

Document Title: Description, general	Function Group: 900	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Description, general

The machine is equipped with a negative flow control system with variable flow. With this system, the working pump can deliver flow according to demand. A variable flow from the pump allows precision work even with high engine speed.

The hydraulic system, also known as the "Automatic Sensing Work Mode," is designed for high-productivity, high-digging capacity, high-maneuvering precision and excellent fuel economy. The summation system, boom, arm and swing priority along with boom and arm regeneration provides optimum performance.

The following important functions are included in the system:

- Summation system: Combines the flow of both hydraulic pumps to ensure quick cycle times and high productivity.
- Boom priority: Gives priority to the boom operation for faster raising when loading or performing deep excavations.
- Swing priority: Gives priority to swing functions for faster simultaneous operations.
- Regeneration system: Prevents cavitation and provides flow to other movements during simultaneous operations for maximum productivity.
- Power boost: All digging and lifting forces are increased.
- Holding valves: Boom and arm holding valves prevent the digging equipment from creeping.

The following functions are included in the main control valve :

- Boom
- Dipper arm
- Bucket
- Slew
- Travel
- Optional equipment, X1

The optional control valve has the following functions:

- Adjustable boom, X2
- Optional equipment, X3
- line rupture for boom and arm

Document Title: Hydraulic description	Function Group: system, 900	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Hydraulic system, description

The machine's hydraulic system is divided into two subsystems - the working hydraulic system and servo hydraulic system.

All power transmission is via hydraulic oil in the **working hydraulic system**.

A working pump supplies the main valve block with oil. The main valve block distributes the oil to the digging equipment's four (five split boom) hydraulic cylinders and the two hydraulic motors for travel and slew. The flow of oil to the different movements is controlled with valve spools in directional valves.

The **servo hydraulic system** is used for control.

A servo pump supplies the control levers and pedals with servo pressure. When the machine is operated, the control pressure valves reduce the servo pressure to a control pressure, which activates the directional valves.

Document Title: Hydraulic oil, description	Function Group: 900	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Hydraulic oil, description

The oil contains selected additives that provide good oxidation stability, corrosion protection and good lubricating characteristics as well as compatibility with bearings containing lead alloys.

The ester base gives the oil a very high viscosity index and good characteristics at low temperatures.

Document Title: Hydraulic system, repair of hydraulic components in workshop	Function Group: 900	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Hydraulic system, repair of hydraulic components in workshop

- Always wear clean coveralls and be strict about personal cleanliness.
- Work on hydraulic components should be performed separate from other work in a so-called "clean room". The room must have good ventilation and the floor must be coated with a binding material. Machining, grinding and similar work is not allowed in the "clean room".
- The workplace must be equipped with thoroughly cleaned tools and suitable containers for cleaning hydraulic components.
- Containers for cleaning hydraulic components must not be used for other cleaning. The containers must be cleaned frequently and filled with new fluid. The containers must be equipped with a removable grating on the bottom, which separates the component from any sludge on the bottom.
- Always clean components that are going to be handled in the "clean room". If an alkaline detergent is used, it should contain anti-corrosion agent.
- Always plan work on the hydraulic system so that it can be completed without any longer interruptions.
- When cleaning during repairing – use dry and clean compressed air for drying, do not use cotton waste or rags.
- Always plug a component when work is completed, use clean plastic plugs of the correct dimensions, and pack the component.
- When cleaning in the "clean room" – use methods that do not stir up dust or dirt.

Document Title: Hydraulic oil, storage and handling	Function Group: 900	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Hydraulic oil, storage and handling

- Hydraulic oil should be stored in tightly sealed tanks or barrels.
- Only containers used for transporting hydraulic oil should be used for this purpose.
- Oil should be stored under cover or in temperature-controlled premises. If oil is stored outdoors, the barrels should be stored horizontally so that water cannot enter and the barrel markings are not eradicated.
- Oil must not be stored at temperatures exceeding 60 °C, or be exposed to direct sunlight or freezing temperatures.

Document Title: Hydraulic system, cleanliness when handling hydraulic components	Function Group: 900	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Hydraulic system, cleanliness when handling hydraulic components

WARNING

Hot hydraulic oil and hydraulic oil under pressure may result in severe personal injuries

NOTICE

It is very important to keep the hydraulic system free from any impurities, as these can cause abnormal wear and may lead to expensive downtime. Greatest possible cleanliness should be maintained during all handling of hydraulic components and hydraulic oil.

NOTE!

A vacuum pump should be used for work on the hydraulic system, see [900 Vacuum pump, connection](#).

Document Title: Hydraulic components, storage and transport	Function Group: 900	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Hydraulic components, storage and transport

- All hydraulic components must be stored in plastic bags or film and they must be plugged. The packaging must not be opened before use of the component.
- Service vehicles should be equipped with an interior which facilitates good order and cleanliness.
- Each service vehicle should carry a roll of plastic film, plastic plugs of the most common sizes and plastic containers for components. Plugs and film should be of the disposable type.

Document Title: Hydraulic system, work instructions	Function Group: 910	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Hydraulic system, work instructions

- Always wear clean coveralls and be strict about personal cleanliness.
- Perform thorough troubleshooting to avoid unnecessary repair work.
- If necessary, move the machine, to as dust-free an environment as possible.
- If possible, do not dismantle components in the field. Use exchange components.
- Protect both replaced components and components that are to be reused by wrapping them in plastic film.
- If the tank is to be drained, and the oil has been found to be free of discolouration and impurities – drain the oil into clean containers, and seal securely. Refilling of this oil or filling of new oil should always be performed by removing the hydraulic oil filter cap and then filling through the filter.
- Use a suitable fluid when cleaning and pour it into a thoroughly cleaned container.

Document Title: Hydraulic components, description	Function Group: 910	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Hydraulic components, description

This machine incorporates the features and functions described below in its hydraulic circuit in order to provide easier operation, greater safety, higher productivity, and better fuel economy.

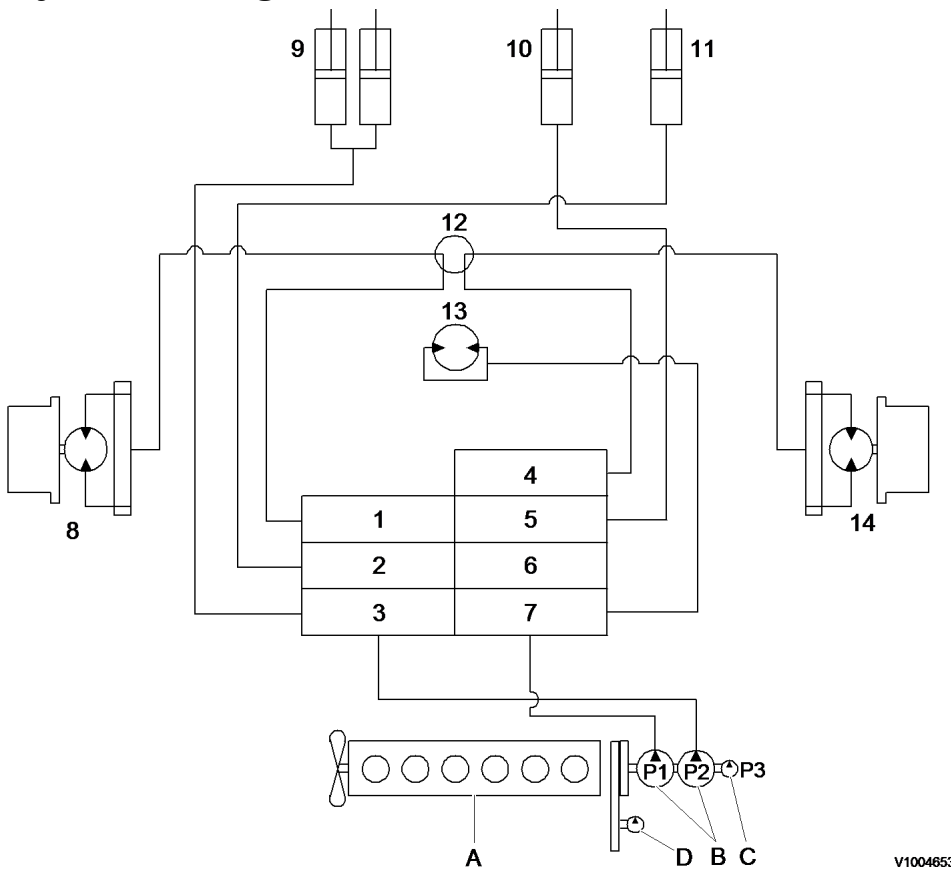
Function of components

Purpose	Component	Function	Feature
Ease of operation and safety	Travel	<ul style="list-style-type: none"> Controlled by servo hydraulic pressure Straight travel Low speed, low/high speed automatic shift 	<ul style="list-style-type: none"> Straight travel during simultaneous operations. Automatic shifting between low and high speed.
	Slew	<ul style="list-style-type: none"> Slew priority circuit (during simultaneous slew and arm in) Automatic slew parking brake Rebound damping function 	<ul style="list-style-type: none"> Easier digging due to the use of simultaneous slew and arm in. Delayed slew parking brake application during slew to allow for inertia. Damping by rebound damping valve.
	Digging units	<ul style="list-style-type: none"> Controlled by servo hydraulic pressure Boom, arm regenerating circuit Holding valve (boom, arm lock) Heavy lift and heavy duty digging 	<ul style="list-style-type: none"> Fine operation. Changing the balance between boom, arm and bucket functions. Decreasing the amount of natural fall of boom when the boom is at rest. Increasing the working pressure by increasing the pressure of main relief valve.
	Others	<ul style="list-style-type: none"> Closed and semi automatically pressurized hydraulic tank Suction strainer Return line: filter and drain filter Servo hydraulic circuit: line filter Hydraulic oil cooled by oil cooler Emergency circuit 	<ul style="list-style-type: none"> Contamination of hydraulic oil prevented, suction ability of pump improved. Damage of hydraulic components prevented. Contamination of hydraulic oil prevented. Servo hydraulic operated circuit failure prevented. Deterioration of hydraulic oil prevented. If engine stopped, movable by weight of digging units.

Productivity increased	Pump	<ul style="list-style-type: none"> • Full horsepower control 	<ul style="list-style-type: none"> • Effective use of engine horsepower through action of two variable displacement pumps.
	Travel	<ul style="list-style-type: none"> • 2-speed auto shift by the 2-speed track motor 	<ul style="list-style-type: none"> • Low speed/high propel torque. • High speed/low propel torque.
	Digging units	<ul style="list-style-type: none"> • Conflux for boom raising • Regeneration for boom lowering • Conflux circuit for arm in under heavy load • Conflux circuit for arm in under light load • Conflux circuit for arm out • Pressure increasing circuit for heavy load 	<ul style="list-style-type: none"> • Faster boom raising. • Positive bucket motion during simultaneous boom lowering and bucket operation. • Faster arm in under heavy load. • Faster arm in under light load. • Faster arm out. • Improved digging, lifting under heavy load.
Fuel economy	Pump	<ul style="list-style-type: none"> • Negative flow control 	<ul style="list-style-type: none"> • Flow minimized when in neutral
	Controller	<ul style="list-style-type: none"> • Mode select switch changeover • Auto idling 	<ul style="list-style-type: none"> • Selecting an effective engine rpm suited for the amount of work, fuel consumption and fine control. • Engine speed decelerated during waiting periods for reduced fuel cost and less noise.

Document Title: Hydraulic schematic diagram,	Function Group: 910	Information Type: Service Information	Date: 2014/8/7 0
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Hydraulic diagram, schematic



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Figure 1
Hydraulic diagram

1	Travel	7	Slew	13	Slew motor
2	Bucket	8	Travel motor	14	Travel motor
3	Boom	9	Boom cylinder	A	Engine
4	Travel	10	Arm cylinder	B	Main pump
5	Arm	11	Bucket cylinder	C	Gear pump
6	Option	12	Center passage	D	Rotator pump (option)

The mechanical power from the engine is converted to hydraulic power by the main pumps. Hydraulic power from the main pumps goes to the track motors, slew motor and hydraulic cylinders via the control valve, where it is converted back to mechanical power, which actuates the travel action, slew action and digging units.

Document Title: Hydraulic tank, description	Function Group:	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Hydraulic tank, description

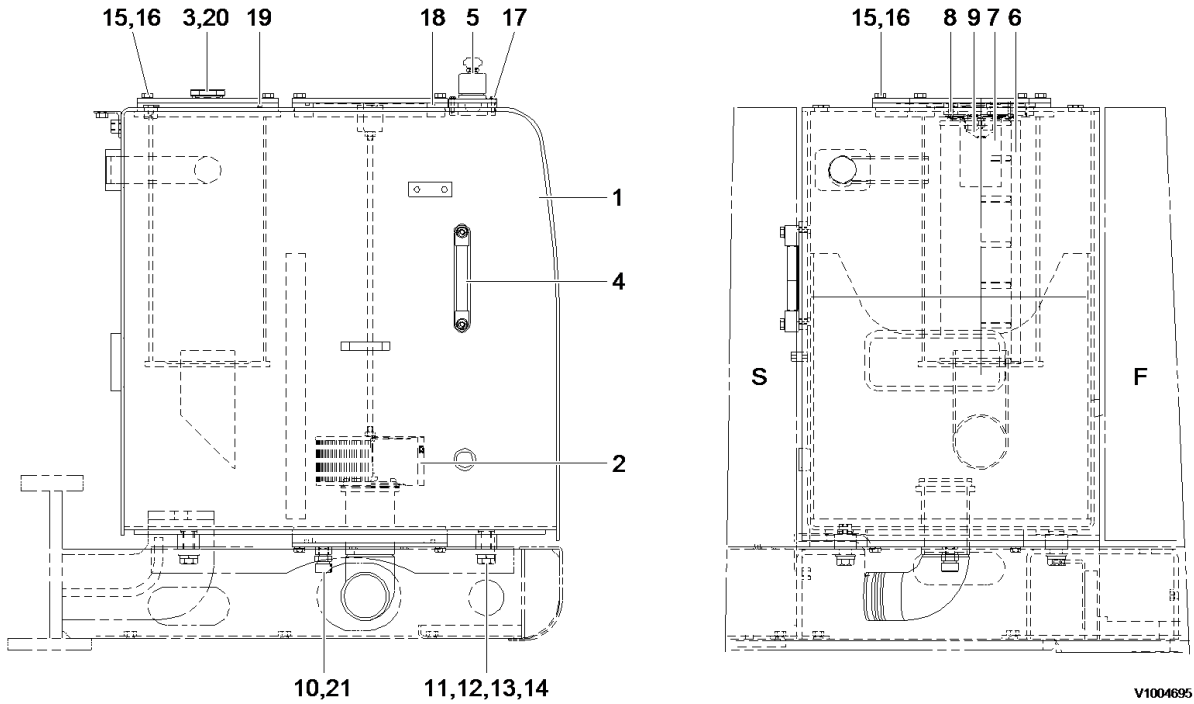


Figure 1
Structure, hydraulic tank

1	Hydraulic tank	8	Spring	15	Spring washer
2	Strainer (80 mesh)	9	Bypass valve	16	Screw
3	Plug	10	Drain valve	17	Screw
4	Sight gauge	11	Shim	18	O-ring
5	Air breather	12	Spring washer	19	O-ring
6	Element strainer	13	Plain washer	20	O-ring
7	Strainer	14	Screw	21	Copper gasket
S	Side door				
F	Fuel tank				

Tightening torque : unit : kgf-m (lbf-ft)

No.	Tightening torque
3	2.5 ± 0.3 (18 ± 2.2)
4	1.5 ± 0.2 (10.8 ± 1.4)
10	4.5 ± 0.5 (32.5 ± 3.6)
14	52.2 ± 5.2 (377 ± 38)
16	6.5 ± 0.7 (47 ± 5)

- To check the oil level, park on a level surface, retract the arm cylinder, extend the bucket cylinder, lower the bucket to the ground and stop the engine.
- Operate each control lever (for digging unit and travel) to its full stroke to release the residual pressure.
- The center line of the sight gauge is normal. Add oil when required.

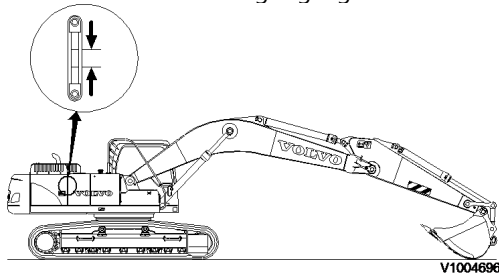


Figure 2
Oil level sight gauge

- When mounting the tank, make the bottom level with frame by use of shim (11).
- Maintain the clearance (front, rear, left, right) within 10 mm (0.4 in).

Oil filter bypass valve

When the filter is clogged



Figure 3
Oil flow, when the filter is clogged

- A. From main control valve

Bypass valve (1) is opened and the oil returns directly to the tank without passing through the filter.

NOTE!

Bypass valve set pressure : 1.5 ± 0.15 kgf/cm² (21.3 \pm 2.1 psi)

Air breather

Preventing negative pressure inside the tank

The tank is a pressurized sealed type, so negative pressure is formed inside the hydraulic tank when the oil level drops during operations. When this happens, the difference in pressure between the tank and the outside atmospheric pressure opens the poppet in the breather, and air from the outside is let into the tank to prevent negative pressure.

At that time filter (2) prevents contamination from entering the tank.

1) Relief set pressure : 0.5 ± 0.1 kgf/cm² (7 \pm 1.4 psi)

2) Suction set pressure : 0.05 ± 0.01 kgf/cm² (0.7 \pm 0.14 psi)

Preventing excessive pressure inside the tank

When the hydraulic actuators are operated, the oil level in the hydraulic system increases as temperature rises. If the hydraulic pressure rises exceeding the set pressure, the breather is actuated to release the hydraulic pressure inside the tank.

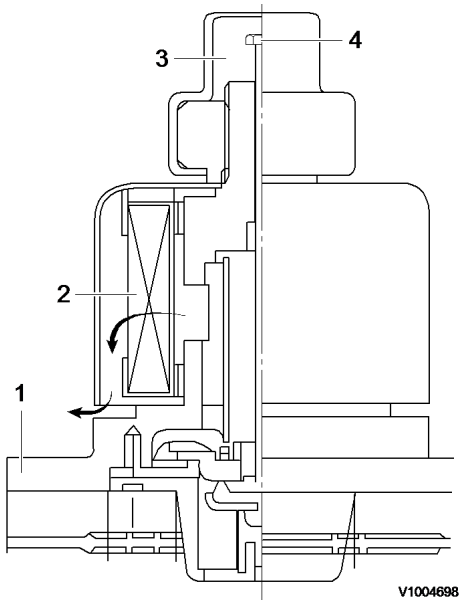


Figure 4
Air breather

1	Body	3	Cap
2	Filter	4	Valve

Hydraulic tank pressurizing

The hydraulic tank is pressurized to create a positive pressure at the hydraulic pump inlet to prevent cavitation.

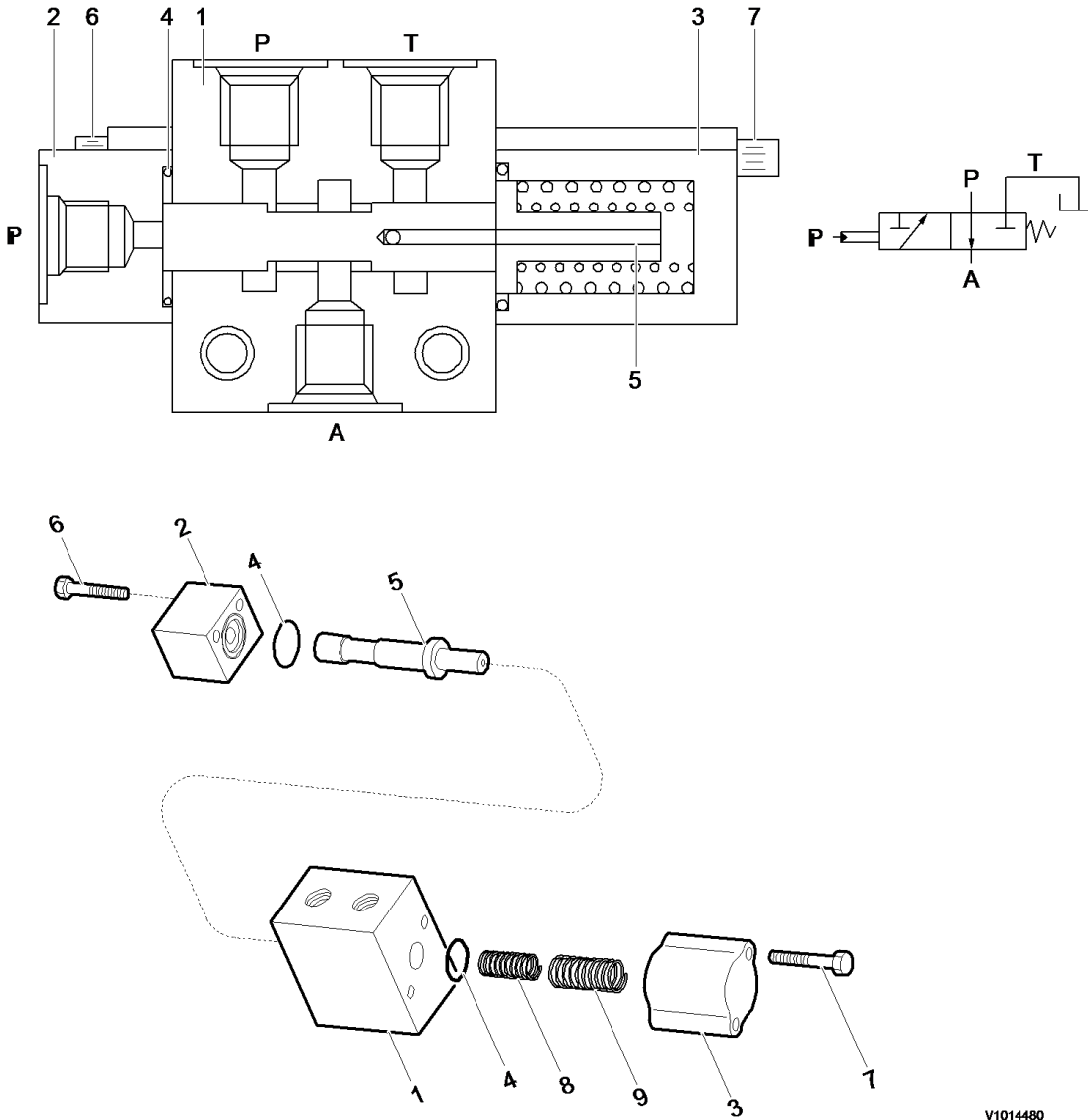
If the tank cap assembly does not function or seal properly, the hydraulic pump could be damaged.

To pressurize the tank, raise the boom to maximum height, extend the arm and bucket cylinders, then lower the boom to the ground.

To prevent hydraulic oil ejection due to the tank internal pressure while hydraulic system maintenance, press the inner button several times to release the pressure until the air is all out.

Document Title: Servo hydraulic selector valve, description	Function Group:	Information Type: Service Information	Date: 2014/8/7 0
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Servo hydraulic selector valve, description



V1014480

Figure 1
Servo hydraulic selector valve

1	Casing	6	Screw (M6 x 20) tightening torque : 1.2 ~ 1.5 kgf·cm (1.0 ~ 1.3 lbf·in)
2	Servo hydraulic cap	7	Screw (M6 x 55) tightening torque : 1.2 ~ 1.5 kgf·cm (1.0 ~ 1.3 lbf·in)
3	Return cap	8	Spring (small)
4	O-ring	9	Spring (large)
5	Spool		

Conflux when boom raising

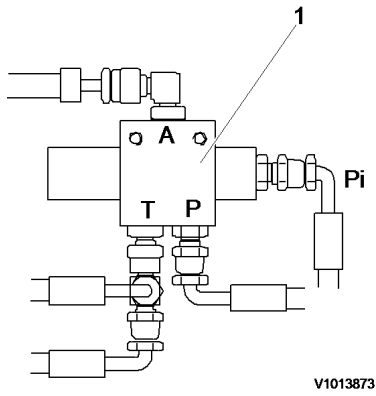


Figure 2
Port connection

When operating the boom, secondary servo hydraulic pressure is not supplied to Pi.

If the servo hydraulic secondary pressure oil flows to P → A and pushes the boom conflux valve piston, the boom conflux logic valve is opened and the oil of P1 pump is combined with P2 pump oil.

Operating when arm in

When Pi oil is applied and the selector valve position is switched during arm in operation, servo hydraulic secondary pressure oil does not flow to port A, the boom conflux logic valve is closed, and the conflux flow of P1 pump oil is blocked.

Document Title: Shuttle valve block, description	Function Group:	Information Type: Service Information	Date: 2014/8/7 0
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Shuttle valve block, description

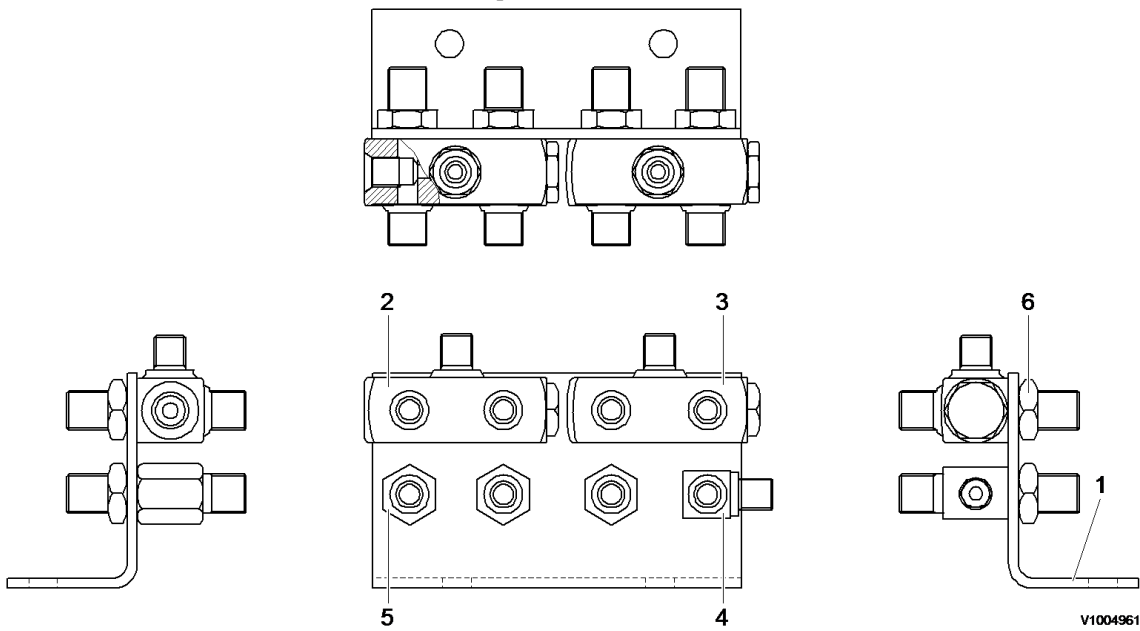


Figure 1
Shuttle valve block

1. Bracket
2. Shuttle valve - A type
3. Shuttle valve - B type
4. Tee connector
5. Long connector
6. Nut, tightening torque : 7.5 ± 0.7 kgf-m (54.2 ± 5 lbf-ft)

NOTE!

Leakage of shuttle valves (2 and 3) : less than 1cc/min.

Document Title: Check valve, description	Function Group:	Information Type: Service Information	Date: 2014/8/7 0
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Check valve, description

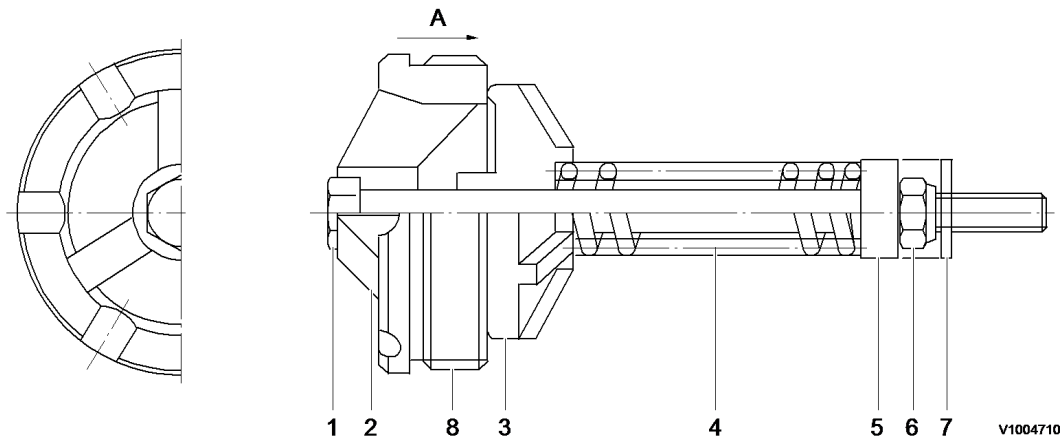


Figure 1
Structure, check valve

1	Screw	4	Spring	7	Split pin
2	Valve cover	5	Spring seat	8	Thread
3	Valve	6	Nut	A	Oil flow

Operating pressure

3.0 kgf/cm² (43 psi) (Main control valve → Oil cooler → Oil tank)

4.5 kgf/cm² (64 psi) (Main control valve → Oil tank)

- Creates a back pressure to prevent reverse flow in the return circuit.

NOTE!

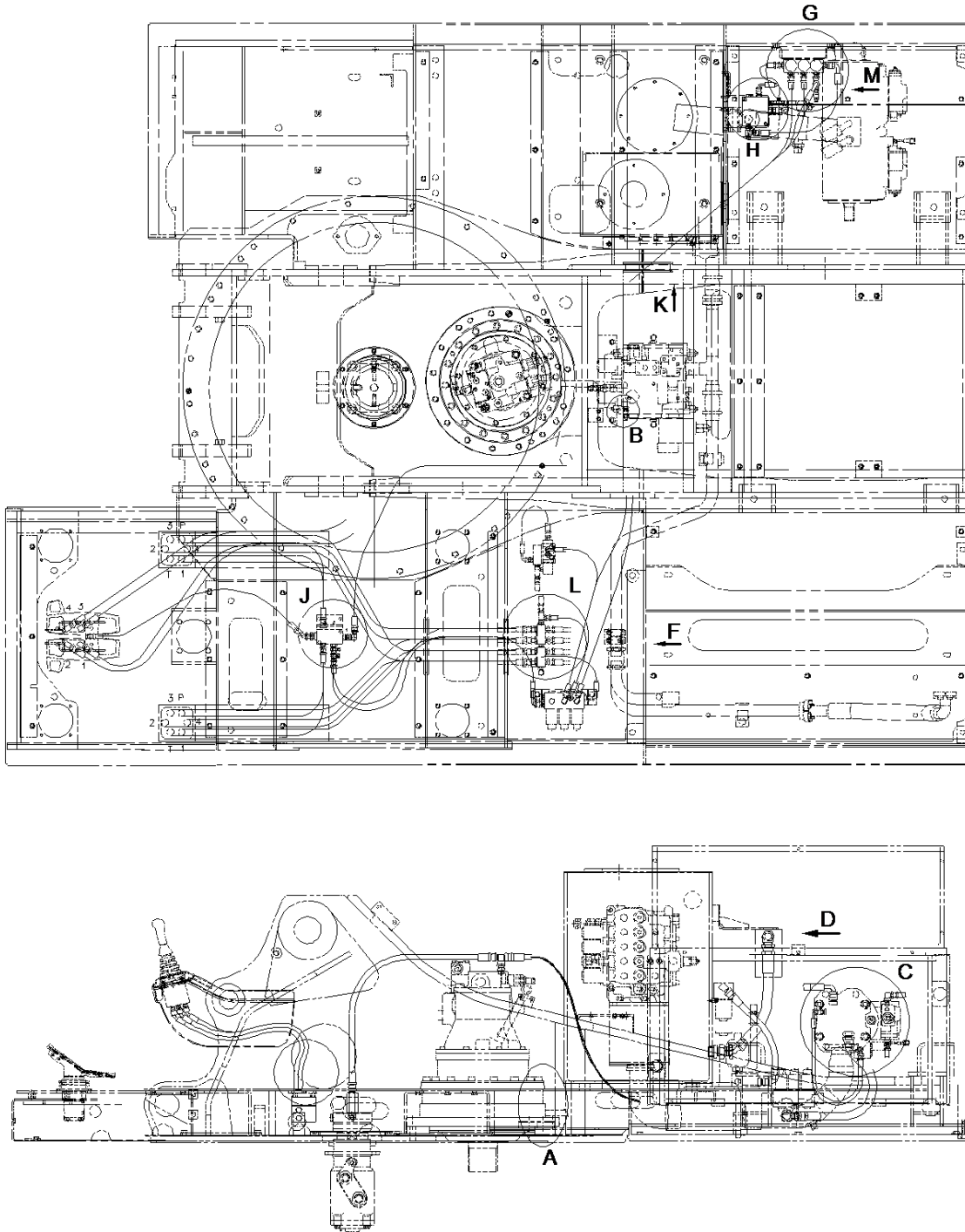
When replacing and reassembling, the check valve must be installed to open in the direction of the flow.

NOTE!

If installed in the reverse direction, excessive back pressure will build in the return circuit.

Document Title: Servo hydraulic line	Function Group:	Information Type: Service Information	Date: 2014/8/7 0
Profile: EXC, EC240B NLC [GB]			

Servo hydraulic line



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Figure 1
Servo hydraulic lines (1)

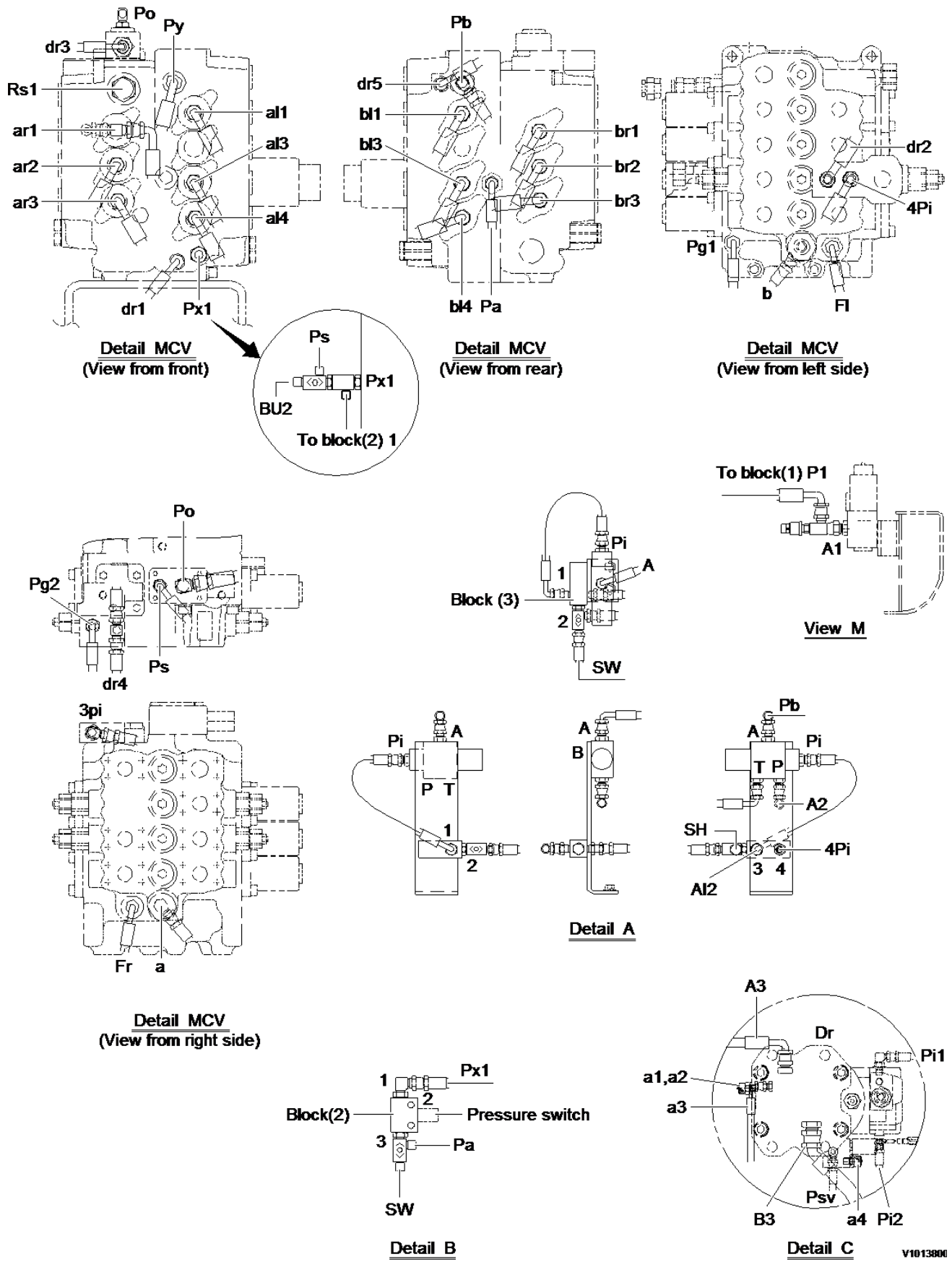
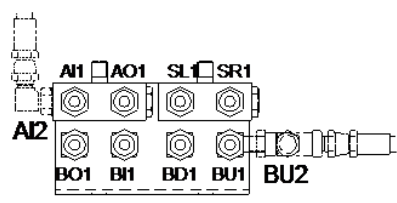
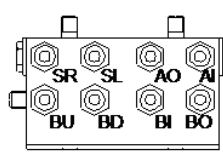
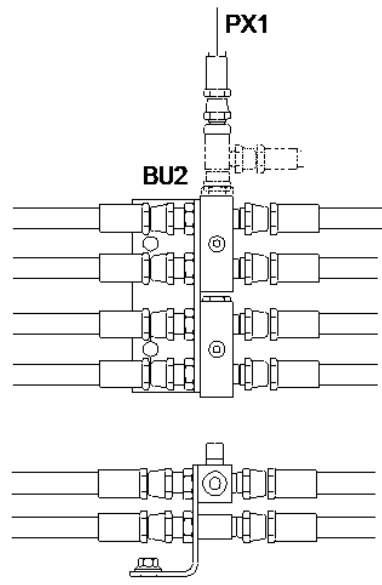
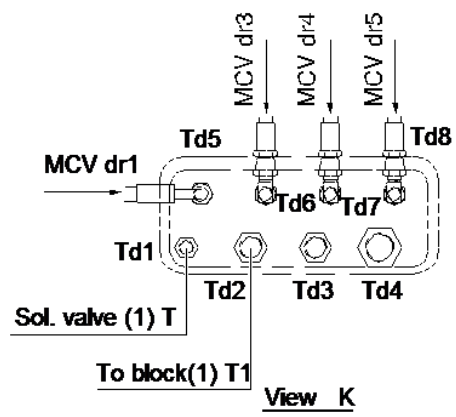
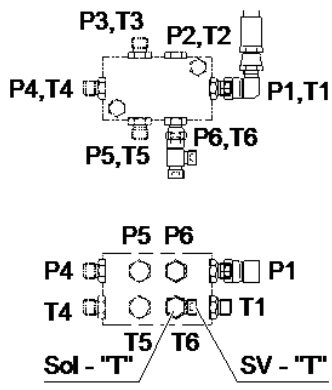
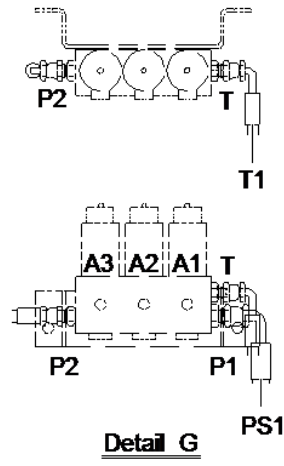
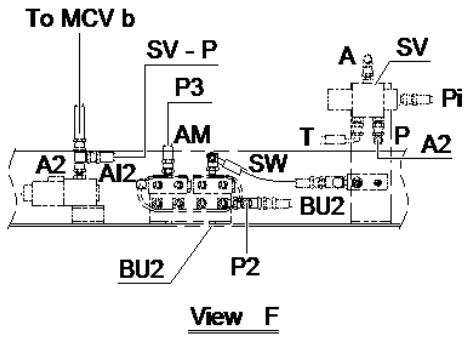
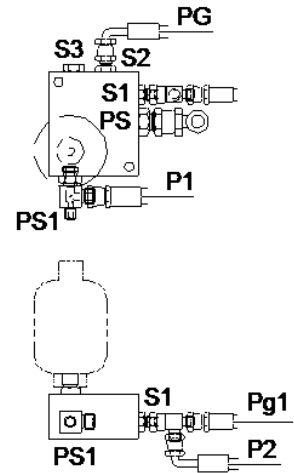
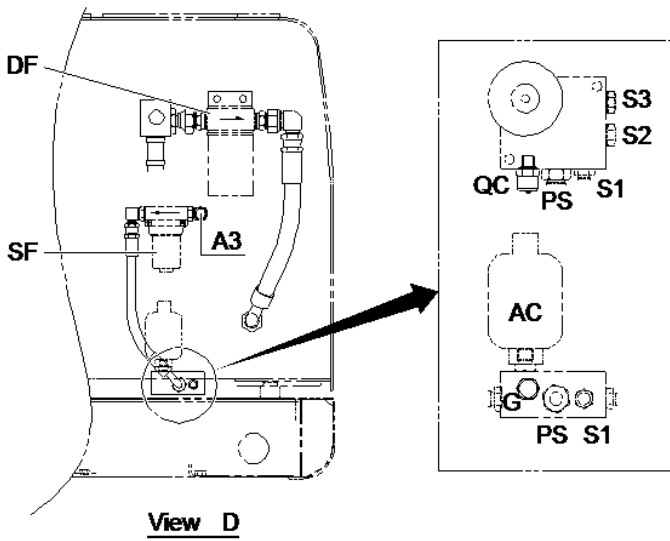


Figure 2
Servo hydraulic lines (2)

MCV	Main control valve	SF	Suction filter
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SV	Solenoid valve	QC	Quick coupler
DF	Drain filter	AC	Accumulator



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