PART NO. TODCS-EN-00

HITACHI

Reliable solutions

Technical Manual
Operational Principle

ZH
210-5B
210LC-5B
Hybrid Excavator

Service Manual consists of the following separate Part No.

Technical Manual (Operational Principle)	: Vol. No.TODCS-EN
Technical Manual (Troubleshooting)	: Vol. No.TTDCS-EN
Workshop Manual	: Vol. No.WDCS-EN
Engine Manual	: Vol. No.ETDCA-EN, EWDCA-EN

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GENERAL

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Hydraulic Component

PUMP DEVICE	Drive Gear Ratio	Main Pump (P1, P2): 1.03, Main Pump (P3): 1, Pilot Pump: 1.11, Assist Alternator Motor; 1.03
MAIN PUMP	Type	Bent-Axis Type Variable Displacement Axial Plunger Pump
	Theoretical Displacement	118 cm^3/rev (7.2 in^3/rev)×3
	Rated Pressure	34.3 MPa (350 kgf/cm^2, 4980 psi)
REGULATOR	Type	Hydraulic Pressure Operated Type
PILOT PUMP	Type	Fixed Displacement Type Gear Pump
	Model	FS 11/16.8
	Theoretical Displacement	16.8 cm^3/rev (1.0 in^3/rev)
CONTROL VALVE	Type	Pilot Pressure Operated Type (4-Spools + 4-Spools + 4-Spools)
	Main Relief Set-Pressure	Normal: 34.3 MPa (350 kgf/cm^2, 4980 psi) at 80 L/min (21 US gpm)
		Power Digging: 38.0 MPa (388 kgf/cm^2, 5510 psi) at 70 L/min (18 US gpm)
	Overload Relief Set-Pressure	39.2 MPa (400 kgf/cm^2, 5690 psi) at 50 L/min (13.2 US gpm) (Boom, Arm, Bucket)

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Regulator

Regulator (17) controls the main pump flow rate in response to the various command signal pressures so that the pump driving power does not exceed the engine output power. Pump 1, pump 2, and pump 3 are equipped with regulator (17) for each.

The major parts of regulator (17) are spring (1), sleeve A (2), sleeve B (8), spool A (3), spool B (7), piston (4), load piston 1 (5), load piston 2 (6), inner spring (9), maximum pump 1 flow rate limit contorl solenoid valve (19), outer spring (10), pump 1 and 2 torque control solenoid valve (14), maximum pump 2 flow rate limit control solenoid valve (15), maximum pump 3 flow rate limit control solenoid valve (20), and pump 3 torque control solenoid valve (16).

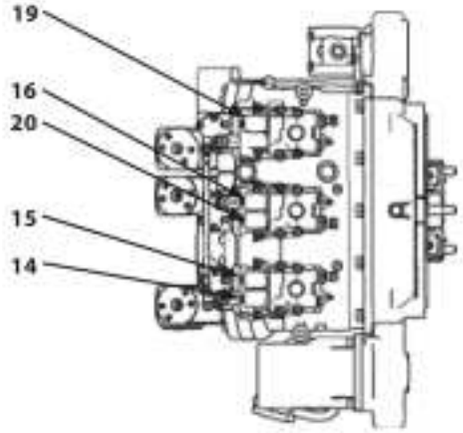
According to the various command signal pressures, regulator (17) opens or closes the circuit to servo piston (11) and the inclination of cylinder block (12) is changed, so that the pump delivery flow rate is controlled.

NOTE: Primary pilot pressure Pg is constantly routed to the small chamber side of servo piston (11).

In addition, each regulator (17) has the following controls.

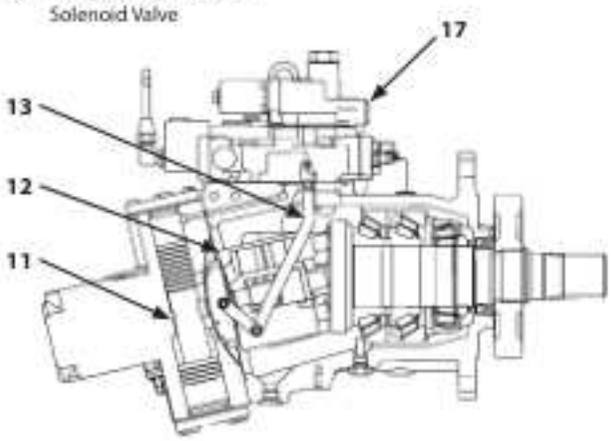
- Regulators for Pump 1 and Pump 2:
  - Control by Pump Control Pressure
  - Control by Own and Partner Pump Delivery Pressure
  - Control by Pilot Pressure from Torque Control Solenoid Valve
  - Control by Pilot Pressure from Maximum Flow Rate Limit Control Solenoid Valve
- Pump 3 Regulator:
  - Control by Pump Control Pressure
  - Control by Own Pump Delivery Pressure
  - Control by Pilot Pressure from Torque Control Solenoid Valve
  - Control by Pilot Pressure from Maximum Flow Rate Limit Control Solenoid Valve

As for each regulator (17), functions are different, but the operational principles are the same. The pump 1 regulator is explained here.



TDCS-03-01-002

14- Pump 1 and 2 Torque Control Solenoid Valve
15- Pump 2 Maximum Flow Rate Limit Control Solenoid Valve
16- Pump 3 Torque Control Solenoid Valve
19- Pump 1 Maximum Flow Rate Limit Control Solenoid Valve
20- Pump 3 Maximum Flow Rate Limit Control Solenoid Valve



TPPP-03-01-003

11- Servo Piston
12- Cylinder Block
13- Link
17- Regulator

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Hybrid System

Outline

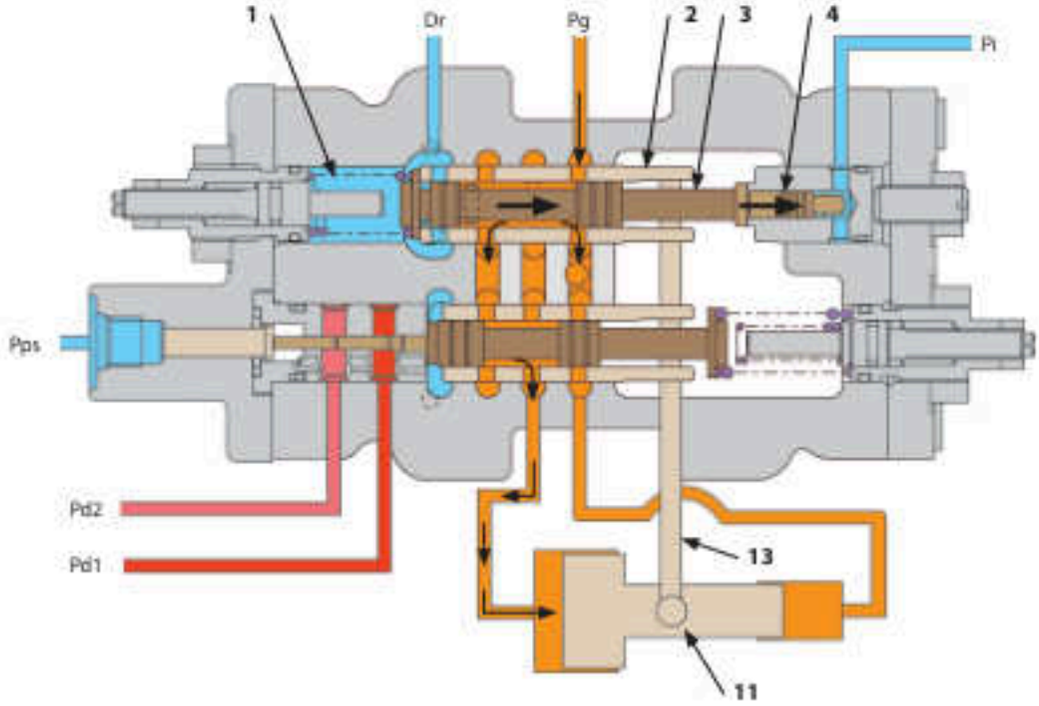
As for this machine, the following components for hybrid are added to the system of the standard hydraulic excavator.

- HCU (Controller for Hybrid System) (40)
- Additional Hydraulic Circuit
  - Swing Pilot Pressure Control Solenoid Valve Unit (44)
  - Swing Control Solenoid Valve Unit (2)
  - Swing Low-Pressure Relief Valve Unit (5) (additionally installed to the swing motor)
  - Swing Pilot Pressure Sensor (45)
  - Swing Main Pressure Sensor (8)
- Electric Component
  - PCU (Power Control Unit) (39)
  - Capacitor Unit (38)
  - Swing Electric Motor (12) (additionally installed to the swing device)
  - Assist Alternator Motor (16) (additionally installed to the pump device)
  - Power Harness
- Cooling System for Hybrid System
  - Pump
  - Radiator
  - Coolant Reservoir

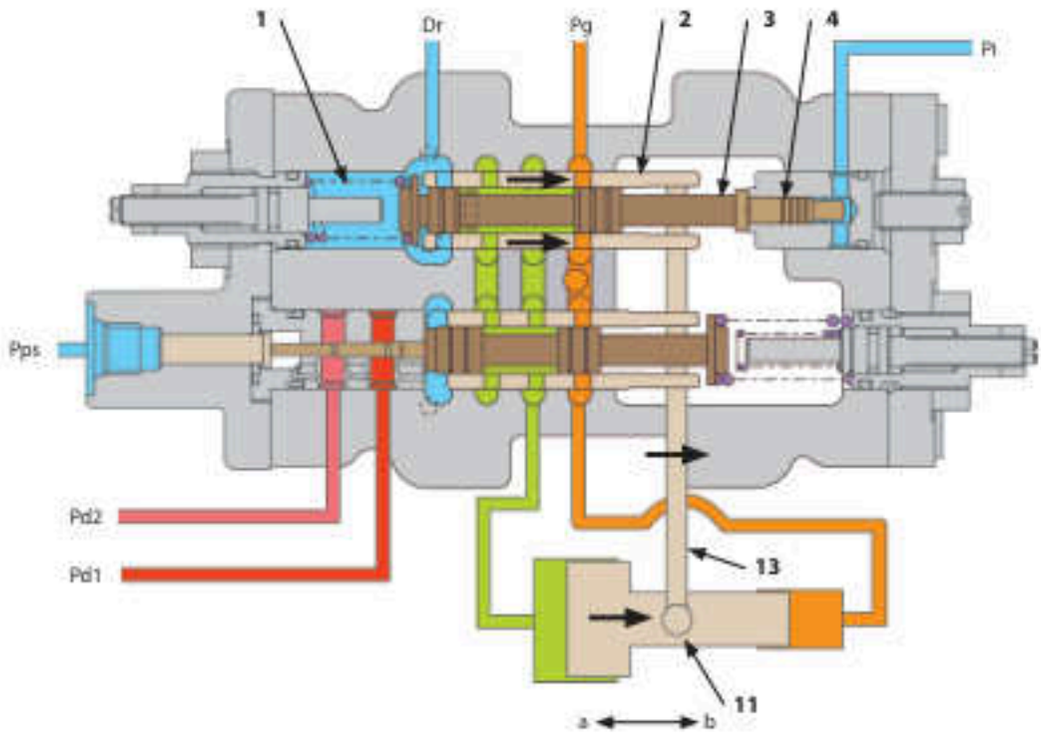
The overall system layout of hybrid system on this machine is shown except for the cooling system. Basically, HCU (40) controls all components. That is, HCU (40) controls the electric components and the solenoid valve unit for hybrid system according to operating conditions inputted from the swing pilot valve and pressure sensors. PCU (39) controls electric motors (12, 16) and the power circuit. PCU (39) is a power control unit, which activates electric motors (12, 16) according to the signals from HCU (40). Capacitor unit (38) has the electric double layer capacitor built-in and is a device which stores the energy. HCU (40) receives information on charged capacity in the capacitor from PCU (39). HCU (40) sends the signals according to the information to PCU (39), and then PCU (39) activates electric motors (12, 16) and controls charged capacity in the capacitor.

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NOTE: The illustration shows the pump1 regulator.



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Pd1- Pump 1 Delivery Pressure
Pd2- Pump 2 Delivery Pressure

Dr- Returning to Hydraulic Oil Tank

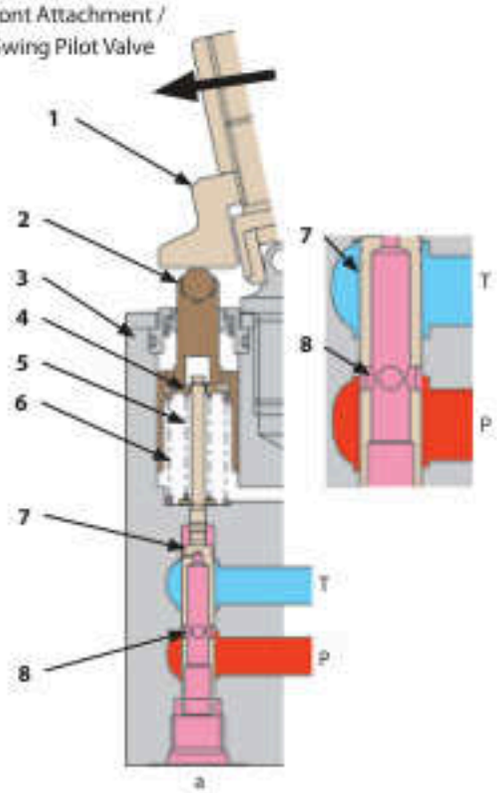
Pi- Pump Control Pressure
Pps- Torque Control Pressure

Pg- Primary Pilot Pressure (From Pilot Pump)

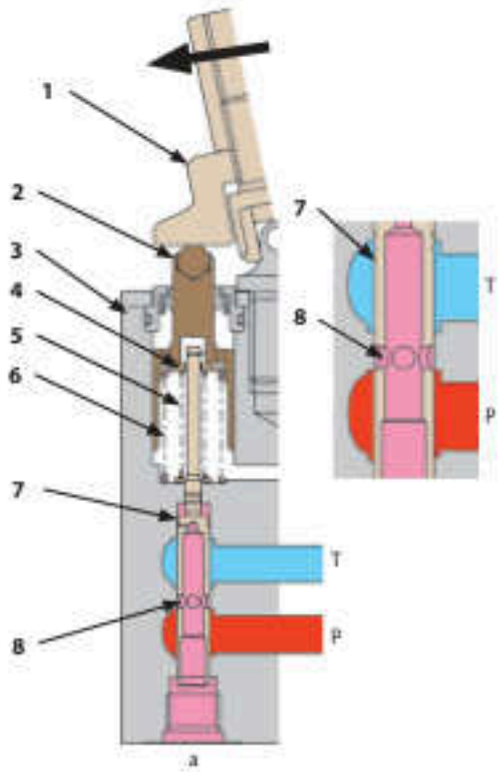
1- Spring
2- Sleeve A
3- Spool A
4- Piston
11- Servo Piston
13- Link

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Front Attachment / Swing Pilot Valve

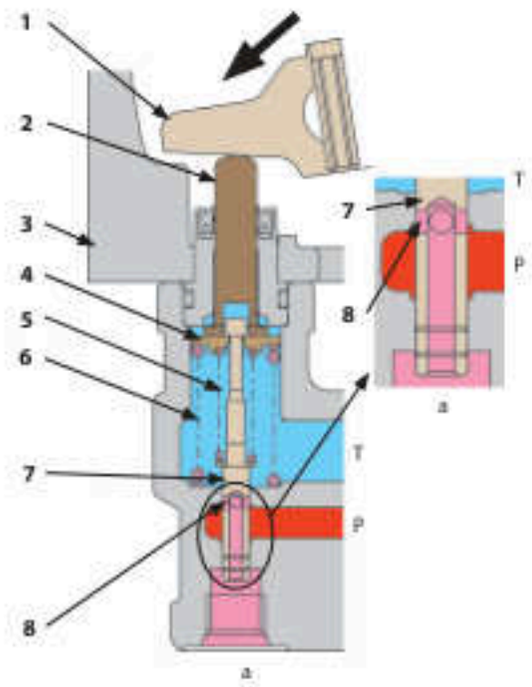


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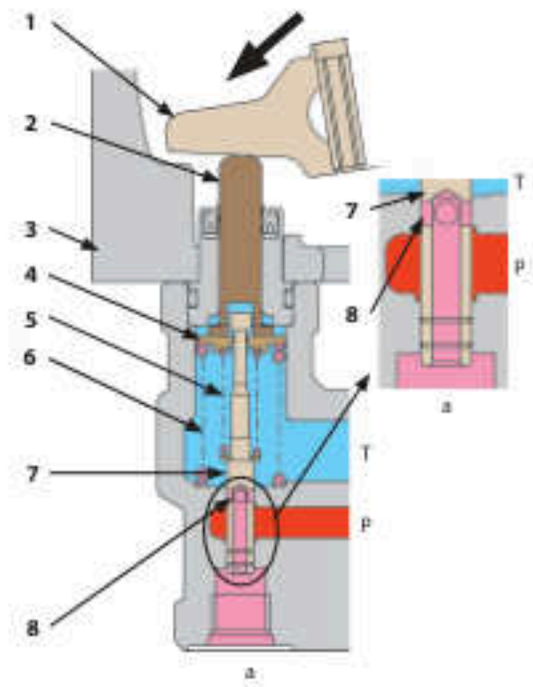


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Travel Pilot Valve



TPPP-03-04-012



TPPP-03-04-013

P- Port P
T- Port T
a- Output Port

1- Cam
2- Pusher
3- Casing
4- Spring Guide
5- Balance Spring
6- Return Spring
7- Spool
8- Hole

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