KOBELCO

SERVICE MANUAL

HYDRAULIC EXCAVATOR

SK220

SK220LC

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SPECIFICATION

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MAINTENANCE STANDARDS AND TEST PROCEDURES

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TROUBLESHOOTING

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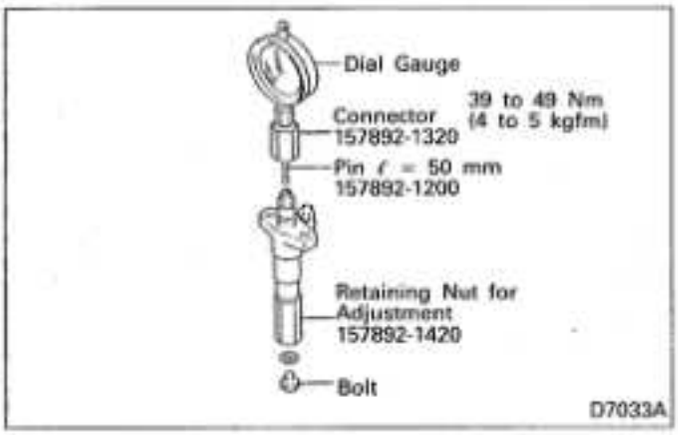
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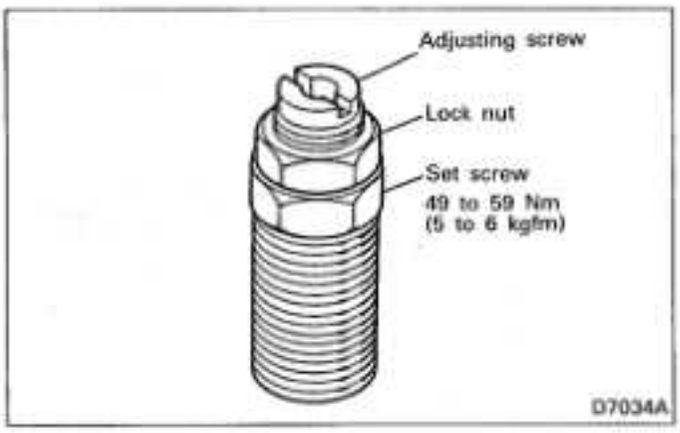
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(4) Checking full lift of needle valve



(a) Install the special tools indicated in above illustration and set 0 point of the Dial Gauge.
(b) Install the nozzle to the Nozzle Tester and operate the tester lever to bleed the inside of the Retaining Nut.
Also check for fuel leaks.
(c) Operate the tester lever to increase the pressure to about 34.5 to 44 MPa (350 to 450 kgf/cm²) so that the needle valve of the nozzle is fully lifted. Read this lift dimension "L" off the dial gauge.
(d) Remove the special tools, Dial Gauge, Connector and Pin.

(5) Installation of prelift shim



(a) Remove the setscrew, lock nut and adjusting screw as an assembly from the nozzle holder.

NOTE:
Never loosen the lock nut as loosening it changes the 2-spring adjusting pressure.

(b) Install the prelift shim selected in (2) between the spacer and 2nd push rod.
(c) Install the 2nd push rod and 2nd spring and tighten the setscrew, lock nut and adjusting screw as an assembly to specified torque.
(d) Check again that the needle valve full lift dimension "S" with the dial gauge by the procedures described in (4).

(6) Checking prelift

Check the prelift based on dimension "L" measured in (4) and dimension "S" measured in (5).

$L - S = \Delta\ell$

where $\ell - 0.02 \leq \Delta\ell \leq \ell + 0.02$ mm

$\Delta\ell$: Prelift (measured)
ℓ: Prelift (0.1 mm)
L: Needle valve full lift dimension (measured)
S: Needle vale lift dimension (measured) with prelift subtracted

If $\Delta\ell$ is outside of specified dimension $\ell \pm 0.02$ mm, replace the prelift adjusting shim as described in (5) and repeat steps (4) and (5) so that $\Delta\ell$ will fall within $\ell + 0.02$ mm.

Select thickness t' of shim to be used as follows.

$t' = t + (\ell - \Delta\ell)$
$T = t' \pm 0.015$ mm

where t: Thickness of existing shim
t': Shim thickness
T: Thickness of shim to actually replace existing shim
ℓ: Prelift (0.1 mm)

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the spring (323). The pressure is then reduced at the secondary side of the spool to discontinue the circuit.

Consequently the circuit pressure g3, g3' for the bypass spool changeover gets down to zero. This brings the bypass spool (301) back home by the action of the spring (322) so as to perform bypass cut.

(2) Auto accel switch is on, the higher of the secondary pilot pressures enters the pressure switch from port PDS of the independent travel valve and serves as the auto accel function switch.

(3) Function of travel priority valve

1) With D-mode OFF

In Fig.12, a pilot pressure P0=50k is working (chamber①): piston A is pressed down to the bottom end so as to regulate the strokes. Where only attachment or travel motion is performed, spool C is restricted by position[I] and fixed.

If attachment and travel motions are carried out at the same time, spool C shifts to take position[II] as pilot pressure is admitted to chamber②. (straight travel function)

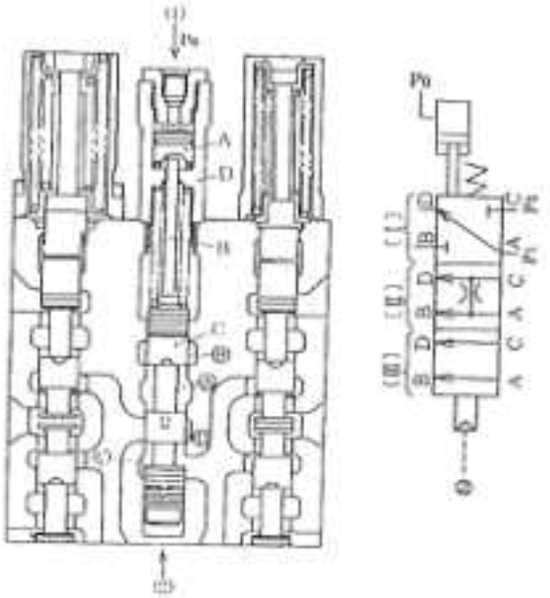


Fig. 12 Travel priority limiter

2) With D-mode ON

Port A1 of the solenoid valve (23) gets through to the tank and pressure P0 of the travel priority limiter (252) gets down to zero, in order to release the stroke regulation of spool C.

In the meantime, if the independent travel switch is on, primary pilot pressure is admitted to port PZ of the control valve from port "A2 of the solenoid valve (23). This raises the pressure in chamber② to 50kgf/cm² (711psi) and changes over the travel priority changeover spool (305) to take position[III].

The result is that the P1 pump is separated for attachment motion, whereas the P2 pump is separated for travel motion.

This means that even if attachment action and travel action are done at the same time, they will not inter fere with each other.

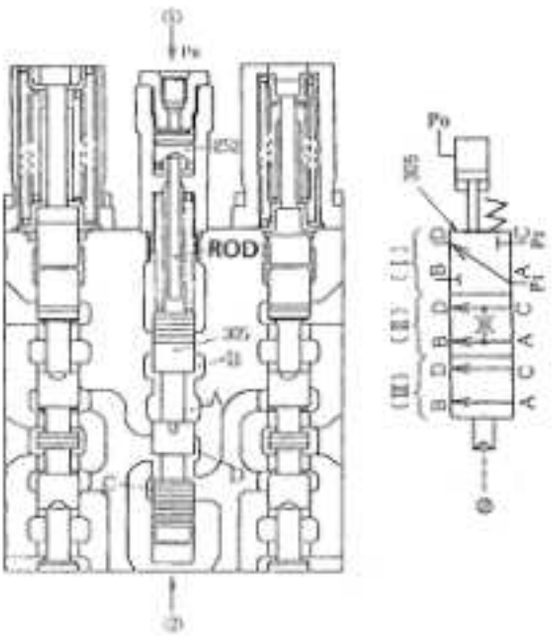


Fig. 13 Travel priority limiter

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4. TROUBLESHOOTING

(1) The hydraulic motor does not start.

Trouble	Cause	Remedy
Pressure does not rise.	Relief valve built in hydraulic motor is out of order.	Correct or replace relief valve.
Pressure rises.	Spool malfunctions. · Spool and body are stuck together. · Restrictor hole is plugged.	Correct or replace.
	Negative brake is not released. · Valve is installed in an opposite way. · Spool is assembled inversely.	Fit the valve in a regular direction. Fit spool in regular direction.

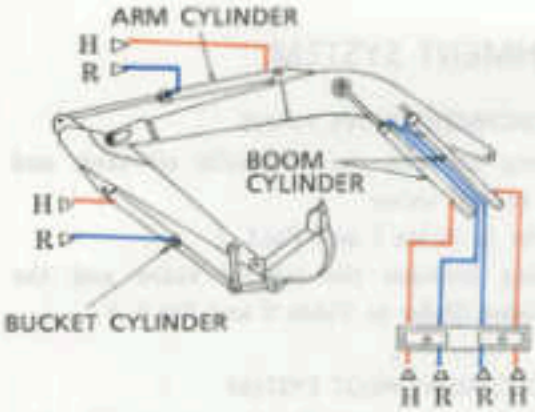
(2) Hydraulic motor runs feebly.

Trouble	Cause	Remedy
Set pressure is normal but brake response delays.	Spool function is out of order. · Spool and body are stuck together.	Correct or replace.
Brake is normal but slow in response.	The viscosity of hydraulic oil is too high.	Replace hydraulic oil or investigate causes of oil temperature rise.
Brake is normal but its starting force is feeble.	Negative brake is not released completely. · Negative pilot path is clogged.	Investigate negative brake path to which hydraulic motor is installed.

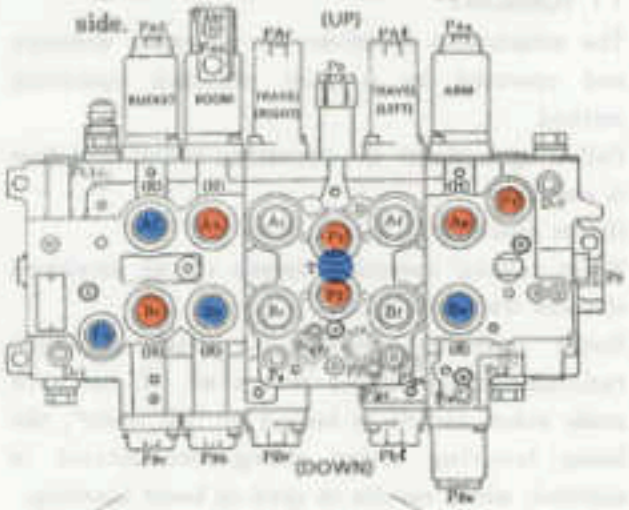
(3) Brake operation is impossible.

Trouble	Cause	Remedy
Reverse brake works.	Spool function is out of order. · Spool and body are stuck together. · Check valve is stuck or includes dirt. · Restrictor hole is clogged.	Correct or replace.

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(2) The orange color shows oil supplied to the cylinder head part, whereas the blue color represents oil returned to the cylinder rod side.



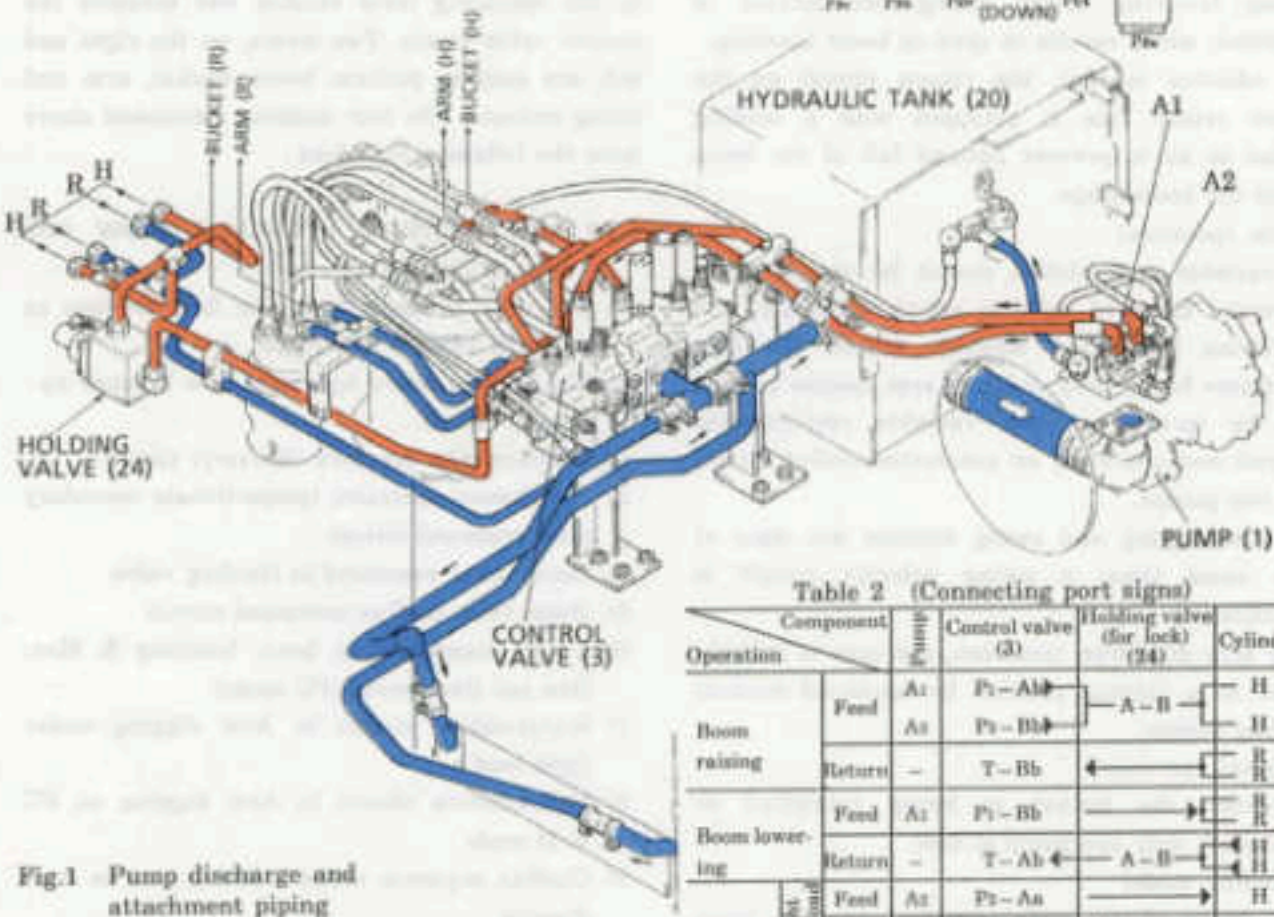


Fig.1 Pump discharge and attachment piping

Table 1 (Connecting port signs)

Component / circuits	Hydraulic tank	Pump (1)	Control valve (3)
Feed	Tank	A1	P1
		A2	P2
Return	Tank	Oil cooler	T

Table 2 (Connecting port signs)

Operation / Component		Pump	Control valve (3)	Holding valve (for lock) (24)	Cylinder
Boom raising	Feed	A1	P1 – Ab	A – B	H
		A2	P2 – Bb		H
	Return	–	T – Bb		R
					R
Boom lowering	Feed	A1	P1 – Bb		R
					R
	Return	–	T – Ab	A – B	H
					H
Arm digging (Light load)	Feed	A2	P2 – Aa		H
	Return	–	T – Ba		R
Arm digging (Heavy load)	Feed	A1	P1	Aa	H
		A2	P2		
	Return	–	T – Ba		R
Arm extension	Feed	A1	P1 – PA		R
		A2	P2 – Ba		
	Return	–	T – Aa		H
Bucket digging	Feed	A1	P1 – BC		H
	Return	–	T – AC		R
Bucket discharge	Feed	A1	P1 – AC		R
	Return	–	T – BC		H

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1. OPERATION OF SWING SYSTEM

1.1 SPECIAL FEATURES OF THE SWING SYSTEM

The swing system has the following functions:

1) Pilot pressure-operated operating method
   Delicate swing operation according to operating lever strokes can be attained by the proportionate pilot-operated secondary pressure.
2) Automatic parking brake for swing motion
   Except for the swing action and the arm pull action, the mechanical parking brake operates at all times so as to prevent the swing motion from drifting on a slope.
3) Delay brake by the action of the reducing valve
   The delay brake is actuated 5-8 seconds after the swing parking brake is released so as to keep it from operating in swing inertia.
4) Swing priority circuit
   In a simultaneous operation of both arm and swing motions, hydraulic pressure is delivered in preference to the swing motor so that swing pressed digging and oblique arm pull motions may be performed smoothly.
5) Swing-back preventive valve
   It absorbs shocks produced as swing motion stops and reduces oscillation caused by swing motion.
6) Loading mode
   Swing and boom raising speeds are varied by the mode potentiometer in the loading mode.
7) Lighting of Swing alarm lamp
   If the swing / back work light switch is selected and then swing motion is done, the swing alarm lamp lights.

1.2 MAIN PIPING CONNECTION

Table 1 (Connecting port signs)

	Hydraulic Oil Tank	Pump ①	Control Valve③	Control Valve④
Supply	Tank →	B1 – A2	– P2 – P3 →	P
Return	Tank ←	Oil Cooler	T	R

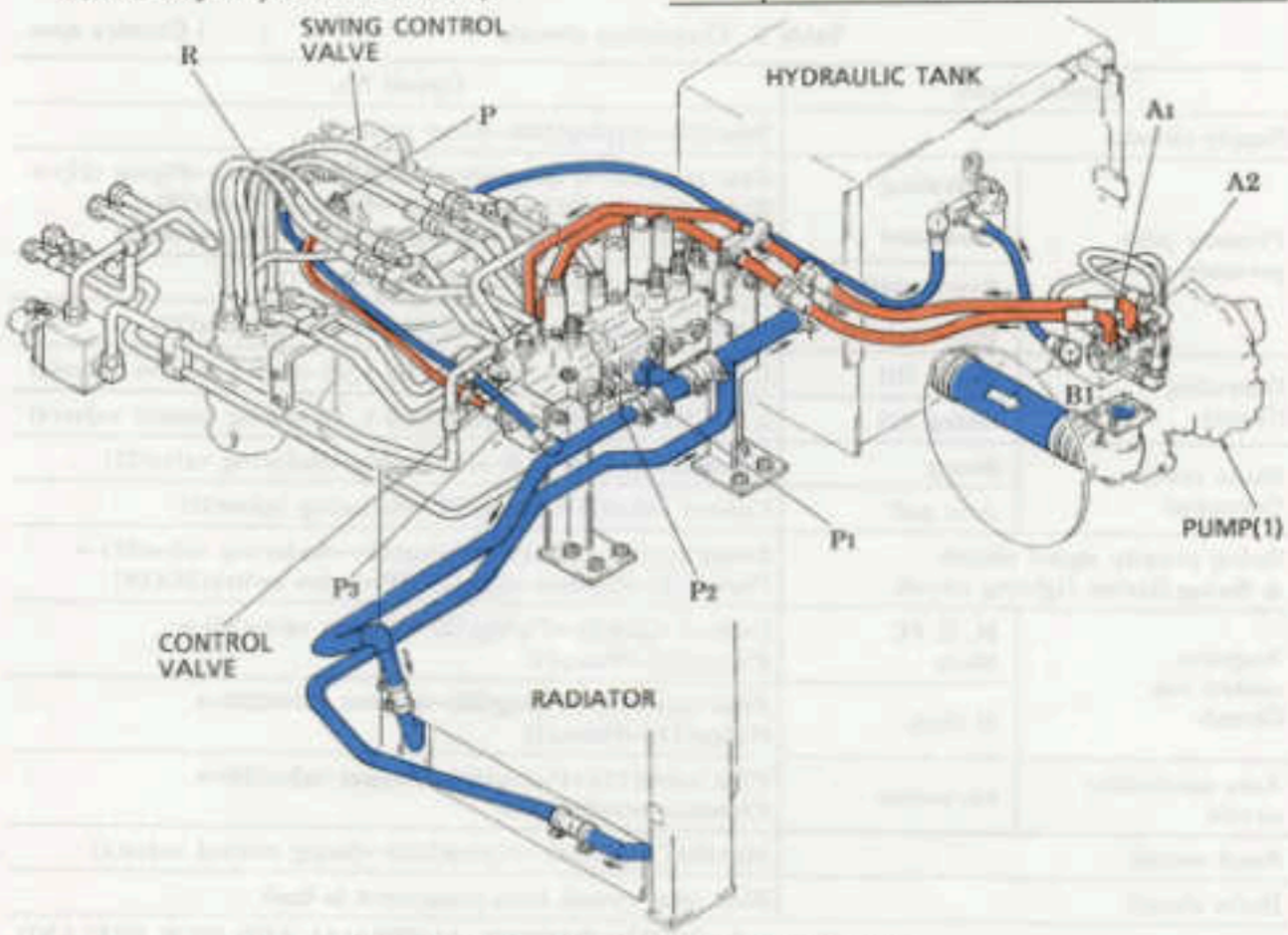


Fig. 1 Oil flow diagram in the Swing system

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4.8 NORTHERN EUROPEAN SPEC. CIRCUIT

This circuit is featured by steering of travel motion controlled by pilot pressure. The automatic swing parking brake can also be operated manually.

The each boom cylinder of the attachment is equipped with a holding valve (boom safety) that prevents fall of the attachment in case the circuit should burst out.

4.8.1 TRAVEL PILOT CIRCUIT

Steering of travel motion can be effected by the secondary pilot pressure of the travel pilot valve interlocked with the travel pedal.

4.8.2 SWING CIRCUIT

(1) Pilot Circuit

The difference between the Northern European Spec. Circuit and pilot in Spec.1 is that a manual swing lock switch is employed. If the switch is not on or remains off, the swing lock is left locked as hydraulic pressure does not enter the release side of the mechanical brake in the auto swing parking brake.

(2) Main Circuit

The main circuit of this system is the same as Spec.1. For details, refer to Single Swing Operation in Spec.1.

If swing action is performed by this circuit, the hydraulic pressure from the No.1 pump attempts to turn the swing motor, but it can not be turned as the mechanical brake is stronger than the swing torque.

4.8.3 BOOM LOWERING CIRCUIT

The circuit is featured by the use of two types of holding valves.

The one attached to the boom cylinder prevents fall of the attachment in case the hydraulic circuit should burst out. Another attached to the frame side serves to prevent natural fall of the boom when the boom cylinder is at rest.

(1) Changeover Action of Holding Valve

If boom lowering motion is performed, the secondary pilot pressure (PB1) enters the PL port of holding valve (24) and opens the return line of the cylinder.

The secondary pilot pressure (PB1) also enters port P of holding valve (36) and opens the return line of the cylinder.

(2) The main circuit is the same as the aforementioned boom lowering circuit.

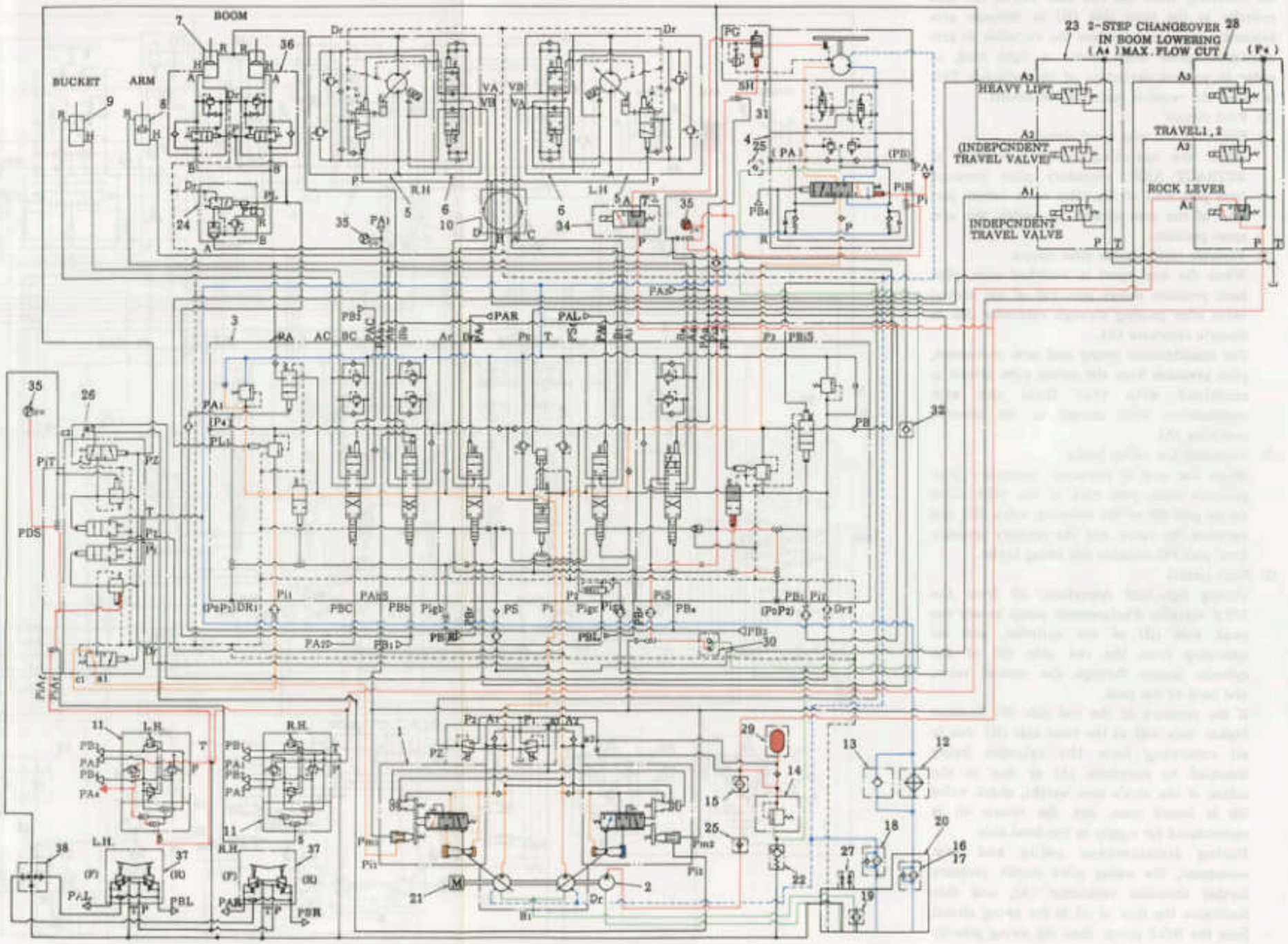


Fig. 21 Simple Swing Motion (at Manual Swing Lock "OFF")

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