

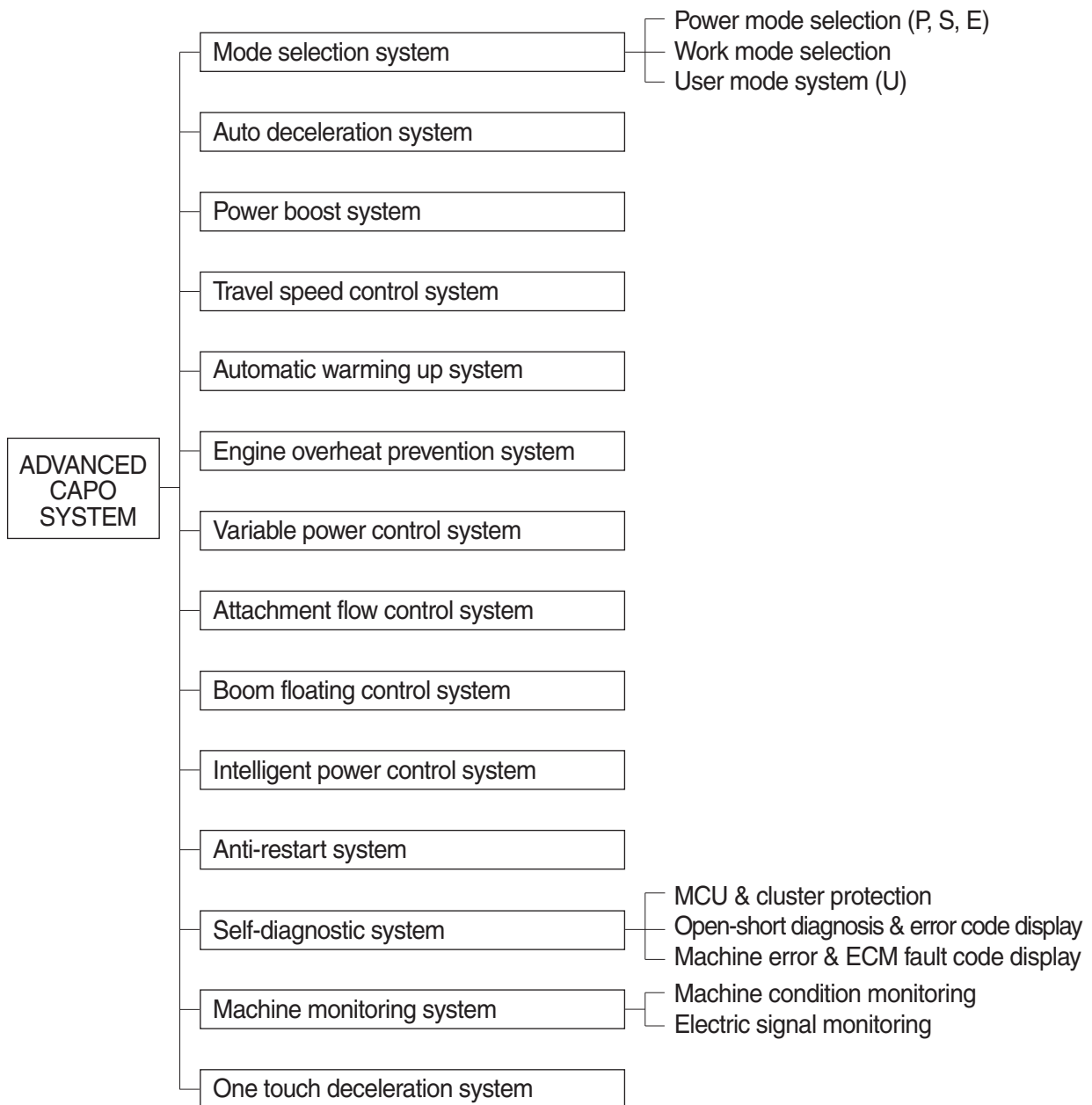
## SECTION 5 MECHATRONICS SYSTEM

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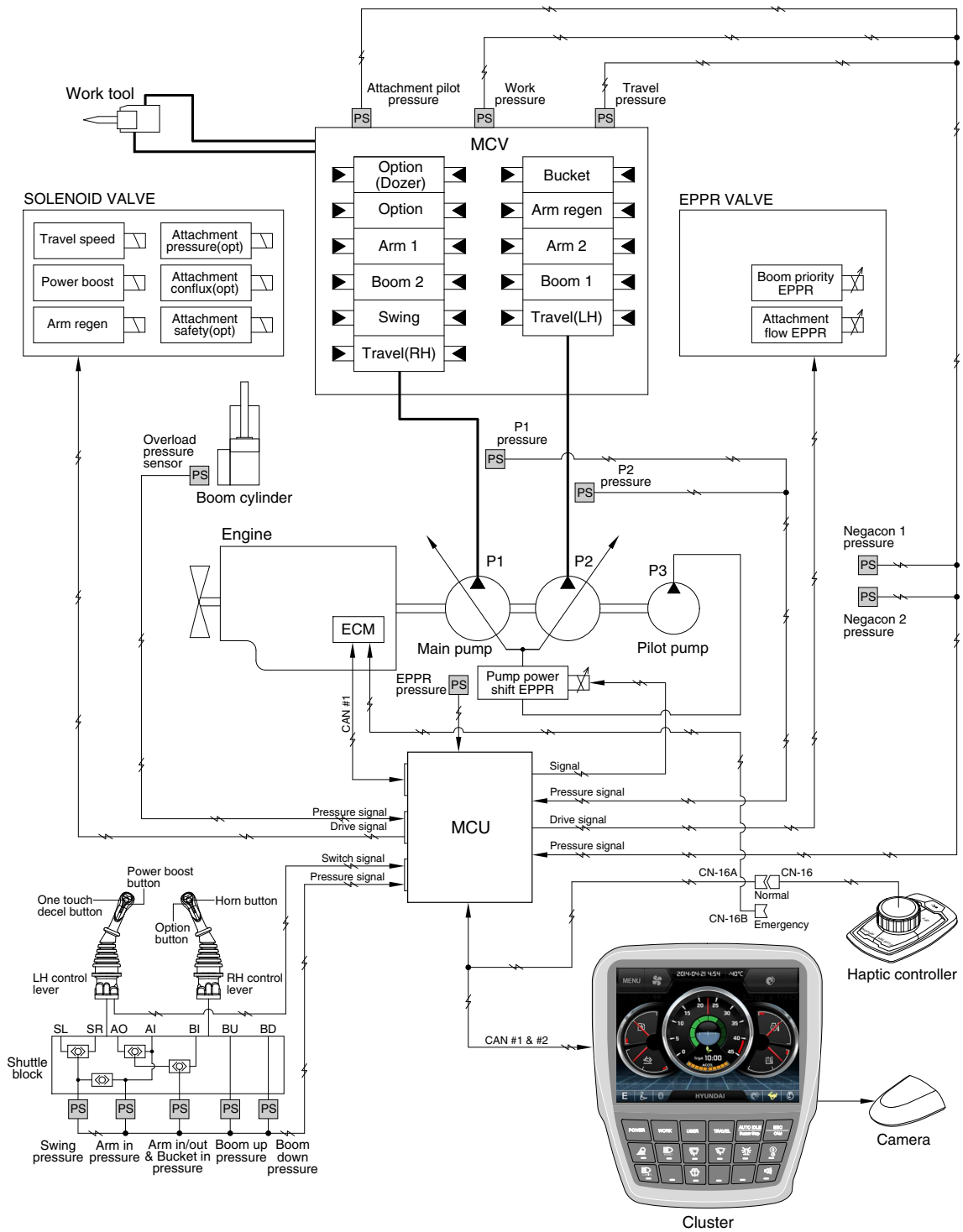
# SECTION 5 MECHATRONICS SYSTEM

## GROUP 1 OUTLINE

The ADVANCED CAPO (Computer Aided Power Optimization) system controls engine and pump mutual power at an optimum and less fuel consuming state for the selected work by mode selection, auto-deceleration, power boost function, etc. It monitors machine conditions, for instance, engine speed, coolant temperature, hydraulic oil temperature, and hydraulic oil pressure, etc. It consists of a MCU, a cluster, an ECM, EPPR valves, and other components. The MCU and the cluster protect themselves from over-current and high voltage input, and diagnose malfunctions caused by short or open circuit in electric system, and display error codes on the cluster.



# SYSTEM DIAGRAM

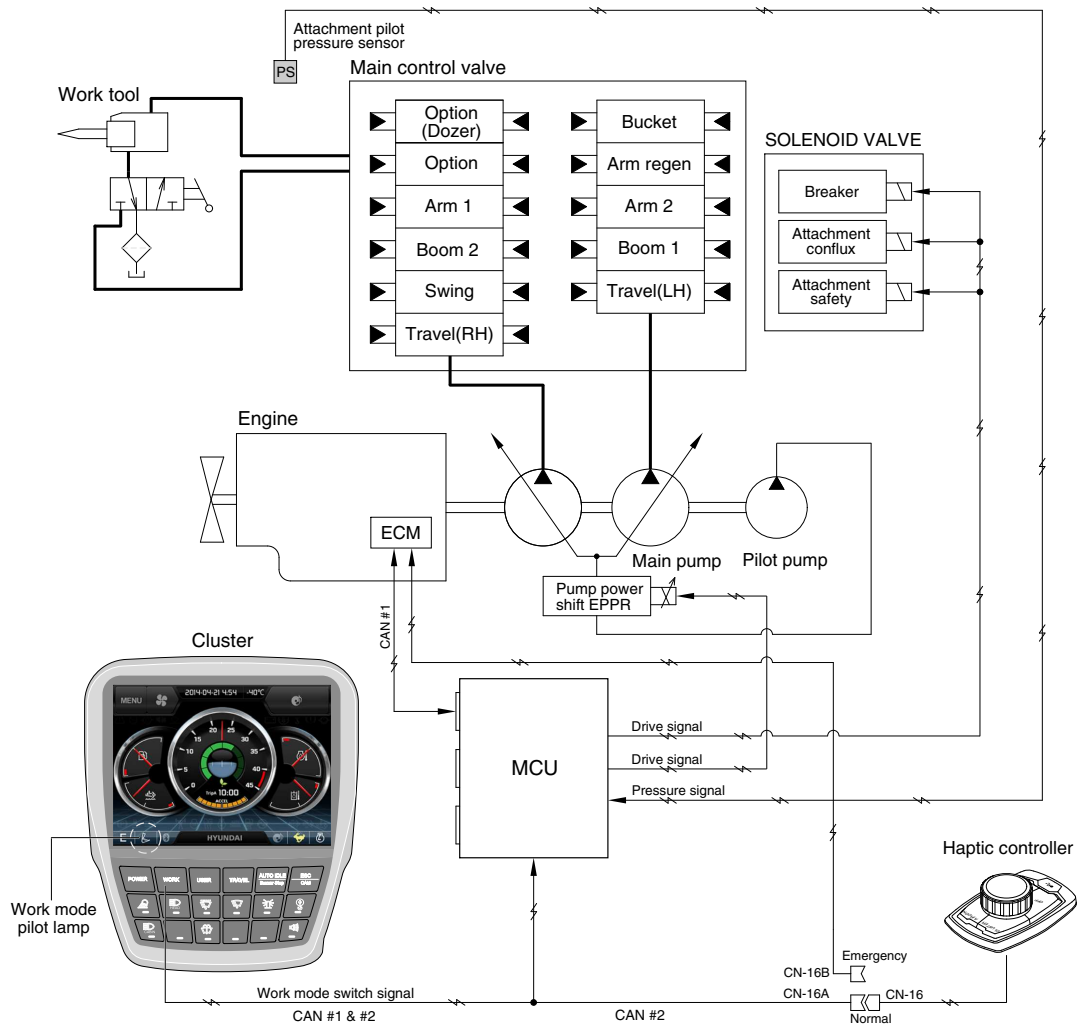


140L5MS04



## 2. WORK MODE SELECTION SYSTEM

Work mode consists of the general operation (bucket) and the optional attachment (breaker, crusher).



140L5MS05

### 1) GENERAL WORK MODE (bucket)

This mode is used to general digging work.

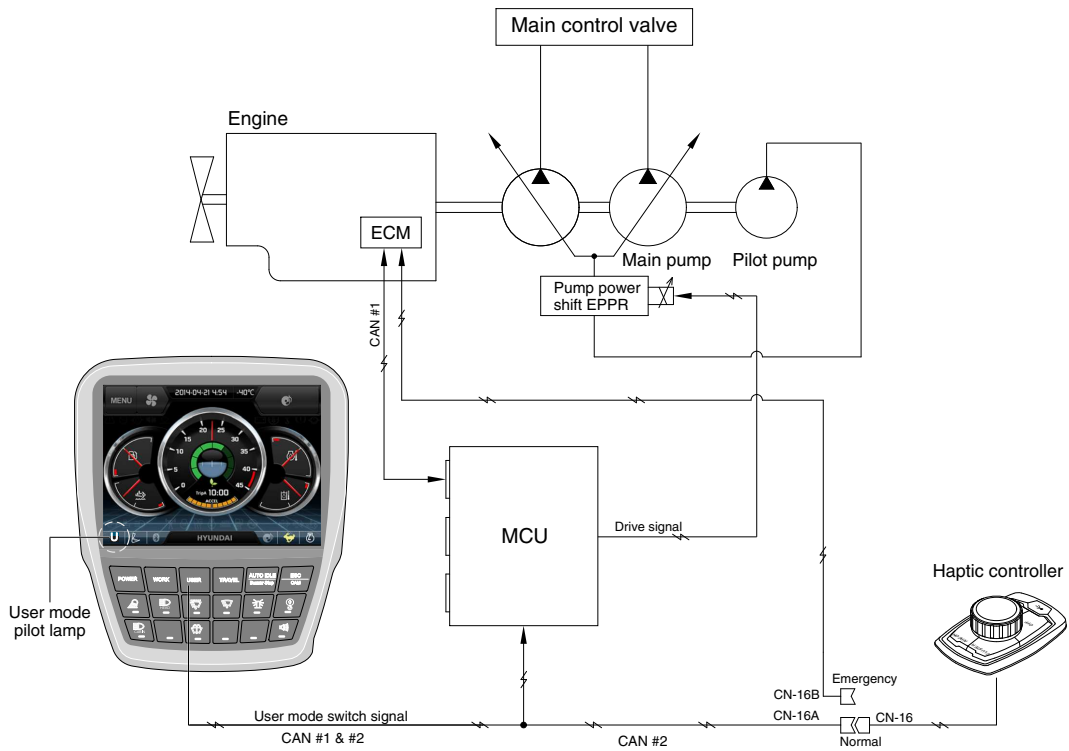
### 2) ATT WORK MODE (breaker, crusher)

It controls the pump flow and system pressure according to the operation of breaker or crusher.

Description	General mode	Work tool	
	Bucket	Breaker	Crusher
Attachment safety solenoid	OFF	-	ON
Attachment conflux solenoid	OFF	ON/OFF	ON/OFF
Attachment flow EPPR current	100 mA	100~700 mA	100~700 mA
Breaker solenoid*	OFF	ON	-

★ When breaker operating button is pushed.

### 3. USER MODE SELECTION SYSTEM



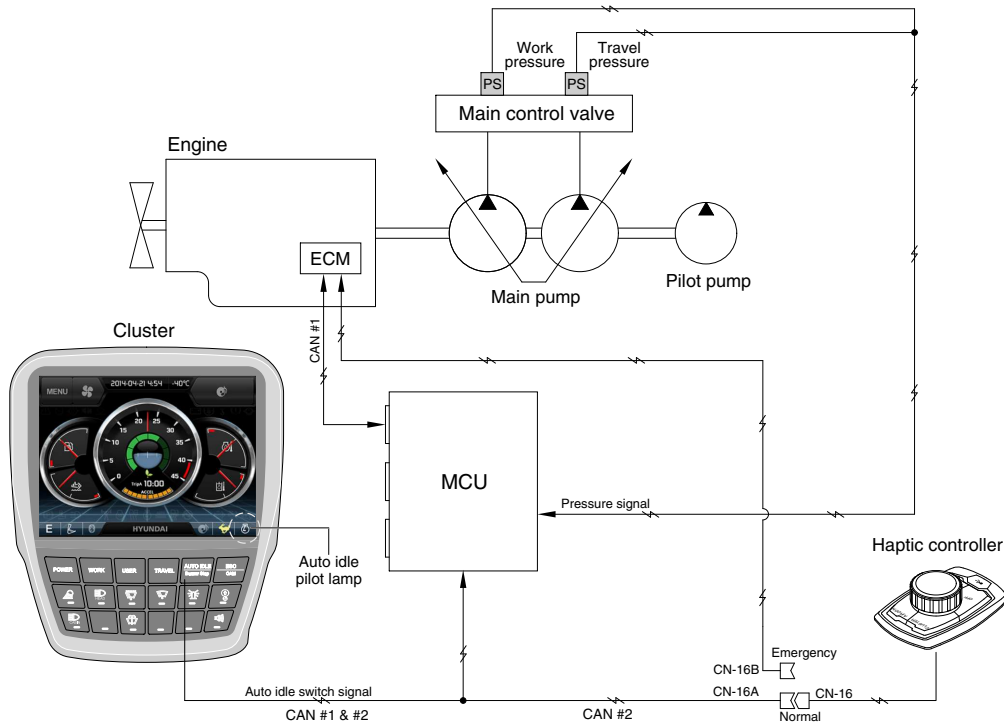
140L5MS104

1) High idle rpm, auto idle rpm and EPPR pressure can be adjusted and memorized in the U-mode.

#### 2) LCD segment vs parameter setting

Step ( )	Engine speed (rpm)	Idle speed (rpm)	Power shift (bar)
1	1300	750	0
2	1400	800	3
3	1500	850	6
4	1600	900	9
5	1700	950	12
6	1800	1000	16
7	1850	1050	20
8	1900	1100 (auto decel)	26
9	1950	1150	32
10	2000	1200	38

## GROUP 3 AUTOMATIC DECELERATION SYSTEM

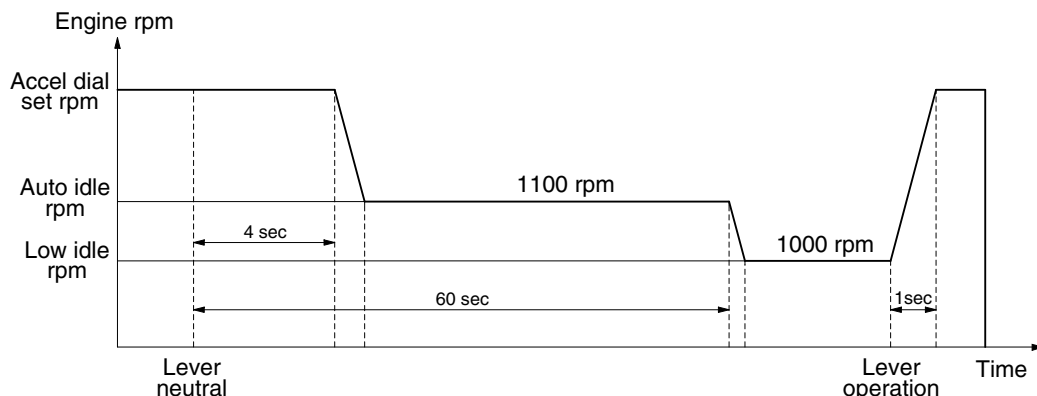


140L5MS55

### 1. WHEN AUTO IDLE PILOT LAMP ON

When all of the work equipment control levers including swing and travel levers are at neutral for 4 seconds, MCU sends throttle command to ECM to reduce the engine speed to 1100 rpm. If the control levers are at neutral for 1 minute, MCU reduces the engine speed to 1000 rpm. As the result of reducing the engine speed, fuel consumption and noise are effectively cut down during non-operation of the control levers.

When the Auto idle pilot lamp is turned off by pressing the switch or any control lever is operated, the reduced engine speed rises upto the speed before deceleration in a second.



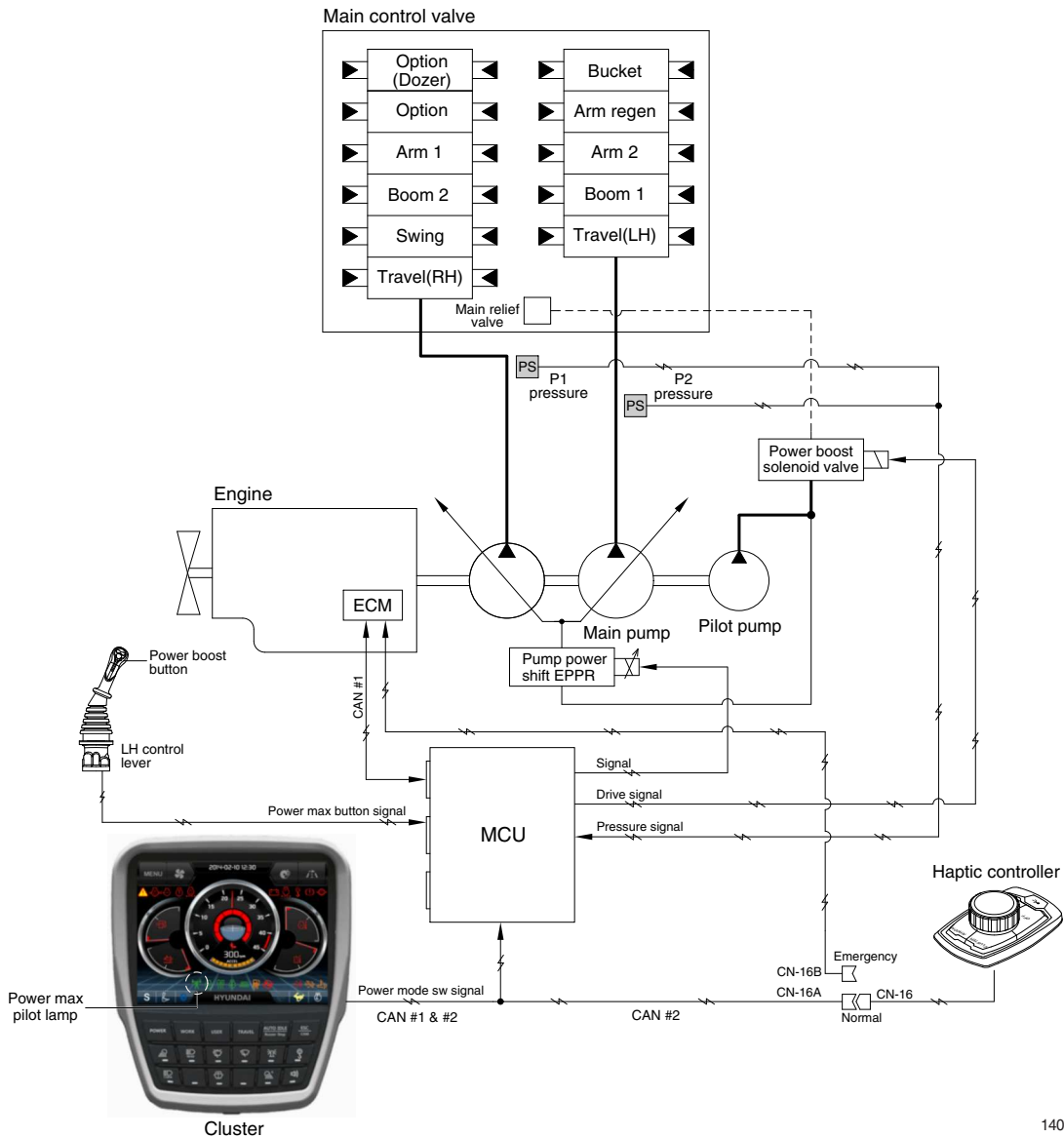
140L5MS01

### 2. WHEN AUTO IDLE PILOT LAMP OFF

The engine speed can be set as desired using the multimodal dial switch, and even if the control levers are neutral, the engine speed is not reduced.

※ Auto idle function can be activated when multimodal dial position is over 4.

## GROUP 4 POWER BOOST SYSTEM



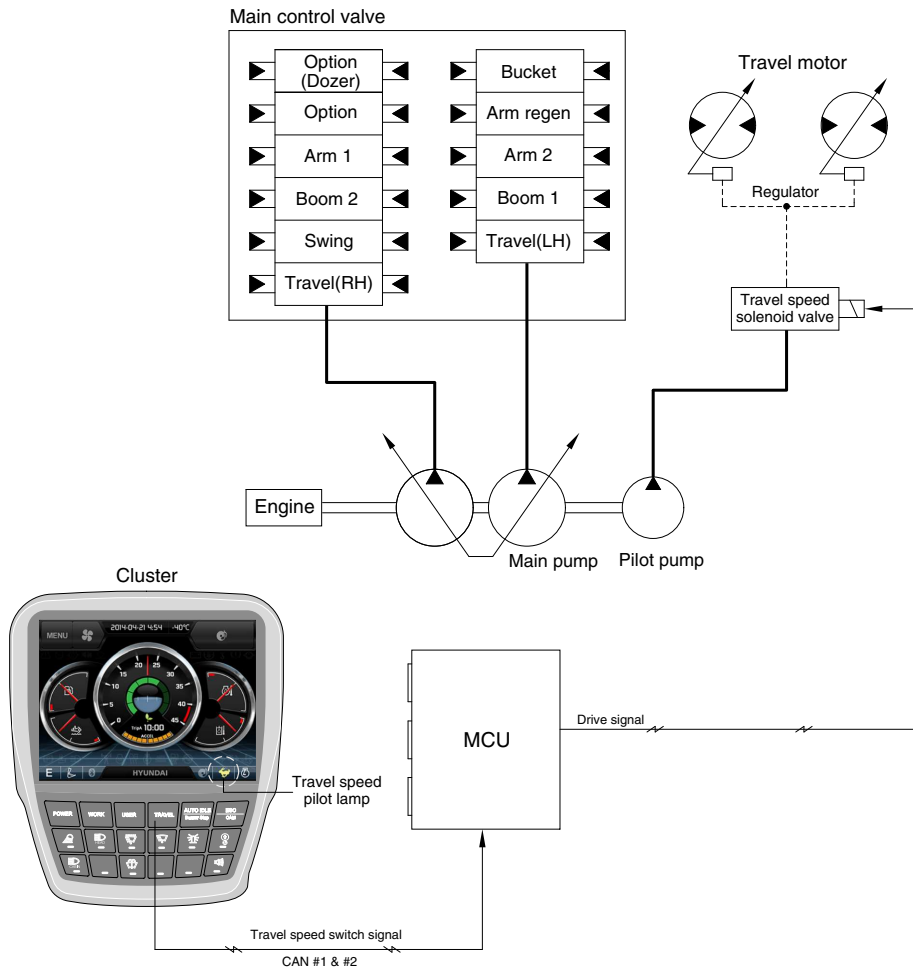
- When the power boost switch on the left control lever knob is pushed ON, the power mode is set P mode and maximum digging power is increased by 10 %.
- When the power boost function is activated, the power boost solenoid valve pilot pressure raises the set pressure of the main relief valve to increase the digging power.

Description	Condition	Function
Activated	Power boost switch : ON Accel dial : over 8	- Power mode : P - Accel dial power : 9 - Power boost solenoid : ON - Power boost pilot lamp : ON - Operating time : max 8 seconds
Canceled	Power boost switch : OFF	- Pre-set power mode - Power boost solenoid : OFF - Power boost pilot lamp : OFF

- ※ When the auto power boost is set to Enable and power mode is set to P mode on the cluster, the digging power is automatically increased as working conditions by the MCU. It is operated max 8 seconds.



# GROUP 5 TRAVEL SPEED CONTROL SYSTEM



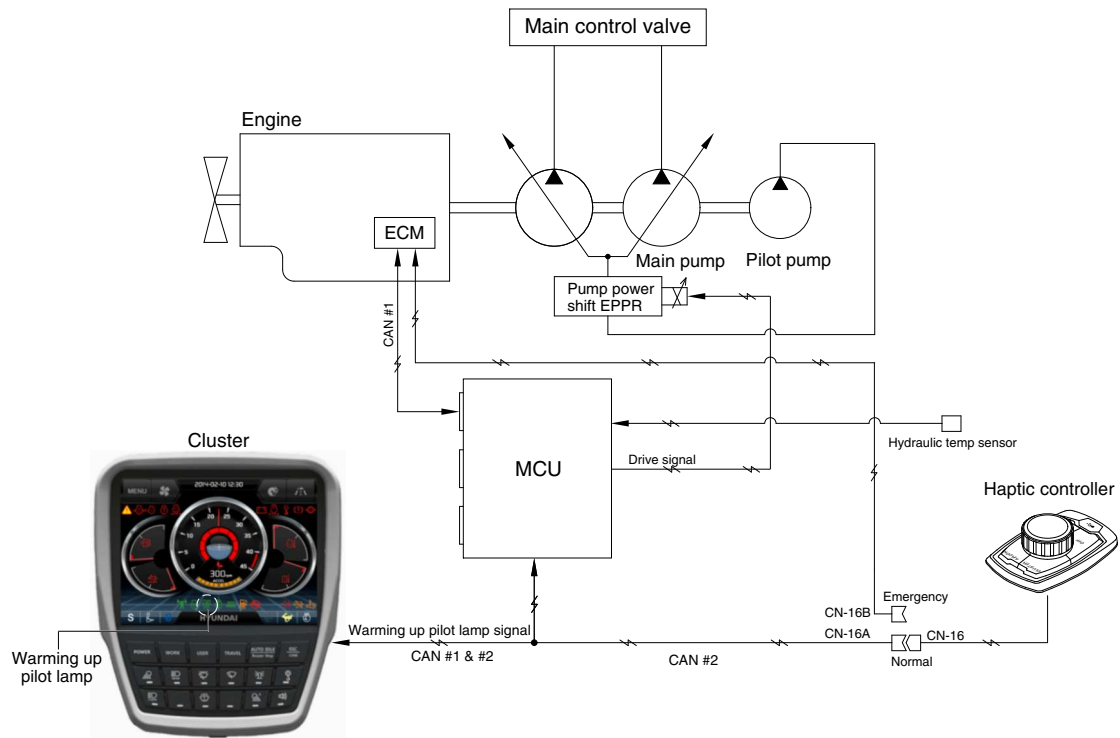
140L5MS07

Travel speed can be switched manually by pressing the travel speed switch on the cluster.

Speed	Travel speed solenoid valve	Lamp on cluster	Operation
Low	OFF	Turtle	Low speed, high driving torque in the travel motor
High	ON	Rabbit	High speed, low driving torque in the travel motor

※ Default : Turtle (Low)

## GROUP 6 AUTOMATIC WARMING UP SYSTEM



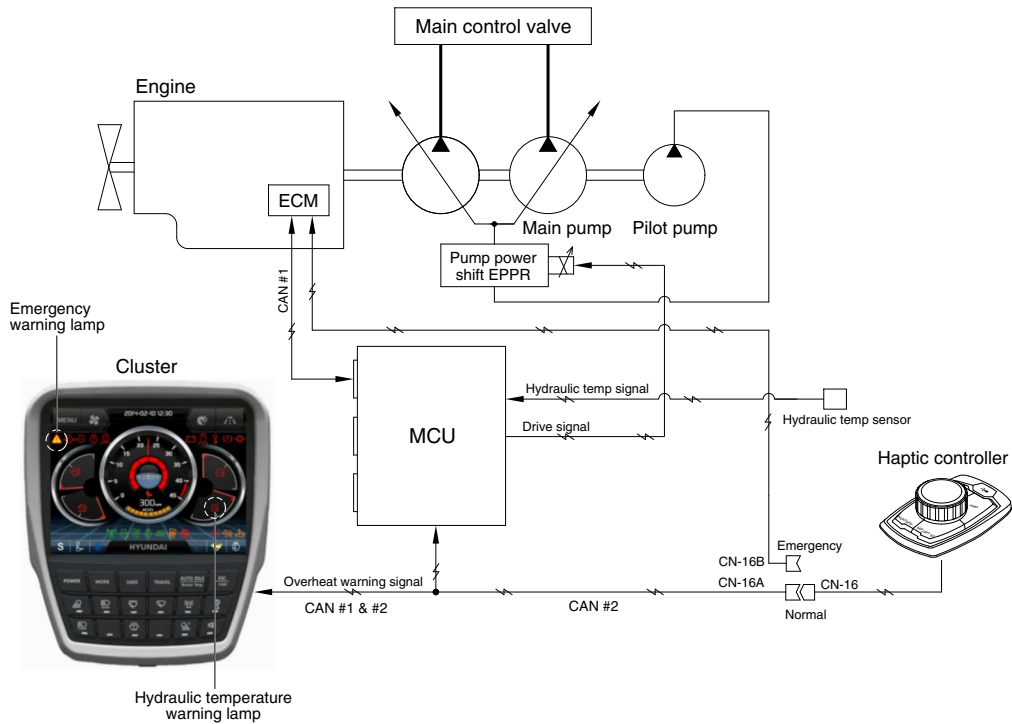
140L5MS08

1. The MCU receives the engine coolant temperature from the ECM, and if the coolant temperature is below 30°C, it increases the engine speed from key start rpm to 1100 rpm. At this time the mode does not change. If the coolant temperature sensor has fault, the hydraulic oil temperature signal is substituted.
2. In case of the coolant temperature increases up to 30°C, the engine speed is decreased to key start speed. And if an operator changes power mode set during the warming up function, the MCU cancels the automatic warming up function.

### 3. LOGIC TABLE

Description	Condition	Function
Actuated	- Coolant temperature : below 30°C (after engine run)	- Power mode : Default (E mode) - Warming up time : 10 minutes (max) - Warming up pilot lamp : ON
Canceled	- Coolant temperature : Above 30°C - Warming up time : Above 10 minutes - Changed power mode set by operator - RCV lever or pedal operating - Auto idle cancel ※ If any of the above conditions is applicable, the automatic warming up function is canceled	- Power mode : set mode - Warming up pilot lamp : OFF

# GROUP 7 ENGINE OVERHEAT PREVENTION SYSTEM



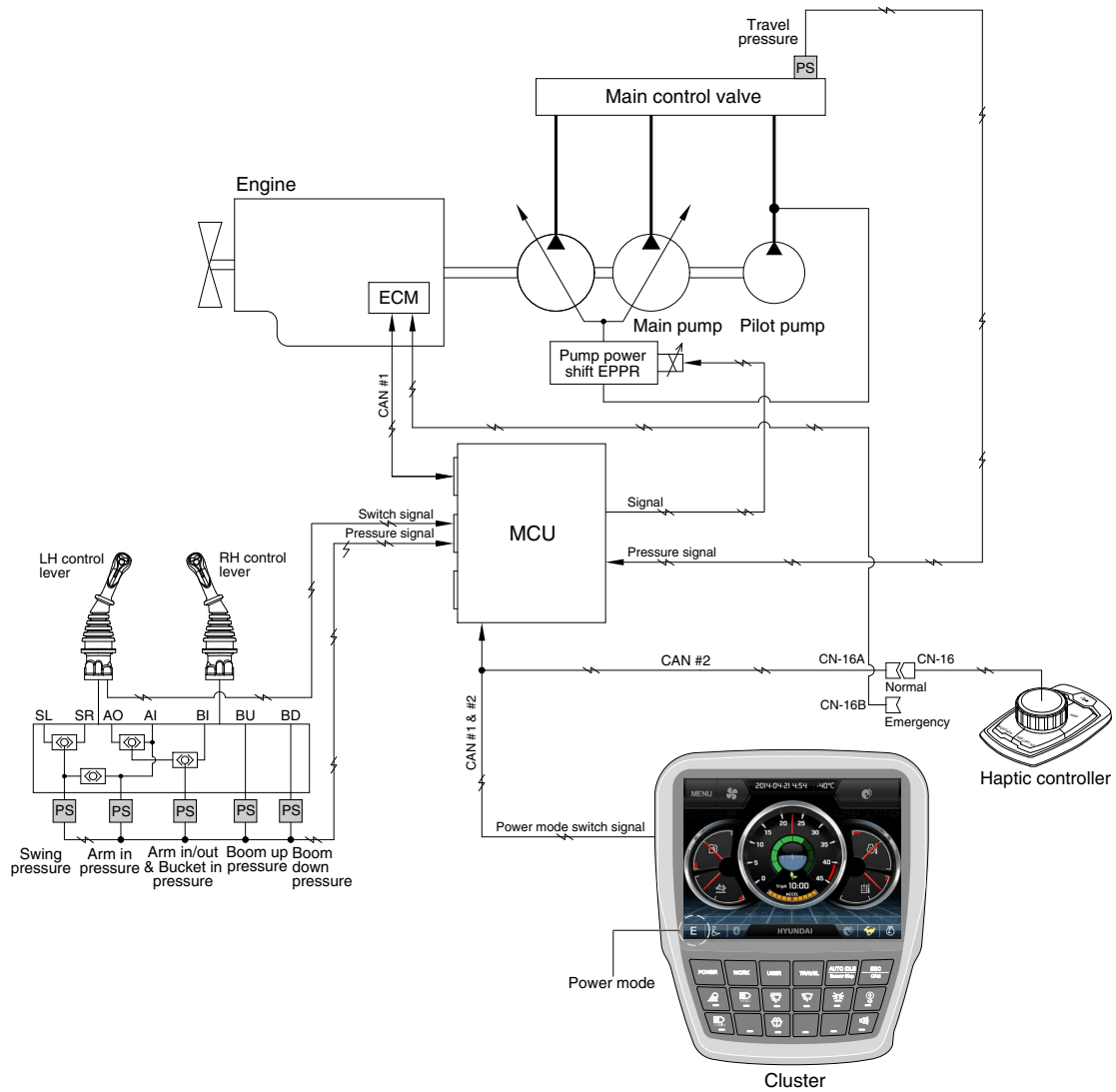
140L5MS09

1. If the engine coolant temperature or the hydraulic oil temperature is overheated over 100°C, the warning lamp is ON and the pump input torque or the engine speed is reduced as below logic table.

## 2. LOGIC TABLE

Description		Condition	Function
First step warning	Activated	- Coolant temperature : Above 103°C - Hydraulic oil temperature : Above 100°C	- Warning lamp : ON , buzzer : OFF - Pump input torque is reduced.
	Canceled	- Coolant temperature : Less than 100°C - Hydraulic oil temperature : Less than 95°C	- Warning lamp & buzzer : ON - Pump input torque is reduced.
Second step warning	Activated	- Coolant temperature : Above 107°C - Hydraulic oil temperature : Above 105°C	- Emergency warning lamp pops up on the center of LCD and the buzzer sounds. - Engine speed is reduced after 10 seconds.
	Canceled	- Coolant temperature : Less than 103°C - Hydraulic oil temperature : Less than 100°C	- Return to pre-set the engine speed. - Hold pump absorption torque on the first step warning.

## GROUP 8 VARIABLE POWER CONTROL SYSTEM



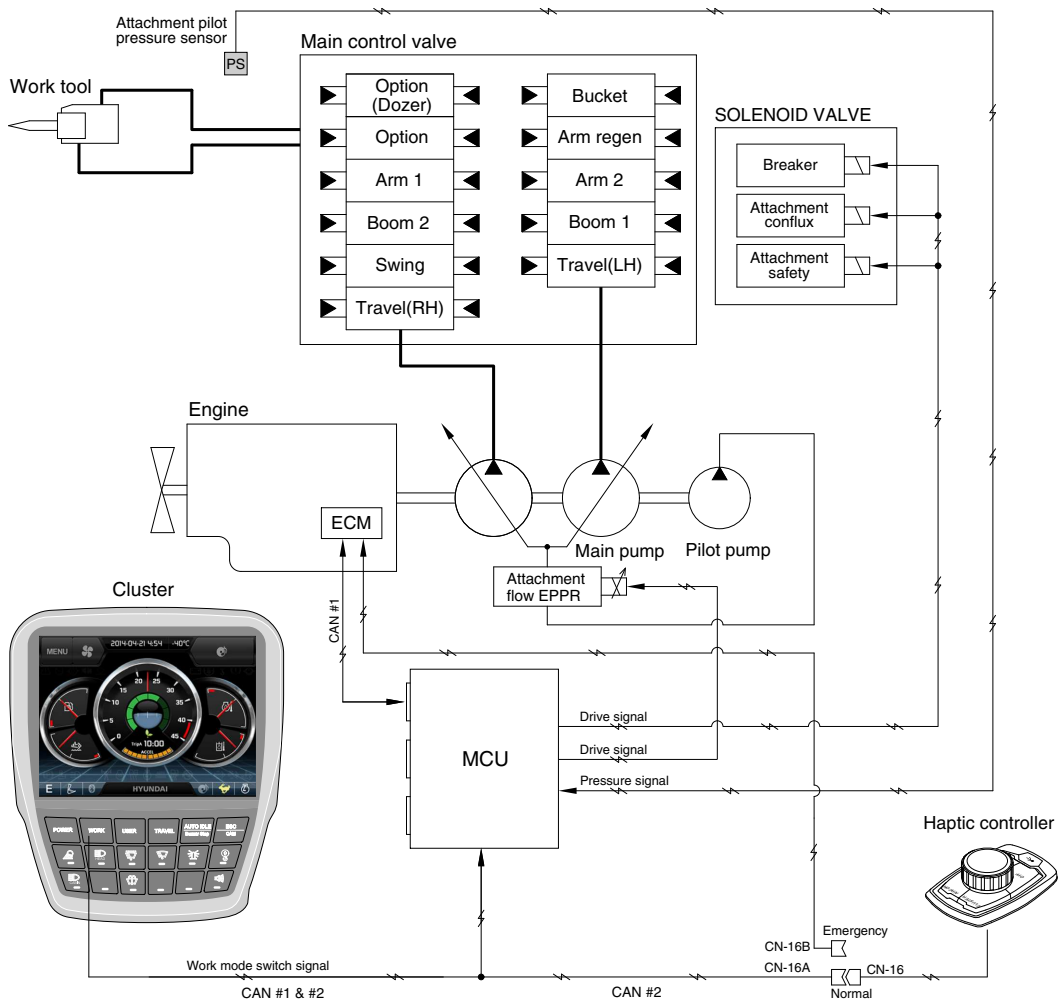
140L5MS10

- The variable power control system controls the engine and pump mutual power according to RCV lever stroke and pump load. It makes fuel saving and smooth control at precise work.

Description	Working condition
Power mode	P, S, E
Work mode	General (bucket)
Pressure sensor	Normal

※ The variable power control function can be activated when the power mode is set to all power mode.

## GROUP 9 ATTACHMENT FLOW CONTROL SYSTEM



140L5MS11

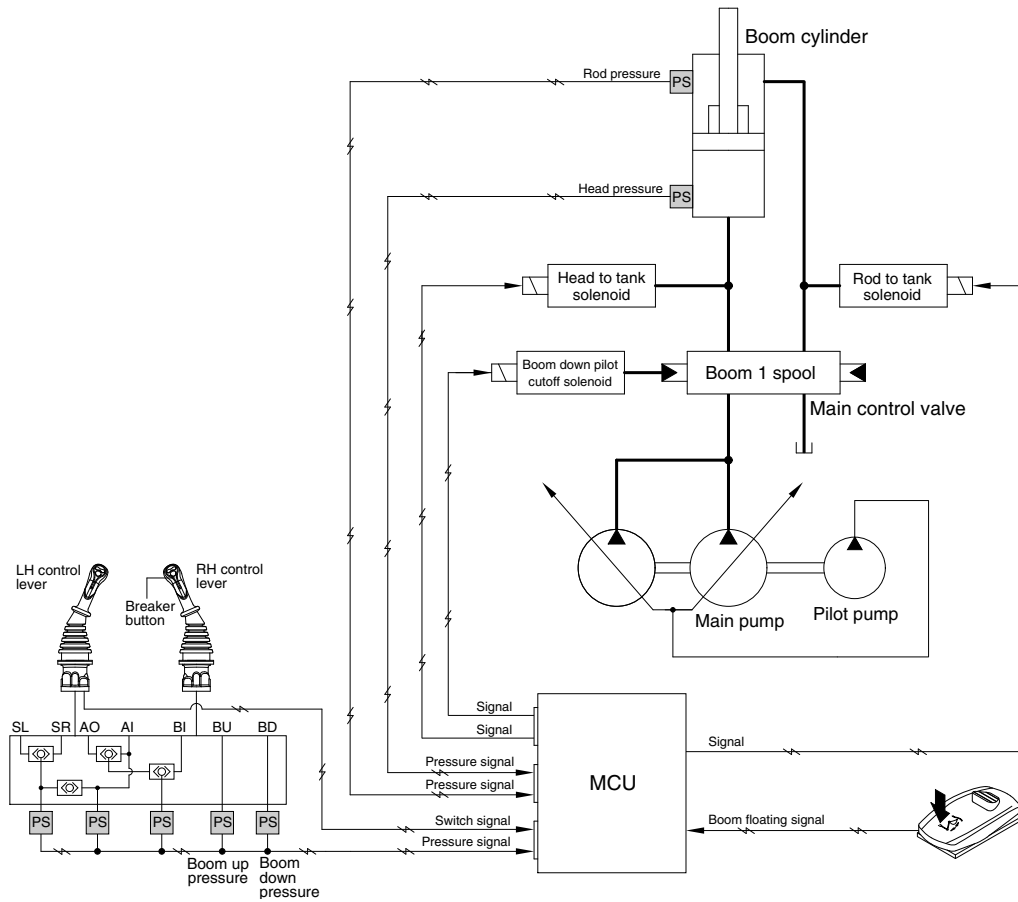
- The system is used to control the pump delivery flow according to set of the work tool on the cluster by the attachment flow EPPR valve.

Description	Work tool	
	Breaker	Crusher
Flow level	100 ~ 180 lpm	100 ~ 440 lpm
Attach safety solenoid	-	ON
Attach conflux solenoid	ON/OFF	ON/OFF
Breaker solenoid★	ON	-

※ Refer to the page 5-79 for the attachment kinds and max flow.

★ When breaker operating button is pushed.

## GROUP 10 BOOM FLOATING CONTROL SYSTEM



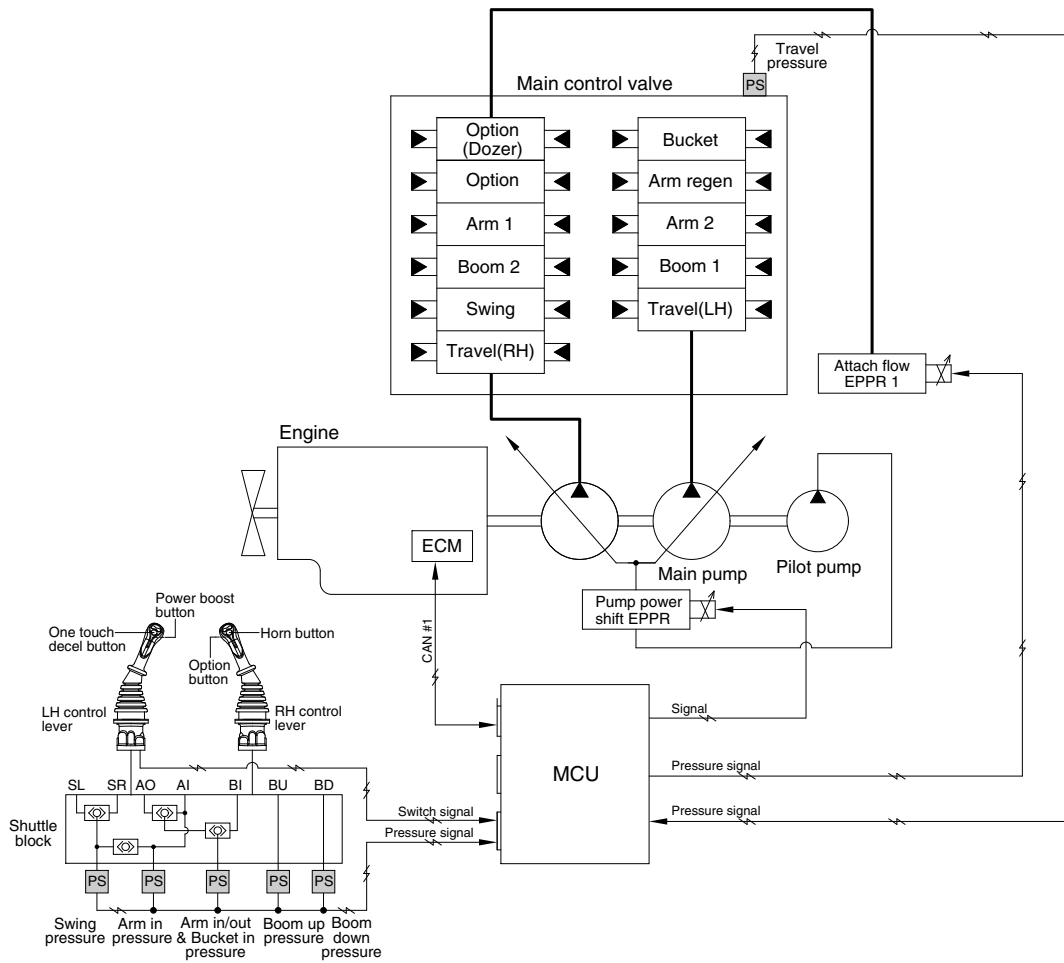
- Boom floating automatically controls boom cylinder along the ground by operating arm cylinder only.

Description		Condition	Function
Work mode*1	Floating mode		
General mode	Boom up floating*2	Floating mode sw : ON	Rod to tank solenoid : ON Head to tank solenoid : OFF Boom down cutoff solenoid : OFF
	Boom up/down floating*2	Floating mode sw : ON Breaker button : Pressed Boom down pilot pressure > 25 bar Boom up pilot pressure < 5 bar	Rod to tank solenoid : ON Head to tank solenoid : ON Boom down cutoff solenoid : ON
Breaker mode	Boom down floating	Floating mode sw : ON Breaker button : Pressed Boom down pilot pressure > 25 bar Boom up pilot pressure < 5 bar	Rod to tank solenoid : OFF Head to tank solenoid : ON Boom down cutoff solenoid : ON
Temporarily canceled		During operation of boom floating Boost sw : Pressed	Rod to tank solenoid : OFF Head to tank solenoid : OFF Boom down cutoff solenoid : OFF

\*1 Boom floating is not activated when work mode is crusher mode.

\*2 These functions are activated just in case the excavator is not in jack up status.

# GROUP 11 INTELLIGENT POWER CONTROL SYSTEM



140L5MS18

1. When the requirement of pump flow rate is low, IPC mode controls pump flow rate to improve fuel efficiency.

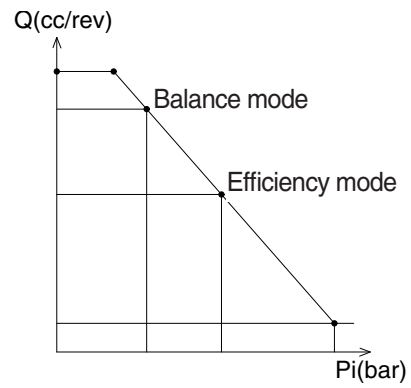
Condition*1	Function
IPC mode : ON*2 Boom up Arm in Not travel motion Not swing motion	Limitation of pump flow rate : Activated
None of upper condition	Limitation of pump flow rate : Canceled

\*1 AND condition

\*2 IPC mode ON/OFF is selected at "Mode setup > IPC mode". See next page.

## 2. IPC MODE SELECTION

IPC mode ON/OFF and the levels of flow rate limit can be selected at "Mode setup > IPC mode"

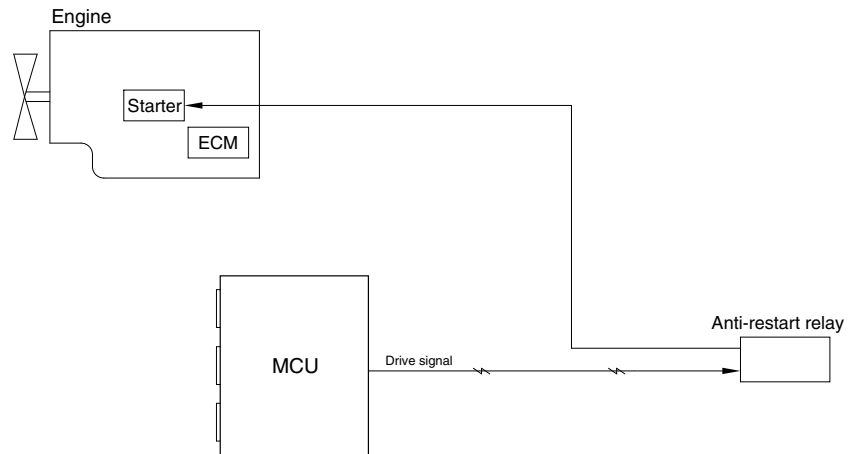


290F3CD311

IPC mode	Description
Balance mode (default)	IPC mode ON, limit level 1
Efficiency mode	IPC mode ON, limit level 2
Speed mode	IPC mode OFF



## GROUP 12 ANTI-RESTART SYSTEM



140L5MS12

### 1. ANTI-RESTART FUNCTION

After a few seconds from the engine starts to run, MCU turns off the start safety relay to protect the starter from inadvertent restarting.

# GROUP 13 SELF-DIAGNOSTIC SYSTEM

## 1. OUTLINE

When any abnormality occurs in the ADVANCED CAPO system caused by electric parts malfunction and by open or short circuit, the MCU diagnoses the problem and sends the error codes to the cluster and also stores them in the memory.

## 2. MONITORING

### 1) Active fault



- The active faults of the MCU, engine ECM or air conditioner can be checked by this menu.

### 2) Logged fault



- The logged faults of the MCU, engine ECM or air conditioner can be checked by this menu.

### 3) Delete logged fault



- The logged faults of the MCU, engine ECM or air conditioner can be deleted by this menu.

### 3. MACHINE ERROR CODES TABLE (SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
101	3	10 seconds continuous, Hydraulic Oil Temp. Measurement Voltage > 3.8V	●		
	4	10 seconds continuous, Hydraulic Oil Temp. Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Hydraulic oil temperature display failure 2. Control Function – Fan revolutions control failure (Checking list) 1. CD-1 (#2), CN-52 (#24) Checking Open/Short 2. CD-1 (#1), CN-51 (#5) Checking Open/Short				
105	0	10 seconds continuous, Working Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Working Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Working Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Working Press. display failure 2. Control Function – Auto Idle operation failure, Engine variable horse power control operation failure (Checking list) 1. CD-7 (#B) – CN-52 (#37) Checking Open/Short 2. CD-7 (#A) – CN-51 (#3) Checking Open/Short 3. CD-7 (#C) – CN-51 (#13) Checking Open/Short				
108	0	10 seconds continuous, Travel Oil Press. Sensor Measurement Voltage > 5.2V		●	
	1	10 seconds continuous, $0.3V \leq$ Travel Oil Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Travel Oil Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Travel Oil Press. display failure 2. Control Function – Auto Idle operation failure, Engine variable horse power control operation failure, IPC operation failure, Driving alarm operation failure (Checking list) 1. CD-6 (#B) – CN-52 (#38) Checking Open/Short 2. CD-6 (#A) – CN-51 (#3) Checking Open/Short 3. CD-6 (#C) – CN-51 (#13) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
120	0	10 seconds continuous, Main Pump 1 (P1) Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Main Pump 1 (P1) Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Main Pump 1 (P1) Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Main Pump 1 (P1) Press. display failure 2. Control Function – Automatic voltage increase operation failure, Overload at compensation control failure  (Checking list) 1. CD-42 (#B) – CN-52 (#29) Checking Open/Short 2. CD-42 (#A) – CN-51 (#3) Checking Open/Short 3. CD-42 (#C) – CN-51 (#13) Checking Open/Short				
121	0	10 seconds continuous, Main Pump 2 (P2) Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Main Pump 2 (P2) Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Main Pump 2 (P2) Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Main Pump 2 (P2) Press. display failure 2. Control Function – Automatic voltage increase operation failure, Overload at compensation control failure  (Checking list) 1. CD-43 (#B) – CN-52 (#12) Checking Open/Short 2. CD-43 (#A) – CN-51 (#3) Checking Open/Short 3. CD-43 (#C) – CN-51 (#13) Checking Open/Short				
122	1	(when you had conditions mounting pressure sensor) 10 seconds continuous, $0.3V \leq$ Overload Press. Sensor Measurement Voltage < 0.8V	●		
	4	(when you had conditions mounting pressure sensor) 10 seconds continuous, Overload Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Overload Press. display failure 2. Control Function – Overload warning alarm failure  (Checking list) 1. CD-31 (#B) – CN-52 (#16) Checking Open/Short 2. CD-31 (#A) – CN-51 (#3) Checking Open/Short 3. CD-31 (#C) – CN-51 (#13) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

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W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
123	0	10 seconds continuous, Negative 1 Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, 0.3V ≤ Negative 1 Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Negative 1 Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Negative 1 Press. display failure 2. Control Function – IPC operation failure, Option attachment flow control operation failure (Checking list) 1. CD-70 (#B) – CN-52 (#33) Checking Open/Short 2. CD-70 (#A) – CN-51 (#3) Checking Open/Short 3. CD-70 (#C) – CN-51 (#13) Checking Open/Short				
124	0	10 seconds continuous, Negative 2 Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, 0.3V ≤ Negative 2 Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Negative 2 Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Negative 2 Press. display failure 2. Control Function – Option attachment flow control operation failure (Checking list) 1. CD-71 (#B) – CN-52 (#17) Checking Open/Short 2. CD-71 (#A) – CN-51 (#3) Checking Open/Short 3. CD-71 (#C) – CN-51 (#13) Checking Open/Short				
127	0	10 seconds continuous, Boom Up Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, 0.3V ≤ Boom Up Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Boom Up Pilot Press. Sensor Measurement < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Boom Up Pilot Press. display failure 2. Control Function – Engine/Pump variable horse power control operation failure, IPC operation failure, Boom first operation failure (Checking list) 1. CD-32 (#B) – CN-52 (#19) Checking Open/Short 2. CD-32 (#A) – CN-51 (#3) Checking Open/Short 3. CD-32 (#C) – CN-5 1(#13) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
128	0	(when you had conditions mounting pressure sensor) 10 seconds continuous, Boom Down Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	(when you had conditions mounting pressure sensor) 10 seconds continuous, 0.3V ≤ Boom Down Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	(when you had conditions mounting pressure sensor) 10 seconds continuous, Boom Down Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Boom Down Pilot Press. display failure 2. Control Function – Boom floating operation failure (Checking list) 1. CD-85 (#B) – CN-53 (#23) Checking Open/Short 2. CD-85 (#A) – CN-53 (#3) Checking Open/Short 3. CD-85 (#C) – CN-53 (#13) Checking Open/Short				
129	0	10 seconds continuous, Arm In Pilot Press. Sensor Measurement Voltage > 4.8V	●		
	1	10 seconds continuous, 0.3V ≤ Arm In Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Arm In Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Arm In Pilot Press. display failure 2. Control Function – IPC operation failure (Checking list) 1. CD-90 (#B) – CN-52 (#28) Checking Open/Short 2. CD-90 (#A) – CN-51 (#3) Checking Open/Short 3. CD-90 (#C) – CN-51 (#13) Checking Open/Short				
133	0	10 seconds continuous, Arm In/Out & Bucket In Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, 0.3V ≤ Arm In/Out & Bucket In Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Arm In/Out & Bucket In Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Arm In/Out & Bucket In Pilot Press. display failure 2. Control Function – Engine variable horse power control operation failure (Checking list) 1. CD-35 (#B) – CN-52 (#14) Checking Open/Short 2. CD-35 (#A) – CN-51 (#3) Checking Open/Short 3. CD-35 (#C) – CN-51 (#13) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

**(SERIAL NO. : -#0610)**

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
135	0	10 seconds continuous, Swing Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, 0.3V ≤ Swing Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Swing Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Swing Pilot Press. display failure 2. Control Function – IPC operation, Boom first operation failure (Checking list) 1. CD-24 (#B) – CN-52 (#36) Checking Open/Short 2. CD-24 (#A) – CN-51 (#3) Checking Open/Short 3. CD-24 (#C) – CN-51 (#13) Checking Open/Short				
138	0	Monitor – Select Attachment(breaker / crusher) 10 seconds continuous, Attachment Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	Monitor – Select Attachment(breaker / crusher) 10 seconds continuous, 0.3V ≤ Attachment Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	Monitor – Select Attachment(breaker / crusher) 10 seconds continuous, Attachment Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Attachment Pilot Press. display failure 2. Control Function – Option attachment flow control operation failure (Checking list) 1. CD-69 (#B) – CN-53 (#14) Checking Open/Short 2. CD-69 (#A) – CN-53 (#3) Checking Open/Short 3. CD-69 (#C) – CN-53 (#13) Checking Open/Short				
139	1	10 seconds continuous, 0.3V ≤ Option Pilot Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Option Pilot Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Option Pilot Press. display failure 2. Control Function – Auto Idle operation failure (Checking list) 1. CD-100 (#B) – CN-52 (#21) Checking Open/Short 2. CD-100 (#A) – CN-51 (#3) Checking Open/Short 3. CD-100 (#C) – CN-1 (#6) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
140	5	(Detection) (When Pump EPPR Current is more than 10 mA) 10 seconds continuous, Pump EPPR drive current < 0 mA (Cancellation) (When Pump EPPR Current is more than 10 mA) 3 seconds continuous, Pump EPPR drive current ≥ 10 mA	●		
	6	(Detection) 10 seconds continuous, Pump EPPR drive current > 1.0A (Cancellation) 3 seconds continuous, Pump EPPR drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Pump horse power setting specification difference (Fuel efficiency/speed specification failure) (Checking list) 1. CN-75 (#2) – CN-52 (#9) Checking Open/Short 2. CN-75 (#1) – CN-52 (#10) Checking Open/Short					
141	5	(Model Parameter) mounting Boom Priority EPPR (Detection) (When Boom Priority EPPR Current is more than 10 mA) 10 seconds continuous, Boom Priority EPPR drive current < 0 mA (Cancellation) (When Boom Priority EPPR Current is more than 10 mA) 3 seconds continuous, Boom Priority EPPR drive current ≥ 10 mA	●		
	6	(Detection) 10 seconds continuous, Boom Priority EPPR drive current > 1.0 A (Cancellation) 3 seconds continuous, Boom Priority EPPR drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Boom first control operation failure (Checking list) 1. CN-133 (#2) – CN-52 (#34) Checking Open/Short 2. CN-133 (#1) – CN-52 (#35) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General                      C : Crawler Type                      W : Wheel Type



(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
143	5	(Detection) (When Travel EPPR Current is more than 10 mA) 10 seconds continuous, Travel EPPR drive current = 0 mA (Cancellation) (When Travel EPPR Current is more than 100 mA) 3 seconds continuous, Travel EPPR drive current $\geq$ 10 mA			●
	6	(Detection) 10 seconds continuous, Travel EPPR drive current > 1.0 A (Cancellation) 3 seconds continuous, Travel EPPR drive current $\leq$ 1.0 A			●
(Results / Symptoms) 1. Control Function – cruise control operation failure (Checking list) 1. CN-246 (#2) – CN-54 (#39) Checking Open/Short 2. CN-246 (#1) – CN-51 (#40) Checking Open/Short					
145	5	(Model Parameter) mounting Remote Cooling Fan EPPR (Detection) (When Remote Cooling Fan EPPR Current is more than 10 mA) 10 seconds continuous, Remote Cooling Fan EPPR drive current = 0 mA (Cancellation) (When Remote Cooling Fan EPPR Current is more than 10 mA) 3 seconds continuous, Remote Cooling Fan EPPR drive current $\geq$ 10 mA	●		
	6	(Detection) 10 seconds continuous, Remote Cooling Fan EPPR drive current > 1.0 A (Cancellation) 3 seconds continuous, Remote Cooling Fan EPPR drive current $\leq$ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Remote fan control operation failure (Checking list) 1. CN-385 (#1) – CN-51 (#9) Checking Open/Short 2. CN-385 (#2) – CN-51 (#14) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General                      C : Crawler Type                      W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
164	4	(Detection) (When Working Cutoff Relay is Off) 10 seconds continuous, Working Cutoff Relay drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Working Cutoff Relay is Off) 3 seconds continuous, Working Cutoff Relay drive unit Measurement Voltage $> 3.0V$			●
	6	(Detection) (When Working Cutoff Relay is On) 10 seconds continuous, Working Cutoff Relay drive current $> 6.5 A$ (Cancellation) (When Working Cutoff Relay is On) 3 seconds continuous, Working Cutoff Relay drive current $\leq 6.5 A$			●
(Results / Symptoms) 1. Control Function – (Wheel Excavator) In driving mode, attachment hydraulic pilot pressure cut off failure  (Checking list) 1. CR-47 (#85) – CN-54 (#9) Checking Open/Short 2. CR-47 (#30, #86) – Fuse box (#28) Checking Open/Short					
166	4	(Detection) (When Power Max Solenoid is Off) 10 seconds continuous, Power Max Solenoid drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Power Max Solenoid is Off) 3 seconds continuous, Power Max Solenoid drive unit Measurement Voltage $> 3.0V$	●		
	6	(Detection) (When Power Max Solenoid is On) 5 seconds continuous, Power Max Solenoid drive current $> 4.5 A$ (Cancellation) (When Power Max Solenoid is On) 3 seconds continuous, Power Max Solenoid drive current $\leq 4.5 A$	●		
(Results / Symptoms) 1. Control Function – Voltage increase operation failure (Checking list) 1. CN-88 (#1) – CN-52 (#2) Checking Open/Short 2. CN-88 (#2) – Fuse box (#30) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
167		(Detection) (When Travel Speed Solenoid is Off) 10 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Travel Speed Solenoid is Off) 3 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage $>$ 3.0V		●	
	4	(When Parking mode is not) (Detection) (When Travel Speed Solenoid is Off) 10 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Travel Speed Solenoid is Off) 3 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage $>$ 3.0V			●
	6	(Detection) (When Travel Speed Solenoid is On) 10 seconds continuous, Travel Speed Solenoid drive current $>$ 4.5 A (Cancellation) (When Travel Speed Solenoid is On) 3 seconds continuous, Travel Speed Solenoid drive current $\leq$ 4.5 A	●		
	(Results / Symptoms) 1. Control Function – driving in 1/2 transmission operation failure (Checking list) 1. CN-70 (#1) – CN-52(#20) Checking Open/Short 2. CN-70 (#2) – Fuse box (#30) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
169	4	Monitor – Selecting attachment(breaker / crusher) (Detection) (When Attachment Conflux Solenoid is Off) 10 seconds continuous, Attachment Conflux Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Attachment Conflux Solenoid is Off) 3 seconds continuous, Attachment Conflux Solenoid drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Attachment Conflux Solenoid is On) 10 seconds continuous, Attachment Conflux Solenoid drive Current > 6.5 A (Cancellation) (When Attachment Conflux Solenoid is On) 3 seconds continuous, Attachment Conflux Solenoid drive Current ≤ 6.5 A	●		
	(Results / symptoms) 1. Control Function – Option attachment flow control – Joining operation failure (Eco breaker mode, crusher mode) (Checking list) 1. CN-237 (#1) – CN-53 (#7) Checking Open/Short 2. CN-237 (#2) – Fuse box (#27) Checking Open/Short				
170	4	(Model Parameter) mounting Arm Regenerating Solenoid (Detection) (When Arm Regeneration Solenoid is Off) 10 seconds continuous, Arm Regeneration Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Arm Regeneration Solenoid is Off) 3 seconds continuous, Arm Regeneration Solenoid drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Arm Regeneration Solenoid is On) 10 seconds continuous, Arm Regeneration Solenoid drive current > 4.5 A (Cancellation) (When Arm Regeneration Solenoid is On) 3 seconds continuous, Arm Regeneration Solenoid drive current ≤ 4.5 A	●		
	(Results / symptoms) 1. Control Function – Arm regeneration operation failure (Checking list) 1. CN-135 (#1) – CN-52 (#1) Checking Open/Short 2. CN-135 (#2) – Fuse box (#30) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
171	4	Monitor – Selecting attachment(crusher) (Detection) (When Attachment Safety Solenoid is Off) 10 seconds continuous, Attachment Safety Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Attachment Safety Solenoid is Off) 3 seconds continuous, Attachment Safety Solenoid drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Attachment Safety Solenoid is On) 10 seconds continuous, Attachment Safety Solenoid drive current > 6.5 A (Cancellation) (When Attachment Safety Solenoid is On) 3 seconds continuous, Attachment Safety Solenoid drive current ≤ 6.5 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control – Option spool pilot pressure cut off failure (crusher mode) (Checking list) 1. CN-149 (#1) – CN-53 (#8) Checking Open/Short 2. CN-149 (#2) – Fuse box (#27) Checking Open/Short					
179	4	Monitor – Selecting attachment(breaker / crusher) (Detection) (When Breaker Operating Solenoid is Off) 10 seconds continuous, Attachment Safety Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Breaker Operating Solenoid is Off) 3 seconds continuous, Attachment Safety Solenoid drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Breaker Operating Solenoid is On) 10 seconds continuous, Attachment Safety Solenoid drive current > 6.5 A (Cancellation) (When Breaker Operating Solenoid is On) 3 seconds continuous, Attachment Safety Solenoid drive current ≤ 6.5 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control – Breaker operation failure (breaker mode) (Checking list) 1. CN-66 (#1) – CN-53 (#9) Checking Open/Short 2. CN-66 (#2) – Fuse box (#33) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
181	4	(Model Parameter) mounting Reverse Cooling Fan Solenoid (Detection) (When Reverse Cooling Fan Solenoid is Off) 10 seconds continuous, Reverse Cooling Fan Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Reverse Cooling Fan Solenoid is Off) 3 seconds continuous, Reverse Cooling Fan Solenoid drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Reverse Cooling Fan Solenoid is On) 10 seconds continuous, Reverse Cooling Fan Solenoid drive current > 4.5 A (Cancellation) (When Reverse Cooling Fan Solenoid is On) 3 seconds continuous, Reverse Cooling Fan Solenoid drive current ≤ 4.5 A	●		
(Results / Symptoms) 1. Control Function – Cooling Fan reverse control operation failure (not applicable)					
188	5	(Detection) (When Attachment Flow EPPR 1 current is equal or more than 300 mA) 10 seconds continuous, Attachment Flow EPPR drive current < 100 mA (Cancellation) (When Attachment Flow EPPR 1 current is equal or more than 300 mA) 3 seconds continuous, Attachment Flow EPPR drive current ≥ 100 mA	●		
	6	(Detection) 10 seconds continuous, Attachment Flow EPPR 1 drive current > 1.0 A (Cancellation) 3 seconds continuous, Attachment Flow EPPR 1 drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – IPC operation failure, Option attachment flow control operation failure (Checking list) 1. CN-242 (#2) – CN-52 (#39) Checking Open/Short 2. CN-242 (#1) – CN-52 (#40) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
189	5	(Detection) (When Attachment Flow EPPR 2 current is equal or more than 300 mA) 10 seconds continuous, Attachment Flow EPPR drive current < 100 mA (Cancellation) (When Attachment Flow EPPR 2 current is equal or more than 300 mA) 3 seconds continuous, Attachment Flow EPPR drive current ≥ 100 mA	●		
	6	(Detection) 10 seconds continuous, Attachment Flow EPPR 2 drive current > 1.0 A (Cancellation) 3 seconds continuous, Attachment Flow EPPR 2 drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control operation failure (Checking list) 1. CN-378 (#2) – CN-52 (#6) Checking Open/Short 2. CN-378 (#1) – CN-52 (#7) Checking Open/Short					
196	0	HW145 10 seconds continuous, Attachment flow control EPPR 1 press. Sensor Measurement Voltage > 5.2V			
	1	HW145 10 seconds continuous, 0.3V ≤ Attachment flow control EPPR 1 press. Sensor Measurement Voltage < 0.8V			
	4	HW145 10 seconds continuous, Attachment flow control EPPR 1 press. Sensor Measurement Voltage < 0.3V			
(Results / Symptoms) 1. Control Function – Driving second pump joining function operation failure (Checking list) 1. CD-93 (#B) – CN-52 (#11) Checking Open/Short 2. CD-93 (#A) – CN-51 (#3) Checking Open/Short 3. CD-93 (#C) – CN-51 (#13) Checking Open/Short					
200	0	10 seconds continuous, Pump EPPR Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, 0.3V ≤ Pump EPPR Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Pump EPPR Press. Sensor Measurement Voltage < 0.3V	●		
(Results / Symptoms) 1. Monitor – Pump EPPR Press. display failure 2. Control Function – Pump input horse power control failure, Overload at compensation control operation failure (Fuel efficiency/speed performance failure) (Checking list) 1. CD-44 (#B) – CN-52 (#32) Checking Open/Short 2. CD-44 (#A) – CN-51 (#3) Checking Open/Short 3. CD-44 (#C) – CN-51 (#13) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
205	0	(Mounting pressure sensor) 10 seconds continuous, Boom Cylinder Rod Press. Sensor Measurement Voltage > 5.2V	●		
	1	(Mounting pressure sensor) 10 seconds continuous, 0.3V ≤ Boom Cylinder Rod Press. Sensor Measurement Voltage < 0.8V	●		
	4	(Mounting pressure sensor) 10 seconds continuous, Boom Cylinder Rod Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Boom Cylinder Rod Press. display failure 2. Control Function – Boom floating control operation failure (Checking list) 1. CD-124 (#B) – CN-53 (#5) Checking Open/Short 2. CD-124 (#A) – CN-53 (#3) Checking Open/Short 3. CD-124 (#C) – CN-53 (#13) Checking Open/Short				
218	4	Mounting pressure sensor (HCESPN128 or HCESPN 205) (Detection) (When Boom Up Floating Solenoid is Off) 10 seconds continuous, Boom Up Floating Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Boom Up Floating Solenoid is Off) 3 seconds continuous, Boom Up Floating Solenoid drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Boom Up Floating Solenoid is On) 10 seconds continuous, Boom Up Floating Solenoid drive current > 6.5 A (Cancellation) (When Boom Up Floating Solenoid is On) 3 seconds continuous, Boom Up Floating Solenoid drive current ≤ 6.5 A	●		
	(Results / Symptoms) 1. Control Function – Boom floating control operation failure (Checking list) 1. CN-368 (#1) – CN-53 (#20) Checking Open/Short 2. CN-368 (#2) – Fuse box (#14) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type



(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
220	4	Mounting pressure sensor (HCESPN 128 or 205) (Detection) (When Boom Down Pilot Pressure Cutoff Solenoid is Off) 10 seconds continuous, Boom Down Pilot Pressure Cutoff Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Boom Down Pilot Pressure Cutoff Solenoid is Off) 3 seconds continuous, Boom Down Pilot Pressure Cutoff Solenoid drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Boom Down Pilot Pressure Cutoff Solenoid is On) 10 seconds continuous, Boom Down Pilot Pressure Cutoff Solenoid drive current > 6.5 A (Cancellation) (When Boom Down Pilot Pressure Cutoff Solenoid is On) 3 seconds continuous, Boom Down Pilot Pressure Cutoff Solenoid drive current ≤ 6.5 A	●		
(Results / Symptoms) 1. Control Function – Boom floating control operation failure (Checking list) 1. CN-369 (#1) – CN-53 (#35) Checking Open/Short 2. CN-369 (#2) – Fuse box (#14) Checking Open/Short					
221	5	Monitor – Selecting attachment(breaker / crusher) (Detection) (When ATT Relief Setting EPPR 1 Current is equal or more than 10 mA) 10 seconds continuous, ATT Relief Setting EPPR 1 drive current = 0 mA (Cancellation) ATT Relief Setting EPPR 1 Current is equal or more than 10 mA) 3 seconds continuous, ATT Relief Setting EPPR 1 drive current ≥ 10 mA	●		
	6	(Detection) 10 seconds continuous, ATT Relief Setting EPPR 1 drive current > 1.0 A (Cancellation) 3 seconds continuous, ATT Relief Setting EPPR 1 drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control – P1 relief pressure setting failure (Checking list) 1. CN-365 (#2) – CN-53 (#39) Checking Open/Short 2. CN-365 (#1) – CN-53 (#40) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General                      C : Crawler Type                      W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
222	5	Monitor – Selecting attachment(crusher) (Detection) (When ATT Relief Setting EPPR 2 Current is equal or more than 10 mA) 10 seconds continuous, ATT Relief Setting EPPR 2 drive current = 0 mA (Cancellation) (When ATT Relief Setting EPPR 2 Current is equal or more than 10 mA) 3 seconds continuous, ATT Relief Setting EPPR 2 drive current ≥ 10mA	●		
	6	(Detection) 10 seconds continuous, ATT Relief Setting EPPR 2 drive current > 1.0 A (Cancellation) 3 seconds continuous, ATT Relief Setting EPPR 2 drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control – P2 relief pressure setting failure (Checking list) 1. CN-366 (#2) – CN-53 (#32) Checking Open/Short 2. CN-366 (#1) – CN-53 (#33) Checking Open/Short					
301	3	10 seconds continuous, Fuel Level Measurement Voltage > 3.8V	●		
	4	10 seconds continuous, Fuel Level Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Fuel remaining display failure (Checking list) 1. CN-2 (#2) – CN-52 (#26) Checking Open/Short 2. CN-2 (#1) – CN-51 (#5) Checking Open/Short				
325	4	(Model Parameter) mounting Fuel Warmer Relay (Detection) (When Fuel Warmer Relay is Off) 10 seconds continuous, Fuel Warmer Relay drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Fuel Warmer Relay is Off) 3 seconds continuous, Fuel Warmer Relay drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Fuel Warmer Relay is On) 10 seconds continuous, Fuel Warmer Relay drive current > 4.5 A (Cancellation) (When Fuel Warmer Relay is On) 3 seconds continuous, Fuel Warmer Relay drive current ≤ 4.5 A	●		
(Results / Symptoms) 1. Control Function – Fuel warmer operation failure (Checking list) 1. CR-46 (#85) – CN-52 (#30) Checking Open/Short 2. CR-46 (#86) – Fuse box(#22) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

**(SERIAL NO. : -#0610)**

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
501	0	10 seconds continuous, Transmission Oil Press. Sensor Measurement Voltage > 5.2V			●
	1	10 seconds continuous, 0.3V ≤ Transmission Oil Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Transmission Oil Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Transmission Oil Press. display failure, Transmission Oil low pressure warning failure (Checking list) 1. CD-5 (#B) – CN-54 (#27) Checking Open/Short 2. CD-5 (#A) – CN-54 (#3) Checking Open/Short 3. CD-5 (#C) – CN-54 (#13) Checking Open/Short				
503	0	10 seconds continuous, Brake Oil Press. Sensor Measurement Voltage > 5.2V			●
	1	10 seconds continuous, 0.3V ≤ Brake Oil Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Brake Oil Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Brake Oil Press. display failure, Brake Oil low pressure warning failure (Checking list) 1. CD-3 (#B) – CN-54 (#4) Checking Open/Short 2. CD-3 (#A) – CN-54 (#3) Checking Open/Short 3. CD-3 (#C) – CN-54 (#13) Checking Open/Short				
505	0	10 seconds continuous, Working Brake Press. Sensor Measurement Voltage > 5.2V			●
	1	10 seconds continuous, 0.3V ≤ Working Brake Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Working Brake Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Working Brake Oil Press. display failure, Working Brake Oil low pressure warning failure (Checking list) 1. CD-38 (#B) – CN-54 (#5) Checking Open/Short 2. CD-38 (#A) – CN-54 (#3) Checking Open/Short 3. CD-38 (#C) – CN-54 (#13) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
514	4	(Detection) (When Parking Relay is Off) 10 seconds continuous, Parking Relay drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Parking Relay is Off) 3 seconds continuous, Parking Relay drive unit Measurement Voltage $>$ 3.0V			●
	6	(Detection) (When Parking Relay is On) 10 seconds continuous, Parking Relay drive current $>$ 6.5 A (Cancellation) (When Parking Relay is On) 3 seconds continuous, Parking Relay drive current $\leq$ 6.5 A			●
(Results / Symptoms) 1. Control Function – Parking Relay operation failure (Checking list) 1. CR-66 (#1) – CN-54 (#20) Checking Open/Short 2. CR-66 (#2) – Fuse box (#30) Checking Open/Short					
517	4	(Detection) (When Traveling Cutoff Relay is Off) 10 seconds continuous, Traveling Cutoff Relay drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Traveling Cutoff Relay is Off) 3 seconds continuous, Traveling Cutoff Relay drive unit Measurement Voltage $>$ 3.0V			●
	6	(Detection) (When Traveling Cutoff Relay is On) 10 seconds continuous, Traveling Cutoff Relay drive current $>$ 6.5 A (Cancellation) (When Traveling Cutoff Relay is On) 3 seconds continuous, Traveling Cutoff Relay drive current $\leq$ 6.5 A			●
(Results / Symptoms) 1. Control Function – Traveling Cutoff Relay operation failure (Checking list) 1. CR-47 (#85) – CN-54 (#9) Checking Open/Short 2. CR-47 (#86) – Fuse box (#28) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
525	4	(Detection) (When Ram Lock Solenoid is Off) 10 seconds continuous, Ram Lock Solenoid drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Ram Lock Solenoid is Off) 3 seconds continuous, Ram Lock Solenoid drive unit Measurement Voltage $> 3.0V$			●
	6	(Detection) (When Ram Lock Solenoid is On) 10 seconds continuous, Ram Lock Solenoid drive current $> 6.5 A$ (Cancellation) (When Ram Lock Solenoid is On) 3 seconds continuous, Ram Lock Solenoid drive current $\leq 6.5 A$			●
(Results / Symptoms) 1. Control Function – Ram lock control operation failure (Checking list) 1. CN-69 (#1) – CN-54 (#8) Checking Open/Short 2. CN-69 (#2) – Fuse box (#33) Checking Open/Short					
527	4	(Detection) (When Creep Solenoid is Off) 10 seconds continuous, Creep Solenoid drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Creep Solenoid is Off) 3 seconds continuous, Creep Solenoid drive unit Measurement Voltage $> 3.0V$			●
	6	(Detection) (When Creep Solenoid is On) 10 seconds continuous, Creep Solenoid drive current $> 6.5 A$ (Cancellation) (When Creep Solenoid is On) 3 seconds continuous, Creep Solenoid drive current $\leq 6.5 A$			●
(Results / Symptoms) 1. Control Function – Creep mode operation failure (Checking list) 1. CN-206 (#1) – CN-54 (#7) Checking Open/Short 2. CN-206 (#2) – Fuse box (#30) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : -#0610)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
530	0	10 seconds continuous, Travel Forward Press. Sensor Measurement Voltage > 5.2V			●
	1	10 seconds continuous, $0.3V \leq$ Travel Forward Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Travel Forward Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Travel Forward Press. display failure 2. Control Function – Driving interoperability power control operation failure (Checking list) 1. CD-73 (#B) – CN-54 (#6) Checking Open/Short 2. CD-73 (#A) – CN-54 (#3) Checking Open/Short 3. CD-73 (#C) – CN-54 (#13) Checking Open/Short				
531	1	10 seconds continuous, $0.3V \leq$ Travel Reverse Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Travel Reverse Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Travel Reverse Press. display failure 2. Control Function – Driving interoperability power control operation failure (Checking list) 1. CD-74 (#B) – CN-54 (#23) Checking Open/Short 2. CD-74 (#A) – CN-54 (#3) Checking Open/Short 3. CD-74 (#C) – CN-54 (#13) Checking Open/Short				
705	0	10 seconds continuous, Battery input Voltage > 35V	●		
	1	10 seconds continuous, Battery input Voltage < 18V	●		
	(Results / Symptoms) 1. Control Function – Startup impossibility (Checking list) 1. CS-74A (#1) – CN-51 (#1) Checking Open/Short				
707	1	(When Engine is equal or more than 400 rpm) 10 seconds continuous, Alternator Node L Measurement Voltage < 18V (In case 12v goods, Alternator Node I Measurement Voltage < 9V)	●		
	(Results / Symptoms) 1. Control Function – Battery charging circuit failure (Checking list) 1. CS-74A (#1) – CN-51 (#2) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

**(SERIAL NO. : -#0610)**

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
714	3	(Model Parameter) Mounting Acc. Dial 10 seconds continuous, Acc. Dial Measurement Voltage > 5.2V	●		
	4	(Model Parameter) Mounting Acc. Dial 10 seconds continuous, Acc. Dial Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Acc. Dial Voltage display failure 2. Control Function – Engine rpm control failure (Checking list) 1. CN-7 (#15) – CN-52 (#23) Checking Open/Short				
722	4	(Detection) (When Travel Alarm (Buzzer) Sound is Off) 10 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Travel Alarm (Buzzer) Sound Relay is Off) 3 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Travel Alarm (Buzzer) Sound is On) 10 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive current > 4.5 A (Cancellation) (When Travel Alarm (Buzzer) Sound is On) 3 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive current ≤ 4.5 A	●		
(Results / Symptoms) 1. Control Function – Driving alarm operation failure (Checking list) 1. CN-81 (#1) – CN-52 (#31) Checking Open/Short 2. CN-81 (#2) – Fuse box (#30) Checking Open/Short					
831	2	(When mounting the A/C Controller) 60 seconds continuous, A/C Controller Communication Data Error	●		
	(Results / Symptoms) 1. Control Function – A/C Controller operation failure (Checking list) 1. CN-11 (#8) – CN-51 (#22) Checking Open/Short 2. CN-11 (#7) – CN-51 (#32) Checking Open/Short				
840	2	60 seconds continuous, Cluster Communication Data Error	●		
	(Results / Symptoms) 1. Control Function – Cluster operation failure (Checking list) 1. CN-56A (#7) – CN-51 (#22) Checking Open/Short 2. CN-56A (#6) – CN-51 (#32) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

**(SERIAL NO. : -#0610)**

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
841	2	10 seconds continuous, ECM Communication Data Error	●		
	(Results / Symptoms) 1. Control Function – ECM operation failure (Checking list) 1. CN-93 (#22) – CN-51 (#21) Checking Open/Short 2. CN-93 (#46) – CN-51 (#31) Checking Open/Short				
845	2	(When mounting the I/O Controller 1) 60 seconds continuous, I/O Controller 1 Communication Data Error	●		
	(Results / Symptoms) 1. Control Function – I/O Controller 1 operation failure (Checking list) 1. CN-53 (#21) – CN-51 (#23) Checking Open/Short 2. CN-53 (#31) – CN-51 (#33) Checking Open/Short				
848	2	(When mounting the Haptic Controller) 60 seconds continuous, Haptic Controller Communication Data Error	●		
	(Results / Symptoms) 1. Control Function – Haptic Controller operation failure (Checking list) 1. CN-8 (#2) – CN-51 (#22) Checking Open/Short 2. CN-8 (#3) – CN-51 (#32) Checking Open/Short				
850	2	(When mounting the RMCU) 60 seconds continuous, RMCU communication Data Error	●		
	(Results / Symptoms) 1. Control Function – RMCU operation failure (Checking list) 1. CN-125A (#3) – CN-51 (#22) Checking Open/Short 2. CN-125A (#11) – CN-51 (#32) Checking Open/Short				
861	2	(When mounting the I/O Controller 2) 60 seconds continuous, I/O Controller 2 communication Data Error	●		
	(Results / Symptoms) 1. Control Function – I/O Controller 2 operation failure (Checking list) 1. CN-53 (#21) – CN-51 (#23) Checking Open/Short 2. CN-53 (#31) – CN-51 (#33) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type



**(SERIAL NO. : -#0610)**

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
866	2	(When mounting the AAVM) 60 seconds continuous, AAVM communication Data Error	●		
	(Results / Symptoms) 1. Control Function – AAVM operation failure (Checking list) 1. CN-401 (#86) – CN-51 (#22) Checking Open/Short 2. CN-401 (#87) – CN-51 (#32) Checking Open/Short				
867	2	60 seconds continuous, RDU communication Data Error	●		
	(Results / Symptoms) 1. Control Function – RDU operation failure (Checking list) 1. CN-376 (#10) – CN-51 (#22) Checking Open/Short 2. CN-376 (#18) – CN-51 (#32) Checking Open/Short				
868	2	60 seconds continuous, Switch Controller communication Data Error	●		
	(Results / Symptoms) 1. Control Function – Switch Controller operation failure (Checking list) 1. CN-56A (#7) – CN-51 (#22) Checking Open/Short 2. CN-56A (#6) – CN-51 (#32) Checking Open/Short				
869	2	(When mounting the BKCU) 60 seconds continuous, BKCU communication Data Error	●		
	(Results / Symptoms) 1. Control Function – BKCU operation failure (Checking list) 1. CS-2B (#A) – CN-51 (#22) Checking Open/Short 2. CS-2B (#B) – CN-51 (#32) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

## MACHINE ERROR CODES TABLE (SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
101	3	10 seconds continuous, Hydraulic Oil Temp. Measurement Voltage > 3.8V	●		
	4	10 seconds continuous, Hydraulic Oil Temp. Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Hydraulic oil temperature display failure 2. Control Function – Fan revolutions control failure (Checking list) 1. CD-1 (#2), CN-51 (#16) Checking Open/Short 2. CD-1 (#1), CN-51 (#25) Checking Open/Short				
105	0	10 seconds continuous, Working Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Working Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Working Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Working Press. display failure 2. Control Function – Auto Idle operation failure, Engine variable horse power control operation failure (Checking list) 1. CD-7 (#B) – CN-52 (#19) Checking Open/Short 2. CD-7 (#A) – CN-51 (#32) Checking Open/Short 3. CD-7 (#C) – CN-51 (#31) Checking Open/Short				
108	0	10 seconds continuous, Travel Oil Press. Sensor Measurement Voltage > 5.2V		●	
	1	10 seconds continuous, $0.3V \leq$ Travel Oil Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Travel Oil Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Travel Oil Press. display failure 2. Control Function – Auto Idle operation failure, Engine variable horse power control operation failure, IPC operation failure, Driving alarm operation failure (Checking list) 1. CD-6 (#B) – CN-52 (#27) Checking Open/Short 2. CD-6 (#A) – CN-51 (#32) Checking Open/Short 3. CD-6 (#C) – CN-51 (#31) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
120	0	10 seconds continuous, Main Pump 1 (P1) Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Main Pump 1 (P1) Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Main Pump 1 (P1) Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Main Pump 1 (P1) Press. display failure 2. Control Function – Automatic voltage increase operation failure, Overload at compensation control failure  (Checking list) 1. CD-42 (#B) – CN-52 (#22) Checking Open/Short 2. CD-42 (#A) – CN-51 (#32) Checking Open/Short 3. CD-42 (#C) – CN-51 (#31) Checking Open/Short				
121	0	10 seconds continuous, Main Pump 2 (P2) Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Main Pump 2 (P2) Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Main Pump 2 (P2) Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Main Pump 2 (P2) Press. display failure 2. Control Function – Automatic voltage increase operation failure, Overload at compensation control failure  (Checking list) 1. CD-43 (#B) – CN-51 (#14) Checking Open/Short 2. CD-43 (#A) – CN-51 (#32) Checking Open/Short 3. CD-43 (#C) – CN-51 (#31) Checking Open/Short				
122	1	(when you had conditions mounting pressure sensor) 10 seconds continuous, $0.3V \leq$ Overload Press. Sensor Measurement Voltage < 0.8V	●		
	4	(when you had conditions mounting pressure sensor) 10 seconds continuous, Overload Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Overload Press. display failure 2. Control Function – Overload warning alarm failure  (Checking list) 1. CD-31 (#B) – CN-52 (#28) Checking Open/Short 2. CD-31 (#A) – CN-51 (#32) Checking Open/Short 3. CD-31 (#C) – CN-51 (#31) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
123	0	10 seconds continuous, Negative 1 Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Negative 1 Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Negative 1 Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Negative 1 Press. display failure 2. Control Function – IPC operation failure, Option attachment flow control operation failure (Checking list) 1. CD-70 (#B) – CN-51 (#22) Checking Open/Short 2. CD-70 (#A) – CN-51 (#32) Checking Open/Short 3. CD-70 (#C) – CN-51 (#31) Checking Open/Short				
124	0	10 seconds continuous, Negative 2 Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Negative 2 Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Negative 2 Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Negative 2 Press. display failure 2. Control Function – Option attachment flow control operation failure (Checking list) 1. CD-71 (#B) – CN-51 (#28) Checking Open/Short 2. CD-71 (#A) – CN-51 (#32) Checking Open/Short 3. CD-71 (#C) – CN-51 (#31) Checking Open/Short				
127	0	10 seconds continuous, Boom Up Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Boom Up Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Boom Up Pilot Press. Sensor Measurement < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Boom Up Pilot Press. display failure 2. Control Function – Engine/Pump variable horse power control operation failure, IPC operation failure, Boom first operation failure (Checking list) 1. CD-32 (#B) – CN-52 (#23) Checking Open/Short 2. CD-32 (#A) – CN-51 (#32) Checking Open/Short 3. CD-32 (#C) – CN-5 1(#31) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
128	0	(when you had conditions mounting pressure sensor) 10 seconds continuous, Boom Down Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	(when you had conditions mounting pressure sensor) 10 seconds continuous, $0.3V \leq$ Boom Down Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	(when you had conditions mounting pressure sensor) 10 seconds continuous, Boom Down Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Boom Down Pilot Press. display failure 2. Control Function – Boom floating operation failure (Checking list) 1. CD-85 (#B) – CN-52 (#31) Checking Open/Short 2. CD-85 (#A) – CN-51 (#32) Checking Open/Short 3. CD-85 (#C) – CN-51 (#31) Checking Open/Short				
129	0	10 seconds continuous, Arm In Pilot Press. Sensor Measurement Voltage > 4.8V	●		
	1	10 seconds continuous, $0.3V \leq$ Arm In Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Arm In Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Arm In Pilot Press. display failure 2. Control Function – IPC operation failure (Checking list) 1. CD-90 (#B) – CN-51 (#21) Checking Open/Short 2. CD-90 (#A) – CN-51 (#32) Checking Open/Short 3. CD-90 (#C) – CN-51 (#31) Checking Open/Short				
133	0	10 seconds continuous, Arm In/Out & Bucket In Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, $0.3V \leq$ Arm In/Out & Bucket In Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Arm In/Out & Bucket In Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Arm In/Out & Bucket In Pilot Press. display failure 2. Control Function – Engine variable horse power control operation failure (Checking list) 1. CD-35 (#B) – CN-52 (#24) Checking Open/Short 2. CD-35 (#A) – CN-51 (#32) Checking Open/Short 3. CD-35 (#C) – CN-51 (#31) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
135	0	10 seconds continuous, Swing Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, 0.3V ≤ Swing Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Swing Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Swing Pilot Press. display failure 2. Control Function – IPC operation, Boom first operation failure (Checking list) 1. CD-24 (#B) – CN-52 (#18) Checking Open/Short 2. CD-24 (#A) – CN-51 (#32) Checking Open/Short 3. CD-24 (#C) – CN-51 (#31) Checking Open/Short				
138	0	Monitor – Select Attachment(breaker / crusher) 10 seconds continuous, Attachment Pilot Press. Sensor Measurement Voltage > 5.2V	●		
	1	Monitor – Select Attachment(breaker / crusher) 10 seconds continuous, 0.3V ≤ Attachment Pilot Press. Sensor Measurement Voltage < 0.8V	●		
	4	Monitor – Select Attachment(breaker / crusher) 10 seconds continuous, Attachment Pilot Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Attachment Pilot Press. display failure 2. Control Function – Option attachment flow control operation failure (Checking list) 1. CD-69 (#B) – CN-52 (#32) Checking Open/Short 2. CD-69 (#A) – CN-51 (#32) Checking Open/Short 3. CD-69 (#C) – CN-51 (#31) Checking Open/Short				
139	1	10 seconds continuous, 0.3V ≤ Option Pilot Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Option Pilot Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Option Pilot Press. display failure 2. Control Function – Auto Idle operation failure (Checking list) 1. CD-100 (#B) – CN-52 (#21) Checking Open/Short 2. CD-100 (#A) – CN-51 (#3) Checking Open/Short 3. CD-100 (#C) – CN-1 (#6) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
140	5	(Detection) (When Pump EPPR Current is more than 10 mA) 10 seconds continuous, Pump EPPR drive current < 0 mA (Cancellation) (When Pump EPPR Current is more than 10 mA) 3 seconds continuous, Pump EPPR drive current ≥ 10 mA	●		
	6	(Detection) 10 seconds continuous, Pump EPPR drive current > 1.0A (Cancellation) 3 seconds continuous, Pump EPPR drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Pump horse power setting specification difference (Fuel efficiency/speed specification failure) (Checking list) 1. CN-75 (#2) – CN-54 (#28) Checking Open/Short 2. CN-75 (#1) – CN-54 (#01) Checking Open/Short					
141	5	(Model Parameter) mounting Boom Priority EPPR (Detection) (When Boom Priority EPPR Current is more than 10 mA) 10 seconds continuous, Boom Priority EPPR drive current < 0 mA (Cancellation) (When Boom Priority EPPR Current is more than 10 mA) 3 seconds continuous, Boom Priority EPPR drive current ≥ 10 mA	●		
	6	(Detection) 10 seconds continuous, Boom Priority EPPR drive current > 1.0 A (Cancellation) 3 seconds continuous, Boom Priority EPPR drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Boom first control operation failure (Checking list) 1. CN-133 (#2) – CN-54 (#34) Checking Open/Short 2. CN-133 (#1) – CN-54 (#04) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
143	5	(Detection) (When Travel EPPR Current is more than 10 mA) 10 seconds continuous, Travel EPPR drive current = 0 mA (Cancellation) (When Travel EPPR Current is more than 100 mA) 3 seconds continuous, Travel EPPR drive current $\geq$ 10 mA			●
	6	(Detection) 10 seconds continuous, Travel EPPR drive current > 1.0 A (Cancellation) 3 seconds continuous, Travel EPPR drive current $\leq$ 1.0 A			●
(Results / Symptoms) 1. Control Function – cruise control operation failure (Checking list) 1. CN-246 (#2) – CN-54 (#39) Checking Open/Short 2. CN-246 (#1) – CN-51 (#40) Checking Open/Short					
145	5	(Model Parameter) mounting Remote Cooling Fan EPPR (Detection) (When Remote Cooling Fan EPPR Current is more than 10 mA) 10 seconds continuous, Remote Cooling Fan EPPR drive current = 0 mA (Cancellation) (When Remote Cooling Fan EPPR Current is more than 10 mA) 3 seconds continuous, Remote Cooling Fan EPPR drive current $\geq$ 10 mA	●		
	6	(Detection) 10 seconds continuous, Remote Cooling Fan EPPR drive current > 1.0 A (Cancellation) 3 seconds continuous, Remote Cooling Fan EPPR drive current $\leq$ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Remote fan control operation failure (Checking list) 1. CN-385 (#3) – CN-53 (#07) Checking Open/Short 2. CN-385 (#1) – CN-51 (#03) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General                      C : Crawler Type                      W : Wheel Type



(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
164	4	(Detection) (When Working Cutoff Relay is Off) 10 seconds continuous, Working Cutoff Relay drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Working Cutoff Relay is Off) 3 seconds continuous, Working Cutoff Relay drive unit Measurement Voltage $> 3.0V$			●
	6	(Detection) (When Working Cutoff Relay is On) 10 seconds continuous, Working Cutoff Relay drive current $> 6.5 A$ (Cancellation) (When Working Cutoff Relay is On) 3 seconds continuous, Working Cutoff Relay drive current $\leq 6.5 A$			●
(Results / Symptoms) 1. Control Function – (Wheel Excavator) In driving mode, attachment hydraulic pilot pressure cut off failure  (Checking list) 1. CR-47 (#85) – CN-54 (#9) Checking Open/Short 2. CR-47 (#30, #86) – Fuse box (#28) Checking Open/Short					
166	4	(Detection) (When Power Max Solenoid is Off) 10 seconds continuous, Power Max Solenoid drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Power Max Solenoid is Off) 3 seconds continuous, Power Max Solenoid drive unit Measurement Voltage $> 3.0V$	●		
	6	(Detection) (When Power Max Solenoid is On) 5 seconds continuous, Power Max Solenoid drive current $> 4.5 A$ (Cancellation) (When Power Max Solenoid is On) 3 seconds continuous, Power Max Solenoid drive current $\leq 4.5 A$	●		
(Results / Symptoms) 1. Control Function – Voltage increase operation failure (Checking list) 1. CN-88 (#1) – CN-53 (#10) Checking Open/Short 2. CN-88 (#2) – Fuse box (#28) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
167	4	(Detection) (When Travel Speed Solenoid is Off) 10 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Travel Speed Solenoid is Off) 3 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage $> 3.0V$		●	
		(When Parking mode is not) (Detection) (When Travel Speed Solenoid is Off) 10 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Travel Speed Solenoid is Off) 3 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage $> 3.0V$			●
	6	(Detection) (When Travel Speed Solenoid is On) 10 seconds continuous, Travel Speed Solenoid drive current $> 4.5 A$ (Cancellation) (When Travel Speed Solenoid is On) 3 seconds continuous, Travel Speed Solenoid drive current $\leq 4.5 A$	●		
	(Results / Symptoms) 1. Control Function – driving in 1/2 transmission operation failure (Checking list) 1. CN-70 (#1) – CN-52(#05) Checking Open/Short 2. CN-70 (#2) – Fuse box(#28) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
169	4	Monitor – Selecting attachment(breaker / crusher) (Detection) (When Attachment Conflux Solenoid is Off) 10 seconds continuous, Attachment Conflux Solenoid drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Attachment Conflux Solenoid is Off) 3 seconds continuous, Attachment Conflux Solenoid drive unit Measurement Voltage $>$ 3.0V	●		
	6	(Detection) (When Attachment Conflux Solenoid is On) 10 seconds continuous, Attachment Conflux Solenoid drive Current $>$ 6.5 A (Cancellation) (When Attachment Conflux Solenoid is On) 3 seconds continuous, Attachment Conflux Solenoid drive Current $\leq$ 6.5 A	●		
(Results / symptoms) 1. Control Function – Option attachment flow control – Joining operation failure (Eco breaker mode, crusher mode) (Checking list) 1. CN-237 (#1) – CN-52 (#16) Checking Open/Short 2. CN-237 (#2) – Fuse box (#19) Checking Open/Short					
170	4	(Model Parameter) mounting Arm Regenerating Solenoid (Detection) (When Arm Regeneration Solenoid is Off) 10 seconds continuous, Arm Regeneration Solenoid drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Arm Regeneration Solenoid is Off) 3 seconds continuous, Arm Regeneration Solenoid drive unit Measurement Voltage $>$ 3.0V	●		
	6	(Detection) (When Arm Regeneration Solenoid is On) 10 seconds continuous, Arm Regeneration Solenoid drive current $>$ 4.5 A (Cancellation) (When Arm Regeneration Solenoid is On) 3 seconds continuous, Arm Regeneration Solenoid drive current $\leq$ 4.5 A	●		
(Results / symptoms) 1. Control Function – Arm regeneration operation failure (Checking list) 1. CN-135 (#1) – CN-52 (#07) Checking Open/Short 2. CN-135 (#2) – Fuse box (#28) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

**(SERIAL NO. : #0611-)**

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
171	4	Monitor – Selecting attachment(crusher) (Detection) (When Attachment Safety Solenoid is Off) 10 seconds continuous, Attachment Safety Solenoid drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Attachment Safety Solenoid is Off) 3 seconds continuous, Attachment Safety Solenoid drive unit Measurement Voltage $>$ 3.0V	●		
	6	(Detection) (When Attachment Safety Solenoid is On) 10 seconds continuous, Attachment Safety Solenoid drive current $>$ 6.5 A (Cancellation) (When Attachment Safety Solenoid is On) 3 seconds continuous, Attachment Safety Solenoid drive current $\leq$ 6.5 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control – Option spool pilot pressure cut off failure (crusher mode) (Checking list) 1. CN-149 (#1) – CN-53 (#09) Checking Open/Short 2. CN-149 (#2) – Fuse box (#19) Checking Open/Short					
179	4	Monitor – Selecting attachment(breaker / crusher) (Detection) (When Breaker Operating Solenoid is Off) 10 seconds continuous, Attachment Safety Solenoid drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Breaker Operating Solenoid is Off) 3 seconds continuous, Attachment Safety Solenoid drive unit Measurement Voltage $>$ 3.0V	●		
	6	(Detection) (When Breaker Operating Solenoid is On) 10 seconds continuous, Attachment Safety Solenoid drive current $>$ 6.5 A (Cancellation) (When Breaker Operating Solenoid is On) 3 seconds continuous, Attachment Safety Solenoid drive current $\leq$ 6.5 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control – Breaker operation failure (breaker mode) (Checking list) 1. CN-66 (#1) – CN-52 (#08) Checking Open/Short 2. CN-66 (#2) – Fuse box (#31) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
181	4	(Model Parameter) mounting Reverse Cooling Fan Solenoid (Detection) (When Reverse Cooling Fan Solenoid is Off) 10 seconds continuous, Reverse Cooling Fan Solenoid drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Reverse Cooling Fan Solenoid is Off) 3 seconds continuous, Reverse Cooling Fan Solenoid drive unit Measurement Voltage $>$ 3.0V	●		
	6	(Detection) (When Reverse Cooling Fan Solenoid is On) 10 seconds continuous, Reverse Cooling Fan Solenoid drive current $>$ 4.5 A (Cancellation) (When Reverse Cooling Fan Solenoid is On) 3 seconds continuous, Reverse Cooling Fan Solenoid drive current $\leq$ 4.5 A	●		
(Results / Symptoms)					
1. Control Function – Cooling Fan reverse control operation failure (not applicable)					
188	5	(Detection) (When pump P1 regulator EPPR current is equal or more than 300 mA) 10 seconds continuous, pump P1 regulator EPPR drive current $<$ 100 mA (Cancellation) (When pump P1 regulator EPPR current is equal or more than 300 mA) 3 seconds continuous, pump P1 regulator EPPR drive current $\geq$ 100 mA	●		
	6	(Detection) 10 seconds continuous, pump P1 regulator EPPR drive current $>$ 1.0 A (Cancellation) 3 seconds continuous, pump P1 regulator EPPR drive current $\leq$ 1.0 A	●		
(Results / Symptoms)					
1. Control Function – IPC operation failure, Option attachment flow control operation failure (Checking list)					
1. CN-242 (#2) – CN-54 (#27) Checking Open/Short					
2. CN-242 (#1) – CN-54 (#02) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
189	5	(Detection) (When pump P2 regulator EPPR current is equal or more than 300 mA) 10 seconds continuous, pump P2 regulator EPPR drive current < 100 mA (Cancellation) (When pump P2 regulator EPPR current is equal or more than 300 mA) 3 seconds continuous, pump P2 regulator EPPR drive current ≥ 100 mA	●		
	6	(Detection) 10 seconds continuous, pump P2 regulator EPPR drive current > 1.0 A (Cancellation) 3 seconds continuous, pump P2 regulator EPPR drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control operation failure (Checking list) 1. CN-243 (#2) – CN-54 (#26) Checking Open/Short 2. CN-243 (#1) – CN-54 (#03) Checking Open/Short					
196	0	HW145 10 seconds continuous, Attachment flow control EPPR 1 press. Sensor Measurement Voltage > 5.2V			
	1	HW145 10 seconds continuous, 0.3V ≤ Attachment flow control EPPR 1 press. Sensor Measurement Voltage < 0.8V			
	4	HW145 10 seconds continuous, Attachment flow control EPPR 1 press. Sensor Measurement Voltage < 0.3V			
(Results / Symptoms) 1. Control Function – Driving second pump joining function operation failure (Checking list) 1. CD-93 (#B) – CN-52 (#34) Checking Open/Short 2. CD-93 (#A) – CN-51 (#32) Checking Open/Short 3. CD-93 (#C) – CN-51 (#31) Checking Open/Short					
200	0	10 seconds continuous, Pump EPPR Press. Sensor Measurement Voltage > 5.2V	●		
	1	10 seconds continuous, 0.3V ≤ Pump EPPR Press. Sensor Measurement Voltage < 0.8V	●		
	4	10 seconds continuous, Pump EPPR Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Pump EPPR Press. display failure 2. Control Function – Pump input horse power control failure, Overload at compensation control operation failure (Fuel efficiency/speed performance failure) (Checking list) 1. CD-44 (#B) – CN-51 (#13) Checking Open/Short 2. CD-44 (#A) – CN-51 (#32) Checking Open/Short 3. CD-44 (#C) – CN-51 (#31) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
205	0	(Mounting pressure sensor) 10 seconds continuous, Boom Cylinder Rod Press. Sensor Measurement Voltage > 5.2V	●		
	1	(Mounting pressure sensor) 10 seconds continuous, 0.3V ≤ Boom Cylinder Rod Press. Sensor Measurement Voltage < 0.8V	●		
	4	(Mounting pressure sensor) 10 seconds continuous, Boom Cylinder Rod Press. Sensor Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Boom Cylinder Rod Press. display failure 2. Control Function – Boom floating control operation failure (Checking list) 1. CD-124 (#B) – CN-52 (#25) Checking Open/Short 2. CD-124 (#A) – CN-51 (#32) Checking Open/Short 3. CD-124 (#C) – CN-51 (#31) Checking Open/Short				
218	4	Mounting pressure sensor (HCESPN128 or HCESPN 205) (Detection) (When Boom Up Floating Solenoid is Off) 10 seconds continuous, Boom Up Floating Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Boom Up Floating Solenoid is Off) 3 seconds continuous, Boom Up Floating Solenoid drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Boom Up Floating Solenoid is On) 10 seconds continuous, Boom Up Floating Solenoid drive current > 6.5 A (Cancellation) (When Boom Up Floating Solenoid is On) 3 seconds continuous, Boom Up Floating Solenoid drive current ≤ 6.5 A	●		
	(Results / Symptoms) 1. Control Function – Boom floating control operation failure (Checking list) 1. CN-368 (#1) – CN-53 (#05) Checking Open/Short 2. CN-368 (#2) – Fuse box (#19) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
220	4	Mounting pressure sensor (HCESPN 128 or 205) (Detection) (When Boom Down Pilot Pressure Cutoff Solenoid is Off) 10 seconds continuous, Boom Down Pilot Pressure Cutoff Solenoid drive unit Measurement Voltage $\leq$ 3.0V (Cancellation) (When Boom Down Pilot Pressure Cutoff Solenoid is Off) 3 seconds continuous, Boom Down Pilot Pressure Cutoff Solenoid drive unit Measurement Voltage $>$ 3.0V	●		
	6	(Detection) (When Boom Down Pilot Pressure Cutoff Solenoid is On) 10 seconds continuous, Boom Down Pilot Pressure Cutoff Solenoid drive current $>$ 6.5 A (Cancellation) (When Boom Down Pilot Pressure Cutoff Solenoid is On) 3 seconds continuous, Boom Down Pilot Pressure Cutoff Solenoid drive current $\leq$ 6.5 A	●		
(Results / Symptoms) 1. Control Function – Boom floating control operation failure (Checking list) 1. CN-369 (#1) – CN-53 (#08) Checking Open/Short 2. CN-369 (#2) – Fuse box (#19) Checking Open/Short					
221	5	Monitor – Selecting attachment(breaker / crusher) (Detection) (When ATT Relief Setting EPPR 1 Current is equal or more than 10 mA) 10 seconds continuous, ATT Relief Setting EPPR 1 drive current = 0 mA (Cancellation) ATT Relief Setting EPPR 1 Current is equal or more than 10 mA) 3 seconds continuous, ATT Relief Setting EPPR 1 drive current $\geq$ 10 mA	●		
	6	(Detection) 10 seconds continuous, ATT Relief Setting EPPR 1 drive current $>$ 1.0 A (Cancellation) 3 seconds continuous, ATT Relief Setting EPPR 1 drive current $\leq$ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control – P1 relief pressure setting failure (Checking list) 1. CN-365 (#2) – CN-54 (#17) Checking Open/Short 2. CN-365 (#1) – CN-54 (#09) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General                      C : Crawler Type                      W : Wheel Type



(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
222	5	Monitor – Selecting attachment(crusher) (Detection) (When ATT Relief Setting EPPR 2 Current is equal or more than 10 mA) 10 seconds continuous, ATT Relief Setting EPPR 2 drive current = 0 mA (Cancellation) (When ATT Relief Setting EPPR 2 Current is equal or more than 10 mA) 3 seconds continuous, ATT Relief Setting EPPR 2 drive current ≥ 10mA	●		
	6	(Detection) 10 seconds continuous, ATT Relief Setting EPPR 2 drive current > 1.0 A (Cancellation) 3 seconds continuous, ATT Relief Setting EPPR 2 drive current ≤ 1.0 A	●		
(Results / Symptoms) 1. Control Function – Option attachment flow control – P2 relief pressure setting failure (Checking list) 1. CN-366 (#2) – CN-54 (#17) Checking Open/Short 2. CN-366 (#1) – CN-54 (#10) Checking Open/Short					
301	3	10 seconds continuous, Fuel Level Measurement Voltage > 3.8V	●		
	4	10 seconds continuous, Fuel Level Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Fuel remaining display failure (Checking list) 1. CD-2 (#2) – CN-51 (#19) Checking Open/Short 2. CD-2 (#1) – CN-51 (#25) Checking Open/Short				
325	4	(Model Parameter) mounting Fuel Warmer Relay (Detection) (When Fuel Warmer Relay is Off) 10 seconds continuous, Fuel Warmer Relay drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Fuel Warmer Relay is Off) 3 seconds continuous, Fuel Warmer Relay drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Fuel Warmer Relay is On) 10 seconds continuous, Fuel Warmer Relay drive current > 4.5 A (Cancellation) (When Fuel Warmer Relay is On) 3 seconds continuous, Fuel Warmer Relay drive current ≤ 4.5 A	●		
(Results / Symptoms) 1. Control Function – Fuel warmer operation failure (Checking list) 1. CR-46 (#85) – CN-52 (#13) Checking Open/Short 2. CR-46 (#86) – Fuse box (#22) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
501	0	10 seconds continuous, Transmission Oil Press. Sensor Measurement Voltage > 5.2V			●
	1	10 seconds continuous, 0.3V ≤ Transmission Oil Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Transmission Oil Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Transmission Oil Press. display failure, Transmission Oil low pressure warning failure (Checking list) 1. CD-5 (#B) – CN-52 (#26) Checking Open/Short 2. CD-5 (#A) – CN-51 (#32) Checking Open/Short 3. CD-5 (#C) – CN-51 (#31) Checking Open/Short				
503	0	10 seconds continuous, Brake Oil Press. Sensor Measurement Voltage > 5.2V			●
	1	10 seconds continuous, 0.3V ≤ Brake Oil Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Brake Oil Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Brake Oil Press. display failure, Brake Oil low pressure warning failure (Checking list) 1. CD-3 (#B) – CN-52 (#29) Checking Open/Short 2. CD-3 (#A) – CN-51 (#32) Checking Open/Short 3. CD-3 (#C) – CN-51 (#31) Checking Open/Short				
505	0	10 seconds continuous, Working Brake Press. Sensor Measurement Voltage > 5.2V			●
	1	10 seconds continuous, 0.3V ≤ Working Brake Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Working Brake Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Working Brake Oil Press. display failure, Working Brake Oil low pressure warning failure (Checking list) 1. CD-38 (#B) – CN-51 (#30) Checking Open/Short 2. CD-38 (#A) – CN-51 (#32) Checking Open/Short 3. CD-38 (#C) – CN-51 (#31) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
514	4	(Detection) (When Parking Relay is Off) 10 seconds continuous, Parking Relay drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Parking Relay is Off) 3 seconds continuous, Parking Relay drive unit Measurement Voltage $> 3.0V$			●
	6	(Detection) (When Parking Relay is On) 10 seconds continuous, Parking Relay drive current $> 6.5 A$ (Cancellation) (When Parking Relay is On) 3 seconds continuous, Parking Relay drive current $\leq 6.5 A$			●
(Results / Symptoms) 1. Control Function – Parking Relay operation failure (Checking list) 1. CR-66 (#1) – CN-53 (#11) Checking Open/Short 2. CR-66 (#2) – Fuse box (#30) Checking Open/Short					
517	4	(Detection) (When Traveling Cutoff Relay is Off) 10 seconds continuous, Traveling Cutoff Relay drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Traveling Cutoff Relay is Off) 3 seconds continuous, Traveling Cutoff Relay drive unit Measurement Voltage $> 3.0V$			●
	6	(Detection) (When Traveling Cutoff Relay is On) 10 seconds continuous, Traveling Cutoff Relay drive current $> 6.5 A$ (Cancellation) (When Traveling Cutoff Relay is On) 3 seconds continuous, Traveling Cutoff Relay drive current $\leq 6.5 A$			●
(Results / Symptoms) 1. Control Function – Traveling Cutoff Relay operation failure (Checking list) 1. CR-47 (#85) – CN-53 (#04) Checking Open/Short 2. CR-47 (#86) – Fuse box (#28) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
525	4	(Detection) (When Ram Lock Solenoid is Off) 10 seconds continuous, Ram Lock Solenoid drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Ram Lock Solenoid is Off) 3 seconds continuous, Ram Lock Solenoid drive unit Measurement Voltage $> 3.0V$			●
	6	(Detection) (When Ram Lock Solenoid is On) 10 seconds continuous, Ram Lock Solenoid drive current $> 6.5 A$ (Cancellation) (When Ram Lock Solenoid is On) 3 seconds continuous, Ram Lock Solenoid drive current $\leq 6.5 A$			●
(Results / Symptoms) 1. Control Function – Ram lock control operation failure (Checking list) 1. CN-69 (#1) – CN-53 (#12) Checking Open/Short 2. CN-69 (#2) – Fuse box (#33) Checking Open/Short					
527	4	(Detection) (When Creep Solenoid is Off) 10 seconds continuous, Creep Solenoid drive unit Measurement Voltage $\leq 3.0V$ (Cancellation) (When Creep Solenoid is Off) 3 seconds continuous, Creep Solenoid drive unit Measurement Voltage $> 3.0V$			●
	6	(Detection) (When Creep Solenoid is On) 10 seconds continuous, Creep Solenoid drive current $> 6.5 A$ (Cancellation) (When Creep Solenoid is On) 3 seconds continuous, Creep Solenoid drive current $\leq 6.5 A$			●
(Results / Symptoms) 1. Control Function – Creep mode operation failure (Checking list) 1. CN-206 (#1) – CN-52 (#17) Checking Open/Short 2. CN-206 (#2) – Fuse box (#30) Checking Open/Short					

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
530	0	10 seconds continuous, Travel Forward Press. Sensor Measurement Voltage > 5.2V			●
	1	10 seconds continuous, 0.3V ≤ Travel Forward Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Travel Forward Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Travel Forward Press. display failure 2. Control Function – Driving interoperability power control operation failure (Checking list) 1. CD-73 (#B) – CN-51 (#20) Checking Open/Short 2. CD-73 (#A) – CN-51 (#32) Checking Open/Short 3. CD-73 (#C) – CN-51 (#31) Checking Open/Short				
531	1	10 seconds continuous, 0.3V ≤ Travel Reverse Press. Sensor Measurement Voltage < 0.8V			●
	4	10 seconds continuous, Travel Reverse Press. Sensor Measurement Voltage < 0.3V			●
	(Results / Symptoms) 1. Monitor – Travel Reverse Press. display failure 2. Control Function – Driving interoperability power control operation failure (Checking list) 1. CD-74 (#B) – CN-52 (#20) Checking Open/Short 2. CD-74 (#A) – CN-51 (#32) Checking Open/Short 3. CD-74 (#C) – CN-51 (#31) Checking Open/Short				
705	0	10 seconds continuous, Battery input Voltage > 35V	●		
	1	10 seconds continuous, Battery input Voltage < 18V	●		
	(Results / Symptoms) 1. Control Function – Startup impossibility (Checking list) 1. CS-74A (#1) – CN-51 (#01) Checking Open/Short				
707	1	(When Engine is equal or more than 400 rpm) 10 seconds continuous, Alternator Node L Measurement Voltage < 18V (In case 12v goods, Alternator Node La Measurement Voltage < 9V)	●		
	(Results / Symptoms) 1. Control Function – Battery charging circuit failure (Checking list) 1. CS-74A (#1) – CN-51 (#26) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
714	3	(Model Parameter) Mounting Acc. Dial 10 seconds continuous, Acc. Dial Measurement Voltage > 5.2V	●		
	4	(Model Parameter) Mounting Acc. Dial 10 seconds continuous, Acc. Dial Measurement Voltage < 0.3V	●		
	(Results / Symptoms) 1. Monitor – Acc. Dial Voltage display failure 2. Control Function – Engine rpm control failure (Checking list) 1. CN-7 (#15) – CN-52 (#33) Checking Open/Short				
722	4	(Detection) (When Travel Alarm (Buzzer) Sound is Off) 10 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Travel Alarm (Buzzer) Sound Relay is Off) 3 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive unit Measurement Voltage > 3.0V	●		
	6	(Detection) (When Travel Alarm (Buzzer) Sound is On) 10 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive current > 4.5 A (Cancellation) (When Travel Alarm (Buzzer) Sound is On) 3 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive current ≤ 4.5 A	●		
	(Results / Symptoms) 1. Control Function – Driving alarm operation failure (Checking list) 1. CN-81 (#1) – CN-52 (#09) Checking Open/Short 2. CN-81 (#2) – Fuse box (#28) Checking Open/Short				
831	2	(When mounting the A/C Controller) 60 seconds continuous, A/C Controller Communication Data Error	●		
	(Results / Symptoms) 1. Control Function – A/C Controller operation failure (Checking list) 1. CN-11 (#8) – CN-51 (#09) Checking Open/Short 2. CN-11 (#7) – CN-51 (#08) Checking Open/Short				
840	2	60 seconds continuous, Cluster Communication Data Error	●		
	(Results / Symptoms) 1. Control Function – Cluster operation failure (Checking list) 1. CN-56A (#5) – CN-52 (#01) Checking Open/Short 2. CN-56A (#4) – CN-52 (#02) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
841	2	10 seconds continuous, ECM Communication Data Error	●		
	(Results / Symptoms) 1. Control Function – ECM operation failure (Checking list) 1. CN-93 (#25) – CN-52 (#02) Checking Open/Short 2. CN-93 (#26) – CN-52 (#01) Checking Open/Short				
848	2	(When mounting the Haptic Controller) 60 seconds continuous, Haptic Controller Communication Data Error	●		
	(Results / Symptoms) 1. Control Function – Haptic Controller operation failure (Checking list) 1. CN-8 (#2) – CN-51 (#09) Checking Open/Short 2. CN-8 (#3) – CN-51 (#08) Checking Open/Short				
850	2	(When mounting the RMCU) 60 seconds continuous, RMCU communication Data Error	●		
	(Results / Symptoms) 1. Control Function – RMCU operation failure (Checking list) 1. CN-125A (#3) – CN-51 (#09) Checking Open/Short 2. CN-125A (#11) – CN-51 (#08) Checking Open/Short				
866	2	(When mounting the AAVM) 60 seconds continuous, AAVM communication Data Error	●		
	(Results / Symptoms) 1. Control Function – AAVM operation failure (Checking list) 1. CN-9 (#5) – CN-51 (#09) Checking Open/Short 2. CN-9 (#6) – CN-51 (#08) Checking Open/Short				
867	2	60 seconds continuous, RDU communication Data Error	●		
	(Results / Symptoms) 1. Control Function – RDU operation failure (Checking list) 1. CN-376 (#10) – CN-51 (#09) Checking Open/Short 2. CN-376 (#18) – CN-51 (#08) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type

(SERIAL NO. : #0611-)

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
868	2	60 seconds continuous, Switch Controller communication Data Error	●		
	(Results / Symptoms) 1. Control Function – Switch Controller operation failure (Checking list) 1. CN-56A (#7) – CN-51 (#08) Checking Open/Short 2. CN-56A (#6) – CN-51 (#09) Checking Open/Short				
869	2	(When mounting the BKCU) 60 seconds continuous, BKCU communication Data Error	●		
	(Results / Symptoms) 1. Control Function – BKCU operation failure (Checking list) 1. CS-2B (#A) – CN-51 (#08) Checking Open/Short 2. CS-2B (#B) – CN-51 (#09) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General

C : Crawler Type

W : Wheel Type



#### 4. ENGINE FAULT CODE

J1939 Code	Description	Effect and Action
27-3	Engine Exhaust Gas Recirculation Valve Position Sensor : Voltage Above Normal	The Electronic Control Module (ECM) detects the following conditions: The signal voltage from the position sensor on the NOx Reduction System (NRS) valve is greater than 4.8 VDC for 0.1 seconds. The warning lamp will come on. The ECM will log the diagnostic Zcode. The NRS valve will be fully closed while the code is active. The engine will be derated. Valve Position Sensor - Test
27-4	Engine Exhaust Gas Recirculation Valve Position Sensor : Voltage Below Normal	The ECM detects the following conditions: The signal voltage from the NRS valve position sensor is less than 0.2 VDC for 0.1 seconds. The warning lamp will come on. The ECM will log the diagnostic code. The NRS valve will be fully closed while the code is active. The engine will be derated. Valve Position Sensor - Test
29-2	Accelerator Pedal Position 2 : Erratic, Intermittent, or Incorrect (Engines equipped with a throttle switch)	The Electronic Control Module (ECM) detects the following condition: There is an invalid combination of positions for the multi-position switch. If equipped, the warning light will come on. The ECM will log the diagnostic code. Throttle Switch Circuit - Test
29-2	Accelerator Pedal Position 2 : Erratic, Intermittent or Incorrect (Engines equipped with an analog throttle)	Analog Throttle Position Sensor Circuit - Test
29-3	Accelerator Pedal Position 2 : Voltage Above Normal (Engines equipped with an analog throttle)	The Electronic Control Module (ECM) detects one of the following conditions: The ECM has been powered for 3 seconds. Diagnostic code 168-4 is not active. 3509 (262) codes are not active. The setting for the upper diagnostic limit has been exceeded for one second. If equipped, the warning lamp will come on. The diagnostic code will be logged. Analog Throttle Position Sensor Circuit - Test
29-3	Accelerator Pedal Position 2 : Voltage Above Normal (Engines equipped with a digital throttle)	The Electronic Control Module (ECM) detects the following conditions: The ECM has been powered for 3 seconds. Diagnostic code 168-4 is not active. There are no active 678 or 41 codes. The setting for the upper diagnostic limit has been exceeded for one second. If equipped, the warning lamp will come on. The diagnostic code will be logged. Digital Throttle Position Sensor Circuit - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
29-4	Accelerator Pedal Position 2 : Voltage Below Normal (Engines equipped with an analog throttle)	The ECM detects one of the following conditions: The ECM has been powered for 3 seconds. Diagnostic code 168-4 is not active. 3510 (2131) codes are not active. The setting for the lower diagnostic limit has been exceeded for one second. If equipped, the warning lamp will come on. The diagnostic code will be logged. Analog Throttle Position Sensor Circuit - Test
29-4	Accelerator Pedal Position 2 : Voltage Below Normal (Engines equipped with a digital throttle)	The ECM detects the following conditions: The ECM has been powered for 3 seconds. Diagnostic code 168-4 is not active. There are no active 678 or 41 codes. The setting for the lower diagnostic limit has been exceeded for one second. If equipped, the warning lamp will come on. The diagnostic code will be logged. Digital Throttle Position Sensor Circuit - Test
29-8	Accelerator Pedal Position 2 : Abnormal Frequency, Pulse Width or Period	The ECM detects the following conditions: The signal frequency from the digital throttle position sensor is equal to 0% or 100% for more than 2 seconds. The ECM has been powered for at least 3 seconds. Diagnostic codes 29-3, 774-3, 29-4, and 774-4 are not active. There are no active 678 or 41 codes. The ECM sets the Throttle Position to "0%". If equipped, the warning lamp will come on. The diagnostic code will be logged if the engine is running. The diagnostic code will not be logged if the engine is cranking. Digital Throttle Position Sensor Circuit - Test
91-2	Accelerator Pedal Position 1 : Erratic, Intermittent, or Incorrect (Engines equipped with a throttle switch)	The Electronic Control Module (ECM) detects the following condition: There is an invalid combination of positions for the multi-position switch. If equipped, the warning light will come on. The ECM will log the diagnostic code. Throttle Switch Circuit - Test
91-2	Accelerator Pedal Position 1 : Erratic, Intermittent or Incorrect (Engines equipped with an analog throttle)	Analog Throttle Position Sensor Circuit - Test
91-3	Accelerator Pedal Position 1 : Voltage Above Normal (Engines equipped with an analog throttle)	The Electronic Control Module (ECM) detects one of the following conditions: The ECM has been powered for 3 seconds. Diagnostic code 168-4 is not active. 3509 (262) codes are not active. The setting for the upper diagnostic limit has been exceeded for one second. If equipped, the warning lamp will come on. The diagnostic code will be logged. Analog Throttle Position Sensor Circuit - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
91-3	Accelerator Pedal Position 1 : Voltage Above Normal (Engines equipped with a digital throttle)	The Electronic Control Module (ECM) detects the following conditions: The ECM has been powered for 3 seconds. Diagnostic code 168-4 is not active. There are no active 678 or 41 codes. The setting for the upper diagnostic limit has been exceeded for one second. If equipped, the warning lamp will come on. The diagnostic code will be logged. Digital Throttle Position Sensor Circuit - Test
91-4	Accelerator Pedal Position 1 : Voltage Below Normal (Engines equipped with an analog throttle)	The ECM detects one of the following conditions: The ECM has been powered for 3 seconds. Diagnostic code 168-4 is not active. 3510 (2131) codes are not active. The setting for the lower diagnostic limit has been exceeded for one second. If equipped, the warning lamp will come on. The diagnostic code will be logged. Analog Throttle Position Sensor Circuit - Test
91-4	Accelerator Pedal Position 1 : Voltage Below Normal (Engines equipped with a digital throttle)	The ECM detects the following conditions: The ECM has been powered for 3 seconds. Diagnostic code 168-4 is not active. There are no active 678 or 41 codes. The setting for the lower diagnostic limit has been exceeded for one second. If equipped, the warning lamp will come on. The diagnostic code will be logged. Digital Throttle Position Sensor Circuit - Test
91-8	Accelerator Pedal Position 1 : Abnormal Frequency, Pulse Width or Period	The ECM detects the following conditions: The signal frequency from the digital throttle position sensor is equal to 0% or 100% for more than 2 seconds. The ECM has been powered for at least 3 seconds. Diagnostic codes 91-3 and 91-4 are not active. There are no active 678 or 41 codes. The ECM sets the Throttle Position to "0%". If equipped, the warning lamp will come on. The diagnostic code will be logged if the engine is running. The diagnostic code will not be logged if the engine is cranking. Digital Throttle Position Sensor Circuit - Test
97-3	Water In Fuel Indicator : Voltage Above Normal	The ECM detects the following conditions: An open circuit in the Water-In-Fuel (WIF) sensor circuit. The ECM has been powered for less than 5 seconds. The warning lamp will stay on when the "indicator lamp self check" has been completed. The ECM will disable the function to detect water in fuel while the code is active. Water in Fuel - Test
97-15	Water In Fuel Indicator : High - least severe (1)	Water has been detected in the fuel that is contained in the fuel/water separator bowl. The water has been present for at least 40 seconds. The warning lamp will come on. Fuel System Water Separator Has Water

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
97-16	Water In Fuel Indicator : High - moderate severity (2)	Water has been detected in the fuel that is contained in the fuel/water separator bowl. The water has been present for at least 60 minutes. The warning lamp will come on. The engine will be derated at 17.5% per second up to a maximum of 35%. Fuel System Water Separator Has Water
98-1	Engine Oil Level : Low - most severe (3)	The engine oil level has dropped below the level of the switch for the time specified in the ECM. The code is logged. The engine is derated and may shut down. Oil Level Is Low
98-18	Engine Oil Level : Low - moderate severity (2)	The engine oil level has dropped below the level of the switch for the time specified in the ECM. The code is logged. The engine is derated. Oil Level Is Low
100-1	Engine Oil Pressure : Low - most severe (3)	The ECM has been powered for at least 2 seconds. The engine has been running for at least 10 seconds. There are no diagnostic trouble codes for the oil pressure sensor. There are no diagnostic trouble codes for the 5 VDC supply. The engine will be derated. Low Engine Oil Pressure
100-3	Engine Oil Pressure : Voltage Above Normal	The Electronic Control Module (ECM) detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test
100-4	Engine Oil Pressure : Voltage Below Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test
100-17	Engine Oil Pressure : Low - least severe (1)	The ECM has been powered for at least 2 seconds. The engine has been running for at least 10 seconds. There are no diagnostic trouble codes for the oil pressure sensor. There are no diagnostic trouble codes for the 5 VDC supply. Low Engine Oil Pressure
100-18	Engine Oil Pressure : Low - moderate severity (2)	The ECM has been powered for at least 2 seconds. The engine has been running for at least 10 seconds. There are no diagnostic trouble codes for the oil pressure sensor. There are no diagnostic trouble codes for the 5 VDC supply. The engine will be derated. Oil Pressure Is Low
100-21	Engine Oil Pressure : Data Drifted Low	5 V Sensor Supply Circuit - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
102-16	Engine Intake Manifold #1 Pressure : High - moderate severity (2)	This pressure is a variable value that is calculated by the ECM. The resulting value is dependent on the operating conditions of the engine. Intake Manifold Air Pressure Is High
102-18	Engine Intake Manifold #1 Pressure : Low - moderate severity (2)	This pressure is a variable value that is calculated by the ECM. The resulting value is dependent on the operating conditions of the engine. Intake Manifold Air Pressure Is Low
105-0	Engine Intake Manifold #1 Temperature : High - most severe (3)	The engine has been running for 3 minutes. No other 105 (172) codes are active. 168 codes are not active. Code 412-16 (E1092 (2)) is not active. The intake manifold air temperature exceeds the value that is programmed into the ECM for 8 seconds. The engine will be shut down. The code is logged. This code will be reset when the temperature is less than 124 °C (255 °F) for 20 seconds. Intake Manifold Air Temperature Is High
105-3	Engine Intake Manifold #1 Temperature : Voltage Above Normal	The Electronic Control Module (ECM) detects the following conditions: The signal voltage from the intake manifold air temperature sensor is greater than 4.95 VDC for more than 8 seconds. Engine, coolant temperature is above - 10 °C (15.0 °F). The ECM will use the default value of 70 °C (158 °F) for the intake manifold air temperature "Voltage High" will be displayed next to the status for "Intake Manifold Air Temperature" on the electronic service tool. The engine may show the following symptoms. Poor stability Poor cold running Poor acceleration under load White smoke Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)
105-4	Engine Intake Manifold #1 Temperature : Voltage Below Normal	The ECM detects the following conditions The signal voltage from the intake manifold air temperature sensor is less than 0.2 VDC for more than 8 seconds. The ECM will use the default value of 70 °C (158 °F) for the intake manifold air temperature "Voltage High" will be displayed next to the status for "Intake Manifold Air Temperature" on the electronic service tool. The engine may show the following symptoms. Poor stability Poor cold running Poor acceleration under load White smoke Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
105-15	Engine Intake Manifold #1 Temperature : High - least severe (1)	The engine has been running for 3 minutes. No other 105 (172) codes are active. 168 codes are not active. Code 412-16 (E1092 (2)) is not active. The intake manifold air temperature exceeds the value that is programmed into the ECM for 8 seconds. The code is logged. This code will be reset when the temperature is less than 122°C (252°F) for 4 seconds. Intake Manifold Air Temperature Is High
105-16	Engine Intake Manifold #1 Temperature : High - moderate severity (2)	The engine has been running for 3 minutes. No other 105 (172) codes are active. 168 codes are not active. Code 412-16 (E1092 (2)) is not active. The intake manifold air temperature exceeds the value that is programmed into the ECM for 8 seconds. The engine will be shut down. The code is logged. This code will be reset when the temperature is less than 124°C (255°F) for 20 seconds. Intake Manifold Air Temperature Is High
107-3	Engine Air Filter 1 Differential Pressure : High - Voltage Above Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. Normal The value of the parameter is set to a gauge pressure. Sensor Signal (Analog, Active) - Test
107-4	Engine Air Filter 1 Differential Pressure : High - Voltage Below Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Sensor Signal (Analog, Active) - Test
107-15	Engine Air Filter 1 Differential Pressure : High - least severe (1)	The air filter differential pressure is above the trip point pressure for the delay time. The code is logged. Inlet Air Is Restricted
107-16	Engine Air Filter 1 Differential Pressure : High - moderate severity (2)	The air filter differential pressure is above the trip point pressure for the delay time. The code is logged. The engine power is derated. Inlet Air Is Restricted
108-3	Barometric Pressure : Voltage Above Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test
108-4	Barometric Pressure : Voltage Below Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
108-21	Barometric Pressure : Data Drifted Low	5 V Sensor Supply Circuit - Test
110-0	Engine Coolant Temperature : High - most severe (3)	The coolant temperature has been at 114°C (237°F) for 10 seconds. The ECM has been powered for at least 2 seconds. The engine has been running for at least 185 seconds. There are no electrical faults or battery faults on the circuit. The engine will be derated. The engine may shut down. Coolant Temperature Is Too High
110-3	Engine Coolant Temperature : Voltage Above Normal	The ECM detects the following conditions : The signal voltage from the engine coolant temperature sensor is greater than 4.95 VDC for more than 8 seconds. An active diagnostic code will be generated after 8 seconds. The ECM will default to 90°C (194°F) for engine coolant temperature "Voltage Above Normal" will be displayed next to the status for "Engine Coolant Temperature" on the electronic service tool. The engine may show the following symptoms. Poor stability Poor cold running White smoke Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)
110-4	Engine Coolant Temperature : Voltage Below Normal	The ECM detects the following conditions : The signal voltage from the engine coolant temperature sensor is less than 0.2 VDC for more than 8 seconds. An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes. The ECM will default to 90°C (194°F) for engine coolant temperature "Voltage Below Normal" will be displayed next to the status for "Engine Coolant Temperature" on the electronic service tool. The engine may show the following symptoms Poor stability Poor cold running White smoke Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)
110-15	Engine Coolant Temperature : High - least severe (1)	The coolant temperature has been at 109°C (228°F) for 10 seconds. The ECM has been powered for at least 2 seconds. The engine has been running for at least 185 seconds. There are no electrical faults or battery faults on the circuit. Coolant Temperature Is Too High
110-16	Engine Coolant Temperature : High - moderate severity (2)	The coolant temperature has been at 111°C (232°F) for 10 seconds. The ECM has been powered for at least 2 seconds. The engine has been running for at least 185 seconds. There are no electrical faults or battery faults on the circuit. The engine will be derated. Coolant Temperature Is Too High

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
111-1	Engine Coolant Level : Low - most severe (3)	The engine has been running for 60 seconds. The engine coolant level has fallen below the coolant level sensor for the specified delay time. Engine power is derated. The code is logged. Coolant Level Is Low
111-18	Engine Coolant Level : Low - moderate severity (2)	The engine has been running for 60 seconds. The engine coolant level has fallen below the coolant level sensor for the specified delay time. Engine power is derated. The code is logged. Coolant Level Is Low
157-3	Engine Injector Metering Rail #1 Pressure : Voltage Above Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test
157-4	Engine Injector Metering Rail #1 Pressure : Voltage Below Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test
157-15	Engine Injector Metering Rail #1 Pressure : High - least severe (1)	Fuel Rail Pressure Problem
157-16	Engine Injector Metering Rail #1 Pressure : High - moderate severity (2)	No other 157 -XX or 1797 -XX codes are active. 3509-XX or 262-XX codes are not active. 3510-XX or 2131-XX codes are not active. No codes for the high-pressure fuel pump or the injectors are active. The fuel rail pressure is above an acceptable level. The code is logged. Engine power is derated. Fuel Rail Pressure Problem
157-17	Engine Injector Metering Rail #1 Pressure : Low - least severe (1)	Fuel Rail Pressure Problem
157-18	Engine Injector Metering Rail #1 Pressure : Low - moderate severity (2)	No other 157 -XX or 1797 -XX codes are active. 3509-XX or 262-XX codes are not active. 3510-XX or 2131-XX codes are not active. No codes for the high-pressure fuel pump or the injectors are active. The fuel rail pressure is below an acceptable level. The code is logged. Engine power is derated. Fuel Rail Pressure Problem
168-2	Battery Potential / Power Input 1 : Erratic, Intermittent or Incorrect	Ignition Keyswitch Circuit and Battery Supply Circuit - Test
168-3	Battery Potential / Power Input 1 : Voltage Above Normal	The ECM detects voltage that is above the acceptable value. Ignition Keyswitch Circuit and Battery Supply Circuit - Test

※ Some fault codes are not applied to this machine.



J1939 Code	Description	Effect and Action
168-4	Battery Potential / Power Input 1 : Voltage Below Normal	The ECM detects voltage that is below the acceptable value. Ignition Keyswitch Circuit and Battery Supply Circuit - Test
172-3	Engine Air Inlet Temperature : Voltage Above Normal	The ECM detects the following conditions: The signal voltage from the air inlet temperature sensor is greater than 4.95 VDC for at least 8 seconds. Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)
172-4	Engine Air Inlet Temperature : Voltage Below Normal	The ECM detects the following conditions: The signal voltage from the air inlet temperature sensor is less than 0.2 VDC for at least 8 seconds. Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)
174-3	Engine Fuel Temperature 1 : Voltage Above Normal	The ECM detects the following conditions: The signal voltage from the fuel temperature sensor is greater than 4.95 VDC for more than 8 seconds. The ECM will default to 40°C (104°F) for fuel temperature "Voltage Above Normal" will be displayed next to the status for "Engine Fuel Temperature" on the electronic service tool. Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)
174-4	Engine Fuel Temperature 1 : Voltage Below Normal	The ECM detects the following conditions: The signal voltage from the fuel temperature sensor is less than 0.2 VDC for more than 8 seconds. The ECM will default to 40°C (104°F) for fuel temperature "Voltage Below Normal" will be displayed next to the status for "Engine Fuel Temperature" on the electronic service tool. Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)
174-15	Engine Fuel Temperature 1 : High - least severe (1)	Fuel Temperature Is High
174-16	Engine Fuel Temperature 1 : High - moderate severity (2)	The temperature of the low-pressure fuel in the high-pressure fuel pump is high. The ECM has been powered for at least 2 seconds. The engine has been operating for at least 185 seconds. There are no other faults in the electrical system. The warning lamp will come on. The engine may be derated by 20%. The warning lamp will go off when the temperature drops below the trip point for 15 seconds. Fuel Temperature Is High
190-0	Engine Speed : High - most severe (3)	The engine has exceeded the value that is programmed into the Electronic Control Module (ECM) for 0.6 seconds. There are no diagnostic trouble codes for the speed/timing sensors. The engine has been running for at least 3 seconds. The engine may shut down. Engine Overspeeds

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
190-8	Engine Speed : Abnormal Frequency, Pulse Width or Period	The Electronic Control Module (ECM) detects the following conditions : An intermittent loss of signal or a complete loss of signal from the primary speed/timing sensor for 2 seconds. The engine has been running for more than 3 seconds. 3512 or 3483 diagnostic trouble codes are not active. The warning light will come on and the diagnostic code will be logged. The ECM will use the signal from the secondary speed/ timing sensor. The engine will be derated . If the signal from the secondary speed/timing sensor is also lost, the engine will shut down. Engine Speed/Timing Sensor Circuit - Test
190-15	Engine Speed : High - least severe (1)	The engine has exceeded the value that is programmed into the Electronic control Module (ECM) for 0.6 seconds. There are no diagnostic trouble codes for the speed/timing sensors. The engine has been running for at least 3 seconds. Engine Overspeeds
411-3	Engine Exhaust Gas Recirculation Differential Pressure : Voltage Above Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Sensor Signal (Analog, Active) - Test
411-4	Engine Exhaust Gas Recirculation Differential Pressure : Voltage Below Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Sensor Signal (Analog, Active) - Test
411-13	Engine Exhaust Gas Recirculation Differential Pressure : Out of Calibration	The ECM detects the following conditions: The NRS differential pressure is outside the acceptable range during initialization check, or during sensor calibration when the engine is not running. The warning lamp will come on and the engine will be derated. The code is logged. Sensor Calibration Required - Test
412-3	Engine Exhaust Gas Recirculation Temperature : Voltage Above Normal	The ECM detects the following conditions: The signal voltage from the Nox Reduction System (NRS) temperature sensor is greater than 4.975 VDC for more than 8 seconds. Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)
412-4	Engine Exhaust Gas Recirculation Temperature : Voltage Below Normal	The ECM detects the following conditions: The signal voltage from the NRS temperature sensor is less than 0.2 VDC for more than 8 seconds. Engine Temperature Sensor Open or Short Circuit - Test (Passive Sensors)

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
412-15	Engine Exhaust Gas Recirculation Temperature : High - least severe (1)	Engines equipped with a Diesel Particulate Filter (DPF): The exhaust gas temperature in the NRS has reached 178°C (352°F) for 8 seconds. Engines not equipped with a DPF : The exhaust gas temperature in the NRS has reached 198°C (388°F) for 8 seconds. The ECM has been powered for at least 2 seconds. The engine has been running for at least 180 seconds. There are no electrical faults on the circuit. NRS Exhaust Gas Temperature Is High
412-16	Engine Exhaust Gas Recirculation Temperature : High - moderate severity (2)	Engines equipped with a DPF : The exhaust gas temperature in the NRS has reached 180°C (356°F) for 8 seconds. Engines not equipped with a DPF : The exhaust gas temperature in the NRS has reached 190°C (374°F) for 8 seconds. The engine will be derated. The ECM has been powered for at least 2 seconds. The engine has been running for at least 180 seconds. There are no electrical faults on the circuit. NRS Exhaust Gas Temperature Is High
558-2	Accelerator Pedal 1 Low Idle Switch : Erratic, Intermittent or Incorrect	The Electronic Control Module (ECM) detects the following condition: The signal from the Idle Validation Switch (IVS) is invalid. If equipped, the warning light will come on. The ECM will log the diagnostic code. Idle Validation Switch Circuit - Test
626-5	Engine Start Enable Device 1 : Current Below Normal	The Electronic Control Module (ECM) detects a low current condition in the output from the ECM to the solenoid for ether injection. The code is latched. The code is logged. Ether injection is disabled Ether Starting Aid - Test
626-6	Engine Start Enable Device 1 : Current Above Normal	The ECM detects a high current condition in the output from the ECM to the solenoid for ether injection. The code is latched. The code is logged. Ether injection is disabled. Ether Starting Aid - Test
630-2	Calibration Memory : Erratic, Intermittent or Incorrect	The engine Electronic Control Module (ECM) detects that one or more of the programmable parameters have not been programmed. The ECM may use a default torque map or the ECM may limit the engine to low idle. The code is active only. Flash Programming
631-2	Calibration Module : Erratic, Intermittent or Incorrect	ECM Memory - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
637-11	Engine Timing Sensor : Other Failure Mode	The Electronic Control Module (ECM) detects the following conditions: The outputs from the primary speed/timing sensor and the secondary speed/timing sensor differ by more than 8 degrees of crankshaft rotation. The engine has been running for more than 5 seconds. Diagnostic code 190-8 is not active. 3512 or 3483 diagnostic trouble codes are not active. The warning light will come on. This code will not be logged. Engine Speed/Timing Sensor Circuit - Test
639-9	J1939 Network #1 : Abnormal Update Rate	Another controller has incorrectly stopped transmitting an expected J1939 message or another controller has incorrectly started transmitting a conflicting J1939 message. The ECM will log the diagnostic code. The engine will not start. CAN Data Link Circuit - Test
639-14	J1939 Network #1 : Special Instruction	The data received from the CAN A data bus is not in the correct format. The code is logged. Data Link Configuration Status - Test
649-3	Engine Exhaust Back Pressure Regulator Solenoid : Voltage Above Normal	Motorized Valve - Test
649-5	Engine Exhaust Back Pressure Regulator Solenoid : Current Below Normal	The ECM detects the following conditions: A low current condition in the output for the exhaust back pressure regulator for 2 seconds. 168 diagnostic codes are not active. The ECM has been powered for at least 2 seconds. If equipped, the warning lamp will come on. The ECM will log the diagnostic code. Motorized Valve - Test
649-6	Engine Exhaust Back Pressure Regulator Solenoid : Current Above Normal	The ECM detects the following conditions: A high current condition in the output for the exhaust back pressure regulator for 2 seconds. The ECM has been powered for at least 2 seconds. If equipped, the warning lamp will come on. The ECM will log the diagnostic code. Motorized Valve - Test
649-7	Engine Exhaust Back Pressure Regulator Solenoid : Not Responding Properly	The ECM detects the following conditions The signal from the exhaust back pressure regulator position sensor indicates that the valve is not in the desired position. This diagnostic code can be caused by a loss of the 5 VDC supply to the exhaust back pressure regulator position sensor. The ECM has been powered for at least 2 seconds. If equipped, the warning lamp will come on. The ECM will log the diagnostic code. Motorized Valve - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
651-2	Engine Injector Cylinder #01 : Erratic, Intermittent or Incorrect	The Electronic Control Module (ECM) detects an injector code that is incorrect for the engine. The warning lamp will come on. Injector Data Incorrect - Test
651-5	Engine Injector Cylinder #01 : Current Below Normal	These diagnostic codes indicate an open circuit (low current) in either the solenoid or the wiring for the electronic unit injector. The Electronic Control Module (ECM) detects the following conditions: A low current condition (open circuit) for each of five consecutive attempts to operate. Battery voltage above 9 VDC for 2 seconds. The warning light will come on. The ECM will log the diagnostic code. The engine will have low power and/or rough running. When an "Cutout Test" is performed, a faulty electronic unit injector will indicate a low reading in comparison with the other electronic unit injectors. The ECM will continue to attempt to operate the electronic unit injector after the diagnostic code has been logged. An open circuit will prevent the operation of the electronic unit injector. Injector Solenoid Circuit - Test
651-6	Engine Injector Cylinder #01 : Current Above Normal	These diagnostic codes indicate a short circuit (high current) in either the solenoid or the wiring for the electronic unit injector The ECM detects the following conditions: A high current condition (short circuit) for each of five consecutive attempts to operate. Battery voltage above 9 VDC for 2 seconds. The warning light will come on. The ECM will log the diagnostic code. The engine will have low power and/or rough running. The ECM will continue to attempt to operate the electronic unit injector after the diagnostic code has been logged. A short circuit will prevent the operation of the electronic unit injector. Injector Solenoid Circuit - Test
652-2	Engine Injector Cylinder #02 : Erratic, Intermittent or Incorrect	The Electronic Control Module (ECM) detects an injector code that is incorrect for the engine. The warning lamp will come on Injector Data Incorrect - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
652-5	Engine Injector Cylinder #02 : Current Below Normal	<p>These diagnostic codes indicate an open circuit (low current) in either the solenoid or the wiring for the electronic unit injector.</p> <p>The Electronic Control Module (ECM) detects the following conditions:</p> <p>A low current condition (open circuit) for each of five consecutive attempts to operate.</p> <p>Battery voltage above 9 VDC for 2 seconds.</p> <p>The warning light will come on. The ECM will log the diagnostic code.</p> <p>The engine will have low power and/or rough running.</p> <p>When an "Cutout Test" is performed, a faulty electronic unit injector will indicate a low reading in comparison with the other electronic unit injectors.</p> <p>The ECM will continue to attempt to operate the electronic unit injector after the diagnostic code has been logged. An open circuit will prevent the operation of the electronic unit injector.</p> <p>Injector Solenoid Circuit - Test</p>
652-6	Engine Injector Cylinder #02 : Current Above Normal	<p>These diagnostic codes indicate a short circuit (high current) in either the solenoid or the wiring for the electronic unit injector.</p> <p>The ECM detects the following conditions:</p> <p>A high current condition (short circuit) for each of five consecutive attempts to operate.</p> <p>Battery voltage above 9 VDC for 2 seconds.</p> <p>The warning light will come on. The ECM will log the diagnostic code.</p> <p>The engine will have low power and/or rough running.</p> <p>The ECM will continue to attempt to operate the electronic unit injector after the diagnostic code has been logged. A short circuit will prevent the operation of the electronic unit injector.</p> <p>Injector Solenoid Circuit - Test</p>
653-2	Engine Injector Cylinder #03 : Erratic, Intermittent or Incorrect	<p>The Electronic Control Module (ECM) detects an injector code that is incorrect for the engine.</p> <p>The warning lamp will come on.</p> <p>Injector Data Incorrect - Test</p>

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
653-5	Engine Injector Cylinder #03 : Current Below Normal	<p>These diagnostic codes indicate an open circuit (low current) in either the solenoid or the wiring for the electronic unit injector.</p> <p>The Electronic Control Module (ECM) detects the following conditions:</p> <p>A low current condition (open circuit) for each of five consecutive attempts to operate.</p> <p>Battery voltage above 9 VDC for 2 seconds.</p> <p>The warning light will come on. The ECM will log the diagnostic code.</p> <p>The engine will have low power and/or rough running.</p> <p>When an "Cutout Test" is performed, a faulty electronic unit injector will indicate a low reading in comparison with the other electronic unit injectors.</p> <p>The ECM will continue to attempt to operate the electronic unit injector after the diagnostic code has been logged. An open circuit will prevent the operation of the electronic unit injector.</p> <p>Injector Solenoid Circuit - Test</p>
653-6	Engine Injector Cylinder #03 : Current Above Normal	<p>These diagnostic codes indicate a short circuit (high current) in either the solenoid or the wiring for the electronic unit injector.</p> <p>The ECM detects the following conditions:</p> <p>A high current condition (short circuit) for each of five consecutive attempts to operate.</p> <p>Battery voltage above 9 VDC for 2 seconds.</p> <p>The warning light will come on. The ECM will log the diagnostic code.</p> <p>The engine will have low power and/or rough running.</p> <p>The ECM will continue to attempt to operate the electronic unit injector after the diagnostic code has been logged. A short circuit will prevent the operation of the electronic unit injector.</p> <p>Injector Solenoid Circuit - Test</p>
654-2	Engine Injector Cylinder #04 : Erratic, Intermittent or Incorrect	<p>The Electronic Control Module (ECM) detects an injector code that is incorrect for the engine.</p> <p>The warning lamp will come on</p> <p>Injector Data Incorrect - Test</p>

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
654-5	Engine Injector Cylinder #04 : Current Below Normal	<p>These diagnostic codes indicate an open circuit (low current) in either the solenoid or the wiring for the electronic unit injector.</p> <p>The Electronic Control Module (ECM) detects the following conditions:</p> <p>A low current condition (open circuit) for each of five consecutive attempts to operate.</p> <p>Battery voltage above 9 VDC for 2 seconds.</p> <p>The warning light will come on. The ECM will log the diagnostic code.</p> <p>The engine will have low power and/or rough running.</p> <p>When an "Cutout Test" is performed, a faulty electronic unit injector will indicate a low reading in comparison with the other electronic unit injectors.</p> <p>The ECM will continue to attempt to operate the electronic unit injector after the diagnostic code has been logged. An open circuit will prevent the operation of the electronic unit injector.</p> <p>Injector Solenoid Circuit - Test</p>
654-6	Engine Injector Cylinder #04 : Current Above Normal	<p>These diagnostic codes indicate a short circuit (high current) in either the solenoid or the wiring for the electronic unit injector.</p> <p>The ECM detects the following conditions:</p> <p>A high current condition (short circuit) for each of five consecutive attempts to operate.</p> <p>Battery voltage above 9 VDC for 2 seconds.</p> <p>The warning light will come on. The ECM will log the diagnostic code.</p> <p>The engine will have low power and/or rough running.</p> <p>The ECM will continue to attempt to operate the electronic unit injector after the diagnostic code has been logged. A short circuit will prevent the operation of the electronic unit injector.</p> <p>Injector Solenoid Circuit - Test</p>
655-2	Engine Injector Cylinder #05 : Erratic, Intermittent or Incorrect (1206E-E66 Engine Only)	Injector Data Incorrect - Test
655-5	Engine Injector Cylinder #05 : Current Below Normal (1206E-E66 Engine Only)	Injector Solenoid Circuit - Test
655-6	Engine Injector Cylinder #05 : Current Above Normal (1206E E66 Engine Only)	Injector Solenoid Circuit - Test
656-2	Engine Injector Cylinder #06 : Erratic, Intermittent or Incorrect (1206E-E66 Engine Only)	Injector Data Incorrect - Test
656-5	Engine Injector Cylinder #06 : Current Below Normal (1206E-E66 Engine Only)	Injector Solenoid Circuit - Test

※ Some fault codes are not applied to this machine.



J1939 Code	Description	Effect and Action
656-6	Engine Injector Cylinder #06 : Current Above Normal (1206E-E66 Engine Only)	Injector Solenoid Circuit - Test
676-5	Engine Glow Plug Relay : Current Below Normal	The Electronic Control Module (ECM) detects the following conditions: The engine is not cranking. The ECM has been powered for at least one second. There is a low current condition (open circuit) in the glow plug start aid relay circuit for more than 2 seconds. The warning light will come on. The diagnostic code will be logged. An ECM that was previously blank will require a total of 2 hours of operation before the diagnostic code will be logged. The ECM is unable to activate the relay for the glow plug starting aid. The glow plugs will not operate. The engine may be difficult to start in cold temperatures and the exhaust may emit white smoke. Glow Plug Starting Aid - Test
676-6	Engine Glow Plug Relay : Current Above Normal	The Electronic Control Module (ECM) detects the following conditions: The engine is not cranking. The ECM has been powered for at least one second. There is a high current condition (short circuit) in the glow plug start aid relay circuit for more than 2 seconds. The warning light will come on. The diagnostic code will be logged. An ECM that was previously blank will require a total of 2 hours of operation before the diagnostic code will be logged. The ECM is unable to activate the relay for the glow plug starting aid. The glow plugs will not operate or the glow plugs will operate all the time. The engine may be difficult to start in cold temperatures and the exhaust may emit white smoke. Starting Aid (Glow Plug) Relay Circuit - Test
678-3	ECU 8 Volts DC Supply : Voltage Above Normal	The ECM detects the following conditions: The 8 VDC supply is more than 8.8 VDC for more than one second. The ECM has been powered for more than 3 seconds. Diagnostic code 168-4 is not active. The ECM will log the diagnostic code and the warning lamp will illuminate when this diagnostic code is active. The engine may be limited to low idle Digital Throttle Position Sensor Circuit - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
678-4	ECU 8 Volts DC Supply : Voltage Below Normal	<p>The ECM detects the following conditions:  The 8 VDC supply is less than 7.2 VDC for more than one second.  The ECM has been powered for more than 3 seconds.  Diagnostic code 168-4 is not active.  The ECM will log the diagnostic code and the warning lamp will illuminate when this diagnostic code is active.  The engine may be limited to low idle.  An active diagnostic code may not cause any noticeable effect on engine response unless the voltage drops below 6.5 VDC.  Digital Throttle Position Sensor Circuit - Test</p>
723-8	Engine Speed Sensor #2 : Abnormal Frequency, Pulse Width or Period	<p>The Electronic Control Module (ECM) detects the following conditions.  A loss of signal from the secondary speed/timing sensor for 2 seconds while the signal from the primary speed/timing sensor remained valid.  The engine has been running for more than 3 seconds.  3512 or 3483 diagnostic trouble codes are not active.  The warning lamp will come on and the diagnostic code will be logged.  The loss of signal from the secondary speed/timing sensor will prevent the engine from starting.  Engine Speed/Timing Sensor Circuit - Test</p>
1075-5	Engine Electric Lift Pump For Engine Fuel Supply : Current Below Normal	<p>The Electronic Control Module (ECM) detects the following conditions:  There are no active 168 diagnostic codes.  The ECM is not attempting to power the relay.  The ECM has been powered for at least 2 seconds.  There is a low current condition in the EFLP relay circuit for more than 2 seconds.  The warning light will come on.  The diagnostic code will be logged.  The ECM is unable to activate the relay for the EFLP. The EFLP will not operate or the EFLP will operate all the time.  The engine will not operate.  Fuel Pump Relay Circuit - Test</p>
1075-6	Engine Electric Lift Pump For Engine Fuel Supply : Current Above Normal	<p>The ECM detects the following conditions:  There are no active 168 diagnostic codes.  The ECM is attempting to power the relay.  The ECM has been powered for at least 2 seconds.  There is a high current condition in the EFLP relay circuit for more than 2 seconds.  The warning light will come on. The diagnostic code will be logged.  The ECM is unable to activate the relay for the EFLP.  The EFLP will not operate or the EFLP will operate all the time. The engine will not operate.  The ECM will continue to attempt to activate the relay. If the current is OK for 6 seconds, then the diagnostic code will be cleared.  Fuel Pump Relay Circuit - Test</p>

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
1076-5	Engine Fuel Injection Pump Fuel Control Valve : Current Below Normal	The Electronic Control Module (ECM) detects the following conditions: Low Current in the output from the ECM to the fuel pump solenoid for 0.6 seconds. There are no active 168 diagnostic codes. The ECM has been powered for at least 0.25 seconds. The warning lamp will come on. The ECM will log the diagnostic code. This diagnostic code detects a fault in the circuit for the fuel pump solenoid. Solenoid Valve - Test
1076-6	Engine Fuel Injection Pump Fuel Control Valve : Current Above Normal	The ECM detects the following conditions: High current in the output from the ECM to the fuel pump solenoid for 0.6 seconds. There are no active 168 diagnostic codes. The ECM has been powered for at least 0.25 seconds. The warning lamp will come on. The ECM will log the diagnostic code. This diagnostic code detects a fault in the circuit for the fuel pump solenoid. This fault is most likely to be caused by a high side short to ground or a low side short to power. Solenoid Valve - Test
1188-3	Engine Turbocharger 1 Wastegate Drive : Voltage Above Normal	Solenoid Valve - Test
1188-5	Engine Turbocharger 1 Wastegate Drive : Current Below Normal	The ECM detects the following conditions: A low current condition in the output from the ECM to the solenoid for the waste gate regulator. There are no active 168 diagnostic codes. The ECM has been powered for at least 2 seconds. The warning lamp will come on once the diagnostic code has been active for 30 seconds. The diagnostic code will be logged The engine will be derated while this diagnostic code is active. After the engine derate has been activated, the electronic service tool will indicate "Turbo Protection Derate Active". This diagnostic code detects a fault in the wastegate regulator that is most likely to be an open circuit Solenoid Valve - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
1188-6	Engine Turbocharger 1 Wastegate Drive : Current Above Normal	The ECM detects the following conditions: A high current condition in the output from the ECM to the solenoid in the wastegate regulator. There are no active 168 diagnostic codes. The ECM has been powered for at least 2 seconds. The warning lamp will come on once the diagnostic code has been active for 30 seconds. The diagnostic code will be logged. The engine will be derated while this diagnostic code is active. After the engine derate has been activated, the electronic service tool will indicate "Turbo Protection Derate Active". This diagnostic code detects a fault in the circuit for the wastegate regulator. This fault is most likely to be caused by a high side short to ground or a low side short to power. Solenoid Valve - Test
1196-9	Anti-theft Component Status States : Abnormal Update Rate	Data Link Circuit - Test
1235-9	J1939 Network #3 : Abnormal Update Rate	The Pump and Electronics Unit (PEU), the ammonia sensor, the soot sensor, or a NOx sensor has incorrectly stopped or started transmitting a data request This diagnostic code applies to the CAN C datalink. The ECM will log the diagnostic code. CAN Data Link - Test
1235-14	J1939 Network #3 : Special Instruction	The data received from the CAN C data bus is not in the correct format. The code is logged. Data Link Configuration Status - Test
1239-0	Engine Fuel Leakage 1: High - most severe (3)	3509-XX or 262-XX codes are not active. 3510-XX or 2131-XX codes are not active. There is a probable fuelleak from the high-pressure fuel system. The amount of leakage is a calculated parameter. The code is logged. The engine will shut down. Fuel Rail Pressure Problem
1761-1	Aftertreatment #1 DEF/AdBlue® Tank Volume : Low - most severe (3)	The DEF tank is 0%. Tank Level : Low - most severe (3) The Emissions System Malfunction lamp is on and the Action lamp flashes. The code is logged. The engine may shut down. DEF/AdBlue® Tank Level Is Low
1761-12	Aftertreatment #1 DEF/AdBlue® Tank Volume : Failure	The ECM detects a failure of the level sensor. The code is logged. DEF/AdBlue® Tank Sensor - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
1761-17	Aftertreatment #1 DEF/AdBlue® Tank Volume : Low - least severe (1)	The level fluid in the Diesel Exhaust Fluid (DEF) tank is less than 14%. The Emissions System Malfunction lamp comes on. The code is logged. DEF/AdBlue® Tank Level Is Low
1761-18	Aftertreatment #1 DEF/AdBlue® Tank Volume : Low - moderate severity (2)	The level fluid in the DEF tank is less than 8%. The Emissions System Malfunction lamp is on and the Action lamp flashes. The code is logged. The engine is derated. DEF/AdBlue® Tank Level Is Low
2659-7	Engine Exhaust Gas Recirculation (EGR) Mass Flow Rate : Not Responding Properly	Actual mass flow through the NOx Reduction System (NRS) does not match the desired mass flow. The Electronic Control Module (ECM) has been powered for at least 2 seconds. The engine is running. There are no active codes for the 5 VDC supply. There are no active 27, 157, 411, 1188, 2791, 3358 or 3563 codes. 412-3 or 412-4 codes are not active. NRS Mass Flow Rate Problem
2659-15	Engine Exhaust Gas Recirculation (EGR) Mass Flow Rate : High - least severe (1)	TBA
2791-3	Engine Exhaust Gas Recirculation (EGR) Valve Control : Voltage Above Normal	Motorized Valve - Test
2791-5	Engine Exhaust Gas Recirculation (EGR) Valve Control : Current Below Normal	The ECM detects the following conditions: A low current condition in the output for the NOx Reduction System (NRS) valve (EGR valve) for 2 seconds. 168 diagnostic codes are not active. The ECM has been powered for at least 2 seconds. If equipped, the warning lamp will come on. The ECM will log the diagnostic code. Motorized Valve - Test
2791-6	Engine Exhaust Gas Recirculation (EGR) Valve Control : Current Above Normal	The ECM detects the following conditions: A high current condition in the output for the NRS valve (EGR valve) for 2 seconds. The ECM has been powered for at least 2 seconds. If equipped, the warning lamp will come on. The ECM will log the diagnostic code. Motorized Valve - Test
2791-7	Engine Exhaust Gas Recirculation (EGR) Valve Control : Not Responding Properly	The ECM detects the following conditions: The signal from the NRS valve position sensor indicates that the valve is not in the desired position. This diagnostic code can be caused by a loss of the 5 VDC supply to the NRS valve position sensor. The ECM has been powered for at least 2 seconds. If equipped, the warning lamp will come on. The ECM will log the diagnostic code. Motorized Valve - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
2882-2	Engine Alternate Rating Select : Erratic, Intermittent, or Incorrect	The Electronic Control Module (ECM) detects a combination of switch positions for the mode switches that has not been defined. If equipped, the warning lamp will come on and the ECM will log the diagnostic. The ECM will return the engine to the last good mode selection or setting. The engine will start and the engine will default to the previous mode selection. The engine may operate at reduced speed or reduced power depending on the mode that is selected. Mode Selection Circuit - Test
2970-2	Accelerator Pedal 2 Low Idle Switch : Erratic, Intermittent, or Incorrect	The Electronic Control Module (ECM) detects the following condition: The signal from the Idle Validation Switch (IVS) is invalid. If equipped, the warning light will come on. The ECM will log the diagnostic code. Idle Validation Switch Circuit - Test
3031-7	Aftertreatment #1 DEF/AdBlue® Tank Temperature : Not Responding Properly	DEF/AdBlue® Tank Temperature Is Low
3031-12	Aftertreatment #1 DEF/AdBlue® Tank Temperature : Failure	The ECM detects a failure of the temperature sensor. The code is logged. DEF/AdBlue® Tank Sensor - Test
3031-16	Aftertreatment #1 DEF/AdBlue® Tank Temperature : High - moderate Severity (2)	The temperature of the Diesel Exhaust Fluid (DEF) in the DEF tank has exceeded the parameter programmed in the ECM. The code is logged. The engine is derated. DEF/AdBlue® Tank Temperature Is High
3031-18	Aftertreatment #1 DEF/AdBlue® Tank Temperature : Low - moderate Severity (2)	The temperature of the Diesel Exhaust Fluid (DEF) in the DEF tank is below the parameter programmed in the ECM after a heat cycle. The code is logged. The engine is derated. DEF/AdBlue® Tank Temperature Is Low
3216-5	Aftertreatment #1 Intake NOx : Current Below Normal	The ECM detects current that is below the acceptable value. Electrical Power Supply -Test
3216-6	Aftertreatment #1 Intake NOx : Current Above Normal	The ECM detects current that is above the acceptable value. Electrical Power Supply -Test
3216-7	Aftertreatment #1 Intake NOx : Not Responding Properly	The engine out NOx level is not responding as expected. The code is logged. NOx Sensor - Test
3216-11	Aftertreatment #1 Intake NOx : Other Failure Mode	The NOx sensor cannot reach the correct operating temperature in the defined time period. Sensor (Data Link Type) - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
3216-12	Aftertreatment #1 Intake NOx : Failure	The data received from the NOx sensor is out of range. The code is logged. The warning lamp is illuminated. Sensor (Data Link Type) - Test
3217-16	Aftertreatment #1 Intake O2 : High - moderate Severity (2)	The Engine Out NOx Sensor is reading a higher than expected level of Oxygen (O2). Clean Emissions Module Has High Oxygen Level
3226-5	Aftertreatment #1 Outlet NOx : Current Below Normal	The ECM detects current that is below the acceptable value. Electrical Power Supply -Test
3226-6	Aftertreatment #1 Outlet NOx : Current Above Normal	The ECM detects current that is above the acceptable value Electrical Power Supply -Test
3226-7	Aftertreatment #1 Outlet NOx : Not Responding Properly	The engine out NOx level is not responding as expected. The code is logged. NOx Sensor - Test
3226-11	Aftertreatment #1 Outlet NOx : Other Failure Mode	The NOx sensor cannot reach the correct operating temperature in the defined time period. Sensor (Data Link Type) - Test
3226-12	Aftertreatment #1 Outlet NOx : Failure	The data received from the NOx sensor is out of range. The code is logged. The warning lamp is illuminated. Sensor (Data Link Type) - Test
3227-16	Aftertreatment #1 Outlet O2 : High - Moderate Severity (2)	The Engine Out NOx Sensor is reading a higher than expected level of Oxygen (O2). Clean Emissions Module Has High Oxygen Level
3242-3	Particulate Trap Intake Gas Temperature : Voltage Above Normal	The ECM detects the following conditions: The signal voltage from the DPF inlet temperature sensor is greater than 4.95 VDC for more than 8 seconds. An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes "Voltage Above Normal" will be displayed next to the status for "DPF Inlet Temperature" on the electronic service tool. Engine Temperature Sensor Open or Short Circuit - Test (Active Sensors)
3242-4	Particulate Trap Intake Gas Temperature : Voltage Below Normal	The ECM detects the following conditions: The signal voltage from the DPF inlet temperature sensor is less than 0.2 VDC for more than 8 seconds. An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes "Voltage Below Normal" will be displayed next to the status for "DPF Inlet Temperature" on the electronic service tool. Engine Temperature Sensor Open or Short Circuit - Test (Active Sensors)

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
3242-17	Particulate Trap Intake Gas Temperature : Low - least severe (1)	The temperature at the intake of the DPF is below the trip point that is calculated by the ECM. The trip point varies depending on engine operating conditions. The code is logged. The code remains active until electrical power to the ECM is cycled. Diesel Particulate Filter Temperature Is High
3242-18	Particulate Trap Intake Gas Temperature : Low - moderate severity (2)	The temperature sensor is not correctly installed. Engine power is derated 30%. The code is logged. The code remains active until electrical power to the ECM is cycled. Diesel Particulate Filter Temperature Is Low
3358-3	Engine Exhaust Gas Recirculation Inlet Pressure : Voltage Above Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test
3358-4	Engine Exhaust Gas Recirculation Inlet Pressure : Voltage Below Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test
3358-13	Engine Exhaust Gas Recirculation Inlet Pressure : Calibration Required	The ECM detects the following conditions: The offset between the NRS inlet pressure and the barometric pressure is outside the acceptable range during initialization check. The offset between the NRS inlet pressure and the barometric pressure is outside the acceptable range during sensor calibration when the engine is not running. The warning lamp will come on and the engine will derate. The code is logged. Sensor Calibration Required - Test
3358-21	Engine Exhaust Gas Recirculation Inlet Pressure : Data Drifted Low	5 V Sensor Supply Circuit - Test
3360-3	Aftertreatment #1 DEF/AdBlue® Controller : Voltage Above Normal	The ECM detects current that is above the acceptable value. Electrical Power Supply -Test
3360-4	Aftertreatment #1 DEF/AdBlue® Controller : Voltage Below Normal	The ECM detects current that is below the acceptable value Electrical Power Supply -Test
3360-9	Aftertreatment #1 DEF/AdBlue® Controller : Abnormal Update Rate	The Dosing Control Unit (DCU) has incorrectly stopped or started transmitting a data request. This diagnostic code applies to the CAN A datalink. The ECM will log the diagnostic code. Can Data Link - Test
3360-14	Aftertreatment #1 DEF/AdBlue® Controller : Special Instruction	The data received from the OCU is not in the correct format. The warning lamp is illuminated. Sensor (Data Link Type) - Test

※ Some fault codes are not applied to this machine.



J1939 Code	Description	Effect and Action
3361-5	Aftertreatment #1 DEF/AdBlue® Dosing Unit : Current Below Normal	The ECM detects the following conditions: A low current condition in the output from the DCU to the solenoid in the DEF. There are no active 168 diagnostic codes. The warning lamp will come on. The diagnostic code will be logged. Solenoid Valve - Test (Solenoid Valves that Connect to the Dosing control Unit (DUC))
3361-6	Aftertreatment #1 DEF/AdBlue® Dosing Unit : Current Above Normal	The ECM detects the following conditions: A high current condition in the output from the DCU to the solenoid in the DEF. There are no active 168 diagnostic codes. The warning lamp will come on. The diagnostic code will be logged. Solenoid Valve - Test (Solenoid Valves that Connect to the Dosing control Unit (DUC))
3361-7	Aftertreatment #1 DEF/AdBlue® Dosing Unit : Not Responding Property	DEF/AdBlue® Module Does Not Respond
3363-5	Aftertreatment #1 DEF/AdBlue® Tank Heater : Current Below Normal	The ECM detects the following conditions: A low current condition in the output from the DCU to the solenoid in the DEF. There are no active 168 diagnostic codes. The warning lamp will come on. The diagnostic code will be logged. Solenoid Valve - Test (Solenoid Valves that Connect to the Dosing control Unit (DUC))
3363-6	Aftertreatment #1 DEF/AdBlue® Tank Heater : Current Above Normal	The ECM detects the following conditions: A high current condition in the output from the DCU to the solenoid in the DEF. There are no active 168 diagnostic codes. The warning lamp will come on. The diagnostic code will be logged. Solenoid Valve - Test (Solenoid Valves that Connect to the Dosing control Unit (DUC))
3509-3	Sensor Supply Voltage 1 : Voltage Above Normal	The Electronic Control Module (ECM) detects the following conditions: The 5 VDC supply for the sensors is greater than 5.16 VDC for more than one second. The ECM has been powered for at least 3 seconds. Diagnostic code 168-4 is not active. The warning lamp will come on. The ECM sets all the sensors on the 5 VDC circuit to the default values. The engine will be derated. 5 V Sensor Supply Circuit - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
3509-4	Sensor Supply Voltage 1 : Voltage Below Normal	The ECM detects the following conditions: The 5 VDC supply for the sensors is less than 4.84 VDC for more than one second. The ECM has been powered for at least 3 seconds. Diagnostic code 168-4 is not active. The warning lamp will come on. The ECM sets all the sensors on the 5 VDC circuit to the default values. The engine will be derated. 5 V Sensor Supply Circuit - Test
3510-3	Sensor Supply Voltage 2 : Voltage Above Normal	The Electronic Control Module (ECM) detects the following conditions: The 5 VDC supply for the sensors is greater than 5.16 VDC for more than one second. The ECM has been powered for at least 3 seconds. Diagnostic code 168-4 is not active. The warning lamp will come on. The ECM sets all the sensors on the 5 VDC circuit to the default values. The engine will be derated. 5 V Sensor Supply Circuit - Test
3510-4	Sensor Supply Voltage 2 : Voltage Below Normal	The ECM detects the following conditions: The 5 VDC supply for the sensors is less than 4.84 VDC for more than one second. The ECM has been powered for at least 3 seconds. Diagnostic code 168-4 is not active. The warning lamp will come on. The ECM sets all the sensors on the 5 VDC circuit to the default values. The engine will be derated. 5 V Sensor Supply Circuit - Test
3511-3	Sensor Supply Voltage 3 : Voltage Above Normal	DEF/AdBlue® Pump Sensor Supply - Test
3511-4	Sensor Supply Voltage 3 : Voltage Below Normal	DEF/AdBlue® Pump Sensor Supply - Test
3512-3	Sensor Supply Voltage 4 : Voltage Above Normal	The ECM detects the following conditions: The 8 VDC supply is more than 8.8 VDC for more than one second. The ECM has been powered for more than 3 seconds. Diagnostic code 168-4 is not active. The ECM will log the diagnostic code and the warning lamp will illuminate while this diagnostic code is active. The engine may be limited to low idle. Speed/Timing - Test
3512-4	Sensor Supply Voltage 4 : Voltage Below Normal	The ECM detects the following conditions: The 8 VDC supply is less than 7.2 VDC for more than one second. The ECM has been powered for more than 3 seconds. Diagnostic code 168-4 is not active. The ECM will log the diagnostic code and the warning lamp will illuminate while this diagnostic code is active. The engine may be limited to low idle. An active diagnostic code may not cause any noticeable effect on engine response unless the voltage drops below 6.5 VDC. Speed/Timing - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
3516-12	Aftertreatment #1 DEF/AdBlue® Concentration : Failure	The Diesel Emissions Fluid (DEF) concentration cannot be determined. The engine warning lamp will come on. DEF/AdBlue® Concentration Is Incorrect
3516-16	Aftertreatment #1 DEF/AdBlue® Concentration : High - moderate severity (2)	The Diesel Emissions Fluid (DEF) has a high concentration. The engine warning lamp will come on. DEF/AdBlue® Concentration Is Incorrect
3516-18	Aftertreatment #1 DEF/AdBlue® Concentration : Low - moderate severity (2)	The Diesel Emissions Fluid (DEF) has a low concentration. The engine warning lamp will come on. DEF/AdBlue® Concentration Is Incorrect
3563-3	Engine Intake Manifold #1 Absolute Pressure : Voltage Above Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test
3563-4	Engine Intake Manifold #1 Absolute Pressure : Voltage Below Normal	The ECM detects signal voltage that is not in the acceptable range. The code is logged. The value of the parameter is set to a gauge pressure. Engine Pressure Sensor Open or Short Circuit - Test
3563-13	Engine Intake Manifold #1 Absolute Pressure : Calibration Required	The ECM detects the following conditions: The offset between the intake manifold air pressure and the barometric pressure is outside the acceptable range during initialization check. The offset between the intake manifold air pressure and the barometric pressure is outside the acceptable range during sensor calibration with the engine not running. The warning lamp will come on and the engine will derate. The code is logged. Sensor Calibration Required - Test
3563-21	Engine Intake Manifold #1 Absolute Pressure : Data Drifted Low	5 V Sensor Supply Circuit - Test
3719-0	Particulate Trap #1 Soot Load Percent : High - most severe (3)	The estimated soot load is above 127 percent. Engine power is derated 100 percent. The emissions system failure lamp will flash and a warning horn will sound. Diesel Particulate Filter Collects Excessive Soot
3719-16	Particulate Trap #1 Soot Load Percent : High - moderate severity (2)	The estimated soot load is above 116 percent. Engine power is gradually derated as the soot load increases. The emissions system failure lamp will flash. Diesel Particulate Filter Collects Excessive Soot

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
4334-3	Aftertreatment #1 DEF/AdBlue® #1 Pressure (absolute) : Voltage Above Normal	There is excessive voltage on the signal wire between the Diesel Exhaust Fluid Controller (DCU) and the DEF pump. or There is an open circuit on the supply, signal, or return wire. The code is logged. DEF/AdBlue® Pump Pressure Sensor - Test
4334-4	Aftertreatment #1 DEF/AdBlue® #1 Pressure (absolute) : Voltage Below Normal	There is low voltage on the signal wire between the DCU and the DEF pump pressure sensor. The code is logged. DEF/AdBlue® Pump Pressure Sensor - Test
4334-16	Aftertreatment #1 DEF/AdBlue® #1 Pressure (absolute) : High - moderate severity (2)	The DCIU detects that the DEF pump pressure is above the acceptable range. The code is logged. DEF/AdBlue® Pressure Is High
4334-18	Aftertreatment #1 DEF/AdBlue® #1 Pressure (absolute) : Low - moderate severity (2)	Diesel Exhaust Fluid (DEF) system pressure dropped below the acceptable threshold during dosing. DEF/AdBlue® Pressure Is Low
4334-21	Aftertreatment #1 DEF/AdBlue® #1 Pressure (absolute) : Data Drifted Low	The signal from the DEF pump pressure sensor is below - 10 kPa (- 1.5 psi) when the DEF system is not primed. Sensor Supply - Test
4354-5	Aftertreatment #1 DEF/AdBlue® Line Heater #1 : Current Below Normal	This code indicates that there is a fault in the #1 (suction) line heater circuit that is probably an open circuit. DEF/AdBlue® Line Heater - Test
4354-6	Aftertreatment #1 DEF/AdBlue® Line Heater #1 : Current Above Normal	This code indicates that there is a fault in the #1 (suction) line heater circuit that is probably a short circuit. DEF/AdBlue® Line Heater - Test
4355-5	Aftertreatment #1 DEF/AdBlue® Line Heater #2 : Current Below Normal	This code indicates that there is a fault in the #2 (delivery) line heater circuit that is probably an open circuit. DEF/AdBlue® Line Heater - Test
4355-6	Aftertreatment #1 DEF/AdBlue® Line Heater #2 : Current Above Normal	This code indicates that there is a fault in the #2 (delivery) line heater circuit that is probably a short circuit. DEF/AdBlue® Line Heater - Test
4356-5	Aftertreatment #1 DEF/AdBlue® Line Heater #3 : Current Below Normal	This code indicates that there is a fault in the #3 (return) line heater circuit that is probably an open circuit. DEF/AdBlue® Line Heater - Test
4356-6	Aftertreatment #1 DEF/AdBlue® Line Heater #3 : Current Above Normal	This code indicates that there is a fault in the #3 (return) line heater circuit that is probably a short circuit. DEF/AdBlue® Line Heater - Test
4360-3	Aftertreatment #1 SCR Catalyst Intake Gas Temperature : Voltage Above Normal	The ECM detects the following conditions: The signal voltage from the SCR inlet temperature sensor is greater than 4.95 VDC for more than 8 seconds. An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes. "Voltage Above Normal" will be displayed next to the status for "SCR Inlet Temperature" on the electronic service tool. Sensor Signal (Analog, Passive) - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
4360-4	Aftertreatment #1 SCR Catalyst Intake Gas Temperature : Voltage Below Normal	The ECM detects the following conditions: The signal voltage from the SCR inlet temperature sensor is less than 0.2 VDC for more than 8 seconds. An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes "Voltage Below Normal" will be displayed next to the status for "SCR Inlet Temperature" on the electronic service tool. Sensor Signal (Analog, Passive) - Test
4360-16	Aftertreatment #1 SCR Catalyst Intake Gas Temperature : High - moderate severity (2)	The aftertreatment Selective Catalytic Reduction (SCR) catalyst intake gas temperature sensor has detected that the SCR intake temperature is above the normal operating range. SCR Catalyst Has Incorrect Inlet Temperature
4360-17	Aftertreatment #1 SCR Catalyst Intake Gas Temperature : Low - least severe (1)	This diagnostic code is only applicable to engines that have a Diesel Particulate Filter (DPF). The Electronic Control Module (ECM) detects that the SCR catalyst intake temperature is below the acceptable range. The code is logged. SCR Catalyst Has Incorrect Inlet Temperature
4360-18	Aftertreatment #1 SCR Catalyst Intake Gas Temperature : Low - moderate severity (2)	The aftertreatment SCR catalyst intake gas temperature sensor has detected that the SCR intake temperature is far below the normal operating range. SCR Catalyst Has Incorrect Inlet Temperature
4360-20	Aftertreatment #1 SCR Catalyst Intake Gas Temperature : Data Drifted High	The ECM detects the following conditions: The SCR inlet temperature sensor has probably failed in range. An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes "Data Drifted High" will be displayed next to the status for "SCR Inlet Temperature" on the electronic service tool. Sensor Signal (Analog, Passive) - Test
4364-2	Aftertreatment #1 SCR Catalyst Conversion Efficiency : Erratic, Intermittent, or Incorrect	The engine out NOx level is not responding as expected. The code is logged. NOx Sensor - Test
4364-18	Aftertreatment #1 SCR Catalyst Conversion Efficiency : Low - moderate severity (2)	The SCR System is not able to reduce NOx in the exhaust system. NOx Conversion Is Low
4374-5	Aftertreatment #1 DEF/AdBlue® Pump #1 Motor Speed : Current Below Normal	This code indicates low current to the DEF pump motor. The code is logged. DEF/AdBlue® Pump - Test
4374-6	Aftertreatment #1 DEF/AdBlue® Pump #1 Motor Speed : Current Above Normal	This code indicates high current to the DEF pump motor. The code is logged. DEF/AdBlue® Pump - Test
4377-12	Aftertreatment #1 Outlet NH3 : Failure	The data received from the ammonia (NH3) sensor is out of range. The code is logged. The warning lamp is illuminated. Sensor (Data Link Type) - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
4380-2	Aftertreatment #1 Outlet NH3 Gas Sensor Power In Range : Erratic, Intermittent or Incorrect	The ECM detects that the power supply to the ammonia (NH3) sensor is not stable. Electrical Power Supply - Test
4765-3	Aftertreatment #1 Diesel Oxidation Catalyst Intake Gas Temperature : Voltage Above Normal	The ECM detects the following conditions: The signal voltage from the DOC inlet temperature sensor is greater than 4.95 VDC for more than 8 seconds. An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes "Voltage Above Normal" will be displayed next to the status for "DOC Inlet Temperature" on the electronic service tool. Sensor Signal (Analog, Passive) - Test
4765-4	Aftertreatment #1 Diesel Oxidation Catalyst Intake Gas Temperature : Voltage Below Normal	The ECM detects the following conditions: The signal voltage from the DOC inlet temperature sensor is less than 0.2 VDC for more than 8 seconds. An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes "Voltage Below Normal" will be displayed next to the status for "DOC Inlet Temperature" on the electronic service tool. Sensor Signal (Analog, Passive) - Test
4765-17	Aftertreatment #1 Diesel Oxidation Catalyst Intake Gas Temperature : Low - least severe (1)	ECM detects that the DOC inlet temperature is below the acceptable range during HC dosing. 4765-17 E2165 (1) The code is logged. Diesel Oxidation Catalyst Has Incorrect inlet Temperature
4783-3	Diesel Particulate Filter #1 Mean Soot Signal : Voltage Above Normal	The Electronic Control Module (ECM) detects the following conditions: The signal voltage for the soot sensor is greater than 32 VDC for 60 seconds. The warning lamp will come on. The ECM will log the diagnostic code. The EBPR may close as a precaution. Soot Sensor - Test
4783-4	Diesel Particulate Filter #1 Mean Soot Signal : Voltage Below Normal	The Electronic Control Module (ECM) detects the following conditions: The signal voltage for the soot sensor is less than 9 VDC for 60 seconds. The warning lamp will come on. The ECM will log the diagnostic code. The EBPR may close as a precaution. Soot Sensor - Test
4783-9	Diesel Particulate Filter #1 Mean Soot Signal : Abnormal Update Rate	Soot Sensor - Test
4783-12	Diesel Particulate Filter #1 Mean Soot Signal : Failure	The ECM detects the following conditions: The soot sensor has failed. The warning lamp will come on and the ECM will log the diagnostic code. Soot Sensor - Test
4783-13	Diesel Particulate Filter #1 Mean Soot Signal : Calibration Required	Soot Sensor - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
4783-19	Diesel Particulate Filter #1 Mean Soot Signal : Data Error	Soot Sensor - Test
4783-21	Diesel Particulate Filter #1 Mean Soot Signal : Data Drifted Low	The ECM detects the following conditions: The soot sensor has not received a valid signal from the soot antenna for at least 60 seconds. The warning lamp will come on and the ECM will log the diagnostic code. Soot Sensor - Test
5019-3	Engine Exhaust Gas Recirculation Outlet Pressure : Voltage Above Normal	Engine Pressure Sensor Open or Short Circuit - Test
5019-4	Engine Exhaust Gas Recirculation Outlet Pressure : Voltage Below Normal	Engine Pressure Sensor Open or Short Circuit - Test
5019-13	Engine Exhaust Gas Recirculation Outlet Pressure : Calibration Required	Sensor Calibration Required - Test
5019-21	Engine Exhaust Gas Recirculation Outlet Pressure : Data Drifted Low	5 V Sensor Supply Circuit - Test
5246-0	Aftertreatment SCR Operator Inducement Severity : High - most severe (3)	This code is a Level 3 inducement associated with an emission activated fault. The Emissions System Malfunction lamp is on, the Action lamp is flashing, and the warning horn may sound. The engine is derated. The engine may stop. SCR Warning System Problem
5246-15	Aftertreatment SCR Operator Inducement Severity : High - least severe (1)	This code is a Level 1 inducement associated with an emission activated fault. The Emissions System Malfunction Lamp is on. SCR Warning System Problem
5246-16	Aftertreatment SCR Operator Inducement Severity : High - moderate severity (2)	This code is a Level 2 inducement associated with an emission activated fault. The Emissions System Malfunction Lamp is on and the Action Lamp is flashing. The engine is derated. SCR Warning System Problem
5298-17	Aftertreatment #1 Diesel Oxidation Catalyst Conversion Efficiency : Low-least severe (1)	ECM detects that the OOC outlet temperature is below the acceptable range during HC dosing. The code is logged. Diesel Oxidation Catalyst Has Low Conversion Efficiency
5392-31	Aftertreatment Diesel Exhaust Fluid Dosing Unit Loss of Prime	The Electronic Control Module (ECM) detects one of the following conditions: DEF system pressure was not within the acceptable limits during priming. DEF system pressure deviated from the acceptable limits after the system had successfully primed. DEF/AdBlue® Pressure Is Low

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
5571-0	High Pressure Common Rail Fuel Pressure Relief Valve : High - most severe (3)	3509-XX or 262-XX codes are not active. 3510-XX or 2131-XX codes are not active. The pressure limiting valve in the fuel rail is open. This code is a calculated parameter. The code is logged. Fuel Rail Pressure Problem
5576-2	Aftertreatment #1 Identification Number Module : Erratic, Intermittent or incorrect	The Electronic Control Module (ECM) detects the following conditions: The installed Clean Emissions Module (CEM) is not a certified match with the engine. There are no other active diagnostic codes for the aftertreatment identification module. There are no active 5V supply diagnostic codes. The ECM has been powered for 2 seconds. "This is a violation of the emissions regulations, and may result in severe fines and/or legal action if not corrected immediately." Do not operate the engine with the active fault. Engine power is derated. Diesel Particulate Filter Identification Signal - Test
5576-8	Aftertreatment #1 Identification Number Module : Abnormal Frequency, Pulse Width, or Period	The ECM detects the following conditions: No signal is detected from the aftertreatment identification module. There are no active 5 V supply diagnostic codes. The ECM has been powered for 2 seconds. Do not continue to operate the engine with the active fault. Engine power is derated. Diesel Particulate Filter Identification Signal - Test
5576-14	Aftertreatment #1 Identification Number Module : Special Instruction	The data received from the aftertreatment ID module is not in the correct format. The code is logged. Diesel Particulate Filter Identification Signal - Test
5625-3	Exhaust Back Pressure Regulator Position : Voltage Above Normal	The ECM detects the following conditions: The signal voltage from the position sensor on the exhaust back pressure regulator is greater than 4.8 VDC for 0.1 seconds. The warning lamp will come on. The ECM will log the diagnostic code. The engine exhaust back pressure regulator will be fully open while the code is active. The engine will be derated. Valve Position Sensor - Test
5625-4	Exhaust Back Pressure Regulator Position : Voltage Below Normal	The ECM detects the following conditions: The signal voltage from the position sensor on the exhaust back pressure regulator is less than 0.2 VDC for 0.1 seconds. The warning lamp will come on. The ECM will log the diagnostic code. The exhaust back pressure regulator will be fully open while the code is active. The engine will be derated. Valve Position Sensor - Test

※ Some fault codes are not applied to this machine.



J1939 Code	Description	Effect and Action
5629-31	Particulate Trap Active Regeneration Inhibited Due To Low Exhaust Gas Pressure - least severe (1)	Diesel Particulate Filter Collects Excessive Soot
5706-5	Aftertreatment #1 Diesel Exhaust Fluid Pump Heater : Current Below Normal	This code indicates low current to the DEF pump motor. The code is logged. DEF/AdBlue® Pump - Test
5706-6	Aftertreatment #1 Diesel Exhaust Fluid Pump Heater : Current Above Normal	This code indicates low current to the DEF pump motor. The code is logged. DEF/AdBlue® Pump - Test
5758-11	Aftertreatment #1 Intake Gas Sensor Power Supply : Other Failure Mode	The ECM detects voltage that is outside the acceptable value. Electrical Power Supply - Test
5759-11	Aftertreatment #1 Outlet Gas Sensor Power Supply : Other Failure Mode	The ECM detects voltage that is outside the acceptable value. Electrical Power Supply - Test
5965-5	Aftertreatment #1 DEF/AdBlue® Control Module Relay Control : Current Below Normal	The Electronic Control Module (ECM) detects a low current condition in the aftertreatment power relay circuit. Relay - Test (Aftertreatment Power Relay)
5965-6	Aftertreatment #1 DEF/AdBlue® Control Module Relay Control : Current Above Normal	The ECM detects a high current condition in the aftertreatment power relay circuit. Relay - Test (Aftertreatment Power Relay)
5966-5	Aftertreatment #1 DEF/AdBlue® Control Module Power Supply : Current Below Normal	A low current condition has been detected on the start switch circuit between the engine ECM and the DCU. DEF/AdBlue® Control Module Power - Test
5966-6	Aftertreatment #1 DEF/AdBlue® Control Module Power Supply : Current Above Normal	A high current condition has been detected on the start switch circuit between the engine ECM and the DCU. DEF/AdBlue® Control Module Power - Test
6309-5	Aftertreatment #1 Diesel Exhaust Fluid Control Module Power Supply 2 : Current Below Normal	A low current condition has been detected on the start switch circuit between the engine ECM and the DCU. DEF/AdBlue® Control Module Power - Test
6309-6	Aftertreatment #1 Diesel Exhaust Fluid Control Module Power Supply 2 : Current Above Normal	A high current condition has been detected on the start switch circuit between the engine ECM and the DCU. DEF/AdBlue® Control Module Power - Test
7441-3	Aftertreatment Ambient Air Temperature : Voltage Above Normal	The ECM detects the following conditions: The signal voltage from the aftertreatment ambient air temperature sensor is greater than 4.95 VDC for more than 8 seconds. An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes "Voltage Above Normal" will be displayed next to the status for "Aftertreatment Ambient Air Temperature" on the electronic service tool. Sensor Signal (Analog, Passive) - Test

※ Some fault codes are not applied to this machine.

J1939 Code	Description	Effect and Action
7441-4	Aftertreatment Ambient Air Temperature : Voltage Below Normal	<p>The ECM detects the following conditions:  The signal voltage from the aftertreatment ambient air temperature sensor is less than 0.2 VDC for more than 8 seconds.</p> <p>An active diagnostic code will be generated after 8 seconds. The diagnostic code will be logged if the engine has been operating for more than 7 minutes "Voltage Below Normal" will be displayed next to the status for "Aftertreatment Ambient Air Temperature" on the electronic service tool.</p> <p>Sensor Signal (Analog, Passive) - Test</p>

※ Some fault codes are not applied to this machine.

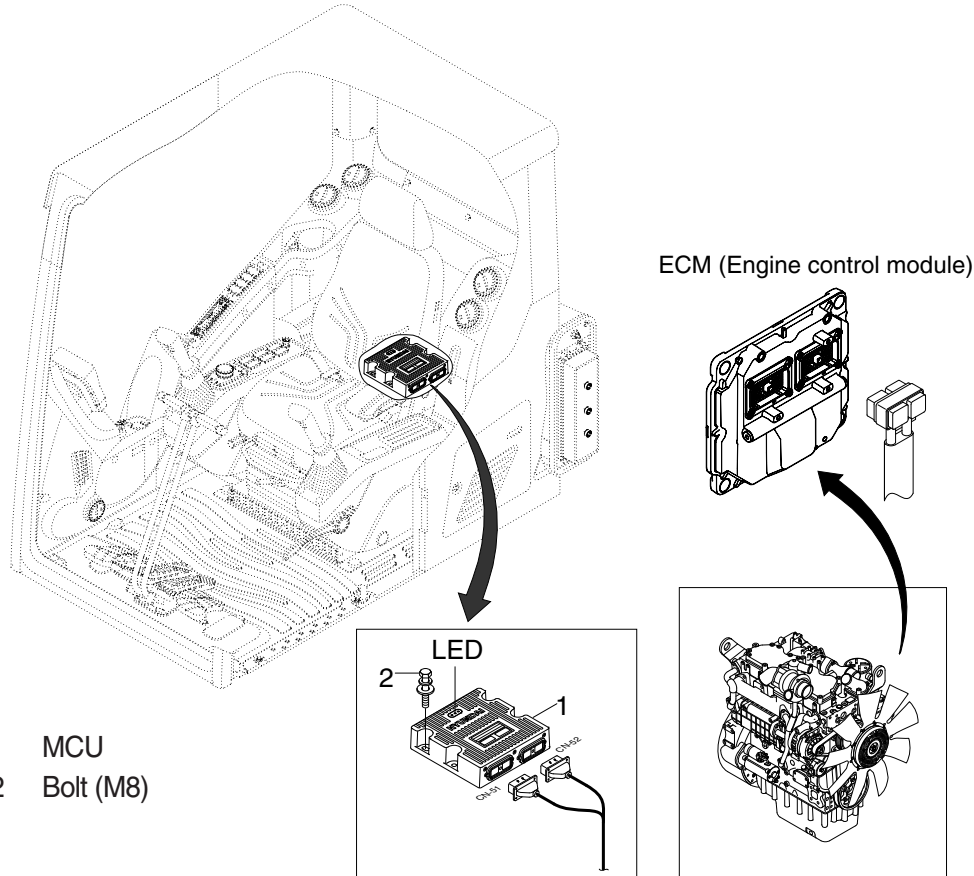
## 5. AAVM FAULT CODE

Fault Code	Description
A01	AAVM Communication Error -AAVM
A02	AAVM Communication Error -Front Camera
A03	AAVM Communication Error -Rear Camera
A04	AAVM Communication Error -Left Camera
A05	AAVM Communication Error -Right Camera
A06	Manual Setting Fail
A07	No MCU CID
A08	MCU CID Format Error
A09	AAVM Hardware Error -AAVM
A10	AAVM Hardware Error -Front Camera
A11	AAVM Hardware Error -Rear Camera
A12	AAVM Hardware Error -Left Camera
A13	AAVM Hardware Error -Right Camera
A14	MCU CID Model is not registered
A15	MCU CID Model can't be applied

## GROUP 14 ENGINE CONTROL SYSTEM

(SERIAL NO. : -#0610)

### 1. MCU and ENGINE ECM



140L5MS52

### 2. MCU ASSEMBLY

1) To match the pump absorption torque with the engine torque, MCU varies EPPR valve output pressure, which control pump discharge amount whenever feedbacked engine speed drops under the reference rpm of each mode set.

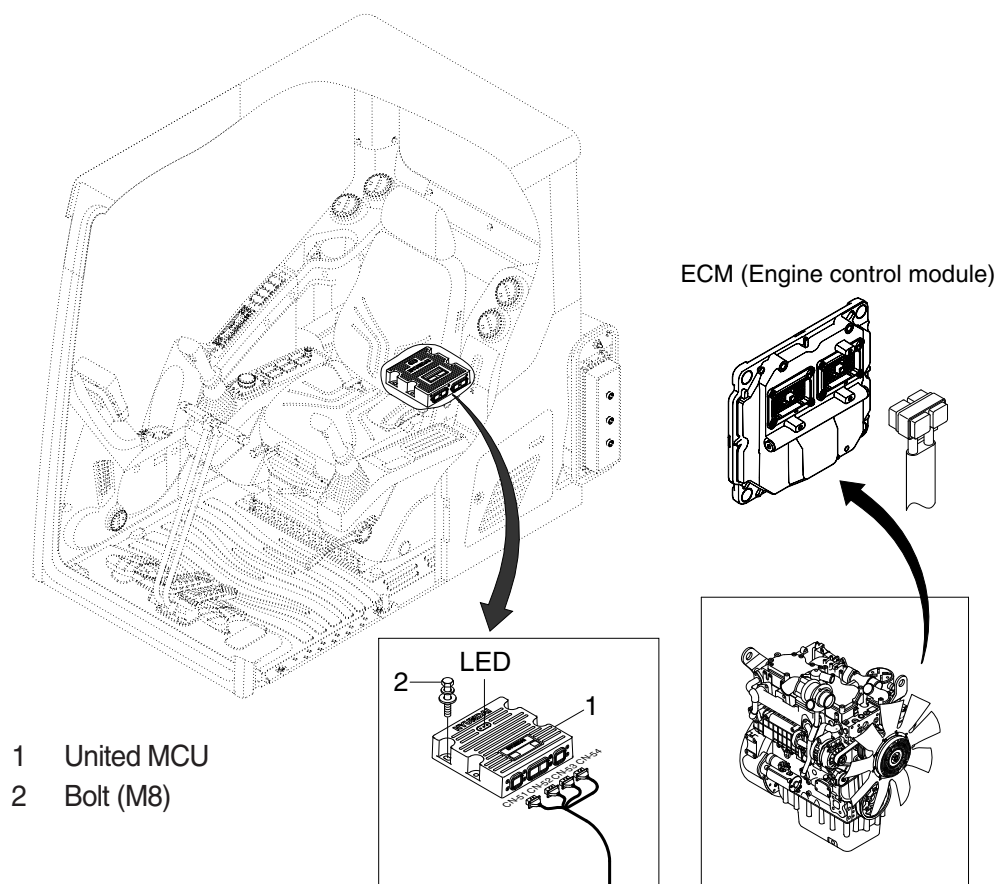
2) Three LED lamps on the MCU display as below.

LED lamp	Trouble	Service
G is turned ON	Normal	-
G and R are turned ON	Trouble on MCU	· Change the MCU
G and Y are turned ON	Trouble on serial communication line	· Check if serial communication lines between MCU and cluster are disconnected
Three LED are turned OFF	Trouble on MCU power	· Check if the input power wire (24 V, GND) of MCU is disconnected · Check the fuse

G : green, R : red, Y : yellow

(SERIAL NO. : #0611-)

## 1. UNITED MCU and ENGINE ECM



140L5MS152

## 2. UNITED MCU ASSEMBLY

- 1) To match the pump absorption torque with the engine torque, united MCU varies EPPR valve output pressure, which control pump discharge amount whenever feedbacked engine speed drops under the reference rpm of each mode set.
- 2) Three LED lamps on the united MCU display as below.

LED lamp	Trouble	Service
G is turned ON	Normal	-
G and R are turned ON	Trouble on united MCU	· Change the united MCU
G and Y are turned ON	Trouble on serial communication line	· Check if serial communication lines between united MCU and cluster are disconnected
Three LED are turned OFF	Trouble on united MCU power	· Check if the input power wire (24 V, GND) of united MCU is disconnected · Check the fuse

G : green, R : red, Y : yellow

## GROUP 15 EPPR VALVE

### 1. PUMP EPPR VALVE

#### 1) COMPOSITION

EPPR (Electro Proportional Pressure Reducing) valve consists of electro magnet and spool valve installed at main pump.

##### (1) Electro magnet valve

Receive electric current from MCU and move the spool proportionally according to the specific amount of electric current value.

##### (2) Spool valve

Is the two way direction control valve for pilot pressure to reduce main pump flow.

When the electro magnet valve is activated, pilot pressure enters into flow regulator of main pump.

##### (3) Pressure and electric current value for each mode

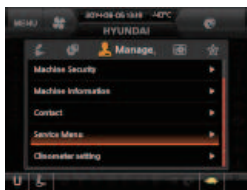
Mode		Pressure		Electric current (mA)	Engine rpm (at accel dial 10)
		kgf/cm <sup>2</sup>	psi		
Standard	P	10	142	330 ± 30	1850 ± 50
	S	13 ± 3	189 ± 40	365 ± 30	1750 ± 50
	E	15 ± 3	218 ± 40	400 ± 30	1650 ± 50
Option	P	0	0	160 ± 30	2100 ± 50
	S	5 ± 3	73 ± 40	250 ± 30	2000 ± 50
	E	10 ± 3	142 ± 40	330 ± 30	1750 ± 50

### 2) HOW TO SWITCH THE POWER SHIFT (STANDARD ↔ OPTION) ON THE CLUSTER

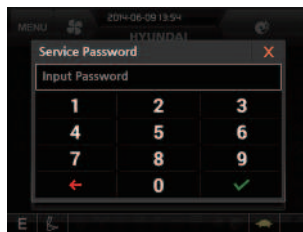
You can switch the EPPR valve pressure set by selecting the power shift (standard ↔ option).

#### Management

##### Service menu



290F3CD149

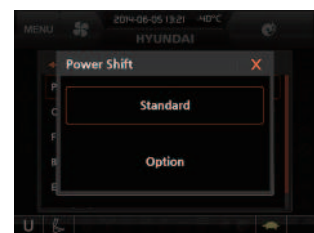


Enter the password

290F3CD126



290F3CD150

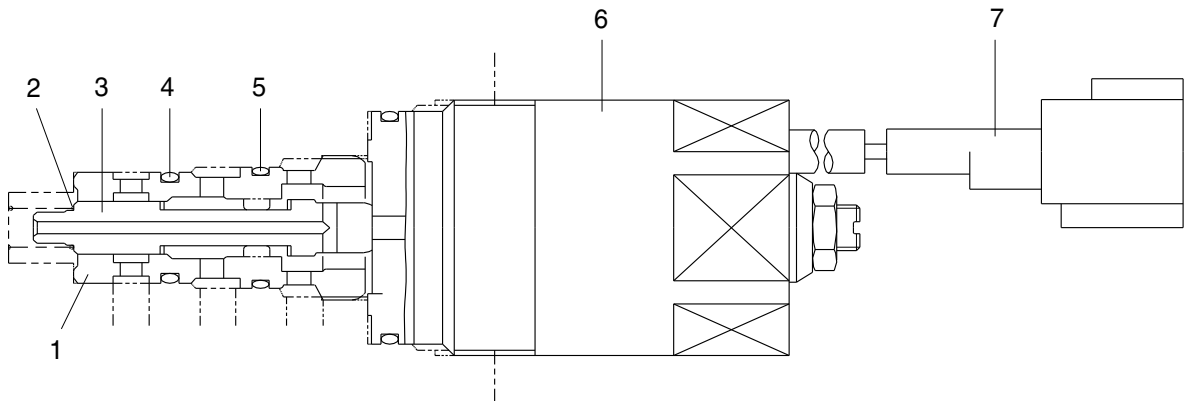


290F3CD151

- Power shift (standard/option) : Power shift pressure can be set by option menu.

### 3) OPERATING PRINCIPLE (pump EPPR valve)

#### (1) Structure

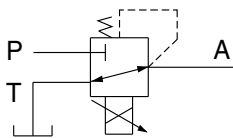


5-22(1)

- 1 Sleeve
- 2 Spring
- 3 Spool

- 4 O-ring
- 5 O-ring

- 6 Solenoid valve
- 7 Connector



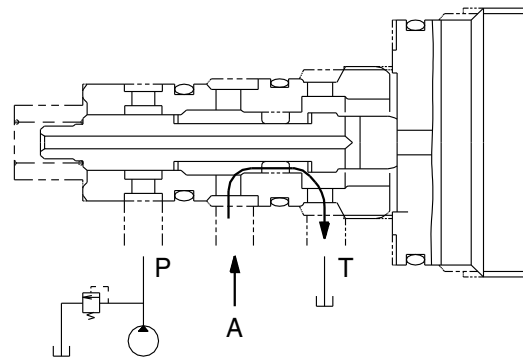
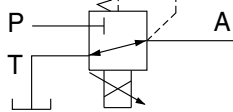
P Pilot oil supply line (pilot pressure)

T Return to tank

A Secondary pressure to flow regulator at main pump

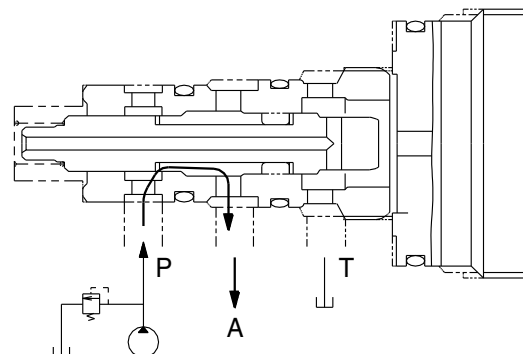
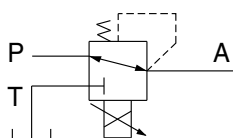
#### (2) Neutral

Pressure line is blocked and A oil returns to tank.



#### (3) Operating

Secondary pressure enters into A.

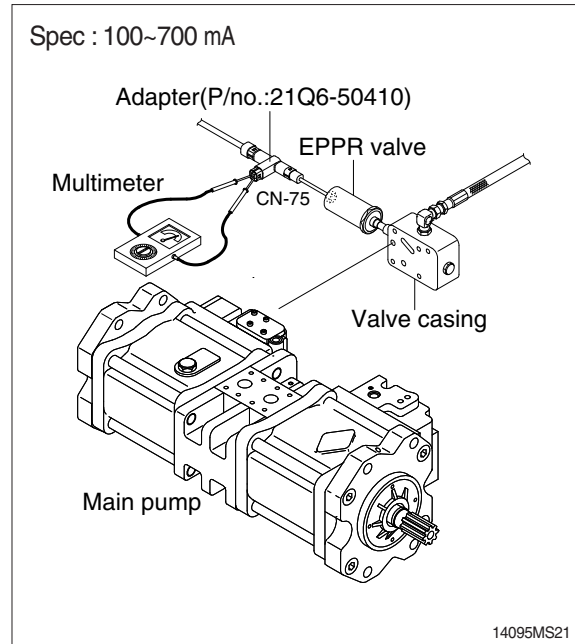


5-22(2)

#### 4) EPPR VALVE CHECK PROCEDURE

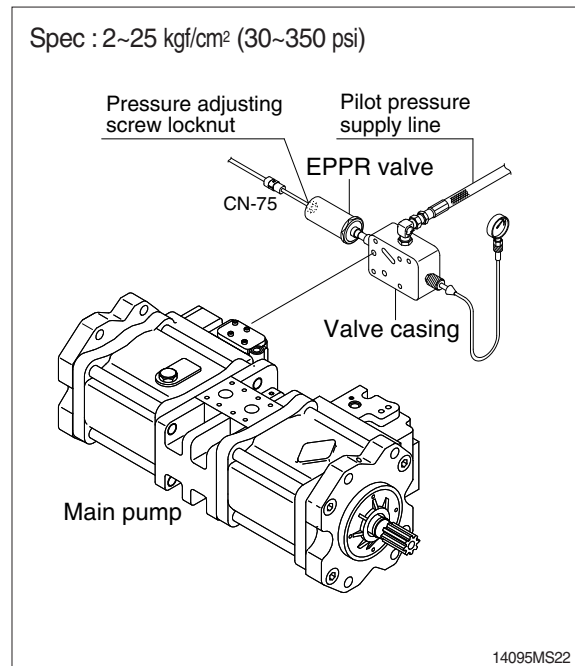
##### (1) Check electric current value at EPPR valve

- ① Disconnect connector CN-75 from EPPR valve.
- ② Insert the adapter to CN-75 and install multimeter as figure.
- ③ Start engine.
- ④ Set S-mode and cancel auto decel mode.  
Position the multimodal dial at 10.
- ⑤ If rpm display show approx  $1750 \pm 50$  rpm
- ⑥ check electric current at bucket circuit relief position.  
Check electric current at bucket circuit
- ⑦ relief position.



##### (2) Check pressure at EPPR valve

- ① Remove plug and connect pressure gauge as figure.  
· Gauge capacity : 0 to 50 kgf/cm<sup>2</sup>  
(0 to 725 psi)
- ② Start engine.
- ③ Set S-mode and cancel auto decel mode.
- ④ Position the multimodal dial at 10.
- ⑤ If tachometer show approx  $1750 \pm 50$  rpm check pressure at relief position of bucket circuit by operating bucket control lever.
- ⑥ If pressure is not correct, adjust it.
- ⑦ After adjust, test the machine.





## 2. BOOM PRIORITY EPPR VALVE

### 1) COMPOSITION

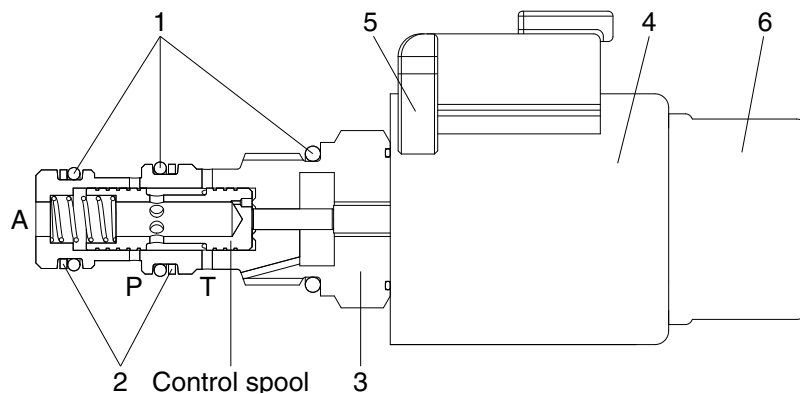
The boom priority EPPR valve is built in a manifold and mainly consisting of valve body and coil. This EPPR valve installed under the solenoid valve.

### 2) CONTROL

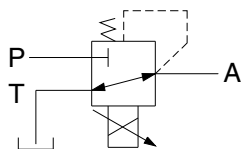
The boom priority EPPR valve has to be controlled by a specific electronic amplifier card, which is supplying the coil with a current 580 mA at 30Ω and 24 V.

### 3) OPERATING PRINCIPLE

#### (1) Structure



21095MS14



P : Pilot supply line  
T : Return to tank  
A : Secondary pressure to flow MCV

- |   |              |   |            |   |           |
|---|--------------|---|------------|---|-----------|
| 1 | O-ring       | 3 | Valve body | 5 | Connector |
| 2 | Support ring | 4 | Coil       | 6 | Cover cap |

#### (2) Operation

In de-energized mode the inlet port (P) is closed and the outlet port (A) is connected to tank port (T).

In energized mode the solenoid armature presses onto the control spool with a force corresponding to the amount of current. This will set a reduced pressure at port A. The setting is proportional to the amount of current applied.

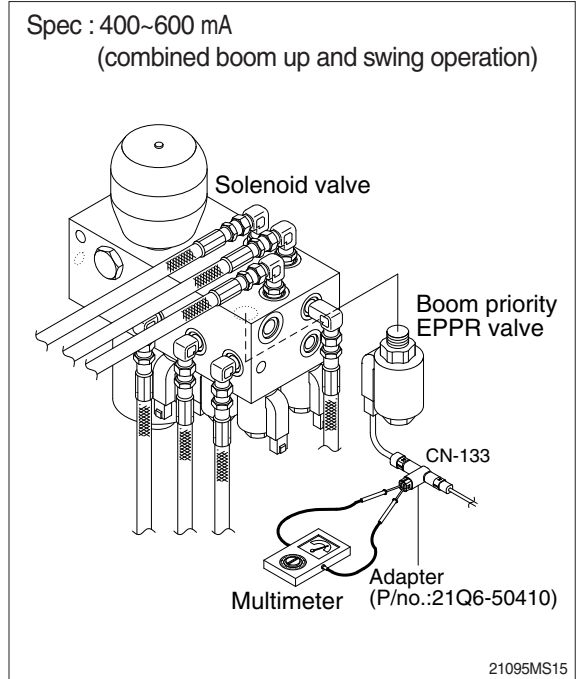
#### (3) Maximum pressure relief

If a pressure from outside is applied on port A the valve may directly switch to tank port (T) and protect the system before overload.

## 2) EPPR VALVE CHECK PROCEDURE

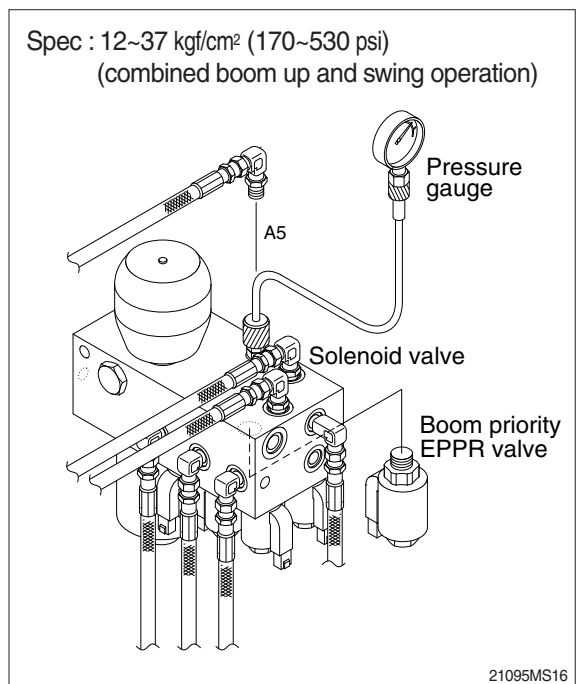
### (1) Check electric current value at EPPR valve

- ① Disconnect connector CN-133 from EPPR valve.
- ② Insert the adapter to CN-133 and install multimeter as figure.
- ③ Start engine.
- ④ Set S-mode and cancel auto decel mode.
- ⑤ If rpm display approx  $1750 \pm 50$  rpm disconnect one wire harness from EPPR valve.
- ⑥ Check electric current in case of combined boom up and swing operation.



### (2) Check pressure at EPPR valve

- ① Remove hose from A5 port and connect pressure gauge as figure.
  - Gauge capacity : 0 to 50 kgf/cm<sup>2</sup>  
(0 to 725 psi)
- ② Start engine.
- ③ Set S-mode and cancel auto decel mode.
- ④ If rpm display approx  $1750 \pm 50$  rpm check pressure (In case of combined boom up and swing operation).
- ⑤ If pressure is not correct, adjust it.
- ⑥ After adjust, test the machine.



## 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



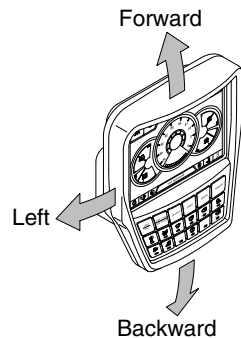
220F3CD01

※ The warning lamp pops up and/or blinks and the buzzer sounds when the machine has a problem.

The warning lamp blinks until the problem is cleared. Refer to page 5-65 for details.

※ This cluster is adjustable.

- Vertical (forward/backward) : each 15°
- Horizontal (left only) : 8°



290F3CD47

## 2) CLUSTER CHECK PROCEDURE

### (1) Start key : ON

#### ① Check monitor

- a. Buzzer sounding for 4 seconds with HYUNDAI logo on cluster.
- ※ If the ESL mode is set to the enable, enter the password to start engine.

#### ② After initialization of cluster, the operating screen is displayed on the LCD.

Also, self diagnostic function is carried out.

- a. Engine rpm display : 0 rpm
- b. Engine coolant temperature gauge : White range
- c. Hydraulic oil temperature gauge : White range
- d. Fuel level gauge : White range

#### ③ Indicating lamp state

- a. Power mode pilot lamp : E mode or U mode
- b. Work mode pilot lamp : General operation mode (bucket)
- c. Travel speed pilot lamp : Low (turtle)

### (2) Start of engine

#### ① Check machine condition

- a. RPM display 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 : E mode or U mode
- e. Travel speed pilot lamp : Low (turtle)

#### ② When warming up operation

- a. Warming up pilot lamp : ON
- b. After engine started, engine speed increases to 1100 rpm.
- ※ Others same as above.

#### ③ When abnormal condition

- a. The warning lamp lights up and the buzzer sounds.
- b. If BUZZER STOP switch is pressed, buzzer sound is canceled but the lamp warning lights up until normal condition.
- ※ The pop-up warning lamp moves to the original position and blink when the buzzer stop switch is pushed. Also the buzzer stops.

### 3. CLUSTER CONNECTOR (SERIAL NO. : -#0610)

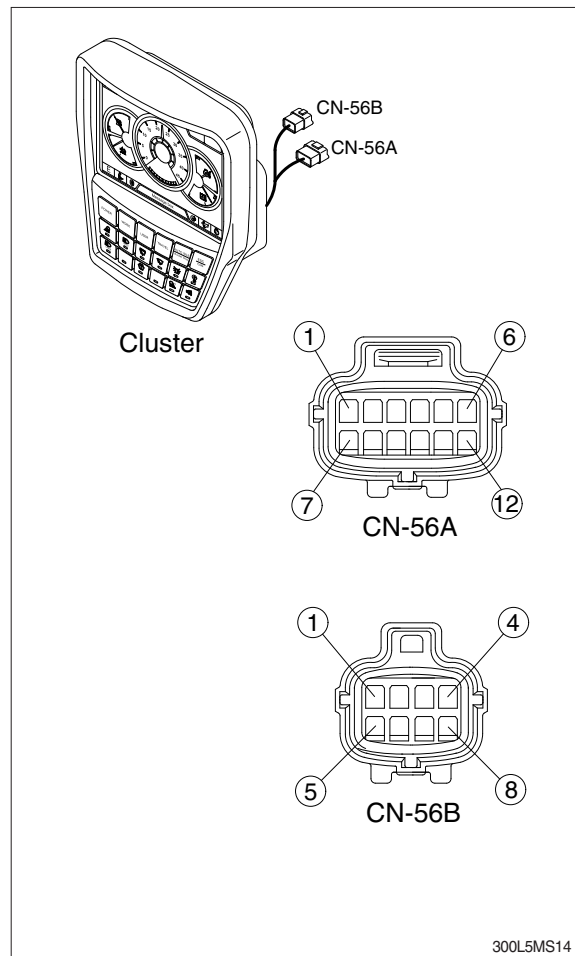
#### 1) CN-56A

No.	Name	Signal
1	Battery 24V	20~32V
2	Power IG (24V)	20~32V
3	GND	-
4	CAN 1 (H)	0~5V
5	CAN 1 (L)	0~5V
6	CAN 2 (H)	20~32V
7	CAN 2 (L)	20~32V
8	RS-232 (RX)	±15V
9	RS-232 (TX)	±15V
10	Aux left	0~5V
11	Aux right	0~5V
12	Aux GND	-

#### 2) CN-56B

No.	Name	Signal
1	CAM 6.5V	6.3~6.7V
2	CAM GND	-
3	CAM DIFF (H)	0~5V
4	CAM DIFF (L)	0~5V
5	CAM 1	NTSC signal
6	CAM 2	NTSC signal
7	CAM 3	NTSC signal
8	CAM shield	-

NTSC : National Television System Committee



300L5MS14

## CLUSTER CONNECTOR (SERIAL NO. : #0611-)

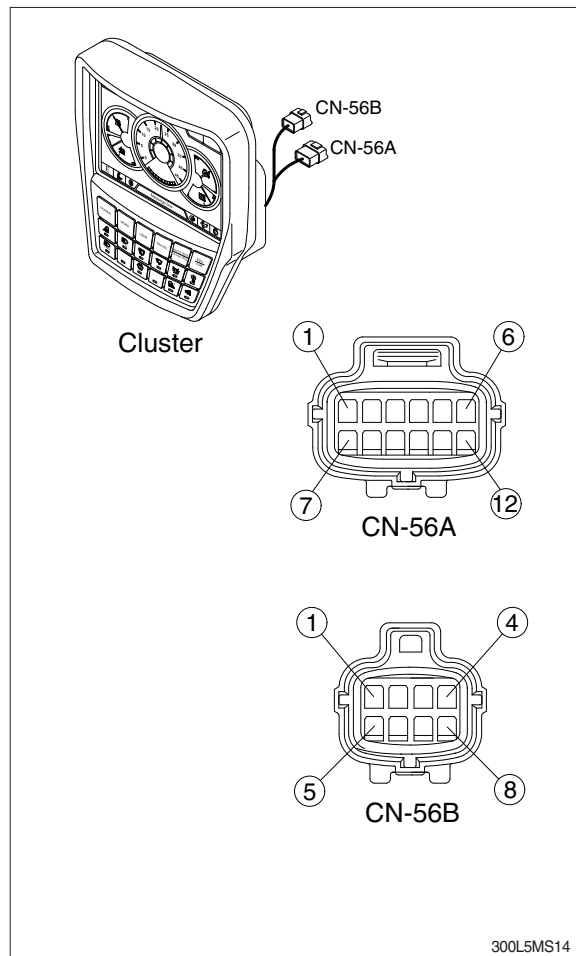
### 1) CN-56A

No.	Name	Signal
1	Battery 24V	20~32V
2	Power IG (24V)	20~32V
3	GND	-
4	CAN 1 (H)	0~5V
5	CAN 1 (L)	0~5V
6	CAN 2 (H)	0~5V
7	CAN 2 (L)	20~32V
8	NC	-
9	NC	-
10	Aux left	0~5V
11	Aux right	0~5V
12	Aux GND	-

### 2) CN-56B

No.	Name	Signal
1	CAM 6.5V	6.3~6.7V
2	CAM GND	-
3	CAM DIFF (H)	0~5V
4	CAM DIFF (L)	0~5V
5	CAM 1	NTSC signal
6	CAM 2	NTSC signal
7	CAM 3	NTSC signal
8	CAM shield	0~5V

NTSC : National Television System Committee

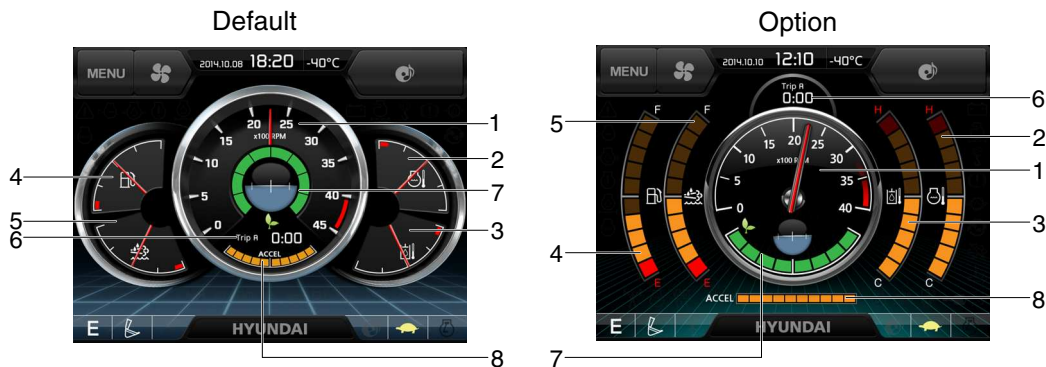


300L5MS14

## 2) GAUGE

### (1) Operation screen

When you first turn starting switch ON, the operation screen will appear.



290F3CD51

- |                                    |                           |
|------------------------------------|---------------------------|
| 1 RPM / Speed gauge                | 5 DEF/AdBlue® level gauge |
| 2 Engine coolant temperature gauge | 6 Tripmeter display       |
| 3 Hydraulic oil temperature gauge  | 7 Eco guage               |
| 4 Fuel level gauge                 | 8 Accel dial gauge        |

※ Operation screen type can be set by the screen type menu of the display.  
Refer to page 5-86 for details.

### (2) RPM / Speed gauge



290F3CD49

① This display the engine speed.


### (3) Engine coolant temperature gauge




290F3CD53

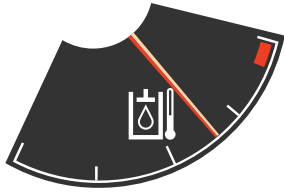
① This gauge indicates the temperature of coolant.

- White range : 40-107°C (104-225°F)
- Red range : Above 107°C (225°F)



② If the indicator is in the red range or  lamp pops up and the buzzer sounds turn OFF the engine and check the engine cooling system.

※ If the gauge indicates the red range or  lamp blinks in red 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.

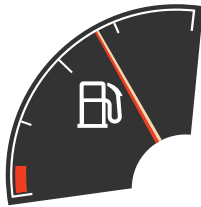
#### (4) Hydraulic oil temperature gauge





290F3CD54

- ① This gauge indicates the temperature of hydraulic oil.
    - White range : 40-105°C(104-221°F)
    - Red range : Above 105°C(221°F)
  - ② If the indicator is in the red range or  lamp pops up and the buzzer sounds reduce the load on the system. If the gauge stays in the red range, stop the machine and check the cause of the problem.
- ※ If the gauge indicates the red range or  lamp blinks in red 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.

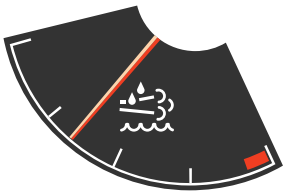
#### (5) Fuel level gauge





290F3CD55

- ① This gauge indicates the amount of fuel in the fuel tank.
  - ② Fill the fuel when the red range, or  lamp pops up and the buzzer sounds.
- ※ If the gauge indicates the red range or  lamp blinks in red 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.

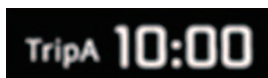
#### (6) DEF/AdBlue® Level gauge



290F3CD57

- ① This gauge indicates the amount of liquid in the DEF/AdBlue® tank.
  - ② Fill the DEF/AdBlue® when the red range, or  lamp pops up and the buzzer sounds.
  - ③ Do not pour DEF/AdBlue® any more when the DEF/AdBlue® fill up warning lamp lights ON.
- ※ Refer to page 5-70.
- ※ If the gauge indicates the red range or  lamp blinks in red 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.

#### (7) Tripmeter display



290F3CD56

- ① This displays the engine the tripmeter.
- ※ Refer to page 5-88 for details.



### (8) Eco gauge



290F3CD58

- ① This gauge indicates the fuel consumption rate and machine load status. So that operators can be careful with fuel economy.
- ② The fuel consumption rate or machine load is higher, the number of segment is increased.
- ③ The color of Eco gauge indicates operation status.
  - White : Idle operation
  - Green : Economy operation
  - Yellow : Non-economy operation at a medium level.
  - Red : Non-economy operation at a high level.

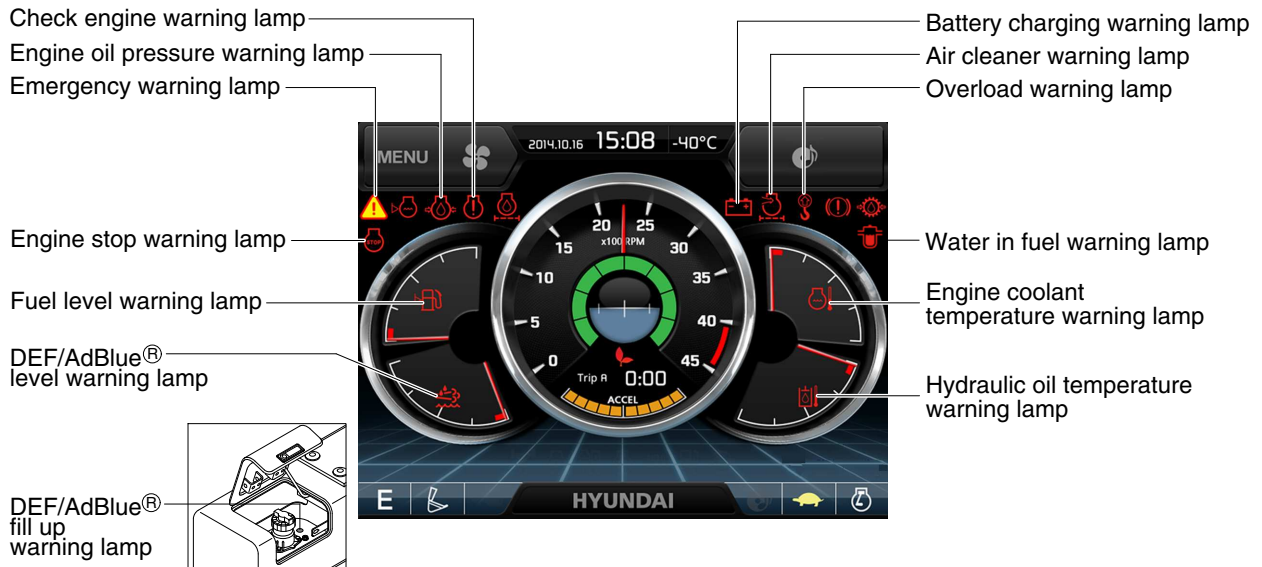
### (9) Accel dial gauge



290F3CD59






- ① This gauge indicates the level of accel dial.

### 3) WARNING LAMPS



140L3CD60

#### ※ Warning lamps and buzzer








Warnings	When error happened	Lamps and buzzer
All warning lamps except below	Warning lamp pops up on the center of the LCD and the buzzer sounds	<ul style="list-style-type: none"> <li>The pop-up warning lamp moves to the original position and blinks, and the buzzer stops when ;</li> <li>- the buzzer stop switch  is pushed</li> <li>- the knob of the haptic controller is pushed</li> <li>- the lamp of the LCD is touched</li> </ul>
	Warning lamp pops up on the center of the LCD and the buzzer sounds	<ul style="list-style-type: none"> <li>The pop-up warning lamp moves to the original position and light ON, and the buzzer stops when ;</li> <li>- the buzzer stop switch  is pushed</li> <li>- the knob of the haptic controller is pushed</li> <li>- the lamp of the LCD is touched</li> </ul> <p>※ Refer to operator's manual page 3-11 for details.</p>
 	Warning lamp pops up on the center of the LCD and the buzzer sounds	<p>※ Refer to operator's manual page 3-7 for details.</p>

※ Refer to page 5-75 for the buzzer stop switch  and operator's manual page 3-57 for the haptic controller.

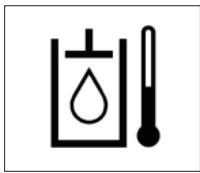
### (1) Engine coolant temperature warning lamp










290F3CD61

- ① Engine coolant temperature warning is indicated two steps.
  - 103°C over : The  lamp pops up and the buzzer sounds.
  - 107°C over : The  lamp pops up and the buzzer sounds.
- ② The pop-up ,  lamps move to the original position and blinks when the buzzer stop switch  is pushed. And the buzzer stops and ,  lamps keep blink.
- ③ Check the cooling system when the lamps keep blink.

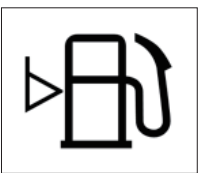
### (2) Hydraulic oil temperature warning lamp



290F3CD62

- ① Hydraulic oil temperature warning is indicated two steps.
  - 100°C over : The  lamp pops up and the buzzer sounds.
  - 105°C over : The  lamp pops up and the buzzer sounds.
- ② The pop-up ,  lamps move to the original position and blinks when the buzzer stop switch  is pushed. And the buzzer stops and ,  lamps keep blink.
- ③ Check the hydraulic oil level and hydraulic oil cooling system.

### (3) Fuel level warning lamp




290F3CD63

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

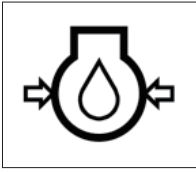
### (4) Emergency warning lamp



290F3CD64

- ① This warning lamp pops up and the buzzer sounds when each of the below warnings is happened.
  - Engine coolant overheating (over 107°C)
  - Hydraulic oil overheating (over 105°C)
  - MCU input voltage abnormal
  - Cluster communication data error
  - Engine ECM communication data error
- ※ The pop-up warning lamp moves to the original position and blinks when the buzzer stop switch  is pushed. And the buzzer stops.
- ② When this warning lamp blinks, machine must be checked and serviced immediately.

#### (5) Engine oil pressure warning lamp



290F3CD65

- ① This warning lamp pops up and the buzzer sounds when the engine oil pressure is low.
- ② If the lamp blinks, shut OFF the engine immediately. Check oil level.

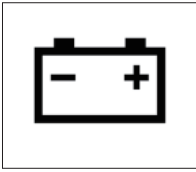
#### (6) Check engine warning lamp



290F3CD66

- ① This warning lamp pops up and the buzzer sounds when the communication between MCU and engine ECM on the engine is abnormal, or if the cluster received specific fault code from engine ECM.
- ② Check the communication line between them.  
If the communication line is OK, then check the fault codes on the cluster.

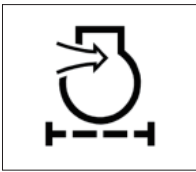
### (7) Battery charging warning lamp



290F3CD67

- ① This warning lamp pops up and the buzzer sounds when the battery charging voltage is low.
- ② Check the battery charging circuit when this lamp blinks.

### (8) Air cleaner warning lamp



290F3CD68

- ① This warning lamp pops up and the buzzer sounds when the filter of air cleaner is clogged.
- ② Check the filter and clean or replace it.

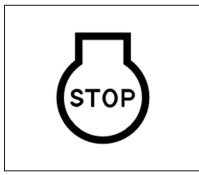
### (9) Overload warning lamp (opt)



290F3CD69

- ① When the machine is overload, the overload warning lamp pops up and the buzzer sounds during the overload switch is ON. (if equipped)
- ② Reduce the machine load.

#### (10) Engine stop warning lamp



290F3CD252

① This warning lamp pops up and the buzzer sounds when 30 minutes elapsed with empty condition of the DEF/AdBlue® tank, stop the engine immediately and check the DEF/AdBlue® tank.

② Fill the DEF/AdBlue® immediately in the DEF/AdBlue® tank.

※ Refer to page 5-70.

#### (11) Water in fuel warning lamp



210WF3CD02

① This warning lamp pops up and the buzzer sounds when the water separator is full of water or malfunctioning.

※ When this lamp blinks, stop the machine and spill water out of the separator.

## (12) DEF/AdBlue® level warning lamp



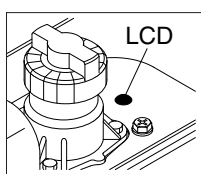
290F3CD257

① This warning lamp indicates when ON or blinking, that the DEF/AdBlue® level is low as table below.

※ It is recommended that the DEF/AdBlue® tank be filled completely full of the DEF/AdBlue® in order to correct any fault conditions.

Warning lamp			Description
DEF/AdBlue® level	Check engine	Stop engine	
On	Off	Off	<ul style="list-style-type: none"> <li>The DEF/AdBlue® level has fallen below the initial warning level (20%).</li> </ul>
On	Off	Off	<ul style="list-style-type: none"> <li>The DEF/AdBlue® level has fallen below the critical warning level (14%).</li> </ul>
On	On	Off	<ul style="list-style-type: none"> <li>The DEF/AdBlue® level has fallen below the initial derate warning level (8%).</li> <li>75% torque derate.</li> </ul>
On	On	On	<ul style="list-style-type: none"> <li>The DEF/AdBlue® level has fallen below the initial warning level (3.5%).</li> <li>5 minute control engine speed and then hold idle only.</li> </ul>

## (13) DEF/AdBlue® fill up warning lamp



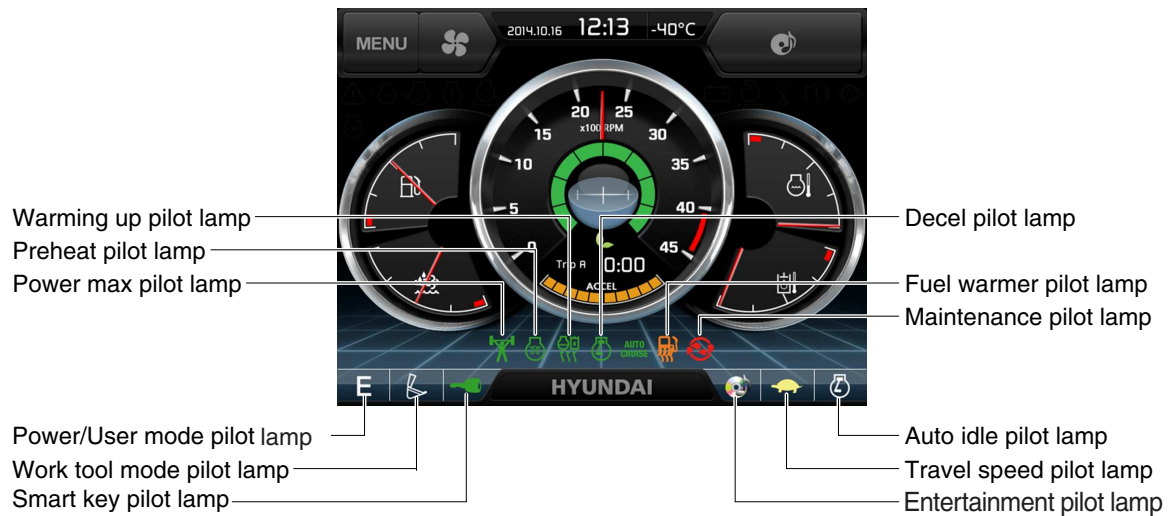
290F3CD272

① This lamp lights ON when the DEF/AdBlue® tank is completely filled with DEF/AdBlue®.

※ Fill the tank with the DEF/AdBlue® after start switch ON and then turn OFF the start switch.

※ Do not pour DEF/AdBlue® any more when this lamp lights ON. Otherwise DEF/AdBlue® tank may freeze and burst in winter season.

## 4) PILOT LAMPS

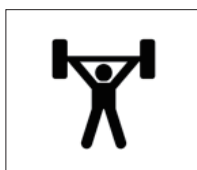


290F3CD74

### (1) Mode pilot lamps

No	Mode	Pilot lamp	Selected mode
1	Power mode		Heavy duty power work mode
			Standard power mode
			Economy power mode
2	User mode		User preferable power mode
3	Work tool mode		General operation - IPC speed mode
			General operation - IPC balance mode
			General operation - IPC efficiency mode
			Breaker operation mode
			Crusher operation mode
4	Travel mode		Low speed traveling
			High speed traveling
5	Auto idle mode		Auto idle

### (2) Power max pilot lamp



290F3CD78

- ① The lamp will be ON when pushing power max switch on the LH RCV lever.
  - ② The power max function is operated maximum 8 seconds.
- ※ Refer to the operator's manual page 3-38 for power max function.



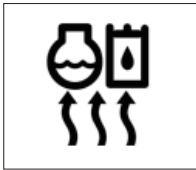
### (3) Preheat pilot lamp



290F3CD79

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

### (4) Warming up pilot lamp



290F3CD80

- 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 the engine.

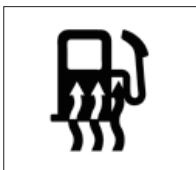
### (5) Decel pilot lamp



290F3CD81

- ① Operating one touch decel switch on the RCV lever makes the lamp ON.
  - ② Also, the lamp will be ON and engine speed will be lowered automatically to save fuel consumption when all levers and pedals are at neutral position, and the auto idle function is selected.
- ※ **One touch decel is not available when the auto idle pilot lamp is turned ON.**
- ※ **Refer to the operator's manual page 3-38.**

### (6) Fuel warmer pilot lamp



290F3CD82

- ① This lamp is turned ON when the coolant temperature is below 10°C (50°F) or the hydraulic oil temperature 20°C (68°F).
- ② The automatic fuel warming is cancelled when the engine coolant temperature is above 60°C, and the hydraulic oil temperature is above 45°C since the start switch was ON position.

### (7) Maintenance pilot lamp



290F3CD83

- ① This lamp will be ON when the consuming parts are needed to change or replace. It means that the change or replacement interval of the consuming parts remains below 30 hours.
  - ② Check the message in maintenance information of main menu. Also, this lamp lights ON for 3 minutes when the start switch is ON position.
- ※ **Refer to the page 5-82.**

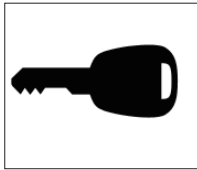
**(8) Entertainment pilot lamp**



290F3CD84

- ① This lamp is on when audio or video files are playing.
- ※ **Refer to the page 5-88.**

**(9) Smart key pilot lamp (opt)**



290F3CD214

- ① This lamp is ON when the engine is started by the start button.
- ② This lamp is red when the a authentication fails, green when succeeds.
- ※ **Refer to the page 5-83.**

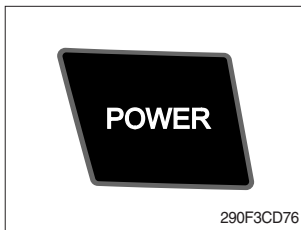
## 5) SWITCHES



290F3CD86

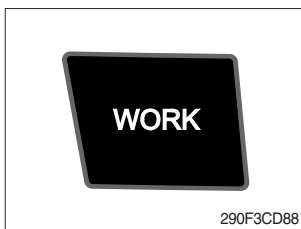
※ When some of the switches are selected, the pilot lamps are displayed on the LCD. Refer to the page 5-71 for details.




### (1) Power mode switch



- ① This switch is to select the machine power mode and selected power mode pilot lamp is displayed on the pilot lamp position.
  - P : Heavy duty power work.
  - S : Standard power work.
  - E : Economy power work.
- ② The pilot lamp changes E → S → P → E in order.

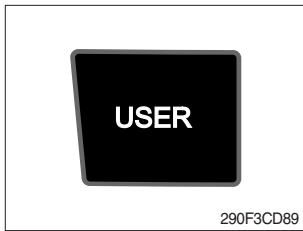
### (2) Work mode switch



- ① This switch is to select the machine work mode, which shifts from general operation mode to optional attachment operation mode.
  -  : General operation mode
  -  : Breaker operation mode (if equipped)
  -  : Crusher operation mode (if equipped)
  - Not installed : Breaker or crusher is not installed.

※ Refer to the operator's manual page 4-7 for details.



### (3) User mode switch



- ① This switch is used to memorize the current machine operating status in the MCU and activate the memorized user mode.
  - Memory : Automatically saved after key OFF.
  - Action : Push this switch.
  - Cancel : Push this switch once more.
- ② Refer to the page 5-79 for another set of user mode.

### (4) Travel speed switch



- ① This switch is used to select the travel speed alternatively.
    -  : Low speed
    -  : High speed
- ※ Do not change the setting of the travel speed switch. Machine stability may be adversely affected.
- ▲ Personal injury can result from sudden changes in machine stability.

### (5) Auto idle/ buzzer stop switch



- ① This switch is used to activate or cancel the auto idle function.
  - Pilot lamp ON : Auto idle function is activated.
  - Pilot lamp OFF : Auto idle function is cancelled.
- ② The buzzer sounds when the machine has a problem. In this case, push this switch and buzzer stops, but the warning lamp blinks until the problem is cleared.

### (6) Escape/Camera switch



- ① This switch is used to return to the previous menu or parent menu.
- ② In the operation screen, pushing this switch will display the view of the camera on the machine (if equipped). Please refer to page 5-88 for the camera.
- ③ If the camera is not installed, this switch is used only ESC function.

### (7) Work light switch



- ① This switch is used to operate the work light.
- ② The pilot lamp is turned ON when operating the switch.

### (8) Head light switch



- ① This switch is used to operate the head light.
- ② The pilot lamp is turned ON when operating the switch.

### (9) Intermittent wiper switch



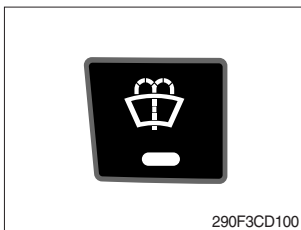
- ① This switch is used to wipe operates intermittently.
- ② The pilot lamp is turned ON when operating the switch.

### (10) Wiper switch



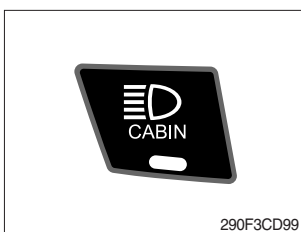
- ① This switch is used to operate the window wiper.
- ② Note that the wiper will self-park when switched off.
- ③ The pilot lamp is turned ON when operating the switch.
- ※ **If the wiper does not operate with the switch in ON position, turn the switch OFF immediately. Check the cause. If the switch remains ON, motor failure can result.**

### (11) Washer switch



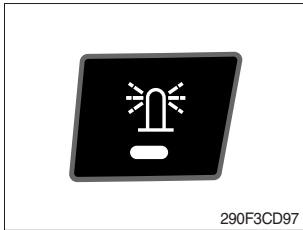
- ① The washer liquid is sprayed and the wiper is operated only while pressing this switch.
- ② The pilot lamp is turned ON when operating the switch.

### (12) Cab light switch



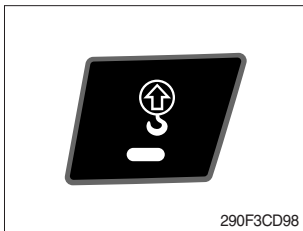
- ① This switch turns ON the cab light on the cab.
- ② The pilot lamp is turned ON when operating the switch.

### (13) Beacon switch



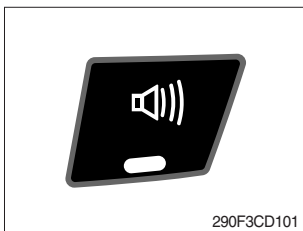
- ① This switch turns ON the rotary light on the cab.
- ② The pilot lamp is turned ON when operating the switch.

### (14) Overload switch



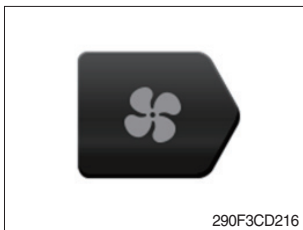
- ① When this switch turned ON, buzzer makes sound and overload warning lamp comes ON in case that the machine is overload.
  - ② When it turned OFF, buzzer stops and warning lamp goes out.
- ▲ Overloading the machine could impact the machines stability which could result in tipover hazard. A tipover hazard could result in serious injury or death. Always activate the overload warning device before you handle or lift objects.**

### (15) Travel alarm switch



- ① This switch is to activate travel alarm function surrounding when the machine travels.
  - ON : The travel alarm function is activated.
  - OFF : The travel alarm function is not activated.

### (16) Air conditioner quick touch switch



- ① This switch used to select air conditioner control mode.
- ※ Refer to the page 5-90.

### (17) Main menu quick touch switch



- ① This switch is to activate the main menu in the cluster.
- ※ Refer to the page 5-78.

### (18) Entertainment quick touch switch



- ① This switch is to activate the entertainment control menu in the cluster.
- ※ Refer to the page 5-87.

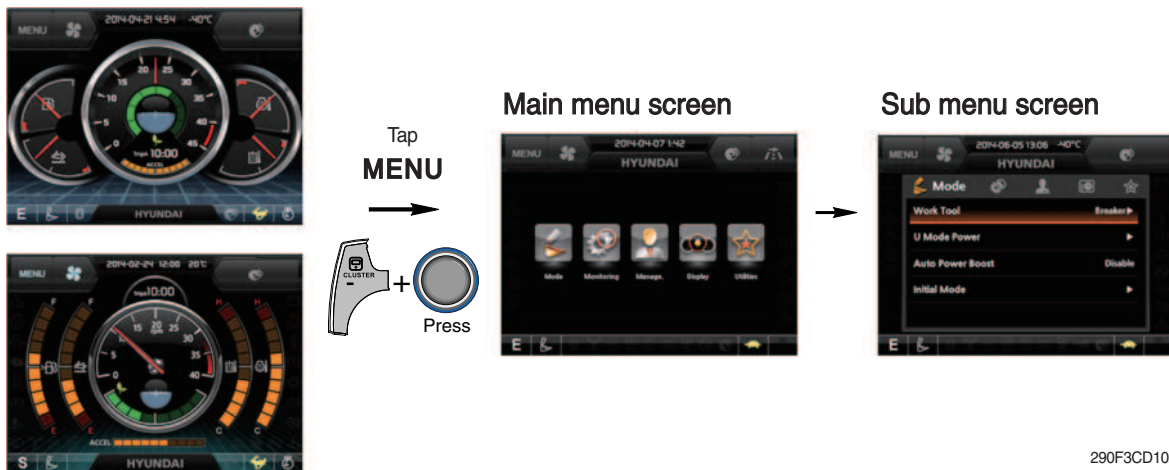
## 6) MAIN MENU

※ You can select or set the menu by the haptic controller or touch screen.

On the operation screen, tap MENU to access the main menu screen.

On the sub menu screen, you can tap the menu bar to access functions or applications.






· Operation screen



290F3CD102

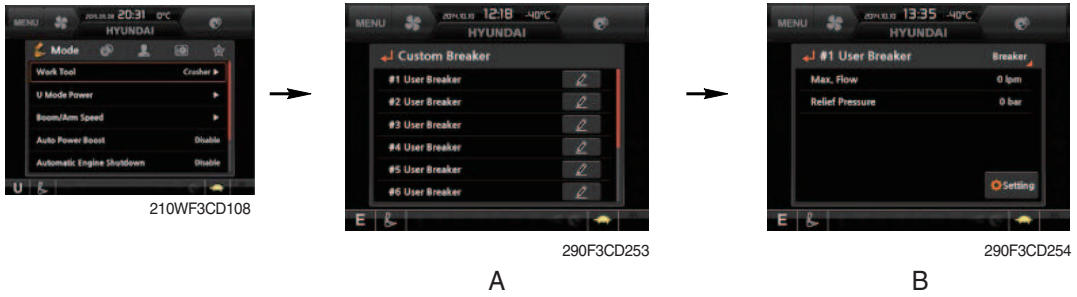
※ Please refer to the haptic controller, operator's manual page 3-58 for selection and change of menu and input value.

### (1) Structure

No	Main menu	Sub menu	Description
1	 Mode 290F3CD103	Work tool U mode power Boom/Arm speed Auto power boost IPC mode Auto engine shutdown (option) Initial mode Emergency mode	Breaker, Crusher, Not installed User mode only Boom speed, Arm speed Enable, Disable Speed mode, Balance mode, Efficiency mode One time, Always, Disable Key on initial mode, Accel initial mode / step Switch function
2	 Monitoring 290F3CD104	Active fault Logged fault Delete logged fault Monitoring	MCU, Engine ECM MCU, Engine ECM All logged fault delete, Initialization canceled Machine information, Switch status, Output status,
3	 Management 290F3CD105	Fuel rate information Maintenance information Machine security Machine information  Contact Service menu  Clinometer Update	General record, Hourly, Daily, Mode record Replacement, Change interval oils and filters ESL mode setting, Password change Model, MCU, Monitor, Haptic / switch controller, RMCU, Relay drive unit, FATC, AAVM (opt) A/S phone number, A/S phone number change Power shift, Operating hour, Breaker mode pump acting, EPPR current level, Overload pressure Clinometer setting Cluster, ETC device
4	 Display 290F3CD106	Display item Clock Brightness Unit setup Language selection Screen type	Engine speed, Tripmeter A, Tripmeter B, Tripmeter C Clock Manual, Auto Temperature, Pressure, Flow, Distance, Date format Korean, English, Chinese, ETC A type, B type
5	 Utilities 290F3CD107	Entertainment Tripmeter Camera	Play Video, Audio, Smart terminal. 3 kinds (A, B, C) Number of active, Display order, AAVM (opt)

## (2) Mode setup

### ① Work tool



- Select on installed optional attachment
  - A : It can set the user's attachment.  
It is available in setting #1~#10.
  - B : Max flow - Set the maximum flow for the attachment.  
Relief pressure - Set the relief pressure.

### ② U mode power



- Engine high idle rpm, auto idle rpm and pump torque (power shift) can be modulated and memorized separately in U-mode.
- U-mode can be activated by user mode switch.

Step (■)	Engine speed (rpm)	Idle speed (rpm)	Power shift (bar)
1	1300	750	0
2	1400	800	3
3	1500	850	6
4	1600	900	9
5	1700	950	12
6	1800	1000	16
7	1850	1050	20
8	1900	1100 (auto decel)	26
9	1950	1150	32
10	2000	1200	38

※ One touch decel & low idle : 1000 rpm

### ③ Boom/Arm speed



- **Boom speed**
  - Boom priority function can be activated or cancelled  
Enable - Boom up speed is automatically adjusted as working conditions by the MCU.  
Disable - Normal operation
- **Arm speed**
  - Arm regeneration function can be activated or cancelled.  
Enable - Arm in speed is up.  
Disable - Normal operation.



#### ④ Auto power boost



210WF3CD118



290F3CD117

- The power boost function can be activated or cancelled.
  - Enable - The digging power is automatically increased as working conditions by the MCU. It is operated max 8 seconds.
  - Disable - Not operated.

#### ⑤ IPC mode



290F3CD310



290F3CD311



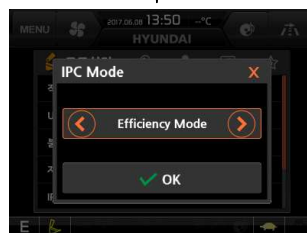
290F3CD304



290F3CD312



290F3CD305



290F3CD313



290F3CD306

- The IPC mode can be selected by this menu.
  - Speed mode
  - Balance mode (default)
  - Efficiency mode
- This mode is applied only general operation mode of the work tool mode.
- ※ Please update the cluster programs if this mode is not displayed in the mode setup menu. Refer to the operator's manual page 3-25-1.

### ⑥ Automatic engine shutdown (option)



210WF3CD11



210WF3CD12



210WF3CD13

- The automatic engine shutdown function can be set by this menu.
  - One time
  - Always
  - Disable
  - Wait time setting : Max 40 minutes, min 2 minutes

### ⑦ Initial mode



290F3CD122



290F3CD119

- **Key on initial mode**
  - Selected the power mode is activated when the engine is started.
- **Accel initial mode**
  - Last setting value
  - User setting value
- **Accel initial step**
  - 0~9 step

### ⑧ Emergency mode



290F3CD248



290F3CD249

- This mode can be use when the switches are abnormal on the cluster.
- The cluster switches will be selected by touched each icon.

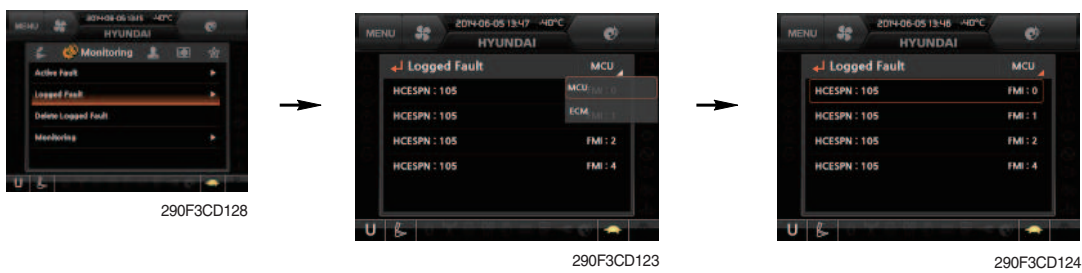
### (3) Monitoring

#### ① Active fault



- The active faults of the MCU, engine ECM or air conditioner can be checked by this menu.

#### ② Logged fault



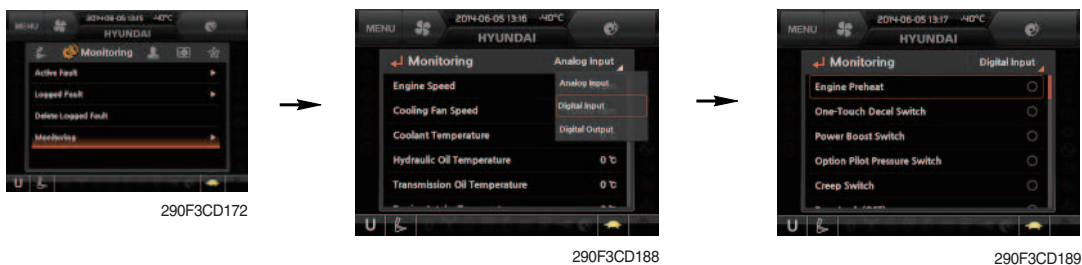
- The logged faults of the MCU, engine ECM or air conditioner can be checked by this menu.

#### ③ Delete logged fault



- The logged faults of the MCU, engine ECM or air conditioner can be deleted by this menu.

#### ④ Monitoring



- The machine status such as the engine rpm, oil temperature, voltage and pressure etc. can be checked by this menu (Analog input).
- The switch status or output status can be confirmed by this menu (Digital input & Digital output).
- The activated switch or output pilot lamps ● are light ON.

#### (4) Management

##### ① Fuel rate information

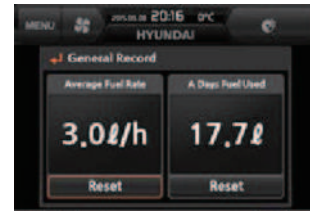


210WF3CD14



210WF3CD15

A



B



C



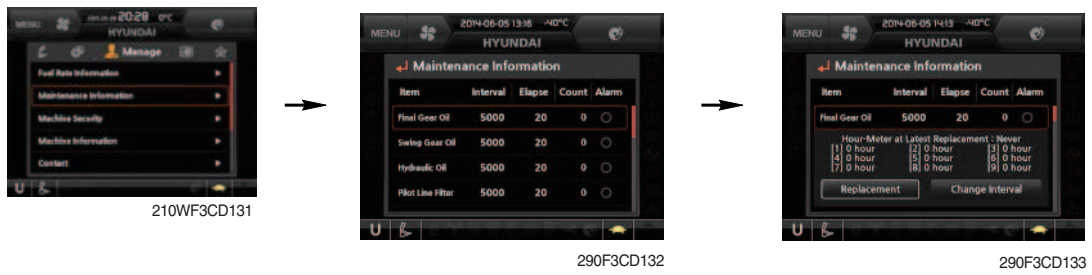
D



210WF3CD16

- **General record (A)**
  - Average fuel rate (left) (from "Reset" to now)  
Fuel consumption divided by engine run time (service meter time).
  - A days fuel used (right)  
Fuel consumption from 24:00 (or "Reset" time) to now (MCU real time).
- **Hourly record (B)**
  - Hourly fuel rates for past 12 hours (service meter time).
  - No record during key-off time.
  - One step shift to the right for every one hour.
  - Automatic deletion for 12 hours earlier data.
  - All hourly records deletion by "Reset".
- **Daily record (C)**
  - Daily fuel consumption for past seven days (MCU real time).
  - No record during key-off time.
  - One step shift to the right at 24:00 for every day.
  - Automatic deletion for 7 days earlier data.
  - All daily records deletion by "Reset".
- **Mode record (D)**
  - Average fuel rate for each power mode/accel dial (at least 7) from "Reset" to now.
  - No record during idle.
  - All mode records deletion by "Reset".

## ② Maintenance information



- Alarm lamp ( ● ) is ON when oil or filter needs to be changed or replaced.
- Replacement : The elapsed time will be reset to zero (0).
- Change interval : The change or replace interval can be changed in the unit of 50 hours.
- **Change or replace interval**

No	Item	Interval
1	Engine oil	500
2	Final gear oil	1000
3	Swing gear oil	1000
4	Hydraulic oil	5000
5	Pilot line filter	1000
6	Drain filter	1000
7	Hydraulic oil return filter	1000
8	Engine oil filter	500
9	Fuel filter	500
10	Pre-filter	500
11	Hydraulic tank breather	1000
12	Air cleaner (inner & outer)	2000
13	Radiator coolant	2000
14	Swing gear pinion grease	1000
15	DEF/AdBlue® supply module filter	1500
16	Crankcase Breather Filter	1500

### ③ Machine security



#### · ESL mode setting

- ESL : Engine Starting Limit
- ESL mode is designed to be a theft deterrent or will prevent the unauthorized operation of the machine.
- When you Enable the ESL mode, the password will be required when the starting switch is turned to the on position.

#### - Machine security

Disable : ESL function is disabled and password is not required to start engine.

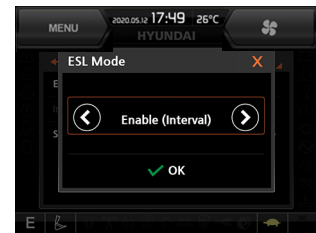
Enable (always) : The password is required whenever the operator starts engine.

- **Interval** : The password is required when the operator starts engine first. But the operator can restart the engine within the interval time without inputting the password. The interval time can be set to a maximum 4 hours.

※ Default password : 00000 +

※ Password length : (5~10 digits) +

- Smart key (option) : Refer to next page.



#### · Password change

- The password is 5~10 digits.



Enter the current password



Enter the new password again



Enter the new password

※ Before first use, please set user password and owner password in advance for machine security.

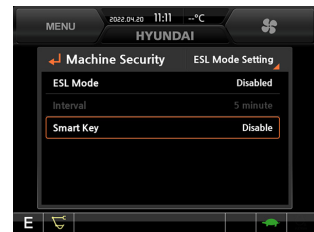
- Smart key



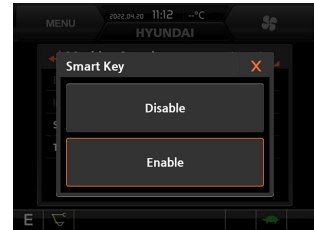
210WF3CD190A



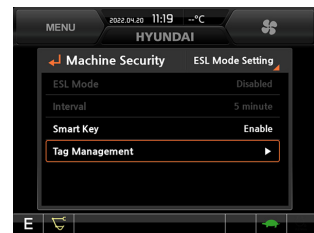
290F3CD135C



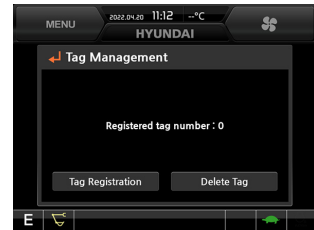
290F3CD001



290F3CD002

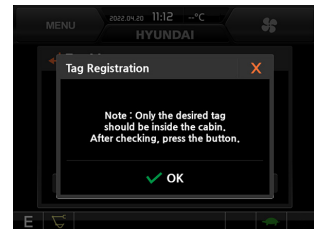


290F3CD003



290F3CD004

Registering



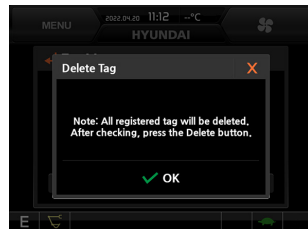
290F3CD005

- Smart key is registered when equipped with optional smart key. If smart key is not inside of the cabin, authentication process fails and the password is needed.
- Tag management menu is activated when the Smart key menu is Enabled.  
You can register and delete the tags.

- Tag management

- When registering a tag : Only the tag you want to register must be in the cabin.
- When deleting a tag : All registered tags are deleted.

Deleting



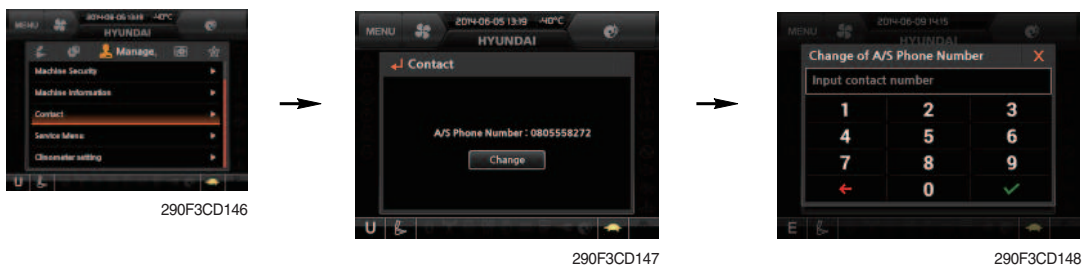
290F3CD006

#### ④ Machine Information



- This can confirm the identification of the model information (ECU), MCU, monitor, haptic controller, switch controller, RMCU, relay driver unit, FATC (air conditioner controller), AAVM (opt).

#### ⑤ Contact (A/S phone number)



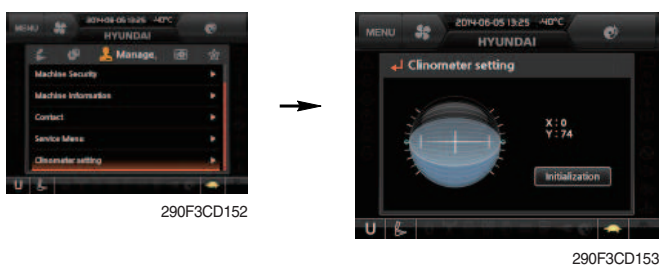
Enter the new A/S phone number

#### ⑥ Service menu



- Power shift (standard/option) : Power shift pressure can be set by option menu.
- Operating hours : Operating hours since the machine line out can be checked by this menu.
- Breaker mode pump acting (1 pump/2 pump)
- EPPR current level (attach flow EPPR 1 & 2, boom priority EPPR, attach relief pressure EPPR 1 & 2)
- Overload pressure : 100 ~ 350 bar

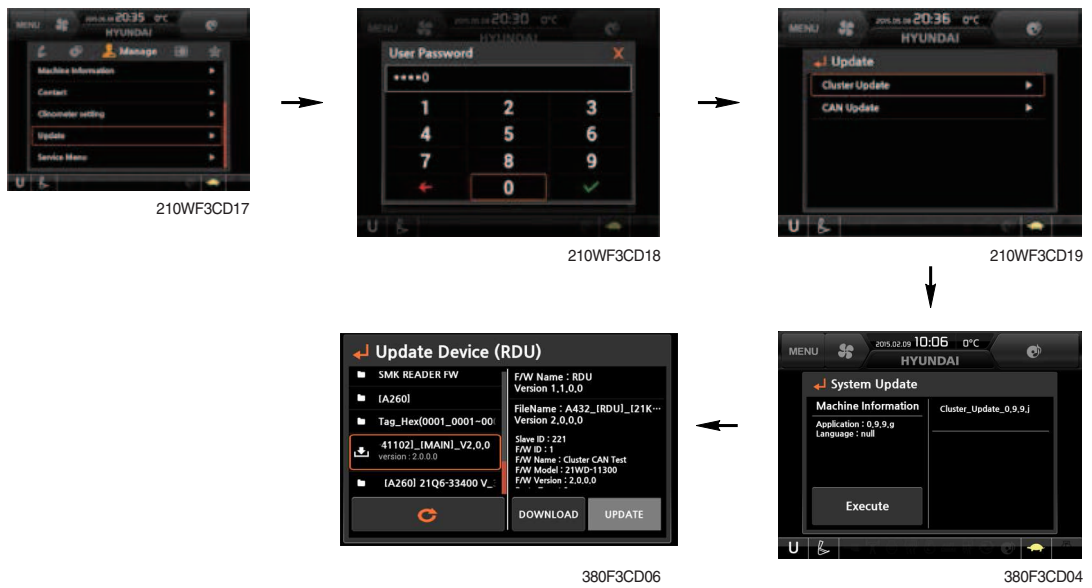
#### ⑦ Clinometer



- When the machine is on the flatland, if tap the "initialization", the values of X, Y reset "0".
- You can confirm tilt of machine in cluster's operating screen.



⑧ Update (cluster & ETC devices)



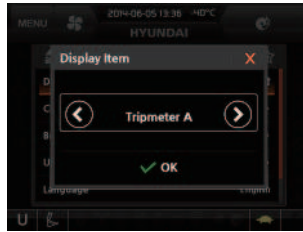
- ETC devices and cluster can be updated through CAN 2 network.
- Insert USB memory stick which includes program files, start download.

## (5) Display

### ① Display item



290F3CD154



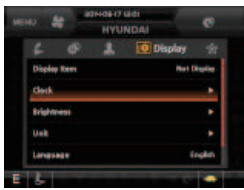
290F3CD155



290F3CD156

- The center display type of the LCD can be selected by this menu.
- The engine speed or each of the tripmeter (A,B,C) is displayed on the center display.

### ② Clock



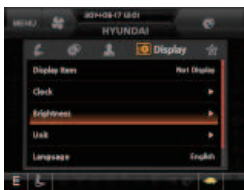
290F3CD157



290F3CD158

- The first line's three spots "\*\*/\*\*/\*\*\*\*" represent Month/Day/Year each.
- The second line shows the current time. (0:00~23:59)

### ③ Brightness



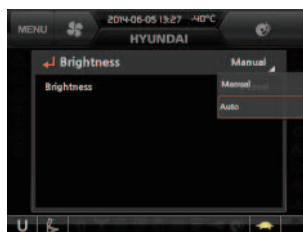
290F3CD159



290F3CD160



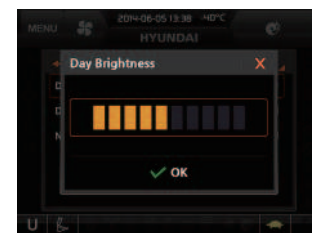
290F3CD139



290F3CD141



290F3CD139



290F3CD192

- If "Auto" is chosen, brightness for day and night can be differently set up. Also by using the bar in lower side, users can define which time interval belongs to day and night. (in bar figure, white area represents night time while orange shows day time)

#### ④ Unit



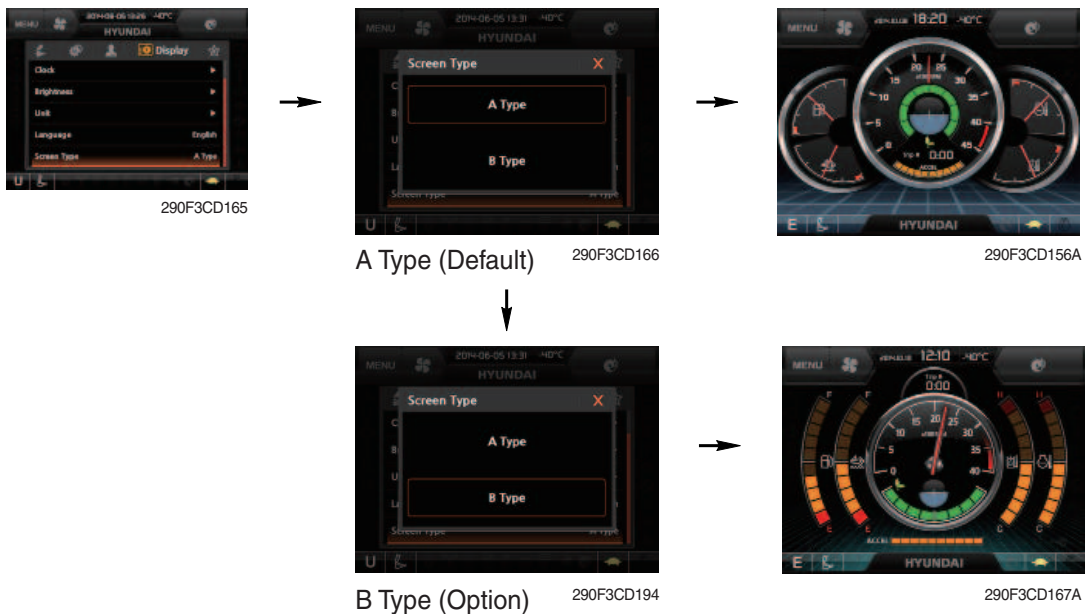
- Temperature : °C ↔ °F
- Pressure : bar ↔ MPa ↔ kgf/cm<sup>2</sup>
- Volume : ℓ ↔ gal
- Flow : lpm ↔ gpm
- Distance : km ↔ mile
- Date format : yy/mm/dd ↔ mm/dd/yy ↔ dd-mm-yy

#### ⑤ Language



- User can select preferable language and all displays are changed the selected language.

#### ⑥ Screen type

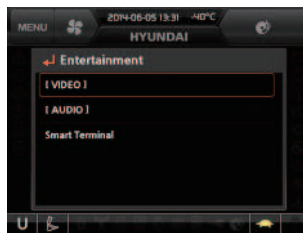


## (6) Utilities

### ① Entertainment



290F3CD195

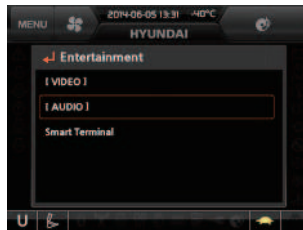


A

290F3CD196



210WF3CD219

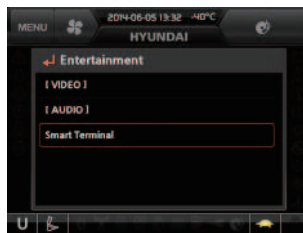


B

290F3CD197



210WF3CD220

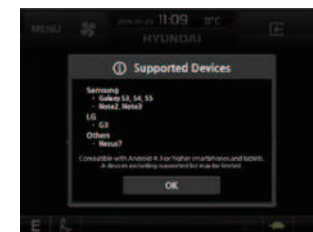


C

290F3CD198



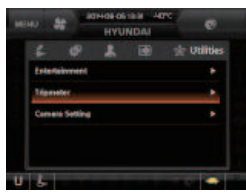
210WF3CD199



210WF3CD22

- Video (A) : This menu operates the video play function.  
mp4, mkv, avi files and so on.
- Audio (B) : This menu operates the play music.  
mp3, mp4 files and so on.
- Smart terminal (C) : The menu features a smartphone and operates the miracast.

## ② Tripmeter



290F3CD168

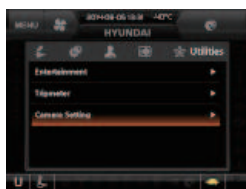


290F3CD169

- Maximum 3 kinds of tripmeters can be used at the same time.
- Each tripmeter can be turned on by choosing "Start" while it also can be turned off by choosing "Stop".
- If the tripmeter icon is activated in the operation screen, it can be controlled directly there.

## ③ Camera setting

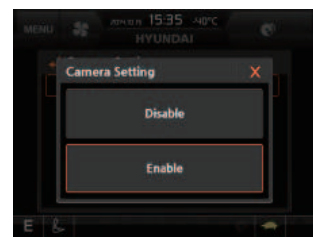
- If the rear camera is not installed on the machine, set disable.
- If the rear camera installed on the machine, set enable.



290F3CD200



290F3CD255



290F3CD256

- In the operation screen, rear camera screen show up when ESC/CAM button is pushed.



290F3CD156



290F3CD221

④ **AAVM** (All Around View Monitoring, option)

- The AAVM buttons of the cluster consist of ESC/CAM and AUTO IDLE/Buzzer stop.



290F3CD244

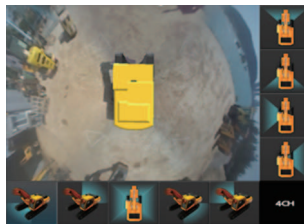
- **Escape button**

- It will enter into the AAVM mode from the beginning screen if the AAVM is installed.
- While in the AAVM mode, select the ESC button to return to the beginning screen.



290F3CD156

The beginning screen



AAVM mode

290F3CD222

- **Buzzer stop button**

- In AAVM mode, it detects surrounding pedestrians or objects and the warning buzzer sounds.
- User can turn OFF the warning sound by pressing buzzer stop button.



290F3CD246

- When the worker or pedestrian go to the blue line (radius 5 m), an external danger area of equipping on the cluster screen, the warning buzzer sounds and it displays the blue rectangular box for the recognition of the worker and pedestrian. At this time, the operator should stop work immediately, and stop the buzzer by pressing the buzzer stop button. And then, please work after you check whether the danger factors are solved.



290F3CD247

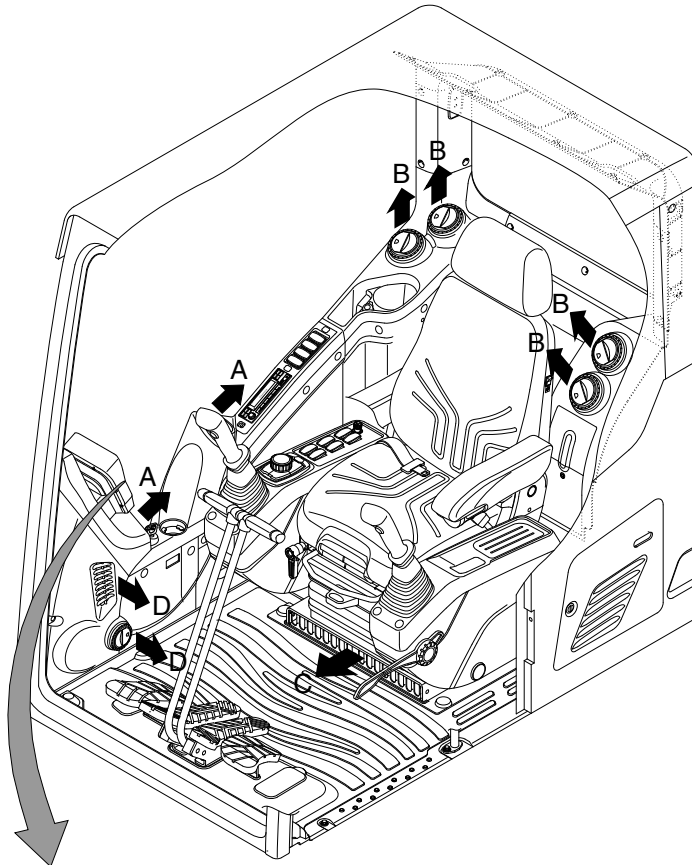
- When the worker or pedestrian go inside of red line (radius 3 m), an internal danger area of equipping on the cluster screen, the warning buzzer sounds and it displays the red rectangular box for the recognition of the worker and pedestrian. At this time, the operator should stop work immediately, and stop the buzzer by pressing the buzzer stop button. And then, please work after you check whether the danger factors are solved.

※ In AAVM mode, a touch screen of the LCD is available only. The multimodal dial of the haptic controller is not available.

## 7) AIR CONDITIONER AND HEATER

Full auto air conditioner and heater system automatically keeps the optimum condition in accordance with operator's temperature configuration sensing ambient and cabin inside temperature.

- Location of air flow ducts

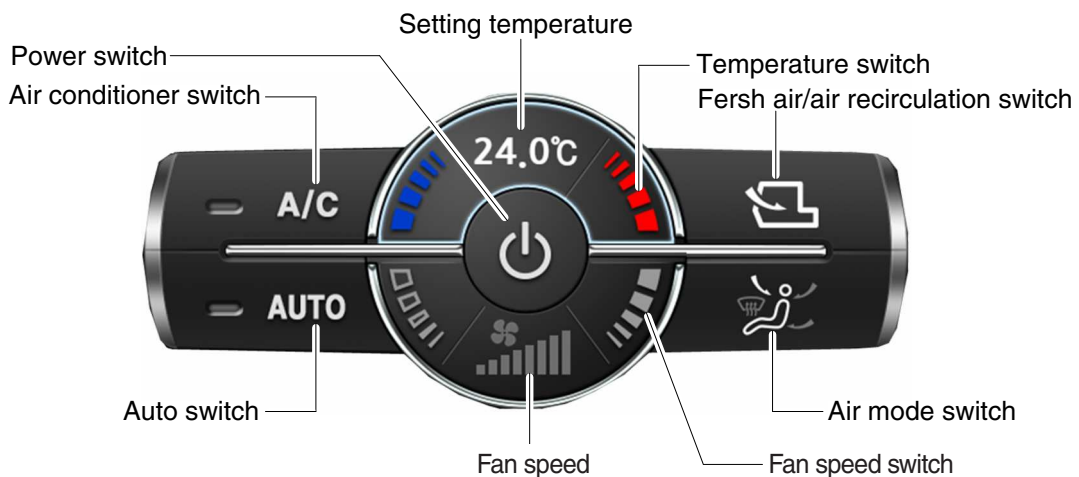


Cluster LCD



Cluster :  or

Haptic controller : 



※ Haptic controller : Refer to the operator's manual page 3-58.

290F3CD201

**(1) Power switch**



- ① This switch makes the system ON/OFF.  
Just before the power OFF, set values are stored.
- ② Default setting values

Function	Air conditioner	In/outlet	LCD	Temperature	Mode
Value	OFF	Inlet	OFF	Previous sw OFF	Previous sw OFF

**(2) Air conditioner switch**



- ① This switch turns the compressor ON/OFF.
- ※ **Air conditioner operates to remove vapor and drains water through a drain hose. Water can be sprayed into the cab in case that the drain cock at the ending point of drain hose has a problem.**  
**In this case, exchange the drain cock.**

**(3) Auto switch**



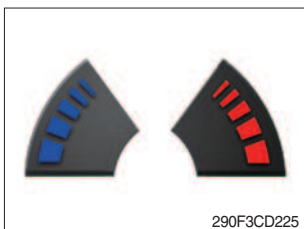
- ① Auto air conditioner and heater system automatically keeps the optimum condition in accordance with operator's temperature configuration sensing ambient and cabin inside temperature.

**(4) Setting temperature**



- ① Display the temperature setting out.

**(5) Temperature switch**



- ① Setting temperature indication  
· Lo (17°C), 17.5~31.5°C, Hi (32°C)
- ② Max cool and max warm beeps 5 times.
- ③ The max cool or the max warm position operates as following table.

Temperature	Compressor	Fan speed	In/outlet	Mode
Max cool	ON	Hi (8 step)	Recirculation	Face
Max warm	OFF	Hi (7 step)	Fresh	Def/Foot

- ④ Temperature unit can be changed between celsius (°C) and fahrenheit (°F)
  - a. Default status (°C)
  - b. Push Up/Down temperature switch simultaneously more than 5 second displayed temperature unit change (°C → °F)

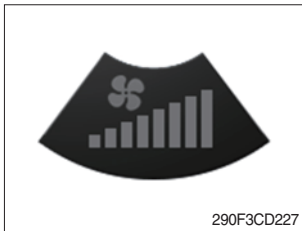


### (6) Fan speed switch



- ① Fan speed is controlled automatically by setted temperature.
- ② This switch controls fan speed manually.
  - There are 8 up/down steps to control fan speed.
  - The maximum step or the minimum step beeps 5 times.

### (7) Fan speed



- ① Steps 1 through 8 to display the amount of wind.

### (8) Fresh air/air recirculation switch



- ① It is possible to change the air-inlet method.
  - a. **Fresh air** (☞)
  - Inhaling air from the outside.
  - b. **Air recirculation** (♻️)
  - It recycles the heated or cooled air to increase the energy efficiency.
- ※ **Change air occasionally when using recirculation for a long time.**
- ※ **Check out the fresh air filter and the recirculation filter periodically to keep a good efficiency.**

### (9) Air mode switch



- ① Operating this switch, it beeps and displays symbol of each mode in order. (Face → Face/Rear → Face/Rear/Foot → Foot → Def/Foot)

Mode switch	Face	Face/Rear	Face/Rear/Foot	Foot	Def/Foot
Outlet	A	●	●	●	
	B		●	●	
	C			●	●
	D				●

- ② When defroster mode operating, FRESH AIR/AIR RECIRCULATION switch turns to FRESH AIR mode and air conditioner switch turns ON.

## 8) SELF DIAGNOSIS FUNCTION

(1) Diagnostic methods : Diagnostic information window, select

(2) Diagnostic indication (Displays fault)

Fault code	Description	Fail safe function
F01	Ambient temperature sensor open	20°C alternate value control
F02	Ambient temperature sensor short	
F03	Cab inside temperature sensor open	25°C alternate value control
F04	Cab inside temperature sensor short	
F05	Evaporate temperature sensor open	0°C alternate value control
F06	Evaporate temperature sensor short	
F07	Null	-
F08	Null	-
F09	Mode 1 actuator open/short	The alternate value is face
F10	Mode 1 actuator drive circuit malfunction	If not, the alternate value is Def/Foot
F11	Intake actuator open/short	The alternate value is air recirculation
F12	Intake actuator drive circuit malfunction	The alternate fresh air
F13	Temperature actuator open/short	If opening amount is 0 %, the alternate value is 0 %
F14	Temperature actuator drive circuit malfunction	If not, the alternate value is 100 %
F15	Null	-
F16	Null	-

# GROUP 17 FUEL WARMER SYSTEM

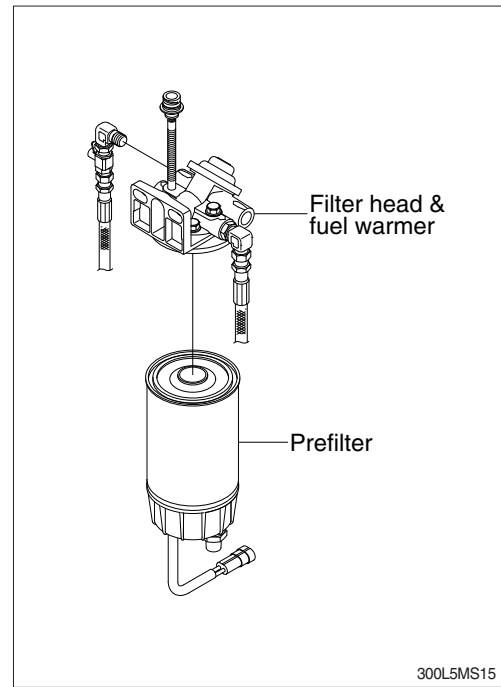
(SERIAL NO. : -#0610)

## 1. SPECIFICATION

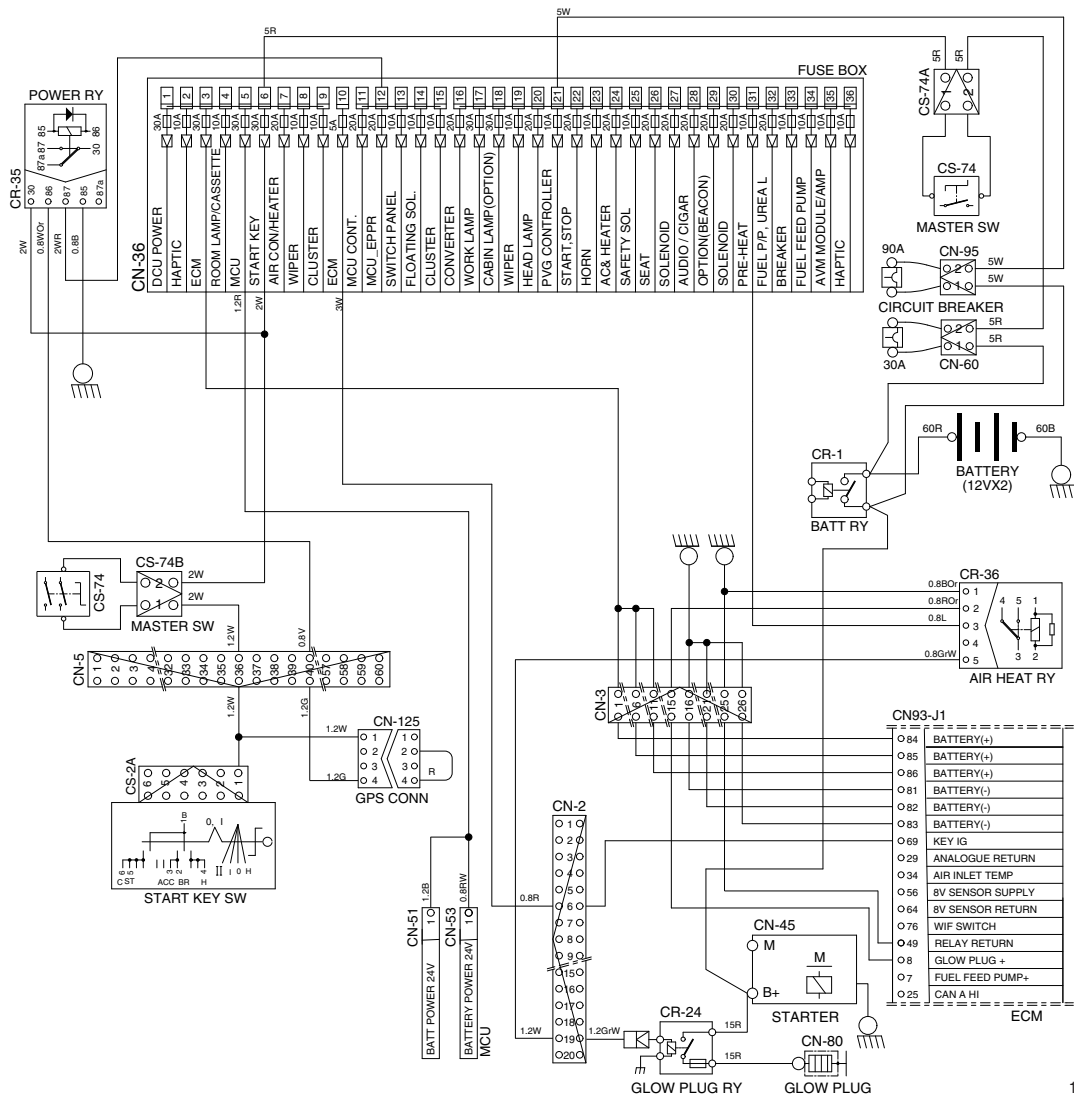
- 1) Operating voltage :  $24 \pm 4$  V
- 2) Power :  $350 \pm 50$  W
- 3) Current : 15 A

## 2. OPERATION

- 1) The current of fuel warmer system is automatically controlled without thermostat according to fuel temperature.
- 2) At the first state, the 15 A current flows to the fuel warmer and engine may be started in 1~2 minutes.
- 3) If the fuel starts to flow, ceramic-disk in the fuel warmer heater senses the fuel temperature to reduce the current as low as 1.5 A.  
So, fuel is protected from overheating by this mechanism.



## 3. ELECTRIC CIRCUIT



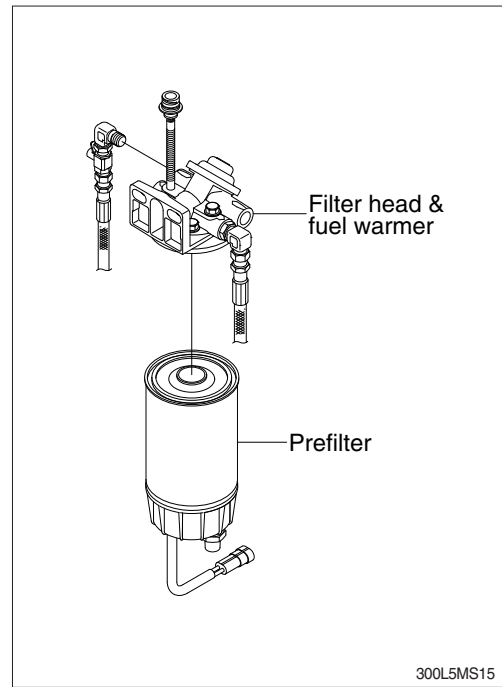
(SERIAL NO. : #0611-)

### 1. SPECIFICATION

- 1) Operating voltage :  $24 \pm 4$  V
- 2) Power :  $350 \pm 50$  W
- 3) Current : 15 A

### 2. OPERATION

- 1) The current of fuel warmer system is automatically controlled without thermostat according to fuel temperature.
- 2) At the first state, the 15 A current flows to the fuel warmer and engine may be started in 1~2 minutes.
- 3) If the fuel starts to flow, ceramic-disk in the fuel warmer heater senses the fuel temperature to reduce the current as low as 1.5 A.  
So, fuel is protected from overheating by this mechanism.



### 3. ELECTRIC CIRCUIT

