

## SECTION 3 HYDRAULIC SYSTEM

### HYDRAULIC SYSTEM (OLD VERSION)

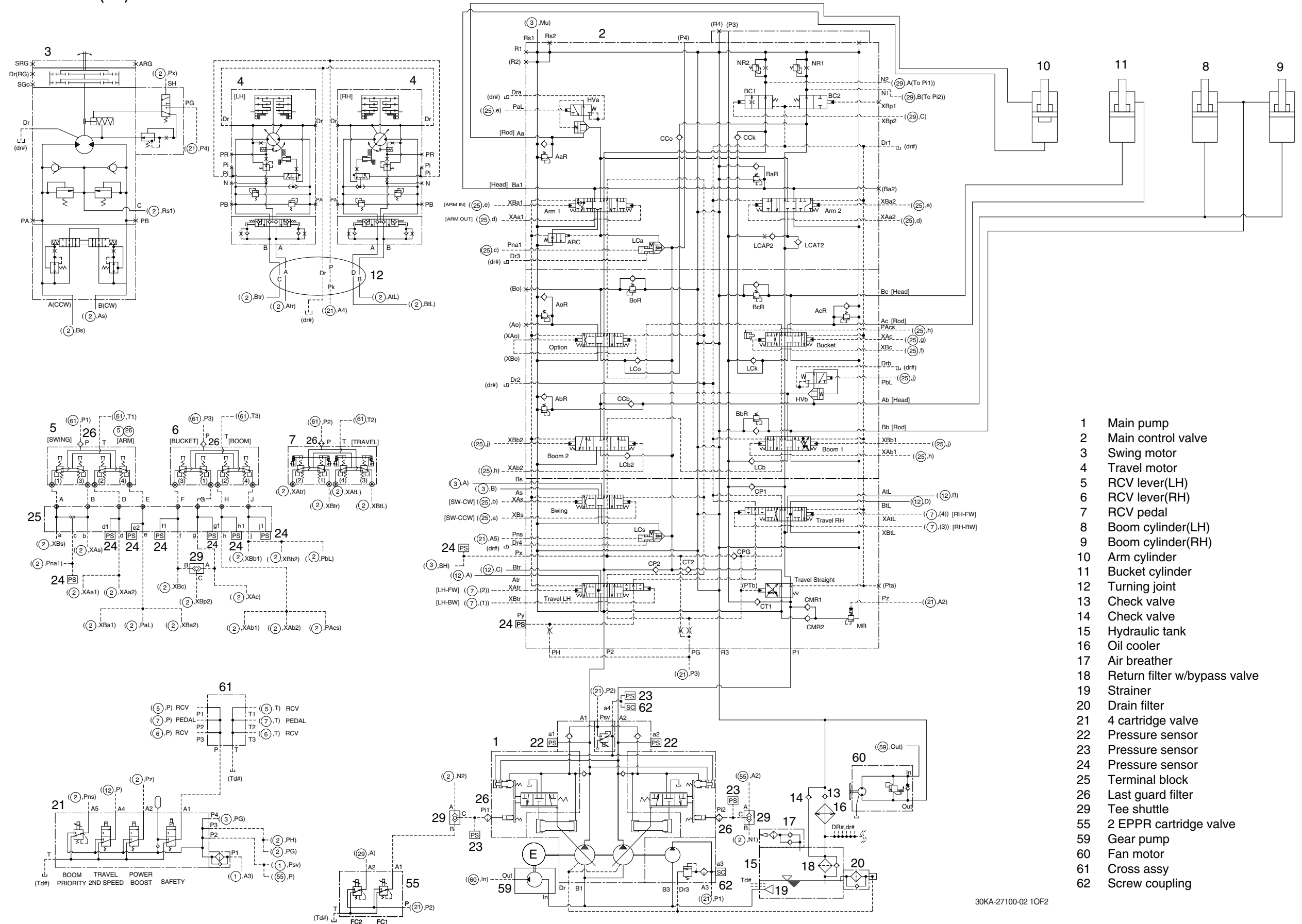
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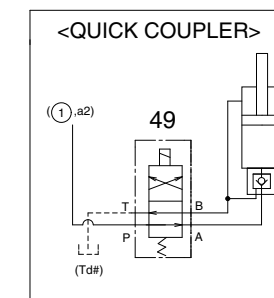
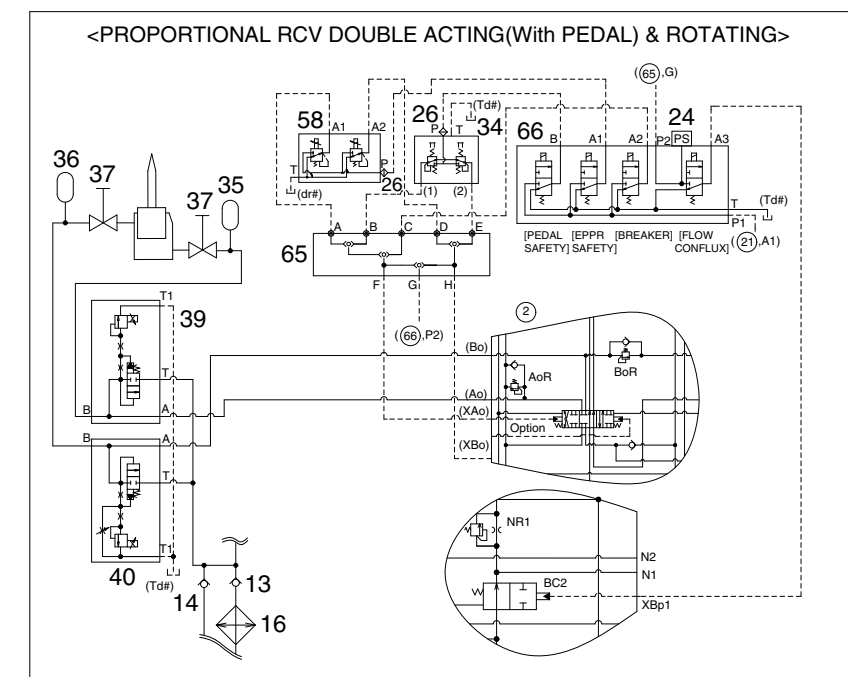
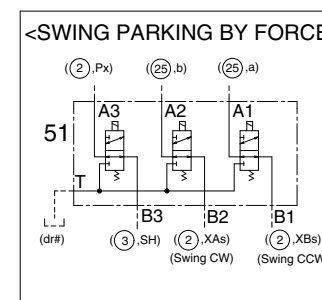
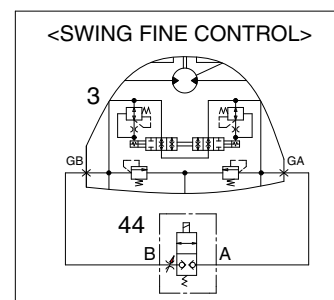
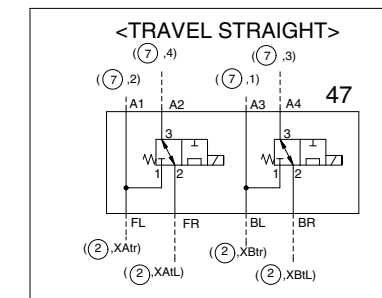
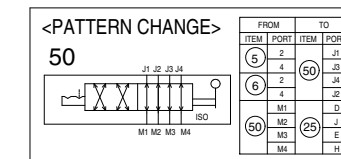
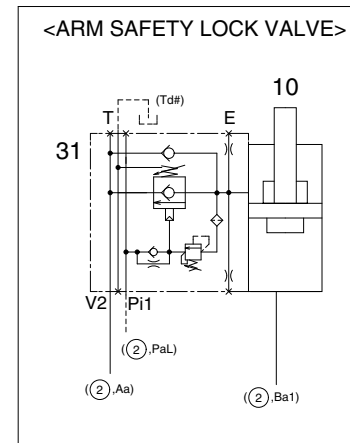
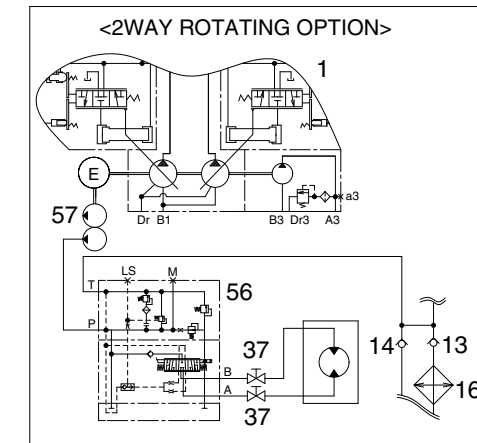
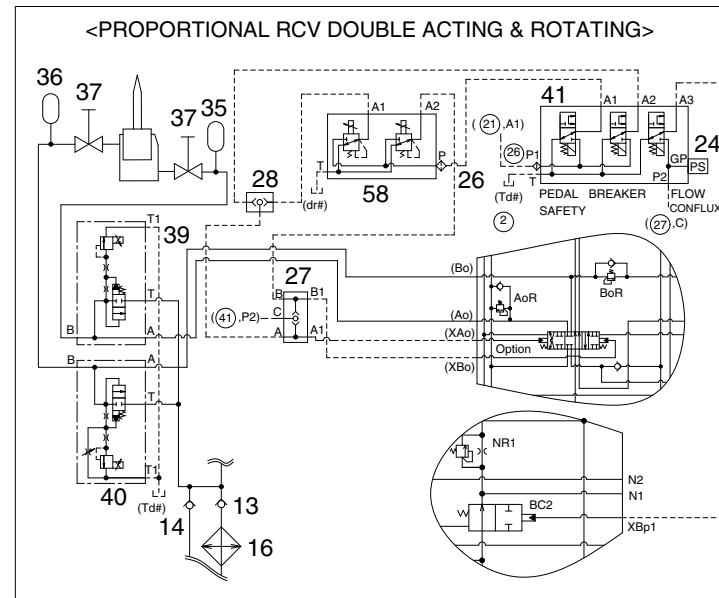
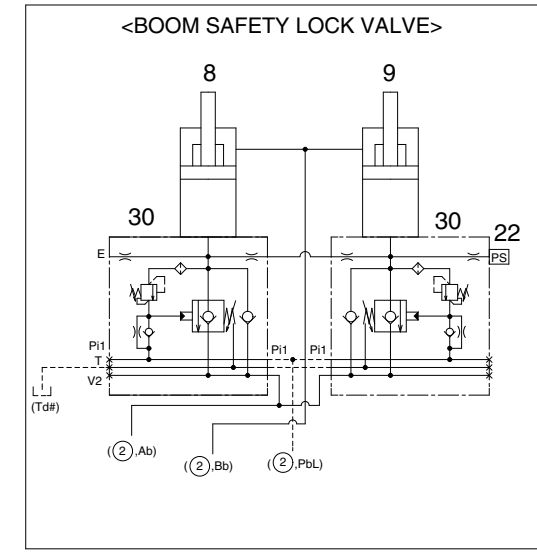
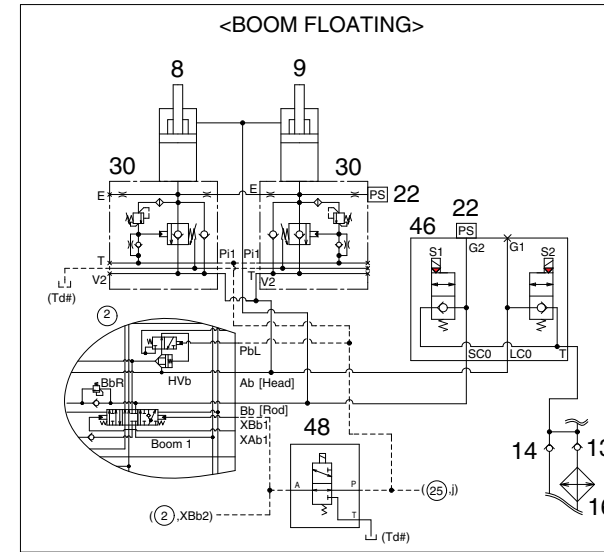
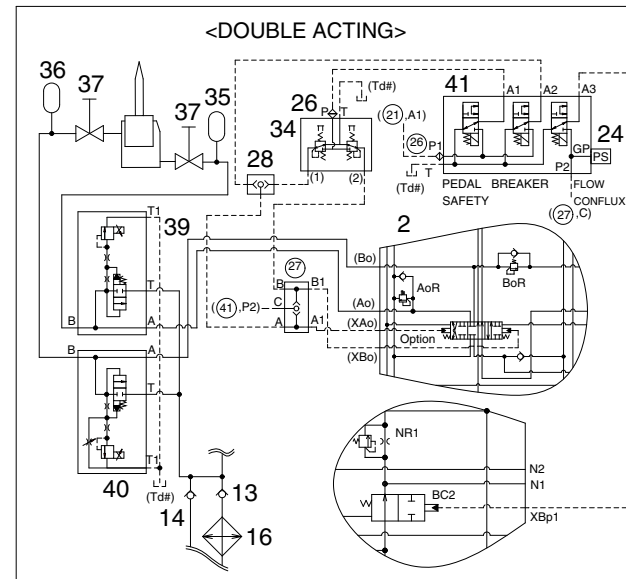
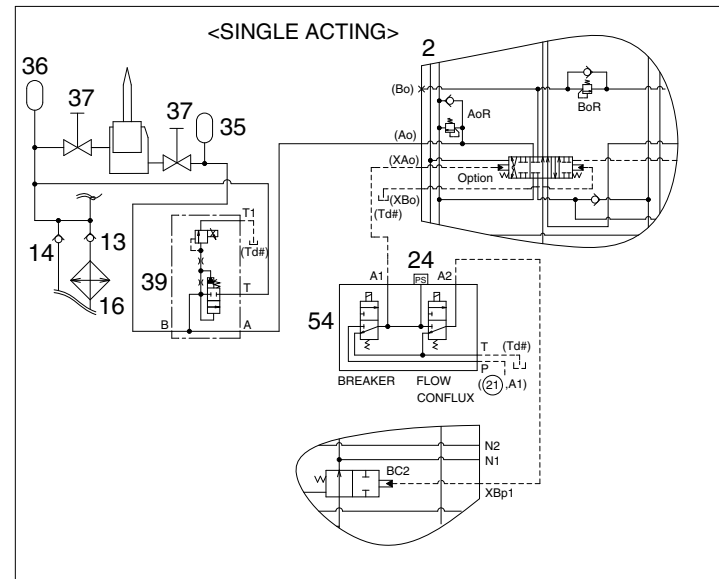
# GROUP 1 HYDRAULIC CIRCUIT (OLD VERSION)

## 1. HYDRAULIC CIRCUIT (1/2)



30KA-27100-02 10F2

## 2. HYDRAULIC CIRCUIT (2/2)



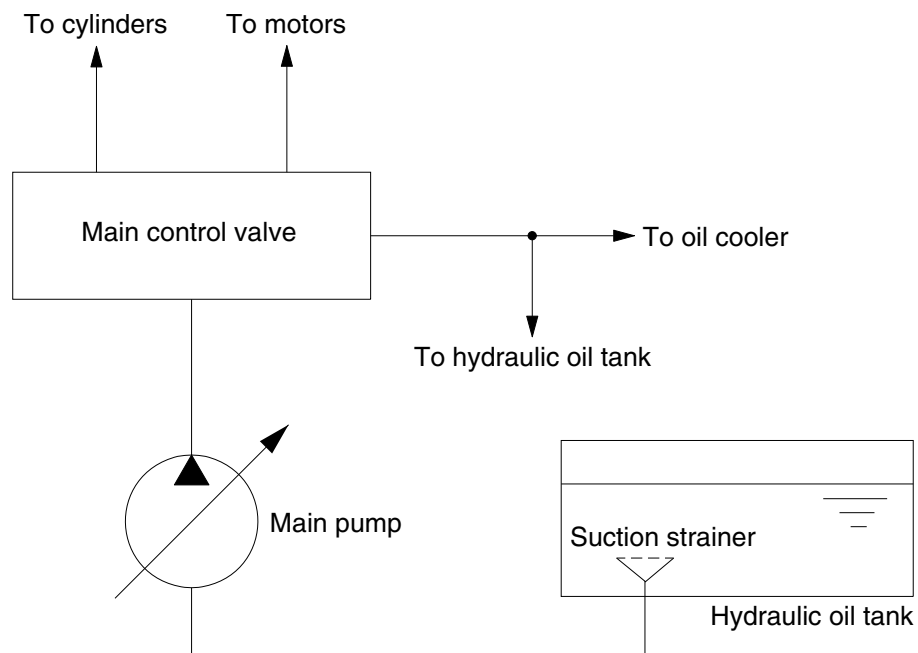
- 1 Main pump
- 2 Main control valve
- 3 Swing motor
- 8 Boom cylinder(LH)
- 9 Boom cylinder(RH)
- 10 Arm cylinder
- 13 Check valve
- 14 Check valve
- 16 Oil cooler
- 22 Pressure sensor
- 24 Pressure sensor
- 26 Last guard filter
- 27 5 shuttle assy(option)
- 28 Tee shuttle(option)
- 30 Boom safety valve(option)
- 31 Arm safety valve(option)
- 34 2 way pedal(option)
- 35 Accumulator(option)
- 36 Accumulator(option)
- 37 Stop valve(option)
- 39 Proportional relief valve(option)
- 40 Proportional relief valve(option)
- 41 3 solenoid cartridge valve(option)
- 44 Solenoid valve(option)
- 46 Float cartridge valve(option)
- 47 Solenoid valve(option)
- 48 Solenoid valve(option)
- 49 Solenoid valve(option)
- 50 Pattern change valve(option)
- 51 Solenoid valve(option)
- 54 Solenoid valve(option)
- 56 Proportional valve(option)
- 57 Gear pump(option)
- 58 2-EPPR valve(option)
- 65 Shuttle block(option)
- 66 Solenoid valve(option)

## GROUP 2 MAIN CIRCUIT (OLD VERSION)

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 tandem 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



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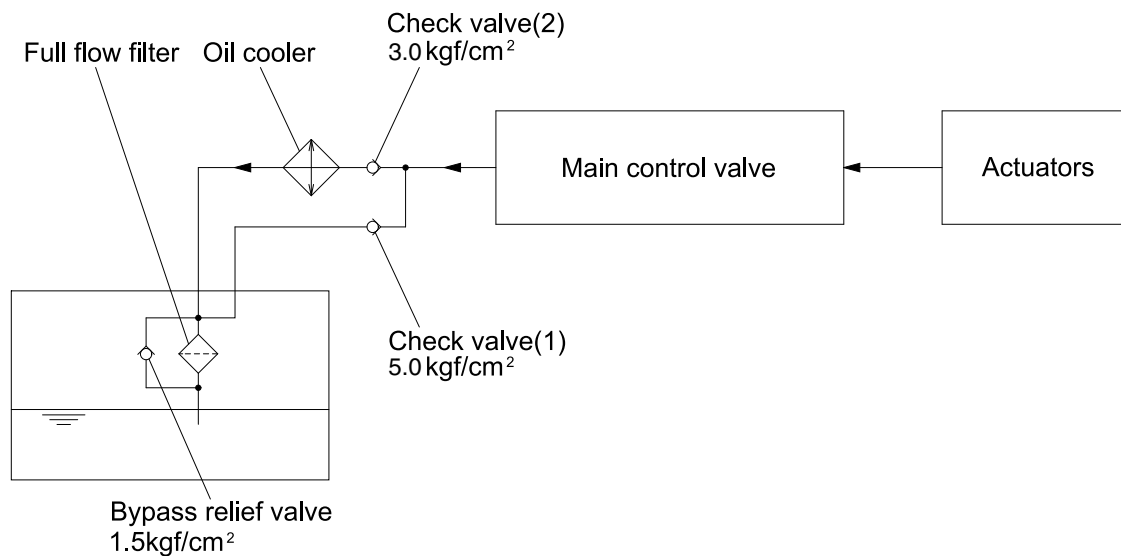
The pumps receive oil from the hydraulic tank through a suction strainer. The discharged oil from the pump flows into the control valve and goes out the tank ports.

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

The control valve controls the hydraulic functions.

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

## 2. RETURN CIRCUIT



380A3CI02

All oil 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 3.0 kgf/cm<sup>2</sup> (43 psi) and 5.0 kgf/cm<sup>2</sup> (71 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. The oil pressure exceeds 5.0 kgf/cm<sup>2</sup> (71 psi), the oil returns directly to the hydraulic tank, resulting in the oil temperature being raised quickly at an appropriate level.

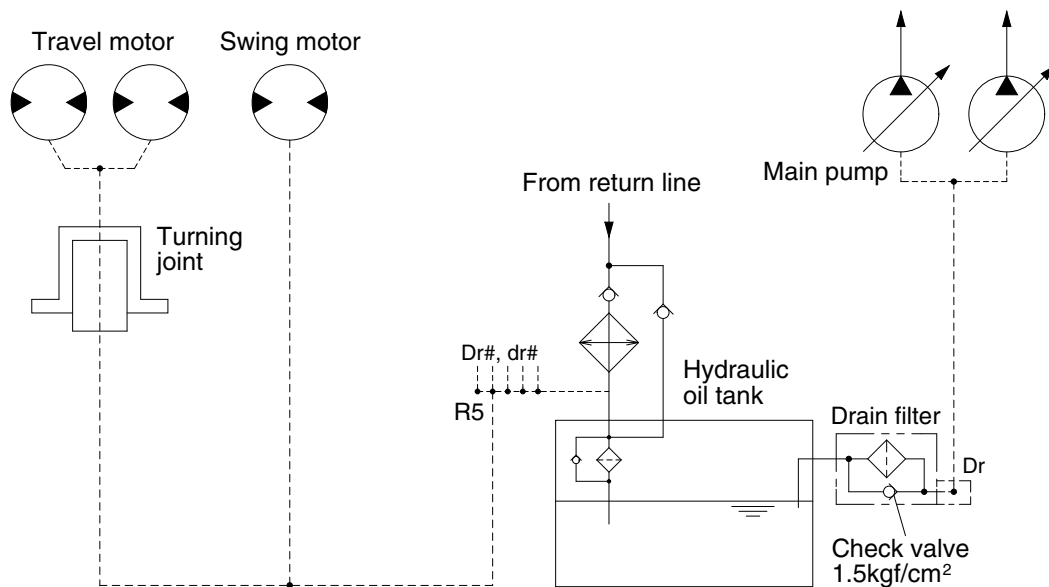
When the oil cooler is clogged, the oil returns directly to the hydraulic tank through bypass check valve (1).

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

The oil from right and left side of control valve is combined and filtered by the return 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/cm<sup>2</sup> (21 psi) differential pressure.

### 3. DRAIN CIRCUIT



380A3CI03

Besides internal leaks from the motors and main pump, the oil for lubrication circulates. These oil have to be fed to the hydraulic tank passing through drain filter and full flow filter in the hydraulic tank. When the drain oil pressure exceed  $1.5 \text{ kgf/cm}^2$  (21 psi), the oil returns to the hydraulic tank directly.

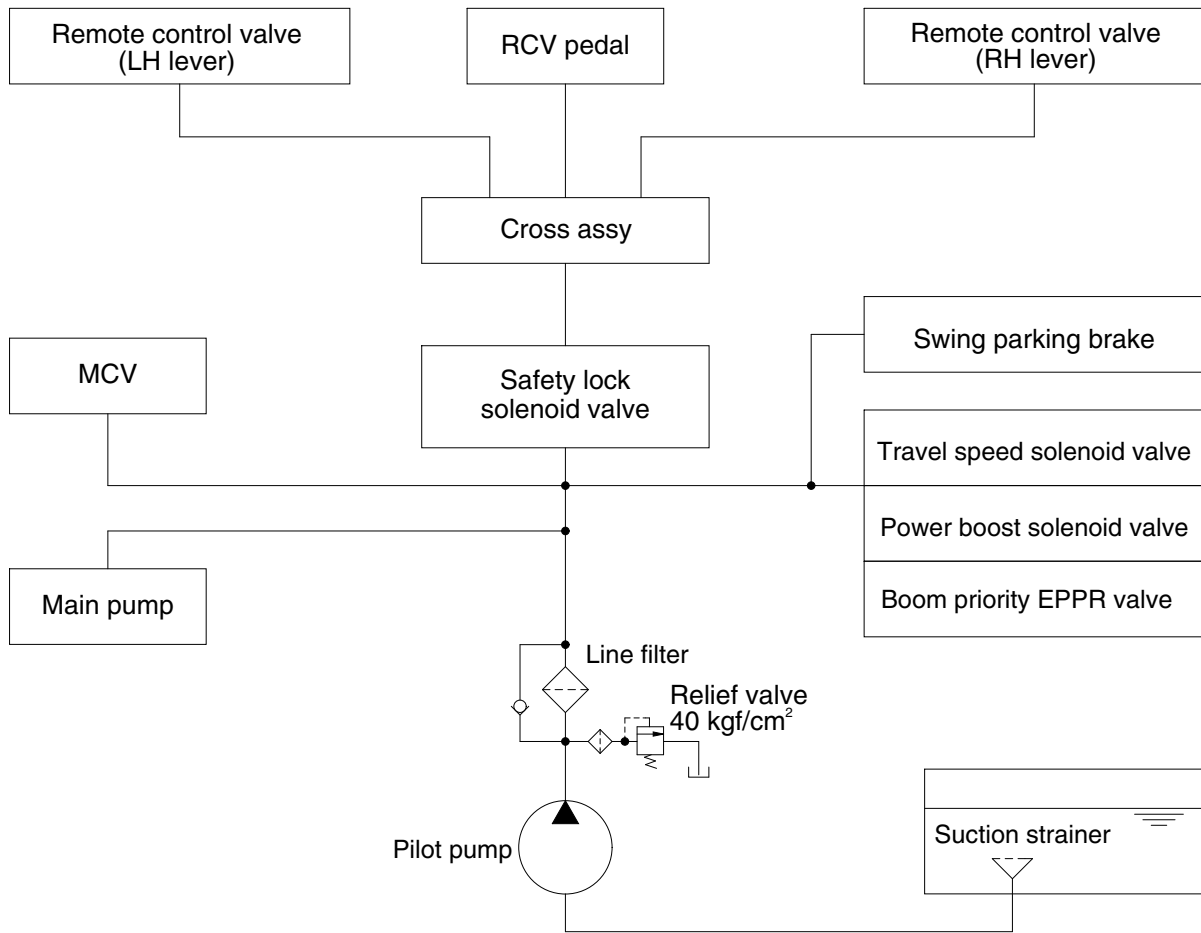
#### 1) TRAVEL MOTOR AND SWING MOTOR DRAIN CIRCUIT

Oil leaking 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 join with oil leak line of the swing motor and return to the hydraulic tank after being filtered by return filter.

#### 2) MAIN PUMP DRAIN CIRCUIT

Oil leaking from main pump come out and return to the hydraulic tank passing through drain filter.

## GROUP 3 PILOT CIRCUIT (OLD VERSION)



380A3CI01

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

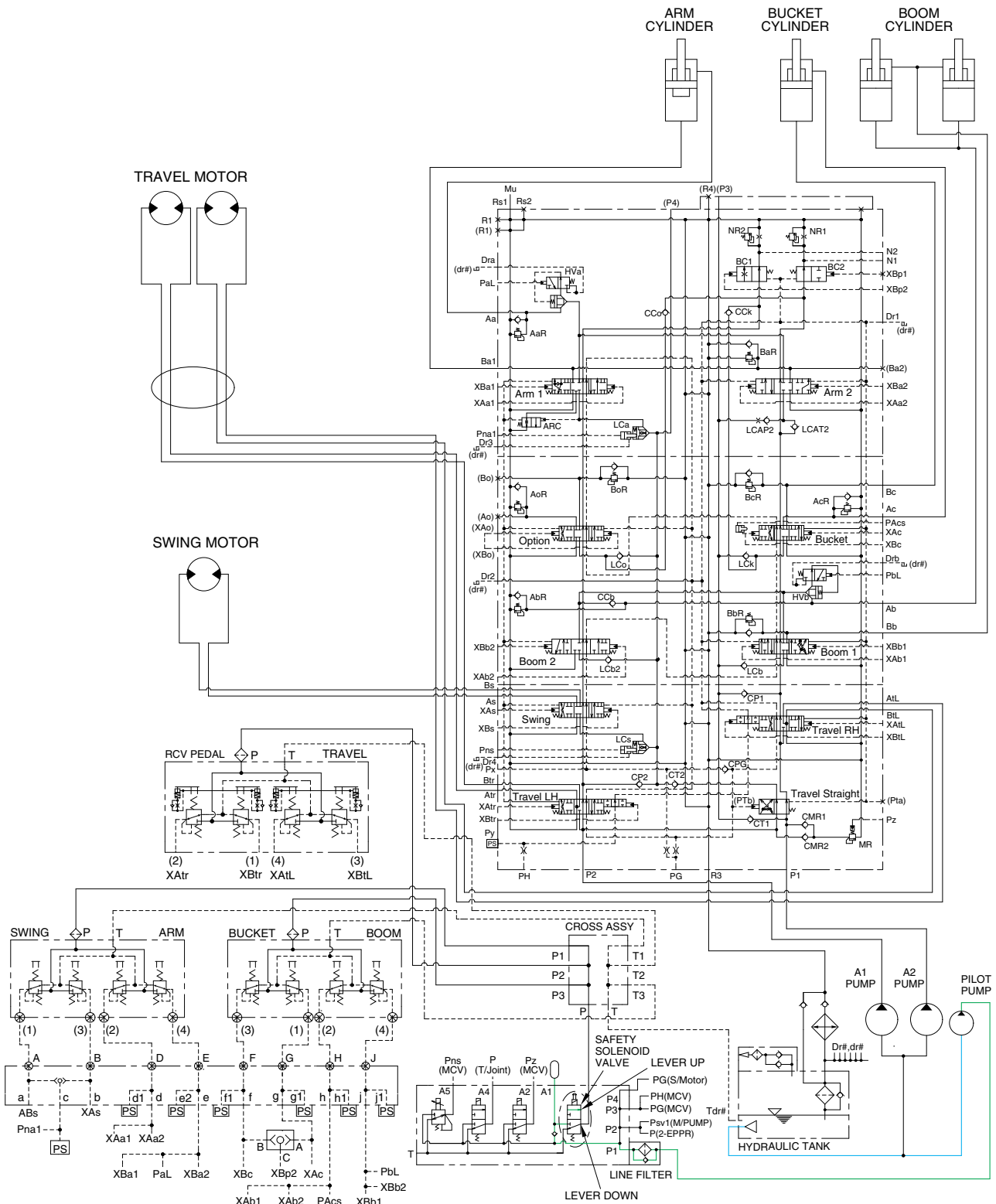
The pilot pump is provided with relief valve, receives the oil from the hydraulic tank through the suction strainer.

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.





## 2. SAFETY SOLENOID VALVE (SAFETY LEVER)



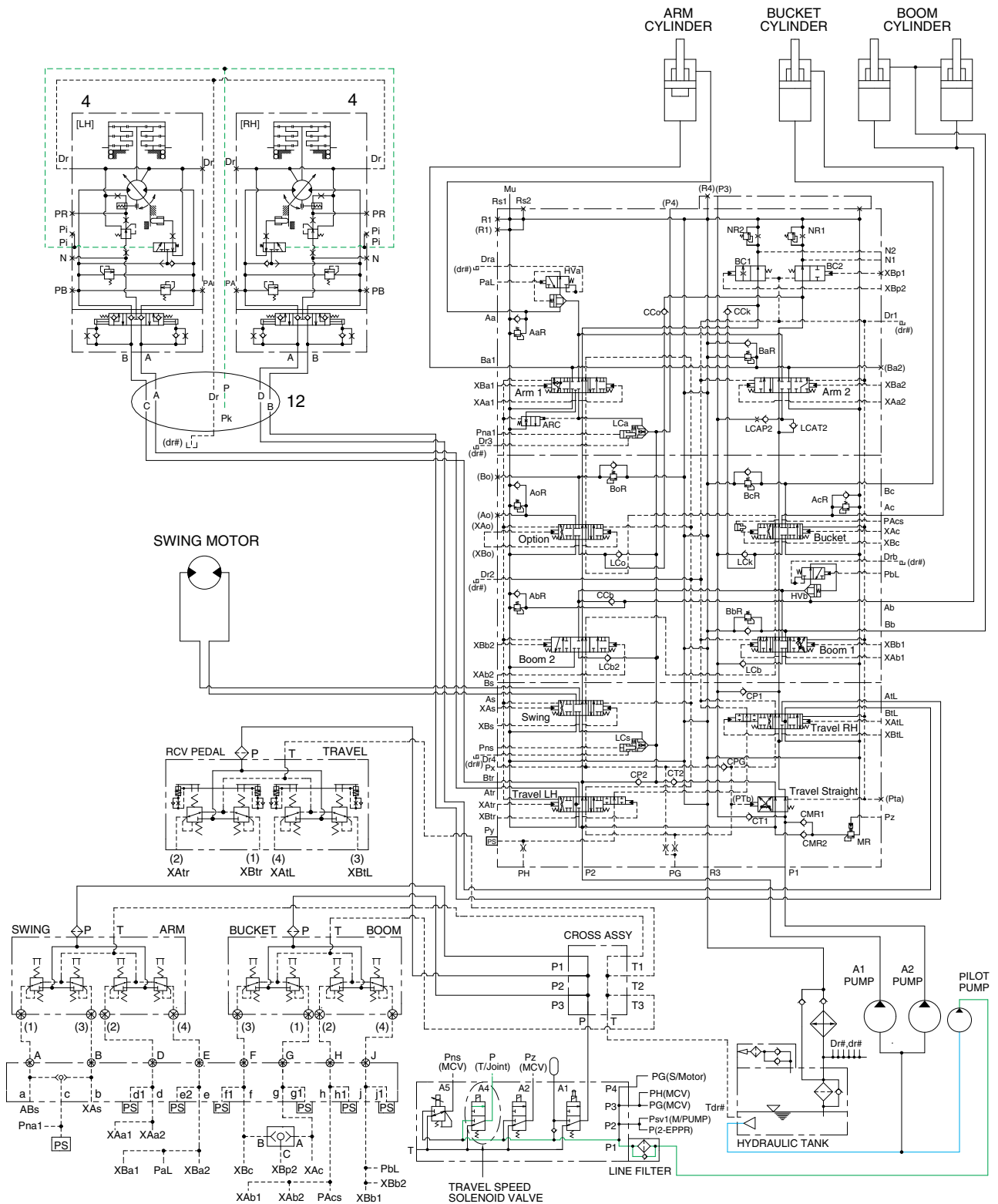
380A3HC03

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

When the lever of the safety solenoid valve moved downward, oil does not flows into the remote control valve, because of blocked by the spool.



## 4. TRAVEL SPEED CONTROL SYSTEM

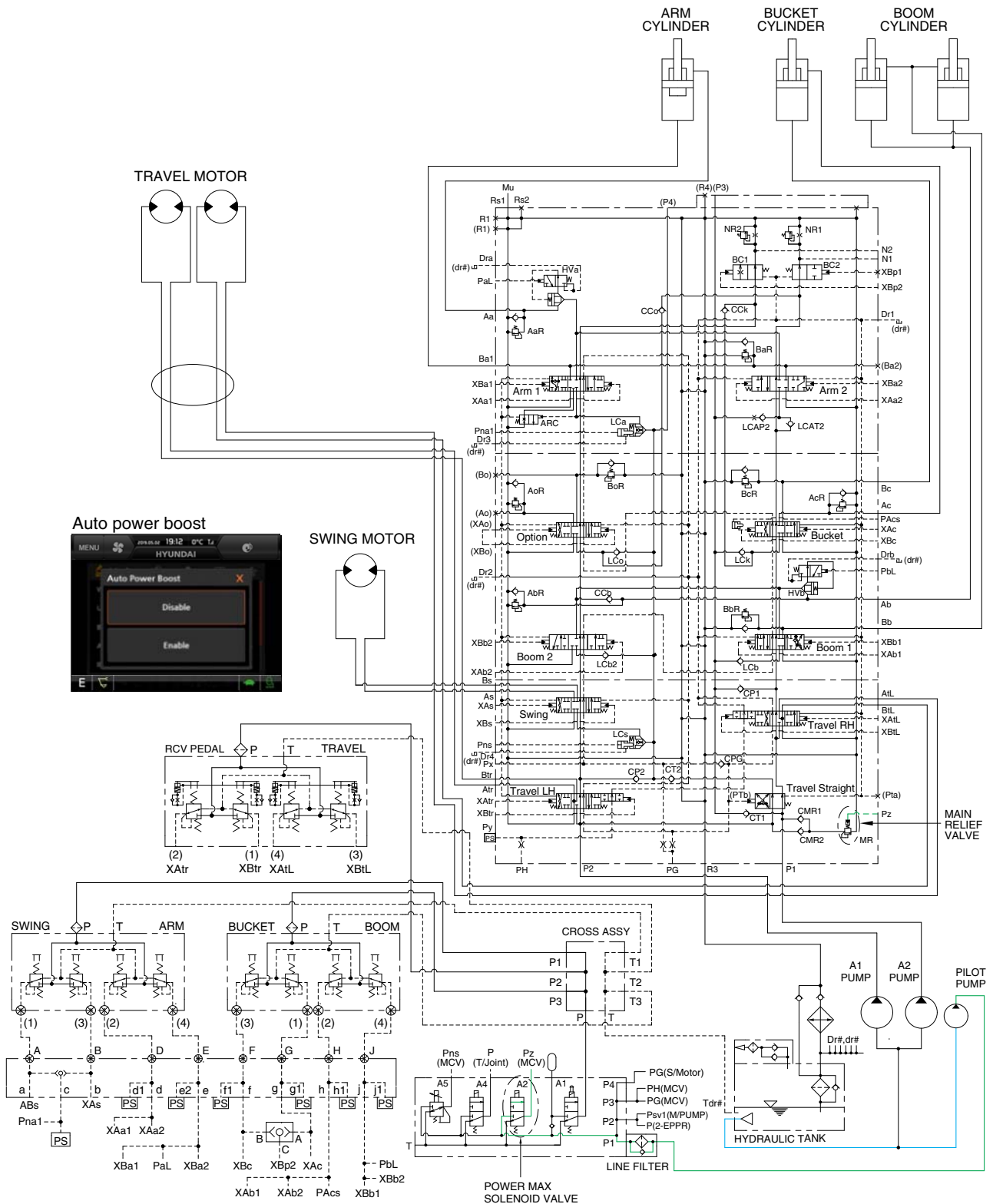


380A3HC05

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

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

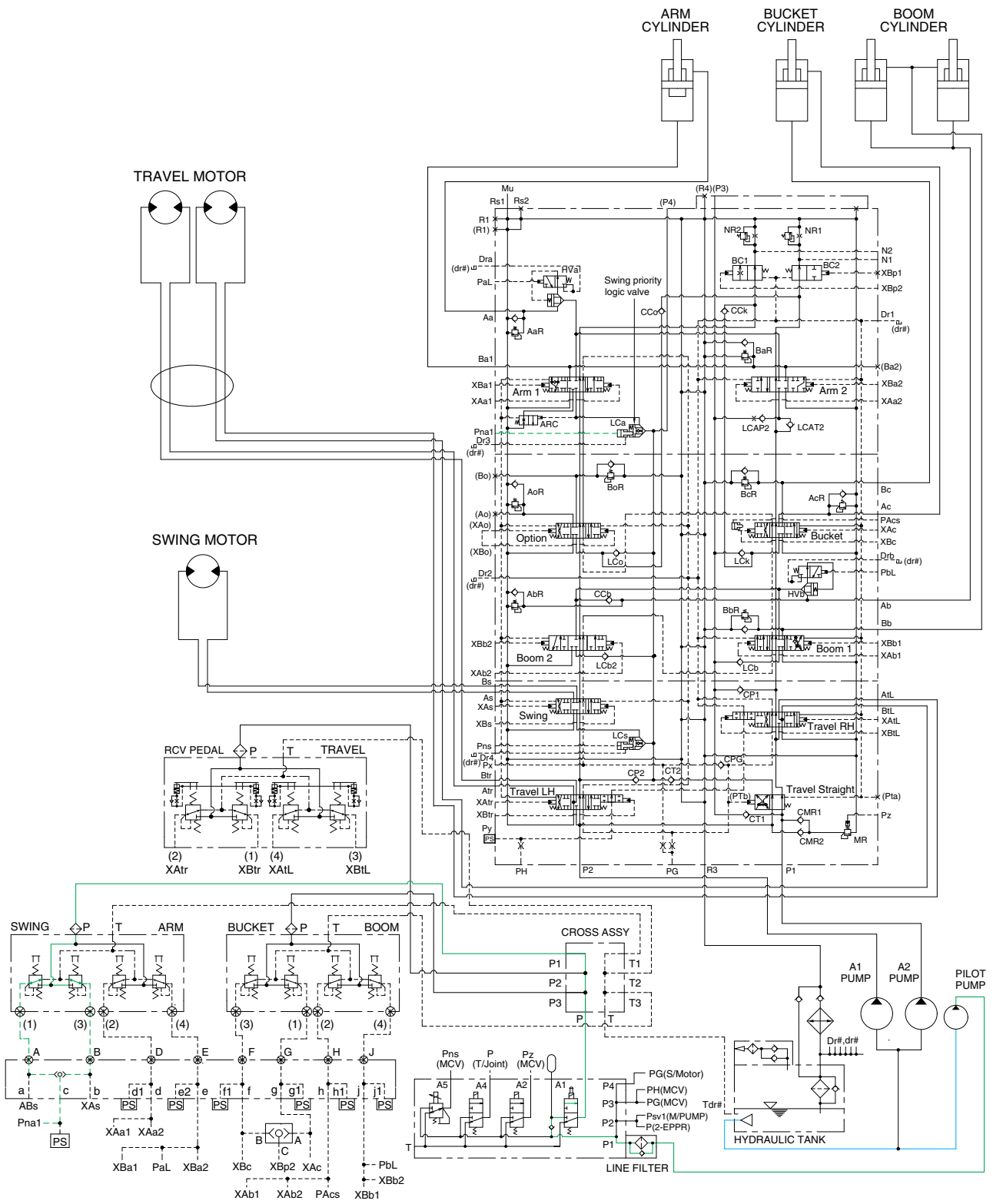
## 5. MAIN RELIEF PRESSURE CHANGE CIRCUIT



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 330 kgf/cm<sup>2</sup> to 360 kgf/cm<sup>2</sup> for increasing the digging power. And even when press continuously, it is canceled after 8 seconds. When the auto power boost function is selected to enable on the cluster, the pressure of the main relief valve is automatically increased to 360 kgf/cm<sup>2</sup> as working condition by the MCU. It is also operated max 8 seconds.



# 7. SWING PRIORITY SYSTEM



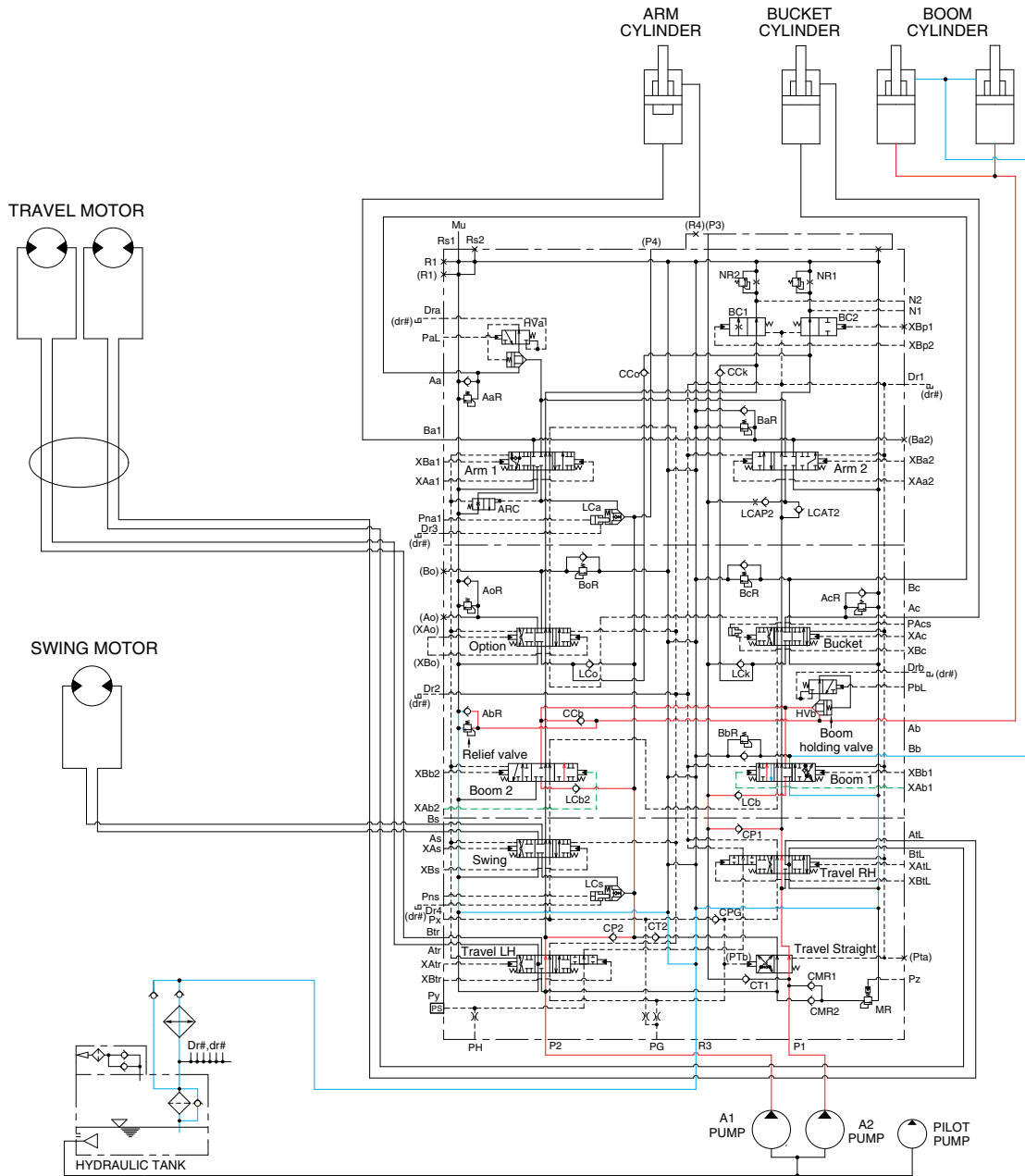
380A3HC08

When carrying out the combined operation of swing and arm of the left control valve, the swing speed can be lowered than operating speed of arm.  
 Pna1 pressure from the swing shuttle block change the swing priority logic valve and decreases the oil flow rate to the next section to make the swing operation more preferential.  
 This is called the swing priority system. For details, refer to page 2-45.



# GROUP 4 SINGLE OPERATION (OLD VERSION)

## 1. BOOM UP OPERATION

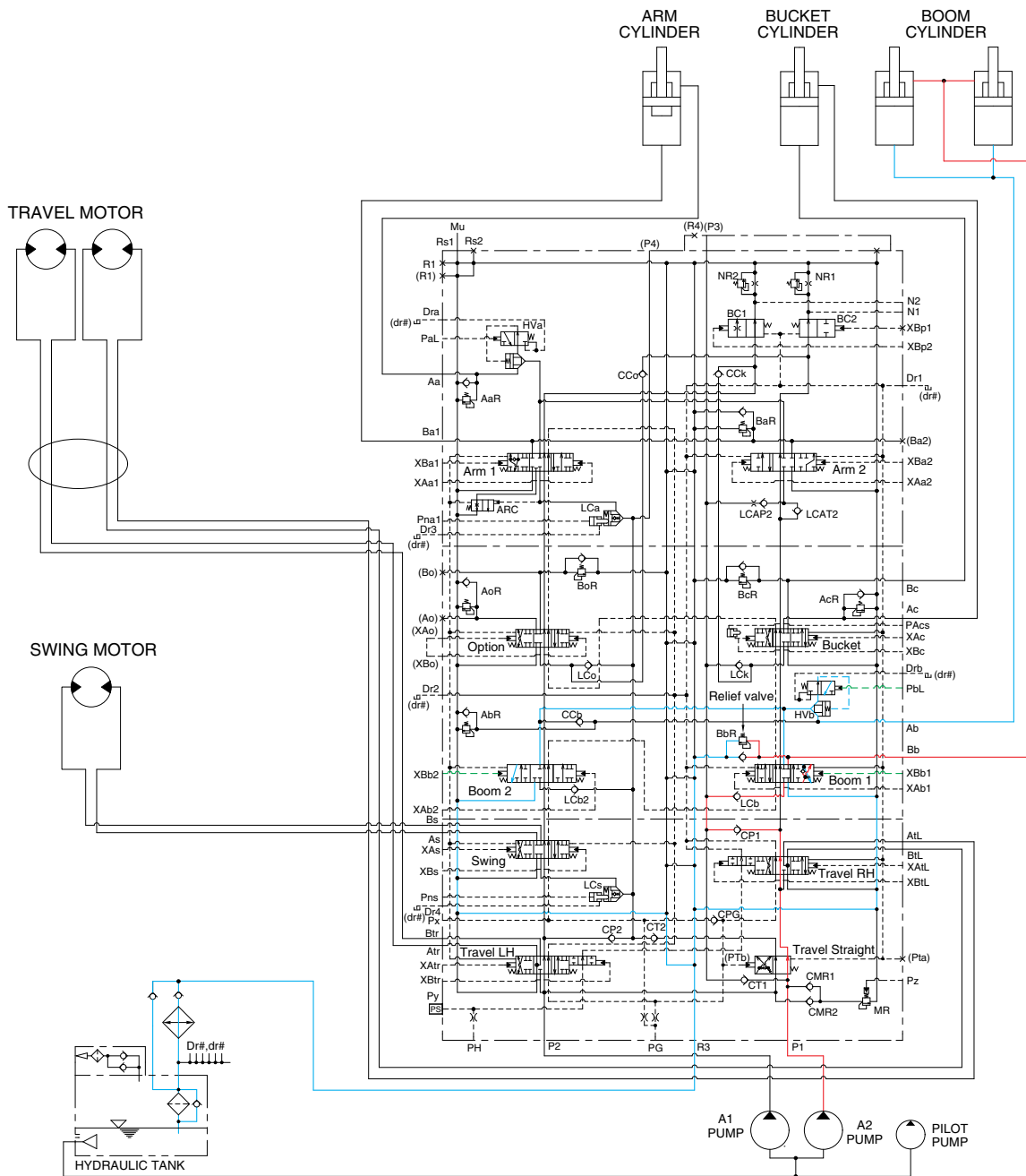


380A3HC10

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 (XAb1, XAb2) from the remote control valve. The oil from the A1 and A2 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 1 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.



## 2. BOOM DOWN OPERATION



380A3HC11

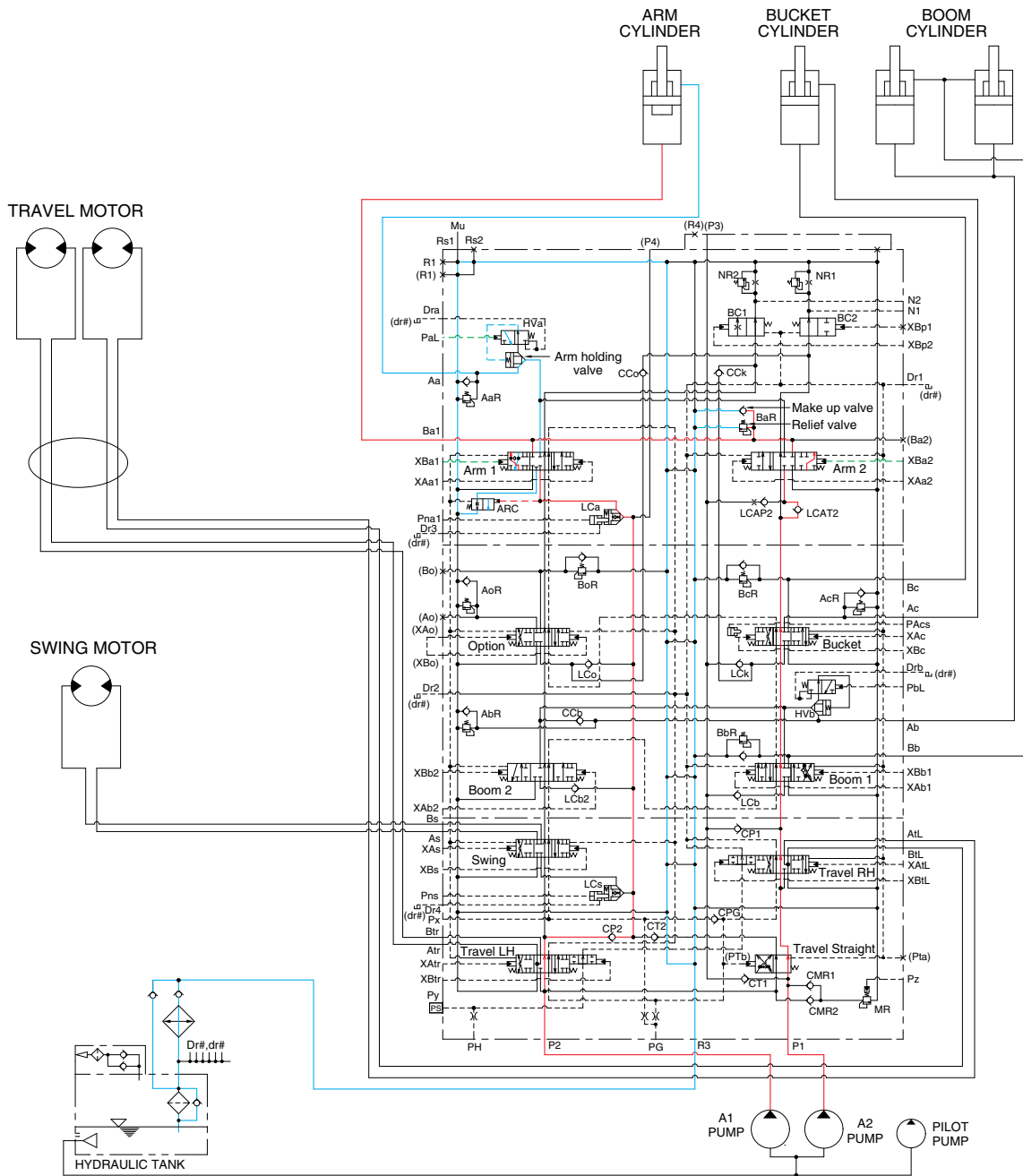
When the RH control lever is pushed forward, the boom 1 spool in the main control valve is moved to the down position by the pilot oil pressure (XBb1, XBb2) from the remote control valve.

The oil from the A2 pump flows into the main control valve and then goes to the small chamber of boom cylinders. At the same time, the oil from the large chamber of boom cylinders returns to the hydraulic tank through the boom 1 and 2 spools in the main control valve.

When the down speed of boom is faster, the oil returned from the large chamber of boom cylinder combines with the oil from the A2 pump, and flows into the small chamber of the boom cylinder.

This prevents cylinder cavitation by the negative pressure when the A2 pump flow can not match the boom down speed. And the excessive pressure in the boom cylinder rod end circuit is prevented by the relief valve.

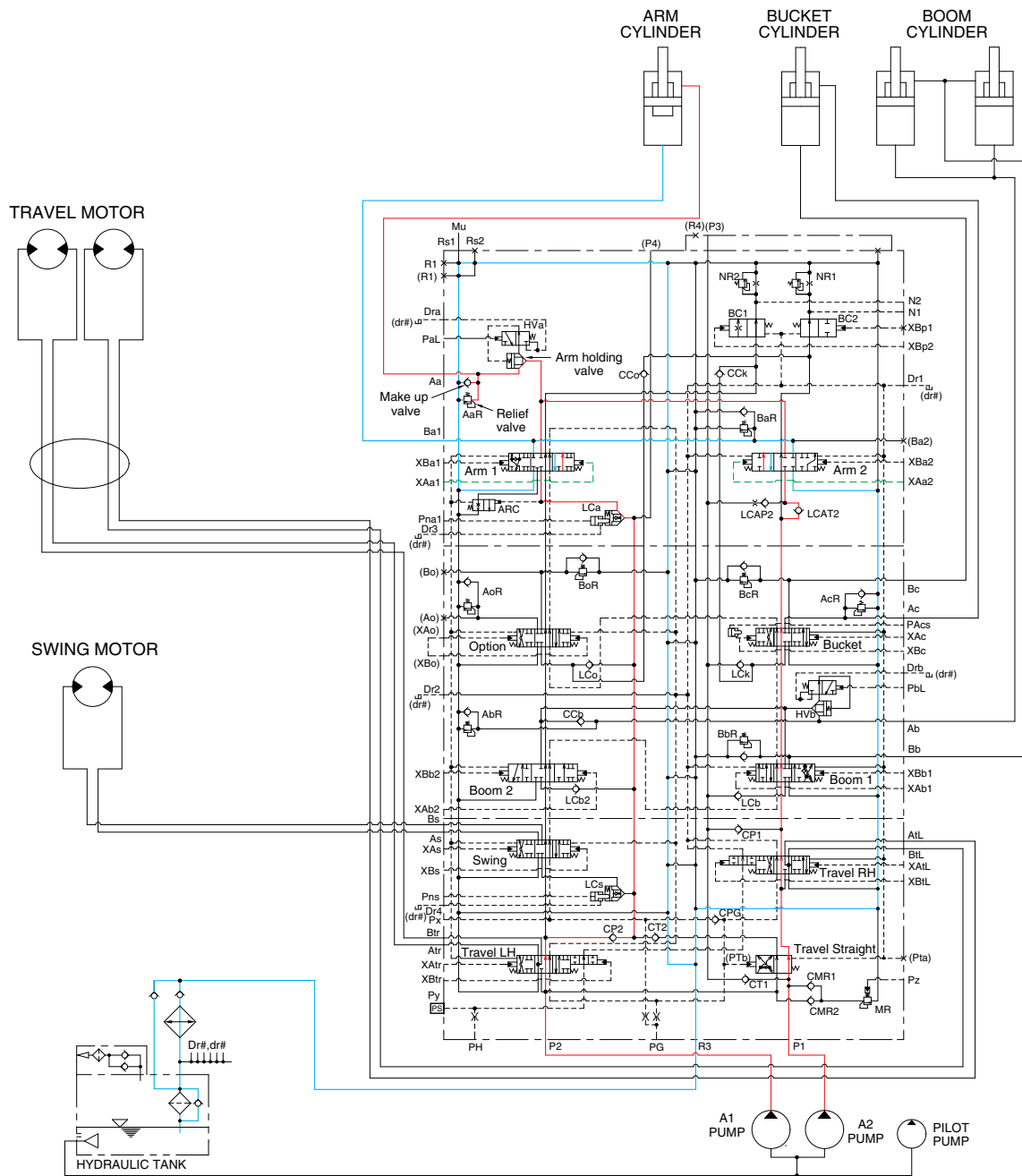
### 3. ARM IN OPERATION



380A3HC12

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 (XBa1, XBa2) from the remote control valve. The oil from the A1 and A2 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 1 spool in the main control valve. When this happens, the arm rolls in. The excessive pressure in the arm cylinder head side is prevented by relief valve. The cavitation which will happen to the head side of the arm cylinder is also prevented by the make-up valve in the main control valve.

## 4. ARM OUT OPERATION



380A3HC13

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 (XAa1, XAa2) from the remote control valve.

The oil from the A1 and A2 pump flows into the main control valve and then goes to the small chamber of arm cylinder.

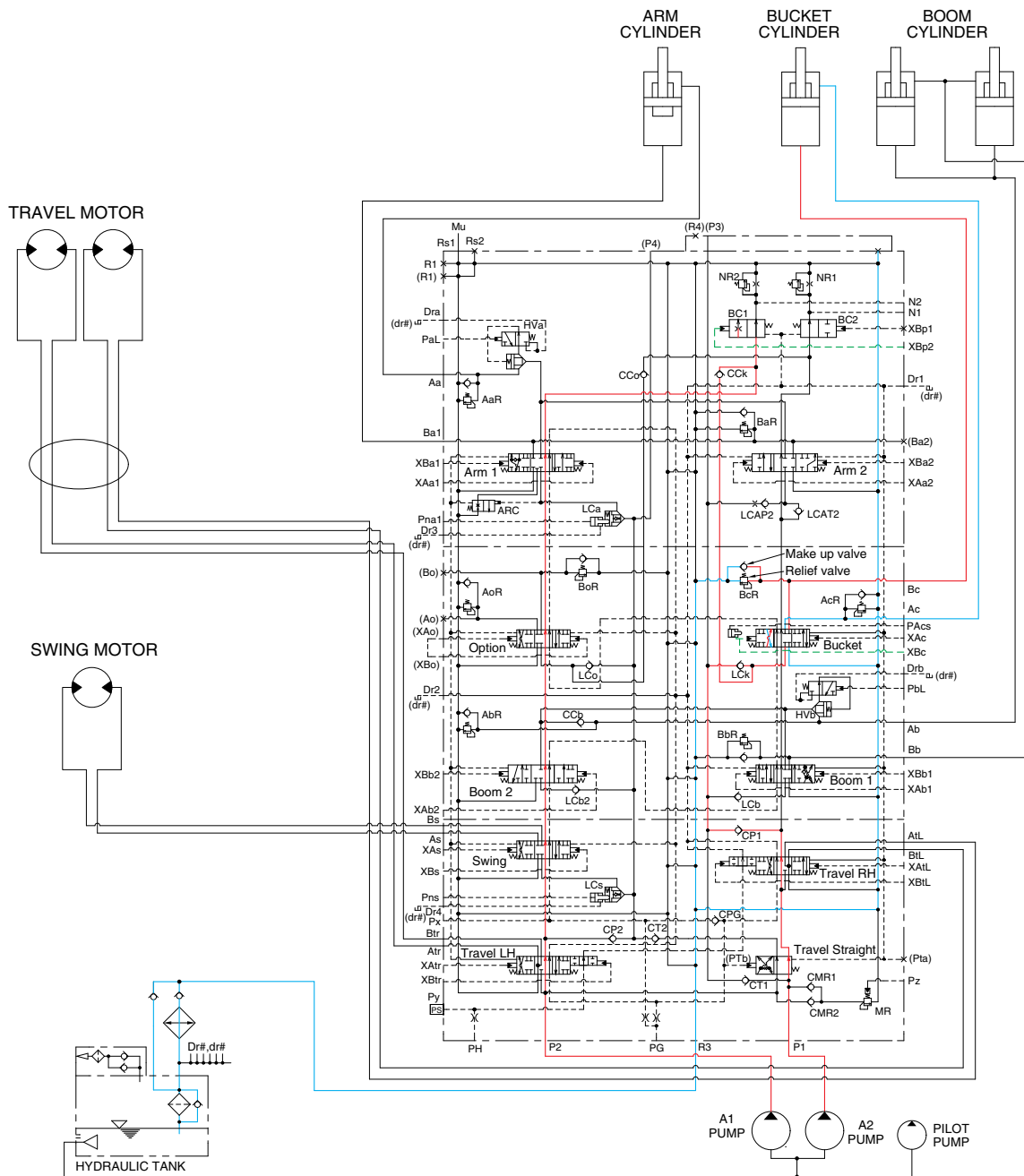
At the same time, the oil from the large chamber of arm cylinder returns to the hydraulic oil tank through the arm spools in the main control valve. When this happens, the arm rolls out.

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

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

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

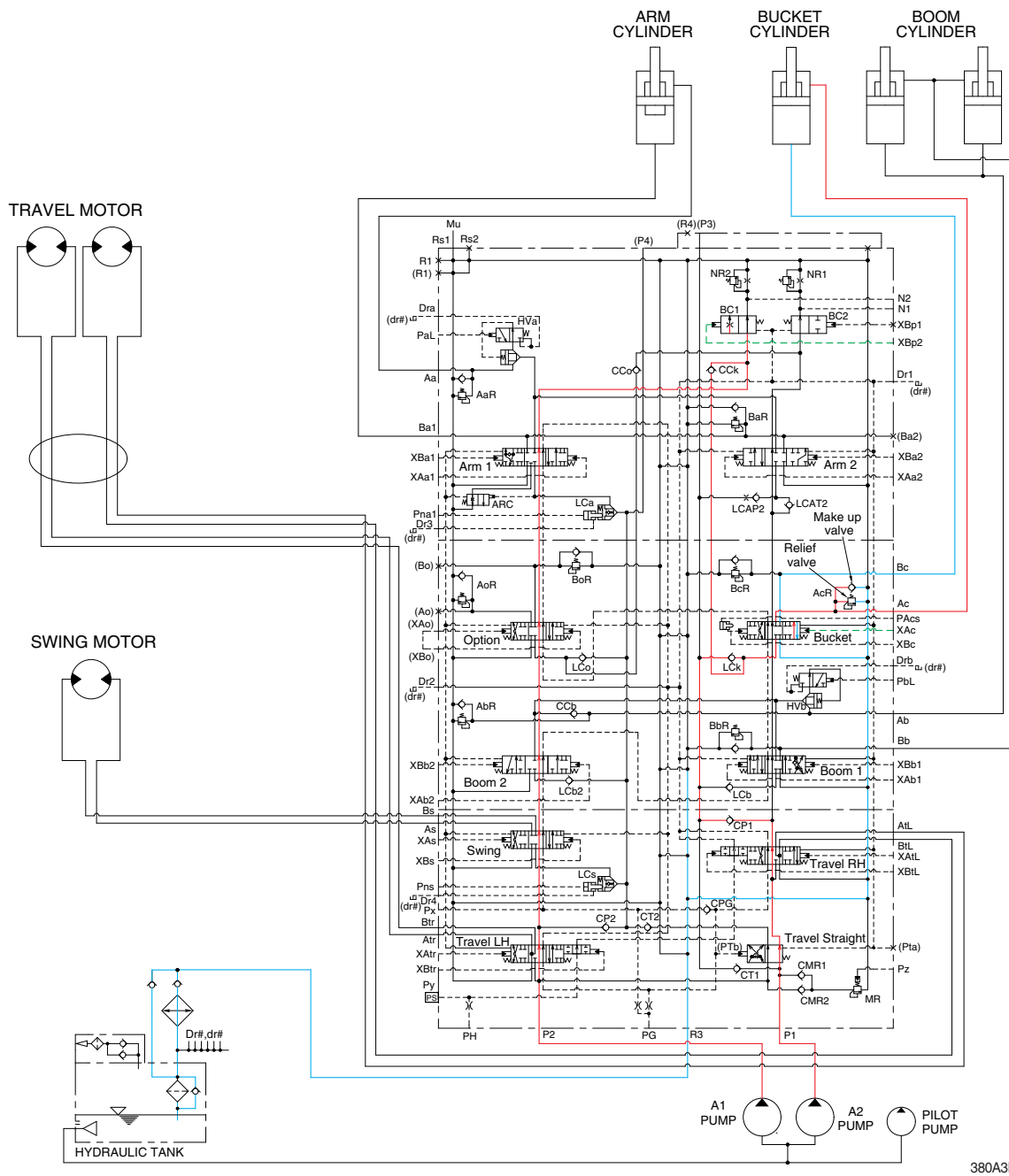
## 5. BUCKET IN OPERATION



380A3HC14

When the RH 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 (XBc) from the remote control valve. The oil from the A2 pump flows into the main control valve and then goes to the large chamber of bucket cylinder. The oil from the A1 pump flows into the large chamber of bucket cylinder through confluence oil passage in the main control valve by bypass cut pilot pressure (XBp2). 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 excessive pressure in the bucket cylinder head side is prevented by relief valve. The cavitation which will happen to the head side of the bucket cylinder is also prevented by the make-up valve in the main control valve.

## 6. BUCKET OUT OPERATION



380A3HC15

When the RH 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 (XAc) from the remote control valve.

The oil from the A2 pump flows into the main control valve and then goes to the small chamber of bucket cylinder. The oil from the A1 pump flows into the large chamber of bucket cylinder through confluence oil passage in the main control valve by bypass cut pilot pressure (XBp2).

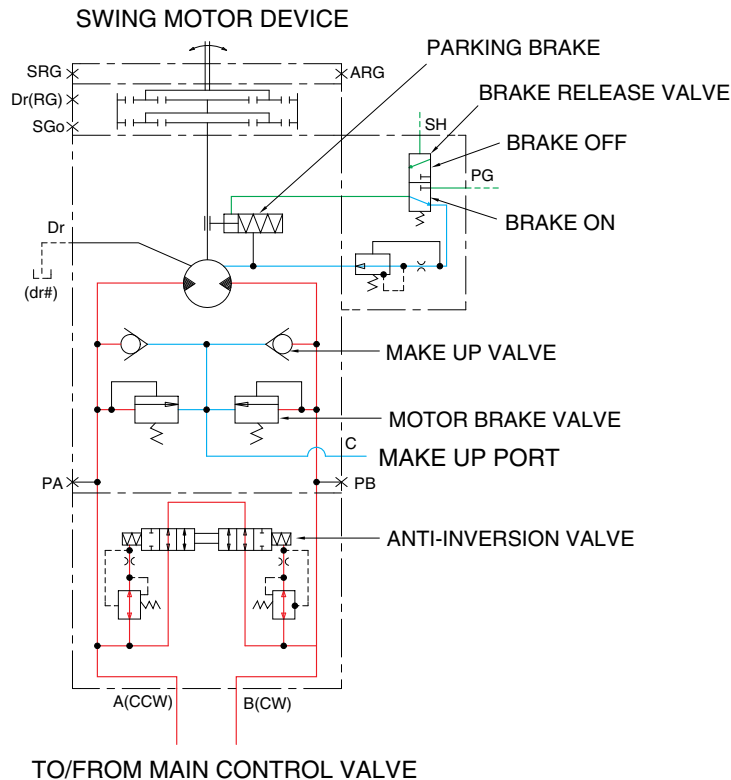
At the same time, the oil from the large chamber of bucket cylinder returns to the hydraulic oil tank through the bucket spool in the main control valve. When this happens, the bucket rolls out.

The excessive pressure in the bucket cylinder rod side is prevented by relief valve.

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



## SWING CIRCUIT OPERATION



380A3HC17

### 1) MOTOR BRAKE VALVE

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

### 2) MAKE UP VALVE

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

### 3) PARKING BRAKE

This is function as a parking brake only when all of the RCV lever (except travel pedal) are not operated.

#### PARKING BRAKE "OFF" OPERATION

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

When one of the RCV lever (except travel lever) placed in the operating position, the pilot oil flows into SH port through the MCV. This pressure transferred to the brake release valve and the brake release valve is change over. Then the pilot oil pressure PG lift the brake piston and release the parking brake.

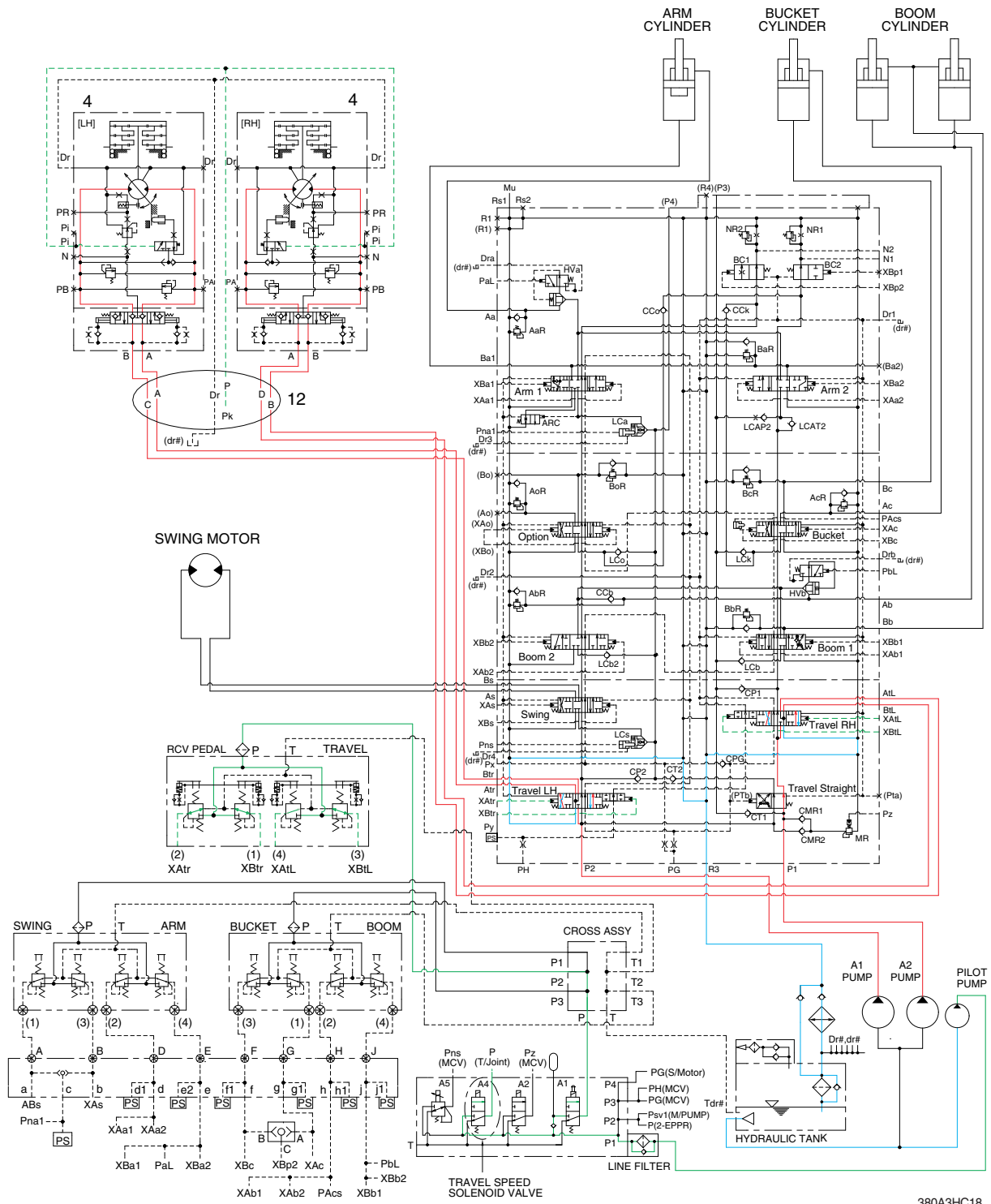
#### PARKING BRAKE "ON" OPERATION

When all of the RCV 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'.

### 4) ANTI-INVERSION VALVE

This anti-inversion valve absorbs shocks produced as swing motion stops and reduced oscillation cause by swing motion.

## 8. TRAVEL FORWARD AND REVERSE OPERATION



380A3HC18

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 (XATr, XBTr, XATL, XBTL) from the remote control valve.

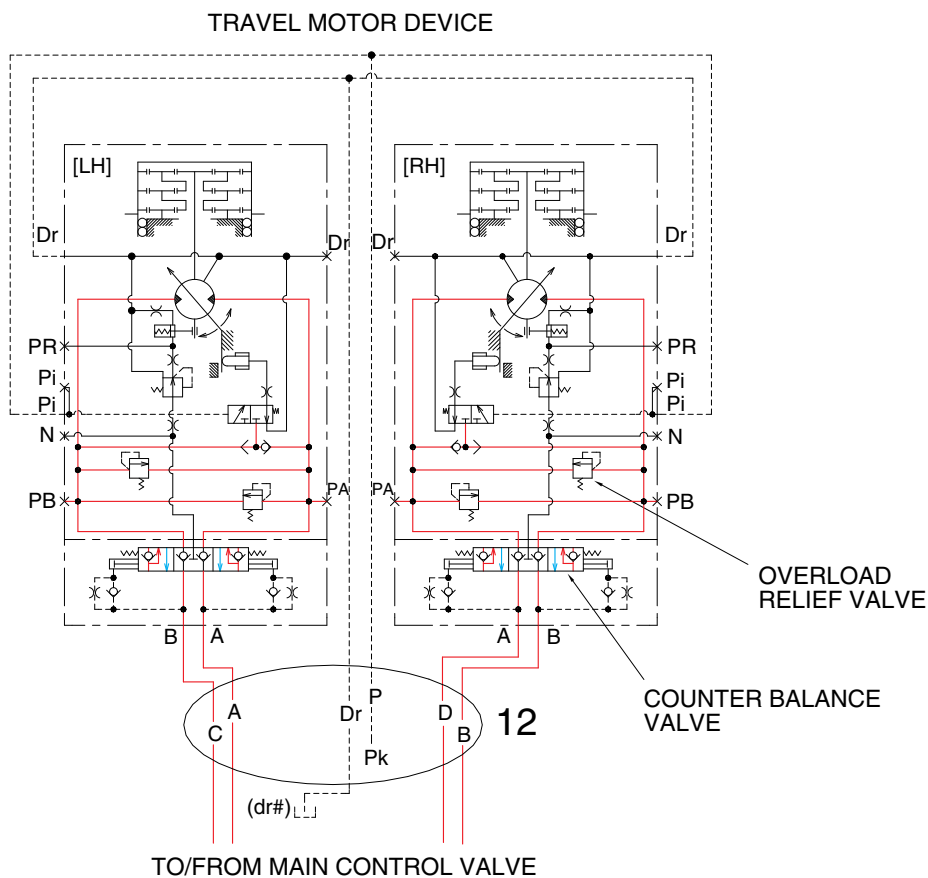
The oil from each pump flows into the main control valve and then goes to each travel motor through the turning joint.

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.



## TRAVEL CIRCUIT OPERATION



380A3HC19

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

### 1) COUNTER BALANCE VALVE

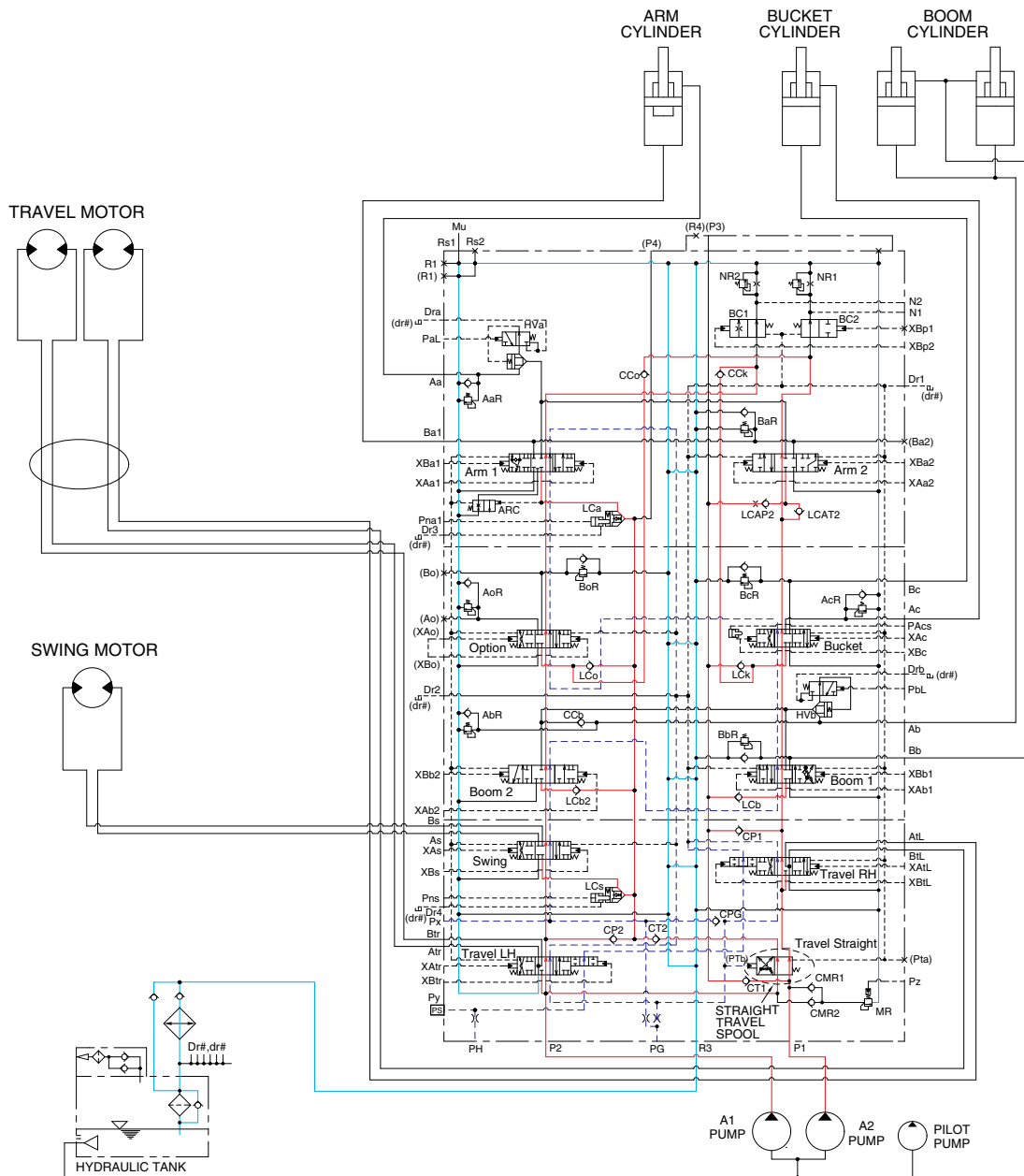
When stopping the motor of slope descending, this valve to prevent the motor over run.

### 2) OVERLOAD RELIEF VALVE

Relief valve limit the circuit pressure below 370 kgf/cm<sup>2</sup> (5260 psi) for the travel motor type 1 and 360 kgf/cm<sup>2</sup> (5120 psi) for the travel motor type 2 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 (OLD VERSION)

## 1. OUTLINE



380A3HC20

The oil from the A1 and A2 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.

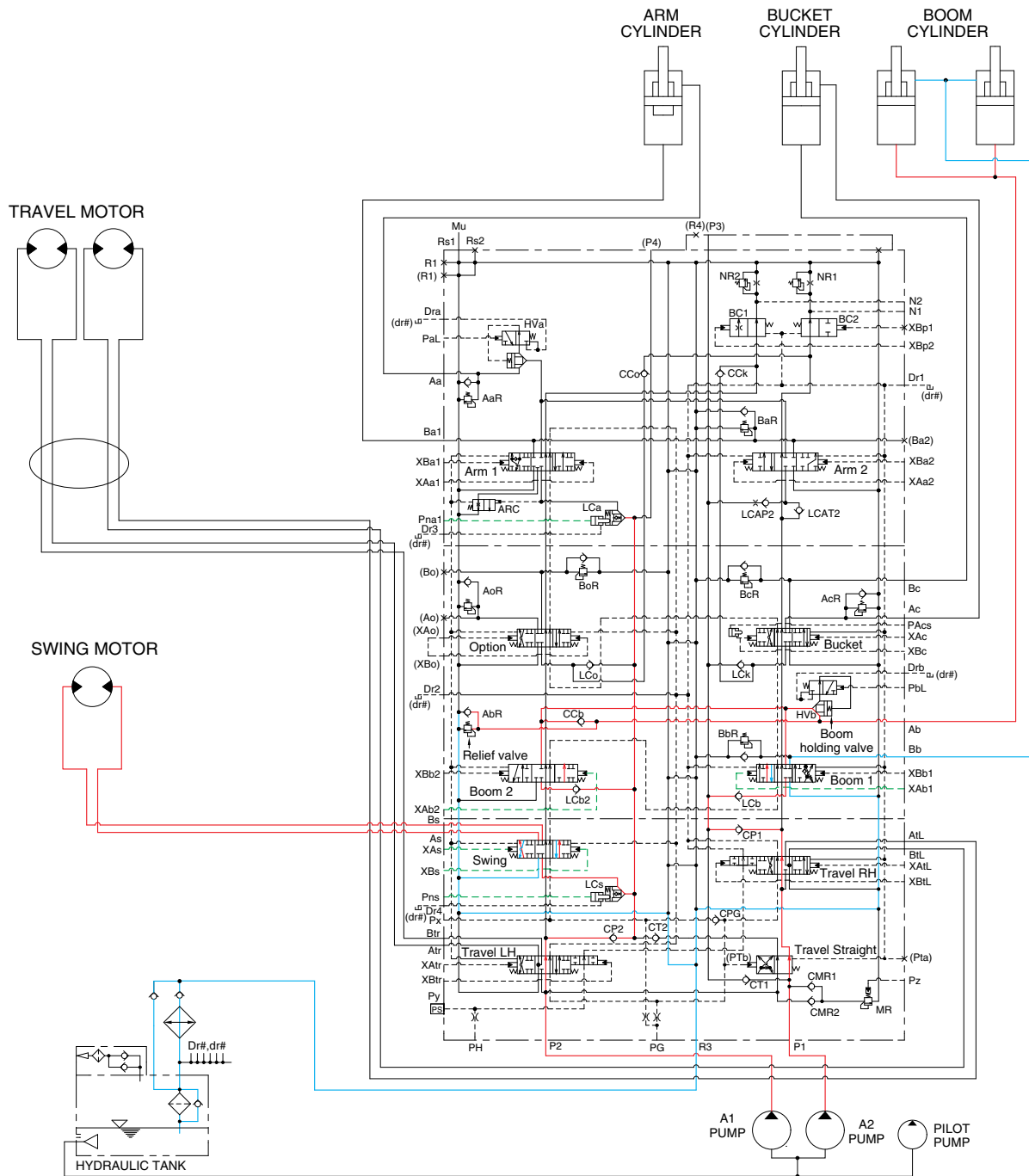
### STRAIGHT TRAVEL SPOOL

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 right 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 UP OPERATION



380A3HC21

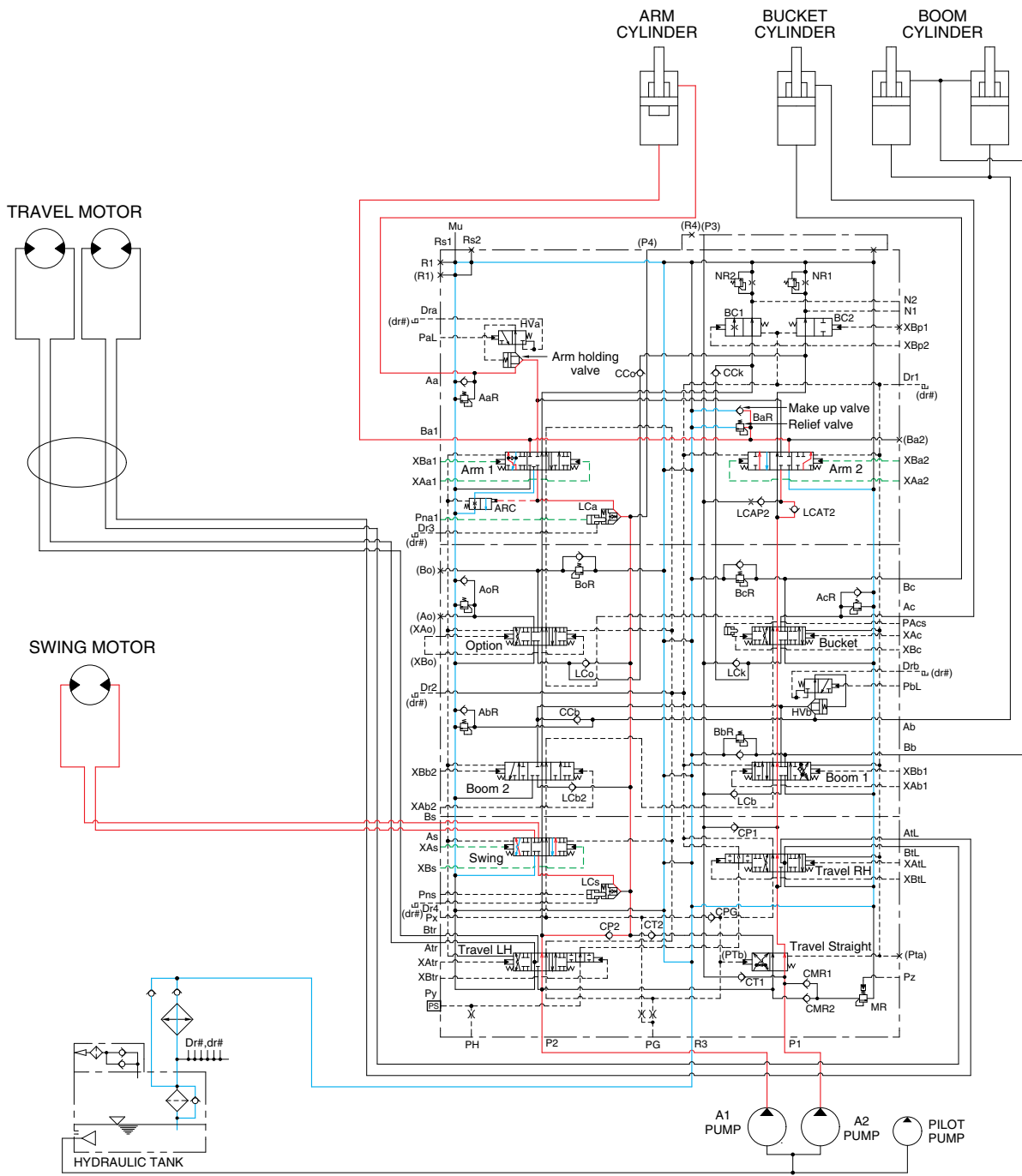
When the swing and boom up functions are operated simultaneously, the swing spool and boom spools in the main control valve are moved to the functional position by the pilot oil pressure (XAs, XBs, XAb1, XAb2) from the remote control valve.

The oil from the A1 pump flows into the swing motor through swing spool and the boom cylinder through boom 2 spool.

The oil from the A2 pump flows into the boom cylinders through the boom 1 spool in the P1 housing side of the main control valve. The upper structure swings and the boom is operated.

Refer to page 3-8 for the boom priority system.

### 3. COMBINED SWING AND ARM OPERATION



380A3HC22

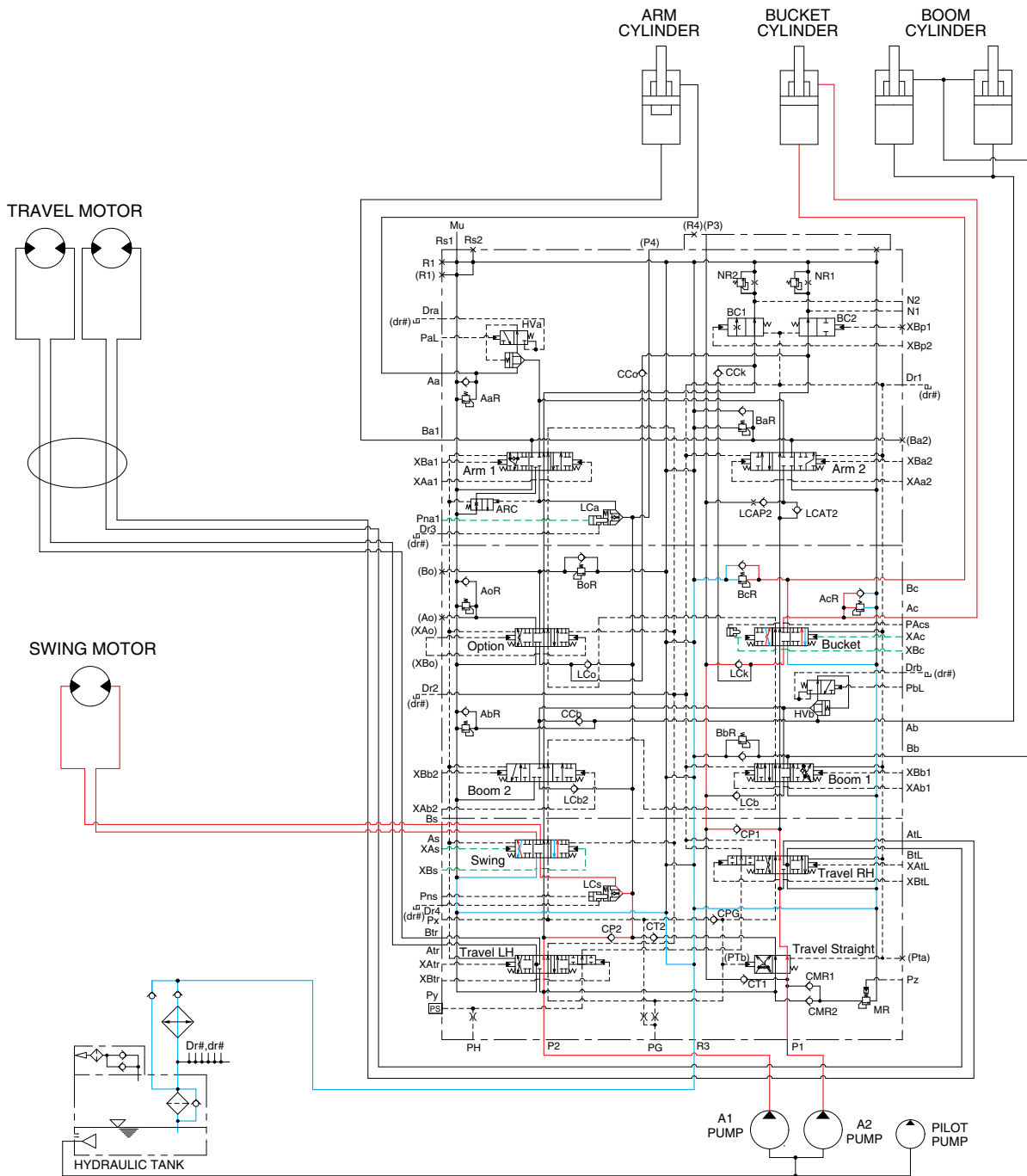
When the swing and arm functions are operated simultaneously, the swing spool and arm spools in the main control valve are moved to the functional position by the pilot oil pressure (XAs, XBs, XAa1, XAa2, XBa1, XBa2) from the remote control valve.

The oil from the A1 pump flows into the swing motor through swing spool and the arm cylinder through arm 1 spool.

The oil from the A2 pump flows into the arm cylinder through the arm 2 spool of the P1 housing side of the main control valve. The upper structure swings and the arm is operated.

Refer to page 2-45 for the swing operation preference function.

#### 4. COMBINED SWING AND BUCKET OPERATION



380A3HC23

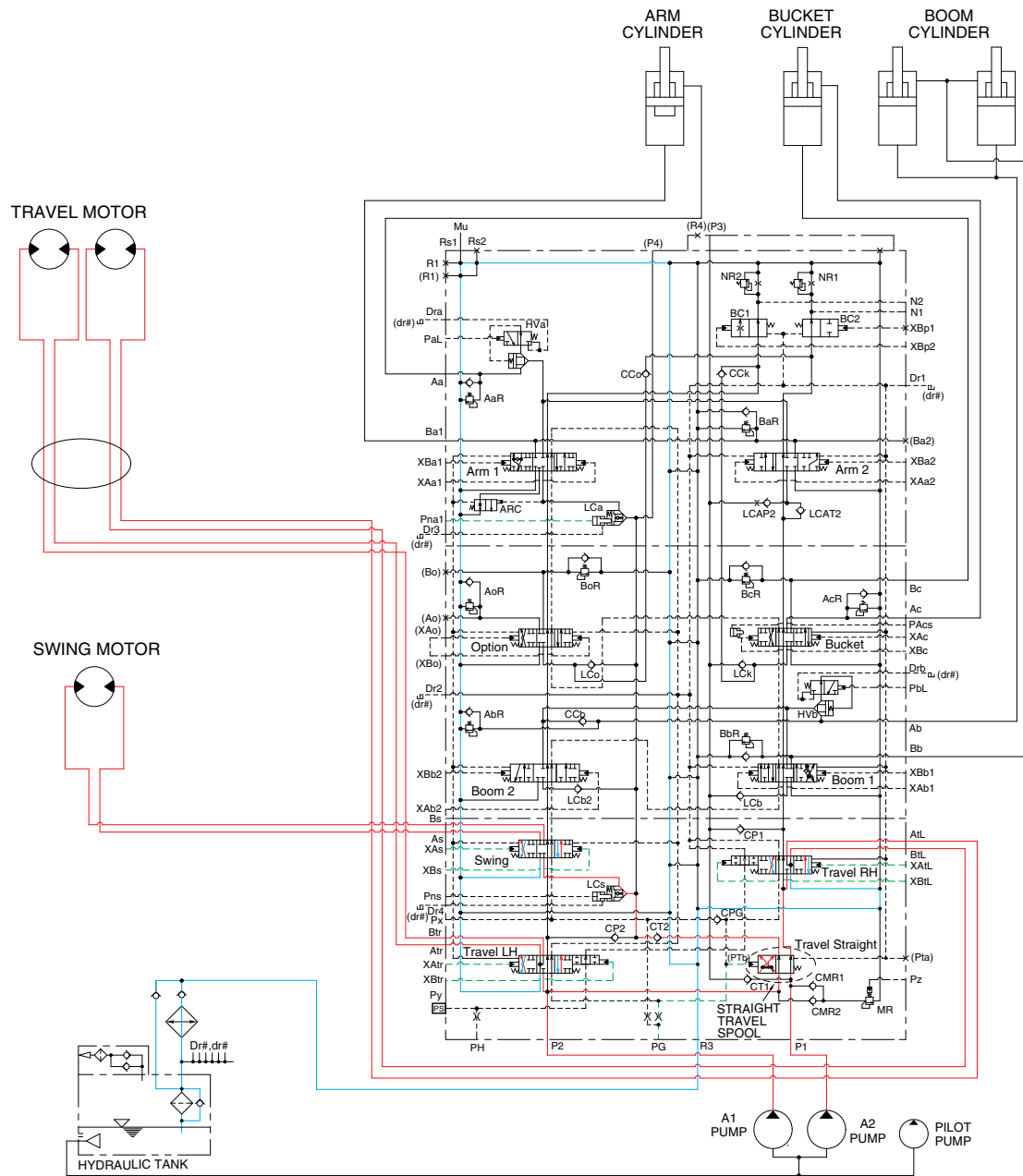
When the swing and bucket functions are operated simultaneously, the swing spool and bucket spool in the main control valve are moved to the functional position by the pilot oil pressure (XAs, XBs, XAc, XBc) from the remote control valve.

The oil from the A1 pump flows into the swing motor through the swing spool in the P2 housing side of the main control valve.

The oil from the A2 pump flows into the bucket cylinder through the bucket spool in the P1 housing side of the main control valve.

The upper structure swings and the bucket is operated.

## 5. COMBINED SWING AND TRAVEL OPERATION



380A3HC24

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 (XAs, XBs, XAtr, XBtr, XAtL, XBtL) from the remote control valve and straight travel spool is pushed to the right by the pilot oil pressure from the pilot pump.

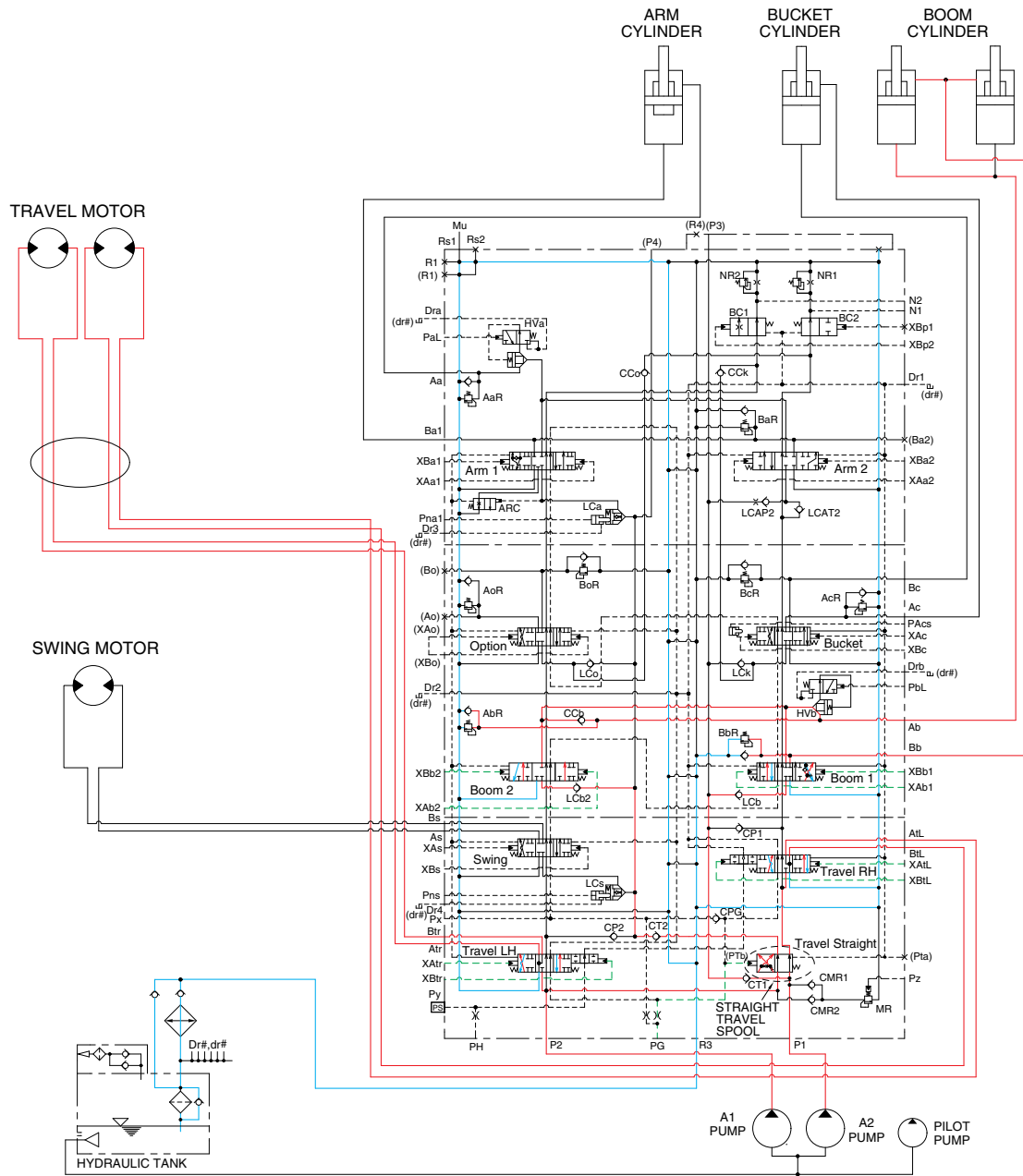
The oil from the A1 pump flows into the travel motors through the RH travel spool of the P2 housing side and the LH travel spool of the P1 housing side via the straight travel spool.

The oil from the A2 pump flows into the swing motor through the swing spool via the straight travel spool.

When the pressure of the travel motors is lower than the pressure of the swing motor, some oil from the A2 pump flows into the travel motors through the check valve and orifice in the straight travel spool. This prevents the rapid slowdown of the travel.

The upper structure swings and the machine travels straight.

## 6. COMBINED BOOM AND TRAVEL OPERATION



380A3HC25

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 (XAs, XBs, XAb1, XAb2, XBb1, XBb2) from the remote control valve and the straight travel spool is pushed to the right by the oil pressure from pilot pump.

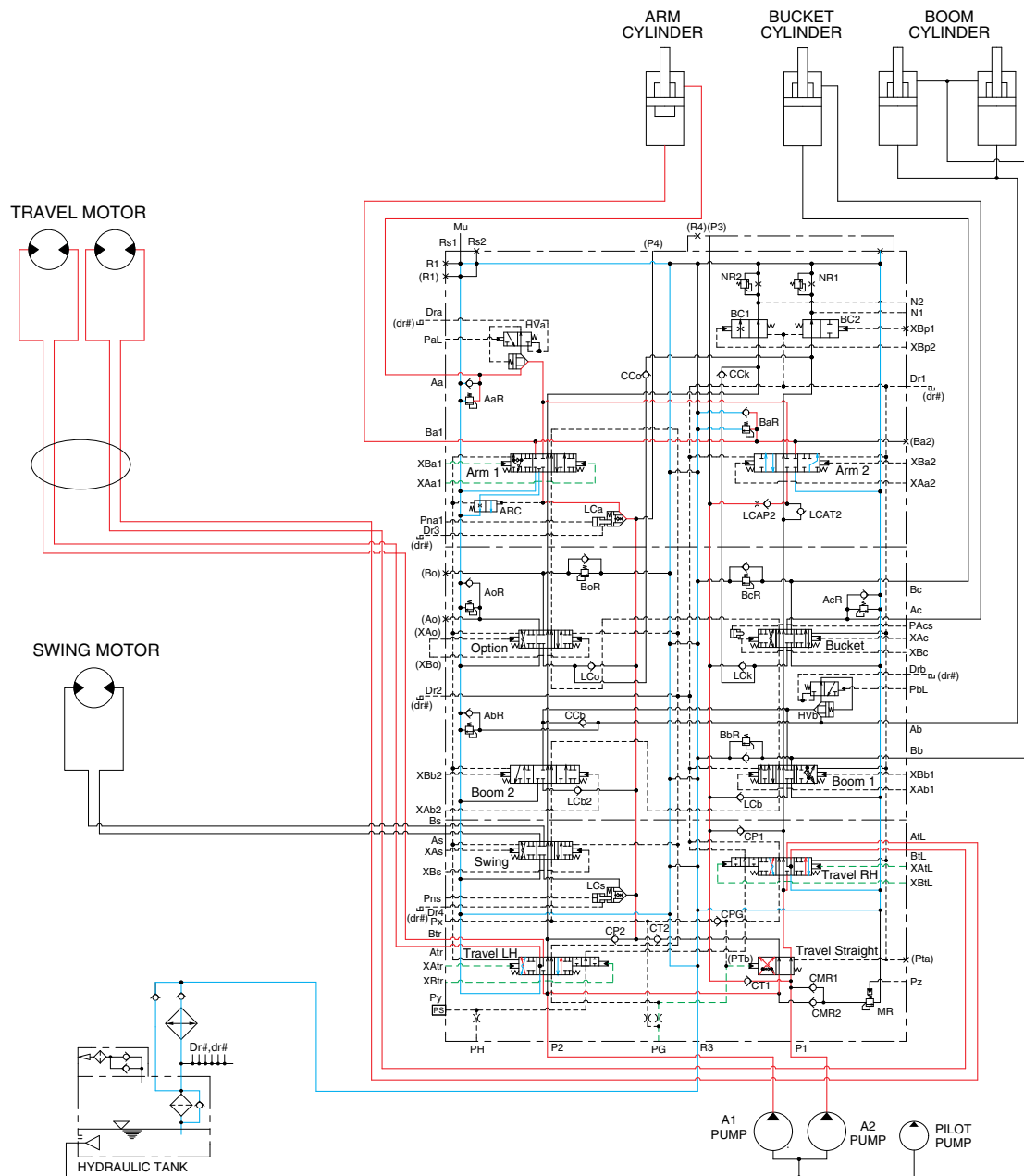
The oil from the A1 pump flows into the travel motors through the RH travel spool of the P2 housing side and the LH travel spool of the P1 housing side via the straight travel spool.

The oil from the A2 pump flows into the boom cylinders through the boom 2 spool and boom 1 spool via the parallel and confluence oil passage in case boom up operation.

When the pressure of the travel motors is lower than the pressure of the boom cylinders, some oil from the A2 pump flows into the travel motors through the check valve and orifice in the straight travel spool. This prevents the rapid slowdown of the travel.

The boom is operated and the machine travels straight.

## 7. COMBINED ARM AND TRAVEL OPERATION



380A3HC26

When the arm and travel functions are operated simultaneously, the arm spools and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (XAs, XBs, XAa1, XAa2, XBa1, XBa2) from the remote control valve and the straight travel spool is pushed to the right by the oil pressure from pilot pump.

The oil from the A1 pump flows into the travel motors through the RH travel spool of the P2 housing side and the LH travel spool of the P1 housing side via the straight travel spool.

The oil from the A2 pump flows into the arm cylinders through the arm 1 spool and arm 2 spool via the parallel and confluence oil passage.

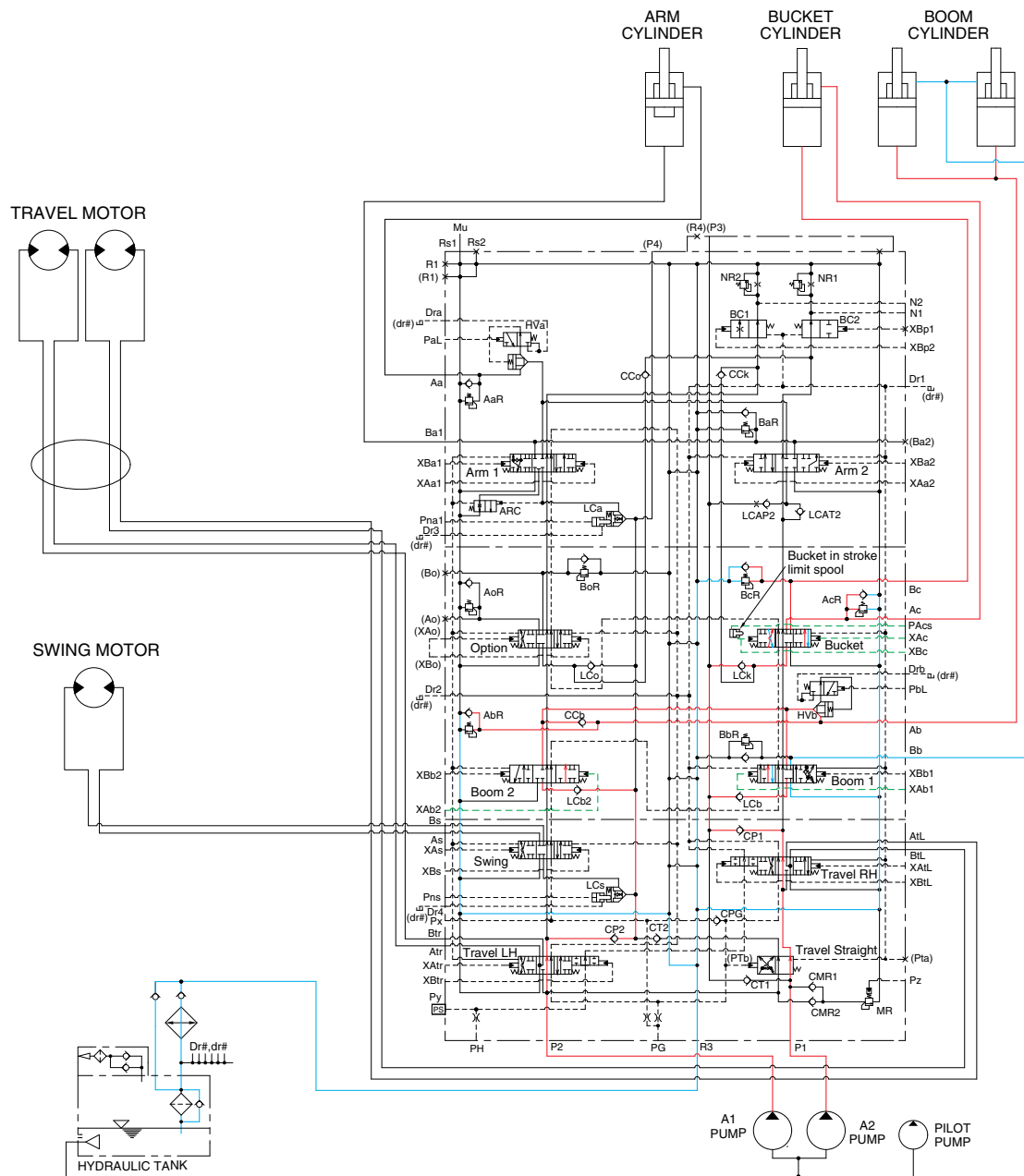
When the pressure of the travel motors is lower than the pressure of the arm cylinder, some oil from the A2 pump flows into the travel motors through the check valve and orifice in the straight travel spool. This prevents the rapid slowdown of the travel.

The arm is operated and the machine travels straight.





## 9. COMBINED BOOM UP AND BUCKET OPERATION



380A3HC28

When the boom up and bucket functions are operated simultaneously, each spool in the main control valve is moved to the functional position by the pilot oil pressure (XAb1, XAb2, XAc, XBc) from the remote control valve.

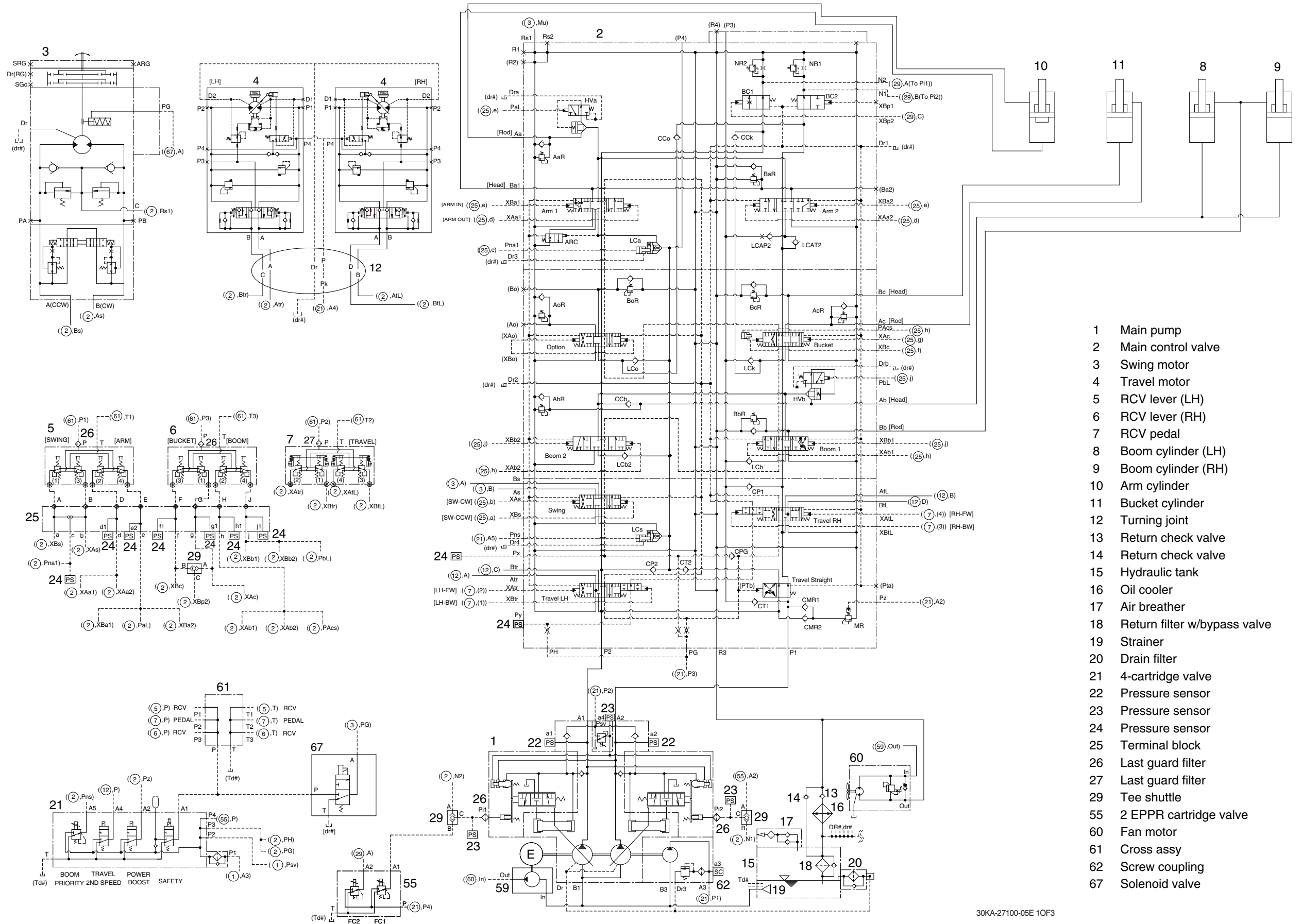
The oil from the A1 pump flows into the boom cylinders through the boom 2 spool in the P2 housing side. The oil from the A2 pump flows into the boom cylinders and bucket cylinder through the boom 1 spool, bucket spool and the parallel and confluence oil passage in the P1 housing side.

Also, when the boom up and bucket in functions are operated simultaneously, the boom up operation preference function is operated by the pilot pressure PAc and then the bucket spool transfers in the half stroke not full stroke (Refer to page 2-42). Therefore, the most of pressurized oil flows into boom 1 spool than the bucket spool to make the boom up operation more preferential.

The boom and bucket are operated.

# GROUP 1 HYDRAULIC CIRCUIT (MACHINE SERIAL NO. : -#0287)

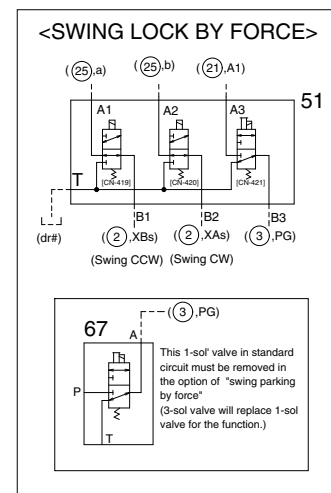
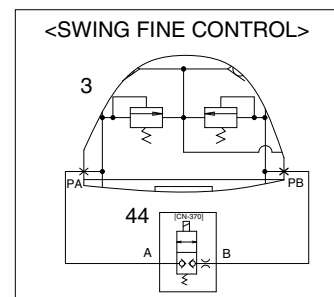
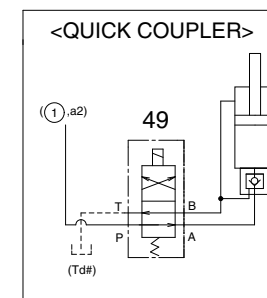
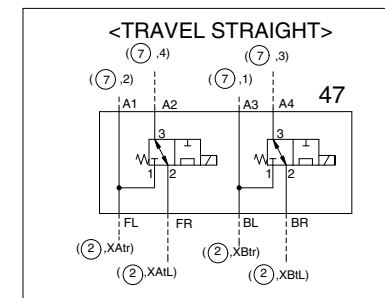
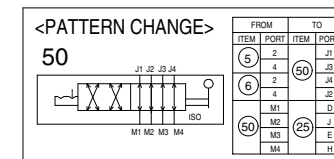
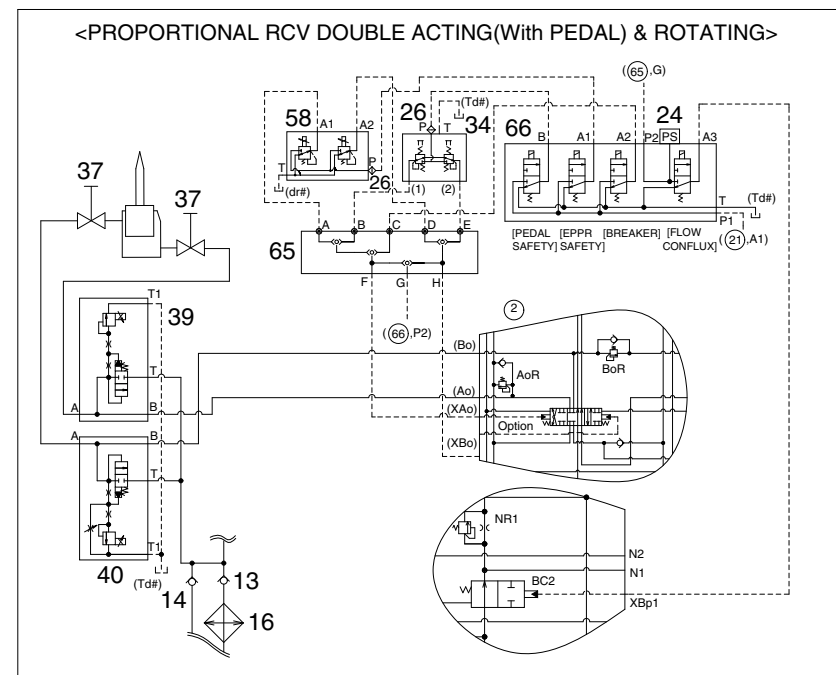
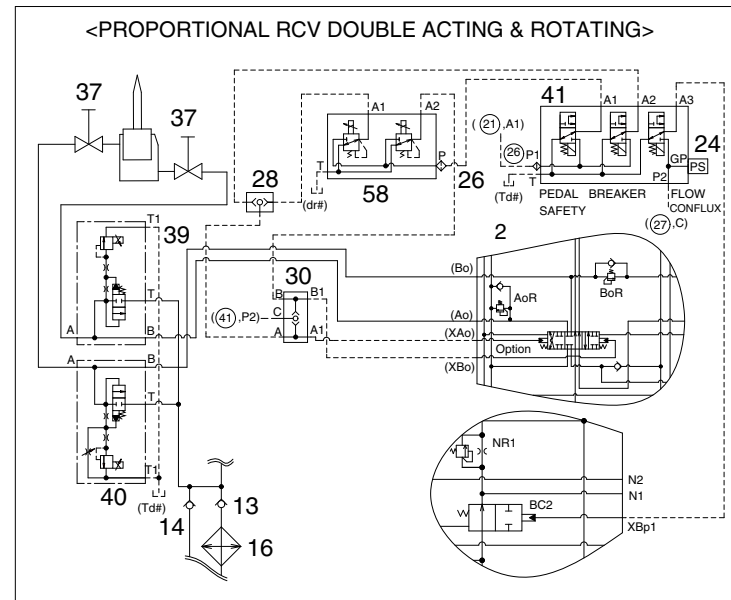
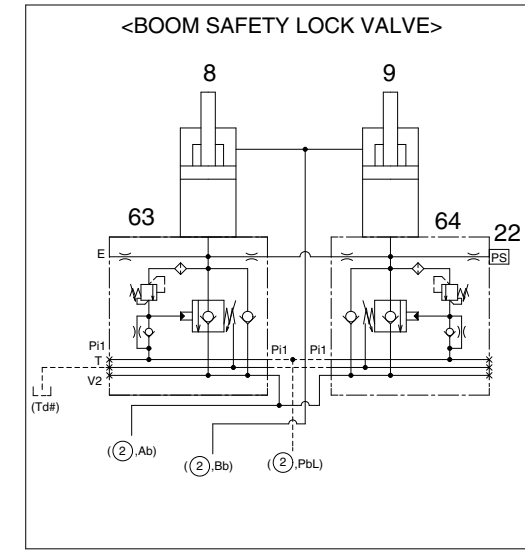
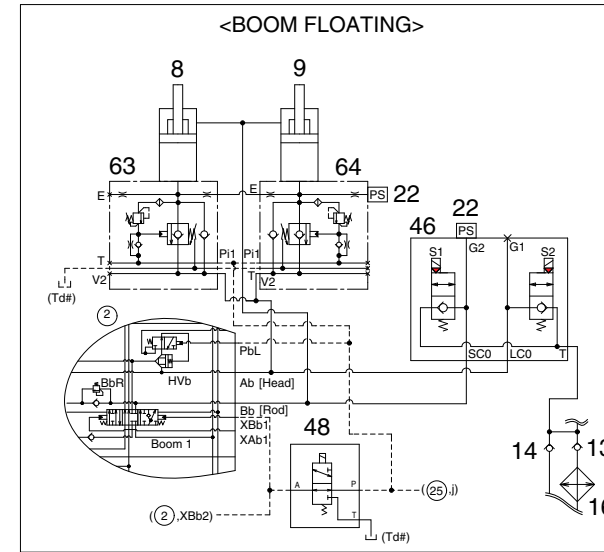
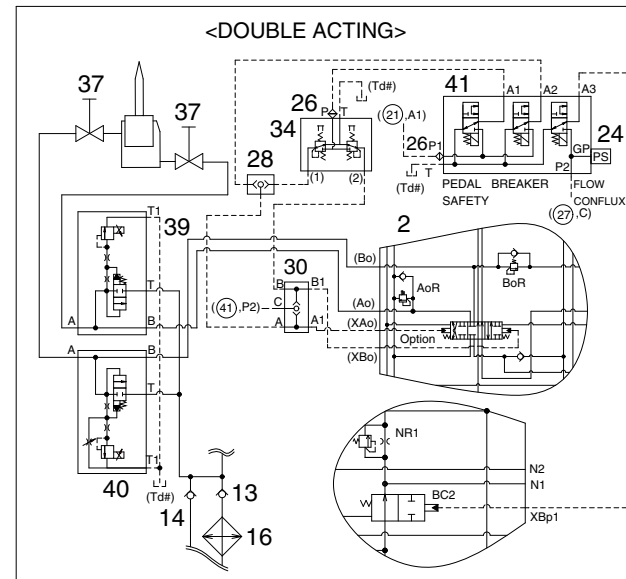
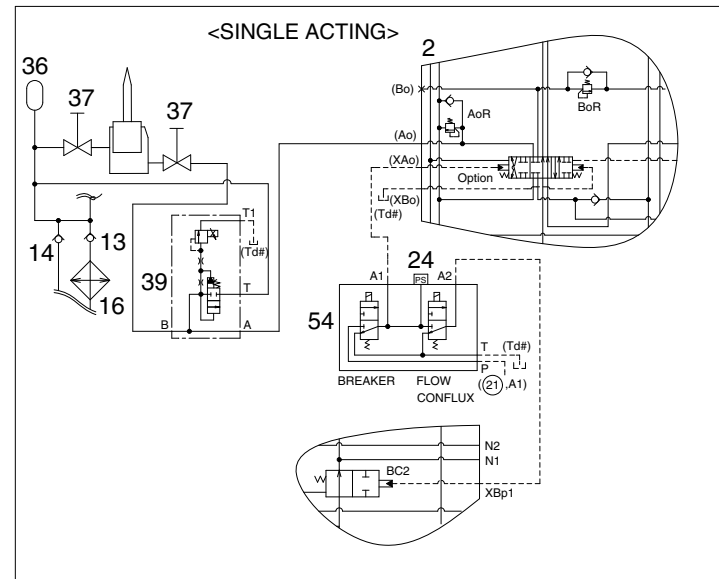
## 1. HYDRAULIC CIRCUIT (1/3)



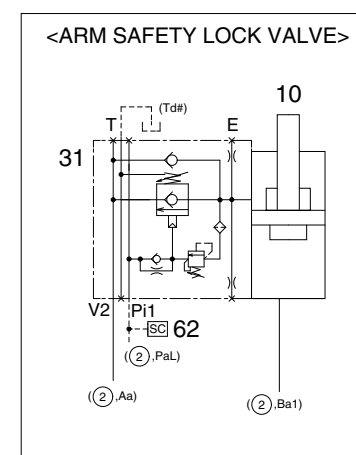
- 1 Main pump
- 2 Main control valve
- 3 Swing motor
- 4 Travel motor
- 5 RCV lever (LH)
- 6 RCV lever (RH)
- 7 RCV pedal
- 8 Boom cylinder (LH)
- 9 Boom cylinder (RH)
- 10 Arm cylinder
- 11 Bucket cylinder
- 12 Turning joint
- 13 Return check valve
- 14 Return check valve
- 15 Hydraulic tank
- 16 Oil cooler
- 17 Air breather
- 18 Return filter w/bypass valve
- 19 Strainer
- 20 Drain filter
- 21 4-cartridge valve
- 22 Pressure sensor
- 23 Pressure sensor
- 24 Pressure sensor
- 25 Terminal block
- 26 Last guard filter
- 27 Last guard filter
- 29 Tee shuttle
- 55 2 EPPR cartridge valve
- 60 Fan motor
- 61 Cross assy
- 62 Screw coupling
- 67 Solenoid valve

30KA-27100-05E 10F3

## 2. HYDRAULIC CIRCUIT (2/3)

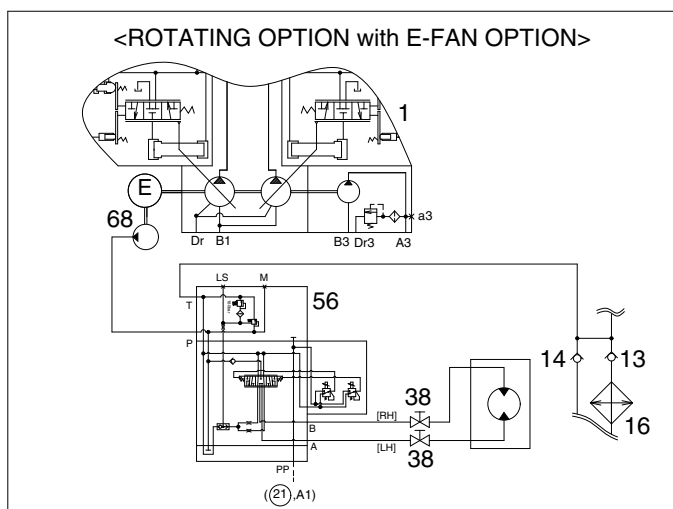
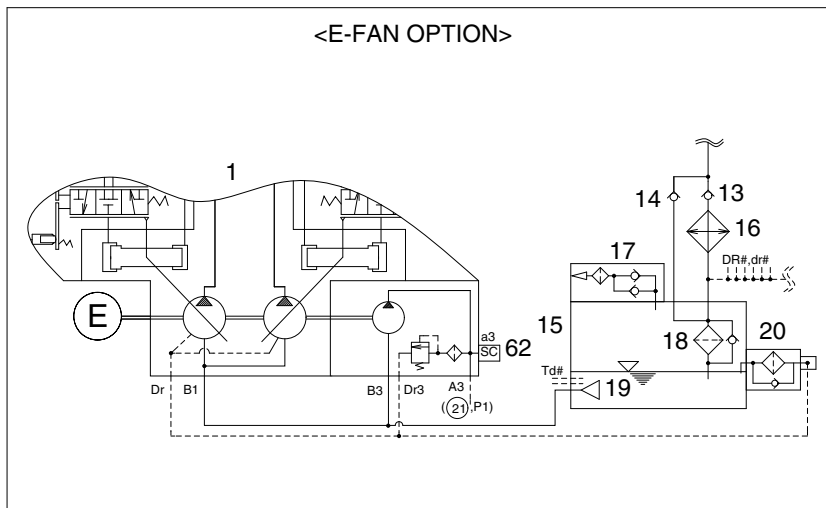
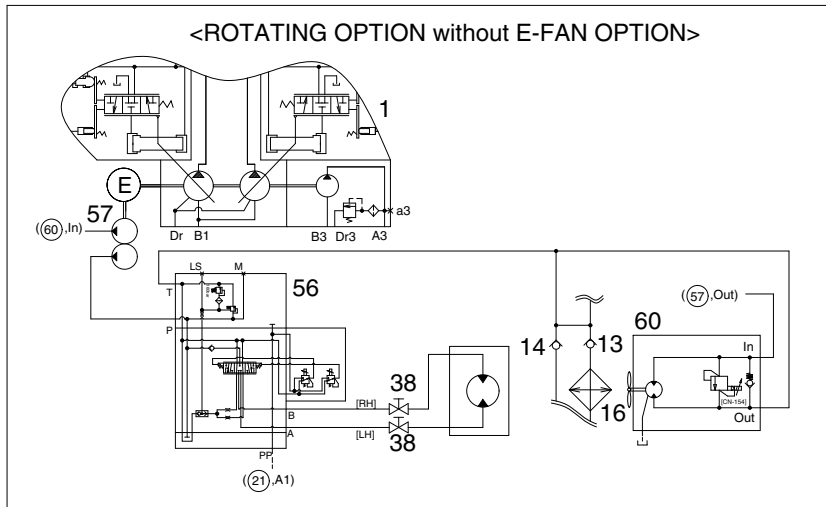


<RCV OPT>			
ITEM	OPT(1)	OPT(2)	PART NO.
5	ERR00	EJA01	31K9-21011/21
		EJA21	31K9-21410/20
		EJA01	31K9-21131/41
		EJA21	31K9-21430/40



- 2 Main control valve
- 3 Swing motor
- 8 Boom cylinder (LH)
- 9 Boom cylinder (RH)
- 10 Arm cylinder
- 13 Return check valve
- 14 Return check valve
- 16 Oil cooler
- 22 Pressure sensor
- 24 Pressure sensor
- 28 Tee shuttle (option)
- 30 5-shuttle valve (option)
- 31 Arm safety valve (option)
- 34 2-way pedal (option)
- 37 Stop valve (option)
- 39 Proportional relief valve (option)
- 40 Proportional relief valve (option)
- 41 3-solenoid cartridge valve (option)
- 44 Solenoid valve (option)
- 46 Floating cartridge valve (option)
- 47 Solenoid valve (option)
- 48 Solenoid valve (option)
- 49 Solenoid valve (option)
- 50 Pattern change valve (option)
- 51 Solenoid valve (option)
- 54 Solenoid valve (option)
- 58 2-EPPR valve (option)
- 62 Screw coupling (option)
- 63 Boom safety valve (option)
- 64 Boom safety valve (option)
- 65 Shuttle block (option)
- 66 Solenoid valve (option)

### 3. HYDRAULIC CIRCUIT (3/3)

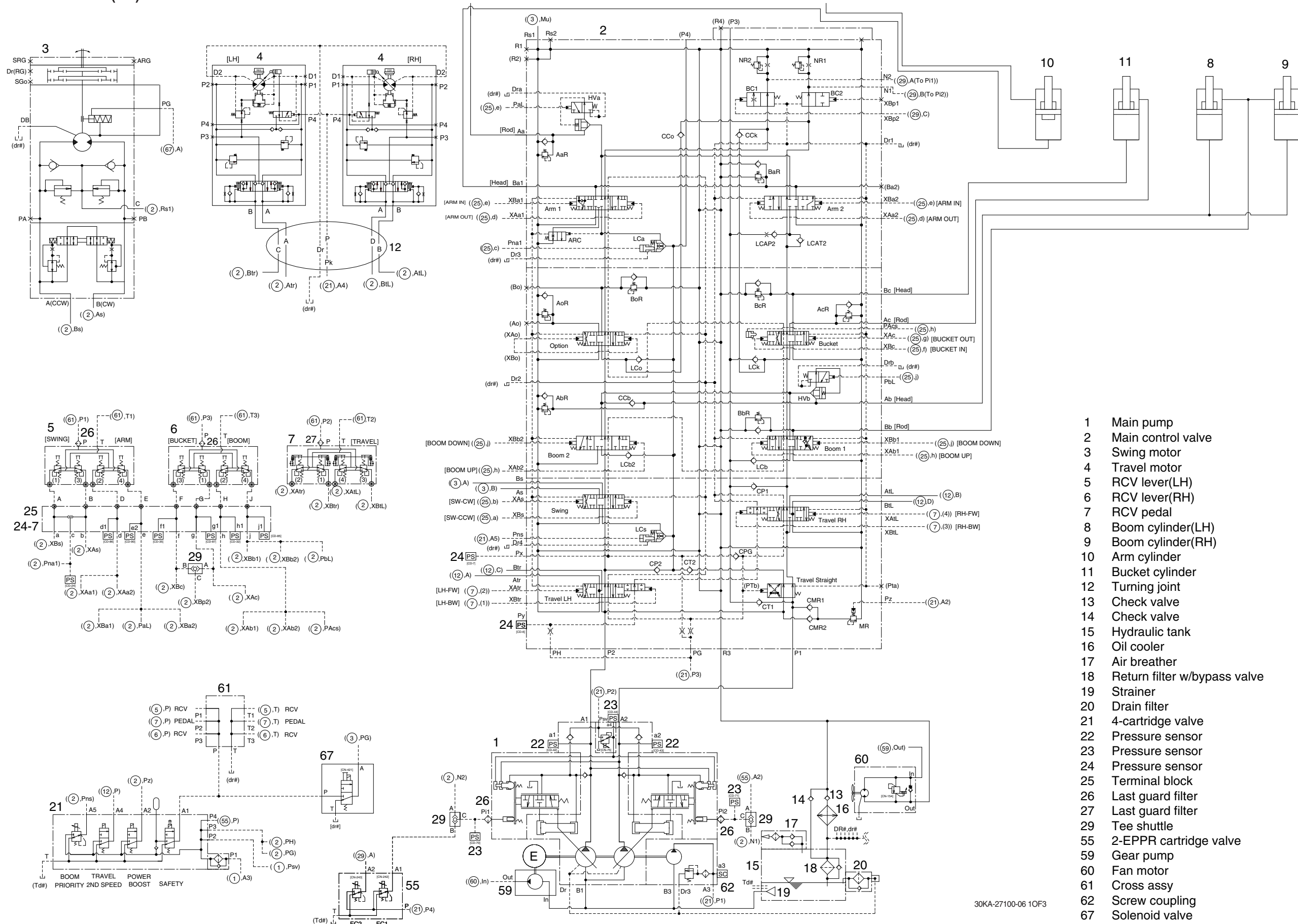


- 1 Main pump
- 13 Return check valve
- 14 Return check valve
- 15 Hydraulic tank
- 16 Oil cooler
- 17 Air breather
- 18 Return filter w/bypass valve
- 19 Strainer
- 20 Drain filter
- 38 Stop valve (option)
- 56 Proportional control valve (option)
- 57 Gear pump (option)
- 60 Fan (option)
- 62 Screw coupling (option)
- 68 Gear pump (option)

30KA-27100-05E 3OF3

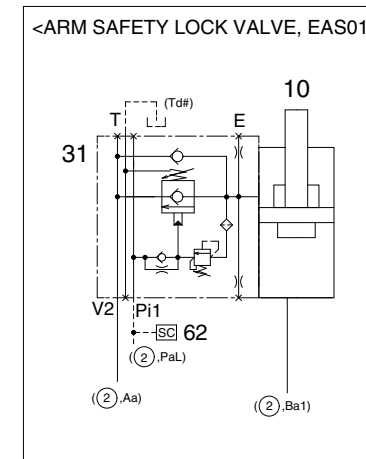
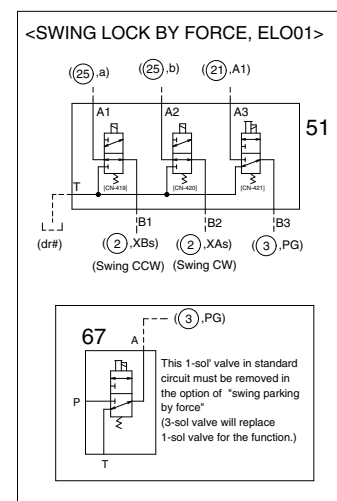
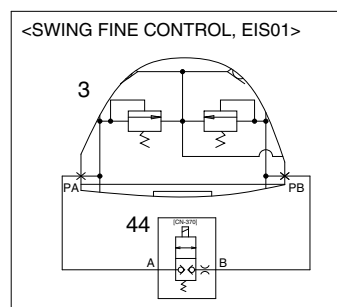
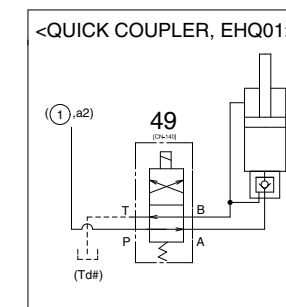
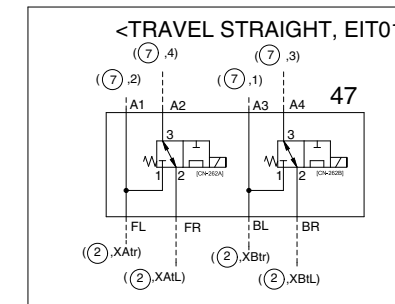
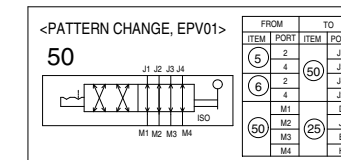
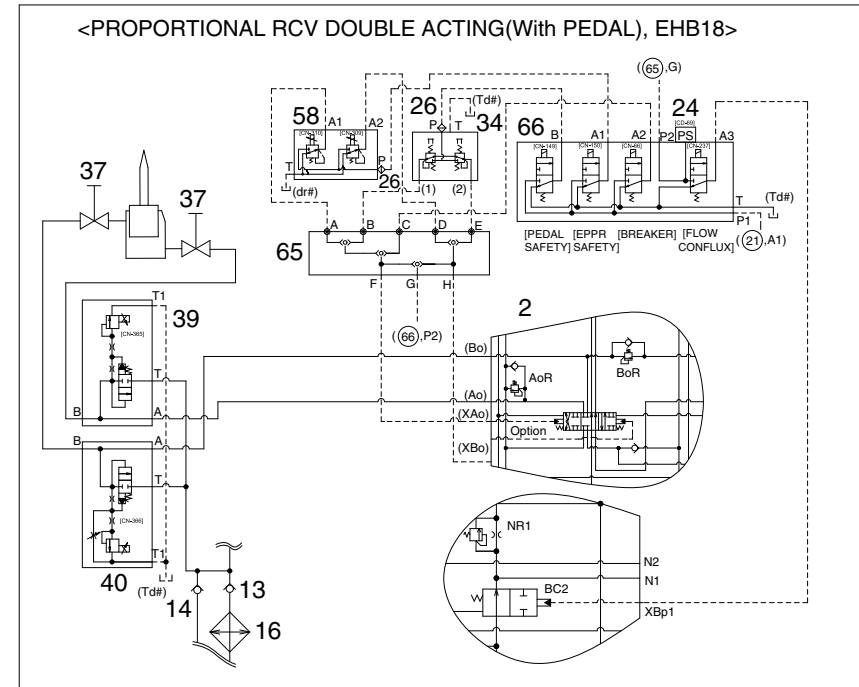
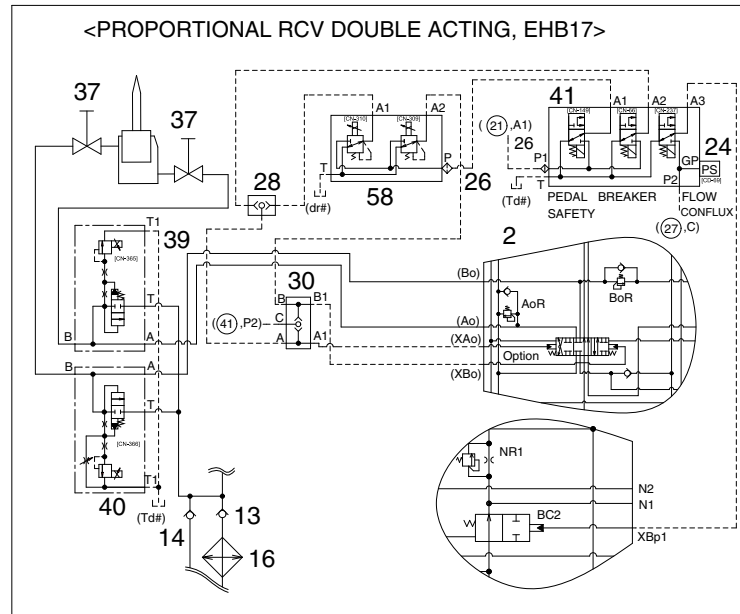
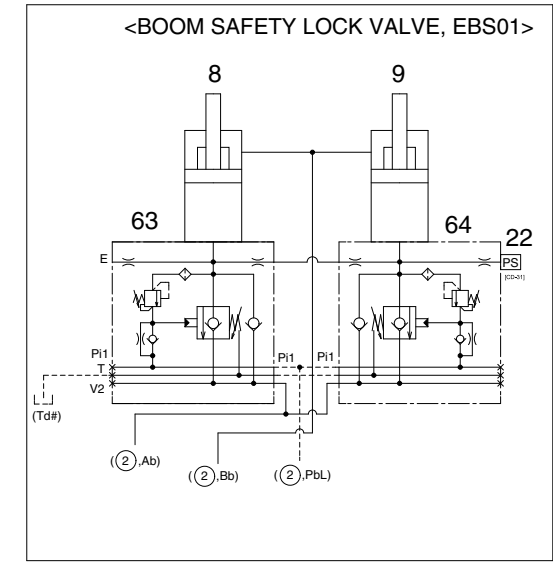
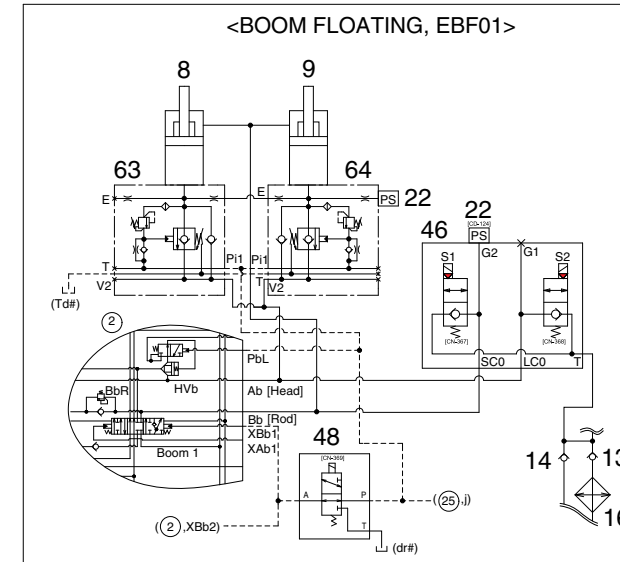
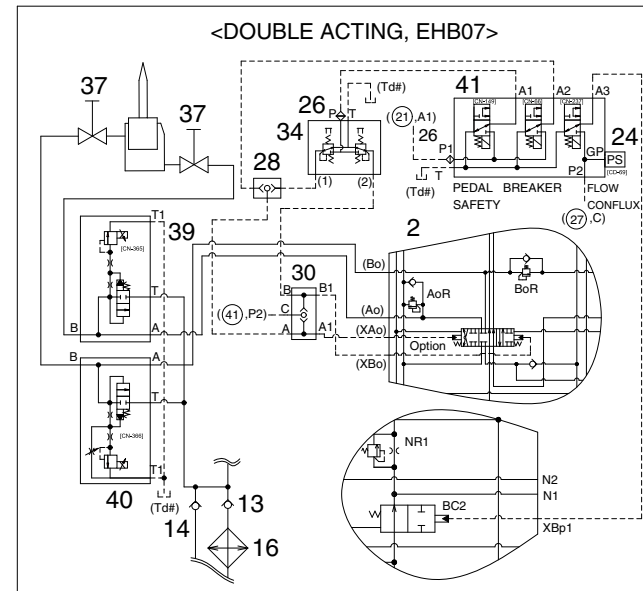
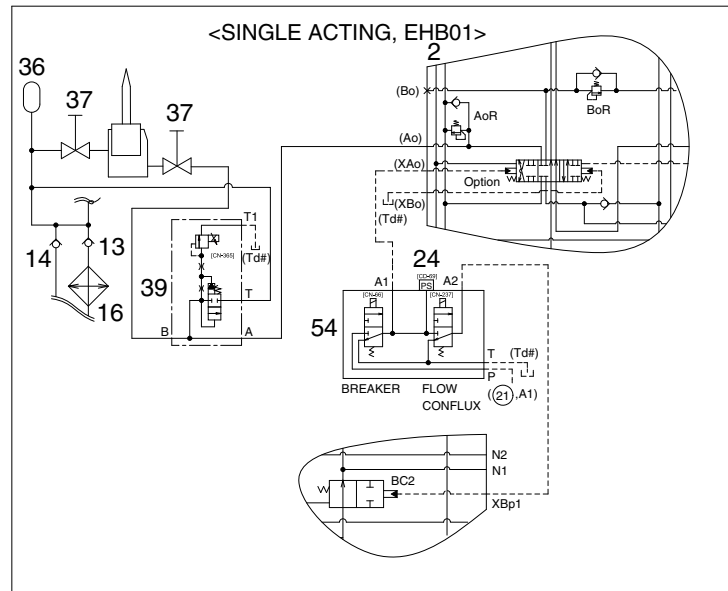
# GROUP 1 HYDRAULIC CIRCUIT (MACHINE SERIAL NO. : #0288-)

## 1. HYDRAULIC CIRCUIT (1/3)



30KA-27100-06 10F3

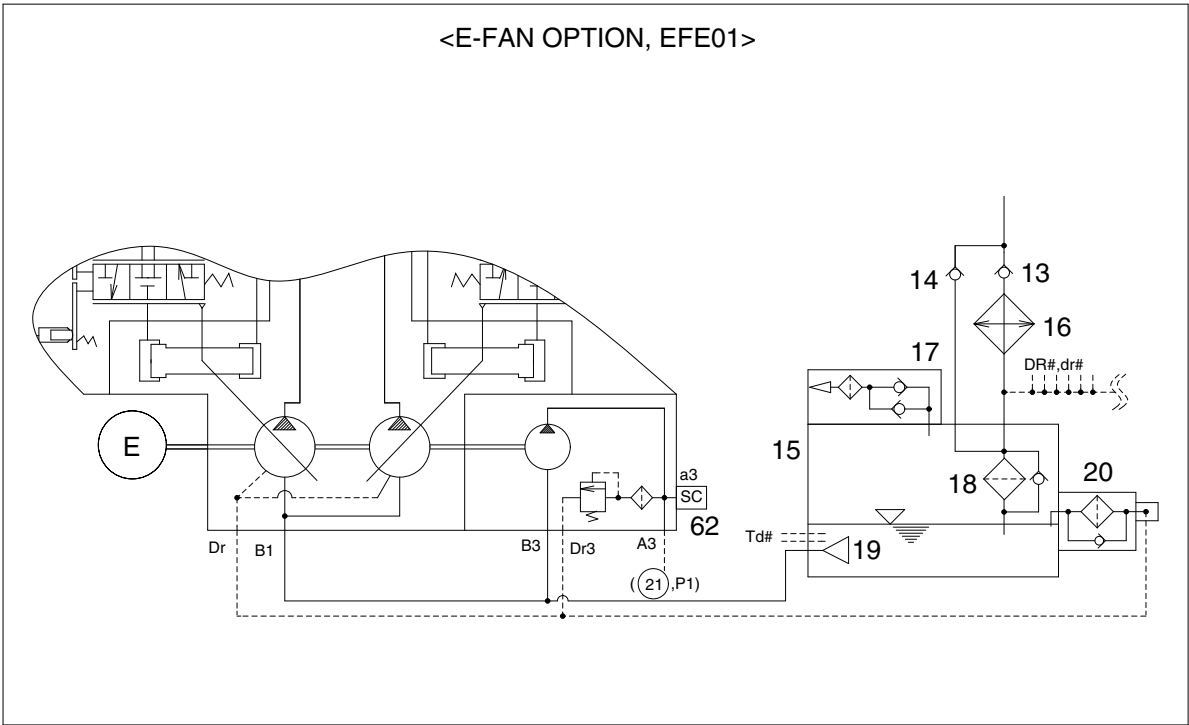
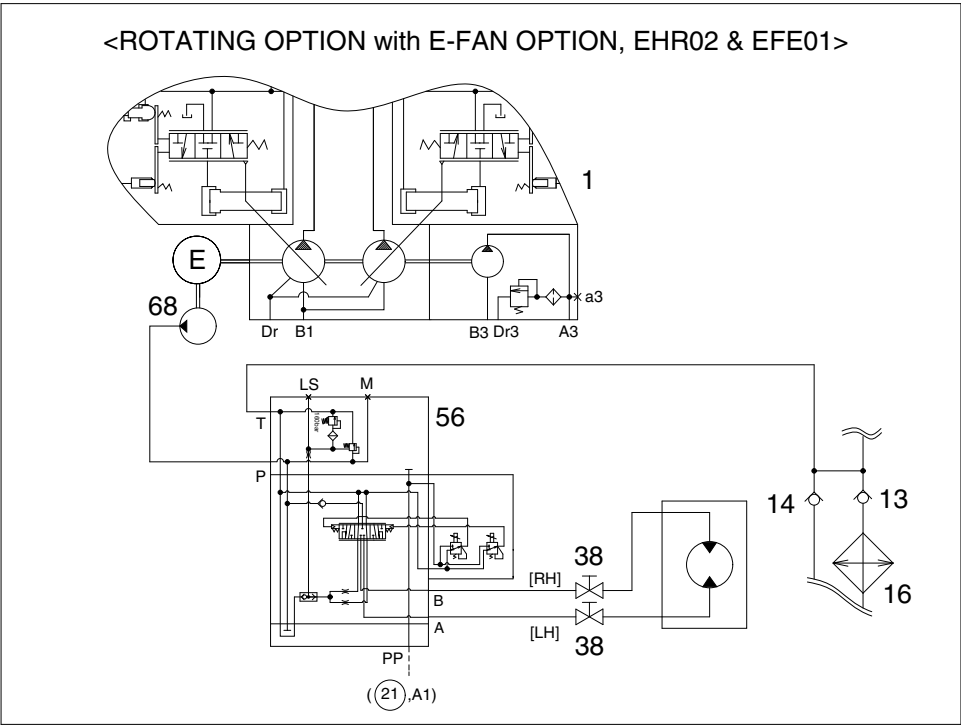
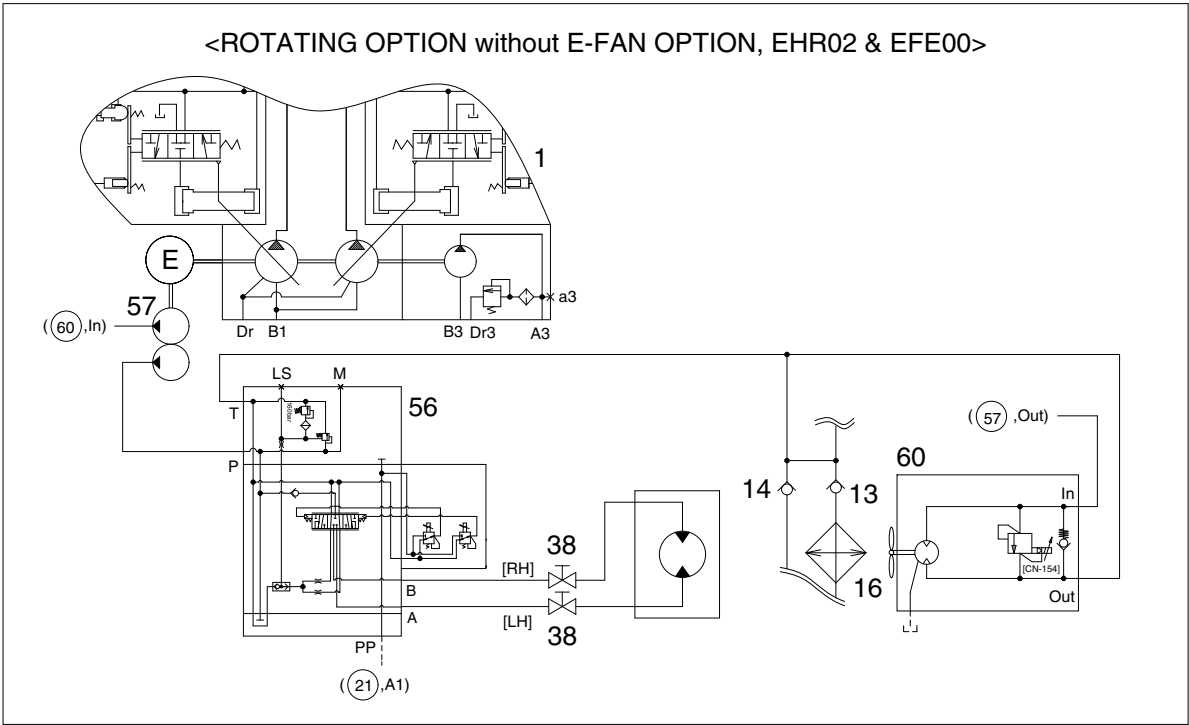
## 2. HYDRAULIC CIRCUIT (2/3)



30KA-27100-06 20F3

- 1 Main pump
- 2 Main control valve
- 3 Swing motor
- 5 RCV lever(LH, option)
- 6 RCV lever(RH, option)
- 8 Boom cylinder(LH)
- 9 Boom cylinder(RH)
- 10 Arm cylinder
- 13 Check valve
- 14 Check valve
- 16 Oil cooler
- 22 Pressure sensor
- 24 Pressure sensor
- 26 Last guard filter
- 28 Tee shuttle(option)
- 30 5-shuttle assy(option)
- 31 Arm safety valve(option)
- 34 2 way pedal(option)
- 36 Accumulator(option)
- 37 Stop valve(option)
- 39 Proportional relief valve(option)
- 40 Proportional relief valve(option)
- 41 3 solenoid cartridge valve(option)
- 44 Solenoid valve(option)
- 46 Float cartridge valve(option)
- 47 Solenoid valve(option)
- 48 Solenoid valve(option)
- 49 Solenoid valve(option)
- 50 Pattern change valve(option)
- 51 Solenoid valve(option)
- 54 Solenoid valve(option)
- 56 Proportional valve(option)
- 57 Gear pump(option)
- 58 2-EPPR valve(option)
- 63 Boom safety valve(LH, option)
- 64 Boom safety valve(RH, option)
- 65 Shuttle block(option)
- 66 Solenoid valve(option)
- 67 Solenoid valve

3. HYDRAULIC CIRCUIT (3/3)



- 1 Main pump
- 13 Return check valve
- 14 Check valve
- 15 Hydraulic tank
- 16 Oil cooler
- 17 Air breather
- 18 Return filter w/bypass valve
- 19 Strainer
- 20 Drain filter
- 38 Stop valve(option)
- 56 Prooortional valve(option)
- 57 Gear pump(option)
- 68 Gear pump(option)

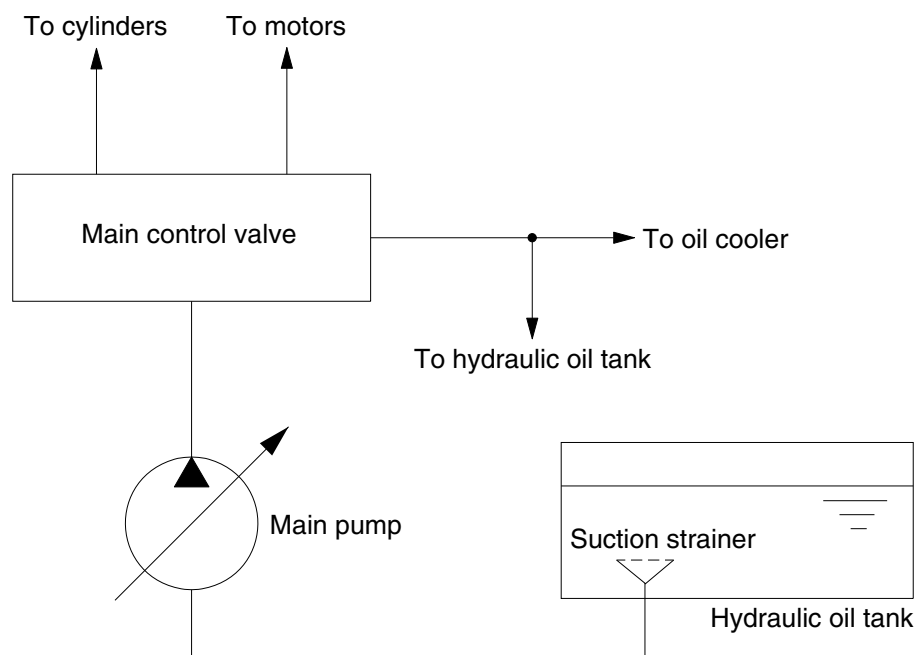


## GROUP 2 MAIN CIRCUIT (CURRENT VERSION)

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 tandem 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

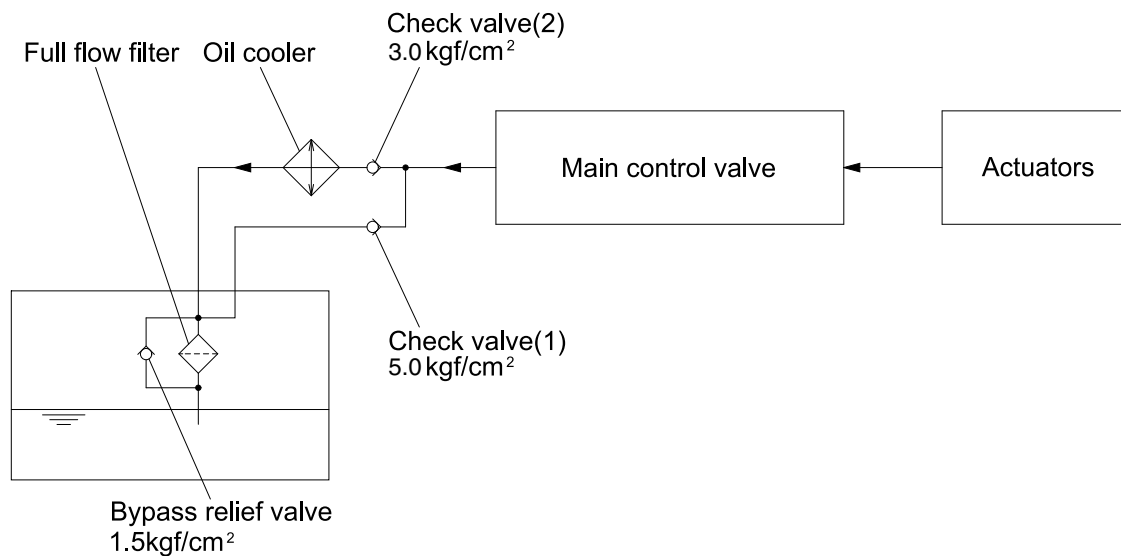
The pumps receive oil from the hydraulic tank through a suction strainer. The discharged oil from the pump flows into the control valve and goes out the tank ports.

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

The control valve controls the hydraulic functions.

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

## 2. RETURN CIRCUIT



380A3CI02

All oil 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  $3.0 \text{ kgf/cm}^2$  (43 psi) and  $5.0 \text{ kgf/cm}^2$  (71 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. The oil pressure exceeds  $5.0 \text{ kgf/cm}^2$  (71 psi), the oil returns directly to the hydraulic tank, resulting in the oil temperature being raised quickly at an appropriate level.

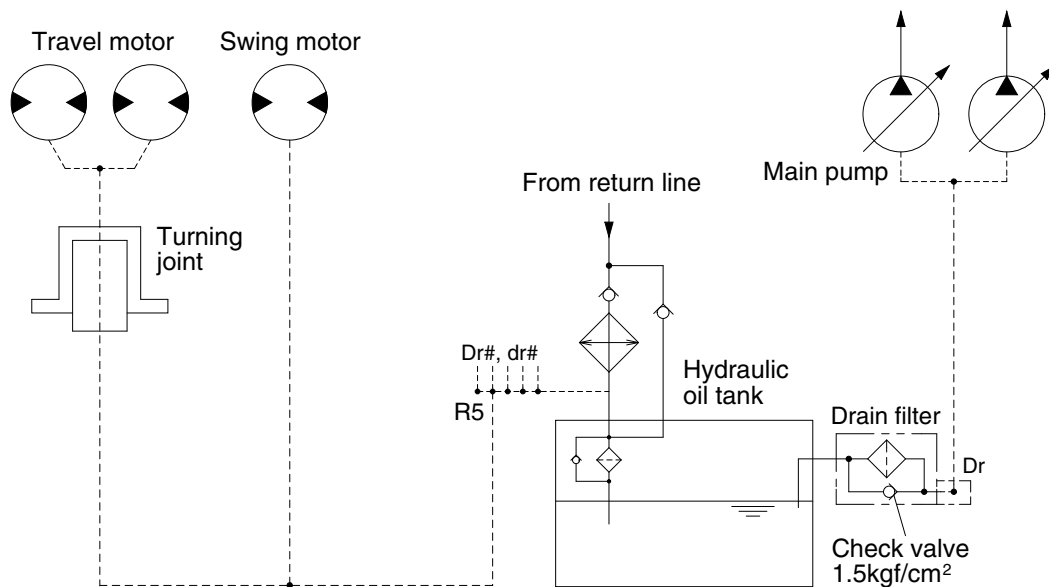
When the oil cooler is clogged, the oil returns directly to the hydraulic tank through bypass check valve (1).

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

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

When the filter element is clogged, the bypass relief valve opens at  $1.5 \text{ kgf/cm}^2$  (21 psi) differential pressure.

### 3. DRAIN CIRCUIT



380A3CI03

Besides internal leaks from the motors and main pump, the oil for lubrication circulates. These oil have to be fed to the hydraulic tank passing through drain filter and full flow filter in the hydraulic tank. When the drain oil pressure exceed  $1.5 \text{ kgf/cm}^2$  (21 psi), the oil returns to the hydraulic tank directly.

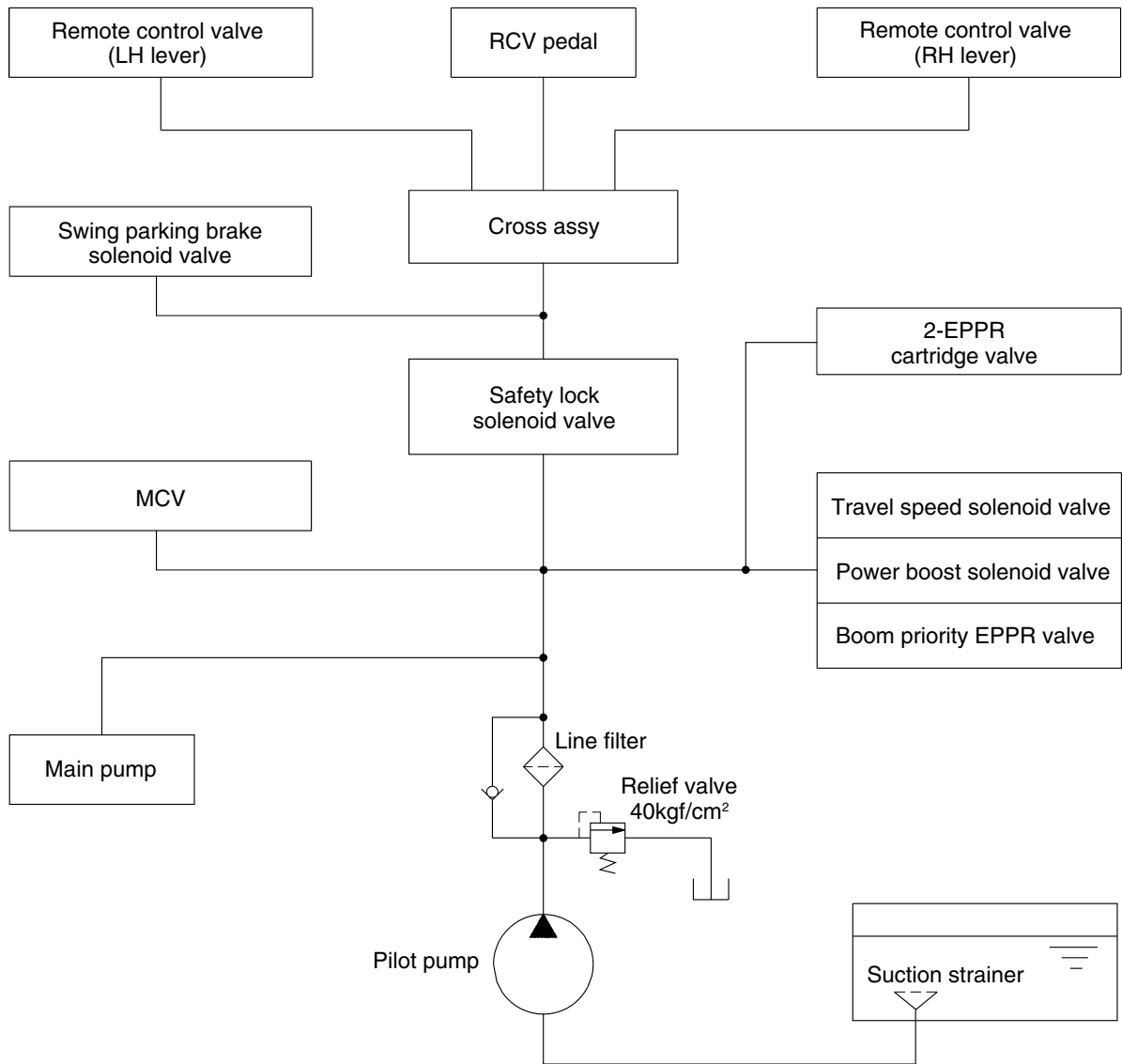
#### 1) TRAVEL MOTOR AND SWING MOTOR DRAIN CIRCUIT

Oil leaking 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 join with oil leak line of the swing motor and return to the hydraulic tank after being filtered by return filter.

#### 2) MAIN PUMP DRAIN CIRCUIT

Oil leaking from main pump come out and return to the hydraulic tank passing through drain filter.

## GROUP 3 PILOT CIRCUIT (CURRENT VERSION)



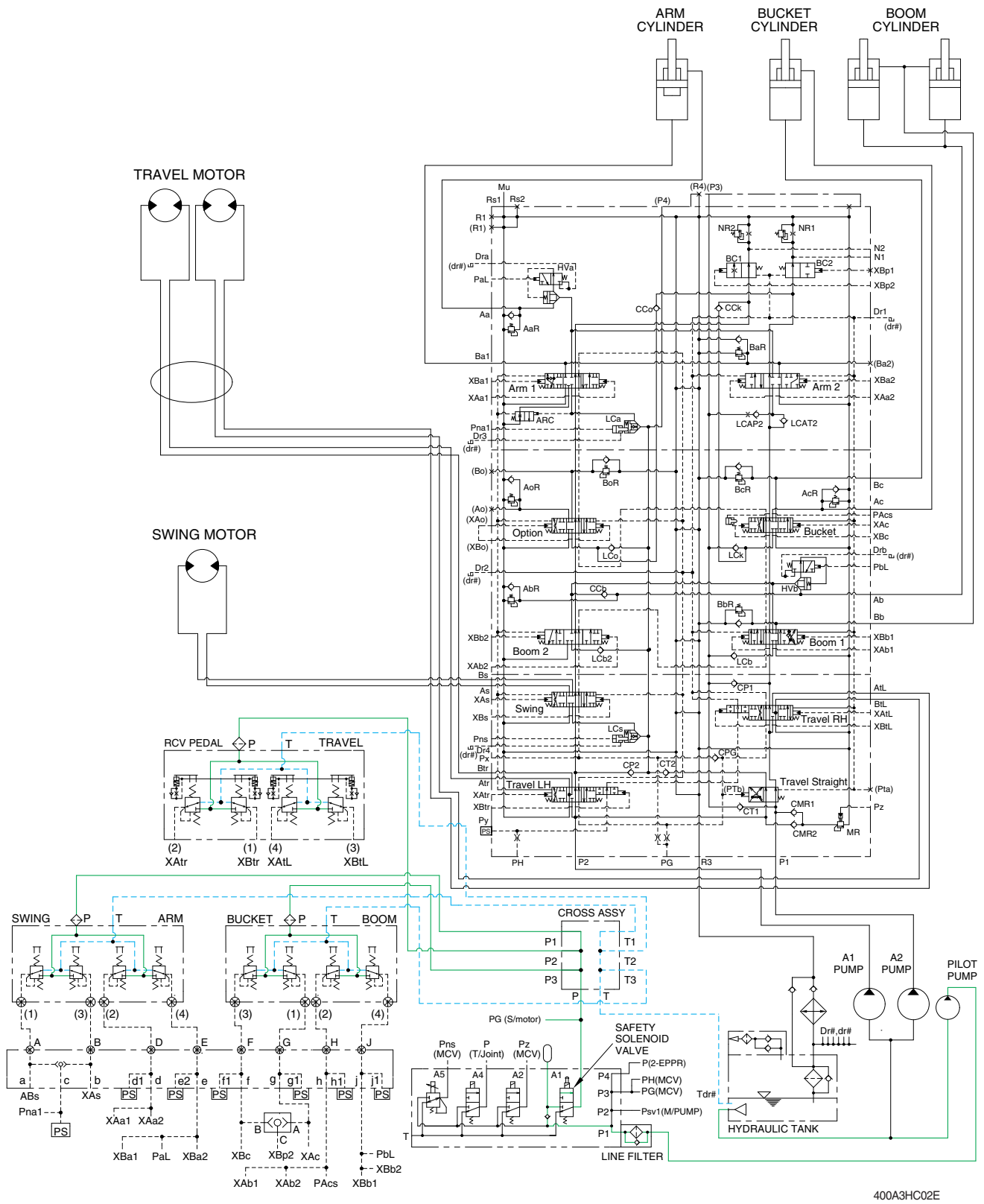
400A3CI01E

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 strainer.

The discharged oil from the pilot pump flows to swing parking solenoid valve the remote control valve through line filter, EPPR valve, solenoid valve assemblies, 2-EPPR cartridge valve, main control valve and safety lock solenoid valve.

# 1. SUCTION, DELIVERY AND RETURN CIRCUIT

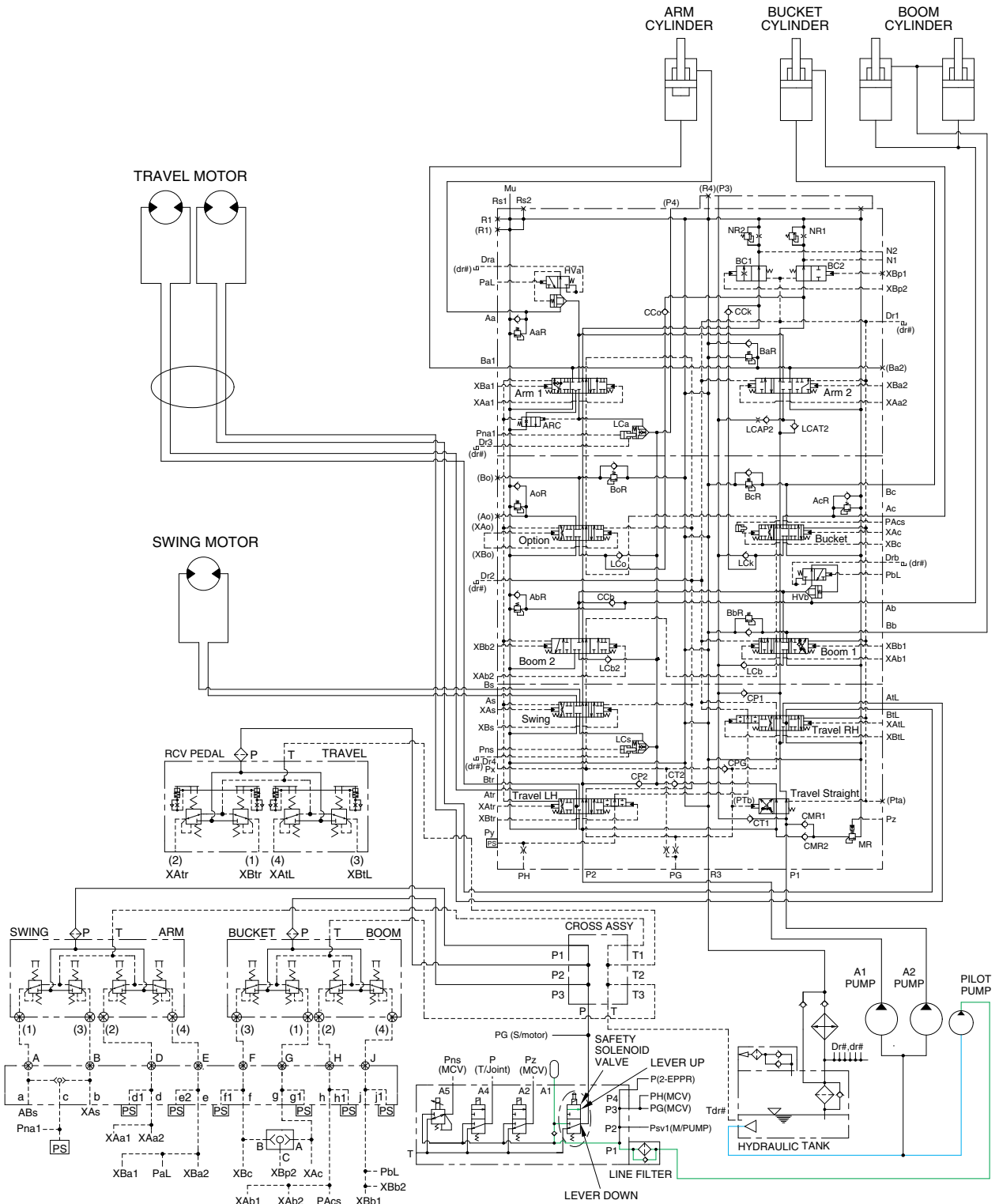


The pilot pump receive oil from the hydraulic tank. The discharged oil from the pilot pump flows to the safety solenoid valve through the line filter. The oil is filtered by the line filter. The pilot relief valve is provided in the pilot pump for limiting the pilot circuit pressure.

The oil filtered by line filter flows remote control valve through safety solenoid valve and cross assy. Also, it flows into the swing parking solenoid valve.

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

## 2. SAFETY SOLENOID VALVE (SAFETY KNOB)

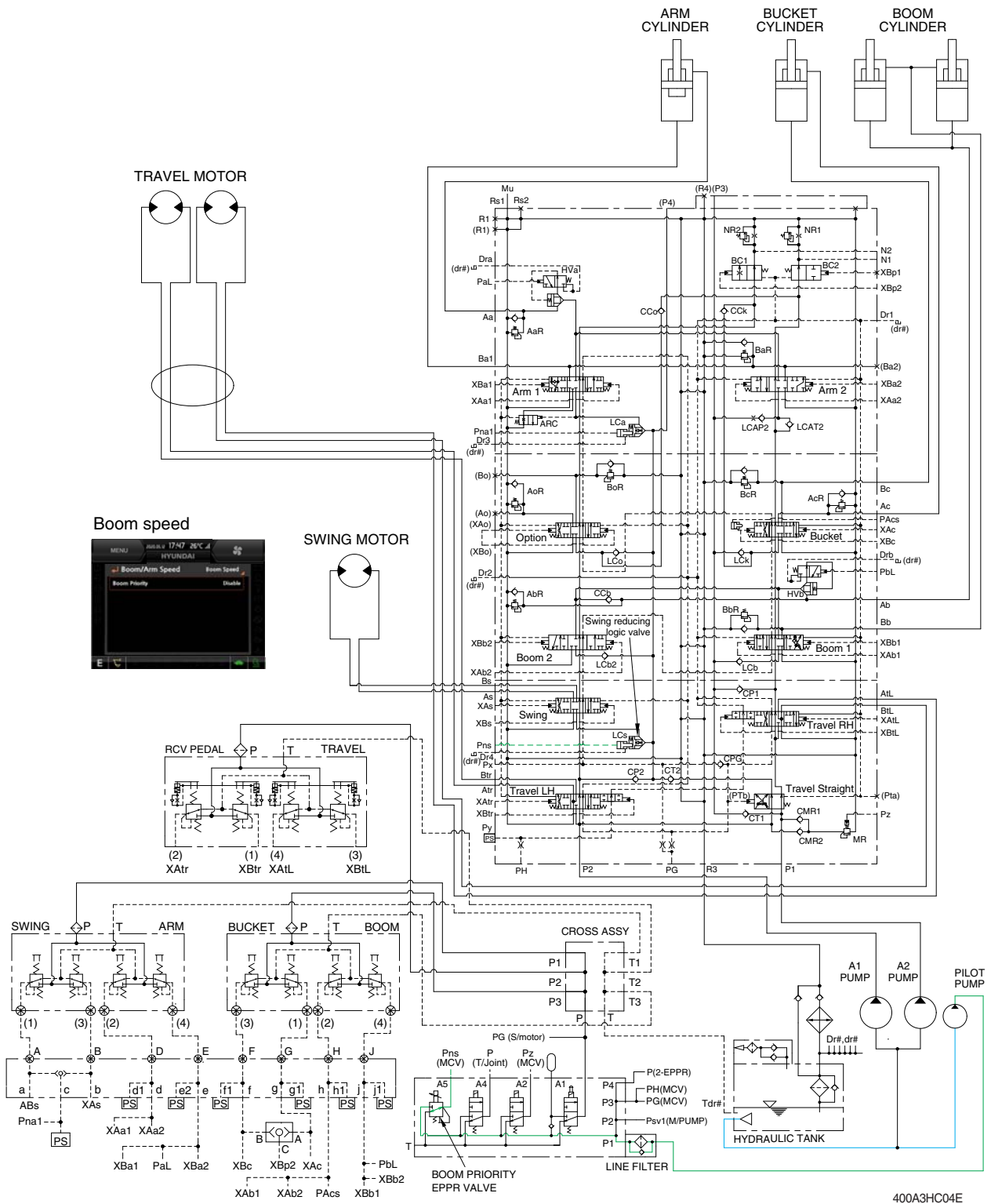


400A3HC03E

When the knob of the safety solenoid valve is moved in the release position, oil flows into the remote control valve through the line filter, safety solenoid valve and cross assy.

When the knob of the safety solenoid valve moved in the lock position, oil does not flows into the remote control valve, because of blocked by the spool.

### 3. BOOM PRIORITY SYSTEM



When carrying out the combined operation of swing and boom up, the boom up operating speed is lowered then normal operation.

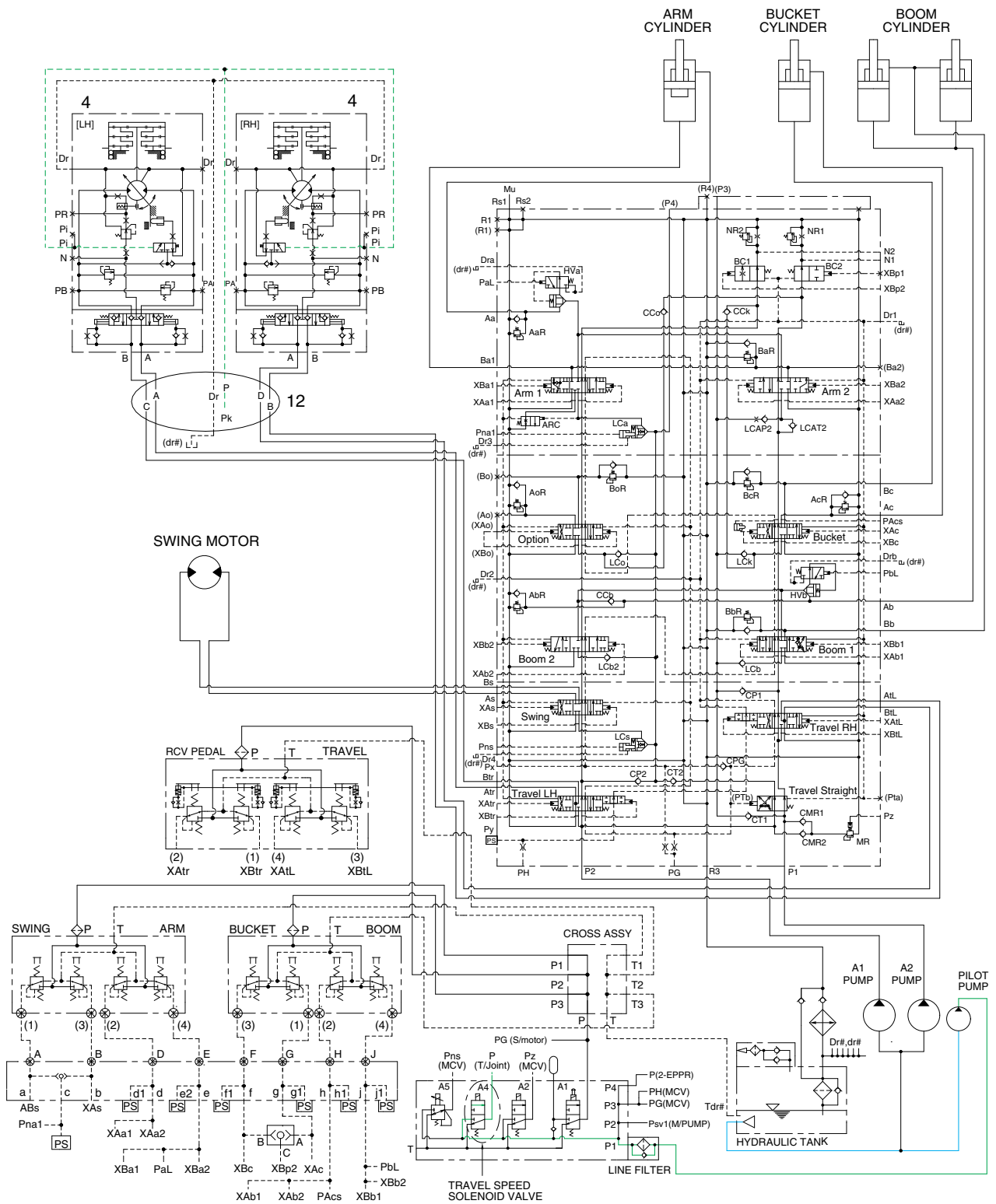
To increase working efficiency, swing speed reducing system is used.

The pilot oil from pilot pump flow into **Pns** port in main control valve through boom EPPR valve. **Pns** oil pressure moves swing reducing logic valve to upper position and oil flow rate to the swing motor decreased.

Then, the boom up speed is increased. This is called the boom priority system.

The boom up speed can be adjusted by the cluster. Refer to page 3-21 of the operator's manual.

## 4. TRAVEL SPEED CONTROL SYSTEM



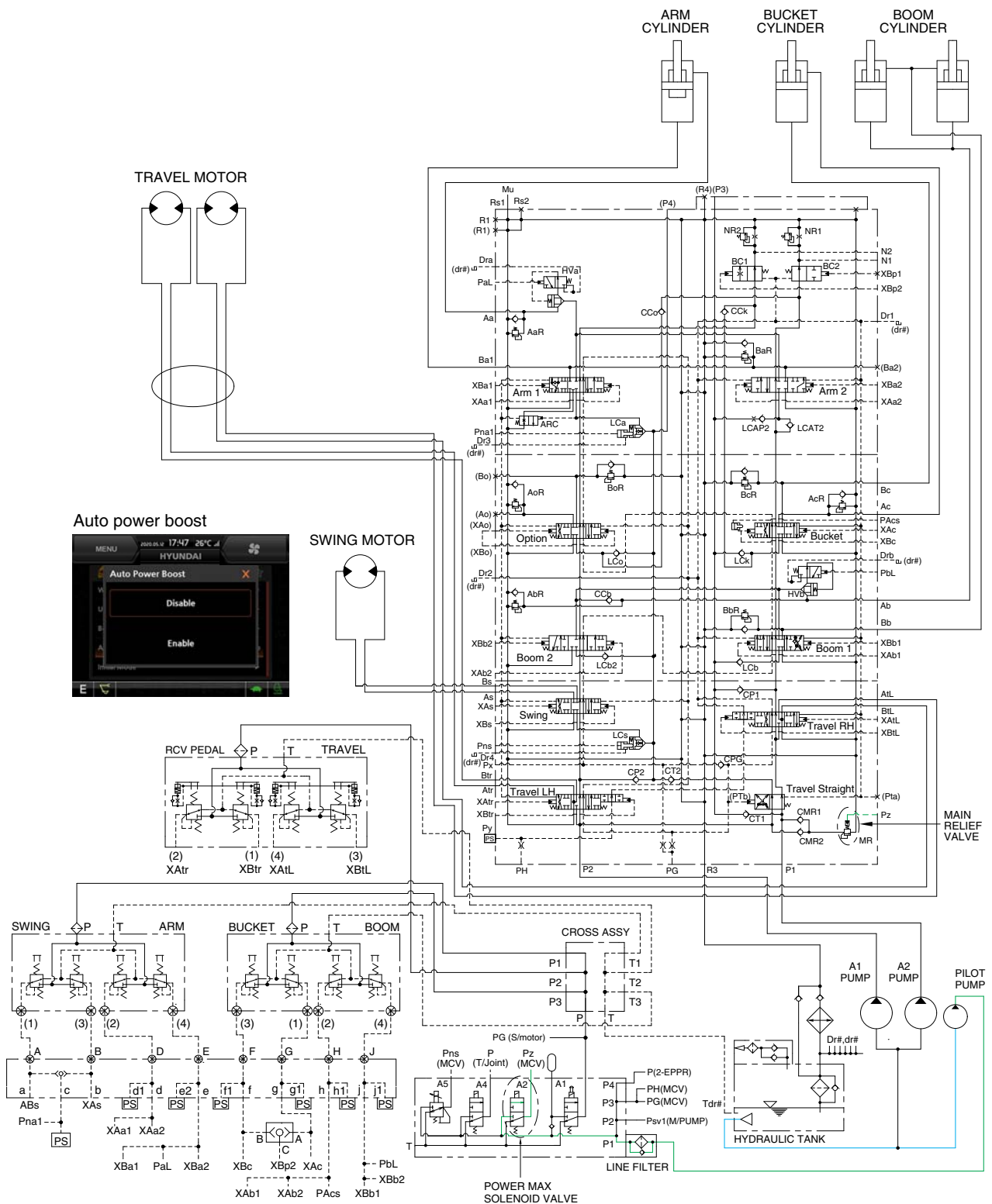
400A3HC05E

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

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



## 5. MAIN RELIEF PRESSURE CHANGE CIRCUIT

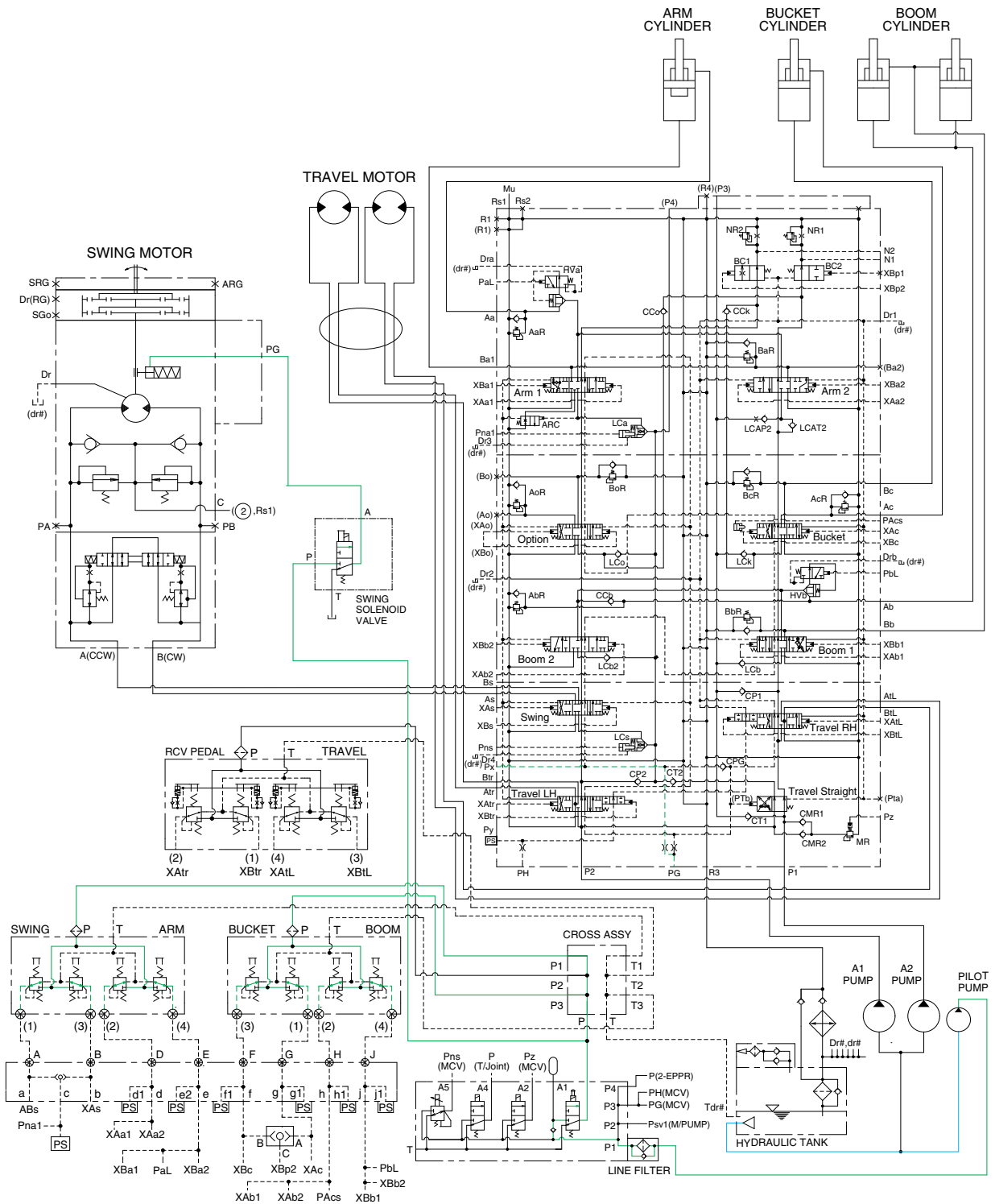


400A3HC06E

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 330 kgf/cm<sup>2</sup> to 360 kgf/cm<sup>2</sup> for increasing the digging power. And even when press continuously, it is canceled after 8 seconds.

When the auto power boost function is selected to enable on the cluster, the pressure of the main relief valve is automatically increased to 360 kgf/cm<sup>2</sup> as working condition by the MCU. It is also operated max 8 seconds.

## 6. SWING PARKING BRAKE RELEASE



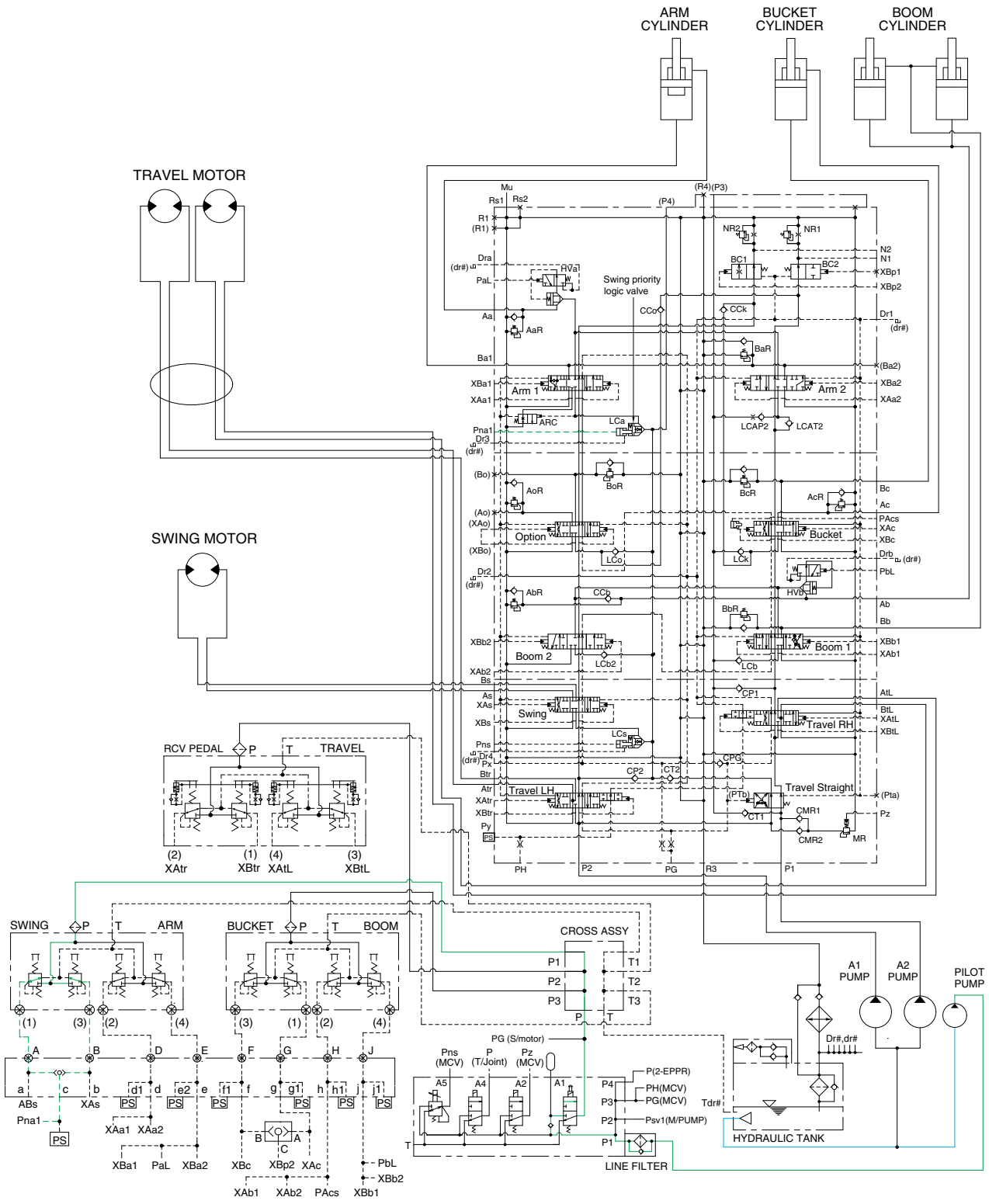
400A3HC07E

When any of the swing, arm in, boom up or travel lever is tilted, the swing brake solenoid valve is shifted to the downward by the MCU that senses the pilot pressure of the RCV control lever.

The discharged oil from pilot pump flows to swing motor PG port through the swing brake solenoid valve. This pressure is applied to swing motor disc, thus the brake is released.

When all of the RCV levers are set in the neutral position, the swing brake solenoid valve is shifted to the upward, oil in the swing motor disc cylinder is drained through the the swing brake solenoid valve, thus the brake is applied. For details, refer to page 2-67-10.

# 7. SWING PRIORITY SYSTEM



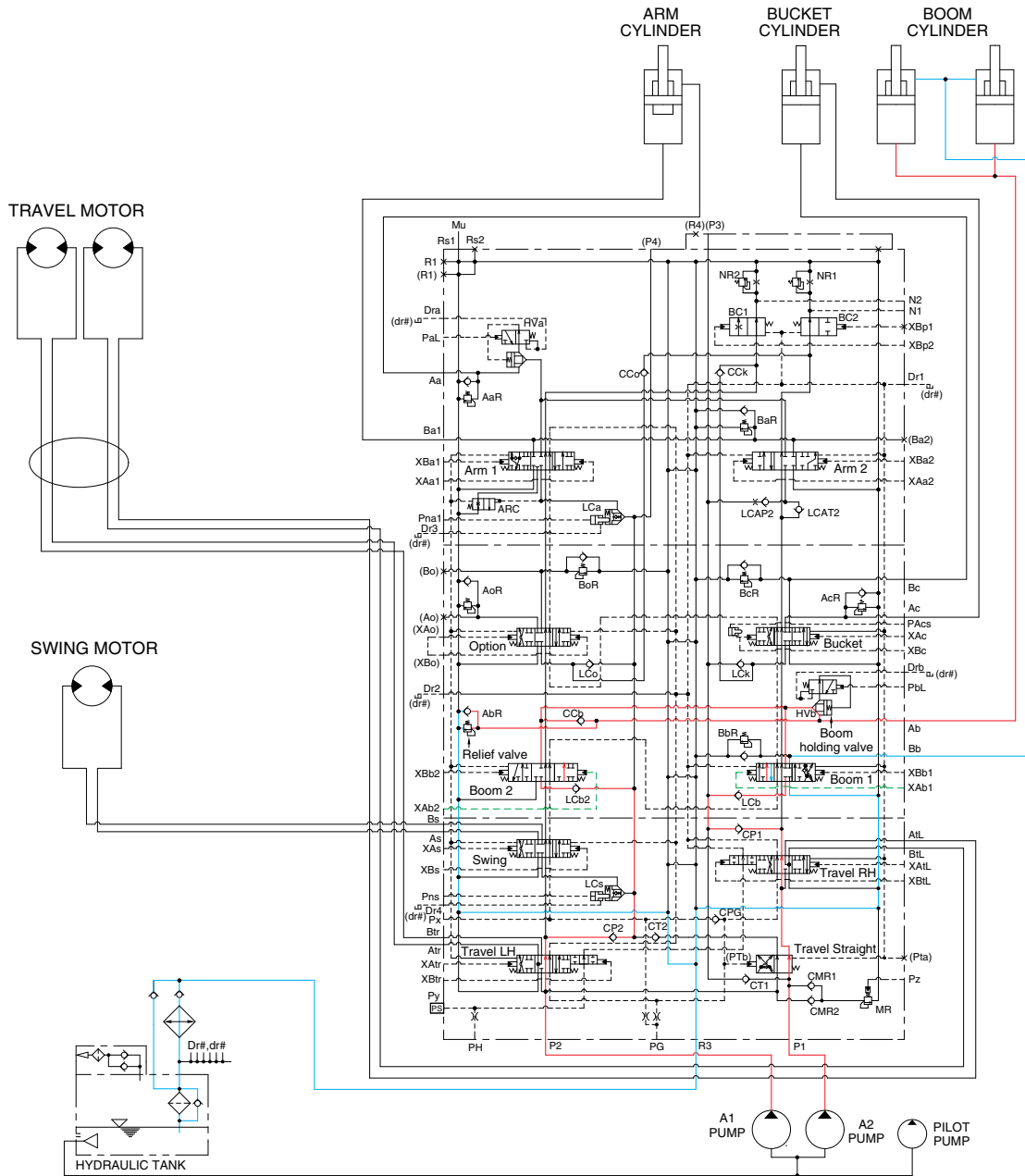
400A3HC08E

When carrying out the combined operation of swing and arm of the left control valve, the swing speed can be lowered than operating speed of arm.  
 Pna1 pressure from the swing shuttle block change the swing priority logic valve and decreases the oil flow rate to the next section to make the swing operation more preferential.  
 This is called the swing priority system. For details, refer to page 2-45.



# GROUP 4 SINGLE OPERATION (CURRENT VERSION)

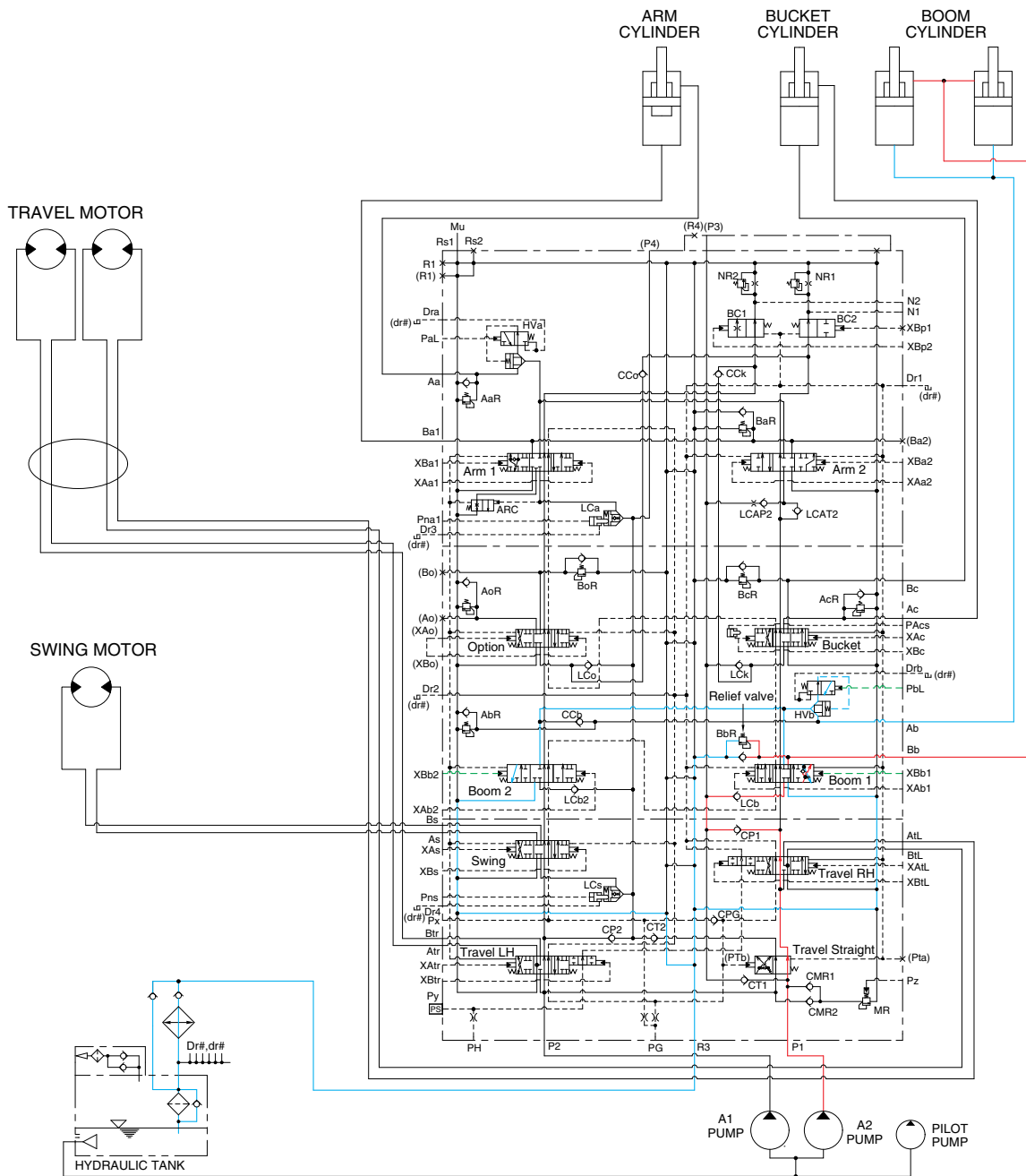
## 1. BOOM UP OPERATION



380A3HC10

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 (XAb1, XAb2) from the remote control valve. The oil from the A1 and A2 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 1 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.

## 2. BOOM DOWN OPERATION



380A3HC11

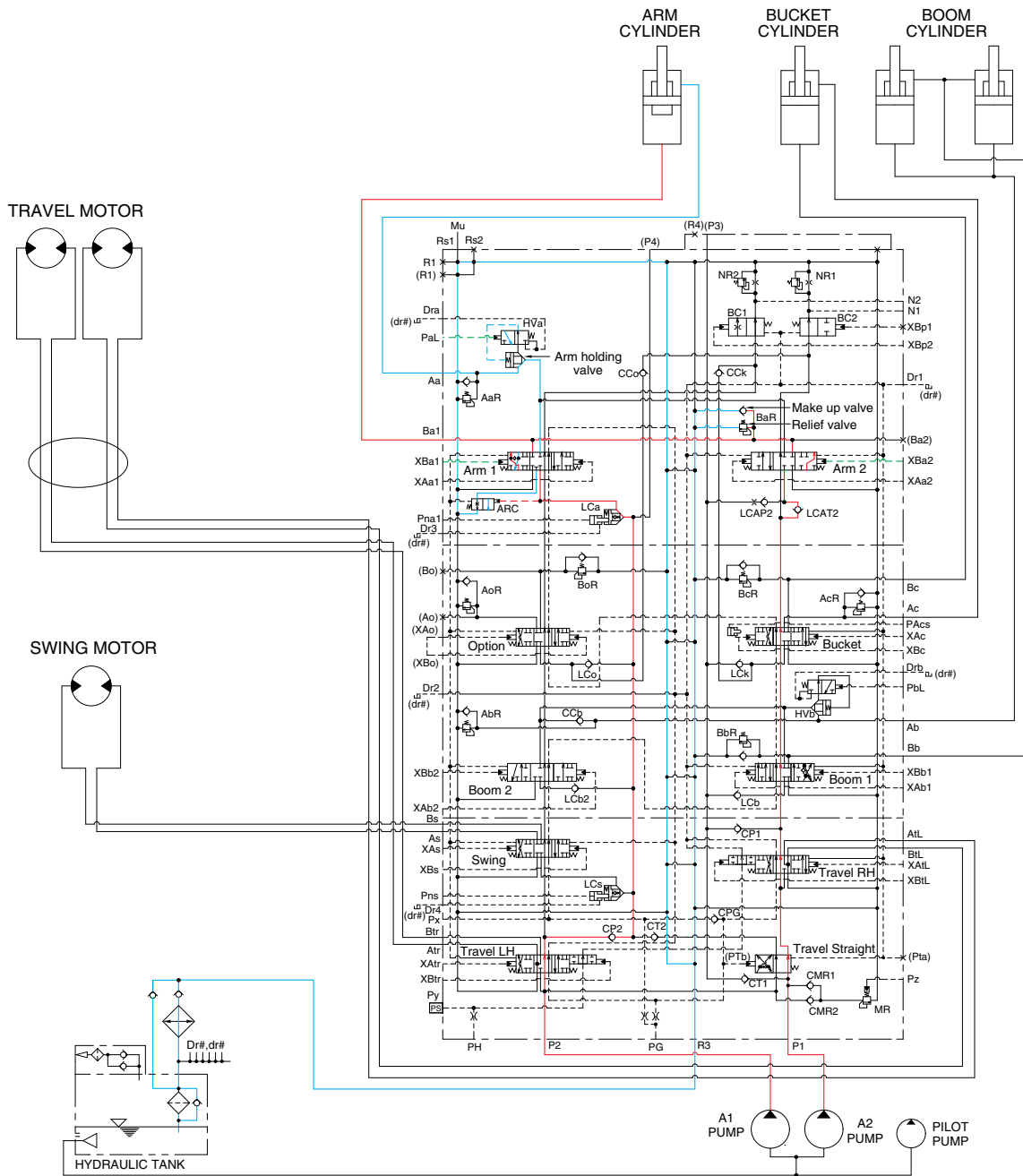
When the RH control lever is pushed forward, the boom 1 spool in the main control valve is moved to the down position by the pilot oil pressure (XBb1, XBb2) from the remote control valve.

The oil from the A2 pump flows into the main control valve and then goes to the small chamber of boom cylinders. At the same time, the oil from the large chamber of boom cylinders returns to the hydraulic tank through the boom 1 and 2 spools in the main control valve.

When the down speed of boom is faster, the oil returned from the large chamber of boom cylinder combines with the oil from the A2 pump, and flows into the small chamber of the boom cylinder.

This prevents cylinder cavitation by the negative pressure when the A2 pump flow can not match the boom down speed. And the excessive pressure in the boom cylinder rod end circuit is prevented by the relief valve.

### 3. ARM IN OPERATION



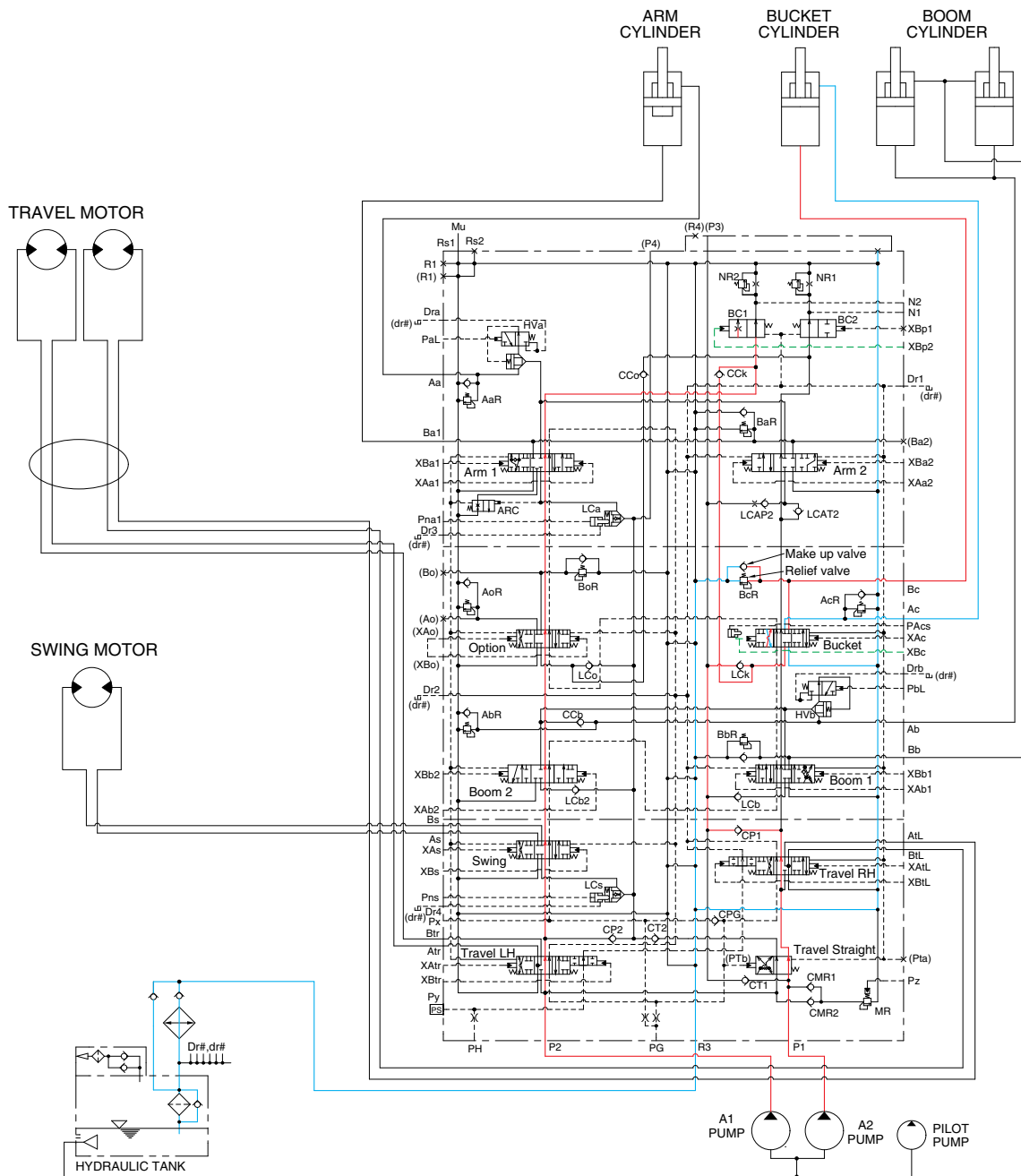
380A3HC12

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 (XBa1, XBa2) from the remote control valve. The oil from the A1 and A2 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 1 spool in the main control valve. When this happens, the arm rolls in. The excessive pressure in the arm cylinder head side is prevented by relief valve. The cavitation which will happen to the head side of the arm cylinder is also prevented by the make-up valve in the main control valve.





## 5. BUCKET IN OPERATION



380A3HC14

When the RH 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 (XBC) from the remote control valve.

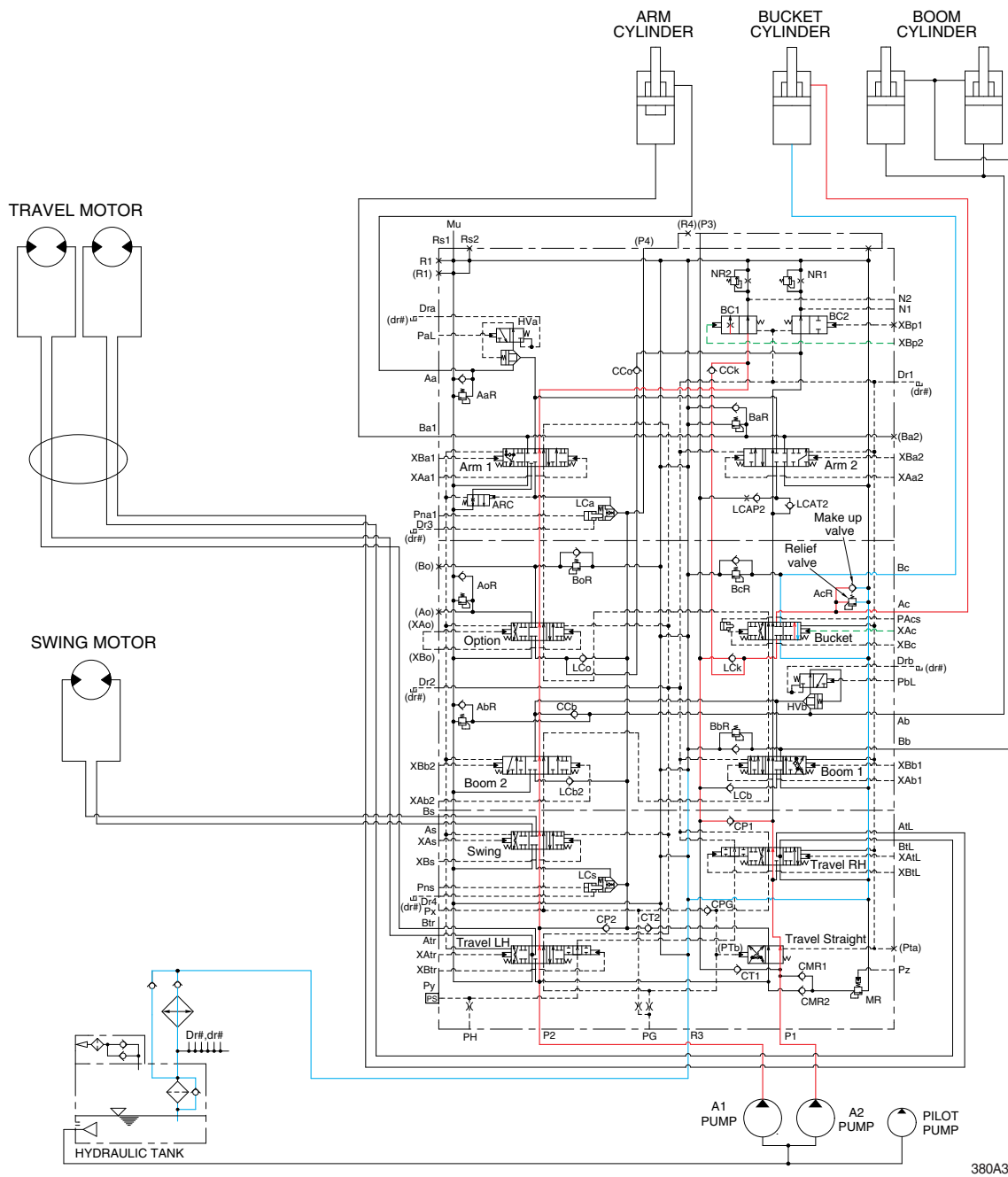
The oil from the A2 pump flows into the main control valve and then goes to the large chamber of bucket cylinder. The oil from the A1 pump flows into the large chamber of bucket cylinder through confluence oil passage in the main control valve by bypass cut pilot pressure (XBp2).

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 excessive pressure in the bucket cylinder head side is prevented by relief valve.

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

## 6. BUCKET OUT OPERATION



380A3HC15

When the RH 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 (XAc) from the remote control valve.

The oil from the A2 pump flows into the main control valve and then goes to the small chamber of bucket cylinder. The oil from the A1 pump flows into the large chamber of bucket cylinder through confluence oil passage in the main control valve by bypass cut pilot pressure (XBp2).

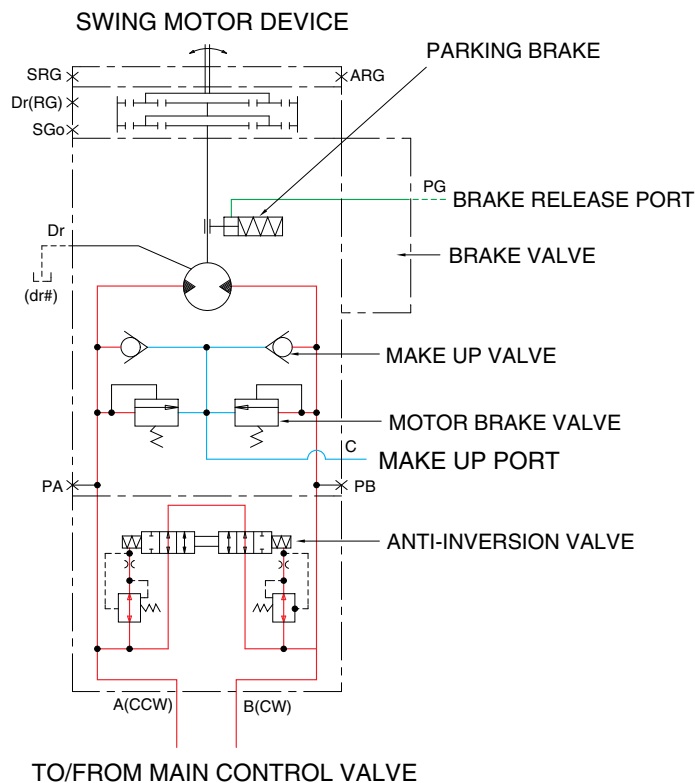
At the same time, the oil from the large chamber of bucket cylinder returns to the hydraulic oil tank through the bucket spool in the main control valve. When this happens, the bucket rolls out.

The excessive pressure in the bucket cylinder rod side is prevented by relief valve.

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



## SWING CIRCUIT OPERATION



400A3HC17E

### 1) MOTOR BRAKE VALVE

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

### 2) MAKE UP VALVE

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

### 3) PARKING BRAKE

This is function as a parking brake only when all of the swing, arm in, boom up or travel control lever is not operated.

#### PARKING BRAKE "OFF" OPERATION

When any of the swing, arm in, travel or boom up control lever is tilted, the swing brake solenoid valve is energized by the MCU that senses the swing pilot oil pressure.

The discharged oil from pilot pump flows to swing motor PG port through the swing brake solenoid valve. This pressure is applied to swing parking brake piston, thus the brake is released.

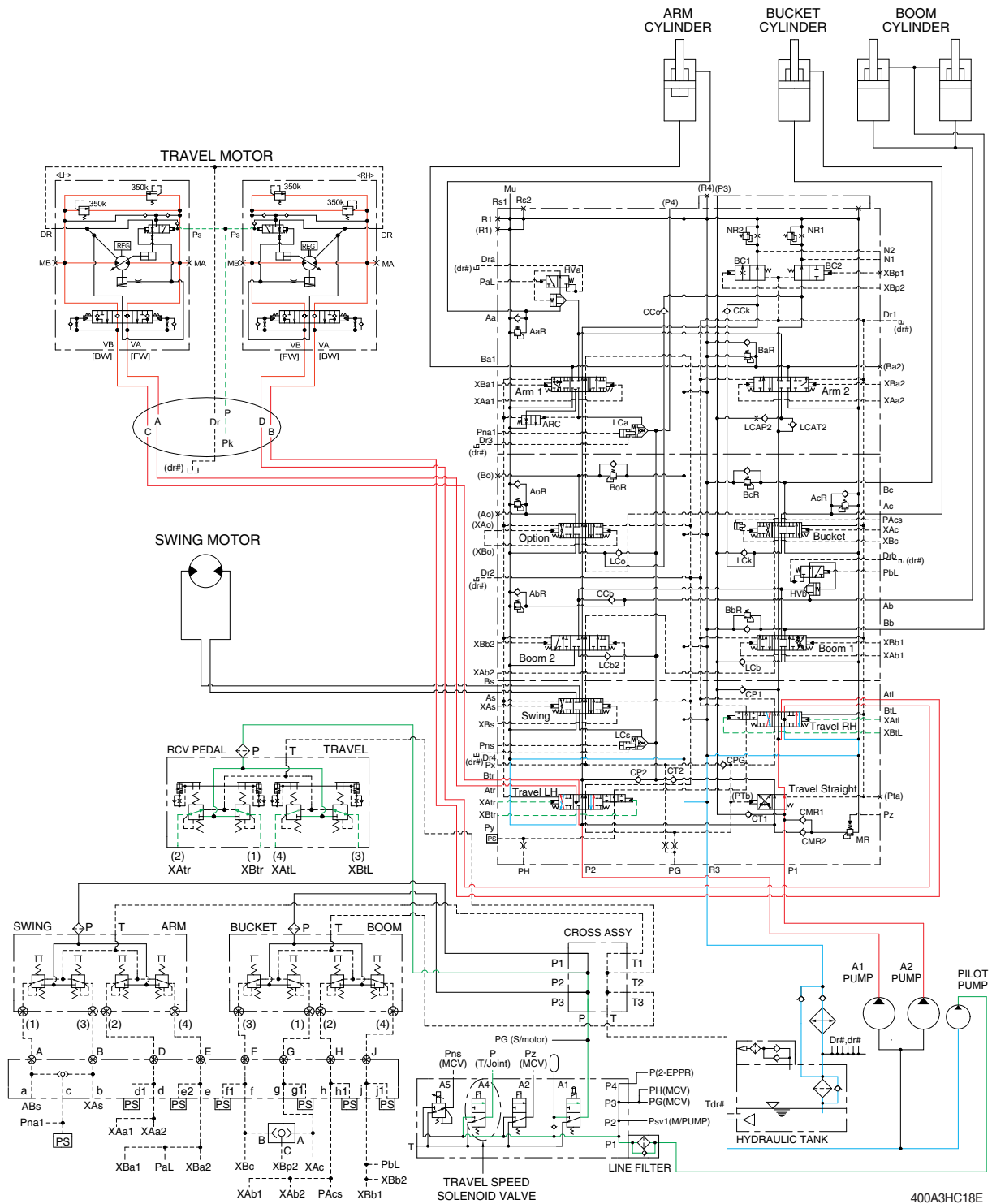
#### PARKING BRAKE "ON" OPERATION

When all of the RCV levers are set in the neutral position, the swing brake solenoid valve is de-energized, oil in the swing parking brake chamber is drained through the the swing brake solenoid valve, thus the brake is applied by spring force.

### 4) ANTI-INVERSION VALVE

This anti-inversion valve absorbs shocks produced as swing motion stops and reduced oscillation cause by swing motion.

## 8. TRAVEL FORWARD AND REVERSE OPERATION



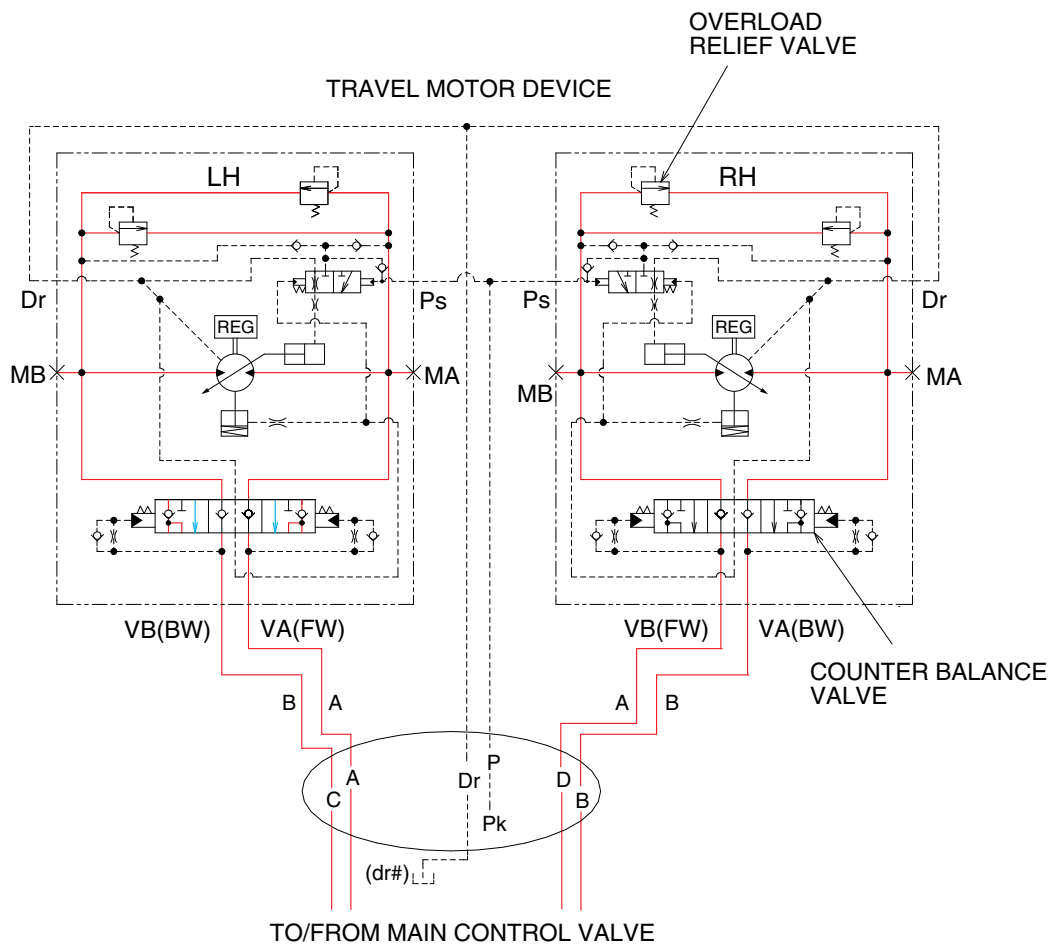
When the travel levers are pushed forward or reverse position, the travel spools in the main control valve are moved to the forward or reverse travel position by the pilot oil pressure (XATr, XBtr, XATL, XBTL) from the remote control valve.

The oil from each pump flows into the main control valve and then goes to each travel motor 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.

## TRAVEL CIRCUIT OPERATION



400A3HC19E

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

### 1) COUNTER BALANCE VALVE

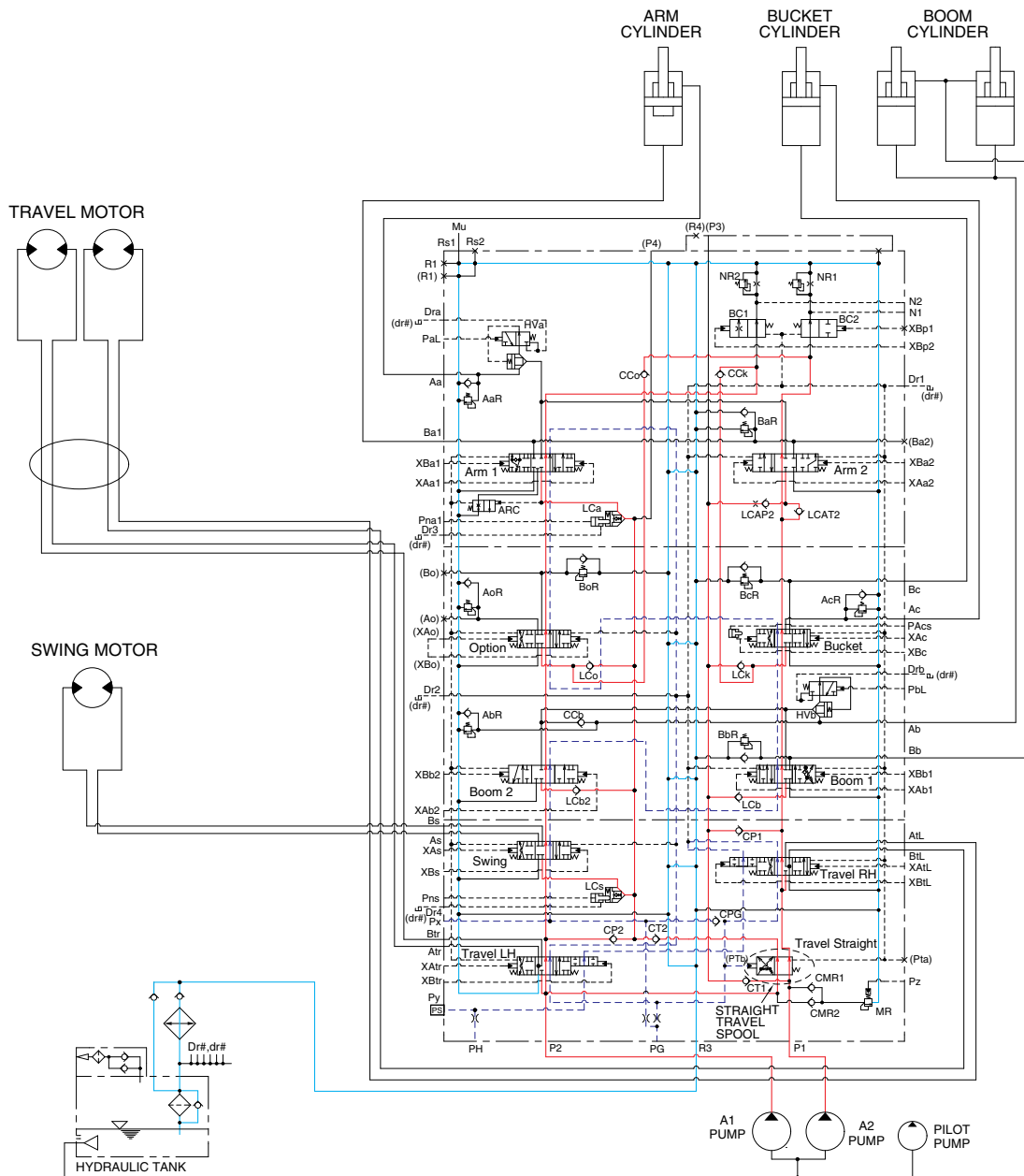
When stopping the motor of slope descending, this valve to prevent the motor over run.

### 2) OVERLOAD RELIEF VALVE

Relief valve limit the circuit pressure below 370 kgf/cm<sup>2</sup> (5260 psi) for the travel motor type 1 and 360 kgf/cm<sup>2</sup> (5120 psi) for the travel motor type 2 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 (CURRENT VERSION)

## 1. OUTLINE



380A3HC20

The oil from the A1 and A2 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.

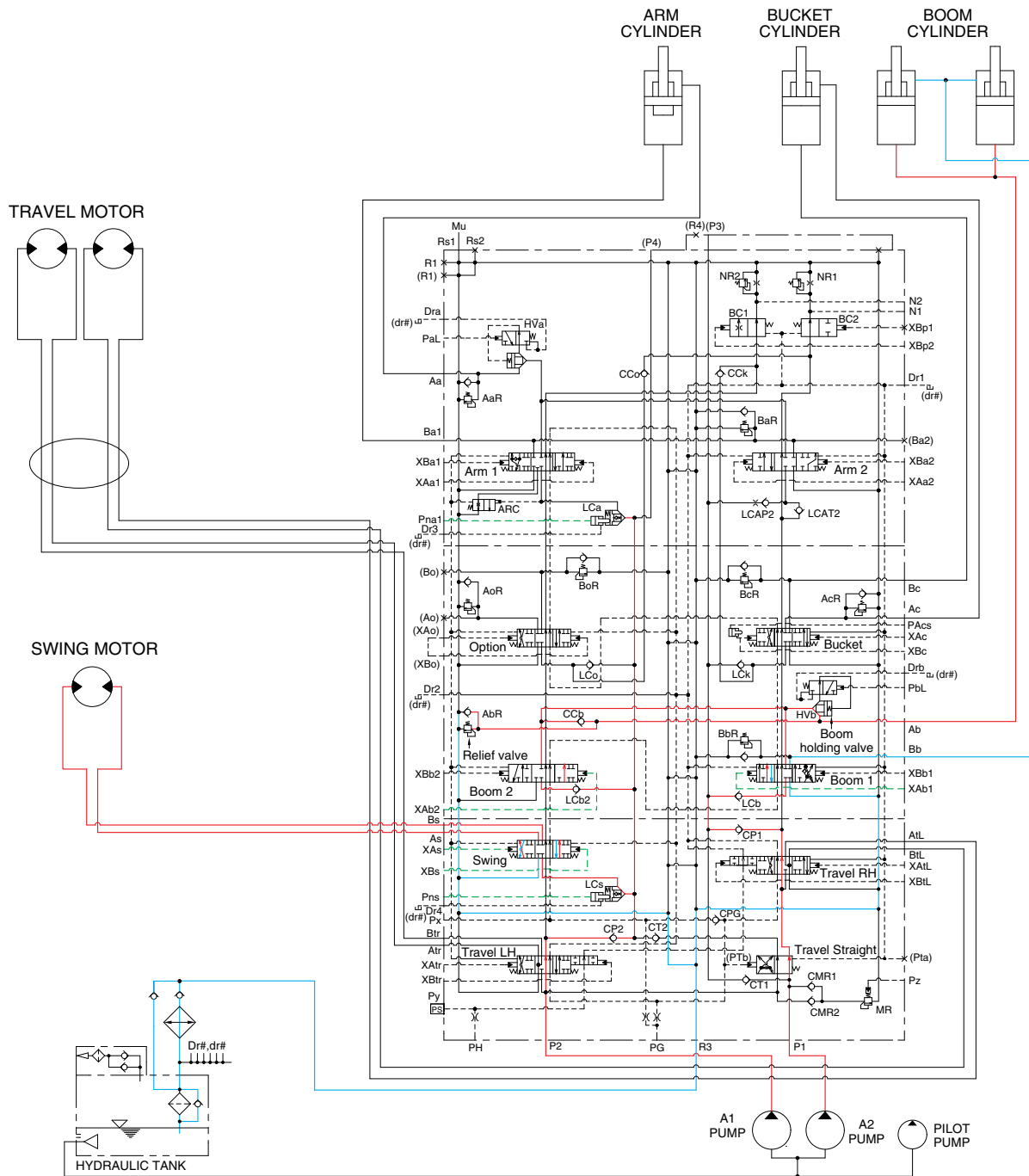
### STRAIGHT TRAVEL SPOOL

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 right 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 UP OPERATION



380A3HC21

When the swing and boom up functions are operated simultaneously, the swing spool and boom spools in the main control valve are moved to the functional position by the pilot oil pressure (XAs, XBs, XAb1, XAb2) from the remote control valve.

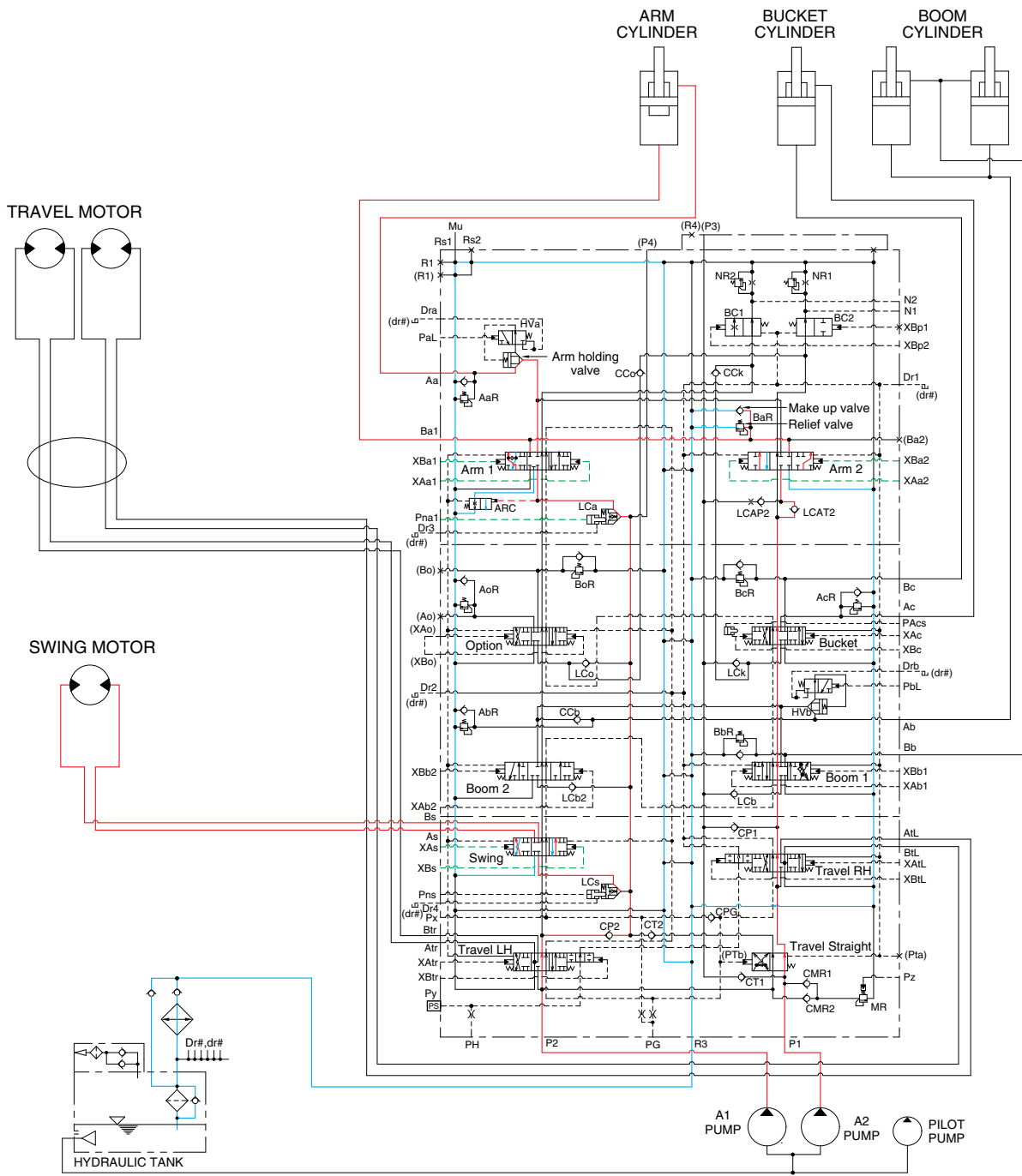
The oil from the A1 pump flows into the swing motor through swing spool and the boom cylinder through boom 2 spool.

The oil from the A2 pump flows into the boom cylinders through the boom 1 spool in the P1 housing side of the main control valve. The upper structure swings and the boom is operated.

Refer to page 3-8 for the boom priority system.



### 3. COMBINED SWING AND ARM OPERATION



380A3HC22

When the swing and arm functions are operated simultaneously, the swing spool and arm spools in the main control valve are moved to the functional position by the pilot oil pressure (XAs, XBs, XAa1, XAa2, XBa1, XBa2) from the remote control valve.

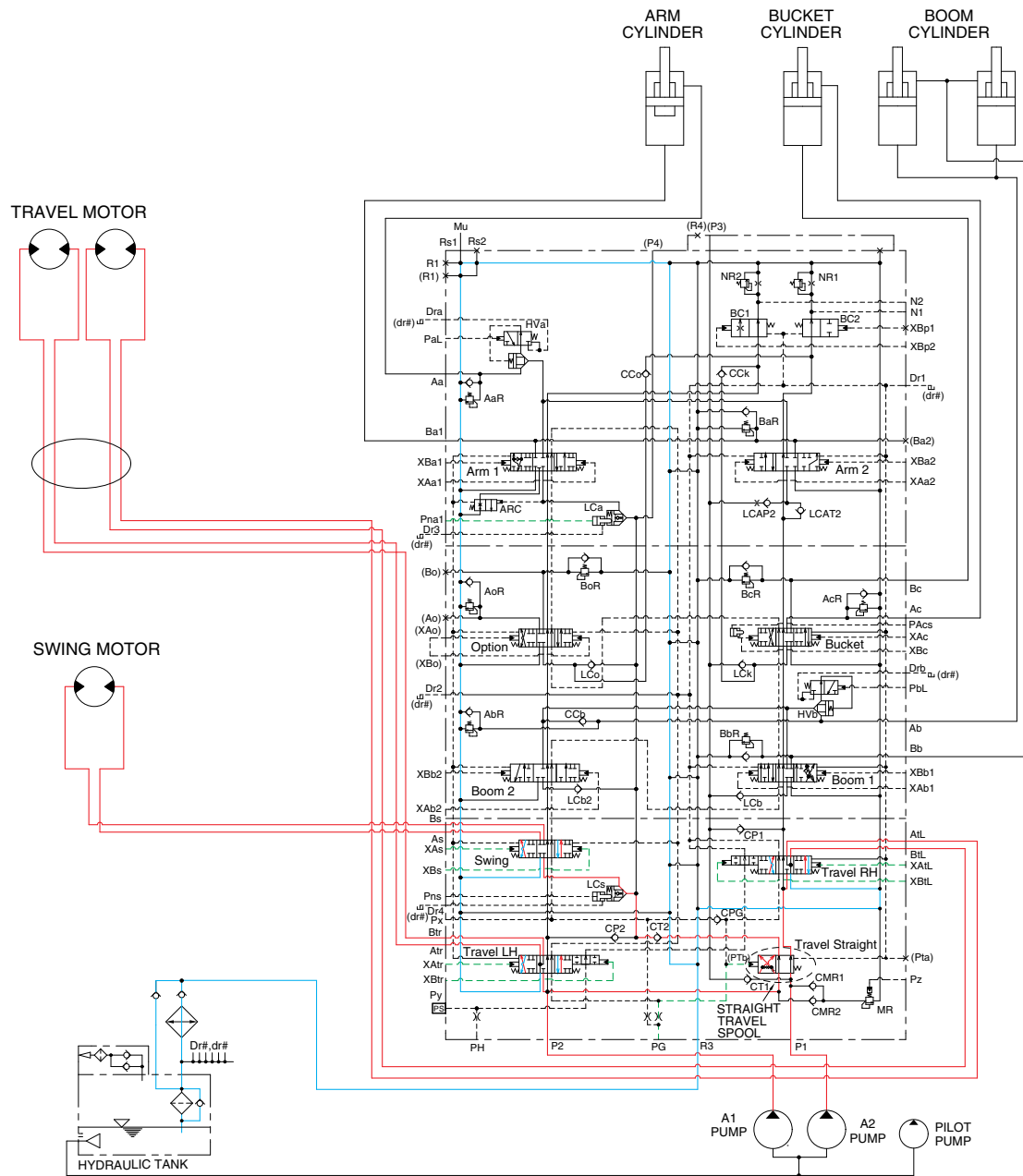
The oil from the A1 pump flows into the swing motor through swing spool and the arm cylinder through arm 1 spool.

The oil from the A2 pump flows into the arm cylinder through the arm 2 spool of the P1 housing side of the main control valve. The upper structure swings and the arm is operated.

Refer to page 2-45 for the swing operation preference function.



## 5. COMBINED SWING AND TRAVEL OPERATION



380A3HC24

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 (XAs, XBs, XAtr, XBtr, XAtL, XBtL) from the remote control valve and straight travel spool is pushed to the right by the pilot oil pressure from the pilot pump.

The oil from the A1 pump flows into the travel motors through the RH travel spool of the P2 housing side and the LH travel spool of the P1 housing side via the straight travel spool.

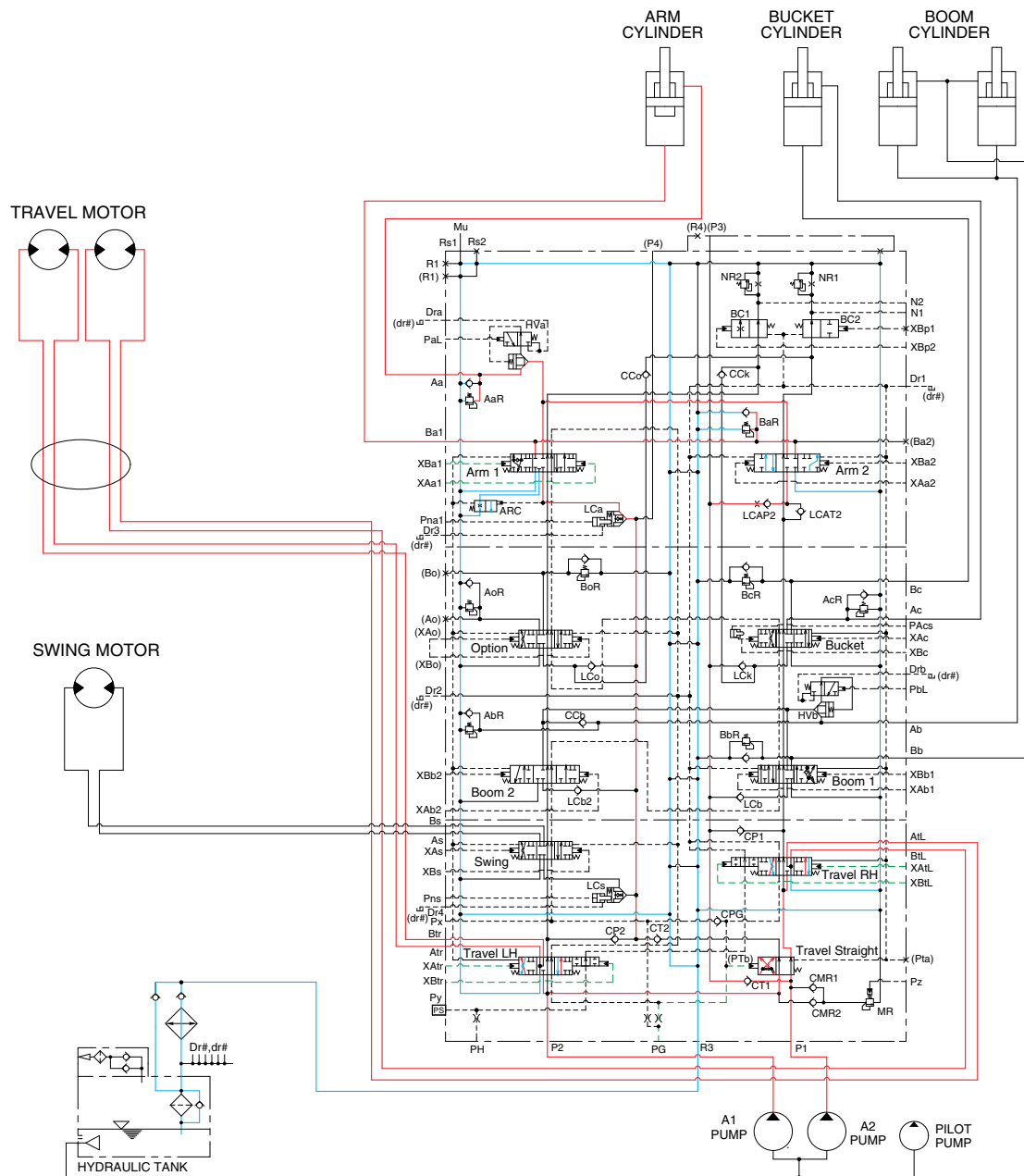
The oil from the A2 pump flows into the swing motor through the swing spool via the straight travel spool.

When the pressure of the travel motors is lower than the pressure of the swing motor, some oil from the A2 pump flows into the travel motors through the check valve and orifice in the straight travel spool. This prevents the rapid slowdown of the travel.

The upper structure swings and the machine travels straight.



## 7. COMBINED ARM AND TRAVEL OPERATION



380A3HC26

When the arm and travel functions are operated simultaneously, the arm spools and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (XAs, XBs, XAa1, XAa2, XBa1, XBa2) from the remote control valve and the straight travel spool is pushed to the right by the oil pressure from pilot pump.

The oil from the A1 pump flows into the travel motors through the RH travel spool of the P2 housing side and the LH travel spool of the P1 housing side via the straight travel spool.

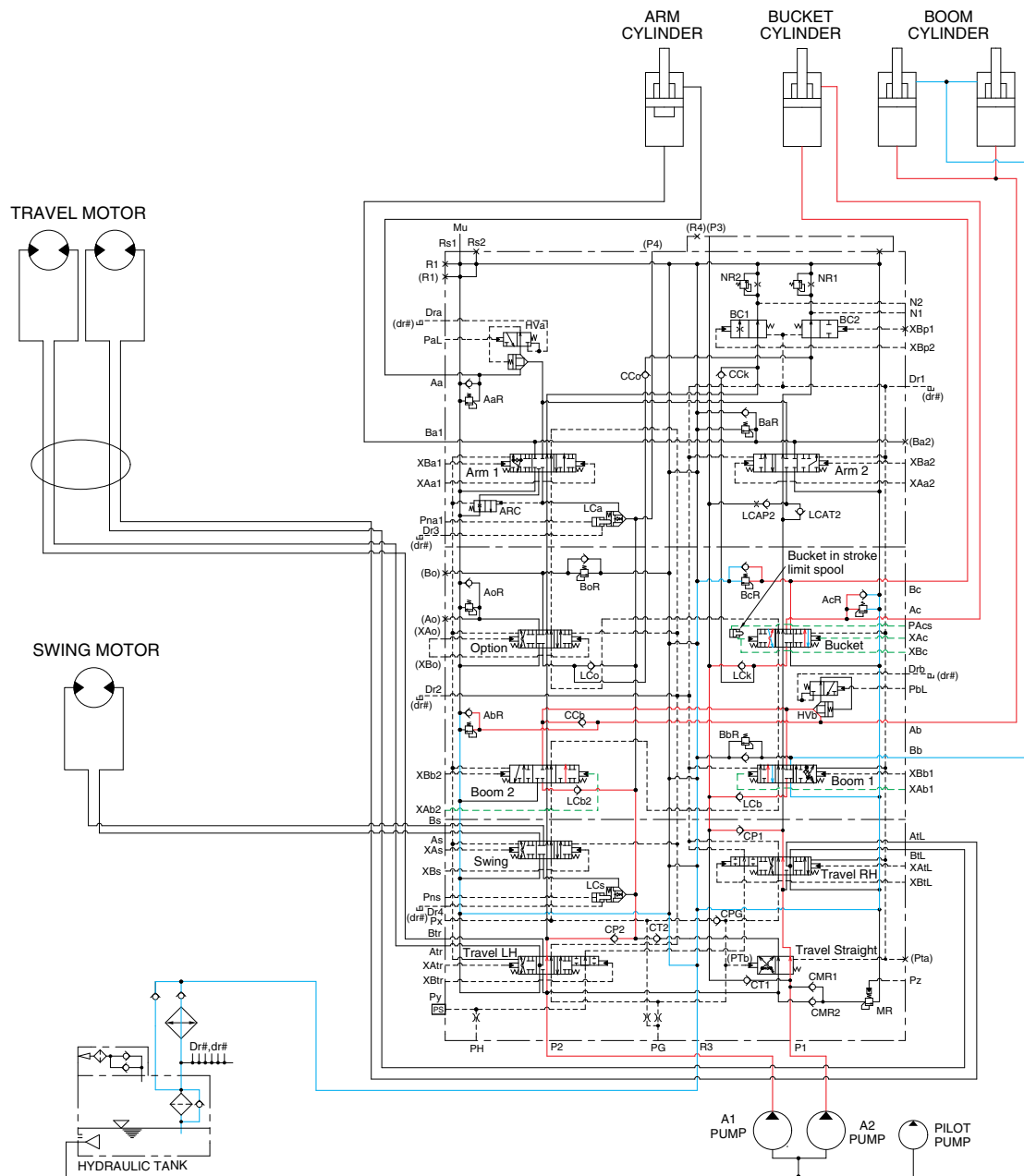
The oil from the A2 pump flows into the arm cylinders through the arm 1 spool and arm 2 spool via the parallel and confluence oil passage.

When the pressure of the travel motors is lower than the pressure of the arm cylinder, some oil from the A2 pump flows into the travel motors through the check valve and orifice in the straight travel spool. This prevents the rapid slowdown of the travel.

The arm is operated and the machine travels straight.



## 9. COMBINED BOOM UP AND BUCKET OPERATION



380A3HC28

When the boom up and bucket functions are operated simultaneously, each spool in the main control valve is moved to the functional position by the pilot oil pressure (XAb1, XAb2, XAc, XBc) from the remote control valve.

The oil from the A1 pump flows into the boom cylinders through the boom 2 spool in the P2 housing side. The oil from the A2 pump flows into the boom cylinders and bucket cylinder through the boom 1 spool, bucket spool and the parallel and confluence oil passage in the P1 housing side.

Also, when the boom up and bucket in functions are operated simultaneously, the boom up operation preference function is operated by the pilot pressure PACs and then the bucket spool transfers in the half stroke not full stroke (Refer to page 2-42). Therefore, the most of pressurized oil flows into boom 1 spool than the bucket spool to make the boom up operation more preferential. The boom and bucket are operated.