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HYDRAULIC EXCAVATOR
CX130



CASE TRAINING CENTRE
AUGUST 2000

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SECTION N°1
GENERALE INTRODUCTION

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Cleanning

Clean all metal parts except bearings, in a suitable cleaning solvent or by steam cleaning. Do not use caustic soda for steam cleaning. After cleaning, dry and put oil on all parts. Clean oil passages with compressed air. Clean bearings in a suitable cleaning solvent, dry the bearings completely and put oil on the bearings.

Inspection

Check all parts when the parts are disassembled. Replace all parts that have wear or damage. Small scoring or grooves can be removed with a hone or crocus cloth. Complete a visual inspection for indications of wear, pitting and the replacement of parts necessary to prevent early failures.

Bearings

Check bearings for easy action. If bearings have a loose fit or rough action replace the bearing. Wash bearings with a suitable cleaning solvent and permit to air dry. DO NOT DRY BEARINGS WITH COMPRESSED AIR.

Needle bearings

Before you press needle bearings in a bore always remove any metal protrusions in the bore or edge of the bore. Before you press bearings into position put petroleum jelly on the inside and outside diameter of the bearings.

Gears

Check all gears for wear and damage. Replace gears that have wear or damage.

Oil seals, O-rings and gaskets

Always install new oil seals, O-rings and gaskets. Put petroleum jelly on seals and O-rings.

Shafts

Check all shafts that have wear or damage. Check the bearing and oil seal surfaces of the shafts for damage.

Service parts

Always install genuine Case service parts. When ordering refer to the Parts Catalog for the correct part number of the genuine Case replacement items. Failures due to the use of other than genuine Case replacement parts are not covered by warranty.

Lubrication

Only use the oils and lubricants specified in the Operator’s or Service Manuals. Failures due to the use of non-specified oils and lubricants are not covered by warranty.

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SAFETY

WARNING: This symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED. The message that follows the symbol contains important information about safety. Carefully read the message. Make sure you fully understand the causes of possible injury or death.

To prevent injury always follow the Warning, Caution and Danger notes in this section and throughout the manual.
Place a “Do not operate“ tag on the starter switch key before carrying out any service or repair work on the machine.

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WARNING: Read the operator’s manual to familiarize yourself with the correct control functions.

WARNING: Operate the machine and equipment controls from the seat position only. Any other method could result in serious injury.

WARNING: This is a one man machine, no riders allowed.

WARNING: Before starting engine, study Operator’s Manual safety messages. Read all safety signs on machine. Clear the area of other persons. Learn and practice safe use of controls before operating.
It is your responsibility to understand and follow manufacturers instructions on machine operation, service and to observe pertinent laws and regulations. Operator’s and Service Manuals may be obtained from your Case dealer.

WARNING: If you wear clothing that is too loose or do not use the correct safety equipment for your job, you can be injured. Always wear clothing that will not catch on objects. Extra safety equipment that can be required includes hard hat, safety shoes, ear protection, eye or face protection, heavy gloves and reflector clothing.

WARNING: When working in the area of the fan belt with the engine running, avoid loose clothing if possible, and use extreme caution.

WARNING: When doing checks and tests on the equipment hydraulics, follow the procedures as they are written. DO NOT change the procedure.

WARNING: When putting the hydraulic cylinders on this machine through the necessary cycles to check operation or to remove air from a circuit, make sure all people are out of the way.

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WARNING: Use insulated gloves or mittens when working with hot parts.

WARNING: Lower all attachments to the ground or use stands to safely support the attachments before you do any maintenance or service.

WARNING: Pin sized and smaller streams of hydraulic oil under pressure can penetrate the skin and result in serious infection. If hydraulic oil under pressure does penetrate the skin, seek medical treatment immediately. Maintain all hoses and tubes in good condition. Make sure all connections are tight. Make a replacement of any tube or hose that is damaged or thought to be damaged. DO NOT use your hand to check for leaks, use a piece of cardboard or wood.

WARNING: When removing hardened pins such as a pivot pin, or a hardened shaft, use a soft head (brass or bronze) hammer or use a driver made from brass or bronze and a steel head hammer.

WARNING: When using a hammer to remove and install pivot pins or separate parts using compressed air or using a grinder, wear eye protection that completely encloses the eyes (approved goggles or other approved eye protectors).

WARNING: Use suitable floor (service) jacks or chain hoist to raise wheels or tracks off the floor. Always block machine in place with suitable safety stands.

WARNING: When servicing or repairing the machine, keep the shop floor and operator's compartment and steps free of oil, water, grease, tools, etc. Use an oil absorbing material and/or shop cloths as required. Use safe practices at all times.

WARNING: Some components of this machine are very heavy. Use suitable lifting equipment or additional help as instructed in this Service Manual.

WARNING: Engine exhaust fumes can cause death. If it is necessary to start the engine in a closed place, remove the exhaust fumes from the area with an exhaust pipe extension. Open the doors and get outside air into the area.

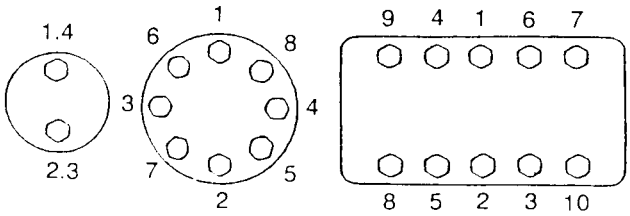
WARNING: When the battery electrolyte is frozen, the battery can explode if (1), you try to charge the battery, or (2), you try to jump start and run the engine. To prevent the battery electrolyte from freezing, try to keep the battery at full charge. If you do not follow these instructions, you or others in the area can be injured.

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STANDARD TORQUE DATA FOR CAP SCREWS AND NUTS

Tightening of cap screws, nuts

Tighten alternately so that tightening torque can be applied evenly. The numbers in the figure below indicate the order of tightening.



JS00481A

Cap screws which have had Loctite used (white residue remains after removal) should be cleaned with light oil or suitable cleaning solvent and dried. Apply 2-3 drops of Loctite to the thread portion of the cap screw and then tighten.

Torque table

Tighten cap screws and nuts according to the table below if there are no other special instructions.

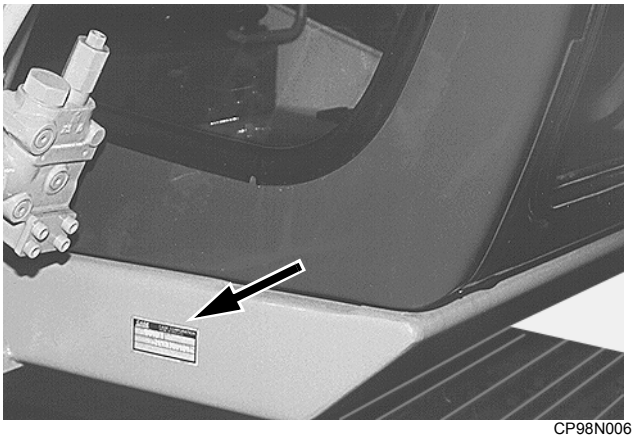
Cap Screw Name Size (Size)			M6	M8	M10	M12	M14	M16	M18	M20
Cap Screw	Spanner	[mm]	10	13	17	19	22	24	27	30
		[in.]	0.39	0.51	0.67	0.75	0.87	0.95	1.06	1.18
	Tightening torque	[Nm]	6.9	19.6	39.2	58.8	98.1	157.2	196.0	274.0
		[lb-ft]	5.1	14.5	29.0	43.4	72.5	116.0	144.6	202.4
Socket Head Cap Screw	Spanner	[mm]	5	6	8	10	12	14	14	17
		[in.]	0.20	0.24	0.32	0.39	0.47	0.55	0.55	0.67
	Tightening torque	[Nm]	8.8	21.6	42.1	78.4	117.6	176.4	245.0	343.0
		[lb-ft]	6.5	15.9	31.1	57.8	86.8	130.1	180.8	253.1

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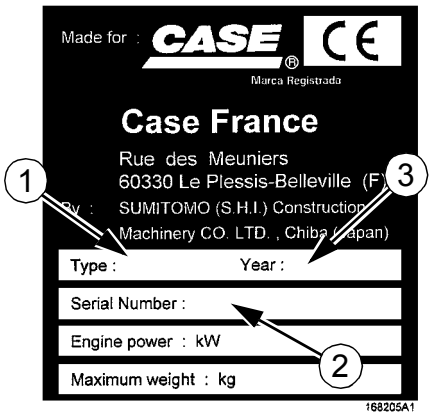
TYPE, SERIAL NUMBER AND YEAR OF MANUFACTURE OF THE MACHINE

When placing a parts order or making a request for information or assistance, always give you CASE Dealer the type and serial number of the machine concerned.
Enter the required information on the lines below: Type, serial number, year of manufacture of the machine and the serial numbers of hydraulic and mechanical components.

Machine



CP98N006



CS99A668

(1) Type .....
(2) Serial number .....
(3) Year of manufacture .....

Engine

Make and type
Serial number

Component serial numbers

Hydraulic pump
Swing reduction gear
Travel reduction gears
Travel control valve
Attachment control valve
Swing control valve

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FLUIDS AND LUBRICANTS

Lubricants must have the correct properties for each application.

WARNING: The conditions of use for individual fluids and lubricants must be respected.

Hydraulic fluid

CASE hydraulic fluid is specially designed for high pressure applications and for the CASE hydraulic system. The type of fluid to be used depends on the ambient temperature.

Temperate climates
-20°C to +40°C
Fluid type ISO VG 46
CASE reference: POHYDR

Hot climates
0°C to +60°C
Fluid type ISO VG 100
CASE reference: POHYPC

Cold climates
-40°C to +20°C
Fluid type ISO VG 22
CASE reference: POHYPF

These various grades of fluid must be in conformity with the CASE specification.

Transmission component oil

Extreme pressure oil used for transmission components inside sealed housings.
Extreme pressure oil TYPE API GL5 GRADE 80W90 or ISO VG 150.

Grease

The type of grease to use depends on ambient temperature.

Temperate and hot climates
-20°C to +60°C
Extreme pressure grease EP NLGI grade 2 with molybdenum disulphide.

Cold climates
-40°C to +20°C
Extreme pressure grease EP NLGI grade 0.

Engine oil

CASE engine oil No. 1 is recommended for your engine. This oil ensures correct lubrication of your engine in all working conditions.
If CASE No. 1 Multiperformance or Performance engine oil is not available, use oil corresponding to category API/CG/CF.
Do not put any Performance Additive or other additive in the sump. Oil change intervals shown in this manual are based on tests carried out on CASE lubricants.

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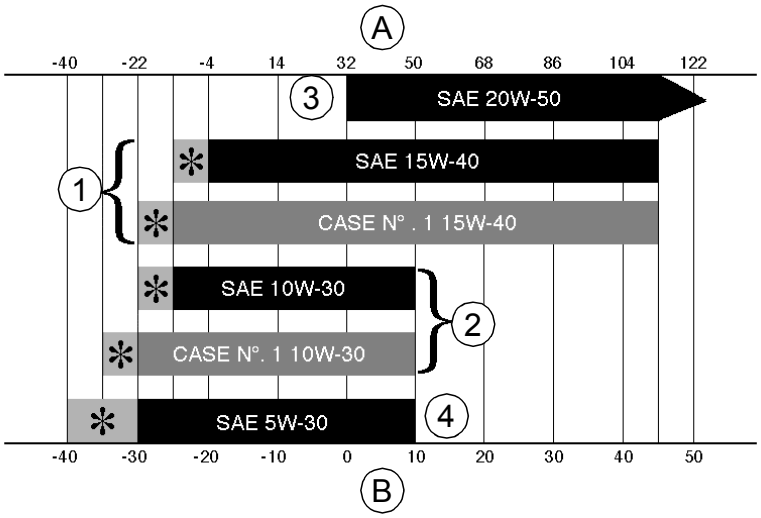


RD97F136



RD97F100

Oil viscosity/Oil range



CS98M561

(A) FAHRENHEIT temperature
(B) CELSIUS temperature

(1) all-seasons
(2) winter
(3) tropical
(4) Arctic

(*) shows that an engine oil heater or engine coolant solution heater must be used.

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Fuel

Use fuel that is to ASTM (American Society for Testing and Materials) D975 standard.
Use Grade No. 2 fuel. The use of other types of fuel can result in a loss of power and may cause high fuel consumption.
In cold weather, the use of a mixture of fuels No. 1 and No. 2 is temporarily permitted. Consult your fuel supplier.
If the temperature falls below the fuel cloud point (point at which wax begins to form) the wax crystals will cause power loss or will prevent the engine from starting.

IMPORTANT : In cold weather, fill the fuel tank at the end of the day's work, in order to prevent the formation of condensation.

Fuel storage

Long storage can lead to the accumulation of impurities and condensation in the fuel. Engine trouble can often be traced to the presence of water in the fuel.
The storage tank must be placed outside and the temperature of the fuel should be kept as low as possible. Drain off water and impurities regularly.

Anti-freeze/Anti-corrosion

Use anti-freeze in all seasons to protect the cooling system from corrosion and all risk of freezing.
In environments with a temperature higher than -36°C, use a mixture of 50% ethylene-glycol based anti-freeze.
For areas where the temperature is below -36°C, it is advisable to use a blend of 40% water and 60% anti-freeze.

Environment

Before carrying out any servicing operation on this machine and before disposing of used fluids or lubricants, always think of the environment. Never throw fluid or oil on the ground and never keep them in leaking receptacles.
Consult your local ecological recycling centre to obtain information on the appropriate means of disposing of these substances.

Components made from plastic or resin

When cleaning plastic parts, the console, the instrument panel, the gauges, etc., do not use petrol (gasoline), paraffin (kerosene), paint solvents, etc. Use only water, soap and a soft cloth.
The use of petrol (gasoline), paraffin (kerosene), paint solvents, etc, will cause discoloration, cracking or deformation of these components.

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Engine CX130

Make - - - - - Isuzu
Model - - - - - BB-4BG1T
Type: Four stroke, water-cooled, overhead valve, direct injection electronically controlled), in-line engine with turbo-charger.
Number of cylinders - - - - - 4
Bore and stroke - - - - - 105x125 mm
Cubic capacity - - - - - 4329 cm^3

Operating conditions

Speed - - - - - 2100 rpm
ECC 1289 power rating - - - - - 69.1 kW (94 hp
Couple maxi - - - - - 324 Nm at 1600 rpm

Capacities

Engine oil capacity - - - - - 15 litres
Engine cooling system- - - - - 17.7 litres
Fuel tank - - - - - 250 litres
Hydraulic fluid reservoir capacity - - - - - 73 litres
Total hydraulic system capacity - - - - - 123 litres
Travel reduction gear housing capacity - - - - - 3 litres
Swing drive housing capacity - - - - - 2.2 litres

NOTE: These capacities are only provided in an indicative manner. To check fluid levels, always use the oil dipstick, sight glasses or the filler cap.

Electrical system

Type of system - - - - - 24 volts negative earth
Alternator amperage - - - - - 40 amps
Battery
Number of batteries required - - - - - 2
Voltage of each battery - - - - - 12 volts
Capacity120 Ah
Starter motor
Voltage - - - - - 24 volts
Power - - - - - 4.5 kW

Hydraulic system

Hydraulic pump- - - - - CX130
Double, axial piston, variable flow pump
Maximum pump flow - - - - - 2x123 l/min
Fixed flow pump (pilot system)
Maximum pilot pump flow - - - - - 23 l/min
Working pressure
Standard - - - - - 343 ±3 bar
Higher pressure (2-stage relief) - - - - - 363 ±5 bar

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Cylinder

	Boom cylinder	Dipper cylinder	Bucket cylinder
	CX130	CX130	CX130
Barrel diameter	105 mm	115 mm	95 mm
Rod diameter	70 mm	80 mm	65 mm
Stroke	990 mm	1110 mm	880 mm

Control valve

Five section control valve for dipper, boom acceleration, swing, option and RH travel.
Four section control valve for dipper acceleration, bucket, boom and LH travel.
Load holding valve for boom and dipper.

Swing

Fixed flow, axial piston motor.

Automatic disc brake.
upperstructure swing speed - 13.4 rpm

Travel

Two-speed, axial piston motor.
Automatic disc brake.
First speed - 3.8 kph
Second speed - 5.5 kph
Gradeability - 70% (35°)
Tractive force - 10 000 daN

Attachment

Break-out force (standard/higher pressure (2-stage relief)) - /8640 daN
Crowd force (standard/higher pressure (2-stage relief)) - /6560 daN

Undercarriage

One-piece undercarriage with welded components.
Lubricated rollers and idler wheels.
Grease type track tension.
Ground pressure
with 500 mm track pads- 0.39 bar
with 600 mm track pads- 0.33 bar
with 700 mm track pads- 0.29 bar

Weight

Engine361 kg
Hydraulic pump90 kg
Attachment control valve140 kg
Motor/reduction gear assembly99 kg
travel motor/reduction gear assembly144 kg
Boom cylinder108 kg
Dipper cylinder157 kg
Bucket cylinder93 kg

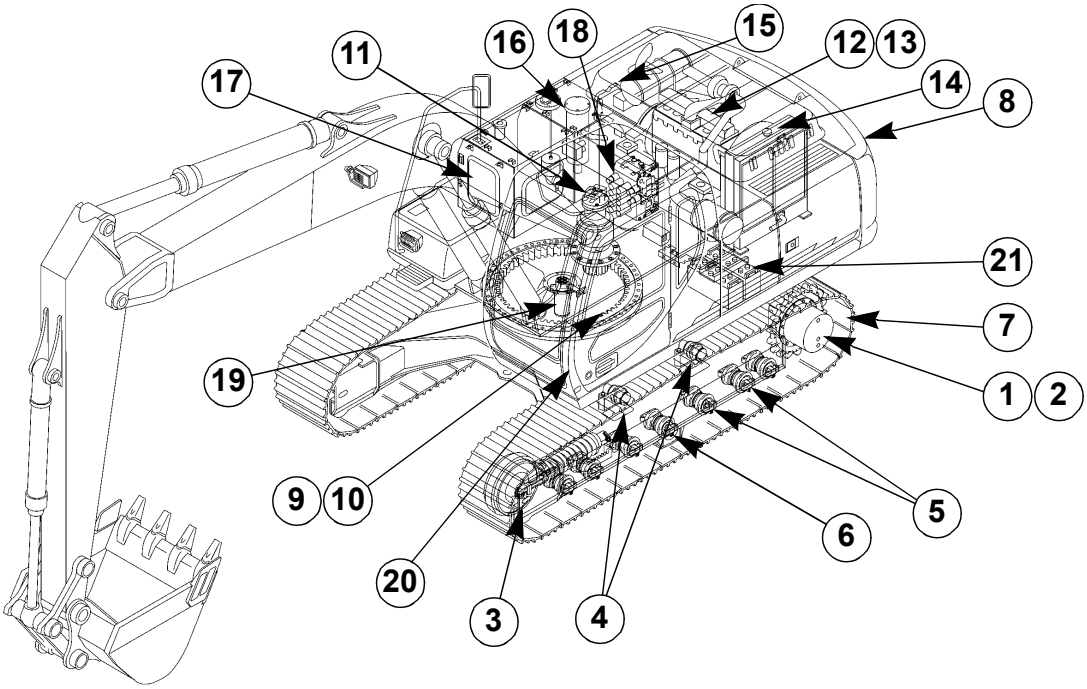
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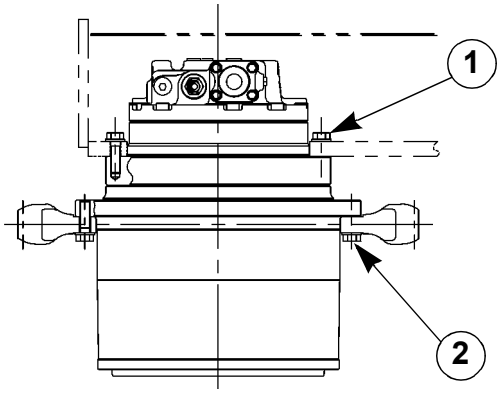
SPECIAL TORQUE SETTINGS

N	Component	Screw (Ø)	Key (mm)	Torque setting (Nm)	
				CX130	CX210
1 *	Travel motor/reduction gear assembly	M16	24	267-312	267-312
2 *	Sprocket	M16	24	267-312	267-312
3 *	Idler wheel	M16	24	267-312	267-312
4 *	Upper roller	M16	24	267-312	-
		M20	30	-	521-608
5 *	Lower roller	M16	27	267-312	-
		M18	27	-	371-432
6	Chain guide	M18	27	-	380-443
7	Track pad	M16	24	392-430	-
		M20	30	-	300 + 120°
8	Counterweight	M27	41	844-980	-
		M27	41	-	1058-1235
		M30	46	-	1333-1549
9	Turntable (undercarriage)	M16	24	280-322	-
		M20	30	-	468-545
		M24	36	-	783-913
10	Turntable (upperstructure)	M16	24	280-322	-
		M20	30	-	468-545
		M24	36	-	783-913
11 *	Swing motor/reduction gear assembly	M16	24	280-322	-
		M20	30	-	521-608
		M24	36	-	783-913
12 *	Engine	M16	24	265-313	265-313
13 *	Engine support	M10	17	64-73	64-74
14	Radiator	M12	19	64-73	-
		M16	24	-	147-176
15 *	Hydraulic pump	M10	17	63-72	-
		M10	17	-	64-74
		M20		-	367-496
16 *	Hydraulic reservoir	M16	24	206-247	-
		M16	24	-	232-276
17 *	Fuel tank	M16	24	206-247	-
		M16	24	-	232-276
18 *	Control valve	M16	24	267-312	267-312
		M12	19	88-107	-
19 *	Hydraulic swivel	M12	19	109-127	109-127
20	Cab	M16	24	78-80	78-80
21	Battery	M10	17	20-29	20-29

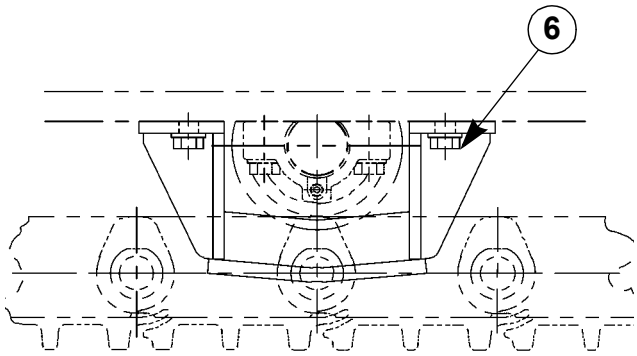
Nota: Use Loctite 262 or an equivalent on retaining screws of components marked with an asterisk (*).

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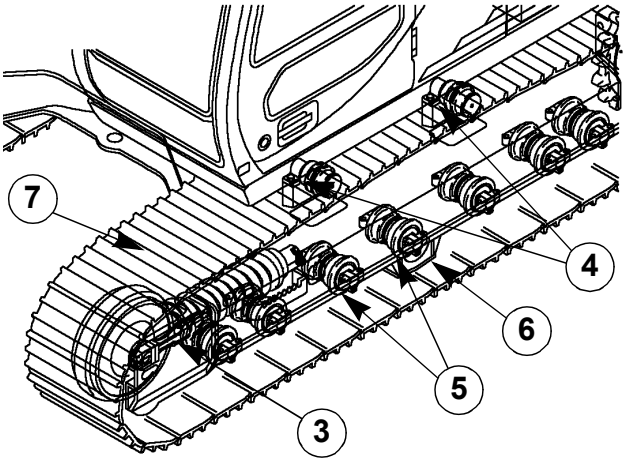




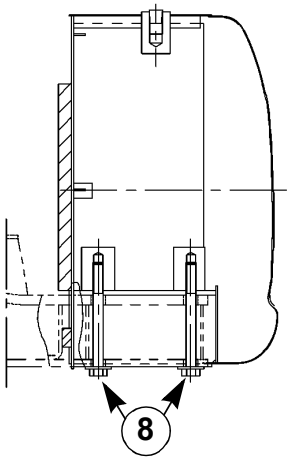
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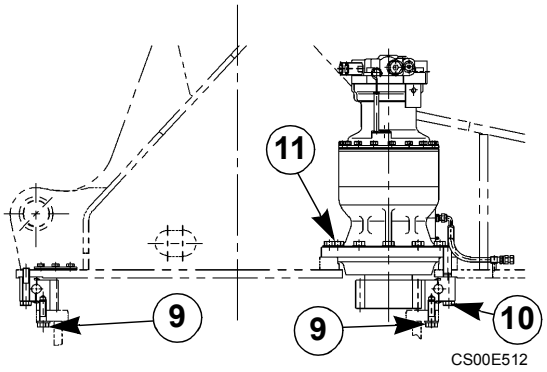
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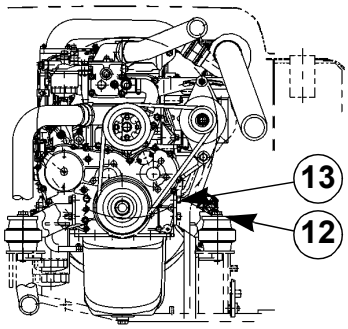
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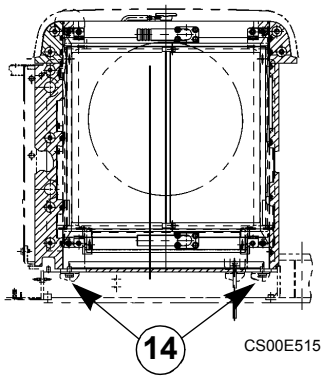
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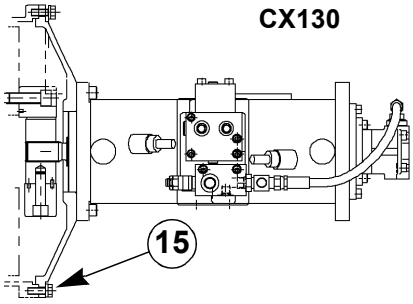
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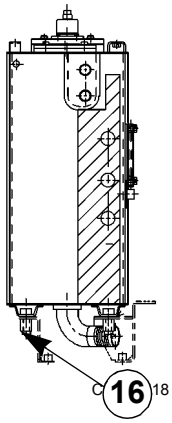
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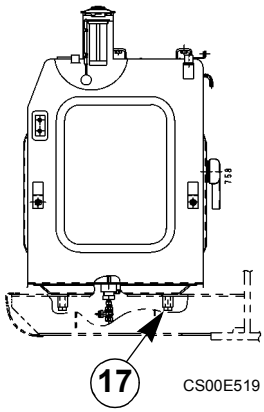


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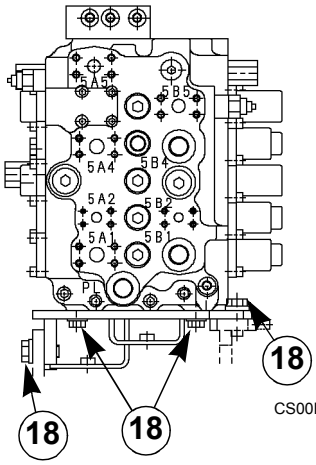


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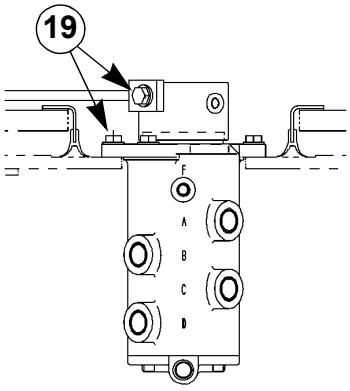


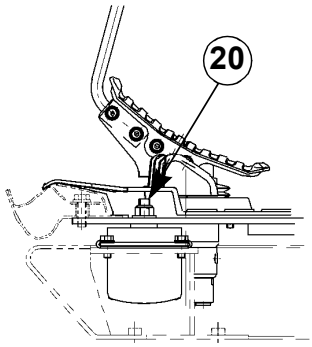


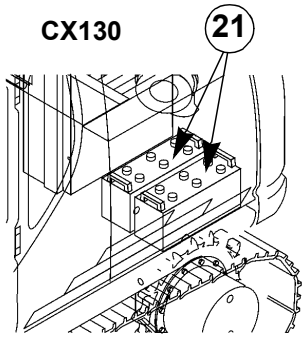
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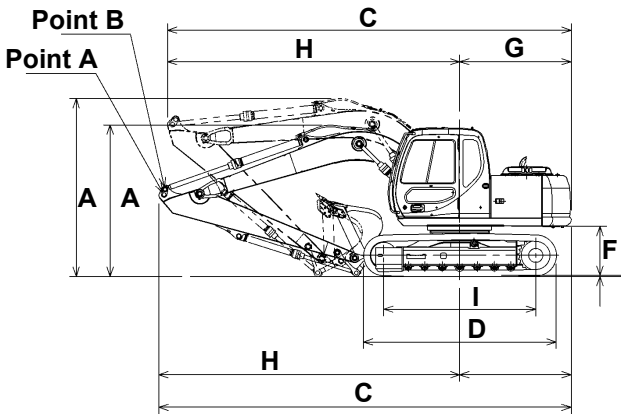




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MACHINE OVERALL DIMENSIONS

Only on CX130 machines with 3 m dipper



CS00E527

Point A: Working position
Point B: Transport position

IMPORTANT: *For CX130 machines with 3 m dipper, it is imperative that the dipper cylinder head/dipper linkage is positioned at point B.*

NOTE: *Never work with the pin in this position.*

WARNING: *When the dipper cylinder is placed in position B (transport), take care not to damage the cab, there can be interference between the bucket and the cab.*

	CX130			
	Dipper			
	2.10 m	2.50 m	3.00 m (A)	3.00 m (B)
A	2.74 m	2.74 m	3.26 m	2.78 m
B	2.74 m	2.74 m	2.74 m	2.74 m
C	7.48 m	7.49 m	7.38 m	7.54 m
D	3.54 m	3.54 m	3.54 m	3.54 m
E	2.52 m	2.52 m	2.52 m	2.52 m
F	0.894 m	0.894 m	0.894 m	0.894 m
G	2.04 m	2.04 m	2.04 m	2.04 m
H	5.44 m	5.45 m	5.34 m	5.50 m
I	2.78 m	2.78 m	2.78 m	2.78 m
J	1.99 m	1.99 m	1.99 m	1.99 m
K	0.50 m	0.50 m	0.50 m	0.50 m
L (with 500 mm track pads)	2.49 m	2.49 m	2.49 m	2.49 m
L (with 600 mm track pads)	2.59 m	2.59 m	2.59 m	2.59 m
L (with 700 mm track pads)	2.69 m	2.69 m	2.69 m	2.69 m
M	0.46 m	0.46 m	0.46 m	0.46 m

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FLUIDS AND LUBRICANTS

Lubricants must have the correct properties for each application.

> **WARNING:** *The conditions of use for individual fluids and lubricants must be respected.*

Hydraulic fluid

CASE hydraulic fluid is specially designed for high pressure applications and for the CASE hydraulic system. The type of fluid to be used depends on the ambient temperature.

Temperate climates

-20°C to +40°C
Fluid type ISO VG 46

Hot climates

0°C to +60°C
Fluid type ISO VG 100

Cold climates

-40°C to +20°C
Fluid type ISO VG 22

These various grades of fluid must be in conformity with CASE.

Transmission component oil

Extreme pressure oil used for enclosed transmission components.
Extreme pressure oil type API GL5 grade 80W90 or ISO VG 150

Grease

The type of grease to use depends on ambient temperature.

Temperate and hot climates

-20°C to +60°C
Extreme pressure grease EP NLGI grade 2 with molybdenum disulphide.

Cold climates

-40°C to +20°C
Extreme pressure grease EP NLGI grade 0.

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Engine oil

CASE N°1 motor oil is the oil recommended for your engine. This oil ensures correct lubrication of your engine in all working conditions.

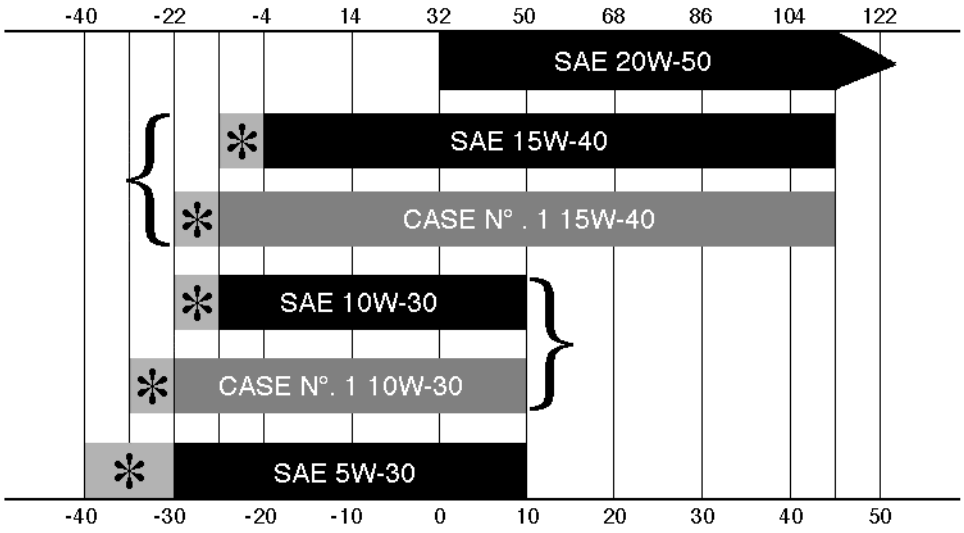
If CASE N°1 Multiperformance or Performance engine oil cannot be obtained, use only oil of the API/CG/CF category.

NOTE: *Do not put any Performance Additive or other additive in the sump. Oil change intervals shown in this manual are based on tests carried out on CASE lubricants.*





Oil viscosity/Oil range



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(A) Fahrenheit Temperature
(B) Celsius Temperature
(1) All seasons
(2) Winter
(3) Tropical
(4) Arctic
(*) Use of an engine oil heater, or and engine coolant heater is required.

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PAGE	SERVICE POINTS	NB OF POINTS	INTERVALS IN HOURS				
			CLEAN	REPLACE	CHECK	GREASE	DRAIN
130/141	Hydraulic breaker (optional)	1			2/10/50 (A)		
144	Engine oil level	1			10		
148	Coolant level	1			10		
155	Hydraulic reservoir level	1			10		
177	Radiator and oil cooler	1	250		10		
178	Fan/alternator belt tension	1			10/250		
136	Attachment	18				50	
139	Quick coupler (optional)	1				50	
150	Drain fuel tank sediment	1			50		
150	Drain water separator	1			50		
164	Hydraulic system lines	-			50		
163	Return filter hydraulic breaker	1		100			
156	Drain hydraulic reservoir sediment	1			250		
166	Primary air filter element	1	250 (B)	1000 (C)	250 (B)		
169	Swing reduction gear oil level	1			250		
171	Travel reduction gears oil level	2			250		
176	Pad screw torque	-			250 (D)		
176	Idler wheel and rollers	-			250		
195	Air conditioning (optional)	-	250		250 (E)		
200	Screw and nut torque	-			250 (D)		
204	Batteries electrolyte level	2			250		
137	Turntable bearing	1				500	
140	Turntable bearing teeth	1				500	
145	Engine oil	1					500
145	Engine oil filters	2		500			
151	Fuel filter	1		500			
154	Hydraulic fluid condition	1			1000		
157	Pilot filter	1		1000 (F)			
160	Breather filter	1		1000			
166	Secondary air filter element	1		1000 (G)			
140/169	Swing reduction gear	1				5000	1000 (H)
172	Travel reduction gears	2					1000 (H)
157	Suction filter	1	2000	5000			
158	Return filter	1		2000 (F)			
159	Ultra clean filter	1		2000			
160	Hydraulic fluid	1		10 000			
75	Safety valves	2				(I)	
148	Cooling circuit	1					(J)
173	Tracks	2	(K)		(K)		
180	Fuel tank filter	1			(K)		
180	Machine inspection	-	(K)		(K)		
194	Fire extinguisher	1			(L)		

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(A) Have this checked by your CASE Dealer every 600 hours or once a year.

(B) Or when the central zone of the restriction indicator is red.

(C) Or after cleaning 6 times.

(D) Check after the first 50 hours during the run-in period.

(E) Have this checked by a specialist every 6 months.

(F) Replace after the first 50 hours during the run-in period.

(G) Or after cleaning the primary air filter element 3 times.

(H) Drain after the first 250 hours during the run-in period.

(I) Have this checked by your CASE Dealer every 6 months.

(J) Every two years or twice a year (autumn/spring) if antifreeze is used.

(K) Periodically.

(L) Check once a month and have it checked every 6 months by a specialist.

NOTE: *Once the machine has completed 500 hours (then 1000 hours, 1500 hours, etc...) the message "Service due" will appear on the screen by way of a reminder that service work is due. See "Systems display and control panel" (item 10), in the "Controls/Instruments/Accessories" Section.*

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HYDRAULIC EXCAVATOR
CX130



SECTION N°2
COMPONENTS LAYOUT

CASE TRAINING CENTRE
AUGUST 2000

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COMPONENTS LAYOUT CX130

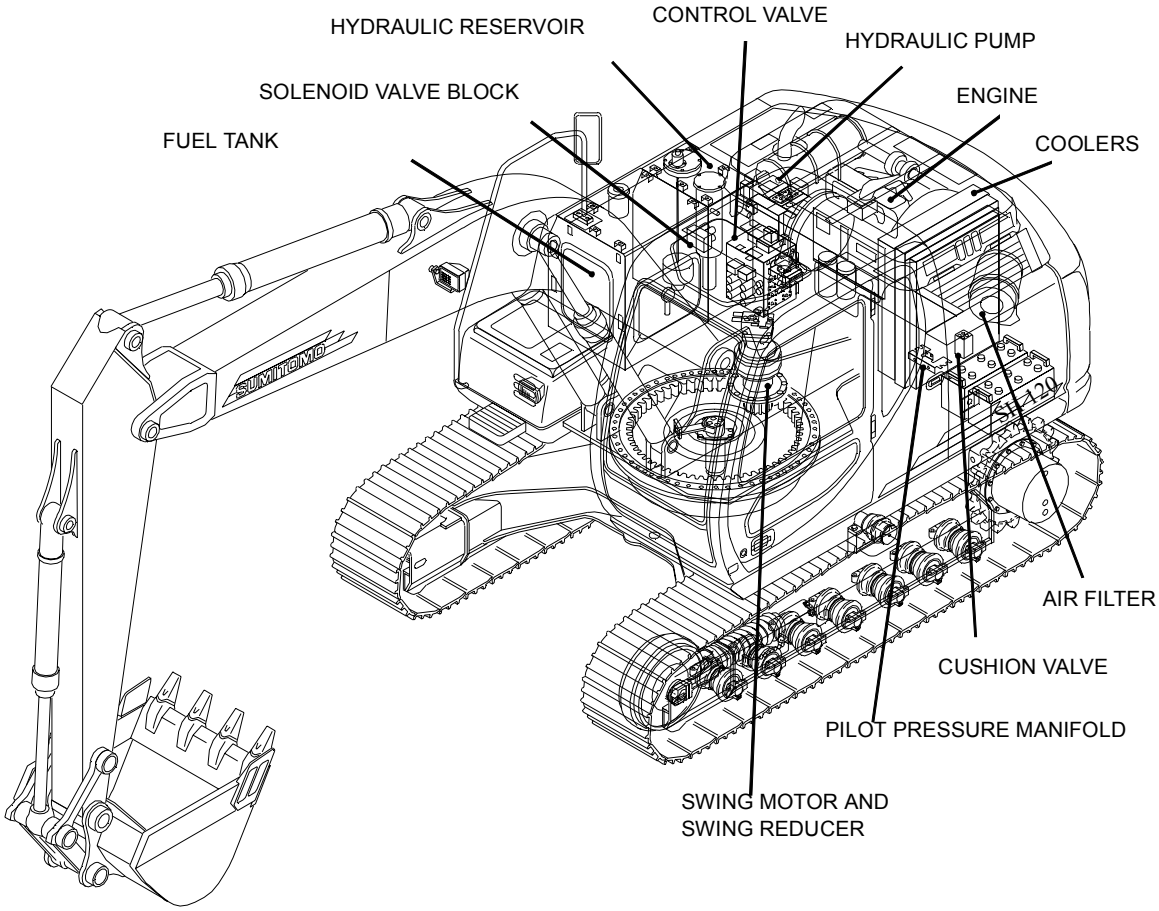
TABLE OF CONTENTS

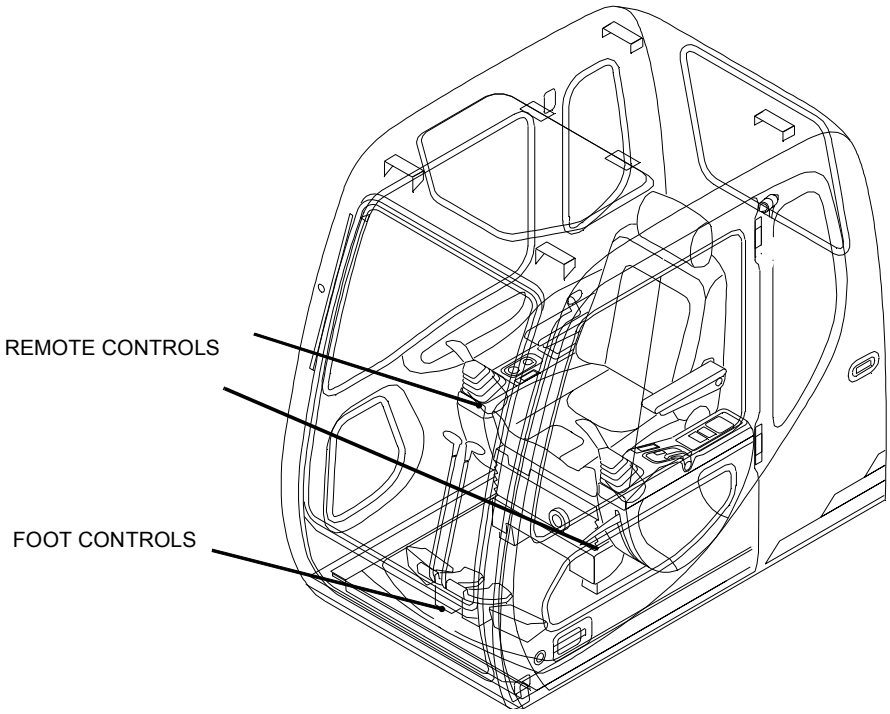
GENERAL LAYOUT 2
ELECTRICAL COMPONENT LAYOUT OF THE UPPER CHASSIS 3
ELECTRICAL COMPONENT LAYOUT OF THE CAB 4
CAB CONTROLS 5
INSTRUMENT PANEL 6

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COMPONENTS LAYOUT CX130

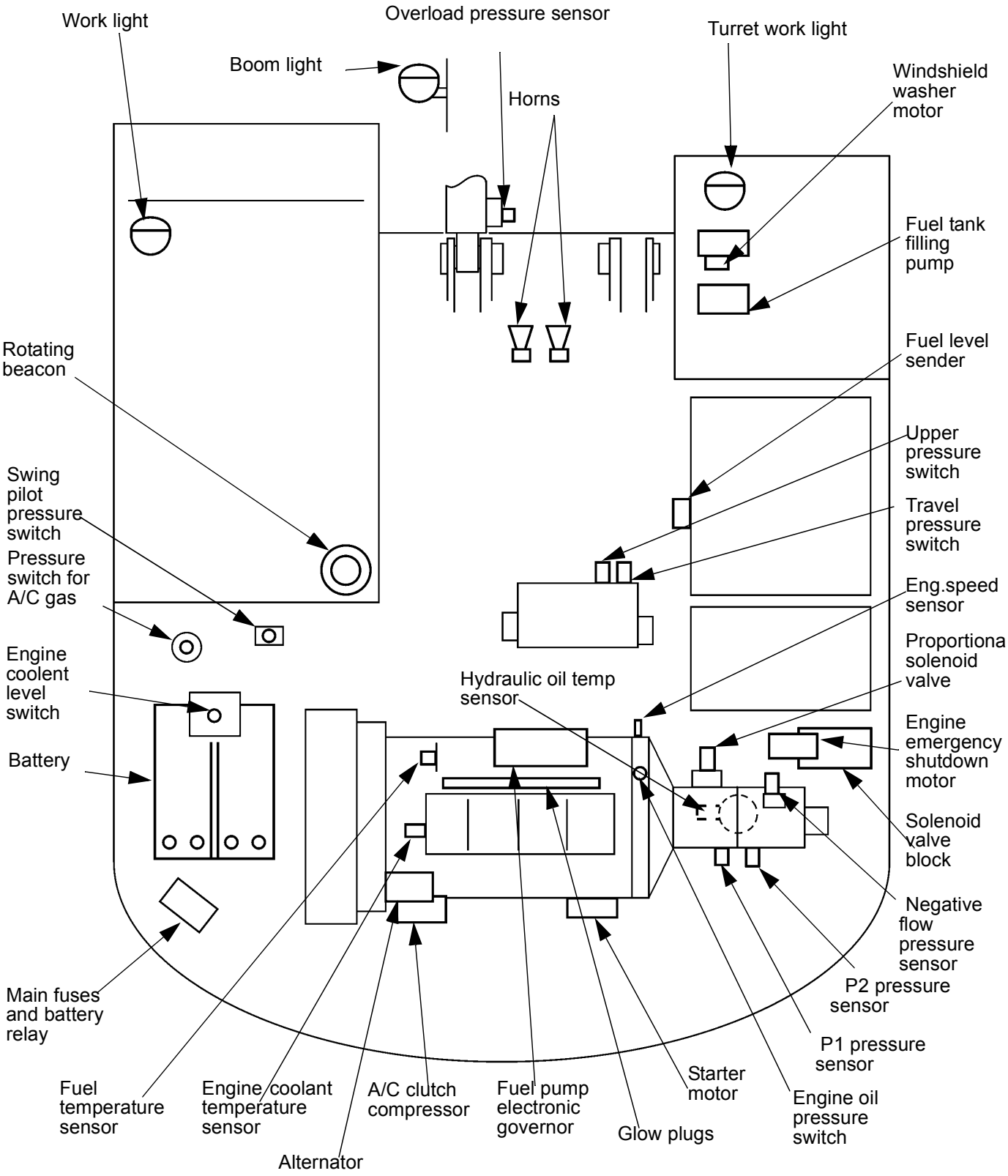
General layout





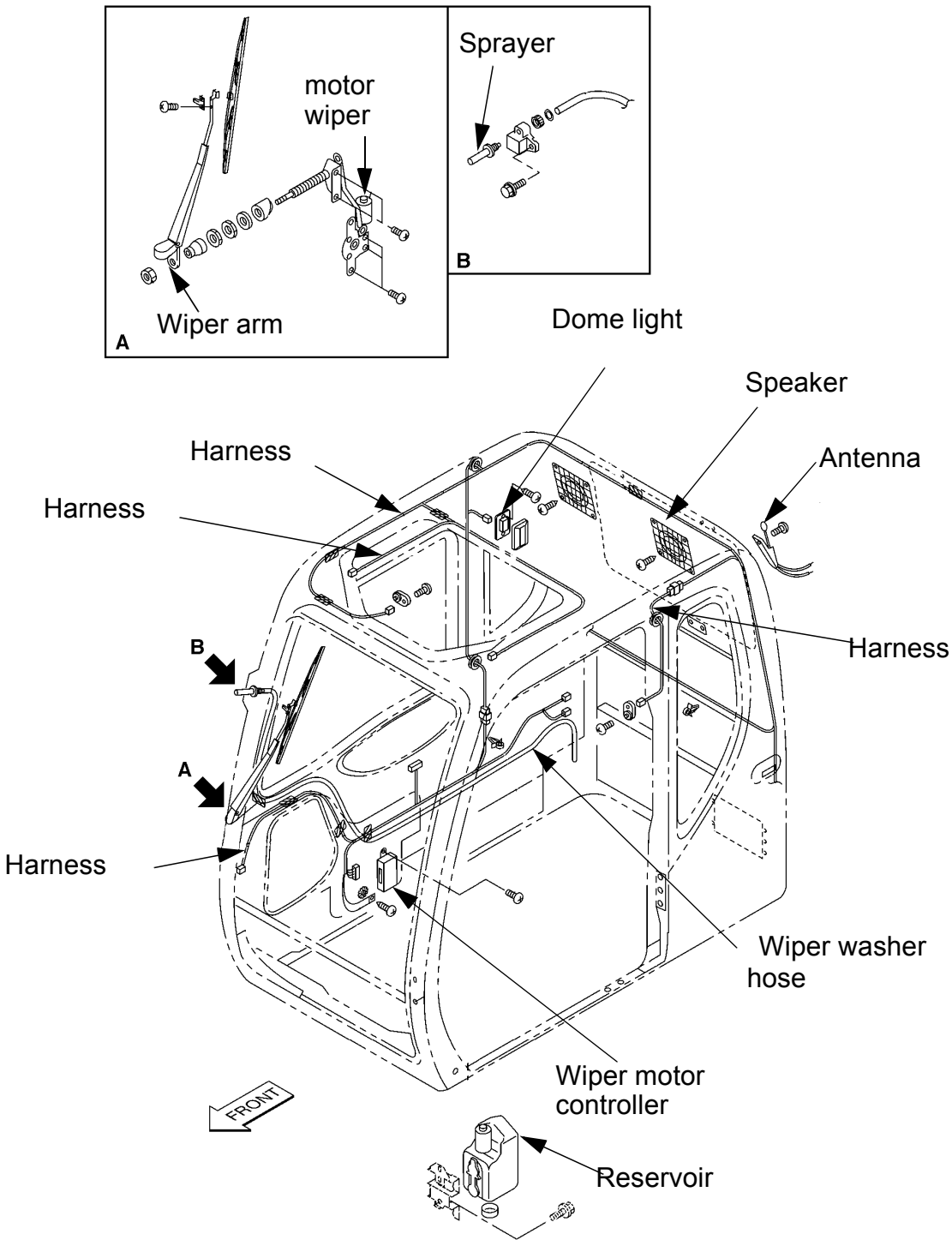
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Turret electrical components



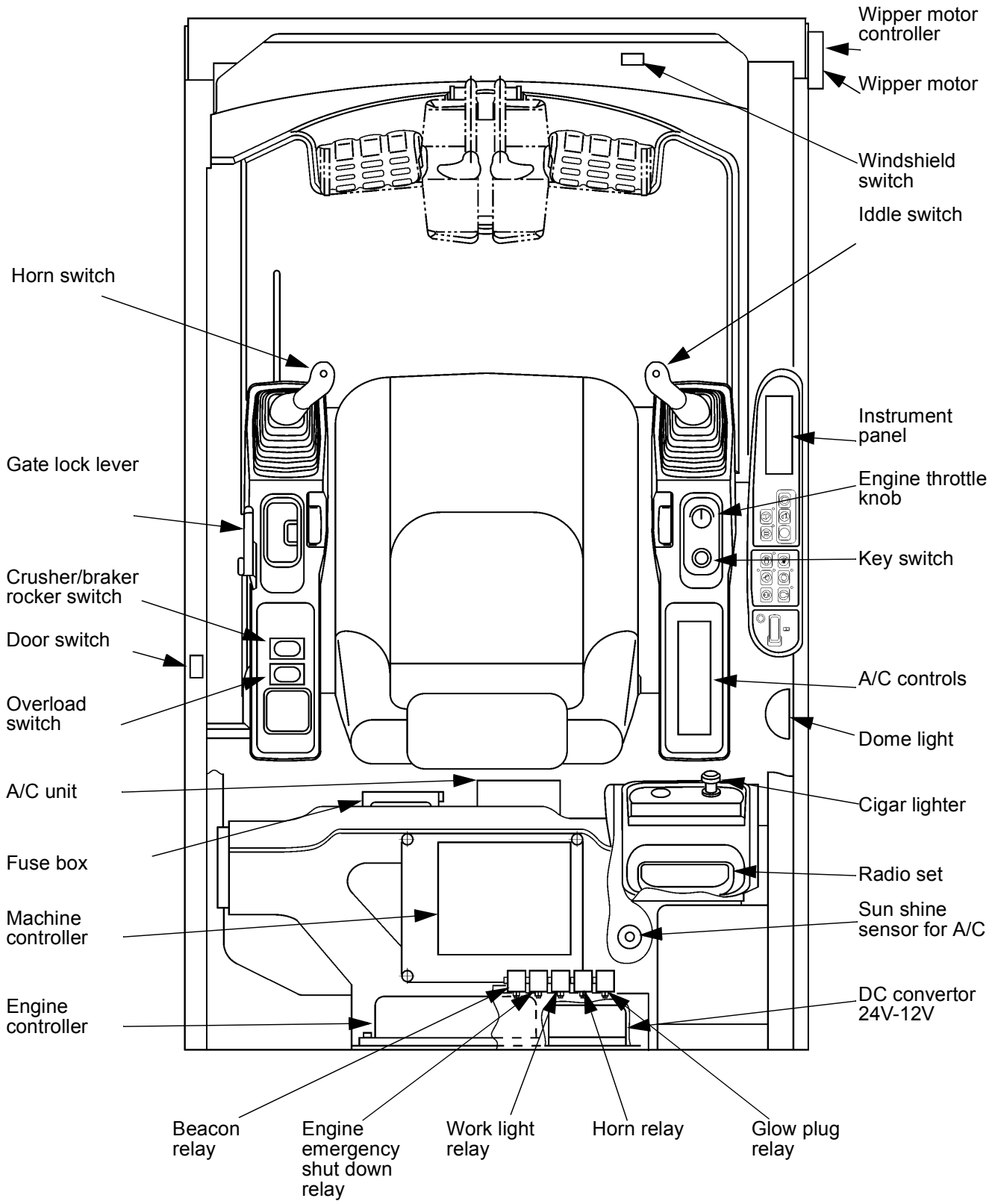
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Cab electrical components



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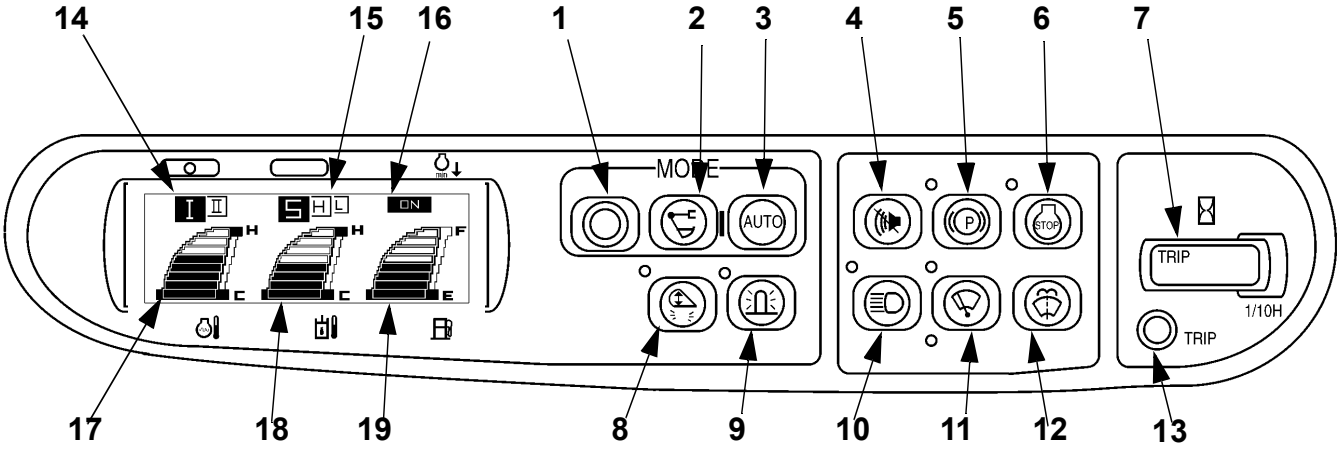
Cab controls



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COMPONENTS LAYOUT CX130

Instrument panel



1. Travel mode switch
2. Work mode switch
3. Auto mode switch
4. Buzzer stop switch
5. Swing brake switchr
6. Emergency shutdown switch
7. Hourmeter
8. Cushion switch
9. Rotating beacon switch
10. Work light switch
11. Wipper switch
12. Windshield washer switch
13. Hourmeter trip switch
14. Travel speed indicator (1 or 2)
15. Work mode indicator (H, S, L or Auto)
16. Auto iddle mode indicator
17. Engine coolent temperature bar-graph
18. Hydraulic oil temperature bar-graph
19. Fuel level bar-graph

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HYDRAULIC EXCAVATOR
CX130



SECTION N°3
COMPONENTS

CASE TRAINING CENTRE
AUGUST 2000

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Hand remote controls

In neutral the hand control is a closed center hydraulic valve. The inlet oil from the pilot pump is blocked at all four regulator spools (27). The ports (1), (2), (3), (4) are ported inside of the valve back to tank through the notches in the regulator spool (27).

There are two springs (20) and (21) for each regulator spool (27). The larger diameter spring (20) provides the return of the handle and this spring (20) is the resistance the operator feels in his wrist.

As the operator views the control, the front and back spring are stronger than the left and right springs. The hand control will require more effort to push and pull than to move side to side. The smaller springs (22) are the regulator spring which connect the plunger (9) to the spool (27).

If the dust cover (26) under the hand control is torn, replace it. This will help prevent contamination from wearing the seals (13) on the push rods (11) & (12).

The cam (24) that pushes on the push rods (11) or (12) can be rotated to adjust the free play in the hand control. A too tight adjustment can cause partial actuation of the spool. The contact area between the cam (24) and the push rods (11 & 12) should be lightly lubrecated with grease.

How it work

As the hand control is moved, the push rod (11 or 12) will push on both large and small diameter springs (20 &22).The smaller spring (22) will push the spool (27) and block of the return passage through the top meetering notches.

The bottom meetering notches will open a passage and allow pilot oil out to the work spool of the equipement control valve. As the work spool moves and compresses the spring in the control valve, the pressure will increase and push up on the bottom of the regulator spool (27). When the pressure of the oil pushing on the work spool equals the force of the spring (22) behind the regulator spool (27) the bottom meetering notches will block the pilot supply. When the force of the spring (22) equals the force of the pressure on the spool (27), the spool (27) is in a balanced position to maintain a proportional pressure with the compression of the spring (22).

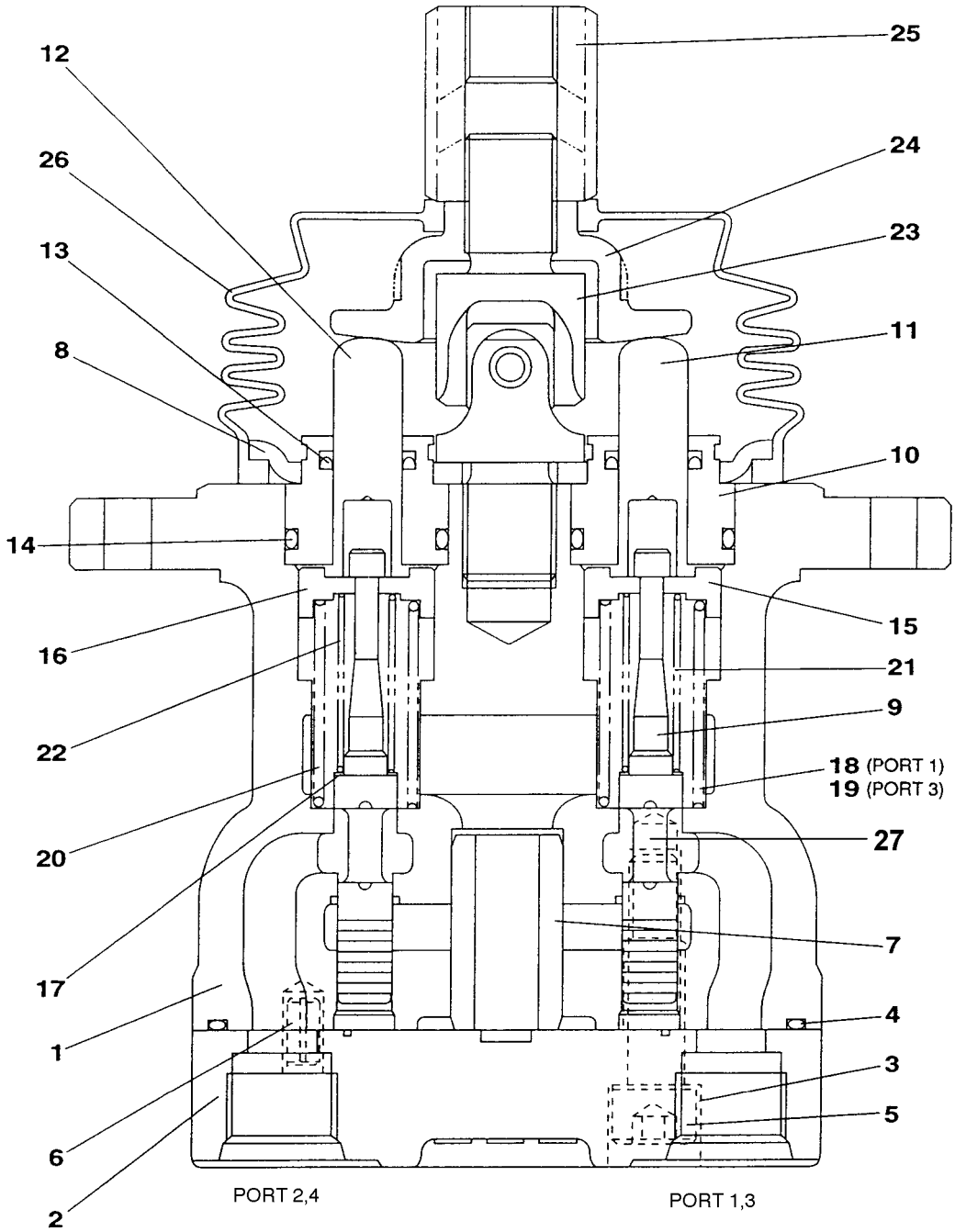
The hand control must be moved further to compress the small spring (22) and push the regulator spool (27) further to increase the pressure again.

The hand control is nothing more than an adjustable pressure regulator , and the operator provides adjustment .

1Body
2. Bottom plate
3. Washer
4. O-ring
5. Screw
6. Dowel
7. Spacer
8. Retainer
9. Spring guide
10. Push rod guide
11. Push rod
12. Push rod
13. Oil seal
14. O-ring
15. Spring cupt
16. Spring cup
17. Shims
18. Spring
19. Spring
20. Spring
21. Spring
22. Spring
23. U-joint
24. Cam
25. Nut
26. Rubber boot
27. Regulator spool

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Hand remote control



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Foot control

In neutral the foot control is a closed center hydraulic valve. The inlet oil from the pilot pump is blocked at both regulator spools (17). The ports (1), (2), (3), (4) are ported inside of the valve back to tank through a hole drilled in the end, and a cross drilled hole in the regulator spool (17).
There are two springs (20) and (21) for each regulator spool (17). The larger diameter spring (21) provides the return of the foot pedal and this spring (21) is the resistance the operator feels in his foot.
Typically the return springs are stronger in foot control than in hand control.

If the dust cover (30) under the foot control is torn, replace it. This will help prevent contamination from wearing the U-seals (6) on the push rods (8).
The gap between the push rod (8) and the screw (28) can be adjusted. A too tight adjustment can cause partial actuation of the spool. The contact area between the push rod (8) and the screw (28) should be lightly lubricated with grease.

How it work

As the foot control is moved, the push rod (8) will push on both large and small diameter springs (21 & 20). The smaller spring (20) will push the spool (17) and block of the return passage through the top meetering notches.

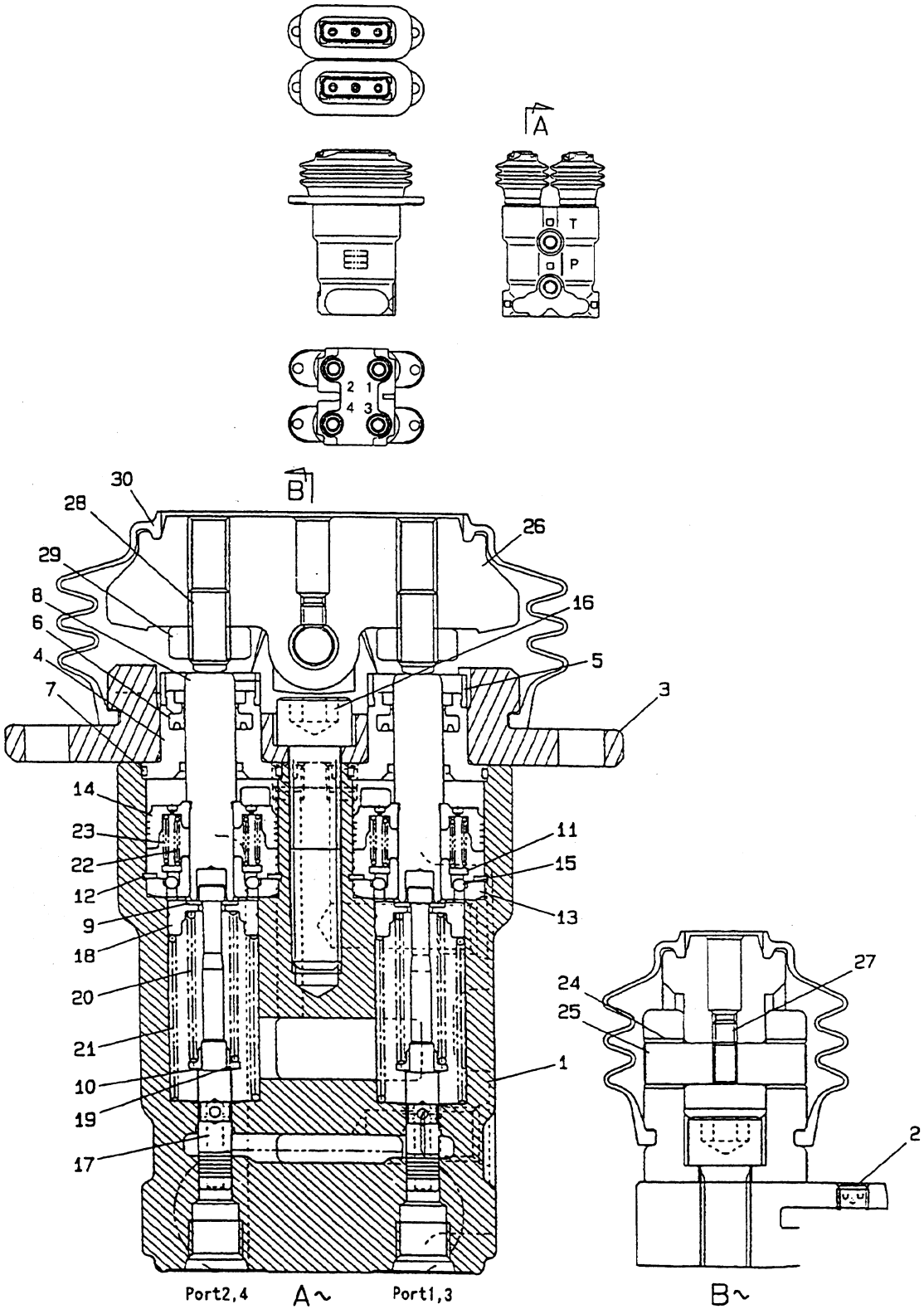
The bottom metering land will open a passage and allow pilot oil out to the work spool of the travel control spool. As the travel spool moves and compresses the spring in the control valve, the pressure will increase and push up on the bottom of the regulator spool (17). When the pressure of the oil pushing on the travel spool equals the force of the spring (20) behind the regulator spool (17) the bottom metering land will block the pilot supply. When the force of the spring (20) equals the force of the pressure on the spool (17), the spool (17) is in a balanced position to maintain a proportional pressure with the compression of the spring (20).

The foot control must be moved further to compress the small spring (20) and push the regulator spool (17) further to increase the pressure again.
The foot control is nothing more than an adjustable pressure regulator, and the operator provides adjustment .

1Body	11>Spring cup	21>Spring (feel lback)
2>Plug	12>Snap ring	22>Spring
3>Mounting braket	13>Ball seat	23>Spring
4>Bushing	14>Piston	24>Bushing
5>Seal cover	15>Ball	25>Shaft
6>U-seal (retainer)	16>Bolt	26>Cam
7>O-ring	17>Regulator spool	27>Bolt
8>Push rod	18>Spring cup	28>Adjustement bolt
9>Spring cup	19>Shim	29>Nut
10>Spring guide	20>Regulator spring	30>Rubber boot

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Foot control



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Auxiliary foot control

In neutral the auxiliary foot control is a closed center hydraulic valve. The inlet oil from the pilot pump is blocked at both regulator spools (12). The ports (1), (2), are ported inside of the valve back to tank through a hole drilled in the end, and a cross drilled hole in the regulator spool (12).
There are two springs (16) and (15) for each regulator spool (12). The larger diameter spring (16) provides the return of the foot pedal and this spring (15) is the resistance the operator feels in his foot.
Typically the return springs are stronger in foot control than in hand control.

If the dust cover (23) under the foot control is torn, replace it. This will help prevent contamination from wearing the U-seals (6) on the push rods (8).
The gap between the push rod (8) and the screw (21) can be adjusted. A too tight adjustment can cause partial actuation of the spool. The contact area between the push rod (8) and the screw (21) should be lightly lubricated with grease.

How it work

As the foot control is moved, the push rod (8) will push on both large and small diameter springs 16 & 15). The smaller spring (15) will push the spool (12) and block of the return passage through the top metering notches.

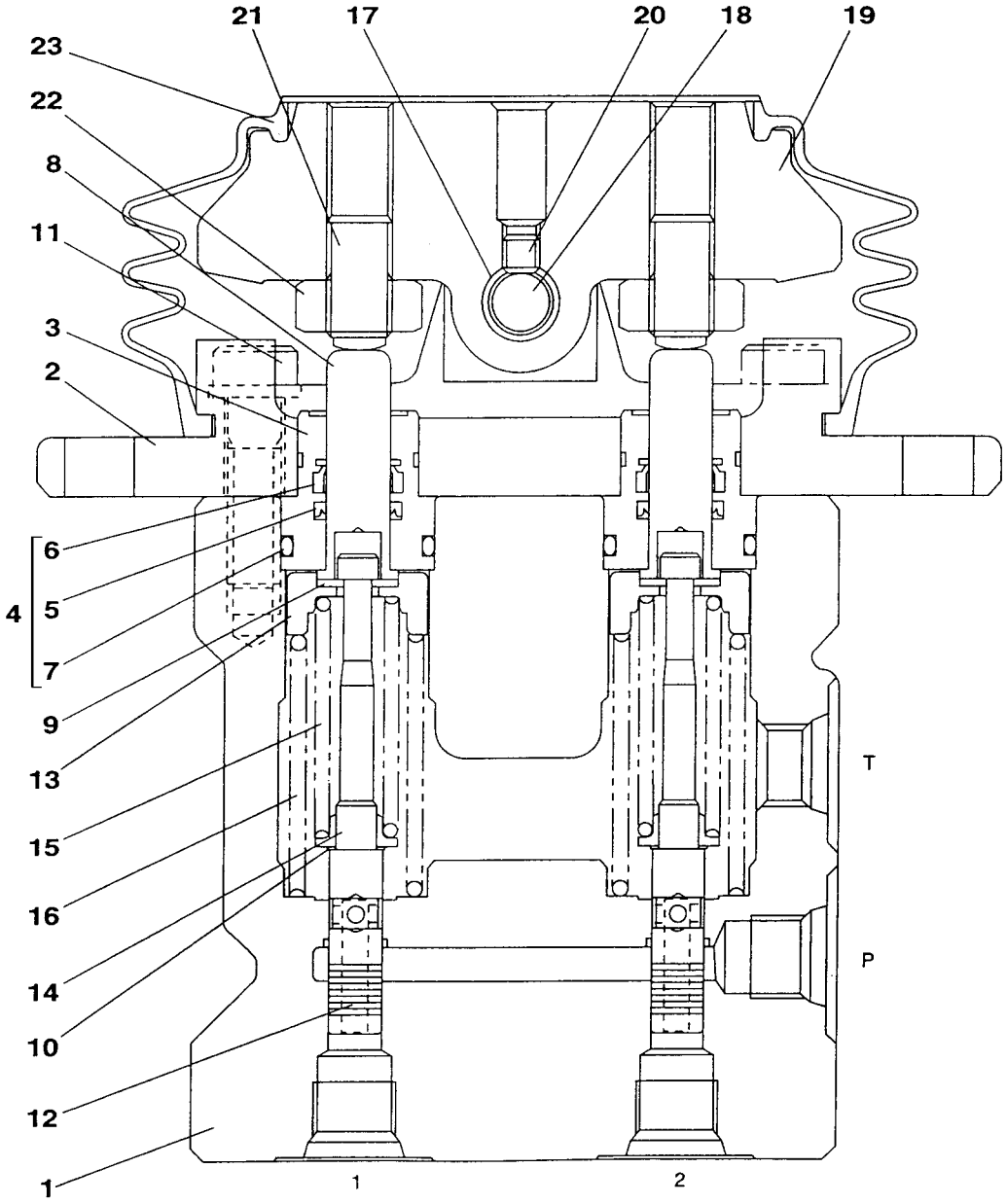
The bottom metering land will open a passage and allow pilot oil out to the work spool of the travel control spool. As the travel spool moves and compresses the spring in the control valve, the pressure will increase and push up on the bottom of the regulator spool (12. When the pressure of the oil pushing on the travel spool equals the force of the spring (15) behind the regulator spool (12) the bottom metering land will block the pilot supply. When the force of the spring (15) equals the force of the pressure on the spool (12), the spool (12) is in a balanced position to maintain a proportional pressure with the compression of the spring (15).

The foot control must be moved further to compress the small spring (15) and push the regulator spool (12) further to increase the pressure again.
The foot control is nothing more than an adjustable pressure regulator, and the operator provides adjustment .

1 Body
2.Mounting braket
3.Seal bushing
4.Seal kit
5.U-seal
6.Wipper seal
7.O-ring
8.Push rod
9.Washer
10.Spring guide
11.Spring guide
12.Snap ring
13.Spring cup
14.Spring retainer
15.Regulator spring
16.Feel back spring
17.Bushing
18.Pin
19.Cam
20.Screw
21.Ajustment bolt
22.Nut
23.Rubber boot

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Auxiliary foot control



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Cushion valve

Purpose of cushion valve

There is a cushion control valve plumbed between the arm and boom hand control valve and the control valve. The cushion valve prevents the control spool from returning to neutral very rapidly. The pilot oil is metered as ist returns to the hand control vale. This keap pressure boom and arm cylinder movement smooth for shock-free operation. There is a solenoid valve to override the cushion function in the 6 solenoid valve bloc. The control for the solenoid valve is a button on the instrument panel.

The function of this cushion valve is to restrict the return of pilot oil from the control valve spool operated.

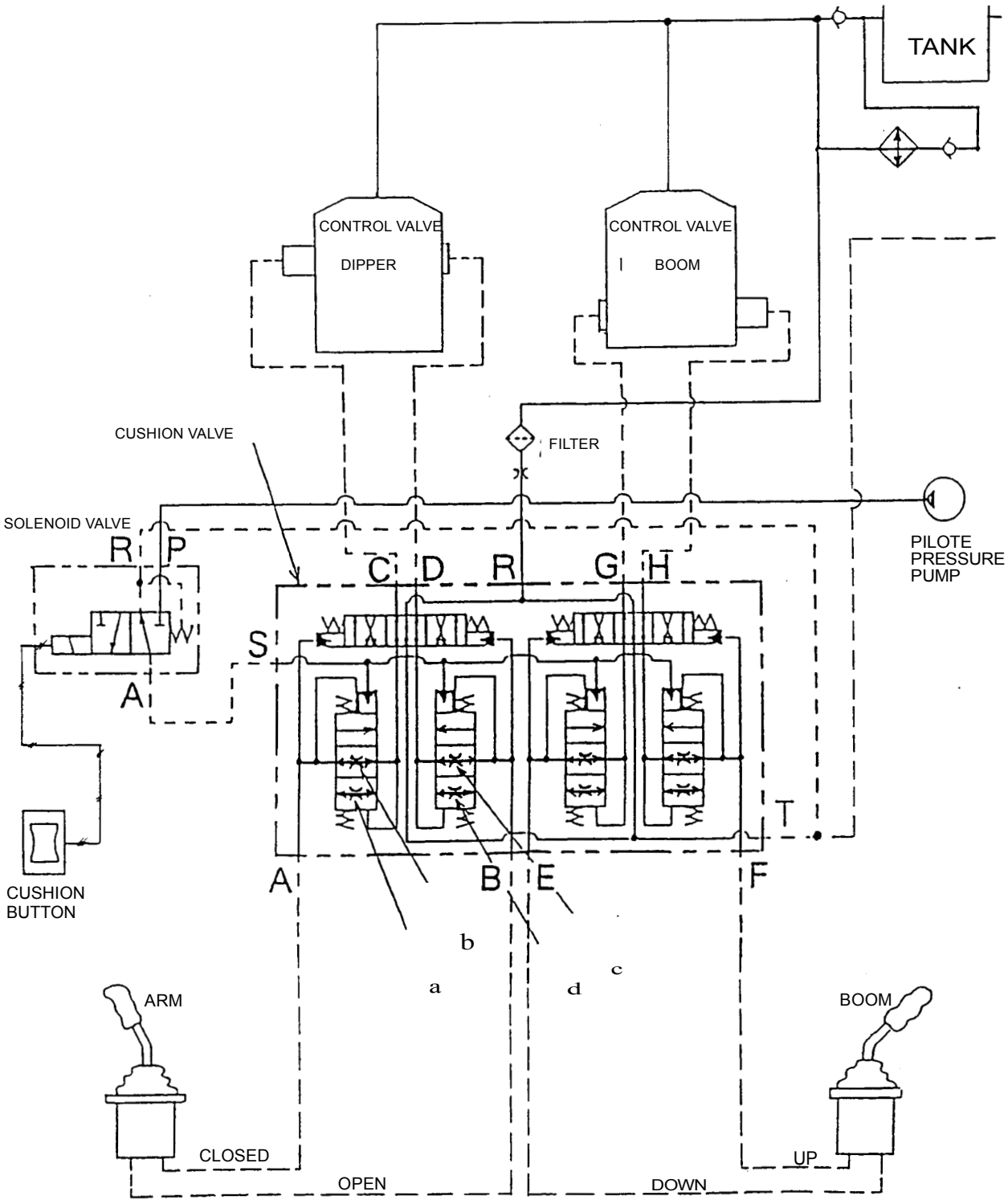
There is an other function in the cushion valve that allows for the rapid return of the boom or arm spool if the hand control is moved in the opposite direction.



Specifications of cushion valve

		CX130	CX210
		NA & EU	NA & EU
Operating Pressure	Mpa	4.41	4.41
	kgf/cm2	45	45
Valve ; cushion change pressure	Mpa	0.735-1.275	0.735-1.275
	kgf/cm2	7.5-13	7.5-13
Orifice Dia. Of spool	Arm close	0.6/0.0	0.8/0.6
	Arm open	0.6/0.0	0.8/0.6
	Boom up	0.6/0.0	0.9/0.6
	Boom down	0.6/0.0	0.65/0.00
Operating Temp. Range	°K	253-368	253-368
	°C	-20/95	-20/95

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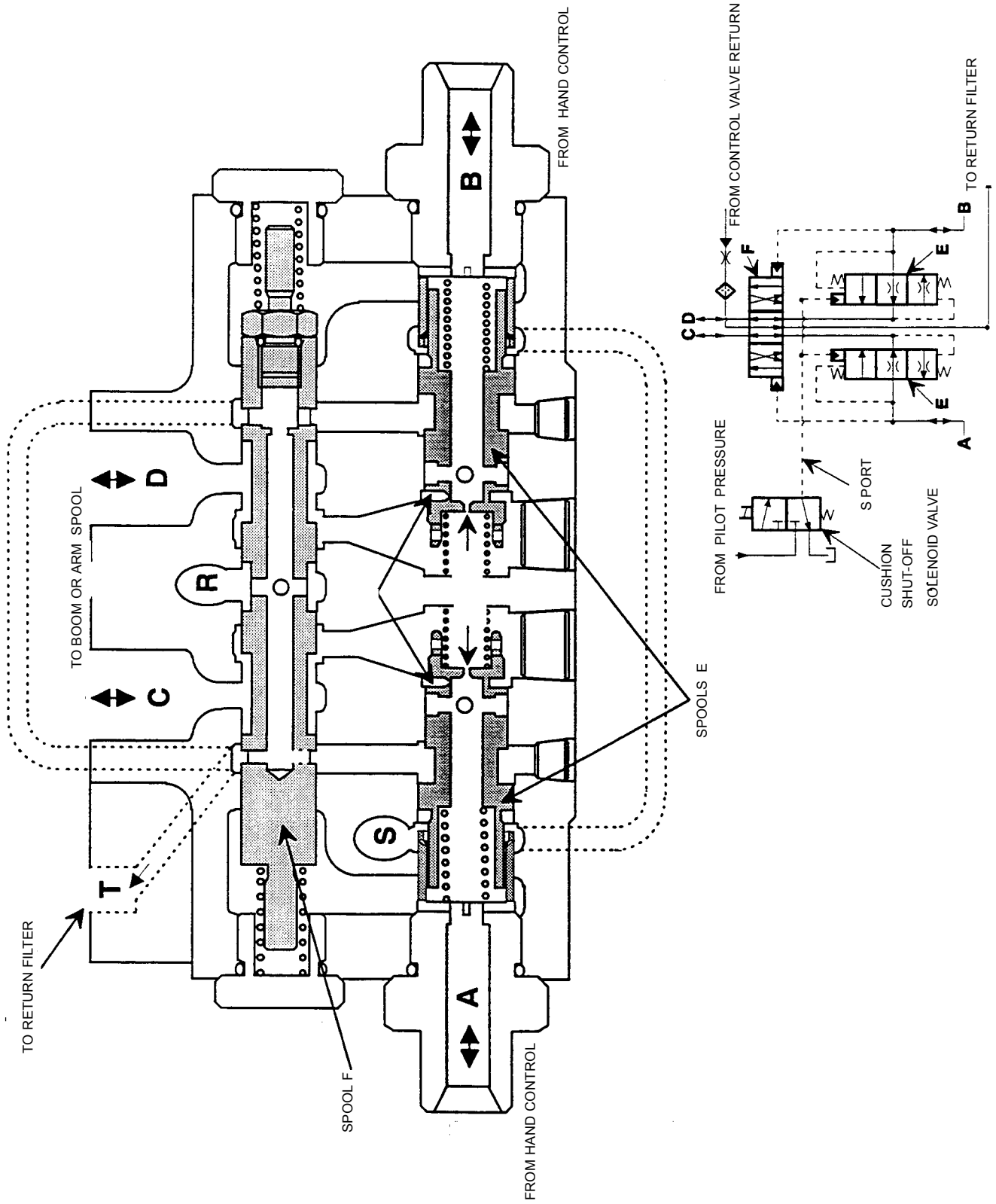
Neutral position

In neutral position of the remote control, the control valve spool ends are connected to the tank through the spool F, the central and cross drilled orifices of the spools E and the remote control valve.
The control valve spool stays in neutral position.

When the lever is neutral, the heat oil separated from the oil cooler line enters the port "R" and flows to the reverse notch spool interior.
Then, after flowing through outer periphery of the respective cushion spools, the oil returns to the hydraulic oil tank through port "T" in the cushion valve.

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Neutral position



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Piloting

The pilot pressure coming from the remote control enters the cushion valve in B and pushes the spool E and F. The pilot pressure goes freely to the control valve work spool end through D port..

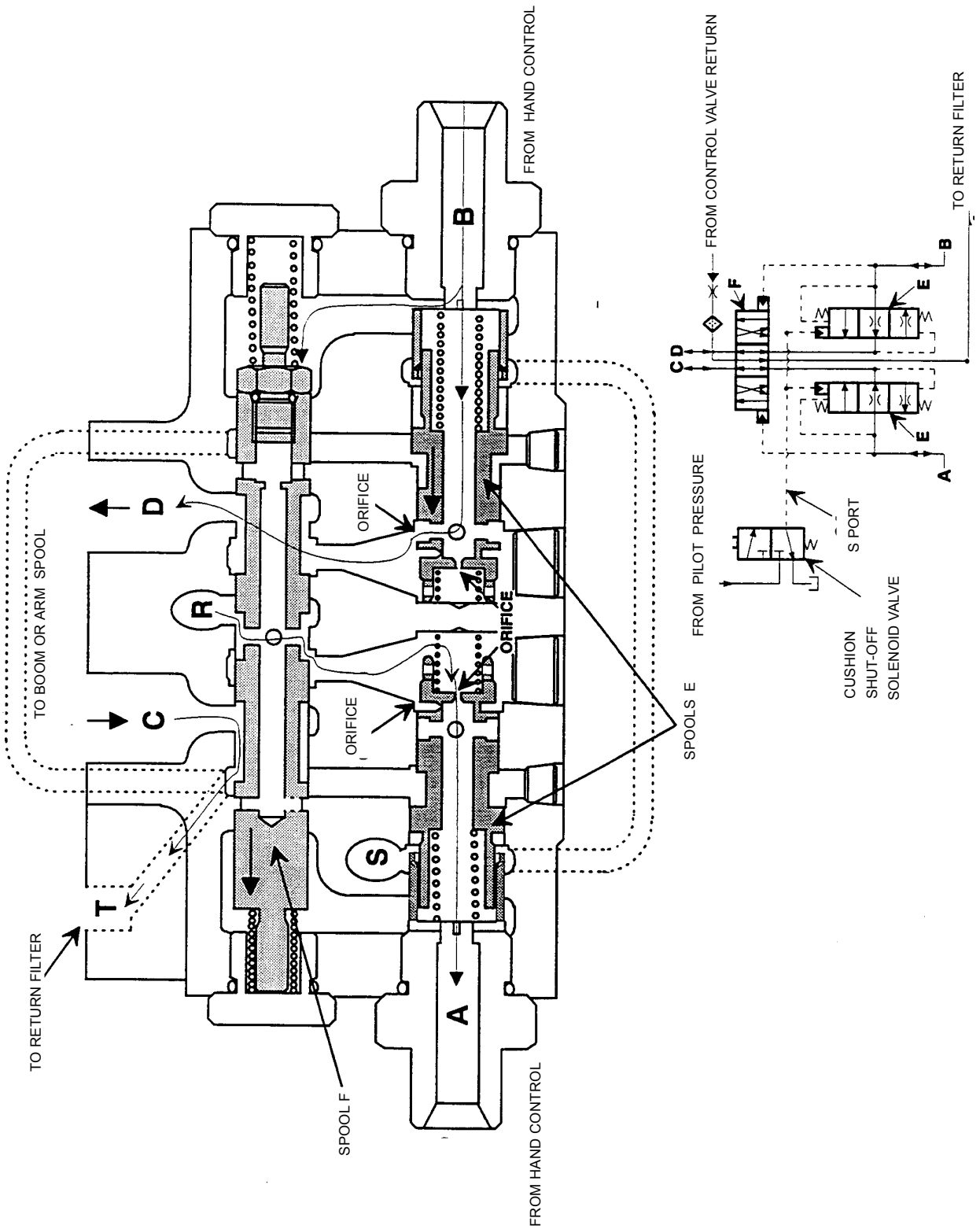
The oil in the opposite end spool of the control valve return to the tank through the port C, and the opened return filter port T.

Heating circuit : during this piloting time an amount of warm oil coming from R (return) flows to the remote control valve through A port.

The work spool move as a circuit without cushion valve.

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Piloting



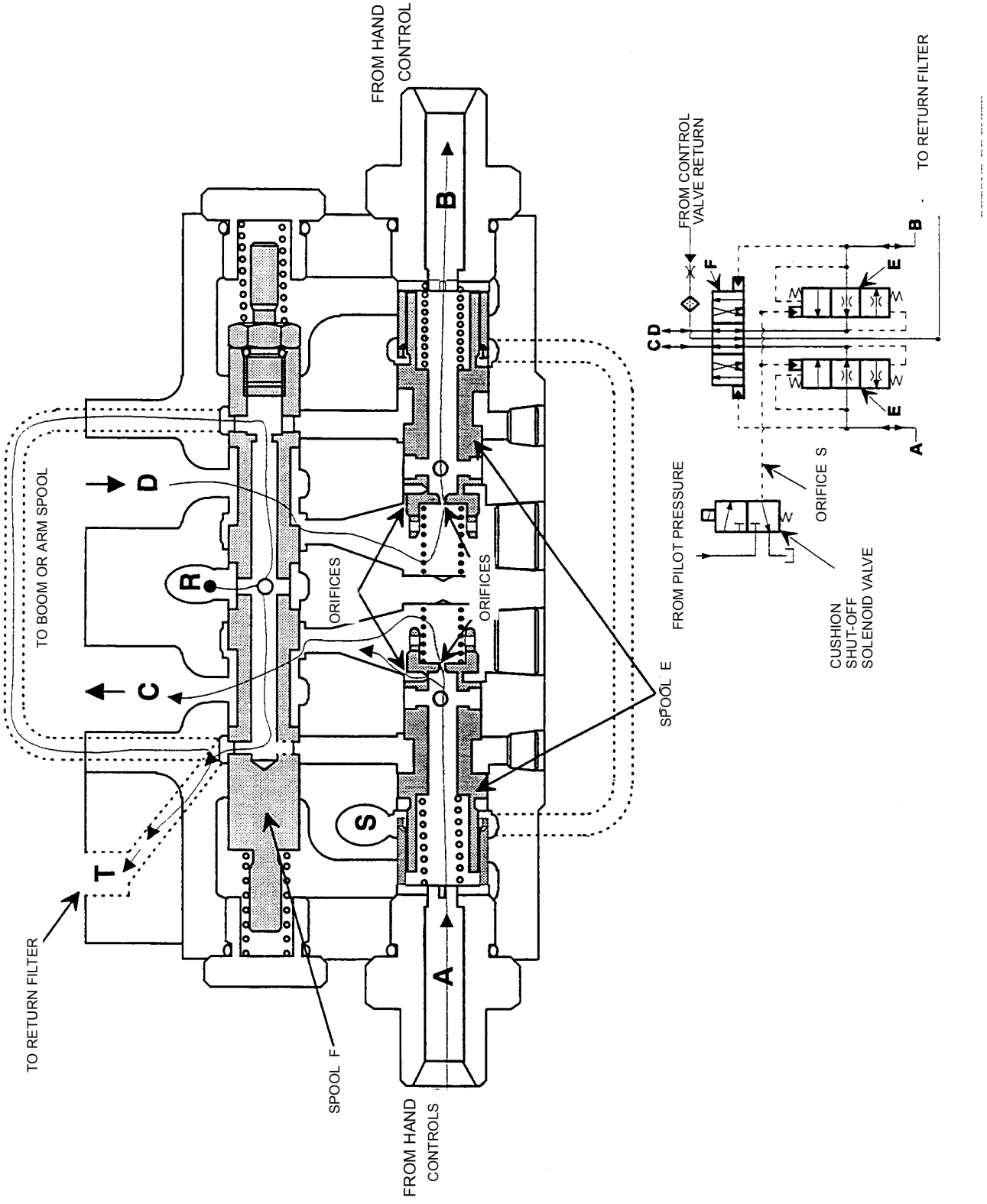
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Cushionning operation

In Soft mode, the solenoid switch is off and the pilot pressure doesn't come from port "S".
Thus, the cushion spool inside the cushion valve is still set as original position and has a restriction of pressure by orifice inside the spool rooms.
The spool has 3 rooms, for instance, upper, middle and lower and due to no pressure from port "S", the middle and lower rooms are to use.
The pressurized oil flow from port "D" is going to middle room first, however, due to the orifice restriction, the oil flow is separated and such separated oil flow pushes up the spool to lower room, which has still another orifice.
Before going to the port "B" to the control valve, the oil flow is also separated and pushes back the spool to middle.
These room changes inside the cushion spool and orifice restriction differences are changing the tank pressure and such mechanism makes arm spool in the control valve returning neutral so slowly; spool damper effect.
That is how the cushion occurs and reduces the shock when arm opening stops.

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Cushionning operation



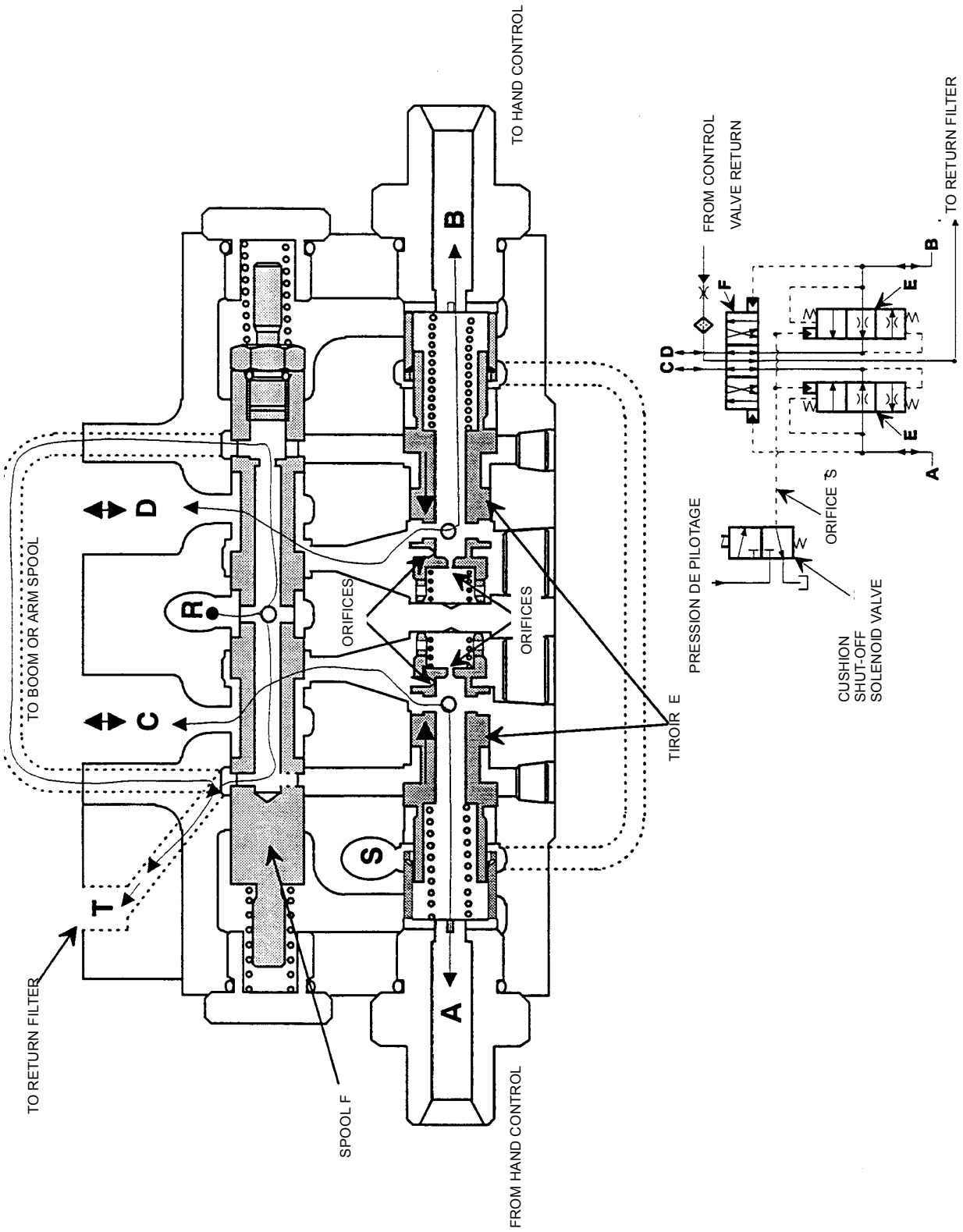
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Cushion cancellation

When arm opening and the lever is returned to neutral, pressurized oil from control valve (a pilot of arm opening) flows into port "D" of the cushion valve.
Electric signal is sent to a controller with hard mode at this time and the controller sends the signal to a solenoid valve.
Then, from solenoid valve, the original pressure (40K) of pilot comes into the cushion valve from port "S" and the cushion spool inside the valve is switched.
The pressurized oil flow from port "D" is connected direct to port "B" and return the tank through the control valve.
Such direct return changes the tank pressure and arm spool in the control valve returns to neutral immediately.
This immediate return makes a shock when stopping arm and such shock is useful for dirt dropping operation.

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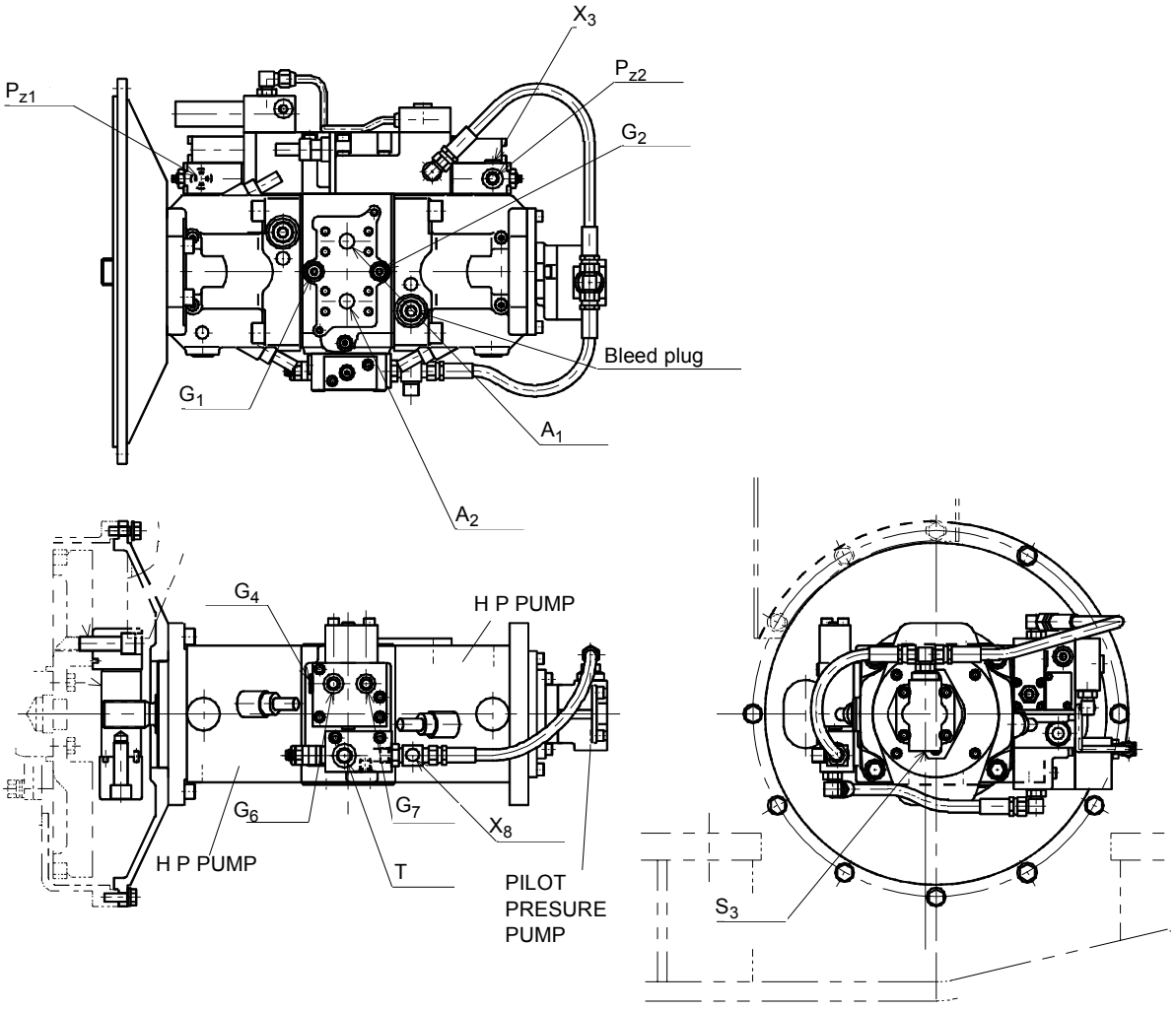
Cushion cancellation



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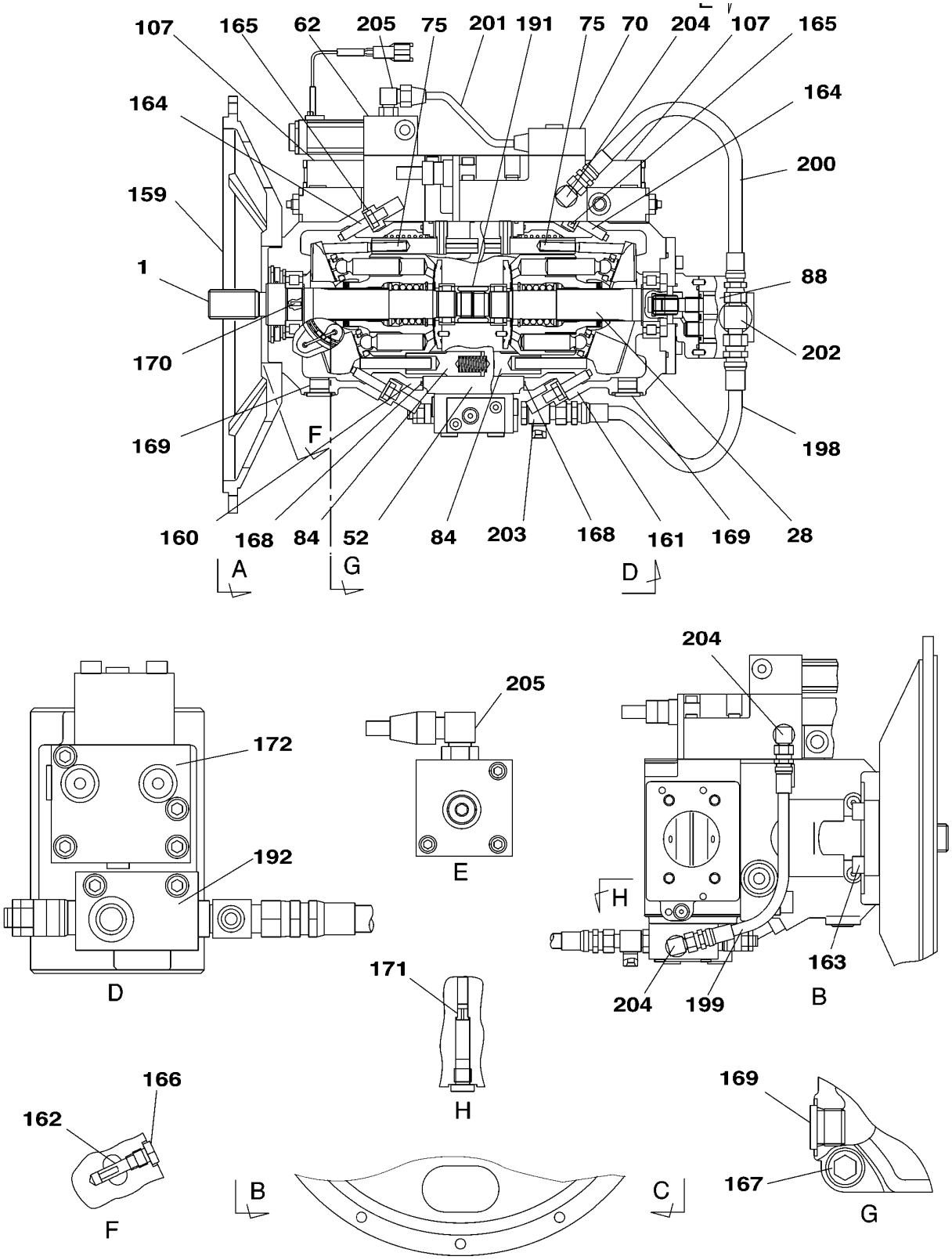
Pump

	Port name	Port size
$A_{1, 2}$	Discharge port	SAE 6000 psi 3/4"
S	Intake port	SAE 2500 psi 2 1/2"
T	Drain port	G 3/8
Pz_1, z_2	Negative flow control pressure port	G 1/4
X_3, $G_{1, 2, 6, 7}$	Gauge port	G 1/4
G_4	Gauge port	G 3/8
X_8	Gear pump discharge s	G 3/8
S	Gear pump intake port	



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Pump

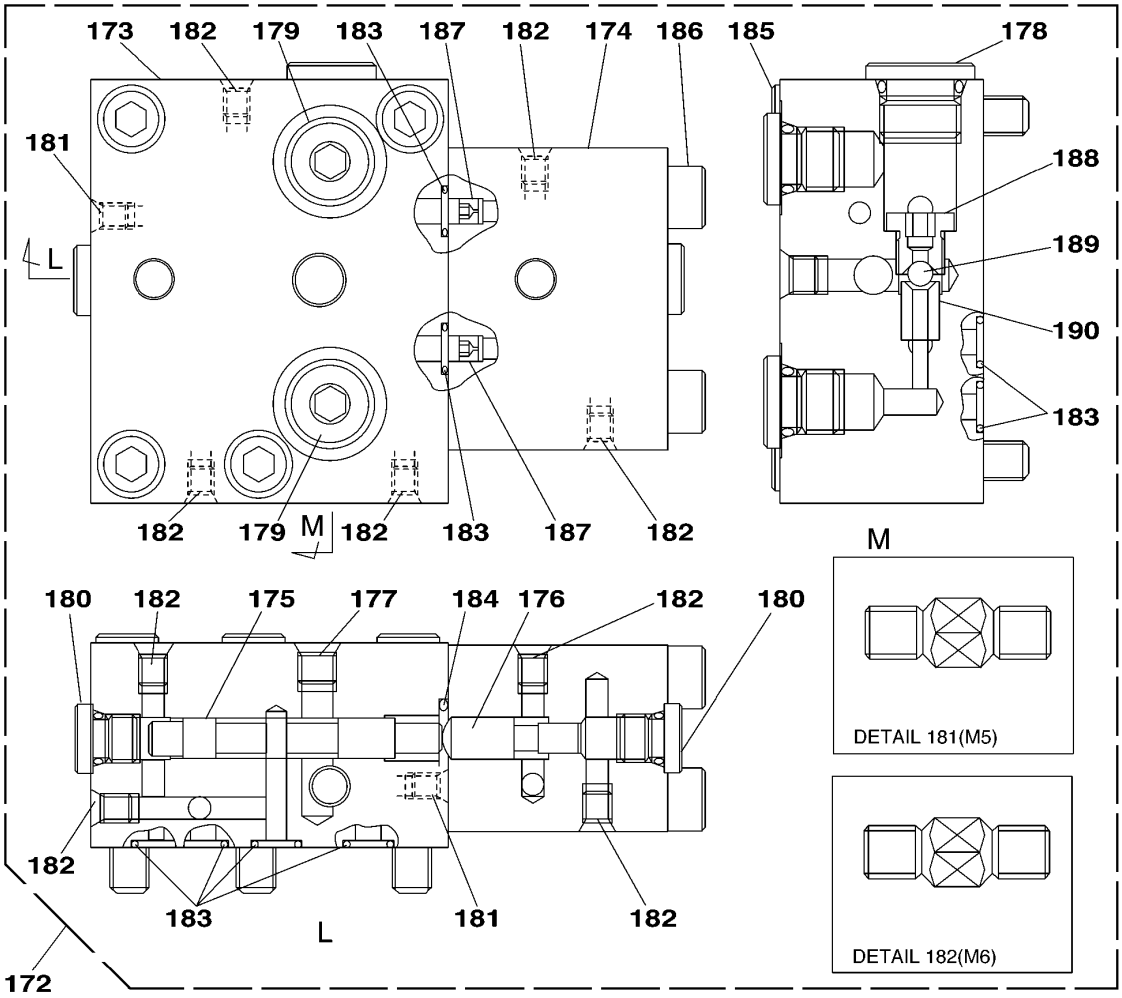


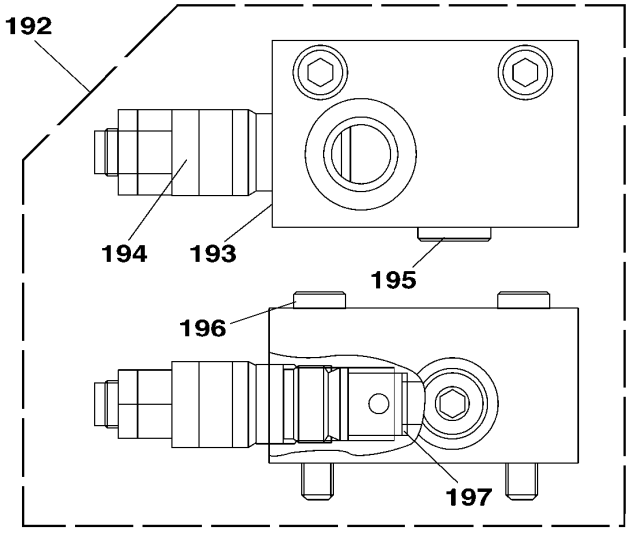
https://truckmanualshub.com/

Pump (follow)

https://truckmanualshub.com/

Pump (follow)



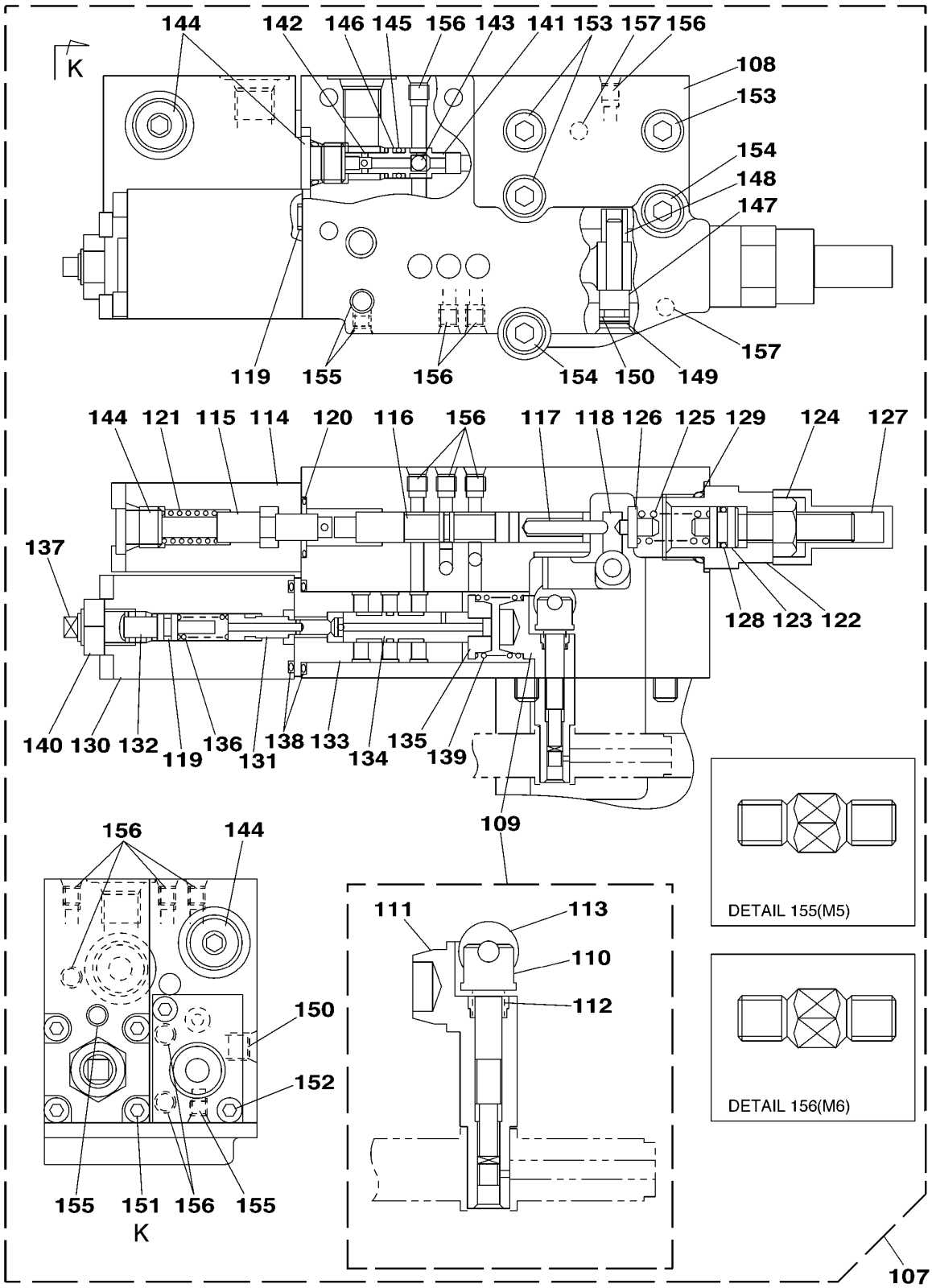


https://truckmanualshub.com/

Pump control block (follow)

https://truckmanualshub.com/

Pump control block)

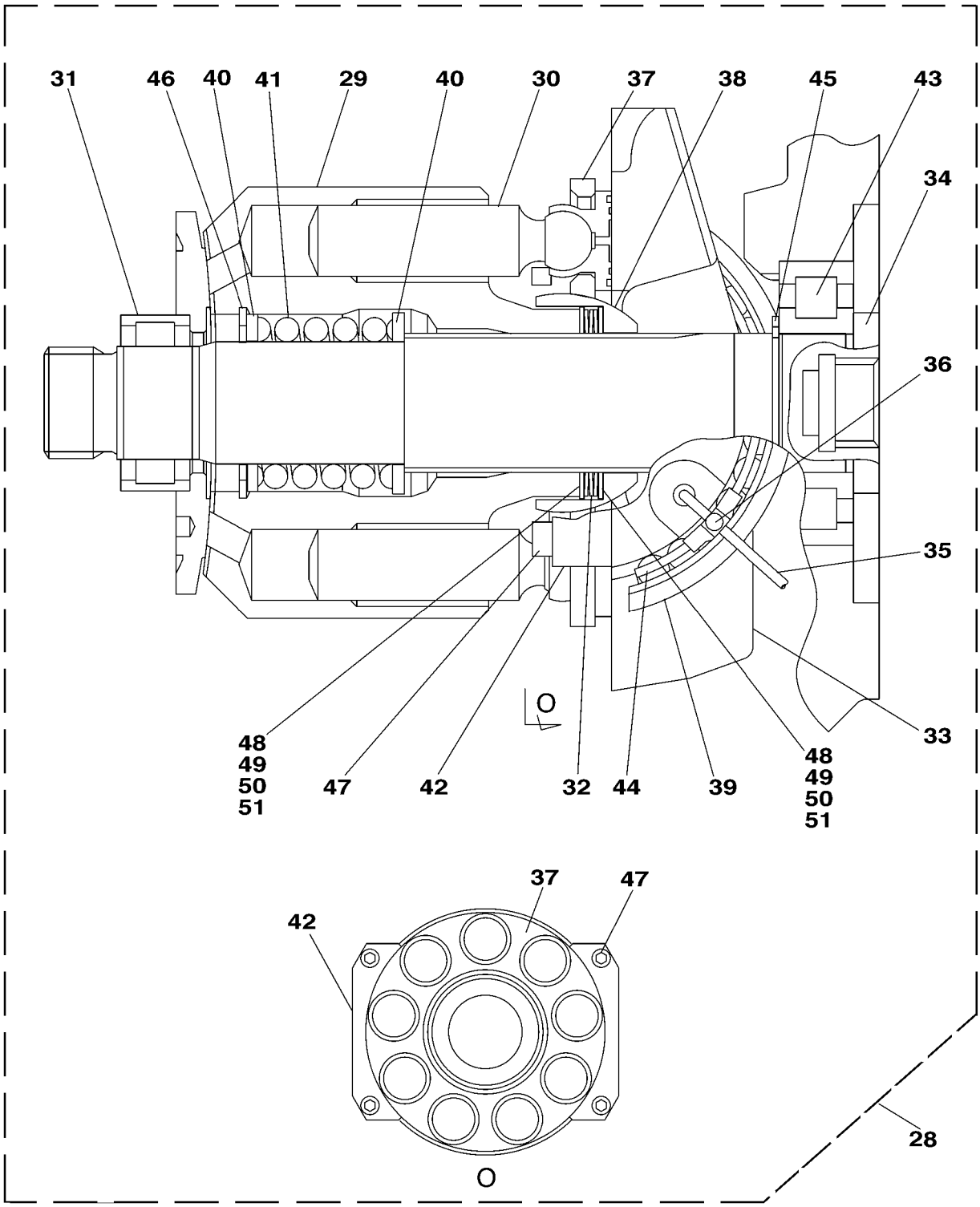


https://truckmanualshub.com/

Pump rotating group assembly (follow)

https://truckmanualshub.com/

Pump rotating group assembly (follow)

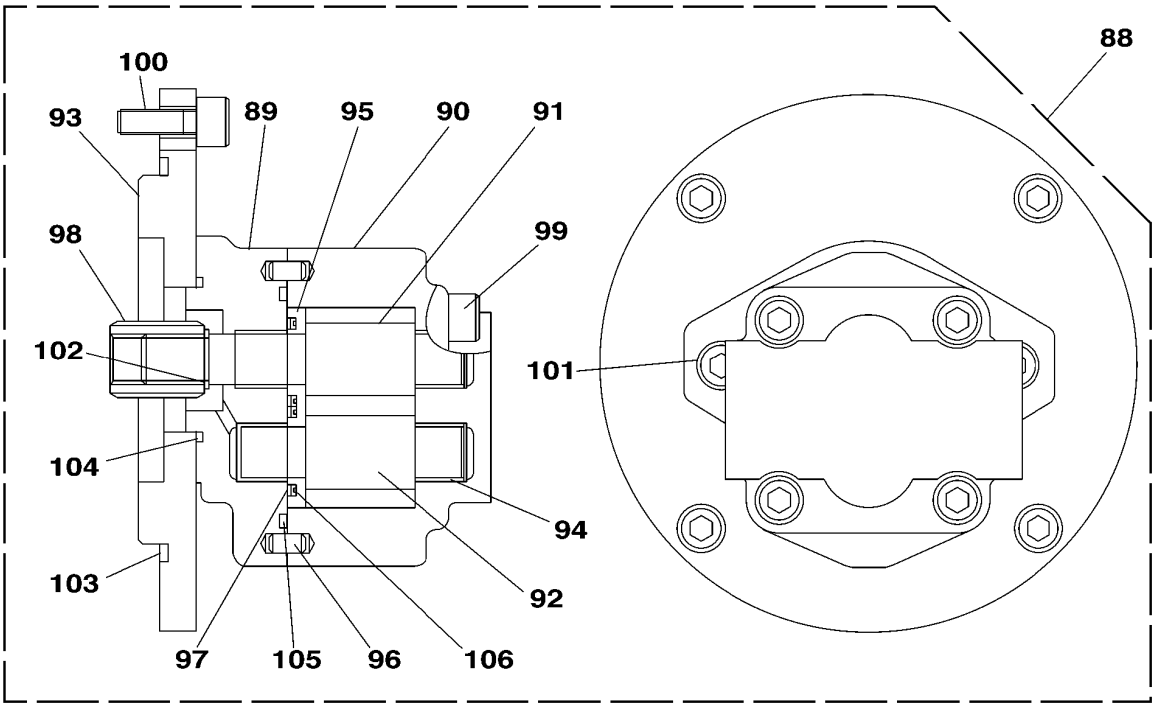


https://truckmanualshub.com/

Pilot pressure pump

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Pilot pressure pump

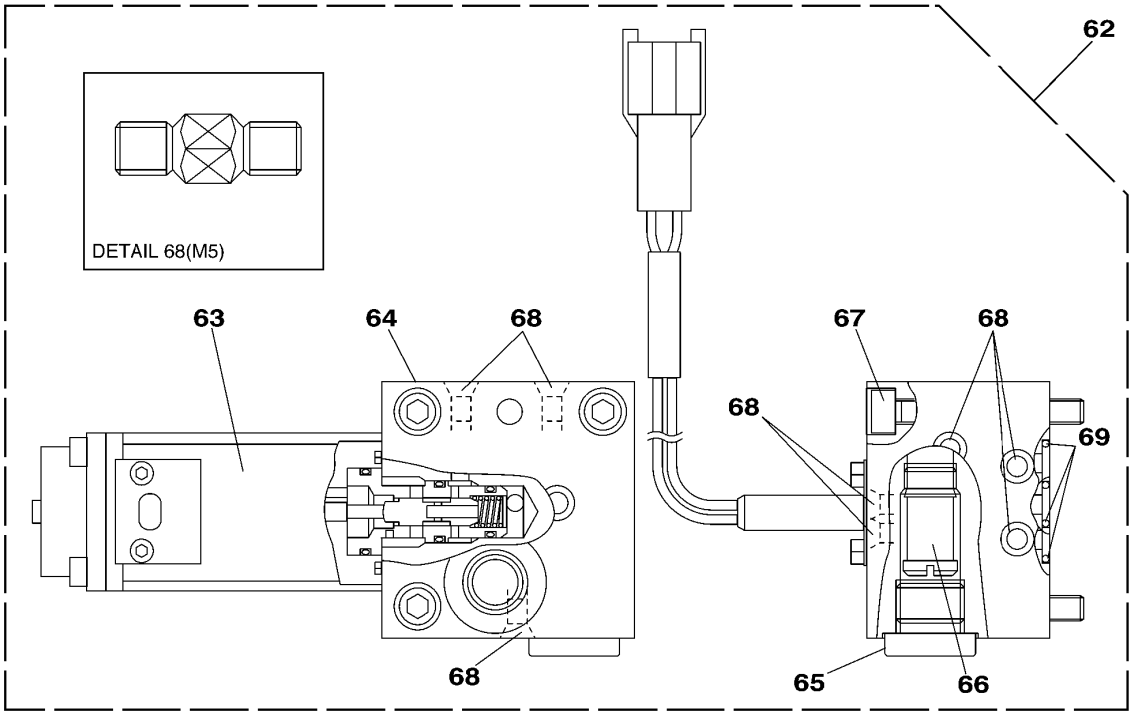


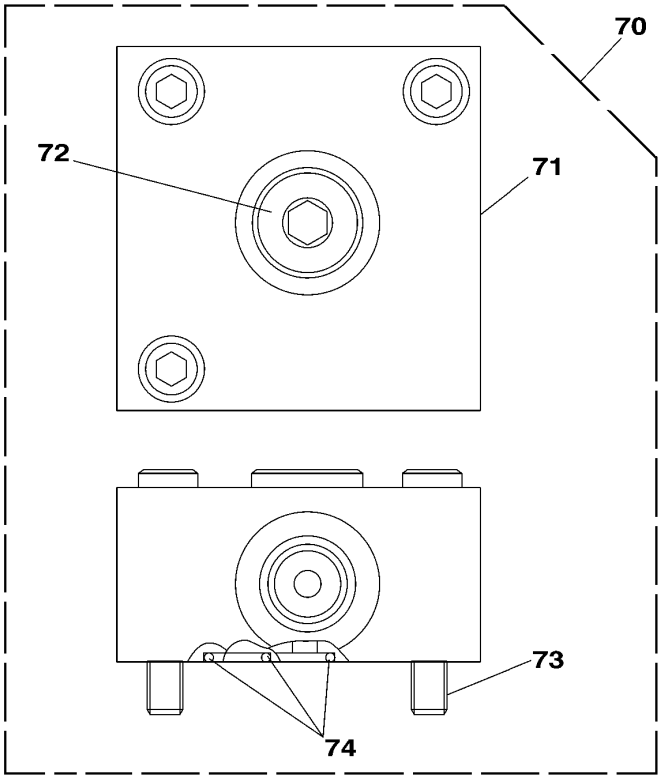
https://truckmanualshub.com/

Proportional solenoid valve

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Proportional solenoid valve

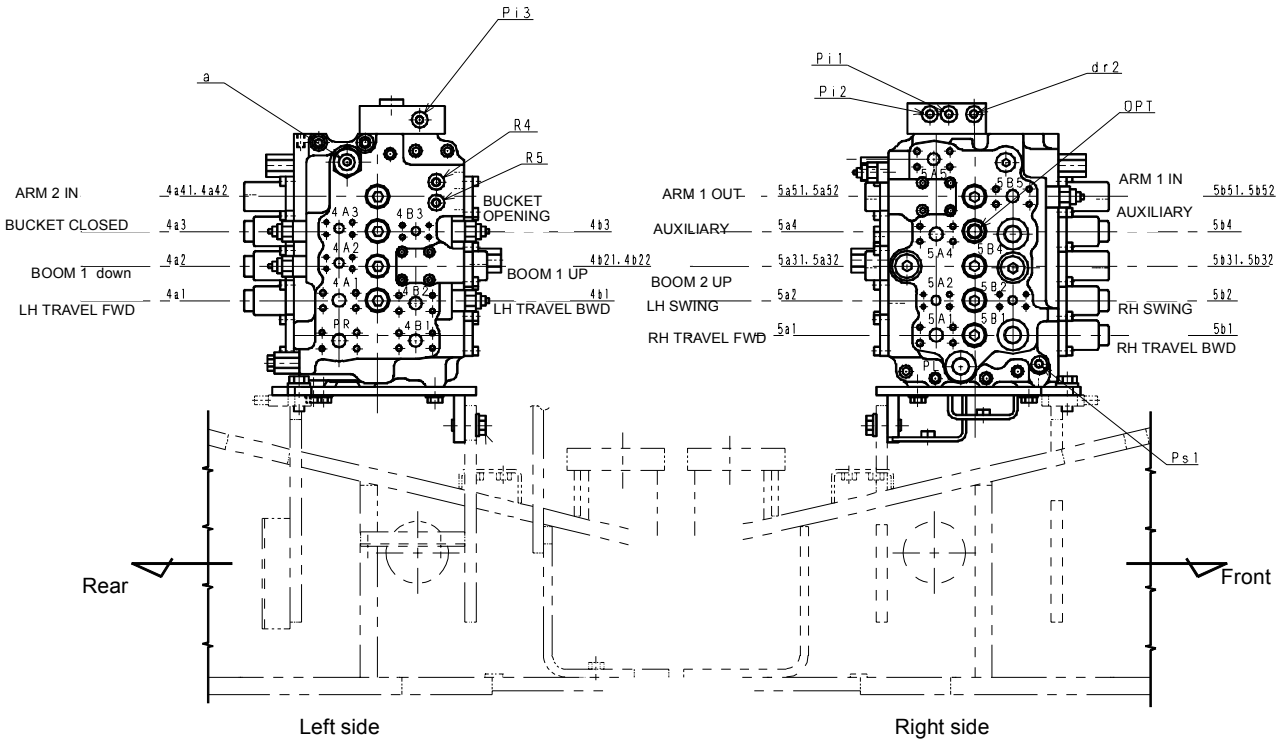




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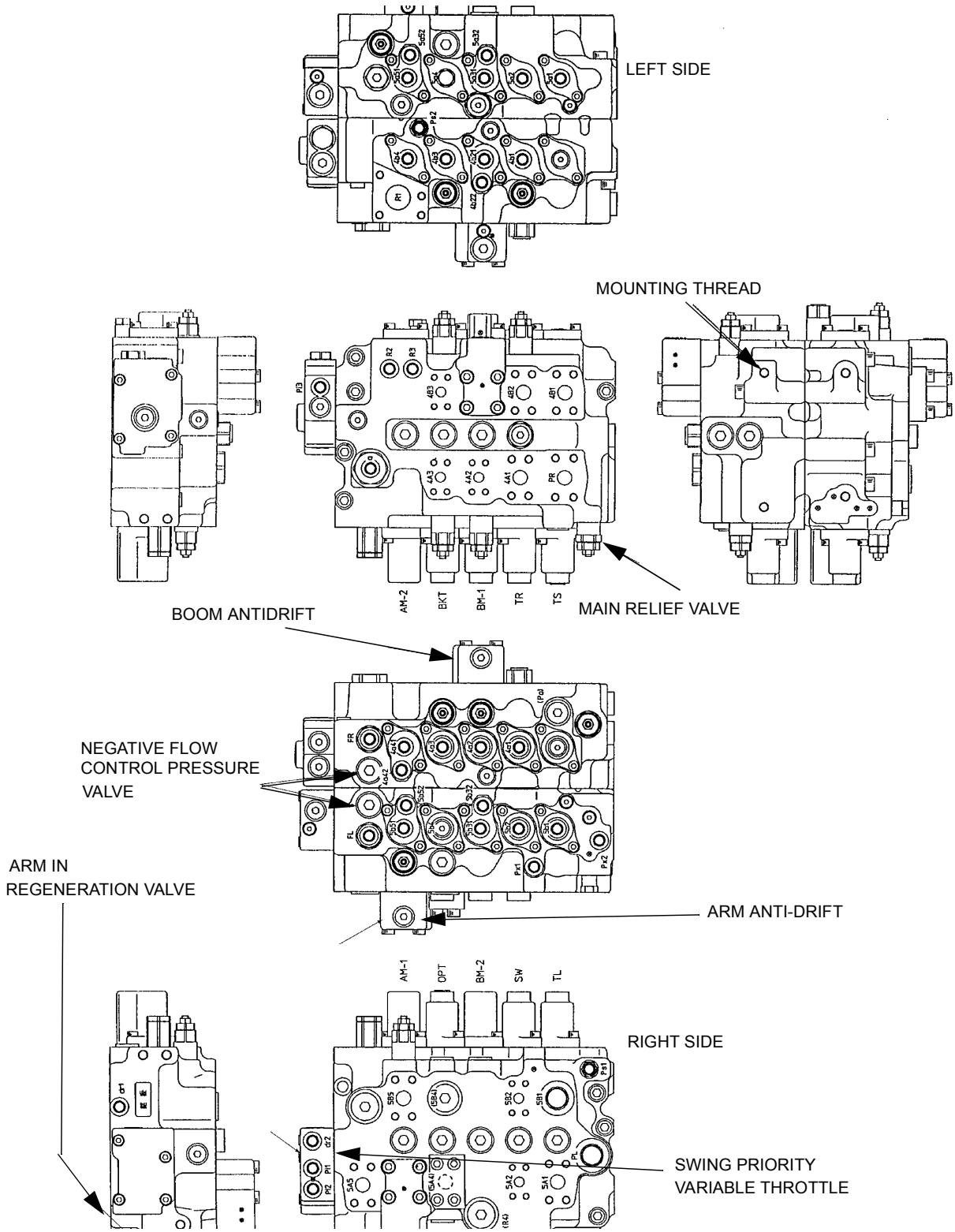
Control valve

Description	Port	Description	Port
Bucket closing	4A3	Dual flow	PO, OPT
Bucket opening	4B3	Return to tank	R1, R2, R3
Boom lowering	4A2	Negative flow control pressure	FR, FL
Boom up	4B2	Travel pressure signal	PX2
Left travel forward	4A1	Upper pressure signal	PX1, PS1
Left travel backward	4B1	Drain line	dr1, dr2
Dipper arm out	5A5	Arm anti-drift	PS2
Dipper arm in	5B5	Boom anti drift	
Right swing	5B2	Ultra-clean filter supply	R5
Left swing	5A2	Pilot circuit heating	R4
Auxiliary	5A4	Swing priority	Pi2
Auxiliary	5B4	Swing priority cancelation	Pi1
Right travel forward	5A1	Arm priority	Pi3
Right travel backward	5B1		
Pump supply	PR, PL		



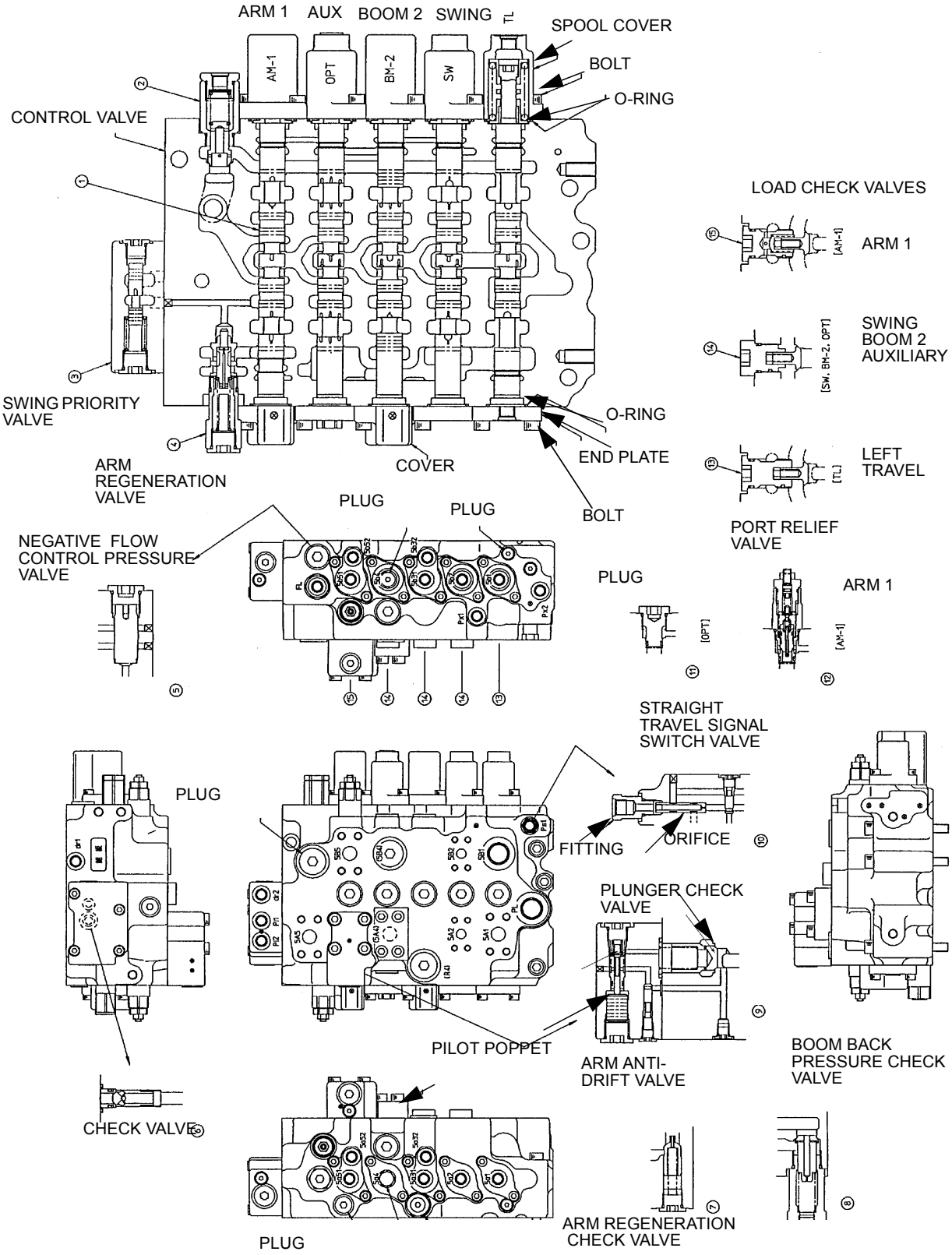
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Control valve



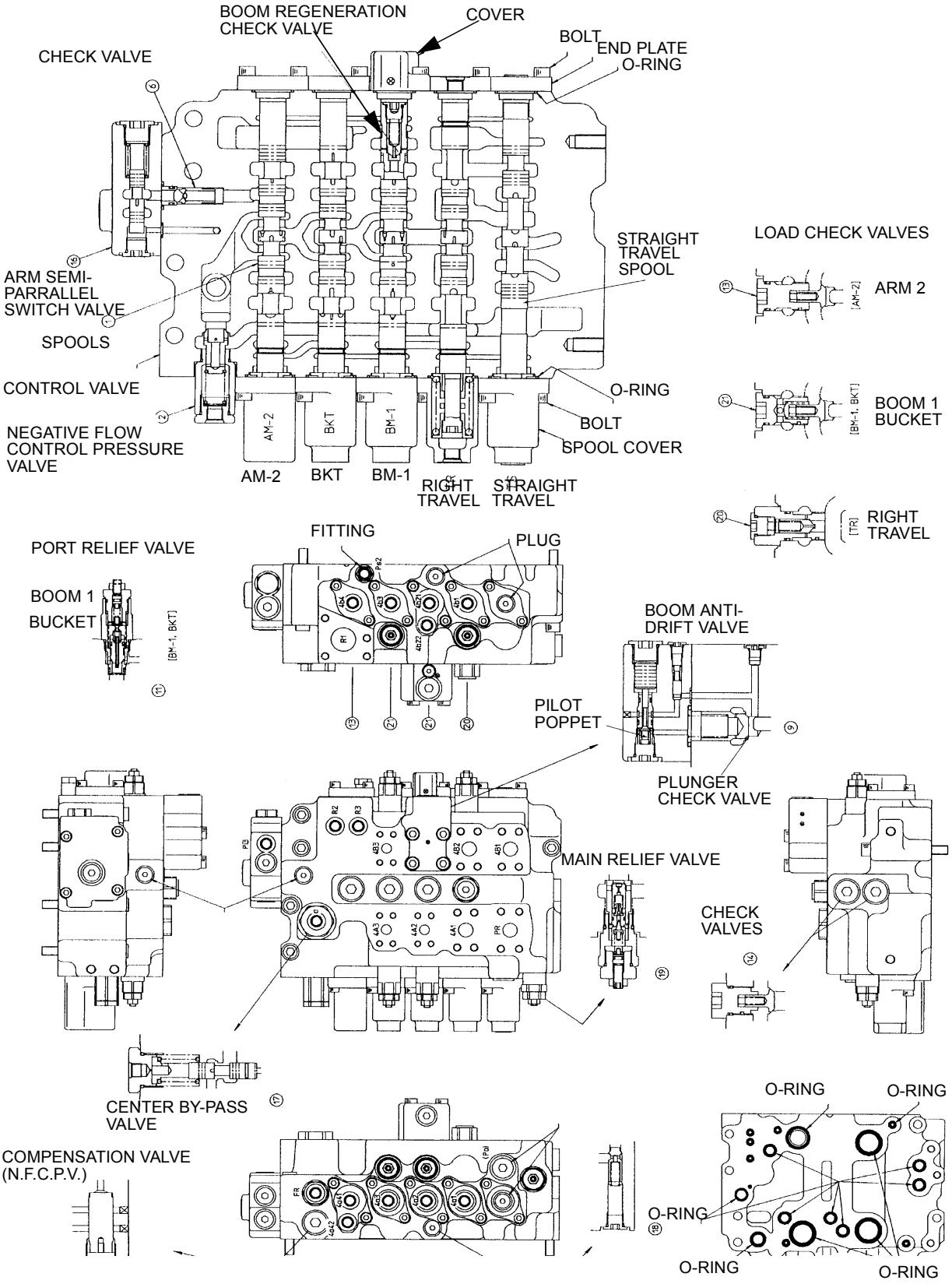
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Control valve (follow)



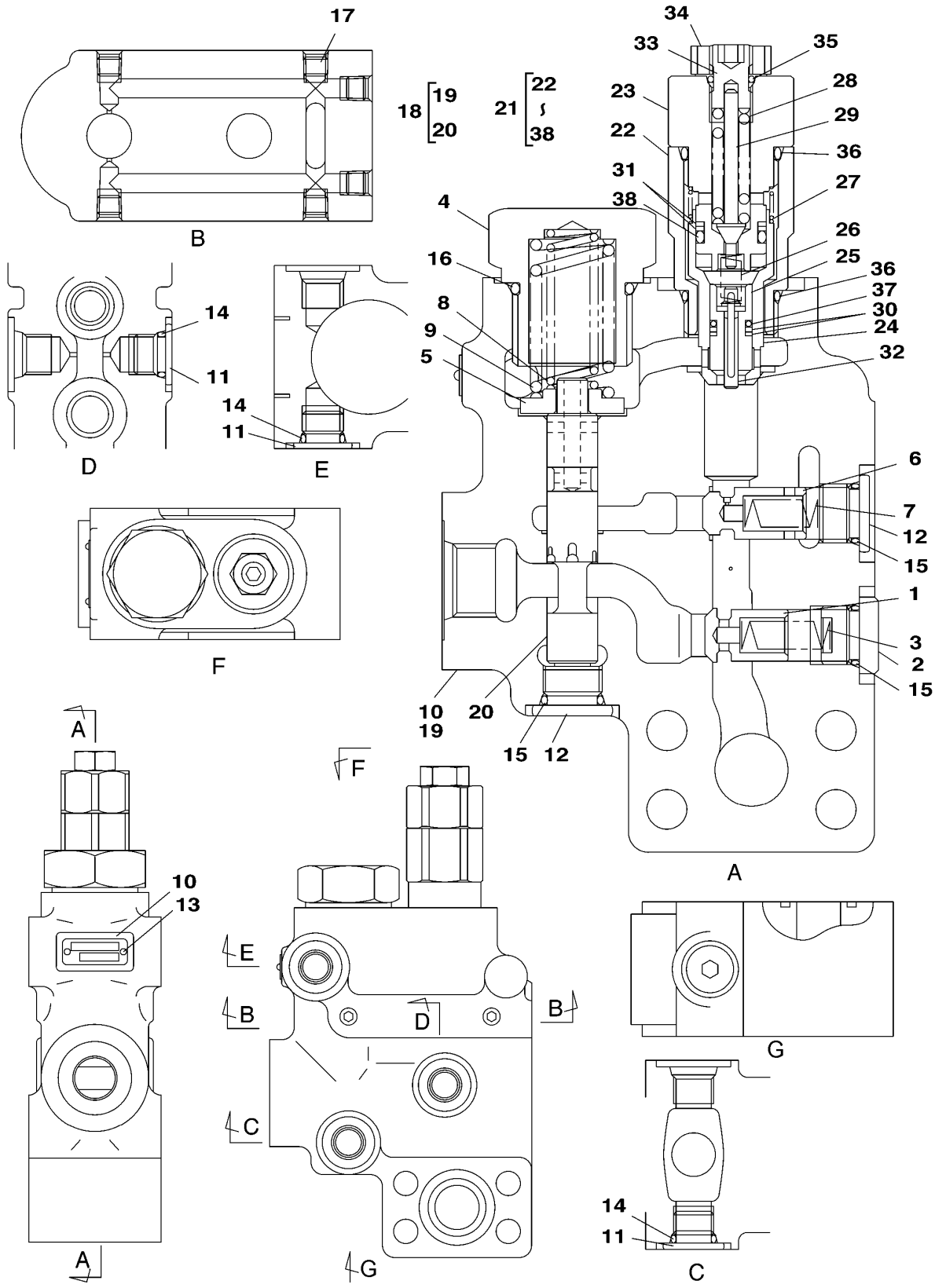
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Control valve (follow))



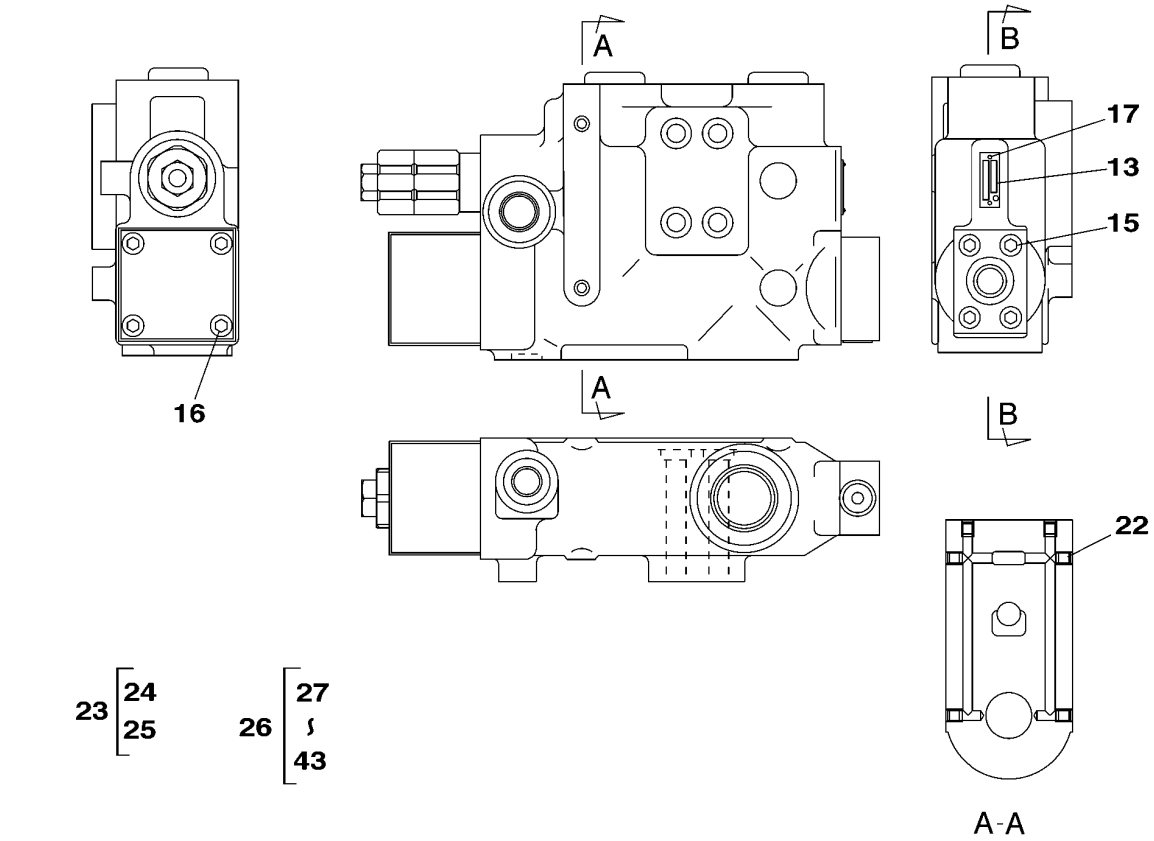
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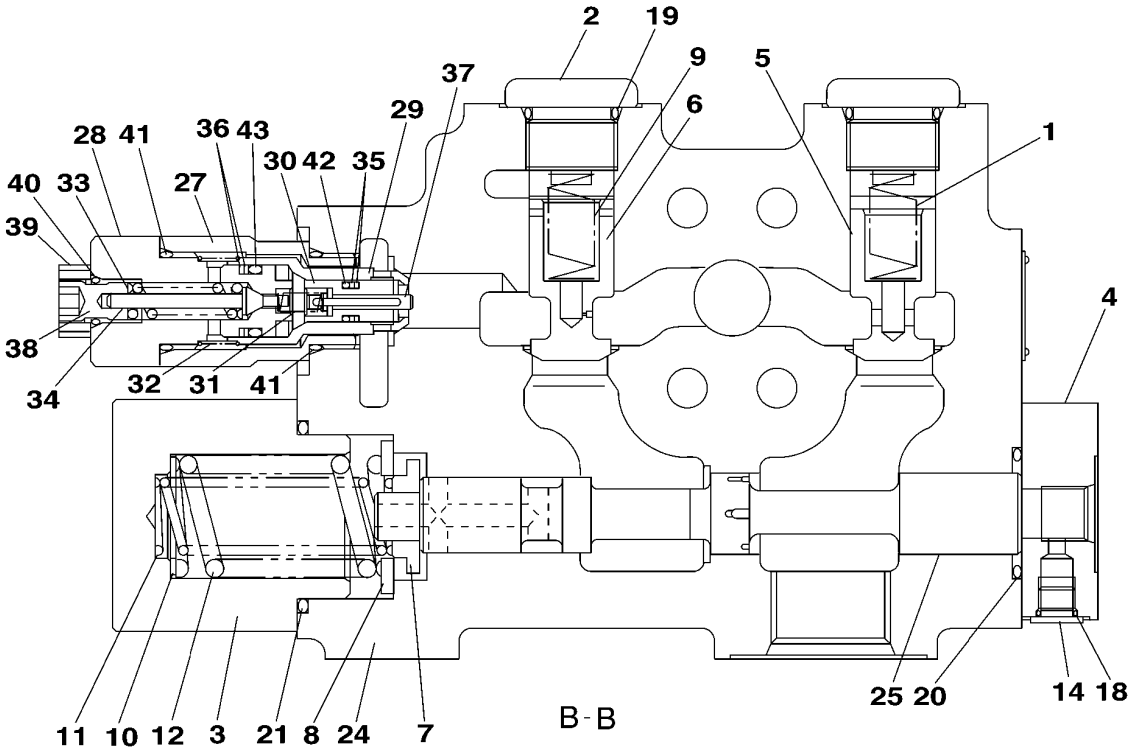
Boom savety valve (H.B.C.V.)



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Dipper arm savety valve (H.B.C.V.)





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Boom savety valve (H.B.C.V)

Purpose:
Two safety valves are fitted on the piston end of the boom cylinders. They avoid any uncontrollable boom down movement when a plumbing failure may occur on the piping between the piston end cylinder and the control valve.

Description:
3A Piloted check valve
3B Check valve
3C Spool
46G Relief valve including an anti-cavitation valve
The two piston ends are connected together by a hose to balance the pressure of the two cylinders. The connecting ports of the balance hose get a restrictor.
A pressure sensor is fitted on P2 orifice to inform the controller of the piston end pressure.

Current operation
Neutral
The cylinder piston end is closed by 3B and 3A check valves. The check valve 3A cannot be pushed back because its spring side is not connected with the tank by 3C spool.

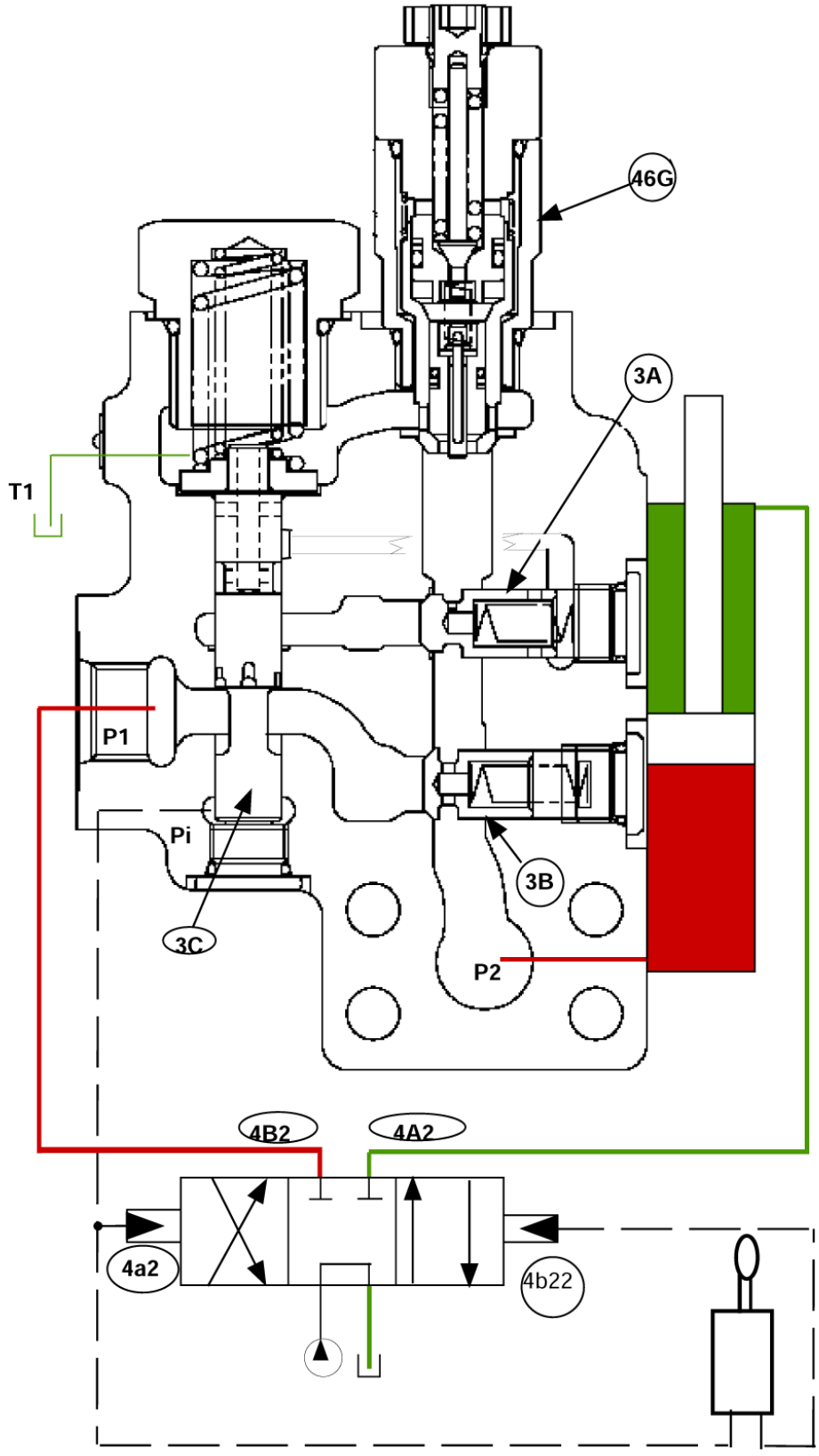
Boom up
The remote control pressure (4b22) pushes the control valve spool. The oil flows out of the control valve (4B2 port), enters the safety valve (P1 port), pushes the (3B) check valve and goes out through the P2 directly connected with the cylinder rod end. The oil of the rod end goes to the return through the (4A2) port of the control valve.

Boom down
The pilot pressure 4a2 pushes the control valve spool and the safety valve spool (3C).
The oil flow supplies the cylinder rod end.
The spring side of the piloted check valve 3A is connected to the tank T1 by the cross drilled and centred drilled holes of the spool 3C. It's pushed back and the oil from the cylinder rod end goes to the tank through the groove of the spool 3C and the port 3B of the control valve.

Safety operation
If a pipe is broken between the piston end and the control valve the operator can operate the boom down. The movement will be controlled by the metering notches of the spool 3C groove.

Leak specification
P2 to P1+ T1 < 4cc / mn at 9,81Mpa with oil temperature at 50°C

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Dipper safety valve

Purpose:
This safety valve is fitted on the rod end arm cylinder. It avoids any uncontrollable movement of the dipper when a plumbing failure may occur on the piping between the rod end cylinder and the control valve.

Description:
3A Piloted check valve
3B Check valve
3C Spool
3G Relief valve including an anti-cavitation valve

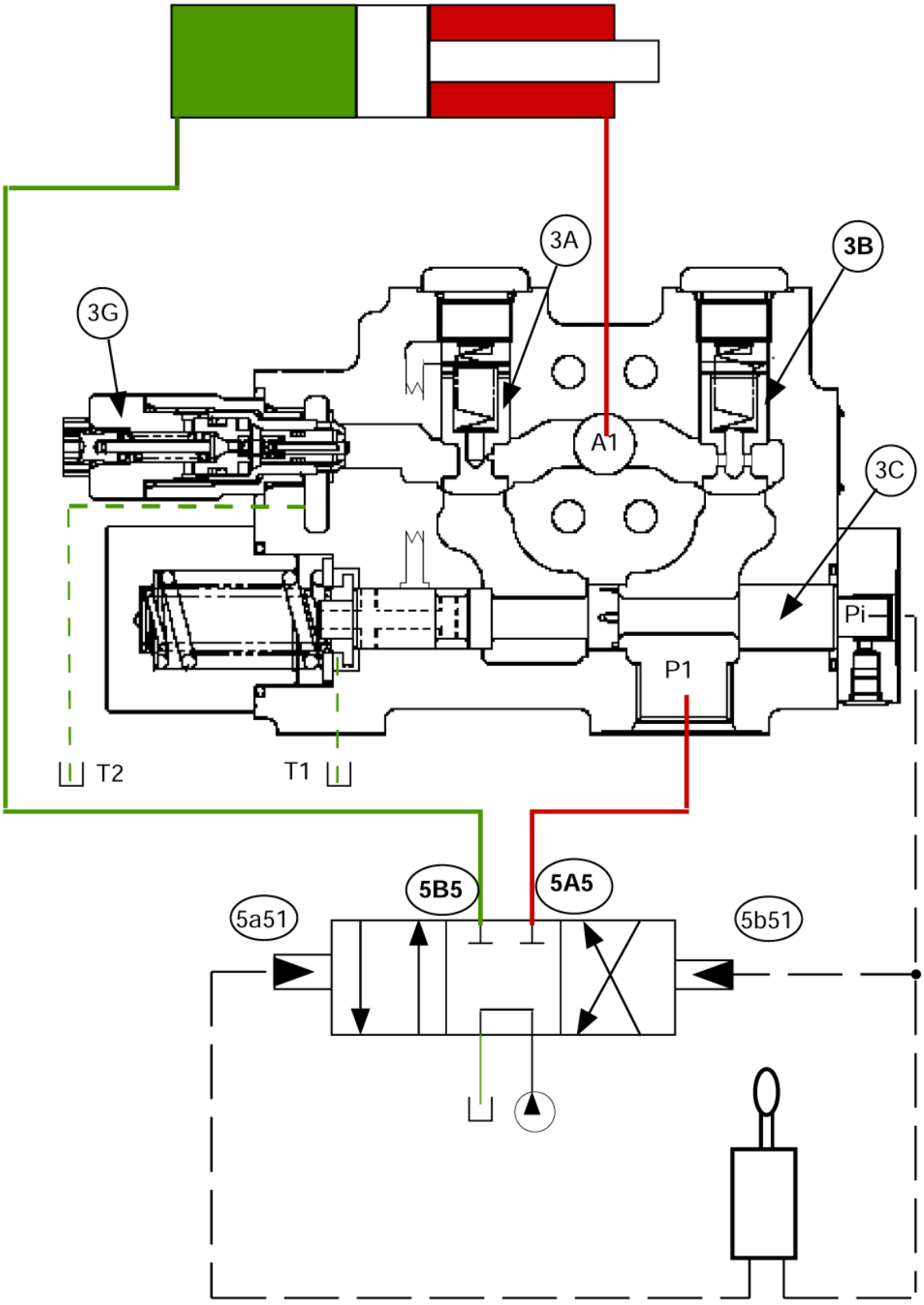
Current operation
Neutral
The cylinder rod pipe is closed by 3B and 3A check valves. The check valve 3A cannot be pushed back because its spring side is not connected with the tank by 3C spool.

Dipper out
The remote control pressure (5a51) pushes the control valve spool. The oil flows out of the control valve ((5A5 port), enters the safety valve (P1 port), pushes the 3B check valve and goes to the cylinder rod end through the port P2 directly connected with the cylinder rod end. The oil of the piston end goes to the return through the 5B5 port of the control valve.
Dipper out
The pilot pressure 5b51pushes the control valve spool and the safety valve spool (3C) to the left.
The oil flow supplies the cylinder piston end.
The spring side of the piloted check valve 3A is connected to the tank by the groove of the spool 3C. It's pushed back and the oil from the cylinder rod end goes to the tank through the metering notches of the spool 3C and the port 5A5 of the control valve.

Safety operation
If a pipe is broken between the rod end and the control valve the operator can operate the arm in. The movement speed will be controlled by the metering notches of the spool 3C groove.

Leak specification
P2 to P1+ T1 < 4cc / mn at 9,81Mpa with oil temperature at 50°C
Valve de sécurité de vérin de balancier de CX130

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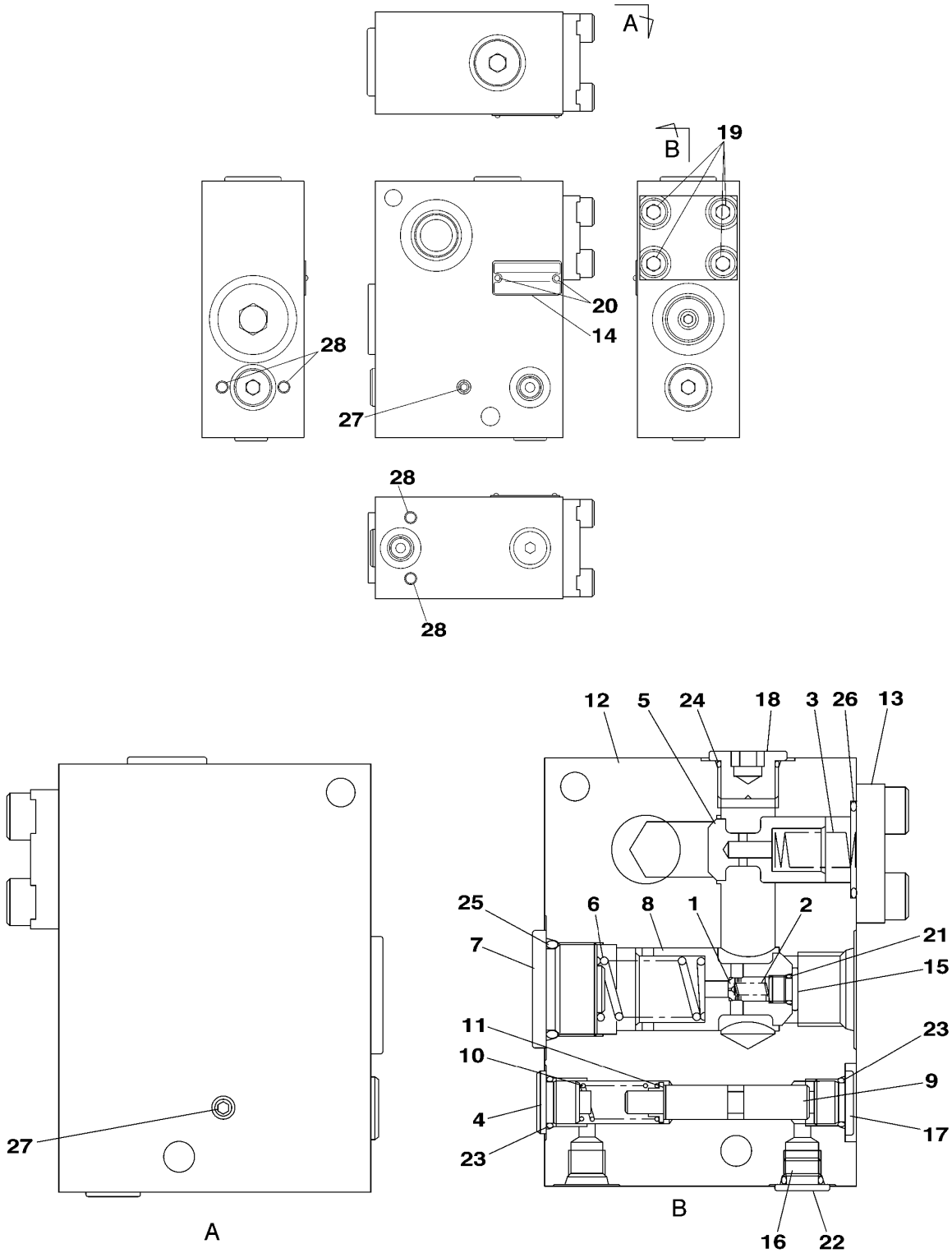


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Dual flow valve

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Dual flow valve

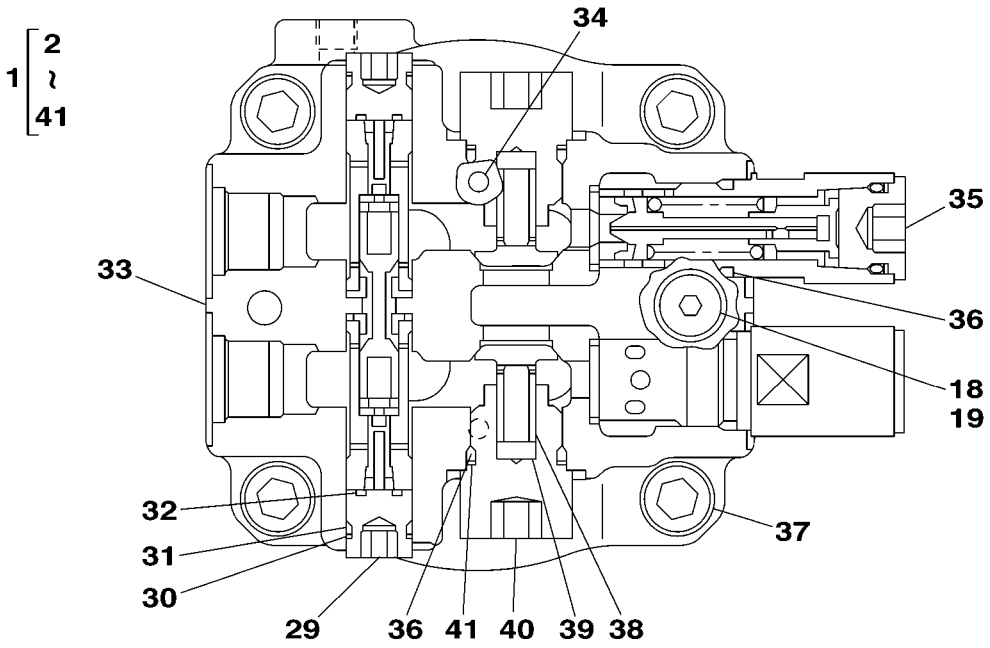


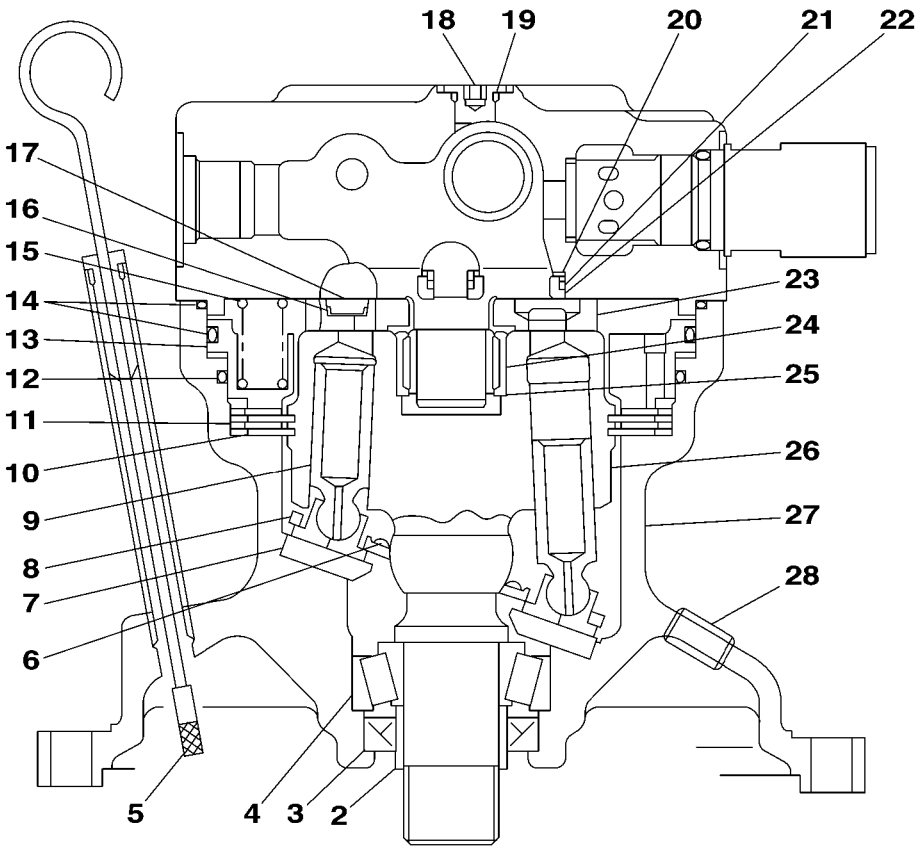
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Swing motor

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Swing motor



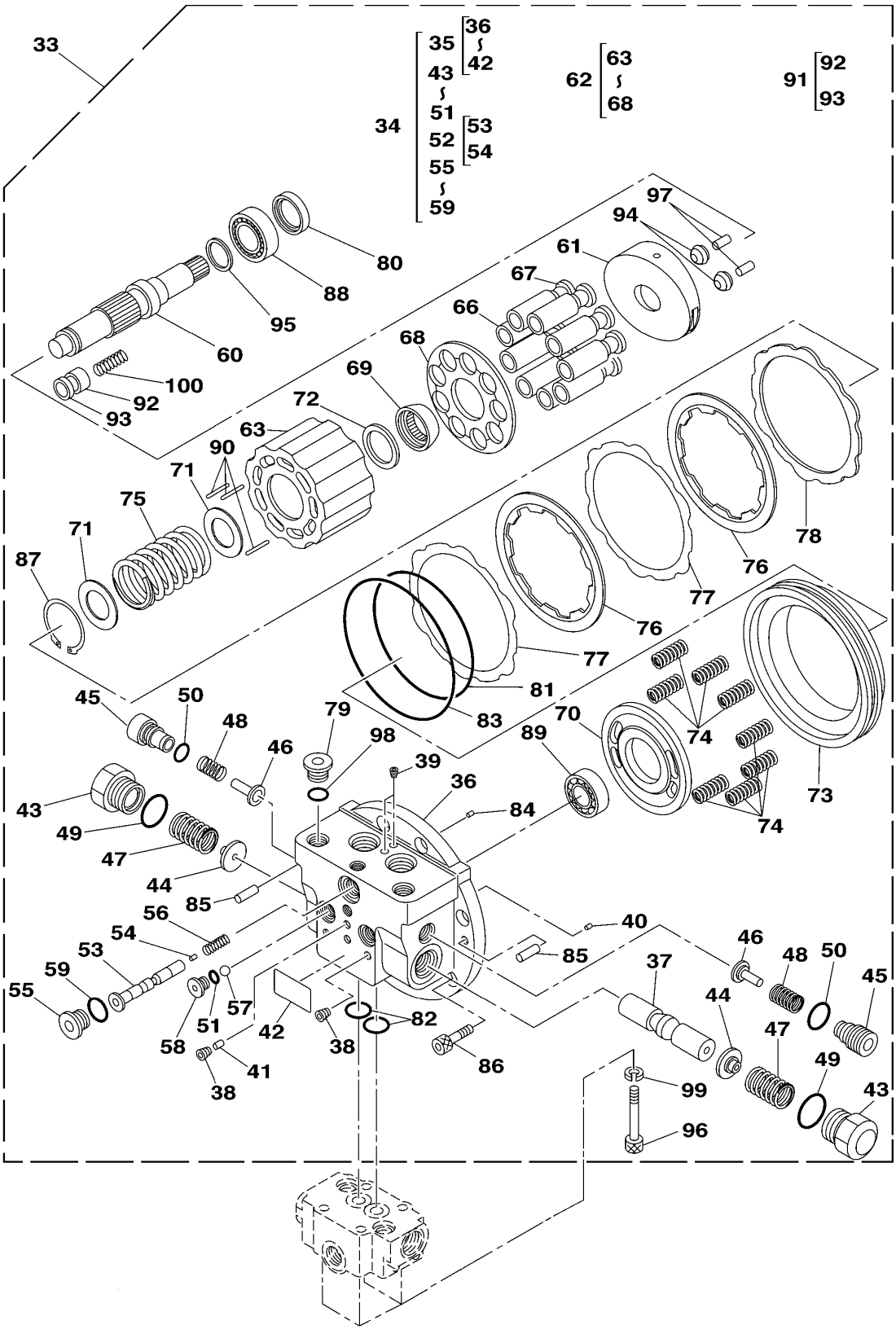


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Travel motor

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Travel motor

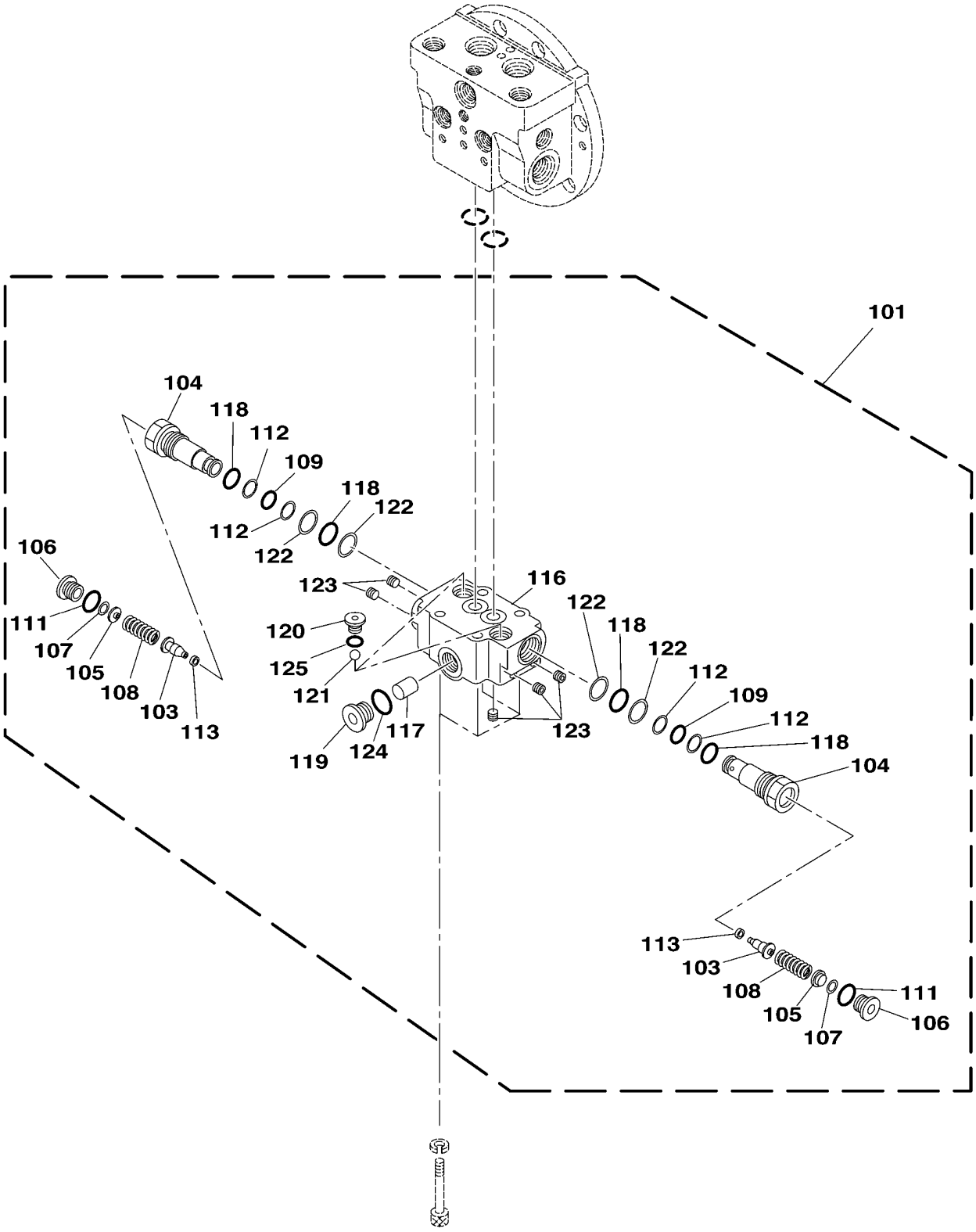


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Travel motor (follow)

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Travel motor (follow)

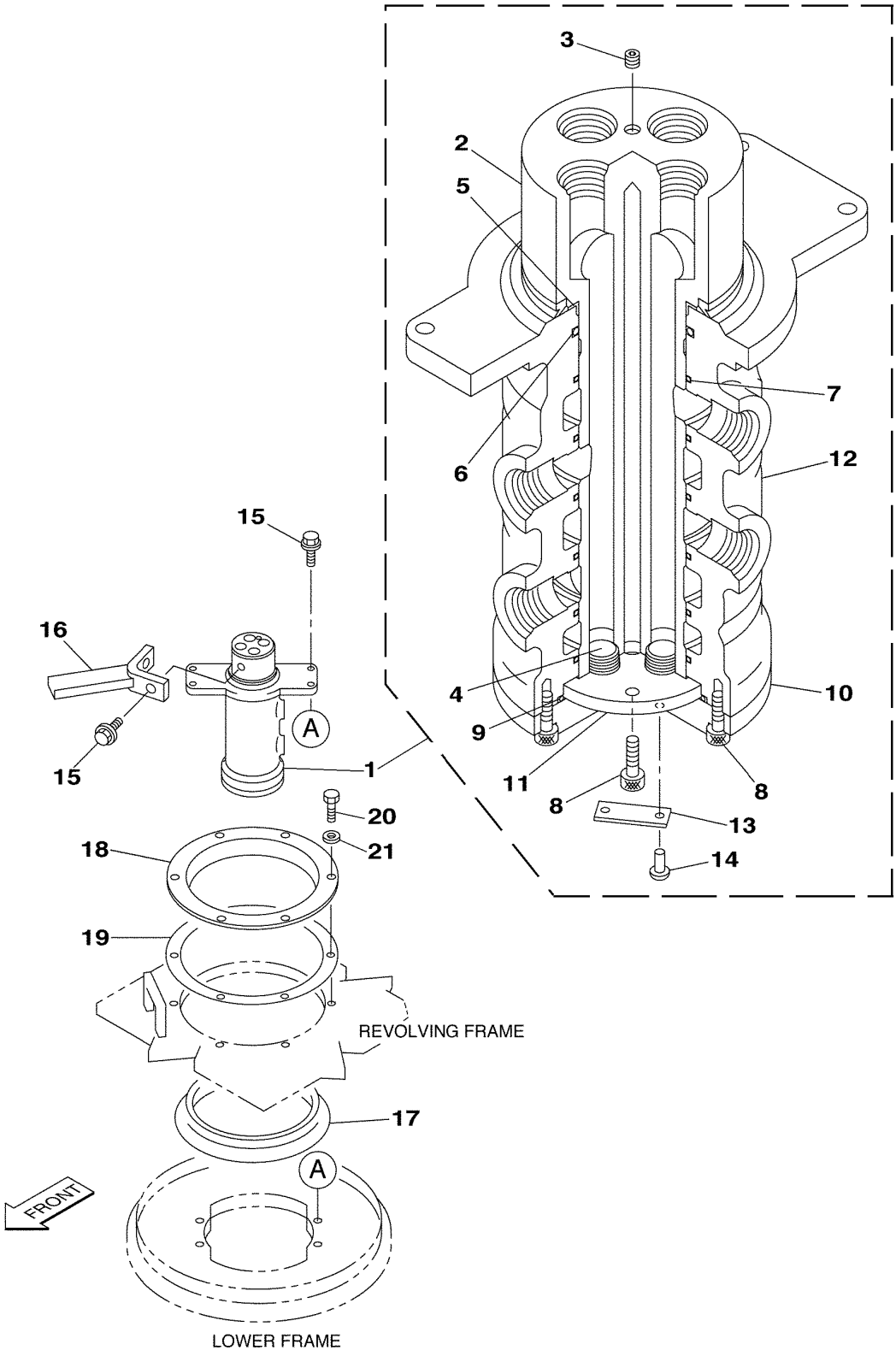


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Swivel joint

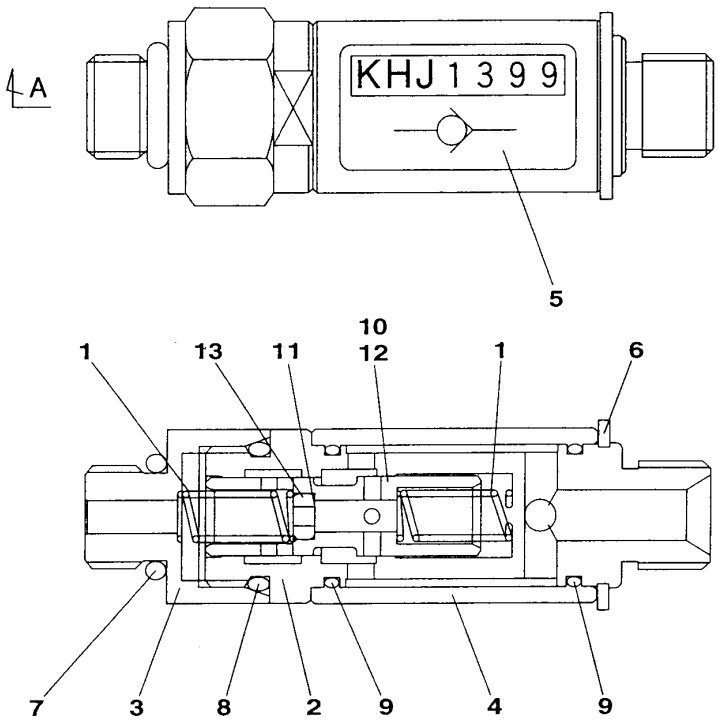
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Swivel joint



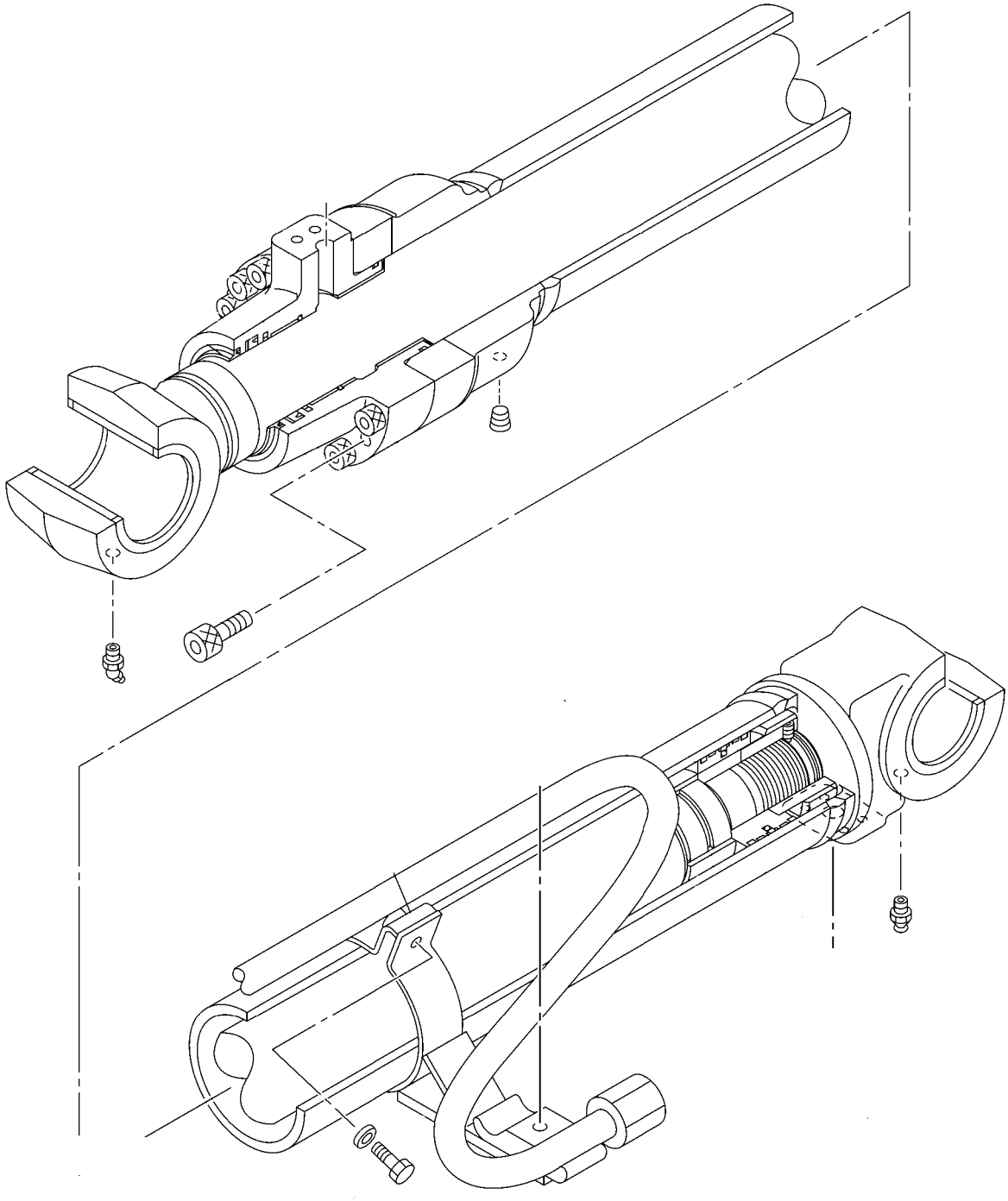
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Flow restrictor



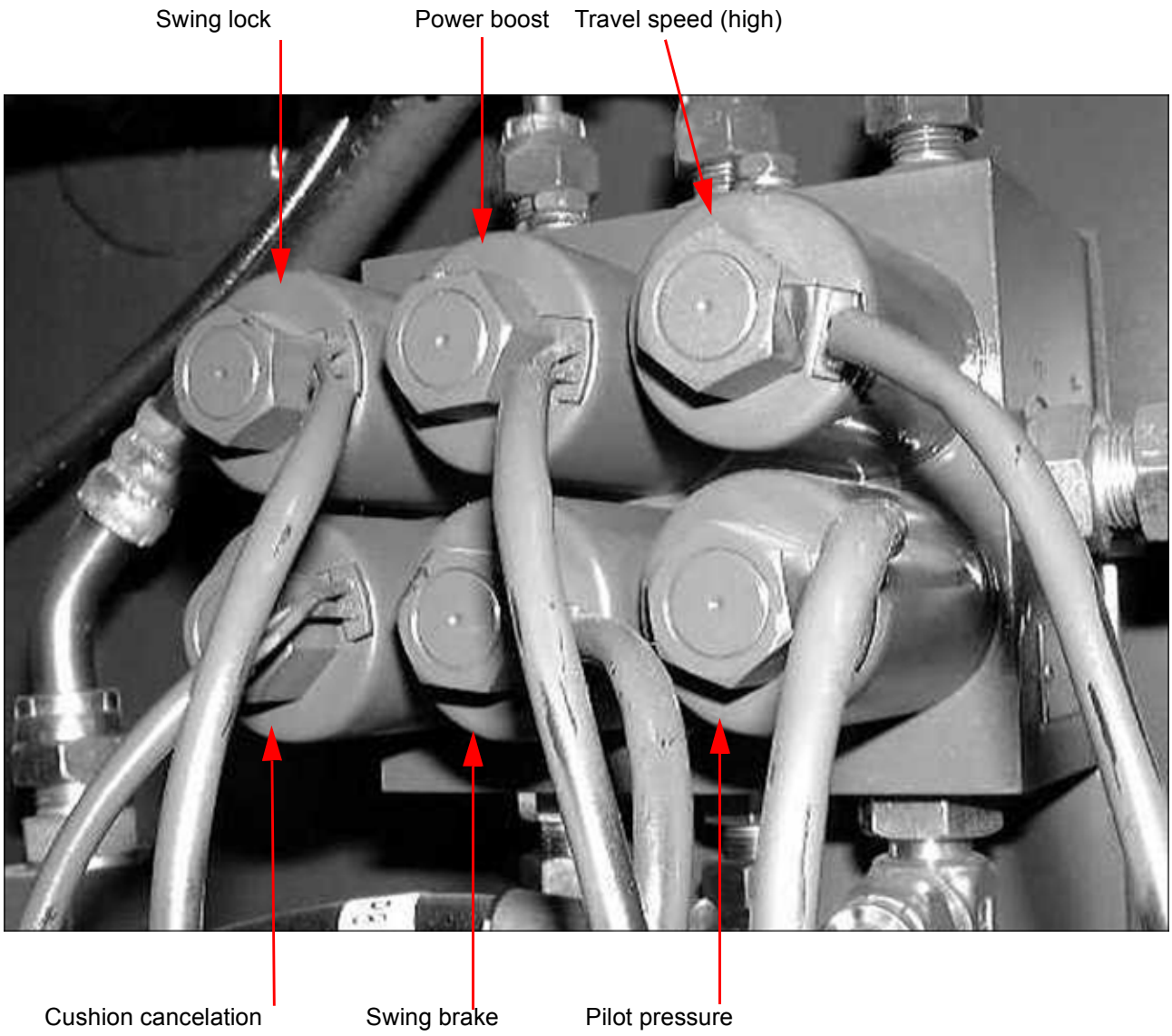
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Boom cylinder



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Solenoid valve block



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HYDRAULIC EXCAVATOR
CX130



SECTION N°4
DIAGNOSTIC - MODEL SELECTION

CASE TRAINING CENTRE
AUGUST 2000

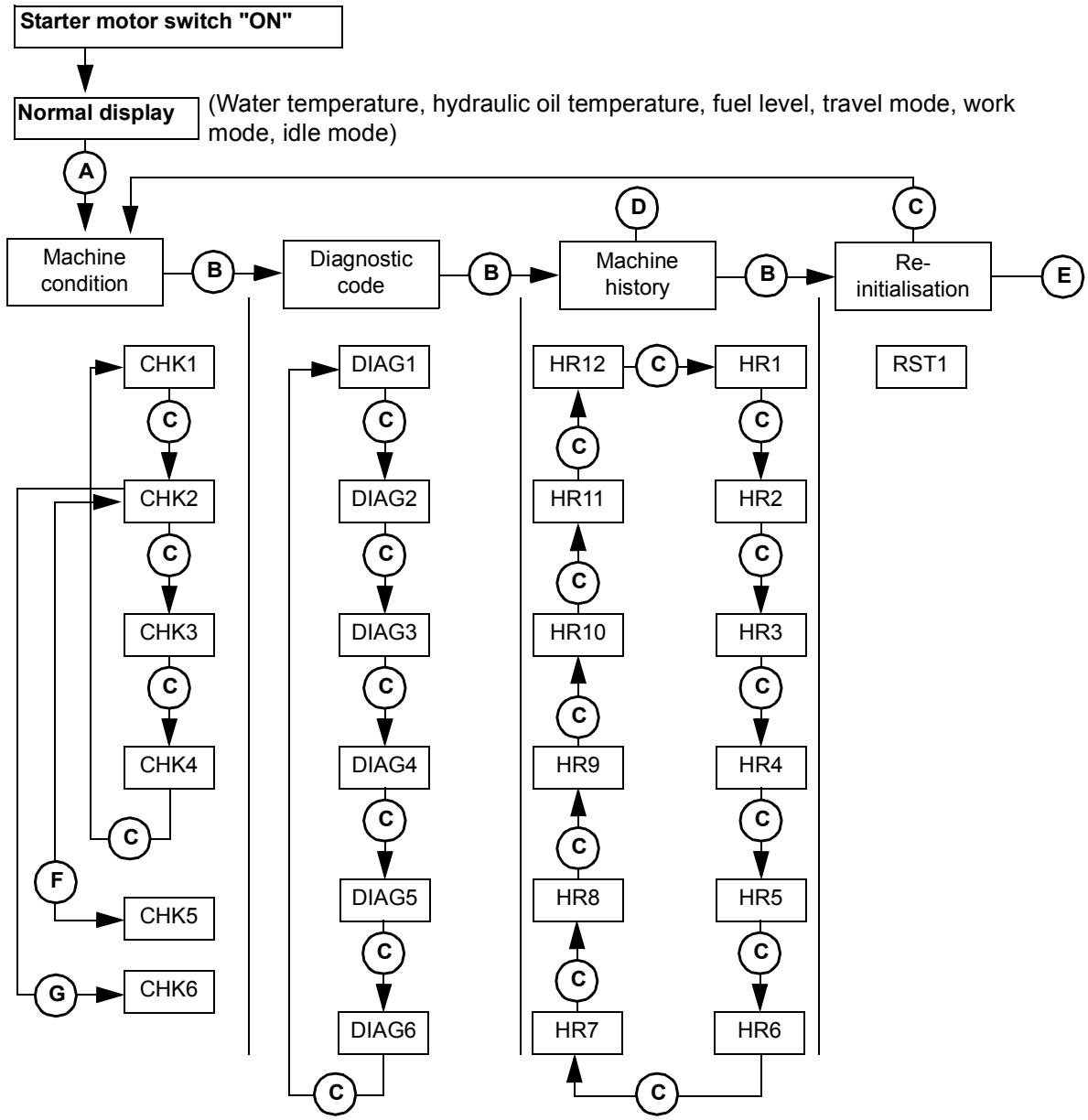
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ACCESS AND CONTENTS OF CONTROL SCREENS

(Diagnostic mode)

Access to control screens



A. Press the travel mode and work mode switches simultaneously for a minimum of 3 seconds
B. Press the automatic mode switch
C. Press the audible warning device stop switch
D. To erase the data, press the work mode switch for a minimum of 10 seconds and the audible warning device sounds
E. To re-initialise the system, press the audible warning device stop switch
To programme the system, press the travel speed switch
To erase the data, press the work mode switch for 10 seconds and the audible warning device sounds
F. To detect overloads on the electrical circuit, press the travel speed switch
G. To detect short-circuits, operate the return to idle switch and the starter motor switch simultaneously, but do not start the engine

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Machine condition

1. Machine condition CHK1

CHK 1	MODE II H		ENG	2000	rpm
P1	030.0	MPa	I	0300	mA
P2	030.0	MPa	WT	0080	C
N	03.00	MPa	OT	0055	C

MODE: Travel - work
P1 Main pump pressure
P2 Main pump pressure
N Regulating pressure (N)
ENG: Engine speed
I Proportioning valve current
WT: Engine water temperature
OT: Hydraulic oil temperature

2a. Machine condition CHK2

CHK 2	MODE II H		TR1	0000
R	0080	%	TR2	0000
FT	0040	C	TR3	0000
TV	0100	%	TR4	0000

R: Engine load rate
FT: Fuel temperature
TV: Rate of acceleration
TR1 to TR3 Electronic control box transistor outputs
TR4 Not used

Transistor output: 0 = OFF, 1 = ON

TR1	0 0 0 0		TR2	0 0 0 0		TR3	0 0 0 0 0	
		Swing brake			Battery relay			Beacon
		Travel 2nd speed			Shock absorption			
		X			Swing pilot cancellation			
		Power boost						X

X: Not used

2b. Machine condition CHK5(was CHK2')

CHK 2	MODE II H		TR1	0001
R	0080	%	TR2	0001
FT	0040	°C	TR3	0000
TV	0100	%	TR4	0000

In screen CHK2. when the travel mode switch is pressed, the CHK2' screen appears and windows TR1 and TR2 show any overloads in the corresponding electrical circuits.

No overload = 0, Overload = 1

Example: In the screen opposite, windows TR1 and TR2 show an overload on the swing brake and battery relay circuit.

NOTE: *In diagnostic mode, if an error code is changed to zero, the data is also erased.*

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2c. Machine condition CHK6(was CHK2'')

CHK 2	MODE II H		TR1	0010
R	0080	%	TR2	0000
FT	0040	C	TR3	0000
TV	0100	%	TR4	0000

1) When the return to idle switch and the starter motor switch are both actuated simultaneously, without starting the engine, automatic checking for short-circuits in output transistors is initialised.

2) If the message "ELEC. PROBLEM" is displayed on the control screen, return to screen CHK2 and press the travel mode switch for 10 seconds. The CHK2" screen will be displayed and the windows TR1 and TR2 will show any short-circuits on the corresponding lines.

NOTE: *If there is no message and the audible warning device sounds 6 times, that means that there is no defect.*

Example: In the screen opposite, window TR1 shows a short-circuit at the travel second speed control transistor output.

3) When the starter motor switch is in the OFF position, the results are erased.

No short-circuit = 0, short-circuit = 1

3. Machine condition CHK3

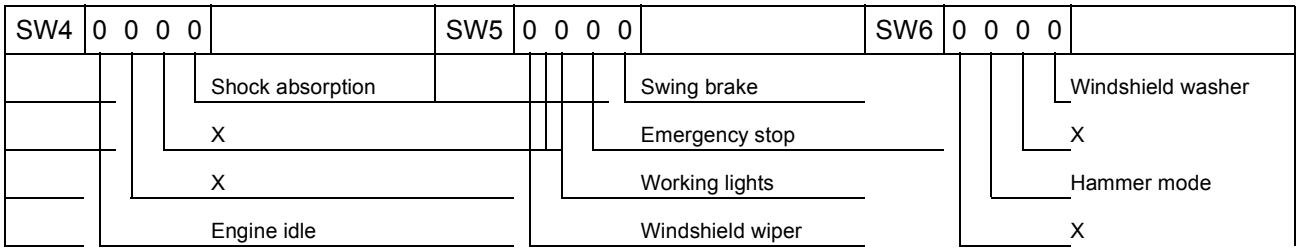
CHK 3	MODE II H		SW4	0000
SW1	0000		SW5	0000
SW2	0000		SW6	0000
SW3	0100		SW7	0000

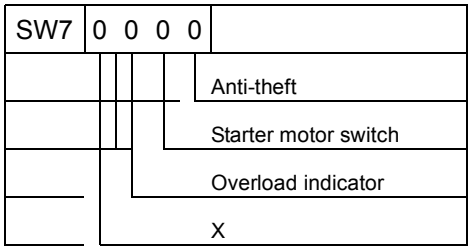
SW1 to SW3	Electronic control box pressure switch inputs
SW4 to SW7	Electronic control box switch inputs

Pressure switch and electronic control box switch inputs: 0 = OFF, 1 = ON

SW1	0 0 0 0		SW2	0 0 0 0		SW3	0 0 0 0	
		Pilot pressure			Engine oil pressure			Battery charge
		Travel pilot pressure			Coolant solution level			X
		Swing pilot pressure			Safety valve pressure			X
		Hammer pilot pressure			X			X

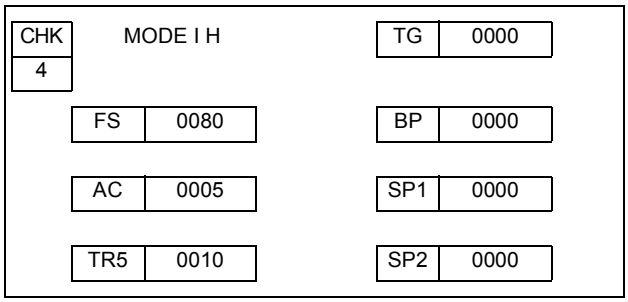
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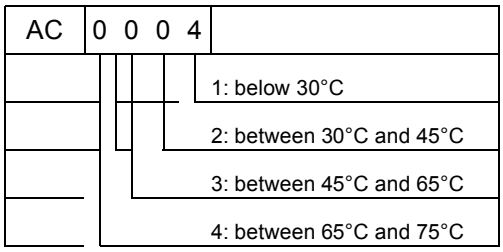


X = Not used

4. Machine condition CHK4



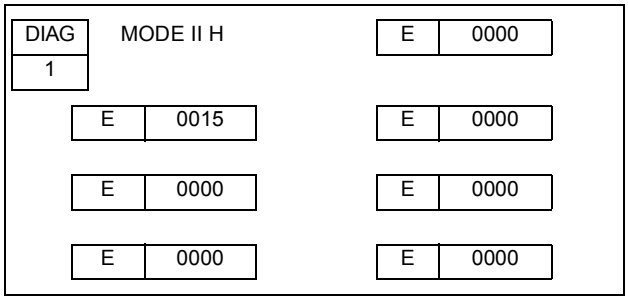
FS: Fuel gauge
AC: A/C control temperature
TR5: Electronic control box transistor output (Not used)
TG: Engine speed
BP: Boom cylinder pressure
SP1 and SP2: Not used



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Diagnostic code

1. Detection of engine failures DIAG1



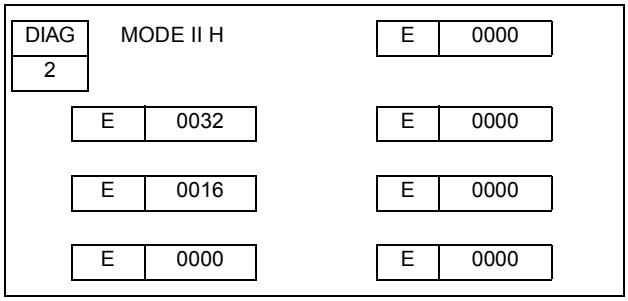
E: Failure code

Failure code

E0000: No defect
E0015: Engine water temperature sender
E0016: Fuel temperature sender
E0025: Fuel flow regulating resistance
E0031: Linear motor control circuit in electronic regulator
E0032: Electronic regulator rack position detector
E0041: Electronic regulator engine speed receiver
E0042: Engine speed detector

Example: In the screen above, there is a defect in the engine water temperature sender.

2. Previous failures in the engine DIAG2



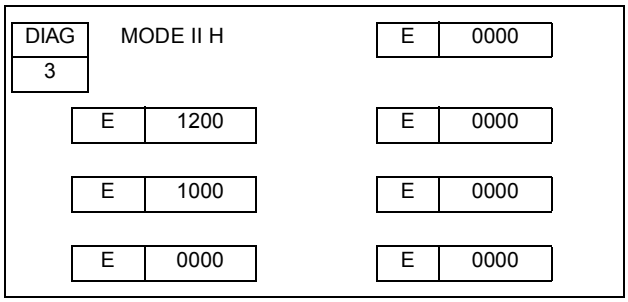
E: Failure code

Example: The screen above shows that there is a defect in the electronic regulator rack position detector (0032) and in the fuel temperature sender (0016).

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3. Previous failures in the engine DIAG3

This screen is connected to the previous screen (DIAG2) as concerns failures involving the hourmeter.



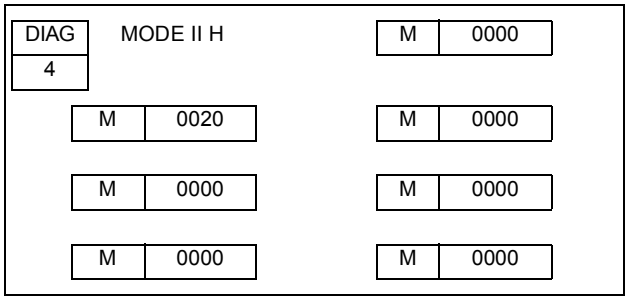
E: Failure code

Example:

The screen above shows that the failure code 0032 (electronic regulator rack position detector) occurred at 1200 H and that failure code 0016 (fuel temperature sender) occurred at 1000 H.

A. the number of hours shown indicates the time at which the failures occurred for the first time since the data was re-initialised.
B. If you wish to erase the failure codes and the number of hours, press the work mode switch for 10 seconds.
C. When data is erased from screens DIAG2 and DIAG3. it is recorded in the electronic control box memory (this data is only visible using an external computer).

4. Excavator failure detection DIAG4



M: Failure code

Failure code

M0000: No defect
M0010: Transistor output short-circuit
M0020: Hydraulic oil temperature sender
M0030: Fuel level sender
M0040: Pressure detector P1
M0050: Pressure detector P2
M0060: Pump regulating pressure detector
M0070: Starter motor switch
M0080: Attachment or travel pilot pressure switch
M0090: CAN communication circuit
M00A0: Electronic control box re-initialisation
M00B0: Engine electronic control box
M00C0: Boom cylinder pressure

Example:

The screen above shows a failure in the hydraulic oil temperature sender (0020).

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5. Previous failures on the excavator DIAG5

DIAG 5	MODE II H	M	0000
M	0020	M	0000
M	0030	M	0000
M	0000	M	0000

M: Failure code

Example:

The screen above shows that there is a failure in the hydraulic oil temperature sender and in the fuel level sender.

6. Previous failures on the excavator DIAG6

This screen is connected to the previous screen (DIAG5) as regards failures involving the hourmeter.

DIAG 3	MODE II H	M	0000
M	1200	M	0000
M	1000	M	0000
M	0000	M	0000

M: Failure code

Example:

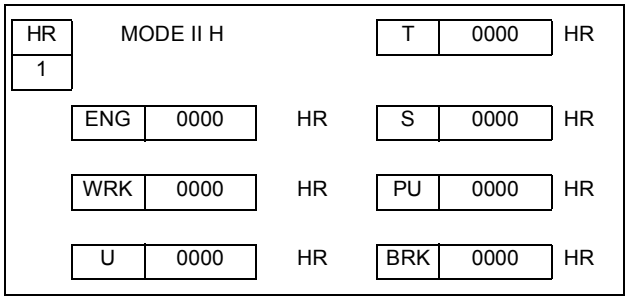
The screen above shows that failure code 0020 (hydraulic oil temperature sender) occurred at 1200 H and that failure code 0030 occurred at 1000 H.

A. The numbers of hours shown indicate the time at which the failures occurred for the first time since the data was re-initialised.
B. To erase the failure codes and the number of hours, press the work mode switch for 10 seconds.
C. When data is erased from screens DIAG5 and DIAG6. it is recorded in the electronic control box memory (this data is only visible using an external computer).

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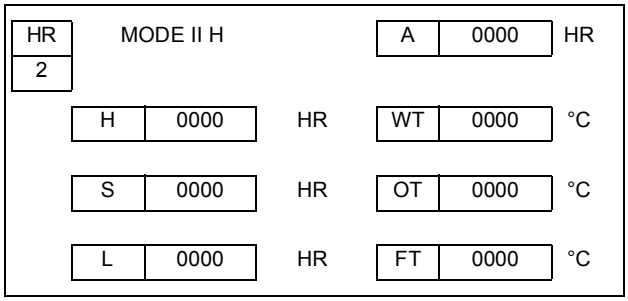
Machine history

1. Screen HR1



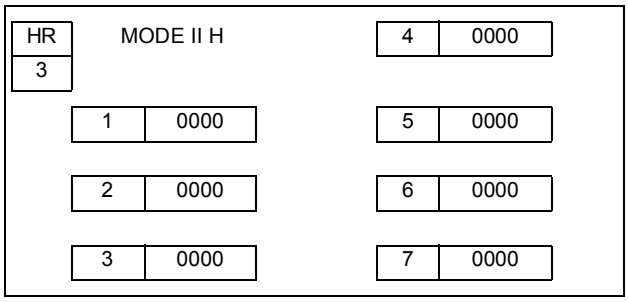
ENG: Hourmeter
WRK: Length of time that excavator has been used (with attachment or travel operating)
U: Length of time that attachment has been used
T Length of time that travel has been used
S: Length of time that swing has been used
PU: Length of time that power boost has been used
BRK: Length of time that hammer has been used

2. Screen HR2



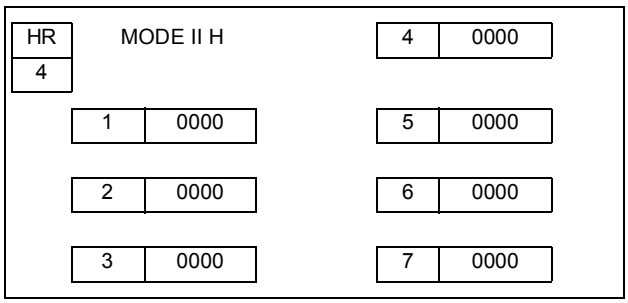
H Length of time excavator was used in H
S: Length of time excavator was used in S
L: Length of time excavator was used in L
A Length of time excavator was used in AUTO
WT: Maximum engine temperature
OT: Hydraulic oil maximum temperature
FT: Fuel maximum temperature

3. Screen HR3



1: Length of time the electronic control box was used
2: Length of time slow travel was used
3: Length of time fast travel was used
4: Length of time travel alone was used
5: Maintenance intervals
6: Not used
7: Not used

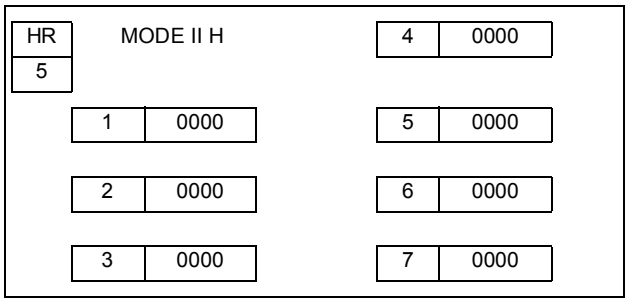
4. Screen HR4, operating time of the various P1 pressures



1: 100 bar (10 MPa) or less
2: Between 100 bar (10 MPa) and 150 bar (15 MPa)
3: Between 150 bar (15 MPa) and 200 bar (20 MPa)
4: Between 200 bar (20 MPa) and 250 bar (25 MPa)
5: Between 250 bar (25 MPa) and 300 bar (30 MPa)
6: Between 300 bar (30 MPa) and 350 bar (35 MPa)
7: 350 bar (35 MPa) or above

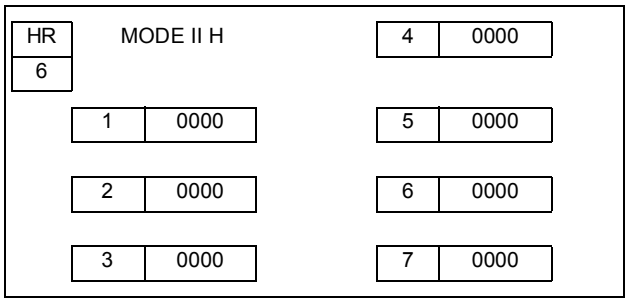
https://truckmanualshub.com/

5. Screen HR5, operating time of the various P2 pressures



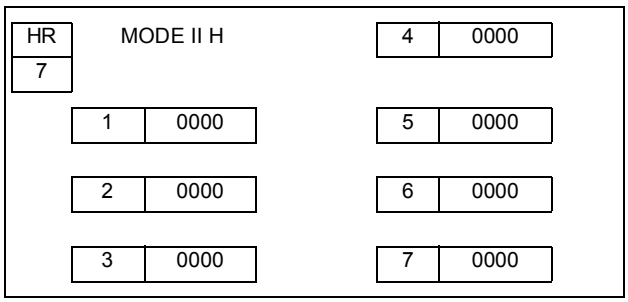
1: 100 bar (10 MPa) or lower
2: Between 100 bar (10 MPa) and 150 bar (15 MPa)
3: Between 150 bar (15 MPa) and 200 bar (20 MPa)
4: Between 200 bar (20 MPa) and 250 bar (25 MPa)
5: Between 250 bar (25 MPa) and 300 bar (30 MPa)
6: Between 300 bar (30 MPa) and 350 bar (35 MPa)
7: 350 bar (35 MPa) or above

6. Screen HR6, operating time of the various engine speeds



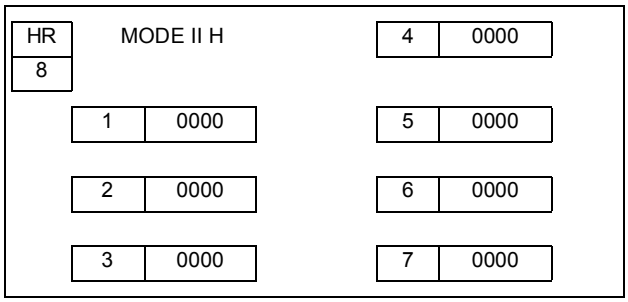
1: 1200 rpm or lower
2: Between 1200 rpm and 1400 rpm
3: Between 1400 rpm and 1600 rpm
4: Between 1600 rpm and 1800 rpm
5: Between 1800 rpm and 2000 rpm
6: Between 2000 rpm and 2200 rpm
7: 2200 rpm or higher

7. Screen HR7, operating time of the various engine water temperatures



1: 77°C or lower (1st and 2nd bar)
2: 77°C to 82°C (3rd bar)
3: 82°C to 97°C (4th bar)
4: 97°C to 100°C (5th bar)
5: 100°C to 103°C (6th bar)
6: 103°C to 105°C (7th bar)
7: 105°C or higher (8th bar)

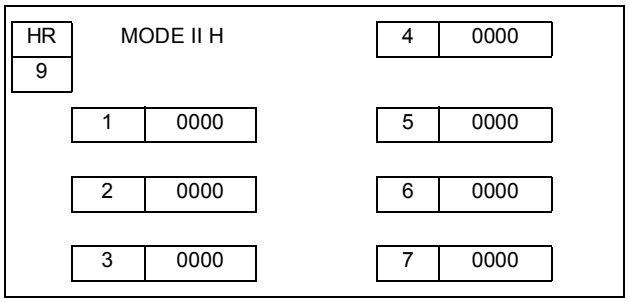
8. Screen HR8, operating time of the various hydraulic oil temperatures



1: 45°C or lower (1st and 2nd bar)
2: 45°C to 60°C (3rd bar)
3: 60°C to 80°C (4th bar)
4: 80°C to 88°C (5th bar)
5: 88°C to 95°C (6th bar)
6: 95°C to 98°C (7th bar)
7: 98°C or higher (8th bar)

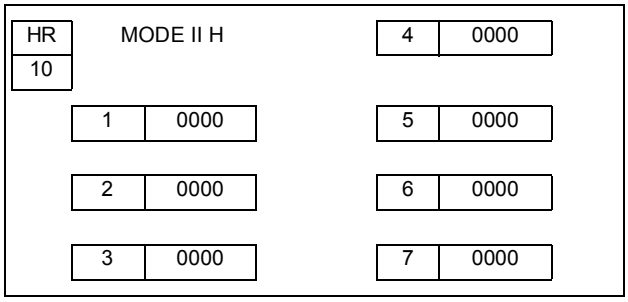
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9. Screen HR9, operating time of the various fuel temperatures



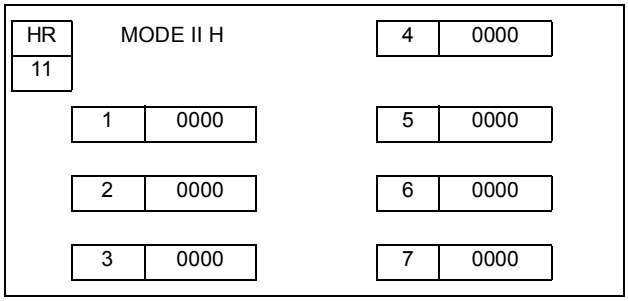
1: 30°C or lower
2: 30°C to 40°C
3: 40°C to 50°C
4: 50°C to 60°C
5: 60°C to 70°C
6: 70°C to 80°C
7: 80°C or higher

10. Screen HR10, operating time of the various engine load rates



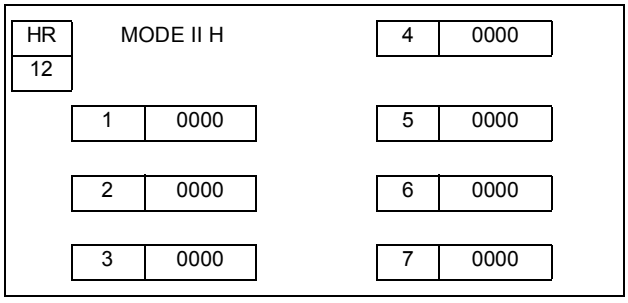
1: 30% or lower
2: 30% to 40%
3: 40% to 50%
4: 50% to 60%
5: 60% to 70%
6: 70% to 80%
7: 80% or higher

11. Screen HR11, operating time of the various engine load rates in mode "H" (maximum speed)



1: 30% or lower
2: 30% to 40%
3: 40% to 50%
4: 50% to 60%
5: 60% to 70%
6: 70% to 80%
7: 80% or higher

12. Screen HR12, operating time of the various engine load rates in mode "S" (maximum speed)



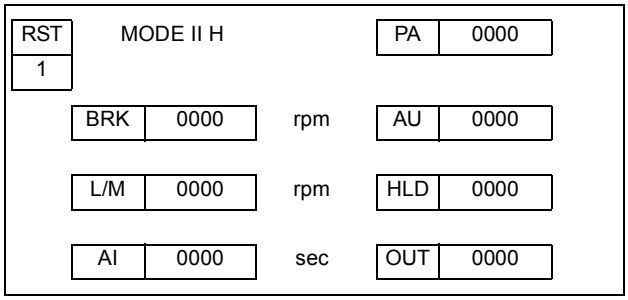
1: 30% or lower
2: 30% to 40%
3: 40% to 50%
4: 50% to 60%
5: 60% to 70%
6: 70% to 80%
7: 80% or higher

To erase all data from the machine history mode (screens HR1 to HR12), press the work mode switch for 10 seconds or more.

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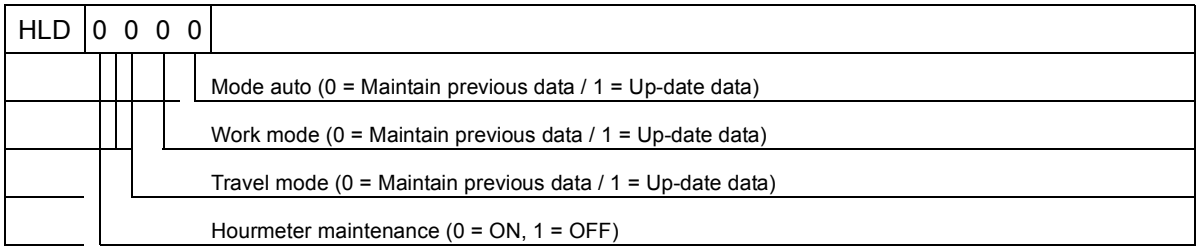
Re-initialisation

1. Re-initialisation RST1



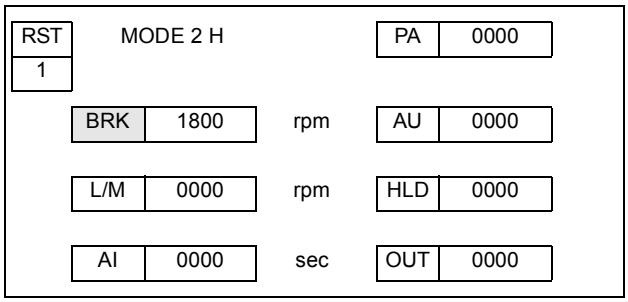
MODE: Travel mode - work mode
BRK: Setting engine speed for hammer option
L/M: Not used
AI: Adjusting timing of automatic return to idle (from 1 to 30 seconds)
PA: Adjusting fuel injection pump
AU: Automatic power boost
HLD: Data management
OUT: Not used

PA = Adjusting fuel injection pump 0 = OFF, 1 = ON
AU = Automatic power boost 0 = ON, 1 = OFF



NOTE: *To select the various adjustment windows, press as many times as necessary on the audible warning device stop switch (a window is selected when the item concerned changes from negative appearance to positive appearance).*

2. Setting engine speed for hammer option



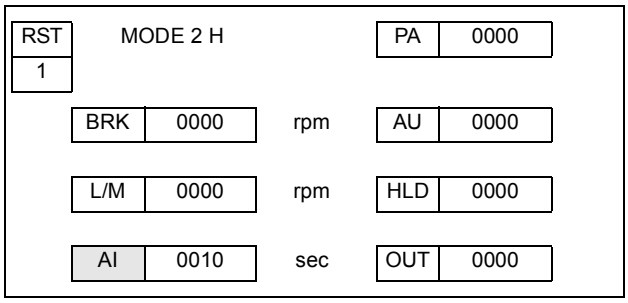
A. Select window BRK .
B. Start the engine, then, using the throttle control, set the required engine speed which is displayed in the BRK window on screen RST 1.
C. To save the engine speed, press the work mode switch for 10 seconds. The audible warning device sounds when saving is completed.
D. Turn the starter key switch to the OFF position.
E. Check the engine speed on screen CHK1.

Example:

In the above screen, the engine speed for the hammer option is set at 1800 rpm.

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3. Setting the automatic return to idle timing

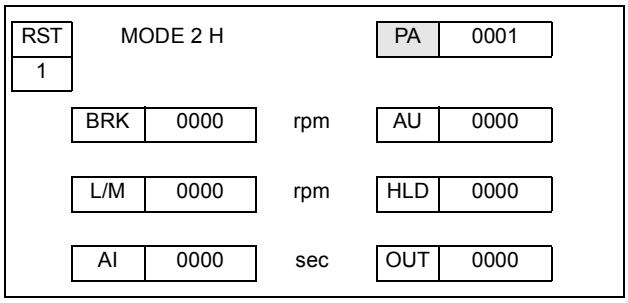


A. Select window AI.
B. Press the travel mode switch as many times as necessary to obtain the required time delay. The setting must be between 1 and 30 seconds.
C. To save the time delay, press the work mode switch for 10 seconds. The audible warning device sounds when saving is completed.
D. Turn the starter key switch to the OFF position.

Example:

In the above screen, the automatic return to idle time delay is set at 10 seconds.

4. Selecting the type of supply to the fuel injection pump



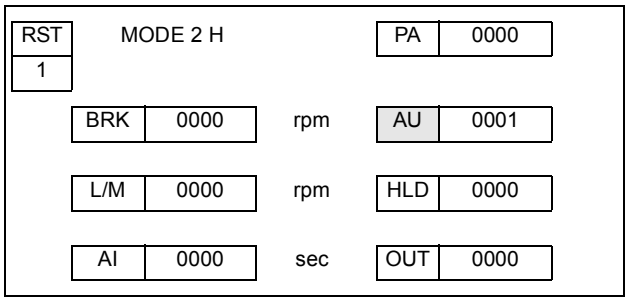
0 = Normal mode
1 = Low power mode

A. Select window PA .
B. To select the type of supply to the fuel injection pump, press the travel mode switch (the right-hand figure changes alternately from 0 to 1 with each pressure of the travel mode switch).
C. To save the selection, press the work mode switch for 10 seconds. The audible warning device sounds when saving is completed.
D. Turn the starter key switch to the OFF position.

Example:

In the above screen, the type of supply to the fuel injection pump is in low power mode.

5. Selecting automatic power boost

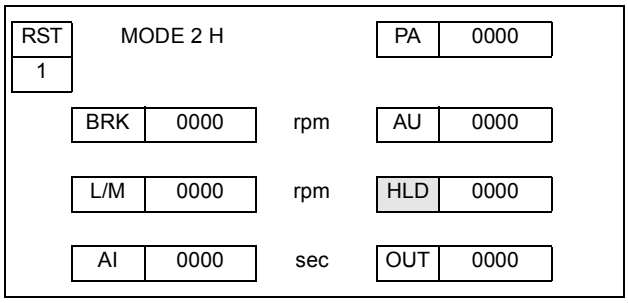


0 = With power boost
1 = Without power boost

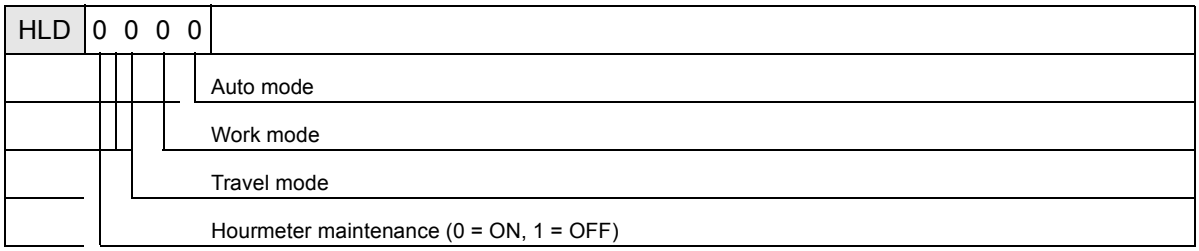
A. Select window AU.
B. To activate or de-activate automatic power boost, press the travel mode switch (the right-hand figure changes alternately from 0 to 1 with each pressure of the travel mode switch).
C. To save the selection, press the work mode switch for 10 seconds. The audible warning device sounds when saving is completed.
D. Turn the starter key switch to the OFF position.

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6. Data management



0 = Maintain previous data
1 = Re-initialisation of data



A. Select window HLD (see NOTE on page 60).
B. To set data management, press the travel mode switch until the required figure appears (each time the travel mode switch is pressed the figures scroll down in the following order: 0000, 0001, 0010, 0011, 0100, 0101 ... up to 1100, 1101, 1110, 1111, 0000).
C. To save the settings, press the work mode switch for 10 seconds. The audible warning device sounds when saving is completed.
D. Turn the starter key switch to the OFF position.

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WARNING MESSAGES

Message display

Starter key switch ON

ELEC. PROBLEM.
LOW FUEL
LOW COOLANT
OVER HEAT
ENG. PRE HEAT
SERVICE DUE

Engine running

ALTERNATOR
LOW OIL PRESS
ENG. IDLING
AUTO WARM UP
POWER UP

MESSAGES	AUDIBLE WARNING	
ENG. PRE HEAT	Yes	This message shows that the engine must be pre-heated before starting. The audible warning device will sound once the correct temperature is reached, the engine can then be started.
AUTO WARM UP		This message shows that the engine is automatically warming up. The message will disappear when the engine reaches its operating temperature or when the acceleration rotating knob or a control lever is operated.
ENG. IDLING		This message shows that the engine has been set at idle speed by means of the return to idle control.
POWER UP		This message shows that maximum power is automatically provided for the attachment.
SERVICE DUE		This message shows that the 500 hours service interval is due. The message is displayed five times when the engine is started up.
LOW FUEL	Yes	This message shows that the level of fuel in the fuel tank is low and that more fuel should be added.
LOW COOLANT	Yes	This message shows that the coolant solution level is low. Shut down the engine, remove the starter switch key, allow the system to cool down then check the level of coolant solution in the expansion reservoir and the radiator.
LOW OIL PRESS	Yes	This message shows that the engine oil pressure is too low. Stop the engine, remove the starter switch key, then check the level.
OVER HEAT	Yes	This message shows that the coolant solution or hydraulic fluid temperature is too high. Reduce engine speed. If the temperature does not decrease, shut down the engine, remove the starter switch key and find the reason for the problem.
ALTERNATOR	Yes	This message shows that there is a defect in the alternator. Shut down the engine, remove the starter switch key, then check the alternator.
ELEC. PROBLEM	Yes	This message shows that there is a defect in the electrical system. Shut down the engine, remove the starter switch key, then find the reason for the problem.

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EXCAVATOR MODEL SELECTION PROCEDURE

The model of excavator is selected after reinitialising the machine code or replacing an electronic control box.

1. Starter key switch ON, the screen below appears and "?" for machine is selected:

MACHINE : SH [?] - 3	
TERRITORY : ? LANGUAGE : ?	
CONT. P / N	**KHR2669**

2. Press the travel mode switch until the required machine code is displayed.

MACHINE CODE	MACHINE MODEL
SH0120	CX130
SH0150	Not used
SH0180	Not used
SH0200	CX210
SH0220	Not used
SH0250	Not used
SH0300	Not used
SH0400	Not used
SH0800	Not used

MACHINE : SH0120- 3	
TERRITORY : ? LANGUAGE : ?	
CONT. P / N	**KHR2669**

3. Press the work mode switch. The screen below appears and "?" for territory is selected.

MACHINE : SH0120- 3	
TERRITORY : [?] LANGUAGE : ?	
CONT. P / N	**KHR2669**

4. Press the travel mode switch until the required destination code is displayed.

Destination code	destination	Pressure unit	T° unit
3	EUROPE	MPa	°C
4	Rest of world	KgF	°C

5. Press the work mode switch. The screen below appears and "?" for language is selected.

MACHINE : SH0120- 3	
TERRITORY : 3 LANGUAGE : [?]	
CONT. P / N	**KHR2669**

6. Press the travel mode switch to display the required language:
   0 = Japanese
   1 = English
   2 = Thai
   3 = Chinese
   4 = German
   5 = French
   6 = Italian
   7 = Spanish
   8 = Portuguese
   9 = Dutch
   10 = Danish
   11 = Norwegian
   12 = Swedish
   13 = Finnish
   14 = Icons

MACHINE : SH0120- 3	
TERRITORY : 3 LANGUAGE : 5	
CONT. P / N	**KHR2669**

Example:

The screen above corresponds to a CX130 model excavator for Europe in French.

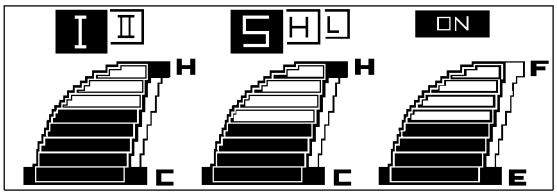
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7. After selecting the machine code, the destination code and the language code, press the auto mode switch and the screen below will appear:



CS00F533

Then the work screen is displayed:



CS00F521

8. If the machine code does not correspond to the engine electronic control box installed, the error code: "E. CONT. ERROR" appears on the screen and the audible warning device sounds.

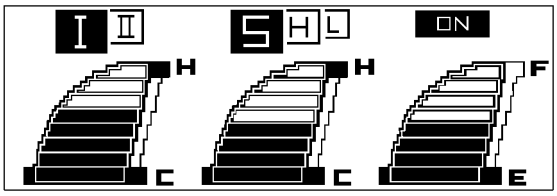
MACHINE : SH0120- 3	
TERRITORY : 3	LANGUAGE : 5
CONT. P / N	KHR2669
E. CONT. ERROR	

9. Check that the machine code corresponds to the electronic control box installed on the excavator.
- If the machine code is wrong, start the procedure again from the beginning.
- If the engine electronic control box installed is not correct, change it.

10. To confirm the excavator model selection, press the auto mode switch for 10 seconds:
The screen below will appear

MACHINE : SH0120- 3	
TERRITORY : 3	LANGUAGE : 5
CONT. P / N	KHR2669

11. Press the auto mode switch again and the work screen will appear:



CS00F521

12. Re-initialising the data
In the excavator model selection screen, if the auto mode switch is pressed for 10 seconds, all the data will be erased and the audible warning device will sound.
If the starter key switch is turned OFF and then ON, the screen below will appear and the procedure starts again from the beginning.

MACHINE : SH ? - 3	
TERRITORY : ?	LANGUAGE : ?
CONT. P / N	KHR2669

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CHANGING THE LANGUAGE CODE

Display the excavator model confirmation screen (press the auto mode switch for 10 seconds).
To change the language code, press the travel mode switch to display the required code.
To confirm the language code, press the work mode switch and the audible warning device sounds.
Turn the starter key switch to OFF.

MACHINE : SH0120- 3	
TERRITORY : 3	LANGUAGE : 1
CONT. P / N	KHR2669

Example:

In the screen opposite, the language code has changed from 5 (French) to 1 (English).

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ANTI-THEFT DEVICE

To prevent the machine from being stolen it is possible to use the anti-theft system, which makes it necessary for a special code to be entered before the machine can be operated.

Your CASE Dealer can do this for you.

Once this operation has been performed, a special access code has to be entered each time you start the engine.

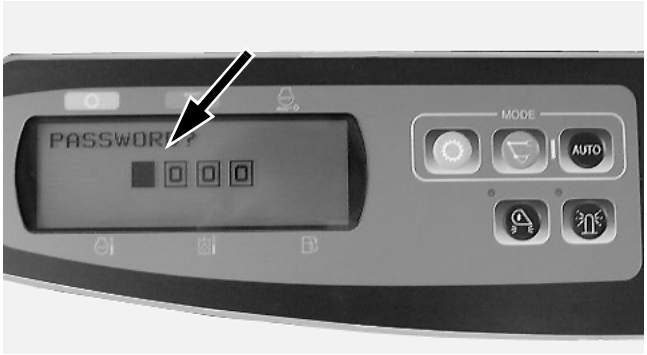
IMPORTANT: Once the code has been entered, do not forget it, as it can not be changed without consulting your CASE Dealer.

Entering the code

Step 1

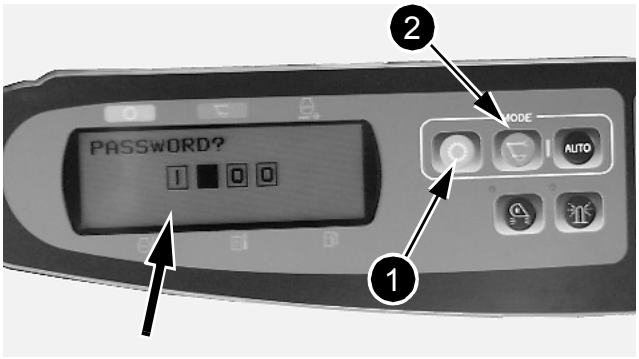
Place the starter switch key in “ON” position.

Step 2



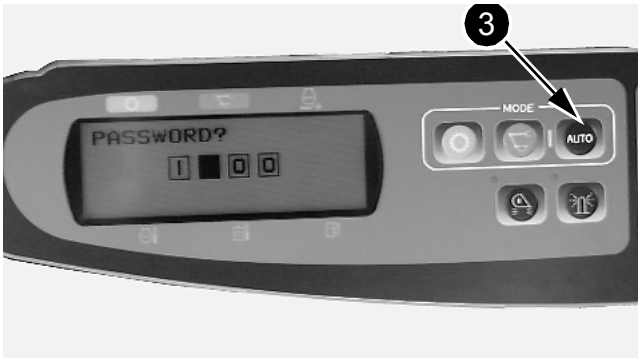
he message “Password” and four boxes will appear on the display screen.

Step 3



To enter the code (e.g. 1234) press button (1) the same number of times as the digit selected (e.g. once), then press button (2) to proceed to the second digit. Press the button (1) same number of times as the second digit (e.g. twice) and then press button (2) to proceed to the third digit. Repeat the procedure for the third and fourth digits.

Step 4



Once all four digits have been entered, press button (3) for the code to be entered in the system. The audible alarm device will sound.

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Step 5

To finish entering the code, place the starter switch key in “OFF” position.

IMPORTANT: Remember to keep careful note of the code number, because if you forget it, it will not be possible to enter a new one without consulting your CASE Dealer.

Using the anti-theft device

The anti-theft device has to be actuated when you are shutting down the engine. Turn the starter switch from “ON” to “OFF”, “ON” to “OFF” for about 2 seconds at a time until the audible alarm device sounds. The anti-theft device is now operational and before being able start the engine you will have to enter the access code.

You are not obliged to activate the anti-theft device. If you so wish, when shutting down the engine, simply place the starter switch key in the “OFF” position and it will not be necessary to enter the access code to start the engine.

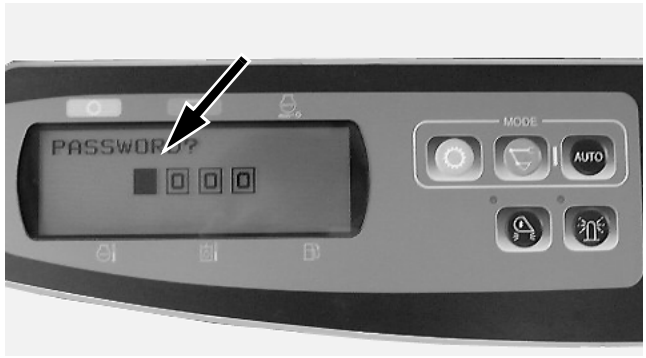
Entering the access code

If the anti-theft device was activated the last time the engine was shut down, then it will be necessary to enter the access code before being able start it again.

Step 1

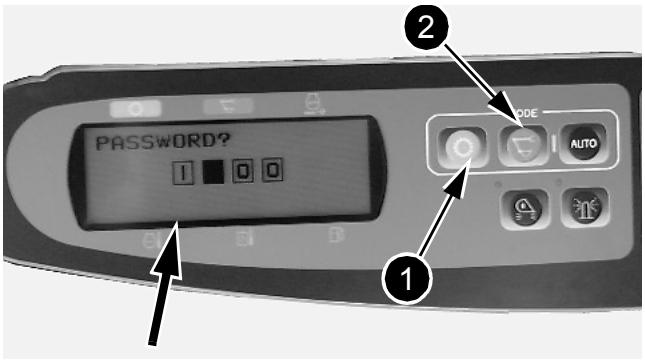
Place the starter switch key in the “ON” position.

Step 2



The message “Password” and four boxes will appear on the display screen.

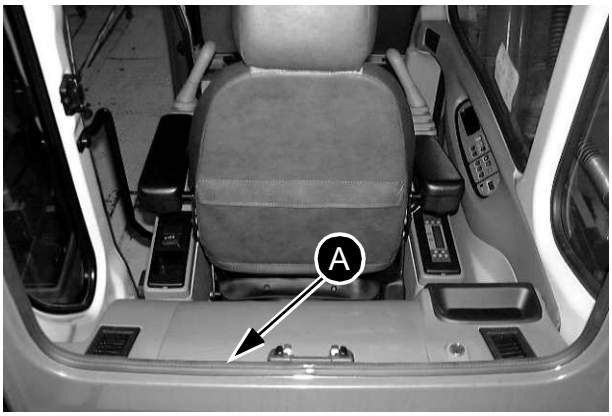
Step 3



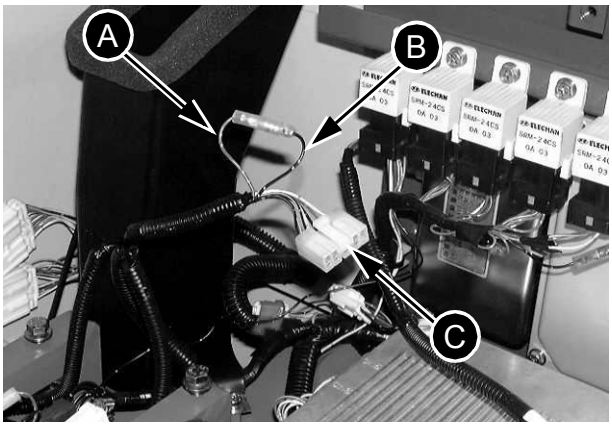
o enter the code (e.g. 1234), press button (1) the same number of times as the digit selected (e.g once) then press button (2) to proceed to the second digit. Press the button (1) same number of times as the second digit (e.g. twice) and then press button (2) to proceed to the third digit. Repeat the procedure for the third and fourth digits.

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CHANGING THE ACCESS CODE FOR THE ANTI-THEFT SYSTEM



A. Hood



A. Violet wire marked 469 female plug
B. Black wire marked 621 male plug
C. Radio connector

1. Remove the hood (A) located behind the operator's seat.

2. Disconnect the two wires (A) (B) covering the anti-theft system.

3. Turn the starter key switch to ON and then OFF.

4. Reconnect the two wires (A) (B) covering the anti-theft system (see paragraph 2).

5. To save the new access code, consult the anti-theft protection section in the operator's manual.

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TROUBLESHOOTING

Prior inspections

Item	Value	Action
POINTS TO BE CHECKED WHEN STARTING		
Lubricants - Coolants		
1. Check the quantity of fuel	---	Add fuel
2. Check that fuel is not contaminated	---	Clean, drain
3. Check the quantity of hydraulic fluid	---	Fill with fluid
4. Inspect the hydraulic fluid filter	---	Drain, clean
5. Check the quantity of oil in each reduction gear	---	Fill with oil
6. Check the quantity of engine oil	---	Fill with oil
7. Check the quantity of coolant	---	Fill with water
8. Check the filter restriction indicator (dust)	---	Clean or change
Electrical equipment		
9. Check the battery terminals and wiring for tightness and corrosion	---	Tighten or change
10. Check the alternator terminals and wiring for tightness and corrosion	---	Tighten or change
11. Check the starter motor terminals and wiring for tightness and corrosion	---	Tighten or change
OTHER POINTS TO CHECK		
Hydraulic system - Mechanical equipment		
12. Abnormal noise or smell	---	Repair
13. Check for oil leaks	---	Repair
14. Air in the system	---	Bleed the air
Electrical system - Electrical equipment		
15. Check the battery voltage (with engine shut down)	23-26 V	Change
16. Check the quantity of fluid in the battery	---	Add or change
17. Make sure that the cables are not discoloured, burnt or stripped	---	Change
18. Check for missing or loose cable retaining clips	---	Repair
19. Check for damp on cables (especially on connectors and terminals)	---	Disconnect and dry if damp
20. Check fuses for condition and corrosion	---	Change
21. Check the alternator voltage (with engine speed above the throttle control mid-point) (when battery charge is insufficient, there can be 25 V only at start up)	27.5-29.5 V	Change
22. Noise from battery relay (with starter motor ON or OFF)	---	Change

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Reading the organisation charts

Error code and description of problem

The error code and the description of the problem are shown in the organisation charts

Error code	Description of problem
1	The message is still displayed even after refuelling
2	The message is still displayed even after adding coolant solution

Prior checks

Before identifying the cause of the problem, always make prior checks.

Procedure method

After checking or measuring the items described in one step, depending on the results, choose YES or NO and pass on to the next step.

The description in the YES or NO refers directly to the cause of the problem as the result of checks or measurements made. Refer to the description of the cause and carry out the repair procedures described on the right-hand side.

The inspection methods/measurements are described in one step. YES should be chosen if the criteria or questions meet the situation; NO if they do not meet it.

The necessary preparation work, operating method and the criteria are described under one step. This should be carefully read before starting the inspection and the measurements and the procedures should be followed, starting by Step (1) since negligent preparation work or incorrect operating methods can cause damage to the machine.

Wire colour

When troubleshooting, refer to the table below for the wire colours. (For connector numbers, refer to the following pages).

Table showing wire colours

Symbol	Wire	Symbol	Wire
B	Black	R	Red
W	White	Y	Yellow
Br	Brown	Lg	Light green
P	Pink	Sb	Sky blue
V	Violet	L	Blue
G	Green	Gr	Grey
O	Orange		

BR indicates colour B striped with R.
Example: BR indicates a black wire with red stripes

IMPORTANT: *Before removing or installing a connector, always turn the ignition key to OFF.*

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Procedures

1. This is what to do to detect defects when the message is still displayed after all necessary measures have been taken to correct the error.

Message displayed	Description of the problem	Problem No.
Low fuel	The message is still displayed even after refilling the fuel tank.	1
Low coolant	The message is still displayed even after refilling with coolant solution.	2
Low oil press	The message is still displayed even after adjusting the engine oil pressure.	3
Over heat	The message is still displayed even when the hydraulic oil temperature is 84°C or less and the engine coolant temperature is 92°C or less.	4
Alternator	The message is still displayed.	5
Elec. problem	The message is still displayed.	6

2. This is what to do if the problem is not indicated by a message but machine operation is not correct.

A. Engine

Description of the problem	Problem No.
The engine does not start. → "ELEC. PROBLEM" is shown on the monitor. → **YES**	**6**
NO →	**7**

3. Problem without message.

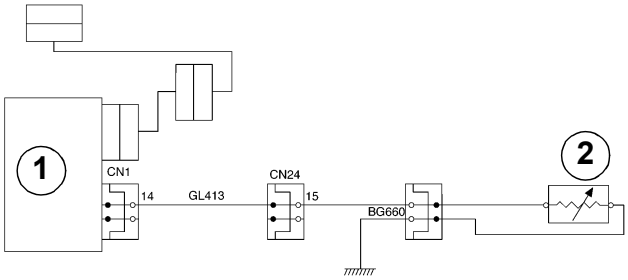
Description of the problem	Problem No.
Impossible to change travel speed →	**8**

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Fuel

Description of the problem No. 1

- The message is still displayed even after refilling the fuel tank.



1. Main electronic control box
2. Fuel level sender

Troubleshooting	Cause	Action
Starter key switch ON Measure the resistance of the fuel level sender using maintenance support CHK4. (Refer to the table below for the resistance). YES →	Defective main electronic control box	Change the main electronic control box
NO → Starter key switch OFF Disconnect the coupler from the fuel level sender to measure the resistance of the coupler at the fuel level sender end. (Refer to the table below for the resistance). NO →	Defective fuel level sender	Change or check the fuel level sender
YES → Disconnect the CN24 connector to measure the resistance between GL female and the GND earth. (Refer to the table below for the resistance). NO →	Bad connection on fuel level sender	Clean the connection terminal
YES → Disconnect connector CN1 to measure the resistance between female GL and the GND earth. (Refer to the table below for the resistance). NO →	Bad connection on CN24	Clean CN24 connection terminal
YES →	Defective main electronic control box or incorrect CN1 connection	Change the main electronic control box or clean the CN1 connection terminal
Note: All the bar graph indicators have disappeared when the circuit is open		

Resistance between GL and BG

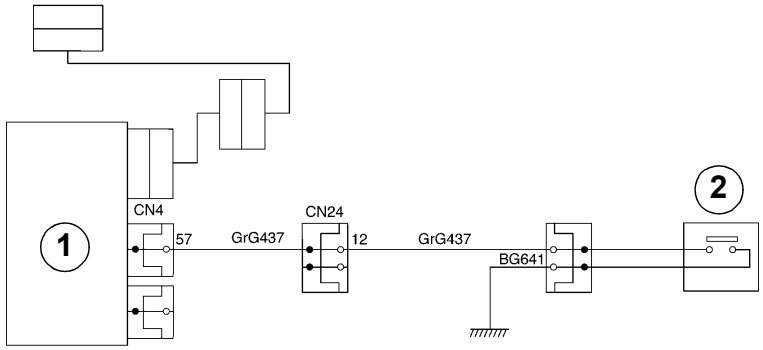
Monitor	1. Refill the tank	2	3	4	5	6	7	8
Resistance (OHM)	80-75	75-61	61-47	47-37	37-30	30-24	24-19	19-10

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Add coolant solution

Description of problem No. 2

- The message is still displayed even after adding coolant solution.



CM00F002

1. Main electronic control box
2. Coolant solution level switch

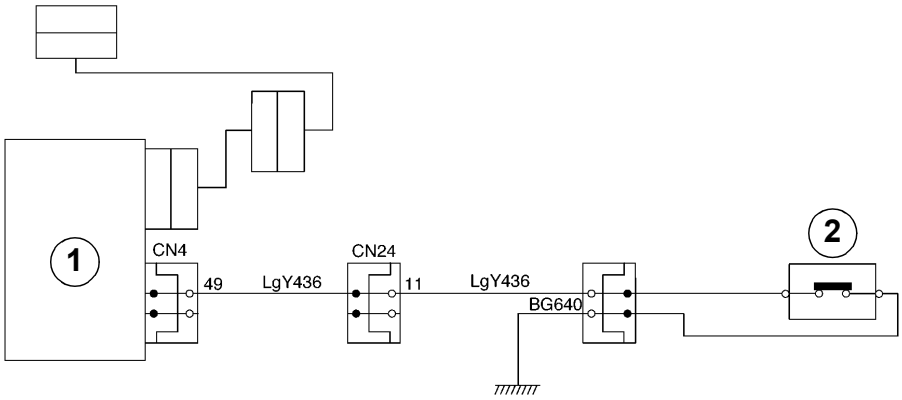
Troubleshooting	Cause	Action
Starter key switch ON Disconnect the reserve tank level pressure switch connector to see if the message disappears YES	Reserve tank level pressure switch is defective	Change the reserve tank
NO Disconnect connector CN24 to see if the message disappears YES	Short-circuit on wire GrG between the reserve tank level pressure switch and CN24	Repair wire GrG
NO Disconnect the connector CN4 to see if the message disappears YES	Short-circuit on wire GrG between CN24 and CN4	Repair wire GrG
NO	Main electronic control box defective	Change the main electronic control box

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Low engine oil pressure

Description of problem No. 3

- The message is still displayed even when the engine oil level is satisfactory.



CM00F003

1. Main electronic control box
2. Engine oil pressure switch

Troubleshooting	Cause	Action
Check the following points during the 12 seconds following starting the engine		
Disconnect the oil pressure switch connector to see if the message disappears → YES	Oil pressure switch defective	Change
NO → Disconnect connector CN24 to see if the message disappears → YES	Short-circuit on wire LgY between the oil pressure switch and CN24	Repair wire LgY
NO → Disconnect connector CN4 to see if the message disappears → YES	Short-circuit on wire LgY between CN24 and CN4	Repair wire LgY
NO	Main electronic control box defective	Change the main electronic control box

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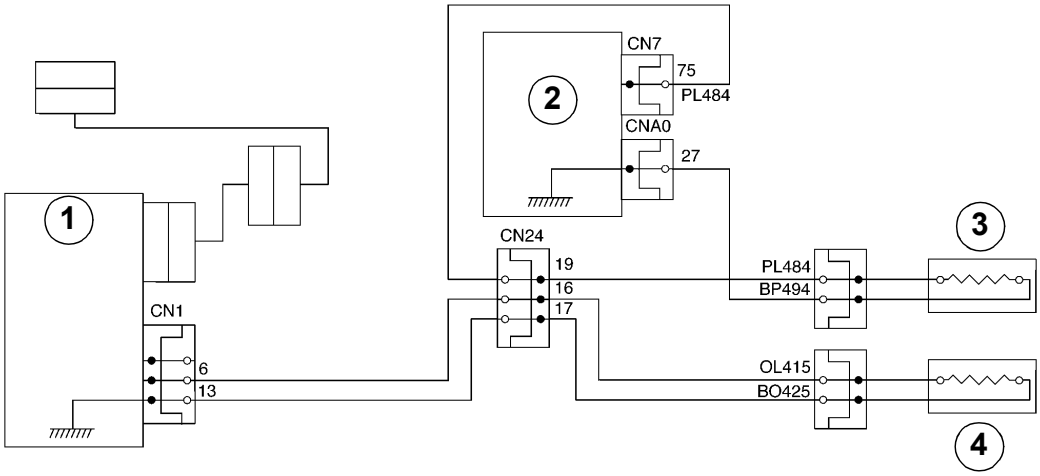
Overheating

Description of problem No. 4

- The message is still displayed even when the real temperature is less than the following: Hydraulic oil temperature 84°C, engine coolant temperature 92°C.

Prior check:

1. Make sure that 8 bars are displayed on the hydraulic oil and engine coolant temperature gauge bar-graphs.



CM00F004

1. Main electronic control box
2. Engine electronic control box
3. Engine coolant temperature sender
4. Hydraulic oil temperature sender

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Troubleshooting	Cause	Action
1. The 8 bars on the coolant temperature bar-graph are displayed. Starter key switch ON The temperature of the temperature sender (coolant) is abnormal compared to maintenance assistance CHK1 (comparison between the real temperature and the indicated temperature). See coolant temperature on CHK1 WT. Measure the real temperature YES → Check problem code E0015 for the coolant temperature sender with the maintenance diagnostic (DIAG 1) YES → Disconnect the coolant temperature sender connector to measure the resistance NO →	Coolant temperature sender defective	Change the temperature sender
YES → Disconnect connectors CN24 and CNAO to measure the resistance between the female terminals PL and BP. (Refer to the table below for the resistances). NO →	Bad connection on the temperature sender connector (coolant)	Clean the temperature sender connecting terminal
YES → Disconnect connectors CN7 and CNAO to measure the resistance between the female terminals PL and BP. (Refer to the table below for the resistances). NO →	Bad connections on CN24	Clean connections CN24
YES →	Main electronic control box defective or bad CN7 and CNAO connections	Change main electronic control box or clean the connecting terminals on CN7 and CNAO

Note: In the event of a short-circuit, the bar-graph disappears completely.

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Overheating (continued)

Troubleshooting	Cause	Action
2. The hydraulic temperature bar-graph displays 8 bars. Starter key switch ON The temperature sender temperature (oil) is abnormal compared to maintenance assistance CHK1 (comparison between the real temperature and that indicated). See coolant temperature in CHK1 OT. Measure the real temperature YES See problem code M0020 for the oil temperature sender using maintenance diagnostic (DIAG 4) YES Disconnect the temperature sender connector (oil) to measure the resistance. (Refer to the table below for the resistances). NO	Temperature sender (oil) defective	Change the oil temperature sender
YES Disconnect connector CN24 to measure the resistance between the male terminals OL and BO. (Refer to the table below for the resistances). NO	Bad connection on the thermal detector (oil) connector	Clean the detector connecting terminal
YES Disconnect connector CN1 to measure the resistance between the female terminals OL and BO. (Refer to the table below for the resistances). NO	Bad connections on CN24	Clean the connecting terminal on CN24
YES	Electronic control box defective or bad connection on CN1	Change the electronic control box or clean the connecting terminals on CN1

Note: In the event of a short-circuit, the bar-graph disappears completely.

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Detector resistances

NOTE: *The resistance varies with the temperature.*

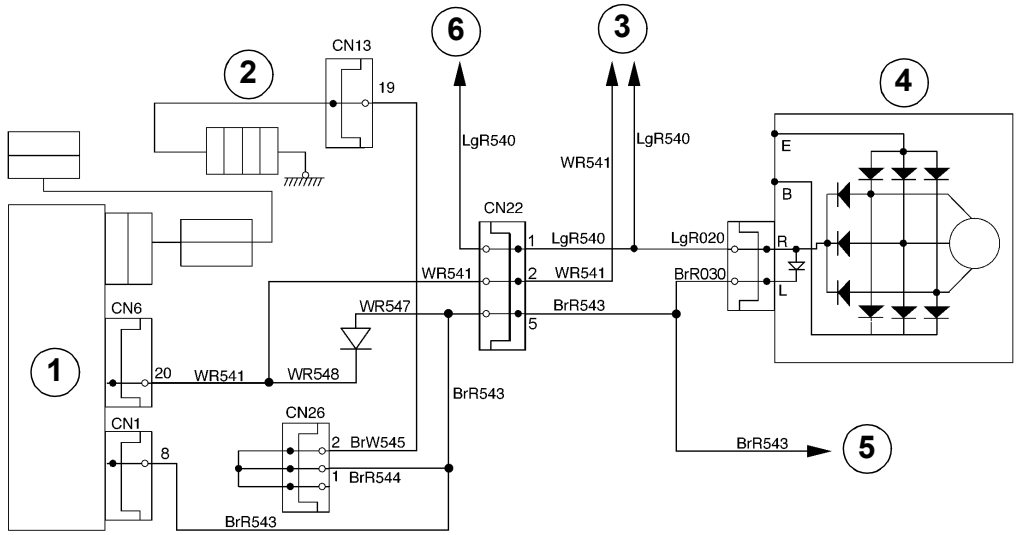
Coolant or oil temperature	Coolant temperature detector	Oil temperature detector
20°C	6.08 kΩ	2.45 kΩ
30°C	4.24 kΩ	1.66 kΩ
40°C	3.02 kΩ	1.15 kΩ
50°C	2.18 kΩ	0.81 kΩ
60°C	1.61 kΩ	0.58 kΩ
70°C	1.20 kΩ	0.43 kΩ
80°C	0.91 kΩ	0.32 kΩ

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Battery charge circuit defective

Description of problem No. 5

- The message is still displayed.



CM00F005

1. Main electronic control box
2. Hourmeter
3. Battery relay
4. Alternator
5. Starter motor
6. Starter motor switch

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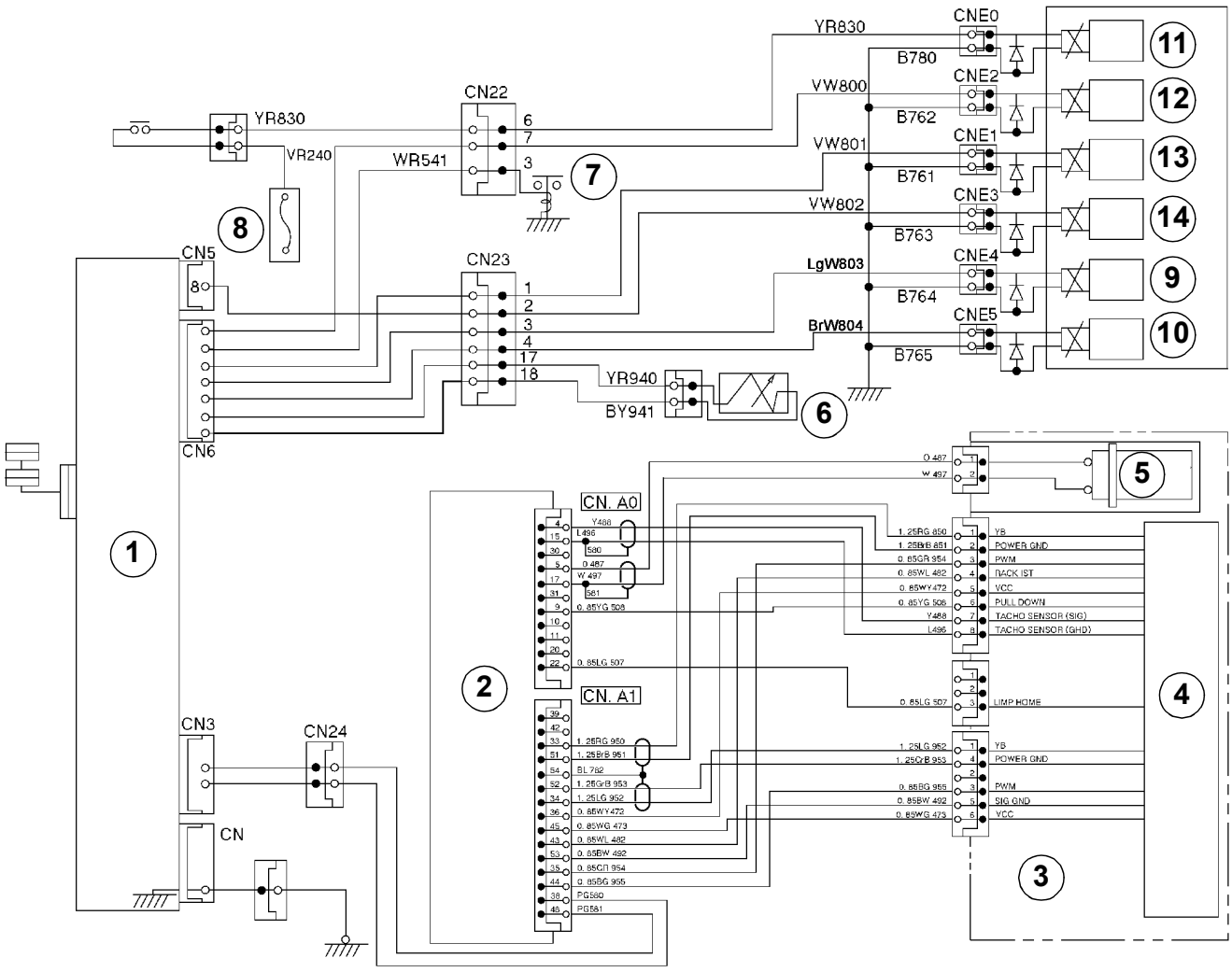
Troubleshooting	Cause	Action
Hourmeter does not work NO → Disconnect CN13 to measure the voltage between the female terminal on wire BrW545 and earth. Over 10V.		
YES	Bad connection on CN13 or defective hourmeter	Clean the connecting terminal CN13 or change the hourmeter
NO → Disconnect CN26 to measure the voltage between the female terminal on wire BrR544 and earth. Over 10V		
YES	Bad connection on CN26 or short-circuit on wire BrW545 between CN26 and CN13	Clean terminal on CN26 or repair wire BrW545
NO → Disconnect CN22 to measure the voltage between the female terminal on wire BrR543 and earth. Over 10 V		
YES	Bad connection on CN22 or short-circuit on wire BrR543 or BrR544 between CN26 and CN22	Clean the terminal on CN22 or repair wire BrR543 or BrR544
NO	Short-circuit on wire BrR543 between CN22 and the alternator or defective alternator	Repair wire BrR543 or change the alternator
YES → Disconnect CN1 to measure the voltage between wire BrR543 at the main electronic control box end and earth. Over 10 V		
YES	Bad connection on CN1 or main electronic control box defective	Clean the connecting terminal on CN1 or change the main electronic control box
NO	Short-circuit on wire Br543 between CN1 and CN26	Repair wire BRR543
Disconnect the connector from terminal R on the alternator to measure the voltage between wire LgR at the alternator end and earth. Over 10 V		
YES	Alternator defective	Change the alternator
NO → Disconnect CN22 to measure the voltage between the male terminal on wire LgR and earth. Over 10 V		
YES	Bad connection at terminal R on the alternator or short-circuit on wire LgR between CN22 and the alternator	Clean the terminal on CN22 or repair wire LgR between CN22 and the alternator
NO	Short-circuit on wire LgR540 between the starting motor switch and CN22 or starting motor switch defective	Repair wire LgR540 or chang the starting motor switch

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Electrical system troubleshooting

Description of problem No. 6

- The message is still displayed



CS00F528

1. Main electronic control box
2. Engine electronic control box
3. Engine
4. Electronic regulator
5. Engine speed detector
6. Proportioning valve
7. Battery relay

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8. Fuse
9. Shock absorbing solenoid valve
10. Swing cancellation solenoid valve
11. Function locking solenoid valve
12. Swing brake solenoid valve
13. Travel 2nd speed solenoid valve
14. Power boost solenoid valve

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DIAGNOSTIC - SELECTION

Troubleshooting	Cause	Action
Troubleshooting using the diagnostic system Starting motor switch ON		
Failure code displayed in DIAG 1 — NO → To DIAG4		
YES → Display E0031 — YES	Defective circuit in the regulator	Check the electronic regulator
NO → Display E0032 — YES	Problem with rack detector signal in regulator	Same as above
NO → Display E0041 — YES	Problem with TDC detector signal	Same as above
Failure code displayed in DIAG 4		
YES → M00B0 — YES	Faulty engine electronic control box	Change the engine electronic control box
NO → M0010 — Check that the transistor output is not short circuited		
YES → To CHK2"		
Self-detection finds the short circuit		
YES → The failure code disappears after disconnecting the solenoid valve connector — YES	Defective solenoid valve	Change the solenoid valve
NO → The failure code disappears after disconnecting connector CN22 — YES	Short circuit on wire between CN22 and the solenoid valve	Repair the wiring
NO → The failure code disappears after disconnecting connector CN23 — YES	Short circuit on wire between CN23 and the solenoid valve	Repair the wiring
NO → The failure code disappears after disconnecting connector CN6 — YES	Short circuit on wire between CN23 and CN6	Repair the wiring
NO → The failure code disappears after disconnecting connector CN5 — YES	Short circuit on wire between CN22 and CN5	Repair the wiring
NO	Electronic control box defective	Change the electronic control box

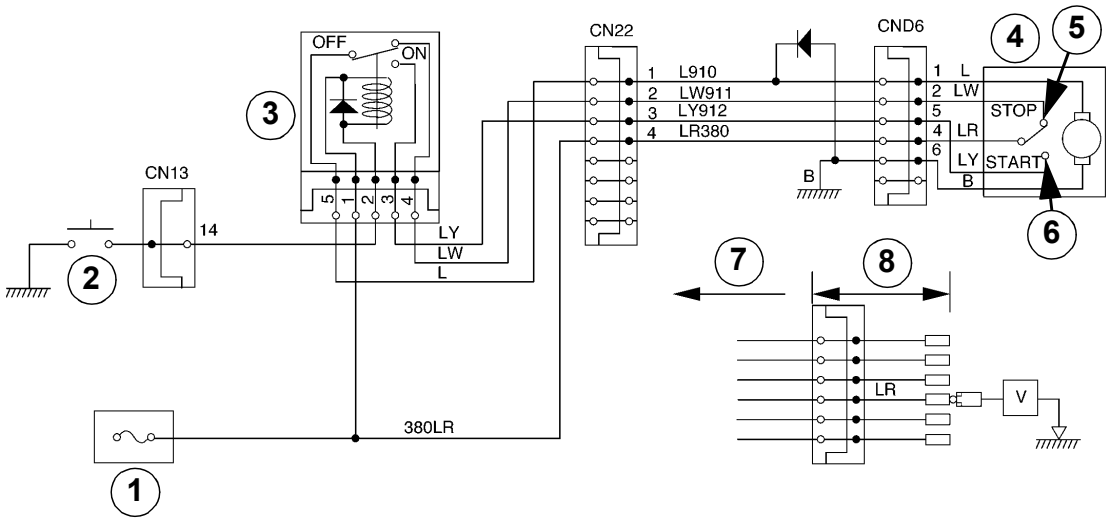
https://truckmanualshub.com/

Description of problem No. 7

The engine will not start even when the message "ELEC. PROBLEM" is no longer displayed.

Prior checks:

1- Make sure there are no problems with the engine and in the fuel system.
2- Make sure that the fuses are intact.
3- Make sure that the starter motor is working and turning the engine.



CM00F006

1. Fuse
2. Emergency stop switch
3. Emergency stop relay
4. Emergency stop motor
5. Stop position
6. Start position
7. Cab end
8. Service connector end

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Troubleshooting	Cause	Action
Starting motor switch ON		
The fuel inlet cut-off lever is in the stop position — NO	Problem with engine system	Check the engine system
YES — Disconnect the connector from the engine emergency stop motor CND6. Connect the appropriate service connector (6P) to connector CND6 at the engine harness end, measure the voltage between the earth (-) and the (+) wire LR. The voltage should be between 20 V and 30 V — NO	Open circuit on wire LR between the stop motor connector and CN or on wire LR between the fuse and CN	Repair the wire LR
YES — Using the same configuration check for continuity between wires L and LW: Starting motor switch ON: continuity Starting motor switch OFF: no continuity — YES	Stop motor defective	Change the stop motor
NO — Measure the voltage at the emergency stop relay terminals, between wire L (+) and earth (-) Emergency stop switch ON = 0 V Emergency stop switch OFF = 20 V to 30 V — NO	Emergency stop relay defective	Change the emergency stop relay
You can also check the emergency stop relay by replacing it temporarily by one of the relays from the other functions — YES	Open circuit between the emergency stop relay and wire L	Change the emergency stop relay or repair wire L

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Translation

Description of problem No. 8

- Not possible to change travel speed

No.	Check	Result	Repair
1	Changing to second speed is not shown on the checking screen when pressing the speed selection switch	Check the signal at connector CN4 terminal 64 on the electronic control box	0 Volt continuous, change the electronic control box
		Check the signal at connector CN13 terminal 3 on the instrument panel	0 Volt continuous, check the connecting cable between terminals 3 and 64
			5 Volts continuous when pressing the switch, change the speed change switch
2	The travel mode changes when the speed control switch is held pressed down for over two seconds	The electrical harness between the electronic control box and the 2nd speed solenoid valve (red) is defective	
		The voltage is equal to 24 V at the output from the electronic control box (CN6 terminal 30)	Check the solenoid valve and the hydraulic system (see hydraulic system troubleshooting)
		The voltage is below 24 V at the output from the electronic control box (CN6 borne 30)	Change the harness
3	Using diagnostic mode CHK3. the travel pressure switch does not change to ON when the travel function is operated	The electrical harness between the electronic control box and the pressure switch is cut	Repair the harness
		The pressure switch is defective	Change the pressure switch
4	Using diagnostic mode CHK3. the pilot pressure switch stays ON	The electrical harness between the electronic control box and the pressure switch is short circuited	Repair the harness
		The pressure switch is defective	Change the pressure switch
5	Check the pressure detectors P1. P2 and the hydraulic pump regulating detector (N) using mode CHK1	One of the harnesses is defective	Repair the harness
		Voltage under 5 V, at input to one of the detectors	Change the electronic control box
		Voltage under 5 V, at input to one of the detectors	Change the electronic control box
		Voltage equal to 5 V, at input to one of the detectors	Change the faulty detector

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6	The hydraulic oil temperature is not displayed or is below 25°C on the CHK1 check screen	The electrical harness between the hydraulic oil temperature sender and the electronic control box (CN1 terminal 6 and 13) is defective	Repair the electrical harness
		Voltage below 5 V, at sender input	Change the electronic control box
		Voltage equal to 5 V, at sender input	Change the oil temperature sender

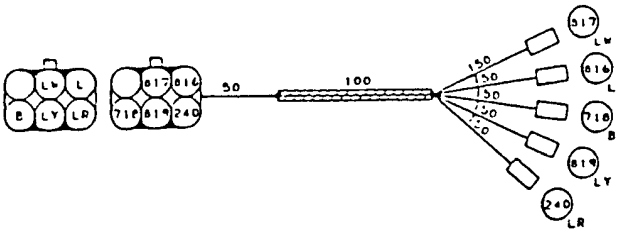
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ELECTRICAL INSPECTION OF COMPONENTS

Inspection equipment

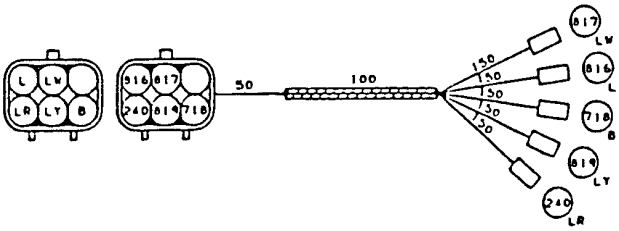
Tool: See "Special Tools"

Details of service connector kit



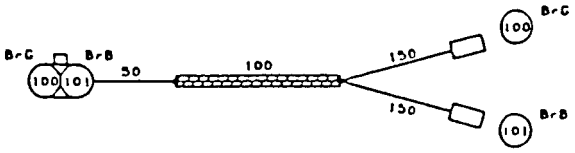
BS98F224

1. For engine emergency stop motor (6P)



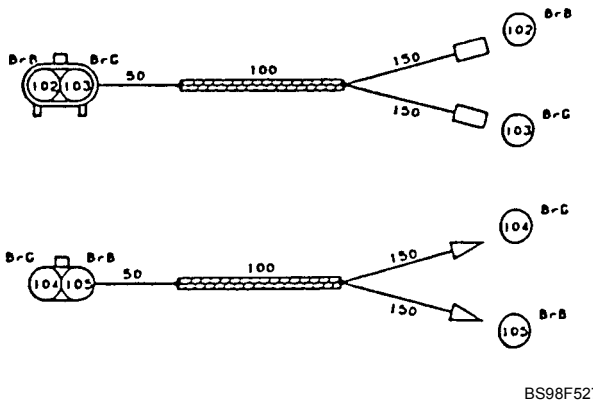
BS98F225

2. For harness end of engine emergency stop motor (6P)



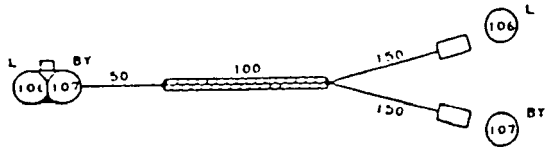
BS98F226

3. For solenoid valve and fuel gauge



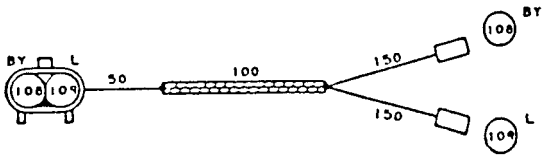
BS98F527

4. For proportioning valve



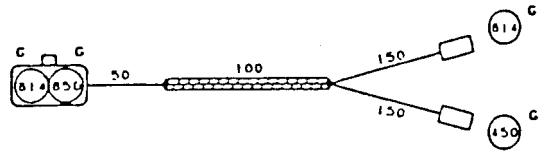
BS98F228

5. For pressure switch (2P)



BS98F229

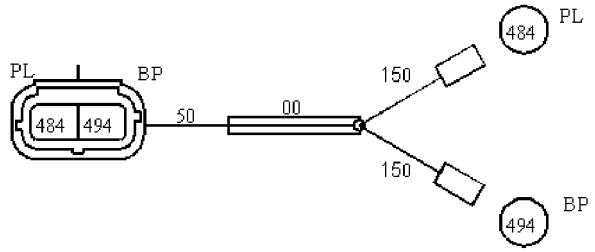
6. For harness end of pressure switch



BS98F230

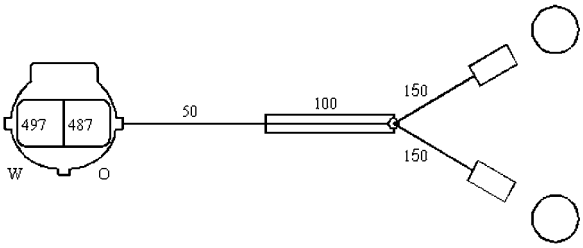
7. For air conditioning evaporator (2P)

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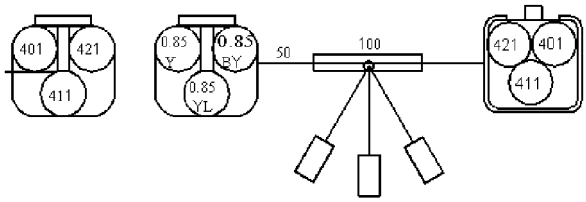
CS00E531

8. For hydraulic oil temperature and engine coolant temp senders



CS00E530

9. For engine speed detector



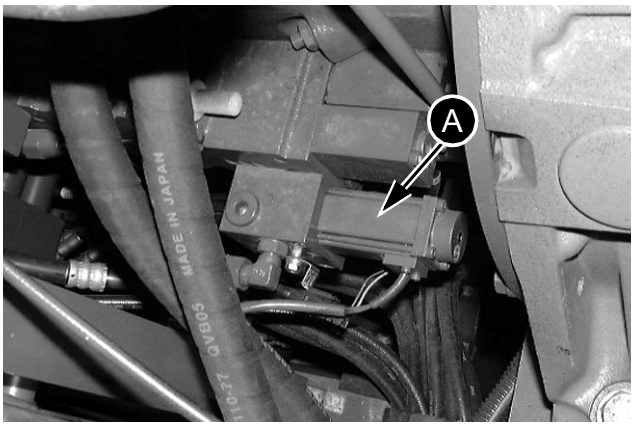
CS00E532

10. For pressure detector

https://truckmanualshub.com/

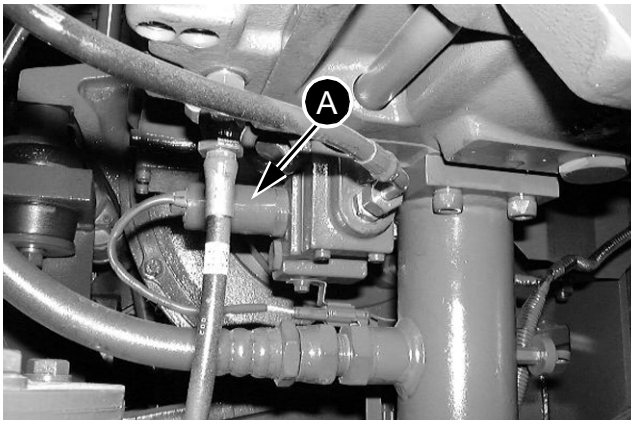
Proportioning valve

CX130



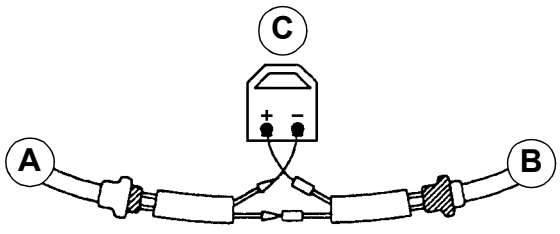
CD00F021

CX210



CD00F022

1. Disconnect the proportioning valve connector (A) from the hydraulic pump.



CS00E534

A. To hydraulic pump
B. To main harness
C. Meter

2. Connect the appropriate service connector (2P) between the connector at the pump end and the connector at the main harness end and install the meter.

NOTE: *The + terminal of the meter should be connected to wire BrB (brown/black) on the service connector coming from the main harness and the - terminal to wire BrB (brown/black) on the service connector coming from the hydraulic pump.*

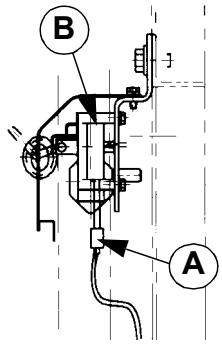
3. When the connections have been made, start the engine and check the current in each work mode, at maximum speed.

Current in mA

Mode / Machine type	H		S	L	Auto	
	Max	Min			S	L
CX130	600	450	450	100 or less	490	450
CX210	407	292	292	50 or less	332	292

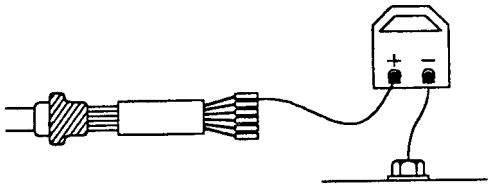
https://truckmanualshub.com/

Engine emergency stop motor



CS00E535

1. Disconnect connector (A) from the engine emergency stop motor (B).



CS99A846

2. Connect the appropriate service connector (6P) to the connector at the main harness end only.
3. Make sure that wire LR (blue/red) on the service connector is connected to wire LR on the main harness and install the meter.

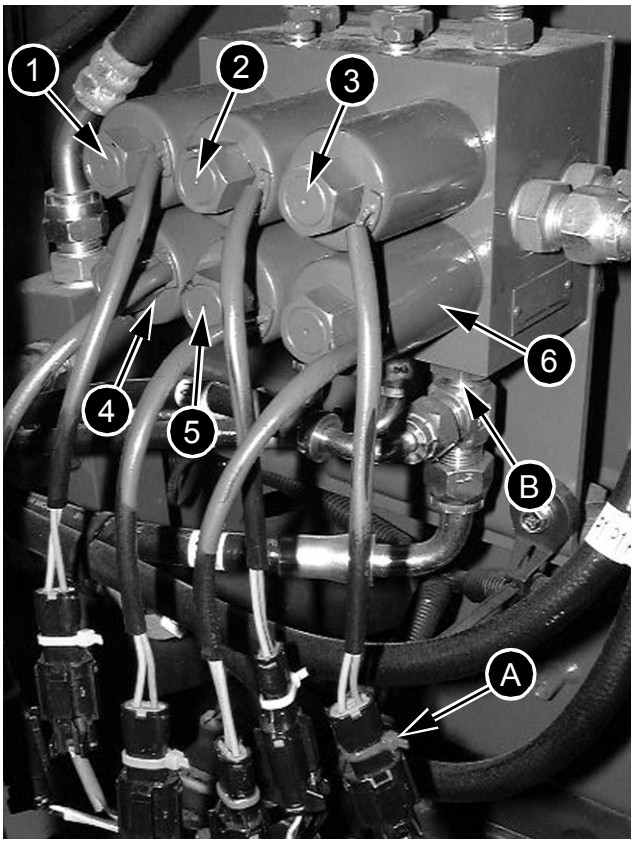
NOTE: *The + terminal on the meter must be connected to wire LR (blue/red) on the service connector and the - terminal to the machine earth.*

4. Turn the starter switch key to "ON", the meter reading should be 24 V.

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Block of 6 solenoid valves

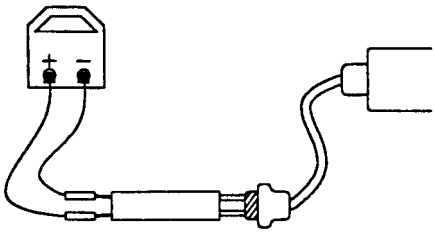
1. Disconnect connector (A) from one of the solenoids on the 6 solenoid valve block (B)



CD00F023

Marking	Function	Ring colour
1	Swing pilot cancellation	Green
2	Power boost	Yellow
3	2nd travel speed	Red
4	Shock absorption	Light green
5	Swing brake	Pink
6	Pilot pressure	Blue

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CS99A843

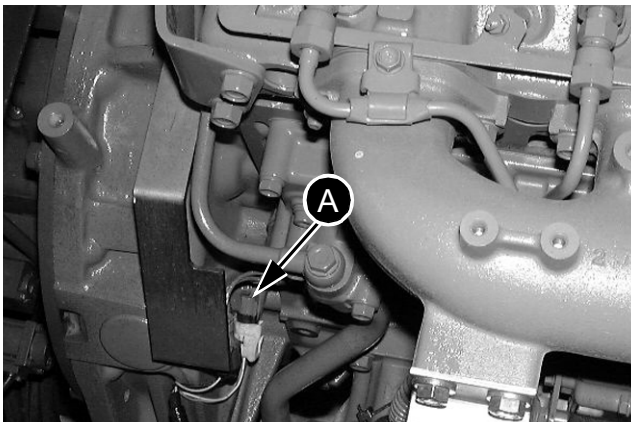
2. Connect the appropriate service connector (2P) to the connector on the disconnected solenoid only and install the meter.
3. When the connection has been made, the solenoid resistance reading should be 45 Ω at 20°C.

NOTE: *The resistance value varies with temperature.*

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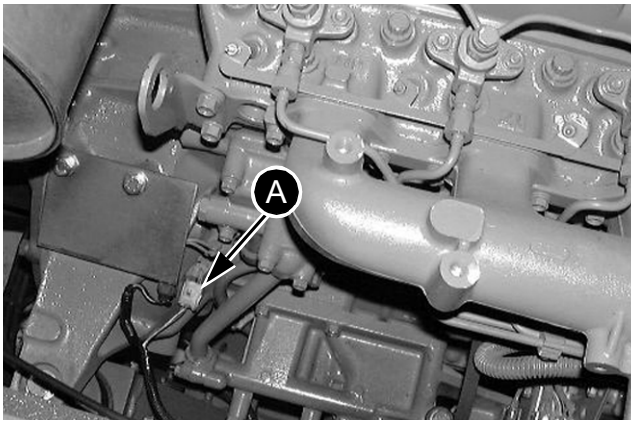
Engine speed detector

CX130



CD00F024

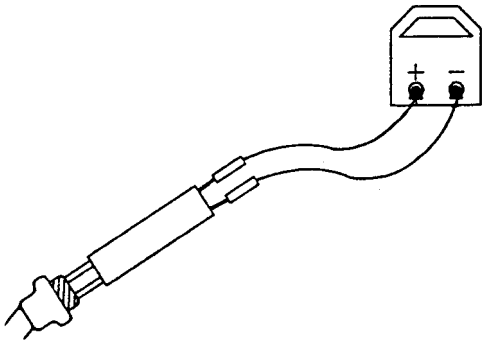
CX210



CD00F025

1. Disconnect connector (A) from the engine speed detector.

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BS98F255

2. Connect the appropriate service connector (2P) to the connector on the speed detector only and install the meter.

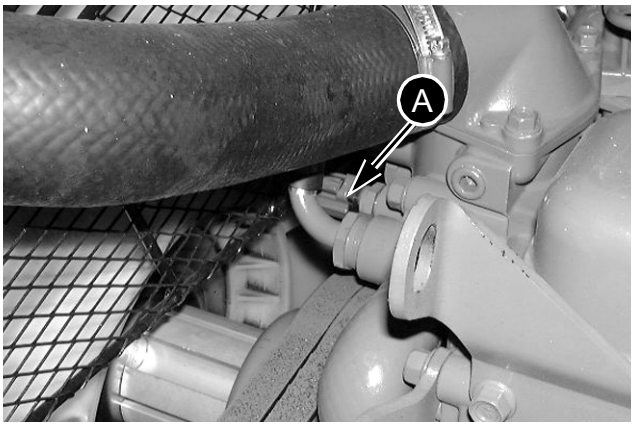
3. When the connection has been made, the speed detector resistance should be 0.7 kΩ at 25°C.

NOTE: *The resistance value varies with temperature.*

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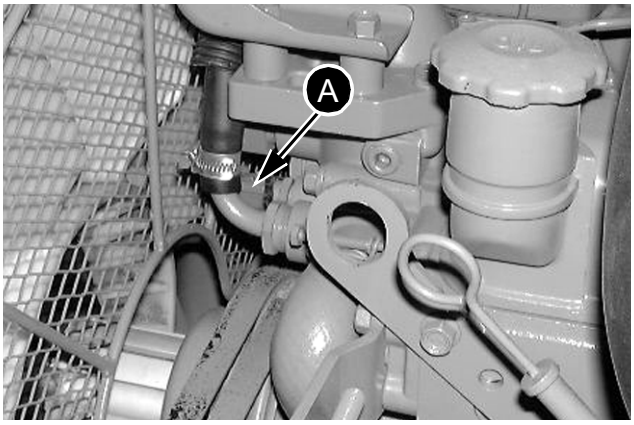
Engine coolant and hydraulic oil temperature senders

CX130



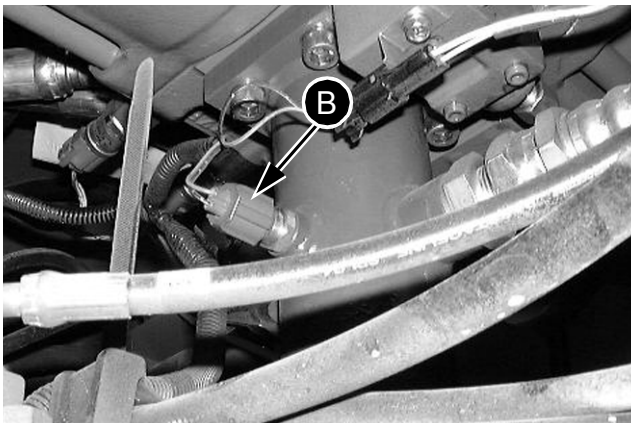
CD00F026

CX210



CD00F027

CX130/CX210

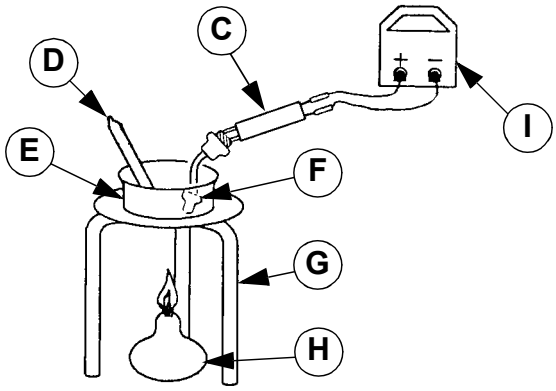


CD00F028

A. Coolant temperature sender
B. Oil temperature sender

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1. Remove the coolant temperature sender (A) or the oil temperature sender (B) from the machine.



CS99A851

C. Service connector (2P)
D. Thermometer
E. Beaker
F. Temperature sender
G. Tripod
H. Spirit lamp
I. Meter

2. Connect the appropriate service connector (2P) to the temperature sender and install the meter.

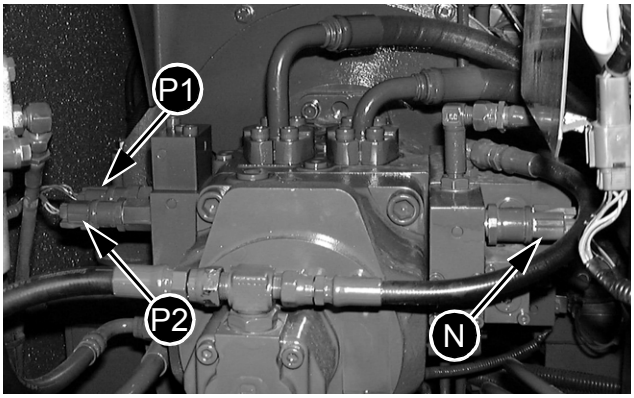
3. When the connection has been made, place the sender in the beaker and gradually increase the temperature in the beaker using the spirit lamp and check the resistance value.

Temperature	Coolant temperature sender	Oil temperature sender
20°C	6.08 k Ω	2.45 k Ω
30°C	4.24 k Ω	1.66 k Ω
40°C	3.02 k Ω	1.15 k Ω
50°C	2.18 k Ω	0.81 k Ω
60°C	1.61 k Ω	0.58 k Ω
70°C	1.20 k Ω	0.43 k Ω
80°C	0.91 k Ω	0.32 k Ω

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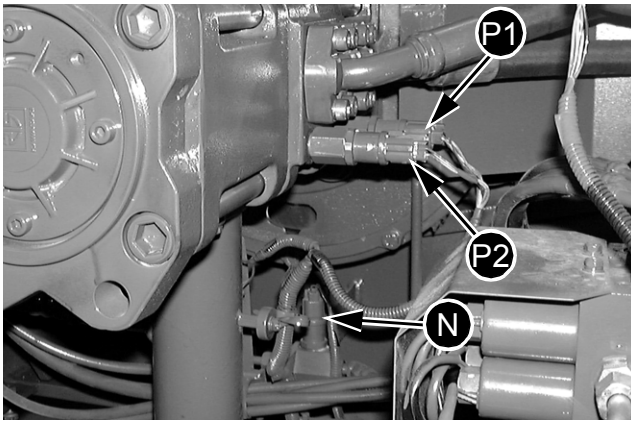
Pressure sender

CX130



CD00E145

CX210

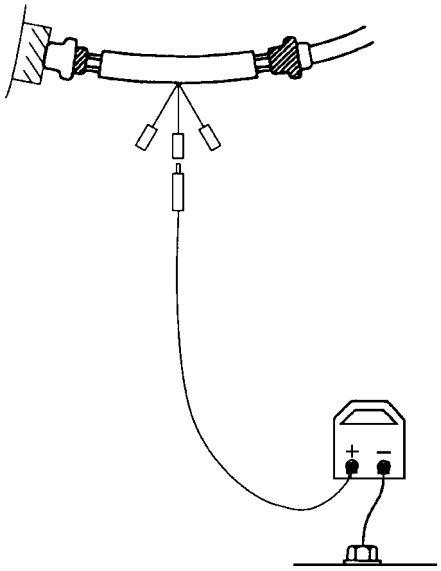


CD00E146

P1. Pressure detector P1
P2. Pressure detector P2
N. Pump regulating pressure detector

1. Disconnect the pressure detector connector from the hydraulic pump.

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CS00E541

2. Connect the appropriate service connector (3P) between the connector at the pump end and the connector on the main harness and install the meter.

NOTE: *The + terminal on the meter should be connected to wire YL (yellow/blue) on the service connector and the – terminal to the machine earth.*

3. When the connection has been made, start the engine and check the voltages in accordance with the pressures.

Pressure detectors P1 and P2

Pressure (MPa)	Voltage (V)
50	4.5
43.7	4
37.5	3
25	2
17.5	1
0	0.5

Pressure detector N

Pressure (MPa)	Voltage (V)
5	4.5
4.37	4
3.75	3
2.50	2
1.25	1
0	0.5

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HYDRAULIC EXCAVATOR
CX130



SECTION N°5
ELECTRICAL

CASE TRAINING CENTRE
AUGUST 2000

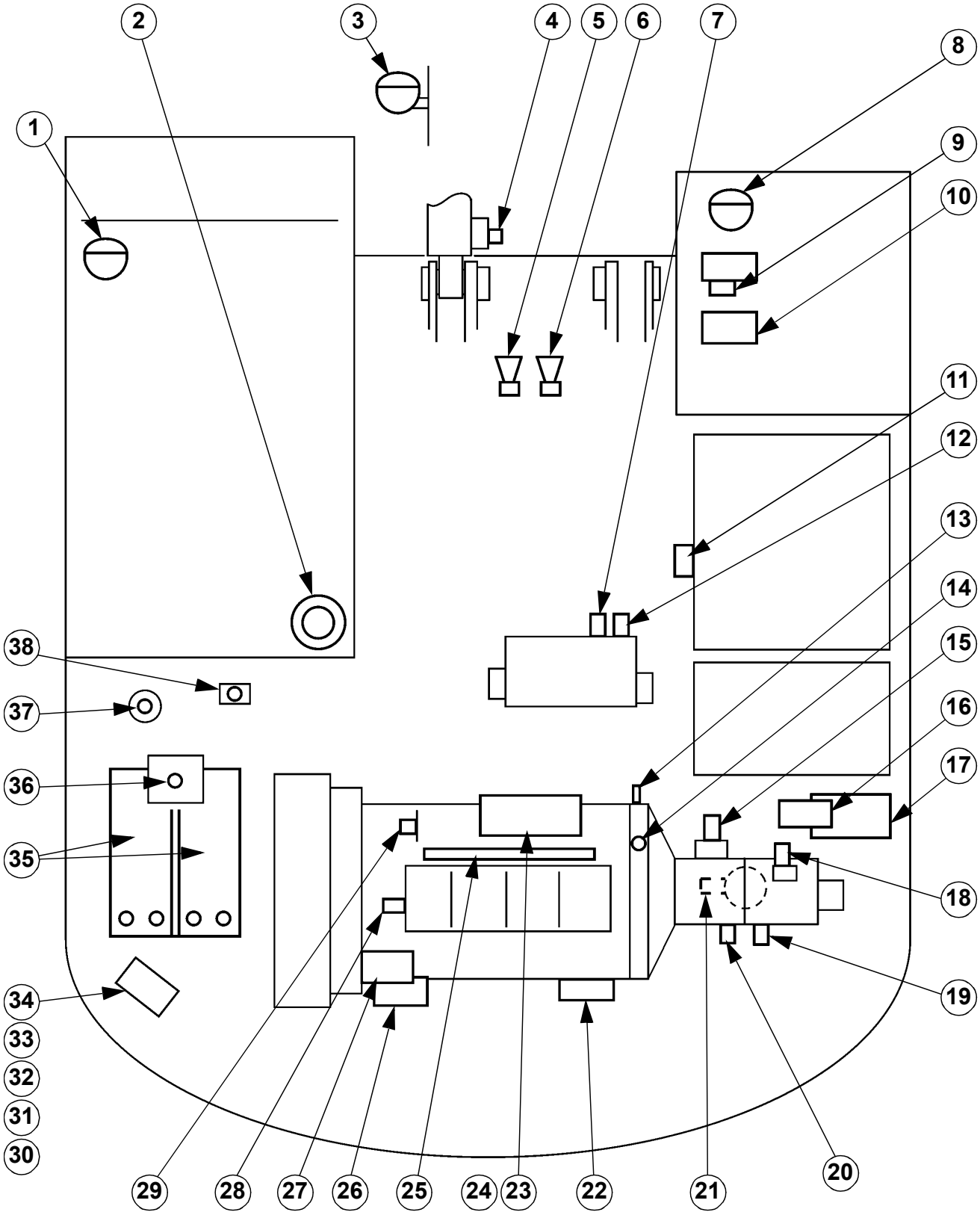
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General location of components (outside the cab)

Model CX130



CM00E003

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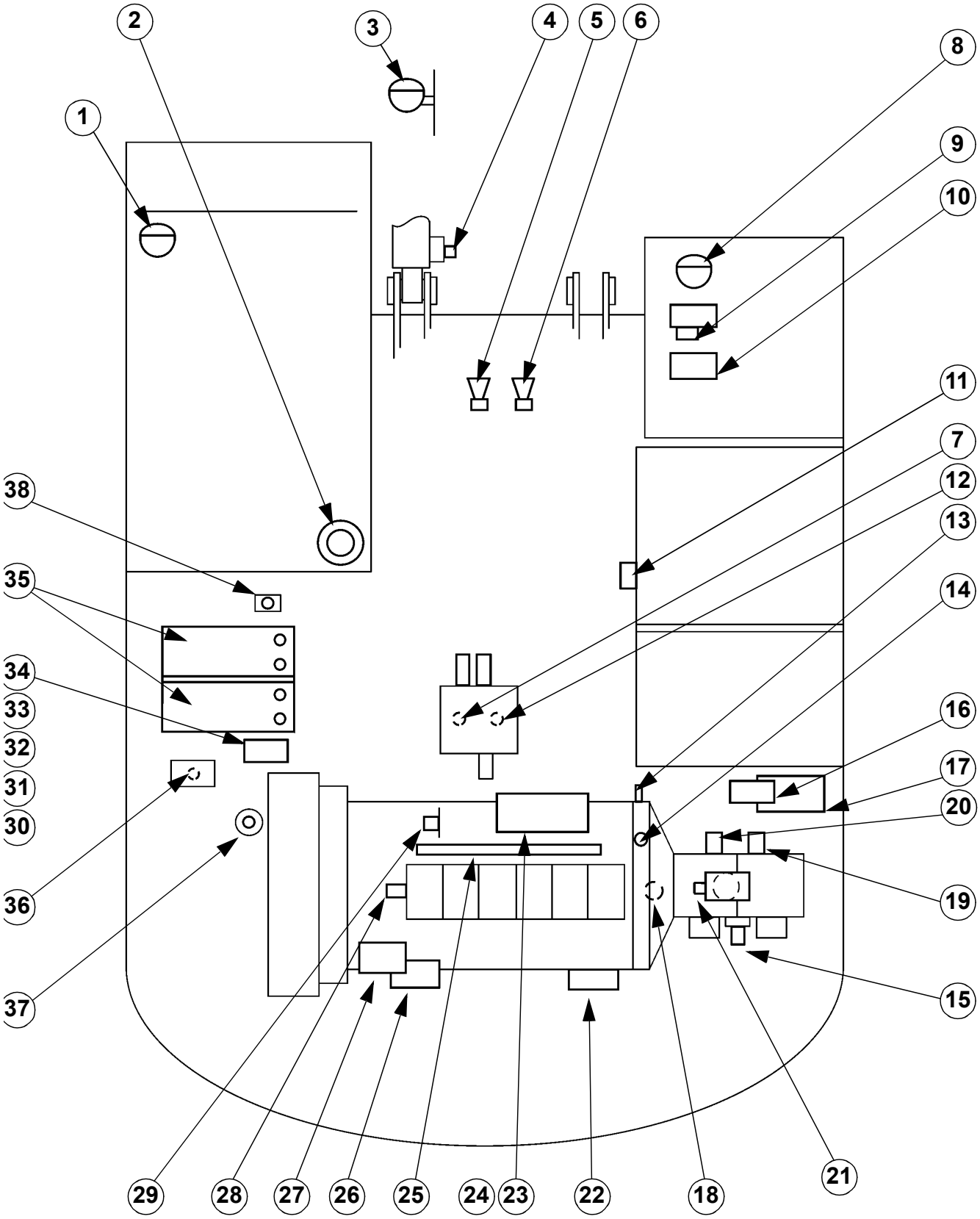
ELECTRIC CIRCUIT

1. Working light (cab)
2. Rotary light
3. Attachment working light
4. Overload indicator pressure detector
5. Horn (low note)
6. Horn (high note)
7. Pilot pressure switch (yellow ring)
8. Working light (upperstructure)
9. Windshield washer motor
10. Fuel filler pump
11. Fuel level indicator
12. Travel pilot pressure switch
13. Engine speed detector
14. Engine oil pressure
15. Proportioning valve
16. Engine emergency stop motor
17. 6 solenoid valve block
18. Hydraulic pump regulating pressure detector
19. P2 pressure detector (yellow ring)
20. P1 pressure detector
21. Hydraulic oil temperature sender
22. Starter motor
23. Electronic regulator
24. Fuel flow regulating resistor
25. Pre-heater plugs
26. Air conditioning compressor magnetic clutch
27. Alternator
28. Engine water temperature sender
29. Fuel temperature sender
30. Battery relay
31. Main protective fuse for circuits F11 and F12
32. Main protective fuse for circuits F3 to F10 and F13 to F20
33. Main protective fuse for circuit F2
34. Main protective fuse for circuit F1
35. Batteries
36. Coolant solution level
37. Air conditioning compressor magnetic clutch contact switch
38. Swing pilot pressure switch

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ELECTRIC CIRCUIT

Model CX210



CM00E004

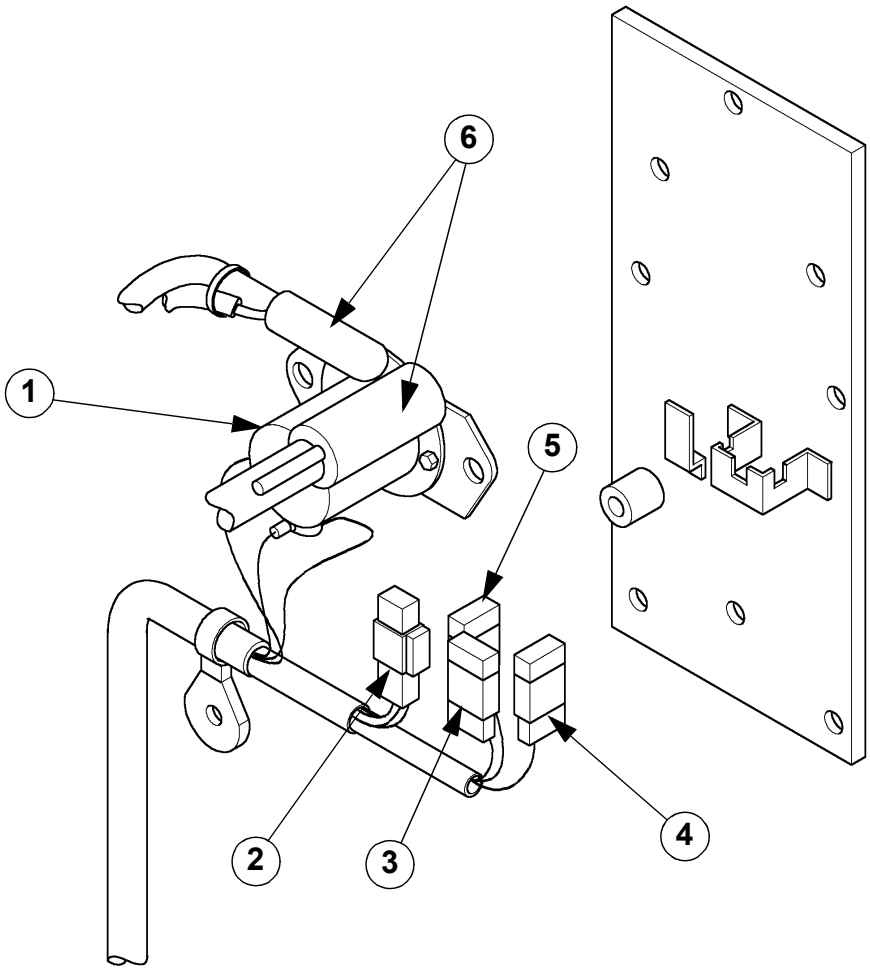
https://truckmanualshub.com/

1. Working light (cab)
2. Rotary light
3. Attachment working light
4. Overload indicator pressure detector
5. Horn (low note)
6. Horn (high note)
7. Pilot pressure switch (yellow ring)
8. Working light (upperstructure)
9. Windshield washer motor
10. Fuel filler pump
11. Fuel level detector
12. Travel pilot pressure switch
13. Engine speed detector
14. Engine oil pressure
15. Proportioning valve
16. Engine emergency stop motor
17. 6 control valves block
18. Hydraulic pump regulating pressure detector
19. P2 pressure detector (yellow ring)
20. P1 pressure detector
21. Hydraulic oil temperature sender
22. Starter motor
23. Electronic regulator
24. Fuel flow regulating resistor
25. Pre-heater plug
26. Air conditioning compressor magnetic clutch
27. Alternator
28. Engine water temperature detector
29. Fuel temperature detector
30. Battery relay
31. Main protective fuse for circuits F11 and F12
32. Main protective fuse for circuits F3 to F10 and F13 to F20
33. Main protective fuse for circuit F2
34. Main protective fuse for circuit F1
35. Batteries
36. Coolant solution level
37. Air conditioning compressor magnetic clutch contact switch
38. Swing pilot pressure

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Relays and main fuses (battery compartment)

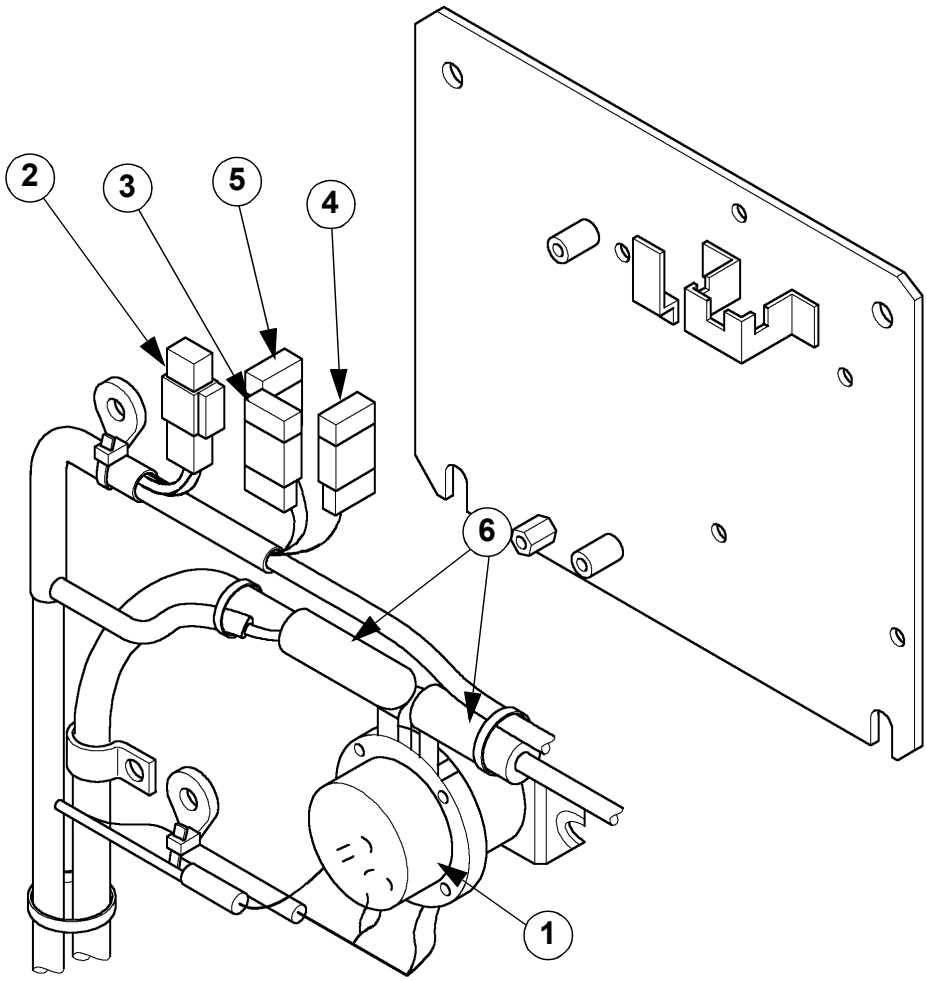
Model CX130



CI00E501

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Model CX210

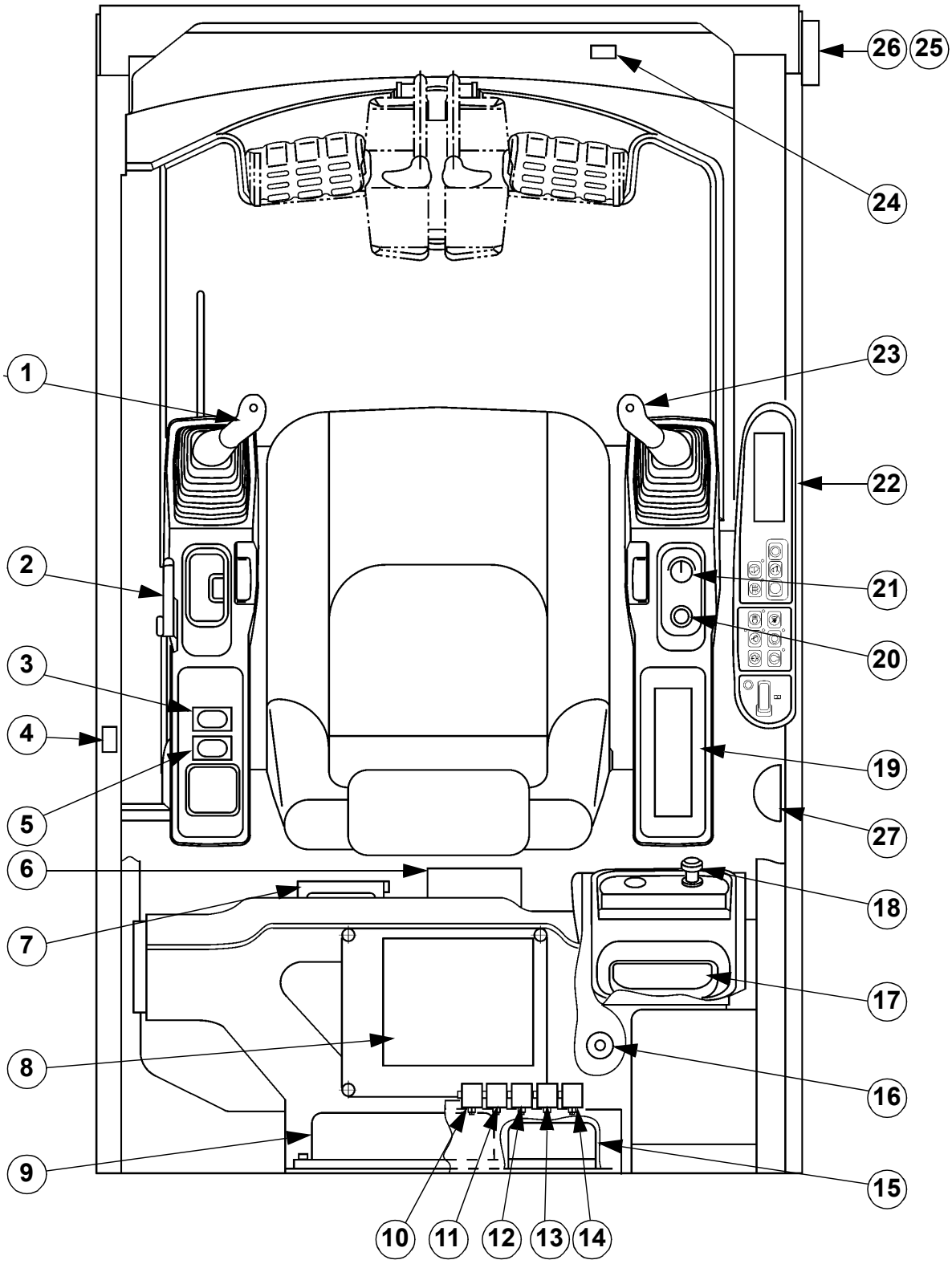


CI00E502

1. Battery relay
2. Fuse 65A: protection of circuits F3 to F10 and F13 to F20A
3. Fuse 20A: protection of circuits F11 and F12 (before contact)
4. Fuse 20A: protection of circuits F1
5. Fuse 20A: protection of circuits F2
6. Battery cables

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General location of components (inside the cab)



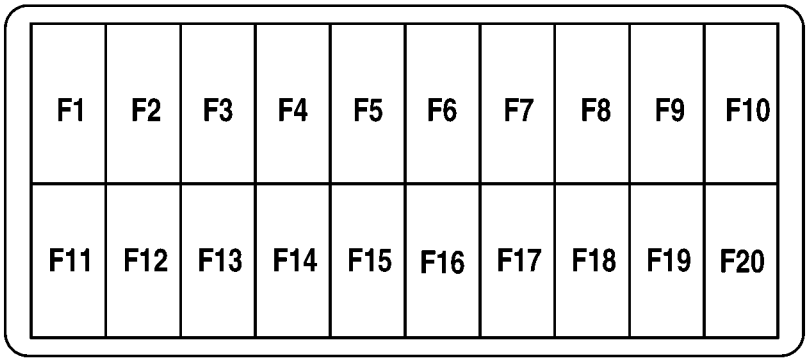
CM00E002

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1. Horn switch
2. Controls cancellation lever contact switch
3. Switch for hammer/grab
4. Door contact switch
5. Overload indicator switch
6. Air conditioner
7. Fuse box
8. Main electronic control box
9. Engine electronic control box
10. Rotary light relay
11. Engine emergency stop relay
12. Working lights relay
13. Horn relay
14. Pre-heat plug relay
15. DC-DC converter (24 V - 12 V)
16. Solar radiation detector
17. Radio
18. Cigarette lighter
19. Air conditioning control
20. Starting contact switch
21. Throttle control
22. Instrument panel
23. Engine idle control
24. Windshield contact switch
25. Windshield wiper motor electronic control box
26. Windshield wiper motor
27. Cab interior lighting

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Fuse box

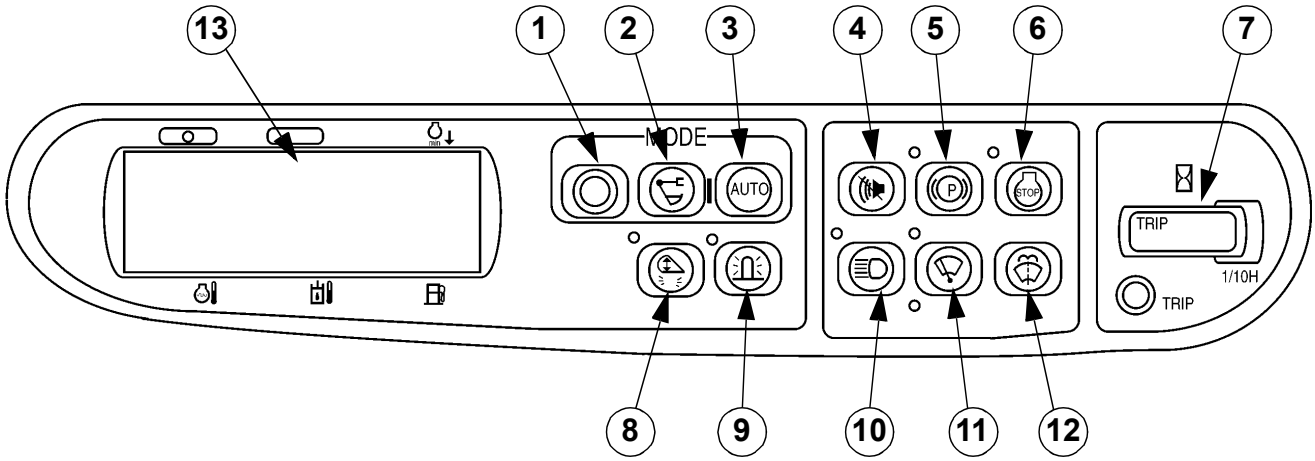


CM00E005

F1	Fuse 20A:	Engine electronic control box
F2	Fuse 20A:	Electronic box control
F3	Fuse 20A:	Power for electronic control box
F4	Fuse 10A:	Hydraulic control cancellation
F5	Fuse 15A:	Grease fitting (not used)
F6	Fuse 10A:	Rotary light
F7	Fuse 20A:	Fuel filler pump
F8	Fuse 15A:	Engine emergency stop motor
F9	Fuse 30A:	Pre-heater plug
F10	Fuse 10A:	Option
F11	Fuse 10A:	Memory
F12	Fuse 10A:	Starting, radio and cab light switch
F13	Fuse 20A:	Air conditioning, heating
F14	Fuse 5A:	Air conditioning compressor
F15	Fuse 15A:	Working lights
F16	Fuse 15A:	Working light (not used)
F17	Fuse 10A:	DC converter (24 V - 12 V)
F18	Fuse 15A:	Windshield wiper and washer
F19	Fuse 10A:	Horn
F20	Fuse 15A:	Cigar lighter and cab seat

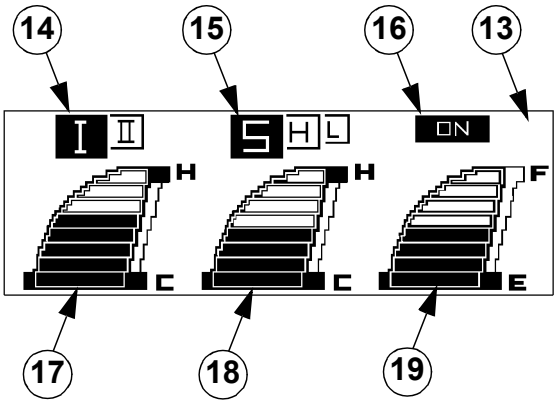
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Instrument panel



CM00E001

1. Travel mode switch
2. Working mode switch
3. Automatic mode switch
4. Buzzer stop switch
5. Swing brake switch
6. Engine emergency stop switch
7. Hourmeter
8. Shock absorption (Hard/soft) switch
9. Rotary light switch
10. Working light switch
11. Windshield wiper switch
12. Windshield washer switch
13. Control screen



CS00F521

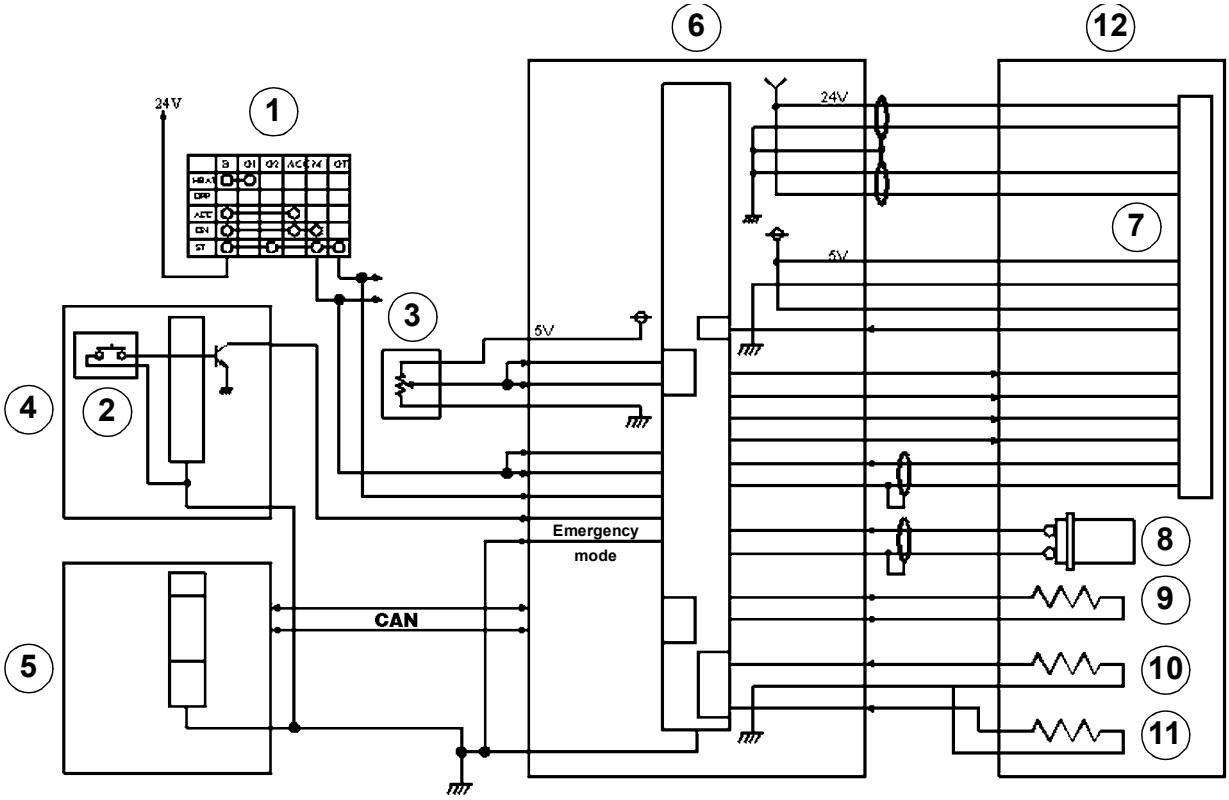
14. Travel speed indicator
15. Working mode indicator
16. Idle mode indicator
17. Water temperature indicator
18. Hydraulic oil temperature indicator
19. Fuel level indicator

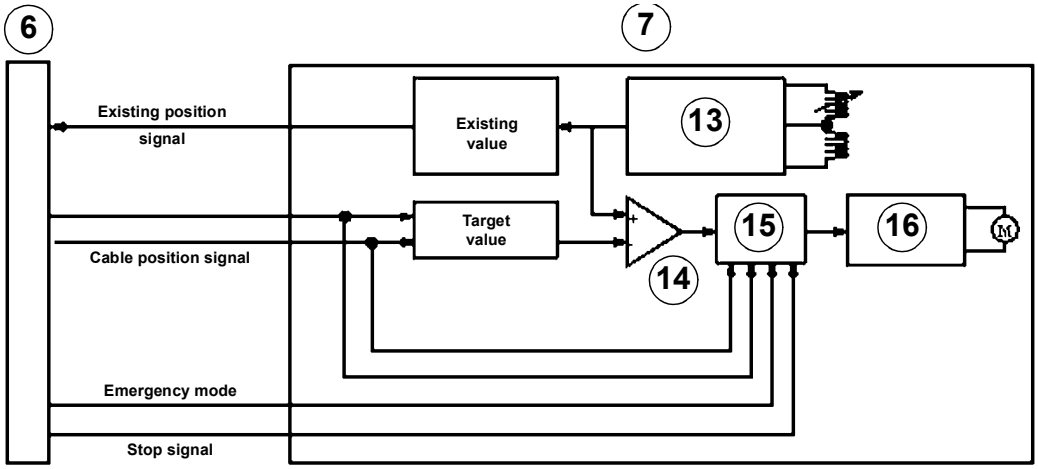
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BASIC OPERATING PRINCIPLES

Engine control

1) Circuit configuration





1. Starter motor switch
2. Emergency stop switch
3. Throttle control
4. Instrument panel
5. Main electronic control box
6. Engine electronic control box
7. Electronic acceleration
8. Engine speed detector
9. Fuel flow regulating resistor
10. Engine water temperature sender
11. Fuel temperature sender
12. Engine
13. Rack detector
14. Control circuit
15. Cancellation circuit
16. Electronic acceleration circuit

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2) Fuel consumption control

1. The engine electronic control box (6) calculates the target speed based on:
   - working mode data sent via CAN communications from the main electronic control box (5),
   - voltage signals from the acceleration control (3),
   - voltage signals from the water temperature sender (10),
   - voltage signals (starter motor switch 1) which feed the engine electronic control box.
2. The engine electronic control box calculates the fuel flow from the difference between the target speed (electronic acceleration tachometric sender) and the real speed (engine speed detector 8),
3. The engine electronic control box converts the fuel flow at the target position of the electronic acceleration rack (7) and corrects that target position in accordance with the regulating resistance (9).

3) Engine starting control

1. When the contact switch (1) is in the starting position the starting signal is sent simultaneously to the starter motor and the engine electronic control box.
2. The engine electronic control box determines the fuel injection flow. This flow is determined from the water temperature data and the real number of revolutions of the engine.
3. Once the starting signal is extinguished, the engine electronic control box changes from starting fuel control to normal fuel injection flow control.

4) Engine stop control

When the engine stop signal is received (when the ignition switch is turned off or the emergency stop control is (2) is operated), the engine electronic control box transmits the rack position signal "no injection" to the electronic acceleration and activates the engine stop signal.

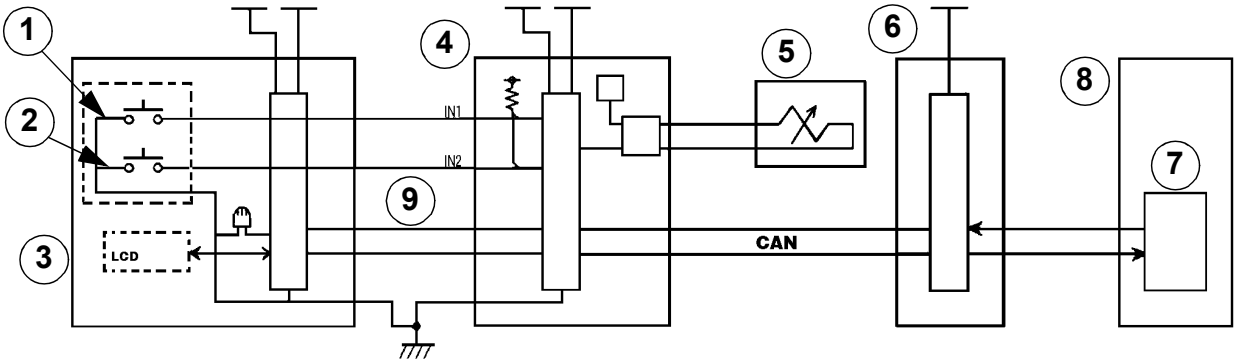
5) Electronic acceleration assistance error and emergency mode

1. The rack detector signal reaches the engine electronic control box.
2. The engine electronic control box compares the target position and the real position of the rack.
3. If the engine electronic control box determines that the rack is not in the correct target position, it will consider it to be an assistance error and will stop the engine.
4. If the emergency mode is activated when an electronic acceleration assistance error occurs, the engine operates in emergency mode (See "Emergency Mode" Section).

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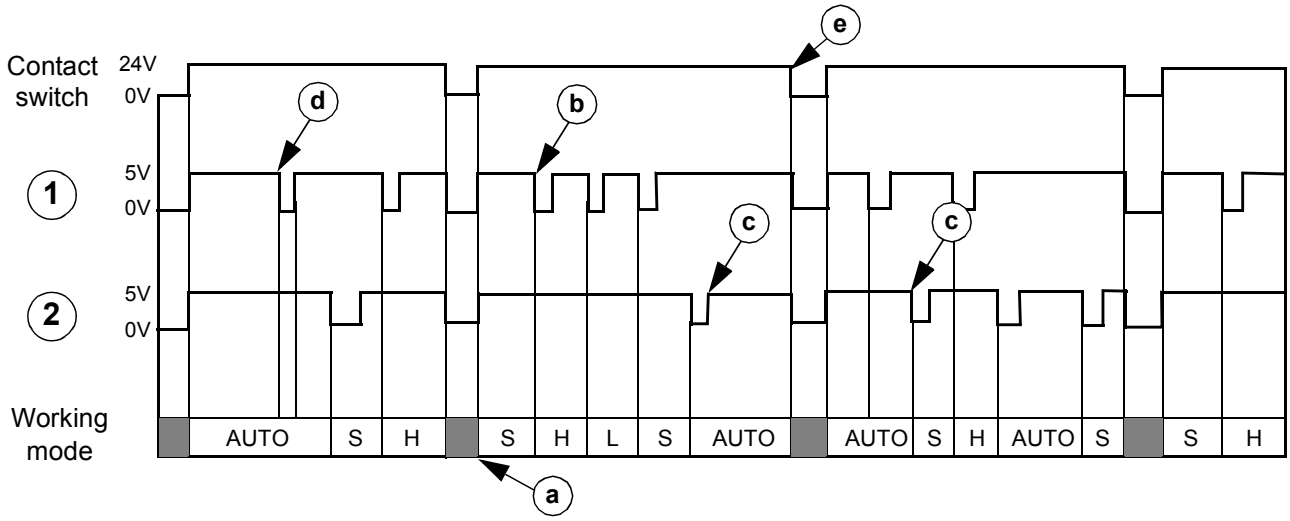
Working mode selection

1) Circuit configuration



CS00F505

2) Timing diagram



1. Working mode switch
2. Automatic mode switch
3. Instrument panel
4. Main electronic control box
5. Proportioning valve
6. Engine electronic control box
7. Electronic acceleration
8. Engine
9. SERIES communication

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3) Mode selector switch

a) When the ignition is switched on, "S" is selected by default (unless auto mode auto was selected when the ignition was switched off)

b) Every time the travel mode switch (1) is pressed, the mode changes:
S → H → L → S → H

c) If the auto mode switch (2) is operated, the mode changes to auto mode. If the auto mode switch is pressed again, the mode changes to "S" mode.

d) When auto mode is running, if the work mode switch (1) is pressed, the mode does not change.

e) If the ignition is switched off in auto mode, the mode stays in auto when the ignition is switched on again.

4) Operation

1. The mode switch signal (1 and 2) is managed by the main electronic control box (4) which changes the mode in accordance with the input signal.

2. The electronic control box (4) transmits the selected mode to the control screen (LCD) via series communications (9). The control screen shows the mode selected.

3. The main electronic control box (4) transmits the selected mode to the engine electronic control box (6) via CAN communications which controls the electronic acceleration (7).
The engine electronic control box (6) transmits the mode and the data concerning the number of revolutions to the main electronic control box (4) via CAN communications.

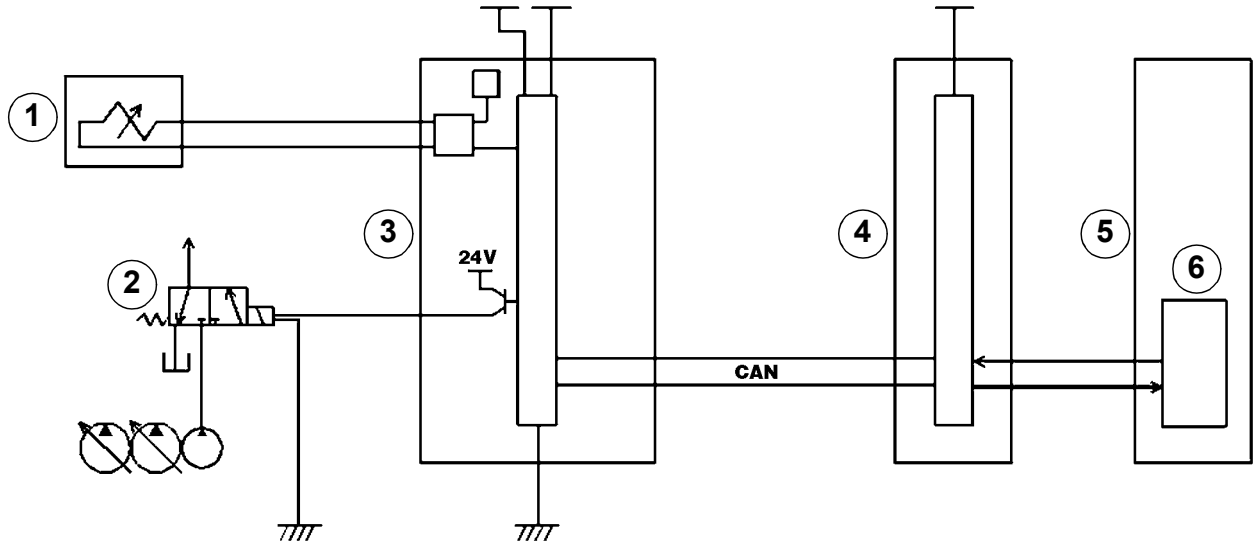
4. The main electronic control box (4) calculates the proportioning valve current (5) based on the mode selected and the data concerning the real number of revolutions of the engine and the target number of revolutions.

5. The main electronic control box (4) transmits the new data to the display screen (LCD) via series communications.

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H/S/L mode control

1) Circuit configuration



CS00F509

1. Proportioning valve
2. Power boost solenoid valve
3. Main electronic control box
4. Engine electronic control box
5. Engine
6. Electronic acceleration

2) Values set for each mode

				CX130	CX210	Hydraulic power boost
Mode H	Number of engine revolutions (Maxi)		rpm	2150±10	2000±10	Automatic control
	Current (variable amperage)	(Max)	mA	600	407	
		(Min)	mA	450	292	
Mode S	Number of engine revolutions (Max -200)		rpm	1950±10	1800±10	Automatic control
	Fixed current amperage (90% of torque)		mA	450	292	
Mode L	Number of engine revolutions (Max -300)		rpm	1850±10	1700±10	Constant
	Fixed current amperage (70% of torque)		mA	<100	<50	
Idle	Number of engine revolutions		rpm	1000±10	900±10	-----
Number of engine revolutions at maximum torque			rpm	1600	1600	-----

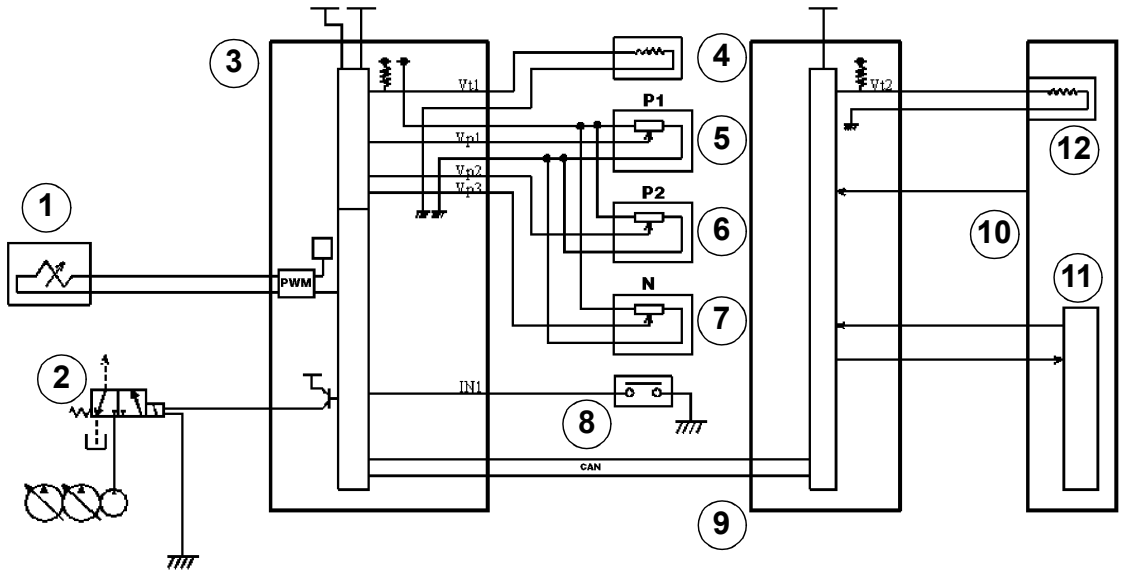
NOTE: *The shown above are for normal conditions; the following are exceptions:*

1. If the target number of engine revolutions is less than the maximum torque number of revolutions, the pump is controlled by the value of "L" mode current (even in H/S modes)
2. In "L" mode, if travel operation only is actuated, the pump is controlled by the value of "S" mode current
3. In "L" mode, if a hydraulic hammer or grab is used, the pump is controlled by the value of "S" mode current.
4. If the engine coolant solution temperature is too low, or the voltage arriving at the engine electronic control box is too low, the idle speed increases to prevent the engine becoming too cool or the battery being discharged.

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Automatic mode control

1) Circuit configuration



CS00F510

1. Proportioning valve
2. Power boost solenoid valve
3. Main electronic control box
4. Hydraulic oil temperature sender
5. Pressure detector P1
6. Pressure detector P2
7. Hydraulic pump regulating detector (N)
8. Travel pilot pressure switch
9. Engine electronic control box
10. Engine
11. Electronic acceleration
12. Water temperature sender

2) Description

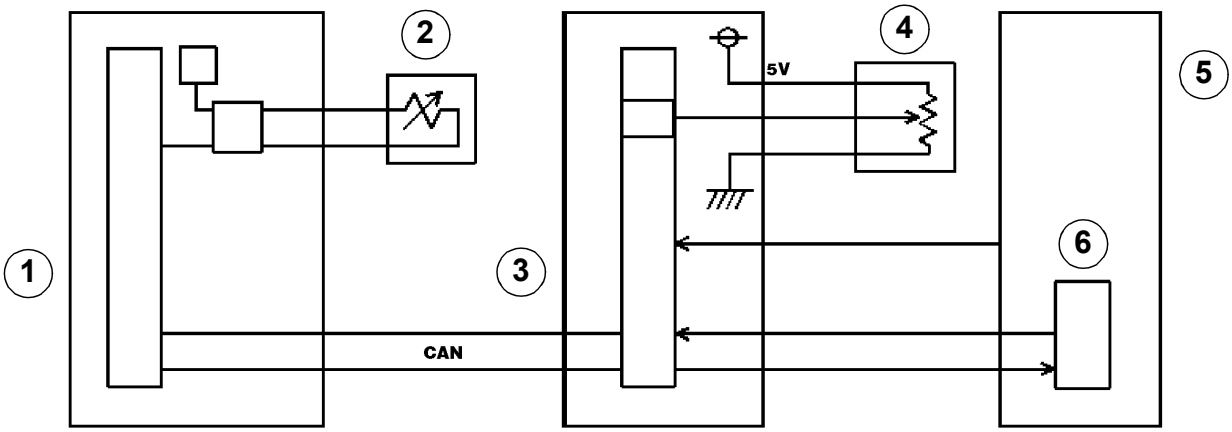
1. If auto mode is selected, 2 modes, SA and LA, are available.
2. When auto mode is selected, LA mode is engaged, which then automatically changes to SA or LA depending on working conditions.
3. If the engine coolant solution temperature is below 50°C or the oil temperature below 25°C, auto mode control does not operate and LA mode is selected. When the water temperature is above 50°C and the oil temperature above 25°C, auto mode starts and continues operating even if the water and oil temperatures fall.
4. When auto mode control is operating, if the travel pressure switch (8) is operated, the mode change does not take place. (If the travel pressure switch is operated in SA mode, the system stays in SA mode and if the pressure switch is operated in LA mode, the system stays in LA mode).

			CX130	CX210
SA mode	Number of engine revolutions (MAX)	rpm	1950±10	1800±10
	Current (equal to S mode + 40 mA)	mA	490	332
	Hydraulic power boost	---	Automatic	Automatic
LA mode	Number of engine revolutions (MAX)	rpm	1850±10	1700±10
	Current (equal to S mode)	mA	450	292
	Hydraulic power boost	---	Automatic	Automatic

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Acceleration control

1) Circuit configuration



CS00F511

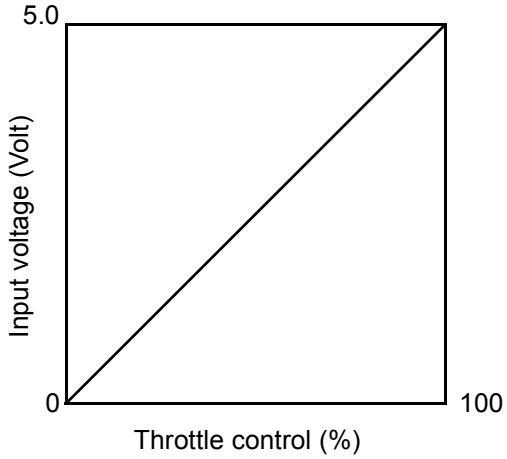
1. Main electronic control box
2. Proportioning valve
3. Engine electronic control box
4. Throttle control
5. Engine
6. Electronic acceleration

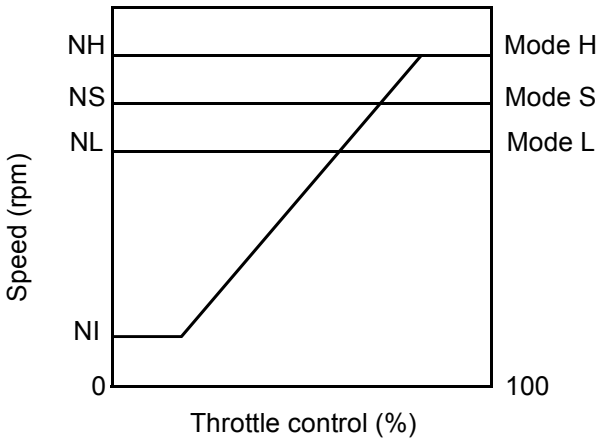
2) Operation

1. The electronic control box (1) transmits the selected work mode to the engine electronic control box (3) via the CAN communications.
2. The engine electronic control box (3) calculates the number of revolutions based on engine output (depending on the mode selected) and the analogue signal (volume) from the throttle control (4).
3. The engine electronic control box calculates the target position of the rack, using the target number of revolutions and the data from each detector (real number of engine revolutions, real position of the rack, fuel flow regulating resistance), and it sends the signal to the electronic acceleration.
4. The electronic acceleration calculates the target position of the rack and its real position (value measured by the rack detector) and moves the rack by turning the electric motor to adjust the quantity of fuel injected.
5. By repeating this process, the engine electronic control box controls the electronic acceleration to obtain: real number of revolutions = target number of revolutions.
6. If the number of engine revolutions has become less than the number of revolutions resulting from the torque set by the throttle control, the value of current delivered by the proportioning valve (2) becomes that of mode "L".

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3) Relation between the throttle control and the number of engine revolutions

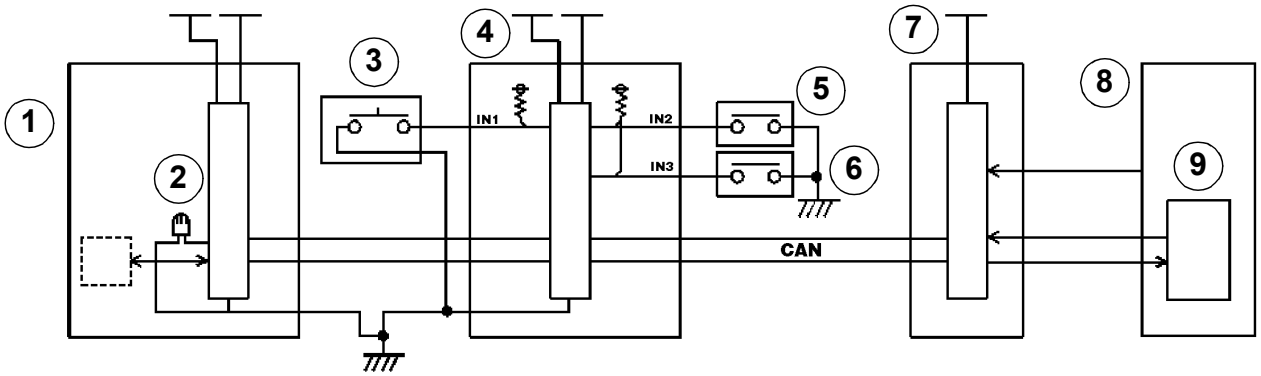




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Control of engine return to idle (automatic/manual)

1) Circuit configuration



CS00F512

1. Instrument panel
2. Audible warning device
3. Return to idle control
4. Main electronic control box
5. Pilot pressure switch
6. Travel pilot pressure switch
7. Engine electronic control box
8. Engine
9. Electronic acceleration

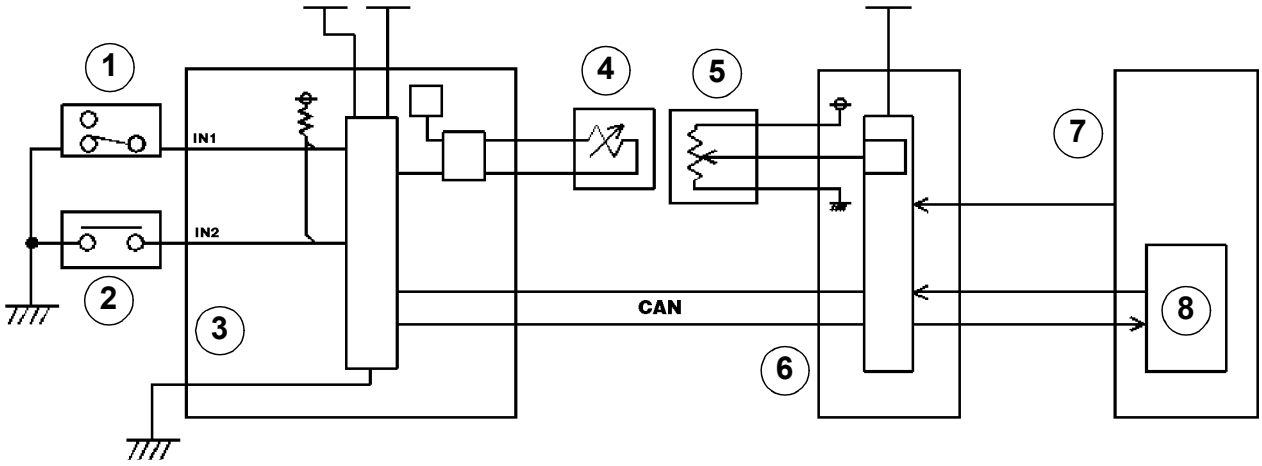
2) Changing from automatic idle to manual idle

1. The idle mode is changed by pressing the return to idle control button (3) for 3 seconds. The audible warning device (2) sounds for 3 seconds. The mode, "ON" or "OFF" is displayed on the control screen (LCD).
   - "ON" = automatic return to idle
   - "OFF" = manual return to idle by pressing the return to idle control button.
2. When the machine is started up, it will be in the previous return to idle mode.
3. If no function is operated and idle mode is "ON", the engine speed automatically returns to idle after 5 seconds. (This timing can be changed to between 1 and 30 seconds).
4. If automatic idle is on and the engine is at idle, the engine speed automatically returns to the original speed when one of the machine functions is operated.
5. If the automatic idle is on, the engine can be returned to idle by pressing the return to idle control button (3). But if automatic idle is not on, the only way to return to idle is to press the control button (3).
6. When automatic or manual idle mode is on, the "ENG. IDLING" message appears on the control screen (LCD).

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Hammer mode control

1) Circuit configuration



CS00F513

1. Hammer/grab switch
2. Hammer pilot switch
3. Main electronic control box
4. Proportioning valve
5. Throttle control
6. Engine electronic control box
7. Electronic acceleration
8. Electronic acceleration

2) Operation

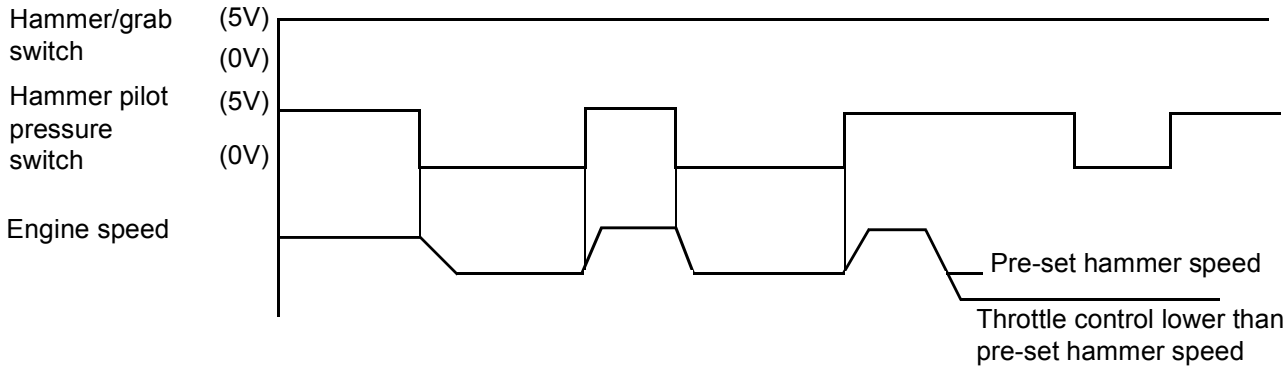
When the hammer/grab switch (1) is turned to hammer function (when the hammer/grab option is installed) and the option pedal is pressed, the hammer pressure switch (2) is on and the engine speed drops to the pre-set hammer speed (see engine speed setting for hammer option).

When the option pedal returns to the neutral position, the hammer pressure switch (2) is deactivated and the engine speed returns to the throttle control setting.

For the pre-set hammer engine speed to function, the throttle control (5) has to be set at a higher speed than the pre-set hammer engine speed.

When the hammer pressure switch (2) is on, the value of current delivered by the proportioning valve (4) becomes that of mode "S".

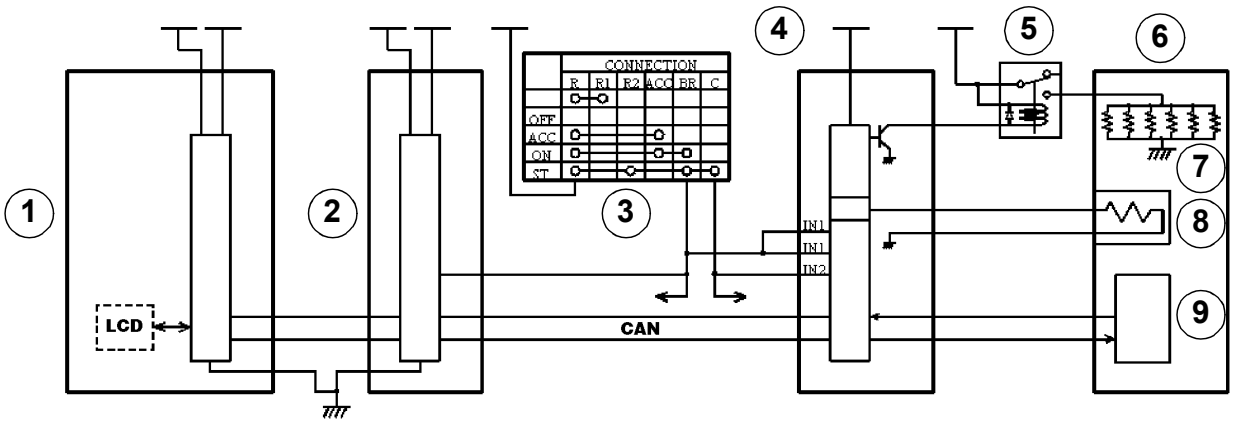
3) Time diagram



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Automatic engine pre-heat

1) Circuit configuration



CS00F514

1. Instrument panel
2. Main electronic control box
3. Starter motor switch
4. Engine electronic control box
5. Pre-heat glow-plug relay
6. Engine
7. Pre-heater plug
8. Engine coolant temperature sender
9. Electronic acceleration

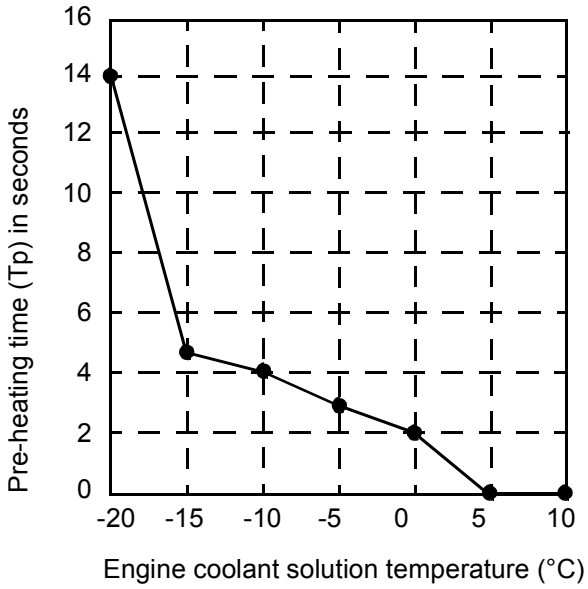
2) Operation

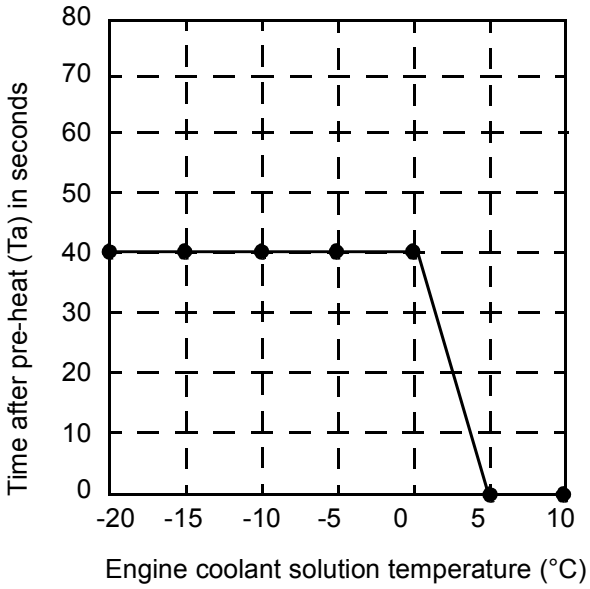
1. When the ignition switch is turned on (IN1 = ON), the main electronic control box (2) calculates the pre-heating time (Tp) by means of the engine coolant temperature (see figure).
2. The engine electronic control box (4) activates the pre-heat relay (5) for the pre-heating time (Tp) previously calculated and transmits a signal to the main electronic control box (2).
3. At the end of pre-heating time (Tp), the pre-heat relay (5) stays on for 2 seconds more.
4. When the ignition switch is turned (3) to "START" (ST, IN2 = ON), the engine electronic control box (4) reactivates the pre-heat relay (5) but does not transmit a signal to the main electronic control box (2).
5. The engine electronic control box (4) calculates the time after pre-heat (Ta) by means of the engine coolant temperature (see figure).
6. When the ignition key (3) is turned back from "START" to "ON" (IN1 = ON; IN2 = OFF), the engine electronic control box (4) activates the pre-heat relay (5) for the time after pre-heat (Ta).
7. During the time after pre-heat (Ta), the message "ENG. PRE HEAT" appears on the control screen (LCD).
8. The control system mentioned above immediately starts, with the ignition on, the message "ENG. PRE HEAT" appears on the control screen (LCD) only if the pre-heating time exceeds 3 seconds (engine coolant solution temperature below -5°C).

NOTE: *When the ignition is switched on, the "CASE" logo appears on the control screen (LCD) for 3 seconds.*

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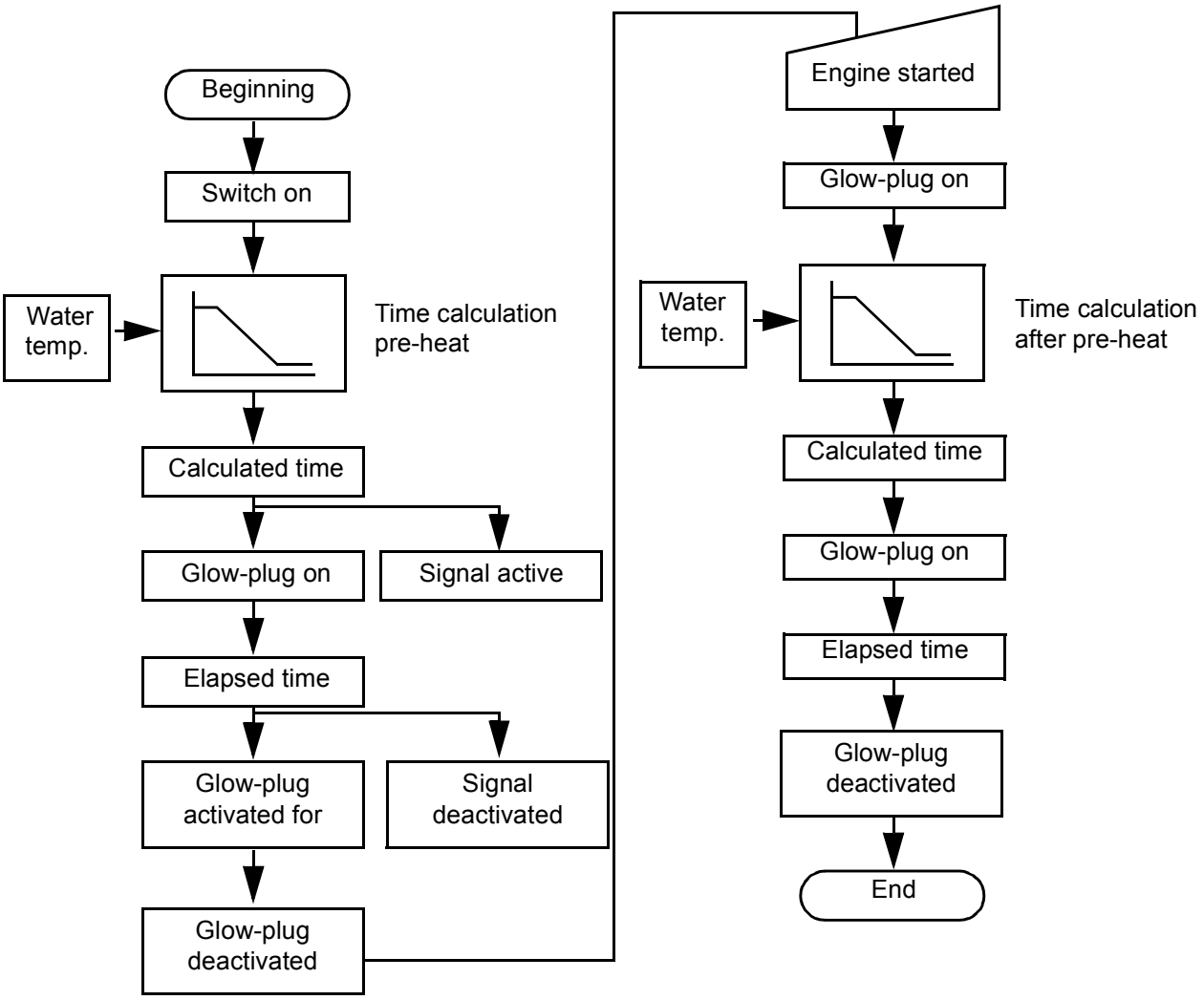
3) Figure showing pre-heating time (Tp) and after pre-heat (Ta)





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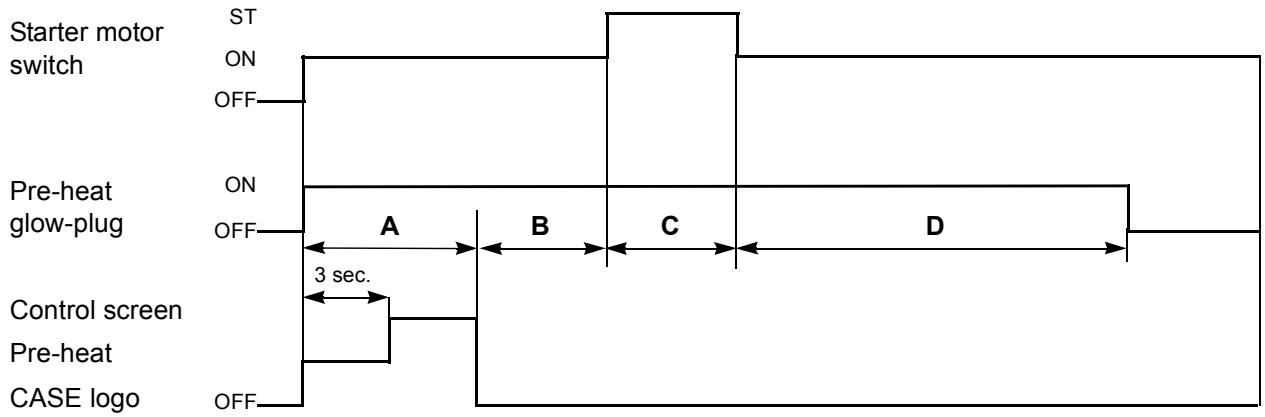
4) Organisation diagram



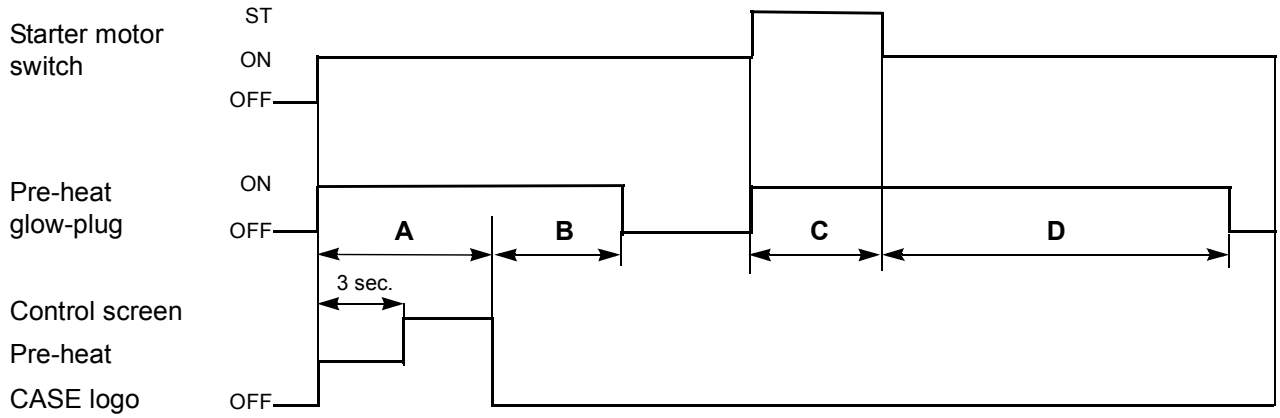
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5) Diagram showing times

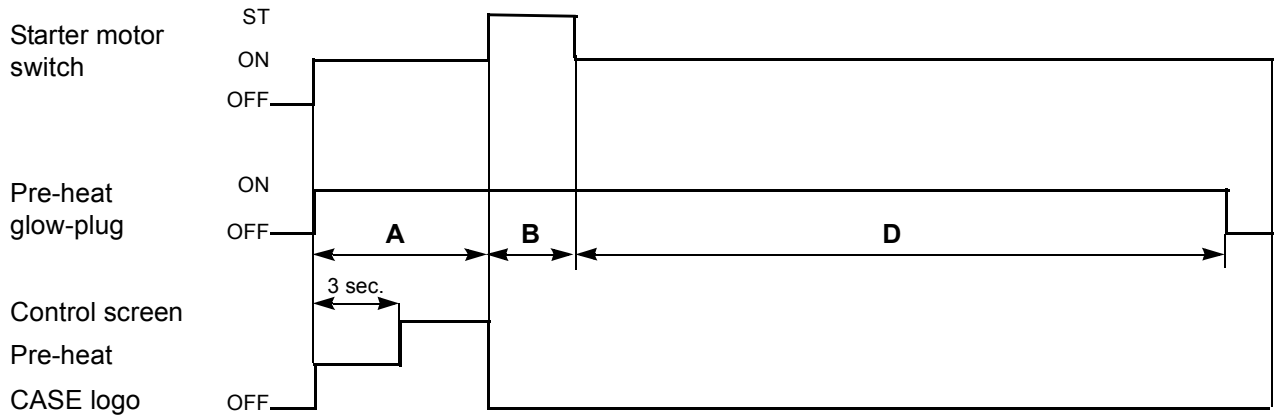
a) If the engine is started during the 2 seconds following the display "ENG. PRE HEAT"



b) If the engine is started after the 2 seconds following the display "ENG. PRE HEAT"



c) If the engine is started while "ENG. PRE HEAT" is displayed

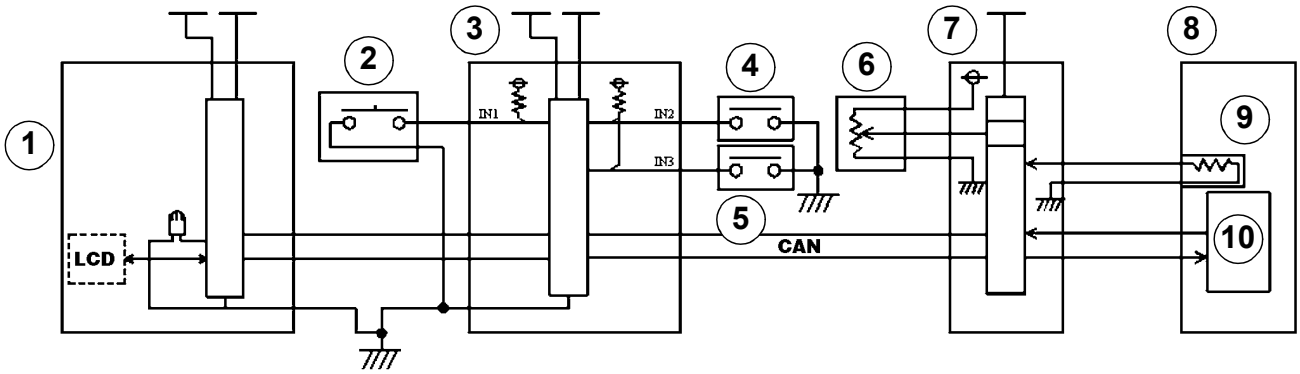


A. Pre-heating time Tp
B. 2 seconds of additional pre-heat
C. Pre-heating time when engine is being started
D. Time after pre-heat Ta

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Automatic engine warm-up

1) Circuit configuration



CS00F515

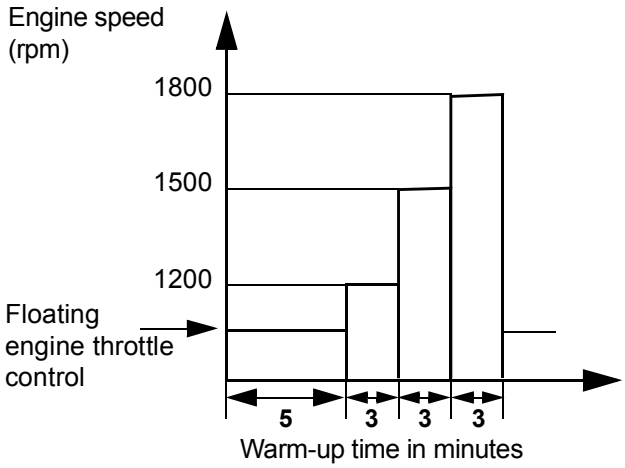
1. Instrument panel
2. Return to idle control
3. Main electronic control box
4. Pilot pressure switch
5. Travel pilot pressure switch
6. Engine throttle control
7. Engine electronic control box
8. Engine
9. Engine coolant temperature sender
10. Electronic acceleration

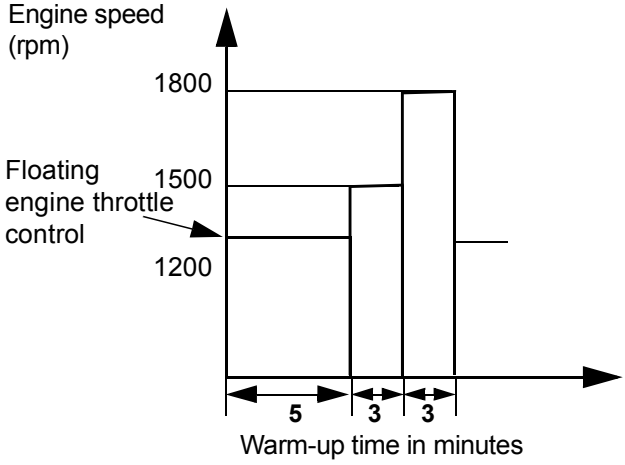
2) Operation

1. When the engine is started, if the coolant solution temperature is equal to or lower than 50°C, the main electronic control box (3) transmits an automatic engine warm-up signal to the engine electronic control box (7).
2. The engine electronic control box (7) manages the automatic engine warm-up.
3. Automatic engine warm-up conditions:
   - Coolant solution temperature (9) equal to or lower than 50°C.
   - Pilot pressure switch (4) and travel pilot pressure switch (5) not on.
   - Return to idle control (2), not on.
   - Position of engine throttle control (6), unchanged.
   - Engine speed not higher than 1800 rpm for 3 minutes.
4. If one of the above conditions is not present, the automatic engine warm-up does not operate. To perform the engine warm-up again, the engine has to be shut down and re-started.
5. When automatic engine warm-up is operating, "AUTO WARM UP" is displayed on the control screen (LCD).

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3) Diagram showing times



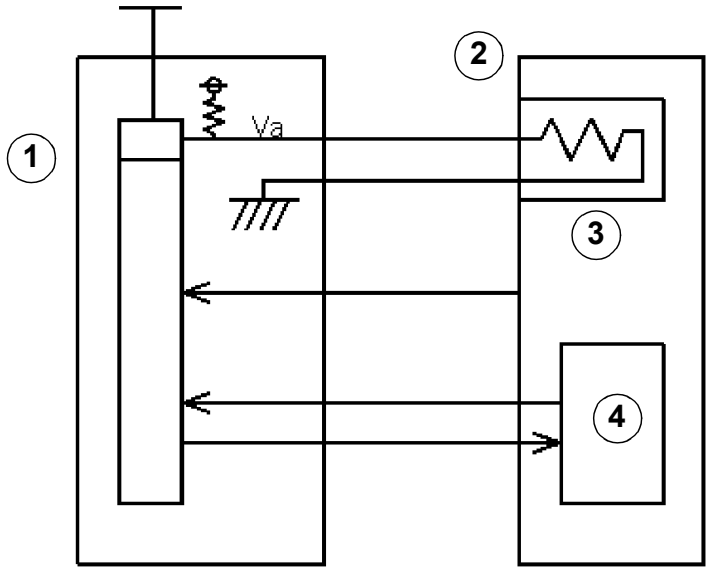


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Idle control by battery voltage and coolant solution temperature

The purpose of this function is to prevent the battery becoming discharged or the coolant solution temperature becoming too low in the event of too long a period at idle speed

1) Circuit configuration



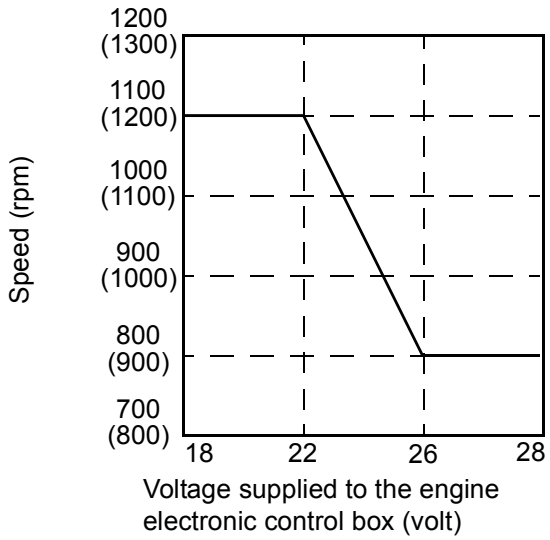
CS00F516

1. Engine electronic control box
2. Engine
3. Engine coolant temperature sender
4. Electronic acceleration

2) Operation

When the idle time is too long and the voltage supplied to the engine electronic control box (1) drops or the coolant solution temperature (3) is low, the idle speed automatically increases (see figure below).

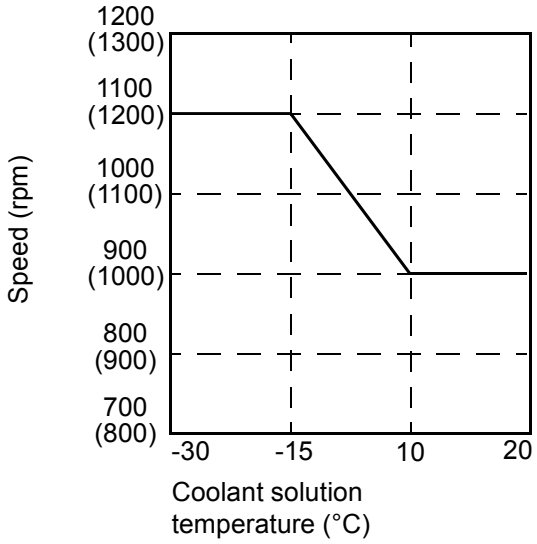
Adjusting the speed in accordance with battery voltage



NOTE: *Numbers in brackets () show values for the CX130.*

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Adjusting the idle speed in accordance with the coolant solution temperature

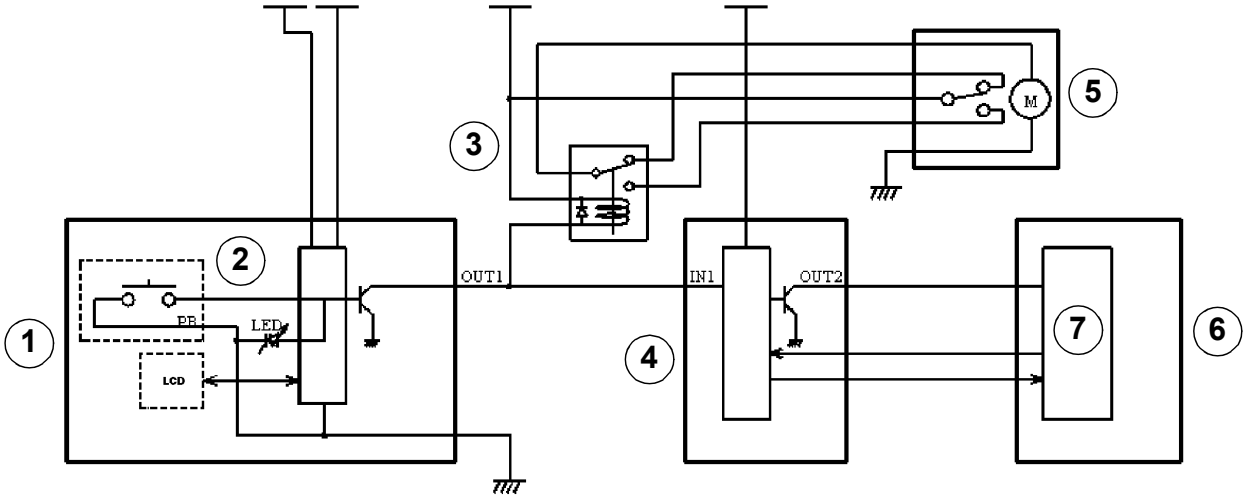


NOTE: *Numbers in brackets () show values for the CX130.*

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Engine emergency stop

1) Circuit configuration



CS00F517

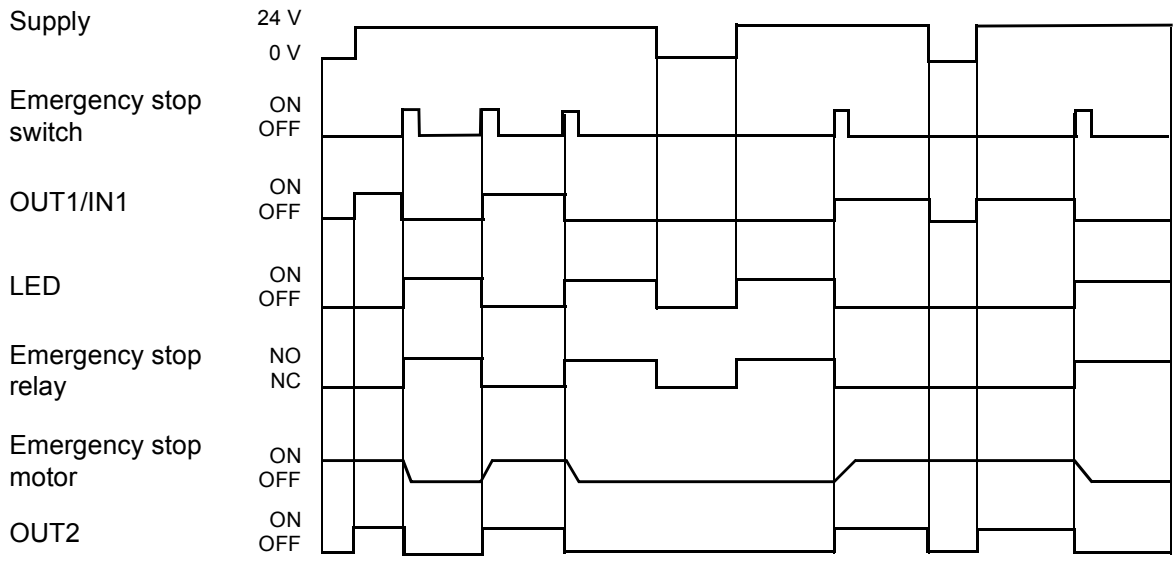
1. Instrument panel
2. Engine emergency stop switch
3. Engine emergency stop relay
4. Engine electronic control box
5. Emergency stop motor
6. Engine
7. Electronic acceleration

2) Operation

1. If the emergency stop switch (2) is pressed, the transistor output OUT 1 = 0 volt and the LED on the switch flash.
2. Since OUT 1 is at 0 volt, the emergency stop relay (3) is activated, along with the emergency stop motor (5).
3. The stop signal input (IN1) on the engine electronic control box (4) falls to 0 volt, the engine electronic control box (4) accepts that as the emergency stop status and transmits the "stop engine" signal OUT 2 = 0 volt.
4. The electronic acceleration starts to control the engine shut down when it received the signal (position of the rack = 0 mm).
5. The emergency stop status is maintained even after the ignition switch is turned off. To deactivate the emergency stop, the emergency stop switch has to be pressed again, with the LED off.

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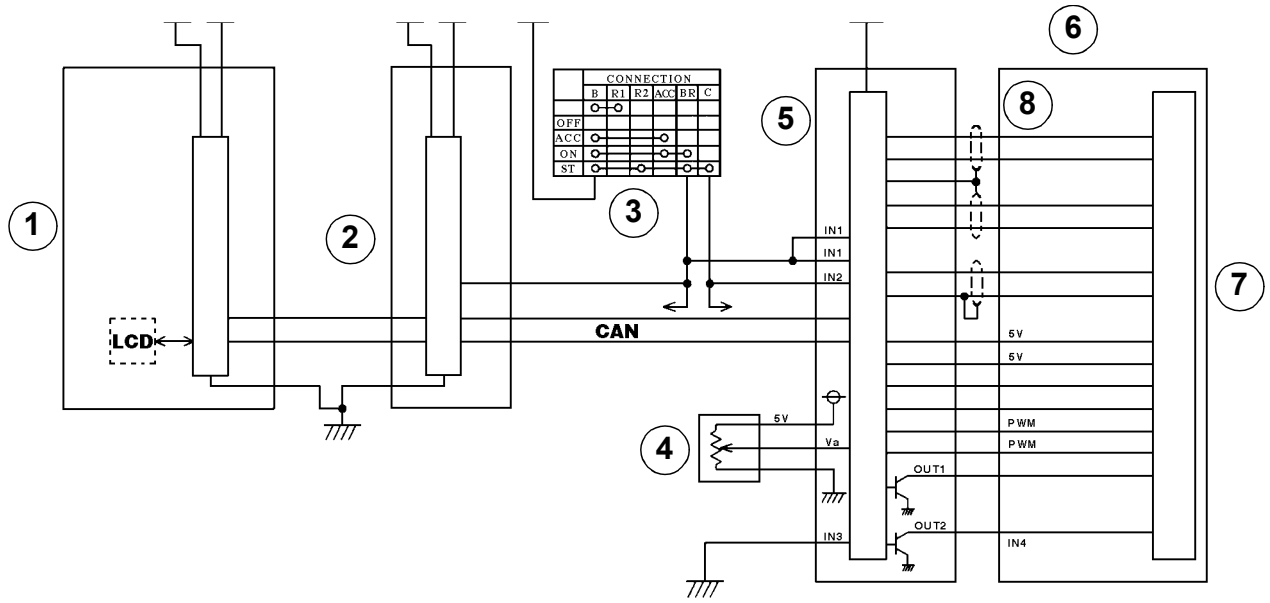
3) Timing diagram



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Emergency mode

1) Circuit configuration



CS00F518

1. Instrument panel
2. Main electronic control box
3. Starter motor switch
4. Engine throttle control
5. Engine electronic control box
6. Engine
7. Electronic acceleration
8. Engine speed detector

2) Electronic acceleration regulator assistance control

The electronic acceleration regulator checks the engine speed by checking the position of the electronic acceleration rack.

- The engine electronic control box sends the target position of the rack to the electronic acceleration regulator, by means of a PWM signal. The regulator compares the value of the real position to the target position informed by the rack position detector incorporated in the regulator. Using the result of the calculation, the electric motor incorporated in the electronic acceleration is actuated to check the position of the rack. The real value of the rack position is then transmitted to the engine electronic control box.
- The engine electronic control box checks if the electronic acceleration regulator is operating correctly by comparing the target position sent with the real value of the rack.
- If there is a difference of 2 mm or more between the real position and the target value of the rack, variations in engine speed will occur (see table below). The engine electronic control box considers that this is an electronic acceleration regulator assistance error.
- If the regulator assistance error is confirmed, the electronic control box stops the engine to prevent it running out of control.

The engine electronic control box transmits the problem codes to the main electronic control box when a regulator assistance error occurs and the error code "ELEC. PROBLEM" is displayed on the control screen (LCD).

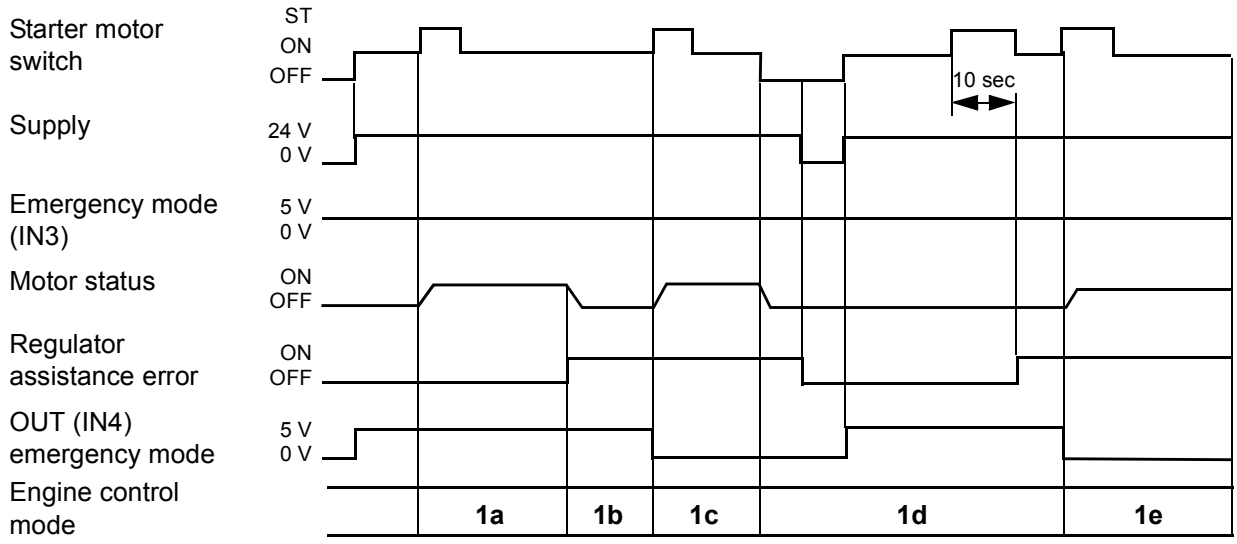
When starting the engine	Machine operation
Variation in engine speed ≥ 500 rpm for 1 second	Variation in engine speed ≥ 1000 rpm for 1 second
Variation in engine speed < 500 rpm for 10 seconds	Variation in engine speed < 1000 rpm for 10 seconds

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3) Checking the emergency mode

1. The engine electronic control box stops the engine by cutting off the fuel injection if an assistance error is detected at the electronic acceleration regulator during operation or when starting the engine.
2. After stopping the engine due to a regulator assistance error, the engine can be re-started in emergency mode (IN3 = ON = GND).
3. When operating in emergency mode, the engine electronic control box only checks the position of the rack against the engine speed obtained by the engine speed detector. Therefore normal engine performance cannot be obtained, since the engine emergency mode has taken over.

4) Timing diagram



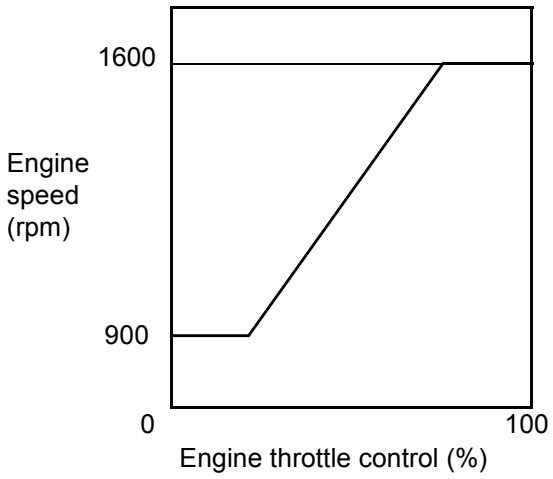
1a. Normal
1b. Off
1c. Emergency mode
1d. Off
1e. Emergency mode

5) Engine control when the emergency mode has taken over

The engine electronic control box determines the target engine speed from the position of the engine throttle control.

The engine electronic control box checks the position of the electronic acceleration rack by the difference between the real engine speed obtained by a signal from a speed detector incorporated in the electronic acceleration (or by the engine speed detector located in the engine bell-housing) and the target speed.

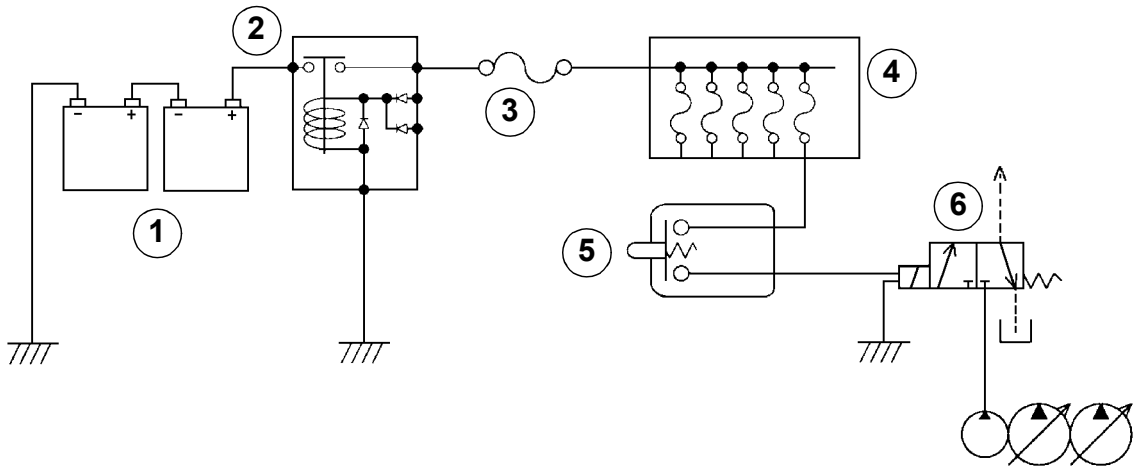
In emergency mode, the engine speed is controlled only by the engine throttle control. Control by the engine throttle control is different from control under normal conditions.



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Locking functions

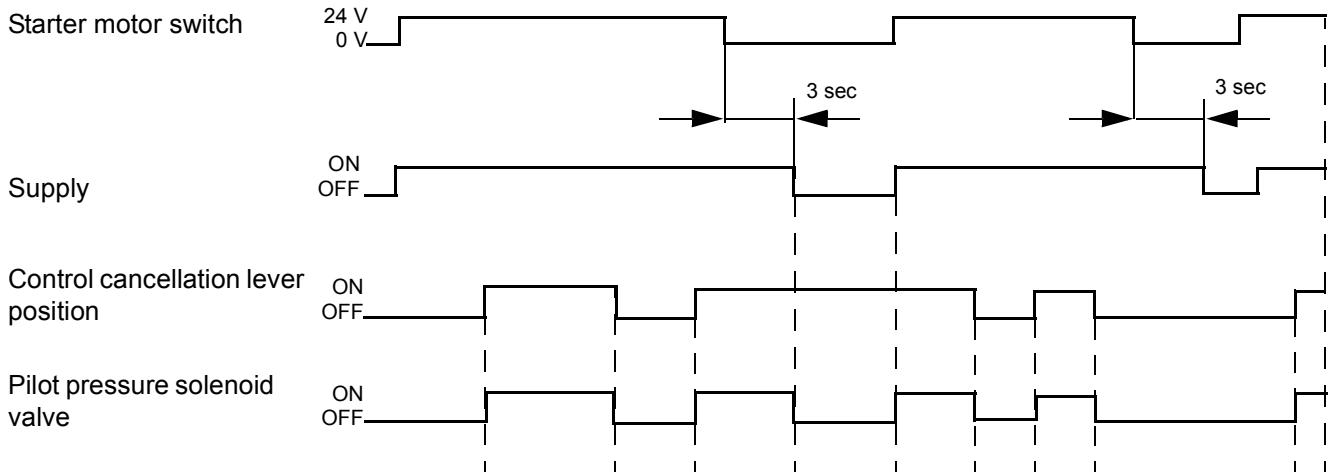
1) Circuit configuration



CS00F501

1. Battery
2. Battery relay
3. Main protective fuse
4. Fuse box
5. Control cancellation lever switch
6. Pilot pressure control solenoid valve

2) Timing diagram



3) Operation

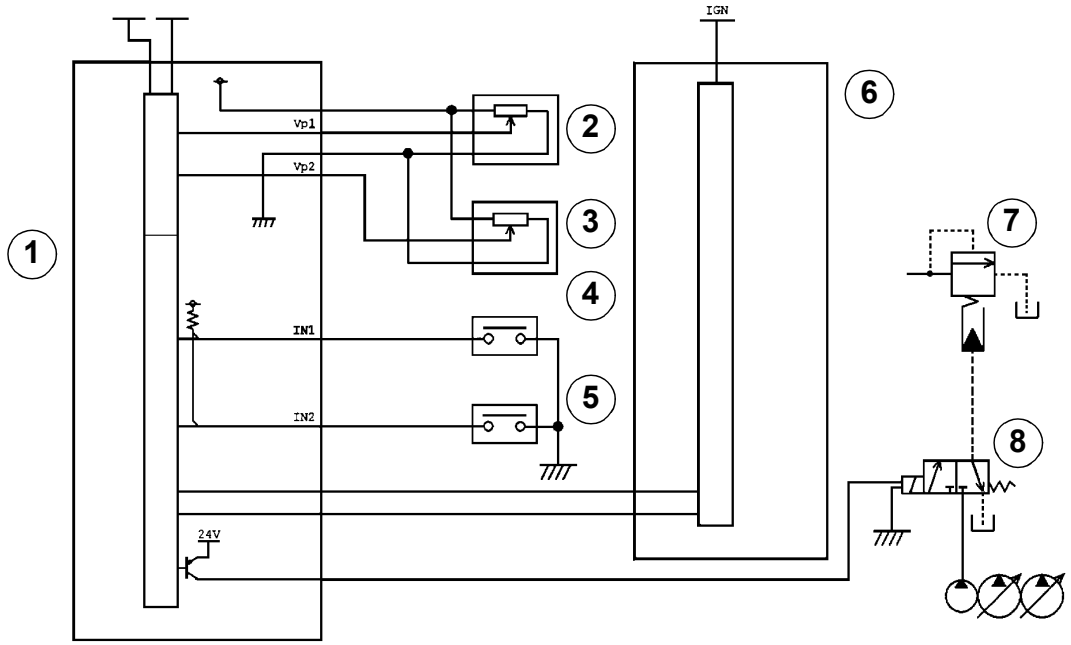
When the engine is started and the control cancellation lever is in the work position, the pilot pressure solenoid valve is activated.

When the pilot pressure solenoid valve is activated, the pilot pressure is supplied to the pilot systems and the machine is ready to operate.

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Power boost

1) Circuit configuration



CS00F502

1. Main electronic control box
2. Pressure detector P1
3. Pressure detector P2
4. Travel pilot pressure switch
5. Option pilot pressure switch
6. Engine electronic control box
7. Main valve
8. Power boost solenoid valve

2) Pressure increase in each work mode

	CX130	CX210
Mode H (Pressure)	Automatic power boost (*) (34.3 ↔ 36.3 MPa)	Automatic power boost (*) (34.3 ↔ 37.3 MPa)
Mode S (Pressure)	Automatic power boost (*) (34.3 ↔ 36.3 MPa)	Automatic power boost (*) (34.3 ↔ 37.3 MPa)
Mode L (Pressure)	Constant power boost (*) (36.3 MPa)	Constant power boost (*) (37.3 MPa)

* When the travel or option pressure switch is activated, the power boost is deactivated.

3) Operation

When operating in mode H or S, the main electronic control box (1) registers the ratio between:

- The load on the engine transmitted by the engine electronic control box (6).
- The load on the hydraulic system transmitted by the pressure detectors P1/P2 (2 and 3).

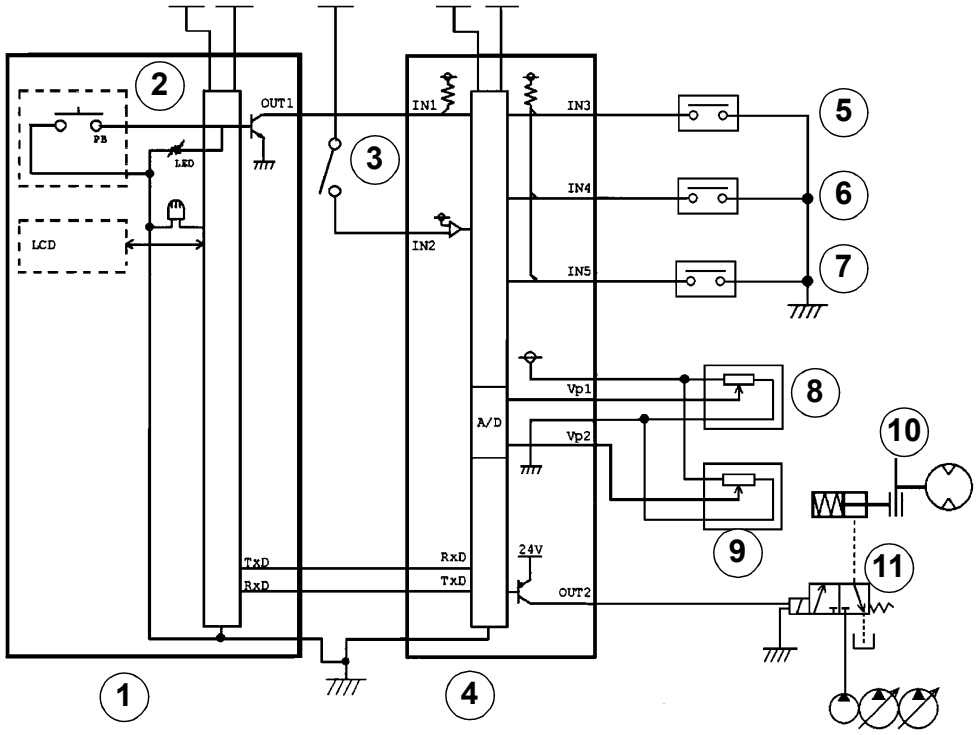
If pressure P1 or P2 is higher than 300 bar (30 MPa) and the load ratio remains within a range of ± 5% for 2 seconds, the main electronic control box (1) activates the power boost solenoid valve (8) for 8 seconds which increases the main pressure.

When the travel (4) or option (5) pressure switch is activated, the main electronic control box deactivates the power boost solenoid valve.

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Swing brake

1) Circuit configuration



CS00F503

1. Instrument panel
2. Swing brake switch
3. Starter motor switch
4. Main electronic control box
5. Swing pilot pressure switch
6. Pilot pressure switch
7. Travel pressure switch
8. Pressure detector P1
9. Pressure detector P2
10. Swing brake
11. Swing brake solenoid valve

2) Swing brake control operation

When the swing brake switch (2) is operated, the red LED comes on and the swing brake locks.

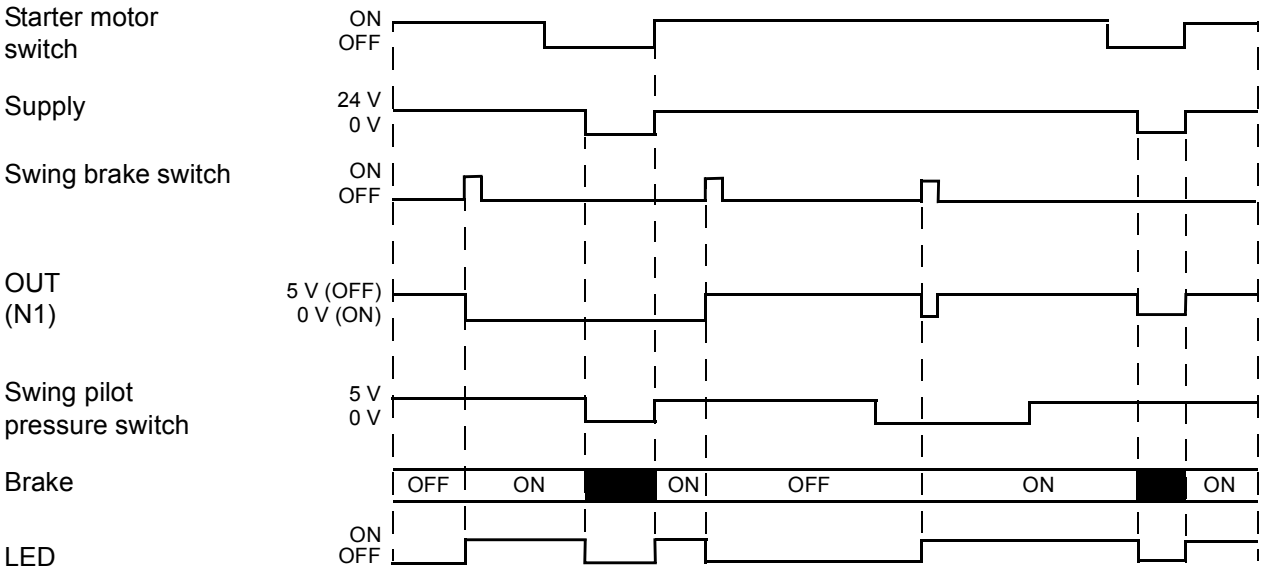
When the swing brake switch is operated again, the red LED goes out, the swing brake unlocks and changes to automatic control (see paragraph 4).

While the swing is locked, the transistor OUT 2 output is activated and the swing brake (10) is locked.

The swing brake remains in the previous state even when the ignition is switched off.

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3) Timing diagram



4) Automatic swing brake control

Automatic brake control operates when the swing brake red LED is off.

When the swing and an attachment function are operated simultaneously, the mechanical swing brake is automatically disengaged. When the operation stops, the mechanical swing brake is automatically activated by the main electronic control box.

The swing brake is automatically deactivated when:
- The swing pilot pressure switch (5) is activated.
- When the pressure at the pressure detectors P1 (8) or P2 (9) is higher than 150 bar (15 MPa).

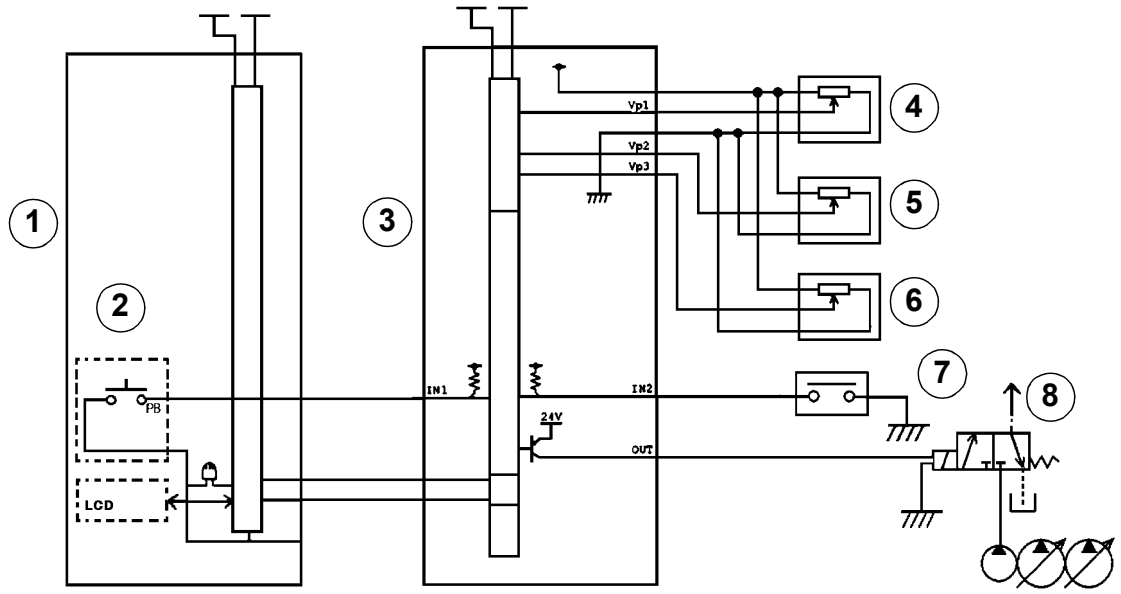
The swing brake is automatically activated when:
- The pilot pressure switch (6) is deactivated for more than 5 seconds.
- The starter switch (3) is in the = OFF position.

When the pressure supplied by the pump (P1 or P2) exceeds 150 bar (15 MPa) during one single travel, the mechanical swing brake is deactivated for 5 seconds, then reactivated.

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Travel speed

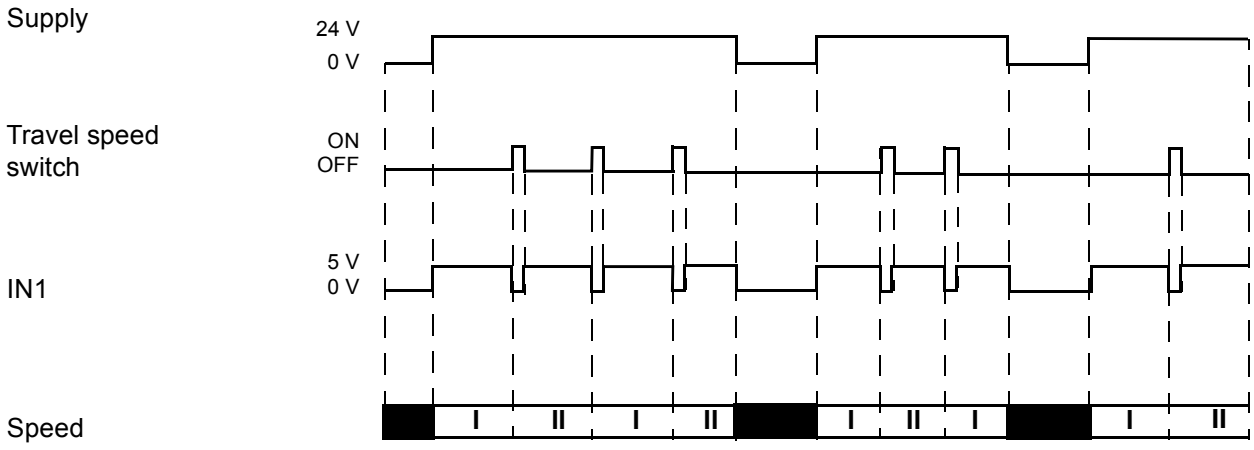
1) Circuit configuration



CS00F504

1. Instrument panel
2. Travel speed switch
3. Main electronic control box
4. Pressure detector P1
5. Pressure detector P2
6. Pump regulating pressure detector (N)
7. Travel pilot pressure switch
8. Travel 2nd speed solenoid valve

2) Timing diagram



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3) Operation

When the starter motor switch is positioned in the “ON” position, 1st speed is selected by default.

Each time the speed switch is pressed (2), the electronic control box (3) registers a signal (IN1: 0 volt).

The electronic control box changes travel speed in the following way I → II, II → I and transmits the modifications to the control screen (LCD).

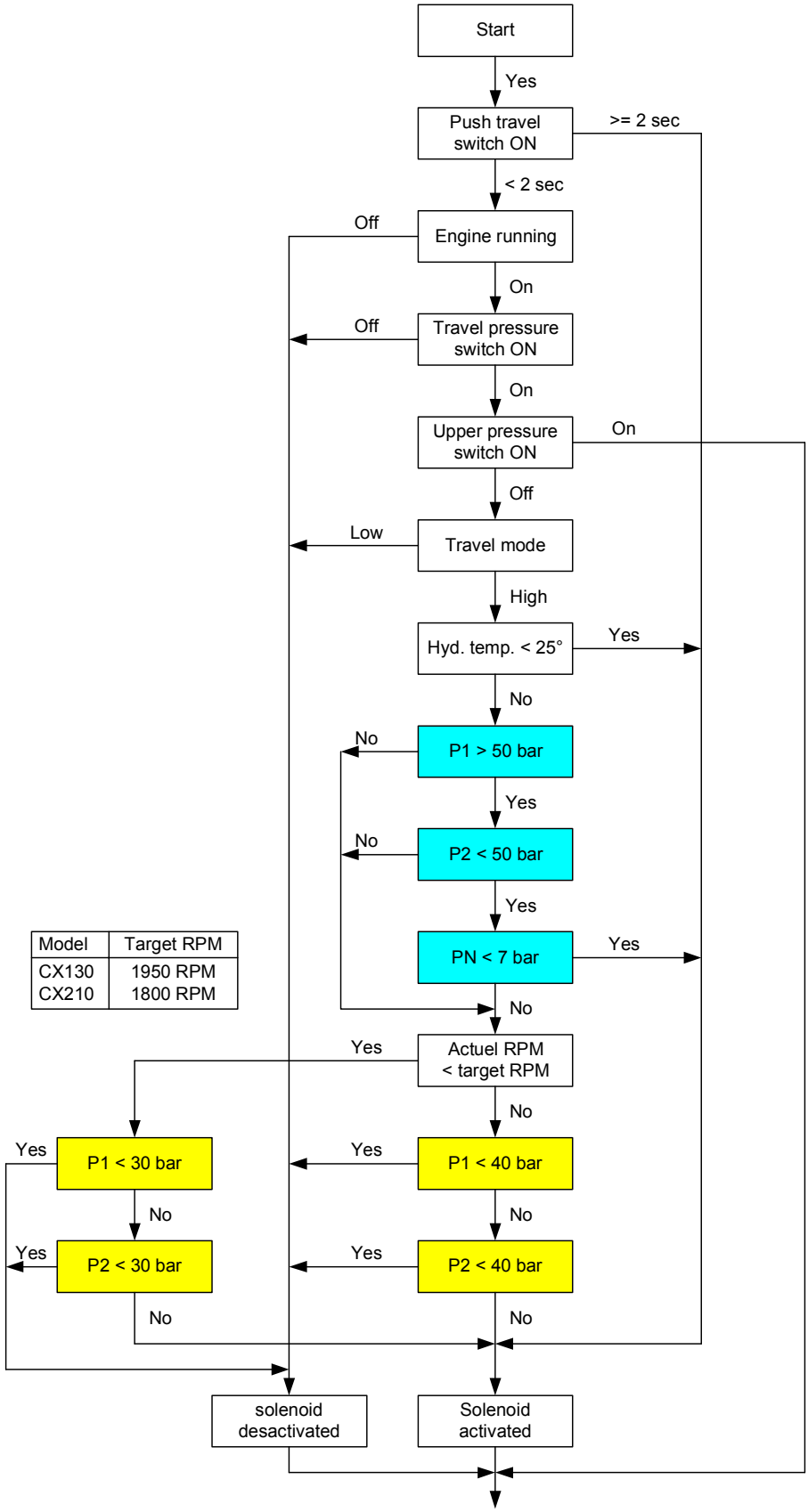
Travel speed I selected

The output from the travel speed change solenoid valve (8) electronic control box (OUT) is deactivated (1st speed).

Travel speed II selected

1. When pressure P1 or P2 is lower than 40 bar (4 MPa) at the electronic control box output (OUT), the travel change speed solenoid valve is deactivated (1st speed).
2. When pressure P1 or P2 is higher than 40 bar (4 MPa) at the electronic control box output (OUT), the travel change speed solenoid valve is activated (2nd speed).
   When the attachment controls are operated, the electronic control box output (OUT) from the travel speed change solenoid valve cannot be activated or deactivated.
3. When the travel pressure is higher than 260 bar (26 MPa), travel motor displacement change spool is pushed back and the swash plate angle is in high displacement (1st speed).
4. Travel speed II can be forced (for cleaning tracks) by holding the speed control switch pressed for over 2 seconds (IN1 = 0 volt).

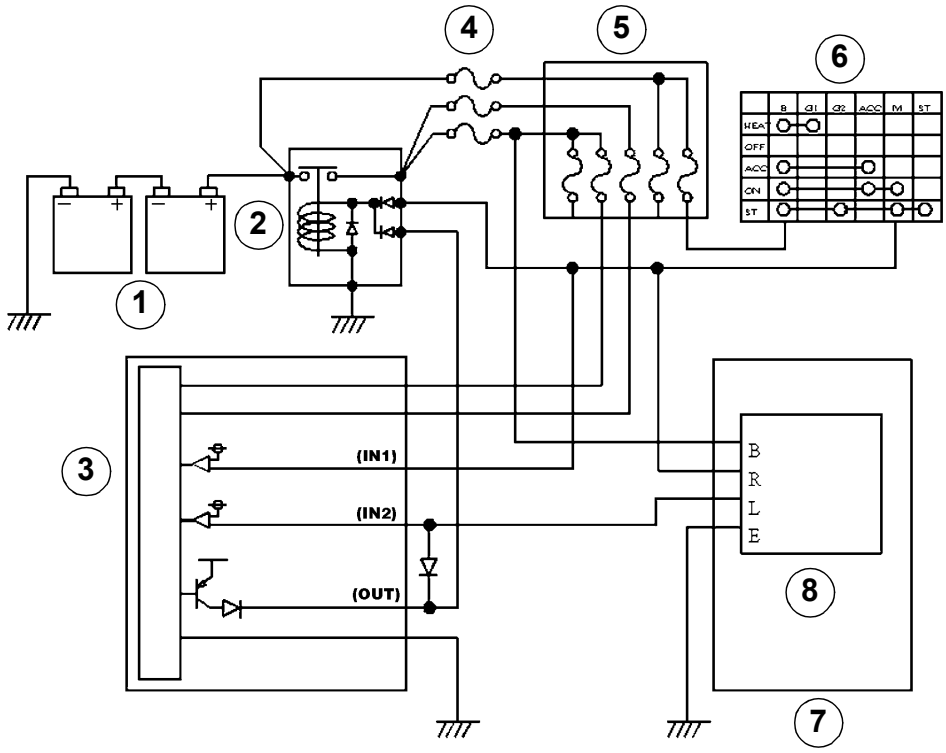
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Supply cut-off delayed

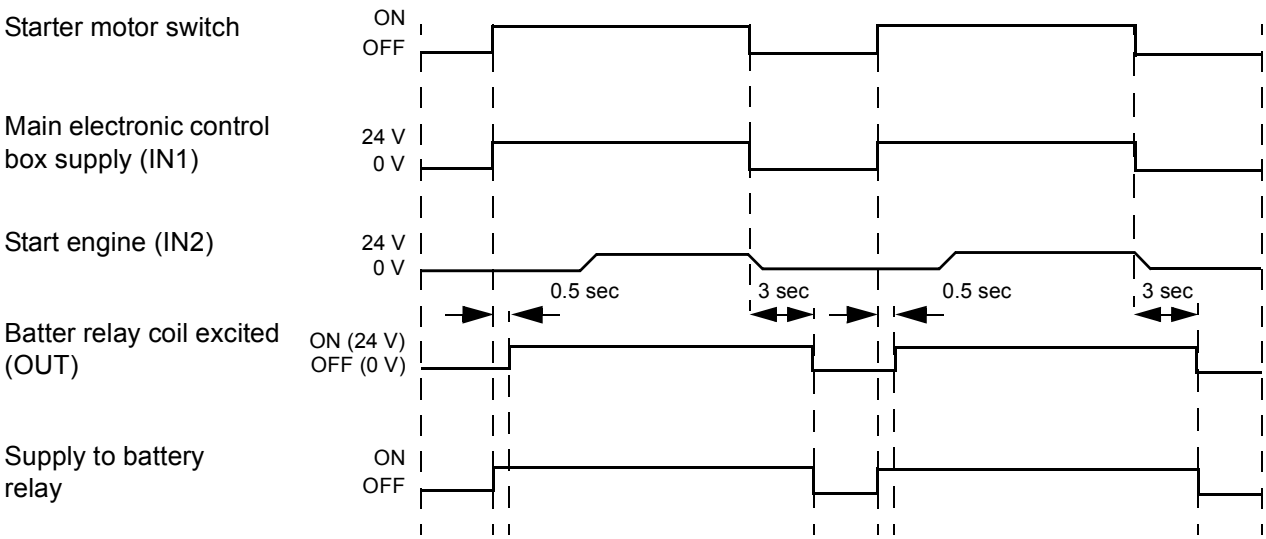
1) Circuit configuration



CS00F506

1. Batteries
2. Battery relay
3. Main electronic control box
4. Main fuses
5. Fuse box
6. Starter motor switch
7. Engine
8. Alternator

2) Timing diagram



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Protection by power transistor

Con-nector	Path	Functions
CN5	**8**	Power boost solenoid valve
CN6	**20**	swing cancellation solenoid valve
CN6	**26**	Battery relay
CN6	**29**	Swing brake solenoid valve
CN6	**30**	Travel speed solenoid valve
CN6	**31**	Shock absorbing solenoid valve

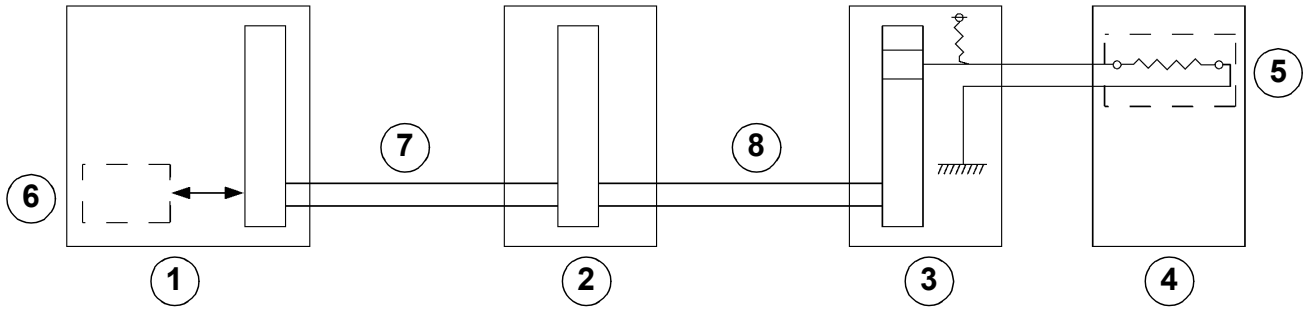
To protect the circuits of the main electronic control box in the event of a short-circuit of a solenoid valve or a relay, the power transistors cut off the electrical supply and the message “ELEC. PROBLEM” appears on the instrument panel control screen. Use the diagnostic mode to locate the short-circuit.

Check the wiring and the components of the affected circuit.

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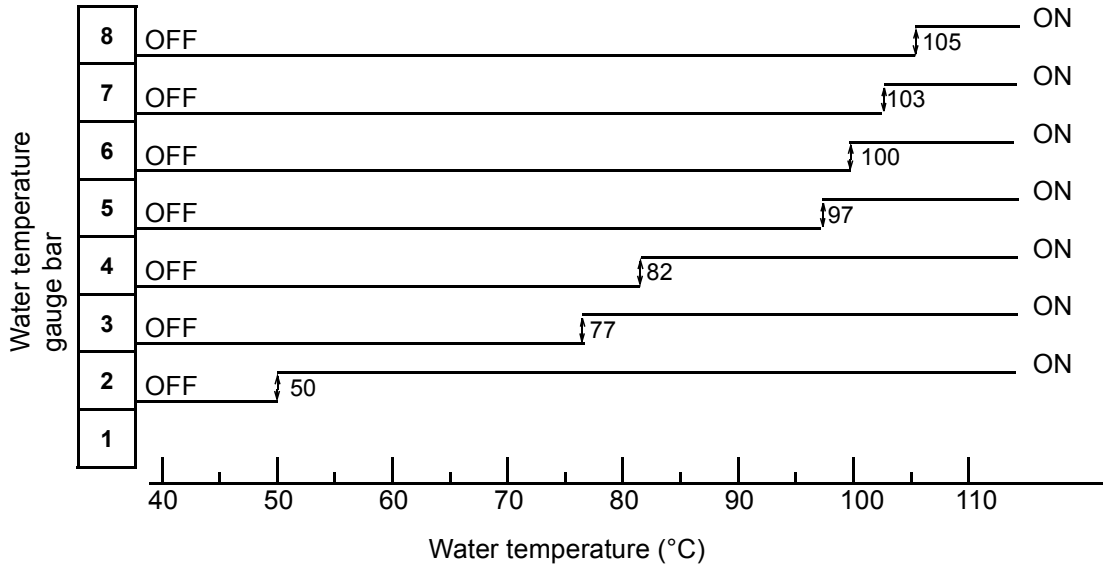
Water temperature gauge

1) Circuit configuration



CM00F007

1. Instrument panel
2. Main electronic control box
3. Engine electronic control box
4. Moteur
5. Water temperature sender
6. Water temperature gauge
7. Series connection
8. CAN connection



2) Operation

A. The engine water temperature sender (5) sends a signal to the engine electronic control box (3).

B. The engine electronic control box (3) send the converted signal to the main electronic control box (2) via the CAN connection (8).

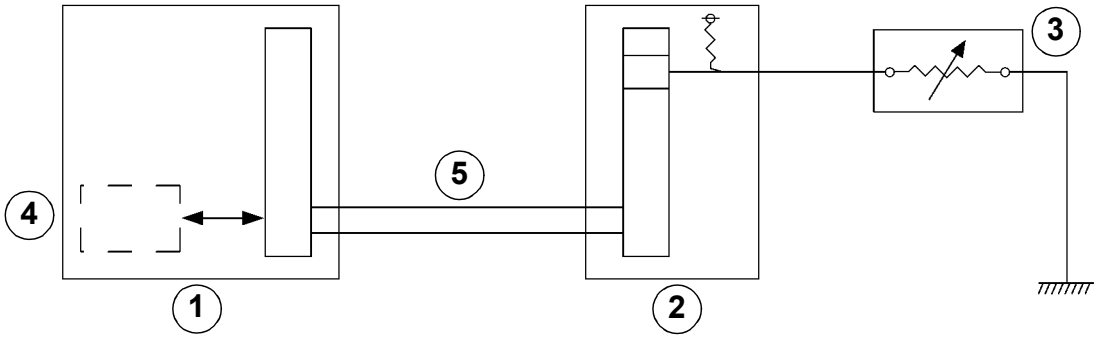
C. The main electronic control box (2) calculates the number of bars to display and transmits the information to the water temperature gauge (6) via the series connection (7).

D. When the 8th bar on the water temperature gauge is displayed, the message “OVER HEAT” appears on the instrument panel control screen (1) and the audible warning device sounds.

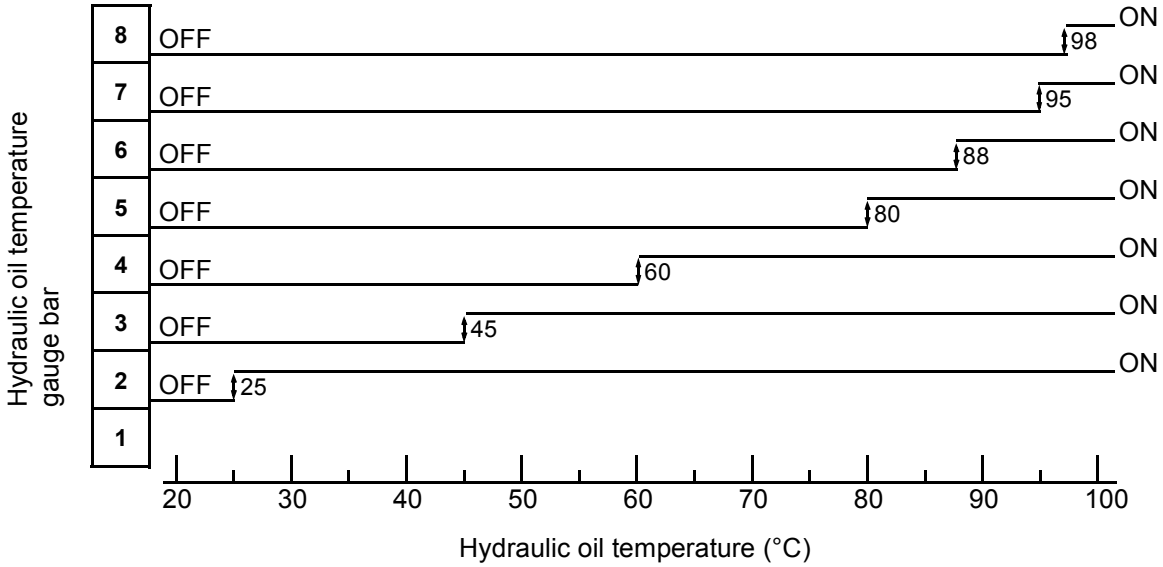
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Hydraulic oil temperature gauge

1) Circuit configuration



CM00F008



1. Instrument panel
2. Main electronic control box
3. Hydraulic oil temperature sender
4. Hydraulic oil temperature gauge
5. Series connection

2) Operation

A. The hydraulic oil temperature sender (3) attached to the inlet pipe sends a signal to the main electronic control box (2).

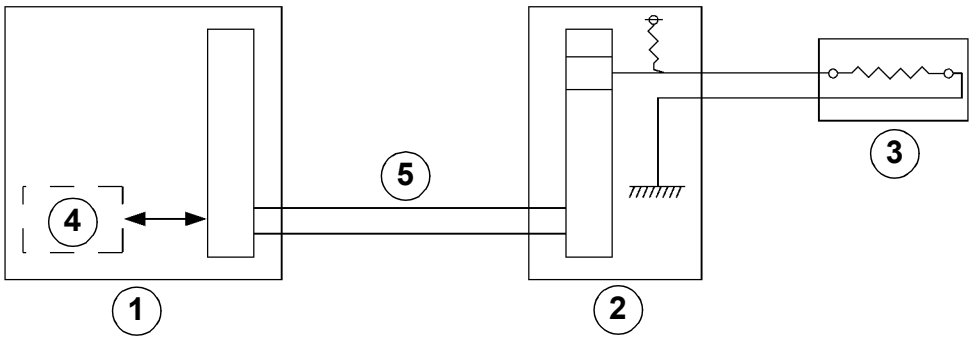
B. The main electronic control box (2) calculates the number of bars to be displayed and sends the information to the oil temperature gauge (4) via the series connection (5).

C. When the 8th bar is displayed on the hydraulic oil temperature gauge, the message “OVER HEAT” appears on the instrument panel control screen (1) and the audible warning device sounds.

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Fuel level

1) Circuit configuration



CM00F009

Remaining fuel (L)		Fuel level sender resistor (Ω)	Input voltage (V)	Bars displayed
CX130	CX210			
191.1 -	261.6 -	10.0 - 18.1	0.455 - 0.766	8
159.8 - 191.1	232.8 - 261.6	18.1 - 23.9	0.766 - 0.964	7
128.5 - 159.8	190.0 - 232.8	23.9 - 29.6	0.964 - 1.142	6
97.1 - 128.5	147.1 - 190.0	29.6 - 36.5	1.142 - 1.337	5
65.7 - 97.1	104.2 - 147.1	36.5 - 46.3	1.337 - 1.582	4
34.4 - 65.7	51.2 - 104.2	46.3 - 60.8	1.582 - 1.891	3
15.6 - 34.4	25.6 - 51.2	60.8 - 74.7	1.891 - 2.138	2
< 15.6	< 25.6	74.7 - 80.0	2.138 - 2.222	1

1. Instrument panel
2. Main electronic control box
3. Fuel level sender
4. Fuel level indicator
5. Series connection

2) Operation

A. The fuel level sender (3) sends a signal to the main electronic control box (2).

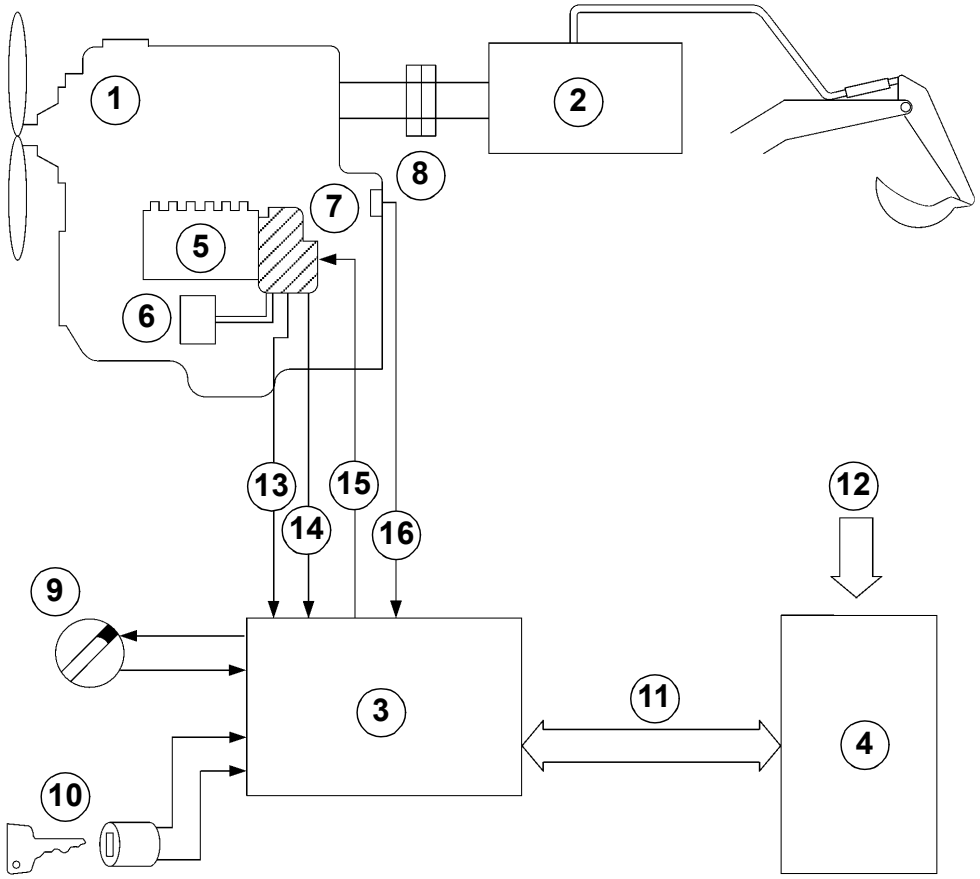
B. The main electronic control box (2) calculates the number of bars to be displayed and sends the information to the fuel level gauge (4) via the series connection (5).

C. When only one bar is displayed on the fuel level gauge (4), the message “LOW FUEL” appears on the instrument panel control screen (1) and the audible warning device sounds.

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Engine fuel injection pump electronic regulator

1) Circuit configuration

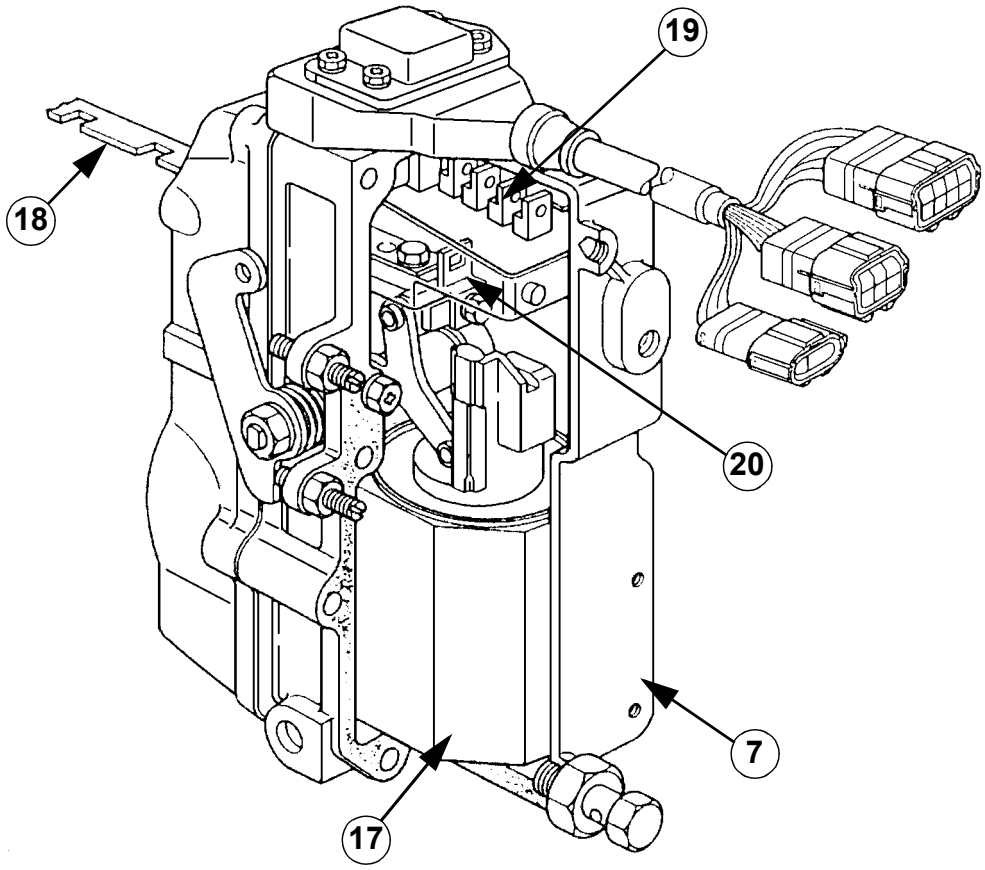


CM00F010

1. Engine
2. Hydraulic system
3. Engine electronic control box
4. Main electronic control box
5. Fuel injection pump
6. Fuel flow regulating resistor
7. Electronic regulator
8. Engine speed detector
9. Throttle control
10. Starter motor switch
11. CAN connection
12. Detector and sender information input
13. Engine speed signal
14. Rack position detector signal
15. Rack control signal
16. Engine speed detector signal

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2) Electronic regulator



CS00F532

17. Linear motor
18. Rack
19. Linear motor control section
20. Rack position detector

3) Operation

A. To ensure low fuel consumption and optimum productivity, the engine electronic control box (3) memorises the various work modes (M, S and L) and selects the optimum work mode in accordance with the signal that it receives from the main electronic control box (4) via the CAN connection (11).

B. The electronic regulator (7) has an input section, a calculating section and a linear motor control section (17).

C. The input section receives the signals coming from the detectors and senders (12) and transmits them after processing to the calculation section.

D. The calculation section compares the information received with the memorised data, and then transmits a control signal to the linear motor (17) control section (19).

E. The control section (19) sends a signal to the regulator (7) linear motor (17) to actuate the fuel injection pump (5) rack control (18).

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HYDRAULIC EXCAVATOR
CX130



SECTION N°6
HYDRAULIC CIRCUIT

CASE TRAINING CENTRE
AUGUST 2000

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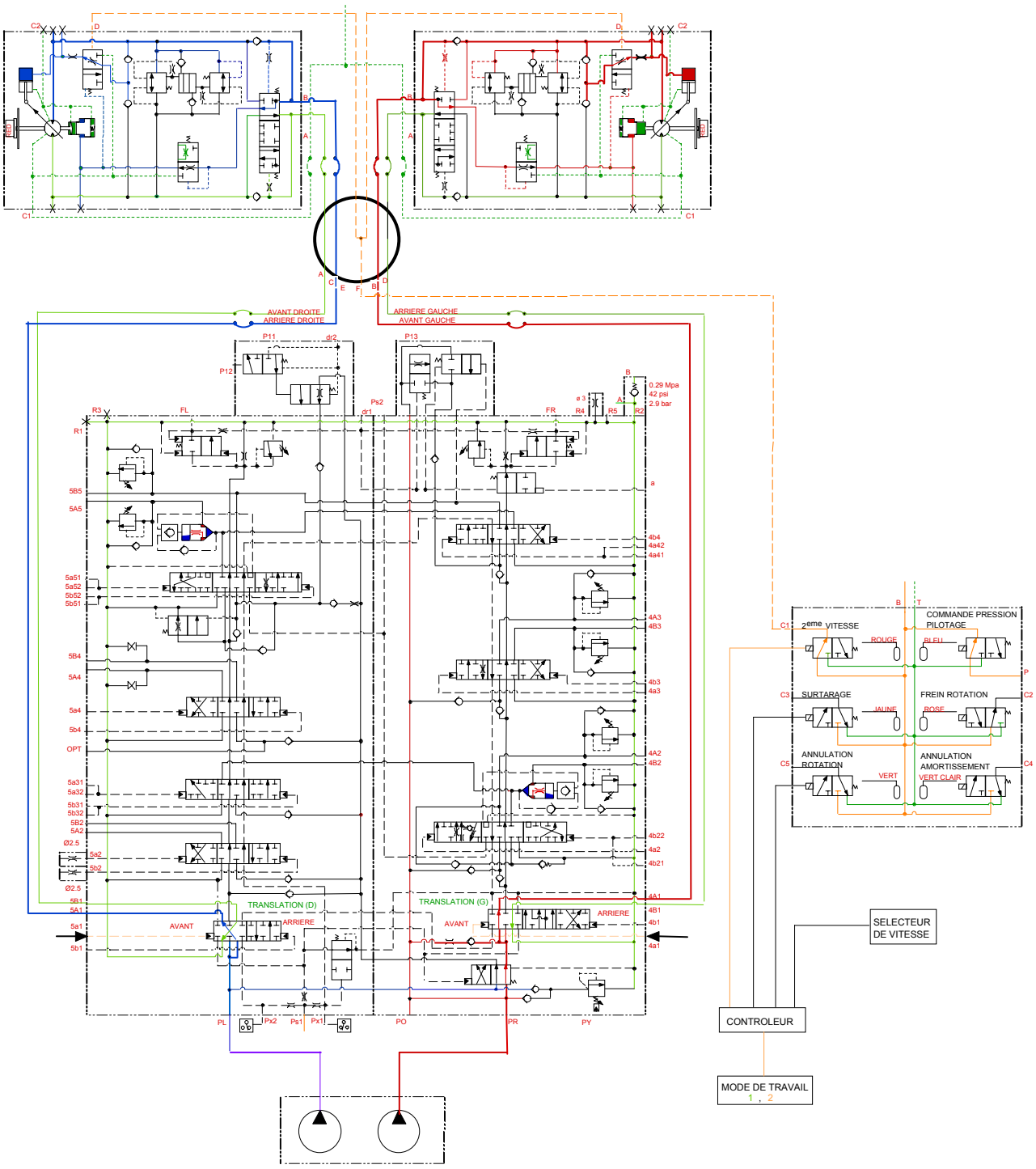
High Speed Travel Circuit

With High Speed Travel, high speeds can be achieved by setting the two-step inclination angel of the travel motor to the smaller one. The circuit has a travel motor, which changes over to lower speed by utilizing load pressure on the travel motor, only when traveling at high speed.

Discharged oil from A1 enters the PR port of control valve entry while discharged oil from A2 enters the PL port of control valve entry. Each flow goes into the travel motor through the changing over of the left and right travel spool. By these flows, the machine travels forward and backward. Electronic signals are sent to the solenoid valve for 2 speed travel in the triple solenoid valves and the solenoid valves are changed over. Original pilot pressure (3.9 MPa) from the C1 port of the triple solenoid valves is connected through the central joint to D ports of the left and right travel motors. The original pressure (3.9 MPa) entered the D ports of the left and right travel motors positions the inclination angle of the travel motor to smaller inclination side, and make the speed faster.

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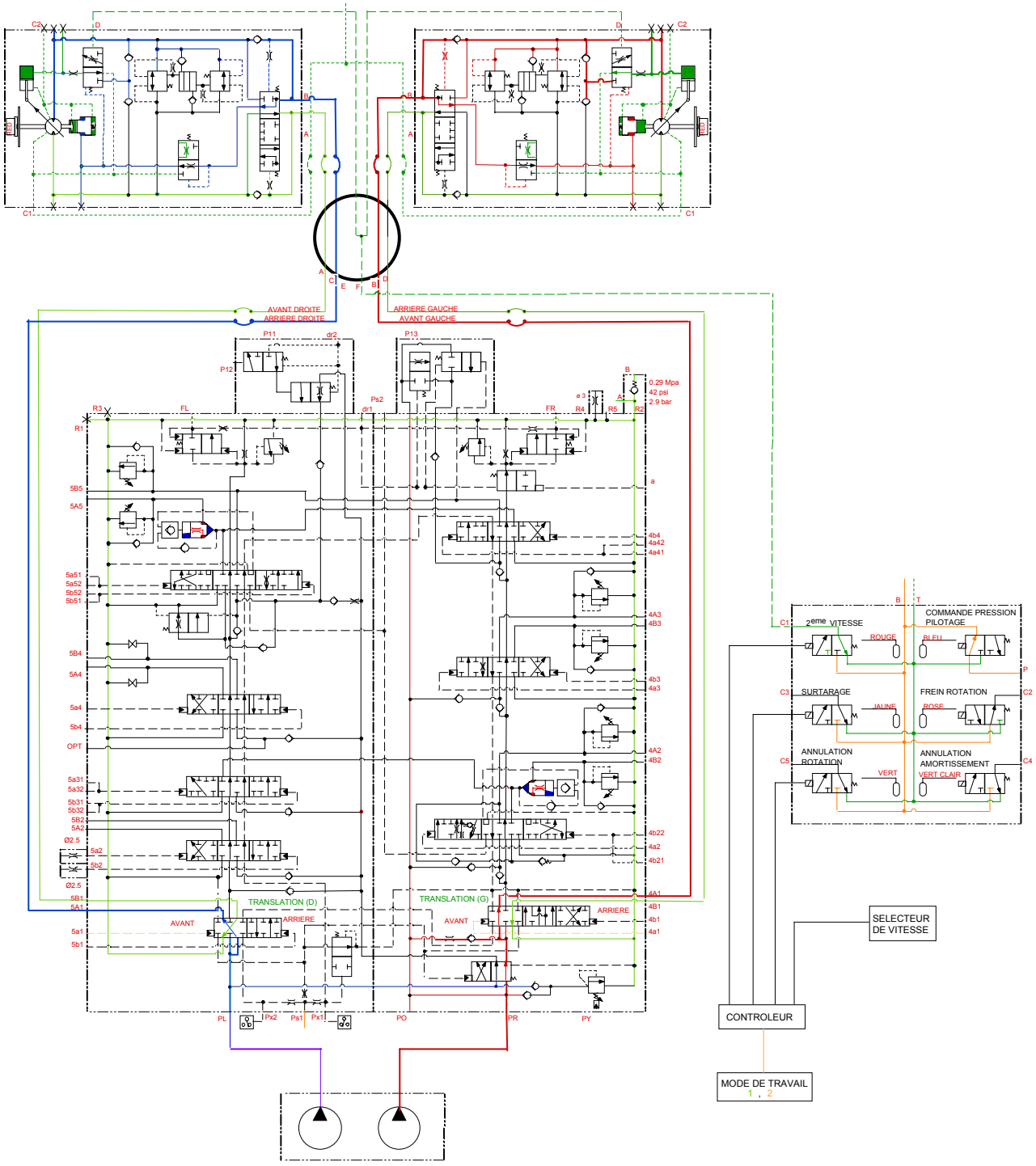
Low Speed Travel Circuit

This is a normal travel pattern. Even the travel status is in high speed, if the key switch is turned OFF and turned ON again, the speed setting will always return to Low Speed.

Discharged oil from A1 enters into the PR port of control valve entry while discharged oil from A2 enters into the PL port of control valve entry. Each flow goes into the travel motor through the changing over of the left and right travel spool. By these flows, the machine travels forward and backward. The 2 speed travel solenoid valve is turned OFF, the hydraulic oil in D port of the travel motor is connected to the tank line.

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Straight Travel Circuit

This section describes the case where travel and boom-up operations are conducted at the same time.

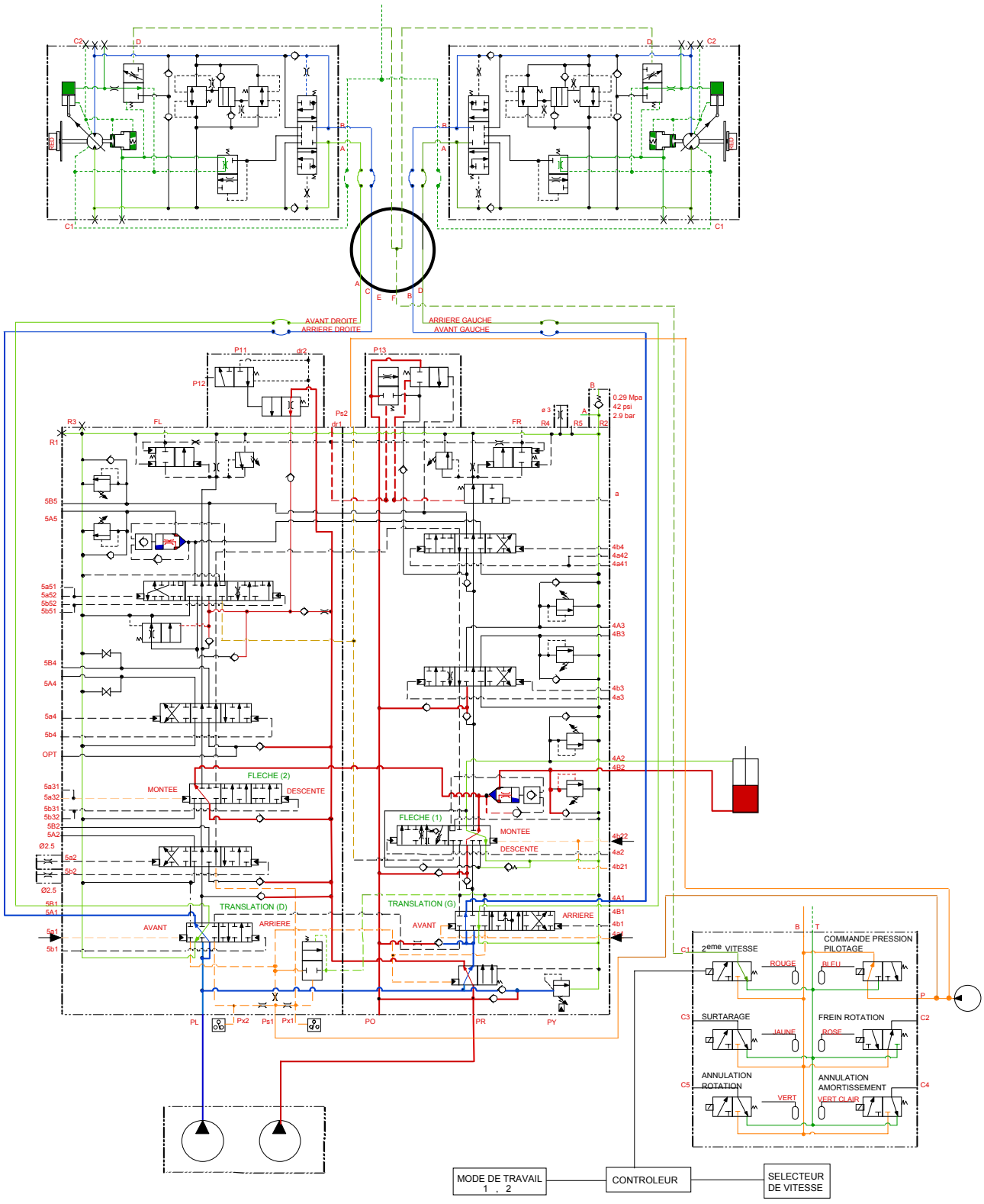
The hydraulic oil entered the pilot pump from Ps1, which is connected to the tank via travel spool, is shut off by changing over of the travel spool.

In addition, changing over of the spool for boom (2) shuts off the branch channels from Ps1 via all spools for the attachments (Boom, Arm, Bucket and Swing) connected to the tank. Therefore, the hydraulic oil from the pilot pump entered at Ps1 can find no place to go and the circuit pressure raises up to the original pressure (3.9 MPa). This original pressure acts on the pilot chamber of the straight travel valve and the straight travel valve changes over. Due to the changing over of the straight travel valve, it becomes possible for RL to drive the travel mechanism and for PR to drive the attachments. For travel, the left and right pressures are equal because one pump drives the left and right motors, thus straight travel is realized. Additionally, extra hydraulic oil from PR is supplied through the check with travel combination limit to the travel side, and speed reduction is limited to the minimum.

It is the same as above when the upper actuators other than boom and travel are operated at the same time.

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Swing Operation, Swing Parking Circuit

When the engine is started and the swing lever is in neutral, the swing brake solenoid valve is turned ON (24 V input) and the swing parking brake is activated.

When the swing pressure switch is turned ON by operating the lever, output to the swing brake solenoid valve from the controller is turned OFF and the swing parking brake is released. Thus swing operation is enabled. When the swing lever is in neutral and attachments such as arm is moved, lateral force is produced while swinging. In order to prevent the dragging caused by braking, this parking bake is designed to be released.

Signals from the pressure sensor A1 or A2 enters the controller and at the time when either one reaches 14.7 MPa, the output to swing brake solenoid valve from the controller is turned OFF and the swing parking brake is released.

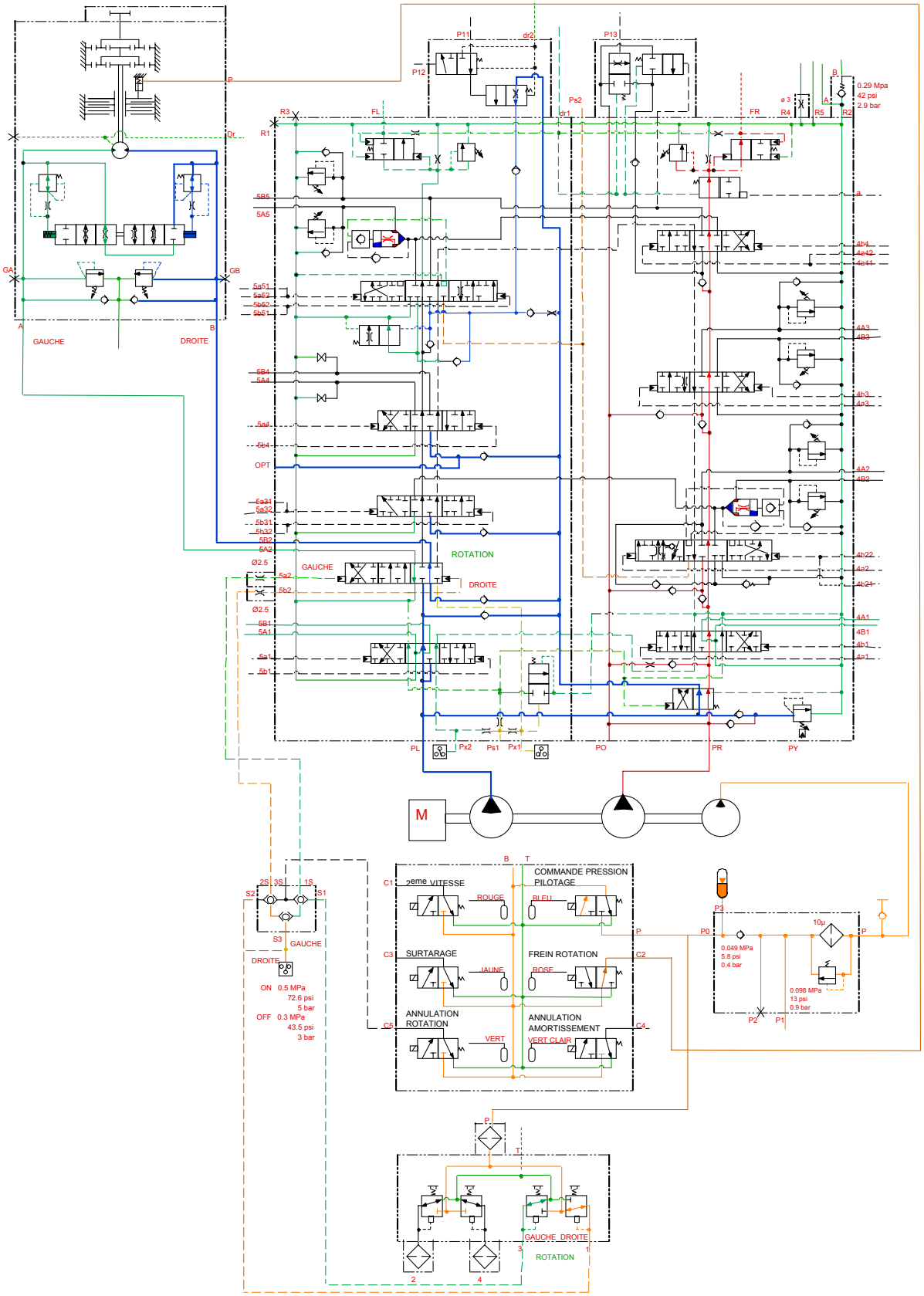
In 5 seconds after the swing pressure switch or attachment pressure switch is turned OFF or the delivery pressure from A1 or A2 is below 14.7 MPa, the solenoid valve is turned ON and the swing parking valve is activated.

If the swing lock switch is turned ON, even the swing pressure switch or attachment pressure switch is turned ON, the swing lock switch has the priority and the parking brake remains unreleased. When the swing lock switch is turned ON and the swing lever is in operation, the swing spool in the main control valve will be changed over.

Key switch	Swing pressure switch	A1 or A2 (MPa) pressure on pressure sensor	Swing brake solenoid valve	Swing motor mechanical brake
OFF	OFF	0	OFF	ON
ON	OFF	0	ON	ON
ON	ON	0 or swing operation pressure	OFF	OFF
ON	OFF	14.7 MPa or more	OFF	OFF

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Swing Priority Variable Throttle Circuit

Swing pilot pressure is supplied to Pi2 port via shuttle valve and changes over the cut valve, and then, connects the pilot port of the swing priority variable throttle to the drain passage. This secures swing force for enforced digging operation with raised swing pressure even when the arm and swing are operated at the same time.

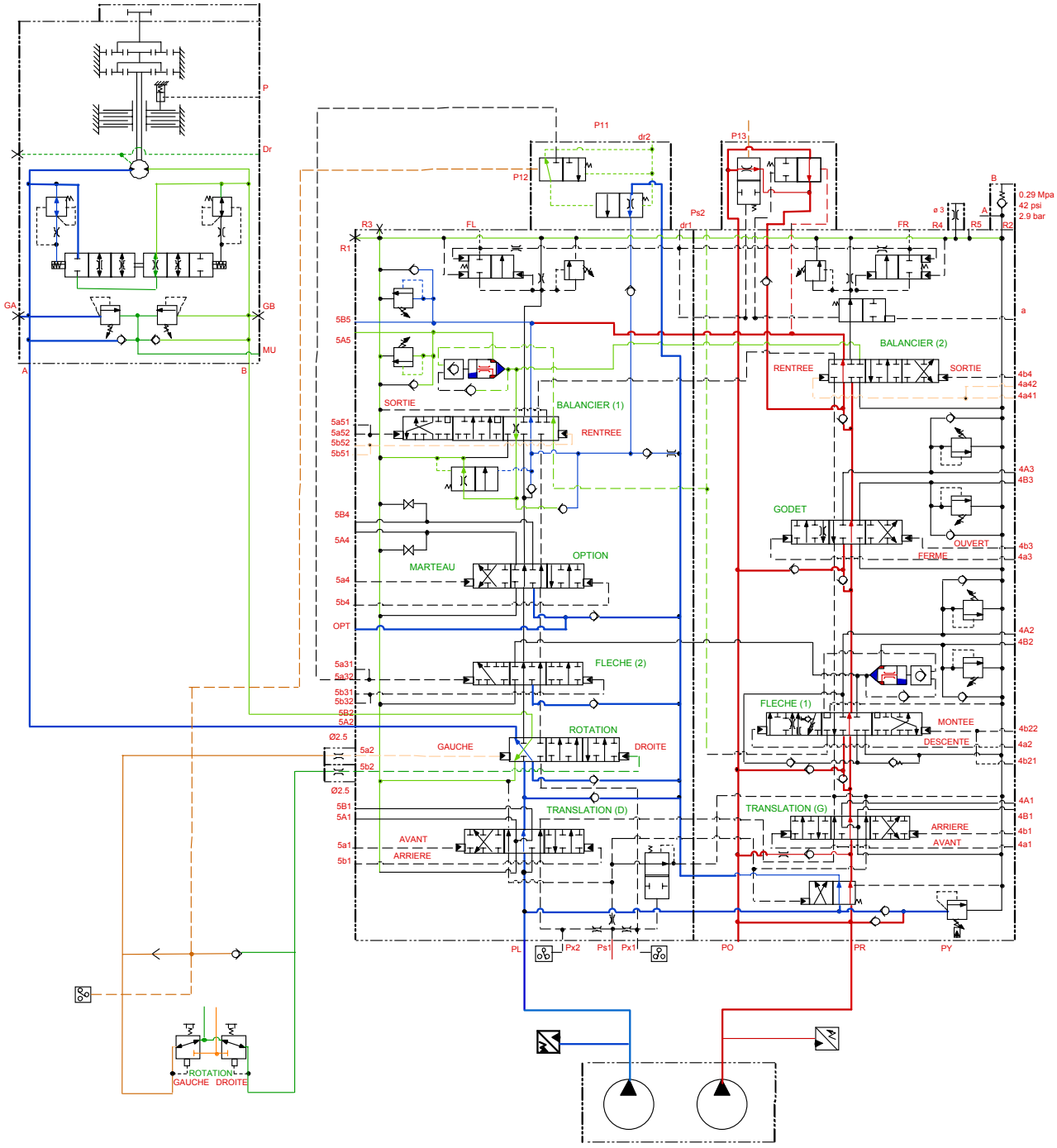
Additionally, when trenching, boom up pilot pressure is supplied from Pi1 port and the supply of hydraulic oil to the arm (1) is secured through moving the swing variable throttle to the right via the cut valve to open the parallel circuit and the smooth trenching operation can be achieved even if the central bypass oil passage is shut off by the boom (2) spool.

When swing and arm in or boom up is operated at the same time, the parallel oil passage remains restricted, and the swing pressure is designed to be retained.

Priority is placed on swing before the cut valve.

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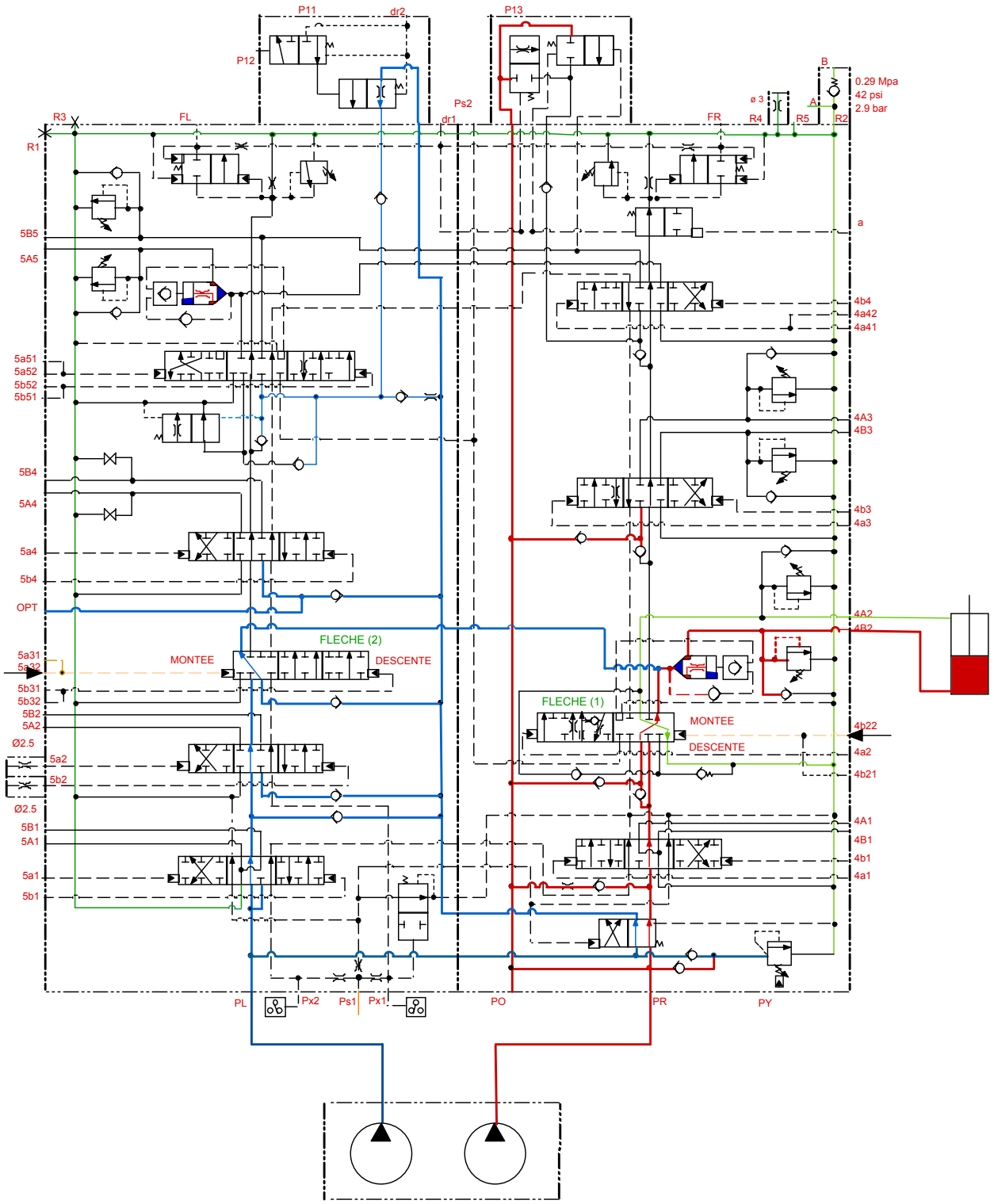
Boom up 2 Speed Circuit

The discharged oil from A1 flows into the boom (1) spool via straight travel valve and left travel spool.

The discharged oil from A2 is supplied to the boom (2) spool from the parallel oil passage via the straight travel valve and merges at the downstream of the boom (1) spool.

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Boom Down Load Holding Valve Circuit

When boom down is operated, pilot pressure is supplied at 4a2 and boom (1) spool is changed over.

At the same time, pilot pressure, which is supplied from Ps2, acts on the poppet of the load holding valve, and the poppet is opened. Then, the hydraulic oil in the spring chamber of the load holding valve check is returned to the tank line via the load holding valve poppet.

The pressure in the spring chamber of the load holding valve check decreases and the check is released.

The hydraulic oil at the bottom of the boom cylinder is returned to the tank line, the rod of the boom cylinder shrinks and the boom is lowered.

Boom Down Recycle Circuit

When boom down is operated, pilot pressure is supplied at 4a2 and boom (1) spool is changed over. The boom load holding valve is opened and oil discharged at the bottom side of the cylinder is recycled to the head side via the boom (1) spool.

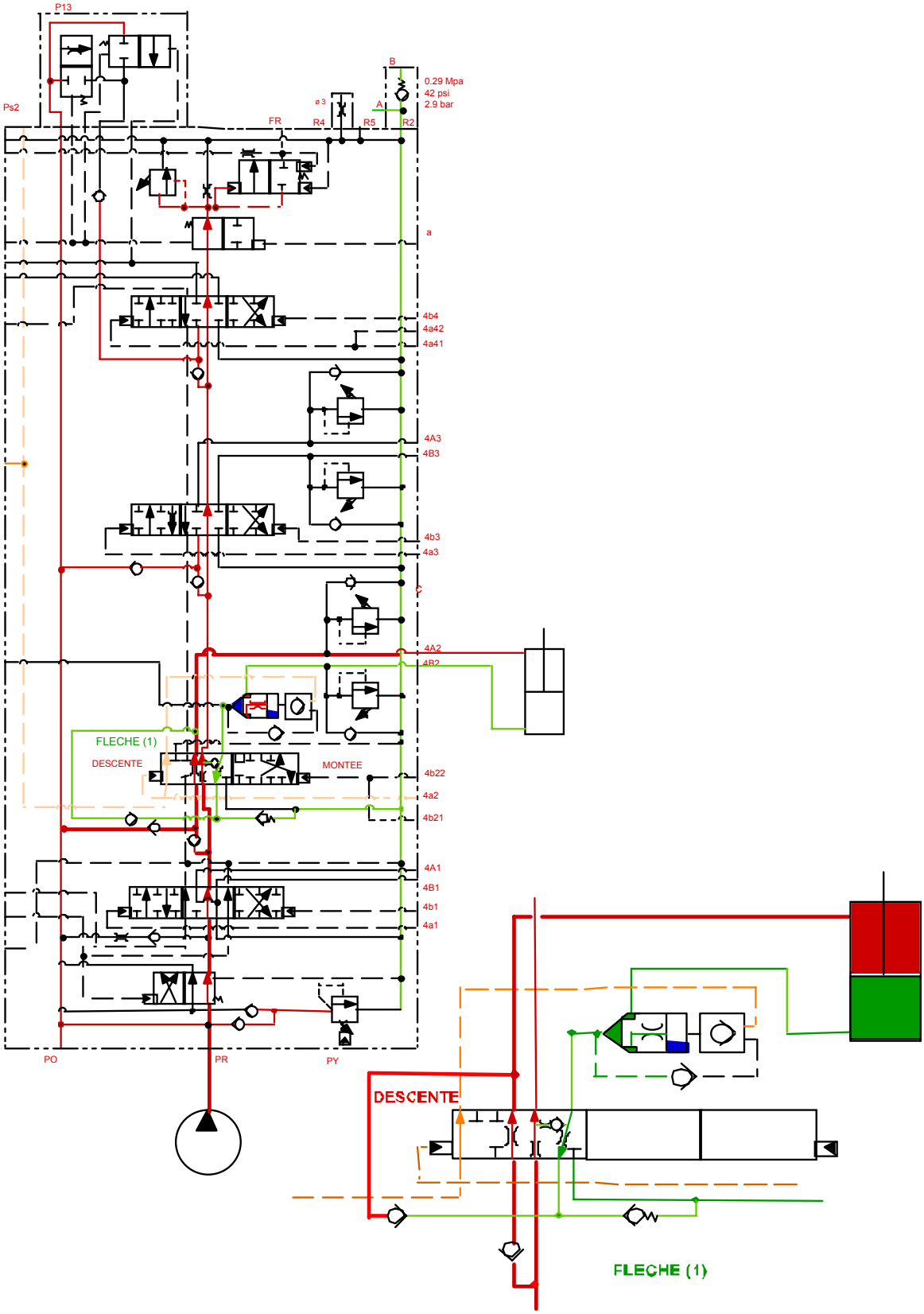
A part of returned oil from the bottom side enters the central bypass, and makes up for the shortage of pressure without the pump's full operation in order to maintain the negative control pressure at a certain level, the engine output can be efficiently used.

Boom Down Extra Vibration Prevention Circuit

Due to the bleeding oil passage of the central bypass, a high pressure occurrence is restricted and extra vibration is reduced even when boom down is operated very quickly, since hydraulic oil is bled.

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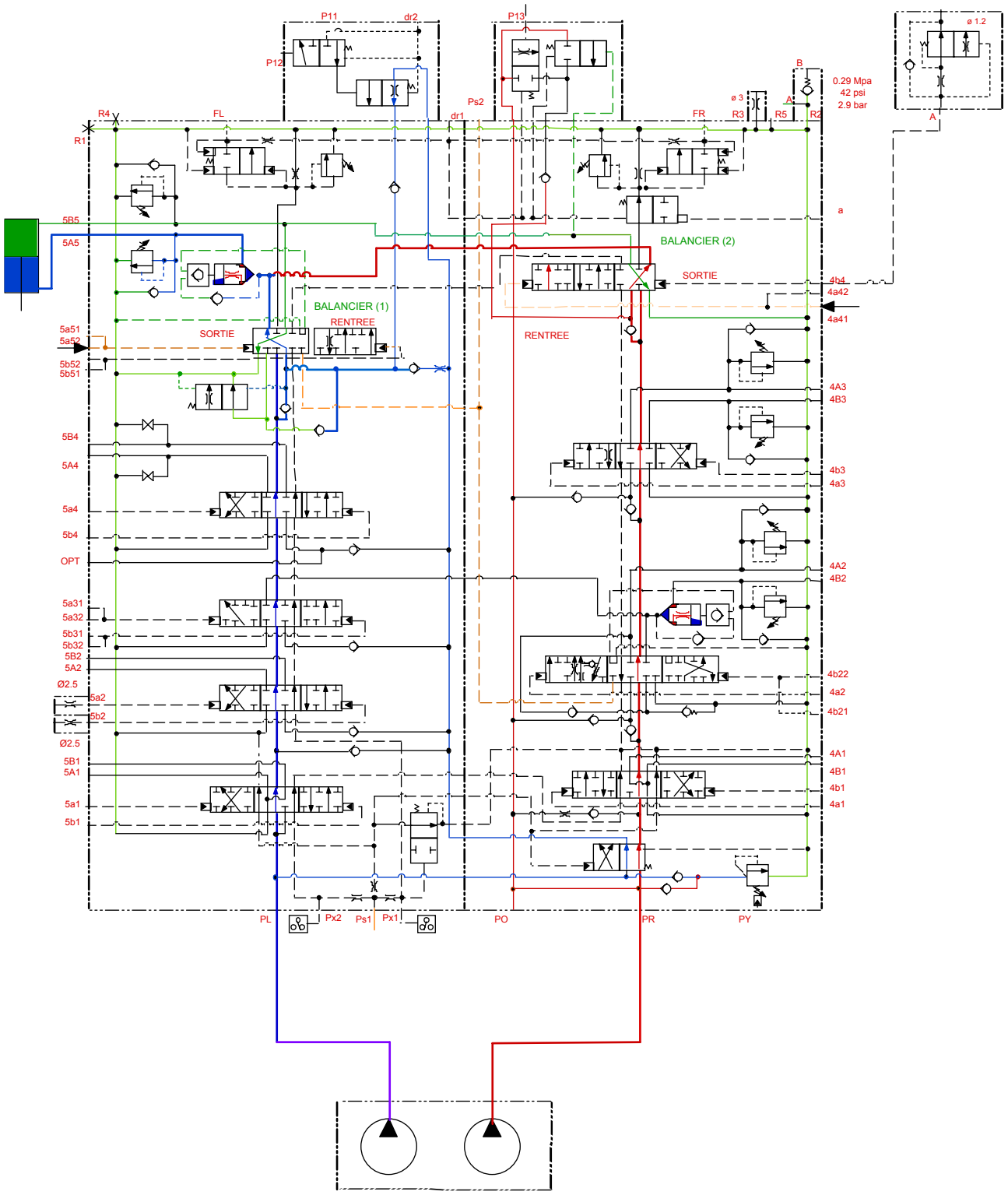
Arm Out 2 Speed Circuit

When the am is out, the discharged oil from A2 is supplied to the arm (1) spool via the central bypass oil passage.

The discharge oil from A1 is supplied to the arm (2) spool through the central bypass oil passage via the straight travel valve, and merges at the downstream of the arm (1) spool, then, flows into the rod side of the arm cylinder via the holding valve. The returned oil from the bottom side goes back to the arm (1) and (2) spools via the tank oil passage.

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HYDRAULIC CIRCUIT



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Arm In Load Holding Valve Circuit

When arm in is operated, pilot pressure is supplied at 5b51 and arm (1) spool is changed over. At the same time, pilot pressure, which is supplied from Ps2, acts on the poppet of the load holding valve, and the poppet is opened.

Then, the hydraulic oil in the spring chamber of the load holding check valve is returned to the tank line via the load holding valve poppet. The pressure in the spring chamber of the load holding valve check decreases and the check is released. The hydraulic oil at the rod of the arm cylinder is returned to the tank line, the arm cylinder extends and the arm is in.

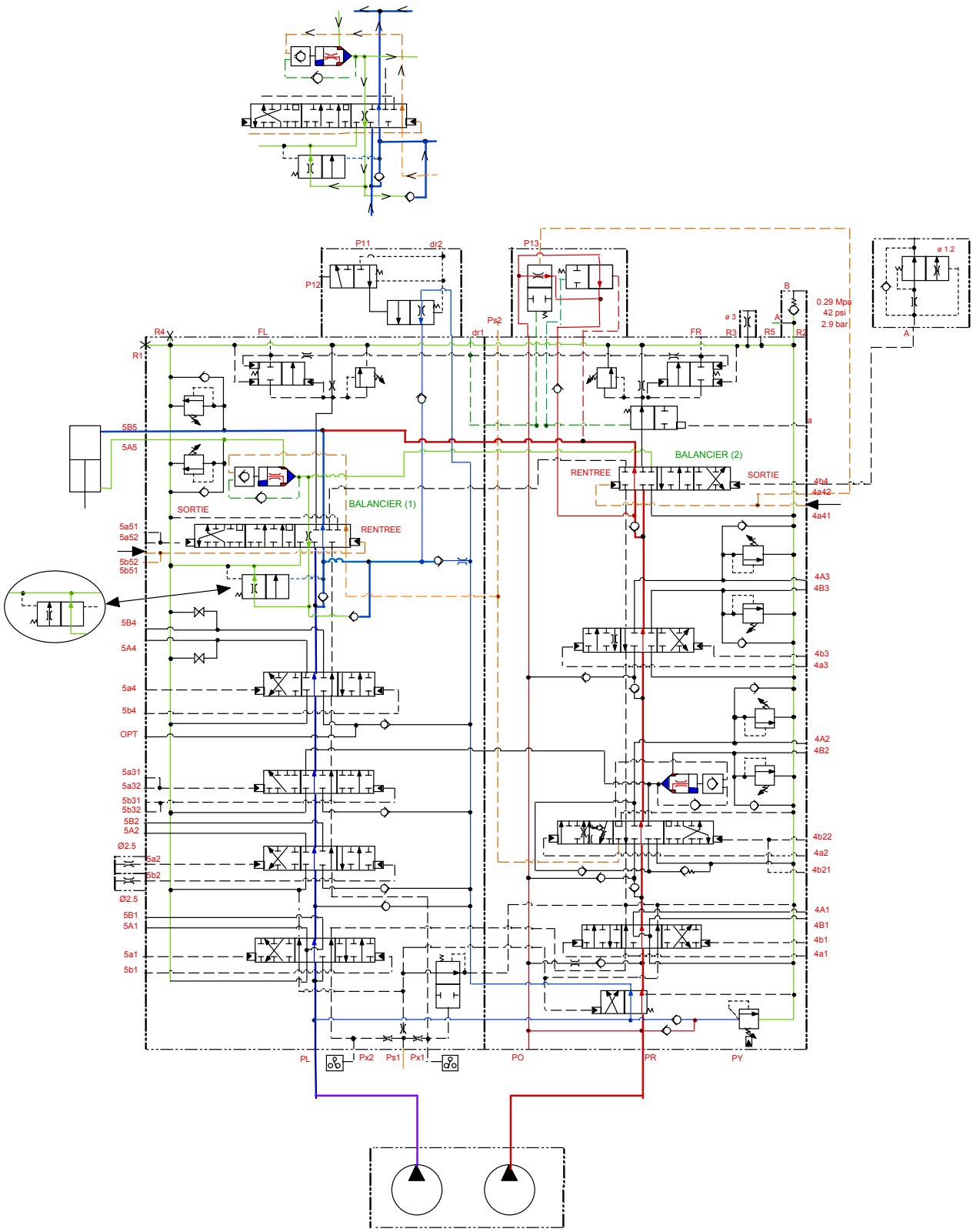
Arm In Forced Recycle Circuit

The return passage for the rod is throttled at the forced recycle release valve and recycle forcibly the returned oil to the bottom side.

When the load pressure is high at the bottom side, the forced recycle valve is changed over to the left and the opening of the tank passage becomes larger and no recycle occurs.

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HYDRAULIC CIRCUIT



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Circuit for Breaker & Crusher (2 Speed Confluence Crusher Circuit)

When pushing the switch in the cab to crusher side, the solenoid is turned ON.

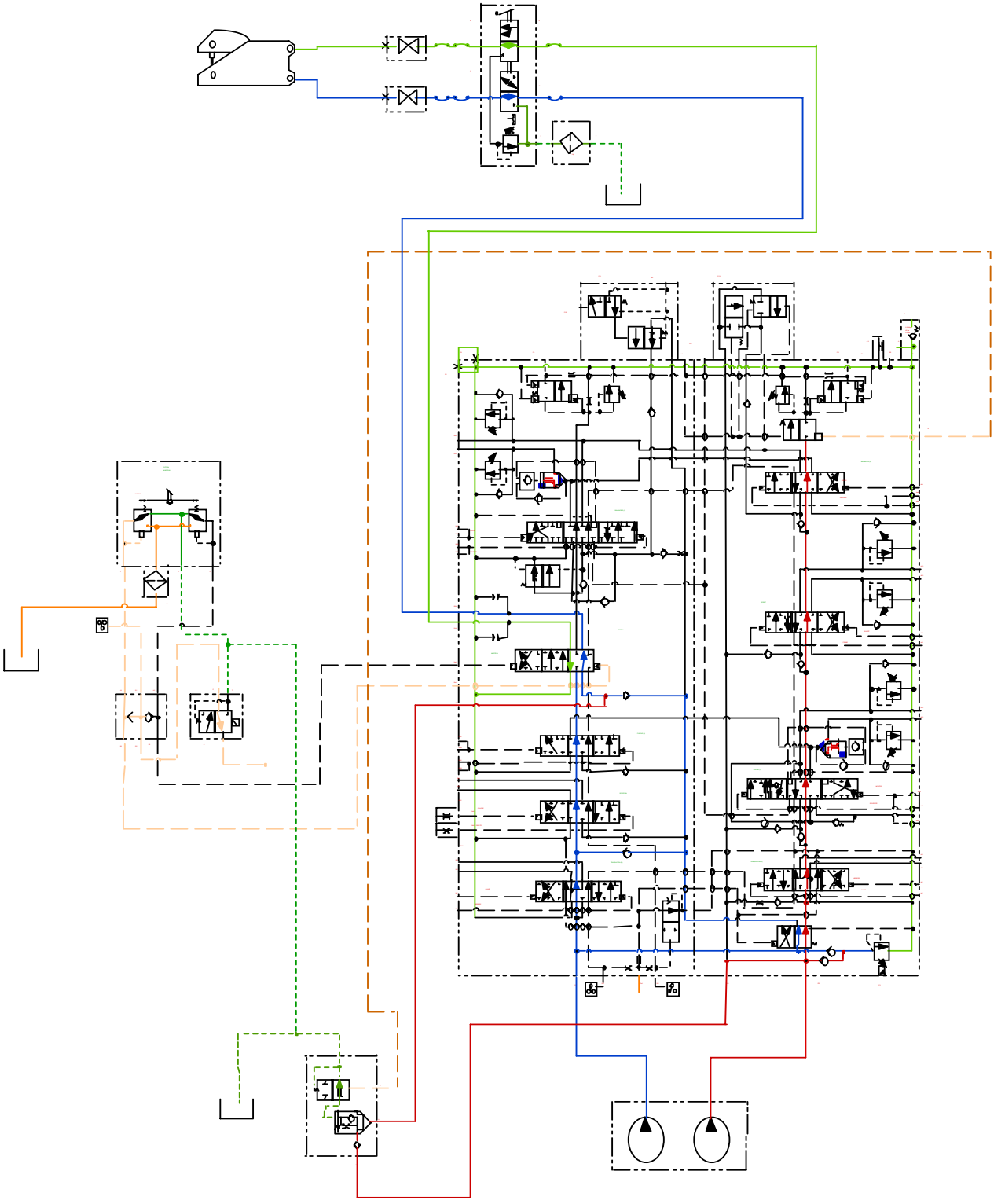
When the auxiliary pedal is moved, pilot pressure from the remote control valve passes through the solenoid valve via the shuttle valve and enters P port of the holding valve and “a” port of the central bypass cut valve in the control valve.

The central bypass cut valve moves to the left and the central bypass is shut off.

Due to the pilot pressure entered P port of the holding valve, the spool is moved to the right. The pressure in the spring chamber is reduced and the holding valve check will be released because the spring chamber of the holding valve check is returned to the tank. As a result, hydraulic oil at P0 port of the control valve enters OPT port of control valve auxiliary spool via the holding valve check and merges the hydraulic oil from A2.

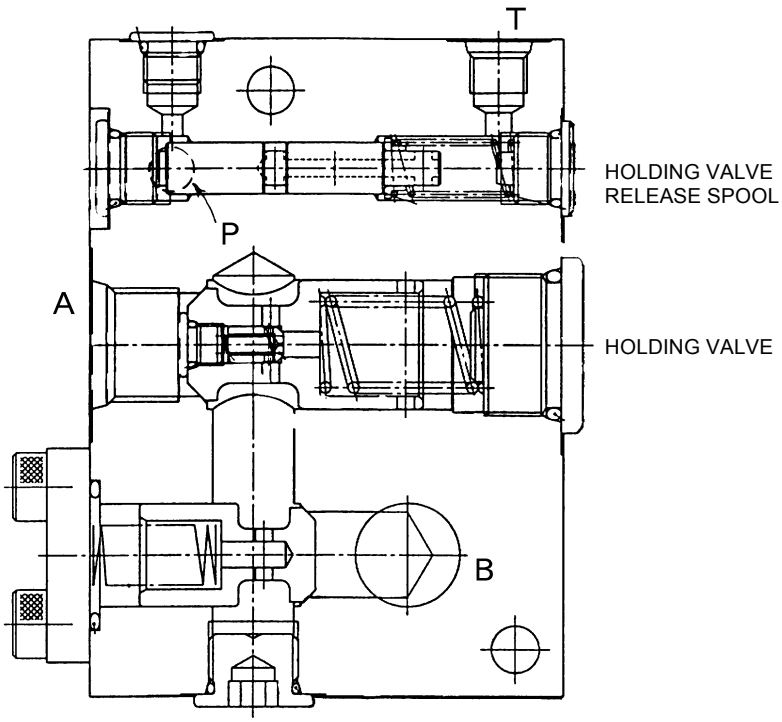
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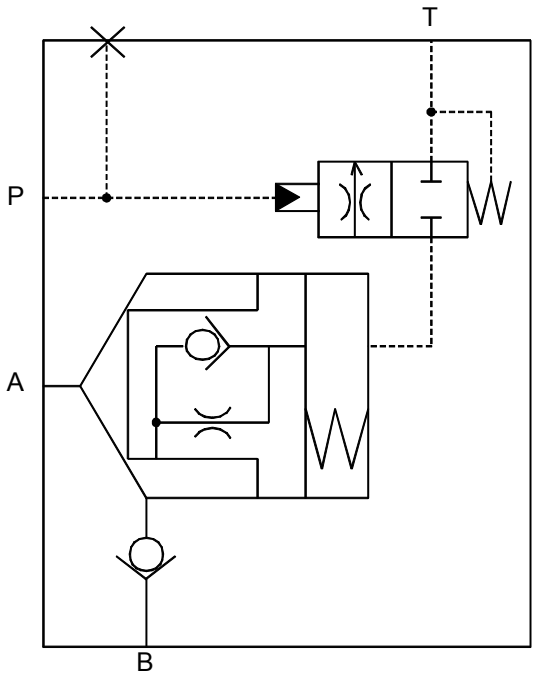
HYDRAULIC CIRCUIT



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Circuit for Breaker & Crusher (Auxiliary Line Holding Valve)





CIRCUIT DIAGRAM

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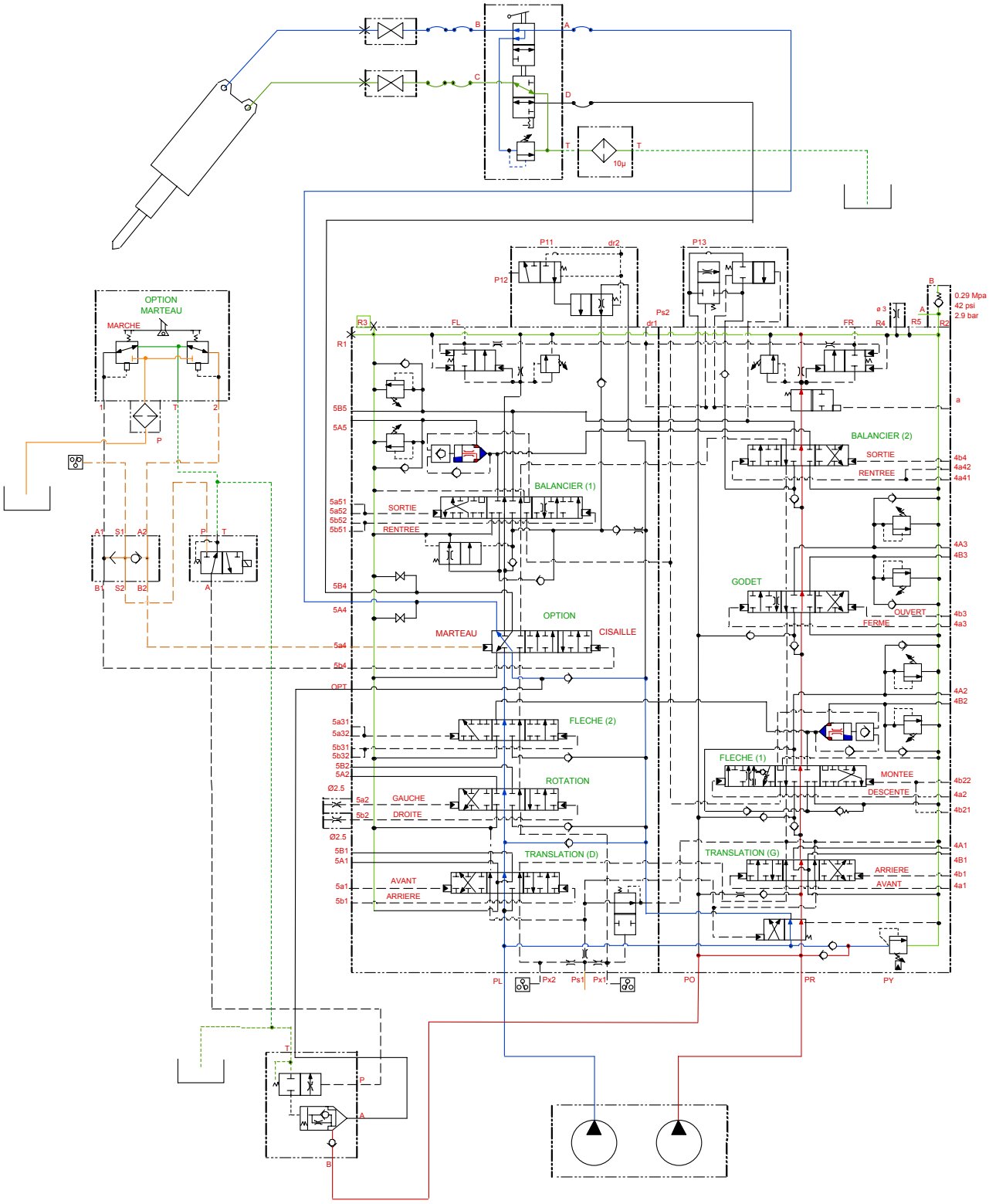
Circuit for Breaker & Crusher (Breaker Circuit)

When the switch in the cab is turned towards the breaker side and the pedal is stepped forward, pilot pressure is detected by the pressure switch, then the engine falls to the preset revolution by the controller.

The pilot pressure entered at 5a4 of the control valve, change over the auxiliary spool while the discharged oil from A2 is supplied to the breaker through the direction valve.

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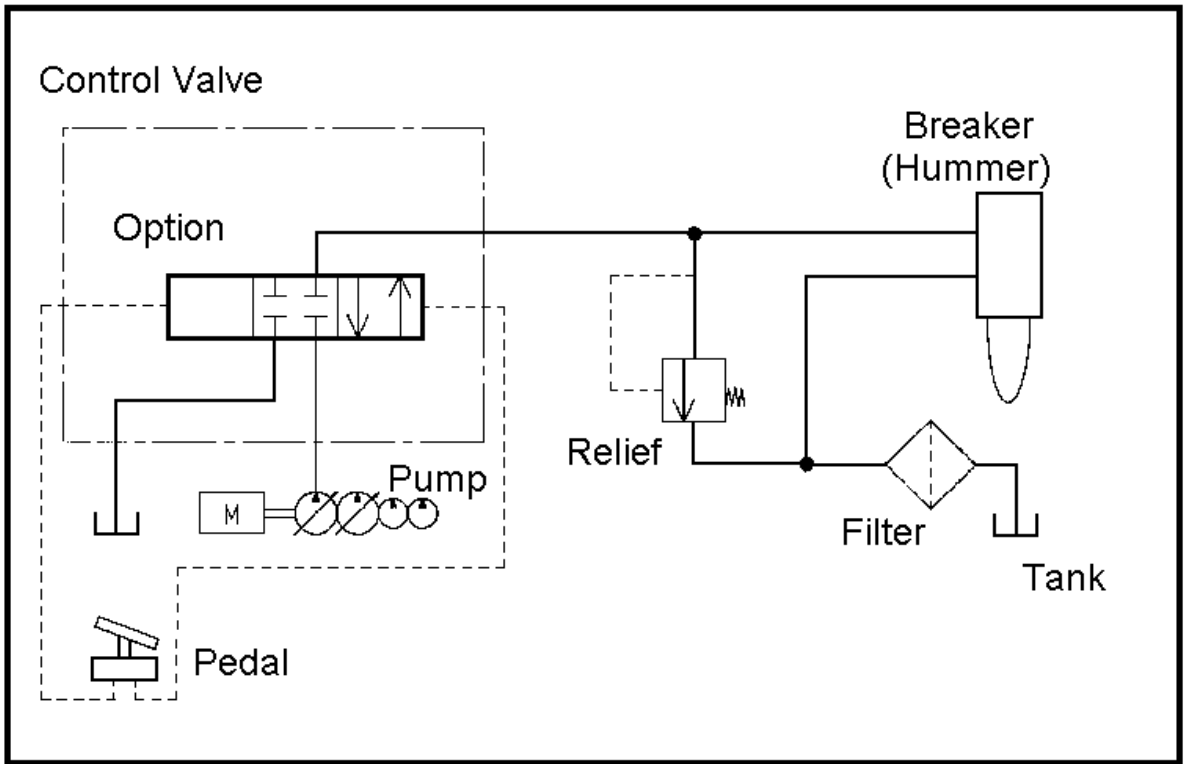
HYDRAULIC CIRCUIT



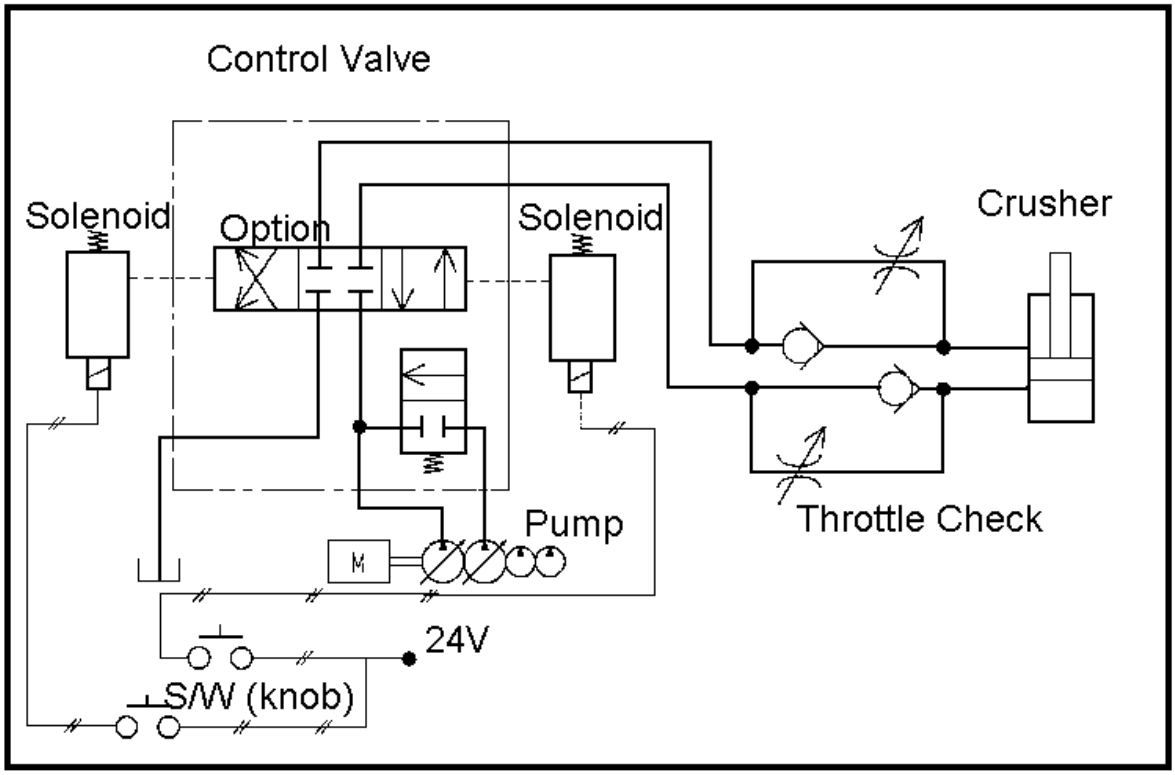
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OPTION CIRCUITS

Hammer option



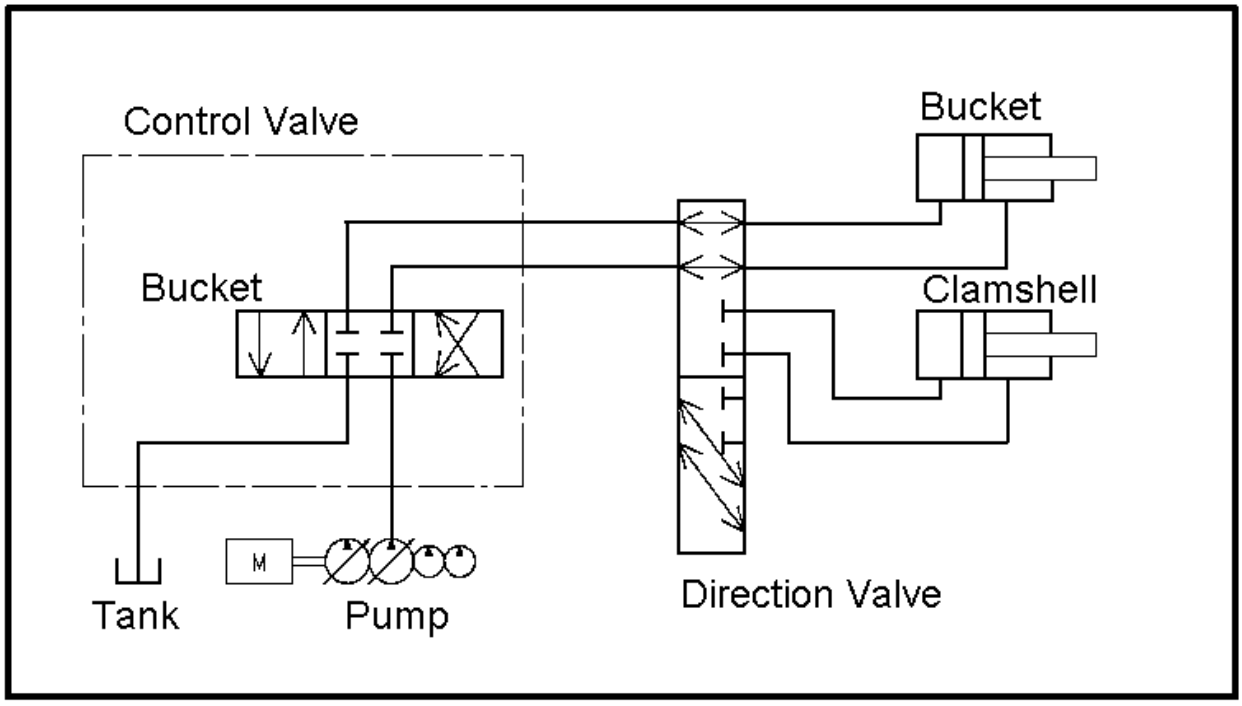
Double acting option



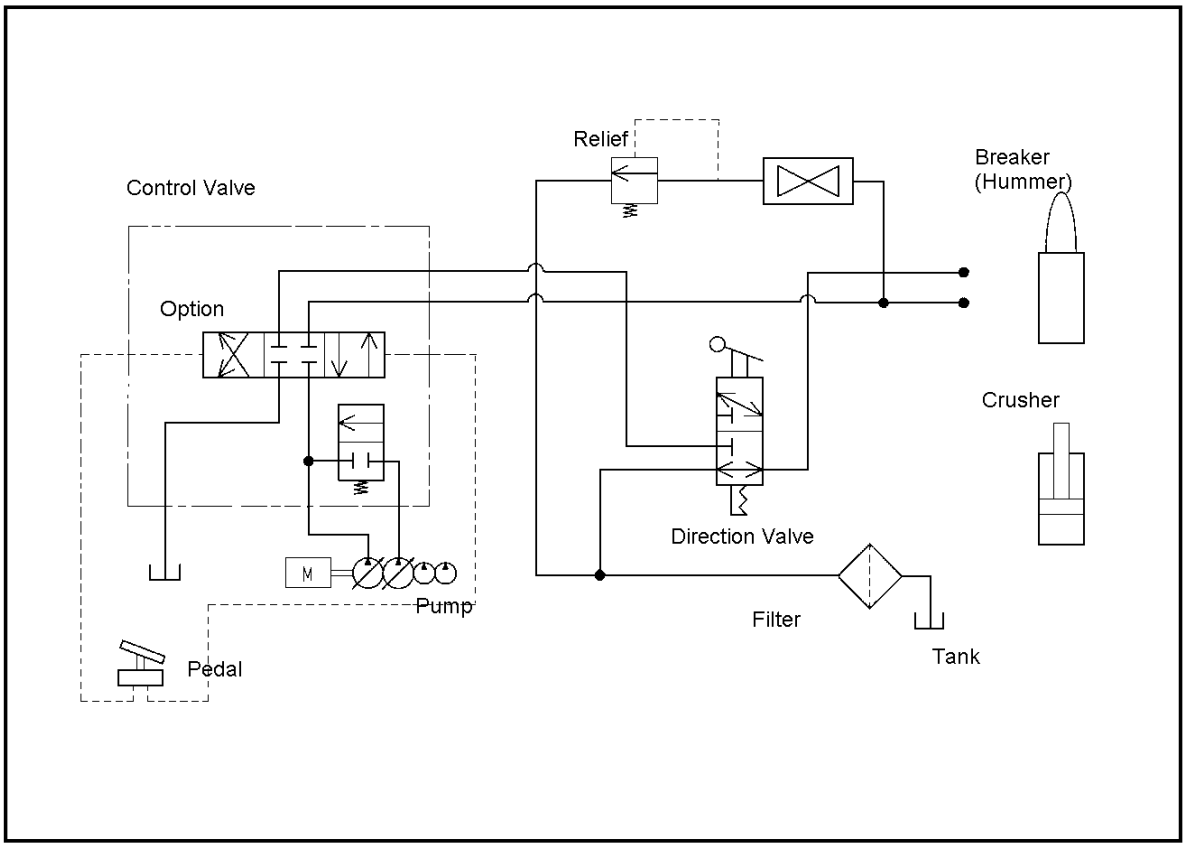
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HYDRAULIC CIRCUIT

Clamshell option

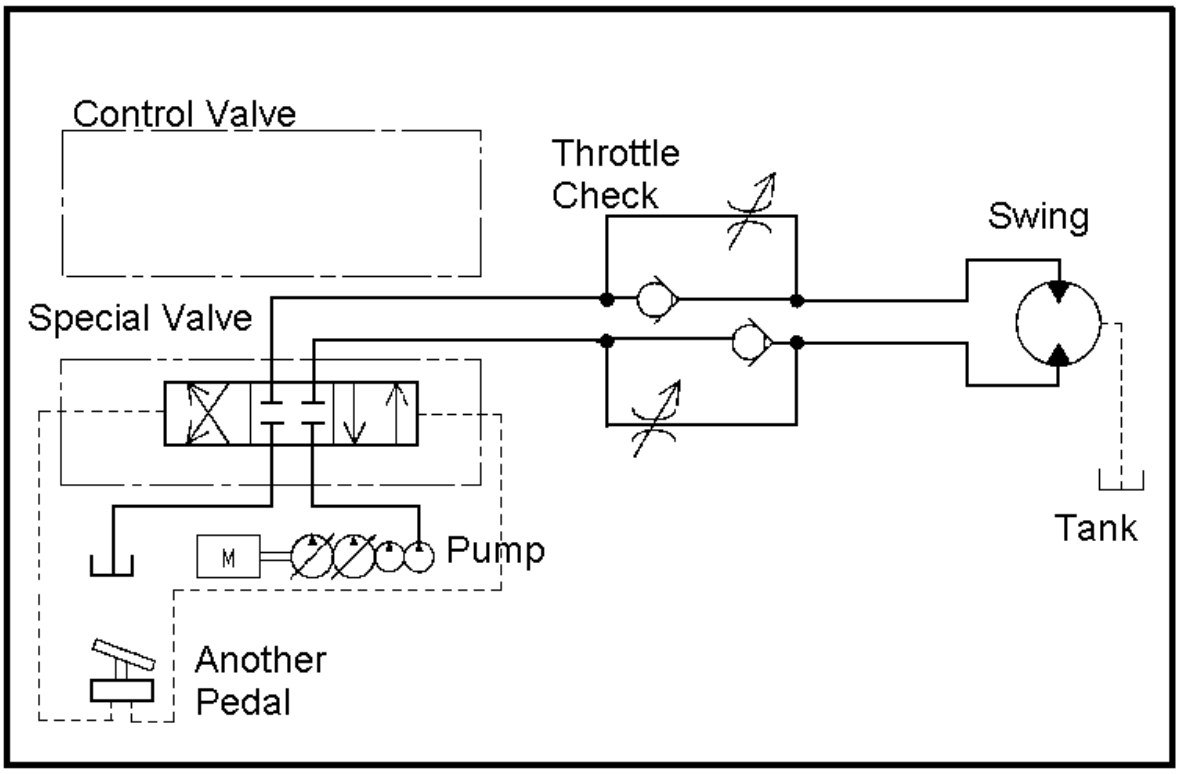


Multipurpose option

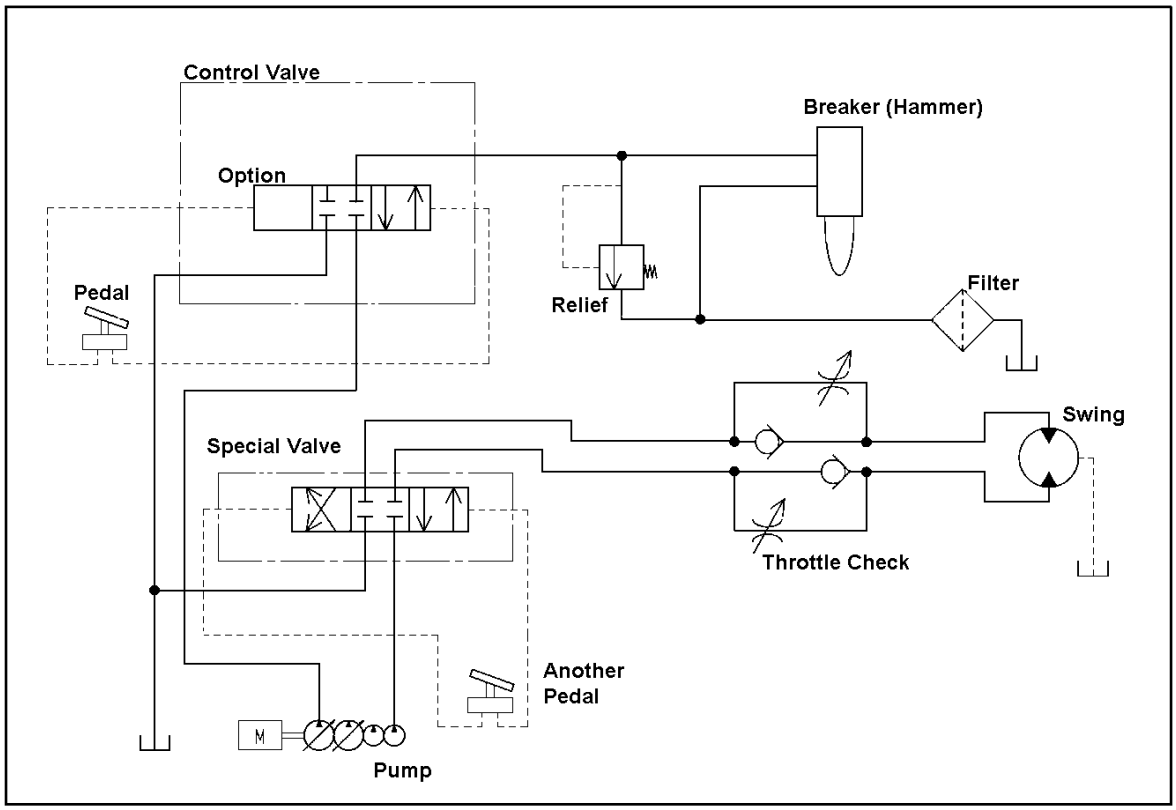


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2nd auxiliary circuit option

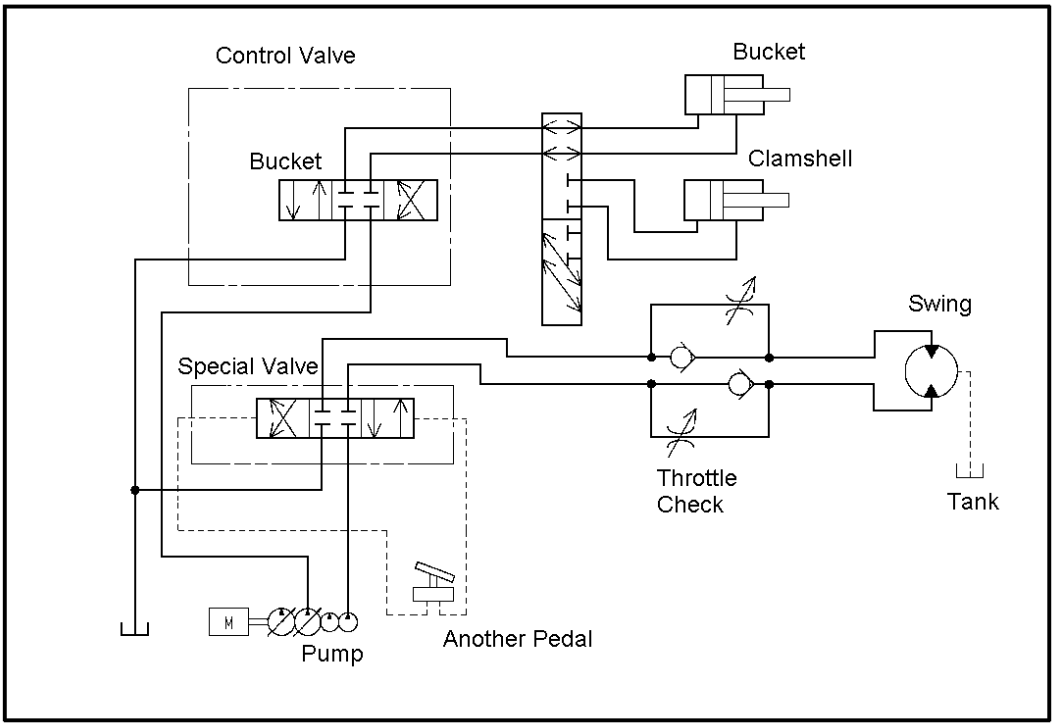


Hammer and 2nd auxiliary option

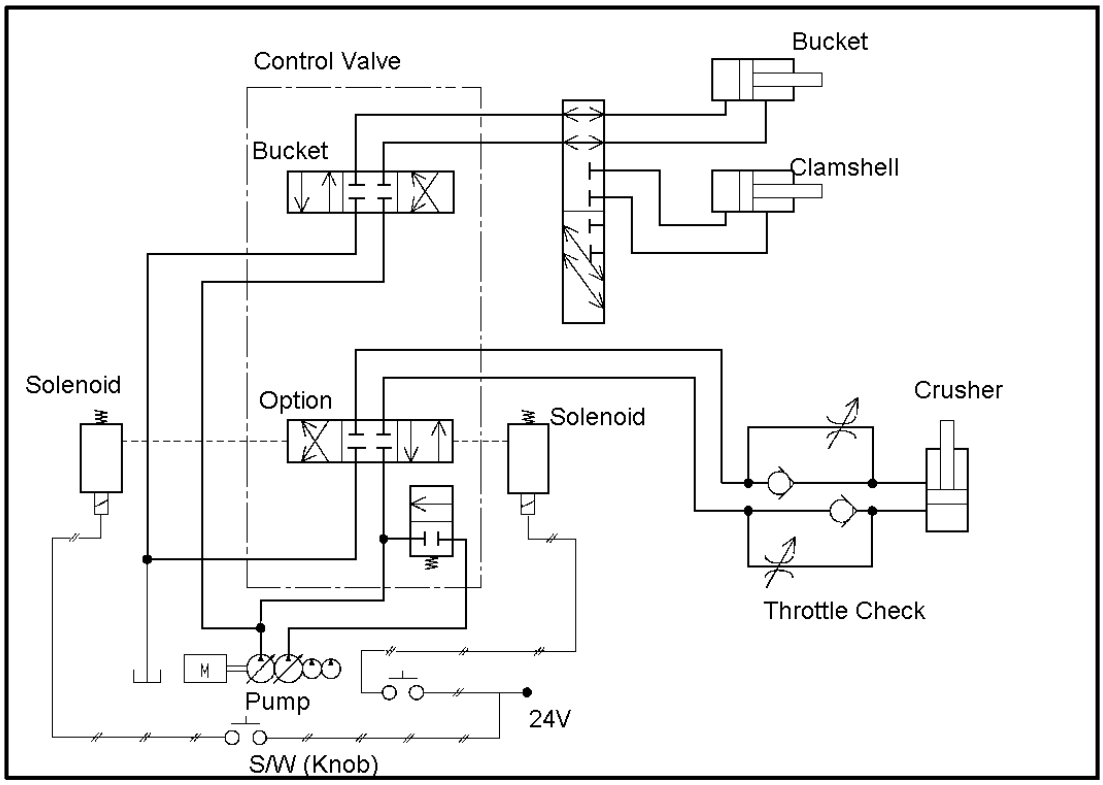


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Clamshell and 2nd auxiliary option



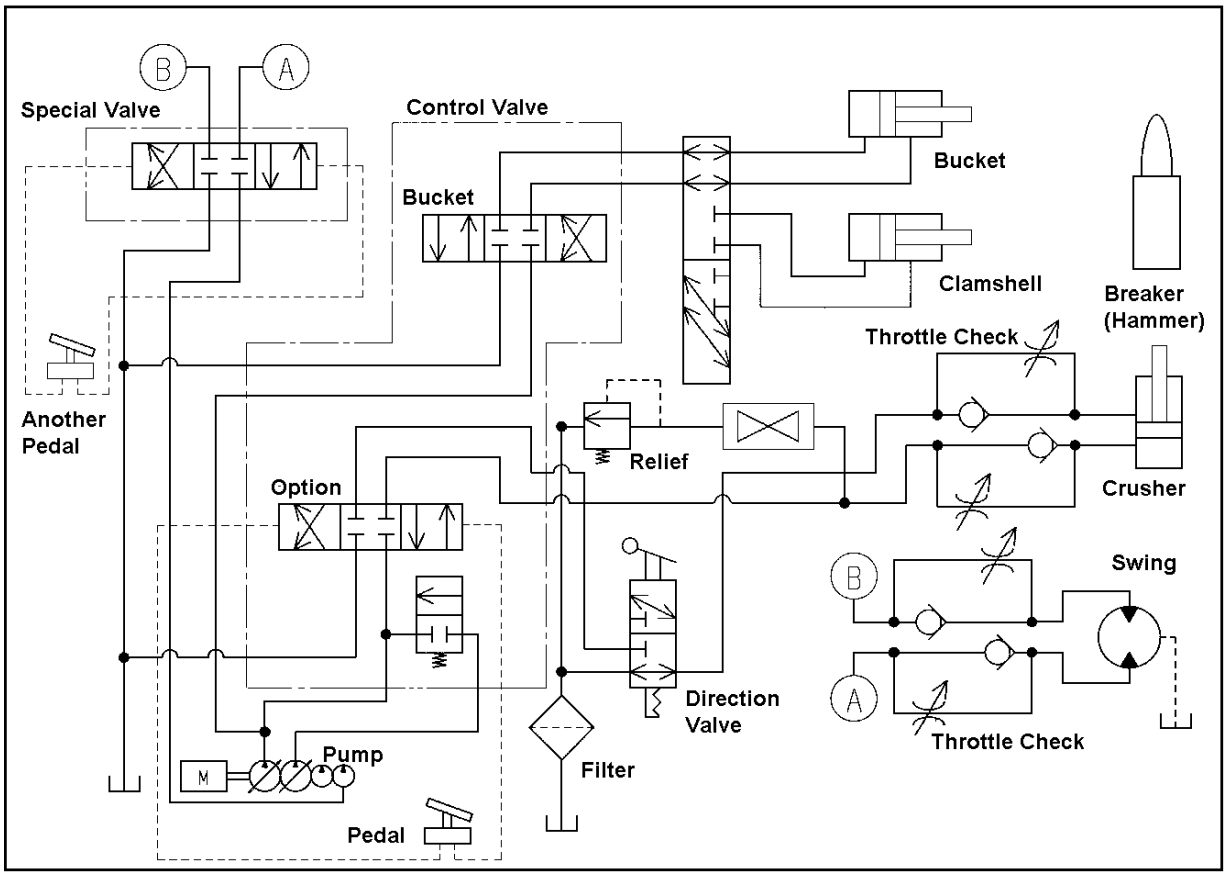
Clamshell and double acting option



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HYDRAULIC CIRCUIT

Clamshell and 2nd auxiliary and multipurpose option



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PUMP CX 130

Pump engine stopped

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Pump engine stopped

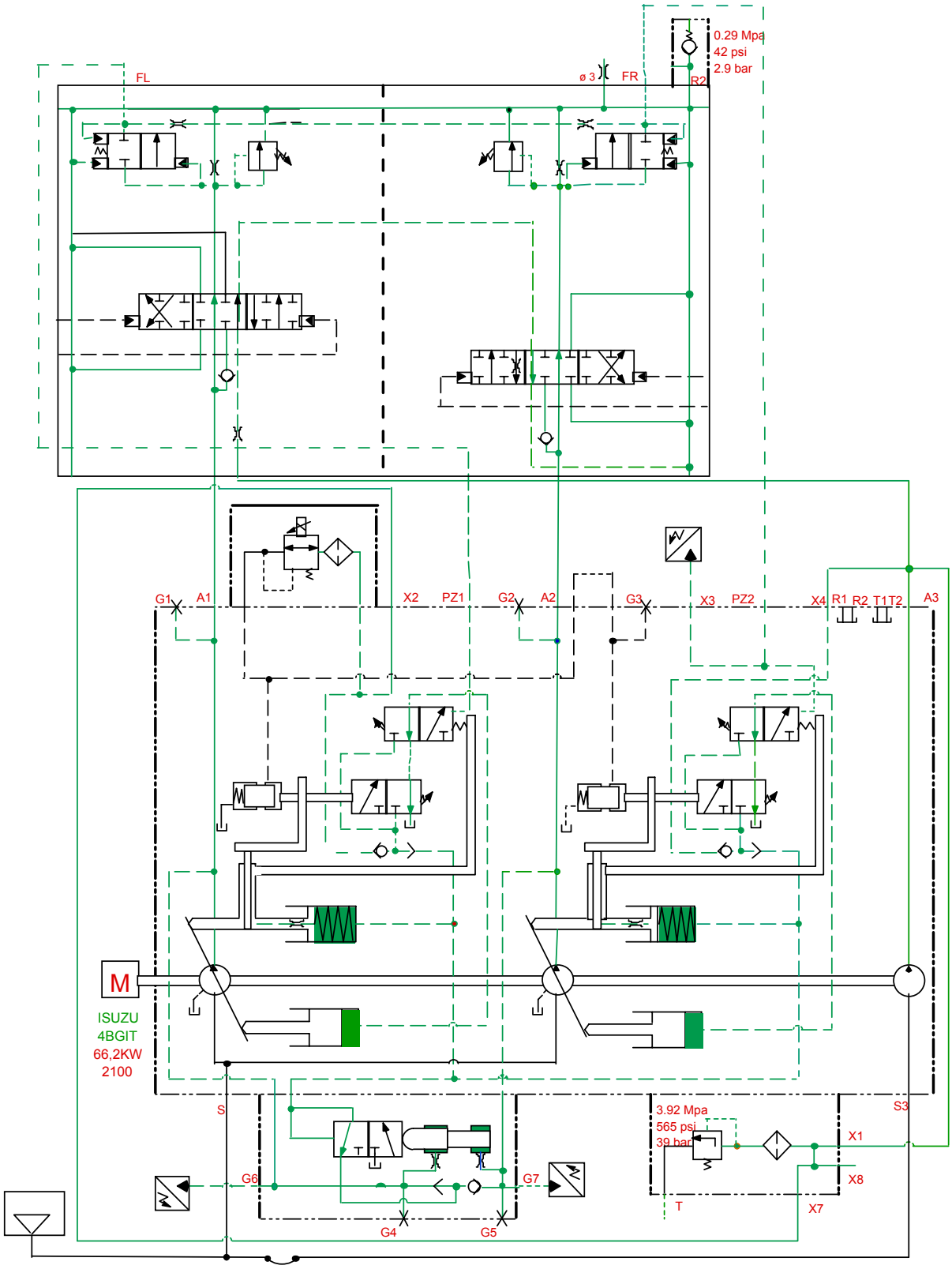
Description of the schematic

A & B, A' & B':	**Servo-piston** of the tilting swash plate
C :	**Compensation spool.** It measure the amount of pressure of both pump outlets by reducing the highest pressure area S' = diameter area S and S + S' = S"
D & D'	**Torque regulation spool**, used to limit mechanically the torque of the pump
E & E'	**Negative flow control valve**, used to limit the pump flow according the operator demand
F	**Proportional solenoid valve**, used to adjust the torque of the pump according the work mod selected (L, S , H or AUTO)

Engine stop, the servo piston is not pushed by the compensated pump pressure of the spool C and the pump swash plates are totally pushed in full flow position.

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HYDRAULIC CIRCUIT



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Pump engine running, controls neutral position

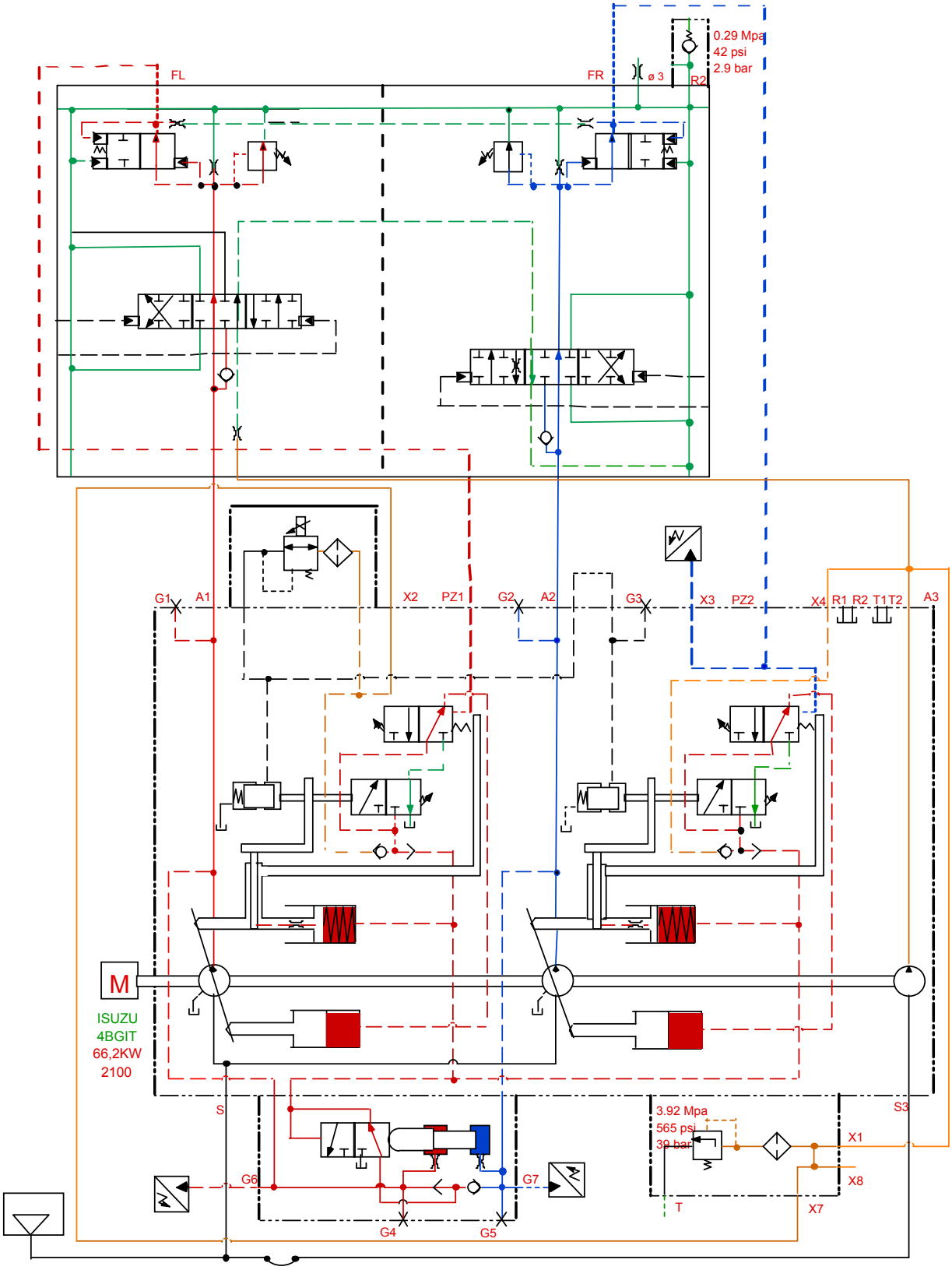
The two negative flow control pressure signals enter the pump in the orifice PZ1 and PZ2 and fully push the Negative flow control valve E to the left.

The B & B' pistons of the servo-pistons are connected with A & A' piston but the force is higher on B & B' piston (bigger area). The pumps deliver a small flow to insure the cooling of the hydraulic oil.

Note: the negative flow control pressure signal is slightly lower than the pump outlet pressure

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HYDRAULIC CIRCUIT



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Pump engine running, one control operated

There are two possibilities
1. The maximum torque pressure is not reached
1. The maximum torque pressure is reached

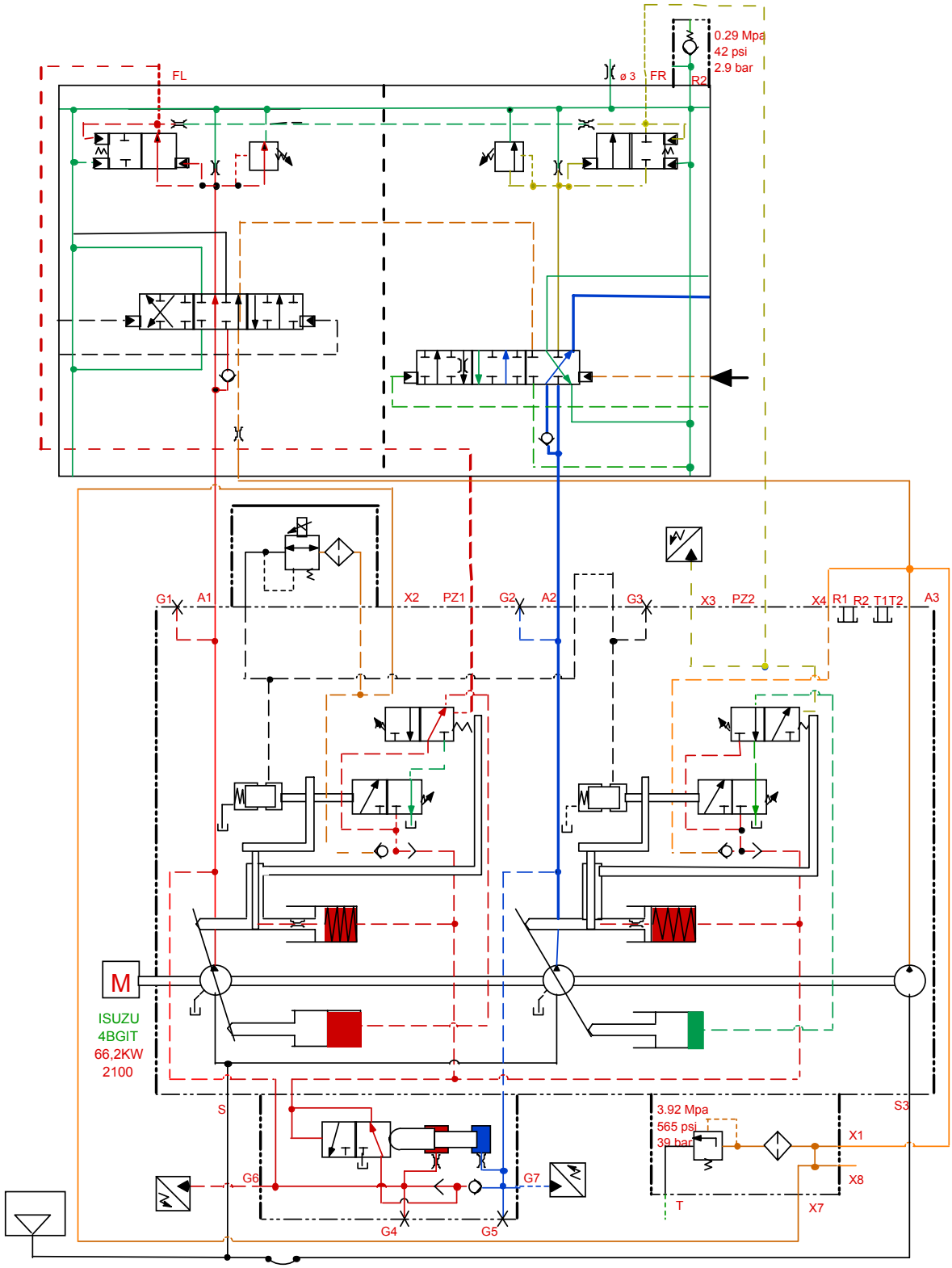
1) The negative flow control signal PZ2 is very low < 2 b. The negative flow control valve E' is totally pushed on the right side by its spring. The piston B' is connected to the tank through E'. The piston C' receives pressure from the compensation valve C. The delivery flow is maximum.

If the operator reduces the flow demand the Negative flow control pressure signal increases, the valve E' comes back to the right and the piston B' receives pressure from the valve A. The angle of the swash plate decrease the flow is reduced.

1) The negative flow control signal PZ2 is very low < 2 b. The negative flow control valve E' is totally pushed on the right side by its spring. The piston B' is connected to the tank through E'. When the pump pressure reach the value of the torque regulation the lever L' push the valve D' to the left and the piston B' & C' are connected; the force is higher on B' piston and the angle of the swash plate decreases.

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HYDRAULIC CIRCUIT



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Pump engine running, two controls operated

There are 3 possibilities
1. The negative flow control signals PZ1 & PZ2 are low and slighltly equal
1. The negative flow control signals PZ1 & PZ2 are different
1. The regulation torque pressure is reached

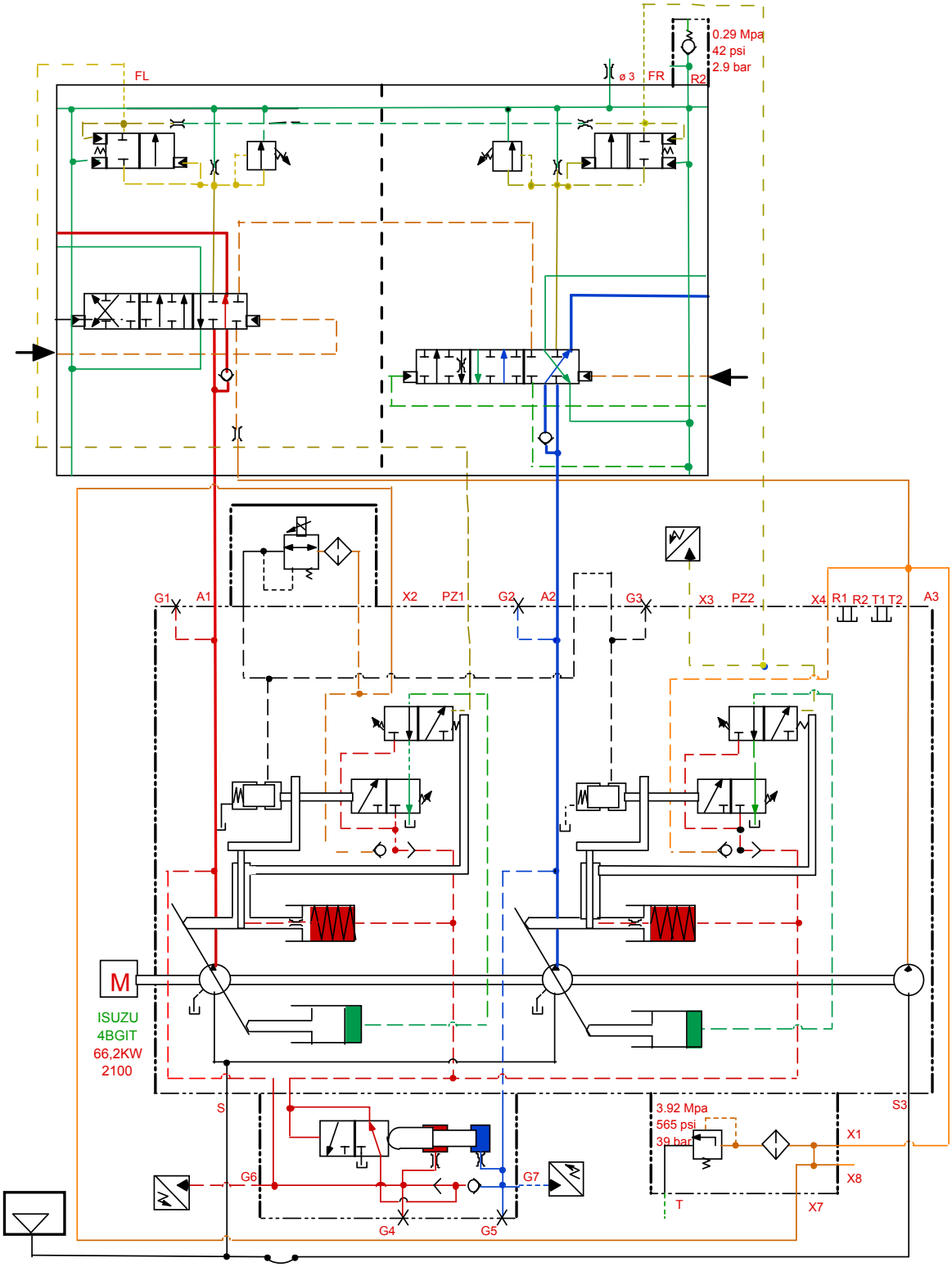
1. If PZ1 equals PZ2 (travel motor fully supply) the negative control signal is very low and the negative control valves E & E' are fully pushed back to the right side by the springs. The piston B and B' are connected to the tank through E & E' valves. The two pumps deliver the same maximum flow.
   A difference of pressure between the RH and LH side doesn't affect the outputs because the pistons A & A' receives the same pressure from the compensation valve C.

1. If PZ1 > PZ2 (current usage for boom and dipper) the dynamic balance of the piston A & B is obtained before the balance of the spool A' & B'. For this reason the swash plate angle is smaller on PZ1 side and the flow is smaller.
   (PZ2> PZ1 respectively)

If PA1 + PA2 reaches the pressure of the torque regulation value, the compensated pressure from the valve C acts identically on the lever L & L'. L & L' levers push on the torque regulations valves D & D' to reduce proportionally the swash plate angle of the two pumps.

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HYDRAULIC CIRCUIT



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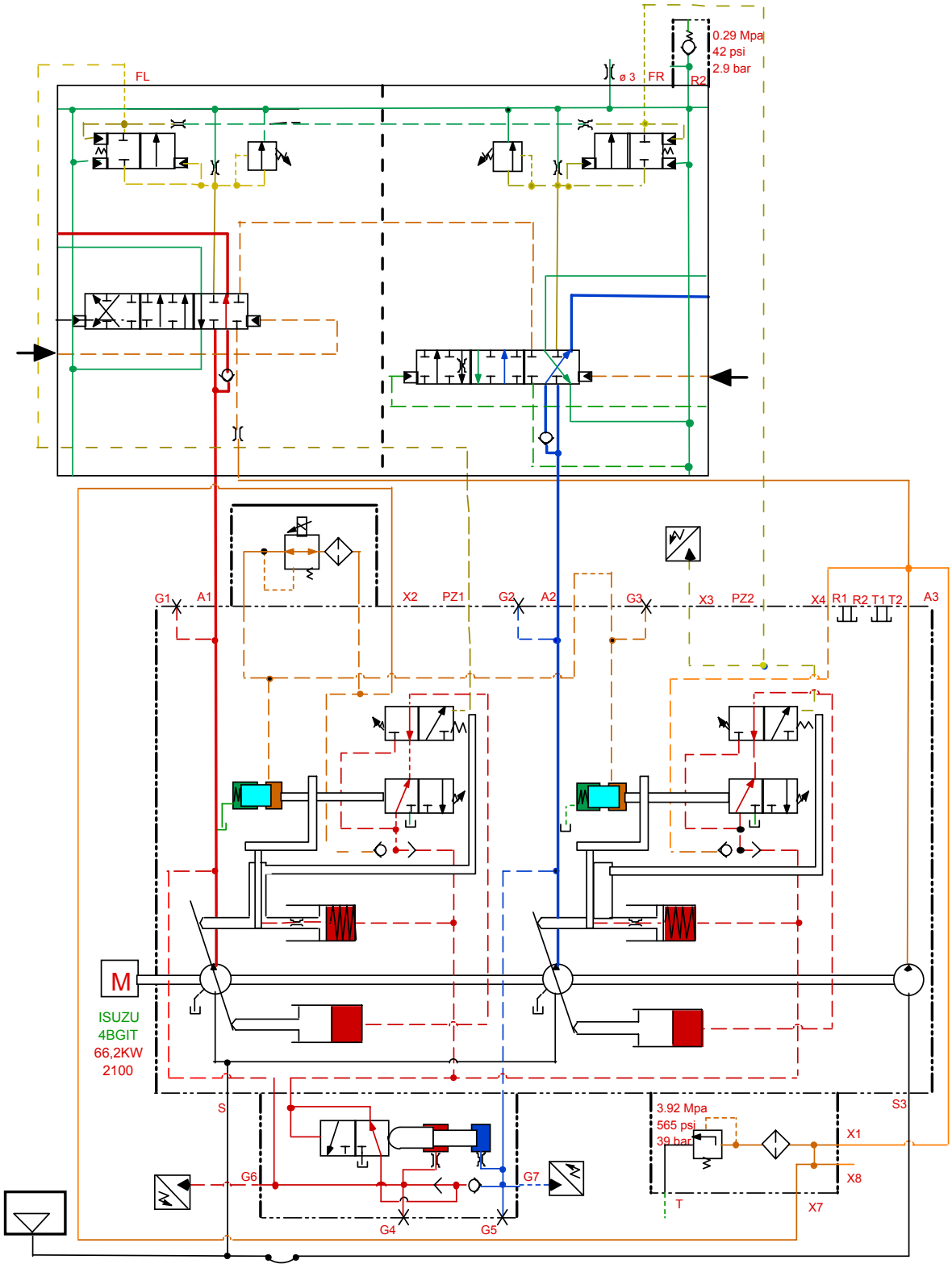
Pump in torque regulation mode H

The proportional valve acts on the pump torque regulation
On the CX130 the pump torque increases when the proportional valve pressure increases.
The output pressure from the proportional valve pushes the piston G & G' to the left side and compresses the non-adjustable spring. A higher force on the levers L& L' coming from the compensation valve C is required to press onto the adjustable spring of the torque regulation valve D & D' to reduce the swash plate angles.

1) In H mode the proportional valve pressure (15,2 to 19,2b with a 600 mA to 450 mA current at 2150 rpm) sets the pump at the maximum output torque.
2) In S mode the proportional valve pressure (9,2 to 13,2b with a 292 mA current at 1950rpm) sets the pump at 90% of the maximum output torque.
3) In L mode the proportional valve pressure (current < 100mA at 1850rpm) sets the pump at 70% of the maximum output torque.

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HYDRAULIC CIRCUIT



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HYDRAULIC EXCAVATOR
CX130



SECTION N°7
SETTINGS

CASE TRAINING CENTRE
AUGUST 2000

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HYDRAULIC PRESSURE SETTINGS

SPECIFICATIONS

High pressure hydraulic pump

Type of pumpDouble axial-type variable flow pump
Max flow - 2x123 L/minLow pressure pump

Fixedflow gear type

Max flow - 23 L/min

Engine speeds

Max speed - 2150 rpm
Idle speed - 960 to 980 rpm

Pressure settings

Pilot circuit relief valve - 39 ± 1 bar
Main relief valve (standard) - 343 ± 3 bar
Main relief valve (higher pressure - 2-stage relief) - 363 ± 5 bar
Secondary relief valves (boom, dipper and bucket) - 383 ± 5 bar
Secondary relief valves swing - 279 ± 4 bar
Safety valves (boom and dipper) - 383 ± 5 bar

Upperstructure swing

Type of motorfixed flow, axial piston type
Displacement - 65 cm^3
Working output - 100 L/min
Swing speed - 13.4 rpm
Disc brakeautomatic brake release

Travel

Type of motor - two-speed, axial piston type
Displacement - 52.7 and 34 cm^3

Boom cylinder

Barrel diameter - 105 mm
Rod diameter - 70 mm
Stroke - 990 mm

Dipper cylinder

Barrel diameter - 115 mm
Rod diameter - 80 mm
Stroke - 1110 mm

Bucket cylinder

Barrel diameter - 95 mm
Rod diameter - 65 mm
Stroke - 880 mm

Hydraulic reservoir

Reservoir capacity - 73 litres
Total circuit capacity - 123 litres

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SPECIAL TOOLS

Tester



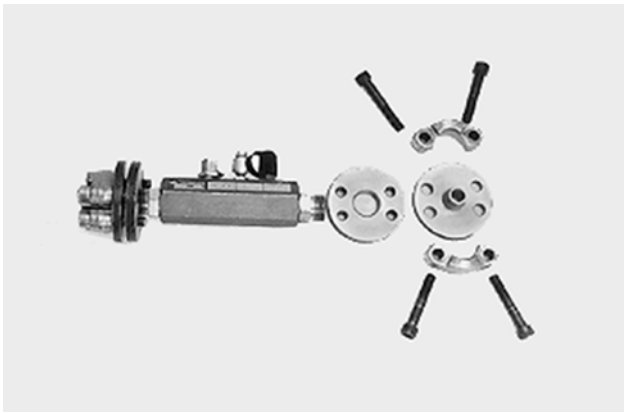
CP96E001

1. *TEST KIT E5444449 FOR MULTI-HANDY 2051*

The Multi-Handy tester can be used every day in the workshop for normal operations.

Le Multi-Handy can be used for:
Checking pressure (two pressure scales), maximum pressure, differential pressure (P delta), temperature, engine speed and flow.

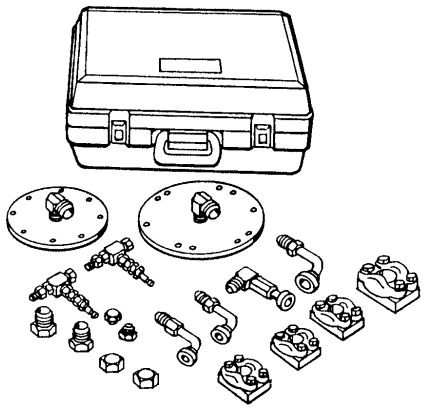
1 Multi-Handy 2051 tester	D5444448
2 pressure detectors 0-600 bar	V5344460
2 straight unions for detector	W5344461
1 elbow union for detector	X5344462
1 engine speed detector	Z5344463
3 cables (5 m long)	E3144472
1 electric plug 220V50Hz	D5344467
1 cigarette lighter cable	E5344468
1 instruction manual	----------
1 carrying case	N5344476



CD98M009

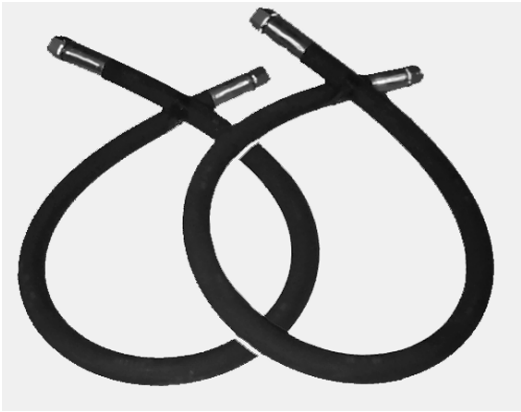
2. *600 LITRE FLOWMETER, ORDER THE FOLLOWING:*

ONE FLOWMETER RE3 Z5344486
TWO PLATES (M45X2) D4323359
TWO FLANGES (Ø 24) B8230183
FOUR HALF-FLANGES D4024267
EIGHT SCREWS (12 X 75) Z1232983



CS99B532

3. *SET OF UNIONS FOR PRESSURE TEST AND HYDRAULIC FLOW CAS 30038.*



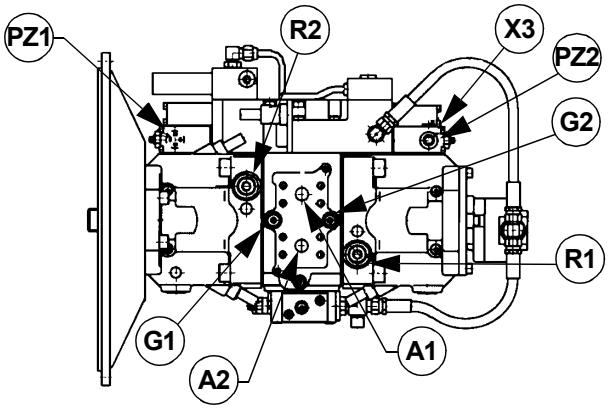
CD99C002

4. *SET OF HIGH PRESSURE HYDRAULIC HOSES CAS 30036 (INCLUDING TWO HIGH PRESSURE HOSES).*

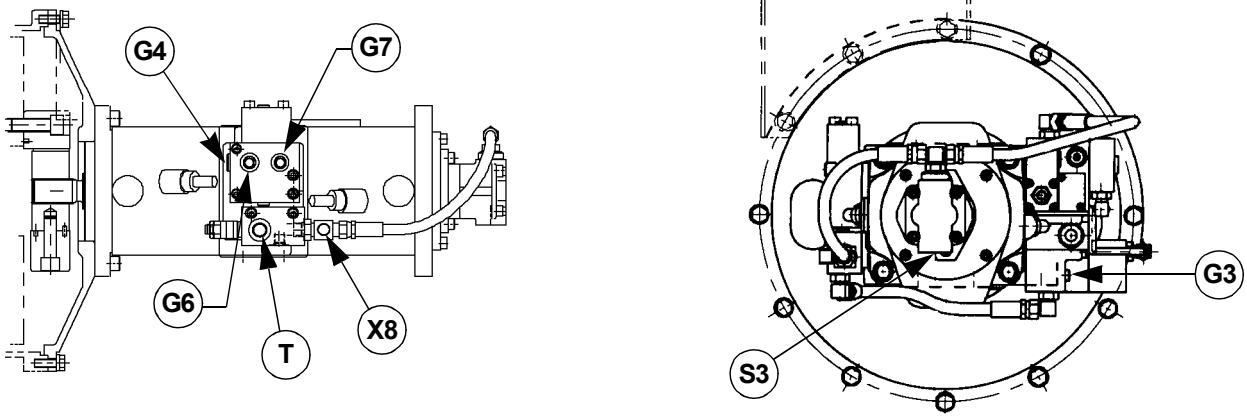
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IDENTIFICATION OF HYDRAULIC COMPONENTS

CX130 pump



CS00E543

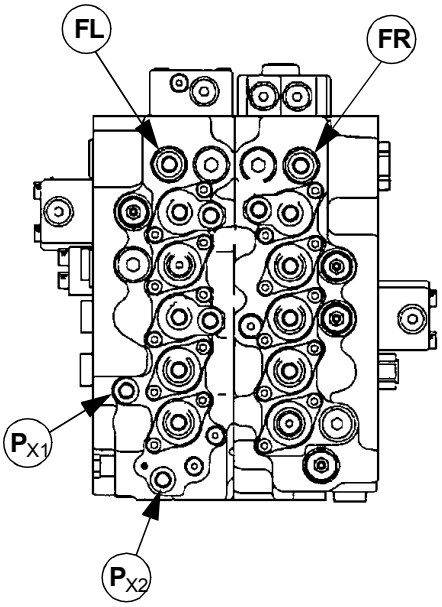


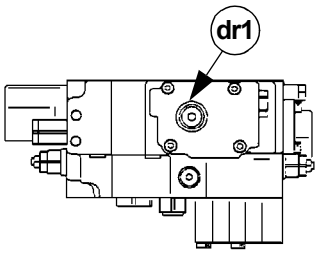
CS00E516CS00E542

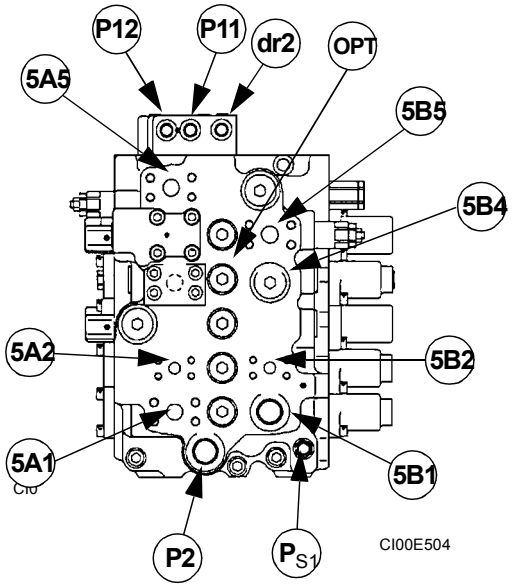
Port	Description	Location
A1-A2	Pump output (P1-P2)	SAE 6000 psi 3/4 "
X8	Pilot pump output	G 3/8
S	Main pump intake	SAE 6000 psi 3/4 "
S3	Pilot pump intake	G 3/4
T	Return from pilot circuit secondary relief valve	G 3/8
PZ1-PZ2	Pump pressure regulation (P1-P2)	G 1/4
X3	Regulating pressure detector	G 1/4
G1 - G2	Pressure P1-P2 (Plugged)	G 1/4
G3	Plugged (Proportional pressure valve)	G 1/4
G4 - G5	Pressure P1-P2 (Plugged)	G 1/8
G6 - G7	Pressure detector P1-P2	G 1/4
R1 - R2	Filling and bleeding orifices	

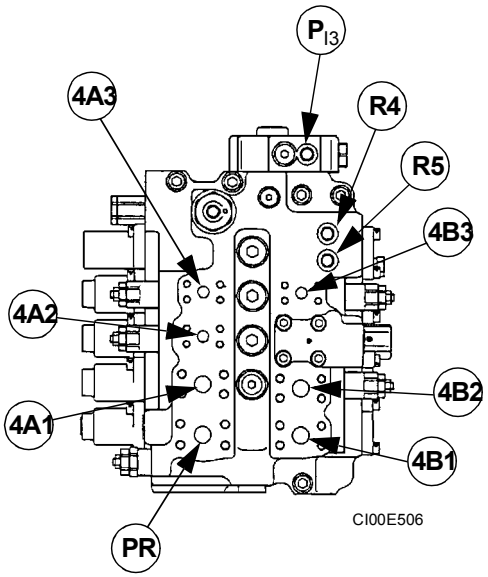
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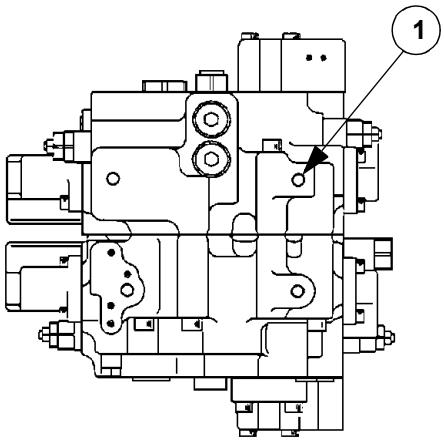
CX130 control valve











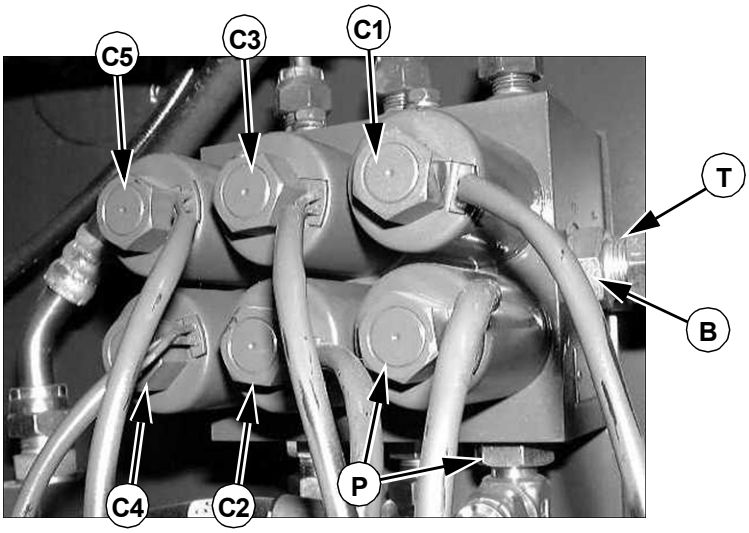
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HYDRAULIC PRESSURE SETTINGS

Port	Description	Location
4A3	Bucket closing	
4B3	Bucket opening	
4A2	Boom lowering	
4B2	Boom raising	
4A1	LH forward travel	
4B1	LH reverse travel	
5A5	Dipper retracting	
5B5	Dipper extending	
5B2	RH swing	
5A2	LH swing	
5A4	Option circuit	
5B4	Option circuit	G 3/4
5A1	RH forward travel	
5B1	RH reverse travel	G 3/4
PR-PL	Inlet - pump P1-P2	G 3/4
P0 - OPT	Supply to option spool	G 1/2
R1 - R3	Plugged	
R2	Check valve return 2.9 bar	
FL-FR	Pump regulating pressure (N)	
PX1	Attachment and swing pressure switch	G 1/4
PX2	Travel pressure switch	G 1/4
PS1	39 bar supply (travel drift)	G 1/4
DR1-DR2	Leak-off return	G 1/4
PS2	Boom/dipper load holding pilot pressure	
R5	By-pass return	G 1/4
R4	To shock absorber (heating)	G 1/4
PI1	Priority to swing	G 1/4
PI2	Cancel priority to swing	G 1/4
PI3	Dipper parallel flow variation	

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6 solenoid valve manifold



CD00E143

Port	Description
B	Supply to pilot manifold
T	Return to reservoir
C1	Select 2nd travel speed
C2	Swing brake control
C3	Higher pressure - 2-stage relief
C4	Cancel pilot system shock absorbing
C5	Cancel swing piloting
P	Pilot pressure cancellation control

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HYDRAULIC PRESSURE SETTINGS

PREPARATION BEFORE INSPECTION

WARNING: *Hydraulic fluid output under pressure can penetrate the skin. Hydraulic fluid can also cause or infect a slight skin cut. In the event of being injured by hydraulic fluid under pressure, consult a doctor immediately. Any delay in obtaining treatment for an injury can cause a serious infection or reaction. Before pressurising the circuits, make sure that all the outlets are correctly tightened and that the hoses and pipes are in good condition. Release pressure in the circuits completely before disconnecting pipes or carrying out any operation on the hydraulic system. Always use a small piece of cardboard or wood to detect leaks of fluid under pressure. Never use your hands.*

WARNING: *Any incorrect use or maintenance of a construction machine can cause accidents. Only persons who have read, understood and who observe the instructions in the operator's manual are accredited to use or maintain this machine.*

WARNING: *The accumulator of this machine is charged with nitrogen under pressure. In the event of incorrect operation of the circuit, change the accumulator. Never try to repair it. Non-observance of these instructions and the procedure shown below can cause serious or fatal injury.*

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HYDRAULIC PRESSURE SETTINGS

1. Releasing pressure in the hydraulic system

Position the machine on hard, flat ground.

Open the bucket until the cylinder rod is completely retracted.

Extend the dipper until the cylinder rod is completely retracted. Lower the boom so that the end of the dipper is resting on the ground. Lower the tool to the ground.

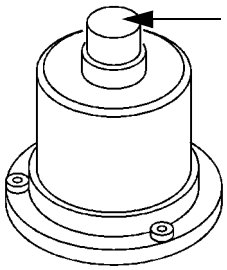
Check in "S" mode on the diagnostic screen that the following values are respected.

CHK 1	MODE II S			ENG	1950	rpm
	P1	030.0	MPa	I	0450	mA
	P2	030.0	MPa	WT	0080	°C
	No.	03.00	MPa	OT	0055	°C

	CX130
Engine speed	1950±10 rpm
Amperage	450 mA

Lower the engine speed to idle for 30 seconds, then shut down the engine.
Turn the starter key switch to "ON", without starting the engine.

Lower the pilot control cancellation lever.
Operate each control 10 times in both directions to release pressure in the circuits.

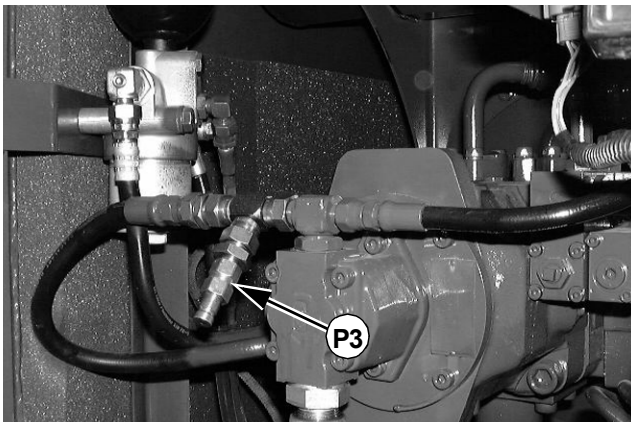


CS00E544

Press the button located on the hydraulic reservoir breather to release pressure in the reservoir.

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2. Installing the pilot pressure test point

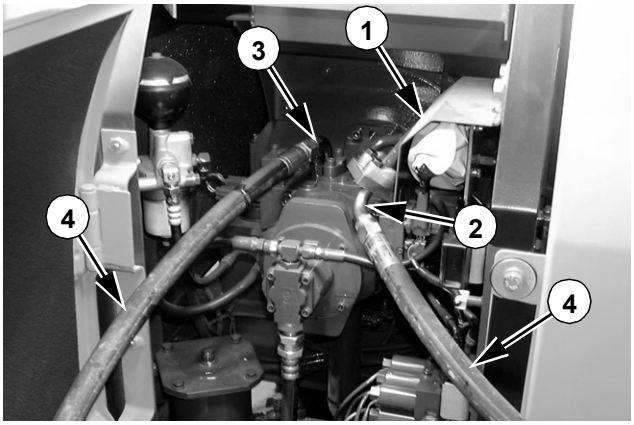


CD00E191

Install a pressure test point (P3) on the pilot circuit using the T-union and quick coupling supplied in the kit CAS 30038.

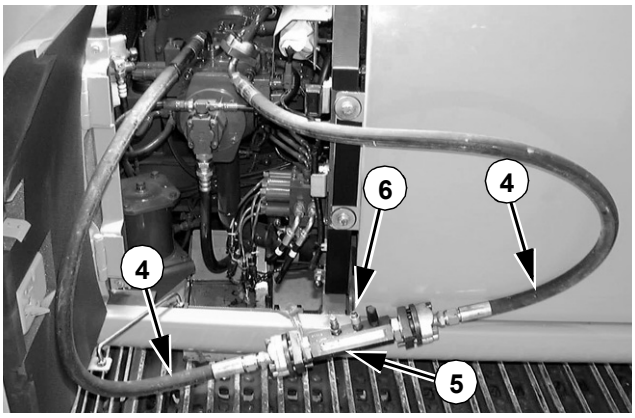
3. Installing the flowmeter

(Checking hydraulic pump flows)
CX130



CD00F008

Remove the hose (1) de the pump outlet to be checked.
Install the flange (2) (CAS 2764) on the hose (1).
Connect the elbow union (3) (CAS 2764) on the pump outlet to be checked.
Install the hoses (4) (CAS 30036) on the elbow union (3) and on the flange (2).
CX130



CD00F007

Install the flowmeter (5) on the hoses (4).
Fasten the flowmeter to the upperstructure.
Connect the multi-handy 2051 connecting cable to the plug on the flowmeter detector (6).

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4. Display on diagnostic screen "CHK1"

CHK 1	MODE II H		ENG	2000	rpm
P1	030.0	MPa	I	0300	mA
P2	030.0	MPa	WT	0080	°C
No.	03.00	MPa	OT	0055	°C

P1 P1 pump pressure in MPa

	CX130	CX210
Inspection orifice	G6	a1
Pressure checked	Boom Bucket LH travel	Dipper RH travel Swing

P2 P2 pump pressure in MPa

	CX130	CX210
Inspection orifice	G7	a2
Pressure checked	Dipper RH travel Swing	Boom Bucket LH travel

N: Pressure regulation of the pump in MPa. The pressure detector at this test point is located on the pump (port X3 on CX130). It is used to check the pump regulated pressure.

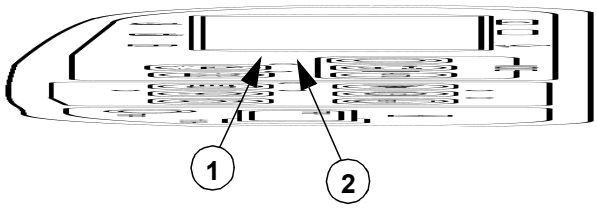
ENG: Engine speed in rpm.

I: Amperage in mA (Proportional valve).

WT: Engine water temperature in °C.

OT: Hydraulic oil temperature in °C.

To access this screen: Select work mode H or S using the control (2).



CM00E001

Press simultaneously on the travel speed control (1) and on the work mode selector control (2) as shown above until the diagnostic screen CHK1 appears (3 seconds).

5. Warming up the engine

1. Start the engine. The engine will have warmed up in 10-15 minutes.
2. Run the engine until the message "Automatic pre-heating" disappears from the display monitor.

6. Warming up the hydraulic fluid

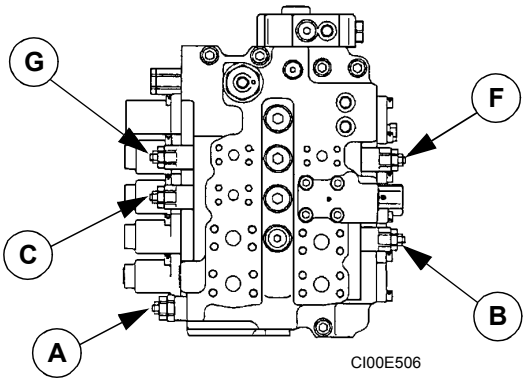
1. Actuate the bucket and dipper controls in one direction (against the cylinder stops) for 30 seconds.
2. Actuate the bucket and dipper controls in the other direction (against the cylinder stops) for 30 seconds.
3. Repeat Steps 1 and 2 until the hydraulic fluid temperature reached 45-55°C.
4. Actuate the boom, swing and travel controls in both directions to warm up all the circuits to 45-55°C.

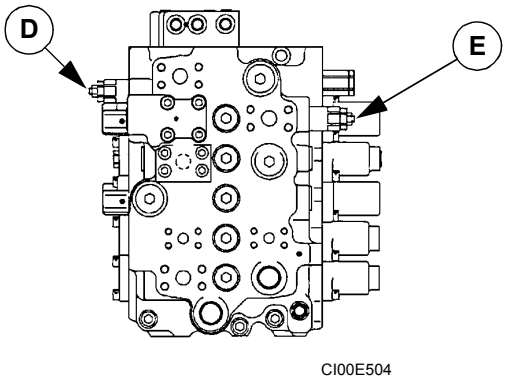
https://truckmanualshub.com/

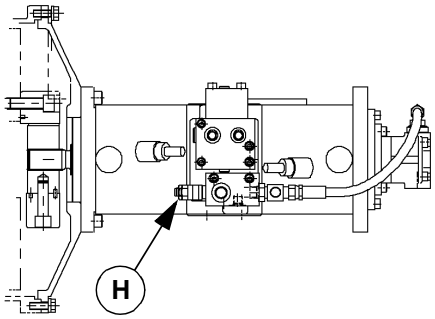
CHECKING AND PRESSURE SETTING PROCEDURE

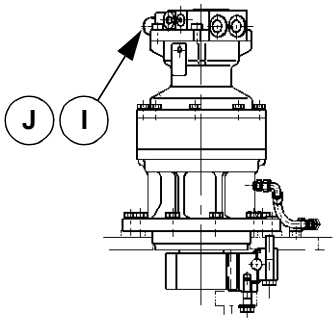
Location of secondary relief valves

CX130









		Pressure with one turn of the screw	
Item	**Description**	**CX130**	**CX210**
A	Main relief valve (standard pressure)	----	213 bar (21.3 MPa)
	Main relief valve (higher pressure - 2-stage relief)	----	284 bar (28.4 MPa)
B	Boom raising secondary relief valve	196 bar (19.6 MPa)	212 bar (21.2 MPa)
C	Boom lowering secondary relief valve	196 bar (19.6 MPa)	212 bar (21.2 MPa)
D	Dipper extending secondary relief valve	196 bar (19.6 MPa)	212 bar (21.2 MPa)
E	Dipper retracting secondary relief valve	196 bar (19.6 MPa)	212 bar (21.2 MPa)
F	Bucket opening secondary relief valve	196 bar (19.6 MPa)	212 bar (21.2 MPa)
G	Bucket closing secondary relief valve	196 bar (19.6 MPa)	212 bar (21.2 MPa)
H	Pilot circuit secondary relief valve	15.6 bar (1.56 MPa)	2 bar (0.2 MPa)
I	RH swing secondary relief valve	5 bar (0.5 MPa)	5 bar (0.5 MPa)
J	LH swing secondary relief valve	5 bar (0.5 MPa)	5 bar (0.5 MPa)

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Pilot system secondary relief valve (H)

Test

1. Connect a 0-100 bar pressure gauge to pressure test point P3.
2. With the engine at full speed, select mode "S".
3. Move the pilot cancellation lever to its low position.
4. With the swing and travel attachment controls in neutral, read the value on the pressure gauge: **The value should be 39±1 bar (3.9±0.1 MPa)**.

Adjustment

1. Loosen the lock nut and turn the valve adjusting screw (H) until 39±1 bar (3.9±0.1 MPa) is reached.
2. Tighten the lock nut while holding the adjusting screw in position.
3. When the adjusting screw has been tightened, check the pressure again and make sure there are no leaks.

Checking the pilot accumulator

Raise the boom completely and extend the dipper.

Shut down the engine, with the starter key switch on "ON".

Operate the boom lowering or dipper retracting control several times consecutively.

The pressure in the accumulator should enable the boom lowering or dipper retracting function to be performed about six times.

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Main relief valve (A)

Test

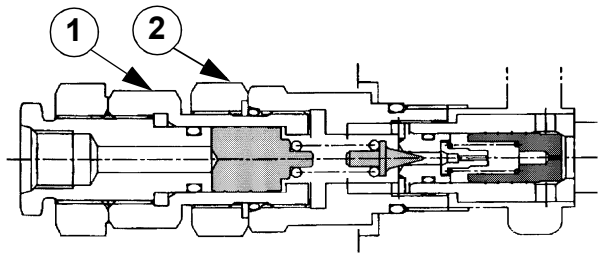
1. Display the screen "CHK1".
2. With the engine at full speed, select mode "S".
3. Operate and hold in position the dipper retracting control (against cylinder stops).
4. Read the pressure on the diagnostic screen:
   When the dipper cylinder is against the stops, the pressure is the standard value for 2 seconds, then at the higher pressure - 2-stage relief value for 8 seconds before falling back to standard pressure.

	Pump	Standard pressure	Higher pressure level
CX130	**P2**	**343±3 bar** (34.3±0.3 MPa)	**363±5 bar** (36.3±0.5 MPa)

NOTE: *To read the higher pressure - 2-stage relief level again, the control lever should be released, then operated against the cylinder stops.*

Adjusting the higher pressure - 2-stage relief

CX130



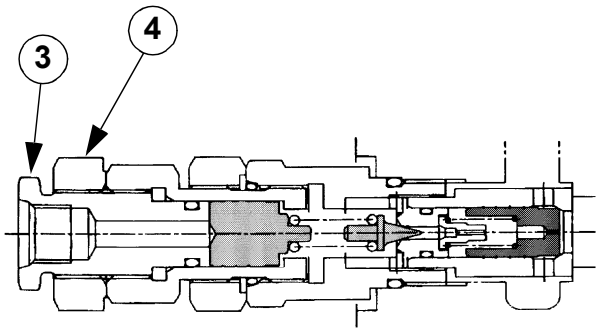
CS00E551

1. Loosen the lock nut (2) and turn the valve adjusting screw (1) until the higher pressure - 2-stage relief level is reached.
   Tighten the screw (1) to increase pressure.
   Untighten the screw (1) to reduce pressure.
2. Tighten the lock nut (2) while holding the adjusting screw (1) in position.
3. When the adjusting screw has been tightened, check the pressure again and make sure there are no leaks.

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Adjusting the standard pressure

CX130



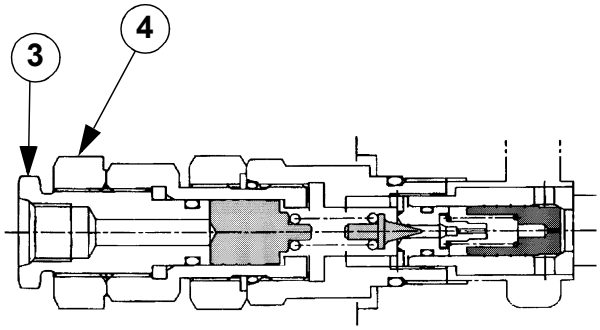
CS00E551

1. Loosen the lock nut (4) and turn the valve adjusting screw (3) until the standard value is reached.
   Tighten the screw (3) to increase the pressure.
   Loosen the screw (3) to reduce the pressure.
2. Tighten the lock nut (4) while holding the adjusting screw (3) in position.
3. When the adjusting screw has been tightened, check the pressure again and make sure there are no leaks.

Attachment secondary relief valves (B, C, D, E, F and G)

Test

CX130



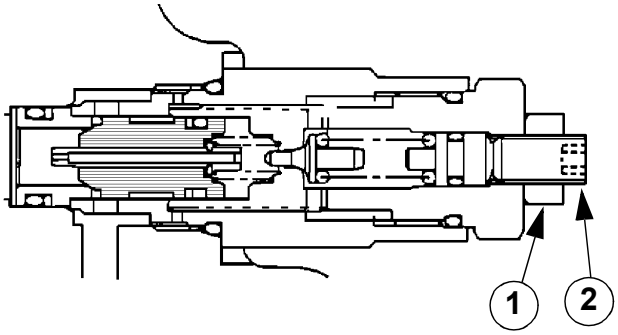
CS00E551

1. Loosen the lock nut (4) and tighten de 180° the secondary relief valve (A) adjusting screw (3) 180°.
2. Display the diagnostic screen "CHK1".
3. Operate and hold in position the corresponding attachment control (against the cylinder stops).
4. Read the pressure on the diagnostic screen, the pressure should be:

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Function	CX130	
Boom raising	P1	**383±5 bar** (38.3±0.5 MPa)
Boom lowering	P1	**383±5 bar** (38.3±0.5 MPa)
Dipper retracting	P2	**383±5 bar** (38.3±0.5 MPa)
Dipper extending	P2	**383±5 bar** (38.3±0.5 MPa)
Bucket opening	P1	**383±5 bar** (38.3±0.5 MPa)
Bucket closing	P1	**383±5 bar** (38.3±0.5 MPa)

Adjustment

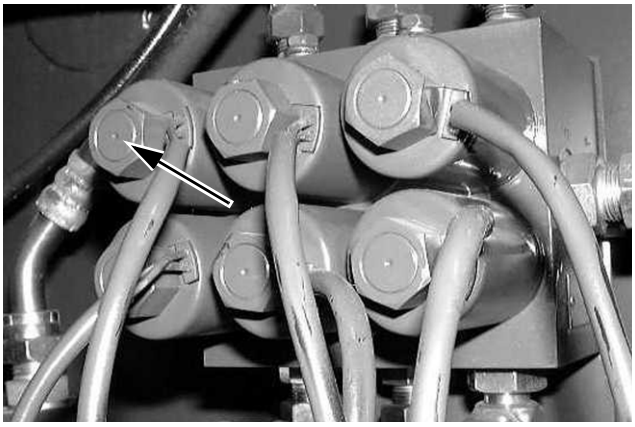


CI00E508

1. Loosen the lock nut (1) and turn the adjusting screw (2) of the valve concerned until the correct pressure is reached.
2. Tighten the lock nut (1) while holding the adjusting screw (2) in position.
3. When the adjusting screw has been tightened, check the pressure again and make sure there are no leaks.
4. Reset the secondary relief valve (A) to its original pressure (refer to "Setting the standard pressure").

Swing secondary relief valves (I, J)

Test



CD00E143

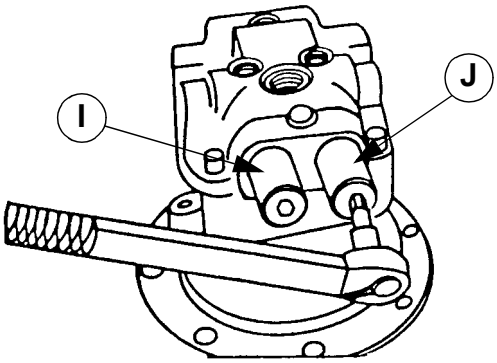
1. Disconnect the swing cancellation solenoid valve connector (green).
2. Display the diagnostic screen "CHK1".
3. Start the engine and select the "S" mode.
4. Operate the swing brake control on the instrument panel (indicator lamp ON).
5. Slowly operate the swing lever to the right, then gradually increase engine speed to full speed to ensure that the swing is locked.
6. Repeat Step 5 for the LH swing, the pressures should be:

Function	CX130	
RH swing	P2	**279±4 bar** (27.9±0.4 MPa)
LH swing	P2	**279±4 bar** (27.9±0.4 MPa)

Note the pressures if they are not correct to find the number of shims needed for adjustment. **One 0.1 mm shim corresponds to 5 bars of pressure**.

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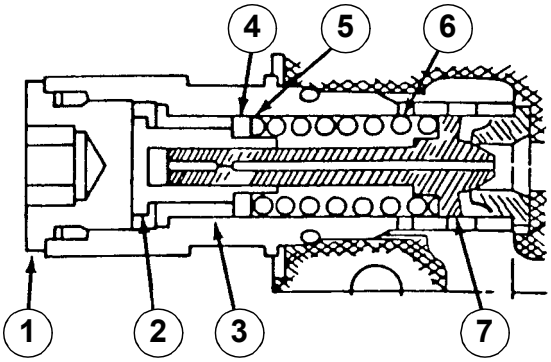
Adjustment



CS99B596

(I) RH swing secondary relief valve
(J) LH swing secondary relief valve

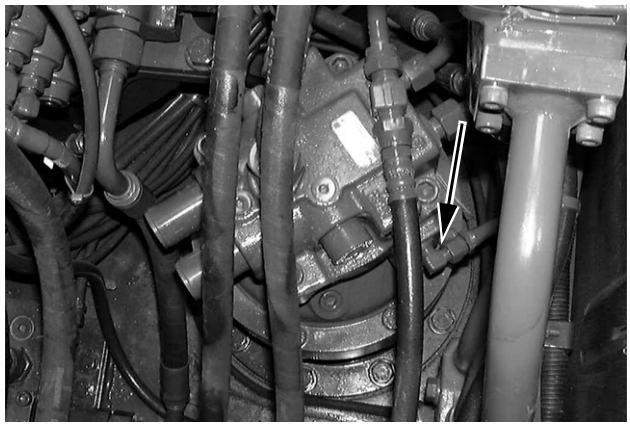
1. Remove the secondary relief valve concerned from the swing motor. If both secondary relief valves have to be removed, mark them ready for reassembly.



CS99B598

2. Tighten the body of the valve in a vice and remove the plug (1), guide (2), liner (3), spacer (4), shims (5), spring (6) and the check valve (7).
3. Remove (to reduce the pressure) or add (to increase the pressure) the number of shims (5) required to reach the correct pressure.
4. Reassemble the parts (1 to 7) of the valve and tighten the plug (1) to 157 Nm.
5. Reassemble the valve on the swing motor and the tighten to 78 Nm.
6. Check the pressure of the valves again and make sure there are no leaks.

Checking the swing braking pressure



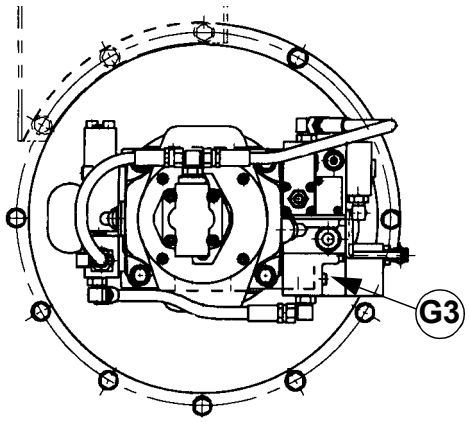
CD00E192

1. Disconnect the hose swing brake supply hose at the reduction gear end and connect a pressure test point and a 0-100 bar pressure gauge to the hose.
2. With the engine at full speed, select mode "S".
3. With the swing control in the neutral position, switch on the swing brake control on the instrument panel (indicator lamp ON), the pressure should be between 0 and 3 bar.
4. With the swing control in the neutral position, switch off the swing brake control on the instrument panel (indicator lamp OFF), the brake release pressure should be about 39 bar.

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Checking the pressure delivered by the proportional valve

CX130



CS00E542

1. Connect a pressure test point and a 0-100 bar pressure gauge to port G3 (CX130) or a4 (CX210) on the pump.
2. Display the diagnostic screen "CHK1".
3. With the engine at full speed, select mode "H".

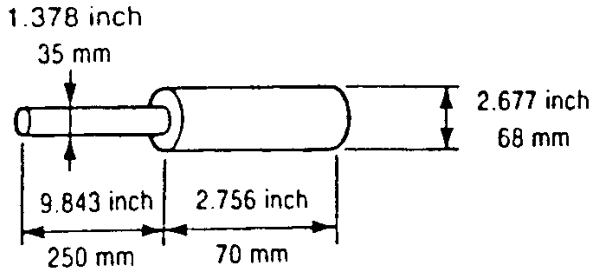
	CX130
Pressure	15.2 to 19.2 bar
Amperage	600 mA

4. With the engine at full speed, select mode "S".

	CX130
Pressure	9.2 to 13.2 bar
Amperage	450 mA

Checking for leaks on the travel motor

Tools required



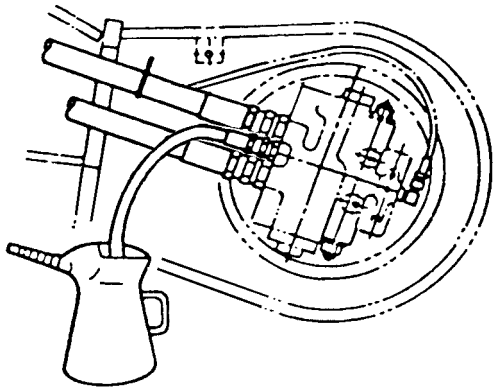
CS99B579

1 locking pin of above dimensions
1 receptacle of10 litres capacity
1 hose
1 plug

Checking for leaks

(With the hydraulic oil between 45 and 55°C)

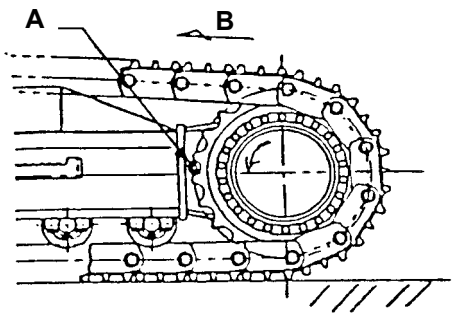
1. Press the breather to release pressure in the hydraulic reservoir.
2. Remove the travel motor protective shield.



CS00E546

3. Disconnect the drain hose from the hydraulic motor and plug it.
4. Use a hose to connect the drain port to the receptacle.

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CS99B580

A: Locking pin
B: Forward

5. Lock the travel on the side to be checked by positioning the locking pin between the sprocket and the undercarriage as shown above.
6. With the engine at full speed, select mode "S".
7. Operate the travel control of the hydraulic motor to be checked and measure the quantity of oil which leaves the drain during 1 min.
8. Repeat Steps 1 to 7 to check the other motor.
9. Compare the quantities of oil collected; if the difference between the two motors is greater than 1 L/min, repair or change the which has output the greatest quantity of oil.

NOTE: *The maximum is about 5 L/min per motor.*

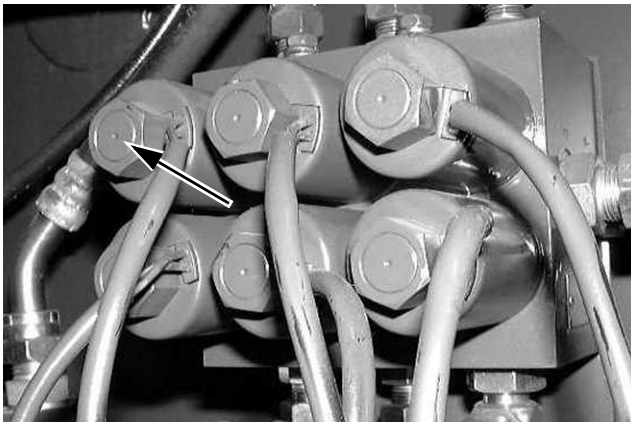
Checking the swing motor for leaks

Tools required

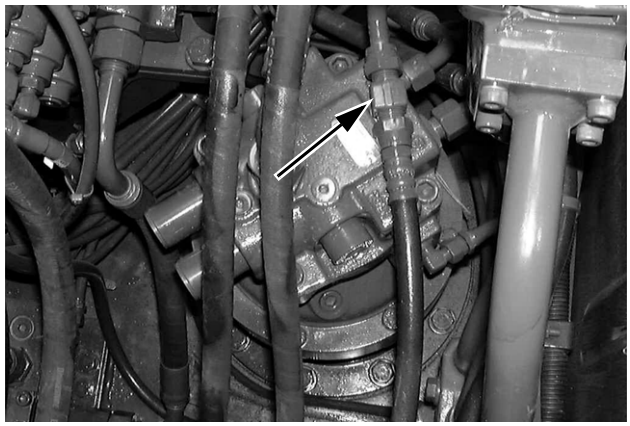
1 receptacle with a capacity of 10 litres
1 hose
1 plug

Checking for leaks

(With the hydraulic oil between 45 and 55°C)



1. Disconnect the swing solenoid valve connector (green).
2. Display the diagnostic screen "CHK1".
3. Start the engine and select the mode "S".
4. Switch on the swing brake control on the instrument panel (indicator lamp ON).
5. Slowly operate the swing control lever and gradually increase the engine speed to full speed to ensure that the swing is locked.
6. Shut down the engine.
7. Press the breather to release pressure in the hydraulic reservoir.



CD00E192

8. Disconnect the hydraulic motor drain hose and plug it.
9. Use a hose to connect the drain port to the receptacle.
10. Start the engine at full speed in mode "S", operate the swing control to right or left and measure the quantity of oil which flows out of the drain hole during 1 min.
11. Since the quantity of oil can vary depending on the test point used, repeat the measurement (Step 10) with the upperstructure at 90°, then at 180°.

NOTE: *The maximum permitted is about 4 L/min.*

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TROUBLESHOOTING

Travel drift

(Pressures P1 and P2 correct)

No.	Tests	Results	Repairs
1	With the tracks lifted, check the rotating speed at the sprockets	Difference in speed between the two sprockets	Check travel motor leaks (No. 4)
2	Check pressures P1 and P2 during travel	The pressure difference between P1 and P2 is greater than 30 bars (3 MPa)	Check the regulating pressure (N) of the pump (No. 3)
3	Check the regulating pressure (N) of the pump	Pressure greater than 6 bars (0.6 MPa)	Check the main valve: Adjust or change
			Check the pump regulator or body which is at fault Adjust or change
		Pressure below 6 bars (0.6 MPa)	Check the travel spool pilot pressure on the side which is at fault:
			Pressure below 30 bars (3 MPa) Check the operation of the control pedal spool, replace or repair
			Pressure greater than 30 bars (3 MPa) Check the travel spool (sticking, scratched ...)
4	Check the travel motors for leaks	Greater than 3 L/min	Replace or repair the travel motor
		Below 3 L/min	Check the travel pressure without load (with track raised)
			Normal pressure, Change the central seal
			Higher than normal pressure, Drain the reduction gear and check if there is any contamination (metal particles). Replace or repair the travel reduction gear

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Not possible to select 2nd travel speed

No.	Tests	Results	Repairs
1	Press the travel speed control and check that the speed changes from I to II on the console screen	Speed II is not displayed	Refer to troubleshooting electrical failures
2	Check on diagnostic screen "CHK2" if the information changes to "ON" when the machine is travelling	Information stays on "OFF"	Check pressures P1 and P2 on diagnostic screen "CHK1" when the machine is travelling 1) both pressures are less than 40 bar: refer to troubleshooting electrical failures 2) both pressures are higher than 40 bar, refer to point No. 3
3	Check the pump regulating pressure (N)	Too high	Adjust the pressure
4	Check the pilot pressure at the output from solenoid valve (C1)	Pressure too low	Check the electrical supply and the solenoid valve coil (No. 5 and 6)
		Pressure correct (39 bar - 3.9 MPa)	Check the pilot pressure at the travel motor displacement change spool (No. 7)
5	Check the voltage at the electrical plug on the displacement change solenoid valve	Voltage < 24 V	Check the electrical harness
6	Check the displacement change solenoid valve coil	Infinite or 0 Ohm	Change the solenoid valve
		About 40 Ohm	Change the solenoid valve coil
7	Check the pilot pressure at the travel motor displacement change spool	Pressure too low	Internal leak at hydraulic swivel, repair or change the hydraulic swivel
		Pressure correct (39 bar - 3.9 MPa)	Check the travel motor displacement change spool. Repair or change the travel motor

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No swing or slow swing

(No problems with other functions)

No.	Tests	Results	Repairs
1	Check the swing pressure	Pressure too low	Adjust or change the secondary relief valves
2	Disconnect the swing brake solenoid valve (pink connector) and operate the swing	No swing or slow swing	Reconnect the solenoid valve and check the swing brake release pressure at the output from the solenoid valve (No. 3)
		The swing operates normally	Check the solenoid valve supply electrical circuit
3	With the engine running and the swing brake deactivated, check the swing brake release pressure	Pressure below 30 bar	Check or change the swing brake solenoid valve
		Pressure greater than 30 bar	Check the swing motor for leaks (No. 5)
4	Disconnect the swing cancellation solenoid valve (green connector) and operate the swing	No swing or slow swing	Check or change the swing cancellation solenoid valve
		The swing operates normally	Check the solenoid valve supply electrical circuit
5	With the engine at full speed, and hydraulic oil at 50°C, check for leaks at the swing motor during the swing	Greater than 2 L/min	Change or repair the swing motor
		Below 2 L/min	Check the swing brake, repair or change

With the excavator on a slope, the swing brake does not hold

No.	Tests	Results	Repairs
1	Check the swing braking system	Abrasion	Incident on the brake, repair or change
2	Check the swing pressure	Pressure too low	Adjust or change the secondary relief valves
3	With the engine at full speed, and hydraulic oil at 50°C, check for leaks on the swing motor during the swing	Greater than 2 L/min	Change or repair the swing motor
4	Check the swing brake pilot pressure at the solenoid valve output	Pressure greater than 1 bar (0.1 MPa)	Check electrical supply and the solenoid valve coil (No. 5 and 6)
5	Check the voltage at the electrical plug on the swing brake pilot solenoid valve	Voltage < 24 V	Check the electrical harness
6	Check the pilot solenoid valve coil	Infinite or 0 Ohm	Change the solenoid valve
		About 40 Ohm	Change the solenoid valve coil

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No movement on any function

(Control cancellation lever in the low position)

No.	Tests	Results	Repairs
1	Check the hydraulic oil level	Lack of hydraulic oil	Top up as required
2	Check the pilot pressure at P3	Pressure below 30 bar (3.0 MPa)	Adjust the pilot circuit secondary relief valve, change it if necessary
3	Check the pilot pressure at outlet port B on the 6 solenoid valve block	Pressure below 30 bar (3.0 MPa)	Check electrical supply and the solenoid valve coil (Nos. 4 and 5)
4	Check the voltage at the pilot solenoid valve connector (blue)	Voltage < 24 V	check the electrical supply and mechanical adjustment of the controls cancellation contact switch. Check the harness between the contact switch and the solenoid valve
5	Check the pilot solenoid valve coil	Infinite or 0 Ohm	Change the solenoid valve
		About 40 Ohm	Change the solenoid valve coil

Lack of power or speed on one of the attachment movements

(No problems with the other movements)

No.	Tests	Results	Repairs
1	Check the P1 or P2 pressure	Pressure too low	Incident on the secondary relief valve of the faulty movement, adjust or change
2	With the engine at full speed (in mode "H"), and the hydraulic oil at 50°C, check the speed of the movement concerned	Below: - Boom raising: 3.4 seconds - Dipper retracting: 3.6 seconds - Dipper extending: 2.6 seconds - Bucket opening: 1.9 seconds - Bucket closing: 2.4 seconds	Leak at the non-return check valve, adjust or change
3	With a load on the end of the attachment and 1 m above the ground, check the retracting and extending of the cylinder rods	Rod retracting or extending over 10 mm greater than: - Boom: 30 mm - Dipper: 60 mm - Bucket: 20 mm	Leak at attachment cylinders, change the piston seals or change the cylinder
4	Manually check the movement of the pilot spool in the control valve for the faulty movement	Difficult to move	Spool stuck or scratched, spring broken
5	Check the pilot pressure of the control valve spool	Pressure below 30 bar	Check the operation of the control lever spool, change or repair

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Not possible to select hard/soft shock absorbing system

No.	Tests	Results	Repairs
1	Check on diagnostic screen "CHK3" if information displayed changes to "ON" when hard/soft shock absorption is selected/deselected	Information stays on "OFF"	Check the signal at the electronic box input: Below 5 volts: change the control box 5 volts: change the electronic box
2	Check the pilot pressure at the hard/soft shock absorption solenoid valve (C4)	Pressure too low	Check the electrical supply and the solenoid valve coil (Nos. 3 and 4)
		Pressure correct (39 bar - 3.9 MPa)	Repair or change the hard/soft shock absorption valve
3	Check the voltage at the electrical plug on the hard/soft shock absorption solenoid valve	Voltage < 24 V	Check the electrical harness
4	Check the hard/soft shock absorption solenoid valve coil	Infinite or 0 Ohm	Change the solenoid valve
		About 40 Ohm	Change the solenoid valve coil

The boom or the dipper does not lower

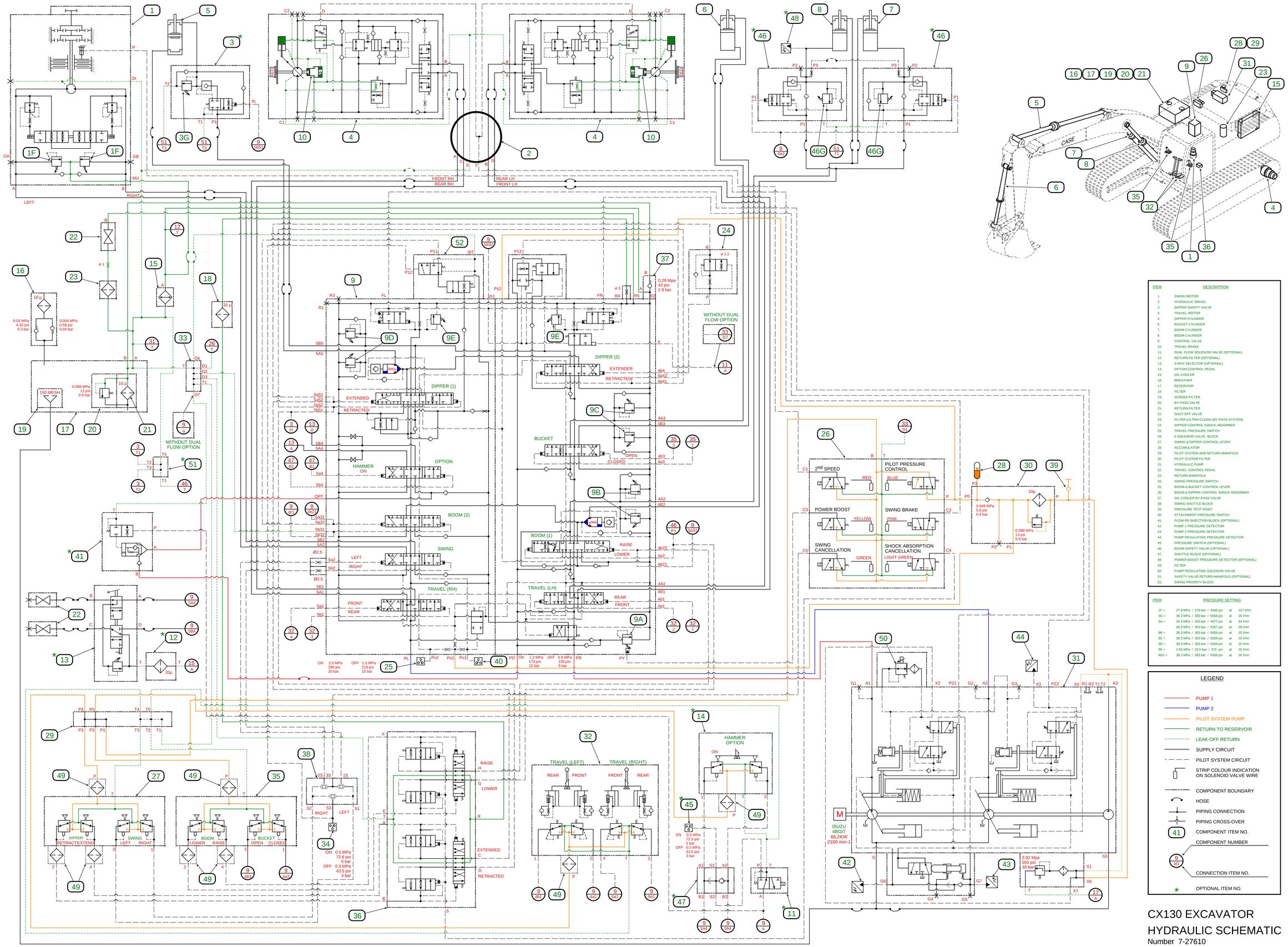
(No problems with other movements)

No.	Tests	Results	Repairs
1	Manually check the movement of the pilot spool	Difficult to move	Spool stuck or spring broken
2	Check the load holding operation	Sticking	Repair or change the load holding valve
3	Check the pilot pressure at the control valve spool	Pressure below 30 bar	Check the operation of the control lever spool, change or repair

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CX130 EXCAVATOR HYDRAULIC / ELECTRICAL SCHEMATIC



ITEM	DESCRIPTION
1.	SWING MOTOR
2.	HYDRAULIC SWIVEL
3.	DIPPER SAFETY VALVE
4.	TRAVEL MOTOR
5.	DIPPER CYLINDER
6.	BUCKET CYLINDER
7.	BOOM CYLINDER
8.	BOOM CYLINDER
9.	CONTROL VALVE
10.	TRAVEL BRAKE
11.	DUAL FLOW SOLENOID VALVE (OPTIONAL)
12.	RETURN FILTER (OPTIONAL)
13.	3-WAY SELECTOR (OPTIONAL)
14.	OPTION CONTROL PEDAL
15.	OIL-COOLER
16.	BREATHER
17.	RESERVOIR
18.	FILTER
19.	SCREEN FILTER
20.	BY-PASS VALVE
21.	RETURN FILTER
22.	SHUT-OFF VALVE
23.	FILTER (ULTRA-CLEAN) (BY-PASS SYSTEM)
24.	DIPPER CONTROL SHOCK ABSORBER
25.	TRAVEL PRESSURE SWITCH
26.	6 SOLENOID VALVE BLOCK
27.	SWING & DIPPER CONTROL LEVER
28.	ACCUMULATOR
29.	PILOT SYSTEM AND RETURN MANIFOLD
30.	PILOT SYSTEM FILTER
31.	HYDRAULIC PUMP
32.	TRAVEL CONTROL PEDAL
33.	RETURN MANIFOLD
34.	SWING PRESSURE SWITCH
35.	BOOM & BUCKET CONTROL LEVER
36.	BOOM & DIPPER CONTROL SHOCK ABSORBER
37.	OIL-COOLER BY-PASS VALVE
38.	SWING SHUTTLE BLOCK
39.	PRESSURE TEST POINT
40.	ATTACHMENT PRESSURE SWITCH
41.	FLOW RE-INJECTION BLOCK (OPTIONAL)
42.	PUMP 1 PRESSURE DETECTOR
43.	PUMP 2 PRESSURE DETECTOR
44.	PUMP REGULATING PRESSURE DETECTOR
45.	PRESSURE SWITCH (OPTIONAL)
46.	BOOM SAFETY VALVE (OPTIONAL)
47.	SHUTTLE BLOCK (OPTIONAL)
48.	POWER BOOST PRESSURE DETECTOR (OPTIONAL)
49.	FILTER
50.	PUMP REGULATING SOLENOID VALVE
51.	SAFETY VALVE RETURN MANIFOLD (OPTIONAL)
52.	SWING PRIORITY BLOCK

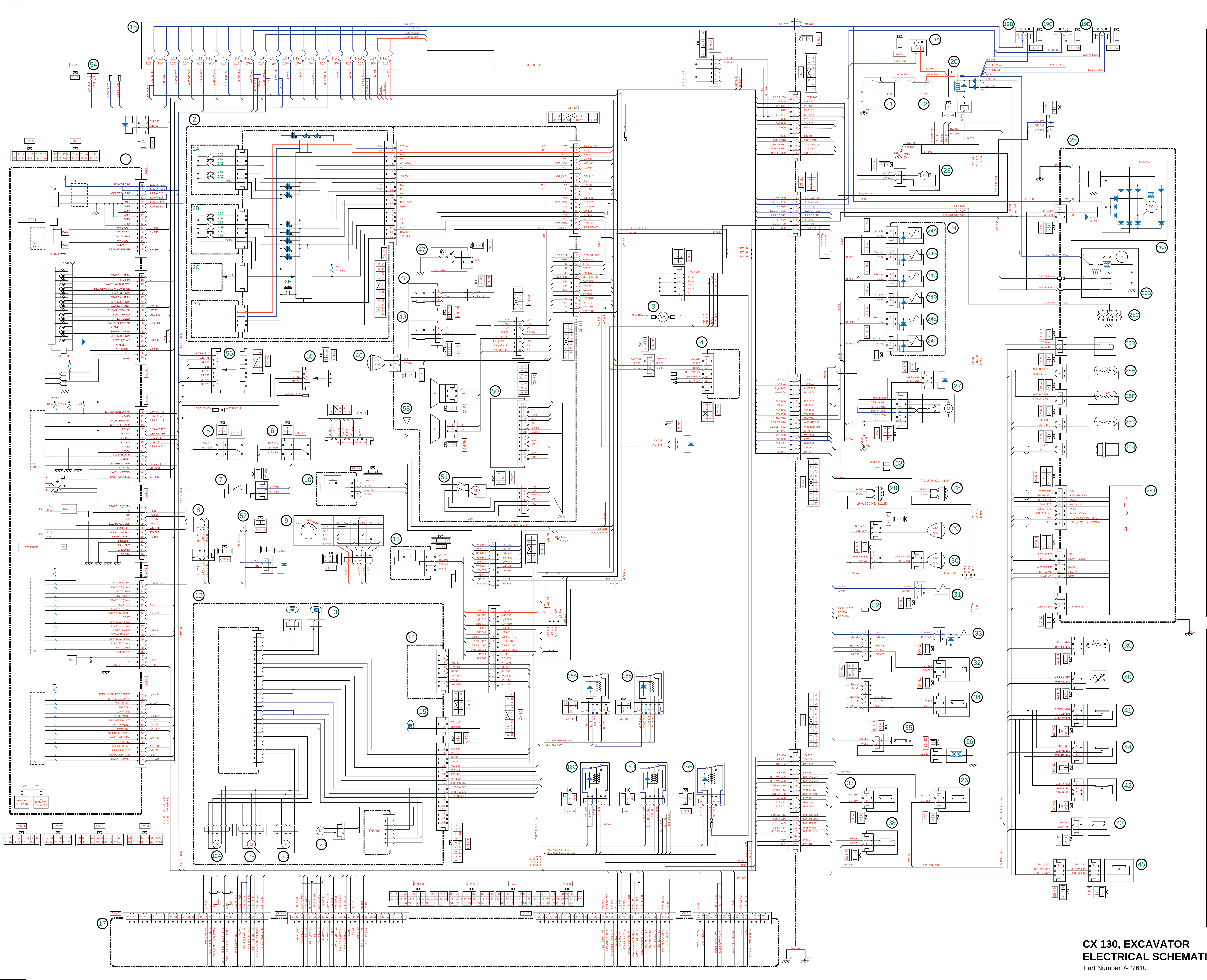
ITEM	PRESSURE SETTING			
1F =	27.9 MPa / 279 bar / 4048 psi	at	107 l/mn	
3G =	38.3 MPa / 383 bar / 5558 psi	at	20 l/mn	
9A =	34.3 MPa / 343 bar / 4977 psi	at	64 l/mn	
	36.3 MPa / 363 bar / 5267 psi	at	56 l/mn	
9B =	38.3 MPa / 383 bar / 5558 psi	at	20 l/mn	
9C =	38.3 MPa / 383 bar / 5558 psi	at	20 l/mn	
9D =	38.3 MPa / 383 bar / 5558 psi	at	20 l/mn	
9E =	2.55 MPa / 25.5 bar / 370 psi	at	35 l/mn	
46G =	38.3 MPa / 383 bar / 5558 psi	at	20 l/mn	

LEGEND

- PUMP 1
- PUMP 2
- PILOT SYSTEM PUMP
- RETURN TO RESERVOIR
- LEAK-OFF RETURN
- SUPPLY CIRCUIT
- PILOT SYSTEM CIRCUIT
- STRIP COLOUR INDICATION ON SOLENOID VALVE WIRE
- COMPONENT BOUNDARY
- HOSE
- PIPING CONNECTION
- PIPING CROSS-OVER
- 41 COMPONENT ITEM NO.
- 9 / 9B1 COMPONENT NUMBER / CONNECTION ITEM NO.
- * OPTIONAL ITEM NO.

CX130 EXCAVATOR
HYDRAULIC SCHEMATIC
Number 7-27610

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ITEM	DESCRIPTION
1.	CONTROLLER
2.	INSTRUMENT PANEL
2A.	SWITCH PANEL (LEFT)
2A1.	TRAVEL SPEED SWITCH
2A2.	WORK MODE SWITCH
2A3.	AUTO MODE SWITCH
2A4.	SOFT/HARD SWITCH
2A5.	BEACON SWITCH
2B.	SWITCH PANEL (RIGHT)
2B1.	BUZZER STOP SWITCH
2B2.	SWING BRAKE SWITCH
2B3.	ENGINE STOP SWITCH
2B4.	WORKING LAMP SWITCH
2B5.	WIPER SWITCH
2B6.	WASHER SWITCH
2C.	MONITOR DISPLAY
2D.	HOUR METER
2E.	BUZZER
3.	CIGARETTE LIGHTER
4.	DC-DC (24V-12V) CONVERTER
5.	OVERLOAD SWITCH
6.	BREAKER/CRUSHER SWITCH
7.	LIMIT SWITCH (GATE)
8.	THROTTLE VOLUME
9.	KEY SWITCH
10.	HORN SWITCH
11.	ONE TOUCH IDLE
12.	AIR CONDITIONER
12A.	MOTOR (AIR CHANGING)
12B.	MOTOR (MODE)
12C.	MOTOR (AIR-MIX)
12D.	BLOWER MOTOR
13.	THERMISTOR
14.	AIR CONDITIONNING SWITCH
15.	SUNLOAD SENSOR
16A.	RELAY-STOP MOTOR
16B.	RELAY-GLOW
16C.	RELAY-HORN
16D.	RELAY-LAMP
16E.	RELAY-BEACON
17.	ENGINE CONTROLLER
18.	FUSE BOX
19A.	MAIN FUSE FOR F11 AND F12 CIRCUITS
19B.	MAIN FUSE FOR F3, F4, F5, F6, F7, F8, F9, F10, F13, F14, F15, F16, F17, F18, F19, AND F20 CIRCUITS
19C.	MAIN FUSE FOR F2 CIRCUIT
19D.	MAIN FUSE FOR F1 CIRCUIT
20.	RELAY BATTERY
21.	BATTERY
22.	BATTERY
23.	WASHER MOTOR
24.	SIX SOLENOID VALVE BANK
24A.	PILOT PRESSURE CONTROL (BLUE TAPE)
24B.	SWING BRAKE (PINK TAPE)
24C.	2 STAGE TRAVEL (RED TAPE)
24D.	2 STAGE RELIEF (YELLOW TAPE)
24E.	SOFT/HARD (LIGHT GREEN TAPE)
24F.	SWING SHUT-OFF (GREEN TAPE)
25.	ENGINE
25A.	ALTERNATOR
25B.	STARTER MOTOR
25C.	GLOW PLUG
25D.	OIL PRESSURE
25E.	TEMPERATURE WATER SENSOR
25F.	TEMPERATURE FUEL SENSOR
25G.	Q ADJUST RESISTOR
25H.	REVOLUTION SENSOR
25J.	ELECTRONIC ACCELERATION
26.	SWING PILOT PRESSURE
27.	ENGINE STOP MOTOR
28.	HORN
29.	LAMP (HOUSE)
30.	LAMP (BOOM)
31.	HYDRAULIC PUMP CONTROL
32.	BREAKER/CRUSHER PILOT PRESSURE
33.	DUAL FLOW AUXILARY (BREAKER/CRUSHER)
34.	BREAKER PILOT PRESSURE
35.	CLUTCH SWITCH
36.	MAGNET CLUTCH
37.	UPPER PILOT PRESSURE (YELLOW TAPE)
38.	TRAVEL PILOT PRESSURE
39.	HYDRAULIC OIL TEMPERATURE SENSOR
40.	FUEL SENSOR
41.	PRESSURE SENSOR (P1)
42.	PRESSURE SENSOR (NEGA-CONT)
43.	RESERVE TANK LSW
44.	PRESSURE SENSOR (P2) (YELLOW TAPE)
45.	PRESSURE SENSOR (HBCV)
46.	LAMP (CAB)
47.	ROOM LAMP
48.	DOOR LIMIT SWITCH
49.	FRONT WINDOW LIMIT SWITCH
50.	WIPER CONTROLLER
51.	WIPER MOTOR
52.	TO FUEL FEED PUMP
53.	TO BEACON
54.	OPTINAL POWER
55.	ENGINE CONTROLLER CHECKER CONNECTOR
56.	CONTROLLER CHECKER CONNECTOR
57.	KAB SEAT
58.	ANTENNA
F1.	FUSE 20A; ENGINE CONTROLLER
F2.	FUSE 20A; COMPUTER CONTROL
F3.	FUSE 20A; COMPUTER POWER
F4.	FUSE 10A; LOCK LEVER (GATE)
F5.	FUSE 15A; LUBRICATOR (NOT USED)
F6.	FUSE 10A; BEACON
F7.	FUSE 20A; FUEL FEED PUMP
F8.	FUSE 15A; ENGINE STOP MOTOR
F9.	FUSE 30A; ENGINE PRE-HEAT
F10.	FUSE 10A; OPTION LINE
F11.	FUSE 10A; BACK-UP
F12.	FUSE 10A; KEY SWITCH, RADIO AND ROOM LAMP
F13.	FUSE 20A; AIR CONDITIONER, HEATER
F14.	FUSE 5A; AIR CONDITIONER COMPRESSOR
F15.	FUSE 15A; WORK LAMP
F16.	FUSE 15A; WORK LAMP (NOT USED)
F17.	FUSE 10A; DC CONVERTER (24V-12V)
F18.	FUSE 15A; WIPER AND WASHER
F19.	FUSE 10A; HORN
F20.	FUSE 10A; CIGARETTE LIGHTER AND KAB SEAT

LEGEND

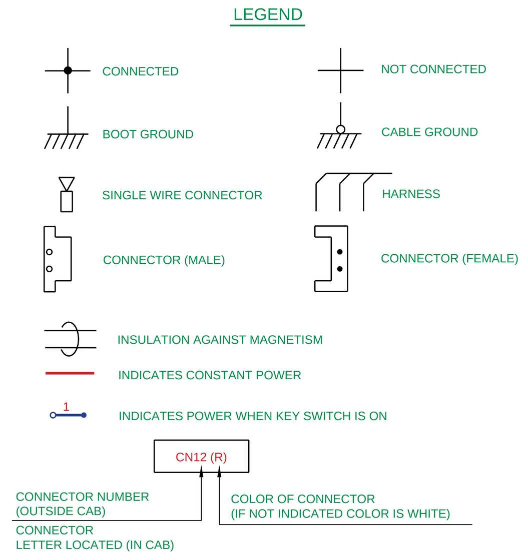


TABLE OF COLOR SYMBOLS

SYMBOL	COLOR
B	BLACK
W	WHITE
Br	BROWN
P	PINK
V	VIOLET
G	GREEN
O	ORANGE
R	RED
Y	YELLOW
Lg	LIGHT GREEN
Sb	SKY BLUE
L	BLUE
Gr	GRAY

NOTE :
1. "BR" INDICATES BLACK CABLE WITH RED STRIPE.
2. WATERPROOF CONNECTORS USED OUTSIDE OF CAB.

CX 130, EXCAVATOR ELECTRICAL SCHEMATIC

Part Number 7-27610