

# KOMATSU

## D55S-3

# DOZER SHOVEL

# SHOP MANUAL

D55S-2008 up

GENERAL

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GENERAL INSTRUCTIONS

ENGINE

TORQUE CONVERTER

TORQFLOW TRANSMISSION

RANGE TRANSMISSION

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# GENERAL

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# FOREWORD

This MANUAL is published for the information and guidance of shop personnel charged with the task of servicing the KOMATSU D55S-3 Dozer Shovel, and provides instructions to be adhered to in disassembling and re-assembling machines of this model in the shop. The instructions are given mainly in the form of procedures, and, in each section of the MANUAL, are preceded by an outline description of each major component in respect to mechanical construction, function and other pertinent items.

## TERMINOLOGY

Effort has been made in the preparation of this MANUAL to use the most common shop terms in order to avoid ambiguity and equivocation. Some key terms used, however, require precise agreement in advance between the writer and the reader as to their meanings, as the clarity of what are aimed at in shop work depends largely on these terms. Throughout this MANUAL, the major key terms are used with following meanings.

### (1) Clockwise (C.W.) and Counterclockwise (C.C.W.)

A circular direction, C.W. or C.C.W., is in the mind of the viewer standing in front and ahead of the machine, except when a driven component is discussed.

Such a component as the oil pump, the component is considered singly and as viewed from its driving side.

### (2) Terms of Servicing Criteria

**BASIC SIZE:** This term is universally defined as the theoretical or nominal standard size (diameter, length, thickness, etc.) from which variations are

made, and is used in this sense throughout.

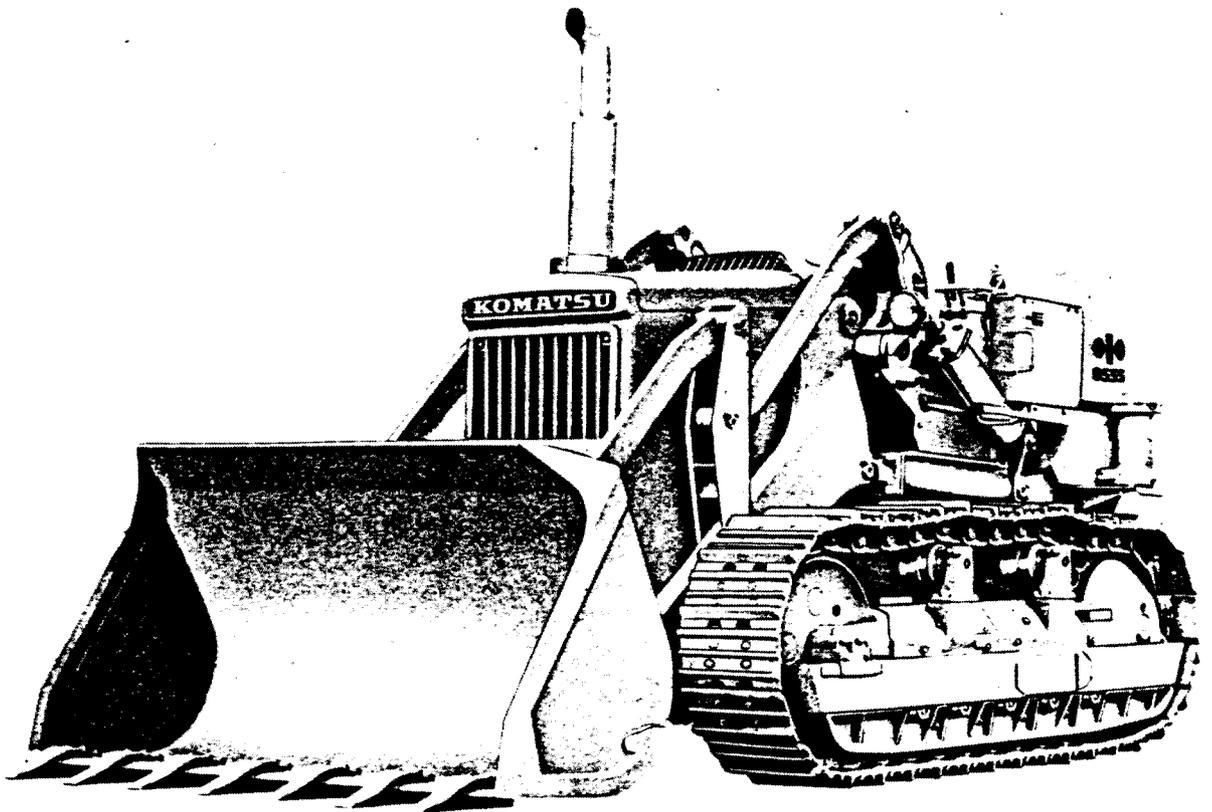
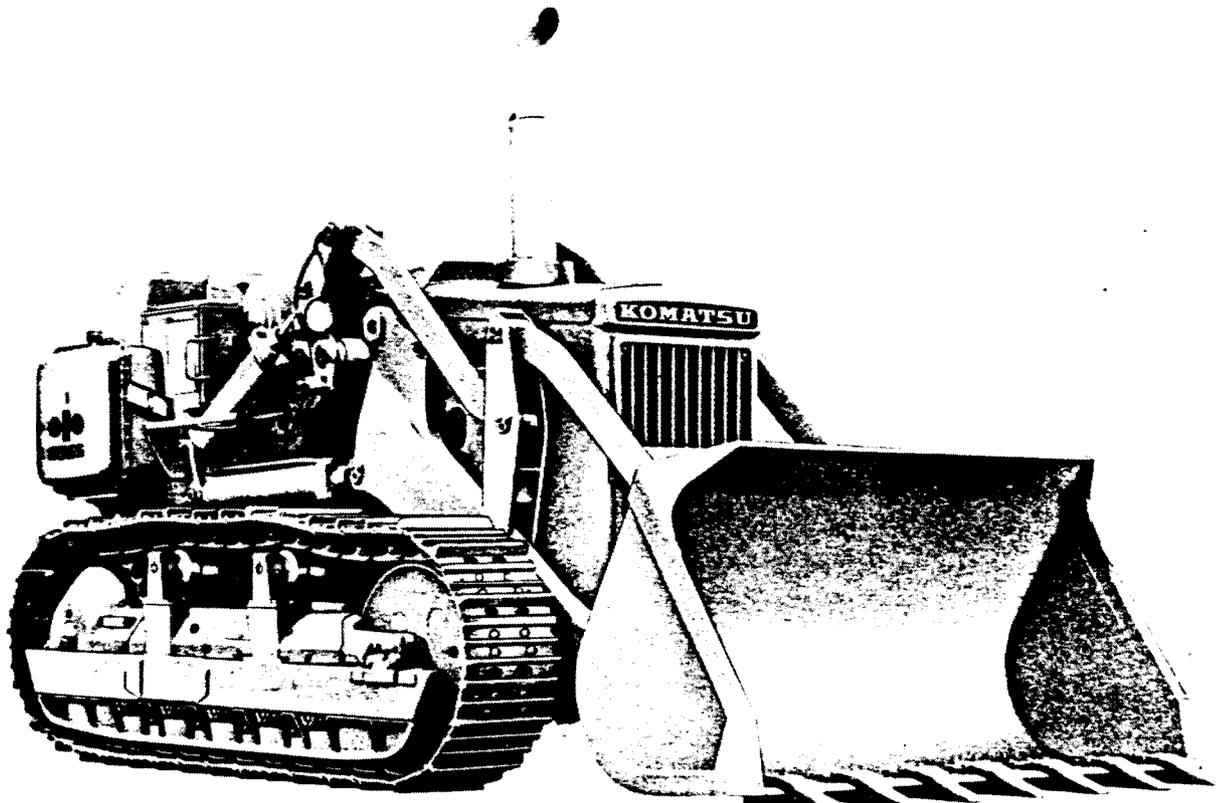
**ASSEMBLY STANDARD:** This is a dimensional value or a range of dimensional values to be adhered to in assembling components. An assemblage is required to satisfy the assembly standard specified for it.

**STANDARD CLEARANCE:** This refers to a clearance range, within which a distance of separation occurring in a full assembly or sub-assembly of replacement parts must take its value.

Such an assembly or sub-assembly is permitted to be installed or mounted in place only when this requirement is satisfied.

**CLEARANCE LIMIT (maximum allowable clearance):** A running clearance between a shaft and its hole, for instance, will increase as the shaft or hole wears progressively. A clearance limit is provided for each critical or important clearance and, if such a clearance is found to have increased upon disassembling beyond the clearance limit specified for it, the parts associated with that clearance must be corrected to take a value within the limit.

**SERVICE LIMIT:** An extra stock is provided in some parts subject to wear, so that these parts may be repaired upon disassembling. There are many such parts that can be re-used repeatedly until their extra stock is used up by grinding, cutting, etc. A service limit is the minimum or the maximum dimension (thickness, diameter, etc.) specified for such a part. Any part found to have exceeded its service limit is not repairable: its serviceability has ended and a replacement part must be used in re-assembling.



D55S-3 DOZER SHOVEL

# **SPECIFICATIONS**

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## SPECIFICATIONS

# SPECIFICATIONS

MACHINE MODEL		D55S-3 DOZER SHOVEL (TORQFLOW)		
Operating weight		13300 kg (29,320 lb)		
<b>DIMENSIONS</b>	Overall length	5165 mm ( 203.3 in)		
	Overall width, w/o bucket	2050 mm ( 80.7 in)		
	Bucket width	2060 mm ( 81.1 in)		
	Overall height (Top of exhaust pipe) (Shovel link)	2970 mm ( 116.9 in) 2210 mm ( 87.0 in)		
	Shoe width	400 mm ( 15.7 in)		
	Track gauge	1600 mm ( 63.0 in)		
	Length of track on ground	2200 mm ( 86.6 in)		
	Ground pressure	0.76 kg/cm <sup>2</sup> (10.81 PSI)		
	Ground contact area.	17600 mm <sup>2</sup> (2730 sq. in)		
	Ground clearance	350 mm ( 13.8 in)		
	Height of drawbar above ground	655 mm ( 25.8 in)		
<b>PERFORMANCE</b>	Travelling speed	Forward Low 1st	0 - 3.3 km/h (0 - 2.1 MPH)	
		2nd	0 - 6.1 km/h (0 - 3.8 MPH)	
		Forward High 1st	0 - 4.8 km/h (0 - 3.0 MPH)	
		2nd	0 - 8.8 km/h (0 - 5.5 MPH)	
	Reverse Low 1st	0 - 4.2 km/h (0 - 2.6 MPH)		
	2nd	0 - 4.8 km/h (0 - 4.8 MPH)		
	Reverse High 1st	0 - 6.0 km/h (0 - 3.7 MPH)		
	2nd	0 - 11.0 km/h (0 - 6.8 MPH)		
Max. rated drawbar pull		16100 kg (35,490 lb)		
Turning radius		2.7 m ( 8.9 ft)		
Grade ability		30°		
<b>ENGINE</b>	Model		KOMATSU S4D120-11	
	Type		Water cooled, 4 cycle, vertical pre-combustion chamber type, turbocharged diesel with air compressor	
	No. of cylinders - bore x stroke		4 - 120 mm x 160 mm (4.72 in x 6.30 in)	
	Piston displacement		7240 cc (442 cu. in)	
	Rated RPM		1900	
	Flywheel horsepower		125 HP	
	Max. torque		55.5 kg.m (401 ft.lb)/1200 RPM	
	Fuel consumption ratio		180 g (0.40 lb)/HP.h	

## SPECIFICATIONS

MACHINE MODEL		D55S-3 DOZER SHOVEL (TORQFLOW)	
ENGINE	Fuel specification		Diesel gas oil (ASTM D975-60T No. 2D) Cetan No. over 45
	Governor		Mechanical, all speed control
	Lubri- cation system	Lubrication method	Gear pump, forced lubrication
		Filter	Full-flow type
		Oil cooler	Water cooled
	Cooling system		Forced circulation by centrifugal water pump
	Air cleaner		Dry, centrifugal type
	Elec. sys- tem	Generator	24V, 0.3 KW
		Battery	24V (12V x 2) - 150 Ah
	Starting method		By electric starting motor 24V, 7.4 KW
TRANSMITTING SYSTEM	Torque conver- ter	Type	TCS36-1A 4-element, single-stage, 3-phase
		Oil specification	Engine oil (SAE No. 10W)
		Cooling method	Water cooled
	Torqflow transmission	Type	Hydraulically actuated, planetary-gear multi-disc type
		Shift speeds	2 speeds forward, 2 speeds reverse
		Shift lever pattern	
		Lubrication	Pressure feed type
	Range trans- mission	Range transmission type	Spur-gear sliding shift type, high-low shift
		Type	Spiral bevel type, single reduction
		Lubrication	Splash type
	Steering clutch		Wet, multiple disc, foot operated, full hydraulic actuated
	Final drive gear	Type	Spur gear, double reduction
		Lubrication	Splash type

## SPECIFICATIONS

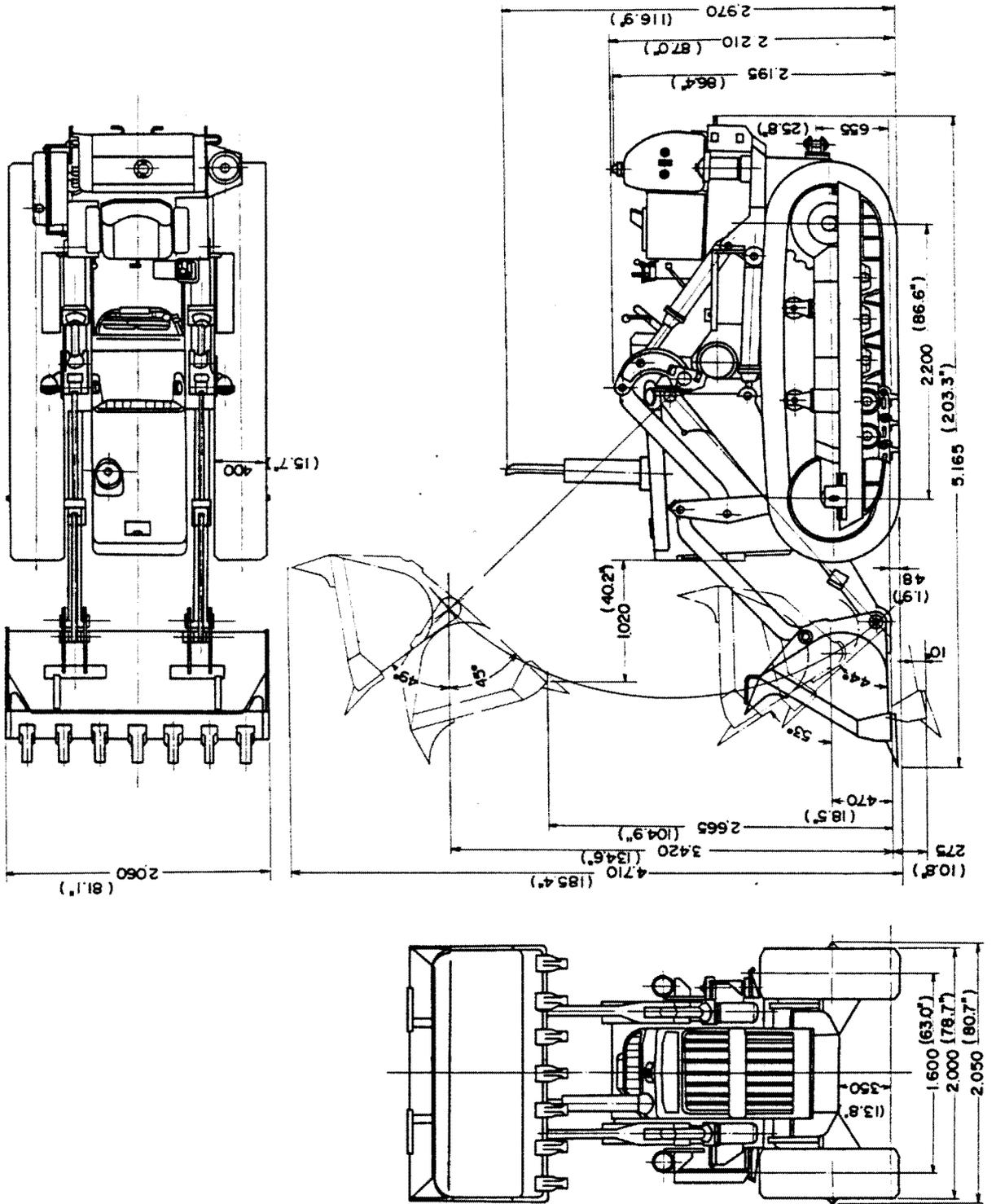
MACHINE MODEL		D55S-3 DOZER SHOVEL (TORQFLOW)	
<b>UNDERCARRIAGE</b>	Suspension		Semi-rigid equalizer bar type
	No. of carrier rollers		2, each side
	No. of track rollers		5, each side
	Shoe	Type	Assembled, semi-double grouser
		Grouser height	48 mm ( 1.9 in)
		No. of shoes	36, each side
		Width	400 mm (15.7 in)
Pitch		190 mm ( 7.5 in)	
<b>BUCKET ATTACHMENT</b>	Max. loading capacity		2800 kg (6,170 lb)
	Bucket capacity		1.4 m <sup>3</sup> (1.8 cu. yd)
	Max. lift		3420 mm (134.6 in)
	Max. dumping height		2665 mm (104.9 in)
	Max. digging depth		275 mm ( 10.8 in)
	Reach		1020 mm ( 40.2 in)
	Max. tilt back angle		44°
<b>HYDRAULIC SYSTEM</b>	Max. oil pressure		140 kg/cm <sup>2</sup> (2,000 PSI)
	Hyd. cyl.	No. of lift cylinder-bore	2 - 140 mm (5.51 in)
		No. of dump cylinder-bore	2 - 130 mm (5.12 in)
	Hydraulic oil pump		Gear pump
	Control valve	Location	Within hydraulic oil tank
		Type	Double spool type
		Operating control position	Lift valve: RAISE, HOLD, LOWER, FLOAT Dump valve: DUMP, HOLD, TILT
	Hydraulic tank	Type	Equipped with built-in control valve
		Capacity	92 liters (24.3 U.S. Gal)
		Location	Right side of operator's seat
		Oil specification	Engine oil (SAE 10W)
Filter		Full-flow type	
<b>DRAWBAR</b>	Location		Rear-end center
	Height of drawbar above ground		655 mm (25.8 in)
	Type		Pin fixed type

## SPECIFICATIONS

MACHINE MODEL		D55S-3 DOZER SHOVEL (TORQFLOW)
<b>CAPACITIES</b>	Cooling water	53 liters (14 U.S.Gal)
	Fuel tank	240 liters (63 U.S.Gal)
	Engine	18 liters ( 4.8 U.S.Gal)
	Torque converter Transmission	38 liters (10 U.S.Gal)
	Bevel gear drive Steering case	65 liters (17 U.S.Gal)
	Final drive case (each)	12 liters ( 3.2 U.S.Gal)
	Hydraulic oil	92 liters (24.3 U.S.Gal)

Specifications are subject to change without notice.

# SPECIFICATIONS

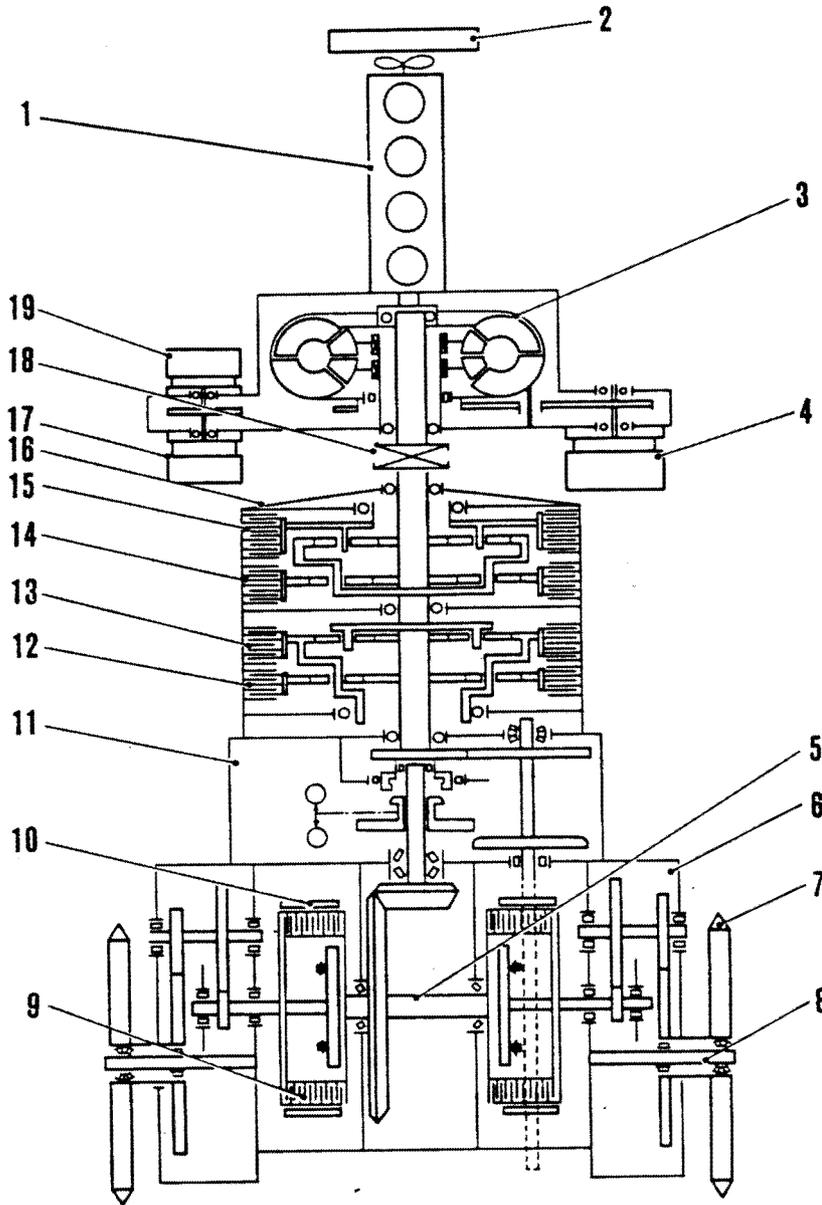


**D55S-3 DOZER SHOVEL**

# SPECIFICATIONS

POWER TRAIN

## POWER TRAIN



- 1. Engine
- 2. Radiator
- 3. Torque converter
- 4. Pump
- 5. Bevel gear shaft
- 6. Final drive
- 7. Sprocket
- 8. Sprocket shaft
- 9. Steering clutch
- 10. Steering brake
- 11. Range transmission
- 12. No. 4 clutch pack
- 13. No. 3 clutch pack
- 14. No. 2 clutch pack
- 15. No. 1 clutch pack
- 16. Torqflow transmission
- 17. Transmission and torque converter pump
- 18. Universal joint
- 19. Steering clutch pump

Direction	Speed		Clutch pack blocked
Forward	Low	1st	No. 2→No. 4
		2nd	No. 2→No. 3
	High	1st	No. 2→No. 4
		2nd	No. 2→No. 3
Reverse	Low	1st	No. 1→No. 4
		2nd	No. 1→No. 3
	High	1st	No. 1→No. 4
		2nd	No. 1→No. 3

## SPECIFICATIONS

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### POWER TRAIN

Power developed by the engine (1) is transmitted to the right and left sprockets through the drive line consisting of torque converter (3), universal joint (18), torqueflow transmission (16), range transmission (11), bevel gear shaft (5), steering clutches (9), and final drive (6), in that order. The power-shift transmission provides four speeds, two for forward and two for reverse, and the range transmission modifies the gearshift selection by transmitting drive according as the high-low lever is in HIGH or LOW.

Drive divides crosswise into two paths

at the spiral bevel pinion and gear, and passes onto the right and left steering clutches. Each steering clutch is followed by the final drive gearing in which the drive is slowed down further through two stages of reduction before actuating the sprocket. The engine mounts are bolted to the main frame, which is welded to the bevel gear shaft case to form a rigid chassis construction. The steering clutches, range transmission and bevel gear drive are housed in the bevel gear shaft case, to the ends of which are bolted the final drive cases.

# GENERAL INSTRUCTIONS

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## GENERAL INSTRUCTIONS

DISASSEMBLING, RE-ASSEMBLING

# GENERAL INSTRUCTIONS

## INSTRUCTIONS FOR DISASSEMBLING WORK

- (1) Before starting to disassemble any part of the machine, study the Parts Book and Service Manual, giving particular attention to the servicing criteria and standards indicated in these publications, to gain a full understanding of the mechanical component to be disassembled. Knowledge of the construction and functions of the component is an essential factor of successful servicing work.
- (2) When draining out lubricants and hydraulic oil, be sure to take note of the color, viscosity and cleanliness with which the oil comes out. Oil in service often suggests the condition of the parts served, particularly when the oil lubricates gears or bearings.
- (3) It is advisable and often mandatory to put match marks across mating joint lines before separating or removing parts, and to scribe identification marks on identical parts such as pistons and valves in the engine.

This provision that you make at the time of disassembling will greatly facilitate your re-assembling work.
- (4) Disassembly assumes that you carefully note the orientation or position of each part, as necessary, and the sequence of taking one part after another from the machine. What you have so noted at the time of disassembling will be an assurance of your restoring or re-assembling the parts correctly.
- (5) Be sure to use the special disassembling tool wherever its use is specified in the procedure. If the special tool is not available, some tool similar to it should be used. Use of a special tool is prescribed where common tools can cause damage of one type or another to the parts involved.
- (6) Tapered parts or press-fitted parts are expected to be tight in place and not to yield easily to hand pulling. If such a part is noted to be loose, be sure to inspect it for wear with greater care.
- (7) Parts taken off upon disassembling should be washed clean and set aside in an orderly manner, making proper provision to protect them against dust.

Use two kinds of washing fluid, one for removing dirt and one for clean washing. Filters, magnetic plugs and breathers are the parts that must be cleaned particularly carefully.
- (8) Make shim stock available in all thickness for use at the time of re-assembling.
- (9) There are some components that should be serviced at specialized shops because use of specialized equipment and instruments is necessary in servicing them. They are injection pumps, governors, starting motors, generators, regulator units, batteries and the like.

## INSTRUCTIONS FOR RE-ASSEMBLING WORK

- (1) Before starting to assemble, make sure all parts are clean. Replacement parts are usually coated with an anti-rust compound; remove the compound by wiping or washing.
- (2) Installation of bearings, bushings, oil seals and the like requires the use of special driving-in or forcing tool in most cases. Driving such a part into its position by directly hitting it with

## GENERAL INSTRUCTIONS

### ADJUSTING, ETC.

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a hammer is a bad practice: always use a piece of wood or soft metal to transmit the hammer blow to the part.

(3) Spring, plain, tongue or toothed washers, cotter pins and locking wires are highly important parts but, because of their small size, are liable to be forgotten at the time of re-assembling.

When fitting such fastening parts as bolts and nuts, check to be sure whether locking means are specified or not for the fastening parts.

(4) Use a torque wrench wherever its use is prescribed or a torque limit is specified. When securing a cover or similar part having many bolts, be

sure to adhere to the standard shop practice of tightening the securing bolts gradually to distribute the pressure evenly.

(5) Match marks are not the marks for identifying mating parts: they are meant to be indexed and aligned as accurately as possible. Ignoring this fact may result in a costly major repair.

(6) Clean tools, clean work benches and tables are keys to successful assembling work. Cleanliness saves working time and promotes accurate assembling.

## INSTRUCTIONS FOR ADJUSTING WORK

(1) Most of assembling operations are terminated with adjusting work. Be sure to check your list so that none of such components will be left unadjusted. Engine oil pressure, track tension, control linkage end play and injection timing are typical items of adjustment that demand your greater at-

tention in re-assembling work.

(2) Check to be sure that components serviced at specialized shops, such as the injection pump, governor, regulator unit and the like, carry notes certifying to the effect that the components are properly adjusted and qualified for re-use.

## INSTRUCTIONS FOR USE OF HAND TOOLS

(1) Use good and correct hand tools. Use of defective or wrong hand tools is a sure way of improperly assembling or damaging the parts.

(2) Never use any special tool for other purposes than the one for which it is intended, or you will damage the machine or the tool.

## INSTRUCTIONS FOR HANDLING BEARINGS IN DISASSEMBLING/RE-ASSEMBLING WORK

(1) Dust is one of the common enemies of all bearings. Dust can often be a cause of bearing noise and accelerates deterioration of the lubricating oil in service.

(2) When replacing a bearing, unpack the replacement bearing only when all preparatory steps for bearing installation have been completed.

(3) In installing a bearing, be sure to position it properly, forcing it all the way against the wall (stepped shoulder or seat).

(4) Use of a number of bearing pullers (some of which serve also as installers) is involved in general disassembling/re-assembling work. Be sure to use these tools where their use is

## GENERAL INSTRUCTIONS

### OIL SEALS

specified. DRIVING a bearing in with a HAMMER is, in most cases, the same thing as driving a sure cause of trouble into the machine.

- (5) For the washing fluid to be used in cleaning bearings, benzine or benzol is recommendable. Kerosene and diesel fuel oil may be used if compressed air is available for blowing dust off, but, with these oils alone fine dust entrapped within a bearing is hard to

remove.

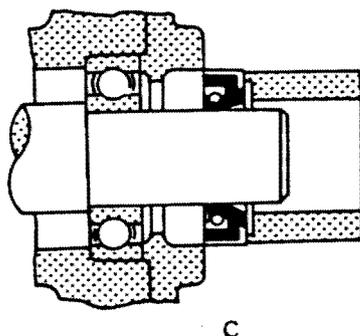
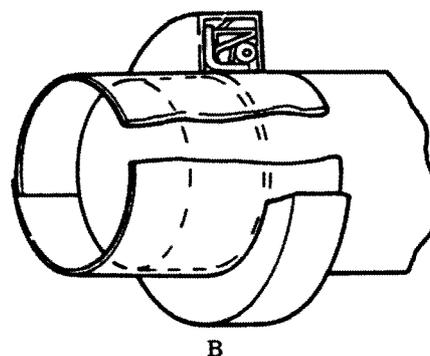
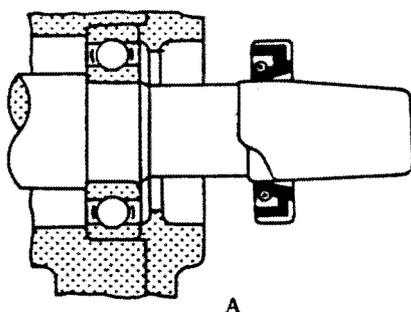
- (6) Upon washing and cleaning bearings, and pending their installation, coat them lightly with grease.
- (7) Spherical roller bearings should be installed with particular attention to positioning. Secure them correctly to eliminate excessive clearance at either end face, or the bearings will wear off prematurely in service.

## INSTRUCTIONS FOR HANDLING OIL SEALS

- (1) In installing an oil seal, make sure the oil seal is so positioned as to bring its lip to the correct side.
- (2) The lip of an oil seal in place is required to present a sharp tip angle for satisfactory sealing action. Thus, it is highly essential to handle oil seals carefully, in order to protect their lips against damage. For instance, winding the wire of a tag around an oil seal is a bad practice and should never be attempted.

Oil the seal just before forcing it into the bore at the time of installing it, or the seal might become scarred due to the friction of dry rubbing faces during initial operation.

Use a guide to slip the seal into bore when installing it, as shown in Fig. A. If such a guide is not available, prepare a makeshift guide with a sheet of brass, as shown in Fig. B. Use of the guide is particularly necessary where the shaft has a keyway or a



## GENERAL INSTRUCTIONS

### SNAP RINGS, ETC.

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shoulder.

- (3) Fig. C illustrates the proper way of forcing the oil seal into the bore. Note that an adapter is used to apply pressure uniformly to the end face of the seal. The forcing adapter should be 0.5-1 mm (0.0197 - 0.039") smaller in

diameter than the bore, and its free end should be shaped to take blows from a mallet or hammer. The surface of the shaft, upon which the seal is mounted, must be smooth and free of any scratch mark.

## INSTRUCTIONS FOR HANDLING SNAP RINGS

- (1) In handling a snap ring, be careful not to twist it nor to deform its corners and ends. Try to preserve its springiness: never expand and contract it in rapid succession. After fitting

it to the shaft, check to be sure the ring is properly seated.

- (2) Always use the ring expander in removing and installing snap rings.

## INSTRUCTIONS FOR HANDLING GASKETS AND PACKINGS

- (1) A copper packing removed from the machine should not be re-used. However, a packing of this type, found to be in good condition after it is annealed, may be re-used.
- (2) Sealing sheets, packings, gaskets and the like are not to be re-used.
- (3) Leather packings, before installation, should be soaked in oil so that

they will become pliable.

- (4) Protect the surfaces of "O" rings and "V" packings against damage. Winding wires directly around them is a bad practice.
- (5) A gasket should be fitted at the time of re-assembling, with its both surfaces coated with an adhesive compound.

## GENERAL INSTRUCTIONS

WEIGHT · TORQUE LIMIT

### WEIGHTS OF MAJOR ASSEMBLIES

Unit: kg (lb)

Operating weight	13300 (29,320)
Engine assembly	1010 ( 2,227)
Fuel tank (filled up to level)	300 ( 661)
Radiator	130 ( 287)
Battery	61 ( 134)
Torque converter	140 ( 309)
Torqflow transmission	480 ( 1,058)
Final drive case	55 ( 121)
Sprocket	78 ( 172)
Final drive gear and hub	65 ( 143)
Steering clutch	70 ( 154)
Steering clutch case and main frame	1080 ( 2,381)
Brake (excl. brack band, each)	35 ( 77)
Bevel gear and bevel gear shaft	45 ( 99)
Undercarriage (excl. shoes, each)	1130 ( 2,491)
Track frame	420 ( 926)
Idler cushion	140 ( 309)
Front idler	170 ( 375)
Carrier roller	38 ( 84)
Track roller	48 ( 106)
Track (each)	950 ( 2,094)
Equalizer bar	120 ( 265)
Hydraulic oil tank (w/control valve)	155 ( 342)
Lift cylinder	87 ( 192)
Dump cylinder	61 ( 134)
Bucket	920 ( 2,028)
Bucket link	1100 ( 2,425)
Side frame	600 ( 1,323)

### TORQUE LIMIT CHART

Nominal Size mm (in)	Pitch mm (in)	Torque	
		kg. m	(ft. lb)
6 (0.236)	1 (0.039)	1.0 to 1.5	( 7 to 11)
8 (0.314)	1.25 (0.049)	2.5 to 3.5	( 19 to 25)
10 (0.394)	1.5 (0.059)	5.5 to 7.5	( 40 to 54)
	1.25 (0.049)		
12 (0.472)	1.75 (0.069)	9.5 to 12.5	( 69 to 90)
	1.5 (0.059)	11.0 to 14.5	( 80 to 105)
14 (0.551)	2 (0.079)	15.0 to 20.0	(108 to 145)
	1.5 (0.059)	17.0 to 22.5	(123 to 163)
16 (0.630)	2 (0.079)	23.5 to 31.5	(170 to 228)
	1.5 (0.059)	25.5 to 34.5	(184 to 250)
18 (0.709)	2.5 (0.098)	32.5 to 43.5	(235 to 315)
	1.5 (0.059)	38.5 to 52.0	(278 to 376)
20 (0.787)	2.5 (0.098)	45.5 to 62.0	(329 to 448)
	1.5 (0.059)	53.5 to 72.5	(387 to 524)
22 (0.866)	2.5 (0.098)	64.5 to 84.5	(467 to 611)
	1.5 (0.059)	71.0 to 96.0	(518 to 694)
24 (0.945)	3 (0.118)	79.0 to 105	(571 to 759)
	1.5 (0.059)	94.0 to 125	(680 to 964)
27 (1.063)	3 (0.118)	110 to 150	(796 to 1,085)
30 (1.181)		145 to 195	(1,049 to 1,410)
33 (1.299)		190 to 250	(1,374 to 1,808)
36 (1.417)		230 to 310	(1,664 to 2,242)

# ENGINE

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### RADIATOR

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INSTALLATION ..... 03-03

### ENGINE

REMOVAL ..... 03-04

INSTALLATION ..... 03-06

ENGINE  
RADIATOR

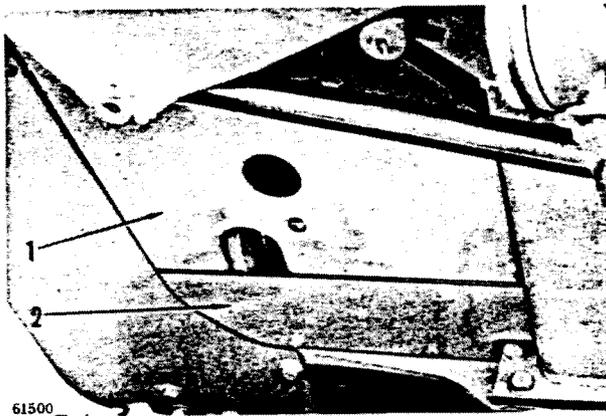
REMOVAL

ENGINE

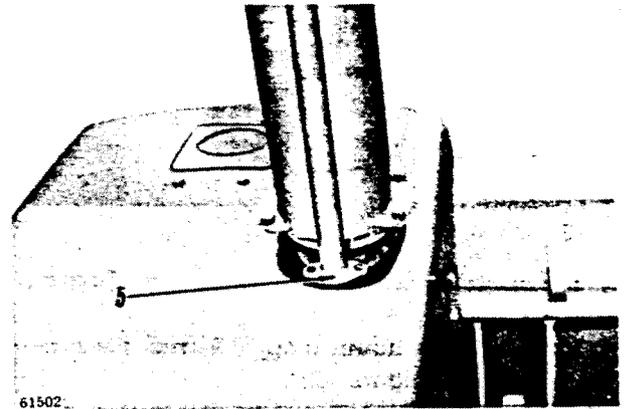
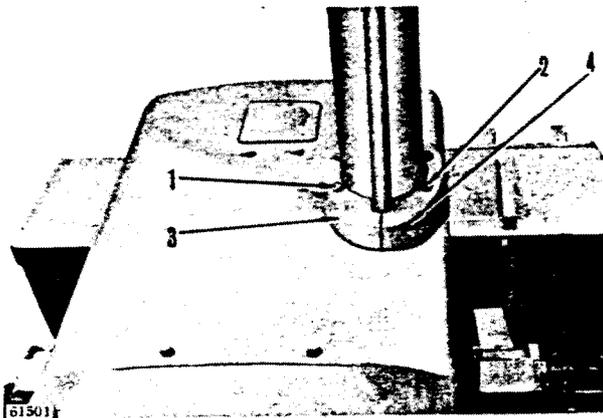
RADIATOR

REMOVAL

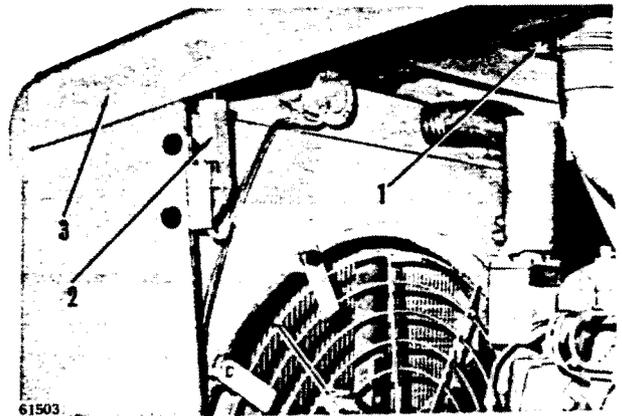
(1) Remove side cover (1) and (2).



(2) Loosen off the bolt (1) and (2) then remove the cover (3) (4), and disconnect the flange (5).



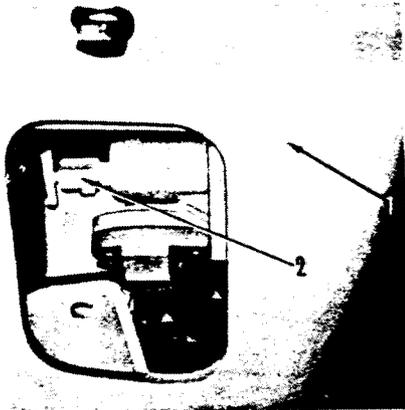
(3) Loosen the pipe clip (1) and take the exhaust pipe. Back off the bolts and remove the bonnet catch (2) on each side and take off the bonnet (3).



# ENGINE RADIATOR

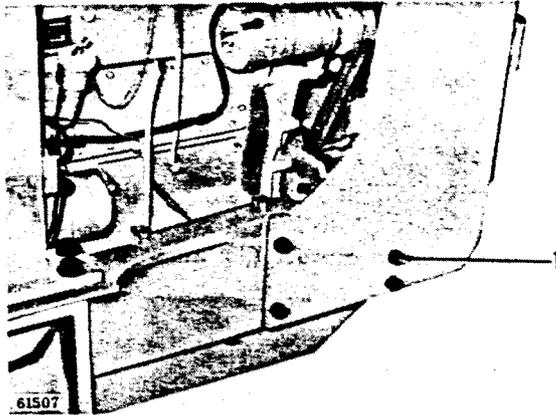
## REMOVAL

- (4) Remove cover from front guard (1).  
Drain radiator by opening the cock (2).  
(2). Take down front guard (1).



61504

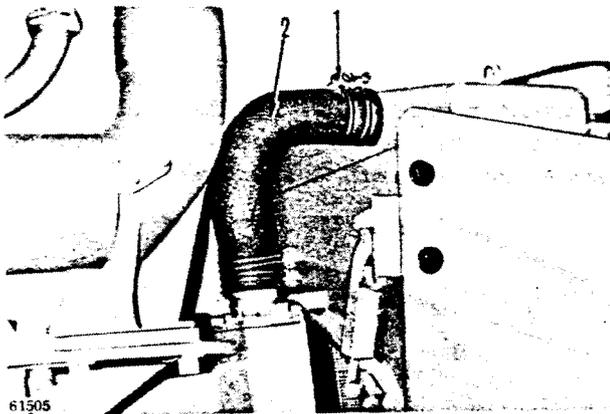
- (8) Loosen the bolts (1), and lift radiator assembly up and out.



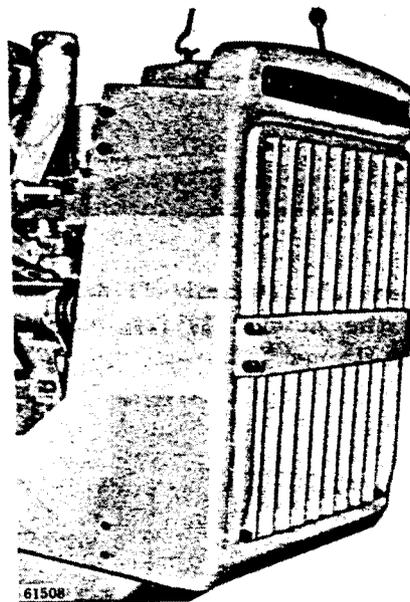
61507

- (5) Remove drain cock under radiator.

- (6) Loosen the hose clip (1) and disconnect rubber hose (2).

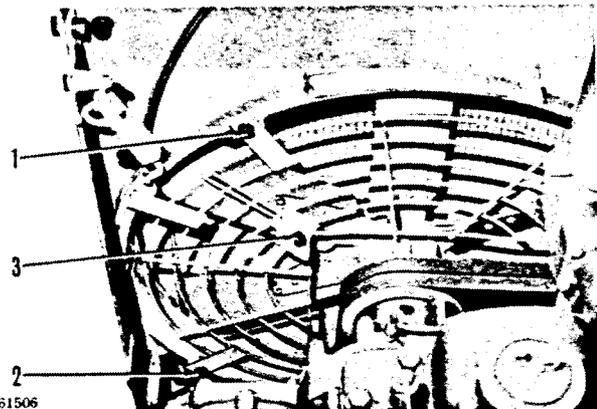


61505



61508

- (7) Loosen the bolts (1) (2) and remove fan guard (3).



61506

**ENGINE  
RADIATOR**

**INSTALLATION**

**INSTALLATION**

- (1) Install the radiator assembly to the main frame.
- (2) Attach the fan shrouds to the radiator.
- (3) Connect the drain pipe the bottom of radiator.
- (4) Clamp the cooling water line (hose) on the radiator.
- (5) Install the front guard.
- (6) Close the drain valve and fill the radiator with cooling water uniformly.
- (7) Install the bonnet.
- (8) Install the exhaust pipe into place, then tighten and lock the pipe band.
- (9) Connect the flange.
- (10) Install the exhaust pipe cover.
- (11) Install the side cover on each side.
- (12) Start the engine and let the engine idle for ten minutes.  
During this idling, take the safety pin out of place, then lower the lift arm all the way down.
- (13) Stop the engine and refill the radiator up to the specified level.

## ENGINE

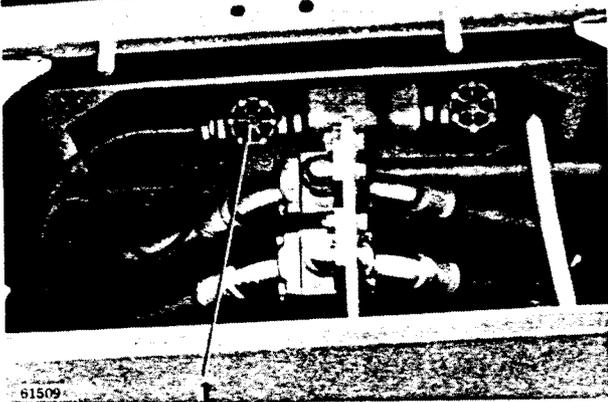
### ENGINE

#### REMOVAL

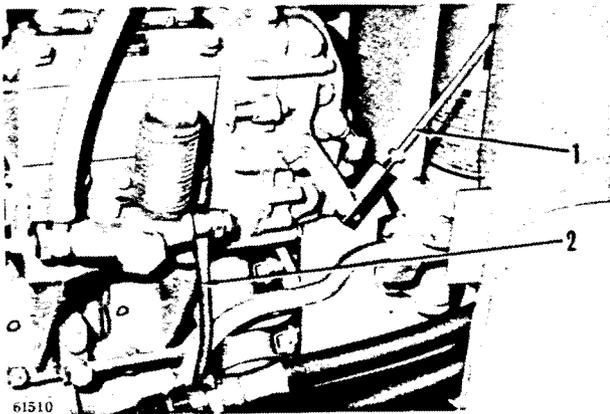
## ENGINE

### REMOVAL (Including the Torque Converter)

- (1) Close fuel valve (1)



- (2) Remove fuel control lever rod (1).  
Disconnect fuel tube (2).



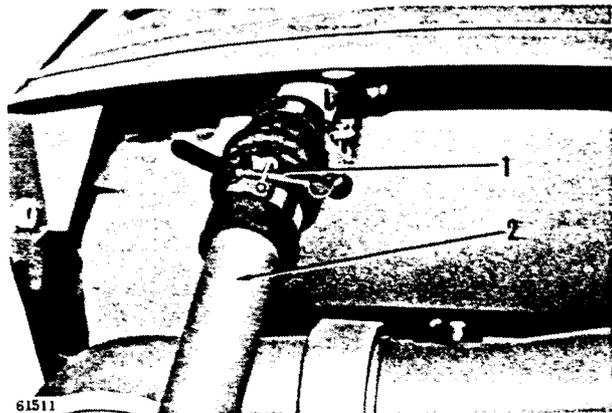
- (3) Disconnect the flange and take the exhaust pipe. Remove the bonnet catch on each side and take off the bonnet. Disconnect the cooling water line (hose). Take down front guard.  
(Refer to RADIATOR removal procedure.)

- (4) Disconnect electrical wires from the engine.  
(Refer to SIDE FRAME removal procedure.)

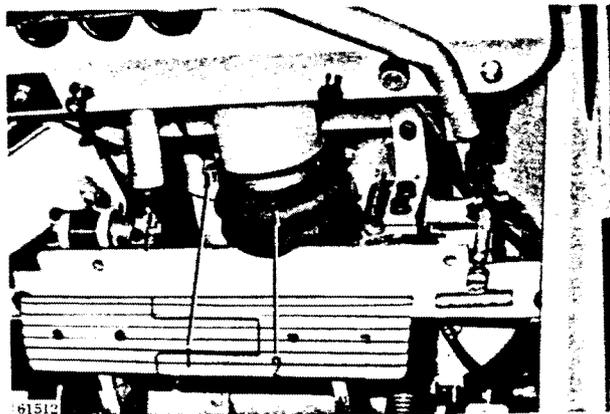
- (5) Disconnect oil pipings from torque converter.

(Refer to TORQUE CONVERTER removal procedure.)

- (6) Loosen the pipe band (1) and disconnect the pipe (2).



- (7) Loosen the pipe band (1) and disconnect the hose (2).



## ENGINE

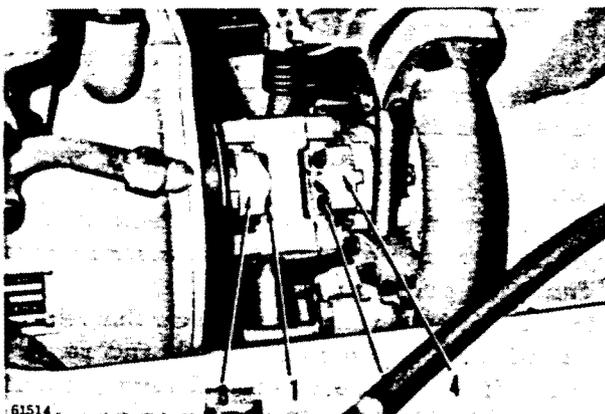
### ENGINE

### REMOVAL

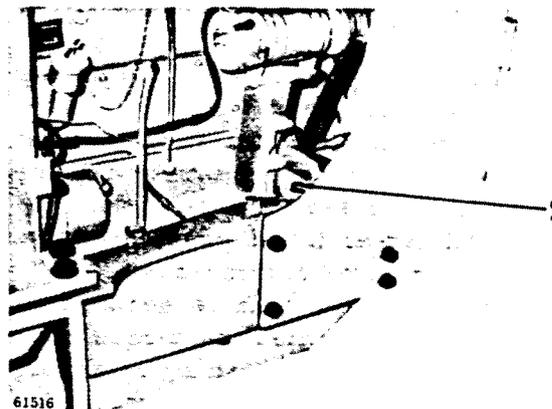
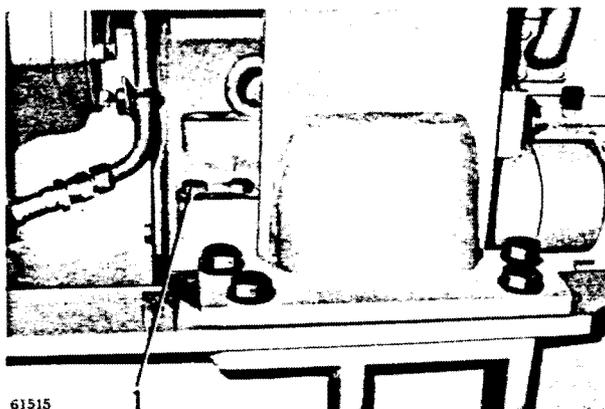
- (8) Disconnect the hose (1).  
Loosen band, detach the flange (2),  
and remove air filter (3).



- (9) Loosen the bolts (1) (2), draw out  
bearing (3) (4), and remove the joint  
assembly.



- (10) Remove engine mounting bolts (1)  
(2).



- (11) Take a hitch on the engine by pass-  
ing the sling under engine cylinder head  
and torque converter, and remove the  
engine unit by lifting it with a hoist.

#### NOTES:

- 1) Before starting to lift the engine, mark sure there are sufficient clearances around the engine, and take care not to bounce the engine against any other part. Lift the engine very slowly.
- 2) Use a wire sling, free from kinks or breakage of any strand.
- 3) Recover the adjusting shims from engine mounts after the engine is taken down, and set them aside for re-use, with an identifying mark provided on each for the mount from which it was recovered.
- 4) Rest the removed engine securely on blocks laid out on the floor, and take the sling off after making sure the engine is stable on the blocks.

## ENGINE

### ENGINE

#### INSTALLATION

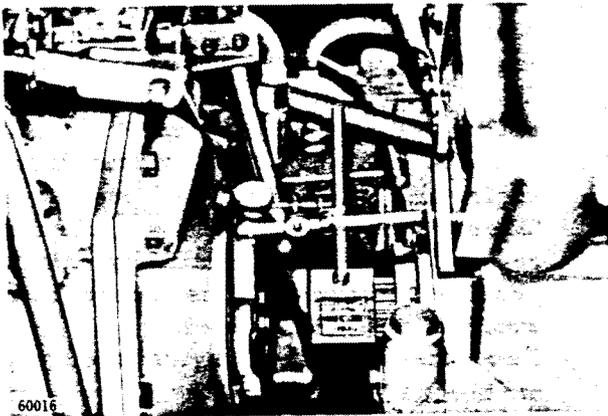
### INSTALLATION

- (1) Be sure to restore the adjusting shims to the engine mounts.

Secure the mounts tentatively to the frame, and check their geometrical arrangement to be sure, roughly, that the engine will center itself properly when it is positioned to the mounts.

- (2) After the engine unit is secured to the main frame, center the torque converter to the transmission by referring to the transmission main shaft.

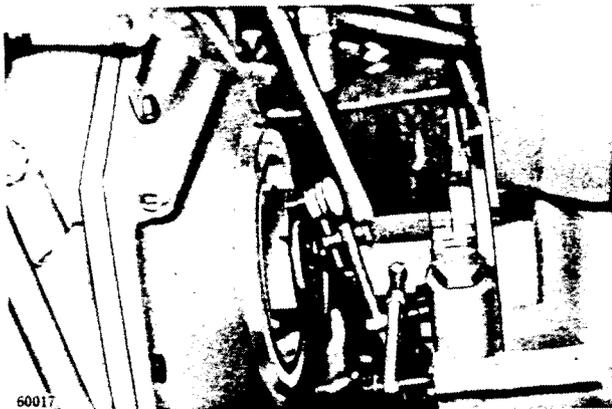
Attach a dial indicator to the torque converter shaft with the spindle on the transmission shaft flange. Then, turn the transmission shaft to center the engine. The engine may be considered to be properly centered if the two run-outs measured are within 0.25 mm (0.00984"): if not, re-position the engine in place by increasing or decreasing the adjusting shims used in engine mounts.



- (3) Tighten the engine mount bolts equally and gradually, passing the wrench from one mount to another and completing the tightening by torquing each bolt up to 25-28 kg-m (180-202 ft-lb).

Before tightening, these bolts should be applied with "Loctite" (bonding compound).

- (4) Install the universal joint.
- (5) Install the piping, wiring and rods relative to the engine.
- (6) Attach the clamps on the cooling water line (hose).
- (7) Install the air filter and connect the air filter hose and dust indicator hose.
- (8) Connect the piping between the air cleaner and the exhaust pipe.
- (9) Connect the fuel tube.
- (10) Install the bonnet and exhaust pipe.
- (11) Install the front guard.
- (12) Open the fuel valve.
- (13) Fill the hydraulic tank and torque converter with oil up to their respective specified level.
- (14) Fill the radiator with cooling water uniformly.
- (15) Start the engine and check to see if the torque converter and instruments function properly.
- (16) Stop the engine and check the levels of oil in the hydraulic tank and radiator. If below the specified level, refill the tank or the radiator up to the specified level.



# TORQUE CONVERTER

## INDEX

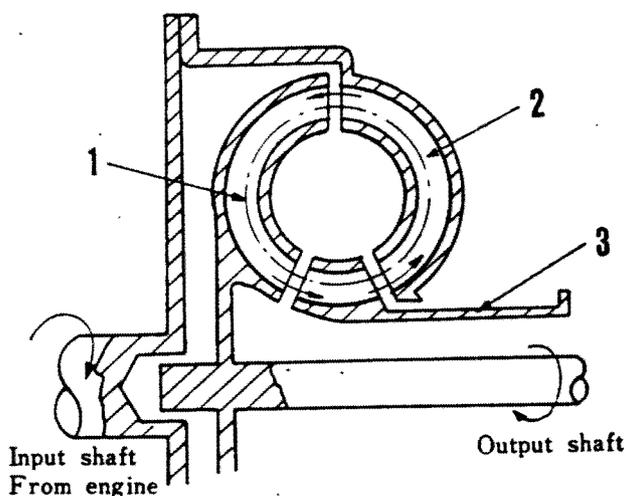
DESCRIPTION .....	04-01
REMOVAL .....	04-03
DISASSEMBLING.....	04-05
ASSEMBLING .....	04-06
INSTALLATION .....	04-07

# TORQUE CONVERTER

## DESCRIPTION

The torque converter has three kinds of element: a pump (impeller), a turbine (runner) and two stators (reactor).

These elements are vane-wheels rotating around a common axis and housed in the converter case. The forward end of turbine shaft is piloted by the flywheel, and the converter case is supported by the stator shaft.



Torque Converter

- |            |           |
|------------|-----------|
| 1. Turbine | 3. Stator |
| 2. Pump    |           |

The oil pump drive gear (for driving transmission oil pump, steering oil pump and hydraulic oil pump) is driven from the main drive gear through the idle gear. The scavenging pump drive gear is directly driven by the main drive gear. Drive from the engine is transmitted to the torque converter directly through the flywheel. Since the

driving plate is engaged with the flywheel through the inner gear teeth of the flywheel, the drive case and impeller rotate together. The motion of impeller is such that it throws oil against the turbine, thereby transmitting power to turbine hydraulically.

Oil flowing out of turbine vanes strikes the vanes of primary and secondary stators. The stators redirect the oil into the inlet side of impeller in a direction assisting the rotation of impeller. The stators are mounted on overrunning clutches (free-wheel mechanism), such that these members run only in one direction with respect to the shaft. When higher speeds are reached, the stators begin to free-wheel and thereby cease their redirecting action.

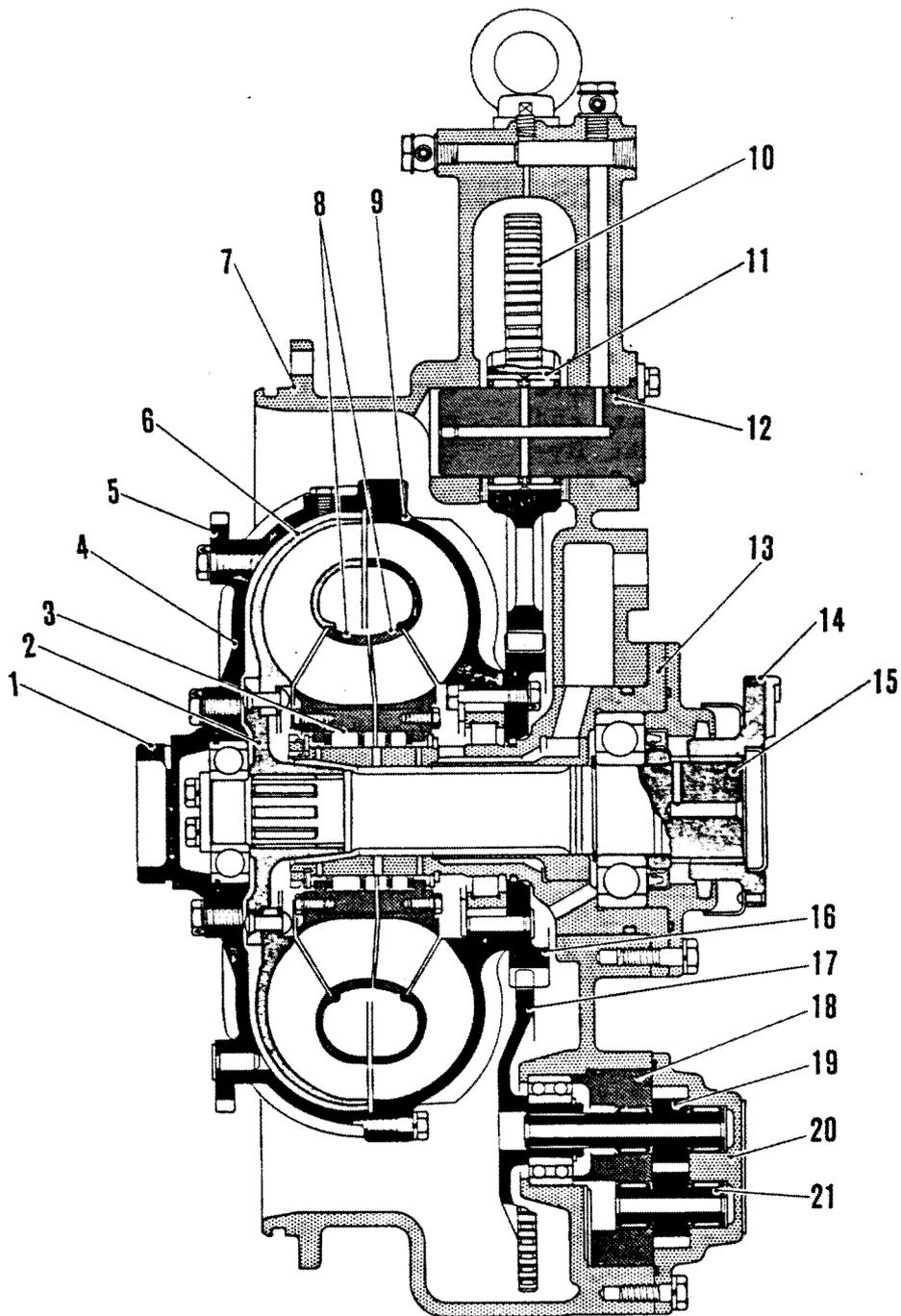
### Oil pump and Oil Piping

The oil pump draws oil from the pump provided in the powershift (hydraulic shift) transmission case and forces the oil through the filter to supply it to the transmission control valve. This valve is a means of hydraulically selecting the gear ratio for the desired speed. The oil used in this control is returned to the torque converter.

The oil leaving the torque converter is cooled by the oil cooler. Part of the cooled oil goes to the transmission and the remainder to the driving shafts of various oil pumps for lubricating their shafts. The oil discharged by the torque converter scavenging pump is returned to the torqflow transmission oil reservoir.

# TORQUE CONVERTER

## DESCRIPTION



Sectional View of Torque Converter

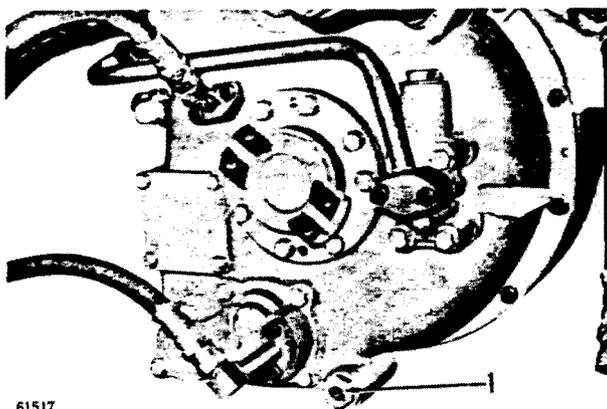
- |                          |                           |                                 |
|--------------------------|---------------------------|---------------------------------|
| 1. Pilot                 | 8. Stator                 | 15. Turbine shaft               |
| 2. Hub                   | 9. Pump                   | 16. Main drive gear pump        |
| 3. Freewheel             | 10. Idler gear            | 17. Scavenging pump drive gear  |
| 4. Drive case            | 11. Needle roller bearing | 18. Pump case cover             |
| 5. Drive plate           | 12. Idler gear shaft      | 19. Scavenging pump drive gear  |
| 6. Turbine               | 13. Stator shaft          | 20. Pump case                   |
| 7. Torque converter case | 14. Coupling              | 21. Scavenging pump driven gear |

# TORQUE CONVERTER

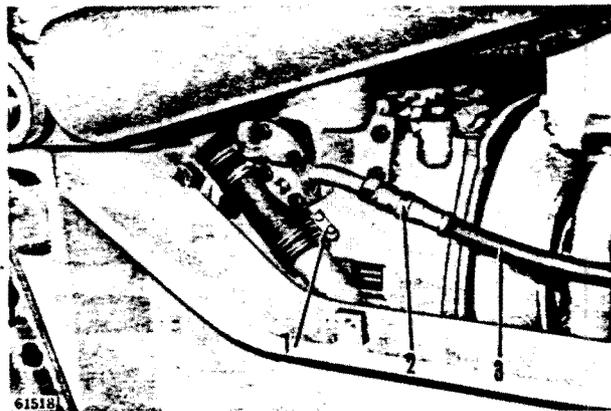
REMOVAL

## REMOVAL

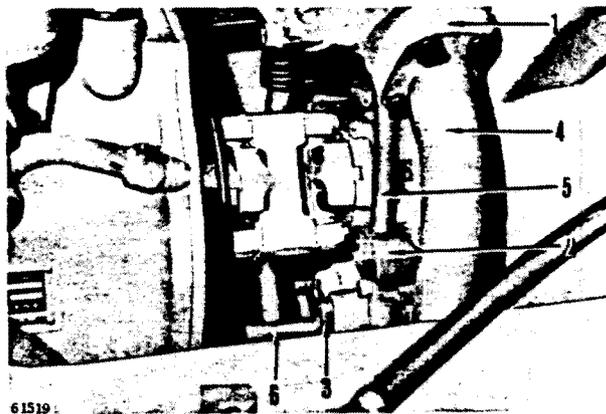
- (1) Lift the machine off the floor by putting 3-40 cm (11.8-15.7") high blocks under the tracks.
- (2) Drain hydraulic oil tank by loosening its drain plug.  
(Refer to CONTROL VALVE removal procedure.)
- (3) Remove all floor plates.  
(Refer to TORQFLOW TRANSMISSION removal procedure.)
- (4) Remove side cover.  
(Refer to ENGINE removal procedure.)
- (5) Remove underguard.  
(Refer to ENGINE removal procedure.)
- (6) Drain torque converter by loosening plug (1).



- (7) Disconnect from the converter the oil pipes leading to and from oil pump.
  - 1) Loosen pipe clip (1).
  - 2) Remove nipple (2) and disconnect rubber hose (3).



- 3) Detach flange (1) (2) (3) and disconnect pipes (4) (5) (6).



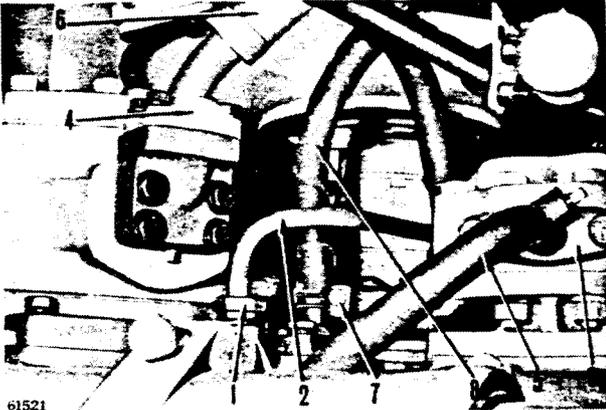
- 4) Loosen nipple (1) and disconnect torque converter pressure tube (2).



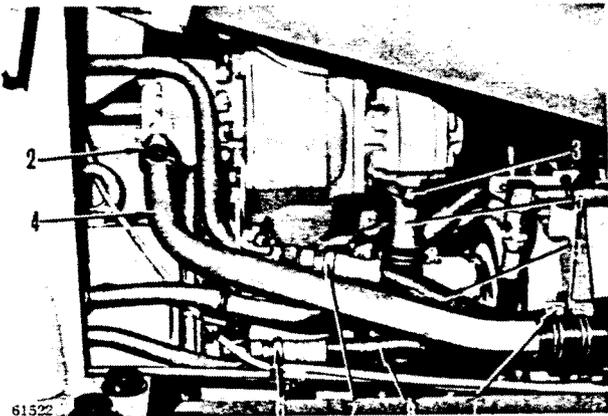
## TORQUE CONVERTER

### REMOVAL

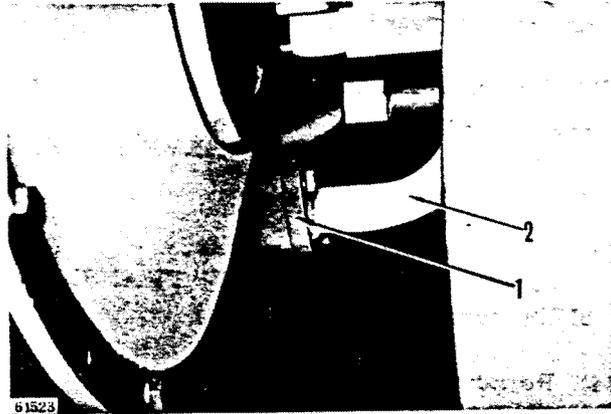
- 5) Loosen nipple (1) and disconnect pipe (2).
- 6) Detach flange (3) (4) and disconnect pipe (5) and rubber hose (6).
- 7) Loosen pipe clip (7) and disconnect rubber hose (8).



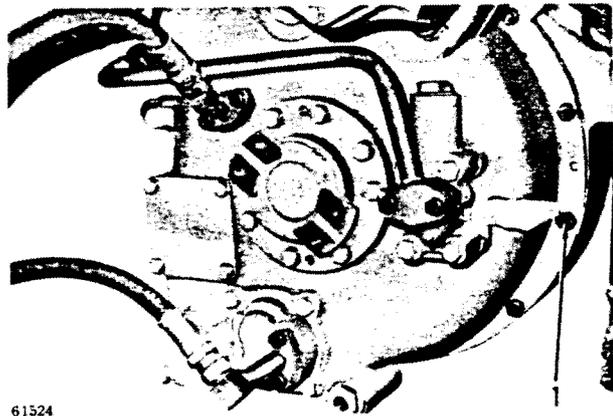
- 8) Loosen pipe clip (1). Detach flange (2) (3) and disconnect pipes (4) (5).
- 9) Loosen nipple (6) (7) and disconnect rubber hose (8) (9).



- 10) Detach flange (1) and disconnect pipe (2) from the torqflow transmission.



- (8) Remove the universal joint between torque converter and torqflow transmission.
- (9) Loosen bolts (1) securing torque converter in place. (Have the weight of the converter take up with a lifting sling so that removal of bolts (1) will free the converter in floating condition.)  
Detach torque converter from the engine.



- (10) Lower torque converter in suspended condition to the floor directly under the chassis.