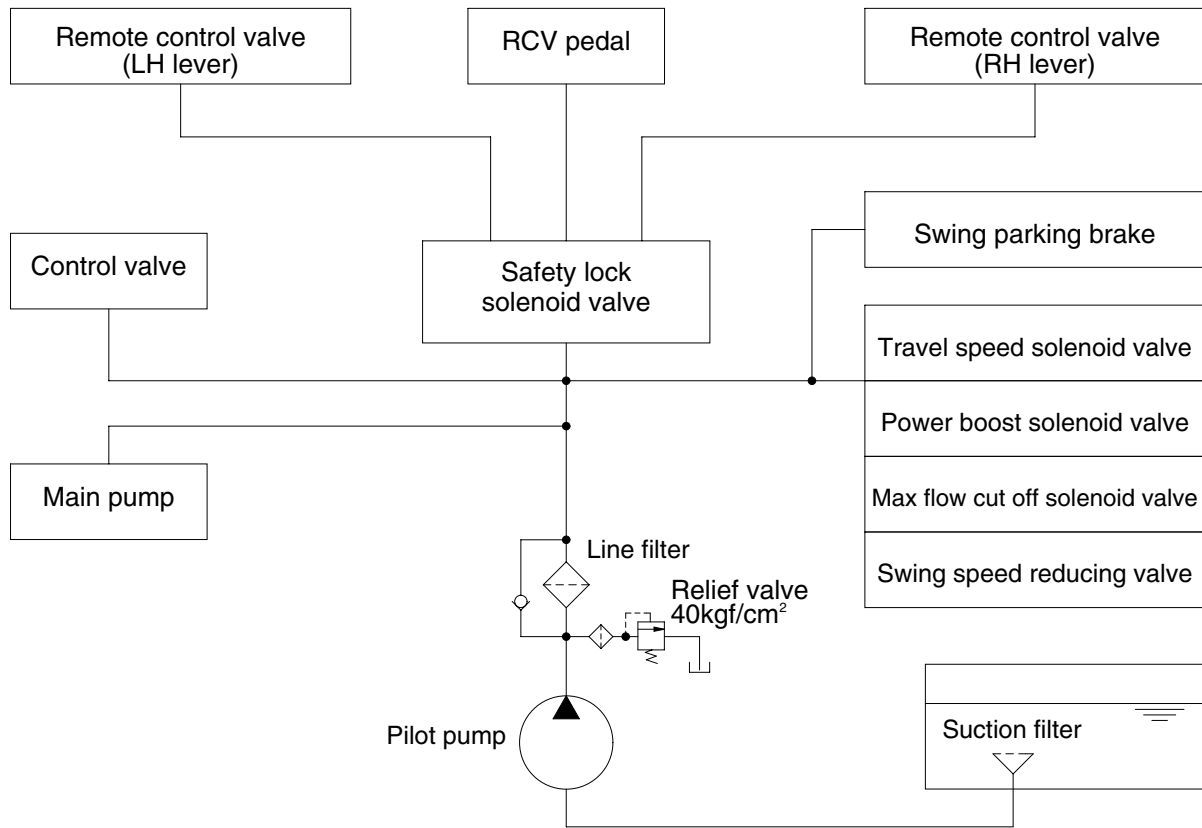


GROUP 3 PILOT CIRCUIT



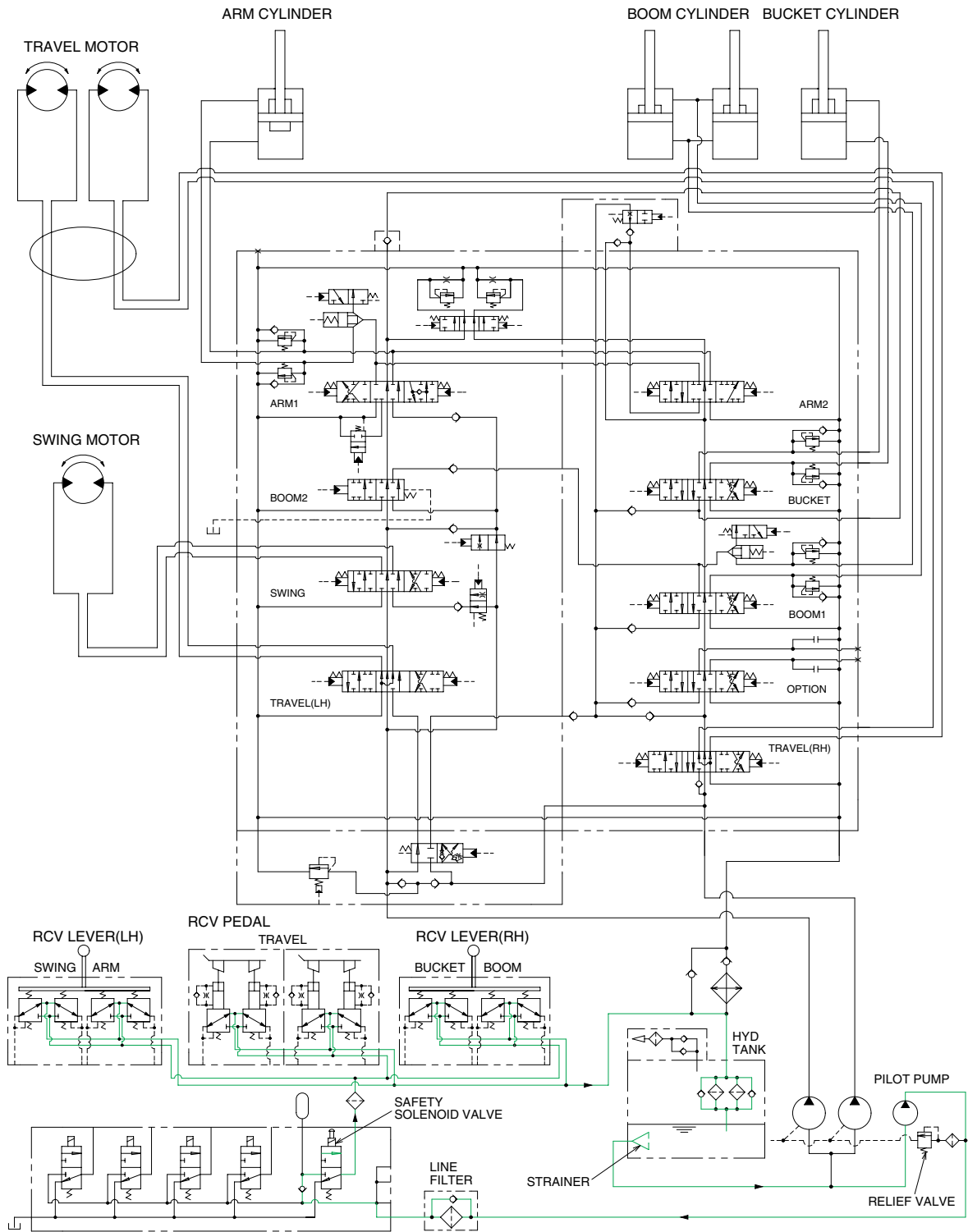
R29073C103

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

The pilot pump is provided with relief valve, receives the oil from the hydraulic tank through the suction filter.

The discharged oil from the pilot pump flows to the remote control valve through line filter, EPPR valve, solenoid valve assemblies, swing parking brake, main control valve and safety lock solenoid valve.

1. SUCTION, DELIVERY AND RETURN CIRCUIT



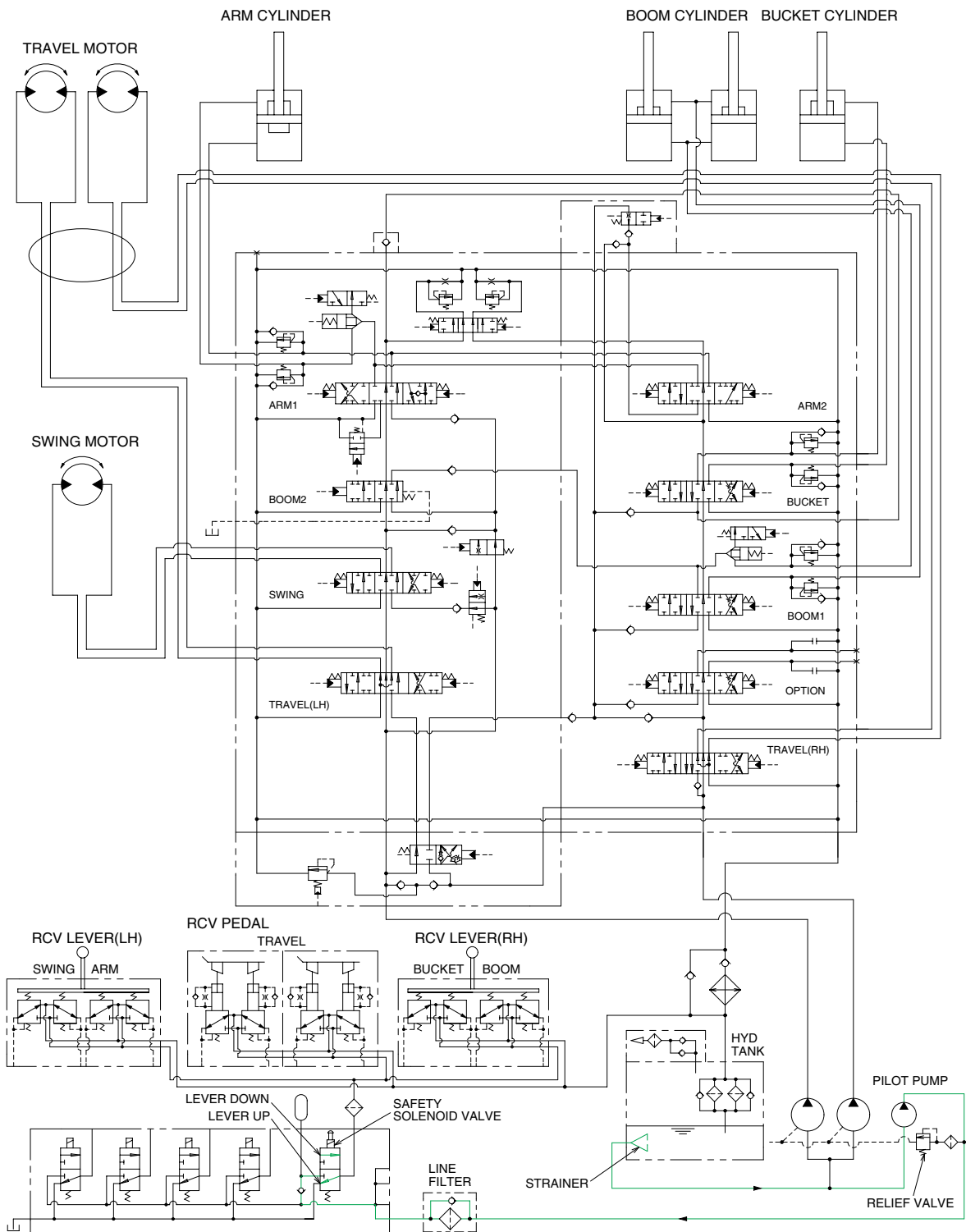
R29073HC02

The pilot pump receive oil from the hydraulic tank. The discharged oil from the pilot 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 pilot pump for limiting the pilot circuit pressure.

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

The return oil from remote control valve returned to hydraulic tank.

2. SAFETY SOLENOID VALVE(SAFETY LEVER)

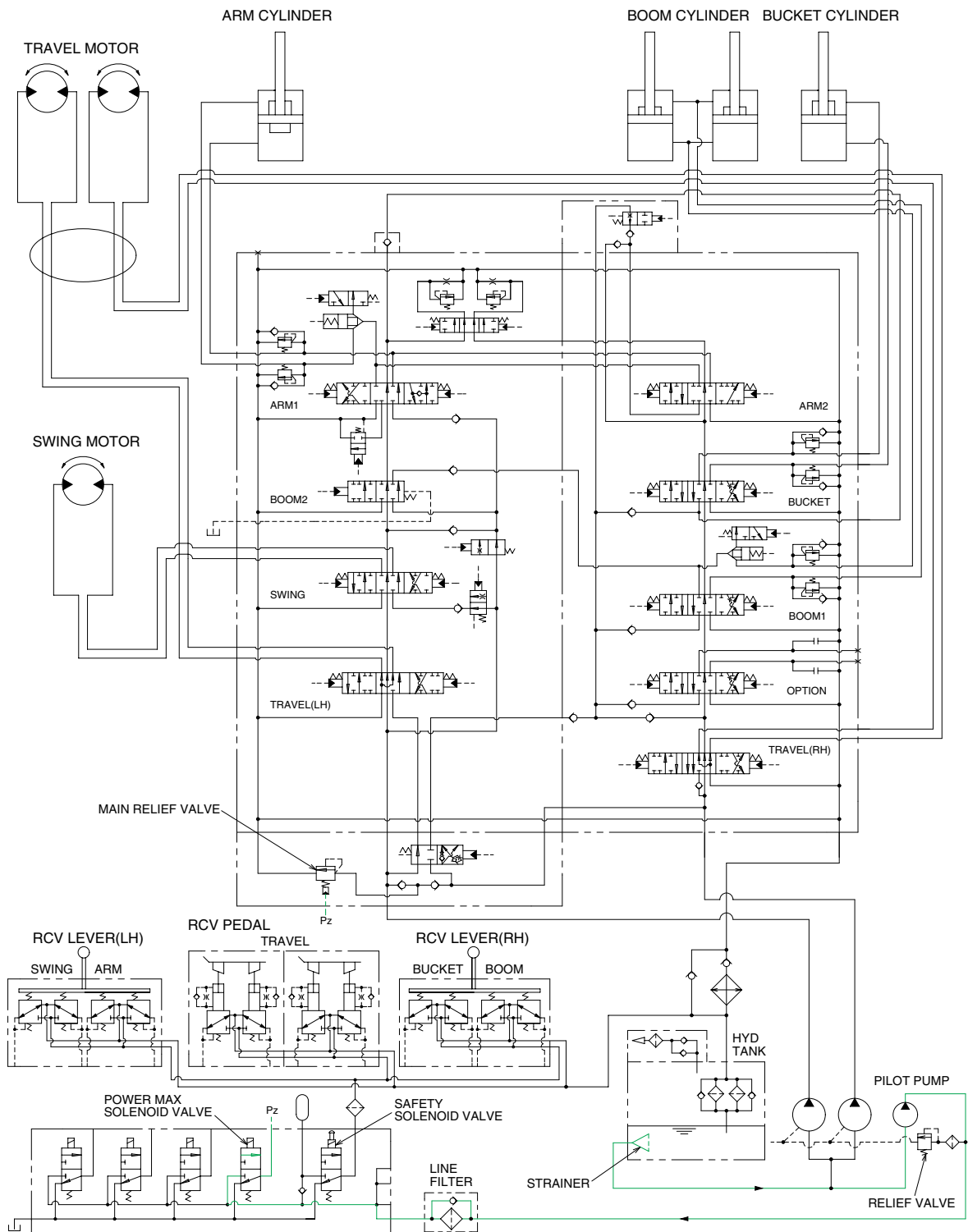


R29073HC03

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

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

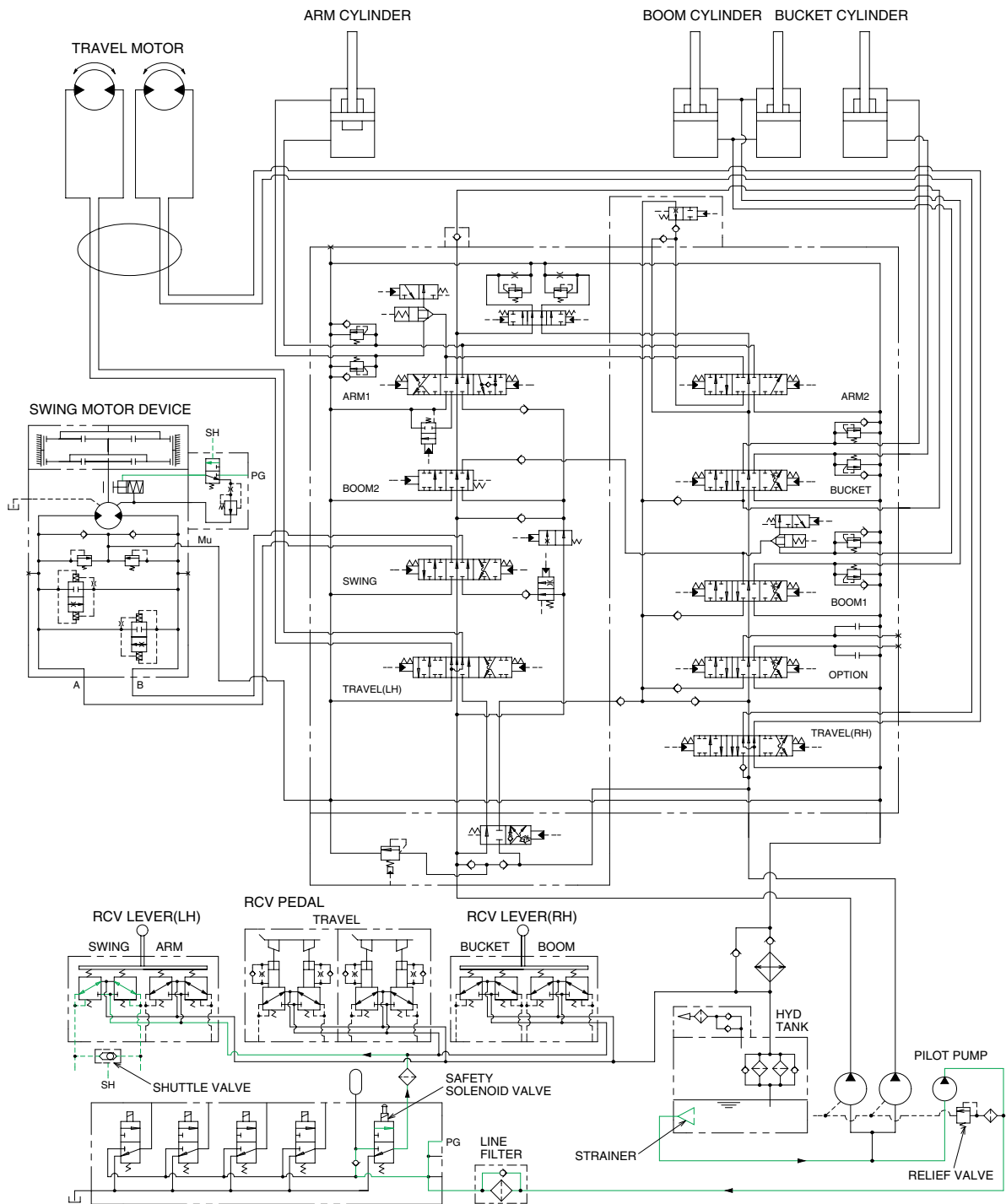
3. MAIN RELIEF PRESSURE CHANGE CIRCUIT



R29073HC04

When the power max switch on the left control lever is pushed ON, the power max solenoid valve is actuated, the discharged oil from the pilot pump into Pz port of the main relief valve of main control valve ; Then the setting pressure of the main control valve is raises from 330kgf/cm² to 360kgf/cm² for increasing the digging power. And even when press continuously, it is canceled after 8 seconds.

4. SWING PARKING BRAKE RELEASE



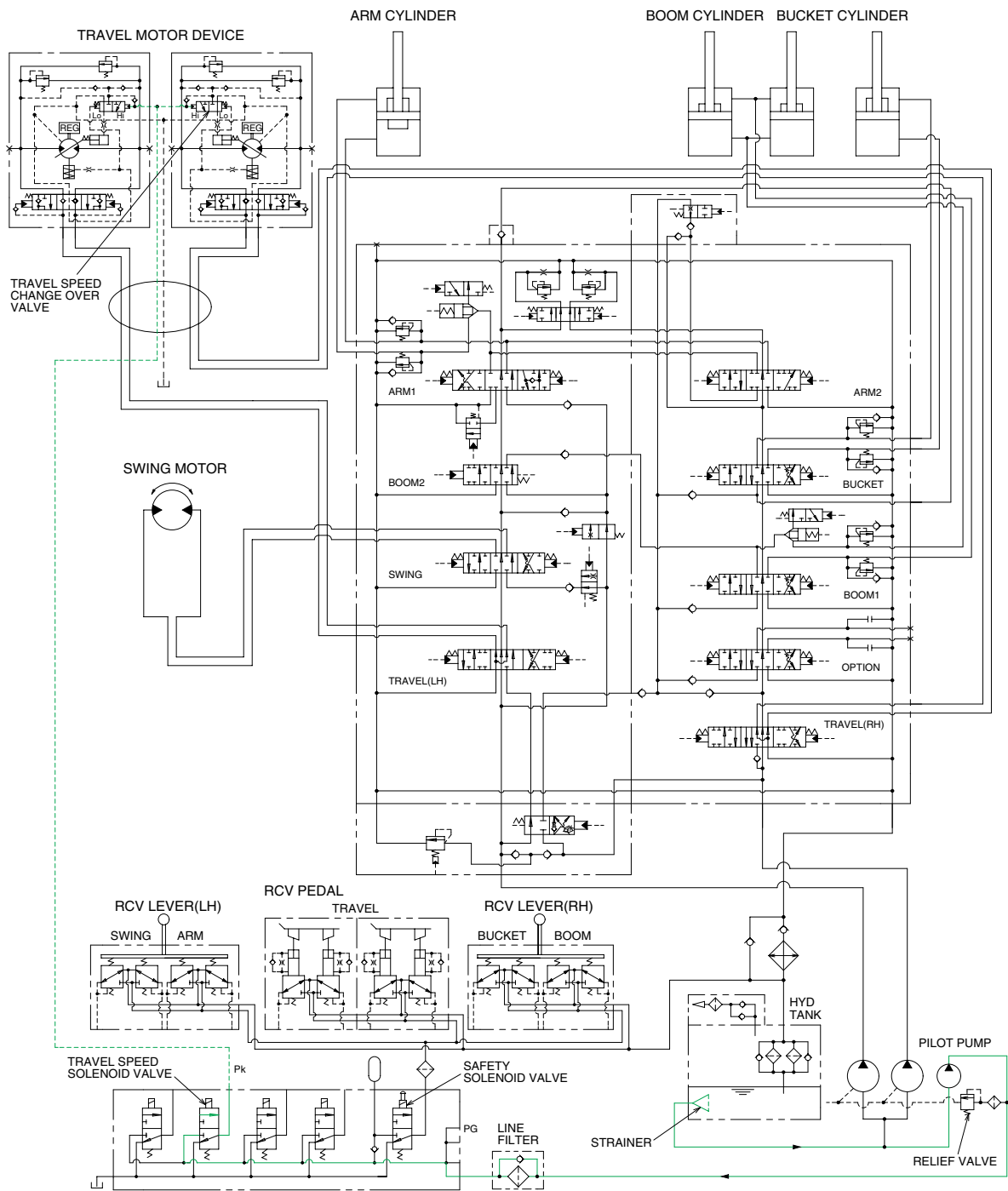
R29073HC05

When the swing control lever is operated, the pilot oil flows to SH port of shuttle valve, this pressure move spool so, discharged oil from pilot pump flows to PG port.

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

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

5. TRAVEL SPEED CONTROL PRESSURE

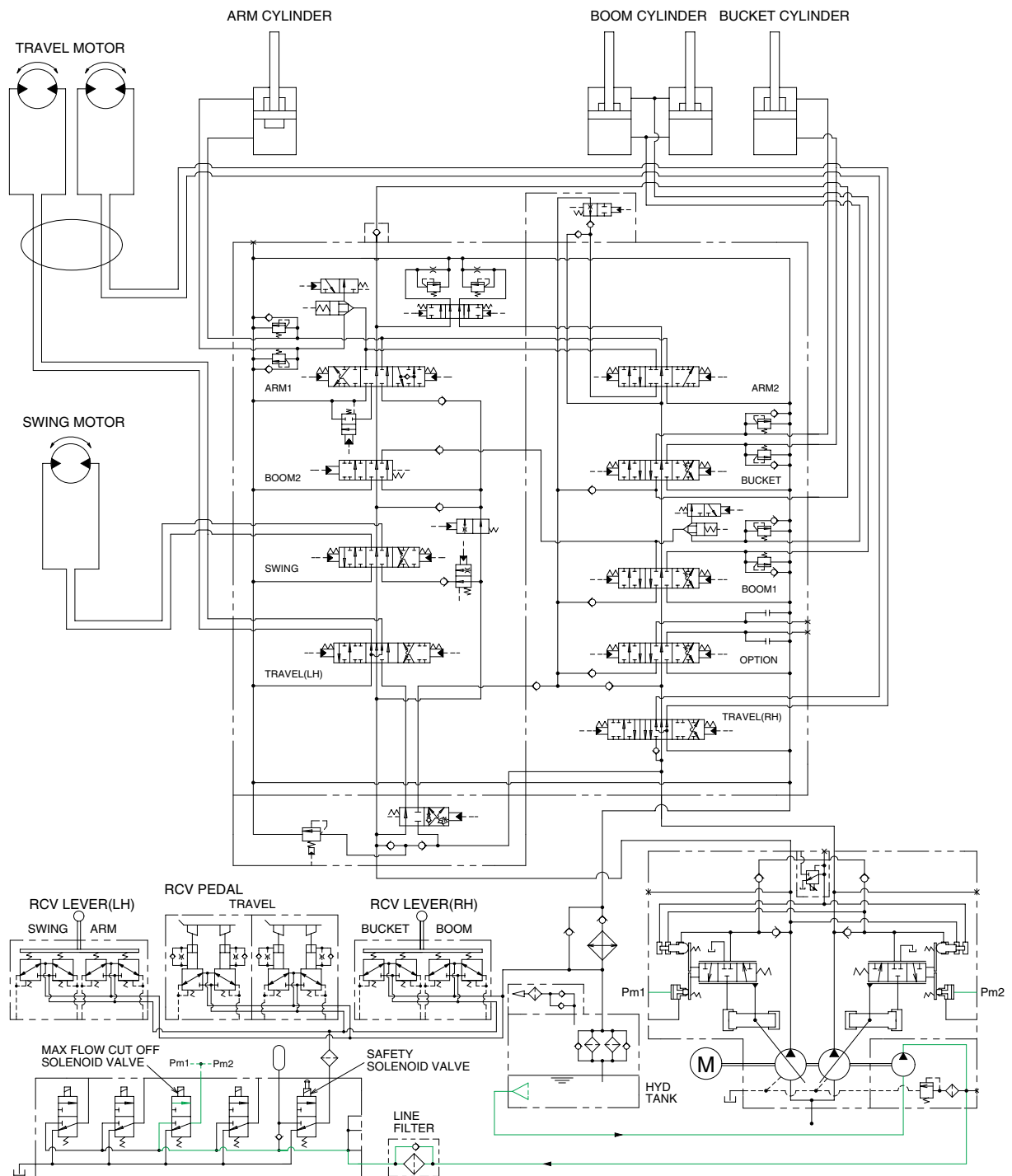


R29073HC06

When the travel speed solenoid valve was placed in the Hi position, the pressure oil from pilot pump through line filter flows to port(Pk) of travel speed change over valve, and the control piston is pushed up, thus minimizing the displacement.

When the travel speed solenoid valve was placed in the Lo position, the oil of Pk port return to the tank and the control piston is returned, thus maximizing the displacement.

6. MAX FLOW CUT OFF SYSTEM

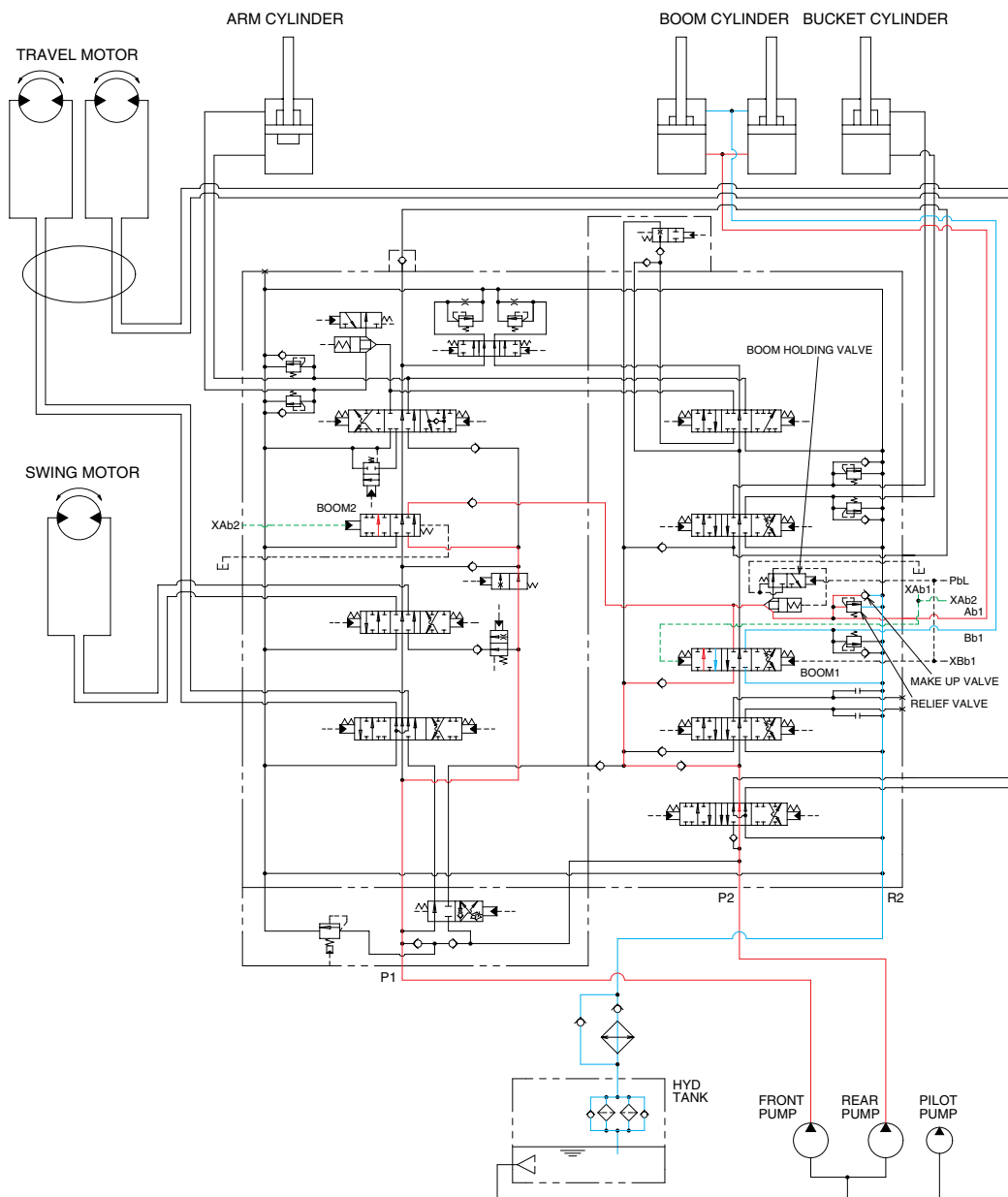


R29073HC07

When the breaker operation mode is selected on the cluster, max flow cut off solenoid valve actuates automatically. Thus pilot pressure(Pm1,Pm2) is sent to the regulator and pump discharge volume is decreased.

GROUP 4 SINGLE OPERATION

1. BOOM UP OPERATION



R29073HC09

When the RH control lever is pulled back, the boom spools in the main control valve are moved to the up position by the pilot oil pressure from the remote control valve.

The oil from the front and rear pump flows into the main control valve and then goes to the large chamber of boom cylinders.

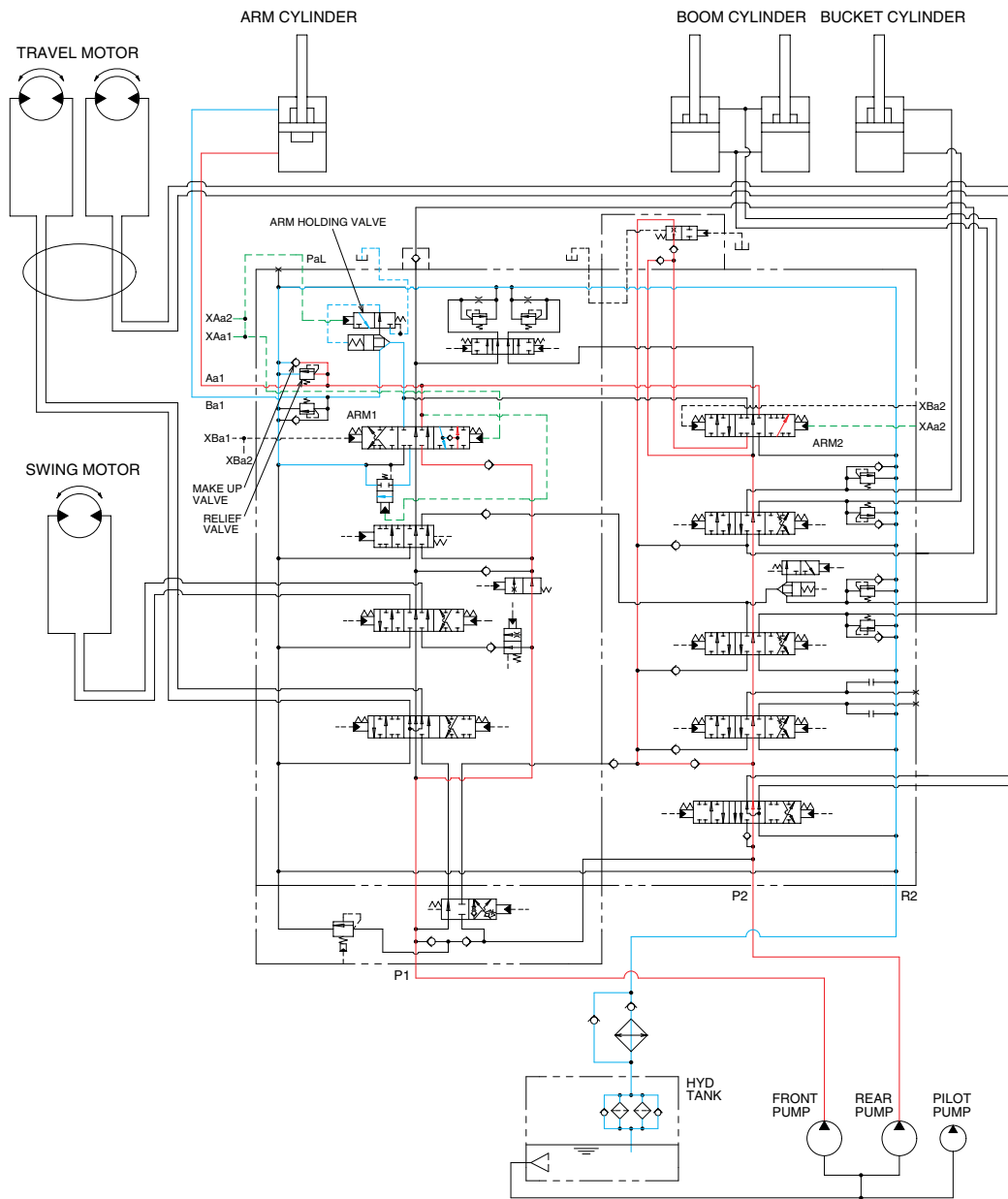
At the same time, the oil from the small chamber of boom cylinders returns to the hydraulic oil tank through the boom spool in the main control valve. When this happens, the boom goes up.

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.

3. ARM ROLL IN OPERATION



R29073HC11

When the LH control lever is pulled back, the arm spools in the main control valve are moved to the roll in position by the pilot oil pressure from the remote control valve.

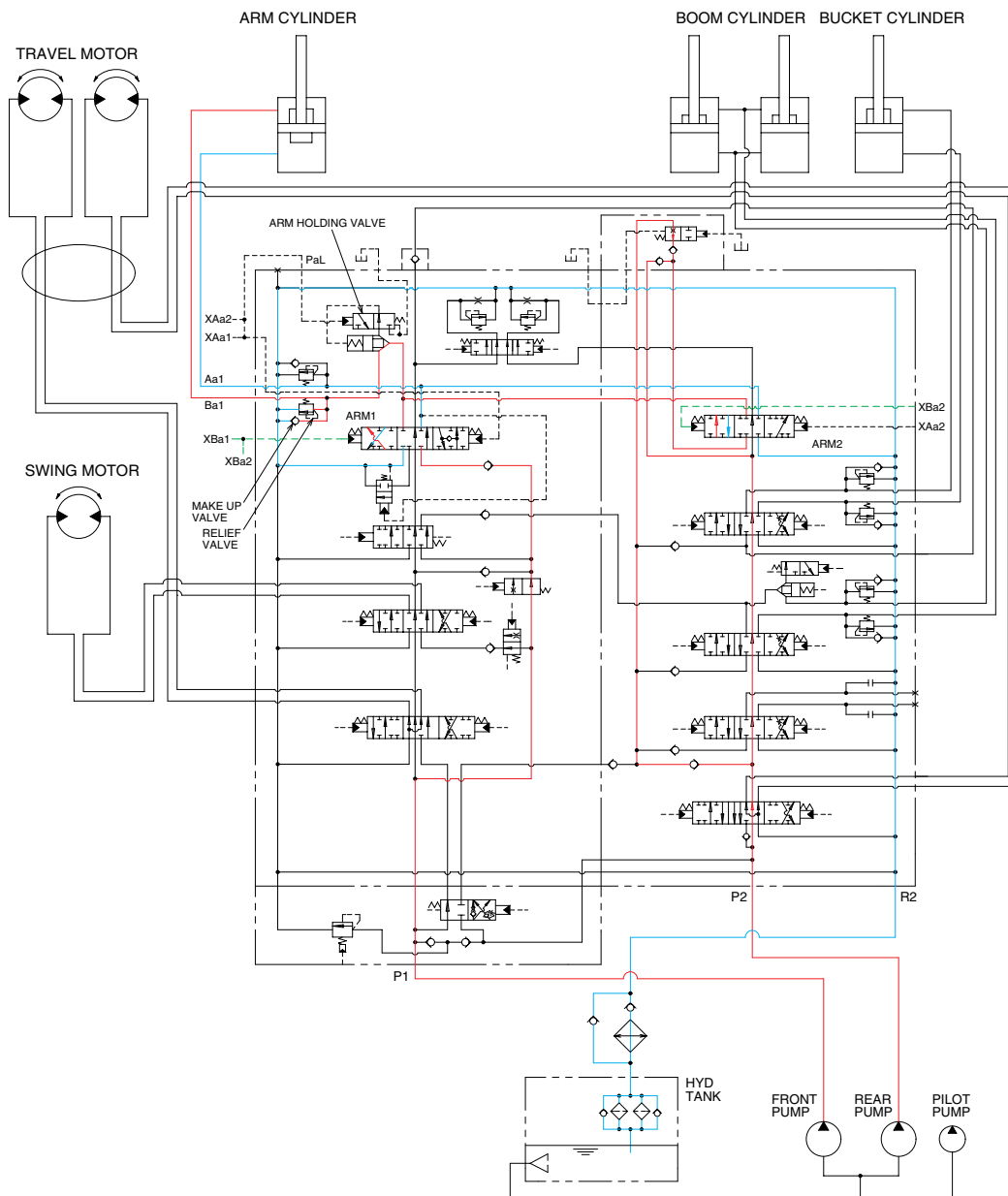
The oil from the front and rear pump flows into the main control valve and then goes to the large chamber of arm cylinder.

At the same time, the oil from the 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 roll in.

When the roll in speed of arm is faster, the oil returned from the small chamber of arm cylinder combines with the oil from both pump, and flows into the large chamber of the arm cylinder by a make up valve.

The excessive pressure in the arm cylinder bottom end circuit is prevented by relief valve.

4. ARM ROLL OUT OPERATION



R29073HC12

When the LH control lever is pushed forward, the arm spools in the main control valve are moved to the roll out position by the pilot oil pressure from the remote control valve.

The oil from the front and rear 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.

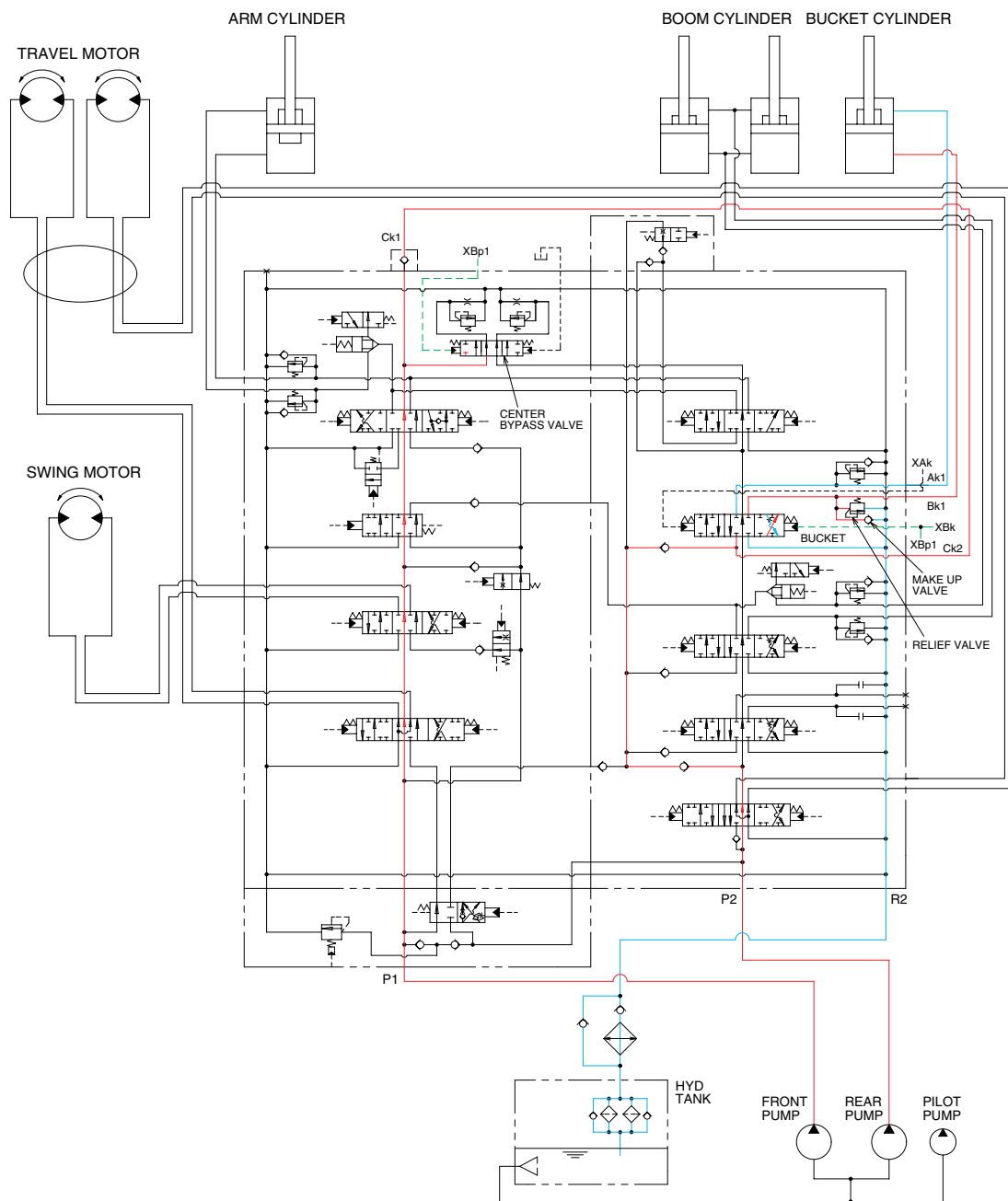
When this happens, the arm roll out. When the roll out speed of arm is faster, the oil returned from the large chamber of arm cylinder combines with the oil from both pump, and flows into the small chamber of the arm cylinder by a make up valve.

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

When the arm is rolled out and the control lever is returned to neutral position, the circuit for the holding pressure at the rod end of the arm cylinder is closed by the arm holding valve.

This prevents the hydraulic drift of arm cylinder.

5. BUCKET ROLL IN OPERATION



R29073HC02

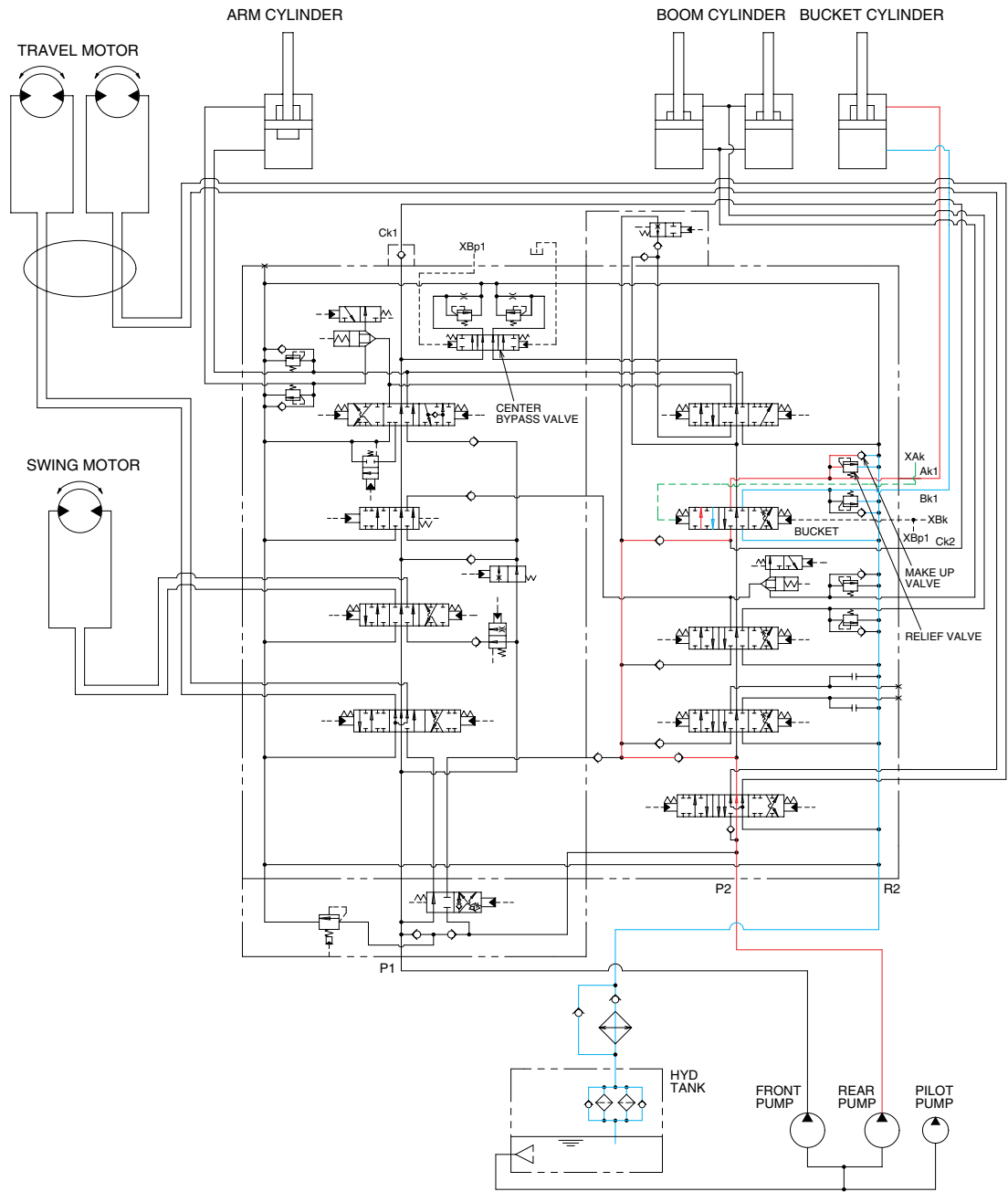
When the RH control lever is manually placed in the bucket roll in position. Then the oil flows from pilot pump through the pilot valve to bucket section of the main control valve. Here the spool position is moved to bucket roll in position.

The center bypass valve is change over by the pilot pressure(XBP1) and then the oil from front pump is joint to the flow of rear pump via confluence passage.

The oil flows from both pump through rod end of the cylinder through the bucket section returned to the hydraulic tank.

The cavitation which will happen to the bottom of the bucket cylinder is prevented by a make up valve, on other hand. The excessive pressure is also prevented by an overload relief valve in the main control valve.

6. BUCKET ROLL OUT OPERATION



R29073HC14

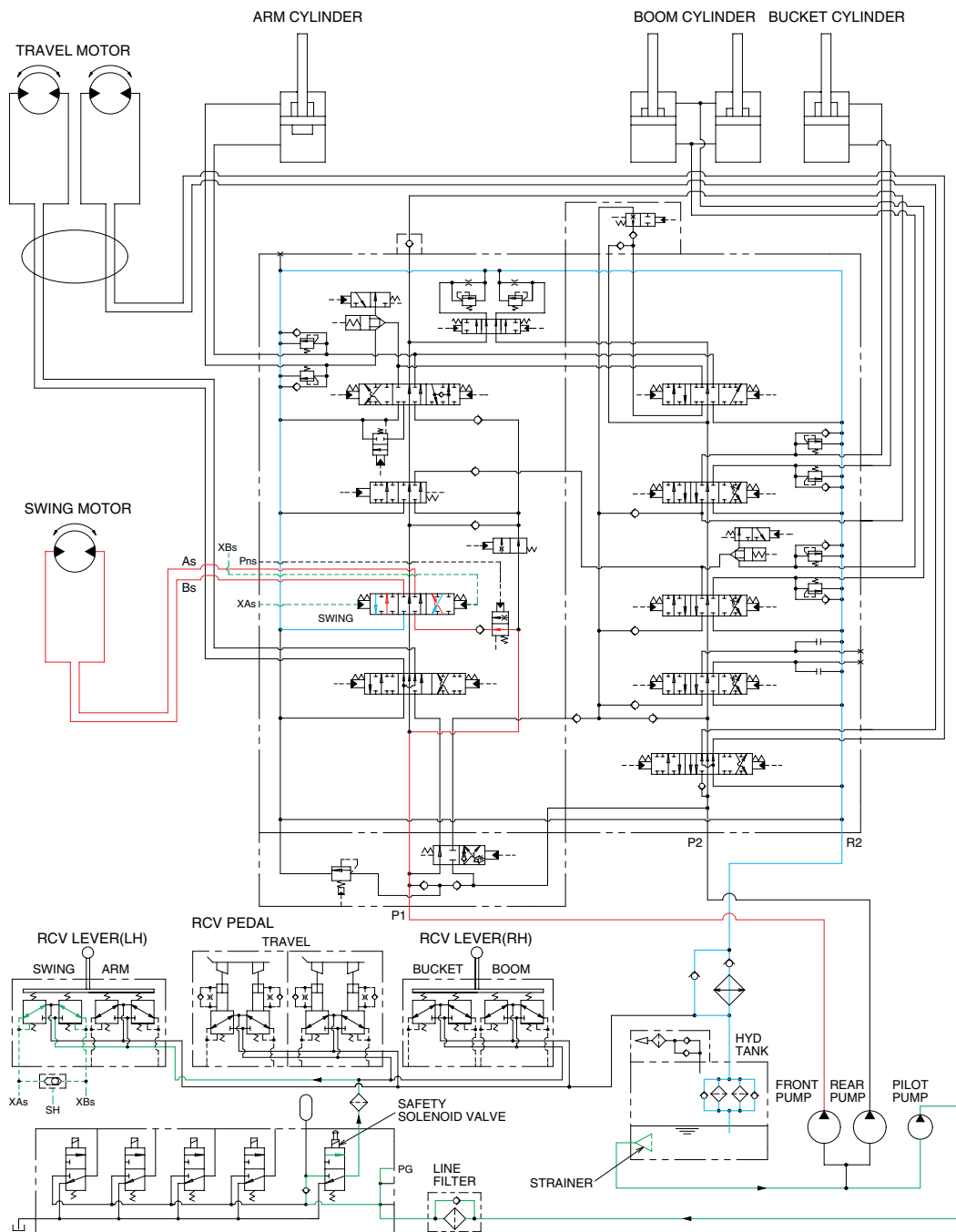
When the RH control lever is manually placed in the bucket roll out position. Then the oil flows from pilot pump through the pilot valve to bucket section of the main control valve. Here the spool position is moved to bucket roll out position.

The oil flows from rear pump through bucket section of main control valve to the rod end of the bucket cylinder, and to roll out bucket.

The return oil flows from the bottom end of the cylinder through the bucket section returned to the hydraulic tank.

The cavitation which will happen to the rod of the bucket cylinder is prevented by a make up valve, on other hand. The excessive pressure is also prevented by an overload relief valve in the main control valve.

7. SWING OPERATION



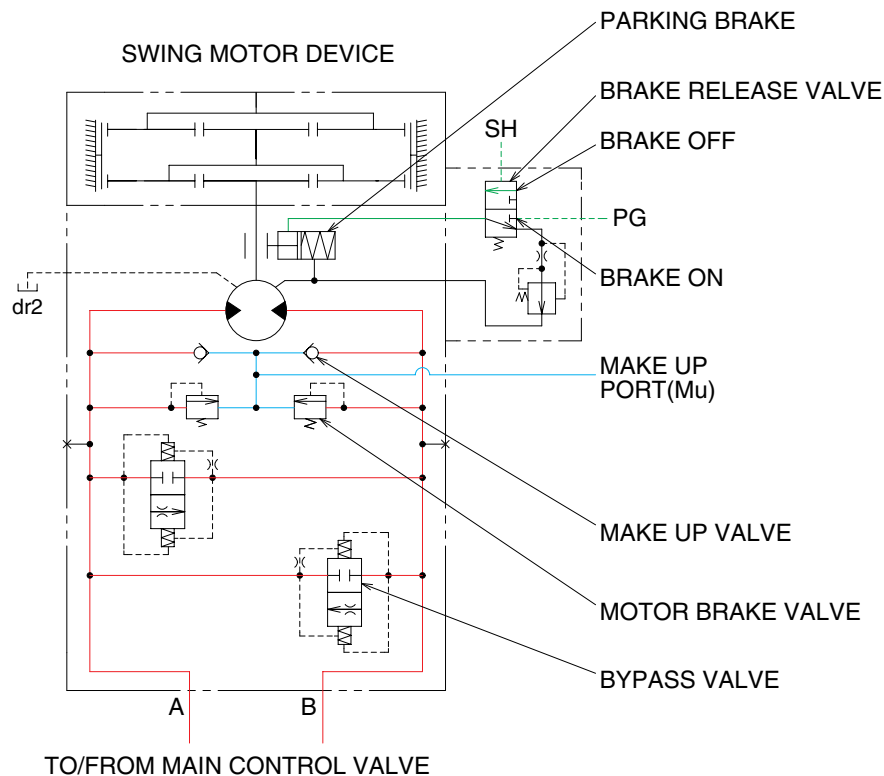
R29073HC15

When the LH control lever is manually placed in the left(Right) swing position. Then the oil flows from front pump through the swing section of the main control valve to swing motor to left(Right) swing the superstructure. The return oil flows from swing motor through the swing section of the main control valve returned to the tank.

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 swing parking brake, make up valve and the overload relief valve are provide in the swing motors. The cavitation which will happen to the swing motor is prevented by the make up valve in the swing motor itself.

SWING CIRCUIT OPERATION



R29073HC16

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 pilot pump.

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

PARKING BRAKE "ON" OPERATION

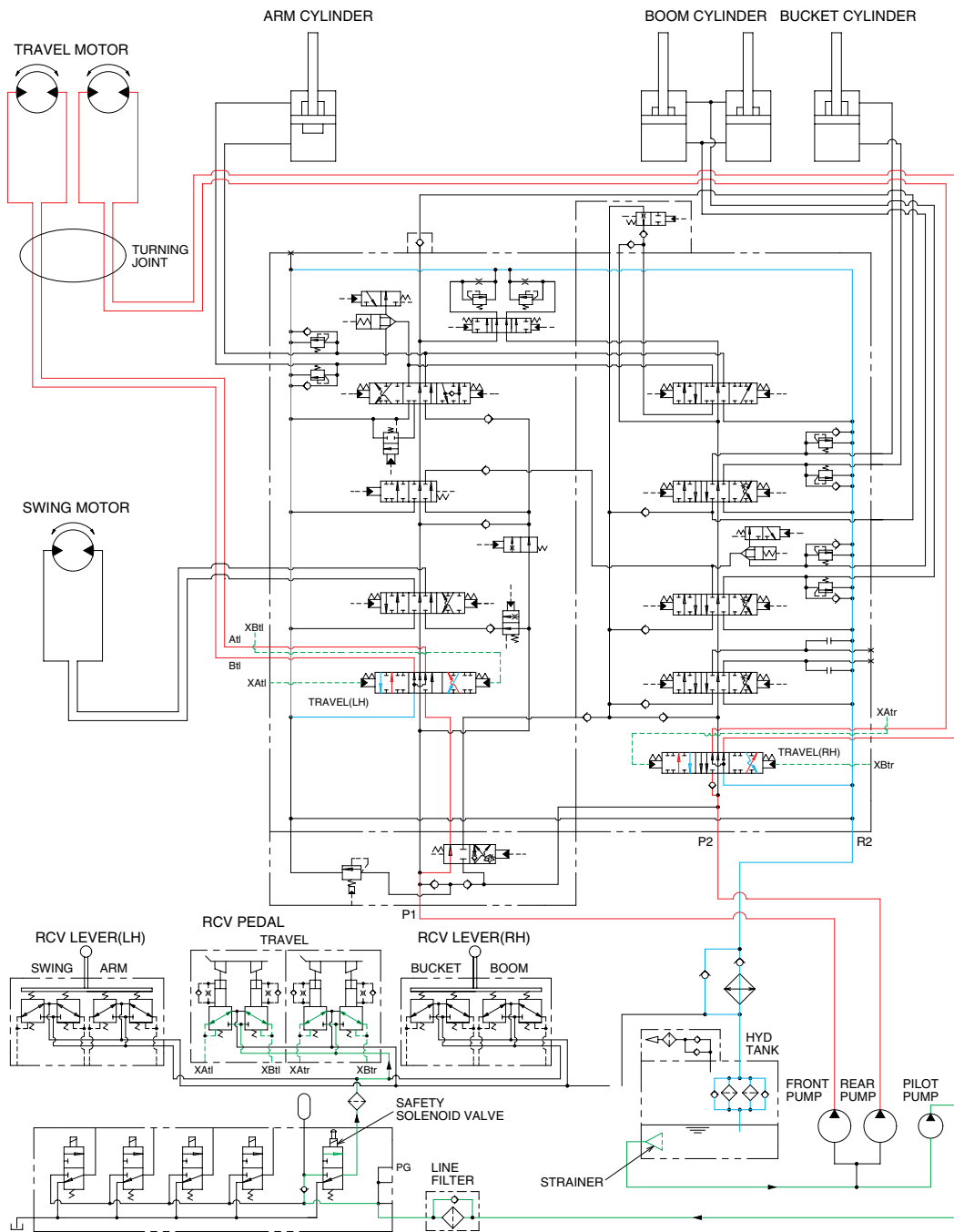
When the control lever placed in the neutral position, the pressure of the pilot oil passage down.

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'.

BYPASS VALVE

This bypass valve absorbs shocks produced as swing motion stops and reduced oscillation cause by swing motion.

8. TRAVEL FORWARD AND REVERSE OPERATION



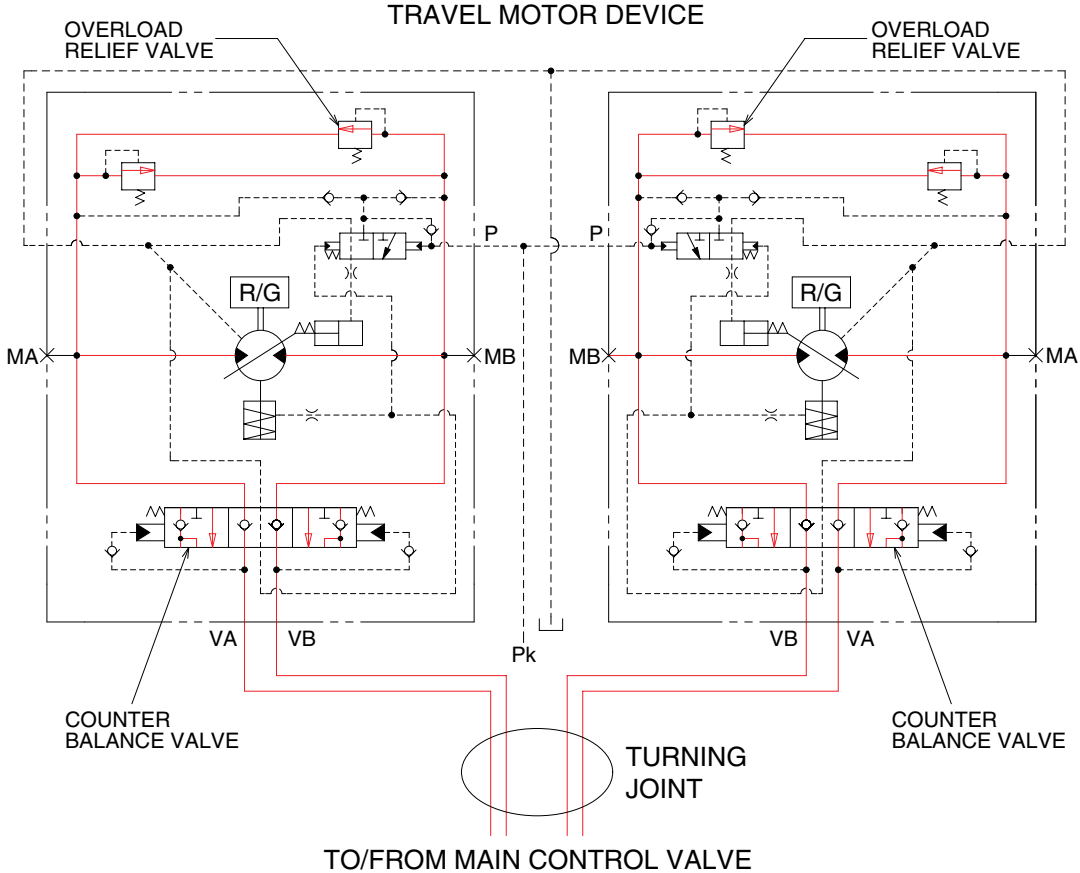
R29073HC17

When the right and left travel levers are manually placed to the forward or reverse position, the oil flows from pilot pump through the pilot valve to travel sections of the main control valve.

Here, spool position is moved to forward and reverse position. The oil flows from rear pump through the travel(RH) section of the main control valve and turning joint to the right travel motor and oil flows from front pump through the travel(LH) section of the main control valve and turning joint to the left travel motor and move the machine forward or reverse.

The return oil flows from both travel motor through the turning joint and travel(RH, LH) sections returned to the tank.

TRAVEL CIRCUIT OPERATION



R29073HC18

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

1) COUNTER BALANCE VALVE

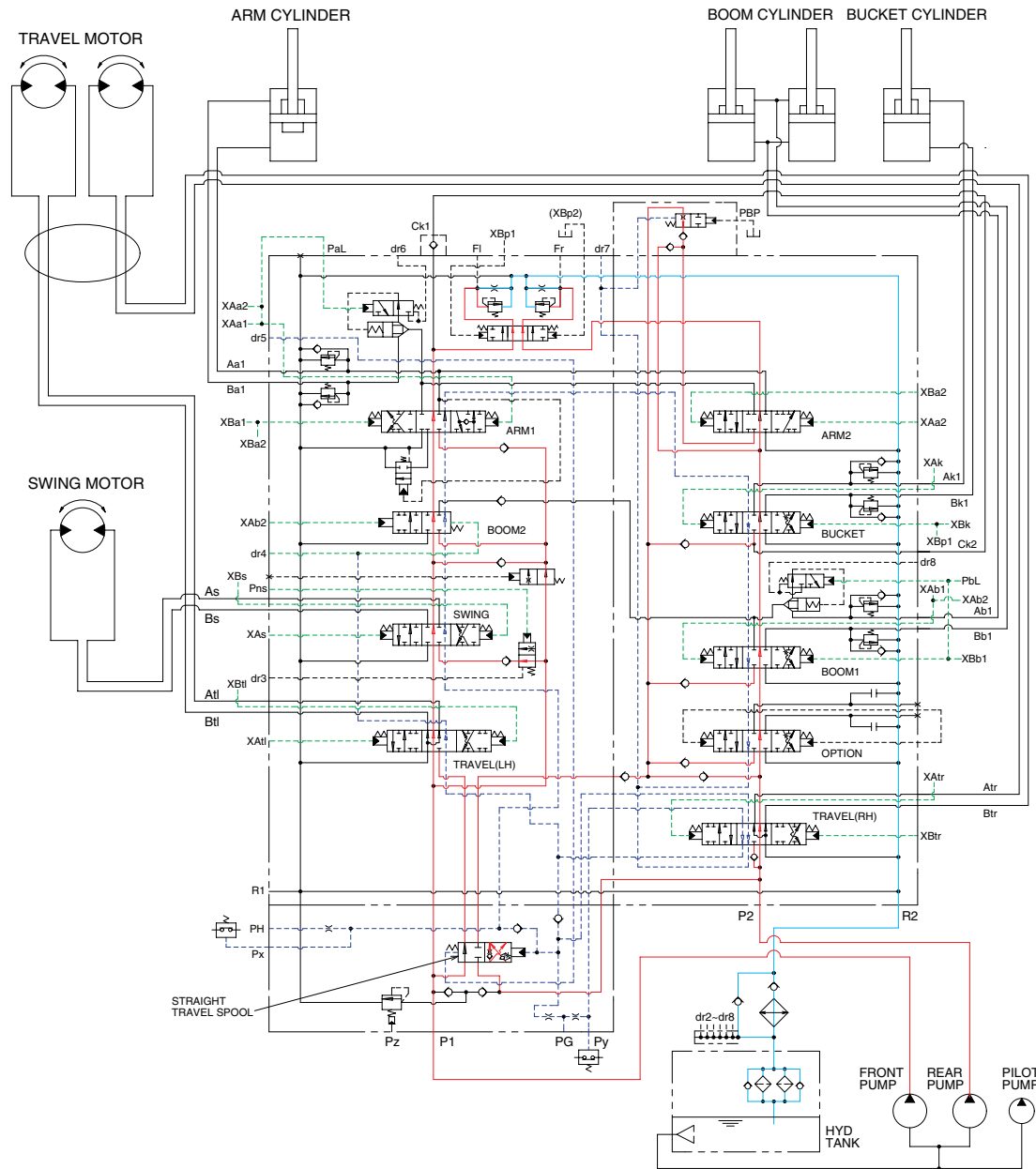
When stopping the motor of slope descending, this valve to prevent the motor over run.

2) OVERLOAD RELIEF VALVE

Relief valve limit the circuit pressure below 365kgf/cm² to prevent high pressure generated at a time of stopping the machine. Stopping the motor, this valve sucks the oil from lower pressure passage for preventing the negative pressure and the cavitation of the motor.

GROUP 5 COMBINED OPERATION

1. OUTLINE



R29073HC19

The oil from the front and rear pump flows through the neutral oil passage, bypass oil passage and confluence 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.

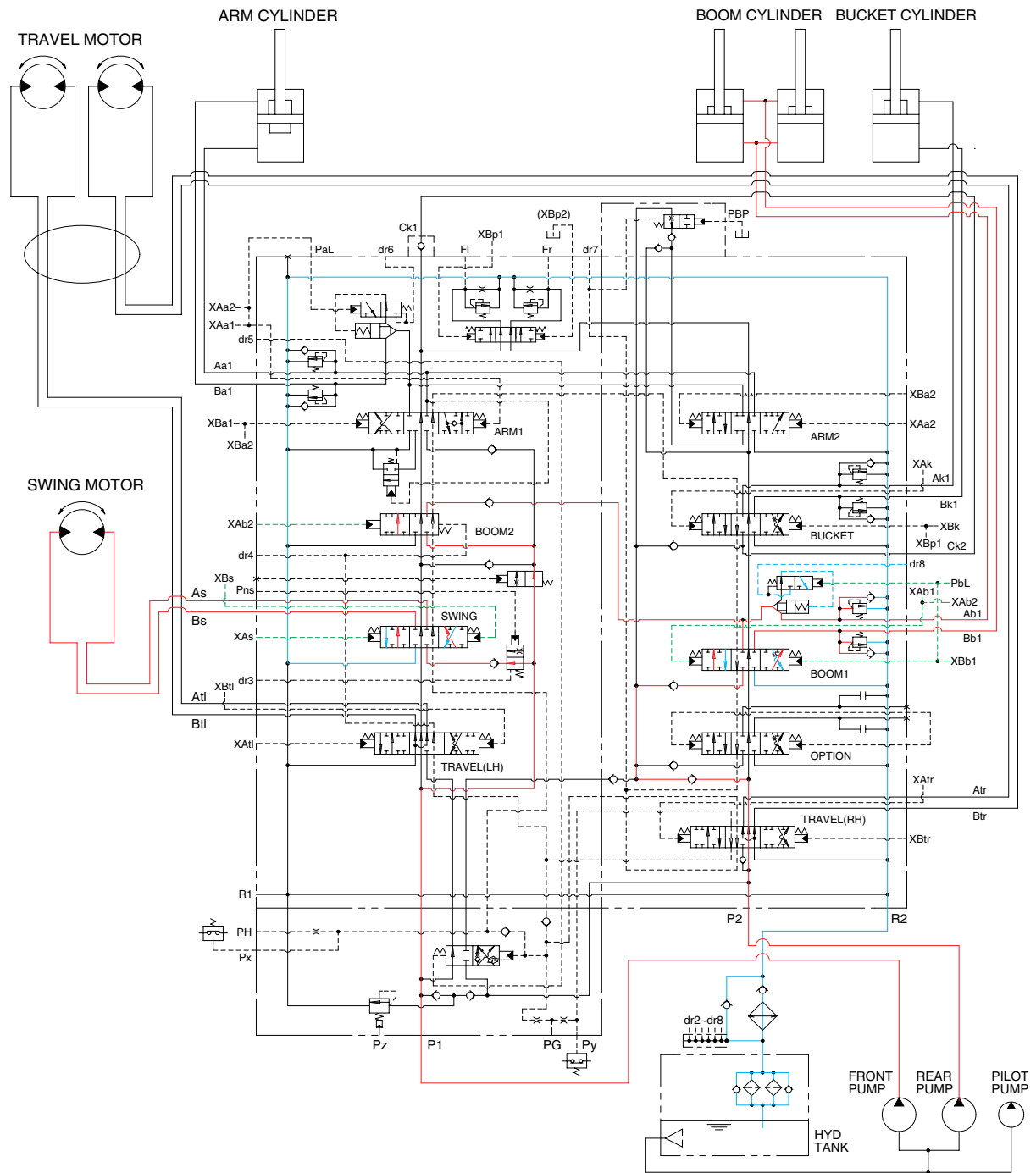
STRAIGHT TRAVEL SPOOL

This straight travel spool is provided in the main control valve.

If any actuator is operated when traveling, the straight travel spool is pushed to the left by the pilot oil pressure from the pilot pump.

Consequently, the left and right travel oil supply passage are connected, and equivalent amount of oil flows into the left and right travel motors. This keeps the straight travel.

2. COMBINED SWING AND BOOM OPERATION



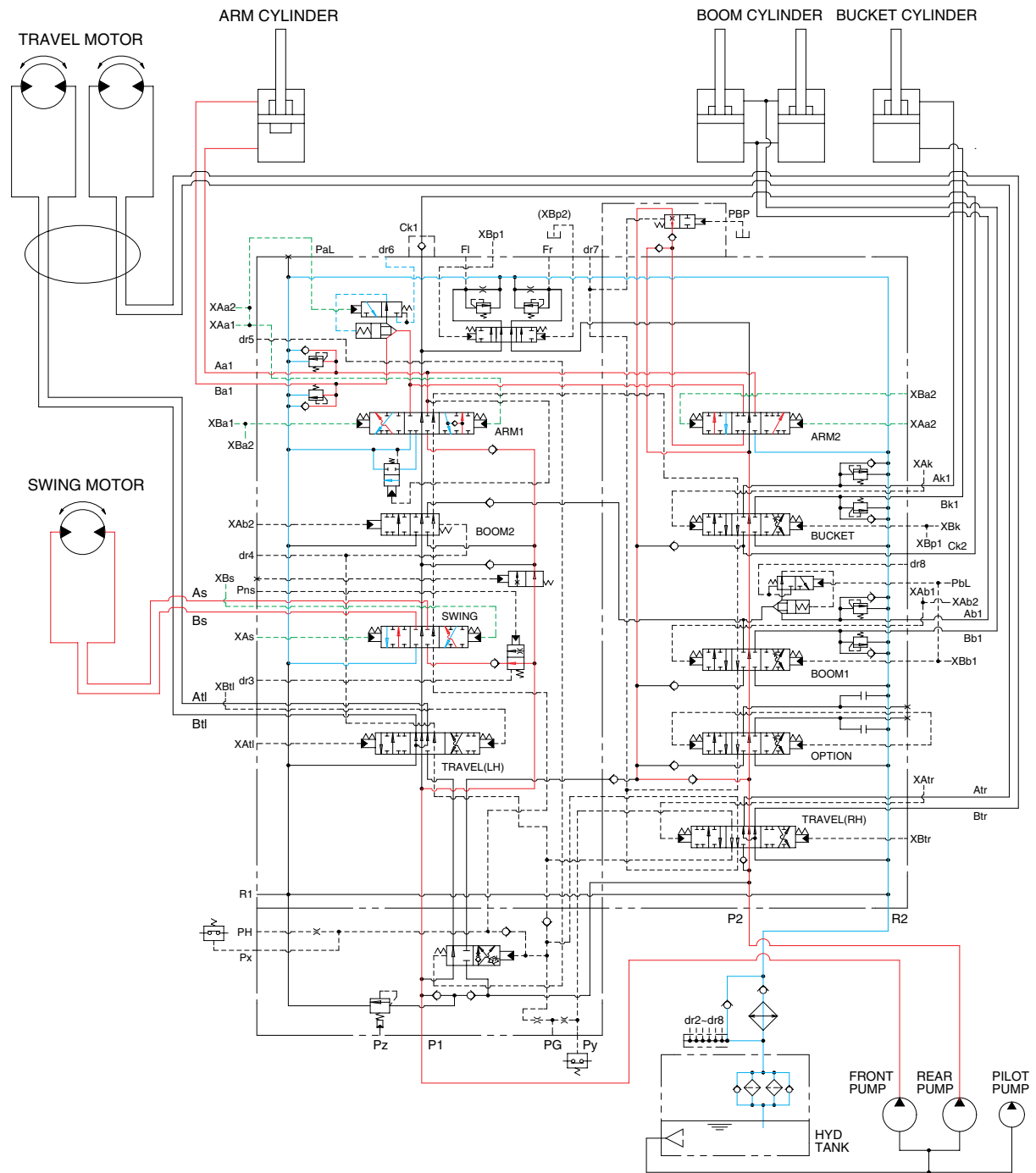
R29073HC20

When the swing and boom functions are operated, simultaneously the swing spool and boom spools changed. The oil flows from the rear pump through boom1 section of the main control valve to boom cylinders and the boom functions.

The oil flows from front pump through swing section to swing motor.

At the same time, the pressure in the boom circuits can be high while the swing pressure is low, therefore the oil flows from front pump to boom cylinders through boom2 section via confluence passage in case boom raise operation.

3. COMBINED SWING AND ARM OPERATION

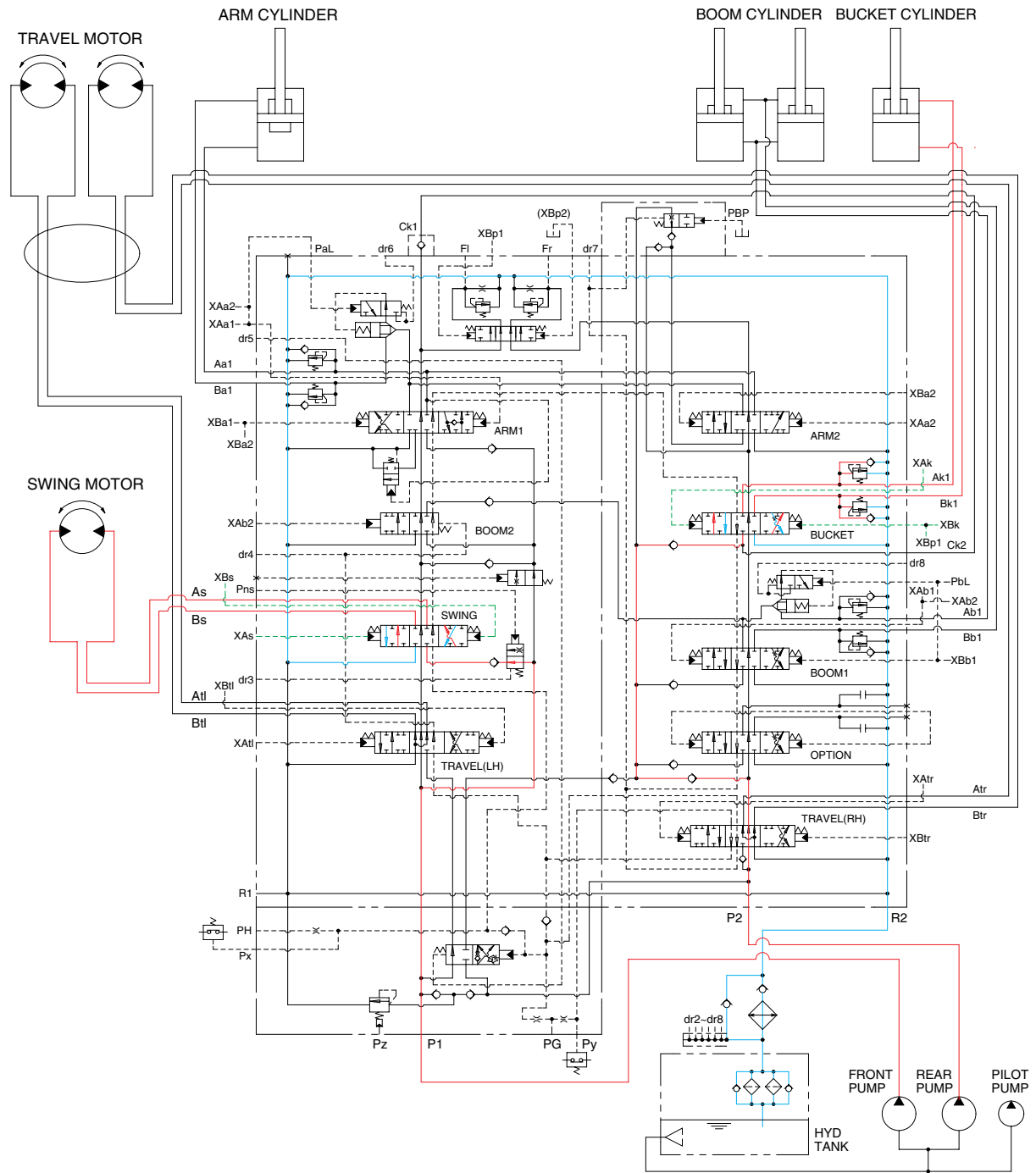


R29073HC21

When the swing and arm functions are operated, simultaneously the swing spool and arm spools changed. The oil flows from the front pump through arm1 and swing section of the main control valve to arm cylinder and swing motor, and the arm and swing functions.

At the same time, the pressure in the arm circuit can be high while the swing pressure is low, therefore the oil flows from rear pump to arm cylinder through arm2 section via confluence passage.

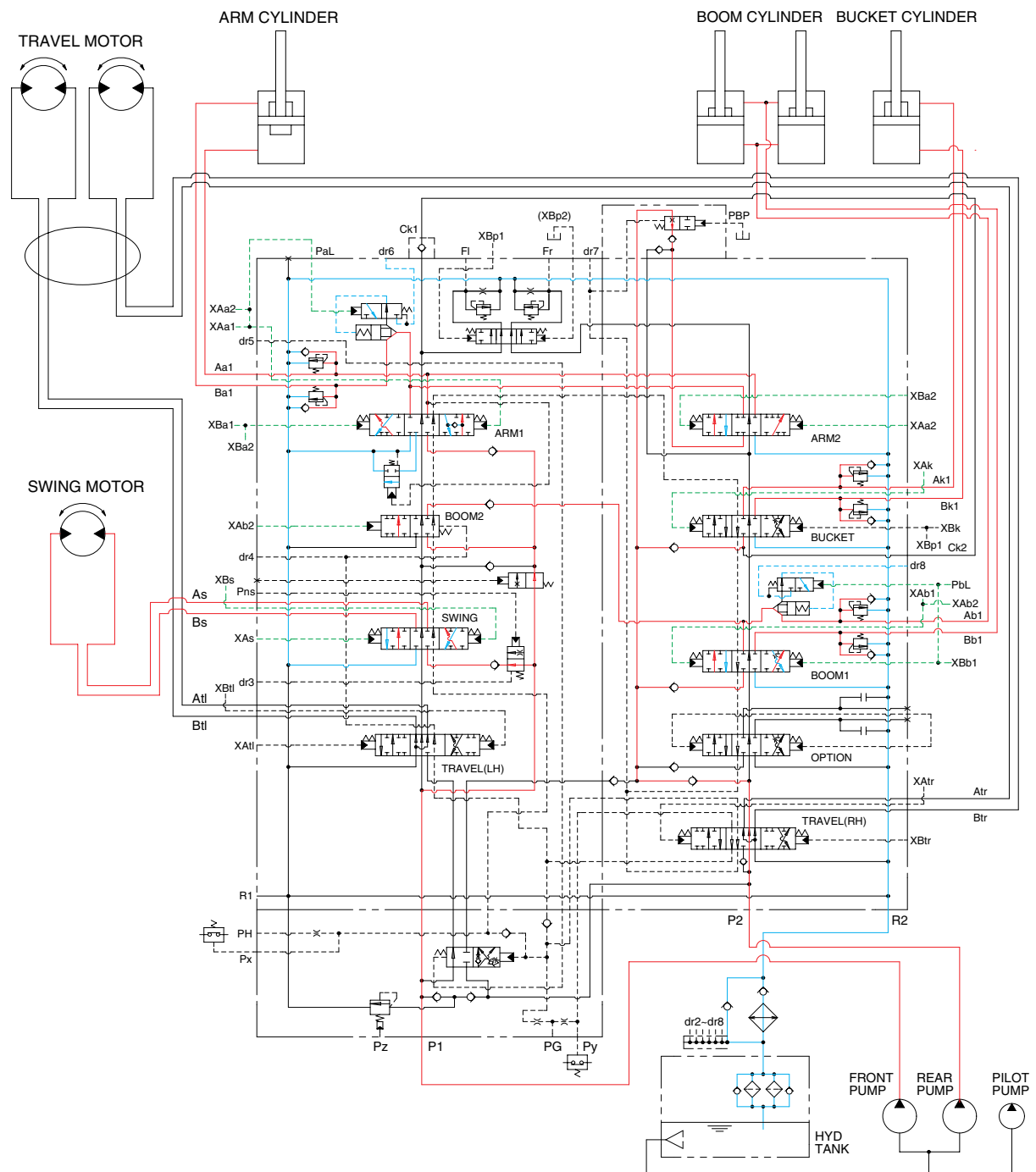
4. COMBINED SWING AND BUCKET OPERATION



R29073HC22

When the swing and bucket functions are operated, the swing and bucket spools changed. The oil flows from the rear pump through the bucket section of the main control valve to the bucket cylinder and the bucket functions. The oil flows from front pump through swing section of the main control valve to the swing motor and swing the superstructure.

5. COMBINED SWING, BOOM, ARM AND BUCKET OPERATION



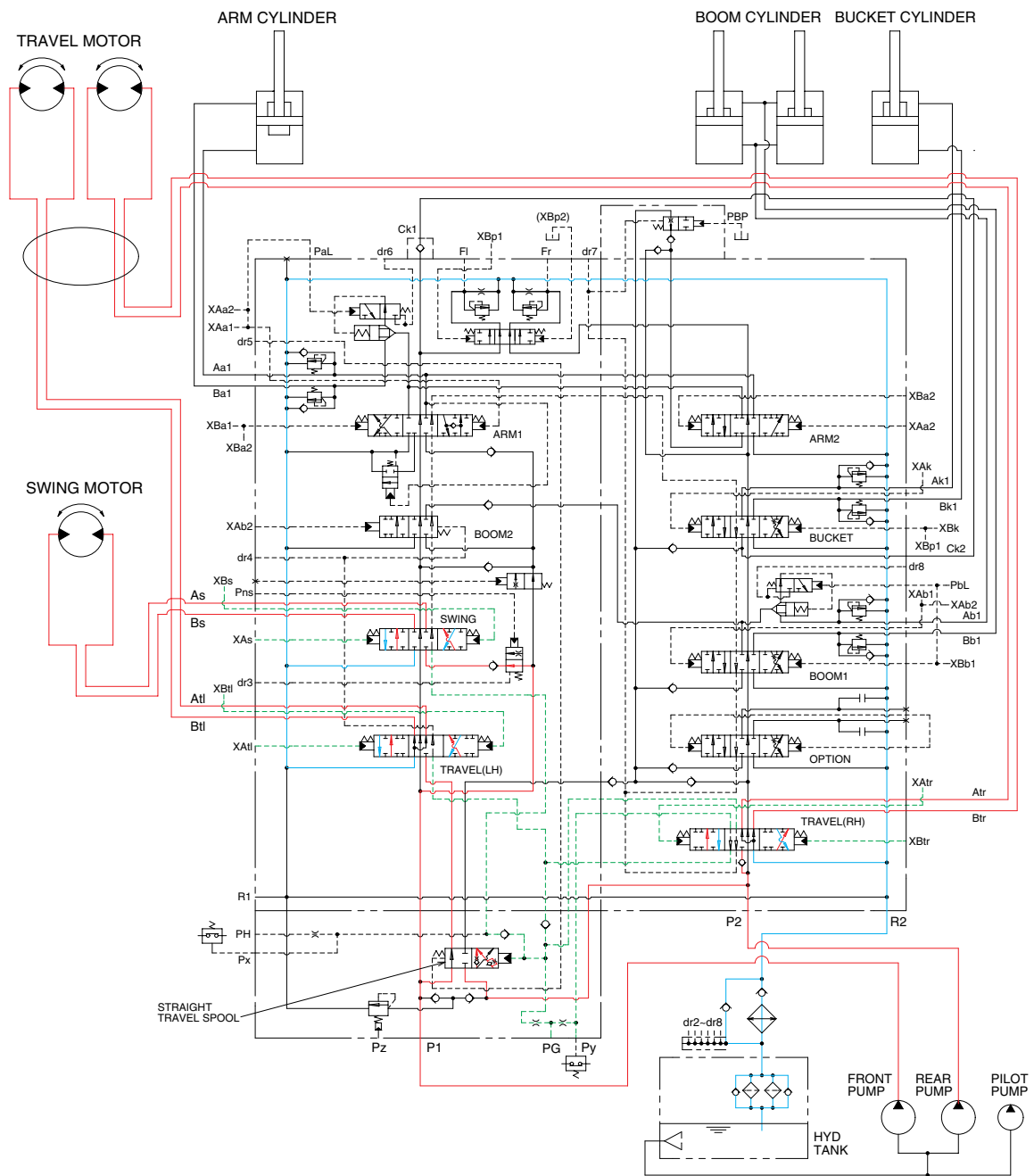
R29073HC23

When the swing, boom, arm and bucket functions are operated, the each spools of the main control valve changed.

The oil flows from rear pump through arm2, boom1 and bucket section to boom, arm and bucket cylinders. The oil flows from front pump through swing, boom2 and arm1 section to swing motor, boom and arm cylinder. Then the functions to each actuators.

According to the state of each actuators functioning, the oil flows from front and rear pump through the confluence oil passage to the each actuators.

6. COMBINED SWING AND TRAVEL OPERATION



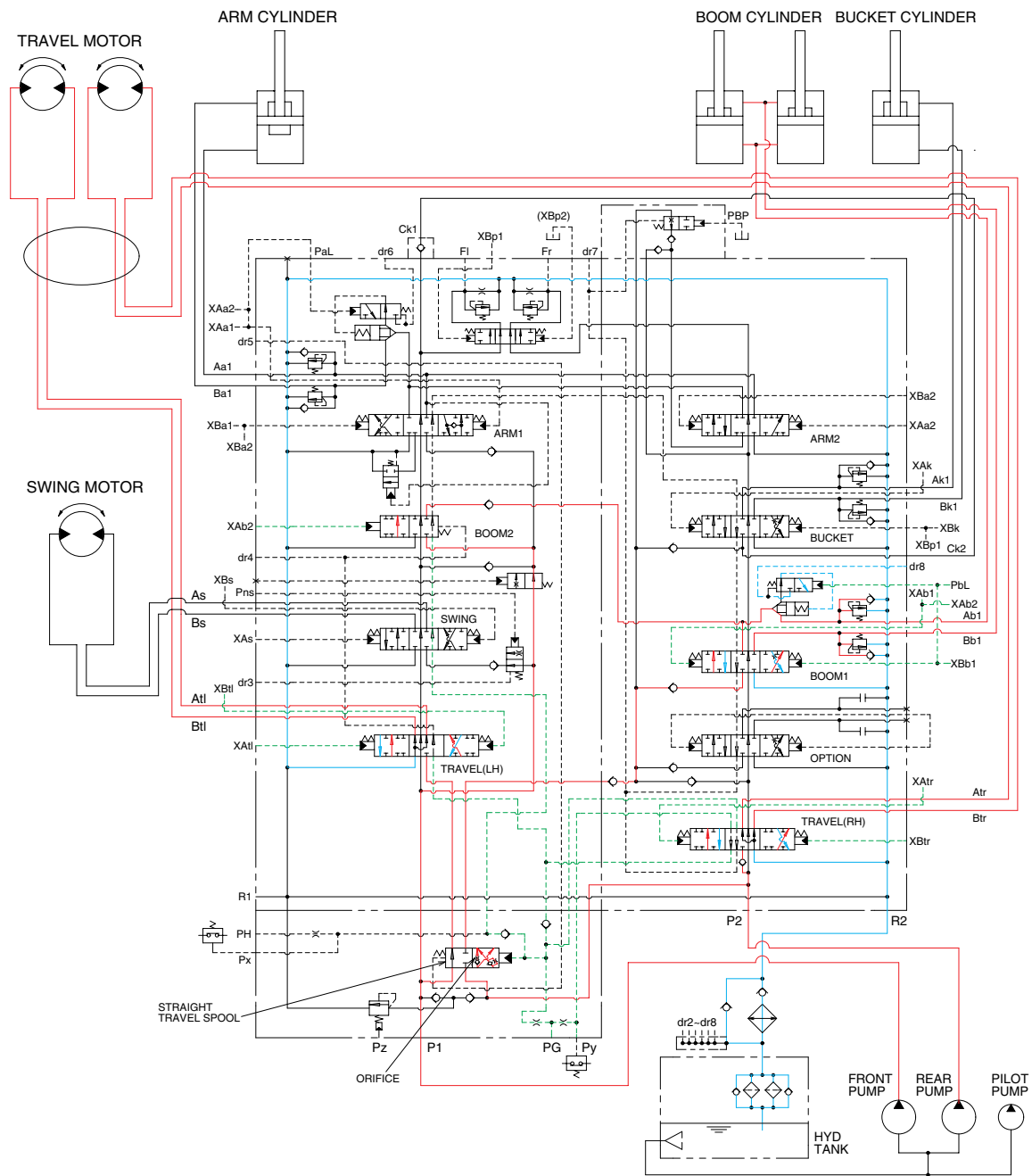
R29073HC24

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 from the remote control valve. At the same time, the straight travel spool is pushed to the left by the pilot oil pressure from the pilot pump.

The oil from the front pump flows into the swing motor through the swing spool. The oil from the rear pump flows into the travel motor through the RH travel spool of the right control valve and the LH travel spool of the left control valve via the straight travel spool.

The superstructure swings and the machine travels straight.

7. COMBINED BOOM AND TRAVEL OPERATION

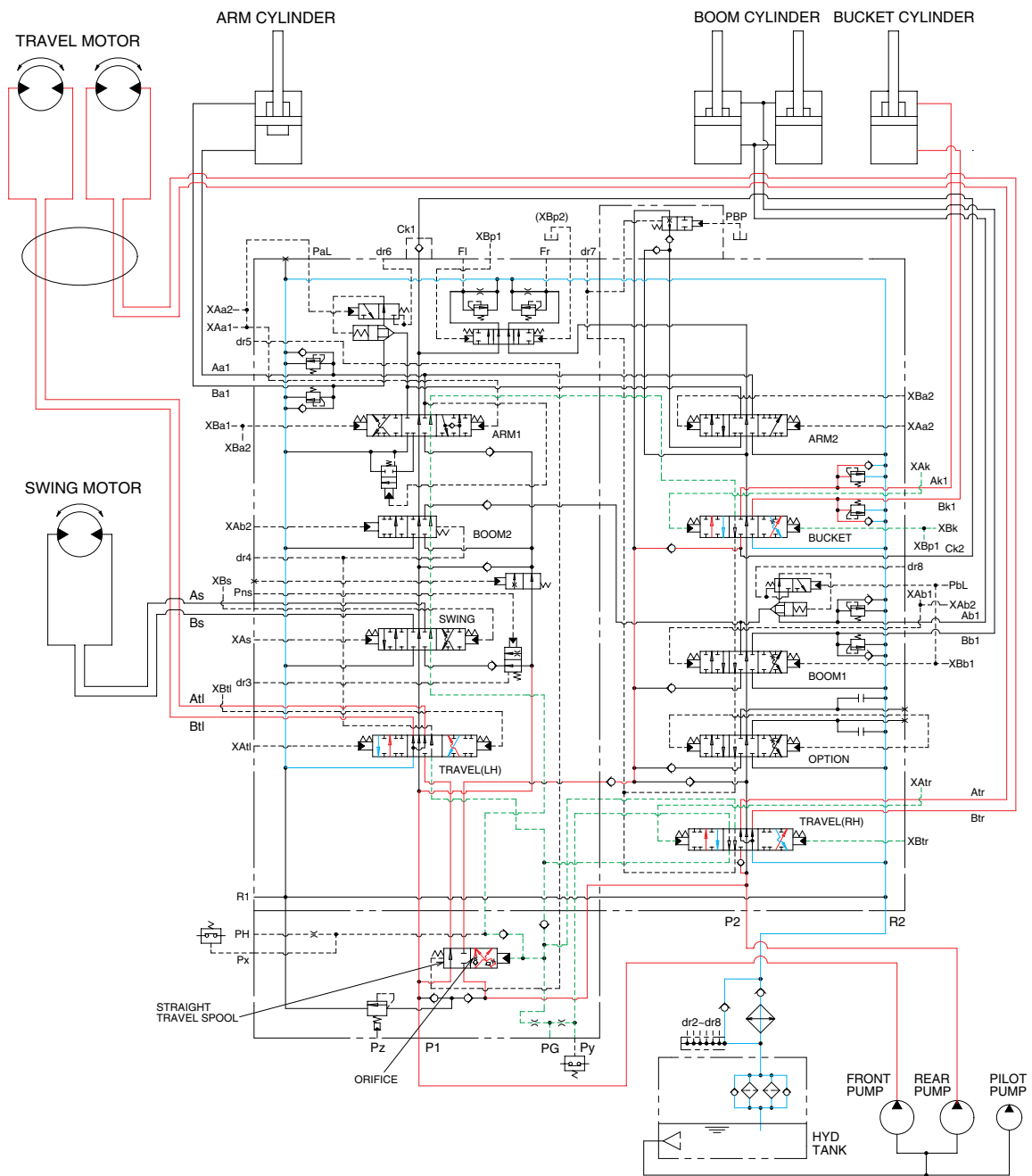


R29073HC25

When the boom and travel functions are operated, simultaneously the boom spools and travel spools in the main control valve are moved to the functional position by the pilot oil pressure from the remote control valve. At the same time, the straight travel spool is pushed to the left by the pilot oil pressure from the pilot pump. The oil from the front pump flows into the boom cylinders through the boom 2 spool and boom 1 spool via the parallel and confluence passage in case boom up operation. The oil from the rear pump flows into the travel motors through the RH travel spool of the right control valve and the LH travel spool of the left control valve via the straight travel spool.

When the travel circuit pressure drops lower than boom pressure, as when traveling downhill, boom priority and smoothness are maintained because of the orifice in the straight travel spool. Thus the machine will continue to travel straight.

9. COMBINED BUCKET AND TRAVEL OPERATION



R29073HC27

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 from the remote control valve. At the same time, the straight travel spool is pushed to the left by the pilot oil pressure from the pilot pump. The oil from the front pump flows into the bucket cylinder through the bucket spool via the confluence oil passage. The oil from the rear pump flows into the travel motors through the RH travel spool of the right control valve and the LH travel spool of the left control valve via the straight travel spool of the control valve.

When the travel circuit pressure drops lower than bucket pressure, as when traveling downhill, bucket priority and smoothness are maintained because of the orifice.

In either case, the machine will continue to travel straight.