

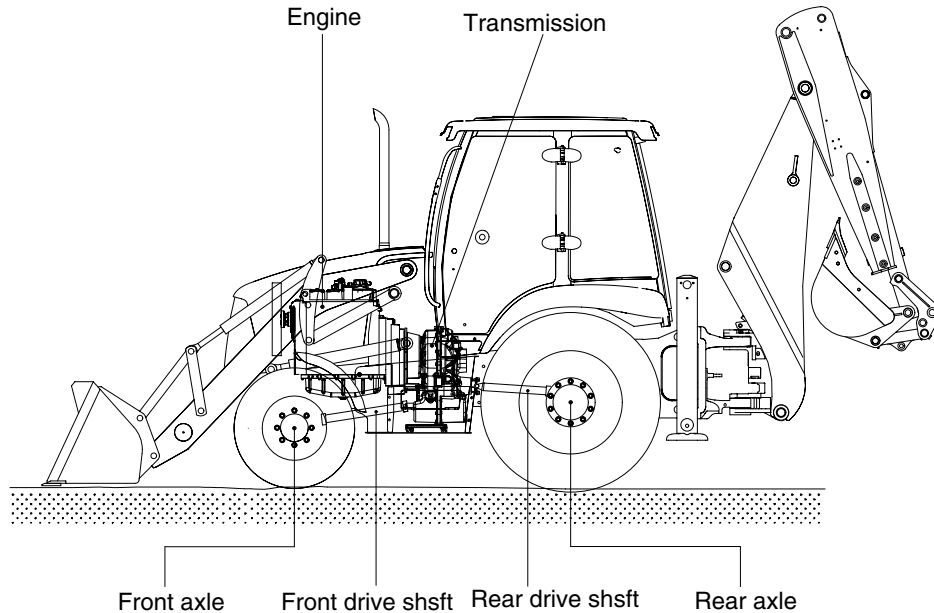
SECTION 3 POWER TRAIN SYSTEM

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SECTION 3 POWER TRAIN SYSTEM

GROUP 1 STRUCTURE AND FUNCTION

1. POWER TRAIN COMPONENT OVERVIEW



HB100PT01-1

The power train consists of the following components:

- Transmission
- Front and rear drive shafts
- Front and rear axles

Engine power is transmitted to the transmission through the torque converter.

The transmission is a hydraulically engaged four speed forward, three speed reverse countershaft type power shift transmission. A multi-disc type parking brake is located in the rear axle.

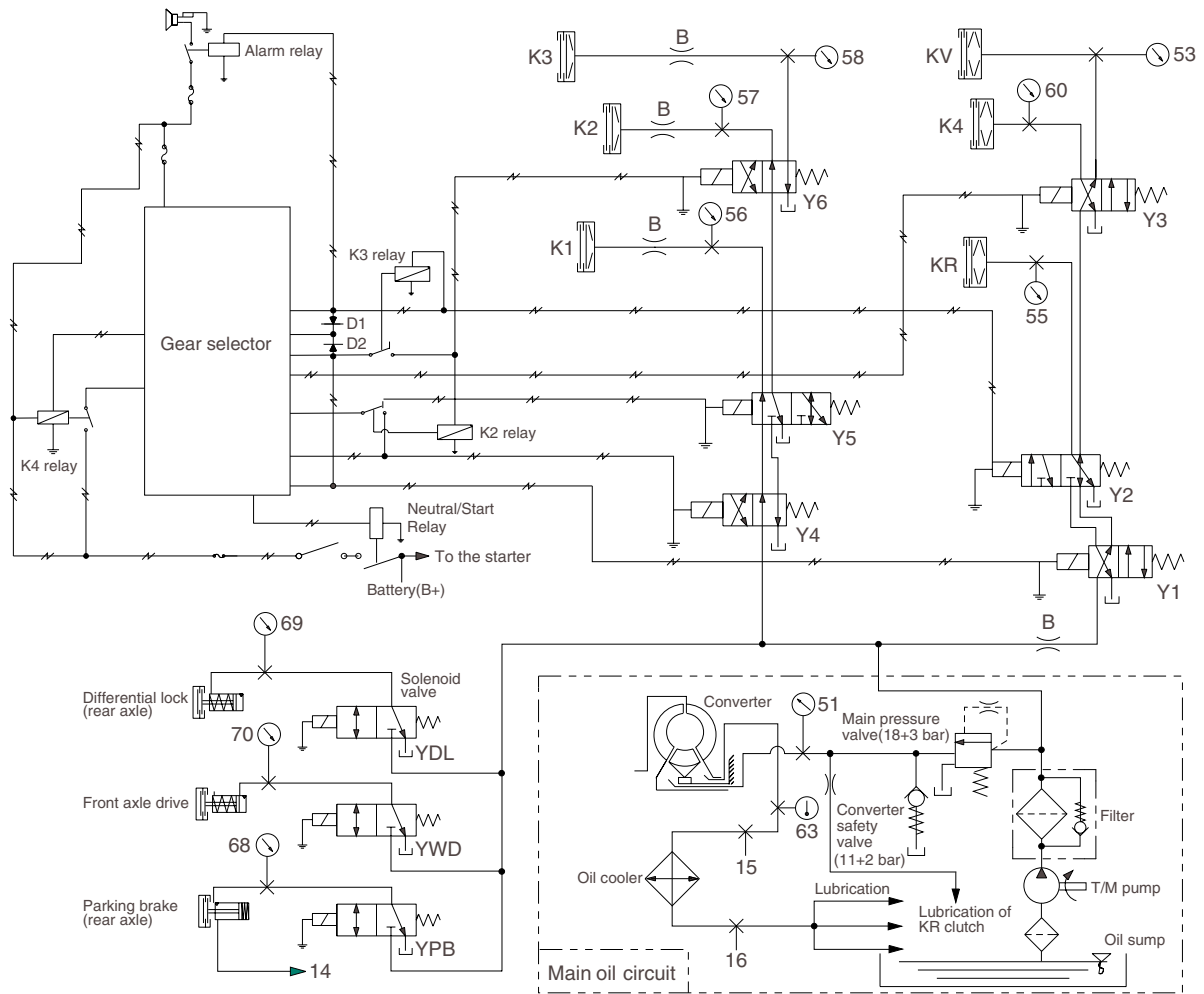
The transmission outputs through universal joints to two drive shaft assemblies. The front drive shaft is a telescoping shaft which drives the front axle. The front axle is mounted directly to the loader front frame. The front axle is equipped with conventional differential.

The rear axle is equipped with hydraulic lock differential.

The power transmitted to front axle and rear axle is reduced by the pinion gear and ring gear of differential. It then passes from the differential to the sun gear shaft (axle shaft) of final drive.

The power of the sun gear is reduced by a planetary mechanism and is transmitted through the planetary hub to the wheel.

HYDRAULIC CIRCUIT



HB100PT02

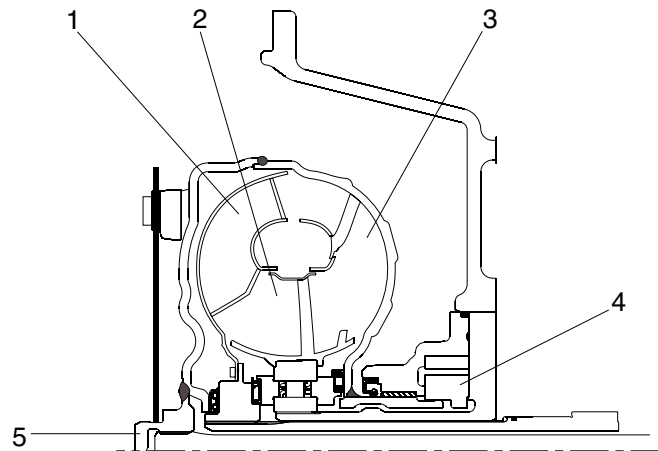
- B Orifice
- KV Forward clutch
- KR Reverse clutch
- K1 Clutch
- K2 Clutch
- K3 Clutch
- K4 Clutch
- Y1~Y6 Solenoid valves to the control valves

Speed	Forward				Reverse			Neutral	Engaged clutch	Current No. of the measuring points
	1	2	3	4	1	2	3	N		
Y1	X	X	X	X					K4	60
Y2					X	X	X		KR	55
Y5	X		X		X				K1	56
Y4		X		X		X	X		K3	58
Y6							X		KV	53
Y3	X	X			X	X			K2	57
Engaged clutches	KV,K1	KV,K2	K4,K1	K4,K2	KR,K1	KR,K2	KR, K3		-	-

X : Pressure regulator under voltage

※ Refer to page 3-23 for measuring points.

2. TORQUE CONVERTER



HB100PT03

- | | | | | | |
|---|--------|---|-------------------|---|--------------|
| 1 | Pump | 3 | Turbine | 5 | Input flange |
| 2 | Stator | 4 | Transmission pump | | |

The converter is working according to the Trilok-system, i.e. it assumes at high turbine speed the characteristics, and with it the favorable efficiency of a fluid clutch.

The converter is designed according to the engine power so that the most favorable operating conditions are obtained for each installation case.

The Torque converter is composed of 3 main components :
Pump wheel - turbine wheel - stator (reaction member)

These 3 impeller wheels are arranged in such a ring-shape system that the fluid is streaming through the circuit components in the indicated order.

Pressure oil from the transmission pump is constantly streaming through the converter. In this way, the converter can fulfill its task to multiply the torque of the engine and at the same time, the heat created in the converter is dissipated via the escaping oil.

The oil which is streaming out of the pump wheel, enters the turbine wheel and is there inversed in the direction of flow.

According to the rate of reversion, the turbine wheel and with it also the output shaft is receiving a more or less high reaction torque. The stator (reaction member), following the turbine, has the task to reverse the oil streaming out of the turbine once more and to deliver it under the suitable discharge direction to the pump wheel.

Due to the reversion, the stator receiving a reaction torque.

The relation turbine torque/pump torque is called torque multiplication. This is the higher, the greater the speed difference of pump wheel and turbine wheel will be.

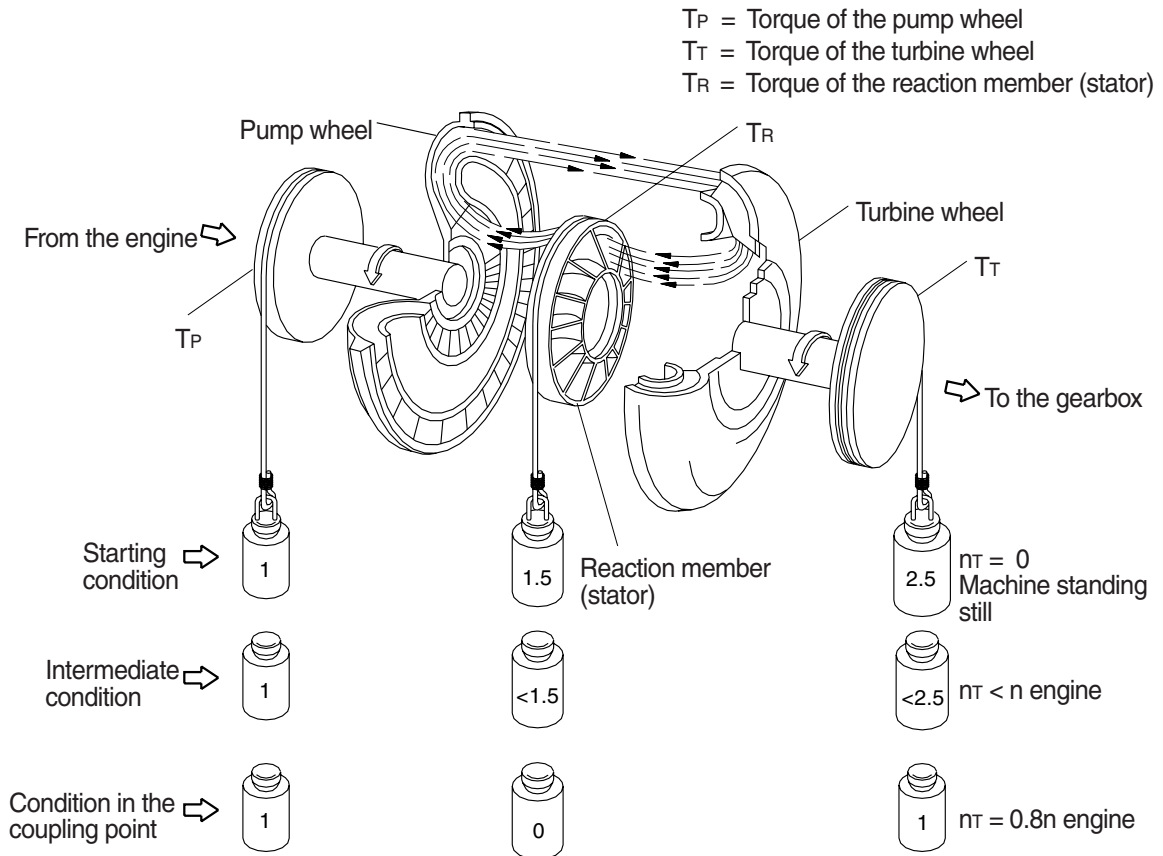
Therefore, the maximum torque multiplication is created at stationary turbine wheel.

With increasing output speed, the torque multiplication is decreasing. The adaption of the output speed to a certain required output torque will be infinitely variable and automatically achieved by the torque converter.

when the turbine speed is reaching about 80% of the pump speed, the torque multiplication becomes 1.0 i.e. the turbine torque becomes equal to that of the pump torque.
 From this point on, the converter is working similar to a fluid clutch.

A stator freewheel serves to improve the efficiency in the upper driving range, in the torque multiplication range it is backing-up the torque upon the housing, and is released in the clutch range. In this way, the stator can rotate freely.

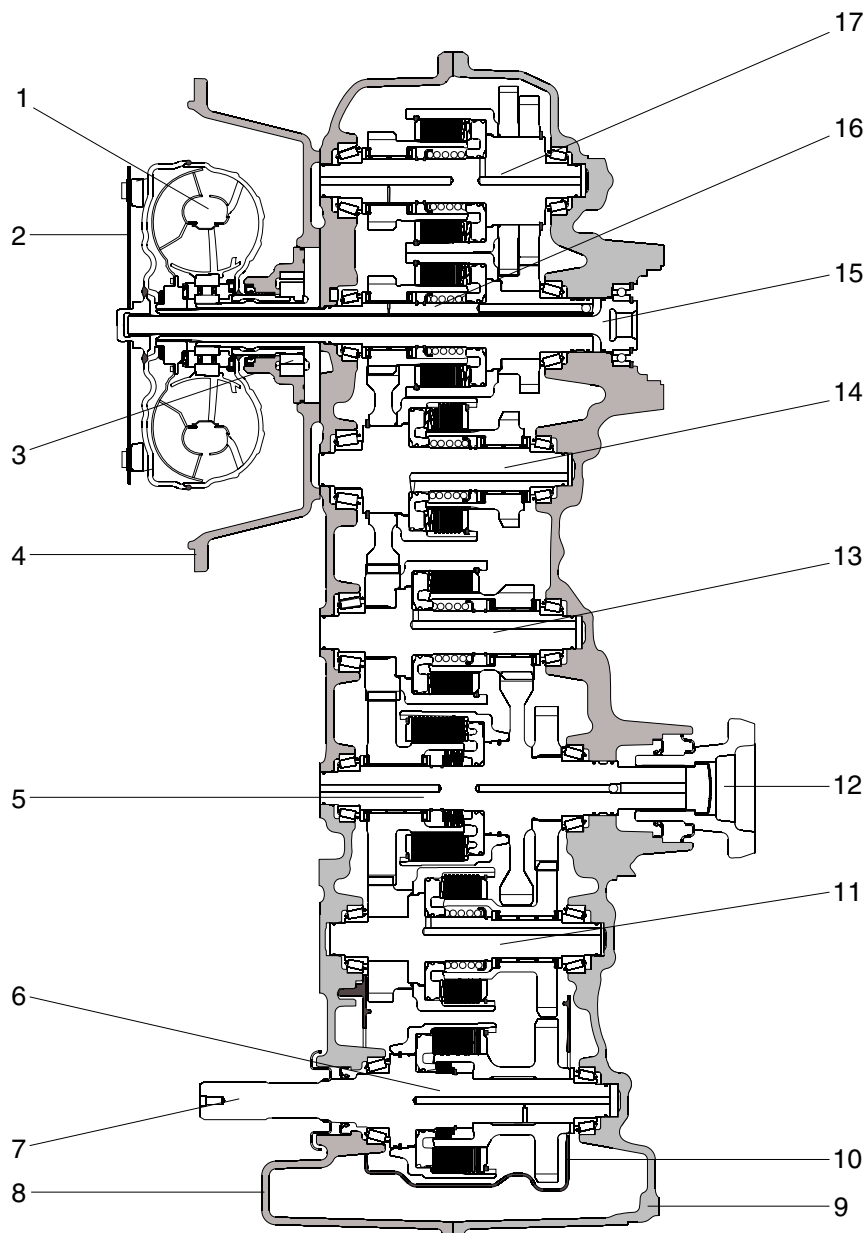
Function of a hydrodynamic torque converter (schematic view)



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3. TRANSMISSION

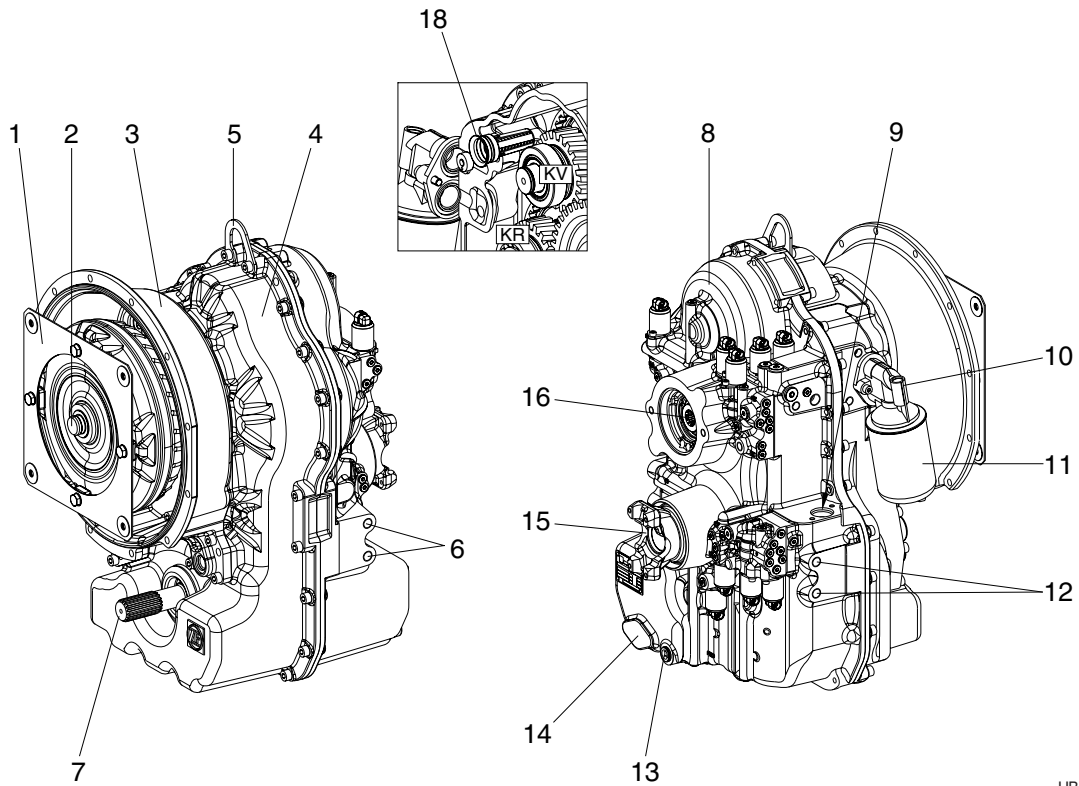
1) LAYOUT



HB100PT04

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|------------------------------|------------------------------|------------------------------------|
| 1 Converter | 7 Output for front axle | 13 Clutch shaft (K1) |
| 2 Flexplate for direct mount | 8 Transmission housing-front | 14 Clutch shaft (K4) |
| 3 Transmission pump | 9 Transmission housing-rear | 15 Engine-dependent power take-off |
| 4 Converter bellhousing | 10 Screen sheet | 16 Input shaft / clutch shaft (KR) |
| 5 Clutch shaft (K2) | 11 Clutch shaft (K3) | 17 Clutch shaft (KV) |
| 6 Front wheel drive | 12 Output flange | |

2) INSTALLATION VIEW



HB100PT05

- | | | | |
|---|-----------------------------------|----|---|
| 1 | Direct mount via flexplate | 10 | Filter head |
| 2 | Converter | 11 | Filter |
| 3 | Converter bellhousing | 12 | Transmission mounting holes M16 |
| 4 | Transmission housing - front part | 13 | Oil drain plug 7/8" 14 UNF |
| 5 | Transport bracket | 14 | Mounting provision for oil filler tube with oil dipstick (option) |
| 6 | Transmission mounting holes M16 | 15 | Output flange |
| 7 | Input shaft front wheel drive | 16 | Engine-dependent power take-off (PTO) |
| 8 | Transmission housing - rear part | 18 | Converter safety valve |
| 9 | Oil filler and oil dipstick | | |

3) OPERATION OF TRANSMISSION

(1) Gearbox diagram

① The multi-speed reversing transmission in countershaft design is powershiftable by hydraulically actuated multi-disk clutches.

All gears are in constant mesh and carried on anti-friction bearings.

The gears, bearings and clutches are cooled and lubricated with oil.

The 4 speed transmission is equipped with 6 multi-disk clutches.

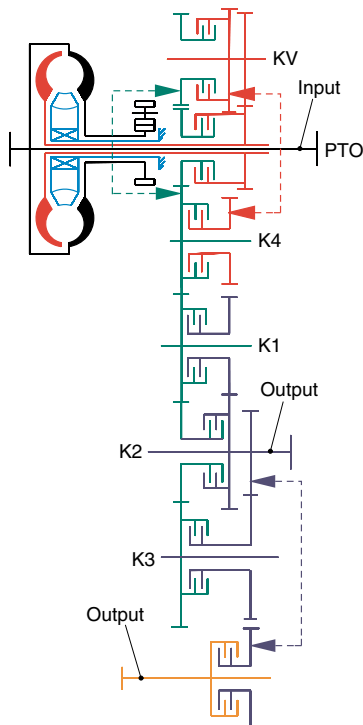
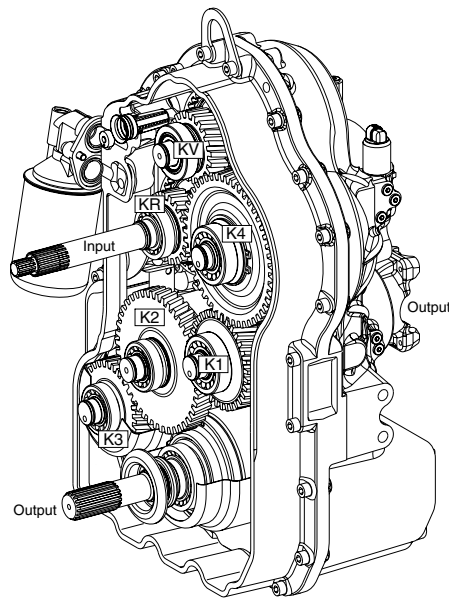
In shifting operation, the respective disk package is compressed by a piston which is movable in axial direction and pressurized by pressure oil.

A compression spring pushes the piston of clutches KV, KR, K1, K3 and K4 back and thus releases the disk package.

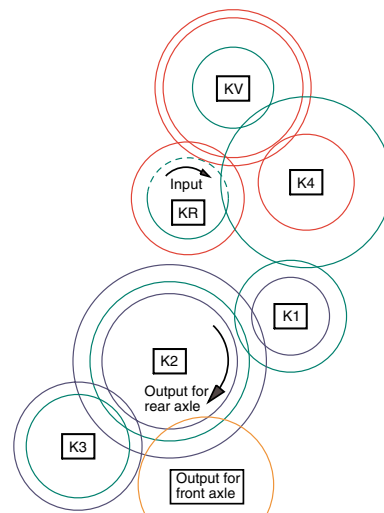
A cup spring package pushes the piston of clutch K2 back.

- KV = Clutch forward
- KR = Clutch reverse/input
- K1 = Clutch 1st speed
- K2 = Clutch 2nd speed/output
- K3 = Clutch 3rd speed
- K4 = Clutch 4th speed

Driving direction	Speed	Clutch
Forward	1	KV/K1
	2	KV/K2
	3	K4/K1
	4	K4/K2
Reverse	1	KR/K1
	2	KR/K2
	3	KR/K3



Transmission schematics

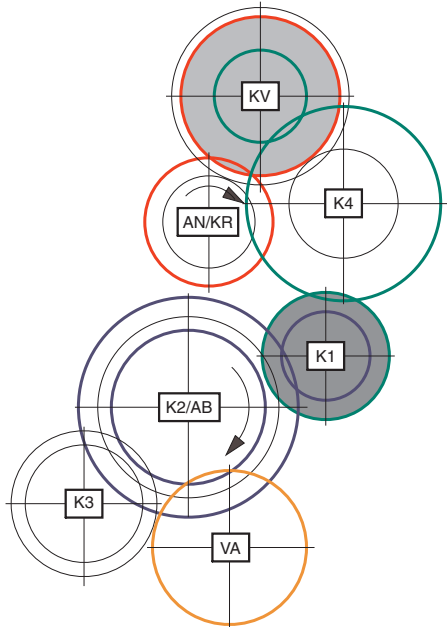


Gear schematics

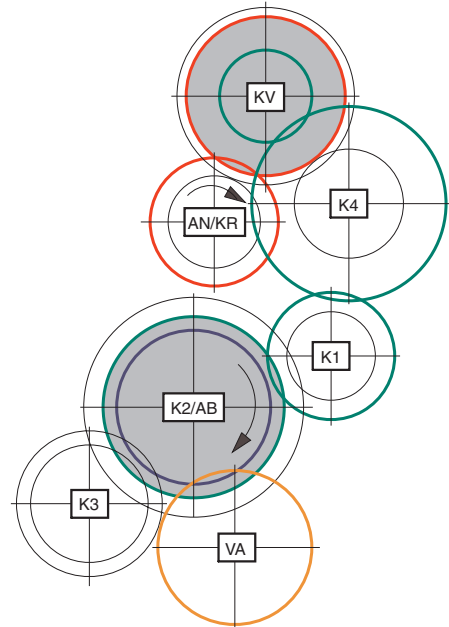
② Forward

In forward, forward clutch and K1, K2, K3, K4 clutch are engaged.

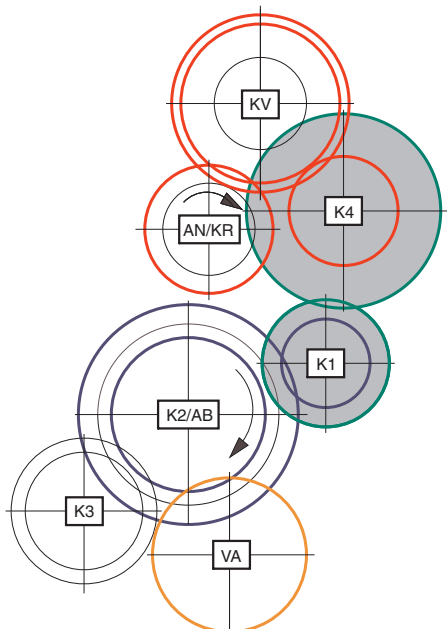
Forward clutch and K1, K2, K3, K4 clutch are actuated by the hydraulic pressure applied to the clutch piston.



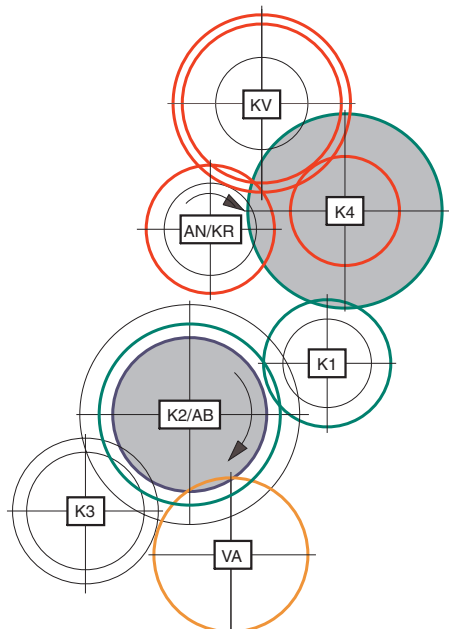
1st gear forward



2nd gear forward



3rd gear forward



4th gear forward

HB100PT13

KR/AN = Clutch reverse/input
KV = Clutch forward
K1 = Clutch 1st speed

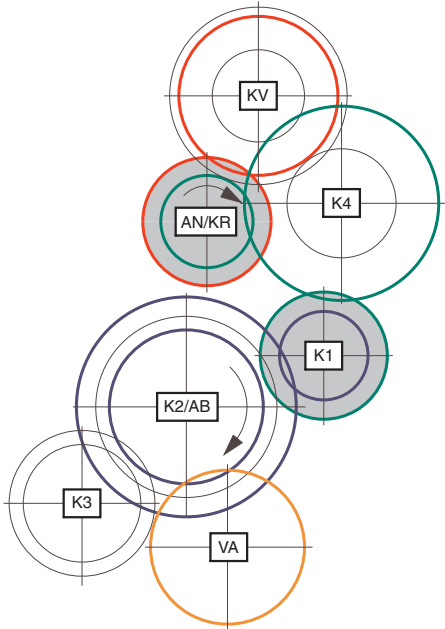
K2/AB = Clutch 2nd speed/output
K3 = Clutch 3rd speed

K4 = Clutch 4th speed
VA = Front wheel drive

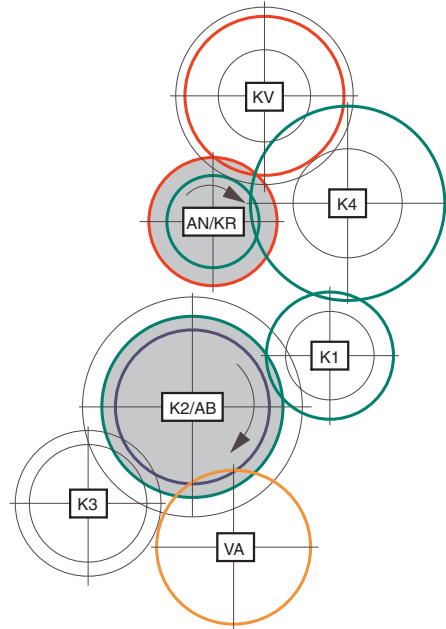
③ Reverse

In reserve, reserve clutch KR and K1, K2, K3 clutch are engaged.

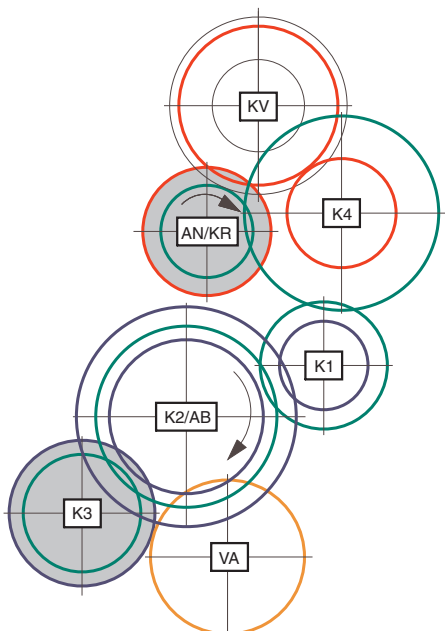
Reverse clutch and K1, K2, K3 are actuated by the hydraulic pressure applied to the clutch piston.



1st gear reverse



2nd gear reverse

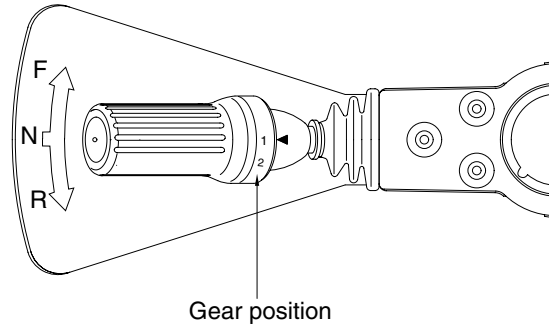


3rd gear reverse

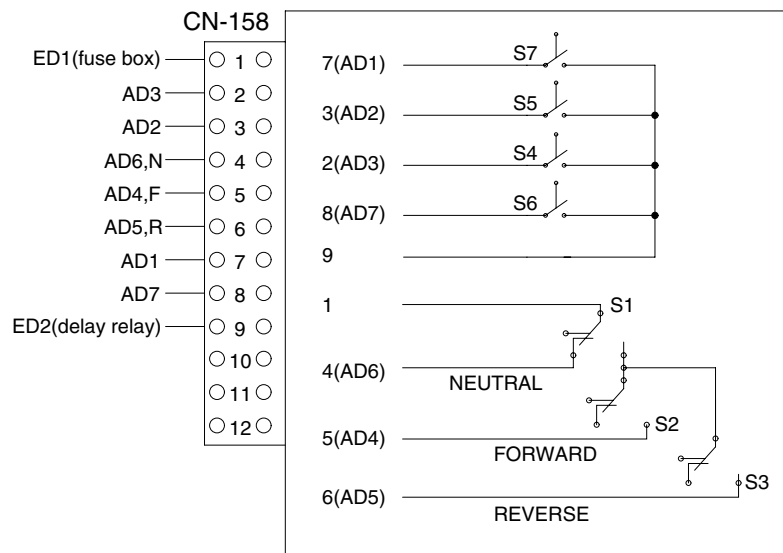
- KR/AN = Clutch reverse/input
- KV = Clutch forward
- K1 = Clutch 1st speed
- K2/AB = Clutch 2nd speed/output
- K3 = Clutch 3rd speed
- K4 = Clutch 4th speed
- VA = Front wheel drive

4) GEAR SELECTOR

The gear selector is designed for the mounting on the steering column left side. The gear positions (speeds) 1 to 4 are selected by a rotative motion and the driving direction (Forward (F) - Neutral (N) - Reverse (R) by tilting the lever.

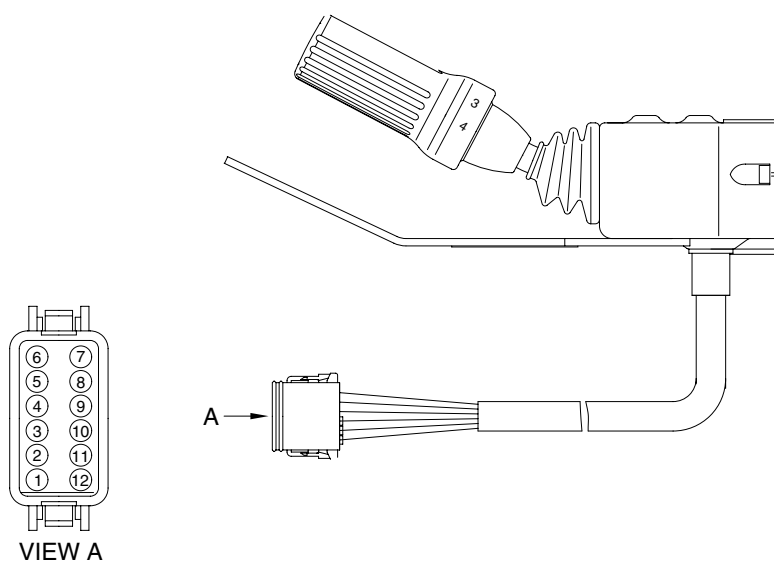


Gear selector wiring



HB100PT26

Gear selector



HB100PT27

Encoding gear selector

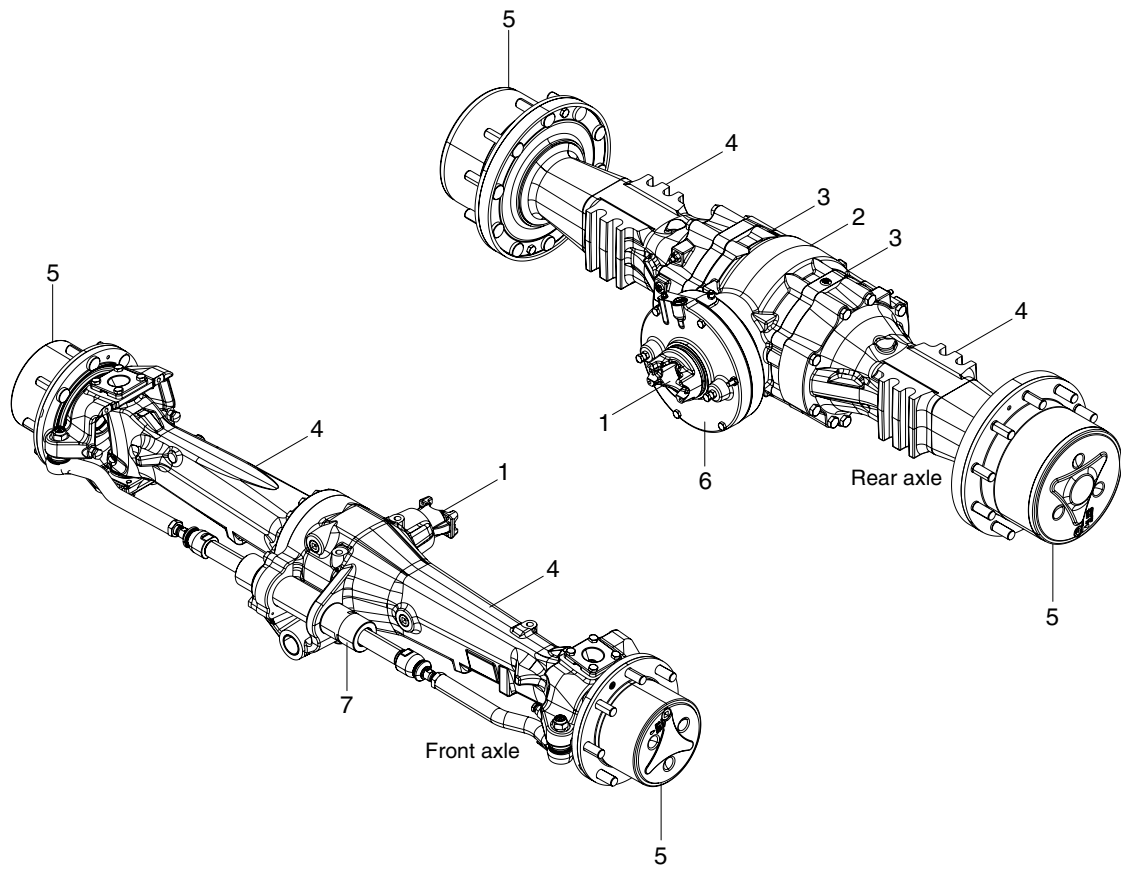
		Output									
Digital inputs		Digital outputs			Selection of direction			Speed range gear			
Symbol	Pin	Symbol	Pin	F	N	R	1	2	3	4	
ED1 (VP)	1	AD4	Y1 (F)	5	X						
		AD5	Y2 (R)	6			X				
		AD6	Y3 (N)	4		X					
ED2 (VP)	9	AD1	Y3	7			X	X			
		AD2	Y4	3				X		X	
		AD3	Y5	2				X		X	
		AD7	Y6	8						X	

X : Pressure regulator under voltage

VP Supply voltage F Forward N Neutral R Reverse Y Solenoid valve Y1~Y6

4. AXLE

1) STRUCTURE



HB100PT10

- | | | | | | |
|---|--------------------|---|---------------|---|-------------------|
| 1 | Input | 4 | Axle housing | 7 | Steering cylinder |
| 2 | Axle drive housing | 5 | Output unit | | |
| 3 | Bearing housing | 6 | Parking brake | | |

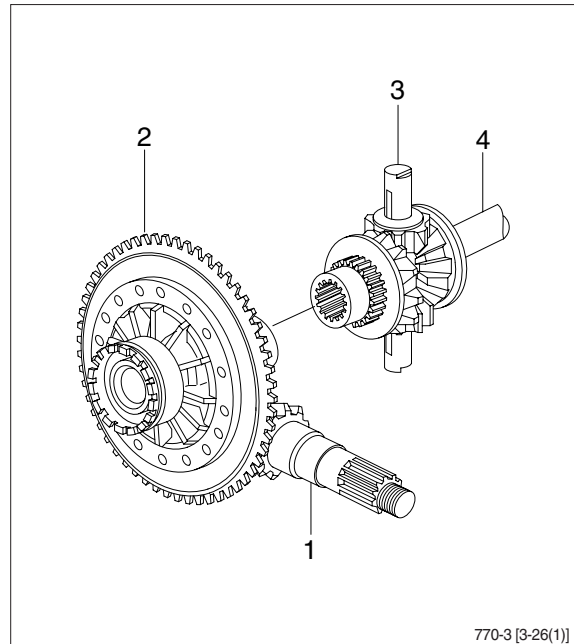
2) DIFFERENTIAL

(1) Description

When the machine makes a turn, the outside wheel must rotate faster than the inside wheel. A differential is a device which continuously transmits power to the right and left wheels while allowing them to turn a different speeds, during a turn.

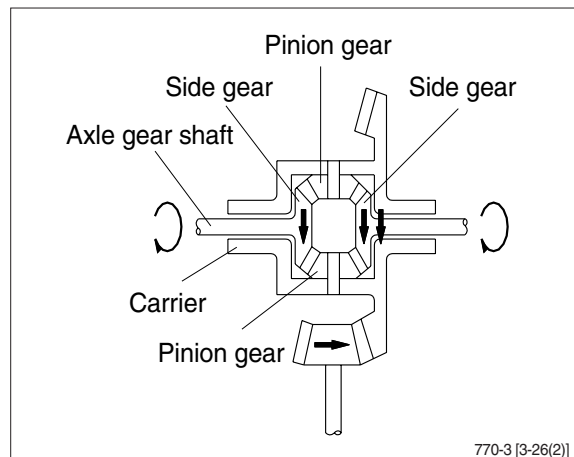
The power from the drive shaft passes through bevel pinion (1) and is transmitted to the bevel gear (2). The bevel gear changes the direction of the motive force by 90 degree, and at the same time reduces the speed.

It then transmits the motive force through the differential (3) to the axle gear shaft (4).



(2) When driving straight forward

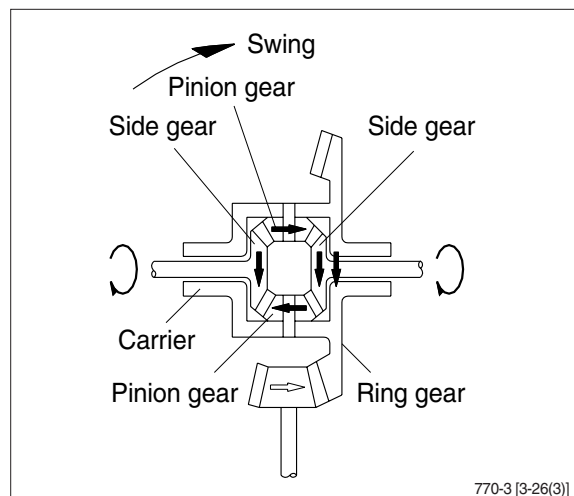
When the machine is being driven straight forward and the right and left wheels are rotating at the same speed, so the pinion gear inside the differential assembly do not rotate. The motive force of the carrier is send through the pinion gear and the side gear, therefore the power is equally transmitted to the left and right axle gear shaft.



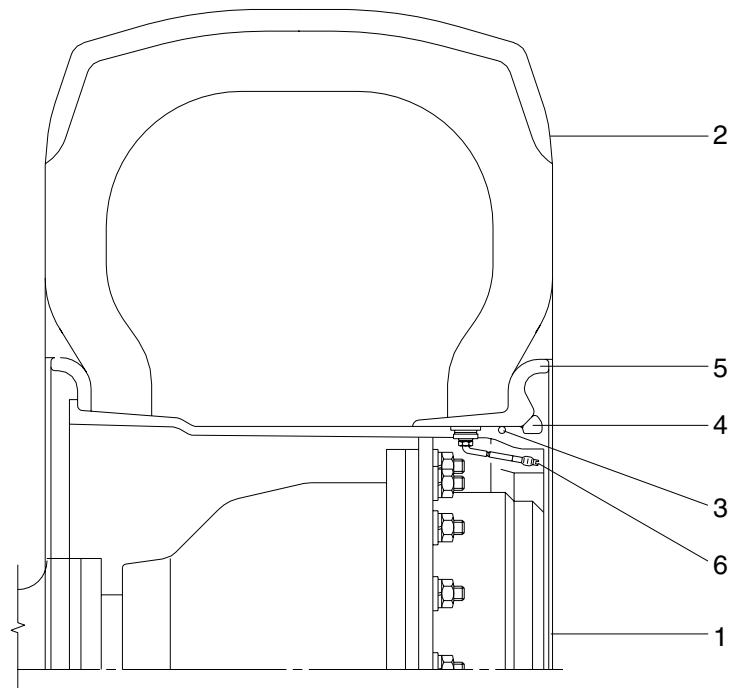
(3) When turning

When turning, the rotating speed of the left and right wheels is different, so the pinion gear and side gear inside the differential assembly rotate in accordance with the difference between the rotating speed of the left and right wheels.

The power of the carrier is then transmitted to the axle gear shafts.



5. TIRE AND WHEEL



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- | | | | | | |
|---|-----------|---|-----------|---|----------------|
| 1 | Wheel rim | 3 | O-ring | 5 | Side ring |
| 2 | Tire | 4 | Lock ring | 6 | Valve assembly |

- 1) The tire acts to absorb the shock from the ground surface to the machine, and at the same time they must rotate in contact with the ground to gain the power which drives the machine.
- 2) Various types of tires are available to suit the purpose. Therefore it is very important to select the correct tires for the type of work and bucket capacity.