

GROUP 16 MONITORING SYSTEM

1. OUTLINE

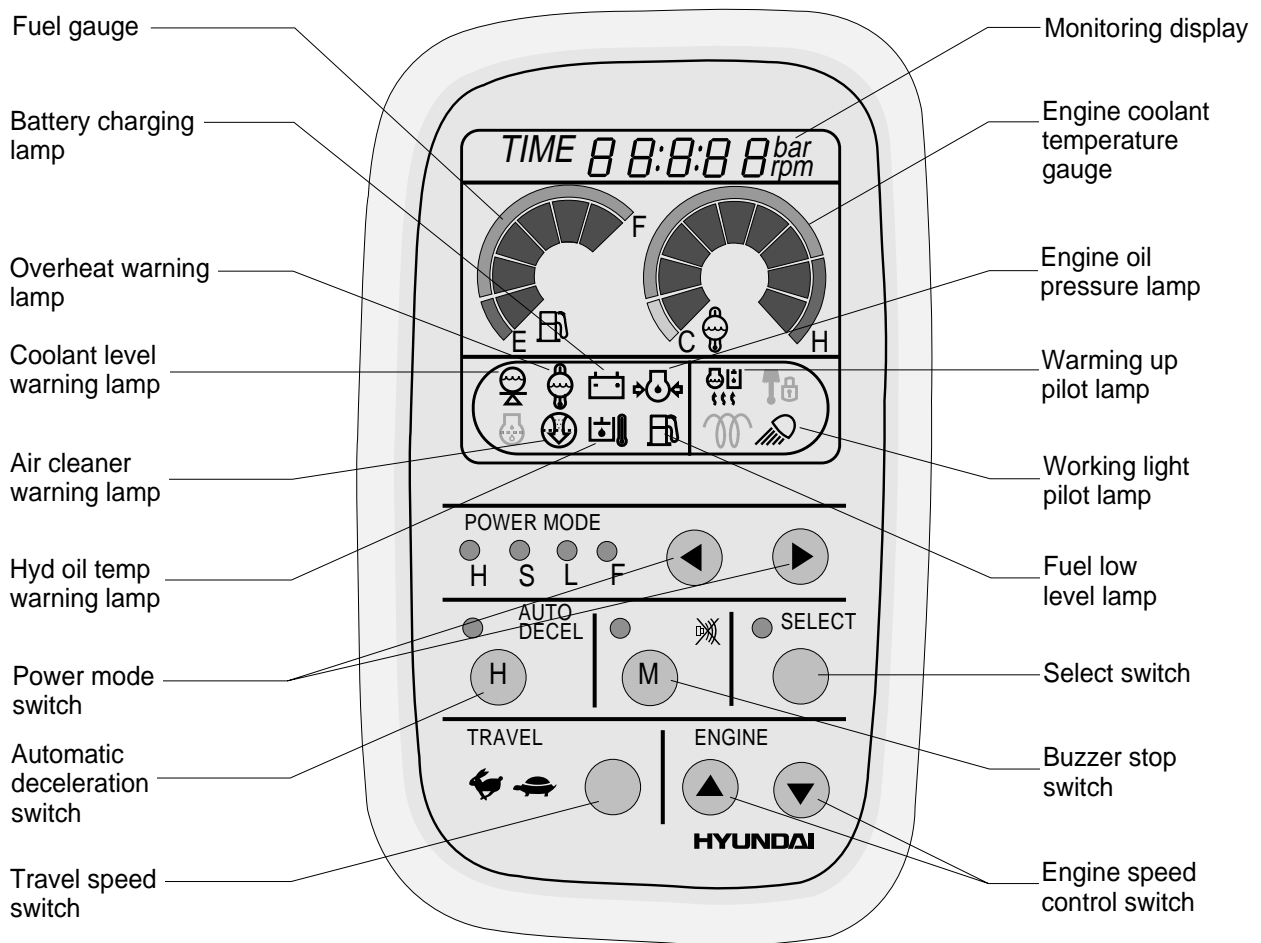
Monitoring system consists of the monitor part and switch part.

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



2) CLUSTER CHECK PROCEDURE

(1) Start key : ON

- ① Check monitor initial 2 seconds
 - a. All lamps light up.
 - b. Buzzer sound.
- ② Check monitor after 2 seconds : Indicate cluster version and machine condition
 - a. Cluster program version : CLS : 11 ← Indicates program version 1.1 for 2 seconds.
 - b. Tachometer : 0rpm
 - c. Fuel gauge : All light up below appropriate level
 - d. Engine coolant temperature gauge : All light up below appropriate level
 - e. 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.
- ③ Switch portion
 - a. Mode selection : S mode
 - b. Auto decel LED : ON
 - c. Travel speed switch : Low(Turtle)

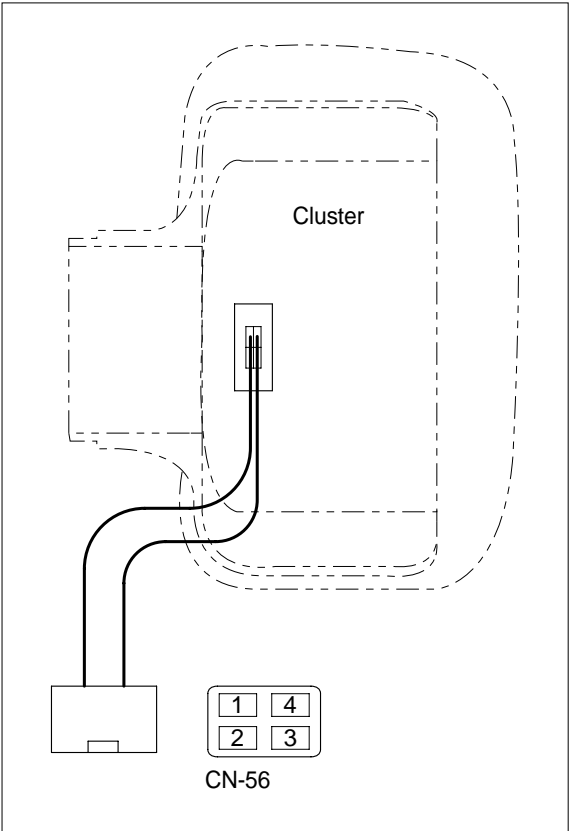
(2) Start of engine

- ① Check machine condition
 - a. Tachometer indicate at present rpm
 - b. Gauge and warning lamp : Indicate at present condition.
 - ※ When normal condition : All warning lamp OFF
 - c. Mode selection : S mode
 - d. Auto decel : ON(About 950rpm)
 - e. Travel speed : Low(Turtle)
- ② When warming up operation
 - a. Warming up lamp : ON
 - b. 10 seconds after engine started, engine speed increases to1200rpm(Auto decel LED : ON)
 - ※ Others same as above ①.
- ③ 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

1) 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)



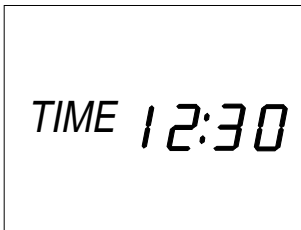
4. CLUSTER FUNCTION

1) TACHOMETER



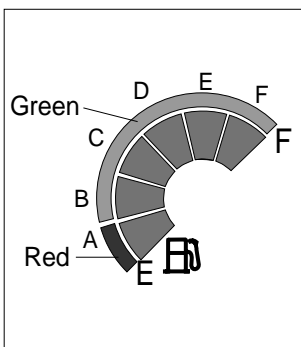
- ① Tachometer displays the number of engine revolutions.
- ② Refer select switch for the selection and adjustment.

2) CLOCK



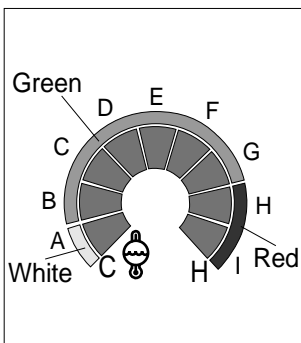
- ① Clock displays the current time by electric digital timer.
- ② Refer select switch for the selection and adjustment.

3) FUEL GAUGE



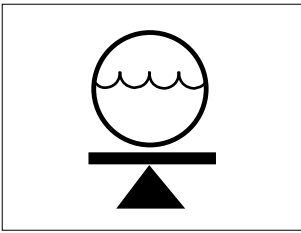
- ① This gauge indicates the amount of fuel in the fuel tank.
 - Warning lamp display : Approximately 50 ℓ
 - Segment A : Approximately 98 ℓ
 - Segment B : Approximately 146 ℓ
 - Segment C : Approximately 194 ℓ
 - Segment D : Approximately 242 ℓ
 - Segment E : Approximately 290 ℓ
 - Segment F : Approximately 340 ℓ
 - Quantity of fuel tank : Approximately 340 ℓ

4) ENGINE COOLANT TEMPERATURE GAUGE



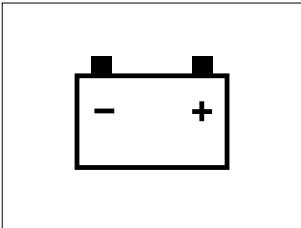
- ① This gauge indicates the temperature of coolant.
 - Segment A : Approximately 40~60°C(White)
 - Segment B : Approximately 60~70°C(Green)
 - Segment C : Approximately 70~85°C(Green)
 - Segment D : Approximately 85~95°C(Green)
 - Segment E : Approximately 95~98°C(Green)
 - Segment F : Approximately 98~100°C(Green)
 - Segment G : Approximately 100~102°C(Green)
 - Segment H : Approximately 102~110°C(Red)
 - Segment I : Approximately 110°C over(Red)

5) COOLANT LEVEL WARNING LAMP



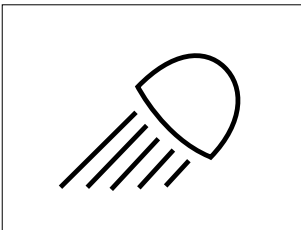
- ① This lamp is turned ON when the coolant is below LOW in the reservoir tank of radiator.
- ② Check if the coolant level is between FULL and LOW in the reservoir tank located at the side of radiator after opening the engine cover, and check if there is mixture of oil and coolant.

6) BATTERY CHARGING LAMP



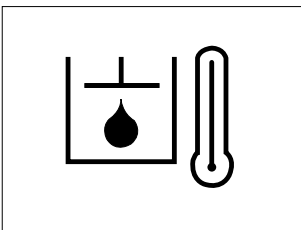
- ① Check if the charging lamp is OFF during engine operation. If the lamp is turned ON, it is not charged.
- ② This lamp is ON before starting the engine, but it is turned OFF after starting the engine. Check the battery charging circuit when this lamp comes ON while the engine runs.

7) WORK LAMP INDICATOR LAMP



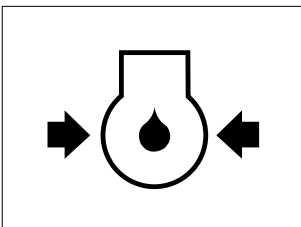
- ① When the work lamp switch is turned ON, the work lamp mounted on boom and the work lamp indicator lamp light ON.

8) HYDRAULIC OIL OVERHEAT WARNING LAMP



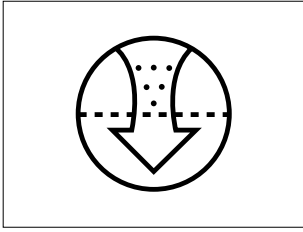
- ① This warning lamp operates and the buzzer sounds when the temperature of hydraulic oil is over 100°C(216°F).
- ② Check the coolant when the lamp is turned ON.

9) ENGINE OIL PRESSURE WARNING LAMP



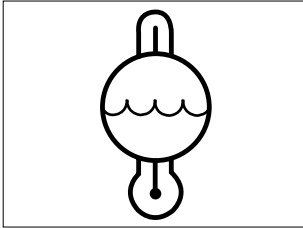
- ① This lamp is turned ON before starting the engine but turned OFF after starting the engine as the pressure caused from the engine oil pump lubricates each part.

10) AIR CLEANER WARNING LAMP



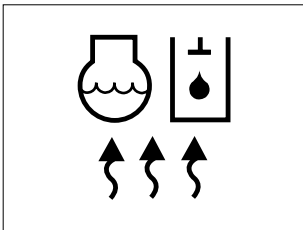
- ① This lamp is turned on when the filter in the air cleaner is clogged.
- ② Check the filter and wash or replace it when the lamp is ON.

11) OVERHEAT WARNING LAMP



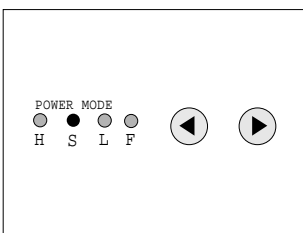
- ① This lamp is turned ON when the temperature of coolant is over the normal temperature(110°C) and lose the cooling function.
- ② Check the coolant when the lamp is ON.

12) WARMING UP LAMP



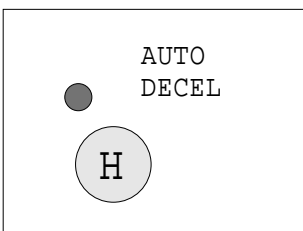
- ① This lamp is turned ON when the coolant temperature is below 30°C.
- ② The automatic warming up is canceled when the engine coolant temperature is above 30°C, or when 10 minutes have passed since starting.

13) MODE SELECTION SWITCH



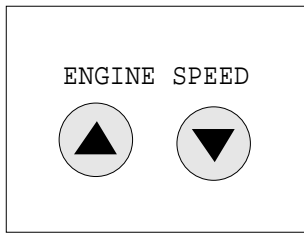
- ① The lamp of selected mode is turned ON by pressing the right switch(◀, ▶), when selecting the mode to use.
 - H : This is used for heavy-duty work.
 - S : This is used for ordinary work.
 - L : This is used for light-duty work.
 - F : This is used for light-duty work, especially for finishing work.
- ② At each pressing of the switch, a short term beep sounds.



14) AUTO DECELERATION SWITCH



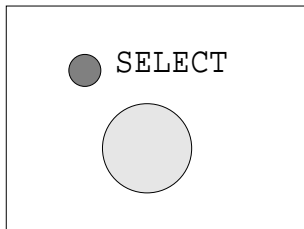
- ① This switch is used to select the auto-deceleration function.
- ② If the auto deceleration function is activated the engine speed is lowered when temporary stop or stand-by for dump is required.
- ③ At each pressing of the switch, a short term beep sounds.

15) ENGINE SPEED CONTROL SWITCH



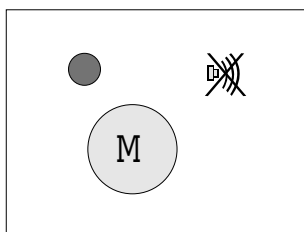
- ① This switch is to control the engine speed, which is increased by pressing  switch and decreased by pressing  switch.
- ② At each pressing of the switches, a short term beep sounds.

16) SELECTION SWITCH(Tachometer and clock)



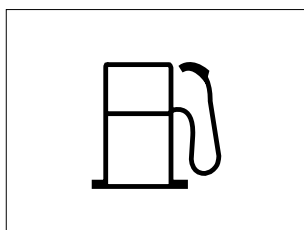
- ① This switch is used to select the tachometer or clock.
- ② The switch is pressed, each function is selected by turns.
- ③ The switch is pressed over 3 seconds, it is selected time adjusting function.
 - Hour : Auto decel switch
 - Minute : Buzzer stop switch
- ④ After time set, if the switch is pressed, it is returned to clock.
- ⑤ If any pump pressure sensor is installed pump pressure display (P1, P2, P3) is also selected by this switch.
- ⑥ At each pressing of the switch, a short term beep sounds.

17) BUZZER STOP SWITCH



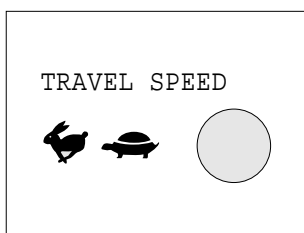
- ① The buzzer sounds is stopped by touching this buzzer stop switch.
- ② There are two kinds of buzzer sound, one is continuous sound which comes out when cluster lights up a warning indicator lamp, and the other sounds intermittently when the self diagnostic system in the CPU controller displays an error code.
- ③ At each pressing of the switch, a short term beep sounds.



18) FUEL LOW LEVEL LAMP



- ① This lamp lights on when fuel level is below 50 ℓ .
In that case, fill up fuel again.

19) TRAVEL SPEED SWITCH



- ① This switch controls the travel speed.
- ② When you press the switch once, travel speed is change over high speed() , and press once more, travel speed is changed over low speed().
- ③ At each pressing of the switch, a short term beep sounds.

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	Option (Only when a pressure sensor is installed)	Front pump pressure	P 1:100^{bar}
		Touch SELECT 3 times		Rear pump pressure	P 2:200^{bar}
		Touch SELECT 4 times		Pilot pressure	P 3:30^{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 2 4:8	
		Touch SELECT 1 time	Potentiometer voltage(V)	P o:2:5	
		Touch SELECT 2 times	Hydraulic oil temperature(°C)	H d:50	
		Touch SELECT 3 times	Power shift pressure (EPPR valve)	E P r:10^{bar}	
		Touch SELECT 4 times	Model & Version	25C:10	
Group 2 (Error code)	Touch SELECT switch twice while pressing BUZZER STOP . In this group BUZZER STOP LED blinks	Default	Current error	E r r:03	
		Touch SELECT 1 time	Recorded error (Only key switch ON)	TIME E r r:03	
		Press speed up(▲) & speed down(▼) at the same time	Recorded error deletion (Only key switch ON)	TIME E r r:00	
Group 3 (Switch input)	Touch SELECT switch 3 times while pressing BUZZER STOP . In this group SELECT LED blinks at 0.5sec intervals	Default	Pump prolix switch	P P:on or oFF	
		Touch SELECT 1 time	Auto decel pressure switch	d P:on or oFF	
		Touch SELECT 2 times	Power boost switch	P b:on or oFF	
Group 4 (Output)	Touch SELECT switch 4 times while pressing BUZZER STOP . In this group SELECT LED blinks at 1sec intervals	Default	Hourmeter	H o:on or oFF	
		Touch SELECT 1 time	Neutral relay (Anti-restart relay)	n r:on or oFF	
		Touch SELECT 2 times	Travel solenoid	S S:on or oFF	
		Touch SELECT 3 times	Power boost solenoid (2-stage relief solenoid)	P S:on or oFF	
		Touch SELECT 4 times	Max flow cut off solenoid	F S: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	2450 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)
	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 : 8	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 : 5	Potentiometer voltage	It shows that potentiometer signal voltage is 2.5V. Range : 0.0~5.0V by 0.1V
	Hd : 50	Hydraulic oil temperature	It shows that hydraulic oil temperature detected by temperature sensor is 50°C. Range : Lo(Below 20°C) ; 30~90°C by 10°C, Hi(Above 100°C).
	EPr : 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
	25C : 10	Model and CPU program version	It shows that machine model(R250LC-3) and the program version of the CPU controller is 1.0. Version display range : 0.0~9.9 by 0.1
Group 2	Err : 03	Current error	It shows that current error of 03(Short circuit in pump EPPR valve 2 lines) is diagnosed by self diagnosis system in the CPU controller. If more than 2 errors, each error code is displayed for 2 seconds and changes to other error codes continuously. Range : 00~47
	TIME Err : 03	Recorded error	It shows recorded error code of 03 which is diagnosed before. If more than 2 error codes, each error code is displayed for 2 seconds and changes to other error codes continuously. Range : 00~47
	TIME Err : 00	Recorded error deletion	It shows all recorded error codes are removed in the CPU controller memory.

Group	Display	Name	Description
Group 3	PP : on or oFF	Pump prolix switch	PP : on Shows that pump prolix switch is pressed on(At emergency position). PP : oFF Shows that pump prolix switch is pressed 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 pressed 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 pressed off (Canceled).
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.
	SS : on or oFF	Travel speed solenoid	SS : on Shows that travel speed solenoid is activated(Hi travel speed). SS : oFF Shows that travel speed solenoid is turned off(Lo travel 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).
	FS : on or oFF	Maximum flow cut off solenoid	FS : on Shows that max flow cut off solenoid is activated to cut off the maximum flow. FS : oFF Shows that max flow cut off solenoid is turned off (Canceled).