTEM

Fuel tank installation

(1) Reverse removal procedure to reinstall both main fuel tank and auxiliary fuel tank.

Fuel filter servicing

(3) The primary fuel filter should be replaced at 8000 km (5000 miles). If water in any amount is regularly found in the fuel system, it is an indication that something is wrong in the method of handling and storing the full oil and a thorough investigation must be made to eliminate the trouble; then the fuel thank(s), lines and filter (s) should be drained, cleaned and a new element installed.

The secondary fuel filter (not shown) should be drained and/or replaced every 8000 km (5000 miles).

1. Fuel filter (secondary).
2. Connector (to filter).
3. Bracket.
4. Bracket (return line).
5. Bracket (return line).
6. Bracket.
7. Nut.
8. Nut.
9. Nut.
10. Fuel line.
11. Return line.
12. Fuel line.
13. Fuel line.
14. Fuel line.
15. Fuel line.

Maintenance

All fuel lines and connectors must be checked periodically to prevent leaks or loose connections. Two fuel lines run from the tank to the engine, one is the supply line and the other in the return line.

Fuel oil specifications

Detroit Diesel engines are designed and manufactured to operate on diesel fuels classified by the ASTM as Designation D-975 (grades 1-D and 2-D). These grades are very similar to grades DF-1 and DF-2 of Federal Specification VV-F-800. Residual fuels and furnace oils, generally, are not considered satisfactory for engines. In some regions, however, fuel suppliers may distribute one fuel that is marketed as either diesel fuel (ASTM D-975) or domestic heating fuel (ASTM D-369) sometimes identified as furnace oil. In this case, the fuel should be investigated to determine whether the properties conform with those shown in Table 2.

Table 2 will serve as a guide in the selection of the proper fuel for various applications. The fuel must be clean, completely distilled, stable, and non-corrosive. DISTILLATION RANGE, CETANE NUMBER, and SULFUR CONTENT, are three of the most important properties of diesel fuels that must be controlled to insure optimum combustion and minimum wear. Engine speed, load, and ambient temperature influence the selection of fuels with respect to distillation range and cetane number. The sulfur content of the fuel must be as low as possible to avoid excessive deposit formation, premature wear, and to minimize the sulfur dioxide exhausted into the atmosphere.

To assure that the fuel you use meets the required properties, enlist the aid of a reputable fuel oil supplier. The responsibility for clean fuel lies with the fuel supplier as well as the operator.

During cold weather engine operation, the cloud point (the temperature at which wax crystals begin to form in diesel fuel) should be 10°F (6°C) below the lowest expected fuel temperature to prevent clogging of the fuel filters by wax crystals.

At temperatures below -20°F (-29°C) particular attention must be given to the cooling system, lubricating system, fuel system, and cold weather starting aids for efficient engine starting and operation.

☐ **Note:** When prolonged idling periods or cold weather conditions below 32°F (0°C) are encountered, the use of lighter distillate fuels may be more practical. The same consideration must be made when operating at altitudes above 5000 feet.

FUEL SYSTEM

SPECIFICATION OR CLASSIFICATION GRADE	W-F-800 DF-1	ASTM D-975 1-D	W-F-800 DF-2	ASTM D-975 2-D
Flash Point, min.	104°F 40°C	100°F 38°C	122°F 50°C	125°F 52°C
Carbon Residue (10% residuum), % max.	0,15	0,15	0,20	0,35
Water & Sediment, % by vol., max.	0,01	trace	0,01	0,05
Ash, % by wt., max.	0,005	0,01	0,005	0,01
Distillation Temperature, 90% by vol. recovery, min.	—	—	—	540°F (282°C)
max.	572°F (300°C)	550°F (288°C)	626°F (330°C)	640°F (338°C)
End Point, max.	626°F (330°C)	— —	671°F (355°C)	— —
Viscosity 100°F (38°C)				
Kinematic, cs, min.	1,4	1,4	2,0	2,0
Saybolt, SUS, min.	—	—	—	32,6
Kinematic, cs, max.	3,0	2,5	4,3	4,3
Saybolt, SUS, max.	—	34,4	—	40,1
Sulfur, % by wt., max	0,50	0,50	0,50	0,50
Cetane No	45	40	45	40

Table 1: Federal Specs. and ASTM Diesel Fuel Properties

TYPICAL APPLICATION	GENERAL FUEL CLASSIFICATION	FINAL BOILING POINT	CETANE NO	SULFUR CONTENT
City Buses	No 1-D	(Max) 550°F (288°C)	(Min) 45	(Max) 0,30%
All Other Applications	Winter No 2-D Summer No 2-D	675°F 675°F (357°C)	45 40	0,50% 0,50%

Table 2: Fuel oil selection chart

☐ **Note:** Prevost Car Inc. recommends the use of no 1-D diesel fuel in all applications, however, no 2-D is acceptable.

Diesel fuel oils general factors

For satisfactory performance and long engine life the quality of fuel used for high speed diesel engine operation is very important. The fuel must used for high speed engine operation is very important. The fuel must be clean, completely distilled, stable and non-corrosive. Distillation range, cetane number and sulfur content are the three most important properties in the selection of diesel fuels for optimum combustion and minimum wear. Engine speed, load and atmospheric temperature influence the selection of fuel distillation range and cetane number. The sulfur content must be as low as possible to avoid excessive deposit formation and premature wear.

Fuel selected should be completely distilled material. Fuels marketed to meet Federal Specification W-F-800 (Grades DF-1 and DF-2) and ASTM Designation D-975 (grades 1-D and 2-D) meet the completely distilled criteria. Some of the general properties of W-F-800 and ASTMD-975 fuels are shown in Table 1.

Residual fuels and domestic furnace oils are not considered satisfactory for 8V-71 diesel engines.

☐ **Note:** Prevost Car Inc. does not recommend the use of drained lubricating oil as a diesel fuel oil.

FUEL SYSTEM

All diesel fuel oil contains a certain amount of sulphur. To high a sulfur content results in excessive cylinder wear due to acid build-up in the lubricating oil. For most satisfactory engine life, fuels containing less than 0,5% sulfur should be used.

Fuel oil should be clean and free of contamination. Storage tanks should be inspected regularly for dirt, water or water-emulsion sludge, and cleaned if contaminated. Storage instability of the fuel can lead to the formation of varnish or sludge in the tank. The presence of these contaminants from storage instability must be resolved with the fuel supplier.

For further information on engine fuel system components, refer to manufacturers diesel engine maintenance manual.

Fuel is drawn from the tank through the fuel strainer and enters the fuel pump at the inlet side. Fuel is then forced through the fuel filter into the fuel manifold, then to the inlet side of the injectors. Surplus fuel returns from the outlet side of the injectors to outlet fuel pipes, into the return manifold and back to the fuel tank.

Engine speed is controlled through the governor, details of which will be found in the manufacturer's diesel engine manual.

The accelerator linkage connects the accelerator pedal with the governor.

When the engine runs out of fuel the following procedure shold be followed for restarting the engine.
1. Fill the fuel tank with recommended fuel oil described earlier in this section. If only partial filling of the tank is possible, add a minimum of 10 gallons U.S. or 8 gallons Imp. (38 liters) of fuel.

2. Remove the primary fuel strainer shell and element and fill the shell with fuel. Install the shell and element.

3. Remove the secondary fuel filter shell and element and fill the shell with fuel. Install the shell and element.

4. Start the engine. Check the filters for leaks.

☐ **Note:** It may be necessary to remove a valve rocker cover and loosen a fuel pipe nut in order to bleed trapped air from the fuel system. Be sure the fuel pipe is retightened before replacing rocker cover.

Fuel flow check

Description

A fuel flow check may be performed by disconnecting flexible fuel return line from fitting at rear bulkhead. Place return line end in a convenient receptacle. As fuel must pass through return line restriction fitting, do not disconnect line at bracket on top of engine. Start engine and measure fuel flow for a period of one minute while maintaning an engine speed of 1200 R.P.M. A fuel flow of approximately 0,8 gallons U.S. or 0,6 gallon Imp. (3 liters) per minute is satisfactory.

Dip end of return line into container of fuel. Air bubbles rising to surface indicates that air is being drawn into fuel system on suction side of fuel pump. If air is present, tighten all fuel lines connections between fuel tank and fuel pump.

If fuel flow is insufficient for satisfactory engine performance, then check for faulty fuel lines, clogged fuel filters or fuel pump.

Priming fuel system

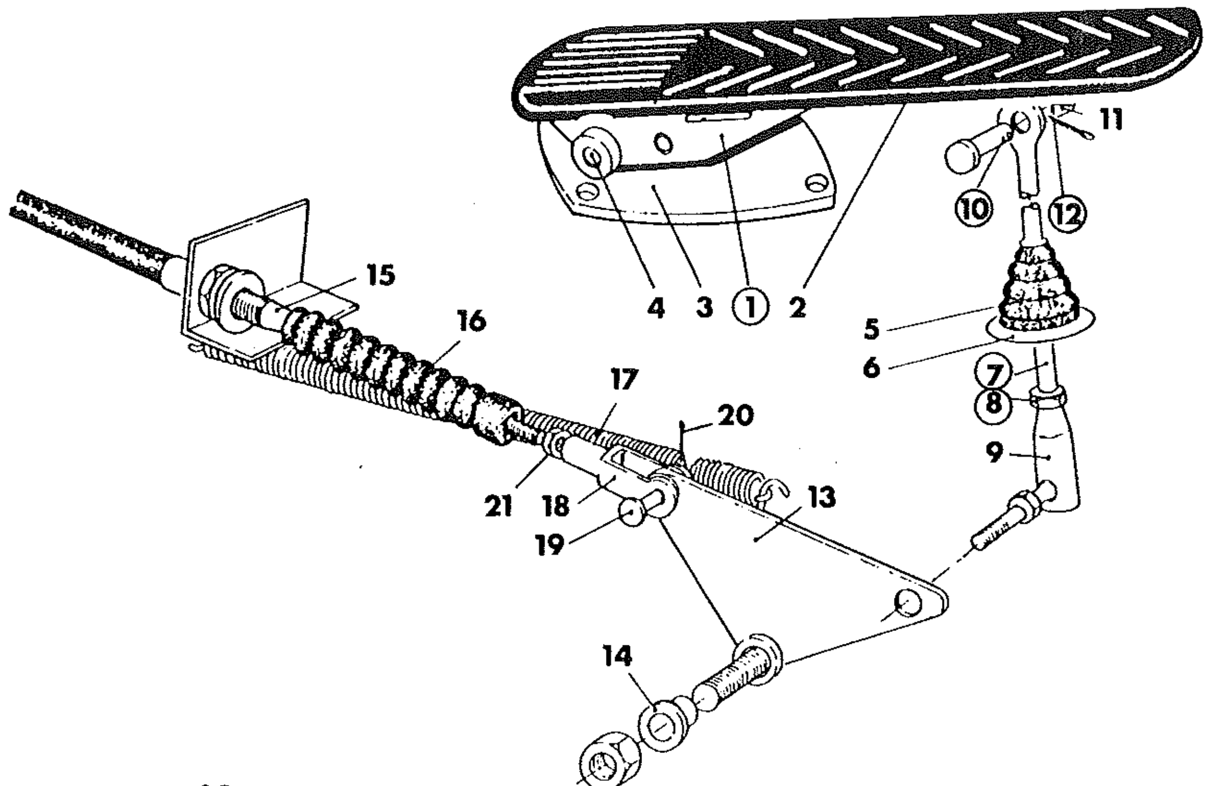
Description

The problem in restarting the engine after it runs out of fuel is that after the fuel is exhausted from the fuel tank, fuel is then pumped from the primary fuel strained and sometimes partially removed from the secondary fuel filter before the fuel supply becomes insufficient to sustain engine firing. The primary fuel strainer and the secondary fuel filter must be refilled with fuel and the fuel lines must be free of air in order for the system to provide adequate fuel for the injectors.

FUEL SYSTEM

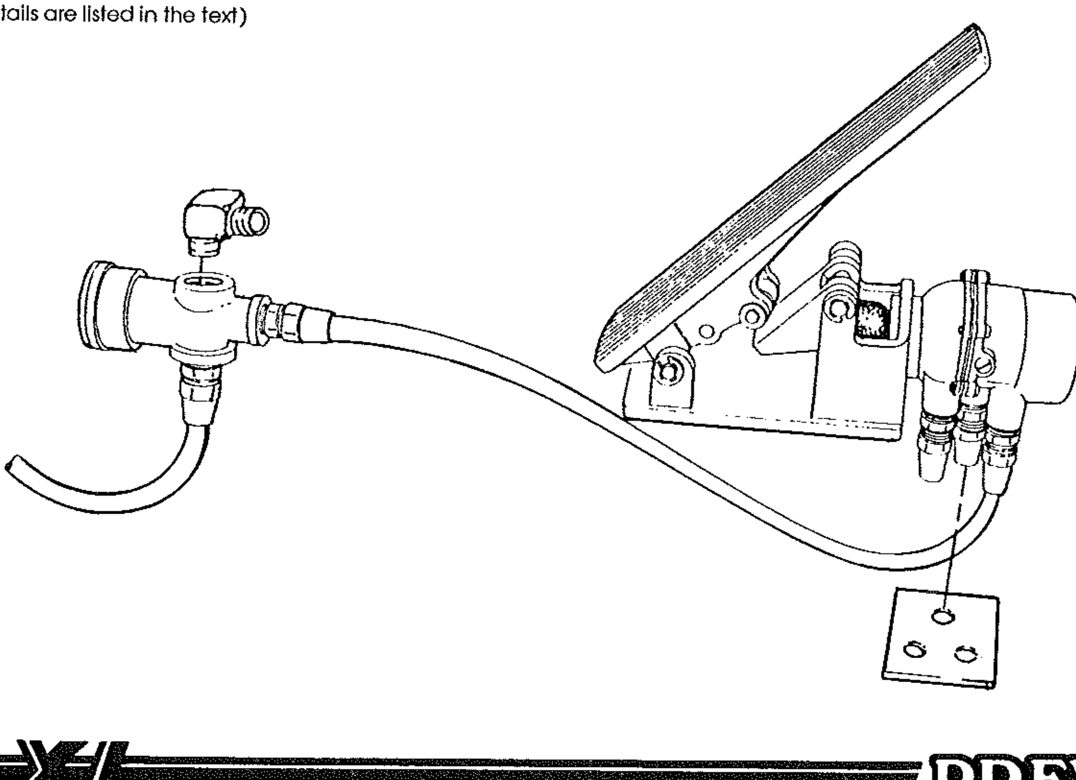
THROTTLE CONTROLS

MECHANICAL TYPE



AIR OPERATED TYPE – **22**

(Details are listed in the text)



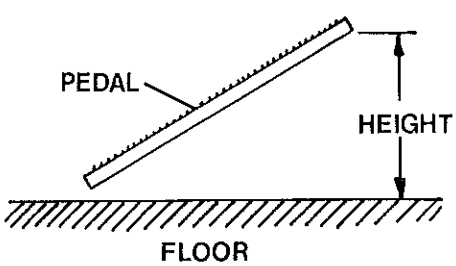
1. Throttle pedal.
2. Pedal cover.
3. Base.
4. Pivot.
5. Dust boot.
6. Ring.
7. Control rod.
8. Lock nut.
9. End yoke.
10. Pin.
11. Retainer.
12. Cotter pin.
13. Pivot flange.
14. Ring.
15. Cable.
16. Cable boot.
17. Return spring.
18. Cable attachment.
19. Pin.
20. Cotter pin.
21. Adjusting nut.
22. Air operated throttle control (details in text).

Adjustement procedure

Mechanical type

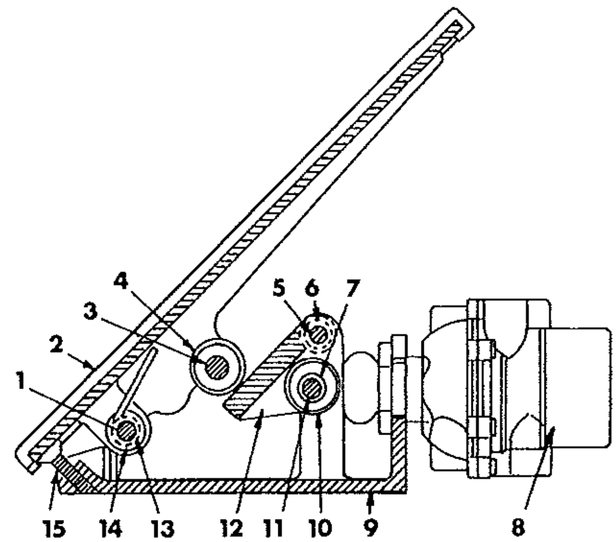
To adjust mechanical type, proceed as follow:

— The pedal height (1) should be 206 mm (8½") as shown.



— To obtain this value remove the cotter pin (12) and the pin (10) then loosen the lock nut (8) and turn the adjusting rod (7) clockwise or counterclockwise to the proper height. Reinstall the pin (10) and a new cotter pin(12) then secure the adjustment using the lock nut (8).

Air operated type



1. Pin.
2. Pedal.
3. Pin.
4. Roller.
5. Pin.
6. Bushing.
7. Pin.
8. Control valve.
9. Pedal base.
10. Roller.
11. Retaining ring.
12. Transfer lever.
13. Bushing.
14. Torsion spring.
15. Stop screw.

Disassembly, cleaning and assembly

1. Remove the retaining rings on the throttle heel pivot pin and the transfer lever pivot pins. Remove the pins, throttle, and transfer lever.

2. Remove the actuating rollers from the underside of the treadle and the transfer lever.

3. Pull the dust boot and actuating plunger out of the control valve.

4. Clean all metal parts in a suitable cleaning solvent and air dry them.

5. Clean the bore of the control valve with a clean cloth dampened with solvent. Do not let solvent get into the control valve.

FUEL SYSTEM

6. Check for excessive worn, damaged, or corroded parts, and replace kparts as required.

7. Wipe the dust boot clean and install it and the rod plunger in the control valve and rod plunger.

8. Clean and lubricate all pivot pins with a dry or drying type lubricant prior to reassembly. Do not use grease or oils as these will attract and retain contaminants.

9. Reinstall the throttle roller and put the throttle back on the treadle base, taking care to engage the torsion spring coils with the heel pivot pin.

10. Reinstall the transfer lever roller and put the transfer lever back on the treadle base, making sure that all retaining rings are installed.

11. If the control valve exhausts air out of the exhaust port when the pedal is depressed; or if the valve operation is sticky or sluggish; or if the body seam leaks excessively, the valve must be repaired and/or replaced.

Testing throttle valve operation

Replace throttle pats as required by inspection. The heel rest stop screw is factory set and sealed: DO NOT adjust it. There are no required adjustments for the treadle valve assembly.

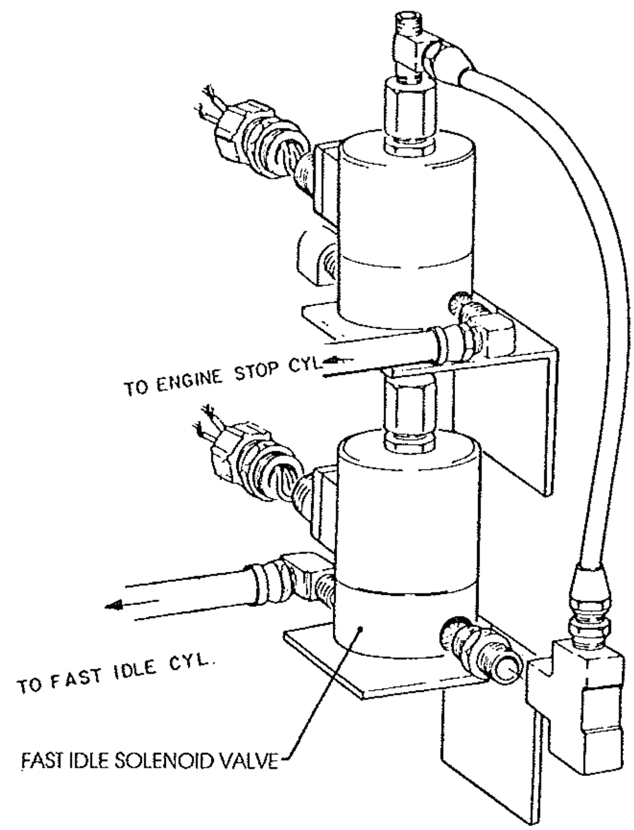
1. Pressurize the throttle valve with the air supply at normal operating pressure.

2. Depress the throttle completely. The engine throttle lever should go to the full throttle position.

3. Release the throttle valve. The engine throttle should immediately move to the idle position.

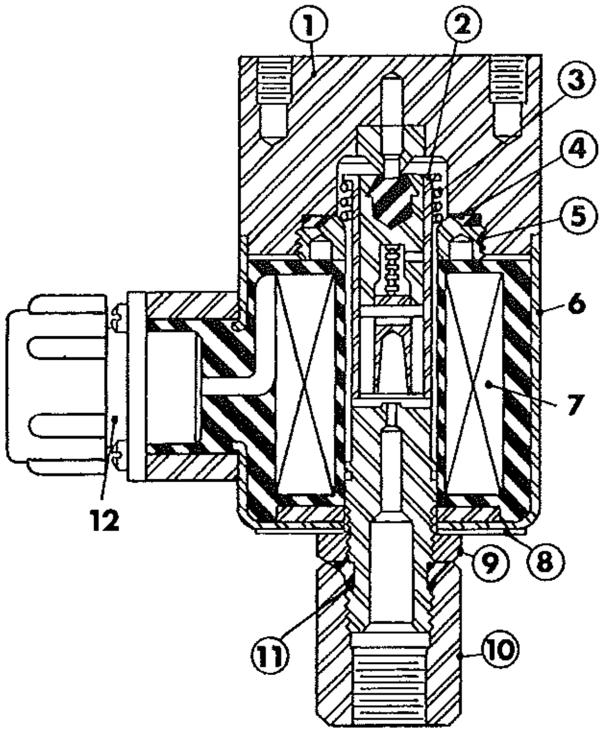
4. Movement of the valve throttle should be free without sticking or binding.

5. Check the valve and fittings for leakage by applying a soap solution to the exhaust port and all joints.



FUEL SYSTEM

Fast idle solenoid valve



1. Valve Body.
2. Plunger Assembly.
3. Spring.
4. Sleeve Seal.
5. Sleeve Assembly.
6. Housing.
7. Coil.
8. Name Plate.
9. Sleeve Nut.
10. Adapter (Air).
11. Adapter Seal.
12. Wiring Connector.

The fast idle solenoid is munted on the engine bulkhead and supplies air to the fast idle air cylinder and the fast idle limiting air cylinder. When the fast idle button switch is placed in «ON» position and the transmission shift lever is in the «NEUTRAL» position, air pressure is supplied to the fast isle solenoid valve. The valve plunger assembly is moved away from the inlet passage and closes the air exhaust opening, thereby applying air pressure to the fast idle air cylinder and the limiting air cylinder.

Disassembly

Remove adapter (10) and seal (11) from valve assembly, then remove sleeve nut (9) which holds housing and coil assembly to sleeve (5). Remove name plate (8).

Remove housing and coil assembly by sliding off lower end of sleeve assembly (5).

Using a spanner wrench (Skinner VO-233) or equivalent, remove sleeve assembly (5), plunger (2) and spring (3) from valve body (1).

Separate plunger and spring from sleeve and remove seal (4) from valve body.

☐ **Note:** Seals (4) and (11) should be discarbed and new seals used when assembling the valve.

Assembly

Examine the valve seats and mating surfaces and check condition of spring. Obtain new parts as required.

Assemble spring (3) on plunger (2), then insert plunger into sleeve assembly (5).

Place new seal (4) in valve body, then screw sleeve into body using spanner wrench.

Assemble housing and coil assembly over sleeve, then install name plate (8) and sleeve nut (9).

☐ **Note:** Overtightening nut (9) will put excessive stress on sleeve. Tighten nut only as necessary to seat parts solidly.

Place new seal (11) in valve assembly and install adapter (10).

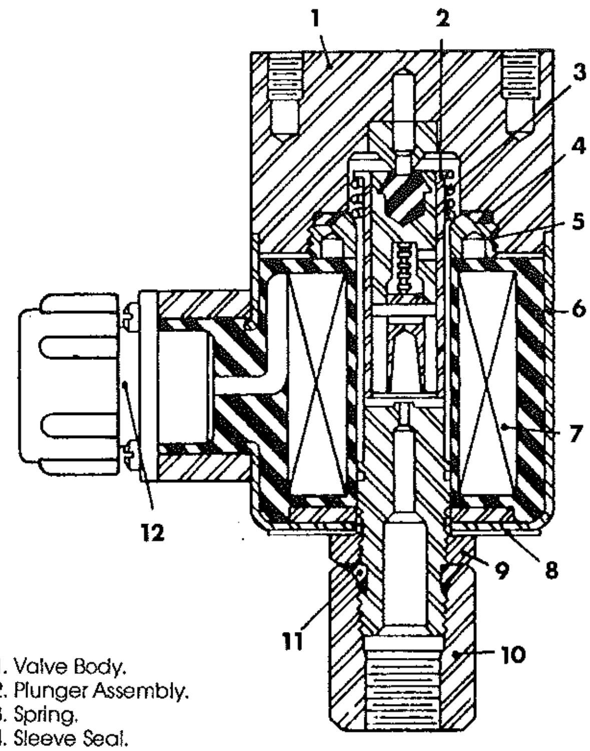
Engine stop solenoid valve

A solenoid valve on the engine bulkhead is used to supply air pressure from the system supply air tank to the engine fuel shut-off air cylinder located on the governor cover. When the ignition switch is rotated to the «RUN» position, the solenoid is energized to cut off air to the air cylinder to render the starting system operative.

When the ignition switch is rotated to «OFF» position, electrical circuit to the solenoid valve is opened and a spring-loaded plunger within the solenoid valve opens the delivery port and closes the exhaust port of the solenoid. Pressurized air from the solenoid is directed into the fuel shut-off air cylinder, forcing the piston rod out against a lever on the governor housing which in turn forces the lever to the no-fuel position, causing the engine to stop.

The solenoid valve can be disassembled for cleaning and inspection. The plunger, spring and seals are available for service replacement.

FUEL SYSTEM



1. Valve Body.
2. Plunger Assembly.
3. Spring.
4. Sleeve Seal.
5. Sleeve Assembly.
6. Housing.
7. Coil.
8. Name Plate.
9. Sleeve Nut.
10. Adapter (Air).
11. Adapter Seal.
12. Wiring Connector.

Solenoid Valve Disassembly

— Remove adapter (10) and seal (11) from the valve, then remove sleeve nut (9) which holds the housing and coil assembly to sleeve assembly (5). Remove the name plate.

— Remove housing and coil assembly by sliding off lower end of sleeve assembly.

— Using a spanner wrench (Skinner, VO-233) remove sleeve, plunger, and spring (5, 2 and 3) from valve body (1).

— Separate plunger and spring from sleeve and remove seal (4) from the valve body. Discards seals (4) and (11) and obtain new seals for use when assembling the valve.

Solenoid Valve Assembly

Examine valve seats and mating surfaces and check condition of the valve spring. Obtain new parts as required and assemble the solenoid as follows:

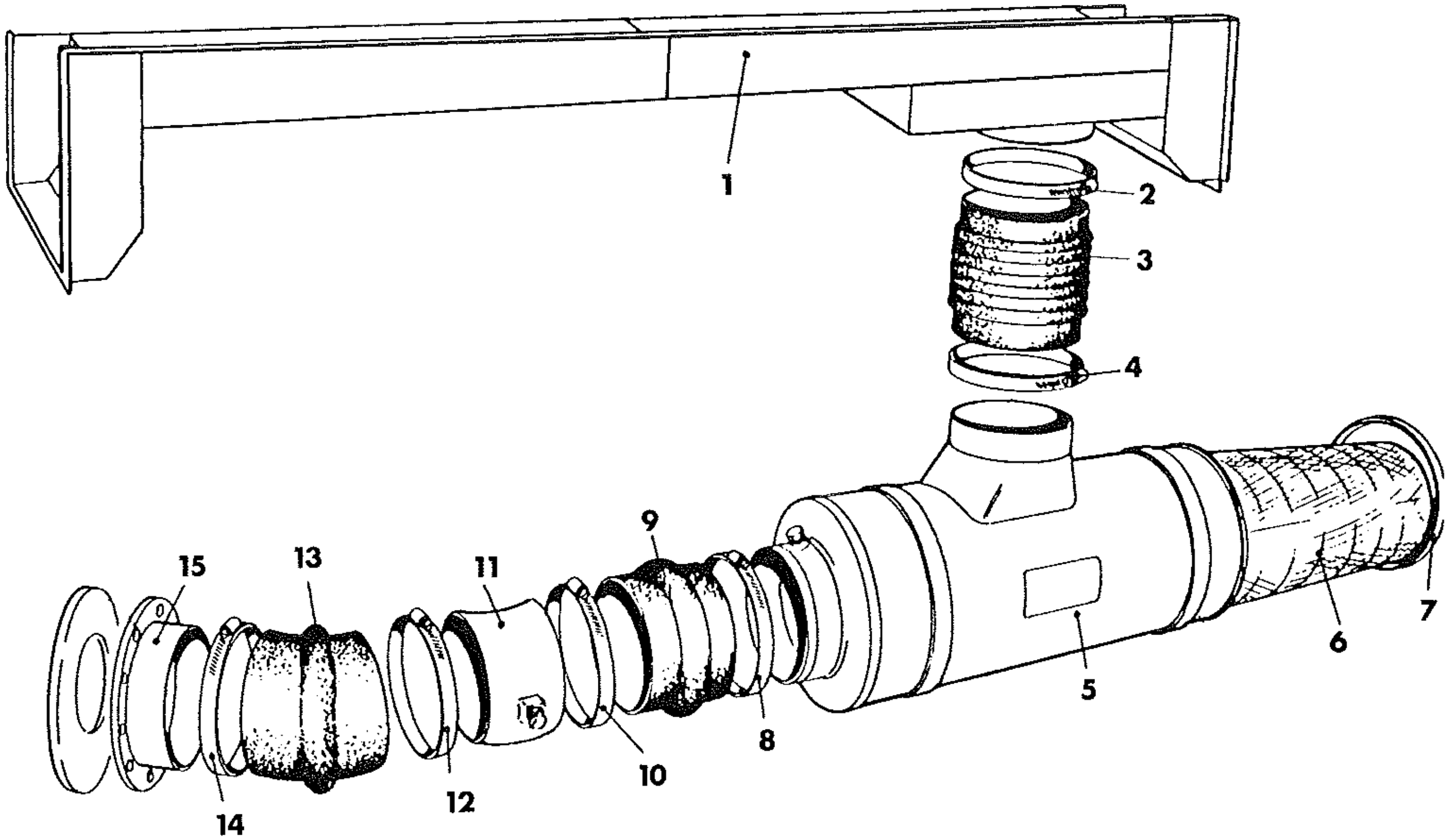
— Assemble spring (3) on plunger (2), then insert plunger into sleeve assembly (5).

— Place a new seal (4) in valve body, then screw sleeve into body using a spanner wrench.

— Assemble housing and coil assembly over sleeve, then install name plate (8) and sleeve nut (9).

FUEL SYSTEM

Air intake and air cleaner installation



1. Air intake duct.
2. Gear clamp.
3. Adaptor (duct to air cleaner body).
4. Gear clamp.
5. Air cleaner body.
6. Air cleaner element.
7. Air clener cover.
8. Gear clamp.
9. Adaptor (rubber).
10. Gear clamp.
11. Adaptor (steel).
12. Gear clamp.
13. Elbow (rubber).
14. Gear clamp.
15. Intake connector.

Service intervals

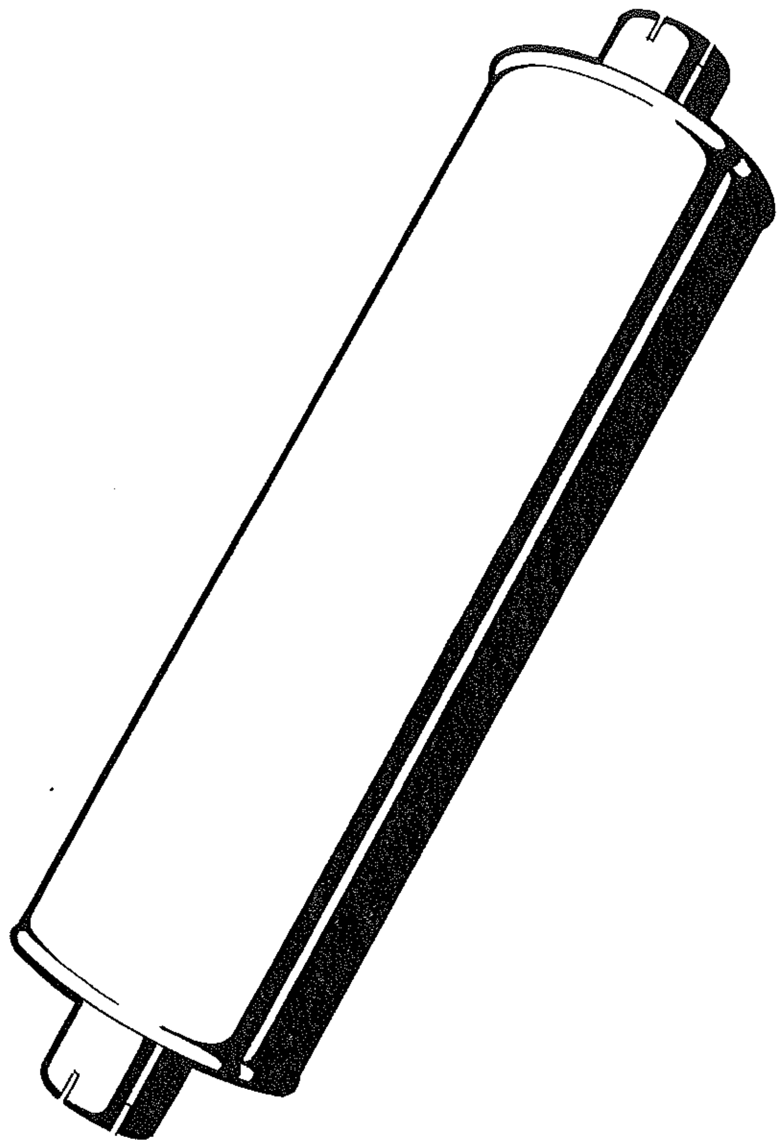
— (5) Inspect the air cleaner for cracks and loose mounting bolts and nuts.

— Check to be sure the restriction indicator is not loose or damaged.

— (2) (4) (8) (10) (12) (14) Check clamps for tightness. Tighten loose gear clamps and replace them if damaged.

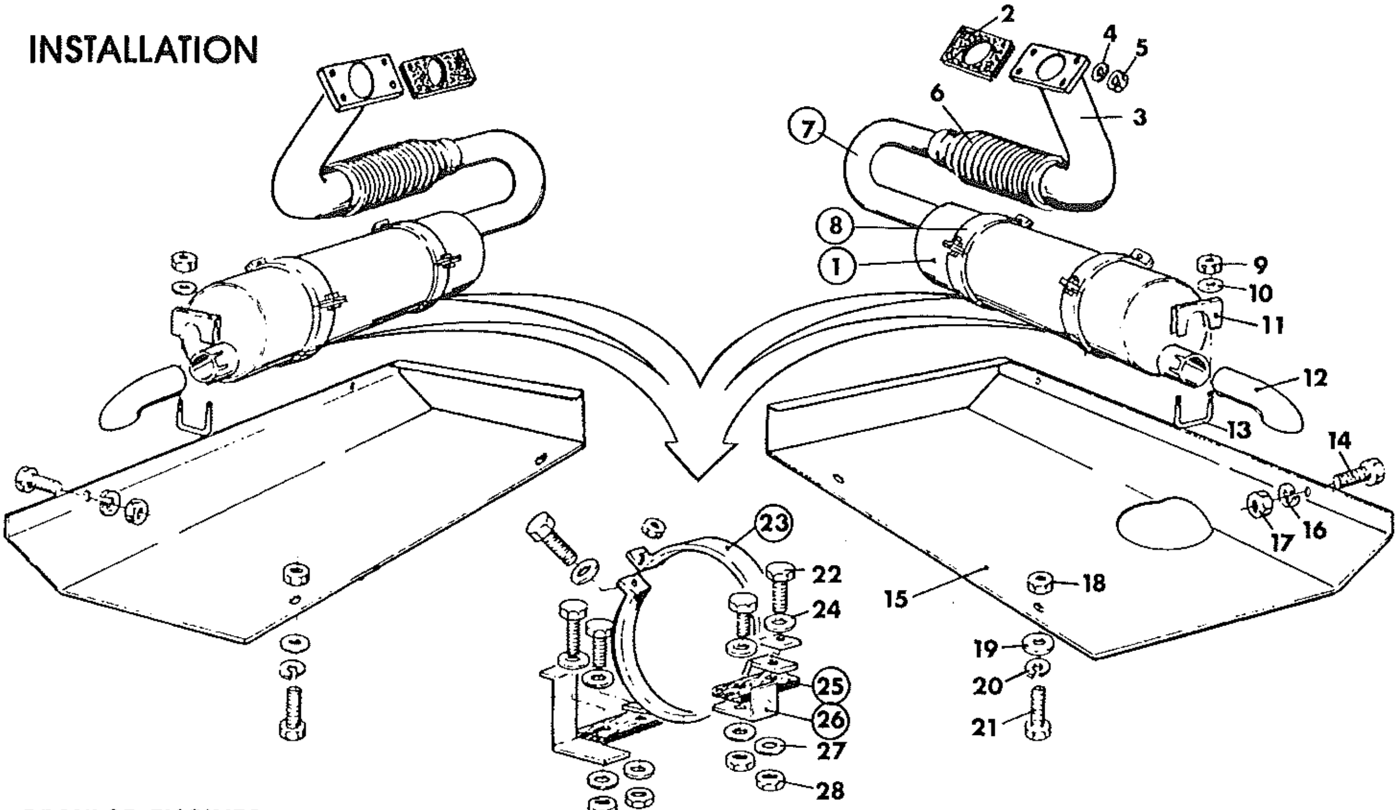
— (6) (7) Replace air cleaner element when restriction indicator shows it. See instructions on filter body.

EXHAUST SYSTEM

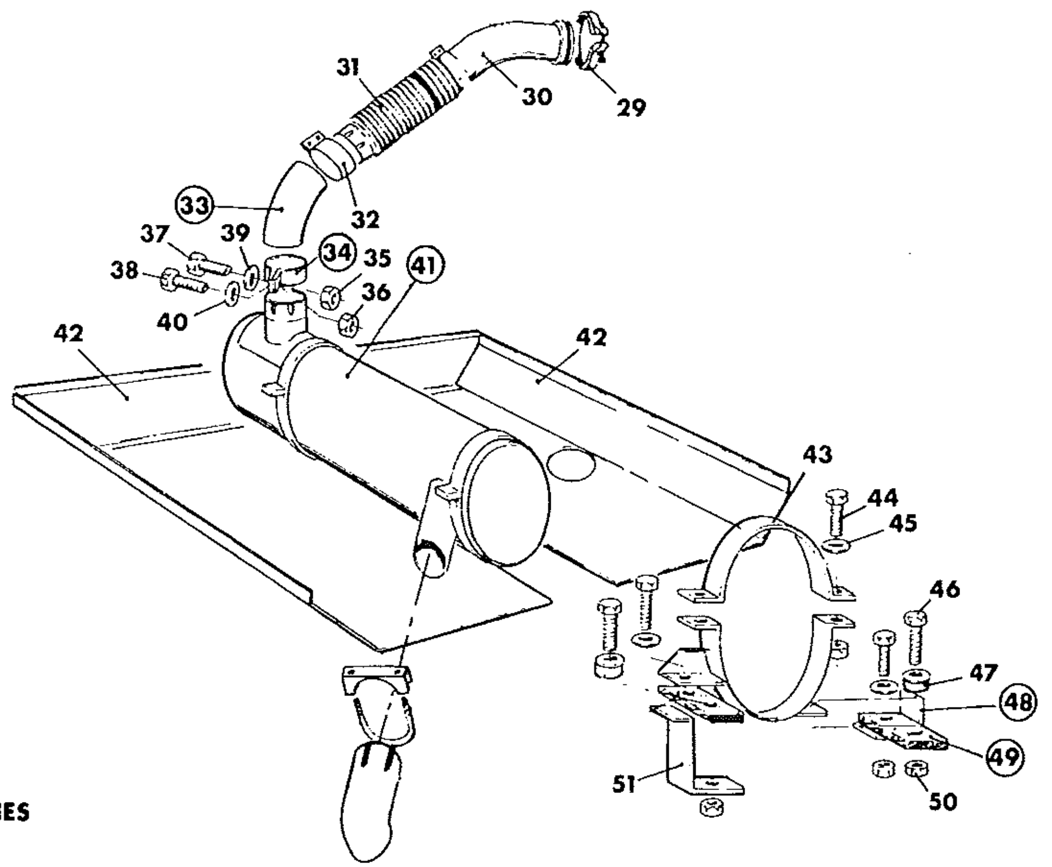


EXHAUST

INSTALLATION



REGULAR ENGINES



TURBO ENGINES

EXHAUST

ITEMS DESCRIPTIONS

1. Muffler (regular engines).
2. Insulator.
3. Connector pipe.
4. Washer.
5. Nut.
6. Flexible connector.
7. Connector pipe.
8. Muffler clamp.
9. Nut.
10. Washer.
11. Clamp.
12. Pipe (outlet).
13. U clamp.
14. Bolt.
15. Muffler pan.
16. Lockwasher.
17. Nut.
18. Nut.
19. Washer.
20. Lockwasher.
21. Bolt.
22. Bolt.
23. Clamp.
24. Washer.
25. Rubber spacer.
26. Bracket.
27. Washer.
28. Nut.
29. Clamp.
30. Connector pipe.
31. Flexible connector.
32. Clamp.
33. Connector pipe.
34. Clamp.
35. Nut.
36. Nut.
37. Bolt.
38. Bolt.
39. Washer.
40. Washer.
41. Muffler (turbo engines).
42. Muffler pan.
43. Clamp.
44. Bolt.
45. Washer.
46. Bolt.
47. Washer.
48. Bracket.
49. Rubber spacer.
50. Nut.
51. Bracket.

● **Warning:** Avoid breathing exhaust gases because they contain carbon monoxide which by itself has no odor or color. Carbon monoxide is dangerous gas. It can cause unconsciousness and can be lethal. If at any time you suspect exhaust fumes are entering the coach, determine and correct the cause as soon as possible.

It is recommended that the exhaust system be inspected as follows:

— At vehicle inspection interval
— Wherever a change is noticed in the sound of the exhaust system
— Wherever the exhaust system is damaged.

When operating the engine in a service garage or in a closed area, the exhaust system must be vented to the outside. Place the shop vent hose(s) over the exhaust outlet pipe(s).

General description

The muffler(s) is (are) rubber mounted to the vehicle frame. This feature reduces the transmission of vibrations to the muffler(s) thus resulting in extended life for muffler(s), brackets and other components.

Maintenance

The exhaust system should be inspected periodically for restrictions and leaks. Kinks or crimped pipes can result in excessive back pressure which can cause increased fuel consumption, power loss, and possible damage to the combustion chamber components. Exhaust leaks are commonly the result of loose clamp bolts, corroded pipes, or a punctured muffler. Damaged components should be replaced immediately.

Muffler replacement

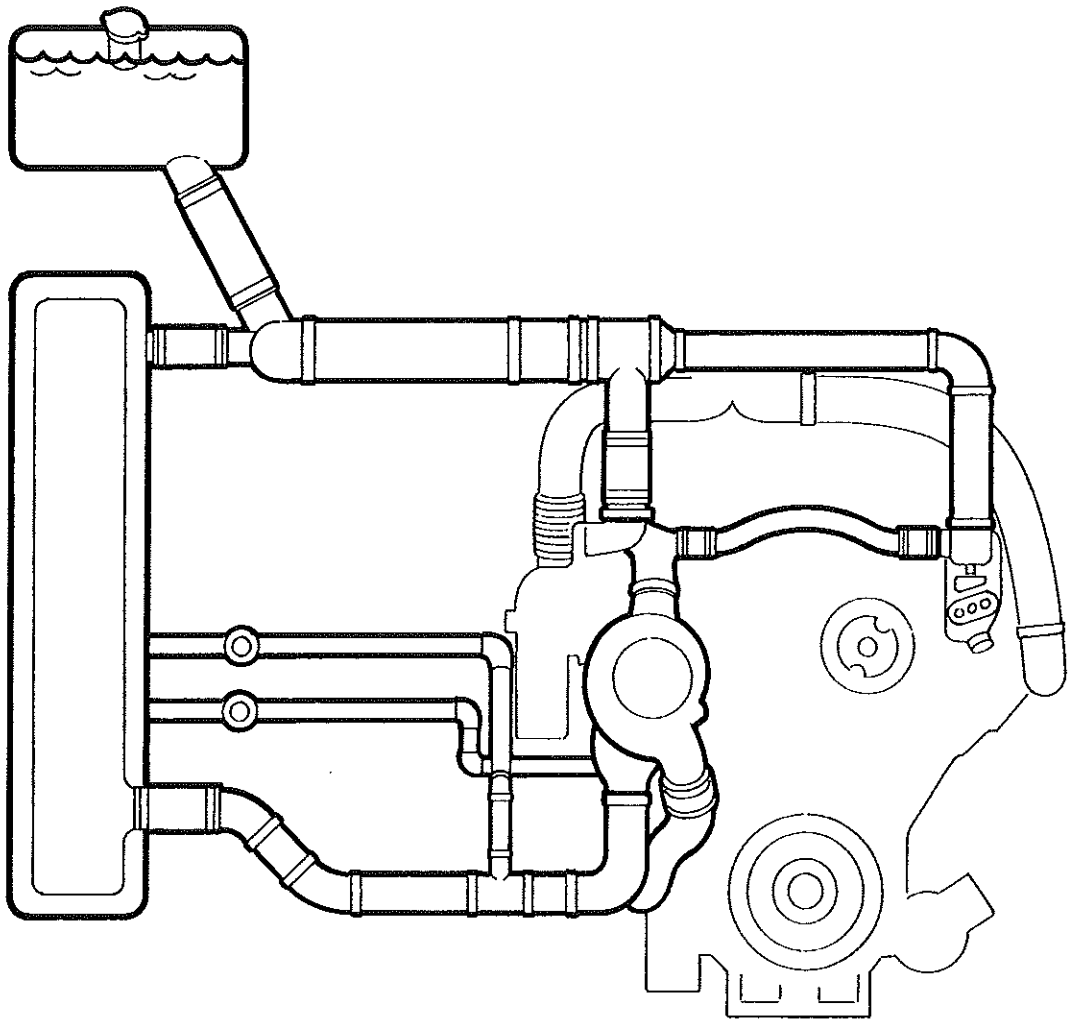
The muffler is mounted on rubber spacers using two retaining clamps. 1 8 25 41 43 49

To remove the muffler,
— Remove the muffler pan 42 (if applicable).
— Loosen muffler clamps at muffler pipe 7 33
— Loosen muffler clamps at muffler bracket(s) 23 26 43 48
— Remove muffler(s) from its location
— Inspect rubber spacers for damage and replace if necessary 25 49

To install the muffler
— Reverse removal procedure.

● **Warning:** Always be sure that muffler and components are cold prior to performing any procedure on them.

COOLING SYSTEM



COOLING SYSTEM

Description

The function of the coolant is to absorb the heat which develops as a result of the combustion process in the engine. In addition, the heat absorbed by the oil is removed by the engine coolant in the oil-to-water oil cooler.

The water pump, located on the engine, pumps the coolant through the engine oil cooler and cylinder heads. From the cylinder heads the coolant flows up into the radiators and then passes down to the water pump, completing the cycle.

The major components of the cooling system are the coolant, radiators, blower gear box and surge tank. These components, as well as the minor ones, are covered in more detail later in this section.

Coolant requirements

Successful engine operation depends on the correct selection and maintenance of the coolant. A suitable coolant must meet the following requirements:

1. Provide adequate heat transfer.

2. Maintain a corrosion resistant environment within the cooling system.

3. Prevent the formation of scale and sludge deposits in the cooling system.

4. Be compatible with the cooling system hose and seal materials.

5. Provide adequate freeze protection during cold weather operation.

Although requirements 1 through 4 are satisfied by combining a suitable water and corrosion inhibitor, Prevost Car recommends the use of a 50-50 solution of water and an ethylene glycol base permanent type antifreeze.

■ **Caution:** Do not use a methoxy propanol base antifreeze as a coolant. This type of antifreeze has a deteriorating affect on some seal materials within the engine.

Coolants & inhibitors

Water

Any water, whether of drinking quality or not, will produce a corrosive environment in the cooling system.

Scale deposits may form on the internal surfaces of the cooling system due to the mineral content of the water. Therefore, any water selected for use as a coolant must be properly treated with inhibitors to control corrosion and scale deposition.

To determine whether water is suitable for use as a coolant when properly inhibited, the following characteristics must be considered: the concentration of chlorides and sulfates, which will accelerate corrosion, the total hardness (percentage of magnesium and calcium present) of the water, which will cause scale deposits, and the total dissolved solids, which may cause scale deposits, sludge deposits corrosion, or a combination of any of these. Chloride, sulfates, magnesium and calcium are only some of the minerals that make up dissolved solids. Water within the limits specified in Tables 1 and 2 is satisfactory as an engine coolant when proper inhibitors are added.

Corrosion inhibitors

A corrosion inhibitor is any water soluble compound which protects the metallic surfaces of the cooling system against corrosive attack. Some of the more commonly used corrosion inhibitors are chromates, borates, nitrates and soluble oil. Depletion of all types of inhibitors occur through normal operation and therefore, strength levels must be maintained by the addition of inhibitors at prescribed intervals.

Chromates

Sodium chromate and potassium chromate are two of most commonly used corrosion inhibitors. Care should be exercised when handling these materials due to their toxic nature.

Chromate inhibitors should not be used with ethylene glycol permanent type antifreeze. Chromium Hydroxide, commonly called «green slime» will result from using chromate inhibitors with ethylene glycol base antifreeze. This material deposits in the cooling system passages, reducing the heat transfer rate causing the engine to overheat. Engines which have operated with chromate inhibited water must be chemically cleaned before the addition of an ethylene glycol base antifreeze. A heavy duty commercial de-scaling solvent should be used in accordance with the manufacturer's recommendations for this purpose.

Soluble oil

Soluble oil has long been used as a corrosion inhibitor. It has however, required very close attention to the concentration level due to loss of heat transfer characteristics if the concentration exceeds 1% by volume. For example, 1¼% of soluble oil in the cooling system increases the fire deck temperature 6% and a 2¼% concentration raises the fire deck temperature up to 15%. For this reason soluble oil is not recommended as a corrosion inhibitor.

COOLING SYSTEM

Non-chromates

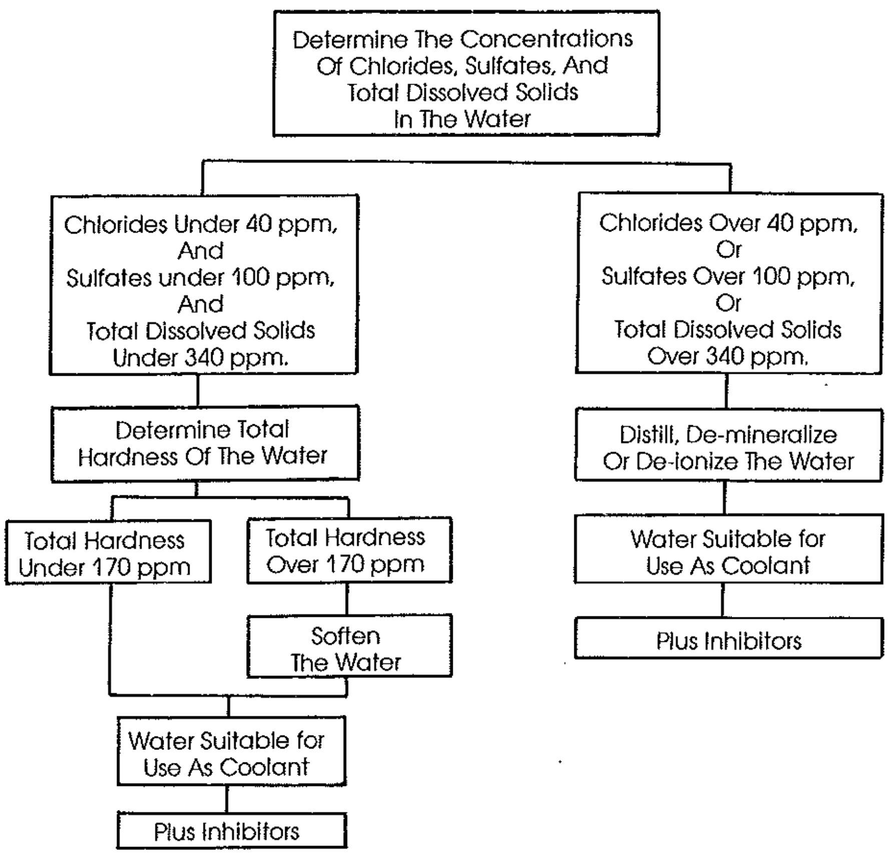
Non-chromate inhibitors (borates, nitrates, etc.) provide excellent corrosion prevention in the cooling system with the added advantage that they can be used with either water or an ethylene glycol antifreeze. Non-chromate inhibitors are strongly recommended for use in Prevost vehicles.

Determining the suitability of water for use as a coolant

	PARTS PER MILLION	GRAINS PER GALLON*
Chlorides (Maximum)	40	2.5
Sulfates (Maximum)	100	5.8
Total Dissolved Solids (Maximum)	340	20
Total Hardness (Maximum)	170	10

Refer to Table 2 for evaluation of water intended for use in a coolant solution.

* 4.5 litres

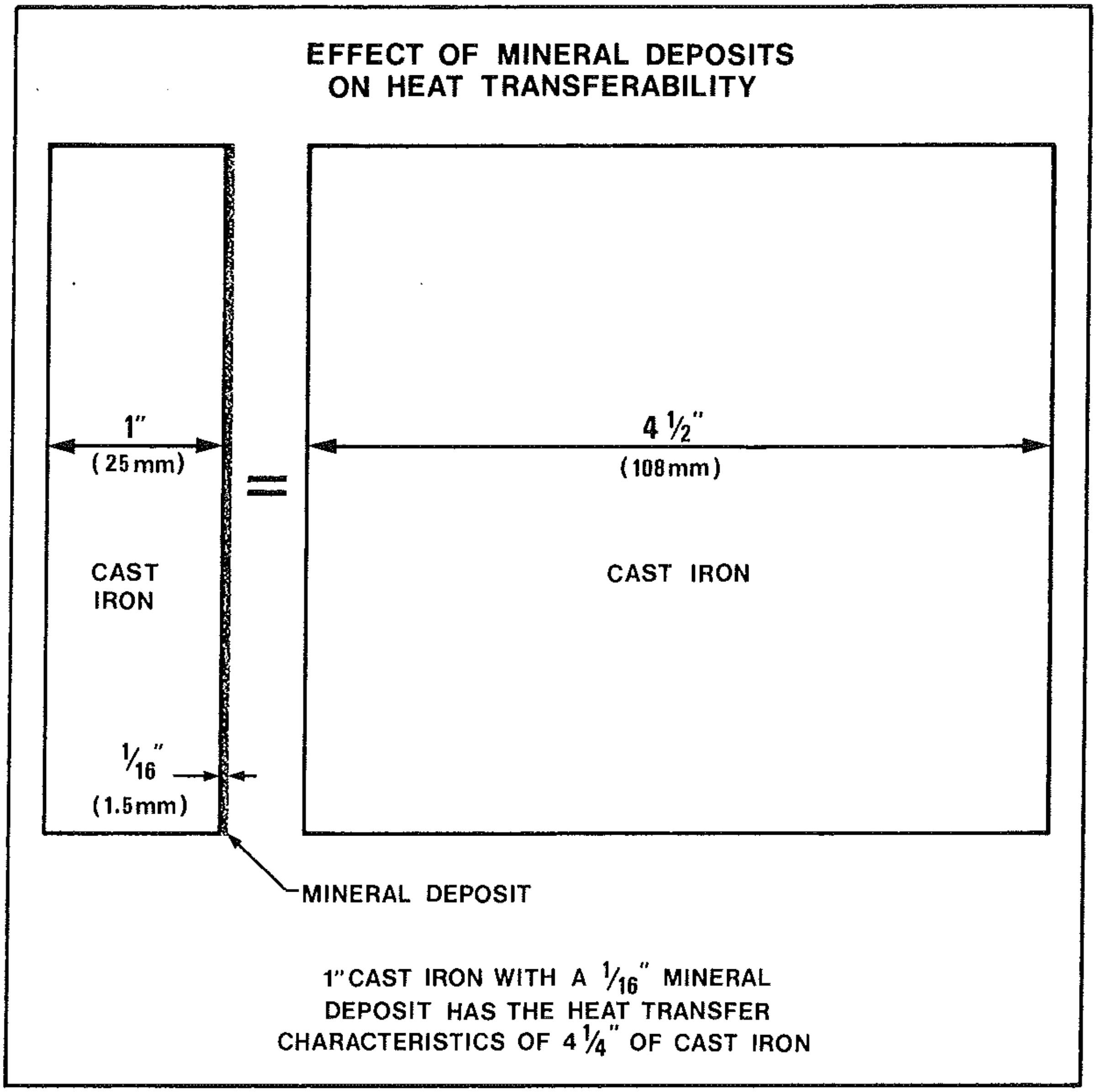


COOLING SYSTEM

Inhibitor systems

An inhibitor system is a combination of chemical compounds which provides corrosion protection as well as water softening. The water softening ability prevents the formation of miniral deposits. Various forms of inhibitor systems are available such a liquid and dry inhibitor additives, as an integral part of permanent antifreeze, and coolant filter elements.

If a coolant is used it is extremely important to choose the correct replacement element. Problems have developed from the use of a magnesium lower support plate used by some manufacturers in their coolant filters. The magnesium will be dissolved by some of the chemicals in the coolant solution and the dissolved particles deposited in the hottest zones of the engine where heat transfer is most critical. The use of an aluminum or zinc plate instead of magnesium is recommended to eliminate these deposits.



COOLING SYSTEM

Antifreeze solutions

An ethylene glycol base permanent type antifreeze solution is recommended for several reasons. This type of antifreeze provides excellent freeze and overheat protection and also contains a corrosion inhibitor. No additional inhibitors are required on initial fill if a minimum antifreeze concentration of 30% by volume is used. Solutions of less than 30% do not provide sufficient corrosion protection, while solutions with an antifreeze concentration greater than 67% by volume adversly affect freeze protection and heat transfer. Refer to chart.

Inhibitor depletion will occur in ethylene glycol base antifreeze through normal service. The inhibitors should be replenished at approximately 500 operating hours or 20,000 miles (32,000 km) intervals with a non-chromate inhibitor system, such as NALCOOL 2000.

Several brands of permanent antifreeze containing various type of sealer additives are available. In the past, coaches operating with these types of antifreeze have experienced plugging problems in various areas of the cooling system. For this reason antifreeze containing sealer additives is not recommended.

For optimum engine performance the following conditions should be met:

1. Always use properly inhibited, ethylene glycol base permanent type antifreeze.

2. Re-inhibit antifreeze with a non-chromate inhibitor system.

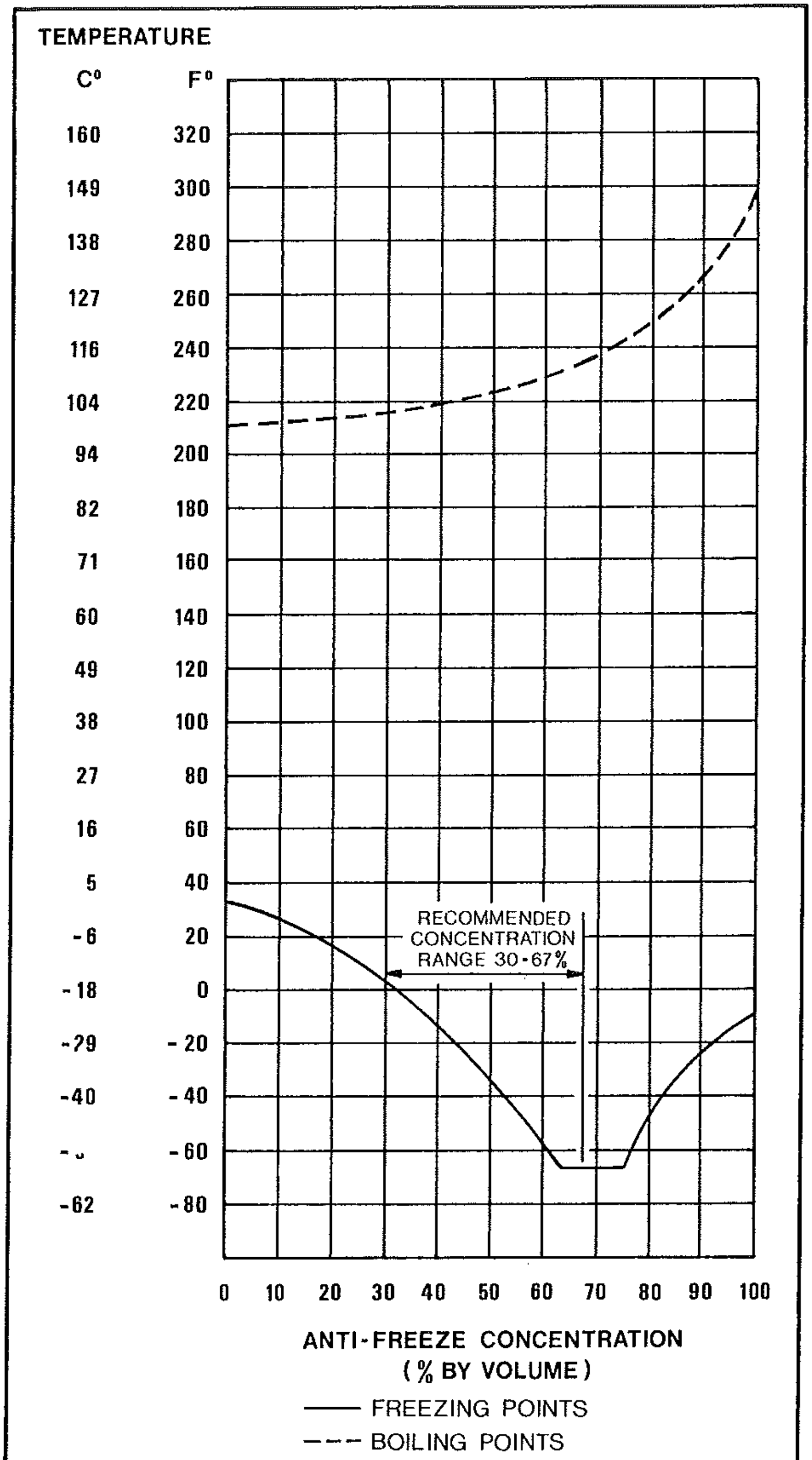
3. Always follow the inhibitor manufacturer's recommendations on usage and handling.

4. Do not use soluble oil as a corrosion inhibitor.

5. Do not use chromate inhibitors with a permanent type antifreeze.

6. Never use an antifreeze that contains sealer additives.

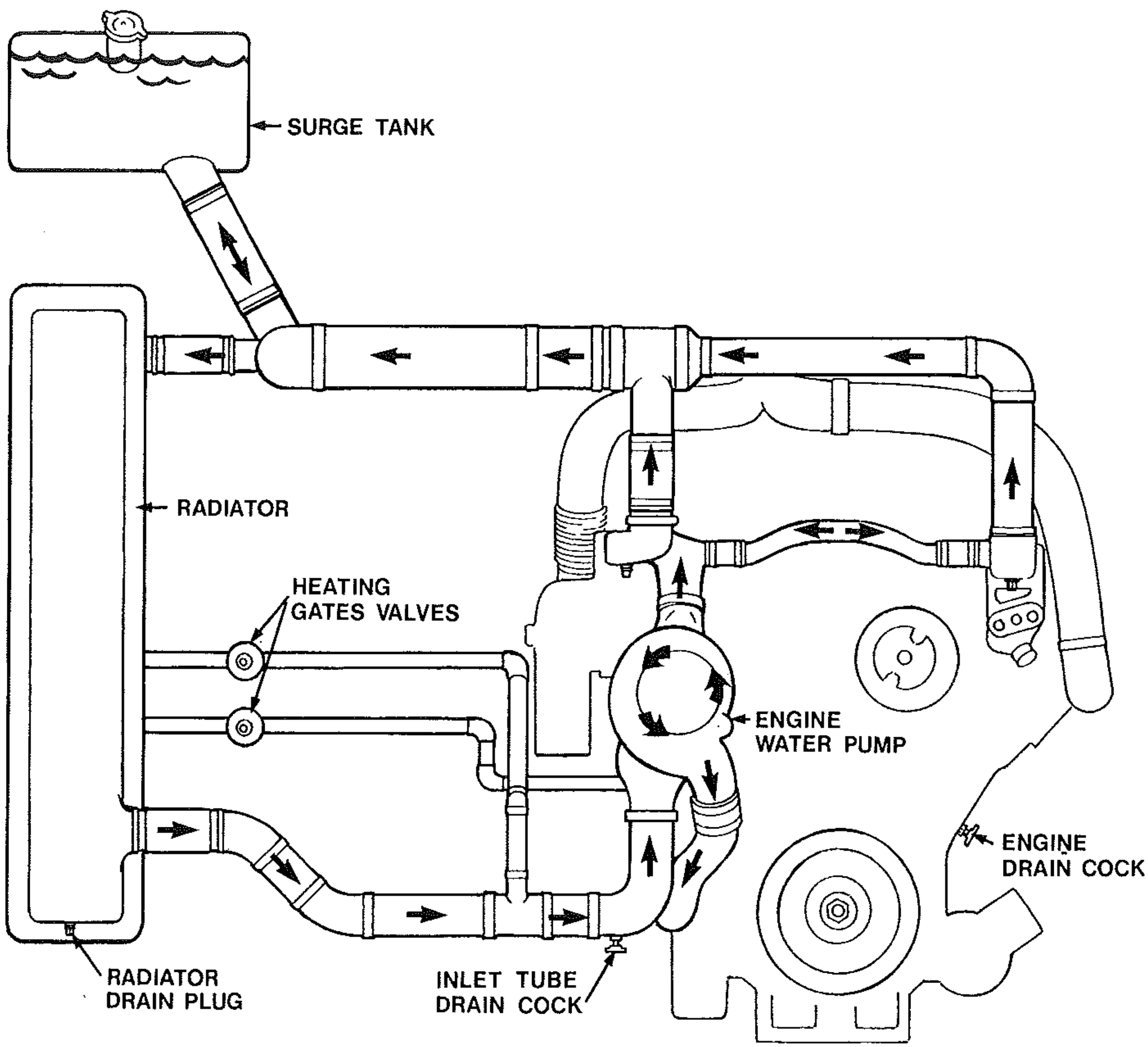
COOLING SYSTEM



Freezing & boiling temperatures of coolant vs antifreeze concentration (at sea level)

COOLING SYSTEM

Cooling system diagram

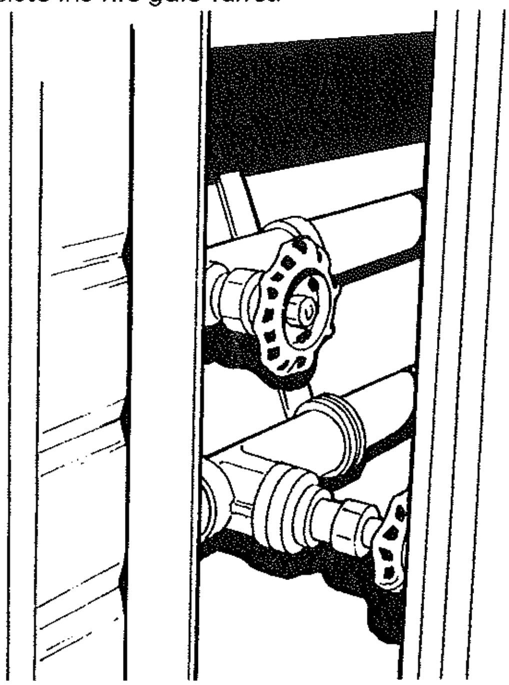


COOLING SYSTEM

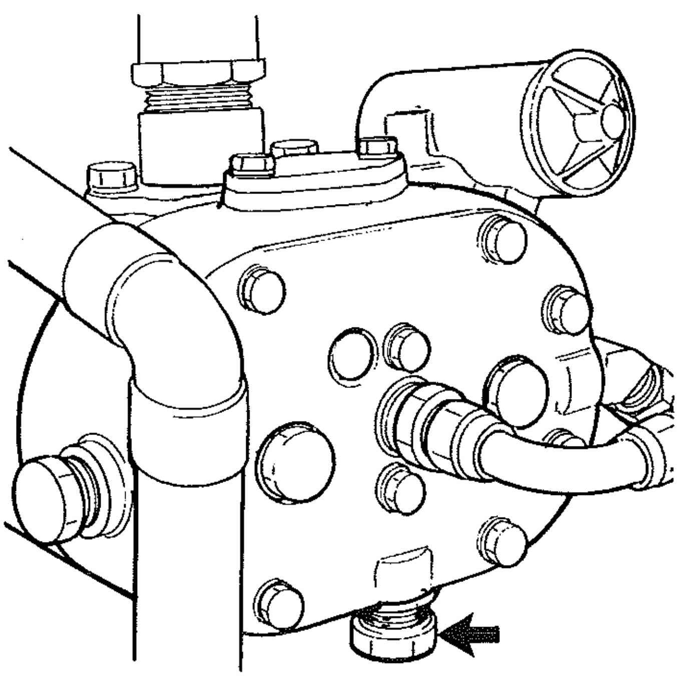
DRAINING

The engine cooling system may be drained as follows:

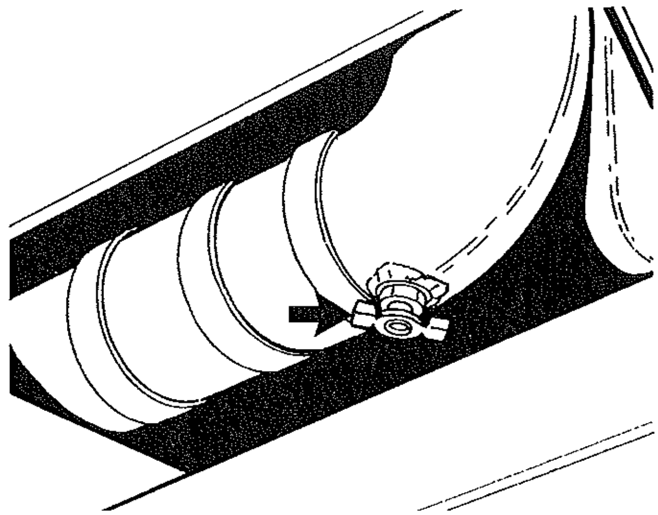
1. Close the two gate valves.



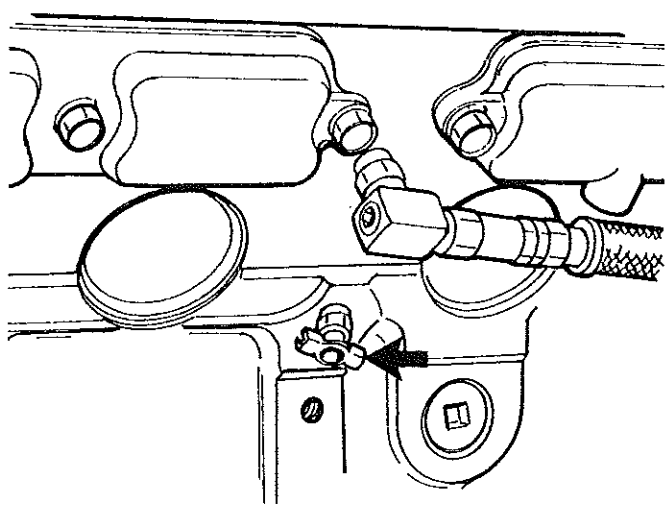
2. Open surge tank cock then drain it.
3. Remove air compressor drain plug.



4. Open inlet water line cock.

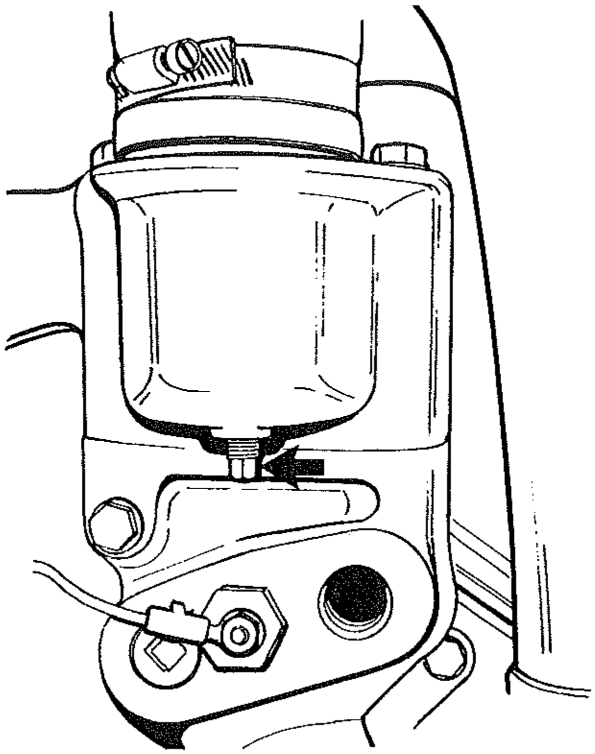


5. Open both engine side drain cocks.

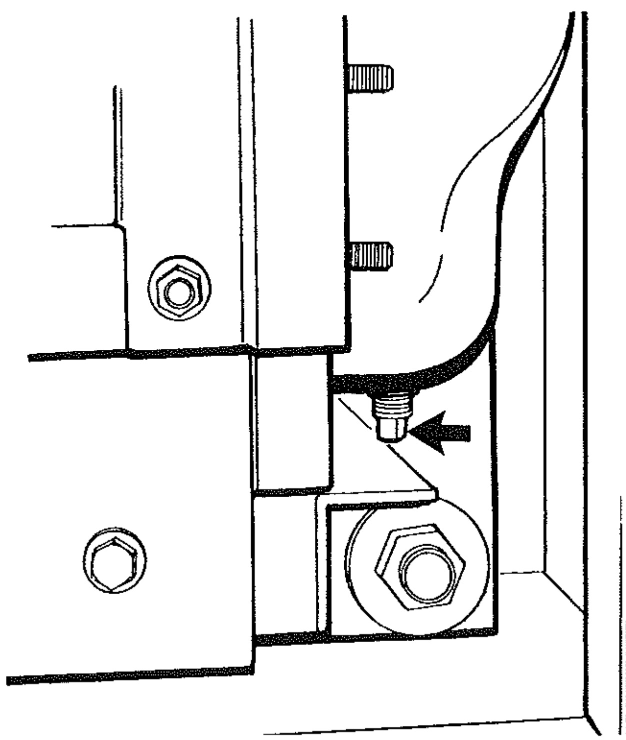


COOLING SYSTEM

6. Open oil cooler drain cock.
7. Loosen plugs on both cylinder head thermostat blocks.



8. Remove radiator drain plug.



Refilling the system

To fill the system, close all drain plugs and cocks, open the gate valves and fill the system through the surge tank.

☐ **Note:** The cooling system is completely filled when coolant becomes at the level of the surge tank drain cock. Open the drain cock to know if coolant level is adequate.

When the cooling system is filled to capacity with cold coolant solution, expansion of the coolant takes place as it heats up. During this initial warm up period it is possible to lose as much as a gallon and a half of coolant. No further excessive coolant loss should be experienced after this period.

■ **Caution:** Never pour cold coolant into a hot engine. The sudden change in temperature may crack the cylinder head or block.

Routine maintenance

A systematic periodic inspection of cooling system components is essential to ensure maximum efficiency.

Check coolant level in the surge tank daily. Keep tank filled. Check antifreeze strength.

Rust proof the cooling system twice a year and drain and fill the system once a year with a properly inhibited water/antifreeze solution.

Check belts for proper tension and replace any frayed or badly worn belts.

Check radiator cores for leaks and ensure that the core is not clogged with dirt or insects. Clean core with a low pressure air hose to avoid damaging the fins.

Inspect the water pump operation. A leaky pump sucks in air, increasing corrosion.

Repair all leaks promptly. Unchecked leaks can lead to trouble. Inspect and tighten radiator mounts periodically. Test and replace thermostats regularly.

Problems may develop from leaks and seepage at the engine water pump and thermostat housings hose connections. These may be caused by deformation and rough surfaces on the castings at the hose mounting surfaces. It is recommended that «Dow Corning RTV-102 Compound» be applied to cast surfaces prior to hose installation.

■ **Caution:** Castings should be clean and free of oil and grease before applying compound. No other sealer should be used with RTV compound.

COOLING SYSTEM

Hose inspection

Rotten, swollen, and worn out hoses or loose hose connections are frequent causes of cooling system problems.

Serious overheating is often caused by old hose collapsing or from rotten rubber shedding from hoses and clogging the coolant passages.

Connections should be inspected periodically and hose clamps tightened. Replace any hose found to be cracked or swollen. When installing a new hose, clean pipe connections and apply a thin layer of a non-hardening sealing compound. Replace worn out clamps or clamps that pinch hoses.

Testing antifreeze solutions

Always test solution before adding water or antifreeze. Engine should warm up to operating temperature. Fill and empty tester several times before using, and ensure that tester is clean inside and out.

Cold weather operations

Although not recommended, plain water with an inhibitor may be used as a coolant where temperatures do not reach below 32°F (0°C). In colder regions antifreeze must be used.

Before adding antifreeze the cooling system should be inspected for winter operation. Cylinder head gaskets should be tightened or replaced where necessary to avoid the possibility of coolant leaking into engine and exhaust gases blowing into cooling system.

After antifreeze has been added, the entire system should be inspected regularly to ensure against the development of leaks.

Thawing cooling system

If the cooling system becomes frozen solid, place the coach in a warm area until the ice is completely thawed. Under no circumstances should the engine be operated when the cooling system is frozen.

Radiator

The radiator is located at the reat left of the vehicle and it is accessible through a hinged radiator door. The radiator is designed to reduce the temperature of the coolant under all operating conditions. It is essential that the radiator core be kept free from corrosion and scale at all times in conjunction with the regular maintenance of the other components of the cooling system.

Radiator shutter

An air operated shutter assembly is provide on the inlet side of the radiator core. It is controlled by an air cylinder. The air supply to the cylinder is controlled by the shutterstat which is mounted on the thermostat housing.

When the engine coolant temperature reaches 190°F (87°C) the shutterstat cuts off the compressed air supply to the shutter cylinder then the shutter opens, allowing cool air to flow into the engine compartment. When the engine coolant temperature is below the setting of the shutterstat, compressed air is allowed to flow to the shutter air cylinder, closing the shutter.

Radiator shutter should be kept clean, and a periodic inspection should be made to ensure it is operating freely. Repair of shutter should only be necessary if the parts have become badly worn or in the event that they have been damaged. In such cases, it is recommended that the entire shutter assembly be replaced.

Alarmstats

Alarmstats set at 210°F are used to control the warning light and buzzer that indicate engine overheat. Refer to section 06 — ELECTRICAL for electrical connections.

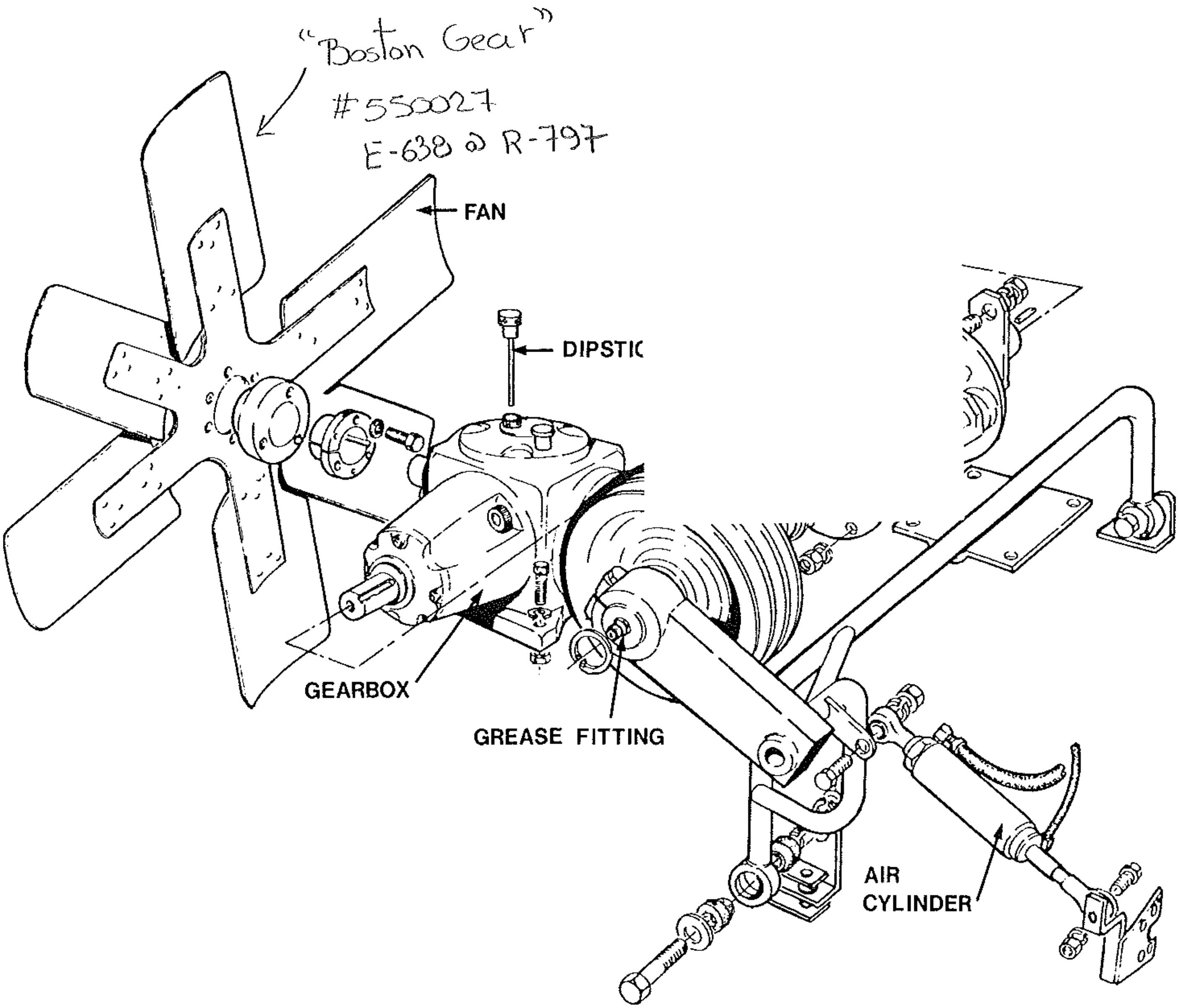
COOLING SYSTEM

Radiator fan gear box

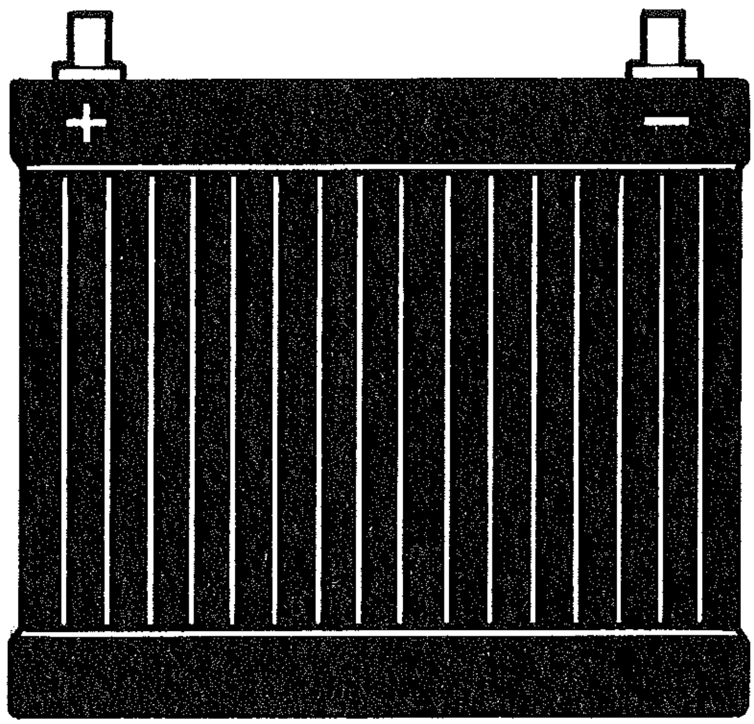
A radiator fan gear box is belt driven from the engine crankshaft pulley. Some vehicles may be equipped with a dipstick on the gear box to verify the oil level inside the gear box; add oil up to upper mark. For gearbox not equipped with a dipstick, oil level should be checked by removing the oil filling plus and you should ensure that oil level is level with the middle of the input and output shaft.

A grease fitting is provided at the end of the gearbox input shaft. Grease should be added weekly or at every 1000 miles (1600 km) to ensure proper lubrication of the input shaft bearing. Only high temperature grease should be used.

Belt tension is achieved by air cylinder regulated at 75 PSI and the cylinder is adjusted using an air valve located on the front top of the engine compartment. For proper operation of the cylinder, the rod should be adjusted at 1" extension when extended.



ELECTRICAL SYSTEM



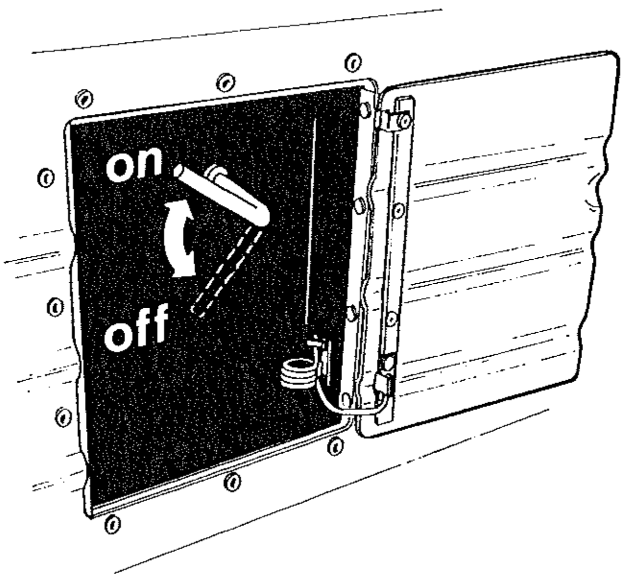
ELECTRICAL

DESCRIPTION

The vehicle uses a 24 volt electrical system. A 24 volt self rectified alternator is gear driven from the engine and can be reached through the engine compartment access door which is located inside the vehicle, on the rear floor.

Battery main switch:

A battery main switch is provided to shut off all electrical supply from the batteries. Four (4) batteries of a maintenance free type are used. The switch is mounted behind an access door on the right side of the vehicle.



Wiring diagrams:

Diagrams are provided and components in each are as follows:

Engine control: shows wiring for starter motor and solenoid, batteries, engine stop solenoid valve, key switch, engine run relay, parking brake tell-tale switch, fuel and neutral switch, fast idle, emergency stop switch, solenoid and relay, voltage regulator, 12 volt cut-out relay, main circuit breakers, booster block.

Air conditioning and heating: shows wiring for air dryer thermal element, defrost motor relay, heat and A/C switch, water pump relay, evaporator fan motor relay, condensor fan motor relay, evaporator fan motor relay, emergency ventilation switch, A/C warning light relay, A/C compressor magnetic switch, Hi and low pressure switches, driver's temperature controls, A/C warning light, A/C liquid solenoid valve, defrost motor, driver's solenoid relay, driver's solenoid valve, passenger area temperature control, water valve, heat tell-tale light, heat sensor, water booster jump, condenser fan motor, evaporator fan motor.

Exterior lighting cover: headlamp switch, 12 volt headlamp relay, high beam tell-tale light, dimmer switch, headlamps, clearance light switch, blinker switch, clearance light relay, foy light switch, fog light, front side marker light L.H., front side marker light R.H., destination sign lights, dash light rheostat, license plate lights.

Interior lighting covers: driver's light, general light switch, dome lights, underseat lights, stepwell lights, instrument lights and rheostat, reading light switch, reading light relay, steering compartment light, front electrical compartment light, R.H. reading lights, L.H. reading lights, emergency exits lights, engine compartment service lights, luggage compartment lights.

Door air-lock shows: door air-lock solenoid valve, door cut-out switch, door air-lock overrule switch, door air-lock switch.

Directional signal light shows: front R.H. directional light, front L.H. directional light, rear R.H. directional light, rear L.H. directional light, hazard warning switch, directional tell-tale lights, directional signal switch, hazard warning flashers.

Charging system covers: key switch, engine run relay, rear engine control switch, battery tell-tale light, rear start switch, blower cut-in relay, voltmeter, voltage regulator, 12 volt cut-in relay, 24 volt alternator, starter, batteries, main circuit breakers.

Alarm & signal shows: horn switch, electrical horns, engine run relay, parking brake tell-tale switch, parking brake tell-tale light, buzzer, lo-air pressure switches, hot engine switch, lo-oil pressure switch, tag axle tell-tale light switch, water temperature gauge, oil pressure gauge, full level gauge, air pressure gauges, stop light relay, stop light switches, passenger chime, fire alarm, stop lights.

Testing circuits:

A careful study of the wiring diagrams should be made to determine the source and flow of current through each electrical circuits. When a circuit is thoroughly understood, a point to point check can be made with the aid of the applicable wiring diagrams. Any circuit may be tested for continuity or shorts with a 2 candle test light or a suitable voltmeter.

All electrical connections must be kept clean and tight. Loose or corroded connections will cause discharged batteries, difficult starting, dim lights and improper functioning of other electrical circuits. Inspect all wiring connections at regular intervals. Make sure knurled nuts on all amphenol plugs are securely tightened.

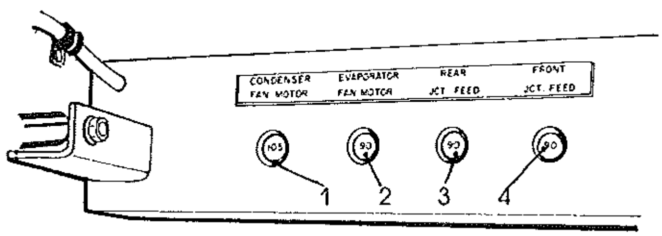
ELECTRICAL

Circuit breakers:

All electrical circuits are protected by circuit breakers.

The main circuit breakers are located inside the last baggage compartment and they are accessible by the right side of the vehicle.

They are used as follows:



1. Condenser fan motor — 105 Amp.
2. Evaporator fan motor — 90 Amp.
3. Rear junction feed — 90 Amp.
4. Front junction feed — 90 Amp.

Relays:

Relays are used to automatically energize or de-energize a circuit from a remote location. The relay draws a very low current to energize its coil. Once the coil is energized, it develops a magnetic field which pull a switch arm closed or open to either energize or de-energize a given component. Because the control current required for the coil is very low, the relay allows a remote station to control a high energy circuit without running great lengths of costly high capacity cable. With the use of a relay, the need for high amperage switches and heavy connectors is eliminated.

Gear driven alternator — oil cooled

The 24 volt, gear driven — oil cooled alternator is brushless, self-rectifying unit, in which all current carrying members, windings, diodes, and field coils are stationary. The only moving component is the rotor.

The oil-cooled alternator is a totally enclosed unit; cooled and lubricated by engine oil. The oil inlet is on the diode end cover. The oil drains back into the engine crankcase through the drive end frame, drive adapter housing and the oil drain tube. The alternator should never be operated with the oil supply line disconnected. A continuous flow of engine oil flows through the alternator to lubricate the bearings and cool the assembly.

A relay or «R» terminal is tapped to energize a control relay in the electrical system.

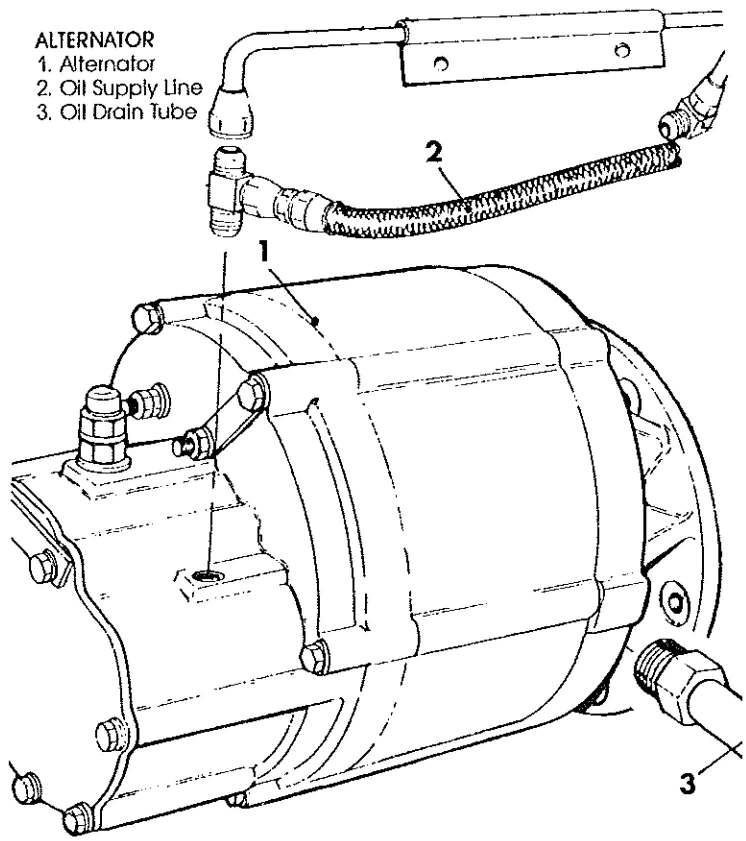
There are three components in the alternator which require electrical checks; the field winding, the six diodes, and the stator windings.

■ **Caution:** Before checking the alternator, TURN OFF the battery disconnect switch.

Field winding

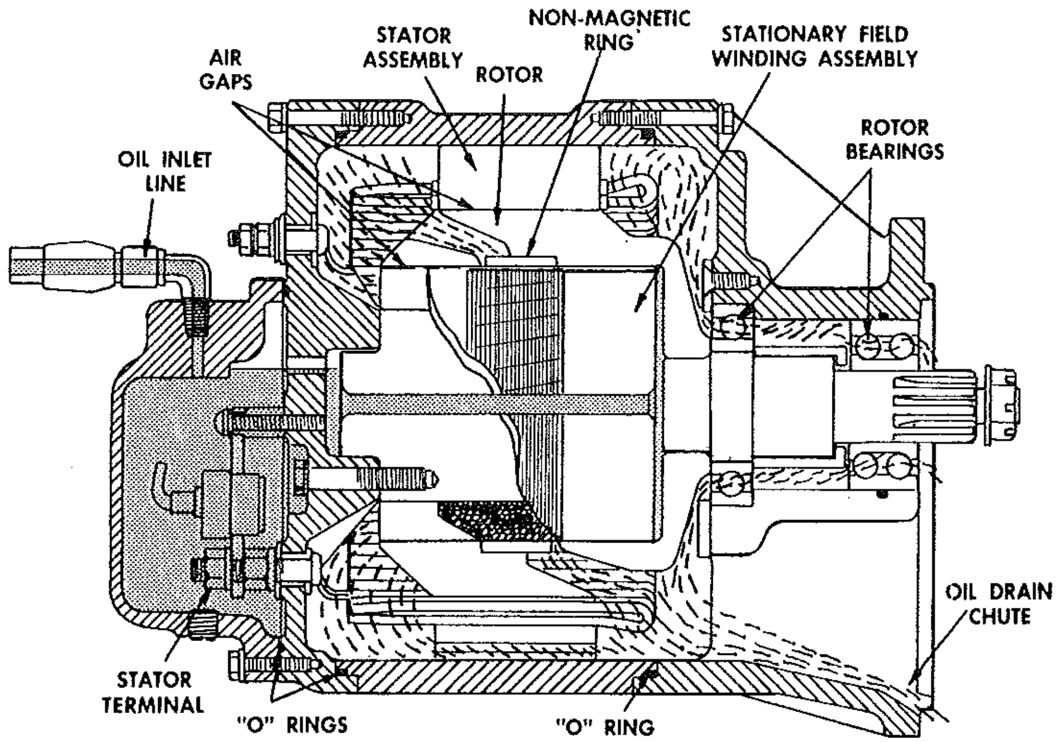
The field winding may be checked for shorts and opens with an ohmmeter. To check the field winding; connect the ohmmeter from the field terminal to ground. A resistance reading above normal indicates an open, and a reading less the normal indicates a short. The normal resistance value is 3.9 to 4.2 ohms at 80°F (27°C). An alternate method of checking is to place a battery of specified voltage, and an ammeter in series with the field winding. The current should register 5.7 to 6.2 amperes at 24 volts. A defective field can be replaced by removing the end frame on which the field terminal is located and then removing the four field coil mounting screw. See the section entitled «Disassembly and Reassembly» for a détailed procedure.

ALTERNATOR
1. Alternator
2. Oil Supply Line
3. Oil Drain Tube

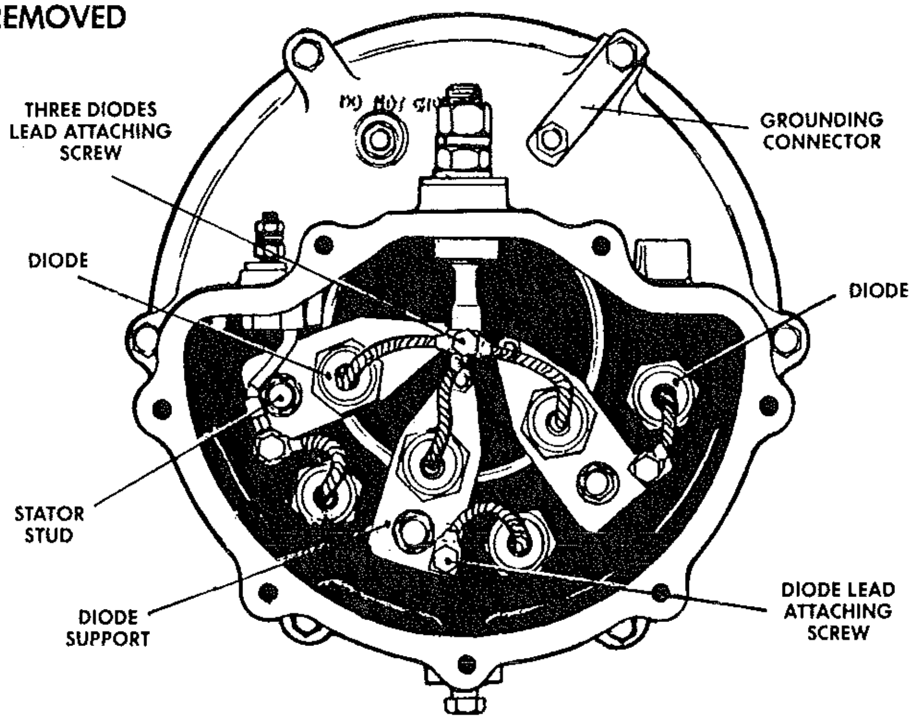


ELECTRICAL

CROSS-SECTIONAL VIEW
SHOWING OIL CIRCULATION

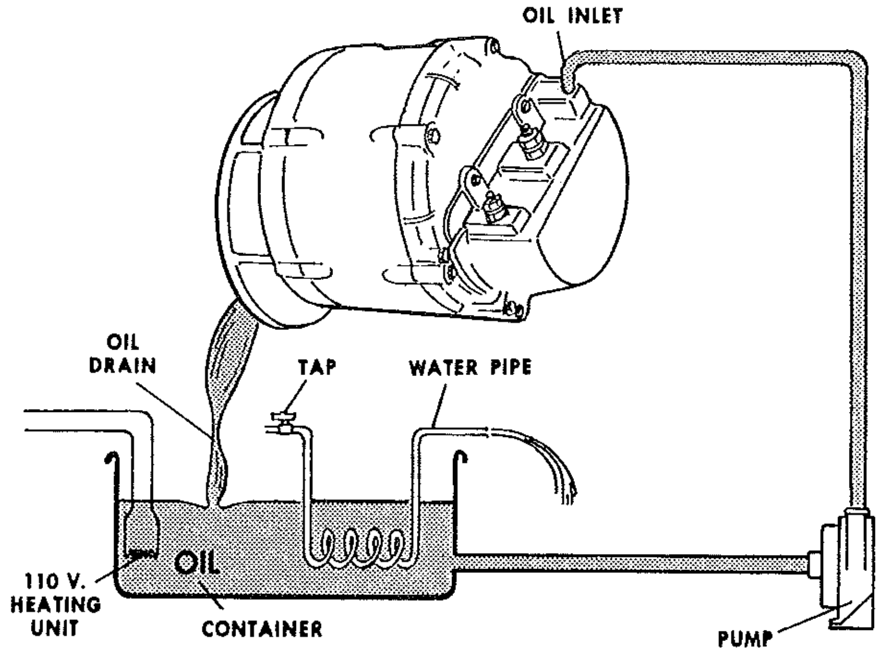


VIEW OF RECTIFIER END FRAME
WITH COVER REMOVED

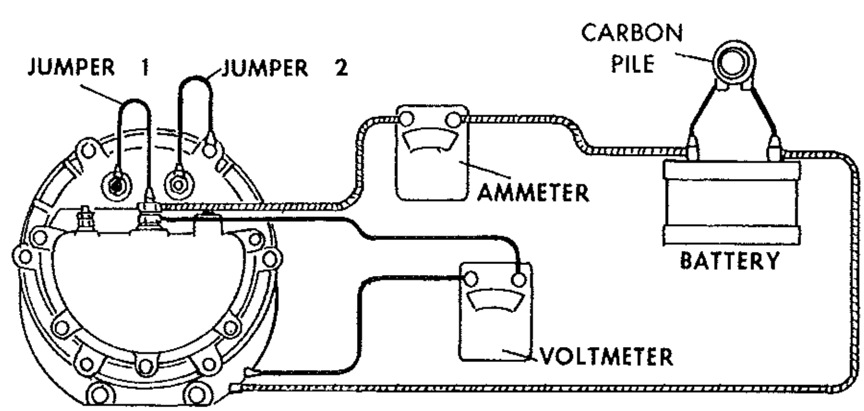


ELECTRICAL

METHOD OF PROVIDING CIRCULATING OIL

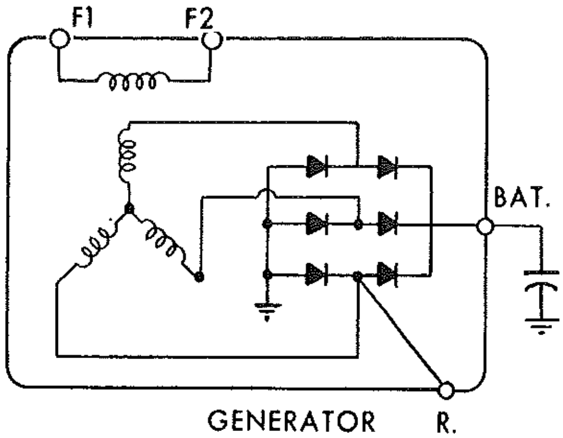


ELECTRICAL CONNECTIONS FOR CHECKING GENERATOR OUTPUT



ELECTRICAL

TYPICAL WIRING DIAGRAM



Checking diodes

Each diode may be check for shorts and opens as follows:

1. Check to ensure the battery is disconnected.
2. Remove the pipe plug from underneath the end housing to drain the oil in the rectifier engine oil supply.
3. Remove the seven screws attaching the diode cover to the end housing. IMPORTANT: DO NOT operate the alternator unless this unit is completely assembled.
4. Detach the D.C. terminal and relay terminal and connect the diode leads.

Each diode may be checked for shorts and opens with an ohmmeter.

IMPORTANT: The ohmmeter polarity may be determined by connecting its leads to voltmeter leads. The volmeter will read up-scale when the negative leads are connected together and the positive leads are connected together. The polarity of the voltmeter leads may be determined by connecting the leads to the identified terminals on a battery.

An ohmmeter with a single 1½ volt cell should be used. Most accurate readings will be determined when the 300 ohm value is calibrated to the center one-third of the scale.

NEGATIVE GROUND ALTERNATOR: To check the diodes mounted in the diode supports for shorts, connect the ohmmeter positive lead to each diode lead and the ohmmeter negative lead to each support as shown in A, B, and C. To Check the diodes mounted in the end frame for shorts, connect the ohmmeter positive lead to each diode lead and the ohmmeter negative lead to the end frame as shown in parts D, E, and F. Ohmmeter readings may vary considerably when checking diodes for shorts, but if the readings is 300 ohms or less, the diode is likely defective and should be replaced. If the diode reads 300 ohms or less, it will allow excessive reverse current from the battery.

To check the diodes mounted in the diode support for opens, connect the ohmmeter negative lead to each diode lead and the ohmmeter positive lead to each support as shown in parts A, B and C. To check the diodes mounted in the end frame for shorts, connect the ohmmeter negatie lead to each diode lead and the ohmmeter positive lead to the end frame as shown in parts D, E, and F. An infinite resistance reading indicates an open diode.

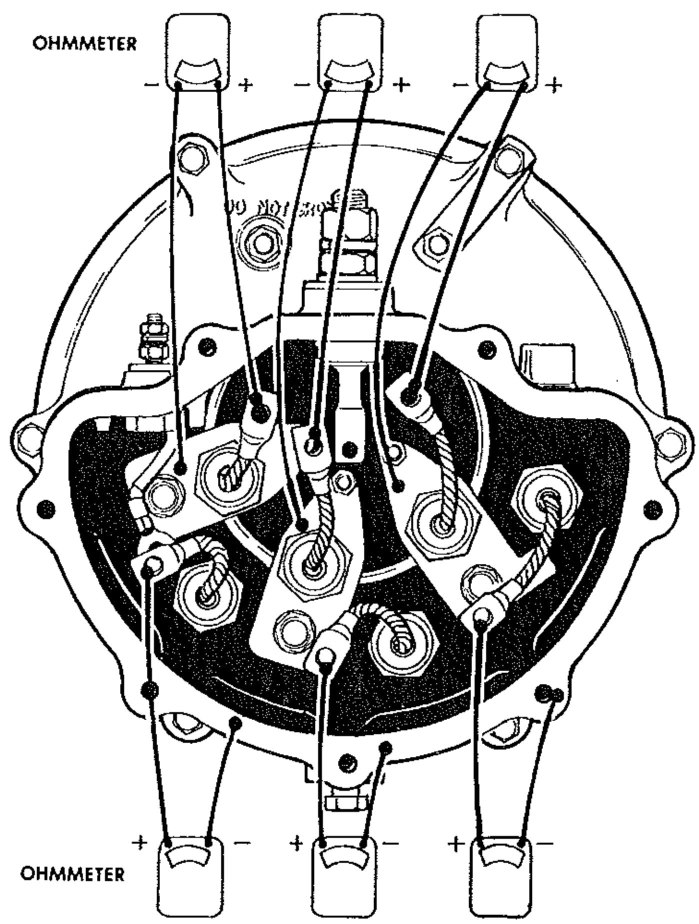
Diodes can be replaced by following the procedure outlined in sections entitled «Disassembly» and «Reassembly»

Re-stake next to the threads in an arbor press with an 1/8 inch (3.2 mm) round punch. Press the punch with gradual pressure; do not strike as the shock may damage the diodes.

☐ **Note:** When re-installing diodes, tighten to 9-11 ft. lbs. (12-15 Nm) torque.

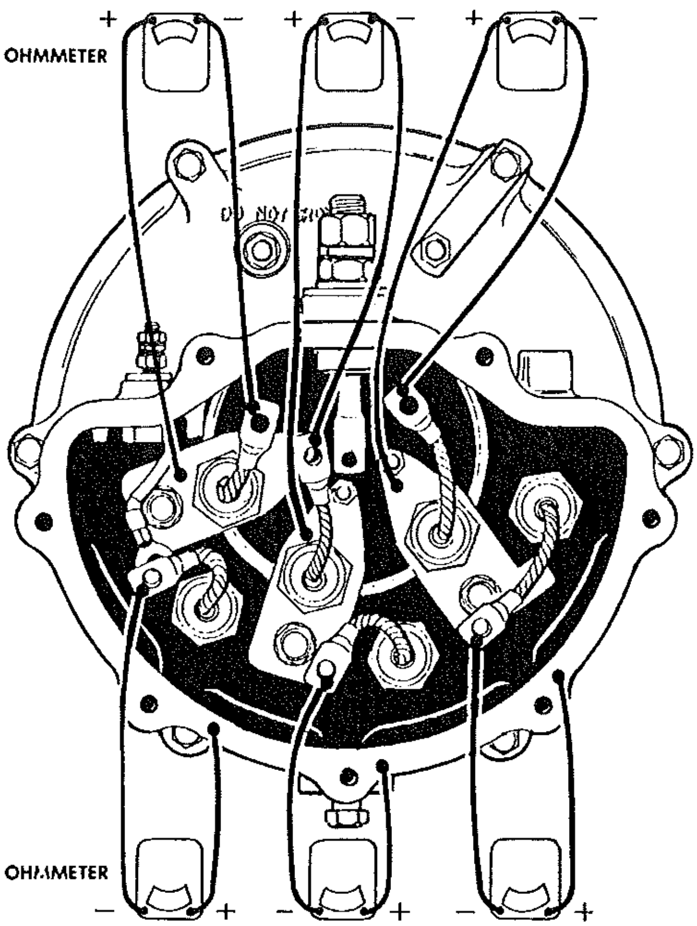
Stator winding checks

The stator windings may be checked for opens and shorts with an ohmmeter as follows:



Checking diodes with ohmmeter on a Typical Oil Cooled Alternator (end cover removed).

ELECTRICAL



Checking diodes with ohmmeter on a Typical Oil Cooled Alternator (end cover removed).

Opens: Connect the ohmmeter leads to two pairs of diode supports as shown in parts A, B, and C. The ohmmeter should show a low resistance. If a high or infinite resistance is measured in either one or both checks, the stator windings are open.

Grounds: To check for grounds, connect the ohmmeter as illustrated in part C. The ohmmeter should show a very high or infinite resistance. If zero, or a very low resistance is measured, the windings are grounded.

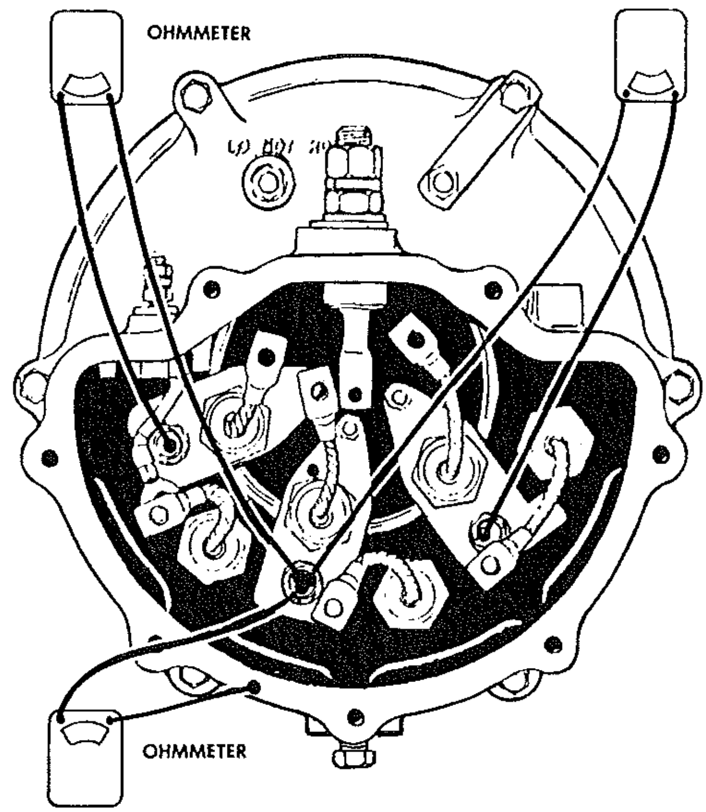
The stator windings are difficult to check for shorts without finely calibrated laboratory test equipment due to the very low resistance values of the windings. However, if all other alternator checks are satisfactory, yet the unit fails to perform to specifications, shorted stator winding are likely.

Disassembly

The alternator may be disassembled by following the steps below:

1. Remove nuts and washers from D.C. terminal on diode end frame.

2. Separate the diode cover plate from the diode end frame by removing mounting screws.



Checking Stator Windings for «Opens» and «Grounds».

3. Remove the parts attaching the diode supports to the end frame, the three screws connecting the diode lead to the diode supports, and the three nuts which attach the stator studs to the diode supports.

4. Separate the diode support assemblies from the diode end frame, and the three nuts which connect the studs to the diode end frame.

5. Mark the position of the drive end frame and diode frame with respect to the stator assembly so that the parts can be reassembled in the same position.

6. Detach the diode end frame and field assembly from the stator assembly by removing the attaching screws.

7. Separate the field assembly from the diode end frame by removing the four attaching screws.

ELECTRICAL

8. Separate the rotor assembly and drive end frame from the stator assembly by removing the attaching screws.

9. Remove the shaft nut and washer, and the pinion gear. Press the rotor shaft out of the drive end frame.

10. Remove the retainer plate and pull the bearings from the drive end frame.

☐ **Note:** When installing the outside nut on the D.C. output terminal, torque the nut to 30-35 ft. lbs. (41-47 Nm). The lower nut should be supported while tightening the top nut.

Reassembly

Reassembly is the reverse of disassembly. When installing the single row bearing into the drive end frame, press against the outer race ONLY to avoid loading the bearings. Attach the bearing retainer plate, and press against the bearing inner race to force the assembly over the shaft. To avoid pressure on the bronze ring in the rotor, support the inside of the rotor against the shaft, and place the shaft in an upright position to faciliate the assembly procedure. Press against the inner race to force the double row bearing over the shaft. When attaching the field to the diode end frame, make sure the mating surfaces are perfectly clean and tighten the mounting screw securely.

☐ **Note:** When re-installing diodes, tighten to 9-11 ft. lbs. (12-15 Nm) torque.

Output check

When removed from the engine, the alternator may be check on a test bench without circulating oil, providing the output is limited to 100 amperes or less. The alternator may be checked without circulating oil at outputs exceeding 100 amperes as long as the period of operation is limited to less than 15 seconds. Operating the alternator at outputs greater than 100 amperes for periods exceeding 15 seconds will cause the alternator to overheat, resulting in damage to the winding and diodes.

Removing alternator from adapter housing

1) Disconnect electrical wiring at the diode end frame.

2) Disconnect the oil supply line at diode end frame and loosen the oil drain tube at the engine.

3) Remove the nuts and washers mounting the alternator to the adapter housing and pull the alternator straight back off the mounting studs. To remove the adaptor housing, remove the mounting nuts and pull away from the studs on the adapter plate. To remove the adapter plate.

Checking alignment of drive plate

When checking the alignment of the drive plate, or replacing it, the Gear Driven Alternator Alignment Tool should be used.

Mount the drive plate loosely on the balance shaft gear. Place alignment Tool pilot bore in balance shaft gear. With the drive plate centered, tighted capscrews to 40-45 ft. lbs. (54-61 Nm). Capscrews are tightened through the four notches in the alignment tool.

Checking alignment on adapter plate

Mount the adapter plate and gasket loosely using the five (5) allen-head capscrews.

☐ **Note:** Gaskets should be coated with permatex spray prior to installation.

Place the alignment tool pilot bore back into the balance shaft gear. The adapter plate may now be centered. Tighten the four (4) ½" allen-head capscrews to 109-114 ft. lbs. (148-155 Nm). Tighten the one (1) 7/16" allen-head capscrew to 73-78 ft. lbs. (99-106 Nm).

☐ **Note:** The oil supply orifice of the alternator housing machined with à 3/32" diameter restrictor hole. This restrictor must be routinely cleaned to maintain proper oil flow through the alternator.

Installation of the gear driven alternator using alignment tool

1. Loosely mount the steel drive plate on balance shaft gear.

2. Place alignment tool pilot bore in balance shaft gear.

3. With drive plate centered, tighten capscrews to 40-45 ft. lbs. (54-61 Nm). Capscrews are tightened through the four notches in the alignment tool.

4. Remove alignment tool.

5. Loosely mount adapter plate and gasket with 5 Allen head capscrews.

☐ **Note:** Gaskets should be coated with a permatex spray prior to installation.

6. Place alignment tool pilot bore back into balance shaft gear. The adapter plate will now be centered.

7. Tighten the four ½" Allen head capscrews to 109-114 ft. lbs. (148-155 Nm). Tighten the one 7/16" Allen head capscrew to 73-78 ft. lbs. (99-106 Nm).

8. Remove alignment tool.

9. Proceed with alternator installation.

ELECTRICAL

Installing alternator and adapter housing

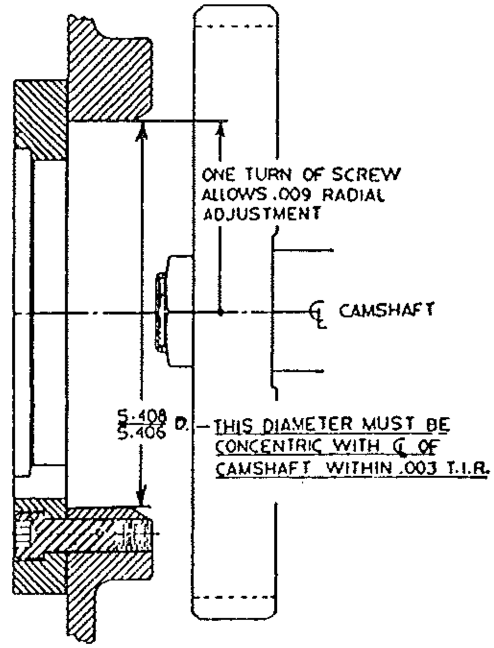
1) Place the adapter housing and gasket over the adapter studs and torque nuts 68-73 ft. lbs. (92-99 Nm).

2) Mount the alternator and gasket into the adapter housing studs and torque to 68-73 ft. lbs. (92-99 Nm).

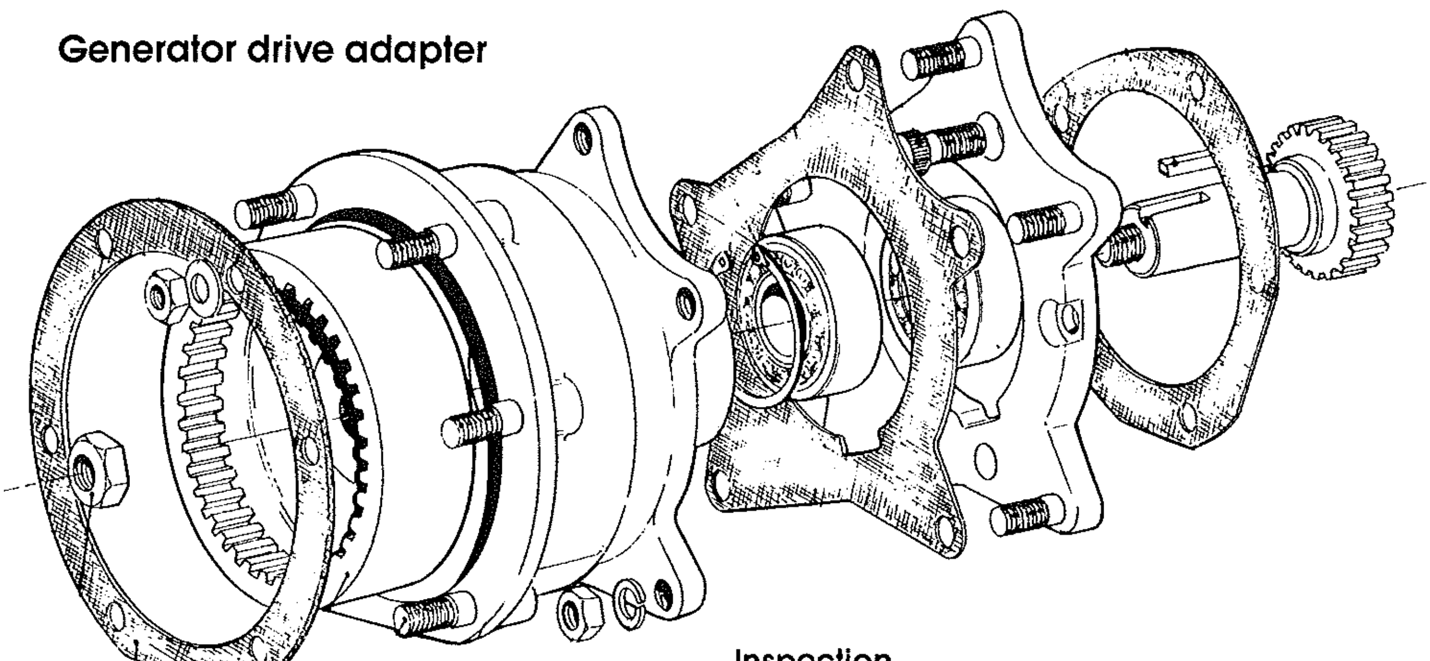
3) Install the oil feed line and tighten the oil drain tube at the engine.

4) Install the electrical connections at the diode end frame.

5) Run the engine and check alternator output and oil leaks.



Generator drive adapter



The generator drive adapter should be inspected every time the generator is removed, or when its condition is suspect.

Removal:

1. Remove the generator.

2. Remove the five nuts and washers that secure the adapter housing to the adapter plate.

3. Pull housing straight off studs.

Inspection

Once the housing is removed, rotate and check end play of shaft to check condition of bearings. Inspect drive gear for worn or chipped teeth. If condition of bearings, shaft, or gear is questionable, replacement is necessary.

Disassembly:

1. Remove 1 1/8" - 12 UNF self locking nut from drive gear shaft.

2. Remove bearing retaining snap ring from the adapter housing. (Do not remove snap ring from shaft).

3. Support the adapter housing on steel blocks on the bed of a hydraulic press and press the drive shaft out of the drive gear bore.

4. Remove the woodruff key from the drive shaft.

5. Install a bearing separator between the lower bearing and the drive spline and snap ring.

6. Support the bearing separator on steel blocks on the bed of a hydraulic press. Press the drive shaft out of the bearing races.

7. Thoroughly clean all parts before reassembly.

Reassembly

1. Place the snap ring on the shaft and set the shaft on the bed of a hydraulic press.

2. Position one of the bearings on the shaft. Using a hollow bearing mandrel, press the bearing onto the shaft until it bottoms. Install the bearing spacer, Figure 6, and press the second bearing onto the shaft until it bottoms. Install the bearing spacer, Figure 6, and press the second bearing onto the shaft in the same manner.

☐ **Note:** A length of steel pipe, 4.5" (114.3 mm) long with an inner diameter of 1.5" (38.1 mm) and a wall thickness of .25" (6.35 mm) will serve as a bearing mandrel.

3. Using a soft hammer, install the woodruff key into the shaft.

4. Install the shaft and bearing assembly into the generator drive adapter housing through the engine side of the housing.

5. Install the snap ring into the groove of the housing.

6. Support the adapter housing on steel blocks to prevent it from moving while installing the gear onto the shaft.

7. Carefully install the gear onto the shaft ensuring that they are perfectly aligned.

☐ **Note:** When pressing in the drive gear shaft, and when pressing drive gear onto the shaft, it may be necessary to cool the shaft with liquid nitrogen to facilitate assembly. Alternately, the shaft may be cooled with dry ice or normal household refrigeration and the gear heated in a hot oil bath.

■ **Caution:** Do not apply direct heat to the gear as this could cause distortion. Utmost care must be taken with cleanliness and perfect alignment of mating parts during assembly.

■ **Caution:** The oil supply orifice of the generator housing is machined with a 3/32" diameter restrictor hole. This restrictor must be routinely cleaned to maintain proper oil flow through the generator.

Voltage regulator

Description

The 24-Volt regulator is a transitor type located in the battery compartment.

The regulator components work together to limit the generator voltage to a pre-set value by controlling the generator field current. This is the only function the regulator performs in the charging circuit.

The voltage at which the generator operates is determined by the regulator adjustment. Once adjusted, the generator voltage remains constant, since the regulator is unaffected by length of service, changes in temperature, or changes in generator output and speed.

Trouble in the electrical system will usually be indicated by one of two conditions — an undercharged battery or an overcharged battery. Either condition can result from an improper voltage regulator setting.

The ideal voltage setting is the one which will maintain the batteries in a fully charged condition with a minimum use of water. A record of water usage and battery specific gravity checks over a service period of reasonable length will establish the ideal voltage setting for the vehicle involved.

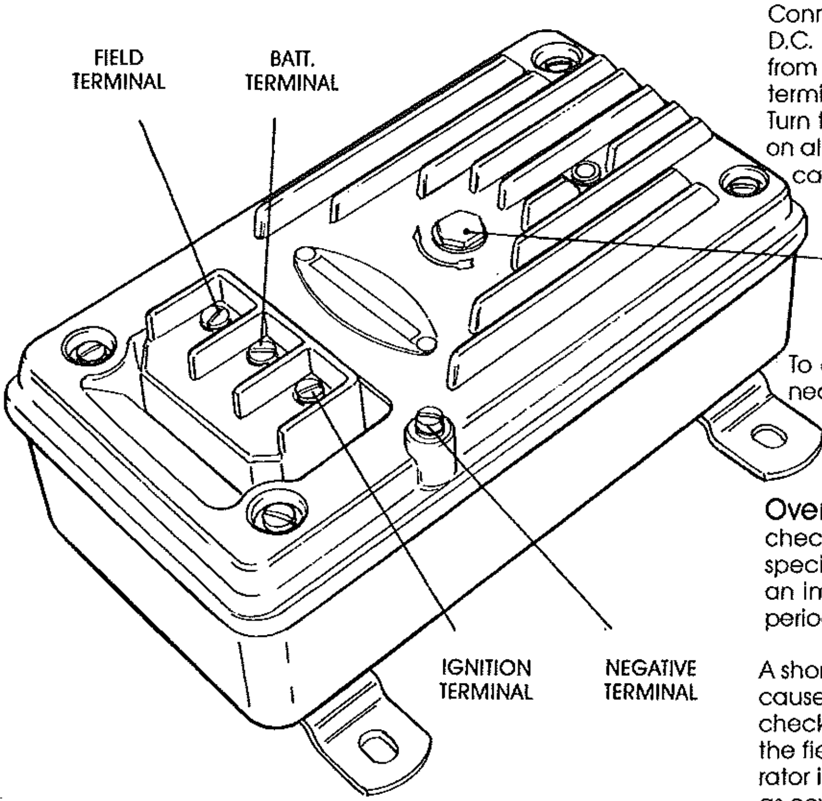
The correct voltage regulator setting will vary according to the rate at which the batteries will absorb the charge without detrimental effect. The rate at which the batteries will absorb the charge in turn varies with such factors as battery age and condition, and outside ambient temperatures.

The ideal voltage setting is one which will maintain the batteries in a NEAR fully charge condition while using a minimum of water. A fully charged condition would cause excessive water usage.

Under ordinary conditions of battery age and condition, a voltage setting of 27.5 volts has been found to be an approximate average.

However, this figure is merely a guide and final adjustment should be made on the basis of battery charge and water consumption.

ELECTRICAL



Checking the voltage setting

To check the voltage setting, connect a voltmeter across the «Pos» and «Neg» terminals on the regulator, and a ammeter at the D.C. terminal on the generator. Operate the engine at approximately 1000 r.p.m. (about 2300 generator r.p.m.) with accessories turned on to obtain 20-200 amperes generator output, and note the voltage setting. The voltage should be steady and reasonably close to specification. Desired variations in setting can be obtained by removing the plug from the voltage regulator cover and turning the adjusting screw inside the regulator. This will change the voltage to meet the needs dictated by operating conditions.

Undercharged battery: If the voltage setting as checked above is steady and reasonably close to the specified value and the battery is undercharged, raise the setting by .3 volt and check for an improved battery condition over a minimum service period of 48 hours. If the voltage cannot be adjusted to the desired value, the generator should be checked as follows:

Stop generator, turn off all accessories and disconnect battery ground strap. Disconnect all leads from the regulator and from the generator field.

■ **Caution:** Do not allow leads to touch ground.

Connect a voltmeter and ammeter in the circuit at the D.C. terminal on the generator. Connect a jumper lead from the generator D.C. terminal to the generator field terminal. Connect a carbon pile load across the battery. Turn to off position. Reconnect battery ground strap. Turn on all vehicle accessories. Operate generator and adjust carbon pile load as required to check for rated output.

To check the generator field winding, proceed as outlined under « field winding » above.

Overcharged battery: If the voltage setting as checked above is steady and reasonably close to the specified value, lower the setting by .3 volt and check for an improved battery condition over a minimum service period of 48 hours.

A shorted or grounded field or a defective regulator can cause an overcharged battery. The field winding can be checked as covered in «Undercharged Battery» above. If the field winding is found not to be defective, the generator is not defective, and the regulator should be check as covered in section entitled «Regulator Checks».

Regulator checks

In the event of voltage regulator failure, before replacing the failed regulator proper tests should be made of the field current draw of the alternator circuit to make sure that a shorted or partially-shorted field coil has not caused premature failure or the voltage regulator.

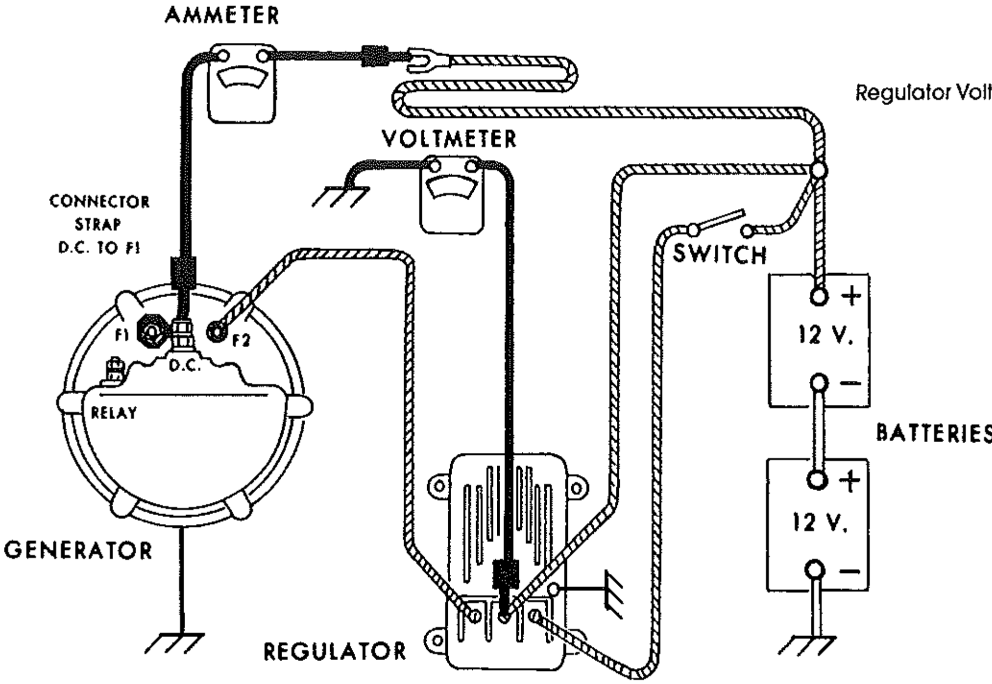
Before making electrical checks, visually inspect the wire-wound resistors for opens, and make sure all soldered connections are secure.

Various electrical checks with an ohmmeter can be made to determine which components are defective.

The ohmmeter must be accurate, and must be one which uses a 1-½ volt dry cell. Also, the ohmmeter polarity must be determined by connecting its leads to voltmeter leads.

The voltmeter will read up-scale when the negative leads are connected together and the positive leads are connected together. The polarity of the voltmeter leads can be determined by connecting its leads to the identified terminals of a battery.

ELECTRICAL



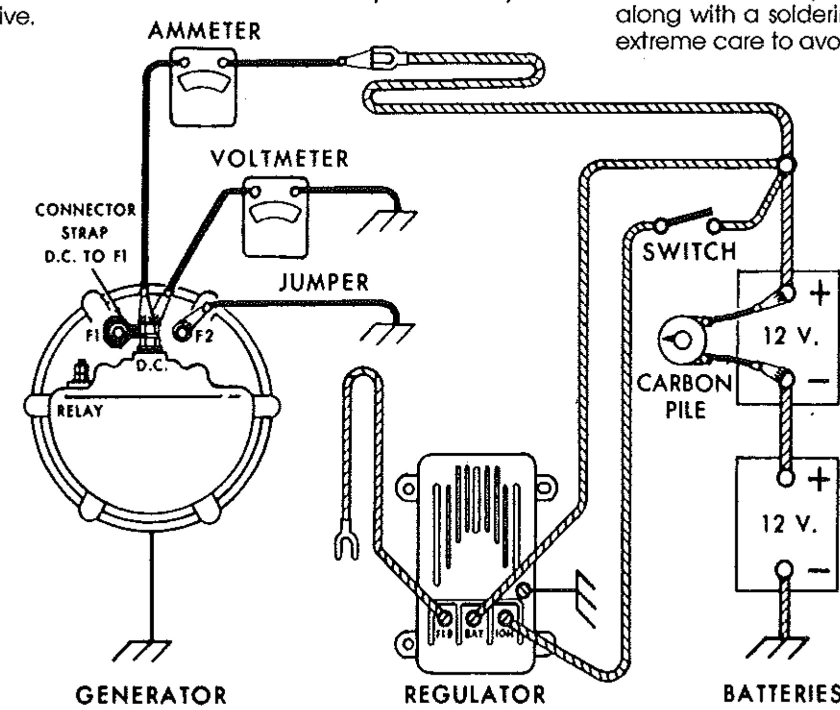
Regulator Voltage Adjustment Test

When making checks, note carefully in the illustrations how the ohmmeter is connected with regards to polarity, and select a scale such that the 10 ohm reading is at or near mid-scale. In general, the 10 ohm reading should be within, or very nearly within, the middle third of the scale.

It is important that the following checks be made in the order listed. If a defective part is found, replace it before proceeding with the remaining checks. Be sure to make all the checks as more than one component may be defective.

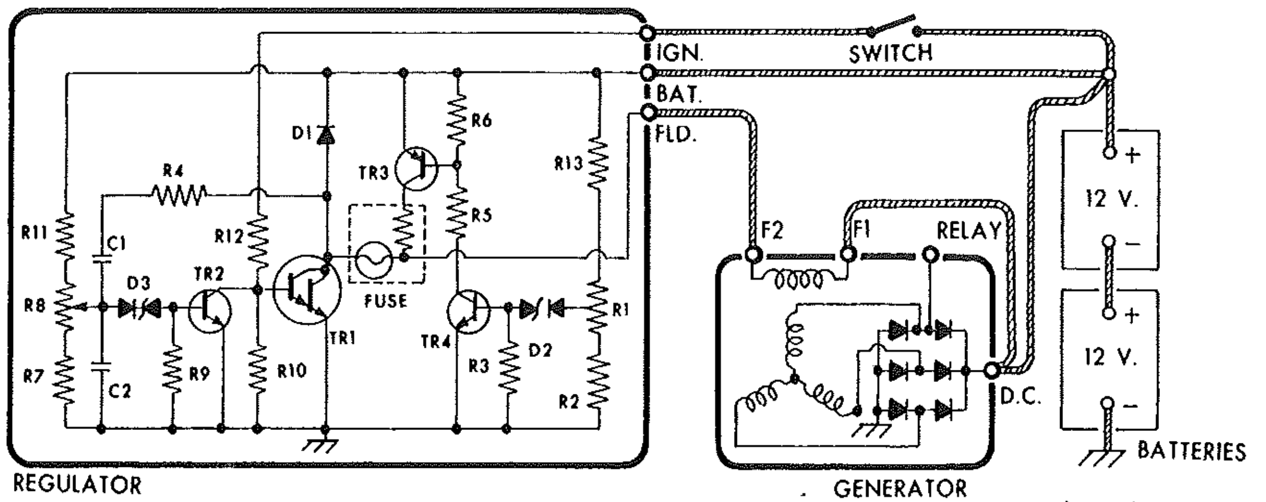
A defective part may be replaced by removing any attaching screws involved and unsoldering the connections. To replace the parts identified, separate the printed circuit board from the cover by removing the eight attaching screws shown in. When resoldering, limit solder time to a minimum as excessive heat may damage the printed circuit and component parts.

■ **Caution:** Good soldered connections are essential for satisfactory operation. A rosin core 63% tin 37% lead solder with 360°F (182°C) melting point is recommended along with a soldering iron rated at 50 watts or less. Use extreme care to avoid overheating.

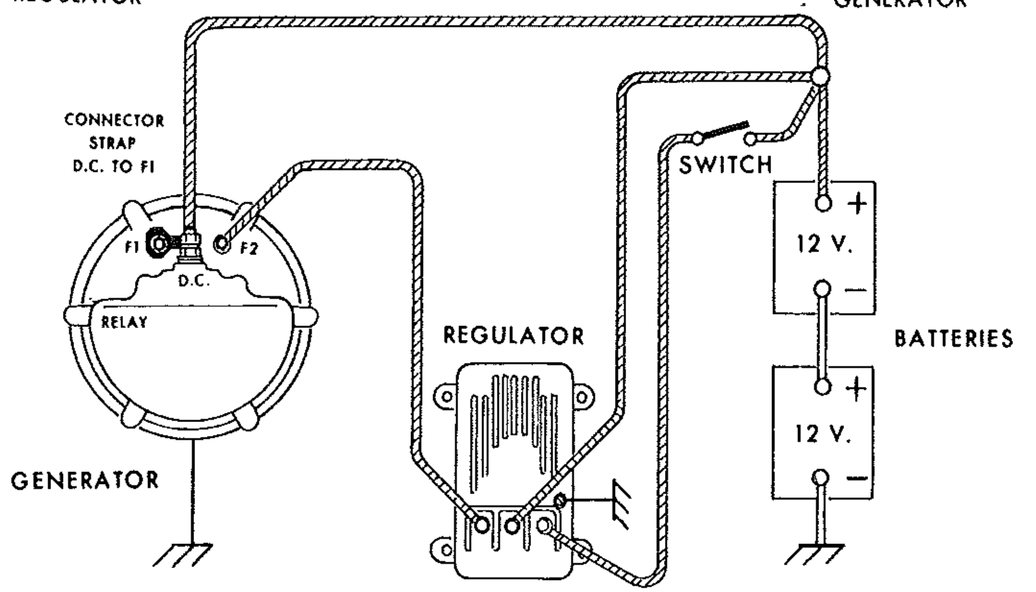


Checking Generator Output

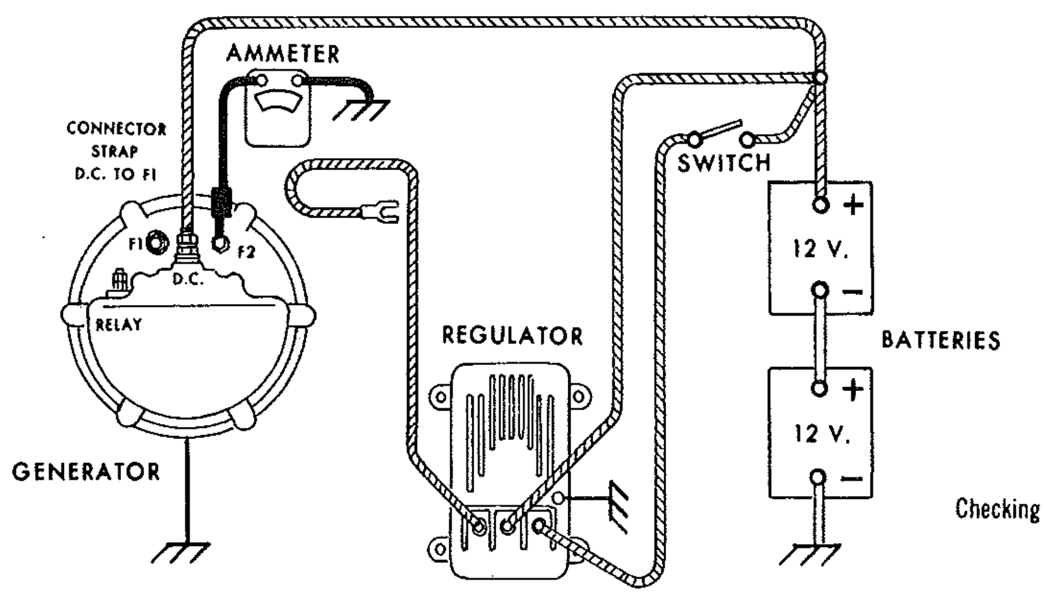
ELECTRICAL



Internal wiring circuit



Typical wiring diagram



Checking generator field winding

ELECTRICAL

Zener diode: To check the zener diode. Unsolder the connection and lift the lead up just enough to separate the lead from the printed circuit. Bending the lead too far may cause it to break off inside the diode. Then connect the ohmmeter leads as shown. If the reading is zero, the diode is shorted. If the reading is very high (infinite) the diode is open. Re-solder the diode lead before proceeding.

Potentiometer: If either reading is 100 ohms or above with the ohmmeter connected as shown the potentiometer.

Filter condenser: To check the filter condenser, connect the ohmmeter as shown. A zero reading indicates a shorted filter condenser. To check for opens, inspect the two soldered connections.

Feed-back condenser: A shorted feed-back condenser will give a zero reading with Ohmmeter connected as shown. To determine if the condenser lead is open, carefully inspect the condenser lead at the soldered connection.

Field discharge diode: The field discharge diode is shorted if a zero reading is obtained with the ohmmeter connected. if the reading is very high (infinite), the diode is open. Note that the diode lead has been unsoldered and that the ohmmeter is connected to the diode lead and to the attaching nut. Re-solder the diode lead before proceeding with other checks.

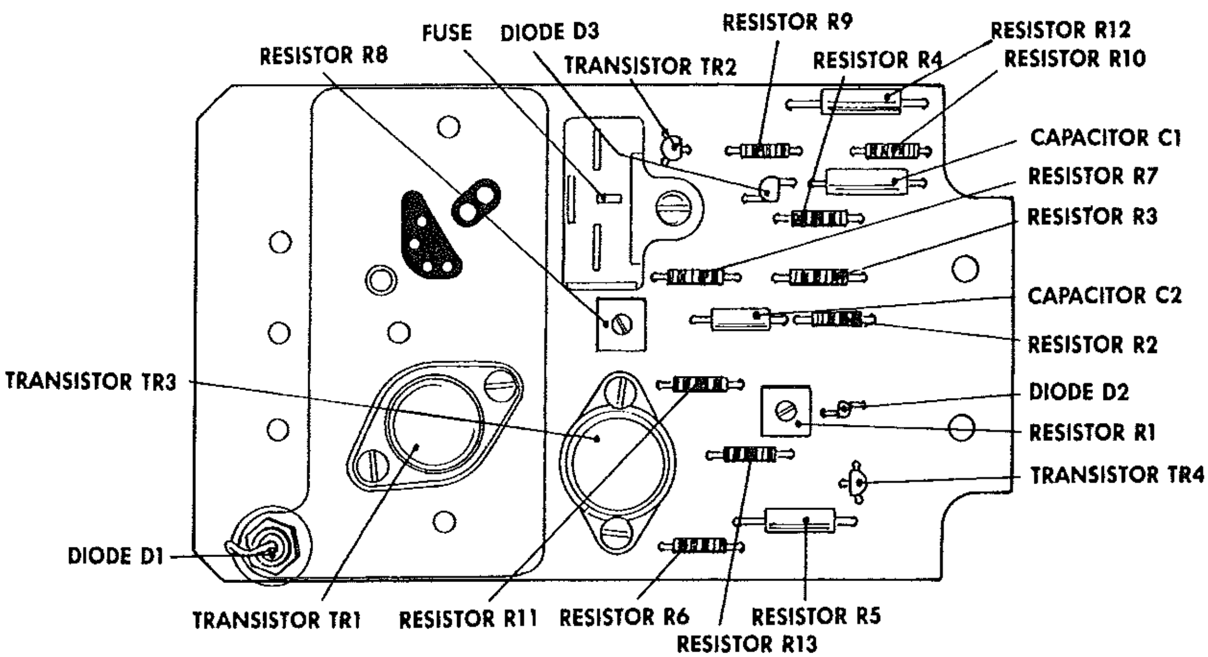
Back bias diode: Check the back bias diode by connecting the ohmmeter as shown. A zero reading indicates a shorted diode and a reading over 1000 ohms indicates an open diode.

Shorted power transistor: Check the power transistors by connecting the Ohmmeter the three ways shown. If any reading is zero ohms, one of the power transistors is shorted. To determine which power transistor is shorted, remove the upper transistor and repeat the check as shown on the transistor which is still mounted on the printed circuit board. If any of the three readings is zero, the transistor is shorted. Also check the transistor which has been removed by connecting the ohmmeter the three ways shown. A zero reading in any one of the three checks indicates a shorted transistor.

Shorted driver transistor: The driver transistor is shorted if any reading is zero with the ohmmeter connected the three ways shown.

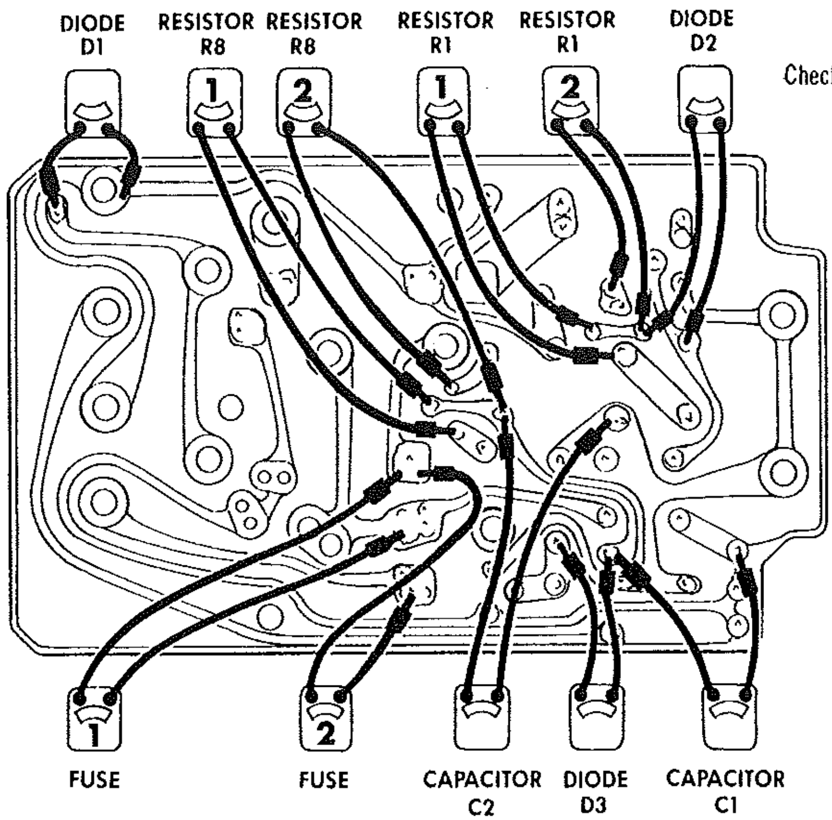
Open transistors: The power transistors and the driver transistor may be checked for opens by removing the transistors from the panel board and connecting the ohmmeter to each as shown. A very high (infinite) reading in either check indicates an open transistor.

When attaching the panel board to the cover, note the location of the insulators as shown. Also, visually re-check all soldered connections and the wire-wound resistors for opens.

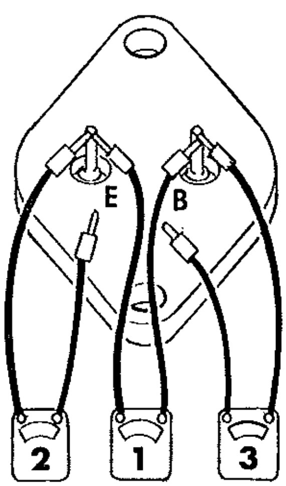


REGULATOR COMPONENTS

ELECTRICAL

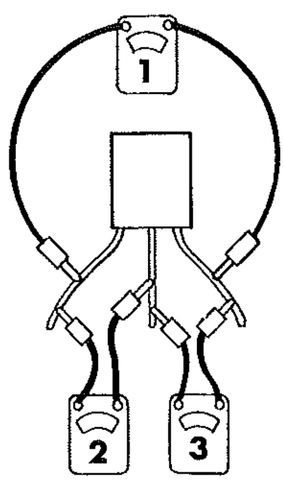


Checking regulator components



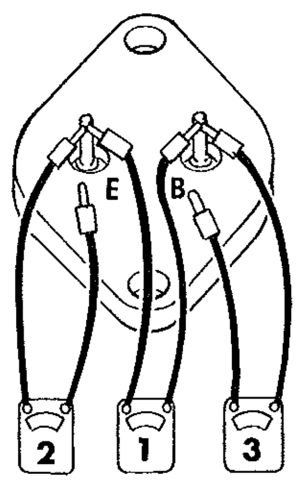
TRANSISTOR TR1

Checking transistor TR1



TRANSISTOR TR2
TRANSISTOR TR4

Checking transistors TR2 and TR4



TRANSISTOR TR3

Checking transistor TR3

ELECTRICAL

Electrical transistorized regulator troubleshooting

Component Failure	System Effect	Probable Cause
Output transistor shorted.	High system voltage. Battery overcharge. Lights burning out.	Negative Grounded Systems: «F» terminal of generator has been grounded. Poor ground in system or poor connection at generator or regulator. Regulator too hot. Ground in wiring between «F» of generator and regulator. Defective transistor. Shorted field in generator. Wire harness connections from regulator reversed.
Output transistor open	No Charge	Severe ground at «F» terminal of generator. Severe ground in wiring between «F» of generator and regulator. Generator field completely shorted.
Drive transistor shorted.	No Charge	Reverse battery polarity. High positive transient from an external source. Defective transistor.
Drive transistor open.	High System voltage.	Defective transistor.
Zener diode shorted or low breakdown voltage.	No Charge.	Reverse battery polarity. High system voltage. Defective zener.
Zener diode open.	High system voltage.	Defective zener.
Field discharge diode open.	High system voltage.	Reverse battery polarity. Defectie diode.
Back bias diode open.	No Chargé.	Severe ground at «F» of generator and regulator.
Back bias diode open.	No Charge.	Severe ground in wiring between «F» and regulator. Generator field completely shorted. Defective diode. Defective output transistor.
Back bias diode shorted.	Poor switching which would cause shorted output transistor.	«F» terminal of generator has been grounded. Poor ground in system or poor connection at generator or regulator. Regulator too hot. Ground in wiring between «F» or generator and regulator. Defective transistor. Shorted field in generator. Defective diode.

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Component Failure	System Effect	Probable Cause
Filter condenser open.	Poor switching may or may not fail output transistor.	Defective connection. Defective capacitor.
Filter condenser shorted.	High system voltage.	Defective capacitor. Reversed capacitor polarity.
Feedback condenser shorted. Feedback condenser open.	High system voltage. Poor switching which could cause shorted output transistor.	Defective capacitor. Poor connection. Defective condenser.
Open resistor in negative side of voltage divider. Open negative side of potentiometer.	High system voltage.	Defective resistor or potentiometer.
Open resistor in positive side of voltage divider. Open positive side of potentiometer.	No Charge.	Defective resistor or potentiometer.
Open collector load resistor.	No Charge.	Defective resistor.
Open drive emitter base resistor.	Poor switching which will short output transistor. High system voltage.	Defective resistor. Reversed field and positive regulator leads.

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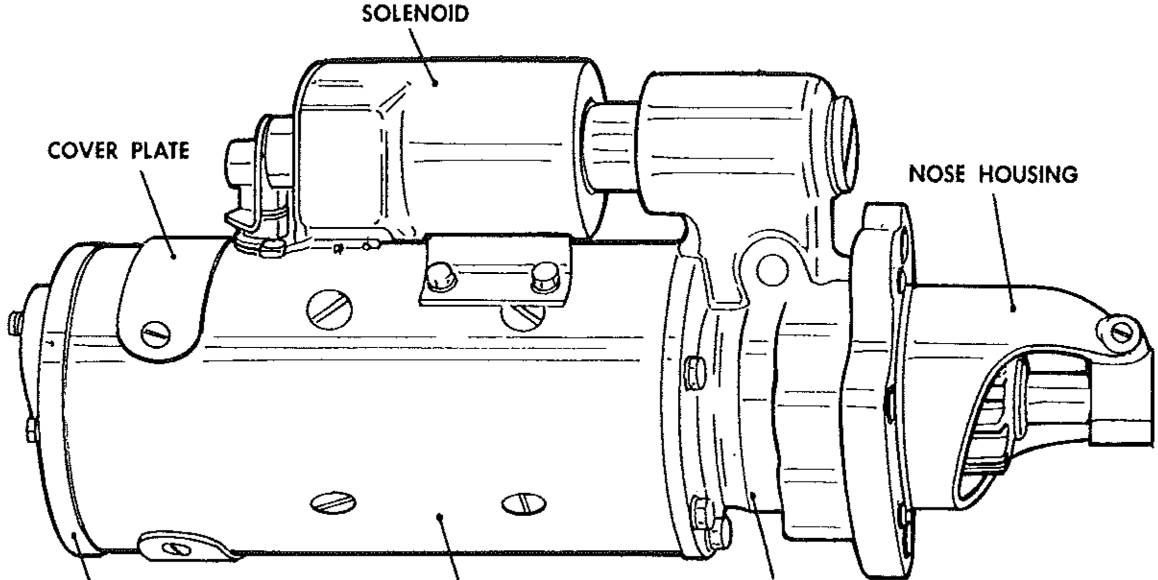
Starting motor

Description

The starting motor has the shift lever and solenoid plunger that are totally enclosed to protect them from exposure to dirt, icing conditions and splash.

Positive lubrication is provided to the bronze bushing located in the commutator end frame, in the lever housing and in the hose housing, by an oil saturated wick that projects through each bushing and contacts the armature shaft.

The clutch is a Positork drive type, moved into mesh with the ring gear by the action of the solenoid. Once engaged, the clutch will not disengage during intermittent engine firing, which prevents damage to pinion and ring gear teeth. The pinion remains engaged until starting is assured and the solenoid circuit is interrupted.



Maintenance

Under normal operating conditions, no maintenance will be required between engine overhaul periods. At time of engine overhaul, the starting motor should be disassembled, inspected, cleaned and tested.

It should be noted that six Allen head capscrews, (5 per 5/16 - 18 x 1-½" lg. and 1 per 5/16 - 18 x 55/64" lg.) that retain the cranking motor lever housing to the nose housing are to be torqued to 13-17 ft. lbs. (18-23 Nm). It is recommended that the above torque be checked when servicing or inspecting the starter drive.

☐ **Note:** When removing the nose housing from the lever housing, mark both prior to disassembly so reassembly will follow in the same order.

Starting motor tests

Never operate the starting motor more than 30 seconds at a time without pausing to allow it to cool for at least 2 minutes. Overheating, caused by excessive starting will seriously damage the starting motor.

To obtain full performance date on a starting motor, or to determine the cause of abnormal operation, the starting motor should be subjected to the following tests. These tests are performed with the starting motor removed from the engine. Failure of the starting motor to perform according to specifications will require disassembling the motor for further checks and adjustments.

No load test: Connect the starting motor in series with fully charged batteries, to give 24 volts, an ammeter capable of reading several hundred amperes, and a variable resistance. Also connect a voltmeter as illustrated from the battery terminal to the motor frame. An R.P.M. indicator is necessary to measure armature speed. Proper voltage can be obtained by varying the resistance unit.

■ **Caution:** The following test requires extreme caution. Follow directions carefully.

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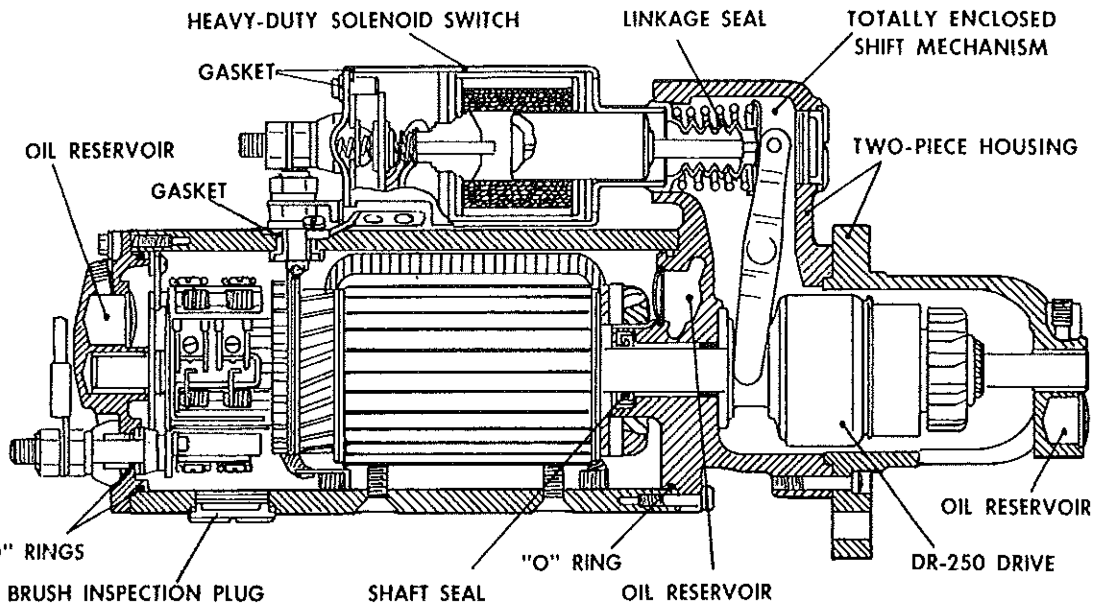
Starting Motor Construction.



Lock torque test: The lock-torque test requires the equipment illustrated. A variable resistance with a high current capacity should be used. The starting motor should be SECURELY mounted and a brake arm hooked to the drive pinion. When specified current is applied, the torque can be computed from the reading on the scale. A one foot brake arm will directly indicate pound feet.

Disassembly

Normally the starting motor should be disassembled only so far as is necessary to make repair or replacement of the defective parts.

Note the relative position of the solenoid, lever housing, and nose housing so the motor can be reassembled in the same manner. Disconnect field coil connector from solenoid motor terminal, and lead from solenoid ground terminal. On motors which have brush inspection plates, remove the plates and then remove the brush lead screws. This will disconnect the field leads from the brush holders.

Remove the attaching bolts and separate the commutator end frame from field frame. Remove armature and clutch assembly from lever housing. Separate solenoid from lever housing by pulling apart.

Cleaning

The driving mechanism armature and fields should not be cleaned in any degreasing tank, or with grease dissolving solvents, since these would dissolve the lubricants in the drive mechanism and damage the insulation in the armature and field coils. All parts except the drive should be cleaned with mineral spirits and a brush. The drive can be wiped with a clean cloth.

If the commutator is dirty it may be cleaned with No. 00 sandpaper.

■ **Caution:** Never use emery cloth to clean commutator.

Armature servicing

If the armature commutator is worn, dirty, out of round, or has high insulation, the armature should be put in a lathe so the commutator can be turned down. The insulation should then be cut 1/32" (.79 mm) wide and 1/32" (.79 mm) deep, and the slots cleaned out to remove any trace of dirt or copper dust. As a final step in this procedure, the commutators should be sanded lightly with No 00 sandpaper to remove any burrs left as a result of the undercutting procedures.

The armature should be checked for opens, short circuits and grounds as follows:

Opens: Opens are usually caused by excessively long starting periods. The most likely place for an open to occur is at the commutator riser bars. Inspect the points where the conductors are joined to the commutator bars for loose connections. The poor connections cause arcing and burning of the commutator bars as the starting motor is used. If the bars are not too badly burned,

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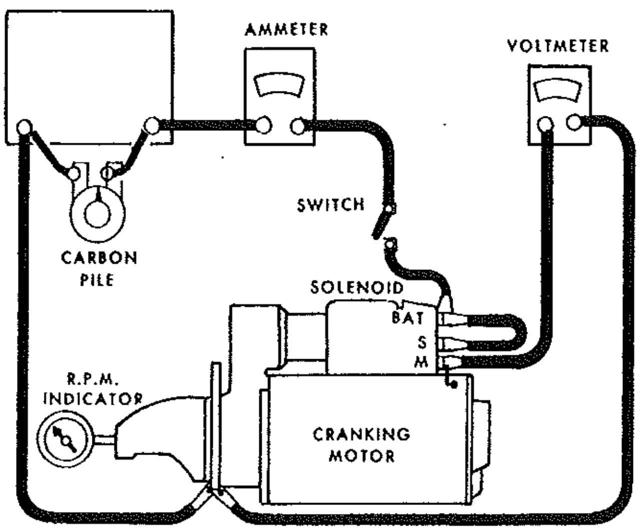
repair can often be effected by resoldering the leads in the riser bars (using rosin flux), and turning down the commutator in a lathe to remove the burned material. The insulation should then be undercut.

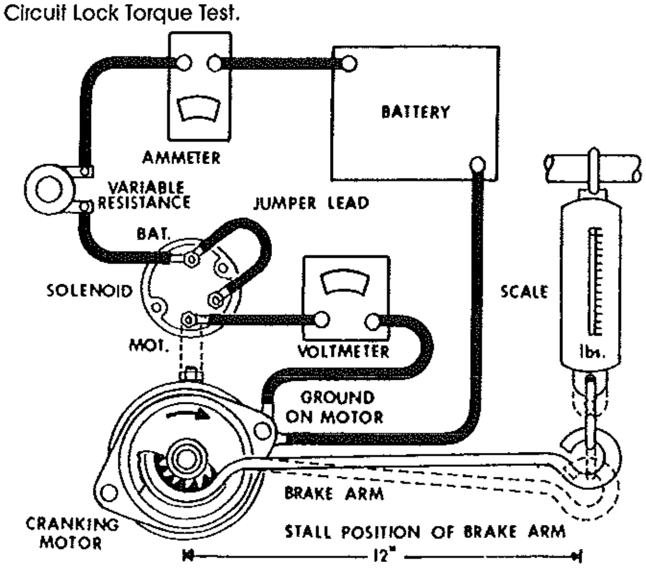
Short circuits: Short circuits in the armature are located by suse of a growler. When the armature is revolved in the growler with a steel strip such as a hacksaw blade held above it, the blade will vibrate above the area of the armature core in which the short circuit is located. Shorts between bars are sometimes produced by brush dust or copper between the bars. These shorts can be eliminated by cleaning out the slots.

Circuit For No-Load Test.



Grounds: Grounds in the armature can be detected by the use of a 100-volt test lamp and test points. If the lamp

Circuit Lock Torque Test.



lights when one test point is placed on the commutator with the other point on the core or shaft, the armature is grounded. Grounds occur as a result of insulation failure which is often brought about by overheating of the starting motor produced by excessively long starting periods or by accumulation of brush dust between the commutator bars and the steel commutator ring.

Field coil checks

The field coils may be checked for grounds and opens by using a test lamp.

Grounds: If the motor has one or more coils normally connected to ground, the ground connections must be disconnected during this check. Connect one lead of the 110-volt test lamp to the field frame and the other lead to the field connector. If the lamp lights, at least one field coil is grounded which must be repaired or replaced.

Opens: Connect test lamp leads to ends of field coils. If lamp does not light, the field coils are open.

Field coil removal

Field coils can be removed from the field frame assembly by using a pole shoe screwdriver. A pole shoe spreader should also be used to prevent distortion of the field frame. Careful installation of the field coils is necessary to prevent shorting or grounding of the field coils as the pole shoes ar tightened into place. Where the pose shoe has a long lip on one side and a short lip on the other, the long lip should be assembled in the direction of armature rotation so it becomes the trailing (not leading) edge of the pole shoe.

Reassembly

The reassembly is the reverse of disassembly.

To reassemble the end frame having eight brushes onto the field frame, pull the armature out of the field frame just far enough to permit the brushes to be placed over the commutator. Then push the commutator end frame and the armature back against the field frame.

The recommended torque for the cross-slotted pole shoe screws is 25-35 ft. lbs. (34-47 Nm).

Lubrication

All wicks and oil reservoirs should be saturated with SAE No. 10 oil. The splines underneath the drive (on the shaft) should be wiped clean but not oiled. Oil in this area may cause failure to engage at very cold temperatures.

Pinion clearance

Pinion clearance should be checked after reassembly of motor to make sure the clearance is within specifications.

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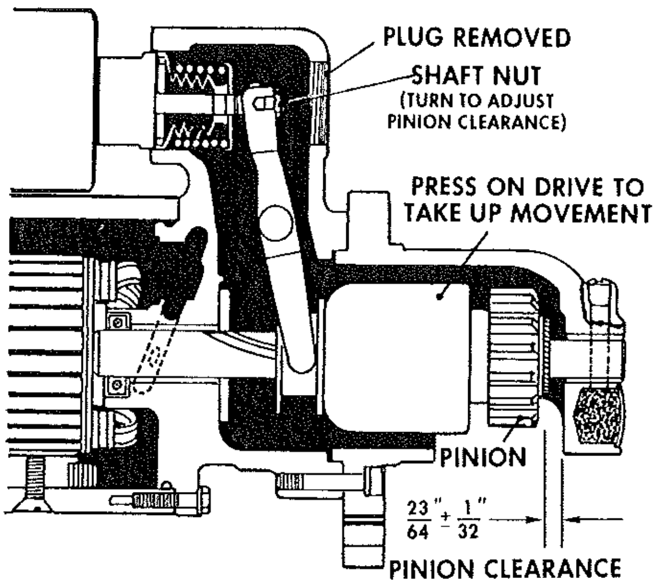
To check pinion clearance (starting motor off engine), first disconnect the motor field coil connector from the solenoid motor terminal. Connect 24 volt battery with the positive battery lead to the solenoid switch terminal (5), and the negative battery lead to the grounded (G) solenoid terminal. Momentarily flash a jumper lead from the solenoid motor terminal to the grounded (G) solenoid terminal.



The pinion gear will now shift into cranking position and remain so until the battery is disconnected. Push the pinion or drive back towards the commutator end to eliminate slack movement. Measure the distance between pinion and pinion stop. This should be 23/64" x 1/32 (9.5 mm x .79).

Pinion clearance is adjusted to these limits by turning the solenoid shaft nut after removing access plug in shift housing.

Starter solenoid

Description

The starting motor solenoid shifts the starting motor pinion into mesh with the flywheel ring gear and also closes the electrical circuit to energize the starting motor.

There are two windings in the solenoid: a pull-in winding and a hold-in winding. Both windings are energized when the external control switch is closed. They produce a magnetic field which pulls the plunger in so that the drive pinion is shifted into mesh, and the main contacts in the solenoid switch are closed to connect the battery directly to the starting motor. Closing of the main switch contacts shorts out the pull-in winding is connected across the main contacts. The magnetism produced by the hold-in winding is sufficient to hold the plunger in, and shorting out the pull-in winding reduces drain on the battery. When the control switch is opened momentarily, the pull-in winding and the hold-in winding are connected in series between the battery and common ground.

The polarity of the pull-in winding is reversed and opposes the magnetic pull of the hold-in winding. All magnetic holding force on the solenoid plunger is thus cancelled. The return spring then quickly pulls the solenoid plunger back, opening the solenoid switch contacts and at the same time withdrawing the pinion gear from the meshing position.

Proper operation of the switch depends on maintaining a definite balance between the magnetic strength of the pull-in and hold-in windings.

This balance is established in the design by the size of wire and the number of turns specified. An open circuit in the hold-in winding or attempts to start with a discharged battery may cause the switch to chatter.

Disassembly

To disassemble the solenoid, remove nuts, washers, and insulators from the switch terminal and battery terminal. Unscrew cover screws and remove cover. Take out the contact disk assembly.

Solenoid tests

Two tests must be made to determine the current draw of (1) both windings in parallel and (2) the hold-in winding alone. The solenoid windings can be tested with the solenoid either off or on the starting motor. However, when the solenoid is checked on the starting motor, it is necessary to disconnect both leads at the main solenoid terminals to prevent interference. The main solenoid terminal which is normaly, connected to the starting motor must then be grounded to the solenoid base by means of a jumper lead. For the first test, connect a source of variable voltage (battery and a variable resistance) in series with an ammeter between the solenoid base and the solenoid small switch terminal. Connect a voltmeter between the same two points. Slowly increase voltage and note the current draw. This should be 55-63 amps at 24 volts. Disconnect the jumper lead grounding the main solenoid terminal and readjust the variable resistance to obtain the specified voltage of 24 volts. This should not exceed 6,8 amps.

When the solenoid has been removed from the starting motor for repair or replacement, the linkage must be adjusted to provide the correct pinion clearance when the solenoid is remounted on the starting motor. See «Starting Motor» earlier in this section for correct pinion clearance adjustment.

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Batteries

Description

Four (4) 12-Volt maintenance free batteries are used.

IMPORTANT: Observe decal on inside of battery compartment for proper connections.

The battery has four (4) major functions to perform on the coach.

(1) It provides a source of current for starting the engine.

(2) It acts as a stabilizer to the voltage in the electrical system.

(3) It can, for a limited time, furnish current when electrical demands of the electrical equipment exceed the output of the generator.

(4) It provides a limited source of power for connected accessories, when the engine is not running.

In replacing batteries, only batteries of the same specification should be used.

The electrical system is negative ground, with the negative battery terminal connected to the coach frame.

■ **Caution:** Make certain that connections are not reversed, since damage to electrical system components will result.

IMPORTANT: After battery cables have been disconnected, wrap terminal with electrical tape or equivalent to prevent accidental grounding.

The «maintenance-free» battery achieves new levels of power, life and dependability. It's the product of improved battery technology, design and new manufacturing methods.

«Maintenance-free» batteries provide starting power in the same way as conventional batteries, but there are important differences which affect testing, charging and other service procedures. These differences must be recognized by service people to assure that improvements in performance and life are received by the user.

The most obvious external difference is the absence of filler caps. The common 12-volt battery has six (6) openings through which water may be added, (6-volt batteries have three (3) openings.) These openings are closed by individual caps or by two closures which gang individual caps together in threes.

Since «maintenance-free» batteries need no water additions, they require no filler openings. Without «filler caps» the top of the battery is smooth and appears to be sealed. But —

«Maintenance-free» batteries are not sealed!

All batteries (including «maintenance-free») generate gases, especially during charge. While the volume of gases produced by the «maintenance-free» battery is reduced by more than 75%, there are small openings to allow this gas to escape. All automotive batteries contain a solution of sulfuric acid and water which is corrosive.

Remember, no battery is «sealed». The corrosive sulfuric acid mixture will espace if the battery is turned upside down or placed on its side.

Keep «maintenance-free» batteries top-side up!

Receiving and visual inspection

Carefully inspect batteries received on incoming shipments. Look for wet, or damaged shipping cartons which may indicate a broken battery which is leaking. Check for obvious damage such as a broken case or cover which may allow the electrolyte to escape. Check the area around the terminal posts to be sure the seal between the post and cover is liquid tight.

If you should-find evidence of moisture on top of the battery and careful examination uncovers no sign of damage, use a disposable paper towel to wipe the surface dry.

If you find batteries which appear to be damaged intransit, secure written acknowledgement from the carrier. Contact your supplier for further instructions on filing a claim and securing replacement of the damaged batteries.

Testing

«Maintenance-free» batteries may be tested in exactly the same manner as conventional batteries except for the use of hydrometers. Since there are no filler openings, there is no access to the electrolyte and, therefore, the hydrometer cannot be used. However, this is no great loss because the hydrometer is not too practical for testing batteries in the field.

The most effective way to determine whether any battery is serviceable is to check the voltage it will deliver for 15 seconds when subjected to a normal starting load. This is called «load testing» and it is the best way to test a battery for serviceability. If the battery can maintain acceptable voltage (cranking power) under load, it has ample power to provide dependable starting.

There are many good «load testers» available. Most of them can be used to test «maintenance-free» as well as conventional batteries. The important thing is to read and understand the instructions for using the tester.

Some of the newer battery «load testers» operate simply by connecting leads to the battery terminals and adjusting a selector knob to «dial in» a load which is approximately half of the «Cold cranking Performance» rating of the battery. If the battery sustains a voltage of 9,6 or higher (sometimes indicated by a green band on the meter) for 15 seconds, the battery is serviceable and will provide adequate power for dependable starting.

Cold temperature reduce the voltage which a battery can deliver under load as follows:

BATTERY TEMPERATURE	MINIMUM VOLTAGE
80°F	9,6
60°F	9,5
40°F	9,3
20°F	8,9
0°F	8,5

If a fully charged battery is «load tested» and cannot sustain the required voltage for 15 seconds, the battery has failed the tests and should be replaced. However, if the battery passes this test, it is well to check the rest of the electrical system for the cause of the starting problem.

Important

Since a good battery which is simply discharged will read the same on «load test» as a battery which is no longer serviceable — i.e., one that fails to sustain 9,6 volts for 15 seconds — it is essential to make sure that the battery under test contains a sufficient charge to assure that the load test is meaningful. An easy-to-understand, step-by-step test procedure is shown on the following page. If the battery passes this test it is serviceable and a check should be made of the vehicle's electrical system.

Charging

«Maintenance-free» batteries may be charged by any charger and at any rate recommended and considered safe for conventional batteries. However, manufacturer's instructions must be followed carefully.

High rate fast chargers deliver initial charge rates of 50 - 60 amperes for 12 volt batteries. Care must be exercised in «fast chargers» to be sure that the voltage is set correctly for the battery being charged and safety controls are operative.

Installation instructions

Batteries with new antimony-free alloys hold a charge 6 to 8 times longer than conventional batteries. Regular batteries containing electrolyte may lose most of their charge in 4-6 months standing idle on the shelf. Antimony-free batteries will retain most of their charge after a year under the same conditions.

However, when a customer buys a new battery, he is paying for and is entitled to receive one that is fully charged. Only a fully charged battery can deliver the power and life which is the basis of the sale. Therefore, it is smart to place the new battery on load test before it is installed. If a charge is indicated, the battery should be recharged before installation.

Clean battery terminal posts and cables. Using sandpaper or a wire brush make the metal really shine. If cables appear damaged, replace them. Faulty cables or corrosion between the battery terminal and the cable will impede or even completely block the flow of power to and from the battery. After cleaning, coat the contact surfaces with mineral grease or petroleum jelly before the terminals are reconnected.

Check electrical system

It is not uncommon to have a new battery returned within a few days or weeks of installation with the complaint that it won't start. It must be remembered that no matter how good a battery may be, it is only one part of a whole electrical system, the main components of which are the:

- STARTER MOTOR
- ALTERNATOR
- VOLTAGE REGULATOR

Battery trouble, customer complaints and costly adjustments can be avoided by making two simple checks after the new battery is installed and before the customer drives away.

Check voltage regulator

The life and performance of any battery are so greatly influenced by the voltage regulator that it is vitally important to make sure that the regulator is known to be in satisfactory operating condition.

If the voltage regulator is not in good operating condition, the battery will not function satisfactorily because the charge it receives is controlled by the regulator. «Maintenance-free» batteries resist overcharge far batter than conventional batteries, but a bad regulator will cause trouble in a «maintenance-free» battery as well as in conventional batteries. In some cases of bad regulation, failure can take place within a year.

A bad regulator can cause «undercharge» — literally starve the battery to death. In this case, more power is drawn out of the battery than is replaced. As a result, the battery gradually runs down until it is so low that it fails completely.

Remember this important fact — the battery is only one part of a total system, all of the parts of which are inter-related and inter-dependent. The alternator is the source of all electrical energy in the vehicle. It supplies power for ignition, lights, heater blower, radio, air conditioner and

ELECTRICAL

other accessories. The battery simply stores some of this energy in a chemical form for use when the generating system is not running. It is not a source of power but merely a reservoir. The battery supplied power for starting but, as soon as the engine is running, the generating system must replace the power withdrawn from the battery.

The new «maintenance-free» battery is a «break-through» in battery power and dependability for modern vehicles. By itself, however, it is not a cure nor the answer to problems in the following areas:

SHORT CIRCUITS	— cause electrical leaks that run batteries down.
CARELESSNESS	— running battery down with ignition, lights or accessories left on when engine is not running.
LOW TEMPERATURES	— reduce battery efficiency because of lower combustion and reduced cranking speeds particularly with heavy summer-weight oils.
POOR, DIRTY CONNECTIONS	— corrosion builds up resistance which impedes — often stops — the flow of power to and from the battery.
LOW REGULATOR SETTINGS	— limit the flow of recharging current from the alternator to the battery thereby starving it.
HIGH OR UNCONTROLLED REGULATOR	— permits excessive flow of current from the alternator to the battery causing excessive loss of water and premature failure.
STOP — START DRIVING	— short distance, low mileage driving drains more power out of the battery than can be replaced during short periods of driving particularly when the vehicles needs to be tuned.
UNDERSIZE BATTERY	— provides inadequate power for starting at below zero temperatures.

Jump starting

Jump starting a vehicle can be hazardous. Improper procedures can result in a battery explosion. To avoid injuries seek the help of a competent garage or towing service.

DANGER! EXPLOSIVE GASES! Cigarettes, flames or sparks could cause the battery to explode. Always shield eyes and face from battery. Wear safety glasses when working around batteries. Do not charge or use booster cables or adjust post connections without proper instruction and training. KEEP VENT CAPS TIGHT AND LEVEL.

POISON! CAUSES SEVERE BURNS! Contains sulfuric acid. Avoid contact with skin, eyes or clothing. In event of accident flush with water and call a physician immediately. KEEP OUT OF REACH OF CHILDREN.

Ground means the cable that runs from the battery post to either the engine block or vehicle frame. Serious damage to the automobile can result from reversed connections.

IF THERE IS NO AVAILABLE ALTERNATIVE OTHER THAN USING JUMPER CABLES, READ AND UNDERSTAND THIS MATERIAL BEFORE PROCEEDING.

Check to see that both batteries have the same voltage types; i.e. 12 volt.

Remove vent caps and check to make certain the battery is not frozen. Do not attempt to jump start a frozen battery as an explosion could result. Do not use matches or open flame to inspect for frozen batteries. (Sealed type MF batteries cannot be inspected to determine if they are frozen. Do not attempt to jump start a sealed MF battery if the possibility of the battery being frozen exists.)

When jump starting a battery, always leave vent caps in place on the battery. Cover vent caps of both batteries with a damp cloth. DO NOT COVER THE TERMINALS.

When connecting cable clamps ALWAYS «rock or twist» the jumper cable connector clamps to insure that the clamp teeth are making good contact.

Before using jumper cable from one vehicle to another, set the parking brakes, turn off accessory switches and ignition keys, and place the gearshift or gear selector in Neutral for standard transmission, Neutral position for automatic transmission equipped vehicles. Make certain vehicles do not touch.

Now PROCEED IN EXACT SEQUENCE.

First Jumper Cable (See Diagram)

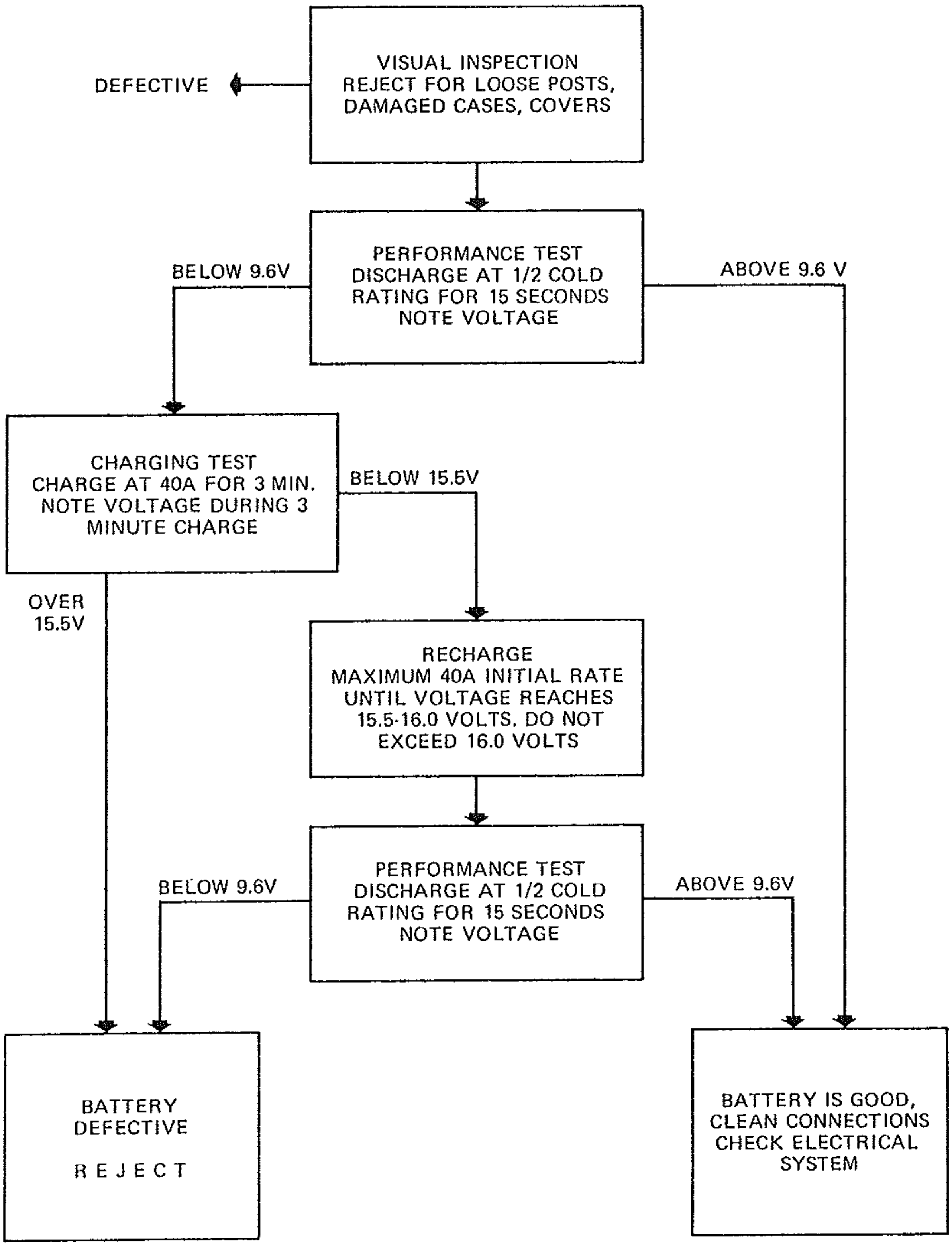
1. Connect one end of first cable to the terminal of the discharged battery which is connected to the starter switch or solenoid (not grounded terminal). Note if this is the positive or negative battery terminal.

2. Connect the other end of the first cable to the terminal post of the booster battery having the same marking; that is, POSITIVE TO POSITIVE or NEGATIVE TO NEGATIVE.

Second Jumper Cable

3. Connect the first end of the second jumper cable to the other terminal of the booster battery.

"Maintenance-Free" Battery Test Procedure



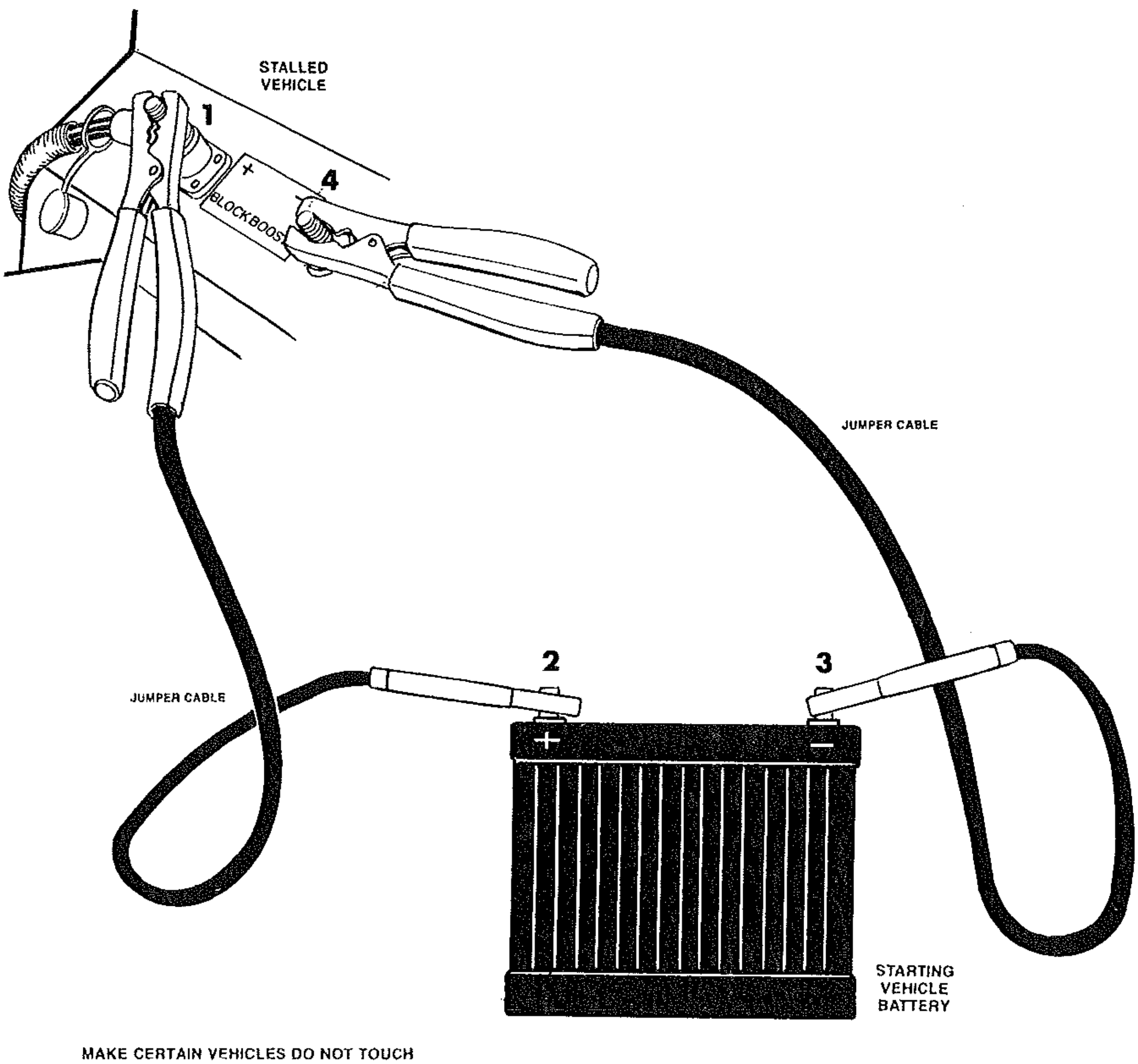
ELECTRICAL

4. With the other end make the FINAL CONNECTION. THIS IS TO BE TO THE ENGINE BLOCK OF THE VEHICLE WITH THE DISCHARGED BATTERY AS FAR AWAY AS POSSIBLE FROM THE BATTERY. DO NOT MAKE FINAL CONNECTION TO THE TERMINAL OF THE STALLED VEHICLE BATTERY.

Engage the starter of the car with the discharged battery. If it does not start immediately, start the engine of the other car to avoid excessive drain on the booster battery.

After the vehicle with the discharge battery is started and running normally, disconnect cables in exact reverse sequence. Remove the cable connection at the engine block first; then the other end of the same cable from the booster battery.

Remove the other cable by disconnecting at the starting vehicle battery first. Then remove final end of second cable for stalled vehicle battery.



THIS HOOK-UP FOR **NEGATIVE** GROUND VEHICLES

ELECTRICAL

Cleaning and inspection

The external condition of the battery and the battery cables should be checked periodically. The top of the battery should be kept clean and the battery hold-down bolts should be kept properly tightened. Neutralize all acid with soda and water solution. Flush trays and battery compartment thoroughly with water. Care must be taken to keep vent plugs tight so that the neutralizing solution does not enter the cells. Repair damage done by acid as required. Scrape all paint bubbles to bare metal. After drying, repaint interior of the battery compartment and the trays. Be sure to check all grommets and cable hangers for possible damage to cables. The hold-down bolts should be kept tight enough to prevent the battery from shaking in its holder, but should not be tightened excessively as to place strain on the battery case.

To ensure a proper contact, the battery cable clamps should be tight on the battery posts. If the posts or cable clamps are corroded, the cables should be disconnected and the posts and clamps cleaned separetely with soda solution and a wire brush. A coating of petroleum jelly should then be applied to the battery posts and the inside of cable clamps to prevent oxidation. Corrosion at the posts can be avoided by lightly coating the posts and the cable clamps with petroleum jelly.

Battery tests

Place a load on batteries with starter for 30 seconds and turn on headlights — low beam — 20 amp. draw — and leave on while using an expanded scale volt meter of .01 scale divisions, check all cells for capacity. If all cells read 1,95 Volts or more with less than .05 volts difference between highest and lowest cell reading, battery is good and sufficiently charged.

Check specific gravity

Use a temperature-correcting hydrometer to measure the specific gravity of each cell. If each cell has a specific gravity of 1,180 or above, and there is a difference of 50 points or more between the highes; and the lowest cell, replace the battery. EXCEPTION: If any cell has a specific gravity of below 1,180, perform «Battery Charge» described later.

☐ **Note:** If the electrolyte level in any cell is too low to produce a reading, add water to the battery and perform «Battery Charge» described later.

Battery charge

If battery is under 1.230 gravity, it must be charged. If the specific gravity reading is less than .050 points between lowest and highest cell, recharge for 24 hours at 12 to 15 amps and 15 volts. Battery is fully charged when reading is checked for three (3) consecutive hourly checks, and no increase is noted. A full charge reading of 1.230 or less is defective and must be activated or scraped.

☐ **Note:** Highly sulfated batteries may have to be charged at 16 to 17 volts to start charging current to flow through the battery, then reduce rate to regular charge of 15 volts.

☐ **Note:** Do not allow electrolyte temperature to go above 125°F (52°C).

High rate discharge test

Never check a battery in a discharge state. Specific gravity must be above 1.230 for the high rate discharge test. If battery was slow-charged, it should stand 8 to 10 hours between performing high rate discharge.

Hook up

The battery leads must be connected to the battery, red to positive, black to negative. Turn the voltmeter selector to the 16 volt position. Connect the voltmeter leads to the battery posts.

Test procedure

Turn the load selector clockwise until the upper scale of the D.C. amperes meter reads two times the ampere-hour rating of the battery. Hold this load on for 15 seconds. While the load is on, read the battery terminal voltage on the 16 Volt scale of the D.C. Volts meter. Turn all controls to off and disconnect the tester.

☐ **Note:** If the terminal voltage reads 10,6 or more, the battery is good.

(1) Check voltage drop between grounded battery terminal (negative) and vehicle frame. With the starting motor turning over, the voltage reading should be less than 0,3 volts. If more, there is excessive resistance in circuit.

(2) Check voltage drop between positive terminal of battery and starting motor terminal stud while starting motor is operating. If the reading is more than 1.0 volts, the resistance is excessive.

(3) Check voltage drop between the starting motor housing and the bus frame. If over 0,2 volts, the resistance is excessive.

Common causes of battery failure

When a battery fails, the cause of failure may be outside the battery. For this reason, locate and correct the cause of the failure to prevent recurrence. Some common causes of battery failure are as follows:

(1) Defect in generating system such as high resistance or faulty generator or regulator.

ELECTRICAL

(2) Defective starter or excessive use of accessories.

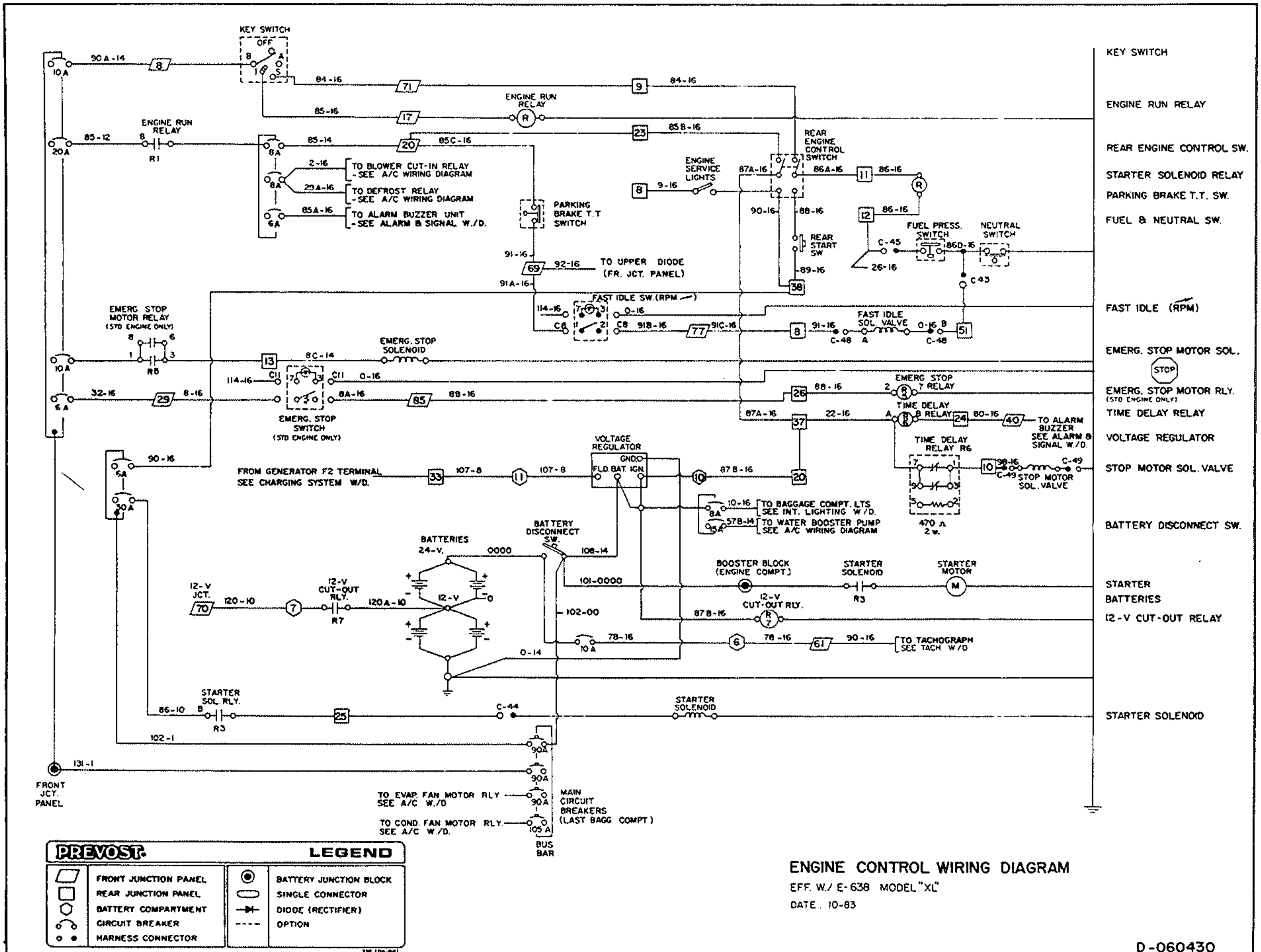
(3) Dirt and electrolyte on top of batteries.

(4) Hardened battery plates, due to battery being in a low state of charge over a long period of time.

(5) Shorted cells, loss of active material from plates.

(6) Driving conditions or requirements under which the vehicle is used only for short drives.

■ **Caution:** When making the above checks, make certain the engine does not start accidentally.

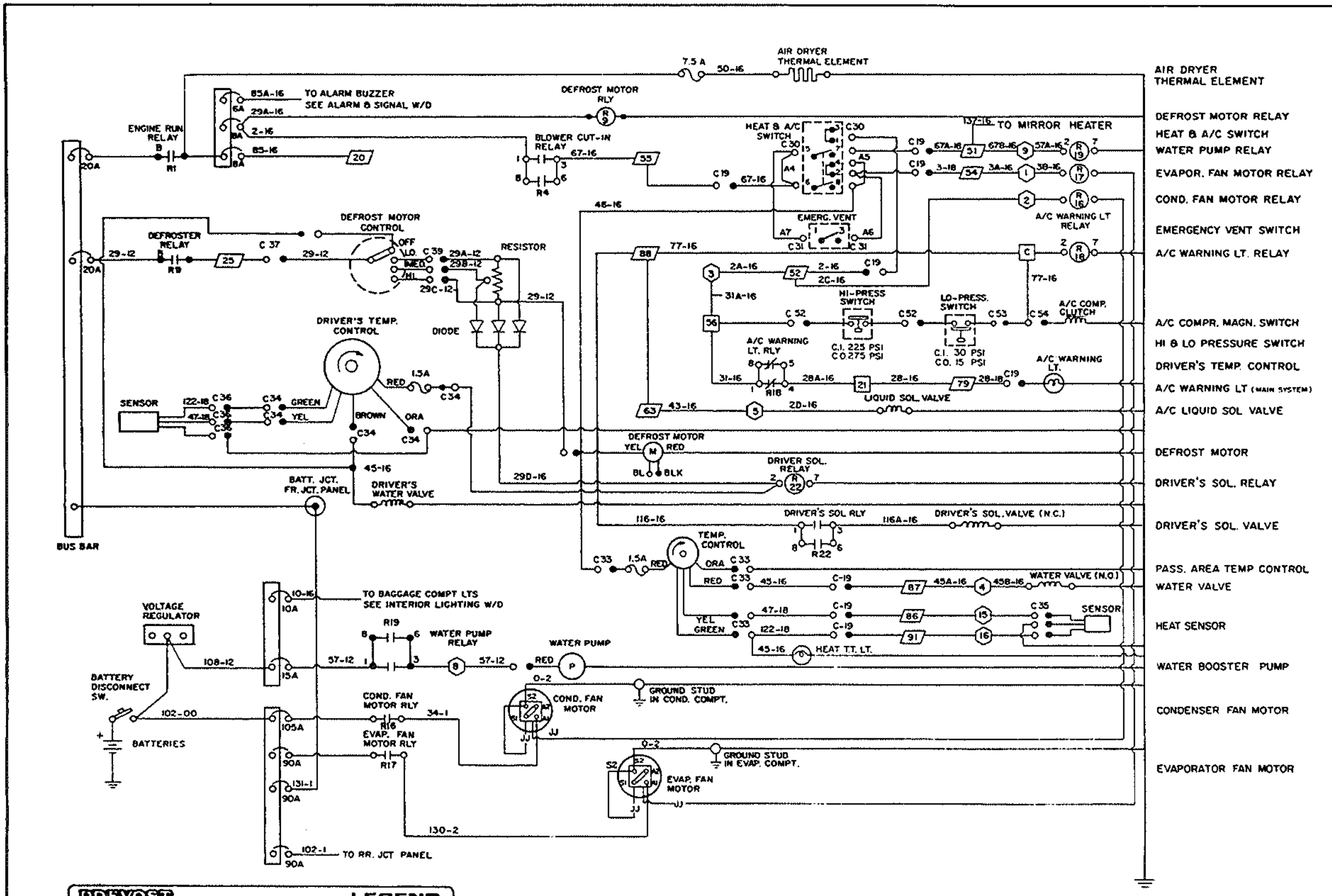


ENGINE CONTROL WIRING DIAGRAM

EFF. W./ E-638 MODEL "XL"

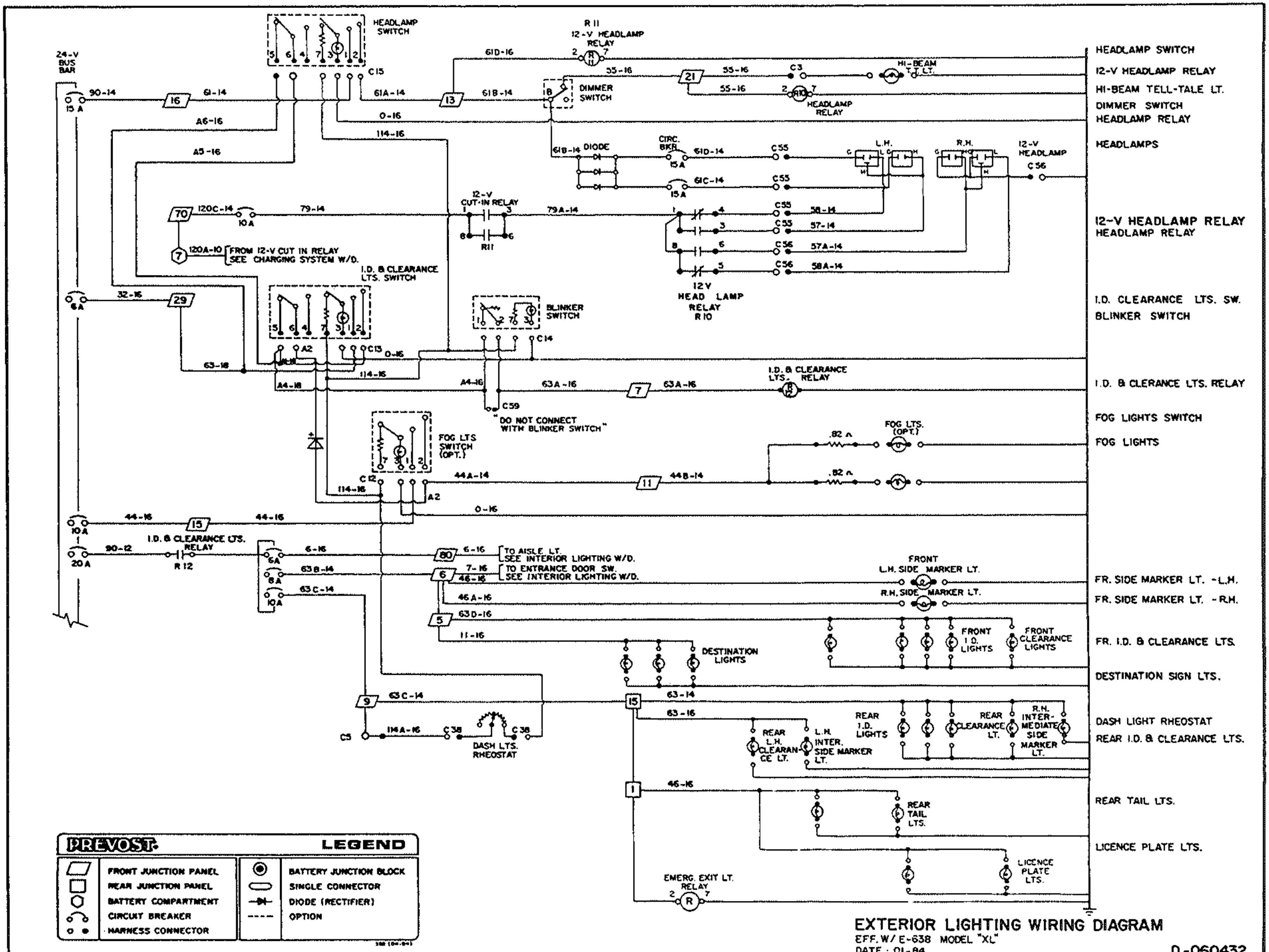
DATE. 10-83

D-060430



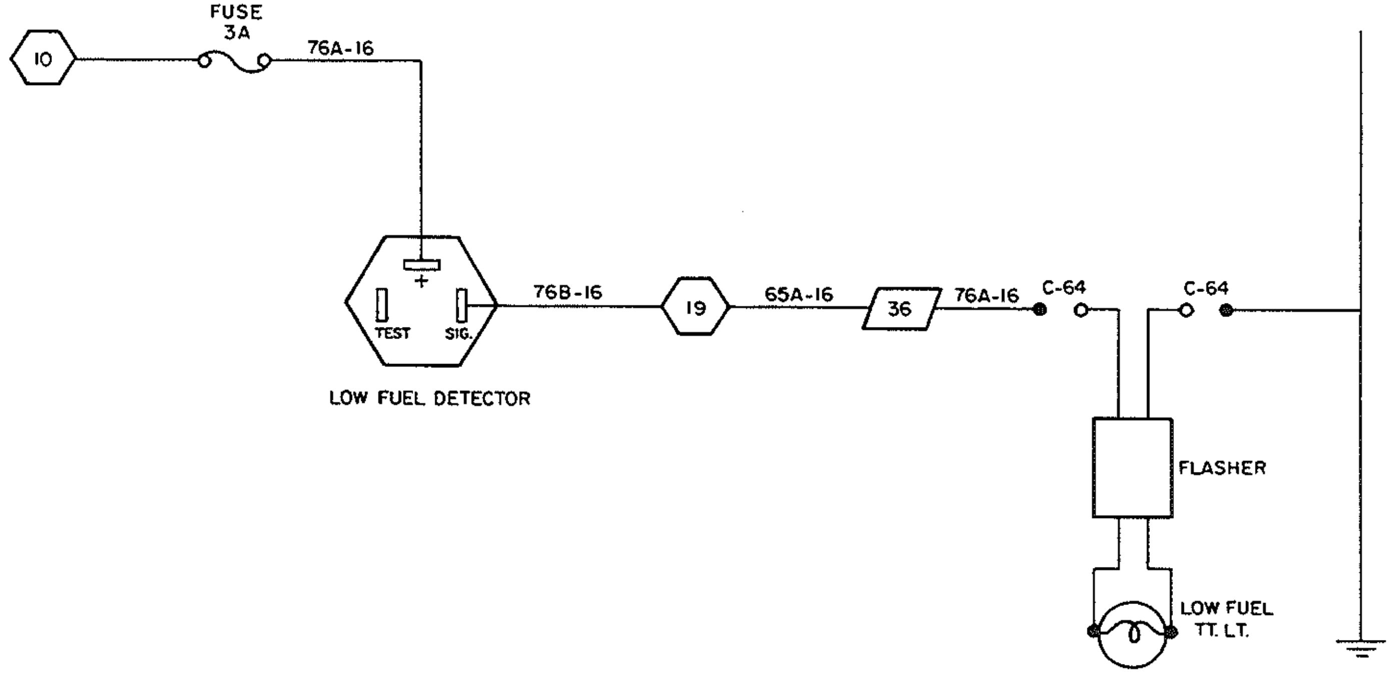
AIR CONDITIONING WIRING DIAGRAM
EFF. W/E-730 MODEL "XL"
DATE · 04-84

D-060431



EXTERIOR LIGHTING WIRING DIAGRAM
EFF. W/ E-638 MODEL "XL"
DATE : 01-84

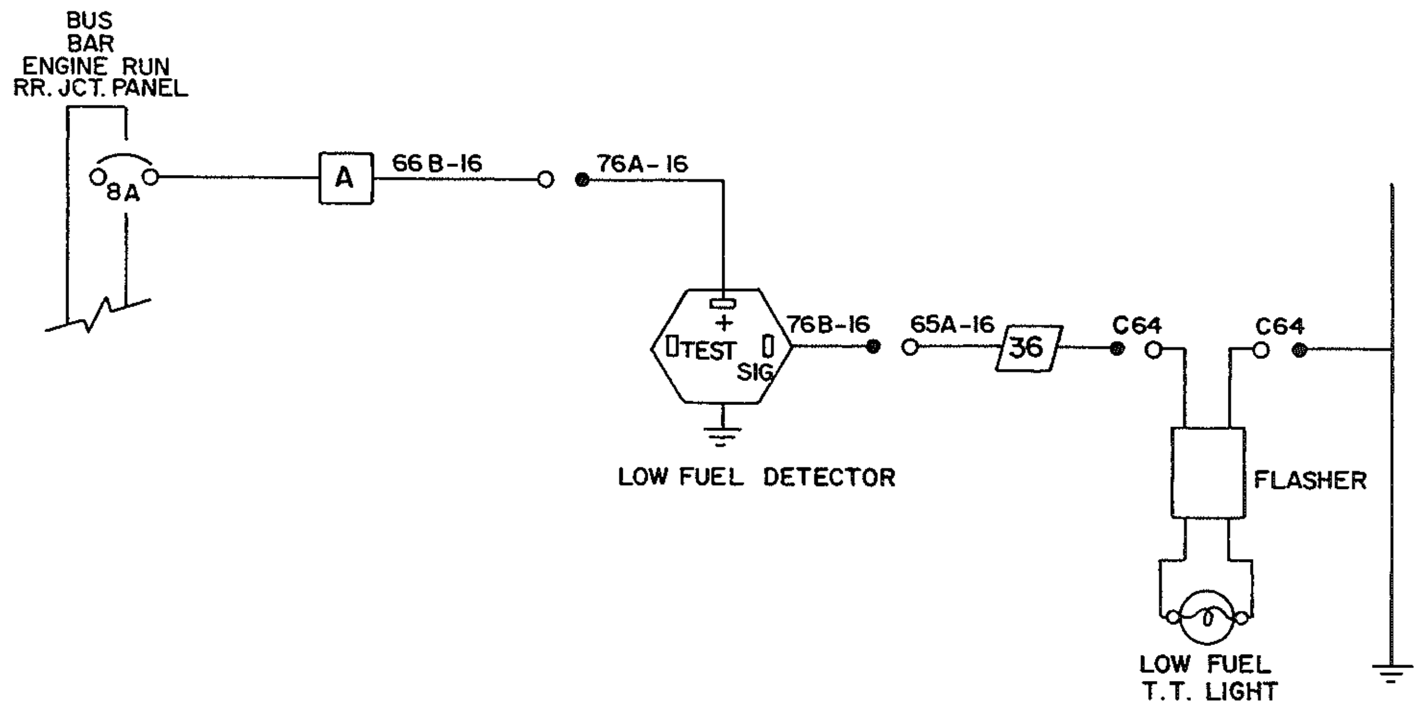
D-060432



PREVOST	LEGEND		
	FRONT JUNCTION PANEL		BATTERY JUNCTION BLOCK
	REAR JUNCTION PANEL		SINGLE CONNECTOR
	BATTERY COMPARTMENT		DIODE (RECTIFIER)
	CIRCUIT BREAKER		OPTION
	HARNESS CONNECTOR		

LOW FUEL WIRING DIAGRAM
EFF. W/E-638 MODEL "XL"
DATE : 04-84

D-060434

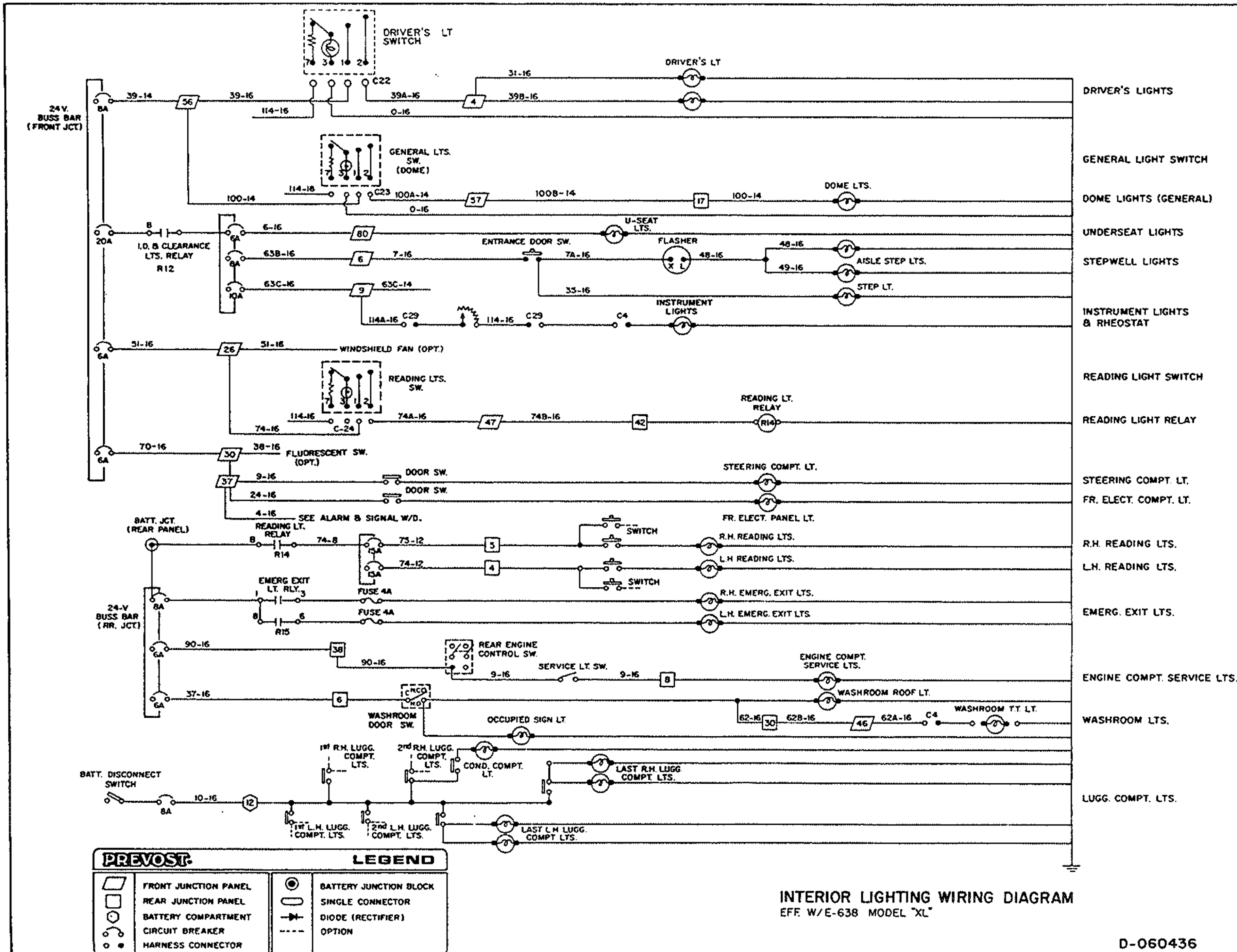


LOW FUEL WIRING DIAGRAM
EFF. W./E-652 MTH "XL"

PREVOST		LEGEND	
	FRONT JUNCTION PANEL		BATTERY JUNCTION BLOCK
	REAR JUNCTION PANEL		SINGLE CONNECTOR
	BATTERY COMPARTMENT		DIODE (RECTIFIER)
	CIRCUIT BREAKER	----	OPTION
	HARNESS CONNECTOR		

DATE : 04-84

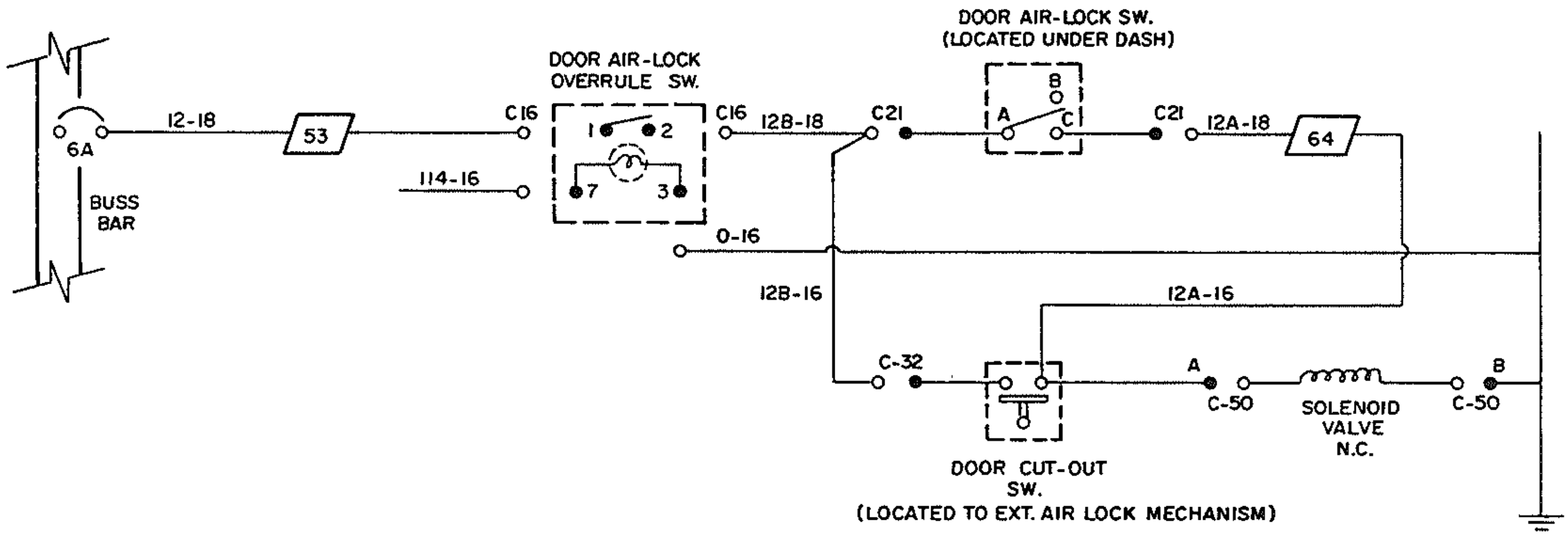
D-060435



INTERIOR LIGHTING WIRING DIAGRAM

EFF. W/E-638 MODEL "XL"

D-060436



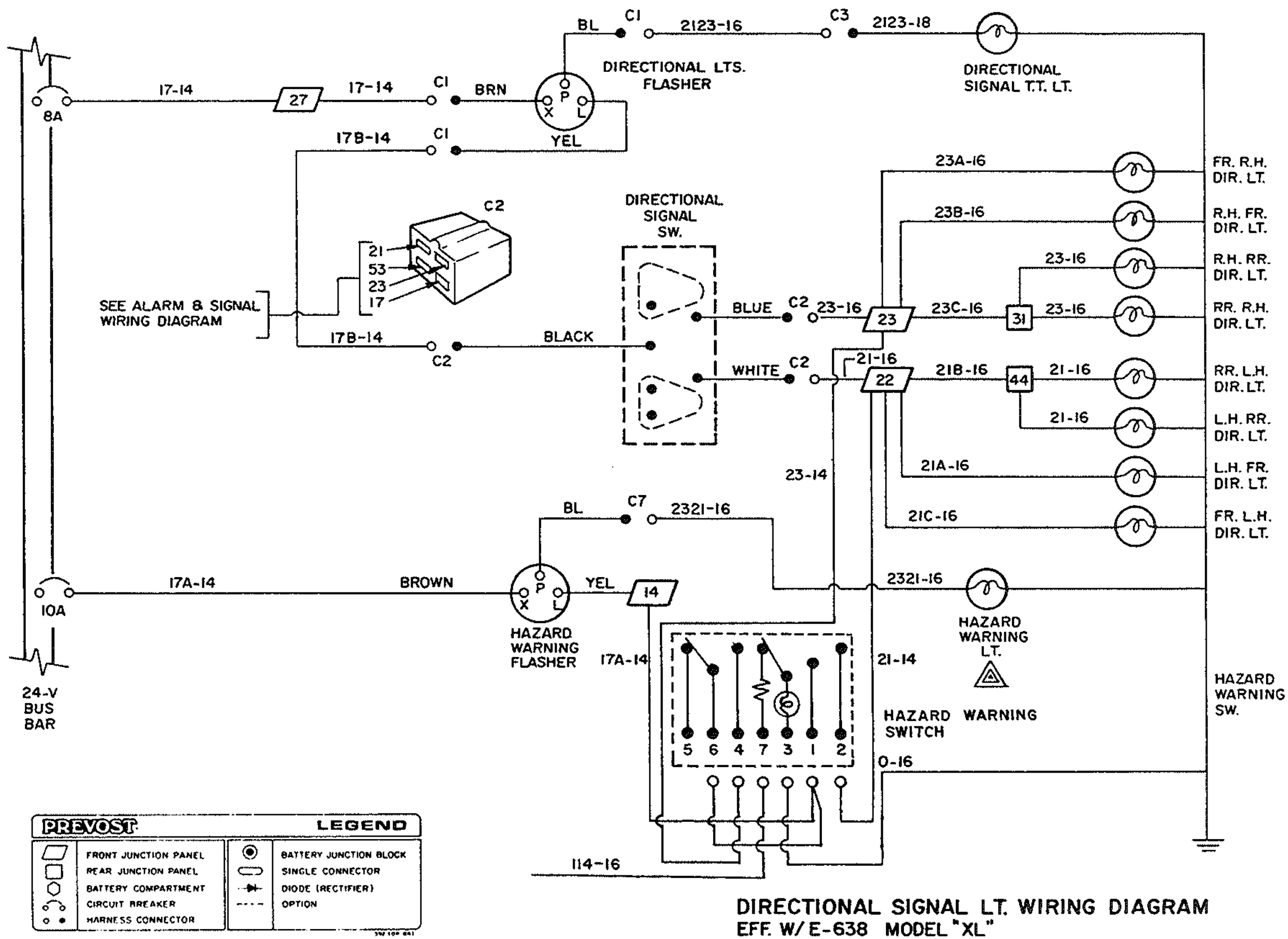
PREVOST		LEGEND	
	FRONT JUNCTION PANEL		BATTERY JUNCTION BLOCK
	REAR JUNCTION PANEL		SINGLE CONNECTOR
	BATTERY COMPARTMENT		DIODE (RECTIFIER)
	CIRCUIT BREAKER	----	OPTION
	HARNESS CONNECTOR		

DOOR AIR LOCK WIRING DIAGRAM

EFF. W/E-638 MODEL "XL"

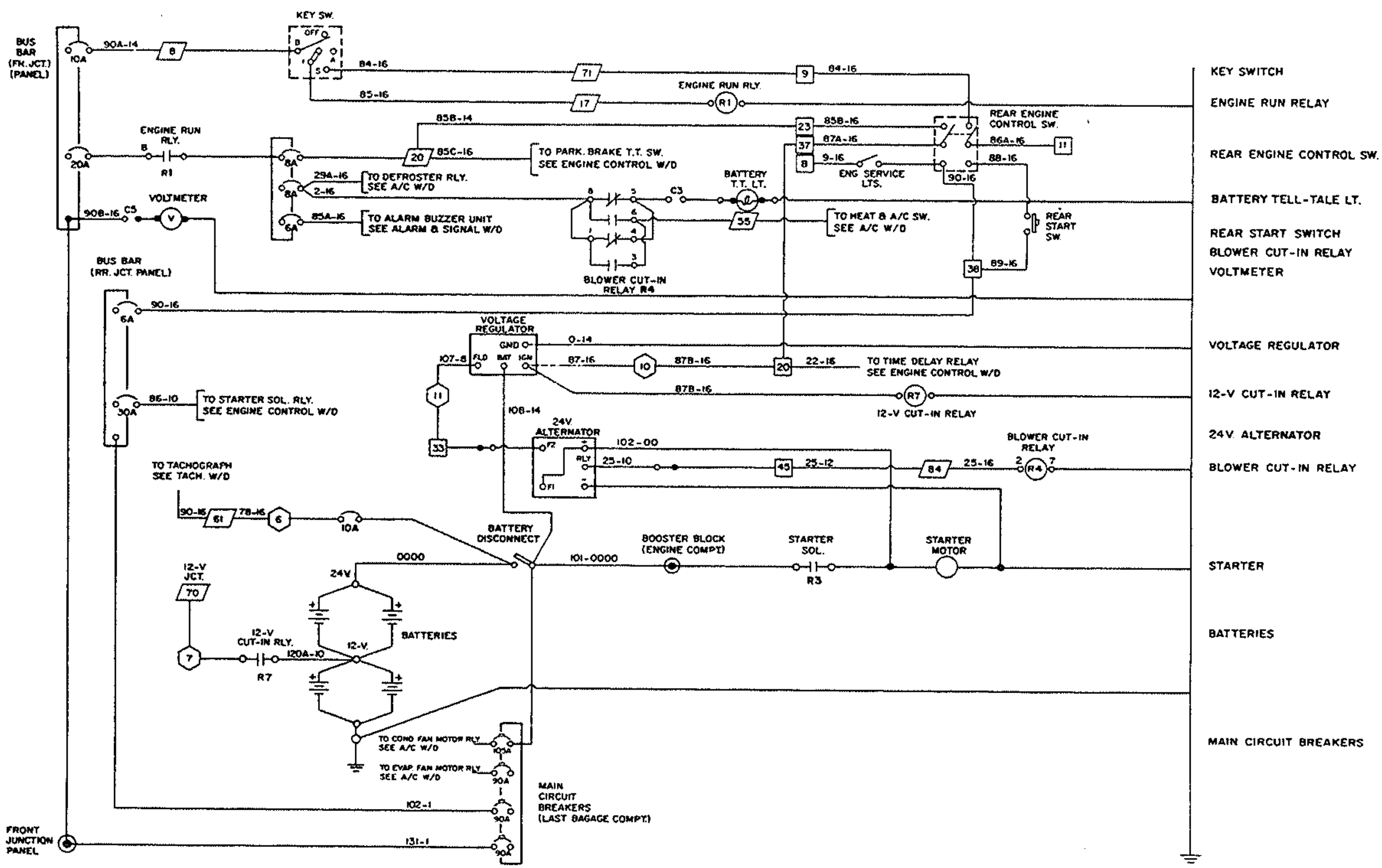
DATE: 02-84

D-060437



DIRECTIONAL SIGNAL LT. WIRING DIAGRAM
EFF. W/ E-638 MODEL "XL"
DATE : 04-84

D-060438



PREVOST

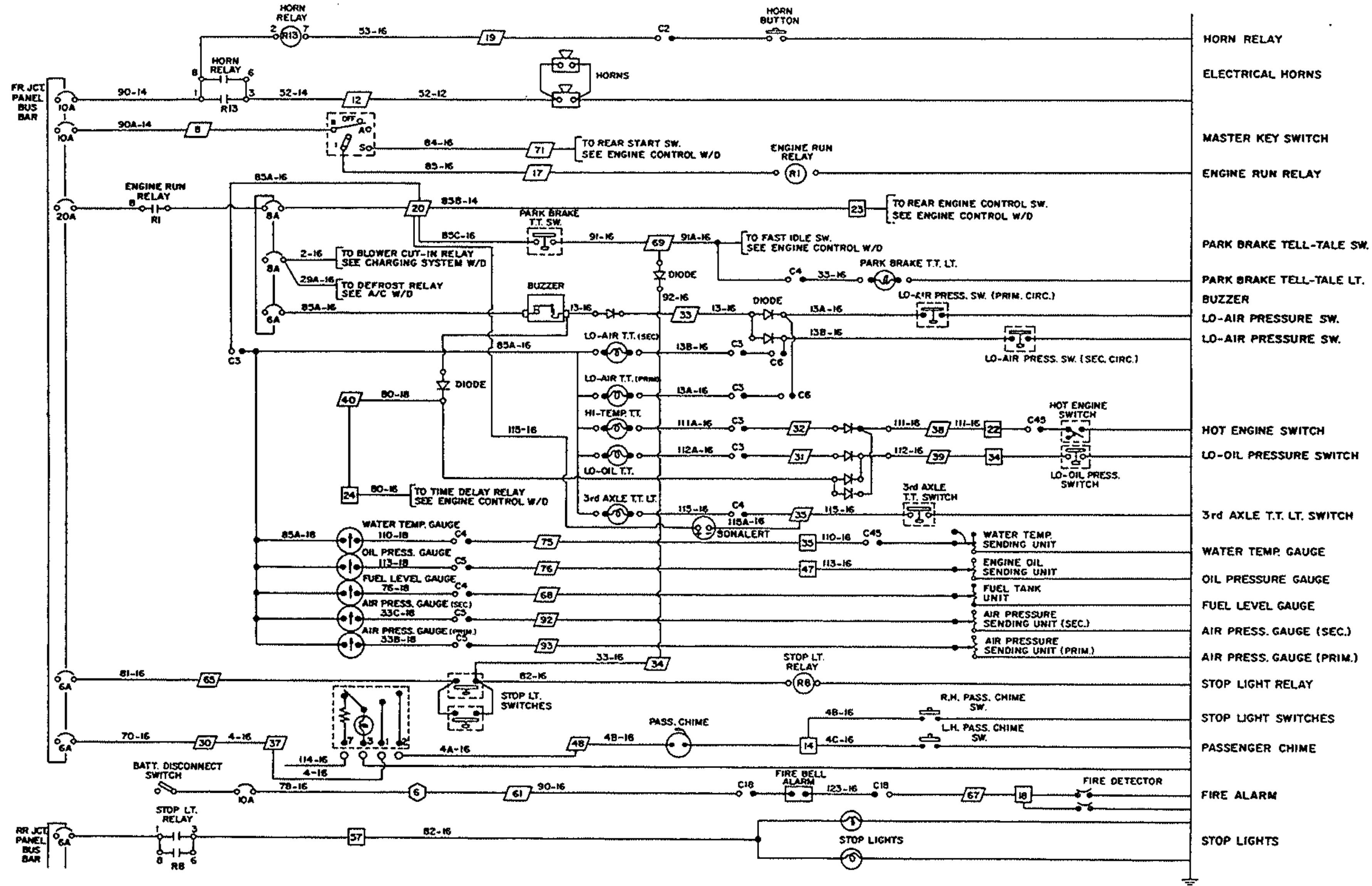
LEGEND

▱	FRONT JUNCTION PANEL	◉	BATTERY JUNCTION BLOCK
□	REAR JUNCTION PANEL	⬭	SINGLE CONNECTOR
⬡	BATTERY COMPARTMENT	—▶|—	DIODE (RECTIFIER)
◠	CIRCUIT BREAKER	----	OPTION
○ ●	HARNESS CONNECTOR		

CHARGING SYSTEM WIRING DIAGRAM

EFF. W/ E-638 MODEL "XL"

D-060139



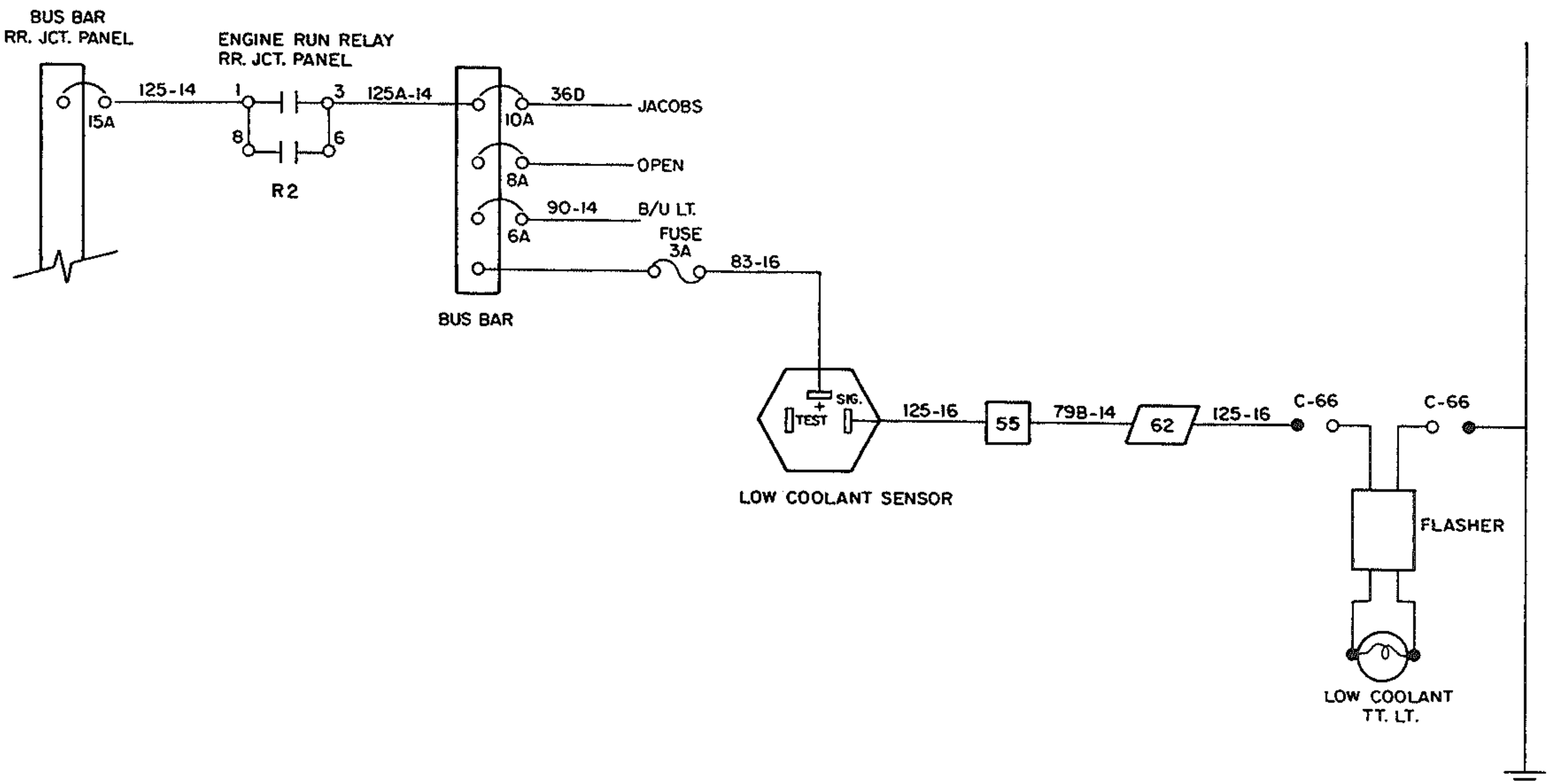
PREVOST LEGEND

▱	FRONT JUNCTION PANEL	◉	BATTERY JUNCTION BLOCK
□	REAR JUNCTION PANEL	⊂⊃	SINGLE CONNECTOR
⬡	BATTERY COMPARTMENT	—▶|—	DIODE (RECTIFIER)
⌒	CIRCUIT BREAKER	----	OPTION
○ ●	HARNESS CONNECTOR		

ALARM & SIGNAL WIRING DIAGRAM

EFF. W/E-638 MODEL "XL"

D-060440



PREVOST LEGEND

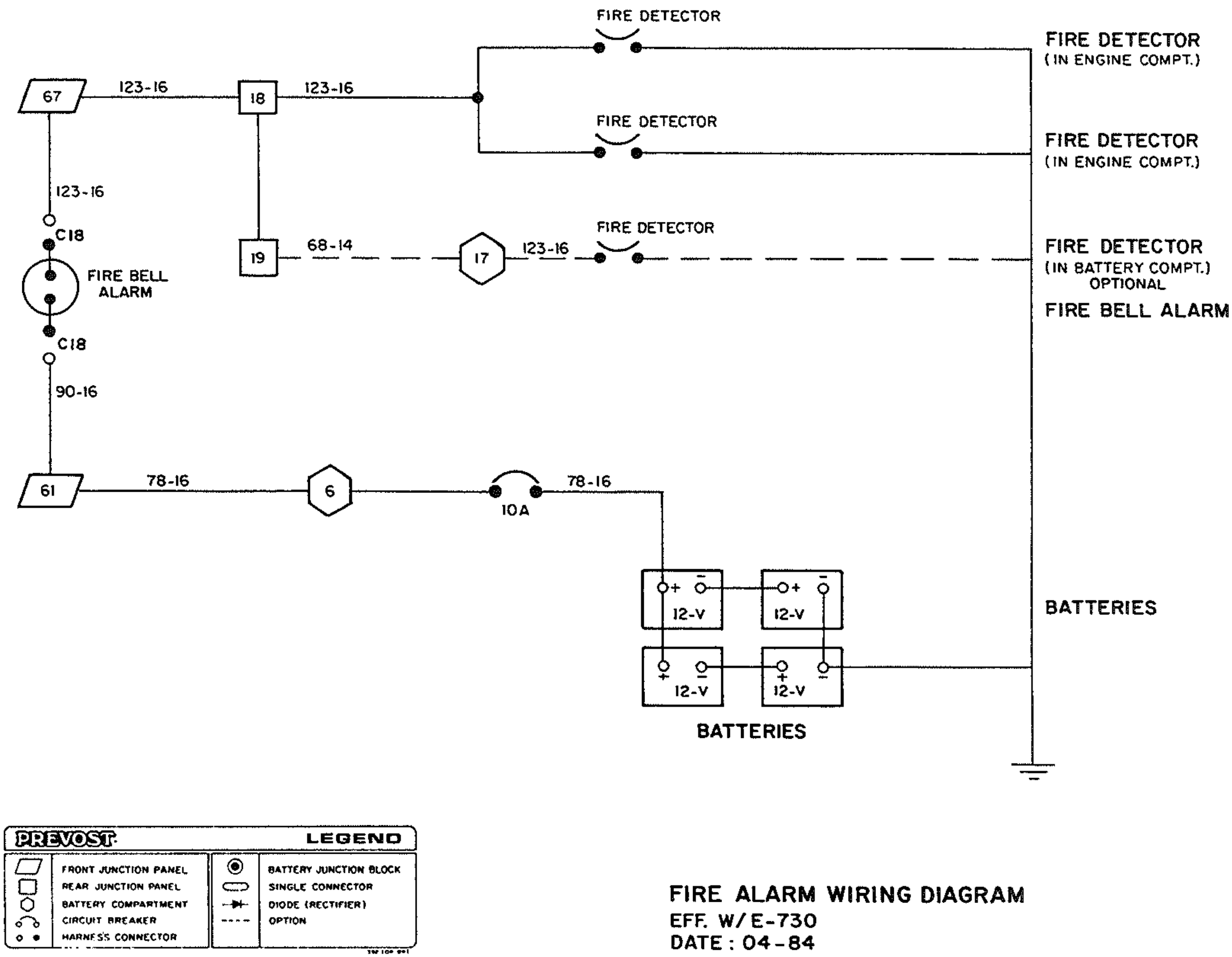
	FRONT JUNCTION PANEL		BATTERY JUNCTION BLOCK
	REAR JUNCTION PANEL		SINGLE CONNECTOR
	BATTERY COMPARTMENT		DIODE (RECTIFIER)
	CIRCUIT BREAKER	----	OPTION
	HARNESS CONNECTOR		

LOW WATER LEVEL WIRING DIAGRAM

EFF. W/E-638 MODEL "XL"

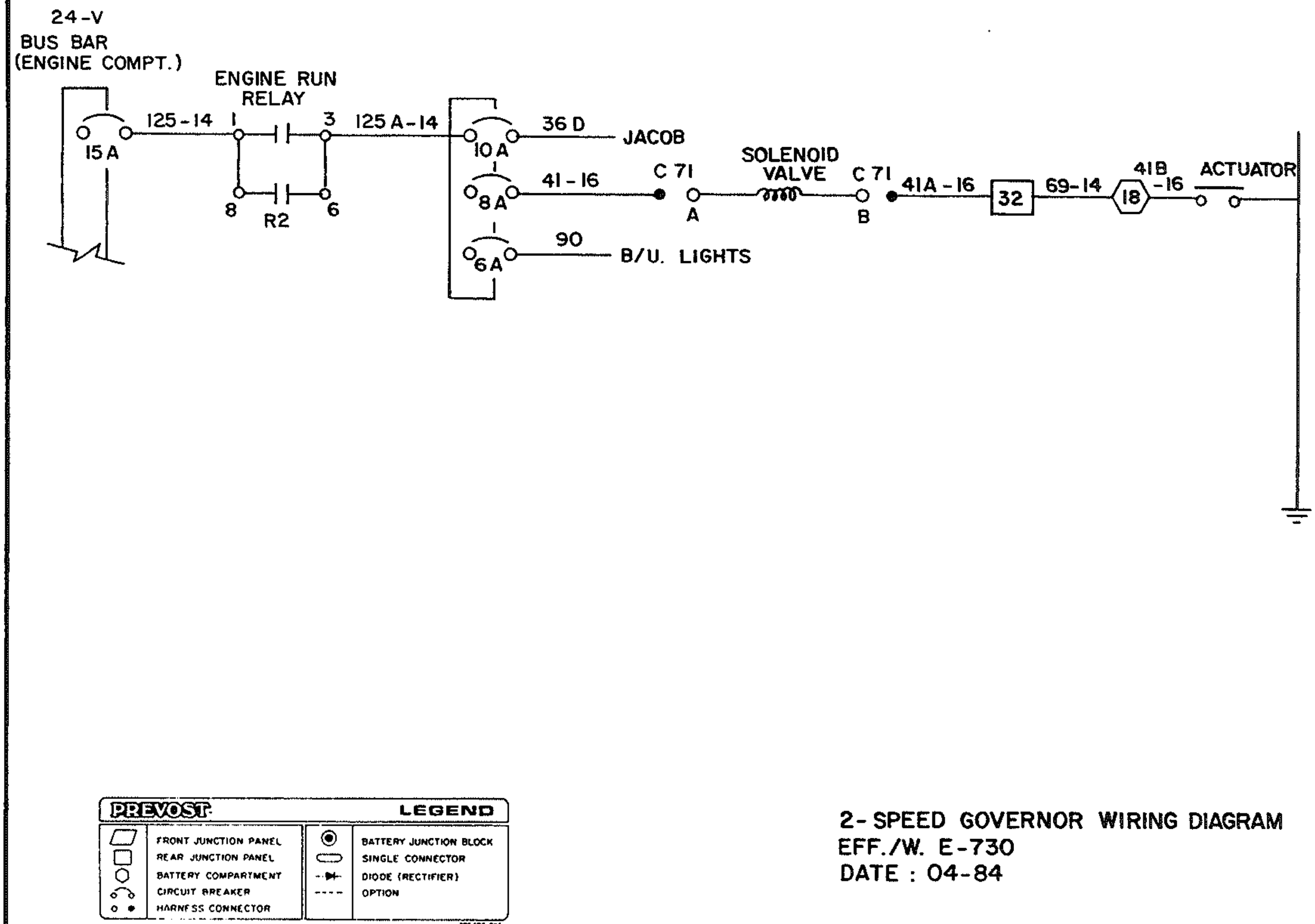
DATE : 04-84

D-060441



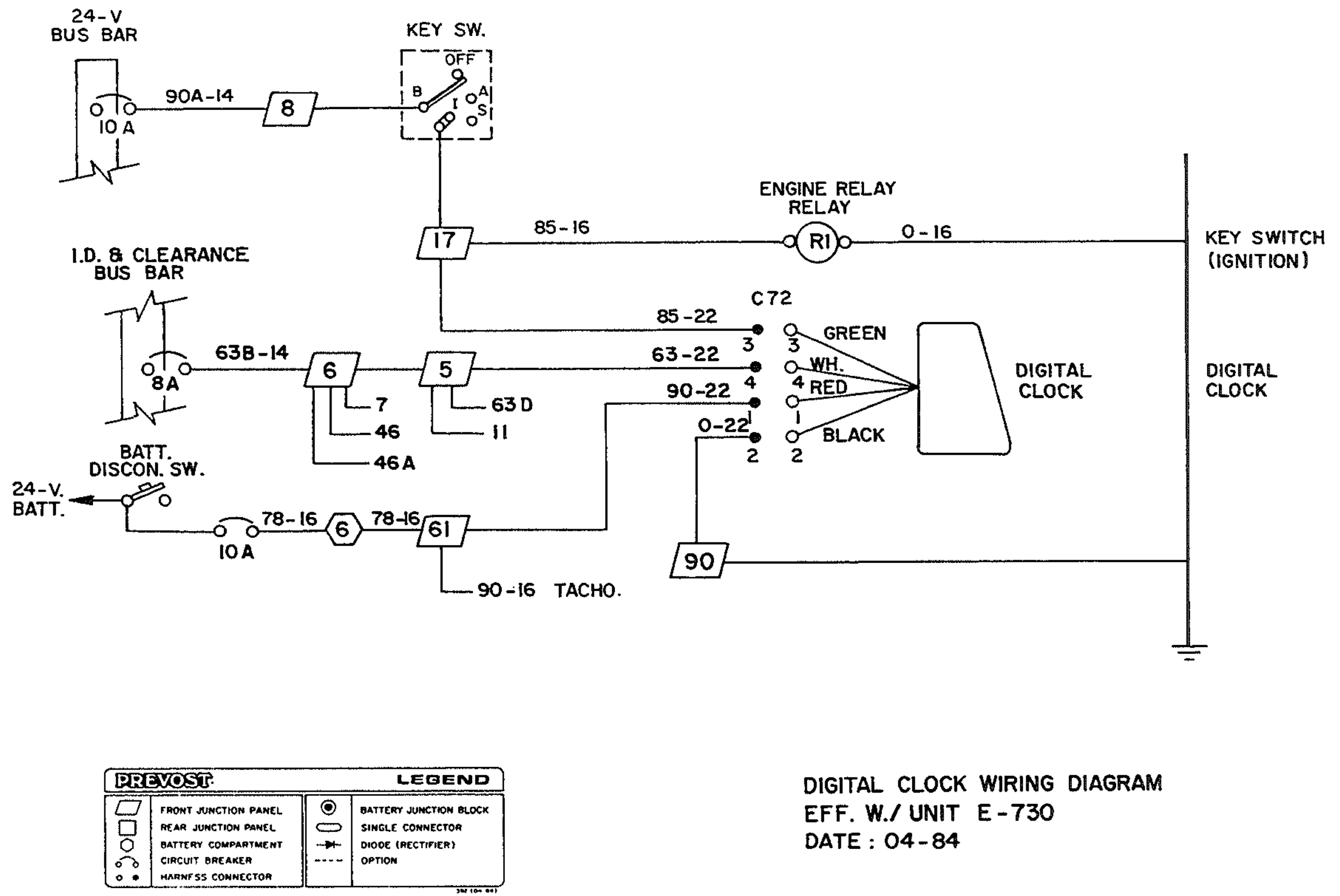
FIRE ALARM WIRING DIAGRAM
EFF. W/E-730
DATE: 04-84

D-060442



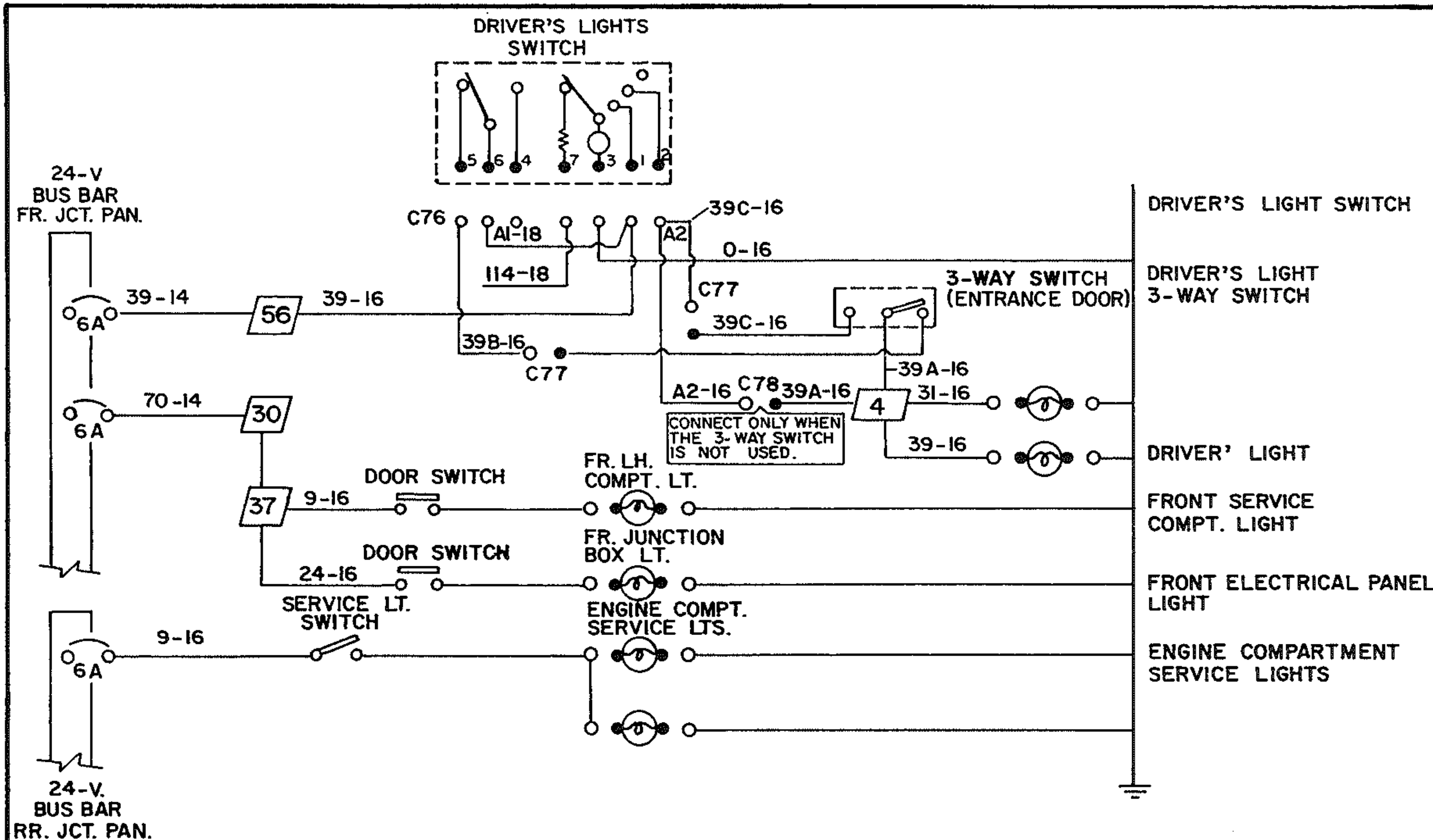
2-SPEED GOVERNOR WIRING DIAGRAM
EFF./W. E-730
DATE : 04-84

D-060454



DIGITAL CLOCK WIRING DIAGRAM
EFF. W./ UNIT E-730
DATE : 04-84

D-060455

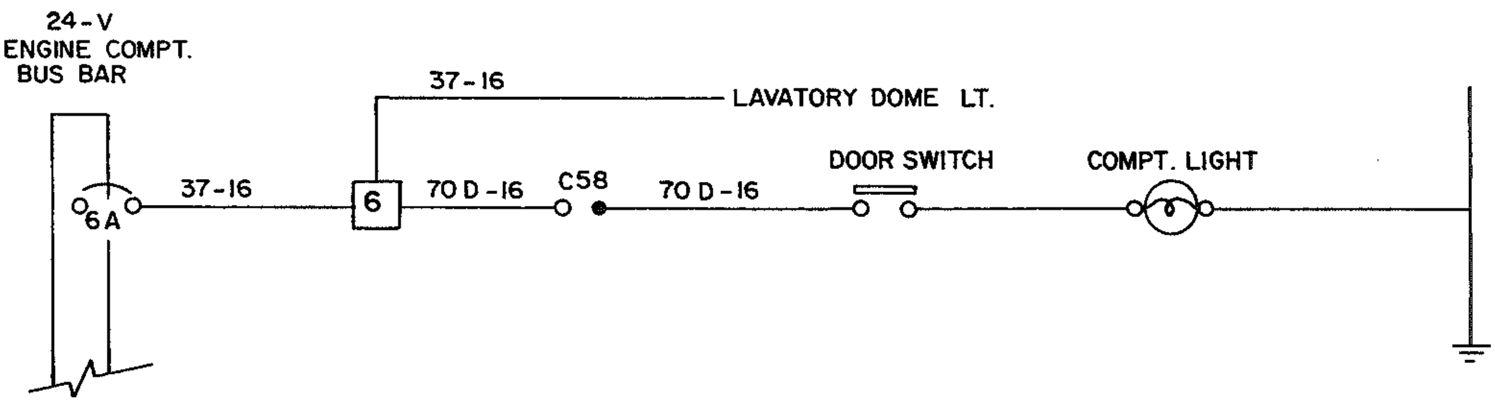


INTERIOR LIGHTING WIRING DIAGRAM
EFF. W./ E-652 XL
DATE : 04-84

PREVOST LEGEND

	FRONT JUNCTION PANEL		BATTERY JUNCTION BLOCK
	REAR JUNCTION PANEL		SINGLE CONNECTOR
	BATTERY COMPARTMENT		DIODE (RECTIFIER)
	CIRCUIT BREAKER		OPTION
	HARNESS CONNECTOR		

D-060456

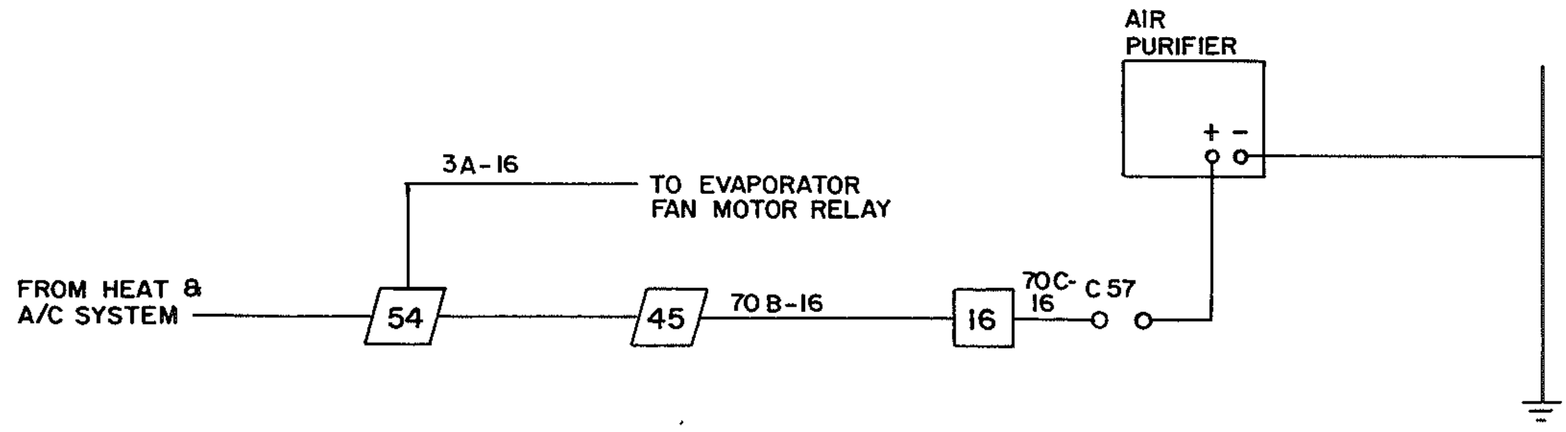


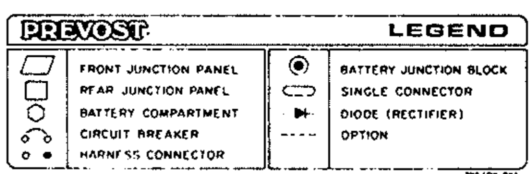
PREVOST LEGEND

▱	FRONT JUNCTION PANEL	◉	BATTERY JUNCTION BLOCK
□	REAR JUNCTION PANEL	⊂⊃	SINGLE CONNECTOR
○	BATTERY COMPARTMENT	▶	DIODE (RECTIFIER)
⌒	CIRCUIT BREAKER	-----	OPTION
○ ●	HARNESS CONNECTOR		

INTERIOR REAR COMPT. LT. WIRING DIAGRAM
EFF. W./ D-639 RE: MARATHON
DATE : 04-84

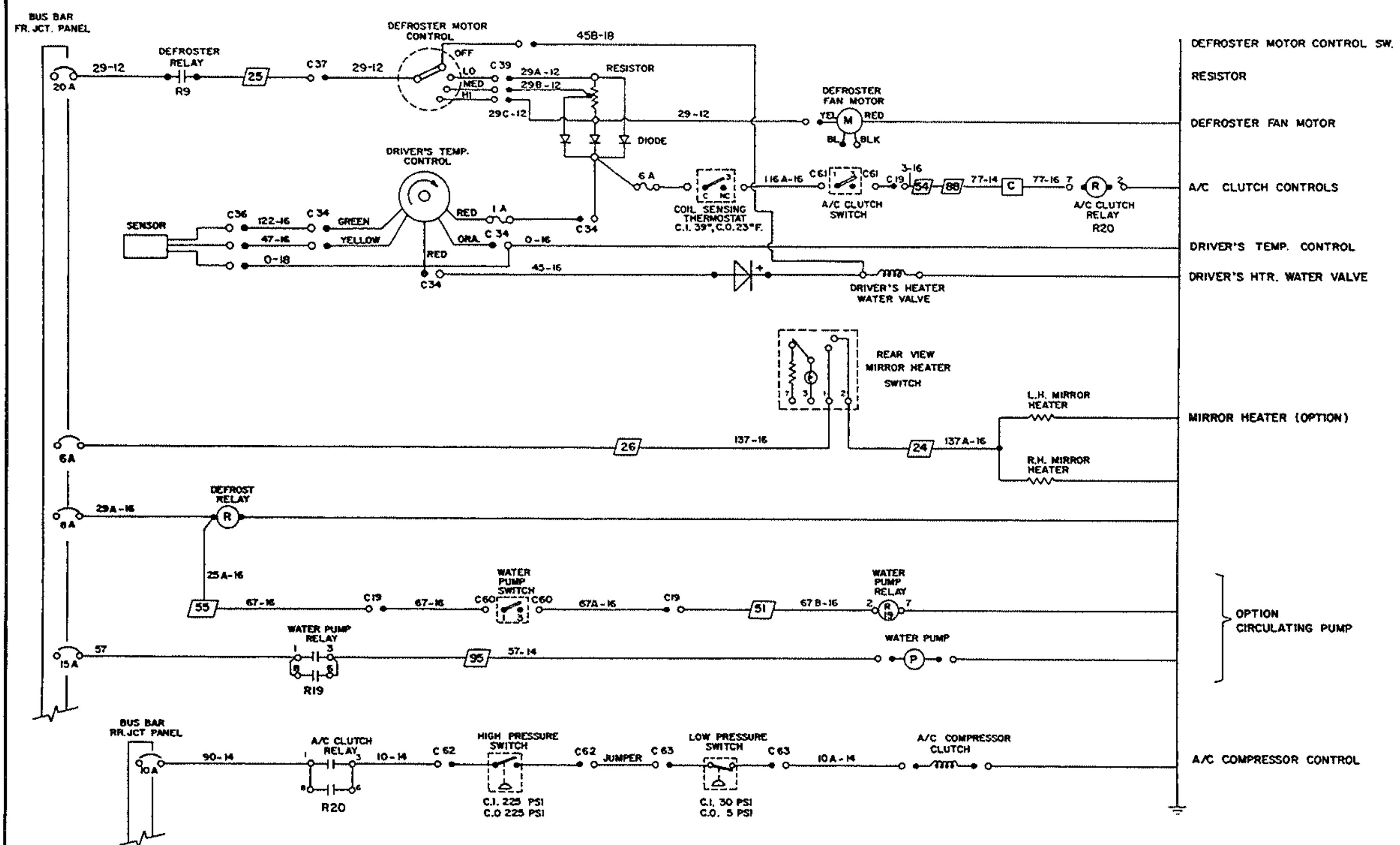
D-060457





AIR PURIFIER WIRING DIAGRAM
EFF. W./ E-730 MARATHON "XL"
DATE : 04-84

D- 060458



PREVOST LEGEND

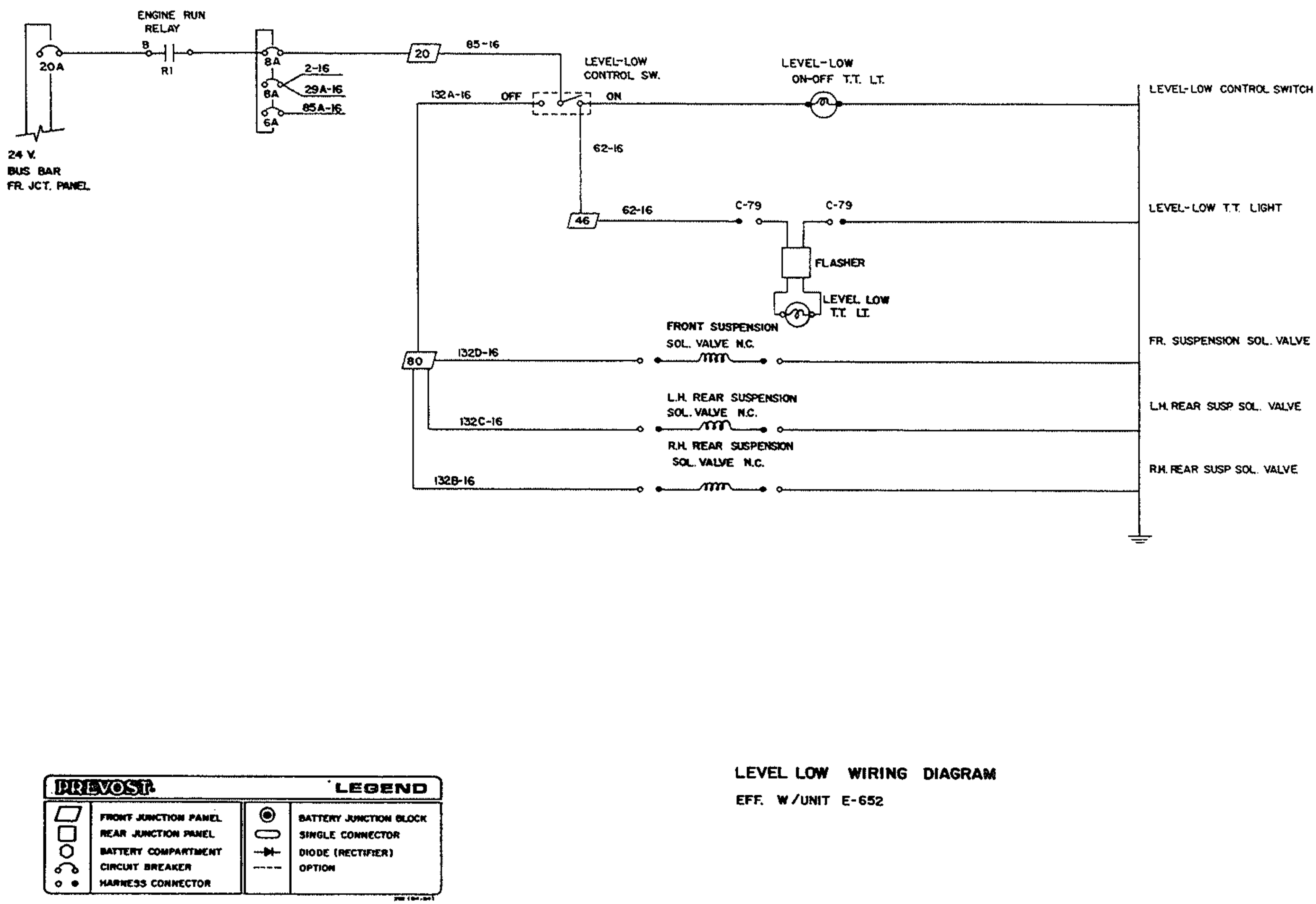
- FRONT JUNCTION PANEL
- REAR JUNCTION PANEL
- BATTERY COMPARTMENT
- CIRCUIT BREAKER
- HARNESS CONNECTOR
- BATTERY JUNCTION BLOCK
- SINGLE CONNECTOR
- DIODE (RECTIFIER)
- OPTION

AIR CONDITIONING WIRING DIAGRAM

EFF. W./ E-652 MTH XL STD.

DATE : 04-84

D-060460

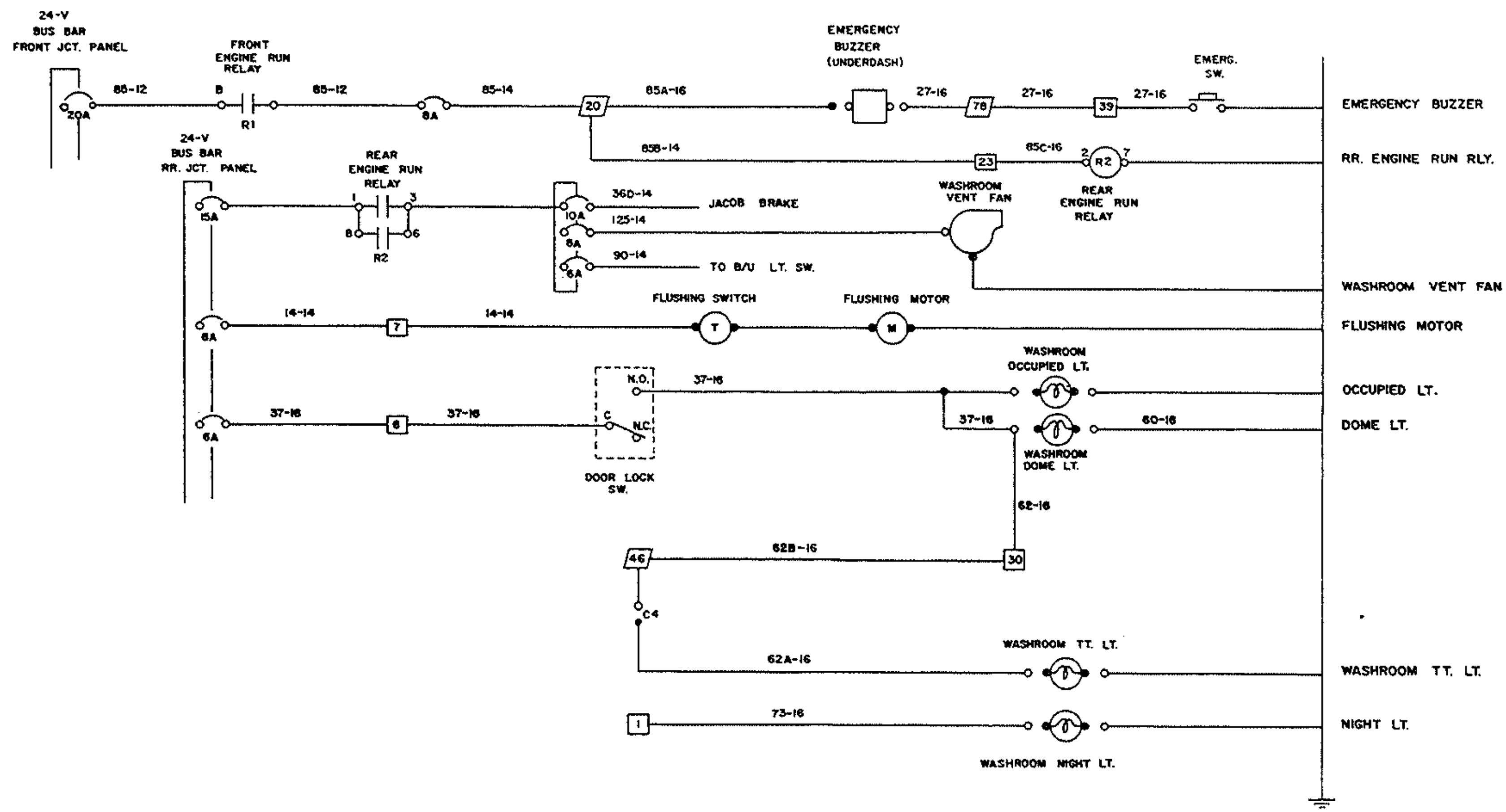


LEVEL LOW WIRING DIAGRAM

EFF. W/UNIT E-652

05/84

D-060468



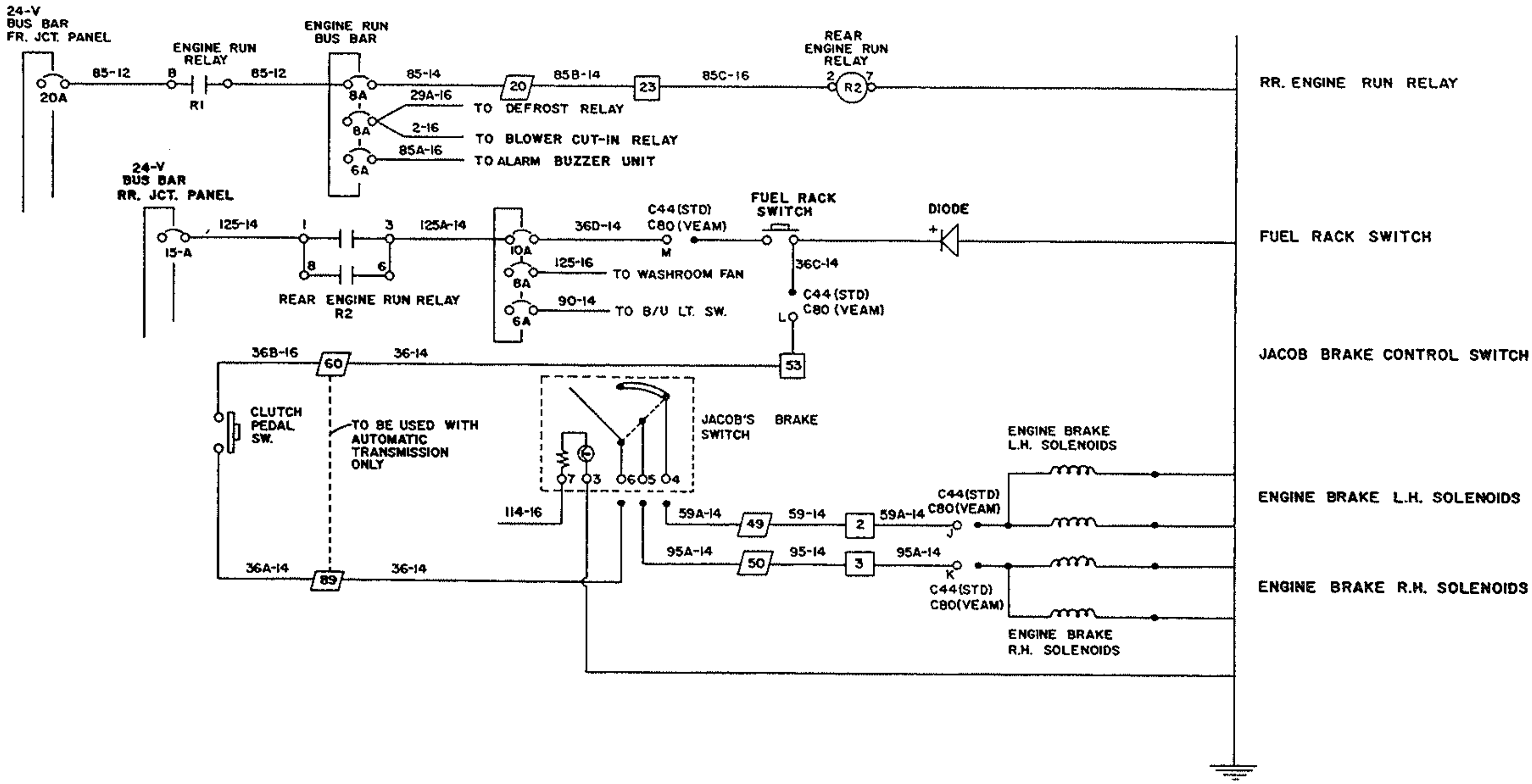
PREVOST LEGEND

▱	FRONT JUNCTION PANEL	◉	BATTERY JUNCTION BLOCK
□	REAR JUNCTION PANEL	⬭	SINGLE CONNECTOR
⬡	BATTERY COMPARTMENT	→⊢	DIODE (RECTIFIER)
⌒	CIRCUIT BREAKER	----	OPTION
○ ●	HARNESS CONNECTOR		

WASHROOM WIRING DIAGRAM
EFF. W/E-638 "XL"

08/84

D-060469



PREVOST **LEGEND**

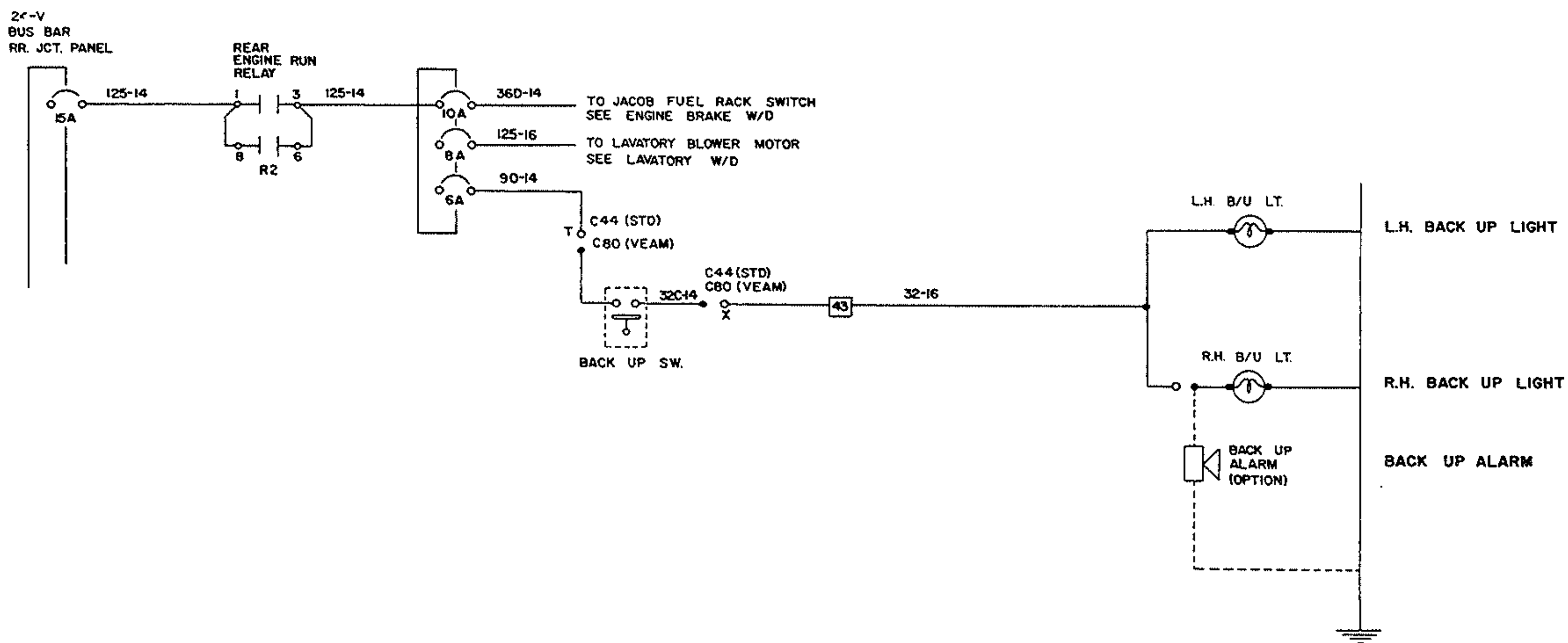
	FRONT JUNCTION PANEL		BATTERY JUNCTION BLOCK
	REAR JUNCTION PANEL		SINGLE CONNECTOR
	BATTERY COMPARTMENT		DIODE (RECTIFIER)
	CIRCUIT BREAKER		OPTION
	HARNESS CONNECTOR		

JACOB-ENGINE BRAKE WIRING DIAGRAM

EFF. W/E-730 "XL"

08/84

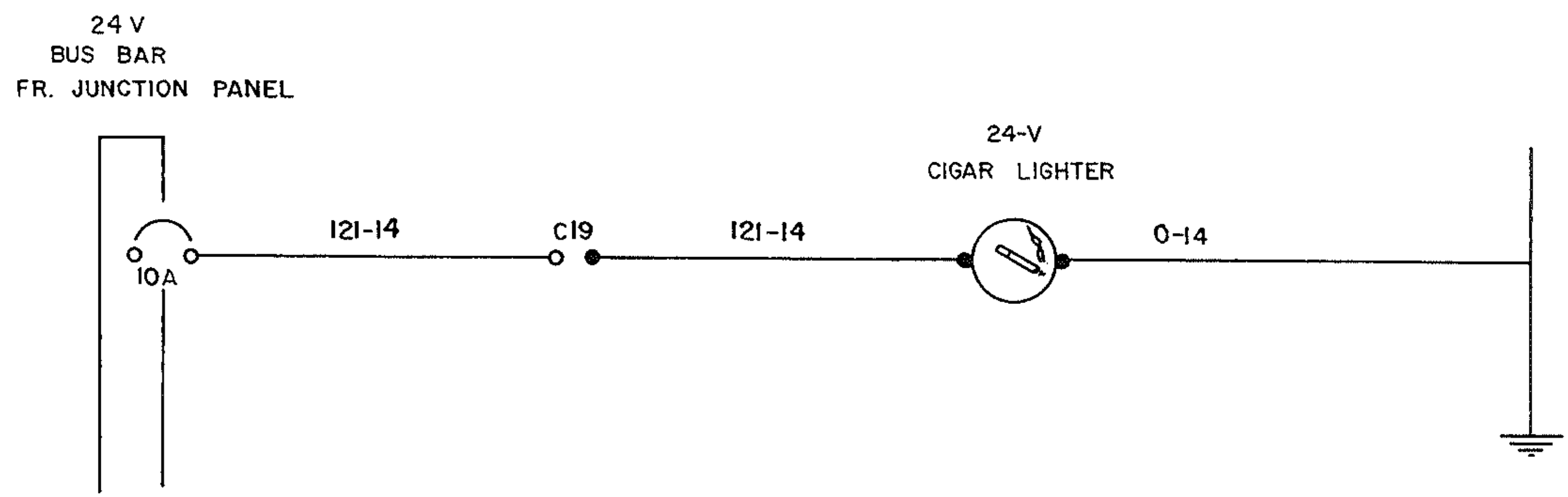
D-060470

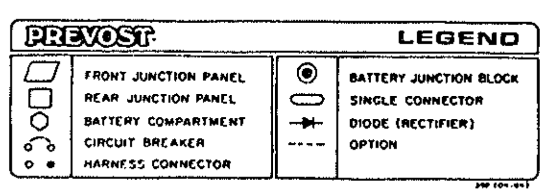


PREVOST		LEGEND	
	FRONT JUNCTION PANEL		BATTERY JUNCTION BLOCK
	REAR JUNCTION PANEL		SINGLE CONNECTOR
	BATTERY COMPARTMENT		DIODE (RECTIFIER)
	CIRCUIT BREAKER		OPTION
	HARNESS CONNECTOR		

BACK UP LT. WIRING DIAGRAM
EFF. W/E-638 "XL"

D-060471

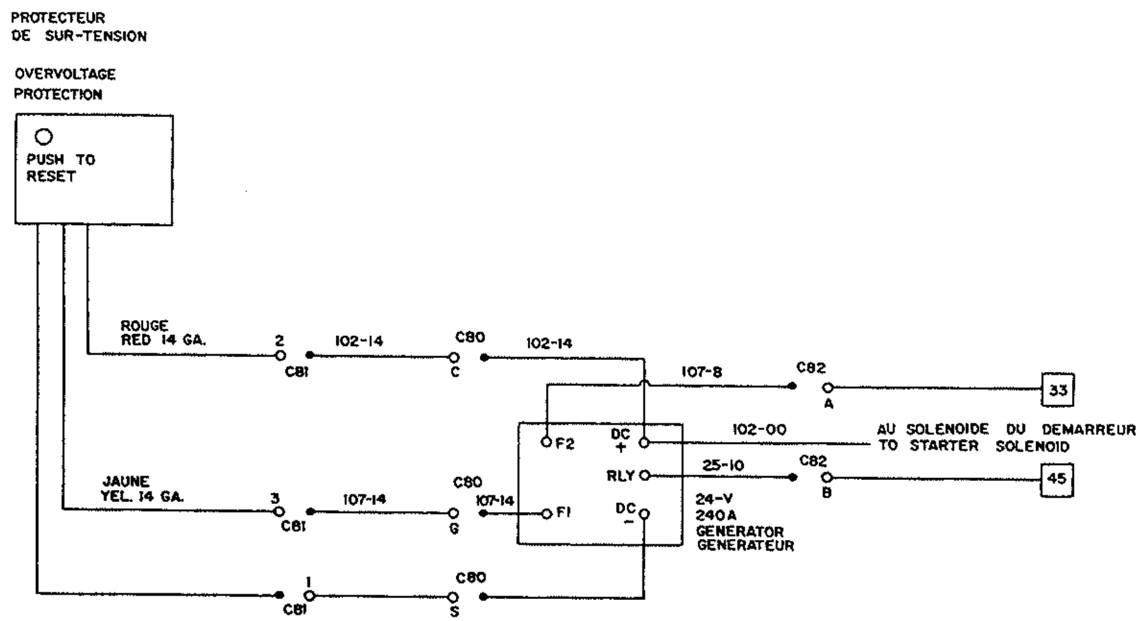


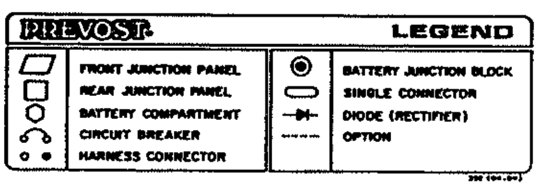


24-V CIGAR LIGHTER WIRING DIAGRAM

EFF. W / E 638 "XL"

D-060472





SCHEMA DE PRINCIPE POUR PROTECTEUR DE SUR-TENSION

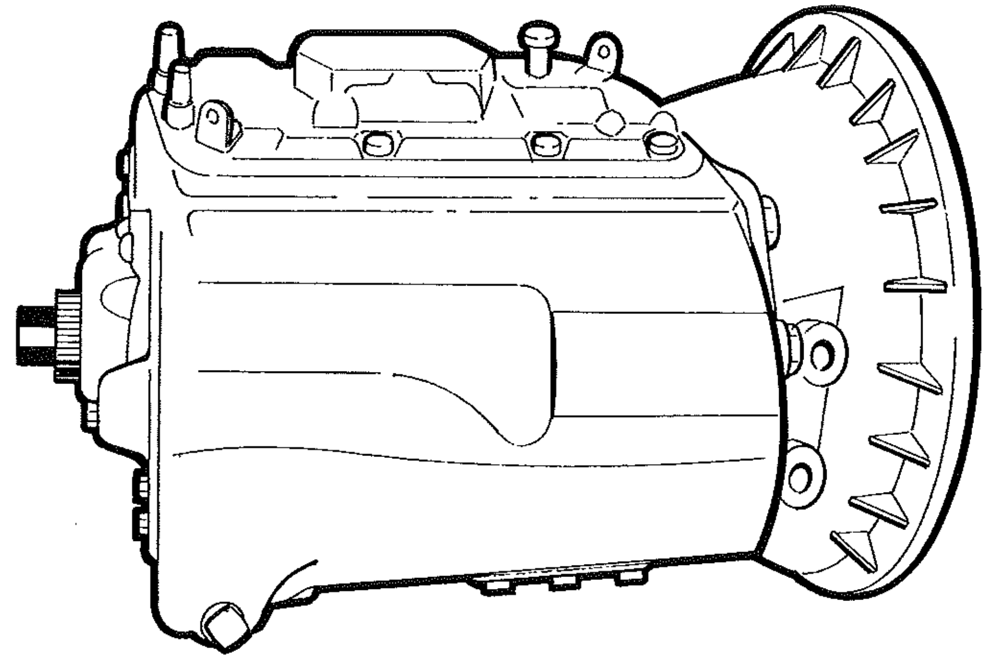
OVERVOLTAGE PROTECTION WIRING DIAGRAM

EFF. W/E-730 "XL" OPTION

08/84

D-060473

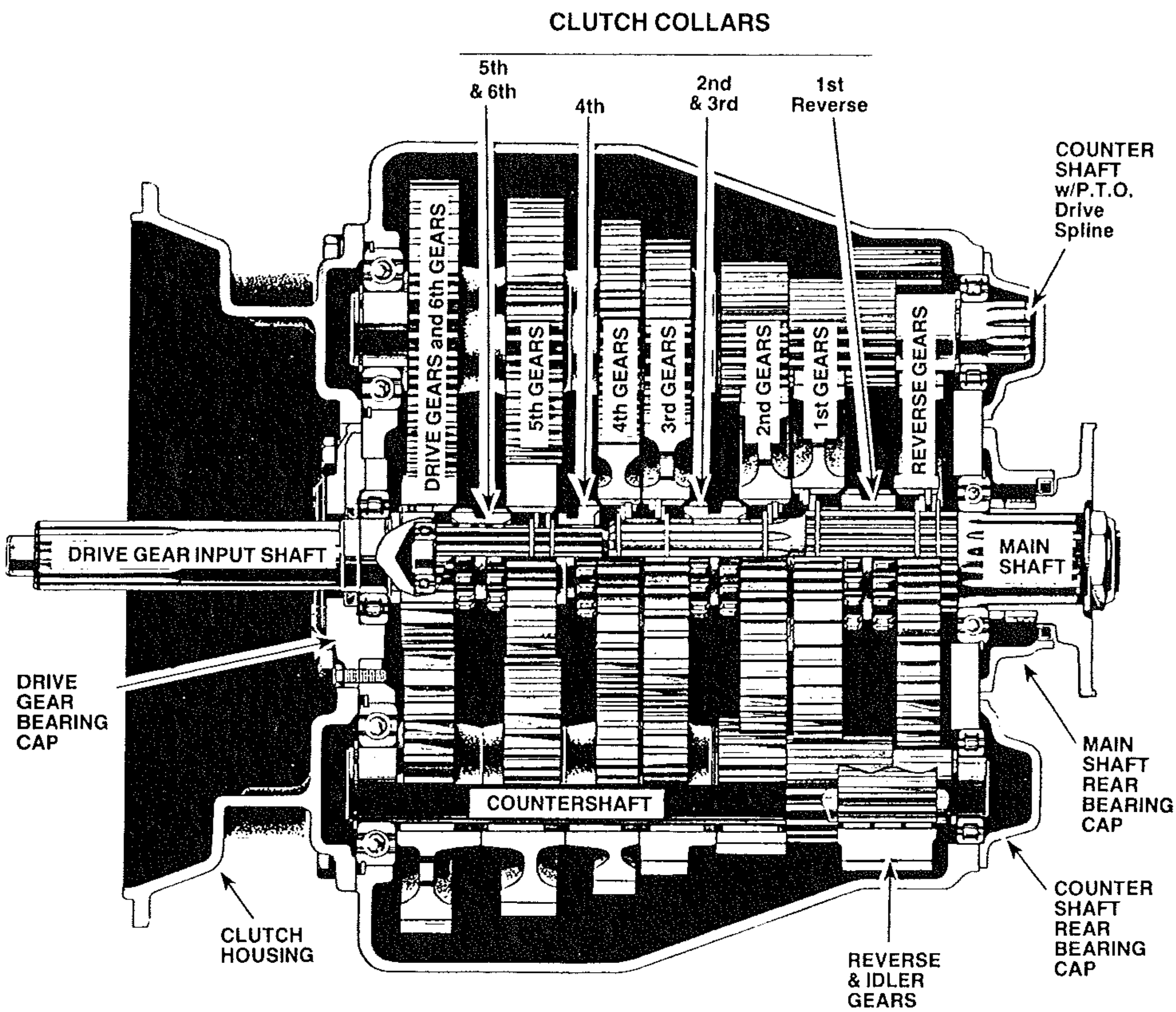
TRANSMISSION



TRANSMISSION

DESCRIPTION

PREVOST vehicles are equipped with a «SPICER 1362B» six speed manual transmission as standard equipment. «ALLISON HT740D four speed and HT754CR» five speed automatic transmissions are available as optional equipment. This section deal with maintenance procedures for the «spicer 1362B» transmission and with the «ALLISON HT740D and HT754CR» automatic transmissions.



CUTAWAY VIEW OF MANUAL TRANSMISSION

TRANSMISSION

Maintenance

To insure proper lubrication and operating temperatures in these units it is most important that the proper lubricants be used and that correct oil levels be maintained.

Recommended Lubricants

The lubricants listed below are recommended, for use in all Spicer mechanical transmissions.

DO NOT USE EXTREME PRESSURE ADDITIVES, such as found in multi-purpose or rear axle type lubricants. These additives are not required in Spicer transmissions, and may in some cases create transmission problems. Multi-purpose oils, as a group, has relatively poor oxidation stability, a high rate of sludge formation and a greater tendency to react on or corrode the steel and bronze parts.

Oil Changes

We recommend an initial oil change and flush after the transmission is placed in actual service. This change should be made any time following 3000 miles (4827 km), but never exceed 5000 miles (8045 km), of over-the-road service. In off-highway use, the change should be made after 24 and before 100 hours of service have elapsed. There are many factors that influence the following oil change periods and we have not specified a definite mileage interval.

In general, it is suggested that a drain and flush period be scheduled every 50,000 miles (80,450 km) for normal over-the-highway operations. The oil level in the transmission should be checked every 5,000 miles (8,045 km) on-highway. When it is necessary to add oil we recommend that types or brands of oil should not be mixed. The correct oil level in Spicer transmissions is established by the «full» mark on the transmission oil dipstick.

Refill

PREVOST vehicles are equipped with an oil reserve tank located in the upper right area of the engine compartment. To refill transmission, proceed as follows.

1. Open the transmission oil fill valve located under oil reserve tank.

2. Open the oil reserve fill door and cap.

3. Pour oil in the oil reserve tank until «FULL» mark on the transmission oil dipstick is reached.

4. Close transmission oil fill valve and then, continue to pour oil until oil reserve tank is full. Level can be checked through transparent tube on the side of oil reserve tank.

5. Close oil reserve fill door and cap.

Overfilling

Do not overfill the transmission. Overfilling usually results in oil breakdown due to excessive heat and aeration from the churning action of the gears. Early breakdown of the oil will result in heavy varnish and sludge deposits that plug up oil ports and build up on splines and bearings. Overflow of oil escapes onto clutch or parking brakes causing additional trouble.

■ **Caution:** Do not tow vehicles equipped with Spicer transmission without first pulling the axles or disconnecting the drive shaft. Lubrication of the internal gear train is inadequate when the vehicle is towed.

Oil recommendations:

Temperature	Grade	Type
Above 0°F	SAE 40	Heavy duty engine oil
Below 0°F	SAE 30	Meeting MIL-L-2104C or MIL-L-46152

Removal and reinstallation

To remove transmission, proceed as follows:

1. With transmission control in neutral position, raise vehicle and block vehicle body securely.

2. Remove winter pan and crossmember from under the transmission.

3. Disconnect control rod universal joint from transmission shifter remote control.

4. Disconnect propeller shaft at transmission companion flange. Refer to section 09, Propeller Shaft Removal and Replacement for the appropriate procedure. Disconnect speedometer wire at connector.

5. Disconnect clutch control rod from rear clutch cross shaft lever; remove bracket between rear clutch cross shaft support and engine support.

6. Remove magnetic drain plug and drain transmission oil. Clean magnetic drain plug before reinstalling.

7. Remove dipstick tube and oil fill tube.

8. Disconnect neutral start switch and back up switch.

9. Remove all wiring harnesses from their supports.

10. Place a transmission jack under transmission. Remove the twelve clutch housing bolts, and slide the transmission straight back from the engine.

■ **Caution:** Damage to the pilot shaft and to the clutch cover assembly may result if transmission is tilted up and down or sideways during removal.

TRANSMISSION

11. Raise vehicle to obtain sufficient clearance so the transmission can be removed from the side of the vehicle.

To reinstall transmission, proceed as follows.

■ **Caution:** During re-installation, care should be taken to ensure that the pilot shaft is aligned with splines of clutch driven discs. Do not use excessive force to bring the engine and transmission case together. Refer to Section 2 (Clutch) for information regarding alignment of clutch driven discs in reassembly.

1. With vehicle raised, raise transmission assembly at engine level, and guide splined shaft into position in clutch disc hubs. Align clutch housing holes, and install twelve clutch housing bolts.

2. Connect clutch control and install the clutch cross shaft reinforcement.

3. Connect propeller shaft at componion flange on transmission. Refer to section 09, Propeller Shaft Removal and Replacement for correct procedure.

4. Connect transmission control rod universal joint to transmission remote control. Make sure that transmission controls are properly adjusted as directed under «Shifting Control» in this section.

5. Reinstall dipstick tube and oil fill tube.

6. Reinstall all wiring harnesses on their supports.

7. Connect neutral start switch, back up switch and speedometer wire.

8. Fill transmission as directed under «Maintenance» in this section.

DISASSEMBLY AND REASSEMBLY

General Precautions for Disassembly

IMPORTANT

Read this section before starting the detailed disassembly procedure.

Follow each procedure closely in each section, making use of both the text and the pictures.

Rebuild Facilities

A suitable holding fixture or overhaul stand is desirable but not necessary to rebuild this unit. The flat bottom of the transmission case provides a suitable working platform when the unit is placed on a sturdy shop table. For easier working conditions, table height should be 28-30 inches. A light chain hoist should be used to handle the mainshaft and countershafts during removal and reassembly procedures.

Cleanliness

Transmissions should be steam cleaned prior to disassembly. Seal all openings before steam cleaning to prevent entry of dirt and water which can damage serviceable parts.

Dirt is abrasive and will cause premature wear of bearings and other parts. We suggest that mechanics have a small wash tank to clean parts just prior to reassembly.

Bearings

When a transmission is removed at relatively low mileage, bearings should be removed with pullers designed for this purpose. Wrap the bearings to keep out dirt. Clean, inspect and lubricate all bearings just prior to reassembly. If accumulated mileage is over 150,000 miles, we suggest that all bearings be replaced.

End Yokes & Flanges

Hammering on end yokes and flanges to remove or install them is not only destructive to the yoke or flange itself, but can also cause serious internal damage. Hammering destroys or mutilates the pilot diameters and warps or bends the flange. Hammering on end yokes will close-in the bearing bores or misalign yoke lugs and result in early failures of journal needle bearings, etc.

Serious damage can be done internally to bearings, thrust faces and washers, pilot bearings, etc., by hammering on external parts.

In most designs when the yoke/flange locknuts are tightened and secure, the internal bearings and gears are in proper location. When the yoke/flange is driven on the shaft, two conditions can exist.

(a) If the bearing fit is tight on the shaft, then usually the bearings will brinell as they must absorb the pounding forces.

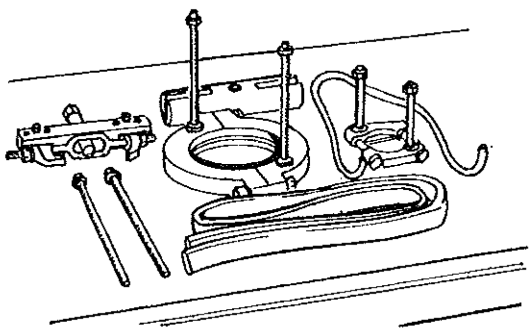
(b) If the bearing is loose, the shaft will keep moving inward until it is stopped by the internal parts such as pilot bearing thrust washers, etc.

TRANSMISSION

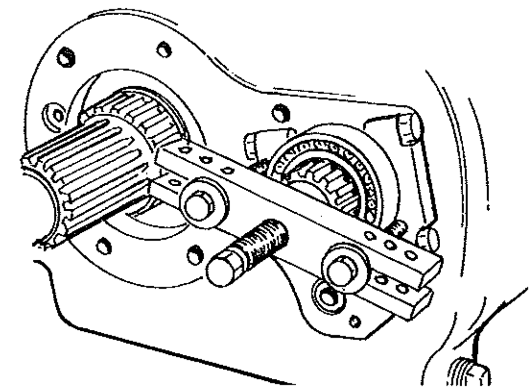
Tool Reference

Tools

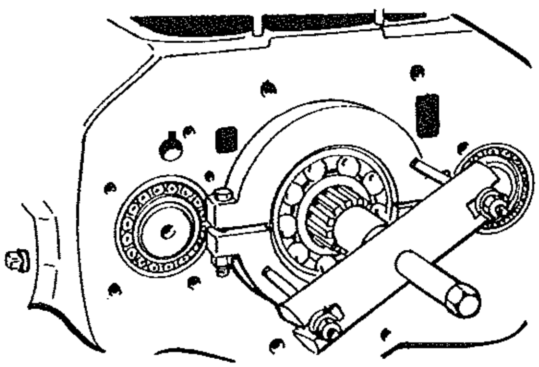
Spicer Transmission can be repaired with ordinary mechanic's hand tools, however this procedure is not only time consuming but could damage otherwise reusable parts. To reduce maintenance costs and vehicle downtime, we recommend using the special tools shown in this section.



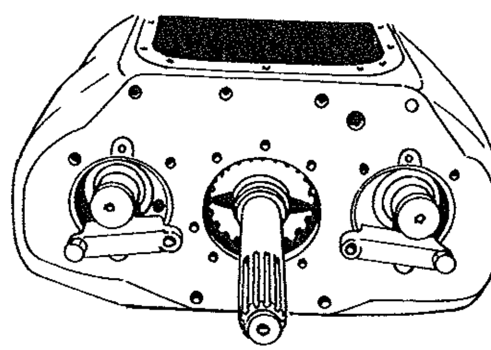
Suggested pullers and alignment tools.



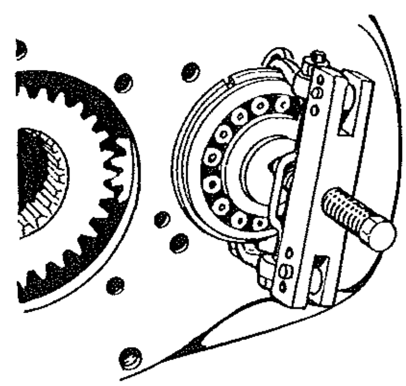
Countershaft rear bearing puller (Snap-on — CJ 950).



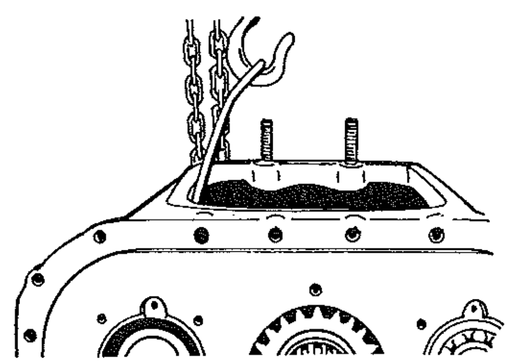
Reversible input and output bearing puller — (Kent Moore J 24348). Used with end yoke remover (J 7804-01).



Countershaft alignment blocks — Kent Moore (J 28720). Provides maximum clearance for mainshaft assembly installation. Allows countershafts to be rotated for timing purposes.



Countershaft front bearing puller (Snap-on — CJ 80).



Countershaft lift hook — (Kent Moore J 23667). Holds countershaft in time while centering the countershaft in the case bore for easier bearing installation.

TRANSMISSION

Remote Control Assembly

Disassembly

Remove six capscrews and lockwashers and separate the remote control from the shifter housing.

1. Remove set screw from universal joint assembly and pull universal joint from the rod.

2. Remove four capscrews and lockwashers holding end cover and gasket in place.

3. Remove set screw from joint shift rod finger and tap rod through cross holes in housing.

4. Remove finger from housing.

5. Remove set screw from inner shift finger.

6. Slide rod and bracket assembly from inner shift finger.

7. Be careful not to lose key from rod or shift finger.

8. Remove seals from cross holes in housing.

Inspection

Check shift fingers for excessive wear. Check all bores and rods for excessive wear or scuffing.

Clean parts thoroughly and apply light coat of grease to pivot points when reassembling.

Assembly

1. Install new key in rod and bracket assembly and install into remote housing, sliding shift finger (inner) on end of rod.

2. Line up set screw hole and install set screw, and torque 40 to 50 lbs. ft.

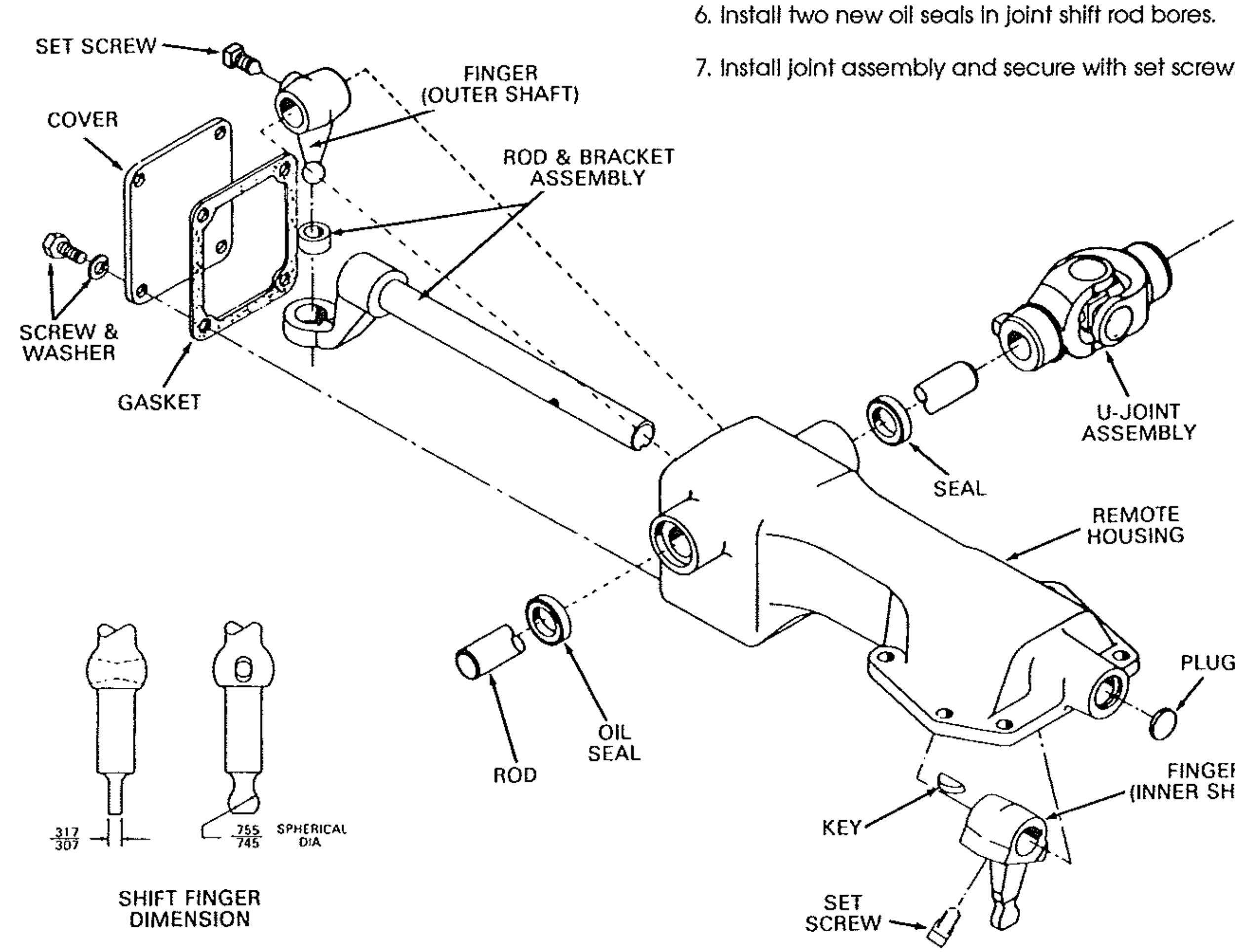
3. Install joint shift rod through cross holes and through outer finger, making sure finger is inserted into bracket.

4. Align set screw hole and install same, and torque 40 to 50 lbs. ft.

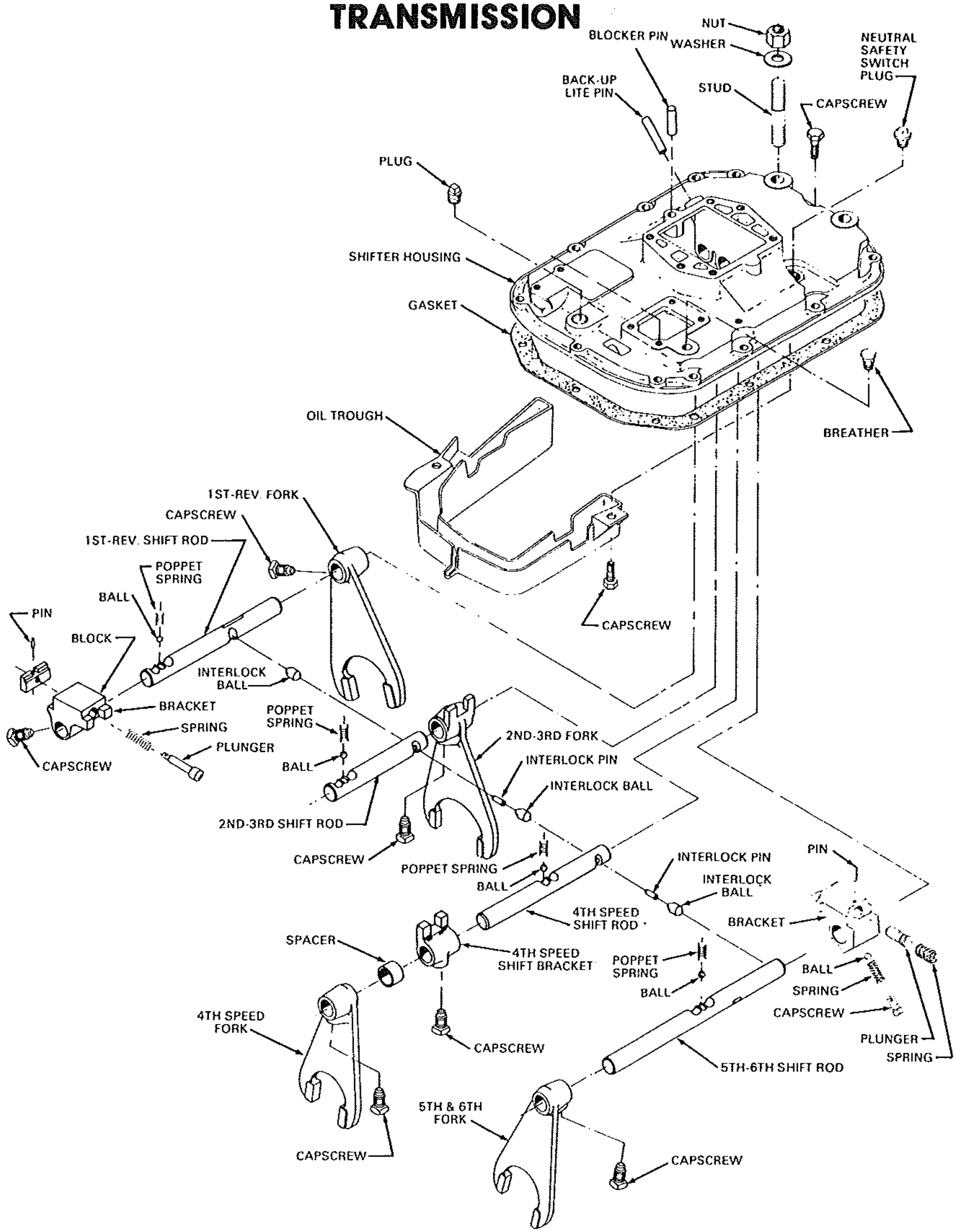
5. Install end cover and secure with four capscrews and lockwashers.

6. Install two new oil seals in joint shift rod bores.

7. Install joint assembly and secure with set screw.



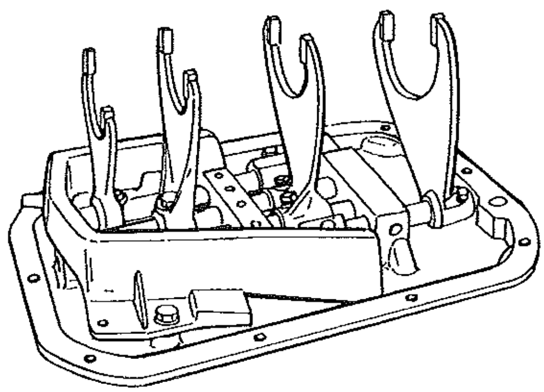
TRANSMISSION



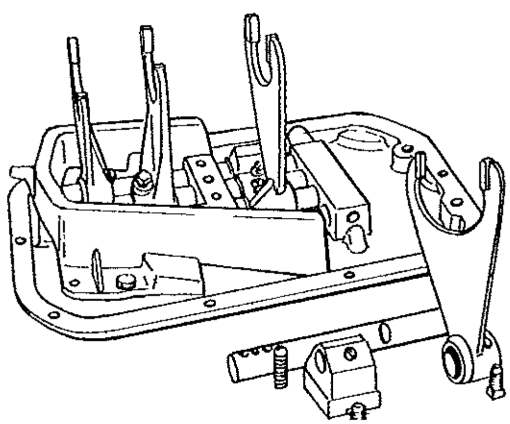
SHIFTER HOUSING
CENTER CONTROL

TRANSMISSION

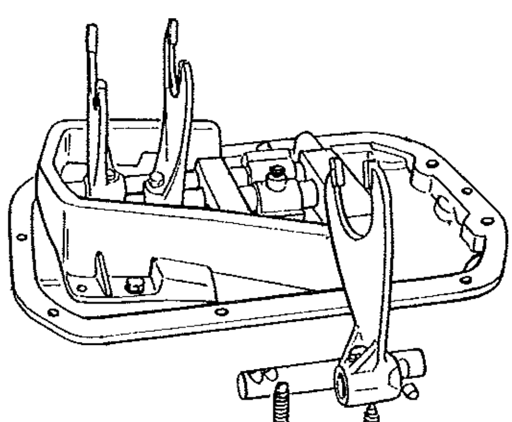
Shifter Housing Disassembly



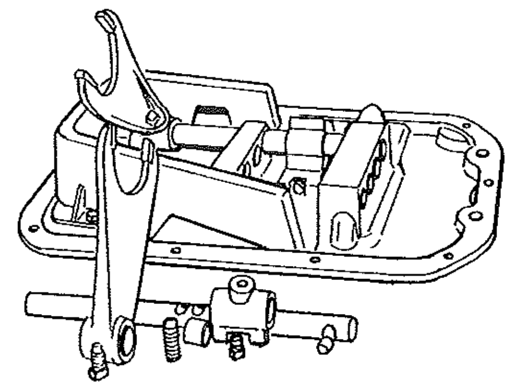
1. Place the cover on a bench with the forks in the neutral position.



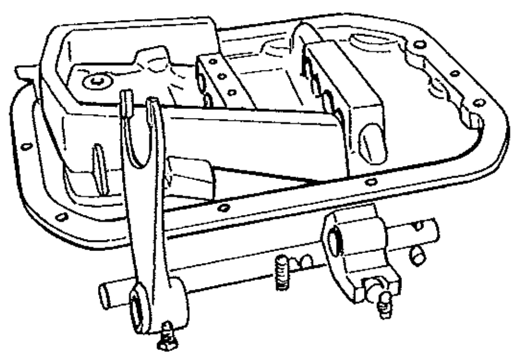
2. Remove the 1st-Reverse fork and bracket set screws. As parts are being removed, use care so that the poppet ball and spring are not lost.



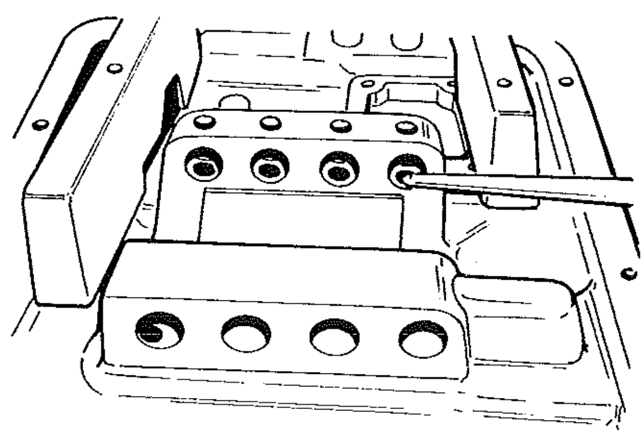
3. Remove the set screw from the 2nd-3rd fork. Tap the rod rearward and remove the poppet ball and spring. As the shift rod is pulled from the rear of the housing, be sure not to lose the interlock pin located in the rod.



4. In the same manner, remove the 4th speed fork and bracket. Recover the poppet ball and spring and also the interlock pin and ball.



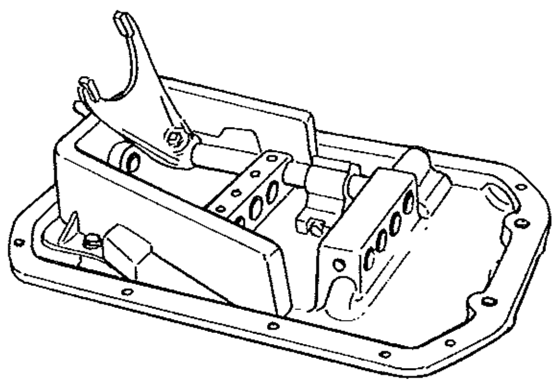
5. Next, remove the 5th-6th fork and bracket to complete the disassembly of the shifter housing.



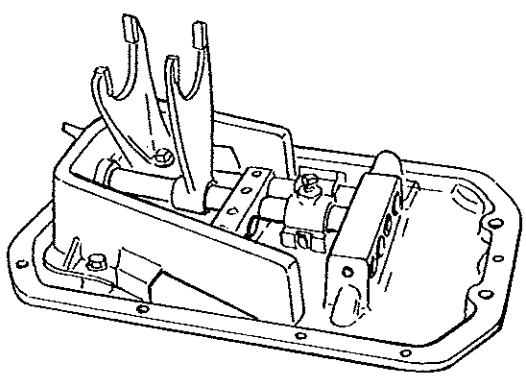
6. Check the poppet holes for chipping or other signs of wear. Since sharp corners are required to insure the proper functioning of the shift rods, any worn holes will result in the unit sticking in gear.

TRANSMISSION

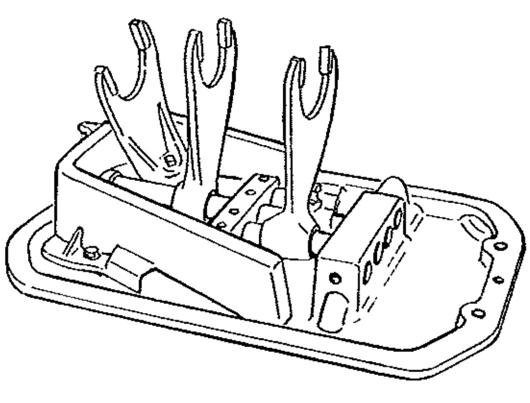
Shifter Housing Reassembly



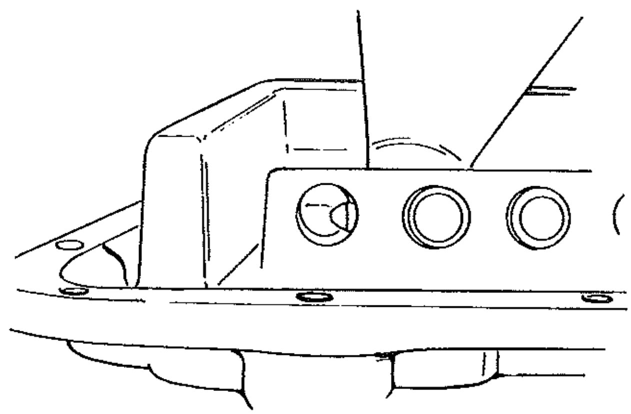
1. After inspection, the shifter housing is ready for reassembly. Install the 5th-6th shift bracket and fork. Torque the set screws 34 to 41 pounds feet (46 to 56 Nm).



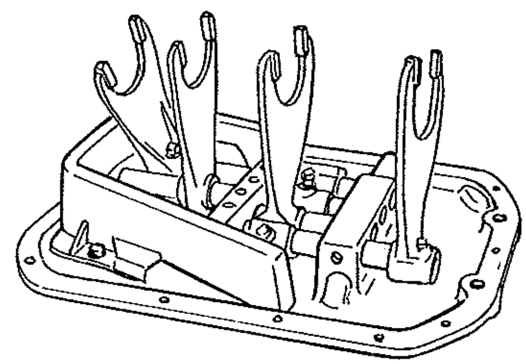
2. Install the 4th speed fork and bracket. Be sure to check each shift rod for free movements as the reassembly progresses.



3. Install the 2nd-3rd shift fork.

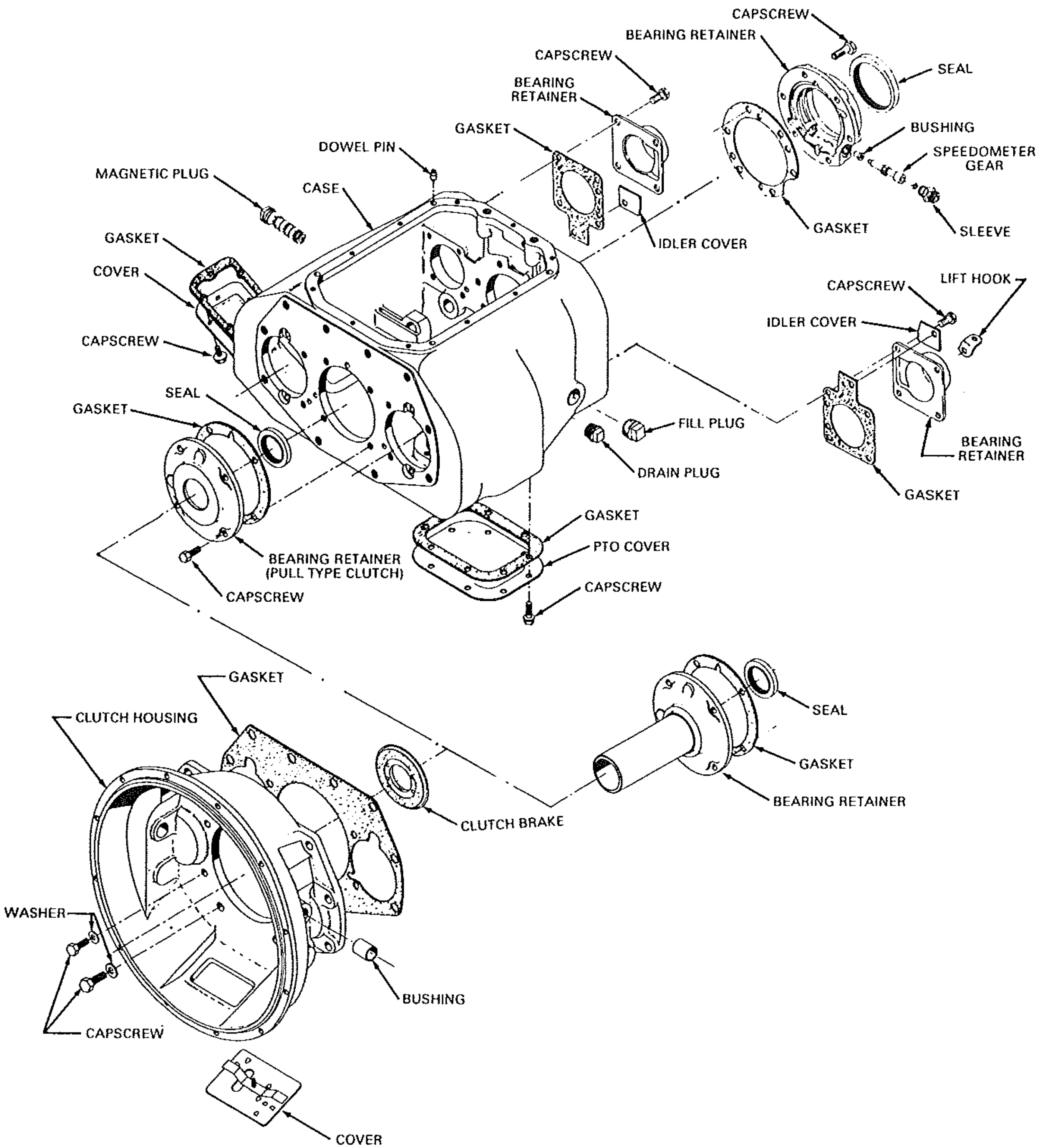


4. During the installation of each shift rod, careful attention is needed to insure the proper installation of all interlock balls. These interlocks prevent the transmission from being shifted into two gears at the same time.



5. With the shifter housing reassembly completed, it is advisable to check for the proper functioning of these interlocks. Shift one fork into gear; if all interlocks are installed correctly, none of the other forks will shift into gear.

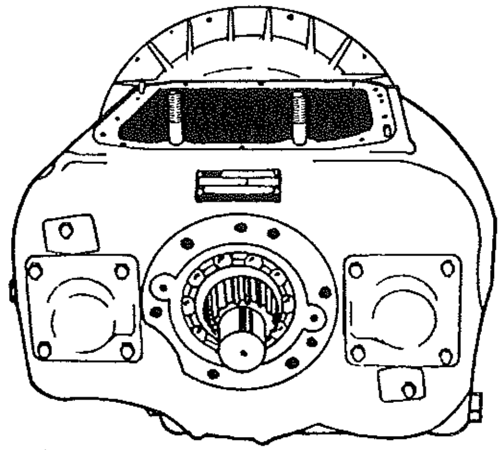
TRANSMISSION



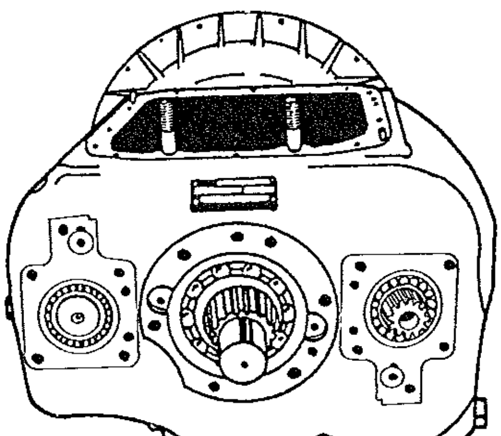
CASE SUB-ASSEMBLY

TRANSMISSION

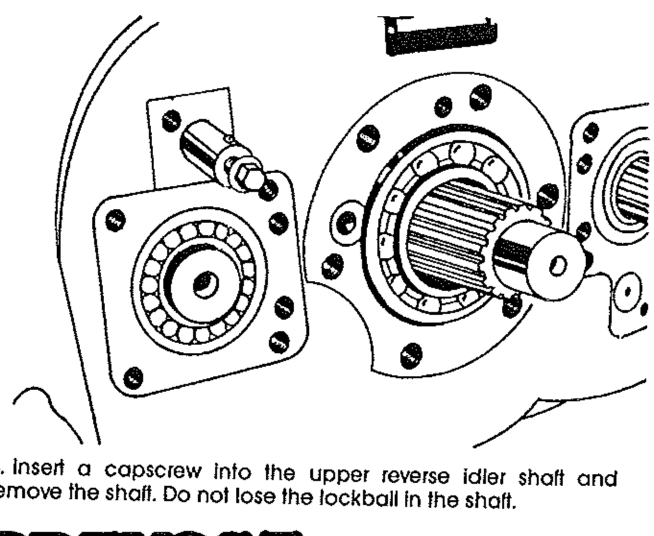
Gears and Case Disassembly



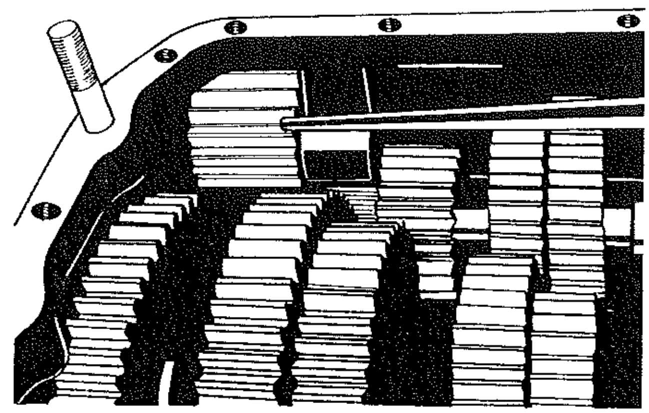
1. Now that the shifter housing is removed, continue the disassembly of the transmission by removing the output bearing cap and gasket.



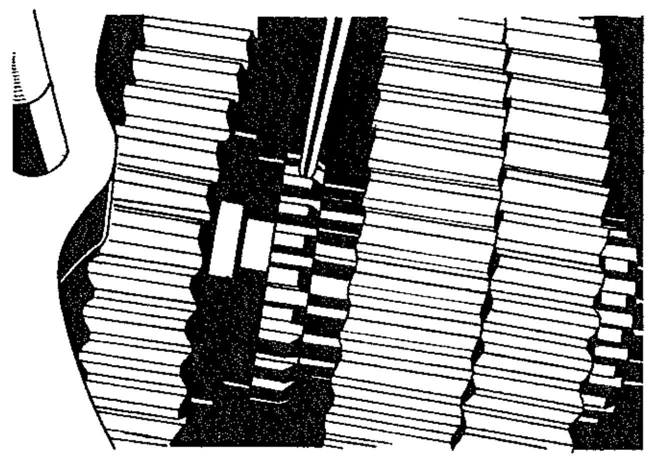
2. Remove the countershaft bearing retainers.



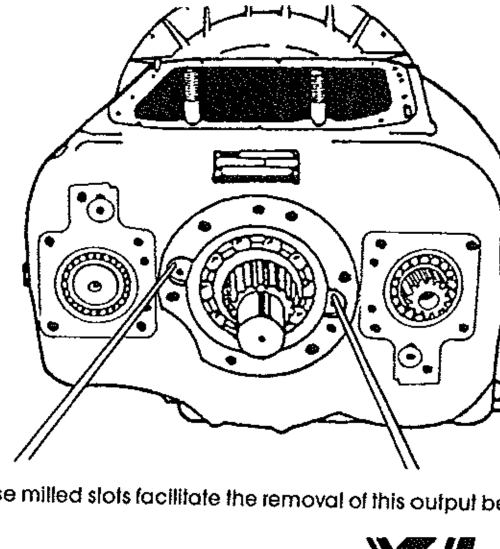
3. Insert a capscrew into the upper reverse idler shaft and remove the shaft. Do not lose the lockball in the shaft.



4. Roll the upper reverse idler gear toward the side of the case.

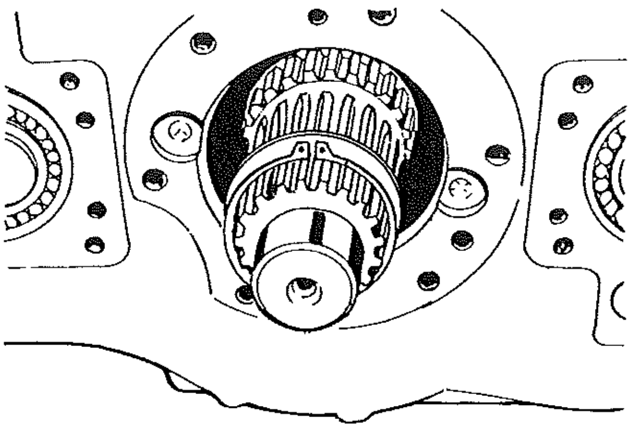


5. Engage the 1st-Reverse collar into reverse gear.

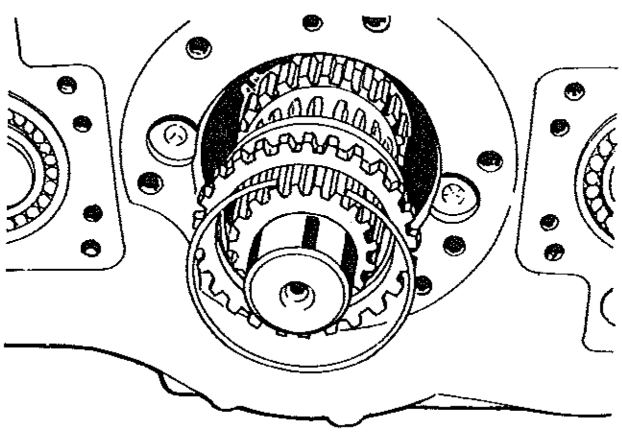


6. These milled slots facilitate the removal of this output bearing.

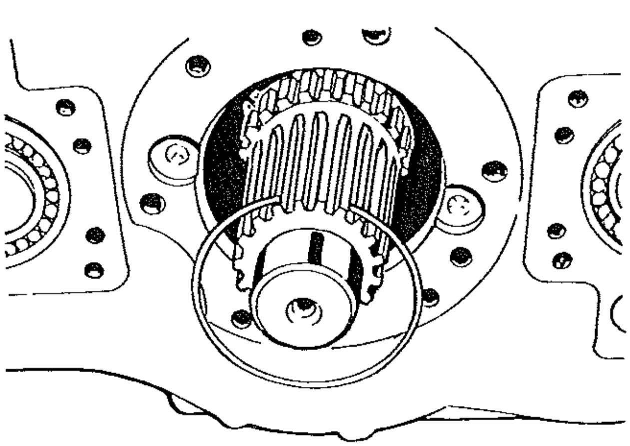
TRANSMISSION



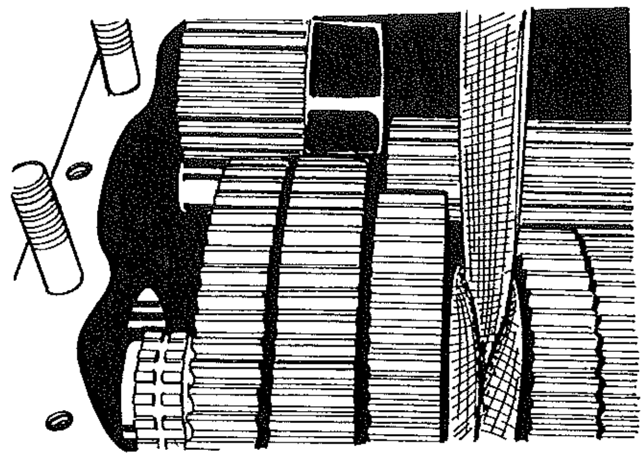
7. Remove the mainshaft snap ring and the internally splined thrust washer.



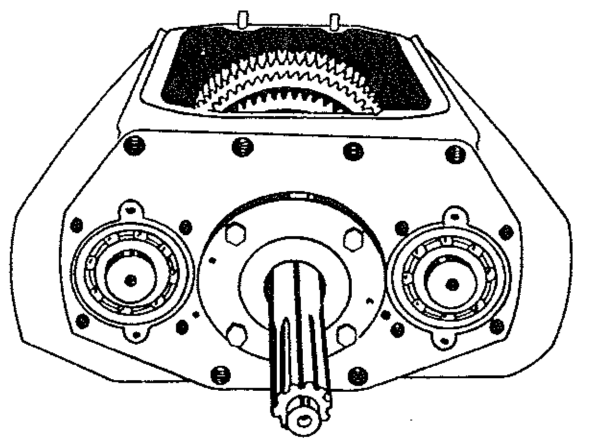
8. Next, remove the gear bore snap ring and both the externally and internally splined thrust washers.



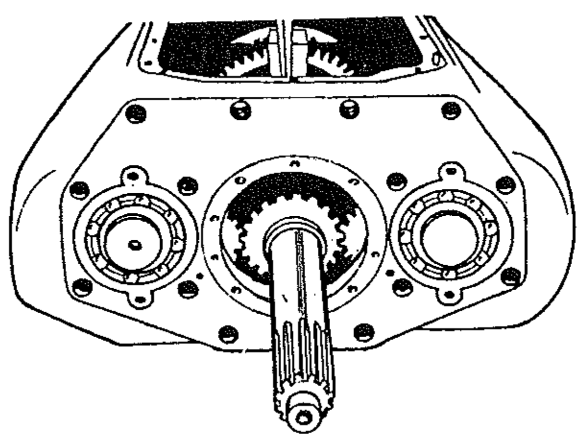
9. Finally, remove the remaining gear bore snap ring.



10. Now, butt the 1st and reverse gears together. Secure both gears with lockwire to provide the necessary clearance for removal of the mainshaft assembly.

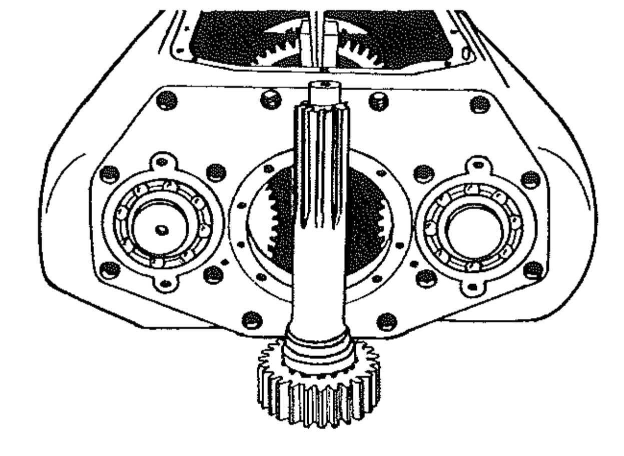


11. Remove the clutch housing.

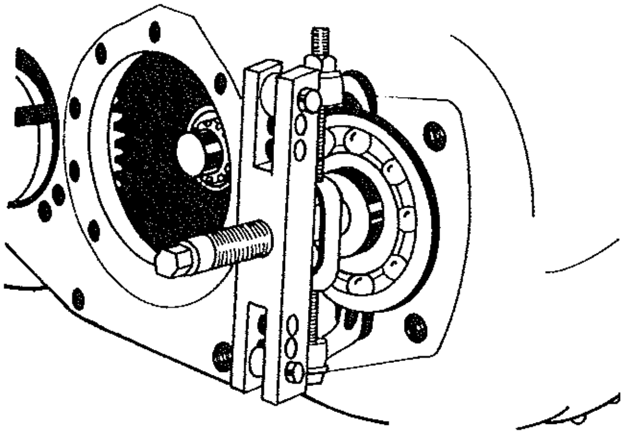


12. Remove the input bearing cap.

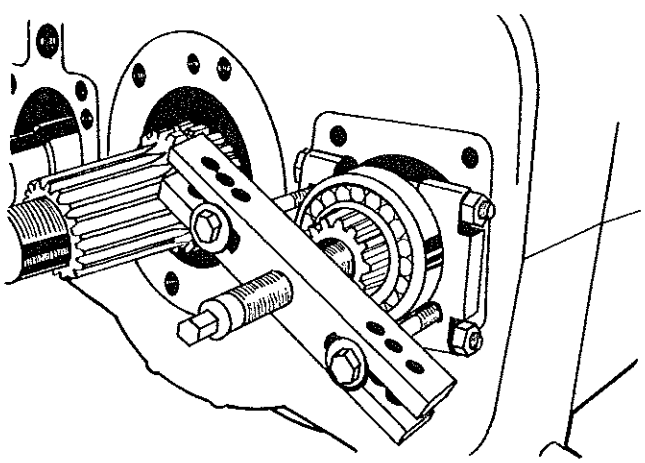
TRANSMISSION



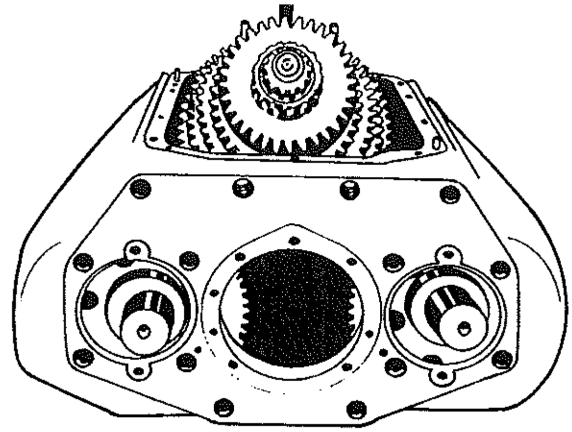
13. Remove the input gear.



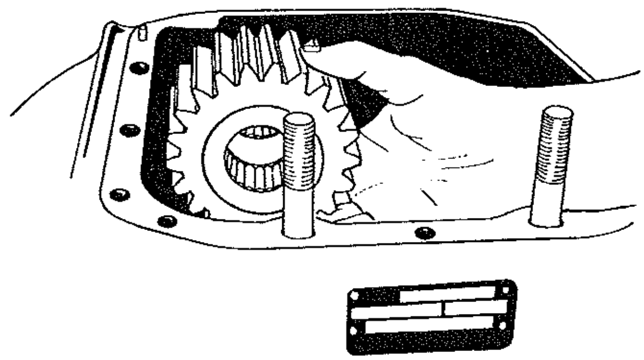
14. Using a puller, remove the countershaft front bearings.



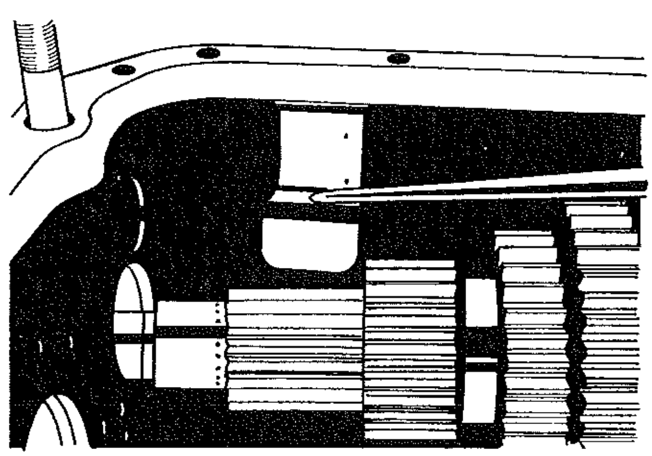
15. Now, move the countershafts to the rear as far as possible and install a puller for bearing removal.



16. To provide adequate clearance for mainshaft removal, move both countershafts forward and toward the side of the case. Then lift the mainshaft assembly out of the case.

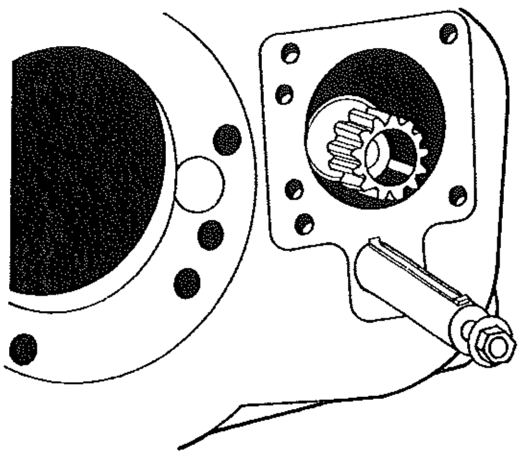


17. Remove the upper reverse idler gear.

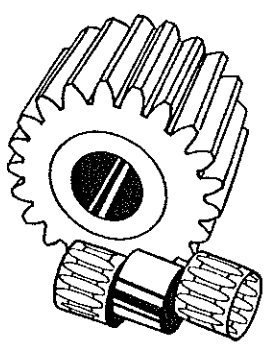


18. Because of this upper idler boss interference, remove the right side countershaft first, then the left.

TRANSMISSION



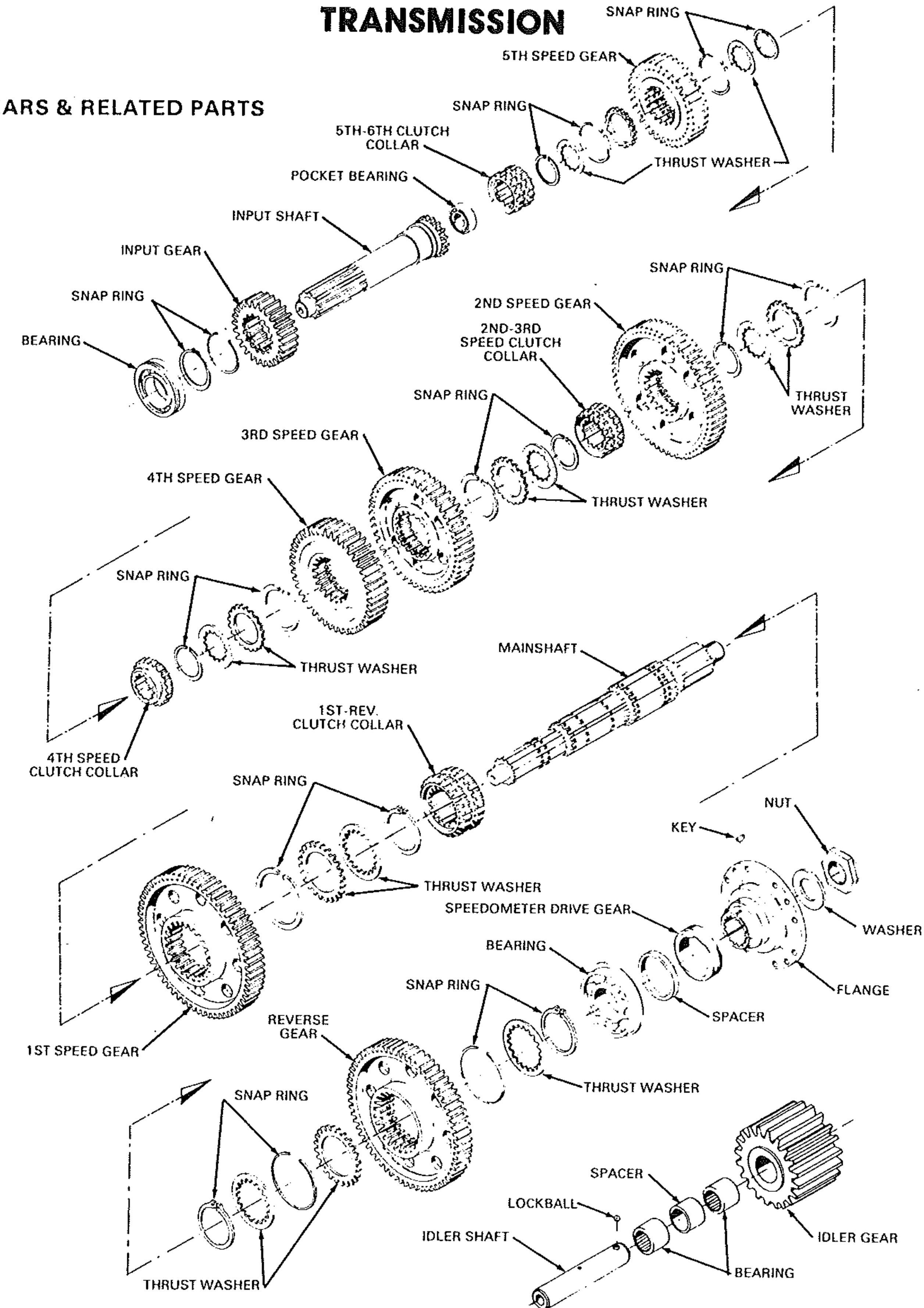
19. Remove both the lower reverse idler shaft and gear.



20. Check both the idler gear and bearings for wear.

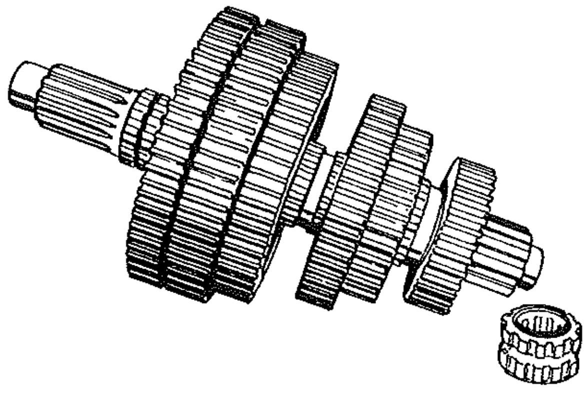
TRANSMISSION

GEARS & RELATED PARTS

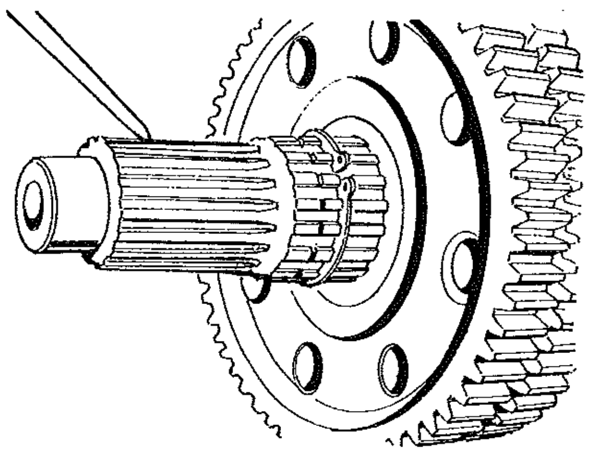


TRANSMISSION

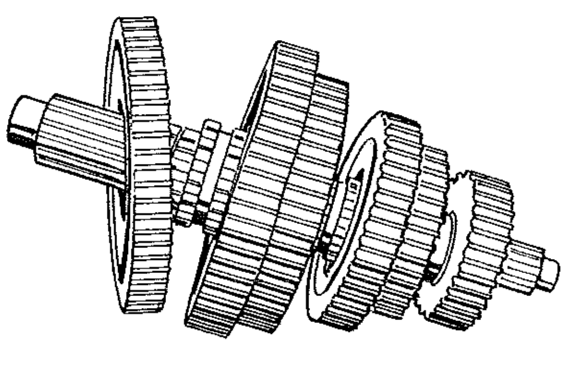
Mainshaft disassembly and reassembly



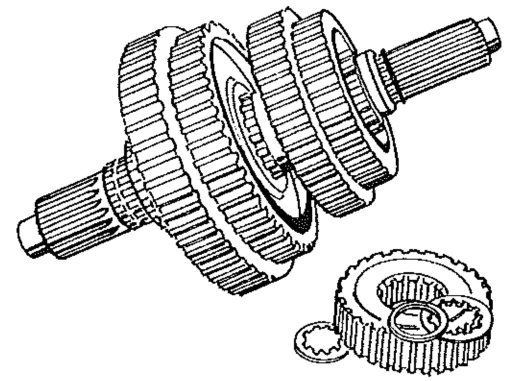
1. Begin the mainshaft disassembly by removing the clutch collar.



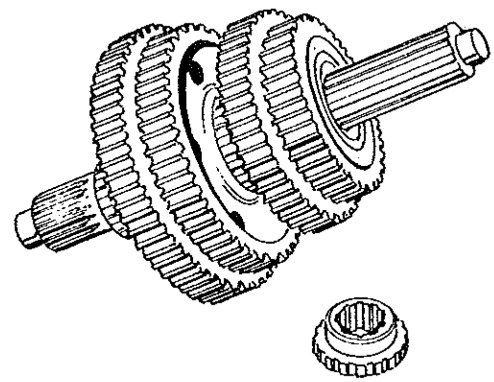
2. This diameter of the mainshaft has been enlarged, thus increasing the torque capacity.



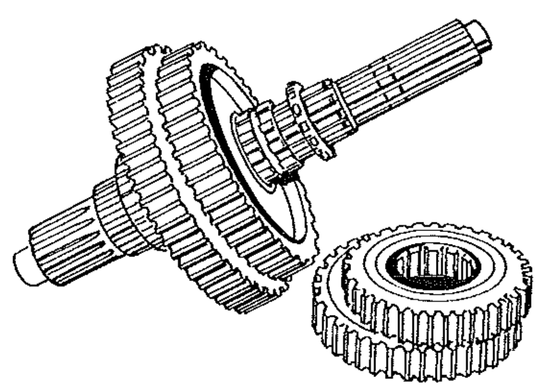
3. Cut the lockwire and remove reverse gear.



4. Remove the snap ring and 5th speed gear.

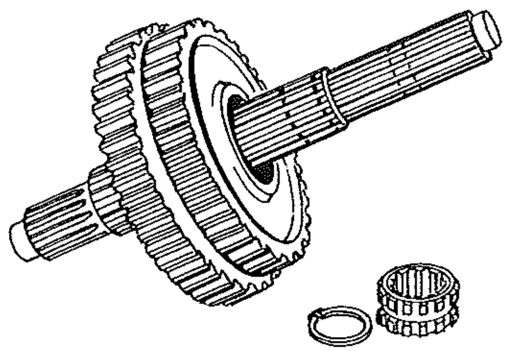


5. Remove another snap ring and the 4th speed clutch collar.

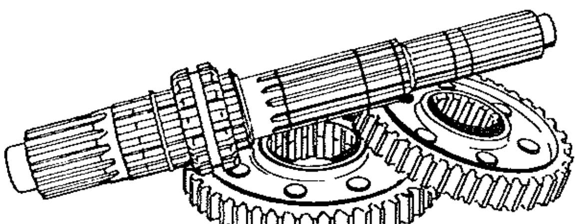


6. After removing the next snap ring, lift both the 4th and the 3rd speed gears from the mainshaft.

TRANSMISSION

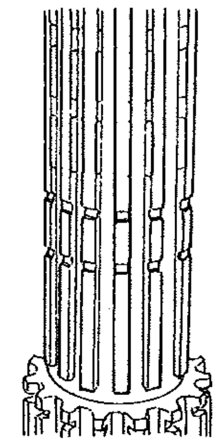


7. The 2nd-3rd speed clutch collar may be removed.

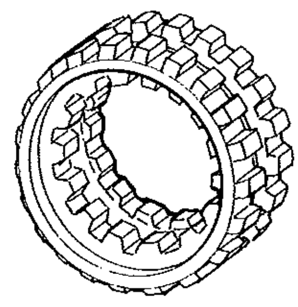


8. Another snap ring secures both the 2nd speed and the 1st speed gears to the mainshaft.

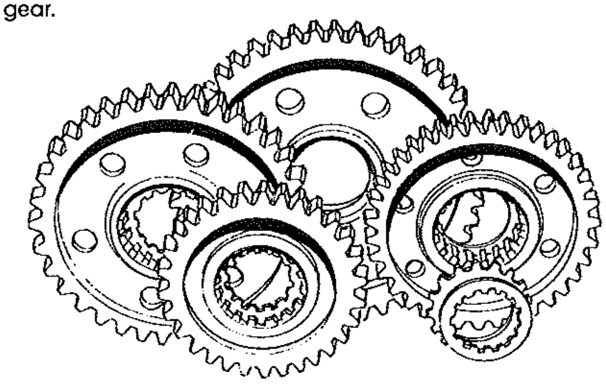
9. All that remains on the mainshaft are two snap rings and the 1st-Reverse clutch collar.



10. Spicer utilizes «gear locks» to maintain clutch collar engagement. The mainshaft splines have machined grooves.

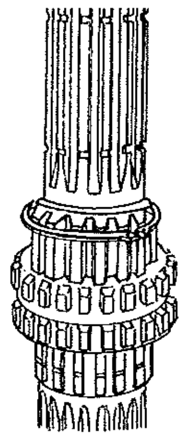


11. While the clutch collar has a relieved area on the internal diameter that provides sharp corners, when «in gear», these edges lock together to keep the transmission in the selected gear.

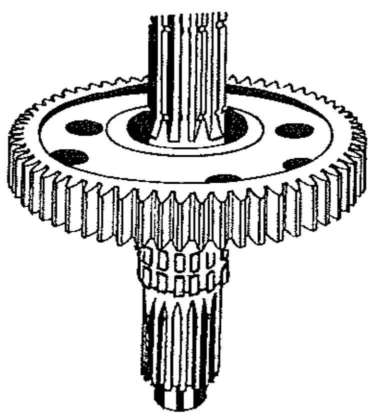


12. Reassembly of the mainshaft may now begin. Apply a light coat of oil on all thrust washer faces. All mainshaft gears contain a set of these thrust washers. The externally splined washer is positioned against the gear bore snap ring and the internally splined washer against the snap ring on the mainshaft.

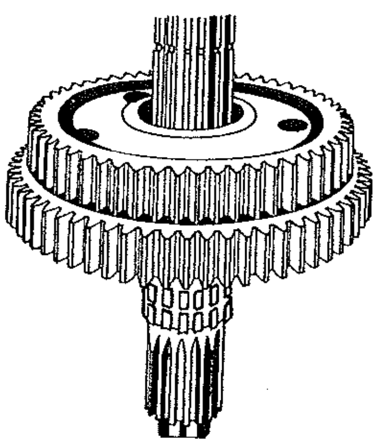
TRANSMISSION



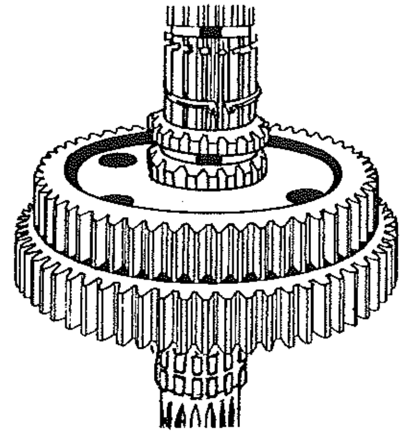
13. Install the 1st-Reverse clutch collar between the mainshaft snap rings.



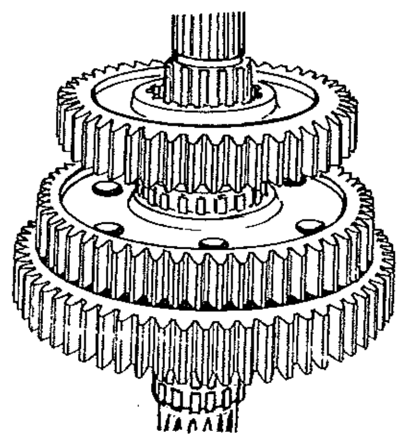
14. Next, the 1st speed gear, complete with thrust washers, is placed on the mainshaft.



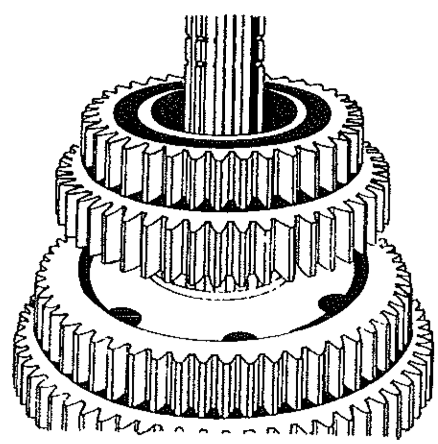
15. Place the 2nd speed gear on the mainshaft and secure with a mainshaft snap ring.



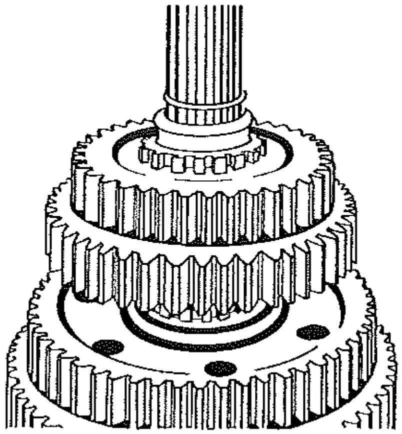
16. Slide the 2nd-3rd clutch collar onto the mainshaft.



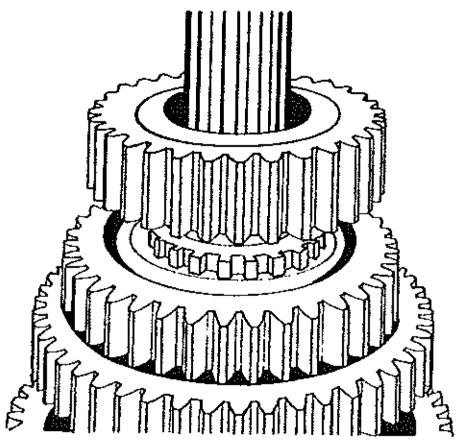
17. Place the 3rd speed gear on the mainshaft with the clutch teeth down.



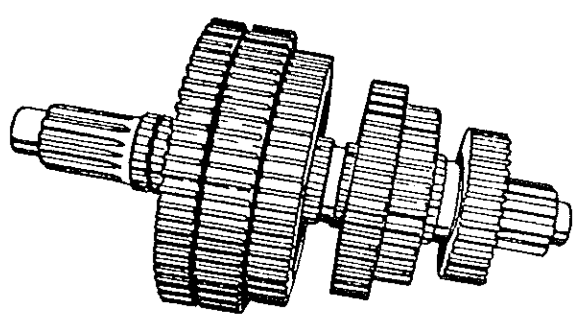
18. The 4th speed gear is installed next and secured with a mainshaft snap ring.



19. Slide the 4th gear clutch collar onto the mainshaft.



20. Then place the 5th speed gear on the mainshaft and secure with a snap ring.



21. Install the reverse gear and butt it against the 1st speed gear. Secure with lockwire.

TRANSMISSION

Inspection

Prior to reassembling the mainshaft, certain individual parts should be examined. Parts damaged from previous service should be eliminated to insure maximum rebuild life.

These suggested inspection procedures should be followed:

Clutch Collars: Both the internal and external teeth must have sharp edges. Rounded corners or excessive chipping will cause gear jumping. Also, examine fork slots for wear.

Gears: Examine for broken or cracked operating teeth. Also, check for any unusual wear patterns. Clutching teeth must not show excessive wear.

Thrust Washers: Check for flatness or excessive face wear (cracks, scoring, etc.).

Snap Rings: Examine for distortion or loss of tension. New snap rings are recommended with every rebuild.

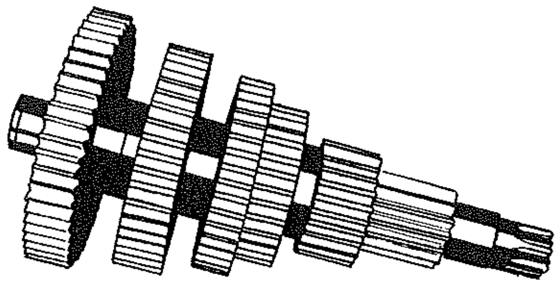
Mainshaft: Check spline gearlocks for sharp corners. Worn or ironed out gearlocks will produce gear jumping. Also, check for chipped splines at snap ring grooves.

TORQUE SPECIFICATIONS FOR NUTS AND CAPSCREWS

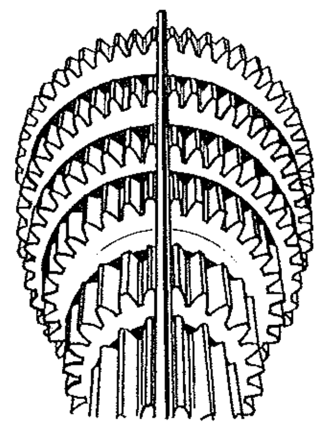
NOM. THREAD SIZE (DIA.)	PART NAME	WRENCH TORQUE LBS. FT.			
		NON-LOCKING TYPE		LOCKING TYPE (Bonded Nylon Patch)	
		MIN.	MAX.	MIN.	MAX.
.250	Cap Screw or Nut	7	10	10	13
.312	"	13	17	20	24
.375	"	25	32	34	41
.438	"	40	50	52	62
.500	"	60	80	78	98
.562	"	90	115	112	137
.625	"	120	150	150	180
.750	"	200	250	240	290
1.250	Nut			500	550
1.375	"			550	600
1.750	"			550	600
	PTO Aperature Cover Capscrews				
.375	Capscrew	10	15	19	24
.438	"	20	25	32	37
	Shift Fork Or Bracket Set Screws	Lockwire Type			
.375	Set Screw	25	32	34	41
.438	"	40	50	52	62

TRANSMISSION

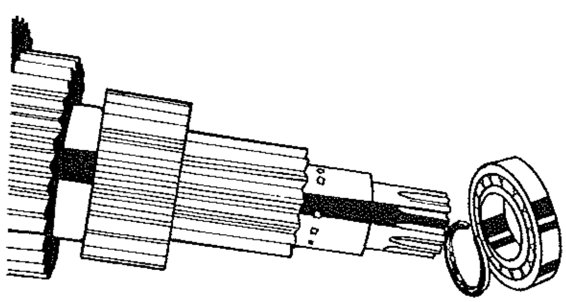
Countershaft disassembly and reassembly



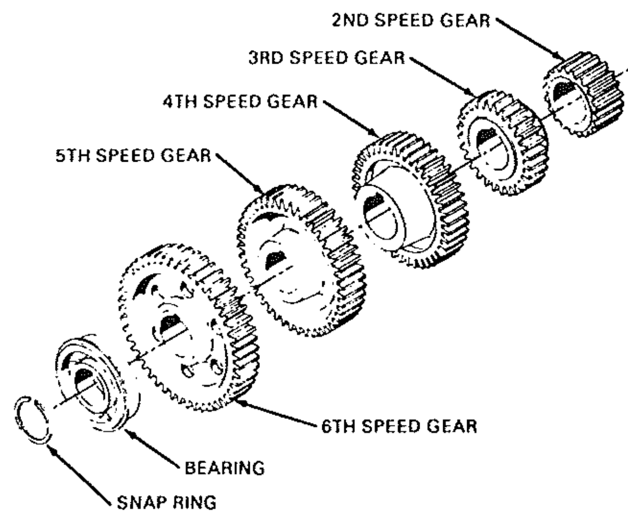
1. This view shows the hub direction of the gears. The first-reverse gear is an integral part of the shaft, while the remaining gears are secured with individual Woodruff keys under each gear.

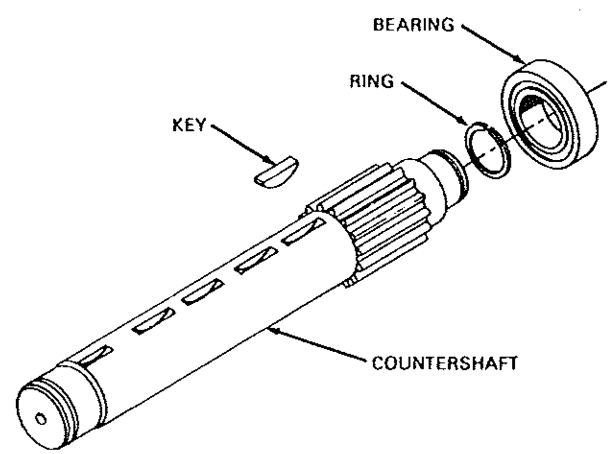


2. If you place a straight edge between these painted teeth, every gear on the countershaft will be in line. When you set these shafts in time, these marks will be directly across from each other.



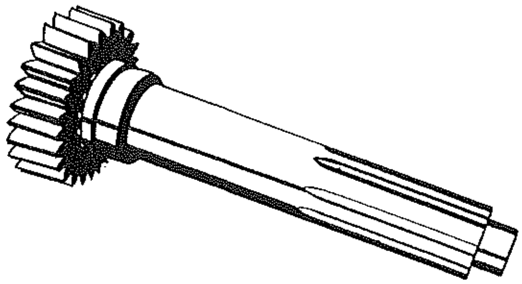
3. The countershaft rear bearing requires a spacer ring for proper location.



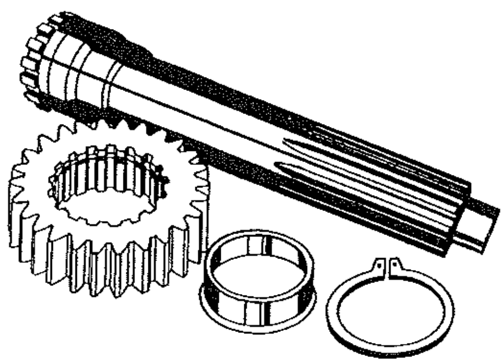


TRANSMISSION

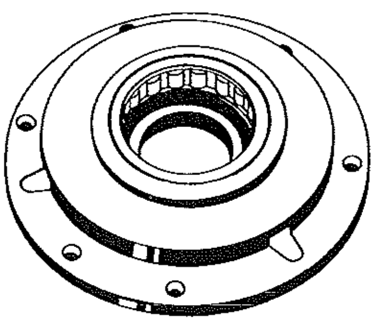
Input gear disassembly and reassembly



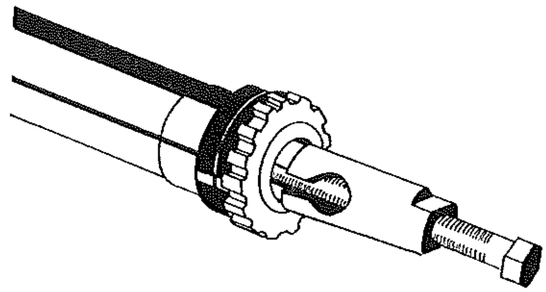
1. The input gear and shaft are separate components secured with a snap ring.



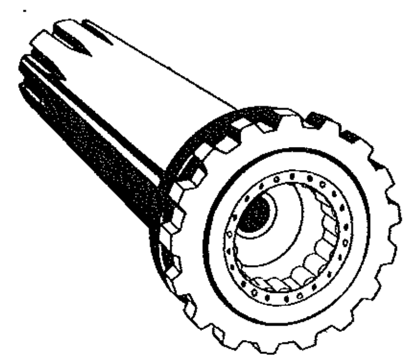
2. This view shows the input sub-assembly when disassembled.



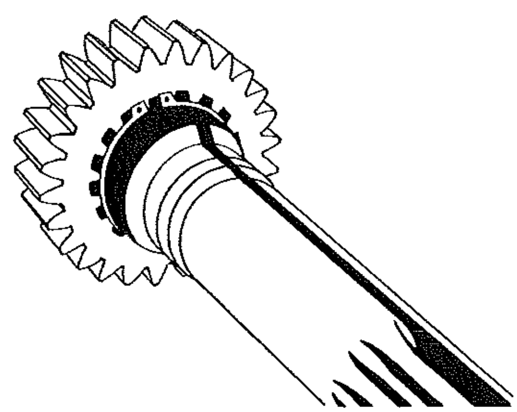
3. The input bearing is a press fit into the input bearing cap.



4. Remove the pocket bearing. Kent-Moore puller J-29128 is recommended.



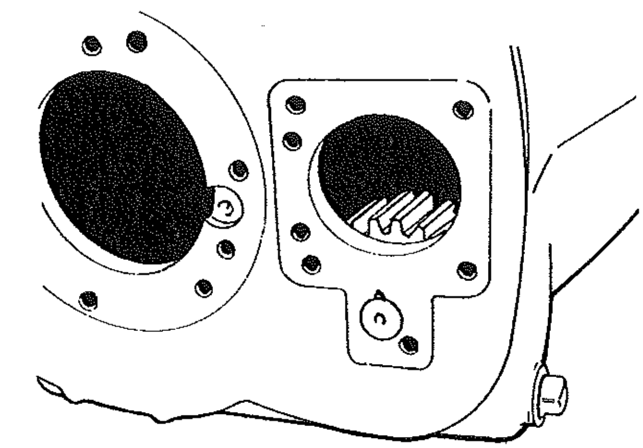
5. This new style pocket bearing is reversible.



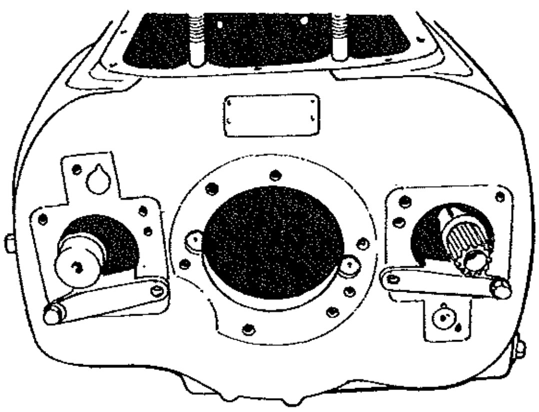
6. The snap ring in the input shaft secures the gear in its proper location.

TRANSMISSION

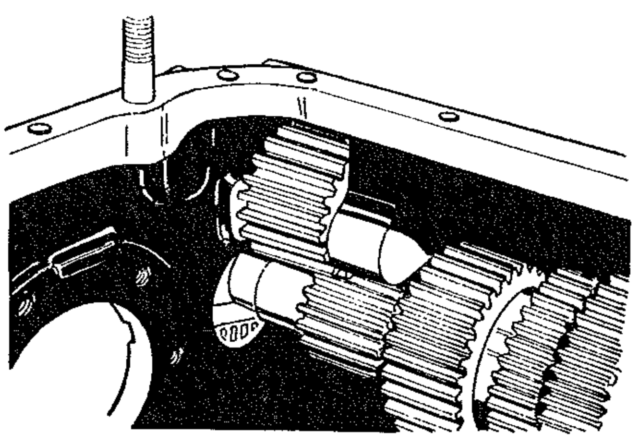
Gears and case reassembly



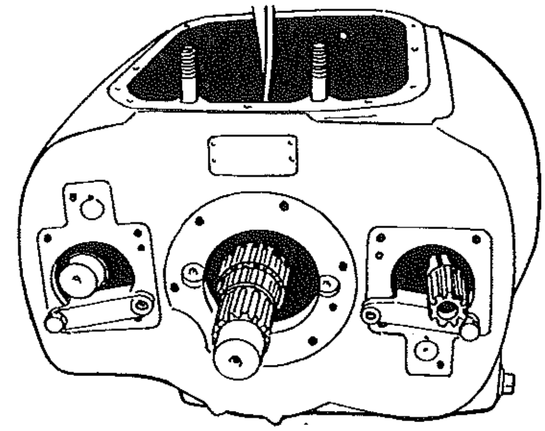
1. Reassembly of the transmission begins by placing the lower reverse idler gear and the shaft into the case.



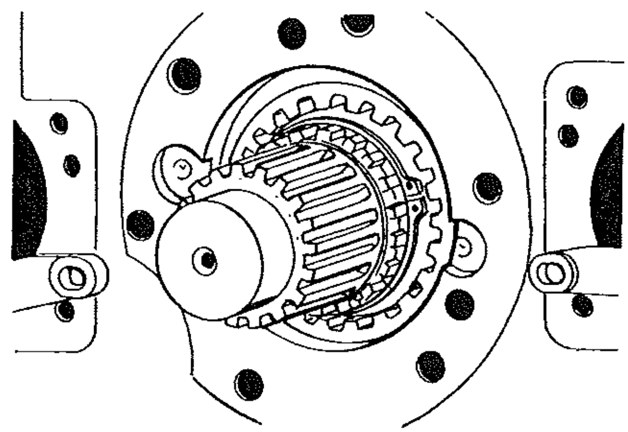
2. Install the left side countershaft first, then the right side. Kent-Moore alignment blocks J-28720 are recommended.



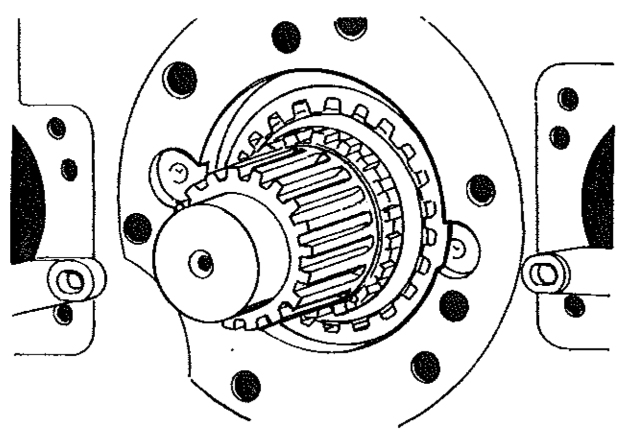
3. Set the upper reverse idler gear into the case. However, do not install the shaft at this time.



4. Lower the mainshaft assembly into the case.

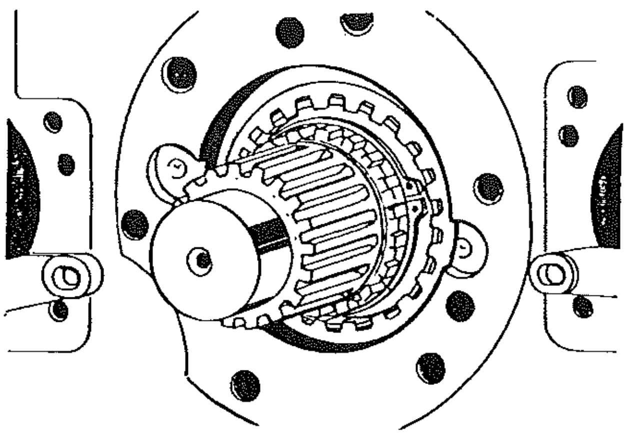


5. Cut and remove the lockwire. Slide the reverse gear rearward and install the first gear bore snap ring.

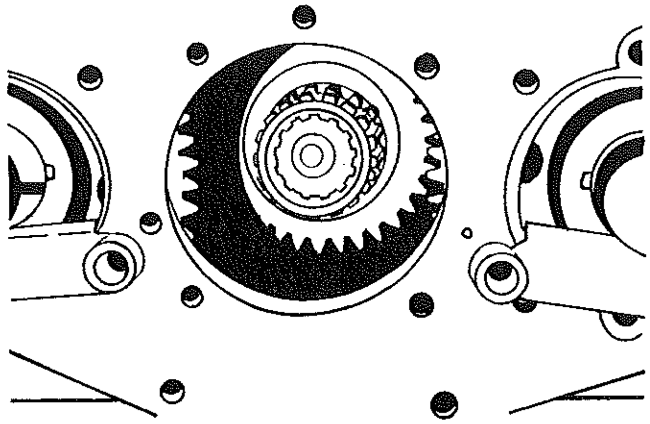


6. Next, place both the internally and the externally splined thrust washers into the bore and secure these washers with the remaining gear bore snap ring.

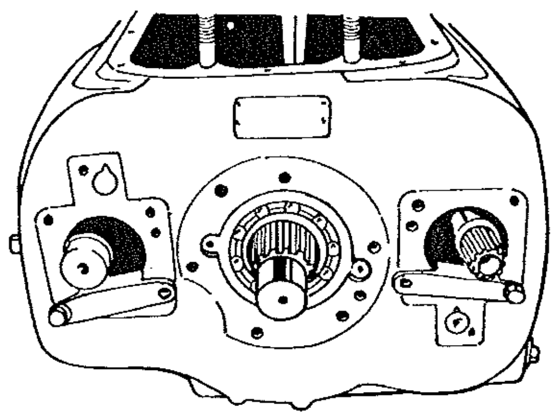
TRANSMISSION



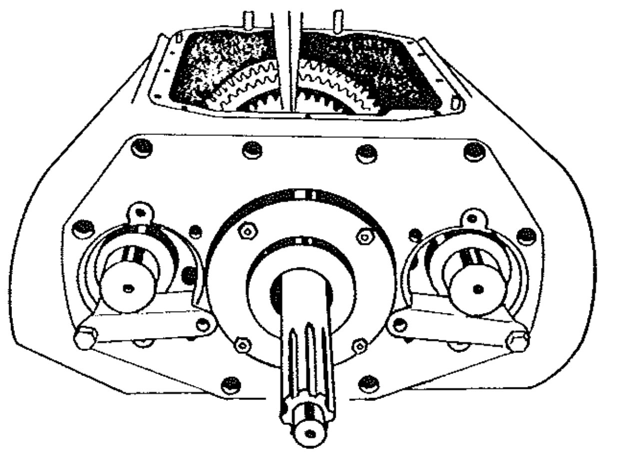
7. Finally, install the internally splined thrust washer and secure it with the mainshaft snap ring.



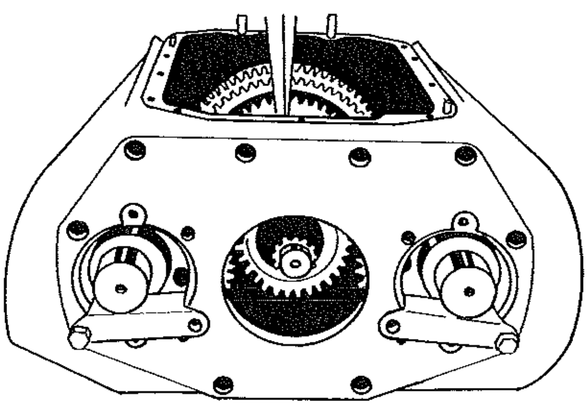
10. Install the 5th-6th clutch collar.



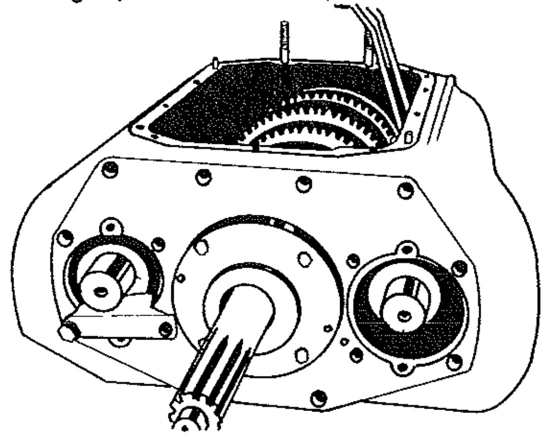
8. Slide the output bearing onto the shaft and using a suitable driver, install the bearing.



11. Place the input sub-assembly into the case, then install the input bearing cap and secure with capscrews.

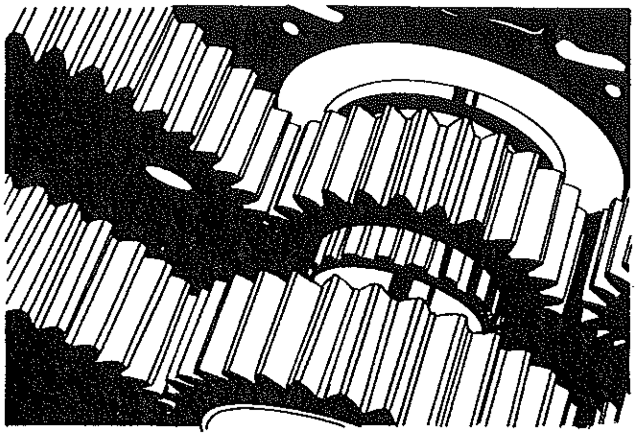


9. Align the countershaft timing marks toward the center of the case.

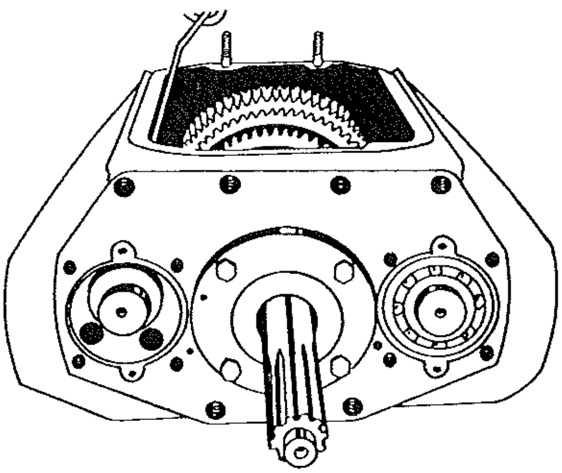


12. With the aid of a countershaft lift hook, Kent-Moore J-23667, set the countershaft in time.

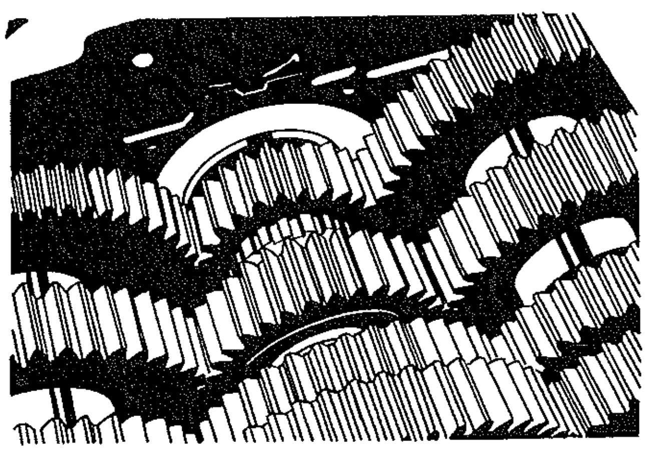
TRANSMISSION



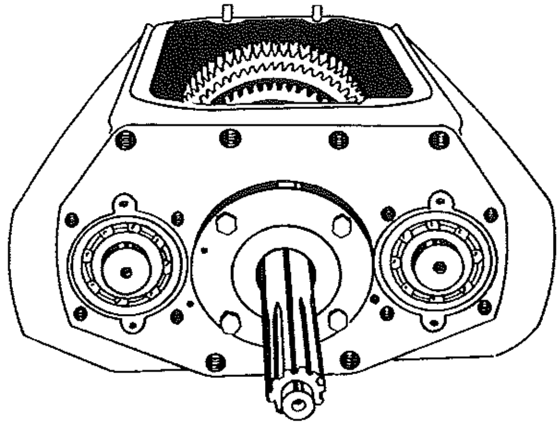
13. This is accomplished by matching paint marks.



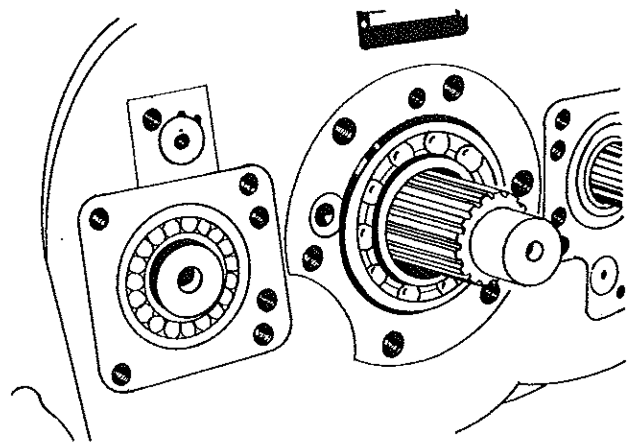
14. Install both the front and the rear bearings.



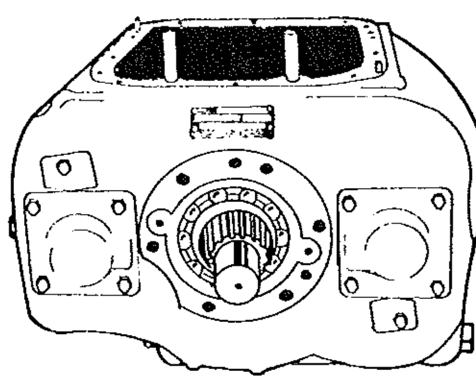
15. Repeat this procedure for the remaining countershaft.



16. The input shaft may now be rotated to check for correct timing. If the shaft turns freely, the unit is in time. If it locks up, check the timing marks for proper alignment.

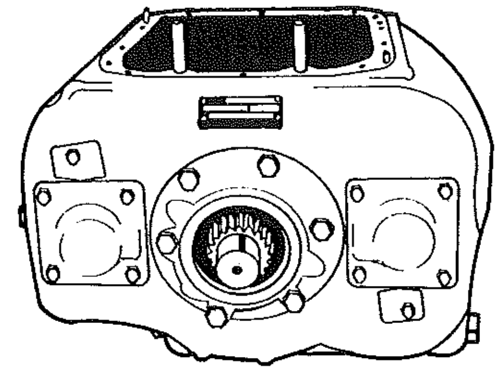


17. Install the upper reverse idler shaft with lockball. It is necessary to lift up on the mainshaft reverse gear to obtain proper alignment.

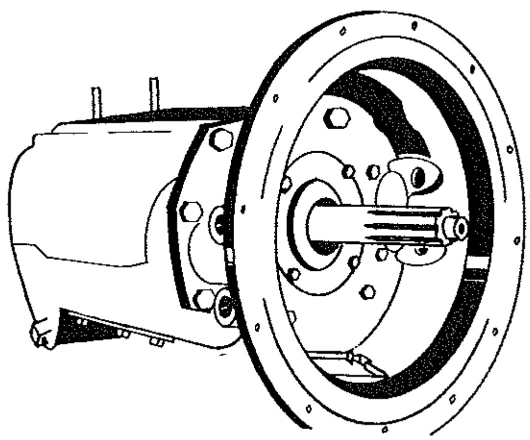


18. Secure the countershaft rear bearing retainers with capscrews. Torque 34 to 41 pounds feet (46 to 56 Nm).

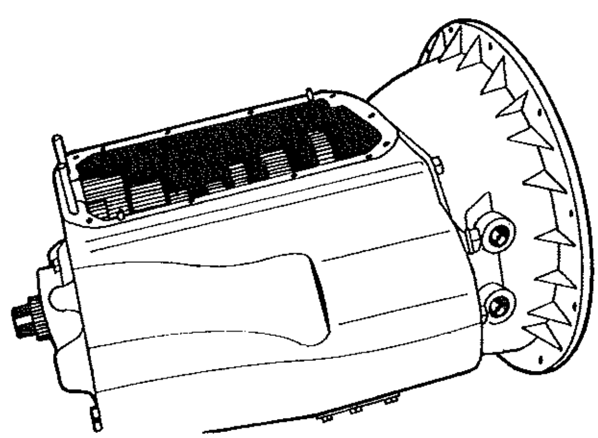
TRANSMISSION



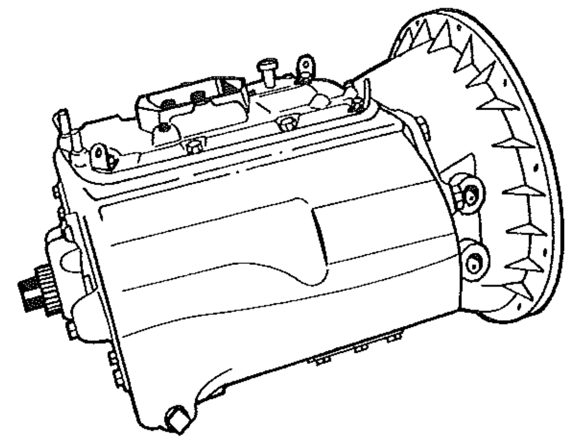
19. Place the output bearing cap on the case and secure with capscrews.



20. Assemble the clutch housing to the case.



21. Shift all the clutch collars into the neutral position.



22. Place the shifter housing in its proper location and secure with capscrews.

TRANSMISSION

TROUBLE SHOOTING

Important Procedure

When locating and correcting unit power or auxiliary transmission troubles, a systematic procedure should be followed.

Road test whenever possible. Mechanics usually get second or third hand reports of trouble experienced with the unit and these reports do not always accurately describe the actual conditions. Sometimes symptoms seem to indicate trouble in the transmission; while, actually the trouble may be caused by the axle, propeller shaft, universal joint, engine or clutch. This is especially true of complaints on noise. Therefore, before removing transmission or related components to locate trouble, always road test to check possibility that trouble may exist in other closely associated units. If the mechanic can drive, road testing will be more effective; however, just riding with the driver can be very informative.

Check Functioning Prior to Disassembly

If remote controls are used, a careful check of the remote and connecting linkage to transmission must be made. The remote unit must be in good working order if the transmission is expected to shift satisfactorily.

Many times the answer to the trouble is apparent when the unit is inspected prior to disassembly, but this evidence is often lost when the parts are separated. If possible, check the unit prior to disassembly. Bear in mind that a careful inspection of the unit should be made as each disassembly step is performed.

Inspect Thoroughly During Disassembly

It is poor practice to disassemble a unit or complete transmission as quickly as possible without bothering to examine the parts as they come down. It happens many times that a mechanic has completely disassembled a unit and failed to find the cause of the trouble because he did not bother to examine the parts as they came apart. After the transmission is disassembled, check the lubricant for foreign particles which often reveal sources of trouble that are overlooked during the disassembly.

Repair or Replace Worn Parts

Many times the parts or critical adjustments that have caused the trouble are not replaced or corrected because the mechanic will only inspect and replace parts that have failed completely. All pieces should be accurately examined because the broken parts are often just the result and not the cause of the trouble. All parts that are broken or worn and no longer meet specifications should be replaced. On large units, like a transmission, it is suggested that a mechanic replace parts that are worn to the extent that they do not have a long service life remaining. This avoids another teardown on the unit in the near future. It is also good practice, at this time, to make the changes or modifications recommended to bring the transmission up to date and increase the service life of the unit.

Noisy Operation

Noise is usually very elusive and generally not the fault of the transmission; therefore, mechanics should road test to determine if the driver's complaint of noise is actually in the transmission.

In numerous instances, drivers have insisted that the noise was in the transmission, however, investigations revealed the noise to be causes by one of the following conditions:

(a) Fan out of balance or blades were bent.

(b) Defective vibration dampers.

(c) Crankshafts out of balance.

(d) Flywheels out of balance.

(e) Flywheels mounting bolts loose.

(f) Engine rough at idle producing rattle in gear train.

(g) Clutch assembly out of balance.

(h) Engine mounts loose or broken.

(i) Power-take-off engaged.

(j) Universal joints worn out.

(k) Propeller shafts out of balance.

(l) Universal joint angles out of plane or at excessive angle.

(m) Center bearings in drive line dry, not mounted properly, etc.

(n) Wheels out of balance.

(o) Tire treads humming or vibrating at certain speeds.

(p) Air leaks on suction side of induction system, especially with turbo-chargers.

Mechanics should try to locate and eliminate noise by means other than transmission removal, or overhaul. However, if the noise appears to be in the transmission, try

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to break it down into the following classifications. If possible, determine what position the gear shift lever is in when the noise occurs. If the noise is evident in only one gear position, the cause of the noise generally traceable to the gears in operation.

(a) Growl and humming or, more serious, a grinding noise. These noises are caused by worn, chipped, rough or cracked gears. As gears continue to wear, the grinding noise will be noticeable, particularly in the gear position that throws the greatest load on the worn gear.

(b) Hissing or, more serious, a thumping or bumping-type noise. Hissing noises can be caused by bad bearings. As bearings wear and retainers start to break up, etc., the noise could change to a thumping or bumping.

(c) Metallic rattles within the transmission usually result from a variety of conditions. Engine torsional vibrations are transmitted to the transmission through the clutch. In heavy duty equipment, clutch discs with vibration dampers are not used, so a rattle, particularly in neutral, is common with diesel equipment. In general, engine speeds should be 600 RPM or above to eliminate objectionable rattles and vibration during the idle. A defective or faulty injector would cause a rough or lower idle speed and a rattle in the transmission. Rattle could also be caused by excessive backlash in P.T.O. unit mounting.

(d) Improper lubricants or lack of lubricant can produce noises. Transmissions with low oil levels sometimes run hotter than normal, as there is insufficient lubricant to cool and cover the gears.

Improved highways permit sustained high speeds. The fact that engines and entire power trains can now cruise at a h igher RPM can introduce vibration frequencies, that were not critical in the past. At slower speeds these items would get by or only pass through critical period while accelerating or decelerating through the gears.

In the past, drive line vibrations such as bent tubes, joints out of phase or alignment, bad angles to short couples, clutches out of balance, gears and shafts in transmission out of balance, were fairly obvious. These items will become more critical in vehicles running at sustained high speeds.

Critical vibrations associated with higher speeds are not the old thumping or bumping type but are high frequency vibrations which sting or tingle the soles of your feet, tickle the end of your fingers, etc. This type of vibration will cause gear seizures, broken synchronizer pins, bearing failure due to retainer rivet failures, promote brinelling, fretting corrosion, etc.

(e) Gear whine is usually caused by lack of backlash between mating gears — improper shimming of P.T.O. units is the big offender here.

Noise in Neutral

Possible Causes:

(a) Misalignment of transmission.

(b) Worn flywheel pilot bearing.

(c) Worn, or scored countershaft bearings.

(d) Worn, or rough reverse idler gear.

(e) Sprung, or worn countershaft.

(f) Excessive backlash in gears.

(g) Worn mainshaft pilot bearing.

(h) Scuffed gear tooth contact surface.

(i) Insufficient lubrication.

(j) Use of incorrect grade of lubricant.

Noise in Gear

Possible Causes

(a) Worn, or rough mainshaft rear bearing.

(b) Rough, chipped, or tapered sliding gear teeth.

(c) Noisy speedometer gears.

(d) Excessive end play of mainshaft gears.

(e) Refer to conditions listed under Noise in Neutral.

Oil Leaks

Possible Causes

(a) Oil level too high.

(b) Wrong lubricant in unit.

(c) Non-shielded bearing used as front or rear bearing cap. (Where applicable).

(d) Seals (if used) defective or omitted from bearing cap, wrong type seal used, etc.

(e) Transmission breather omitted, plugged internally, etc.

(f) Capscrews loose, omitted or missing from remote control, shifter housing, bearing caps, P.T.O. or covers, etc.

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(g) Oil drain-back openings in bearing caps or case plugged with varnish, dirt, covered with gasket material, etc.

(h) Broken gaskets, gaskets shifted or squeezed out of position, pieces still under bearing caps, clutch housing, P.T.O. and covers, etc.

(i) Cracks or holes in castings.

(j) Drain plug loose.

(k) Also possibility that oil leakage could be from engine.

(l) Speedometer adaptor or connections.

Walking or Jumping Out of Gear

If the units are walking out of gear it could be caused by:

(a) Interference or resistance in the shift mechanism preventing full engagement of the sliding clutch gear or

(b) If the gear has been shifted completely into position some other malfunction which could move the gear or the shift itself out of its proper location.

If remote controls are used, the mechanic must satisfy himself that the remote units are satisfactory and that transmission is actually at fault. One other point that should be noted is whether the unit walks out of gear under drive (while pulling a load) or on a coast load. Also, does the gear hop occur on smooth or only on rough roads. A number of items that would prevent full engagement of gears are:

(a) Improperly positioned forward remote control which limits full travell forward and backward from the remote neutral position.

(b) Improper length shift rods or linkage that limits travel of forward remote from neutral position.

(c) Loose bell cranks, sloppy ball and socket joints.

(d) Shift rods, cables, etc., too spongy, flexible, or not secured properly at both ends.

(e) Worn or loose engine mounts if forward unit is mounted to frame.

(f) Forward remote mount too flimsy, loose on frame, etc.

(g) Set screws loose at remote control joints or on shift forks inside remote or even inside transmission unit.

(h) Shift fork pads or groove in sliding gear or collar worn excessively.

(i) Worn taper on gear clutch teeth.

(j) Transmission and engine out of alignment either vertically or horizontally.

A few items which could move the gear or shaft out of proper position, particularly on rough roads are:

(a) Use of heavy shift lever extensions.

(b) Shift rod poppet springs broken.

(c) Shift rod poppet notches worn.

(d) Shift rod bent or sprung out of line.

(e) Shift fork pads not square with shift rod bore.

(f) Excessive end-play in drive gear, mainshaft or countershaft, caused by worn bearings, retainers, etc.

(g) Thrust washers worn excessively or missing.

Hard Shifting

An improperly operating clutch will interfere with the proper shifting of gears in any transmission. It is important that the release mechanism also be used in proper working order. If the mechanic is sure that a full and complete clutch release is being made, the following could be a few of the possible causes for hard shifting complaints:

(a) No lubricant in remote control units. Forward remote is isolated and is often overlooked. However, many remote controls used on transmissions and auxiliaries require separate lubrication.

(b) No lubricant in (or grease fittings on) U-joints or swivels of remote controls.

(c) Lack of lubricant or wrong lubricant used, causing buildup of sticky varnish and sludge deposits on splines of shaft and gears.

(d) Badly worn or bent shift rods.

(e) Improper adjustment on shifter linkage.

(f) Sliding clutch gears tight on splines of shaft.

(g) Clutch teeth burred over, chipped or badly mutilated due to improper shifting.

(h) Binding or interference of shift lever with other objects or rods inside the cab or near the remote control island.

(i) Driver not familiar with proper shifting procedure for this transmission. Also includes proper shifting if used with 2-speed axle, auxiliary, etc.

(j) Clutch or drive gear pilot bearing seized, rough, or dragging.

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(k) Clutch brake engaging too soon when clutch pedal is depressed.

(l) Wrong lubricant especially if E.P. type lubricant are added.

(m) Free running gears, seized or galled on either the thrust face or diameters.

Sticking in Gear

(a) Clutch not releasing.

(b) Sliding clutch gears tight on splines.

(c) Chips wedged between or under splines of shaft and gear.

(d) Improper adjustment excessive wear or lost motion in shifter linkage.

(e) Clutch brake set too high on clutch pedal — locking gears behind hopping guard.

Bearing Failures

The service life of most transmissions either main or auxiliaries is governed by the life of the bearings. Majority of bearing failures can be attributed to vibration and dirt. Some of the more prominent reasons for unit removal with bearing failures are:

(a) Worn out due to dirt.

(b) Fatigue of raceways or balls.

(c) Wrong type or grade of lubricant.

(d) Lack of lubricant.

(e) Vibrations — breakup of retainer & brinelling of races — fretting corrosion.

(f) Bearings tied-up due to chips in bearings.

(g) Bearings set-up too tight or too loose.

(h) Improper assembly — brinelling bearing.

(i) Improper fit of shafts or bore.

(j) Acid etch of bearings due to water in lube.

(k) Overloading of vehicle. Overload from engine or engine too large for transmissions used.

Dirt

More than 90% of all ball bearing failures are caused by dirt which is always abrasive.

Dirt may enter the bearings during assembly of the units or be carried into the bearing by the lubricant while in service. Dirt may enter through seals, breather or even dirty containers used for addition or change of lubricant.

Softer material such as dirt, dust, etc., usually forms abrasive paste or lapping compounds within the bearings themselves since the unit pressure between the balls and raceways makes a perfect pulverizer. The rolling motion tends to entrap and hold the abrasives. As the balls and raceways wear, the bearings become noisy. The lapping action tends to increase rapidly as the fine steel from the balls and rollway adds to the lapping material.

Hard coarse materials such as chips, etc., may enter the bearing during assembly from hammers, drifts, power chisels, etc., or be manufactured within the unit during service from raking teeth, etc. These chips produce small indentation in balls and races. Jamming of these hard particles between balls and races may cause the inner face to turn on shaft, or the outer race to turn in the housing.

Fatigue

All bearings are subject to fatigue and must be replaced eventually. Your own operating experience will dictate mileage replacement of bearings showing only normal wear.

Corrosion

Water, acid and corrosive materials formed by deterioration of lubricant, will produce reddish-brown coating and small etched holes over outer and exposed surfaces of race. Corrosive oxides also act as lapping agent.

Brinelling caused by improper assembly or removal — usually hammering with off-center blows. Use drivers, preferably under an arbor, or puller.

Shaft Fits

Excessive looseness under load is very objectionable because it produces a creeping or slipping of the inner ring on the rotating shaft. This causes the surface metal of shafts to scrub or wear off.

Bearing fits on rotating shafts are usually specified as tight. When play or looseness, even .001", exists between the bearing and shaft, there is a very powerful force tending to rotate the inner race on the shaft; this force is caused by the looseness or lost motion between the parts and disappears when no looseness exists.

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Removal of Bearings

It is far more difficult to remove bearings from a shaft than to put them on. In most cases it is necessary to remove the bearing by pulling on the outer-race which can damage the balls or races. Since such damage is seldom visible, it does not become known until after complete reassembly. It is good preventative maintenance to replace most ball bearings during the overhaul period. If a bearing is not going to be replaced, avoid removal during low mileage rebuild.

Interchangeability

All ball bearings (whether manufactured here or abroad) are interchangeable in regard to — standardized dimensions, tolerances and fits. However, for a given shaft size there are standard bearings for light, medium, and heavy-duty service.

Numbers and symbols stamped on inner and outer races of bearings designate size and type.

Numbering systems of different bearing manufacturers, however, have not been standardized. Consult interchangeable tables and use proper bearings for replacement parts.

Clutch Trouble Shooting

Faulty clutch operation interferes with proper shifting of gears in any transmission. The two following paragraphs describe the most common problems encountered with Spicer clutches.

(a) If the clutch slips or does not engage properly, first check the internal clutch adjustment. If adjustment does not remedy the situation, check for weak pressure springs, no free pedal, worn or oily clutch facings and binding release mechanism.

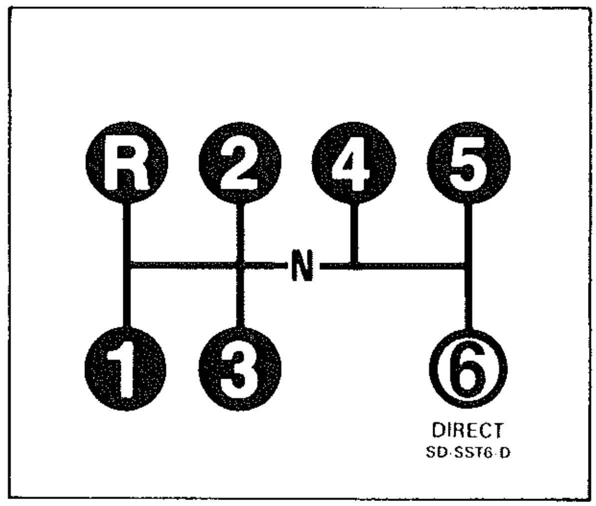
(b) If the clutch drags or does not release properly, check the internal clutch adjustment. Some other causes for clutch drag are: intermediate plate sticking on drive pins or drive lugs; pressure plate not retracting; driven disc distorted or warped; splines worn on main drive gear of transmission; clutch release bearing dammaged; bushing in release sleeve dragging on transmission drive gear.

«Spicer» 1362-B 6 speed transmission

Specifications:

— Speeds:	6 forward, 1 reverse
— Torque capacity:	950 — 1400 lbs ft. (1290 — 1896 Nm)
— Length:	28 1/8" (715 mm)
— Weight:	545 lbs (247 kg)
— Clutch:	15½" (394 mm) 2 plate
— Oil capacity:	41 pts. U.S. (341 mp. Pts) (19 liters)

Shift pattern:



Ratios:

GEAR	RATIO	% STEP
1	8.53	
2	4.87	75
3	3.00	62
4	1.90	58
5	1.33	43
6	1.00	33
REV.	8.53	

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Shifting control

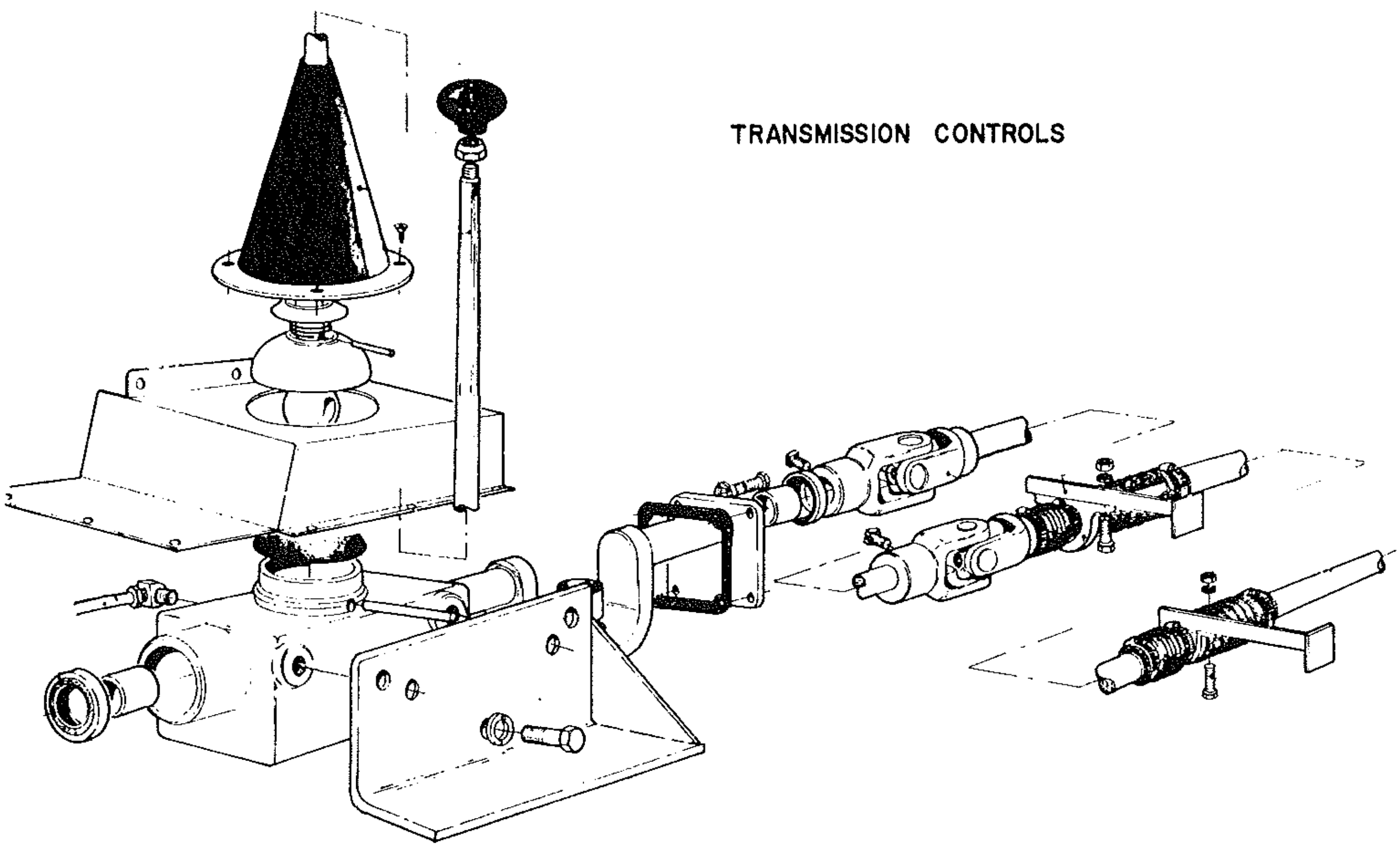
Description:

The shifting control is a single-roll type which does not require a solenoid for reverse.

Gear range selection is made by a conventional shift lever mounted in a tower, which is bolted to vehicle frame, near driver's seat. A shift rod located in the base of shift lever tower is connected to a control rod which runs from front to rear, under vehicle floor.

The movement of the shift lever is transmitted to transmission through rods, universal joints, and transmission remote control. Transmission control rods from shift lever to transmission remote control are supported as per the following illustration.

TRANSMISSION CONTROLS



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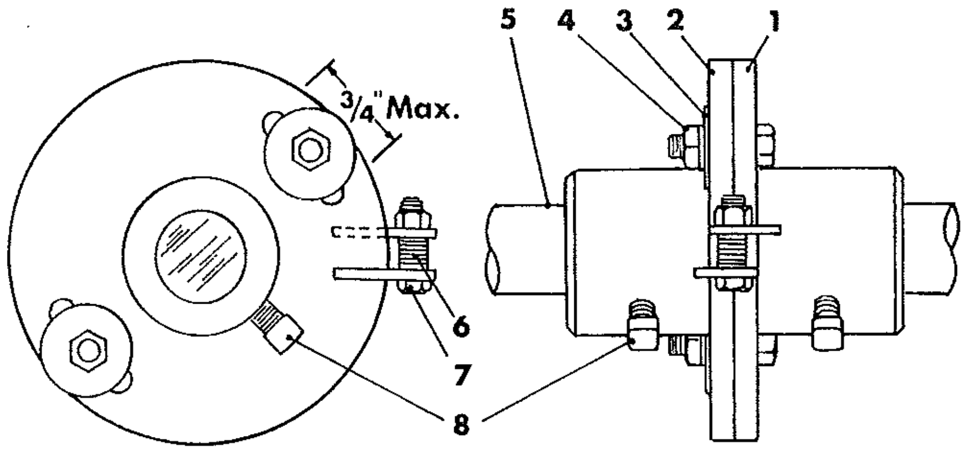
Control rod adjustment

The lateral stroke of the shift lever can be adjusted by a flange connection located on the rear section of the control rod. To adjust control rod, proceed as follows:

1. Loosen flange connection cap screws.

2. Add or remove shims in order to obtain the proper lateral stroke of the shift lever.

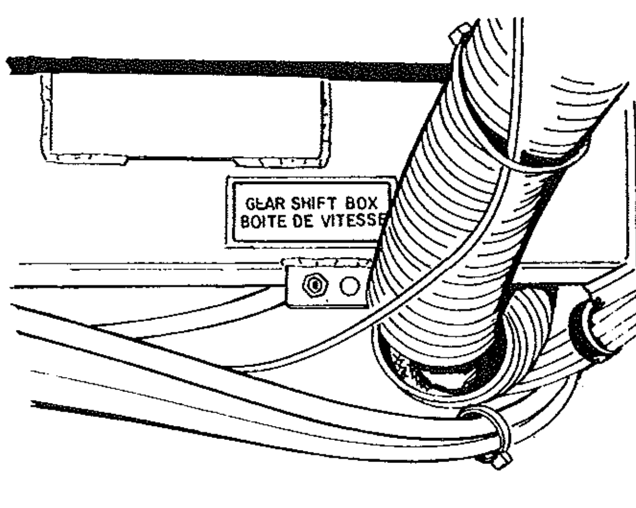
3. Tighten flange connection cap screws.



1. Half of Flange Connection
2. Half of Flange Connection
3. Flat Washer
4. Flange Adjusting Screw & Nut & Lock washer
5. Shaft
6. Adjustment Washers
7. Adjusting Screws
8. Set Screws

Transmission controls lubrication

To obtain proper operation of the transmission controls, control rod universal joints and control tower should be lubricated every 10,000 miles with a chassis lubricant that can resist to heat and the washing effects of water. There are four (4) points of lubrication for the control rod, one on each universal joint. The lubrication fitting for control tower is located at the rear of the steering compartment, on the upper right corner.



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Control tower replacement

1° Removal:

To remove control tower, proceed as follows:

1. Remove shift lever ball.

2. Remove control tower cover located at the base of shift lever.

3. Disconnect lubrication tube and universal joint from control tower.

4. Remove control tower retaining bolts from control tower bracket.

5. Remove control tower through vehicle floor.

2° Installation:

To install control tower, proceed as follows:

1. Install control tower assembly to control tower bracket and tighten retaining bolts.

2. Connect lubrication tube and universal joint to control tower.

3. Reinstall control tower cover and shift lever ball.

4. Check control rod adjustment.

Automatic transmission

Detailed service procedures for the Allison 740D and 754CR automatic transmission may be found in the «Allison Transmissions HT700D Series Service Manual».

Changing oil filter element

To change oil filter element, proceed as follows:

1. Drain the filter by removing the plug (13) at the bottom of the center stud (11).

2. Loosen the center stud (11). The shell (2), the filter element (3), and adapter (14) may now be removed from the base casting (1).

3. Remove the adapter (14) and discard the two «O» Rings (4 & 5).

4. Remove and discard the filter element (3).

5. Thoroughly clean any dirt or oil from the base casting (1).

6. Rinse out the inside of the shell (2) with solvent and wipe it dry.

7. Install the thick section «O» Ring (5) into the internal groove of the adapter (14). Install the thin section «O» Ring (4) into the external groove of the adapter.

8. Apply oil to the «O» Rings in the adapter and place the adapter on the shell (2).

9. Install the new filter element (3) into the shell.

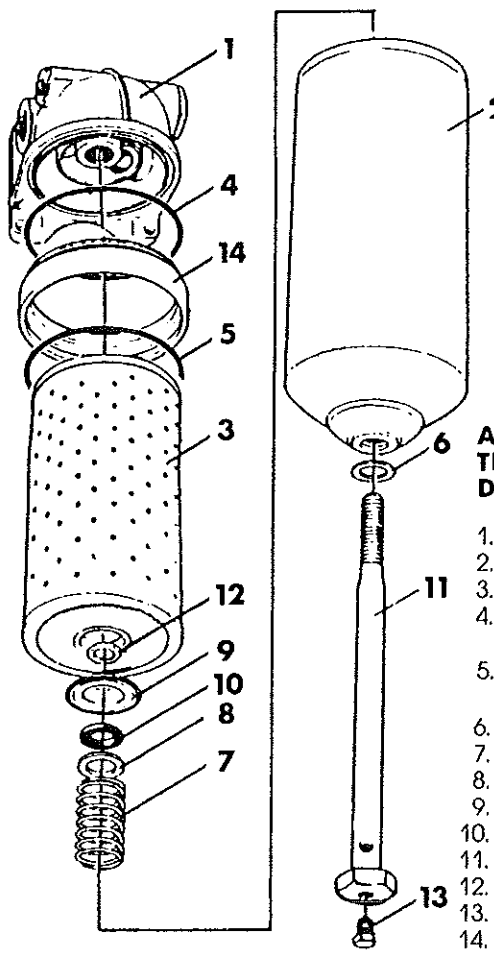
10. Install adapter, shell, and filter element assembly on the base casting (1) and tighten the center stud (11) to 50-60 ft. lbs. (68-81 Nm).

11. Install the drain plug (13) into the center stud.

12. Run the engine and check for leaks around the base casting (1) and adapter (14).

☐ **Note:** A leak may occur if the base casting was not adequately cleaned.

13. Check the oil and bring to proper level with «Dexron» or «Dexron II».



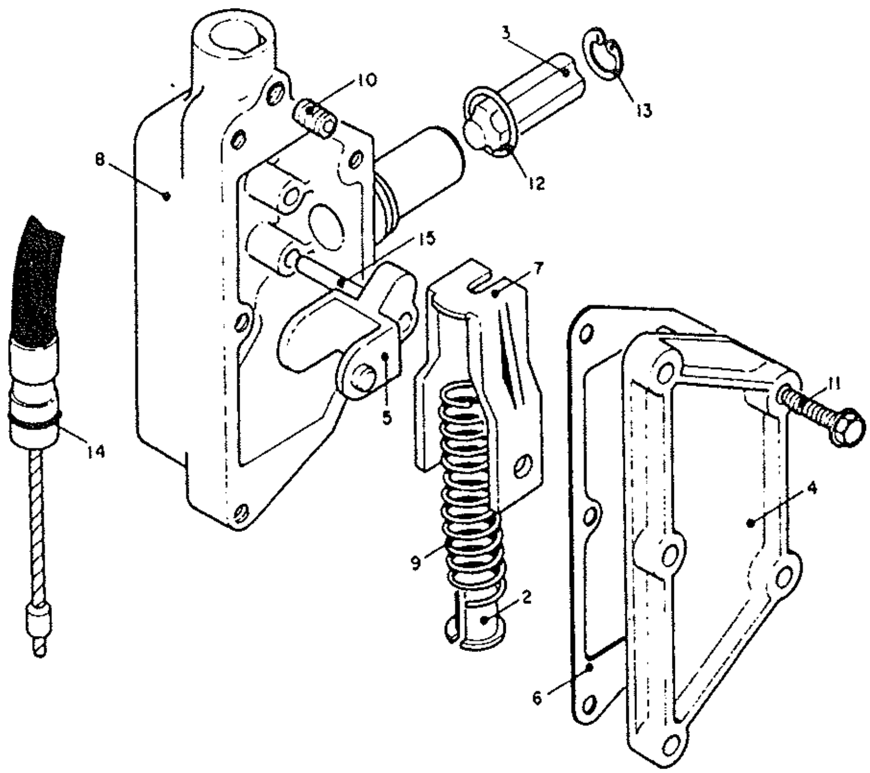
AUTOMATIC TRANS. FILTER DISASSEMBLY

1. Base Casting.
2. Shell.
3. Filter Element.
4. Thin Section «O» Ring.
5. Thick Section «O» Ring.
6. Copper Gasket.
7. Spring.
8. Washer.
9. Retainer.
10. Rubber Seal.
11. Center Stud.
12. Pal Nut.
13. Drain Plug.
14. Adapter.

TRANSMISSION

Modulator valve adjustment

Rotate the governor pivot lever to the full throttle position. Pull the cable until it is internally bottomed. Adjust trunnion on end of cable to permit a «free pin» with fuel control lever. Install and secure pin. Check linkage for proper return to idle position. Check cable for proper travel, should be approximately 1.187" minimum (30.162 mm) and/or 1.56" maximum (39.62 mm).



Modulator valve

2. Thimble.
3. Plunger.
4. Cover.
5. Lever.
6. Gasket.
7. Spring Retainer.
8. Housing.
9. Spring.
10. Set Screw.
11. Cap Screw.
12. «O» Ring.
13. Retainer.
14. «O» Ring.
15. Dowel Pin.

Shifter cable adjustment

Place shifter lever in neutral position. Loosen shifter cable adjusting nut. Place shifter cable lever in neutral position. Then, tighten shifter cable adjusting nut.

Removal and Replacement

Automatic transmission and engine should be removed as a unit. A fork lift is required to perform this procedure. Refer to section 01, engine removal and replacement, for the appropriate procedure.

It is also possible to remove the automatic transmission independently from engine by performing the following instructions:

1. Using safe lifting equipment, raise vehicle in order to allow tag axle removal. Refer to section II. Tag axle removal and replacement for correct procedure.

2. Remove propeller shaft from vehicle. Refer to section 09, Propeller shaft removal and replacement for the appropriate procedure.

3. Disconnect and remove all wiring harnesses from transmission. Remove transmission oil cooler hoses from transmission. Remove power steering hose bracket from transmission.

4. On vehicles equipped with a series 92 engine, open right engine side door and remove holding tank hose and auxiliary holding tank, if applicable. Then, remove the plug located on the left side (starter side) of the torque converter housing.

5. On vehicles equipped with a series 71 engine, remove winter pan from under vehicle. Then remove the upper plug located on the right side of the torque converter housing.

6. Disconnect torque converter at flex disc assembly by removing the 12 retaining bolts through the plug hole. To align retaining bolts plug hole, rotate crankshaft pulley clockwise until you can reach the bolt through the hole.

■ **Caution:** Do not rotate crankshaft pulley counterclockwise to avoid loosening of the crankshaft pulley retaining bolt.

TRANSMISSION

7. Using suitable jacks, firmly support rear end of engine and transmission. Then remove the 24 retaining bolts of the torque converter housing.

8. Disconnect transmission support at engine cradle. Then slide the transmission straight back from the engine.

● **Warning:** Make sure that rear end of engine is firmly supported when removing transmission. Severe damage and/or injuries may occur if it is not performed.

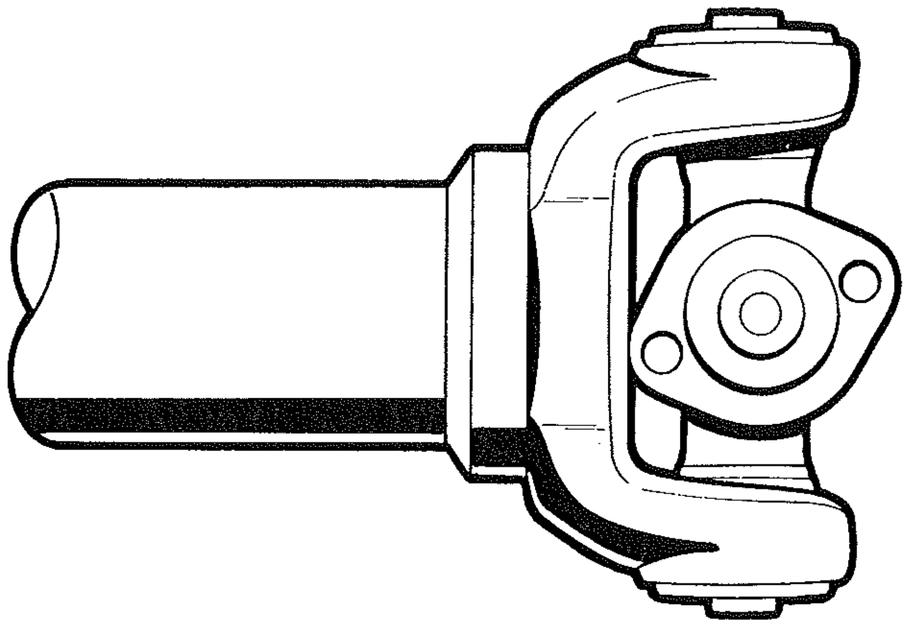
9. Lower transmission in order to be able to remove it from the side of the vehicle.

■ **Caution:** When removing or reinstalling the transmission, special care should be taken not to tilt the transmission forward to prevent the torque converter from falling off the transmission.

To reinstall the automatic transmission, reverse the above mentioned procedure.

☐ **Note:** Torque converter retaining bolts must be tightned to a torque of 120 ft. lbs (160 Nm).

PROPELLER SHAFT



PROPELLER SHAFT

Description

The propeller shaft transmits power from the transmission to the differential. It is of the tubular type, and used two heavy duty needle bearing type universal joints.

The slip joint compensates for variations in distance between transmission and differential brought about the rise and fall of the rear axle as the coach passes over uneven surfaces. The slip joint also facilitates removal of the transmission or rear axle. Universal joints may have a flange yoke or a splined yoke for attachment to the transmission and differential, depending on the transmission and engine installed on your vehicle.

Maintenance

Both universal joints are provided with lubrication fittings. A third lubrication fitting is provided at the slip joint.

The propeller shaft lubrication fittings should be serviced with chassis lubricant every 6000 miles.

Shaft flanges should be checked at regular inspection intervals for loose or broken bolts, lockwashers and nuts. When installing bolts, use only new 3/8" (9,52 mm) spring lock washers to provide a proper lock. The recommended torque value for the hex nuts is 35-39 ft. lb (47 -53 nm).

■ **Caution:** Do not reuse old lockwashers. Install only grade 8 bolts and grade 5 nuts, if you have to replace them.

Removal and replacement

Before attempting to remove propeller shaft, note that slip yoke and shaft are marked with arrows to insure correct alignment of trunnions. If these arrows are not clearly identified, mark yoke and shaft before disconnecting slip joint.

To remove propeller shaft from vehicle, proceed as follows:

1. Remove propeller shaft safety guard.

2. On units equipped with a flange yoke, remove nuts, lock washers and bolts which attach propeller shaft flange to transmission and/or differential.

3. On units equipped with a splined yoke, disconnect slip yoke from splined yoke at differential and/or transmission, by removing the two (2) bearings from splined yoke.

4. To separate slip yoke from shaft, unscrew dust cap from slip yoke and pull yoke off splined stud shaft.

To replace propeller shaft on vehicle, reverse the preceding procedure.

Universal joints service procedures

Disassembly

Bend tangs of lock plate. Unscrew capscrews and remove lock plate. To remove the needle bearings and retaining, cap sub-assembly, use a large pair of channel lock pliers on retaining cap edges, turn retaining cap and bearing sub-assembly at the same time lifting upward to remove the sub-assembly from the journal trunnion diameter and out of the yoke hole. Turn the joint over and tap the exposed end of the journal cross until the opposite needle bearing is free. Use a soft round drift with flat face about 1/32" (.79 mm) smaller in diameter than the hole in the yoke.

Remove the journal cross by sliding it to one side of the yoke and tilting it over the top of the yoke lug.

Cleaning and inspection

Thoroughly clean grease from bearings, journals, and other parts. Clean all lubricant passages in the journal, and the lubrication fittings. Needle bearing assemblies may be soaked in cleaning solution to soften particles of hard grease. It is extremely important that bearing assemblies be absolutely clean, since even very small particles of dirt or grit can cause rapid bearing wear. Do not attempt to disassemble needle bearings.

Bearing journal areas should be inspected for roughness or grooving. If light honing does not remove roughness, the entire bearing assembly should be replaced. Excessive wear of the needle bearings is indicated if the needles drop out of the retainer, or if marks are present on the journal bearing surface.

Inspect yokes for cracks, wear or distortion.

Universal joint repair kits are available for overhaul of these assemblies.

Reassembly

Pack needle bearing assemblies with clean grease. Insert one trunnion of the journal into the yoke as far as possible from the inside, and tilt until opposite trunnion clears the yoke and drops into position. Install lubrication fittings and lubricate bearings approximately 1/3 full with chassis lubricant.

Insert bearing assemblies from outside of yoke and tap into place with plastic hammer. Do not use a steel hammer for this purpose. The joints should move freely, in the bearings and not bind. Also, if new needle bearing assemblies are not being installed, care should be taken to replace bearing assemblies in the same locations from which they were removed. Install bearing caps, new lock straps, and capscrews. Tighten capscrews firmly then lock screws by bending lock straps against screw heads.

PROPELLER SHAFT

Lubrication

Universal joints

To insure proper lubrication of all four bearing assemblies on universal joints, it is essential that mechanics add lubricant until it appears at all journal cross bearing seals. This assures removal of dirt particles and other contaminants that may find their way into the bearings and indicates to the mechanic that the bearings are fully lubricated.

Do not assume that bearing cavities have been filled with new lubricant unless flow is noticed around all four bearing seals.

Journal cross seals are designed to relieve. However, if all the seals do not «pop» when being lubed, move the driveshaft laterally in all four directions and pull or push on the drive shaft in the direction opposite to the journal cross seal not relieving while lube gun pressure is being applied to the alemite fitting. An increase in line pressure may also be necessary.

Drive shaft assembly

Factory assembly drive shafts are lubricated at the plant prior to shipment. When installing spare parts replacement assemblies, it is recommended that all universal joints be lubricated after installation of the drive shaft prior to putting vehicle in service. High quality extreme pressure (EP) grease is recommended for universal joints. Lithium soap base greases meeting NLGI Grade 1 and Grade 2 specifications are preferred. The use of greases that tend to separate and cake should be avoided.

Troubleshooting

Noise and vibration in the drive line often originate in the propeller shaft. Noise and vibration originating in the universal joint and propeller shaft assembly appear only at certain speeds, and usually come and go as the vehicle speed is increased or decreased. Noises produced by the rear axle, on the other hand, are generally present throughout the vehicle's speed range.

When propeller shaft assembly noise and vibration becomes excessive, the cause should be determined and corrected immediately, since rear axle pinion failure is often a direct result.

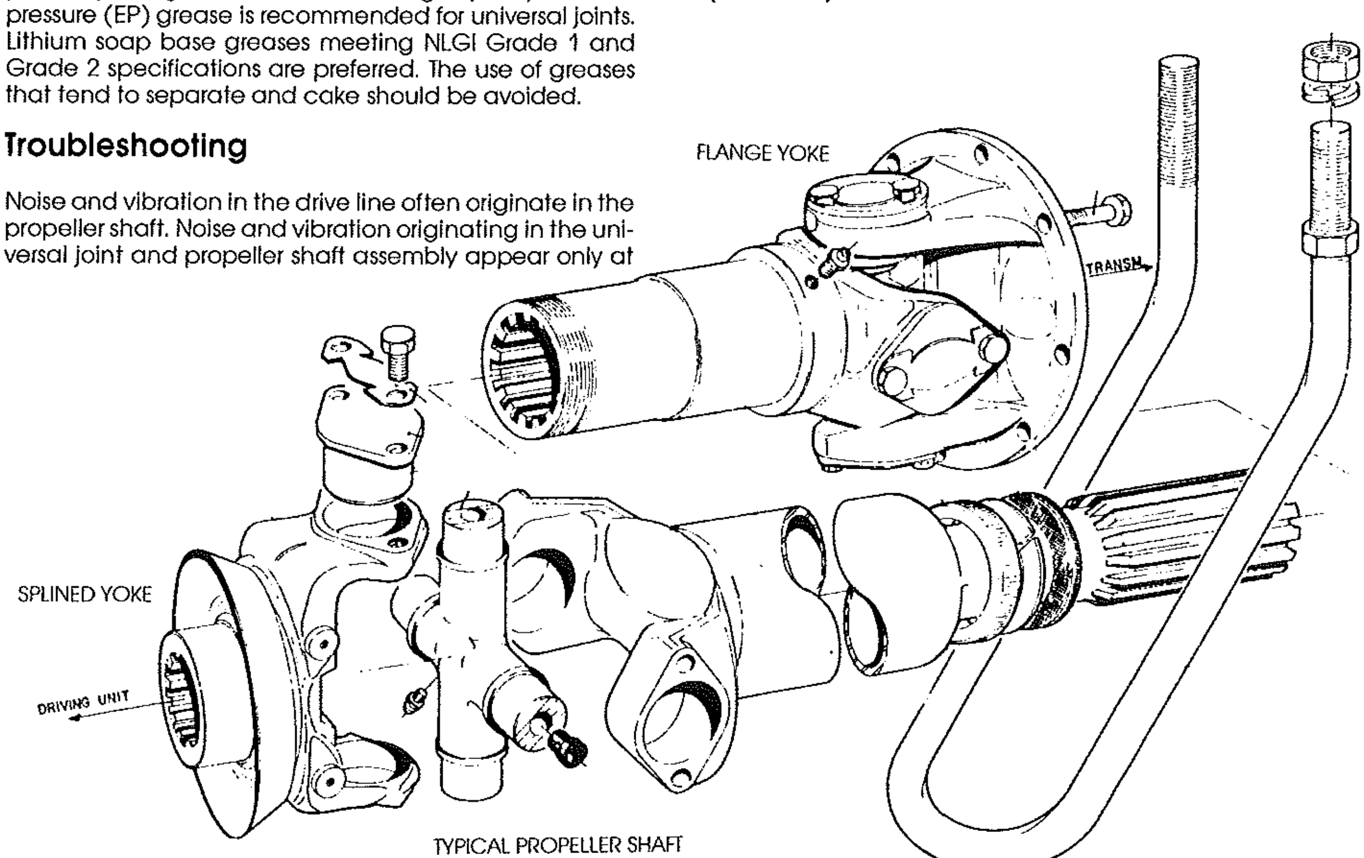
Propeller shaft noise and vibration often appears to originate in the rear axle.

Common causes of propeller shaft and universal joint vibration are propeller shaft assembly out of balance; excessive flange runout or distorted yokes; loose yoke nuts; universal joint yoke misalignment.

If an out-of-balance condition is suspected, the assembly may be tested using a balancing machine. If a balancing machine is not available, the check may be made of each component of the assembly individually on the vehicle. Substitute one component at a time, road testing as each new part is installed. Continue this procedure until the entire assembly meets the required standard of performance.

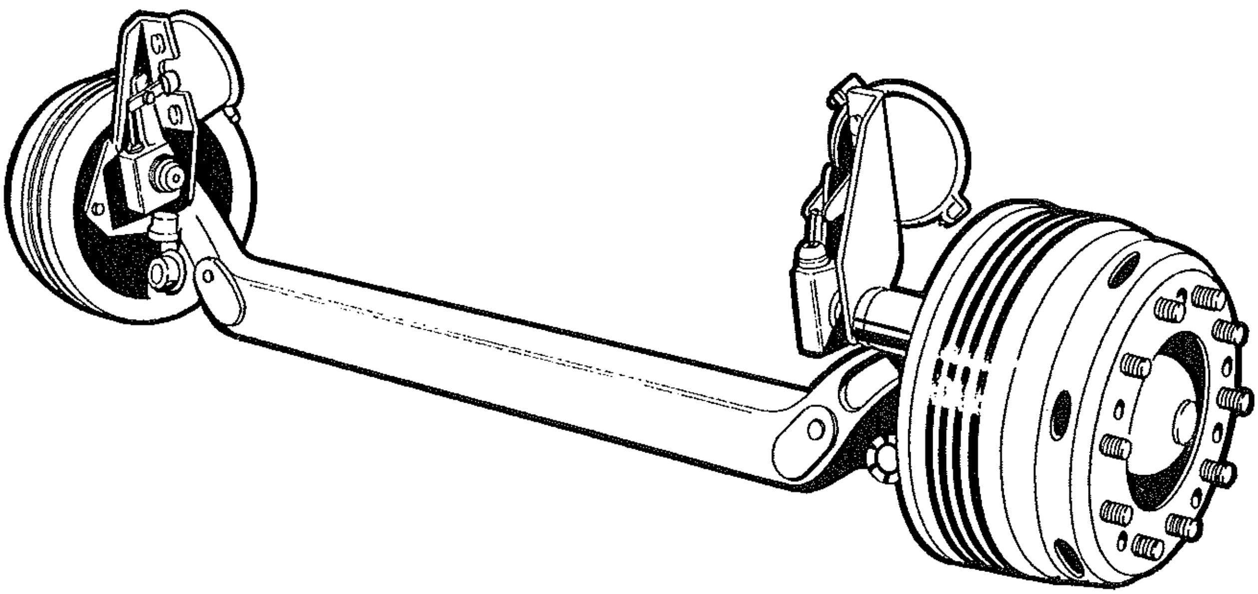
Torque specifications

Flange yoke retaining nuts: 40-48 ft.lb (55-67 Nm)
Universal joint bearing retaining cap screws: 32-42 ft.lb (42-58 Nm)



TYPICAL PROPELLER SHAFT

FRONT AXLE



FRONT AXLE

DESCRIPTION:

The front axle is of square beam construction using tempered seamless steel tube center sections with heat-treated steel forged knuckle pin ends. Steering knuckle pins are tapered, drawn into the axle center by tightening the nut at the upper end of the pin. The pin then becomes an integral part of the axle center.

Steering knuckles are bushed in the upper and lower pin bosses so that they may turn freely about the pins. Bronze bushings with grooves on the inside allow grease to flow uniformly to high-pressure areas. Grease fittings are installed at both upper and lower knuckle pin bosses.

The two steering knuckle assemblies are connected to each other by the tie rod which is threaded at each end and held securely in position by clamps.

Right-hand and left-hand threads are provided to simplify toe-in adjustment.

Wheel bearings, air suspension, steering, and brake parts which are mounted on the front axle are described in the applicable sections of this manual.

Front end alignment

Correct front end alignment must be maintained for ease of steering and satisfactory tire life. Road shock, vibrations, normal stresses and strains set up in the front end system under average operation can result in loss of front end alignment.

If incorrect front end alignment is suspected, front wheel balance should first be checked to make sure that the difficulties are not originating from out-of-balance front wheels. A check of tire inflation, wheel installation and run out, wheel bearing adjustment, tie rod and drag-link end wear should also be made.

Correct front end alignment can only be maintained when parts in the steering knuckle are in satisfactory condition.

Factors in front end alignment are as follows:

1. Front wheel toe-in: The distance the wheels are closer together at the front than at the rear.

2. Front wheel camber: The amount the wheel inclines from the vertical plane. «Positive» camber means the wheels lean outward at the top. «Negative» camber means the wheels lean inward at the top, and «Zero» camber means that the wheels are in a vertical plane.

3. Axle caster: The fore and aft inclination from vertical of the steering knuckle. «Positive» caster is inclination of the top of the steering knuckle towards the rear of the vehicle. «Negative» caster is the inclination of the top of the steering knuckle towards the front of the vehicle. «Zero» caster means no inclination of the steering knuckle.

4. King pin inclination: The amount king pins are inclined inward at the top.

5. Steering Geometry: The science of keeping the front wheels in proper alignment during left or right turns.

Camber adjustment

Before checking front wheel camber, jack up the front axle of the vehicle and check wheel bearings and steering knuckle pins. To do this attach a camber gauge to the wheel collar, pull outward at the bottom to take up all slack and take the camber reading. If the reading differs more than ¼ of 1 degree, adjust the wheel bearings and repeat the check. If the second reading is still different in excess of ¼ of 1 degree, replace the steering knuckle bushings and pins.

Check wheel run out for excessive wobbling. Correct any discrepancy either by straightening or replacing the wheel.

A final camber reading should be made with the full weight of the coach on a level floor. Camber readings can be made as illustrated in the alignment charts if no camber gauge is available. The difference between the two readings (B minus A) should not vary more than 3/32" + 3.17 mm) from one wheel to the other.

A larger difference is usually due to a benty axle or a bent steering knuckle. To determine if the axle is bent, check the king pin inclination (U minus V on the chart). If the king pin inclination is correct, the trouble is a bent steering knuckle which should be replaced.

Front wheel toe-in

Toe-in is utilized to prevent undue tire wear. To measure and adjust toe-in, the following procedure is recommended:

1. Jack up the front axle.

2. Using a piece of chalk, whiten the center area of both front tires around the entire circumference.

3. Position a scribe or pointed instrument against the whitened part of each tire and rotate the tires. The scribe must be held firmly so that a single straight line is scribed all the way around the tire.

4. Place a full-floating turning radius gauge plate under each wheel. Lower the vehicle and remove the lock pins from the gauge plates. If full-floating turning radius gauge plates are not available, lower the vehicle and move it backward and then forward approximately 6 ft. (1.8 m).

FRONT AXLE

5. Set the sliding scale end of a trammel bar on zero and lock in place. Position the bar at the rear of the tires and adjust the pointers to line up with the scribe lines on the tires and lock in place. (Scale still set at zero.)

6. Place the trammel bar at the front of the tires. Adjust the scale end so that the pointers line up with the scribe marks.

7. Read toe-in or toe-out from the scale. Scale should read toe-in 1/16" +1/16" (1.58 mm + 1.58 mm).

8. If adjustment is necessary, loosen the tie-rod clamps and turn tie-rod as required then tighten the clamps. If the vehicle is not on gauge plates, move it backward then forward about 6 ft. (1.8 m)

9. Recheck the toe-in to ensure that it is correct.

Steering geometry

Steering geometry is dependent on the design of the front end components. Field adjustments are not possible, but a check should be made to see that steering arms, linkage and other parts are properly installed and are not bent and distorted. Bent or damaged parts should be replaced. The alignment chart includes measurements which can be made to determine satisfactory condition of front end parts.

Maintenance

Periodic inspection of the front axle assembly should be made to see that all bolts are tight and that no damage and distortion has taken place. Suspension support stud nuts, U-bolt nuts, tie-rod arm and steering arm nuts, and stop screws should be checked and tightened if necessary to the torque specifications shown at the end of this section. Attention should also be given to the condition of the steering knuckle pins and bushings. If excessive looseness is found at this point, the bushings and pins should be replaced.

Lubrication

Periodic lubrication according to the recommendations in the lubrication section of this manual should be carried out. Points which require lubrication are the steering knuckle pins, tie-rod ends, and drag link ends. These are provided with grease fittings for pressure lubrication.

Steering knuckles, king pins, and bushings may be replaced without removing the axle from the coach. Tie-rod and drag link ends may also be replaced without removing the axle.

If extensive overall work or straightening of the front axle center are necessary, the axle should of course, be removed.

Caster

The purpose of caster angle («N» on the chart) is to give a trailing effect. This results in stabilized steering and a tendency of the wheels to return to the straight ahead position after making a turn.

Excessive caster results in hard steering around corners. A shimmy may also develop when returning to the straight ahead position.

Insufficient caster will cause wandering and weaving.

Caster variations may be caused by a bent axle, tilting or distortion of side suspension supports, or unequal tightening of the front and rear suspension support bolts.

Front axle repairs

In the interest of safety and preserving the service life of front axle assemblies, Rockwell International recommends that front axle assemblies not be repair welded. Repair welding can detract from the structural integrity of a component, particularly as to heat-treated parts where the benefit of heat-treatment may be nullified by the welding.

Since it can be extremely hazardous and detrimental to repair weld components of any kind, repair welding can be approved only where stringent controls are imposed and equipment... customarily located only at manufacturing facilities... is employed, so as to minimize the potentially detrimental effects of repair welding.

Straightening of bent parts should be done cold. Various components are heat-treated and hot straightening would destroy some of the heat-treatment.

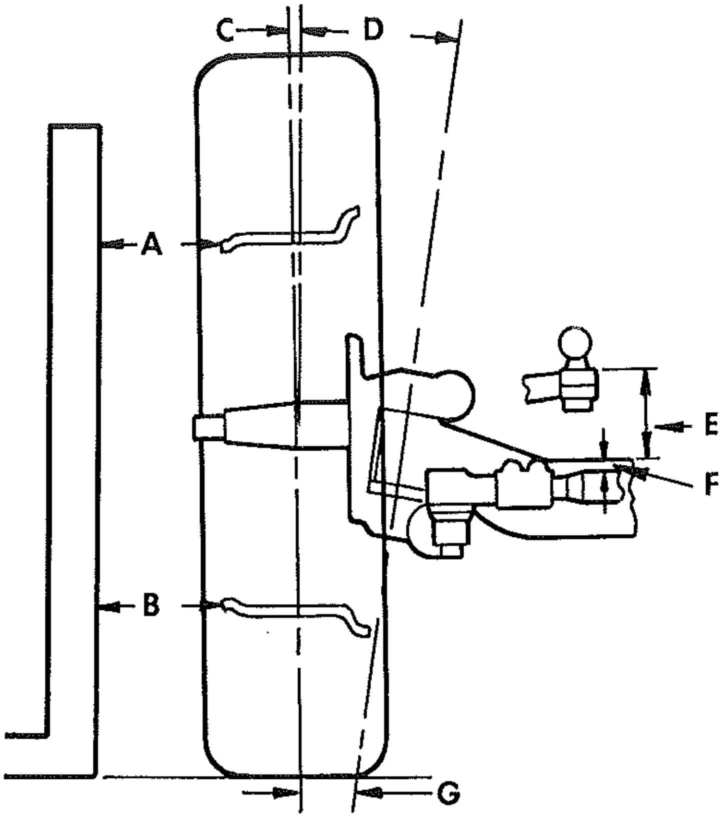
Bent steering arms, cross tube arms or steering knuckles should be replaced rather than straightened. (It is not necessary to remove steering arms and cross tube arms from the knuckle unless replacements are required.)

Front wheel alignment specifications

Camber (B minus A) degrees............Right: 0° ± 3/8°
left : Positive 3/8° ± 3/8°
Toe-In (J minus A) 1/8" + 0 -1/16 (3.16mm + 0"
- 1.58 mm)
Caster Angle (N).............................Positive 3°
Wheel Track .... 85.60" (2,037 mm)

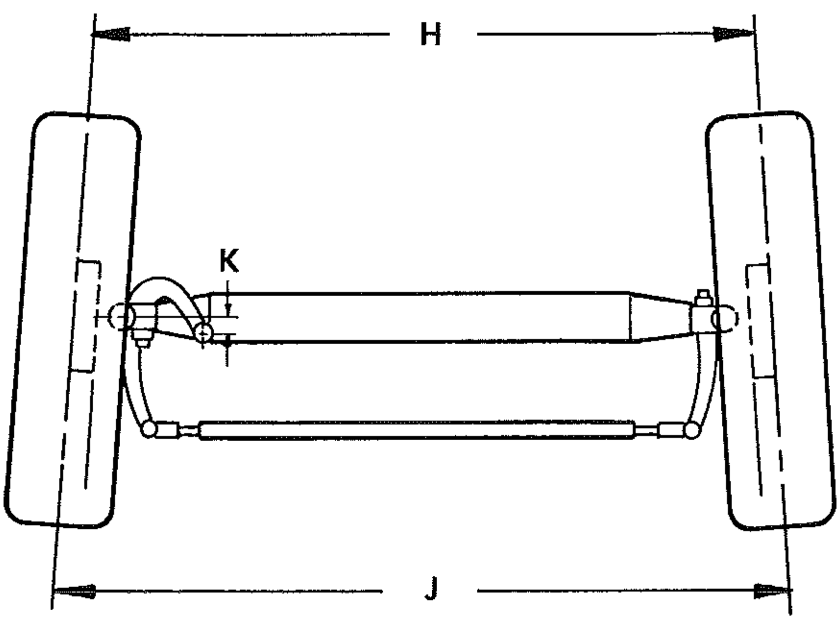
FRONT AXLE

Front wheel alignment chart



B. Minus A .... Camber (inches)
C .... Camber (degrees)
D .... Pin Inclination
E .... Drag Link Arm Above Spring Seat
F .... Top of Tie Rod Below Spring Seat
G .... Tire Overhang

CAMBER, PIN INCLINATION, ARM & ROD LOCATIONS.



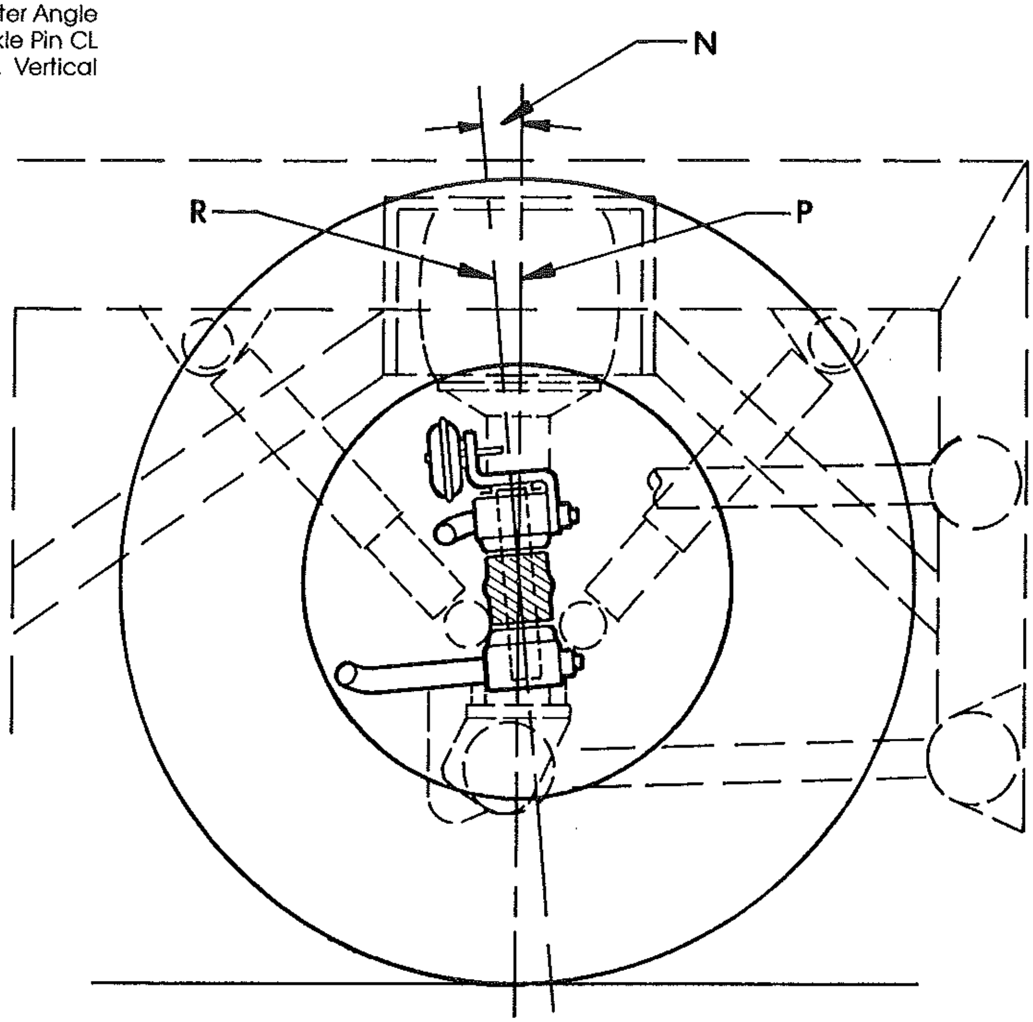
J. Minus H .... Toe-In
K .... Relation of Link Arm to Axle Centre

TOE-IN, ROD, & ARM LOCATIONS

FRONT AXLE

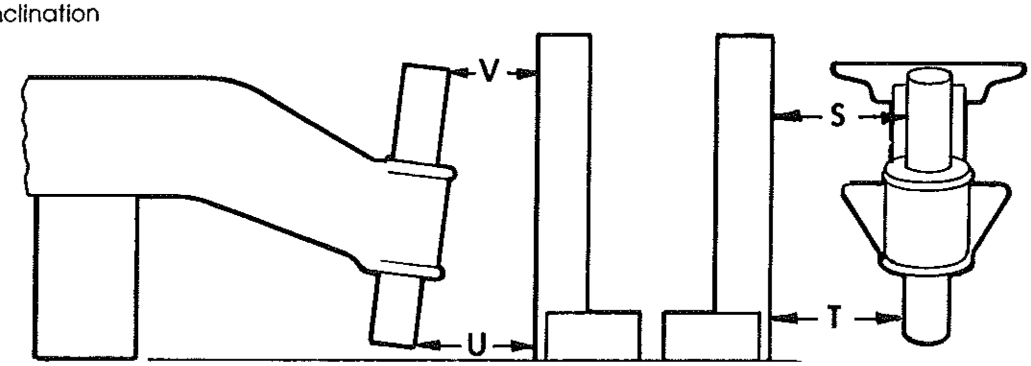
N .... Caster Angle
R .... Knuckle Pin CL
P .... Vertical

FRONT AXLE CASTER



T Minus S .... I Beam Twist
U Minus V .... Pin Inclination

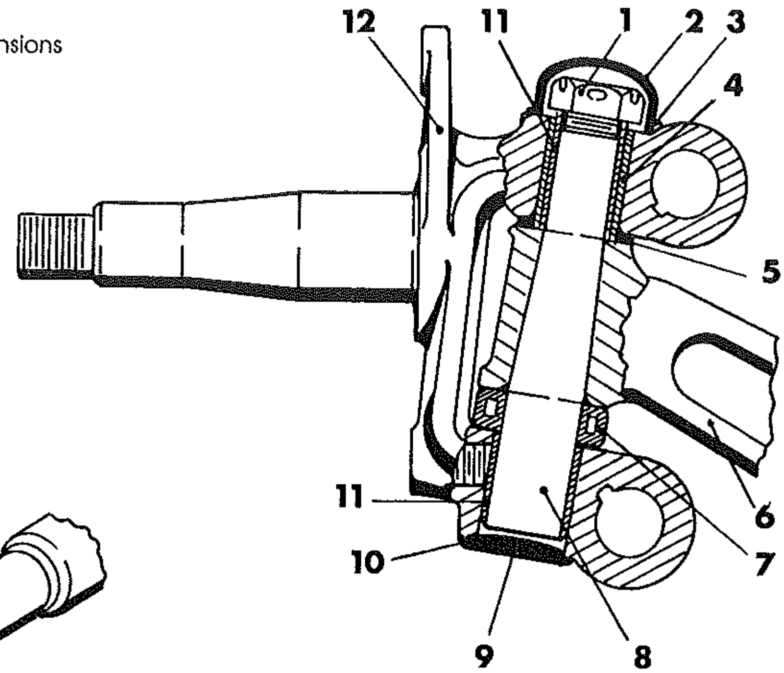
AXLE CENTER TWIST & PIN INCLINATION

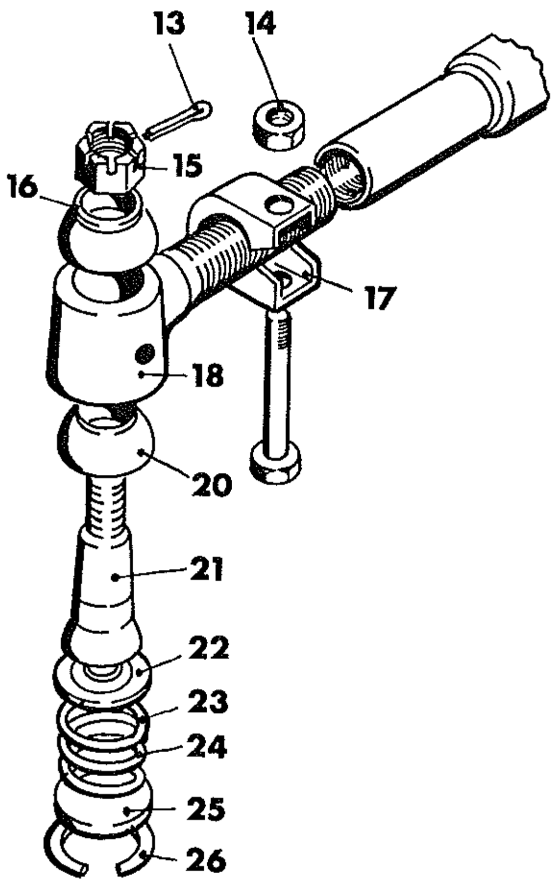


FRONT AXLE

Refer to «SPECIFICATIONS» for Correct Dimensions

1. Nut
2. Cover
3. Capscrew
4. Sleeve
5. Shim
6. Axle Center
7. Thrust Bearing
8. King Pin
9. Retaining Ring
10. Expansion Plug
11. Bushing
12. Steering Knuckle





13. Cotter Pin
14. Nut
15. Nut
16. Dust Cover
17. Clamp
18. Body
19. Bolt
20. Bearing
21. Stud
22. Spring Seat
23. Grease Retainer
24. Spring
25. Retaining Plug
26. Retaining Ring

Figure 1-1: Steering Knuckle & Tie Rod End

FRONT AXLE

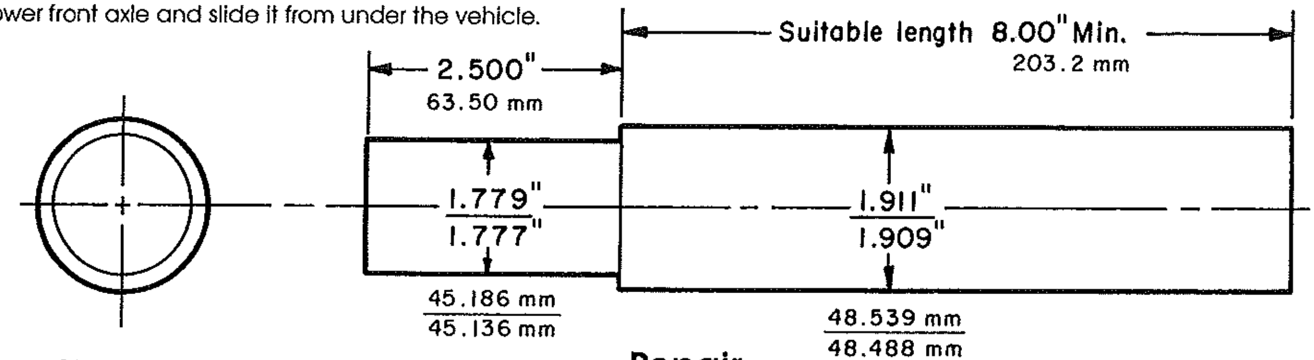
Front axle removal and replacement

To remove front axle, proceed as follows:
1. Using safe lifting equipment, raise the front end of the vehicle so the tires clear the floor. Block the vehicle securely in this position. Then, remove the wheels.
2. Using a suitable jack, support front axle.
3. Disconnect leveling valve lever and exhaust air from air bellows by pulling down the lever.
4. Disconnect brake loses at brake chambers.
5. Disconnect drag link at drag link arm.
6. Disconnect air bellows at front axle.
7. Disconnect lateral rod at frame, upper radius rods (2) at front axle and lower radius rods at frame.
8. Remove shock absorbers.
9. Lower front axle and slide it from under the vehicle.

● **Warning:** Make sure that front axle is supported firmly and equally on each side to prevent it from falling off the jack.

To replace the front axle on the vehicle, reverse the above mentioned procedure. Refer to section 16, suspension, for the proper installation of shock absorbers, air bellows, radius rods and lateral rod.

Figure 1-2: Bushing Removal & Installation Tool



STEERING KNUCKLES

Description

For construction of the steering knuckles, refer to Figure 1-1. The steering knuckles may be removed from the axle without removing the axle assembly from the coach.

Removal

To remove the steering knuckle, jack up the front end of the vehicle so the tires clear the floor. Block securely in this position and remove jacks. Do not attempt to disassemble or perform knuckle repair with the vehicle supported by jacks only.

Remove hub cap plate, wheel bearing adjusting nut, lock, lock dowel ring, and doweled nut assembly. Remove outer wheel bearing cone and wheel and hub assembly. Disconnect the tie-rod from the steering arm.

The tapered knuckle pins must be removed from the bottom side of the knuckle. Disconnect push rod and remove brake chamber. Remove the knuckle pin cover cap screws, cover and cover gasket. Remove the lock ring with a pair of snap ring pliers. Dislodge and remove the expansion plug with a drift. Drive knuckle pin out by using a bronze drift on the upper end. Remove the knuckle pin sleeve and lift off steering knuckle, thrust bearing and spacing washers.

Repair

Removal and replacement of bronze steering knuckle bushings should be done using the removal and installation tool shown in Figure 1-2. Such a tool can be made from a piece of round bar stock which is ground with a step to serve as a pilot.

Worn bushings are pressed out of the knuckle employing the tool described. New bushings should be installed with the same tool. The pilot of this tool prevents collapse or distortion of the bushing during installation. The bushing should be pressed into the knuckle in three or more steps, using an arbor press, to allow it to align itself in the bore. First press the bushing into the knuckle approximately 1/8" (3.17 mm) and relieve press pressure. Then press the bushing in another ½" (12.7 mm) and relieve press pressure. The bushing can now be pressed in until it is flush with the inner machined surface of the knuckle. This applies to both upper and lower bushings.

To finish a bushing either a burnishing bar or reamer should be employed. Suitable reamers are illustrated in Figure 1-3. A burnishing ball should not be used for this operation, since it does not insure a true alignment between the two bushings.

The reamer has a removable pilot which is installed to ream the upper bushing. The pilot is then removed to ream the lower bushing.

Avoid the possibility of tapering or enlarging the upper bushing while inserting the tool to ream the lower bushing.

FRONT AXLE

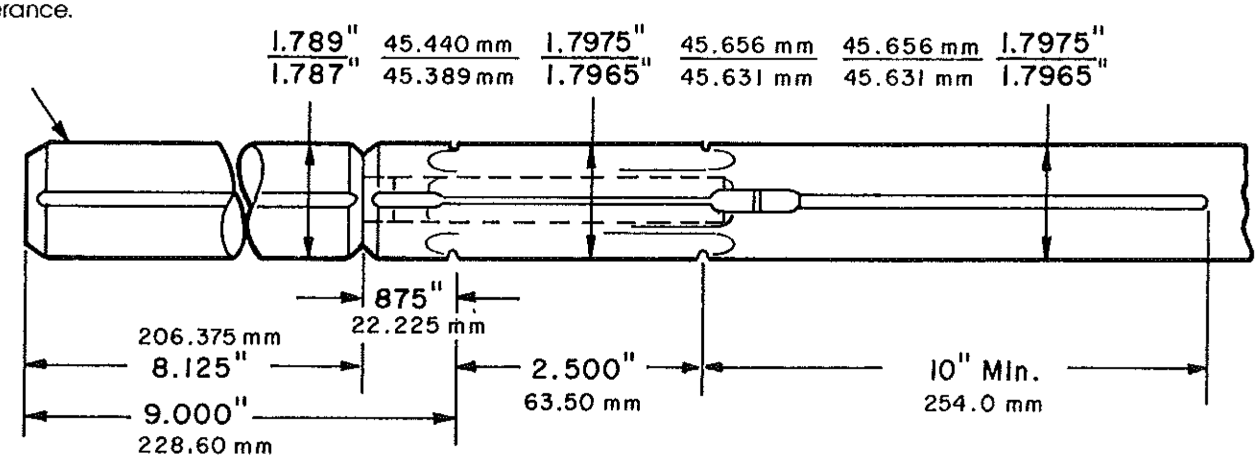
Reassembly

Before reassembly, make sure that the knuckle pin hole in the axle center is clean and dry. Position and support the steering knuckle assembly on the axle center. Slide the thrust bearing between the lower surface of the axle center and the lower steering knuckle yoke. Thrust bearings should be positioned with the retainer lip down. Align the steering knuckle holes with axle center and thrust bearing holes. Place a jack under the lower side of steering knuckle yoke and raise the knuckle so that all clearance is taken up between the lower yoke, thrust bearing and lower face of the axle center. Clearance between the top face of the upper axle center end and lower face of upper knuckle pin boss should not exceed .015 in. (.381 mm)
Washers and shims are available in various thicknesses to take up this clearance and hold within the desired tolerance.

Make sure the knuckle pin nut turns on the threads. Insert the knuckle pin from the bottom yoke of knuckle and drive the pin into the seat of the axle center and by using a bronze drift. Place the steel knuckle pin sleeve over the pin and top into place. Install nut and tighten to 350-390 ft. lbs. (475-529 Nm) to draw the knuckle pin into the axle center. Then apply additional turn to line up with the next cotter pin hole. Don not back off.

Figure 1-3: Bushing Reamer

For reassembly of brakes refer to Sec. 4, «Brakes and Air System» and Section 15, «Wheels, Hubs and Drums.»



TIE ROD ENDS

Description

The tie-rod assembly is of 3 piece construction comprised of a rod and two end assemblies. The tie-rod end automatically compensates for wear on bearing surfaces. The tie-rod end stud is held in contact with the bearing surface by tension of a spring which holds the seat firmly against the inner end of the stud. An end plug, retained by a locking ring, holds the internal tie-rod end parts in position. Excessive play indicates that the bearing surfaces are worn, and new tie-rod end assemblies should be installed.

Removal and replacement

To remove tie-rod ends from the tie-rod assembly, remove cotter pins and nuts from the tie-rod ends, and support the steering arm to prevent bending. Using a small drift, drive the tie-rod end tapered stud out of the steering arm. Loosen clamp bolts and remove tie-rod ends from the tie-rod tube.

To reassemble, assemble the tie-rod end on the tie rod tube, but do not tighten clamp bolt. Insert the tie rod end stud into the steering arm and tighten to 165-180 ft. lbs. (224-244 Nm). Tighten clamp bolts to 55-65 ft. lbs. (75-88 Nm). When replacement of tie rod assembly is required the toe-in-should be checked as described earlier in this section.

Disassembly

Pry end plug lock out of groove in body. Remove plug, seat, and spring. Remove grease retrainer. Stud and bearing assembly can then be removed from the tie-rod end body.

All worn parts should be replaced. Tension of the retaining spring should be checked, and the spring replaced if it does not have sufficient tension to hold the tie-rod end stud firmly against the bearing. A new grease retainer should be used.

FRONT AXLE

Reassembly

Lubricate parts with light grease before reassembly. Insert stud and bearing assembly into tie-rod end body, place grease retainer over end of end stud seat, and position seat in body. Place the retaining spring inside the seat, position end plug on spring, then compress spring and install end plug lock in groove.

(Before replacement of tie-rod on steering arm, clean tapered portion of tie-rod end stud.)

Procedure for checking wear at the tie rod ends

Socket wear is indicated by ball stud turning torque and socket end movement. Zero turning torque with looseness in the ball stud is indicative of extreme wear. To check this, the socket must be removed from the vehicle. End movement may be checked with the socket assembly attached to its mating arm. If a force, sufficient to overcome the spring pressure is applied to the end of the forging, the amount of movement is another indicator of wear. The following may be used for the specified types of assemblies.

SOCKET TYPE		ORIGINAL	END MOVEMENT WORN
New Style Serviceable Socket Assy.	L.H. R.H.	.020 Max .508 mm	.090 Max. 2.28 mm

Specifications

AXLE CENTER
Type .... square Beam
Allowable Twist (Variation between ends) .... ½°

STEERING KNUCKLES
Spindle diameter:
Inner Bearing .... 2.5623-2.5613 in. (65.082-65.057 mm)
Outer Bearing .... 2.1248-2.1243 in. (53.970-53.957 mm)
Up and down movement .....005-065 in. (.127-1.65 mm)
Bushing bore diameter .... 1.919-1.921 in. (48.743-48.793 mm)

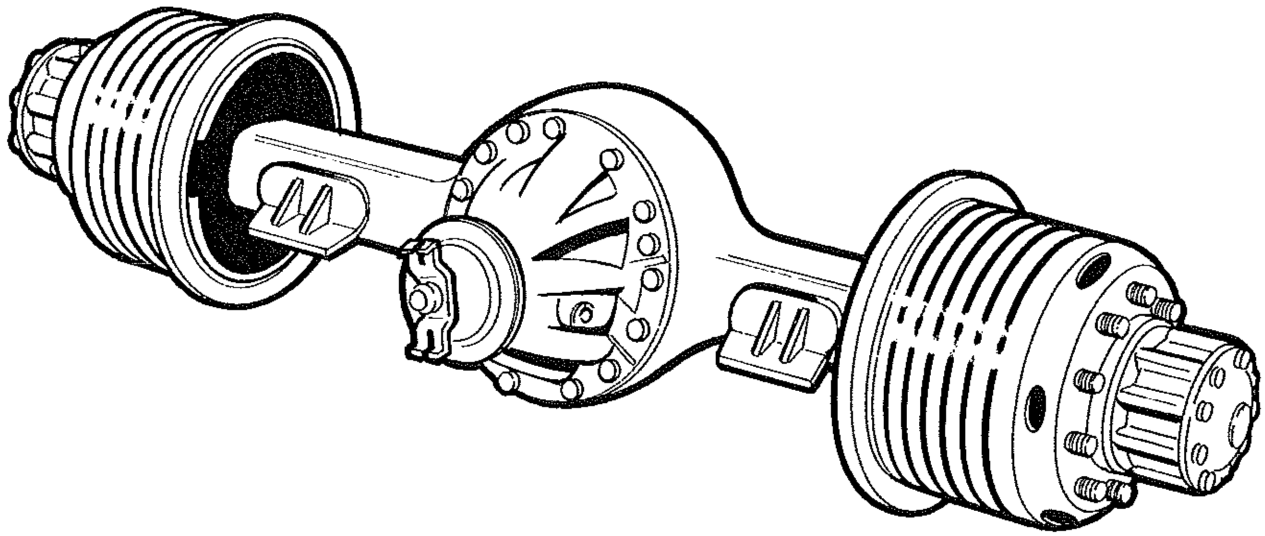
STEERING KNUCKLE BUSHINGS
Material .... Bronze
Inside-Line Ream .... 1.7935-1.7945 in. (45.555-45.580 mm)
Line Burnish .... 1.7965-1.7975 in. (45.6311-45.6565 mm)

KING PIN
Type .... Tapered
Diameter
Large End .... 1.794-1.793 in. (45.5676-45.5422 mm)
Small End .... 1.3095-1.3085 in. (33.2613-33.2359 mm)

TORQUE SPECIFICATIONS

LOCATION	DIAMETER	TORQUE-FT.LBS	(Nm)
Tie Rod End Nut	7/8"	165-180	(224-244)
Tie Rod Clamp Bolt	5/8"	55-65	(75-88)
Steering Arm Ball Nut	7/8"	165-180	(224-244)
Steering Arm Nut	1 1/8"	350-390	(475-529)
King Pin Nut	1 1/8"	350-390	(475-529)

REAR AXLE



REAR AXLE

Description

The single-reduction final drive employs a heavy duty drive pinion and drive gear. The differential and gear assembly is mounted on tapered roller bearings.

The straddle-mounted pinion has two tapered roller bearings in front of the pinion teeth which take the forward and reverse thrust, and a third bearing behind the pinion teeth to carry the radial load.

Maintenance

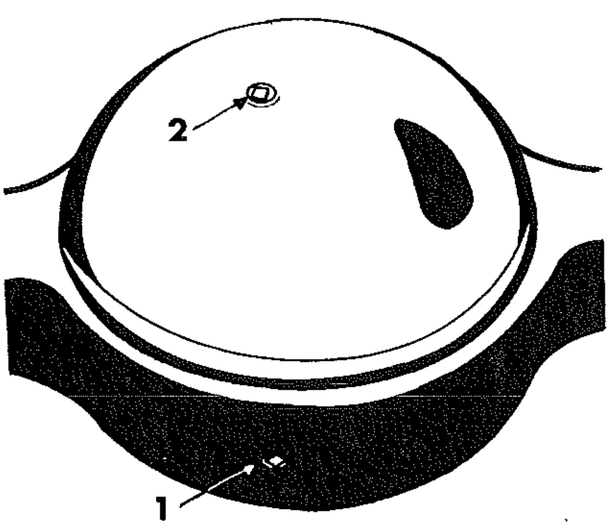
Lubrication recommendations will be found in Section 24 (Lubrication) of this manual.

To ensure maximum life of the differential and prevent premature failure, the original "factory fill" lubricant should be drained before putting vehicle into regular service or prior to 3 000 miles (4,828 Km).

During initial stages of normal operation, tiny metal particles are freed from mating surfaces of moving parts. These metal particles are carried by the lubricant through the assembly and act as lapping compound which accelerates wear of all parts.

Draining the factory lubricant prior to 3 000 miles (4,828 Km) also prevents lubricant contamination caused by differences in the «factory fill» and lubricant used by the operator when topping.

1. Axle Housing Drain
2. Axle Housing Fill



Removal and replacement

Rear axle and rear suspension beam must be removed as a unit. Follow these instructions to perform rear axle removal procedure:

1. Place vehicle on a hydraulic hoist or use two (2) hydraulic jacks, one at each side of the rear axle assembly. Then raise vehicle slightly and remove drive and tag axle wheels.

2. Raise vehicle 2 to 3 foot higher than its normal level. Then place two (2) jackstands under rear jacking points. Refer to Section 18, «Jacking Points», to know the location of these points.

● **Warning:** Jackstands must have a minimum capacity of 10 000 pounds each (or more if vehicle is loaded).

3. Lower rear of vehicle in order to have it supported by the jackstands. At the same time, rear axle assembly must be suppported by the hydraulic hoist or by the two (2) hydraulic jacks.

4. Disconnect both rear leveling valve levers from their supports. Then exhaust air from air bellows by pulling down the leveling valve levers.

5. With parking brake not applied, install emergency brake release stud, nut and washer, and tighten nut until washer is bottomed on spring brake chamber. This will keep brake spring compressed. Then, exhaust air from air brake chambers by pulling the emergency brake button; disconnect air brake hoses from air brake chambers.

6. Remove propeller shaft. Refer to section 09 Propeller shaft removal and replacement for the correct procedure.

7. Disconnect the following suspension components:

— radius rods (2) and lateral rod at vehicle frame

— torque rod at tripod

— shock absorbers and air bellows at suspension beam. Refer to section 16, Suspension for the appropriate procedure.

8. Lower rear axle unit and slide it from under vehicle.

9. Reverse the above mentioned procedure to reinstall rear axle unit on the vehicle.

Rear Axle Unit Disassembly:

To disassemble rear suspension beam from rear axle housing proceed as follows:

REAR AXLE

1. Cut the welded nuts at the tripod removable leg attachments. Then, remove the tripod removable leg.

2. Unscrew all retaining nuts and bolts (8) at suspension beam attachments.

3. Using a safe lifting device, remove rear axle housing from rear suspension beam.

To reassemble rear suspension beam to rear axle housing, proceed as follows:

1. Install rear axle housing on rear suspension beam. Align mounting holes.

2. Install retaining nuts and bolts (8). Tighten to a torque of 250 ft. lbs (340 Nm). Then weld nuts to bolts.

Differential carrier

Remove plug from bottom of axle housing and drain lubricant. Remove axle shaft drive stud nuts and lockwashers. Rap axle shaft sharply in center of flange with heavy steel hammer on drift to free dowels. Remove tapered dowels and axle shafts.

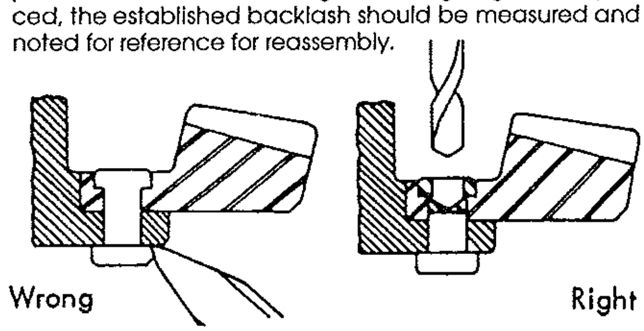
■ **Caution:** Prying shafts loose will damage the hubs and oil seals.

Remove carrier to housing stud nuts and washers. Loosen two top nuts and leave on studs to prevent carrier from falling. Break carrier loose from axle with rawhide mallet & puller screws.

Remove top nuts and washers and work carrier free using puller screws in holes where provided. A small pinch bar may be used to straighten the carrier in the housing bore. However, the end must be rounded to prevent indenting the carrier flange. A roller jack may be used to facilitate removal of carrier.

Disassembly

Place carrier in suitable holding fixture. If the initial inspection indicates the drive gear is not going to be replaced, the established backlash should be measured and noted for reference for reassembly.



Removing Drive Gear Rivets

Differential And Gear Assembly Removal:

1. Loosen jam nut and back off thrust adjusting screw. Center punch one differential carrier leg and bearing cap to identify for proper reassembling.

2. Cut lock wire, remove cap screws and adjusting nut locks. Remove bearing cap stud nuts or cap screws, bearing caps and adjusting nuts.

3. Lift out differential and gear assembly.

Differential And Gear Disassembly:

1. If orinigal identification marks are not clear, mark differential case halves with a punch or chisel for correct alignment on reassembling.

2. Cut lock wire, remove bolts and separate case halves.

3. Remove spider, pinions, side gears and thrust washers. If necessary, remove rivets and separate gear and case.

Ring Gear Removal:

1. Carefully center punch rivets in center of head. Use a drill bit 1/32" (.79 mm) smaller than the 9/16" rivet to drill through the head. Press out rivets.

Tonnage required for squeezing a 9/16" cold rivet is 36 tons (32 metric tons). This pressure is approximate for annealed steel rivets and pressure may be adjusted to suit individual working conditions. Final pressure should be held for approximately one minute to make sure the rivet has filled the hole.

When replacing the ring gear, rivets are removed. If bolts are used to replace rivets the following torque values should be used.

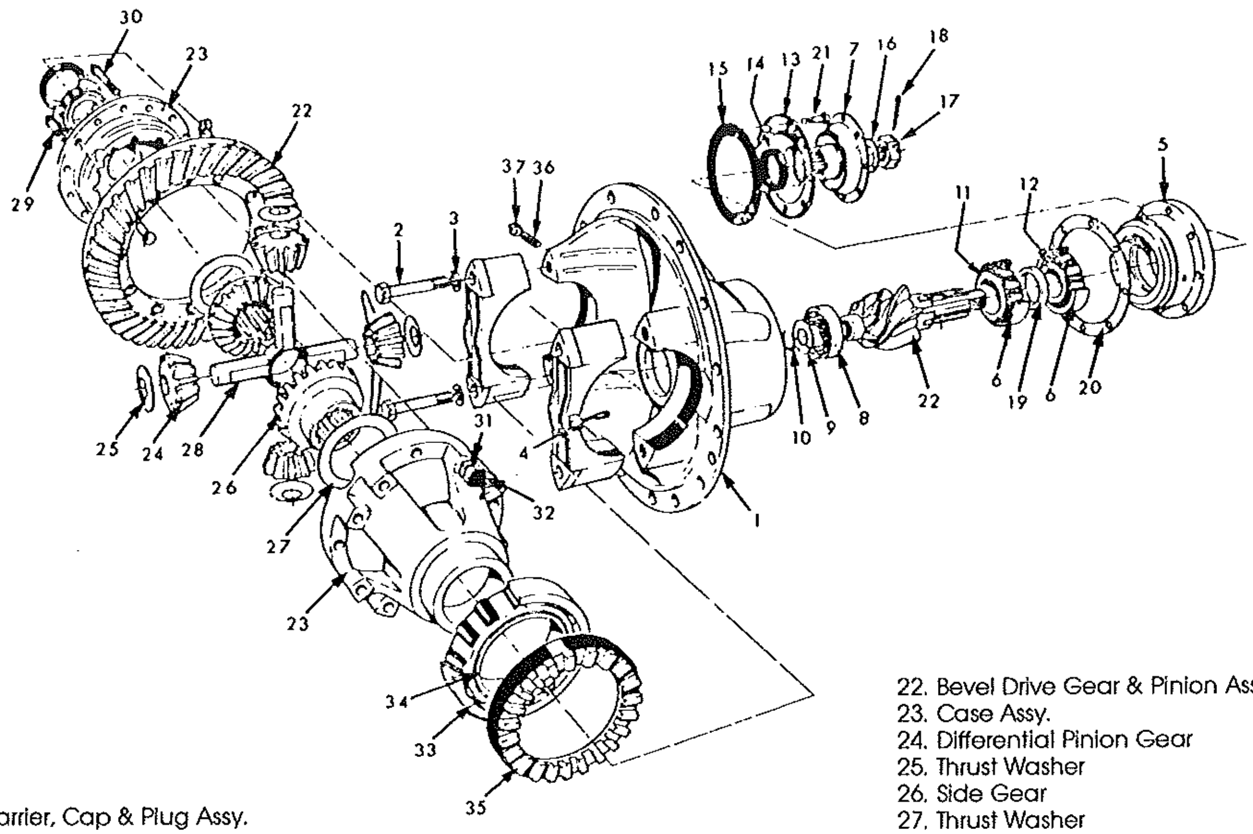
Bolt Size

1/2" (12.7 mm)
5/8" '15.8 mm)

Torque

85 - 115 ft. lbs. (115 - 156 Nm)
180 - 230 ft. lbs. (244 - 312 Nm)

REAR AXLE



1. Carrier, Cap & Plug Assy.
2. Capscrew
3. Washer
4. Adj. Ring Block Pin
5. Cage & Cup Assy.
6. Inner & Outer Cup
7. Companion Flange & Slinger Assy.
8. Bearing
9. Retainer
10. Lock Ring
11. Inner Bearing Cone
12. Outer Bearing Cone
13. Cover & Oil Seal Assy.
14. Oil Seal Assy.
15. Gasket
16. Washer
17. Nut
18. Cotter Pin
19. Spacers
20. Shims
21. Capscrew
22. Bevel Drive Gear & Pinion Assy.
23. Case Assy.
24. Differential Pinion Gear
25. Thrust Washer
26. Side Gear
27. Thrust Washer
28. Spider
29. Short Case Bolt
30. Long Case Bolt
31. Washers
32. Nut
33. Bearing Cup
34. Bearing Cone
35. Adjusting Ring
36. Drive Gear Thrust Screw
37. Thrust Gear Lock Nut

Pinion And Cage Assembly Removal:

1. With a suitable tool, remove companion flange or yoke, pinion shaft nut and washer. Remove pinion cage stud nuts or capscrews and remove bearing cage using puller screws in holes where provided.

■ **Caution:** The use of a pinch bar will damage the shims. Driving pinion from inner end with a drift will damage the bearing lock ring groove.

2. Wire shim pack together to facilitate adjustment on reassembling.

Disassembling Pinion And Cage:

1. Tap shaft out of cage with mallet or press shaft from cage. Remove outer bearing from cage.

2. Remove spacer or spacer combination from pinion shaft. If necessary to replace rear thrust bearing or radial bearing, remove with suitable puller.

Repair

Thorough visual inspection for indications of wear or stress, and the replacement of such parts as are necessary will eliminate costly and avoidable drive unit failure.

Inspect all bearings, cups and cones, including those not removed from parts of the drive unit, and replace if rollers or cups are worn, pitted or damaged in any way. Remove parts needing replacement with a suitable puller or in a press with sleeves. Avoid the use of drifts and hammers. They may easily mutilate or distort component parts.

Inspect hypoid gears for wear or damage. Gears which are worn, ridged, pitted or scored, should be replaced. When necessary to replace either the drive pinion or drive gear of hypoid set, the entire gear set should be replaced.

Inspect the differential assembly for pitted, scored or worn thrust surfaces of differential case halves, thrust washers, spider trunnions and differential gears. Thrust washers must be replaced in sets. The use of a combination of old and new washers will result in premature failure.

Check the differential pinion and side gear teeth for wear or damage. Always replace the differential pinions and side gears in sets.

Inspect axle shafts for signs of torsional fractures or other indication of impending failure.

Cleaning

Parts having ground and polished surfaces such as gears, bearings, shafts and collars, should be cleaned in suitable solvent such as kerosene or diesel fuel. Gasoline should be avoided.

■ **Caution:** Do not clean these parts in a hot solution tank or with water and alkaline solutions such as sodium hydroxide, orthosilicates or phosphates.

Steam cleaning assembled drive units after they have been removed from the housing is not recommended. When this method of cleaning is used, water is trapped in the cored passge of the castings and in the close clearances between parts as well as on the parts. This can lead to corrosion (rust) of critical parts of the assembly and the possibility of circulating rust particles in the lubricant. Premature failing of bearings, gears, and other parts can be caused by this practice. Assembled drive units cannot be properly cleaned by steam cleaning, dipping or slushing. Complete drive unit disassembly is a necessary requisite to thorough cleaning.

Rough parts such as differential carrier castings and cast brackets may be cleaned in hot solution tanks with mild alkali solutions providing these parts are not ground or polished. The parts should remain in the tank long enough to be thoroughly cleaned and heated through. This will aid the evaporation of the rinse water. The parts should be thoroughly rinsed after cleaning to remove all traces of alkali. Completely assembled axles may be steam cleaned on the outside only, to facilitate initial removal and disassembly, providing all openings are closed. Breathers, vented shift units, and all other openings should be tightly covered or closed to prevent the possibility of water entering the assembly.

Parts should be thoroughly dried immediately after cleaning. Use soft, clean lintless absorbent towels or wiping rags free of abrasive material, such as lapping compound, metal filings or contaminated oil. Bearings should never be dried by spinning with compressed air.

Reassembly

Parts that have been cleaned, dried, inspected and are to be immediately reassembled, should be coated with light oil to prevent corrosion. If these parts are to be stored for any length of time, they should be treated with a good RUST PREVENTATIVE and wrapped in special paper or other material designed to prevent corrosion.

Replace all worn or damaged parts. Hex nuts with rounded corners, all lockwashers, oil seals and gaskets should be replaced at the time of overhaul. Remove nicks, mars and burrs from machined or ground surfaces. Threads must be clean and free to obtain accurate adjustment and correct torque. A fine mill file or India stone is suitable for this purpose. Studs must be tight prior to reassembling the parts. When assembling component parts use a press where possible.

Tighten all the nuts to the specified torque. (See torque limits following service instructions.) Use soft iron locking wire to prevent possibility of wire breakage.

The burrs, caused by lockwashers, at the spot face of stud holes of cages and covers should be removed to assure easy reassembly of these parts.

If new cups are to be installed, press firmly against pinion bearing cage shoulders. Lubricate bearings and cups with light machine oil. Press rear thrust and radial bearings firmly against the pinion shoulders with a suitable sleeve that will bear only on bearing inner race.

Install radial bearing lock ring and squeeze ring into pinion shaft groove with pliers. Insert pinion and bearing assembly in pinion cage and position spacer or spacer combination over pinion shaft. Press front bearing firmly against spacer. Rotate cage several revolutions to assure normal bearing contact.

While in press under pressure, check bearing preload torque. Wrap soft wire around cage and pull on horizontal line with pound scale. If a press is not available, the pinion nut may be tightened to the correct torque and preload checked. Nut torque required to obtain correct preload is 800 - 1 000 ft. lbs. (1 085 - 1 492 Nm). Use rotating torque not starting torque. If rotating torque is not within 5 to 15 inch pounds (.56 - 1.7 Nm), use thinner spacer to increase or thicker spacer to decrease preload.

Install flange, washer and pinion shaft nut. Place pinion and cage assembly over carrier studs. Tighten shaft nut to the correct torque. The flange must be held with a suitable tool or fixture to tighten nut.

Recheck pinion bearing preload torque. Tighten to the correct torque and install cotter key.

■ **Caution:** Do not back off nut to align cotter key holes.

Pinion And Cage Assembly Installation:

1. Install correct shim pack. Locate thin shims on both sides for maximum sealing ability.

2. Position pinion and cage assembly over studs and tap into position with soft mallet. Install lockwashers and stud nuts or cap screws. Tighten to correct torque.

Assembling Differential and Gear:

1. Rivet the hypoid gear to the case half with new rivets. Rivets should not be heated, but always upset cold. When the correct rivet is used, the head being formed will be at least 1/8" (3.17 mm) larger in diameter than the rivet hole. The head will then be approximately the same height as the perforation of the case holes and result in gear eccentricity.

2. Differential case and gear bolts are available for service replacement of rivets. The use of proper bolts greatly facilitates servicing these units in the field and eliminates the need for special equipment necessary to correctly hold rivets.

Differential Pinion And Side Gear Assembly:

1. Position thrust washer and side gear in bevel gear and case half assembly.

2. Place spider with pinions and thrust washers in position. Install component side gear and thrust washer.

3. Align mating marks, position component case half and draw assembly together with four bolts or cap screws equally spaced.

4. Check assembly for free rotation of differential gears and correct if necessary. Install remaining bolts and cap screws, tighten to correct torque and lock wire.

5. If bearings are to be replaced, press squarely and firmly on differential case halves.

Differential And Gear Assembly Installation:

1. After checking related parts, coat the differential bearing cones and cups with specified rear axle lubricant.

2. Place the bearing cups over the assembled differential bearing cones, then position the differential assembly in the carrier.

3. Insert bearing adjusting nuts and turn hand tight against bearing cups. Install bearing caps in the correct location as marked and tap lightly into position.

■ **Caution:** If bearing caps do not position properly, adjusting nuts may be cross threaded. Remove caps and reposition the adjusting nuts. Forcing caps into position will result in irreparable damage to the carrier housing or bearing caps.

4. Install flat washers and cap screws. Tighten cap screws to 470 - 595 ft. lbs. (637 - 807 Nm).

Installing Bearing Cups In Carrier Leg Bores:

1. Temporarily install the bearing cups. Tighten cap screws to proper torque.

2. Bearing cups must be of a hand push fit in the bores, otherwise the bores must be reworked with a scraper or emery cloth until a hand push fit is obtained.

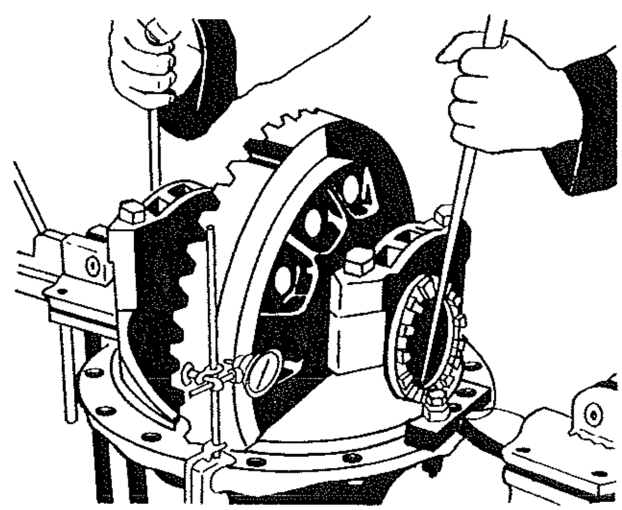
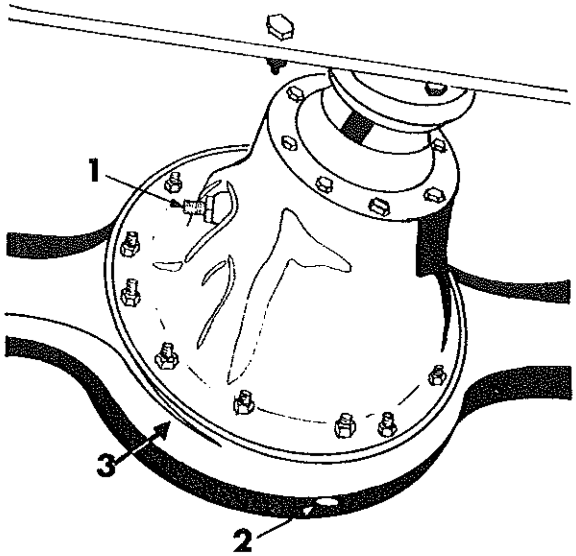


Figure 2-3: Differential Bearing Preload Adjustment

REAR AXLE



1. Drive Gear Thrust Screw
2. Rear Axle Housing Lube Drain
3. Rear Axle Housing

3. Use a blued bearing cup as a gauge and check the fits as work progresses. Once the cups fit properly, remove the bearing caps.

Bearing Preload Adjustment

Using dial indicator at backface of gear, loosen the bearing adjusting nut on the side opposite gear only, sufficient to notice end play on the indicator.

Check gear for runout. If runout exceeds .008" (.203 mm), remove differential and check for cause. Tighten adjusting nuts one notch each from .000 end play to preload differential bearings.

Hypoid Gear Backlash

If the drive gear is not going to be replaced, we suggest the established backlash recorded before disassembly be used. For new gears the new backlash should be initially set at .010" (.254 mm). Adjust backlash by moving gear only. This is done by backing off one adjusting ring and advancing the opposite ring the same amount.

Tooth Contact

Apply oiled red lead lightly to the hypoid gear teeth. When the pinion is rotated the red lead is squeezed away by the contact of the teeth, leaving bare areas the exact size, shape and location of the contacts.

Sharper impressions may be obtained by applying a small amount of resistance to the gear with a flat steel bar and using a wrench to rotate the pinion. When making adjustments, check the drive side of the gear teeth. Coast side should be automatically correct when drive side is correct. As a rule, coating about twelve teeth is sufficient for checking purposes.

After obtaining a satisfactory tooth contact, especially in relation to the top and bottom of the tooth, the backlash can be altered within the limits of .005" - .015" (.127 mm -.381 mm) to obtain a better contact position relative to the length of the tooth.

A high backlash setting can be used to keep the contact from starting too close to the toe, and a low backlash setting can be used to keep the contact from starting too far away from the toe.

Bevel Gear Thrust Adjust

To secure correct clearance between adjusting screw and back face of bevel drive gear tighten screw firmly and back off ¼" turn. The correct adjustment is .010" - .015" (.254 mm - .381 mm) clearance. Recheck to assure minimum clearance of .010" (.254 mm) during full rotation of bevel drive gear.

Drive Unit

Remove any accumulation of dirt, grit or gum from housing bowl and sleeves. Clean housing thoroughly with solvent and blow dry with compressed air. Inspect housing for cracks, loose studs, nicks, and burrs at machine surfaces. Remove nicks and burrs with stone or file. Make all necessary repairs or parts replacement before installing drive unit in housing. Install new drive unit to housing gasket over housing studs.

REAR AXLE

Roll the carrier into position on roller jack.

■ **Caution:** Do not drive carrier into housing with a hammer at the carrier stud flange. The flange may easily be distorted and cause severe oil leakage. Install lock-washers and stud nuts on any studs under carrier housing offsets. It is impossible to start these nuts after carrier is drawn into housing.

Start carrier into housing with four flat washers and nuts equally spaced.

Tighten the four nuts over flat washers alternately to draw carrier squarely into axle housing. If necessary, remove nuts and flat washers and install taper dowels, lockwashers and stud nuts. Tighten to the correct torque. Install axle shafts.

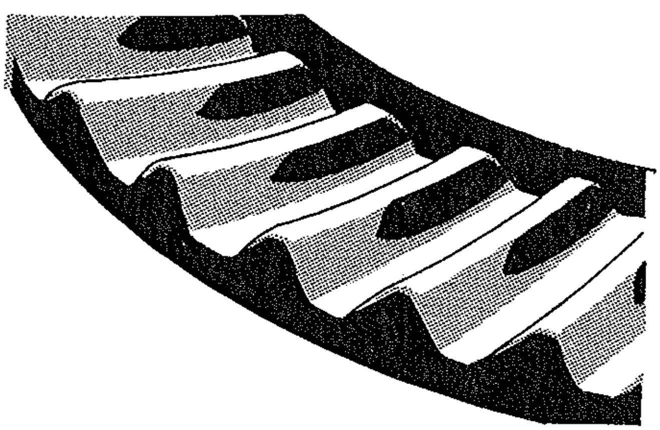
With adjustments properly made (pinion at correct depth and backlash set at .010" (.254 mm), the above contacts will be procured. The area of contact favors the toe and is centered between the top and bottom of the tooth.

The hand rolled patterns (gears unloaded) will result in a pattern centered in the length of the tooth when the gears are under load. The loaded pattern will be almost full length and the top of pattern will approach the top of the gear tooth.

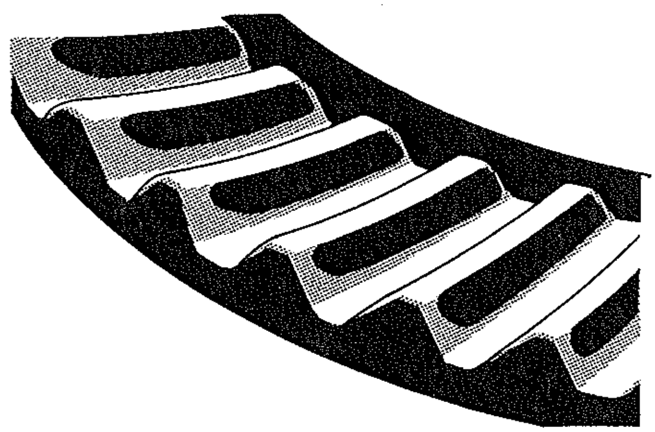
The pattern on the coast side of teeth will appear the same width as the drive side; however the over-all length will be centered between the toe and heel of gear tooth.

Set used hypoid gear to have the tooth contacts to match wear pattern. Hand rolled pattern of used gears will be smaller in area and should be at the toe end of wear patterns.

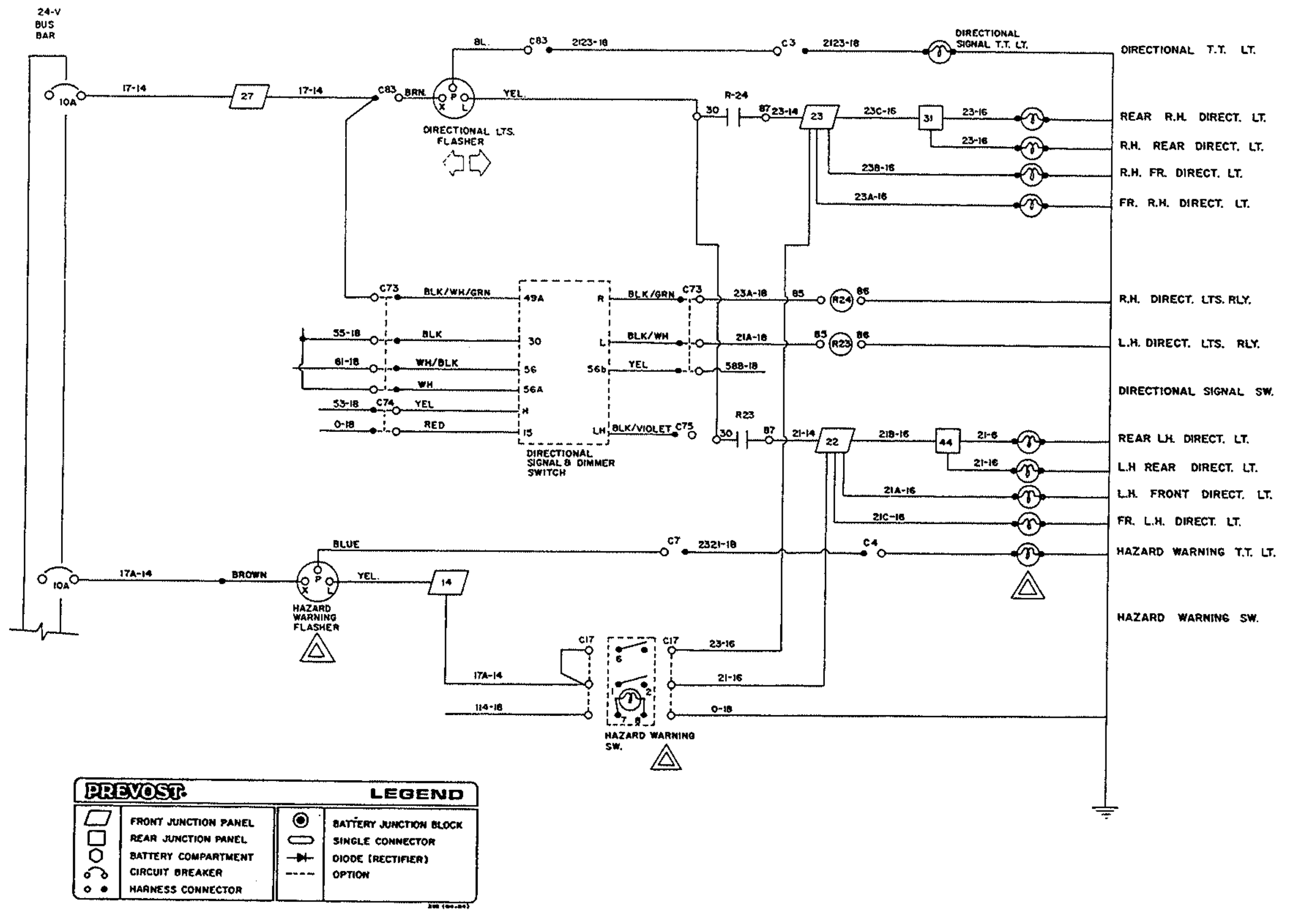
CORRECT TOOTH CONTACT ASSURES LONGER GEAR LIFE



Satisfactory Tooth Contact (Gears Unloaded)



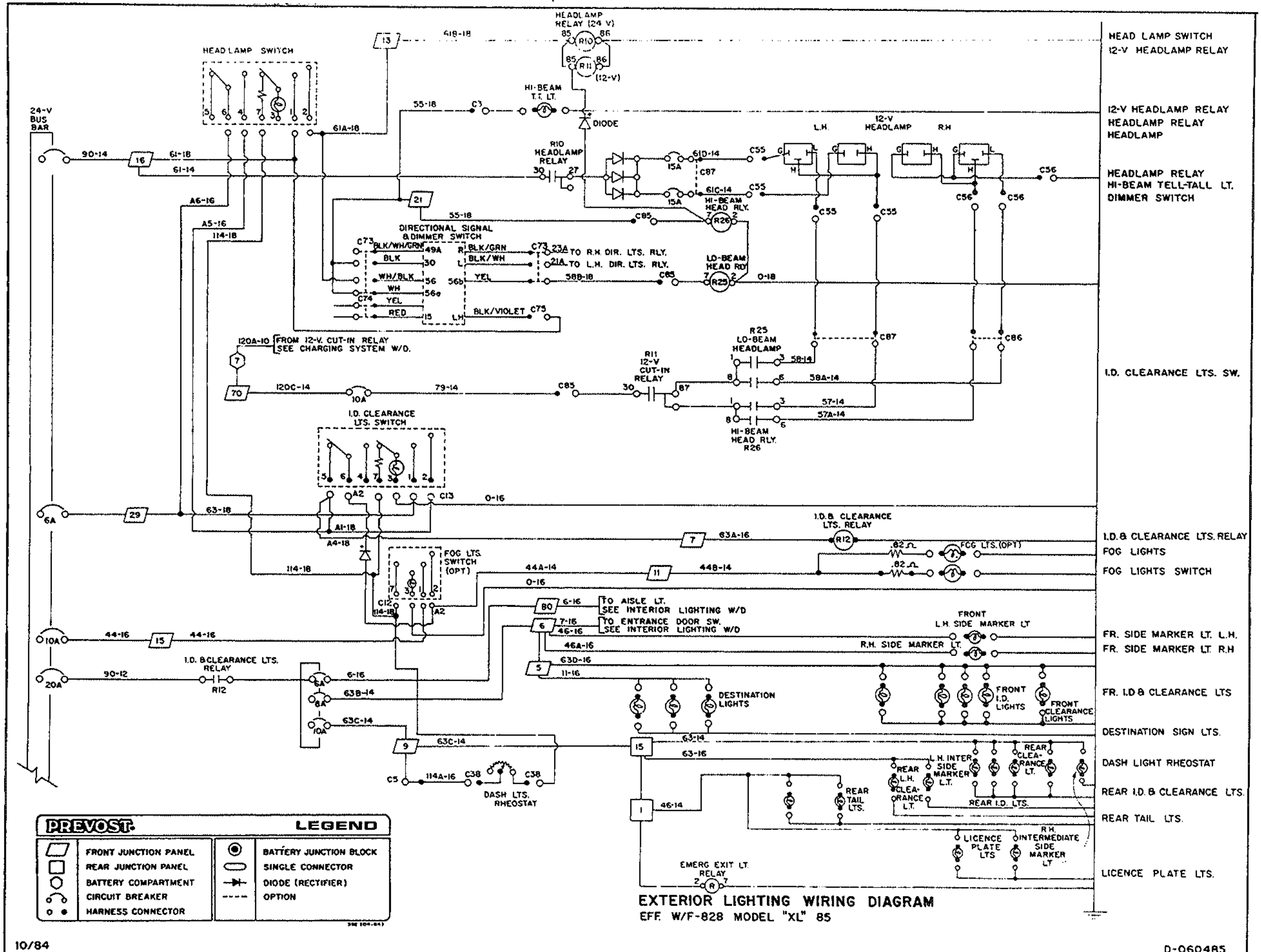
Satisfactory Tooth Contact (Gears Loaded)



DIRECTIONAL SIGNAL LT. WIRING DIAGRAM
EFF. W/F-828

10/84

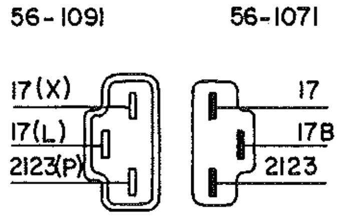
D-060484



HEAD LAMP SWITCH
12-V HEADLAMP RELAY
12-V HEADLAMP RELAY
HEADLAMP RELAY
HEADLAMP
HEADLAMP RELAY
HI-BEAM TELL-TALL LT.
DIMMER SWITCH
I.D. CLEARANCE LTS. SW.
I.D.& CLEARANCE LTS. RELAY
FOG LIGHTS
FOG LIGHTS SWITCH
FR. SIDE MARKER LT. L.H.
FR. SIDE MARKER LT. R.H
FR. I.D.& CLEARANCE LTS
DESTINATION SIGN LTS.
DASH LIGHT RHEOSTAT
REAR I.D.& CLEARANCE LTS.
REAR TAIL LTS.
LICENCE PLATE LTS.
24-V BUS BAR
HEADLAMP RELAY (24 V)
HI-BEAM T.T. LT.
DIODE
R10 HEADLAMP RELAY
12-V HEADLAMP
L.H.
R.H
HI-BEAM HEAD RLY.
LO-BEAM HEAD RLY
DIRECTIONAL SIGNAL & DIMMER SWITCH
TO R.H. DIR. LTS. RLY.
TO L.H. DIR. LTS. RLY.
FROM 12-V. CUT-IN RELAY
SEE CHARGING SYSTEM W/D.
R11 12-V CUT-IN RELAY
R25 LO-BEAM HEADLAMP
HI-BEAM HEAD RLY. R26
I.D. CLEARANCE LTS. SWITCH
I.D.& CLEARANCE LTS. RELAY
FOG LTS. (OPT)
FOG LTS. SWITCH (OPT)
TO AISLE LT.
SEE INTERIOR LIGHTING W/D
TO ENTRANCE DOOR SW.
SEE INTERIOR LIGHTING W/D
FRONT L.H. SIDE MARKER LT
R.H. SIDE MARKER LT.
I.D. & CLEARANCE LTS. RELAY
DESTINATION LIGHTS
FRONT I.D. LIGHTS
FRONT CLEARANCE LIGHTS
DASH LTS. RHEOSTAT
REAR L.H. CLEARANCE LT.
L.H. INTER SIDE MARKER LT.
REAR CLEARANCE LT.
REAR I.D. LTS.
REAR TAIL LTS.
LICENCE PLATE LTS
R.H. INTERMEDIATE SIDE MARKER LT.
EMERG EXIT LT. RELAY
PREVOST
LEGEND
FRONT JUNCTION PANEL
REAR JUNCTION PANEL
BATTERY COMPARTMENT
CIRCUIT BREAKER
HARNESS CONNECTOR
BATTERY JUNCTION BLOCK
SINGLE CONNECTOR
DIODE (RECTIFIER)
OPTION
EXTERIOR LIGHTING WIRING DIAGRAM
EFF. W/F-828 MODEL "XL" 85
10/84
D-060485

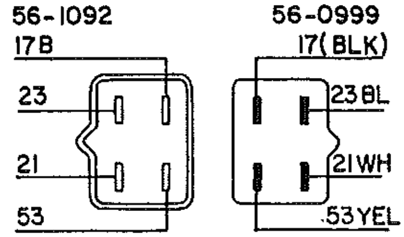
WIRE CONNECTOR CODE

C1



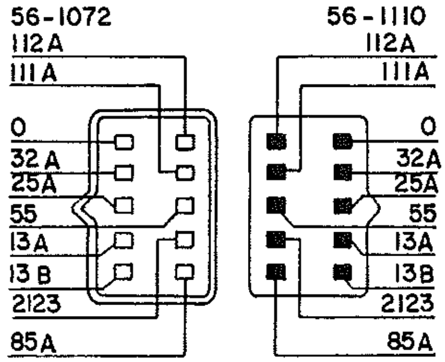
DIRECTIONAL LIGHT FLASHER
(AT L.H. SIDE OF STEERING COLUMN)
XL 84

C2



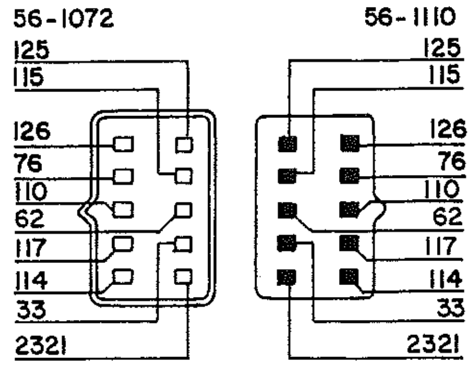
DIRECTIONAL SIGNAL SWITCH
(STEERING COLUMN)
XL 84

C3



INSTRUMENT PANEL CONNECTOR
(AT L.H. SIDE OF STEERING COLUMN)

C4



INSTRUMENT PANEL CONNECTOR
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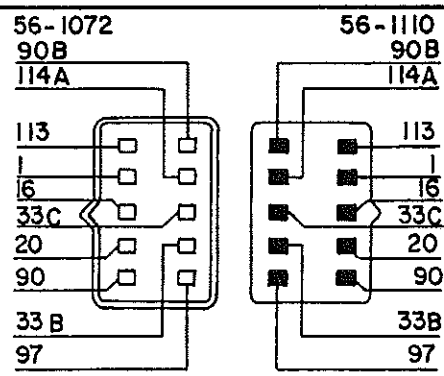
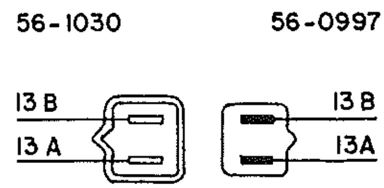
C5



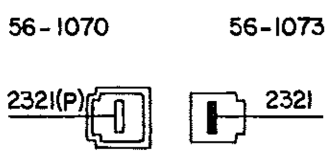
INSTRUMENT PANEL CONNECTOR
(AT L.H. SIDE OF STEERING)

C6



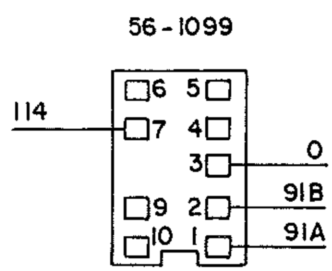
LOW AIR PRESSURE - DIODE
(FRONT JUNCTION PANEL)

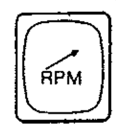
C7



HAZARD WARNING FLASHER
(FRONT JUNCTION PANEL)

C8

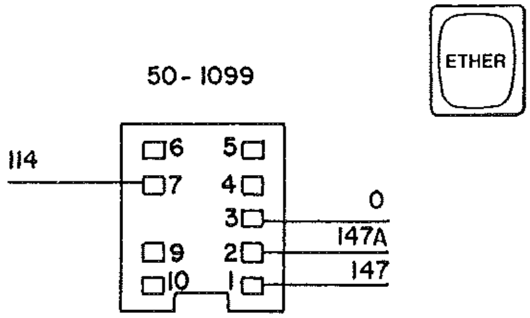




FAST IDLE SWITCH
(AT L.H. SIDE OF STEERING COLUMN)

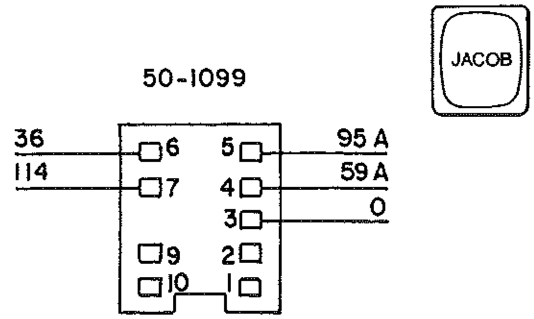
WIRE CONNECTOR CODE

C9



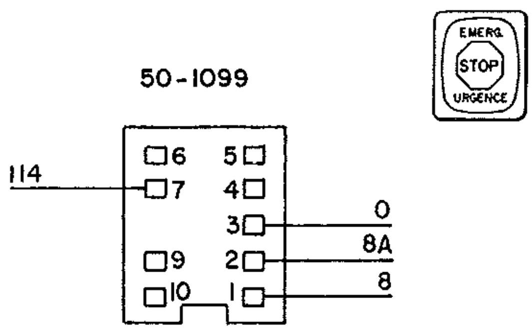
ETHER SWITCH
(AT L.H. SIDE OF STEERING COLUMN)

C10



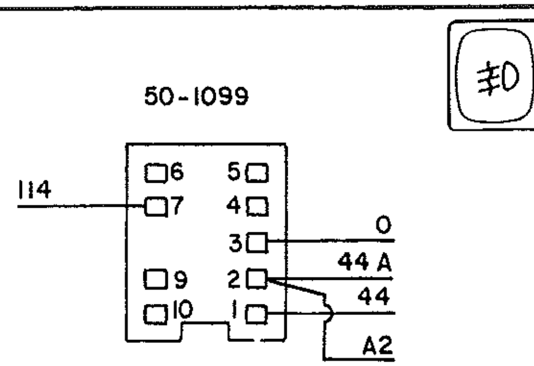
JACOB'S BRAKE
(AT L.H. SIDE OF STEERING COLUMN)

C11



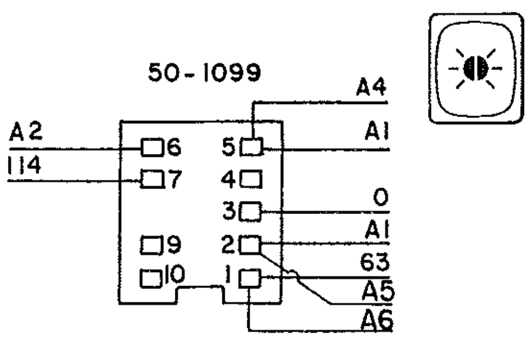
EMERGENCY STOP MOTOR SWITCH
(AT L.H. SIDE OF STEERING COLUMN)

C12



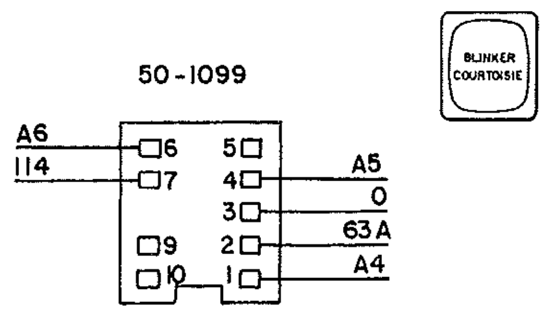
FOG LAMP SWITCH
(AT L.H. SIDE OF STEERING COLUMN)

C13



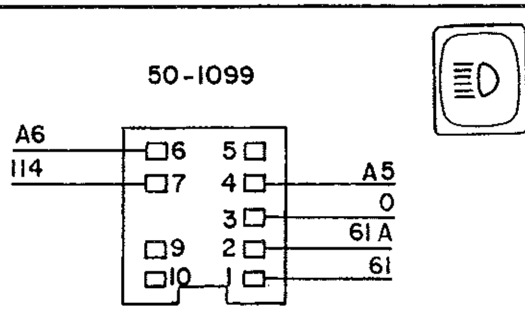
I.D. & CLEARANCE LTS. SWITCH
(AT R.H. SIDE OF STEERING COLUMN)

C14



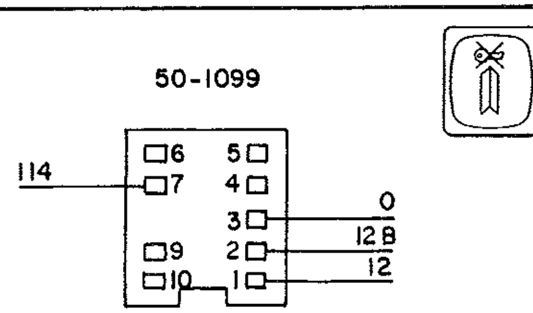
BLINKER SWITCH
(AT R.H. SIDE OF STEERING COLUMN)

C15



HEADLAMP SWITCH
(AT R.H. SIDE OF STEERING COLUMN)

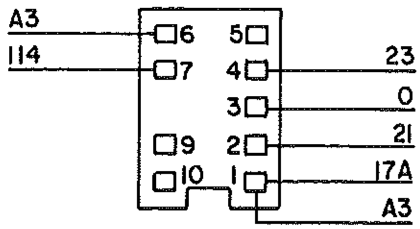
C16



DOOR OVERRULE SWITCH
(AT R.H. SIDE OF STEERIN COLUMN)

C17

56-1099



HAZARD WARNING SIGNAL SWITCH
(AT R.H. SIDE OF STEERING COLUMN)

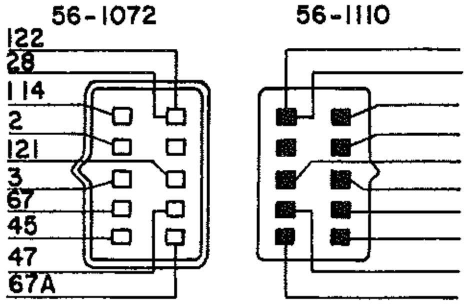
C18

56-1030 56-0997

FIRE BELL CONNECTOR
(ON TOP OF DRIVER'S HEATER BOX)

C19

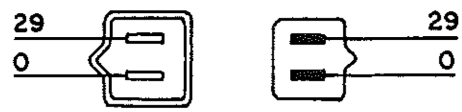
56-1072 56-1110



R.H. SIDE CONSOLE CONNECTOR

C20

56-1030 56-0997



R.H. SIDE CONSOLE CONNECTOR

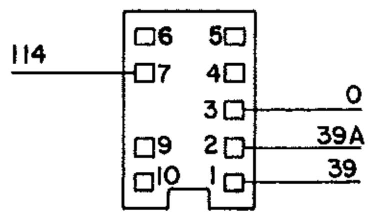
C21

56-1030 56-0997

DOOR AIR LOCK SWITCH
(AT DOOR CONTROL MECHANISM)

C22

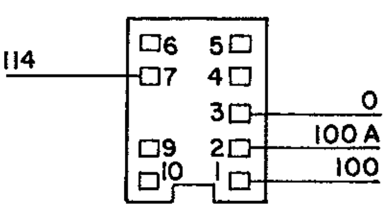
56-1099



DRIVER'S LIGHT SWITCH
(ON L.H. SIDE OF DRIVER)
(HIGHWAY COACH)

C23

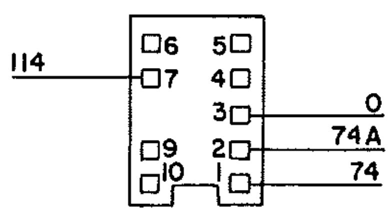
56-1099



DOME LIGHT SWITCH
(ON L.H. SIDE OF DRIVER)

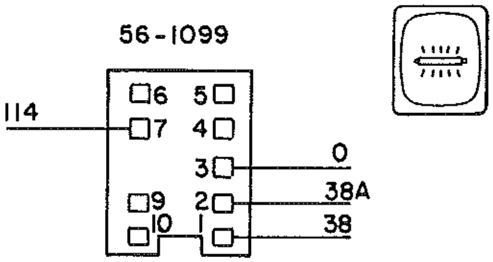
C24

56-1099



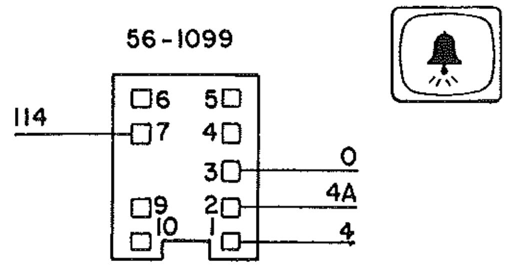
READING LIGHT SWITCH
(ON L.H. SIDE OF DRIVER)

C25



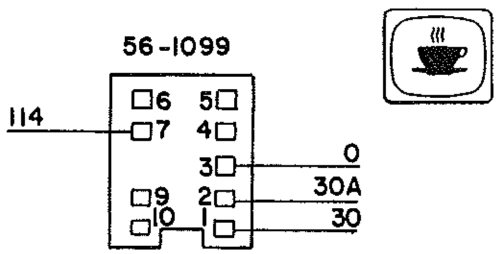
FLORESCENT SWITCH
(AT L.H. SIDE OF DRIVER)

C26



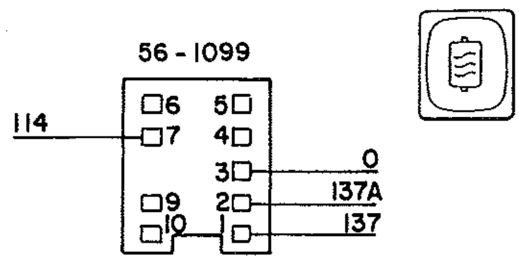
PASSENGER CHIME SWITCH
(AT L.H. SIDE OF DRIVER)

C27



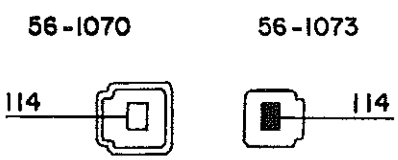
GALLEY SWITCH
(AT L.H. SIDE OF DRIVER)

C28



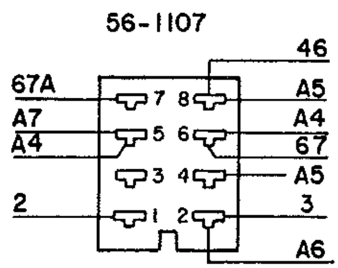
MIRROR HEATER SWITCH
(AT L.H. SIDE OF DRIVER

C29



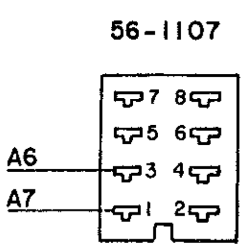
SWITCH ILLUMINATING LIGHT
(FRONT JUNCTION PANEL)

C30



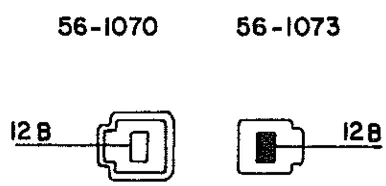
MAIN HEATER SWITCH
(BEHIND R.H. SIDE CONSOLE)

C31



EMERGENCY VENT SWITCH
(BEHIND R.H. SIDE CONSOLE)

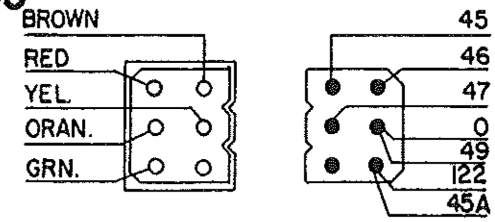
C32



DOOR AIR LOCK SWITCH
(AT DOOR CONTROL MECHANISM)

C33

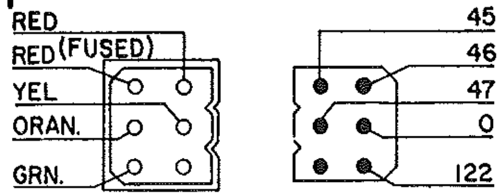
56-1103



MAIN TEMPERATURE CONTROL
(BEHIND R.H. CONSOLE)

C 34

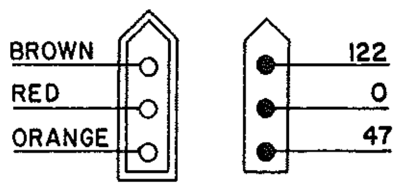
56-1103



DRIVER TEMPERATURE CONTROL
(BEHIND R.H. CONSOLE)

C35

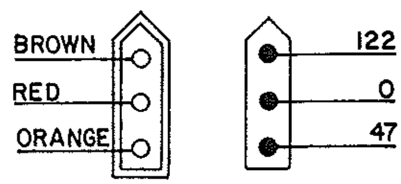
56-1104



TEMPERATURE SENSOR
(IN AIR RECIRCULATION GRILLE)

C 36

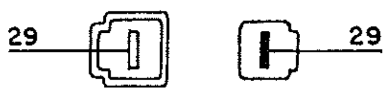
56-1104



TEMPERATURE SENSOR
(UNDER R.H. CONSOLE)

C37

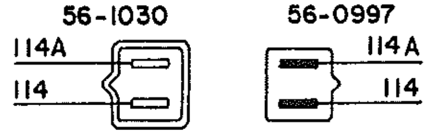
56-1070 56-1073



DEFROST FAN MOTOR SWITCH
(BEHIND R.H. CONSOLE)

C38

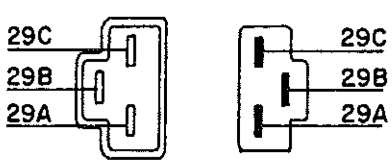
56-1030 56-0997



INSTRUMENT LIGHT RHEOSTAT
(BEHIND INSTRUMENT PANEL)

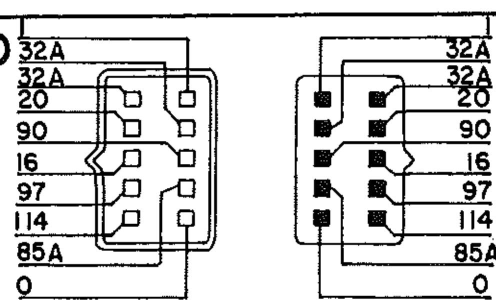
C 39

56-1091 56-1071



DEFROST FAN MOTOR SWITCH
(BEHIND R.H. CONSOLE)

C40

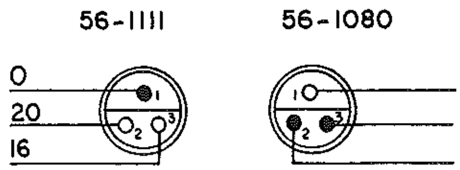


56-1072 56-1110

TACHOMETER & SPEEDOMETER CONNECTOR
(BEHIND INSTRUMENT PANEL)

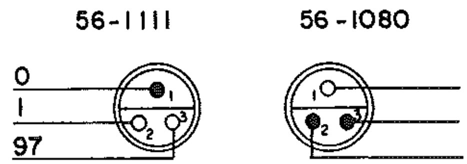
WIRE CONNECTOR CODE

C41



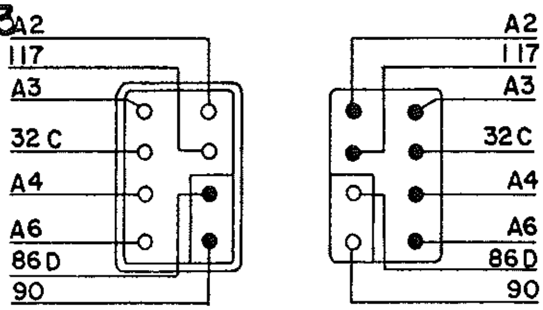
SPEEDOMETER SENDER
(ON TRANSMISSION)

C42



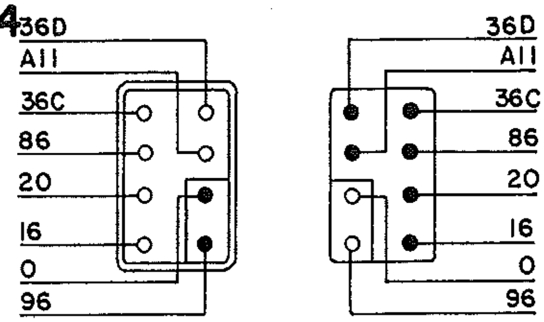
TACHOMETER SENDER
(ON ENGINE)

C43



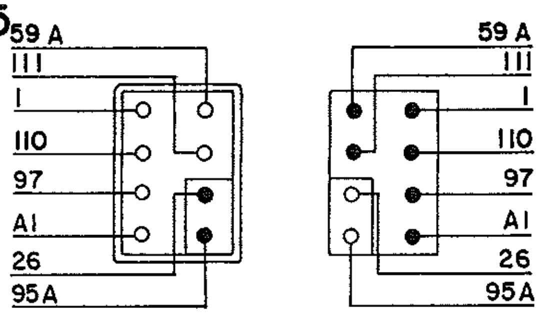
ENGINE HARNESS
(IN REAR JUNCTION BOX)

C44



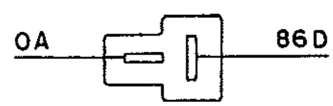
ENGINE HARNESS
(IN REAR JUNCTION BOX)

C45



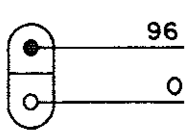
ENGINE HARNESS
(IN REAR JUNCTION BOX)

C46



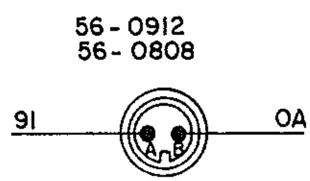
NEUTRAL START SWITCH
(AUTOMATIC TRANSMISSION)

C47



CRUISE CONTROL SENDER
(ON TRANSMISSION)

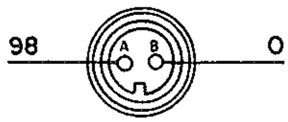
C48



FAST IDLE SOLENOID VALVE
(ON ENGINE BULKHEAD)

C49

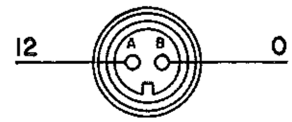
56-0412
56-0808



STOP MOTOR SOLENOID
(ON ENGINE BULKHEAD)

C50

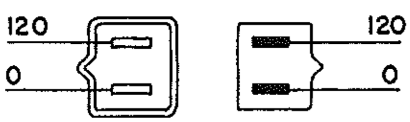
56-0412
56-0808



DOOR AIR LOCK SOLENOID VALVE
(IN HEATING DUCT - 1st R.H. SECTION)

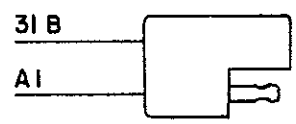
C51

56-1030 56-0997



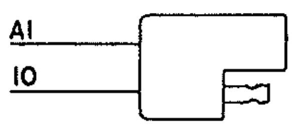
CONVERTER 24-12 (RADIO)
(IN FRONT JUNCTION BOX)

C52



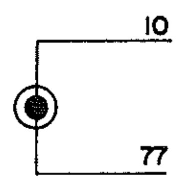
HIGH PRESSURE SWITCH
(ON A/C COMPRESSOR)

C53



LOW PRESSURE SWITCH
(ON A/C COMPRESSOR)

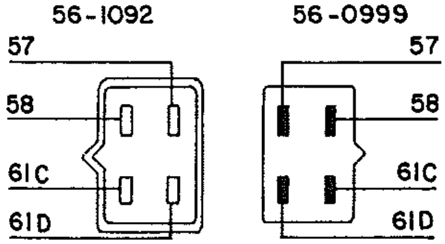
C54



A/C COMPRESSOR CLUTCH

C55

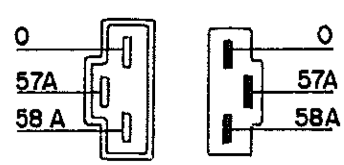
56-1092 56-0999



L.H. SIDE HEADLAMP
(IN STEERING COMPARTMENT)

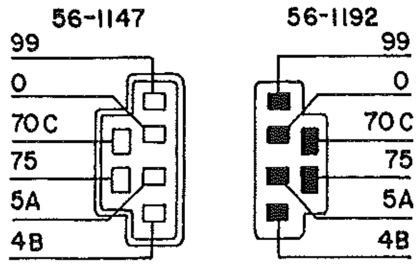
C56

56-1091 56-1071



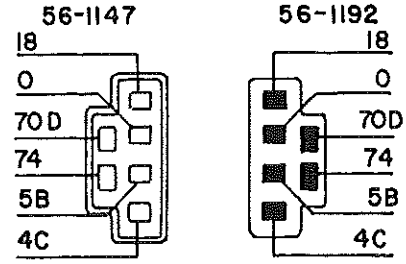
R.H. SIDE HEADLAMP
(IN SPARE TIRE COMPARTMENT)

C57



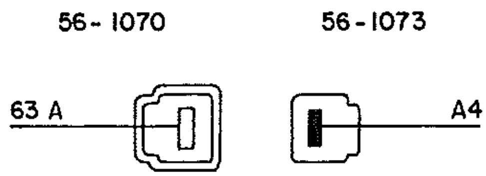
ROOF R.H. HARNESS
(WASHROOM TOP SECTION)

C58



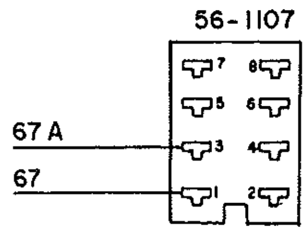
ROOF L.H. HARNESS
(LAST L.H. TOP SECTION)

C59



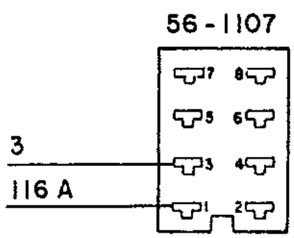
BLINKER SWITCH
(AT R.H. SIDE OF STEERING COLUMN)
(TO BE CONNECTED W/O BLINKER ONLY)

C60



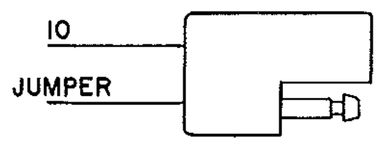
WATER PUMP SWITCH
(BEHIND R.H. SIDE CONSOLE)

C61



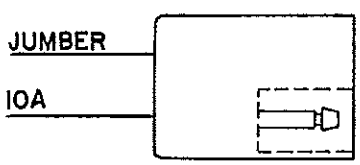
A/C CLUTCH SWITCH
(BEHIND R.H. SIDE CONSOLE)

C62



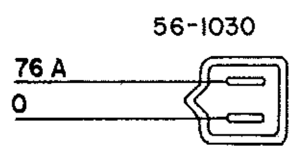
HIGH PRESSURE SWITCH
(ON A/C DELCO COMPRESSOR-MTH)

C63



LOW PRESSURE SWITCH
(ON A/C DELCO COMPRESSOR - MTH)

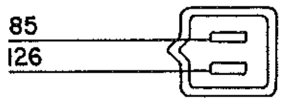
C64



LOW FUEL T.T. LIGHT
(BEHIND INSTRUMENT PANEL)

C65

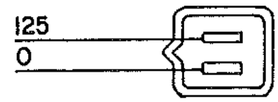
56-1030



FRONT KNEEL TELL TALE LT.
(BEHIND INSTRUMENT PANEL)

C66

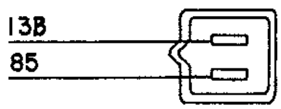
56-1030



LOW WATER LEVEL TELL TALE LT.
(BEHIND INSTRUMENT PANEL)

C67

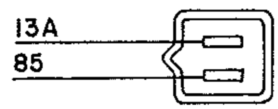
56-1030



LOW AIR TELLTALE LT. (SEC.)
(BEHIND INSTRUMENT PANEL)

C68

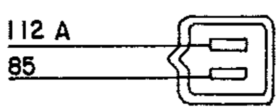
56-1030



LOW AIR TELLTALE LT. (PRIM.)
(BEHIND INSTRUMENT PANEL)

C69

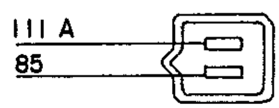
56-1030



LOW OIL PRESSURE TELLTALE LT.
(BEHIND INSTRUMENT PANEL)

C70

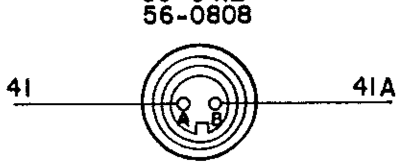
56-1030



HIGH TEMP. WATER TELLTALE LT.
(BEHIND INSTRUMENT PANEL)

C71

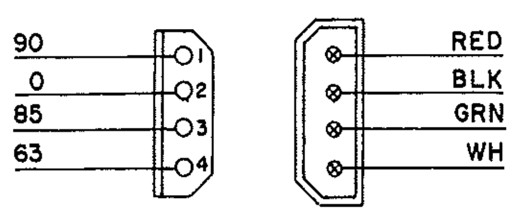
56-0412
56-0808



2-SIGNAL GOUVERNOR SOL. VALVE
(ENGINE COMPARTMENT)

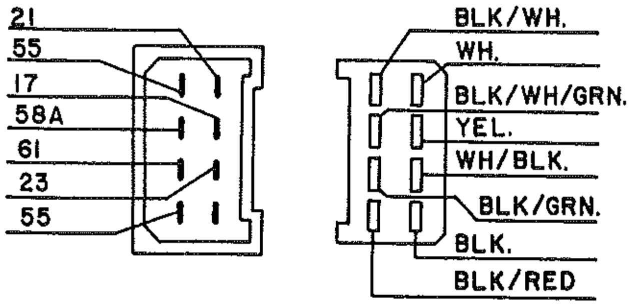
C72

56-0852 56-0851



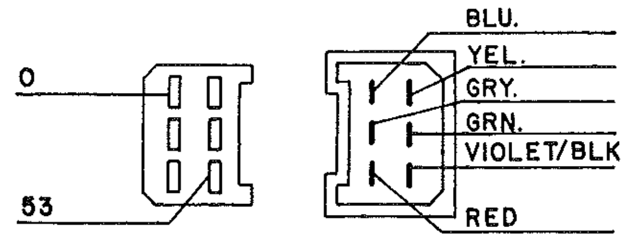
DIGITAL CLOCK
(DESTINATION SIGN COMPART.)

C73



DIRECTIONAL SIGNAL SWITCH
(STEERING COLUMN) XL 85

C74



DIRECTIONAL SIGNAL SWITCH
(STEERING COLUMN) XL 85

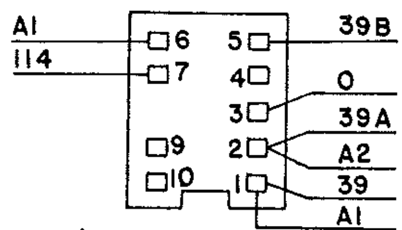
C75

56-1070 56-1073

DEFROST CONTROL SWITCH
(BEHIND R.H. SIDE CONSOLE)

C76

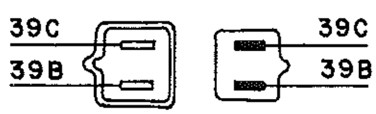
56-1099



DRIVER'S LIGHT SWITCH
(ON L.H. SIDE OF DRIVER-MTH.)

C77

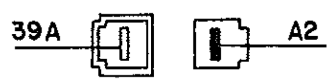
56-1030 56-0997



DRIVER'S LIGHT—3 WAY
(IN FRONT JCT. BOX)

C78

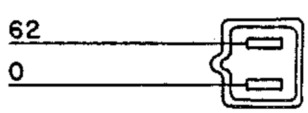
56-1070 56-1073



DRIVER'S LIGHT
(IN FRONT JCT. BOX)

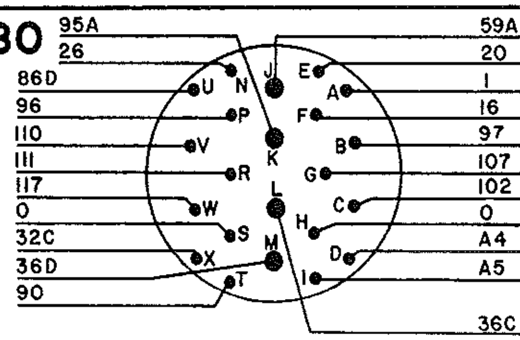
C79

56-1030



LEVEL-LOW TELL-TALE LT.
(BEHIND INSTRUMENT PANEL MTH)

C80

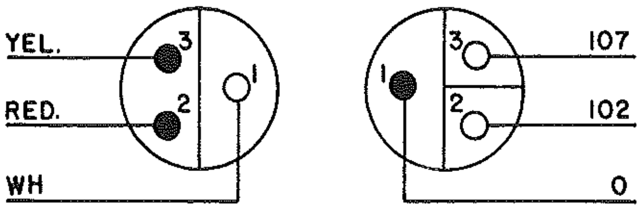


ENGINE HARNESS (VEAM)
(REAR JUNCTION BOX)

PREVOST®

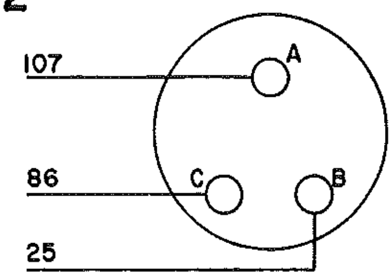
WIRE CONNECTOR CODE

C81



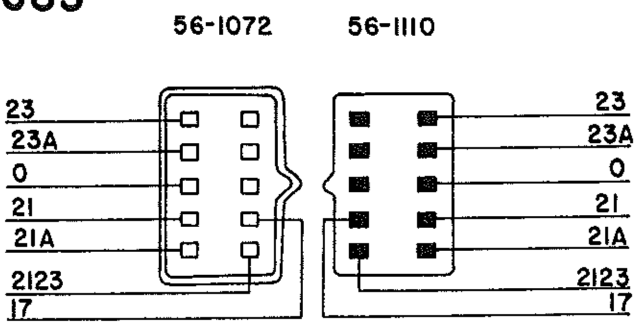
OVERVOLTAGE RELAY
(IN REAR JUNCTION BOX)

C82



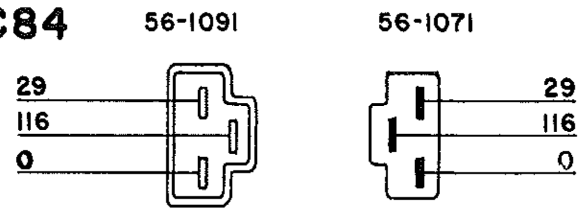
ENGINE HARNESS (VEAM)
(AT REAR JUNCTION BOX)

C83



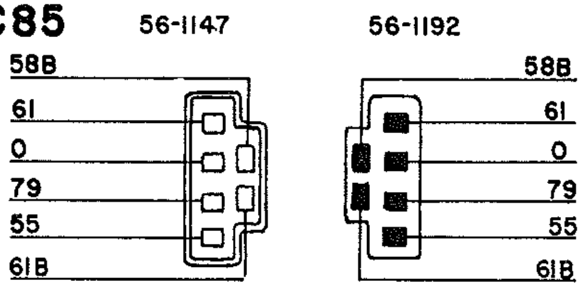
DIRECTIONAL SIGNAL MODULE
(UNDER INSTRUMENT PANEL)
XL85

C84



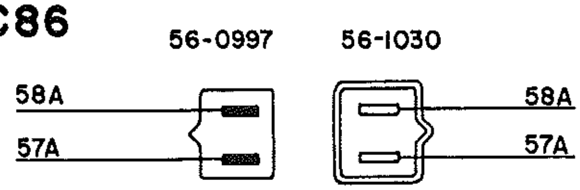
R.H. SIDE CONSOLE CONNECTOR
XL 85

C85



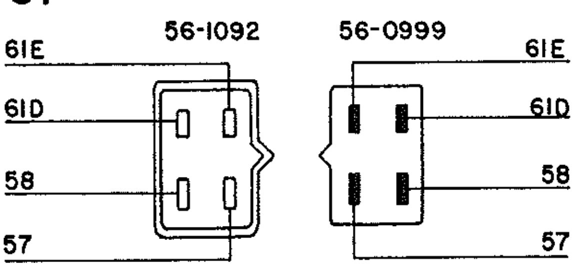
HEADLAMP MODULE
(FRONT SERVICE COMPT)
XL 85

C86



HEADLAMP MODULE
(FRONT SERVICE COMPT)
XL85

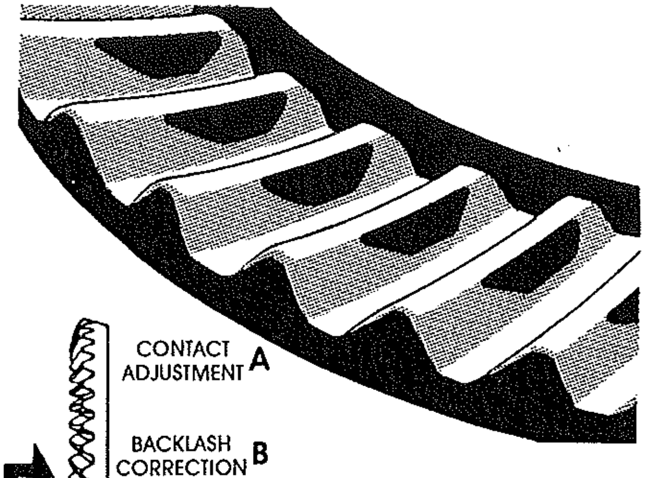
C87

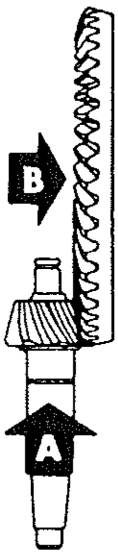


HEADLAMP MODULE
(FRONT SERVICE COMPT)
XL85

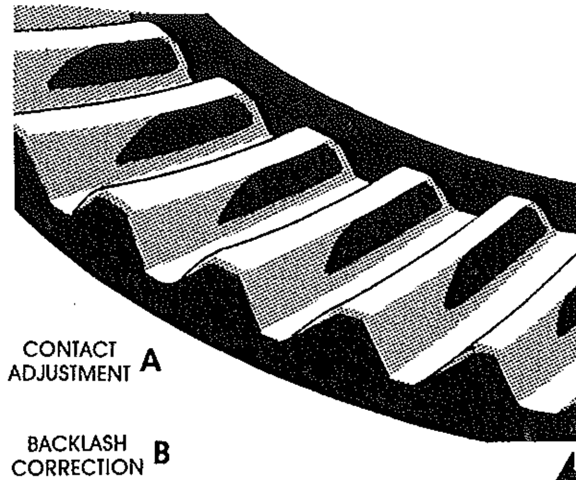
REAR AXLE

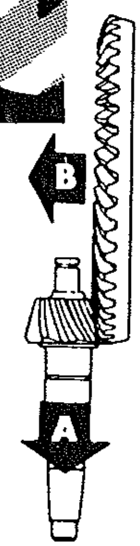
INCORRECT TOOTH CONTACT





A HIGH NARROW CONTACT is not desirable. If gears are allowed to operate with an adjustment of this kind, noise, galling and rolling over of the top edges of the teeth will result. To obtain correct contact, move pinion toward gear to lower contact area to proper location. This adjustment will decrease backlash between pinion and gear teeth, which may be corrected by moving gear away from pinion.





A LOW NARROW CONTACT is not desirable. If gears are allowed to operate with an adjustment of this kind, galling, noise and grooving of teeth will result. To obtain correct contact, move pinion away from gear to raise contact area to proper location. Correct backlash of .005" to .015" may be obtained by moving gear toward pinion. (.127 - .381 mm)

NOTE: The actual blacklash changes approx. .008" (.203 mm) for each. .010" (.254 mm) movement of the gear.

Yoke Or Companion Flange Installation On Interference Fit Splines

The installation of yokes with interference fit splines will require the use of a three piece installation tool consisting of a shaft, collar and nut. The installation tool can be fabricated according to figure 11... .

Yoke Removal Procedures

1. Hold flange or yoke with suitable tool and remove pinion shaft nut and washer.

2. Remove flange or yoke with a suitable puller. DO NOT DRIVE FLANGE OFF, AS IT WILL CAUSE EXCESSIVE RUNOUT.

Yoke Installation Procedures

☐ **Note:** Do not drive yokes onto pinion by pounding or taping, this will damage the yoke, splines, shafts and bearings.

1. Clean all parts thoroughly (splines of yoke shaft, seals and wiping area on yoke, etc.)

2. Coat yoke seal elements with recommended axle lubricant. Also ensure that there are no burrs or nicks on the yoke wiper surface that will pass through the seal during installation.

3. Thread the yoke installation shaft onto pinion shaft until installation shaft bottoms.

REAR AXLE

4. Slide the yoke over the installation shaft, aligning yoke and shaft splines of drive unit.

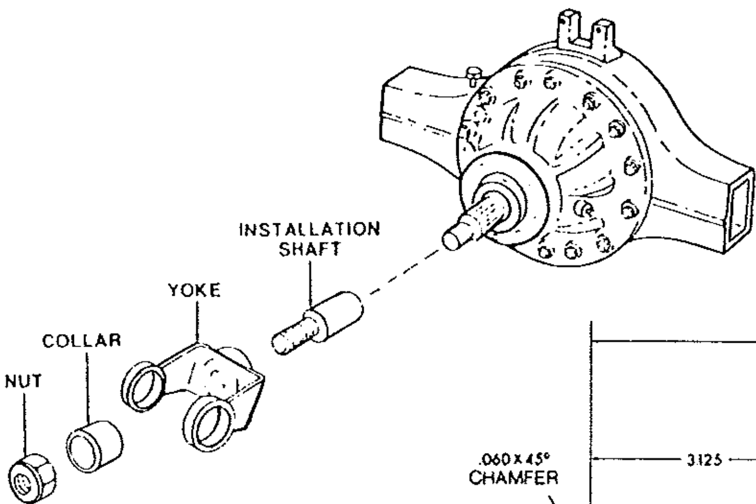
5. Place installation collar over the installation shaft, against yoke.

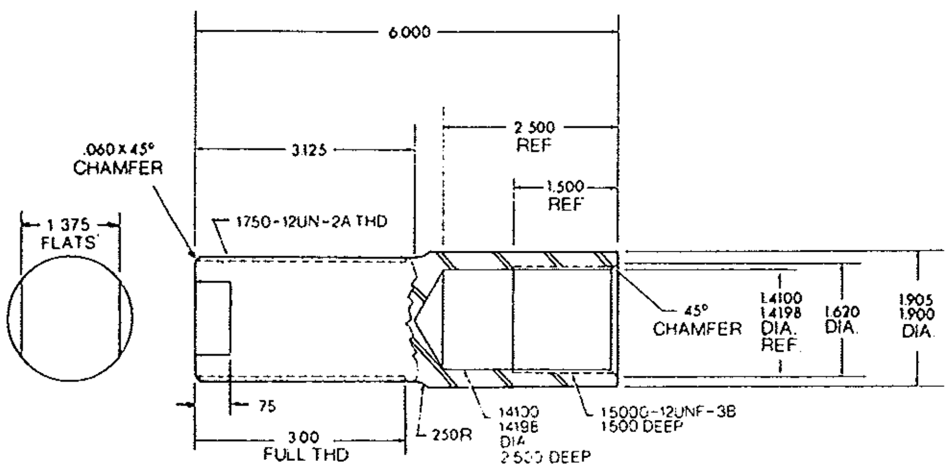
6. Thread nut onto installation shaft, against the collar. Continue threading the nut against the collar until yoke seats against bearing. A torque of 200 ft. lbs. (271 Nm) on nut may be required to properly install and seat the yoke.

■ **Caution:** Do not use a prevailing torque nut to install the yoke. Use only the nut furnished with tool.

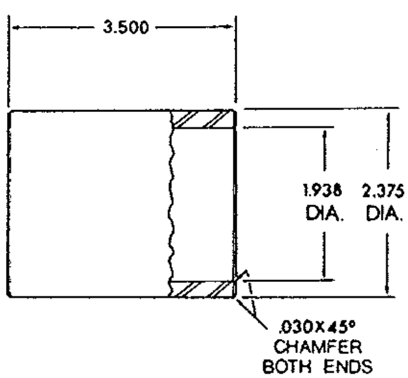
7. Remove all parts of the installation tool from drive unit and install pinion washer and nut. Tighten nut to minimum 800 ft. lbs. (1,085 Nm), maximum 1 100 ft. lbs. (1,492 Nm).

☐ **Note:** The above yoke installation procedures may also be used to install yokes with slip fit splines if necessary.

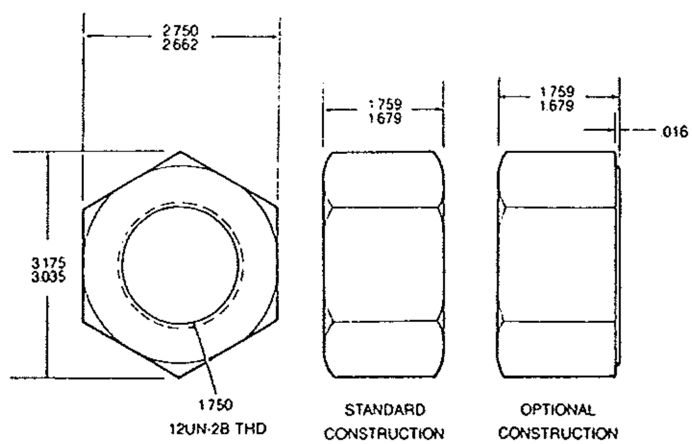




SHAFT



COLLAR



NUT

REAR AXLE

TABULATION OF TORQUE LIMITS
CAP SCREWS & STUD NUTS

LOCATION	DIAMETER	NO. THREADS	TORQUE — LB. FT. MIN.	TORQUE — LB. FT. MAX.	TORQUE — N. m MIN.	TORQUE — N. m MAX.
Pinion Cage	3/8"	16	33	43	45	58
	1/2"	13	81	104	110	141
	9/16"	12	116	149	157	202
	5/8"	11	160	205	217	278
Carrier to Housing	7/16"	14	53	67	72	90
	1/2"	20	81	104	110	141
	5/8"	18	160	205	217	278
	3/4"	16	290	370	393	502
Differential Case Bolt	1/2"	20	92	118	125	160
	9/16"	18	130	167	176	226
	5/8"	18	185	235	251	318
	3/4"	16	320	415	434	563
Pinion Shaft	7/8"	20	175	250	237	339
	1"	20	300	400	407	542
	1¼"	18	700	900	949	1,220
	1½"	18	800	1100	1,085	1,492
	1½"	12	800	1100	1,085	1,492
	1¾"	12	800	1100	1,085	1,492
	2"	12	800	1100	1,085	1,492
Differential Bearing	5/16"	18	16	20	22	27
Adjusting Nut Lock	1/2"	13	75	96	102	130

DIFFERENTIAL BEARING CAP
CAP SCREWS OR STUD NUTS
(Later axle models employing hardened washers)

CAP SCREW OR STUD NUT DIAMETER	CAP SCREW OR COARSE STUD THREAD	STUD NUT OR FINE THREAD	TORQUE — LB. FT. MIN.	TORQUE — LB. FT. MAX.	TORQUE — N.m MIN.	TORQUE — N.m MAX.
5/8"	11	18	160	205	217	278
3/4"	10	16	290	370	393	502
7/8"	9	14	470	595	637	807
7/8"	14	14	510	655	691	888
1"	14	14	580	745	786	1,010

Torques given apply to parts coated with machine oil; for dry (or «as received») parts increase torques 10%; for parts coated with multipurpose gear oil decrease torques 10%. Nuts on studs to use same torque as for driving the stud.

REAR AXLE

TAG AXLE

DESCRIPTION:

The tag axle is located behind the drive axle. It carries a single wheel and tire on each side. The tag axle can be raised by pulling a hand-operated button located at right of the driver's seat. This feature permits to obtain an increased traction at the drive wheels. It aslo decreases the turning radius, thus facilitating city driving.

Removal and Replacement:

To remove tag axle from vehicle, proceed as follows:

1. Raise vehicle slightly and remove tag axle wheels.

2. Raise vehicle in order to ease access to suspension components. Then, support vehicle at frame, as described in section 18, Jacking points.

3. Support tag axle with a suitable hydraulic jack.

4. Disconnect both rear leveling valve levers from their supports. Then exhaust air from air bellows by pulling down the leveling valve levers.

5. Disconnect air bellows at tag axle beam.

6. Disconnect brake hoses at air brake chambers.

7. Disconnect tag lift chains.

8. Disconnect shock absorbers at tag axle.

9. Disconnect radius rods (4) and lateral rod at vehicle frame.

10. Lower tag axle beam and slide it from under the vehicle.

To reinstall the tag axle, reverse the preceding procedure.

Tag Axle Alignment:

When replacing the tag axle, make sure that it is parallel to the drive axle. To check it, measure the distance between the drive axle and the tag axle at left and right side. If the difference in reading does not exceed 1/16", no adjustment is required. If the difference is more than 1/16", adjust according to the following procedure:

☐ **Note:** Readings must be taken when vehicle is on its wheels.

1. Loosen clamp retaining bolts at lower left radius rod.

2. Turn radius rod adjusting nut in order to obtain the desired reading. Do not exceed 2 turns.

3. If more than 2 turns are required, loosen clamp retaining bolts at upper left radius. Then, turn upper radius rod and lower radius rod alternately to obtain the desired reading.

☐ **Note:** Do not exceed a difference of 2 turns between the adjustment of the upper radius and the adjustment of the lower radius rod.

4. When the desired reading is obtained, tighten all clamp retaining bolts at upper and lower radius rod. Torque to 175 - 200 ft. lbs (240 - 275 Nm).

SPECIFICATIONS

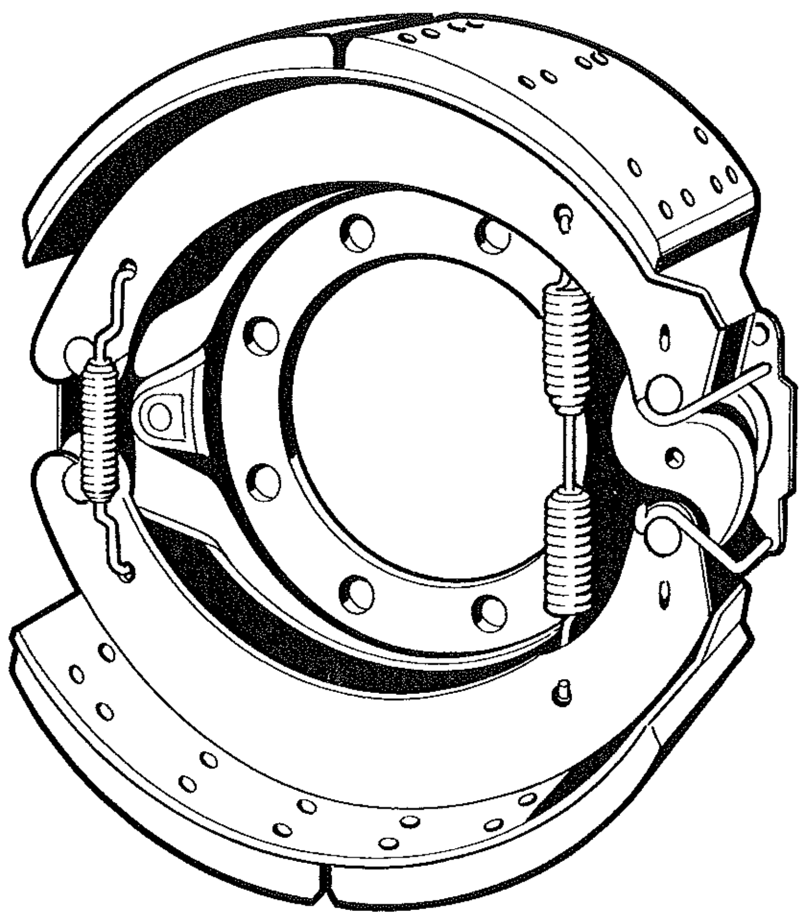
REAR AXLE

Make	Rockwell International
Wheel Track (From Center of Duals)	76-½" (1,943 mm)
Gears, Type	Hypoid
Axle, Type	Full Floating, Pressed Steel Housing
Rear Axle Ratio (Standard)	3.73:1
Rear Axle Lube Capacity	IMP. 15 qts. (17 liters) U.S. 18 qts. (17 liters)

CLEARANCE

Differential Bearing End Play	.000" (.000 mm)
Differential Gear Run-Out Max.	.008" (.203 mm)
Hypoid Gear Backlash (New)	.010" (.254 mm)
Hypoid Gear Backlash Limits	.005" — .015" (.127 mm — .381 mm)

BRAKE & AIR SYSTEM



BRAKE & AIR SYSTEM

DESCRIPTION:

The air system of the vehicle provides a means for braking, suspension, and for operating controls and accessories. This section covers brake operation. Details of the suspension system are covered in Section 16 of this manual. The other air operated controls and accessories are covered in their own section. Included in this section is a schematic drawing of the vehicle air brake system.

The basic air system consists of a compressor, air reservoirs, filters, and the necessary fittings and piping. The brake system consists of brake chambers, brake application valve, parking brake valve, spring brake valve, quick release valves, relay valves, check valves, reservoirs, filters and necessary fittings and connecting piping.

● **Warning:** When working on or around air brake systems and components, the following precautions should be observed:

1) Always block vehicle wheels. Stop engine when working under a vehicle. Depleting vehicle air system pressure may cause vehicle to roll. Keep hands away from chamber push rods and slack adjusters; they may apply as system pressure drops.

2) Never connect or disconnect a hose or line containing air pressure. It may whip as air escapes. Never remove a component or pipe plug unless you are certain all system pressure has been depleted.

3) Never exceed recommended air pressure and always wear safety glasses when working with air pressure. Never look into air jets or direct them at anyone.

4) Never attempt to disassemble a component until you have read and understand recommended procedures. Some components contain powerful springs and injury can result if not properly disassembled. Use only proper tools and observe all precautions pertaining to use of those tools.

5) Always clean connecting piping and/or fittings, and coat pipe threads with teflon pipe sealant before installing any air brake system component.

BRAKE OPERATION

Description:

The brakes used in this vehicle incorporate both service and parking air-operate brakes. The air system is divided in two circuits: the primary circuit serves rear brakes, and the secondary circuit serves front brakes. Operation of the parking brake is as follows:

Normal running

With the handle of the parking brake valve pushed in, air pressure from primary or secondary reservoir, depending on which one has the greater pressure, is delivered through a shuttle valve (double check valve), then through the parking brake valve, to the supply port of the spring brake valve. The air pressure is then directed through a quick release valve to the lock port of the rear brake actuator. This compresses the spring of the spring brakes, thus releasing the rear brakes.

Parking

With the handle of the parking brake valve pulled out, the exhaust port of the spring brake valve and the lock port of the rear brake actuator are vented. This releases the spring of the spring brakes, thus applying applying the rear brakes.

SERVICE BRAKE OPERATION

Normal operation

When a service brake application is made, air pressure from the primary reservoir is delivered through the brake application valve to the rear relay valves. This triggers the relay valves to allow air pressure from the primary reservoir to be directed to the service port of the rear brake actuators, thus applying rear brakes.

At the same time, air pressure from the secondary reservoir is delivered through the brake application valve, then through a quick release valve, to the port of the front brake actuators, thus applying front brakes.

☐ **Note:** An interlock relay valve is installed between the tag axle relay valve and the brake application valve. When the tag axle wheels are raised, the interlock relay valve is closed, so there is no brake application on the tag axle to prevent tire scuffing.

Emergency operation

If an air pressure drop occurs in the primary circuit, the secondary circuit will provide air pressure to the spring brake chambers to keep the springs compressed. If a service brake application is made, the spring brake valve will modulate the spring brakes to permit the driver to stop the vehicle safely.

In an air pressure drop occurs in the secondary circuit, no front brake application can be made, but the driver can still drive the vehicle for a short distance at slow speed before stopping in a safe place.

● **Warning:** If an air pressure drop occurs in one of the two (2) circuits, the operator should stop the vehicle as soon as possible to have the problem corrected. If the air pressure of the other circuit reaches 40 ± 5 psi, the spring brakes will be automatically

PARKING BRAKE VALVE

Description:

The parking brake valve is located at right of the driver's

BRAKE & AIR SYSTEM

seat. When the vehicle is moving under normal conditions, the valve should be pushed in. To apply parking brakes, the valve must be pulled up. The parking brake application valve is a push-pull manually operable on-off air control valve with an exhaust function. It is pressure sensitive, so that it will automatically move from the applied to the exhaust position as supply pressure is reduced to 40 ± 5 psi. It also has an auxiliary port which is connected to the service brake line to release the spring brakes if a service application is made, preventing compounding of forces on the spring brake chambers.

PREVENTIVE MAINTENANCE:

Every six months, 50,000 miles or 1,800 operating hours, check the parking brake valve for proper operation. Refer to "Operating and Leakage test" in this section.

REMOVAL AND INSTALLATION:

Block the vehicle by means other than brakes and drain all reservoirs.

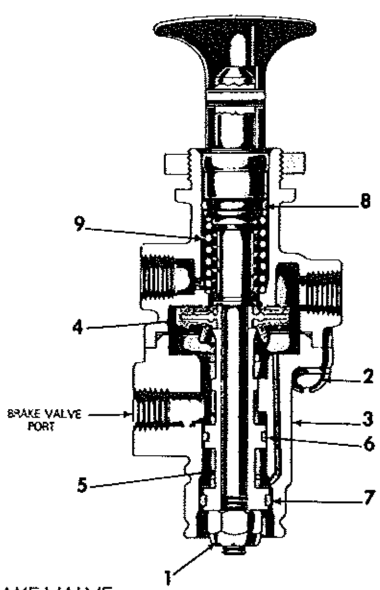
1) Remove the six (6) retaining screws of the access panel located below the parking brake valve, then remove the access panel.

2) Remove the valve button by driving the button roll-pin out with a punch.

3) Disconnect the air connections.

4) Remove the mounting nut and remove the valve.

To install the parking brake valve, apply pipe sealant on all fitting pipe thread connections. Then, reverse the removal procedure.



PARKING BRAKE VALVE

DISASSEMBLY AND REASSEMBLY

1) Insert a small punch through the roll pin hole in the plunger and remove the lock nut (1) from the plunger.

2) Withdraw the plunger and remove the spring (9) and O-Ring (8).

3) Remove the two machine screws (2) and remove the lower cover (3).

4) Remove the inlet-exhaust valve (4), and piston (5).

5) Remove O-Rings (6 & 7) from piston.

6) To reassemble the parking brake valve, reverse the preceding procedure.

OPERATING AND LEAKAGE TESTS

1) Connect a 120 psi air source to the supply port. An accurate test gauge should be tee'd into the supply line and a means of controlling the supply pressure provided. A small volume with a gauge should be connected to the delivery port.

2) With the button pulled out (exhaust position), leakage at the brake valve port or at plunger stem should not exceed a 1" bubble in five seconds.

3) Push the button in. Supply pressure should be present in the delivery volume. Leakage at the exhaust port or around the plunger stem should not exceed a 4" bubble in five seconds.

4) Pull the button out and apply pressure at the brake valve port. Supply pressure should be present in the delivery volume and leakage at the exhaust port should not exceed a 1" bubble in five seconds.

☐ **Note:** If the parking brake valve does not function as described or if leakage is excessive, it is recommended to replace it.

SERVICE BRAKE VALVE

Description:

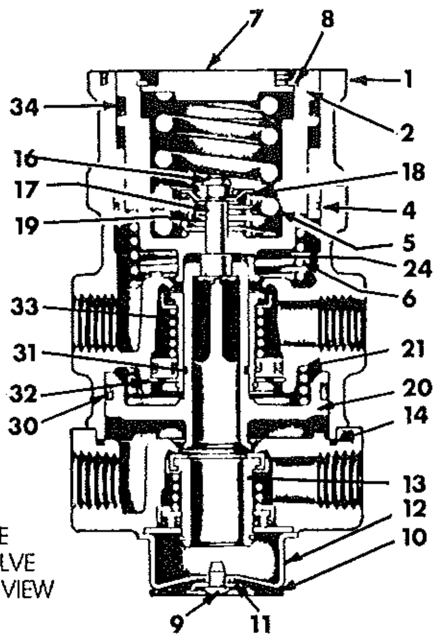
The service brake application valve is a dual brake valve which is floor mounted, treadle operated, and provides the driver with a graduated control for applying and releasing the vehicle brakes. It features two separate supply and delivery circuits for front and rear braking.

The circuits in the service brake valve are identified as follows: The No. 1 circuit portion is that portion of the valve between the spring seat which contacts the plunger and the relay piston; the No. 2 circuit portion is that portion between the relay piston and the exhaust cavity.

BRAKE & AIR SYSTEM

The No. 1 circuit portion of the valve is similar in operation to a standard single-circuit air brake valve, and under normal operating conditions the No. 2 circuit portion is similar in operation to a relay valve.

Both No. 1 and No. 2 circuit portions of the Brake Valve use a common exhaust protected by an exhaust diaphragm.



SERVICE BRAKE VALVE SECTIONAL VIEW

OPERATION

Applying: normal operation - No. 1 circuit portion

When the brake treadle is depressed, the plunger exerts force on the spring seat, graduating spring, and No. 1 piston. The No. 1 piston which contains the exhaust valve seat, closes the No. 1 exhaust valve. As the exhaust valve closes, the No. 1 inlet valve is moved off its seat allowing No. 1 air to flow out the No. 1 delivery port.

Applying: normal operation - No. 2 circuit portion

When the No. 1 inlet valve is moved off its seat, air is permitted to pass through the bleed passage and enters the relay piston cavity. The air pressure moves the relay piston, which contains the exhaust seat and closes the No. 2 exhaust valve. As the No. 2 exhaust valve closes, the No. 2 inlet valve is moved off its seat allowing the No. 2 air to flow out the No. 2 delivery port. Because of the small volume of air required to move the relay piston, action of the No. 2 circuit portion of the valve is almost simultaneous with the No. 1 circuit portion.

Applying: loss of air in the No. 2 circuit

Should air be lost in the No. 2 circuit, the No. 1 circuit portion will continue to function as described above under "Normal Operation: No. 1 Circuit Portion".

Applying: loss of air in the No. 1 circuit

Should air be lost in the No. 1 circuit, the function will be as follows: As the brake treadle is depressed and no air pressure is present in the No. 1 circuit supply and delivery ports, the No. 1 piston will mechanically move the relay piston allowing the piston to close the No. 2 exhaust valve and open the No. 2 inlet valve and allow air to flow out the No. 2 delivery port.

Balanced: No. 1 circuit portion

When the No. 1 delivery pressure acting on the piston equals the mechanical force of the brake pedal application, the No. 1 piston will move and the No. 1 inlet valve will close, stopping the further flow of air from the No. 1 supply line through the valve. The exhaust valve remains closed preventing any escape of air through the exhaust port.

Balanced: No. 2 circuit portion

When the air pressure on the No. 2 side of the relay piston approaches that being delivered on the No. 1 side of the relay piston, the relay piston moves closing the No. 2 inlet valve and stopping further flow of air from the supply line through the valve. The exhaust remains closed as the No. 2 delivery pressure balances the No. 1 delivery pressure.

When applications in the graduating range are made, a balanced position in the No. 1 portion is reached as the air pressure on the delivery side of the No. 1 piston equals the efforts exerted by the driver's foot on the treadle. A balanced position in the No. 2 portion is reached when air pressure on the No. 2 side of the relay piston closely approaches the air pressure on the No. 1 side of the relay piston.

When the brake treadle is fully depressed, both the No. 1 and No. 2 inlet valves remain open and full reservoir pressure is delivered to the actuators.

Releasing: No. 1 circuit portion

With the brake treadle released, mechanical force is removed from the spring seat, graduating spring, and No. 1 piston. Air pressure and spring load moves the No. 1 piston, opening the No. 1 delivery line to exhaust out the exhaust port.

Releasing: No. 2 circuit portion

With the brake treadle released, air is exhausted from the No. 1 circuit side of the relay piston. Air pressure and spring load move the relay piston, opening the No. 2 exhaust valve allowing air pressure in the No. 2 delivery line to exhaust out the exhaust port.

BRAKE & AIR SYSTEM

PREVENTIVE MAINTENANCE

Every 3 months, 25,000 miles or 900 operating hours

Clean any accumulated dirt, gravel, or foreign material away from the heel of the treadle, plunger boot, and mounting plate.

Using light oil, lubricate the treadle roller, roller pin, and hinge pin.

Check the rubber plunger boot for cracks, holes or deterioration and replace if necessary. Also, check mounting plate and treadle for integrity.

Apply 2 to 4 drops of oil between plunger and mounting plate — **do not over oil!**

Every year, 100,000 milles, or 3,600 operating hours

Disassemble, clean parts with mineral spirits, replace all rubber parts or any part worn or damaged. Check for proper operation before placing vehicle in service.

SERVICE CHECKS

Operating check

Check the delivery pressure of both No. 1 and No. 2 circuits using test gauges known to be accurate. Depress the treadle to several positions between the fully released and fully applied positions, and check the delivered pressure on the test gauges to see that it varies equally and proportionately with the movement of the brake pedal.

After a full application is released, the reading on the test gauges should fall off to zero promptly. It should be noted that the No. 1 circuit delivery pressure will be about 2 PSI greater than the No. 2 circuit delivery pressure with both supply reservoirs at the same pressure. This is normal for this valve.

Important

A change in vehicle braking characteristics or a low pressure warning may indicate a malfunction in one or the other brake circuit, and although the vehicle air brake system may continue to function, the vehicle should not be operated untill the necessary repairs have been made and both braking circuits, including the pneumatic and mechanical devices are operating normally. Always check the vehicle brake system for proper operation after performing brake work and before returning the vehicle to service.

Leakage check

1) Make and hold a high pressure (80 psi) application.

2) Coat the exhaust port and body of the brake valve with a soap solution.

3) Leakage permitted is a one inch bubble in 3 seconds.

If the brake valve dos not function as described above or leakage is excessive, it is recommended that it be replaced with a new or remanufactured unit, or repaired with genuine Prevost parts.

REMOVAL

1) Block de vehicle wheels or park the vehicle by mechanical means. Drain all air system reservoirs.

2) Identify and disconnect all supply and delivery lines at the brake valve.

3) Remove the brake valve and treadle assembly from the vehicle by removing the three cap screws on the outer bolt circle of the mounting plate. The basic brake valve alone can be removed by removing the three cap screws on the inner bolt circle.

DISASSEMBLY (See Fig. 12-2)

1) If the entire brake valve and treadle assembly was removed from the vehicle, remove the three cap screws securing the treadle assembly to the basic brake valve.

2) Remove the Philips head screw (9) securing the exhaust diaphragm (10) and washer (11) to the exhaust cover (12).

3) Remove the four screws that secure the exhaust cover (12) to the lower body.

4) Remove the No. 2 inlet and exhaust valve assembly (13) from the lower body.

5) Remove the four hex head cap screws securing the lower body to the upper body and separate the body halves.

6) Remove the rubber seal ring (14) from the lower body.

7) While depressing spring seat (7), remove retaining ring (8).

8) Remove spring seat and coil spring (5).

9) Using a 3/8" wrench, hold the lock nut (16) on the threaded end of the stem (17) in the primary piston (2). Insert a screwdriver in the exhaust passage through the center of the valve and engage the slotted head of the stem.

BRAKE & AIR SYSTEM

10) Remove lock nut (16), spring seat (18), stem spring (19), primary piston (2), and primary piston return spring (6). Remove O-ring (34).

11) Remove adapter (1). Remove O-ring (4) from adapter.

■ **Caution:** Before proceeding with the disassembly, refer to Figure 4 and note that the lock nut and stem are used to contain the No. 1 piston return spring, stem spring and the relay piston spring. The combined force of these springs is approximately 50 pounds and care must be taken when removing the lock nut as the spring forces will be released. It is recommended that the primary piston and relay piston be manually or mechanically contained while the nut and stem are being removed.

CLEANING AND INSPECTION

1) Wash all metal parts in mineral spirits and dry.

2) Inspect all parts for excessive wear or deterioration.

3) Inspect the valve seats for nicks or burrs.

4) Check the springs for cracks or corrosion.

5) Replace all rubber parts and any part not found to be serviceable during inspection, using only genuine Bendix replacement parts.

ASSEMBLY

Prior to reassembling, lubricate all O-rings, O-ring grooves, piston bores and metal to metal moving surfaces with Dow Corning 55-M pneumatic grease.

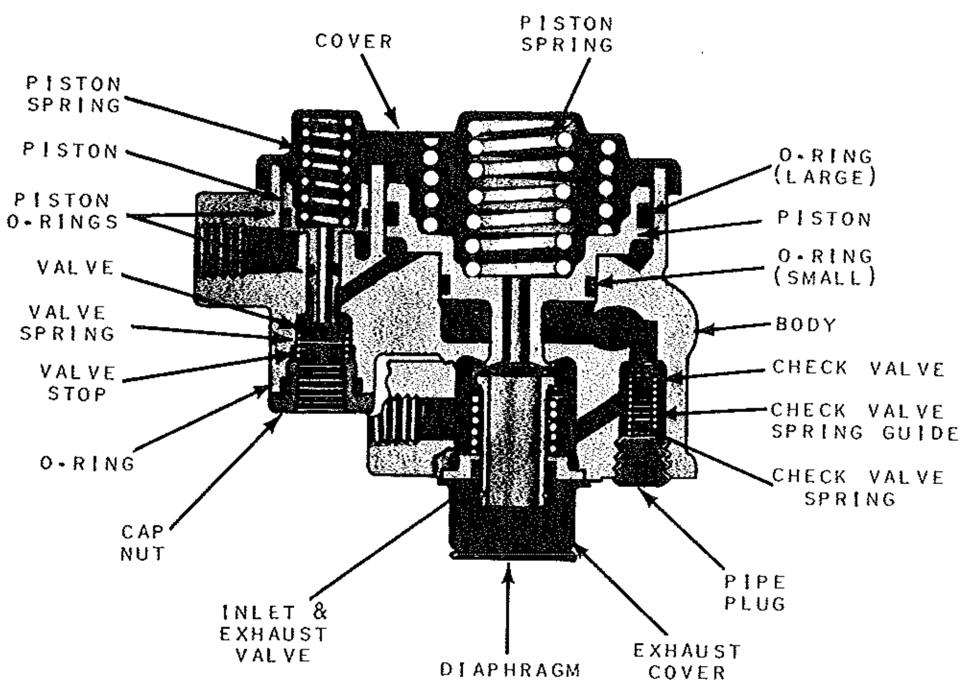
☐ **Note:** All torques specified in this manual are **assembly** torques and can be expected to fall off, after assembly is accomplished. **Do not retorque** after initial assembly torques fall.

To reassemble the service brake valve, reverse the disassembly procedure.

SPRING BRAKE VALVE

The spring brake valve is located under the vehicle floor, at the bottom of the spare tire compartment. The function of the spring brake valve is to supply a specific, limited hold-off pressure to the spring brakes, and in the event of loss of no. 1 service air pressure, to modulate the spring brakes through the use of the service brake valve.

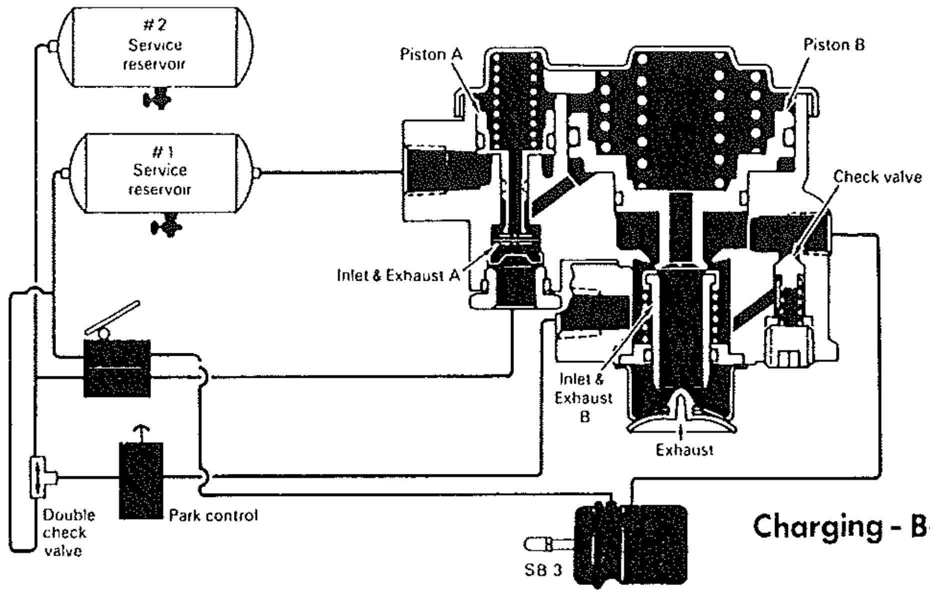
The valve has four air connection ports and a diaphragm protected exhaust port. Each air connection port is labeled with embossed letters to assists in the identification. Two (2) 5/16" diameter holes are provided in the integral mounting bracket of the valve body.



Spring brake valve – Sectional view

BRAKE & AIR SYSTEM

Operation — Initial air system charge

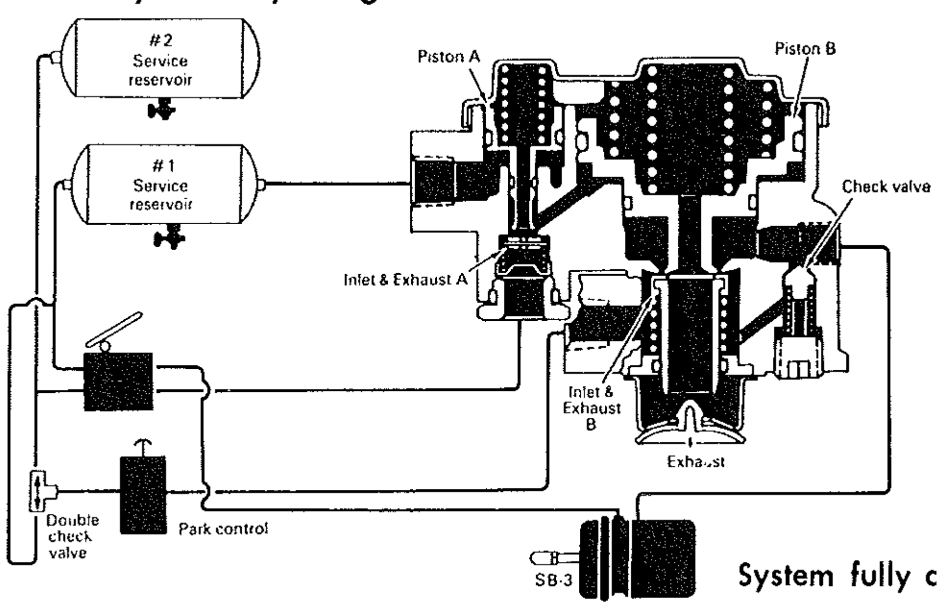


Charging - Belows 55 p.s.i.

Initial charge air, from #1 & #2 service reservoirs flows through the park control valve and enters the spring brake valve supply port. Air entering the supply port flows past inlet and exhaust valve B to the underside of piston B and out the delivery port of the spring brake valve to the emergency air connection at the spring brake actuator. Note that the springs above piston B force it into contact with inlet and exhaust valve B. In the position shown the exhaust is closed and the inlet is open.

Air flowing from the No. 1 reservoir only enters the reservoirs port of spring brake valve. This air remains under piston A as system pressure builds. With No. 1 reservoir pressure below approximately 55 P.S.I. the spring above the piston A forces it into contact with inlet and exhaust valve A causing the exhaust to seal and the inlet to open.

Operation — Air brake system fully charged



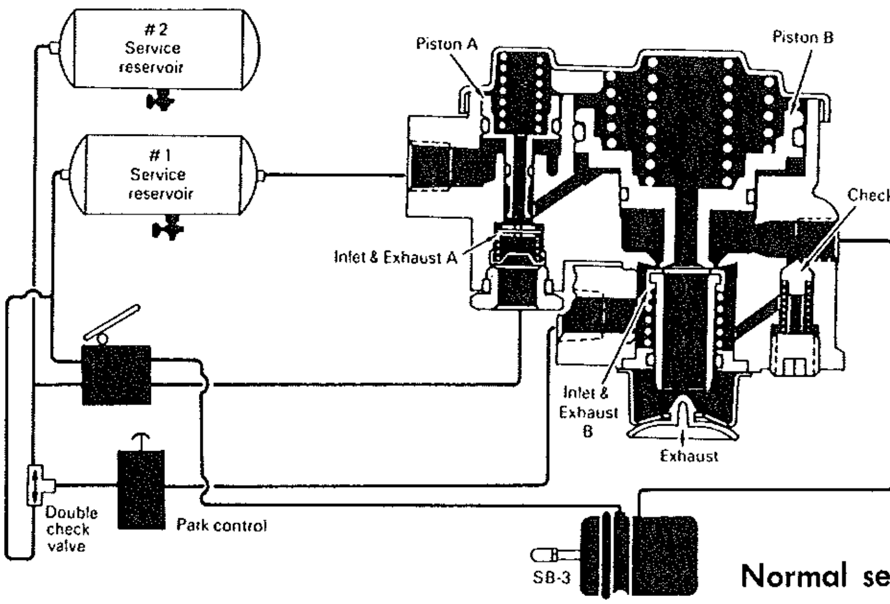
System fully charged

BRAKE & AIR SYSTEM

With air system pressure above approximately 55 P.S.I. in No. 1 & 2 service reservoirs, piston A has moved against the force of the spring above it, allowing the inlet of valve A to close and opening the hollow exhaust passage through piston A.

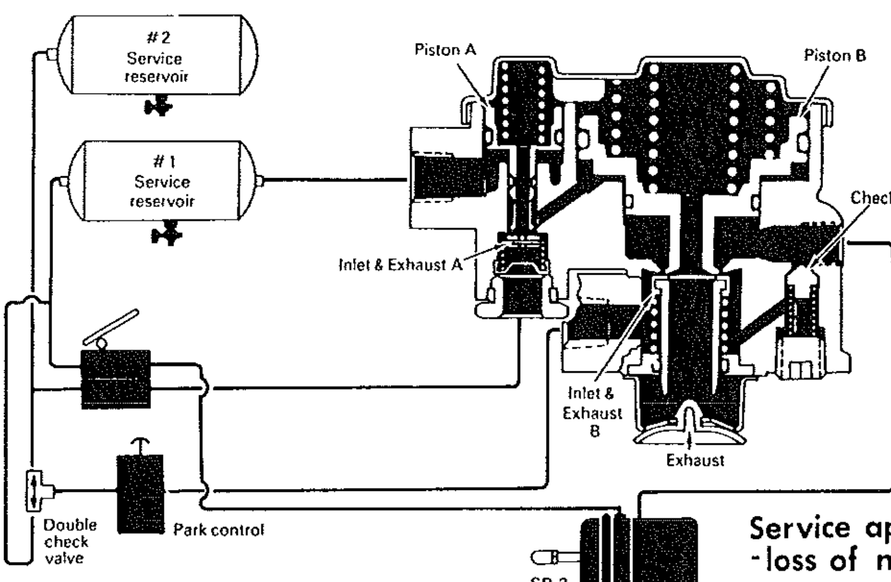
When air pressure beneath piston B is approximately 95 P.S.I., piston B rises slightly, against the force of the springs above it, allowing the inlet of valve B to close. The exhaust through valve B remains closed. The closing of the inlet portion of valve B traps approximately 95 P.S.I. in the hold-off cavity of the spring brake actuators while allowing full air system pressure to build else-where.

Operation — Normal service reservoirs 1 & 2 charged



Normal service application

When a service application is made by actuating the dual brake valve, air from the No. 2 delivery circuit is delivered from the brake valve to the control port, and is stopped at the closed inlet of valve A. No movement of the internal components of the spring brake valve takes place. Air from the No. 1 delivery circuit of the dual brake valve actuates the service section of the spring brake actuators.

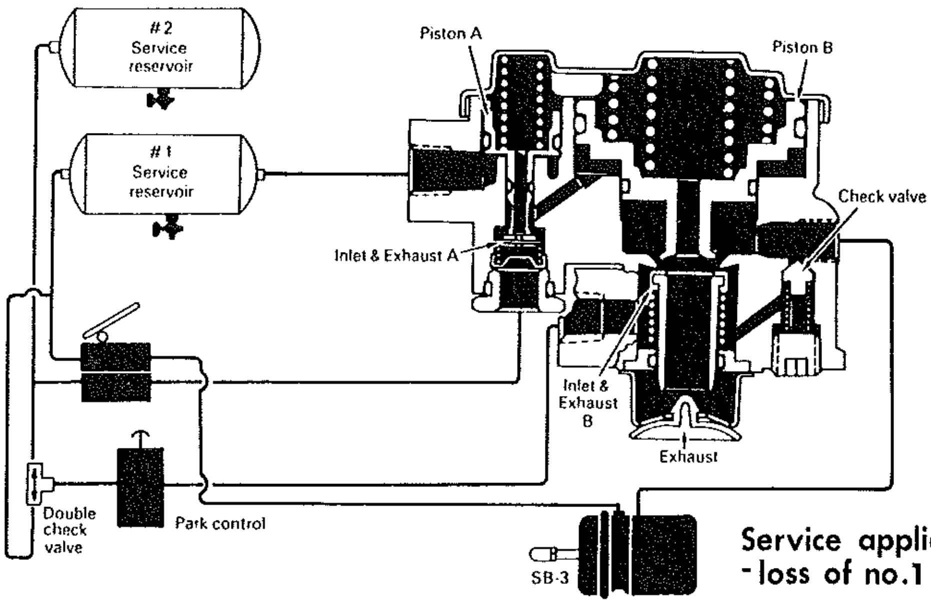


Service application -loss of no.2 reservoir

BRAKE & AIR SYSTEM

Operation — Service application with loss of No. 2 reservoir pressure

In the event air pressure is lost in No. 2 reservoir, the No. 1 reservoir as well as the parking control valve will be protected through the action of the double and single check valves in the air system. A service application of the dual air brake valve in this situation results in little or no air being delivered from the No. 2 delivery circuit to the control port of the spring brake valve. No movement of the spring brake valve internal components takes place. Braking is assured since the No. 1 service reservoir is protected and the No. 1 delivery circuit of the dual brake valve will apply the service of the spring brake actuators.



Service application - loss of no.1 reservoir

Operation — Service application with loss of No. 1 reservoir pressure

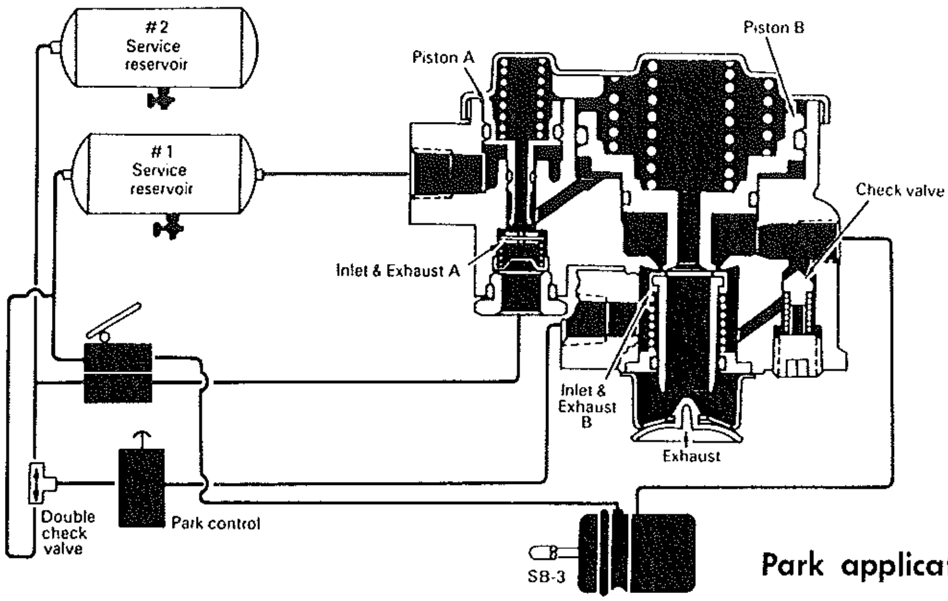
When air pressure in the No. 1 service reservoir falls below approximately 55 P.S.I., the pressure beneath piston A is insufficient to resist the spring force above and piston A moves into contact with valve A. Initial contact between piston A and valve A closes the hollow exhaust passage of piston A. Continued movement of the piston opens the inlet of valve A.

The No. 2 service reservoir and the park control valve are protected from pressure loss by the action of the Double Check Valve.

When a service application of the dual brake valve is made, air delivered from the No. 2 delivery circuit of the dual brake valve enters the spring brake valve control port. Air entering the control port, now moves past the inlet of valve A and is conducted through a passage in the body to the underside of piston B. The added force of air pressure beneath piston B, moves up, opening the exhaust of valve B. When the exhaust of valve B opens, air pressure trapped in the emergency section of the spring brake actuator is allowed to escape resulting in a brake application by the emergency section. The amount of air pressure released from the spring brake is in proportion to the amount of air pressure delivered to the control port of the spring brake valve by the No. 2 delivery of the dual brake valve.

BRAKE & AIR SYSTEM

Operation — Parking



Park application

With both system #1 and #2 intact when the park control valve is placed in the "park" or exhaust position, the spring brake valve supply of air pressure and the air pressure in the spring brake actuator cavities is exhausted. The single check valve in the spring brake assists this exhaust of air pressure from the spring brake by allowing the air below piston B to flow back out the open exhaust of the park control valve. When air pressure below piston B has dropped sufficiently, piston B moves down opening the inlet of valve B thus providing an additional exhaust passage for air exhausting through the spring brake valve from the spring brakes.

Preventive maintenance

After every 3,600 operating hours, 100,000 miles or yearly, clean and inspect all parts. If signs of wear or deterioration are found, install new parts using only genuine Prevost replacement parts.

SERVICE CHECKS

Operating checks

Block vehicle and hold by means other than vehicle brakes. Charge air brake system to governor cut-out pressure.

1) Place parking control valve in the "park" position. Observe that the spring brake actuators apply promptly. In the delivery port of the valve install a test gauge known to be accurate. Place the parking control valve in the "release" position. Observe that the spring brake actuators release fully.

2) With the parking control valve in the "release" position, note the gauge pressure reading. If the pressure reading is lower than governor cut-out pressure, the valve must be repaired or replaced.

3) Place the parking control valve in the "park" position, the gauge reading should drop to zero promptly. A slow release of pressure could indicate faulty operation of the single check valve.

4) Place the parking control valve in the "release" position. Locate the number one service reservoir and drain it completely.

Apply the foot brake valve several times and note that the pressure reading on the gauge decreases each time the foot brake valve is applied. After the foot brake valve has been applied several times, pressure on the gauge will drop to the point where release of the spring brake actuators will no longer occur.

Leakage check

With the air system fully charged and the parking control valve in the "release" position, coat the exhaust port and

BRAKE & AIR SYSTEM

around the valve corner with a soap solution. Slight leakage is permitted.

If the Spring Brake Valve does not function as described above, or leakage is excessive, it is recommended that it be replaced. If it is not possible, the valve can be repaired with genuine Prevost parts.

REMOVAL

1) Prior to removing the spring brake valve, apply the parking brakes and drain all the vehicle reservoirs.

2) Identify or mark all air line before disconnecting them from the spring brake valve.

3) Remove the two mounting bolts from the spring brake valve and remove the valve.

DISASSEMBLY

1) Remove the socket head pipe plug.

2) Remove the check valve spring, spring guide, and the check valve.

3) Remove the two Philips head screws and remove the exhaust cover.

4) Separate the exhaust diaphragm from the cover.

5) Remove the inlet and exhaust valve assembly.

6) Remove the inlet and exhaust valve cap nut and separate the cap nut O-ring.

7) Remove the valve stop, valve spring and inlet and exhaust valve.

8) Remove the four Philips head screws and lockwashers that secure the cover to the body.

■ **Caution:** The cover is under a spring load, and should be held while removing the screws.

9) Remove the cover and the three piston springs.

10) Remove the small piston and the small and large O-rings.

11) Remove the large piston and the large and small O-rings from it.

CLEANING & INSPECTION

Wash all metal parts in cleaning solvent and dry them.
Inspect all parts for excessive wear or deterioration.
Inspect the valve seats for nicks or burrs.
Check the springs for cracks or corrosion.
Replace all rubber parts and any part not found to be serviceable during inspection, using only genuine Prevost replacement parts.

ASSEMBLY

Prior to reassembly of the Spring Brake Valve, lubricate all O-rings, O-ring grooves, piston bores and metal to metal moving surfaces with silicone base lubricant.

☐ **Note:** All torques specified in this manual are **assembly** torques and can be expected to fall off, after assembly is accomplished. **Do not retorque** after initial assembly torques fall.

To convert inch pounds of torque to foot pounds of torques, divide inch pounds by 12.

$$\frac{\text{Inch pounds}}{12} = \text{Foot pounds}$$

To convert foot pounds of torque in inch pounds of torque multiply foot pounds by 12.

$$\text{Foot pounds} \times 12 = \text{Inch pounds}$$

1) Assemble the check valve, valve spring guide and valve spring and insert them in the body.

2) Apply a pipe sealant to the socket head pipe plug and install it in the body. Tighten to 130-170 inch pounds of torques.

3) Place the inlet and exhaust valve assembly into the valve body.

4) Secure the exhaust cover using the two 10-24 Philips screws and their lockwashers.

5) Tighten the screws to 20-30 inch pounds of torque. Insert the exhaust diaphragm into the exhaust cover.

6) Place inlet exhaust valve in the body and install the valve spring and valve stop.

7) Install the O-ring on the cap nut and install the cap nut in the body. Tighten to 100-125 inch pounds of torque.

8) Install the small and large O-rings on the small diameter piston and insert the piston in the body.

9) Intall the large and small O-rings on the large diameter piston and insert the piston in the body.

10) Install the piston springs in their respective pistons.

11) Secure the cover to the body using the four ¼"-20 Philips head screws and lockwashers.

12) Tighten the four screws using 50-80 inch pounds of torque.

BRAKE & AIR SYSTEM

QUICK RELEASE VALVES

Description

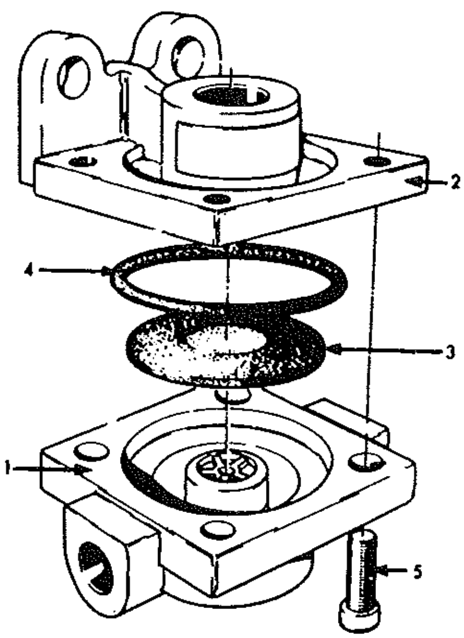
The quick-release valve speeds up the release of air pressure from the front brake chambers. When a brake valve application is released, the exhaust of the quick-release valve opens and the air pressure accumulated in the brake chambers is exhausted through the quick-release valve, rather than exhausting back through the brake valve.

A line from a delivery port of the brake valve is connected to the top port of the quick-release valve. The two side ports are for brake chamber connections and the bottom port is the exhaust.

Operation

When a brake valve application is made, air pressure enters the top port of the quick-release valve, moves the diaphragm down, closing the exhaust port. At the same time this air pressure forces the edges of the diaphragm down and flows past into the brake chambers.

As soon as the brake chamber pressure beneath the diaphragm equals the air pressure being delivered by the brake valve, the diaphragm spring forces the outer edges of the diaphragm against the body seat. The exhaust port is still sealed by the center portion of the diaphragm. When the brake valve is released, air pressure above the diaphragm raises it and the exhaust port opens allowing brake chamber pressure to release.



1. Body
2. Cover
3. Diaphragm
4. Grommet
5. Cap Screw

Maintenance

Every 3,600 operating hours, 100,000 miles or yearly, clean exhaust port and check the valve for leakage as outlined below.

Leakage test

Make and hold a foot brake valve application and coat exhaust port with soap solution. Leakage of a one (1) inch bubble in three (3) seconds is permitted. Coat body and cover with soap solution. No leakage permitted between body and cover.

If the quick-release valve does not function as described or if leakage is excessive, it is recommended that it be replaced.

Removal and installation

Drain air brake system. Disconnect air lines from quick-release valve. Remove mounting bolts, and then valve.

To re-install mount quick-release valve with its exhaust port pointing down. Connect brake valve to top port and brake chamber lines to side ports. Make sure exhaust port is not restricted.

RELAY VALVES

Description

The Relay Valve functions as a relay station to speed up the application and release of the brakes. The valve is mounted at the rear of the vehicle in proximity to the chamber it serves. The valve operates as a remote controlled brake valve that delivers or releases air to the chambers in response to the control air delivered to it from the foot brake valve.

OPERATION

Application

Air pressure delivered to the service port enters the small cavity above the piston and moves the piston down. The exhaust seat moves down with the piston and seats on the inner or exhaust portion of the inlet/exhaust valve, sealing off the exhaust passage. At the same time, the outer or inlet portion of the inlet/exhaust valve moves off its seat, permitting supply air to flow from the reservoir, past the open inlet valve and into the brake chambers.

BRAKE & AIR SYSTEM

Balance

The air pressure being delivered by the open inlet valve also is effective on the bottom area of the relay piston. When air pressure beneath the piston equals the service air pressure above, the piston lifts slightly and the inlet spring returns the inlet valve to its seat. The exhaust remains closed as the service line pressure balances the delivery pressure. As delivered air pressure is changed, the valve reacts instantly to the change holding the brake application at that level.

Exhaust or release

When air pressure from the service port and air pressure in the cavity above the relay piston is exhausted, air pressure beneath piston lifts the relay piston and the exhaust seat moves away from the exhaust valve, opening the exhaust passage. With the exhaust passage open, the air pressure in the brake chambers is then permitted to exhaust through the exhaust port, releasing the brakes.

Maintenance

Every three months, 25,000 miles (40,000 km) or 900 operating hours, check for proper operation.

Operational and leakage test:

1) Chock the wheels, fully charge air brake system and adjust the brakes.

2) Make several brake applications and check for prompt application and release at each wheel.

3) Check for inlet valve and O-ring leakage: with the service brakes released, coat the exhaust port and the area around the retaining ring with a soap solution; 1" bubble in 3 seconds leakage is permitted.

4) Check for exhaust valve leakage: with the service brakes fully applied, coat the exhaust port with a soap solution; 1" bubble in 3 seconds leakage is permitted. Coat the outside of the valve where the cover joins the body to check for seal ring leakage; no leakage is permitted.

If the valves do not function as described above, or if leakage is excessive, it is recommended to replace them.

REMOVAL AND INSTALLATION

Removal

1) Block and hold vehicle by means other than air brakes.

2) Drain brake system reservoirs.

3) Identify air lines and disconnect them from valve.

4) Remove mounting bolts, then valve.

Installation

1) Clean air lines.

2) Inspect all lines for damage and replace as necessary.

3) Install valve and tighten mounting bolts.

4) Connect air lines to valve.

5) Test valve as outlined in "Operational and Leakage Test".

AIR COMPRESSOR

Description

The function of the air compressor is to provide and maintain air under pressure to operate devices in the air brake and auxiliary air systems.

The air compressor is a two cylinder single state, reciprocating compressor with a rated displacement of 15.5 cubic feet (439 dm^3) of air per minute at 1250 RPM.

The compressor assembly is made up of three cast iron sub-assemblies; the cylinder head, the cylinder block and the crankcase. The cylinder head houses the discharge valving and is installed to the cylinder block. The cylinder block houses the cylinder bores and inlet valves and is installed to the crankcase. The crankcase houses the crankshaft and main bearings.

The cylinder head and block are cooled by coolant routed to the compressor from the engine cooling system. Lubrication of the internal parts of the compressor is provided by the oil feed line from the engine's pressurized oil system.

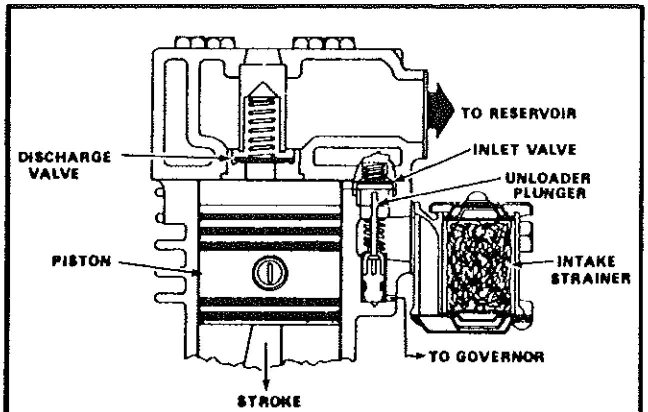
OPERATION

The compressor is driven by the vehicle engine and is operating continuously while the engine is running. Actual compression of air is controlled by the compressor unloading mechanism and the governor. The governor is mounted on the compressor and maintains the brake system air pressure to a preset maximum and minimum pressure level.

BRAKE & AIR SYSTEM

Intake & Compression (Loaded):

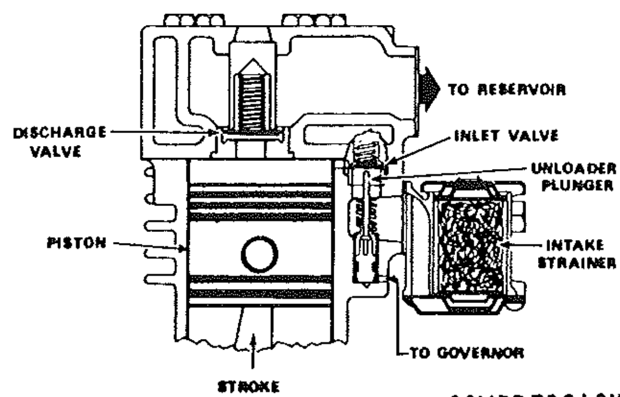
During the downstroke of the piston, a slight vacuum created above the piston causes the inlet valve to move off its seat. Atmospheric air is drawn in through the compressor intake, past the open inlet valve, and on top of the piston.



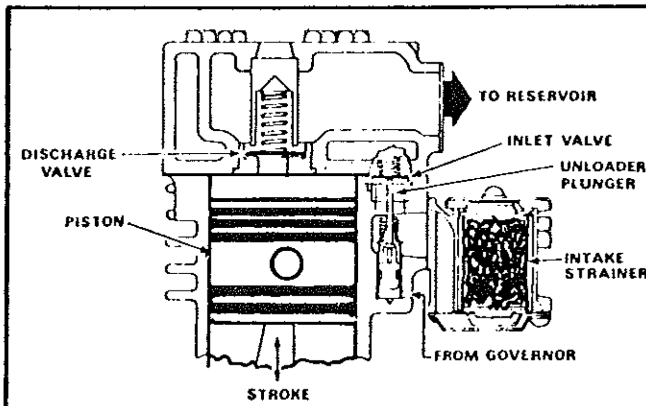
INTAKE

As the piston starts its upward stroke, the air that was drawn in on the down stroke is being compressed. Now, air pressure on top of the inlet valve plus the force of its spring, returns the inlet valve to its seat. The piston continues the upward stroke and compresses the air sufficiently to overcome the discharge valve spring and upseat the discharge valve. The compressed air then flows past the open discharge valve, into the discharge line and on to the reservoirs.

As the piston reaches the top of its stroke and starts down, the discharge valve spring returns the discharge valve to its seat. This prevents the compressed air in the discharge line from returning to the cylinder bore as the intake and compression cycle is repeated.



COMPRESSION



UNLOADING

Non-compression (Unloaded):

When the air pressure in the reservoir reaches to high pressure setting of the governor, the governor opens, allowing air to pass from the reservoir through the governor and into the cavity beneath the unloader pistons. This lifts the unloader pistons and plungers. The plungers move up and hold the inlet valves off their seats.

With the inlet valves held off their seats by the unloader pistons and plungers, air is merely pumped back and forth between the two cylinders. When air is used from the reservoir and the pressure drops to low pressure setting of the governor, the governor closes and in doing so exhauts the air from beneath the unloader pistons. The unloader saddle spring forces the saddle, pistons and plungers down and the inlet valves return to their seats. Compression is then resumed.

Maintenance

Every 6 months, 1,800 operating hours or 50,000 miles (80,500 km), remove the discharge fittings and inspect the compressor discharge port and discharge line for excessive carbon deposits. If the excessive build-up is noted in either, the discharge line must be cleaned and the air induction system, oil supply system and if necessary, replace compressor. Check for noisy compressor operation which could indicate a worn drive gear coupling. Check all compressor mounting bolts and retighten evenly if necessary. Check for leakage and proper unloader operation.

■ **Caution:** Should it be necessary to drain the engine cooling system to prevent damage from freezing, the cylinder head of the compressor must also be drained.

GENERAL SERVICE CHECKS

Inspection

It is of the utmost importance that the compressor receives a clean supply of air. The connection of the compressor intake to the engine air cleaner must be properly installed and maintained. Check the compressor mountings to be sure they are secure.

Inspect the oil supply and return lines. Be sure these lines are properly installed and that the compressor is getting the proper supply of oil, and just as important, that the oil is returning to the engine. Check the coolant lines to and from the compressor. Check the unloader mechanism for proper operation.

Operating and leakage tests

The air compressor must be capable of raising air system pressure from 85 to 100 psi in 25 seconds or less. This test must be performed with the engine operating at maximum recommended governed speed.

Leakage past the discharge valves can be detected as follows: Remove the discharge line and cylinder head from the compressor and apply shop air back through the discharge port. Coat the discharge valve seats with soapsuds. Bubble leakage is permitted.

The unloader pistons can be checked for leakage as follows: Build up the air system to governor cut-out and shut off engine. Listen for escaping air at the compressor intake. To pinpoint leakage, apply a small amount of oil around the unloader pistons. No leakage permitted.

If the compressor does not function as described above, or leakage is excessive, it is recommended that it be replaced or exchanged for a rebuilt unit.

Removal and installation

Drain the air pressure from all the reservoirs in the system. Disconnect all air, water, and oil lines leading to and from the compressor. Remove the four (4) compressor mounting bolts. Then, remove compressor and drive gear. Inspect drive gear for visible wear or damage. Since this part is precision fitted, it must be replaced if its is worn or damaged.

To install the compressor, reverse the above procedure.

Testing rebuilt compressor

In order to properly test a compressor under operating conditions, a test rack for correct mounting, cooling, lubricating, and driving the compressor is necessary. Such tests are not compulsory if the unit has been carefully rebuilt by an experienced person. A compressor efficiency or build-up test can be run as follows: An engine lubricated compressor must be connected to an oil supply line of at least 15 pounds pressure during the test and an oil return line must be installed to keep the crankcase drained.

Connect to the compressor discharge port, a reservoir with a volume of 1500 cubic inches, including the volume of connecting line. With the compressor operating at 2100 rpm, the time required to raise the reservoir pressure from 85 psi to 100 psi should not exceed 5 seconds. During this test, the compressor should be checked for gasket leakage and noisy operation, as well as unloader operation and leakage.

Troubleshouting

The following is a list of the most commonly experienced compressor deficiencies and their probable causes.

Excessive build-up and recovery time

1) Restriction in the compressor inlet or discharge lines or cavities.

2) Leaking or broken discharge valves.

3) Inlet valves worn excessively or stuck open.

4) Excessive air system leakage

5) Excessive wear on piston rings and/or cylinders.

Noisy compressor operation

1) Excessively worn drive coupling.

2) Worn or burned out bearings.

3) Excessive wear.

4) Improper lubrication to the compressor

5) Restrictions in the cylinder head or discharge line.

Excessive oil passage

1) A small, kinked, or restricted oil return line.

2) Back pressure from the engine crankcase.

3) High inlet vacuum at the compressor.

4) Excessive engine oil pressure.

5) Defective oil seal or oil seal ring in the end cover(s)

6) Piston rings improperly installed.

7) Excessive ring or cylinder wear.

BRAKE & AIR SYSTEM

Compressor fails to unload

1) Defective or worn unloader pistons or bores.

2) Inlet cavity restrictions.

3) Defective governor.

4) Unloader line from govenor pistons kinked or the cavity beneath the unloader pistons restricted.

5) Unloader mechanism binding or kinked.

SPECIFICATIONS

Number of cylinders	2
Bore size	2.75"
Stroke	1.81"
Displacement @ 1250 RPM	15.5 CU. FT.
Maximum recommended RPM	3000
Minimum coolant flow at maximum RPM	2.5 GAL/MIN.
Recommended maximum inlet temp.	250°F
Recommended maximum discharge temp.	400°F
Minimum pressure required to unload	60 PSI
Recommended air induction	naturally aspirated only
Weight	46 lbs. (approx.)

GOVERNOR

Description

The governor, operating in conjunction with the compressor unloading mechanism, automatically controls the air pressure in the air brake or air supply system between the desired, predetermined maximum and minimum pressures. The compressor runs continually while the engine runs, but the actual compression of air is controlled by the governor actuating the compressor unloading mechanism which stops or starts compression when the maximum or minimum reservoir pressures are reached. The governor has a piston upon which air pressure acts to overcome the pressure setting spring and control the inlet and exhaust valve to either admit or exhaust air to or from the compressor unloading mechanism.

Operation

Reservoir air pressure enters the governor at its reservoir port and acts on the area of the piston and beneath the inlet and exhaust valve. As the air pressure builds up, the piston moves against the resistance of the pressure setting spring. The piston and inlet and exhaust valve move up when the reservoir air pressure reaches the cut-out setting of the governor. The exhaust stem seats on the inlet and exhaust valve and then the inlet passage opens. Reservoir air pressure then flows by the open inlet valve, through the passage in the piston and out the unloader port to the compressor unloading mechanism. Air also flows around the piston and acts upon the additional area of the piston. This additive force wich results from a larger area on the piston assures a positive action and fully opens the inlet valve.

As the system reservoir air pressure drops to the cut-in setting of the governor, the force exerted by the air pressure on the piston will be reduced so that the pressure setting spring will move the piston down. The inlet valve will close and the exhaust will open. With the exhaust open, the air in the unloader line will escape back through the piston, through the exhaust stem and out the exhaust port.

Preventive maintenance

Every 3 months, 25,000 miles or 900 operating hours clean or replace filters. If filters are removed, they should be replaced with new filters.

Every 6 months, 50,000 miles or 1800 operating hours, disassemble, clean and replace parts if necessary.

SERVICE TESTS

Operating tests

Start engine and build up air pressure in the air system and check the pressure registered by the dash gauge or test gauge at the time the governor cuts out, stopping the compression of air by the compressor. The cut-out pressure should be approximately 115-118 p.s.i. (793-814 kPa) maximum.

With the engine still running, make a series of brake applications to reduce the air pressure and observe at what pressure to governor cuts-in the compressor. As in the case of the cut-out pressure, the cut in pressure should be 95-105 p.s.i. (655-724 kPa). Never condemn or adjust the governor pressure settings unless they are checked with an accurate test gauge or a dash gauge that is registering accurately. If the pressure settings of the gouvernor are inaccurately or it is necessary that they be changed, the procedure is as follows:

a) Remove the top cover from the governor.

b) Loosen the adjusting screw locknut.

c) To raise the pressure settings, turn the adjusting screw counter-clockwise.

To lower the pressure settings, turn the adjusting screw clockwise.

☐ **Note:** The pressure range between cut-in and cut-out is non-adjustable.)

Leakage Test

Leakage tests on the D-2 Governor should be in both cut-in and cut-out position.

Cut-in position

Apply soap solution to exhaust port. Slight bubble leakage permitted. Excessive leakage indicates a faulty inlet valve or lower piston O-ring.

BRAKE & AIR SYSTEM

Cut-out position

Apply soap solution to exhaust port. Slight bubble leakage permitted. Excessive leakage indicates a faulty exhaust valve seat, stem, O-ring or upper piston O-ring.

If the governor does not function as described or leakage is excessive, it is recommended that it be replaced with a new or remanufactured unit, or repaired with genuine Prevost parts.

Removal and installation

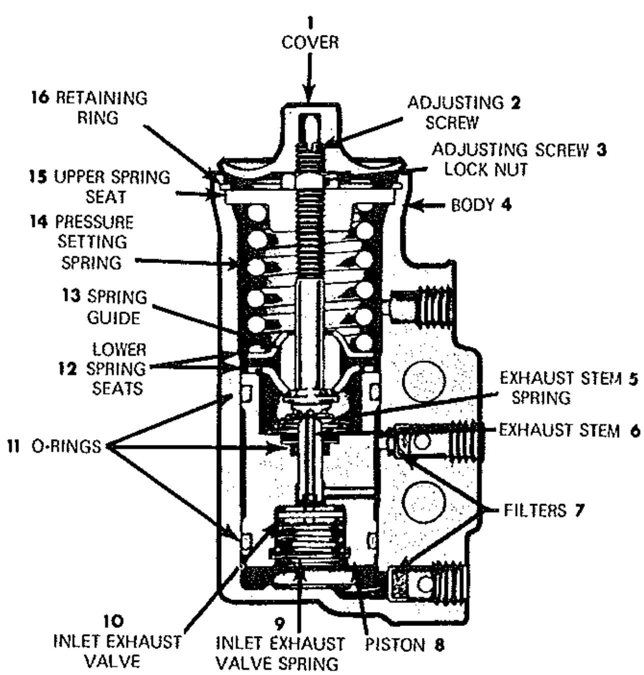
Apply parking brake.

Drain air brake system and disconnect reservoir air line.

Remove governor mounting bolts, then governor.

Clean mounting pad on both compressor and governor block. Clean connecting line, or lines. Also be sure compressor unloading port is clear and clean.

Install governor using a new governor mounting gasket. Connect air lines to governor. Test governor as outlined earlier.



Governor – Sectional view

Disassembly

Clean governor exterior of road dirt and grease.

Unscrew the top cover (1).

With a pair of retaining ring pliers, remove the spring assembly retaining ring (16).

Remove the adjusting screw (2) and spring assembly.

Remove the lock nut (3), then the hex-shaped upper spring seat (15) from the adjusting screw.

Remove the pressure setting spring (14), lower spring seat (12), spring guide (13) and the other lower spring seat (12) from the adjusting screw.

Remove the exhaust stem and its spring from the top of the piston. With the body in the inverted position, tap lightly and remove the piston.

Remove the inlet and exhaust valve spring (9) and the valve (10) from the piston.

Remove the two piston O-rings (11) and with a hooked wire remove the exhaust stem O-ring (11).

Clean or remove the unloader and reservoir port filters (7).

Cleaning and inspection

Clean all metal parts in meneral spirits.

Wipe rubber parts dry.

Inspect body for cracks or other damage. Be particularly careful that all air passages in the body, filters, exhaust stem, and piston are not obstructed.

Check springs for craks, distortion, or corrosion.

Replace all parts which are worn or dammaged.

Assembly

Prior to assembly lubricate the lower body bore, the top of the piston, the piston grooves, piston O-rings, spring guide and ajusting screw with Dow Corning 55-M pneumatic grease.

Install the exhaust stem O-ring (11) in its groove in the stem bore of the piston.

Install upper and lower piston O-rings (11).

Drop the inlet and exhaust valve (10) into place at the bottom of the piston.

BRAKE & AIR SYSTEM

Install the inlet valve spring (9) with the small end against the valve. Press the spring down until the larger coiled end snaps into the groove inside the piston.

Position the exhaust stem spring (5) over the exhaust stem. Then carefully press the stem into the stem bore of the piston.

Install the piston in the body.

Install one lower spring seat (12), spring guide (13), the other lower spring seat (12), pressure setting spring (14), and the hex-shaped upper spring seat (15) on the adjusting screw, in that order. Screw the upper spring seat (15) down until the dimension from the top of the seat to the bottom of the stem head is approximately 1-7/8 inches.

Install the lock nut (3).

Before placing the adjusting screw and stem assembly in the governor body, check to be sure the exhaust stem (6) and its spring are in place in the piston.

Install the adjusting screw (2) and spring assembly and retaining ring (16).

Perform operating and leakage checks as outlined under Service Checks section.

After checks have been completed, top cover should be screwed on tightly until it seals the body against the entrance of any foreign matter.

If necessary, install new filters in the reservoir and unloader ports. These cup-shaped filters can be installed with the head of a pencil.

AIR DRYER

Description

The air dryer is installed between the drive axle and the tag axle, on the right side of the vehicle. The purpose of the air dryer is to remove any water and oil vapor from the air system, by means of condensation and a desiccant. This provides longer component life and helps prevent freeze-up. The system is self-purging during the unloading cycle of the air compressor.

The housing assembly consists of two cylindrical steel stampings welded together. A safety valve is mounted in the lower housing assembly protecting against excessive pressure build-up within the housing.

The desiccant sealing plate assembly is located midway in the housing assembly and houses a replaceable ball-type single check. Also located in the plate assembly is the purge orifice.

The desiccant cartridge and the pleated paper oil filter are removable and comprise a complete serviceable unit.

The desiccant beads, which are referred to as the "drying bed", are a drying substance that has the unique property of exposing a tremendous surface area in proportion to its bulk. One pound of the desiccant beads has about two millions square feet of absorptive area made up of a large number of submicroscopic cavities in each bead. Each desiccant absorbs or colects moisture.

The desiccant beads are held in place by steel perforated plates and filter cloths. The top plate is held in place by a spring and the bottom plate rests on a shoulder approximately 1/8" (3.1 mm) from the bottom of the cartridge housing.

The end cover assembly is retained by a lock ring, capscrews and retainers and houses the purge valve and heater assembly.

The heater and thermostat assembly prevents freeze-up in the purge drain valve when the dryer is used in severe winter conditions.

The 120 watt, 24 volt DC heater and thermostat assembly has an operating range between 50°F-85°F (10°C-29°C).

☐ **Note:** The heater and thermostat assembly provided with the air dryer has a 3/16" (4.7 mm) diameter threaded electrical terminal protected by a boot and is non-serviceable.

Operation

The operation of the Type AD-2 dryer can be best described by separating the operation into two cycles: the charge cycle and the purge cycle.

Charge cycle

Compressor in compressing cycle — With the compressor in its "loaded" or compressing cycle, air from the compressor enters the air dryer through the discharge line. When the air, along with the water and contaminents, enter the air dryer, the velocity or speed of the air reduces substantially and much of the entrained liquid drops to the bottom or sump of the air dryer. The initial air flow is toward the bottom of the dryer, but air flow direction changes 180° at the bottom of the air dryer, dropping some water and oil.

The air now passes through the oil filter which removes some oil and foreign material but does not remove water vapor. At this point, the air remains saturated with water.

BRAKE & AIR SYSTEM

The filtered air and vapors penetrate the desiccant drying bed and the absorptions process begins. Water vapor is removed from the air by the dessicant.

The unsaturated "dry air" passes through the ball check valve and purge orifice into the purge volume. From the purge volume air flows through a check valve and the air reservoir.

Purge cycle:

When desired air system pressure is reached, the governor cuts out (115-118 p.s.i., 793-814 kPa), pressurizing the unloader cavity of the compressor which unloads the compressor (non-compressing cycle).

The line connecting the governor unloader port to the end cover purge valve port (bottom of the air dryer) is also pressurized, opening the exhaust of the purge valve to atmosphere. With the exhaust of the purge valve open, contaminents in the discharge line and dryer sump are purged, or forced past the open exhaust out to atmosphere.

The reverse air flows across the desiccant starts the removal process of moisture from the desiccant surface. Dry air flowing from the purge volume through the purge orifice and across the drying bed further dries the desiccant.

The combination of these reverse flows strips the water vapor from the dessicant (drying bed). This normally takes between 12-15 seconds.

The desiccant becomes activated from this cycle and is now ready for another charge cycle, which occurs when the compressor returns to the compressing cycle.

PREVENTIVE MAINTENANCE & CHECKING SERVICEABILITY

Every 25,000 miles (40,000 km) or every 3 months:

1) Check for moisture in the brake air system by draining air reservoirs and checking for presence of water. In areas where more than approximately a 30° range of temperature is common, small amounts of water can accumulate in the air brake system due to condensation. The presence of small amounts of water due to condensation is normal and should not be considered as an indication that the air dryer is not performing properly.

The desiccant cartridge should be replaced or rebuilt when it has been determined that the dessicant is contaminated and does not have adequate water absorption capacity. However, the following checks should be made before replacing the dessicant cartridge to ascertain that the water accumulation is not related to the below listed items.

a) An outside air source has been used to charge the system. This air did not pass through the drying bed.

b) Air usage exceptionally high and not normal for the coach. This may be due to accessory air demands or some unusual air requirement that does not allow the compressor to load and unload (compressing and non-compressing cycle) in a normal fashion. Check for high air system leakage.

2) Check mounting bolts for tightness. Check all air and electrical connections.

3) Check the operation of the integral single check valve in the air dryer. Build the air system to governor cut-out (115-118 p.s.i., 793-814 kPa) and observe the test air gauge installed in the wet air tank reservoir. A rapid loss of pressure could indicate a failed check valve. This can be confirmed by checking at the purge valve exhaust.

☐ **Note:** Purge valve will be open when governor cut-out (115-118 p.s.i., 793-814 kPa) pressure is reached. Allow two minutes for purge cycle before testing the check valve.

4) Check for excessive leakage at the purge valve by coating the exhaust with a soap solution while the compressor is loaded (compressing air).

5) Check the operation of the safety valve by pulling the exposed stem while the compressor is loaded (compressing air). There must be an exhaust of air while the stem is held and the valve should reseat when the stem is released.

6) Check all air lines and fittings leading to and from the air dryer for leakage and integrity.

7) Check the operation of the heater and thermostat during cold weather operation. This can be done by allowing the end cover assembly to cool below 50°F (10°C) and feeling the end cover when the ignition is turned on. The end cover should be warm to the touch within a few moments. Warming should cease at about 85°F (29°C).

The desiccant change interval may vary; however, it is generally recommended that the dessicant be replaced every 12 months. If experience has shown that extended or shortened life has resulted for a particular installation, then the yearly can be increased or reduced accordingly.

Rebuilding the air dryer

If, after completing the routine serviceability tests, it has been determined that one or more components of the air dryer requires replacement or maintenance, rebuilt or replace components of the air dryer using only genuine Prevost replacement parts or kits.

BRAKE & AIR SYSTEM

Removal of desiccant cartridge

1) Make certain the vehicle is safety parked. Block the wheels if necessary.

2) Drain the air system completely, being sure that the lines, leading into and out of the air dryer are at atmospheric pressure.

3) Disconnect the air line from the end cover and mark location of this port on the air dryer.

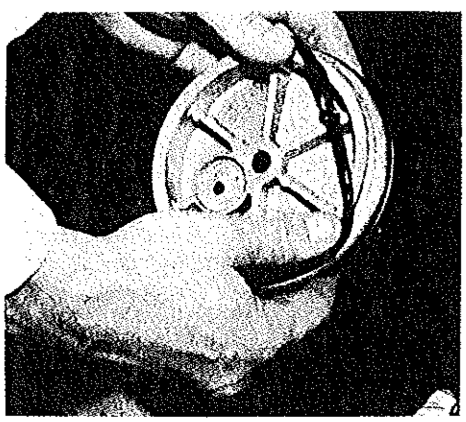
4)Disconnect the heater wire.

5) Loosen the three capscrews on the end cover and turn the retaining clamps aside (capscrews may be left finger tight).

6) Locate the notch in the air dryer shell. While pushing the end cover up into the dryer, insert the blade of a screwdriver in the notch and slowly pry out the retaining ring. Remove the end cover assembly and set it aside temporarily.

7) Using a ¾" socket wrench, remove the cartridge and desiccant sealing plate assembly.

☐ **Note:** Be certain the desiccant sealing plate assembly comes out with the cartridge.



Installing O-ring on end cover

Remove and rebuilding desiccant sealing ring

Before the desiccant cartridge can be replaced or rebuilt the desiccant sealing plate must be removed. It is recommended that all non-metallic parts be replaced when the plate is removed. Removing the single hex lock nut will permit the desiccant plate to be separated from the desiccant cartridge. After removing the desiccant cartridge:

1) Remove the two O-rings from the desiccant plate and discard them.

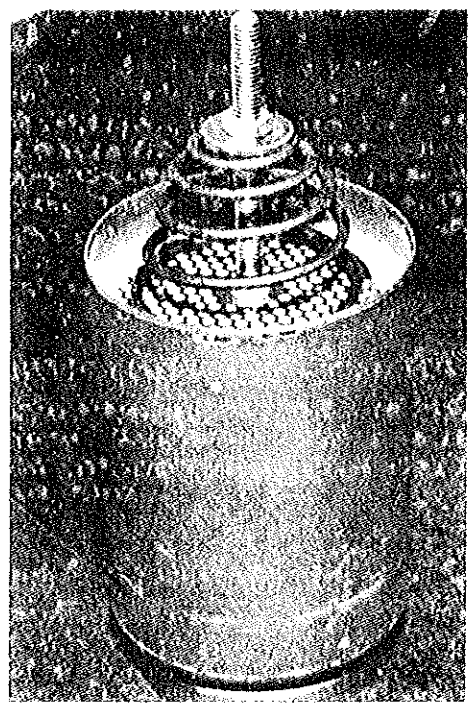
2) Remove the ball check valve retaining clip and remove and discard the rubber ball valve.

3) Clean the desiccant plate thouroughly using a quality commercial solvent, making sure the purge orifice and check valve seat are clean.

4) Install a new ball check valve and replace the retaining clip and screw.

5) Thoroughly lubricate the two new O-rings and install them in their respective grooves in the purge plate.

6) Set the desiccant sealing plate aside for reinstallation on the desiccant cartridge.



Decissant cartridge with sealing plate removed

Replacing desiccant cartridge

Prior to installing the new replacement cartridge in the air dryer, the following steps must be followed.

1) Carefully remove the lock nut from the cartridge bolt using an 11/16" open end or box wrench.
IMPORTANT: Care must be taken not to allow the cartridge bolt to slip out the cartridge when the lock nut is removed. Loss of desiccant material will occur should this happen.

BRAKE & AIR SYSTEM

2) Install the previously rebuilt desiccant sealing plate on the cartridge bolt so that the ball check retaining clip remain visible.

3) While holding the cartridge bolt, reinstall the lock nut on the cartridge bolt.
IMPORTANT: Before tightening the lock nut make certain that the shoulder (the unthreaded portion) of the cartridge bolt extends slightly above the perforated desiccant plate.

4) By tightening the lock nut, draw the desiccant sealing plate down into the desiccant cartridge until the shoulder of the desiccant sealing plate is against the cartridge shell.

Rebuilding the desiccant cartridge

The desiccant cartridges are identified by the letters BW stamped in the hex head of the cartridge bolt, and by the letters and number AD-2 displayed on the bottom face of the oil filter.

Disassembly of desiccant cartridge

1) Carefully remove the lock nut on top of the desiccant sealing plate. (The plate is spring loaded, however, the spring load is completely relieved when the nut is removed).

2) Remove the desiccant sealing plate and rebuilt it as outlined under the "REMOVING AND REBUILDING DESICCANT SEALING PLATE".

3) Remove and retain the spring, spring seat, bolt and cartridge shell. Discard the oil separator filter, the two perforated plates and desiccant material.

Rebuilding end cover assembly

To remove the end cover asembly from the air dryer, follow steps 1-6 under the section entitle "REMOVAL OF DESICCANT CARTRIDGE". Before rebuilding the end cover, clean the exterior thoroughly using a quality commercial solvent.

Disassembly of end cover assembly

1) Remove and discard the large O-ring around the end cover assembly.

2) Remove the single No. 6-32 screw securing the exhaust diaphragm and separate the diaphragm, washer and screws. Discard the diaphragm.

3) Remove the three No. 6-32 screws securing the exhaust cover and remove the exhaust cover.

4) Remove the purge valve assembly, the large hex cap nut, from the end cover and discard both O-rings around the cap nut.

5) Using a 7/16" socket wrench and a large screwdriver, remove the 1/4"-20 hex head cap screw which holds the assembly together.

6) Separate cap screw, purge valve, purge valve piston and the piston return spring.

7) Discard the piston O-ring, the purge valve, and the piston return spring. Wash all remaining parts in a commercial solvent, making sure all surfaces, bores, ports and passages are clean and dry before reassembly.

Reassembly of end cover assembly

1) Lubricate the piston O-ring and install it on the piston.

2) Lubricate the piston bore and install the piston.

3) Install the purge piston return spring and piston.

4) Install the purge valve in the large cap nut so that the rubber portion rests on the metal seat of the cap nut.

5) Secure the valve to the piston using the 1/4-20 capscrews and lockwasher and torque to 50 inch lbs. (5.6 Nm).

6) Lubricate and install the two cap nut O-rings.

7) Lubricate the cap nut threads and the cap not bore of the end cover and install the cap nut, torquing it to 180-250 inch lbs (20.3-28.2 Nm).

8) Secure the exhaust diaphragm to the exhaust cover using the No. 6-32 Philips head screw and diaphragm washer.

9) Secure the exhaust cover to the purge valve hex head cap nut using No. 6-32 Philips head screws.

10) Lubricate and install the large diameter O-ring around the end cover assembly.

☐ **Note:** The heater and the thermostat assembly in the dryer end cover are non-serviceable. DO NOT REMOVE THE THERMOSTAT COVER. Should this assembly become defective, the end cover must be replaced.

Rebuilding outlet port check valve

1) Make certain the vehicle is safety parked. Block the wheels if necessary.

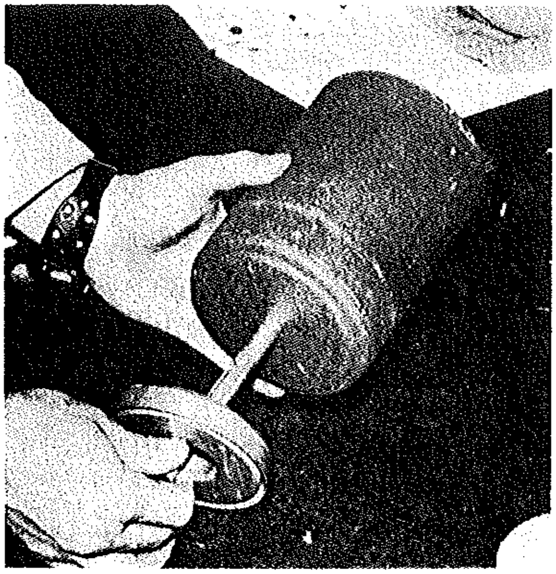
2) Locate and remove the line connected to the outlet port.

3) Remove the check valve from the outlet port.

4) Remove the rubber sealing ring from the external threaded portion of the body and discard it.

BRAKE & AIR SYSTEM

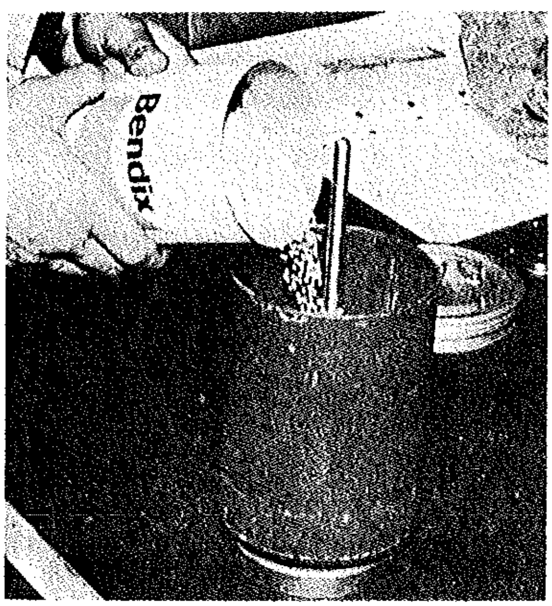
5) Disassemble the check valve by unscrewing the body halves and note the order of the removal of the parts.



Decissant cartridge with sealing plate removed

6) Discard and replace: the check valve, valve spring and metal seal washer.

7) Wash all parts in a quality commercial solvent making sure all surfaces are clean and dry prior to reassembly.

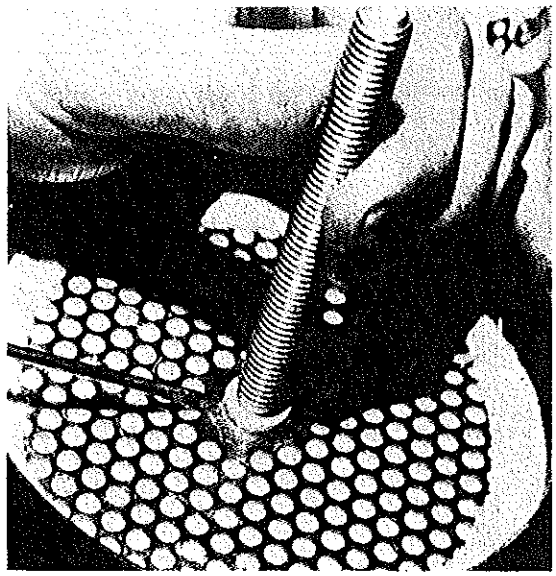


Filling cartridge with dessicant material

8) Coat all parts with a film of barium base lubricant.

9) Reassemble the check valve and torque the body halves to 200-225 inch lbs. (22.5-25.4 Nm).

10) Reinstall the check valve in the outlet port and reconnect the line leading to the wet air tank.

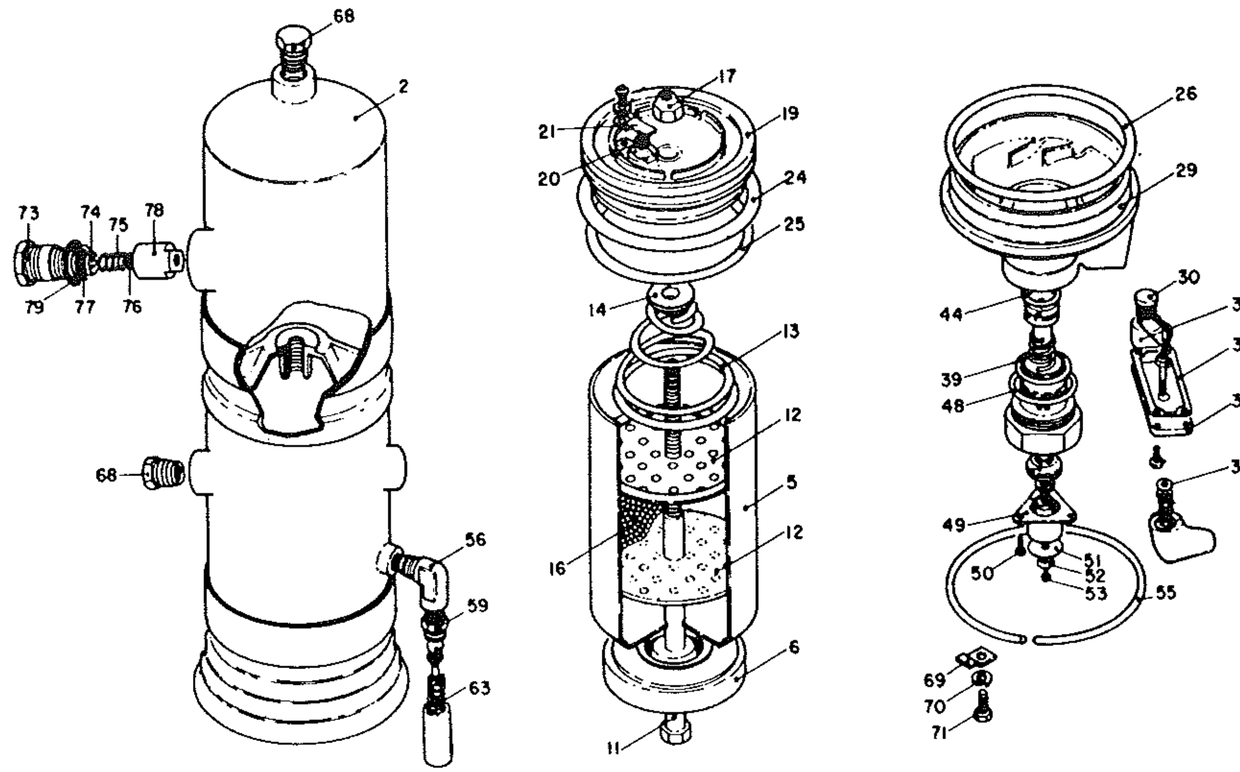


Installing perforated plate into shell

Installing internal parts into decissant shell

BRAKE & AIR SYSTEM

Type AD-2 Discharge Filter Dryer



2. Housing Assy.
5. Cartridge Shell
6. Filter - Oil Separator
11. Bolt - Cartridge
12. Perforated Plate S/A
13. Conical Spring
14. Spring Seat
16. Desiccant
17. Lock Nut - 7/16 - 14 Hex.
19. Plate - Desiccant Sealing
20. Ball Valve
21. Valve Cover
24. "O" Ring
25. "O" Ring
26. "O" Ring - End Cover
29. End Cover
30. Thermostat Unit
31. Gasket
32. Cover - Thermostat
33. Spacer
34. "O" Ring
39. "O" Ring
44. "O" Ring
48. "O" Ring
49. Exhaust Cover
50. Screw - #6-32 Thread Forming
51. Diaphragm
52. Washer - Diaphragm
53. Screw - #6-32 Thread Forming
55. Retainer Ring
56. Elbow
59. Body
63. Spring
68. Pipe Plug
69. Retaining Clip
70. Lock Washer
71. Cap Screw - 1/4" - 20 Hex. Hd.
73. Body
74. Spring Guide
75. Spring
76. Ball Valve
77. Sealing Washer
78. End Cap
79. "O" Ring

BRAKE & AIR SYSTEM

Reinstalling desiccant cartridge

1) Wipe the inside of the dryer clean. If solvent is used, be certain that no residue is left in the shell.

2) Check to be certain a film of barium base grease is present on the O-rings and install the cartridge and purge plate assembly into the body. Engage the bolt and tighten to 375 inch lbs (42.3 Nm) torque.

3) Check the end cover O-ring to be certain it is clean and lubricate the O-ring with a barium base lubricant. Install the O-ring on the end cover and install the end cover in the dryer body.

4) Position the end cover as marked during removal and install the retainer ring so that the gap in the ring is within an inch of the notch in the body.

5) Grease the threads on the three capscrews and reinstall them with their retainers in the end cover.

6) Reconnect the air control line to the purge valve port in the end cover.

7) Reconnect the thermostat and heater wire.

8) Test the air dryer as outlined under the "Preventive Maintenance and Checking Serviceability".

Tap shell with plastic mallet to settle decissant

SHUTTLE VALVE

Description and Operation:

The shuttle valve is located in the spare tire compartment, under the driver's floor. Under normal conditions, the shuttle valve dos not play an active role in the braking system. Should any pressure drop occur in one of the two circuits, the shuttle valve will allow air from the other circuit to be directed to the parking brake valve, thus permitting the vehicle to be operated for a short distance.

Maintenance:

Every 3,600 operating hours, 100,000 miles (160,000 km) or yearly, check the shuttle valve for leakage and proper operation as outlined below.

Operating and leakage test:

To test the shuttle valve, two separately controlled air supplies must be connected to the inlet ports.

1) Install an accurate test gauge in the outlet port or in line from outlet port.

2) Apply and release air to one inlet port and note that gauge registers application and release.

3) Repeat by applying and releasing air to other inlet port.

4) Leakage check should be performed at inlet ports of valve in the following manner:

a) Disconnect line from one inlet port.

b) Apply air to other inlet port and coat opposite inlet port with soap solution. Permissible leakage is a one inch bubble in five seconds.

c) Repeat step "b" applying air to other inlet port while checking opposite inlet port for leakage.

If the shuttle valve does not function as described or if leakage is excessive, it is recommended that the valve be replaced.

SAFETY VALVE

Description

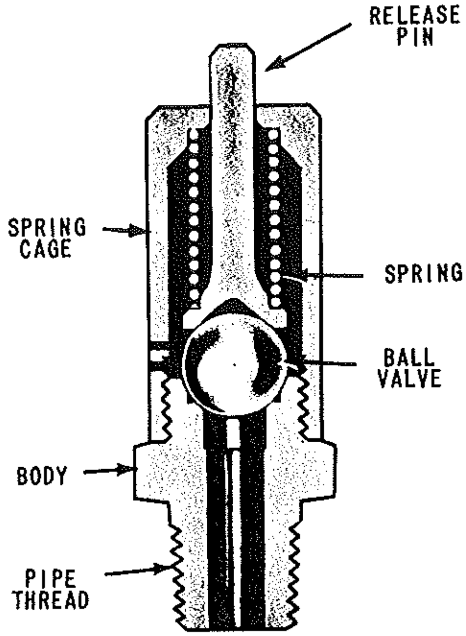
The safety valve is mounted horizontally onto the air dryer, just above the lower air dryer bracket. The safety valve protects the air brake system against excessive air pressure build-up. The valve consists of a spring loaded ball valve subjected to reservoir pressure which will permit air to exhaust reservoir pressure to atmosphere if reservoir pressure rises above 150 p.s.i. (1,035 kPa).

Operation:

Should system pressure rise to approximately 150 p.s.i. (1,035 kPa), air pressure would force the ball valve off its seat, and allow reservoir pressure to vent to atmosphere through the exhaust port in the spring cage. When reservoir pressure decreases sufficiently, the spring force will seat the ball check valve, sealing of reservoir pressure. This would occur at approximately 135 p.s.i. (930 kPa).

Normally, the safety valve remains inoperative and only functions if for any reason reservoir pressure rises above 150 p.s.i. (1,035 kPa).

BRAKE & AIR SYSTEM



Constant "popping off" or exhausting of the safety valve can be caused by a faulty safety valve, faulty governor, faulty compressor unloading mechanism, or a combination of any of the preceeding.

Maintenance:

Every 100,000 miles (160,000 km), 3,600 operating hours, or yearly, the safety valve should be checked for proper operation, as described under "Operating and Leakage Checks"

OPERATING AND LEAKAGE CHECKS

Operating Test

With air pressure in the system, pull the exposed end of the valve stem removing the spring load from the ball check valve. Air should exhaust from the valve's exhaust port. Release the stem, the air flow should stop. Failure of valve to pass operating test would indicate the valve should be disassembled and cleaned, or replaced.

Leakage Check

Coat the exhaust port with soap solution. A leakage of a one (1) inch bubble in 5 seconds is permitted. Excessive leakage indicate dirt in valve, faulty ball valve or seat. Valve should be disassembled and cleaned, or replaced.

Removal and installation

To remove the safety valve, use a wrench and unscrew valve from reservoir.

Install the safety valve horizontally with exhaust port pointed down and stem of valve facing rear of vehicle. Apply pipe sealant on valve threads before installation.

Disassembly

1) Clamp spring cage in vise.

2) Using a wrench, unscrew body from spring cage.

3) Remove ball valve, spring and release pin from spring cage.

Cleanning and inspection

Clean all parts in good metal cleaning solvent. Inspect all parts. If some parts are not considered serviceable, the valve should be replaced.

Assembly

1) Install spring, release pin in spring cage.

2) Position ball valve in body and screw spring cage into body.

3) Place spring cage in vise and tighten securely.

PARKING BRAKE OVERRULE VALVE (OPTIONAL)

Description

The parking brake overrule valve is located at right of the driver's seat, next to the parking brake valve. This valve permits the release of the spring brakes a minimum of three times, so the vehicle can be driven to a safe place in case of spring brake application. No maintenance is required on this valve, as it is rarely operated. In case of malfunction, replace the valve.

CHECK VALVES

Description

A check valve is located in the inlet port of each service tank (primary and secondary).

These check valves are used to allow air flow in one direction only and to prevent flow of air in the reverse direction.

Operating

Air flow in the normal direction moves the check valve disc from its seat, and the flow is unobstructed. Flow in the reverse direction is prevented by the seating of the disc, which is caused by a drop in upstream air pressure and assisted by the spring.

BRAKE & AIR SYSTEM

Maintenance

Every six months, 1800 operating hours or every 50,000 miles (80,000 km), inspect each check valve for leakage and proper operation as outlined below.

Operating and leakage check

With air pressure present at outlet side of check valve and the inlet side open to atmosphere, coat the open end of the check valve with soap suds; a bubble leakage is permitted. If the check valve leaks excessively, it should be replaced with a new check valve.

Removal and installation

Apply parking brakes. Completely drain all reservoirs. Disconnect air line from check valve, then unscrew check valve from reservoir. Before installing the check valve, check and, if necessary, clean or replace air line to valve. Apply pipe sealant on valve threaded end, then install the valve to the reservoir.

STOP LIGHT SWITCH

Description

The stop light switches (2) are electropneumatic switches that operate in conjunction with the brake valve and stop lights by completing the electrical circuit and lighting the stop lights when a brake application is made. Both switches are located under the driver's floor, on the brake application valve.

Operating and Leakage Test

1) Install an accurate air gauge in the service line. Apply brake valve, stop lights should light at 6 p.s.i. or less.

2) Release the brake valve and note that the stop light goes "off"

3) With the brake applied, leakage is not permitted at the cover or inlet port of the stop light switch.

If the switch does not function as described above, it is recommended that it be replaced with a new stop light switch.

LOW AIR PRESSURE SWITCH

Description

The low air pressure switches (2) are safety devices designed to give an automatic warning to the driver whenever air pressure in the air brake system is below approximately 65 p.s.i. (448 kPa). The switch consists of a die cost body, nylon cover and employs a spring loaded O-ring diaphragm and piston. A gasket is used between the cover and the body. The electrical contacts remain closed by spring force until the air brake system pressure below the diaphragm is above the setting of the low air pressure switches (approx. 60 p.s.i., 448 kPa). These switches are located under the driver's floor on the primary and secondary manifold block.

Operating and Leakage Test

1) Operation of the low air pressure switch may be checked with ignition switch "on" by reducing the system pressure and observing that low pressure warning occurs when system pressure drops below approximately 66 p.s.i. (448 kPa). The contacts will be closed when the warning device operates.

2) With air pressure present at the supply port, coat the switch with soap solution. No leakage is permitted.

● **Warning:** This test must be performed every month or each 10,000 miles (16,000 km). If one of the two or both low air pressure switches do not operate as described under "Operating and Leakage Test", it (they) must be replaced with a new low air pressure switch(es). In such a case, the new switch(es) must be tested before driving the vehicle.

Removal and installation

Before removing the low air pressure switch, the ignition switch should be in "off" position, and the air system must be drained. Then, disconnect the electrical connections at the switch, and unscrew the switch fom the fitting. To reinstall the low air pressure switch, apply pipe sealant on the switch threads, then reverse the preceding procedure.

RESERVOIRS

Description:

A reservoir is a storage tank. Its function is to provide a volume of compressed air for braking which will be adequate in relation to the volume used by the brake chambers and auxiliary devices and to provide a location in the system where the air, heated by compression, may be cooled.

A total of four air reservoirs are used on the vehicle: the wet tank the primary circuit service reservoir, the secondary circuit service reservoir and the accessory reservoir. The wet tank is located over the drive axle on the left side of the vehicle. The primary circuit service reservoir is located over the drive axle on the right side of the vehicle. The secondary circuit service reservoir is mounted transversally over the front axle. The accessory reservoir is located in the steering compartment.

BRAKE & AIR SYSTEM

Maintenance:

Every month or each 10,000 miles (16,000 km), check reservoir mountings, lines and fittings. Remove any dirt or outside corrosion from reservoirs. At the same time, each reservoir should be completely drained to remove oil and water that could have accumulated. More frequent drainage may be required depending on the degree of humidity where the vehicle is operated.

AIR FILTERS

Description

Two air filters are installed in the air system to provide clean air to its components. The first one deserves the brake system and is located in the engine compartment, just beside the booster block. The second one deserves air operated accessories and is located in the steering compartment.

Maintenance

Air filters should be drained every month or each 10,000 miles (16,000 km). A drain cock is provided for this purpose under each air filter. Furthermore, air filter elements should be replaced every year or each 100,000 miles (160,000 km). To replace air filter element, proceed as follows:

1) Drain air filter completely.

2) Unscrew the four (4) retaining bolts of the lower portion of the air filter body. Then, remove the lower portion.

3) Remove the air filter element and replace with a new one.

4) Clean the sealing surface of both the lower and upper portions of the air filter body. Then, install a new gasket.

5) Reinstall the lower portion of the air filter body and tighten the four (4) retaining bolts evenly.

BRAKES

Description

The brakes used on the coach are heavy duty, two shoes type. Shoes are mounted with individual anchor pins on open-type spiders. The brakes are actuated by "S" type, constant lift cams which are forged integral with the shaft and mounted in needle bearings. Cam pressure is applied through roller cam followers attached to the brake shoes.

DRUMS

Machining of brake drums is permitted under the following guideline.

Original Diameter — 14.50" (368.3 mm)
Maximum Allowable
Wear — drive axle: — 14.830" (376.7 mm.)
— front and tag axle: — 14.937" (379.4 mm.)

Under no circumstances should brake drums be used if they have been machined to a greater than allowed.

When refaced drums and oversize linings are used, precautions regarding cam travel should be observed to prevent sticking cams or cam "roll over". This condition may occur when linings become worn. The service instructions relative to the use of oversize roller cam followers should be carefully followed. Drums which have been refaced should be installed on vehicles operating under the least severe conditions.

BRAKE LININGS

Linings vary considerably in size and content. They should be replaced only with linings which conform with the manufacturer's recommendations.

BRAKE MAINTENANCE

A schedule for the periodic adjustment, cleaning, inspection and lubrification of brake equipment should be establised by the operator on the basis of parts particularly subject to wear depreciation. To compensate for this wear, brakes should be adjusted as frequently as required to maintain satisfactory operation and maximum safety. Adjustments should provide uniform lining clearance, correct travel of levers and proper equalization.

Brakes should be cleaned, inspected, lubricated and adjusted each time the hubs are removed.

Brake lining wear may be determined by reading gauge showing brake cam position in relation to slack adjuster. When adjustment is made to brakes, pointer will move toward part of dial marked "Worn". Reading gauge when brakes are adjusted will show just how far pointer has been moved and thus how much the linings are worn.

Disassembly

Remove wheels as outlined in Section 13 (Wheels, Hubs & Tires). Remove shoe return spring. Remove lock rings, retainers and felts from anchor pins. Cut lock wire and remove anchor pin lock screws. Remove anchor pins and shoe assemblies. Loosen Allen screws and remove roller cam followers and pins. Remove sloack adjuster. Remove lock ring or loosen lock screw in spacer and remove cam shaft. Wire spacers to brake spider. Remove washers and felts from cam shaft and spider. Remove bushings from shoe of bearings from spider as required.

BRAKE & AIR SYSTEM

Repair

During major overhaul, the following parts should be carefully checked and if necessary, replaced with genuine replacement part as required: Backing plates for distorsion, and backing plates and spiders for looseness or sheared rivets: Anchor pins for wear or misalignment; Brake shoes for wear at anchor pin holes, wear plates or angle faces; Cam shafts and cam shaft bearing or bushings for wear or brinelling; Shoe return springs should be replaced at the time of overhaul; Brake linings for grease saturation, wear, and loose rivets or bolts; Drums for cracks, scoring or other damage.

Prior to reassembling, the following parts should be LIGHTLY COATED with lubricant. Anchor pins at abutment block or shoe surface; Adjustable anchor pin bearing surface; Cam shaft bearings or bushings; Cam roller followers or wear plates.

Reassembly

Install new bushings in brake shoes if required. New bushings must be line reamed to size before assembling shoes. Install new bearings in brake spider as required.

Install roller cam followers and pins. Tighten Allen lock screws securely.

■ **Caution:** See instructions relative to roller cam followers where drums have been refaced and oversize liners installed. Install large washers, felt and washer on cam end of shaft. Install washers, felt retainers and spacers when inserting cam shaft through spider and bracket.

Install lock ring or tighten set screw in spacer. Position brake shoe over spider and tap anchor pin into position with "flat" in line with lock screw hole. Repeat with opposite shoe assembly.

Install lock screws, tighten securely and thread with lockwire. Position felts, retainers and install lock rings. Install shoe return spring. Install slack adjuster on splined end of cam shaft and adjust as required.

Assemble pointer to slack adjuster with tangs locking in place. Assemble dial to camshaft in approximate position as shown with slack adjuster in line up with one of the pointers. Cut off excess pointers that Dial does not line up with. Assemble Snap rings using washers to take up end play if necessary.

Adjustment

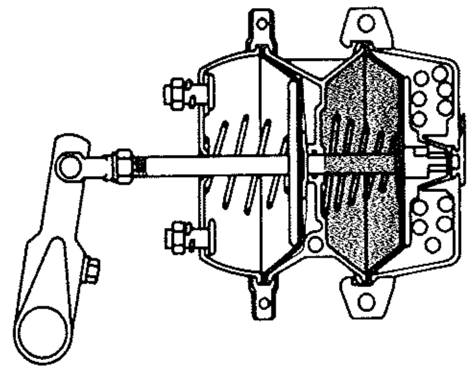
New linings should be circle ground to a few thousandths less than drum diameter. Adjust cam as required to obtain 80 percent contact. Adjust slack adjuster on splined end of cam shaft and adjust as required. See "Slack Adjusters" in this section.

BRAKE CHAMBERS
Spring brakes (rear)

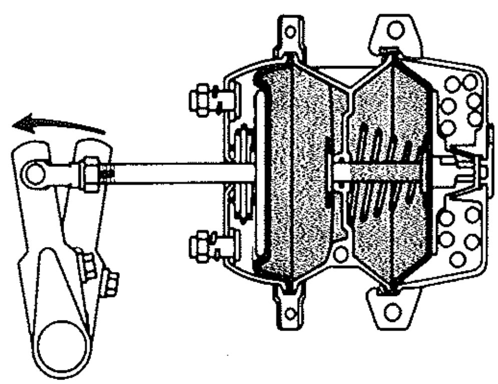
Description

The rear driving axle brake chambers combine the functions of a conventional service brake chamber with a secondary diaphragm and locking mechanism to give emergency and parking operation.

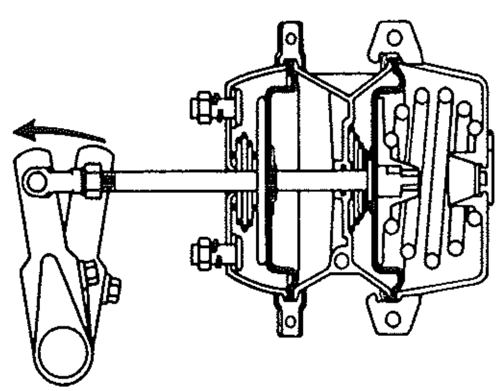
Operation



DURING NORMAL DRIVING, air pressure cages the spring and holds it ready for parking or emergency braking.

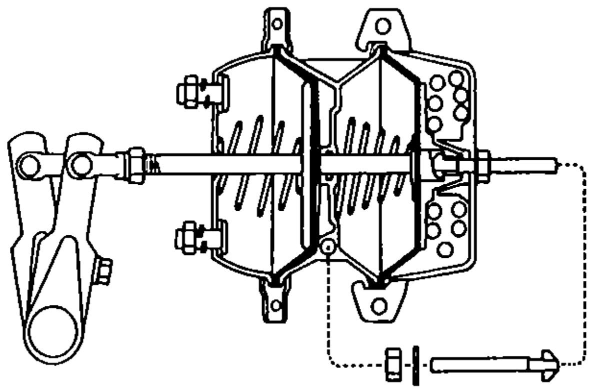


DURING NORMAL SERVICE BRAKE OPERATION, the spring brake does not apply. Air pressure keeps the spring caged.



BRAKE & AIR SYSTEM

FOR SPRING BRAKE PARKING, application of the dash control valve exhausts air from the spring brake chamber, permitting spring force to actuate the service brake for positive parking. For emergencies, the spring brake operates automatically upon loss of air pressure.



TO MECHANICALLY RELEASE THE COMPRESSION SPRING, remove the release tool from its "side pocket" and insert it into the pressure plate. Then turn the release tool one-quarter turn to seat cross pin in pressure plate receptacle. Turn nut with wrench untill spring is fully caged.

● **Warning:** Spring brake chambers contain an extreme high pressure spring, which can possibly cause serious injuries if special precautions are not taken when working around this area. To avoid such injuries, the following recommendations must be applied:

1) Spring brake chambers maintenance and/or repairs must be performed by trained and qualified personnel only.

2) Before manually releasing spring brakes, visually check spring brake chambers for cracks and/or corrosion.

3) Make sure that the cross pin of the release tool is securely inserted and seated in pressure plate receptacle before turning the nut to cage the spring.

4) Never stand in the axis line of the spring brake chambers, especially when caging the compression spring.

Maintenance

a) Every month or later every 5,000 miles (8,000 km) depending on type of operation:

1) Check push rod travel and adjust travel at the slack adjuster if needed. Push rod travel should be as short as possible without brake dragging.

2) Check push rod to slack adjuster alignment from release to full stroke position to be sure push rod moves out and returns properly without binding. Also check the angle formed by the slack adjuster arm and the push rod. It should be 90° or greater when the chamber is in the applied or released positions.

3) Check tightness of mounting nuts. Check cotter pins to make sure they are in place.

4) Check all hoses and lines. They should be secure and in good condition.

b) Every year or after 100,000 miles (160,000 km), depending on type of operation:

1) Disassemble and clean all parts.

2) Install new diaphragm or any other part if it is worn or deteriorated.

When the diaphragm, spring, or both are replaced, they should be replaced in the corresponding chamber on the same axle.

Leakage Test

1) Make and hold a full brake application.

2) Using soap solution, coat clamping ring(s). If leakage is detected, tighten clamping ring(s) only enough to stop leakage. DO NOT OVERTIGHTEN as this can distort clamping ring. Coat area around push rod hole. No leakage is permitted. If leakage is detected, the diaphragm must be replaced.

REMOVAL AND INSTALLATION

Removal

1) Block vehicle wheels by means other than parking brake.

2) Apply parking brake.

3) Release spring brakes mechanically as described in step #4 under "OPERATION" in this section.

4) Disconnect air lines from chamber.

5) Remove the yoke pin.

6) Unscrew brake chamber retaining bolts. Then remove the brake chamber.

Installation

1) Mount brake chamber to mounting bracket and tighten retaining bolts.

2) Install yoke pin.

BRAKE & AIR SYSTEM

3) Check the angle formed by the push rod and the slack adjuster arm. It should be greater than 90° in both applied and released positions.

4) Connect air lines to chamber. Check to be sure that hoses are properly supported to provide proper clearance.

Diaphragm replacement

1) Clean exterior of brake chamber and mark ports in relation to position to each other so that it may be assembled in the same way.

2) Release spring brakes mechanically as described in step #4 under "OPERATION" in this section.

3) Remove spring brake clamps and/or service brake clamp depending on which diaphragm has to be replaced. (If replacing service brake chamber diaphragm, remove service brake clamp. Remove spring brake to replace spring brake chamber diaphragm).

4) Remove chamber assembly and diaphragm by sliding chamber off adapter.

5) Discard old diaphragm from chamber and replace with new diaphragm.

☐ **Note:** For ease of assembly, first place diaphragm in chamber before sliding chamber back on adapter.

To re-assemble the unit, reverse the procedure. Tap clamps to insure proper sealing.

FRONT AND TAG AXLE BRAKE CHAMBERS

Description

Brake chambers used at the front axle and tag axle wheels are identical in construction.

Brake chambers convert compressed air pressure into mechanical force and movement which applies the vehicle brakes. These brake chambers are of the clamp ring type. The diaphragm is held between the two plates by a clamping ring, two nuts and two bolts.

Air pressure enters the pressure side of the brake chamber and forces against the diaphragm which in turn moves the push rod assembly forward. The push rod is connected to a slack adjuster which is attached to the cam shaft that rotates the brake cam and applies the brakes.

When air pressure is released from the brake chamber, the push rod return spring in combination with the brake shoe return spring returns the diaphragm, push rod, slack adjuster and brake cam to their released positions, releasing the brakes.

Maintenance

Refer to spring brake chamber maintenance. The same procedure applies for front and tag axle wheel brake chambers.

Leakage Test

Refer to spring brake chamber leakage test. The same procedure applies.

REMOVAL AND INSTALLATION

Removal

1) Apply parking brake.

● **Warning:** If spring brake chambers have to be removed at the same time, also block vehicle wheels by means other than parking brake.

2) Disconnect air line from chamber.

3) Remove the yoke pin.

4) Unscrew the brake chamber retaining bolts. Then remove the brake chamber.

Installation

1) Mount brake chamber to mounting bracket and tighten retaining bolts.

2) Install the yoke pin.

3) Check the angle formed by the push rod and the slack adjuster arm. It should be greater than 90° in both applied and released positions.

4) Connect air line to chamber. Check to be sure that hoses are properly supported to provide proper clearance.

Disassembly

1) Clean exterior of brake chamber and mark parts in relation to position to each other so that it many be assembled in the same way.

☐ **Note:** If brake chamber is to be dismantled without removing non-pressure plate from vehicle, slack adjuster should be backed-off.

2) Pull out push rod and clamp it at non-pressure plate. If using vise-grip pliers, push rod should be protected so that it will not be damaged.

3) Remove clamp ring nuts and bolts. Then, remove clamp rings.

4) Remove pressure plate and diaphragm.

BRAKE & AIR SYSTEM

5) Remove yoke lock nut and yoke from push rod and release grip on push rod.

6) Remove push rod assembly and spring.

7) Remove boot or O-ring (if applicable).

Cleaning and inspection

1) Clean all metal parts in cleaning solvent, removing all rust and scale. All diaphragm sealing surfaces should be smooth and clean.

2) Carefully inspect all metal parts for cracks, distortion or dammage.

3) Replace parts considered not serviceable.

Assembly

1) Stand push rod assembly upright on a flat surface.

2) Position return spring on push rod.

3) Install boot or O-ring on non-pressure plate (if applicable).

4) Position non-pressure plate on push rod, and press plate down against tension of spring until plate bottoms on flat surface. Clamp rod with vise grips (protect rod) at the plate.

5) Check aligment marks (made before disassembly) and position diaphragm in pressure plate and place on non-pressure plate.

6) Install clamp rings, clamp ring nuts and bolts.

7) Tighten nuts and bolts evenly and only enough to eliminate leakage.

MANUAL SLACK ADJUSTERS

Description

Slack adjusters are supplied to provide a quick and simple method of adjusting brakes to compensate for brake lining wear.

The slack adjusters utilize the worm and gear principle to ensure maximum road service with a minimum of maintenance.

In normal operation, the entire slack adjuster remains rigid as a unit and rotates with the brake camshaft as the brakes are applied or released. When the brakes are applied, air pressure loads the brake chamber and the chamber push rod rotates the slack adjuster. The slack adjuster rotates the camshaft which spreads the brake shoes and applies the brakes. When the brakes are released, the air pressure in the brake chamber is released. The brake chamber release springs and the brake shoe return springs then return the brake cam, camshaft, slack adjuster and the brake chamber push rod to a released position.

Adjustment

■ **Caution:** Prior to adjusting the rear coach brakes, ensure that the system air pressure is above 65 p.s.i. (449 kPa).

While making brake adjustments, the wheel must be in a jacked-up position.

Install the wrench on the adjusting screw and disengage the locking sleeve by depressing it. While the locking sleeve is in the depressed position, calibrations may be made by turning the adjusting screw.

The brakes on the coach can be calibrated by turning the adjusting screws until the brakes shoes are tight against the brake drum and the brake chamber push rod is in the released position.

Back-off the adjusting screw two (2) notches on the front units and three (3) notches on the rear units.

When all adjustments have been completed, ensure that the locking sleeve is returned to a locked position by permitting it to engage the hexagon head of the adjusting screw. The slack adjuster arm and brake chamber push rod should now form an angle obtuse to 90 degrees: ALL THE SLACK ADJUSTERS ON THE COACH MUST BE AT THE SAME ANGLE.

Maintenance

Slack adjusters must be lubricated once every 5000 miles (8000 km). The slack adjuster grease fittings may be lubricated with a standard shop grease gun. Only Molybdenum Disulphide Grease should be used on the slack adjusters.

Operating Test

Apply the coach brakes and inspect to ensure that the slack adjusters rotate freely and without binding. Release the brakes and check to be sure that slack adjusters return to a released position freely without binding. With the brakes released, the angle formed by the slack adjuster arm and the brake chamber push rod should be obtuse to 90 degrees. Now, with the brakes applied, check to ensure that the angle formed by the slack adjuster arm and the brake chamber push rod is still slightly obtuse to 90 degrees. All coach slack adjusters must be set to the same angle.

BRAKE & AIR SYSTEM

Removal and installation

To remove a slack adjuster, remove the brake chamber push rod yolk pin, capscrew, and the washer which holds the slack adjuster onto the brake camshaft. Other methods of affixing the slack adjuster onto the brake camshaft may also be used, however, the washer and capscrew method is the most common. Slide the slack adjuster off the spline end of the camshaft.

When installing a slack adjuster, clearance must be allowed to ensure that the slack adjusters can be rotated to the maximum stroke of the brake chamber. Install the grease fitting and locate the slack adjuster on the camshaft in such a manner as to allow both the adjuster screw and grease fitting easy access in case of servicing.

Place the washer and screw, or snap ring (depending on model of adjuster) onto the end of the slack adjuster in order to hold the slack adjuster in place.

Refer to "Operating Test" in this section to ensure that proper adjustments are made to provide for these conditions when installing a slack adjuster.

AUTOMATIC SLACK ADJUSTERS (OPTIONAL)

Description

The "SAB" Automatic Slack Adjuster is a mechanism designed to (1) convert brake chamber force and transmit it as torque to turn the camshaft and apply the brakes, (2) control lining-to-drum running clearance by automatic adjustment when the clearence increases due to lining wear.

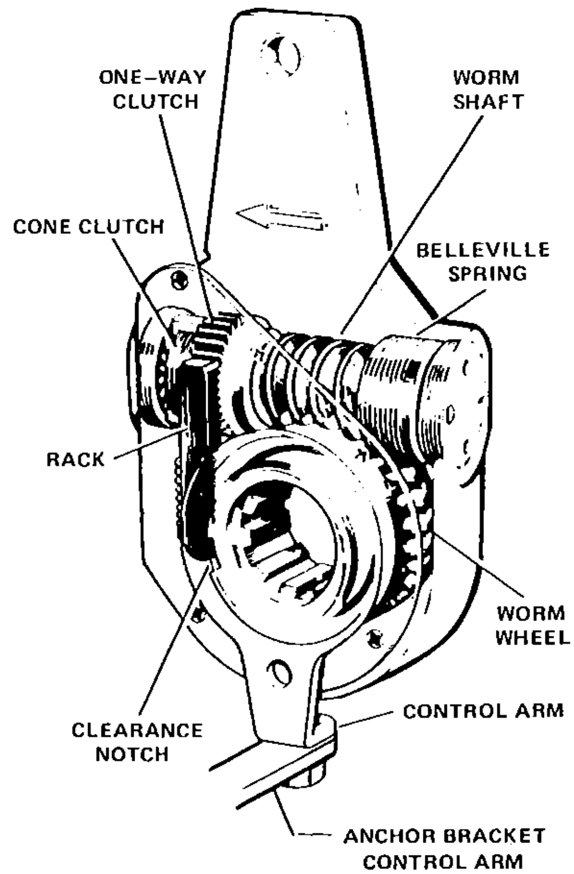
Operation

The slack adjuster incorporates a worm wheel and worm shaft set mated with an adjusting mechanism utilizing a spring loaded-torque sensing worm shaft cone clutch, one-way rotary clutch, and a shoe-to-drum running clearance notch. These components are housed within an environmentally sealed body. The control arm is securely fixed to a stationary member such as the brake chamber or axle housing by means of an anchor bracket.

During brake application and when the shoes contact the drum, torque is generated at the foundation brake which overcomes the belleville spring load on the worm shaft. This allows the worm shaft to disengage from the adjusting mechanism, resulting in the adjusting clutches being isolated and protected from the high torques and stress developed during brake application.

As the slack adjuster is applied the rack rotates the one-way clutch gear in a direction that over-rides the clutch spring. This places the rack in the drive position.

During brake release, the rack begins to rotate the one-way clutch gear in a driving direction. Since the wormshaft is still disconnected from the clutch mechanism, no adjustment is made. As the brake shoes leave the drum, the torque from the foundation brake is reduced allowing the belleville spring force to reconnect the worm shaft and adjusting clutches. At this point, the rack tops driving the one-way clutch and passes through the clearance notch which results in a "No Adjust" signal to the clutches. This "No Adjust" portion of the return travel is the point at which the predetermined running clearance is installed. After the rack passes through the clearance notch, and additional return travel is required for complete brake release, the rack again rotates the one-way clutch gear in the driving direction (worm shaft now re-connected) which rotates the worm shaft resulting in an adjustment at the brake shoe.



This process is repeated on every brake apply and release. The greater the amount of return travel (after the clearance notch is passed through) the greater the amount of adjustment. On each subsequent brake apply and release, the amount of adjustment becomes smaller until the excess clearance is removed. When the adjuster reaches the full release position at the same time the rack passes through the clearance notch, the predetermined shoe-to-drum clearance is reached and no additional adjustment is required.

BRAKE & AIR SYSTEM

PREVENTIVE MAINTENANCE

Preventive maintenance performed on a regular schedule will ensure optimum performance of the automatic adjuster and in increased service life.

Lubrication

Lubricate adjuster with any approved type grease (see below) at established intervals, but do not exceed limits shown in table.

Type Vehicle	Lube Interval	Approved Greases	
		Normal Temperature	Below -20°F
Transit Coach	Every 2 months or 6,000 Miles	Any extreme pressure #2 type grease such as — Esso Lidoc EP 2 Shell Darina#1	Texaco Low Temp EP or
Hiway Coach	Every 6 months or 50,000 Miles	Texaco Thermotex EP 1 Sunplex#1 EP	-Equivalent-

Inspection

1) During normal lubrication intervals, visually inspect slack adjuster and anchor bracket for damage. Check that anchor bracket is tight and the control arm is in it's "Full Release" position. (refer to installation procedure section).

2) Maintaining proper brake adjustment and brake balance cannot be accomplished by the slack adjuster alone. The condition of foundation brake components have a direct bearing on the effectiveness of brake adjustment. Therefore, periodic inspection of these components is necessary.

a) BRAKE CHAMBERS: Check that brake chamber mounting bolts are tight and proper alignment is maintained to avoid interference between chamber pushrod and chamber housing. Verify that brake chamber pushrod lenght is equal on opposing brake chambers of the same axle.

The use of moly-disulphide loaded grease or oil is not recommended since it may lower friction capabilities in the adjusting clutch parts, and decrease automatic adjustment reliability.

b) CAMSHAFT BUSHINGS: Optimum brake adjustment cannot be achieved when worn bushings are used.

c) WHEEL BEARING ADJUSTMENT: Accurate wheel bearing adjustment is necessary to maintain proper alignment between the brake drum and brake shoes.

d) WHEEL TORQUING: An improperly tightened wheel could distort the drum making proper brake adjustment impossible.

3) During brake reline or major brake system overhaul intervals, the slack adjuster should be removed and "bench tested" to insure that performance levels of the adjusting mechanism has been maintained. Refer to "Off Vehicle Check-Out" portion of this section for testing procedures.

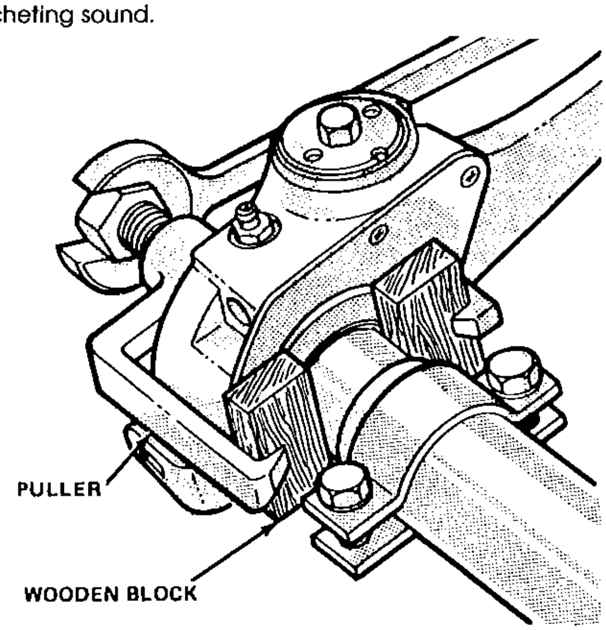
Removal

Important: Before removing adjusters, CHOCK WHEELS, build up full system air pressure and place all brake controls in off or release position. Make certain spring chambers are caged and/or fully released.

1) Remove clevis pin from brake chamber clevis.

2) Using 12 mm wrench or socket, turn adjusting hex counterclockwise until adjuster rotates clear of brake chamber clevis.

☐ **Note:** Rotation of adjusting hex in this direction takes considerable effort, and will be accompanied by a ratcheting sound.



Removal from brake cam shaft using puller tool

3) Disconnect control arm lever from anchor bracket by removing anchor bolt from bracket.

4) Remove camshaft retaining ring or bolt and spacing washers.

BRAKE & AIR SYSTEM

5) Remove adjuster from camshaft. If adjuster does not slide off easily, use a puller tool. DO NOT HAMMER ON COVER PLATE.

■ **Caution:** Do not apply puller jaws directly on face of cover — use wooden blocks to prevent internal dammage.

Installation

1) Check that brake chambers are in fully released position. Make certain spring chambers are fully caged and/or released.

2) Before installing adjusters, inspect condition of foundation brake and check for any needed repair or adjustment such as:

a) Brake Drums — cracked or out-of-round.

b) Brake Shoes — loose linings, broken return springs, anchor pins.

c) Camshaft Bushings — worn, cracked, seized.

d) Camshaft Splines — cracks, broken teeth, burrs.

e) Brake Chamber — mounting bolts, equal pushrod lenght, alignment.

f) Pushrod clevis yoke installed at proper distance from brake chamber.

3) Assemble control arm anchor bracket onto the stationary member but do not tighten.

4) Install slack adjuster on camshaft spline with adjusting hex pointing away from brake chamber. Use camshaft spacing washers to align slack adjuster with clevis and achieve proper end play clearance (approximately .30" to .060") without binding. Secure slack adjuster on camshaft with standard retainer.

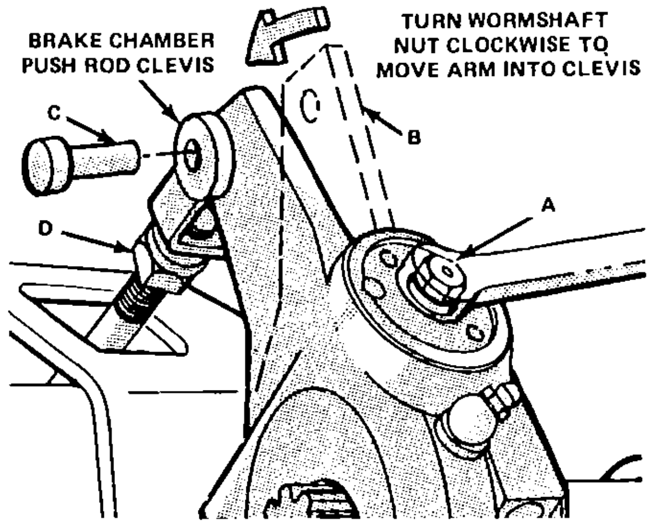
☐ **Note:** For camshafts using bolt and washer retainer insure that retaining washer does not bind against the slack adjuster worm wheel.

5) Pull slack adjuster in the braking direction by hand and release to verify the assembly is free to return to full off position.

6) Using a 12 mm wrench, manually rotate adjusting hex (A) clockwise until clevis pin holes in adjuster arm (B) and brake chamber push rod clevis are aligned.

Install clevis pin (C) and retainer. Check that clevis yoke jam nut (D) is tight.

■ **Caution:** do not push lever arm into clevis, or pull out chamber pushrod to align pin holes.



Installation of air chamber push rod clevis on adjuster

7) Rotate control arm in direction away from adjusting hex (toward brake chamber) untill the positive internal stop (full release position) is contacted. Do not hammer on control arm, as internal dammage may result.

ANCHOR BRACKETS FOR SLOTTED CONTROL ARM LEVER
Holding control arm in full release position, move anchor bracket so that it aligns with control arm slot. Thread anchor bolt (A) and lockwasher into bracket so that pin end enters control arm slot and tighten. Making certain that control arm does not move from "Full Release", tighten anchor bracket mounting bolts. Also check that there is a minimum clearance of about .060" at point (B) so that the anchor bracket does not put load on control arm.

Rotate control arm (A) away from adjusting hex to the full release position. Making certain control arm does not move, tighten all fasteners.

8) Check installation of slack adjuster by removing clevis pin and lightly push adjuster into clevis and release. If holes remain in alignment — a proper installation was made.

If holes in adjuster and clevis DO NOT remain in alignment —

a) Re-align adjuster with clevis and reinstall clevis pin and retainer.

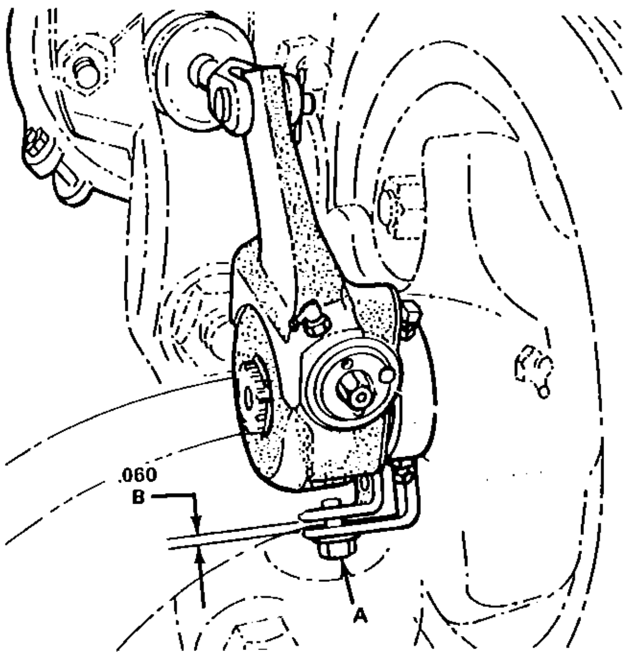
b) Loosen anchor bracket mounting fasteners.

c) Repeat step 7 and re-check.

9) Prior to release of vehicle for service, initial brake adjustment may be accomplished by —

a) Manually adjusting brakes according to regular practice and procedure.

BRAKE & AIR SYSTEM



SLOTTED CONTROL ARM

☐ **Note:** De-adjustment of adjuster takes considerable effort and will be accompanied by a ratcheting sound.

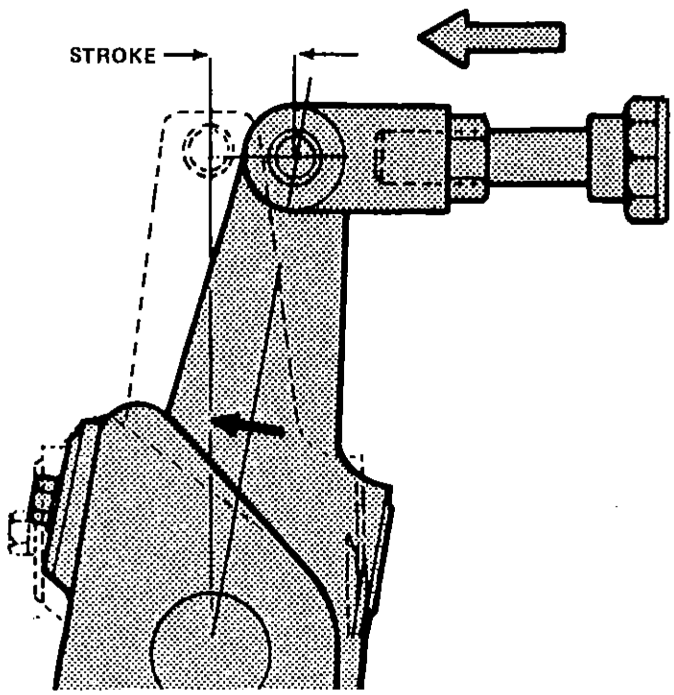
— OR —

b) With full pressure in the vehicle air system, operate the service brakes (allow FULL return on brake release) until the brake chamber pushrod travel is reduced to within acceptable limits.

Final operating pushrod travels will not be obtained until the vehicle has been driven and the brakes heated.

The pushrod travel should not exceed values listed as follows:

Brake Chamber Type	Pushrod Travel Maximum
16 — 24	1¾"
36	2¼"



Checking length of brake chamber stroke

TROUBLE SHOOTING

When vehicle braking complaints occur, use the following guide as an aid to determine cause:

Measure Chamber Pushrod Travel

Install wheel chocks

Build up full system air pressure and place all brake controls in off or release position.

Measure the distance the brake chamber pushrod travels during a full pressure service brake application.

TIGHT OR DRAGGING BRAKES

Check foundation brake components for:

1) Out-of-round drums

2) Brake chamber not fully releasing:
   - Spring brakes not fully released
   - Pushrod binding on chamber housing or dammaged.
   - Air supply not exhausting completely.

3) Wheel bearing adjustment

4) Broken shoe return spring

5) Loose linings

BRAKE & AIR SYSTEM

INSPECT SLACK ADJUSTERS FOR

Condition

1) Control arm anchor bracket not positioned properly

2) Slack bound against camshaft housing — no end play

3) Sticking rack or broken rack return springs

4) Worm shaft not disengaging from adjusting clutch

Corrective Action

1) Refer to installation procedures and reposition control arm anchor bracket

2) Eliminate bind (refer to installation procedures)

3) Replace slack adjuster

4) (Same as item 3 above)

EXCESSIVE CHAMBER PUSHROD TRAVEL

Check foundation brake components for:

1) Out-of-round or cracked drums

2) Worn camshaft bushings

3) Binding camshaft

4) Loose brake chamber mounting

5) Extreme differences in lining-to-drum clearance between shoes on same wheel.

INSPECT SLACK ADJUSTER FOR

Condition

1) Loose, broken or bent control arm anchor bracket.

2) Excessive wear or movement between anchor bolt in bracket and control arm slot.

3) Damaged or worn control arm assembly, resulting in lateral movement between control arm and cover plate.

4) Broken Rack — Manually de-adjust slack adjuster and determine if unit adjusts on brake release (refer to check-out procedures — Section "D").

5) Insufficient belleville spring load (check-out same as item 4 above).

6) Worn clutch assembly — (check-out same as item 4 above).

Corrective Action

1) Re-position and tighten bracket or replace (refer to installation procedures).

2) Replace anchor bolt and/or control arm assembly (refer to overhaul procedures).

3) Replace control arm assembly (refer to overhaul procedures).

4) Replace slack adjuster and/or recondition (refer to overhaul procedures).

5) (Same as item 4 above).

6) (Same as item 4 above).

CHECK-OUT PROCEDURES

On vehicle

Functional operation of the slack adjuster can be performed on vehicle by:

a) Insure that wheel are **chocked** and emergency/park brakes are in full off position.

b) Manually de-adjust brakes (turn adjustment hex counterclockwise) to create an excessive clearance condition.

c) Make a full service brake application and full brake release. During the brake release, observe rotation of the adjustment hex (attaching a wrench on the hex will make this rotation easier to see). This rotation indicates that an excessive clearance has been determined by the slack adjuster, and it is making an adjustment to compensate. On each subsequent brake release the amount of adjustment and pushrod travel will be reduced untill the desired clearance is achieved and so additional adjustment is required.

If adjuster fails to adjust, remove from vehicle and perform "Off Vehicle" functional test.

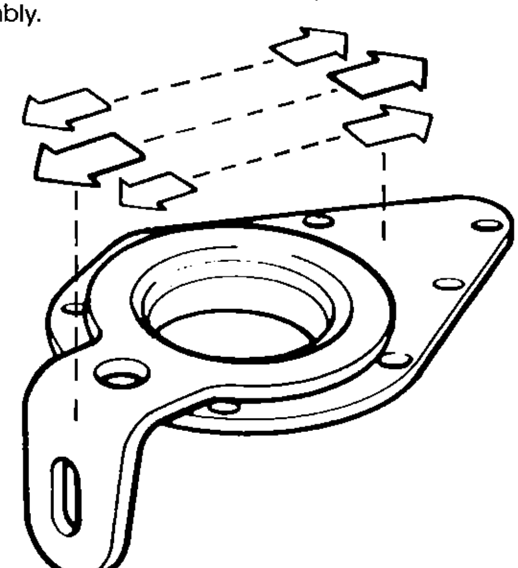
Off vehicle

Periodic "Bench Test" of the automatic slack adjuster is recommended at brake reline or major brake overhaul

It is during these intervals that it would be most convenient to remove adjusters from vehicle and perform the following checks to insure proper function of the internal mechanisms. (Refer to assembly removal section)

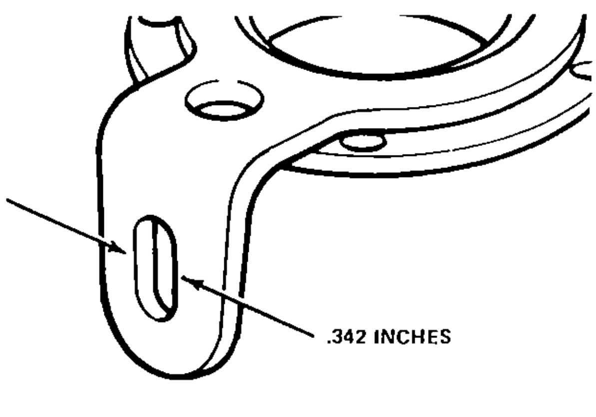
Control arm assembly

Secure slack adjuster lever arm in vise. Attempt to move control arm in a lateral direction, and note if any free play exists between control arm and cover plate. If free play is apparent, this indicates excessive seal wear which could result in contamination entering the slack adjuster assembly.



INSPECT FOR LATERAL MOVEMENT

On slotted-type control arm assemblies, inspect the anchor bolt contact area of slot. The width of the slot should not exceed .342 inches.

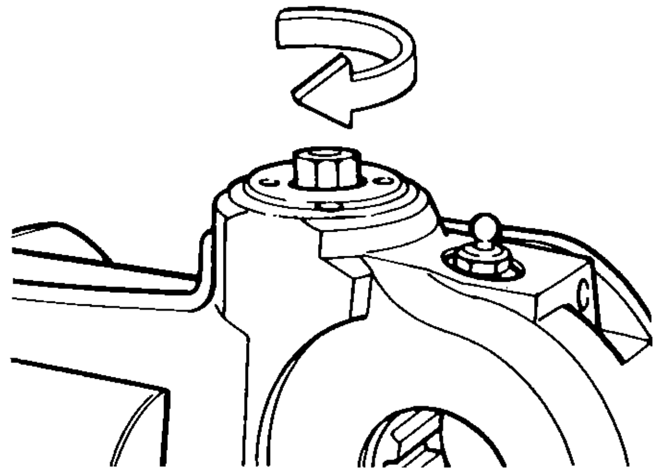


Should either of these conditions exist it is recommended that the control arm assembly be replaced

FUNCTIONAL BENCH TEST

Manual adjustment torque

With adjuster lever arm secured in vise, place a 12 mm socket and inch pound torque wrench on the adjusting hex. Rotate adjustment hex approximately twenty (20) revolutions in a clockwise direction. Note highest reading. This reading should not exceed a maximum of 35 lb./in. torque. A greater torque value indicates excessive internal friction and the assembly should be replaced.

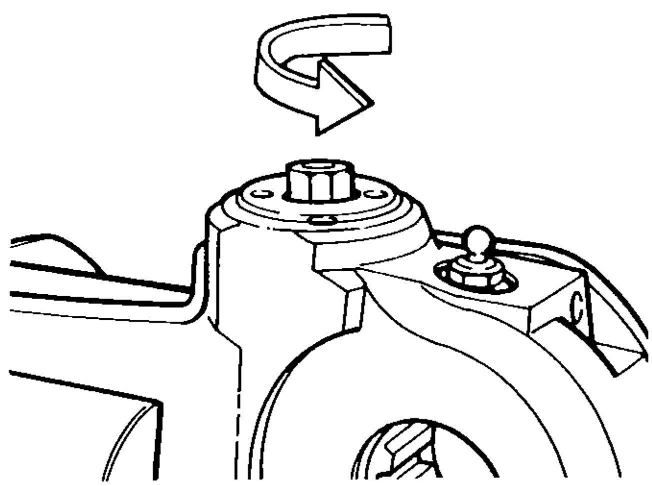


De-adjustment torque

With adjuster lever arm secured in vise, place a 12 mm socket and foot pound torque wrench on the adjusting hex. Rotate adjustment hex in a counterclockwise direction until clutch disengagement occurs.

☐ **Note:** This event is determined by an audible "click".

This reading should be a minimum of 180 in./lbs. (15 lb./ft.) torque. Perform this functions three (3) times and average the values. If the torque value is lower than specified, it would indicate unacceptable clutch performance and the assembly should be replaced.



BRAKE & AIR SYSTEM

SPECIFICATIONS

Air compressor

Make .... BENDIX WESTINGHOUSE
Model .... TU FLO 700
Capacity (at 1250 RPM) .... 15.5 cu. ft. (439 liters)

Governor

Make .... BENDIX WESTINGHOUSE
Model D-2
Cut-In pressure .... 95-105 p.s.i. (655-724 kPa)
Cut-out pressure .... 115-118 p.s.i. (793-814 kPa)

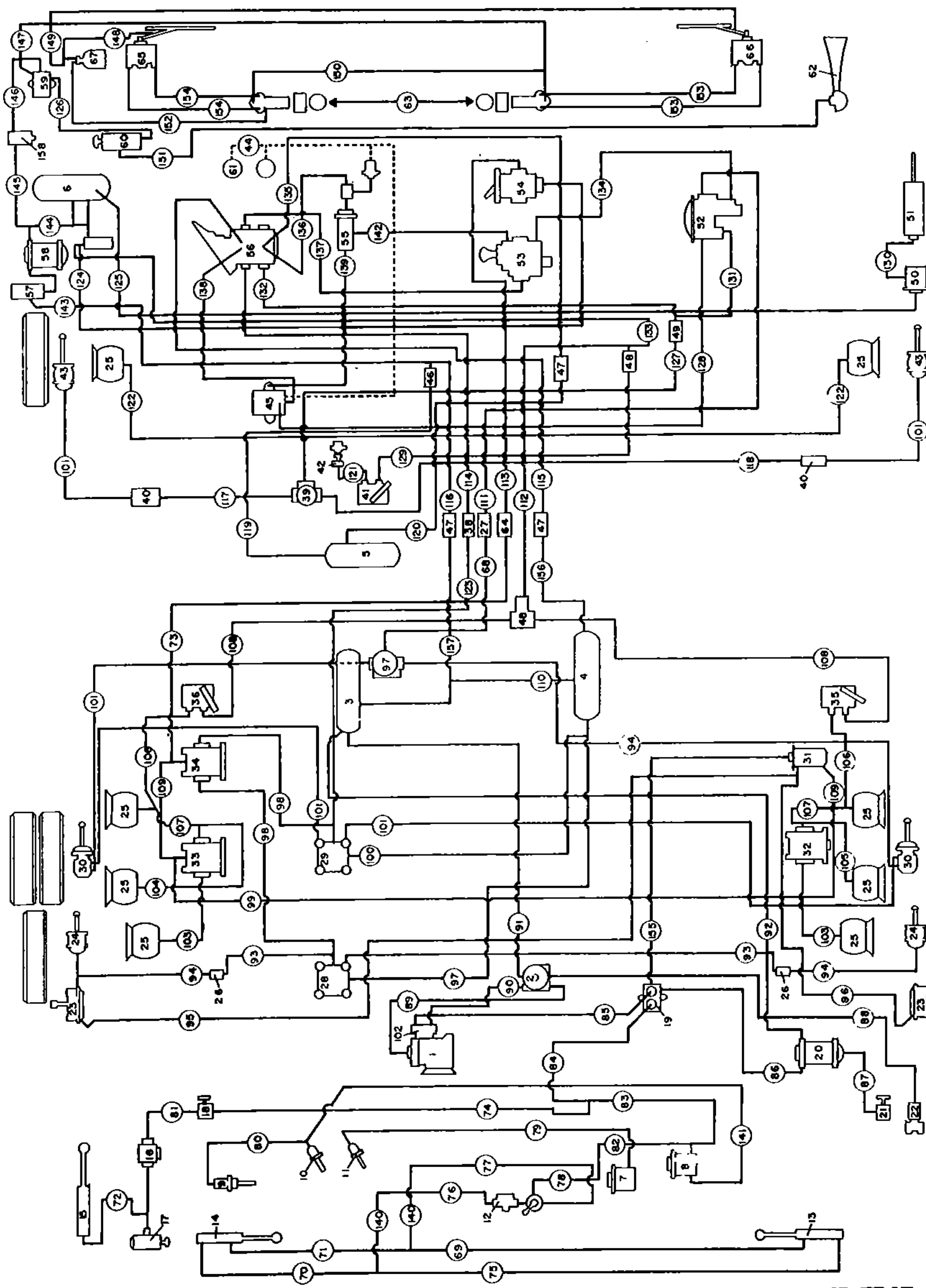
BRAKE CHAMBERS	FRONT	REAR	TAG AXLE
Make	Bendix Westinghouse	Anchorlok	Bendix Westinghouse
Type	24	36	16

SLACK ADJUSTERS	FRONT	REAR	TAG AXLE
Make		Bendix Westinghouse	
Model	PL-18	PL-20	PL-18

AUTOMATIC SLACK ADJUSTERS	
Make	Borg-Warner

Item	Description
01.	Compressor, air
02.	Air dryer assy
03.	Tank assy, wet
04.	Tank assy, serv. — prim. circ.
05.	Tank assy, serv. — sec. circ.
06.	Tank assy, accessories
07.	Valve assy, solenoid — stop motor
08.	Valve assy, solenoid — fast idle
09.	Cylinder, air — fast idle
10.	Cylinder, limiting — fast idle
11.	Cylinder, air — stop motor
12.	Control, regulator & fill valve assy
13.	Cylinder, belt tightener — A/C compr.
14.	Cylinder, belt tightener — Fan
15.	Cylinder, shutter
16.	Shutterstat
17.	Drain cock manuel exhaust
18.	Cock, shut-off
19.	Block assy, manifold fittings
20.	Filter assy — air rear
21.	Drain anchor elbow assy
22.	Valve assy, emergency fill schrader
23.	Cylinder R.H. & L.H. lift — tag axle
24.	Brake chamber R.H. & L.H. — Tag axle
25.	Air belows assy
26.	Bulkhead — Tag
27.	Bulkhead 3/8" I.D.
28.	Valve assy, relay — tag
29.	Valve assy, relay — drive axle
30.	Spring brake — diff.
31.	Valve assy, inversion — tag
32.	Valve R.H. assy, relay — tag
33.	Valve L.H. assy, relay — tag
34.	Valve assy, interlock relay
35.	Valve R.H. assy, HT. control — rear susp.
36.	Valve L.H. assy, HT. control — rear susp.
37.	Valve assy, rear quick release
38.	Bulkhead 1/2" I.D.
39.	Valve assy, front quick release
40.	Bulkhead, front axle
41.	Valve assy, HT. control — front susp.
42.	Tee & Elbow assy — front bellows
43.	Brake chamber
44.	Wiring harness — air press. gauge
45.	Manifold block assy. front — Prim. circ.
46.	Bulkhead assy 5/8" I.D., front
47.	Bulkhead assy 5/8" I.D., front
48.	Bulkhead assy 3/8" I.D., front
49.	Bulkhead assy 1/2" I.D., front
50.	Valve, solenoid — door airlock
51.	Cylinder — door airlock
52.	Valve assy — spring brake

BRAKE & AIR SYSTEM



BRAKE & AIR SYSTEM

Item	Description
53.	Valve assy — parking brake
54.	Valve assy, control — tag
55.	Valve assy, check — double shuttle
56.	Valve assy, brake appli.
57.	Valve, protection
58.	filter assy, air — front
59.	Manifold block assy, front
60.	Valve assy, air horn control
61.	Gauge, air pressure — dashboard
62.	Air horn
63.	Valve assy R.H. & L.H., control — wiper
64.	Bulkhead 1/4" I.D.
65.	Motor wiper & Bracket assy L.H.
66.	Motor wiper & Bracket assy R.H.
67.	Bottle — windshield washer
68.	Tube 3/8" O.D. × 60" LG. yellow
69.	Hose assy, 24" LG.
70.	Hose assy, 26¼" LG.
71.	Hose assy, 19" LG.
72.	Hose assy, 73½" LG.
73.	Tube 1/4" O.D. × 95" LG. black
74.	Tube 1/4" O.D. × 33" LG. cop
75.	Hose assy 32" LG.
76.	Tube 1/4" O.D. × 48" LG. — cop
77.	Tube 1/4" O.D. × 55" LG. — cop
78.	Tube 1/4" O.D. × 27" LG. — cop
79.	Hose assy 23¾" LG. — Teflon
80.	Hose assy 13½" LG. — Teflon
81.	Hose assy 22½" LG.
82.	Tube 1/4" O.D. × 11" LG. — cop
83.	Tube 1/4" O.D. × 12" LG. — cop
84.	Tube 1/4" O.D. × 33" LG. — cop
85.	Hose assy 14" LG., Teflon — gouvernor
86.	Tube 3/8" O.D. × 12" LG. — cop
87.	Tube 3/8" O.D. × 35" LG. — cop
88.	Tube 1/4" O.D. × 76" LG. — cop
89.	Hose assy 48" LG. Teflon
90.	Hose assy 55" LG. Teflon
91.	Tube 3/4" O.D. × 55" LG. green
92.	Tube 3/8" O.D. × 95" LG. green
93.	Tube 1/2" O.D. × 22½" LG. green
94.	Hose assy 1/2" × 26" LG.
95.	Tube 3/8" O.D. × 80" LG. — black
96.	Tube 3/8" O.D. × 51" LG. — black
97.	Tube 5/8" O.D. × 51" LG. — green
98.	Tube 3/8" O.D. × 25½" LG. green
99.	Tube 1/4" O.D. × 45" LG. black
100.	Tube 5/8" O.D. × 44" LG. — green
101.	Hose assy 1/2" × 27½" LG.
102.	Gouvernor assy
103.	Tube 3/8" O.D. × 24" LG. — blue
104.	Tube 3/8" O.D. × 6" LG. — blue
105.	Tube 3/8" O.D. × 9" LG. — blue
106.	Tube 3/8" O.D. × 26" LG. — blue
107.	Tube 3/8" O.D. × 89" LG. — blue
108.	Tube 3/8" O.D. × 64" LG. — blue
109.	Tube 1/4" O.D. × 11½" LG. — black
110.	Tube 5/8" O.D. × 33" LG. — green
111.	Tube 3/8" O.D. × 24" LG. — yellow
112.	Tube 3/8" O.D. × 24" LG. — blue
113.	Tube 1/4" O.D. × 26.6" LG. — black
114.	Tube 1/2" O.D. × 27" LG. — green
115.	Tube 5/8" O.D. × 24" LG. — green
116.	Tube 5/8" O.D. × 27" LG. — green
117.	Tube 1/2" O.D. × 44" LG. — red
118.	Tube 1/2" O.D. × 34" LG. — red
119.	Tube 5/8" O.D. × 50" LG. — green
120.	Tube 5/8" O.D. × 34" LG. — red
121.	Tube 3/8" O.D. × 20" LG. — blue
122.	Tube 3/8" O.D. × 60" LG. — blue
123.	Tube 1/2" O.D. × 75" LG. — green
124.	Tube 3/8" O.D. × 80" LG. — black
125.	Tube 1/4" O.D. × 9'5" LG. — black
126.	Tube 1/4" O.D. × 27" LG. — black
127.	Tube 1/2" O.D. × 21" LG. — red
128.	Tube 3/8" O.D. × 29" LG. — green
129.	Tube 3/8" O.D. × 20" LG. — blue
130.	Tube 1/4" O.D. × 10" LG. — black
131.	Tube 3/8" O.D. × 5" LG. — red
132.	Tube 1/2" O.D. × 4'5" LG. — red
133.	Tube 3/8" O.D. × 49" LG. — blue
134.	Tube 3/8" O.D. × 41" LG. — yellow
135.	Tube 5/8" O.D. × 51" LG. — red
136.	Tube 3/8" O.D. × 25" LG. — red
137.	Tube 3/8" O.D. × 68" LG. — green
138.	Tube 3/8" O.D. × 38" LG. — green
139.	Tube 3/8" O.D. × 8" LG. — green
140.	Hose assy 40" LG. — Teflon
141.	Hose assy 19¼" LG. — Teflon
142.	Tube 3/8" O.D. × 36" LG. — yellow
143.	Tube 3/8" O.D. × 42" LG. — green
144.	Tube 3/8" O.D. × 17" LG. — black
145.	Tube 3/8" O.D. × 20" LG. — black
146.	Tube 3/8" O.D. × 28" LG. — black
147.	Tube 8' LG. (see assy 30-0092)
148.	Hose 3/16" O.D. × 85" LG. — black
149.	Hose 3/16" O.D. × 140" LG. — black
150.	Tube (see assy 30-0092)
151.	Tube 1/4" O.D. × 11' LG. — black
152.	Hose 3/16" O.D. × 73" LG. — black
153.	Tube (see assy 30-0092)
154.	Tube (see assy 30-0092)
155.	Tube 3/8" O.D. × 55" LG. — black
156.	Tube 5/8" O.D. × 12" LG. — green
157.	Tube 5/8" O.D. × 25" LG. — green
160.	Valve assy — solenoid

BRAKE & AIR SYSTEM

TROUBLESHOOTING

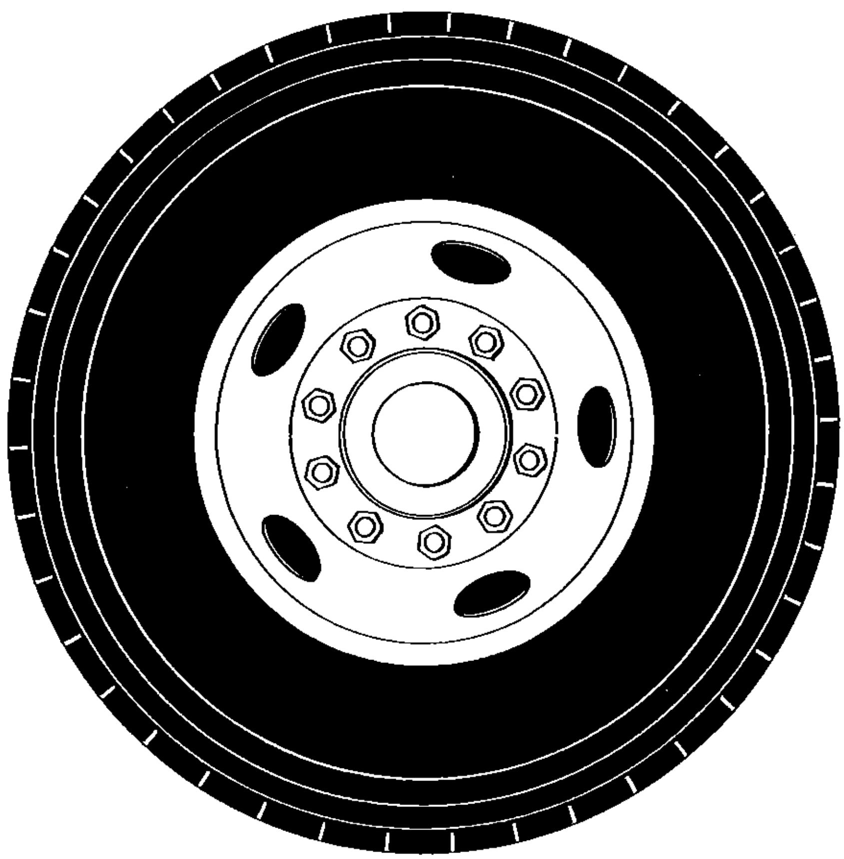
TROUBLE	CAUSE
COMPRESSOR FAILS TO MAINTAIN SUFFICIENT PRESSURE IN AIR SYSTEM	1. Dirty air filter 2. Restriction in compressor inlet or discharge lines or cavities. 3. Leaking or broken discharge valves. 4. Drive coupling slipping. 5. Inlet valves worn excessively or stuck open. 6. Excessive air system leakage. 7. Excessive wear on piston rings and/or cylinders.
NOISY OPERATION	1. Loose drive gear. 2. Excessively worn drive coupling. 3. Worn or burnt out bearings. 4. Excessive wear. 5. Improper lubrication to the compressor. 6. Restrictions in the cylinder head or discharge line.
COMPRESSOR PASSES EXCESSIVE OIL	1. Dirty air filter. 2. Oil supply lines to compressor or return lines flooded. 3. Back pressure from engine crankcase. 4. High inlet vacuum at the compressor. 5. Excessive engine oil pressure. 6. Defective oil seal or oil seal ring in end cover. 7. Piston rings improperly installed. 8. Excessive ring or cylinder wear.
COMPRESSOR FAILS TO UNLOAD	1. Defective or worn unloader pistons or bores. 2. Inlet cavity restrictions. 3. Defective governor. 4. Unloader line from governor pistons kinked or the cavity beneath the unloader pistons restricted. 5. Unloader mechanism binding or kinked.
COMPRESSOR KNOCKS CONTINUOUSLY OR INTERMITTENTLY	1. Loose drive gear. 2. Worn or burnt out bearings. 3. Excessive carbon deposits in compressor cylinder head.
COMPRESSOR KNOCKS CONTINUOUSLY OR INTERMITTENTLY	1. Loose drive gear. 2. Worn or burnt out bearings. 3. Excessive carbon deposits in compressor cylinder head.
SAFETY VALVE "BLOWS OFF"	1. Safety valve out of adjustment. 2. Air pressure in the air brake system above normal.
INSUFFICIENT BRAKES	1. Brakes need adjusting, lubricating or relining. 2. Low air pressure in brake system (below 80 pounds). 3. Brake valve delivery pressure below normal.
BRAKES APPLY TOO SLOWLY	1. Brakes need adjusting or lubricating. 2. Low air pressure in the brake system (below 80 p.s.i.)* 3. Brake valve delivery pressure below normal. 4. Excessive leakage with brakes applied. 5. Restricted tubing or hose line. (552 kPa)*
BRAKES RELEASE TOO SLOWLY	1. Brakes need adjusting or lubricating. 2. Brake valve not returning to fully released position. 3. Restricted tubing or hose line. 4. Exhaust port of brake valve or quick release valve restricted or plugged. 5. Defective brake valve or quick release valve.

BRAKE & AIR SYSTEM

TROUBLESHOOTING

TROUBLE	CAUSE
BRAKES DO NOT APPLY	1. No air pressure in brake system. 2. Restricted or broken tubing or hose line. 3. Defective brake valve.
BRAKES DO NOT RELEASE	1. Brake rigging binding. 2. Brake valve not in fully released position. 3. Defective brake valve. 4. Restriction in tubing or hose line.
UNEVEN BRAKES	1. Brakes need adjusting, lubricating, or relining. 2. Grease on brake lining — reline brakes. 3. Brake shoe release spring or brake chamber release spring broken. 4. Brake drum out of round. 5. Brake chamber diaphragm leaking.
AIR PRESSURE WILL NOT RISE TO NORMAL	1. Defective air gauge (registering incorrectly). 2. Excessive leakage. 3. Reservoir drain cock open. 4. Governor out of adjustment. 5. No clearance at compressor unloading valves. 6. Defective compressor.
AIR PRESSURE RISES TO NORMAL TOO SLOWLY	1. Excessive leakage. 2. Clogged air cleaner. 3. No clearance at compressor unloading valves. 4. Engine speed too low. 5. Compressor discharge valve leakage. 6. Worn compressor. 7. Excessive carbon in compressor cylinder head or discharge line.
AIR PRESSURE RISES ABOVE NORMAL	1. Defective air gauge (registering incorrectly). 2. Compressor governor out of adjustment. 3. Defective compressor governor. 4. Restriction in line between governor and compressor unloading mechanism. 5. Too much clearance at compressor unloader valves. 6. Unloading valve cavities or unloading passage in compressor cylinder head blocked with carbon. 7. Compressor unloading valves stuck closed.
AIR PRESSURE DROPS QUICKLY WITH ENGINE STOPPED AND BRAKES RELEASED	1. Leaking brake valve. 2. Leaking tubing or hose line. 3. Compressor discharge valves leaking. 4. Compressor governor leaking. 5. Excessive leakage elsewhere in the air brake system.
AIR PRESSURE DROPS QUICKLY WITH ENGINE STOPPED AND BRAKES FULLY APPLIED	1. Leaking brake chamber diaphragm. 2. Leaking brake cylinder. 3. Leaking brake valve. 4. Leaking tubing or hose line.
BRAKES GRAB	1. Grease on brake lining — reline brakes. 2. Brake drum out of round. 3. Defective brake valve. 4. Brake rigging binding.

WHEELS, HUBS & TIRES



WHEELS , HUBS & TIRES

Description:

Prevost vehicles are equipped with stud-piloted wheels as standard equipment. Hub-piloted wheels and aluminum wheels are available as optional equipment. These are 22.5" x 8.25" wheels mounted with 12R x 22.5 tubeless type radial tires. Stud-piloted wheel nuts and studs have left-hand threads on the left side of the vehicle, and right hand threads on the right side of the vehicle. When the hub-piloted wheels are used, all studs and nuts have right hand threads.

☐ **Note:** Other wheels and tires may be supplied upon special request. In these cases, the information about such wheels and tires will be obtained from their manufacturer. The spare wheel and tire are carried in the compartment located directly behind the front bumper. Access is gained by removing the two (2) retaining bolts located on the front bumper, then pulling the bumper out and down. Make sure that both bumper retaining bolts are firmly tightened in place after closing compartment door.

Wheel Nut Tightening Procedure

It is important that wheel stud nuts be tightened alternately on opposite sides of wheel. Refer to Figure 13-1 for suggested sequence for tightening and a recommended procedure following.

(A) Run the stud nuts in lightly referring to Figure 13-1 for sequence so that wheel will position it self concentrically with hub. This is importnt, otherwise wheel may be eccentric with hub and will not run straight. In this initial step, run the nuts up only as necessary to correctly position wheel.

(B) Tighten stud nuts progressively as shown in Figure 13-1 with an impact wrench. But final tightening should be done with a torque wrench. Tighten stud nuts to 450 - 500 ft. lbs. (610 - 678 Nm).

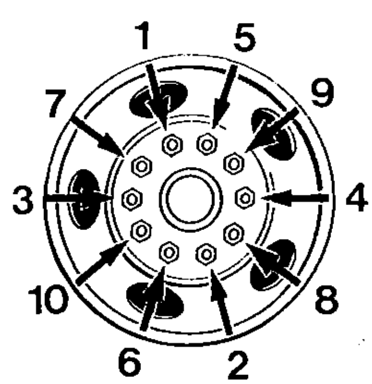


FIG.13.1 STUD TIGHTENING SEQUENCE

Wheel Maintenance

Description

Maintenance consists of periodic checks to see that wheel nuts are tightened to the proper torque. With a new coach, or after new wheels have been instilled, stud nuts should be tightened every 100 miles (161 km) for the first 500 miles (805 km) to allow setting in of clamping surfaces.

Wheel studs and nuts must be kept free from grease and oil. No lubricant whatsoever should be used.

When installing wheel studs to hubs, check lockwashers and nuts retaining the wheel stud to wheel hub and if washers and nuts are deformed, damaged or severely corroded, install new parts. Install washer and nut to new stud and torque to 585 to 750 ft. lbs. (793 - 1,017 Nm) Dry.

Cleanliness of wheel and drum mating surfaces is important for proper wheel mounting. On new drums the inner and outer surfaces of the mounting flange should be thoroughly cleaned to remove rust preventive coating.

Worn wheel stud holes will usually be accompanied by evidence of a bright worn surface on the wheel face, indicating that the loose wheels were working aginst each other. Wheels in this condition should be replaced. Inspect for hidden cracks in wheels, if cracked they should be replaced.

Check for stripped threads on wheel studs. When damaged threads are discovered, the stud should be replaced. When a broken stud is replaced, the studs on each side of it should be replaced. This is because the other studs in the wheel have been subject to undue strain. When damaged inner or outer cap nuts are found, it is an indication of a loose mounting condition. Cap nuts and studs, if necessary, must be replaced. If wheel ball seats are damaged, the wheel also should be replaced. Corrosion or galling of the stud and nut assembly can reach a point where removal of cap nuts is difficult. If this is a persistent problem, a light application of lubricant can be applied on the first three threads of the stud and the first three threads of inner cap nut. Care should be taken to keep all lubricant from ball seat of stud hole or ball faces of cap nuts.

In case of a broken, cracked or worn hub face, it should be replaced. A badly worn hub face is always caused by running wheel assemblies in a loose condition. If the wear is not too excessive, the entire hub face can be machined to a flat surface with the studs removed. Otherwise, with a badly out of flat or worn condition, the hub should be replaced.

When mounting rear dual wheels, care should be taken to position the tire valve stems 180° apart so that access to both inner and outer tire valves may be obtained.

WHEELS , HUBS & TIRES

Front And Rear Trailing Wheel Hubs

Description:

Front and rear trailing wheel hubs are oil lubricated. Grease lubricated hubs are available as optional equipment. A sight glass is provided with oil lubricated hubs for convenient check of oil level. Level should be checked daily. If oil is not visible in the sight gauge level mark, SAE 90 gear oil should be added through the snap plug hole at the center of the hub cap to bring level to the correct point.

Adjustment

To adjust front wheel bearings, remove cap screws, lockwashers, hub cap, and gasket. Flatten jam nut lock and remove jam nut, and lock ring.

Before bearing adjustment is made, brakes must be released and not drag. Bearing play may be checked by jacking up the wheels one at a time and observing bearing play using a long bar under the tire. Observe movement of break drum in relation to brake spider. If bearings are adjusted properly, movement of the drum will be just perceptible and the wheel will turn freely.

Tighten adjusting nut until the wheel binds, at the same time rotating the wheel to make sure all surfaces are in proper contact. Back off adjusting nut about 1/8 turn to make sure the wheel turns freely. Replace lock ring with valve pin in adjusting nut inserted in the hole of the ring. Install jam nut lock and jam nut. Tighten to approximately 200 - 300 ft. lbs (271 - 407 Nm). Recheck bearing adjustment. Bend lips of jam nut lock over flats of jam nut. Replace hub cap using a new gasket.

☐ **Note:** A special key is provided with the vehicle to rotate wheel bearing adjusting nut and jam nut.

Disassembly And Repair

If bearings are to be removed, raise vehicle and remove wheel. Remove brake drum-to-hub retaining screws and remove brake drum. Remove hub cap and gasket. Remove jam nut, jam nut lock, lock ring and bearing adjusting nut. Pull hub assembly off spindle, being careful not to let the bearing fall out of hub. The oil seal and bearings can now be removed from the hub.

All parts should be thoroughly cleaned. Bearing cone and roller assemblies can be cleaned in a suitable cleaning solvent using a stiff brush to remove old lubricant.

If excessive wear, deterioration, cracking, or pitting are present on the bearing cups, rollers, or cones, the bearings should be replaced. Seals should be replaced every time they are removed from the hub. To install new oil seal, use a suitable adapter and drive the seal into the bore until it bottoms.

When installing wheel on the spindle, center the wheel hub with spindle to avoid damaging the seal with the end of the spindle. Push wheel straight over the spindle until I.D. (inside diameter) of seal pressfits over spacer. Prefill hub cavity with SAE-90 gear oil (or wheel bearing grease if vehicle is equipped with grease lubricted wheel hubs). Lubricate outer bearing cone and assemble. Adjust bearings and lock. Install hub cap and new gasket. Fill hub with SAE-90 gear oil until reaches level mark on sight glass. Insert rubber fill plug.

Rear Wheel Hubs

Description

Rear wheels use a single oil-seal assembly and are lubricated from the supply of oil in the differential housing. Bearings are tapered roller, adjustable for wear.

Rear hubs require no periodic checking of lubricant level, provided correct level is maintained in the differential housing.

☐ **Note:** Grease lubricated rear wheel berings are available as optional equipment.

Bearing Adjustment

To adjust rear wheel bearings, jack up rear of coach and remove rear axle shaft as indicated in Section 11 (Rear axle) of this manual. Remove gaskets. Unscrew lock nut and remove adjusting nut lock ring.

To make the adjustment, tighten adjusting nut until the wheel bids, rotating the wheel while tightening so that all surfaces are in proper contact. Back off adjusting nut about 1/8 turn to make sure that the wheel turns freely.

Replace lock ring, and adjust nut dowel pin in one of the holes. The ring may be turned over if necessary to allow more accurate adjustment of bearings. Tighten lock nut and recheck bearing adjustment. Replace the axle shaft using a new gasket.

Disassembly And Repair

Jack up the rear of the coach and remove rear axle shaft. Remove wheels and tires. Remove brake drum-to-hub retaining screws and remove brake drum. Remove lock nut, lock ring and adjusting nut from axle housing making sure to prevent the outer bearing from falling out. Remove outer bearing cone and roller assembly.

Remove screws attaching inner oil seal retainer to hub, and remove inner bearing cone and roller assembly. Bearing cups can be removed from the hub using a hammer and a long brass drift.

WHEELS , HUBS & TIRES

All parts should be thoroughly cleaned. Bearing cone and roller assemblies can be cleaned in a suitable cleaning solvent using a stiff brush to remove old lubricant.

If excessive wear, deterioration, cracking, or pitting are present on the bearing cups, rollers, or cones, the bearing should be replaced. Seals should be replaced every time they are removed from the hub. To install new oil seal, use a suitable adapter and drive the seal into the retainer bore until it bottoms.

When installing wheel on spindle, center the wheel hub with spindle to avoid damaging the seal with the end of the spindle. Push wheel straight over the spindle until I.D. of seal pressfits on wiper. Pre-fill hub cavity with SAE-140 differential oil. Lubricate outer bearing cone and assemble. Adjust bearing and lock. Assemble axle flange to axle using a new gasket. Apply sealant in stud area.

☐ **Note:** On vehicles equipped with grease lubricated wheel bearings, use wheel bearing grease instead of SAE-140 oil.

With axle flange filler held in six o'clock position, fill hub until final level is even with hole. Insert and tighten plug securely. (1 qt. of oil). To complete filling operation, after both wheels have been assembled and filled according to above procedure, raise the differential oil level to proper factory recommended level. Clean vent thoroughly.

☐ **Note:** During regular inspection check lubricant level in wheels and differential. Clean and replace vent as required.

Tire Maintenance

A regular and correct maintenance procedure is essential to safe and economical tire service.

Daily, inspect each tire carefully for cuts or foreign matter such as nails, glass, etc. Remove any foreign matter lodged between tires and dual wheels. Check tire inflation pressure with an accurate gauge. Pressure should be checked before starting a run and should be as recommended by tire manufacturer. Always use same gauge to check the pressure to eliminate any differences resulting from gauge error.

If pressure loss is greater than normal, remove and inspect tire to determine cause. Replace any missing valve caps.

☐ **Note:** Tire pressure should be taken with pressure cold.

Inflation Of Tires

Improper inflation is the greatest cause for loss of tire life expectancy. Tires should be checked frequently for this condition. Unless correct air pressure is consistently maintained, tires will not function as they should; consequently safe, economical operation of vehicle will be materially affected.

An under-inflated tire runs sluggishly, heats up quickly because of greater flexing, and is subjected to more frequent bruising. Over-inflation does not compensate for over-loading. It does not add strength to tire, in fact, it actually weakens the tire by reducing its ability to absorb road shock, and may cause a blow-out.

In addition to the deteriorating effect improperly inflated tires may have on tire life, they will also affect steering, riding comfort, and safe driving.

Balanced Inflation

The operating efficiency of vehicle will be seriously upset if air pressures in tires are out of balance. Balanced inflation may be expressed as: all tires on the same axle should always carry same air pressure. A difference in air pressure of rear tires and front tires may be permissible within certain limitations; however there should not be a difference in pressures between right and left tires on the same axle. A 5 p.s.i. (34.5 kPa) under-inflation in one front tire not only can destroy ease of steering, but creates steering hazards which generally point to a potential accident. An under-inflated rear tire will greatly affect brake efficiency. Balance tire pressures for ease of steering, comfort in riding, safety in driving, as well as for minimum fuel consumption and maximum tire mileage.

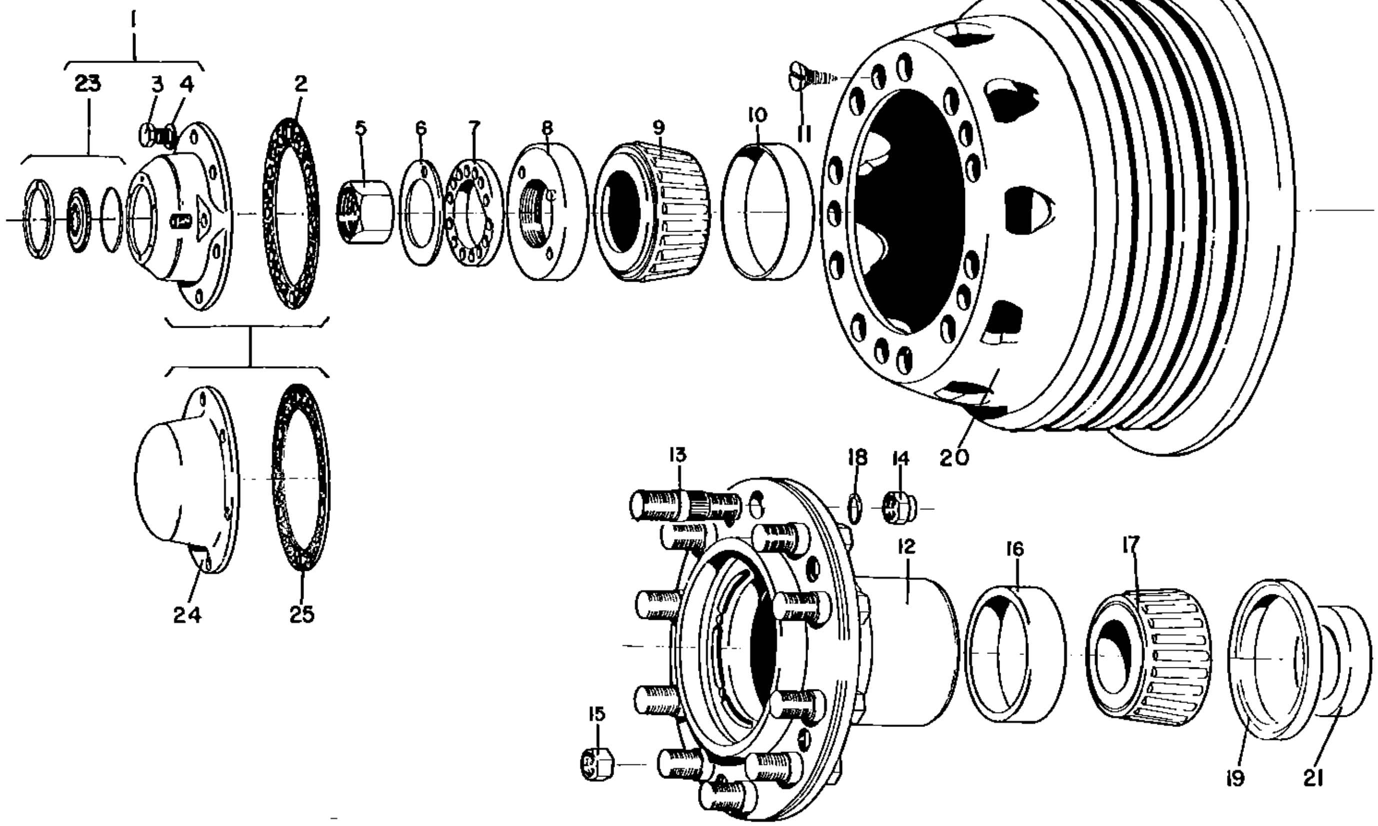
Pressure Loss

At periodic intervals, each tire should be gauged for pressure loss with an accurate gauge before tires are brought to correct operating pressure. The purpose of this check is to determine exact pressure losses in each tire. If at the time this check is made, a definite pressure loss is noted in any one of the tires, an inspection should be made of tire showing loss and cause of loss corrected. This method should definitely establish a ««danger signal»» on the condition of tires. Pressure loss check should be made consistently with the same gauge, so that any element of inaccuracy in gauge will be the same for all tires.

☐ **Note:** Tire pressure should be taken with pressure cold.

WHEELS , HUBS & TIRES

FRONT & TAG AXLES, HUBS & DRUMS

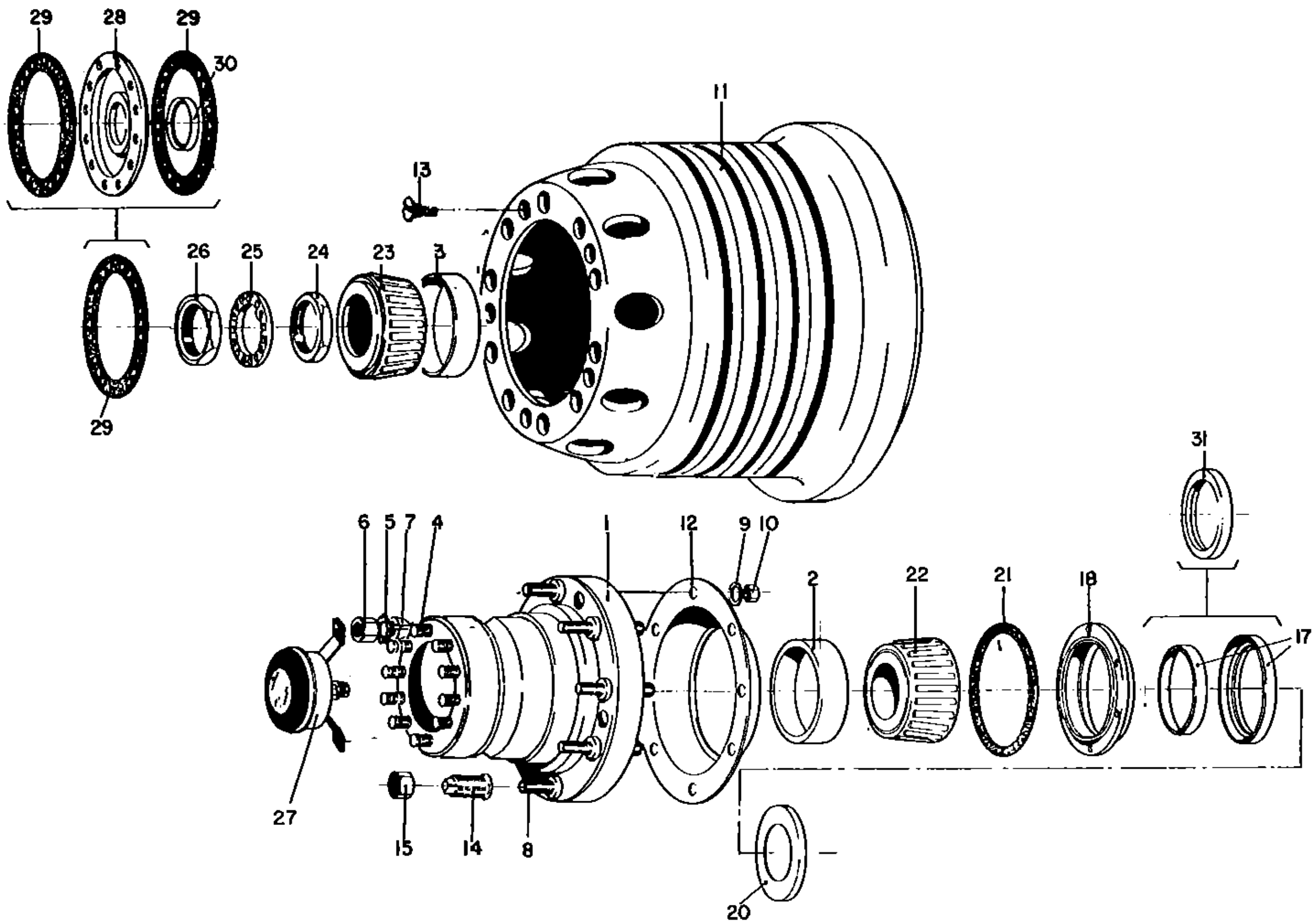


ITEM.	QTY	DESCRIPTION
		FRONT HUB & DRUM ASSY, eff. w/axle 16930wx399
1	2	— CAP, Hub
23	1	— — WINDOW KIT
2	2	— GASKET, Hub Cap
3	12	— SCREW, Cap
4	12	— WASHER, Lock
5	2	— JAM NUT
6	2	— JAM NUT LOCK
7	2	— LOCK RING
8	2	— ADJUSTING NUT
9	2	— BEARING CONE, Outer Wheel
11	5	— MACHINE SCREW
12	1	— HUB & CUP ASSY
10	1	— — CUP, Outer Wheel Bearing
16	1	— — CUP, Inner Wheel Bearing
13	10	— STUD R.H., Wheel
	10	— STUD L.H., Wheel
14	10	— NUT, Lock
15	10	— NUT R.H., Wheel Cap
	10	— NUT L.H., Wheel Cap
17	2	— BEARING CONE, Inner Wheel
18	10	— WASHER, Hardener
19	2	— OIL SEAL ASSY
20	1	— DRUM, Brake
21	2	— SPACER, Wheel Bearing
22	2	— SLINGER, Wheel Bearing

ITEM	QTY	DESCRIPTION
		WITH GREASE SEAL
19	2	GREASE SEAL ASSY
24	2	CAP, Hub
25	2	GREASE SEAL ASSY

WHEELS , HUBS & TIRES

REAR AXLES , HUBS & DRUMS



ITEM	DESCRIPTION
1	DIFFERENTIAL AXLE ASSY — R-164WX-38
1	— HUB & CUP ASSY
2	— — CUP, Inner
3	— — CUP, Outer
4	— STUD
5	— WASHER, Lock
	— WASHER, Lock
6	— NUT, Stud
7	— DOWEL
8	— STUD L.H., Wheel
	— STUD R.H., Wheel
10	— NUT, Wheel Stud
11	— DRUM, Brake
12	— SLINGER, Oil
13	— SPECIAL SCREW
14	— NUT L.H., Wheel Stud — Inner
	— NUT R.H., Wheel Stud — Inner
15	— NUT L.H., Wheel Stud — Outer
	— NUT R.H., Wheel Stud — Outer
17	— RETAINER ASSY (With Oil Seal)
	— — SEAL ASSY, Oil
21	— WIPER, Oil Seal
22	— GASKET
24	— BEARING CONE — Inner
25	— BEARING CONE — Outer
26	— ADJUSTING NUT
27	— Lock Ring
28	— LOCK NUT
	— SHAFT AXLE L.H.
	— SHAFT AXLE R.H.
29	— GASKET
31	HUBODOMETER

WHEELS , HUBS & TIRES

Tire Rotation

Tire rotation is not necessary unless uneven wear appears. If it is the case, the following system of interchanging is recommended: right front to left rear inside or right rear outside, and left front to right rear inside or left rear outside.

If inside dual tires show more wear than outside dual tires, place front tires on inside when changing. In this case, outside dual tires can be interchanged between right and left hand side of vehicle.

If outside dual tires show more wear than inside dual tires, place front tires on outside dual tires when changing. At the same time, interchange right and left hand inside dual tires.

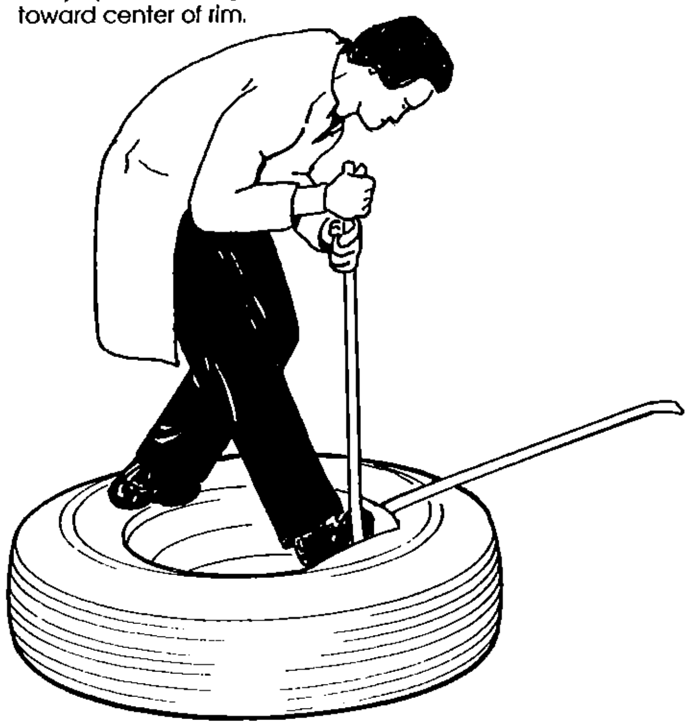
New tires should be installed on front wheels where they run coolest.

Tubeless Type Wheel Assembly Demounting And Mounting

Tools required: 2 tubeless tire tools, 1 pair visegrip pliers, lubricant and brush.

■ **Caution:** Avoid the use of any lubricant containing water, or any solvent injurious to rubber.

Demounting: Deflate tire. With tire lying flat, loosen both beads by walking on tire with heels close to rim. With wide side of rim down, lubricate top bead. With stops toward rim, insert spoon ends of both tools about 10" (254 mm) apart. Holding bead in well with foot, pull one tool toward center of rim.

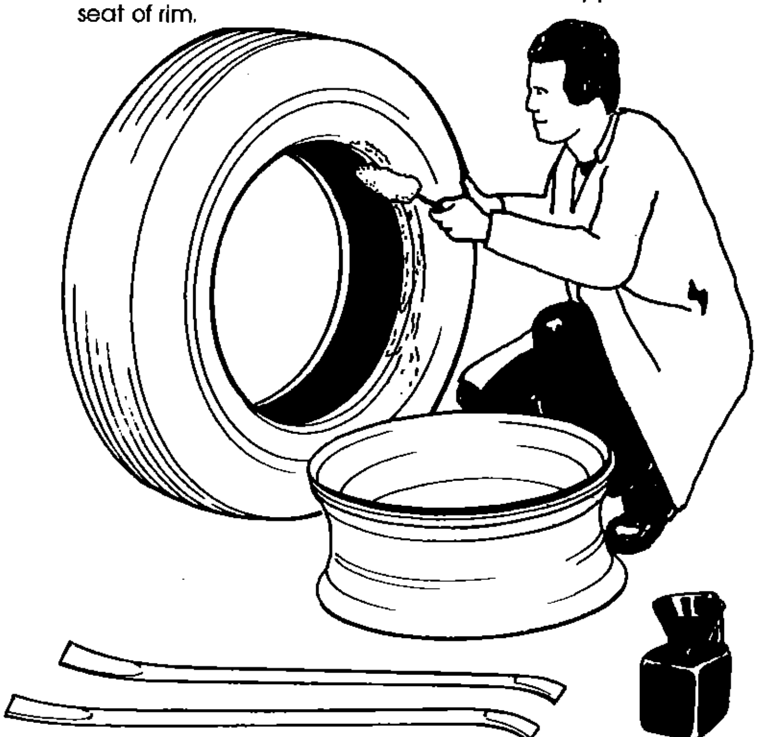


Hold tool in position with one foot and pull second tool toward center of rim. Progressively work head off rim, taking additional bites if necessary.

Stand assembly in vertical position. Lubricate second bead. At top of assembly insert straight end of tool between bead and back flange of rim at about a 45° angle. Turn tool so that it is perpendicular to rim. Pry second bead off.

WHEELS , HUBS & TIRES

Mounting: Be sure right valve is used and is properly installed in the rim. Inspect rim to insure bead seats are clean and smooth. Then place rim on floor with side down and lubricate first bead of tire and upper bead seat of rim.



Push first bead into well of rim and onto rim as far as possible. Using straight end of tool (with stop resting on rim flange), take small bites to work remaining section of first bead on to rim.

Hold second bead in well by standing on tire and anchor with vise-grip pliers (snub side toward tire). Using spoon end of tire tool with stop toward rim, use small bites until bead slips over flange. If necessary, insert second tire tool and lubricate last 6" (152 mm) of bead before completely mounting. Inflate tire to recommended pressure. Examine valve assembly occasionnally to avoid leaks.

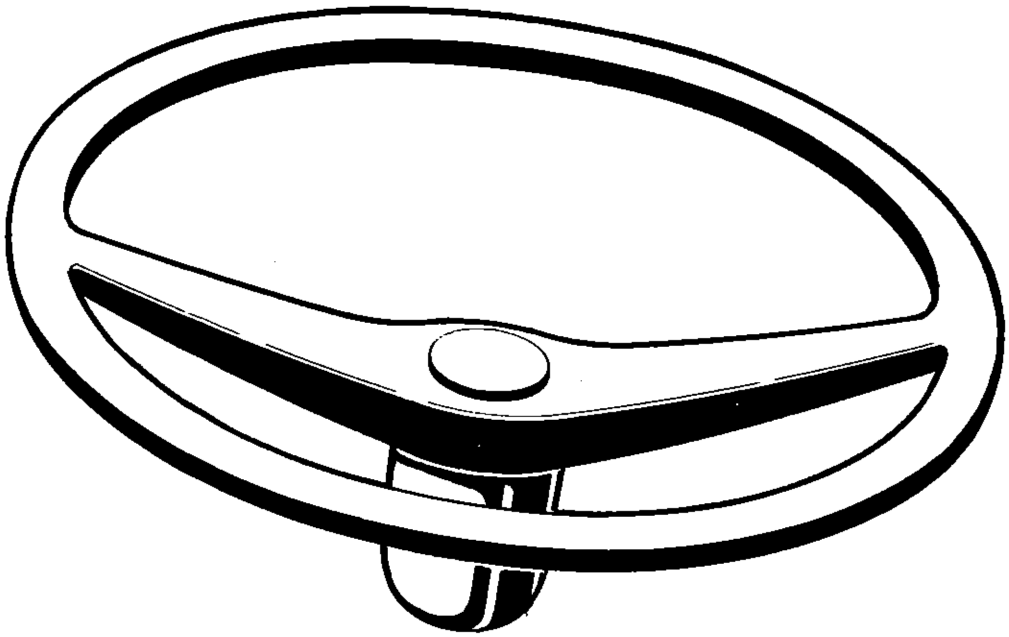
Safety Precautions

1. Use only rims free from damage, rust or pitting.
2. Inflate tire in a safety cage or use a portable safety device.

SPECIFICATIONS

Wheel size	22.50" x 8.25" (571.5 x 209.5 mm)
Tire size	12.5 R x 22.5 (radial)
Wheel stud nut torque	450-500 ft. lbs (610 - 678 Nm)

STEERING



STEERING

DESCRIPTION

The XL serie vehicles are equipped with a ROSS HFB70 integral steering gear. This integral power steering gear incorporates a manual steering mechanism, a hydraulic control valve and a hydraulic power cylinder. The control valve is a rotary type which directs oil flow from the engine power steering pump to either one of the cylinder cavities. The flow directed to a cavity is dependent upon the speed at which the steering wheel is turned.

Force on the steering wheel is transmitted to the steering gear input shaft. The input is connected to the worm shaft by means of a torsion bar. The torsion bar turns with the input shaft, exerting a rotationnal force on the worm shaft. The worm shaft in turn transmits the force through a ball nut mechanism to axial force on the rack piston. The rack piston resists this force due to its engagement to the sector shaft. With this résistance, the torsion bar is twisted by the input shaft. Pressurized fluid moves the rack piston axially through the cylinder bore and the rack piston then turns the sector shaft and steers the vehicle.

If the steered wheels receive a shock load, the shock force is transmitted through the sector shaft to the rack piston and on to the worm shaft. This force causes the control valve to send high pressure fluid to the proper cavity to resist the shock force. By hydraulically absorbing the shock, the steering gear prevents kick back at the steering wheel.

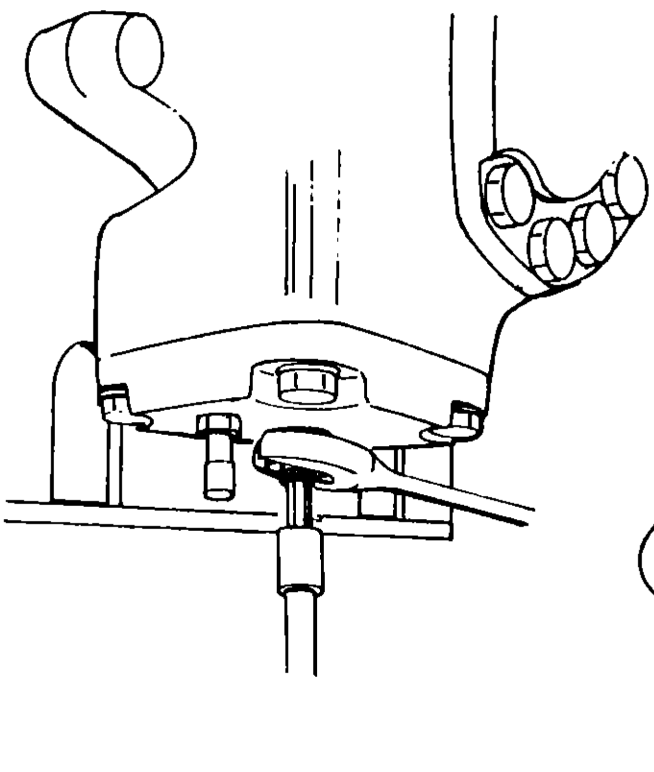
The steering gear is equipped with two (2) unloading valves (poppets) at either end of the housing. As the steered wheels approach the axle stop, the correspon-ding poppet is opened. This reduces heat generated by the pump. The tripped poppet also reduces the load force on the steering linkage. These poppets may be adjusted by the adjusting screws on either end of the steering gear.

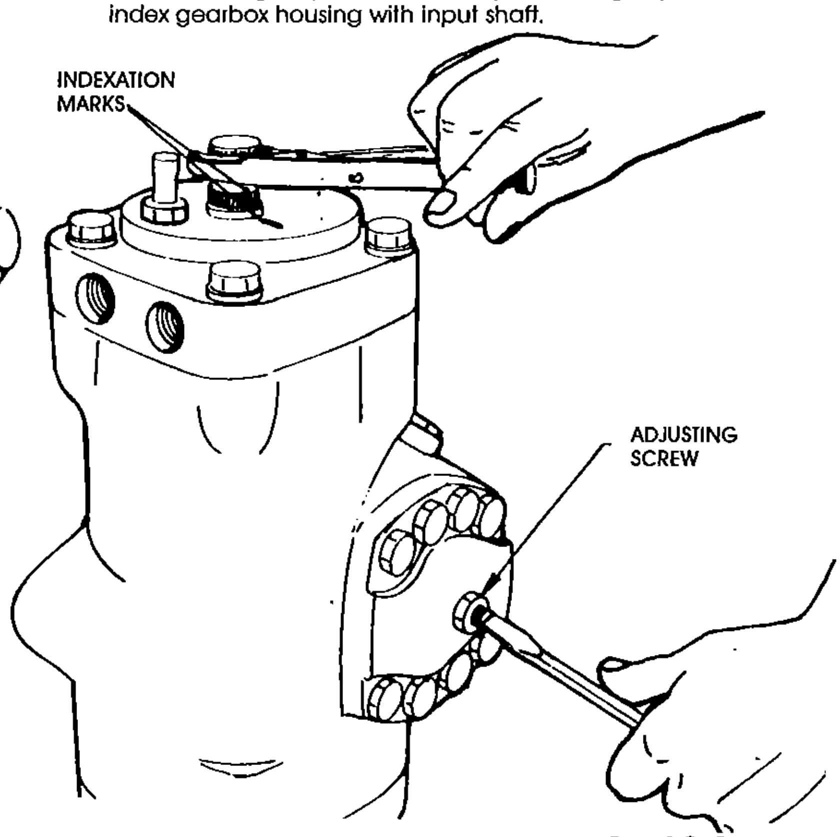
GEARBOX ADJUSTMENT:

1) Remove drag link from steering gearbox.

2) Be sure to be able to gain access to the two (2) adjus-ting screws under the gearbox.

3) Rotate input shaft to its maximum in one direction or the other while calculating the number of required rota-tions. Use a socket 13/16 (12 slots) to do so and reverse one half the total number of rotations previously calcula-ted. This will give you the middle point. Using a punch, index gearbox housing with input shaft.

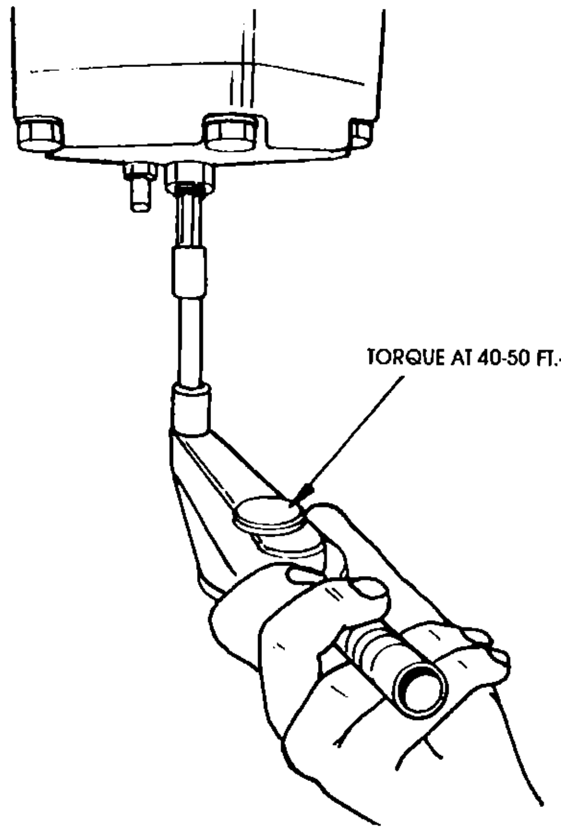




STEERING

4) Unscrew two (2) rotations the worm preload adjusting screw which is located at the center of the gearbox on the opposite side of the input shaft, then, manually tighten it.

5) Be sure marks are indexed and unscrew one (1) rotation the adjusting screw which is located opposite of the output shaft. Rotate input shaft 90° from one side to the other and tighten adjusting screw until a slight resistance is felt.

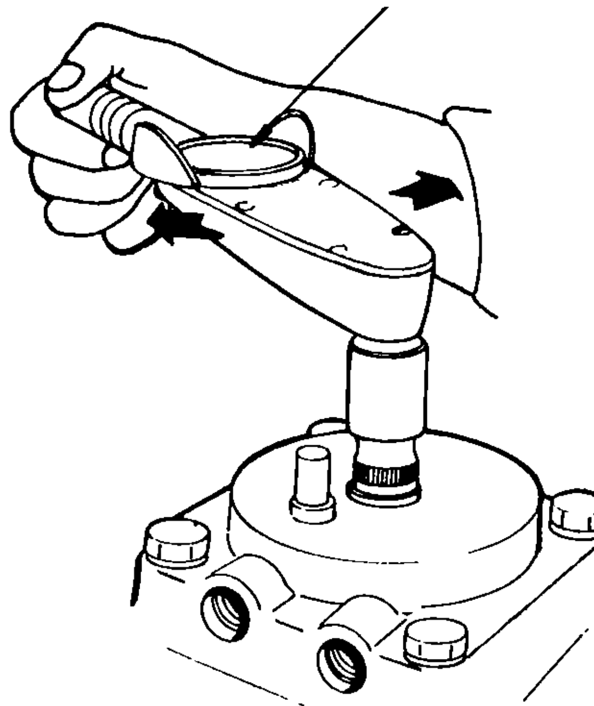


Torque locknut to 40-50 ft-lbs. The torque of the input shaft should not exceed 28-35 in-lbs at this step at any point of the gearbox travel. Ensure the adjusting screw does not rotate while tightening lock nut.

6) Adjust worm preload as follows:

- Rotate input shaft in each direction and torque worm preload adjusting screw to 60-70 in-lbs. The required torque to rotate the input shaft should not exceed 55 in-lbs at any point of the rotation. Retorque locknut to 70-80 ft-lbs.

7) Replace input shaft at its middle position then install pitman arm at 5° to 10° facing backward. Notice that the output shaft marks are in line with the two (2) cover screws.



8) Install steering column while adjusting the steering wheel at neutral point. Adjust the wheels in a straight line and install drag link.

9) Make a road test and verify if steering wheel returns to its neutral point or close to it after the vehicle has turned in one direction or the other. Notice the position of steering wheel while driving in a strdight line. If it should be moved more than one (1) spline, make the adjustment on the drag link. A quarter of a turn on the drag link corresponds to one (1) inche of steering sheel displacement.

10) Adjust hydraulic limits of the end of stroke while taking care never to retain steering wheel more than 15 seconds in its maximum rotation.

Note that the upper screw limits the right travel and that the pump relief should be 1500 PSI.

C) NECESSARY TOOLS

1) Torque wrench in-lbs and ft-lbs

2) Socket 13/16 - 12 slots

3) Socket 5/16

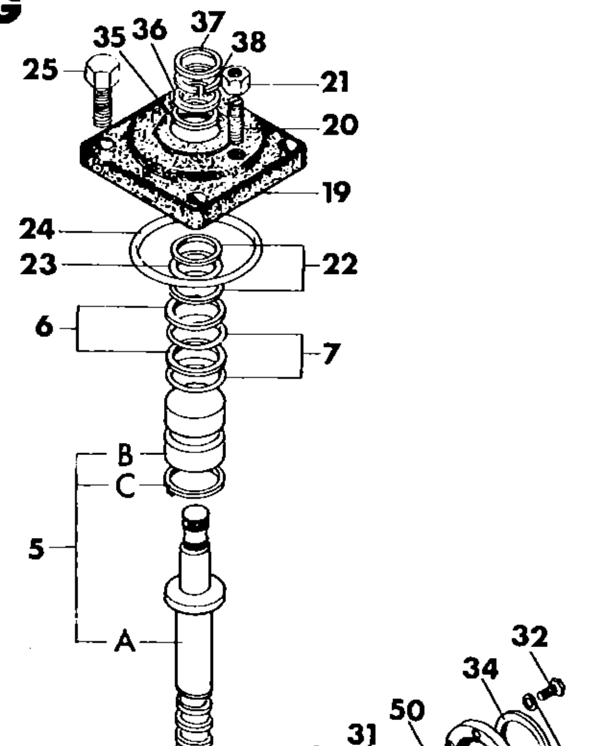
4) Hexagonal rod 5/16" 2" lg

5) Key - 1 1/16"

6) Key - 3/4"

7) Screw-driver

STEERING



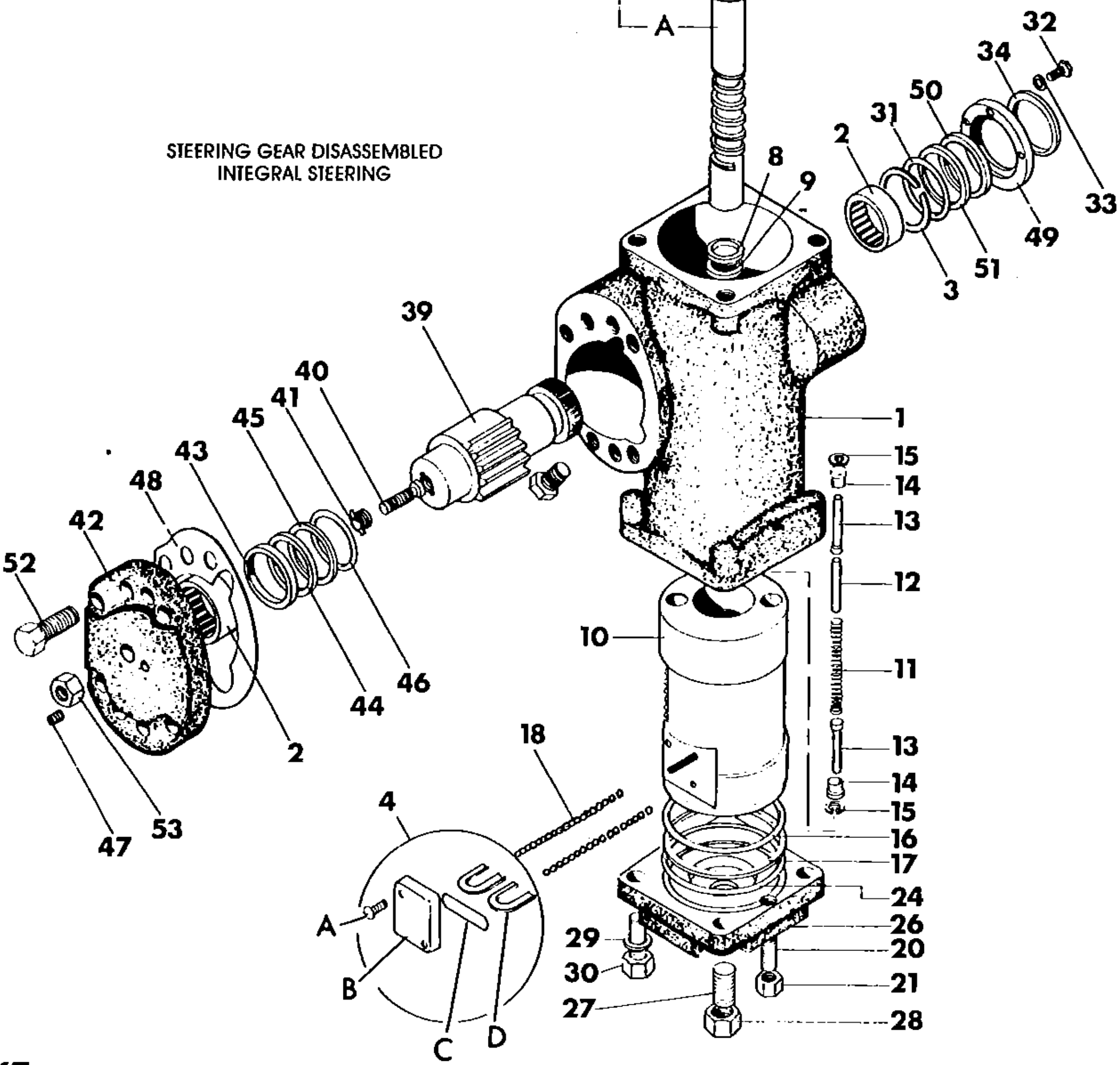
REMOVAL OF STEERING GEARBOX

Remove the pinch bolt on the pitman arm. Drive a wedge into the groove at the top of the arm to loosen it from the sector shaft. Slide the pitman arm off the shaft. Clean the area around the fittings. Disconnect the hoses and plug the holes to prevent the entry of dirt.

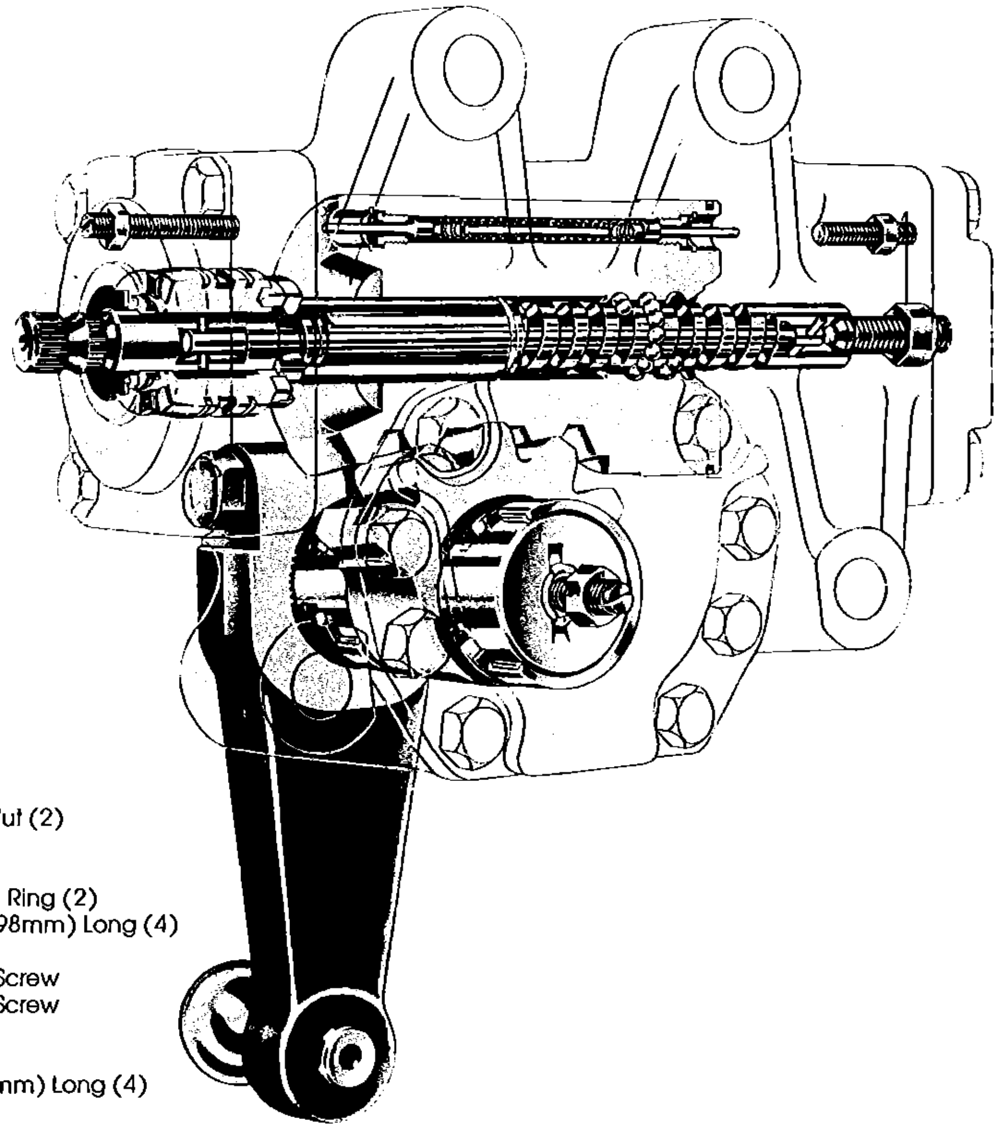
■ **Caution:** The steering gearbox weighs approximately 110 lbs (50 kg) dry. Before continuing with the removal procedure, support the gearbox to prevent it from falling from the frame after the mounting bolts have been removed.

Take out the bolts that secure the gearbox to the frame and support then carefully remove the gearbox.

STEERING GEAR DISASSEMBLED
INTEGRAL STEERING



STEERING



1. Housing
2. Bearing (2)
3. Retaining Ring
4. Guide & Strap Kit
4A. Allen Head Bolts (2)
4B. Ball Return Guide Cap
4C. Ball Return Guide Cap Seal
4D. Ball Return Guides
5. Worm & Valve Assembly
5A. Worm Shaft
5B. Valve Sleeve
5C. Drive Ring
6. Teflon Seal Ring (2)
7. Backup "0" Ring (2)
8. Worm Shaft Backup "0"
9. Teflon Worm Shaft Seal
10. Rack Piston
11. Spring
12. Nylon Spacer Rod
13. Poppet (2)
14. Poppet Seat (2)
15. Retaining Ring (2)
16. Rack Piston Backup "0" Ring
17. Teflon Rack Piston Seal
18. Balls (34)
19. Valve Housing
20. Poppet Adjusting Screw 2.313" (58.75mm) Long (2)
21. Poppet Adjusting Screw Jam Nut (2)
22. Thrust Washer (2)
23. Thrust Bearing
24. End Cover & Valve Housing "0" Ring (2)
25. Valve Housing Bolts 2.125" (53.98mm) Long (4)
26. End Cover
27. Worm Shaft Preload Adjusting Screw
28. Worm Shaft Preload Adjusting Screw Jam Nut
29. End Cover Washer (4)
30. End Cover Bolts 1.625" (41.275mm) Long (4)
31. Trunnion Cover "0" Ring
32. Trunnion Cover Bolts (4)
33. Trunnion Cover Washers (4)
34. Dirt & Water Seal
35. Input Shaft Seal
36. Steel Backup Washer
37. Dirt & Water Seal
38. Retaining Ring
39. Sector Shaft
40. Sector Shaft Adjusting Screw
41. Retainer
42. Side Cover
43. Steel Backup Washer
44. Teflon Backup Washer
45. Side Cover Seal (Two Piece)
46. Retaining Ring
47. Vent Plug
48. Side Cover Gasket
49. Trunnion Cover
50. Teflon Backup Washer
51. Sector Shaft Seal (Two-Piece)
52. Side Cover Bolts (8)
53. Sector Shaft Adjusting Screw Jam nut

DISASSEMBLY

Drain steering gearbox and clean the outer surface.
■ **Caution:** Never steam clean or high-pressure wash any hydraulic components. Do not force or abuse closely fitted parts.

Position the gearbox in a vise with the worm shaft in a horizontal position. Rotate the worm shaft to the end of the sector shaft travel. Position the timing mark on the sector shaft in a vertical direction (halfway between two capscrews). The steering gear is now in its center of travel.

Clean the serrated end of the sector shaft and loosen the jam nut on the sector shaft adjusting screw.

Remove and discard the dirt and water seal from the trunnion cover.

STEERING

Remove the four (4) bolts from the trunnion cover with a ½ inch socket.

Remove the eight special ring head bolts from the side cover with a 13/16 inch socket. There will be some draining of fluid at this point.

☐ **Note:** These eight bolts have a special sealing ring located on the underside of the bolt head. If it is necessary to replace any of these bolts use only the same special type and length of bolts.

Begin to remove the side cover and sector shaft assembly and stop when the bearing rolls are half exposed. A soft hammer may be needed to start removal of the side cover sector shaft assembly.

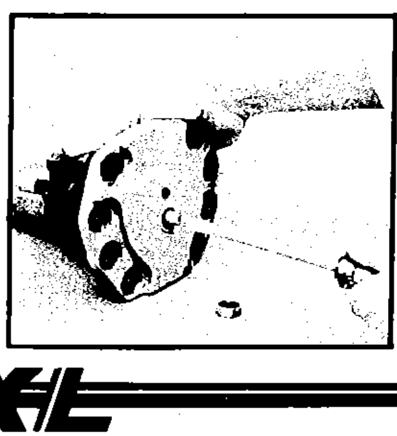
■ **Caution:** Exercise care in removing this assembly slowly. If the assembly is removed too quickly it will be difficult to retain the bearing rolls in the race. When the rolls are half exposed, apply enough grease to retain them in the housing bearing. If one or more rolls is lost, it is necessary to replace the entire bearing.

Completely remove the side cover sector shaft assembly. If the bearing is damaged or it becomes necessary to replace the housing bearing, remove the bearing in the following manner.

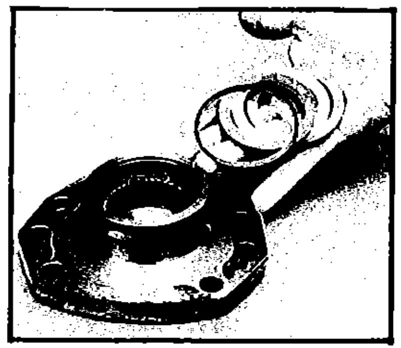
— Using an appropriate bearing mandrel, apply pressure from the side cover opening and press the bearing out through the trunnion cover opening. Care must be taken to maintain a good, square contact between the housing and press base to avoid damaging the bearing bore. If the bearing is cocked during removal, it may burnish the bore, causing it to become oversized and to require replacement of the gearbox housing.

Remove the sector shaft adjusting screw jam nut. Screw the sector shaft adjusting screw through the side cover. Place the side cover exterior face down and lift the sector shaft out vertically.

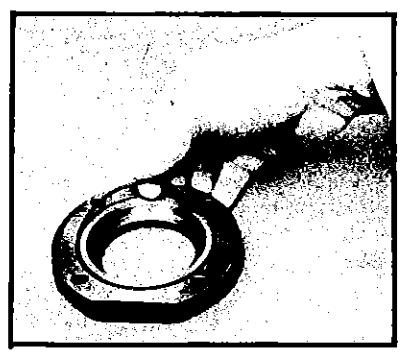
☐ **Note:** Removal of the sector shaft will allow the side cover bearings to fall into the side cover cavity. Immediately collect and count all the side cover bearings at this times.



Remove the retaining ring, the two-piece side cover seal, the teflon backup washer, ant the steel backup washer from the side cover. Discard the seal and the teflon washer.



Remove the trunnion cover "0" ring, the two-piece sector shaft seal and the teflon backup washer from the trunnion cover. Discard seal, washer, and "0" ring.

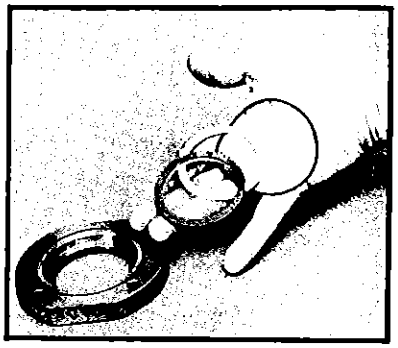


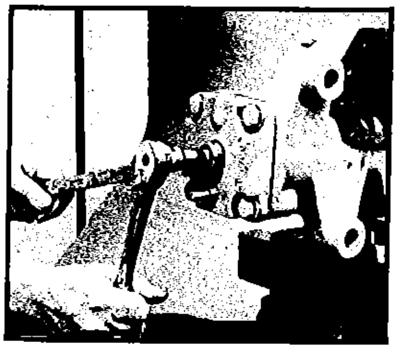
Loosen the worm shaft adjusting screw jam nut with a 15/16 inch socket, and loosen the worm shaft preload adjusting screw two turns with a 15/16 allen socket or screw driver. Loosen the poppet adjusting screw jam nut and the poppet adjusting screw two turns.

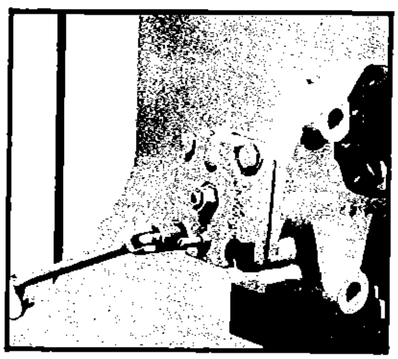
Remove the four end cover bolts with a 13/16 inch socket and remove the four washers.

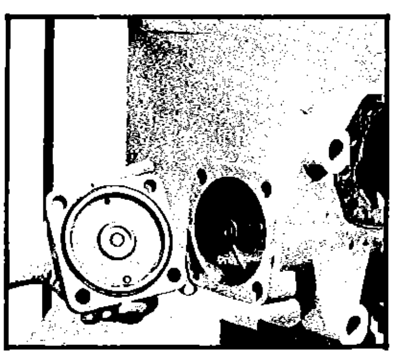
Remove the end cover. Some fluid will drain at this point.

STEERING





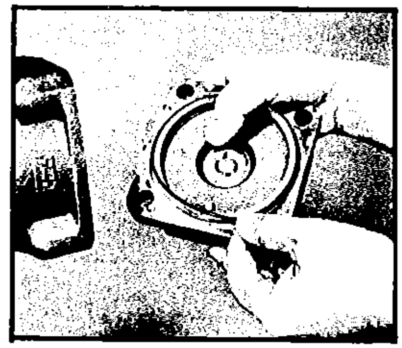


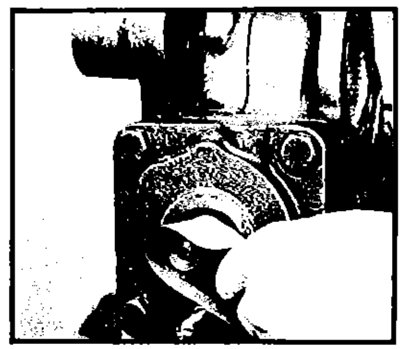


Remove and discard the end cover "0" ring from the end cover.

Clean the input shaft with a fine grade emery paper.

Loosen the poppet adjusting screw jam nut and the poppet adjusting screw in the valve housing two turns.

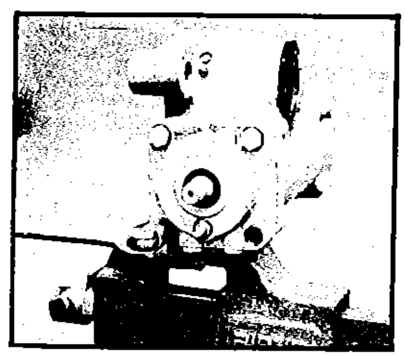




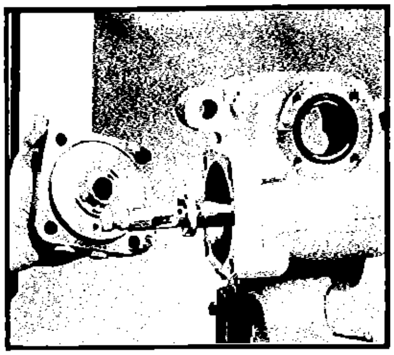
Remove the four valve housing bolts with a 13/16 inch socket.

Remove the valve housing. Some fluid will drain.

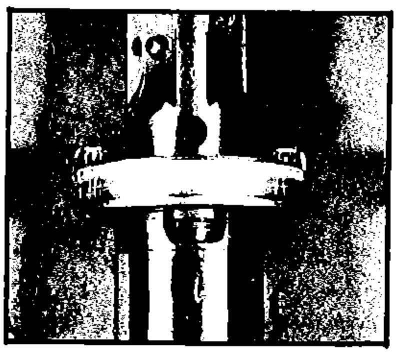
☐ **Note:** The valve sleeve will probably remain in the valve housing.

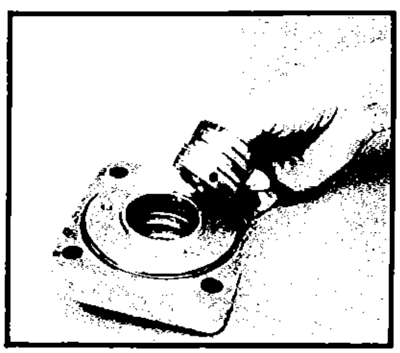


STEERING



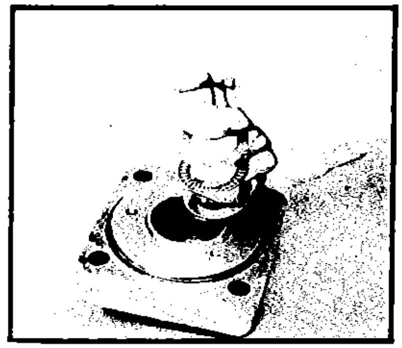
■ **Caution:** Do not remove the drive ring from the worm shaft or attempt to unbend the tangs which hold the drive ring in place on the worm shaft. Doing either will alter the valve timing and could cause the coach to pull to one side or the other after the gear is installed and operated.





Remove the valve sleeve from the valve housing.
Remove the first thrust washer, the thrust bearing and the second thrust washer from the valve housing.

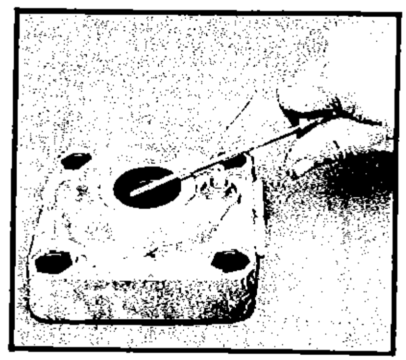
☐ **Note:** The second thrust washer may remain on the end of the valve sleeve.

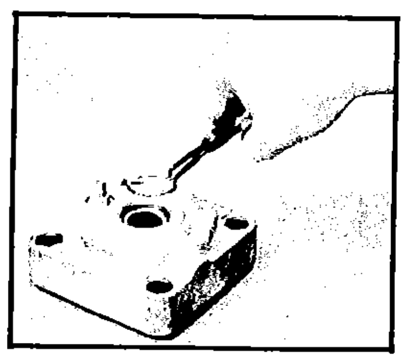


Remove and discard the valve housing "0" ring from the valve housing.

Remove and discard the dirt and water seal.

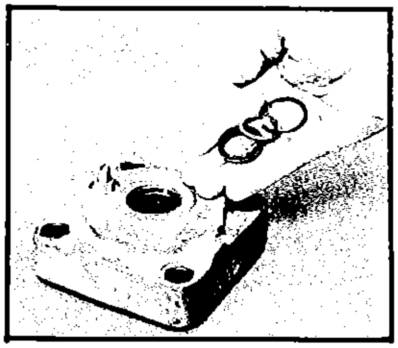
Remove the retaining ring.



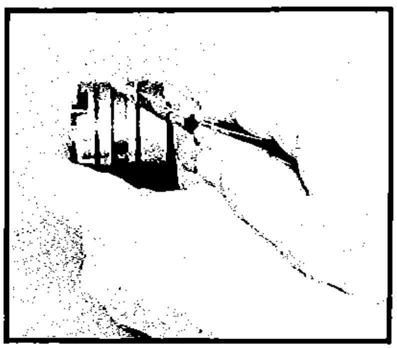


Remove the steel backup washer and the two-piece input shaft seal from the valve housing. Discard the seal.

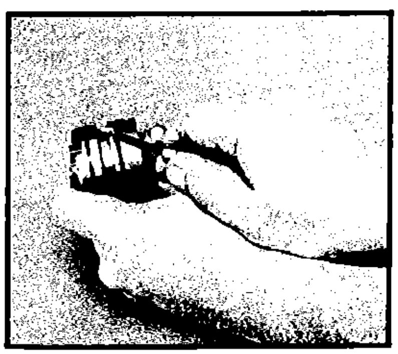
STEERING



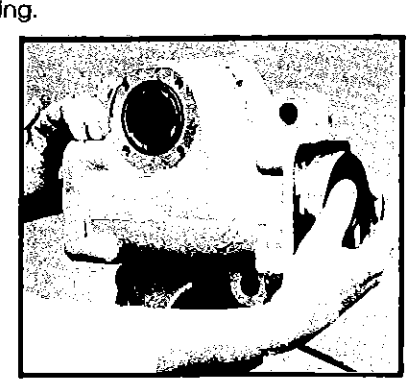
Remove and discard the two teflon seal rings from the valve sleeve.



Remove the two backup "0" rings from the valve sleeve grooves.



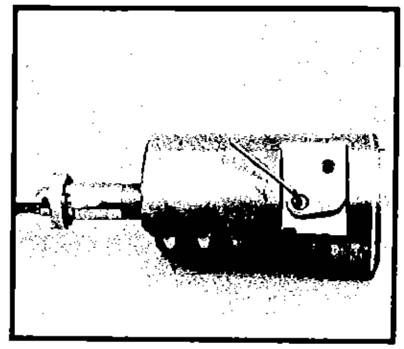
Remove the rack piston worm shaft assembly from the gear housing.



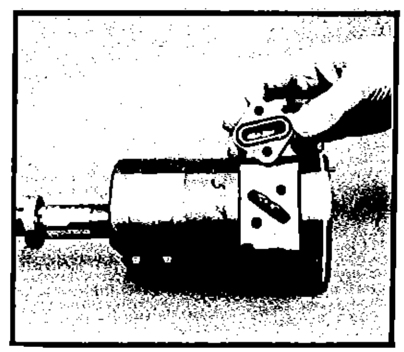
☐ **Note:** The worm shaft will be inside the rack piston with the input part of the worm protruding from the rack piston. When removing this assembly from the housing, take care to prevent the teflon rack piston seal from getting caught in the sector shaft cavity. Remove the assembly from the long end of the housing.

Lay the rack piston worm shaft assembly on a clean rag to prevent the piston from rolling.

Remove the two allen head bolts from the ball return guide cap.



Remove the ball return guide cap and the ball return guide cap seal.

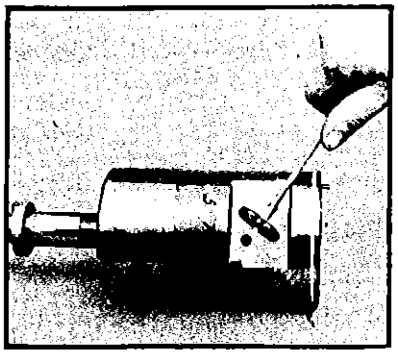


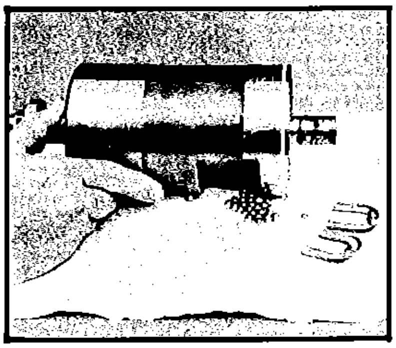
Remove the two ball return guides and the balls from the rack piston by rotating the worm shaft until the balls fall out.

☐ **Note:** Ball return guides are closely fitted with the rack piston and you may have to remove them by carefully inserting a screw driver between the rack piston and ball return guides.

■ **Caution:** Assembly contains a set of 34 matched balls, and you must take special care not to lose any. If any balls are lost, a complete, new set of matched balls will be required.

STEERING

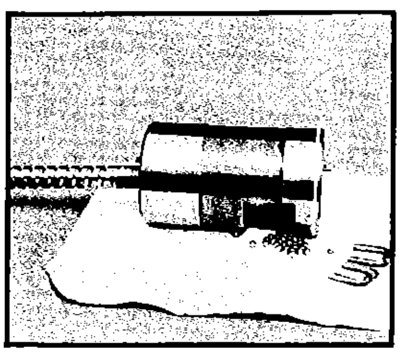


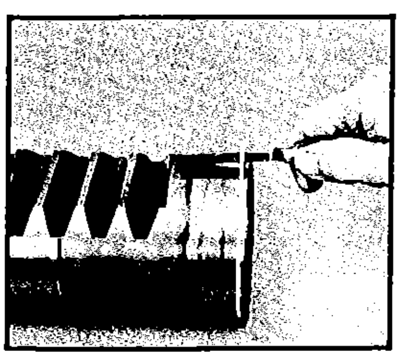


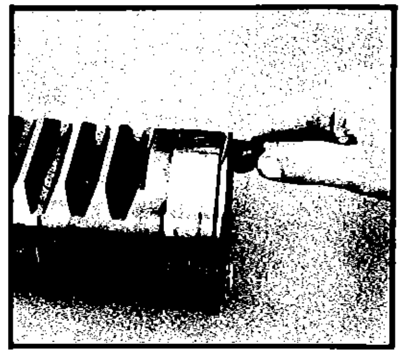
Remove the worm shaft from the rack piston.

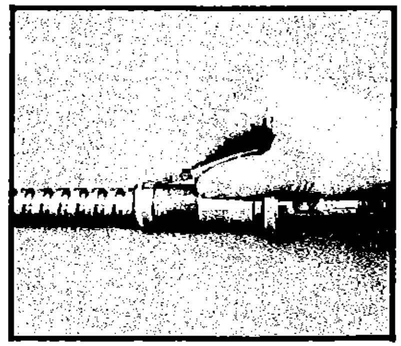
Remove and discard the rack piston seal ring.

Remove and discard the rack piston backup "0" ring from the rack piston.



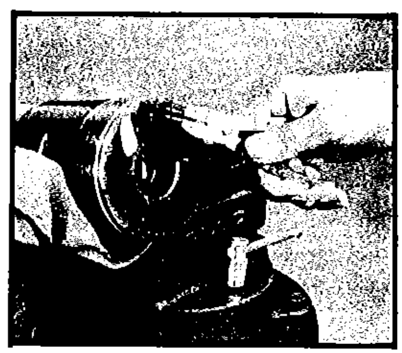




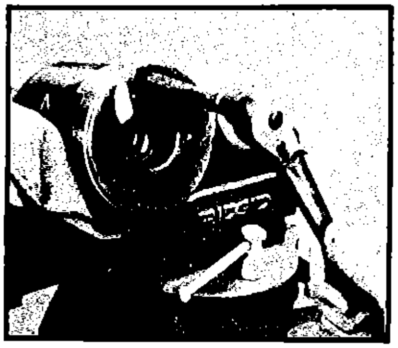


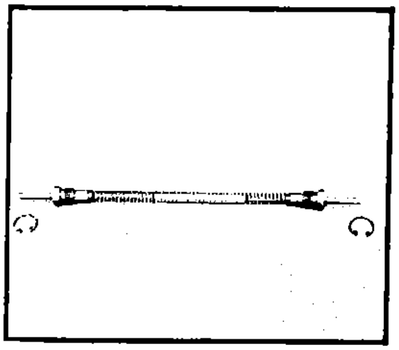
Remove and discard the worm shaft seal ring. Then, remove and discard the worm shaft "0" ring from the worm shaft.

It is not usually required to service the poppet assembly. If required, however, position the rack piston carefully in a vise equipped with soft jaws. Then remove two retaining rings, two poppet seats, two poppets, nylon spacer rod and spring.



STEERING

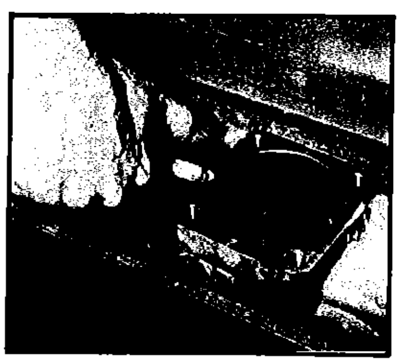




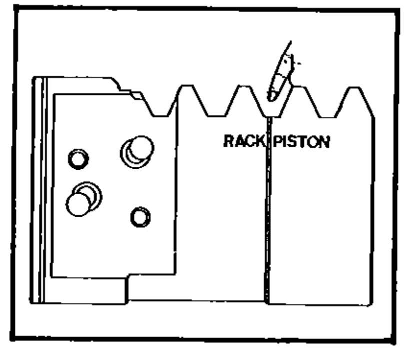
THIS COMPLETES DISASSEMBLY

Inspection

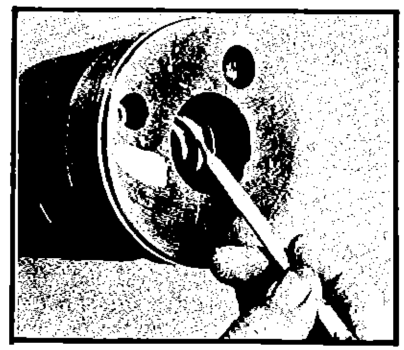
☐ **Note:** All sealing surfaces and seal cavities must be free from nicks and corrosion. If you detect any nicks or corrosion, you must replace the part to ensure proper sealing. Before you inspect the steering gear, wash all parts in clean, clear solvent and blow dry.



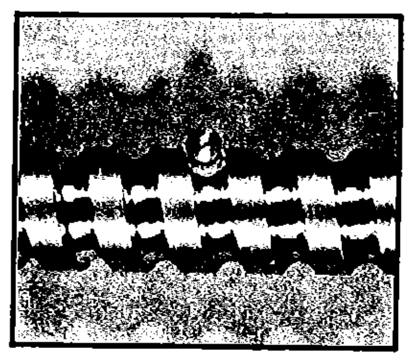
Inspect rack piston teeth for cracks and wear. If you can detect a step by running your fingernail edge horizontally across the teeth surface, replace the rack piston.



Inspect the rack piston ball track grooves (helical shaped) for brinelling (dents) or spalling (flakes). If either condition exists, the rack piston, valve sleeve, sector shaft, and worm shaft must all be replaced.

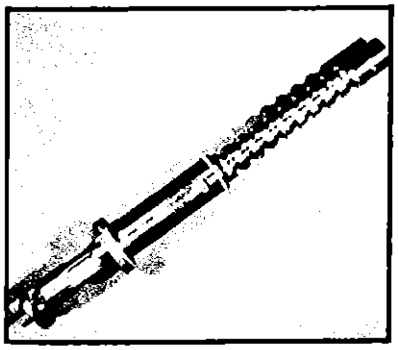


Inspect the worm shaft ball track grooves (helical shaped) for brinelling or spalling. (For an example of how ball sits properly on the track and to see normal machine marks on the shaft). Visually inspect the upper input shaft seal area near serrations for nicks, and run your fingernail edge across the sealing surface to detect steps.



☐ **Note:** The input shaft is pinned to the worm shaft by the torsion bar pin, and the worm shaft/input shaft assembly is flexible at this joint. As a result, the assembly may be slightly bent at this joint. This slight bend is normal.

STEERING

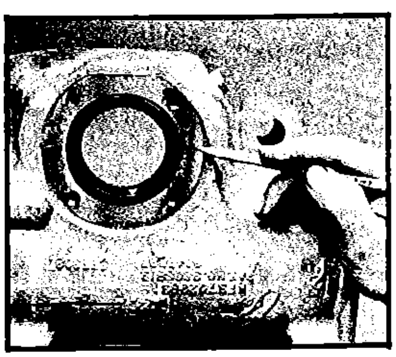


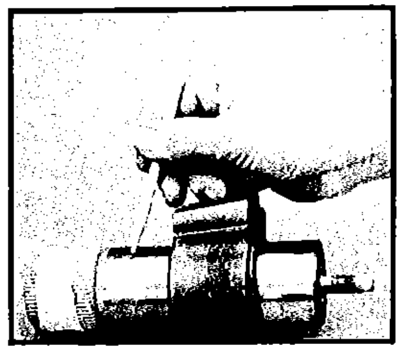
As you inspect the housing cylinder bore, you wil notice scoring marks running lengtwise through the bore. This scoring is normal. The scoring in the steering gear cylinder should not be compared to the scoring you might see in the cylinder bores of an internal combustion engine.

Check the housing faces for nicks which would prevent proper sealing. Replace the housing if these nicks are present.

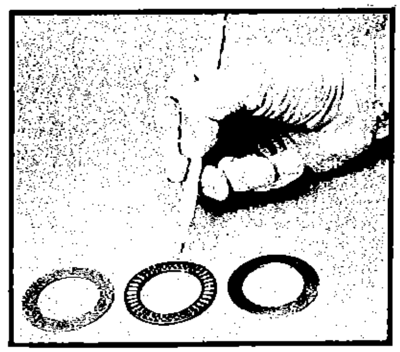
Inspect the housing bearing for brinelling or spalling. If either condition exists, or if one or more of the rolls is lost, replace the bearing.

Inspect the sector shaft bearing sealing areas for brinelling or spalling. Run your fingernail edge across these areas to detect steps. Inspect for cracks. If any of these conditions exist, replace the sector shaft.



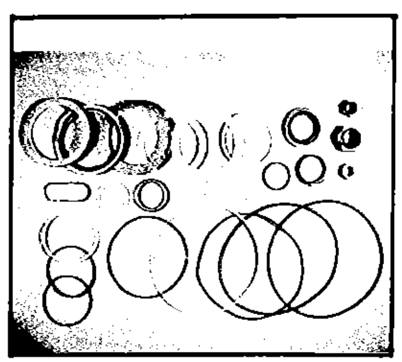


Inspect the thrust bearing rollers for any deterioration. Inspect the two thrust washer for brinelling, spalling, or cracks. Replace any part if you detect these conditions.



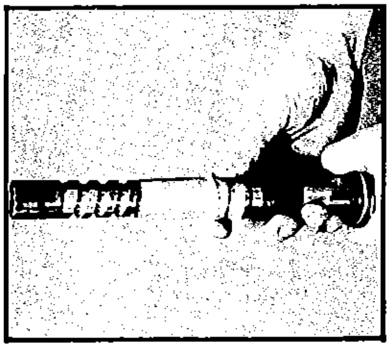
Assembly

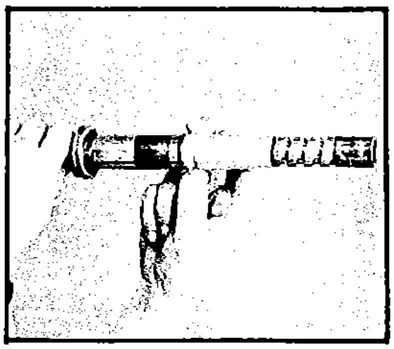
☐ **Note:** Once you have completed your inspection and are ready to reassemble the gear (including new parts, if necessary), wash all parts again in clean, clear solvent and blow dry. All gaskets, seals, and seal rings must be replaced with new ones each time the gear is disassembled. Replace those gasket seals, and seal rings, as well as seal kits.



STEERING

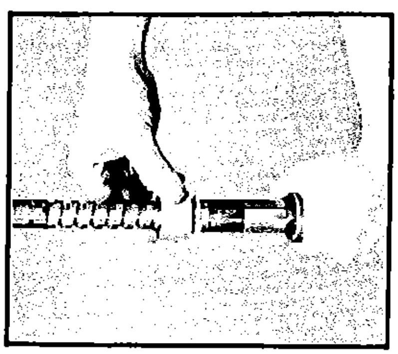
Using seal installation tool, assemble the new worm shaft backup "0" ring, then the new teflon worm shaft seal into the worm shaft ring groove.





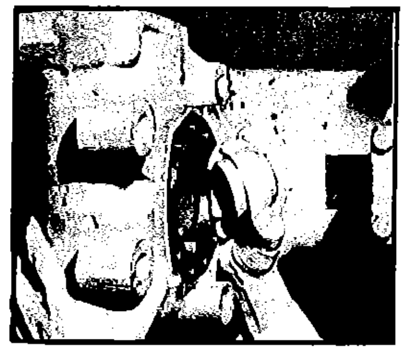
Compress the seal with seal compression tool and set the worm shaft aside for 10 minutes.

☐ **Note:** Allow for time to insure that the ring and seal are properly seated when you assemble the worm shaft into the rack piston. If you do not allow for this time, the seal may break when you put the worm shaft into the rack piston.

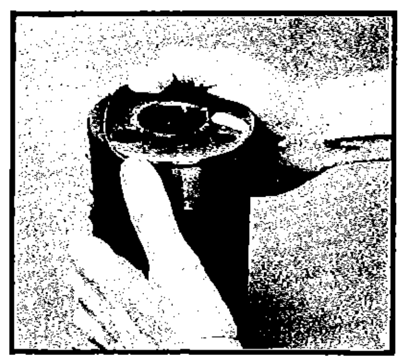


If required, press the new housing bearing into the housing from side cover, using bearing mandrel. Care must be taken during this procedure to make certain that the housing is square with the press base and that the bearing is not cocked. Apply a generous amount of clean wheel bearing grease to the bearing race to retain the bearing rolls. Assemble either 41 or 42 rolls, depending on the type of bearing used. Grease must retain rolls.

■ **Caution:** Rolls must be in place to insure proper installation of bearing. If rolls are not in place, bearing race may collapse and fail. The flange may become damaged or broken, causing premature bearing failure. Again, do not mix housing bearing rolls with side cover bearing rolls.



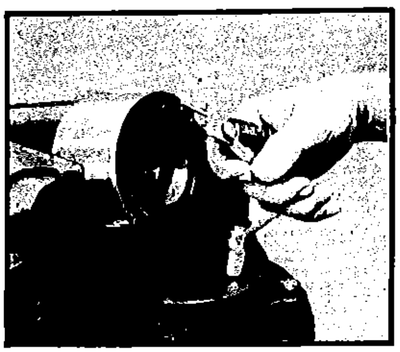
Install the new rack piston backup "0" ring, the new teflon rack piston seal ring into the rack piston ring groove. Do not stretch the rings as you install them. Coat with a liberal amount of grease.

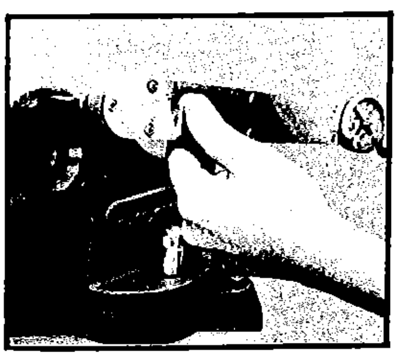


STEERING

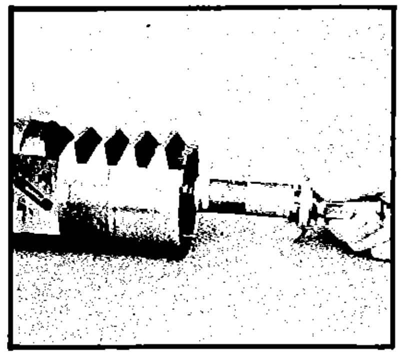
■ **Caution:** During the following step, you should wear eye protection.

If the poppets were removed, then install into the rack piston one poppet seat, one poppet, the spring, the nylon spacer rod, the other poppet, and the other poppet seat. Torque both poppet seats to 20-25 ft. lbs. (27.1 -33.8 Nm). Install both retaining rings.





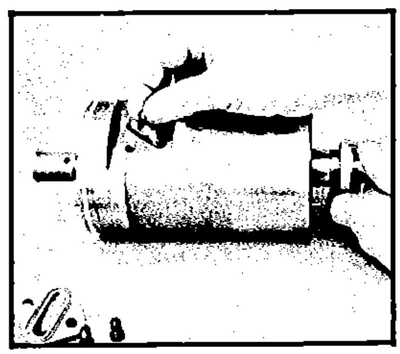
Grease the seal ring cavity in the rack piston and install the worm shaft into the rack piston.



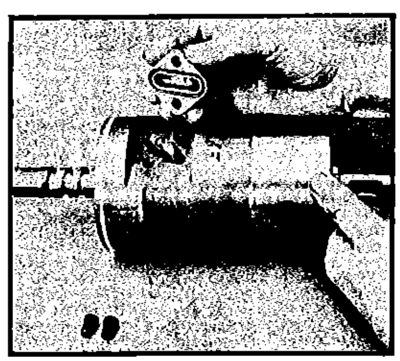
Assemble the ball return guides into the rack piston. Make sure that the ball return guides are seated.

Assemble 34 balls into the ball return guides and rack piston. Drop the balls through the hole provided in the ball return guides. As you drop the balls, rotate the worm shaft to pull the balls down into the grooves. Read warning before continuing with assembly.

● **Warning:** Make sure the ball return guides stay down in place while you assemble the balls. Failure to hold the guides down may result in a ball being trapped outside the closed loop. A trapped ball can result in a steering lockup.

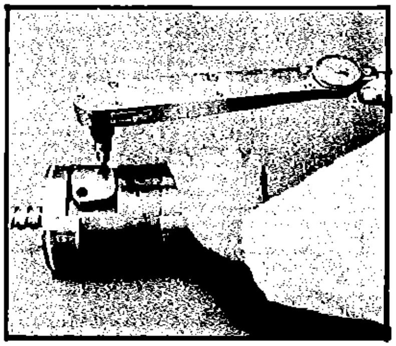


Grease the ball return guide cap seal and place it in the ball return guide cap groove. Assemble the ball return guide cap so that the seal is in full contact with the rack piston surface.



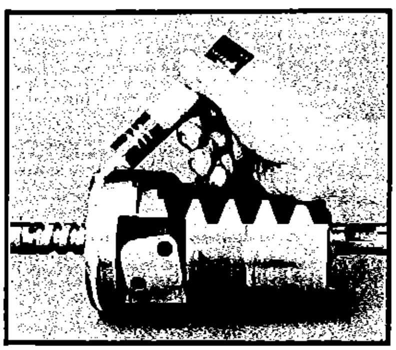
STEERING

Install the two allen head bolts and torque them to 15-19 ft. lbs. (20.3 - 25.7 NM).



● **Warning:** Rotate the wormshaft from end of travel to end of travel, to make certain that you have installed the balls properly. If you cannot rotate the shaft, you will have to remove the balls and reassemble them. If you install the gear on a coach with shaft unable to rotate, the gear will not function.

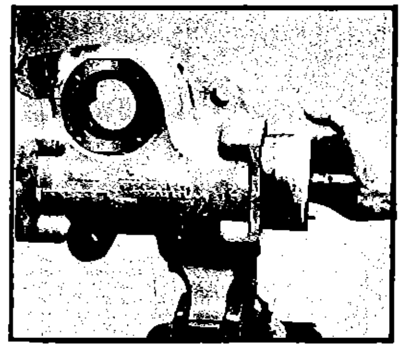
Apply a generous amount of clean grease to the Teflon rack piston seal and to the housing cylinder bore.



Install the rack piston worm shaft assembly into the long end of the housing, so that the Teflon rack piston seal goes in last.

■ **Caution:** Be certain that the seal enters the long end last; otherwise a large section of the seal will be cut and the coach will have no power steering assist.

☐ **Note:** To ease the later assembly of the sector shaft, rotate the rack piston worm shaft assembly in the housing so that the rack piston teeth are exposed in the sector shaft cavity of the housing.



Assemble the worm shaft adjusting screw jam nut onto the solid (nonslotted) end of the worm shaft preload adjusting screw so that the seal on the jam nut faces the end cover. Assemble the poppet valve adjusting screw jam nuts onto the poppet valve adjusting screws in the same manner as described for parts.

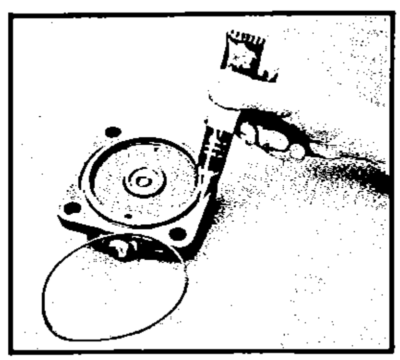
☐ **Note:** The poppet valve adjusting screws may or may not be of the same length. If not the same length, assemble the shorter adjusting screw (20; 2.25 in. 5.715 cm long) into the end cover a few turns.

● **Warning:** If the screws are of unequal length, you must install the shorter screw into the end cover. Otherwise, the poppet assembly may break and cause the steering gear to lock up.

Assemble the worm shaft preload adjusting screw into the end cover a few turns. Final adjustments will be made later.

Apply clean grease to the end cover "O" ring groove on the end cover. Install the new end cover "O" ring into the end cover "O" ring groove.

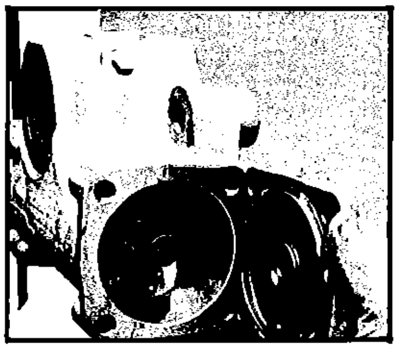
☐ **Note:** When installed, the end cover "O" ring should extend slightly above the machined surface of the end cover.



STEERING

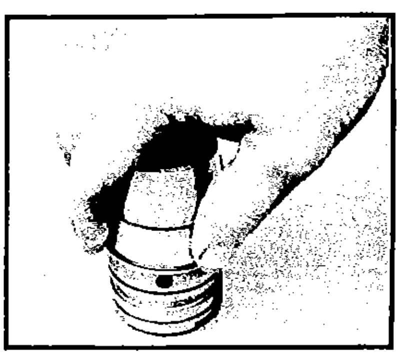
■ **Caution:** When performing the next step make sure that the rack piston teeth are fully visible in the sector shaft cavity of the housing. This is necessary to ensure proper location of the poppets, and to ensure that the poppet adjusting screw will contact the poppets.

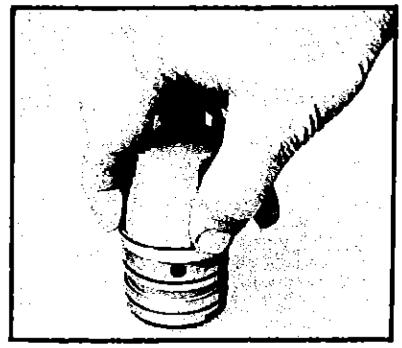
Position the end cover so that the poppet adjusting screw is aligned with the end of the poppet.



Install the four end cover bolts, 1.625 in. (4.127cm) long and washers and torque the bolts to 145-155 ft. lbs. (196 -210 Nm).

Grease the two new backup "0" rings and the two new Teflon seal rings. Using seal installation tool, assemble the backup "0" rings, then the Teflon seal rings into the valve sleeve.





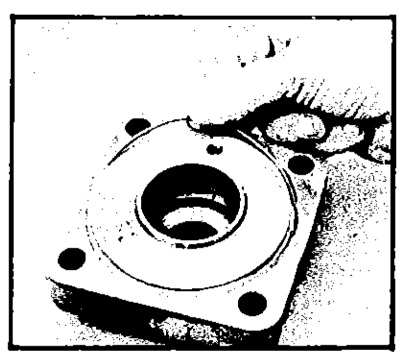
Use compression tool to compress the Teflon seal rings. Leave the compression tool on for 10 minutes.

☐ **Note:** If you do not allow for this compression time, the valve sleeve assembly will be difficult to assemble into the valve housing.

Assemble the poppet valve adjusting screw into the valve housing 4 or 5 turns. Final adjustments will be made later.

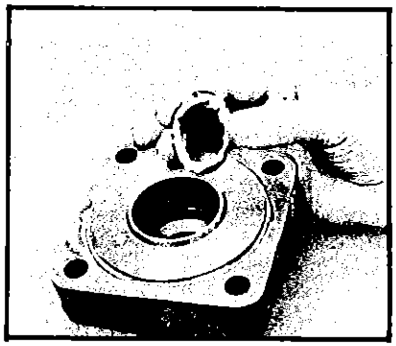
Apply clean grease to the valve housing "0" ring groove. Install the new valve housing "0" ring into the valve housing "0" ring groove.

☐ **Note:** When installed, the valve housing "0" ring should extend slightly above the machine surface of the valve housing.

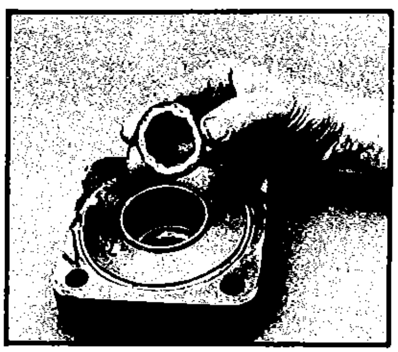


STEERING

Apply a generous amount of clean grease to one thrust washer. Install the thrust washer into the valve housing, making sure to center the thrust washer.

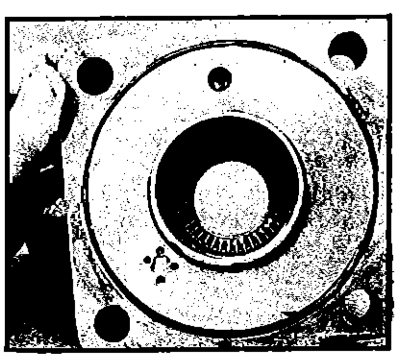


Apply a generous amount of clean grease to the thrust bearing. Install the thrust bearing into the valve housing (onto the thrust washer), making sure to center the bearing on the washer.



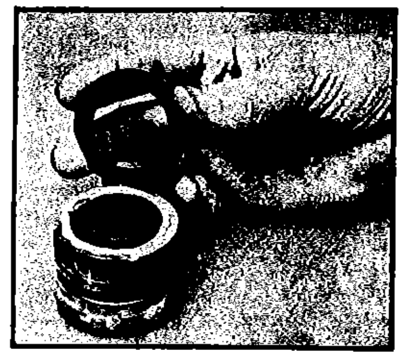
● **Warning:** The thrust washer and thrust bearing must be flat and centered in the counterbore surface.

Otherwise, the thrust washer could break when you assemble the valve housing into the gear housing. A broken washer could cause uncontrollable steering.



Remove the compression tool from the valve sleeve. Apply more grease to the valve sleeve seals, and grease the thrust washer face on the end of the valve sleeve without the drive slots. Place the other thrust washer onto the valve sleeve end without the drive slots.

● **Warning:** This thrust washer must be secure on the valve sleeve. If not, it can break and cause uncontrollable steering.

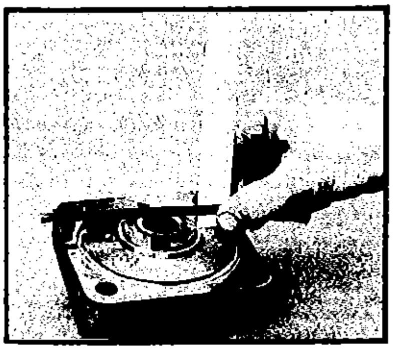


Assemble the valve sleeve with attached thrust washer down into the valve housing.

When the valve sleeve is down in place, it should measure between .370 and .400 inches (.939 - 1.01 cm) above the face of the valve housing to the end of the valve sleeve nose.

● **Warning:** Do not force valve sleeve down into valve housing. Make sure valve sleeve seal rings are compressed. Misassembly or incorrect measurement may cause the thrust washers or thrust bearing to break during gear operation, which will result in uncontrollable steering.

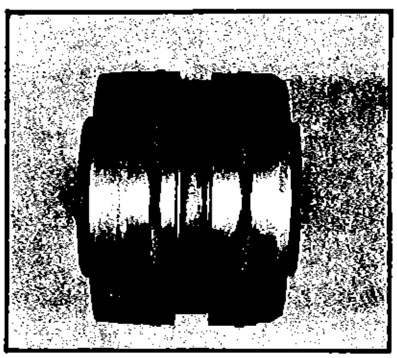
STEERING



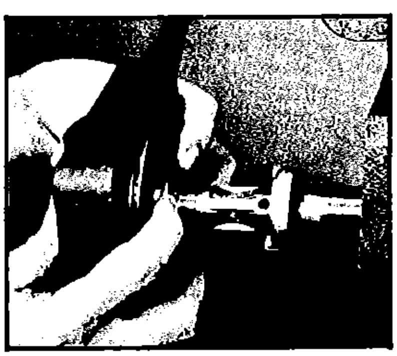
Position the rack piston so that it is flush with the open end of the gear housing. Rotate the worm shaft until it extends out of the rack piston as far as it will go.

● **Warning:** Worm shaft and valve sleeve units are assembled and sold as matched sets. Use only prematched sets for replacement. Never mate an old sleeve with a new worm or an old worm with a new sleeve. To do so may damage the gear or injure the driver, or do both during operation.

Locate the timing mark on the valve sleeve, a faint, punched mark on the chamfered edge of the valve sleeve.

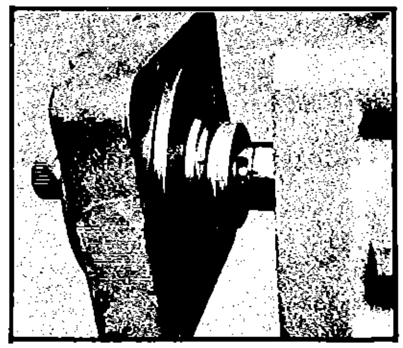


Locate the scribed timing mark on the worm shaft. Next, grasp the valve housing/valve sleeve assembly with your thumbs on the valve housing face and your fingers applying pressure to keep the valve sleeve in the valve housing.



Align the previously located timing marks and place the valve housing/valve sleeve assembly onto the input shaft end of the worm shaft until the drive lugs are fully engaged.

☐ **Note:** Valve sleeves are identified and matched to the right or left hand lead of the worm screw. If the screw has a right hand thread (that is, goes into the rack piston when turned clockwise), then the correct valve spool will have the letter "R" stamped between the lands. For a left hand worm lead (which will come out of the rack piston when turned clockwise), the valve spool has no identifying mark between the lands.



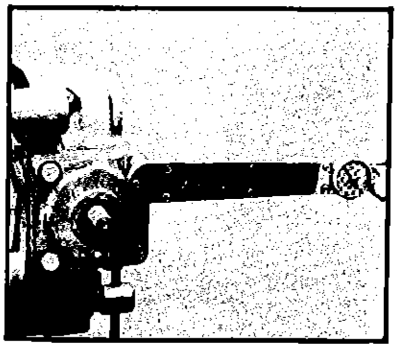
● **Warning:** If an incorrect hand valve spool is placed on a worm and assembled into the gear, the gear will not function correctly. Rather the mechanism will malfunction by turning the steering wheel with such force that it could injure the driver.

Maintain pressure on the valve end of the valve housing to ensure continued engagement of the drive lugs and thrust bearing package. While maintaining pressure,

rotate the valve housing to align the poppet adjusting screw with poppet in the rack piston. Continuing pressure rotate the input shaft to bring the valve housing into contact with gear housing face.

STEERING

Assemble four valve housing bolts 2.125 in. (5.39 cm) long into the housing and torque to 145-155 ft. lbs. (196 -210 Nm).

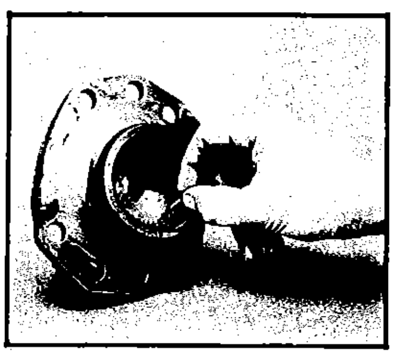


Apply a generous amount of clean wheel bearing grease (do not substitute another type of grease) to the bearing race inside the side cover.

■ **Caution:** Use only wheel bearing grease. This bearing is sealed and will receive no lubrication from the hydraulic fluid in the gear. Failure to use wheel bearing grease could result in premature bearing wear.

☐ **Note:** You will have 41 or 42 rolls to assemble into the side cover bearing 41 rolls - BR-970; 42 rolls - BR-970-1. Do not mix these rolls for the side cover with the rolls for the trunnion cover side of the gear housing.

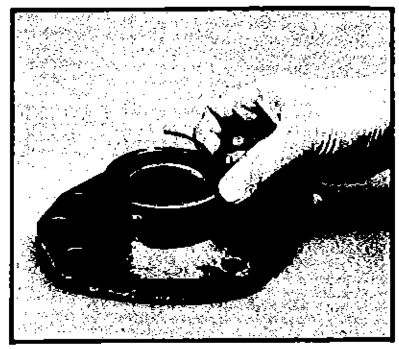
Assemble 41 or 42 rolls into the side cover bearing race. Grease must retain rolls.



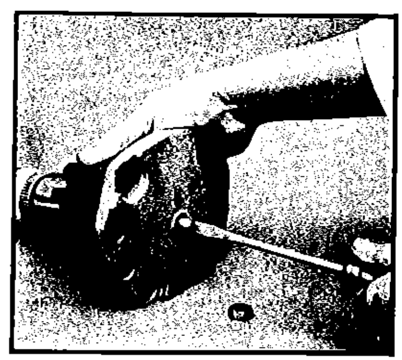
Assemble the steel backup washer, the new Teflon backup washer, and the new two-piece side cover seal into the side cover. Assemble two-piece seal so that words "oil side" are visible.

■ **Caution:** The words "oil side" must be visible once the seal is in place. Otherwise, the seal will not function, which could result in a loss of power steering assist.

Assemble retaining ring into the ring groove in the side cover.



Apply a generous amount of clean grease to the short bearing area of the sector shaft, and insert the sector shaft into the side cover. Screw the adjusting screw into the side cover until it reaches solid height. Then, back out the adjusting screw one turn, so that the side cover rotates freely on the sector shaft.

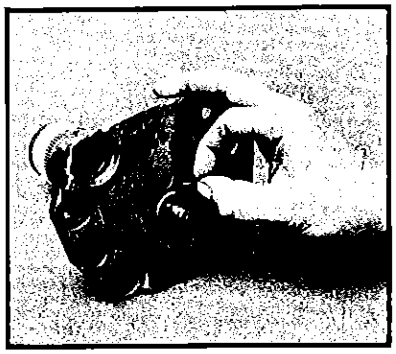


Assemble the jam nut onto the adjusting screw a few threads. Final adjustment will be made later.

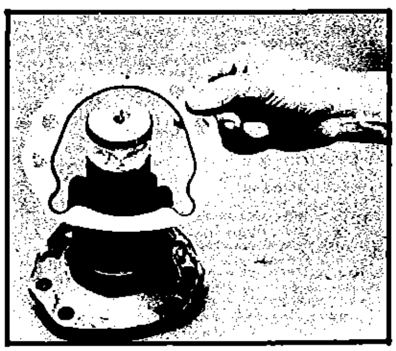
Assemble the vent plug into the hole provided on the side cover. Press the vent plug in flush with the side cover.

STEERING

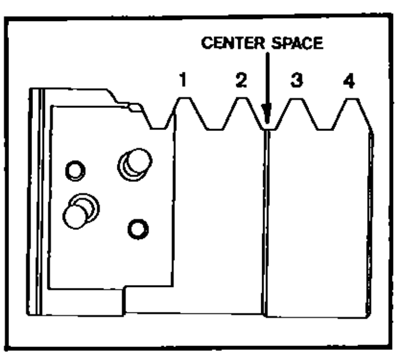
● **Warning:** Do not weld or otherwise plug this hole in any permanent manner. This is a safety vent which functions only if the side cover seal fails. If the seal fails and plug cannot vent, the steering gear may lockup or otherwise malfunction.



Apply clean grease to the new side cover gasket and assemble it onto the side cover. There must be enough grease to hold the gasket in place.



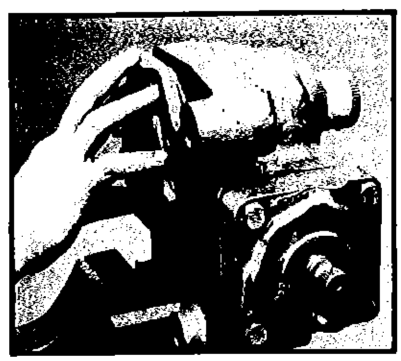
There are four teeth on the rack piston.



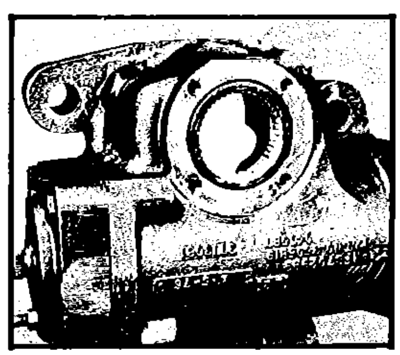
Position the tooth space between the second and third teeth in the center of the sector shaft cavity.

■ **Caution:** If the rack piston is not centered, the gear travel will be severely limited in one direction of travel, and significant internal damage to the steering gear can occur when the gear is operated.

Clean off any old tape on the sector shaft serrations. Retape the serrations and bolt groove with one layer of tape. Assemble the sector shaft side cover assembly into the gear housing, with the center tooth of the sector shaft engaging the tooth space between the second and third teeth on the rack piston.



● **Warning:** As you place the sector shaft through the housing bearing, be careful not to knock out any of the bearing rolls. Be careful also not to pinch the side cover gasket. Should the bearing rolls be knocked out, or the side cover gasket pinched, premature bearing and seal failure may occur, which could result in a loss of power steering assist.



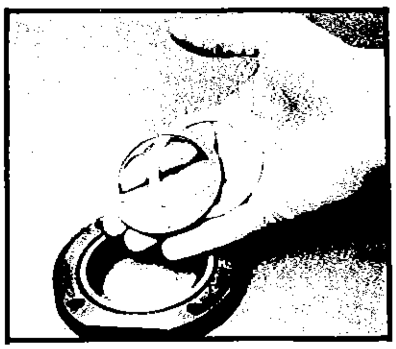
STEERING

Assemble the eight special ring head bolts and torque them to 150 - 170 ft. lbs. (203-230 NM).

Place the trunnion cover on a bench to install the new seal plackage. Start with the Teflon backup washer.

Assemble the two-piece sector shaft seal so that the words "oil side" are visible.

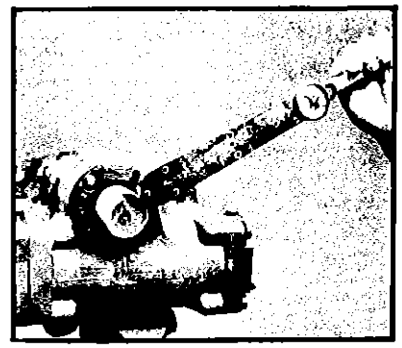
● **Warning:** The words "oil side" must be visible. If not, the seal will not function and a loss of power steering assist may occur.



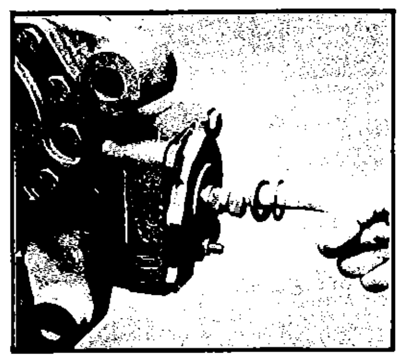
Grease the new trunnion cover "0" ring and install it into the trunnion cover "0" ring groove.

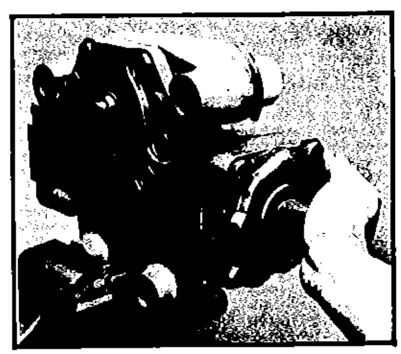
Before installing the trunnion cover and seal assembly onto the housing, visually inspect the housing bearing to ensure that all bearing rolls are properly in place. Then install the trunnion cover.

Install a new dirt and water seal. Install four trunnion cover bolts, and torque the bolts to 15 - 22 ft. lbs. (20 -29 Nm).



Apply clean grease to the input shaft seal assembly and to the input shaft. Install the new two-piece input seal flat side up and the steel backup washer, using the seal driving tool. Install the retaining ring.





Pack the area around the input shaft with clean grease and install the dirt and water seal.

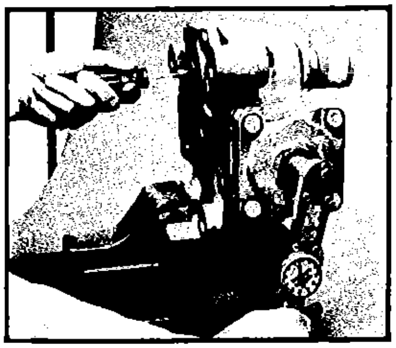
THIS COMPLETES ASSEMBLY. BEFORE INSTALLING GEAR ONTO COACH, MAKE THE FINAL ADJUSTMENTS DESCRIBED ON THE FOLLOWING PAGE.

STEERING

Final adjustments

Screw the worm shaft preload adjusting screw finger tight until it contacts the worm shaft.

Adjust the sector shaft adjusting screw while rotating the input shaft 90° each direction until the input shaft torque reaches 25 - 30 in. lbs. (2.825 - 3.39 Nm).



☐ **Note:** Use a 12 point socket and an in. lb. (Nm) torque wrench to ro'ate the input shaft.

Center the steering gear by aligning the sector shaft timing mark halfway between two trunnion cover bolts. The timing will be perpendicular to the center line of the cylinder bore. Back out the sector shaft adjusting screw (40) one turn and note the torque required to rotate the input shaft through 90° each side of center. Move the adjusting screw to provide a rise in torque of 2 - 4 in. lbs. (.226 - .452 Nm) at this point within 45° each side of center. After tightening the jam nut to 40 - 45 ft. lbs., (54.2 - 60.975 Nm) the torque now required to rotate the input shaft must not exceed 29 in. lbs. (3.164 Nm) at any point in the steering gear travel.

Torque the worm shaft preload adjusting screw to 60 - 70 in. lbs. (6.78 - 7.91 Nm) making sure the jam nut does not contact the end cover. Torque the jam nut to 70 - 80 ft. lbs., (94.85 - 108.4 Nm), making sure the adjusting screw does not move.

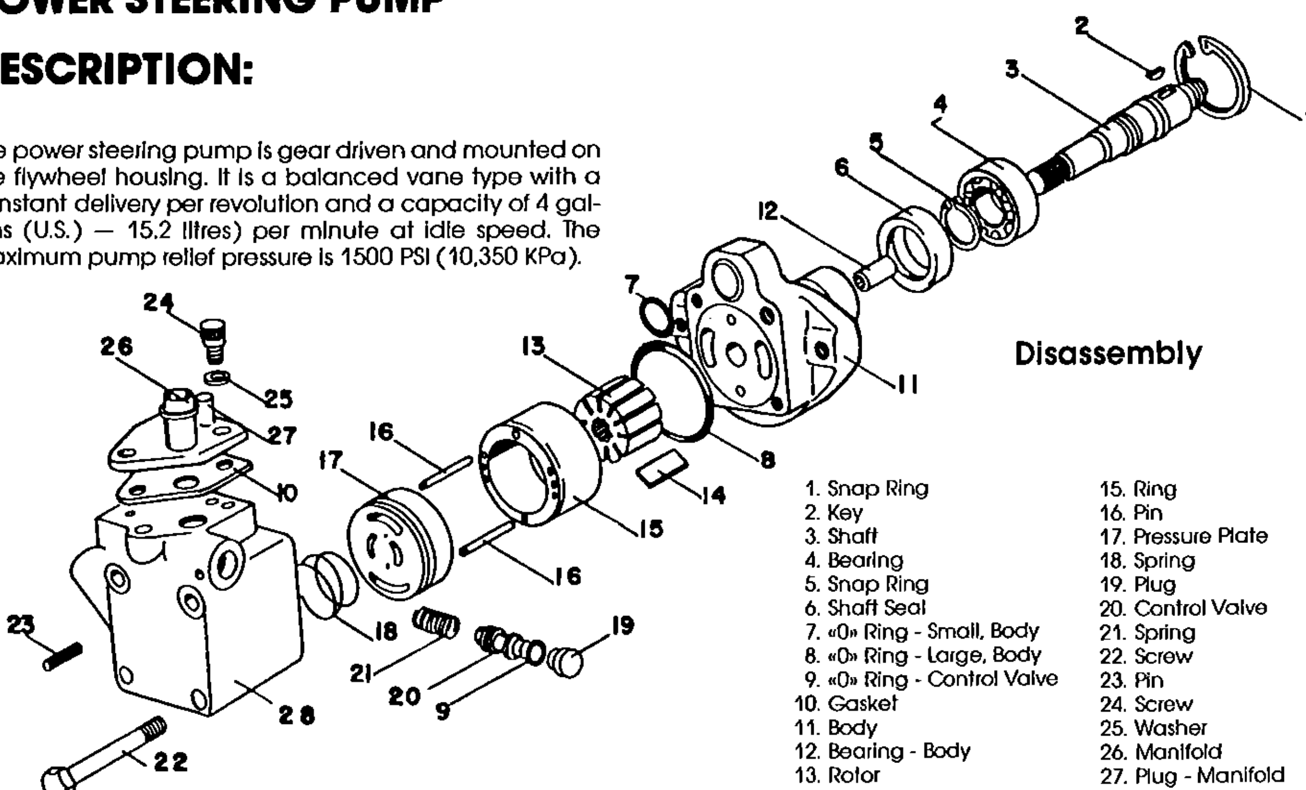
The torque now required to rotate the input shaft through complete travel should not exceed 50 in. lbs (5.65 Nm).

☐ **Note:** 55 in. lbs. (6.215 Nm) is allowable if fluid is in the gear.

POWER STEERING PUMP

DESCRIPTION:

The power steering pump is gear driven and mounted on the flywheel housing. It is a balanced vane type with a constant delivery per revolution and a capacity of 4 gallons (U.S.) — 15.2 litres) per minute at idle speed. The maximum pump relief pressure is 1500 PSI (10,350 KPa).



Disassembly

1. Snap Ring
2. Key
3. Shaft
4. Bearing
5. Snap Ring
6. Shaft Seal
7. «0» Ring - Small, Body
8. «0» Ring - Large, Body
9. «0» Ring - Control Valve
10. Gasket
11. Body
12. Bearing - Body
13. Rotor
14. Vane
15. Ring
16. Pin
17. Pressure Plate
18. Spring
19. Plug
20. Control Valve
21. Spring
22. Screw
23. Pin
24. Screw
25. Washer
26. Manifold
27. Plug - Manifold
28. Cover

STEERING

Removal and installation:

The pump is located under the air compressor and is accessible through the right hand engine compartment door. The pump is removed by disconnecting the outlet hose and removing the inlet hose. Then, remove the mounting bolts. Mounting flange gasket should be replaced whenever pump is removed. To install, reverse removal procedure.

POWER STEERING PUMP-DISASSEMBLED

During the disassembly, special attention should be given to identification of parts for proper reassembly.

Using a suitable cleaning solvent, thoroughly clean the exterior of the power steering pump to prevent entry of dirt or other foreign matter into the pump during overhaul procedures.

Remove the three manifold capscrews and washers. Remove manifold. Remove and discard manifold gasket.

Remove cover mounted capscrews and separate the cover from the pump body. Remove pressure plate spring and pressure plate. Remove pump ring locating pins, rotor vanes and the two O-Rings.

Mount cover in a vise. Drive out the retaining pin with a suitable punch. Protect the control valve plug and sub-assembly against falling from the bore. Work the plug, control valve and spring from the bore.

☐ **Note:** Access to the control valve plug and control valve sub-assembly may be gained through the large chamfered hole which leads to control valve bore from inside the cover.

Remove outer retaining ring from the pump body. Support the shaft end of the pump body in a two inch (50.8mm) straight pipe coupling, and using an arbor press, remove shaft. The shaft assembly should drop through a slot in the press table so that the shaft will not be damaged. Remove inner retaining ring and ball bearing from shaft. Press shaft seal from the pump body.

Inspection and repair

Wash all parts, except seals, in clean mineral solvent and lay them aside for inspection. Replace all old seals and o-rings at reassembly.

Inspect the surfaces of ring rotor, vanes pressure plate and body which are subject to wear. Light scoring may be removed from the faces of the body or wear plate with crocus cloth (by placing the cloth on a flat surface), medium India Stone or by lapping. Check edges of vanes for wear. Vanes must not have excessive play in slots or burrs on edges. Replace if necessasry. Check each rotor slot for sticky vanes or wear. Vanes should drop in rotor slots by their own weight when both slot and vane are dry.

Insert the control valve in its bore in pump cover. There should be no binding. Chech the valve and bore ofr excessive wear and scoring. Replace if necessary. Wash bearing thoroughly. Inspect and replace bearing if worn or damaged.

Replace the shaft seal at each overhaul to prevent oil leakage. Check the drive shaft oil seal diameter for wear and scoring. Do not install a new seal on a shaft which is worn or damaged at the oil seal diameter. Replace the shaft if worn. Stone and polish the sharp edges on the shaft to prevent damage to the seal.

Stone all mating surfaces of body and cover with a medium India stone to remove all burrs and sharp edges. Rewash all parts after stoning.

Reassembly

☐ **Note:** Immerse all parts in clean SAE 10 engine oil to facilitate reassembly.

Starting with the shaft end, press the inner needle bearing in the pump body using an arbor press. Assemble the snap ring on the shoulder portion of the shaft and install the shaft in the pump body.

Press the outer bearing onto the shaft. The edge of the bearing must be 1/64" (.39 mm) below the shaft seal shoulder when assembled. This provides for shaft end play of .010 - .015" (.254 - .381 mm).

☐ **Note:** Tools for installing bearings can be made from round stock with an outside diameter slightly smaller than that of the bearing and the inside diameter slightly larger than the shaft diameter. Do not score or damage the shaft during this operation.

Position the shaft seal on the shaft end of the body, being careful not to damage the seal. Using the special tool mentioned above, press seal in until it engages the shoulder in the pump body. This shoulder acts as a positive stop for the seal. Do not overpress as this will result in damage to the seal.

Install the locating pins in the pump body. Install the ring over the pins according to the correct direction of rotation. Install the rotor with the chamfered edge of the splined hole "in" towards the pump body. Install the vanes with their radius edge toward the inner ring contour. Oil the cartridge with clean engine oil and install the pressure plate. Install the 0-rings, pressure plate spring and cover. Tighten cover screws to 25 - 30 ft. lbs. (34 - 40 Nm) torque.

STEERING

Install the pressure compensating spring into the control valve bore. Insert the valve assembly with the hex towards the spring. Install the plug with the "0" Ring into the bore and hold it in position while driving a new retaining pin.

Install the 0-rings in the pump body and secure the manifold to the pump cover with three screws. The copper washers are used on the three screws where the tapped hole enters the oil passage.

POWER STEERING RESERVOIR

The power steering reservoir is located in the upper left hand side of engine compartment. It is recommended that the filter element be serviced at an interval of every 50 000 miles (80 000 km) depending on operating conditions.

■ **Caution:** After element and gaskets are installed, install cover and bolt assembly. Check for leake after operating the system.

Oil Level Check

To verify oil level, stop engine then remove dipstick on reservoir cover. Using a clean rag, clean the dipstick then reinstall it in the reservoir. Again remove dipstick then verify if oil level is in safe area on the dipstick. Add oil as necessary using only «DEXRON» oil.

STEERING WHEEL

Removal

1 — Set battery main switch to "OFF" position.

2 — From the driver's seat, push on the electric horn cover whill turning it counter clockwise. This will allow horn removal.

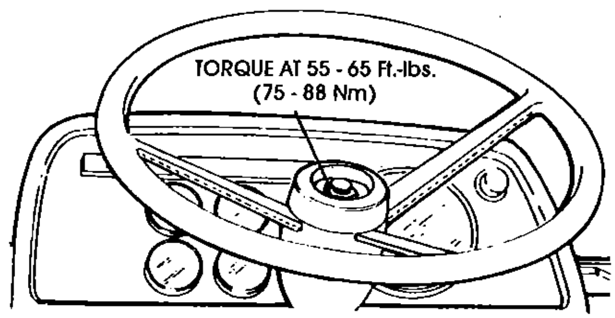
3 — Remove spring and contact cup.

4 — Loosen and remove the steering wheel nut and washer.

5 — Using a suitable puller, remove the steering wheel.

Installation

To install, reverse removal procedure then torque steering wheel nut to: 55-65 ft. lbs. (75 - 88 Nm).



TROUBLESHOOTING

Trouble	Cause	Remedy
Pump Not Delivering Oil.	Driven in wrong direction of rotation.	Check direction of pump shaft rotation.
	Pump drive shaft disengaged or sheared	Remove pump; determine damage to cartridge parts (see disassembly instructions) replace sheared shaft and needed parts.
	Flow control valve stuck open.	Disassemble pump & wash control valve in a clean solvent. Return valve to its bore and slide it back & forth. No stickiness in movement should occur. If a gritty feeling is noted on the valve O.D., it may be polished with crocus cloth. Avoid removal of excess material or rounding of valve edges during this operation. Do not attempt to polish the valve bore. Wash all parts before reassembly of pump. Flush entire system thoroughly & fill with clean oil as recommended.

STEERING

TROUBLESHOOTING

Trouble	Cause	Remedy
	Vane(s) stuck in rotor slots.	Disassemble pump, examine rotor slots for dirt, grime or small metal chips. Clean rotor & vanes in a good grade solvent (Mineral spirits or kerosene) reassemble parts & check for free vane movement.
	Oil viscosity too heavy to prime. Pump intake partially blocked.	Use fluid of the proper viscosity as recommended. Drain system completely; flush to clear pump passages. Flush and refill system with clean oil as recommended.
	Air vent for oil tank clogged, or dirty strainer.	Remove filler cap and clean air vent slot. Check filter or strainer in tank for clogged condition. Drain, flush and add clean oil to system if strainer was clogged.
Pump Making Noise.	Restricted or partially clogged intake line or clogged filter.	Pump must receive intake oil freely or cavitation will result. Drain system, and clean intake line & strainers. Add new oil and strain by recommended procedures.
	Air leak at pump intake piping joints or pump shaft seal.	Test by pouring oil on joints and around drive shaft. Listen for change in operation. Tighten joints affected and replace pump drive shaft seal according to service instructions.
	Coupling misalignment.	Re-align and replace oil seal and bearings if damaged by shaft misalignment.
	Reservoir or manifold seal leakage.	Leakage between manifold or reservoir at replenishing hole due to O-ring damage. The reservoir inlet tube to pump cover O-ring should be carefully examined for damage such as cuts, nicks or dirt.
Hard Steering Either While Parking Or Existing All The Time.	Insufficient pump pressure.	Check pump pressure with gauge. If insufficient, check for cause — sticky relief valve in pump or flow control, Defective pump.
	Sticky relief valve in pump or flow control. (Prevents pressure build up).	Replace relief valve — may require total replacement.
	Low fluid level. (Loss of oil due to leaks of damaged lines).	Repair to eliminate leaks and refill system and reservoir.
	Improper front end alignment.	Align to specifications.
	Lack of steering gear lubricant.	Add lube to proper level.

STEERING

TROUBLESHOOTING

Trouble	Cause	Remedy
	Low tire pressure. Too much friction in system.	Inflate to proper pressure. Lubricate and check for binding.
Hard Steering Occuring Only Part Of The Time.	Insufficient hydraulic pressure. Air in system. Loose or too tight linkage connections. Improper steering gear adjustment.	See Above. Adjust where necessary. See instructions on adjustment.
	Insufficient oil flow.	Check for damaged hoses, weak or sticking valve springs, or worn pump slots.
Hard Steering In One Direction Or Certain Position.	Bind in mechanical section.	Raise front of coach and check moving parts.
«Lumpy» feeling (Momentary Spots Of Hard Steering).	This indicates a delay in power application. Air in Oil.	Check for excessive free play in mechanical parts. Bleed system as per previous instructions.
	Loose joints or linkage. Insufficient oil flow.	Adjust where necessary. Check for damaged hoses, weak or sticking valve springs, or worn pump parts.
	Low oil supply.	Check level and refill if necessary.
Hard Steering Accompanied by Abnormal Noise.	Air in system. Pump malfunction. Low oil supply.	Bleed as per instructions. See Pump Repair Section. See Above.
No Recovery From Turn To Straight Ahead.	Insufficient caster. Tight ball socket connections & other linkage connections, snug. Tight front axle spindles.	Increase caster. Loosen connections but keep them sung. Make free.
	Spool in valve sticking. (Prevents centering of valve).	Disassemble valve and inspect for sticking. Clean. Reassemble valve or replace & reinstall on gear.
	Tire pressure low.	Check pressure.
	Front end out of alignment.	Align front end.
	Steering column binding.	Eliminate bind.
	Pump flow insufficient.	Check pump pressure with gauge, if insufficient check for cause.
	Steering gear improperly adjusted.	Adjust to specifications.
Shimmy	Loose ball socket connections or other linkage connections.	Tighten.
	Wheels out of balance. Badly worn and unevenly worn tires.	Balance. Replace.

STEERING

TROUBLESHOOTING

Trouble	Cause	Remedy
	Wheel bearing improperly adjusted or worn.	Check bearings, replace, if necessary.
	Excessive caster.	Correct and have front alignment checked to specifications.
External Oil Leakage	Finding location of leak may be difficult, as oil may «Run» away from leak point on the gear of chassis.	Check all fittings, hoses, and pump. Replace any possible causes of leakage.
Excessive Pump Pressure with Steering Gear in Neutral Position.	Kink in oil return line.	Relocate line to remove kink.
Other Causes of Hard Steering.	Caster in camber degree incorrect.	Correct to specifications. See «Front End Alignment.»
	Air in system.	Bleed system and check for cause of air.
Lost Motion or Lash at Steering Wheel.	Steering wheel loose on shaft.	Tighten to specifications.
	Loose connections between gear and steering column.	Tighten connections.
	Steering gear loose on frame.	Tighten.
	Pitman arm loose on sector shaft.	Tighten.
	Components in steering linkage loose or worn.	Adjust or replace where necessary.
	Steering gear improperly adjusted.	Adjust.
Overheating of Steering Gear.	Undersize replacement hose or line.	Replace with correct size hose or line.
	Restricted hose or line due to kink or severe bend.	Relocate line or hose to remove kink.
	Restricted recentering of valve due to column binding or side loading of input shaft.	Inspect and repair gear to correct.

● **Warning:** If the hydraulic system fluid becomes overheated, it can cause the seals in the steering gear to shrink, harden, or crack and lose their sealing ability.

The following troubleshooting tips apply only to coaches equipped with booster assisted steering.

Hard Steering Either While Parking Or Existing All The Time.	Spool in valve sticking.	Disassemble valve and inspect for sticking. Clean. Reassemble valve or replace & reinstall on gear. Check for equal amount of movement of spool each way from center.

STEERING

TROUBLESHOOTING

Trouble	Cause	Remedy
	Wear of actuator lever in bushing of valve actuator.	Replace actuator lever and possibly actuator with bushing.
	Cam stud shaft ben or sprung. column alignment.	Replace bent parts and correct
	Bind of cam in needle bearings.	Eliminate cause of bind.
	Taper studs adjusted too tight in cam groove.	Adjust.
	Broken piston or piston rings in power cylinder.	Replace. Check condition of cylinder wall.
Hard Steering In One Direction Or Certain Position.	Bent booster cylinder piston rod.	Replace or Service.
Other Causes of Hard Steering.	Valve loose on mounting. Damaged booster cylinder.	Tighten. See disassembly and repair of booster cylinder.
No Recovery From Turn to Straight Ahead.	Bind of cam shaft. (Prevents centering of valve).	Eliminate bind.
No Recovery From Turn to Straight Ahead.	Bind of cam in needle bearing. (Prevents centering of valve).	Eliminate cause of bind.
	Taper studs adjusted too tight in cam groove.	Adjust.

The following troubleshooting tips apply only to coaches equipped with integral steering.

External Oil Leakage.	Rubber relief (vent) plug leaking at side cover indicates failure of sector shaft oil seal in side cover. (Integral Steering Only)	Replace oil seal.
Overheating of Steering Gear	Poppets not properly adjusted.	Adjust to specifications.

SUSPENSION

SUSPENSION

Description

The vehicle is provided with an air suspension system. The system consists of air springs, height control valves, radius rods and shock absorbers. The system is entirely automatic in operation and is designed to maintain a constant vehicle height regardless of loading.

Suspension flexible members are of a «Rolling lobe» type and they are made from a special compound rubber and nylon tire fabric, and moulded to the proper contour and dimensions. The entire vertical load of the vehicle is taken by air springs. They are attached to both sub-frame and axles. Radius rods are used to hold the axles in the proper transverse and longitudinal positions. Five (5) radius rods are used for the front axle, four (4) are used for the rear axle. Thus no change in height control, takes place during normal driving.

Double acting shock absorbers are used to improve the ride characteristics. Two (2) shock absorbers are used at the front axle but locations are provided to add two (2) extra shock absorbers if desired. Four (4) shock absorbers are used at the rear axle and two (2) at the tag axle.

Tag axle unloading system

The tag axle allows the driver to unload the tag axle wheels to add weight to the drive wheels on icy conditions. A buzzer will sound and a tell-tale will glow to remind the driver to return the system to normal operation as soon as conditions permit. This system will increase the load on the drive axle wheels by approximately 9000 to 11,000 lb.

Maintenance

(8) (11) (13) (14) (15) (16) (20) At assembly, always reinstall with a new tab lock (14).

(13) If you replace only the radius rods rubber bushings on your vehicle suspension, be sure to install the proper rubber bushing type # 63-0021.

■ **Caution:** Avoid using other manufacturer's rubber bushings than the above mentioned bushing #63-0021. This rubber bushing have been calibrated in accordance with PREVOST'S vehicle suspension and its hardness is different from the others manufacturer's bushings.

It is no longer necessary to clean the new bushing prior to its installation. The use of a solvent and/or soap is not recommended as the new bushing has no wax coating and is ready to be installed.

■ **Caution:** It is of the upmost importance that the assembly be perfectly paralled and aligned at both radius rod ends in order to obtain the maximum performance from your vehicle suspension and maximum life of rubber bushings.

(27) (28) (29) (30) (32) To repair suspension air springs proceed as follows:

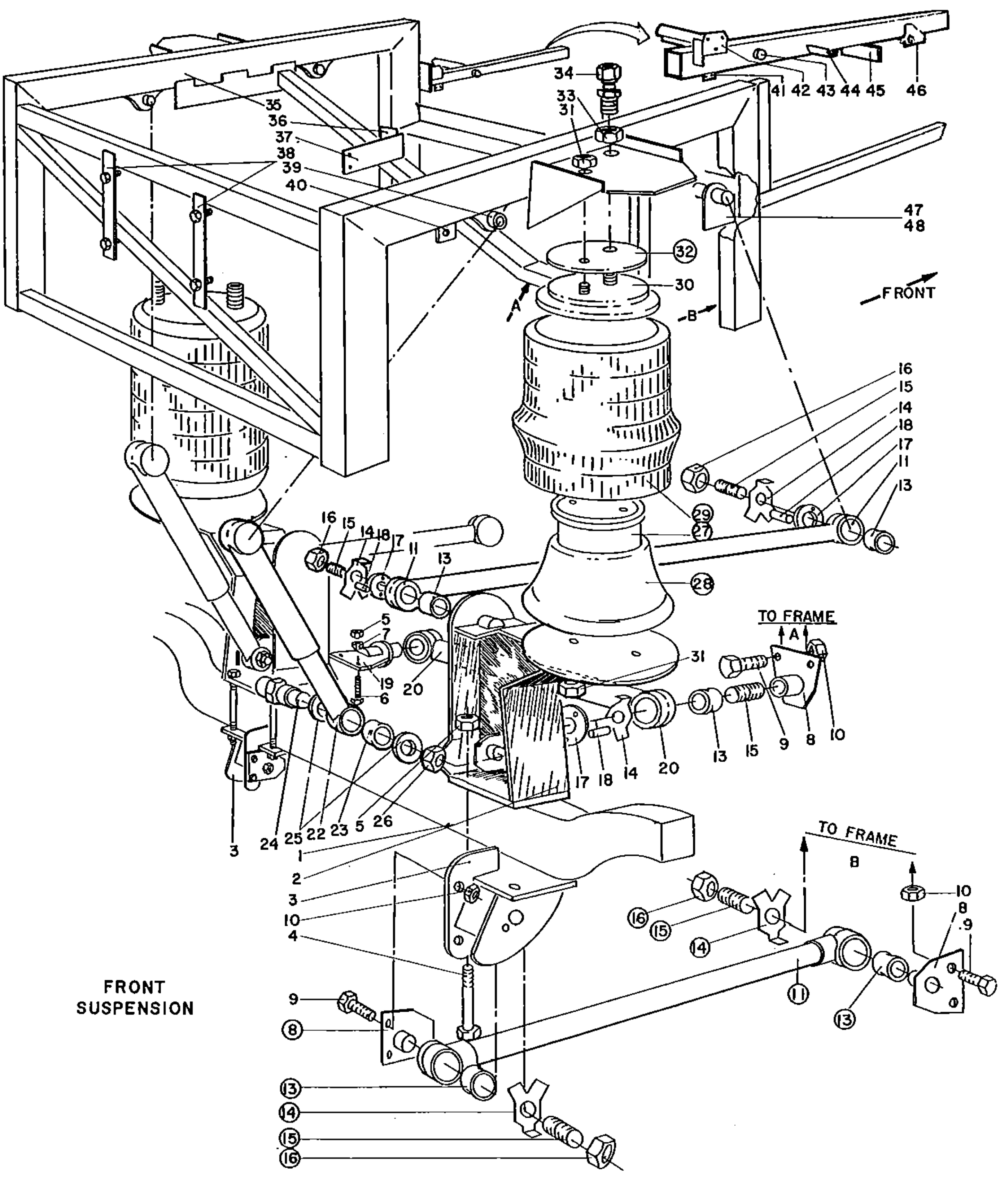
—Raise the vehicle in order to remove the wheels.

—Raise the vehicle in order to work under it.

● **Warning:** Be sure vehicle is properly supported.

PARTS DESCRIPTION

1. Front axle.
2. Bellow base.
3. Attachment.
4. Bolt.
5. Nut.
6. Bolt.
7. Lockwasher.
8. Pin (Prevost).
9. Bolt.
10. Nut.
11. Radius Rod.
12. Bracket.
13. Bushing.
14. Tab lock.
15. Pin.
16. Nut.
17. Spacer washer.
18. Pin.
19. Mounting Plate.
20. Radius rod.
21. Pin.
22. Shock absorber.
23. Bushing.
24. Mounting bolt.
25. Spacer washer.
26. Nut.
27. Volume can.
28. Bellow seat.
29. Bellow.
30. Cover.
31. Nut.
32. Plate.
33. Nut.
34. Air Inlet.
35. Front sub-frame.
36. Plate.
37. Plate.
38. Bracket.
39. Bushing.
40. Bracket.
41. Bracket.
42. Bracket.
43. Pin.
44. Plate.
45. Bracket.
46. Bracket.
47. Mounting Plate.
48. Mounting Plate.



FRONT SUSPENSION

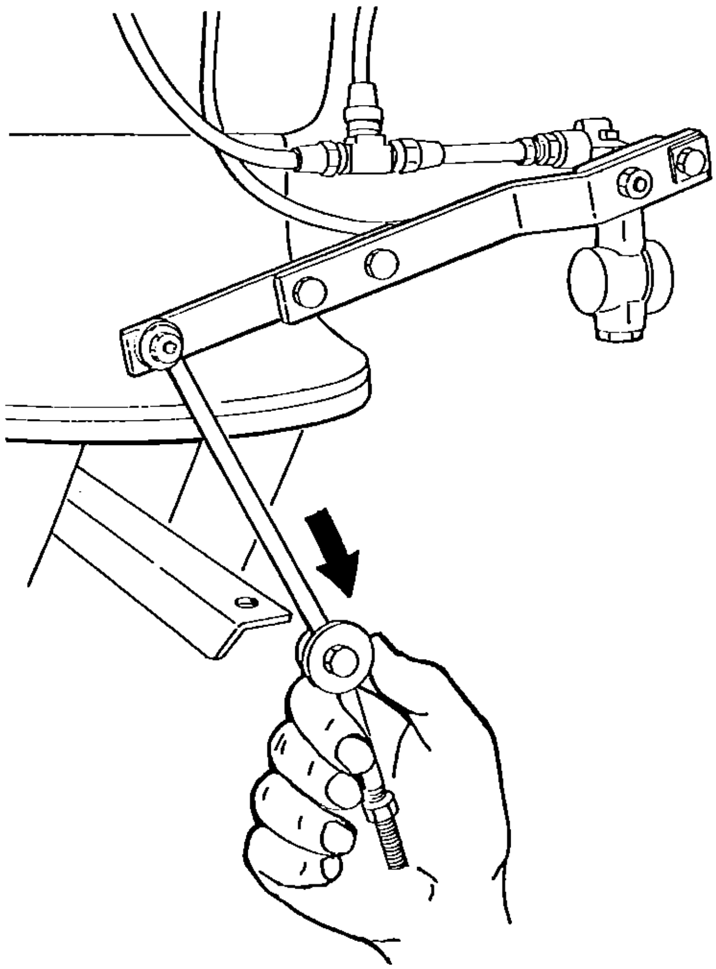
SUSPENSION

—Install retaining stands under the vehicle.

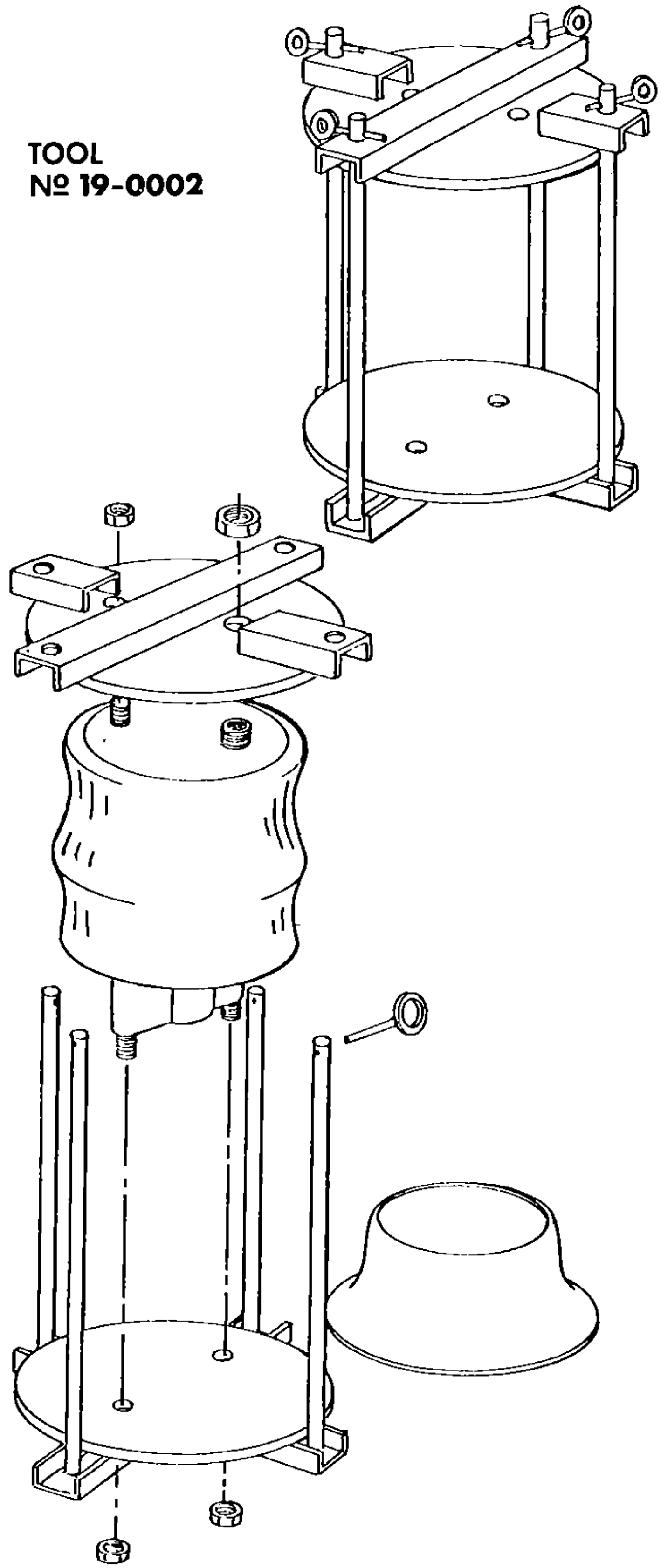
—Lower the vehicle so that it becomes by the retaining stands, and maintain the contact of the lift with the rear axle and with the front axle.

—Remove leveling valves linkage.

—Exhaust air pressure from bellows by pushing downward on the leveling valve levers.



TOOL
Nº 19-0002



—Remove the air fitting on the top of each bellow.

—Remove nuts on the top and on the bottom of the air springs.

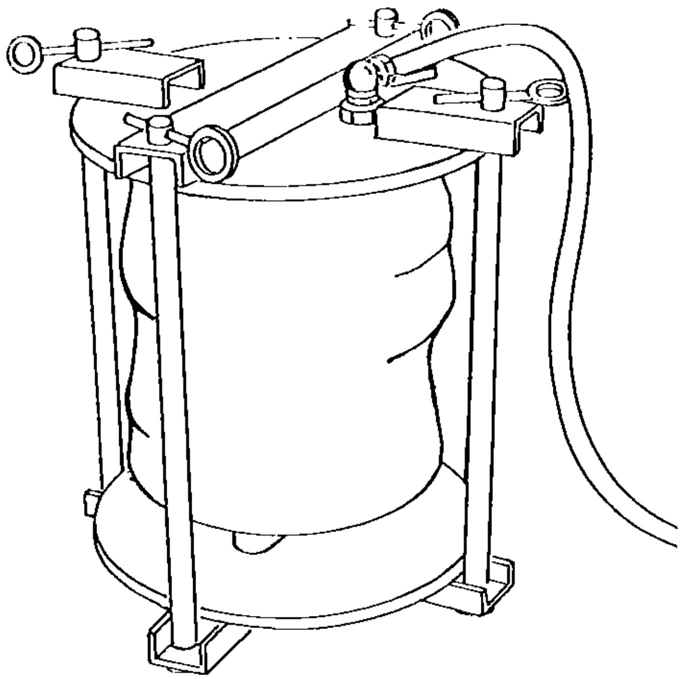
—Remove the air spring.

—Using tool #19-0002, disassemble air spring as per the following steps:

SUSPENSION

—Remove the bellow piston.

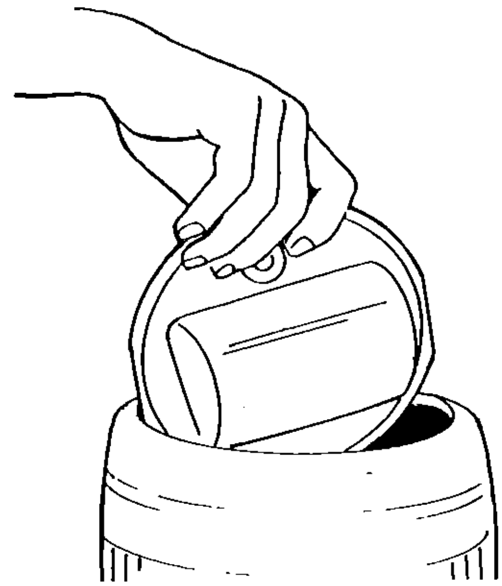
—Install the bellow as shown and apply air pressure, this will disassemble the lower retainer from the flexible member.



—Remove tool #19-0002 from the air spring.

—Remove upper retainer using a rubber hammer.

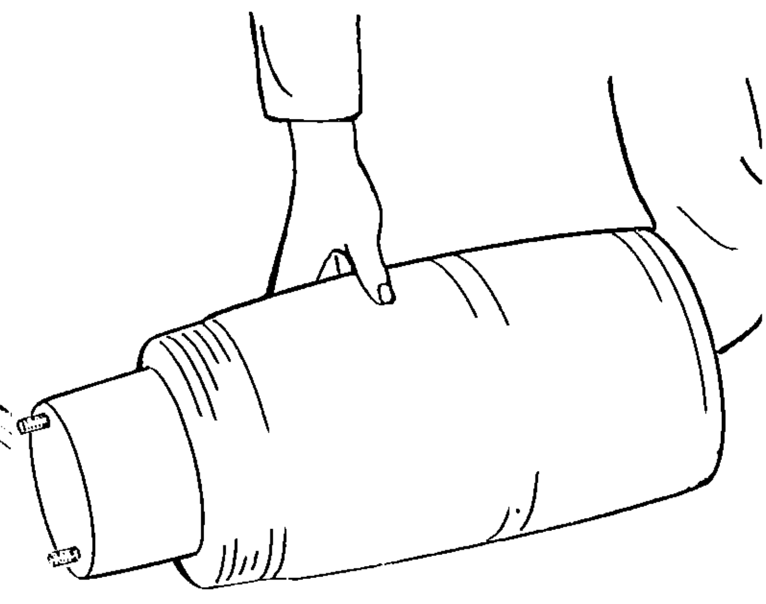
—Rotate upper retainer in order to align its two (2) flat surfaces with the wall of flexible member then pull it out.



—Pull on the bellow seat in order to remove it from the skirt.

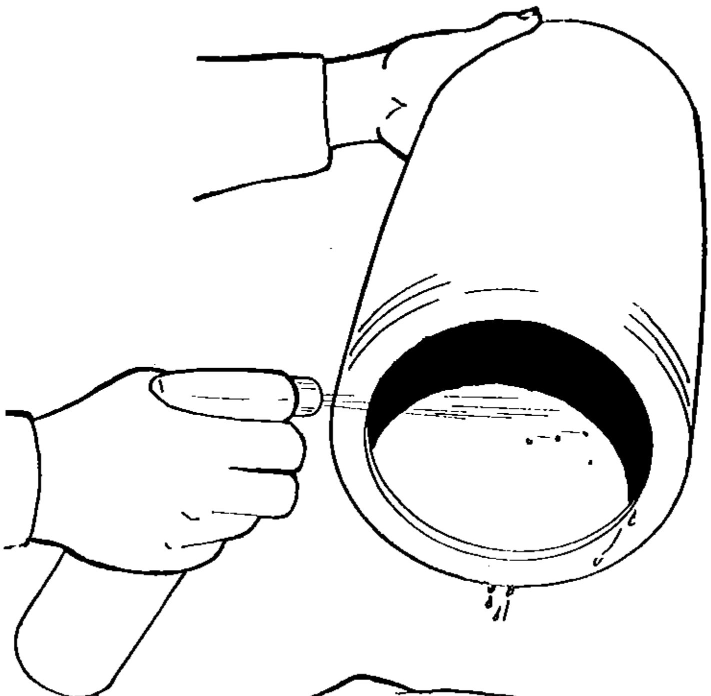
—Install volume can #63-0063 in the bottom of the bellow skirt as shown.

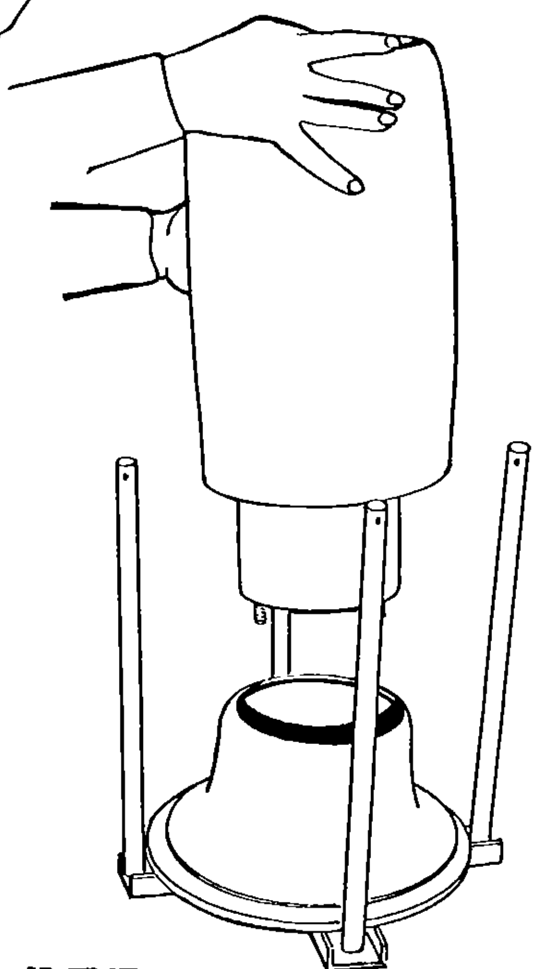
☐ **Note:** The use of silicone lubricant is recommended to facilitate this procedure and we suggest that you apply a slight pressure on the lower retainer in order to ensure its complete seating in the bellow skirt.



SUSPENSION

—Apply silicone lubricant at the top portion of the skirt.

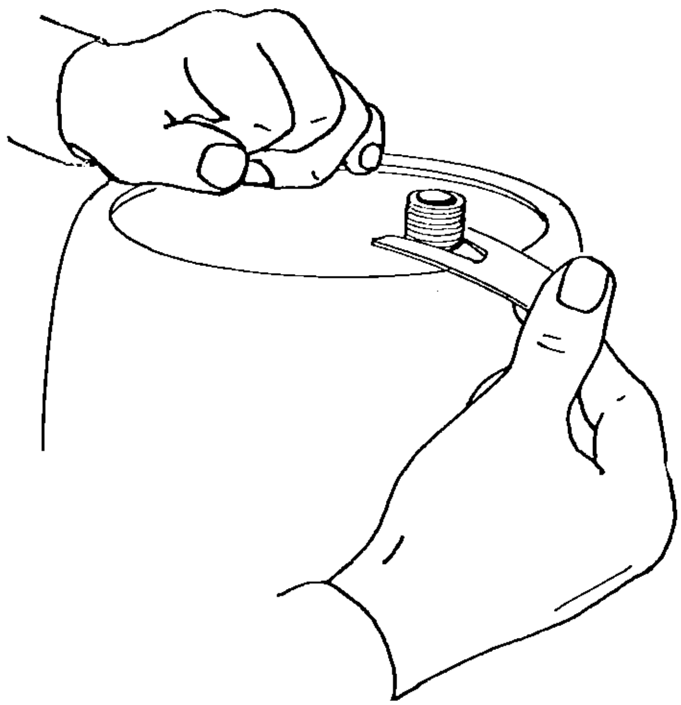


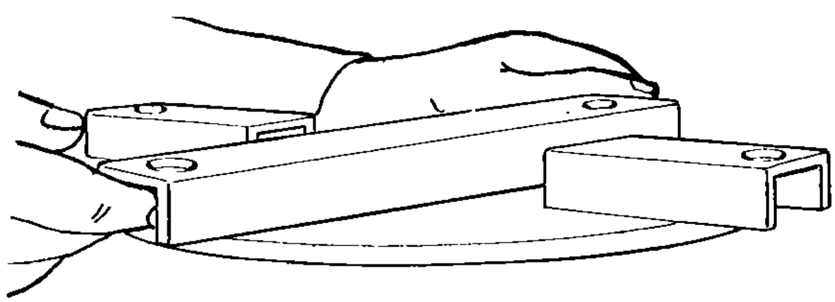


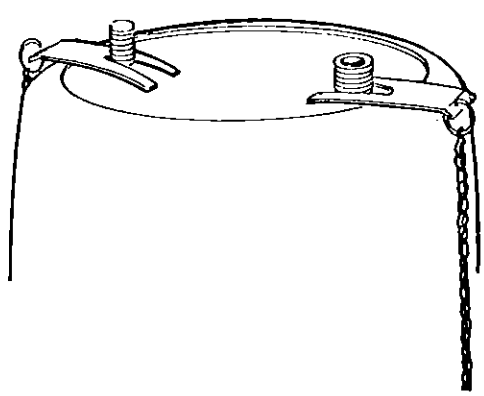
—Install new piston # 63-0042 under the volume can and torque the nuts as shown.

■ **Caution:** Be sure the upper and lower studs and nuts are positioned in the same axe line.

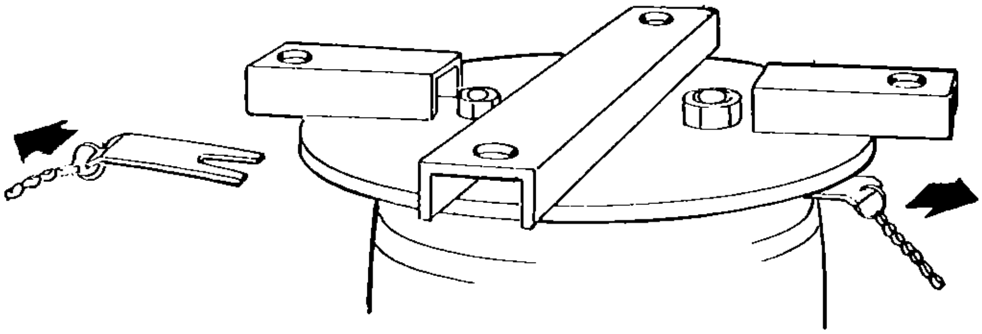
—Using tool # 19-0002 install upper plate to the upper cover.



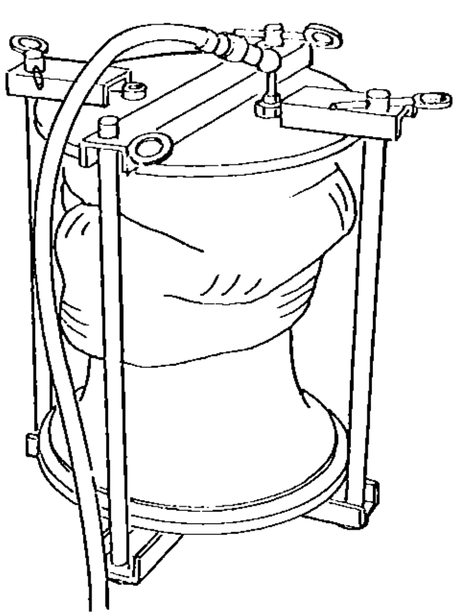


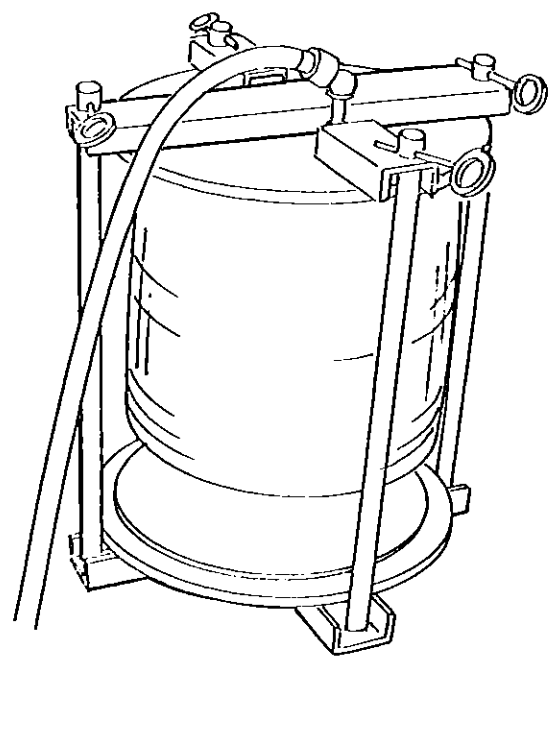


SUSPENSION



—Apply 90 PSI air pressure in order to properly seat the bellow assy components.





—Adjust suspension height.

SUSPENSION

Suspension height adjustment

To adjust suspension height, proceed as follows:

1. Run engine at fast idle until air pressure reaches 120 psi (830 kPa)

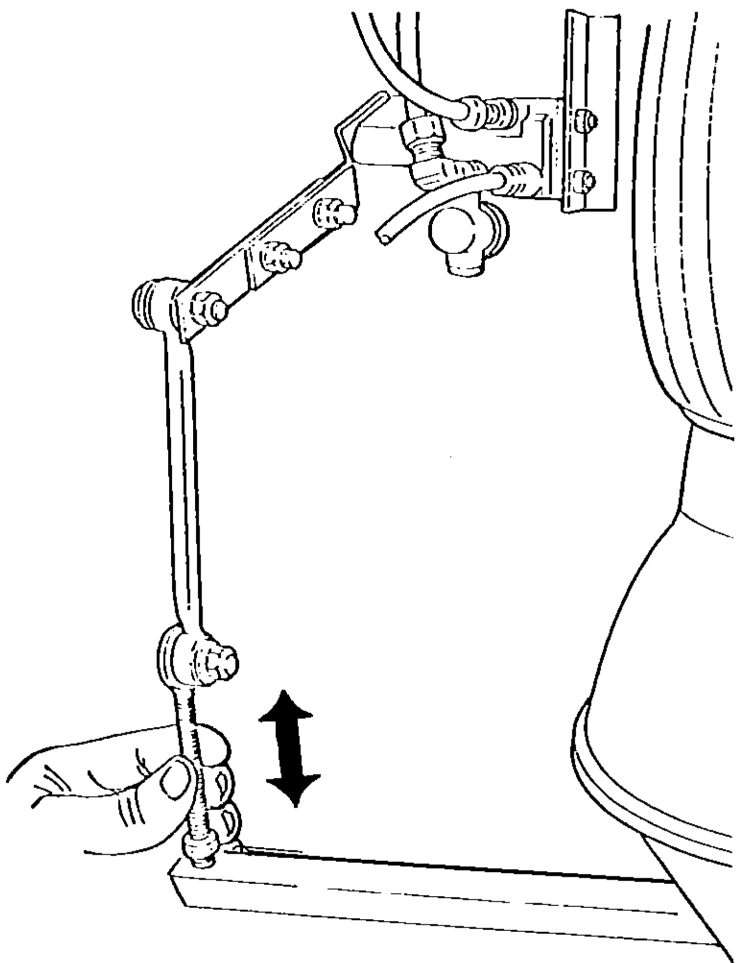
● **Warning:** Make sure this procedure is performed in a well ventilated area to avoid inhalation of exhaust fumes.

2. Park vehicle on a level surface, apply parking brakes, then stop engine.

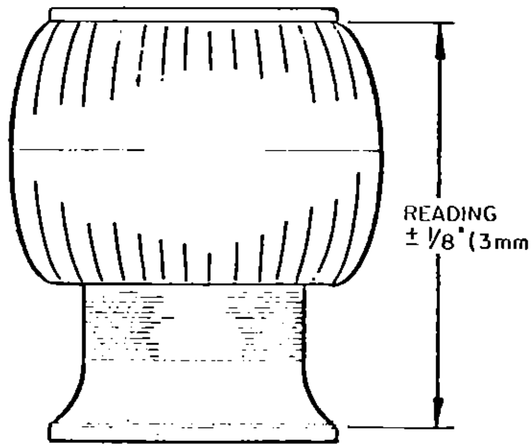
□ **Note:** Make sure there is no air leak to prevent air pressure from dropping.

3. Loosen the adjusting nuts of the leveling valve lever.

4. Lower or raise the leveling valve lever in order to obtain the proper suspension height value on each bellow, starting at rear axle. (Refer to specification chart).



5. Reading must be taken as follow:



□ **Note:** Allow suspension to stabilize prior to take reading.

6. Since the desired height is obtained, tighten suspension valve nuts.

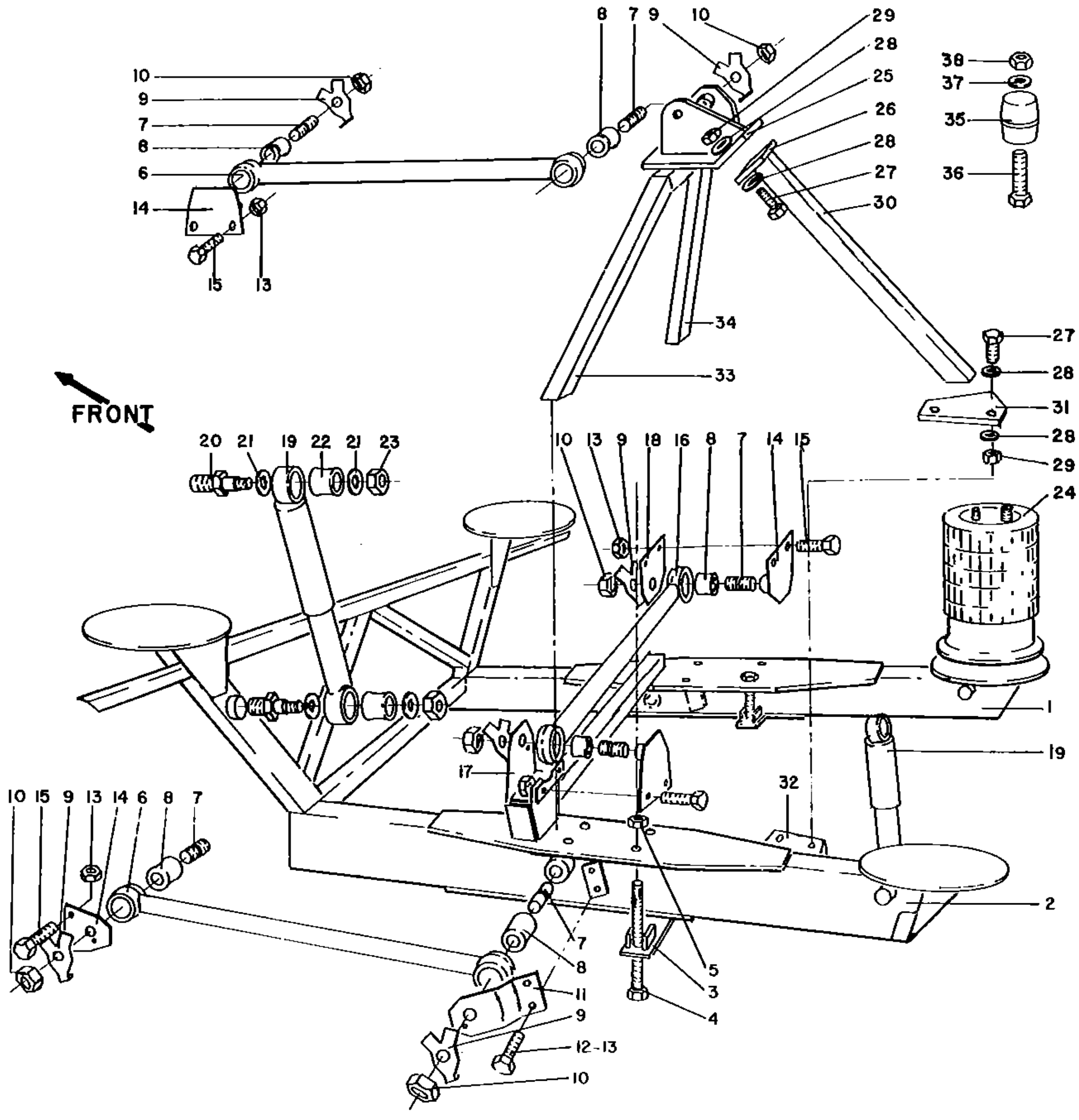
Specification chart:

SERIE	MODEL	FRONT AXLE	DRIVE AXLE
96"	COACH	11½" (29.2 cm)	10 5/8" (27 cm)
	BUS SHELL 35' and 40'	11½" (29.2 cm)	10 5/8" (27 cm)
XL	COACH	11½" (29.2 cm)	11½" (29.2 cm)
(102")	BUS SHELL 40'	11½" (29.2 cm)	11½" (29.2 cm)

□ **Note:** Air springs should be checked periodically for punctures, deterioration, cracks and chafing.

SUSPENSION

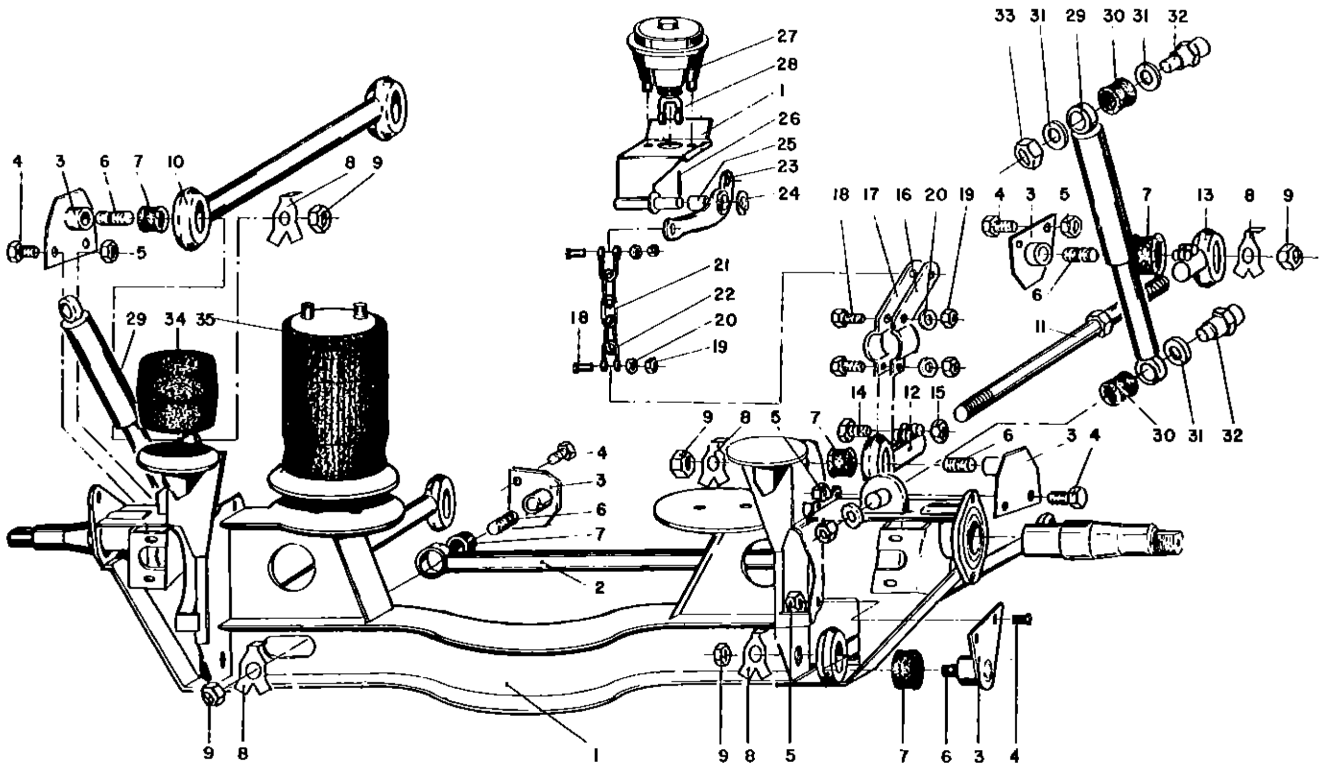
REAR SUSPENSION



1. Suspension beam RH.
2. Suspension beam LH.
3. Plate.
4. Bolt.
5. Nut.
6. Radius Rod.
7. Pin.
8. Bushing.
9. Tab lock.
10. Nut.
11. Plate.
12. Bolt.
13. Bolt.
14. Plate.
15. Bolt.
16. Radius Rod.
17. Plate.
18. Plate.
19. Shock absorber.
20. Bolt.
21. Lock washer.
22. Bushing.
23. Nut.
24. Air Spring (bellow).
25. Upper Plate.
26. Plate.
27. Bolt.
28. Washer.
29. Nut.
30. Removable leg.
31. Lower plate.
32.
33. Leg (LH)
34. Leg (RH)

SUSPENSION

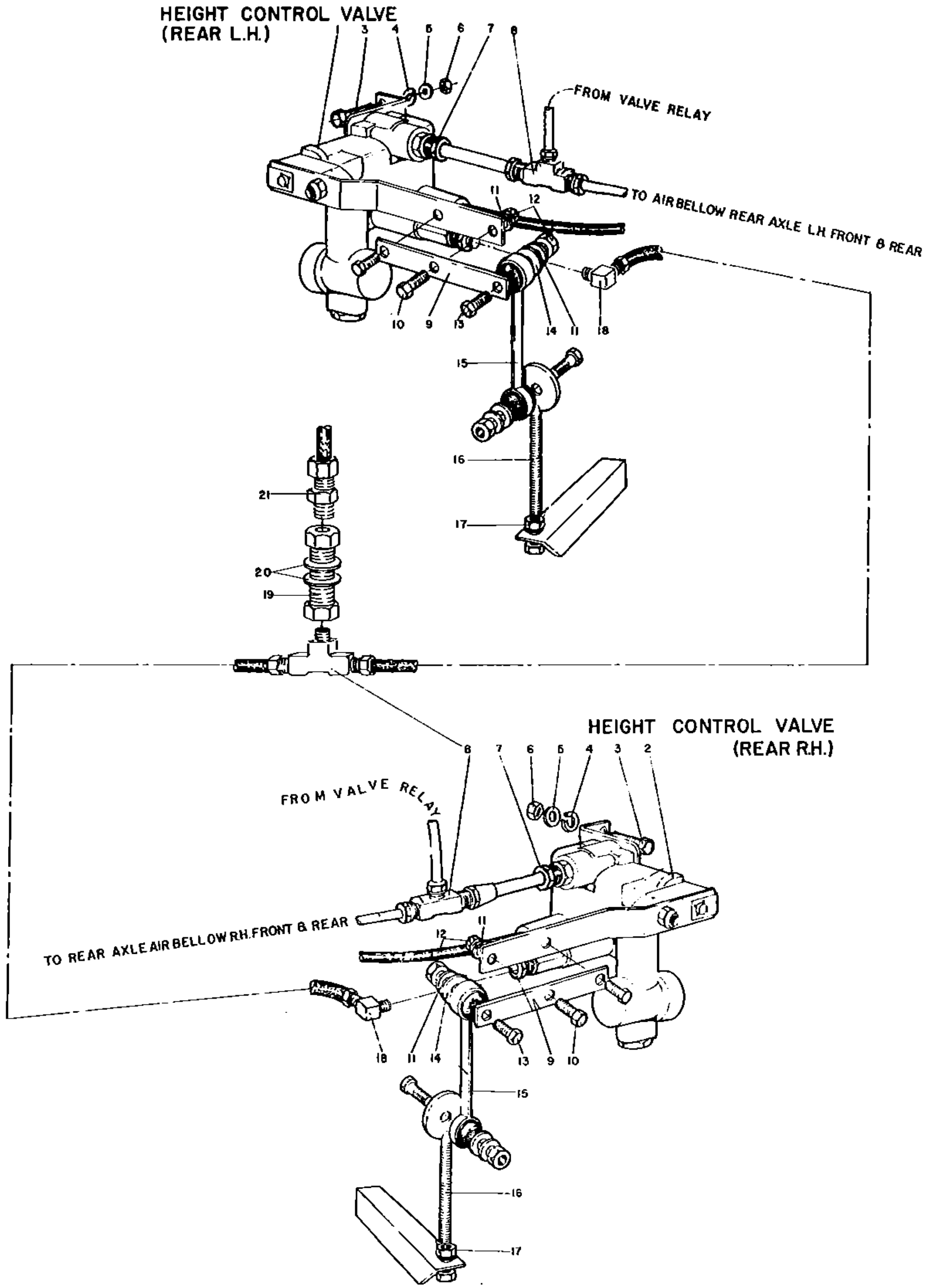
TAG AXLE SUSPENSION



1. Axle Beam.
2. Radius Rod.
3. Pin bracket.
4. Bolt.
5. Bracket.
6. Pin.
7. Bushing.
8. Tab lock.
9. Nut.
10. Radius Rod.
11. Rod.
12. Bolt.
13. Radius Rod End.
14. Bolt.
15. Nut.
16. Plate.
17. Plate.
18. Bolt.
19. Nut.
20. Washer.
21. Nut.
22. Bolt.
23. Bracket.
24. Washer.
25. Bushing.
26. Pin.
27. Air chamber.
28. Attachment.
29. Shock absorber.
30. Bushing.
31. Washer.
32. Bolt.
33. Nut.
34. Bumper.
35. Air Spring (bellow)

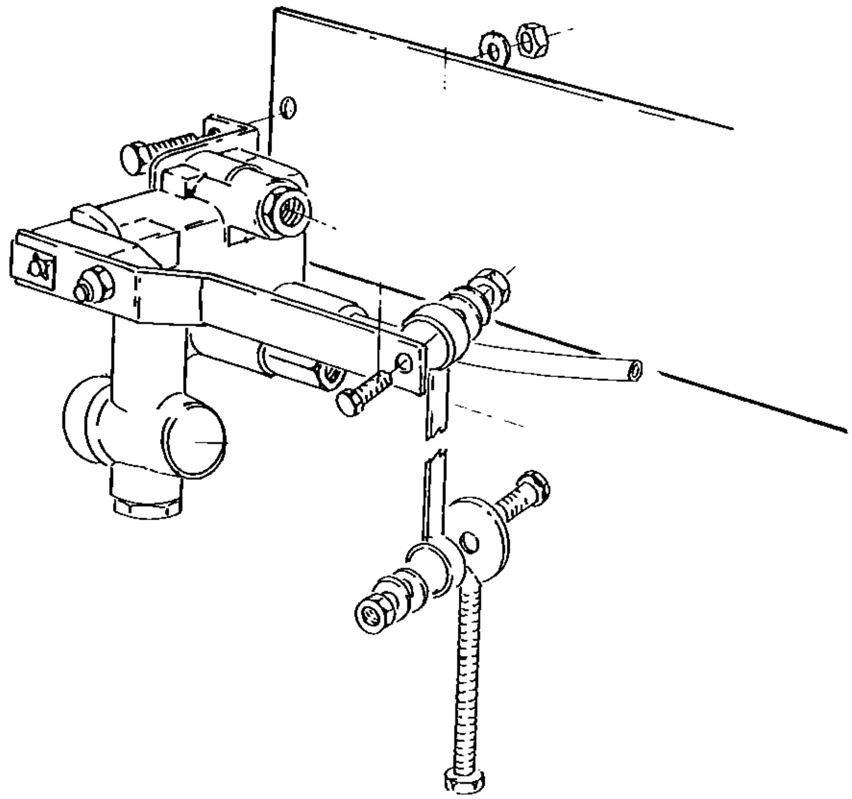
SUSPENSION

Height control valve



SUSPENSION

HEIGHT CONTROL VALVE -FRONT



Loading position

When loaded, body of vehicle settles. Since valve is linked to suspension, and valve is mounted to vehicle body, valve moves downward with body during loading. As overtravel lever and control shaft turns, intake valve lever presses against pin of valve core. As pin is depressed, air pressure flows through height control valve into air bellows. Increased air pressure expands air-bellows and raises body of vehicle. Intake valve is protected by check valve which permits air to travel in one direction only.

Neutral position

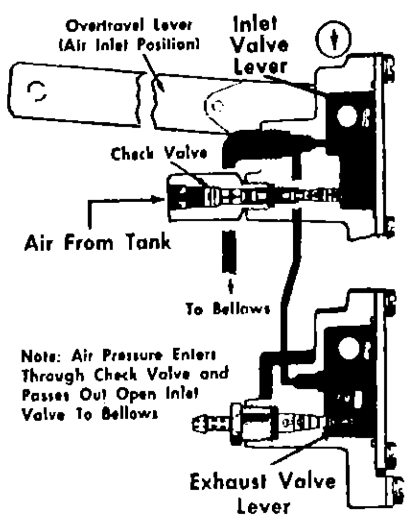
Increased pressure expands air bellows lifting vehicle body and height control valve. The overtravel lever returns to «neutral» as vehicle body approaches normal ride height. Intake valve lever also moves closing valve. The exhaust valve remains closed and the check valve in intake adapter prevents air from escaping from valve body and air bellows. This condition remains static until vehicle load is altered, moving overtravel lever from «neutral» for one or more seconds actuating intake or exhaust valves.

Unloading position

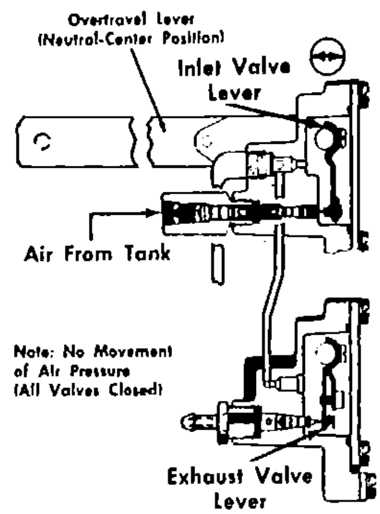
When load is lightened, pressure in air bellows raises vehicle body. Overtravel lever is pulled downward from «neutral». This applies a force that slowly moves the delay piston. The exhaust valve lever moving with delay piston, opens exhaust valve when lever moves beyond free travel range. Intake valve remains closed thus allowing air from air bellows to exhaust to atmosphere. As air is exhausted from air bellows, the vehicle body is lowered until overtravel lever returns to «neutral» position.

When vehicle is in motion with body at normal ride height, overtravel lever is in «neutral» position. Small movements of lever may occur without activating control valve as it must move in excess of 3/16" (4.7 mm) before either valve is opened.

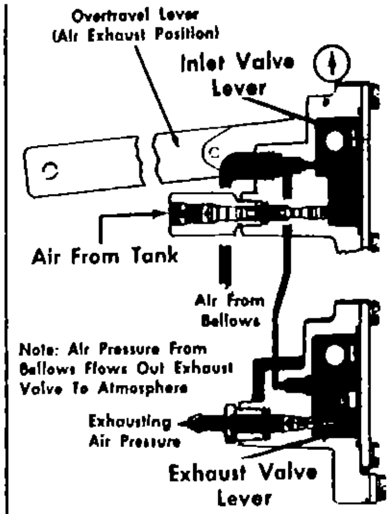
SUSPENSION



LOADING



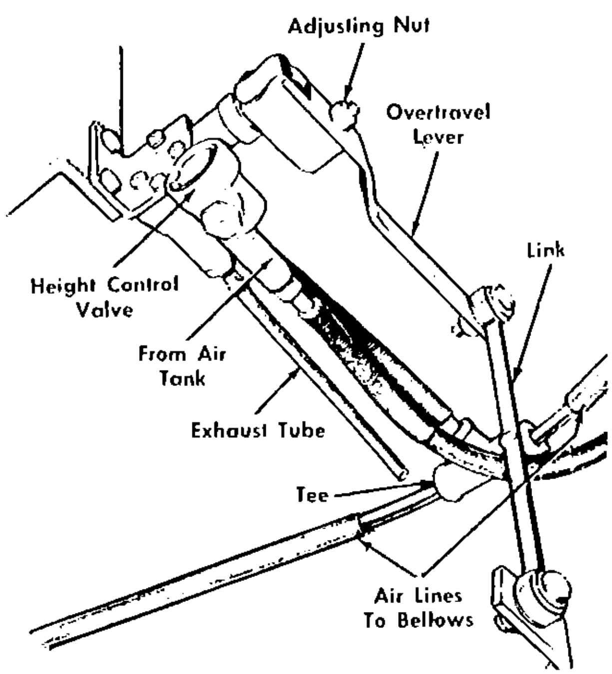
NEUTRAL



UNLOADING

Maintenance

The height control valve requires no periodic maintenance. Height control valve linkage operates on rubber bushings and no lubrication at this point should be attempted.



Removal

1. Support body of vehicle by placing blocks under body by jack points.

2. Open drain cock in air filter and exhaust all air from system.

3. Disconnect overtravel lever from link and pull down to exhaust remaining air from air beams.

4. Disconnect both lines from control valve and cover ends with tape.

5. Detach height control valve from mounting bracket. Replacement is the reverse of removal. After assembly, check for leakage using soap and water.

Height control valve air leakage check

The following procedure is for making air leakage check when valve assembly is removed from vehicle.

(1) Clean the exterior of valve assembly.

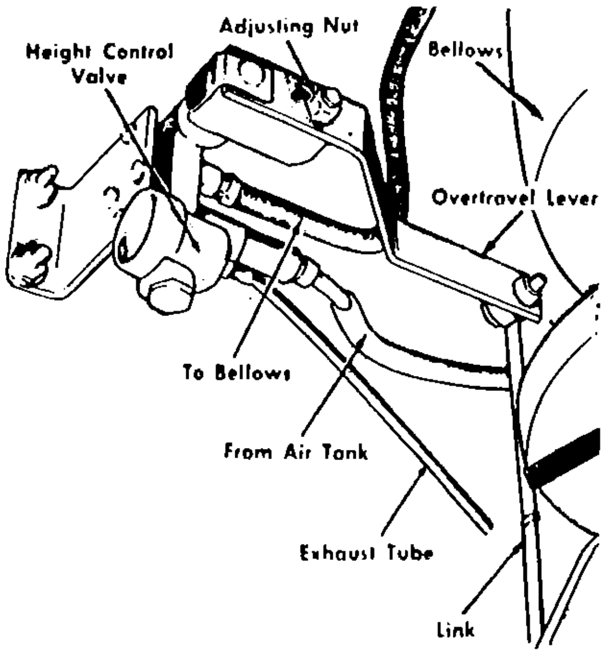
(2) Connect air pressure line to air inlet port then open the air pressure (70-100 psi; 483-690 kPa).

(3) Dip the valve assembly in a container of water, and watch for air bubbles when the overtravel lever is in the center position. No air should escape from any point of the valve assembly.

SUSPENSION

(4) If bubbles appear from the bellows port, this is an indication that the air inlet valve assembly is defective and must be replaced.

(5) Remove air pressure line from air inlet fitting and connect it to the bellows port. If bubbles appear at the air inlet check valve port, this is an indication that check valve unit is defective and must be replaced.



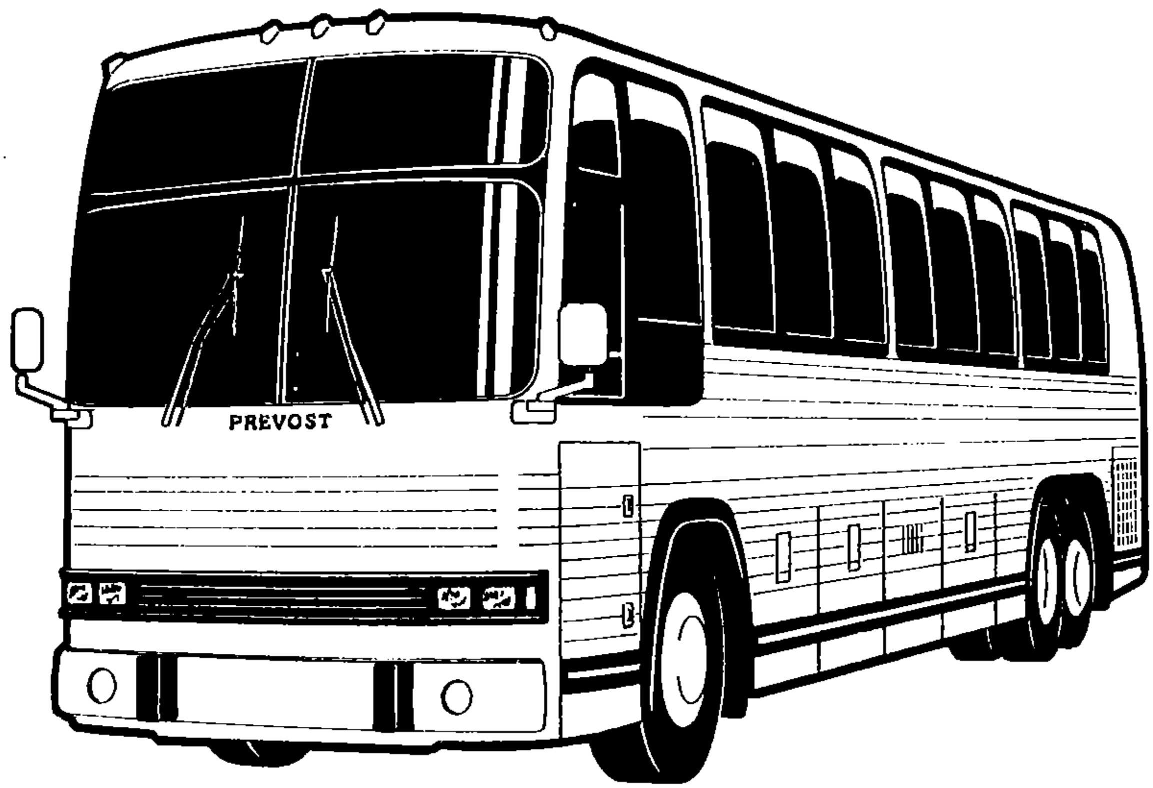
(6) If bubbles appear at the exhaust port, it is an indication that the exhaust valve assembly is defective and must be replaced.

(7) If no leaks are found, remove valve assembly from the water, then with air pressure still connected to the bellow port, actuate overtravel lever to remove any excessive amount of water which may have entered exhaust valve chamber. Remove air line and connect it to the air inlet port and repeat operation here to remove water from the air inlet valve chamber.

TROUBLESHOOTING

MALFUNCTION	POSSIBLE CAUSE	CORRECTIVE MEASURE
Bellows deflate overtime	Defective check valve assembly.	Replace check valve assembly.
	Defective exhaust valve assembly.	Replace exhaust valve assembly.
	Leak in air line and/or bellows.	Replace air line or bellows.
	Defective valve cover rubber O-rings or gasket	Replace valve cover O-rings or gasket.
Bellows raise to full height and fail to exhaust air pressure.	A clogged exhaust screen in height control valve assembly.	Remove and clean screen.
	A combination clogged exhaust screen and a defective air inlet valve assembly.	Clean exhaust screen and replace air inlet valve assembly.
Intermittent hissing noise at height control valve during operation.	Loss of time delay action fluid in height control valve assembly.	Add fluid, then install new cover and delay piston plug gasket O-rings.
Erratic valve action.	Dirt or foreign matter in the air valve lever chamber.	Remove valve cover and blown out dirt. Install cover using new gasket.
	Defective valves.	Overhaul height control valve assembly.
Vehicle body falls to level to satisfactory ride height.	Improper height control valve overtravel lever adjustment.	Adjust lever as directed.

BODY



BODY

DESCRIPTION

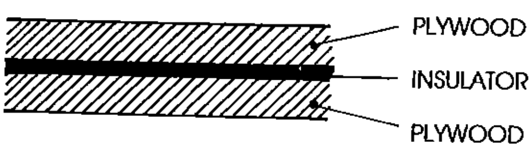
The body is of the integral structure type. The frame is made of 14, 16 and 18 gauge high tensile steel and stainless steel. The frame structure is completely welded and properly braced as necessary.

All exterior panels are riveted securely to the frame members. Between each panel and member contact points, a special anti-corrosion coating is provided. This coating is made of TECTYL 127, by VALVOLINE.

The complete structure is protected against corrosion prior to assembly.

Floor

The floor is 1-1/8" (38 mm) thick and is made of 2 layers of plywood of 1/2" thick and a 1/8" insulator between each plywood layer.



The insulator acts to reduce noise from the power train.

Roof

The front and rear roof caps are fiberglass moulded. Main roof panels are high tensile aluminum and they are riveted to the roof structure.

Exterior maintenance

PREVOST®, through its diligent research, design and utilization of the most advanced technology available, has done its share to help prevent corrosion and has provided you with the finest quality vehicle construction. Now, it is up to you. Proper care of your vehicle can help ensure long-terme corrosion prevention and a high resale value.

The most common causes of corrosion are:

- The accumulation of road salt, dirt and moisture in hard-to-reach areas under the vehicle.
- Chipping of paint, or undercoating caused by minor accidents or by stones and gravel.

Care is especially important if you operate your vehicle under certain environmental conditions such as:

- Road salt or dust control chemicals: This will accelerate corrosion, as will the presence of salt in the air near the sea-coast or in areas of industrial pollution.
- High humidity: this will accelerate corrosion especially when temperature range is just above the freezing point.
- Wetness or dampness to certain parts of your vehicle for an extended period of time, may cause corrosion eventhough other parts of the vehicle may be dry.
- High temperature: will cause corrosion to those components which are prevented from quick-drying due to lack of proper ventilation.

The following precaution can be taken to maintain your vehicle as beautiful as new:

- wash your vehicle frequently
- check the exterior condition frequently
- do not park your vehicle in a damp, poorly ventilated garage

INTERIOR

Upholstery maintenance

Description

Upholstery fabrics, in fact any fabric-clothing included, must be kept clean if maximum service is to be expected. In both appearance and wearability, best results are obtained if upholstery is cleaned at regular intervals and cleaned before dirt, dust and grit have been ground into the fabric. Vacuuming is all that is necessary for long periods but for a thorough cleaning provided the covers are to be cleaned in place (not removed) the most economical and effective method is to wash the upholstery, either with a neutral (non-alkaline) soap or an approved foam-type cleaner. If this is done at frequent, regular intervals the upholstery will look as "good as new" at all times. If covers are to be removed for cleaning then only dry cleaning is recommended as washing, not properly controlled, might cause some shrinkage preventing the covers from being reapplied to the seats without damage. Only Stoddard Solvent is recommended as the dry cleaning agent because most covers used on seats are a combination of cloth and vinyl and Stoddard Solvent assures much longer life from the vinyl than would solvents. If cleaning of vinyl only then mild soap and water is recommended. The first step is to remove all the loose dirt and dust that may be in the fabric. For this purpose a powerfull commercial vacuum cleaner is best. Many maintenance personal, as they vacuum, beat the seat cushions and backs with a small carpet beater or a padded stick of wood in order to loosen dirt and dust facilitating its removal. Should seats be removed from coach a high pressure air line which is more effective than vacuuming in the removal of imbedded dust and dirt.

BODY

The word "washing" should not be misinterpreted. By washing, it is not meant you should soak the fabric. The objective is to loosen the greasy bond between the fibers and the dirt they have picked up. It will not harm the upholstery to become thoroughly wet, but it will take it longer to dry, and before equipment goes back into service the seats should be thoroughly dry. If spots or stains are to be removed, in order to avoid a "cleaning ring", they should be removed from backs and cushions before seats are washed, not after.

The consensus of operator opinion and pratice in cleaning upholstery is that the following procedure gets the best results:

(1) After the seat cushions and backs have been well vacuumed, a thick lather of soap or cleaner suds should be scrubbed into the fabric. This can be done with a stiff bristle brush, a sponge or by a detelging machine, if one is available.

(2) Follow the scrubbing by sponging the suds from the fabric with a clean sponge or a clean cloth dampened with water. Rinse the sponge or cloth often. Change water often. This is very important.

(3) Before the coach goes back into service, the upholstery should be allowed to dry. To speed up the drying after upholstery has been cleaned, escess moisture can be blown off from the fabric with an air line.

☐ **Note:** Oil in the air line is a hazard, blow the liner clear, testing against a piece of paper. In other instances, it has been found that it is as effective to press the edge of a flat stick of hardwood on the cushion and slowly draw it across the fabric.

Even the most soiled seats can be returned to much of their original appearance by a thorough cleaning. But a regular schedule of cleanings that keeps your upholstery reasonably clean at all times will add months to the service life of your upholstery.

An optimum upholstery maintenance schedule

After each vehicle comes off its regular run, seats are brushed after the floor of the bus has been swept. A whisk broom is generally used.

☐ **Note:** Many maintenance personal find it best to use some sort of "dust layer" on the vehicle floor before sweeping in order to keep the dust down and avoid spreading it onto the seats.

Once a week, at least-oftener if the vehicle is in the maintenance shop for a bi-weekly mechanical checkup, the seat cushions and seat backs should be vacuum cleaned. Many maintenance personal then have the seats wiped with a damp clean cloth to remove any dirt or dust raised to the surface of the fabric but not removed by the vacuum.

At each mechanical check-up during which the vehicle remains in the shop for 24 hours or more, the seat upholstery is vacuum cleaned, spots removed and then "shampooed".

An average upholstery maintenance schedule

Once a week the seat upholstery is brushed with a whisk broom, if this is sufficient to remove most of the dust and dirt that has accumulated. If for any reason the seats have become very dirty, they should be vacuum cleaned and wiped.

At every other mechanical check-up period — at least once every two months — the seat upholstery is vacuumed and washed.

A minimum upholstery maintenance schedule

Once a month the upholstery is vacuumed.

Every four months, upholstery is vacuumed and washed or dry cleaned. (Washing or dry cleaning only twice a year should be minimum.) You should keep a close check on the interiors of the vehicle and, whenever necessary, wash or dry clean the upholstery, regardless of whether or not the six months are up.

CARE AND MAINTENANCE OF FIRTH SEAT FABRICS

Routine cleaning

All that is required to remove the dirt is a gentle beating with the hand or the back of a brush. This will bring the dirt to the surface where it is easily removed by a vacuum or a soft brush. It is preferable to vacuum or brush in the direction of the pile which can easily be recognized by running a hand lightly over the pile. Cleaning should be carried out as often as possible. If the fabric becomes excessively dirty then particles of grit will cause gradual wear to take place thus reducing the life of the fabric.

Method A

Apply a non-flammable solvent (Trichloroethylene) with a clean, white, absorbent material, treating small areas, working from the outer edge towards the centre of the stain. Blot frequently with a dry cloth to avoid rings. OPEN WINDOWS AND DOORS TO ALLOW FUMES TO DISPERSE.

BODY

Method B

Sponge the stain with a solution of household detergent and lukewarm water. DO NOT SOAK. Follow this by rubbing with a damp cloth, rinsing cloth between each treatment.

● **Warning:** do not use soap, washing powder, ammonia, soda, bleach or any products which contain them.

Alcoholic liquids

Sponge with water followed by Method B.

Battery acid

Saturate with a solution of Sodium Bicarbonate, leave a few minutes before drying out. It is important for the above treatment to be carried out immediately to avoid serious damage to the fabric.

Beverage stains

Use Methode A. If stain persists try Methylated spirits.

Blood stains

Use Method B.

Burns

Scrape blackened area with a knife and treat with Method B. Extensive burns require expert attention.

Chewing gum

Soften with Cyclohexanone and scrape off carefully with a knife.

Cosmetics

Use Method A followed by Method B.

Inks — writing ink

Use Method B. If brown stain remains treat as for rust.

Copying ink

Treat with Methylated spirits, blotting frequently to avoid ink spreading. Using cleaning Method B to complete the treatment.

Ballpen ink

Treat as copying ink.

Marking ink (Felt-tipped Pens)

Treat with Methyl Ethyl Ketone (MEK) followed by Method B.

Oil, grease and paint marks

Remove surplus substance with a knife or spoon then treat with Method A followed by Method B. Should stains reappear repeat cleaning process.

Rust

Use Method B followed by a warm solution of Oxalic Acid, complete treatment by sponging with water.

Tar

Soften with Benzene and then treat with Method A followed by Method B.

Urine

Use Method B.

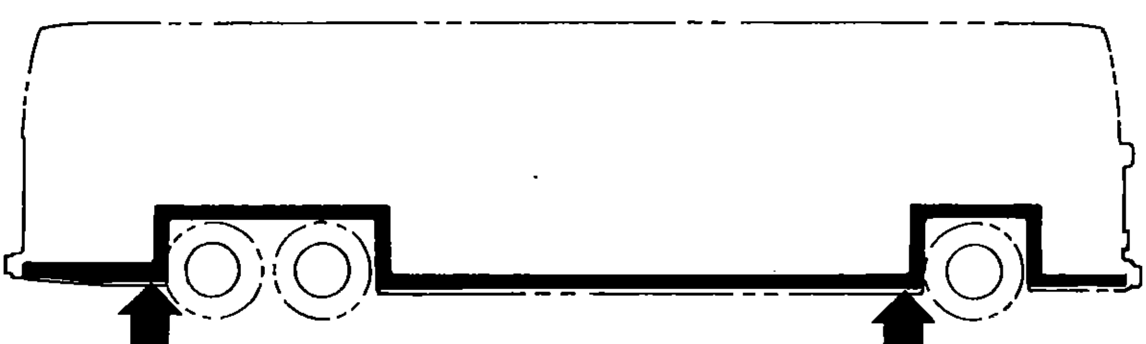
Vomit

Use Method B.

☐ **Note:** Prompt and correct cleaning will remove most stains. Wrong treatment will only increase the damage.

VEHICLE JACKING POINTS

When it is necessary to raise the vehicle, we recommend that it be done under the front and rear axles. If, for any reason, the vehicle may not be raised from under the above mentioned axles, jacks under body members must be used as illustrated:



BODY

■ **Caution:** Care must be taken to insure that proper pressure is applied only at the points indicated. Otherwise distorsion and/or damage may result to body section.

Welding

The entire frame structure is a welded design. Self contained suspension bogies for the front and rear are jig welded to ensure proper alignment of the main radius rod attaching points.

Welding rod recommendations

The following welding rods should be used when making welding repairs to the body structure:

APPLICATION	DIAM.	A.W.S.
1. Stn. Stl. to Stl. or Corten, Light Gauge	3/32" (2.4 mm)	No. 308
2. Stn. Stl. to Stn. Stl. or Corten, Heavy Gauge	1/8"-5/32" (3.2-4.0 mm)	No. 308
3. Corten to Corten Light Gauge	3/32"-1/8" (2.4-3.2 mm)	No. 6011
4. Corten to Corten Heavy Gauge	3/32"-5/32" (2.4-4.0 mm)	No. 7018

REPAIR OF FIBREGLASS PARTS

All repairs to fibreglass parts consists of filling the damaged area with fibreglass cloth and resin or strand fibreglass and resin. The repair is allowed to harden and then the finishing operations are performed. Use of the various materials is determined by the type of repair to be made. Large holes, torn sections and separate joints require the adhesive qualities of the resin and the reinforcing qualities of the fibreglass. Small dents, scratches or pits can be repaired using resin and strand fibreglass and filler mixed into paste. Instructions for either mix are explained later under respective headings.

For best results the ambient temperature should be 70° to 75°F (21° - 24°C), when, making repairs. Some people experience a skin reaction to resins. When, and if this happens, wipe off skin with denatured alcohol or a good thinner. There are several protective hand creams on the market and use of one of these creams is recommended.

If any disc grinding or sanding is to be done in an enclosed area, a respirator should be used. Goggles should also be worn whenever grinding or sanding is done.

Extreme care must be taken if the sander is electrically operated as dust of some resins is combustible when subjected to sparks or open flame. The proper tool for sanding resin is a low speed, air driven disc sander with a water attachment or a dry sander having a vacuum bag attachment. Either will eliminate flying glass and resin dust.

The following additionnal tools and materials will assist in making repairs. Hacksaw blade, assorted files, emery paper or cloth (No. 150 grit or finer), scissors or tin snips, wax paper or cellophane sheets, small 3" (76.2 mm) paint roller, paint brush, putty knife, acetone and one or more heat lamps.

Procedure for using fibreglass cloth

Where necessary, sand paint away around damaged area. On underside of coach, scrape away undercoating from damaged area and wipe clean with solvent.

Grind or file the damaged area to form a "V" at the broken or cracked portion. Sides of "V" should have a shallow pitch for maximum bonding area.

□ **Note:** Roughening the surface improves adhesion of resin.

If panelling is warped from original shape, use "C" clamps and improvised clamp plates to align surfaces. Preheat area to be repaired using one or two heat lamps positioned 12 to 15 inches (305-381 mm) from repair.

■ **Caution:** 200°F (93°C) is the high limit for this material and to go higher is to risk material distortion or crystalizing.

Cut fibreglass cloth with scissors or tin snips one to three inches larger than area to be repaired. Build up area to desired height.

Mix desired quantity of resin and hardener in proportions of half a tablespoon of M.E.K. catalyst hardener to one quart of vibrin 135 resin. Do not use wax cups for mixing and do not allow resin to enter hardener can or vice-versa. Mixture which is too thin can be thickened to desired consistency by adding powdered filler. Two tablespoons of filer to one-half pint of mix will usually supply desired consistency.

Saturate layers of fibreglass with mixture then place laminates over damaged area. Smooth out wrinkles and make sure general contour of area is maintained. Bubbles and wrinkles can be rolled out using a roller.

■ **Caution:** Once the resin and hardener have been mixed the pot.-life (working time) of the mix is approximately 15 minutes. Any accidental contamination to the skin, clothing, tools, etc., must be removed within this period. Use acetone to remove uncurred resin.

Heat resin material again placing lamps 12 to 15 inches (305-381 mm) from repaired area. Allow 12 to 15 minutes for repair to cure. After repair is cured, grind, file or sand to contour. Files other than body files may be more suitable. Feather edge and finish sanding.

BODY

After making repair, small pits or irregularities may appear in finished surfaces. Imperfections should be repaired using a liberal amount of chopped strand or filler mixed with resin to form a paste. See "Procedure Using Fibreglass Paste".

Repair procedure using fibreglass paste

Fibreglass paste is used for repairing small dents, scratches, and pits. Paste is made by mixing resin, hardener and fibreglass strand or filler to the consistency of putty.

Where necessary, sand paint away around damaged area. On underside of coach, scrape away undercoating from damaged area and wipe clean with solvent.

Preheat the area to be repaired using heat lamps. Mix desired quantity of resin and hardener (Refer to Manufacturer's instruction on container.) Add powdered fibreglass strand into mixture to thicken it into a putty state.

■ **Caution:** If repair is to be made on a vertical surface, adding of powdered filler material to mixture will reduce tendency of hot resin to flow or run.

Apply the material with a putty knife or similar object, building material up to desired contour. For deep filling and on vertical surfaces several layers of material may be used.

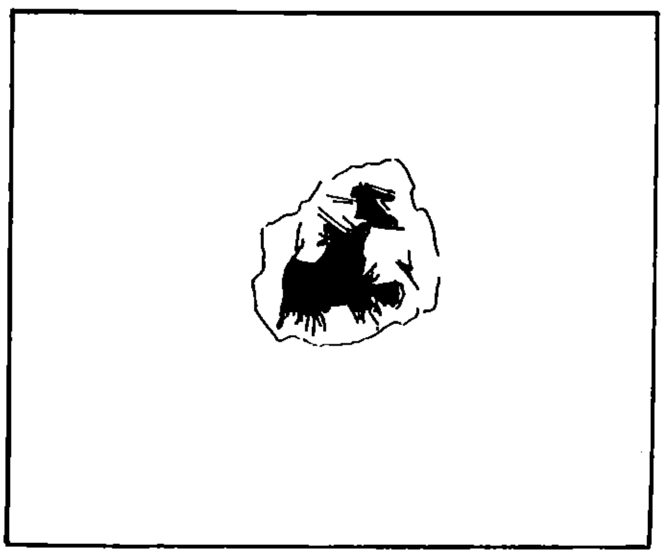
A hack-saw blade held flat to adjacent contour and then pulled, using sawing action across repair when the resin is in the jell stage, will remove excess resin from repair.

Finish repair in the same manner as when using fibreglass cloth.

Typical views of fibreglass repairs

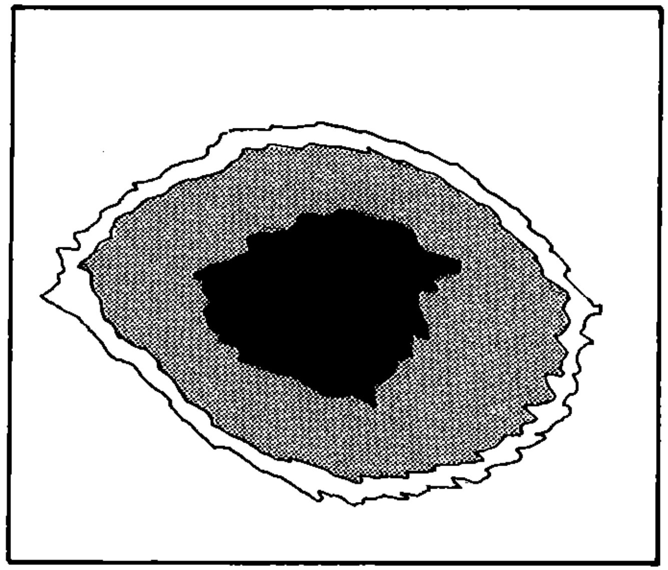
VIEW A

Area to be repaired.



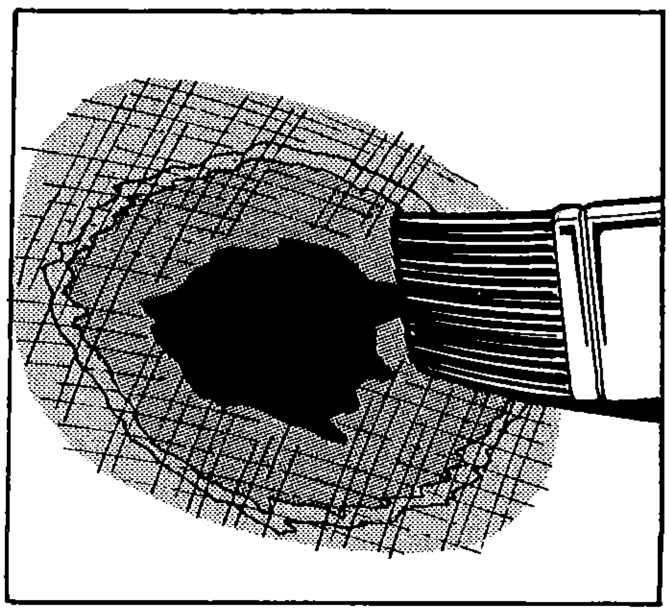
VIEW B

Remove all loose particles or damaged material using a power sander or rasp, clean area, overlapping hole approx. 1-1/2" (25.4-38.1 mm) all around. Remove all dirt, grease and paint from area to ensure good bonding surface. Feather the cleaned area all around.



VIEW C

Cut a piece of fibreglass mat slightly larger than area being repaired. Impregnate mat with general purpose Polyester Resin — catalized normally. Use a clean paint brush to apply the Polyester Resin. Apply impregnated mat over hole and press onto surface with brush to obtain good adherance. Another coat of general purpose Polyester Resin can be applied at this time.



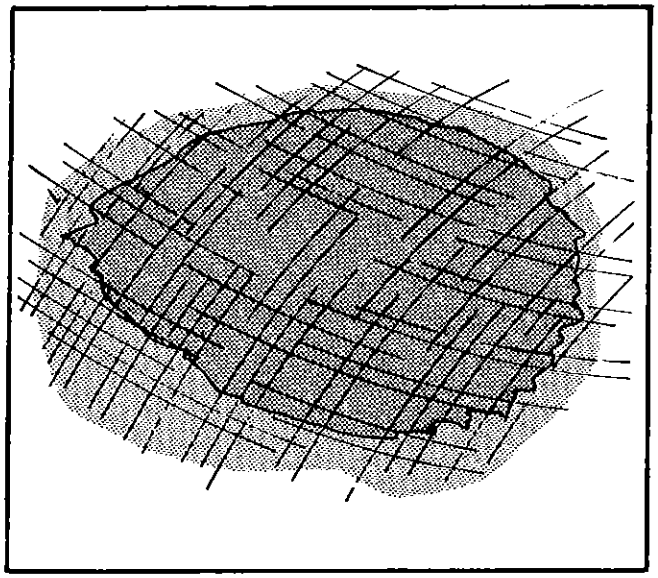
BODY

☐ **Note:** Be sure all air is removed from between surfaces being joined. Allow area to harden, when hard, sand surface to remove any wax.

Typical views of fibreglass repairs (Cont'd)

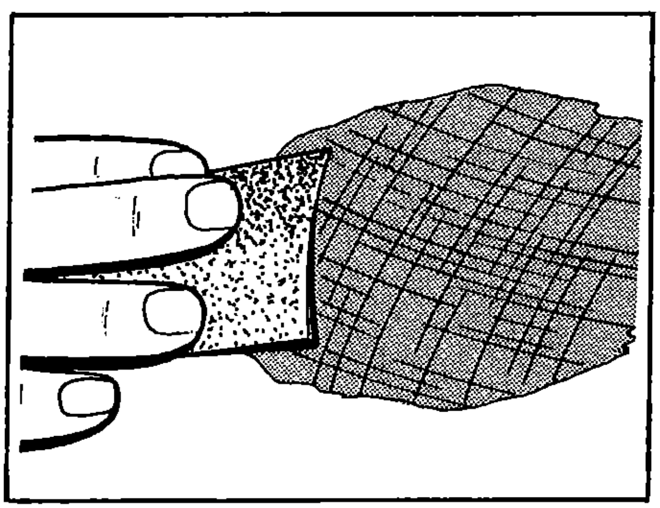
VIEW D

Apply another mat, follow with a cloth patch and then another mat, these layers must be thoroughly impregnated with the Polyester Resin brushed well ensuring at the same time that all air is removed from between the layers. Apply more layers of mat and cloth as required until the required strength and tickness is obtained. (minimum: two 1-1/2 oz.-42.5 g. mat and one 9 oz.-255 g. cloth). Allow area to harden. Allow sufficient time for patch to cool off properly before proceeding with next step.



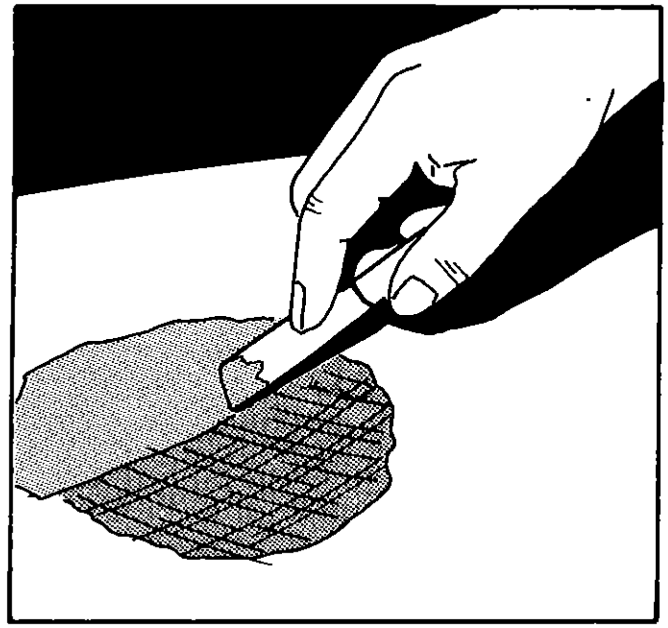
VIEW E

Sand off area to the contour required using coarse sandpaper # 100.



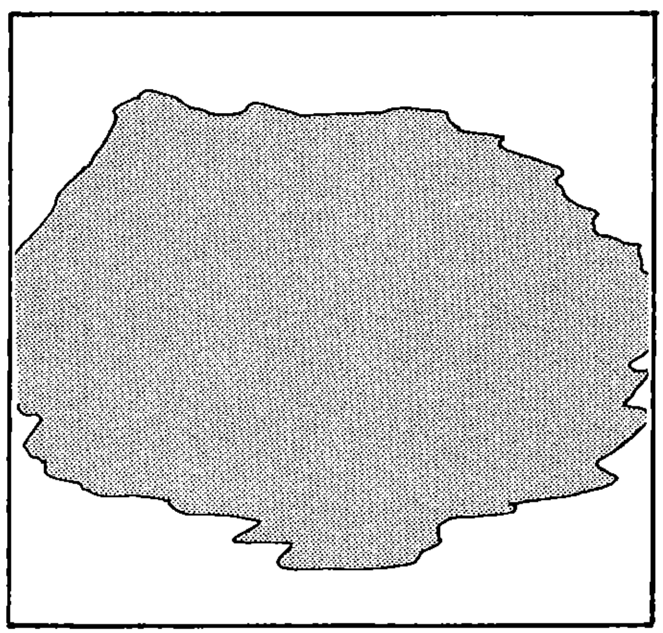
VIEW F

Apply a layer of Resin Putty.



VIEW G

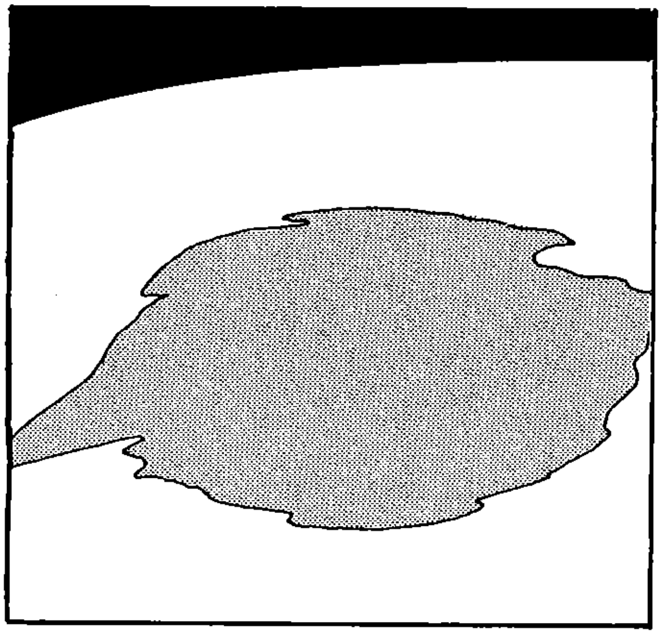
Allow damaged area to dry for approx. 15 to 20 minutes.



BODY

VIEW H

Smooth off surface with coarse sandpaper # 100 to required finished shape. Further smooth surface with fine sandpaper # 120 to obtain completed surface to match surrounding area panelling. Re-prime and repaint the area to match surrounding paintwork.



☐ **Note:** The repairs described can be carried out without removing panel from coach.

PAINTING

Paint manufactured by DuPont is used on coach exteriors. This high gloss polyurethane enamel finish is designed for exposure to extreme conditions. The 2-package product is comprised of a pigmented base and activator. Companion products include an optional drytime accelerator, additive to eliminate fish-eyes, and reducer.

☐ **Note:** Allow wheel hubs to come to room temperature prior to painting so a condensate does not appear causing lack of adhesion of paint.

The following specifications cover refinishing of both bare metals and fiberglass as well as painted metals and fiberglass.

Safety procedures and equipment

Care should be exercised in storing, handling mixing and applying Imron paint and Inron chemical materials listed in this manual. The topcoat, primer, solvent, catalysts, accelerators, activators and cleaners are highly volatile and/or toxic if not property used. In addition to observing the safety instructions listed on the packaging the following safety precautions should be practiced.

1) No smoking in the paint room or any adjacent area expsed to residue fumes.

2) Only NIOSH (National Institute for Occupational Safety and Health) approved respirators should be used.

3) Adequate ventilation must be maintained.

4) Wash hands prior to eating.

5) Wear rubber gloves, rubber apron, and face shield during all phases of paint and chemical handling.

6) If available, operator supplied air (Independent Breathing Apparatus) should be used.

Section I: Steel — Unpainted (new panels, etc)

a) **Surface Preparation** — Wash with 3812S Enamel Reducer and wipe dry with clean cloths.

b) **Apply 5717S Metal Conditioner** — In a plastic container, mix 5717S Metal Conditioner with two (2) parts water and apply to the surface with a cloth or sponge; if rust or corrosion is present, use a "Scotch-Brite" or similar abrasive pad. While still wet, wipe dry with clean cloths.

c) **Apply 224S Coversion Coating** — In a plastic container and without dilution, use a "Scotch-Brite" or similar pad and apply to the treated metal surface. Leave on the surface two (2) to five (5) minutes. Work only as much area as can be coated and rinsed before the solution dries. Reapply if surface dries before rinsing. Rinse by flushing the surface with cold water or mop with a damp sponge or cloth rinsed occasionally in clean water. Wipe dry with clean cloths or air dry. Apply primer.

d) Apply 825S Corlar® Epoxy Primer.

Section II: Stainless steel — Unpainted

a) **Surface Preparation** — Wash with 3812S Enamel Reducer and wipe dry with clean cloths. Fine particle sand blast or sand well.

b) **Apply 5717S Metal Conditioner** — In a plastic container, mix 5717S Metal conditioner with two (2) parts water and apply to the surface with a cloth or sponge; if corrosion is present, use a "Scotch-Brite" or similar abrasive pad. While still wet, dry witch clean cloths.

c) **Apply 224S Coversion Coating** — In a plastic container and without dilution, use a "Scotch-Brite" or similar pad an apply to the treated metal surface. Leave on the surface two (2) to five (5) minutes. Work only as much area as can be coated and rinsed before the solution dries. Reapply if surface dries before rinsing. Rinse by flushing the surface with cold water or mop with a damp sponge or cloth rinsed occasionnally in clean water. Wipe dry with clean cloths or air dry. Apply primer.

d) Apply 825S Corlar® Epoxy Primer.

Section III: Aluminum — unpainted

a) **Surface Preparation** — Wash with 3812S Enamel Reducer and wipe dry with clean cloths.

b) **Aply 225S Aluminum Cleaner** — In a plastic container, mix 225S Aluminum Cleaner with two (2) parts water and apply to the surface with a cloth or sponge; if rust or corrosion is present, use a "Scotch-Brite" or similar abrasive pad. While still wet, wipe dry with clean cloths.

c) **Apply 226S Conversion Coating** — In a plastic container and without dilution, use a "Scotch-Brite" or similar pad and apply to the treated metal surface. Leave on the surface two (2) to five (5) minutes. Work only as much area can be coated and rinsed before the solution dries. Reaplly if surface dries before rinsing. Rinse by flushing the surface with cold water or mop with a damp sponge or cloth rinsed occasionally in clean water. Wipe dry with clean cloths or air dry. Apply primer.

d) Apply 824S/825S Corlar® Epoxy Primer.

Section IV: Fiberglass — unpainted

a) **Surface Preparation** — Wash the surface with 3919S Prep-Sol®. While still wet, wipe dry with clean cloths.

b) Sand thoroughly and apply 824S/825S Corlar® Epoxy Primer.

Section V: Previously painted surfaces

a) **Surface Preparation** — Steel, stainless steel, aluminium fiberglass. Wash the painted surfaces with soap and water to remove dirt and water soluble contaminants.

b) Wipe the painted surfaces with 3918S Prep-Sol® to remove wax, grease and other contaiminants. While solvent is wet, wipe dry.

c) Repair flaws in the painted surface by grinding off paint in the damaged areas and file in body filler, if necessary. Featheredge ground-off areas by machine or hand sanding. Treat bare metal areas with the appropriate conditioners and conversion coatings as described in Sections I, II, and III.

d) Apply 824S, 825S, 100S or 110S as recommended in Section VI, VII and VII-A.

Section VI: Priming — Steel, Stainless Steel, Aluminium, Fiberglass (new)

a) 825S Corlar® Epoxy Primer (red) is our recommendation for Steel, Stainless Steel and Aluminium.

b) 824S Corlar® Primer (Gray) is our recommendation for Fiberglass and may also be used on Aluminium.

c) **Directions for Use** — 824S/825S Corlar® Epoxy Primer.

1) **Activation** — to two (2) parts 824S/825S Primer, add one (1) part 826S Activator.

2) **Induction Period** — allow activated primer to stand one (1) hour at 70°F and above; two (2) hours when temperature is below 70°F. This will allow the chemical reaction to take place.

3) **Pot Life** — three days at 70°F

4) **Reduction** — reduce activated primer 33 1/3 percent by volume (ratio 3 to 1) with 3602S Lacquer Thinner to a viscosity of 21-24 sec. in a DuPont M-50 Viscosity Cup or equivalent.

5) **Application** — Using 45-55 PSI "at the gun", spray one full wet coat to give a dry film thickness of 0.7 to 1.0 mils.

6) **Drying time** — two (2) to six (6) hours depending on temperature and film thickness. Over night dry may be necessary when 2 or 3 coats have been applied and/or when temperature are low.

Section VII: Priming — Previously painted surfaces (Stell, Stainless Steel, Aluminium, Fiberglass)

a) 825S Corlar® Epoxy Primer (red) is our recommendations for priming or "spot priming" previously painted surfaces where the metal substrate is Steel, Stainless Steel or Aluminium.

b) 824S Corlar® Epoxy Primer (Gray) is our recommendation for painting or "spot priming" previously painted surfaces where the subtrate is Fiberglass (can also be used on aluminium).

c) **Directions for Use** — 824S/825S Corlar® Epoxy Primer.

1) **Activation** — to two (2) parts 824S/825S Primer, add one (1) part 826S Activator.

2) **Induction Period** — allow activated primer to stand one (1) hour at 70°F and above: two (2) hours when temperature is below 70°F. This will allow the chemical reaction to take place.

3) **Pot Life** — Three days at 70°F.

4) **Reduction** — "For Spot Repairs" — reduce the activated primer 20 percent by volume (ratio 5 to 1) with 360S Lacquer Thinner.

5) **Application** — using 45-55 PSI "at the gun", spray until satisfactory filling is achieved (2 to 4 coats).

BODY

6) **Drying time** — with this heaver mixture, drying time will be extended to four (4) to eight (8) hours and overnight dry may be necessary.

Section VII-A: Alternate priming system for "Spot Priming" — 100S/110S Multi-purpose Primer

100S Gray/110S Red Oxide Multi-Purpose Acylic Lacquer Primer may be used as an alternate priming system for making "spot repairs" on small bare metal areas. Metal to be treated as described in Sections I, II and III.

a) **Directions for Use:**

1) **Reduction** — 80 to 125 percent by volume (ratio 1 to 1) to a viscosity of 23-24 sec. in a DuPont M-50 Viscosity Cup or equivalent with 3661S Lacquer Thinner in the mid-temp ranges and 3602S Lacquer Thinner during the warm weather.

2) **Application** — using 35-45 PSI "at the gun", spray three (3) or more coats as needed. Allow each coat to completely flash.

3)**Drying time** — allow to dry thoroughly before sanding — 30 to 60 minutes.

Section VIII: Imron® Topcoats

a) **Activator** — Imron® must be actived with 192S Activator. Ratio: one (1) parts 192S Activator to three (3) parts Imron®. Mix thoroughly.

b) **Additives - 189S Dry-Time Accelerator** — to be used for faster tape-free time. Ratio: up to four (4) ounces of 189S to one (1) gallon of mixed Imron®.
259S Fish Eye Eliminator — when necessary, use to eliminate fish eyes. Use up to two (2) ounces per gallon.

c) **Reducers** — 8485S used to reduce Imron® to a viscosity of 18-22 seconds in a Dupont M-50 Viscosity Cup. **8100S** used as an Imron® retarder.

d) **Air Pressure** — 50 PSI "at the gun" for solid colors. 65 PSI "at the gun" for metallic colors.

e) **Application** — for solid colors (non-metallic), spray a medium first coat. Allow to become tacky and follow with a full second coat. For metallic colors, spray three (3) light to medium coats. After hiding has been achieved, reduce activated Imron® 15% with 8485S Imron® Reducer. Apply one or two mist coats to improve flow out and reduce mottling.

f) **Two-Toning** — at 77°F and 50 percent humidity, two toning can be done in six (6) to ten (10) hours. If 189S Accelerator is used, two-toning can be done in two (2) to four (4) hours minimum at 70-75°F.

■ **Caution:** Clean all equipment with 3602S Lacquer Thinner or 8485S Reducer immediately after use.

Decal Application

The following drying times should be observed to prevent blistering when applying decals over Imron® paint. Overnight drying following 30 minutes drying at 180°F, 60 minutes drying at 140°F or 120 minutes drying at 110°F. If sufficient time and temperature is allowed in the cure of the Imron® it is possible to apply decals to the Imron® surface without experiencing the blistering effect.

REPAIR OF VINYL COVERED PANELS

1) Remove existing damaged vinyl covering from metal panel.

2) Thorough cleaning of the panel is essential. Use a Toluene cleaning fluid.

3) Apply a coat of No. 1368 3M contact cement to panel and bottom side of vinyl.
Allow cement to dry until tack-free before applying vinyl to panel.

☐ **Note:** Cement must be sprayed on smoothly. If spraying equipment is not available, the cement can be brushed on, however application must be thin, uniform and smooth.

REPLACEMENT OF FLOOR COVERING

1) Remove existing damaged floor covering from wood floor.

2) Thorough cleanning of the floor is essential. Wire brushing or sanding methods are recommended.

3) Remove all sanding dust an other foreign matter. Floor must be clean before aplying adhesive.

4) Under passenger seats, on center aisle, driver's area and entrance area, apply a coat of Armstrong Lino Cement No. SP235 adhesive to plywood floor. Lino covering can be applied immediately.

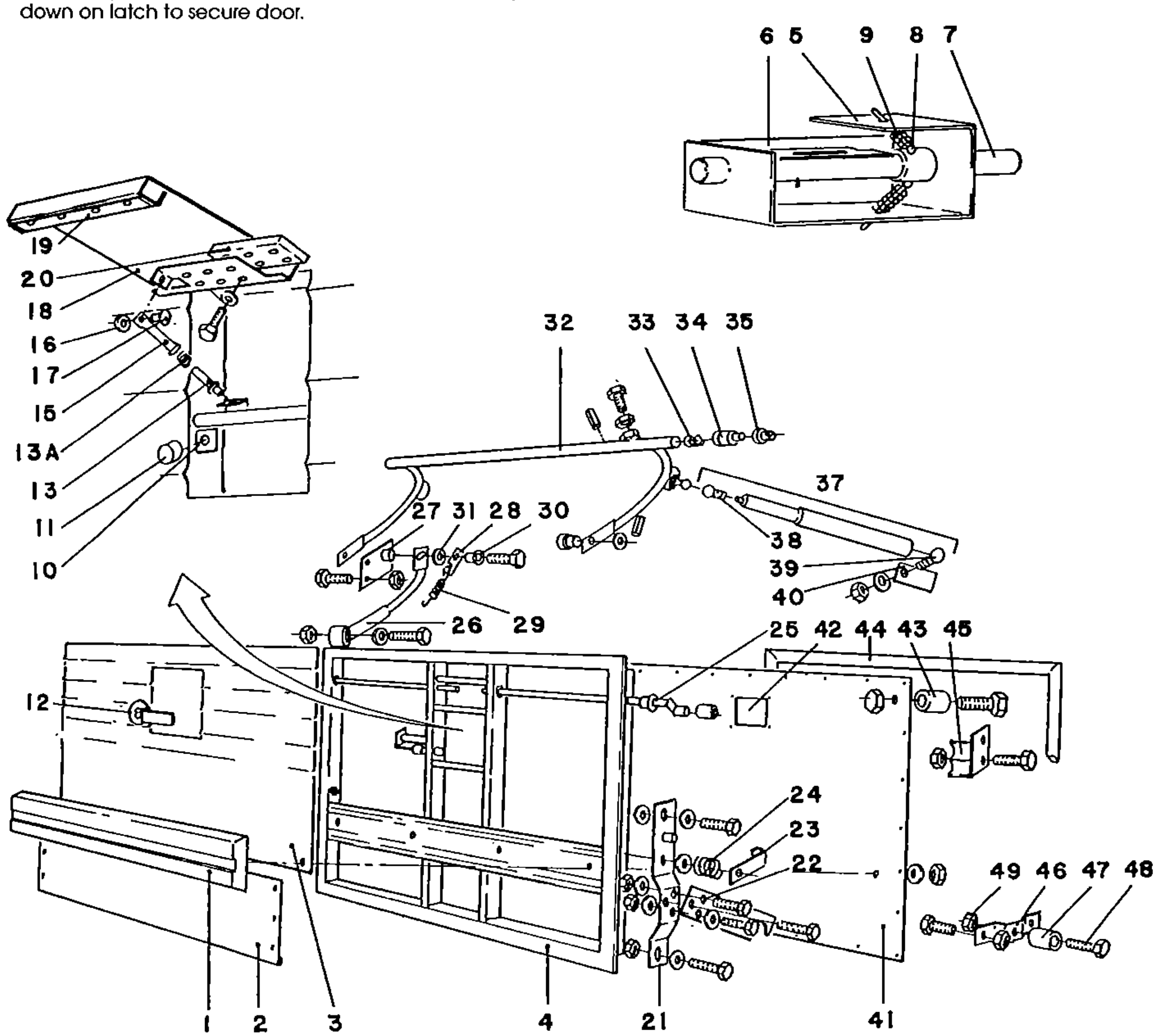
BODY

BAGGAGE DOORS

Description

Baggage doors are of the pantograph type. Doors lift out and up parallel to the side of coach and are held in open position by a cylinder.

Baggage doors incorporate a flush-type latch lock, flush mounted at center of each door. Insert fingers under latch, then pull outward and up to unlatch door. To close, hold latch in open position, pull downward on door and push down on latch to secure door.



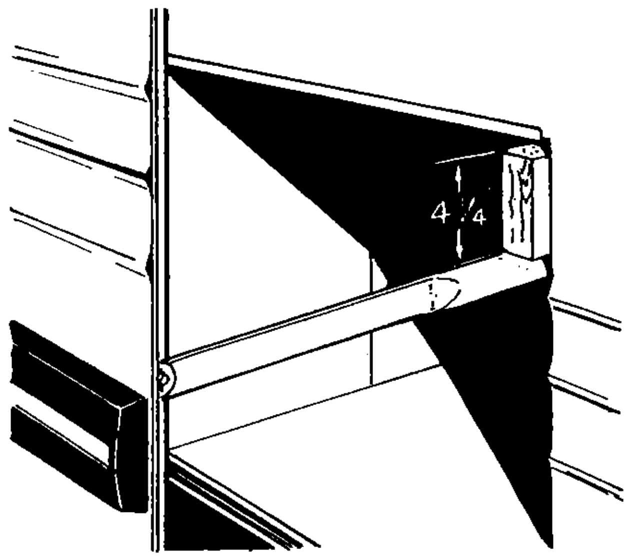
BODY

Item	Qty.	Description
	1	Door Assy
01	1	— Rub Rail Assy (see Group 1855)
02	1	— Panel — Lower
03	1	— Panel — Upper
04	1	— Frame Assy
	1	— —Lock Support Assy
05	1	— ——Support
06	1	— ——Plate
07	1	— ——Rod Assy
08	2	— ——Rivet
09	2	— ——Spring
10	1	— ——Support Assy
11	1	— ——Bumper, Rubber
12	1	— Pivot, Lock
13	1	— Rod Assy Male
13.1	1	— Spring
14	1	— Handle Assy
15	1	— —Barrel, Handle Outer
16	1	— —Washer, Rubber
17	1	— —Rivet 1/4" X 3/8" LG.
18	1	— —Handle
19	1	— —Panel, Security
20	1	— Hinge, Plate
21	2	— Support Lock Plate
22	2	— Lockplate, Lower
23	1	— Hook
24	1	— Spring
N.S.	1	— Spacer
25	1	— Lever, Upper
26	1	— Lever, Lower
27	1	— Attachment, Lower
28	1	— Attachment, Spring
29	1	— Spring
30	1	— Bearing
31	1	— Spacer
32	1	— Lever
33	1	— Spring
34	1	— Pivot
35	2	— Bushing
36	2	— Ball Stud
37	1	— Cylinder Assy
38	1	— —Roller Anchor Plate
39	1	— —Roller
40	1	— Plate
41	1	— Panel Int.
42	1	— Plate Access
43	2	— Bumper, Rubber
44	1	— Weather Strip Assy
45	2	— Catch Stricker
46	1	— Anchor Roller
47	1	— Catch Roller, Lower
48	1	— Screw 5/16", Cap
49	1	— Nut 5/16" — 18

Removal

■ **Caution:** Removal of baggage doors should be performed by more than one person.

1) Open door to half position. Use a wood block between baggage door lever (32) and baggage compartment frame to hold door in that position. (See fig. 18.4)



2) Remove bolt, lockwasher and flat washer retaining lower lever (26) to baggage door. Then, push lower lever away from baggage door.

3) Remove roll pin (50) and lockwasher (51) at each pivot pin (52) of the bagage door lever.

● **Warning:** The baggage door must be supported at this stage to prevent it from falling during final removal procedures.

4) Move each lever apart from baggage door. Then, remove baggage door.

To remove baggage door lever (32), proceed as follows:

1) Remove cylinder assembly (37) by removing retaining bolt at each end of the cylinder.

2) Loosen jam nut (53) and bolt (54).

3) Move lever toward right. Then, remove lever from vehicle.

To remove lower lever (26), remove the retaining bolt at lower attachment.

Inspection:

Inspect all pivots and bushings for wear and damage. Replace them if necessary. Check cylinder tension. Replace cylinder if tension is too weak.

Installation:

To install baggage door lever and lower lever, reverse the above-mentionned procedure. To install baggage door, proceed as follows:

1) Use a wood block between the upper lever and the baggage compartment frame in order to retain the lever at mid point of its stroke.

2) Support baggage door and spread lever arms in order to insert baggage door pivot pins into lever mounting holes.

3) Install lockwasher (51) and roll pin (50) at each pivot pin (52).

4) Align lower lever mounting hole with its attaching point. Then, install flat washer, lockwasher and retaining bolt.

5) Remove wood block and close baggage door.

Adjustments:

If the baggage door needs to be adjusted, the following procedures should be applied:

1) Door height should be adjusted so there is a distance of 3/16" (.5 cm) between the door top edge and the top of the baggage compartment. To adjust, loosen the lock plate support (21) retaining bolts, position the door correctly, then tighten the lock plate support retaining bolts.

2) If the baggage door locks too tightly or too loosely, the catch striker (45) should be adjusted. To adjust, loosen the catch striker retaining bolts, position the striker correctly, then tighten the catch striker retaining bolts.

3) If the lower part of the baggage door does not close evently with the side of the vehicle, the lower lock plate (22) should be adjusted. To adjust, loosen the lower lock plate retaining bolts, position the lower lock plate to obtain proper adjustment, then tighten the retaining bolts.

4) When all baggage doors are opened, they should be approximately at the same height. If they are not, the cylinders (37) need adjustment. To adjust, loosen the retaining bolts and position the cylinders so that all the baggage doors open to the same height. Then, tighten retaining bolts.

ENTRANCE DOOR

Description

A manually operated sedan type entrance door is provided ahead of the front axle on the right side of the coach. The door is held in the closed position during coach operation by an air cylinder-operated locking mechanism. A single-acting air cylinder is used, having a return spring in the cylinder body. The air cylinder is controlled by an electrically operated valve which is energized by a microswitch located in the manual door control mechanism.

With the entrance door in the closed position, the microswitch is closed, energizing the air valve and loading the door lock cylinder. The cylinder moves the door lock in a position which engages a latch on the entrance door, holding the door positively closed.

To open the door, initial movement of the door operating handle opens the microswitch, de-energizing the air valve and venting the cylinder. The action of the return spring in the cylinder moves the door lock away from the latch. Further movement of the door control handle opens the door.

An adjustment is provided at the micro-switch in the event that this unit requires replacement. The micro-switch is located under the dash directly beneath the door control handle. The correct adjustment is obtained when the micro-switch contacts close as the door control mechanism begins to pass center during closing of the door.

An overrule switch, which opens the air valve circuit regardless of the position of the micro-switch is provided on the dash at right of the operator's position. This is designed for use in emergencies or when the door control system does not function properly.

Adjustments:

Control rod: The entrance door control rod may be adjusted by means of an adjusting nut located at the right end of the control rod. This adjustment is provided to modify the effort required at the door control handle to open or to close the door.

To adjust, remove the access panel located under the dash at right of driver's position. Loosen control rod adjustment jam nut. Turn adjusting nut to obtain desired adjustment at door control handle. Then, tighten jam nut and reinstall access panel.

Control handle: the stroke from open to closed position can be adjusted by means of two rubber bumpers on which the control lever bottoms when the door is completely closed or completely opened. These rubber bumpers are provided with adjusting nuts to allow proper adjustments.

BODY

The open door locking device can be adjusted as it is provided with an adjusting slot. If the door handle releases too firmly from the open-lock position, the locking device should be adjusted lower. If it releases too loosely, the locking device should be adjusted higher.

Micro-switch: This switch controls the operation of the door air cylinder. It should be adjusted in order to have the air cylinder energized at the correct time. If adjustment is required, loosen the switch mounting nuts, and set the switch to a position where it will energize at correct position of lever and entrance door.

■ **Caution:** Switch must energize when entrance door is fully closed. If switch is set too far forward, it would energize and actuate the solenoid valve which in turn controls the air cylinder before the door is fully closed. If switch is set too far back, it would not energize and actuate the solenoid valve, the air cylinder would not be actuated and the door would not lock.

ENTRANCE DOOR AIR LOCK

Description:

The entrance door air lock system is made of three main components: the air cylinder, the solenoid valve and the exterior release control. The system is located inside the vehicle at left of the entrance door, on the vehicle floor, except for the exterior release control which is located beneath the vehicle floor.

AIR CYLINDER:

Description:

The entrance door air cylinder is a single acting type which holds the door in the closed and locked position during coach operation. The door air cylinder requires no maintenance as it is of the sealed type.

SOLENOID VALVE:

Description

The door control solenoid valve controls the supply of air to the door air cylinder. It is triggered by the micro-switch located beneath the door handle, or by the exterior release control switch, depending on where the door is opened from. This valve requires no maintenance and no adjustment. If it is found to be defective, it has to be replaced.

Removal and installation:

To remove the solenoid valve, proceed as follows:

1) Shut off air pressure and electric current to the valve.

2) Disconnect wiring harness and air lines from the solenoid valve.

3) Unscrew the two (2) retraining bolts from under the solenoid valve. Then, remove the solenoid valve.

To reinstall, reverse the above-mentioned procedure.

EXTERIOR RELEASE CONTROL:

Description:

The exterior release control is a mechanism which permits to open or close, lock or unlock the entrance door from outside the vehicle. To hold the door in closed position, the handle must be turned counterclockwise. To lock the door, the handle must be turned counterclockwise, then pulled all the way out, and a padlock must be inserted in the hole of the handle rod. To open the door, remove the padlock to release the handle all the way in, then turn the handle clockwise.

Adjustment:

The exterior release control mechanism should be adjusted in order that the solenoid valve be energized only when the door is fully closed, and that the handle rod can be pulled out just enough to allow padlock insertion. To adjust, remove access panel under air cylinder. Adjust as required.

COMPARTMENT DOORS

R.H. engine compartment door

The R.H. engine compartment door is front hinged with upper and lower brackets. To open, pull handle. Access is provided to the lavatory holding tank fill connections and drain valve, air conditioning compressor, air filter, battery booster block and left bank of engine.

Lavatory compartment access door (2):

The lavatory compartment access door is located over the right rear service door. It is held closed by a quarter turn slotted head screw. Open the access door to introduce a water hose or a vacuum cleaner hose when servicing the lavatory compartment.

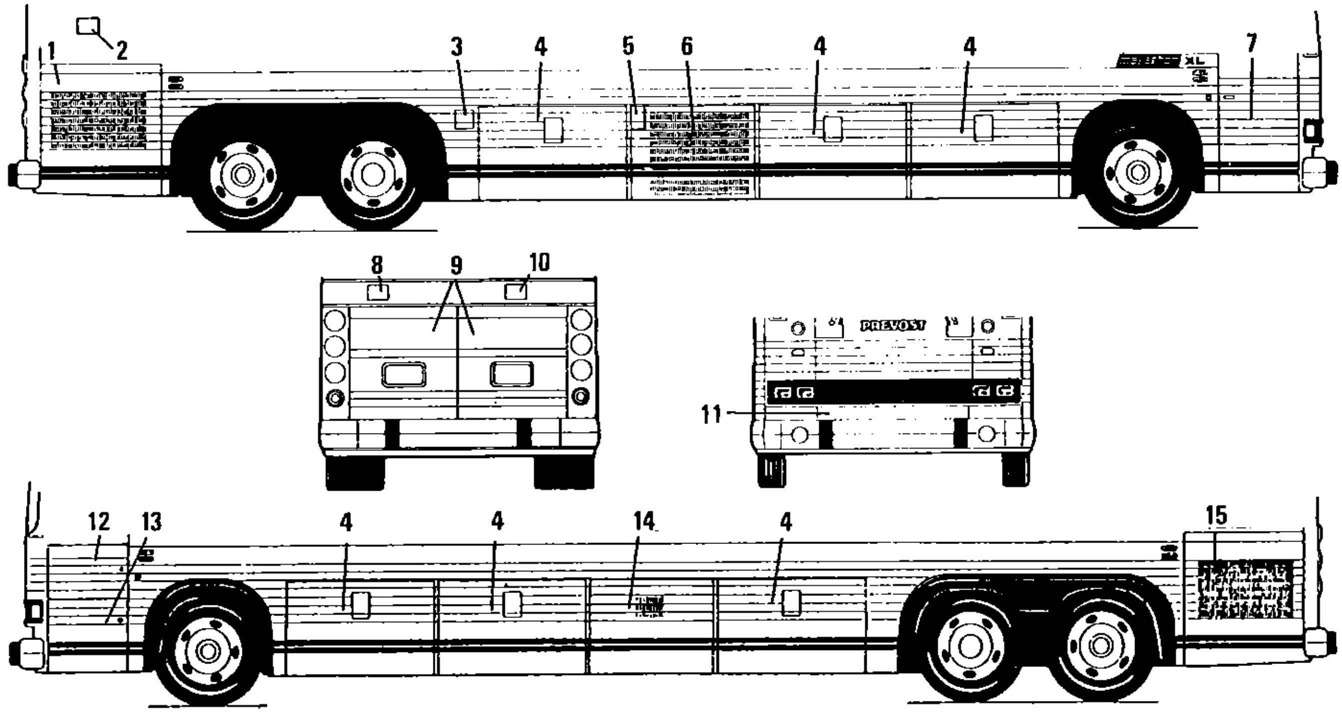
Battery main switch door (3):

The battery main switch door is front hinged, piano type with an over-center spring to securely hold door in closed position. It provides access to the battery main switch, so it can be set to "ON" or "OFF" position. It is located on the right side of the vehicle, just in front of the rear wheels.

Fuel tank filler door (5):

The fuel tank filler door is of the same type as the battery main switch door. It is located on the right side between condenser compartment door and the rear baggage door. It provides access to fuel tank cap.

BODY



Condenser compartment door:

The condenser compartment door is front hinged, piano type and is held closed by two (2) Philips head screws. It is located on the right side of the vehicle, between the second and the third baggage doors. Access is provided to condenser, fans, receiver tank and other air conditioning components.

Engine coolant filler door (8):

The engine coolant filler door is located over the left rear engine compartment door. It is held closed by a quarter turn slotted head screw. Access is provided to the engine coolant tank. Refer to section 24, Lubrification, for proper maintenance.

Engine rear compartment doors (9):

The left and right rear engine compartment doors are side mounted. The left door is held closed by the right door, which in turns is held closed by a quarter turn handle. Both doors may be locked in open position by a locking device located above the upper bracket of each door. Access is provided to engine compartment.

Engine oil reserve filler door (10):

The engine oil reserve filler door is located over the right rear engine compartment door.It is held closed by a quarter turn slotted head screw. Access is provided to the engine oil reserve tank. Refer to section 24, Lubrification, for proper maintenance.

Spare wheel and tire compartment (11):

The spare wheel and tire compartment door is located behind the front bumper to which it is bolted. To open, remove the two (2) bumper retaining bolts, then lower front bumper and compartment door to open position. To pull out spare tire, loosen turnbuckle to release support and tire carrier assembly. Tire can then be easily pulled out using support as a rail extension.

Electrical junction box service door (12):

The electrical junction box service door is located below the driver's window and is front hinged, held closed by two (2) quarter turn slotted head screws. Access is provided for servicing the front electrical junction box.

Steering compartment door (13):

The steering compartment door is located below the electrical junction box service door. It is front hinged and held closed by two (2) quarter turn slotted head screws. Access is provided to accessory air tank, steering components and windshield washer reservoir.

A/C compartment door (14):

The A/C compartment door is located on the left side of the vehicle, between the second and third baggage doors. It is front linged, piano type and held closed by three (3) Philips head screws. Access is provided to the evaporator motor and fans, water pump and water valve.

BODY

L.H. engine compartment door (15):

The L.H. engine compartment door is front hinged with upper and lower brackets. Pull handle to open. Access is provided to the radiator shutter and shutterstat, and to the heating valves ("Gate" valves).

WINDSHIELD WIPERS

Description:

Two air-operated windshield wipers are provided, controlled by two knobs located on the dash panel at right of driver's position. Each knob controls its corresponding wiper while the left knob also controls the winshield washer operation.

Maintenance:

Wiper motor and control valves require no periodic maintenance. If one of the control valves is found defective, it should be replaced. The wiper motor can be overhauled if required.

Removal and replacement:

To remove a wiper motor, proceed as follows:

1) Remove the access panel located under the dash at right of driver's position.

2) Disconnect air lines at wiper motor. Also disconnect the corresponding windshield washer tube at the "T" connection.

3) From outside of the vehicle, pull out the windshield washer tube and grommet.

4) Remove windshield wiper blade, main arm and idler arm assembly by removing the crown nuts which attach the assembly to the pivot shafts.

5) Remove wiper motor mounting panel retaining screws. Then, lift out complete assembly.

Reverse the above-mentioned procedure to replace the wiper motor.

Disassembly and reassembly:

The motor consists of four subassemblies: the body valves, the motor valve assembly, the piston assembly and the shaft and gear assembly. The following procedure should be followed to disassemble, clean and inspect the wiper motor:

☐ **Note:** Access panel screws are painted and it could happen that the paint on these screws be damaged at removal procedure. We suggest that you make a paint touch-up at reassembly. Refer to paint scheme diagram for the proper type and number of paint to be used.

a) Remove the mounting bracket from the motor being repaired.

b) Remove the three (3) screws holding the body halves together and holding the shaft in one hand separate same. Note position of motor valve in body half.

c) Note position of timing marks on gear and rack, then remove the shaft, gear, and sleeve assembly.

d) Disassemble the sub-assemblies accordingly:

1) **Body Halves:** No further disassembly is required.

2) **Motor Valve Assembly:** Remove from body half. No further disassembly is required. Replace if necessary with proper valve.

3) **Piston Assembly:** Remove from body halves. Remove "O" rings, rubber bumpers and spacers.

4) **Shaft & Gear Assembly:** Remove shaft and bearings and check for concentricity. If gear has excessive wear, replace.

e) Clean all metal parts with an OSHA approved solvent.

f) Inspect same for excessive wear and replace where necessary.

g) If piston has excessive wear, be certain to replace.

h) Check both body halves for excessive scoring and replace if necessary.

i) Replace, regardless, main cylinder "O" rings and valve body seals with PREVOST service parts only.

j) **Caution:** Blow all air passages clear.

k)Lubricate parts with pneumatic grease only.

l) Assemble the four (4) sub-assemblies in reverse order (see above). Assemble motor valve in proper position.

m) Check the assembled motor for excessive air leakage and tighteen carefully where necessary.

Adjustments:

Wiper arm angle is adjustable to allow proper location of the wiper blade when the wipers are not in operation. At stop position, the lower end of the wiper blade should be at 4½" (± ½"), 11 cm (± 1 cm) from the bottom edge of the winshield. Adjust wiper arm angle as follows.

1) Remove crown nut which attaches idler arm to pivot shaft. Then, remove idler arm from pivot shaft.

BODY

2) Remove crown nut which attaches main arm to pivot shaft. Then, using an "Allen" key, loosen the bolt which secures the main arm mounting splines into pivot shaft splines.

3) Using a screwdriver, slightly enlarge the slot at lower end of the main arm. Then, pull main arm off the pivot shaft.

4) As the pivot shaft is splined, reinstall the main arm in the notch that permits positioning the wiper blade as described above. When the arm is adjusted, tighten all nuts and bolts.

Idler shaft lenght is adjustable to allow setting wiper blade angle. Each blade should travel across winshield in a position so that when the arm is at the end of its inward sweep, the wiper blade is parallel with the center post of the windshield. Adjust angle of blade as follows:

Loosen lock nuts on idler shaft. Remove crown nut which attaches shaft arm to pivot shaft. Remove arm from shaft. While holding outer end of idler shaft, turn shaft arm to shorten or lenghten shaft assembly. Reinstall arm on pivot shaft and check angle of blade. Repeat if necessary, then install crown nut on pivot shaft and tighten firmly. Tighten lock nuts on idler shaft.

WINDSHIELD WASHER

Description:

The windshield washer is air-operated, controlled by the left windshield wiper control knob. To operate, push control knob while the winshield wipers are operating. The windshield washer reservoir is located in the steering compartment and has a screw-on type cover. Reservoir supply should be checked daily.

Adjustment:

Windshield washer nozzles can be adjusted in order to have the jet spray properly directed. To adjust, use a screwdriver and turn the nozzles to obtain desired spray angle.

DESTINATION SIGN

Description

On the "Le Mirage" model, the destination sign is located over the right hand windshield. On the "Marathon" model, it is centered over the two windshields.

Maintenance:

It is recommended that the following inspections and checks be made on a regularly scheduled basis:

1) Check to see if mechanism runs freely and easily. Crank handle on destination sign; if it seems to bind, check for foreign objects.

2) If curtain is loose on rollers, run curtain to one end and turn crank handle until curtain roll is tight on roller. Run actuating mechanism through full cycle of curtain and repeat tightening action on opposite end of curtain.

3) Apply a slight amount of MP grease on gears to help mechanism to run freely.

Sign Curtain Repair

In event a destination sign curtain is torn, it can be repaired with 3M polyester tape or any equivalent cellophane tape. When repairing a tear, the tape should be used on both sides of the curtain.

When it becomes necessary to install or add curtain inserts in either cloth or mylar curtains the following procedure should be followed : Butt splice or overlap, and apply a strip of 3/4" (19.0 mm) wide polyester tape over front and rear seam.

The above method is much easier and more accurate way of installing inserts. It also makes for considerably less bulk and better turning curtain rolls.

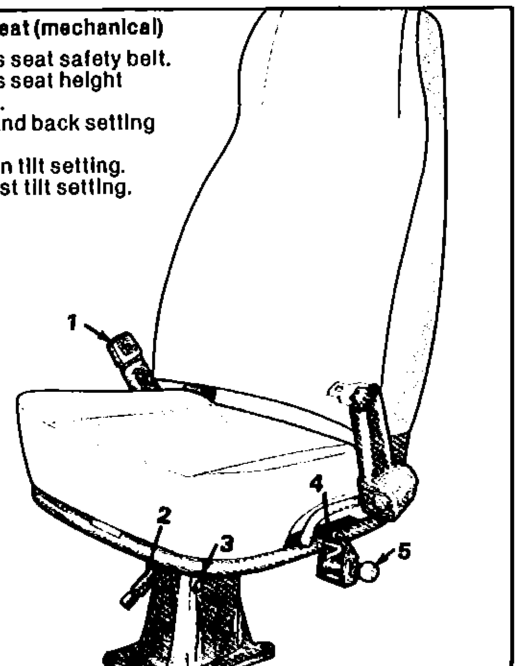
DRIVER'S SEAT

Description

Three types of seats are available: the "National" seat with mechanical suspension and the "Isri" seat with mechanical or air suspension.

Driver's seat (mechanical)

1. Driver's seat safety belt.
2. Driver's seat height setting.
3. Front and back setting lever.
4. Cushion tilt setting.
5. Backrest tilt setting.

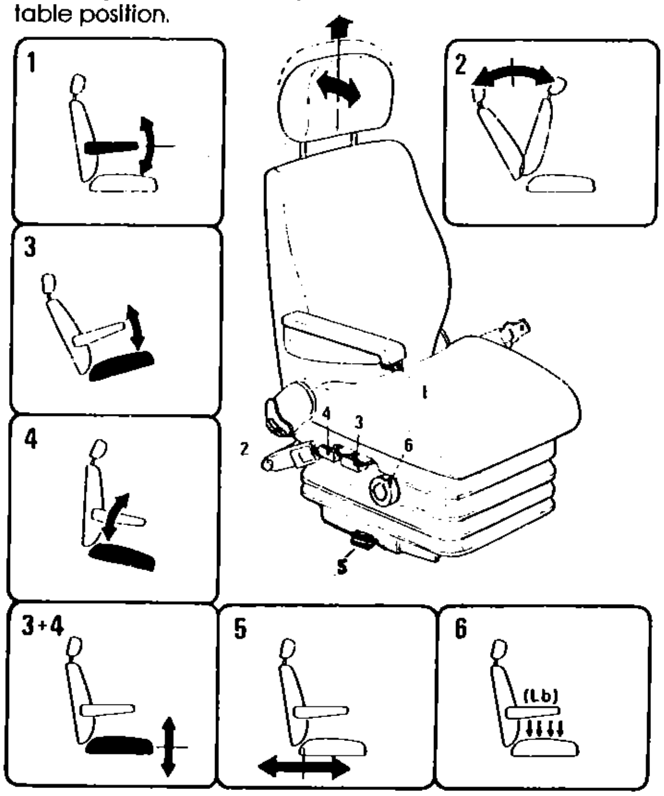


BODY

Adjustment:

1) **National** seat: this type of seat may be adjusted fore and aft by pushing toward right the lock lever located at left front of seat. The seat back can be reclined by pulling the knob located at base of seat back on the left side of seat. The back of the seat cushion can be tilted up or down by turning the handle located at left rear corner of the seat. Seat may be raised or lowered by pushing the lever located at the seat base with the heel, and at the same time pulling or pushing the seat frame.

2) **"ISRI"** seat with mechanical suspension: refer to the following illustration to adjust the seat to the most confortable position.



3) "ISRI" seat with air suspension: the adjustments for this type of seat are the same as shown above, except for #6 which is made automatically.

☐ **Note:** "ISRI" seats are available with lumbars support as optimal equipment. When so equiped, the seat is provided with two additional control knobs located at the right front corners of the seat. The front knob controls the amount of air in the lower part of the backrest. The rear knob controls the amount of air in the center part of the backrest. Press the upper part of the knob to inflate the cushion. Press the lower part of the knob to deflate..

■ **Caution:** Seat belts are to be worn at all times. For maximum protection they should be pulled tight to fit snugly — with webbing bearing on hip bones and pulling downward and rearward at 45 degree angle.

Maintenance:

It is strongly recommended that floor fittings be inspected for looseness and the floor checked for corrosion at least twice a year. If it becomes necessary to clean the webbing, use a mild detergent with lukewarm water. Do not re-dye or use solvent type cleaners on webbing as this may weaken the fibers or affect the original dye or when fraying takes place replace belt.

EXTERIOR REAR VIEW MIRRORS

Description

Two exterior rear view mirrors are installed, on each side of the vehicle. The mirrors have replaceable glass and can be easily replaced if broken. To prevent breakage of the windshield glass and driver's window by accidental striking of mirror, bumper stops are installed in the mirror mounting brackets.

Adjustment:

Mirror head can be rotated by loosening the adjusting screw located at the base of the mirror head. Adjust to desired position, then tighten adjusting screw firmly.

Mirror head can also be tilted up or down. To adjust, use an "Allen" key and loosen the adjusting screw located at the mirror end of the mirror arm. Position mirror head as required, then tighten adjusting screw firmly.

Mirror arm angle can be adjusted in order to obtain desired vehicle width. To adjust, loosen adjusting screw located at body end of mirror arm. Position mirror arm as desired, then tighten adjusting screw.

Replacement of mirror glass

Remove the ten screws which attach the bezel to the mirror head. Then remove bezel from head. Remove broken mirror glass, then position new glass in mirror head. Position bezel over glass and secure with ten screws.

Heated rear view mirrors (optional):

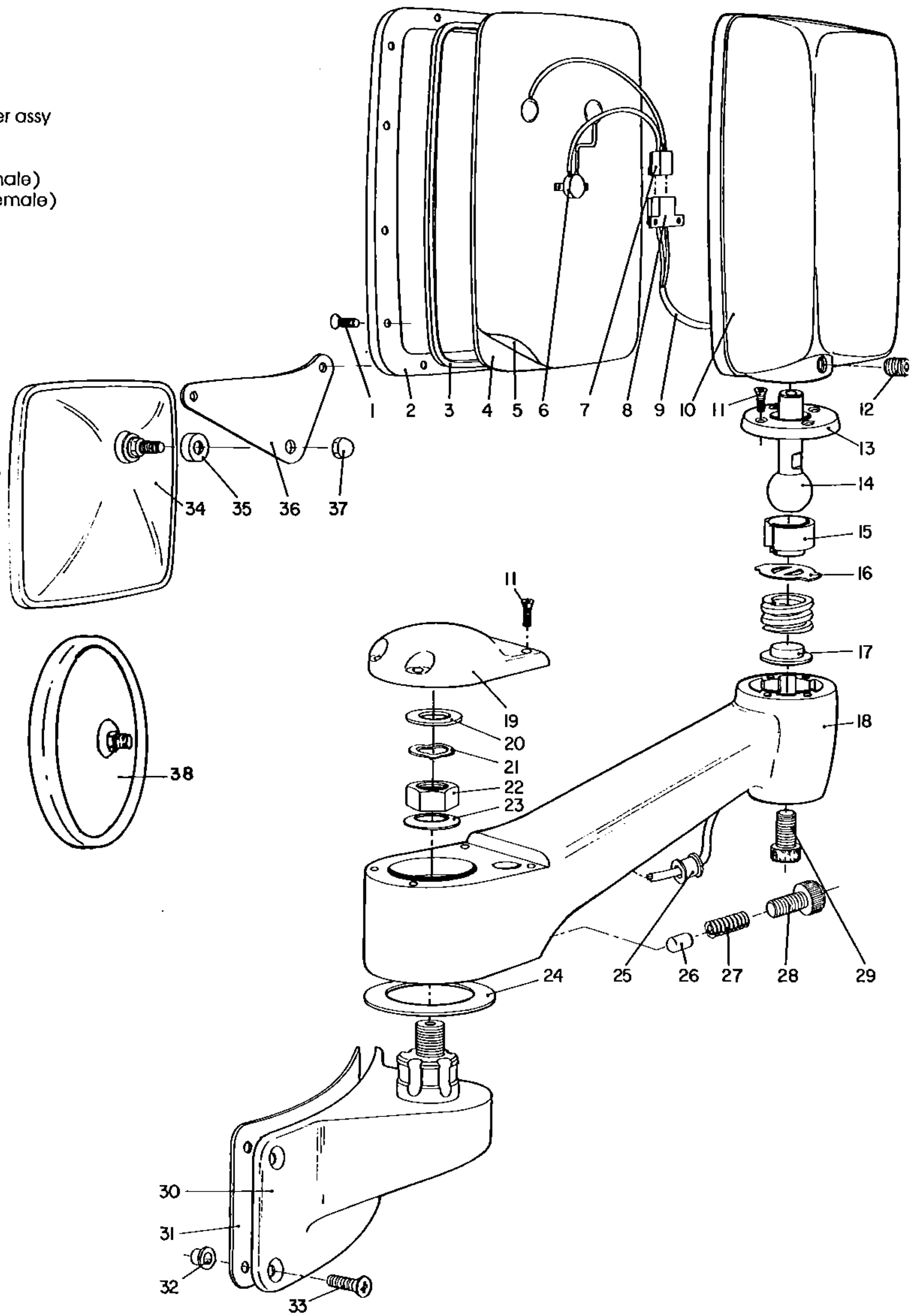
Heated exterior rear view mirrors may be provided to prevent the mirrors from frosting in cold weather. A heating element is installad inside both mirrors and is initially energized by an "ON-OFF" switch located on the switch panel at left of driver's position.

The "ON-OFF" switch is wired in series with the heat switch of the main heating system. Therefore, both switches must be activated before the mirror heating element is kept at a sustained temperature by a heat regulated thermostat.

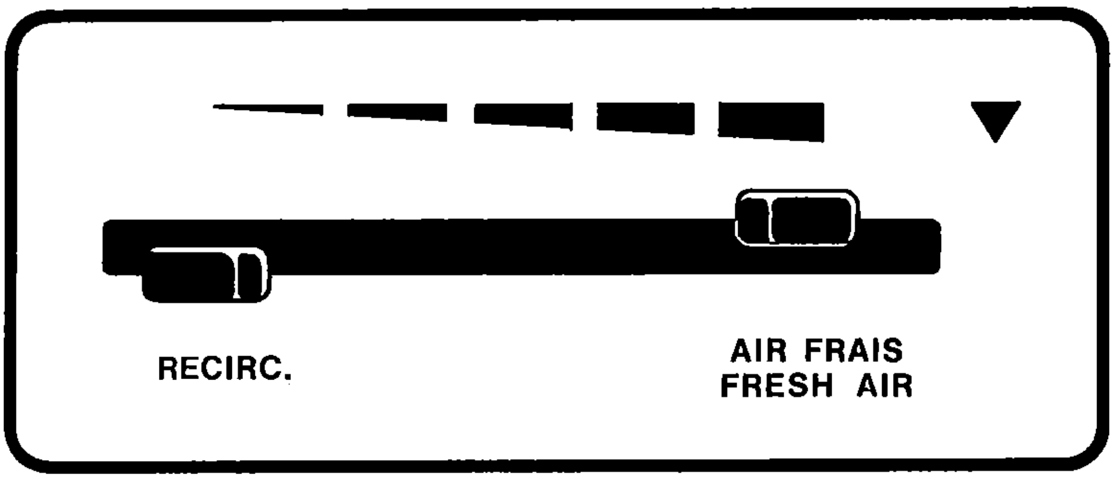
BODY

Item Description

01. Screw
02. Rim
03. Seal
04. Mirror & Heater assy
05. Heater
06. Thermostat
07. Connector (male)
08. Connector (female)
10. Body
11. Screw
12. Screw
13. Stopper
14. Ball stud
15. Stand
16. Plate
16. Spring
17. Washer
18. Arm
19. Cap
20. Washer
21. Washer, spring
22. Nut
23. Washer, spring
24. Seat
25. Grommet
26. Pin
27. Spring
28. Screw
29. Screw
30. Bracket
31. Gasket
32. Nutsert
33. Screw
34. Mirror, convex
35. Seat
36. Bracket l.h.
36. Bracket r.h.
37. Nut
38. Mirror, convex



HEATING & A/C SYSTEM

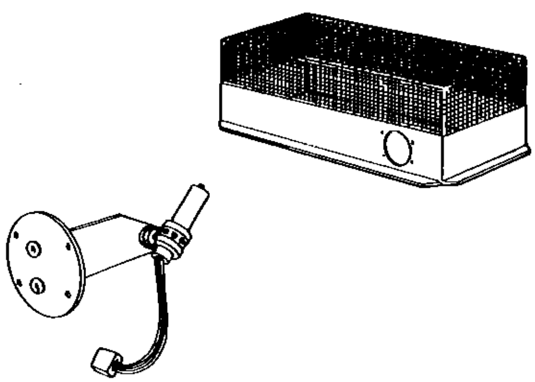


HEATING & AIR CONDITIONING

HEATING SYSTEM

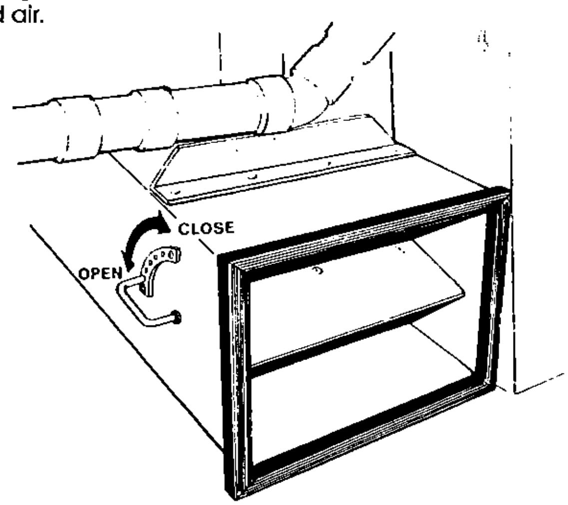
The vehicle is provided with a hot water forced air heating system which uses the engine cooling medium for heating the interior of the vehicle and windshield defrosting. Two (2) heating radiator cores are provided, one for the main interior heating system and one for the driver's heater and defroster.

A solid state thermostat and control are used to operate the heating system without trouble. The thermostat is located half-way on the left side of the vehicle underneath a passenger seat and it is protected using a metal cage.



Fresh air ventilation

The vehicle is equipped with a special air duct which allows a variable percentage of outside fresh air from being drawn into the vehicle and it is mixed with recirculated air.



This duct should be open during winter season to increase the efficiency of the heating system then it should be gradually closed during summer season to facilitate the operation of the air conditioning system. This provides a healthy, fresh atmosphere in the vehicle.

In the case of a failure in the ventilation system, an emergency system can be operated by using the emergency ventilation switch which is located on the dashboard at the right of the A/C and heating switch.

Draining and refilling

Refer to section 05-(Cooling) for instructions on draining and refilling the engine cooling system.

If the heating system is to be drained without draining the engine cooling system, close gate valves in engine compartment and drain radiator cores. A manual vent plug is provided in the top of the main heater core and at the top of the driver's heater core for bleeding air while refilling. The vent plugs allow air to enter while draining.

Main heater water valve

The flow of hot water to the vehicle main heater core is controlled by an electric water valve. This valve is so designed that the pilot valve within the assembly opens and closes a port which directs pressure to either the top or bottom of the valve diaphragm, thus opening or closing the valve.

A delay action is built into the water valve through a means of an orifice in the valve body and a modulating cup on the diaphragm assembly. When the vehicle is operating with no current to the water valve solenoïd, inlet water pressure is directed to the upper side of the diaphragm, thus forcing it open.

The pilot valve is normally open, relieving any build-up of pressure under the diaphragm. When the solenoïd is energized the pilot valve closes, water pressure builds up through the orifice to the under side of the diaphragm and keeps the valve in closed position.

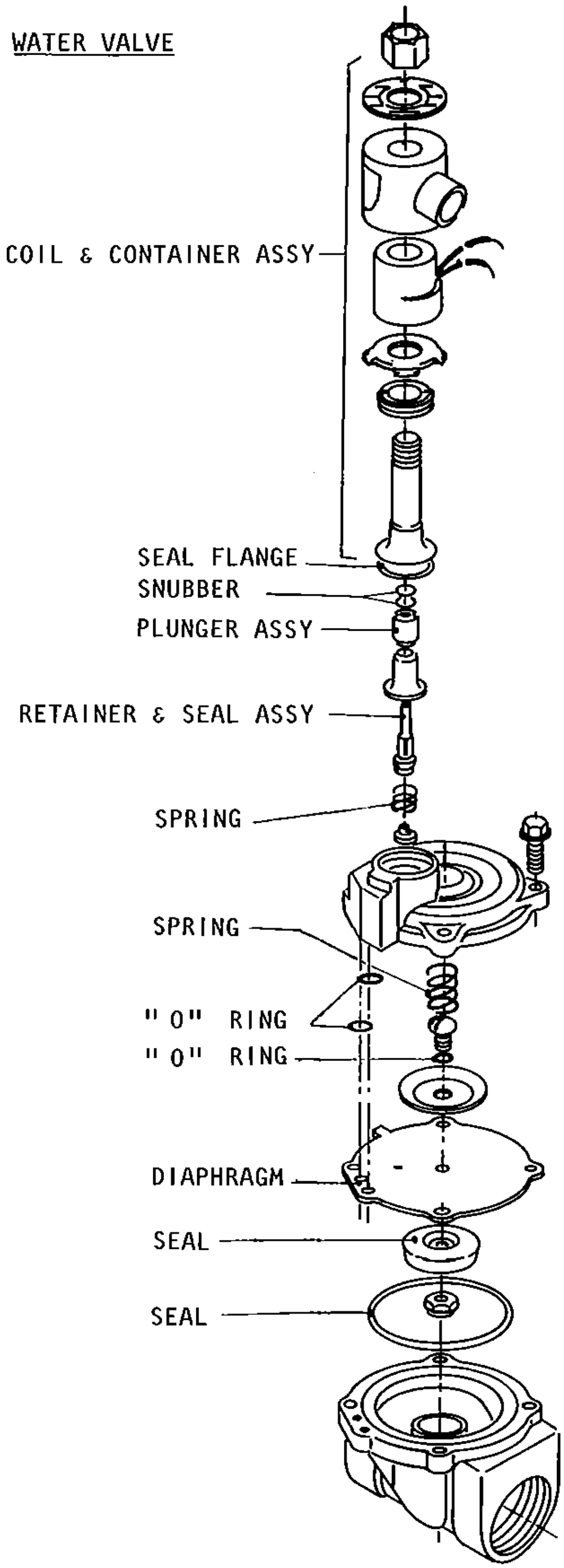
The main heater water valve requires a minimum amount of maintenance. The valve should be free of any dirt sediment which might interfere with the operation. The diaphragm should be replaced once every year before the heating season begins. No other maintenance is needed unless a malfunction occurs.

Overhaul

In the event of a malfunction, remove the water valve from the system.

■ **Caution:** Do not allow any liquid to reach the solenoid coil. After removing the valve from the system, carefully drain the remaining liquid from the inlet and outlet openings.

HEATING & AIR CONDITIONING



Disassembly

Remove the terminal nuts, lockwashers, washers from the valve.

Remove the screw and lockwashers from the coil and container assembly.

Remove the valve seat assembly from the coil and container assembly by turning it counter clockwise with a wrench..

☐ **Note:** The valve should be held secure in a padded vise for disassembly.

The valve seat assembly must be replaced in its entirety if its is damaged or worm.

Remove the eight No. 10-24 filister head machine screws used to secure the lower valve body to the upper valve body. Carfully separate the two portions by using s screw driver at the two pry-lugs on either side of the valve. The dowel pin will remain in the upper valve body.

The diaphragm valve disc assembly is now removed and the diaphragm replaced. This is done by removing the lock-nut and the diaphragm washer. If difficulty is experienced in removing the locknut, carefully hold the assembly in a vise between two strips of soft wood.

■ **Caution:** Do not tighten vise so as to damage or bend the disc assembly.

The locknut should be torqued to 25-30 inch pounds (2.8-3.3 Nm) and the valve disc screw is torqued to 12-15 inch pounds (1.3-1.6 Nm).

Cleaning and inspection

Before reassembling the valve, make sure that all parts are clean and in good condition. Thoroughly clean the serrations in the upper and lower valve bodies.

If the valve seat assembly is defective or leaks more than six drops per minute at 10 p.s.i. (69 kPa) when the coil is energized, it should be replaced.

Reassembly

Position the diaphragm disc assembly on the upper valve body so that the holes in the diaphragm align with the dowel pin as well as with the pilot-channel hole and the valve body mounting holes. Set the conical spring on the locknut. Carefully place the lower valve body on the diaphragm disc assembly, engaging the dowell pin with the hole opposite. Secure the eight No. 10-24 fillster head machine screws. Tighten the screws evenly around the valve body to 15 in. lbs (1.6 Nm). Insert the valve seat assembly into the upper valve body and tighten.

Screw the flux ring assembly into the valve body.

HEATING & AIR CONDITIONING

HEATING SYSTEM

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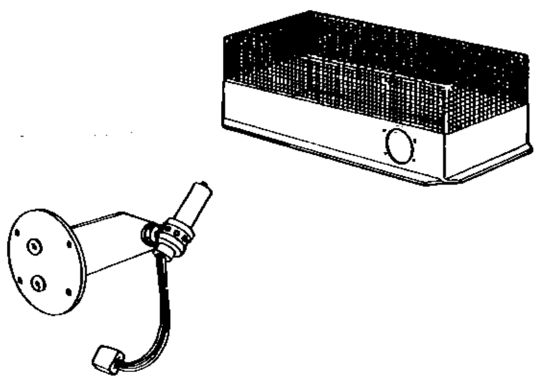

Fresh air ventilation

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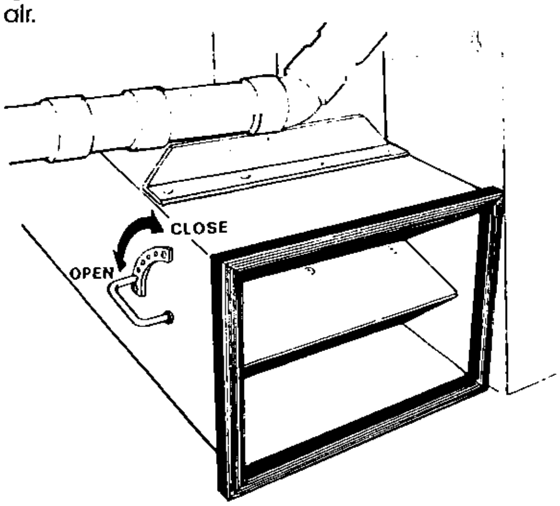

This duct should be open during winter season to increase the efficiency of the heating system then it should be gradually closed during summer season to facilitate the operation of the air conditioning system. This provides a healthy, fresh atmosphere in the vehicle.

In the case of a failure in the ventilation system, an emergency system can be operated by using the emergency ventilation switch which is located on the dashboard at the right of the A/C and heating switch.

Draining and refilling

Refer to section 05-(Cooling) for instructions on draining and refilling the engine cooling system.

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The pilot valve is normally open, relieving any build-up of pressure under the diaphragm. When the solenoïd is energized the pilot valve closes, water pressure builds up through the orifice to the under side of the diaphragm and keeps the valve in closed position.

The main heater water valve requires a minimum amount of maintenance. The valve should be free of any dirt sediment which might interfere with the operation. The diaphragm should be replaced once every year before the heating season begins. No other maintenance is needed unless a malfunction occurs.

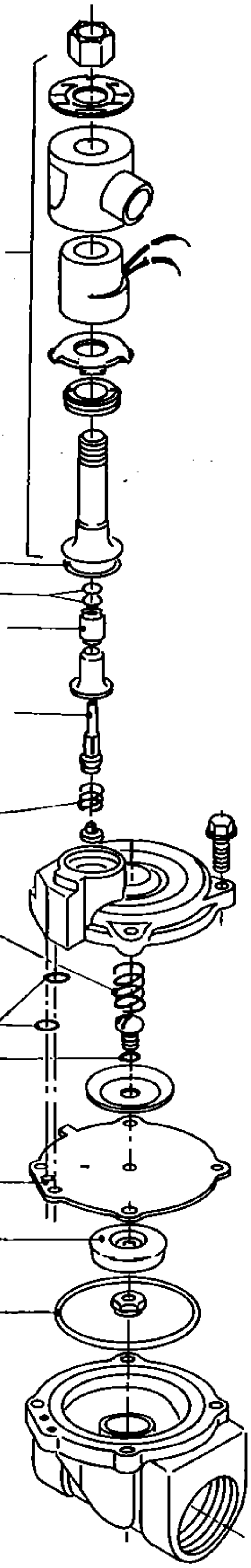
Overhaul

In the event of a malfunction, remove the water valve from the system.

■ **Caution:** Do not allow any liquid to reach the solenoid coil. After removing the valve from the system, carefully drain the remaining liquid from the inlet and outlet openings.

HEATING & AIR CONDITIONING

WATER VALVE



Disassembly

Remove the terminal nuts, lockwashers, washers from the valve.

Remove the screw and lockwashers from the coil and container assembly.

Remove the valve seat assembly from the coil and container assembly by turning it counter clockwise with a wrench..

☐ **Note:**The valve should be held secure in a padded vise for disassembly.

The valve seat assembly must be replaced in its entirety if its is damaged or worm.

Remove the eight No. 10-24 fillster head machine screws used to secure the lower valve body to the upper valve body. Carfully separate the two portions by using s screw driver at the two pry-lugs on either side of the valve. The dowel pin will remain in the upper valve body.

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■ **Caution:**Do not tighten vise so as to damage or bend the disc assembly.

The locknut should be torqued to 25-30 inch pounds (2.8-3.3 Nm) and the valve disc screw is torqued to 12-15 inch pounds (1.3-1.6 Nm).

Cleaning and inspection

Before reassembling the valve, make sure that all parts are clean and in good condition. Thoroughly clean the serrations in the upper and lower valve bodies.

If the valve seat assembly is defective or leaks more than six drops per minute at 10 p.s.i. (69 kPa) when the coil is energized, it should be replaced.

Reassembly

Position the diaphragm disc assembly on the upper valve body so that the holes in the diaphragm align with the dowel pin as well as with the pilot-channel hole and the valve body mounting holes. Set the conical spring on the locknut. Carefully place the lower valve body on the diaphragm disc assembly, engaging the dowell pin with the hole opposite. Secure the eight No. 10-24 fillster head machine screws. Tighten the screws evenly around the valve body to 15 in. lbs (1.6 Nm). Insert the valve seat assembly into the upper valve body and tighten.

Screw the flux ring assembly into the valve body.

HEATING & AIR CONDITIONING

Seat the cover assembly firmly on the flux ring assembly and tighten.

Testing valve after servicing

After servicing, the valve should be tested using water at approximately 170°F +/- 10° (77°C + 6°) and DC voltage at 24 VDC.

Apply water at 25 p.s.i. (172 kPa) to valve inlet and outlet; check for external leakage.

Reduce pressure to 10 p.s.i. (69 kPa) and open valve outlet. Check operation of valve by cycling valve several times.

Check internal leakage (thru seat and needle valve) with 10 p.s.i. (69 kPa) at valve inlet and solenoid energized.

Maximum allowable leakage is six drops per minute thru the needle valve and zero leakage thru the disc seat.

Evaporator motor

The evaporator motor is located in the evaporator compartment at the left of the vehicle. It is a 27.5 volt — 2 H.P. motor which is activating a double blower fan unit. The motor is mounted on a support fastened on a non-corrugated floor.

Proceed as follow to remove the evaporator motor:

1) Set battery main switch to "OFF" position.

2) Loosen and remove the three (3) Phillips head screw to open the condenser compartment door. (The door is left hinged.)

3) Disconnect electrical connection on motor plate.

4) Disconnect air duct connector at motor fan cages.

5) Lossen and remove motor support retaining bolts then remove complete unit of motor, support, cages and fan assy.

6) On a work bench, remove support and fan cages from the unit then remove the fans.

☐ **Note:** Position of the fans should be indexed with the motor shaft in order to keep proper fan alignment at reassembly.

■ **Caution:** never suoport evaporator motor by its output shafts while moving it.

7) To reinstall the evaporator motor, reverse removal procedure.

Brushes replacement

Proceed as follow to replace brushes:

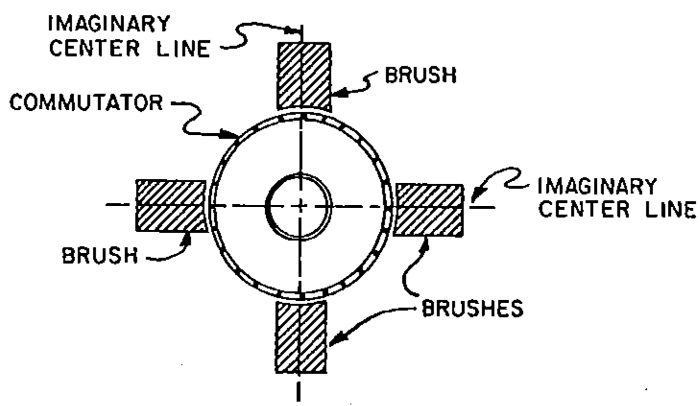
1) Set battery main switched to "OFF" position.

2) Remove the protective band from the motor housing.

3) Remove the brushes as per the standard procedure.

4) Position the new brushes at their NEUTRAL POINT over the commutator by loosening the four (4) brushes holders retaining screws. Apply six (6) volts or less between wires A1 and A2. Be sure wires A1 and A2 are disconnected. At this stage, the armature should not turn. If the armature turns, rotate the brushes holders clockwise or counter-clockwise and check again. Tighten the brushes holders retaining screws.

☐ **Note:** Rotate the brushes by short steps such as 0.025 — 0.050 mm (0.001"-0.002"). This will prevent the rotation of the commutator.



■ **Caution:** Hold the motor shaft with your hand when you apply six (6) volts or less to A1 and A2. This will help you to feel the commutator roration direction.

☐ **Note:** We recommend you to have this step performed by a high qualified service man.

5) Remove the A/C compressor belt then start the engine to operate electrical motor and using a pumice-stone, lighty press on the commutator to properly seat the brushes.

☐ **Note:** When the mating surfaces form a perfect arc and that no noise is heard, the brushes are well seated. Be sure no electrical sparks appear. This visual inspection should be done in a dark area.

6) Stop A/C system then stop vehicle engine.

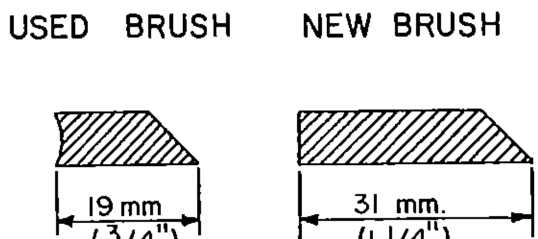
7) Reinstall protective band then reinstall A/C compressor belt.

HEATING & AIR CONDITIONING

Brushes inspection

Brushes condition and lenght must be checked every 24,000 km (15,000 miles). The MAXIMUM wear of the brushes MUST NOT exceed 13 mm (0.5").

☐ **Note:** New brushes length is 31 mm (1¼"). If an used brush reaches less than 19 mm (¾") of free length, replace it.



AIR CONDITIONING SYSTEM

The vehicle is equipped with an air conditioning system which is designed to render confortable and healtful the atmosphere inside the vehicle. A mixture of cooled, filtered, dehumidified, fresh and recirculated air is supplied through wall ducts. The combination of outside and recirculated air is continually filtered, resulting in a clean fresh atmosphere. The air is filtered, cooled and dehumidified by evaporator coil, then passed through a temperature controlled heat core. An evaporator motor, 27.5 volts — 2 H.P. which is the same as the condenser motor, is used to feed the air up into the wall ducts.

A/C cycle

Refrigeration may be defined as **the transfer of heat from a place where it is not wanted to a place where it is unobjectionable.** The major components for a closed circuit refrigeration system are the compressor, the evaporator, condenser and a receiver tank.

The air conditioning system used in Prevost vehicles is a "closed type system" using Freon 12 as refrigerant.

The refrigerant flows to the compressor, is compressed to high pressure and reaches a temperature higher than the surrounding air. It is passed through the air-cooled fins and tubes of the condenser coil forcing the hot high pressure gas to be condensed into a liquid form.

— The liquid refrigerant flows to the receiver tank then through a filter dryer where all moisture acid is received. It is passed through a moisture indicator which is used to indicate if any moisture is present in the system.

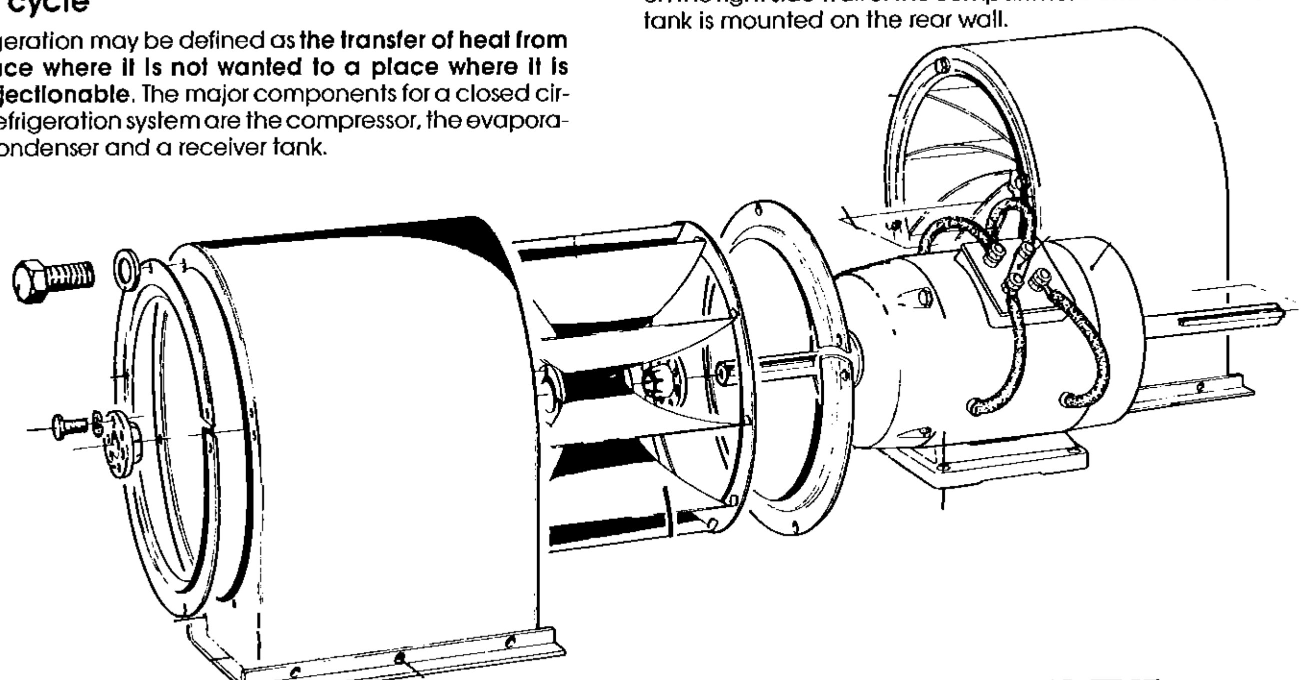
— By its own pressure, the liquid refrigerant flows through a thermostatic controlled expansion valve where reduced pressure causes it to become a low temperature and low pressure liquid.

— The cold low pressure refrigerant passes through the evaporator coil, absorb heat from the air passing over the fins ans tubes, and changes into gas. In this form, the refrigerant is drawn into the compressor to repeat the cycle.

Condenser motor

The condenser motor is located in the condenser compartment, at the right of the vehicle. To gain access to the condenser motor, loosen and remove the screws holding closed the condenser compartment door.

Motor, fans and cages are mounted on a support fastened to a non-corrugated floor. A receiver dryer is located on the right side wall of the compartment and the receiver tank is mounted on the rear wall.



HEATING & AIR CONDITIONING

Condenser motor removal

Proceed as follows to remove the condenser motor.

1) Set battery main switch to "OFF" position.

2) Open condenser compartment door as previously explained then disconnect electrical wiring at motor plate.

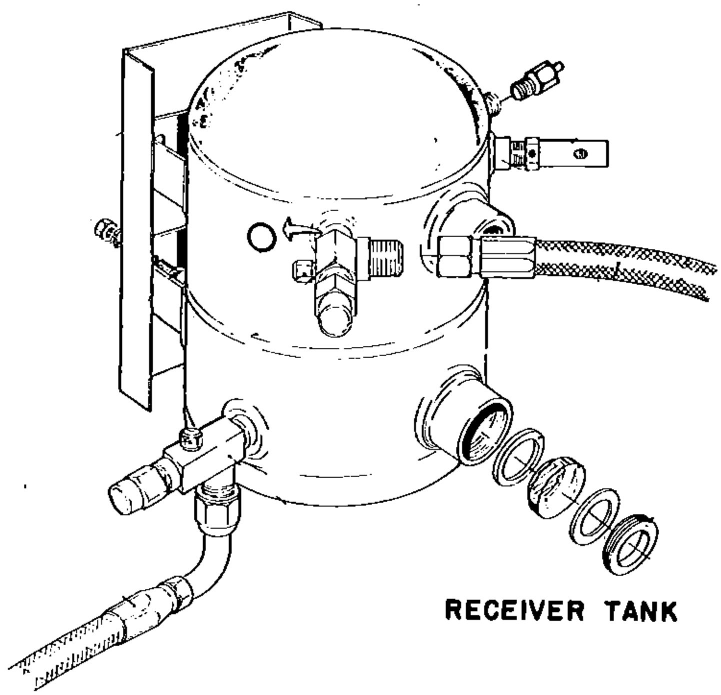
3) Loosen motor support from the floor then remove the complete motor unit from the compartment.

4) On a work bench, remove support and fan cages from the unit then remove the fans.

☐ **Note:** Position of the fans should be indexed with the motor shaft in order to keep proper fan alignment at reassembly.

■ **Caution:** Never support condenser motor by its output shafts while moving it.

5) To reinstall the condenser motor, reverse the removal procedure.



RECEIVER TANK

Brushes replacement:

For brushes replacement, refer to evaporator motor brushes replacement procedure.

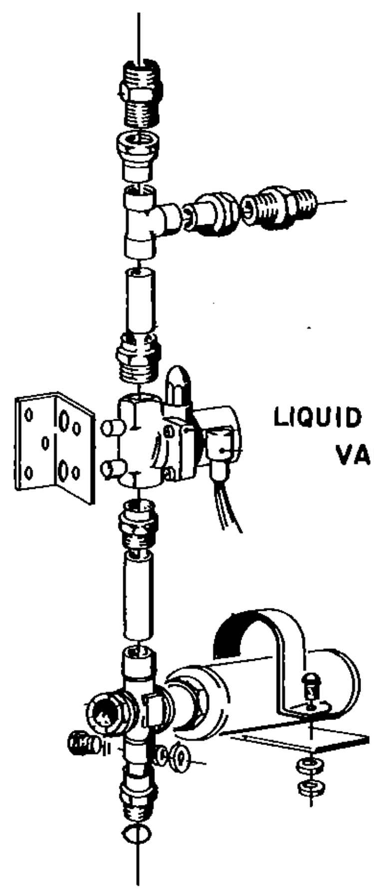
Brushes inspection:

Brushes inspection procedure for condenser motor brushes is the same as the procedure outlined for the evaporator motor brushes.

A/C controls

1) **Temperature rheostat:** Located on the dashboard to the right of the driver. It controls the air temperature in the vehicle during both heating and air conditioning cycles.

2) **A/C and Heating-switch:** Located on the same panel as the temperature rheostat. In "A/C" position, a tell-tale will glow and the system will be energized and functions as required. In "Heat" position, the heating system will be in operation and the temperature can be adjusted as required using the temperature control rheostat.



LIQUID SOLENOID
VALVE

Receiver tank

The receiver tank is located in the condenser compartment. The right glass can be observed by opening the condenser compartment door. The function of the receiver tank is to store the liquid refrigerant. During normal operation, the level of the refrigerant should be approximately halfway mark on the lower glass.

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Filter dryer:

A filter dryer is installed between the receiver tank and the expansion valve. It is used to absorb moisture from the refrigerant. The filter should be replaced if the system has been open to prolonged exposure as shown by the moisture indicator sight glass. When the moisture indicator sight glass indicates a blue color then the system is "dry" (normal) condition. When the moisture indicates a pink color then the system is "wet" or has moisture, then the filter dryer should be replaced.

A/C Compressor:

Coaches are equipped with a O5G A/C compressor made by Carrier. It is designed to give a capacity of 37 CFM at 1750 R.P.M. This compressor is a 6 cylinders, reciprocating type with two (2) cylinders under each of the compressor head. The discharge gas from each side head is internally routed to the center head where it is discharged to the system.

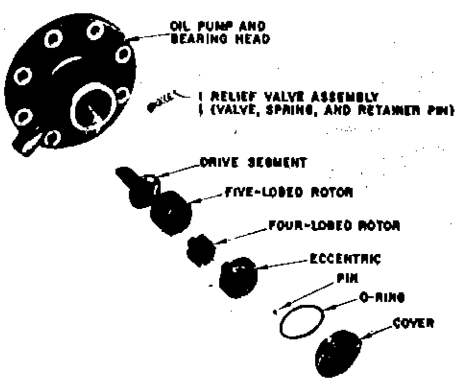
The suction and service valves are provided with a double seat and gauge connections. This enable servicing the compressor and refrigerant lines.

With the valve stems turned all the way clockwise (frontseated), the gauge ports are open to the compressor, and the compressor is isolated from the lines going to the refrigeration system.

With the valve stems turned counterclockwise all the way out (backseated), the compressor is open to the refrigerant lines and closed off from the gauge ports.

With the valve stems midway between the frontseated and backseated position, the compressor is open to the refrigerant lines and to the ports.

☐ **Note:** Before attempting to attach manifold lines to the gauge ports, ensure the valve stems are fully backseated before taking off the nuts.

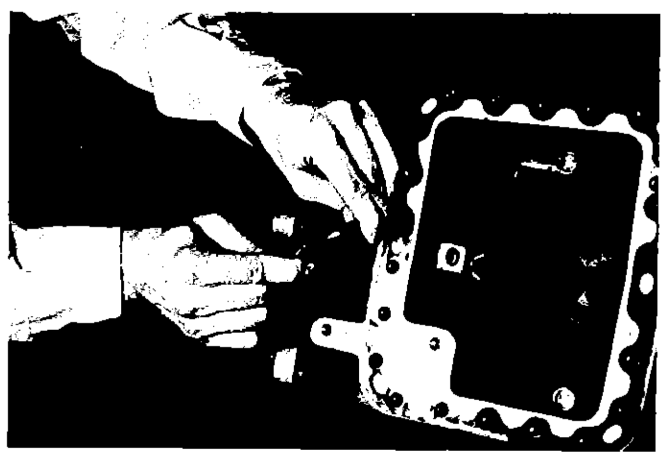


This is the low-speed oil pump and bearing head assembly used on the O5G compressors specifically for bus applications. Minimum speed for lubrication using this style pump is 400 rpm. The drive segment keyed to the end of the crankshaft rotates the five-lobed rotor. Oil trapped between the five-lobed rotor and the four-lobed rotor is forced through the crankshaft to the main bearings, rod bearings, etc.

The pump direction must be set to coincide with the crankshaft direction of rotation (there is a direction arrow on the pump bearing head assembly). The direction of the pump is set by placing the pin in the proper eccentric slot (labeled cw or ccw). The oil pumps are preset at the factory to rotate in the clockwise direction when viewed from the shaft end of the compressor.

The crankshaft is drilled to enable the pump to supply oil to the main bearings, connecting rod bearings, and the shaft seal. At the seal end main bearing, the oil path is divided in two directions. The largest quantity flows to the oil relief valve, which regulates oil pressure at 15-18 psi above suction pressure. When this pressure is reached, the relief valve opens allowing oil to return to the crankcase. The remaining oil flows through an orifice and into the shaft seal lubrification and cooling. This oil is returned to the crankcase through an overflow passage. The oil pressure equalization system consists of two oil return check valves and a 1/8-inch pressure equalization port between the suction manifold and crankcase.

The oil strainer is accessible by removing the compressor bottom plate. If the strainer is torn or damaged, it should be replaced. If it is dirty, it can be cleaned with a solvent. (Methyl Ethyl Ketone, mineral spirits, etc.)



The oil pressure regulator is designed to maintain oil pressure at 15-18 psi above suction pressure. When the oil pressure reaches this 15-18 psi above suction pressure, the relief valve spring is moved forward allowing oil to return to the crankcase. The valve can be easily checked by removing it and using a small piece of stiff wire to depress the spring mechanism, ensuring that it is not sticking.

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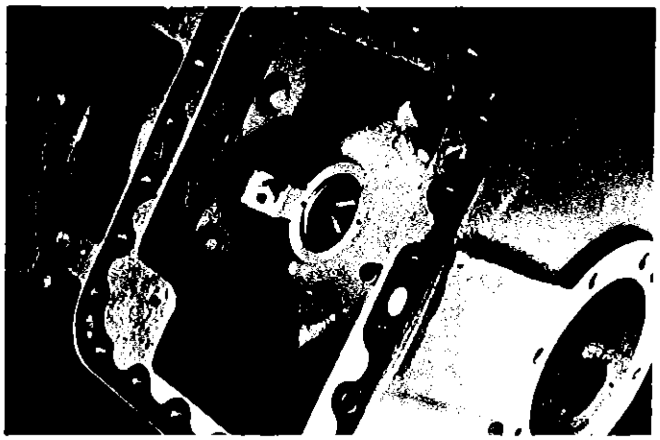
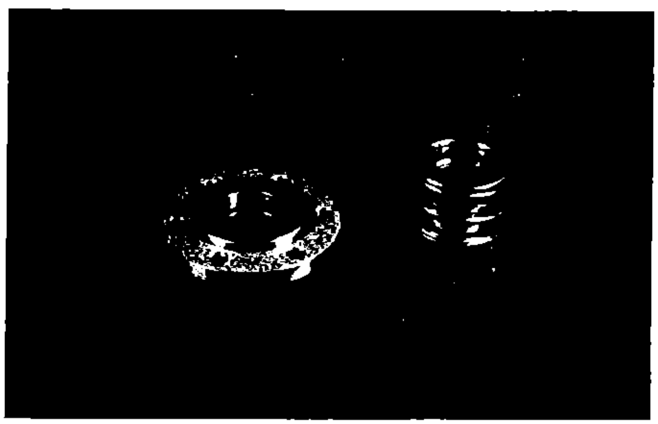
Under normal operating conditions, the suction pressure is equal to the crankcase pressure. This will allow the oil return check valves to open, allowing oil that has circulated through the system to return to the crankcase. During flooded start conditions, the crankcase pressure will rise above the suction pressure causing the check valves to close. This will prevent excess oil loss from the compressor crankcase. The 1/8-inch equalization port allows for release of excessive pressure that has built up of excessive pressure that has built up in the crankcase to go to the suction manifold. This also will ensure that pil loss is kept to a minimum.

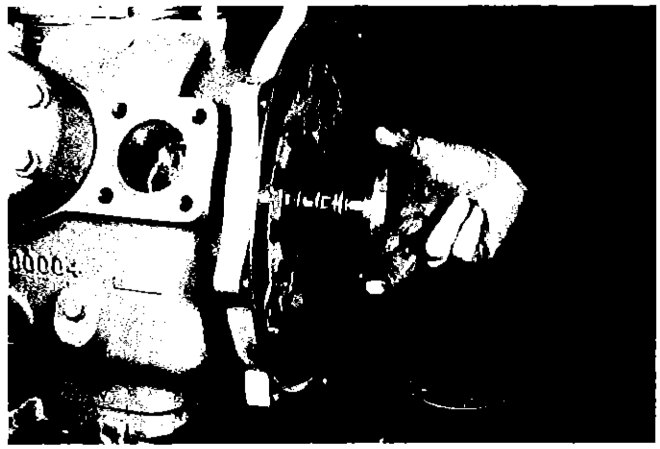
The pump end main bearing is integral with the bearing head and is not replaceable. If worn, the bearing head must be replaced.



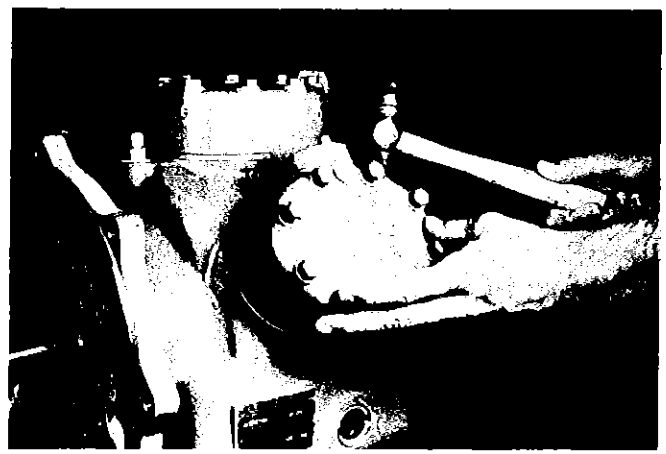
There are two seal end main bearings installed in the O5G compressor. The bearings are steel backed, tin base babbitt material. They should be installed with the oil groove on top, and the closed portion of the V toward the inside of the bearing housing. When installed, there will be a 5/16-inch gap between the two bearings. After this type of bearing is installed, line boring is required.



The compressor seal assembly consists of a spring loaded bellows, a carbon ring, and a cover plate. If a seal assembly should need replacing, always replace the complete assembly. Never use a new carbon washer with a used cover plate or vice-versa. If the new carbon ring gets damaged during assembly, replace it with another new one.

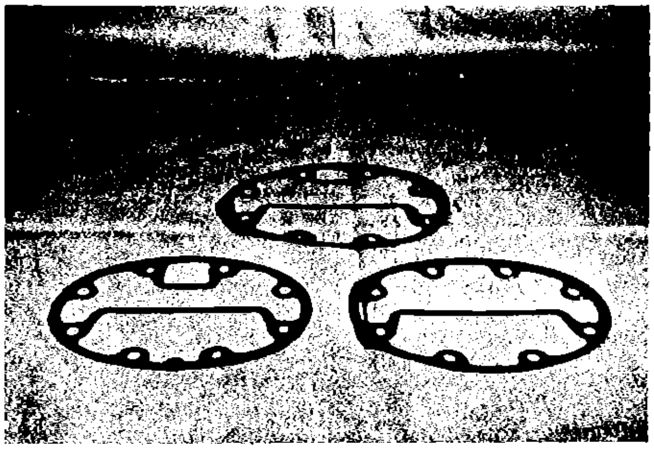


To install a new seal assembly, first clean off the area of the crankshaft that the bellows assembly grips. Next, lubricate the bellows with compressor oil. To prevent damage to the new face plate and carbon washer, use the old cover and washer to push the bellows into its seating position. Next, lubricate the new carbon washer and put it in place in the bellows assembly. The face plate and gasket can now be installed using a cross-hatch pattern on the bolts, torquing to speficications.

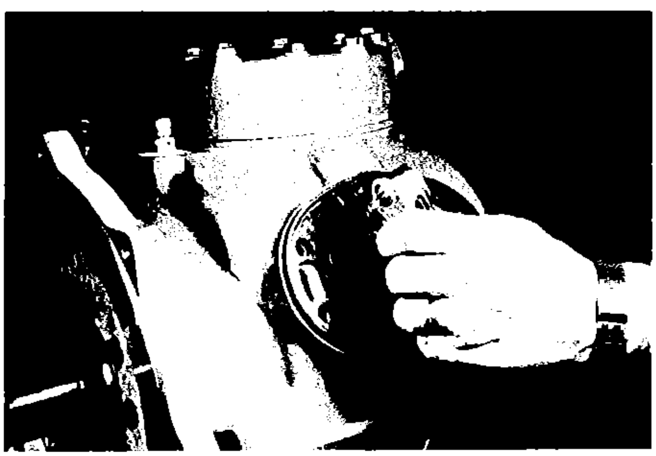


If the cylinder head or valve plate assembly is to be serviced, caution should be taken before removing the cylinder head. Any time the compressor is opened, the internal pressure must be relieved first. After this pressure is relieved, a further precaution should be taken in case any internal pressure is entrapped within the head. When removing the head, do not unscrew the capscrews all the way before breaking the seal. Loosen the capscrews a few turns, then tap it lightly with a wooden, plastic or rawhide mallet to free it.

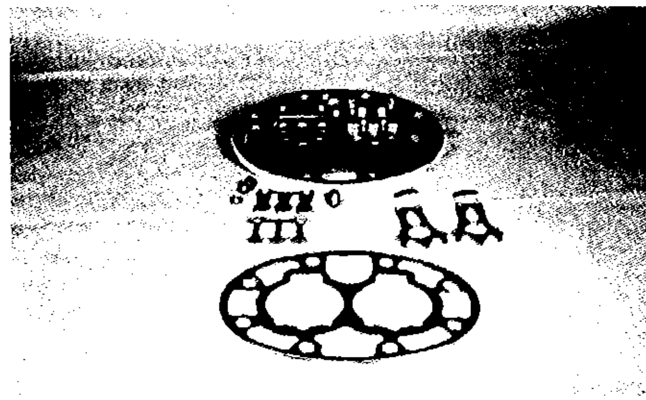
HEATING & AIR CONDITIONING



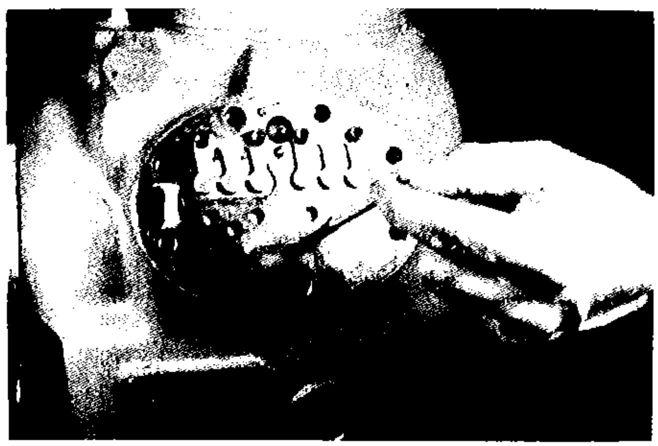
O5G cylinder head gaskets are set up for the center head, standard side heads, and side heads with unloaders. The top gasket shown here is for the center head, the lower left is for a side head with unloaders, and the lower right is a standard side head. The cutout for the recirculation port on the unloader gasket is larger than the cutout for the center head crossover port. Unloader gaskets can also be identified by an elongated slot used for pressure feed to the capacity control valve.



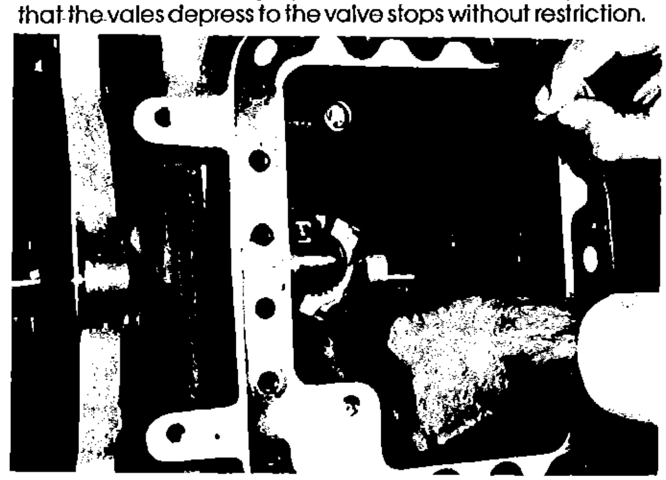
When removing the valve plate from the cylinder deck, the outside holes of the discharge valve stops may be used for jacking purposes. Remove the discharge valve stop and valve and use the same capscrew without the lock washer and screw it into the outer hole. It will seat against the cylinder deck and jack the plate away from the deck.



The discharge and suction valves should not be re-used; always use new valves and gaskets when reassembling the cylinder head and valve plate assemblies.



When reassembling the valve plate assembly, check the suction valve action before placing the head back on. This can be done using a pencil eraser by checking to see that the vales depress to the valve stops without restriction.



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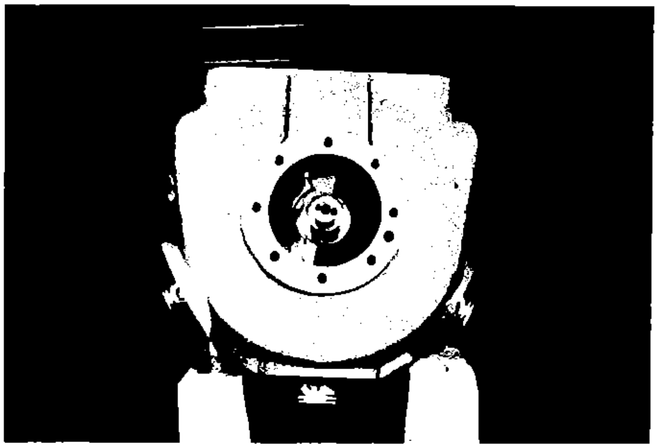
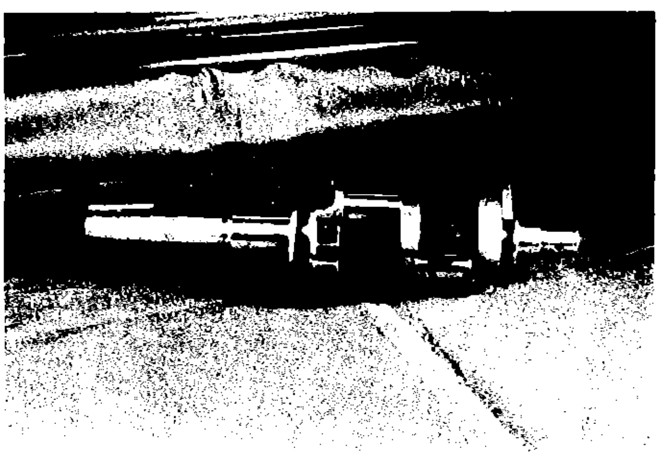
Note the chamfer on the rod and caps; this chamfer must face toward the crank shoulder when assembling. On the middle rod and cap, it makes no difference which way it faces. The rods and caps are matched sets and must not be interchanged. MARK THEM BEFORE DISASEMBLING. Also, when reassembling, use new epoxy encapsulated capscrews and flat washers.

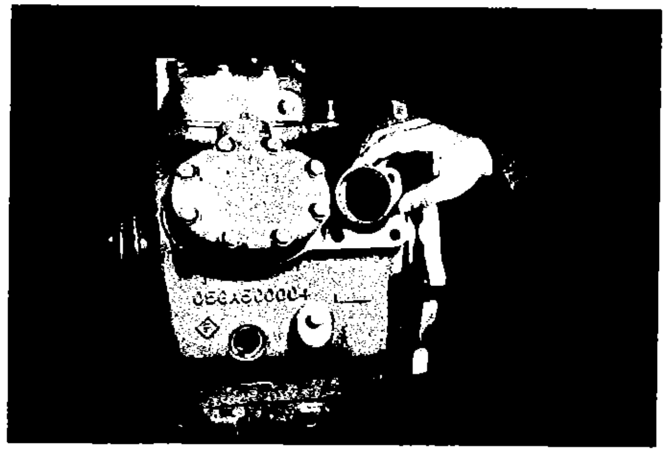


If the crankshaft is to be removed, the rod caps must first be disconnected and the rods pushed down so that the piston rings extend below the cylinders. If this is done, remove and discard the old piston rings. The cylinder walls must then be rehoned lightly to break their hard, glazed surfaces. Clean thoroughly after breaking the glaze and place new rings on the pistons when re-installing.

☐ **Note:** If the pistons are ever removed from the rods, the pistons and piston pins are matched sets and must not be interchanged.



Two brass thrust washers are used in the O5G compressor. The pump end thrust washer is positioned on two dowel pins located on the bearing head and is installed with the oil pump and bearing head assembly. The seal end thrust washer is positioned just ahead of the seal end main bearing on two dowel pins installed in the crankcase. If the crankshaft is ever removed, both thrust washers should be inspected for wear and scoring before reassembly. (End play of the compressor can be checked by using a dial indicator on the compressor crankshaft or by using a feeler gauge between the seal end thrust washer and the crank shoulder.)



If the compressor is to be disassembled, the suction strainer should also be checked. If the strainer is dirty, it should be cleaned; if damaged, it should be replaced. The strainer has been preformed to fit into the cavity. (It can be cleaned with a solvent such as methyl ethyl ketone, mineral spirits, etc.).

Clutch assembly

The A/C compressor is manufactured by General Motor. The outer pully of the clutch is driven by a 3 V groove belt from the engine crankshaft pulley. Thus this outer pulley will rotate whenever engine is running. When there is a demand for cooling (A/C), the control circuit will supply 24 volts DC potential to the clutch coil which, when energized, engages the compressor.

Removal

1) Remove clutch retaining capscrew (3/8 - 24 1-1/4) and washers from the compressor crankshaft.

2) Install a flange type gear puller into the three 5/16 - 18 tapped holes in the clutch armature (pressure plate) Never use a puller in the belt grooves as damage to clutch may result.

■ **Caution:** It is extremely important that the puller bolts be inserted no more than 3/8-inch into the armature or damage may occur to bearing and/or bearing seal. Use two stopnuts on each bolt. Tighten them together leaving 5/16 - 3/8-inch of exposed thread. Then install these bolts finger-tight.

3) To remove armature/rotor assembly, screw in the gear puller jacking bolt. Use a drift pin to prevent the clutch from rotating.

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4) The armature/rotor assembly can now be carrefully lifted away from the compressor and clutch coil. Remove the gear puller from the clutch.

5) To remove the coil, simply disconnect the coil electrical cable from the wire harness and remove the four capscrews holding the coil to the compressor. Do not lose the spacers used on the two lower capscrews.

Clutch disassembly

Once the clutch is removed from the compressor, it can be disassembled by removing two snap rings which hold the armature — rotor assembly together.

1) To remove the smaller armature snap ring, use a medium size pair of external snap pliers

2) To remove the large bearing snap ring, a very large set of internal snap ring pliers is required because the snap ring is very used when removing this ring to prevent personal injury.

3) To separate the clutch into individual parts, an arbor press and suitable support fixtures will be required.

a) To remove the armature/hub assembly from the bearing, place the clutch on arbor press bearing side up.

b) Use a suitable support under the outer edges of the rotor to allow clearance for the armature — hub to pass out of the bearing.

c) Use a cylindrical device such a large socket which will sit on the edge of the hub and pass through the inner bearing race. This will be used to press the hub from the bearing.

d) Remove the armature . Provisions must be made to prevent dropping the armature when it falls free from the bearing.

4) To remo'‘e the bearing from the rotor, the rotor must be turned ove. ınd supported to allow clearance for the bearing to pass out of the rotor. Again, using a socket or suitable tubular device that will sit on the inner bearing race, press the bearing out as shown above.

☐ **Note:** The bearing should not be removed unless a new one is to be used for reassembly. It could be internally damaged during removal which could result in future bearing failure.

The shiny surfaces on the armature and rotor are the mating parts which lock together when the clutch coil energizes. They should be inspected for cracks and other visible wear or damage.

☐ **Note:** These parts are burnished at the factory and are, therefore, a matched set and can not be replaced individually.

The bearing contains double row ball bearings. They are permanently sealed and lubricated to ensure long, dependable service.

Clutch re-assembly

1) a) To press a new bearing into the rotor, first inspect the rotor to make sure no dirt or foreign material is in the inner bore of the rotor. Clean if necessary.

b) Place the rotor face down on the arbor press.

c) Lay the **new bearing** in place on the rotor.

d) Using a suitable cylindrical support on the outer bearing race, press the bearing into the rotor until it bottoms into the counterbore on the rotor.

e) Install large bearing snap ring.

2) a) To install armature-hub into rotor bearing assembly, place the rotor face up on the arbor.

b) Set the armature hub into place in the bearing. Press the nub through the bearing.

c) Install armature snap ring.

The clutch is now ready for re-installation on the compressor.

Clutch installation

1) To install the coil on the compressor, the outside edge of the compressor shaft seal cover must be free from dirt and other foreign material.

2) Push the coil on to the seal cover plate until it seats against the compressor, orienting the coil so that the electrical cable is located toward the compressor mounting base. This is important because it is the only way the bolt alignment will be correct.

■ **Caution:** When installing coil on to the compressor seal cover plate, do not force the coil on. Do not attempt to draw the coil on using the mounting capscrews. If the coil will not seat, remove it and inspect the seal cover plate and coil pilot diameter for burrs or dirt. If no obstruction is found and the seal cover plate diameter is 4.300 inches or less, reject the clutch.

3) Start the four mounting capscrews by hand to make sure they all fit properly. Be sure to install spacers behind the coil mounting flange

4) Torque capscrews to 25-30 ft-lb torque.

5) a) The air gap between the coil and rotor must be checked to insure that there is adequate clearance. To check, insert a .020-inch feeler gauge between the rotor and coil when installing the rotor assembly.

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b) Position the rotor on the crankshaft to align the keyways. Don't install the key.

c) Seat the rotor assembly by lightly tapping the hub with a mallet.

d) Slowly rotate rotor while moving the feeler gauge all the way around the coil circumference.

e) If the air gap is less tha .020 inch at any point, reject the clutch.

6) Insert the key until it is flush with the clutch hub face. If necessary, tap key lightly with hammer as shown above.

7) Insert the 3/8 - 24 × 1-1/4-inch capscrew and washers (use a new lockwasher) into the end of the compressor crankshaft.

8) Install two 5/16 - 18 capscrews into tapped holes in clutch armature. Again use two stopnuts on these bolts to prevent more than 3/8-inch penetration of the bolt into the clutch to prevent bearing and/or seal damage.

9) Insert a drift pin between the two capscrews to prevent the compressor from rotating while tightening the clutch retaining capscrews to 16-20 ft-lb torque

10) Remove the two jacking capscrews from the armature.

11) As a final check, rotate the clutch rotor and listen for any interference noise.

Clutch coil

To make an electrical check of the clutch coil, the following procedure should be followed:

1) Disconnect both clutch wires from bus wiring harness.

2) Attach an ohmmeter to the two coil leads.

a) If ohmmeter reads approximately 7.5 ohms, coil is all right.

b) If ohmmeter reads zero ohms, coil is shorted. It must be replaced.

c) If ohmmeter reads very high or infinite ohms, coil is open. It must be replaced.

3) a) Attach one ohmmeter lead to the coil housing. Make sure lead makes contact through painted surface.

b) Attach other ohmmeter lead to one coil wire. Meter should read infinite ohms; if not, coil is shorted to housing and will have to be replaced.

TROUBLESHOOTING

A) Low suction pressure... high superheat

Probable cause	Remedy
Inlet pressure too low from excessive vertical lift, undersize liquid line or excessive low condensing temperature. Resulting pressure difference across valve too small.	Increase head pressure. If liquid line is too small, replace with proper size.
Gas in liquid line-due to pressure drop or insufficient refrigerant charge.	Locate cause of liquid line flash and correct by use of any of the following methods. (1) Add charge (2) Replace or clean filter dryer (3) Check for proper line size.
Valve orifice too small.	Replace with proper valve.
Superheat adjustment too high.	Adjust superheat to the proper specification.
Power assembly failure or partial loss of charge.	Replace power assembly or replace valve.
Air filter screen clogged.	Clean or replace filter screen.
Plugged lines.	Clean, repair or replace lines.
Liquid line too small.	Install proper size liquid line.
Suction line to small.	Install proper size suction line.

B) Low suction pressure... low superheat

Probable cause	Remedy
Compressor having wrong pulley size.	Install proper size pulley.
Uneven or inadequate evaporator loading due to poor air distribution or liquid flow.	Balance evaporator load distribution by providing correct air or liquid distribution.

C) High suction pressure... high superheat

Probable cause	Remedy
Compressor discharge valve leaking.	Repair or replace valve.

D) High suction pressure... low superheat

Probable cause	Remedy
Valve superheat too low.	Adjust superheat to the proper specification.
Compressor discharge valves leaking.	Repair or replace discharge valve.

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E) Fluctuating discharge pressure

Probable cause	Remedy
Insufficient charge.	Add charge to the system.

F) High discharge pressure

Probable cause	Remedy
Air or non-condensable gases in condenser.	Purge and recharge system
Overcharge of refrigerant.	Bleed to proper charge.
Condenser dirty.	Clean condenser.
Insufficient cooling air Distribution over air Cooled condenser	Properly locate condenser to freely dispel hot discharged air.

O5G COMPRESSOR TORQUE VALUES

SIZE DIAM (in.)	THREADS PER IN.	TORQUE RANGE FT-LB	TORQUE RANGE MKG	USAGE
1/16	27 (pipe)	8-12	1.11-1.66	Pipe Plug — Crankshaft
1/4	20 (pipe)	20-25	2.77-3.45	Oil Return Check Valve — Crankcase
	20 (pipe)	20-25	2.77-3.45	Pipe Plug — Press. Gauge Connection
	20	8-10	1.11-1.38	Connecting Rod Capscrew
	28	12-16	1.66-2.21	Unloader Valve
	28	6-10	0.83-1.38	Oil Pump Drive Segment
No. 10	32	4-6	0.55-0.83	Oil Pump Drive Segment
5/16	18	16-20	2.21-2.77	Cover Plate — Pump End Bearing Head Suction Valve Discharge Valve Suction Valve Adapter — Crankcase
3/8	16	25-30	3.46-4.15	Pump End Bearing Head Bottom Plate — Crankcase Compressor Foot Seal Cover
	16	30-35	4.15-4.84	Cylinder Head
7/16	14	55-60	7.61-8.30	End Cover — Crankcase
1-1/2	18 NEF	35-45	4.84-6.22	Oil Level Sight Glass

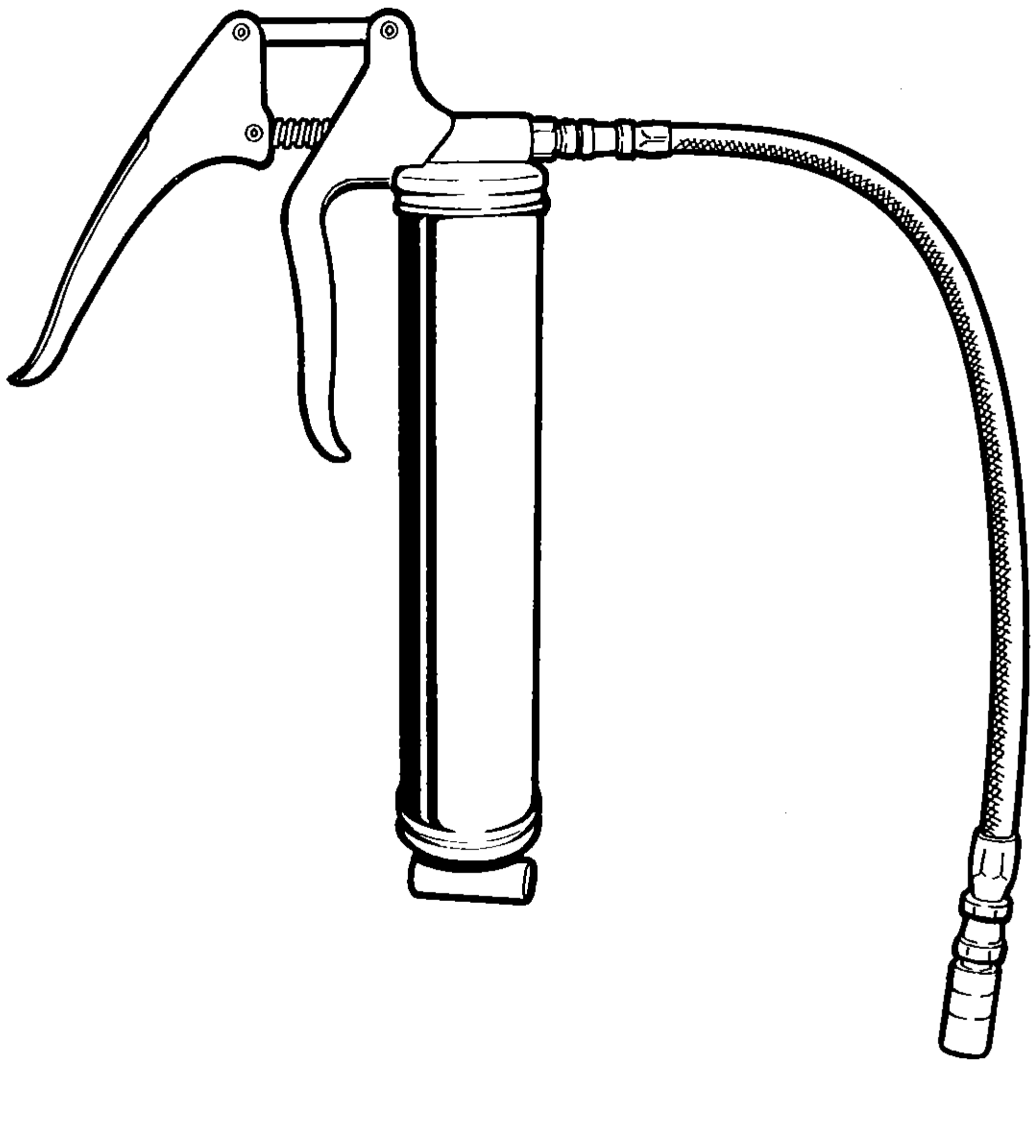
NEF — National Extra Fine

HEATING & AIR CONDITIONING

PART NAME	FACTORY MAXIMUM INCHES	FACTORY MAXIMUM MM	FACTORY MINIMUM INCHES	FACTORY MINIMUM MM	MAXIMUM WEAR BEFORE REPAIR INCHES	MAXIMUM WEAR BEFORE REPAIR MM
SEAL END						
Main Bearing Dia	1.8760	47.6504			.002	0.051
Main Bearing Journal Dia			1.8725	47.5615	.002	0.051
PUMP END						
Main Bearing Dia	1.3755	34.9377			.002	0.051
Main Bearing Journal Dia			1.3735	34.8869	.002	0.051
CONNECTING ROD DIA	1.3755	34.9377			.002	0.051
Piston Pin Bearing			.6875	17.4701	.001	0.025
CRANKPIN DIAMETER			1.3735	34.8869	.0025	0.0635
Throw (Height)	1.9698	50.0329				
THRUST WASHER (Thickness)						
Pump End	.145	3.683	.144	3.658	.040*	1.016
Seal End	.157	3.987	.155	3.937	.040*	1.016
CYLINDERS AND PISTONS						
Bore	2.0010	50.8254			.002	0.051
Piston (Dia)			1.996	50.0698	.002	0.051
Piston Pin (Dia)			.6873	17.4574	.001	0.025
Piston Pin Bearing			Thumbfit			
Piston Ring Gap	.013	0.330	.005	0.127	.025	0.635
Piston Ring Side Clearance	.002	0.051	0.001	0.0254	.002	0.051
SUCTION VALVE RECESS						
(Depth)	.082	2.083	.078	1.981	.090	2.286

* Maximum end clearance between thrust washer and shaft. Shaft end play .015-.036

LUBRICATION



LUBRICATION

Lubrication

A lubrication chart is included in this section to give approximate location of key service points on the coach. Where cleaning, removal or disassembly are required for lubrication purposes, these procedures are covered in the applicable sections of this manual.

Lubrication intervals are based on recommendations for normal operating conditions. Where more severe service is encountered, more frequent attention will be required.

New coaches

Lubricant in the transmission and differential supplied as ««factory fill»» in new coaches should be drained and refilled after 1 000 miles (1,600 km) and in no case over 3 000 (4,800 km) of initial operation.

Routine Service

Engine Crankcase

Engine crankcase oil should be checked daily or before the start of each run and oil added to bring the level to the ««Full»» mark on the dipstick. A new oil filter element should be installed each time the crankcase oil is changed.

Oil Changes

The oil change period is dependent on the operating conditions (e.g. load factors etc.) of an engine that will vary with the numerous service applications. It is recommended however, that the oil change interval be based on 300 operating hours times the average vehicle operating speed.

The drain interval may then be gradually increased or decreased with experience on a specific lubricant while also considering the recommendations of the oil supplier (analysis of drained oil can be helpful here) until the most practical oil drain period for the particular service has been established.

Solvents should not be used as flushing oils in running engines. Dilution of the fresh refill oil supply can occur, which may be detrimental.

Full flow oil filtration systems have been used in Detroit diesel engines since they have been manufactured. For the best results, the oil filter element should be replaced each time the oil is changed.

Engine oil temperature should be checked every 25 000 miles (40,000 km) to determine oil cooler efficiency. This check should be made by inserting a steel jacketed thermometer in the dipstick opening immediately after stopping a hot, loaded engine. If the oil temperature exceeds the coolant temperature by more than 60°F (33°C), the oil cooler may be clogged.

Checking Oil Levels

Lubricant compartments of the engine and transmission are provided with dipsticks for checking lubricant level. They are connected to a two-gallon oil reserve tank by two shut-off valves, allowing oil to be added to crankcase or transmission by opening the corresponding valve. Comparison of oil levels in sight gauge, before and after adding oil, shows how much oil has been added.

☐ **Note:** On vehicles equipped with an automatic transmission, the oil reserve tank is connected to the engine only.

Oil Recommendations

Satisfactory prolonged heavy-duty engine operation requires heavy-duty lubricating oils with additives. These oils provide better lubrication, have more heat resistance and counteract sludge formation more effectively than the straight mineral type oils.

Heavy duty engine oil meeting MIL-L-2104C or MIL-L-46152 specifications should be used for both the engine and manual transmission. Oil grade should be SAE-40 for vehicles operating at temperature above 0°F (-18°C), and SAE-30 for operation at below 0°F (-18°C).

On vehicles equipped with an automatic transmission, transmission must be filled with Dexron automatic transmission fluid.

General purpose gear lubricant SAE-140 grade, is recommended for use in the differential.

Flexible Hose Maintenance

The performance of engine and auxiliary equipment is greatly dependent on the ability of flexible hoses to transfer lubricating oil, air, coolant, and fuel oil. Maintenance of hoses is an important step to ensure efficient, economical, and safe operation of the engine and related equipment.

Pre-Start Inspection

Check hoses daily as part of the pre-start up inspection. Examine hoses for leaks, and check all fittings, clamps, and ties carefully. Ensure that hoses are not resting on or touching shafts, couplings, heated surfaces including

LUBRICATION

exhaust manifolds, any sharp edges, or other obviously hazardous areas. Since all machinery vibrates and moves to a certain extent, clamps and ties can fatigue with age. To ensure continued proper support, inspect fasteners frequently and tighten or replace them as necessary.

Leaks

Investigate leaks immediately to determine if fittings have loosened or cracked and also if hoses have ruptured or worn through. Take corrective action immediately. Leaks are not only potentially detrimental to machine operation, but can also result in added expense caused by the need to replace lost fluids.

■ **Caution:** Personal injury and/or property damage may result from fire due to the leakage of flammable fluids such as fuel or lube oil.

Service Life

A hose has a limited service life. The service life of a hose is determined by the temperature and pressure of the gas or fluid within it, the time in service, the mounting, the ambient temperatures, amount of flexing, and the vibration it is subject to. With this in mind, it is recommended that all hoses be thoroughly inspected at least every 500 operating hours and/or annually. Look for cover damage or indications of damaged, twisted, worn, crimped brittle, cracked, or leaking lines. Hoses having the outer cover worn through or damaged metal reinforcement should be considered unfit for further service.

It is also recommended that all hoses in or out of machinery be replaced during major overhaul and/or after a maximum of five years service. Replacement hose assemblies should always be equal to or superior to the original equipment supplied with the engine.

RECOMMENDED LUBRICANT CODE:

O-1 H.D. Engine Oil Mil-L-2104C or Mil-L-46152 (not MS)

O-2 Dexron Automatic Transmission Oil

L-1 High Melting Point, Water Resistant, Lithium Base Grease

L-2 Molybdenum Disulphide Grease

L-3 «Lubriplate» #105

G-1 General Purpose Gear Lubricant — SAE 90

G-2 General Purpose Gear Lubricant — SAE 140

A-1 Air Conditioning Compressor Oil

S-1 Shutterstat Fluid

W-1 Windshield Washer Fluid

W-2 Engine Coolant

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LUBRICATION AND SERVICING SCHEDULE

1- CHECK DAILY — SERVICE IF REQUIRED

ITEM #	DESCRIPTION	SERVICE	LUBRICANT
R-13	Engine Oil	Keep to «full» level	0-1 (SAE 40 or 30)
R-11	Transmission Oil	Keep to «full» level	O-1
R-33	Power Steering Oil	Keep to «full» level	O-2
F-11	Windshield Washer	Fill Reservoir	W-1
F-5 and R-7	Wheel Bearings	Check level in sight glass	G-1
	Check hoses for leaks		
	Check V-belts for tension		
	Check tire pressure		

2- SERVICE EVERY 6,250 MILES (10,000 KM)

ITEM #	DESCRIPTION	SERVICE	LUBRICANT
F-1	Entrance Door Hinges	2 grease fittings (under vehicle)	L-2
F-2	Gear Shift Box	1 grease fitting (steering compartment)	L-2
F-3	Brake Camshaft (front axle)	1 grease fitting on each side	L-2
F-4	Steering Knuckles	2 grease fittings at each side	L-2
F-7	Steering Tie Rod Ends	1 grease fitting at each side	L-2
F-12	Steering Drag Link Socket	1 grease fitting at each end	L-2
F-13	Steering Column U-Joint	2 grease fittings	L-2
F-16	Slack Adjuster (front)	1 grease fitting at each side	L-2
F-17	Brake Shoe Anchor Pin (front)	2 grease fittings at each side	L-2
F-18	Shift Control Rod U-Joints	2 grease fittings	L-2
R-1, R-6	Slack Adjusters (rear)	2 grease fittings at each side	L-2
R-2, R-5	Brake Camshafts (rear)	2 grease fittings at each side	L-2
R-4, R-9	Propeller Shaft U-Joints	1 grease fitting at each end	L-2
R-8	Propeller Shaft Slip Joint	1 grease fitting at each end	L-2
R-10	Speedometer Adaptor (Opt.)	1 grease fitting	L-2
R-15	A.C. Compressor Base	2 grease fittings	L-2
R-17	Shift Control Rod U-Joints	2 grease fittings	L-2
R-18	Clutch Control Cross Shaft	2 grease fittings	L-2

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R-19	Clutch Release Bearing	1 grease fitting	L-2
R-20	Clutch Release Shaft	1 grease fitting	L-2
R-22	Tachometer Adaptor (Opt.)	1 grease fitting	L-2
R-28	Fan Pulley Bearing	1 grease fitting	L-2
R-30	Brake Shoe Anchor Pin (aux. axle)	2 grease fittings at each side	L-2
R-31	Brake Shoe Anchor Pin (rear axle)	2 grease fittings at each side	L-2
R-34	Auxiliary Axle Lever	1 grease fitting at each side	L-2
F-9	Destination Sign Gears	Apply lubricant on gears	L-3
R-14	Air Cleaner[1]	Inspect and clean, replace element if required	
R-15	Air Conditioning Compressor	Check oil level in sight glass	A-1
R-16	Differential	Check Oil — Keep to level of filler plug	G-2
R-23	Fan Gear Box	Check Oil — Keep to level of filler plug (at rear of gearbox)	O-1
R-32	Engine Coolant	Check level — Keep to level of filler neck	W-2

[1] On vehicles equipped with oil bath type air filter, empty cup, clean out and refill with a nonvolatile oil (SAE-20).

■ **Caution:** Never operate without oil. Under severe dust conditions, service daily.

3- SERVICE EVERY 12,500 MILES (20,000 KM)

ITEM #	DESCRIPTION	SERVICE	LUBRICANT
R-13	Engine Oil	Drain and Refill	O-1 (SAE 40 or 30)
R-24	Engine Oil Filter	Replace Element	
R-21	Fuel Strainer	Replace Element	
R-26	Fuel Filter	Replace Element	
R-35	Shutterstat Lubricator	Drain Filter Bowl Add 1 ounce of Fluid	S-1
	Check Air Gauges for Leaks		
	Check Steering and Accelerator Linkage		
	Check all Lights and Switches		
	Tighten Wheel Nuts		
	Check Cooling System for Leaks-Test Anti-Freeze (-32°F)		
	Remove and Clean Heater and AC Filters		

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Operate and Reset Emergency Stop

Adjust Brakes

Drain Air Tanks

4- SERVICE EVERY 25,000 MILES (40,000 KM)

Check AC Unit — Service if necessary

Clean Battery Connections

Clean Differential Breather

Clean all Air Intake Ducts and Screens

Remove Wheels and Inspect Brakes

Drain and Refill Wheel Bearing Oil[1]

Clean AC Condenser Coil

Check Clutch Pedal Clearance

5- SERVICE EVERY 50,000 MILES (80,000 KM)

Drain Transmission Oil and Refill

Drain Differential Oil and Refill

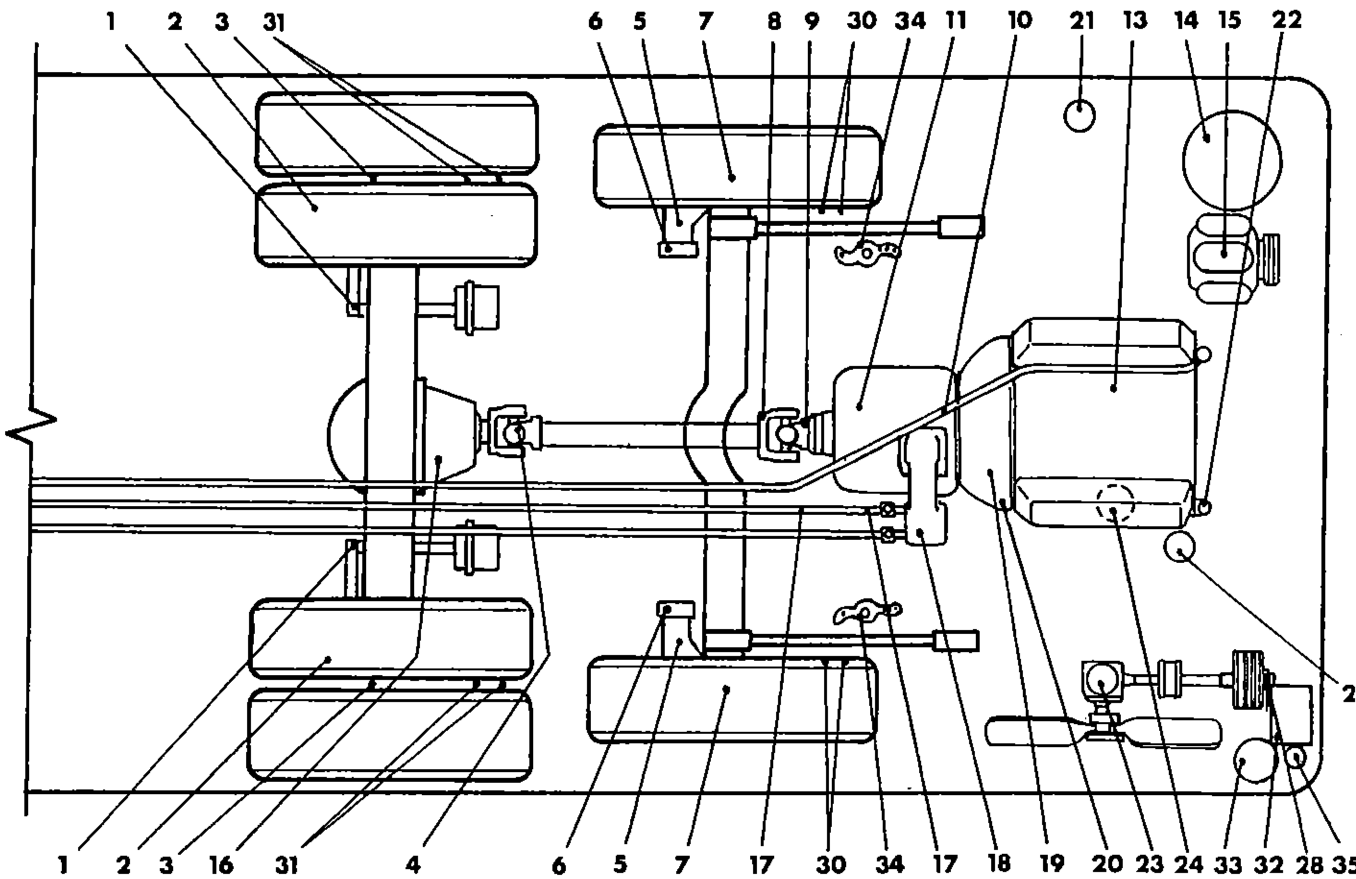
Change Automatic Transmission Oil Filter

Change Air Dryer Filter

1 On vehicle equipped with grease lubricated wheel bearings, clean and inspect bearings. Pack with wheel bearing grease.

LUBRICATION

REAR LUBRICATION AND SERVICING CHART

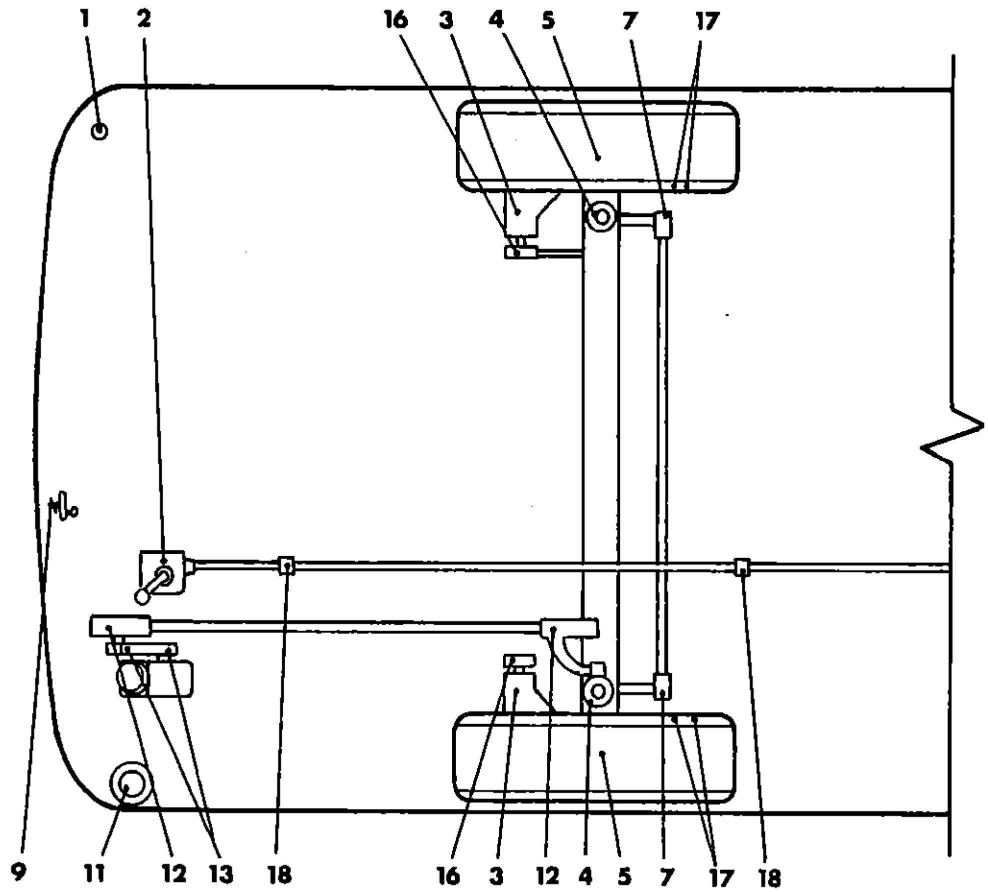


1- Slack Adjuster (rear axle)
2- Brake Camshaft (rear axle)
3- Wheel Bearing (rear axle)
4- Propeller Shaft U-Joint
5- Brake Camshaft (aux. axle)
6- Slack Adjuster (aux. axle)
7- Wheel Bearing (aux. axle)
8- Propeller Shaft Slip Joint
9- Propeller Shaft U-Joint
10- Speedometer Adapter (OPT.)
11- Transmission
13- Engine
14- Air Cleaner
15- Air Conditioning Compressor
16- Rear Axle Differential
17- Shift Control Rod U-Joint
18- Clutch Control Cross Shaft
19- Clutch Release Bearing
20- Clutch Release Shaft
21- Fuel Strainer
22- Tachometer Adapter (OPT.)
23- Fan Gear Box
24- Oil Filter
26- Fuel Filter
28- Fan Pulley Bearing
30- Brake Shoe Anchor Pin (aux. axle)
31- Brake Shoe Anchor Pin (rear axle)
32- Engine Coolant
33- Power Steering
34- Tag Lever
35- Shutterstat Lubricator

MANUAL TRANSM. ONLY

LUBRICATION

FRONT LUBRICATION AND SERVICING CHART



1- Entrance Door Hinges
2- Gear Shift Box
3- Brake Camshaft (front axle)
4- Steering Knuckles
5- Wheel Bearing
7- Steering Tie Rod Ends
9- Destination Sign Gears
11- Windshield Washer Reservoir
12- Steering Drag Link Socket
13- Steering Column U-Joint
16- Slack Adjuster
17- Brake Shoe Anchor Pin
18- Shift Control Rod U-Joint

MANUAL TRANSMISSION ONLY

NOTES