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60Z7 SHOP MANUAL General Information Function & Structure

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SHOP MANUAL

WHEEL LOADER

60Z7

General Information
Function & Structure

Powered by DEUTZ TCD36 Engine

Serial No. 60D1-8001 and up

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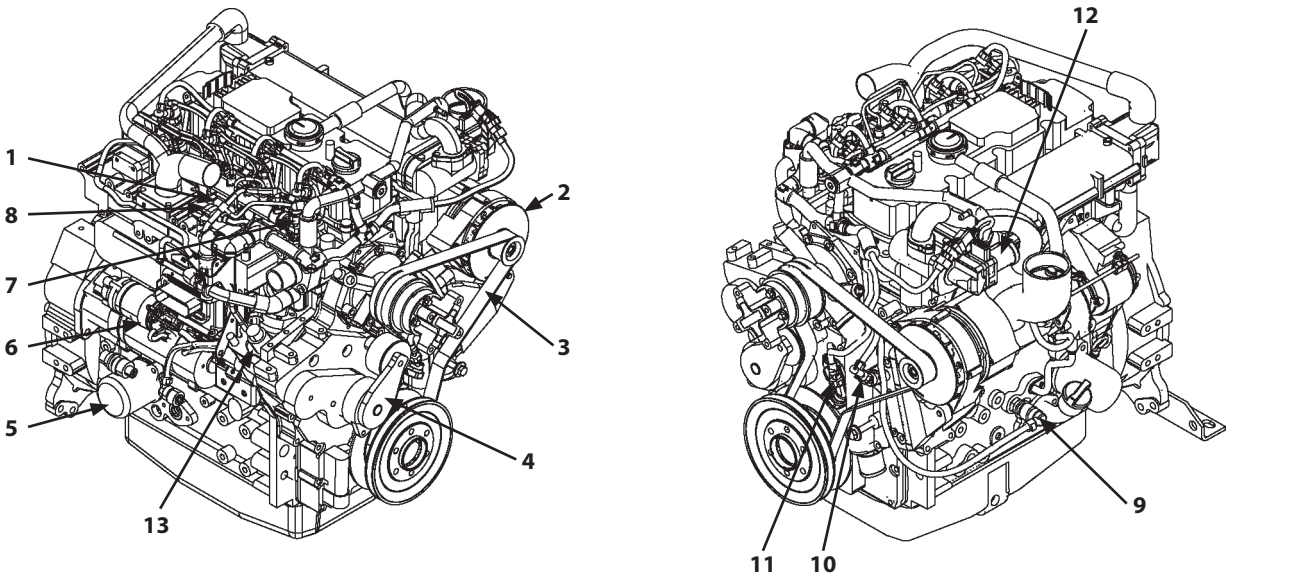


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Engine



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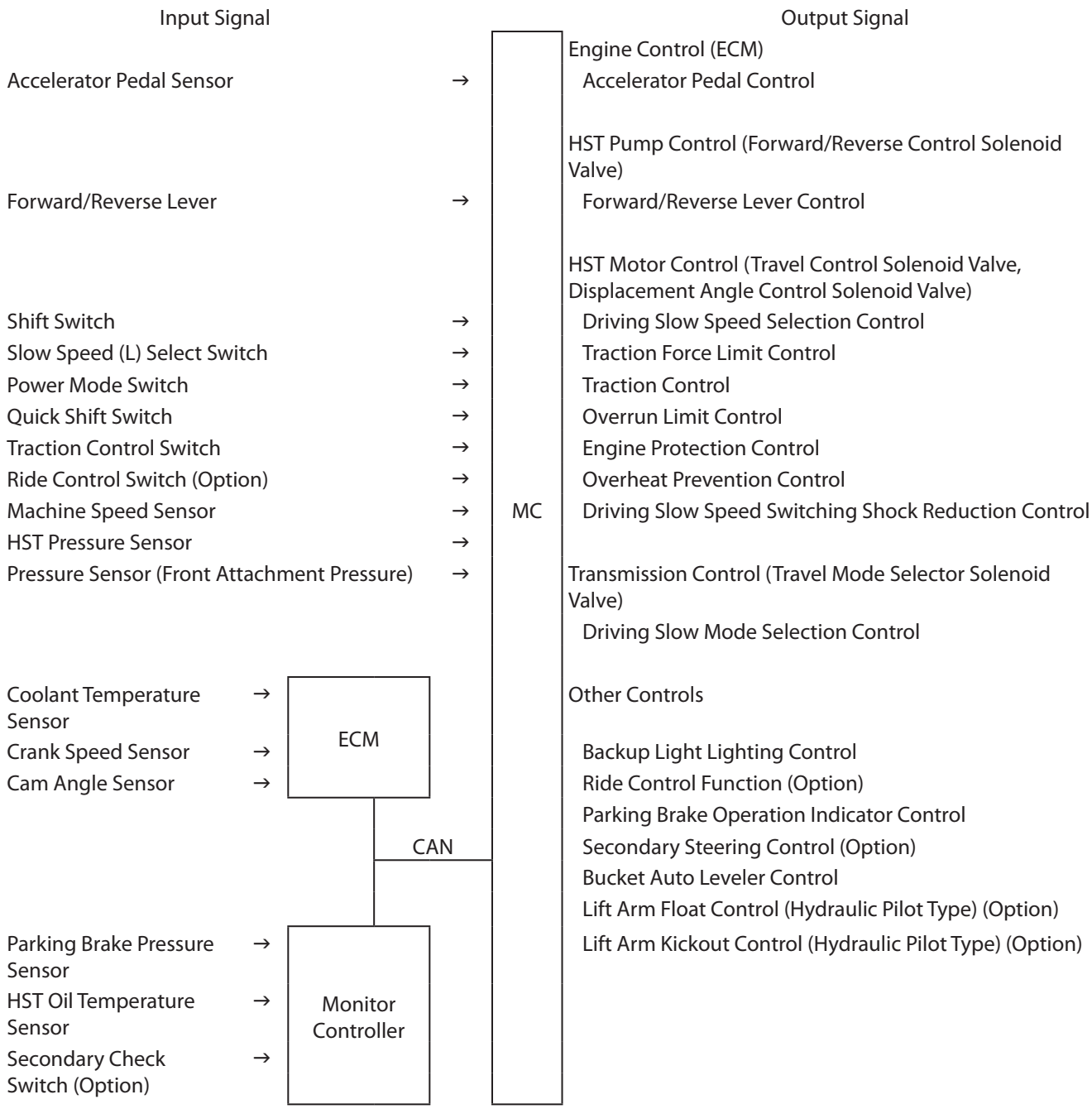
1- Common Rail Pressure Sensor
2- Alternator
3- Fan Belt
4- Auto Tension Pulley
5- Engine Oil Filter
6- Starter
7- Coolant Temperature Sensor
8- Boost Pressure/Boost Temperature Sensor
9- Engine Oil Pressure Sensor
10- Cam Angle Sensor
11- Crank Speed Sensor
12- EGR Valve
13- Supply Pump

Engine

COOLING SYSTEM	Cooling Fan	Dia. 510 mm (20 in), 7 Blades, Hybrid
	Thermostat	Cracking Temperature at Atmospheric Pressure : 88 °C (190 °F)
		Full Open 95 °C (203 °F)
LUBRICATION SYSTEM	Lubrication Pump Type	Trochoid Pump
	Oil Filter	Full-Flow Paper Element Type
	Oil Cooler	Water Cooled Integral Type
STARTING SYSTEM	Motor	Magnetic Pinion Shift Reduction Type
	Voltage/Output	24 V/4.0 kW
PREHEAT SYSTEM	Preheating Method	Glow Plug Type
ENGINE STOP SYSTEM	Stop Method	Fuel Shut-Off (Electronic Control)
ALTERNATOR	Type	AC Type
	Voltage/Output	24 V/80 A
SUPERCHARGING SYSTEM	Type	Exhaust-Turbocharger Type, Forced Lubrication
FUEL SYSTEM	Type	Common Rail Type
	Governor	Electronic All Speed Control
	Injection Nozzle	Electrical Multi-Hole Injector

Electrical Component

ENGINE OIL PRESSURE SENSOR	Operating Pressure	48 kPa (0.5 kgf/cm^2, 7.0 psi)
COOLANT TEMPERATURE SENSOR	Operating Temperature	-10 to 110 °C (14 to 230 °F)
FUEL LEVEL SENSOR	Resistance Value	Empty : 90 $^{+10}_{0}$ Ω, Full : 10 $^{0}_{-4}$ Ω
HYDRAULIC OIL TEMPERATURE SENSOR	Operating Temperature	-30 to 120 °C (-22 to 248 °F)
BATTERY RELAY	Voltage/Current	24 V/100 A
PREHEAT RELAY 2	Voltage/Current	24 V/100 A


Input Signal
Output Signal
Engine Control (ECM)
Accelerator Pedal Sensor →
Accelerator Pedal Control
HST Pump Control (Forward/Reverse Control Solenoid Valve)
Forward/Reverse Lever →
Forward/Reverse Lever Control
HST Motor Control (Travel Control Solenoid Valve, Displacement Angle Control Solenoid Valve)
Shift Switch →
Driving Slow Speed Selection Control
Slow Speed (L) Select Switch →
Traction Force Limit Control
Power Mode Switch →
Traction Control
Quick Shift Switch →
Overrun Limit Control
Traction Control Switch →
Engine Protection Control
Ride Control Switch (Option) →
Overheat Prevention Control
Machine Speed Sensor →
MC
Driving Slow Speed Switching Shock Reduction Control
HST Pressure Sensor →
Pressure Sensor (Front Attachment Pressure) →
Transmission Control (Travel Mode Selector Solenoid Valve)
Driving Slow Mode Selection Control
Coolant Temperature Sensor →
ECM
Other Controls
Crank Speed Sensor →
Backup Light Lighting Control
Cam Angle Sensor →
Ride Control Function (Option)
Parking Brake Operation Indicator Control
CAN
Secondary Steering Control (Option)
Bucket Auto Leveler Control
Lift Arm Float Control (Hydraulic Pilot Type) (Option)
Parking Brake Pressure Sensor →
Lift Arm Kickout Control (Hydraulic Pilot Type) (Option)
HST Oil Temperature Sensor →
Monitor Controller
Secondary Check Switch (Option) →

- Forward/Reverse Lever Reverse (R) Position

Operation:

1. When forward/reverse lever (1) is set in the reverse (R) position (f), current flows from terminal R in forward/reverse lever (1) to MC (2).

2. MC (2) activates reverse side solenoid valve (3) of forward/reverse control solenoid valve (4) of HST pump (10).

3. Pressure oil from HST charge pump (7) is routed to the spring chamber of displacement angle control cylinder (8) on reverse side of HST pump (10) through reverse side solenoid valve (3).

4. Pressure oil ed from HST pump (10) flows to port B (h) in the HST motor through y port A and rotates the HST motor in reverse.

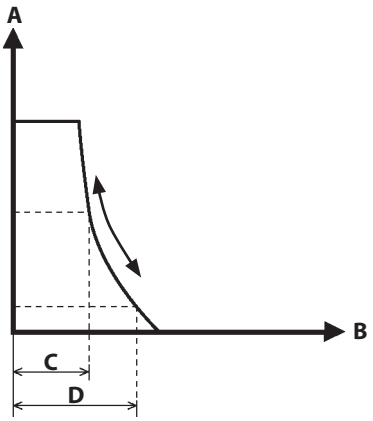
Driving Slow Speed Selection Control (only Cab Spec. Machine)

Purpose:
Machine speed in slow-speed driving is optimized.

IMPORTANT: This control functions when shift switch (3) is set in slow position (4) while driving forward.

Operation:

1. Slow Speed (L) Select Switch (5) sends voltage signal according to the rotation angle to MC (6).
2. MC (6) calculates the machine speed according to the voltage signals sent from machine speed sensor (1) and slow speed (L) select switch (5).
3. MC (6) activates displacement angle control solenoid valve (7) according to the machine speed.
4. Pressure oil from HST motor (8) is routed to displacement angle control cylinder (9) of HST motor (8) through displacement angle control solenoid valve (7).
5. Displacement angle control cylinder (9) sets HST motor (8) to the displacement angle according to the machine speed.
6. Consequently, the rotation speed of HST motor (8) is changed to the selected speed of slow (L) driving speed limit switch (5) while driving in slow speed.



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A- HST Motor Displacement Angle
B- Machine Speed
C- 7 km/h (4.3 mph)
D- 11.5 km/h (7 mph)

Overheat Prevention Control

Purpose:
When the coolant temperature and HST oil temperature rise abnormally, the overheat prevention control prevents abnormal rise of coolant temperature by limiting minimum displacement angle of HST motor (6), reducing HST motor (6) speed and reducing the machine speed.

Operation:

1. ECM (2) receives the signals from coolant temperature sensor (1).
2. ECM (2) sends the coolant temperature signals to MC (4) by using CAN communication (3).
3. Signals from HST oil temperature sensor (9) is sent to monitor controller (8).
4. Monitor controller (8) sends HST oil temperature signals to MC (4) by using CAN communication (3).
5. MC (4) activates displacement angle control solenoid valve (5) by calculating the displacement angle of HST motor (6).
6. Pressure oil from HST motor (6) is routed to displacement angle control cylinder (7) of HST motor (6) through displacement angle control solenoid valve (5).
7. Displacement angle control cylinder (7) increases displacement angle of HST motor (6).
8. Therefore, the rotation speed of HST motor (6) is decreased and the machine speed is decelerated.
9. As the HST pump speed is also decreased and engine load is decreased, rise of the coolant and HST oil temperature is reduced.

Slow Speed Selection by using Quick Shift Switch (4)

Operation:

1. When quick shift switch (4) is pushed with shift switch (2) is in Hi position and the machine speed is 10 km/h (6.2 mph) or lower, MC (3) activates travel mode selector solenoid valve (7).

2. Pressure oil flowing from brake/transmission pump (a) is routed to travel mode selector valve (9) through drive mode selection solenoid valve (7), thus travel mode selector valve (9) is sifted.

3. Pressure oil flowing from brake/transmission pump (a) is routed to clutch slow speed side (6) through drive mode selection valve (9), the clutch is shifted to the slow speed.

4. When quick shift switch (4) is pushed again, MC (3) deactivates drive mode selection solenoid valve (7).

5. Drive mode selection valve (9) is shifted by spring (8).

6. Pressure oil flowing from brake/transmission pump (a) is routed to clutch high speed side (10) through drive mode selection valve (9), the clutch is shifted to the high speed.

Secondary Steering Control (Option)

Purpose:
When hydraulic pressure oil cannot be supplied to the steering circuit due to the engine fault, the steering operation cannot be made.
The secondary steering control activates secondary steering pump (8) for a while, and makes the steering operation possible.

IMPORTANT: Large capacity of electricity is required in order to operate secondary steering pump (8). Check secondary steering pump (8) within 1 or 2 seconds.

- Operation of secondary steering pump (8) by operating secondary steering check switch (6) (option)

Operation:

1. When secondary steering check switch (6) is set to the ON position, current from terminal #1-33 in monitor controller (4) flows to the ground circuit through secondary steering check switch (6).

2. Monitor controller (4) connects the ground circuit of secondary steering pump relay (5) while current flows from terminal #1-33 in monitor controller (4) to the ground circuit, thus secondary steering pump relay (5) is excited continuously.

3. Monitor controller (4) lights the secondary steering indicator while secondary steering pump relay (5) is excited.

4. Current from battery (a) flows to secondary steering motor (7) through secondary steering pump relay (5) and operates secondary steering pump (8).

5. Pressure oil from secondary steering pump (8) is supplied to steering circuit (b) and makes the steering operation possible for a while.

Lift Arm Kickout Control (Hydraulic Pilot Type) (Option)

Purpose:
The lift arm kickout control automatically stops raising the lift arm at any height when returning the lift arm to the highest position.

Operation:

1. Plate (3) is located in front of lift arm proximity switch (2) when the bucket is lowered. While plate (3) passes by lift arm proximity switch (2), lift arm proximity switch (2) is turned ON.
2. Kickout relay (8) (coil side) is connected to the ground through lift arm proximity switch (2). Then, kickout relay (8) turns ON.
3. Coil (5) on the lift arm raise side is connected to the ground through kickout relay (8) (contact side).
4. Current from battery (a) flows to coil (5) on the lift arm raise side and excites coil (5) on the lift arm raise side.
5. When the lift arm control lever is moved farther than the lift arm raise detent position (position to move farther than the raise position), the lift arm control lever is held by coil (5) on the lift arm raise side and pressure oil from pilot valve (4) moves lift arm spool (7) in control valve (6).
6. Pressure oil from main pump (e) flows to the bottom side of lift arm cylinder (1) through lift arm spool (7) in control valve (6) and raise the lift arm.
7. At the same time, plate (3) passes by lift arm proximity switch (2).
8. When plate (3) becomes distant from lift arm proximity switch (2), lift arm proximity switch (2) is turned OFF, kickout relay (8) (coil side) is disconnect from the ground, and kickout relay (8) is turned OFF.
9. As coil (5) on the lift arm raise side is disconnected from the ground, it turned OFF.
10. Therefore, the lift arm control lever is returned to neutral (N) position (c). As lift arm spool (7) in control valve (6) also returns to neutral position (c), lift arm cylinder (1) stops.
11. Consequently, the lift arm raising operation is stopped automatically.

Fuel Injection Timing Control

Purpose:
The fuel injection timing control calculates the best fuel injection timing.

Operation:
1. ECM calculates the fuel injection timing according to the engine speed and fuel injection amount.
2. ECM turns two-way valve (2) in the injector ON/OFF according to fuel injection timing.

Fuel Injection Rate Control

Purpose:
The fuel injection rate control improves combustion in the engine cylinder.

Operation:
1. The injector injects small amount of fuel (pilot injection) first and ignites.
2. After igniting, the injector makes secondary injection (main injection).
3. ECM controls fuel injection timing and fuel injection amount by turning two-way valve (2) in the injector ON/OFF.

Operation of Fuel Injection:
1. Fuel pressure is always applied to nozzle (6) in the injector.
2. When turning electromagnetic coil (9) in two-way valve (2) ON, high-pressure fuel in control chamber (5) returns to the fuel tank through orifice A (4).
3. Therefore, hydraulic piston (10) is raised and nozzle (6) is opened so that the injection starts.
4. When turning electromagnetic coil (9) in two-way valve (2) OFF, valve (8) is closed and the circuit to the fuel tank is closed. High-pressure fuel from the common rail flows to control chamber (5) through orifice B (12).
5. Therefore, when high-pressure fuel flows to control chamber (5), hydraulic piston (10) is lowered by the pressure difference due to movement of hydraulic piston (10). As nozzle (6) is closed, the injection stops.

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Steering Stop Circuit (When steering cylinder is at stroke end)

1. Pressurized oil which flows from port P in steering valve (4) to greater (6) is divided in steering spool (14) and is routed to port LS2 through port LS and orifice 3 (8) in priority valve (10).

2. When steering cylinder (5) reaches the stroke end, the pressure at port LS 2 in priority valve (10) also increases due to pressurized oil flowing from main pump (1) through port LS.

3. When the pressure at port LS2 exceeds the specified level, relief valve (12) in priority valve (10) is operated and pressurized oil routed to port LS2 flows from relief valve (12) to hydraulic oil tank (13).

4. Therefore, the pressure difference between port LS1 and port LS2 occurs due to orifice 2 (9).

5. Therefore, priority spool (2) in priority valve (10) is moved to the left and pressurized oil from main pump (1) flows to control valve (3).

- Combined operation of steering and lift arm raise:

NOTE: The lift arm raise operation when turning the steering wheel (right) is explained here.

1. When steering wheel (4) is rotated right, pressurized oil (CF) from priority valve (3) is supplied to steering valve (5). At the same time, other pressurized oil is supplied to control valve (9) from port EF. (Refer to Priority Valve Circuit (When steering is in neutral).)

2. Pressurized oil from port CF in priority valve (3) flows to steering spool (7) through load check valve (8) in steering valve (5).

3. Pressurized oil flowing to steering spool (7) moves steering cylinders (6) and the machine turns right. (Refer to Steering Circuit.)

4. Lift arm spool (13) in control valve (9) is shifted when the front attachment control lever is set to lift arm raise operation.

5. Pressurized oil port EF in priority valve (3) flows to lift arm spool (13) through load check valve (14) in control valve (9).

6. Pressurized oil flowing to lift arm spool (13) moves lift arm cylinders (11) and raises the lift arm.

7. Therefore, steering (right) operation and lift arm raise operation are simultaneously made.

Inching Circuit

1. When depressing brake pedal (7), declutch valve (6) is activated and pressurized oil from DA valve (3) flows to hydraulic oil tank (5).

2. Therefore, the displacement angle control pressure of HST pump (1) decreases and displacement angle control cylinder (4) returns to the neutral position.

3. Consequently, the displacement angle of HST pump (1) is changed to the neutral position and the delivery flow rate of HST pump (1) decreases.

4. As the delivery flow rate HST pump (1) decreases, the rotation speed of the HST motor decreases and the machine speed is decelerated.

5. The displacement angle control pressure of HST pump (1) is changed according to the depressing amount of brake pedal (7).
   When brake pedal (7) is depressed fully, the displacement angle of HST pump (1) is in the neutral position.

Parking Brake Circuit

NOTE: When parking brake solenoid valve (13) is ON, parking brake (12) is released. When parking brake solenoid valve (13) is OFF, parking brake (12) is applied. (Refer to Electrical System.)

- Circuit with parking brake (12) released:

1. Pressurized oil from brake/transmission pump (1) is routed to parking brake solenoid valve (13).

2. When the parking brake switch is turned OFF (release), parking brake solenoid valve (13) is turned ON and the spool of parking brake solenoid valve (13) is moved.

3. Pressurized oil from brake/transmission pump (1) compresses the spring of parking brake (12) in transmission (11) through parking brake solenoid valve (13) so that parking brake (12) is released.

Electric Power Circuit (Key Switch: OFF)

The battery (2) minus terminal is grounded to the body.
Current from the battery (1) plus terminal flows as shown below when key switch (1) is in the OFF position.

Battery (2)	Fusible Link A (4)	Key Switch (1) Terminal B		
		Fuse Box A(5)	Terminal #4	Fuel Pump Relay (Power) (6)
			Terminal #5	Horn Relay (Power) (7)
			Terminal #6	Flasher (Power) (8)
				Hazard Light Switch (9)
			Terminal #7	Load Dump Relay (Power) (22)
				Communication Terminal (Power) (10)
				ICF (C1) (Power) (11)
				ICF (C2) (Power) (12)
				Option (13)
				Monitor Controller (Backup Power) (14)
			Terminal #8	ECM (Power) (21)
			Terminal #17	Light Switch (15)
			Terminal #18	Option 1 (16)
		Fuse Box B (17)	Terminal #11	Radio (Power) (18)
				Cab Light (Power) (19)
				Tachograph (Power) (20)

Engine Starting Circuit (Key Switch: START)

IMPORTANT: ECM receives the forward/reverse lever position signal from MC by using CAN communication.

Forward/Reverse Lever at Neutral Position

1. When key switch (1) is set to the START position, terminal B (2) is connected to terminals M (3) and ST (4) in key switch (1).

2. Current from terminal M (3) flows through fuse #13 of fuse box A (10) and excites battery relay (6). The battery power from battery relay (6) is routed to the relay contact in starter motor (9) through starter relay 1 (8).

3. At the same time, current from fuse #14 of fuse box A (10) flow to terminal K88 in ECM (11) and the key ON signal is sent to ECM (11).

4. ECM (11) receives the forward/reverse lever neutral position signal from MC (12) by using CAN communication (13). Then, ECM (11) connects terminal K73 in ECM (11) to the ground circuit.

5. Current from terminal ST (4) flows to terminal K35 in ECM (11) and the start signal is sent.

6. Current from terminal K28 in ECM (11) flows to the coil in starter relay 1 (8) and starter relay 1 (8) is turned ON.

7. Therefore, current from starter relay 1 (8) also flows to starter motor (9).

8. Consequently, the relay in starter motor (9) is turned ON and starter motor (9) rotates.

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Pilot Shut-Off Circuit (Key Switch: ON) (Hydraulic Operated Type) (Option)

- Control Level Lock Switch (9): ON (Lock) Position

1. When key switch (1) is in the ON position, current from battery relay (3) flows to pilot shut-off relay (7) through fusible link (100 A) (5), fuse #15 of fuse box A (6).

2. When control lever lock switch (9) is in the ON (lock) position, terminals #2 and #4 are connected inside control lever lock switch (9).

3. Pilot shut-off relay (7) (coil side) is connected to the ground through control lever lock switch (9). Then, pilot shut-off relay (7) is excited.

4. Current which flows to pilot shut-off solenoid valve (8) from pilot shut-off relay (7) (contact side) stops flowing. Then, pilot shut-off solenoid valve (8) is turned OFF.

5. Therefore, pressure oil which flows to the pilot valve from the HST charging pump is blocked by pilot shut-off solenoid valve (8).

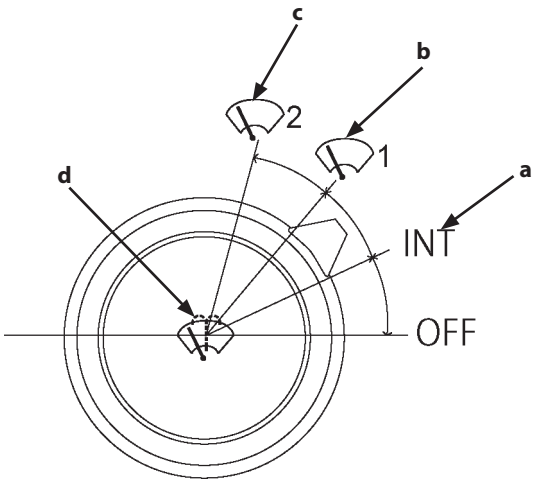
6. Consequently, pressure oil from the HST charging pump is not supplied to the pilot valve. (Refer to Hydraulic System.)

7. Current from fuse #11 of fuse box A (6) flow to terminals #8 and #9 in control lever lock switch (9) and turn on the indicators of control lever lock switch (9).

Front Wiper Circuit (Front Wiper Switch (6)): Fast)

1. When front wiper switch (6) is set to fast position (c), monitor controller (8) turns ON wiper relay (F) 1 (3) and wiper relay (F) 2 (2).

2. Current from fuse #3 of fuse box B (7) flow to wiper motor (F) (1) and the front wiper is operated at fast speed.



MNEC-01-076

Front Wiper Switch

a- INT. Position
b- Slow Position
c- Fast Position
d- Washer Switch

Cab Light Circuit

Front Cab Light Circuit

1. When front cab light switch (3) is set to neutral position (4), front cab light (2) is connected to the ground through door open/close switch (6).
2. When the cab door is opened, door open/close switch (6) is turned ON. Current from fuse #11 of fuse box B (1) flow to front cab light (2) and turns on front cab light (2).
3. When the cab door is closed, door open/close switch (6) is turned OFF. Door open/close switch (6) is disconnected from the ground and cab light (2) is tuned off.
4. When front cab light switch (3) is set to ON position (5), front cab light (2) is connected to the ground.
5. Current from fuse #11 of fuse box B (1) flow to front cab light (2) and turns on cab light (2).

Rear Cab Light Circuit

1. When rear cab light switch (8) is set to the ON position, rear cab light (7) is connected to the ground.
2. Current from fuse #11 of fuse box B (1) flow to rear cab light (7) and turns on rear cab light (7).

Work Light Circuit

1. When key switch (1) is set to the ON position, terminal B (2) is connected to terminal M (3) in key switch (1).

2. Current from terminal M (3) flows through fuse #13 of fuse box A (8) and excites battery relay (5).

3. Current from battery (4) flows to light switch (10) through battery relay (5), fusible link (A) (6), fuse #17 of fuse box A (8).

4. When light switch (10) is set to the S position or H position, current flows to work light switch (13) from light switch (10) and turns on switch light (20) of work light switch (13).

5. When front work light position (14) of work light switch (13) is pushed, terminals #1 and #2 are connected inside work light switch (13).

6. Current from terminal #2 of work light switch (13) flows to front work light relay (16) and excites it.

7. Current from fuse #5 of fuse box B (9) flows to front work lights (17, 18) through front work light relay (16) and turns on front work lights (17, 18).

8. At the same time, current from fuse #5 of fuse box B (9) flows to monitor controller (19) and turns on the work light indicator.

Hazard Light Circuit

1. Current from battery (2) flows to flasher (6), turn signal light relay (R) (14) (contact side), and turn signal light relay (L) (15) (contact side) through fusible link A (4), and fuse #6 of fuse box A (5).

2. In addition, current from fuse #6 of fuse box A (5) flows to hazard light switch (7).

3. When light switch (11) is set to S position (12) or H position (13), current flows to hazard light switch (7) from light switch (11) and turns on switch light 1 (9) of hazard light switch (7).

4. When hazard light switch (7) is set to ON position (8), current from hazard light switch (7) flows to turn signal light relay (R) (14) (coil side) and turn signal light relay (L) (15) (coil side). Then, turn signal light relay (R) (14) and turn signal light relay (L) (15) are excited respectively.

5. Current from flasher (6) flows to turn signal light relay (R) (14) and turn signal light relay (L) (15) respectively.

6. Current from turn signal light relay (L) (15) flows to turn signal lights (18, 19).

7. Current from turn signal light relay (R) (14) flows to turn signal lights (16, 17).

8. At the same time, current flows to hazard light switch (7) from turn signal light relay (R) (14) and turns on switch light 2 (10) of hazard light switch (7).

9. As current from flasher (6) flows intermittently, turn signal lights blink.

10. At the same time, current from flasher (6) flows to monitor controller (20) and the left-turn signal light indicator and right-turn signal light indicator blink.

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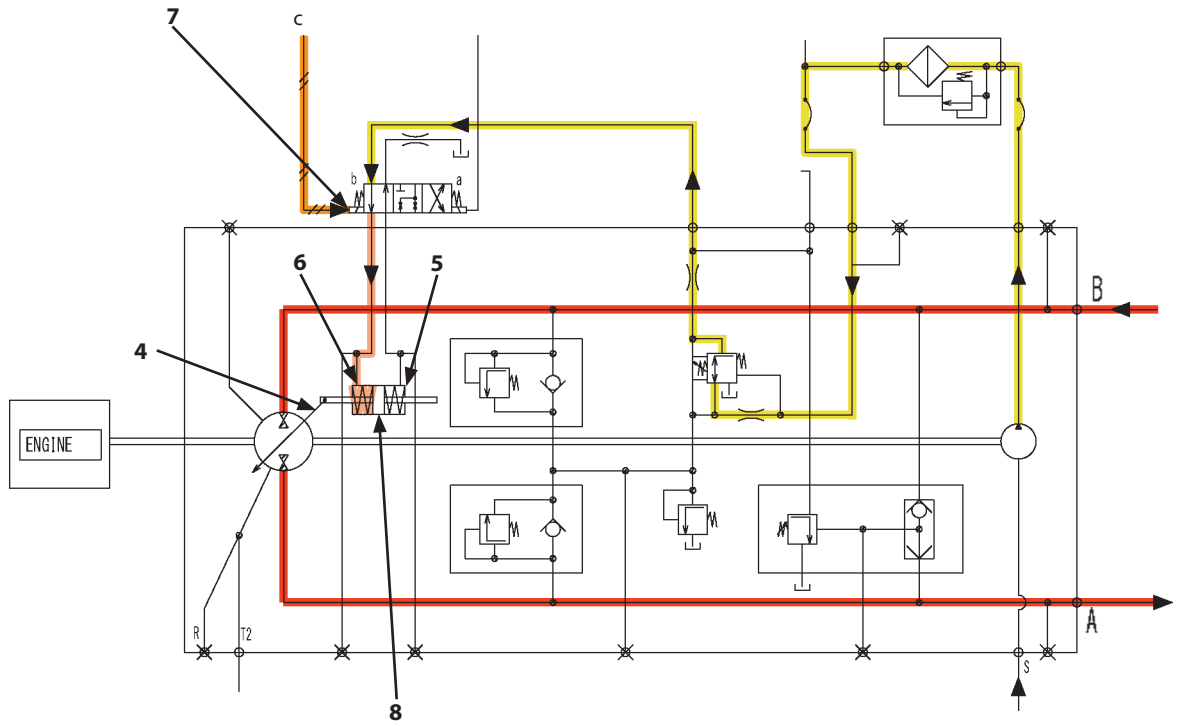
Reverse:

1. Pressurized oil from forward/reverse control solenoid valve (7) flows to chamber B (6) in the displacement angle control cylinder.

2. Servo piston (8) moves and changes the displacement angle of swash plate (4) to the reverse position.

3. The HST pump delivers pressurized oil from port A.

4. As servo piston (8) has moved, pressurized oil from chamber A (5) of the displacement angle control cylinder returns to the hydraulic oil tank through the return circuit of forward/reverse control solenoid valve (7).



T4FJ-03-01-017

1- Shaft
2- Plunger
3- Cylinder Block
4- Swash Plate
5- Chamber A
6- Chamber B
7- Forward/Reverse Control Solenoid Valve
8- Servo Piston

High-Pressure Relief Valve

The high pressure relief valve regulates the maximum pressure of the travel circuit and protects the circuit on the high-pressure side. In addition, it has the make-up function for HST charging.
When the pressurized oil flow rate to the suction side circuit is insufficient, pressurized oil from the HST charging pump is routed to the suction side circuit.

Relief Operation

1. Pressure in port HP (travel circuit) is routed to pilot poppet (6) through orifice (9) in piston (8).

2. When pressure in port HP reaches the set pressure of spring C (4), pilot poppet (6) is opened. Pressurized oil flows to passage (5) and flows to port LP (hydraulic oil tank) through the external circumference of main poppet (3).

3. At this time, a pressure difference is caused between port HP and spring chamber (7) due to orifice (9).

4. When this pressure difference reaches the set pressure of spring A (2) and spring B (1), piston (8) and main poppet (3) are opened and pressurized oil in port HP flows to port LP.

5. Consequently, the pressure in the travel circuit decreases.

6. When the pressure in the travel circuit decreases to the specified pressure, piston (8) and main poppet (3) are closed by the force of spring A (2) and spring B (1).

Hydraulic Circuit

Main Circuit

Pressurized oil from main pump (10) flows to hydraulic oil tank (9) through neutral circuit (11).

Parallel circuit (12) is provided in the main circuit and makes the combined operation possible.

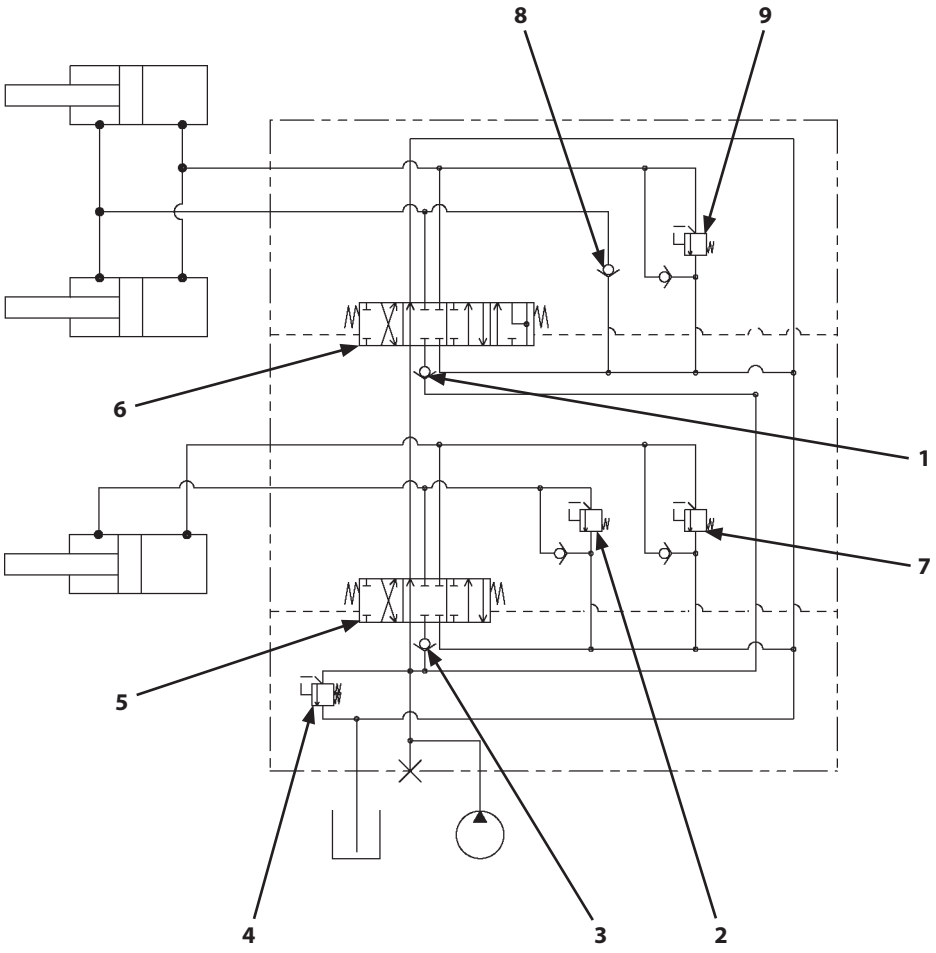
Main relief valve (4) is provided in the main circuit (between pump and actuator).
Main relief valve (4) prevents the pressure in main circuit from exceeding the set pressure when the spool is operated (or when the control lever is operated).

Overload relief valve (2) is provided in the bucket circuit (between control valve and bucket cylinder (7)).
Overload relief valve (2) prevents surge pressure caused by external force in the bucket circuit from exceeding the set pressure when bucket spool (5) is in neutral (with the control lever set in neutral).

The spool in the control valve is operated by operating the control lever.

NOTE: Lift arm spool (6) in the lift arm circuit has two stage functions. First stage function is lift arm lower (a) and second stage function is lift arm float (b).

Control Valve Hydraulic Diagram



TNCC-03-02-002

Make-Up Operation

1. When pressure in port HP (actuator circuit) decreases lower than pressure in port LP (hydraulic oil tank), sleeve (10) is moved to the right.

2. Hydraulic oil in port LP flows to port HP and cavitation is prevented.

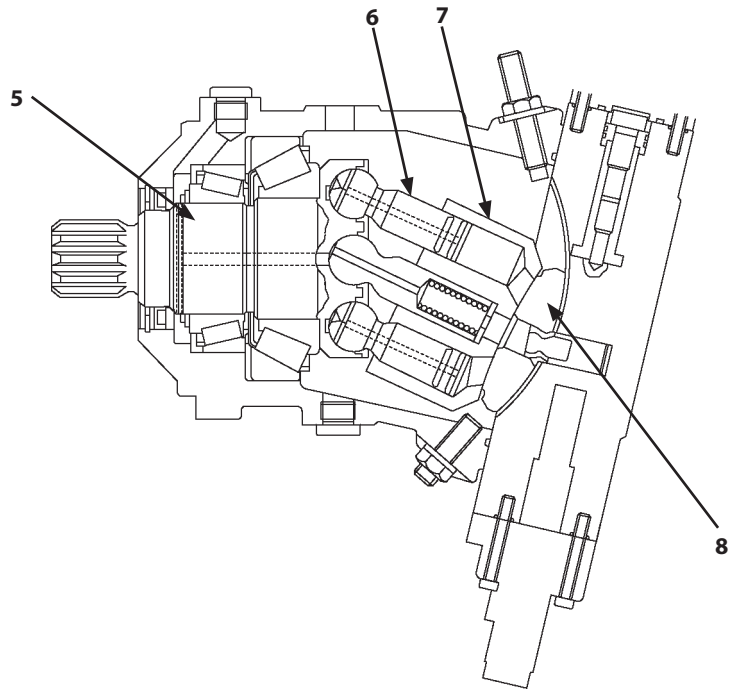
3. When pressure in port HP increases to the specified pressure, sleeve (10) is closed by the force of spring C (7).

(Blank)

Travel Motor

The travel motor is a bent-axis type variable displacement axial plunger motor.
The travel motor consists of valve plate (8), cylinder block (7), plunger (6), and shaft (5).
Shaft (5) and cylinder block (7) are connected by plunger (6).

When pressurized oil is supplied from the HST pump, plunger (6) reciprocates in the cylinder block (7) bore and cylinder block (7) slides on valve plate (8). Then, shaft (5) rotates.



T4FC-03-09-006

5- Shaft
6- Plunger
7- Cylinder Block
8- Valve Plate

Operation

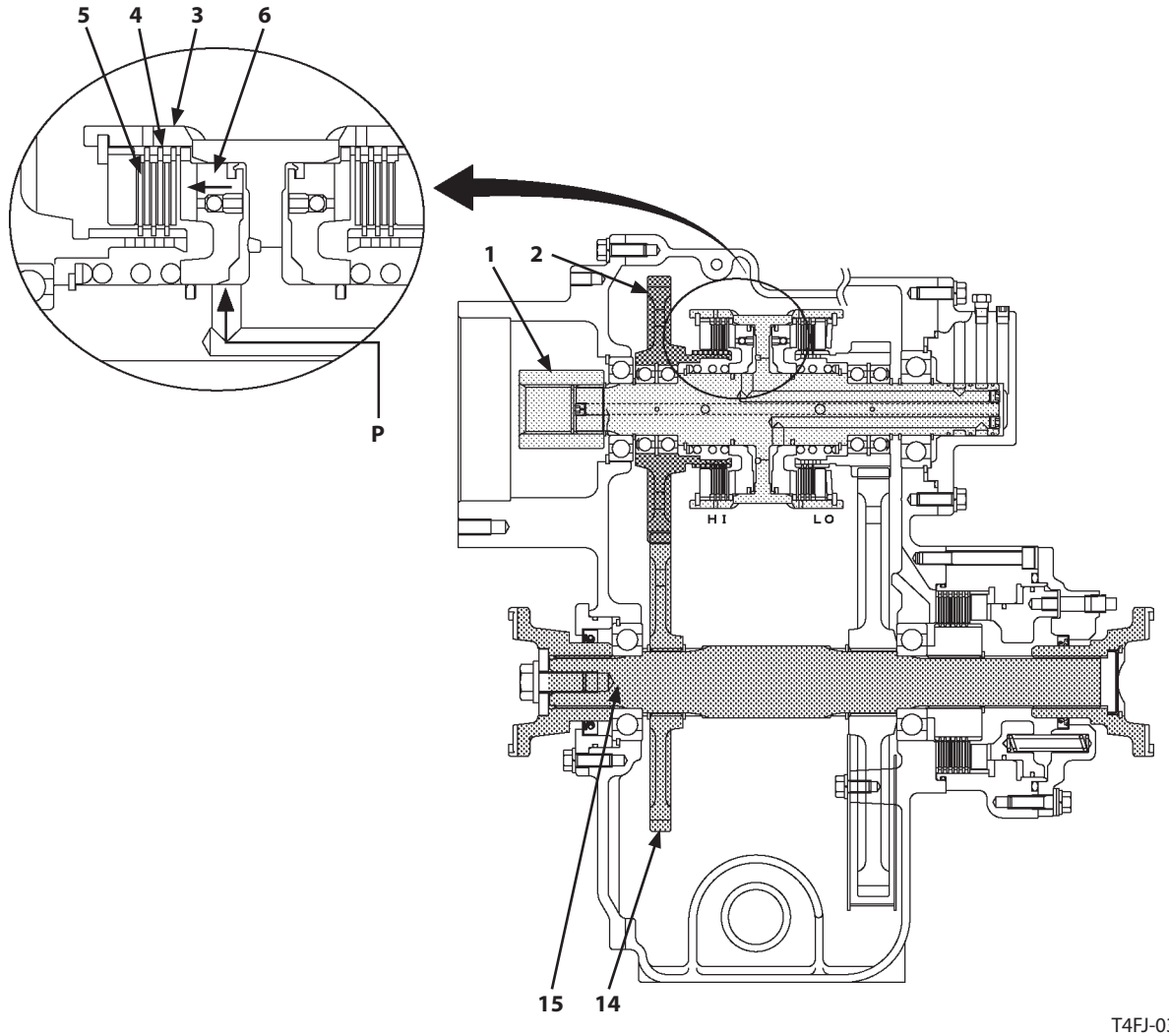
When fast speed mode is selected:

1. When the shift switch is set to the Hi position, pressurized oil (P) is delivered to fast-speed clutch (3). (Refer to SYSTEM / Hydraulic System.)

2. When pressurized oil (P) is delivered, piston (6) is moved to the left and pushes drive plates (4) and clutch discs (5) so that fast-speed clutch (3) is engaged.

3. When fast-speed clutch (3) is engaged, input shaft (1) is connected to fast-speed drive gear (2).

4. Fast-speed driven gear (14) is connected to output shaft (15) by a spline joint. The output power of the HST motor is transmitted to input shaft (1), fast-speed drive gear (2), fast-speed driven gear (14), and output shaft (15) in sequence. Then, output shaft (15) rotates at fast speed.



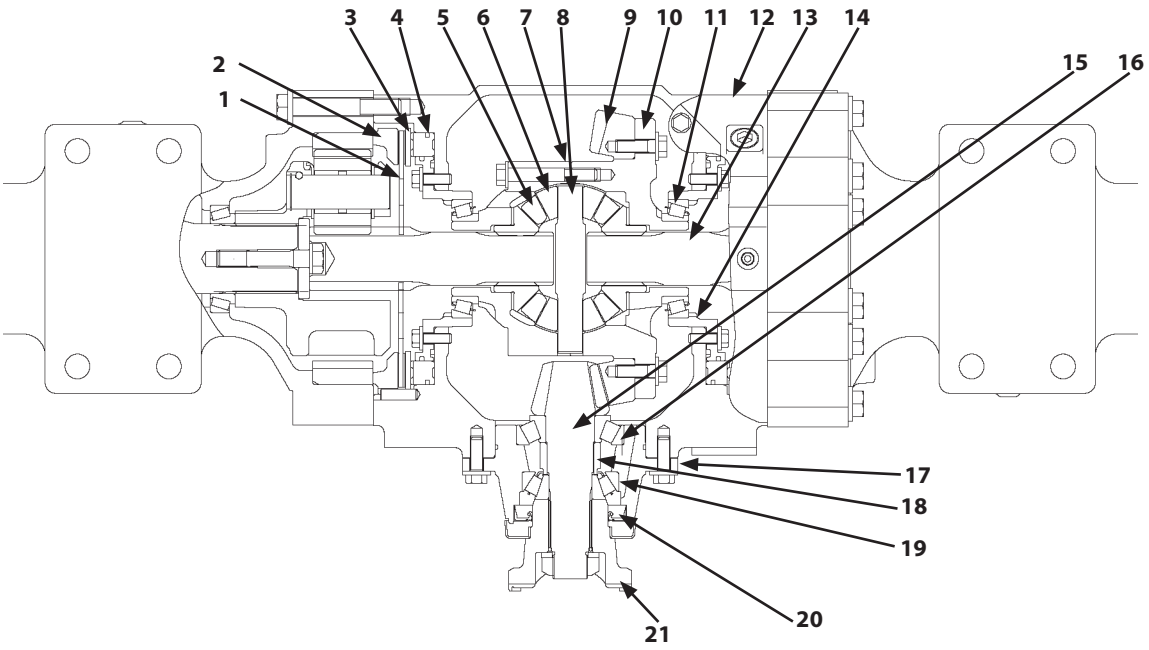
T4FJ-03-06-002

P- Pressurized Oil

1- Input Shaft
2- Fast-Speed Drive Gear
3- Fast-Speed Clutch
4- Drive Plate
5- Clutch Disc
6- Piston
14- Fast-Speed Driven Gear
15- Output Shaft

Differential

The differential enables the left and right drive wheels to rotate at different rotating speeds while steering and traveling on uneven surfaces.



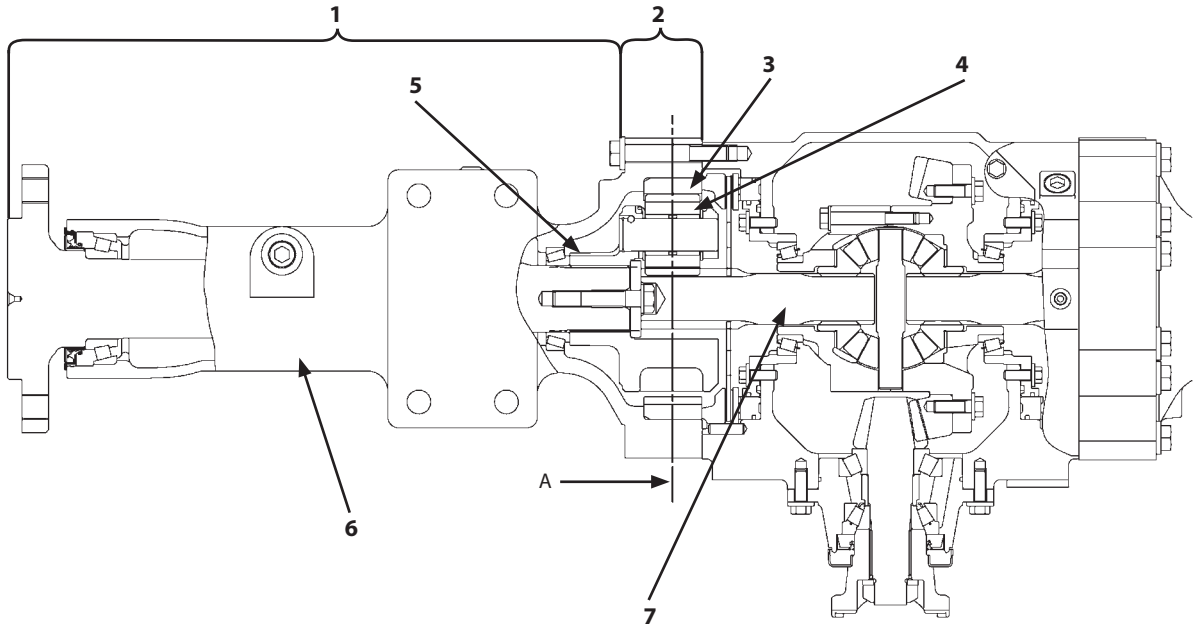
T4FJ-03-07-002

1- Brake Disc
2- End Plate
3- Brake Ring
4- Piston
5- Side Gear
6- Pinion Gear
7- Case B
8- Spider
9- Ring Gear
10- Case A
11- Roller Bearing
12- Differential Body
13- Shaft
14- Bearing Retainer
15- Pinion Shaft
16- Roller Bearing
17- Bearing Cage
18- Spacer
19- Roller Bearing
20- Oil Seal
21- Flange

Final Drive / Axle Shaft

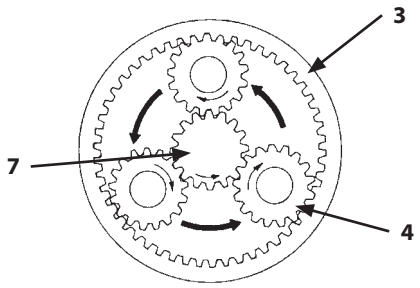
Final drive (2) is the device for finally decreasing the speed in the power transmission system, and of the planetary gear type.
As for power transmission, the power from the differential is transmitted from shaft (7) and rotates three planetary gears (4) in ring gear (3). The rotation of planetary gear (4) is transmitted to axle shaft (1) through planetary carrier (5).

View A



T4FJ-03-07-006

Section A



T4FJ-03-07-007

1- Axle Shaft
2- Final Drive
3- Ring Gear
4- Planetary Gear
5- Planetary Carrier
6- Housing
7- Shaft

Inching Valve (Declutch Valve)

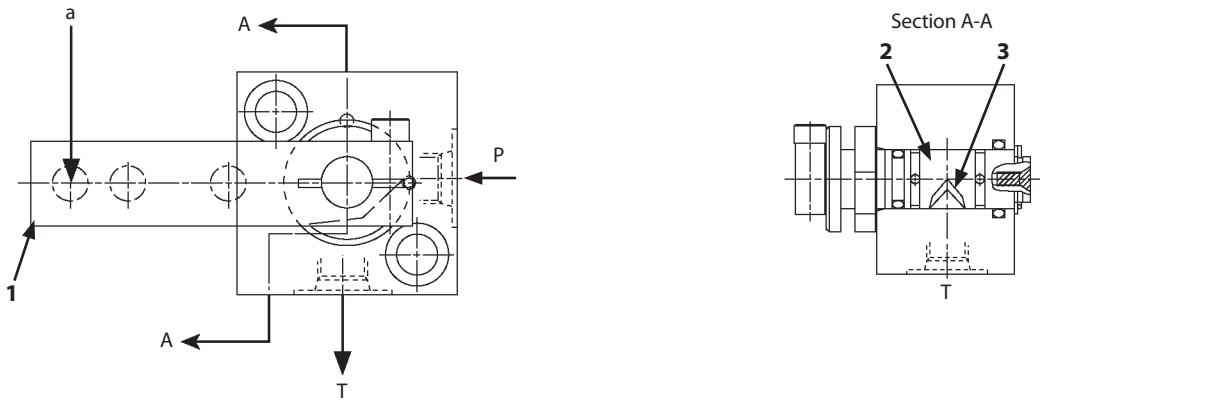
The inching (declutch) valve is operated by brake pedal (a), which rotates the spool, flows HST charge pressure oil to the hydraulic oil tank, decreases the HST pump displacement angle control pressure, and decreases the HST pump delivery flow rate.

1. When brake pedal (a) is stepped on, spool (2) rotates via lever (1) which is in conjunction with brake pedal (a). Pressurized oil from the DA valve flows to port P and flows to the hydraulic oil tank through notch (3) on spool (2) and port T.

2. As the notch (3) size of spool (2) increases according to the brake pedal (a) depressing amount, pressurized oil flow rate flowing to the hydraulic oil tank also increases.

3. Therefore, the HST pump displacement control pressure decreases. As the displacement angle control cylinder moves toward the neutral position, the HST pump rotation speed decreases.

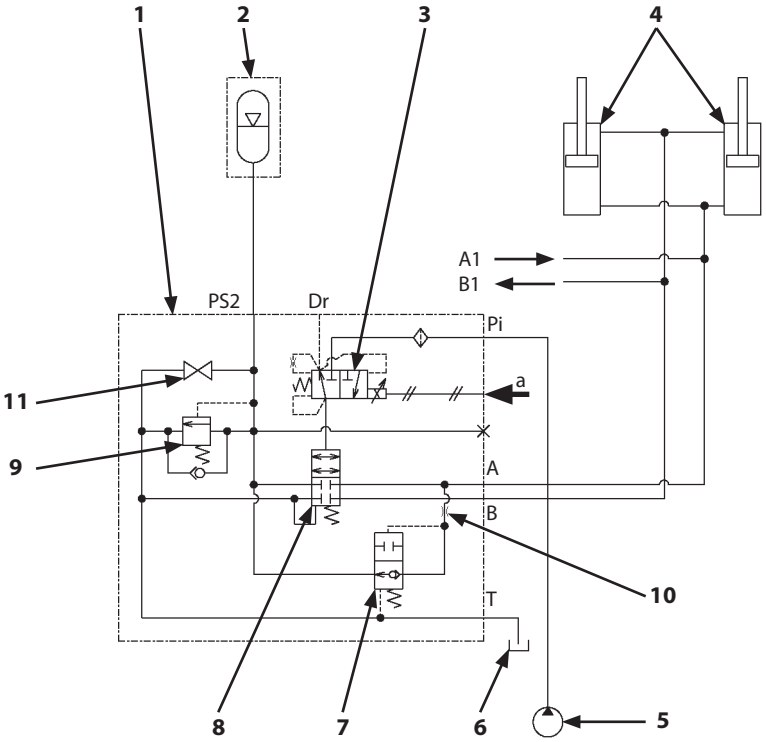
4. Consequently, as pressurized oil flow rate flowing from the HST pump to the HST motor decreases, the HST motor rotation speed decreases.



T4FJ-03-09-001

a-	Brake Pedal	P-	Port P	T-	Port T
1-	Lever	2-	Spool	3-	Notch

Ride Control Hydraulic Circuit



TNDB-03-12-002

A1- Lift Arm Cylinder Bottom Side Circuit
B1- Lift Arm Cylinder Rod Side Circuit

1- Ride Control Valve
2- Ride Control Accumulator
3- Ride Control Solenoid Valve
4- Lift Arm Cylinder

a- ON Signal from MC
A- Port A (from Lift Arm Cylinder Bottom Side)

5- HST Charge Pump
6- Hydraulic Oil Tank
7- Charge-Cut Spool
8- Ride Control Spool

B- Port B (to Lift Arm Cylinder Rod Side)
Pi- Port Pi (Pilot Pressure Oil)

9- Overload Relief Valve
10- Orifice
11- Drain Plug

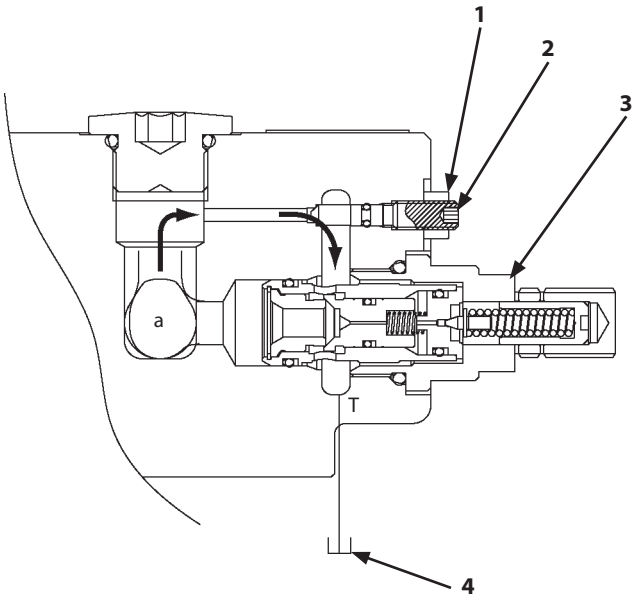
PS2- Port PS2 (to Ride Control Accumulator)
T- Port T (to Hydraulic Oil Tank)

Drain Plug

The ride control valve is provided with drain plug (2) in order to return pressure oil of the ride control accumulator to hydraulic oil tank (4) at the time of maintenance or something.

Pressurized oil from the ride control accumulator flows to hydraulic oil tank (4) by loosening drain plug (2). Therefore, the pressure of ride control accumulator decreases.

CAUTION: Do not loosen drain plug (2) too much as pressurized oil may spout out due to removal of drain plug (2). Do not loosen drain plug (2) more than 2 turns.



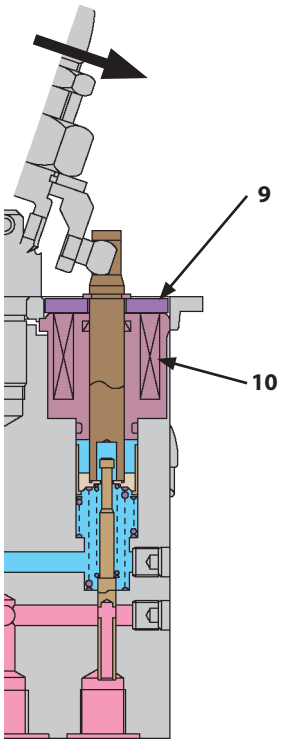
TNDB-03-12-010

a- From Ride Control Accumulator

1- Lock Nut
2- Drain Plug
3- Overload Relief Valve
4- Hydraulic Oil Tank

Electromagnetic Detent

1. The coil for detent is installed in the pilot valve.
2. If the control lever is fully stroked, plate (9) is adsorbed by coil assembly (10).
3. Adsorption condition is retained until coil assembly (10) is unexcited or until adsorption is forcefully cancelled by operating the control lever toward the other direction.



TNED-03-06-007

9- Plate

10- Coil Assembly

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