

## GROUP 16 MONITORING SYSTEM

### 1. OUTLINE

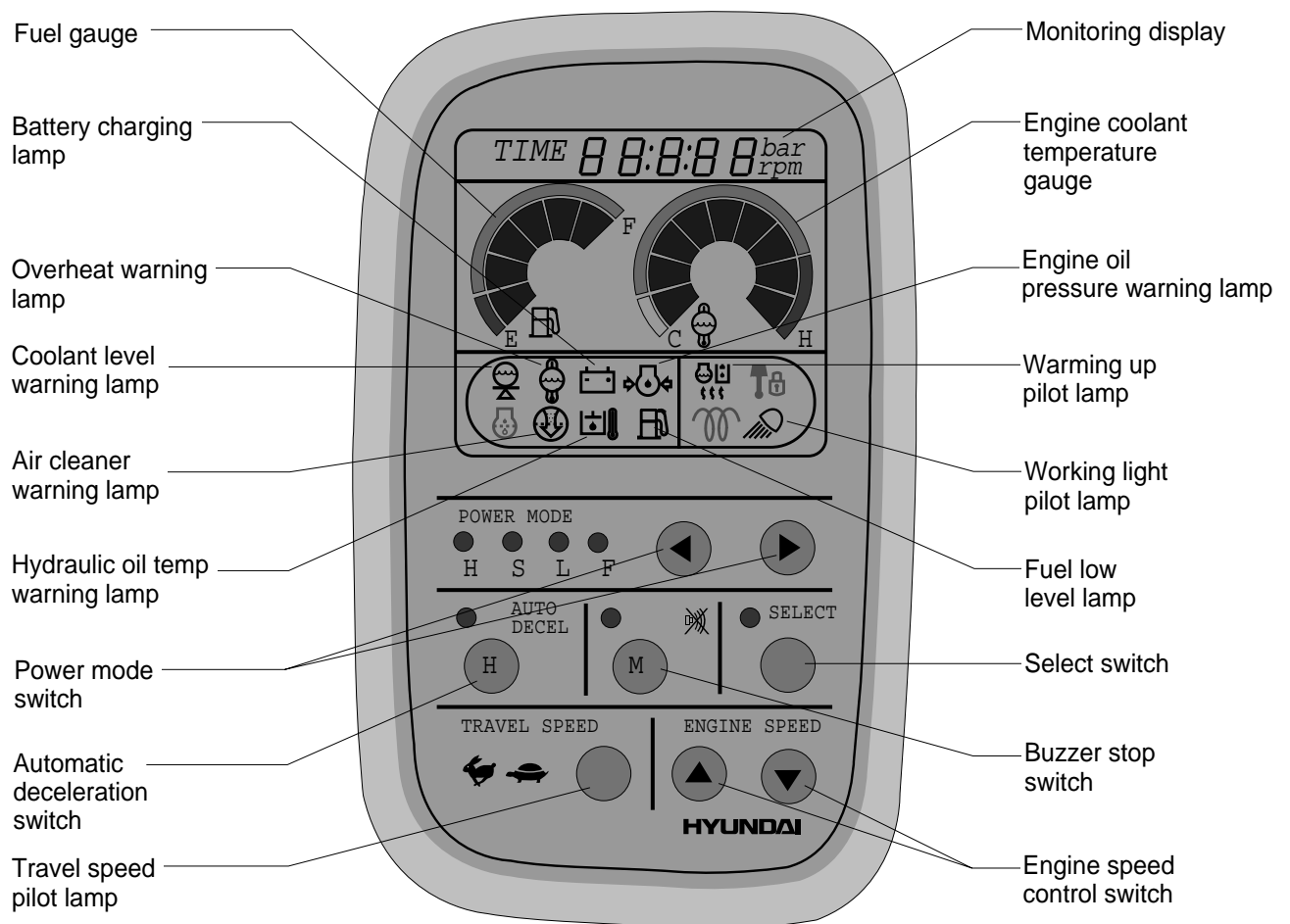
Monitoring system consists of the monitor part and switch part.

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 : 10 ← Indicates program version 1.0 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 Indicating lamp state
  - a. Mode selection : S mode
  - b. Auto decel LED : ON
  - c. Travel speed pilot lamp : Low(Turtle)

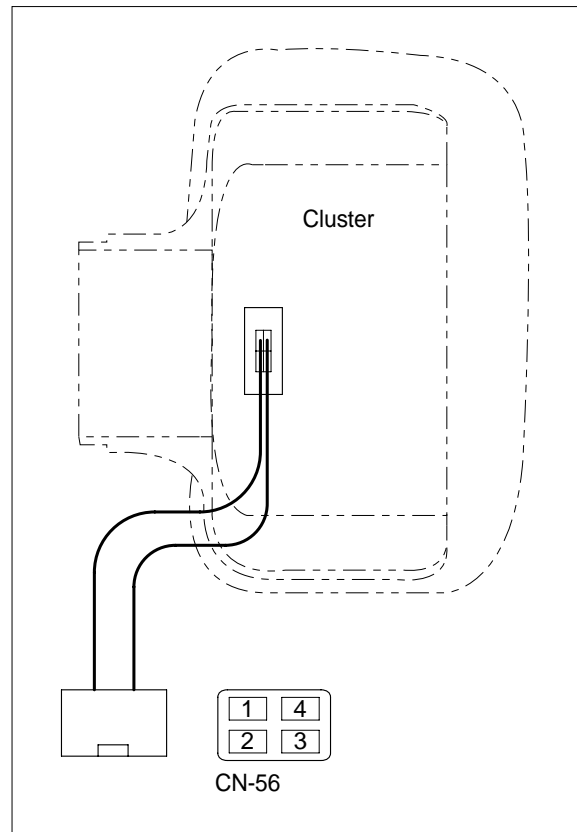
### (2) Start of engine

- 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
  - e. Travel speed : Low(Turtle)
- ② When warming up operation
  - a. Warming up lamp : ON
  - b. 10 seconds after engine started, engine speed increases to 1200rpm (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

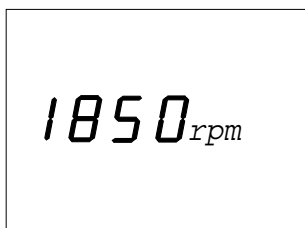
#### 1) CONNECTOR

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



## 4. CLUSTER FUNCTION

### 1) TACHOMETER



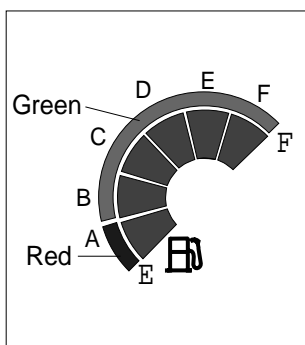
- ① Tachometer displays the number of engine revolutions.
- ② Refer select switch for the selection and adjustment.

### 2) CLOCK



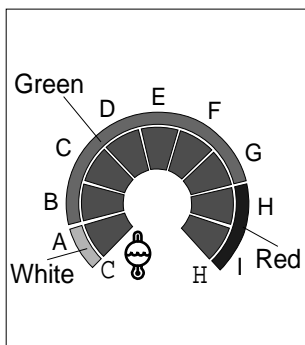
- ① Clock displays the current time by electric digital timer.
- ② Refer select switch for the selection and adjustment.

### 3) FUEL GAUGE



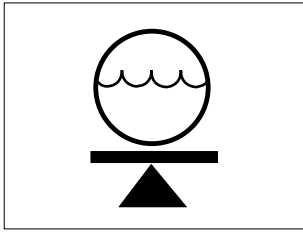
- ① This gauge indicates the amount of fuel in the fuel tank.
  - Warning lamp display : Approximately 56 l
  - Segment A : Approximately 98 l
  - Segment B : Approximately 151 l
  - Segment C : Approximately 200 l
  - Segment D : Approximately 249 l
  - Segment E : Approximately 298 l
  - Segment F : Approximately 350 l
  - Quantity of fuel tank : Approximately 350 l

### 4) ENGINE COOLANT TEMPERATURE GAUGE



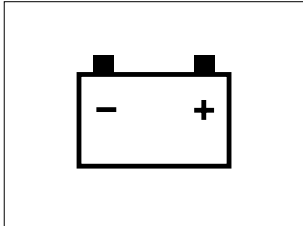
- ① This gauge indicates the temperature of coolant.
  - Segment A : Approximately 40~60°C(White)
  - Segment B : Approximately 60~70°C(Green)
  - Segment C : Approximately 70~85°C(Green)
  - Segment D : Approximately 85~98°C(Green)
  - Segment E : Approximately 98~101°C(Green)
  - Segment F : Approximately 101~103°C(Green)
  - Segment G : Approximately 103~105°C(Green)
  - Segment H : Approximately 105~110°C(Red)
  - Segment I : Approximately 110°C over(Red)

#### 5) COOLANT LEVEL WARNING LAMP



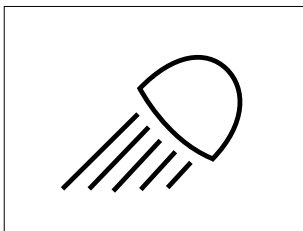
- ① This lamp is turned ON when the coolant is below LOW in the reservoir tank of radiator.
- ② Check if the coolant level is between FULL and LOW in the reservoir tank located at the side of RH cowl after opening the engine cover, and check if there is mixture of oil and coolant.

#### 6) BATTERY CHARGING LAMP



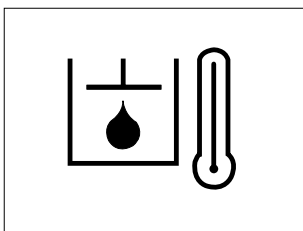
- ① Check if the charging lamp is OFF during engine operation. If the lamp is turned ON, it is not charged.
- ② This lamp is ON before starting the engine, but it is turned OFF after starting the engine. Check the battery charging circuit when this lamp comes ON while the engine runs.

#### 7) WORK LAMP INDICATOR LAMP



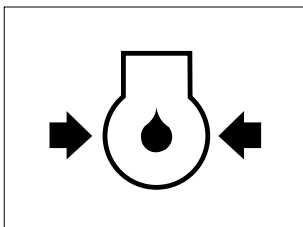
- ① When the work lamp switch is turned ON, the work lamp mounted on boom and the work lamp indicator lamp light ON.

#### 8) HYDRAULIC OIL OVERHEAT WARNING LAMP



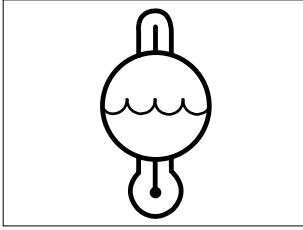
- ① This warning lamp operates and the buzzer sounds when the temperature of hydraulic oil is over 100°C(216°F).
- ② Check the coolant when the lamp is turned ON.

#### 9) ENGINE OIL PRESSURE WARNING LAMP



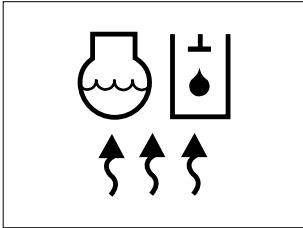
- ① This lamp is turned ON before starting the engine but turned OFF after starting the engine as the pressure caused from the engine oil pump lubricates each part.

#### 10) OVERHEAT WARNING LAMP



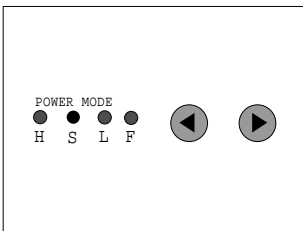
- ① This lamp is turned ON when the temperature of coolant is over the normal temperature(110°C) and lose the cooling function.
- ② Check the coolant when the lamp is ON.

#### 11) WARMING UP LAMP



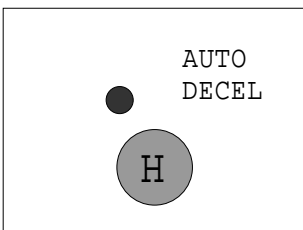
- ① This lamp is turned ON when the coolant temperature is below 30°C.
- ② The automatic warming up is canceled when the engine coolant temperature is above 30°C, or when 10 minutes have passed since starting.

#### 12) MODE SELECTION SWITCH



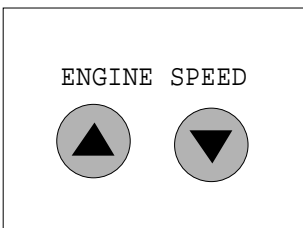
- ① The lamp of selected mode is turned ON by pressing the right switch( ◀ , ▶ ), when selecting the mode to use.
  - H : This is used for heavy-duty work.
  - S : This is used for ordinary work.
  - L : This is used for light-duty work.
  - F : This is used for light-duty work, especially for finishing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

#### 13) AUTO DECELERATION SWITCH



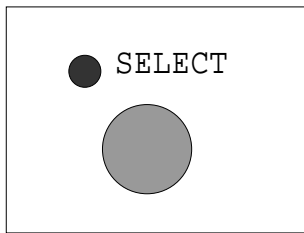
- ① This switch is used to select the auto-deceleration function.
- ② If the auto deceleration function is activated the engine speed is lowered when temporary stop or stand-by for dump is required.
- ③ At each pressing of the switch, a short term beep sounds.

#### 14) ENGINE SPEED CONTROL SWITCH



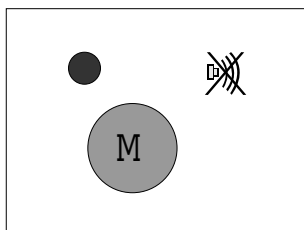
- ① This switch is to control the engine speed, which is increased by pressing ▲ switch and decreased by pressing ▼ switch.
- ② At each pressing of the switches, a short term beep sounds.

#### 15) SELECTION SWITCH(Tachometer and clock)



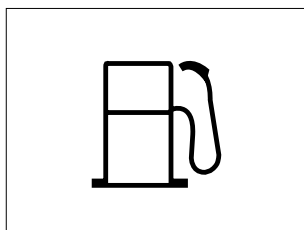
- ① This switch is used to select the tachometer or clock.
- ② The switch is pressed, each function is selected by turns.
- ③ The switch is pressed over 3 seconds, it is selected time adjusting function.
  - Hour : Auto decel switch
  - Minute : Buzzer stop switch
- ④ After time set, if the switch is 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.

#### 16) BUZZER STOP SWITCH



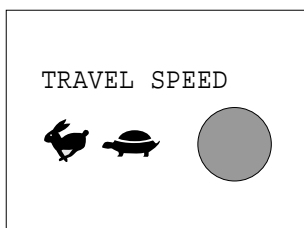
- ① The buzzer sounds is stopped by touching this buzzer stop switch.
- ② Buzzer sound comes out when cluster lights up a warning indicator lamp.
- ③ At each pressing of the switch, a short term beep sounds.



#### 17) FUEL LOW LEVEL LAMP



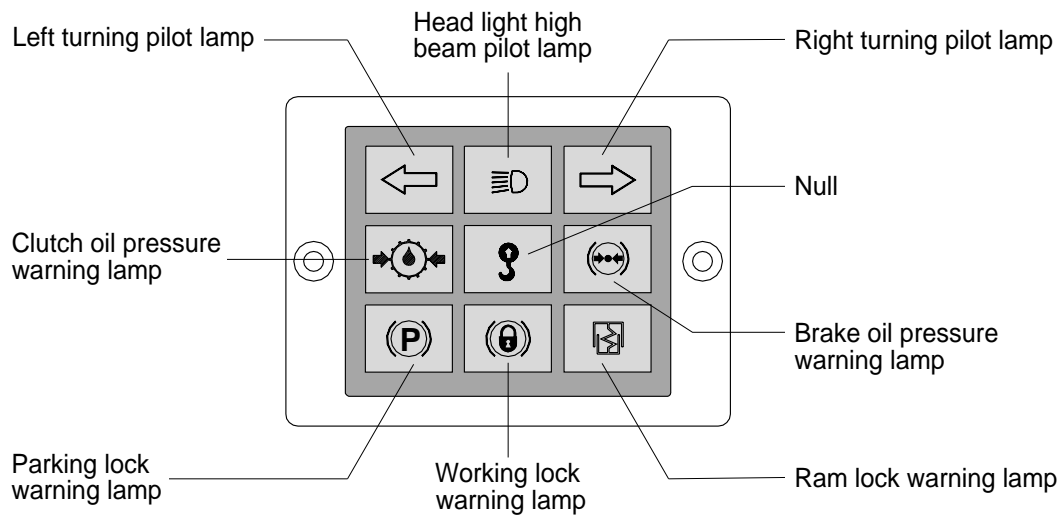
- ① This lamp lights on when fuel level is below 56 l .  
In that case, fill up fuel again.

#### 18) PILOT LAMP

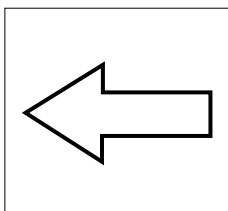


- ① This lamp indicates the travel speed.
- ② When the machine travels selected high speed by LH multifunction switch, the rabbit mark(  ) is turned ON machine travels selected low speed, the turtle mark(  ) is turned ON.

## 5.WARNING INDICATOR FUNCTION

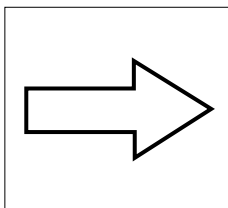


### 1) LEFT TURNING PILOT LAMP



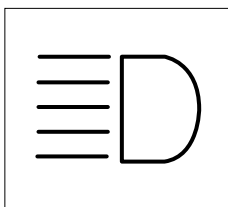
- (1) This lamp flashes with sound when the RH multifunction switch is move to forward position.

### 2) RIGHT TURNING PILOT LAMP



- (1) This lamp flashes with sound when the RH multifunction switch is move to backward position.

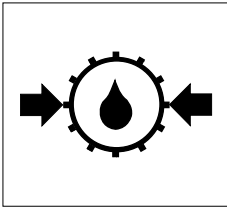
### 3) HEAD LIGHT HIGH BEAM PILOT LAMP



- (1) This lamp is ON when the head light switch is high beam position or passing function.
- (2) When passing other machines ahead, this lamp must be used for a few seconds to give other machines warning for a few seconds.

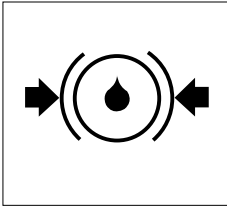


#### 4) CLUTCH OIL PRESSURE WARNING LAMP



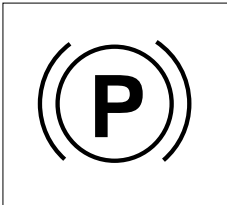
- (1) The lamp lights ON when the oil pressure of the transmission drops.
- (2) When the lamp is ON, stop the engine and check the transmission system.

#### 5) BRAKE OIL PRESSURE WARNING LAMP



- (1) The lamp lights ON when the oil pressure of service brake drops below the normal range.
- (2) When the lamp is ON, stop the engine and check for its cause.
  - ※ **Do not operate until any problems are corrected.**

#### 6) PARKING LOCK WARNING LAMP



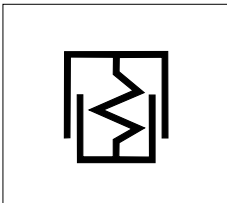
- (1) When the parking brake is actuated, the lamp lights ON.
  - ※ **Check the lamp is OFF before driving.**

#### 7) WORKING LOCK WARNING LAMP



- (1) This lamp lights ON when the service brake is applied.
- (2) Refer to **service brake pedal** at operator's manual page 3-16 for details.

#### 8) RAM LOCK WARNING LAMP



- (1) This warning lamp lights ON when ram lock switch is rear position.
- (2) Also, the warning lamp lights ON when the parking switch is ON or service brake is applied.

## 6. 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		
<b>Group 0</b> (Default)	Way 1 Key switch <b>ON</b> or <b>START</b>	Initial	Engine rpm	<b>950<sub>rpm</sub></b>
		Touch <b>SELECT</b> 1 time	Time	<b>TIME 12:30</b>
	Way 2 Touch <b>AUTO DECEL</b> switch while pressing <b>BUZZER STOP</b> at group 1~4.	Touch <b>SELECT</b> 2 times	Front pump pressure	<b>P 1: 100<sub>bar</sub></b>
		Touch <b>SELECT</b> 3 times	Rear pump pressure	<b>P 2: 200<sub>bar</sub></b>
		Touch <b>SELECT</b> 4 times	Pilot pressure	<b>P 3: 30<sub>bar</sub></b>
<b>Group 1</b> (Volt, temp, EPPR press, version)	Touch <b>SELECT</b> switch <b>once</b> while pressing <b>BUZZER STOP</b> . In this group <b>SELECT</b> LED <b>ON</b>	Default	Battery voltage(V)	<b>624.8</b>
		Touch <b>SELECT</b> 1 time	Potentiometer voltage(V)	<b>P o: 2.5</b>
		Touch <b>SELECT</b> 2 times	Hydraulic oil temperature(°C)	<b>H d: 50</b>
		Touch <b>SELECT</b> 3 times	Power shift pressure (EPPR valve)	<b>E P r: 10<sub>bar</sub></b>
		Touch <b>SELECT</b> 4 times	Model & Version	<b>02C: 10</b>
<b>Group 2</b> (Error code)	Touch <b>SELECT</b> switch <b>twice</b> while pressing <b>BUZZER STOP</b> . In this group <b>BUZZER STOP</b> LED blinks at 0.5sec intervals	Default	Current error	<b>E r r: 03</b>
		Touch <b>SELECT</b> 1 time	Recorded error (Only key switch ON)	<b>TIME E r r: 03</b>
		Press speed up(▲) & speed down(▼) at the same time	Recorded error deletion (Only key switch ON)	<b>TIME E r r: 00</b>
<b>Group 3</b> (Switch input)	Touch <b>SELECT</b> switch <b>3 times</b> while pressing <b>BUZZER STOP</b> . In this group <b>SELECT</b> LED blinks at 0.5sec intervals	Default	Pump prolix switch	<b>P P: on or off</b>
		Touch <b>SELECT</b> 1 time	Auto decel pressure switch	<b>d P: on or off</b>
		Touch <b>SELECT</b> 2 times	Power boost switch	<b>P b: on or off</b>
		Touch <b>SELECT</b> 3 times	Parking switch	<b>P r: on or off</b>
<b>Group 4</b> (Output)	Touch <b>SELECT</b> switch <b>4 times</b> while pressing <b>BUZZER STOP</b> . In this group <b>SELECT</b> LED blinks at 1sec intervals	Initial	Hourmeter	<b>H o: on or off</b>
		Touch <b>SELECT</b> 1 time	Neutral relay (Anti-restart relay)	<b>n r: on or off</b>
		Touch <b>SELECT</b> 2 time	Power boost solenoid (2-stage relief solenoid)	<b>P S: on or off</b>
		Touch <b>SELECT</b> 3 time	Max flow cut off solenoid	<b>F S: on or off</b>
		Touch <b>SELECT</b> 4 time	Transmission oil pressure warning lamp	<b>o L: on or off</b>
		Touch <b>SELECT</b> 5 time	Brake fail lamp	<b>b L: on or off</b>

※ 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
<b>Group 0</b>	<b>2450 rpm</b>	Engine speed	It displays current engine speed detected by engine speed sensor from 500 to 3000rpm. Range : 500~3000rpm by 10rpm
	<b>TIME 12 : 30</b>	Time	It displays current time(12 is hour and 30 is minute) Range : Hour(1~12), minute(00~59)
	<b>P1 : 100bar</b> (Option)	Front pump pressure	It displays front pump pressure of 100bar which is detected by pressure sensor. Range : 000~ 500bar by 10bar
	<b>P2 : 200bar</b> (Option)	Rear pump pressure	It displays rear pump pressure of 200bar which is detected by pressure sensor. Range : 000~ 500bar by 10bar
	<b>P3 : 30bar</b> (Option)	Pilot pump pressure	It displays pilot pump pressure of 30bar which is detected by pressure sensor. Range : 00~50bar by 1bar
<b>Group 1</b>	<b>b24 : 8</b>	Battery voltage	It shows that battery power of 24.8V is supplied into CPU controller. Range : 00.0~48.0V by 0.1V
	<b>Po : 2 : 5</b>	Potentiometer voltage	It shows that potentiometer signal voltage is 2.5V. Range : 0.0~5.0V by 0.1V
	<b>Hd : 50</b>	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).
	<b>EPr : 10bar</b>	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
	<b>02C : 10</b>	Model and CPU program version	It shows that machine model(R200W-3) and the program version of the CPU controller is 1.0. Version display range : 0.0~9.9 by 0.1
<b>Group 2</b>	<b>Err : 03</b>	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
	<b>TIME Err : 03</b>	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
	<b>TIME Err : 00</b>	Recorded error deletion	It shows all recorded error codes are removed in the CPU controller memory.

Group	Display	Name	Description
<b>Group 3</b>	<b>PP : on or oFF</b>	Pump prolix switch	<b>PP : on</b> Shows that pump prolix switch is turned on(At emergency position). <b>PP : oFF</b> Shows that pump prolix switch is turned off(At normal position).
	<b>dP : on or oFF</b>	Auto decel pressure switch	<b>dP : on</b> Shows that auto decel pressure switch is pressed on (Operation of control lever). <b>dP : oFF</b> Shows that auto decel pressure switch is released off (No operation of control lever).
	<b>Pb : on or oFF</b>	Power boost switch	<b>Pb : on</b> Shows that power boost switch is pressed on (Activated). <b>Pb : oFF</b> Shows that power boost switch is released off (Canceled).
	<b>Pr : on or oFF</b>	Parking switch	<b>Pr : on</b> Shows that parking switch is turned on. <b>Pr : oFF</b> Shows that parking switch is turned off.
<b>Group 4</b>	<b>Ho : on or oFF</b>	Hourmeter	<b>Ho : on</b> Shows that hourmeter is activated by CPU controller. <b>Ho : oFF</b> Shows that hourmeter is turned off.
	<b>nr : on or oFF</b>	Neutral relay (Anti-restart relay)	<b>nr : on</b> Shows that neutral relay for anti-restarting function is activated(Engine start is possible). <b>nr : oFF</b> Shows that neutral relay is turned off to disable the engine restart.
	<b>PS : on or oFF</b>	Power boost solenoid	<b>PS : on</b> Shows that power boost solenoid is activated to maximize the power(Power up). <b>PS : oFF</b> Shows that power boost solenoid is turned off(Cancel the power boost function).
	<b>PS : on or oFF</b>	Maximum flow cut off solenoid	<b>FS : on</b> Shows that max flow cut off solenoid is activated to cut off the maximum flow of pumps. <b>FS : oFF</b> Shows that max flow cut off solenoid is turned off (Canded).
	<b>oL : on or oFF</b>	Transmission oil pressure warning lamp	<b>oL : on / oFF</b> Shows that transmission oil pressure is low(Abnormal).
	<b>bL : on or oFF</b>	Brake fail warning lamp	<b>bL : on / oFF</b> Shows that braker fail pressure is low(Abnormal).