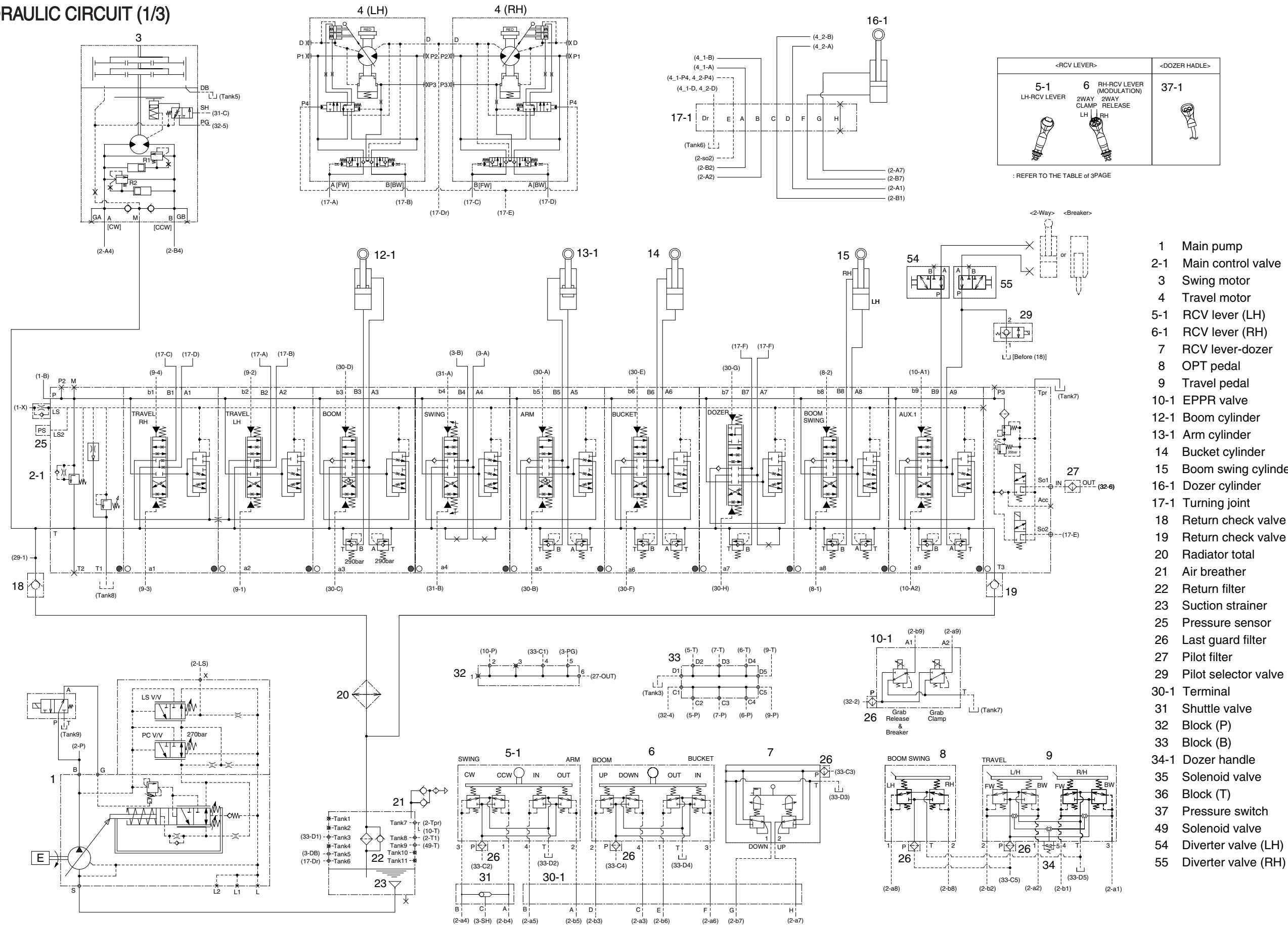


SECTION 3 HYDRAULIC SYSTEM

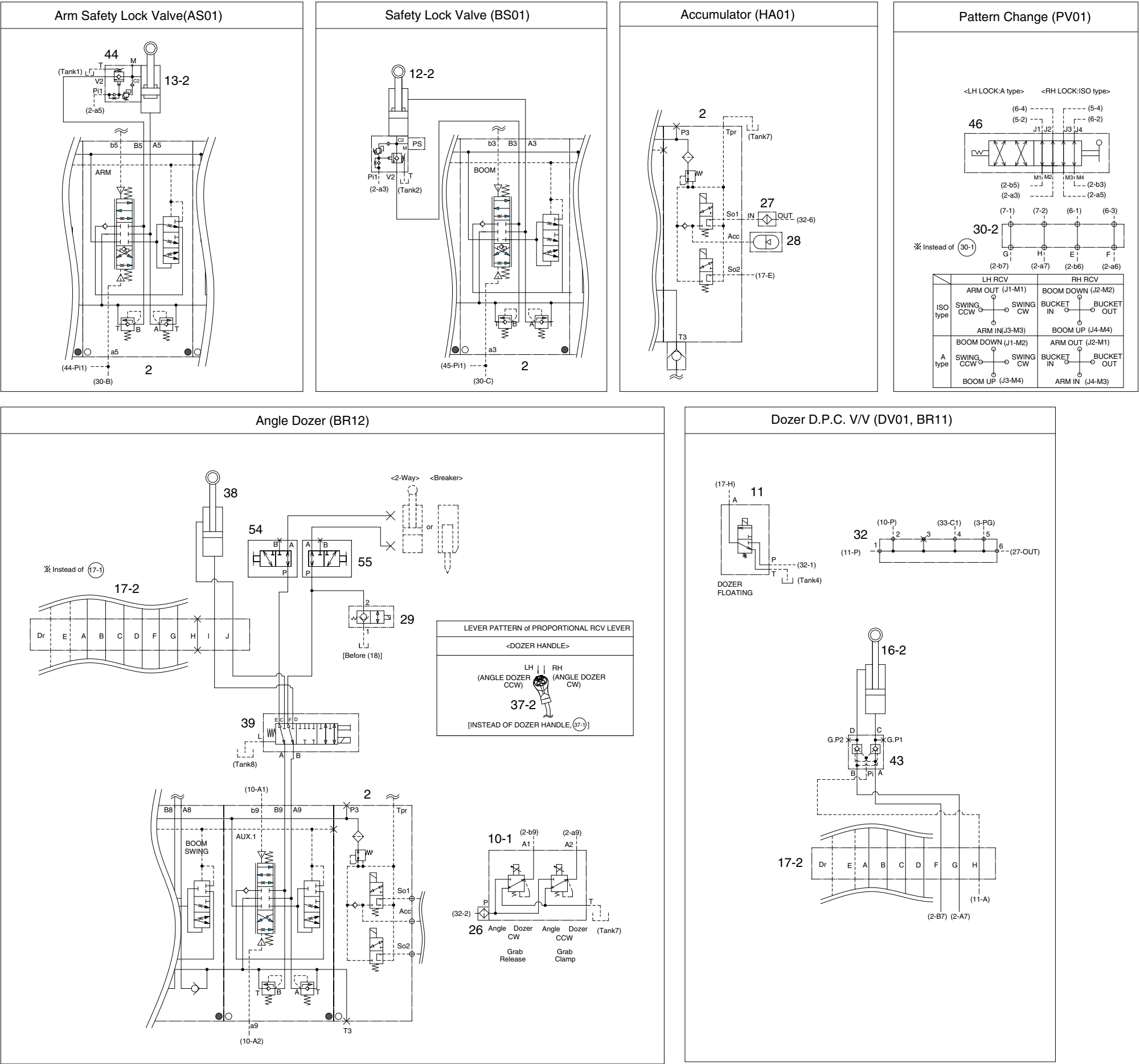
Group 1	Hydraulic Circuit	3-1
Group 2	Main Circuit	3-4
Group 3	Pilot Circuit	3-7
Group 4	Single Operation	3-12
Group 5	Combined Operation	3-24

GROUP 1 HYDRAULIC CIRCUIT

1. HYDRAULIC CIRCUIT (1/3)

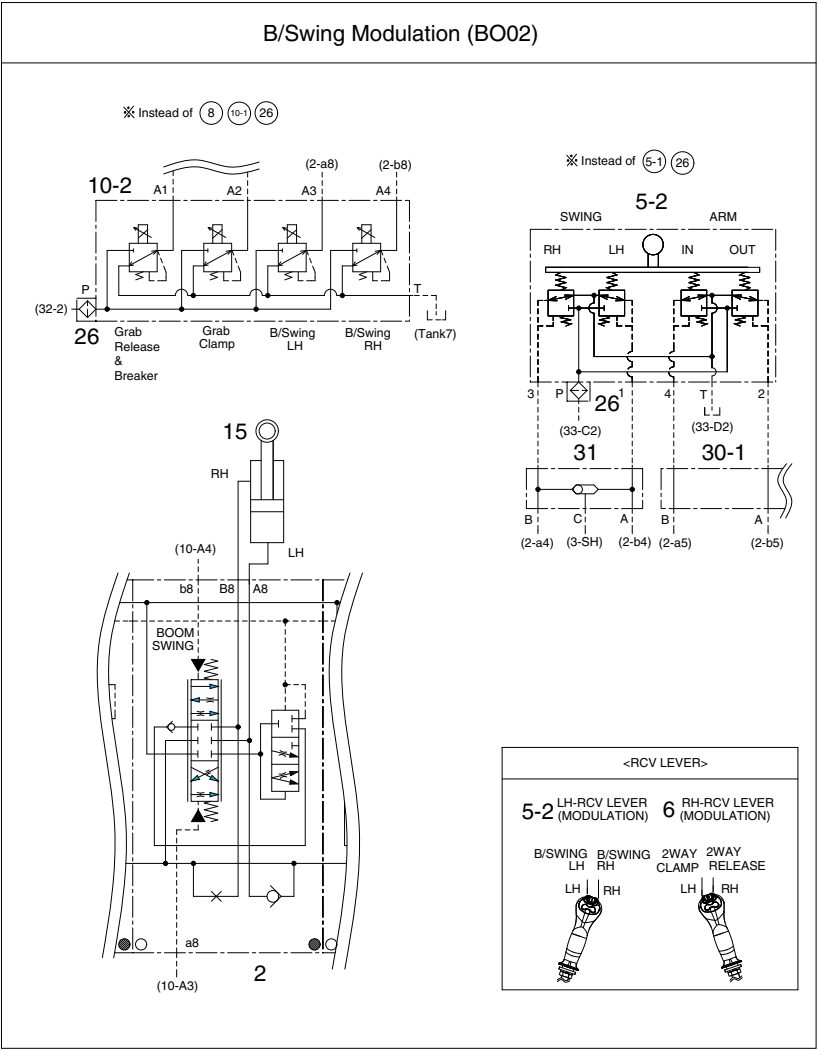
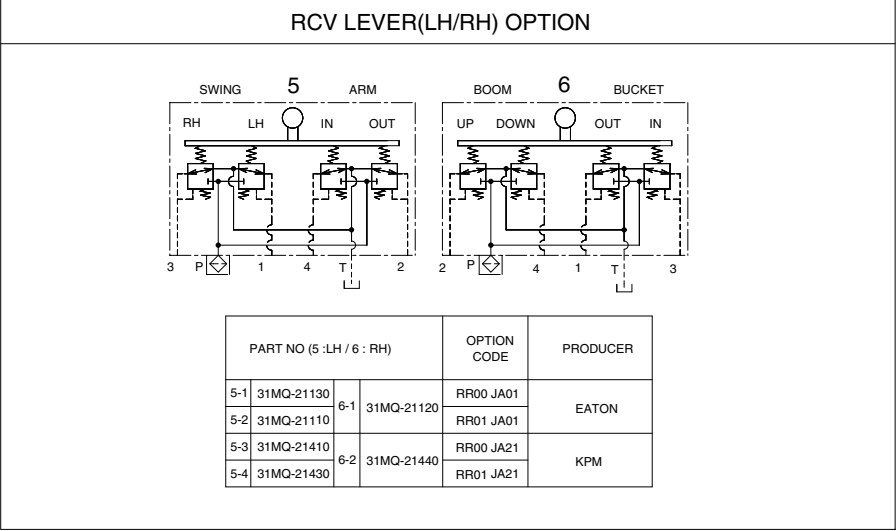
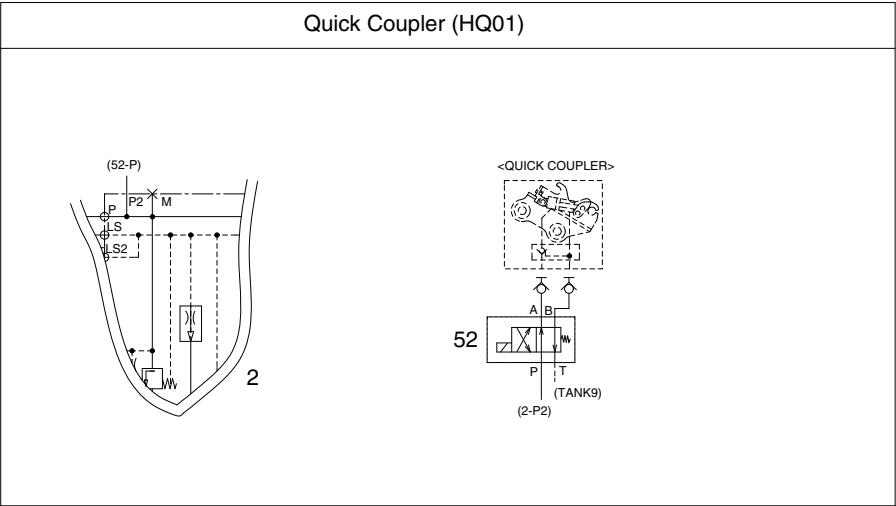
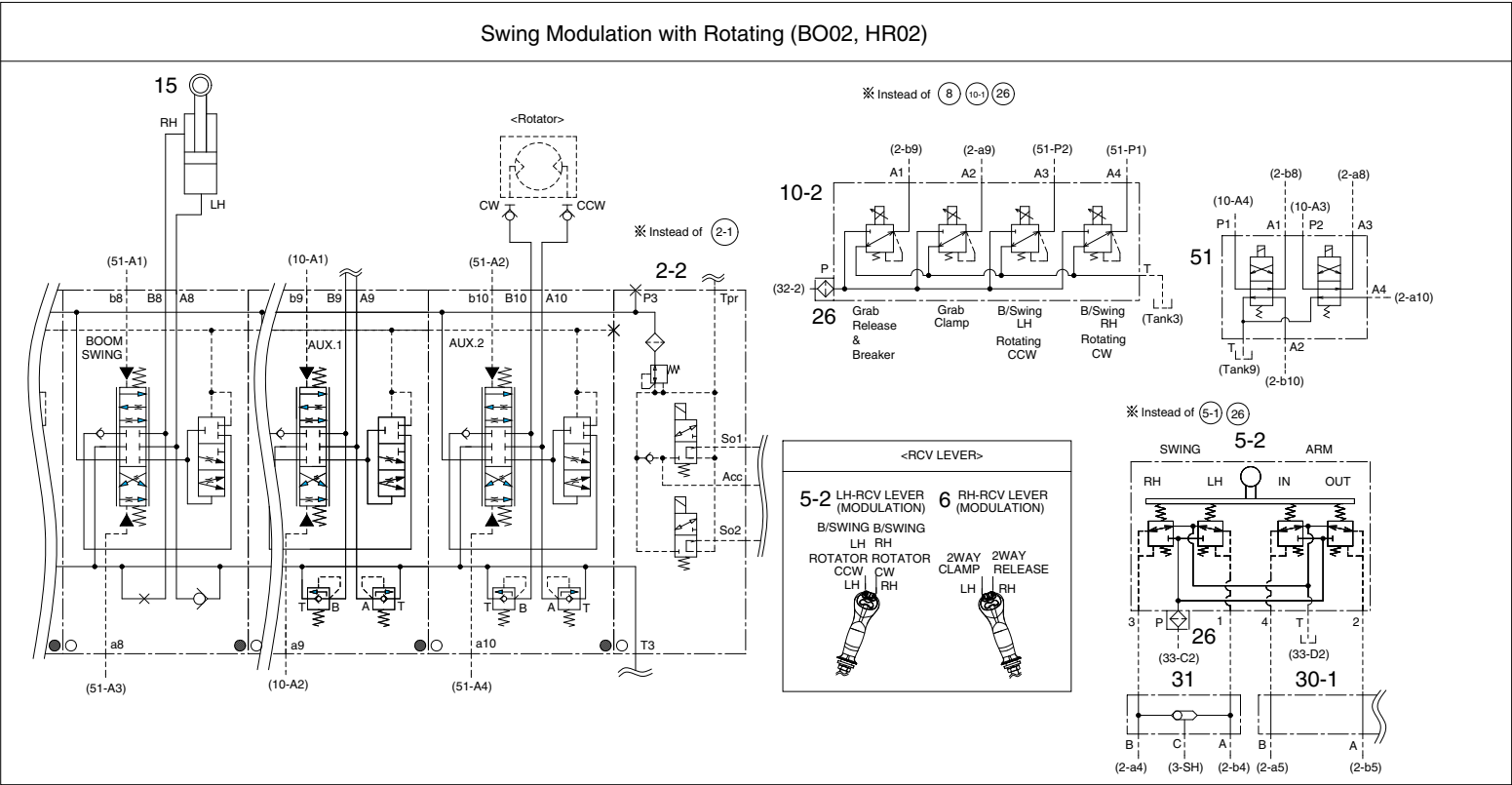


2. HYDRAULIC CIRCUIT (2/3)



- 11 Solenoid valve
- 12-2 Boom cylinder
- 13-2 Arm cylinder
- 16-2 Dozer cylinder
- 17-2 Turning joint
- 25 Pressure sensor
- 28 Accumulator
- 30-2 Terminal assy
- 37-2 Dozer handle
- 38 Angle dozer cylinder
- 39 Selector valve
- 43 Double pilot check
- 44 Safety lock valve
- 45 Safety lock valve
- 46 Pattern change valve

3. HYDRAULIC CIRCUIT (3/3)



- 2-2 Main control valve
- 5-2 RCV lever-LH
- 10-2 4-EPPR valve
- 15 Boom swing cylinder
- 26 Last guard filter
- 30-1 Terminal
- 31 Shuttle valve
- 51 Solenoid valve
- 52 Solenoid valve

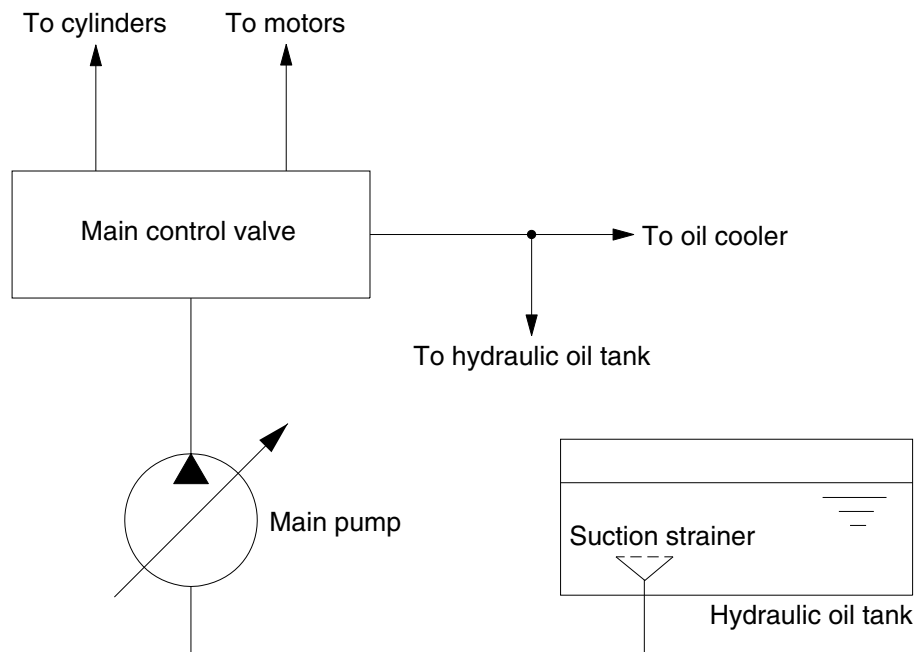
GROUP 2 MAIN CIRCUIT

The main hydraulic circuit consists of suction circuit, delivery circuit, return circuit and drain circuit.

The hydraulic system consists of one main pump, one control valve, one swing motor, four cylinders and two travel motors.

The swash plate type variable displacement axial piston pump is used as the main pump and is driven by the engine at ratio 1.0 of engine speed.

1. SUCTION AND DELIVERY CIRCUIT



140L3CI01

The pumps receive oil from the hydraulic tank through a suction strainer. The discharged oil from the pump flows into the main control valve and goes out the tank ports.

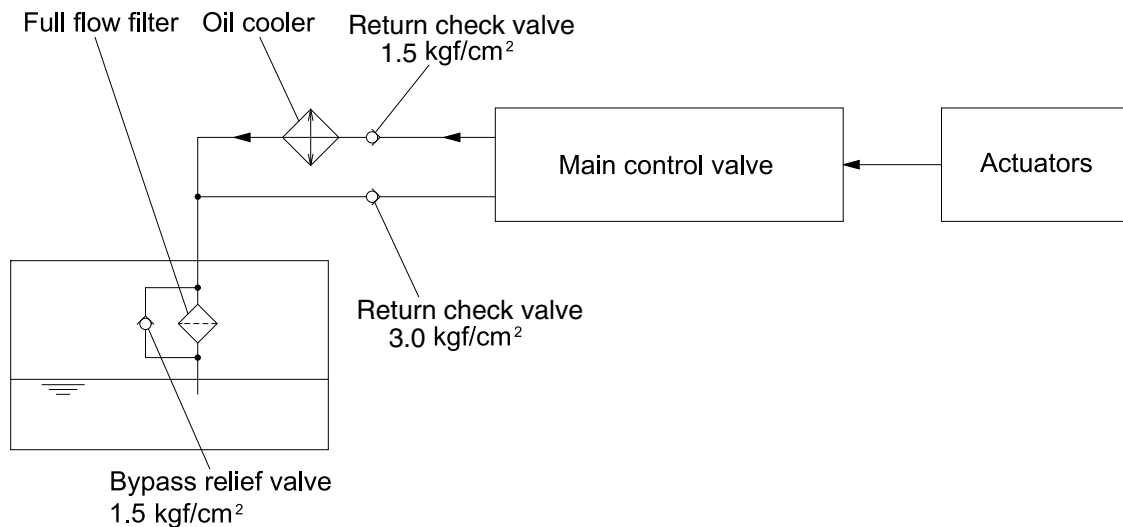
The oil discharged from the main pump flows to the actuators through the main control valve.

The main control valve controls the hydraulic functions.

The return oil from the actuators flows to the hydraulic tank through the main control valve and the oil cooler.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. RETURN CIRCUIT



40A3CI02

All oil returned from each actuator returns to the hydraulic tank through the control valve.

The bypass check valves are provided in the return circuit.

The setting pressure of bypass check valves are 1.5 kgf/cm² (21 psi) and 3.0 kgf/cm² (43 psi). Usually, oil returns to the hydraulic tank from the left side of control valve through oil cooler.

When oil temperature is low, viscosity becomes higher and flow resistance increases when passing through the oil cooler. When the oil pressure exceeds 3.0 kgf/cm² (43 psi), the oil returns directly to the hydraulic tank, resulting in the oil temperature being raised quickly at an appropriate level.

When the oil cooler is clogged, the oil returns directly to the hydraulic tank through bypass check valve (1).

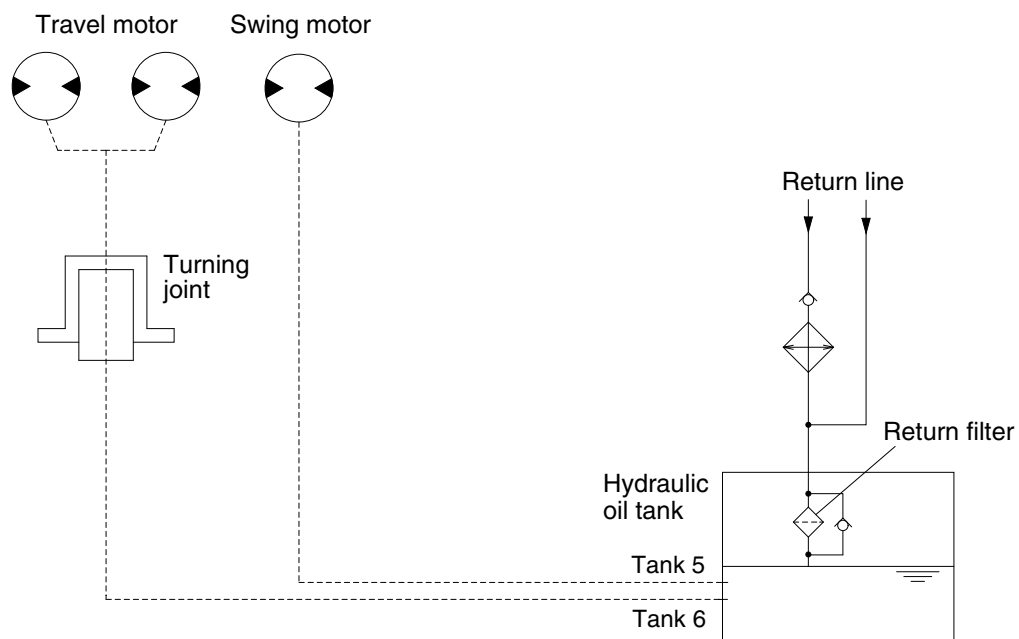
The full-flow filter and bypass relief valve are provided in the hydraulic tank.

The oil returned from right and left side of control valve is combined and filtered by the full-flow filter. A bypass relief valve is provided in the full-flow filter.

When the filter element is clogged, the bypass relief valve opens at 1.5 kgf/cm² (21 psi) differential pressure.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. DRAIN CIRCUIT



40A3CI03

Besides internal leaks from the motors and main pump, the oil for lubrication circulates.

1) TRAVEL MOTOR DRAIN CIRCUIT

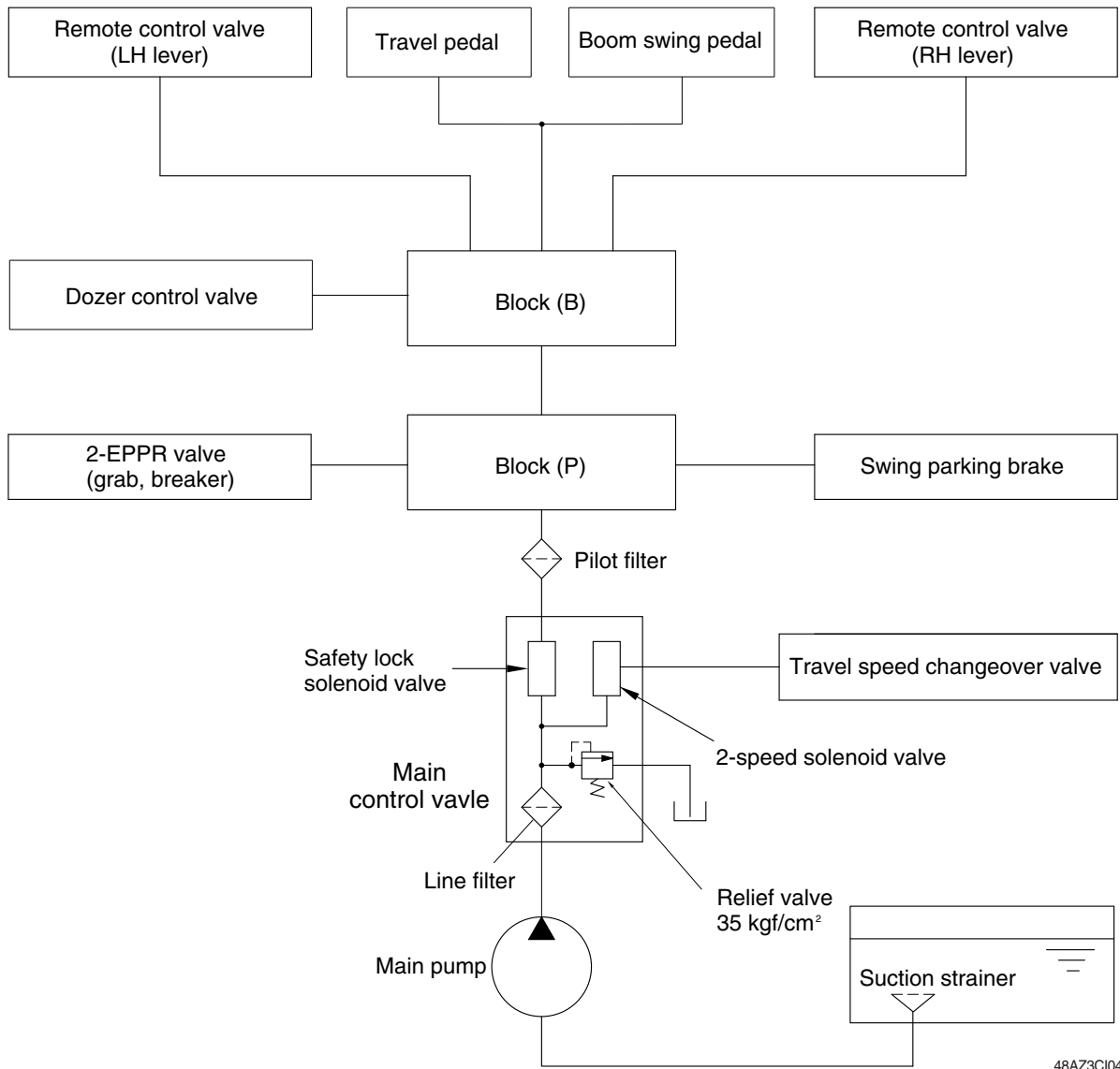
Oil leaked from the right and left travel motors comes out of the drain ports provided in the respective motor casing and join with each other. These oils pass through the turning joint and return to the hydraulic oil tank.

2) SWING MOTOR DRAIN CIRCUIT

Oil leaked from the swing motor returns to the hydraulic tank passing through return filter.

※ The circuit diagram may differ from the equipment, so please check before a repair.

GROUP 3 PILOT CIRCUIT



48AZ3C104

The pilot circuit consists of suction circuit, delivery circuit and return circuit.

Some of the main pump discharged oil is used the pilot line oil and the pilot line is provided with the relief valve.

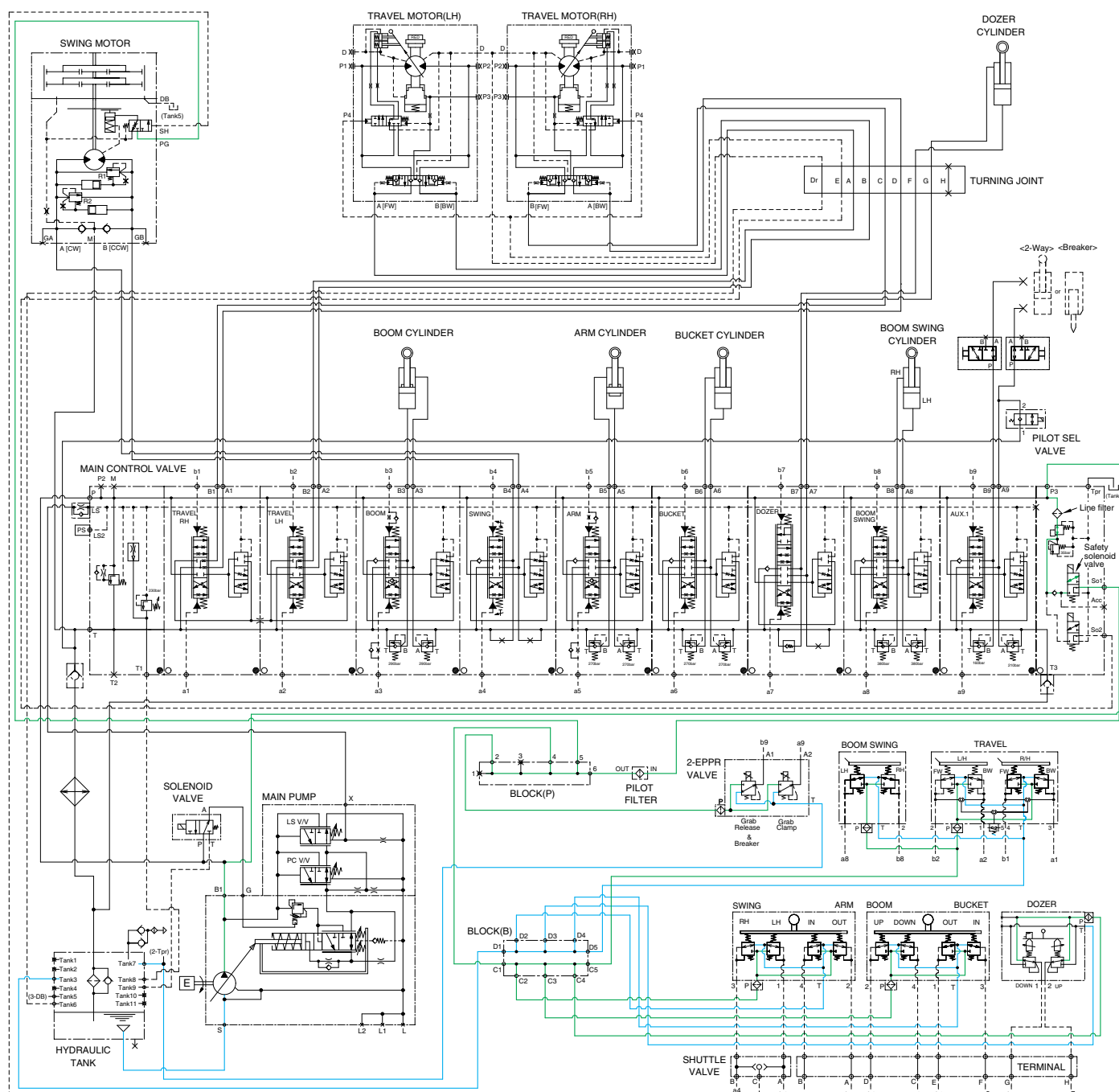
The pilot oil is supplied each control valve and pedal through the line filter and safety lock solenoid valve in the main control valve as below.

- The pilot oil flows to the remote control valve (LH, RH), travel pedal, boom swing pedal and dozer lever through the pilot filter, block (P) and block (B).
- The pilot oil flows to the swing parking brake and 2-EPPR valve (grab, breaker) through the pilot filter and block (P).

Also, the pilot oil flows to the travel speed solenoid valve through the line filter in the main control valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

1. SUCTION, DELIVERY AND RETURN CIRCUIT



40A3HC02

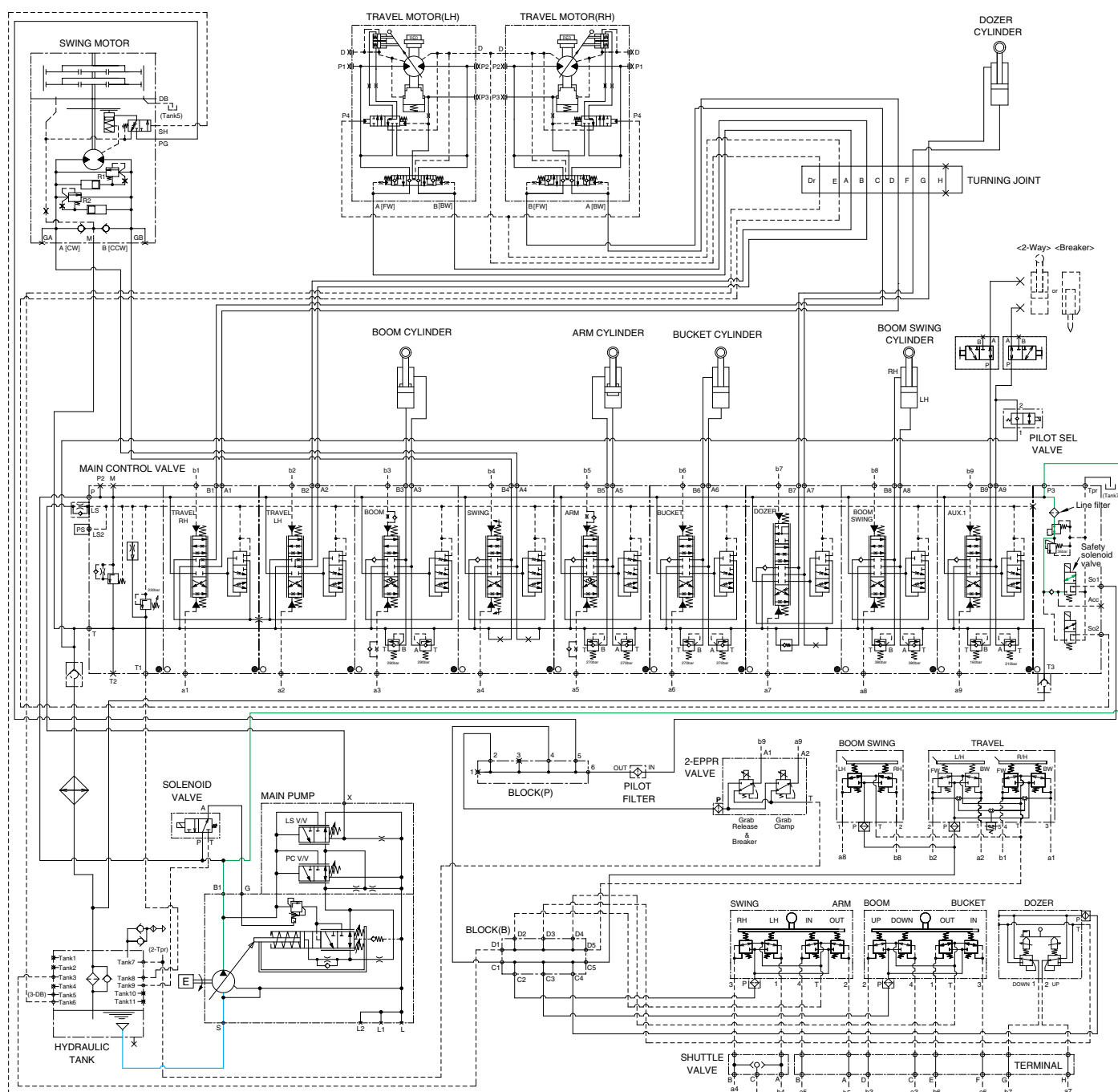
The main pump receive oil from the hydraulic tank. The discharged oil from the main pump flows to the safety solenoid valve through the line filter. The oil is filtered by the line filter. The pilot relief valve is provided in the main control valve for limiting the pilot circuit pressure.

The oil filtered by pilot filter flows remote control valve through safety solenoid valve.

The return oil flow into the hydraulic tank through block (B).

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. SAFETY VALVE (SAFETY LEVER)



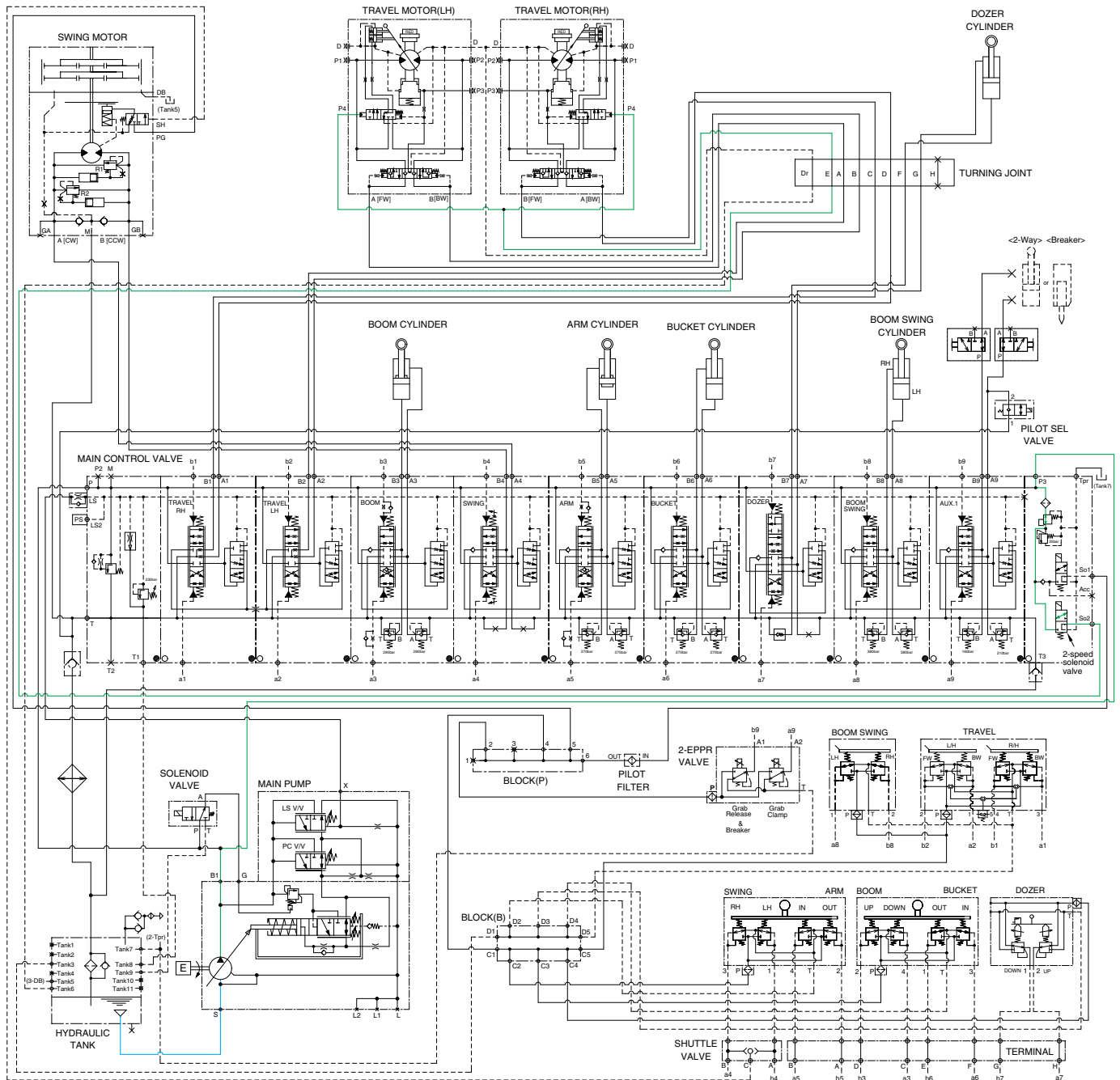
40A3HC03

When the lever of the safety solenoid valve is moved downward, oil flows into the remote control valve through solenoid valve and line filter in the main control valve.

When the lever of the safety solenoid valve is moved upward, oil does not flow into the remote control valve, because of the blocked port.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. TRAVEL SPEED CONTROL SYSTEM



40A3HC04

When the travel speed switch is pushed, the travel speed solenoid valve is actuated and the discharged oil from the pilot pump flows to the P4 port of pilot valve in the travel motors.

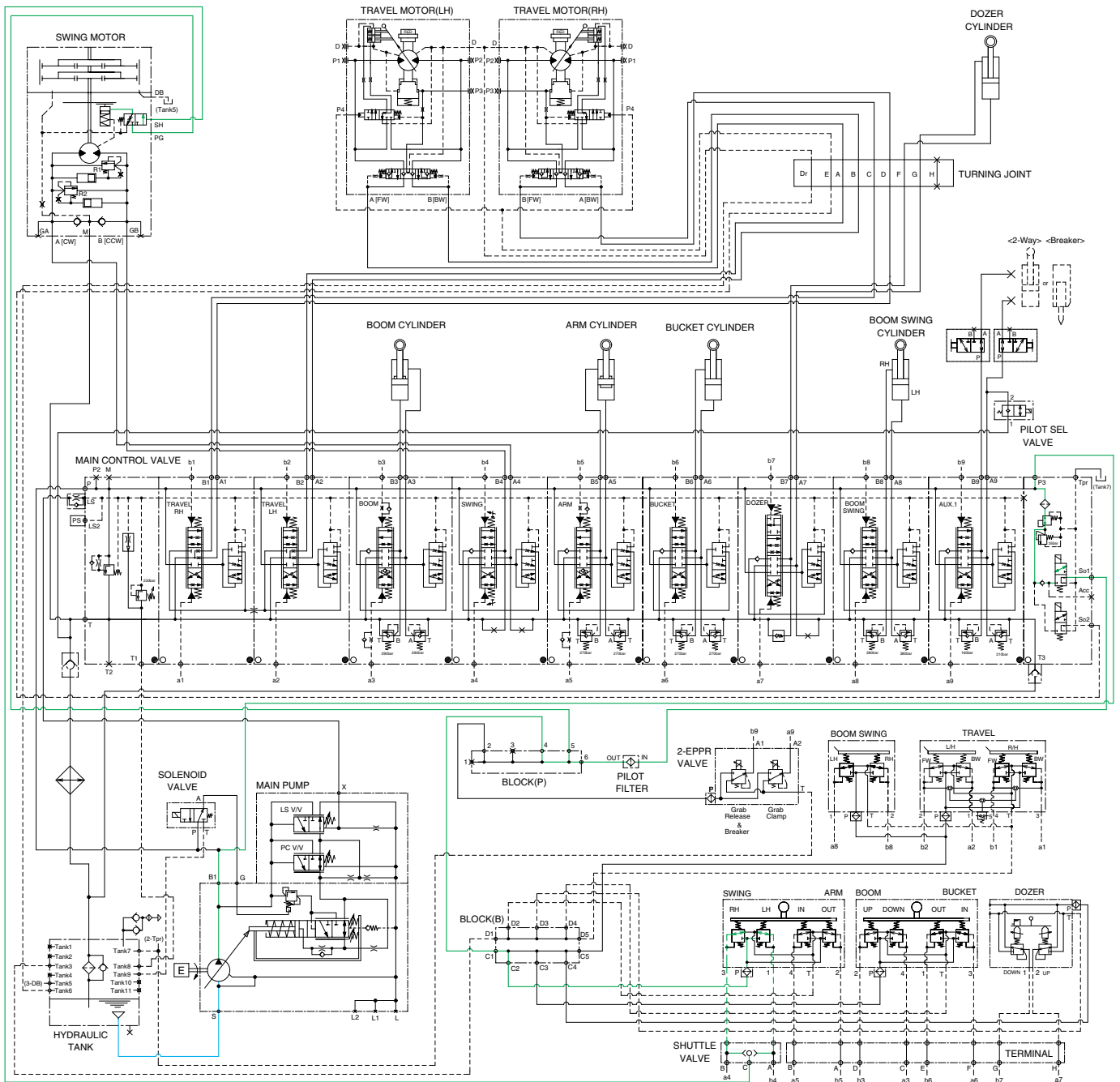
As a result, the control piston is pushed by the main oil flow, thus the displacement is minimized.

When the travel speed switch is pushed once more, the travel speed solenoid valve is return to original position by the force of spring, the hydraulic oil of P4 port returns to the hydraulic tank.

As a result, the control piston is returned by the main oil flow, thus the displacement is maximized.

※ The circuit diagram may differ from the equipment, so please check before a repair.

4. SWING PARKING BRAKE RELEASE



40A3HC05

When the swing control lever is tilted, the pilot oil flow into SH port of shuttle valve, this pressure move spool so, discharged oil from pilot valve flow into PG port.

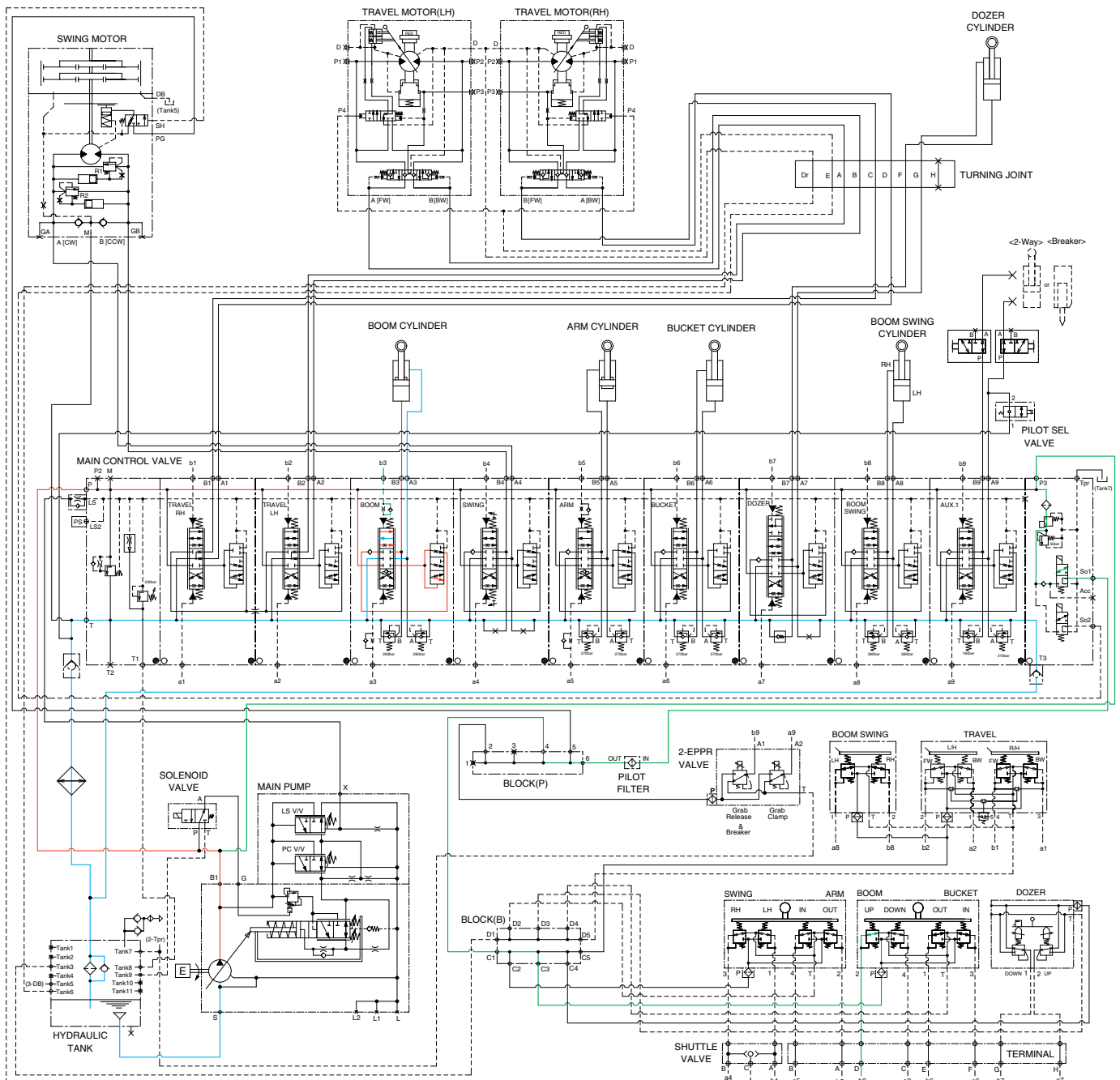
This pressure is applied to swing motor disc, thus the brake is released.

When the swing control lever is set in the neutral position, oil in the swing motor disc cylinder is drained, thus the brake is applied.

※ The circuit diagram may differ from the equipment, so please check before a repair.

GROUP 4 SINGLE OPERATION

1. BOOM UP OPERATION



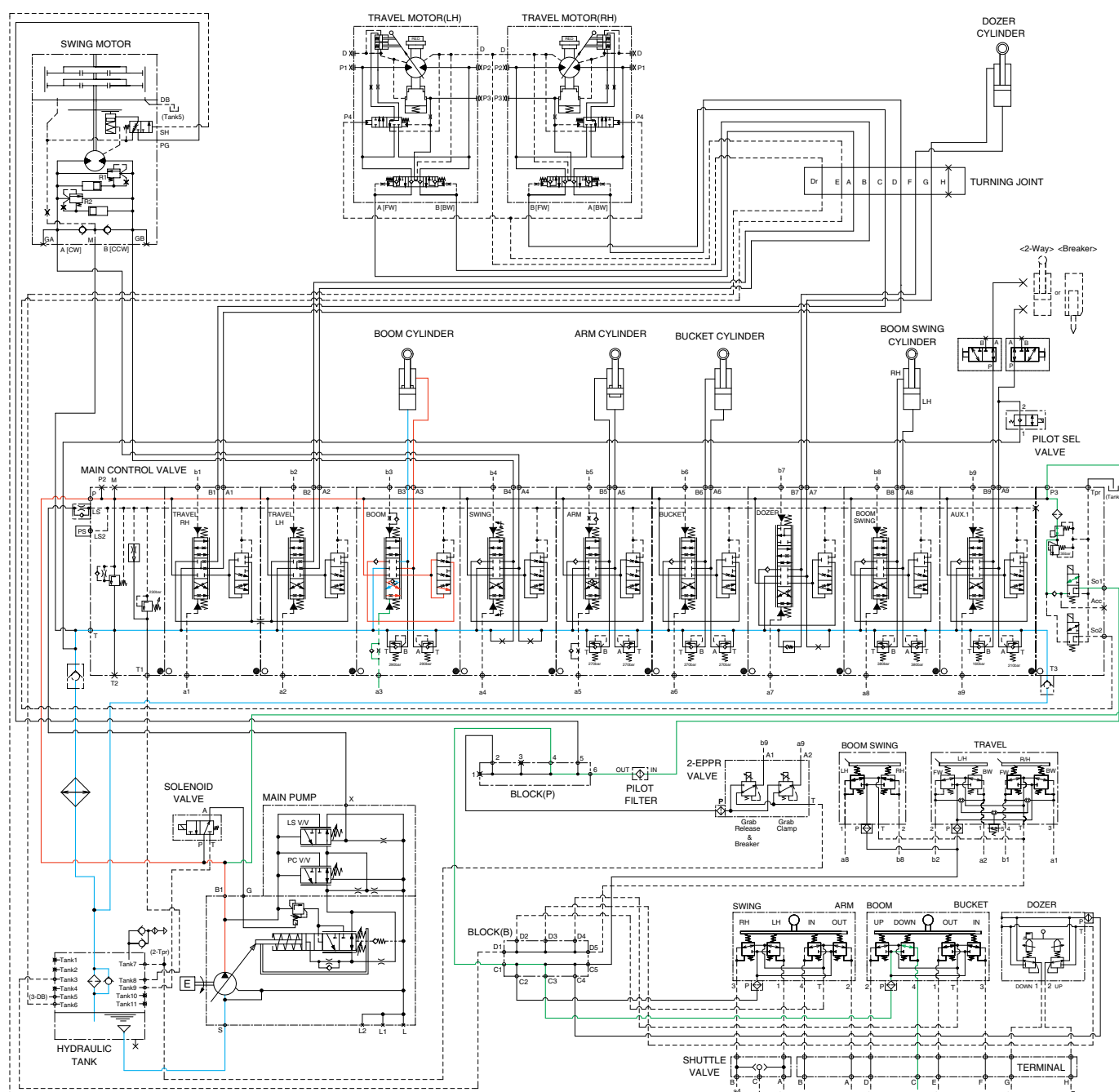
40A3HC10

When the right control lever is pulled back, the boom spool in the main control valve is moved to the up position by the pilot oil pressure (b3) from the remote control valve.

The oil from the main pump flows into the main control valve and then goes to the large chamber of boom cylinder. At the same time, the oil from the small chamber of boom cylinder returns to the hydraulic oil tank through the boom spool in the main control valve. When this happens, the boom goes up. The excessive pressure in the boom cylinder bottom end circuit is prevented by relief valve. When the boom is up and the control lever is returned to neutral position, the circuit for the holding pressure at the bottom end of the boom cylinder is closed by the boom holding valve. This prevents the hydraulic drift of boom cylinder.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. BOOM DOWN OPERATION



40A3HC11

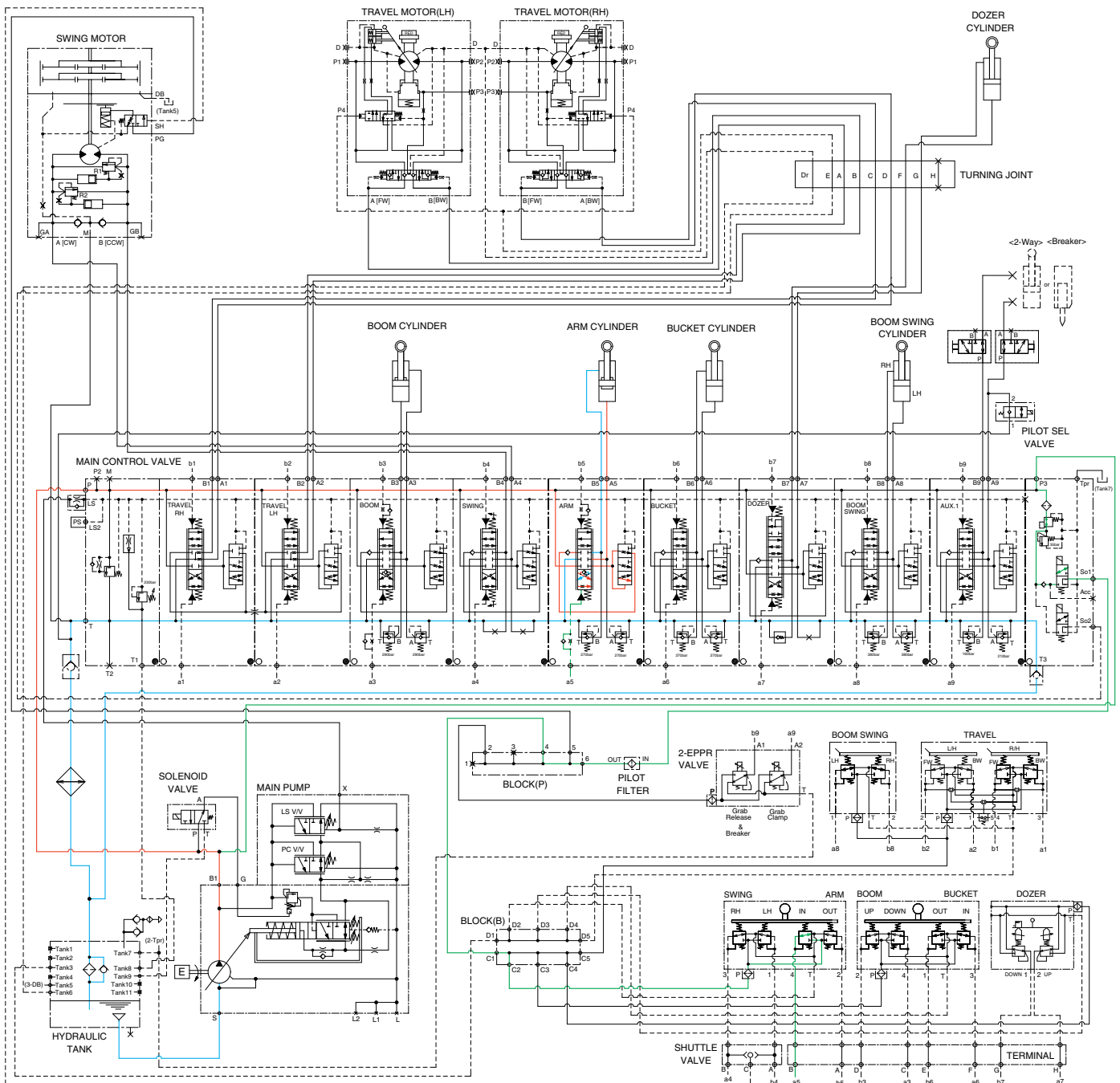
When the right control lever is pushed forward, the boom spool in the main control valve is moved to the down position by the pilot oil pressure (a3) from the remote control valve.

The oil from the main pump flows into the main control valve and then goes to the small chamber of boom cylinder. At the same time, the oil from the large chamber of boom cylinder returns to the hydraulic tank through the boom spool in the main control valve.

The excessive pressure in the boom cylinder rod end circuit is prevented by the relief valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. ARM ROLL IN OPERATION



40A3HC12

When the left control lever is pulled back, the arm spool in the main control valve is moved to the roll in position by the pilot oil pressure (a5) from the remote control valve.

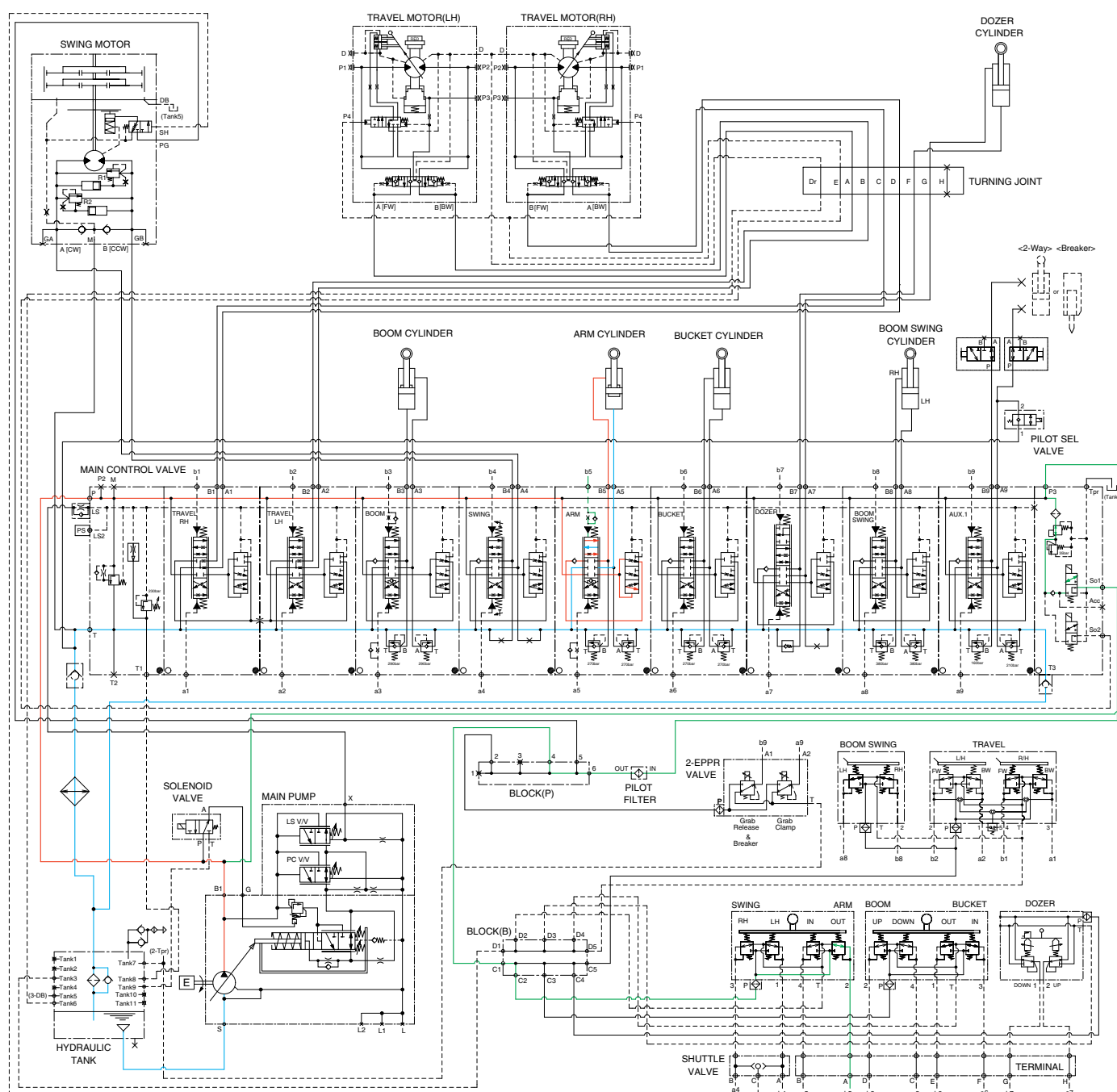
The oil from the main pump flows into the main control valve and then goes to the large chamber of arm cylinder.

At the same time, the oil from small chamber of arm cylinder returns to the hydraulic oil tank through the arm spool in the main control valve. When this happens, the arm rolls in.

The cavitation which will happen to the bottom of the arm cylinder is also prevented by the make-up valve in the main control valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

4. ARM ROLL OUT OPERATION



40A3HC13

When the left control lever is pushed forward, the arm spool in the main control valve is moved to the roll out position by the pilot oil pressure (b5) from the remote control valve.

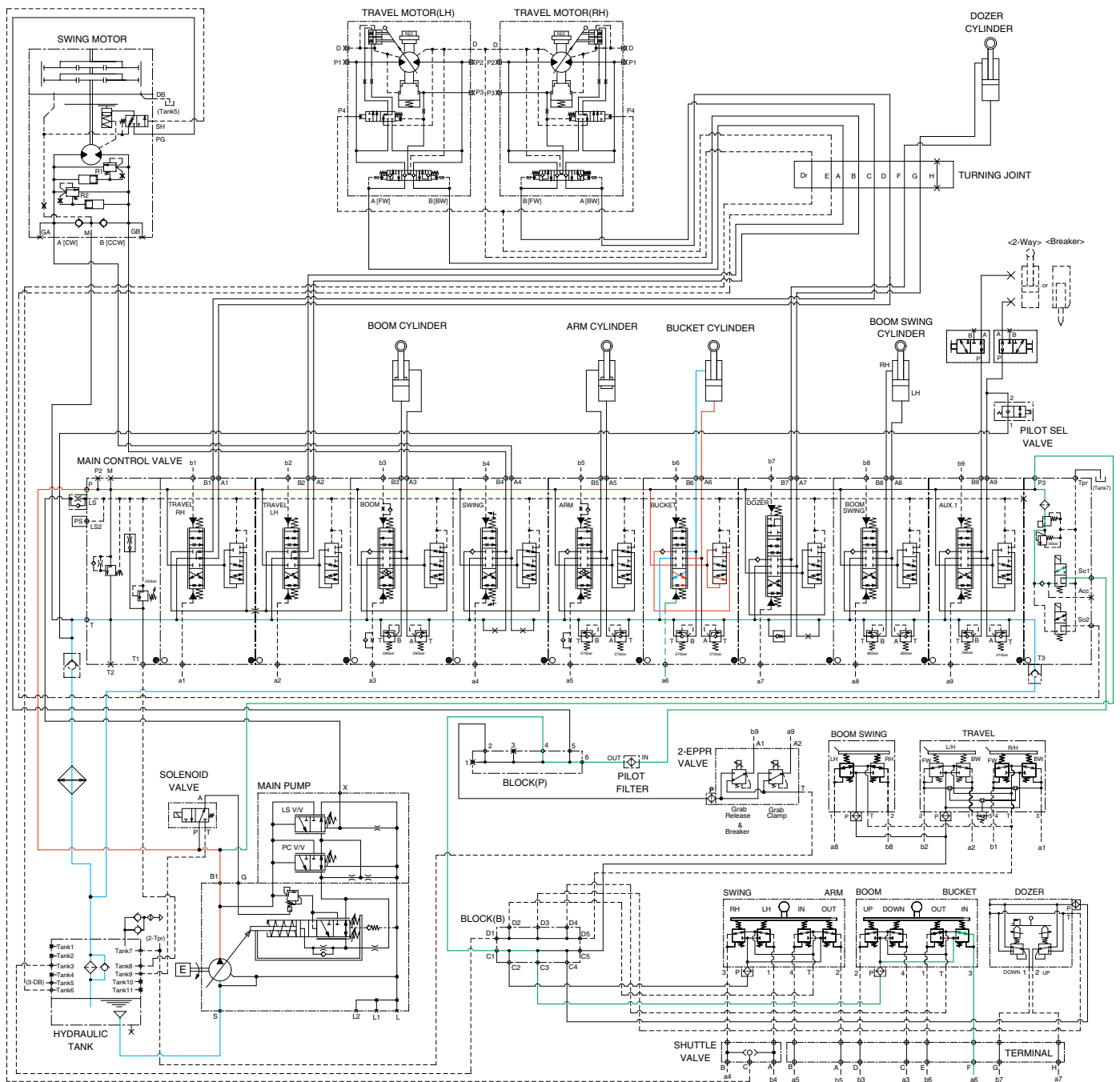
The oil from the main pump flows into the main control valve and then goes to the small chamber of arm cylinder.

At the same time, the oil from the large chamber of arm cylinder returns to the hydraulic oil tank through the arm spool in the main control valve. When this happens, the arm rolls out.

The cavitation which will happen to the rod of the arm cylinder is also prevented by the make-up valve in the main control valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

5. BUCKET ROLL IN OPERATION



40A3HC14

When the right control lever is pulled left, the bucket spool in the main control valve is moved to the roll in position by the pilot oil pressure (a6) from the remote control valve.

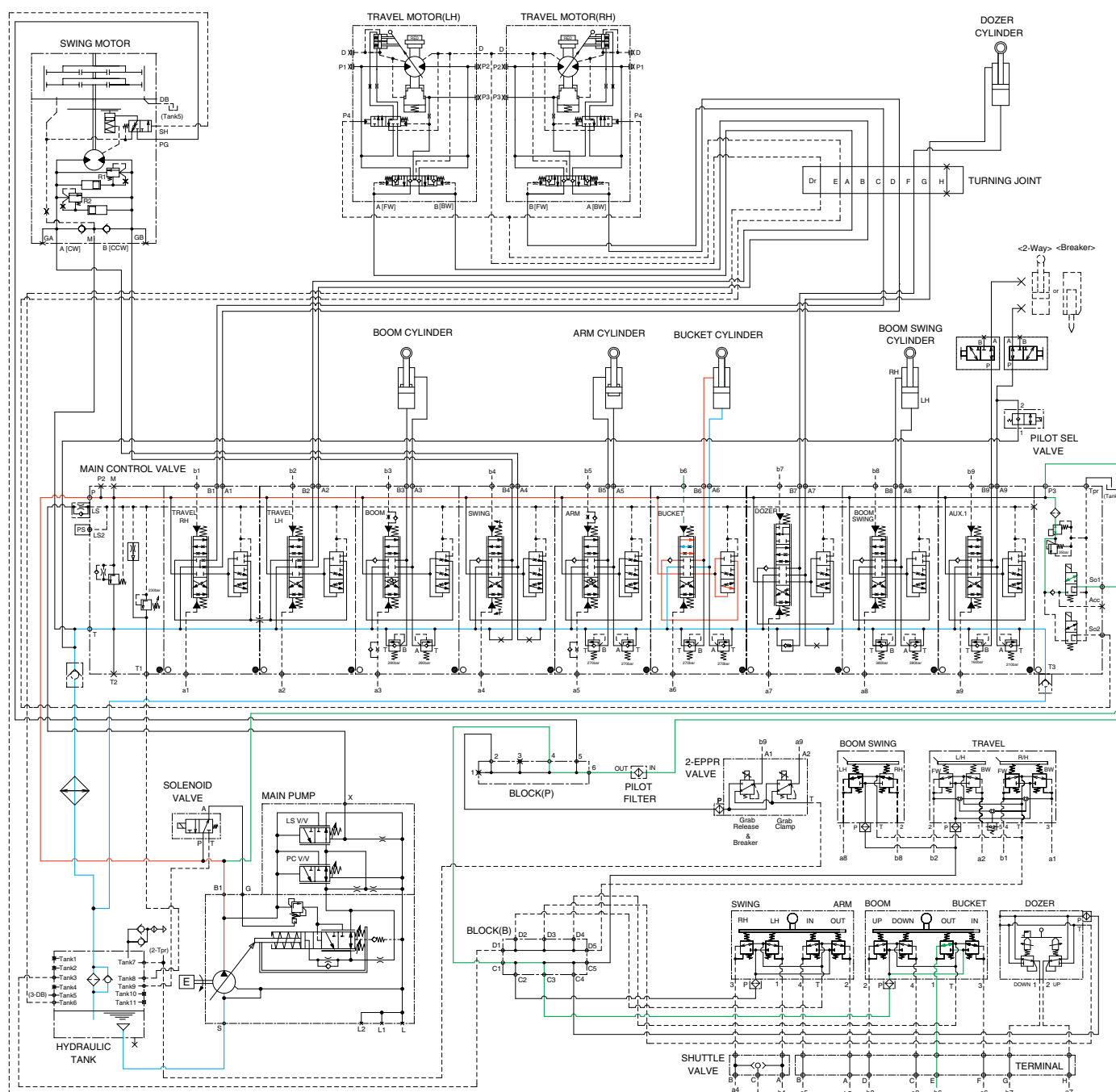
The oil from the main pump flows into the main control valve and then goes to the large chamber of bucket cylinder.

At the same time, the oil from the small chamber of bucket cylinder returns to the hydraulic oil tank through the bucket spool in the main control valve. When this happens, the bucket rolls in.

The cavitation which will happen to the bottom of the bucket cylinder is also prevented by the make-up valve in the main control valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

6. BUCKET ROLL OUT OPERATION



40A3HC15

When the right control lever is pushed right, the bucket spool in the main control valve is moved to the roll out position by the pilot oil pressure (b6) from the remote control valve.

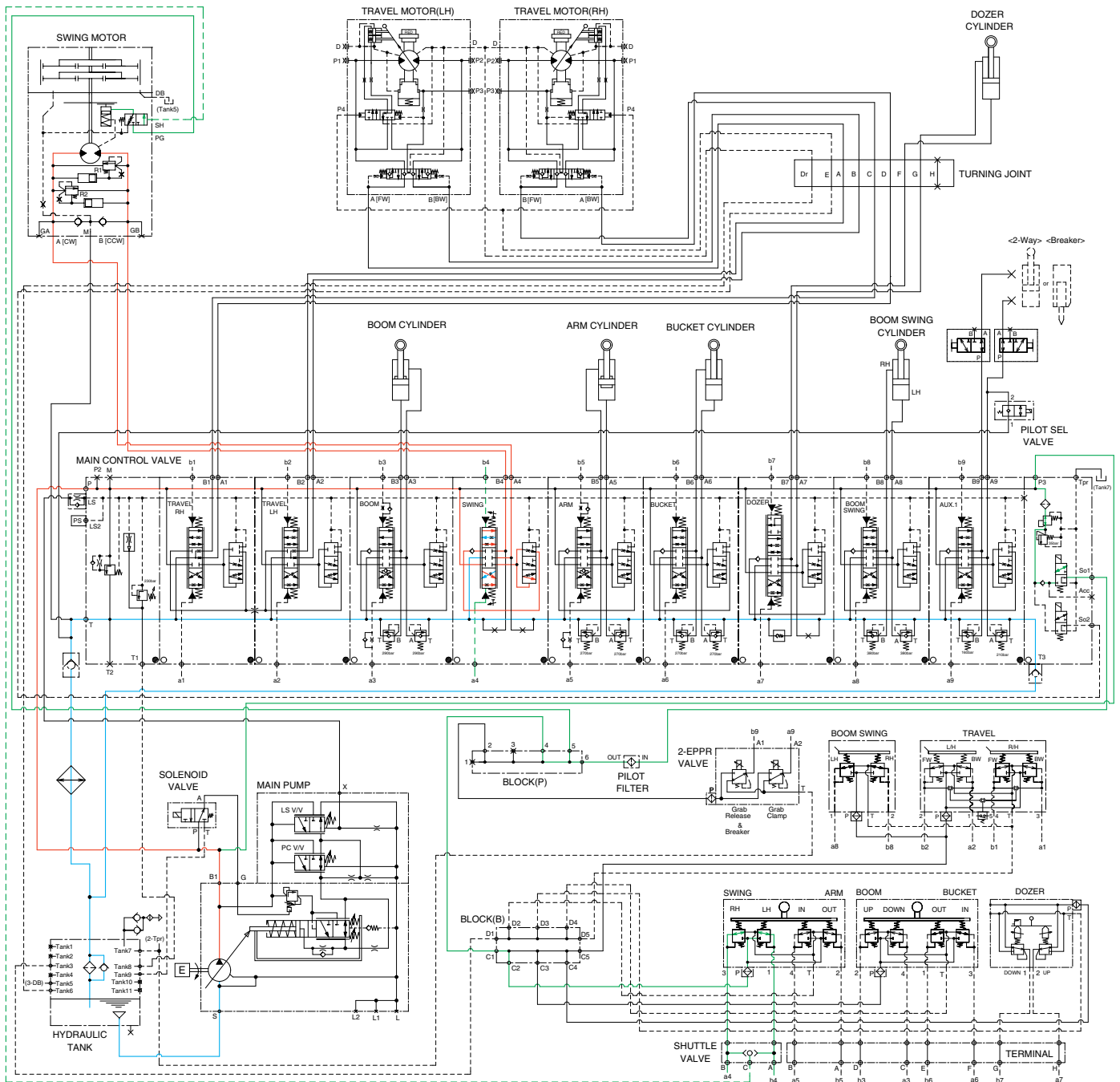
The oil from the main pump flows into the main control valve and then goes to the small chamber of bucket cylinder.

At the same time, the oil from the large chamber of bucket cylinder returns to the hydraulic oil tank through the bucket spool in the main control valve. When this happens, the bucket rolls out.

The cavitation which will happen to the rod of the bucket cylinder is also prevented by the make-up valve in the main control valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

7. SWING OPERATION

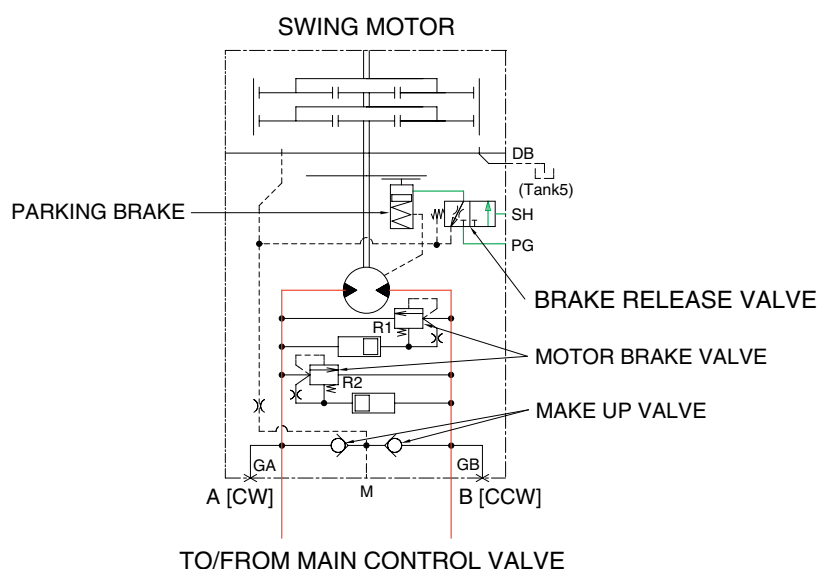


40A3HC16

When the left control lever is pushed left or right, the swing spool in the main control valve is moved to the left or right swing position by the pilot oil pressure (a4, b4) from the remote control valve. The oil from the main pump flows into the main control valve and then goes to the swing motor. At the same time, the return oil from the swing motor returns to the hydraulic oil tank through the swing spool in the main control valve. When this happens, the superstructure swings to the left or right. The swing parking brake, make up valve and the overload relief valve are provided in the swing motors. The cavitation which will happen to the swing motor is also prevented by the make up valve in the swing motor itself.

※ The circuit diagram may differ from the equipment, so please check before a repair.

SWING CIRCUIT OPERATION



40A3HC17

1) MOTOR BRAKE VALVE

Motor brake valve for the swing motor limits to cushion the starting and stopping pressure of swing operation.

2) MAKE UP VALVE

The make up valves prevent cavitation by supplying return oil to the vacuum side of the motor.

3) PARKING BRAKE

In case that the parking, of the machine at slope is required during operation, there is the danger of involuntary swing caused by the self weight of the machine. The brake is connected to prevent this involuntary swing.

PARKING BRAKE "OFF" OPERATION

The parking brake is released by the pilot pressure oil from the main pump.

When the left control lever placed in the swing position, the pilot pressure (SH) at the shuttle valve is transferred to the brake release valve and the brake release valve is change over. Then the pilot pressure (PG) lift the brake piston and release the parking brake.

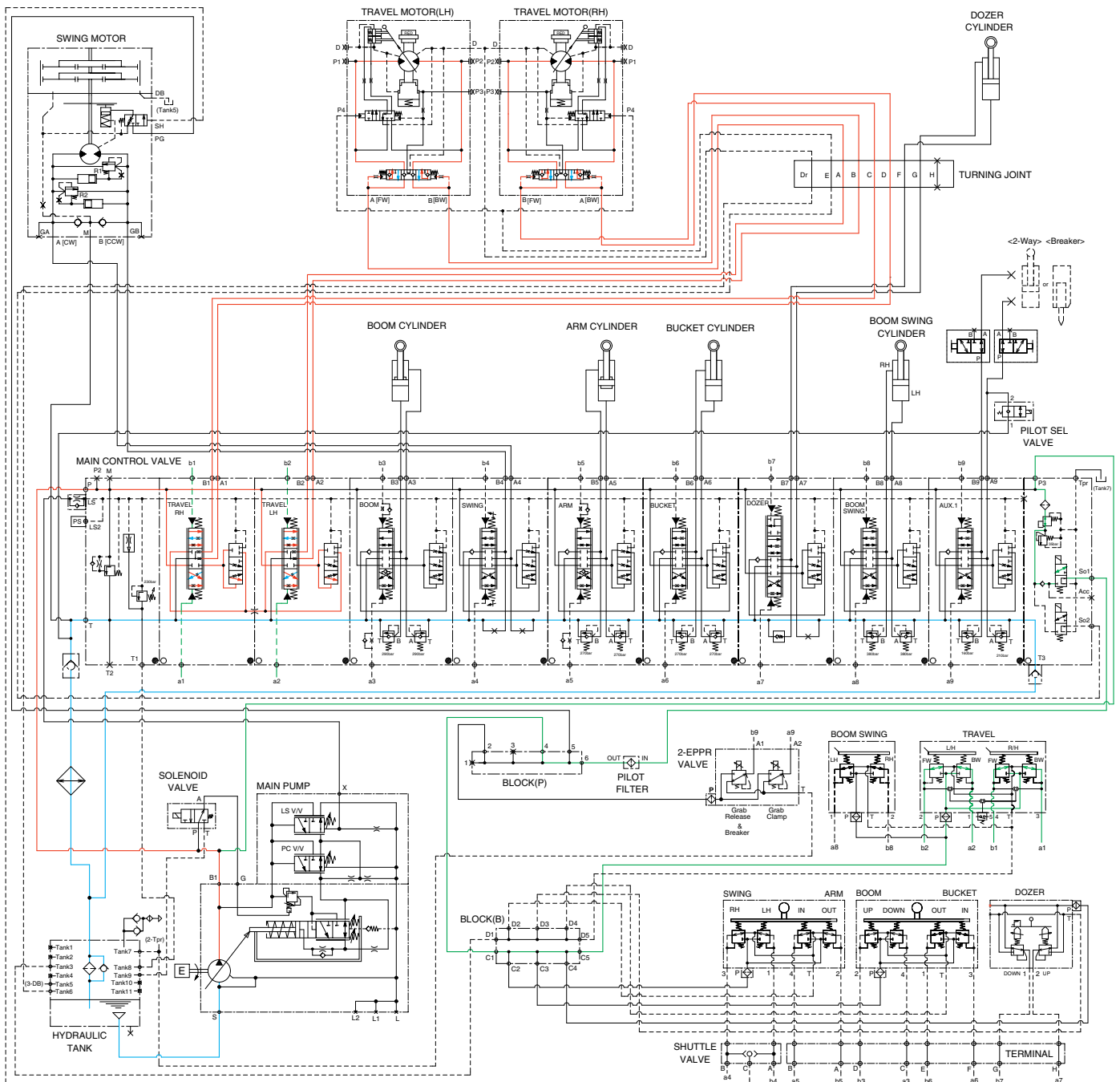
PARKING BRAKE "ON" OPERATION

When the control lever placed in the neutral position, the pressure of the pilot oil passage down.

Then the brake release valve returned to the neutral position and the oil is returned from the brake piston to the tank. And the brake is set to 'ON'.

※ The circuit diagram may differ from the equipment, so please check before a repair.

8. TRAVEL FORWARD AND REVERSE OPERATION

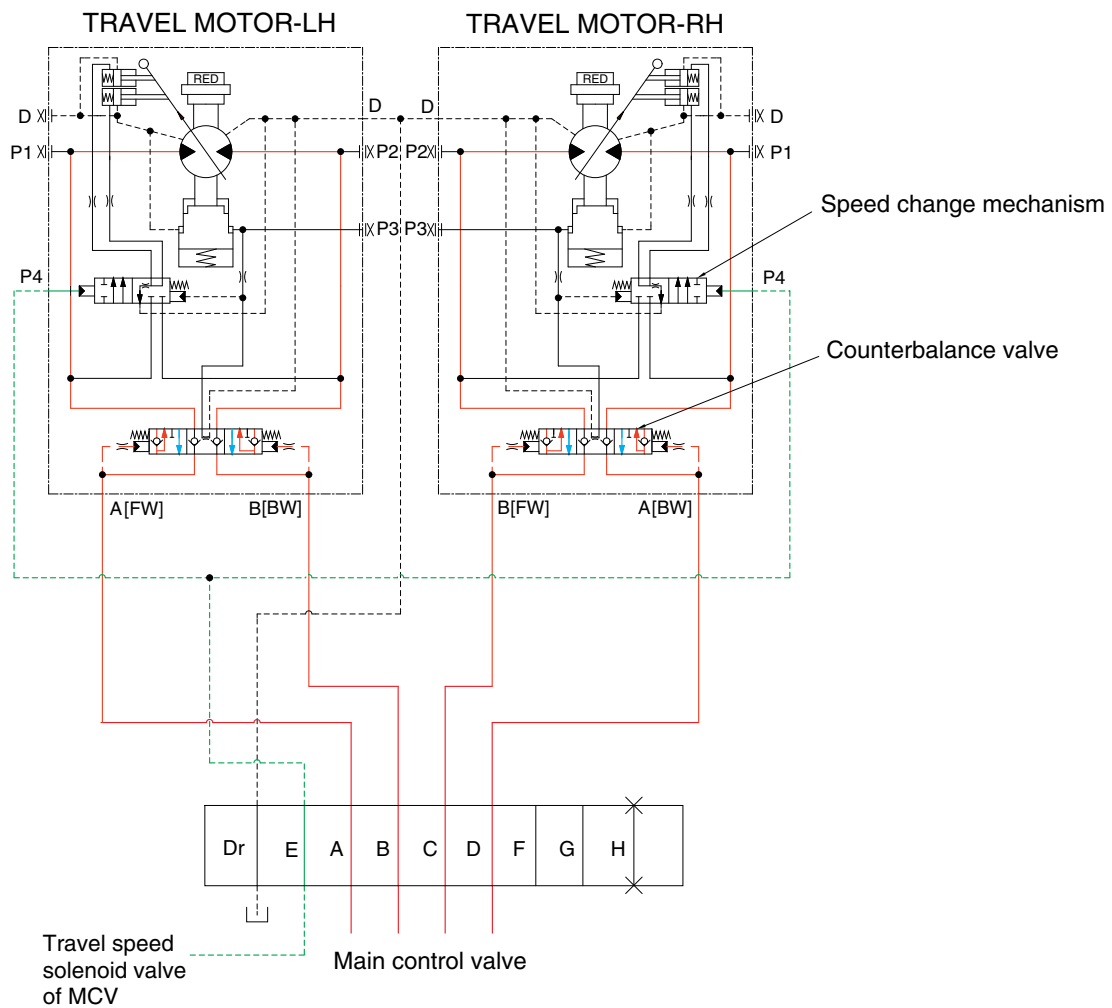


40A3HC18

When the travel levers are pushed forward or reverse position, the travel spools in the main control valve are moved to the forward or reverse travel position by the pilot oil pressure (a1,b1, a2, b2) from the travel control valve. The oil from the main pump flows into the main control valve and then goes to the both travel motors through the turning joint. The return oil from both travel motors returns to the hydraulic oil tank through the turning joint and the travel spools in the main control valve. When this happens, the machine moves to the forward or reverse.

※ The circuit diagram may differ from the equipment, so please check before a repair.

TRAVEL CIRCUIT OPERATION



40A3HC19

Valves are provided on travel motors to offer the following functions.

1) COUNTER BALANCE VALVE

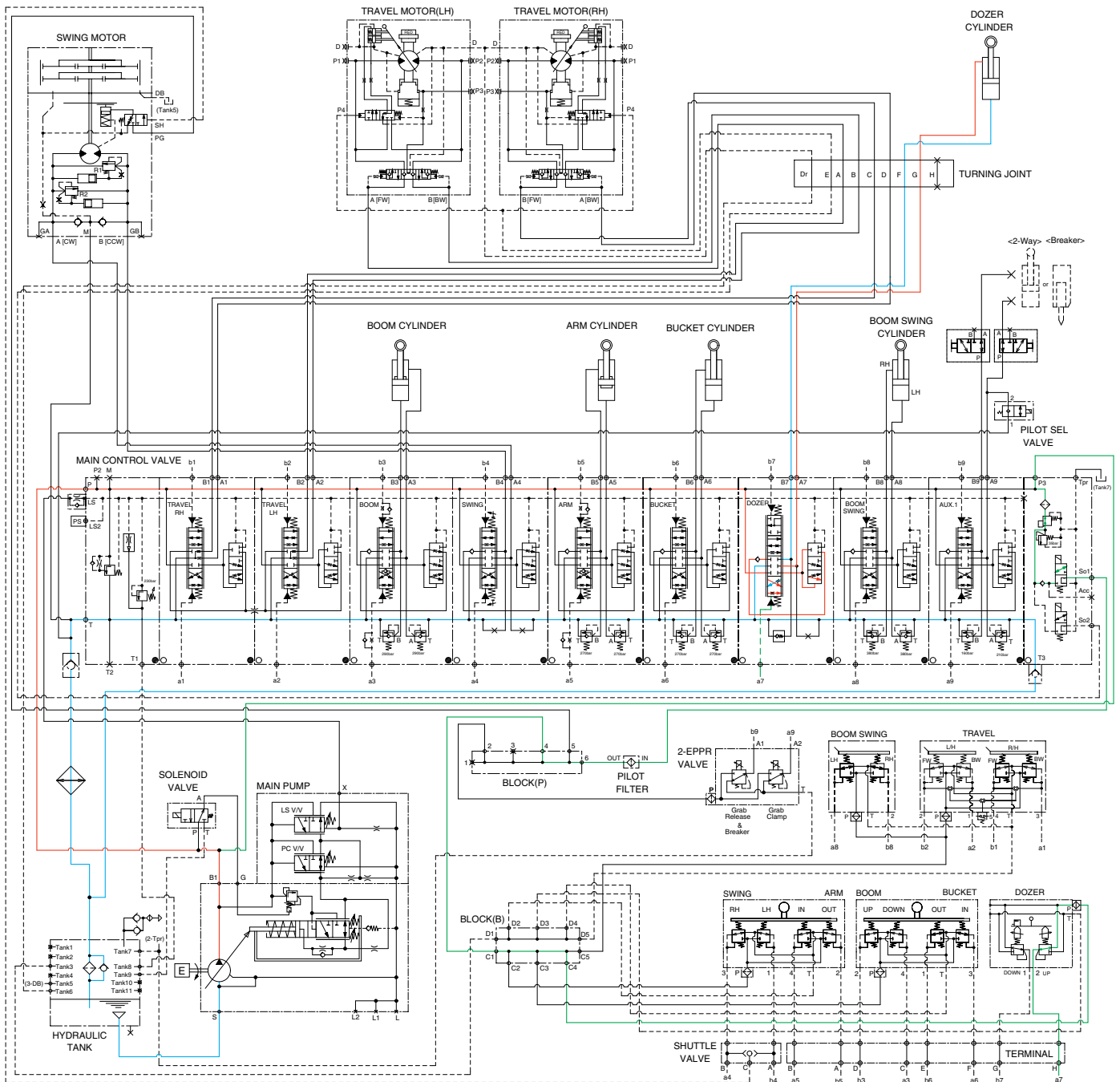
When stopping the motor of slope descending, this valve to prevent the motor over run.

2) SPEED CHANGE MECHANISM (auto)

Auto two speed control mechanism consists of two spools and spring. This valve automatically changes motor displacement in portion to motor pressure.

※ The circuit diagram may differ from the equipment, so please check before a repair.

9. DOZER UP OPERATION



40A3HC20

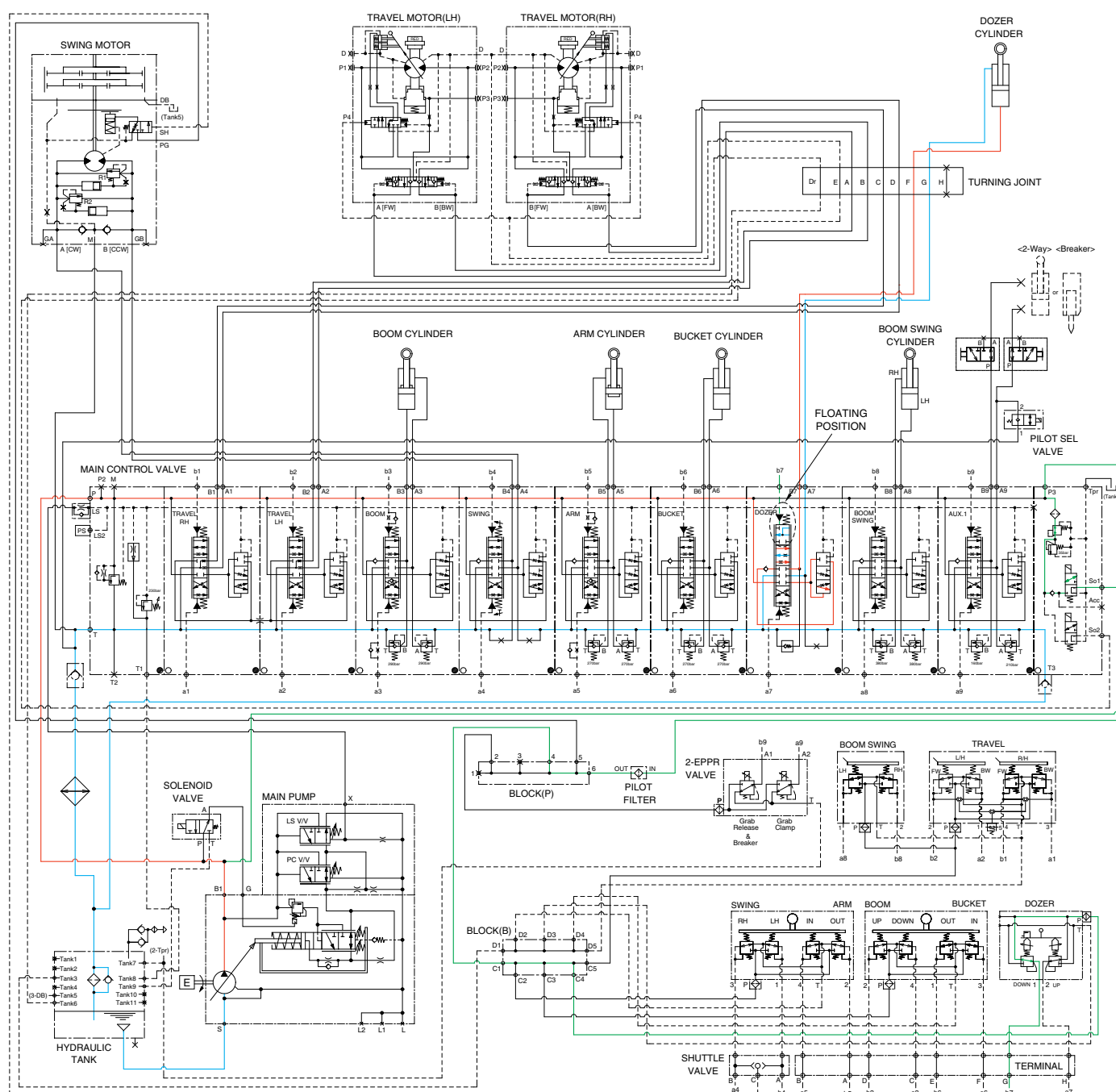
When the dozer control lever is pulled back, the dozer spool in the main control valve is moved to the dozer up position by the pilot oil pressure (a7) from the remote control valve.

The oil from the main pump flows into the main control valve and then goes to the small chamber of dozer cylinders through the turning joint.

At the same time, the oil from the large chamber of dozer cylinders returns to the hydraulic oil tank through the turning joint and dozer spool in the main control valve. When this happens, the dozer goes up.

※ The circuit diagram may differ from the equipment, so please check before a repair.

10. DOZER DOWN OPERATION



40A3HC21

When the dozer control lever is pushed forward, the dozer spool in the main control valve is moved to the dozer down position by the pilot oil pressure (b7) from the remote control valve.

The oil from the main pump flows into the main control valve and then goes to the large chamber of dozer cylinders through the turning joint.

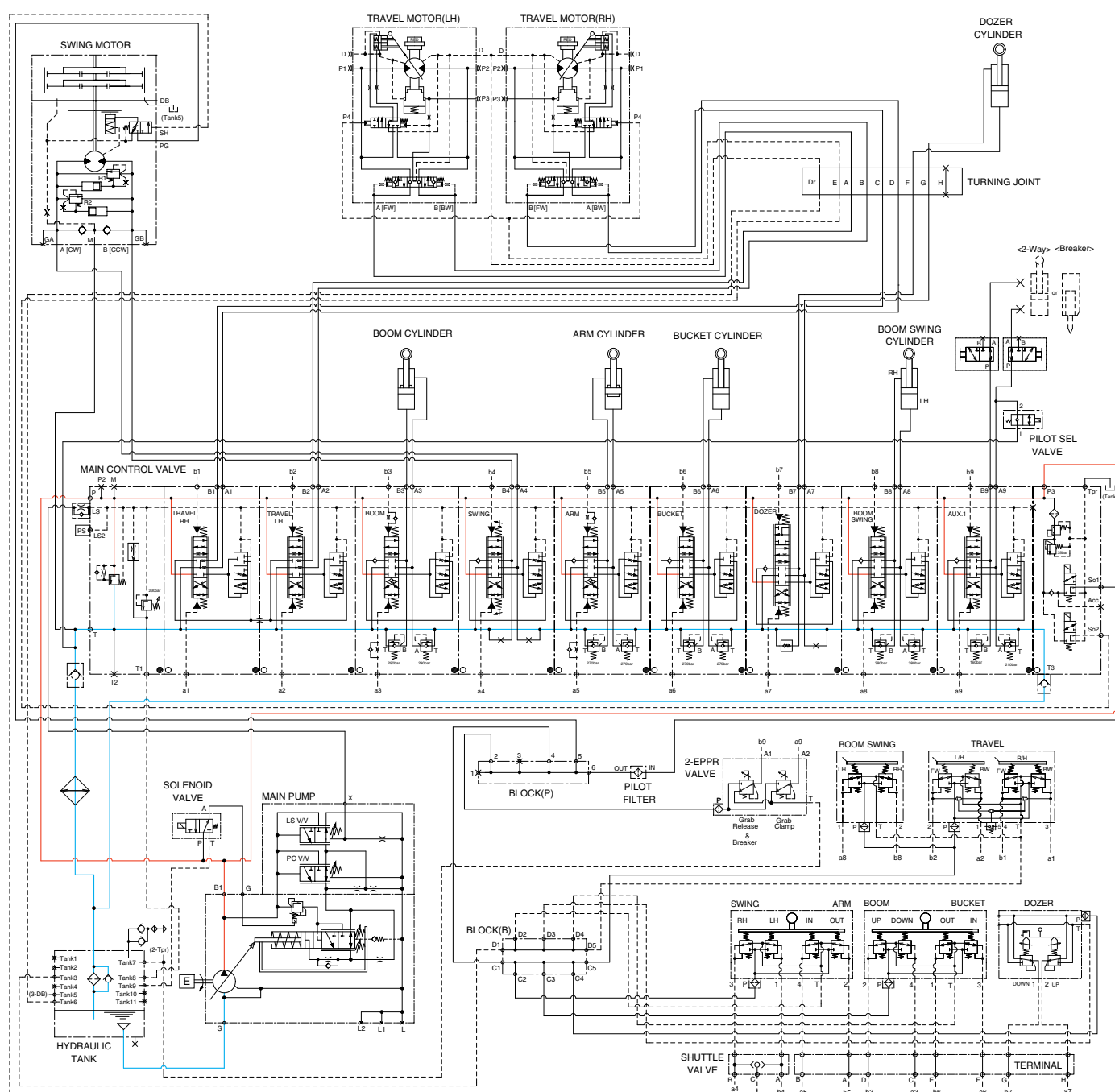
At the same time, the oil from the small chamber of dozer cylinders returns to the hydraulic oil tank through the turning joint and dozer spool in the main control valve. When this happens, the dozer blade is down.

Press the dozer floating button and push the dozer control lever until the end, the dozer spool is moved to the floating position. Then the hydraulic oil of the rod and head goes to tank, and floating is accomplished. Refer to the operator's manual page 3-33.

※ The circuit diagram may differ from the equipment, so please check before a repair.

GROUP 5 COMBINED OPERATION

1. OUTLINE

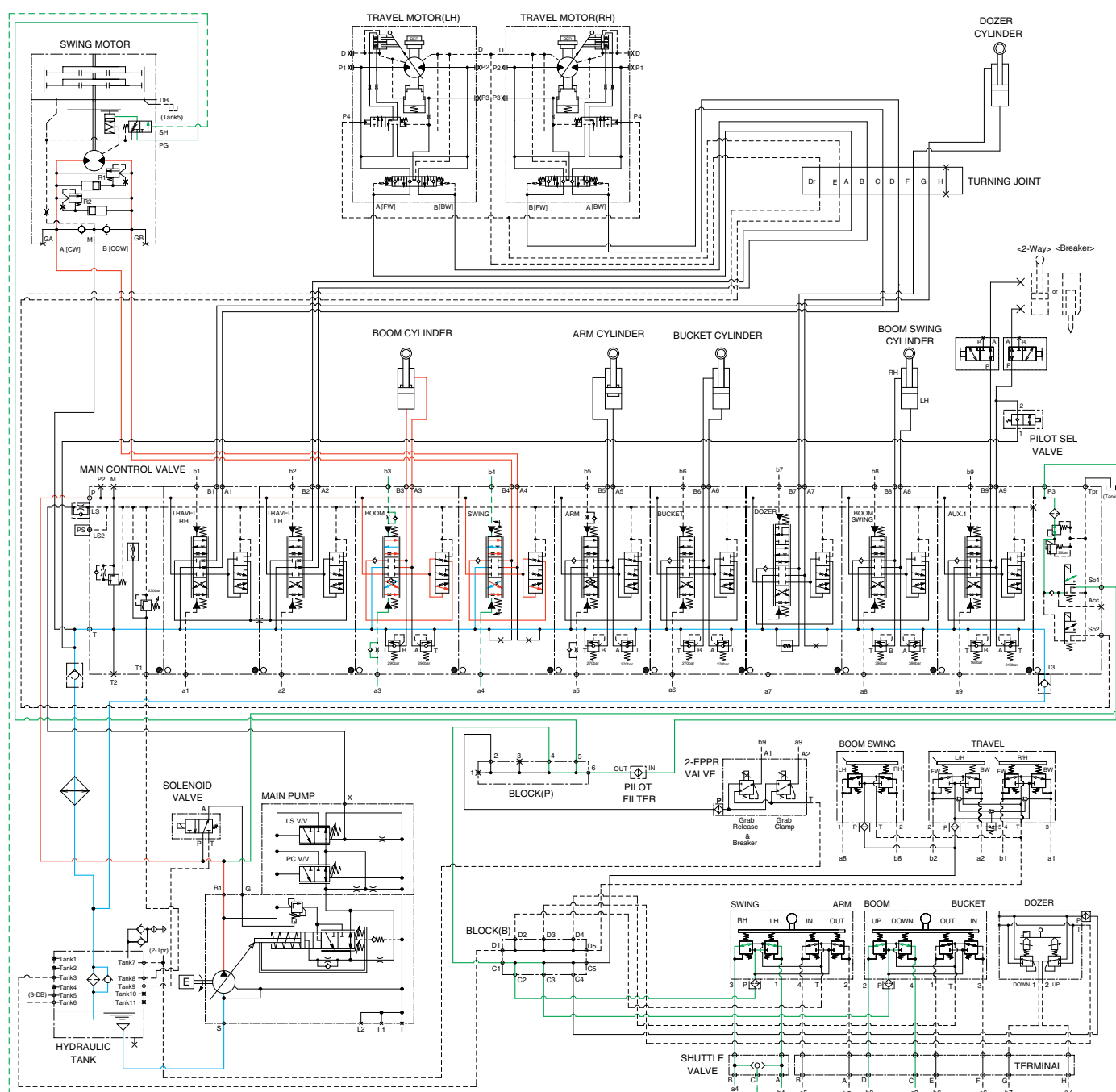


40A3HC30

The oil from the main pump flows through the parallel oil passage in the main control valve. Then the oil goes to each actuator and operates them. Check valves and orifices are located on these oil passage in the main control valve. These control the oil from the main pumps so as to correspond to the operation of each actuator and smooth the combined operation.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. COMBINED SWING AND BOOM OPERATION



40A3HC31

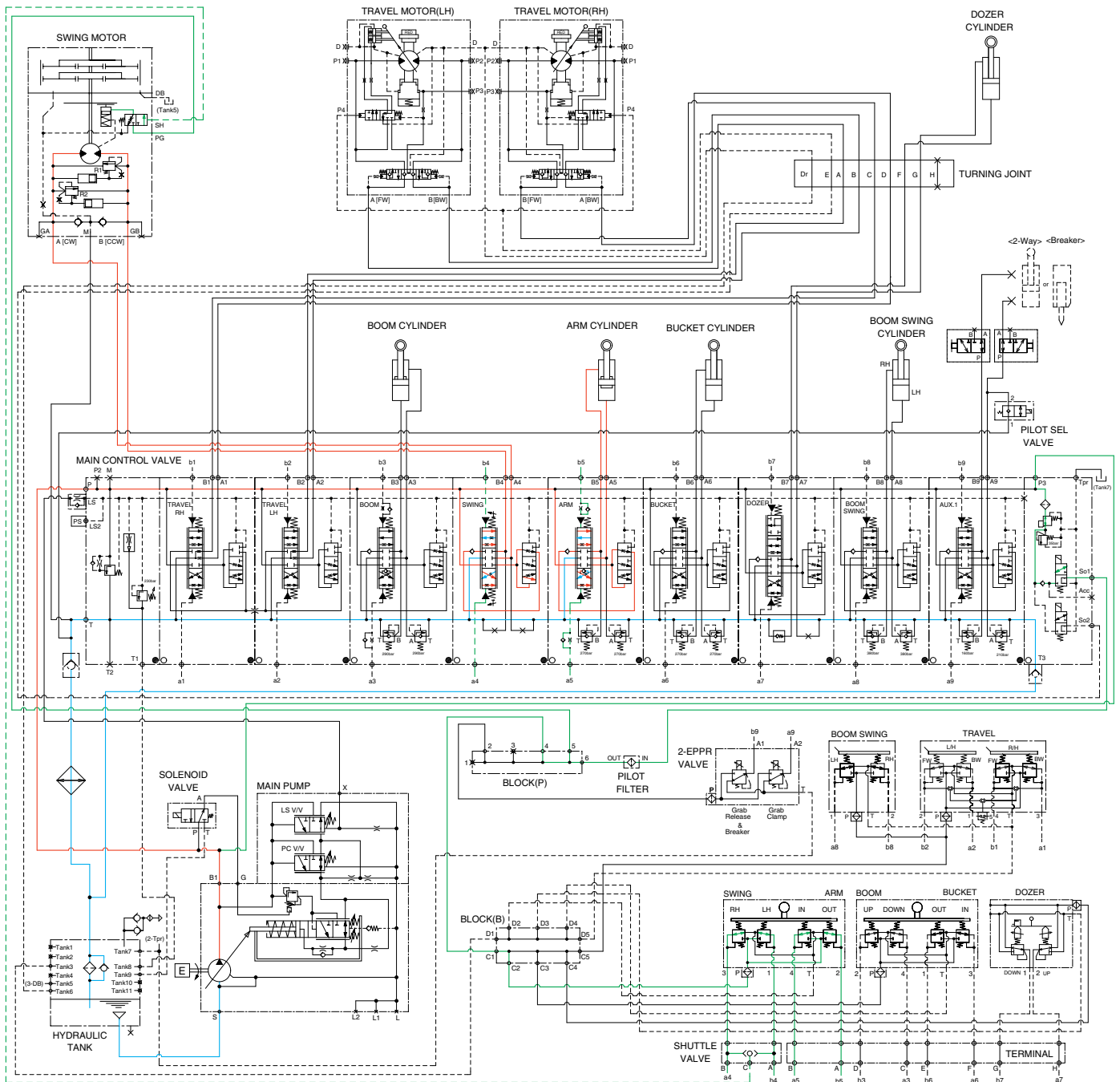
When the swing and boom functions are operated, simultaneously the swing spool and boom spool in the main control valve are moved to the functional position by the pilot oil pressure (a4, b4, a3, b3) from the remote control valve.

The oil from the main pump flows into the boom cylinder through boom spool and flows into the swing motor through the swing spool via the parallel passage.

The superstructure swings and the boom is operated.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. COMBINED SWING AND ARM OPERATION



40A3HC32

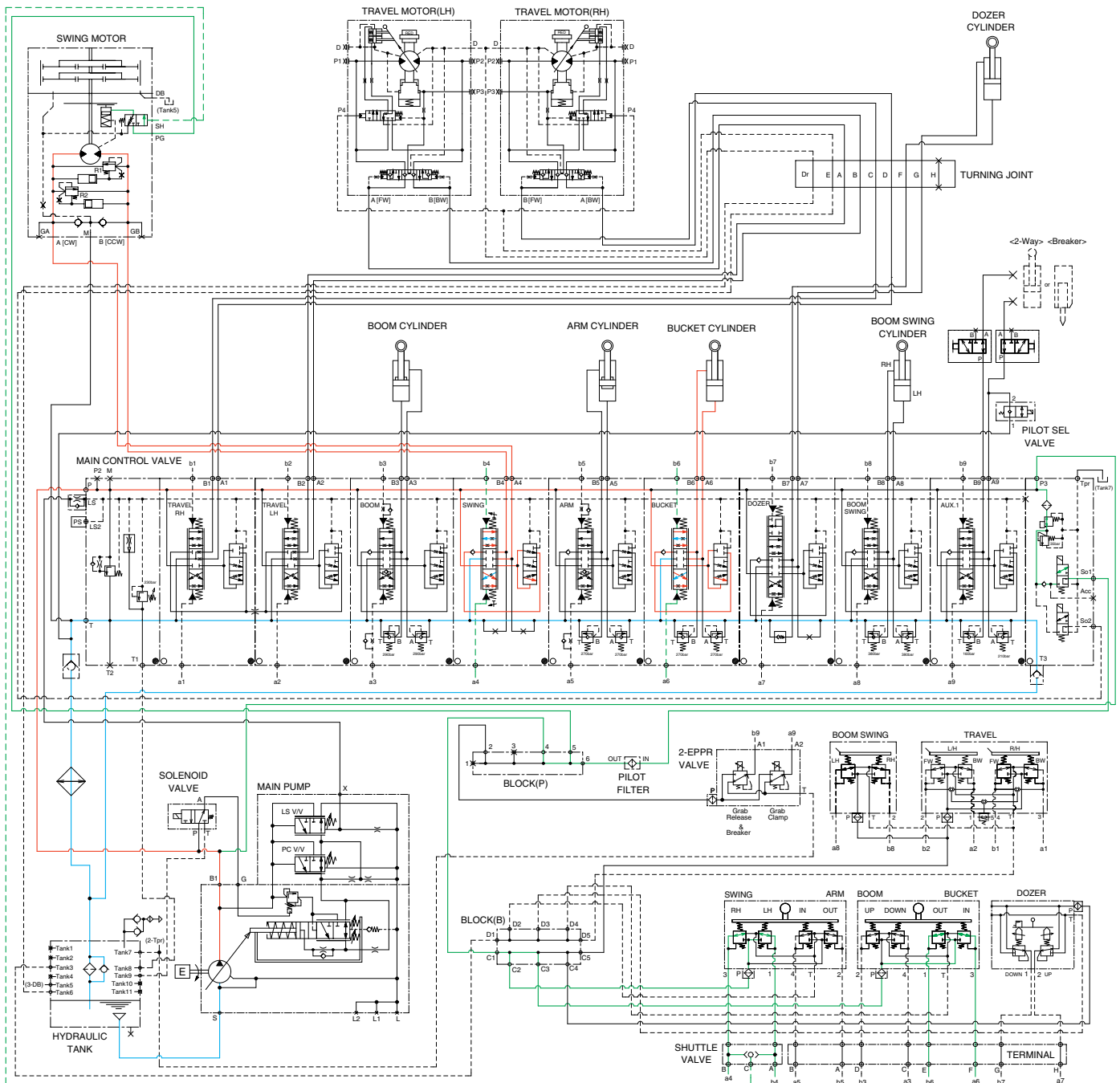
When the swing and arm functions are operated, simultaneously the swing spool and arm spool in the main control valve are moved to the functional position by the pilot oil pressure (a4, b4, a5, b5) from the remote control valve.

The oil from the main pump flows into the swing motor through swing spool via the parallel passage and flows into the arm cylinder through the arm spool.

The superstructure swings and the arm is operated.

※ The circuit diagram may differ from the equipment, so please check before a repair.

4. COMBINED SWING AND BUCKET OPERATION



40A3HC33

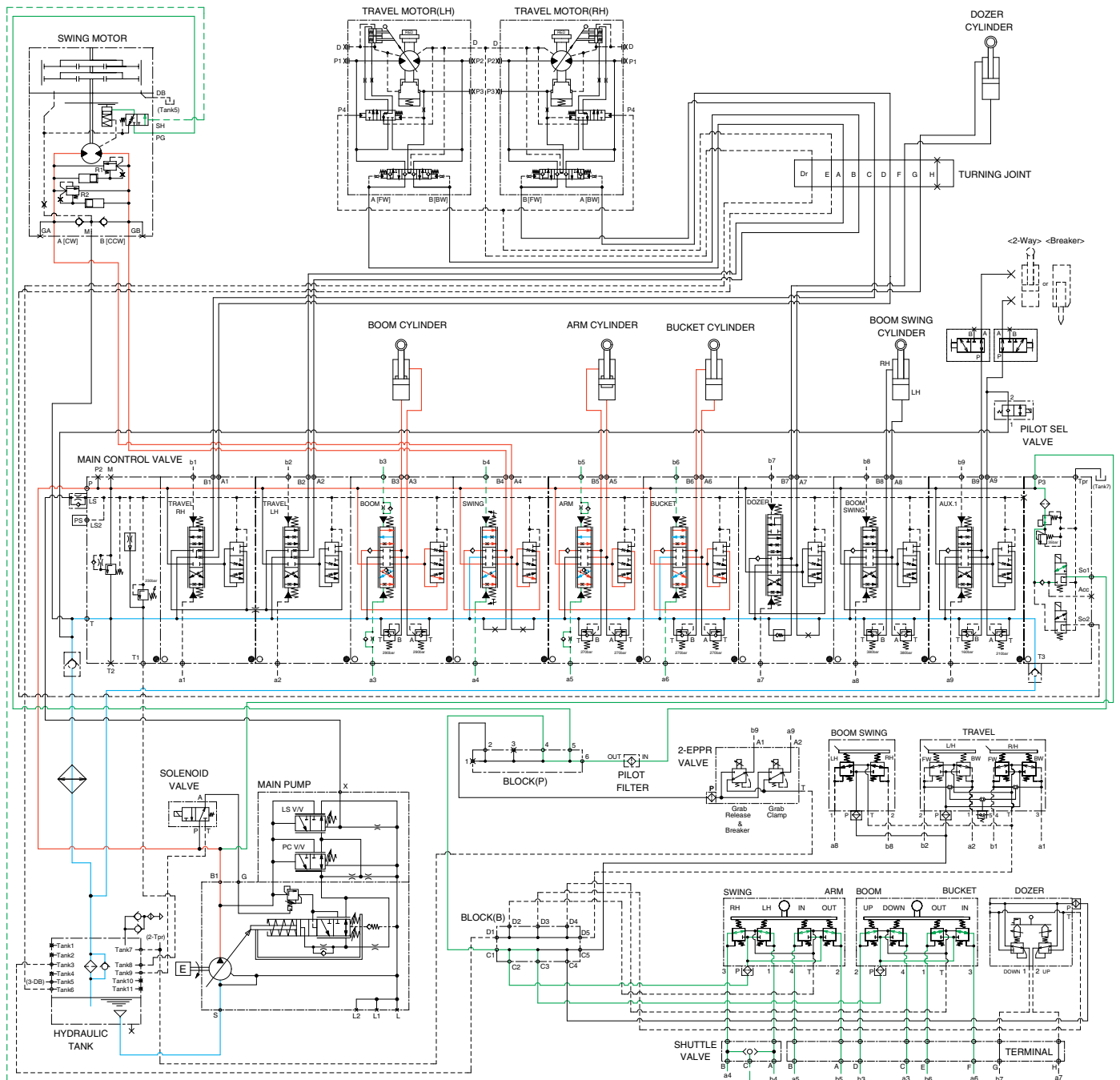
When the swing and bucket functions are operated, simultaneously the swing spool and bucket spool in the main control valve are moved to the functional position by the pilot oil pressure (a4, b4, a6, b6) from the remote control valve.

The oil from the main pump flows into the swing motor through the swing spool via the parallel passage and flows into the bucket cylinder through the bucket spool.

The superstructure swings and the bucket is operated.

※ The circuit diagram may differ from the equipment, so please check before a repair.

5. COMBINED SWING, BOOM, ARM AND BUCKET OPERATION



40A3HC34

When the swing, boom, arm and bucket functions are operated, simultaneously each spool in the main control valve is moved to the functional position by the pilot oil pressure (a4, b4, a3, b3, a5, b5, a6, b6) from the remote control valve.

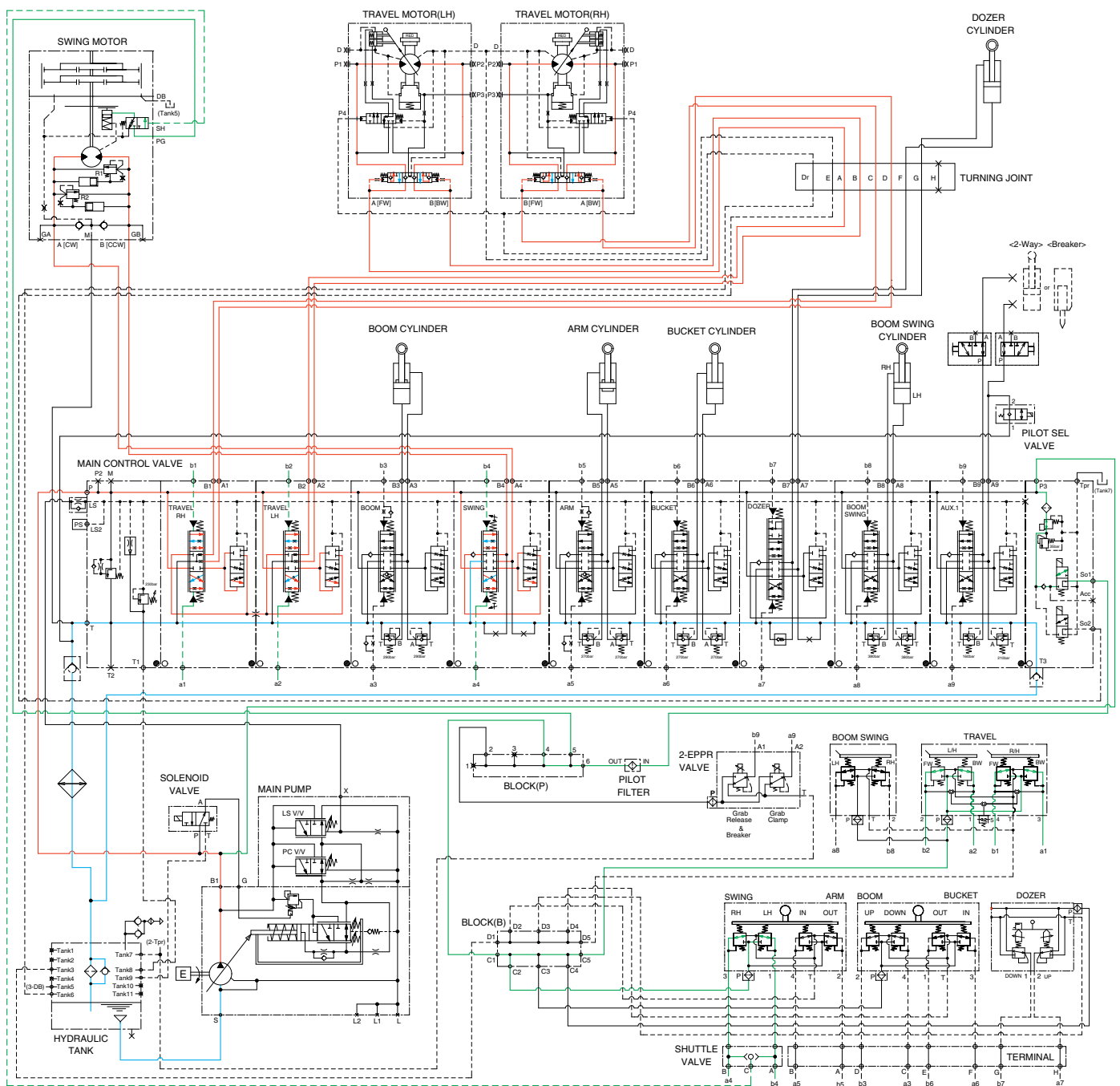
The oil from the main pump flows into the boom cylinder, arm cylinder and bucket cylinder through the boom spool, arm spool, bucket spool by the parallel passage.

Also, the oil flows into the swing motor through the swing spool via the parallel passage.

The superstructure swings and the boom, arm and bucket are operated.

※ The circuit diagram may differ from the equipment, so please check before a repair.

6. COMBINED SWING AND TRAVEL OPERATION



40A3HC35

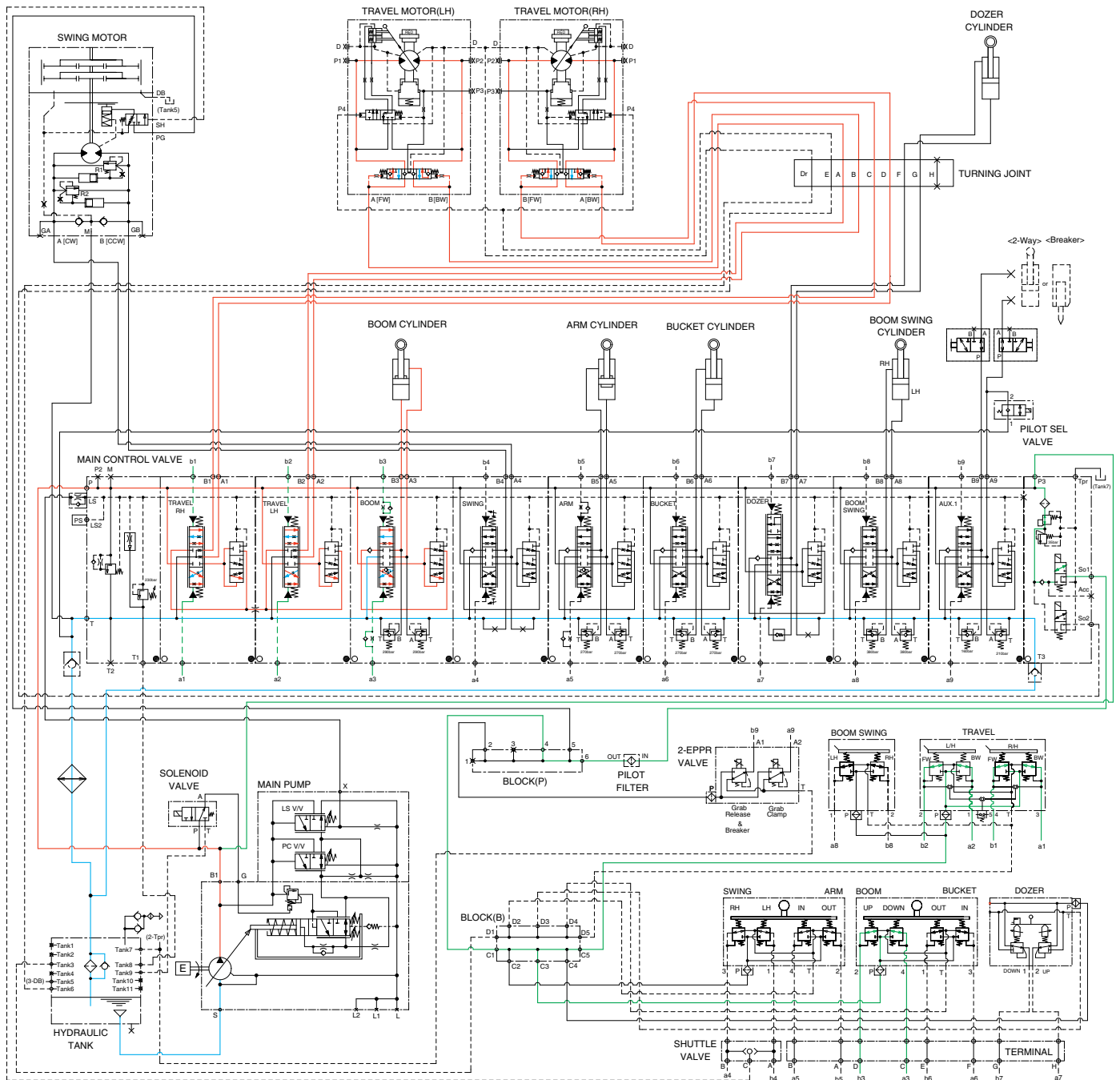
When the swing and travel functions are operated, simultaneously the swing spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (a4, b4, a1, b1, a2, b2) from the remote control valve.

The oil from the main pump flows into the swing motor and LH and RH travel motors through the swing spool and both travel spools via the parallel passage.

The superstructure swings and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

7. COMBINED BOOM AND TRAVEL OPERATION



40A3HC36

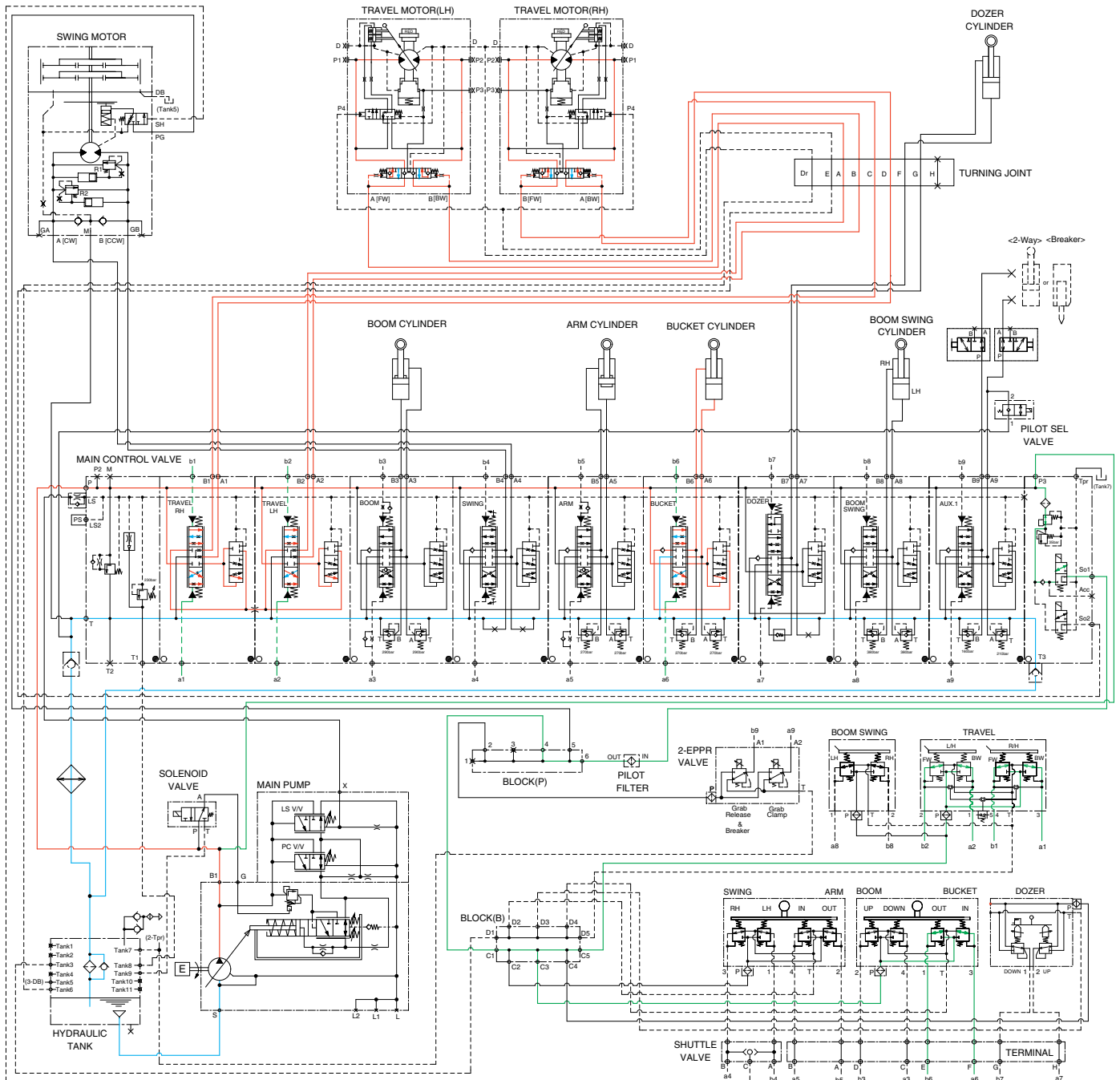
When the boom and travel functions are operated, simultaneously the boom spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (a3, b3, a1, b1, a2, b2) from the remote control valve.

The oil from the main pump flows into the boom cylinder and the travel motors through boom, travel LH and travel RH spools via the parallel passage.

The boom is operated and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

8. COMBINED ARM AND TRAVEL OPERATION



40A3HC37

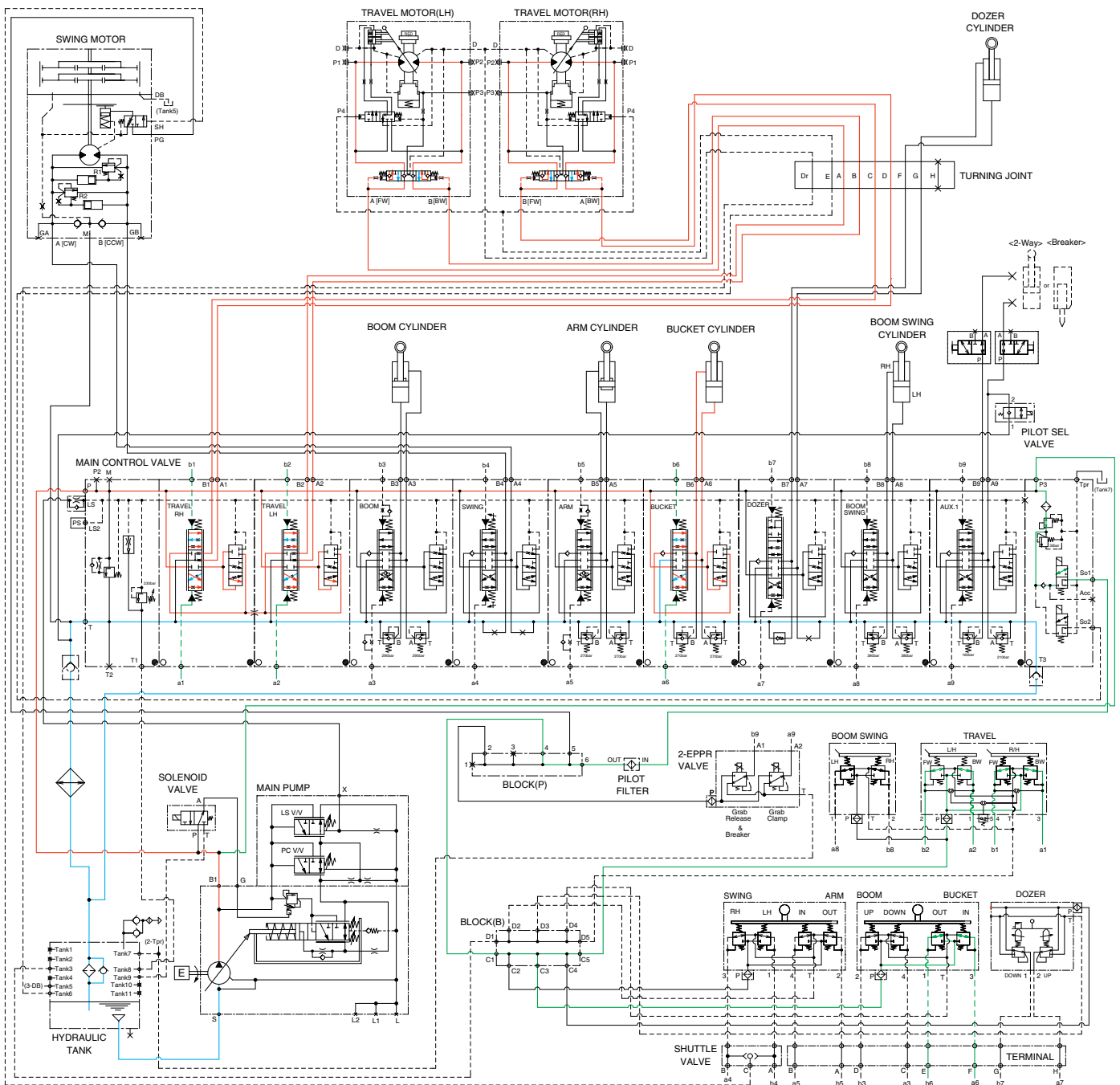
When the arm and travel functions are operated, simultaneously the arm spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (a5, b5, a1, b1, a2, b2) from the remote control valve.

The oil from the main pump flows into the travel motors and the arm cylinder through travel spools and arm spools via the parallel passage.

The arm is operated and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

9. COMBINED BUCKET AND TRAVEL OPERATION



40A3HC38

When the bucket and travel functions are operated, simultaneously the bucket spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (a6, b6, a1, b1, a2, b2) from the remote control valve. The oil from the main pump flows into the travel motors and the bucket cylinder through the travel spools and the bucket spool via the parallel passage.

The bucket is operated and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.