PART NO. TODEG-EN-01

HITACHI

Reliable solutions

Technical Manual
Operational Principle

ZX60-5G
Hydraulic Excavator

Service Manual consists of the following separate Part No.

Technical Manual (Operational Principle)	: Vol. No.TODEG-E
Technical Manual (Troubleshooting)	: Vol. No.TTDEG-E
Workshop Manual	: Vol. No.WDEG-E
Engine Manual	: Vol. No.ETADB-EN, EWADB-EN

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CYLINDER		Boom	Arm	Bucket
	Rod Diameter	60 mm (2.36")	55 mm (2.17")	50 mm (1.97")
	Cylinder Bore	105 mm (4.13")	85 mm (3.35")	80 mm (3.15")
	Stroke	736 mm (2'5.0")	843 mm (2'9.2")	581 mm (1'10.9")
	Fully Retracted Length	1140 mm (3'8.9")	1282 mm (4'2.5")	891 mm (2'11.1")
	Plating Thickness	30 µm (1.18 µin)	30 µm (1.18 µin)	30 µm (1.18 µin)

CYLINDER		Blade
	Rod Diameter	65 mm (2.56")
	Cylinder Bore	110 mm (4.33")
	Stroke	148 mm (5.83")
	Fully Retracted Length	548 mm (1'9.6")
	Plating Thickness	30 µm (1.18 µin)

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Hydraulic Circuit

The hydraulic circuit in control valve is divided into main circuit, pilot operation control circuit, and pilot signal circuit.

Main Circuit

Pressure oil from main pump 1 (1) flows to port P1 on the top of control valve (13), and flows to each spool of travel (left) (19), bucket (21), boom 1 (22), and arm 2 (24) in 8-spool side (a) in control valve (13).
Pressure oil from main pump 2 (2) flows to port P2 on the side of 5-spool side (b) in control valve (13), and flows to each spool of auxiliary 1 (17), arm 1 (16), boom 2 (15), and travel (right) (14).
Pressure oil from main pump 3 (3) flows to port P3 on the side of 5-spool side (b) in control valve (13), and flows to each spool of auxiliary 2 (18), blade (29), and swing (28).
When the spool is in neutral (control lever is in neutral), pressure oil from the main pump returns to the hydraulic oil tank through the neutral circuit. When the spool is operated (control lever is operated), pressure oil from the main pump flows to the actuator through the spool.
The main circuit has parallel circuit (26) and the flow combiner circuit. The combined operation of actuator becomes possible by using these circuit.
When the load applied to boom raise becomes large during combined operation of swing and boom raise, flow combiner check valve (boom raise) (9) is closed. Pressure oil flows to the swing and the swing operation speed becomes fast.
When the load applied to the bucket circuit such as bucket relief operation during combined operation of bucket and travel, flow combiner check valve (bucket) (10) is closed.
As pressure oil flows to the travel circuit has priority, the travel speed becomes fast.
In case the arm or boom is relieved during combined operation of travel and arm or boom, flow combiner check valve (travel) (11) is opened and all pressure oil flows to the travel circuit so that the travel speed becomes fast.

Pressure in the main circuit (between pump and actuator) is controlled by main relief valve (6) and is prevented from exceeding the set pressure when the spool (control lever) is operated.
In addition, the relief set pressures of main relief valve (6) of the circuit in main pumps 1 (1) and 2 (2) in control valve (13) can be selected in 2 stages: one is for the travel operation and the other is for the front attachment/swing operation. Main relief valve (6) of the circuit in main pump 3 (3) is operated when the blade, swing, and arm roll-in are operated.
Pressure in the actuator circuit (between control valve and actuator) is controlled by overload relief valve (5) and is prevented from exceeding the set pressure by external force when the spool (control lever) is in neutral.

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Engine Fan Clutch

The engine fan clutch automatically controls the fan rotation speed according to the air temperature (coming from the radiator) in front of the fan. It reduces fan noise by reducing the excessive fan rotation speed. It also prevents the engine from being over cooled at low temperatures in winter season.

When decreasing fan rotation speed:

1. When the air temperature in front of fan (1) is low, bimetallic strip (6) is not deformed. Then, the pressing force of bimetallic strip (6) is transmitted to valve (10) through piston (5).
2. Valve (10) closes oil feed port (11). This disconnects oil reserve room (4) from actuation room (7).
3. Due to the centrifugal force of drive disc (3), the silicon oil in torque transmission room (8) flows to oil recovery port (2) due to dam (13) near oil recovery port (2). Then, the silicon oil is returned to oil reserve room (4).
4. When the silicon oil in torque transmission room (8) decreases, oil viscosity in torque transmission room (8) is decreased.
5. The engine rotation power is transmitted to shaft (9), drive disc (3), and case (12). As oil viscosity in torque transmission room (8) is decreased, slippage between drive disc (3) and case (12) is generated. This slippage reduces the rotation speed of fan (1) attached to case (12).
6. The rotation speed of fan (1) is decreased according to decreasing oil viscosity in torque transmission room (8).

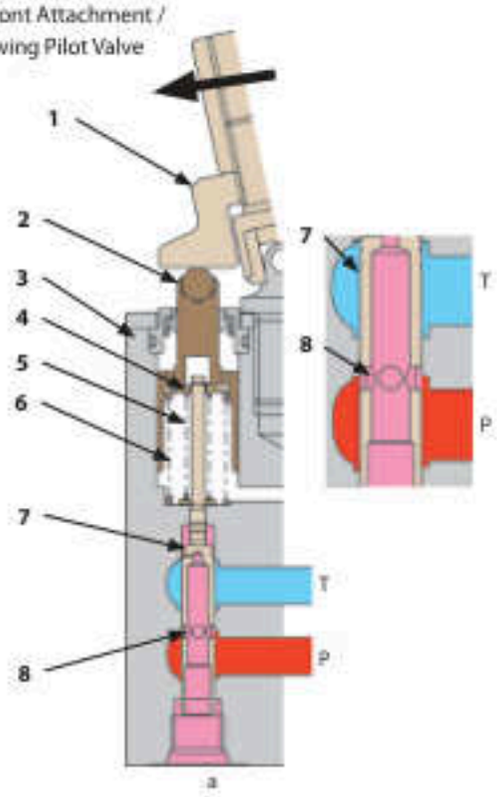
When increasing fan rotation speed:

1. When the air temperature in front of fan (1) is high, bimetallic strip (6) is deformed. This generates the reaction force and moves piston (5) leftward. Then, valve (10) is released.
2. When valve (10) moves leftward, oil feed port (11) is opened and oil reserve room (4) is connected to actuation room (7). The silicon oil in oil reserve room (4) flows to actuation room (7) through oil feed port (11).
3. Due to the centrifugal force of drive disc (3), the silicon oil in actuation room (7) is supplied to torque transmission room (8).
4. When the silicon oil in torque transmission room (8) increases, oil viscosity in torque transmission room (8) is increased.
5. The engine rotation power is transmitted to shaft (9), drive disc (3), and case (12). As oil viscosity in torque transmission room (8) is increased, slippage between drive disc (3) and case (12) is reduced. This increases the rotation speed of fan (1).
6. The rotation speed of fan (1) is increased according to increasing oil viscosity in torque transmission room (8).

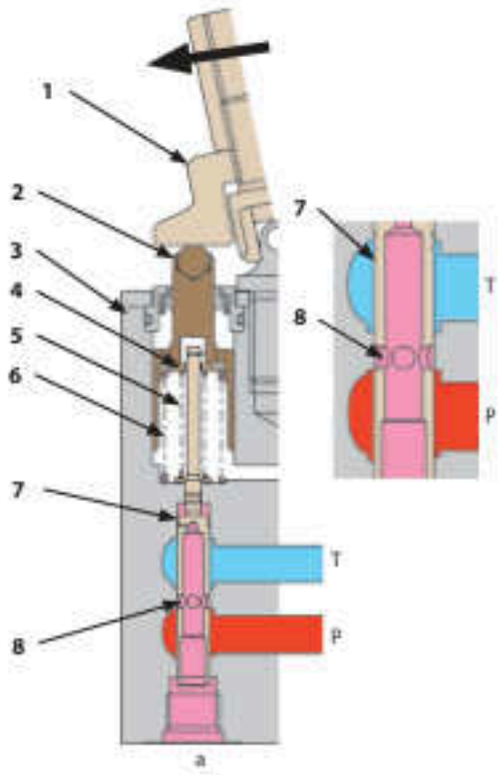
NOTE: Bimetallic strip (6) is formed of two dissimilar metals; different temperature coefficients of expansion of the metals cause bimetallic strip (6) to bend when the temperature changes. This serves to open or close a contact.

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Front Attachment / Swing Pilot Valve

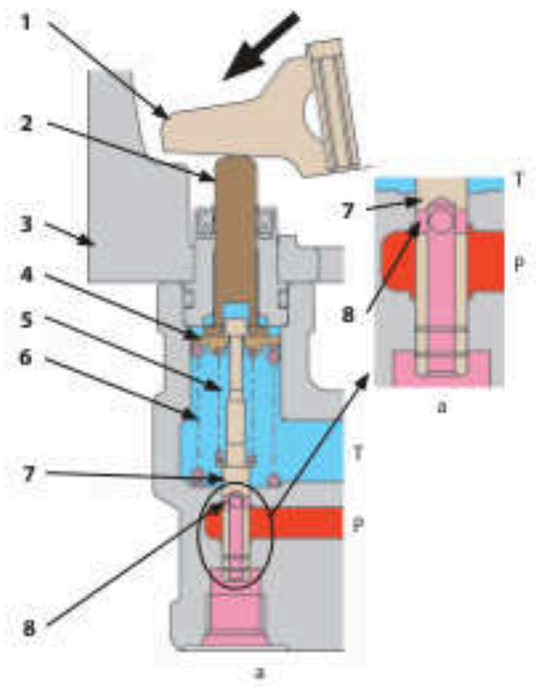


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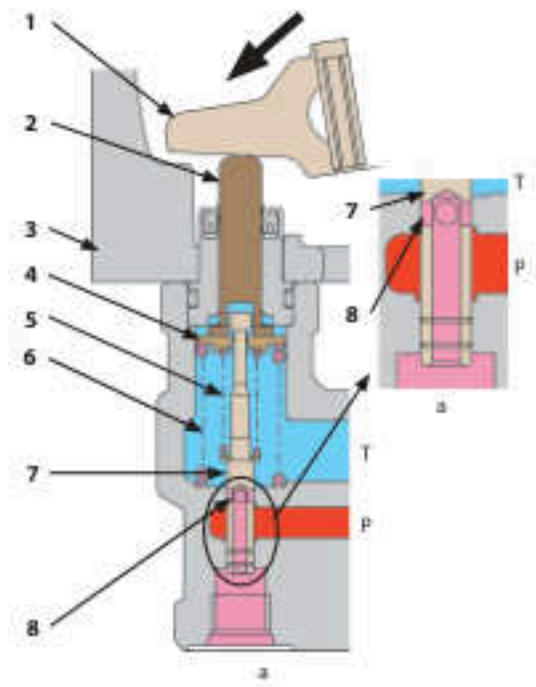


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Travel Pilot Valve



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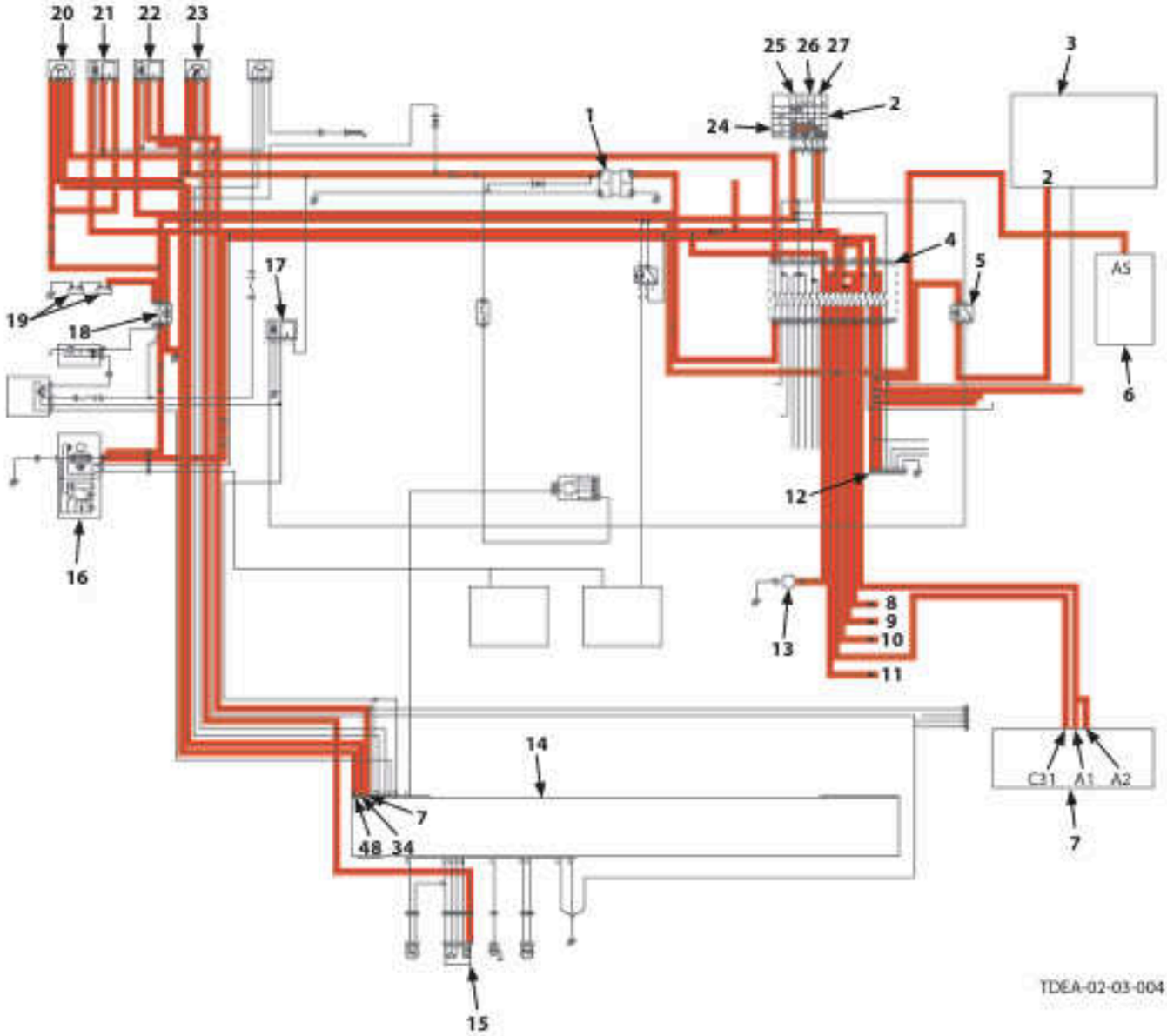


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P- Port P
T- Port T
a- Output Port

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

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1- DC/DC Converter
2- Key Switch
3- GSM
4- Fuse Box
5- Start Relay
6- ICX Controller
7- MC
8- Compressor
9- Light
10- Wiper
11- Air Conditioner
12- Option
13- Fuel Pump
14- E-ECU
15- Rack Actuator
16- Alternator
17- Starter Relay 2
18- Battery Relay
19- Battery
20- Main Relay 1
21- Main Relay 2
22- IGN Relay
23- Actuator Relay
24- ON Position
25- Terminal B
26- Terminal ACC
27- Terminal M

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