

GROUP 13 MONITORING SYSTEM

1. OUTLINE

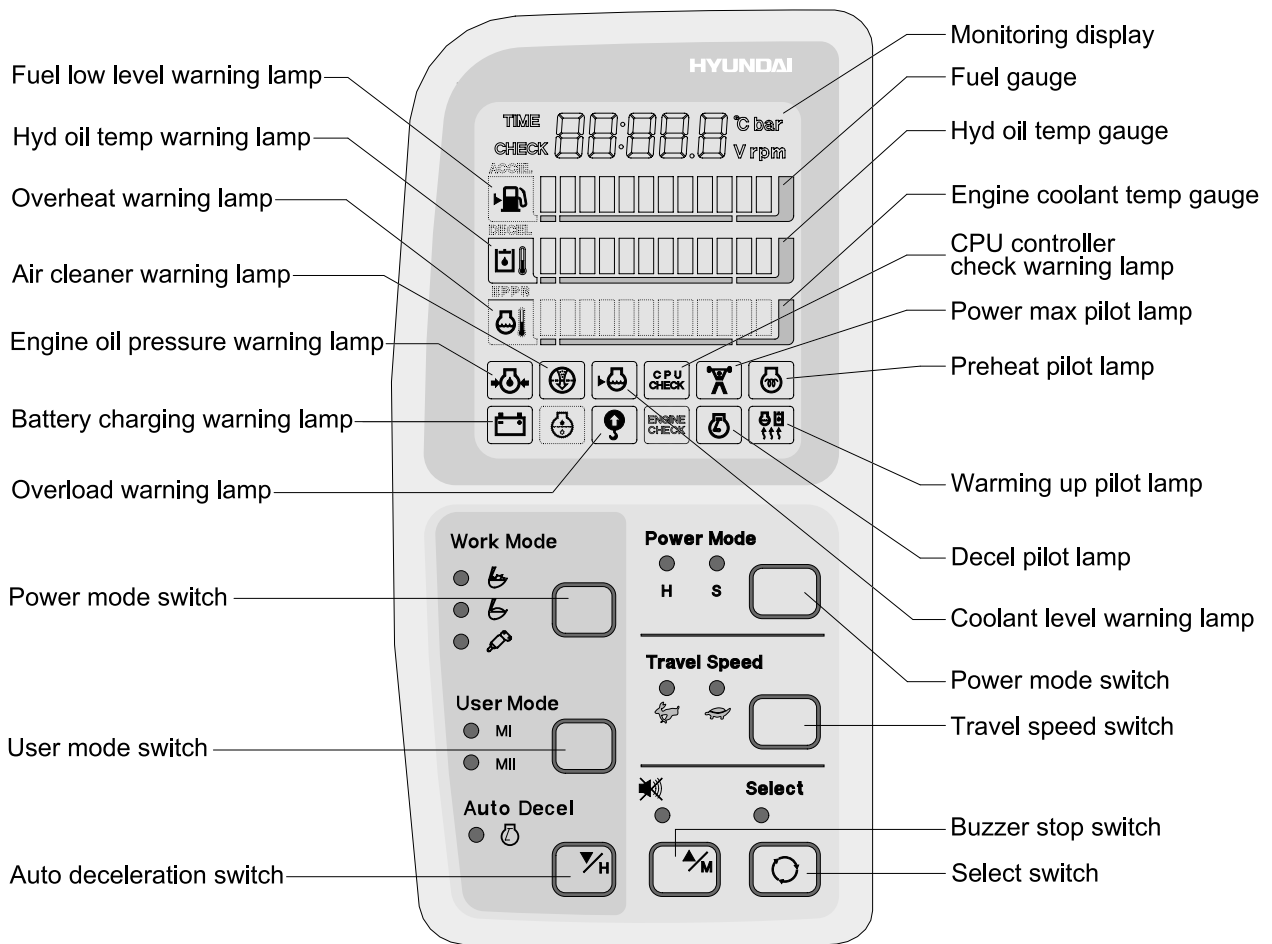
Monitoring system consists of the monitor part and switch part.

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



21075MS65A

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(Turtle)

(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(Turtle)

When warming up operation

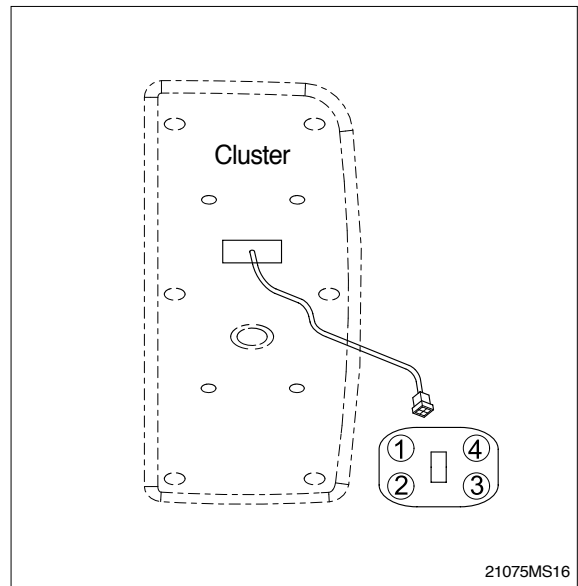
- a. Warming up lamp : ON
- b. 10 seconds after engine started, engine speed increases to 1200 rpm (Auto decel LED : ON)
Others same as above .

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.

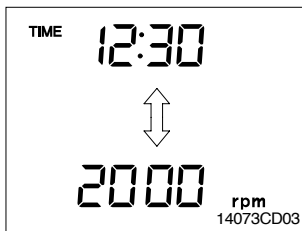
3. CLUSTER CONNECTOR

| 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) |



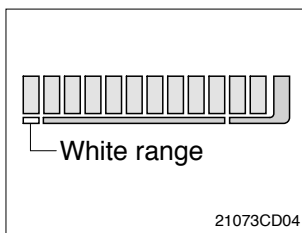
4. CLUSTER FUNCTION



1) MONITORING DISPLAY



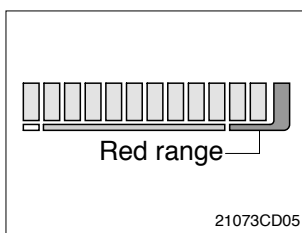
- (1) This displays the current time and machine information such as engine rpm, coolant/hydraulic oil temperature, hydraulic oil pressure and also error codes.
Refer to the page 5-34 for details.

2) FUEL GAUGE



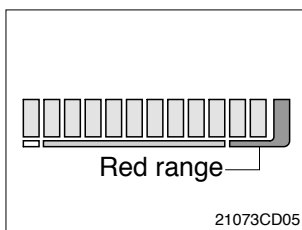
- (1) This gauge indicates the amount of fuel in the fuel tank.
- (2) Fill the fuel when the white range or warning lamp  blinks.
If the gauge illuminates the white range or warning lamp  blinks even though the machine is on the normal condition, check the electric device as that can be caused by the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

3) HYDRAULIC OIL TEMPERATURE GAUGE



- (1) This indicates the temperature of coolant.
 - White range : Below 30°C(86°F)
 - Green range : 30-105 °C(86-221°F)
 - Red range : Above 105°C(221°F)
- (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



- (1) This indicates the temperature of coolant.
 - White range : Below 30°C(86°F)
 - Green range : 30-105 °C(86-221°F)
 - Red range : Above 105°C(221°F)
- (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.

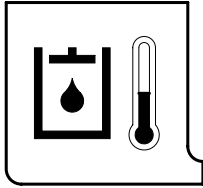
5) FUEL LOW LEVEL WARNING LAMP



21073CD04A

- (1) This lamp blinks and the buzzer sounds when the level of fuel is below 31 (8.2U.S. gal).
- (2) Fill the fuel immediately when the lamp blinks.

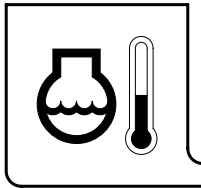
6) HYDRAULIC OIL TEMPERATURE WARNING LAMP



21073CD05A

- (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.

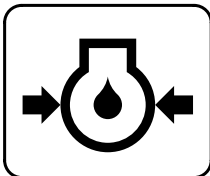
7) OVERHEAT WARNING LAMP



21073CD06A

- (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.

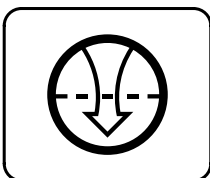
8) ENGINE OIL PRESSURE WARNING LAMP



21073CD07

- (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.

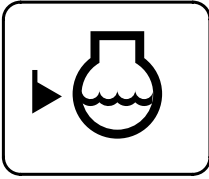
9) AIR CLEANER WARNING LAMP



21073CD08

- (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.

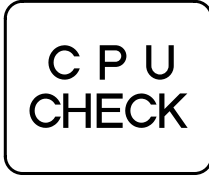
10) COOLANT LEVEL WARNING LAMP



21073CD09

- (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.

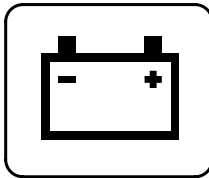
11) CPU CONTROLLER CHECK WARNING LAMP



21073CD10

- (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.

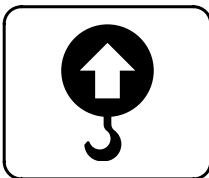
12) BATTERY CHARGING WARNING LAMP



21073CD13

- (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.

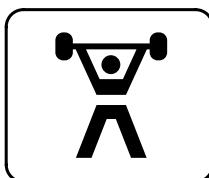
13) OVERLOAD WARNING LAMP



21073CD15

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

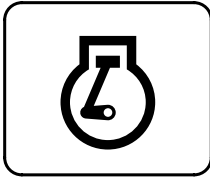
14) POWER MAX PILOT LAMP



21073CD11

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

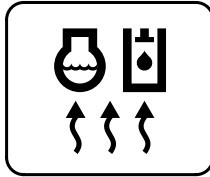
15) DECEL PILOT LAMP



21073CD17

- (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.

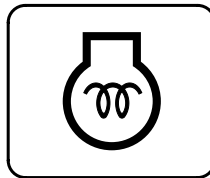
16) WARMING UP PILOT LAMP



21073CD18

- (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.

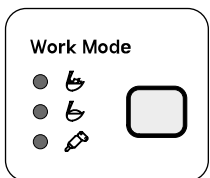
17) PREHEAT PILOT LAMP






21073CD12

- (1) Turning the start key switch ON position starts preheating in cold weather.
- (2) Start the engine as this lamp is OFF.

18) WORK MODE SWITCH

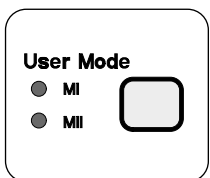


21073CD20

- (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 row by pressing the switch.
 -  : Heavy duty work mode
 -  : General work mode
 -  : Breaker operation mode

Refer to the page 5-4 for details.

19) USER MODE SWITCH

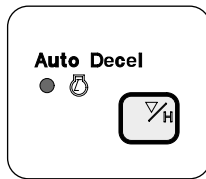


21073CD21

- (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.

20) AUTO DECELERATION SWITCH



21073CD22

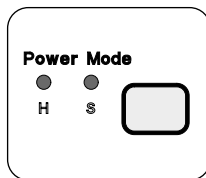
(1) This switch is used to actuate or cancel the auto deceleration function.

When the switch actuated and all control levers and pedals are at neutral position. Engine speed will be lowered automatically to save fuel consumption.

- 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 indicating lamp on the LCD panel ON.

21) POWER MODE SWITCH

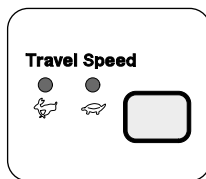


21073CD23

(1) The lamp of selected mode is turned ON by pressing the switch().

- H : High power work.
- S : Standard power work.

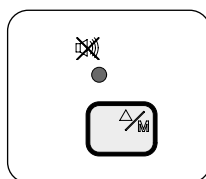
22) TRAVEL SPEED CONTROL SWITCH



21073CD24

(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 it again.

23) BUZZER STOP SWITCH



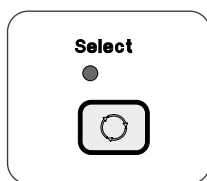
21073CD25

(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.

24) SELECT SWITCH



21073CD25A

- (1) This switch is used to select the monitor display function.
Refer to the page 5-35 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 returns to clock display.

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 | Initial | Engine rpm | 950 rpm | |
| | | Touch SELECT 1 time | Time | TIME 12:30 | |
| | Way 2 Touch AUTO DECEL switch while pressing BUZZER STOP at group 1~4. | Touch SECLET 2 times | Power shift pressure (EPPR valve) | EP: 10 bar | |
| | | Touch SELECT 3 times | CPU model & version | 21C14 | |
| | | 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: 24.8 v | |
| | | Touch SELECT 1 time | Potentiometer voltage(V) | Pa: 2.5 v | |
| | | Touch SELECT 2 times | Accel dial voltage(V) | dL: 3.8 v | |
| | | Touch SELECT 3 times | Hydraulic oil temperature(,C) | Hd: 50 °C | |
| | | Touch SELECT 4 times | Coolant temperature(,C) | Ct: 85 °C | |
| 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 | |

| 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 | H ₀ :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 | AL: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 |
| | 21 : C1.4 *21 : C5.0 | Model and CPU program version | It shows that machine model(R210LC-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 |

* : TIER II Only

| 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. |