

CLARK HRS33000 LD POWERSHIFT TRANSMISSION

COMONENT TECHNICAL MANUAL CLARK HRS33000 LD TRANSMISSION CTM365 (25AUG04)

**CALIFORNIA
Proposition 65 Warning**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.



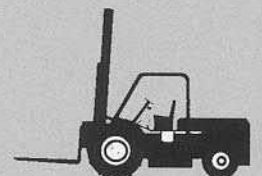
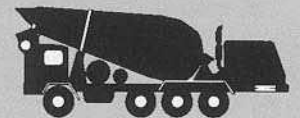
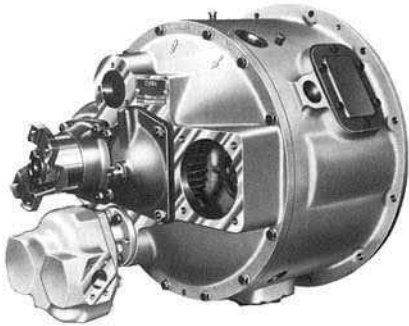
WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Worldwide Construction and Forestry Division

English

HRS 33000 LD
0212



SPICER OFF-HIGHWAY COMPONENTS



FOREWORD

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the CLARK-HURTH COMPONENTS product.

Extreme care has been exercised in the design, selection of materials and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated will be reimbursed many times in low cost operation and trouble free service.

In order to become familiar with the various parts of the product, its principle of operation, trouble shooting and adjustments, it is urged that the mechanic study the instructions in this manual carefully and use it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts if required, only **Clark-Hurth Components**—approved parts as listed in the applicable parts manual should be used. Use of “will-fit” or non-approved parts may endanger proper operation and performance of the equipment. **Clark-Hurth Components** does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied by or approved by **Clark-Hurth Components**. **IMPORTANT: Always furnish the Distributor with the serial and model number when ordering parts.**



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NOTE: Metric Dimensions Shown in Brackets [].

TRANSMISSION ASSEMBLY

The transmission and hydraulic torque portion of the power train enacts an important role in transmitting engine power to the driving wheels. In order to properly maintain and service these units it is important to first understand their function and how they operate.

The transmission and torque converter function together and operate through a common hydraulic system. It is necessary to consider both units in the study of their function and operation.

To supplement the text below, and for reference use therewith, the following illustrations are provided.:

Dipstick and Hose Group	Idler Shaft Group
Converter Housing Group	Output Shaft Group
Transmission Case Group	PTO Group
Turbine Shaft Group	Emergency Steer Pump Drive Group
Wheel Group	Pressure Regulator Valve Group
Drive Plate Group	Charging Pump Group
Pump Drive Group	Hydraulic Brake Group
Forward High/Low Shaft Group	Electric Control Valve Group
Reverse & 2nd Shaft Group	Companion Flange Group
Low Speed Shaft Group	

The HR Model consists of a torque converter and powershifted transmission in one package mounted directly to the engine.

The shift control valve assembly is directly mounted on the side of the converter housing. The function of the control valve assembly is to direct oil under pressure to the desired directional and speed clutches. A provision is made to neutralize the transmission when the brakes are applied which is accomplished through the use of an actuated shutoff valve. The speed and directional clutch assemblies are mounted inside the transmission case and are connected to the output shaft of the converter. The purpose of the speed or directional clutches is to direct the power flow through the gear train to provide the desired speed range and direction.

HOW THE UNITS OPERATE

With the engine running, the converter charging pump draws oil from the transmission sump through the removable oil suction screen and directs it through the pressure regulating valve and oil filter.

The pressure regulating valve maintains pressure to the transmission control cover for actuating the direction and speed clutches. This requires a small portion of the total volume of oil used in the system. The remaining volume of oil is directed through the torque converter circuit to the oil cooler and returns to the transmission for positive lubrication. This regulator valve consists of a hardened valve spool operating in a closely fitting bore. The valve spool is spring loaded to hold the valve in a closed position. When a specific pressure is achieved, the valve spool works against the spring until a port is exposed along the side of the bore. This sequence of events provides the proper system pressure.

After entering the converter housing the oil is directed through the stator support to the converter blade cavity and exits in the passage between the turbine shaft and converter support. The oil then flows out of the converter to the oil cooler. After leaving the cooler, the oil is directed to a fitting on the transmission. The oil then gravity drains to the transmission sump.

The hydraulic torque converter consists basically of three elements and their related parts to multiply engine torque. The engine power is transmitted from the engine flywheel to the impeller elements through the impeller cover. This element is the pump portion of the hydraulic torque converter and is the primary component which starts the oil flowing to the other components which results in torque multiplication. This element can be compared to a centrifugal pump in that it picks up fluid at its center and discharges at its outer diameter.

The torque converter turbine is mounted opposite the impeller and is connected to the output shaft of the torque converter. This element receives fluid at its outer diameter and discharges at its center. Fluid directed by the impeller out into the particular design of blading in the turbine and the reaction member is the means by which the hydraulic torque converter multiplies torque.

The reaction member of the torque converter is located between and at the center or inner diameters of the impeller and turbine elements. Its function is to take fluid which is exhausting from the inner portion of the turbine and change its direction to allow correct entry for recirculation into the impeller element.

The torque converter will multiply engine torque to its designated maximum multiplication ratio when the output shaft is at zero RPM. Therefore, we can say that as the output shaft is decreasing in speed the torque multiplication is increasing.

The shift control valve assembly consists of a valve body with spool type solenoid cartridge valves which is controlled electronically.

With the engine running and the directional control lever in neutral position, oil pressure from the regulating valve is blocked at the control valve, and the transmission is in neutral. Selection of forward or reverse will direct oil, under pressure to either the forward or reverse directional clutch as desired. When either directional clutch is selected the opposite clutch is relieved of pressure and vents back through the direction selectional spool. The same procedure is used in the speed selector.

The direction or speed clutch assembly consists of a drum with internal splines and a bore to receive a hydraulically actuated piston. The piston is "oil tight" by the use of sealing rings. A steel disc with external splines is inserted into the drum and rests against the piston. Next, a friction disc with splines at the inner diameter is inserted. Discs are alternated until the required total is achieved. A heavy back-up plate is then inserted and secured with a snap ring. A hub with O.D. splines is inserted into the splines of disc with teeth on the inner diameter. The disc and hub are free to increase in speed or rotate in the opposite direction as long as no pressure is present in that specific clutch.

To engage the clutch, as previously stated, the control valve is placed in the desired position. This allows oil under pressure to flow from the control valve, through a tube, to the chosen clutch shaft. Oil pressure sealing rings located on the clutch shaft direct oil under pressure to pass thru a drilled passageway in the clutch shaft to enter the piston cavity. Pressure of the oil forces the piston and disc against the heavy back-up plate. The disc, with teeth on the outer diameter, clamping against disc with teeth on the inner diameter, enables the hub and clutch shaft to be locked together and allows them to drive as a unit.

There are bleed balls in some of the clutches which allow quick escape for oil when the pressure to the piston is released.

SAFETY PRECAUTIONS

To reduce the chance of personal injury and/or property damage, the following instruction must be carefully observed.

Proper service and repair are important to the safety of the service technician and the safe, reliable operation of the machine. If replacement parts are required the part must be replaced with one of the same part number or with an equivalent part. Do not use a replacement part of lesser quality.

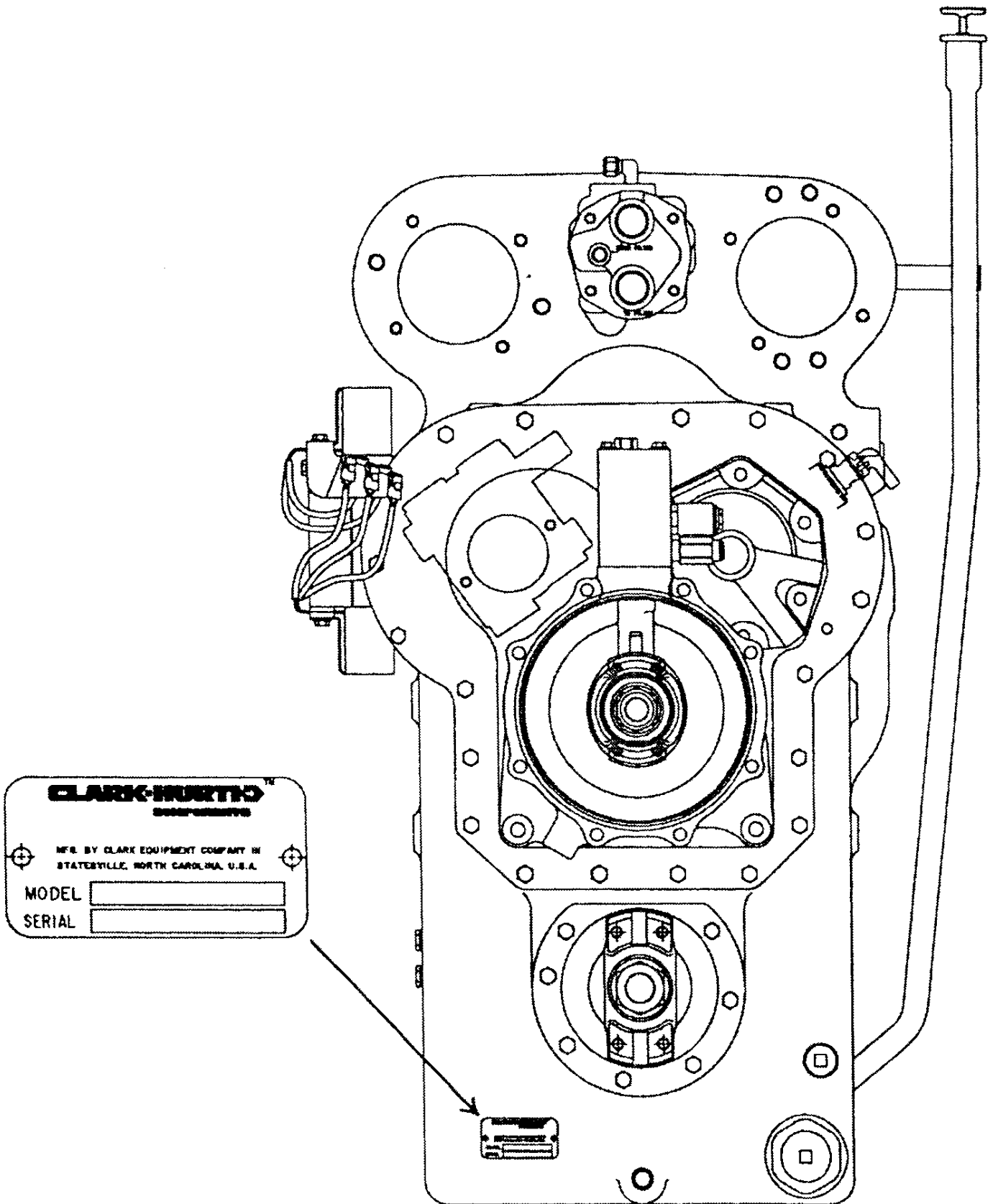
The service procedures recommended in this manual are effective methods of performing service and repair. Some of these procedures require the use of tools specifically designed for the purpose.

Accordingly, anyone who intends to use a replacement part, service procedure or tool, which is not recommended by Clark-Hurth, must first determine that neither his safety nor the safe operation of the machine will be jeopardized by the replacement part, service procedure or tool selected.

It is important to note that this manual contains various 'Cautions' and 'Notices' that must be carefully observed in order to reduce the risk of personal injury during service or repair, or the possibility that improper service or repair may damage the unit or render it unsafe. It is also important to understand that these 'Cautions' and 'Notices' are not inclusive, because it is impossible to warn of all the possible hazardous consequences that might result from failure to follow these instructions.

TRANSMISSION IDENTIFICATION

NAMEPLATE LOCATION ON REAR LEFT LOWER CORNER OF TRANSMISSION CASE



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 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 material 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 loaded 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. 3 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 multi-purpose grease grade 2 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.

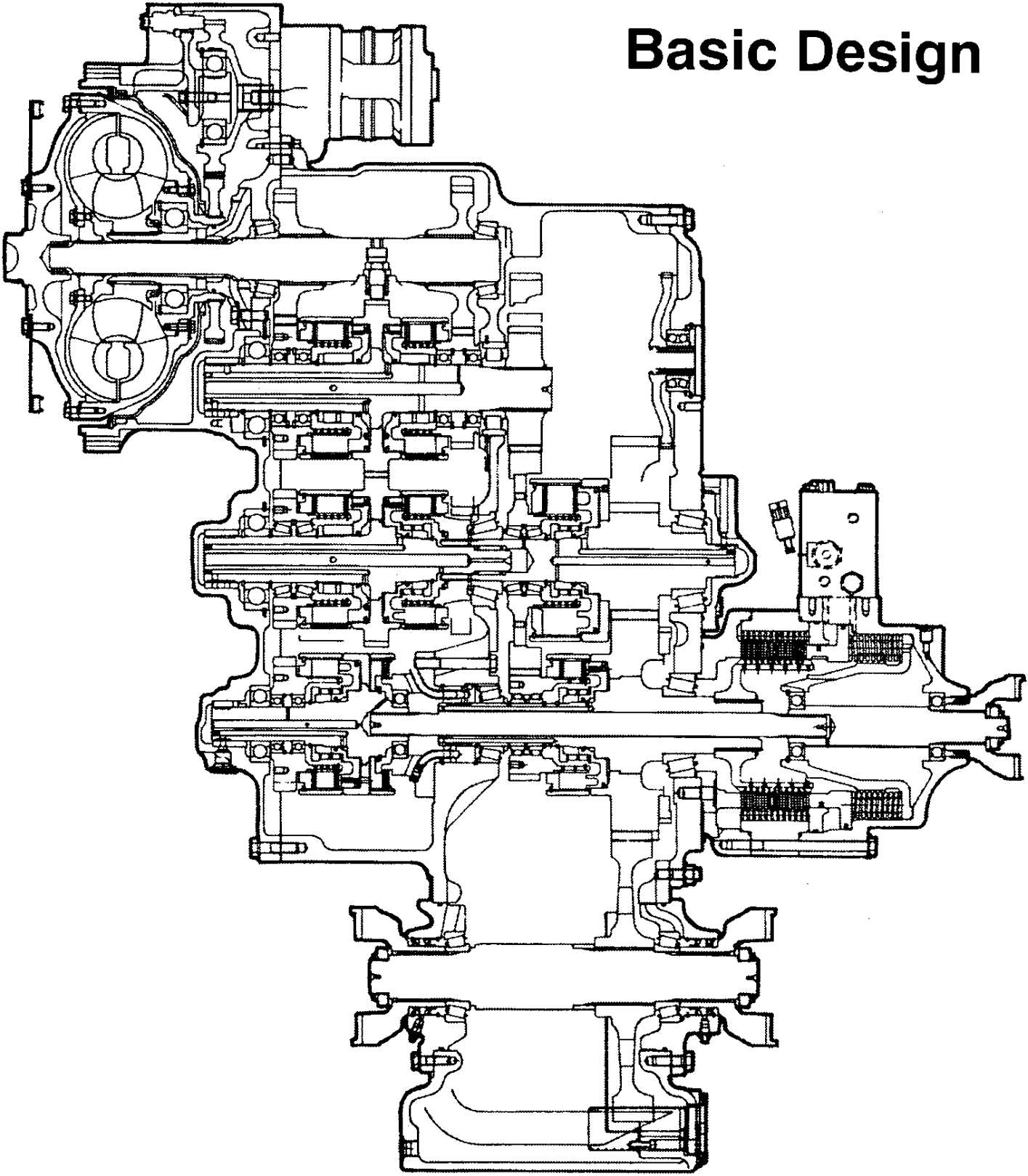
Gears and Shafts

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 failure.

Basic Design



SPECIFICATIONS AND SERVICE DATA-POWER SHIFT TRANSMISSION AND TORQUE CONVERTER

CONVERTER OUT PRESSURE	Converter outlet temp. 180- 200 degrees F. [82,3-93,3 degrees C.] Operating Specifications: 25 PSI.[172,4 kPa] minimum pressure at 2000 RPM. engine speed and a maximum of 70 PSI [482,6 kPa] outlet pressure with engine operating at no-load governed speed.	OIL CAPACITY	40 Quarts
CONTROLS	Forward and Reverse - Electric Speed Selection - Electric	OIL FILTRATION	Full flow oil filter safety by-pass, also strainer screen in sump at bottom of transmission case.
CLUTCH TYPE	Multiple discs, hydraulically actuated, spring release, automatic wear compensation and no adjustment. All clutches oil cooled and lubricated.	CLUTCH PRESSURE	240-310 PSI [1654,8- 2137,4 kPa] With parking brake set, engine at low idle, shift thru directional 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.
CLUTCH INNER DISC	Friction	ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.	
CLUTCH OUTER DISC	Steel		
DRY WEIGHT	1450 LBS. [657 kg]		

BRAKE RELEASE PROCEDURE

Consult equipment manufacturer's manual for brake release and towing procedure.

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 driveslines. Because of the design of the hydraulic system, the engine **cannot** be started by pushing or towing.

LUBRICATION

RECOMMENDED LUBRICANTS FOR CLARK-HURTH POWER SHIFTED TRANSMISSION AND TORQUE CONVERTER

TYPE OF OIL	See Lube Chart
CAPACITY	Consult Operators 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 low idle and oil at 180° to 200°F [82,2° [93,e°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].

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.

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 and remove sump screen. Clean screen thoroughly and replace, using new gaskets.
- (b) Drain oil filters, remove and discard filter elements.
- (c) Refill transmission to LOW mark.
- (d) Run engine at low idle to prime converter and lines.
- (e) Recheck level with engine running at low idle 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.

Prevailing Ambient Temperature

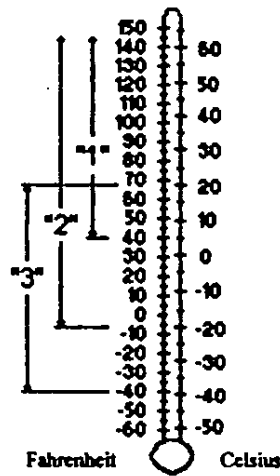
Temperature Range "1"	Tractor Hydraulic Fluids C-4 Approved Grade 30
Temperature Range "2"	Multi-Grade Tractor Hydraulic Fluids C-4 Approved Grade 10W & Higher
Temperature Range "3"	Multi-Grade Artic Tractor Hydraulic Fluids C-4 Approved Grade 5W & Higher

LUBRICANTS: Select only Tractor Hydraulic Fluids that meet Approved C-4 specifications.

PREFERRED OIL VISCOSITY: Select highest oil viscosity compatible with prevailing ambient temperatures and oil application chart.

Temperature range "3" may be used to lower ambient temperatures when sump preheaters are used.

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

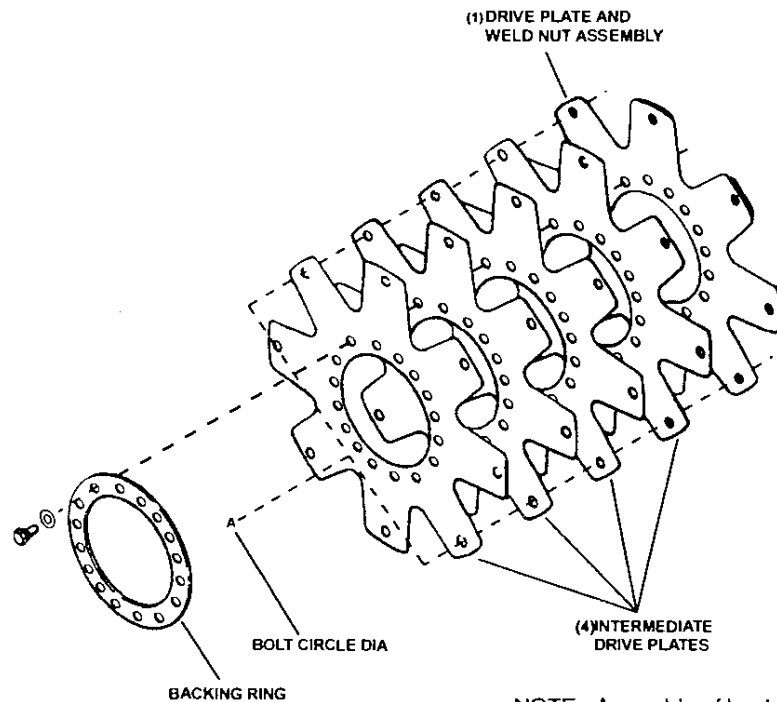


DRIVE PLATE INSTALLATION

HRS 33000 Series Transmission Drive Plate Kits.

Proper Identification by Bolt Circle Diameter.

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



"A" Dimension (Bolt Circle Diameter)

13.50" [342,900 mm] Diameter
Kit No. 802578

Each kit will include the following parts:

- 4 Intermediate Drive Plates
- 1 Drive Plate and Weld Nut Assembly
- 1 Backing Ring
- 16 Drive Plate mounting screws
- 16 Drive Plate Washer
- 1 Instruction Sheet

NOTE: Assembly of backing ring and drive plates on impeller cover 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 cover 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 cover holes must be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a new screw for reinstallation.

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 cap-screws and washers. Tighten 22 to 26 ft. lbs. torque [30-35 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. Dry thoroughly.
2. Check engine flywheel and housing for conformance to standard S.A.E. #3 - S.A.E J-927 and J-1033 tolerance specifications for pilot bore size, pilot bore runout and mounting face flatness. Measure and record engine crankshaft end play.
3. Install two 3.50 [88,90 mm] long converter 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 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 converter on flywheel housing aligning drive plate to flywheel and converter to flywheel housing.
Install converter to flywheel housing screws. Tighten screws to specified torque. Remove converter to engine guide studs. Install remaining screws and tighten to specified torque.
6. Remove drive plate locating stud.
7. Install drive plate attaching screw. Snug screw but **do not tighten**. 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, tighten each capscrew to the following torque: M-10 capscrews 48 ft. lbs torque [60-65 N.m.] This will require rotating the engine flywheel until the full amount of eight (8) screws have been tightened.
8. Measure engine crankshaft end play after converter has been completely installed on engine flywheel. This value must be within .001 [0,025 mm] of the end play recorded in Step No. 2.

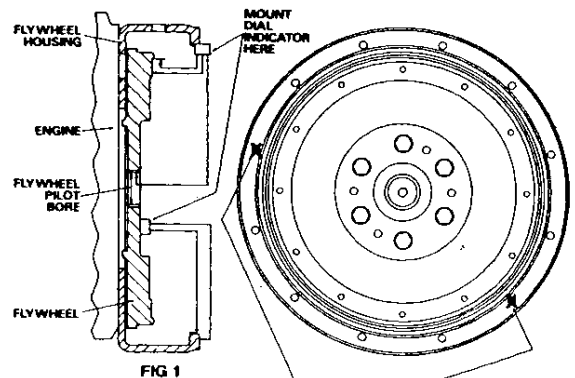


FIG 1

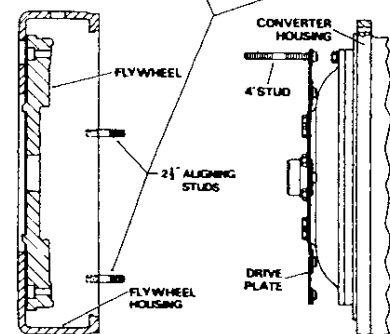


FIG 2

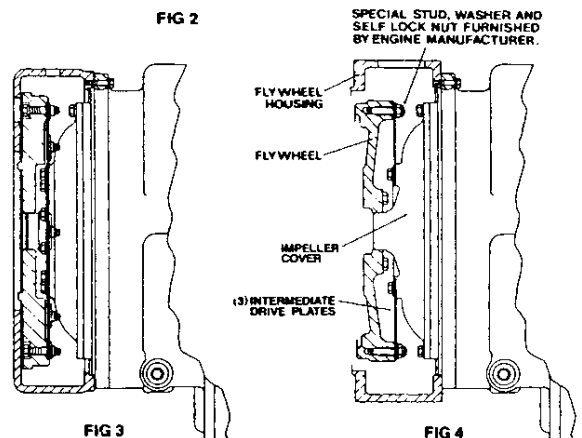
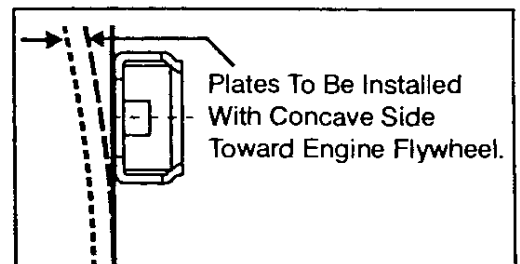


FIG 3

FIG 4

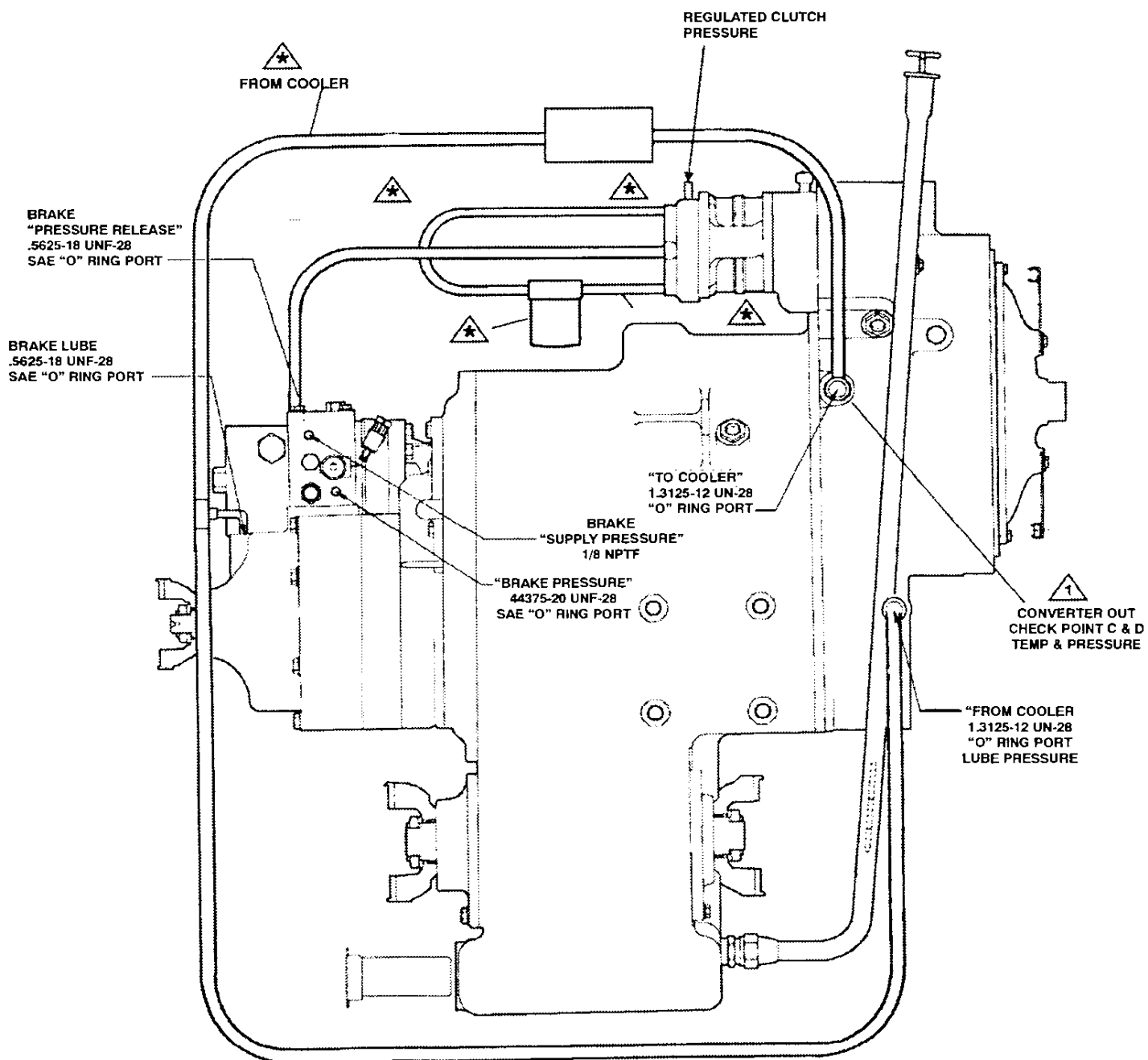
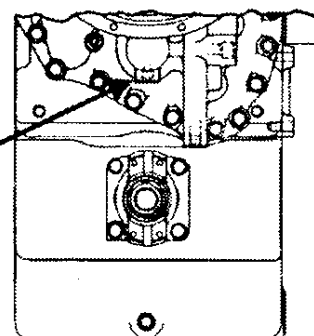


EXTERNAL PLUMBING DIAGRAM

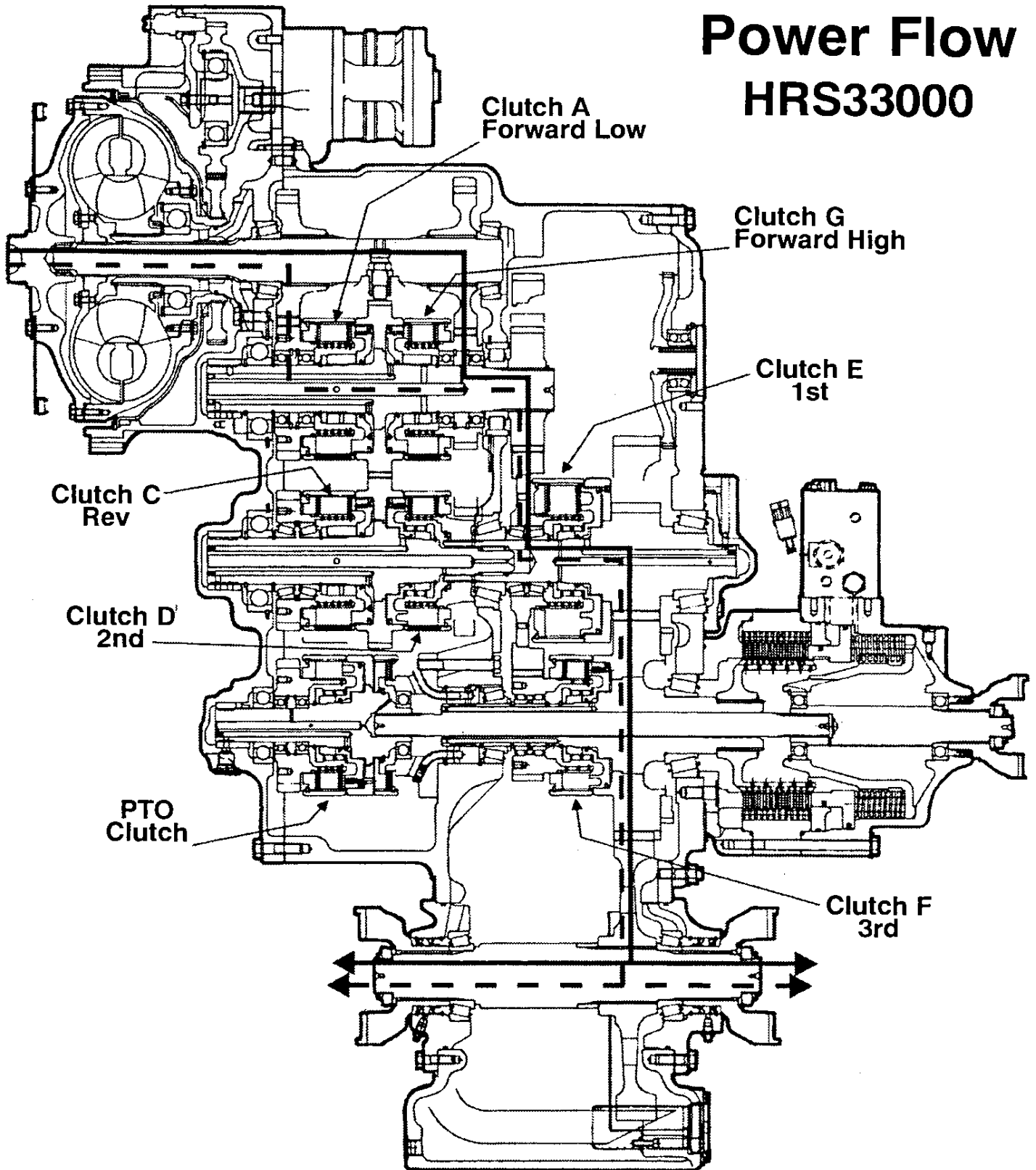
- ★ GENERAL HOSE LINE OPERATING REQUIREMENTS:
250° TEMP RANGE FOR CONTINUOUS
OPERATING WITH 300°F INTERMITTENT RANGE
300 PSI CONTINUOUS PRESSURE
600 PSI SURGE PRESSURE

- 1 CHECK POINTS "C" & "D" ARE PERMANENT
REQUIREMENTS, AND THEIR INSTALLATION
IS REQUIRED IN THIS AREA. FITTINGS LEFT
TO CUSTOMER OPTION

PTO APPLY
.750 16 UNF-28 THD
STD SAE O-RING PORT INLET



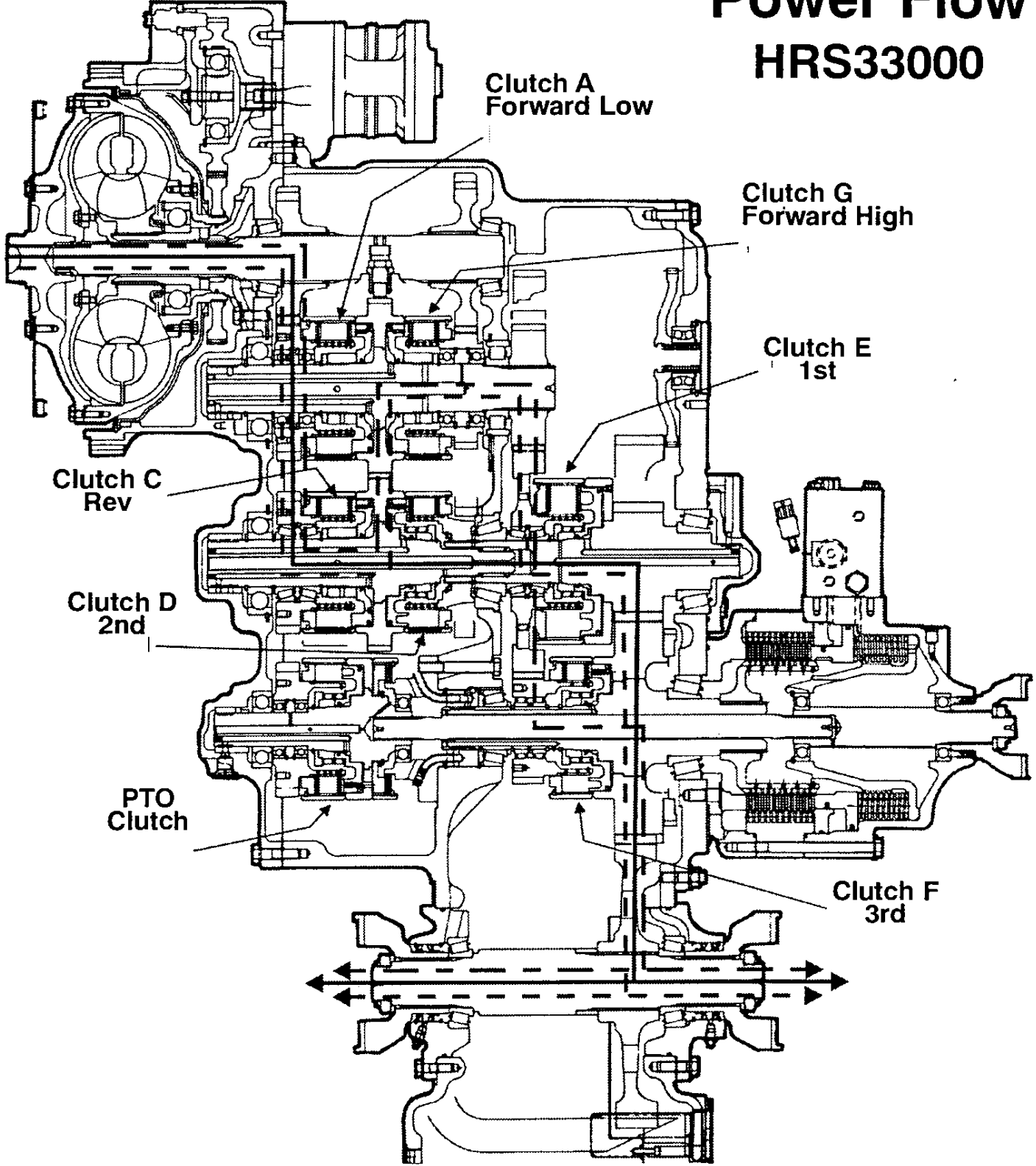
Power Flow HRS33000



FWD 1st -----
 FWD 2nd _____

Direction & Speed	Engaged Clutch						
	A	C	D	E	F	G	
Forward 1st	●			●			
Forward 2nd				●		●	

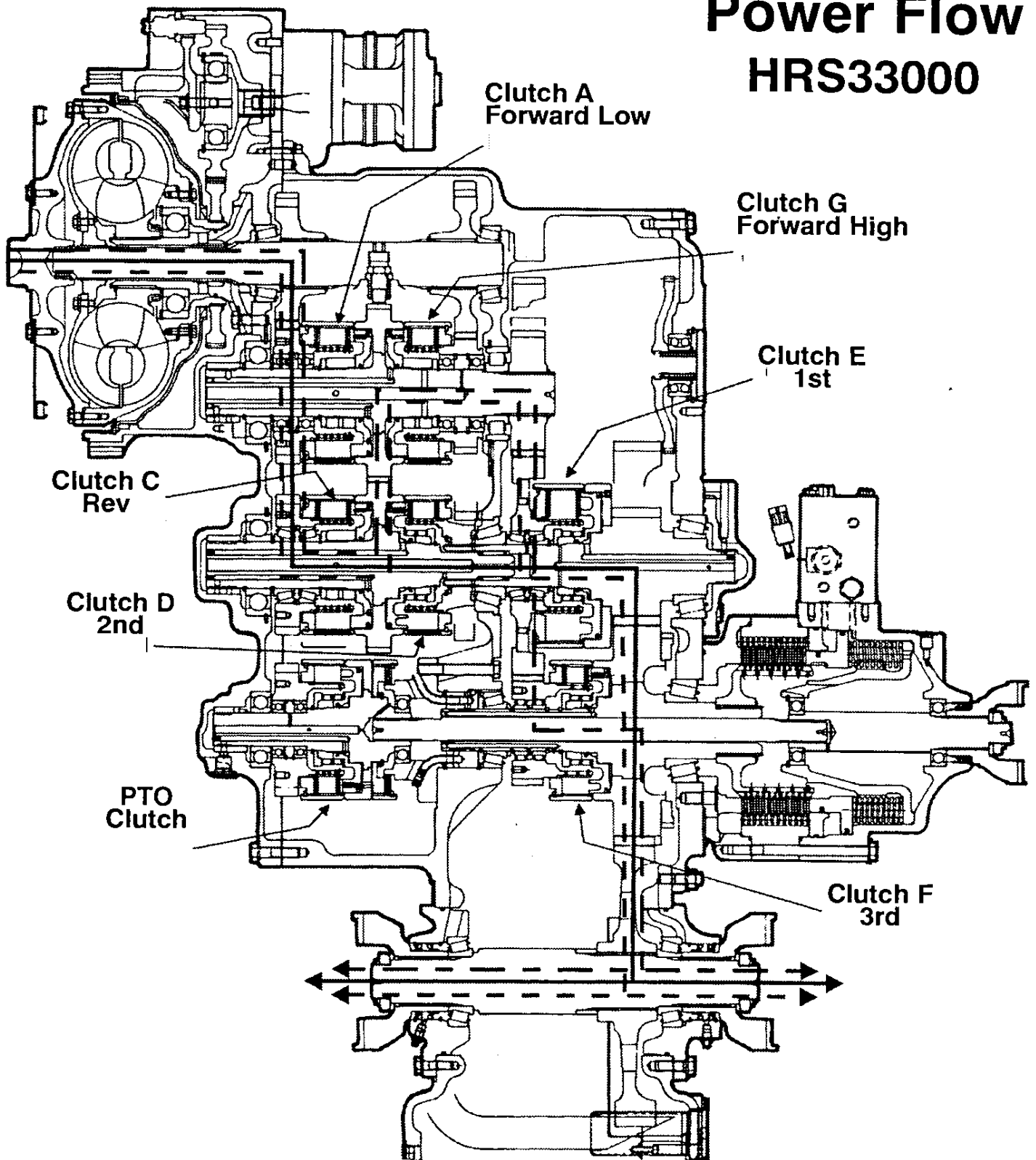
Power Flow HRS33000





FWD 3rd - - - - -
FWD 4th —————

Direction & Speed	Engaged Clutch						
	A	C	D	E	F	G	
Forward 3rd	●		●				
Forward 4th			●			●	

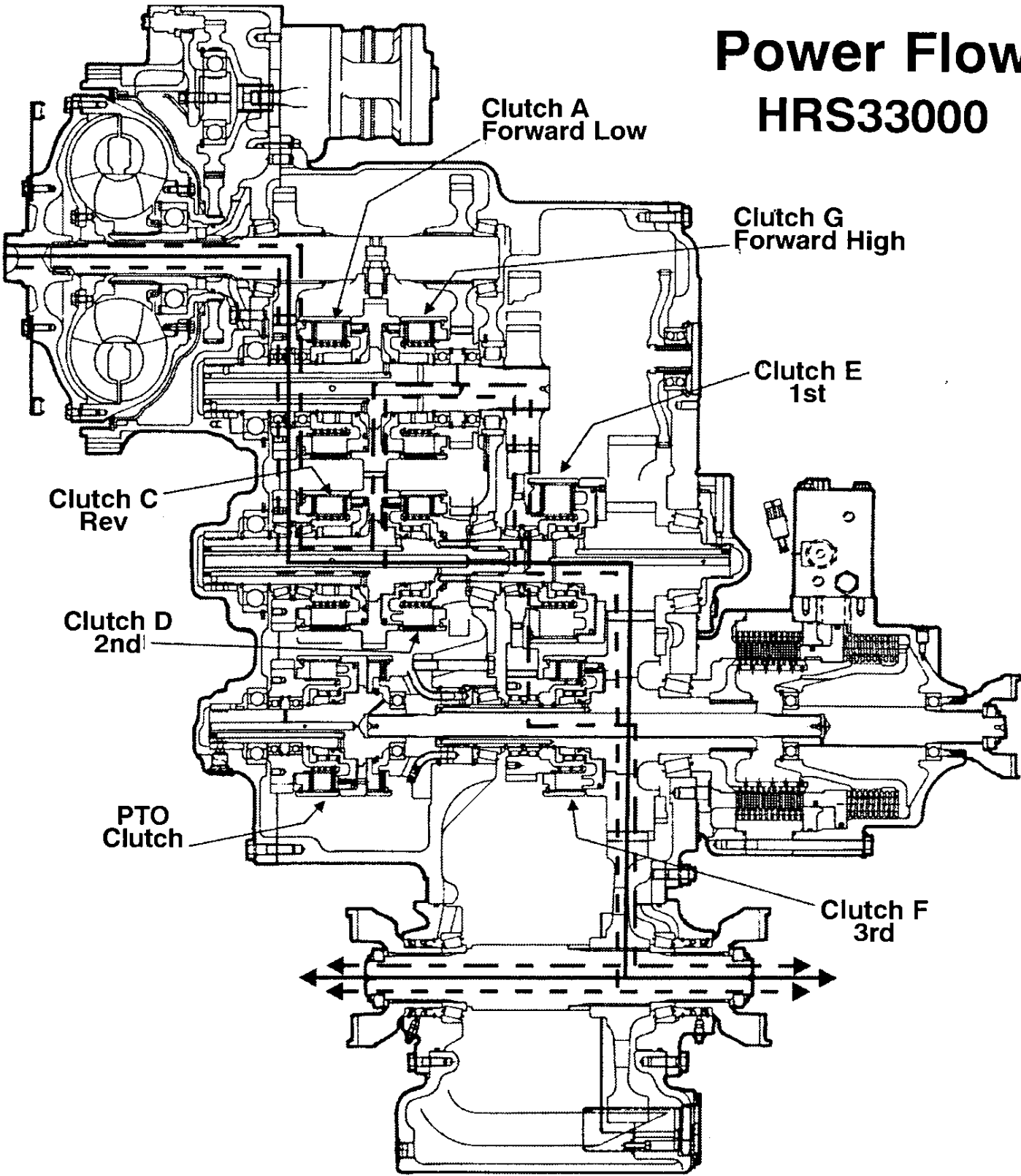
Power Flow HRS33000



FWD 5th 
 FWD 6th 

Direction & Speed	Engaged Clutch						
	A	C	D	E	F	G	
Forward 5th	●				●		
Forward 6th					●	●	

Power Flow HRS33000



REV 1st - - - - -
REV 2nd - - - - -
REV 3rd - . - . - .

Direction & Speed	Engaged Clutch						
	A	C	D	E	F	G	
Reverse 1st		●		●			
Reverse 2nd		●	●				
Reverse 3rd		●			●		