

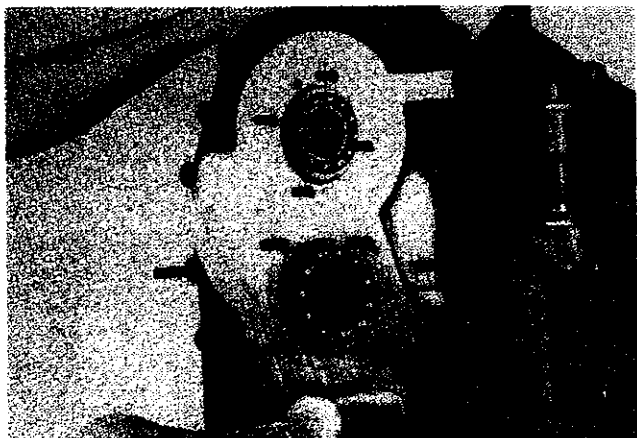


Figure 200

The use of aligning studs will facilitate rear cover installation. Tap cover in place.

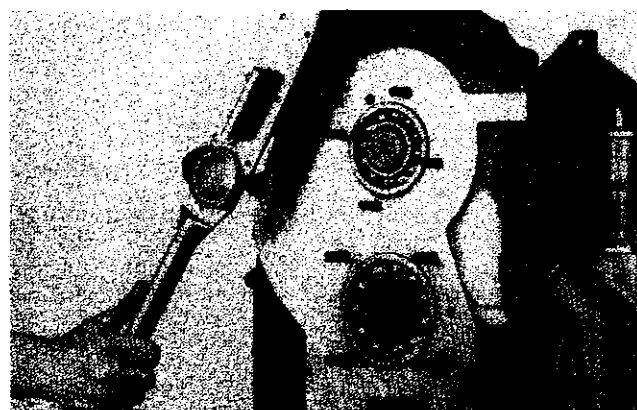


Figure 201

Install rear cover bolts and washers, tighten to specified torque. (See torque chart)



Figure 202

From the front, tap on the low clutch shaft. The low clutch drum will move to the rear and will hit the 3rd clutch gear and the output gear. Tap on low clutch until all three shaft rear bearing locating ring grooves are exposed. Install 3rd clutch rear bearing locating ring.



Figure 203

Install new gasket and 3rd clutch rear bearing cap.



Figure 204

Install washers and stud nuts. Tighten to specified torque. (See torque chart)

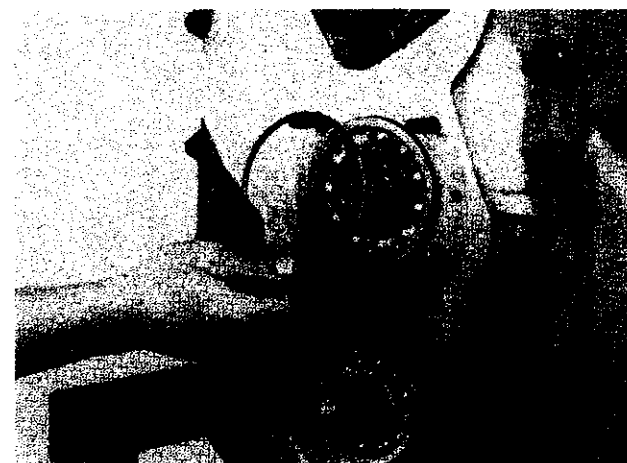


Figure 205

Install low clutch rear bearing locating ring.

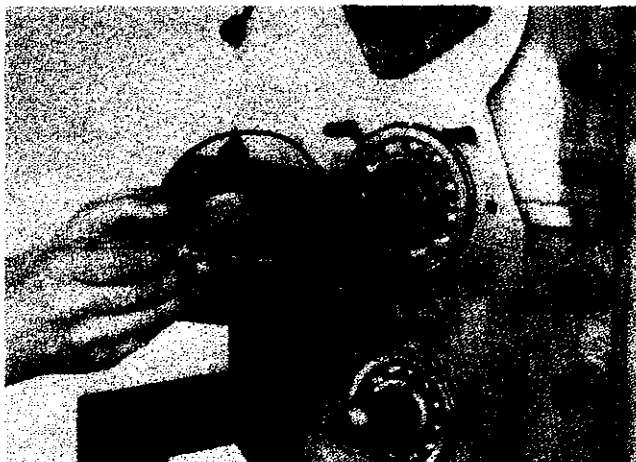


Figure 206

Position new "O" rings on the low clutch rear bearing cap.

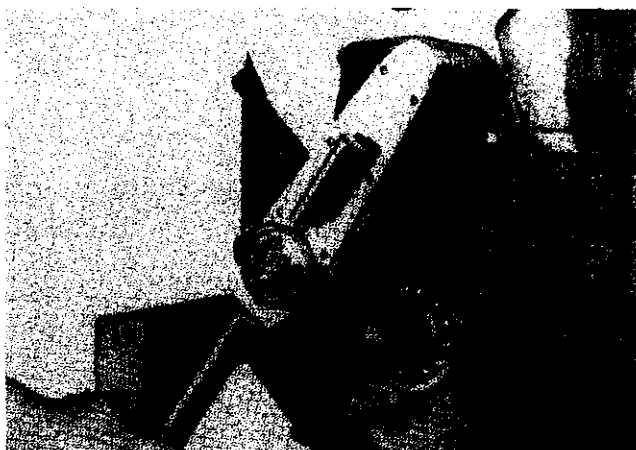


Figure 207

Install bearing cap, washers and stud nuts. Tighten to specified torque. (See torque chart)



Figure 208

Install output shaft rear bearing locating ring.



Figure 209

Apply a light coat of Permatex #2 to the outer diameter of the output shaft oil seal. With lip of seal down, press seal in bearing cap to a depth of .44 [11,2 mm] from outer face of cap. (See assembly instruction page.) Install new gasket and bearing cap on studs.

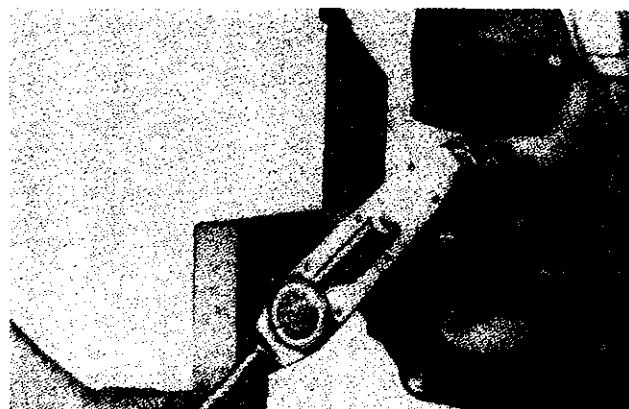


Figure 210

Install bearing cap washers and stud nuts. Tighten to specified torque. (See torque chart)



Figure 211

Position output flange on output shaft. Install "O" ring, washer and flange nut.

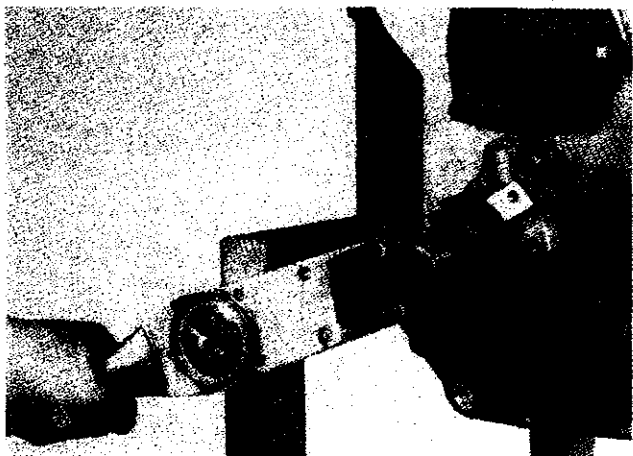


Figure 212

Using a flange retainer to prevent turning, tighten flange nut 200 TO 250 Ft. Lb. torque. [271,2-338,9N.m]



Figure 215

Position the front disconnect shift hub on the output shaft with the shift fork groove to the front.

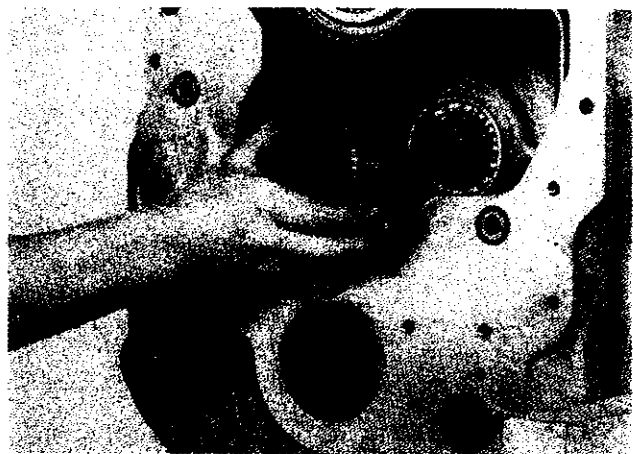


Figure 213

Position the 2nd clutch disc hub on the low clutch shaft.



Figure 216

Position the shift fork in hub groove and align the shift rail and support with shift fork.

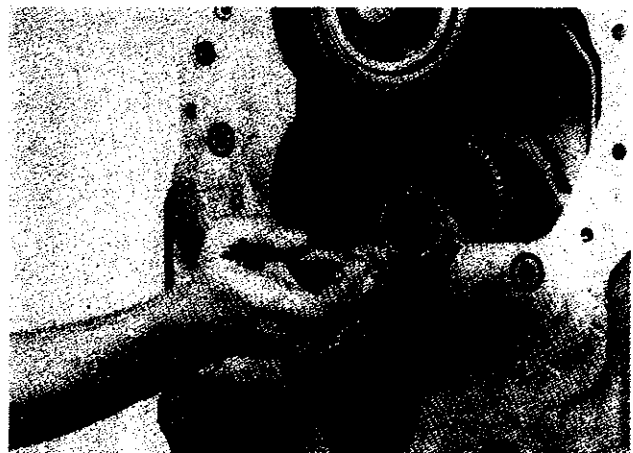


Figure 214

Install disc hub retainer ring.



Figure 217

Install shift fork to rail lock screw. Tighten securely and lock wire to prevent loosening.

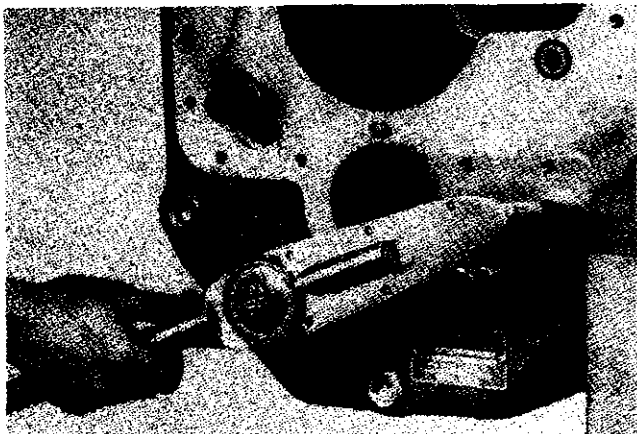


Figure 218

Tighten shift rail support bolts to specified torque. (See torque chart)



Figure 221

Install disconnect shaft bearing.



Figure 219

Install disconnect shaft bearing locating ring.



Figure 222

Install bearing retainer ring.



Figure 220

Position disconnect shaft into pocket in output shaft. Use caution as not to damage output shaft bushing.



Figure 223

Apply a light coat of Permatex #2 to the outer diameter of the front output oil seal. Install the seal with the lip in to a depth of .25 [6,4mm]. (See assembly instruction page). For R-Model front end proceed to Figure 312.

IMPELLER DISASSEMBLY AND REASSEMBLY DISASSEMBLY



Figure 224
Straighten lock tab from bolt head.



Figure 225
Remove impeller to impeller hub bolts.

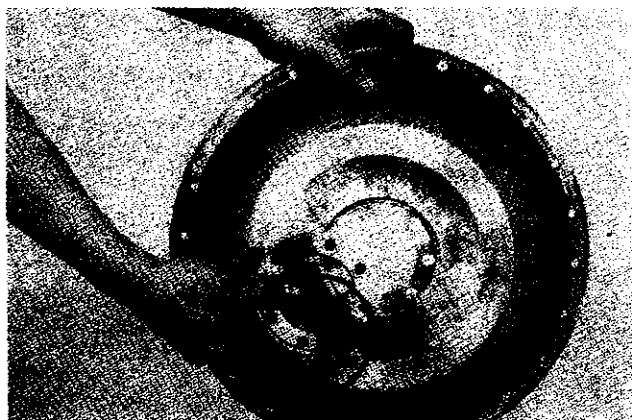


Figure 226
Remove impeller hub and "O" ring.

(See cleaning and inspection page.) REASSEMBLY

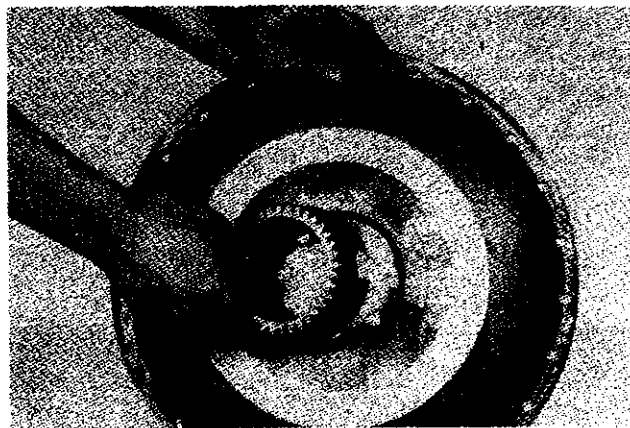


Figure 227
Position a new "O" ring on impeller. Align hub bolt holes with holes in impeller. Using new lock tabs, start bolts in impeller hub.



Figure 228
Tighten impeller hub bolts to specified torque. (See torque chart)



Figure 229
Bend lock tab corners over hub bolt heads.

TURBINE AND IMPELLER COVER DISASSEMBLY AND REASSEMBLY DISASSEMBLY

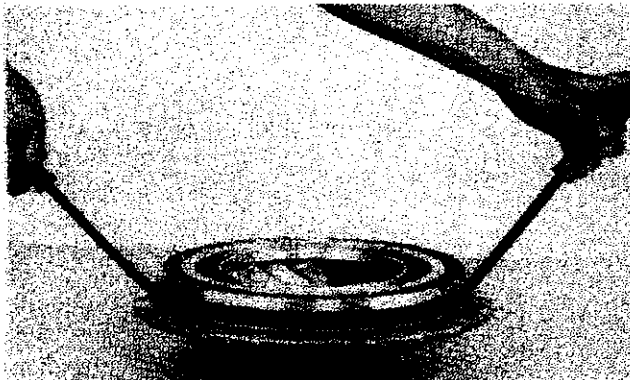


Figure 230

Pry turbine from impeller cover, use caution as not to damage face of impeller cover or turbine. **NOTE:** Some units have a bolted on turbine hub. If either the turbine or hub is replaced see page 66 for reassembly.



Figure 231

Remove impeller cover to impeller "O" ring.

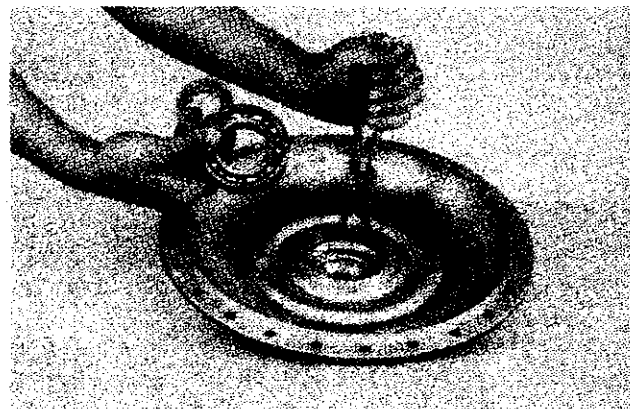


Figure 232

Spread impeller cover bearing retainer ring. Remove bearing and retainer washer.

(See cleaning and inspection page.) REASSEMBLY

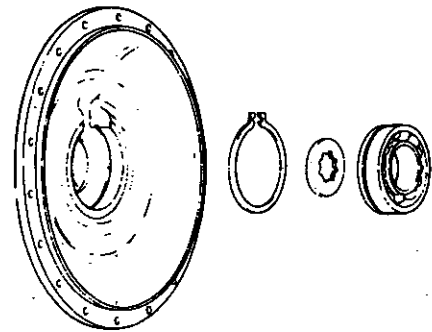


Figure 233

If the impeller cover bearing retaining washer or bearing was replaced, use the following procedure for reassembly. Heat cover 200° to 250°F [93° - 121°C]. Position snap ring in groove. Place bearing retainer washer in cover. While cover is hot press bearing into position spreading ears on snap ring at the same time. Align snap ring groove in bearing with snap ring. Release snap ring. Check ring to be certain it is in full position in groove. Press turbine into bearing in impeller cover.

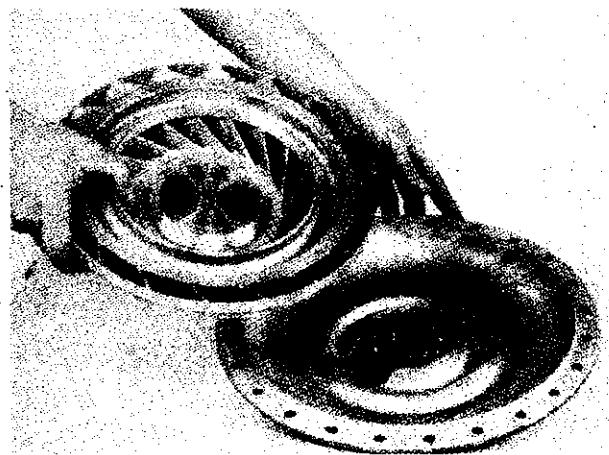


Figure 234

Position turbine in impeller cover and tap into place.

CONVERTER HOUSING DISASSEMBLY & REASSEMBLY

DISASSEMBLY

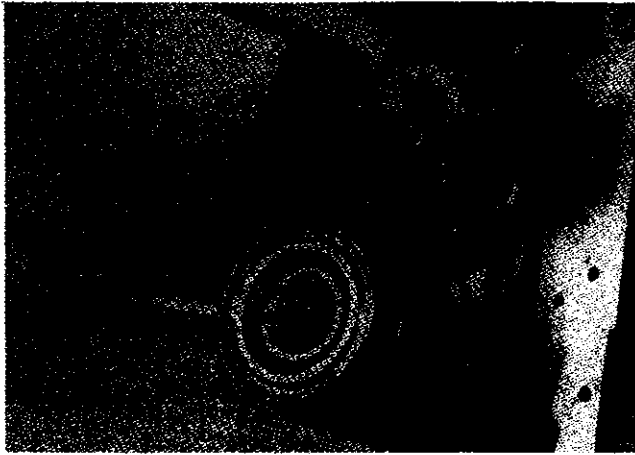


Figure 235

Spread reverse clutch front bearing locating ring. Pry reverse and 2nd clutch from housing.



Figure 236

Using spreading type snap ring pliers, spread turbine shaft bearing locating ring. Tap turbine shaft and bearing from stator support.



Figure 237

Unclinch lock nut by straightening upset metal in notch in idler shaft. Remove nut and spacer.



Figure 238

Remove idler gear and outer taper bearing from idler shaft.

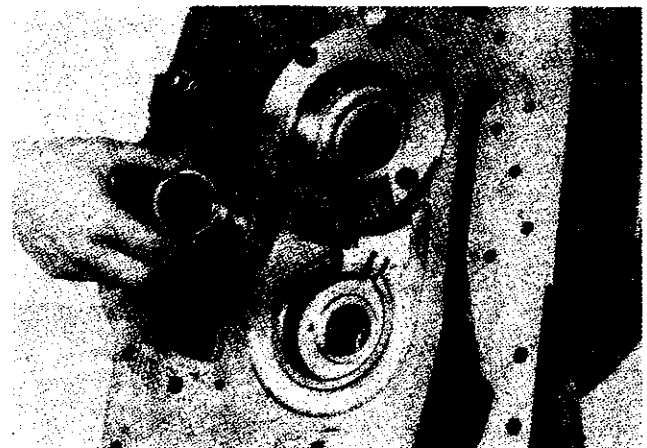


Figure 239

Remove bearing spacer.



Figure 240

Remove inner taper bearing.

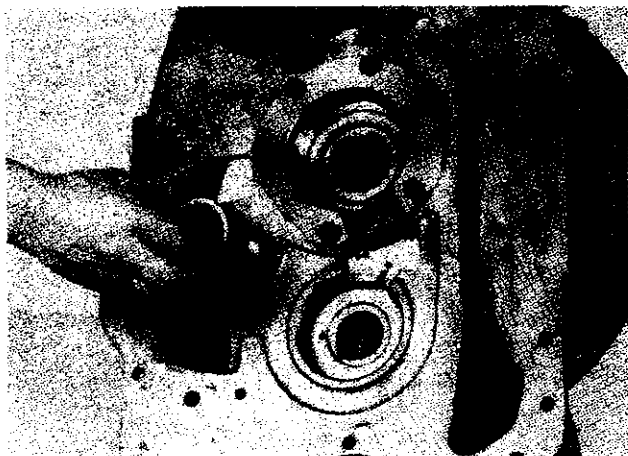


Figure 241

Remove inner spacer.



Figure 244

Tap stator support from housing.



Figure 242

Tap idler shaft from housing, use caution as not to lose shaft lock ball.

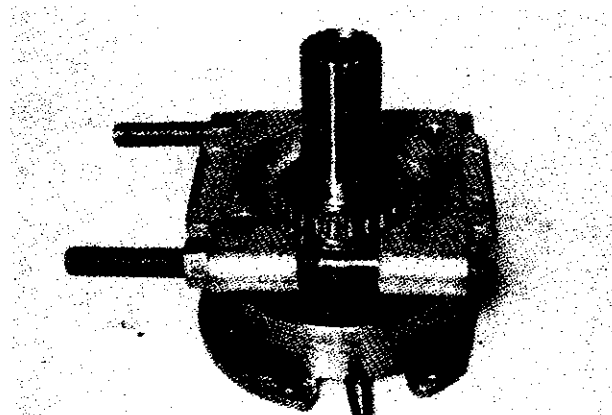


Figure 245

Remove impeller hub bearing from support as shown. Remove support oil sealing ring and ring expander spring.



Figure 243

If stator support is to be removed, remove support bolts.

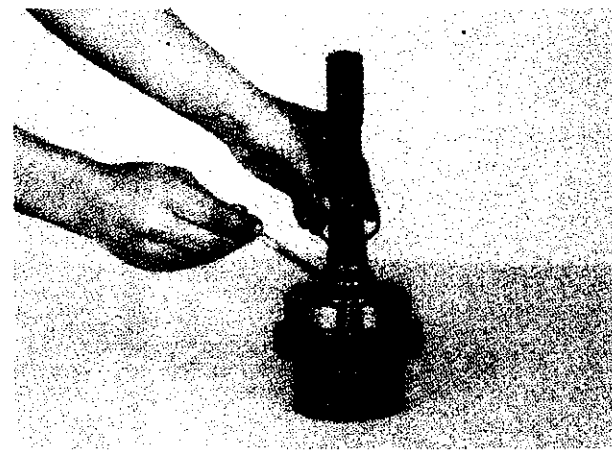


Figure 246

Remove turbine shaft oil sealing ring.

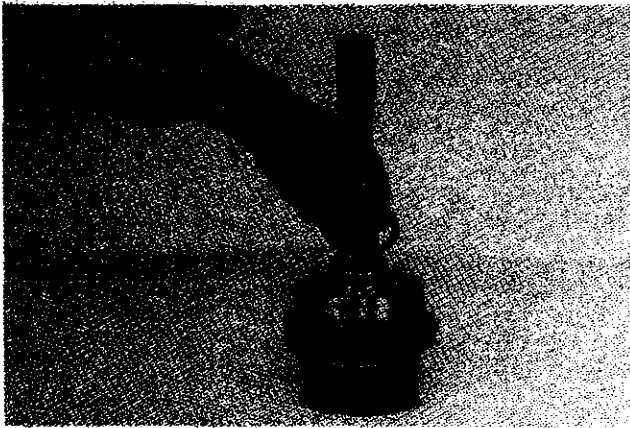


Figure 247

Remove bearing retainer ring and washer.

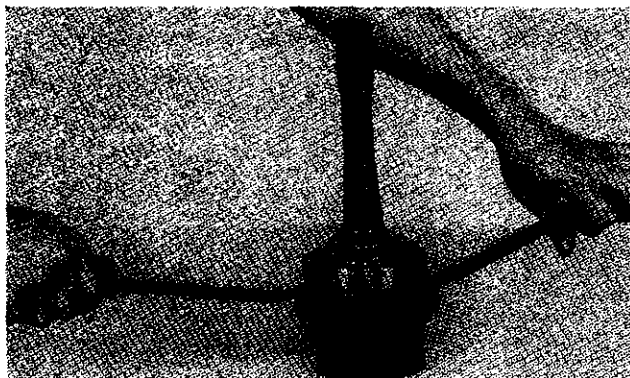


Figure 248

Pry bearing from turbine shaft.

(See cleaning and inspection page.)

CONVERTER HOUSING REASSEMBLY

NOTE: If a new transmission case or converter housing is needed for reassembly see Page 81 for speed sensor bushing installation.

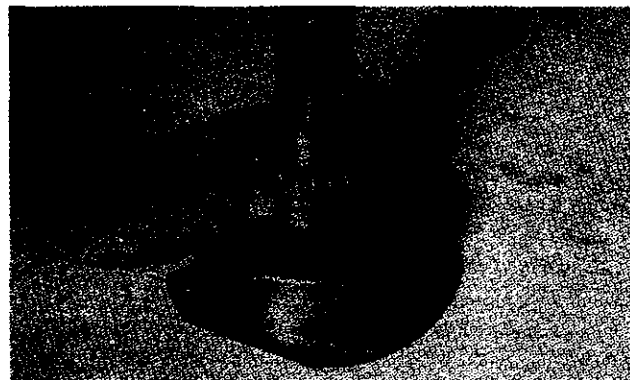


Figure 249

Install new sealing ring expander spring and oil sealing ring on support. Expander spring gap to be 180° from sealing ring hook joint. Press support bearing into position. **NOTE:** Bearing part number must be up.



Figure 250

Position support in converter housing aligning holes in support with holes in housing. Tap support into position.



Figure 251

Install support washers and bolts. Tighten to specified torque. (See torque chart)

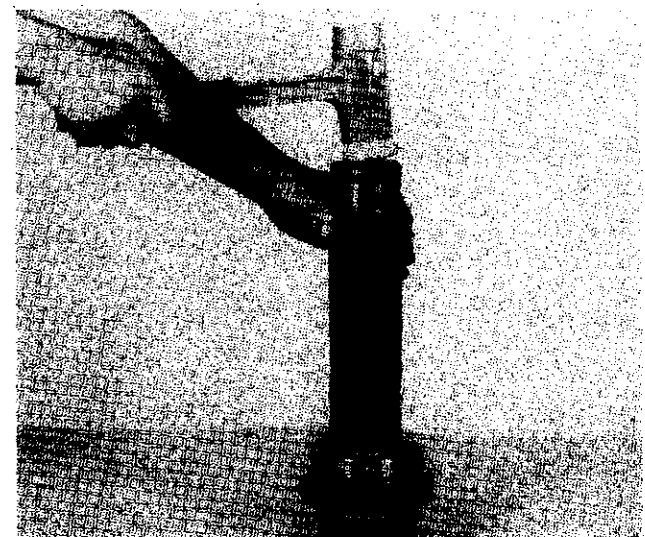


Figure 252

Install turbine shaft bearing on shaft. **NOTE:** Bearing locating ring groove must be down.

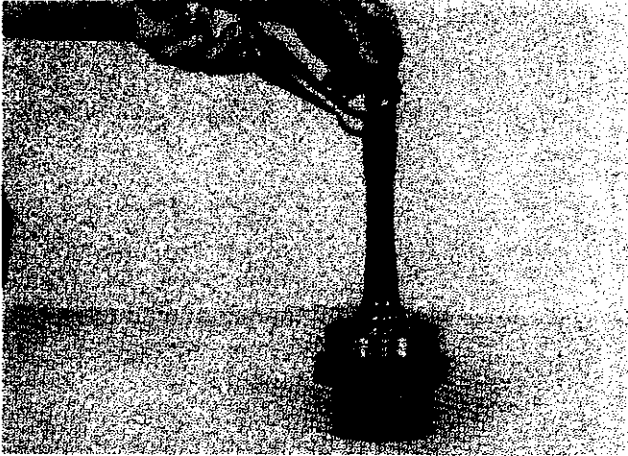


Figure 253

Install bearing washer and retainer ring.

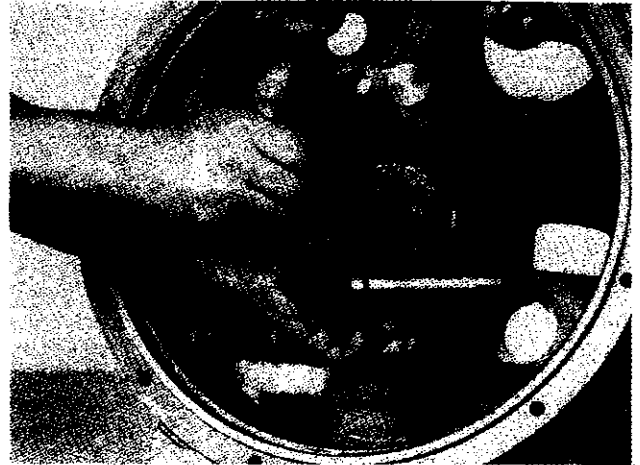


Figure 256

With new "O" ring on shaft, position idler shaft and lock ball in converter housing. Tap shaft into position.

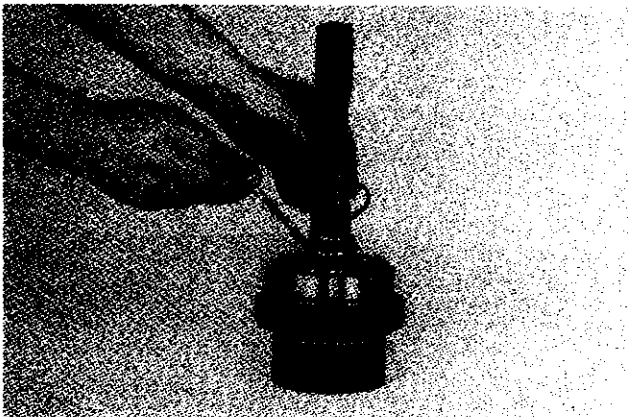


Figure 254

Install turbine shaft oil sealing ring.

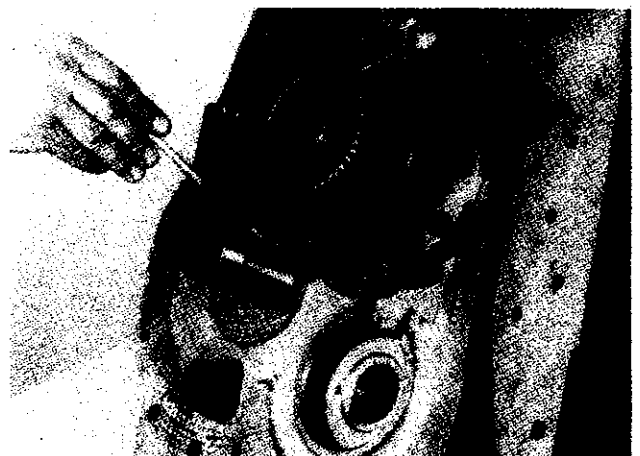


Figure 257

Position shaft lock ball in shaft.



Figure 255

Spread ears on turbine shaft bearing retainer ring located in reaction member support. Tap turbine shaft and bearing into position, being certain bearing snap ring is in full position in snap ring groove.

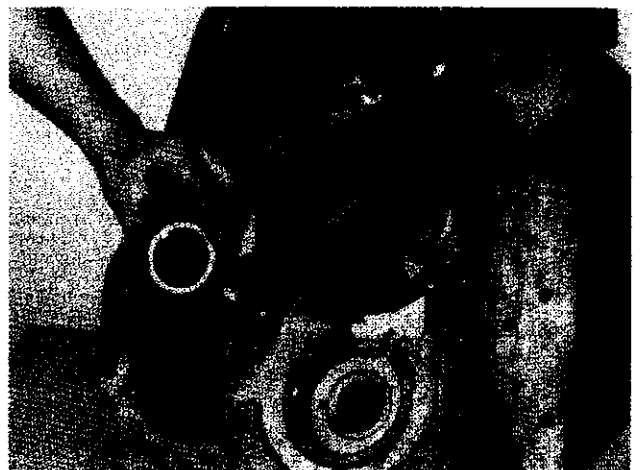


Figure 258

Place bearing spacer on shaft.

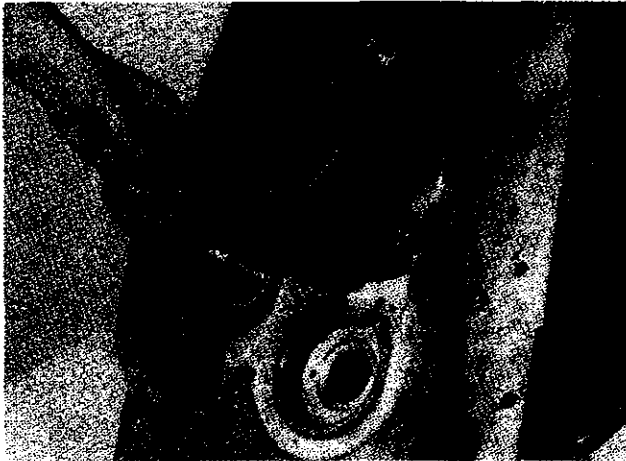


Figure 259

Install idler gear inner taper bearing on shaft with large diameter of taper down.

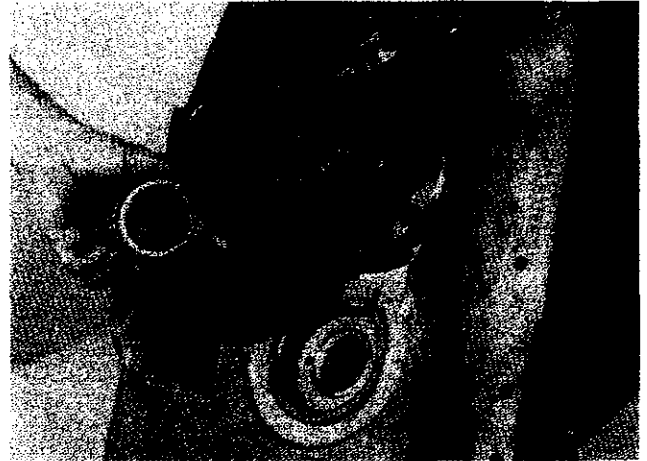


Figure 262

Install outer taper bearing on shaft with large diameter of taper out.



Figure 260

Place idler gear and taper bearing cup assembly on bearing with hub of gear up.

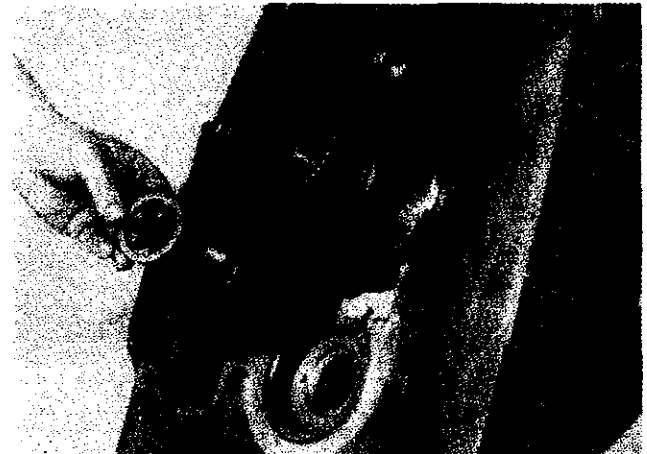


Figure 263

Place outer bearing spacer on shaft.



Figure 261

Position bearing spacer on shaft.



Figure 264

Install lock nut.



Figure 265

Tighten nut 200 to 250 Ft. Lbs. torque. [271,2-338,9N.m]

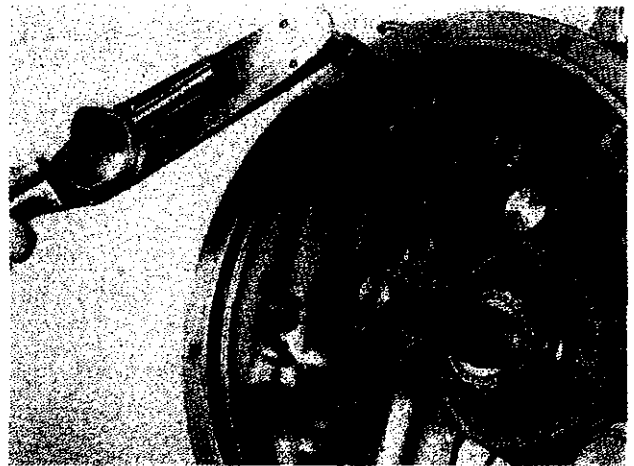


Figure 268

Tighten cap screws to specified torque. (See torque chart)



Figure 266

Stake nut securely in shaft notch.



Figure 269

If pump idler gear locating ring was removed, install ring in inner ring groove.



Figure 267

Position charging pump drive gear and install cap screws.

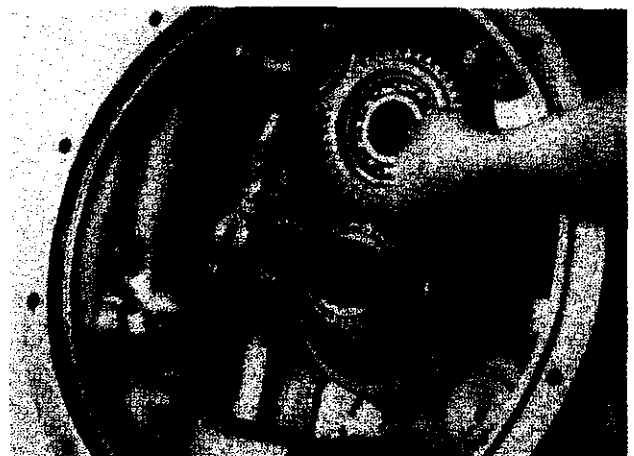


Figure 270

Position idler gear and bearing assembly on shaft.



Figure 271

Install gear assembly retainer ring.

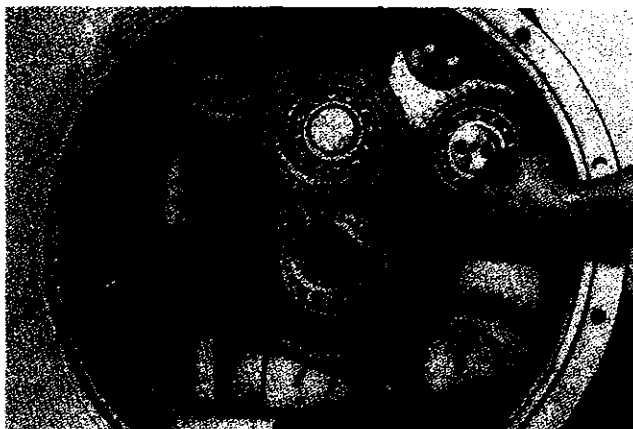


Figure 272

Position auxiliary pump drive gear and install capscrews. Tighten to specified torque. (See torque chart)



Figure 273

Place pilot bearing on 2nd clutch shaft. A light coat of grease will hold bearing in place. Position reverse and 2nd speed clutch on disc hub aligning splines of disc hub with internal teeth of 2nd speed clutch friction discs. Disc hub must be in full position with friction discs. Do not force this operation.

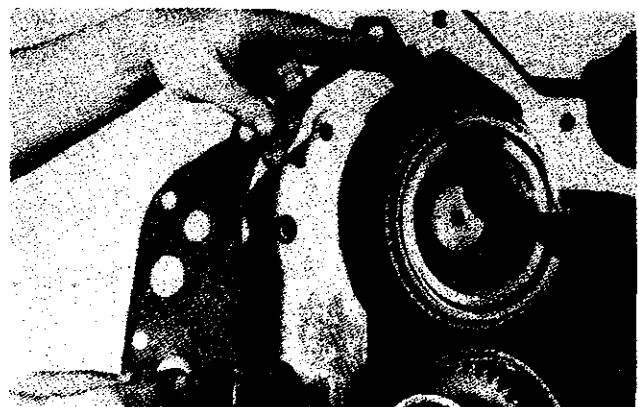


Figure 274

Position new "O" rings and gasket on front of transmission housing. A light coat of chassis grease will hold "O" rings and gasket in place.



Figure 275

Position pilot bearing on forward clutch shaft.



Figure 276

The use of two aligning studs will facilitate aligning the converter housing to the transmission housing. Install converter housing assembly to transmission assembly using extreme caution as to align the clutch pilots into the clutch disc hubs. As the clutch pilots enter the discs hubs, turn the turbine shaft and output shaft back and forth. This will help align all of the clutch inner discs with the disc hubs. **DO NOT FORCE THIS OPERATION.**



Figure 277

Spread ears on the reverse clutch front bearing snap ring. Lock pliers open to hold snap ring open. Tap converter housing in place. Use caution as not to damage reverse clutch front piston ring. Note aligning stud.

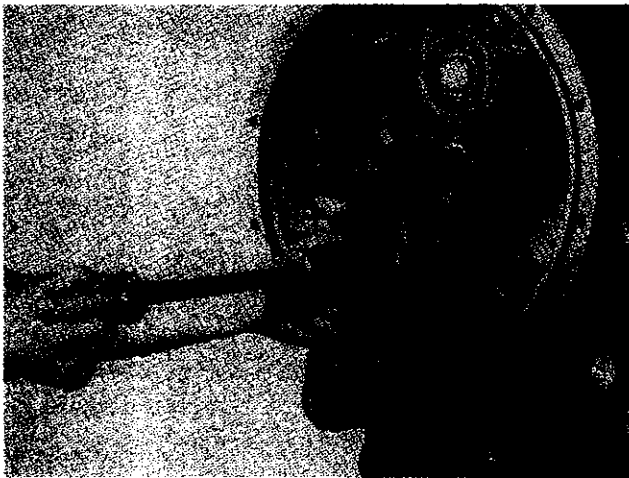


Figure 278

Install a capscREW in the front and one in the rear of the converter housing and snug up but do not tighten. This will hold the converter housing to the transmission housing. Using a hook type hammer puller as shown pull the reverse clutch gear toward the front of the converter housing. This will move the reverse and 2nd clutch assembly forward to align the snap ring groove in the bearing with the snap ring in the housing. Being certain bearing snap ring is in full position in snap ring groove, remove pliers.



Figure 279

When all the clutches are properly aligned, the converter housing will be tight against the transmission housing. Install two housing to housing capscREWS and lockwashers. Remove aligning studs. Install remaining capscREWS and lockwashers. Tighten capscREWS to specified torque. (See torque chart)

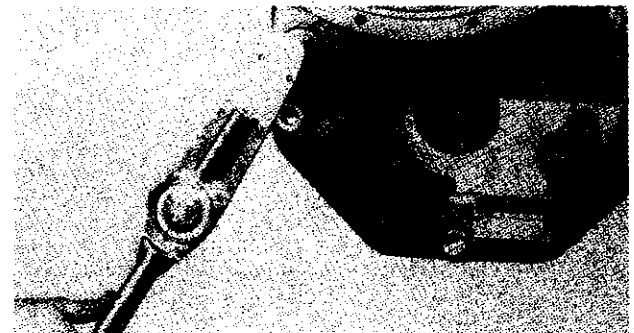


Figure 280

Install oil screen. Assemble and tighten 10 to 15 Ft. Lbs. torque. [13,6-20,3N.m]

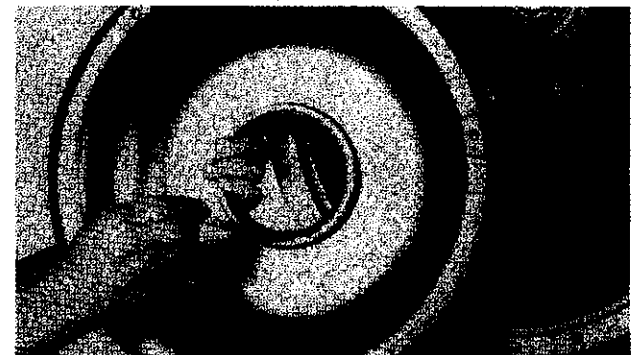


Figure 281

Apply a light coat of Dow Corning RTV-03-7069 sealant to O.D. of oil baffle or counter bore in converter housing. Remove immediately any excess sealant that could enter the oil circuit. Assemble new oil baffle oil seal in baffle. Position oil baffle puller screw holes 15° to 30° either side of vertical center line. Tap baffle into position until baffle shoulders in converter housing.

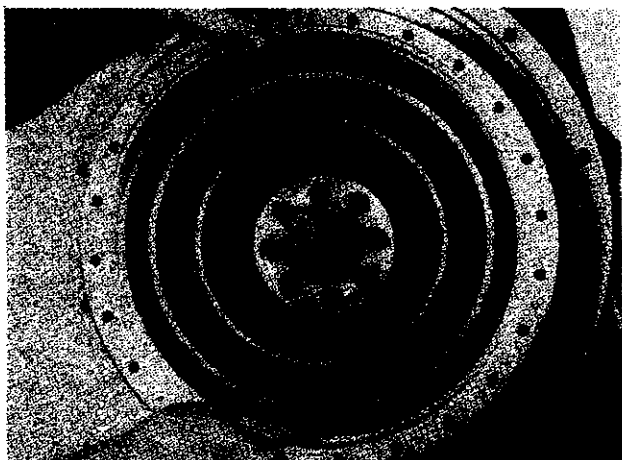


Figure 282

Install impeller and hub assembly using caution as not to damage the oil baffle oil seal.



Figure 283

Position impeller hub bearing spacer on stator support.

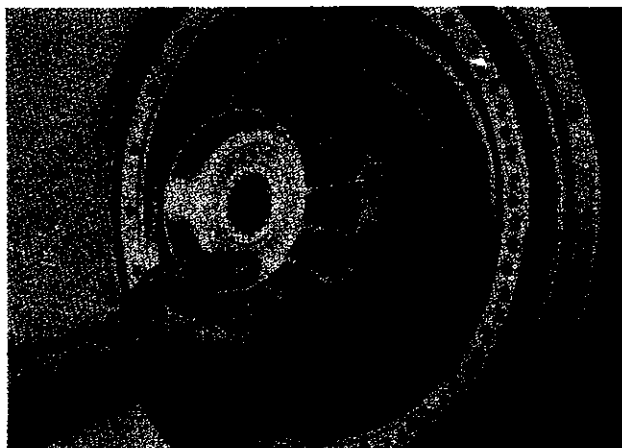


Figure 284

Install fixed reaction member. For freewheel reaction member, see Figure 285.

FREEWHEEL ASSEMBLY

NOTE: The freewheel assembly cannot be serviced. If the freewheel is damaged it must be replaced as an assembly.



Figure 285

Install outer race and sprag assembly in reaction member.
NOTE: Undercut shoulder of race must go toward the rear of the reaction member.

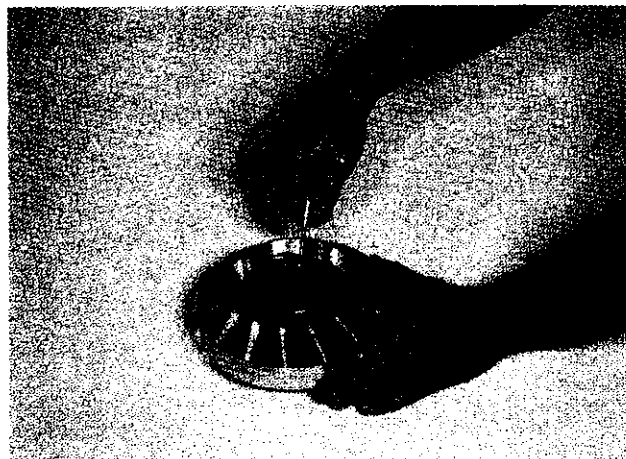


Figure 286

Install outer race to reaction member retainer ring.

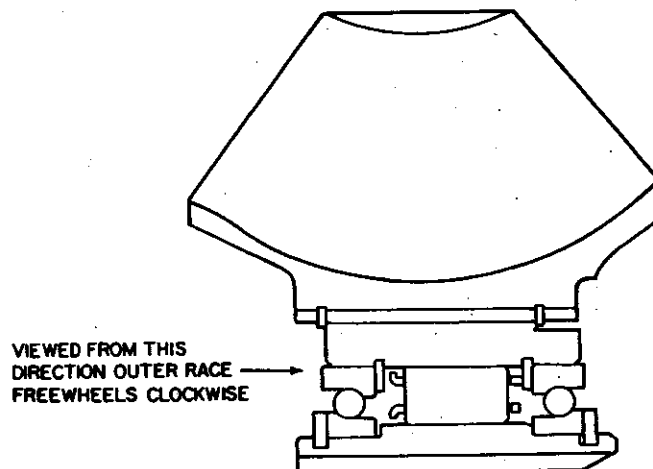


Figure 287

**MUST FREEWHEEL IN
CLOCKWISE ENGINE ROTATION**

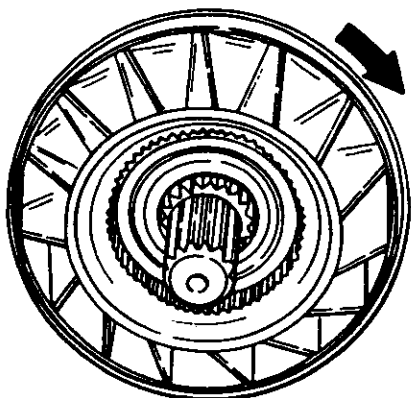


Figure 288

Position reaction member to impeller hub gear spacer on reaction member support. Install reaction member on support. Check rotation of freewheeling reaction member to be sure of proper freewheel assembly.

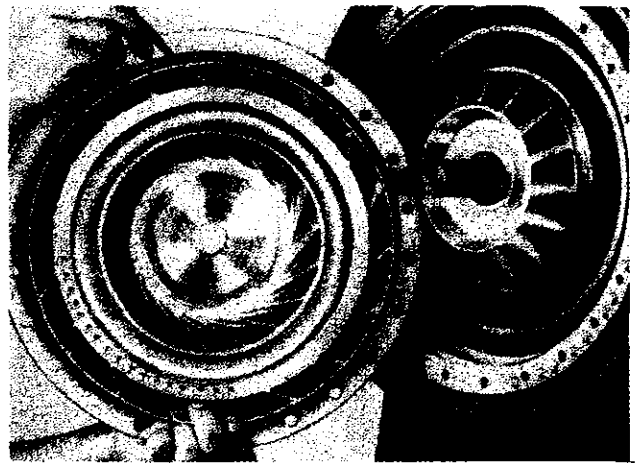


Figure 291

With a new impeller cover to impeller "O" ring in place, install turbine and impeller cover assembly on turbine shaft.

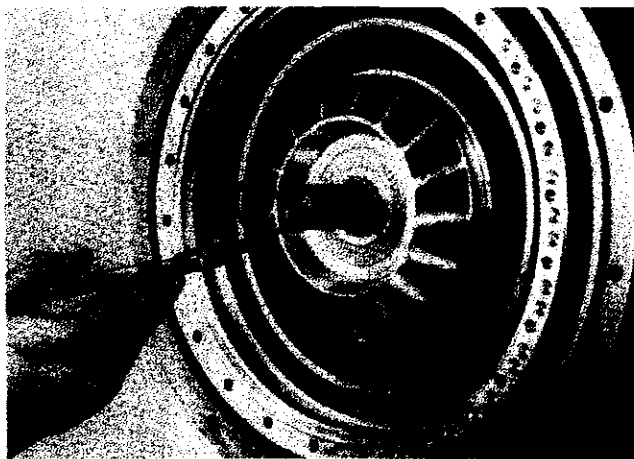


Figure 289

Install reaction member retainer ring.

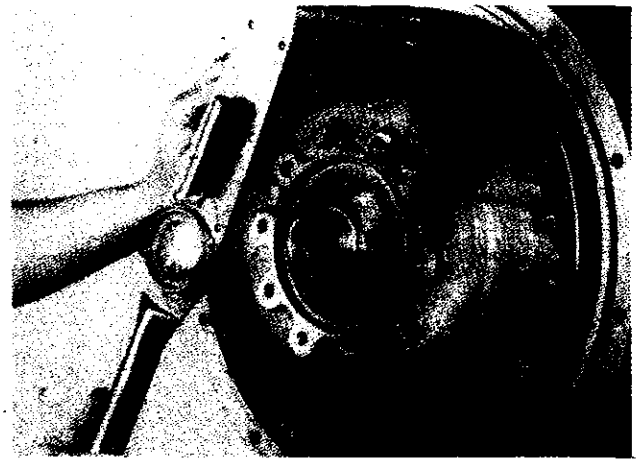


Figure 292

Install impeller cover to impeller washers and bolts. Tighten to specified torque. (See torque chart)

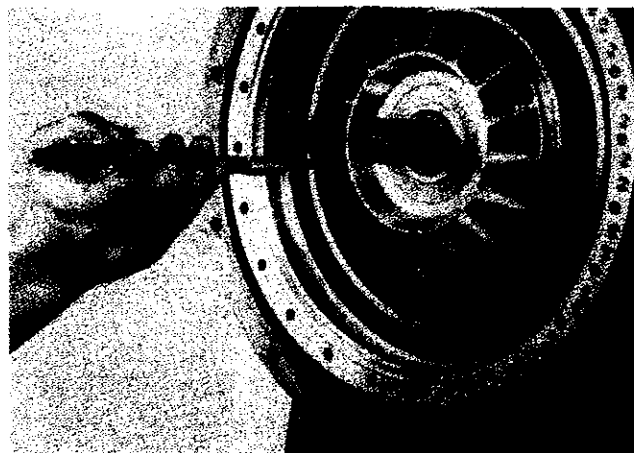


Figure 290

Install turbine locating ring.

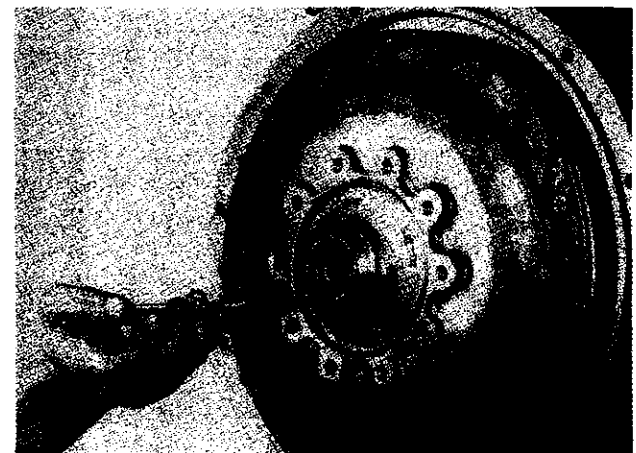


Figure 293

Install turbine retainer ring. See Figure 293-A.

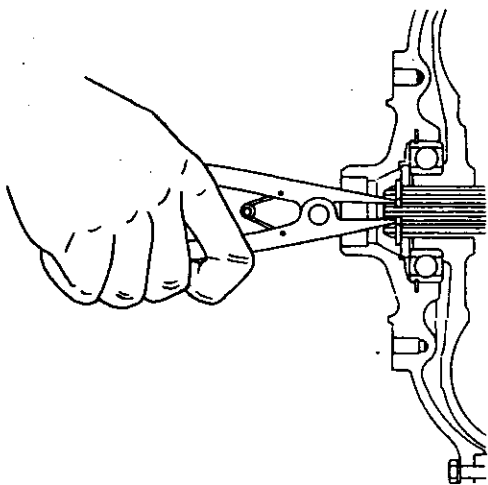


Figure 293-A

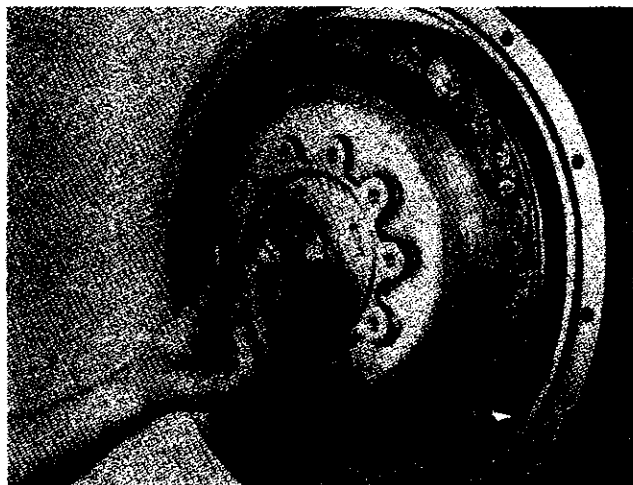


Figure 294

Position new "O" ring on impeller cover bore plug. Lubricate ring to facilitate reassembly. Install plug in cover.

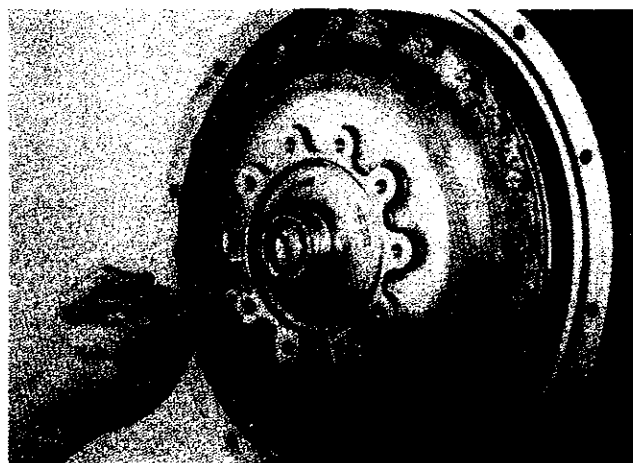


Figure 295

Install bore plug retainer ring.

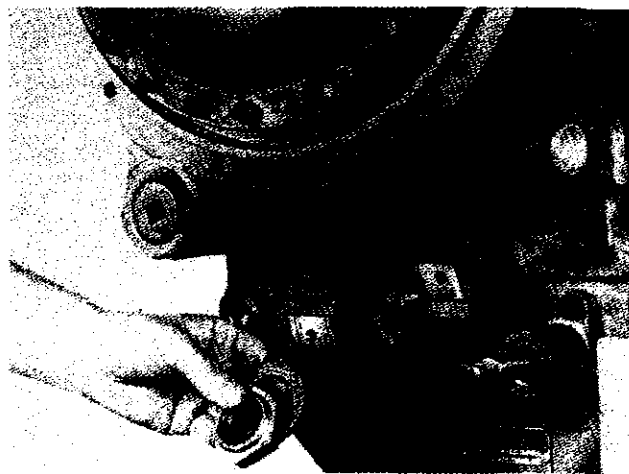


Figure 296

Place front output flange on shaft. Install "O" ring, washer and nut.

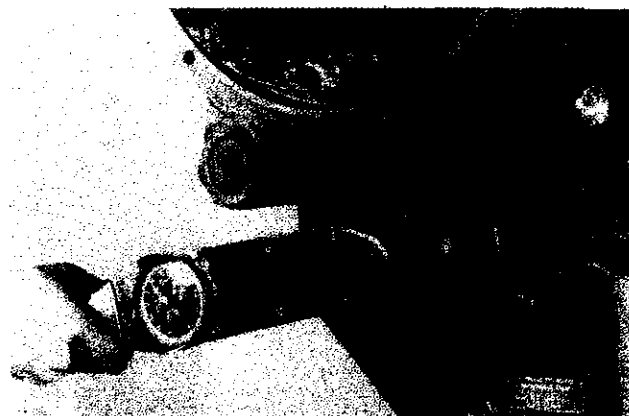


Figure 297

Use a flange retainer to prevent flange from turning and tighten nut 200 to 250 Ft. Lbs. torque. [271,2-338-9N.m]

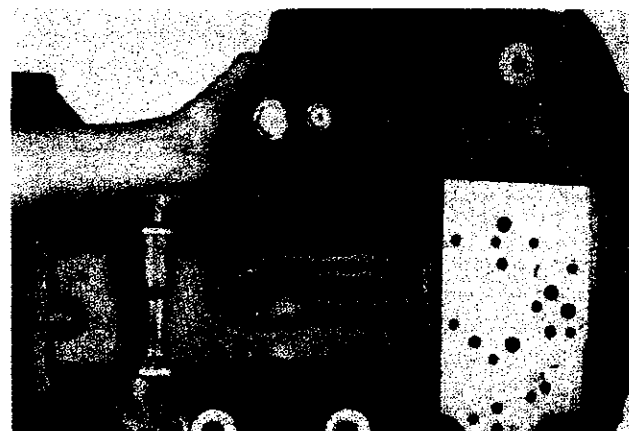


Figure 298

Using a new gasket and "O" ring, position charging pump assembly on studs. Install washers, nuts and capscrews.

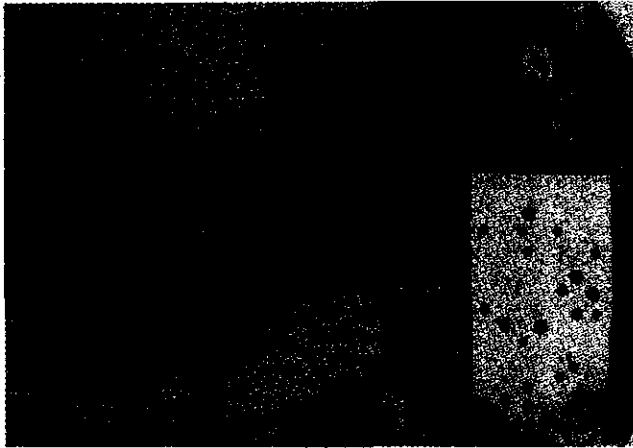


Figure 299

Tighten stud nuts and capscrews to specified torque. (See torque chart)

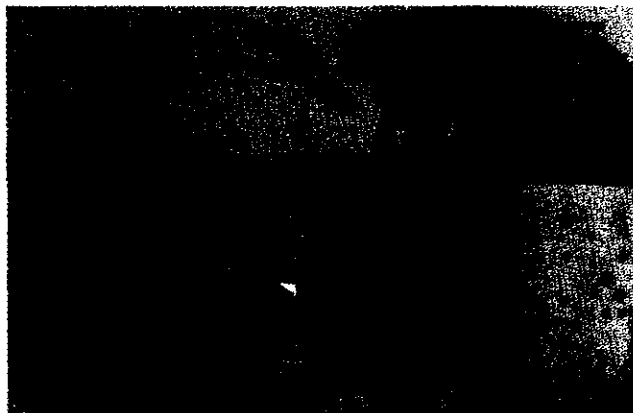


Figure 300

Install new oil filter cartridge. **NOTE:** It is recommended that the filter cartridge be changed after 50 and 100 hours of operation on new and rebuilt or repaired units.



Figure 301

Place a new control valve gasket on housing. **NOTE:** The use of aligning studs will facilitate valve installation.



Figure 302

Position valve assembly on aligning studs. Install capscrews, remove aligning studs, install remaining capscrews and tighten to specified torque (See torque chart)



Figure 303

If auxiliary pump is not used, install gasket and pump hole cover. Install bolts and washers and tighten to specified torque. (See torque chart)



Figure 304

See special section on page 64 for drive plate installation.

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.

CAUTION: Care should be exercised to avoid skin rashes, fire hazards and inhalation of vapors when using solvent type cleaners.

Bearings

Remove bearings from cleaning fluid and strike flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning. Do not spin bearings when drying. Bearings may be rotated slowly by hand to facilitate drying process.

Housings

Clean interior and exterior of housings, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

CAUTION: Care should be exercised to avoid inhalation of vapors and skin rashes when using alkali cleaners.

All parts cleaned must be thoroughly dried immediately by using moisture-free compressed air or soft, lintless absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil or lapping compound.

INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

Bearings

Carefully inspect all rollers; cages and cups for wear, chipping or nicks to determine fitness of bearings for further use. Do not replace a bearing cone or cup individually without replacing the mating cup or cone at the same time. After inspection, dip bearings in Automatic Transmission Fluid and wrap in clean lintless cloth or paper to protect them until installed.

Oil Seals, Gaskets, Etc.

Replacement of spring load oil seals, "O" rings, metal sealing rings, gaskets and snap rings is more economical when unit is disassembled than premature overhaul to replace these parts at a future time. Further loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed. Cutting, scratching, or curling under of lip of seal seriously impairs its efficiency. Apply a thin coat of Permatex No. 2 on the outer diameter of the oil seal to assure an oil tight fit into the retainer. When assembling new metal type sealing rings, same should be lubricated with coat of chassis grease to stabilize rings in their grooves for ease of assembly of mating members. Lubricate all "O" rings and seals with recommended type Automatic Transmission Fluid before assembly.

Gears and Shafts

If magna-flux process is available, use process to check parts. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks or scores. If gear teeth show spots where case hardening is worn through or cracked, replace with new gear. Small nicks may be removed with suitable hone. Inspect shafts and quills to make certain they are not sprung, bent, or splines twisted, and that shafts are true.

Housing, Covers, etc.

Inspect housings, covers and bearing caps to be certain they are thoroughly clean and that mating surfaces, bearing bores, etc., are free from nicks or burrs. Check all parts carefully for evidence of cracks or condition which would cause subsequent oil leaks or failures.

SERVICING MACHINE AFTER TRANSMISSION OVERHAUL

The transmission, torque converter, and its allied hydraulic system are important links in the drive line between the engine and the wheels. The proper operation of either unit depends greatly on the condition and operation of the other; therefore, whenever repair or overhaul of one unit is performed, the balance of the system must be considered before the job can be considered completed.

After the overhauled or repaired transmission has been installed in the machine, the oil cooler, and connecting hydraulic system must be thoroughly cleaned. This can be accomplished in several manners and a degree of judgment must be exercised as to the method employed.

The following are considered the minimum steps to be taken:

1. Drain engine system thoroughly.
2. Disconnect and clean all hydraulic lines. Where feasible, hydraulic lines should be removed from machine for cleaning.
3. Replace oil filter elements, cleaning out filter cases thoroughly.
4. The oil cooler must be thoroughly cleaned. The cooler should be "back flushed" with oil and compressed air until all foreign material has been removed. Flushing in direction of normal oil flow will not adequately clean the cooler. If necessary, cooler assembly should be removed from

machine for cleaning, using oil, compressed air and steam cleaner for that purpose. **DO NOT** use flushing compounds for cleaning purposes.

5. On remote mounted torque converters remove drain plug from torque converter and inspect interior of converter housing, gears, etc. If presence of considerable foreign material is noted, it will be necessary that converter be removed, disassembled and cleaned thoroughly. It is realized this entails extra labor; however, such labor is a minor cost compared to cost of difficulties which can result from presence of such foreign material in the system.
6. Reassemble all components and use only type oil recommended in lubrication section. Fill transmission through filler opening until fluid comes up to **LOW** mark on transmission dipstick.

Run engine two minutes at 500-600 RPM to prime torque converter and hydraulic lines. Recheck level of fluid in transmission with engine running at idle (500-600 RPM).

Add quantity necessary to bring fluid level to **LOW** mark on dipstick. Recheck with hot oil (180-200° F.) [82, 2-93, 3° C].

Bring oil level to **FULL** mark on dipstick.

7. Recheck all drain plugs, lines, connections, etc., for leaks and tighten where necessary.

TOWING OR PUSH STARTING

Before towing the vehicle, be sure to lift the rear wheels off the ground or disconnect the driveline to avoid damage to the transmission during towing.

NOTE: If the transmission has 4 wheel drive, disconnect both front and rear drive-lines. Because of the design of the hydraulic system, the engine cannot be started by pushing or towing.

SPECIFICATIONS AND SERVICE DATA—POWER SHIFT TRANSMISSION AND TORQUE CONVERTER

CONVERTER OUT PRESSURE	Converter outlet oil temp. 180° - 200° F. [82,3° - 93,3° C]. Transmission in NEUTRAL . Operating specifications: 25 P.S.I. [172,4 kPa] minimum pressure at 2000 R.P.M. engine speed AND a maximum of 70 P.S.I. [482,6 kPa] outlet pressure with engine operating at no-load governed speed.
CONTROLS	Forward and Reverse — Manual Speed Selection — Manual
CLUTCH TYPE	Multiple discs, hydraulically actuated, spring released, automatic wear compensation and no adjustment. All clutches oil cooled and lubricated.
CLUTCH INNER DISC	Friction.
CLUTCH OUTER DISC	Steel.

OIL FILTRATION	Full flow oil filter safety by-pass, also strainer screen in sump at bottom of transmission case.
CLUTCH PRESSURE	180-220 psi [1241,1 - 1516,8 kPa] — With parking brake set (see note), oil temperature 180° - 200° F. [82,2° - 93,3° C], engine at idle (400 to 600 RPM), shift thru direction and speed clutches. All clutch pressure must be equal within 5 psi, [34,5 kPa] if clutch pressure varies in any one clutch more than 5 psi, [34,5 kPa] repair clutch.

NOTE: Never use service brakes while making clutch pressure checks. Units having brake actuated declutching in forward and/or reverse will not give a true reading.

ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.

LUBRICATION

TYPE OF OIL See Lube Chart.

CAPACITY Consult Operator's Manual on applicable machine model for system capacity. Torque Converter, Transmission and allied hydraulic system must be considered as a whole to determine capacity.

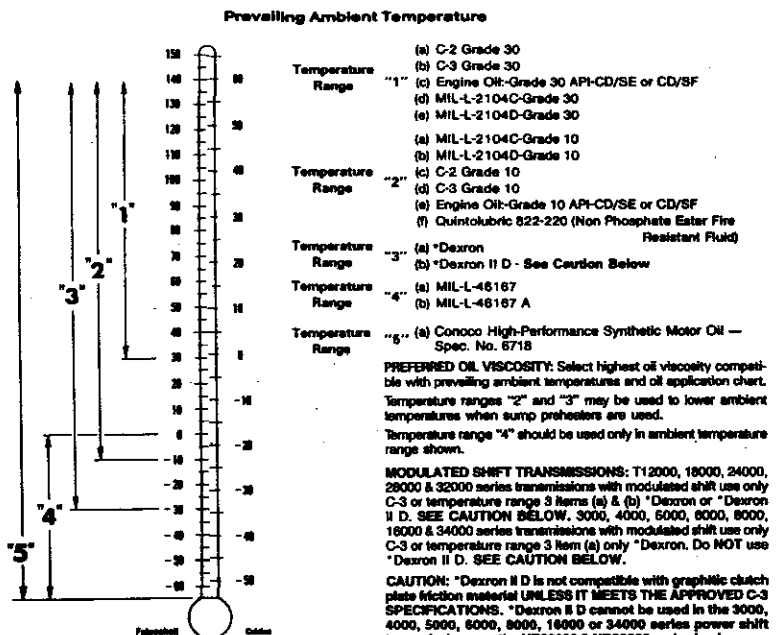
CHECK PERIOD Check oil level DAILY with engine running at 500-600 RPM and oil at 180° to 200° F. [82,2 - 93,3° C]. Maintain oil level to FULL mark.

NORMAL * DRAIN PERIOD Every 500 hours, change oil filter element. Every 1000 hours, drain and refill system as follows: Drain with oil at 150° to 200° F. [65,6 - 93,3° C].

NOTE: It is recommended that filter elements be changed after 50 and 100 hours of operation on new and rebuilt or repaired units.

- (a) Drain transmission
- (b) Drain oil filters, remove and discard filter elements. Clean filter shells and install new elements.
- (c) Refill transmission to LOW mark.
- (d) Run engine at 500-600 RPM to prime converter and lines.
- (e) Recheck level with engine running at 500 - 600 RPM and add oil to bring level to LOW mark. When oil temperature is hot (180-200° F.) [82,2-93,3° C] make final oil level check. **BRING OIL LEVEL TO FULL MARK.**

RECOMMENDED LUBRICANTS FOR CLARK-HURTH COMPONENTS POWER SHIFTED TRANSMISSION AND TORQUE CONVERTERS



*Dexron is a registered trademark of General Motors Corporation.

PREFERRED OIL VISCOSITY: Select highest oil viscosity compatible with prevailing ambient temperatures and oil application chart. Temperature ranges "2" and "3" may be used to lower ambient temperatures when sump preheaters are used. Temperature range "4" should be used only in ambient temperature range shown.

MODULATED SHIFT TRANSMISSIONS: T12000, 18000, 24000, 28000 & 32000 series transmissions with modulated shift use only C-3 or temperature range 3 items (a) & (b) "Dexron" or "Dexron II D. SEE CAUTION BELOW. 3000, 4000, 5000, 6000, 8000, 16000 & 34000 series transmissions with modulated shift use only C-3 or temperature range 3 item (a) only "Dexron. Do NOT use "Dexron II D. SEE CAUTION BELOW.

CAUTION: "Dexron II D is not compatible with graphite clutch plate friction material UNLESS IT MEETS THE APPROVED C-3 SPECIFICATIONS. "Dexron II D cannot be used in the 3000, 4000, 5000, 6000, 8000, 16000 or 34000 series power shift transmissions, or the HR28000 & HR32000 series having converter lock-up, or the C270 series converter having lock-up UNLESS IT MEETS THE APPROVED C-3 SPECIFICATIONS.

Any deviation from this chart must have written approval from the application department of the Clark-Hurth Components Engineering and Marketing Department.

*Normal drain periods and filter change intervals are for average environmental and duty-cycle conditions. Severe or sustained high operating temperatures or very dusty atmospheric conditions will cause accelerated deterioration and contamination. For extreme conditions judgment must be used to determine the required change intervals.

TROUBLE SHOOTING GUIDE

For The

R & HR Model, 18000 Transmission

The following data is presented as an aid to locating the source of difficulty in a malfunctioning unit. It is necessary to consider the torque converter charging pump, transmission, oil cooler, and connecting lines as a complete system when running down the source of trouble since the proper operation of any unit therein depends greatly on the condition and operations of

the others. By studying the principles of operation together with data in this section, it may be possible to correct any malfunction which may occur in the system.

TROUBLE SHOOTING PROCEDURE BASICALLY CONSISTS OF TWO CLASSIFICATIONS: MECHANICAL AND HYDRAULIC.

MECHANICAL CHECKS

Prior to checking any part of the system from a hydraulic standpoint, the following mechanical checks should be made:

1. A check should be made to be sure all control lever linkage is properly connected and adjusted at all connecting points.

2. Check shift levers and rods for binding or restrictions in travel that would prevent full engagement. Shift levers by hand at control valve, if full engagement cannot be obtained, difficulty may be in control cover and valve assembly.

HYDRAULIC CHECKS

Before checking on the torque converter, transmission, and allied hydraulic system for pressures and rate of oil flow, it is essential that the following preliminary checks be made:

Check oil level in transmission. This should be done with oil temperatures of 180 to 200° F. [82,2-93,3° C]. DO NOT ATTEMPT THESE CHECKS WITH COLD OIL. To bring the oil temperature to this specification it is necessary to either work the machine or "stall" out

the converter. Where the former means is impractical, the latter means should be employed as follows:

Engage shift levers in forward and high speed and apply brakes. Accelerate engine half to three-quarter throttle.

Hold stall until desired converter outlet temperature is reached. **CAUTION: FULL THROTTLE STALL SPEEDS FOR AN EXCESSIVE LENGTH OF TIME WILL OVERHEAT THE CONVERTER.**

LOW CLUTCH PRESSURE

Cause	Remedy
1. Low oil level.	1. Fill to proper level.
2. Clutch pressure regulating valve spool stuck open.	2. Clean valve spool and housing.
3. Faulty charging pump.	3. Replace pump.
4. Broken or worn clutch shaft or piston sealing rings.	4. Replace sealing rings.
5. Clutch piston bleed valve stuck open.	5. Clean bleed valves thoroughly.

LOW CONVERTER CHARGING PUMP OUTPUT

1. Low oil level.	1. Fill to proper level.
2. Suction screen plugged.	2. Clean suction screen.
3. Air leaks at pump intake hose and connections or collapsed hose. (R-18000 only)	3. Tighten all connections or replace hose if necessary.
4. Defective oil pump.	4. Replace pump.

OVERHEATING

1. Worn oil sealing rings.	1. Remove, disassemble, and rebuild converter assembly.
2. Worn oil pump.	2. Replace.
3. Low oil level.	3. Fill to proper level.
4. Pump suction line taking air. (R-18000 only)	4. Check oil line connections and tighten securely.

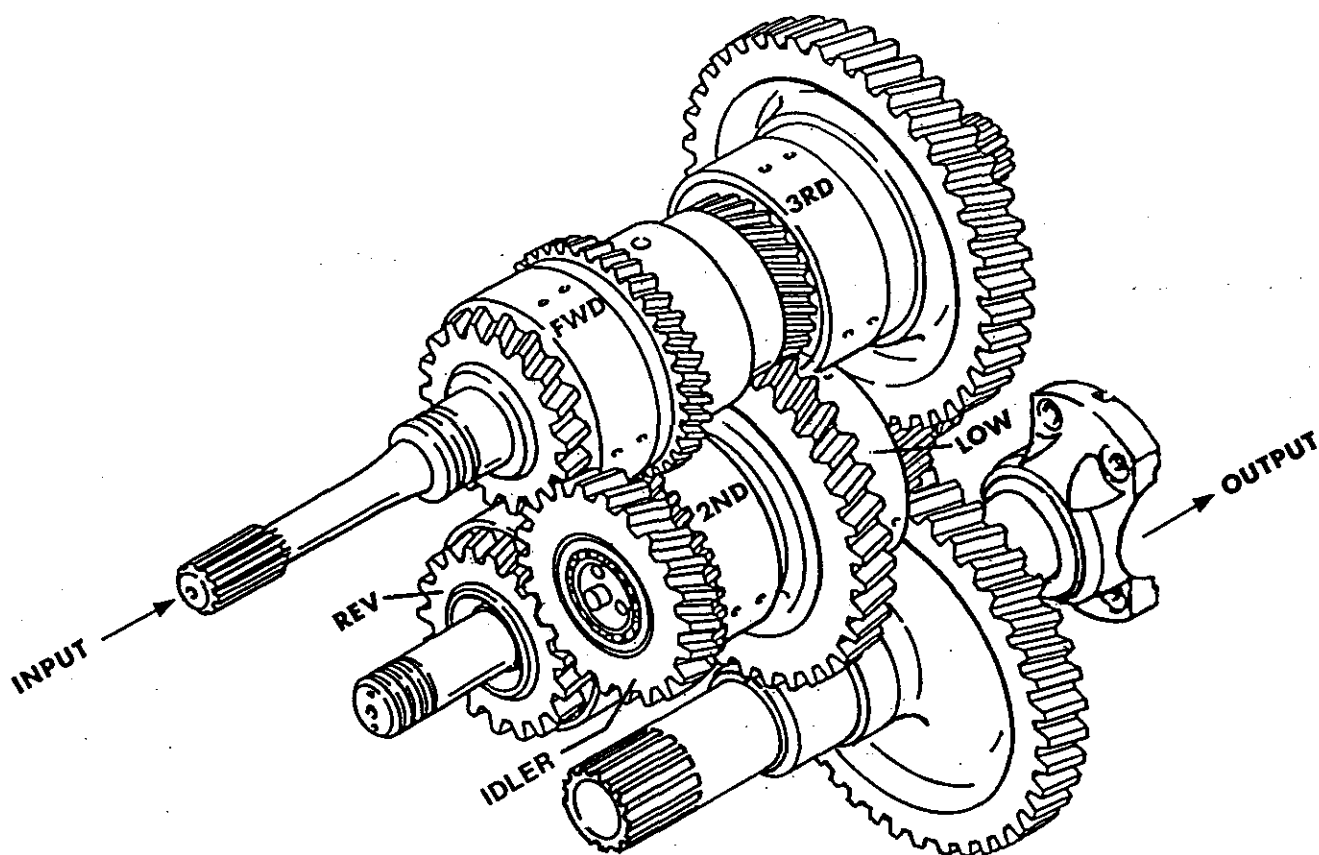
NOISY CONVERTER

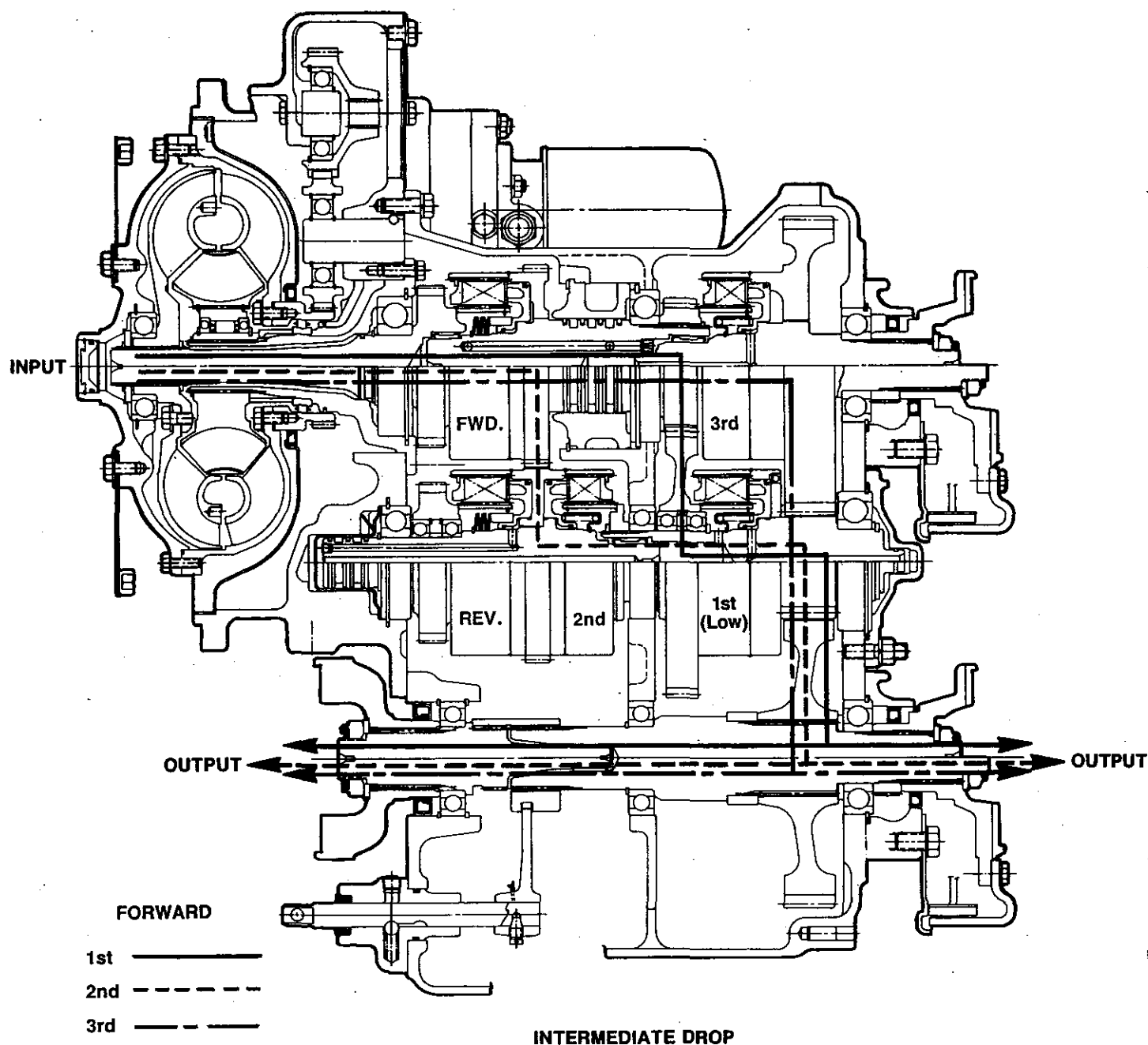
1. Worn oil pump.	1. Replace.
2. Worn or damaged bearings.	2. A complete disassembly will be necessary to determine what bearing is faulty.

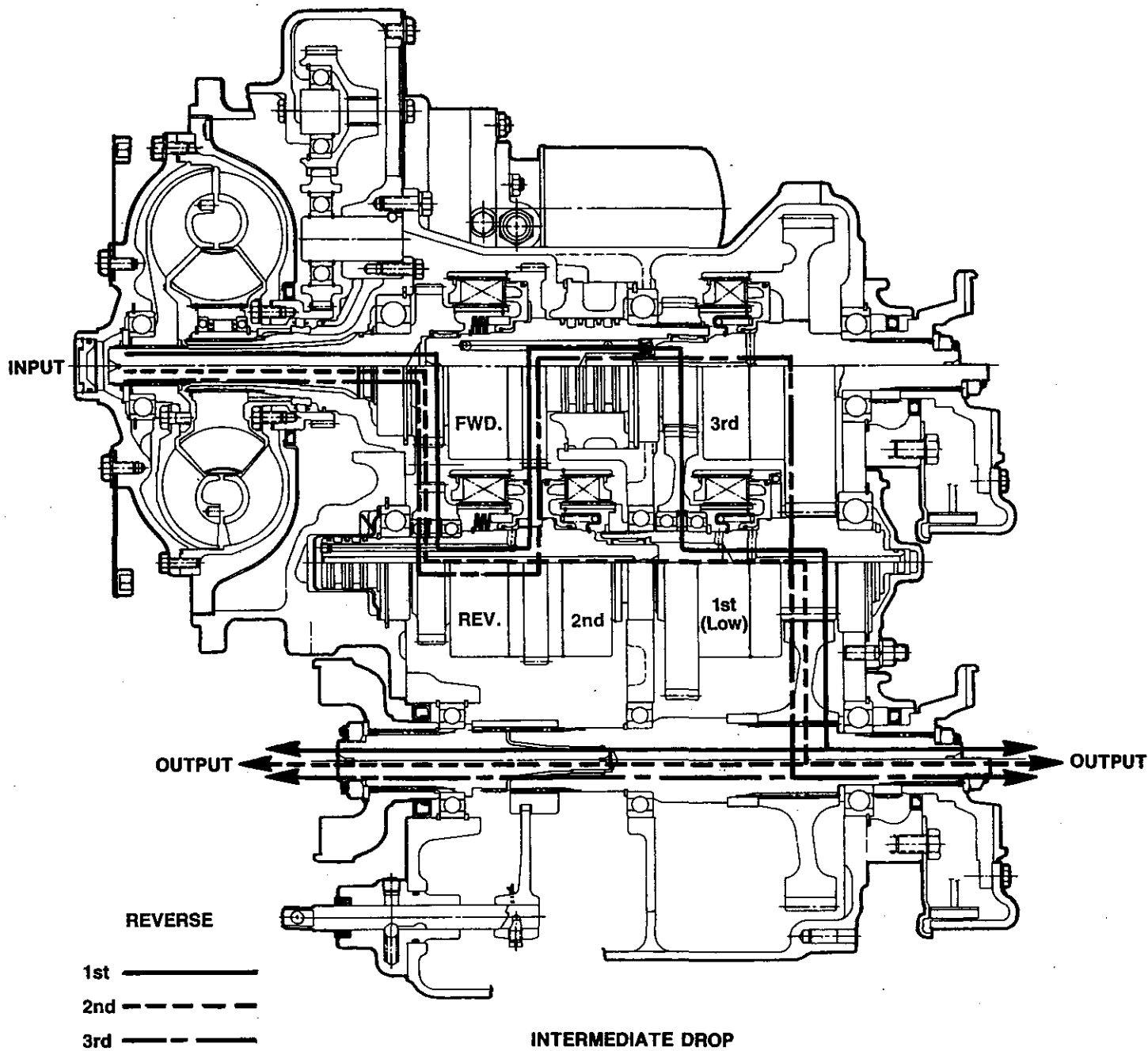
LACK OF POWER

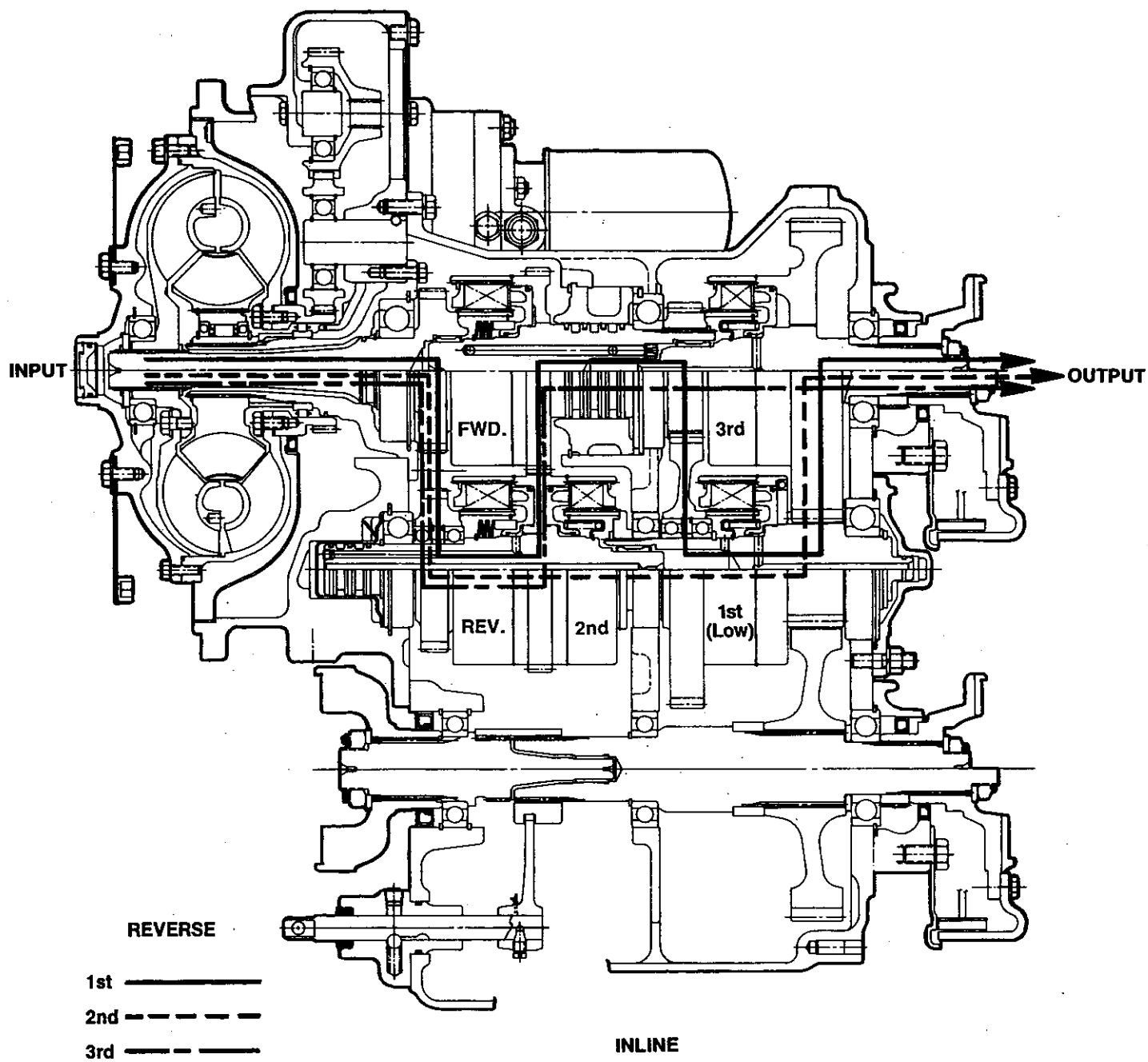
1. Low engine RPM at converter stall.	1. Tune engine check governor.
2. See "Overheating" and make same checks.	2. Make corrections as explained in "Overheating."

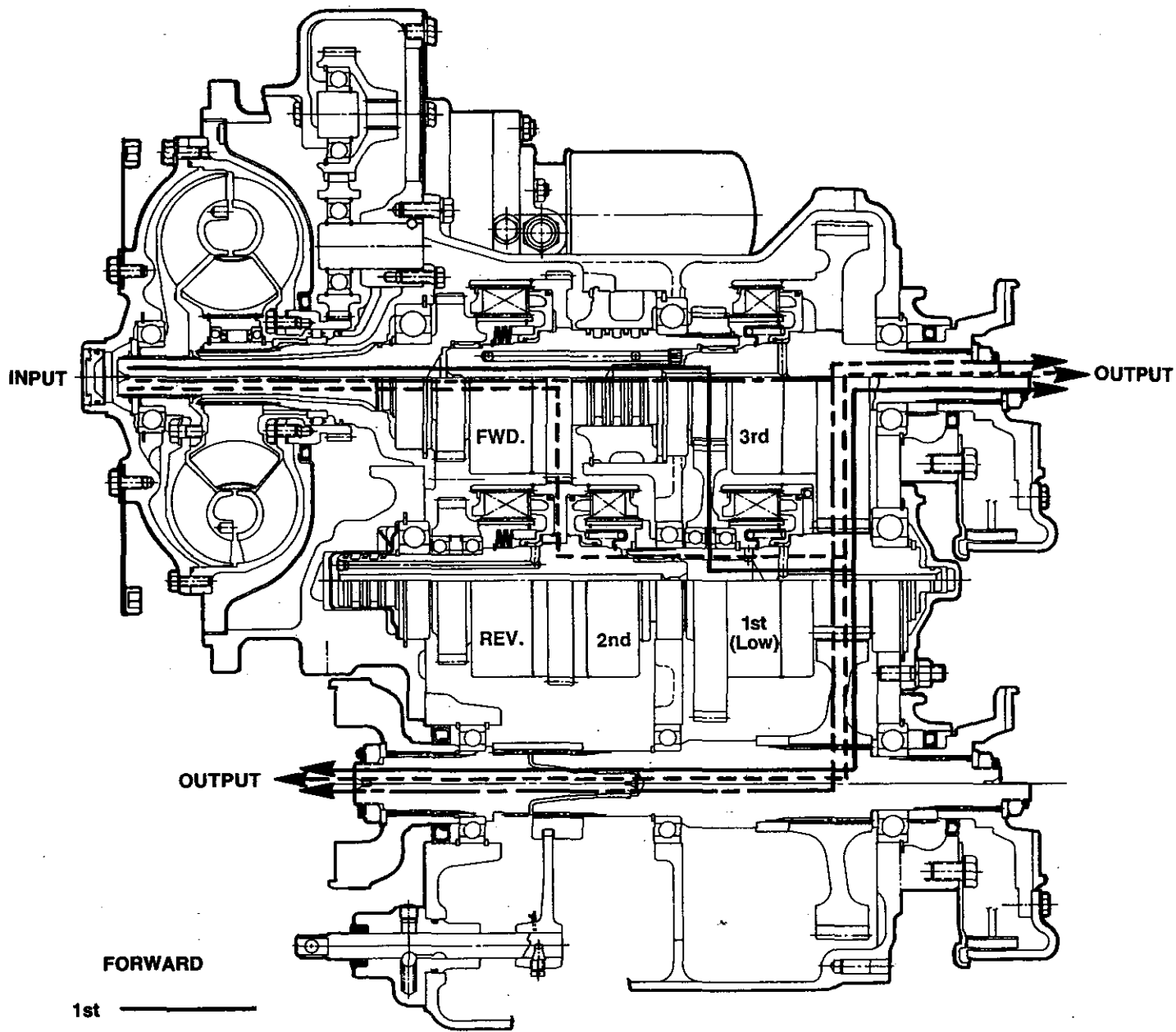
**18000 3 SPEED INTERMEDIATE DROP
CLUTCH AND GEAR ARRANGEMENT**



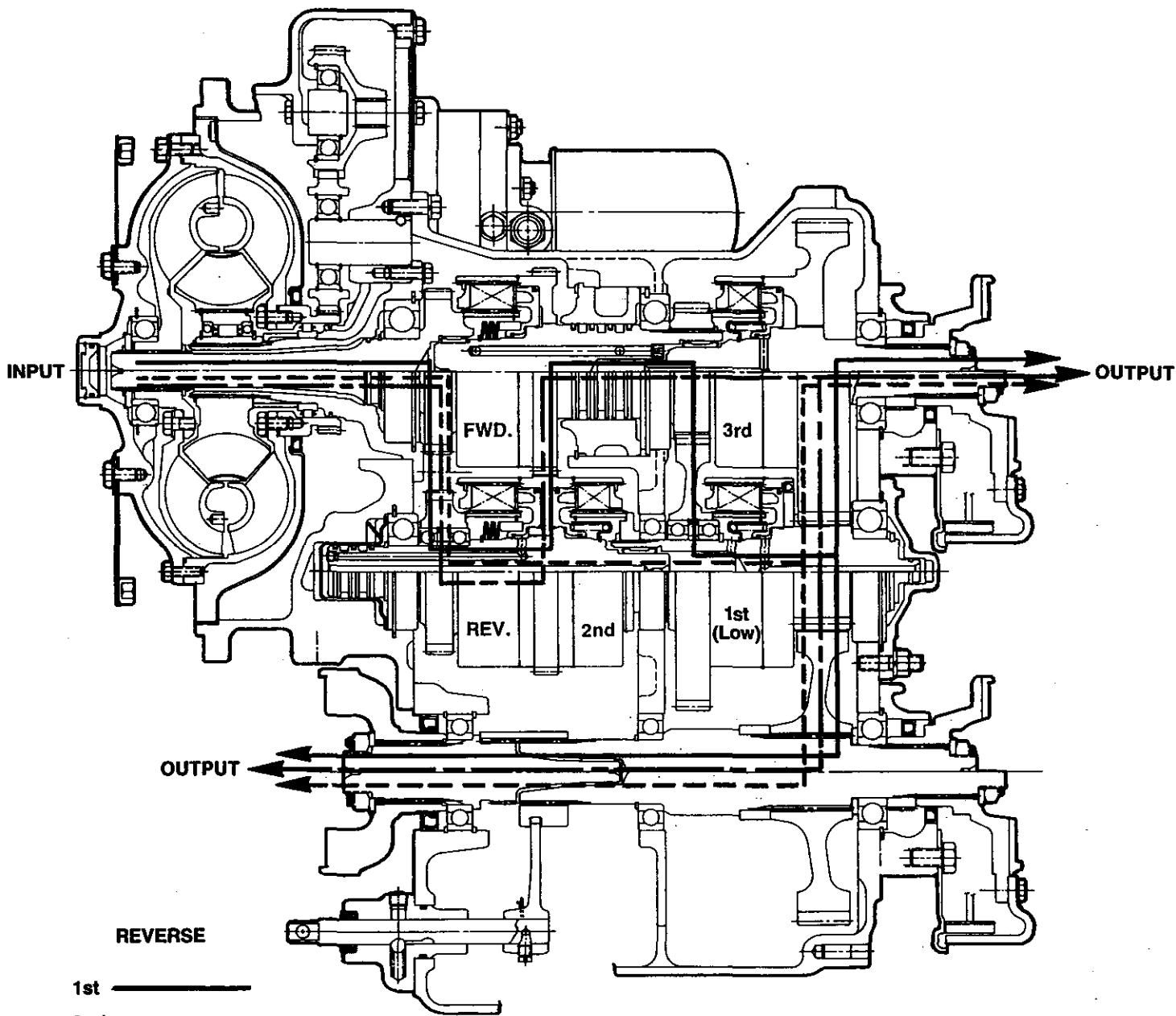








INLINE—FRONT DISCONNECT



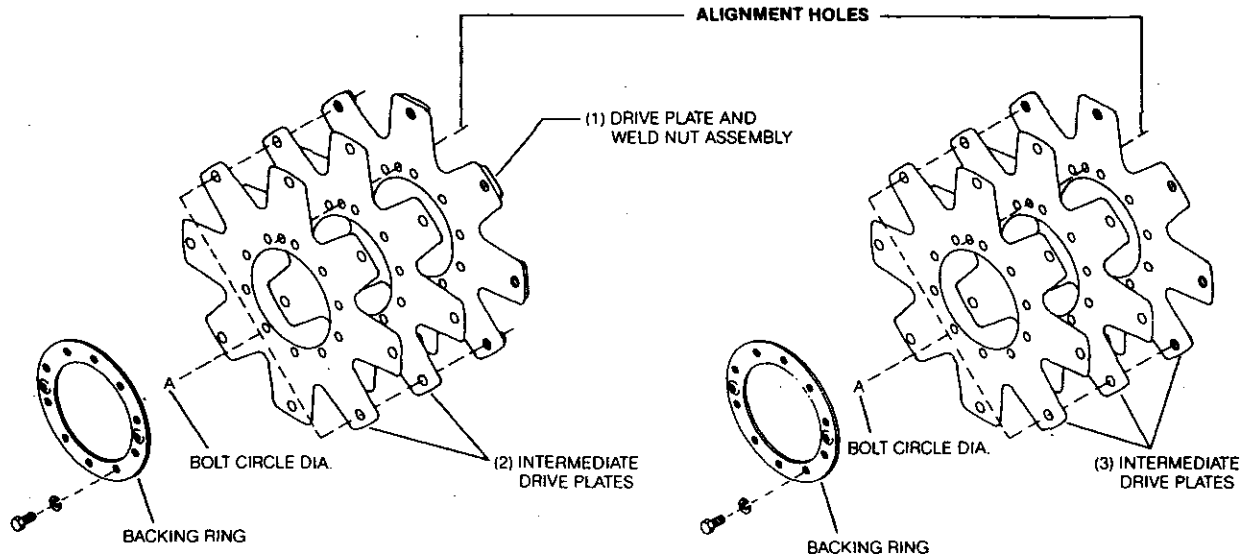
INLINE—FRONT DISCONNECT

18000 SERIES TRANSMISSION CONVERTER DRIVE PLATE KITS

Proper Identification by Bolt Circle Diameter

Measure the "A" dimension (Bolt Circle diameter) and order Drive Plate Kit listed below.

Note four (4) kits have two (2) intermediate drive plates and one (1) drive plate and weld nut assembly. Two (2) kits with three intermediate drive plates.



"A" Dimension (Bolt Circle Diameter)

11.38" [288,900 mm] Diameter
Kit No. 802229
13.12" [333,375 mm] Diameter
Kit No. 802230
13.50" [342,900 mm] Diameter
Kit No. 802231
17.00" [431,800 mm] Diameter
Kit No. 802356

Each Kit will include the following parts:

- 2 Intermediate Drive Plates.
- 1 Drive Plate and Weld Nut Assembly.
- 1 Backing Ring.
- 10 Screw and Lockwasher Assembly.
- 1 Instruction Sheet.

"A" Dimension (Bolt Circle Diameter)

11.38" [288,900 mm] Diameter
Kit No. 802494
13.12" [333,375 mm] Diameter
Kit No. 802393
13.50" [342,900 mm] Diameter
Kit No. 802232

Each Kit will include the following parts:

- 3 Intermediate Drive Plates.
- 1 Backing Ring.
- 10 Screw and Lockwasher Assembly.
- 1 Instruction Sheet.

NOTE: Some drive plates and backing rings will have fourteen (14) mounting holes. Only ten (10) mounting holes will be used.

TO FACILITATE ASSEMBLY, ALIGN SMALL HOLES IN DRIVE PLATES — SEE ILLUSTRATION ABOVE.

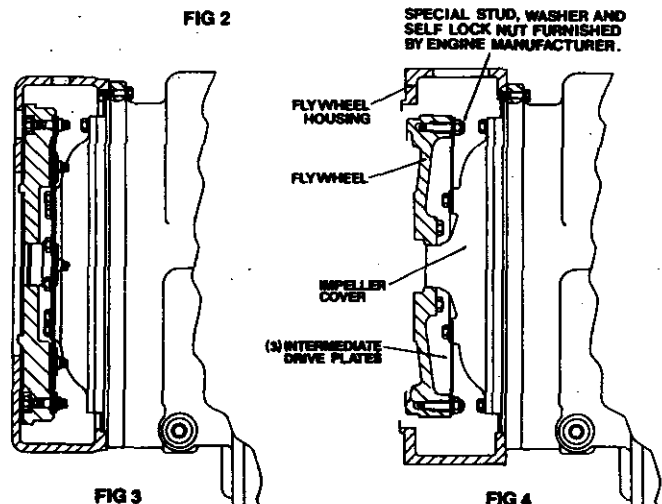
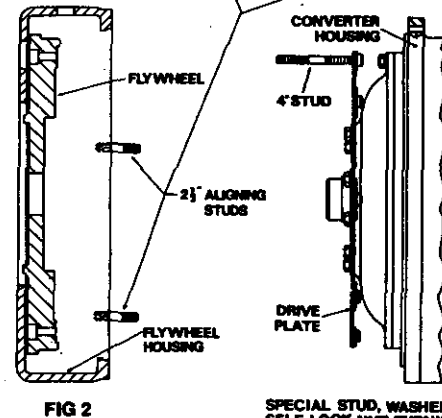
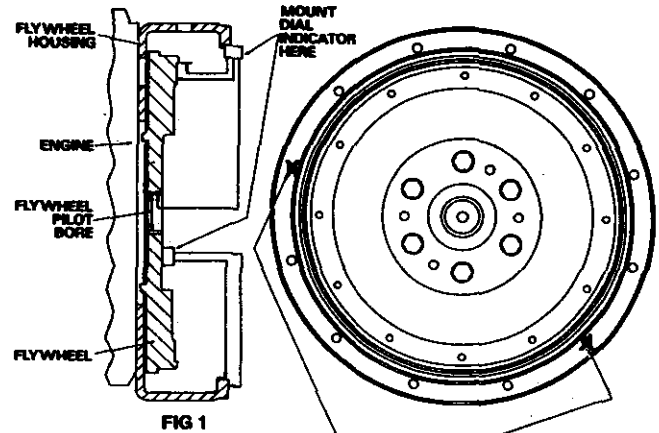
Position drive plate and weld nut assembly on impeller cover with weld nuts toward cover. Align intermediate drive plate and backing ring with holes in impeller cover. **NOTE:** Two dimples 180° apart in backing ring must be out (toward engine flywheel). Install capscrews and washers. Tighten 23 to 25 lbf-ft torque [31,2 - 33,8 N-m.].

TRANSMISSION TO ENGINE INSTALLATION PROCEDURE

1. Remove all burrs from flywheel mounting face and nose pilot bore. Clean drive plate surface with solvent.
2. Check engine flywheel and housing for conformance to standard S.A.E. #3 - S.A.E. J-927 tolerance specifications for pilot bore size, pilot bore runout and mounting face flatness. Measure and record engine crankshaft end play.
3. Install two 2.50 [63, 50 mm] long transmission to flywheel housing guide studs in the engine flywheel housing as shown. Rotate the engine flywheel to align a drive plate mounting screw hole with the flywheel housing access hole.
- *4. Install a 4.00 [101, 60 mm] long drive plate locating stud .3750-24 fine thread in a drive plate nut. Align the locating stud in the drive plate with the flywheel drive plate mounting screw hole positioned in step No. 3.
5. Locate transmission on flywheel housing aligning drive plate to flywheel and transmission to flywheel housing. **NOTE:** Fig. 4 installation, align drive plate holes with flywheel studs.

Install transmission to flywheel housing screws. Tighten screws to specified torque. Remove transmission to engine guide studs. Install remaining screws and tighten to specified torque.
- *6. Remove drive plate locating stud.
7. Install drive plate attaching screw and washer. Snug screw but do not tighten. **NOTE:** Fig. 4 installation, install drive plate attaching washers and nuts. Tighten each nut 28 to 30 ft. lbs. torque [38,0 - 40,6 N.m]. Some engine flywheel housings have a hole located on the flywheel housing circumference in line with the drive plate screw access hole. A screwdriver or pry bar used to hold the drive plate against the flywheel will facilitate installation of the drive plate screws. Rotate the engine flywheel and install the remaining seven (7) flywheel to drive plate attaching screws. Snug screws but do not tighten. After all eight (8) screws are installed torque each one 25 to 30 ft. lbs. torque [33,9 - 40,6 N.m]. This will require torquing each screw and rotating the engine flywheel until the full amount of eight (8) screws have been tightened.
8. Measure engine crankshaft end play after transmission has been completely installed on engine flywheel. This value must be within .001 [0,025mm] of the end play recorded in step No. 2.

* Does not apply to units having 3 intermediate drive plates. See Fig. 4.



If the turbine or turbine hub was replaced or disassembled, this procedure must be used for reassembly.

TURBINE HUB ASSEMBLY WITH BACKING RING AND SPECIAL SELF LOCKING SCREWS

1. Clean hub mounting surface and tapped holes with solvent. Dry thoroughly being certain tapped holes are dry and clean.

2. Install backing ring and special screws to approximately .06 [1,5] of seated position. With a calibrated torque wrench, tighten screws 37 to 41 lbs. ft. torque [50,2 - 55,6 N·m]. **NOTE:** Assembly of turbine hub must be completed within a fifteen minute period from start of screw installation. The screws are prepared with a coating which begins to harden after installation in the hub holes. If not tightened to proper torque within the fifteen minute period, insufficient screw clamping tension will result. The special screw is to be used for one installation only. If the screw is removed for any reason it must be replaced. The compound left in the hub holes must be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a new screw for reinstallation.

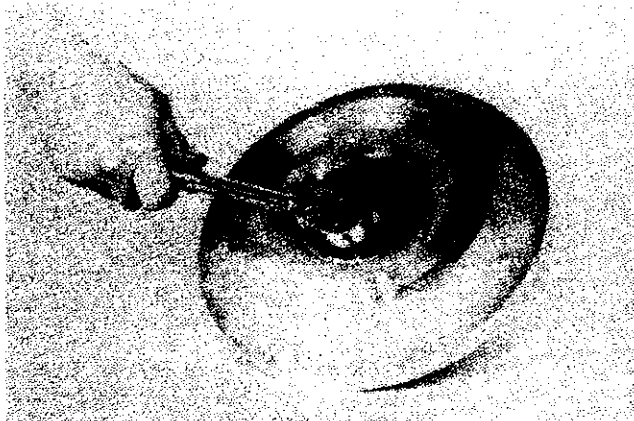


Figure A

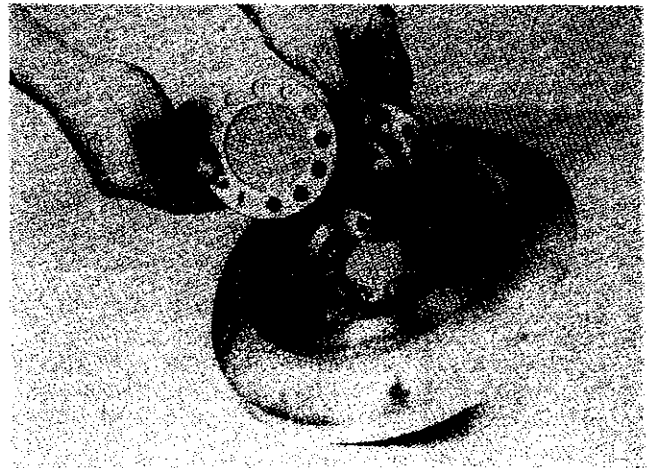


Figure B

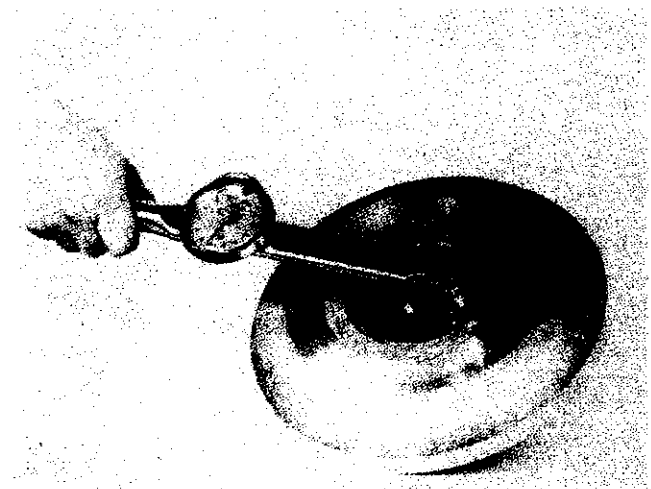
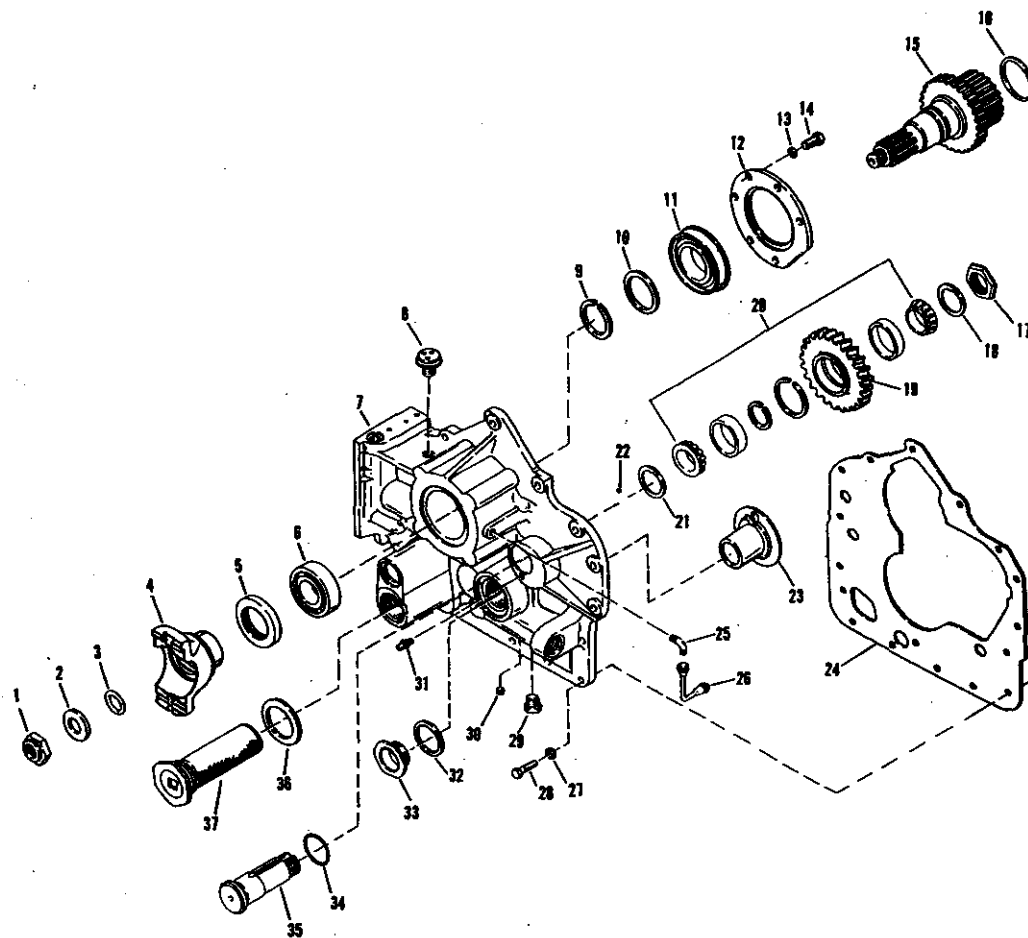


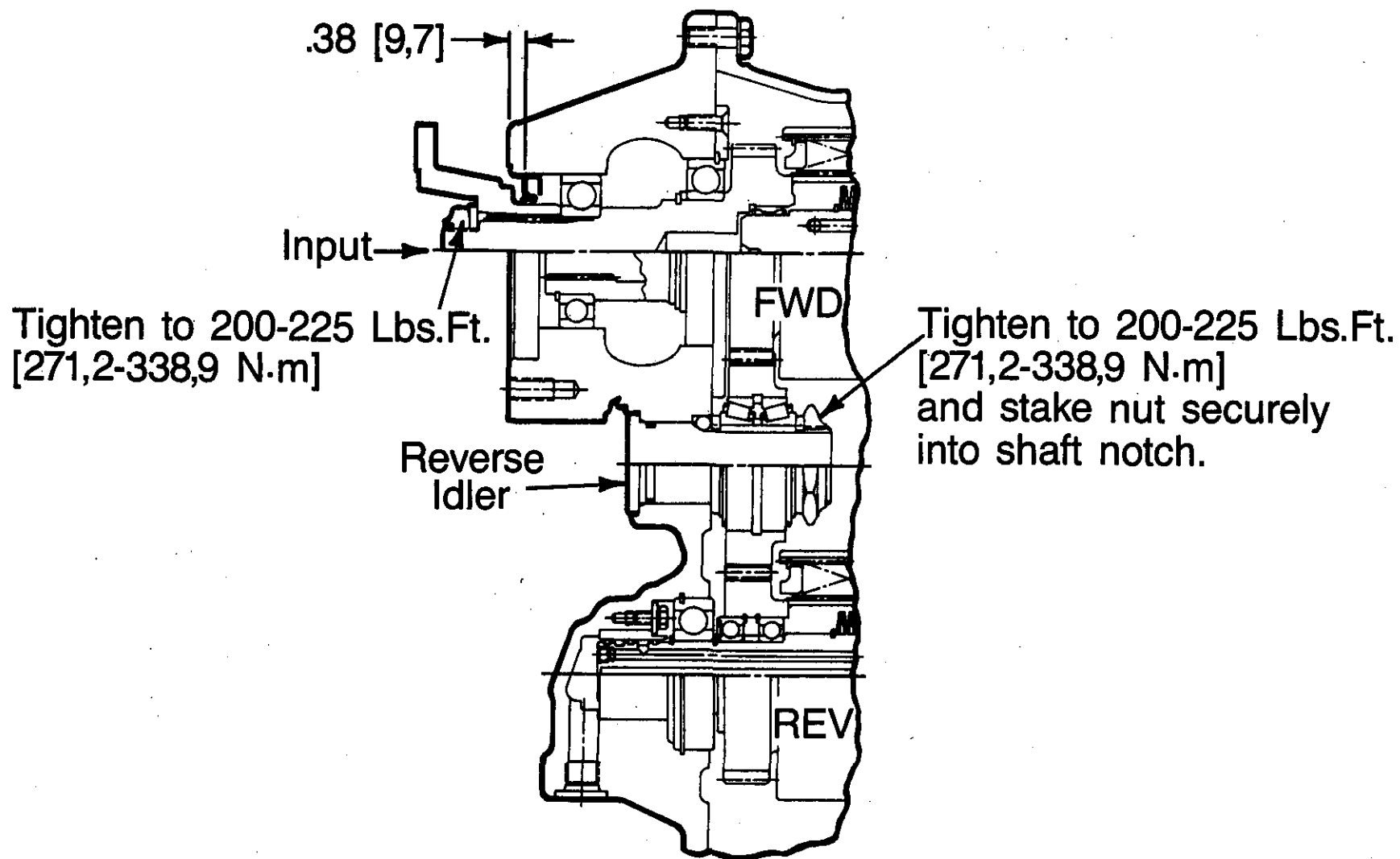
Figure C

R MODEL FRONT COVER GROUP



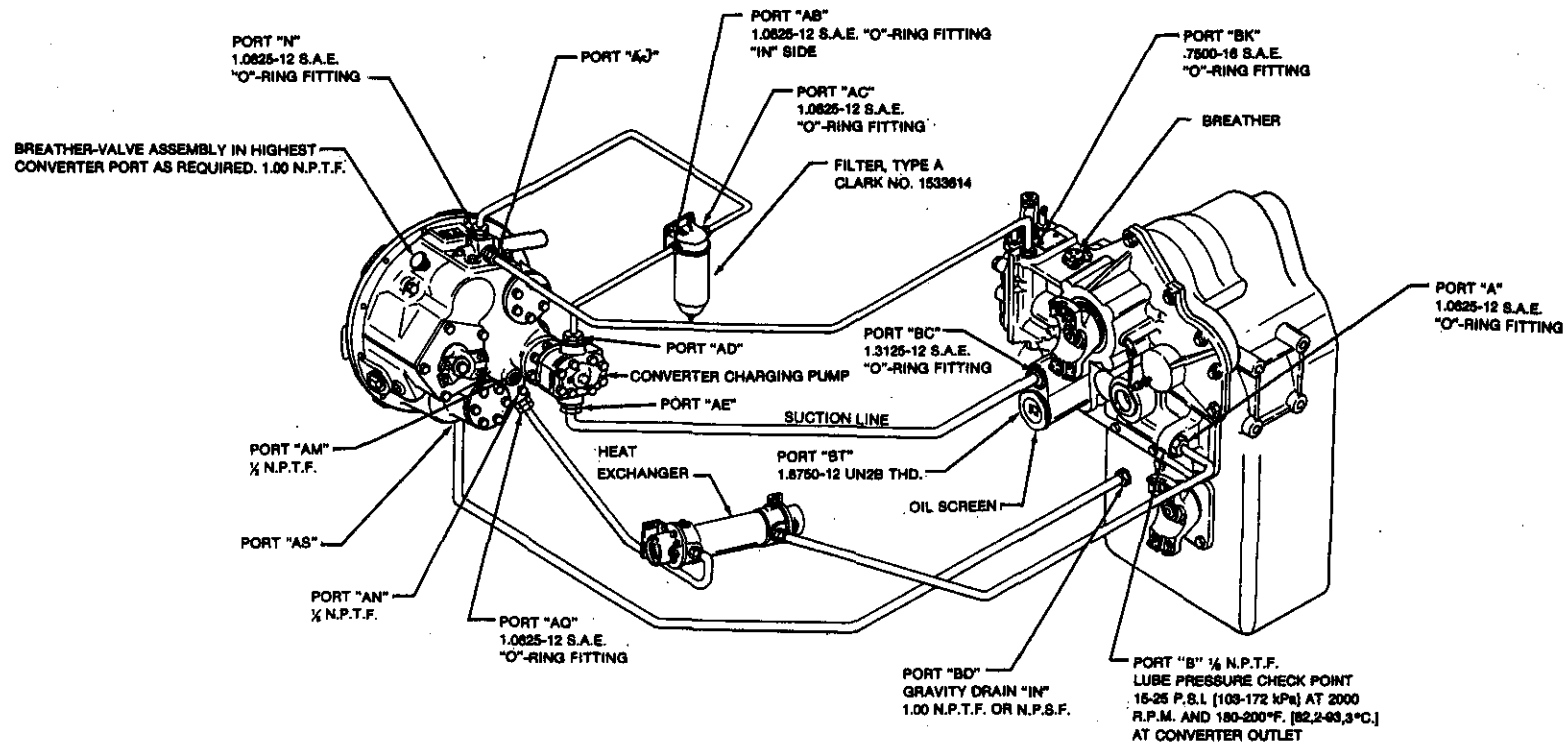
ITEM	DESCRIPTION	QTY
1	Input Flange Nut	1
2	Input Flange Washer	1
3	Input Flange "O" Ring	1
4	Input Flange	1
5	Input Flange Oil Seal	1
6	Input Shaft Front Bearing	1
7	Front Cover	1
8	Breather	1
9	Rear Bearing Snap Ring	1
10	Rear Bearing Washer	1
11	Input Shaft Rear Bearing	1
12	Rear Bearing Retaining Plate	1
13	Retaining Plate Screw Lockwasher	6
14	Retaining Plate Screw	6
15	Input Shaft & Hub Assembly	1
16	Baffle Ring	1
17	Bearing Retainer Plate Nut	1
18	Reverse Idler Thrust Plate	1
19	Reverse Idler Gear	1

ITEM	DESCRIPTION	QTY
20	Reverse Idler Gear Bearing Assembly	1
21	Reverse Idler Thrust Plate	1
22	Idler Shaft Lockball	1
23	Clutch Shaft Oil Sealing Ring Sleeve	1
24	Front Cover to Transmission Case Gasket	1
25	Lube Tube Fitting	1
26	Lube Tube Assembly	1
27	Front Cover to Case Screw Lockwasher	16
28	Front Cover to Case Screw	16
29	Lube Plug	1
30	Lube Plug	1
31	Lube Tube Fitting	1
32	Front Cover Plug Gasket	1
33	Front Cover Plug	1
34	Reverse Idler Shaft "O" Ring	1
35	Reverse Idler Shaft	1
36	Screen Assembly Gasket	1
37	Suction Screen Assembly	1



R-MODEL

PLUMBING DIAGRAM R-18000 SERIES TRANSMISSION



NOTES

HOSE LINE OPERATING REQUIREMENTS

1. PRESSURE LINES SUITABLE FOR OPERATION FROM AMBIENT TO 250°F. [121,1°C.] CONTINUOUS OPERATING TEMPERATURE. MUST WITHSTAND 300 P.S.I. [2068 kPa] CONTINUOUS PRESSURE WITH 600 P.S.I. [4136 kPa] INTERMITTENT SURGES. REF. S.A.E. SPEC. NO. J517,100R1 HYDRAULIC HOSE SPECIFICATION.
2. SUCTION LINE TO BE PROTECTED FROM COLLAPSE BY INTERWOVEN STEEL WIRE. REF. S.A.E. SPEC. NO. J517,100R4 HYDRAULIC HOSE SPECIFICATION. SUITABLE FOR OPERATION FROM AMBIENT TO 250°F. [121,1°C.] CONTINUOUS OPERATING TEMPERATURE.
3. GRAVITY DRAIN LINE SUITABLE FOR OPERATION FROM AMBIENT TO 250°F. [121,1°C.] CONTINUOUS OPERATING TEMPERATURE. REF. S.A.E. SPEC. NO. J517,100R1 HYDRAULIC HOSE SPECIFICATION.
4. ALL HOSE LINES USED MUST CONFORM TO S.A.E. SPEC. NO. J1019 TEST PROCEDURE FOR HIGH TEMP. TRANSMISSION OIL HOSE.

PORT "AS" — CONVERTER DRAIN

SELECT LOWEST OF PORTS NOTED FOR GRAVITY DRAIN TO TRANSMISSION. LINE MUST HAVE CONTINUOUS SLOPE FROM CONVERTER TO TRANSMISSION. IF VEHICLE CONFIGURATION WILL NOT ALLOW SLOPE OF DRAIN LINE UNDER ALL OPERATING CONDITIONS, A SCAVENGER PUMP MUST BE PROVIDED.

PORT "AM" — CONVERTER OUTLET TEMPERATURE

PORT IS TO BE USED FOR CONVERTER OUTLET TEMP. PICK-UP, GAUGE IS TO BE LOCATED IN THE OPERATOR COMPARTMENT. SEE OIL TEMP. GAUGE SPECIFICATIONS.

PORT "AN" — CONVERTER OUTLET PRESSURE

CONVERTER OUTLET PRESSURE EQUALS THE TOTAL PRESSURE DROP OF THE HEAT EXCHANGER, HEAT EXCHANGER LINES AND BACK PRESSURE OF THE TRANSMISSION LUBRICATION SYSTEM. CONVERTER OUTLET OIL TEMP. 180-220°F. [82.2-93.3°C.], TRANSMISSION IN NEUTRAL.

OPERATING SPECIFICATIONS:

25 P.S.I. [172 kPa] MINIMUM PRESSURE AT 2000 R.P.M. ENGINE AND A MAXIMUM OF 70 P.S.I. [482 kPa] OUTLET PRESSURE WITH ENGINE AT NO-LOAD GOVERNED SPEED.

CLUTCH PRESSURE

180-220 P.S.I. [1241-1516 kPa] WITH PARKING BRAKE SET (SEE NOTE), OIL TEMPERATURE 180-200°F. [82.2-93.3°C.], ENGINE AT IDLE (400 TO 600 RPM), SHIFT THRU DIRECTION AND SPEED CLUTCHES. ALL CLUTCH PRESSURE MUST BE EQUAL WITH 5 P.S.I. [34 kPa]. IF CLUTCH PRESSURE VARIES IN ANY ONE CLUTCH MORE THAN 5 P.S.I. [34 kPa] REPAIR CLUTCH.

NOTE: NEVER USE SERVICE BRAKES WHILE MAKING CLUTCH PRESSURE CHECKS. UNITS HAVING BRAKE ACTUATED DECLUTCHING IN FORWARD AND/OR REVERSE WILL NOT GIVE A TRUE READING.

ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.

HOSE LINE SIZE			
FROM PORT	TO PORT	LINE I.D.	REMARKS
BC	AE	1.00 [25,4]	SUCTION LINE
AD	AB	.75 [19,0]	
AC	N	.75 [19,0]	
AJ	BK	.50 [12,7]	
AQ	HEAT EXCHANGER	.75 [19,0]	
HEAT EXCHANGER	A	.75 [19,0]	
AS	BO	1.00 [25,4]	DRAIN LINE
HEAT EXCHANGER	D	.75 [19,0]	
BR	A	.75 [19,0]	

**18000 3 SPEED INTERMEDIATE DROP OUTPUT
R-Model (remote mounted) transmission front cover
removal, disassembly, reassembly and installation
on transmission**

CAUTION: Cleanliness is of extreme importance in the repair and overhaul of this unit. Before attempting any repairs, the

exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

FRONT COVER REMOVAL

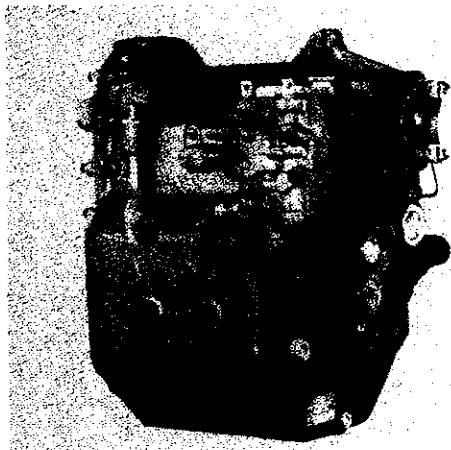


Figure 305

Side view of R-18000 with mechanical control valve.



Figure 307

Remove input flange.

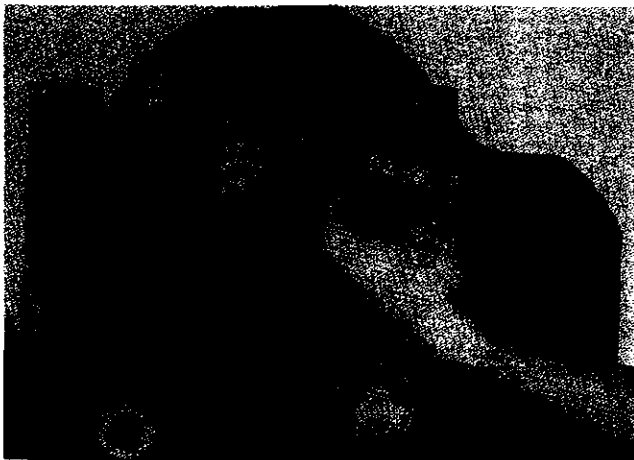


Figure 306

Remove control valve bolts and washers, remove control valve, use caution as not to lose detent balls and springs. Remove input flange nut, washer and "O" ring.

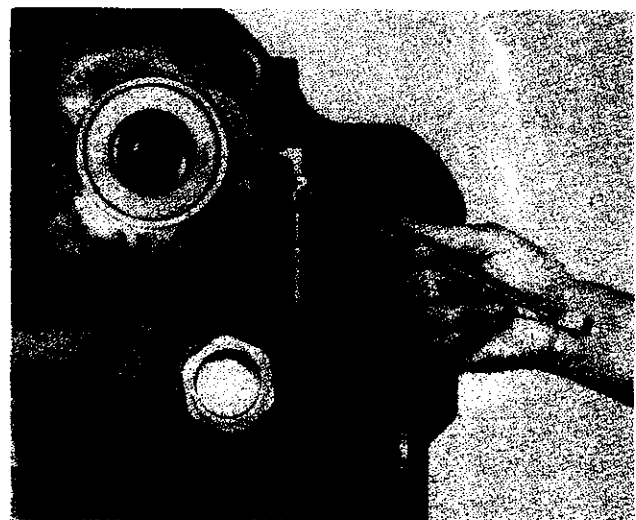


Figure 308

Loosen lube tube fitting nut.



Figure 309

Remove lube tube and fittings for cleaning or replacing.



Figure 310

Support front cover with a chain hoist. Remove front cover to transmission case bolts and washers.

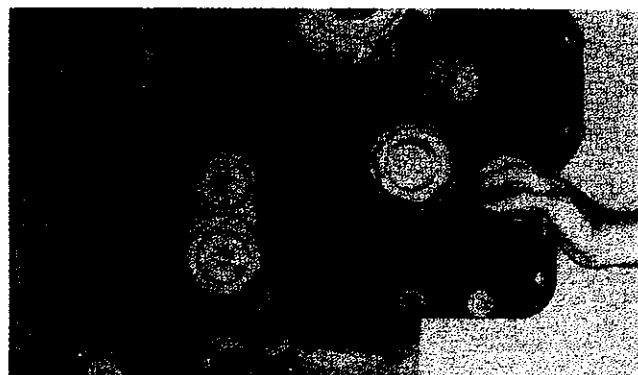


Figure 311

Separate front cover from transmission case assembly. **NOTE:** Reverse and 2nd clutch will come out with front cover.

See Figure 31 for Transmission Disassembly

FRONT COVER DISASSEMBLY

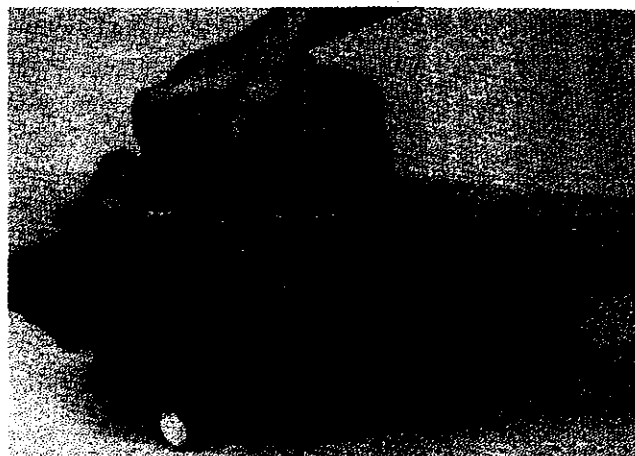


Figure 312

Spread reverse clutch front bearing locating ring out of bearing ring groove. Pry reverse and 2nd clutch from front cover.



Figure 313

Unclinch lock nut by straightening upset metal in notch in idler shaft. Remove idler shaft nut.



Figure 314

Remove nut and spacer.

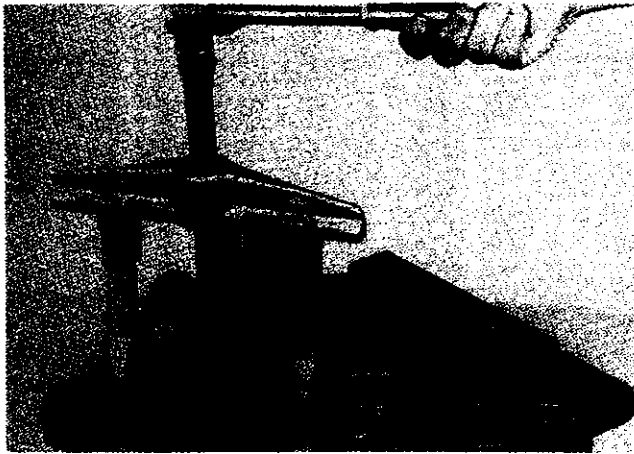


Figure 315
Remove idler gear and outer taper bearing.



Figure 318
Remove inner bearing spacer.



Figure 316
Remove taper bearing spacer.



Figure 319
Note idler shaft lock ball.

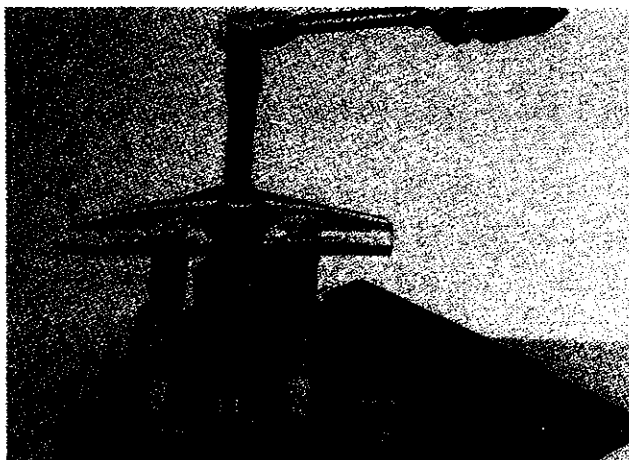


Figure 317
Remove inner taper bearing.



Figure 320
Tap idler shaft from cover, use caution as not to lose lock ball.



Figure 321
Remove idler shaft "O" ring.



Figure 322
Remove input shaft retainer plate capscrews and washers.



Figure 323
Tap input shaft from cover.



Figure 324
Remove input shaft and bearing assembly. NOTE: If the oil suction screen was not removed, remove and clean separately from front cover. Remove input shaft oil seal from cover.

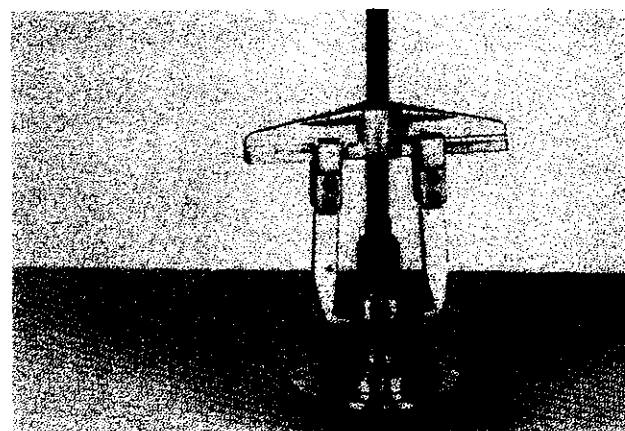


Figure 325
Remove input shaft front bearing.



Figure 326
Remove input shaft rear bearing retainer ring.

FRONT COVER REASSEMBLY

(See cleaning and inspection page.)

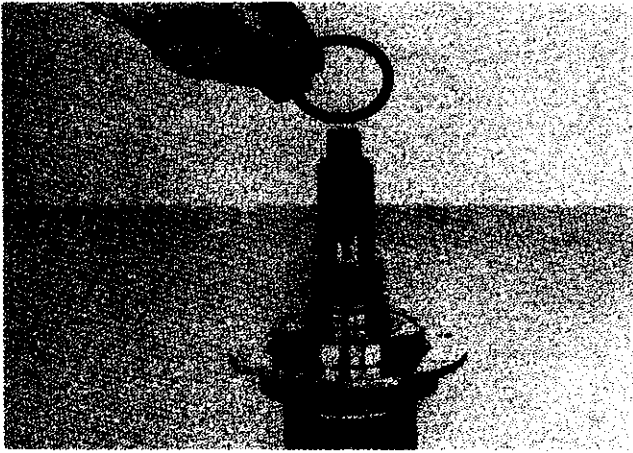


Figure 327

Remove bearing washer.

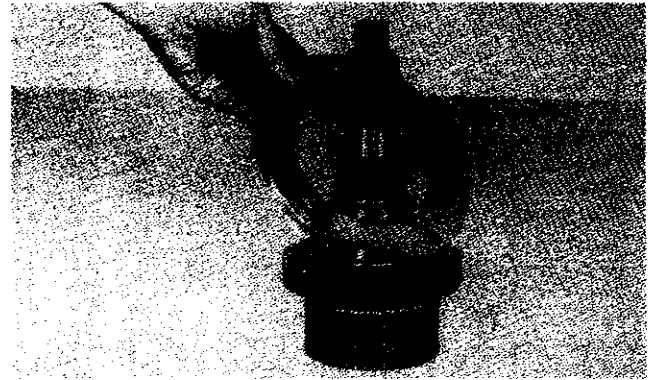


Figure 330

Position bearing retainer plate on input shaft with bearing snap ring groove up.

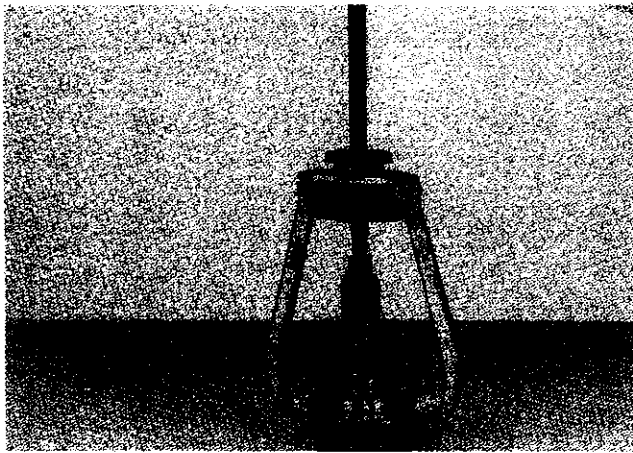


Figure 328

Remove retainer plate and rear bearing.

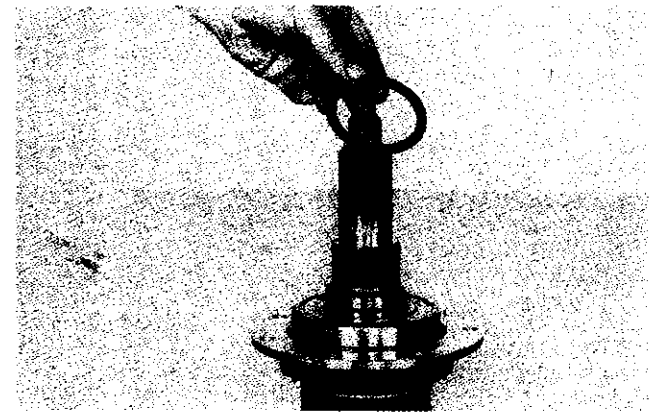


Figure 331

Press rear bearing on input shaft with snap ring down and into ring groove of retainer plate, bearing shield will be up. Position bearing washer on shaft.



Figure 329

Plate and bearing removed.



Figure 332

Install bearing retainer ring.

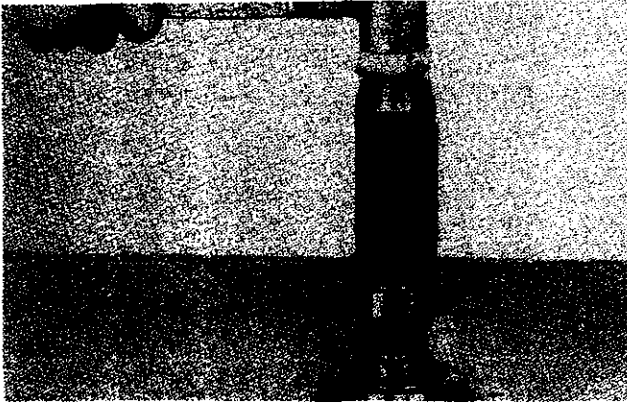


Figure 333

Install front bearing on input shaft. Coat outer diameter of input shaft oil seal with a light coat of Permatex #2. Press seal into front cover with lip of seal in and to a dimension of .360 [9,2 mm] to .390 [9,9 mm] from the outer surface of the cover. (See assembly instruction drawing).



Figure 334

Tap input shaft assembly in front cover aligning holes in retainer plate with holes in cover. Install capscrews and washers.

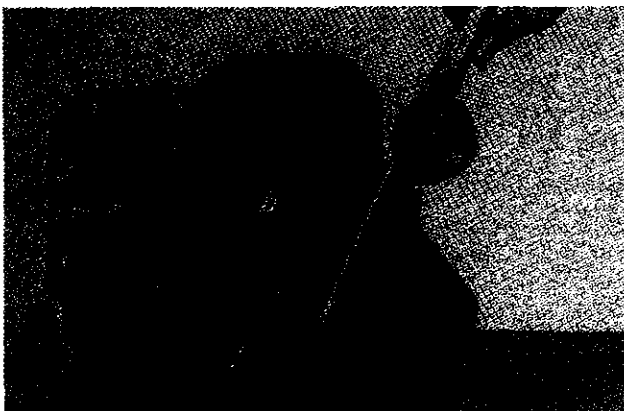


Figure 335

Tighten capscrews to specified torque. (See torque chart).

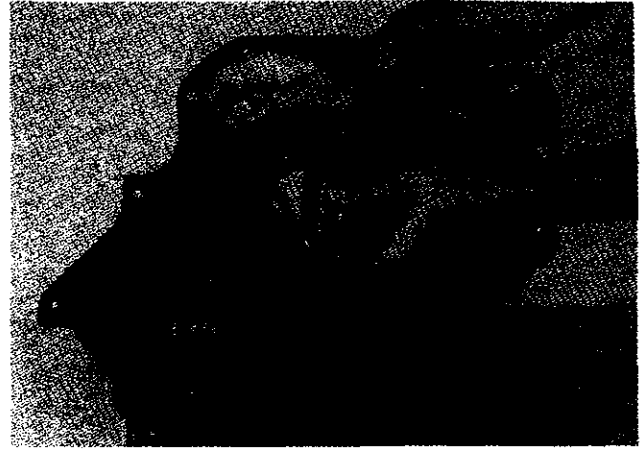


Figure 336

Install new "O" ring on idler shaft.



Figure 337

Align slot in idler shaft with lock ball notch in cover. Tap shaft into position.



Figure 338

Install lock ball in idler shaft and notch.

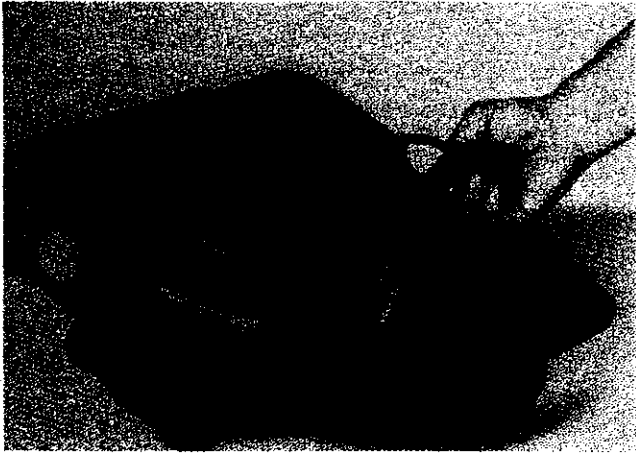


Figure 339

Install idler shaft inner taper bearing spacer on shaft.



Figure 342

Position idler gear on shaft with long hub of gear up.

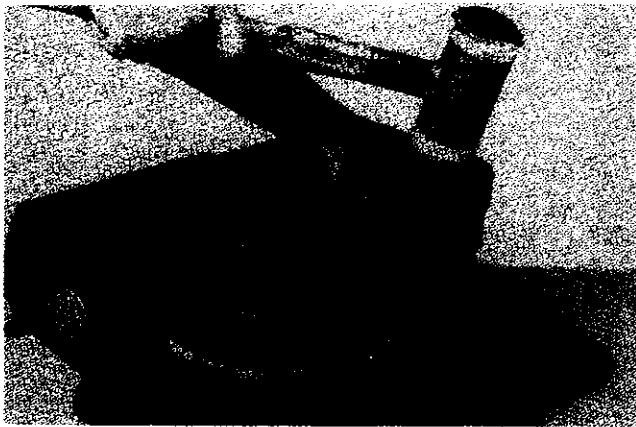


Figure 340

Install inner taper bearing on shaft with large diameter of taper down.



Figure 343

Position outer taper bearing on shaft with large diameter of taper up.

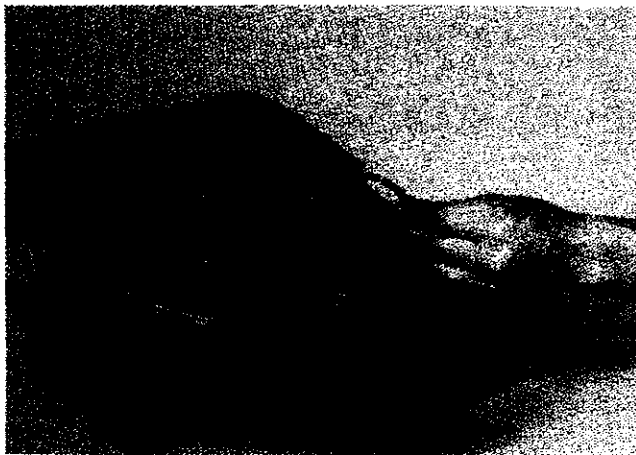


Figure 341

Position bearing spacer on shaft.

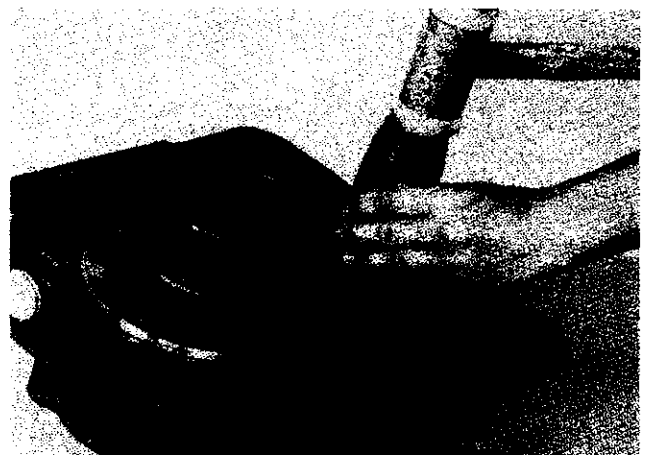


Figure 344

Tap bearing into position in idler gear.

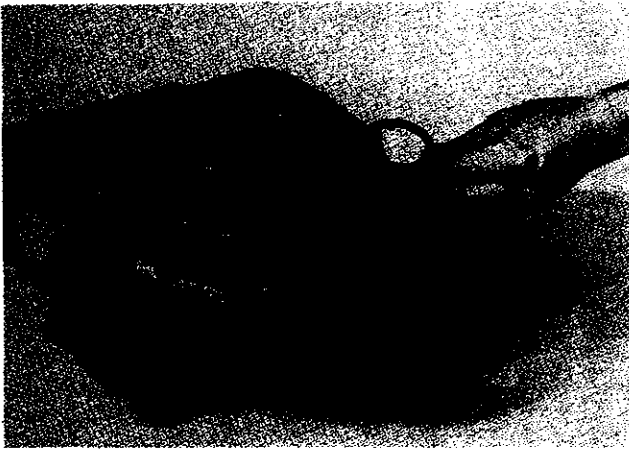


Figure 345
Install outer bearing spacer on shaft.



Figure 348
Stake nut securely in shaft notch.



Figure 346
Install retainer nut.

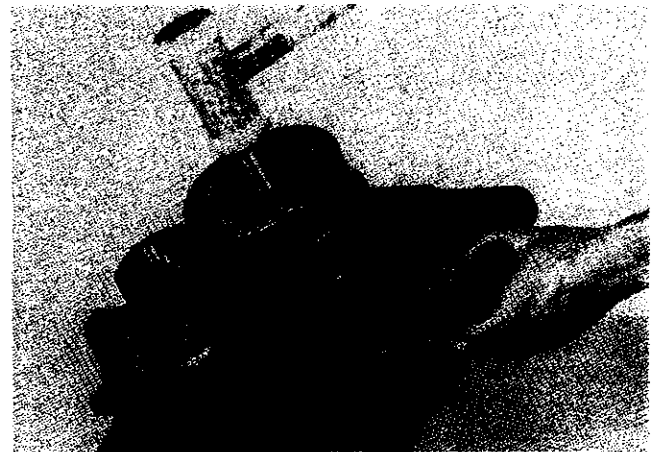


Figure 349
Spread reverse clutch front bearing locating ring. Position reverse and 2nd clutch in cover and tap into place. Align bearing snap ring groove with snap ring, release snap ring in groove being sure snap ring is in full position in ring groove. Position the 2nd speed clutch shaft pilot bearing on clutch shaft, a light coat of good quality grease will hold bearing in position on shaft. Install pilot bearing on forward clutch shaft. (See Figure 275).



Figure 347
Tighten nut 200 to 250 lbf-ft torque [271,2-338,8 N·m].

FRONT COVER ASSEMBLY

Installation on Transmission Case

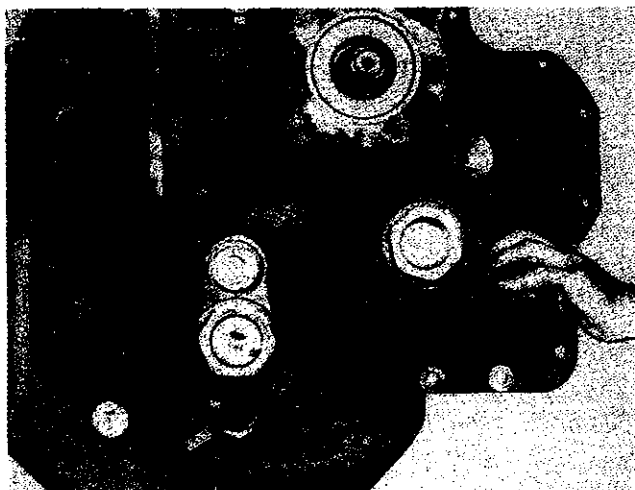


Figure 350

Position new gasket and "O" rings on front of transmission housing. A light coat of chassis grease will hold gasket in place. Locate front cover on transmission housing. **NOTE:** The use of aligning studs will facilitate alignment and front cover installation. Use extreme caution as to align the clutch pilots into the clutch disc hubs. As the clutch pilots enter the discs hubs, turn the input shaft and output shaft back and forth. This will help align all of the clutch inner discs with the disc hubs. **DO NOT FORCE THIS OPERATION.**

When the clutches are properly aligned, the front cover will be tight against the transmission case. Install front cover to transmission case bolts and washers. **DO NOT USE BOLTS TO PULL CASE AND COVER TOGETHER.**

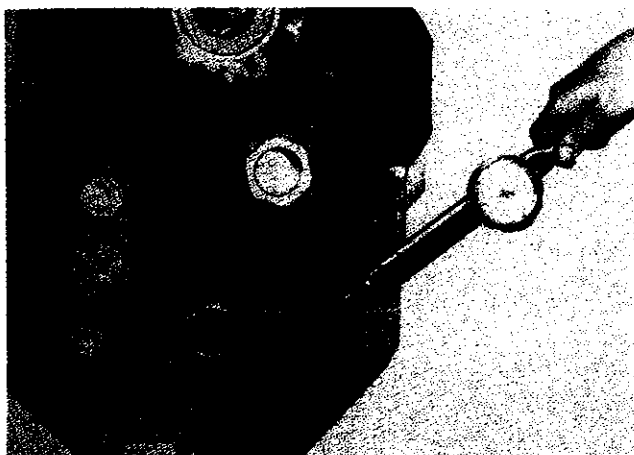


Figure 351

Tighten bolts to specified torque (See torque chart).

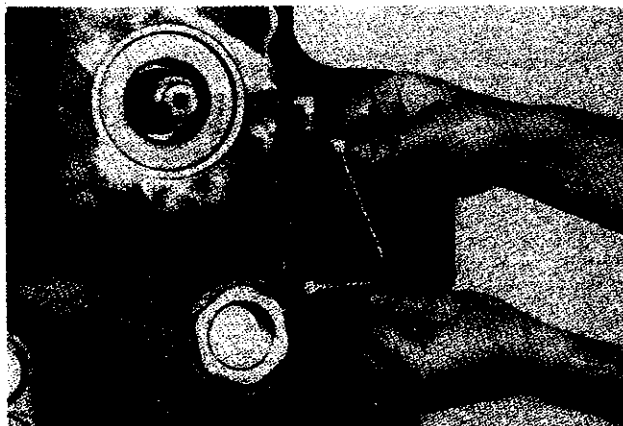


Figure 352

If lube fittings were removed for cleaning, install fittings. Install lube tube on fittings and tighten tube nuts securely.



Figure 353

Position input flange on input shaft.



Figure 354

Install flange "O" ring, washer and flange nut.

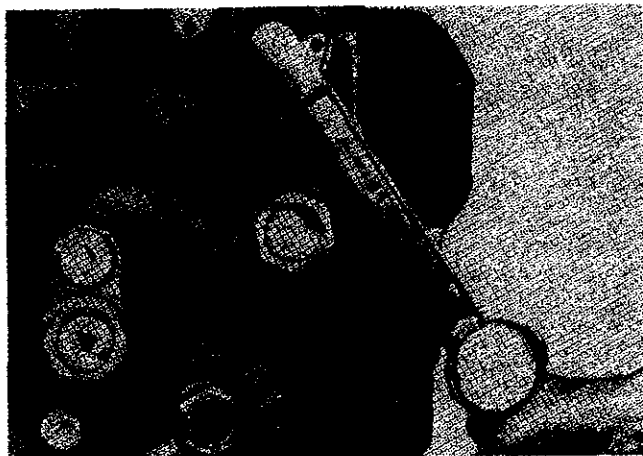
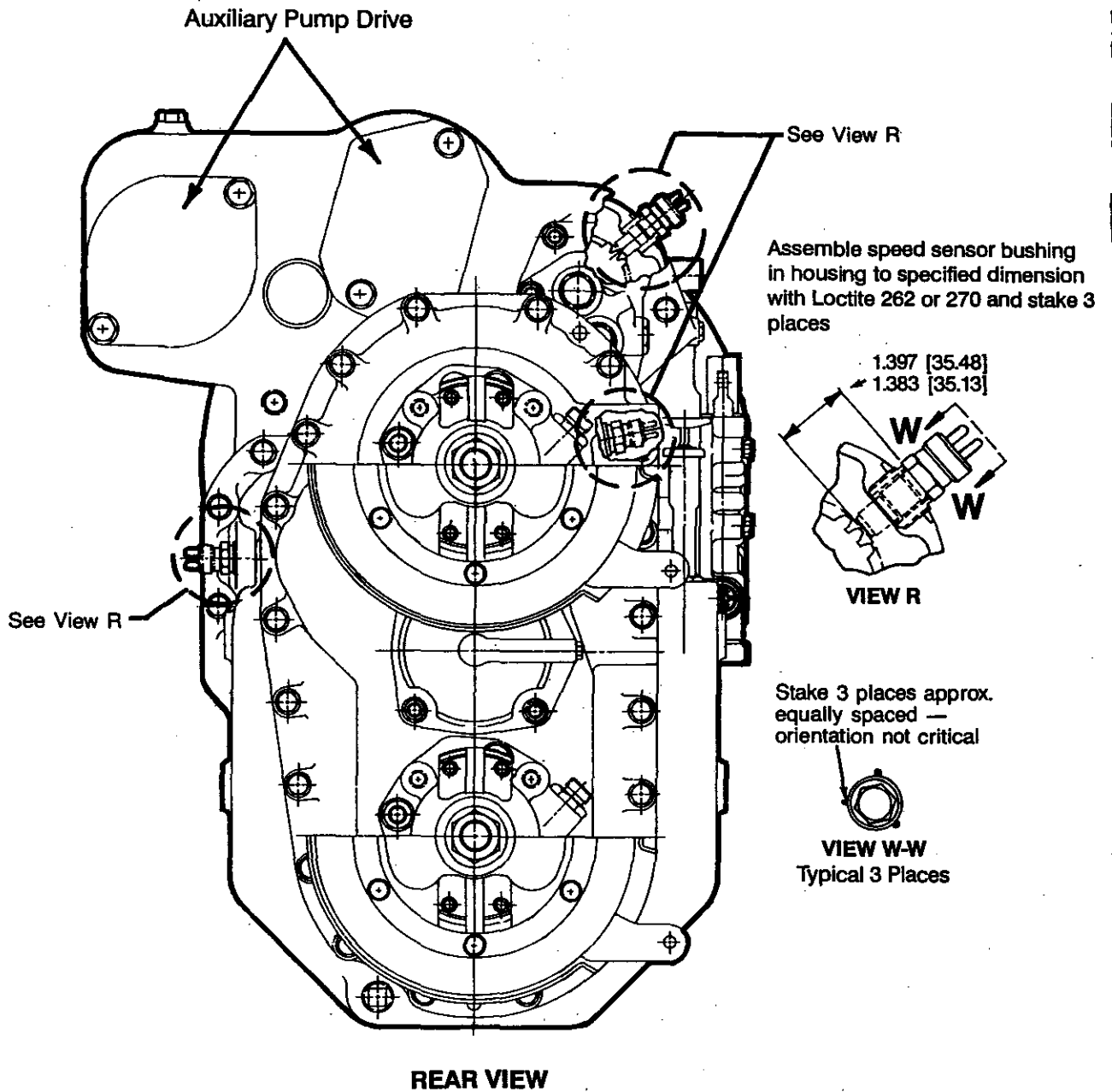


Figure 355

Secure input flange to prevent turning and tighten flange nut
200 to 250 lbf·ft [271,2-338.9 N·m].

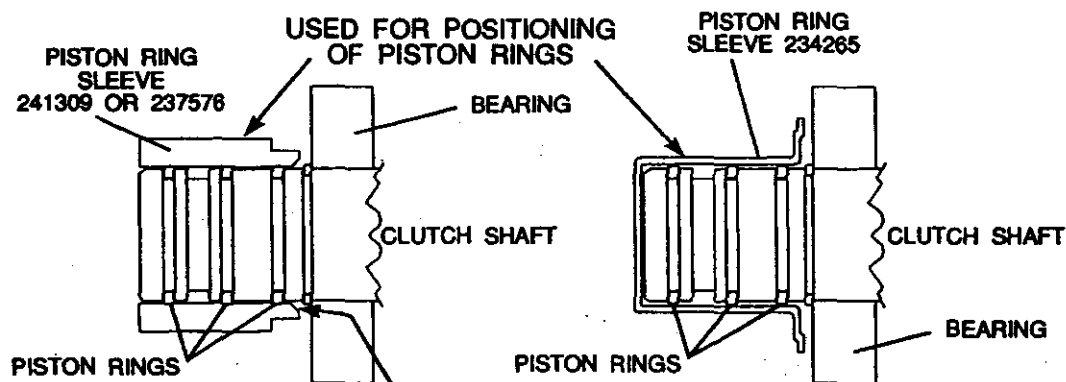
SPEED SENSOR INSTALLATION



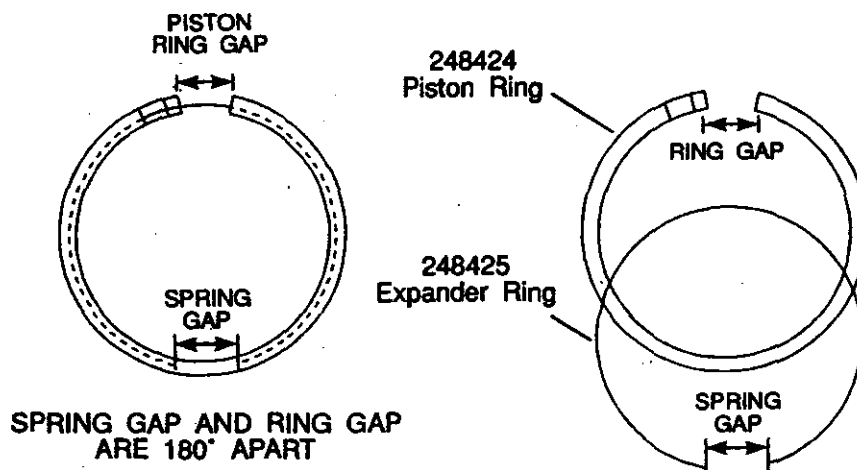
PROPER INSTALLATION OF TEFLON PISTON RING AND PISTON RING EXPANDER SPRINGS

NOTE: NOT ALL TRANSMISSIONS WILL HAVE TEFLON PISTON RINGS AND EXPANDER SPRINGS

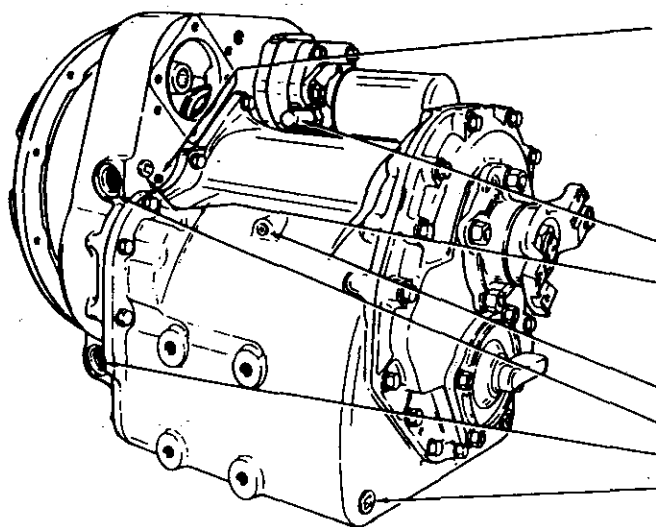
1. Fill the oil sealing ring grooves with a good grade of grease, this will help stabilize the teflon ring and expander spring in the ring groove for installation.
2. Position the expander spring in the inner groove of the new piston ring, with the expander spring gap 180° from the hook joint gap of the piston ring.
3. Carefully position the piston ring and expander spring on the clutch shaft in the inner most ring groove. Hook the piston piston ring joint.
4. Repeat steps 1, 2 and 3 for the remaining ring or rings making certain all hook joints are fastened securely.
5. Apply a heavy coat of grease to the outer diameter of the rings and clutch shaft. Center the piston ring's in the ring groove.
6. Before installing the clutch assembly in the front cover or converter housing it is recommended a piston ring sleeve P/N's 241309, 237576 or 234265 be used to center all of the piston rings in their respective ring grooves. Use extreme caution to not damage piston rings when installing the clutch shaft in the front transmission cover or converter housing.



Be sure that lead in chamfer and intersection of lead in chamfer to piston ring bore is free of burrs and nicks.



PRESSURE CHECK POINTS



CHECK POINT "C" CONVERTER OUTLET PRESSURE 25 P.S.I. [173 kPa] MINIMUM PRESSURE AT 2000 R.P.M. ENGINE SPEED AND A MAXIMUM OF 70 P.S.I. [483 kPa] OUTLET PRESSURE WITH ENGINE OPERATING AT NO LOAD GOVERNED SPEED.

PRESSURE REGULATOR VALVE

CHECK POINT "D" CONVERTER OUTLET TEMPERATURE RED LINE 250° F. [121° C] ½ N.P.T.F. PORT SIZE — MAY USE CLARK NO. 234033 (REF.) OR SAE NO. 2 TEMPERATURE PICKUP.

LUBE (CONSTRUCTION HOLE ONLY)

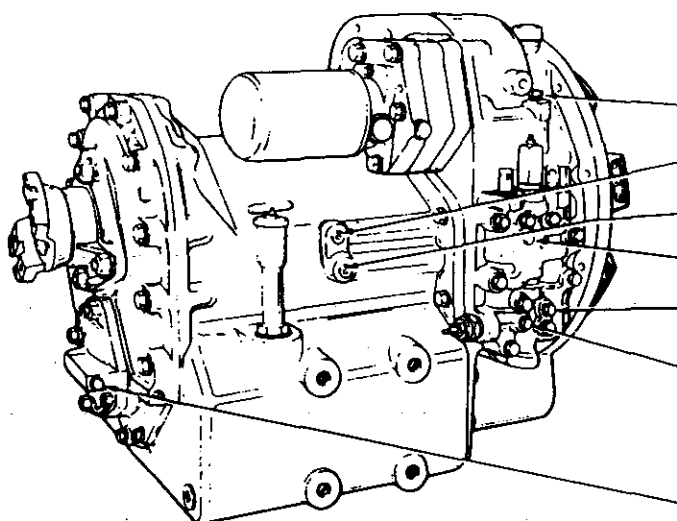
CONVERTER OUT

TO LUBE FROM COOLER

DRAIN

CHECK POINTS A & D SHOULD BE MONITORED BY GAUGES LOCATED IN OPERATOR'S COMPARTMENT.

CHECK POINT "A" CLUTCH PRESSURE ¼ N.P.T.F. CLUTCH PRESSURE 180 to 220 P.S.I. [1241-1516 kPa].



CHECK POINT FOR FORWARD MODULATED CLUTCH PRESSURE 180 to 220 P.S.I. [1241-1516 kPa]

3RD

TRANSMISSION FWD. CLUTCH PRESSURE PORT (¼ N.P.T.F.)

2ND

TRANSMISSION REV. CLUTCH PRESSURE PORT (¼ N.P.T.F.)

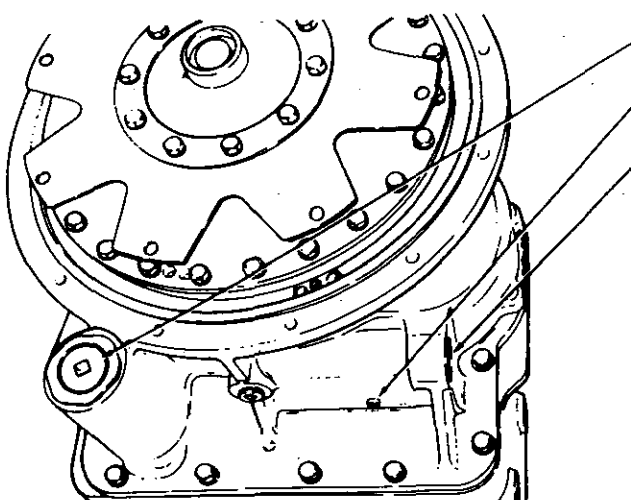
THESE PORTS ARE PROVIDED FOR INSTALLATION OF BACK-UP WARNING LIGHT PRESSURE SWITCH OR HORN.

1ST (LOW)

SUMP SCREEN

CHECK POINT "H" LUBE PRESSURE ¼ N.P.T.F. 15-25 P.S.I. [103-172 kPa] @ 2000 RPM & 180°-200° F. [82.2-93.3° C] AT CONVERTER OUTLET.

TO LUBE FROM COOLER



HOSE LINE OPERATING REQUIREMENTS:

1. PRESSURE LINES:

AMBIENT TO 250° F [121° C] FOR CONTINUOUS OPERATION. MUST WITHSTAND 300 P.S.I. [2068 kPa] CONTINUOUS OPERATION WITH 600 P.S.I. [4137 kPa] SURGE PRESSURE REF. SAE 100RI HYDRAULIC HOSE.

2. OIL SPECIFICATIONS: SEE LUBRICATION SECTION.

3. ALL HOSE LINES USED MUST CONFORM TO SAE SPEC NO. SAE J1019 TESTS & PROCEDURES FOR HIGH-TEMPERATURE TRANSMISSION OIL HOSE, LUBRICATING OIL HOSE & HOSE ASSEMBLIES.