SECTION XIX — SPECIAL EQUIPMENT

1. GENERAL

Most of the special equipment, mentioned in this section and illustrated in the Parts List for the Model HD 16 tractor, may be purchased separately for field installation, or the tractor may be ordered with the equipment factory installed. For a more complete list and additional information concerning special equipment, contact your "Allis-Chalmers" Construction Machinery Dealer.

2. GUARD EQUIPMENT

The standard guard equipment furnished on a standard model tractor includes a full width crankcase guard, rear shield for protecting the underside of the transmission, front bumper, wrap around radiator guard and guards for the track idler, truck wheels, and track sprockets.

A. Additional Guard Equipment

1. Bottom Guard Group (Heavy-Duty)

The heavy-duty bottom guard group consists of two sections, front and rear. The front section is a heavy, full width front guard (bolted to the main frame in place of the standard crankcase guard) for protecting the area in front of the equalizing spring. It also includes a full-width rear guard (bolted to the main frame in place of the standard rear shield) for protecting the transmission and the steering clutch and final drive housing. The bottom guard group gives the tractor a smooth underside and the tractor is less likely to hang up on stumps or rocks. The bottom guard group is available for all model HD 16 tractors, except the HD 16FC and HD 16GC.

2. Fuel Tank and Seat Guard

The fuel tank and seat guard is a heavy steel guard, designed to protect the fuel tank for tractors engaged in logging operations. The fuel tank and seat guard bolts to the rear fenders and can be installed only on tractors equipped with the heavy rear fenders. This guard can be used on all model HD 16 tractors, except the HD 16FC and HD 16GC.

3. Heavy Rear Fenders

Heavy rear fenders are available to replace the standard rear fenders on all model HD 16 tractors, except the HD 16FC and HD 16GC. These fenders are required for installation of the fuel tank and seat guard.

4. Truck Frame Guard Equipment (Heavy-Duty)

Heavy-Duty truck frame guard equipment is available to replace the standard truck frame guard equipment for all model HD 16 tractors. The heavy-duty guard equipment includes truck wheel, sprocket, and truck frame end guards. These guards are available as separate items.

5. Wrap-Around Radiator Guards

The following types of wrap-around guards are available:

a. Hydraulic Dozer: Required for all tractors equipped with hydraulically-operated dozers. This guard is also available with a front bumper so that a hydraulic dozer may be added at some future date.

b. Cable Dozer (Rear Mounted Cable Control Units): Required for all tractors equipped with rear cable dozer mounting. This guard can also be used for front cable control unit mounting.

c. Cable Dozer (Front Mounted Cable Control Units): Required for front cable dozer mounting. This guard is also available with a front bumper so that a cable dozer may be added at some future date.

B. Radiator Screen

There are two types of screens available for the model HD 16 tractors.

1. Fine Mesh Type Radiator Screen

The fine mesh screen is standard equipment on models HD 16AC, HD 16DC, HD 16FC, and HD 16GC tractors with pusher type fan, and is special equipment on HD 16A and HD 16D tractors. The screen is mounted on the front of the radiator on tractors equipped with a suction type fan and mounted on the back of the radiator on tractors equipped with a pusher type fan.

2. Heavy Mesh Type Grille Screen

The heavy mesh screen is for use on all model HD 16 tractors using either a suction type or pusher type fan.

C. Engine Side Screens

The engine side screens are a heavy mesh screen available for all model HD 16 tractors except the HD 16FC and HD 16GC. A screen is installed between the engine hood and the front fender, on each side of the engine, to prevent debris from entering the engine compartment.

3. COLD WEATHER EQUIPMENT

A. Hood Side Plates

Hood side plates to fit all model HD 16 tractors are available for cold weather use. The hood side plates hook to the engine hood and fasten to the front fenders with spring loaded fasteners.

B. Radiator Curtain

A radiator curtain is available for cold weather use. The curtain cannot be used on tractors equipped with a pusher type fan.

C. Engine Air Heater

An engine air heater is available and may be substituted for the cold weather engine primer which is provided on the tractor as standard equipment. For a description of the air heater, refer to Section III, Topic 5.

4. PUSHER AND SUCTION TYPE FANS

Pusher type fans are used on models HD 16AC, HD 16DC, HD 16FC, and HD 16GC as standard equipment. A suction type fan is used on model HD 16A, and HD 16D tractors as standard equipment. A suction type or pusher type fan is available for all model HD 16 tractors and either type fan may be used, depending upon operating conditions. The fans are interchangeable, except that a spacer and longer capscrews are required for attaching the suction type fan to the fan hub.

5. ENGINE HOUR METER

The engine hour meter is an electrically energized clock which records the number of hours the engine has operated. The meter records up to 10,000 hours then repeats. Starting and stopping of the clock is controlled by the engine oil pressure so that the meter will record only when the engine is operating. The engine hour meter is mounted on a shock-proof bracket attached to the left front side of the cowl (refer to Section VIII, Topic 6).

6. LIGHTS

Either a rear flood light or a tail light may be installed on the welded bracket, located on the front of the fuel tank, near the upper left hand corner.

7. POWER PULLEY AND POWER TAKE-OFF

A. Power Pulley

A power pulley is available for the models HD 16A, HD 16AC, HD 16D, and HD 16DC tractors. The power pulley is mounted at the rear of the steering clutch and final drive housing and is driven by the transmission top shaft. The pulley is 18" in diameter by 15" wide and is driven clockwise (viewed from left side of tractor) at 693 R.P.M. at engine speed of 1600 R.P.M.

B. Straight Rear Power Take-Off

A straight rear power take-off is available for the models HD 16A, HD 16AC, HD 16D, and HD 16DC tractors. The power take-off is mounted at the rear of the steering clutch and final drive housing and is driven at 1600 R.P.M. at engine speed of 1600 R.P.M. The power take-off shaft rotates counter-clockwise viewed from the rear of the tractor. A power take-off shaft guard is also available.

C. Reversible Reduction Power Take-Off

The reversible reduction power take-off is available for the models HD 16A, HD 16AC, HD 16D, and HD 16DC tractors. The power take-off is mounted at the rear of the steering clutch and final drive housing and is driven by the transmission top shaft. The power take-off shaft rotates clockwise at 430 R.P.M. or counterclockwise at 335 R.P.M. at engine speed of 1600 R.P.M. A power take-off shaft guard is also available.

8. MISCELLANEOUS

In addition to the items listed above, the following special equipment is also available.

A. Engine Air Pre-Cleaner Extension

The engine pre-cleaner extension is for use when the tractor is operated under extremely dusty or sandy conditions. It extends the engine air cleaner intake pipe approximately 49 7/8" above the cowl. The air pre-cleaner extension cannot be used on model HD 16GC tractors.

B. Odometer

The odometer, which is driven from the front end of the transmission pinion shaft, registers miles or kilometers the tractor has traveled.

C. Skeleton Sprocket

The skeleton sprocket is designed to help prevent excessive packing when the tractor is operating in mud or snow.

D. Heavy-Duty Filters

This special equipment consists of large capacity engine lubricating oil and fuel filters. The required attaching brackets must be ordered separately from repair stock for field installation of the filters.

E. Cab

The all steel cab, with safety glass enclosures, is applicable to all model HD 16 tractors, except HD 16FC and HD 16GC.

F. Front Pusher

The front pusher plate is mounted on the main frame and is adjustable vertically to two positions. This pusher is applicable to the model HD 16A, HD 16AC, HD 16D, and HD 16DC tractors.

G. Bucket Seats

An adjustable type bucket seat is available for all the HD 16 tractors. The adjustable type bucket seat is standard equipment on the HD 16GC tractors.

H. Canopy Top

The canopy top is mounted on four brackets attached to the rear fenders and is applicable to all model HD 16 tractors, except the HD 16FC and HD 16GC.

I. Engine Decelerator Pedal

The decelerator pedal is standard equipment on the models HD 16AC, HD 16DC, HD 16FC, and HD 16GC tractors Serial No. 4001 and above, and is available for all other models as special equipment.

J. Exhaust Deflector and Rain Shield

The exhaust deflector and rain shield is applicable to all model HD 16 tractors; it deflects exhaust gases away from the operator.

K. Exhaust Rain Cap

The exhaust rain cap is applicable to all model HD 16 tractors; it keeps out rain and foreign material.

SECTION XX — GENERAL MAINTENANCE INSTRUCTIONS

1. BEARINGS AND BUSHINGS

A. Ball and Roller Bearings

Thoroughly clean the bearings in clean solvent and dry with compressed air free of moisture. Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers, and races. Make certain that the shield(s) and the ball retainers are in good condition and are not dented or damaged.

Badly worn ball bearings can be detected by the presence of excessive end play between the outer and inner races. This condition can be detected by holding one race steady and moving the other race endwise, comparing the difference in movement of the races of the used bearing and a new bearing.

Check the outer and inner races for indications of bearing creepage. This can be detected by marks on the bearing races or on the bearing area of the bore or shaft where the bearing has been used.

Always lubricate a bearing at assembly with clean lubricant.

B. Tapered Roller Bearings

1. Thoroughly clean the bearings in clean solvent and dry with compressed air free of moisture. Inspect the bearings for worn and pitted rollers and races. Make certain that the roller retainer is in good condition and that the retainer is not bent or damaged.

2. Inspect the O.D. of the bearing cup (outer race) and the I.D. of the cone (inner race) for marks which indicate creepage.

3. Always set up a tapered roller bearing in accordance with the specifications. IMPORTANT: *DO NOT EXPERIMENT.* A properly set up tapered roller bearing will give satisfactory service for a very long time, while a bearing pre-loaded too much or set up too loose may fail in a comparatively short time.

4. Always lubricate the bearings at assembly with clean lubricant.

C. Needle Bearings

Needle bearings are used primarily in place of bushings where an oscillating motion is present. They are seldom used on a revolving part.

1. Thoroughly clean and inspect the rollers for wear or damage.

2. Inspect the needle retaining cage for dents which may interfere with the free rolling of the needles.

3. Be sure that the needles or rollers are not "cocked" in the cage and rotate each needle individually to be sure that it will turn.

4. Pack the bearings at assembly with clean lubricant.

D. General

1. Do not use a bearing which is in bad condition.

2. After the bearings have been removed, keep the bearings spotlessly clean, well lubricated, and wrap the bearings in clean oil proof paper to prevent the entrance of dirt and rusting. When installing new bearings, do not remove the bearings from the package until ready for assembling. Do not wash the lubricant from a new bearing.

3. Use a press and a suitable sleeve or driver when installing bearings. If these are not available, a cold rolled soft steel rod and hammer may be used to drive the bearings into position; do not strike the bearing shield or ball retainer when installing.

   Bearings may be heated to expand the bore, thus facilitating the installation of the bearing on a shaft. One method of transferring heat to bearings is through the use of hot oil. The bearings should never be placed directly on the bottom of a tank or container, but should be suspended in the oil on hooks or placed on a screen so that they may be heated uniformly. A light or medium grade of clean lubricating oil should be used and the temperature must never exceed 300° F.

4. When installing a bearing on a shaft, drive or press on the inner race; when installing it in a bore, drive or press on the outer race.

5. Be careful not to strike the shield, snap ring, ball retainer, or balls when using a rod and hammer to install the bearings.

6. When using a slide hammer type puller to remove or install an assembly containing tapered roller bearings, be sure that the pull is evenly distributed on the bearing. Do not allow the cup and the cone of the bearing to become separated, as each blow of the slide hammer, with the cup and cone separated, would cause the cup and the cone to be rammed together and damage to the bearing would result.

E. Bushings

1. Do not remove the bushings for inspection unless the bushings are loose in their bores or are excessively worn, then they must be removed and replaced.

2. Use a press and a suitable sleeve or driver to install bushings. Ream the bushings to the specified dimensions when reaming is required.

2. SHAFTS, SPLINES, AND DETENTS

A. Shafts

Inspect all shafts for worn areas and make certain they are not twisted or bent. Check the bearing journals and make certain they are smooth, round, and are of the specified diameter to assure the proper fit of the bearing or bushing.

B. Splines

1. Inspect the splines of all shafts for roughness, burrs, and wear. Remove all burrs and roughness from the splines with a stone or mill file.

2. Be sure the splines of all shafts are smooth and try all the gears on their respective shafts to be sure that they slide freely on the splines.

C. Detents

Inspect the detent notches in the transmission shifting fork shafts. Make certain the detent balls have been entering the detent notches. Remove any burrs or roughness on the shifting fork shafts with a stone or mill file.

3. SHIFTING FORKS

Check the transmission shifting forks for tightness and proper location on the shifting fork shafts and make certain the forks are not bent as indicated by uneven wear. Observe the side faces of the forks for wear and roughness; also, check the groove in the gear or pinion in which the fork operates. Remove any roughness on these parts with a stone or mill file.

4. OIL SEALS

A. Lip Type

1. When any work has been done which involves the removal of a shaft from an oil seal, or the removal of an oil seal from its bore, the sealing lip of the seal must be carefully examined.

2. The sealing lip must not be scratched, folded over, torn, or charred from heat. The lip must be flexible and the spring, located inside the lip, must have the proper tension to return the lip to its proper position when the lip is pressed in by hand.

3. Be sure that the surface of the shaft contacted by the lip of the oil seal is smooth and free from burrs.

4. When installing an oil seal on a shaft, or a shaft through an oil seal, be sure to protect the sealing lip from damage which might be caused from a keyway, splines, threads, or a hole through the shaft. A small scratch or cut, or a fold in the lip of the seal, will render the seal useless.

   Use an oil seal installing bushing, or a thin sheet of stiff paper wrapped around the sharp portion of the shaft, then slide the seal over the bushing or paper.

5. Use an oil seal installing tool or a press when installing seals into their bores, to prevent damage to the outer case of the seals. If the proper installing tools are not available, a smooth piece of metal or a block of wood can be placed flat against the face of the seal and the seal can be driven into position with a hammer.

6. When a new oil seal is to be installed, always lubricate the sealing lip before installing.

B. Positive Type

1. The sealing surfaces of the seal rings (positive type) must be smooth and flat. Scratches on the sealing surface, no matter how slight, may be conducive to leakage of lubricant. If replacement of a seal ring is necessary, its mating ring must also be replaced. When assembling, make certain that the sealing surfaces are clean and lubricate the sealing surfaces with clean engine oil.

2. Check the seal boot (rubber) for cracks and be sure that it is securely cemented to the seal spring assembly and the seal ring.

3. Check the seal spring assembly and make certain the springs are in good condition and that the spring assembly is exerting an even pressure on its entire periphery.

5. GASKETS

1. When a gasket is removed from the tractor, clean the gasket and inspect it for damage. If it is in good condition, and is to be used again, immerse it in a container of oil and keep it in the container until it is needed.

2. Do not use a gasket which is torn, hardened, or shrunk out of shape.

6. GEARS

1. Thoroughly clean and inspect all gears for worn, pitted, chipped, or cracked teeth.

2. Check the internal splines for galling, roughness, and wear and make certain the gears slide freely onto the shaft splines.

7. HOSES

Inspect all water and air hoses, fuel lines, hydraulic lines, and lubricating oil lines for leaks and signs of collapsing and deterioration of the rubber on the inside of the hoses. Replace if necessary. Check all hose clamps and supporting clamps and make certain they are secure and properly installed.

8. WIRING

1. Do not allow the insulation of the cables to become soaked with fuel or lubricating oil.

2. Wrap all frayed spots of the insulation with tape. Check all supporting clips and make certain they are secure and properly installed.

3. Keep all terminals and connections clean and tight.

4. When replacing or repairing electrical cables, make certain that the proper gage cable(s) are used (refer to "WIRING DIAGRAM — SCHEMATIC," Figure 1 or 2, Section VI).

9. BATTERIES

1. Keep the batteries clean and maintain the level of the electrolyte solution $\frac{3}{8}$" above the battery plates by the addition of clean distilled water.

2. Be sure that the battery hold-down assemblies are tight so that the batteries do not shift around in their compartments.

3. Periodically clean the battery terminals and apply a light coating of petroleum jelly to the terminals.

4. Periodically check the specific gravity of the batteries with a hydrometer (refer to Section VI).

10. RADIATOR

1. Keep the radiator filled to the proper level with clean coolant. Only clean water free from lime or other minerals should be used. A permanent type (glycol base) anti-freeze solution should be used in freezing weather.

2. Remove all leaves and other debris from the air passages of the radiator. IMPORTANT: *DO NOT PAINT THE RADIATOR CORE.*

3. Keep the radiator, radiator support, and the radiator guard mounting bolts properly tightened.

4. Keep the fan drive belts properly adjusted and make certain the belts are in good condition.

11. FILTERS

1. Fuel filter elements should be changed after every 300 to 500 hours of operation (more often if conditions warrant) or when the filter elements become clogged. The engine oil filter elements should be changed each time the oil in the crankcase is changed.
2. When installing new filter elements be sure that all gaskets are in place and are in good condition.
3. Check all filter connections for leaks after an element has been replaced.

12. PIPING AND TUBING

1. Tighten fittings only tight enough to prevent leakage. If the fittings are drawn up too tight, damage may result.
2. Always be sure that the fittings and nuts are clean before tightening.

13. FASTENERS

1. Keep all nuts, bolts, hose clamps, etc., tight at all times. A periodic check of these parts does not take long and may prevent the occurrence of a major failure.
2. Inspect and tighten the track shoe bolts frequently, especially if operating over rough hard terrain.
3. Replace any broken or missing capscrews, nuts, or lockwashers.

14. ADJUSTING SHIMS

Shims should be flat and the surfaces clean and free from foreign substances or corrosion. When removing or adding shims, check the thickness of each shim with a micrometer to obtain accurate adjustments.

15. MISCELLANEOUS

1. Keep the outside of the engine free from deposits of oily dust, which acts as an insulation material and prevents cooling by radiation.
2. Make all adjustments as specified in this manual.
3. Use only genuine "Allis-Chalmers" parts for replacement.

SECTION XXI — FITS AND TOLERANCES

1. DESCRIPTION

This Section has been prepared to provide those responsible for Tractor Maintenance with the proper fits and tolerance information for the various assemblies. The information herein deals with fits and tolerances of parts when they are new and, whenever possible, the amount of permissible wear before the parts should be replaced. When making repairs refer to this Section for the proper fit and tolerance information. The information given in this Section applies to all HD 16 tractors unless otherwise indicated.

2. ENGINE

Description	Size of New Parts	Install New Parts When Clearance Exceeds
A. Cylinder Sleeve		
1. Type	Replaceable wet	
2. I.D.	5.251" — 5.252"	
3. O.D. of sleeve at machined area below flange	5.871" — 5.873"	
4. O.D. at cylinder sleeve packing ring location	5.778" — 5.780"	
5. Cylinder block-to-sleeve clearance at sleeve lower O.D.	.001" — .005" loose	
6. Cylinder block-to-sleeve clearance at machined area below flange	.001" — .005" loose	
7. Clearance between piston skirt and cylinder sleeve	.010" — .012"	.020"
8. Projection of cylinder sleeve flange above cylinder block with sleeve installed	.006" — .009"	

Description	Size of New Parts	Install New Parts When Clearance Exceeds
9. Maximum allowable sleeve flange stand-out variation between adjacent sleeves (controlled by shims)	.003"	
10. Flange height adjusting shims available	.005", .008", .010", .015", and .020"	
11. Allowable cylinder sleeve wall taper	.0015"	.006"
12. Allowable out of round when installed	.0015"	.006"
B. Cylinder Block		
1. Counterbore diameter in cylinder block for cylinder sleeve flange	6.229" — 6.234"	
2. Depth of counterbore for cylinder sleeve flange	.456" — .457"	
3. Bore in cylinder block for cylinder sleeve	5.781" — 5.783"	
4. Bore in cylinder block for camshaft bearings	2.747" — 2.748"	
5. Bearing bore in cylinder block (less bearing; cap in plate; and nuts tightened to specified torque)	4.1243" — 4.1250"	
C. Piston (HD 844 Engines)		
1. Compression pressure for normal engines (with engine at normal operating temperature; firing on 5 cylinders at 600 R.P.M.; and at sea level conditions)	415 P.S.I.	
2. Length	6¾"	
3. Diameter of bottom of skirt measured at right angle to the piston pin	5.240" — 5.241"	
4. Bore for piston pin (cold)	1.7518" — 1.7520"	
5. Measurement from center of piston pin bore-to-top of piston	3.751" — 3.755"	
6. Piston skirt-to-sleeve clearance at skirt bottom	.010" — .012"	.020"
7. Depth of recess in piston for intake valve head	5/32"	
D. Piston (16000 Engine)		
1. Compression pressure for normal engines (with engine at normal operating temperature; firing on 5 cylinders at 600 R.P.M.; and at sea level conditions)	425 P.S.I.	
2. Length	6¾"	
3. Diameter of bottom of skirt measured at right angle to the piston pin	5.237" — 5.238"	
4. Bore for piston pin (cold)	1.7518" — 1.7520"	
5. Measurement from center of piston pin bore-to-top of piston	3.751" — 3.755"	
6. Piston skirt-to-sleeve clearance at skirt bottom	.010" — .012"	.020"
E. Piston Pin		
1. Length	4.490" — 4.500"	
2. Diameter	1.7515" — 1.7517"	
3. Fit of pin at room temperature	.0001" — .0005" loose	.002"
4. I.D. of connecting rod bushing after reaming	1.7527" — 1.7533"	
5. Piston pin-to-connecting rod bushing clearance	.0010" — .0018" loose	.003"

Description	Size of New Parts	Install New Parts When Clearance Exceeds
F. Piston Rings		
1. Number of rings on each piston	5	
2. Location of rings	One top ring; two compression rings and one oil ring above the piston pin. Also one oil ring below the piston pin.	
3. Gap between ring ends — fitted:		
Top (HD 844 engines)	.018" — .033"	
Top (16000 engine)	.024" — .039"	
Second and third	.016" — .031"	
Fourth and fifth	.018" — .033"	
4. Clearance of rings in grooves:		
Top (HD 844 engines)	.004" — .006"	.010"
Top (16000 engine)	.003" — .004"	.010"
Second and third (compression rings)	.0015" — .0035"	.008"
Fourth and fifth (oil control rings)	.0015" — .0035"	.008"
G. Crankshaft		
1. Journal diameter for connecting rods	3.2475" — 3.2485"	
2. Journal diameter for main bearings	3.745" — 3.746"	
3. Width between connecting rod journal cheeks	2.1235" — 2.1265"	
4. Width of main bearing journals (HD 844 engines):		
a. Front bearing	3"	
b. Intermediate bearing	$2\frac{3}{16}$"	
c. Center bearing	3.375" — 3.377"	
d. Rear bearing	$2\frac{5}{8}$"	
5. Width of main bearing journals (16000 engine):		
a. Front bearing	$2\frac{15}{16}$"	
b. Intermediate bearing	$2\frac{1}{16}$"	
c. Center bearing	3.250" — 3.252"	
d. Rear bearing	$2\frac{9}{16}$"	
6. Crankshaft end play	.007" — .015"	.020"
7. Crankshaft journals may be ground	.010", .020", .030", .040" undersize	
H. Main Bearings		
1. Main bearing-to-crankshaft clearance	.0021" — .0048"	.007"
2. I.D. of front, intermediate, center, and rear bearings	3.7481" — 3.7498"	
3. Length of front and rear bearings (HD 844 engines)	2.245" — 2.255"	
4. Length of front and rear bearings (16000 engine)	2.182" — 2.192"	
5. Length of center bearing (HD 844 engines)	2.871" — 2.881"	
6. Length of center bearing (16000 engine)	2.746" — 2.756"	
7. Length of intermediate bearing (HD 844 engines)	1.745" — 1.755"	
8. Length of intermediate bearing (16000 engine)	1.620" — 1.630"	
9. Undersized bearings available for service	.010", .020", .030", and .040"	
10. Wall thickness (standard bearing)	.1876" — .1881"	

Description	Size of New Parts	Install New Parts When Clearance Exceeds
I. Connecting Rod Bearings		
1. I.D. of bearing	3.2510" — 3.2525"	
2. Connecting rod bearing-to-journal clearance	.0025" — .0050"	.007"
3. Length	1.715" — 1.725"	
4. Undersize bearings available for service	.010", .020", .030", and .040"	
5. Wall thickness (standard bearing)	.12375" — .12425"	
J. Connecting Rods		
1. Connecting rod length (center-to-center)	12.498" — 12.502"	
2. I.D. of connecting rod bushing (ream in place)	1.7527" — 1.7533"	
3. Bearing bore (less bearing; cap in place; and nuts tightened to the specified torque)	3.4995" — 3.5000"	
4. Side clearance at crankshaft end	.004" — .009"	
5. Piston pin-to-connecting rod bushing clearance	.0010" — .0018"	.003"
K. Exhaust Valve		
1. Face angle	45°	
2. Clearance (cold)	.018"	
3. Clearance (engine coolant at normal operating temperature)	.015"	
4. Head diameter	2"	
5. Length overall (HD 844 engines)	7.924" — 7.965"	
6. Length overall (16000 engine)	8.020" — 8.046"	
7. Stem diameter (HD 844 engines)	.4330" — .4335"	
8. Stem diameter (16000 engine)	.4327" — .4337"	
L. Exhaust Valve Spring		
1. Free length	3 1/4"	
2. Spring load at 2 3/4"	76-86 lbs.	
3. Spring load at 2 13/64"	200-210 lbs.	
M. Exhaust Valve Seat Insert		
1. Seat angle	45°	
2. Seat width	3/64" — 1/16"	
3. O.D. (HD 844 engines)	2.1895" — 2.1905"	
4. O.D. (16000 engine)	2.049" — 2.050"	
5. Fit of seat in cylinder head	.0025" — .0045" tight	
6. Refacing wheel angles	30°; 45°; 60°	
N. Exhaust Valve Guide		
1. Length (HD 844 engines)	4 5/16"	
2. Length (16000 engine)	4 1/2"	
3. I.D. (ream after assembly)	.4375" — .4380"	
4. Stem-to-guide clearance	.0040" — .0055"	.007"

Description	Size of New Parts	Install New Parts When Clearance Exceeds
5. Guide stand-out above flat surface of counterbore in cylinder head	1 1/8"	
O. Intake Valve (HD 844 Engines)		
1. Face angle	45°	
2. Clearance (cold)	.015"	
3. Clearance (engine coolant at normal operating temperature)	.012"	
4. Head diameter	2 3/16"	
5. Length overall	9.463"	
6. Stem diameter	4.350" — 4.355"	
P. Intake Valve (16000 Engine)		
1. Face angle	45°	
2. Clearance (cold)	.018"	
3. Clearance (engine coolant at normal operating temperature)	.015"	
4. Head diameter	1.619" — 1.629"	
5. Length overall	7.292" — 7.318"	
6. Stem diameter	.3715" — .3720"	
Q. Indexing Guide Dowel Pin (16000 Engine)		
1. Gage-height	1/8"	
R. Intake Valve Spring (HD 844 Engines)		
1. Free length	3 1/4"	
2. Spring load at 2 3/4"	76-86 lbs.	
3. Spring load at 2 13/64"	200-210 lbs.	
S. Intake Valve Inner Spring (16000 Engine)		
1. Free length	2 35/64"	
2. Spring load at 1 7/8"	17-20 lbs.	
3. Spring load at 1 21/64"	35-39 lbs.	
T. Intake Valve Outer Spring (16000 Engine)		
1. Free length	2 5/8"	
2. Spring load at 2"	34-37 lbs.	
3. Spring load at 1 29/64"	70-74 lbs.	
U. Combined Load of Intake Valve Inner and Outer Springs (16000 Engine)		
1. Closed	51-57 lbs.	
2. Open	105-113 lbs.	
V. Intake Valve Seat Insert (16000 Engine)		

Description	Size of New Parts	Install New Parts When Clearance Exceeds
1. Seat angle	45°	
2. Seat width	3/64" — 1/16"	
3. O.D.	1.552" — 1.572"	
4. Fit of seat in cylinder head	.0025" — .0045" tight	
5. Refacing wheel angles	30°; 45°; 60°	

W. Intake Valve Guide (HD 844 Engines)

1. Length	5 7/16"	
2. I.D. (ream after assembly)	.4380" — .4385"	
3. Valve stem-to-guide clearance	.0025" — .0040"	.0055"
4. Guide stand-out above flat surface of counterbore in cylinder head	1 1/8"	

X. Intake Valve Guide (16000 Engine)

1. Length	3 7/8"	
2. I.D. (ream after assembly)	.3745" — .3755"	
3. Valve stem-to-guide clearance	.0025" — .0040"	.0055"
4. Guide stand-out above flat surface of counterbore in cylinder head	1 9/32"	

Y. Intake Valve Bridge (16000 Engine)

1. Bridge-to-guide pin clearance	.002" — .003"	
2. Guide pin length	4 1/2"	
3. Guide pin O.D.	.4970" — .4975"	
4. Guide pin gage height	1 29/32"	

Z. Rocker Arm Shaft

1. Length	17"	
2. O.D.	.999" — 1.000"	

AA. Rocker Arm

1. Fit of rocker arm bushing in rocker arm bore	.004" — .0065" tight	
2. Rocker arm bushing finished bore	1.0010" — 1.0015"	
3. Rocker arm shaft-to-bushing clearance	.0010" — .0025"	.005"
4. Rocker arm ratio	1.51:1	
5. Locking stud orifice (16000 engine)	.0785"	

BB. Camshaft

1. Number of bearings used	4	
2. I.D. of installed camshaft bearings	2.498" — 2.501"	
3. O.D. of camshaft journals	2.494" — 2.495"	
4. Camshaft bearing-to-journal running clearance	.003" — .007"	.010"
5. O.D. of camshaft bearings	2.750" — 2.751"	
6. Fit of camshaft bearings in bore of cylinder block	.002" — .004" tight	
7. Camshaft front bearing length	1 7/8"	

Description	Size of New Parts	Install New Parts When Clearance Exceeds
8. Camshaft rear bearing and intermediate bearings length	1 3/8"	
9. Camshaft end play	.003" — .009"	.015"
10. Thrust plate thickness	.204" — .206"	
CC. Timing Gear Train		
1. Backlash between mating gears (HD 844 engines)	.006" — .014"	.020"
2. Backlash between mating gears (16000 engine)	.003" — .011"	.020"
DD. Lubricating Oil Pressure Pump and Scavenging Oil Pump		
1. Running clearance between pump driving gear and pump cover (oil pressure pump)	.010" — .029"	
2. Backlash between mating pump gears	.003" — .006"	
3. Gears-to-pump body radial clearance	.0022" — .0032"	.006"
4. Pump gear side clearance	.005" — .007"	.010"
5. I.D. of gear shaft bushings (finished bore)	.7495" — .7505"	
6. O.D. of pump gear shafts	.7475" — .7480"	
7. Pump gear shaft-to-bushing clearance	.0015" — .0030"	
EE. Accessory Drive		
1. Housing bushings I.D.	1.2495" — 1.2507"	
2. Upper and lower shaft O.D. at housing bushing location	1.247" — 1.248"	
3. Lower shaft end play	.002" — .005"	
4. Accessory drive gear-to-front thrust washer clearance	.002" — .005"	
5. Fuel transfer pump driven gear bushing I.D. (16000 engine)	.8745" — .8755"	
6. Driven shaft O.D. at bushing location (16000 engine)	.872" — .873"	
7. Lower shaft cover bushing I.D. (16000 engine)	1.003" — 1.0035"	
8. Lower shaft O.D. at cover bushing location (16000 engine)	.999" — 1.000"	
FF. Fuel Transfer Pump		
1. Rotation when viewed from drive end:		
a. (HD 844 engines)	Clockwise	
b. (16000 engine)	Counterclockwise	
2. Relief valve setting	47-60 P.S.I.	

GG. Engine Capscrew, Bolt, and Nut Torque Requirements

Application	Torque Requirement
1. Connecting rod bolt nuts	135 lbs. ft.
2. Cylinder head 1/2" stud nuts	95 — 105 lbs. ft.
3. Cylinder head 5/8" stud nuts	180 — 190 lbs. ft.
4. Crankshaft pulley capscrew	290 — 310 lbs. ft.
5. Exhaust manifold stud nuts (HD 844 engines)	45 — 50 lbs. ft.
6. Exhaust manifold stud nuts (16000 engine)	85 — 95 lbs. ft.

7.	Flywheel bolt nuts	150 — 165 lbs. ft.
8.	Flywheel housing capscrews	80 — 85 lbs. ft.
9.	Idler gear shaft nut	140 lbs. ft.
10.	Intake manifold stud nuts	45 — 50 lbs. ft.
11.	Main bearing cap 5/8" stud nuts	160 — 170 lbs. ft.
12.	Main bearing cap 7/8" stud nuts	245 — 275 lbs. ft.
13.	Oil filter center bolts	75 — 80 lbs. ft.
14.	Oil pan-to-cylinder block capscrews	45 — 50 lbs. ft.
15.	Oil pan-to-flywheel housing capscrews	45 — 50 lbs. ft.

HH. Engine Stud Gage Heights

	Application	Gage Height
1.	Gage height of number 2, 3, 6, and 7 main bearing cap studs	4 13/32"
2.	Gage height of center main bearing cap studs	4 1/2"
3.	Gage height of number 1 and 5 main bearing cap studs	4 21/32"
4.	Gage height of 5/8" cylinder head studs (HD 844 engines)	7 13/16"
5.	Gage height of 1/2" cylinder head studs (HD 844 engines)	7 11/16"
6.	Gage height of all 1/2" cylinder head studs except the two located directly above the oil cavity in the left side of the engine (16000 engine)	6"
7.	Gage height of the two 1/2" cylinder head studs located directly above the oil cavity in the left side of the engine (16000 engine)	6 5/8"
8.	Gage height of .625" x 8 5/16" cylinder head pilot studs (16000 engine)	6 9/16"
9.	Gage height of 5/8" x 8 3/16" cylinder head studs	6 7/16"

3. ENGINE CLUTCH — MODEL HD 16A AND HD 16D TRACTORS

	Description	Size of New Parts
A.	**Counterbore Depth in Flywheel for Drive Plate and Pressure Plate**	1.428" — 1.438"
B.	**Driven Plate**	
1.	Thickness (including facings)	.458" — .490"
2.	Plate O.D.	17"
C.	**Pressure Plate**	
1.	Width	1 1/2"
2.	O.D.	17 1/8"
D.	**Shifting Sleeve**	
1.	O.D. at bearing location	3.1493" — 3.1500"
2.	Bushing I.D.	2.500" — 2.502"
3.	Shifting sleeve bearing I.D.	3.1496"
E.	**Carrier Assembly**	
1.	Bearing bore	5.5122" — 5.5134"
2.	Shifting sleeve bearing O.D.	5.5118"

Description	Size of New Parts
F. Clutch Shaft	
1. O.D. at shifting sleeve location	2.496" — 2.498"
2. O.D. at front ball bearing location (pilot bearing)	1.1797" — 1.1804"
3. O.D. at rear ball bearing location	2.1653" — 2.1659"
4. Length	19 13/32"

4. ENGINE CLUTCH — MODEL HD 16AC AND HD 16DC TRACTORS

A. Counterbore Depth in Flywheel for Drive Plate and Pressure Plate	1.240" — 1.250"
B. Driven Plate	
1. Thickness (including facings)	.310" — .316"
2. Plate O.D.	16 3/4"
C. Pressure Plate	
1. Width	1"
2. O.D.	16 3/4"
D. Shifting Sleeve Collar	
1. O.D. at bearing location	4.3307" — 4.3317"
2. I.D.	3.653" — 3.658"
3. Shifting sleeve bearing I.D.	4.3307"
E. Shifting Sleeve	
1. I.D. at bearing location	5.9998" — 6.0010"
2. Bearing O.D.	6.000"
3. I.D. at input carrier location	6.010" — 6.013"
4. Length (prior to tractor S/N 1879)	5.1563"
5. Length (effective with tractor S/N 1879)	4.640"

5. TRANSMISSION — MODEL HD 16A AND HD 16D TRACTORS

A. Case	
1. Topshaft front bearing bore	3.9364" — 3.9374"
2. Topshaft rear bearing bore	4.7242" — 4.7252"
3. Intermediate shaft front bearing bore	4.3305" — 4.3315"
4. Intermediate shaft rear bearing bore	3.9364" — 3.9374"
5. Bevel pinion shaft front bearing bore	5.1176" — 5.1186"
6. Bevel pinion shaft rear bearing bore	6.2984" — 6.2996"
B. Top Shaft	
1. O.D. at front bearing location	2.1660" — 2.1667"
2. O.D. at rear bearing location	2.1655" — 2.1661"

Description	Size of New Parts
C. Top Shaft Front Bearing Retainer	
1. Seal bore diameter	3.7495" — 3.7525"
2. Bearing bore diameter	3.938" — 3.940"
D. Top Shaft Front Bearing Spacer	
1. I.D.	1.974" — 1.975"
2. Width	.497" — .502"
E. Top Shaft Front Bearing (Roller)	
1. O.D.	3.9362" — 3.9370"
2. I.D.	2.1648" — 2.1654"
3. Width	.8218" — .8268"
F. Top Shaft Front Bearing Spacing Sleeve	
1. I.D.	2.170" — 2.175"
2. Width	.702" — .707"
G. Top Shaft Gear Spacer	
1. I.D.	2.170" — 2.175"
2. Width	.210" — .215"
H. Top Shaft High Range and Second Reverse Gear	
1. Number of gear teeth	36
2. Hub width	1.874" — 1.877"
3. Backlash with mating gear	.004" — .006"
I. Top Shaft Spacing Sleeve	
1. O.D.	3"
2. Width	1.752" — 1.755"
J. Top Shaft Low Range Gear	
1. Number of gear teeth	30
2. Number of internal splines	21
3. Hub width	2.312" — 2.315"
4. Backlash with mating gear	.004" — .006"
K. Top Shaft Third Reverse Gear	
1. Number of gear teeth	40
2. Number of internal splines	21
3. Hub width	3.468" — 3.471"
4. Backlash with mating gear	.004" — .006"
L. Top Shaft Spacing Sleeve	
1. O.D.	3"
2. Length	4.122" — 4.127"

Description	Size of New Parts
M. Top Shaft First Reverse Gear	
1. Number of teeth	18
2. Number of internal splines	18
3. Hub width	2.406" — 2.409"
4. Backlash with mating gear	.004" — .006"
N. Top Shaft Rear Bearing (Ball)	
1. O.D.	4.7238" — 4.7244"
2. I.D.	2.1648" — 2.1654"
3. Width	1.1367" — 1.1417"
O. Top Shaft Rear Bearing Sleeve	
1. O.D.	4.720" — 4.723"
2. Length (not including boss)	3.781" — 3.791"
P. Intermediate Shaft	
1. O.D. at front bearing location	1.9684" — 1.9689"
2. O.D. at front bearing oil seal	1.120" — 1.125"
3. O.D. at rear bearing location	1.7722" — 1.7728"
Q. Intermediate Shaft Front Bearing Cover	
1. Seal bore diameter	1.999" — 2.001"
2. Bearing bore diameter	4.332" — 4.334"
R. Intermediate Shaft Front Bearing	
1. O.D.	4.3299" — 4.3307"
2. I.D.	1.9680" — 1.9685"
3. Width	1.058" — 1.063"
S. Intermediate Shaft Front Bearing Spacing Washer	
1. I.D.	1.980" — 1.982"
2. Width	.370" — .375"
T. Intermediate Shaft High Range Gear Roller Bearing and Race	
1. Race O.D.	2.4995" — 2.5000"
2. Race I.D.	1.9684" — 1.9689"
3. Race width	2.000" — 2.005"
4. Bearing O.D.	3.126" — 3.127"
5. Bearing I.D.	2.4995" — 2.5000"
U. Intermediate Shaft High Range Gear	
1. Number of helical gear teeth	28
2. Number of clutch gear teeth	24
3. Bore diameter	3.126" — 3.127"

Description	Size of New Parts
4. Width	2.485" — 2.490"
5. Backlash with mating gear	.004" — .006"
V. Intermediate Shaft Gear Bearing Spacer	
1. I.D.	1.974" — 1.979"
2. Width	.500" — .505"
W. Intermediate Shaft Shifting Collar	
1. Number of internal teeth	24
2. Width	1⅛"
3. O.D.	6.080" — 6.090"
4. Groove width	.432" — .442"
5. Groove depth	.235" — .245"
6. Backlash with mating gear	.004" — .006"
X. Intermediate Shaft Low Range Gear Hub	
1. Number of teeth	24
2. Number of internal splines	21
3. Hub width	3.937" — 3.940"
4. O.D. at bearing location	3.3740" — 3.3745"
5. Backlash with mating gear	.004" — .006"
Y. Intermediate Shaft Low Range Gear Bearing	
1. O.D.	3.126" — 3.127"
2. I.D.	2.4995" — 2.5000"
Z. Intermediate Shaft Low Range Gear	
1. Number of helical gear teeth	35
2. Number of clutch gear teeth	24
3. Bore diameter	4.001" — 4.002"
4. Width	2.680" — 2.685"
5. Backlash with mating gear	.004" — .006"
AA. Intermediate Shaft Third and Fifth Speed Gear	
1. Number of teeth	36
2. Number of internal splines	21
3. Hub width	1.968" — 1.971"
4. Backlash with mating gear	.004" — .006"
BB. Intermediate Shaft Spacing Sleeve	
1. O.D.	3"
2. Width	1.752" — 1.755"
CC. Intermediate Shaft Fourth and Sixth Speed Gear	
1. Number of teeth	40
2. Number of internal splines	21

Description	Size of New Parts
3. Hub width	3.468" — 3.471"
4. Backlash with mating gear	.004" — .006"
DD. Intermediate Shaft Spacing Sleeve	
1. O.D.	3"
2. Width	4.122" — 4.127"
EE. Intermediate Shaft First and Second Speed Gear	
1. Number of teeth	19
2. Number of internal splines	18
3. Hub width	2.250" — 2.253"
4. Backlash with mating gear	.004" — .006"
FF. Intermediate Shaft Rear Bearing Spacer	
1. I.D.	1.788" — 1.793"
2. Width	.298" — .303"
GG. Intermediate Shaft Rear Roller Bearing	
1. O.D.	3.9364" — 3.9370"
2. I.D.	1.7712" — 1.7717"
3. Width	.9793" — .9843"
HH. Bevel Pinion Shaft	
1. Number of pinion teeth	11
2. O.D. at front bearing location	2.3621" — 2.3627"
3. O.D. at rear bearing location	3.5442" — 3.5450"
4. Backlash with bevel gear	.008" — .014"
II. Bevel Pinion Shaft Front Bearing (Ball)	
1. O.D.	5.1171" — 5.1181"
2. I.D.	2.3616" — 2.3622"
3. Width	2.120" — 2.125"
JJ. Bevel Pinion Shaft Front Bearing Spacing Washer	
1. I.D.	2.368" — 2.373"
2. Width	.435" — .440"
KK. Bevel Pinion Shaft Second Reverse and Third and Fifth Speed Gear Hub	
1. Number of clutch teeth	28
2. Number of internal splines	26
3. O.D. at roller bearing locations	4.1240" — 4.1245"
4. Length	7.592" — 7.595"
5. Backlash with mating gears	.004" — .006"

Description	Size of New Parts
LL. Bevel Pinion Shaft Second Reverse and Third and Fifth Speed Gear Roller Bearings	
1. O.D.	4.751" — 4.752"
2. I.D.	4.1245" — 4.1250"
MM. Bevel Pinion Shaft Second Reverse Gear	
1. Number of helical gear teeth (R.H.)	48
2. Number of clutch gear teeth	28
3. Bore diameter	4.751" — 4.752"
4. Width of hub	2.970" — 2.975"
5. Backlash with mating gear	.004" — .006"
NN. Bevel Pinion Shaft Third and Fifth Speed Gear	
1. Number of helical gear teeth (L.H.)	48
2. Number of clutch gear teeth	28
3. Bore diameter	4.751" — 4.752"
4. Width	3.345" — 3.350"
5. Backlash with mating gear	.004" — .006"
OO. Bevel Pinion Shaft Second Reverse and Third and Fifth Speed Gear Shifting Collar	
1. Number of internal teeth	28
2. Width	1 1/8"
3. O.D.	6.830" — 6.840"
4. Groove width	.432" — .442"
5. Groove depth	.235" — .245"
6. Backlash with mating gear	.004" — .006"
PP. Bevel Pinion Shaft Third Reverse and Fourth and Sixth Speed Gear Hub	
1. Number of clutch teeth	28
2. Number of internal splines	26
3. O.D. at roller bearing locations	4.1240" — 4.1245"
4. Length	4.997" — 5.000"
5. Backlash with mating gears	.004" — .006"
QQ. Bevel Pinion Shaft Third Reverse and Fourth and Sixth Speed Gear Roller Bearings	
1. O.D.	4.751" — 4.752"
2. I.D.	4.1245" — 4.1250"
RR. Bevel Pinion Shaft Gear Spacing Washers	
1. Number used	3
2. O.D.	5.495" — 5.500"
3. Width	.315" — .317"

Description	Size of New Parts
SS. Bevel Pinion Shaft Third Reverse and Fourth and Sixth Speed Gears	
1. Number used	2
2. Number of helical gear teeth	41
3. Number of clutch gear teeth	28
4. Bore diameter	4.751" — 4.752"
5. Width of hub	1.860" — 1.865"
6. Backlash with mating gear	.004" — .006"
TT. Bevel Pinion Shaft Third Reverse and Fourth and Sixth Speed Gear Shifting Collar	
1. Number of internal teeth	28
2. Width	1⅛"
3. O.D.	6.830" — 6.840"
4. Groove width	.432" — .442"
5. Groove depth	.235" — .245"
6. Backlash with mating gear	.004" — .006"
UU. Bevel Pinion Shaft First Reverse and First and Second Speed Gear Hub	
1. Number of clutch teeth	28
2. Number of internal splines	26
3. O.D. at roller bearing locations	4.1240" — 4.1245"
4. Length	6.247" — 6.250"
5. Backlash with mating gear	.004" — .006"
VV. Bevel Pinion Shaft First Reverse and First and Second Speed Gear Roller Bearings	
1. O.D.	4.751" — 4.752"
2. I.D.	4.1245" — 4.1250"
WW. Bevel Pinion Shaft First Reverse and Fourth and Sixth Speed Gears	
1. Number used	2
2. Number of helical gear teeth	54
3. Number of clutch gear teeth	28
4. Bore diameter	4.751" — 4.752"
5. Width	2.485" — 2.490"
XX. Bevel Pinion Shaft First Reverse and Fourth and Sixth Speed Gear Shifting Collar	
1. Number of internal teeth	28
2. Width	1⅛"
3. O.D.	6.830" — 6.840"
4. Groove width	.432" — .442"
5. Groove depth	.235" — .245"
6. Backlash with mating gear	.004" — .006"

Description	Size of New Parts
YY. Bevel Pinion Shaft Rear Bearing Spacer	
1. I.D.	3.358" — 3.363"
2. Width	.643" — .646"
ZZ. Bevel Pinion Shaft Rear Bearing (Roller)	
1. O.D.	6.2982" — 6.2992"
2. I.D.	3.5425" — 3.5433"
3. Width	1.1761" — 1.1811"
AAA. Torque Specifications and Clearances	
1. Shifting fork clamp capscrew	83 — 93 lbs. ft.
2. Top shaft nut torque	175 — 200 lbs. ft.
3. Intermediate shaft front nut torque	480 — 520 lbs. ft.
4. Intermediate shaft rear nut torque	175 — 225 lbs. ft.
5. Bevel pinion shaft nut torque	480 — 520 lbs. ft.
6. Top shaft rear bearing sleeve stand-out from case	.000" — .005"
7. Bevel pinion shaft front bearing end play	.000" — .002"

6. TRANSMISSION — MODEL HD 16AC AND HD 16DC TRACTORS

A. Case	
1. Topshaft front bearing bore	4.3305" — 4.3315"
2. Topshaft rear bearing bore	4.3300" — 4.3312"
3. Reverse shaft front bearing bore	3.5427" — 3.5437"
4. Reverse shaft rear bearing bore	3.1491" — 3.1501"
5. Bevel pinion shaft front bearing bore	5.1176" — 5.1186"
6. Bevel pinion shaft rear bearing bore	6.2984" — 6.2996"
B. Top Shaft	
1. O.D. at front bearing location	1.9684" — 1.9689"
2. O.D. at rear bearing location	2.3621" — 2.3627"
C. Top Shaft Front Bearing Retainer	
1. Seal bore diameter	3.7495" — 3.7525"
2. O.D. at case bore location	4.326" — 4.328"
D. Top Shaft Front Bearing (Ball)	
1. O.D.	4.3301" — 4.3307"
2. I.D.	1.9680" — 1.9685"
3. Width	1.745" — 1.750"
E. Top Shaft Front Bearing Spacer	
1. I.D.	1.974" — 1.979"
2. Width	.845" — .850"

Description	Size of New Parts
F. Top Shaft Third Speed Gear	
1. Number of Teeth	46
2. Width of hub	2.685" — 2.688"
3. Backlash with mating gear	.004" — .006"
G. Top Shaft Spacing Sleeve	
1. O.D.	3"
2. Width	1.752" — 1.755"
H. Top Shaft Second Speed and Reverse Gear	
1. Number of Teeth	36
2. Width	2.343" — 2.346"
3. Backlash with mating gear	.004" — .006"
I. Top Shaft Spacing Sleeve	
1. O.D.	3"
2. Length	4.562" — 4.565"
J. Top Shaft First Speed Gear	
1. Number of gear teeth	22
2. Width	1.840" — 1.845"
3. Backlash with mating gear	.004" — .006"
K. Top Shaft Rear Bearing Spacer	
1. I.D.	2.367" — 2.383"
2. Width	.410" — .415"
L. Top Shaft Rear Bearing (Roller)	
1. O.D.	4.3299" — 4.3307"
2. I.D.	2.3616" — 2.3622"
3. Width	.8611" — .8661"
M. Reverse Shaft	
1. O.D. at front bearing location	1.5749" — 1.5754"
2. O.D. at rear bearing location	1.3783" — 1.3788"
N. Reverse Shaft Front Bearing (Ball)	
1. O.D.	3.5427" — 3.5433"
2. I.D.	1.5743" — 1.5748"
3. Width	.9005" — .9055"
O. Reverse Shaft Front Bearing Spacer	
1. I.D.	1.580" — 1.585"
2. Width	.370" — .375"

Description	Size of New Parts
P. Reverse Shaft Spacing Sleeve	
1. O.D.	2 3/8"
2. Length	2.560" — 2.565"
Q. Reverse Shaft Gear Spacing Washer	
1. I.D.	2.125" — 2.130"
2. Width	.185" — .190"
R. Reverse Shaft Second Reverse Gear	
1. Number of gear teeth	36
2. Width	2.343" — 2.346"
3. Backlash with mating gear	.004" — .006"
S. Reverse Shaft Spacing Sleeve	
1. O.D.	3"
2. Width	1.752" — 1.755"
T. Reverse Shaft Reverse Gear	
1. Number of gear teeth	28
2. Width	1.812" — 1.815"
3. Backlash with mating gear	.004" — .006"
U. Reverse Shaft First Reverse Gear	
1. Number of teeth	22
2. Width	1.840" — 1.845"
3. Backlash with mating gear	.004" — .006"
V. Reverse Shaft Rear Bearing (Roller)	
1. O.D.	3.1490" — 3.1496"
2. I.D.	1.3775" — 1.3780"
3. Width	.8218" — .8268"
W. Bevel Pinion Shaft	
1. Number of pinion teeth	14
2. O.D. at front bearing location	2.3621" — 2.3627"
3. O.D. at rear bearing location	3.5442" — 3.5450"
4. Backlash with bevel gear	.008" — .014"
X. Bevel Pinion Shaft Front Bearing Cover	
1. Width	1 7/8"
2. Bearing recess depth	.200" — .210"
Y. Bevel Pinion Shaft Front Bearing (Ball)	
1. O.D.	5.1171" — 5.1181"
2. I.D.	2.3616" — 2.3622"

Description	Size of New Parts
3. Width	2.120" — 2.125"
Z. Bevel Pinion Shaft Third Speed Gear Hub	
1. Number of clutch teeth	24
2. O.D. at roller bearing locations	3.3740" — 3.3745"
3. Length	3.466" — 3.469"
4. Backlash with mating gear	.004" — .006"
AA. Bevel Pinion Shaft Third Speed Gear Roller Bearings	
1. O.D.	4.001" — 4.002"
2. I.D.	3.3745" — 3.3750"
BB. Bevel Pinion Shaft Third Speed Gear	
1. Number of helical gear teeth	35
2. Number of clutch teeth	24
3. Bore diameter	4.001" — 4.002"
4. Width	2.110" — 2.115"
CC. Bevel Pinion Shaft Third Speed Gear Shifting Collar	
1. Number of internal teeth	24
2. Width	1⅛"
3. O.D.	6.080" — 6.090"
4. Groove width	.432" — .442"
5. Groove depth	.235" — .245"
6. Backlash with mating gear	.004" — .006"
DD. Bevel Pinion Shaft Spacing Washer	
1. O.D.	5.495" — 5.500"
2. Width	.315" — .317"
EE. Bevel Pinion Shaft Second Reverse and Second Speed Gear Hub	
1. Number of clutch teeth	28
2. Number of internal splines	26
3. O.D. at roller bearing locations	4.1240" — 4.1245"
4. Length	5.434" — 5.437"
5. Backlash with mating gear	.004" — .006"
FF. Bevel Pinion Shaft Second Reverse and Second Speed Gear Bearings	
1. O.D.	4.751" — 4.752"
2. I.D.	4.1245" — 4.1250"
GG. Bevel Pinion Shaft Second Reverse and Second Speed Gears	
1. Number of helical gear teeth	48

Description	Size of New Parts
2. Number of clutch teeth	28
3. Bore diameter	4.751" — 4.752"
4. Width of hub	2.079" — 2.084"
5. Backlash with mating gear	.004" — .006"

HH. Bevel Pinion Shaft Second Reverse and Second Speed Gear Shifting Collar

1. Number of internal teeth	28
2. Width	1⅛"
3. O.D.	6.830" — 6.840"
4. Groove width	.432" — .442"
5. Groove depth	.235" — .245"
6. Backlash with mating gear	.004" — .006"

II. Bevel Pinion Shaft Spacing Washers

1. Number used	2
2. O.D.	5.495" — 5.500"
3. Width	.315" — .317"

JJ. Bevel Pinion Shaft First Reverse and First Speed Gear Hub

1. Number of clutch teeth	28
2. O.D. at roller bearing locations	4.1240" — 4.1245"
3. Length	6.247" — 6.250"
4. Backlash with mating gear	.004" — .006"

KK. Bevel Pinion Shaft First Reverse and First Speed Gear Roller Bearings

1. O.D.	4.751" — 4.752"
2. I.D.	4.1245" — 4.1250"

LL. Bevel Pinion Shaft First Reverse and First Speed Gears

1. Number of helical gear teeth	51
2. Number of clutch gear teeth	28
3. Bore diameter	4.751" — 4.752"
4. Width	2.485" — 2.490"

MM. Bevel Pinion Shaft First Reverse and First Speed Gear Shifting Collar

1. Number of internal teeth	28
2. Width	1⅛"
3. O.D.	6.830" — 6.840"
4. Groove width	.432" — .442"
5. Groove depth	.235" — .245"
6. Backlash with mating gear	.004" — .006"

NN. Bevel Pinion Shaft Rear Bearing Spacer

Description	Size of New Parts
1. I.D.	3.358" — 3.363"
2. Width	.643" — .646"
OO. Bevel Pinion Shaft Rear Bearing (Roller)	
1. O.D.	6.2982" — 6.2992"
2. I.D.	3.5425" — 3.5433"
3. Width	1.1761" — 1.1811"
PP. Torque Specifications and Clearances	
1. Shifting fork clamp capscrews	83 — 93 lbs. ft.
2. Top shaft nut torque	180 — 220 lbs. ft.
3. Reverse shaft front nut torque	180 — 220 lbs. ft.
4. Bevel pinion shaft nut torque	480 — 520 lbs. ft.
5. Reverse shaft and top shaft front bearing maximum end play	.003"
6. Bevel pinion front bearing end play	.000" — .002"

7. BEVEL GEAR

A. Bevel Gear	
1. Number of teeth	50
2. I.D. at shaft location	3.374" — 3.375"
3. Backlash with bevel pinion	.008" — .014"
4. Direction of spiral (tractors without torque converter)	Right Hand
5. Direction of spiral (tractors with torque converter)	Left Hand
B. Bevel Gear Shaft	
1. O.D. at gear location	3.372" — 3.373"
2. O.D. of bolting flange	6 3/8"
3. O.D. at bearing location	2.8765" — 2.8775"
4. O.D. at seal location	2.745" — 2.750"
5. Length	18.245" — 18.255"
6. Bearing I.D.	2.875" — 2.876"
C. Bevel Gear Bearing Cup Cage	
1. Hub O.D.	6.433" — 6.434"
2. Seal bore	3.750" — 3.752"
3. Bearing cup bore	5.748" — 5.749"
4. Bearing cup O.D.	5.750" — 5.751"
5. Bearing pre-load	.002" — .004" tight

8. TORQUE CONVERTER

A. Input Shaft	
1. O.D. at front ball bearing	2.9527" — 2.9533"
2. I.D. of front ball bearing	2.9522" — 2.9528"
3. O.D. at over-running clutch location	1.7708" — 1.7713"

Description	Size of New Parts
B. Input Shaft Bearing Carrier	
1. I.D. at input shaft ball bearing location	5.1174" — 5.1186"
2. O.D. of input shaft ball bearing	5.1171" — 5.1181"
3. I.D. of input shaft ball bearing	2.9522" — 2.9528"
4. I.D. at clutch housing double row ball bearing location (effective with tractor S/N 1879)	6.2980" — 6.2992"
5. O.D. of clutch housing double row ball bearing (effective with tractor S/N 1879)	6.2982" — 6.2992"
6. Body O.D.	6.002" — 6.004"
7. Width (prior to tractor S/N 1879)	5.060"
8. Width (effective with tractor S/N 1879)	4.600"
C. Clutch Housing (Tractors with Torque Converter)	
1. I.D. at ball bearing location	6.2980" — 6.2992"
2. Ball bearing O.D.	6.2982" — 6.2992"
D. Fluid Seal Assembly	
1. Maximum solid height	1.701"
2. Minimum free height	1.839"
3. Load when compressed to 1.770" height	23 to 25 lbs.
E. Impeller Wheel	
1. Hub O.D. at clutch housing bearing location	3.5428" — 3.5435"
2. Hub O.D. at seal location	3.995" — 4.000"
3. Hub I.D. at "O" ring location	3.020" — 2.025"
F. Turbine Wheel	
1. Outer race I.D. for over-running clutch	3.4800" — 3.4805"
2. Hub O.D. at seal assembly location	3.995" — 4.000"
3. Hub O.D. at turbine housing ball bearing location	3.5428" — 3.5435"
G. Turbine Housing	
1. I.D. of counterbore for clutch housing pilot	16.375" — 16.378"
2. I.D. at turbine housing ball bearing location	6.2980" — 6.2992"

9. STEERING CLUTCHES AND BRAKE DRUMS

A. Throwout Bearing Cage	
1. Bearing bore	6.6927" — 6.6939"
2. Bore for throwout sleeve	4.110" — 4.114"
B. Throwout Ball Bearing	
1. O.D.	6.6929"
2. I.D.	4.3307"
3. Width	1.1024"

Description	Size of New Parts
C. Throwout Sleeve	
1. Hub O.D. at bearing location	4.3305" — 4.3315"
2. Hub O.D. at cage location	4.102" — 4.104"
D. Driving Hub	
1. Pilot flange O.D.	9.246" — 9.248"
2. Hub O.D. at sleeve locations	3.742" — 3.744"
3. Retaining capscrew torque	300 lbs. ft.
4. Hub-to-steering clutch capscrew torque	90 — 100 lbs. ft.
E. Throwout Plate	
1. O.D.	8.810" — 8.815"
2. Width	1.058" — 1.068"
F. Throwout Plate Spacer	
1. O.D.	7/8"
2. Length	5.059" — 5.065"
G. Pressure Spring	
1. Number of coils	11 1/2
2. Free height	5 1/2"
3. Assembled height	4 17/64"
4. Load at assembled height	456 — 504 lbs.
5. Solid height	3 13/16"
H. Steering Clutch Hub	
1. Number of teeth	84
2. I.D. for throwout plate	8.875" — 8.880"
I. Back Plate	
1. Number of internal teeth	84
2. Thickness	.245" — .255"
3. O.D.	14.380" — 14.385"
J. Friction Disc (Flat)	
1. Number of external teeth	75
2. Number of discs per clutch	12
3. Thickness	.152" — .157"
K. Friction Disc (Tapered)	
1. Number of external teeth	75
2. Number of discs per clutch	2
3. Thickness at missing tooth location	.172" — .177"
4. Thickness approximately 180° from missing tooth location	.142" — .147"

Description	Size of New Parts
L. Steel Disc	
1. Number of internal teeth	84
2. Number of discs per clutch	14
3. Thickness	.084" — .096"
M. Pressure Plate	
1. O.D.	14.240" — 14.260"
2. Width	$1\frac{19}{32}$"
N. Brake Drum	
1. O.D.	$16\frac{3}{4}$"
2. Number of teeth	75
3. Width	$6\frac{5}{8}$"
4. Bore for brake drum hub pilot	13.125" — 13.127"
O. Steering Hydraulic Pump Assembly	
1. Capacity at 750 R.P.M. (pump speed) and at 400 P.S.I.	2 G.P.M.
2. Back plate	
(a) Seal bore	1.498" — 1.500"
(b) Bore of installed drive shaft bushing	1.0015" — 1.0030"
(c) Bore for idling gear shaft	.9985" — .9990"
3. Front plate	
(a) Width	1.340" — 1.345"
(b) Bore of installed drive shaft	1.0015" — 1.0030"
4. Idler gear shaft	
(a) Length	$3\frac{15}{16}$"
(b) O.D.	.9995" — 1.000"
5. Idler gear	
(a) I.D.	1.0020" — 1.0025"
(b) Backlash with mating gear	.016"
6. Drive shaft	
(a) Length	5.037" — 5.051"
(b) O.D.	.9995" — 1.0000"
7. Drive gear	
(a) I.D.	1.0005" — 1.0010"
(b) Backlash with mating gear	.016"
P. Steering Hydraulic Valve Assembly	
1. Housing	
(a) Bore diameter at control piston location	2.000" — 2.002"
(b) Bore diameter at bearing retainer location	2.115" — 2.135"
2. Spool valve	
(a) Length	$10\frac{1}{2}$"
(b) O.D.	.8745" — .8750"

Description	Size of New Parts
3. Control piston	
(a) O.D.	1.9985" — 1.9995"
(b) Length	2¾"
4. Lever shaft bearing retainer	
(a) Lever shaft bore diameter	1.2495" — 1.2505"
(b) Seal bore	1.623" — 1.625"
5. Actuating lever shaft	
(a) O.D.	1.000" — 1.0005"
(b) Length	7 1/32"

10. FINAL DRIVES

A. Brake Drum Hub

1. Pilot flange O.D.	13.121" — 13.123"
2. Hub O.D.	3.748" — 3.750"
3. Retaining capscrew torque	300 lbs. ft.
4. Hub-to-brake drum capscrew torque	90 — 100 lbs. ft.

B. Final Drive Pinion Inner Bearing Cup Cage

1. Bore diameter for seal	4.7495" — 4.7525"
2. Oil seal O.D.	4.754" — 4.758"
3. Bore diameter for bearing cup	5.373" — 5.374"
4. Bearing cup O.D.	5.375" — 5.376"

C. Final Drive Pinion

1. Backlash with mating gear	.006" — .009"
2. Length	11.395" — 11.405"
3. O.D. at inner bearing cone location	2.814" — 2.815"
4. Inner bearing cone I.D.	2.8125" — 2.8135"
5. O.D. at outer bearing cone location	1.9385" — 1.9390"
6. Outer bearing cone I.D.	1.9375" — 1.9380"
7. Bearing pre-load	10 to 20 lbs. in. or .002" — .003" tight

D. Final Drive Pinion Outer Bearing Cup Cage

1. Bearing cup O.D.	4.500" — 4.501"
2. Bore diameter for bearing cup	4.498" — 4.499"
3. Retaining capscrew torque	70 — 90 lbs. ft.

E. Intermediate Pinion and Gear Inner Bearing Cup Cage

1. Bore diameter for bearing cup	4.998" — 4.999"
2. Bearing cup O.D.	5.000" — 5.001"

F. Intermediate Gear

1. External tooth backlash with mating pinion	.0065" — .0085"
2. Internal tooth backlash with mating pinion	.0015" — .0035"

Description	Size of New Parts
G. Intermediate Pinion	
1. Backlash with mating gear	.006" — .009"
2. Length	11½"
3. O.D. at inner bearing cone location	2.3135" — 2.3140"
4. Inner bearing cone I.D.	2.3125" — 2.3130"
5. O.D. at outer bearing cone location	2.5590" — 2.5600"
6. Outer bearing cone I.D.	2.5575" — 2.5585"
7. Bearing pre-load	10 to 20 lbs. in. or .002" — .003" tight
H. Intermediate Pinion Outer Bearing Cup Cage	
1. Bore diameter for bearing cup	5.873" — 5.874"
2. Bearing cup O.D.	5.875" — 5.876"
3. Retaining capscrew torque (⅝" capscrews)	150 — 165 lbs. ft.
4. Retaining capscrew torque (early model with ½" capscrews)	70 — 90 lbs. ft.
I. Sprocket Shaft Inner Bearing Cup Cage — Model HD 16A; HD 16D; HD 16AC; and HD 16DC Tractors	
1. Bore diameter for bearing cup	5.373" — 5.374"
2. Bearing cup O.D.	5.375" — 5.376"
J. Sprocket Shaft Inner Bearing Cup Cage — Model HD 16FC and HD 16GC Tractors	
1. Bore diameter for bearing cup	5.3427" — 5.3437"
2. Bearing cup O.D.	5.3447" — 5.3457"
K. Sprocket Shaft Driving Gear	
1. Number of external teeth	52
2. External tooth backlash with mating pinion	.006" — .009"
L. Sprocket Shaft — Model HD 16A; HD 16D; HD 16AC; and HD 16DC Tractors	
1. O.D. at inner bearing location	2.8145" — 2.8155"
2. Inner bearing cone I.D.	2.8125" — 2.8135"
3. O.D. at intermediate bearing location	5.2525" — 5.2535"
4. Intermediate bearing cone I.D.	5.250" — 5.251"
5. O.D. at outboard bearing location	2.7565" — 2.7570"
6. I.D. of outboard bearing	2.7553" — 2.7563"
7. Bearing pre-load	10 to 20 lbs. in. or .002" — .003" tight
M. Sprocket Shaft — Model HD 16FC and HD 16GC Tractors	
1. O.D. at inner bearing location	2.564" — 2.565"
2. Inner bearing cone I.D.	2.8125" — 2.8135"
3. O.D. at intermediate bearing location	5.2525" — 5.2535"
4. Intermediate bearing I.D.	5.250" — 5.251"

Description	Size of New Parts
5. O.D. at outboard bearing location	2.7565" — 2.7570"
6. Outboard bearing I.D.	2.7553" — 2.7554"
7. Bearing pre-load	10 to 20 lbs. in. or .002" — .003" tight
N. Sprocket Shaft Intermediate Bearing Cup Cage	
1. Bore diameter for bearing cup	7.748" — 7.749"
2. Bearing cup O.D.	7.750" — 7.751"
O. Track Sprocket	
1. Hub O.D. at seal location	7.746" — 7.750"
2. Sprocket retaining nut torque	4500 — 5000 lbs. ft.
P. Outboard Bearing Cage	
1. Bore diameter for bearing	5.9053" — 5.9063"
2. Outboard bearing O.D.	5.9045" — 5.9055"
3. Bearing pre-load	19 to 25 lbs. in. or .001" — .002" tight
4. Cage retaining capscrew torque	150 — 165 lbs. ft.

11. TRUCK WHEELS

A. Shaft	
1. Projection of shaft beyond seal retainer at bracket locations	3.260" — 3.265"
2. O.D. at bracket location	1.807" — 1.812"
3. O.D. at seal retainer location	2.093" — 2.094"
4. Seal retainer I.D.	2.0885" — 2.0905"
5. O.D. at bearing cone location	2.5015" — 2.5025"
6. Bearing cone I.D.	2.5000" — 2.5005"
B. Bearing Pre-load	15 — 45 lbs. in.
C. Wheel	
1. Bore diameter for bearing cups	4.8095" — 4.8105"
2. Bearing cup O.D.	4.8125" — 4.8135"

12. TRACK SUPPORT ROLLERS

A. Shaft	
1. Projection of shaft beyond seal retainer at bracket location	3.560" — 3.565"
2. O.D. at bracket location	1.966" — 1.970"
3. O.D. at seal retainer location	1.995" — 1.996"
4. O.D. at bearing cone location	2.0015" — 2.0025"
5. Bearing cone I.D.	2.0000" — 2.0005"
B. Bearing Pre-load	15 — 45 lbs. in.

Description	Size of New Parts
C. Roller	
1. Bore diameter for bearing cups	3.873" — 3.874"
2. Bearing cup O.D.	3.875" — 3.876"

13. TRACK IDLERS

A. Shaft	
1. Projection of shaft beyond seal retainers at bracket location	3.094" — 3.098"
2. Bracket I.D.	2.468" — 2.470"
3. O.D. at seal retainer locations	2.495" — 2.496"
4. Seal retainer I.D.	2.492" — 2.494"
5. O.D. at bearing locations	2.5015" — 2.5025"
6. Bearing I.D.	2.5000" — 2.5005"
7. O.D. at bracket locations	2.466" — 2.469"
B. Bearing Retainer	
1. O.D. at idler bore location	5.997" — 5.998"
2. I.D. at bearing cup location	5.374" — 5.375"
C. Idler	
1. Bearing retainer bore	5.999" — 6.001"
2. Hub width	6.370" — 6.380"

14. TRACK

A. Master Link	
1. Master bushing	
(a) O.D.	2.621" — 2.626"
(b) I.D.	1.770" — 1.780"
2. Master pin	
(a) O.D.	1.746" — 1.747"
(b) Length	9.600" — 9.635"
3. Master bushing spacer	
(a) O.D.	2.623" — 2.628"
(b) I.D.	1.770" — 1.780"
(c) Thickness	.503" — .518"
B. Standard Link	
1. Standard bushing	
(a) O.D.	2.623" — 2.628"
(b) I.D.	1.770" — 1.780"
(c) Length	6.777" — 6.817"
2. Standard pin	
(a) O.D.	1.749" — 1.753"
(b) Length	9.315" — 9.350"

Description	Size of New Parts

C. Side Bar

1. Bore for track pin	1.741" — 1.743"
2. Counterbore for bushing	2.745" — 2.755"
3. Bore for bushing	2.617" — 2.619"
4. Center-to-center of bores	7.843" — 7.858"
5. Assembled width between side bars (Center-to-center of track shoe bolt holes):	
(a) Bushing end	5.7425" — 5.7575"
(b) Track pin end	5.9925" — 6.0075"

15. SPRING SADDLE AND TRUCK FRAMES

A. Spring Saddle, Saddle Pin, and Bushings

1. Bore in spring saddle for bushings	3.749" — 3.751"
2. O.D. of spring saddle pin bushing	3.752" — 3.754"
3. I.D. of spring saddle pin bushing	2.9955" — 3.0005"
4. Diameter of saddle pin at bushing location	2.9785" — 2.9800"
5. Spring saddle capscrew torque	1000 — 1100 lbs. ft.

B. Truck Frames

1. Bore for sprocket shaft outboard bearing cage (cap in place)	7.498" — 7.500"
2. Bore for pivot shaft bushing	3.234" — 3.235"
3. O.D. of pivot shaft bushing	3.239" — 3.240"
4. I.D. of pivot shaft bushing	2.476" — 2.479"
5. Length of pivot shaft bushing	$4\frac{15}{16}$"
6. O.D. of pivot shaft	2.469" — 2.470"
7. Length of pivot shaft	$10\frac{3}{8}$"