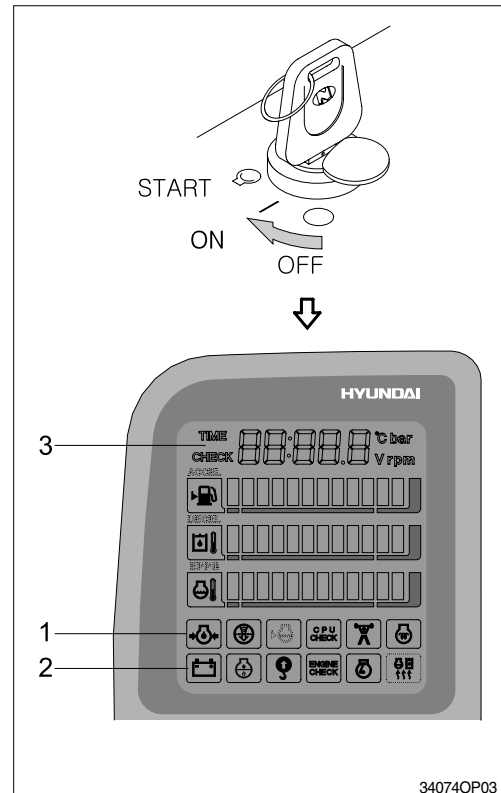


### 3. STARTING AND STOP THE ENGINE

#### 1) CHECK INDICATOR LIGHTS

- (1) Check if all the operating lever is on the neutral position.
- (2) Turn the starting switch to the ON position, and check following.
  - ① If all the lamps light ON and buzzer sounding for 2 seconds.
  - ② After lamp check **CL : 1.4**, the version of cluster program, is displayed on **Monitoring display (3)** for 5 seconds and the cluster returns to default.
  - ③ Only below lamps will light ON and all the other lights will turn OFF after 2 seconds.
    - Battery charging warning lamp(2)
    - Engine oil pressure warning lamp(1)

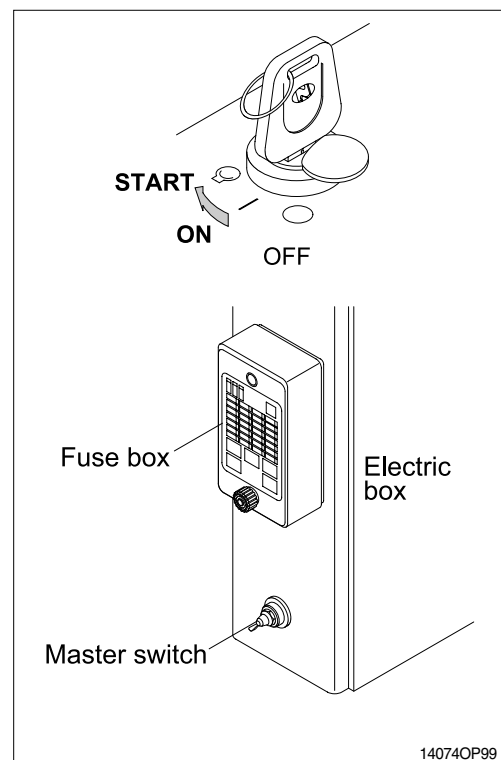
※ Refer to the **START PROCEDURE** on the page 0-13.



#### 2) STARTING ENGINE IN NORMAL TEMPERATURE

※ Sound the horn to warn the surroundings after checking if personnel or obstacles are in the area.

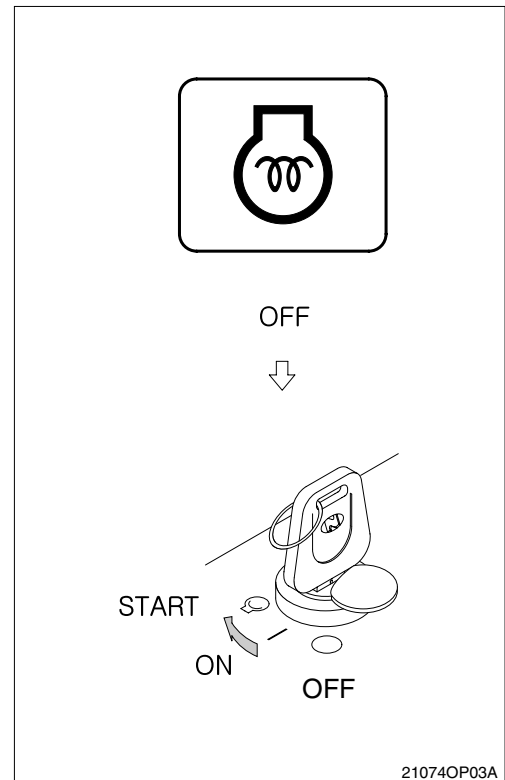
- (1) Turn the starting switch to START position to start the engine.
  - ※ If the engine does not start, allow the starter to cool for about 2 minutes before attempting to start the engine again.
- (2) Release the starting switch instantly after the engine starts to avoid possible damage to the starting motor.



### 3) STARTING ENGINE IN COLD WEATHER

- ※ Sound horn to warn surroundings after checking if there are obstacles in the area.
- ※ Replace the engine oil and fuel referring to recommended oils at page 2-16.
- ※ Fill the anti-freeze solution to the coolant as required.

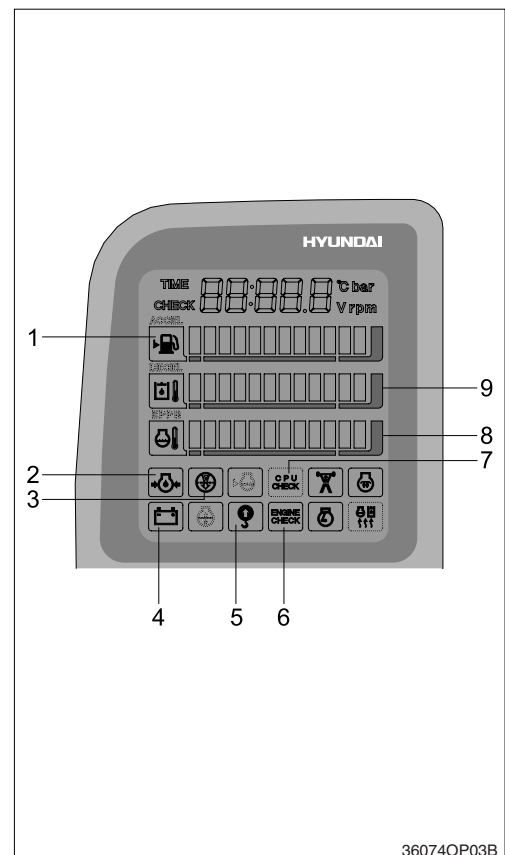
- (1) Check if all the levers are in the neutral position.
- (2) Turn the starting switch to ON position, and wait the preheat pilot lamp OFF.
- (3) Start the engine by turning the starting switch to the START position after the preheat pilot lamp OFF.
  - ※ If necessary use the preheat switch.
  - ※ If the engine does not start, allow the starter to cool for about 2 minutes before attempting to start the engine again.
- (4) Release the starting switch immediately after starting engine.
- (5) The operation for the warming up machine is automatic.



### 4) INSPECTION AFTER ENGINE START

Inspect and confirm the following after engine starts.

- (1) Is the level gauge of hydraulic oil tank in the normal level?
  - (2) Are there leakages of oil or water?
  - (3) Are all the warning lamps OFF(1-7)?
  - (4) Is the indicator of engine coolant temperature gauge(8) and hydraulic oil temperature gauge(9) in the green zone?
  - (5) Is the engine sound and the color of exhaust gas normal?
  - (6) Are the sound and vibration normal?
- ※ Do not increase engine speed quickly after starting, it can damage engine or turbocharger.
  - ※ If there are problems in the control panel, stop the engine immediately and correct problem as required.



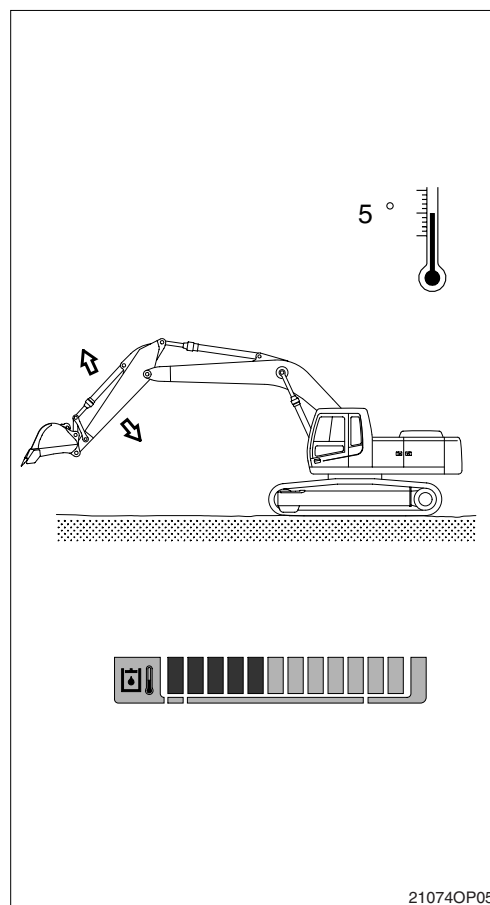
## 5) WARMING-UP OPERATION

- ※ The most suitable temperature for the hydraulic oil is about 50°C(122°F).

It can cause serious trouble in the hydraulic system by sudden operation when the hydraulic oil temperature is below 25°C(77°F).

Then temperature must be raised to at least 25°C(77°F) before starting work.

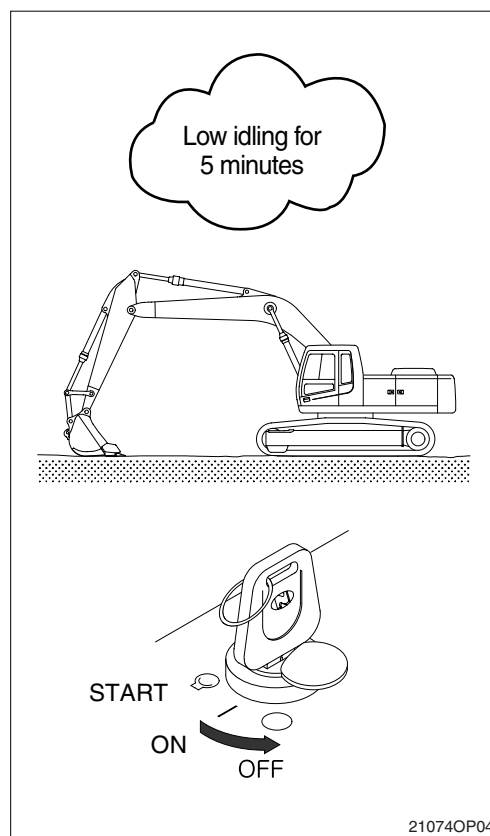
- (1) Run the engine at low idling for 5 minutes.
- (2) Speed up the idling and run the engine at mid-range speed.
- (3) Operate bucket lever for 5 minutes.
  - ※ **Do not operate anything except bucket lever.**
- (4) Run the engine at the high speed and operate the bucket lever and arm lever for 5-10 minutes.
  - ※ **Operate only the bucket lever and arm lever.**
- (5) This warming-up operation will be completed by operation of all cylinders several times, and operation of swing and traveling.
  - ※ **Increase the warming-up operation during winter.**



## 6) TO STOP THE ENGINE

- ※ If the engine is abruptly stopped before it has cooled down, engine life may be greatly shortened. Consequently, do not abruptly stop the engine apart from an emergency.
- ※ In particular if the engine has overheated, do not abruptly stop it but run it at medium speed to allow it to cool gradually, then stop it.

- (1) Down the bucket on the ground then put all the levers in the neutral position.
- (2) Run the engine at low idling speed for about 5 minutes.
- (3) Return the key of starting switch to the OFF position.
- (4) Remove the key to prevent other people using the machine and LOCK safety lever.
- (5) Lock the cab door.

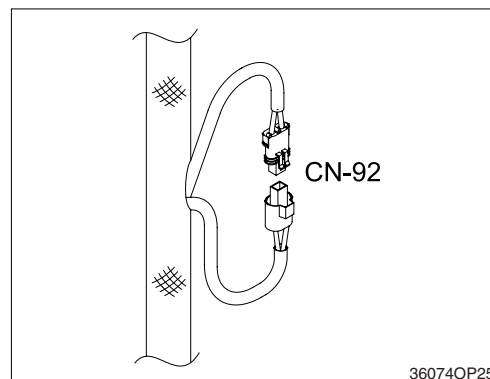


## 7) OPERATION IN CASE OF MALFUNCTION OF THE CPU CONTROLLER

- ※ The following explains the way to start and to control engine speed in case of malfunction of the CPU controller.

### (1) Emergency starting engine

- ① If the CPU controller is removed, the engine does not start
- ② Before starting the engine, connect the connector CN-92 A with B



### (2) Engine speed control

Engine speed can be controlled as following.

- ① Connecting the prolix resistor to CN-47 connector.
- ② Connecting the CN-16 connector to CN-16B.
- ③ Engine speed controlled by rotating accel dial switch.

