Foreword, safety and general information

Important safety notice

- Appropriate servicing and repair are extremely important to ensure safe operation of the machine. The shop manual describes the effective and safe servicing and repair methods recommended by Komatsu. Some of these methods require the use of the special tools designed by Komatsu for the specific purpose.
- The symbol mark ⚠ is used for such matters that require special cautions during the work. The work indicated by the caution mark should be performed according to the instructions with special attention to the cautions. Should hazardous situation occur or be anticipated during such work, be sure to keep safe first and take every necessary measure.

General precautions

⚠ **Inappropriate handling causes an extreme danger. Read and understand what is described in the operation and maintenance manual before operating the machine. Read and understand what is described in this manual before starting the work.**

- Before performing any greasing or repairs, read all the safety labels stuck to the machine. For the locations of the safety labels and detailed explanation of precautions, see the operation and maintenance manual.
- Locate a place in the repair workshop to keep the tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt, water or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.
- When performing any work, always wear the safety shoes and helmet. Do not wear loose work cloths, or clothes with buttons missing.
  1. Always wear the protective eyeglasses when hitting parts with a hammer.
  2. Always wear the protective eyeglasses when grinding parts with a grinder, etc.
- When performing any work with two or more workers, always agree on the working procedure before starting. While working, always keep conversations of the work between your fellow workers and your self on any step of the work. During the work, hang the warning tag of “UNDER WORKING” in the operator's compartment.
- Only qualified workers must perform the work and operation which require license or qualification.
- Keep the tools in good condition. And learn the correct way to use the tools, and use the proper ones among them. Before starting the work, thoroughly check the tools, forklift truck, service car, etc.
- If welding repairs is required, always have a trained and experienced welder with good knowledge of welding perform the work. When performing welding work, always wear welding gloves, apron, shielding goggles, cap, etc.
- Before starting work, warm up your body thoroughly to start work under good condition.
- Avoid continuing work for long hours and take rests with proper intervals to keep your body in good condition. Take a rest in a specified safe place.

Safety points

1	Good arrangement
2	Correct work clothes
3	Observance of work standard
4	Practice of making and checking signals
5	Prohibition of operation and handling by unlicensed workers
6	Safety check before starting work
7	Wearing protective goggles (for cleaning or grinding work)
8	Wearing shielding goggles and protectors (for welding work)
9	Good physical condition and preparation
10	Precautions against work which you are not used to or you are used to too much

Preparation

- Before adding oil or making any repairs, place the machine on a firm and level ground, and apply the parking brake and chock the wheels or tracks to prevent the machine from moving.
- Before starting work, lower the work equipment (blade, ripper, bucket, etc.) to the ground. If it is not possible to lower the equipment to the ground, insert the lock pin or use blocks to prevent the work equipment from falling. And be sure to lock all the work equipment control levers and hang a warning tag on them.

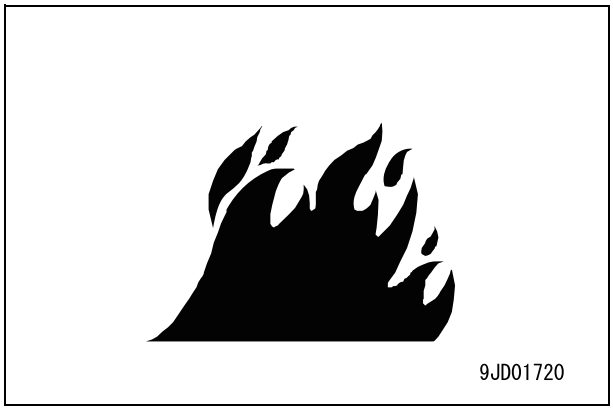
Fire prevention

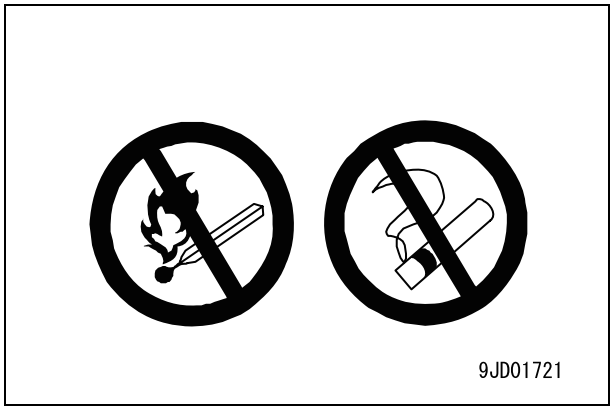
Action if fire occurs

- Turn the starting switch to the OFF position to shutdown the engine.
- Use the handrails and steps to get off the machine.
- Do not jump off the machine. You may fall or suffer serious injury.
- The fume generated by a fire contains harmful materials which have a bad influence on a human body when they are sucked.
  Don't breathe a fume.
- After a fire, there may be harmful compounds left. If it touches your skin it may have a bad influence on your body.
  Be sure to wear rubber gloves when handle the materials left after the fire.
  The material of the gloves, which is recommended is polychloroprene (Neoprene) or polyvinyl chloride (in the lower temperature environment).
  When wearing cotton-work-gloves, wear rubber gloves under them.

Prevent fire

- **Fire caused by fuel, oil, coolant or window washer fluid**
  Do not bring any flame or fire close to flammable substances such as fuel, oil, coolant or window washer fluid.There is danger that they may catch fire. Always observe the following.
  - Do not smoke or use any flame near fuel or other flammable substances.
  - Shut down the engine before adding fuel.
  - Do not leave the machine when adding fuel or oil.
  - Tighten all the fuel and oil caps securely.
  - Be careful not to spill fuel on overheated surfaces or on parts of the electrical system.
  - After adding fuel or oil, wipe up any spilled fuel or oil.
  - Put greasy rags and other flammable materials into a safe container to maintain safety at the workplace.
  - When washing parts with oil, use a non-flammable oil. Do not use diesel oil or gasoline.There is danger that they may catch fire.
  - Do not weld or use a cutting torch to cut any pipes or tubes that contain flammable liquids.
  - Determine well-ventilated areas for storing oil and fuel. Keep the oil and fuel in the specified place and do not allow unauthorized persons to enter.
  - When performing grinding or welding work on the machine, move any flammable materials to a safe place before starting.





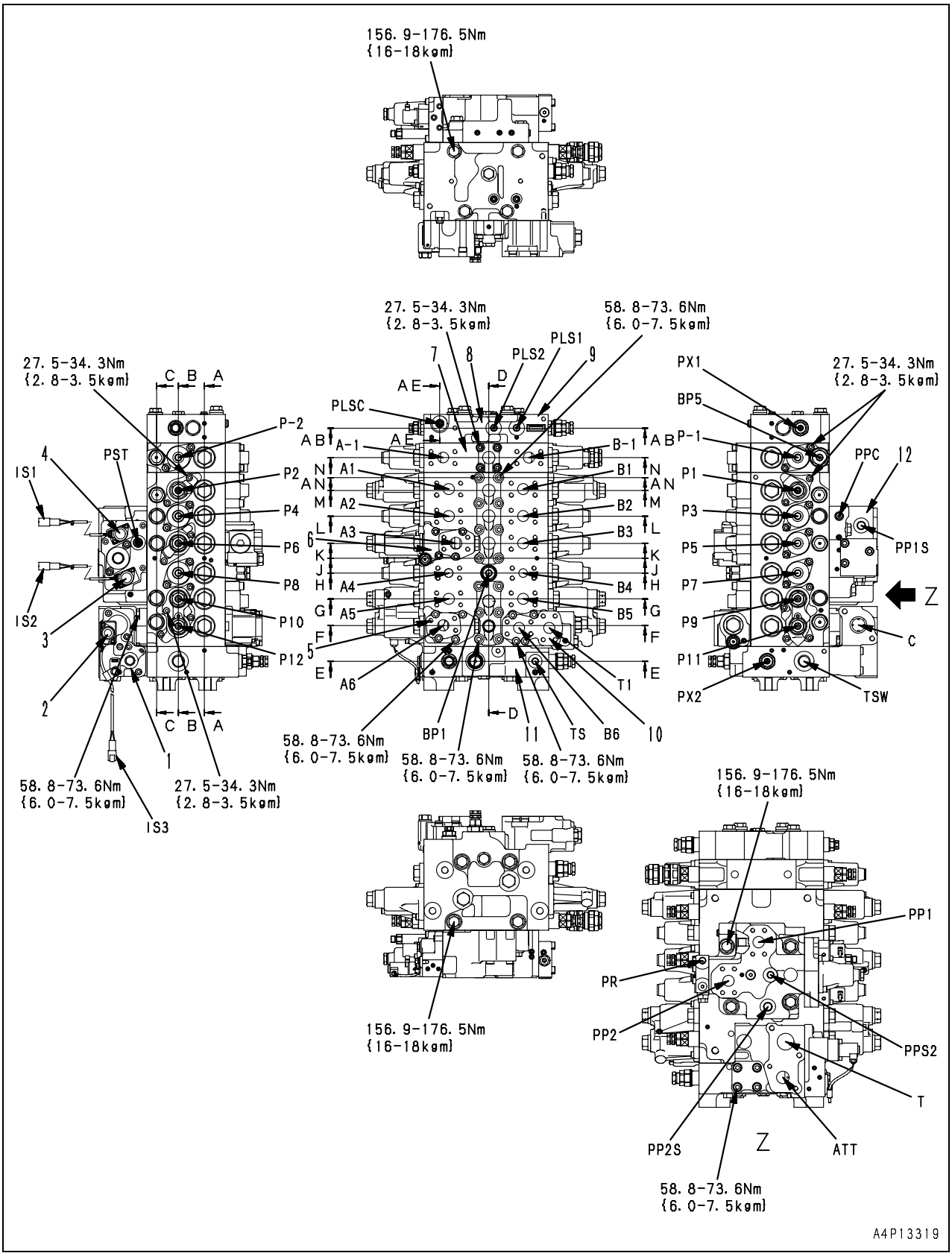
- **Fire caused by accumulation or attachment of flammable material**
  - Remove any dry leaves, chips, pieces of paper, coal dust, or any other flammable materials accumulated or attached to or around the engine exhaust manifold, muffler, or battery, or on the undercovers.
  - To prevent fires from being caught, remove any flammable materials such as dry leaves, chips, pieces of paper, coal dust, or any other flammable materials accumulated around the cooling system (radiator, oil cooler) or on the undercover.

- **Fire coming from electric wiring**
  Short circuits in the electrical system can cause fire. Always observe the following.
  - Keep all the electric wiring connections clean and securely tightened.
  - Check the wiring every day for looseness or damage. Reconnect any loose connectors or refasten wiring clamps. Repair or replace any damaged wiring.

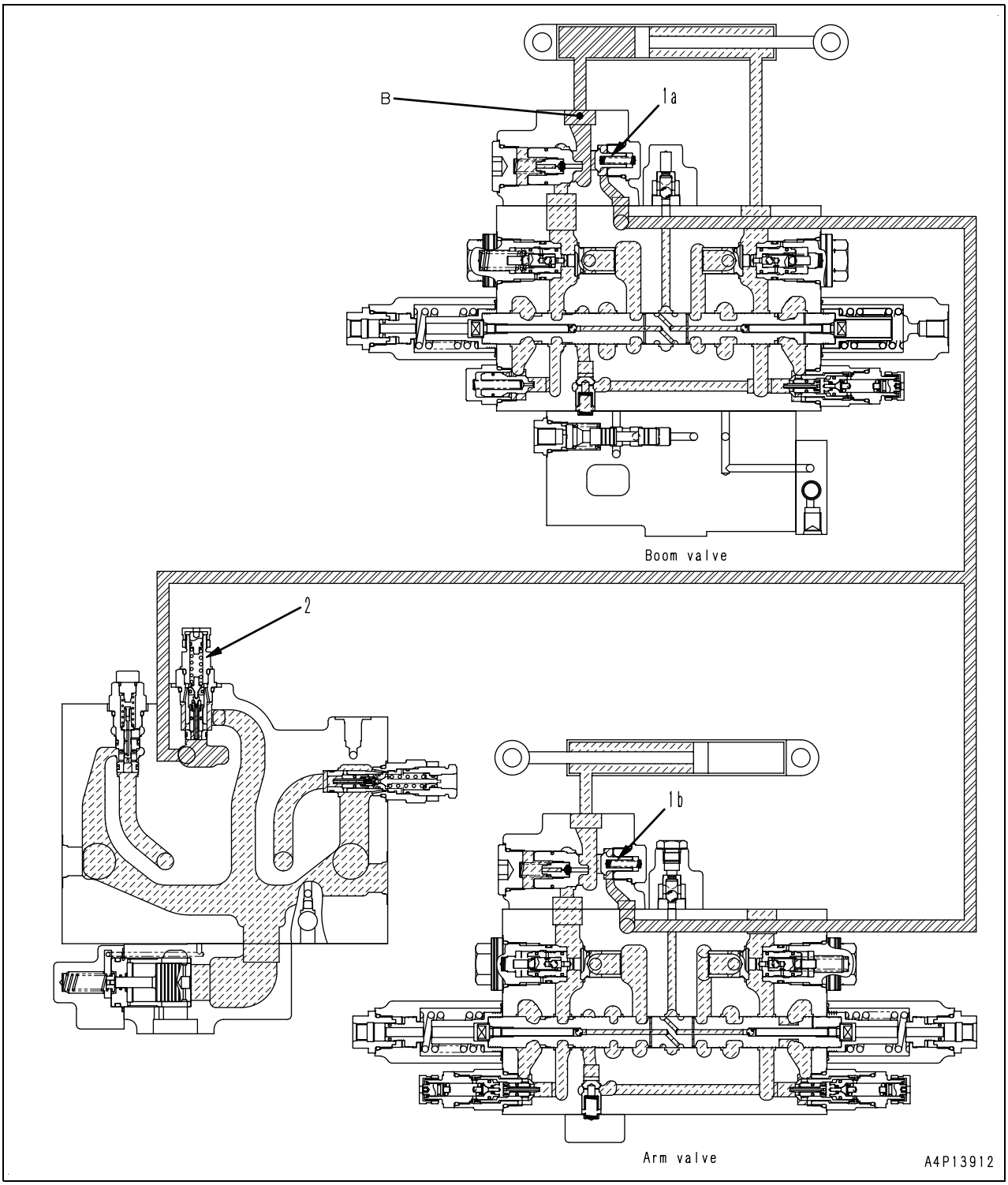
Abbreviation	Full Spelling	Purpose of use (major applicable machine (*), or equipment/device)	Explanation
KCSF	Komatsu Catalyzed Soot Filter	Engine	This filter is used to capture soot in exhaust gas. It is built in to KDPF.
KDOC	Komatsu Diesel Oxidation Catalyst	Engine	The catalyst used for purifying exhaust gas. It is built in to KDPF.
KDPF	Komatsu Diesel Particulate Filter	Engine	This component with built-in KDOC (catalyst) and KCSF purifies exhaust gas. Part building in (soot-capturing filter) It is installed in place of the currently used muffler.
KTCS	Komatsu Traction Control System	Travel and brake (HM system)	Function that recovers the drive force of the wheels by braking automatically with the optimum force and at the same time activates the inter-axle differential lock when the wheels idle while the machine travels on the soft ground road.
KVGT	Komatsu Variable Geometry Turbocharger	Engine	The turbocharger on which the cross-section area of the exhaust passage is made variable.
LCD	Liquid Crystal Display	Machine monitor	Liquid Display Image display equipment such as the monitor which assembles in the liquid crystal element.
LED	Light Emitting Diode	Electronic parts	Light Emitting Diode Semi-conductor element that emits light when the voltage is applied in the normal direction.
LIN	Local Interconnect Network	Communication and electronic control	One of communication standards that is used in the network on the machine
LS	Load Sensing	Oil pressure	Function that detects differential pressure of pump and controls discharge amount according to load.
LVDS	Low Voltage Differential Signaling	Communication and electronic control	One of communication standards that is used in the network on the machine
MAF	Mass Air Flow	Engine	It means the intake air flow of the engine. It is not used independently but used together with the sensor. The mass air flow sensor may be called MAF sensor.
MMS	Multimedia Messaging Service	Communication	Service that allows transmission and reception of short messages consisting of characters or voice or images between cell phones.
NC	Normally Closed	Electric and hydraulic	Device actuated to open electric or hydraulic circuits that are normally closed if not actuated.
NO	Normally Open	Electric and hydraulic	Device actuated to close electric or hydraulic circuits that are normally open if not actuated.
OLSS	Open-center Load Sensing System	Oil pressure	Hydraulic system that can operate multiple actuators at the same time, regardless of the load.
PC	Pressure Compensation	Oil pressure	A function used to correct oil pressure.
PCCS	Palm command control system	Steering (D)	System in which a controller instantly analyses data from each lever, pedal, and dial, and performs optimum electronic control of the engine and transmission.
PCV	Pre-stroke Control Valve	Engine	Valve installed at inlet port of pump to adjust fuel intake amount in order to control fuel discharge amount of supply pump.

Control valve

★ In this section, only the 7-spool valve (6-spool valve + service valve) is shown.

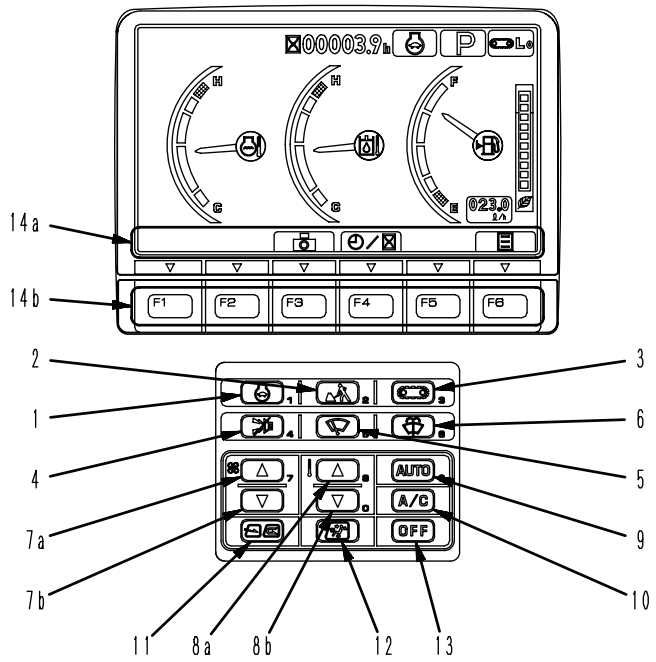


Safety valve for hydraulic drift prevention valve
Operation when abnormally high pressure is generated



- If abnormally high pressure is generated in the boom cylinder bottom circuit, the pressurized oil in port (B) opens check valve (1a) to actuate safety valve for hydraulic drift prevention valve (2).
- The pressurized oil of the boom cylinder bottom circuit pressure or arm cylinder head circuit pressure, whichever has higher pressure, opens check valve (1a) or (1b) to actuate safety valve for hydraulic drift prevention valve (2).

Switches



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No.	Name	Function	Operation
1	Auto-deceleration switch [Numeric keypad: 1]	Switches the auto-deceleration function ON/OFF. Lights up: ON Lights off: OFF	• When working mode is “L”, this switch is always “OFF” after engine started. OFF ⟷ ON
2	(*1) Working mode selector switch [Numeric keypad: 2]	Displays the working mode selector screen.	P: Heavy-duty operation E: Low-fuel operation L: Fine operation B: Breaker operation ATT-P: Double-acting attachment operation ATT-E: Double-acting attachment and low-fuel operation
3	Travel speed selector switch [Numeric keypad: 3]	Changes the travel speed. Lo lights up: Low speed Mi lights up: Medium speed Hi lights up: High speed	• Speed is sequentially changed as shown below. • Lo (Low speed) → Mi (Medium speed) → Hi (High speed) → Lo (Low speed)
4	Buzzer cancel switch [Numeric keypad: 4]	Stops the alarm buzzer. (Some alarm buzzer does not stop sounding even if the switch is pressed.)	• The alarm buzzer stops sounding. • The alarm buzzer sounds again if another error worth alarming is detected.
5	(*2) Wiper switch [Numeric keypad: 5]	Operates the front glass wiper. INT: Intermittent operation ON: Continuous operation Lights off: Holds in position	• Pressing the switch sequentially changes the wiper operation. OFF (Stop) → INT (Intermittent) → ON (Continuous) → OFF (Stop)

Operation table of PPC lock solenoid valve

Operating condition		Operation
Lock lever	Lock	OFF
	Free	ON

Operation table of 2-stage relief solenoid valve

Operating condition			Operation
Overheat 1st setting is ON			OFF
Overheat 2nd setting is ON			
All of work equipment, swing, and travel signals are OFF			
Swing lock switch is ON			ON
Travel signal is ON			
L mode is selected			
Boom LOWER signal is ON			
P/E mode is selected	Left knob switch is ON	Signals other than swing single signal are ON	
		Swing single signal is ON	OFF
Other than above condition			

Operation table of swing holding brake solenoid valve

Operating condition		Operation
Work equipment, swing, and travel signals	All are OFF	OFF
	Any one is ON	ON

Operation table of travel speed selector solenoid valve

Operating condition			Operation
Overheat 2nd setting signal is ON			OFF
Fuel control dial is at 1,500 rpm or below			
Travel speed switch is at Lo/Mi (PC200-8M0) Travel speed switch is at Lo (PC220-8M0)			
Travel speed switch is at Hi (PC200-8M0) Travel speed switch is at Mi/Hi (PC220-8M0)	Travel signal is OFF		
	Travel signal is ON	F or R pump pressure is 24.5 MPa {250 kg/cm^2}	
		F or R pump pressure is 15.3 MPa {150 kg/cm^2}	ON
Other than above condition			

Operation table of travel junction solenoid valve

Operating condition			Operation
Travel steering signal is ON			ON
Travel steering signal is OFF	Travel lever is operated independently	F or R pump pressure is 24.5 MPa {250 kg/cm^2}	
	Other than above condition		OFF

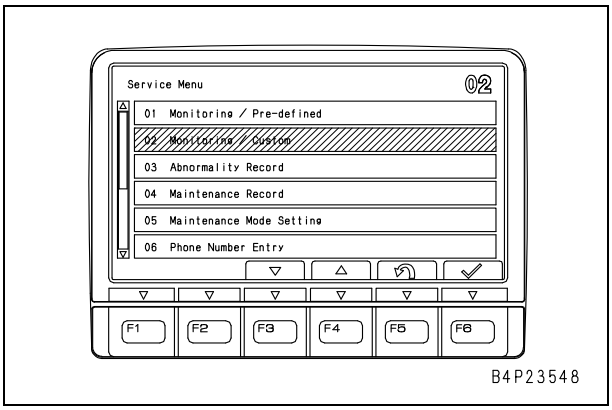
Operation table of ATT return selector solenoid valve (Machine with provision for attachment)

Operating condition	Operation
Working mode: Other than B	OFF
Working mode: B	ON

Monitoring / Custom

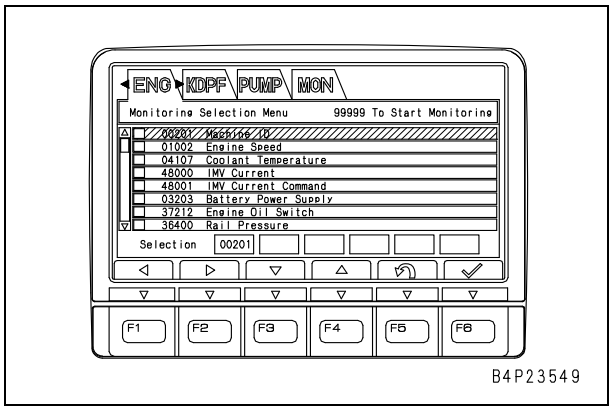
The machine monitor can monitor the condition of the machine in real time by receiving signals from various switches, sensors, and actuators installed to many parts of the machine and the information from the controllers which control them.
The monitoring function allows you to select a desired monitoring item.

1. Selecting the menu
   Select “Monitoring” on the “Service Menu” screen.

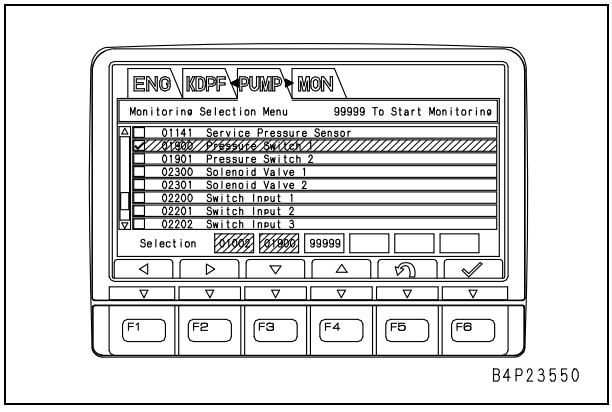


2. Selecting monitoring item
   After the “Monitoring selection menu” screen for monitoring item selection is displayed, select the item to be monitored by using the function switches or numeral input switches.
   - [F1]: Moves to left item
   - [F2]: Moves to right item
   - [F3]: Moves to lower item
   - [F4]: Moves to upper item
   - [F5]: Deletes the entered numbers/ Returns the display to the service menu
   - [F6]: Validates the selection

   ★ In setting of the monitoring, each time function switch [F2] is pressed, sequential switching among [ENG] → [PUMP] → [MON] → [ENG] takes place in this order. (Pressing [F1] induces the sequential switching in the reverse order.)
   ★ Selection with function switches: Select an applicable equipment using [F1] or [F2], and select an item using [F3] or [F4] and determine it using [F6].
   ★ Selection with numeral input switch: Select a desired item by entering the corresponding 5-digit code and then validate it using [F6].
   ★ If the color of the selection cursor changes from yellow to red, selection of the item is entered.
   ★ You can select up to six monitoring codes at the same time. Note, however, that six items may not be available depending on how they are displayed on the screen.



3. Getting machine monitor ready for monitoring
   After selecting monitoring items, set the machine monitor ready for monitoring by using the function switch or numeral input switch.
   ★ Execution by use of function switches: Double-click [F6] or hold it down (for approximately 2 seconds).
   ★ Execution using numeral input switch: [99999] and press [F6].
   ★ When monitoring only two items, for example, select them and enter them by using [F6]. If [F6] is pressed once more at this time, the machine monitor is set ready for monitoring.
   ★ If monitoring items are selected up to the limit number, the machine monitor is automatically set ready for monitoring.



Failure code	Trouble (Displayed on screen)	Component in charge	Action level	Category of record	Reference documents No.
CA132	Throttle Sensor Low Error	ENG	L03	Electrical system	Troubleshooting by failure code, Part 1 SEN06133-**
CA144	Coolant Temp Sens High Error	ENG	L01	Electrical system	
CA145	Coolant Temp Sens Low Error	ENG	L01	Electrical system	
CA153	Chg Air Temp Sensor High Error	ENG	L03	Electrical system	
CA154	Chg Air Temp Sensor Low Error	ENG	L03	Electrical system	
CA155	Chg Air Temp High Speed Derate	ENG	L03	Electrical system	
CA187	Sens Supply 2 Volt Low Error	ENG	L03	Electrical system	
CA221	Ambient Press Sens High Error	ENG	L03	Electrical system	
CA222	Ambient Press Sens Low Error	ENG	L03	Electrical system	
CA227	Sens 2 Supply Volt High Error	ENG	L03	Electrical system	
CA234	Eng Overspeed	ENG	—	Electrical system	
CA238	Ne Speed Sens Supply Volt Error	ENG	L01	Electrical system	
CA271	IMV/PCV1 Short Error	ENG	L03	Electrical system	
CA272	IMV/PCV1 Open Error	ENG	L03	Electrical system	
CA322	Inj #1(L#1) Open/Short Error	ENG	L03	Electrical system	Troubleshooting by failure code, Part 2 SEN06134-**
CA323	Inj #5(L#5) Open/Short Error	ENG	L03	Electrical system	
CA324	Inj #3(L#3) Open/Short Error	ENG	L03	Electrical system	
CA325	Inj #6(L#6) Open/Short Error	ENG	L03	Electrical system	
CA331	Inj #2(L#2) Open/Short Error	ENG	L03	Electrical system	
CA332	Inj #4(L#4) Open/Short Error	ENG	L03	Electrical system	
CA342	Calibration Code Incompatibility	ENG	L04	Electrical system	
CA351	Injectors Drive Circuit Error	ENG	L03	Electrical system	
CA352	Sens Supply 1 Volt Low Error	ENG	L03	Electrical system	
CA386	Sens Supply 1 Volt High Error	ENG	L03	Electrical system	
CA428	Water in Fuel Sensor High Error	ENG	L01	Electrical system	

Failure code [CA111] ECM Critical Internal Failure

Action level	Failure code	Failure	Engine Controller Module Critical Internal Failure (Engine controller system)
L04	**CA111**		
Detail of failure	● Memory or power supply circuit in engine controller is defective.		
Action of controller	● None in particular		
Problem on machine	● Engine may stop during operation or may not be able to start.		
Related information	● Power supply voltage to engine controller can be checked with monitoring function. (Code: 03203 Battery voltage) ● Method of reproducing failure code: Start engine.		

Cause		Procedure, measuring location, criteria and remarks
1	Defect in related system	If another failure code is displayed, perform troubleshooting for it.
2	Perform troubleshooting for failure code [**CA441**].	

Failure code [CA115] Eng Ne and Bkup Speed Sens Error

Action level	Failure code	Failure	Engine Ne and Bkup speed sensor Error (Engine controller system)
L04	**CA115**		
Detail of failure	● Signals from both engine Ne and Bkup speed sensors are abnormal.		
Action of controller	● None in particular		
Problem on machine	● Engine stops. ● Engine does not start		
Related information	● Method of reproducing failure code: Start engine.		

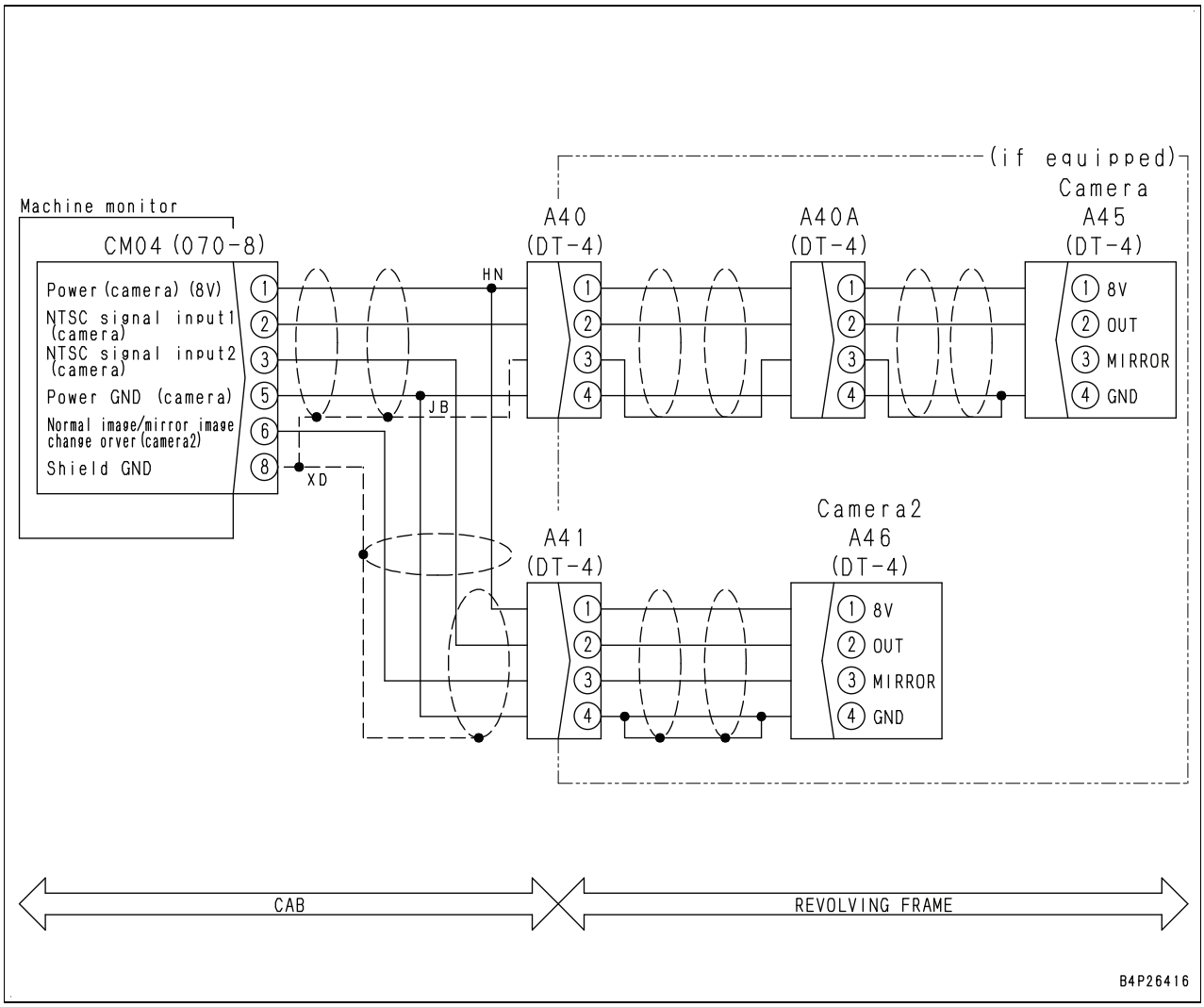
Cause		Procedure, measuring location, criteria and remarks
1	Defective connection of sensor connector	Connectors of Ne speed sensor and Bkup speed sensor may be connected defectively (wrong connection). Check them.
2	Defective Ne speed sensor system	Perform troubleshooting for troubleshooting Nos. 1 to 10 of failure code [**CA689**].
3	Defective Bkup speed sensor system	Perform troubleshooting for failure code [**CA778**].
4	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Failure code [CA488] Chg Air Temp High Torque Derate

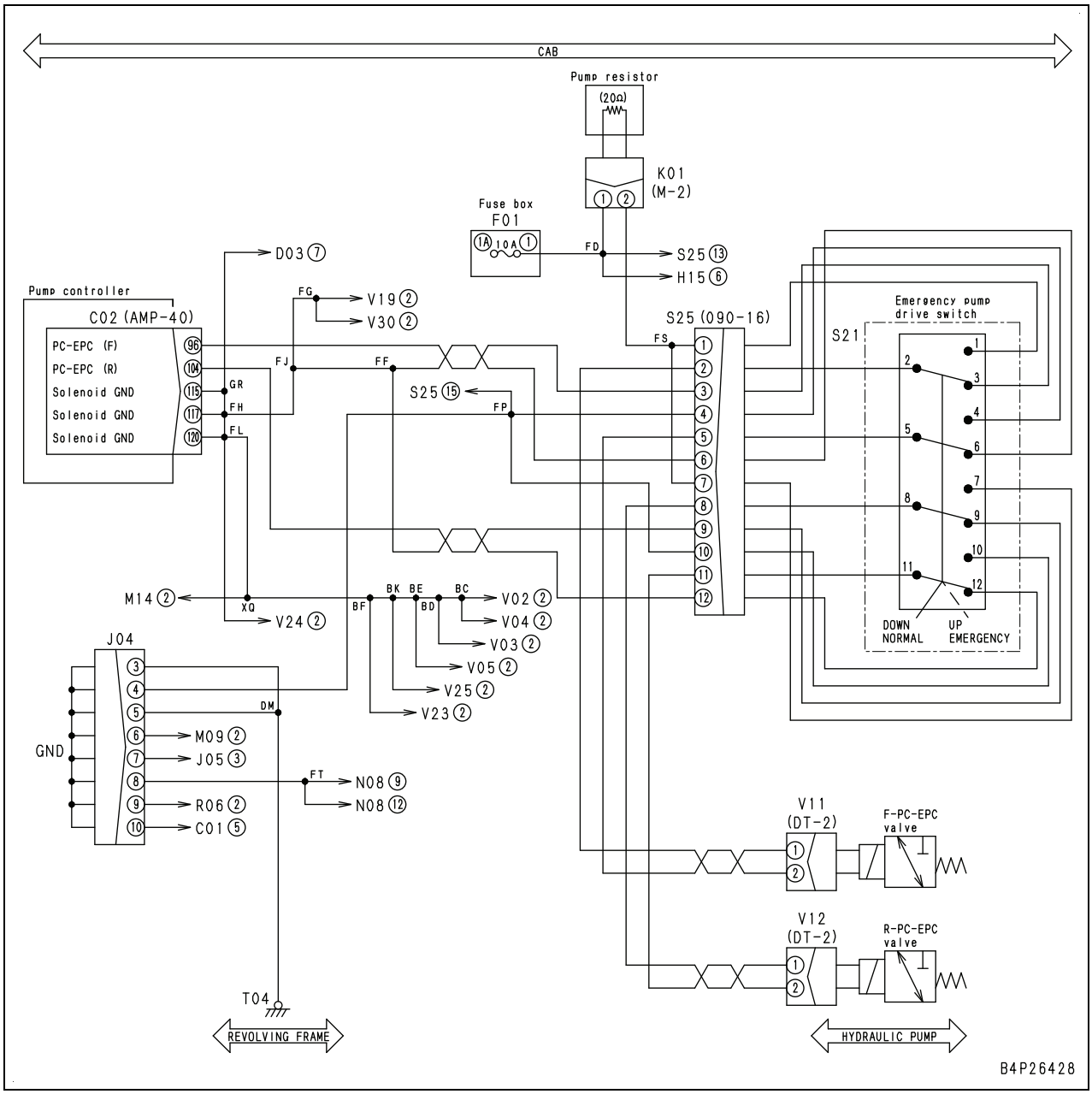
Action level	Failure code	Failure	Charge air temperature high torque derate (Engine controller system)
L03	**CA488**		
Detail of failure	● Temperature signal from boost pressure & temperature sensor exceeds upper limit of temperature control.		
Action of controller	● Restricts engine output and allows engine to run.		
Problem on machine	● Engine output lowers.		
Related information	● Boost temperature can be checked with monitoring function. (Code 18500: Boost temperature) ● Method of reproducing failure code: Start engine.		

Cause		Procedure, measuring location, criteria and remarks
1	Lowered cooling performance of aftercooler	Cooling performance of aftercooler may degrade. Check following points: ● Looseness and damage of fan belt ● Insufficient cooling air ● Clogging of aftercooler fins
2	Abnormal rise of turbocharger outlet temperature	Outlet temperature of turbocharger may be abnormally high. Check related parts.
3	Defective boost temperature sensor	Perform troubleshooting for failure codes [**CA153**] and [**CA154**].

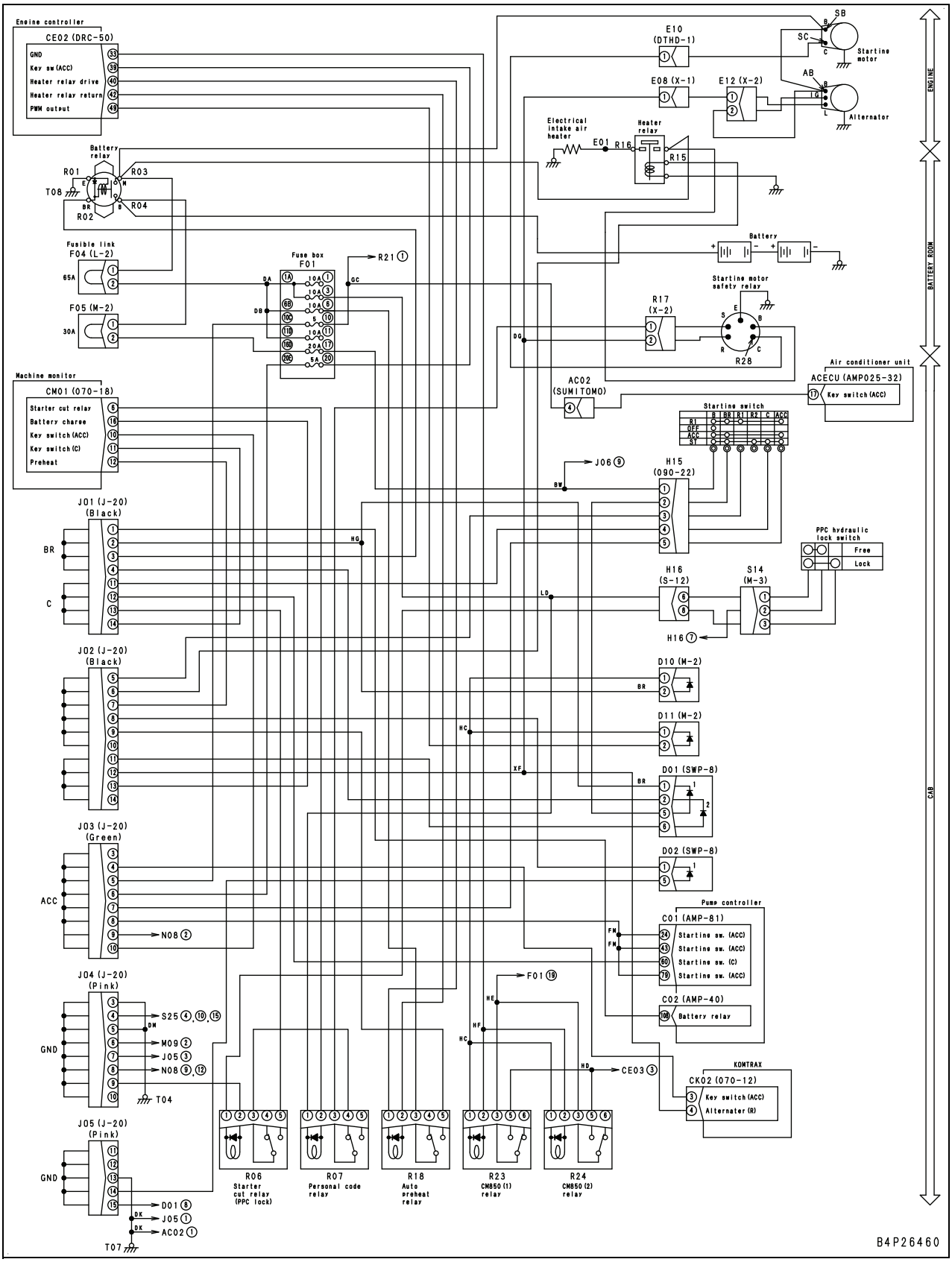
Circuit diagram related to camera power supply



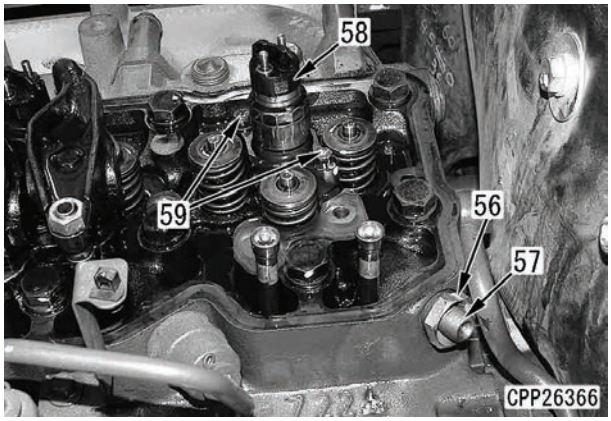
Circuit diagram related to PC-EPC solenoid



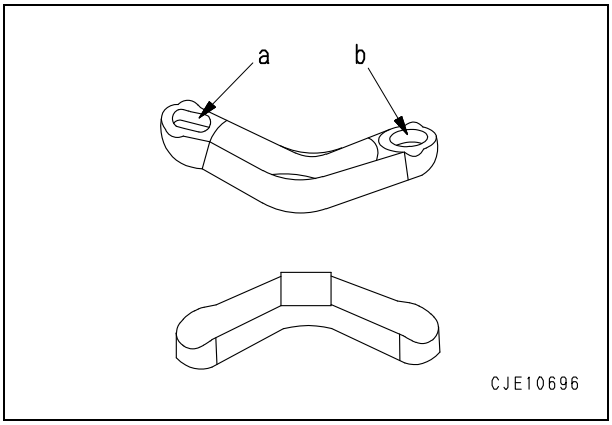
Circuit diagram related to preheating of engine

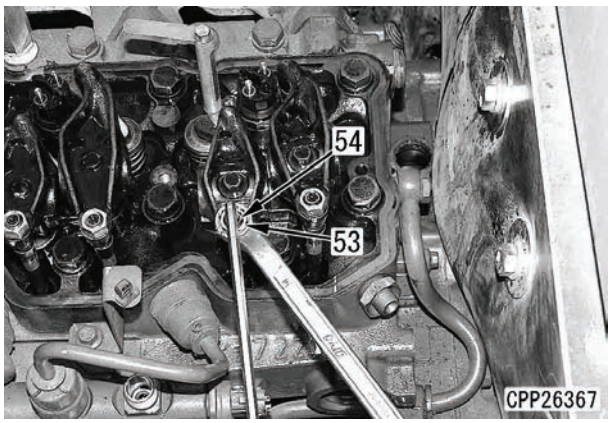


9) Tighten inlet connector (57) lightly by using retaining nut (56). (Push into the hole of the injector)
   Retaining nut:
   15 ± 5 Nm {1.5 ± 0.5 kgm}
10) Tighten mounting bolts (57) of fuel injector (58) alternately.
   Fuel injector mounting bolt:
   8 ± 0.8 Nm {0.8 ± 0.08 kgm}
11) Tighten retaining nut (60).
   Retaining nut:
   50 ± 5 Nm {5.1 ± 0.5 kgm}

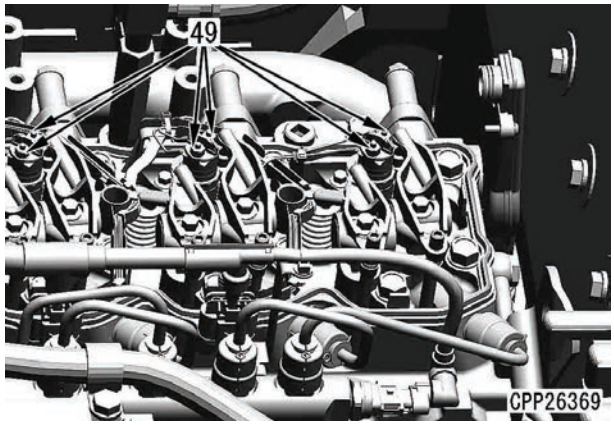


4. Crosshead and rocker arm
   1) Install the crosshead and rocker arm.
      ★ Since the hole shapes at parts "**a**" and "**b**" of each crosshead are different, install them to their respective intake and exhaust valves in the original directions.
      ★ Check that the spherical portion of adjustment screw (54) is fitted properly in the socket of the push rod and then tighten the mounting bolt.
      Rocker arm mounting bolt:
      36 ± 5 Nm {3.7 ± 0.5 kgm}
   2) Adjust the valve clearance. For details, see Testing and adjusting, "Adjusting valve clearance".
      Locknut (53):
      20 to 28 Nm {2.04 to 2.86 kgm}





5. Install harnesses and nuts (49).
   ★ Check the wiring harness that does not interfere with the rocker arm.
   Mounting nut (49):
   1.5 ± 0.25 Nm {0.15 ± 0.03 kgm}



6. Install gasket assembly (51).