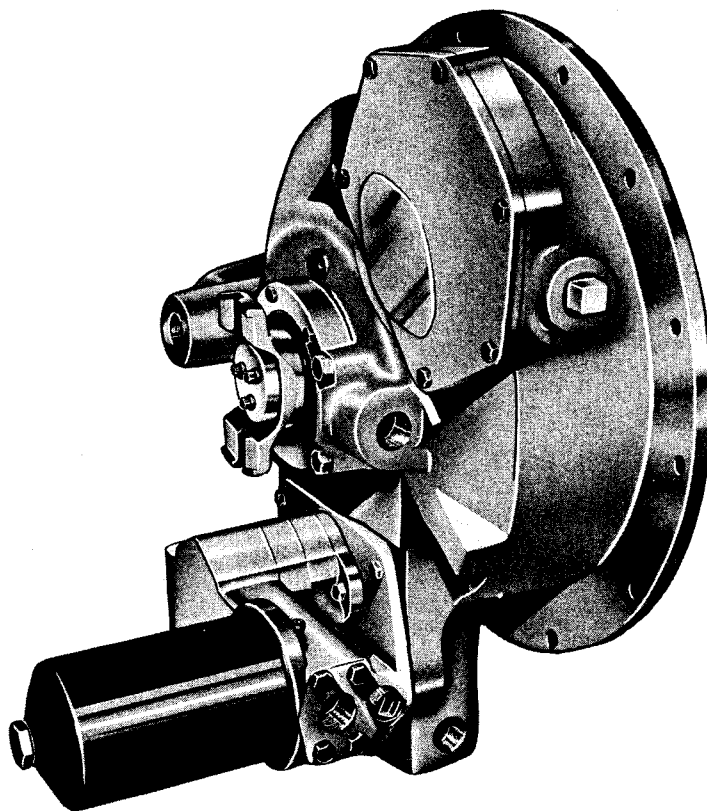


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MAINTENANCE MANUAL SM 142

**Model 6-F-1514**



**SINGLE - STAGE**

# Hydraulic Torque Converter

**SUMPLESS**

**TWIN DISC CLUTCH COMPANY**  
GENERAL OFFICE AND FACTORY • RACINE, WISCONSIN  
HYDRAULIC DIVISION • ROCKFORD, ILLINOIS

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# Hydraulic Torque Converter

ORIGINAL ISSUE – DECEMBER 1963

*Prepared by*

**TWIN DISC CLUTCH COMPANY**

1328 Racine Street

Racine, Wisconsin, U. S. A.

*Price \$2.00*



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# Hydraulic Torque Converter

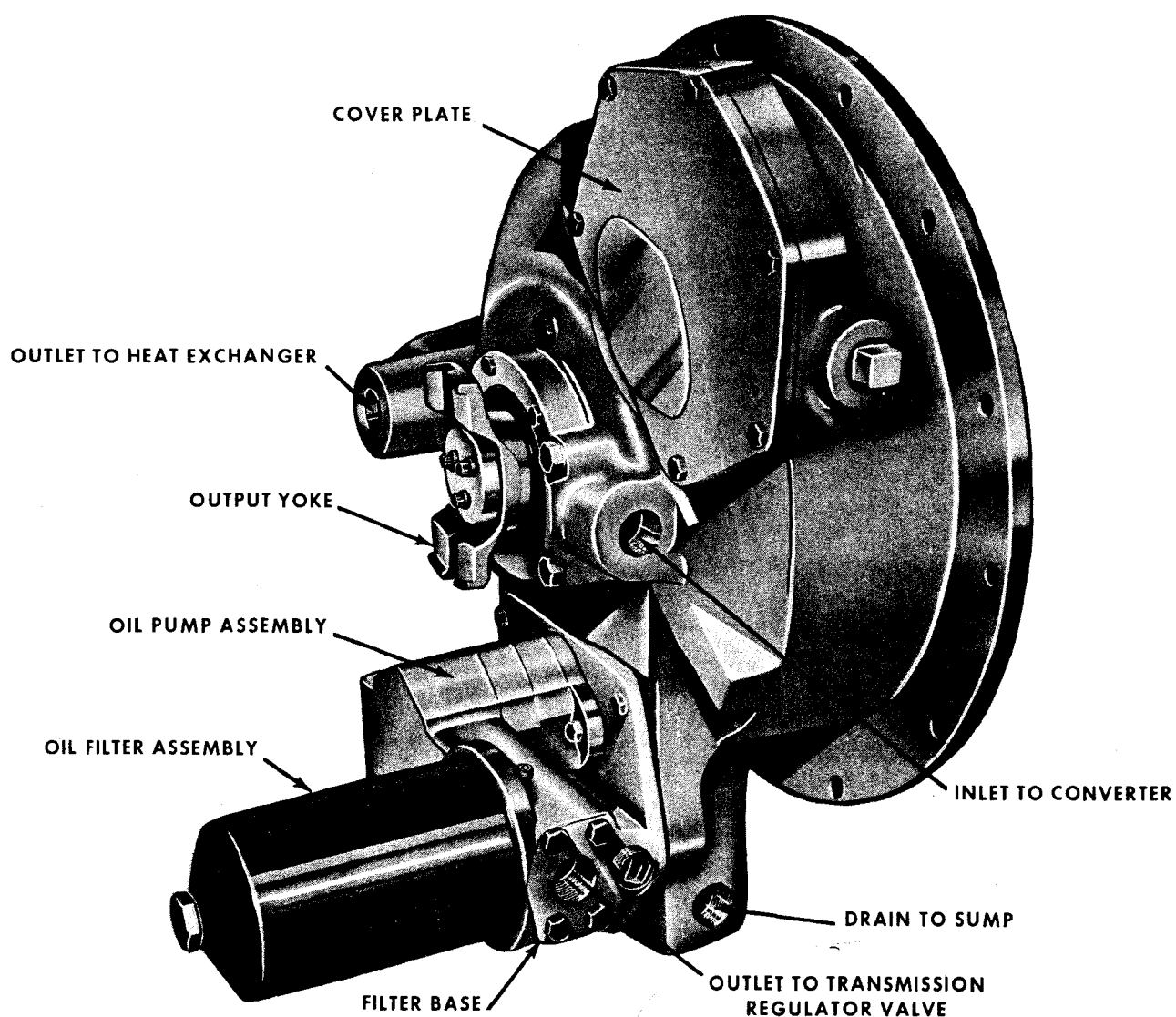


Figure 1. Model 6-F-1514 Series Single-Stage Torque Converter – Output End.

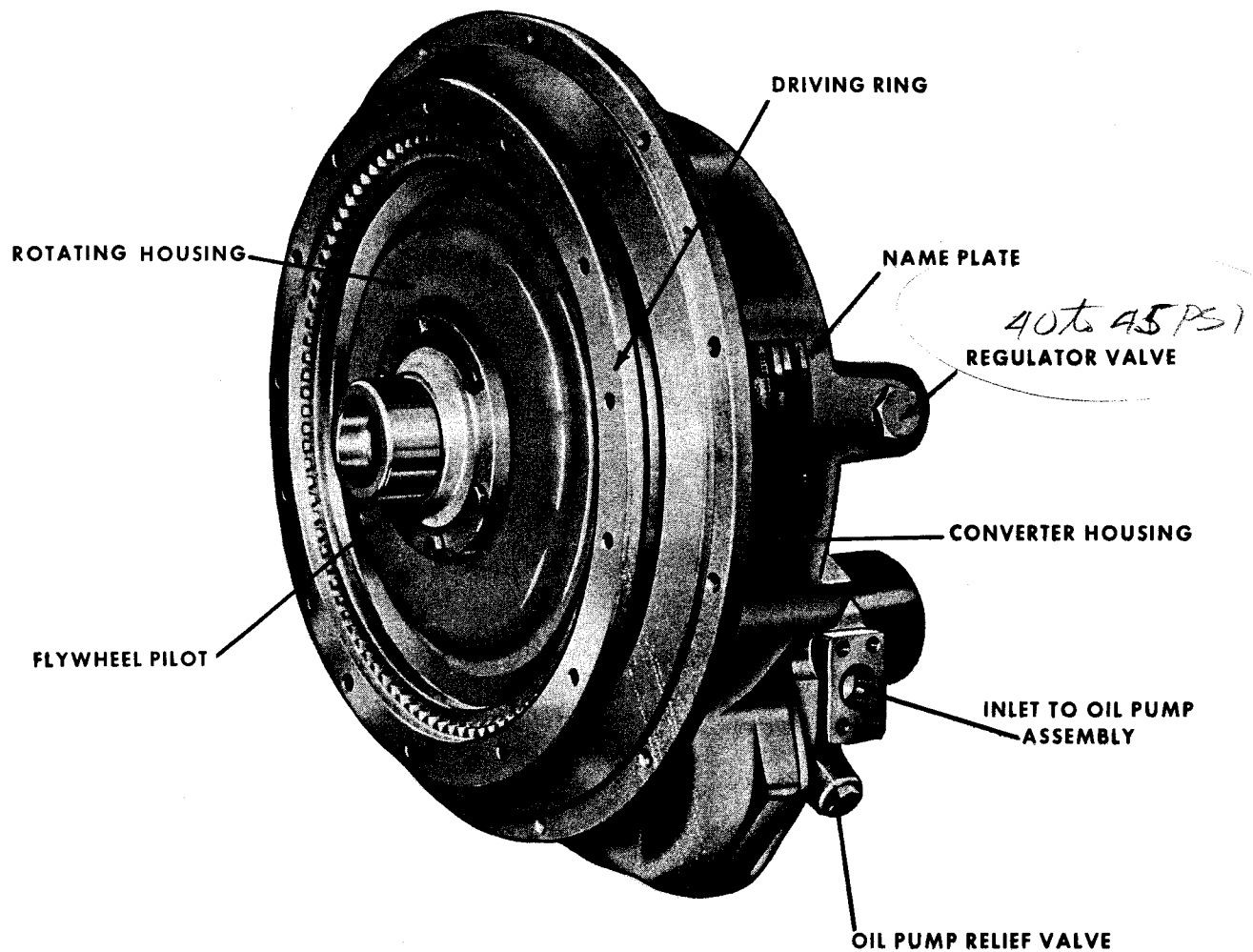


Figure 2. Model 6-F-1514 Series Single-Stage Torque Converter – Input End.



# Hydraulic Torque Converter

## Section I. INTRODUCTION

### 1. GENERAL.

A. *Scope.* This maintenance manual contains factual instructions and illustrations for the operation, removal, disassembly, assembly, and installation of the Twin Disc Clutch Company Hydraulic Torque Converter—Model 6-F-1514 Series. Engineering details and performance characteristics of single-stage hydraulic torque converters may be obtained by writing to the Twin Disc Clutch Company, Hydraulic Division, Rockford, Illinois, U.S.A.

B. *Special Tools.* The manual also contains engineering drawings for the fabrication of special tools that may be used during disassembly and assembly procedures.

C. *Parts List.* A complete parts breakdown, with exploded view illustrations, is provided to facilitate the ordering of spare or replacement parts.

D. *Trouble Shooting.* The manual also contains a trouble shooting table which will assist in determining the cause of functional difficulties that may occur. Proper use of the symptom, cause, and remedy columns of the table will determine whether a simple repair can be accomplished on the torque converter or complete disassembly is necessary.

### 2. DISTRIBUTION.

This maintenance manual should be made available to, and read in its entirety by, all personnel responsible for the operation or maintenance of the hydraulic torque converter. A thorough understanding of the material in this manual will result in lengthy and satisfactory service from the converter.

### 3. ORDERING PARTS.

A. *Source.* Service parts can be obtained from the Twin Disc Clutch Company, Racine, Wisconsin, U.S.A., from any Branch Sales Engineering Office, or from any Twin Disc Authorized Parts Station. Locate your nearest current parts source by writing to the Twin Disc Clutch Company, Central Service Department, Racine, Wisconsin, U.S.A.

B. *Method.* When ordering a service part, always give the figure number of the illustration containing the part, the item number of the part, the description of the part, and the quantity required.

Do not use the word "complete", but state exactly each item wanted. Do not designate the quantity by "sets", but specify the number of parts required. Also, it is highly imperative that the *Model, Specification, and Serial Numbers* of the unit be included. These numbers will always be found stamped on the converter name plate.

### NOTE

*If detail part numbers of the hydraulic torque converter are desired, write to an address given in Paragraph 3A, and submit the specification number.*

### 4. PARTS SHIPMENT.

A. *Method.* Specifically state whether the parts are to be shipped by freight, express, etc., whenever ordering spare or replacement parts. If shipping instructions are not specified on the order, we will use our own judgement and take into consideration time as well as expense. The Twin Disc Clutch Company will *not* be responsible for any charges incurred by this procedure.

B. *Destination.* Furnish the complete shipping and postal address. All shipments will be made F.O.B., Racine, Wisconsin, U.S.A., or the Branch Sales Engineering Office location.

### 5. REPLACEMENTS AND ADJUSTMENTS.

A. *General.* Any complaint which the user or ultimate customer may have concerning the hydraulic torque converter must be submitted through the original equipment manufacturer or the dealer from whom the unit was purchased.

B. *Warranty Conditions.* The Twin Disc Clutch Company, having stipulated the specification number on the converter name plate, absolves itself of any responsibility resulting from any external, internal, or installation changes made in the field without the express *written* approval of the Twin Disc Clutch Company. All returned parts, new or old, emanating from any of the above stated changes will *not* be accepted for credit. Furthermore, any torque converter whose impeller or turbine wheel is changed in order to adapt the unit to an engine other than that specified will not be covered by the Twin Disc Clutch Company Standard Warranty.

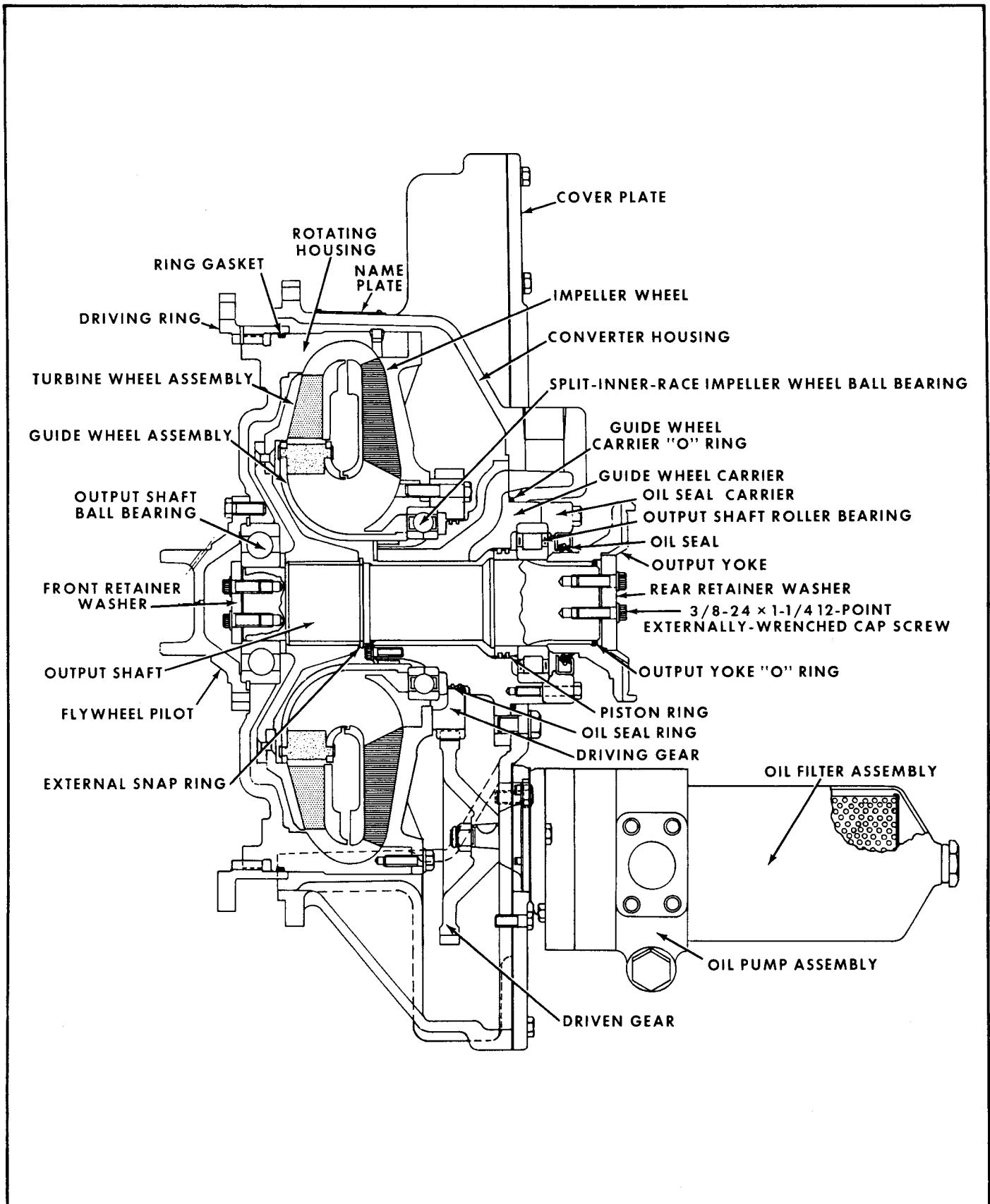


Figure 3. Model 6-F-1514 Series Single-Stage Torque Converter – Cross-Section View.





# Hydraulic Torque Converter

## Section II. DESCRIPTION

### 6. HYDRAULIC TORQUE CONVERTER.

A. *General.* The Twin Disc Single-Stage Hydraulic Torque Converter Model 6-F-1514 Series described in this maintenance manual is composed of the following six major groups of parts: the input group, the converter housing group, the basic converter group, the pump-and-filter group, the output group, and optional pump mounting groups. The converter is designed for mounting on an SAE No. 1 engine flywheel housing.

B. *Construction.* This model torque converter is a flange-type unit that is bolted directly to the engine flywheel housing. The driving ring is installed on the engine flywheel. The driving ring is designed to mesh with the gear teeth that are on the outside diameter of the rotating housing. This method of installation is used because of the simplicity and ease of removal and installation; however, extreme care must be exercised during installation to ensure proper alignment between the torque converter and the engine.

C. *Optional Hydraulic Pump Drive Mounting.* Three optional pump drives are available for the mounting of an auxiliary hydraulic pump. These drive component parts must be ordered separately. They are listed as SAE "C" 4-bolt (13-tooth spline), SAE "C" 4-bolt (14-tooth spline), and SAE "D" 4-bolt.

D. *Oil Filter and Supply.* The oil filter assembly mounted on the lower six o'clock section of the torque converter is of the full-flow design, capable of trapping particles 25 micron in size. The filter base contains inlet and outlet passages and a by-pass passage. A by-pass valve is located in this passage to by-pass the inlet oil to the outlet passage in the event the restriction across the filter causes a pressure differential greater than 50 psi. This would occur with a dirt-clogged filter and/or excessive pressure surge in the oil supply pressure. The converter oil supply is obtained from a remotely-located sump.

### 7. INPUT GROUP OF PARTS.

A. *Driving Ring.* The driving ring is the connecting drive member between the engine flywheel and the converter. The driving ring is bolted to the engine flywheel and meshes with the external gear teeth on the rotating housing.

B. *Flywheel Pilot.* The flywheel pilot is mounted to the rotating housing, and serves the purpose of alignment with the flywheel for stability of the converter output shaft. The flywheel pilot also serves as a bearing retainer for the forward output shaft ball bearing.

### 8. CONVERTER HOUSING GROUP OF PARTS.

A. *Converter Housing.* The converter housing is a high-quality casting reinforced as required for support of the converter components. The housing has mounting provisions for two pumps, a regulator valve, and oil line fittings. Passages are cast-in for oil supply to the converter circuit and regulator valve. The regulator valve by-pass oil is directed by fittings and tubes to the pump mounting cavities, where it assists in lubrication of the pump drive parts. A 5/8-11 NC thread is tapped in an upper boss for the installation of an eyebolt to facilitate the removal and installation of the converter. The housing attaches directly to an SAE No. 1 flywheel housing.

B. *Guide Wheel Carrier.* The guide wheel carrier is mounted with the guide wheel carrier "O" ring to the converter housing. The carrier provides a mounting surface for the guide wheel, making the guide wheel the stationary or reaction member of the converter circuit.

C. *Reducer Bushing.* A reducer bushing mounted in the tapped hole at the top of the housing provides for a vent line connection to the transmission sump.

D. *Regulator Valve.* The pressure regulator valve mounted in the housing controls the converter circuit pressure between 35 and 45 psi.

### 9. BASIC CONVERTER GROUP OF PARTS.

A. *Rotating Housing.* The rotating housing is bolted to the impeller wheel. The housing rotates at engine speed, and provides an enclosure for the basic converter circuit. Two plugs are installed at 180-degrees from each other in the housing to facilitate draining of the converter circuit.

B. *Impeller Wheel.* The impeller wheel is bolted to the rotating housing, and therefore rotates at engine speed. The driving gear is bolted to the impeller wheel and also rotates at engine speed. A choice of impeller wheels is available for close

matching to various engine models. A split-inner-race ball bearing is used between the impeller wheel and the guide wheel carrier.

C. *Turbine Wheel Assembly.* The turbine wheel assembly consists of an aluminum cast blade section riveted to a nodular iron carrier section. The turbine wheel assembly is spline-connected to the output shaft. A choice of various turbine wheels is also available to match various engine models. A snap ring locates the hub of the turbine wheel on the output shaft.

D. *Guide Wheel Assembly.* The guide wheel assembly is the stationary reaction member of the torque converter circuit and is bolted and doweled to the guide wheel carrier. The guide wheel is a fabricated assembly consisting of steel blades and stamped steel shells. A number of different guide wheels are available to match with the proper turbine and impeller wheels to accommodate the various engine models.

## 10. PUMP-AND-FILTER GROUP OF PARTS.

A. *Oil Filter Assembly.* The oil filter assembly consists of a 25 micron element and a self-contained relief valve, which will by-pass dirty oil, if the pressure differential across the element exceeds 5 to 8 psi. The element and the filter housing are retained to the filter base with a long through-bolt, having a hex-head and a 1-14 NF thread.

B. *Filter Base.* The filter base provides a means of mounting the oil filter assembly to the discharge-side of the oil pump. The base contains a relief valve assembly consisting of a piston, spring, and plug. This relief valve will by-pass inlet to outlet oil at 50 psi differential pressure across the oil filter assembly.

C. *Oil Pump Assembly.* A positive-displacement, gear-type pump is mounted on the lower section of the converter housing with a mounting plate and gasket. The oil pump assembly supplies the nec-

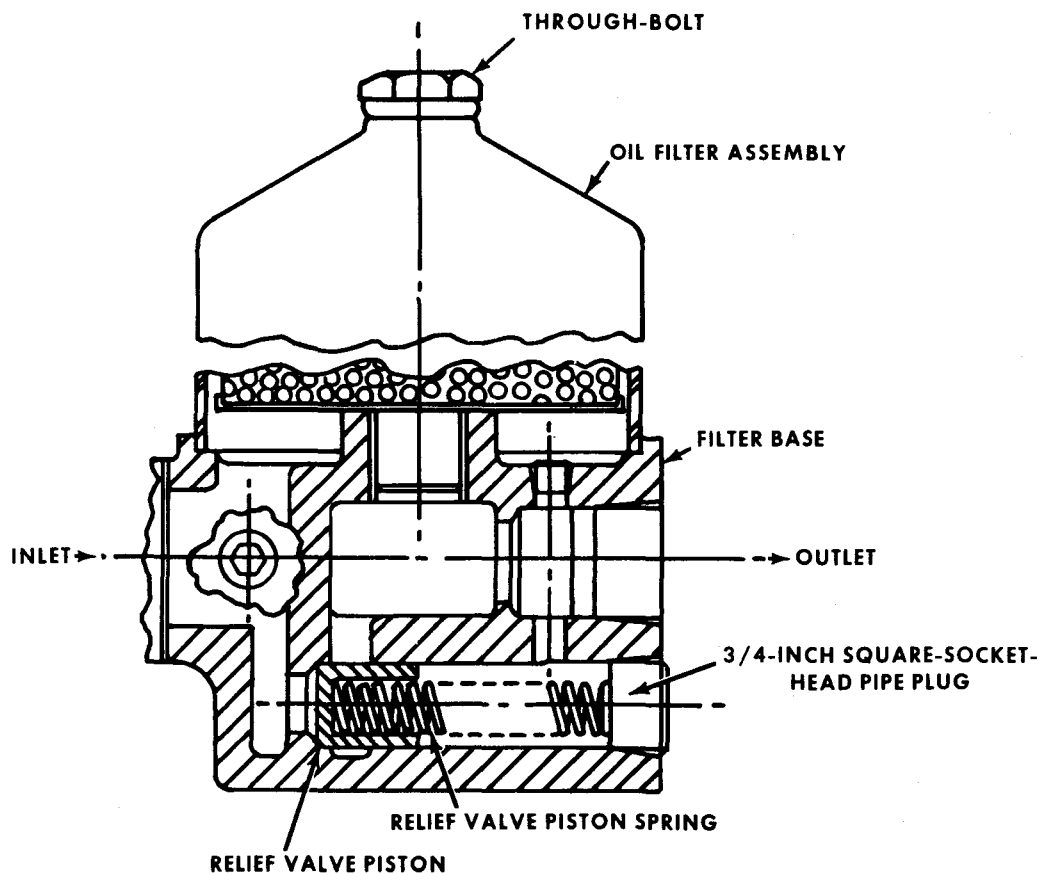


Figure 4. Filter Base – Cross-Section View.



# Hydraulic Torque Converter

essary oil volume and pressure to operate the converter and power-shift transmission. The pump is rated for a minimum capacity of 17.5 gpm @ 200 psi rotating at 1800 rpm (the rating is with ATQF Type "A" automatic transmission oil at 80° F.). The driven gear is keyed and nut retained to the pump drive shaft. A relief valve is integral with the pump. The valve is adjusted by the manufacturer to crack at 240 psi and blow at 300 psi.

D. *Driving Gear.* A driving gear, to drive the standard and/or auxiliary oil pumps, is bolted to the impeller wheel. The pump, therefore, is operating whenever the engine flywheel is turning. The driving gear meshes with and drives the driven gear (running backlash .006 – .015-inch).

## 11. OUTPUT GROUP OF PARTS.

A. *Output Shaft.* The output shaft is spline-connected to the turbine wheel assembly and the output yoke. A roller bearing supports the shaft at the rear. A ball bearing supports it at the front. The front ball bearing is mounted in the rotating housing and flywheel pilot. The roller bearing at the rear is mounted in the guide wheel carrier and the oil seal carrier.

B. *Output Yoke.* The output yoke is spline-connected to the output shaft and secured with a retainer washer and three cap screws. The output yoke "O" ring is used beneath the retainer washer against the yoke and shaft splines to prevent external oil leakage along the splines. A highly-polished seal surface on the yoke provides an area for the oil seal (double-lip) to ride. This oil seal is press-fitted in the seal carrier which is mounted to the guide wheel carrier.

C. *Piston Ring Carrier.* A piston ring carrier to accommodate two piston rings is pressed on the output shaft from the rear. The cone of the roller bearing is then pressed on the shaft against the carrier.

## Section III. PRINCIPLES OF OPERATION

### 12. TORQUE MULTIPLICATION.

A. *General.* The torque converter consists of three basic parts: the impeller wheel, the turbine wheel assembly, and the guide wheel assembly. The rotating housing may or may not be considered a basic part as its function is to enclose the converter circuit. The impeller wheel consists of a

series of blades which act as a pump wheel to impart momentum to the oil contained within the converter circuit. The turbine wheel assembly also consists of a single set of blades; hence the designation, single-stage torque converter. The guide wheel assembly also consists of a single set of blades, and because these are stationary they are referred to as stators. The converter circuit must always contain a solid fill of oil to operate properly.

B. *Function.* The function of a torque converter is to multiply the torque, or twisting force created by the engine crankshaft. The amount of load, or resistance, applied to the output shaft of the torque converter will determine the extent to which engine (or input) torque is multiplied. Therefore, little or no torque multiplication will occur, or is necessary, when the encountered load can be moved with approximately the same amount of torque being produced by the engine. When the load is increased, the torque required at the output shaft of the converter exceeds the torque being produced by the engine. The oil in the converter circuit is then directed in such a manner as to increase the turning effort of the converter output shaft. Thus, the Twin Disc torque converter selects the proper output torque required for any load within the capacity limits of the converter, and does automatically what must be done manually with a mechanical transmission.

### 13. OIL FLOW.

A. *General.* Oil is moved by the rotating blades of the impeller wheel, and directed against the blades of the turbine wheel assembly. The oil passes through the turbine blades and strikes the stator blades of the guide wheel assembly. The stators then redirect the oil back to the impeller wheel to repeat the cycle.

B. *Torque Selection.* Under normal conditions, the oil passes through the converter circuit easily and quickly, striking each blade at a very slight angle. However, when a load is applied the turbine wheel slows down (since it is connected directly to the loaded output shaft), and the oil strikes the turbine wheel blades at a sharper angle. The flow of the oil as it is directed and redirected through the turbine wheel blades results in the torque multiplication of the converter. As the oil passes through the blades, the output torque is increased up to three times the input torque. Thus, the Twin Disc torque converter automatically se-

lects the proper output torque required to drive the load being encountered.

## Section IV. OIL SYSTEM

### 14. GENERAL.

A. *Oil System Components.* The components that comprise the torque converter oil system are as follows:

Transmission or other remotely-located sump.  
Oil pump—relief valve assembly.  
Filter—by-pass check valve.  
Heat exchanger—(customer-furnished).  
Converter circuit.  
Circuit pressure regulator.  
Connecting lines and passages.

B. *Types of Converter Oil.* Oil produced by several manufacturers are approved by the Twin Disc Clutch Company for use in single-stage hydraulic torque converters. One of these oils must

be used for maximum performance. Refer to Paragraph 43 for a complete list of recommended and approved converter oils. Use an SAE 10W oil H.D. above minus 10°F., and an SAE 5W oil H.D. below minus 10°F. Oil to meet API service class MS.

C. *Oil Capacity.* The oil capacity of the Model 6-F-1514 Series Single-Stage Torque Converter is included as a part of the transmission or other remote sump oil fill. However, the converter circuit initial fill would be approximately 9 quarts not including the connecting lines, heat exchanger and other plumbing.

### 15. OIL CIRCULATION.

A. *General.* The oil system for the Model 6-F-1514 Series Single-Stage Torque Converter for lubrication and operation is integral. That is, the ball and roller bearings are enclosed in and become a part of the converter circuit oil circulation flow. The oil flow is as follows:

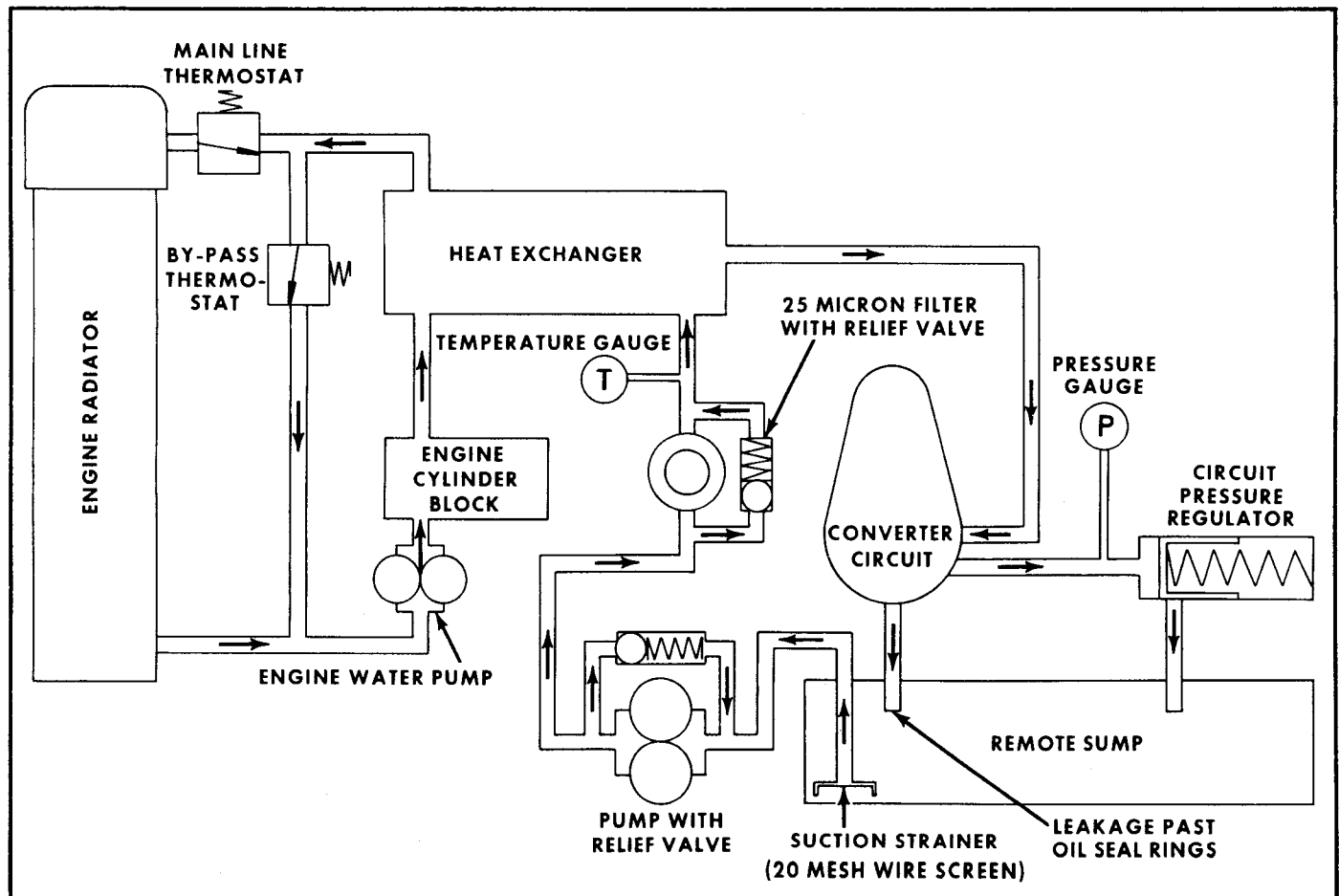


Figure 5. Oil Flow with Remote Sump – Schematic View.



# Hydraulic Torque Converter

The engine driven pump, mounted on the converter, draws oil from the transmission or other sump through a strainer screen. The pump built-in relief valve controls the maximum pump output pressure between 240 and 300 psi. The oil is directed from the pump through a 25 micron filter. The filter contains an internal by-pass valve. This valve is rated to by-pass incoming oil when the restriction of the element reaches a state causing a differential pressure of from 5 to 8 psi. An additional positive by-pass valve is located in the filter circuit at the filter base. This valve by-passes oil from the filter inlet to the filter outlet in the event the filter restriction causes a pressure differential of 50 psi across the filter. Oil leaving the oil filter is directed through the heat exchanger and then into the converter circuit. The oil enters the converter circuit through passages in the converter housing and the guide wheel carrier, passing between the carrier and the output shaft. The oil directed along the output shaft forward, joins the converter circuit oil through the separation between the turbine wheel and the guide wheel. The oil constantly leaving the converter circuit follows the guide wheel hub section, flows through the rear ball bearing, and enters the outlet passage of the carrier to the regulator valve mounting port. By-pass oil from the regulator valve flows through tubing to the pump mounting areas to lubricate the pump drives, and then drains to sump. Oil seepage from the piston rings and wet flywheel drains down into the sump through the drain line. Converter circuit pressure oil is also deflected from the rotating housing behind the turbine wheel and into the front ball bearing and flywheel pilot. The flywheel pilot has a calibrated leak to permit oil into the flywheel area. Centrifugal force flings the oil onto the drive ring teeth for lubrication. Drainage returns to sump. The rear roller bearing is lubricated by oil seepage past piston rings. This oil drains to sump. Oil is prevented from leaking externally by the double-lip oil seal and "O" ring assembled with the output yoke.

**B. Oil Pressure.** The oil pump and the converter pressure regulator valve create the basic oil pressure of the converter circuit. Normal operating pressure is between 35 and 45 psi. The oil pump and transmission pressure regulator valve create the basic oil pressure for the transmission clutches. Normal operating pressure is approximately 200 psi.

**C. Oil Temperature.** The normal operating temperature is between 180 and 220°F. The *maximum* temperature for SAFE continuous operation is 250°F.

**D. Oil Cooling.** An oil-to-water heat exchanger which utilizes engine cooling water must be provided which can dissipate 25 percent of the net rated horsepower of the engine. The physical size of the heat exchanger will depend on its internal construction and the temperature and flow rate of the engine water available. The converter oil temperature at the inlet to the heat exchanger must *not* exceed 250°F. The water circuit shall be connected with the engine water by-pass so that on cold starts the water from the heat exchanger will recirculate through the engine block and by-pass line, rather than through the engine radiator, until the system is up to operating temperature. Minimum recommended oil temperature is 160°F.

## 16. LUBRICATION.

**A. General.** All moving parts of the Model 6-F-1514 Series Torque Converter are lubricated by the oil within the converter as it travels throughout the oil system. No further lubrication is required. However, a daily check should be made of the oil level within the system.

**B. Output Shaft Ball Bearing (Input End).** Lubrication of this ball bearing is provided by the converter circuit oil.

**C. Output Shaft Roller Bearing (Output End).** This bearing is lubricated by the oil seepage past the piston rings.

**D. Impeller Wheel Ball Bearing.** This bearing is lubricated by the oil discharge flow from the converter circuit.

## Section V. PREVENTIVE MAINTENANCE

## 17. GENERAL.

**A. Lubrication.** As covered in Paragraph 16 the lubrication of the Model 6-F-1514 Torque Converter is integral and the only requirement is a daily check of the oil supply in the system.

**B. Overhaul Interval.** A complete overhaul of the Model 6-F-1514 Torque Converter should be made at the same time that the engine is overhauled. Worn parts and those indicating fatigue should be replaced at this time.

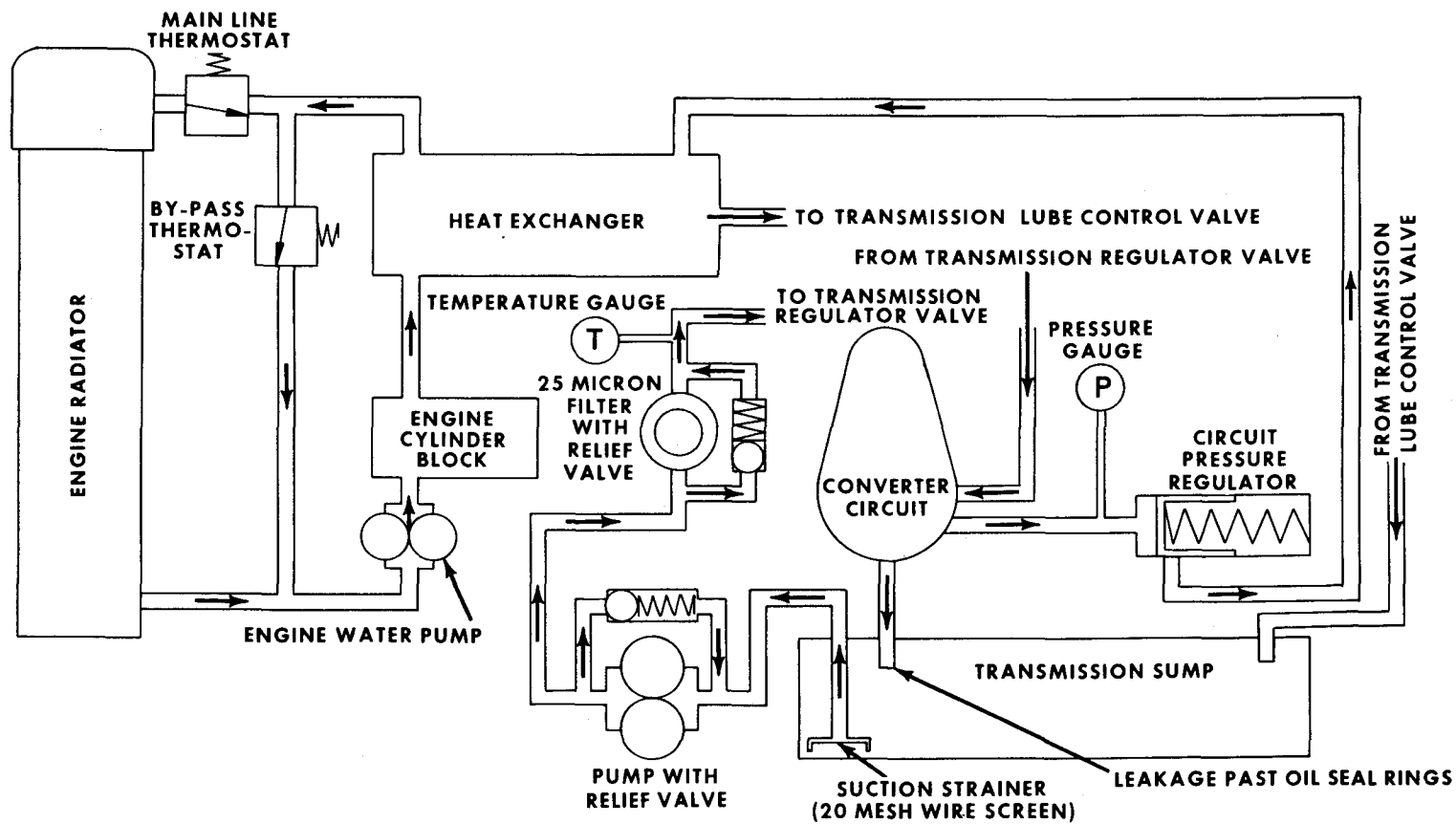


Figure 6. Oil Flow with Transmission Sump – Schematic View.



# Hydraulic Torque Converter

## 18. OIL SYSTEM.

A. *Oil Level.* The converter circuit of the torque converter must contain a solid fill of oil at all times. With the unit in operation a fair indication of correct oil fill will be reflected by a steady pressure gauge reading between 35 and 45 psi. Check the oil level by the following procedure:

(1) Operate the engine for 10 minutes or until engine temperature reaches normal operating range.

(2) Turn off the engine. Check the oil level in the transmission or other remote sump as quickly as possible after stopping the engine. The oil must be maintained at a level between the high and low marks on the gauge.

### NOTE

*If the engine is not operated, or if the check is made after the engine has been stopped for a considerable length of time, an erroneous reading will be obtained. With the engine static, 50% of the converter oil drains down into the sump and causes a greater than normal oil level reading.*

B. *Oil Change Interval.* The oil in the converter must be changed every 1000 hours of operation or every 3 months—whichever occurs first. Use a new oil filter service kit when changing the oil. The approximate oil capacity is 9 quarts less plumbing and heat exchanger.

C. *Draining.* Shut off the engine. Remove the sump vent line from the reducer bushing on the top of the converter housing. Remove the reducer bushing for access to the two 1/8-inch hex-socket-head pipe plugs. Use a magnetic-tip Allen head wrench to remove the plugs, which are located 180-degrees apart. The engine crankshaft will have to be barred-over slowly to align the rotating housing drain plugs with the opening. After removal of the two plugs, turn the rotating housing so one of the open holes is on top to serve as a vent. The converter circuit oil remaining will drain from the lower opening and continue through the converter housing and drain line to the sump. Draining of the sump then will prepare the unit for refill. Permit sufficient time for draining. Re-install the two pipe plugs, reducer bushing, and vent line. Install plug in sump.

D. *Filling.* Make certain all drain pipe plugs are tightened securely. Use only Twin Disc recommended and approved converter oil of the proper weight to fill the converter (plus whatever quantity is required for the plumbing, heat exchanger, etc.). Check the oil level by following the procedure described in Paragraph 18A.

## 19. PERIODIC VISUAL INSPECTION.

A. *General.* Frequently inspect the converter mounting components. Replace damaged parts as required.

B. *Plumbing.* Inspect the connecting lines for leaks, kinks, or other damage. Replace a damaged line. Inspect the heat exchanger for leaks and damage. Replace damaged parts.

C. *Pressure and Temperature Gauge Assemblies.* Periodically inspect the pressure and temperature gauge assemblies for damage. Replace a damaged gauge. If a gauge is suspected of being inaccurate, replace the gauge with one of proven accuracy to determine the extent of malfunction.

D. *Oil Seal.* Periodically inspect the rear areas of the converter near the yoke for signs of oil leakage past the oil seal. Replace a leaking seal.

## Section VI. TROUBLE SHOOTING

## 20. GENERAL.

This section of the manual has been prepared to assist maintenance personnel in trouble shooting the hydraulic torque converter. When trouble shooting the torque converter, always remember to consider the entire power package.

## 21. TROUBLE SHOOTING CHART.

The trouble shooting chart (Table I) is organized in three columns. Proper use of the chart will aid in rapid determination and repair of any functional difficulties that may occur.

Table 1. Trouble Shooting.

| Symptom  | Cause  | Remedy   |
|--|--|--|
| 1. Overheating.  | <p>1-1. Insufficient heat exchanger capacity for duty or climate.</p> <p>1-2. Bearing failure.</p> <p>1-3. Heat exchanger and lines clogged.</p> <p>1-4. Improper oil level.</p> <p>1-5. Converter and engine not matched.</p> | <p>1-1. Install a larger heat exchanger or modify the engine cooling arrangement.</p> <p>1-2. Remove the torque converter from the engine (pars. 22 &amp; 23). Disassemble the torque converter (pars. 24 - 30) and replace the damaged parts.</p> <p>1-3. Remove the heat exchanger and lines and inspect.</p> <p>1-4. Check oil level (par. 18A).</p> <p>1-5. Check application with Twin Disc Application Engineering Department.</p> |
| 2. High converter oil pressure.                                  | <p>2-1. Converter pressure regulator valve sticking closed.</p>  | <p>2-1. Remove converter pressure regulator parts (par. 26b), and clean.</p>   |
| 3. Low oil pressure from transmission pressure regulator valve.  | <p>3-1. Low oil level.</p> <p>3-2. Clogged suction line strainer screen.</p> <p>3-3. Foamed oil.</p>   | <p>3-1. Refer to Remedy 1-4.</p> <p>3-2. Remove screen and clean.</p> <p>3-3. Check for leaks in suction line.</p>   |
| 4. High oil pressure from transmission pressure regulator valve. | <p>4-1. Transmission pressure regulator valve sticking closed.</p>   | <p>4-1. Remove transmission pressure regulator valve and clean.</p>  |
| 5. Poor performance.   | <p>5-1. Low oil pressure.</p> <p>5-2. Improper oil.</p> <p>5-3. Converter and engine not matched.</p>  | <p>5-1. Refer to Remedy 1-4.</p> <p>5-2. Use recommended oil (par. 43).</p> <p>5-3. Refer to Remedy 1-5.</p>   |





# Hydraulic Torque Converter

Table I. Trouble Shooting.

| Symptom                              | Cause   | Remedy   |
|--------------------------------------|---|--|
| 6. Low oil level.                    | 6-1. Leakage.   | 6-1. Inspect for and rectify leaks. Fill sump to correct level.  |
| 7. Foreign matter in oil or filters. | 7-1. Converter or transmission failure.                       | 7-1. Remove failed unit and disassemble. All parts must be cleaned including hoses, heat exchanger, and filter base. |
| 8. Output oil seal leaking.          | 8-1. Damaged or foreign matter under lip of seal.             | 8-1. Remove output yoke. Remove oil seal and replace.  |
| 9. Noisy converter.                  | 9-1. Bearing failure.<br>9-2. Teeth on rotating housing worn. | 9-1. Refer to Remedy 1-2.<br>9-2. Refer to Remedy 1-2.   |

## Section VII. REMOVAL

### 22. PRIOR TO REMOVAL.

A. *Oil System.* Drain the hydraulic torque converter of oil (par. 18C).

B. *Support.* Support the hydraulic torque converter with a jack and/or a hoist attached with a lifting eye in the hole provided on the top of the converter housing.

C. *Plumbing.* Disconnect the inlet, drain, and vent lines from the converter. Cap or plug all openings to prevent dirt entry.

D. *Output End.* Remove the drive shaft from the output yoke.

### 23. REMOVAL.

A. *Support.* Raise the means of support enough to remove the downward strain. Remove the cap screws or nuts and studs that secure the converter housing to the engine flywheel housing.

B. *Separation.* Pry and shift the converter rearward from the engine flywheel to disengage the flywheel pilot and rotating housing teeth from the

flywheel and driving ring. When the converter is free, remove it for disassembly. If the driving ring is furnished with the torque converter, remove it from the flywheel only if replacement is necessary.

## Section VIII. DISASSEMBLY

### 24. PUMP-AND-FILTER GROUP OF PARTS.

A. Remove the filter cover of the oil filter assembly (fig. 40, 51) and the filter element and gasket (52) from the filter base (44). Discard the element and gasket.

B. Remove the four hex-head cap screws (fig. 40, 46) that secure the filter base to the oil pump assembly (42). Remove the filter base and the filter base flat gasket (43) from the oil pump assembly. Discard the gasket. Remove the three hex-socket-head pipe plugs (45, 50 & 53) from the filter base. Remove the square-socket-head pipe plug (47), the relief valve piston spring (48), and the relief valve piston (49) from the filter base.

C. Remove the six hex-head cap screws (fig. 40, 41) and copper washers (40) from the pump mounting plate (38). Discard the copper washers. Remove the mounting plate, with attached parts, and the pump mounting plate flat gasket (37) from the con-

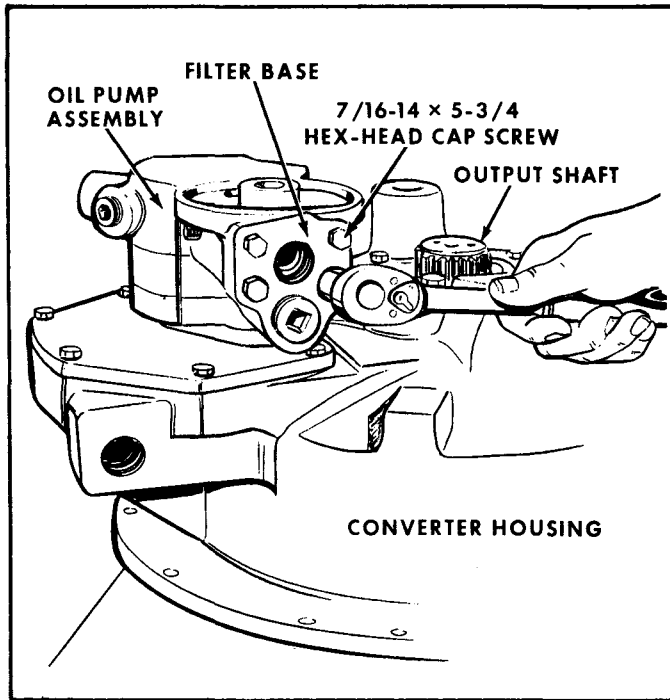


Figure 7. Removing the Filter Base from the Oil Pump Assembly.

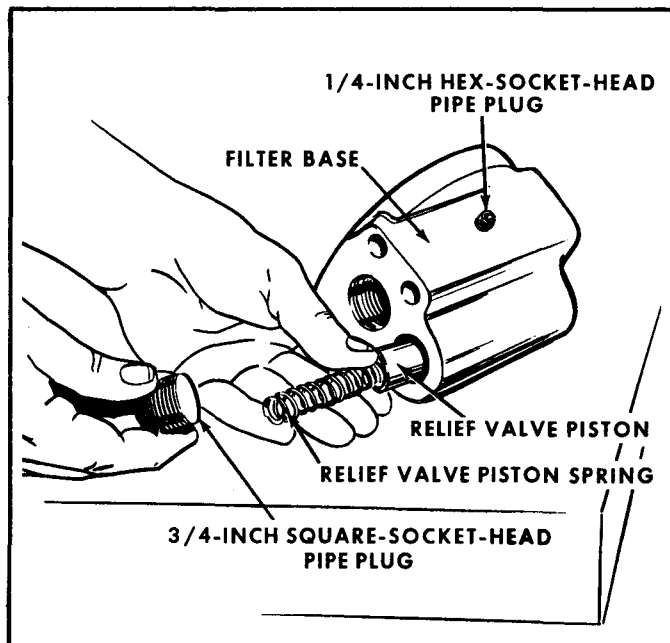


Figure 8. Removing the Relief Valve from the Filter Base.

verter housing (9). Discard the gasket. Remove the roll pin (30) from the plate or housing only if replacement of parts is necessary. Remove the slotted hex nut (35) that secures the driven gear (36) on the shaft of the oil pump. Remove the driven gear and

the key from the shaft of the oil pump. Remove the two hex-head cap screws (54) and copper washers (55) that secure the oil pump to the mounting plate. Remove the oil pump and the oil pump flat gasket (39) from the mounting plate. Discard the gasket and the copper washers.

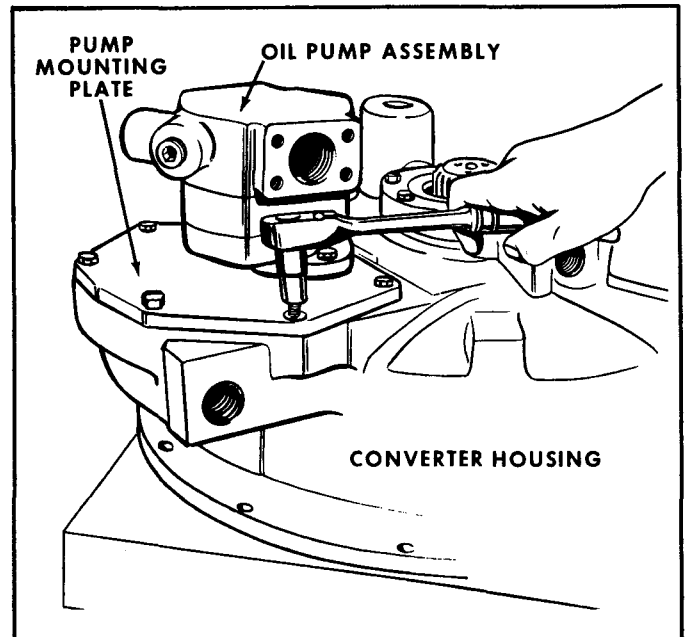


Figure 9. Removing the Pump Mounting Plate from the Converter Housing.

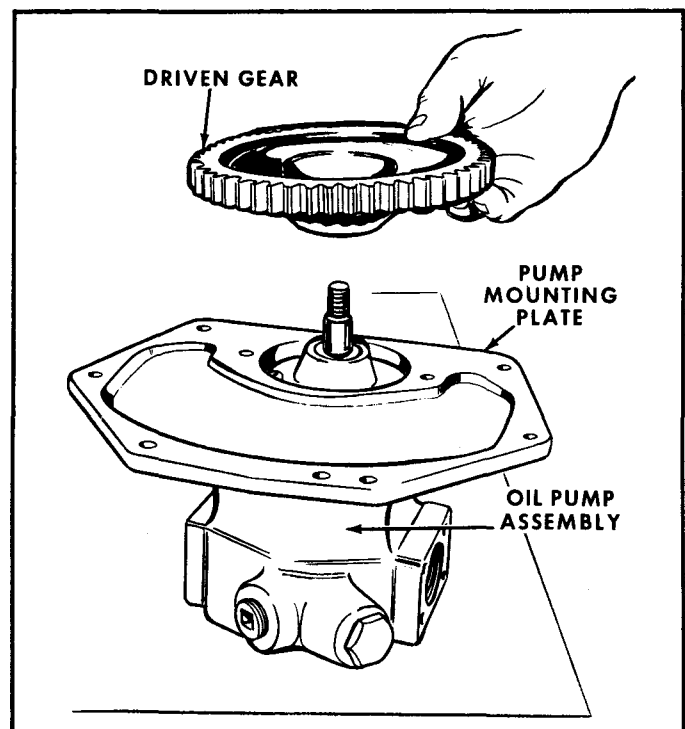


Figure 10. Removing the Driven Gear from the Oil Pump Assembly.

# Hydraulic Torque Converter

## 25. OUTPUT GROUP OF PARTS.

A. Remove the three 12-point, externally-wrenched cap screws (fig. 40, 28) and the rear retainer washer (27) that secure the output yoke (25) to the output shaft (fig. 41, 14). Remove the output yoke "O" ring (fig. 40, 26) from the output yoke and the output shaft. Discard the "O" ring. Use a standard foot-type puller, and remove the output yoke from the output shaft.

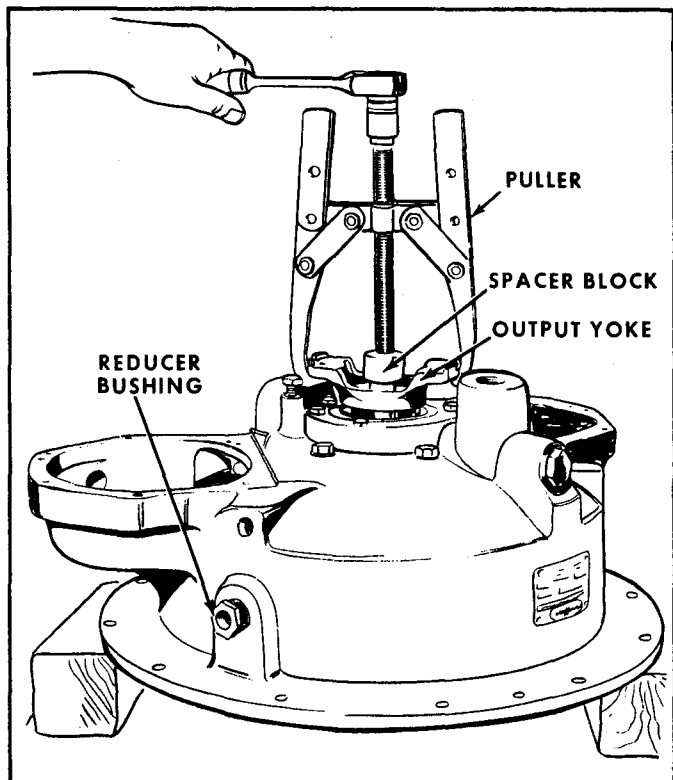


Figure 11. Removing the Output Yoke from the Output Shaft.

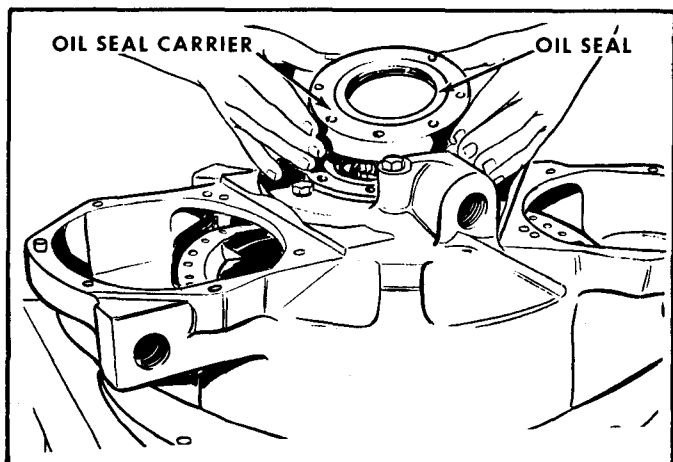


Figure 12. Removing the Oil Seal Carrier from the Guide Wheel Carrier.

B. Remove the six hex-head cap screws (fig. 40, 29) that secure the oil seal carrier (23) to the guide wheel carrier (fig. 41, 24). Remove the oil seal carrier and the guide wheel carrier gasket (fig. 40, 17) from the guide wheel carrier. Discard the gasket. Remove the oil seal (24) from the oil seal carrier. Discard the oil seal.

## 26. CONVERTER HOUSING GROUP OF PARTS.

A. Remove the six hex-head cap screws (fig. 40, 16 & 21) and copper washers (15 & 22) that secure the converter housing and the guide wheel carrier together. Discard the copper washers. Use a hoist, and remove the converter housing from the basic converter group of parts.

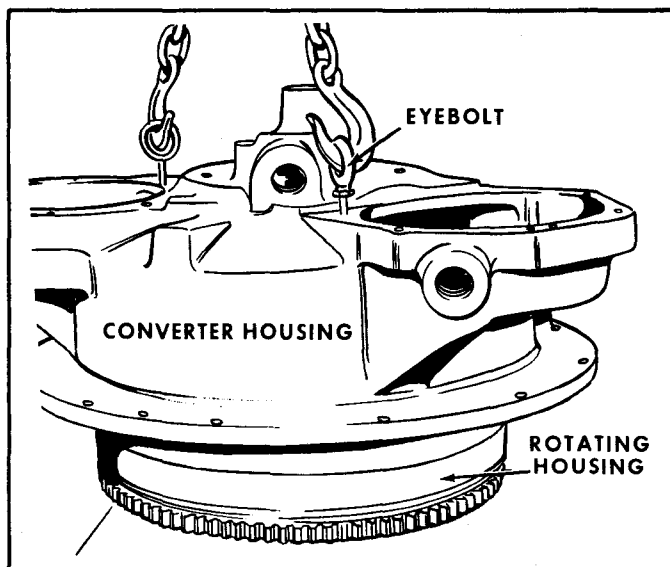


Figure 13. Removing the Converter Housing from the Basic Converter Group of Parts.

B. Remove the square-head pipe plug (fig. 40, 14) and the reducer bushing (8) from the converter housing. Remove the regulator valve plug (32), the regulator valve plug copper washer (31), the regulator valve piston spring (34), and the regulator valve piston (33) from the converter housing. Discard the copper washer.

C. Remove the short and long lubrication tubes (fig. 40, 2 & 4), the two inverted elbow fittings (1 & 5), and the inverted tee fitting (3) from the converter housing only if replacement of parts is necessary.

D. Remove the four drive screws (fig. 40, 7) and the name plate (6) from the converter housing only if replacement of parts is necessary.

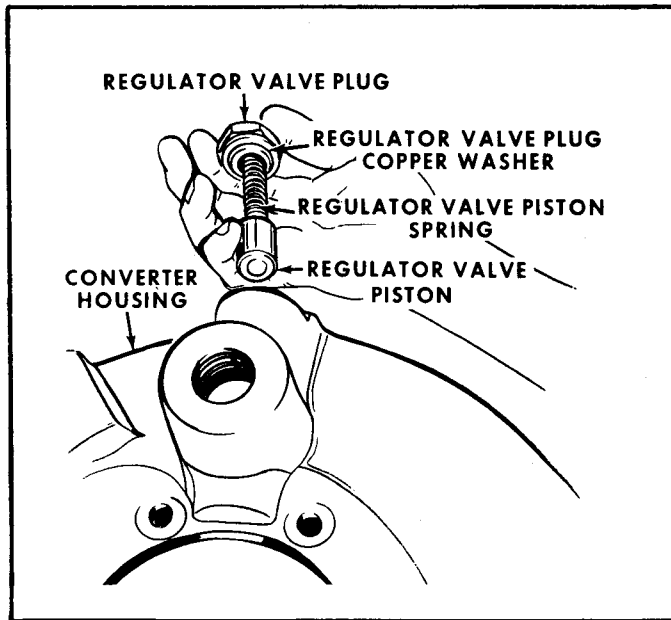


Figure 14. Removing the Regulator Valve from the Converter Housing.

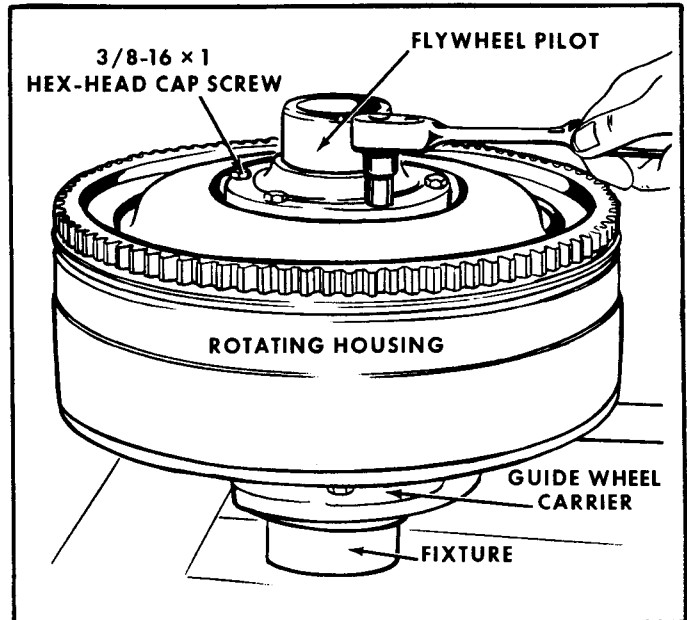


Figure 15. Removing the Flywheel Pilot from the Rotating Housing.

E. Remove the six hex-head cap screws (fig. 40, 13) and copper washers (12) that secure the cover plate (11) to the converter housing. Remove the cover plate and the cover plate flat gasket (10) from the converter housing. Discard the copper washers and the gasket.

## 27. INPUT GROUP OF PARTS.

A. Remove the ring gasket (fig. 41, 4) from the rotating housing (9). Discard the gasket.

B. Remove the six hex-head cap screws (fig. 41, 2) that secure the flywheel pilot (3) to the rotating housing. Remove the flywheel pilot from the rotating housing.

C. Remove the two 12-point, externally-wrenched cap screws (fig. 41, 5) and the front retainer washer (6) from the output shaft (14).

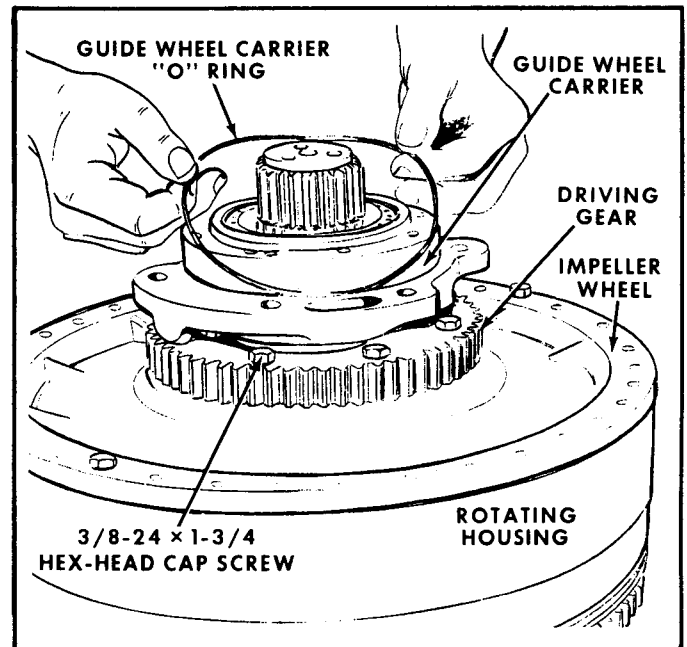


Figure 16. Removing the Guide Wheel Carrier "O" Ring from the Guide Wheel Carrier.

## 28. BASIC CONVERTER GROUP OF PARTS.

A. Place the basic converter group of parts on a bench with the guide wheel carrier up. Remove the guide wheel carrier "O" ring (fig. 41, 25) from the guide wheel carrier. Discard the "O" ring.

B. Remove the thirty-six hex-head cap screws (fig. 41, 26) and special flat washers (27) that secure the impeller wheel (20) to the rotating housing. Invert the basic converter group of parts on the bench.

C. Install two 3/8-16 screws in the rotating housing. Place a round steel block in position over the end of the output shaft. Use a forked-foot puller, and remove the rotating housing and the output shaft ball bearing (fig. 41, 7) from the output shaft. Remove the bearing spacer (8) from the output shaft. Remove the ball bearing and the two hex-socket-head pipe plugs (10 & 11) from the rotating housing.

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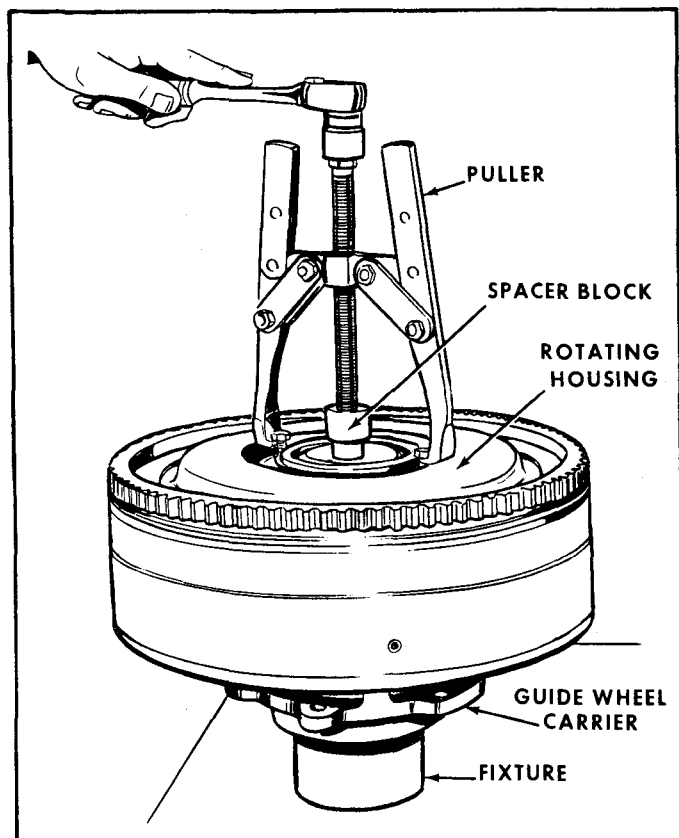


Figure 17. Removing the Rotating Housing from the Impeller Wheel.

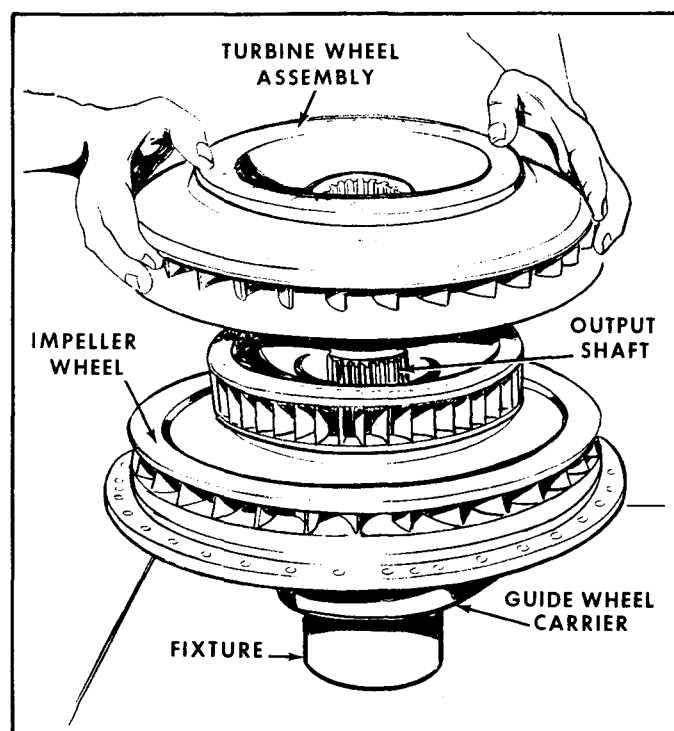


Figure 18. Removing the Turbine Wheel Assembly from the Output Shaft.

D. Remove the turbine wheel assembly (fig. 41, 12) from the output shaft. Remove the external snap ring (13) from the output shaft.

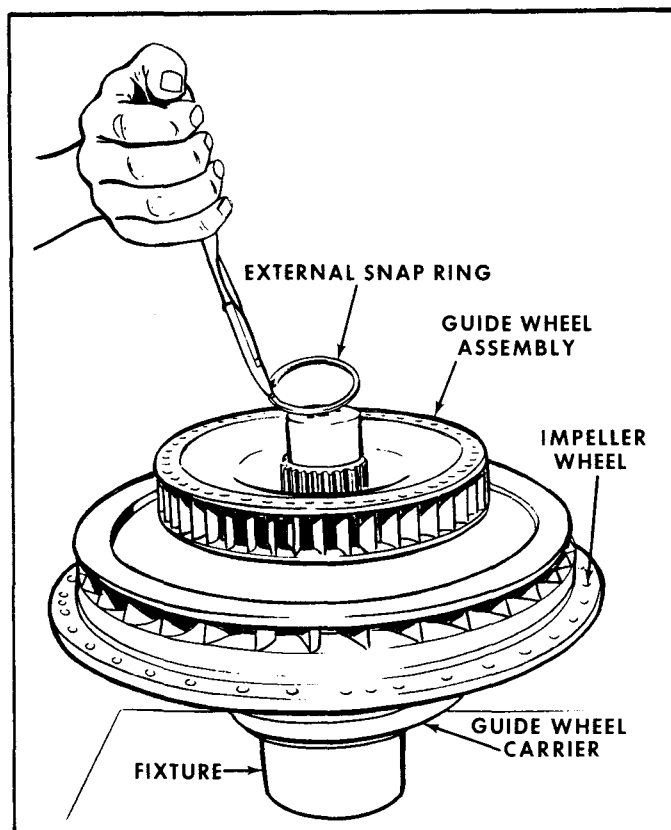


Figure 19. Removing the External Snap Ring from the Output Shaft.

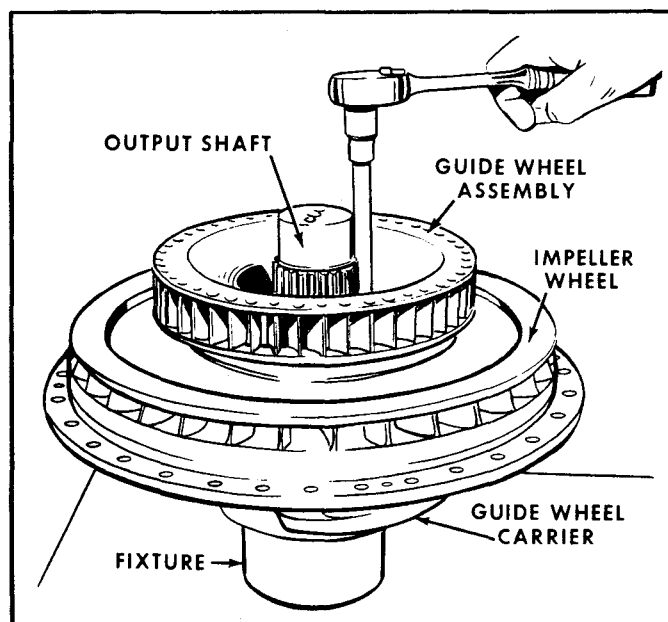


Figure 20. Removing the Guide Wheel Assembly from the Guide Wheel Carrier.

E. Remove the six 12-point, externally-wrenched cap screws (fig. 41, 15) and the two clamp plates (16) that secure the guide wheel assembly (17) to the guide wheel carrier. Remove the guide wheel assembly from the guide wheel carrier.

F. Remove the impeller wheel, with attached parts, from the guide wheel carrier. Remove one-half of the split-inner-race impeller wheel ball bearing (fig. 41, 19) from the outer race. Remove the eight hex-head cap screws (22) that secure the impeller wheel, the bearing carrier (18), and the driving gear (21) together. Separate the parts, and remove the outer race of the ball bearing from the bearing carrier.

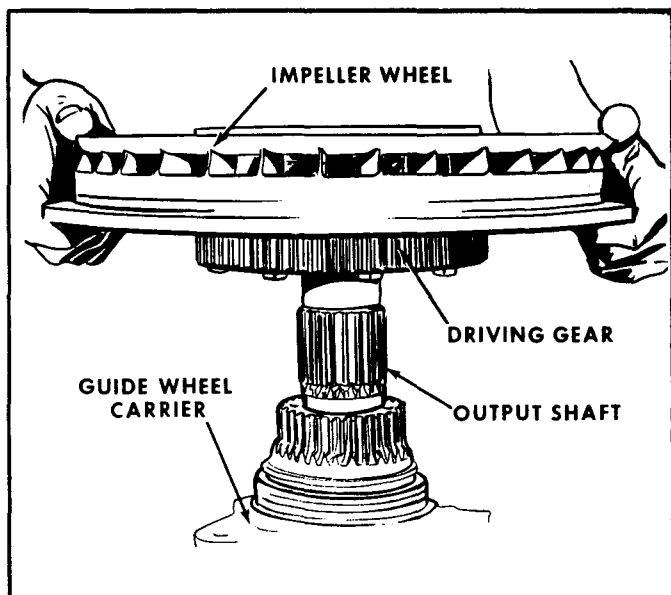


Figure 21. Removing the Impeller Wheel with attached parts.

G. Use a standard puller, and remove the guide wheel carrier, with attached parts, from the output shaft. Remove the remaining half of the inner race from the guide wheel carrier. Remove the two oil seal rings (fig. 41, 23) from the guide wheel carrier. Discard the oil seal rings. Remove the outer race of the output shaft roller bearing (fig. 40, 20) from the guide wheel carrier.

## 29. OUTPUT SHAFT GROUP OF PARTS.

A. Remove the two piston rings (fig. 40, 18) from the piston ring carrier (19). Discard the piston rings.

B. Use an arbor press, and remove the piston

ring carrier and the inner race of the output shaft roller bearing from the output shaft.

## 30. OPTIONAL POWER PUMP MOUNTING GROUPS OF PARTS.

A. Optional power pump mounting groups of parts are available for this model torque converter. Follow the individual disassembly procedure for the applicable group of parts.

B. The SAE "C" 4-bolt, power pump mounting group of parts is disassembled as follows:

(1) Remove the four cap screws that secure the pump to the pump mounting plate. Remove the pump from the mounting plate.

(2) Remove the six hex-head cap screws (fig. 42, 17) and copper washers (18) that secure the pump mounting plate (10) to the converter housing. Remove the pump mounting plate, with attached parts, and the mounting plate flat gasket (9) from the converter housing. Discard the gasket and the copper washers. Remove the mounting plate roll pin (8) from the plate or housing only if replacement of parts is necessary.

(3) Remove the internal snap ring (fig. 42, 16) that retains the bearing retainer (12) in the pump mounting plate. Remove the bearing retainer, with attached parts, from the pump mounting plate. Remove the bearing retainer "O" ring (11) from the bearing retainer. Discard the "O" ring. Remove the oil seal (13) from the bearing retainer. Discard the oil seal.

(4) Remove the external snap ring (fig. 42, 7) from the driven gear (2). Press the driven gear from the driven gear ball bearings (3 & 6). Remove the ball bearing (3) from the driven gear or the pump mounting plate. Remove the driven gear bearing spacer (4), the internal snap ring (5), and the ball bearing (6) from the pump mounting plate.

(5) Remove the splined adapter and the internal snap ring (fig. 42, 14), if installed, from the driven gear. Remove the expansion plug (1) from the driven gear only if replacement of parts is necessary.

C. The SAE "D" 4-bolt, power pump mounting group of parts is disassembled as follows:

(1) Remove the four cap screws that



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secure the pump to the pump mounting plate. Remove the pump from the mounting plate and the driven gear (fig. 43, 16).

(2) Remove the six hex-head cap screws (fig. 43, 11) and copper washers (10) that secure the pump mounting plate (9) to the converter housing. Remove the pump mounting plate, with attached parts, and the mounting plate flat gasket (8) from the converter housing. Discard the gasket and the copper washers. Remove the mounting plate roll pin (7) from the plate or housing only if replacement of parts is necessary.

(3) Remove the internal snap ring (fig. 43, 14) that retains the seal carrier (13) in the pump mounting plate. Remove the seal carrier, with attached parts, from the pump mounting plate. Remove the seal carrier "O" ring (12) from the seal carrier. Discard the "O" ring. Remove the oil seal (15) from the seal carrier. Discard the oil seal.

(4) Straighten the locking tabs of the bearing lock nut washer (fig. 43, 5) from the flats of the bearing lock nuts (4 & 6). Remove the lock nuts and washer from the driven gear. Press the driven gear, with attached parts, from the cone of the driven gear tapered roller bearing (3). Use a standard puller, and remove the cone of the driven gear tapered roller bearing (1) from the driven gear. Remove the expansion plug (17) from the driven gear only if replacement of parts is necessary.

(5) Remove the cone of the driven gear tapered roller bearing (fig. 43, 3) from the cup. Use a three-legged, inside-foot type puller, and remove the cups from the pump mounting plate. Remove the two internal snap rings (2) from the pump mounting plate.

## Section IX. CLEANING AND INSPECTION

### 31. GENERAL.

- A. *Oil Seals.* Replace all oil seals.
- B. *Gaskets.* Replace all gaskets.
- C. *Piston Rings.* Replace all piston rings.
- D. *"O" Rings.* Replace all "O" rings.
- E. *Copper Washers.* Replace all copper washers.

### 32. CLEANING.

A. *Ball and Roller Bearings.* Use standard maintenance procedures to clean all bearings.

B. *Oil Pump Assembly.* Use only fresh cleaning agent when flushing the oil pump assembly.

C. *All Other Parts.* Thoroughly clean all other parts with a suitable cleaning agent. After cleaning, dry with compressed air. Lubricate all machined surfaces with clean oil. Examine each part after cleaning to make certain all foreign matter has been removed.

#### NOTE

*Do not use any abrasive material on the pressure regulator valve parts as damage will result.*

### 33. INSPECTION.

A. *Ball and Roller Bearings.* Use standard maintenance procedures to inspect all bearings.

B. *Castings.* Inspect all castings for cracks. Replace a cracked casting. Inspect all bearing bores, mounting faces, and shoulders for grooves, wear, scratches, etc. Remove burrs and scratches with a crocus cloth. Inspect tapped holes for damaged threads. Chase damaged threads with a used tap of the correct size. Replace all castings that cannot be repaired.

C. *Splined Parts.* Inspect all splined parts for worn, twisted, chipped, or burred splines. Remove these defects with a soft stone. Replace a splined part that cannot be repaired.

D. *Threaded Parts.* Inspect all threaded parts for damaged threads. Repair damaged threads with a thread file or a fine three-cornered file. Replace a threaded part that cannot be repaired.

E. *Driving Ring.* Inspect the driving ring for damage. Replace a damaged or worn driving ring.

F. *Impeller and Turbine Wheels.* Carefully inspect the blades and castings of the impeller and turbine wheels for cracks or other damage. Replace a damaged impeller or turbine wheel.

G. *Guide Wheel Assembly.* Carefully inspect the guide wheel assembly for broken, bent, or loose blades. Replace a damaged guide wheel assembly.

## Section X. ASSEMBLY

### NOTE

All torque ratings given are under dry conditions.

#### 34. CONVERTER HOUSING GROUP OF PARTS.

A. If removal had been necessary, install the two inverted elbow fittings (fig. 40, 1 & 5) and the inverted tee fitting (3) in the converter housing (9). Install the short lubrication tube (2) and the long lubrication tube (4) in the fittings.

B. If replacement had been necessary, place a new name plate (fig. 40, 6) in position against the converter housing, and secure the name plate to the converter housing with four drive screws (7). Transfer the data stamped on the old name plate to the new name plate.

C. Install the reducer bushing (fig. 40, 8), the 1-inch square-head pipe plug (14), and the 3/8 x 5/8 roll pin (30) in the converter housing.

D. Install the regulator valve piston (fig. 40, 33), the regulator valve piston spring (34), a new regulator valve plug copper washer (31), and the regulator valve plug (32) in the converter housing.

#### 35. OUTPUT SHAFT GROUP OF PARTS.

A. Use an arbor press, and press the piston ring carrier (fig. 40, 19) and the inner race of the output shaft roller bearing (20) against the shoulder of the output end of the output shaft (fig. 41, 14). The piston ring groove area of the carrier must be adjacent to the shoulder.

B. Install two new piston rings (fig. 40, 18) in the piston ring grooves of the piston ring carrier. Lubricate the rings with clean oil.

#### 36. BASIC CONVERTER GROUP OF PARTS.

A. Use special tool T-11232, and install one-half of the inner race of the split-inner-race impeller wheel ball bearing (fig. 41, 19) on the guide wheel carrier (24).

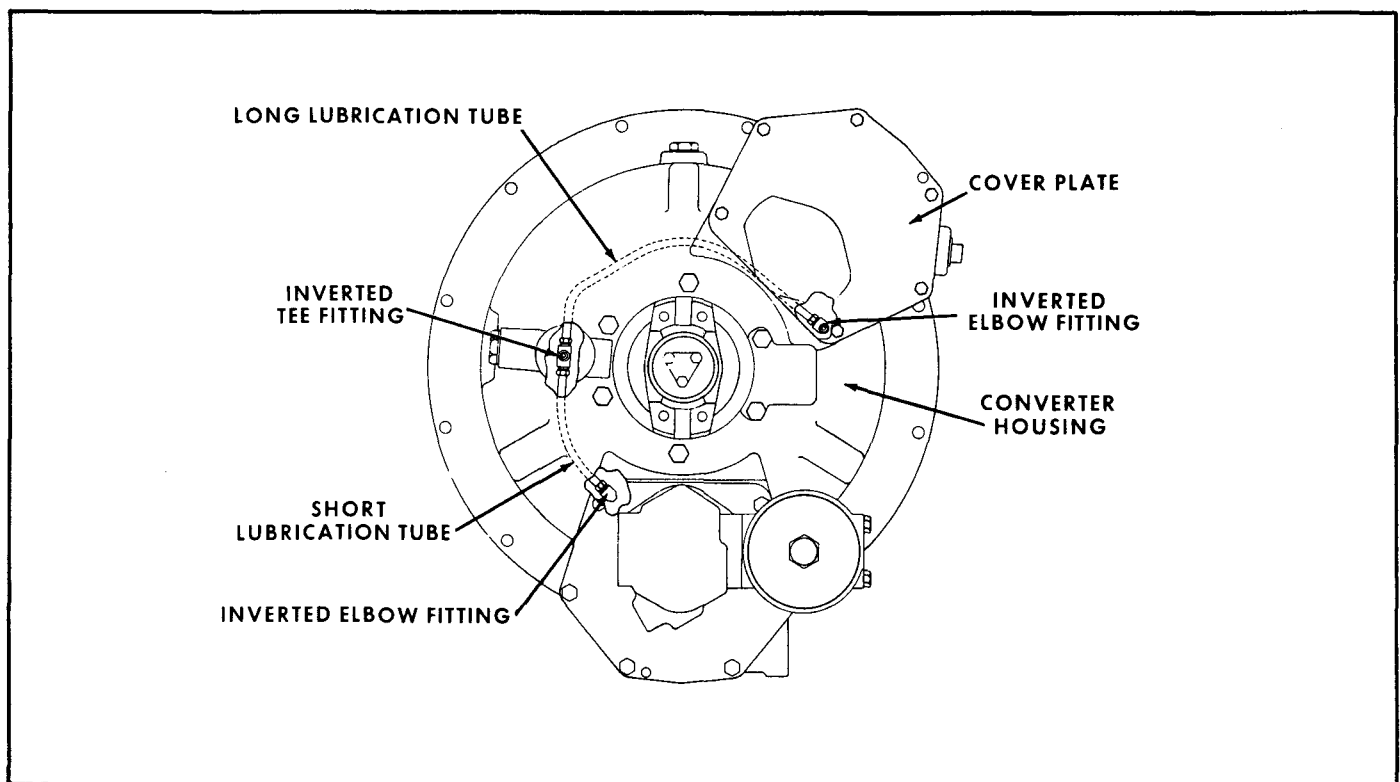


Figure 22. Tubes and Fittings installed in the Converter Housing.





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B. Place the output shaft, input end up, in a suitable diameter fixture approximately three inches high. Place the outer race of the output shaft roller bearing in position over the inner race. Place the guide wheel carrier in position over the output shaft, the installed piston rings in the piston ring carrier, and the roller bearing outer race. Install two new oil seal rings (fig. 41, 23) on the guide wheel carrier.

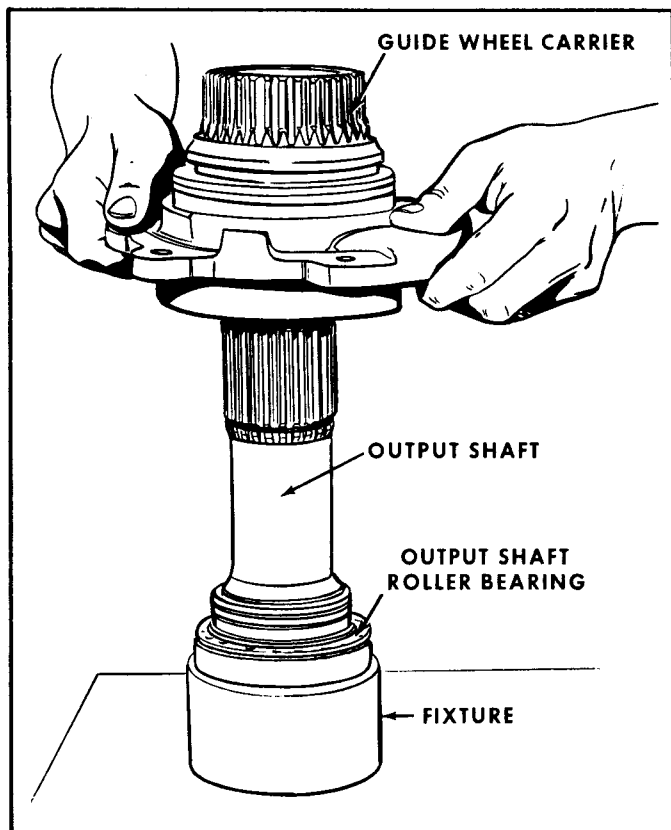


Figure 23. Installing the Guide Wheel Carrier on the Output Shaft.

C. Install the outer race of the split-inner-race impeller wheel ball bearing (fig. 41, 19) in the bearing carrier (18). Place the bearing carrier, impeller wheel (20), and the driving gear (21) in position, and secure the parts together with eight 3/8-24 x 1-3/4 hex-head cap screws (22). Tighten the cap screws to 38 lbs.-ft. torque. Place the impeller wheel, with attached parts, in position on the inner race and the oil seal rings installed on the guide wheel carrier.

D. Use special tool T-11232, and install the remaining inner race of the impeller wheel ball bearing on the guide wheel carrier.

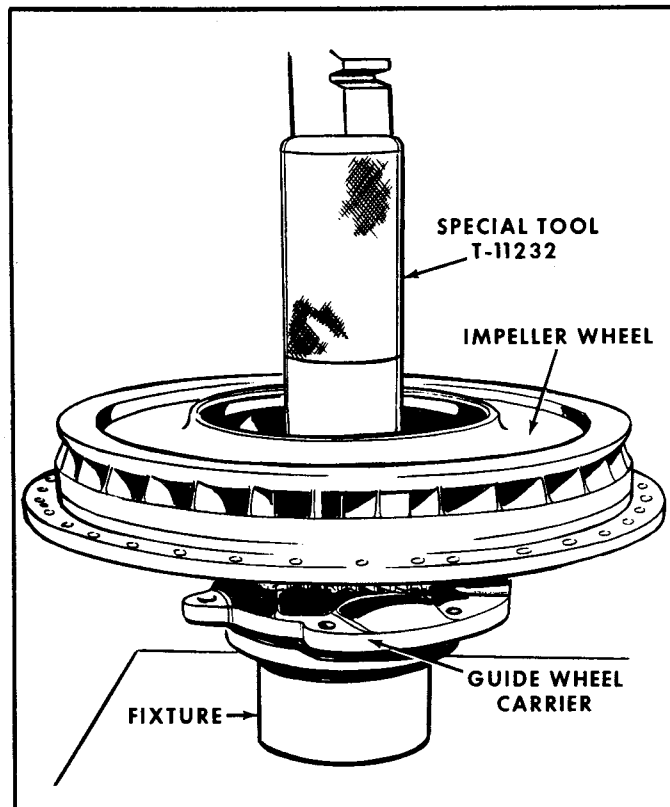


Figure 24. Installing Inner Race of Impeller Wheel Ball Bearing on the Guide Wheel Carrier with Special Tool T-11232.

E. Place the guide wheel assembly (fig. 41, 17) in position against the guide wheel carrier, and secure the guide wheel to the carrier with two clamp plates (16) and six 5/16-18 x 1 12-point, externally-wrenched cap screws (15). Tighten the cap screws to 26 lbs.-ft. torque.

F. Install the external snap ring (fig. 41, 13) on the output shaft. Use special tool T-11235, and press the turbine wheel assembly (12) on the output shaft and against the snap ring.

G. Install the two 1/8-inch hex-socket-head pipe plugs (fig. 41, 10 & 11) in the rotating housing (9). Place the rotating housing in position over the basic converter group of parts and against the impeller wheel. Secure the rotating housing and impeller wheel together with thirty-six 5/16-18 x 1-1/4 hex-head cap screws (26) and 5/16-inch special flat washers (27). Tighten the cap screws to 21 lbs.-ft. torque.

H. Place the bearing spacer (fig. 41, 8) in position over the output shaft and against the turbine wheel. Place the output shaft ball bearing (7) in

position over the output shaft. Use the front retainer washer (6) and a spacer block, and press the ball bearing partially on the shaft. Finish installing the ball bearing with the retainer washer and two 3/8-24 x 7/8 12-point, externally-wrenched cap screws (5). Tighten the cap screws to 47 lbs.-ft. torque.

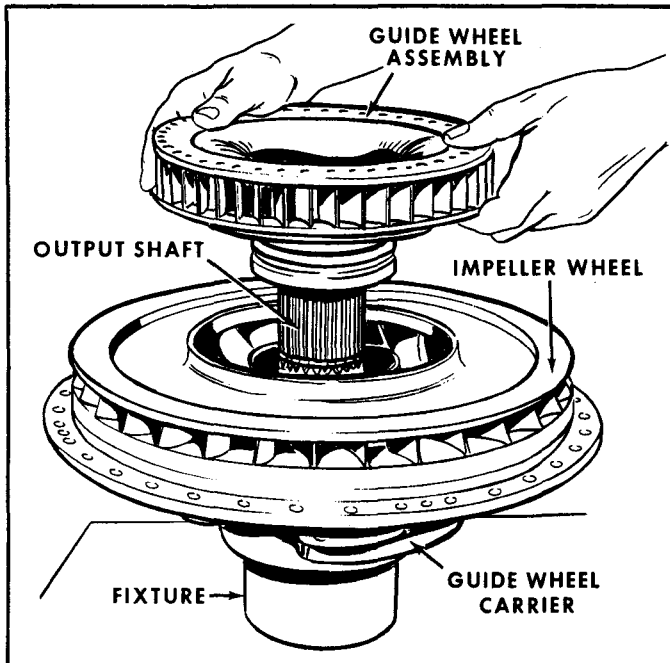


Figure 25. Installing the Guide Wheel Assembly on the Guide Wheel Carrier.

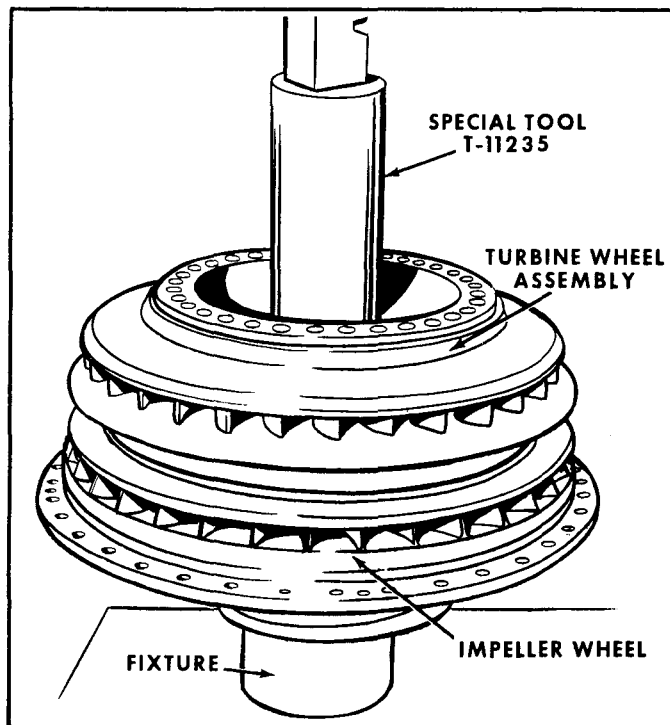


Figure 26. Installing the Turbine Wheel Assembly on the Output Shaft with Special Tool T-11235.

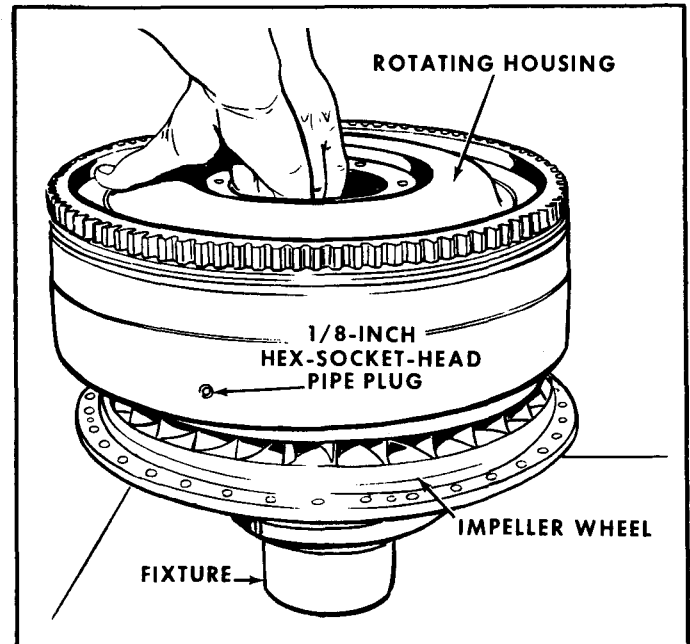


Figure 27. Positioning the Rotating Housing.

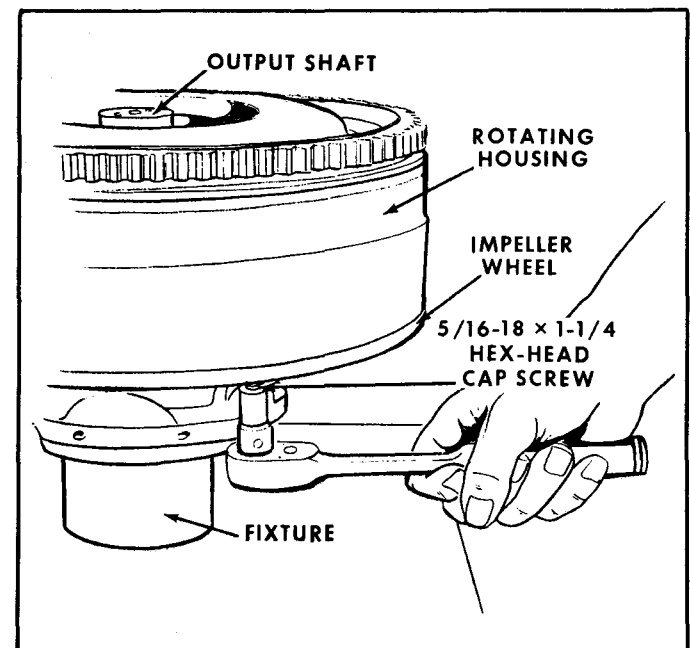


Figure 28. Securing the Rotating Housing and Impeller Wheel together.

## 37. INPUT GROUP OF PARTS.

A. Place the flywheel pilot (fig. 41, 3) in position against the ball bearing and the rotating housing, and secure the pilot to the housing with six 3/8-16 x 1 hex-head cap screws (2). Tighten the cap screws to 38 lbs.-ft. torque.

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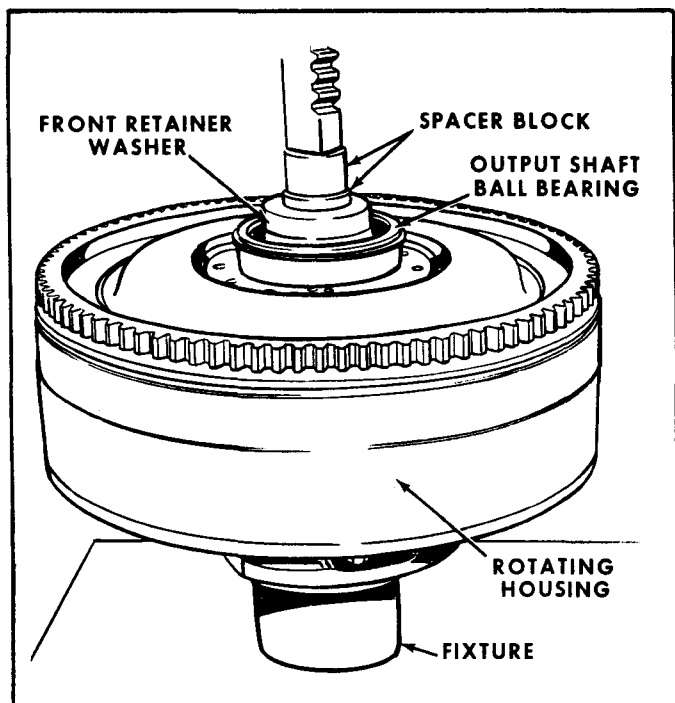


Figure 29. Installing the Output Shaft Ball Bearing on the Output Shaft.

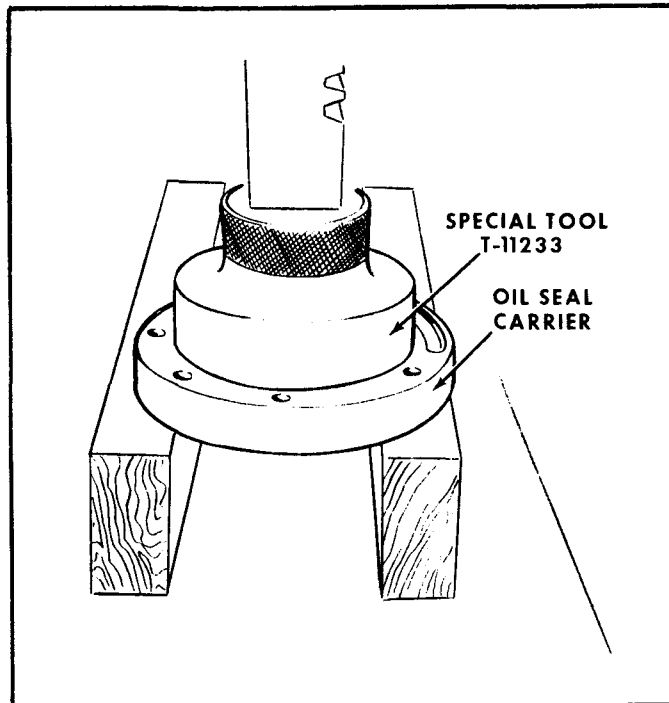


Figure 30. Installing the Oil Seal in the Oil Seal Carrier with Special Tool T-11233.

B. Install a new ring gasket (fig. 41, 4) in the groove of the rotating housing.

C. Invert the assembled parts on a work bench, so that the output end is up. Install a new guide wheel carrier "O" ring (fig. 41, 25) on the guide wheel carrier.

D. Use a hoist, and place the converter housing in position over the guide wheel carrier. Secure the converter housing to the guide wheel carrier with four 1/2-13 x 1 hex-head cap screws (fig. 40, 21), two 1/2-13 x 2-3/4 hex-head cap screws (16), and six new 1/2-inch copper washers (15 & 22). Tighten the cap screws to 85 lbs.-ft. torque.

## 38. OUTPUT GROUP OF PARTS.

A. Use special tool T-11233, and install a new oil seal (fig. 40, 24) in the oil seal carrier (23).

B. Place the oil seal carrier, with installed seal, and a new guide wheel carrier gasket (fig. 40, 17) in position against the guide wheel carrier. Secure the oil seal carrier to the guide wheel carrier with six 5/16-18 x 1-1/2 hex-head cap screws (29). Tighten the cap screws to 21 lbs.-ft. torque.

C. Coat the oil seal surface of the output yoke (fig. 40, 25) with clean grease. Place the output yoke in position on the output shaft, and install a new output yoke "O" ring (26) on the output shaft. Secure the yoke to the shaft with the rear retainer washer (27) and three 3/8-24 x 1-1/4 12-point, externally-wrenched cap screws (28). Tighten the cap screws to 47 lbs.-ft. torque.

## 39. PUMP-AND-FILTER GROUP OF PARTS.

A. Place the oil pump assembly (fig. 40, 42) and a new oil pump flat gasket (39) in position against the pump mounting plate (38). Secure the oil pump to the plate with two 3/8-16 x 1 hex-head cap screws (54) and two new 3/8-inch copper washers (55). Tighten the cap screws to 38 lbs.-ft. torque.

B. Install the Woodruff key in the pump shaft, and place the driven gear (fig. 40, 36) in position on the key and shaft. Secure the gear on the shaft with the 1/2-20 slotted hex nut (35). Tighten the hex nut to 85 lbs.-ft. torque.

C. Place the pump mounting plate, with attached parts, and a new pump mounting plate flat gasket (fig. 40, 37) in position against the converter

housing. Secure the plate to the housing with six 3/8-16 x 1 hex-head cap screws (41) and two new 3/8-inch copper washers (40). The two copper washers are installed beneath the cap screws adjacent to the output yoke. Tighten the cap screws to 38 lbs.-ft. torque.

D. Place the cover plate (*fig. 40, 11*) and a new cover plate flat gasket (10) in position against the converter housing. Secure the plate to the housing with six 3/8-16 x 1-1/4 hex-head cap screws (13) and six new 3/8-inch copper washers (12). Tighten the cap screws to 38 lbs.-ft. torque.

E. Install the relief valve piston (*fig. 40, 49*), the relief valve piston spring (48), and the 3/4-inch square-socket-head pipe plug (47) in the filter base (44). If removal had been necessary, install the two 1/8-inch hex-socket-head pipe plugs (50 & 53) and the 1/4-inch hex-socket-head pipe plug (45) in the filter base. Tighten the pipe plugs to prevent leakage. Place the filter base, with attached parts, and a new filter base flat gasket (43) in position against the oil pump assembly, and secure the filter base to the oil pump with four 7/16-14 x 5-3/4 hex-head cap screws (46). Tighten the cap screws to 55 lbs.-ft. torque.

F. Place a new oil filter gasket and a new oil filter element (*fig. 40, 52*) in position on the filter base. Install the filter cover over the gasket and element, and secure the cover to the base by tightening the hex-head of the long, through-bolt at the top of the cover to 100 lbs.-ft. torque. After installation of the torque converter to the engine, start the engine, and permit the torque converter to come up to normal operating temperature. Again, tighten the through-bolt to 100 lbs.-ft. torque. Check for leakage. If leakage occurs, replace the gasket beneath the through-bolt and/or the gasket beneath the filter cover.

## 40. OPTIONAL POWER PUMP MOUNTING GROUPS OF PARTS.

A. Follow the individual assembly procedure for the applicable group of parts.

B. The SAE "C" 4-bolt, power pump mounting group of parts is assembled as follows:

(1) Install the internal snap ring (*fig. 42, 5*) in the pump mounting plate (10).

(2) Install the driven gear ball bearing

(*fig. 42, 3*) on the driven gear (2). The inner race of the ball bearing must be against the shoulder of the driven gear. Install the driven gear bearing spacer (4) on the driven gear and against the ball bearing. If removal had been necessary, install the expansion plug (1) in the driven gear.

(3) Install the driven gear, with attached parts, into the pump mounting plate so that the ball bearing is flush with the face of the plate. Install the driven gear ball bearing (*fig. 42, 6*) on the driven gear and against the installed snap ring in the pump mounting plate. Install the external snap ring (7) on the driven gear and against the ball bearing.

(4) If removal had been necessary, install the internal snap ring (*fig. 42, 14*) and the splined adapter (15) in the driven gear.

(5) Use special tool T-11230, and install a new oil seal (*fig. 42, 13*) in the bearing retainer (12). Install a new bearing retainer "O" ring (11) on the bearing retainer. Place the bearing retainer in position in the pump mounting plate, and secure the retainer in the plate with the internal snap ring (16). Exercise caution to prevent damage to the oil seal.

(6) Install the mounting plate roll pin (*fig. 42, 8*) in the converter housing. Place the pump mounting plate, with attached parts, and a new mounting plate flat gasket (9) in position against the converter housing. Secure the plate to the housing with six 3/8-16 x 1-1/4 hex-head cap screws (17) and six new 3/8-inch copper washers (18). Tighten the cap screws to 38 lbs.-ft. torque.

(7) Place the pump in position against the pump mounting plate, and secure the pump to the plate with the four cap screws previously removed.

C. The SAE "D" 4-bolt, power pump mounting group of parts is assembled as follows:

(1) Install the two internal snap rings (*fig. 43, 2*) in the pump mounting plate (9).

(2) Use special tool T-11229, and install the cups of the driven gear tapered roller bearings (*fig. 43, 1 & 3*) in the pump mounting plate. The wide part of each cup must be against a snap ring.



# Hydraulic Torque Converter

(3) If removal had been necessary, install the expansion plug (fig. 43, 17) in the driven gear (16). Install the cone of the driven gear tapered roller bearing (1) on the driven gear. The wide part of the cone must be against the shoulder of the driven gear. Place the driven gear, with attached parts, in position in the pump mounting plate. Install the cone of the driven gear tapered roller bearing (3) on the driven gear.

(4) Install the bearing lock nut (fig. 43, 4) on the driven gear and against the ball bearing. Tighten the lock nut sufficiently to establish a bearing end play between 0.004 and 0.006-inch. Place the bearing lock nut washer (5) in position on the driven gear and against the bearing lock nut. Install the bearing lock nut (6) on the driven gear and against the washer. Bend a tab of the washer into a cutout flat of each lock nut.

(5) Use special tool T-11230, and install a new oil seal (fig. 43, 15) in the seal carrier (13). Install a new seal carrier "O" ring (12) on the seal carrier. Place the seal carrier in position in the pump mounting plate, and secure the carrier in the plate with the internal snap ring (14). Exercise caution to prevent damage to the oil seal.

(6) Install the mounting plate roll pin (fig. 43, 7) in the converter housing. Place the pump mounting plate, with attached parts, and a new mounting plate flat gasket (8) in position against the converter housing. Secure the plate to the housing with six 3/8-16 x 1-1/4 hex-head cap screws (11) and six new 3/8-inch copper washers (10). Tighten the cap screws to 38 lbs.-ft. torque.

(7) Place the pump in position against the pump mounting plate, and secure the pump to the plate with the four cap screws previously removed.

## Section XI. INSTALLATION

### 41. PRIOR TO INSTALLATION.

A. *General.* The engine must be checked for trueness of the flywheel and the flywheel housing. Thoroughly clean the engine flywheel and the engine flywheel housing prior to making the tests.

B. *Checking Face of Engine Flywheel Housing.* Bolt a thousandths indicator or gauge to the engine flywheel so that the indicator is perpendicular to the face of the engine flywheel housing, and the indicator stem is riding on the face of the flange (fig. 31). Rotate the engine flywheel and note the face deviation of the engine flywheel housing flange. The face deviation must not exceed the tolerance listed in Table II.

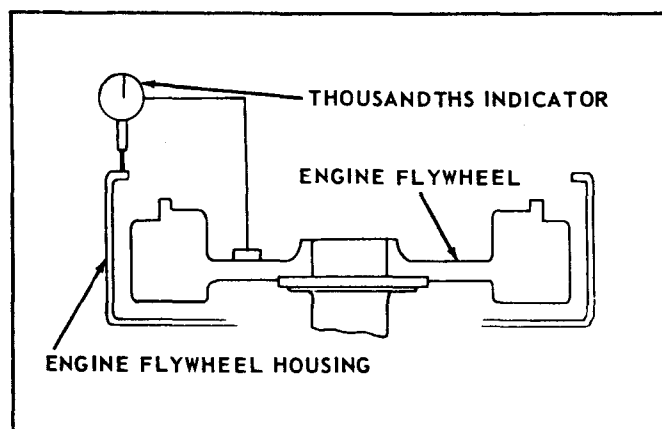


Figure 31. Checking the Face of the Engine Flywheel Housing.

Table II. Tolerances for Engine Flywheel Housings.

| S.A.E.<br>Housing Number | Face<br>Deviation | Bore<br>Eccentricity |
|--------------------------|-------------------|----------------------|
| 1                        | 0.008             | 0.008                |
| 2                        | 0.008             | 0.008                |

### NOTE

All figures are total indicator reading tolerances.

C. *Checking Bore of Engine Flywheel Housing.* With the indicator bolted as in B above, adjust

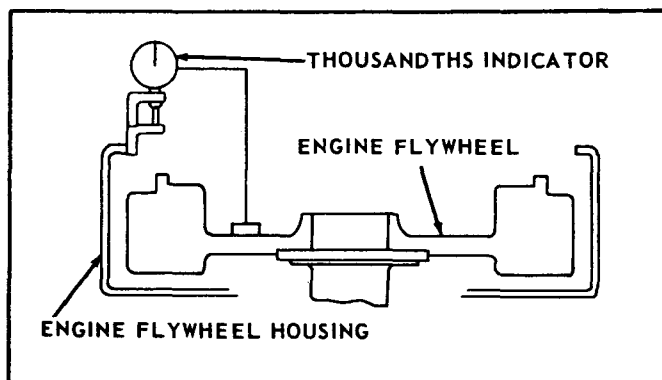


Figure 32. Checking the Bore of the Engine Flywheel Housing.

the indicator stem so that it will ride on the bore of the engine flywheel housing (fig. 32). Rotate the engine flywheel and note the bore eccentricity of the engine flywheel housing bore. The bore eccentricity must not exceed the tolerance listed in Table II.

**D. Checking Driving Ring Surface of Engine Flywheel.** Bolt a thousandths indicator or gauge to the engine flywheel housing so that the indicator is perpendicular to the engine flywheel, and the indicator stem is riding on the inner face of the flywheel (fig. 33). The variation of face runout of the surface to which the driving ring is bolted should not exceed 0.0005-inch maximum total indicator reading per inch of diameter.

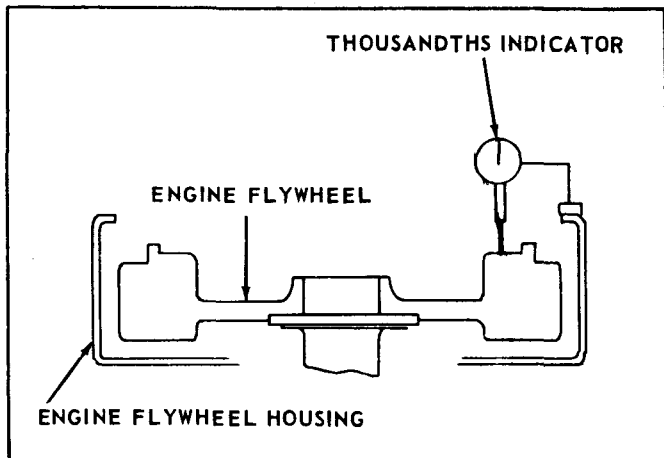


Figure 33. Checking the Driving Ring Surface of the Engine Flywheel.

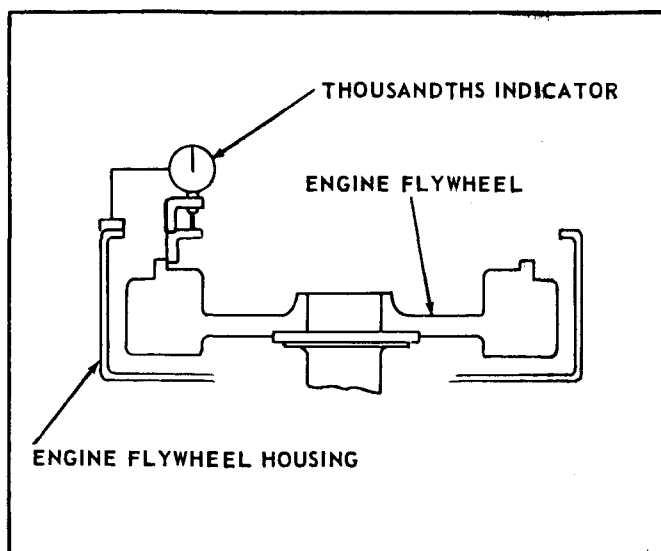


Figure 34. Checking the Driving Ring Pilot Bore of the Engine Flywheel.

**E. Checking Driving Ring Pilot Bore of Engine Flywheel.** With the indicator bolted as in D above, adjust the indicator stem so that it will ride on the driving ring pilot bore of the engine flywheel (fig. 34). The driving ring pilot bore eccentricity of the engine flywheel should not exceed 0.005-inch maximum total indicator reading.

## 42. INSTALLATION.

**A. General.** The alignment of the torque converter with the engine is an extremely important factor in obtaining lengthy, trouble-free performance from the torque converter. An extra few minutes of time for an accurate and proper installation will be returned many times in avoiding unnecessary downtime.

**B. Alignment.** Install the driving ring on the engine flywheel. Lift the torque converter with a hoist, or other suitable means, and place the unit in position against the engine flywheel housing. Guide the teeth of the rotating housing into the driving ring. Secure the converter housing to the engine flywheel housing with suitable fasteners.

**C. Oil System.** Fill the oil system with the proper type, weight, and amount of oil (par. 18D) after connecting all lines previously disconnected.

**D. Gauges.** A temperature gauge, with a range from 150 to 300°F., shall be installed in the fluid line between the cooling pump and the heat exchanger. A pressure gauge, with a range from 0 to 100 psi, shall be installed in the converter circuit outlet line ahead of the circuit pressure regulator.

## Section XII.

### RECOMMENDED OILS

## 43. RECOMMENDED AND APPROVED OILS.

Table III contains a non-exclusive list of recommended oils that have been tested and approved by the Twin Disc Clutch Company for use in Single-Stage Hydraulic Torque Converters.



# Hydraulic Torque Converter

Table III. Approved Oils for Single-Stage Hydraulic Torque Converters.

| Trade Name                        | Manufacturer                      |
|-----------------------------------|-----------------------------------|
| Rotella                           | Shell Oil Company                 |
| Mobiloil                          | Socony Mobil Oil Company          |
| American HD-M                     | American Oil Company              |
| Havoline Motor Oil                | Texaco, Inc.                      |
| T5X or Unitec                     | Union Oil Company of California   |
| DX Motor Oil                      | DX Sunray Oil Company             |
| Rubilene Super HD or Super Tenol  | Sinclair Refining Company         |
| C300 Series                       | Cities Service Oil Company        |
| BP Energol Diesel D               | British Petroleum Company Limited |
| Phillips 66                       | Phillips Petroleum Company        |
| Super RPM Delo Special            | Standard Oil Company (California) |
| Dual Action HD-1 or Kendall F-L   | Kendall Refining Company          |
| Veedol High Detergency            | Tidewater Oil Company             |
| Sunoco Ocnus Mil. or Supplement 1 | Sun Oil Company                   |
| Gulf Dieselube HD                 | Gulf Oil Corporation              |
| Deusol Cr. (Proper Viscosity)     | Castrol Limited (England)         |
| Conoco Super Motor Oil            | Continental Oil Company           |
| Encolube H DX                     | Humble Oil & Refining Company     |

## Section XIII. SPECIAL TOOLS

### 44. SPECIAL TOOLS.

Figures 35 through 39 in this section identify the special tools by tool number. All pertinent information necessary for tool fabrication is shown on each tool drawing. These tools are intended primarily to make overhaul procedures easier.

## Section XIV. PARTS LIST

### 45. PARTS LIST.

Use Figures 40, 41, 42, and 43 and the adjacent parts list for ordering spare or replacement parts in accordance with the instructions contained in Paragraphs 3 and 4.

**NOTE**

**THE TWIN DISC CLUTCH COMPANY WILL NOT  
MANUFACTURE, FOR GENERAL USE, THE TOOLS  
ILLUSTRATED IN THIS MANUAL.**



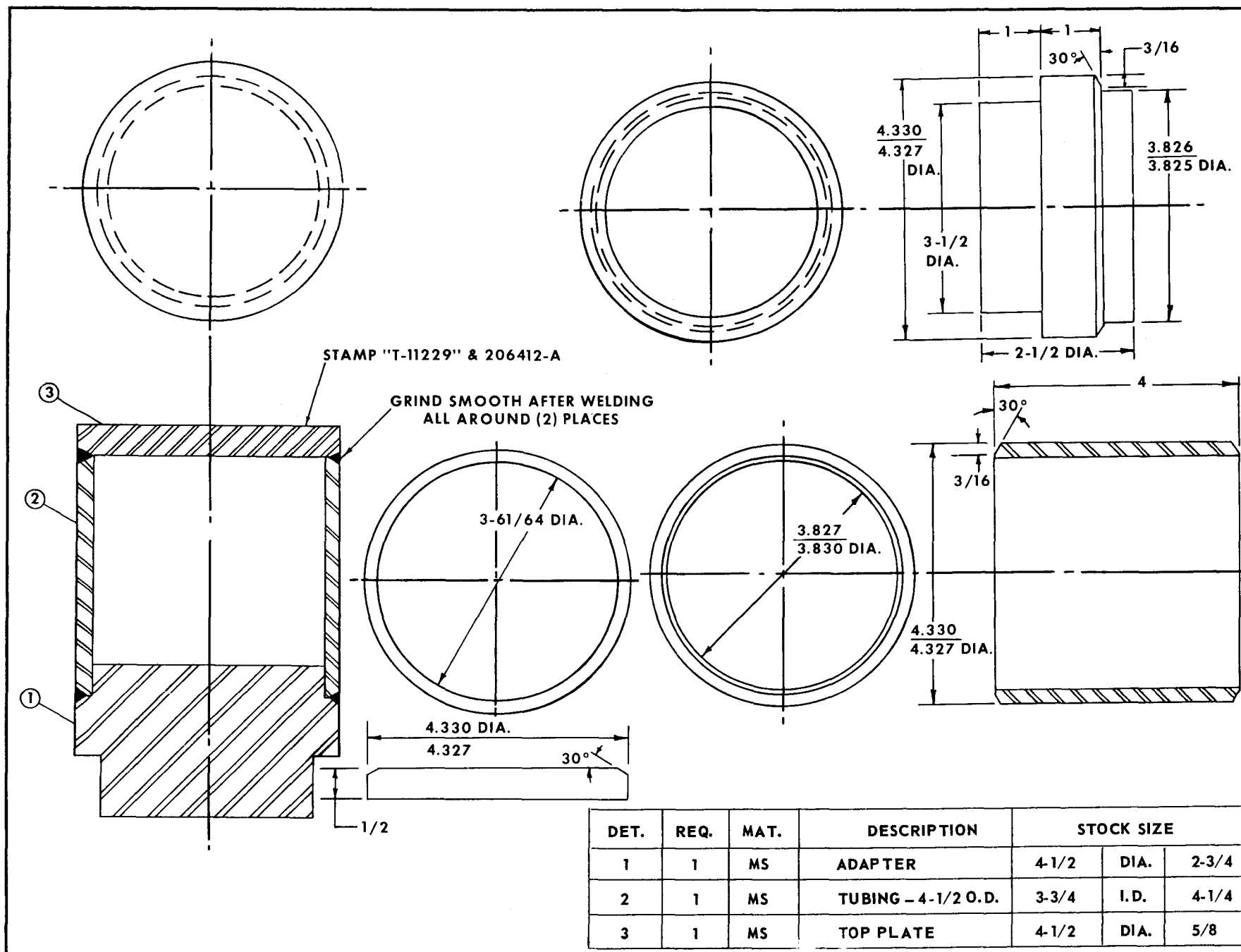


Figure 35. Special Tool T-11229.



# Hydraulic Torque Converter

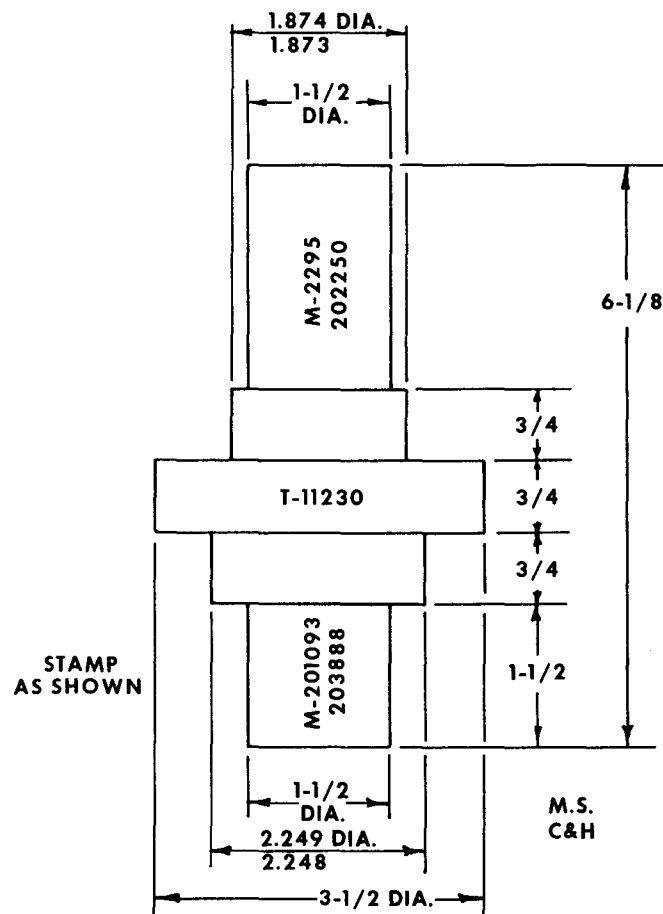


Figure 36. Special Tool T-11230.

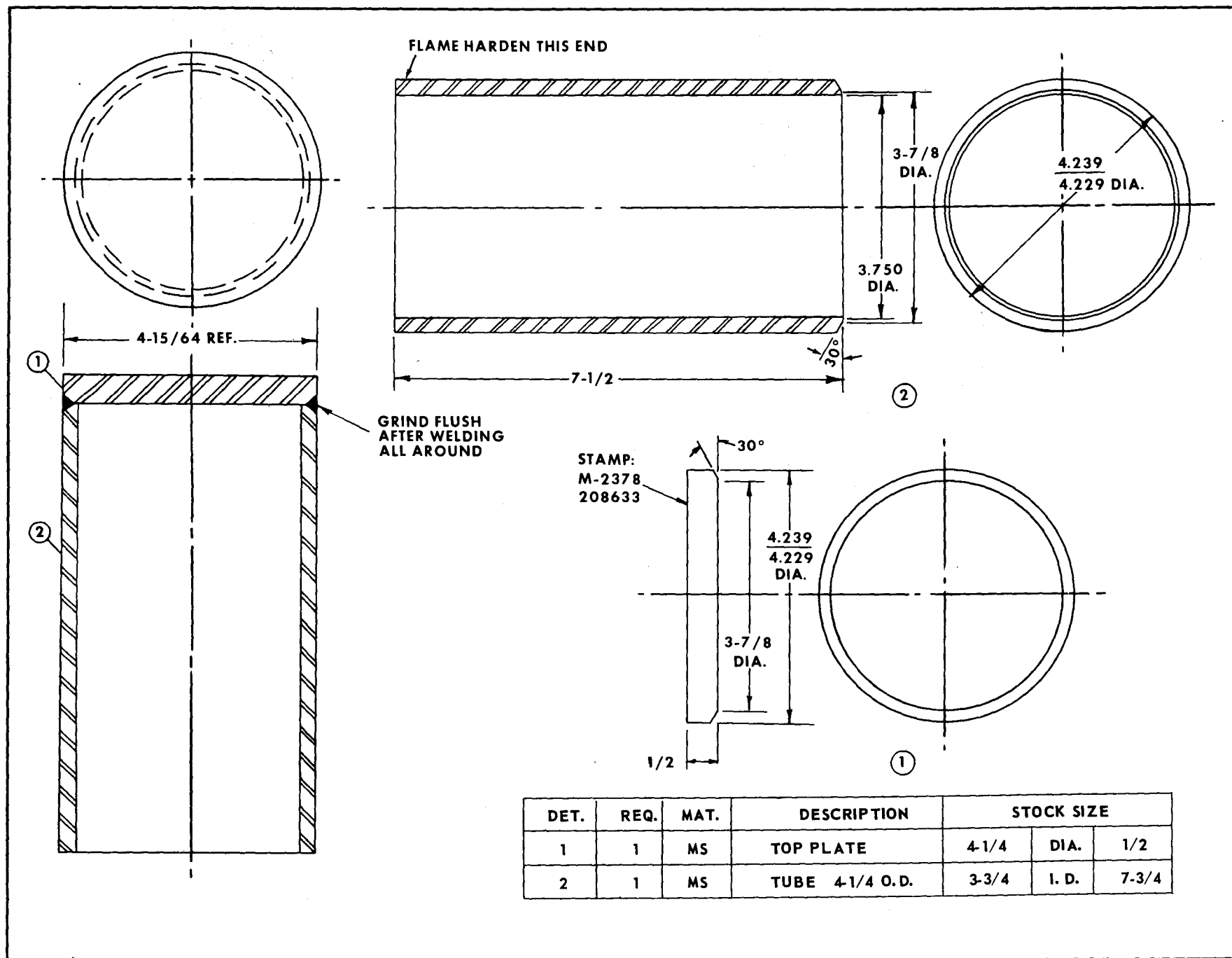


Figure 37. Special Tool T-11232.

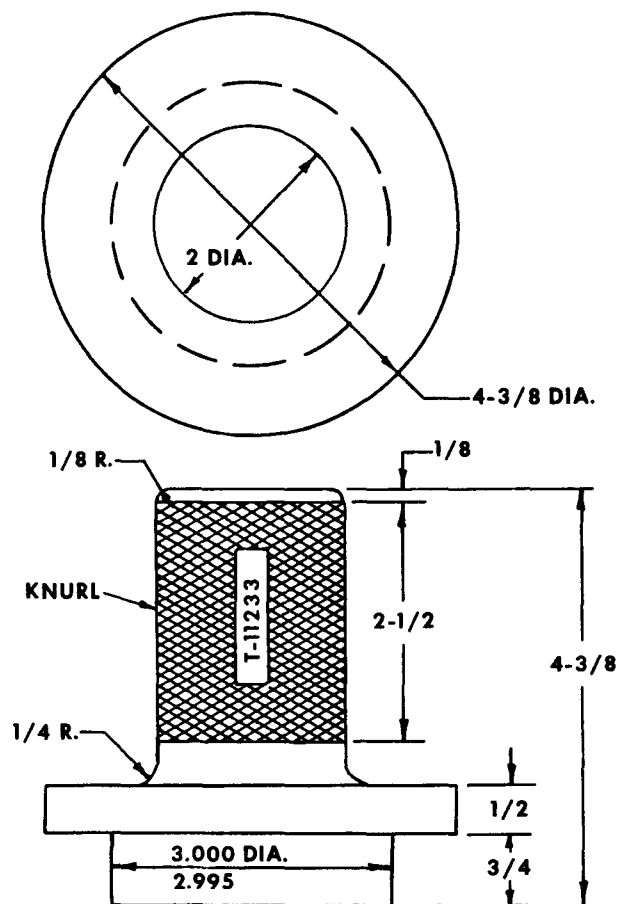


Figure 38. Special Tool T-11233.

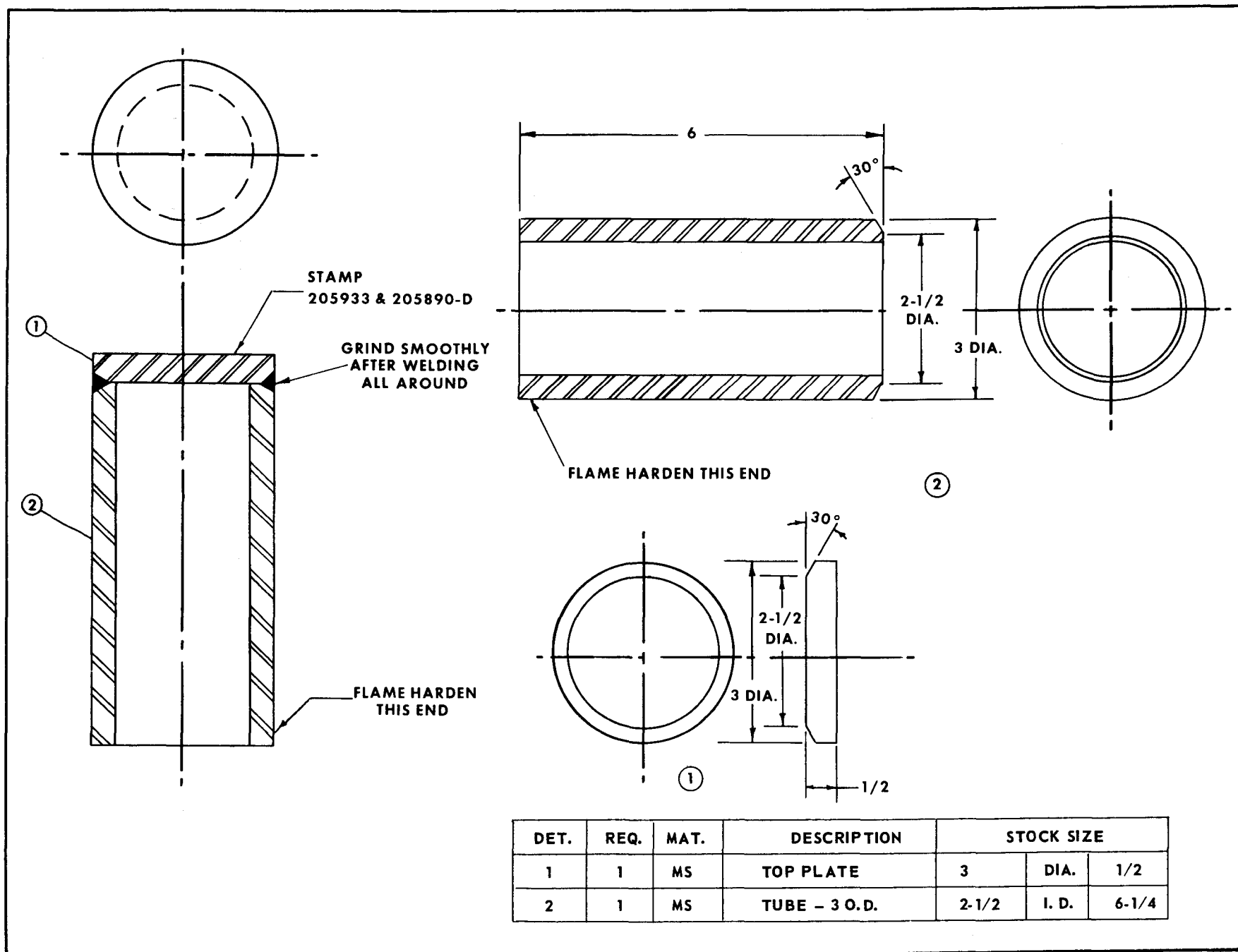


Figure 39. Special Tool T-11235.

# Hydraulic Torque Converter

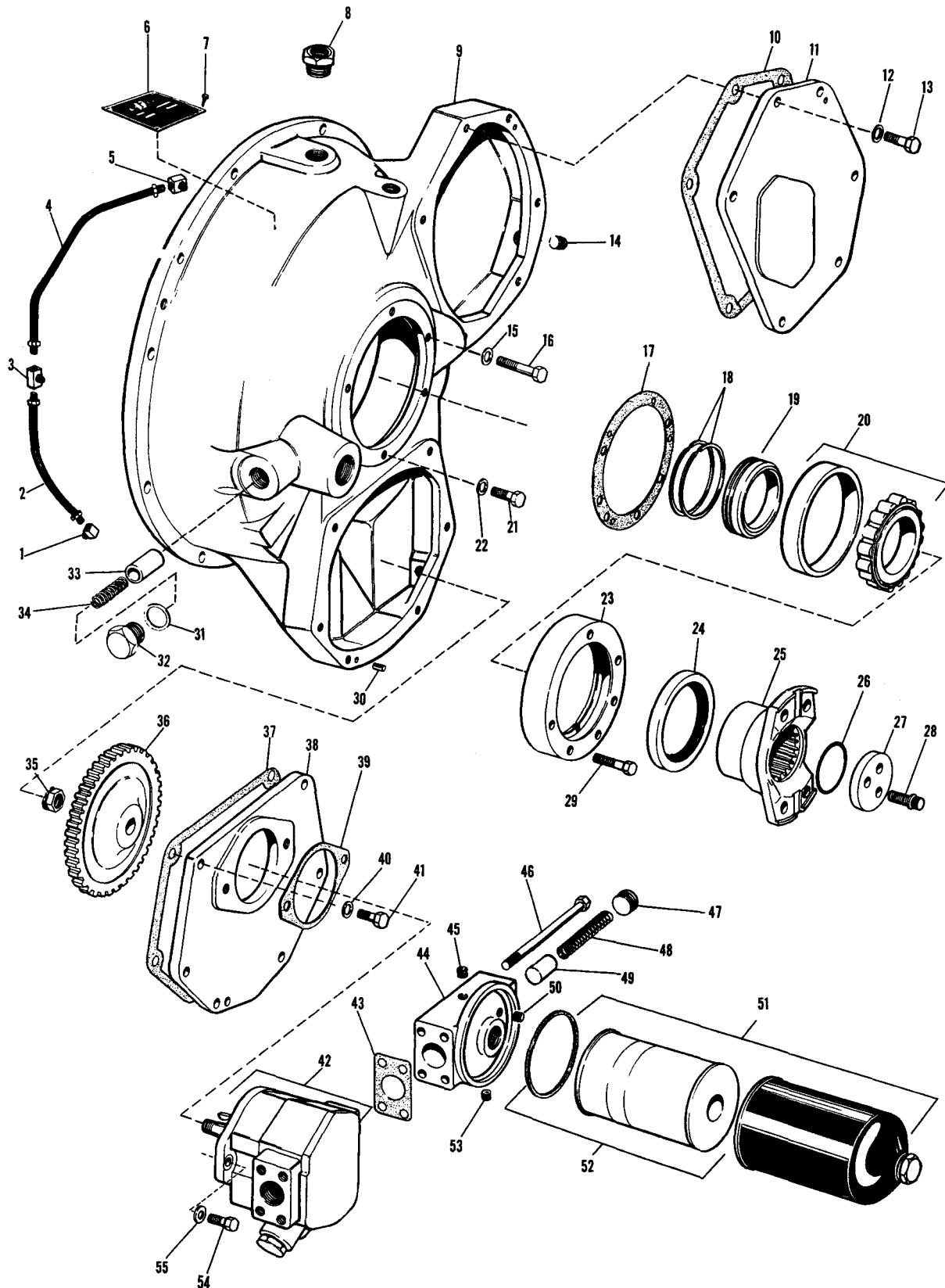


Figure 40. Model 6-F-1514 Series Single-Stage Torque Converter – Exploded View.

# Model 6-F-1514

## MODEL 6-F-1514 SERIES SINGLE-STAGE TORQUE CONVERTER - PARTS LIST.

| Item | Description  | Quantity |
|------|--|----------|
| 1    | FITTING, elbow, inverted *                                   | 1        |
| 2    | TUBE, lubrication, short *                                   | 1        |
| 3    | FITTING, tee, inverted *                                     | 1        |
| 4    | TUBE, lubrication, long *                                    | 1        |
| 5    | FITTING, elbow, inverted *                                   | 1        |
| 6    | PLATE, name  | 1        |
| 7    | SCREW, drive   | 4        |
| 8    | BUSHING, reducer   | 1        |
| 9    | HOUSING, converter *   | 1        |
| 10   | GASKET, flat, plate, cover                                   | 1        |
| 11   | PLATE, cover   | 1        |
| 12   | WASHER, copper, 3/8-inch                                     | 6        |
| 13   | SCREW, cap, hex-head, 3/8-16 x 1-1/4                         | 6        |
| 14   | PLUG, pipe, square-head, 1-inch                              | 1        |
| 15   | WASHER, copper, 1/2-inch                                     | 2        |
| 16   | SCREW, cap, hex-head, 1/2-13 x 2-3/4                         | 2        |
| 17   | GASKET, carrier, wheel, guide                                | 1        |
| 18   | RING, piston   | 2        |
| 19   | CARRIER, ring, piston  | 1        |
| 20   | ROLLER BEARING, shaft, output                                | 1        |
| 21   | SCREW, cap, hex-head, 1/2-13 x 1                             | 4        |
| 22   | WASHER, copper, 1/2-inch                                     | 4        |
| 23   | CARRIER, seal, oil   | 1        |
| 24   | SEAL, oil  | 1        |
| 25   | YOKE, output   | 1        |
| 26   | "O" RING, yoke, output                                       | 1        |
| 27   | WASHER, retainer, rear                                       | 1        |
| 28   | SCREW, cap, externally-wrenched, 12-point,<br>3/8-24 x 1-1/4 | 3        |

| Item | Description                              | Quantity |
|------|--|----------|
| 29   | SCREW, cap, hex-head, 5/16-18 x 1-1/2    | 6        |
| 30   | PIN, roll, 3/8 x 5/8                     | 1        |
| 31   | WASHER, copper, plug, valve, regulator   | 1        |
| 32   | PLUG, valve, regulator                   | 1        |
| 33   | PISTON, valve, regulator                 | 1        |
| 34   | SPRING, piston, valve, regulator         | 1        |
| 35   | NUT, hex, slotted, 1/2-20                | 1        |
| 36   | GEAR, driven                             | 1        |
| 37   | GASKET, flat, plate, mounting, pump      | 1        |
| 38   | PLATE, mounting, pump                    | 1        |
| 39   | GASKET, flat, pump, oil                  | 1        |
| 40   | WASHER, copper, 3/8-inch                 | 2        |
| 41   | SCREW, cap, hex-head, 3/8-16 x 1         | 6        |
| 42   | PUMP, oil, assembly                      | 1        |
| 43   | GASKET, flat, base, filter               | 1        |
| 44   | BASE, filter                             | 1        |
| 45   | PLUG, pipe, hex-socket-head, 1/4-inch    | 1        |
| 46   | SCREW, cap, hex-head, 7/16-14 x 5-3/4    | 4        |
| 47   | PLUG, pipe, square-socket-head, 3/4-inch | 1        |
| 48   | SPRING, piston, valve, relief            | 1        |
| 49   | PISTON, valve, relief                    | 1        |
| 50   | PLUG, pipe, hex-socket-head, 1/8-inch    | 1        |
| 51   | FILTER, oil, assembly                    | 1        |
| 52   | KIT, service, filter, oil                | 1        |
| 53   | PLUG, pipe, hex-socket-head, 1/8-inch    | 1        |
| 54   | SCREW, cap, hex-head, 3/8-16 x 1         | 2        |
| 55   | WASHER, copper, 3/8-inch                 | 2        |

\* - Can be purchased as HOUSING, converter, assembly.

# Hydraulic Torque Converter

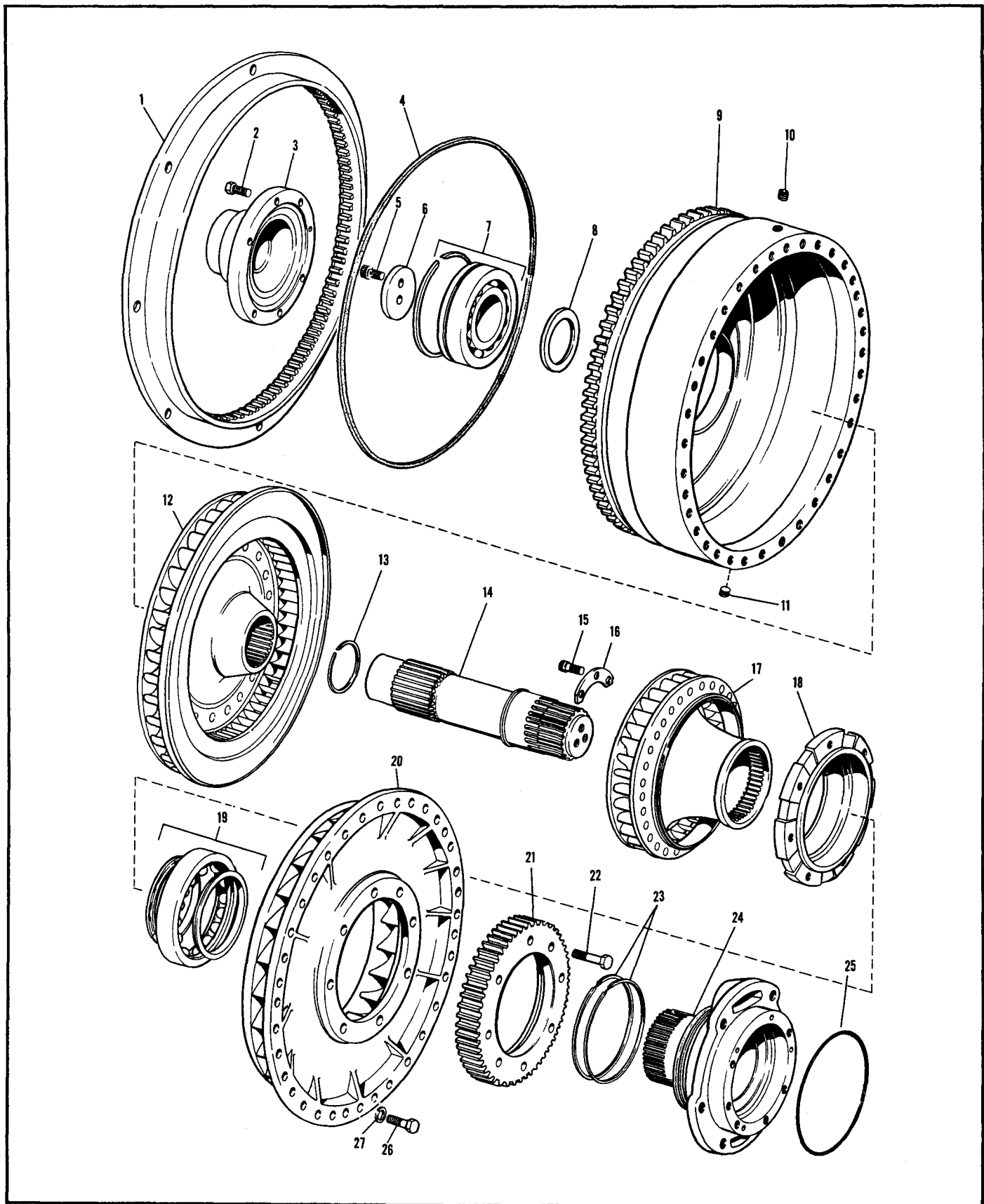


Figure 41. Model 6-F-1514 Series Single-Stage Torque Converter – Exploded View.



# Model 6-F-1514

## MODEL 6-F-1514 SERIES SINGLE-STAGE TORQUE CONVERTER – PARTS LIST.

| <i>Item</i> | <i>Description</i>   | <i>Quantity</i> |
|-------------|--|-----------------|
| 1           | RING, driving  | 1               |
| 2           | SCREW, cap, hex-head, 3/8-16 x 1                           | 6               |
| 3           | PILOT, flywheel  | 1               |
| 4           | GASKET, ring   | 1               |
| 5           | SCREW, cap, externally-wrenched, 12-point,<br>3/8-24 x 7/8 | 2               |
| 6           | WASHER, retainer, front                                    | 1               |
| 7           | BALL BEARING, shaft, output                                | 1               |
| 8           | SPACER, bearing  | 1               |
| 9           | HOUSING, rotating  | 1               |
| 10          | PLUG, pipe, hex-socket-head, 1/8-inch                      | 1               |
| 11          | PLUG, pipe, hex-socket-head, 1/8-inch                      | 1               |
| 12          | WHEEL, turbine, assembly                                   | 1               |
| 13          | RING, snap, external                                       | 1               |
| 14          | SHAFT, output  | 1               |
| 15          | SCREW, cap, externally-wrenched, 12-point,<br>5/16-18 x 1  | 6               |
| 16          | PLATE, clamp   | 2               |
| 17          | WHEEL, guide, assembly                                     | 1               |
| 18          | CARRIER, bearing   | 1               |
| 19          | BALL BEARING, wheel, impeller, split-<br>inner-race        | 1               |
| 20          | WHEEL, impeller  | 1               |
| 21          | GEAR, driving  | 1               |
| 22          | SCREW, cap, hex-head, 3/8-24 x 1-3/4                       | 8               |
| 23          | RING, seal, oil  | 2               |
| 24          | CARRIER, wheel, guide                                      | 1               |
| 25          | "O" RING, carrier, wheel, guide                            | 1               |
| 26          | SCREW, cap, hex-head, 5/16-18 x 1-1/4                      | 36              |
| 27          | WASHER, flat, 5/16-inch, special                           | 36              |

# Hydraulic Torque Converter

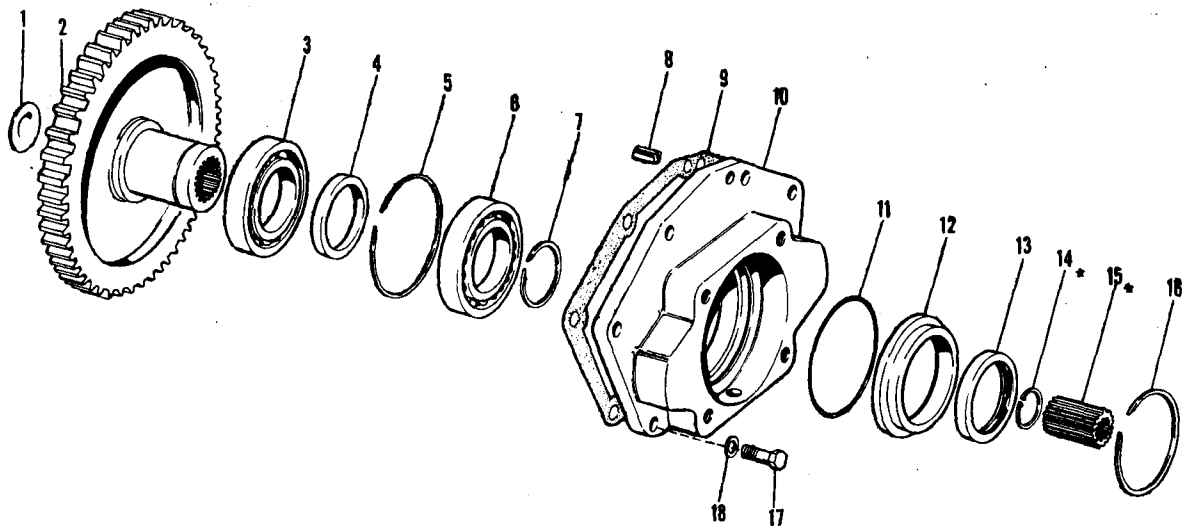


Figure 42. SAE "C" Power Pump Mounting Group of Parts – Exploded View.

## SAE "C" POWER PUMP MOUNTING GROUP OF PARTS - PARTS LIST.

| <i>Item</i> | <i>Description</i>                   | <i>Quantity</i> |
|-------------|--------------------------------------|-----------------|
| 1           | PLUG, expansion                      | 1               |
| 2           | GEAR, driven                         | 1               |
| 3           | BALL BEARING, gear, driven           | 1               |
| 4           | SPACER, bearing, gear, driven        | 1               |
| 5           | RING, snap, internal                 | 1               |
| 6           | BALL BEARING, gear, driven           | 1               |
| 7           | RING, snap, external                 | 1               |
| 8           | PIN, roll, plate, mounting           | 1               |
| 9           | GASKET, flat, plate, mounting        | 1               |
| 10          | PLATE, mounting, pump                | 1               |
| 11          | "O" RING, retainer, bearing          | 1               |
| 12          | RETAINER, bearing                    | 1               |
| 13          | SEAL, oil                            | 1               |
| 14          | RING, snap, internal *               | 1               |
| 15          | ADAPTER, splined *                   | 1               |
| 16          | RING, snap, internal                 | 1               |
| 17          | SCREW, cap, hex-head, 3/8-16 x 1-1/4 | 6               |
| 18          | WASHER, copper, 3/8-inch             | 6               |

\* - Used only with Assembly X-205907-D.

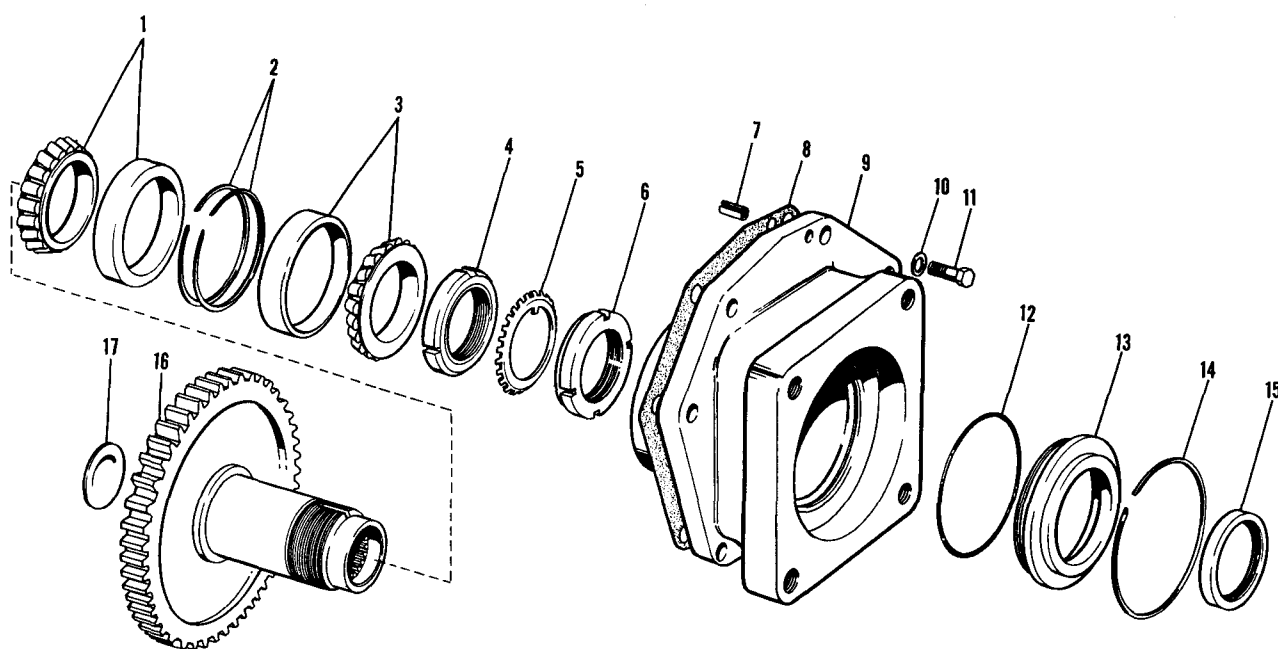
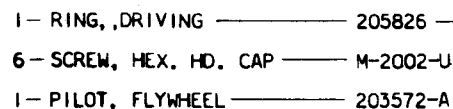


Figure 43. SAE "D" Power Pump Mounting Group of Parts – Exploded View.

## SAE "D" POWER PUMP MOUNTING GROUP OF PARTS – PARTS LIST.

| <i>Item</i> | <i>Description</i>                    | <i>Quantity</i> |
|-------------|---------------------------------------|-----------------|
| 1           | ROLLER BEARING, tapered, gear, driven | 1               |
| 2           | RING, snap, internal                  | 2               |
| 3           | ROLLER BEARING, tapered, gear, driven | 1               |
| 4           | NUT, lock, bearing                    | 1               |
| 5           | WASHER, nut, lock, bearing            | 1               |
| 6           | BALL BEARING, gear, driven            | 1               |
| 7           | PIN, roll, plate, mounting            | 1               |
| 8           | GASKET, flat, plate, mounting         | 1               |
| 9           | PLATE, mounting, pump                 | 1               |
| 10          | WASHER, copper, 3/8-inch              | 6               |
| 11          | SCREW, cap, hex-head, 3/8-16 x 1-1/4  | 6               |
| 12          | "O" RING, carrier, seal               | 1               |
| 13          | CARRIER, seal                         | 1               |
| 14          | RING, snap, internal                  | 1               |
| 15          | SEAL, oil                             | 1               |
| 16          | GEAR, driven                          | 1               |
| 17          | PLUG, expansion                       | 1               |



0 1 2 3 4 5 6

INCHES

REFERENCE SPECIFICATION Z-202, 595

**DIMENSIONAL TOLERANCE UNLESS SPECIFIED**  
**MACHINED SURFACES ± .01**  
**ANGULAR LOCATION OF DRILLED HOLES ± .005**  
**ANGULAR LOCATION BETWEEN CIRCLES OF DRILLED HOLES ± .03**  
**MACHINED ANGLES ± 2° EXCEPT CHAMFERS**  
**CASTING FINISH \_\_\_\_\_ MIN \_\_\_\_\_ MAX;**

SIMILAR TO  
PART NO.

|             |            |                |             |           |
|-------------|------------|----------------|-------------|-----------|
|             | -          |                |             |           |
|             | -          |                |             |           |
|             | -          |                |             |           |
|             | -          |                |             |           |
|             | -          |                |             |           |
|             | -          |                |             |           |
|             | -          |                |             |           |
|             | -          |                |             |           |
| <b>SYM.</b> | <b>WAS</b> | <b>CN. NO.</b> | <b>DATE</b> | <b>BY</b> |

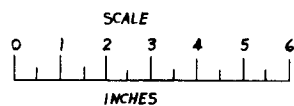
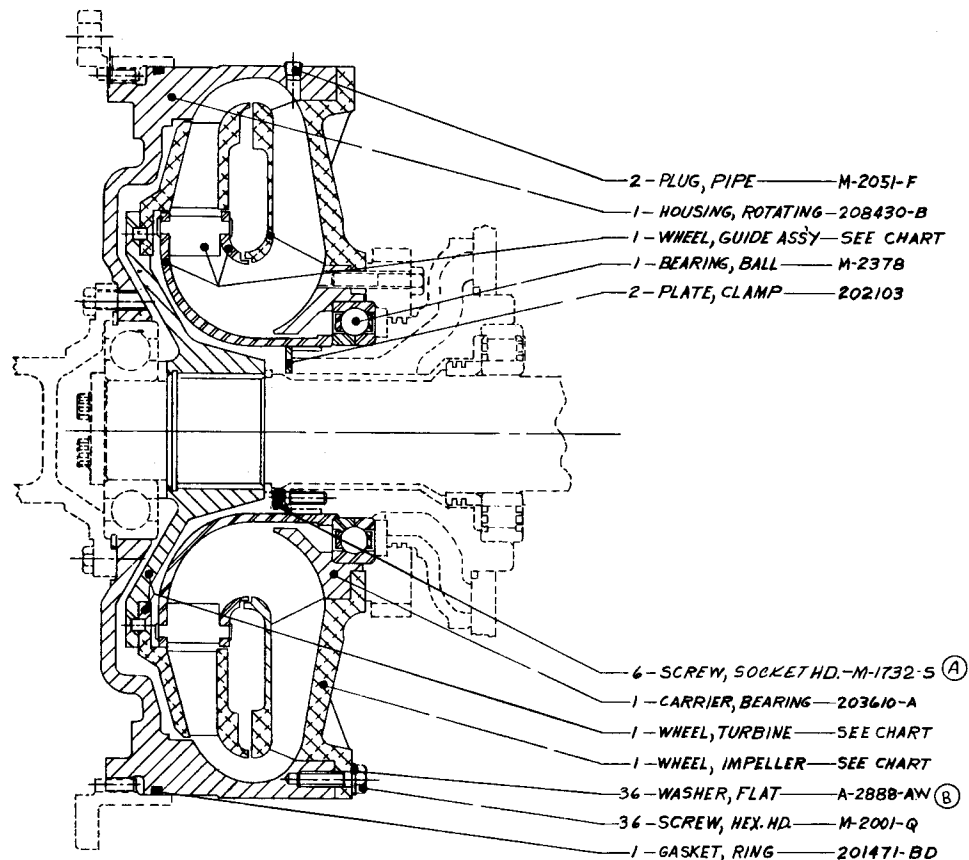
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|      |     |         |      |    |
|      |     |         |      |    |
|      |     |         |      |    |
|      |     |         |      |    |
| SYM. | WAS | CM. NO. | DATE | BY |

[illegible]

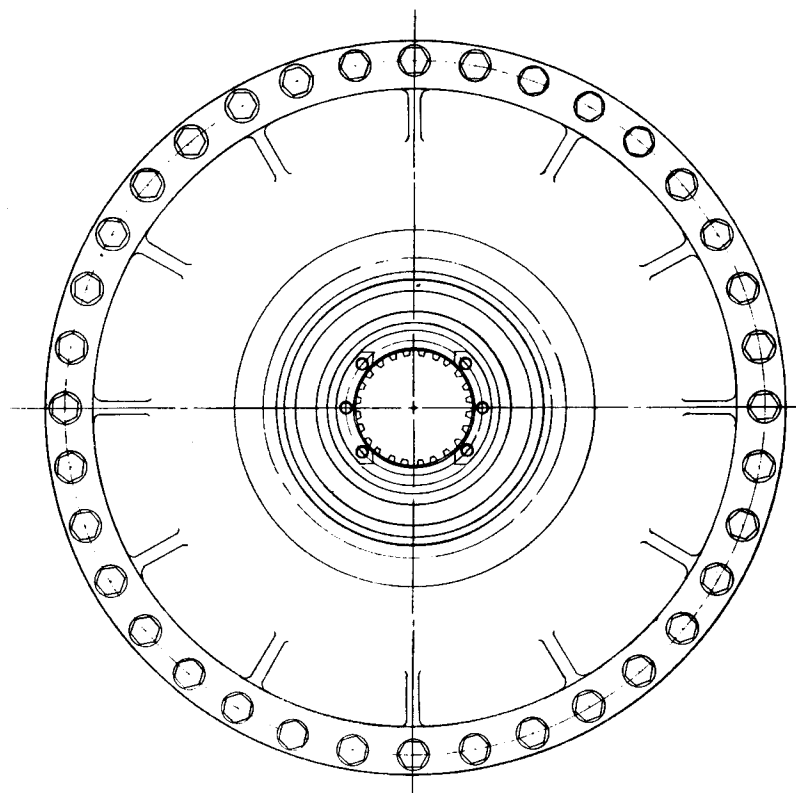
|              |  |   |  |
|--------------|--|---|--|
| MATERIAL     |  | HEAT TREAT  |  |
| ASSEMBLY NO. |  | FIRST USE<br>MODEL NO.  |  |
| NAME         |  | DATE 12-30-55<br>SCALE $\frac{1}{2}'' = 1''$<br>DRAWN GP<br>CHECKED J.B.<br>APPROVED S.B. |  |

**TWIN DISC CLUTCH CO.**  
HYDRAULIC DIVISION  
ROCKFORD, ILLINOIS, U. S. A. ✓

X-203731



| MS  | WHEEL<br>IMPELLER | WHEEL<br>TURBINE | GUIDE<br>WHEEL |
|-----|-------------------|------------------|----------------|
| 200 | 208217-D          | X-208634 A       | X-205883-B     |
| 235 | 208217-E          | X-208634         | X-205883-B     |
| 280 | 208217-F          | X-208634         | X-205883-B     |
| 335 | 208217-C          | X-208634         | X-205883-B     |
| 400 | 208217-G          | X-208634         | X-205883-C     |



## PARTS DRAWING HEAVY DUTY BASIC GROUP MODEL 6-F-1514

FOR USE WITH TD-44-1100 SERIES TRANSMISSIONS

### REF. SPECIFICATION Z-203655

DIMENSIONAL TOLERANCE UNLESS SPECIFIED  
 MACHINED SURFACES  $\pm .01$   
 ANGULAR LOCATION OF DRILLED HOLES  $\pm .005$   
 ANGULAR LOCATION BETWEEN CIRCLES OF DRILLED HOLES  $\pm .03$   
 MACHINED ANGLES  $\pm 2^\circ$  EXCEPT CHAMFERS  
 CASTING FINISH — MIN. — MAX.

SIMILAR TO  
 PART NO. X-206065

| SYM. | WAB                | CH. NO.  | DATE | BY | SYM. | WAB | CH. NO. | DATE | BY | SYM. | WAB | CH. NO. | DATE | BY |
|------|--------------------|----------|------|----|------|-----|---------|------|----|------|-----|---------|------|----|
| B    | A-2888-AW-A2888-AF | 11-11-65 | FJP  |    |      |     |         |      |    |      |     |         |      |    |
| A    | M-1732-S-M-2001-Q  | 11-11-65 | DR   |    |      |     |         |      |    |      |     |         |      |    |

|                   |          |                       |      |  |  |
|-------------------|----------|-----------------------|------|--|--|
| MATERIAL          |          | HEAT TREAT            |      | DATE 12-15-62  |  |
| SURFACE TREATMENT |          | ASSEMBLY NO.          |      | FIRST USE MODEL NO.  |  |
| WEIGHT<br>ROUGH   | FINISHED | WTS.<br>LBS.<br>IN. 1 | NAME | APPROVED   |  |
|                   |          |                       |      | TWIN DISC CLUTCH CO.<br>HYDRAULIC DIVISION<br>ROCKFORD, ILLINOIS, U. S. A. |  |
|                   |          |                       |      | X-206741   |  |

