

GROUP 13 MONITORING SYSTEM

1. OUTLINE

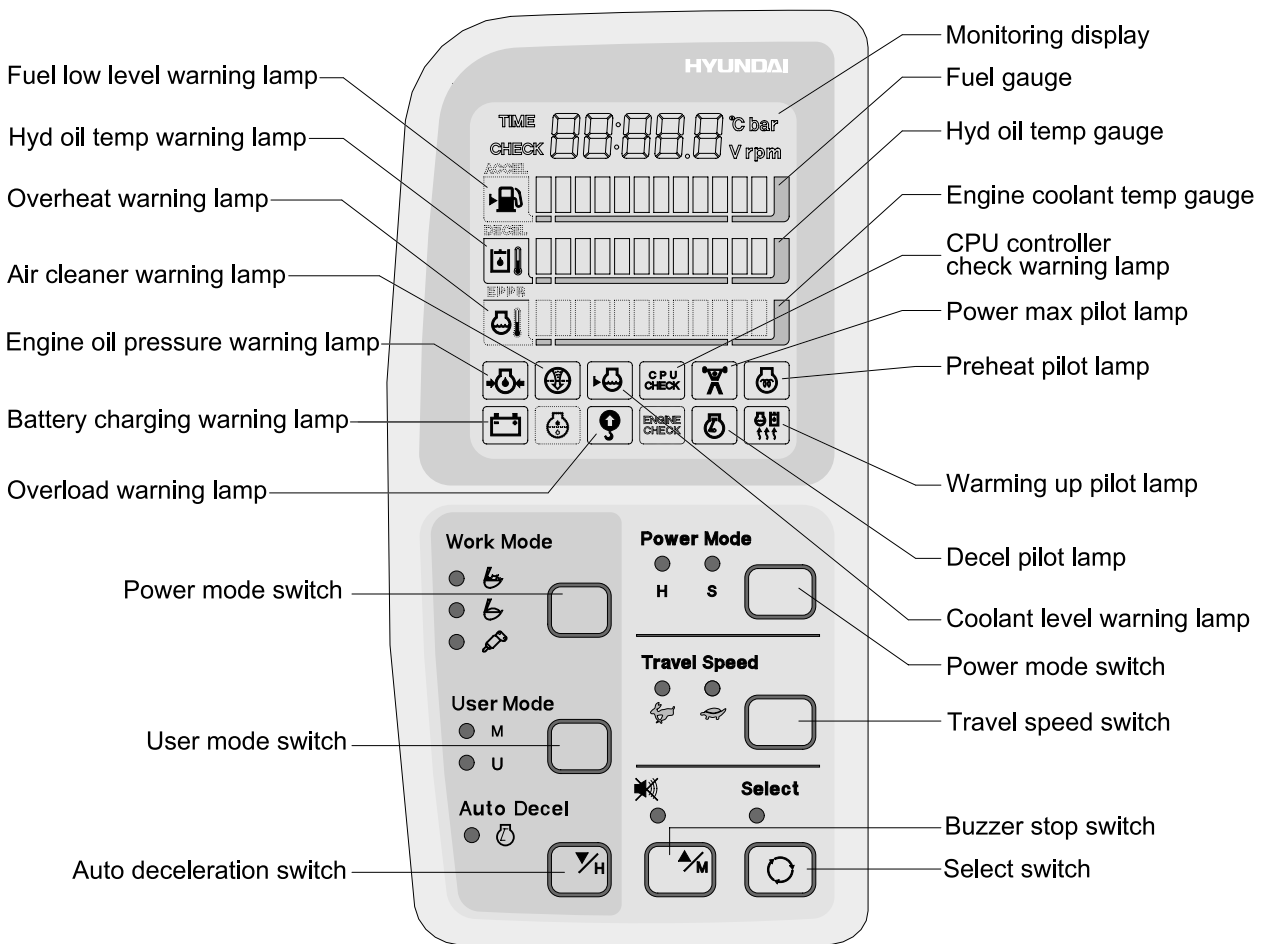
Monitoring system consists of the monitor part and switch part.

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



16075MS31

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 : 1.5 ← Indicates program version 1.5 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

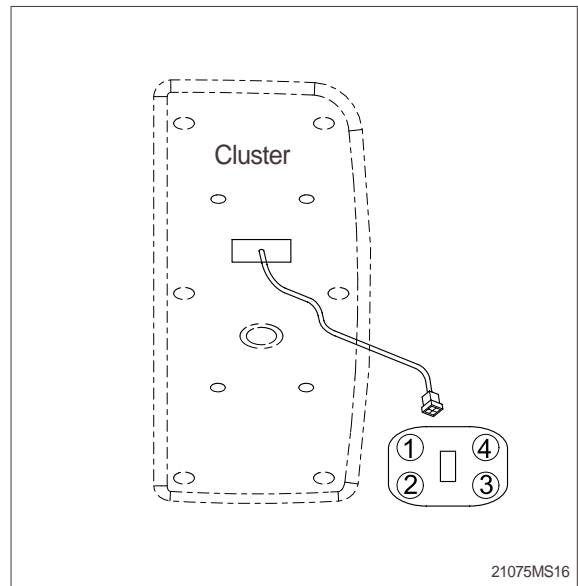
- a. Warming up lamp : ON
- b. 10 seconds after engine started, engine speed increases to 1200 rpm (Auto decel LED : ON)
Others same as above .

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.

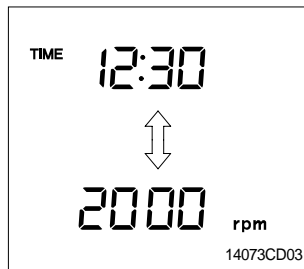
3. CLUSTER CONNECTOR

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

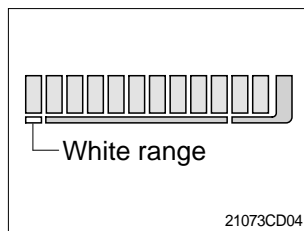
1) MONITORING DISPLAY



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 5-33 for details.

2) FUEL GAUGE

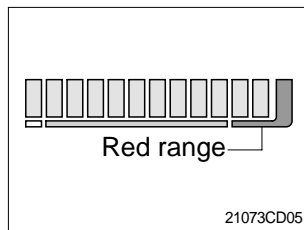


This gauge indicates the amount of fuel in the fuel tank.

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



This indicates the temperature of coolant.

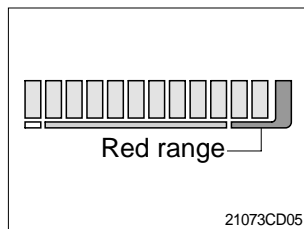
- White range : 30°C(86°F) below
- Green range : 30-105 °C(86-221°F)
- Red range : 105°C(221°F) above

The green range illuminates when operating.

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

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



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

The green range illuminates when operating.

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

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

5) FUEL LOW LEVEL WARNING LAMP

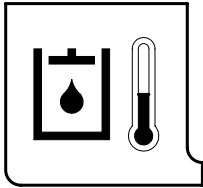


21073CD04A

This lamp blinks and the buzzer sounds when the level of fuel is below 38 (10.0U.S. gal).

Fill the fuel immediately when the lamp blinks.

6) HYDRAULIC OIL TEMPERATURE WARNING LAMP



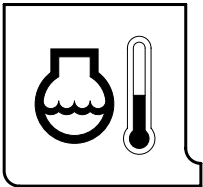
21073CD05A

This warning lamp operates and the buzzer sounds when the temperature of hydraulic oil is over 105 °C (221 °F) .

Check the hydraulic oil level when the lamp blinks.

Check for debris between oil cooler and radiator.

7) OVERHEAT WARNING LAMP

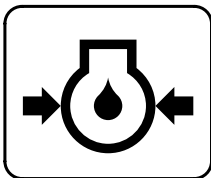


21073CD06A

This lamp blinks and the buzzer sounds when the temperature of coolant is over the normal temperature 110°C (230°F) .

Check the cooling system when the lamp blinks.

8) ENGINE OIL PRESSURE WARNING LAMP

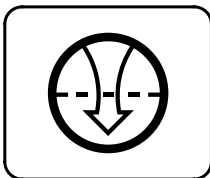


21073CD07

This lamp blinks and the buzzer sounds after starting the engine because of pressure.

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

9) AIR CLEANER WARNING LAMP

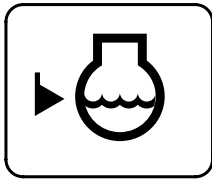


21073CD08

This lamp is operated by the vacuum caused inside when the filter of air cleaner is clogged which supply air to the engine.

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

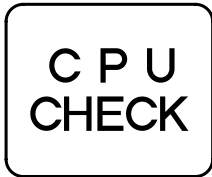
10) COOLANT LEVEL WARNING LAMP



21073CD09

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

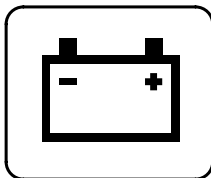
11) CPU CONTROLLER CHECK WARNING LAMP



21073CD10

Communication problem with CPU controller makes the lamp blinks and the buzzer sounds.
With lamp blinks all of the lamp on the cluster LCD will be OFF.

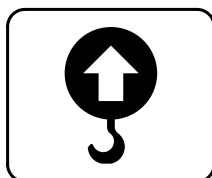
12) BATTERY CHARGING WARNING LAMP



21073CD13

This lamp blinks and the buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.
Check the battery charging circuit when this lamp blinks, during engine operation.

13) OVERLOAD WARNING LAMP



21073CD15

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

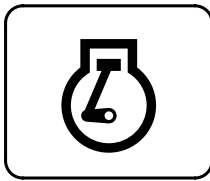
14) POWER BOOST PILOT LAMP



21073CD11

The lamp will be ON when pushing power boost switch on the LH RCV lever.

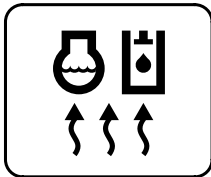
15) ONE TOUCH DECEL PILOT LAMP



21073CD17

Operating auto decel or one touch decel makes the lamp ON.
The lamp will be ON when pushing one touch decel switch on the LH RCV lever.

16) WARMING UP PILOT LAMP



21073CD18

This lamp is turned ON when the coolant temperature is below 30°C (86 °F).

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

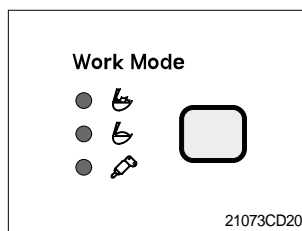


21073CD12




This lamp is turned ON when the preheating function is actuated in cold weather.

Start the engine as this lamp is OFF.

18) WORK MODE SWITCH

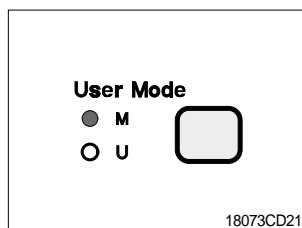


This switch is to select the machine operation mode, which shifts from general operation mode to heavy operation mode and breaker mode in a row by pressing the switch.

-  : Heavy duty work mode
-  : General work mode
-  : Breaker operation mode

Refer to the page 5-4 for details.

19) USER MODE SWITCH

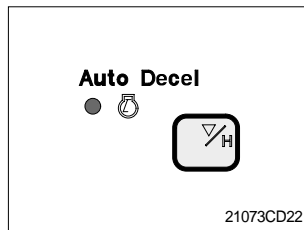


This switch is to select the maximum power or user mode.

- M : Maximum power
- U : Memorizing operators preferable power setting.

Refer to the page 5-5 for details.

20) AUTO DECELERATION SWITCH

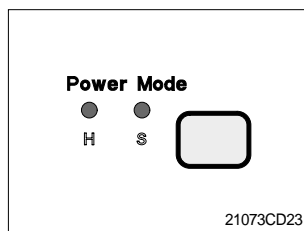


This switch is used to actuate the auto deceleration function so the engine speed is lowered automatically when all control levers and pedals are at neutral position to save the fuel.

- Light ON : Auto deceleration function is selected.
- Light OFF : Auto deceleration function is cancelled so that the engine speed increased to previous setting value.

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

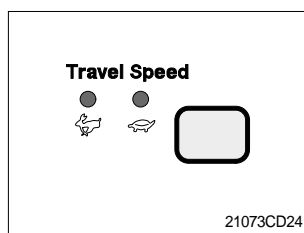
21) POWER MODE SWITCH



The lamp of selected mode is turned ON by pressing the switch(), when selecting the mode to use.

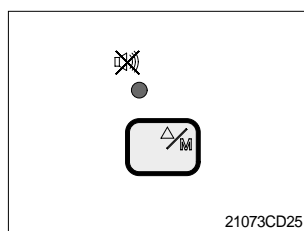
- H : This is used for high power work.
- S : This is used for standard power work.

22) TRAVEL SPEED CONTROL SWITCH



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.

23) BUZZER STOP SWITCH

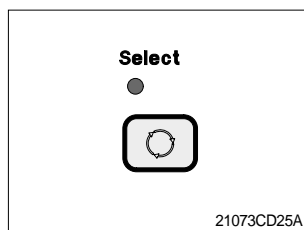


When the starting switch is turned ON first, normally the alarm buzzer sounds for 5 seconds during lamp check operation.

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



This switch is used to select the monitor display function.

Refer to the page 5-33 for details.

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.

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	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 SELECT 2 times	Power shift pressure (EPPR valve)	EP: 10 bar	
		Touch SELECT 3 times	CPU model & version	16C 1.1	
		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	
		Touch SELECT 7 times	Over load switch	o l: 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	Swing 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	2200 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
	16 : C1.2	Model and CPU program version	It shows that machine model(R160LC-7) and the program version of the CPU controller is 5.0. 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	b24 : 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

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.
	ol : on or oFF	Over load switch	ol : on Shows that over load switch is pressed. ol : oFF Shows that over load 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	Swing priority solenoid	bs : on Shows that swing priority solenoid is activated. bs : oFF Shows that swing 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.