PART NO. TOKHA90-EN-00

HITACHI

Reliable solutions

Technical Manual
Operational Principle

EX8000-7
Hydraulic Excavator
FCO Cummins engine

BACKHOE FRONT

Service Manual consists of the following separate Part No.
Technical Manual (Operational Principle) : Vol. No.TOKHA90-EN
Technical Manual (Troubleshooting) : Vol. No.TTKHA90-EN
Workshop Manual : Vol. No.WKHA90-EN

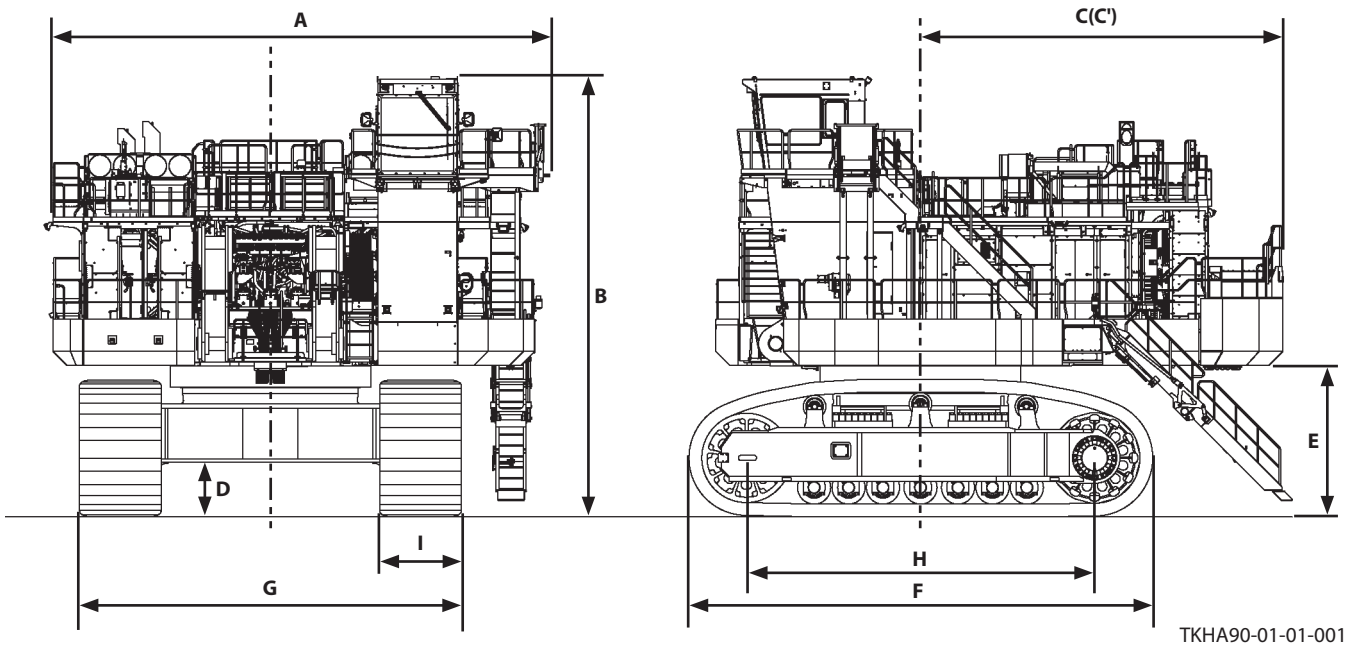
EX8000-7 HYDRAULIC EXCAVATOR TECHNICAL MANUAL OPERATIONAL PRINCIPLE

TOKHA90-EN-00

Hitachi Construction Machinery Co., Ltd.

PRINTED IN JAPAN (K) 2019, 06

Specifications

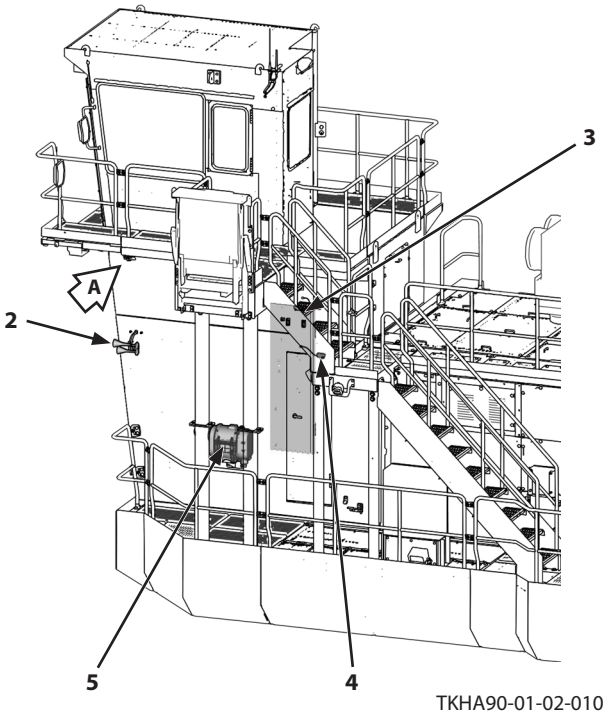


TKHA90-01-01-001

Model	EX8000-7 Hydraulic Excavator	
Type of Front-End Attachment	Loader Front	Backhoe Front
Bucket Capacity (Heaped)	PCSA 43.0 m^3 (56.2 yd^3)	PCSA 43.0 m^3 (56.2 yd^3)
Operating Weight	827000 kg (1823300 lb)	839000 kg (1849700 lb)
Engine	Cummins QSKTA60-CE	
Engine Power	1450 kW/1800 min^{-1} (1970 PS/1800 rpm) ×2	
A: Overall Width	11260 mm (36 ft 11 in)	
B: Cab Height	*9900 mm (32 ft 6 in)	
C: Rear End Swing Radius	8480 mm (27 ft 10 in)	
C': Rear End Length	8210 mm (26 ft 11 in)	
D: Minimum Ground Clearance	*1250 mm (4 ft 1 in)	
E: Counterweight Clearance	*3430 mm (11 ft 3 in)	
F: Undercarriage Length	10500 mm (34 ft 5 in)	
G: Undercarriage Width	8650 mm (28 ft 5 in)	
H: Sprocket Center to Idler Center	7900 mm (25 ft 11 in)	
I: Track Shoe Width	1850 mm (6 ft 1 in) (Grouser shoe)	
Ground Pressure	249 kPa (36.1 psi)	252 kPa (36.6 psi)
Swing Speed	3.2 min^{-1} (rpm)	
Travel Speed (Fast/Slow)	2.0/1.4 km/h (1.2/0.9 mph)	
Gradeability	30° (tanθ = 0.58)	

*NOTE: * The dimensions do not include the height of the shoe lug.*

Electrical System (Around Cab Bed)



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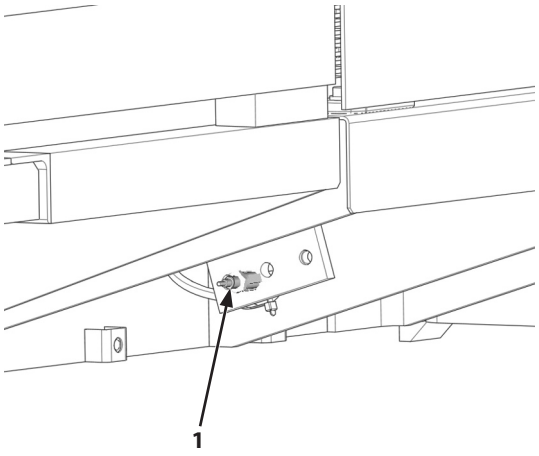
View A



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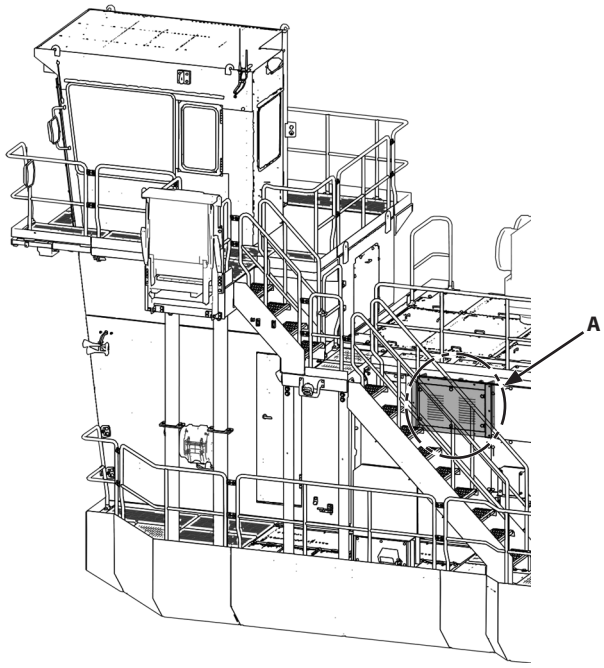
1- Ambient Air Temperature Sensor 1
2- Horn
3- Limit Switch 2 (Cab Bed Door (R))
4- Limit Switch 1 (Cab Bed Door (L))
5- Air Cleaner (For Cab Bed Pressurization)

Electrical System (Left Pump Compartment Controller Box)



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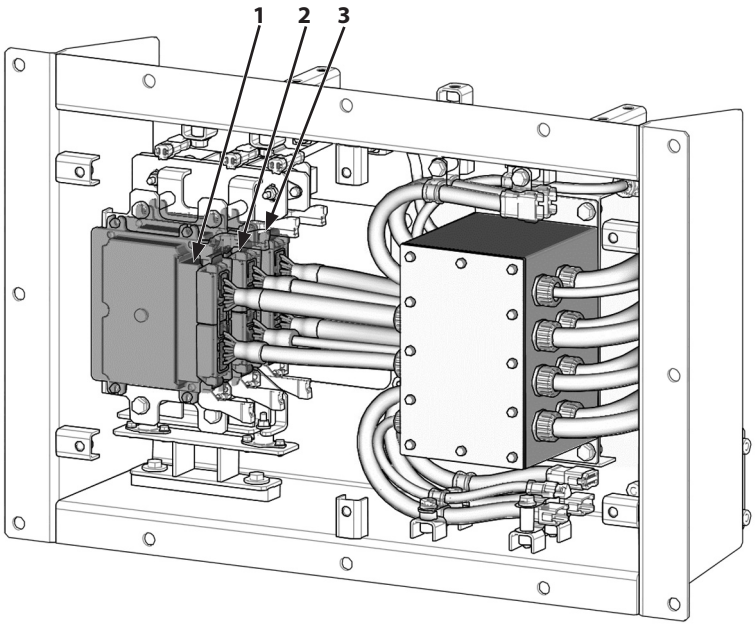
Detail A



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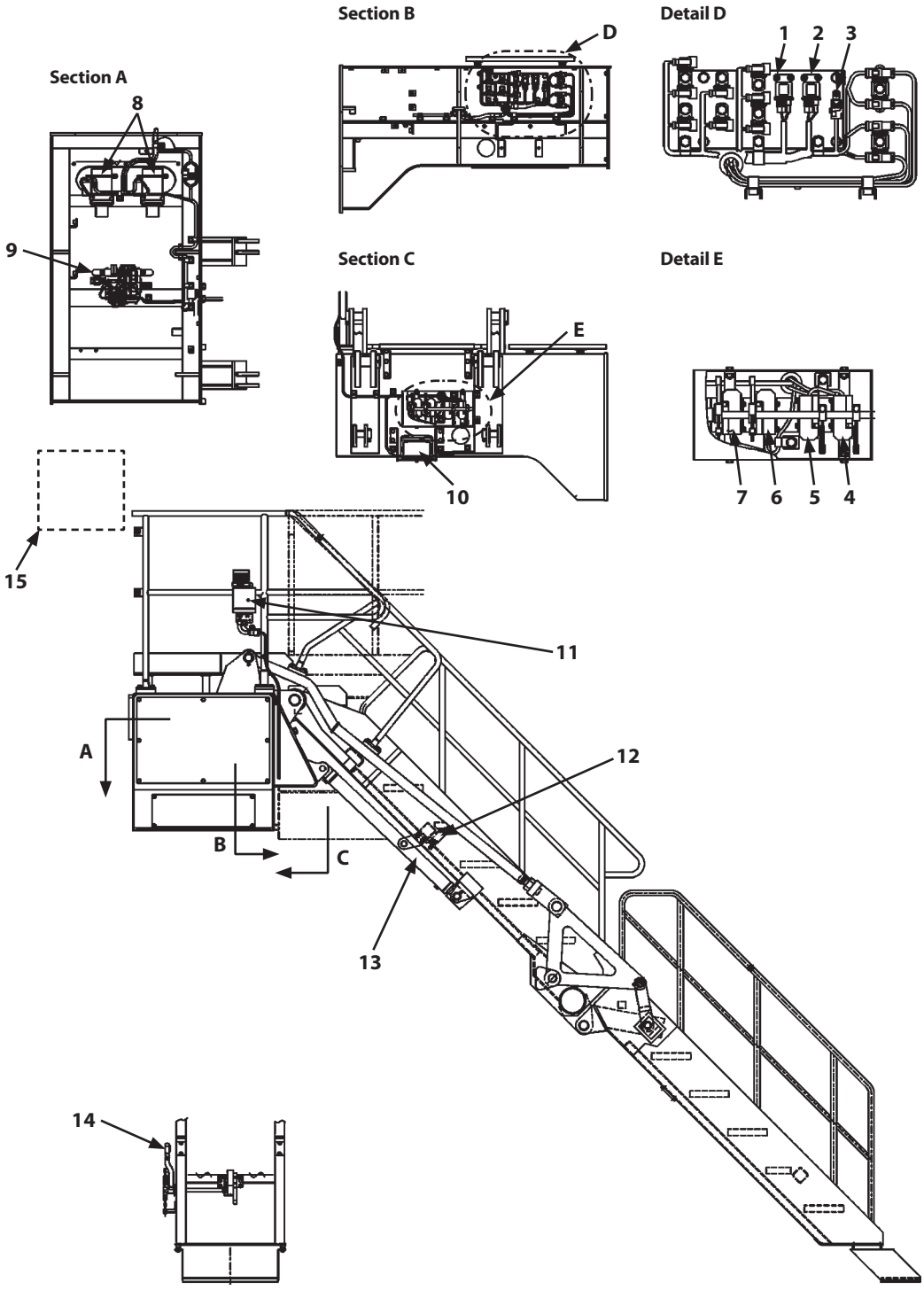
1- EHU (L) 2- PMU (L) 3- PFU (L)

Folding Stairway

Folding Stairway



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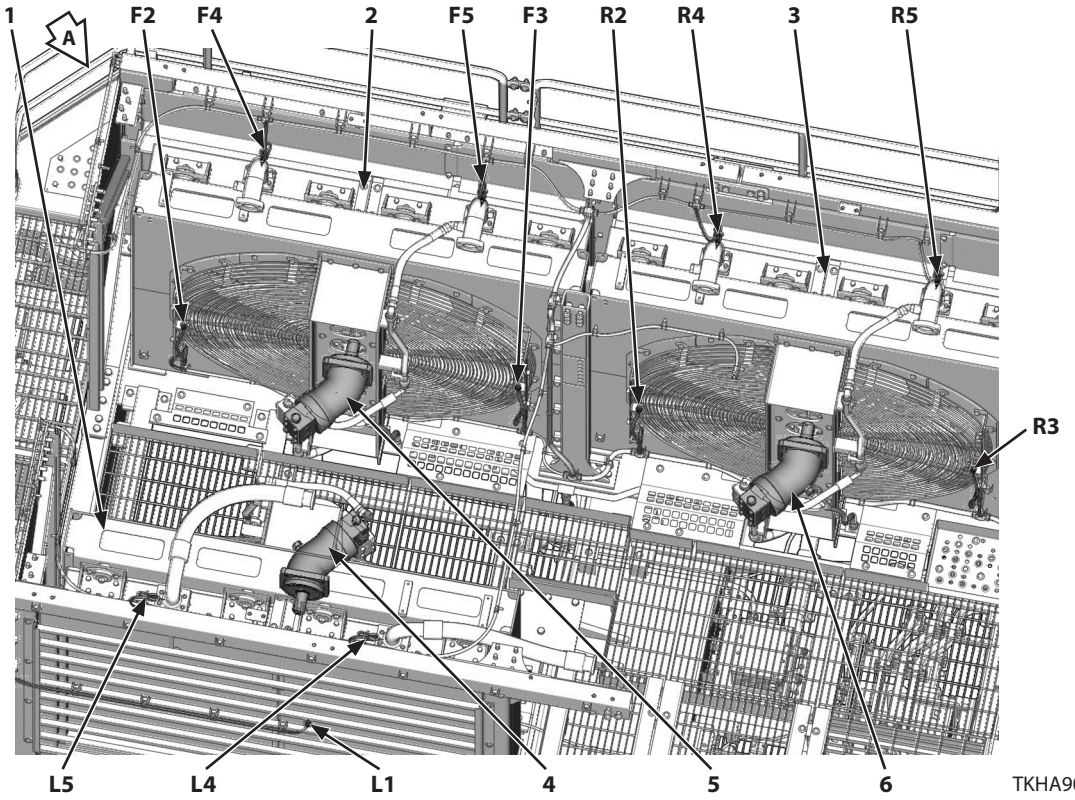
1- Folding Stairway Relay 2
2- Folding Stairway Relay 3
3- Folding Stairway Relay 4
4- Limit Switch (For Extending Detection)
5- Limit Switch (For Extending Stroke End Control)
6- Limit Switch (For Retracting Stroke End Control)
7- Limit Switch (For Retracting Detection)
8- Folding Stairway Pump
9- Valve Unit (Refer to T1-2-29.)
10- Work Light (For Folding Stairway)
11- Folding Stairway Alarm/Flash Light
12- Limit Switch (Pilot Lock Lever)
13- Folding Stairway Cylinder
14- Folding Stairway Relay Lock Lever
15- Switch Box (Refer to T1-2-28.)

Around Oil Cooler



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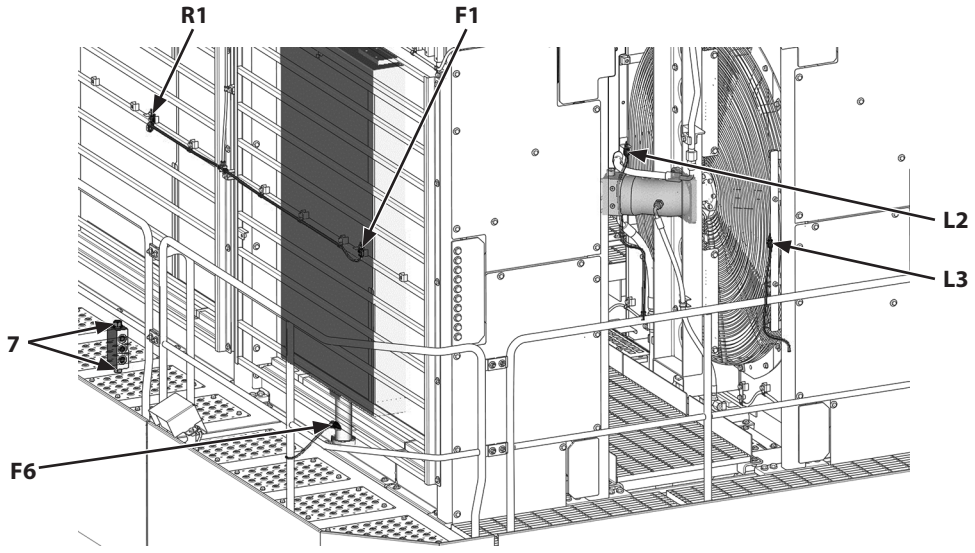
View A



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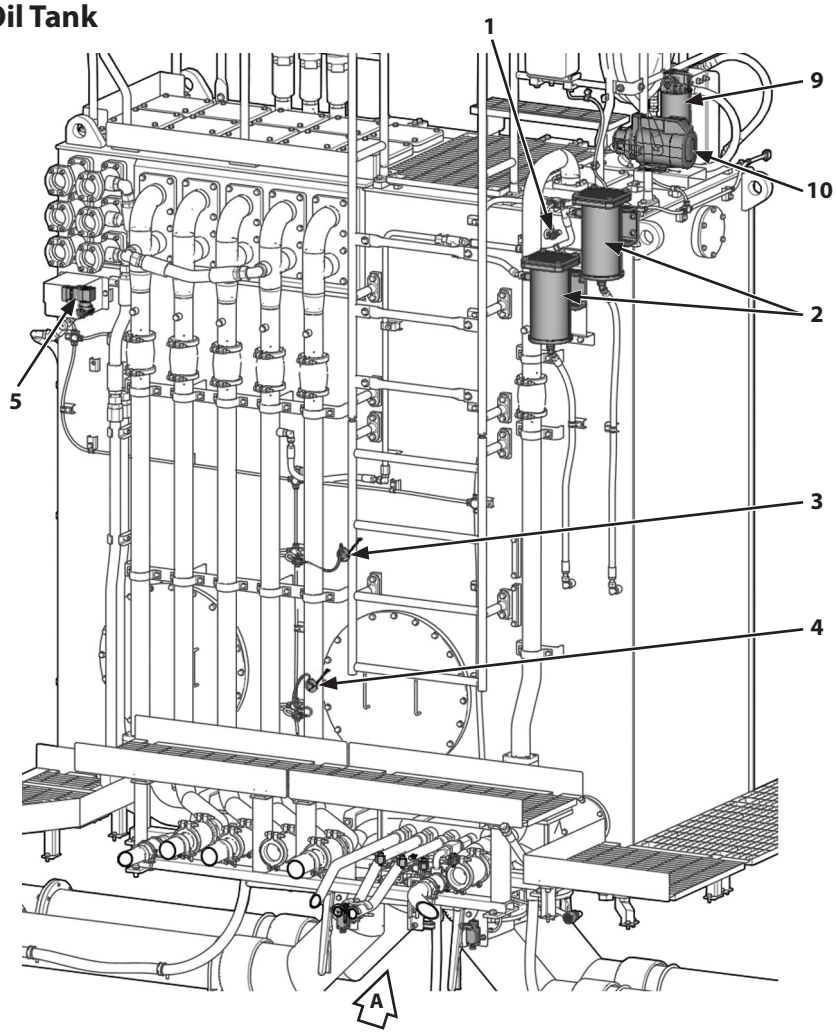
1- Oil Cooler 1
2- Oil Cooler 2
3- Oil Cooler 3
4- Oil Cooler Fan Motor 1
5- Oil Cooler Fan Motor 2
6- Oil Cooler Fan Motor 3
7- Check Valve (2 Used)

L1- Oil Cooler 1 Front Air Temperature Sensor
L2- Oil Cooler 1 Rear Air Temperature Sensor 1
L3- Oil Cooler 1 Rear Air Temperature Sensor 2
L4- Oil Cooler 1 Outlet Hydraulic Oil Temperature Sensor 1
L5- Oil Cooler 1 Outlet Hydraulic Oil Temperature Sensor 2

F1- Oil Cooler 2 Front Air Temperature Sensor
F2- Oil Cooler 2 Rear Air Temperature Sensor 1
F3- Oil Cooler 2 Rear Air Temperature Sensor 2
F4- Oil Cooler 2 Outlet Hydraulic Oil Temperature Sensor 1
F5- Oil Cooler 2 Outlet Hydraulic Oil Temperature Sensor 2
F6- Oil Cooler Inlet Hydraulic Oil Temperature Sensor

R1- Oil Cooler 3 Front Air Temperature Sensor
R2- Oil Cooler 3 Rear Air Temperature Sensor 1
R3- Oil Cooler 3 Rear Air Temperature Sensor 2
R4- Oil Cooler 3 Outlet Hydraulic Oil Temperature Sensor 1
R5- Oil Cooler 3 Outlet Hydraulic Oil Temperature Sensor 2

Around Hydraulic Oil Tank



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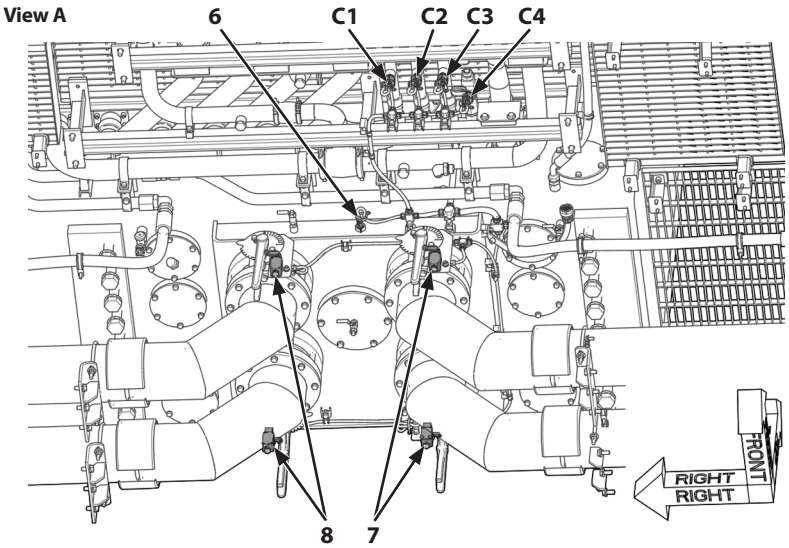

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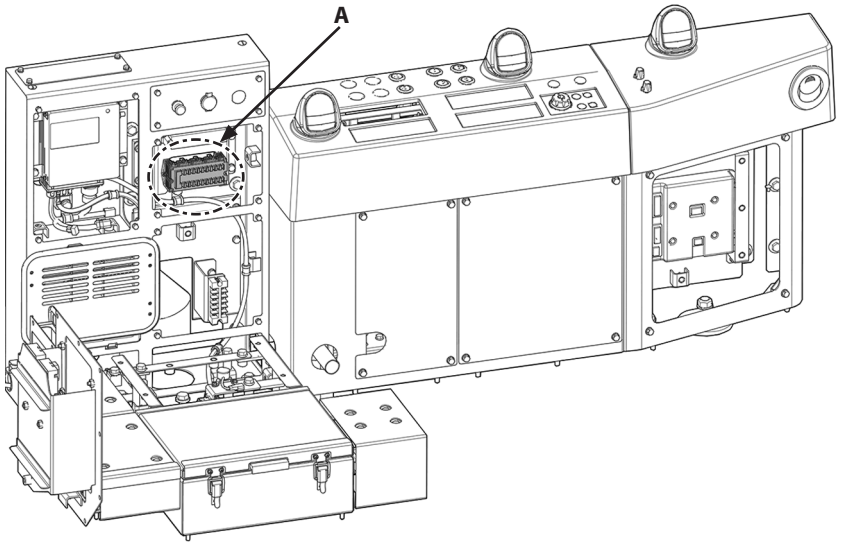
C1- Contamination Sensor (Swing Motors Right Front, Right Rear)
C2- Contamination Sensor (Swing Motors Center Front, Center Rear)
C3- Contamination Sensor (Swing Motors Left Front, Left Rear)
C4- Contamination Sensor (Travel Motor)

1- Pressure Sensor (For Hydraulic Oil Tank)
2- Bypass Filter (2 Used)
3- Hydraulic Oil Level Check Switch
4- Hydraulic Oil Level Warning Switch
5- Air Bleeding Solenoid Valve
6- Hydraulic Oil Temperature Sensor
7- Valve Limit Switch (L-Suction) (2 Used)
8- Valve Limit Switch (R-Suction) (2 Used)
9- Electric Pump Filter (Option)
10- Electric Pump (Option)

Layout of Fuse

Left Console (Rear Side)



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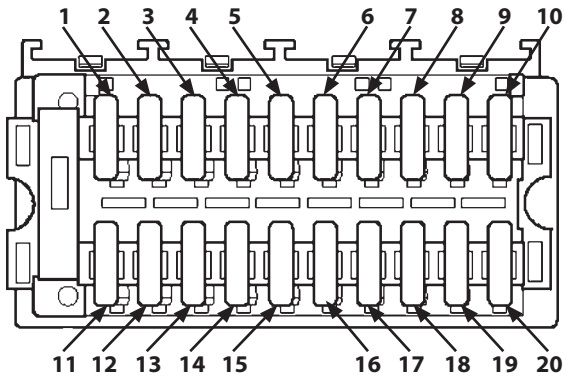
Detail A



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Fuse Box (Cab 1)

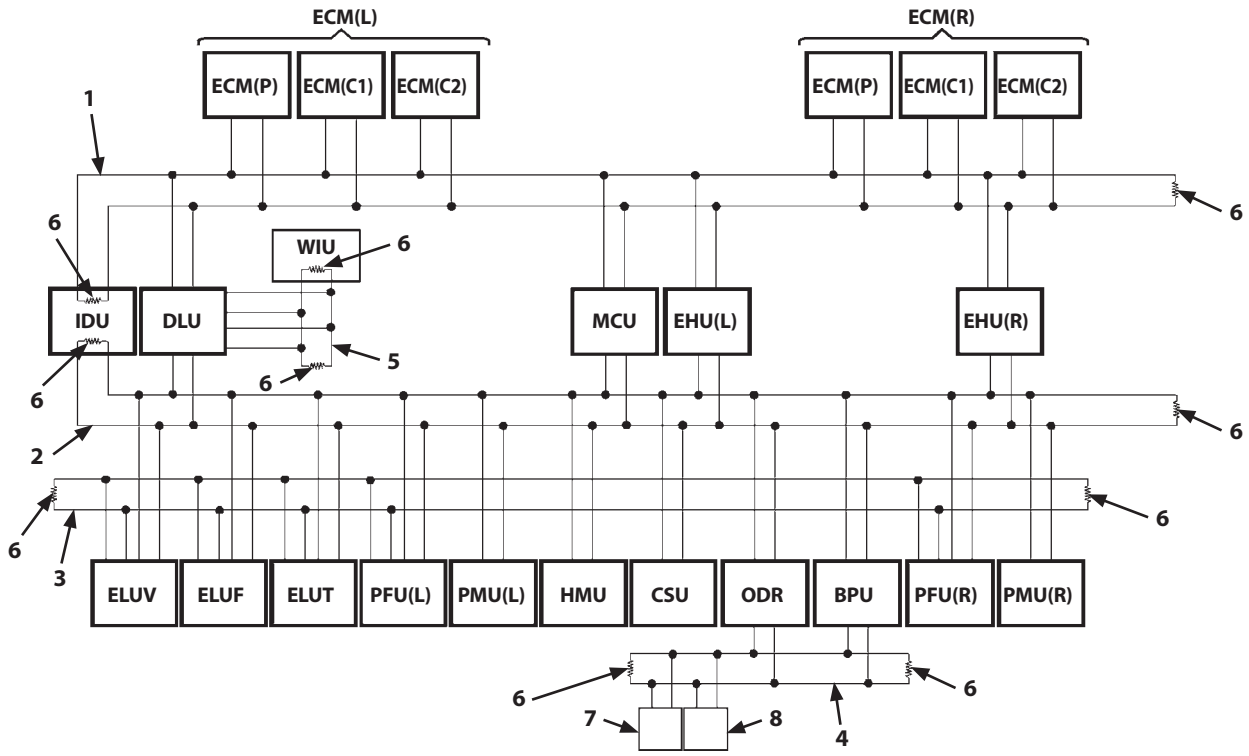
Fuse No.	Capacity	Connected to
1	20A	Key Switch (Main Power)
2	5A	ELUF, ELUT (Main Power)
3	5A	IDU (Battery Power)
4	5A	DLU (Main Power)
5	5A	Satellite Terminal (Option) (Battery Power)
6	5A	Radio (Backup Power)
7	5A	ELUF, ELUT (Key Switch ON Signal)
8	5A	IDU (Key Switch ON Signal)
9	5A	DLU (Key Switch ON Signal)
10	5A	Buzzer
11	10A	Control Unit (Key Switch ON Signal)
12	15A	Monitoring Unit (Key Switch ON Signal)
13	5A	ECM (Key Switch ON Signal)
14	5A	Horn Relay, Horn Air Compressor Relay (Power)
15	10A	Cigar Lighter (Power)
16	10A	Power Source Terminal (ACC)
17	15A	Power Source Terminal (12 V)
18	5A	Radio (Power)
19	10A	12V Socket (Power)
20	5A	Pilot Shut-Off Lever Switch (Key Switch ON Signal)

IMPORTANT: This list shows design specifications, which are not servicing standards.

Performance		
Fuel Consumption (When rated, Gross)		204 g/kW·h (150 g/PS·h)
Maximum Output Torque (Gross)		8364 N·m/1500 min^{-1} (6170 lbf·ft/1500 rpm)
No Load Speed	Fast:	1900 ± 30 min^{-1} (rpm)
	Slow:	800 ± 30 min^{-1} (rpm)

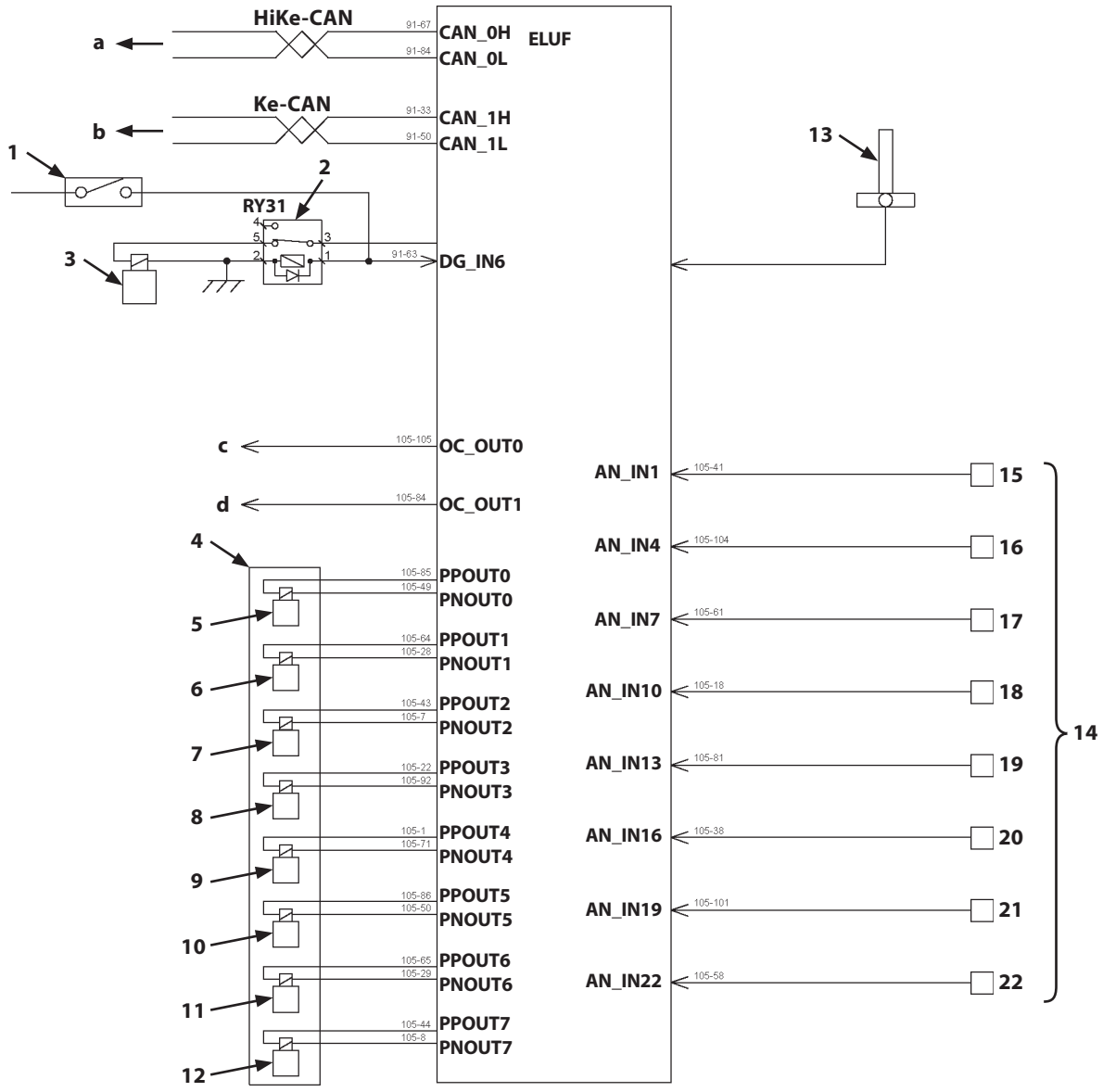
PRESSURE SWITCH	Auto-Lubrication Device	23.5 Mpa (3410 psi)		
GREASE PUMP	Grease Maximum Delivery Pressure	24.5±0.5 Mpa (3550 ± 73 psi)		
	Grease Delivery Amount	9.6 L/min (2.5 US gpm)		
GREASE TANK LEVEL SWITCH	Application	For Grease Level Indicator		
	Type	Electrostatic Capacity Type	Grease Capacity	1000 L (264 US gal) (Grease Tank)

AIR CONDITIONER	Refrigerant	134 a
	Cooling Ability	over 4.5 kW (6.1 PS)
	Cool Air Volume	over 550 m^3 (720 yd^3)
	Heating Ability	over 5.8 kW (7.9 PS)
	Warm Air Volume	over 390 m^3 (510 yd^3)
	Temperature Adjusting System	Electronic Type
	Refrigerant Quantity	Refrigeration Cycle 1 (Air Conditioner (Right)) = 1100±50 g (2.4±0.1 lb) Refrigeration Cycle 2 (Air Conditioner (Left)) = 1200±50 g (2.6±0.1 lb) Refrigeration Cycle 3 (Air Conditioner (Rear)) = 1200±50 g (2.6±0.1 lb)
	Compressor Oil Quantity	180 cm^3 (11 in^3)



TKHA90-02-01-002

1- J1939-CAN
2- Ke-CAN
3- HiKe-CAN
4- HiSe-CAN
5- DLU-CAN
6- Termination Resistor (120 Ω)
7- Swing Angular Rate Sensor (Upperstructure)
8- Swing Angular Rate Sensor (Undercarriage)



TKGB-02-01-022

a- To ELUT, ELUV, PFU (L), PFU (R)

b- To MCU, IDU, DLU, ELUT, ELUV

c- Warning Light LED (Yellow)

d- Warning Light LED (Red)

1- Pilot Shut-Off Lever Switch
2- Pilot Shut-Off Solenoid Valve Relay
3- Pilot Shut-Off Solenoid Valve
4- EDQR Valves (Upper, Lower)
5- Boom Raise Solenoid Valve
6- Boom Lower Solenoid Valve
7- LD: Bucket Tilt-Out Solenoid Valve/BH: Bucket Roll-Out Solenoid Valve
8- LD: Bucket Tilt-In Solenoid Valve/BH: Bucket Roll-In Solenoid Valve
9- Swing Left Solenoid Valve
10- Swing Right Solenoid Valve
11- LD: Arm Extend Solenoid Valve/BH: Arm Roll-In Solenoid Valve
12- LD: Arm Retract Solenoid Valve/BH: Arm Roll-Out Solenoid Valve
13- Electric Control Lever (Front Attachment, Swing)
14- Pilot Pressure Sensor
15- Boom Raise
16- Boom Lower
17- LD: Arm Extend/BH: Arm Roll-In
18- LD: Arm Retract/BH: Arm Roll-Out
19- Swing Left
20- Swing Right
21- LD: Bucket Tilt-Out/BH: Bucket Roll-Out
22- LD: Bucket Tilt-In/BH: Bucket Roll-In

NOTE: LD: Loading Shovel
BH: Backhoe

IDU: Information Display Unit (Information Display Controller)

Outline

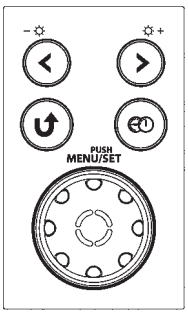
IDU receives the data by using the CAN communication and key pad. IDU displays the data on the monitor display.

- Meter Display
  The display data such as the meter data and machine model information is sent to IDU from other controllers (MCU, ECM (L), ECM (R), PFU (L), PFU (R), ELUF, DLU, HUM, and ODR). IDU displays these data on the monitor display.

Meter Display Item
1- Engine Coolant Temperature Gauge (L)
2- Engine Oil Temperature Gauge (L)
3- Engine Oil Pressure Gauge (L)
4- Engine Speed meter (L)
5- Engine Coolant Temperature Gauge (R)
6- Engine Oil Temperature Gauge (R)
7- Engine Oil Pressure Gauge (R)
8- Engine Speed Meter (R)
9- Machine Inclination/Travel Indicator
10- Grease Gauge
11- Fuel Gauge
12- Hydraulic Oil Temperature Gauge

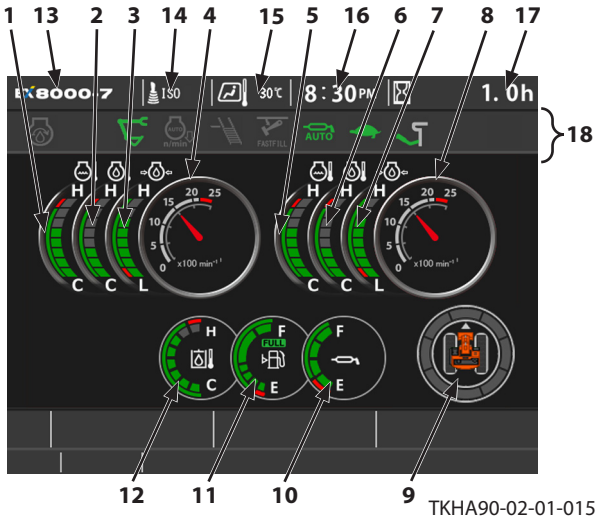
Other Display Item
13- Machine Model
14- Operating Pattern of Electric Control Levers
15- Ambient Temperature Gauge
16- Clock
17- Hour Meter
18- Status Indication (Refer to T2-1-28.)

Key Pad



TKEB-05-05-003

Monitor Display



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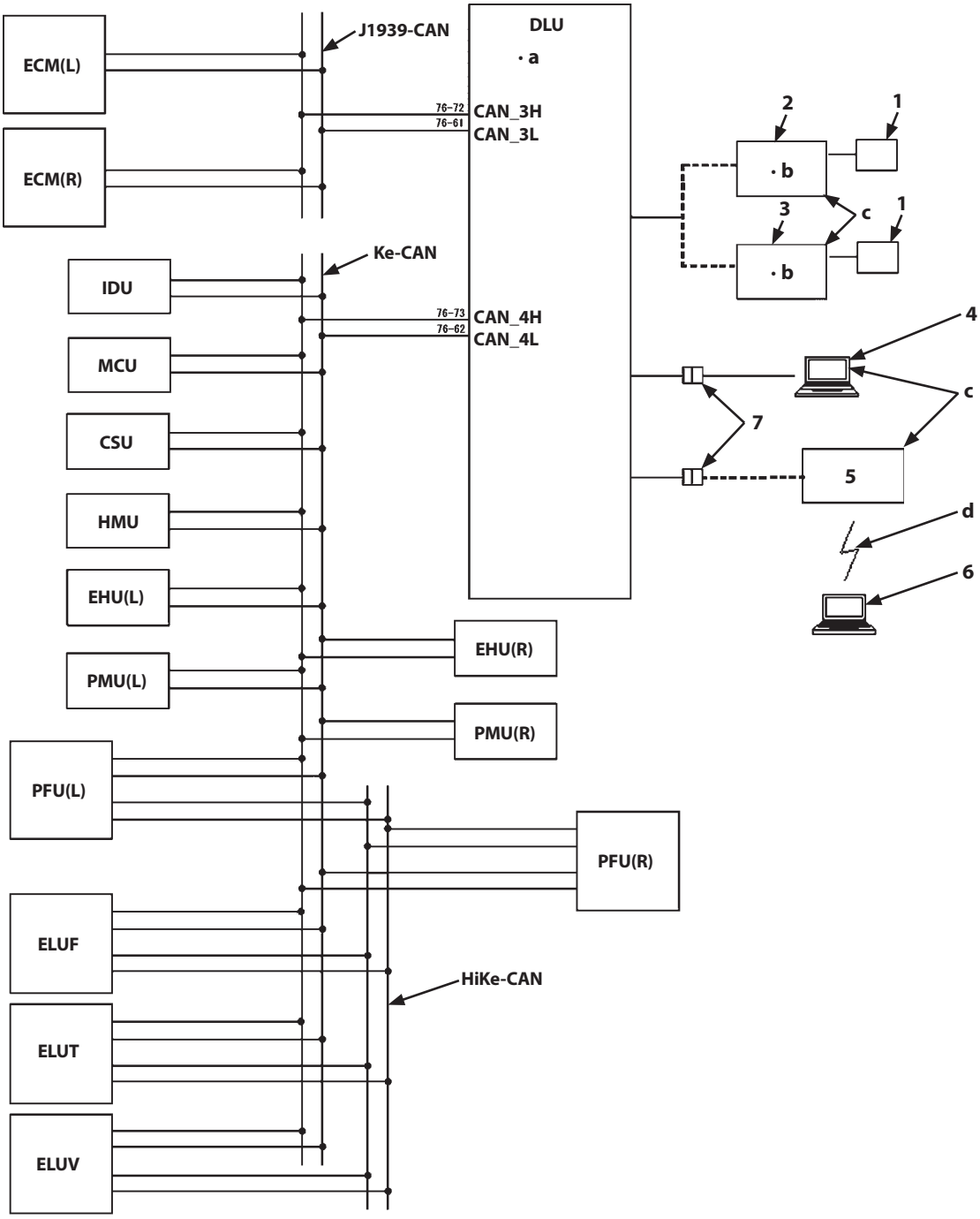
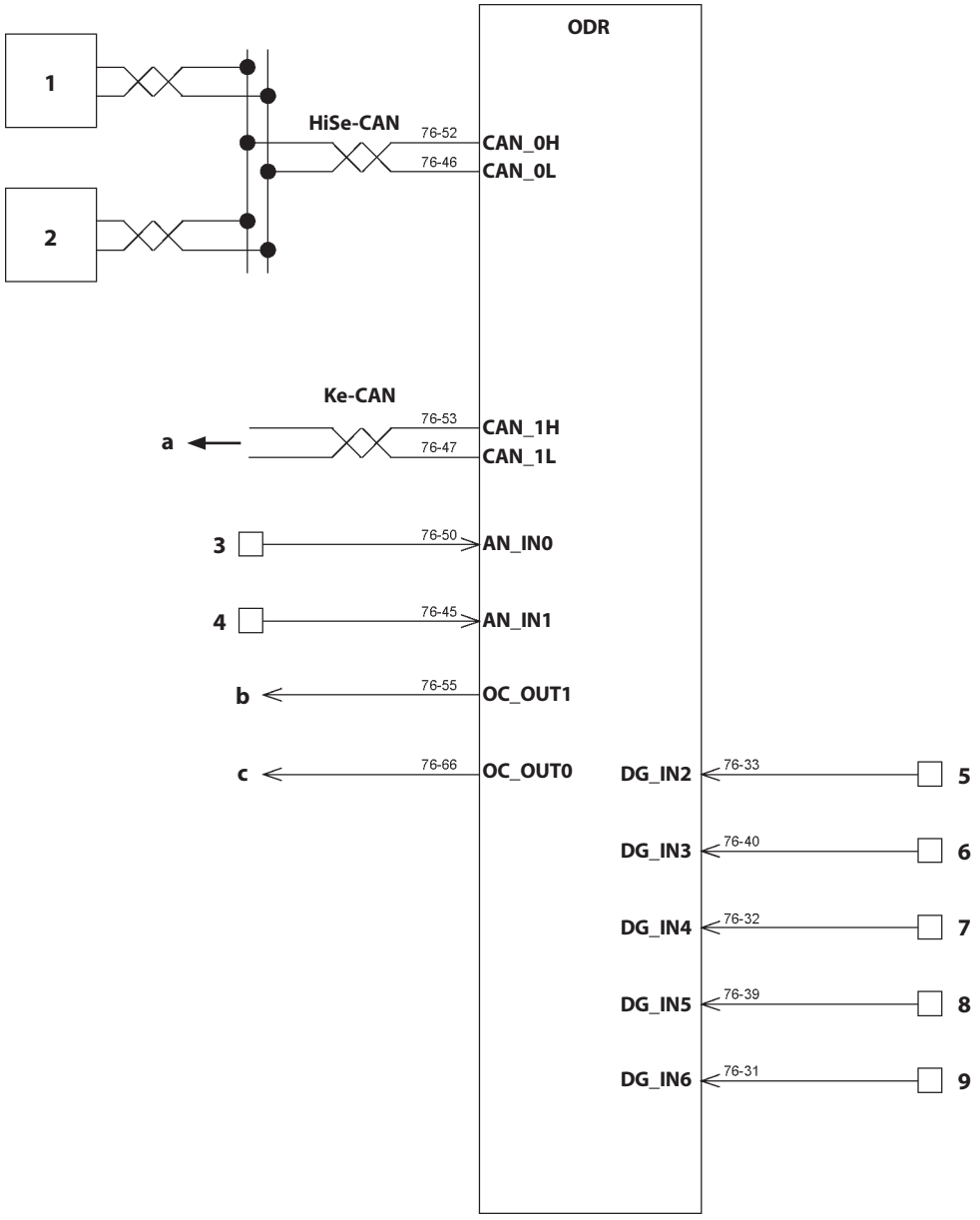


TKHA90-02-01-010

a- Built-In Clock
b- GPS Receiver
c- Connect to one side or the other.
d- Wi-Fi Communication

1- GPS Antenna
2- Satellite Communication Terminal (Option)
3- Mobile Communication Terminal (Option)
4- PC (MPDr. software installed)
5- WIU (Option)
6- PC (Special software installed)
7- Download Connector (Only one place can be used.)



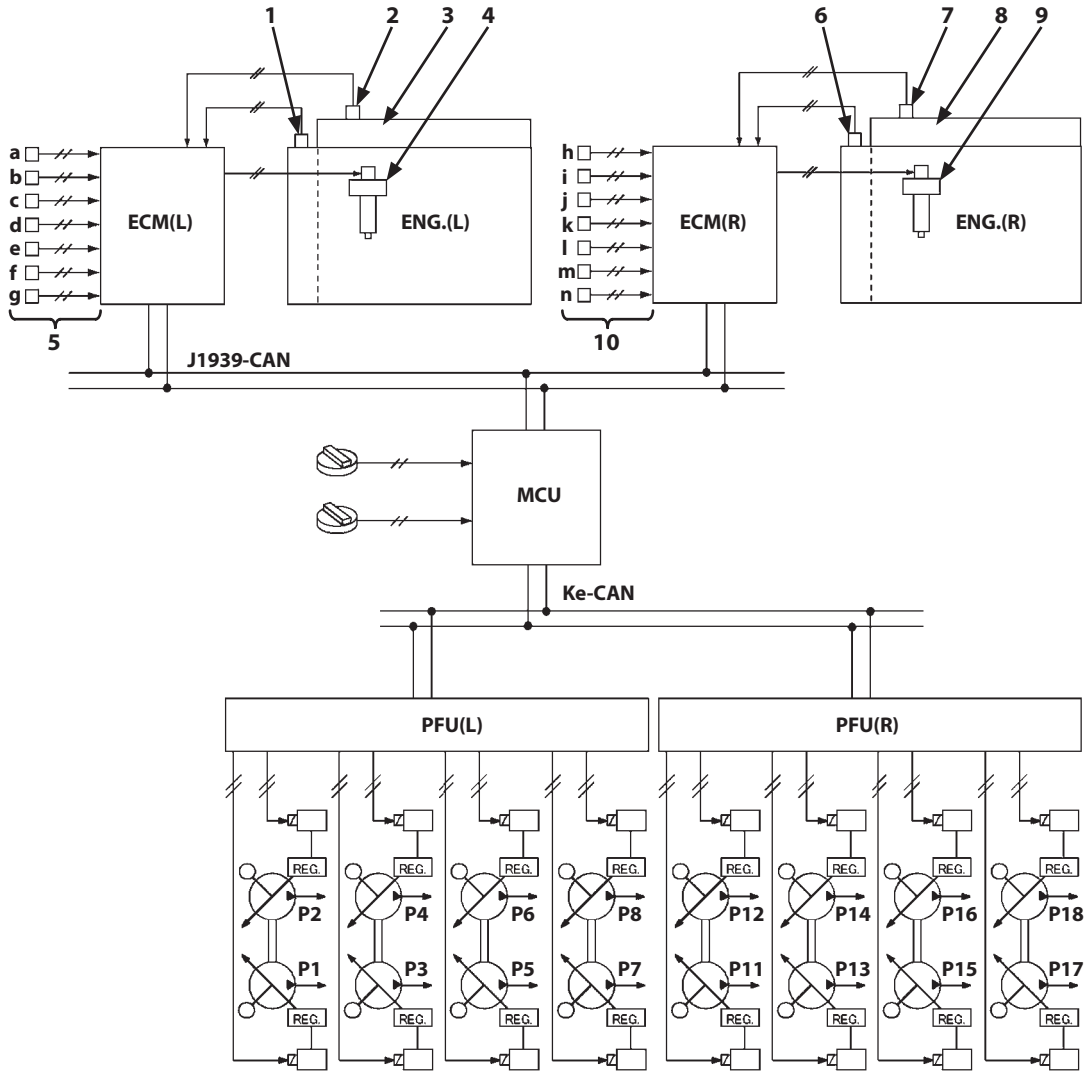
TKGB-02-01-018

a- To IDU, DLU

b- Warning Light LED (Yellow)

c- Warning Light LED (Red)

1- Swing Angular Rate Sensor (Upperstructure)
2- Swing Angular Rate Sensor (Undercarriage)
3- Body Tilt Sensor (Pitch)
4- Body Tilt Sensor (Roll)
5- Swing Angular Position Switch 1
6- Swing Angular Position Switch 2
7- Swing Angular Position Switch 3
8- Swing Angular Position Switch 4
9- Swing Angular Position Switch 5

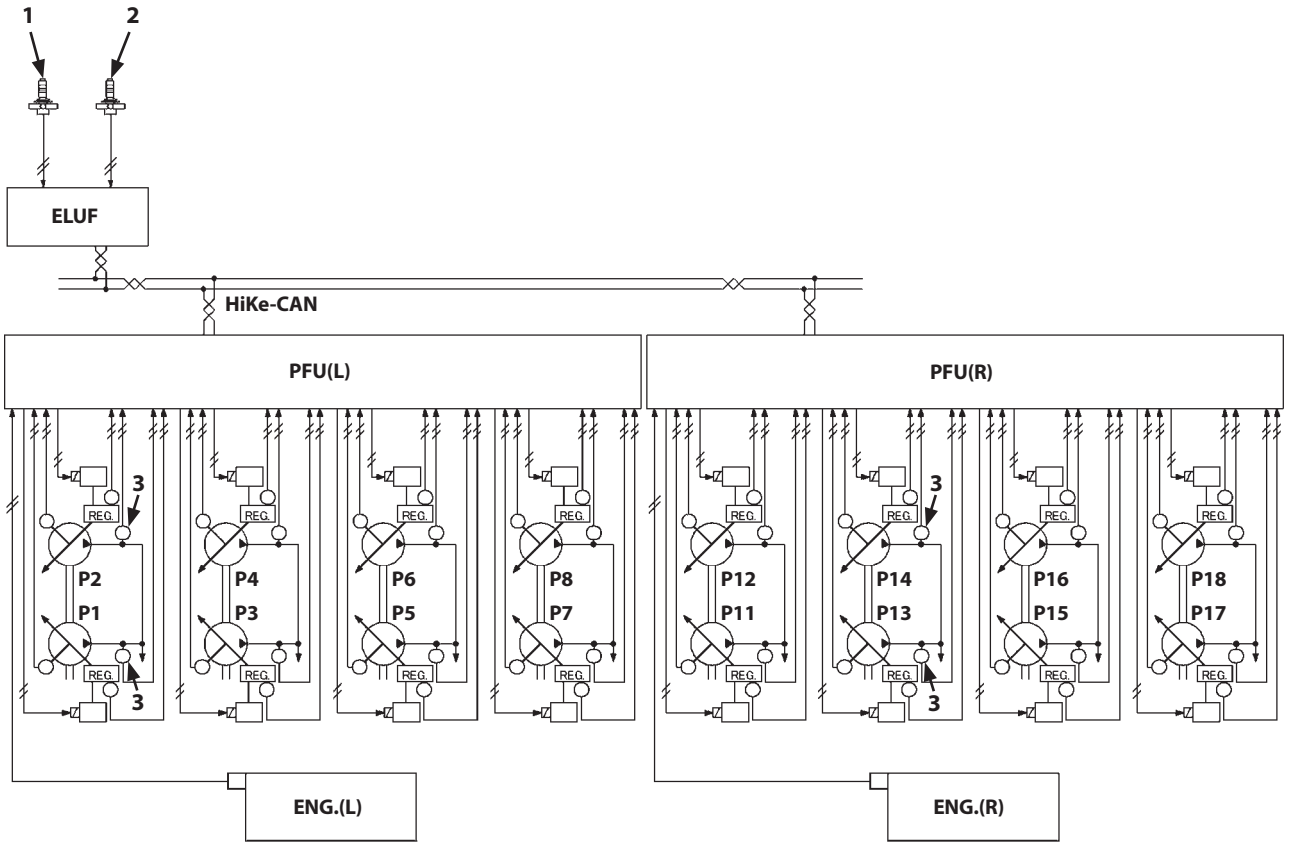


TKHA90-02-02-001

1- Crank Speed Sensor (L)
2- Intake Manifold Temperature Sensor (L)
3- Intake Manifold (L)
4- Injector (L)
5- Sensors
6- Crank Speed Sensor (R)
7- Intake Manifold Temperature Sensor (R)
8- Intake Manifold (R)
9- Injector (R)
10- Sensors

a- Engine Coolant Temperature Sensor (L)
b- Engine Oil Pressure Sensor (L)
c- Coolant Level Sensor (L)
d- Fuel Temperature Sensor (L)
e- Crank Case Pressure Sensor (L)
f- Coolant Pressure Sensor (L)
g- Engine Oil Temperature Sensor (L)
h- Engine Coolant Temperature Sensor (R)
i- Engine Oil Pressure Sensor (R)
j- Coolant Level Sensor (R)
k- Fuel Temperature Sensor (R)
l- Crank Case Pressure Sensor (R)
m- Coolant Pressure Sensor (R)
n- Engine Oil Temperature Sensor (R)

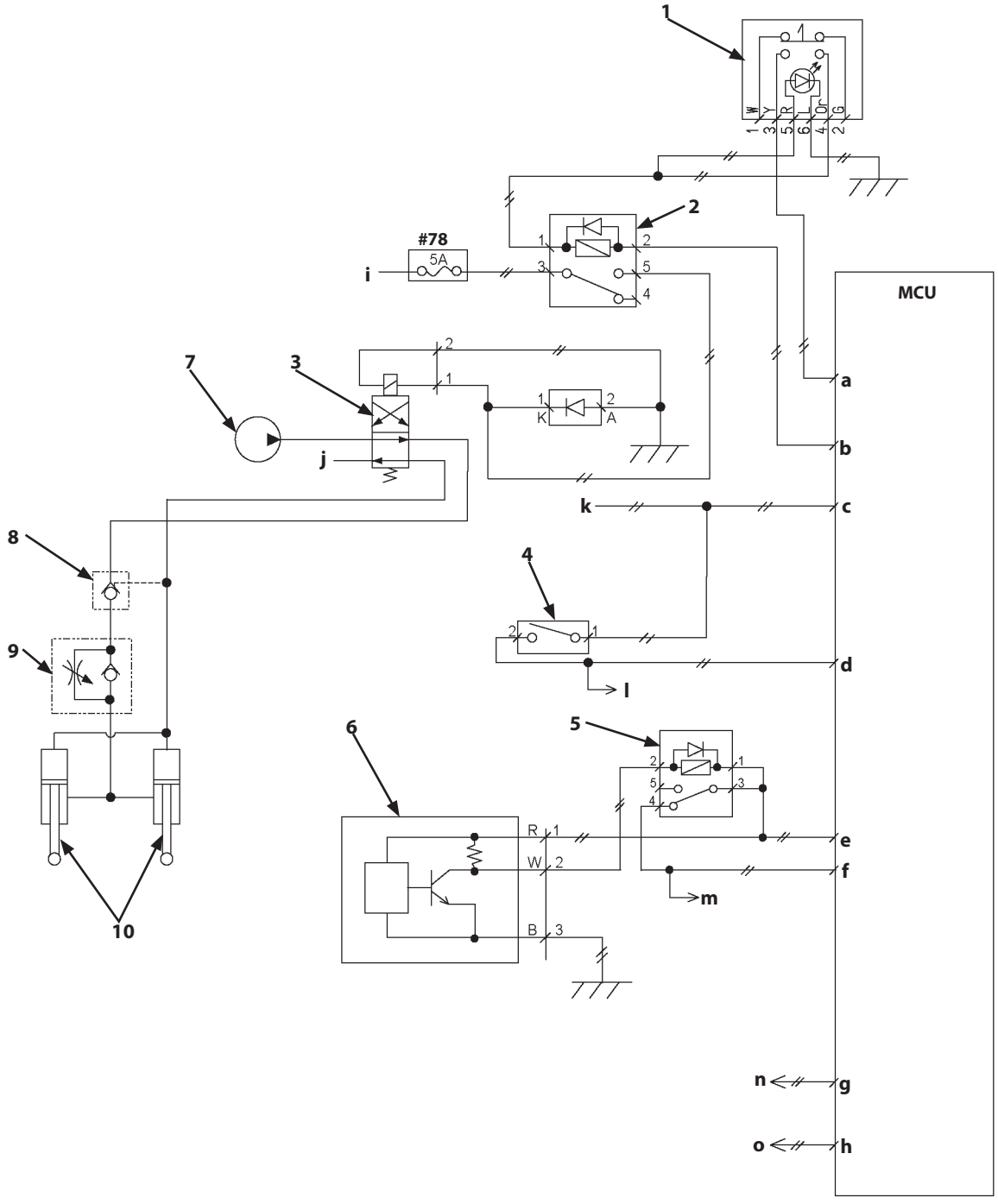
P1- Main Pump L1
P2- Main Pump L2
P3 Main Pump L3
P4- Main Pump L4
P5- Main Pump L5
P6- Main Pump L6
P7- Main Pump L7
P8- Main Pump L8
P11- Main Pump R1
P12- Main Pump R2
P13- Main Pump R3
P14- Main Pump R4
P15- Main Pump R5
P16- Main Pump R6
P17- Main Pump R7
P18- Main Pump R8



TKHA90-02-02-005

P1- Main Pump L1
P2- Main Pump L2
P3- Main Pump L3
P4- Main Pump L4
P5- Main Pump L5
P6- Main Pump L6
P7- Main Pump L7
P8- Main Pump L8
P11- Main Pump R1
P12- Main Pump R2
P13- Main Pump R3
P14- Main Pump R4
P15- Main Pump R5
P16- Main Pump R6
P17- Main Pump R7
P18- Main Pump R8

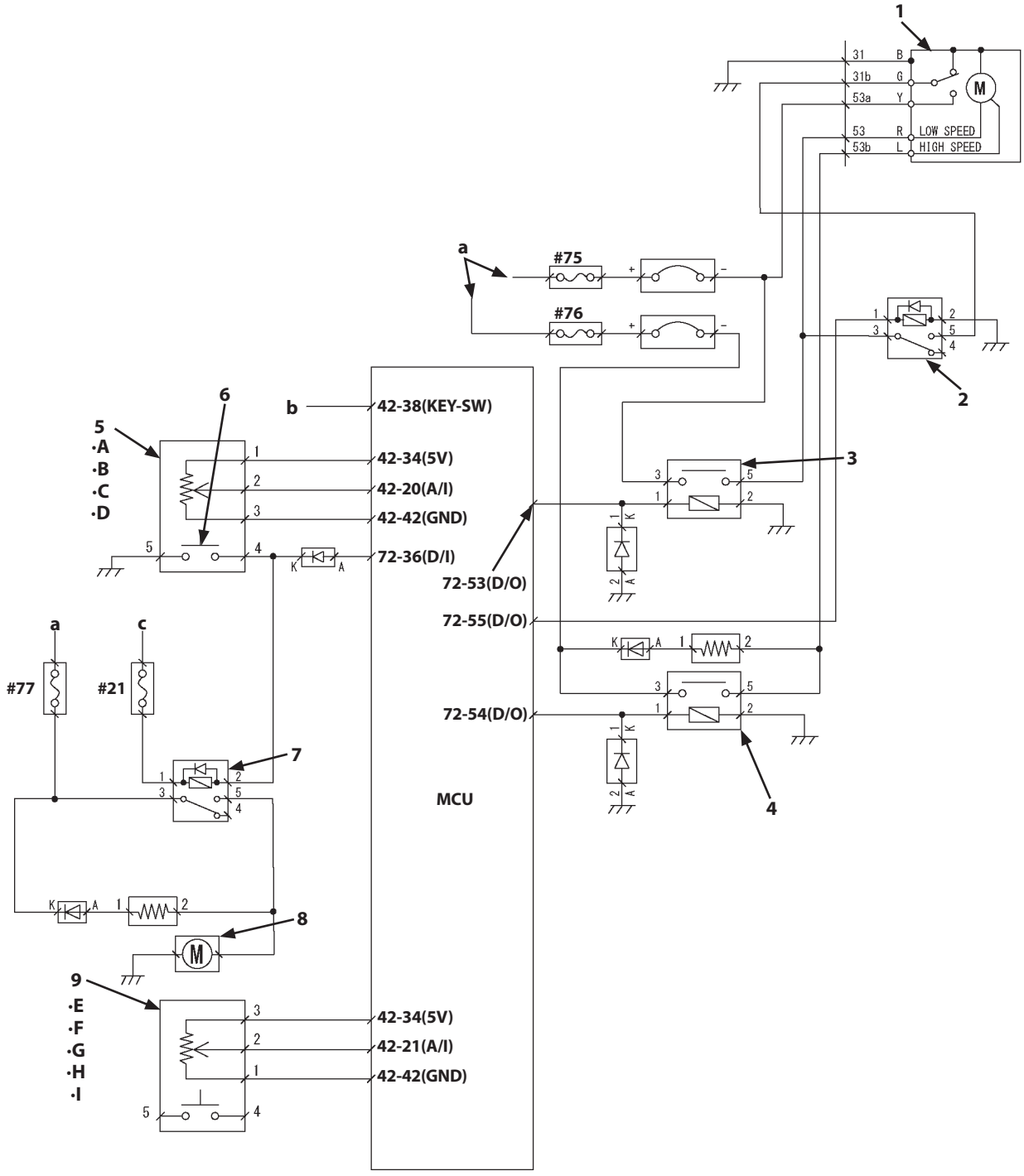
1- Electric Control Lever (Arm/ Swing)
2- Electric Control Lever (Boom/ Bucket)
3- Delivery Pressure Sensor



TKEB-02-02-006

a- Power Source for 24V D/I
b- D/O
c- KEY_SW
d- D/I (24V)
e- Power Source for 24V D/I
f- D/I (24V)
g- D/O
h- Ke-CAN
i- From Battery
j- To Hydraulic Oil Tank
k- Key Switch ON Signal
l- To ELUF
m- To ELUF
n- Warning Light LED (Red)
o- To IDU

1- Fast Filling Switch
2- Fast Filling Relay
3- Fast Filling Solenoid Valve
4- Pilot Shut-Off Switch
5- Fast Filling Panel Position Relay
6- Fast Filling Panel Position Switch
7- Pilot Pump
8- Pilot Check Valve
9- Slow Return Valve
10- Lift Cylinder



TKEB-02-02-009

a- From Battery
b- Key Switch ON Signal
c- From Key Switch

A- HIGH
B- LOW
C- INT.

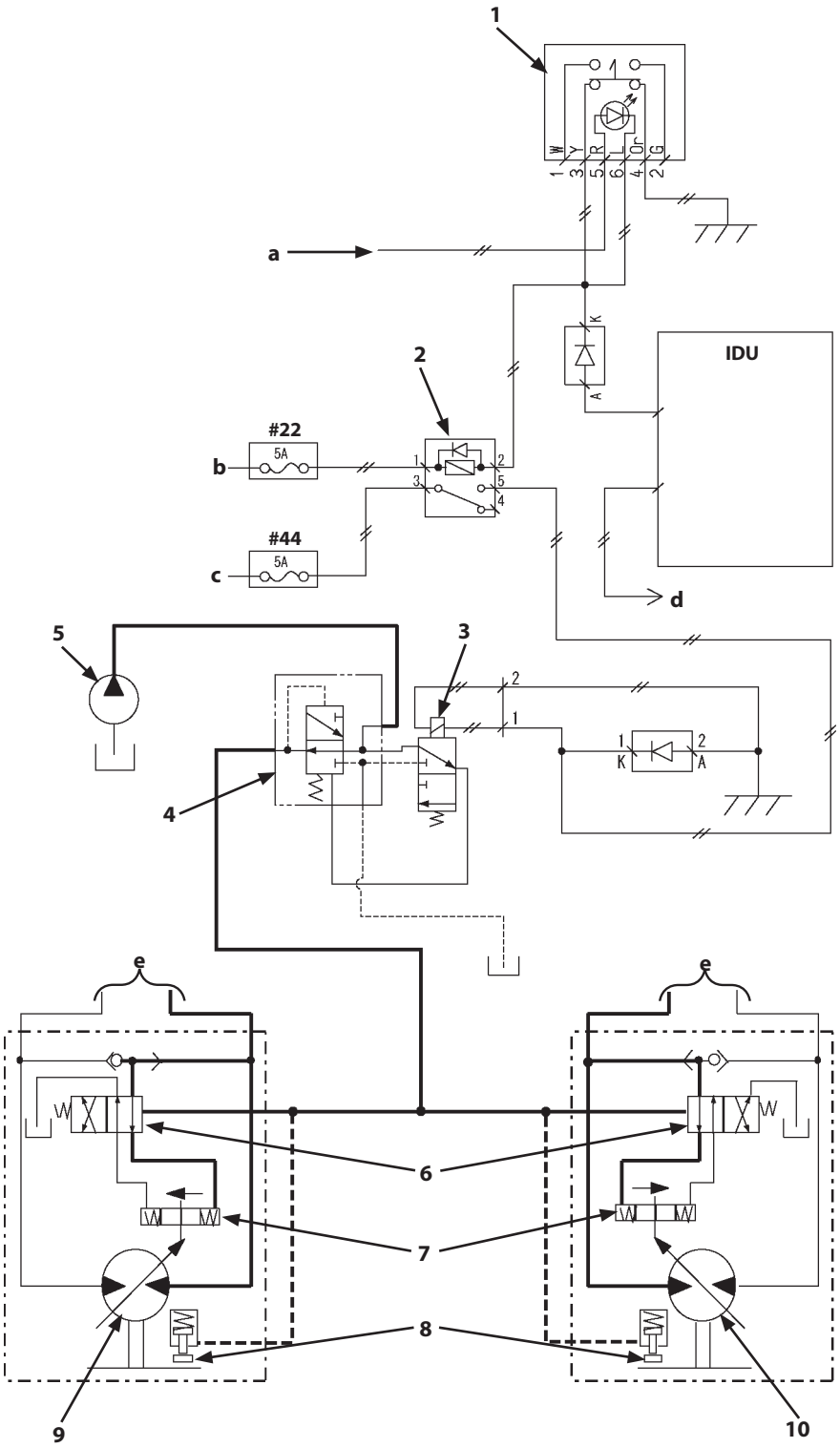
D- OFF
E- 25 seconds
F- 20 seconds

G- 15 seconds
H- 10 seconds
I- 5 seconds

1- Wiper Motor
2- Wiper Relay 2
3- Wiper Relay 1

4- Wiper Relay 3
5- Wiper Switch
6- Washer Switch

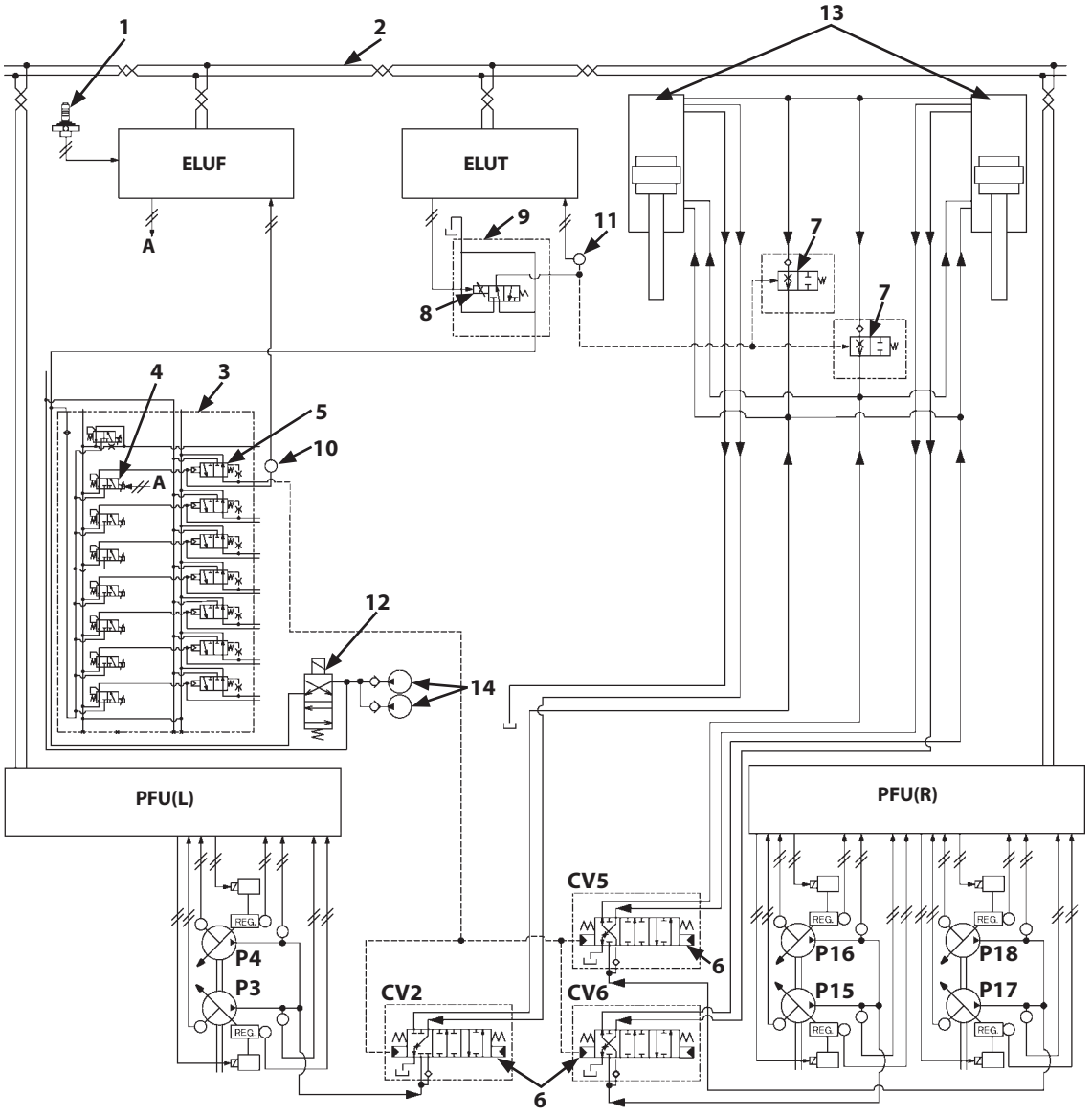
7- Washer Motor Relay
8- Washer Motor
9- Wiper Interval Switch



TKEB-02-02-013

a- From LED Power
b- Key Switch ON Signal
c- From Battery Line
d- Travel Mode Display
e- From Control Valve

1- Travel Mode Switch
2- Travel Mode Relay
3- Travel Mode Selector Solenoid Valve
4- Reducing Valve
5- Pilot Pump
6- Travel Mode Selector Valve
7- Tilt Piston
8- Parking Brake
9- Travel Motor (Left)
10- Travel Motor (Right)



TKHA90-02-03-001

P3- Main Pump L3
P4- Main Pump L4

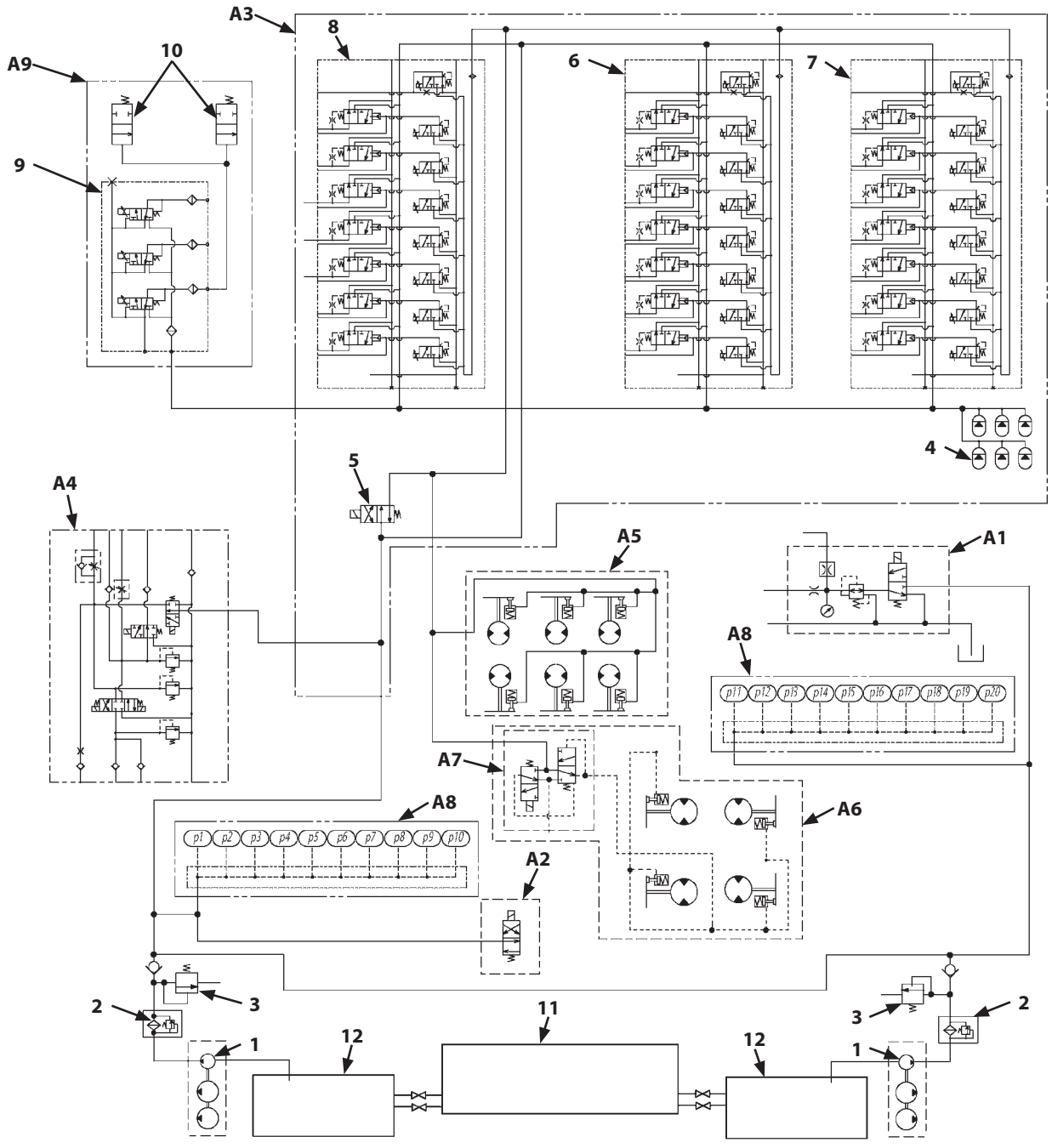
P15- Main Pump R5
P16- Main Pump R6

P17- Main Pump R7
P18- Main Pump R8

CV2- Control Valve 2 (Lower Left)
CV5- Control Valve 5 (Upper Right)

CV6- Control Valve 6 (Lower Right)

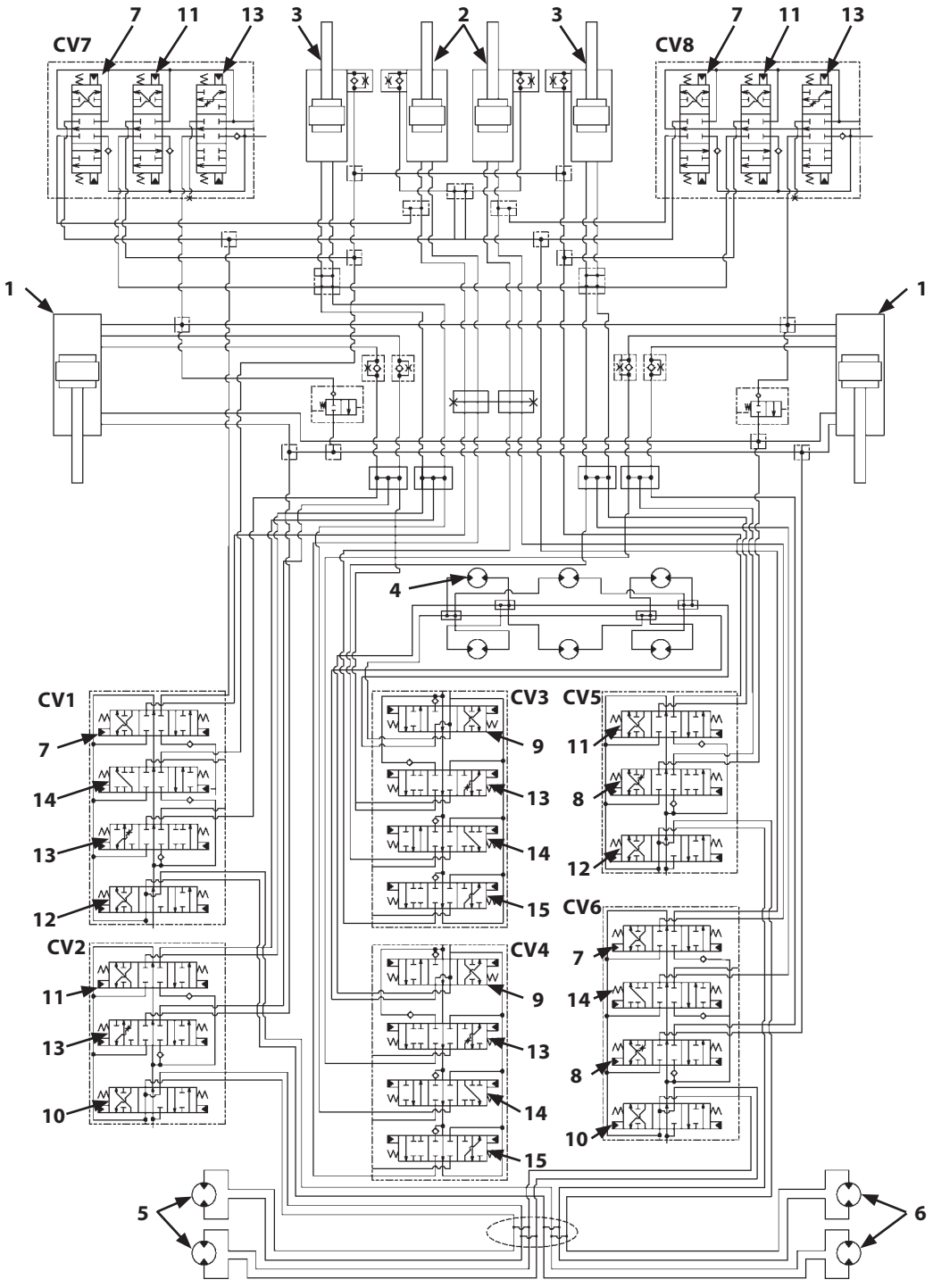
1- Electric Control Lever
2- HiKe-CAN
3- EDQR Valve (Lower)
4- Boom Lower Solenoid Valve
5- Boom Lower Spool
6- Boom Spool
7- Boom Lower Make-Up Valve
8- Boom Lower Make-Up Solenoid Valve
9- 3-Spool Solenoid Valve Unit
10- Pressure Sensor (Boom Lower)
11- Pressure Sensor (Boom Lower Make-Up)
12- Pilot Shut-Off Solenoid Valve
13- Boom Cylinder
14- Pilot Pumps (L), (R)



TKHA90-02-04-001

A1- Auto-Lubrication Control Circuit
A2- Fast Filling Panel Operation Control Circuit
A3- Operation Control Circuit
A4- Folding Stairway Control Circuit
A5- Swing Parking Brake Release Circuit
A6- Travel Parking Brake Release Circuit
A7- Travel Mode Control Circuit
A8- Main Pump Control Circuit, Oil Cooler Fan Motor Pump Control Circuit, Radiator Fan Motor Pump Control Circuit
A9- Boom Lower Flow Rate Regeneration Control Circuit

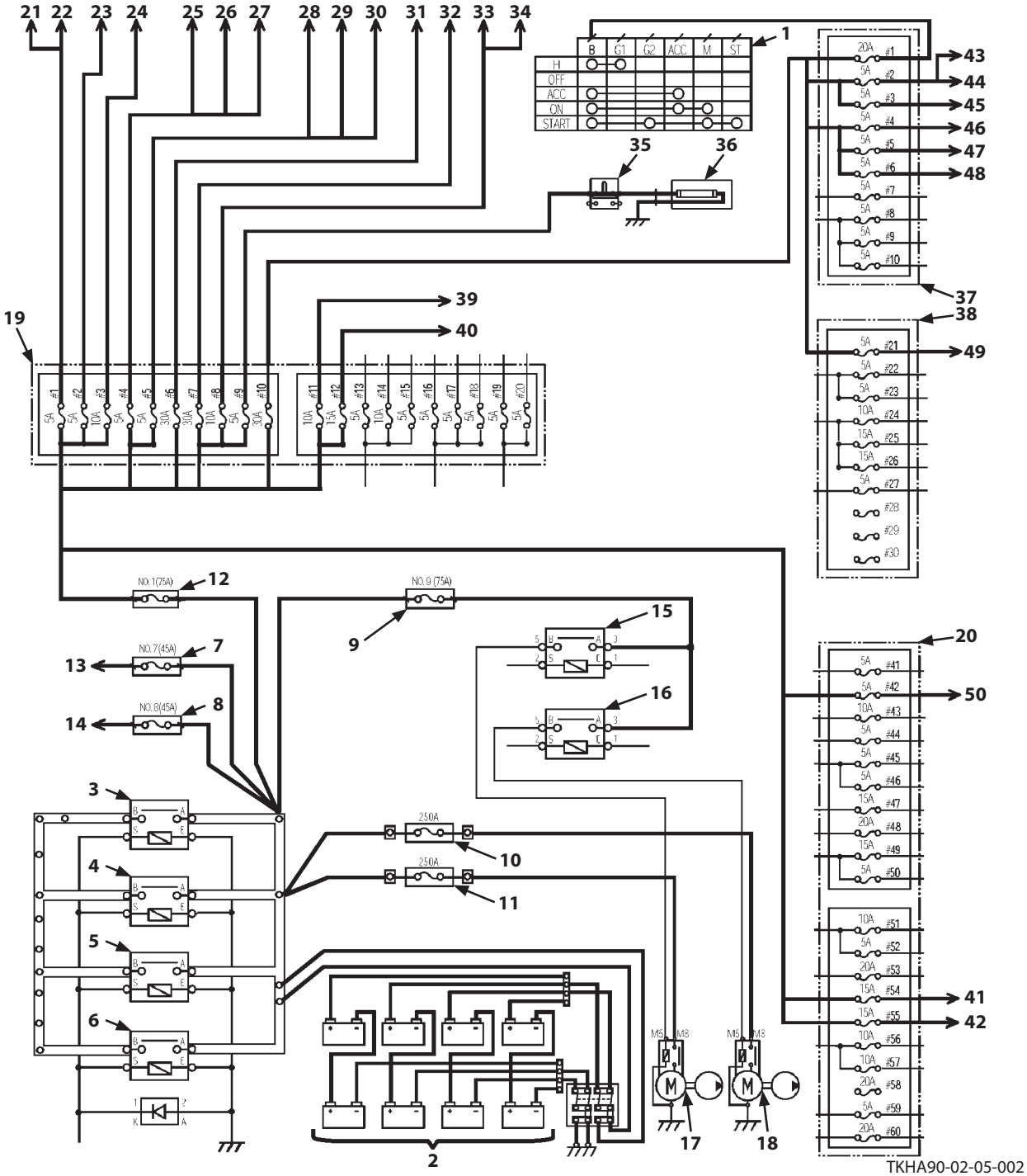
1- Pilot Pumps (L), (R)
2- Pilot Filter (2 Used)
3- Pilot Relief Valve (2 Used)
4- Accumulator (6 Used)
5- Pilot Shut-Off Solenoid Valve
6- EDQR Valve (Upper)
7- EDQR Valve (Lower)
8- EDQR Valve (On the Boom)
9- 3-Spool Solenoid Valve Unit
10- Make-Up Valve (2 Used)
11- Hydraulic Oil Tank
12- Suction Manifolds (L), (R)



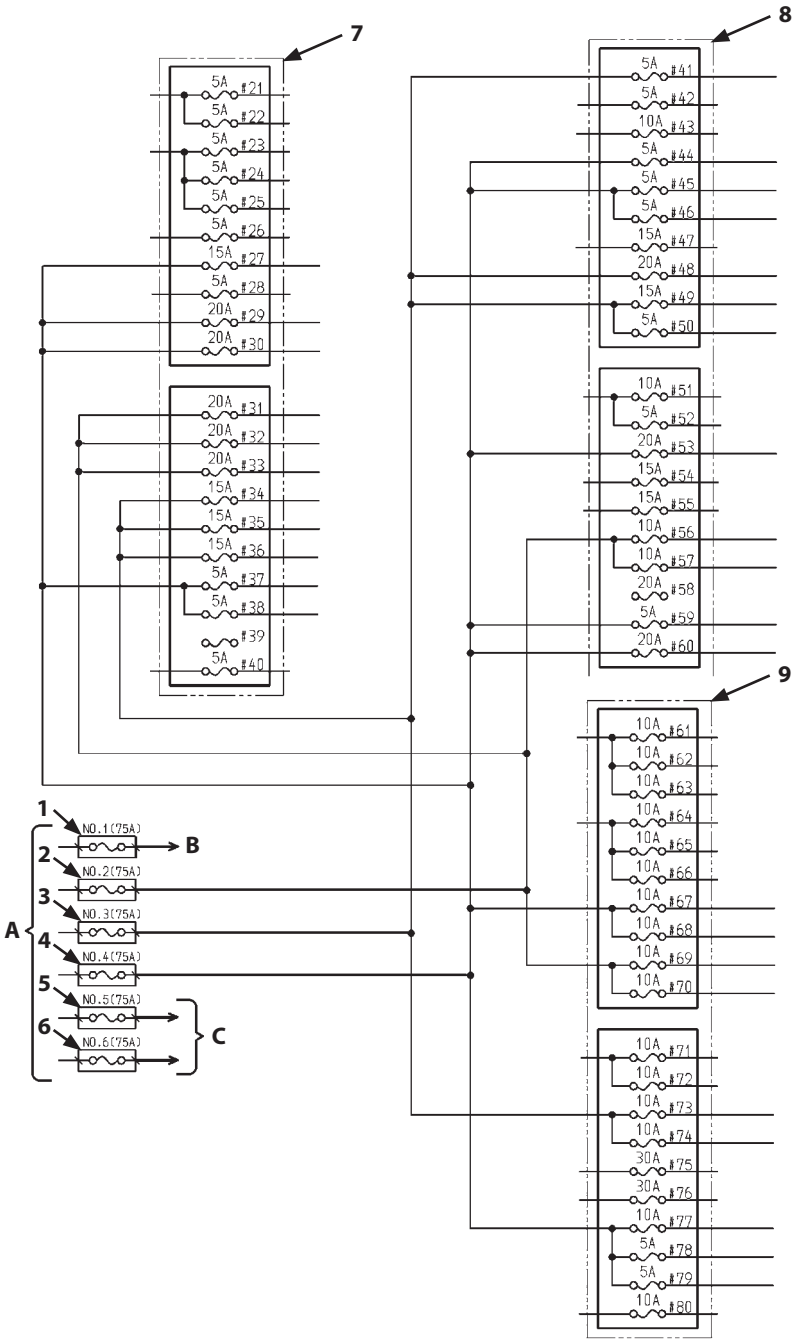
TKHA90-02-04-005

CV1- Control Valve 1 (Upper Left)
CV2- Control Valve 2 (Lower Left)
CV3- Control Valve 3 (Upper Center)
CV4- Control Valve 4 (Lower Center)
CV5- Control Valve 5 (Upper Right)
CV6- Control Valve 6 (Lower Right)
CV7- Control Valve 7 (Boom Left)
CV8- Control Valve 8 (Boom Right)

1- Boom Cylinder (2 Used)
2- Bucket Cylinder (2 Used)
3- Arm Cylinder (2 Used)
4- Swing Motor (6 Used)
5- Travel Motor (Left) (2 Used)
6- Travel Motor (Right) (2 Used)
7- Bucket Spool
8- Boom Spool
9- Swing Spool
10- Left Travel Spool
11- Arm Spool
12- Right Travel Spool
13- Boom Raise Spool
14- Arm Roll-In Spool
15- Bucket Roll-In Spool



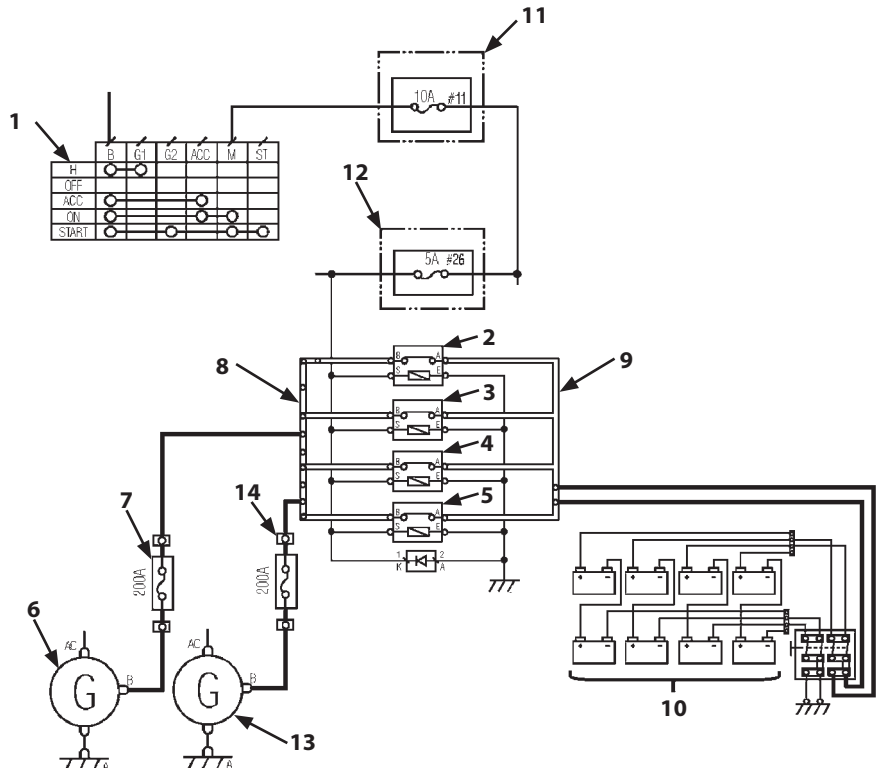
1- Key Switch
2- Battery
3- Battery Relay 1
4- Battery Relay 2
5- Battery Relay 3
6- Battery Relay 4
7- Slow Blow Fuse 7
8- Slow Blow Fuse 8
9- Slow Blow Fuse 9
10- Fuse (250 A)
11- Fuse (250 A)
12- Slow Blow Fuse 1
13- ECM(L)
14- ECM(R)
15- Folding Stairway Relay 2 (Refer to T1-2-27.)
16- Folding Stairway Relay 3 (Refer to T1-2-27.)
17- Folding Stairway Pump 1
18- Folding Stairway Pump 2
19- Fuse Box 1
20- Fuse Box 3
21- MCU
22- HMU
23- Delayed Power OFF Relay
24- Third Party Interface
25- PFU(L)
26- PMU(L)
27- EHU(L)
28- PFU(R)
29- PMU(R)
30- EHU(R)
31- Horn Air Compressor Relay (L1)
32- Horn Air Compressor Relay (R1)
33- Folding Stairway Relay 1 (Refer to T1-2-14 [45].)
34- Folding Stairway Alarm/Flash Light
35- Limit Switch (Electrical Equipment Box Door)
36- Electrical Equipment Box Light
37- Fuse Box (Cab 1)
38- Fuse Box (Cab 2)
39- C/U (J1939-CAN) (Auxiliary)
40- Monitoring Unit
41- ECM Data Link (L)
42- ECM Data Link (R)
43- ELUF
44- ELUT
45- IDU
46- DLU
47- Communication Terminal
48- Radio (Backup)
49- WIU (Option)
50- ELUV



TKHA90-02-05-007

1- Slow Blow Fuse 1
2- Slow Blow Fuse 2
3- Slow Blow Fuse 3
4- Slow Blow Fuse 4
5- Slow Blow Fuse 5
6- Slow Blow Fuse 6
7- Fuse Box 2
8- Fuse Box 3
9- Fuse Box 4

A- Refer to T2-5-9.
B- Refer to T2-5-13.
C- Refer to T2-5-17.



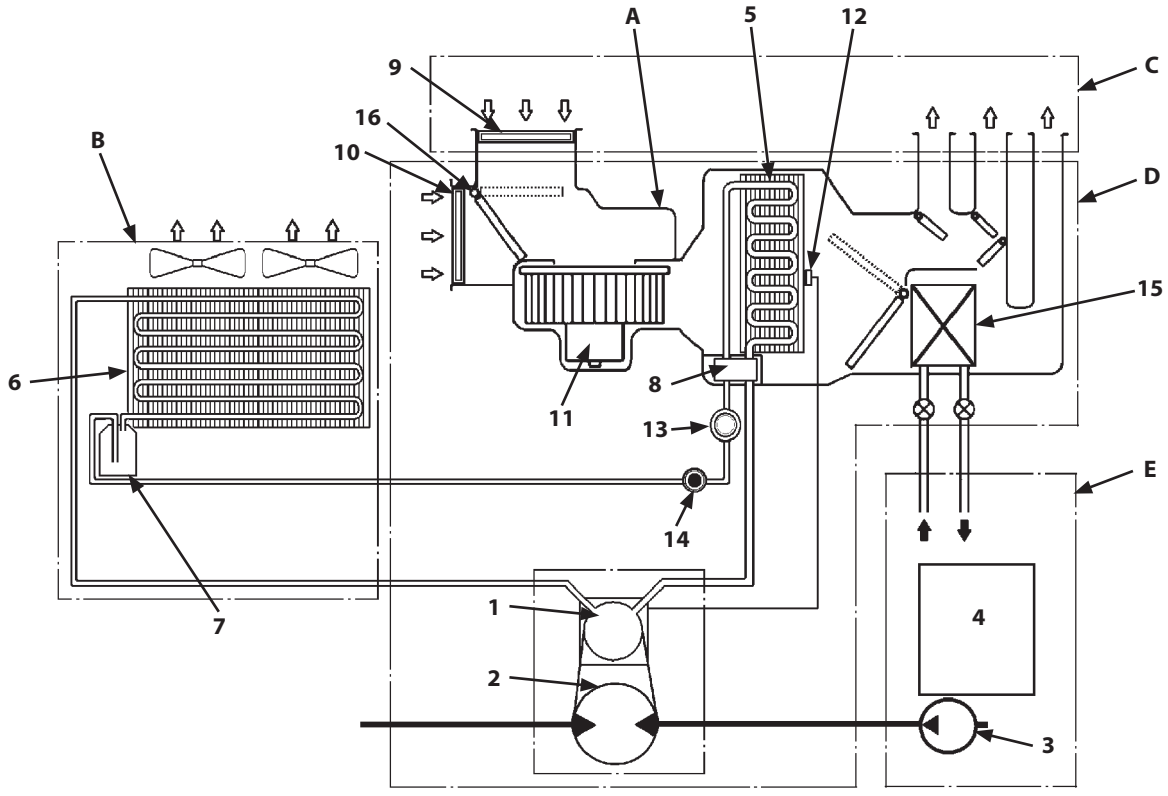
TKHA90-02-05-011

1- Key Switch
2- Battery Relay 1
3- Battery Relay 2
4- Battery Relay 3
5- Battery Relay 4
6- Alternator (L)
7- Fuse (200 A) (L)
8- Terminal (Sub)
9- Terminal (Main)
10- Battery
11- Fuse Box (Cab 1) (Refer to T1-2-57.)
12- Fuse Box 2 (Refer to T1-2-60.)
13- Alternator (R)
14- Fuse (200 A) (R)

Outline

The air conditioning system consists of air conditioner unit (A), condenser unit (B), air conditioner compressor (1), air conditioner compressor motor (2), and air conditioner compressor motor pump (3).
Configuration layout of the air conditioning system is illustrated below.
Either fresh or re-circulated air is induced into air conditioner unit (A) by operating the fresh/re-circulated air damper servo motor (16).
The induced air flows out of the vents through evaporator (5) or heater (15) by blower motor (11). Evaporator (5) is a device used to cool the air. Heater (15) is a device used to warm the air.
In the air conditioning system, after the refrigerant is compressed by air conditioner compressor (1), it is sent to evaporator (5) in which the refrigerant expands to cool the air. Air conditioner compressor (1) is activated by the air conditioner compressor motor (2). The air conditioner compressor motor (2) is activated by pressure oil from the air conditioner compressor motor pump (3).

Heater (15) warms air by absorbing heat from the warmed engine (4) coolant. The temperature is kept at the set temperature by adjusting evaporator (5) and heater (15).
The air conditioner controller controls the air conditioning system. The air conditioner controller controls the damper operation by corresponding to the job site conditions such as ambient and cab inside air temperatures, operator's set-temperature, and the set-ventilation mode.
In addition, the air conditioner controller displays the air conditioner system operation status on the liquid crystal panel of the air conditioner controller.



TKEB-05-07-001

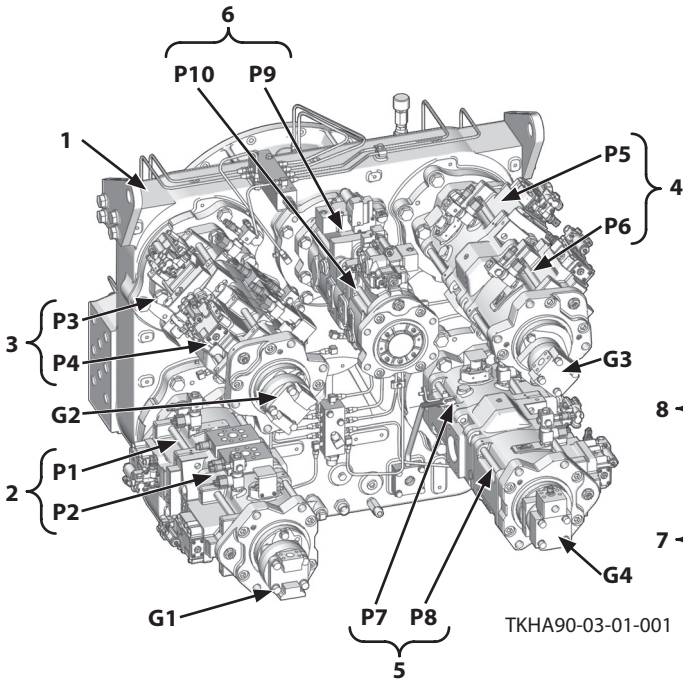
A- Air Conditioner Unit
B- Condenser Unit
C- Cab
D- Cab Bed
E- Engine Compartment

1- Air Conditioner Compressor
2- Air Conditioner Compressor Motor
3- Air Conditioner Compressor Motor Pump
4- Engine
5- Evaporator
6- Air Conditioner Condenser
7- Receiver Tank
8- Expansion Valve
9- Re-Circulated Air Filter
10- Fresh Air Filter
11- Blower Motor
12- Frost Sensor
13- Sight Glass
14- High/Low Pressure Switch
15- Heater
16- Fresh/Re-Circulated Air Damper Servo Motor

Outline

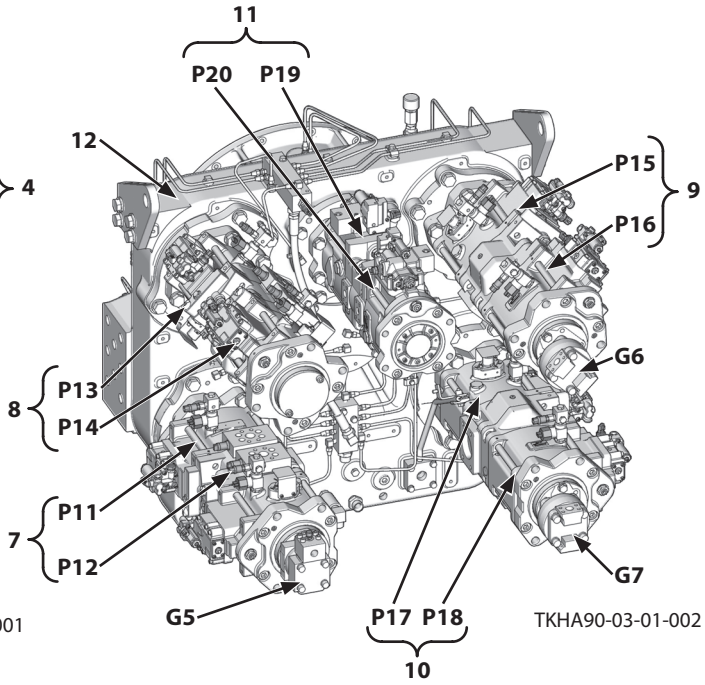
The pump devices are installed on the right and left engines. The pump device consists of pump transmission ((L) (1) or (R) (12)), tandem pumps (5 used) (2 to 6 or (7 to 11)), and gear pumps (G1 to G4 or (G5 to G7)).
Pump transmission (L) (1) and (R) (12) distributes the engine output power by using gears and transmits to each pump.
Tandem pumps (10 used) (2 to 11) are swash plate type variable displacement tandem plunger pumps, and consist of main pumps L1 to L8 (P1 to P8), main pumps R1 to R8 (P11 to P18), radiator fan motor pump (L) (P9), radiator fan motor pump (R) (P19), oil cooler fan motor pump (L) (P10) and oil cooler fan motor pump (R) (P20).
Each main pumps (P1 to P8, P11 to P18) supplies high pressure oil.
Each radiator fan motor pumps (P9, P19) supplies pressure oil to radiator fan motors (4 used for each). Each oil cooler fan motor pumps (P10, P20) supplies pressure oil to oil cooler fan motors (2 used for each).
Gear pumps (G1 to G7) are connected to the end of tandem pumps (7 used) (2 to 5, 7, 9, 10) by splines joint.

Left Engine



TKHA90-03-01-001

Right Engine



TKHA90-03-01-002

1- Pump transmission (L)
2- Tandem Pump (P1, P2)
3- Tandem Pump (P3, P4)
4- Tandem Pump (P5, P6)
5- Tandem Pump (P7, P8)
6- Tandem Pump (P9, P10)
7- Tandem Pump (P11, P12)
8- Tandem Pump (P13, P14)
9- Tandem Pump (P15, P16)
10- Tandem Pump (P17, P18)
11- Tandem Pump (P19, P20)
12- Pump transmission (R)

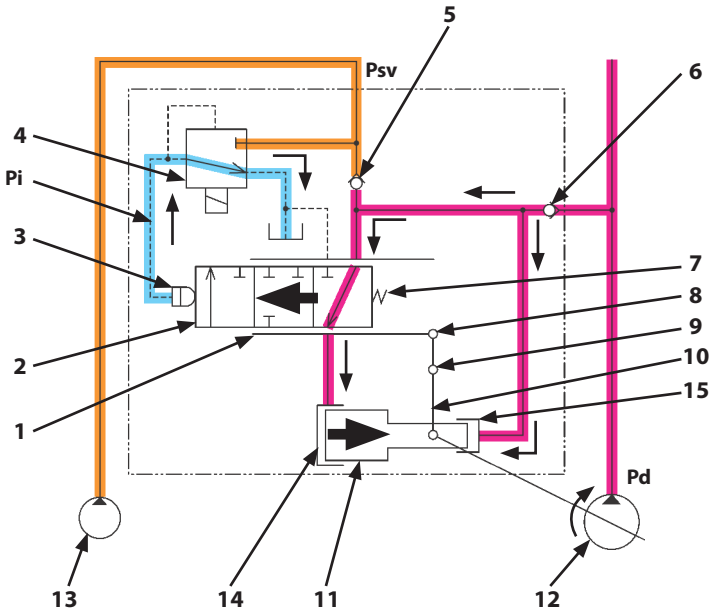
P1- Main Pump L1
P2- Main Pump L2
P3- Main Pump L3
P4- Main Pump L4
P5- Main Pump L5
P6- Main Pump L6
P7- Main Pump L7
P8- Main Pump L8
P9- Fan Motor Drive Pump (Radiator) (L)
P10- Fan Motor Drive Pump (Oil Cooler) (L)
P11- Main Pump R1
P12- Main Pump R2
P13- Main Pump R3
P14- Main Pump R4
P15- Main Pump R5
P16- Main Pump R6
P17- Main Pump R7
P18- Main Pump R8
P19- Fan Motor Drive Pump (Radiator) (R)
P20- Fan Motor Drive Pump (Oil Cooler) (R)

Gear Pump

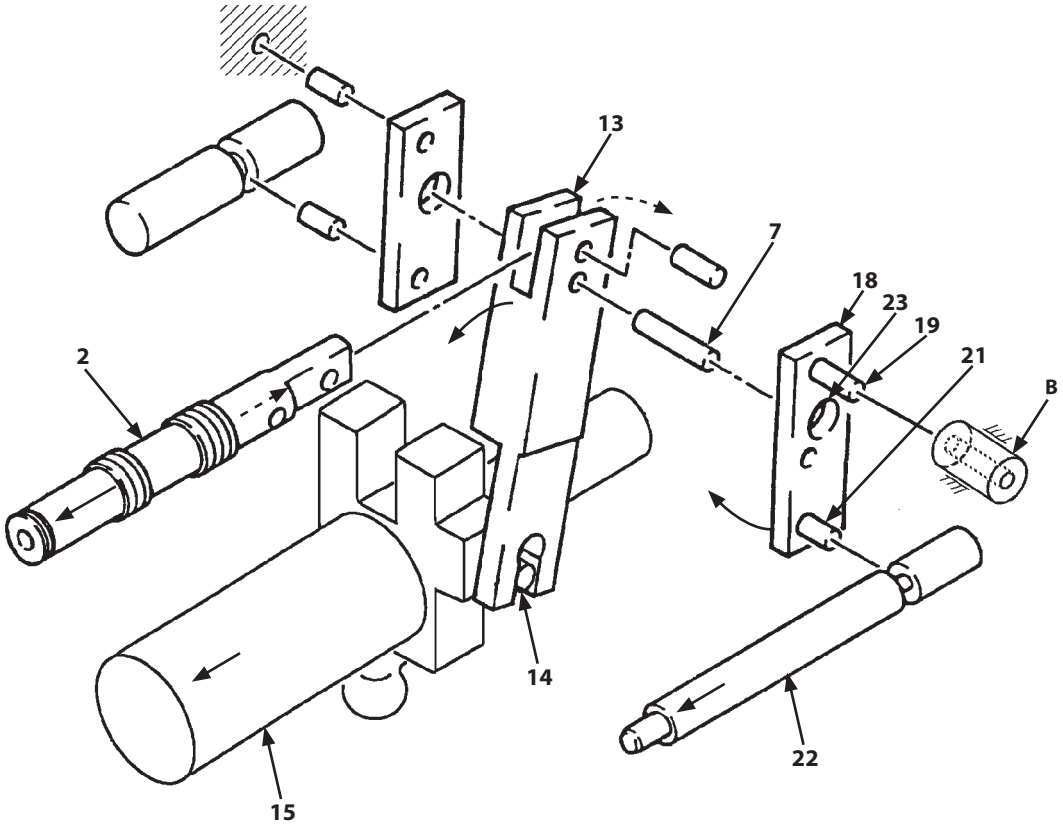
G1- Pilot Pump (L)
G2- Air Fan Motor and Fuel Cooler/ Pump Transmission Oil Cooler Fan Motor Pump (L)
G3- Air Conditioner Compressor Motor Pump
G4- Pump Transmission Oil Pump (L)
G5- Pump Transmission Oil Pump (R)
G6- Air Fan Motor and Fuel Cooler/ Pump Transmission Oil Cooler Fan Motor Pump (R)
G7- Pilot Pump (R)

- Flow Rate Decrease (Flow rate control pressure Pi decreases.)

1. The pump control solenoid valve (4) controls the flow rate control pressure Pi according to the signal from PFU (R) or PFU (L).
2. Spool (2) is moved to the left until the flow rate control pressure Pi balances with the spring (7) force.
3. Pressure oil acting on piston (3) is returned to the hydraulic oil tank through the pump control solenoid valve (4).
4. As spool (2) is moved, the own pump delivery pressure Pd acts on large chamber (14) of servo piston (11) via check valve (6), sleeve (1), and spool (2).
5. The own pump delivery pressure Pd always acts on small chamber (15) of servo piston (11). Due to the difference in the pressure receiving areas, servo piston (11) is moved to the right.
6. As servo piston (11) is moved to the right, feedback lever (10) turns counterclockwise around pin (9).
7. As the end of feedback lever (10) is connected to sleeve (1) by pin (8), sleeve (1) is moved to the left.
8. Servo piston (11) moves until the open part between sleeve (1) and spool (2) is closed. Servo piston (11) stops when the open part is completely closed.
9. As described above, the pump displacement angle decreases and the pump delivery flow rate decreases. The decreased amount of the pump delivery flow rate is proportional to the decreased amount of the flow rate control pressure Pi.



T1J1-03-01-005



T1J1-03-01-007

P9- Radiator Fan Motor Pump (L)
P10- Oil Cooler Fan Motor Pump (L)
P19- Radiator Fan Motor Pump (R)
P20- Oil Cooler Fan Motor Pump (R)

Pf- Own Pump Delivery Pressure
Pi- Flow Rate Control Pressure
Pr- Primary Pilot Pressure
a- Displacement Angle Increase
b- Displacement Angle Decrease

1- Compensating Piston
2- Spool
3- Sleeve
4- Lever 2
5- Pin
6- Pin
7- Pin
8- Hole
9- Inner Spring
10- Outer Spring
11- Compensating Rod
12- Pin
13- Feedback Lever
14- Pin
15- Servo Piston
16- Spool
17- Pump Control Solenoid Valve
18- Lever 1
19- Pin
20- Spring
21- Pin
22- Piston
23- Hole
25- Pilot Pump
26- Large Chamber
27- Small Chamber

Contamination Sensor

Contamination sensors (1) are respectively installed in sixteen main pumps. Contamination sensors (1) change the current values according to the contamination level of hydraulic oil and detect abnormality of the main pumps.

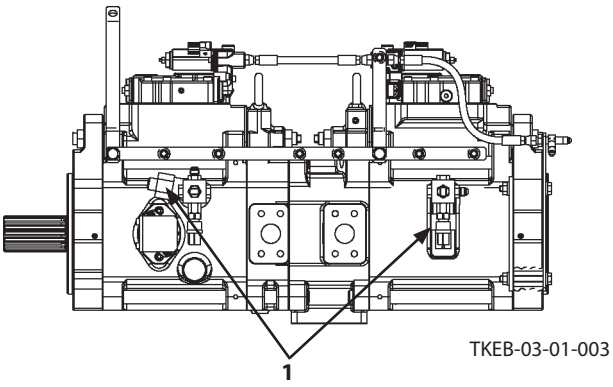
When hydraulic oil is contaminated by metal powder, metal powder adheres to magnet (4) of contamination sensor (1) and decreases the resistance value of contamination sensor (1) (terminal #2 (2) of the connector). CSU (CONTAMI. SENSING UNIT) identifies the resistance value of contamination sensor (1). When any one of the resistance values is less than the specified value, CSU turns on warning light LED (yellow) in the cab. At the same time, CSU outputs the signal to IDU by using the CAN communication. IDU displays the alarm on the display.

The abnormal main pump can be identified by checking sixteen indicators on the contamination sensor amplifier. (Refer to T1-2-15.)

NOTE: CSU is located in the control box.

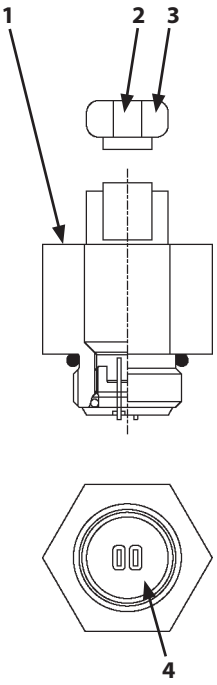
NOTE: The contamination sensor is installed in the following components as well as the main pump. (Refer to T1-2-47.)

Swing Motor: 3 Used (common to front and rear swing motors)
Travel Motor: 1 Used (common to right and left travel motors)



TKEB-03-01-003

1- Contamination Sensor

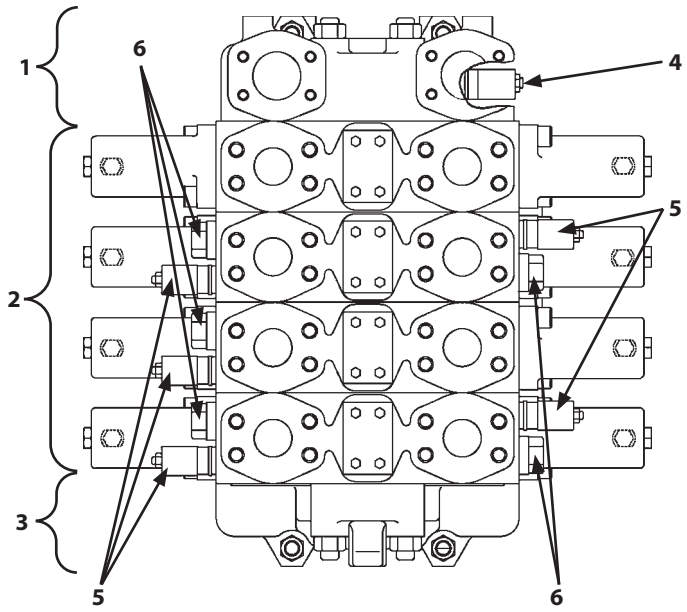


TKEB-03-01-004

2- Terminal #2
3- Terminal #1
4- Magnet

Overview

The control valve controls the oil flow rate, direction, and main circuit pressure.
The control valve consists of inlet section (1), plural valve sections (2), and outlet section (3). Operation of the spool provided with each valve section (2) is controlled by the pilot pressure.
The main relief valve (4) is provided with on inlet section (1). When necessary, overload relief valve (5) and make-up valve (6) are installed on valve section (2).

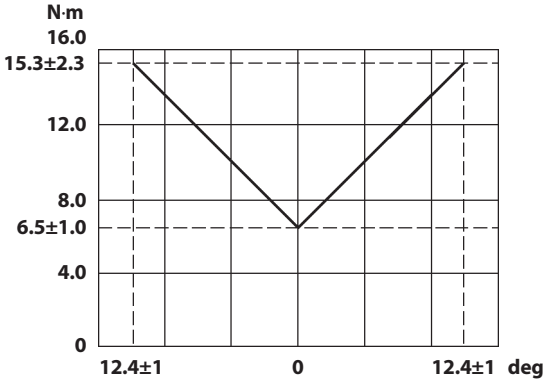


TKHA90-03-03-001

1- Inlet Section
2- Valve Section
3- Outlet Section
4- Main Relief Valve
5- Overload Relief Valve
6- Make-Up Valve

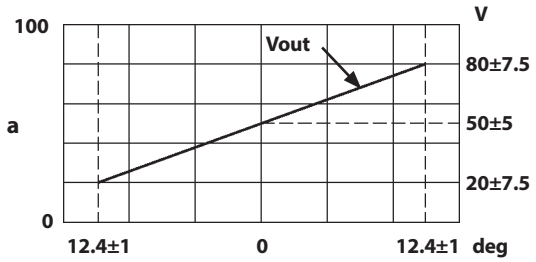
Travel (Control Curve: 25±5 degree C)

Control Torque



T18M-03-04-003

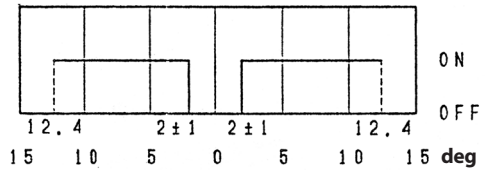
Output Voltage Ratio



T18M-03-04-004

a- Output Voltage Ratio

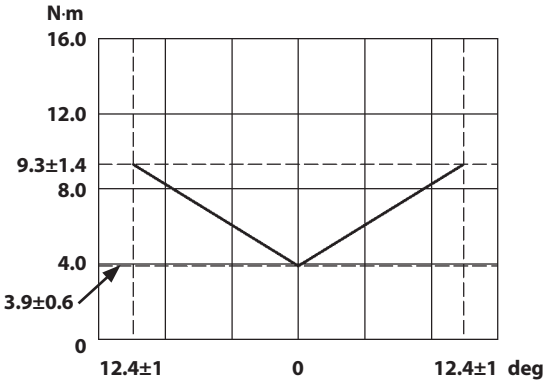
Neutral Switch Voltage



T18G-03-04-006

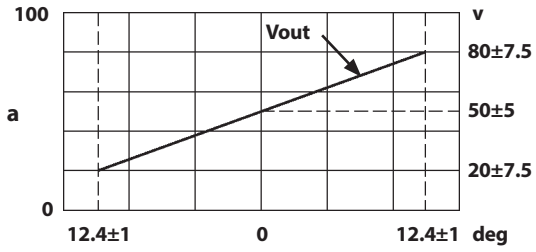
Bucket Open/Close (Control Curve: 25±5 degree C)

Control Torque



T18L-03-04-001

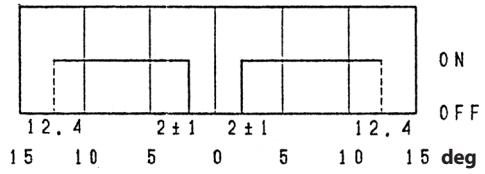
Output Voltage Ratio



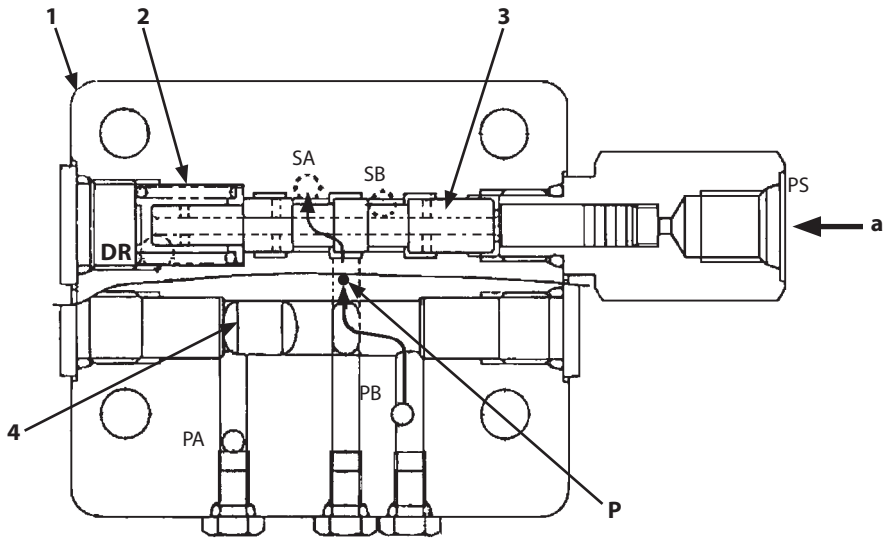
T18M-03-04-004

a- Output Voltage Ratio

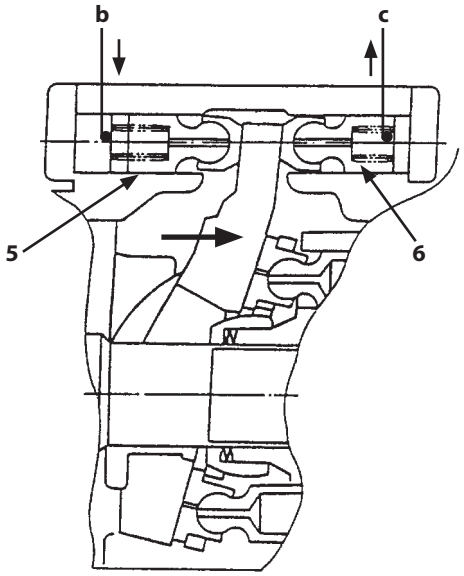
Neutral Switch Voltage



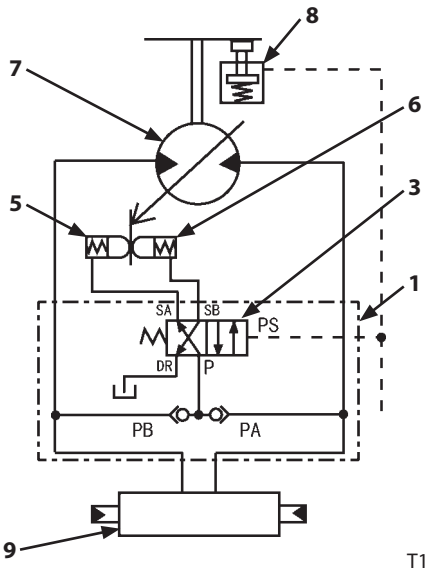
T18G-03-04-006



TKEB-03-05-004



T118-03-06-002



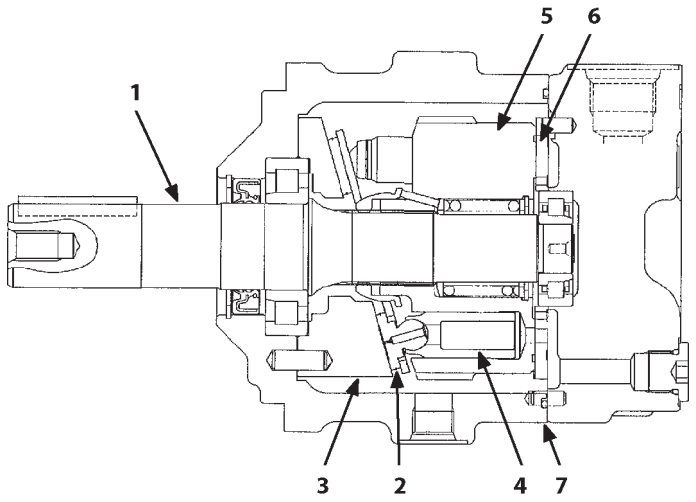
T141-03-05-003

a- Pilot Pressure from Reducing Valve (2.4 MPa (350 psi))
b- From Port SA
c- To Port SB

1- Travel Mode Selector Valve
2- Spring
3- Spool
4- Shuttle
5- Tilt Piston (Slow Speed Side)
6- Tilt Piston (Fast Speed Side)
7- Travel Motor
8- Parking Brake
9- Control Valve

Air Conditioner Compressor Motor, Radiator Fan Motor, Air Fan Motor, Fuel Cooler/Pump Transmission Oil Cooler Fan Motor

The air conditioner compressor motor, radiator fan motor, air fan motor and the fuel cooler/pump transmission oil cooler fan motor are a swash-plate type, fixed displacement axial plunger motor.
The motor consists of shaft (1), swash plate (3), shoes (2), plungers (4), rotor (5), valve plate (6), and housing (7). Shoe (2) is crimped onto plunger (4) which is inserted into the bore of rotor (5). Rotor (5) is connected to shaft (1) by a spline joint.



TKFB91-03-06-001

1- Shaft
2- Shoe
3- Swash Plate
4- Plunger
5- Rotor
6- Valve Plate
7- Housing

Solenoid Valve

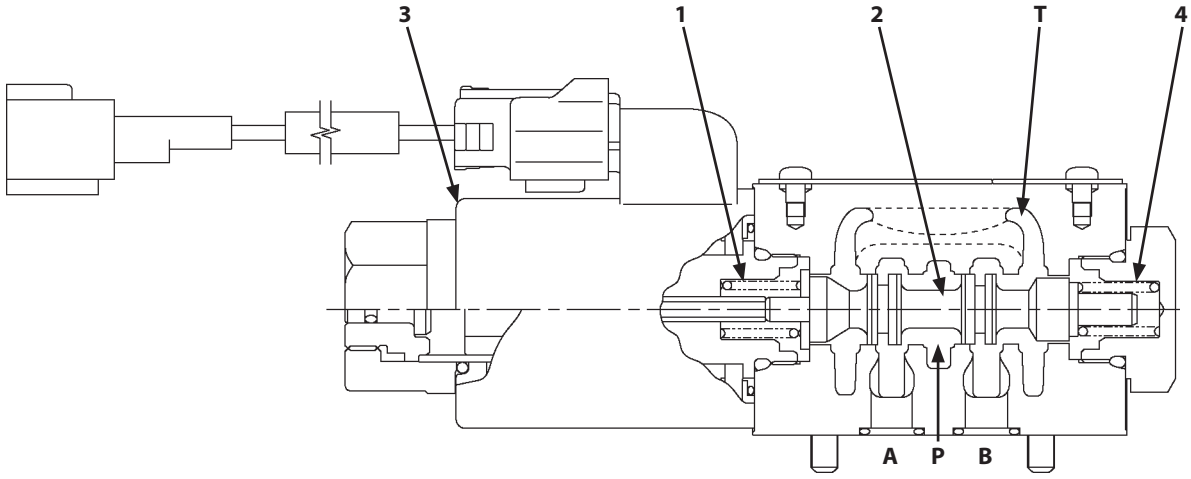
This solenoid valve is used for the following solenoid valves.

- Pilot Shut-Off Solenoid Valve
- Travel Mode Selector Solenoid Valve
- Fast Filling Solenoid Valve

The solenoid valve is an ON/OFF solenoid valve. The solenoid valve changes the output port according to the signal to the solenoid.

- Neutral state
  Spool (2) is set in the neutral position by springs (1, 4).Port P (P) is connected to port A (A). Port T (T) is connected to port B (B).

- Operating state
  When solenoid (3) is excited, spool (2) is pushed to the right. Port P (P) is connected to port B (B). Port T (T) is connected to port A (A).



TKGB-03-06-003

A-	Port A	B-	Port B	P-	Port P	T-	Port T
1-	Spring	2-	Spool	3-	Solenoid	4-	Spring