CASE

REPAIR MANUAL

Crawler Excavator

CX210B
CX230B
CX240B

SM210BTOC-0EN

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CRAWLER EXCAVATOR CX210B-CX230B-CX240B
SERVICE MANUAL

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5. EPF (engine protection feature)

This feature controls the engine speed or stopping when the coolant temperature rises, the boost temperature rises, or the oil pressure drops.

Trouble state:

Recovered = State in which trouble recovered from during the key ON cycle

Ongoing = State in which the key was switched OFF, then ON again with the previous trouble underway (or continuing)

		Degree of speed restriction	Explanation
Coolant temperature over 105°C (221°F)	Trouble underway	0: None	-
	Recovered	0: None	-
	Ongoing	0: None	-
Coolant temperature over 110°C (230°F)	Trouble underway	2: Low idle	-
	Recovered	0: None	When the coolant temperature falls below 105°C (221°F), the system recovers and controls returns to normal.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (2 minutes) until judgment starts, the engine speed is restricted to low idle.After that, the status moves to trouble underway or recovered based on the judgment results.
Coolant temperature over 120°C (248°F)	Trouble underway	4: Stop (restart possible)	Engine stop.The engine cannot be restarted until either the key is switched ON again or the coolant temperature recovers to the normal level.
	Recovered	0: None	When the coolant temperature falls below 120°C (248°F), the degree of restriction due to the coolant temperature being over 120°C (248°F)goes to 0 (Normal control). However, if the degree of restriction due to the coolant temperature being over 110°C (230°F) is not 0, that degree of restriction is applied.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (1 minute) until judgment starts, the engine speed is restricted to low idle.After that, the status moves to trouble underway or recovered based on the judgment results.
Boost temperature over 80°C (176°F)	Trouble underway	2: Low idle	-
	Recovered	0: None	When the boost temperature falls below 70°C (158°F), the system recovers and controls returns to normal.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (1 minute) until judgment starts, the engine speed is restricted to low idle. After that, the status moves to trouble underway or recovered based on the judgment results.
Boost temperature over 90°C (194°F)	Trouble underway	4: Stop (restart possible)	Engine stop.The engine cannot be restarted until either the key is switched ON again or the boost temperature recovers to the normal level.
	Recovered	0: None	When the boost temperature falls below 90°C (194°F), the degree of restriction due to the boost temperature being over 90°C (194°F) goes to 0 (Normal control). However, if the degree of restriction due to the boost temperature being over 80°C (176°F) is not 0, that degree of restriction is applied.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (1 minute) until judgment starts, the engine speed is restricted to low idle.After that, the status moves to trouble underway or recovered based on the judgment results.
Engine oil pressure drop	Trouble underway	4: Stop (restart possible)	Engine stop. The engine cannot be restarted until the key is switched ON again. Recovery cannot be judged until the engine is restarted, so the system does not move from trouble underway to be recovered.
	Recovered	0: None	The engine oil pressure recovers to less than 40 kPa (5.8 PSI) and controls returns to normal.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (30 s) until judgment starts, the engine speed is restricted to low idle. After that, the status moves to trouble underway or recovered based on the judgment.

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TROUBLESHOOTING

1) General precautions

Following are countermeasures if you find abnormality during the operation of Kawasaki swash plate type axial piston pump and motor.

General precautions are:

a) Considerations before starting repair.

Determine the characteristics of the abnormality before starting repair. Consider if the cause is originated from the wrong circuit, failure of regulator, or attached valve. Double check that the problem involves the pump motor.

b) Before disassembling a system, make sure to read through the service manual. Conduct the disassembly in a correct manner.

c) When disassembling a system, be careful not to allow dust to enter.

d) Parts are finished precisely. Be careful not to damage them when handling.

2) Troubleshooting for the pump main body

Pumps are often attached to a regulator, attached valves and attached pumps. It can be difficult to find the cause of the problem. Checking the following points is useful to identify the problem area.

a) Filter check and drain oil check

Check the filter element. Check if a considerable amount of contamination is found.

It is normal that a little amount of metal dust originated from abrasion of the shoe or cylinders is seen. However, if the amount of metal dust is extremely high in the filter, the shoe might be damaged. Check drain oil of inside the pump casing, as well.

b) Abnormal noise / abnormal vibration

Check for abnormal noise or abnormal vibration in the main pump. Examine if the sound repeats with regular frequency such as, a hunching sound in the regulator or hunching sound of the valve relief.

If there is an abnormal vibration or sound, cavitation or damage inside the pump should be considered.

c) When using two pumps.

If piping uses two single pumps or two motors, change the pipe of each pump.

By changing the pipe, the problem can be identified whether it is caused by a pump failure or a piping failure after the pump.

4) Perform pressure measurement.

If the problem is related to the controlling function, examine the problem areas using pressure measurement tools instead of performing overhaul inspection.

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MOTOR

1. Travel Motor

1) Travel motor operation explanation

1] Structural diagram

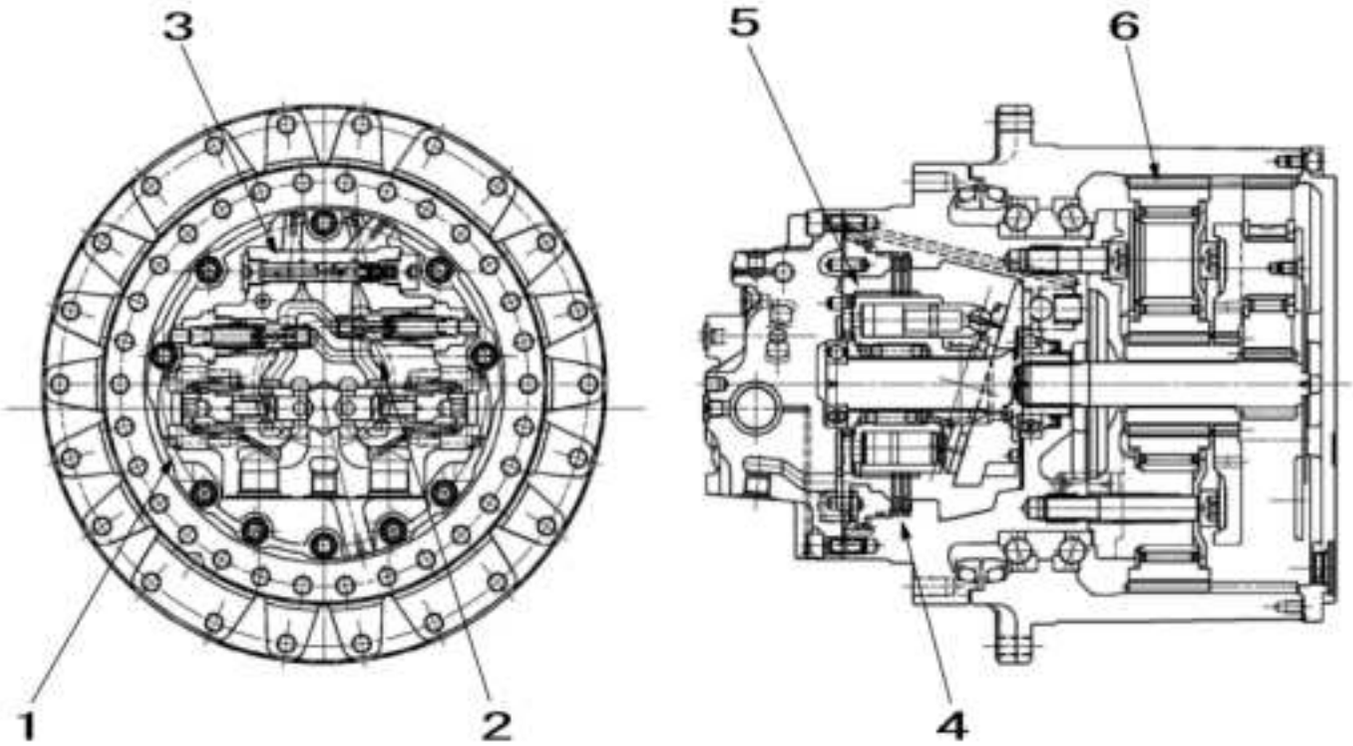


Figure 1 Motor structural diagram

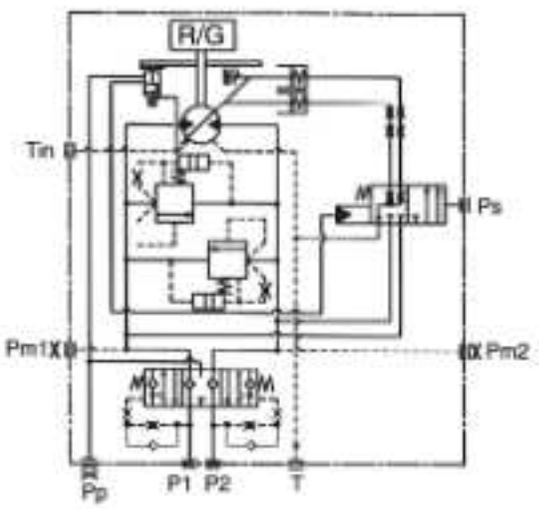


Figure 2 Hydraulic circuit diagram
Automatic 2-speed type

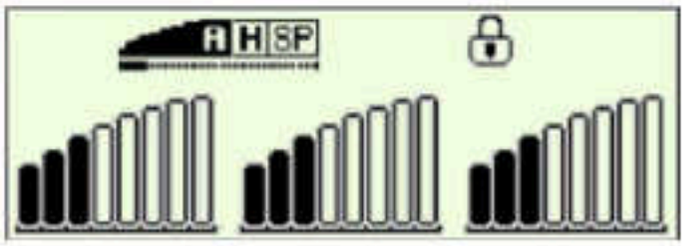
1	Double counter balance valve	4	Parking brake
2	Crossover relief valve	5	Piston motor
3	2-speed switching mechanism	6	Reduction gear

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B) Anti-theft function operation

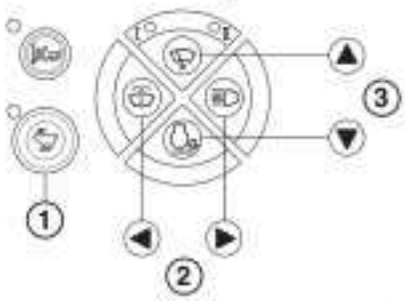
1) Enabling the anti-theft function

1. If the key is switched twice in a row ON => OFF => ON => OFF with the engine stopped, the anti-theft function is switched ON.
   (All the key switching operations must be done within 2 seconds)
2. When the anti-theft comes ON, the monitor buzzes and the "key" icon is displayed.
   (Once the anti-theft is switched ON, this icon is displayed while the power is OFF)



3. The next time the key is switched ON, the anti-theft operates and the password input screen is displayed.
   Input the password made up of 4 digits 0 to 9.
   Input by using the monitor switches below.
   If an incorrect number is input, "ERROR" is displayed and the buzzer buzzes.
   The key must be switched OFF, then ON again before the password can be re-input.



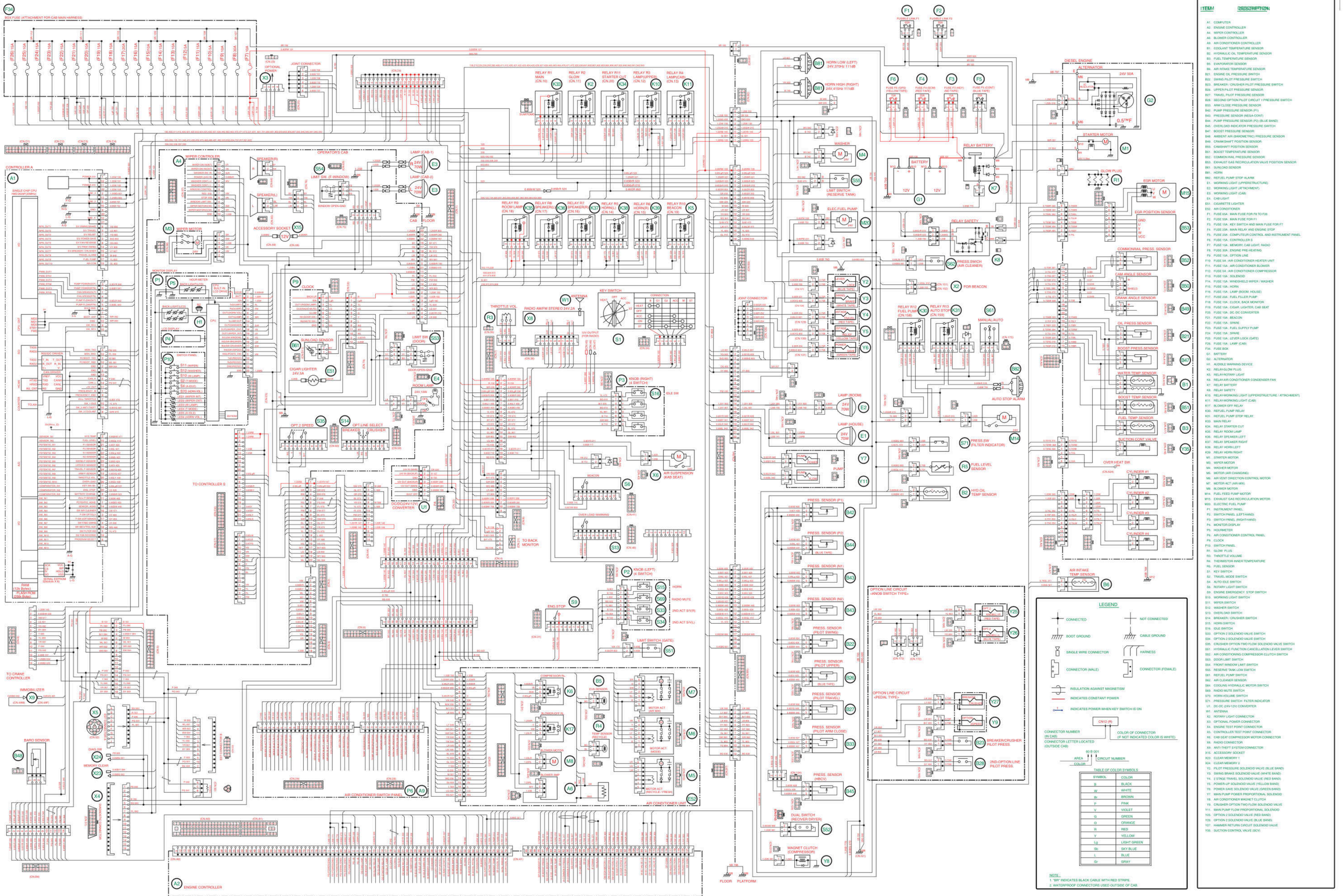


1	Enter	3	Numeric value increase / decrease
2	Cursor movement		

2) Disabling the anti-theft function

1. If the engine is stopped by switching OFF the key, the anti-theft function does not operate.
2. To disable the anti-theft function, disconnect the anti-theft knob terminals VG (purple/green) and BG (black/green). The registered password is canceled.

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ITEM	DESCRIPTION
A1.	COMPUTER
A2.	ENGINE CONTROLLER
A4.	WIPER CONTROLLER
A6.	BLOWER CONTROLLER
A8.	AIR CONDITIONER CONTROLLER
B1.	COOLANT TEMPERATURE SENSOR
B2.	HYDRAULIC OIL TEMPERATURE SENSOR
B3.	FUEL TEMPERATURE SENSOR
B5.	EVAPORATOR SENSOR
B6.	AIR INTAKE TEMPERATURE SENSOR
B21.	ENGINE OIL PRESSURE SWITCH
B22.	SWING PILOT PRESSURE SWITCH
B23.	BREAKER / CRUSHER PILOT PRESSURE SWITCH
B26.	UPPER PILOT PRESSURE SENSOR
B27.	TRAVEL PILOT PRESSURE SENSOR
B28.	SECOND OPTION PILOT CIRCUIT 1 PRESSURE SWITCH
B33.	ARM CLOSE PRESSURE SENSOR
B42.	PUMP PRESSURE SENSOR (P1)
B43.	PRESSURE SENSOR (NEGA-CONT)
B44.	PUMP PRESSURE SENSOR (P2) (BLUE BAND)
B45.	OVERLOAD INDICATOR PRESSURE SWITCH
B47.	BOOST PRESSURE SENSOR
B48.	AMBIENT AIR (BAROMETRIC) PRESSURE SENSOR
B49.	CRANKSHAFT POSITION SENSOR
B50.	CAMSHAFT POSITION SENSOR
B51.	BOOST TEMPERATURE SENSOR
B52.	COMMON RAIL PRESSURE SENSOR
B53.	EXHAUST GAS RECIRCULATION VALVE POSITION SENSOR
B61.	SUNLOAD SENSOR
B81.	HORN
B82.	REFUEL PUMP STOP ALARM
E1.	WORKING LIGHT (UPPERSTRUCTURE)
E2.	WORKING LIGHT (ATTACHMENT)
E3.	WORKING LIGHT (CAB)
E4.	CAB LIGHT
ES1.	CIGARETTE LIGHTER
E52.	AIR CONDITIONER
F1.	FUSE 65A : MAIN FUSE FOR F5 TO F26
F2.	FUSE 50A : MAIN FUSE FOR F1
F3.	FUSE 15A : KEY SWITCH AND MAIN FUSE FOR F7
F4.	FUSE 20A : MAIN RELAY AND ENGINE STOP
F5.	FUSE 20A : COMPUTER,ECU CONTROL AND INSTRUMENT PANEL
F6.	FUSE 15A : CONTROLLER S
F7.	FUSE 10A : MEMORY, CAB LIGHT, RADIO
F8.	FUSE 30A : ENGINE PRE-HEATING
F9.	FUSE 10A : OPTION LINE
F10.	FUSE 5A : AIR CONDITIONER HEATER UNIT
F11.	FUSE 15A : AIR CONDITIONER BLOWER
F12.	FUSE 5A : AIR CONDITIONER COMPRESSOR
F13.	FUSE 10A : SOLENOID
F14.	FUSE 15A : WINDSHIELD WIPER / WASHER
F15.	FUSE 15A : HORN
F16.	FUSE 15A : LAMP (BOOM, HOUSE)
F17.	FUSE 20A : FUEL FILLER PUMP
F18.	FUSE 15A : CLOCK, BACK MONITOR
F19.	FUSE 15A : CIGAR, LIGHTER, CAB SEAT
F20.	FUSE 15A : DC-DC CONVERTER
F21.	FUSE 15A : BEACON
F22.	FUSE 15A : SPARE
F23.	FUSE 15A : FUEL SUPPLY PUMP
F24.	FUSE 15A : SPARE
F25.	FUSE 10A : LEVER LOCK (GATE)
F26.	FUSE 15A : LAMP (CAB)
F34.	FUSE BOX
G1.	BATTERY
G2.	ALTERNATOR
H1.	AUDIBLE WARNING DEVICE
K2.	RELAY-GLOW PLUG
K5.	RELAY-ROTARY LIGHT
K6.	RELAY-AIR CONDITIONER CONDENSER FAN
K7.	RELAY BATTERY
K8.	RELAY SAFETY
K16.	RELAY-WORKING LIGHT (UPPERSTRUCTURE / ATTACHMENT)
K11.	RELAY-WORKING LIGHT (CAB)
K17.	BLOWER OFF RELAY
K30.	REFUEL PUMP RELAY
K31.	REFUEL PUMP STOP RELAY
K33.	MAIN RELAY
K34.	RELAY STARTER CUT
K35.	RELAY ROOM LAMP
K36.	RELAY SPEAKER LEFT
K37.	RELAY SPEAKER RIGHT
K38.	RELAY HORN LEFT
K39.	RELAY HORN RIGHT
M1.	STARTER MOTOR
M3.	WIPER MOTOR
M4.	WASHER MOTOR
M5.	MOTOR (AIR CHANGING)
M6.	AIR VENT DIRECTION CONTROL MOTOR
M7.	MOTOR ACT (AIR MIX)
M8.	BLOWER MOTOR
M14.	FUEL FEED PUMP MOTOR
M15.	EXHAUST GAS RECIRCULATION MOTOR
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R3.	THROTTLE VOLUME
R4.	THERMISTOR (INNER TEMPERATURE
R5.	FUEL SENSOR
S1.	KEY SWITCH
S2.	TRAVEL MODE SWITCH
S4.	AUTO IDLE SWITCH
S6.	ROTARY LIGHT SWITCH
S9.	ENGINE EMERGENCY STOP SWITCH
S10.	WORKING LIGHT SWITCH
S11.	WIPER SWITCH
S12.	WASHER SWITCH
S13.	OVERLOAD SWITCH
S14.	BREAKER / CRUSHER SWITCH
S15.	HORN SWITCH
S16.	IDLE SWITCH
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S34.	OPTION 2 SOLENOID VALVE SWITCH
S35.	CRUSHER OPTION TWO FLOW SOLENOID VALVE SWITCH
S51.	HYDRAULIC FUNCTION CANCELLATION LEVER SWITCH
S52.	AIR CONDITIONING COMPRESSOR CLUTCH SWITCH
S53.	DOOR LIMIT SWITCH
S54.	FRONT WINDOW LIMIT SWITCH
S55.	RESERVE TANK LOW SWITCH
S61.	REFUEL PUMP SWITCH
S62.	AIR CLEANER SENSOR
S64.	COOLING HYDRAULIC MOTOR SWITCH
S69.	RADIO MUTE SWITCH
S70.	HORN VOLUME SWITCH
S71.	PRESSURE SWITCH FILTER INDICATOR
U1.	DC-DC 24V-12V) CONVERTER
W1.	ANTENNA
X2.	ROTARY LIGHT CONNECTOR
X3.	OPTIONAL POWER CONNECTOR
X4.	ENGINE TEST POINT CONNECTOR
X5.	CONTROLLER TEST POINT CONNECTOR
X6.	CAB SEAT COMPRESSOR MOTOR CONNECTOR
X8.	RADIO CONNECTOR
X9.	ANTI-THEFT SYSTEM CONNECTOR
X15.	ACCESSORY SOCKET
X22.	CLEAR MEMORY 1
X24.	CLEAR MEMORY 2
Y2.	PILOT PRESSURE SOLENOID VALVE (BLUE BAND)
Y3.	SWING BRAKE SOLENOID VALVE (WHITE BAND)
Y4.	2 STAGE TRAVEL SOLENOID VALVE (RED BAND)
Y5.	POWER-UP SOLENOID VALVE (YELLOW BAND)
Y6.	POWER SAVE SOLENOID VALVE (GREEN BAND)
Y7.	MAIN PUMP POWER PROPORTIONAL SOLENOID
Y8.	AIR CONDITIONER MAGNET CLUTCH
Y9.	CRUSHER OPTION TWO FLOW SOLENOID VALVE
Y11.	MAIN PUMP FLOW PROPORTIONAL SOLENOID
Y25.	OPTION 2 SOLENOID VALVE (RED BAND)
Y26.	OPTION 2 SOLENOID VALVE (BLUE BAND)
Y27.	HAMMER RETURN CIRCUIT SOLENOID VALVE
Y35.	SUCTION CONTROL VALVE (SCV)

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