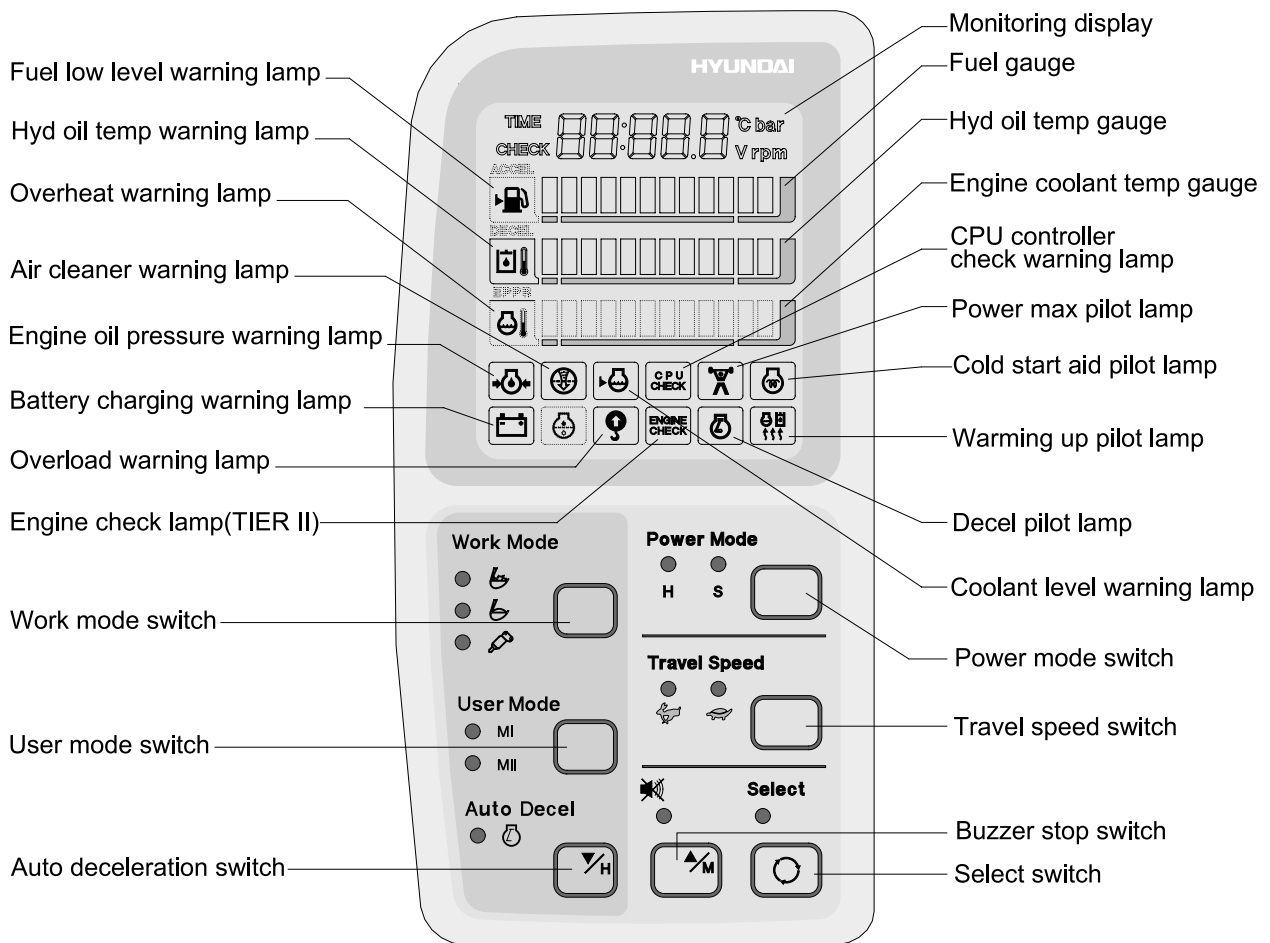## 1. OUTLINE

Monitoring system consists of the monitor part and switch part.

The monitor part gives warnings when any abnormality occurs in the machine and informs the condition of the machine.

Various select switches are built into the monitor panel, which act as the control portion of the machine control system.

2. CLUSTER

1) MONITOR PANEL

Fuel low level warning lamp

Hyd oil temp warning lamp

Overheat warning lamp

Air cleaner warning lamp

Engine oil pressure warning lamp

Battery charging warning lamp

Overload warning lamp

Engine check lamp(TIER II)

Work mode switch

User mode switch

Auto deceleration switch

Monitoring display

Fuel gauge

Hyd oil temp gauge

Engine coolant temp gauge

CPU controller check warning lamp

Power max pilot lamp

Cold start aid pilot lamp

Warming up pilot lamp

Decel pilot lamp

Coolant level warning lamp

Power mode switch

Travel speed switch

Buzzer stop switch

Select switch

2) CLUSTER CHECK PROCEDURE

(1) Start key : ON

Check monitor initial 5 seconds

a. All lamps light up.
b. Buzzer sound.

Check monitor after 5 seconds : Indicate cluster version and machine condition

a. Cluster program version : CL : 1.4 ←— Indicates program version 1.4 for 2 seconds.
b. Tachometer : 0rpm
c. Fuel gauge : All light up below appropriate level
d. Hydraulic temperature : All light up below appropriate level
e. Engine coolant temperature gauge : All light up below appropriate level
f. Warning lamp
During start key **ON** the engine oil pressure lamp and battery charging lamp go on, but it is not abnormal.
When engine coolant temperature below 30 C, the warming up lamp lights up.

Indicating lamp state

a. Work mode selection : General work
b. Power mode selection : S mode
c. User mode selection : No LED ON
d. Auto decel LED : ON
e. Travel speed pilot lamp : Low(Turttle)

(2) Start of engine

Check machine condition

a. Tachometer indicates at present rpm
b. Gauge and warning lamp : Indicate at present condition.
When normal condition : All warning lamp OFF
c. Work mode selection : General work
d. Power mode selection : S mode
e. User mode selection : No LED ON
f. Auto decel LED : ON
g. Travel speed pilot lamp : Low(Turttle)

When warming up operation

a. Warming up lamp : ON
b. 10 seconds after engine started, engine speed increases to1200 rpm(Auto decel LED : ON)
Others same as above .

When abnormal condition

a. The lamp lights up and the buzzer sounds.
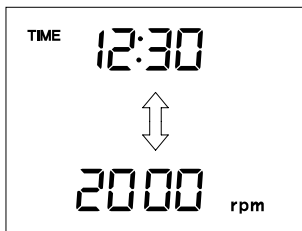b. If **BUZZER STOP** switch is pressed, buzzer sound is canceled but the lamp light up until normal condition.

3. CLUSTER CONNECTOR

No.	Signal	Input / Output
1	Power IG(24V)	Input(20~32V)
2	GND	Input(0V)
3	Serial-(RX)	Input(Vpp=12V)
4	Serial+(TX)	Output(Vpp=4V)
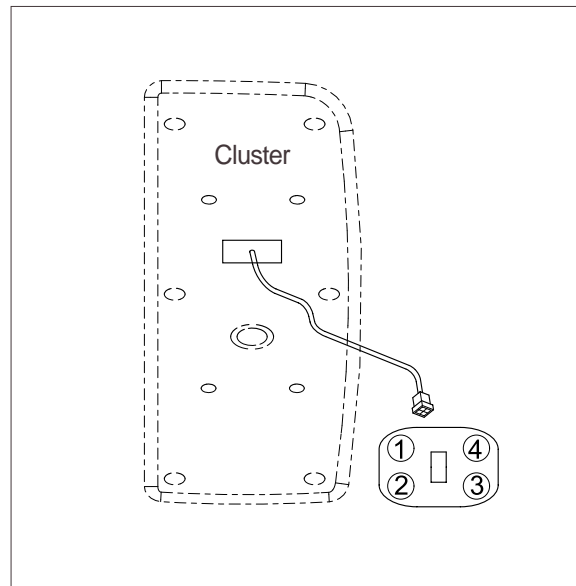
Cluster

4. CLUSTER FUNCTION
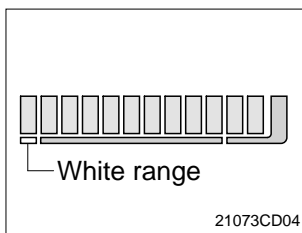
1) MONITORING DISPLAY

```
TIME  12:30
        ⇕
      2000  rpm
```

(1) This displays the current time and machine information such as engine rpm, coolant/hydraulic oil temperature, hydraulic oil pressure and also error codes.
Refer to the page 5-35 for details.

2) FUEL GAUGE

└─ White range

21073CD04

(1) This gauge indicates the amount of fuel in the fuel tank.

(2) Fill the fuel when the white range or warning lamp 🔋 blinks.
If the gauge illuminates the white range or warning lamp 🔋 blinks even though the machine is on the normal condition, check the electric device as that can be caused by the poor connection of electricity or sensor.

3) HYDRAULIC OIL TEMPERATURE GAUGE
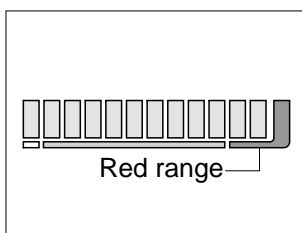
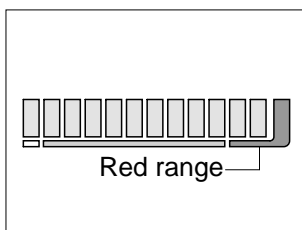Red range ─┘

(1) This indicates the temperature of coolant.
· White range : 30 C(86 F) below
· Green range : 30-105 C(86-221 F)
· Red range : 105 C(221 F) above

(2) The green range illuminates when operating.

(3) Keep idling engine at low speed until the green range illuminates, before operation of machine.

(4) When the red range illuminates, reduce the load on the system. If the gauge stays in the red range, stop the machine and check the cause of the problem.

4) Engine coolant temperature gauge

Red range ─┘

(1) This indicates the temperature of coolant.
· White range : 30 C(86 F) below
· Green range : 30-105 C(86-221 F)
· Red range : 105 C(221 F) above

(2) The green range illuminates when operating.

(3) Keep idling engine at low speed until the green range illuminates, before operation of machine.

(4) When the red range illuminates, turn OFF the engine, check the radiator and engine.

5) FUEL LOW LEVEL WARNING LAMP
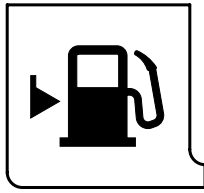
(1) This lamp blinks and the buzzer sounds when the level of fuel is below 40ℓ(10.6U.S. gal).

(2) Fill the fuel immediately when the lamp blinks.

6) HYDRAULIC OIL TEMPERATURE WARNING LAMP
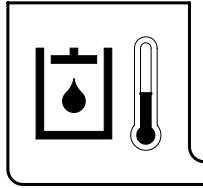
(1) This warning lamp operates and the buzzer sounds when the temperature of hydraulic oil is over 105 C(221 F).

(2) Check the hydraulic oil level when the lamp blinks.

(3) Check for debris between oil cooler and radiator.

7) OVERHEAT WARNING LAMP
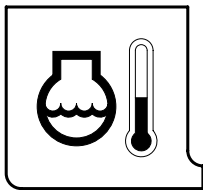
(1) This lamp blinks and the buzzer sounds when the temperature of coolant is over the normal temperature 110 C(230 F) .

(2) Check the cooling system when the lamp blinks.

8) ENGINE OIL PRESSURE WARNING LAMP
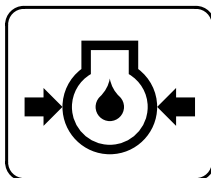
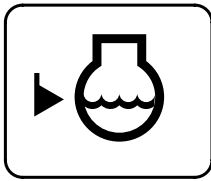(1) This lamp blinks and the buzzer sounds after starting the engine because of pressure.

(2) If the lamp blinks during engine operation, shut OFF engine immediately. Check oil level.

9) AIR CLEANER WARNING LAMP
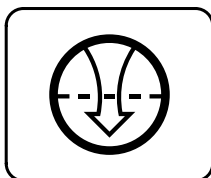
(1) This lamp is operated by the vacuum caused inside when the filter of air cleaner is clogged which supply air to the engine.

(2) Check the filter and clean or replace it when the lamp blinks.

10) COOLANT LEVEL WARNING LAMP

(1) This lamp blinks and the buzzer sounds when the coolant is below LOW in the reservoir tank of radiator.

(2) Check the reservoir tank when the lamp blinks.
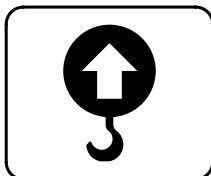
11) CPU CONTROLLER CHECK WARNING LAMP
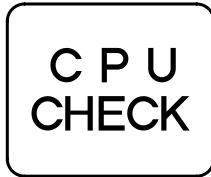
(1) Communication problem with CPU controller makes the lamp blinks and the buzzer sounds.

(2) Check if any fuse for CPU burnt off.

(3) If not check the communication line between them.

12) BATTERY CHARGING WARNING LAMP
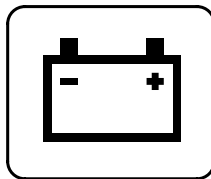
(1) This lamp blinks and the buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.

(2) Check the battery charging circuit when this lamp blinks, during engine operation.

13) OVERLOAD WARNING LAMP

(1) When the machine is overload, the overload warning lamp blinks during the overload switch ON.

14) ENGINE CHECK LAMP (TIER II only)
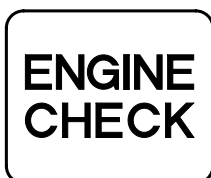
This lamp blinks and the buzzer sounds when the communication between CPU controller and ECM on the engine is abnormal or if any fault code received from ECM.
Check the communication line between them.
If the communication OK, then check the fault code on the cluster.

15) POWER MAX PILOT LAMP

(1) The lamp will be ON when pushing power max switch on the LH RCV lever.

16) DECEL PILOT LAMP

(1) Operating auto decel or one touch decel makes the lamp ON.

(2) The lamp will be ON when pushing one touch decel switch on the LH RCV lever.
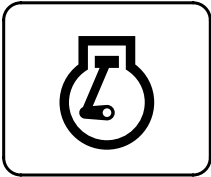
17) WARMING UP PILOT LAMP
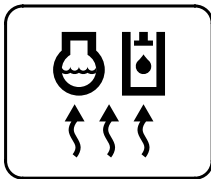
(1) This lamp is turned ON when the coolant temperature is below 30 C(86 F).

(2) The automatic warming up is cancelled when the engine coolant temperature is above 30 C, or when 10 minutes have passed since starting.

18) PREHEAT PILOT LAMP

(1) Turning the start key switch ON position starts preheating in cold weather.

(2) Start the engine as this lamp is OFF.

19) WORK MODE SWITCH
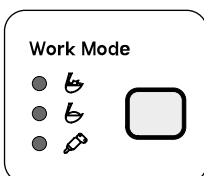
Work Mode

(1) This switch is to select the machine operation mode, which shifts from general operation mode to heavy operation mode and breaker mode in a raw by pressing the switch.
- · : Heavy duty work mode
- · : General work mode
- · : Breaker operation mode
Refer to the page 5-4 for details.

20) USER MODE SWITCH
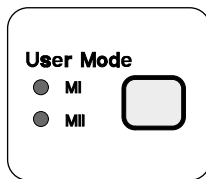
(1) This switch is to select the memory sets, at which you can change the engine and pump power and memorize it into MI and MII mode for your preference.
Refer to the page 5-5 for details.

21) AUTO DECELERATION SWITCH
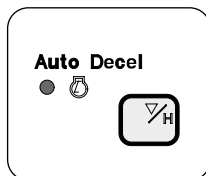
(1) This switch is used to actuate the auto deceleration function so the engine speed is lowered automatically when all control levers and pedals are at neutral position to save the fuel.
· Light ON : Auto deceleration function is selected.
· Light OFF : Auto deceleration function is cancelled so that the engine speed increased to previous setting value.

(2) Operating the auto deceleration function makes the decel indicate lamp on the LCD panel ON.

22) POWER MODE SWITCH
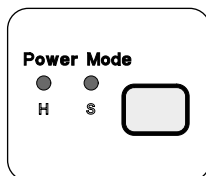
(1) The lamp of selected mode is turned ON by pressing the switch(⬜), when selecting the mode to use.
· H : This is used for high power work.
· S : This is used for standard power work.

23) TRAVEL SPEED CONTROL SWITCH
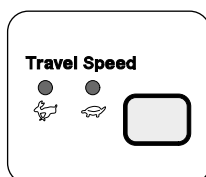
(1) This switch is to control the travel speed which is changed to high speed(Rabbit mark) by pressing the switch and low speed(Turtle mark) by pressing again.

24) BUZZER STOP SWITCH
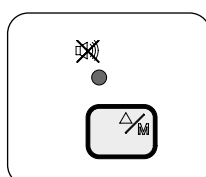
(1) When the starting switch is turned ON first, normally the alarm buzzer sounds for 2 seconds during lamp check operation.

(2) The red lamp lights ON and the buzzer sounds when the machine has a problem.
In this case, press this switch and buzzer stops, but the red lamp lights until the problem is cleared.

25) SELECT SWITCH
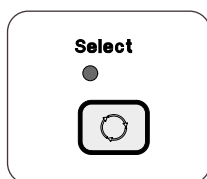
Select

(1) This switch is used to select the monitor display function.
   Refer to the page 5-37 for details.

(2) If the switch is pressed for 3 seconds in time display mode, it is selected time adjusting function, as below.
   · Hour by auto decel( )switch
   · Minute by buzzer stop( ) switch.

(3) After time set, the switch is pressed, it is returned clock.

5. MONITORING DISPLAY

1) OUTLINE

Information of machine performance as monitored by the CPU controller can be displayed on the cluster when the operator selects a display mode by touching **SELECT** switch alone or with **BUZZER STOP** switch on the cluster as below.

Display group	How to select display mode		Name	Display on the cluster
	Group selection	Display mode selection		
Group 0 (Default)	Way 1 Key switch **ON** or **START** Way 2 Touch **AUTO DECEL** switch while pressing **BUZZER STOP** at group 1~4.	Initial	Engine rpm	950 rpm
		Touch **SELECT** 1 time	Time	TIME 12:30
		Touch **SECLET** 2 times	Power shift pressure (EPPR valve)	EP: 10 bar
		Touch **SELECT** 3 times	CPU model & version	29:C 1.4
		Touch **SELECT** 4 times	Option (Only when a pressure sensor is installed)	Front pump pressure	P1:100 bar
		Touch **SELECT** 5 times		Rear pump pressure	P2:200 bar
		Touch **SELECT** 6 times		Pilot pressure	P3:30 bar
Group 1 (Volt, temp, EPPR press, version)	Touch **SELECT** switch **once** while pressing **BUZZER STOP**. In this group **SELECT** LED **ON**	Default	Battery voltage(V)	b:24.8v
		Touch **SELECT** 1 time	Potentiometer voltage(V)	Po: 2.5v
		Touch **SELECT** 2 times	Accel dial voltage(V)	dL: 3.8v
		Touch **SELECT** 3 times	Hydraulic oil temperature(C)	Hd: 50℃
		Touch **SELECT** 4 times	Coolant temperature(C)	Ct: 85℃
		* Touch **SELECT** 5 times	Ambient pressure (kpa)	AP:100
Group 2 (Error code)	Touch **SELECT** switch **twice** while pressing **BUZZER STOP**. In this group **BUZZER STOP** LED blinks	Default	Current error	CHECK Er: 03
		Touch **SELECT** 1 time	Recorded error (Only key switch ON)	TIME Er: 03
		Press down(▼) & **SELECT** at the same time	Recorded error deletion (Only key switch ON)	TIME Er: 00
Group 3 (Switch input)	Touch **SELECT** switch **3 times** while pressing **BUZZER STOP**. In this group **SELECT** LED blinks at 0.5sec interval	Default	Pump prolix switch	PP:on or oFF
		Touch **SELECT** 1 time	Auto decel pressure switch	dP:on or oFF
		Touch **SELECT** 2 times	Power boost switch	Pb:on or oFF
		Touch **SELECT** 3 times	Travel oil pressure switch	oP:on or oFF
		Touch **SELECT** 4 times	One touch decel switch	od:on or oFF
		Touch **SELECT** 5 times	Travel alarm switch	br:on or oFF
		Touch **SELECT** 6 times	Preheat switch	PH:on or oFF

* : TIER II only

Display group	How to select display mode		Name	Display on the cluster
	Group selection	Display mode selection		
Group 4 (Output)	Touch **SELECT** switch **4 times** while pressing **BUZZER STOP.** In this group **SELECT** LED blinks at 1sec interval	Default	Hourmeter	Ho:on or oFF
		Touch **SELECT** 1 time	Neutral relay (Anti-restart relay)	nr:on or oFF
		Touch **SELECT** 2 times	Travel speed solenoid	tS:on or oFF
		Touch **SELECT** 3 times	Power boost solenoid (2-stage relief solenoid)	PS:on or oFF
		Touch **SELECT** 4 times	Boom priority solenoid	bS:on or oFF
		Touch **SELECT** 5 times	Travel alarm	AU:on or oFF
		Touch **SELECT** 6 times	Max flow cut off solenoid	FS:on or oFF
		Touch **SELECT** 7 times	Preheat relay	PR:on or oFF

By touching **SELECT** switch once while pressing **BUZZER STOP**, display group shifts.
Example : Group 0 → 1 → 2 → 3 → 4 → 0

2) DESCRIPTION OF MONITORING DISPLAY

Group	Display	Name	Description
Group 0	**2250 rpm**	Engine speed	It displays current engine speed detected by engine speed sensor from 500 to 3000rpm. Range : 500~3000rpm by 10rpm
	TIME 12 : 30	Time	It displays current time(12 is hour and 30 is minute) Range : Hour(1~12), minute(00~59)
	EP : 10bar	Power shift pressure of EPPR valve	It shows that pump power shift pressure of EPPR valve being controlled by the CPU controller is 10bar. Range : 00~50bar by 1bar
	29 : C1.4	Model and CPU program version	It shows that machine model(R290LC-7) and the program version of the CPU controller is 1.4. Version display range : 0.0~9.9 by 0.1
	P1 : 100bar (Option)	Front pump pressure	It displays front pump pressure of 100bar which is detected by pressure sensor. Range : 000~500bar by 10bar
	P2 : 200bar (Option)	Rear pump pressure	It displays rear pump pressure of 200bar which is detected by pressure sensor. Range : 000~500bar by 10bar
	P3 : 30bar (Option)	Pilot pump pressure	It displays pilot pump pressure of 30bar which is detected by pressure sensor. Range : 00~50bar by 1bar
Group 1	**b : 24.8V**	Battery voltage	It shows that battery power of 24.8V is supplied into CPU controller. Range : 00.0~48.0V by 0.1V
	Po : 2.5V	Potentiometer voltage	It shows that potentiometer signal voltage is 2.5V. Range : 0.0~5.0V by 0.1V
	dL : 3.8V	Accel dial voltage	It shows that accel dial signal voltage is 3.8V. Range : 0.0~5.0V by 0.1V
	Hd : 50 C	Hydraulic oil temperature	It shows that hydraulic oil temperature detected by temperature sensor is 50 C. Range : 0~150 C by 1 C
	Ct : 85 C	Coolant temperature	It shows that coolant oil temperature detected by temperature sensor is 50 C. Range : 0~150 C by 1 C
	AP : 100	Ambient pressure	It shows that ambient pressure detected by ECM is 100 kpascal. Range : 0 ~ 125 kpa by 1kpa.

Group	Display	Name	Description
Group 2	CHECK **Er : 03**	Current error	It shows that current error of 03(Short circuit in pump EPPR valve system) is diagnosed by self diagnosis system in the CPU controller. If more than 2 errors, when pressing ▼ or ▲ switch, other error codes show. Range : 00~58
	TIME **Er : 03**	Recorded error	It shows recorded error code of 03 which is diagnosed before. If more than 2 error codes, when pressing ▼ or ▲ switch, other error codes show. Range : 00~58
	TIME **Er : 00**	Recorded error deletion	It shows all recorded error codes are removed in the CPU controller memory.
Group 3	**PP : on** or **oFF**	Pump prolix switch	**PP : on** Shows that pump prolix switch is turned on(At emergency position). **PP : oFF** Shows that pump prolix switch is turned off(At normal position).
	dP : on or **oFF**	Auto decel pressure switch	**dP : on** Shows that auto decel pressure switch is pressed on (No operation of control lever). **dP : oFF** Shows that auto decel pressure switch is released off (Operation of control lever).
	Pb : on or **oFF**	Power boost switch	**Pb : on** Shows that power boost switch is pressed on (Activated). **Pb : oFF** Shows that power boost switch is released off (Canceled).
	oP : on or **oFF**	Travel oil pressure switch	**oP : on** Shows that travel oil pressure switch is pressed on (No operation of travel control lever). **oP : oFF** Shows that travel oil pressure switch is released off (Operation of travel control lever).
	od : on or **oFF**	One touch decel switch	**od : on** Shows that one touch decel switch is pressed. **od : oFF** Shows that one touch decel switch is released.
	br : on or **oFF**	Travel alarm switch	**br : on** Shows that travel alarm function is selected. **br : oFF** Shows that travel alarm function is canceled.
	PH : on or **oFF**	Preheat switch	**PH : on** Shows that preheat switch is pressed. **PH : oFF** Shows that preheat switch is released.

Group	Display	Name	Description
Group 4	**Ho : on** or **oFF**	Hourmeter	**Ho : on** Shows that hourmeter is activated by CPU controller. **Ho : oFF** Shows that hourmeter is turned off.
	nr : on or **oFF**	Neutral relay (Anti-restart relay)	**nr : on** Shows that neutral relay for anti-restarting function is activated(Engine start is possible). **nr : oFF** Shows that neutral relay is turned off to disable the engine restart.
	ts : on or **oFF**	Travel speed solenoid	**ts : on** Shows that travel speed solenoid is activated (High speed). **ts : oFF** Shows that travel speed solenoid is released (Low speed).
	PS : on or **oFF**	Power boost solenoid	**PS : on** Shows that power boost solenoid is activated to maximize the power(Power up). **PS : oFF** Shows that power boost solenoid is turned off(Cancel the power boost function).
	bs : on or **oFF**	Boom priority solenoid	**bs : on** Shows that boom priority solenoid is activated. **bs : oFF** Shows that boom priority solenoid is released.
	Ru : on or **oFF**	Travel alarm	**Ru : on** Shows that travel buzzer is activated. **Ru :oFF** Shows that travel buzzer is canceled.
	FS : on or **oFF**	Max flow cut off solenoid	**FS : on** Shows that max flow cut off solenoid is activated. **FS : oFF** Shows that max flow cut off solenoid is released.
	PR : on or **oFF**	Preheat relay	**PR : on** Shows that preheat relay is activated. **PR : oFF** Shows that preheat relay is released.