1	Outline	5-1
2	Mode Selection System ·····	5-3
3	Automatic Deceleration System	5-6
4	Power Boost System	5-7
5	Travel Speed Control System	5-8
6	Automatic Warming Up System	5-9
7	Engine Overheat Prevention System	5-10
8	Variable Power Control System	5-11
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	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	 Outline Mode Selection System Automatic Deceleration System Power Boost System Travel Speed Control System Automatic Warming Up System Automatic Warming Up System Engine Overheat Prevention System Variable Power Control System Variable Power Control System Attachment Flow Control System Intelligent Power Control System Self-Diagnostic System Engine Control 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 two 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



130ZF5MS01

GROUP 2 MODE SELECTION SYSTEM

1. POWER MODE SELECTION SYSTEM



Mode selection system (micro computer based electro-hydraulic pump and engine mutual control system) optimizes the engine and pump performance.

The combination of 3 power modes (P, S, E) and accel dial position (10 set) makes it possible to use the engine and pump power more effectively corresponding to the work conditions from a heavy and great power requesting work to a light and precise work.

		Engine rpm				Power shift by EPPR valve			
Power	Application	Standard		Option		Standard		Option	
mode		Unload	Load	Unload	Load	Current (mA)	Pressure (kgf/cm ²)	Current (mA)	Pressure (kgf/cm ²)
Р	Heavy duty power	1850±50	1950±50	2100±50	2050±50	290±30	8 (3)	160±30	0 (0)
S	Standard power	1750±50	1850±50	2000±50	1950±50	330±30	10 (5)±3	250±30	5 (5)±3
E	Economy operation	1650±50	1750±50	1750±50	1850±50	360±30	12 (7)±3	330±30	10 (5)±3
AUTO DECEL	Engine deceleration	1100±100	-	1100±100	-	700±30	38±3	700±30	38±3
One touch decel	Engine quick deceleration	1000±100	-	1000±100	-	700±30	38±3	700±30	38±3
KEY START	Key switch start position	1000±100	-	1000±100	-	700±30	38±3	700±30	38±3

* Power shift (Standard/Option) can be changed by "Service menu" in "Management" on the cluster.

※ (): Load

2. WORK MODE SELECTION SYSTEM

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



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
Description	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



1) Engine speed, idle speed and pump power shift pressure can be adjusted and memorized in the U-mode.

2) I	LCD	segment	vs	parameter	setting
------	-----	---------	----	-----------	---------

Step (∎)	Engine speed (rpm)	Idle speed (rpm)	Power shift pressure (bar)
1	1300	1000	0
2	1400	1050	3
3	1500	1100 (Auto decel)	6
4	1600	1130	9
5	1700	1150	12
6	1800	1180	16
7	1900	1200	20
8	2000	1230	26
9	2050	1250	32
10	2100	1280	38

* Refer to the page 5-76.

GROUP 3 AUTOMATIC DECELERATION SYSTEM



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.



2. WHEN AUTO IDLE PILOT LAMP OFF

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

* Auto idle function can be activated when accel dial position is over 4.

GROUP 4 POWER BOOST SYSTEM



- When the power boost switch on the left control lever 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 Imap : ON Operating time : max 8 seconds
Canceled	Power boost switch : OFF	Pre-set power modePower boost solenoid : OFFPower 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



130ZF5MS07

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 speed)

GROUP 6 AUTOMATIC WARMING UP SYSTEM



- 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 1000 rpm. At this time the mode does not change. If the coolant temperature sensor has fault, the hydraulic oil temperature signal is substituted.
- 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.

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

3.	LOGIC	TABLE

GROUP 7 ENGINE OVERHEAT PREVENTION SYSTEM



1. If the engine coolant temperature or the hydraulic oil temperature is overheated over set temperature, 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	Activated	 Coolant temperature : Above 103°C Hydraulic oil temperature : Above 100°C 	 Warning lamp : Pops up and buzzer sounds. Pump input torque is reduced.
warning	Canceled	- Coolant temperature : Less than 100°C - Hydraulic oil temperature : Less than 95°C	- Return to pre-set the pump absorption torque.
Second step	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.
warning	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 NEW VARIABLE POWER CONTROL SYSTEM



 The new variable power control system makes constantly exact pump control through improvement variable engine speed control and response and optimization of control input sensor signal.

It makes fuel saving and smooth control at precise work.

Description	Function		
Description	Stand by	Working	
Engine speed	- 100 ~ 150 rpm lower than working	- Set rpm	
Pump EPPR	- 13 bar	- 8 bar	
Pump flow	- Lower than working	- Normal pump flow	

* The variable power control function can be activated at all of the power mode.

GROUP 9 ATTACHMENT FLOW CONTROL SYSTEM



• 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			
Description	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 5-76 for the attachment kinds and max flow.

★ When breaker operating switch is pushed.

GROUP 10 INTELLIGENT POWER CONTROL SYSTEM



145ZF5MS13

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"



GROUP 11 ANTI-RESTART SYSTEM



300L5MS12

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 12 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



290F3CD121

290F3CD125

· 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

DTC		Dia matria Oritaria	Application				
HCESPN	FMI	Diagnostic Criteria		С	W		
	3	10 seconds continuous, Hydraulic Oil Temp. Measurement Voltage > 3.8V					
	4	10 seconds continuous, Hydraulic Oil Temp. Measurement Voltage < 0.3V					
	(Resu	Its / Symptoms)					
101	1. Moi	nitor – Hydraulic oil temperature display failure					
	2. Cor	ntrol Function – Fan revolutions control failure					
	(Chec	king list)					
	1. CD [.]	-1 (#2), CN-52 (#24) Checking Open/Short					
	2. CD	-1 (#1), CN-51 (#5) Checking Open/Short					
	0	10 seconds continuous, Working Press. Sensor					
	0	Measurement Voltage > 5.2V					
	1	10 seconds continuous, 0.3V≤ Working Press. Sensor Measurement					
		Voltage < 0.8V					
	4	10 seconds continuous, Working Press. Sensor					
	Measuren	Measurement Voltage < 0.3V					
105	(Results / Symptoms)						
100	1. Monitor – Working Press. display failure						
	2. Control Function – Auto Idle operation failure, Engine variable horse power control operation						
		failure					
	(Chec	king 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		1			
	0	10 seconds continuous, Travel Oil Press. Sensor					
		Measurement Voltage > 5.2V					
	1	10 seconds continuous, $0.3V \le$ Iravel Oil Press. Sensor Measurement					
		Voltage < 0.8V					
	4	Negeurement Voltage < 0.2)/					
	(D	the (Correctores)			<u> </u>		
108	(Hesu	its / Symptoms)					
		nitor – Travel Oli Press. display laliure					
	2. Cor	follure IPC exercise follure. Engine variable horse power control	opera	llion			
	(Choo	king list)					
		6 (#B) CN 52 (#28) Checking Open/Short					
	ינט.ו ס רח	$-0(\pi D) = O(-32(\pi 30) O(ecking Open/Short)$					
	2.00	-6 (#C) = CN-51 (#13) Checking Open/Short					
	3. UD						

 $\,\,$ Some error codes are not applied to this machine.

G : General C : Crawler Type W : Wheel Type

DTC		Dia su a stia Oritaria		Application			
HCESPN	FMI	Diagnostic Criteria	G	С	W		
	0	10 seconds continuous, Main Pump 1 (P1) Press. Sensor Measurement Voltage > 5.2V					
	1	10 seconds continuous, 0.3V ≤ Main Pump 1 (P1) Press. Sensor Measurement Voltage < 0.8V					
120	4	10 seconds continuous, Main Pump 1 (P1) Press. Sensor Measurement Voltage < 0.3V					
	(Resu 1. Mor 2. Cor (Cheo	lits / Symptoms) nitor – Main Pump 1 (P1) Press. display failure ntrol Function – Automatic voltage increase operation failure, Overload at compe failure king list)	ensati	on co	ntrol		
	1. CD 2. CD 3. CD	-42 (#B) – CN-52 (#29) Checking Open/Short -42 (#A) – CN-51 (#3) Checking Open/Short -42 (#C) – CN-51 (#13) Checking Open/Short					
	0	10 seconds continuous, Main Pump 2 (P2) Press. Sensor Measurement Voltage > 5.2V					
	1	10 seconds continuous, 0.3V≤ Main Pump 2 (P2) Press. Sensor Measurement Voltage < 0.8V					
	4	10 seconds continuous, Main Pump 2 (P2) Press. Sensor Measurement Voltage < 0.3V					
101	(Results / Symptoms)						
121	1. Monitor – Main Pump 2 (P2) Press. display failure						
	2. Control Function – Automatic voltage increase operation failure, Overload at compensation control						
	failure						
	(Chec	king 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		1			
	1	(when you had conditions mounting pressure sensor) 10 seconds continuous, $0.3V \le Overload$ Press. Sensor Measurement					
		(when you had conditions mounting pressure sensor)					
	4	10 seconds continuous, Overload Press. Sensor					
		Measurement Voltage < 0.3V	-				
122	(Resu	Ilts / Symptoms)					
	1. Mo	nitor – Overload Press. display failure					
	2. Cor	ntrol Function – Overload warning alarm failure					
	(Chec	king 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					

G : General C : Crawler Type	W : Wheel Type
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DTC				Application			
HCESPN	FMI	Diagnostic Criteria		С	W		
	0	10 seconds continuous, Negative 1 Press. Sensor					
	0	Measurement Voltage > 5.2V					
	1	10 seconds continuous, $0.3V \le$ Negative 1 Press. Sensor Measurement					
		Voltage < 0.8V					
	4	10 seconds continuous, Negative 1 Press. Sensor					
		Measurement Voltage < 0.3V	-				
123	(Resu	lts / Symptoms)					
	1. Moi	nitor – Negative 1 Press. display failure					
	2. Cor	ntrol Function – IPC operation failure, Option attachment flow control operation f	ailure				
	(Cheo	king 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					
	0	10 seconds continuous, Negative 2 Press. Sensor					
	Mea	Measurement Voltage > 5.2V					
	1	Voltage < 0.9V					
		10 seconds continuous. Negative 2 Press. Sensor					
	4	Measurement Voltage < 0.3V					
124	(Resu	lts / Symptoms)					
	1. Monitor – Negative 2 Press. display failure						
	2. Cor	ntrol Function – Option attachment flow control operation failure					
	(Chec	king 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					
	0	10 seconds continuous, Boom Up Pilot Press. Sensor					
	0	Measurement Voltage > 5.2V					
	1	10 seconds continuous, 0.3V $\!$					
	-	Voltage < 0.8V					
	4	10 seconds continuous, Boom Up Pilot Press. Sensor Measurement < 0.3V					
	(Resu	Its / Symptoms)					
127	1. Mo	nitor – Boom Up Pilot Press. display failure					
	2. Control Function – Engine/Pump variable horse power control operation failure, IPC operation						
		failure, Boom first operation failure					
	(Cheo	king 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					

G : General	C : Crawler Type	W : Wheel Type
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DTC		Dia una activa Oritania		Application		
HCESPN	FMI	Diagnostic Criteria	G	С	W	
		(when you had conditions mounting pressure sensor)				
	0	10 seconds continuous, Boom Down Pilot Press. Sensor Measurement				
		Voltage > 5.2V				
		(when you had conditions mounting pressure sensor)				
	1	10 seconds continuous, $0.3V \le$ Boom Down Pilot Press. Sensor				
		Measurement Voltage < 0.8V				
		(when you had conditions mounting pressure sensor)	_			
128	4	10 seconds continuous, Boom Down Pilot Press. Sensor Measurement				
120		Voltage < 0.3V				
	(Resu	Its / Symptoms)				
	1. Mo	nitor – Boom Down Pilot Press. display failure				
	2. Cor	ntrol Function – Boom floating operation failure				
	(Chec	king 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				
	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 Pliot Press. Sensor				
	(5	iveasurement voltage < 0.3v				
129	(Resu	lits / Symptoms)				
	1. MO	nitor – Arm in Pilot Press. display failure				
	2. Col	ntrol Function – IPC operation failure				
		King list)				
		-90 (#D) = CN-52 (#28) Checking Open/Short				
	2.00	-90 (#A) - CN-51 (#3) Checking Open/Short				
	3. UD					
	0	To seconds continuous,				
		10 seconds continuous				
	-1	0.3V < Arm In/Out & Bucket In Pilot Press, Sensor				
	•	Measurement Voltage $< 0.8V$				
		10 seconds continuous.				
	4	Arm In/Out & Bucket In Pilot Press. Sensor Measurement Voltage < 0.3V				
133	(Resu	lts / Symptoms)				
	1. Mo	nitor – Arm In/Out & Bucket In Pilot Press. display failure				
	2. Cor	ntrol Function – Engine variable horse power control operation failure				
	(Chec	king 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				

 $\ensuremath{\,\times\,}$ Some error codes are not applied to this machine. C : Crawler Type

G : General

DTC		Diagnostia Criteria		Application			
HCESPN	FMI			С	W		
	0	10 seconds continuous, Swing Pilot Press. Sensor					
	0	Measurement Voltage > 5.2V					
	1	10 seconds continuous, $0.3V \le$ Swing Pilot Press. Sensor Measurement					
		Voltage < 0.8V					
	4	10 seconds continuous, Swing Pilot Press. Sensor					
		Measurement Voltage < 0.3V	-				
135	(Resu	lts / Symptoms)					
	1. Mo	nitor – Swing Pilot Press. display failure					
	2. Cor	ntrol Function – IPC operation, Boom first operation failure					
	(Chec	king 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					
		Monitor – Select Attachment(breaker / crusher)					
	0	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)	-				
138		10 seconds continuous, Attachment Pilot Press. Sensor Measurement					
100		Voltage < 0.3V					
	(Resu	Its / Symptoms)					
	1. Moi	hitor – Attachment Pilot Press. display failure					
	2. Cor	ntrol Function – Option attachment flow control operation failure					
	(Cheo	king 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					
	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					
	(Resu	Its / Symptoms)					
139	1. Monitor – Option Pilot Press. display failure						
	2. Control Function – Auto Idle operation failure						
	(Cheo						
	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					

G : General	C : Crawler Type	W : Wheel Type
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DTC			Application		
HCESPN	FMI	Diagnostic Criteria		С	W
	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 (Detection)	•		
140	6	10 seconds continuous, Pump EPPR drive current > 1.0A (Cancellation) 3 seconds continuous, Pump EPPB drive current < 1.0 A	•		
	(Resu 1. Cor	Its / Symptoms) htrol Function – Pump horse power setting specification difference (Fuel efficiency/speed specification failure)			
	(Chec 1. CN- 2. CN-	king list) -75 (#2) – CN-52 (#9) Checking Open/Short -75 (#1) – CN-52 (#10) Checking Open/Short			
	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 	•		
141	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 	•		
	(Result 1. Cort (Chect 1. CN 2. CN	Its / Symptoms) htrol Function – Boom first control operation failure king list) -133 (#2) – CN-52 (#34) Checking Open/Short -133 (#1) – CN-52 (#35) Checking Open/Short			

G : General C : Crawler Type W : Wheel Type

DTC		Dia sur a stia. Orita sia	Application		
HCESPN	FMI	Diagnostic Criteria		С	W
	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 ≥ 10 mA (Detection) 10 seconds continuous, Travel EPPR drive current > 1.0 A 			•
	6	(Cancellation) 3 seconds continuous. Travel EPPB drive current < 1.0 A			
	(Resu	lts / Symptoms)			
	1. Cor	ntrol Function – cruise control operation failure			
	(Chec	king list)			
	1. CN	-246 (#2) – CN-54 (#39) Checking Open/Short			
	2. CN	-246 (#1) – CN-51 (#40) Checking Open/Short			
	2.011	(Model Parameter) mounting Remote Cooling Fan EPPR			
		(Detection)			
		(When Remote Cooling Fan EPPR Current is more than 10 mA)			
	5	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			
1.45		(Detection)			
145	6	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			
	(Resu	lts / Symptoms)			
	1. Cor	ntrol Function – Remote fan control operation failure			
	(Chec	king list)			
	1. CD	-52 (#1) – CN-51 (#9) Checking Open/Short			
	2. CD	-52 (#2) – CN-51 (#14) Checking Open/Short			

G : General C : Crawler Type W : Wheel Type

DTC		Dia su estis Oritoria	Application		on
HCESPN	FMI	Diagnostic Criteria		С	W
164	4	 (Detection) (When Working Cutoff Relay is Off) 10 seconds continuous, Working Cutoff Relay drive unit Measurement Voltage ≤ 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 ≤ 6.5 A 			•
	(Resu 1. Cor (Chec 1. CR- 2. CR-	Its / Symptoms) htrol Function – (Wheel Excavator) In driving mode, attachment hydraulic pilot p failure king list) -47 (#85) – CN-54 (#9) Checking Open/Short -47 (#30, #86) – CN-45 (#B+ term) Checking Open/Short	ressu	re cut	off
166	4	 (Detection) (When Power Max Solenoid is Off) 10 seconds continuous, Power Max Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Power Max Solenoid is Off) 3 seconds continuous, Power Max Solenoid drive unit Measurement Voltage > 3.0V (Detection) (When Power Max Solenoid is On) 	•		
	6 (Resu 1. Cor (Chec 1. CN- 2. CN-	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 ≤ 4.5 A Its / Symptoms) htrol Function – Voltage increase operation failure king list) -88 (#1) – CN-52 (#2) Checking Open/Short -88 (#2) – CN-45 (#B+ term) Checking Open/Short	•		

 $\ensuremath{\,\times\,}$ Some error codes are not applied to this machine.

G : General	C : Crawler Type	W : Wheel Type
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DTC		Diagnostia Criteria	Application		
HCESPN	FMI	- Diagnostic Criteria		С	W
167		 (Detection) (When Travel Speed Solenoid is Off) 10 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage ≤ 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 ≤ 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 ≤ 4.5 A 	•		
	(Result 1. Cort (Chect 1. CN 2. CN	Its / Symptoms) htrol Function – driving in 1/2 transmission operation failure king list) -70 (#1) – CN-52(#20) Checking Open/Short -70 (#2) – CN-45(#B+ term) Checking Open/Short		1	

G : General

C : Crawler Type

DTC				Application	
HCESPN	FMI	Diagnostic Criteria	G	С	W
		Monitor – Selecting attachment(breaker / crusher)			
		(Detection)			
		(When Attachment Conflux Solenoid is Off)			
		10 seconds continuous, Attachment Conflux Solenoid drive unit			
	4	Measurement Voltage \leq 3.0V			
		(Cancellation)			
		(When Attachment Conflux Solenoid is Off)			
		3 seconds continuous, Attachment Conflux Solenoid drive unit Measurement			
		Voltage > 3.0V			
169		(When Attachment Conflux Solenoid is On)			
	6	10 seconds continuous, Attachment Conflux Solenoid drive Current > 6.5 A			
		(Cancellation)			
		(vvnen Attachment Conflux Solenoid is On)			
	(D	3 seconds continuous, Attachment Continux Solenoid drive Current \leq 6.5 A			
	(Hesu	its / symptoms)			
	I. Cor	itroi Function – Option attachment flow control – Joining operation failure			
	(ECO	breaker mode, crusher mode)			
		King list)			
	2 CD	(237 (#1) - CR-35 (#7) Checking Open/Short			
	2.00	(Model Parameter) mounting Arm Pagenarating Solonoid			
		(Noder rarameter) mounting Ann Negenerating Sciencia			
		(When Arm Regeneration Sciencid is Off)			
		10 seconds continuous. Arm Regeneration Solenoid drive unit Measurement			
	4	Voltage < 3.0V			
	•	(Cancellation)			
		(When Arm Regeneration Solenoid is Off)			
		3 seconds continuous. Arm Regeneration Solenoid drive unit Measurement			
		Voltage > 3.0V			
		(Detection)			
170		(When Arm Regeneration Solenoid is On)			
	•	10 seconds continuous, Arm Regeneration Solenoid drive current > 4.5 A			
	6	(Cancellation)			
		(When Arm Regeneration Solenoid is On)			
		3 seconds continuous, Arm Regeneration Solenoid drive current \leq 4.5 A			
	(Deteo	ction)			
	(Wher	n Arm Regeneration Solenoid is On)			
	10 sec	conds continuous, Arm Regeneration Solenoid drive current > 4.5 A			
	(Canc	ellation)			
	(Wher	n Arm Regeneration Solenoid is On)			
	3 seco	onds continuous, Arm Regeneration Solenoid drive current \leq 4.5 A			

 $\ensuremath{\,\times\,}$ Some error codes are not applied to this machine.

G : General C : Crawler Type W : Wheel Type

DTC			Ар	ion	
HCESPN	FMI	Diagnostic Criteria	G	С	W
	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	•		
171	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 	•		
	(Result 1. Col (crush (Chec 1. CD 2. CD	lts / Symptoms) ntrol Function – Option attachment flow control – Option spool pilot pressur ner mode) -king list) -149 (#1) – CN-53 (#8) Checking Open/Short -149 (#2) – CR-35 (#87) Checking Open/Short	e cut	off fa	ailure
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 (Detection) (When Breaker Operating Solenoid is Off) 3 seconds continuous, Attachment Safety Solenoid drive unit Measurement Voltage > 3.0V (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)	•		
	(Result 1. Cor (Chec 1. CD 2. CD 3. CD	3 seconds continuous, Attachment Safety Solenoid drive current ≤ 6.5 A Its / Symptoms) htrol Function – Option attachment flow control – Breaker operation failure (brea- king list) -66 (#1) – CN-53 (#9) Checking Open/Short -66 (#2) – CN-45 (#B+ term) Checking Open/Short -66 (#C) – CN-51 (#13) Checking Open/Short	ker m	ode)	

DTC		Dia su a stia Oritaria	Application		
HCESPN	FMI	Diagnostic Chiena	G	С	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 	•		
	6	Measurement Voltage > 3.0V (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)			I	
	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 	•		
	(Result 1. Cort (Chect 1. CN 2. CN	Its / Symptoms) htrol Function – IPC operation failure, Option attachment flow control operation f king list) -242 (#2) – CN-52 (#39) Checking Open/Short -242 (#1) – CN-52 (#40) Checking Open/Short	ailure		

C : Crawler Type

G : General

DTC		Discussetia Cuitaria		Application		
HCESPN	FMI	Diagnostic Criteria	G	С	W	
	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 	•			
189	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 	•			
	(Resu 1. Cor (Chec 1. CN 2. CN	lts / Symptoms) ntrol Function – Option attachment flow control operation failure king list) -243 (#2) – CN-52 (#6) Checking Open/Short -243 (#1) – CN-52 (#7) Checking Open/Short				
	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				
196	4	HW145 10 seconds continuous, Attachment flow control EPPR 1 press. Sensor Measurement Voltage < 0.3V				
	(Resu 1. Cor (Chec 1. CD 2. CD 3. CD	Its / Symptoms) htrol Function – Driving second pump joining function operation failure king list) -33 (#B) – CN-52 (#11) Checking Open/Short -33 (#A) – CN-51 (#3) Checking Open/Short -33 (#C) – CN-51 (#13) Checking Open/Short				
	0	10 seconds continuous, Pump EPPR Press. Sensor Measurement Voltage > $5.2V$ 10 seconds continuous, $0.3V \le$ Pump EPPR Press. Sensor Measurement Voltage < $0.8V$	•			
200	4 (Resu 1. Mor 2. Cor (Fuel (Chec 1. CD 2. CD 3. CD	10 seconds continuous, Pump EPPR Press. Sensor Measurement Voltage < 0.3V Its / Symptoms) hitor – Pump EPPR Press. display failure htrol Function – Pump input horse power control failure, Overload at compensat operation failure efficiency/speed performance failure) king list) -44 (#B) – CN-52 (#32) Checking Open/Short -44 (#A) – CN-51 (#3) Checking Open/Short -44 (#C) – CN-51 (#13) Checking Open/Short	• ion cc	ontrol		

C : Crawler Type

HCESPN FMI G	С							
		W						
(Mounting pressure sensor)								
0 10 seconds continuous, Boom Cylinder Rod Press. Sensor Measurement								
Voltage > 5.2V								
(Mounting pressure sensor)								
1 10 seconds continuous, 0.3V≤ Boom Cylinder Rod Press. Sensor								
Measurement Voltage < 0.8V								
(Mounting pressure sensor)								
205 Voltage < 0.3V								
(Besults / Symptoms)								
1. Monitor – Boom Cylinder Bod 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	2. CD-124 (#A) – CN-53 (#3) Checking Open/Short							
3. CD-124 (#C) – CN-53 (#13) Checking Open/Short								
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								
4 Voltage \leq 3.0V								
(Cancellation)								
(When Boom Up Floating Solenoid is Off)								
3 seconds continuous, Boom Up Floating Solenoid drive unit Measurement								
Voltage > 3.0V								
218 (Detection)								
(when Boom Up Floating Solehold Is On)								
6 (Cancellation)								
(When Boom Lin Electing Selencid is On)								
3 seconds continuous. Boom Up Floating Solenoid drive current < 6.5 A								
(Besults / Symptoms)								
1 Control Function – Boom floating control operation failure								
(Checking list)								
1. CD-368 (#1) – CN-53 (#20) Checking Open/Short								
2. CD-368 (#2) – CR-35 (#87) Checking Open/Short								

G : General

C : Crawler Type

DTC			Applicatio		on
HCESPN	FMI	Diagnostic Unteria	G	С	W
		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			
	4	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			
220		(Detection)			
220		(When Boom Down Pilot Pressure Cutoff Solenoid is On)			
		10 seconds continuous, Boom Down Pilot Pressure Cutoff Solenoid drive			
	6	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			
	(Resu	Its / Symptoms)			
	1. Cor	ntrol Function – Boom floating control operation failure			
	(Chec	king list)			
	1. CD-369 (#1) – CN-53 (#35) Checking Open/Short				
	2. CD	-369 (#2) – CR-35 (#87) Checking Open/Short			
		Monitor – Selecting attachment(breaker / crusher)			
	_	(When AI I Relief Setting EPPR 1 Current is equal or more than 10 mA)			
	5	10 seconds continuous, AI I Relief Setting EPPR 1 drive current = 0 mA			
		(Cancellation)			
		AT I Relief Setting EPPR I Current is equal or more than 10 mA)			
		3 seconds continuous, ALL Relief Setting EPPR 1 drive current ≥ 10 mA			
221		(Delection)			
	6	(Cancellation)			
		3 seconds continuous. ATT Relief Setting EPPR 1 drive current < 1.0.4			
	(Book	\sim seconds continuous, At the lief detailing Litter that a five current \simeq 1.0 A			
		nts / Symptoms) http://www.control	~		
	(Cher	king list)			
		-365 (#2) - CN-53 (#39) Checking Open/Short			
	2 CD	-365 (#1) - CN-53 (#40) Checking Open/Short			
	2.00				

G : General	C : Crawler Type	W : Wheel Type
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DTC			Application		
HCESPN	FMI	Diagnostic Criteria	G	С	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 (Detection) 10 seconds continuous, ATT Relief Setting EPPR 2 drive current > 1.0 A	•		
	6 (Resu 1. Cor (Cheo 1. CD	10 seconds continuous, ATT Relief Setting EPPR 2 drive current > 1.0 A (Cancellation) 3 seconds continuous, ATT Relief Setting EPPR 2 drive current \leq 1.0 A lts / Symptoms) htrol Function – Option attachment flow control – P2 relief pressure setting failuit king list) -366 (#2) – CN-53 (#32) Checking Open/Short -366 (#1) – CN-53 (#33) Checking Open/Short	re		
	2.00	10 seconds continuous. Eucl Level Measurement Voltage > 3.8V			
	1	10 seconds continuous, Fuel Level Measurement Voltage < 0.3V			
301	(Resu 1. Mo (Chec 1. CD 2. CD	 Inter - Fuel remaining display failure -2 (#2) - CN-52 (#26) Checking Open/Short -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 	•		
	(Resu 1. Cor (Chec 1. CR 2. CR	ilts / Symptoms) htrol Function – Fuel warmer operation failure king list) -46 (#85) – CN-52 (#30) Checking Open/Short -46 (#86) – CN-45 (#B+ term) Checking Open/Short			

C : Crawler Type

G : General

DTC			Application					
HCESPN	FMI	Diagnostic Criteria	G	С	W			
	0	10 seconds continuous, Transmission Oil Press. Sensor Measurement						
	0	Voltage > 5.2V						
	1	10 seconds continuous, $0.3V \le$ Transmission Oil Press. Sensor						
		Measurement Voltage < 0.8V						
	4	Voltage < 0.2V						
501	(Rocu							
	(Tesulis / Symptoms) 1 Monitor – Transmission Oil Press, display failure, Transmission Oil Iow pressure warning failure							
	(Checking list)							
	1. CD	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							
	0	10 seconds continuous, Brake Oil Press. Sensor						
	0	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						
503	(Deeu	Ite (Symptome)			L			
	(Hesults / Symptoms)							
	(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							
	0	10 seconds continuous, Working Brake Press. Sensor Measurement						
	0	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						
505	(Deeu	Vollage < 0.3V			L			
	(Hesuits / Symptoms)							
	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						

G : General

C : Crawler Type W

DTC			Application				
HCESPN	FMI	Diagnostic Criteria	G	С	W		
514	4	(Detection) (When Parking Relay is Off) 10 seconds continuous, Parking Relay drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Parking Relay is Off) 3 seconds continuous, Parking Relay drive unit Measurement Voltage > 3.0V (Detection)			•		
	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 ≤ 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) – CN-45 (#B+ term) Checking Open/Short 						
517	4	 (Detection) (When Traveling Cutoff Relay is Off) 10 seconds continuous, Traveling Cutoff Relay drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Traveling Cutoff Relay is Off) 3 seconds continuous, Traveling Cutoff Relay drive unit Measurement Voltage > 3.0V (Detection) (When Traveling Cutoff Relay is On) 10 seconds continuous, Traveling Cutoff Relay drive current > 6.5 A (Cancellation) 			•		
	(Resu 1. Cor (Chec 1. CR 2. CR	(Cancentation) (When Traveling Cutoff Relay is On) 3 seconds continuous, Traveling Cutoff Relay drive current ≤ 6.5 A Its / Symptoms) htrol Function – Traveling Cutoff Relay operation failure king list) -47 (#85) – CN-54 (#9) Checking Open/Short -47 (#86) – CN-45 (#B+ term) Checking Open/Short					

G : General

C : Crawler Type

DTC			Application				
HCESPN	FMI	Diagnostic Criteria	G	С	W		
525	4	 (Detection) (When Ram Lock Solenoid is Off) 10 seconds continuous, Ram Lock Solenoid drive unit Measurement Voltage ≤ 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 ≤ 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) – CN-45 (#B+ term) Checking Open/Short 						
527	4	 (Detection) (When Creep Solenoid is Off) 10 seconds continuous, Creep Solenoid drive unit Measurement Voltage ≤ 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 ≤ 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) – CN-45 (#B+ term) Checking Open/Short						

G : General

C : Crawler Type
DTC		Discrestia Criteria		Application		
HCESPN	FMI	Diagnostic Chiena	G	С	W	
	0	10 seconds continuous, Travel Forward Press. Sensor Measurement				
		Voltage > 5.2V				
	10 seconds continuous, 0.3V≤ Travel Forward Press. Sensor Meas					
		Voltage < 0.8V				
	4	Voltage < 0.3V				
530	(Resu	Its / Symptoms)				
000	1. Mor	nitor – Travel Forward Press. display failure				
	2. Cor	ntrol Function – Driving interoperability power control operation failure				
	(Chec	king 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				
	1	10 seconds continuous, 0.3V≤ Travel Reverse Press. Sensor Measurement				
		Voltage < 0.8V				
	4	10 seconds continuous, Travel Reverse Press. Sensor Measurement				
	(Pocu	Vollage < 0.3V				
521	1 Mor	nitor – Travel Reverse Press, display failure				
551	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				
	0	10 seconds continuous, Battery input Voltage > 35V				
	1	10 seconds continuous, Battery input Voltage < 18V				
705	(Resu	lts / Symptoms)				
	1. Control Function – Startup impossibility					
	(Chec	king list)				
	1. CS-	74A (#1) – CN-51 (#1) Checking Open/Short				
		(When Engine is equal or more than 400 rpm) 10 seconds continuous,	_			
	1	Alternator Node D ⁺ Measurement Voltage < 18V				
		(In case 12v goods, Alternator Node I Measurement Voltage < 9V)				
707	(Resu	Its / Symptoms)				
	1. Control Function – Battery charging circuit failure					
	1.05	-14A (#1) – UN-51 (#2) Unecking Open/Short				

 $\,\,$ Some error codes are not applied to this machine.

G : General C : Crawler Type W : Wheel Type

DTC				Application		
HCESPN	FMI	Diagnostic Chiena		С	W	
	0	(Model Parameter) Mounting Acc. Dial				
	3	10 seconds continuous, Acc. Dial Measurement Voltage > 5.2V				
	4	(Model Parameter) Mounting Acc. Dial				
	Т	10 seconds continuous, Acc. Dial Measurement Voltage < 0.3V				
714	(Resu	lts / Symptoms)				
	1. Mor	nitor – Acc. Dial Voltage display failure				
	2. Cor	ntrol Function – Engine rpm control failure				
	(Chec	king list)				
	1. CN-	-7 (#15) – CN-52 (#23) Checking Open/Short				
		(Detection)				
		(When Travel Alarm (Buzzer) Sound is Off)				
		10 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive unit				
	4	Measurement Voltage \leq 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				
		(Detection)				
	6	(vvnen Travel Alarm (Buzzer) Sound Is On)				
722		10 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive				
		current > 4.5 A				
		(Cancellation)				
		(vvnen Travel Alarm (Buzzer) Sound Is On)				
		3 seconds continuous, Travel Alarm (Buzzer) Sound Relay drive				
	(D	$current \leq 4.5 \text{ A}$				
	(Hesu	its / Symptoms)				
	1. Cor	lurol Function – Driving alarm operation failure				
		King list) 81 (#1) CN 52 (#21) Chaolving Onan/Shart				
	1. CN-81 (#1) – CN-52 (#31) Checking Open/Short 2. CN-81 (#2) – CN-45 (#B Lterm) Checking Open/Short					
	2.011	$(M_{\text{hen mounting the A/C Centreller})$				
	2	(When mounting the A/C Controller)				
	(Deeu	to (Sumptomo)				
0.01		ns / Symptoms)				
001	1. Control Function – A/C Controller operation failure					
	(Unecking list)					
	2 CN	(47) - CN-51 (432) Checking Open/Short				
	2.011	60 seconds continuous. Cluster Communication Data Error				
	2					
	(Resu	Its / Symptoms)				
840	1. Cor	ntrol Function – Cluster operation failure				
		->>A (#/) - CN-51 (#22) Checking Open/Short				
	2. UN					

 $\ensuremath{\,\times\,}$ Some error codes are not applied to this machine.

DTC			Application			
HCESPN	FMI	Diagnostic Unteria	G	С	W	
	2	10 seconds continuous, ECM Communication Data Error				
	(Resu	Its / Symptoms)				
841	1. Cor	trol Function – ECM operation failure				
0.11	(Chec	king list)				
	1. CN	-93 (#22) – CN-51 (#21) Checking Open/Short				
	2. CN	93 (#46) – CN-51 (#31) Checking Open/Short				
	2	(When mounting the I/O Controller 1)				
	_	60 seconds continuous, I/O Controller 1 Communication Data Error				
	(Resu	Its / Symptoms)				
845	1. Cor	ntrol Function – I/O Controller 1 operation failure				
	(Chec					
	1. CN	-53 (#21) – CN-51 (#23) Checking Open/Short				
	2. CIN	(M/Lear mean the Leartie Controller)				
	2	(when mounting the Haptic Controller)				
	(Deeu	to seconds continuous, haptic controller communication Data Error				
040	(Results / Symptoms)					
040	(Chec	king list)				
	1 CN	-8 (#2) – CN-51 (#22) Checking Open/Short				
	2. CN	8 (#3) – CN-51 (#32) Checking Open/Short				
		(When mounting the BMCU)	_			
	2	60 seconds continuous, RMCU communication Data Error				
	(Resu	luts / Symptoms)				
850	1. Cor	ntrol Function – RMCU operation failure				
	(Chec	king list)				
	1. CN	125 (#3) – CN-51 (#22) Checking Open/Short				
	2. CN	-125 (#11) – CN-51 (#32) Checking Open/Short				
	2	(When mounting the I/O Controller 2)				
	~	60 seconds continuous, I/O Controller 2 communication Data Error				
	(Resu	lts / Symptoms)				
861	1. Cor	ntrol Function – I/O Controller 2 operation failure				
	(Chec	king list)				
	1. CN	-54 (#21) – CN-51 (#23) Checking Open/Short				
	2. CN	-54 (#31) – CN-51 (#33) Checking Open/Short				

 $\,\,$ Some error codes are not applied to this machine.

G : General C : Crawler Type W : Wheel Type

DTC		Dia maastia Critaria	Application		ion	
HCESPN	FMI	Diagnostic Chiena		С	W	
	2	(When mounting the AAVM)				
	2	60 seconds continuous, AAVM communication Data Error				
	(Resu	lts / Symptoms)				
866	1. Cor	ntrol Function – AAVM operation failure				
	(Chec	king list)				
	1. CN	-401 (#86) – CN-51 (#22) Checking Open/Short				
	2. CN	-401 (#87) – CN-51 (#32) Checking Open/Short				
	2	60 seconds continuous, RDU communication Data Error				
	(Resu	Its / Symptoms)				
867	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				
	2	60 seconds continuous, Switch Controller communication Data Error				
	(Resu	Its / Symptoms)				
868	1. Cor	ntrol Function – Switch Controller operation failure				
	(Chec	king list)				
	1. CN	-56A (#7) – CN-51 (#22) Checking Open/Short				
	2. CN	-56A (#6) – CN-51 (#32) Checking Open/Short		1		
	2	(When mounting the BKCU)				
		60 seconds continuous, BKCU communication Data Error				
	(Resu	lts / Symptoms)				
869	1. Cor	ntrol Function – BKCU operation failure				
	(Chec	king 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

4. ENGINE FAULT CODE

J1939 Code	Description	Refer to Procedure
27-3	Engine Exhaust Gas Recirculation Valve Position : Voltage Above Normal	Valve Position - Test
27-4	Engine Exhaust Gas Recirculation Valve Position : Voltage Below Normal	Valve Position - Test
29-3	Accelerator Pedal Position 2 : Voltage Above Normal	Speed Control - Test
29-4	Accelerator Pedal Position 2 : Voltage Below Normal	Speed Control - Test
51-3	Engine Throttle Valve 1 Position : Voltage Above Normal	Valve Position - Test
51-4	Engine Throttle Valve 1 Position : Voltage Below Normal	Valve Position - Test
91-3	Accelerator Pedal Position 1 : Voltage Above Normal	Speed Control - Test
91-4	Accelerator Pedal Position 1 : Voltage Below Normal	Speed Control - Test
97-15	Water in Fuel Indicator : High - least severe (1)	Fuel Contains Water
100-2	Engine Oil Pressure : Erratic, Intermittent, or Incorrect	Switch Circuits - Test (Oil Pressure Switch)
100-17	Engine Oil Pressure : Low - least severe (1)	Oil Pressure Is Low
102-3	Engine Intake Manifold #1 Pressure : Voltage Above Normal	Sensor Signal (Analog, Active) - Test
102-4	Engine Intake Manifold #1 Pressure : Voltage Below Normal	Sensor Signal (Analog, Active) - Test
102-20	Engine Intake Manifold #1 Pressure : Data Drifted High	Sensor Signal (Analog, Active) - Test
102-21	Engine Intake Manifold #1 Pressure : Data Drifted Low	Sensor Signal (Analog, Active) - Test
105-3	Engine Intake Manifold #1 Temperature : Voltage Above Normal	Sensor Signal (Analog, Passive) - Test
105-4	Engine Intake Manifold #1 Temperature : Voltage Below Normal	Sensor Signal (Analog, Passive) - Test
107-2	Engine Air Filter 1 Differential Pressure : Erratic, Intermittent, or Incorrect	Switch Circuits - Test (Air Filter Restriction Switch)
107-15	Engine Air Filter 1 Differential Pressure : High - least severe (1)	Inlet Air Is Restricted
107-16	Engine Air Filter 1 Differential Pressure : High - moderate severity (2)	Inlet Air Is Restricted

J1939 Code	Description	Refer to Procedure
108-3	Barometric Pressure : Voltage Above Normal	Sensor Signal (Analog, Active) - Test
108-4	Barometric Pressure : Voltage Below Normal	Sensor Signal (Analog, Active) - Test
110-3	Engine Coolant Temperature : Voltage Above Normal	Sensor Signal (Analog, Passive) - Test
110-4	Engine Coolant Temperature : Voltage Below Normal	Sensor Signal (Analog, Passive) - Test
110-15	Engine Coolant Temperature : High - least severe (1)	Coolant Temperature Is High
110-16	Engine Coolant Temperature : High - moderate severity (2)	Coolant Temperature Is High
152-2	Number Of ECU Resets : Erratic, Intermittent, or Incorrect	ECM Memory - Test
157-0	Engine Injector Metering Rail #1 Pressure : High - most severe (3)	Fuel Rail Pressure Problem
157-2	Engine Injector Metering Rail #1 Pressure : Erratic, Intermittent, or Incorrect	Fuel Rail Pressure Problem
157-3	Engine Injector Metering Rail #1 Pressure : Voltage Above Normal	Sensor Signal (Analog, Active) - Test
157-4	Engine Injector Metering Rail #1 Pressure : Voltage Below Normal	Sensor Signal (Analog, Active) - Test
157-10	Engine Injector Metering Rail #1 Pressure : Abnormal Update Rate	Sensor Signal (Analog, Active) - Test
157-16	Engine Injector Metering Rail #1 Pressure : High - moderate severity (2)	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)	Fuel Rail Pressure Problem
166-2	Engine Rated Power : Erratic, Intermittent, or Incorrect	ECM Memory - Test
166-14	Engine Rated Power : Special Instuction	ECM Memory - Test
168-3	Battery Potential / Power Input 1 : Voltage Above Normal	Electrical Power Supply - Test
168-4	Battery Potential / Power Input 1 : Voltage Below Normal	Electrical Power Supply - Test
172-3	Engine Air Inlet Temperature : Voltage Above Normal	Sensor Signal (Analog, Passive) - Test
172-4	Engine Air Inlet Temperature : Voltage Below Normal	Sensor Signal (Analog, Passive) - Test
173-3	Engine Exhaust Gas Temperature : Voltage Above Normal	Sensor Signal (Analog, Passive) - Test

J1939 Code	Description	Refer to Procedure
173-4	Engine Exhaust Gas Temperature : Voltage Below Normal	Sensor Signal (Analog, Passive) - Test
174-3	Engine Fuel Temperature 1 : Voltage Above Normal	Sensor Signal (Analog, Passive) - Test
174-4	Engine Fuel Temperature 1 : Voltage Below Normal	Sensor Signal (Analog, Passive) - Test
190-8	Engine Speed : Abnormal Frequency, Pulse Width, or Period	Speed/Timing - Test
190-15	Engine Speed : High - least severe (1)	Engine Overspeeds
558-2	Accelerator Pedal 1 Low Idle Switch : Erratic, Intermittent, or Incorrect	Idle Validation - Test
593-31	Engine Idle Shutdown has Shutdown Engine	This code indicates that an engine idle shutdown is about to occur. This code does not represent a fault. If equipped, the warning lamp will come on.
594-31	Engine Idle Shutdown Driver Alert Mode	This code indicates that an engine idle shutdown has oc- curred. This code does not represent a fault. If equipped, the warning lamp will flash and the shutdown lamp will come on.
623-5	Red Stop Lamp : Current Below Normal	Indicator Lamp - Test
623-6	Red Stop Lamp : Current Above Normal	Indicator Lamp - Test
624-5	Amber Warning Lamp : Current Below Normal	Indicator Lamp - Test
624-6	Amber Warning Lamp : Current Above Normal	Indicator Lamp - Test
630-2	Calibration Memory : Erratic, Intermittent, or Incorrect	Injector Data Incorrect - Test
637-11	Engine Timing Sensor : Other Failure Mode	Speed/Timing - Test
639-9	J1939 Network #1 : Abnormal Update Rate	Data Link - Test
639-14	J1939 Network #1 : Special Instruction	Data Link - Test
651-5	Engine Injector Cylinder #01 : Current Below Normal	Injector Solenoid - Test
651-6	Engine Injector Cylinder #01 : Current Above Normal	Injector Solenoid - Test
651-20	Engine Injector Cylinder #01 : Data Drifted High	Injector Data Incorrect - Test
651-21	Engine Injector Cylinder #01 : Data Drifted Low	Injector Data Incorrect - Test
652-5	Engine Injector Cylinder #02 : Current Below Normal	Injector Solenoid - Test
652-6	Engine Injector Cylinder #02 : Current Above Normal	Injector Solenoid - Test
652-20	Engine Injector Cylinder #02 : Data Drifted High	Injector Data Incorrect - Test

J1939 Code	Description	Refer to Procedure
652-21	Engine Injector Cylinder #02 : Data Drifted Low	Injector Data Incorrect - Test
653-5	Engine Injector Cylinder #03 : Current Below Normal	Injector Solenoid - Test
653-6	Engine Injector Cylinder #03 : Current Above Normal	Injector Solenoid - Test
653-20	Engine Injector Cylinder #03 : Data Drifted High	Injector Data Incorrect - Test
653-21	Engine Injector Cylinder #03 : Data Drifted Low	Injector Data Incorrect - Test
654-5	Engine Injector Cylinder #04 : Current Below Normal	Injector Solenoid - Test
654-6	Engine Injector Cylinder #04 : Current Above Normal	Injector Solenoid - Test
654-20	Engine Injector Cylinder #04 : Data Drifted High	Injector Data Incorrect - Test
654-21	Engine Injector Cylinder #04 : Data Drifted Low	Injector Data Incorrect - Test
676-5	Engine Glow Plug Relay : Current Below Normal	Glow Plug Starting Aid - Test
676-6	Engine Glow Plug Relay : Current Above Normal	Glow Plug Starting Aid - Test
676-19	Engine Glow Plug Relay : Data Error	Glow Plug Starting Aid - Test
677-3	Engine Starter Motor Relay : Voltage Above Normal	Relay - Test (Start Relay)
677-5	Engine Starter Motor Relay : Current Below Normal	Relay - Test (Start Relay)
677-6	Engine Starter Motor Relay : Current Above Normal	Relay - Test (Start Relay)
723-8	Engine Speed Sensor #2 : Abnormal Frequency, Pulse Width, or Period	Speed/Timing - Test
970-31	Engine Auxiliary Shutdown Switch	This code indicates that the shutdown switch for the engine has been activated. The ECM will disable fuel injection until the switch has been deactivated. No troubleshooting is required.
976-2	PTO Governor State : Erratic, Intermittent, or Incorrect	Power Take-Off - Test
1041-2	Start Signal Indicator : Erratic, Intermittent, or Incorrect	Relay - Test (Start Relay)
1076-2	Engine Fuel Injection Pump Fuel Control Valve : Erratic, Intermittent, or Incorrect	Solenoid Valve - Test
1076-5	Engine Fuel Injection Pump Fuel Control Valve : Current Below Normal	Solenoid Valve - Test
1076-6	Engine Fuel Injection Pump Fuel Control Valve : Current Above Normal	Solenoid Valve - Test
1081-5	Engine Wait to Start Lamp : Current Below Normal	Indicator Lamp - Test
1081-6	Engine Wait to Start Lamp : Current Above Normal	Indicator Lamp - Test

J1939 Code	Description	Refer to Procedure
1110-31	Engine Protection System has Shutdown Engine	The engine protection system has shutdown the engine. Troubleshoot all other diagnostic codes in order to clear this code.
1127-16	Engine Turbocharger 1 Boost Pressure : High - moderate severity (2)	Intake Manifold Air Pressure Is High
1127-18	Engine Turbocharger 1 Boost Pressure : Low - moderate severity (2)	Intake Manifold Air Pressure Is Low
1188-5	Engine Turbocharger Wastegate Actuator 1 Position : Current Below Normal	Solenoid Valve - Test
1188-6	Engine Turbocharger Wastegate Actuator 1 Position : Current Above Normal	Solenoid Valve - Test
1209-3	Engine Exhaust Gas Pressure : Voltage Above Normal	Sensor Signal (Analog, Active) - Test (Exhaust Gas Pres- sure Sensor)
1209-4	Engine Exhaust Gas Pressure : Voltage Below Normal	Sensor Signal (Analog, Active) - Test (Exhaust Gas Pres- sure Sensor)
1221-2	Continuously Monitored Systems Support/Status ; Erratic, Intermittent, or Incorrect	ECM Memory - Test
1221-14	Continuously Monitored Systems Support/Status ; Special Instruction	Another diagnostic code has requested engine speed limitation. The warning lamp will flash. The engine speed is limited to 1200 rpm. Troubleshoot all other diagnostic codes. If this code is the only active diagnostic code, replace the ECM. Refer to Troubleshooting, "ECM - Replace"
1239-0	Engine Fuel Leakage 1 : High - most severe (3)	Fuel Rail Pressure Problem
1485-7	ECM Main Relay : Not Responding Properly	Relay - Test (ECM Main Relay)
1485-14	ECM Main relay : Special Instruction	Relay - Test (ECM Main Relay)
2791-5	Engine Exhaust Gas Recirculation (EGR) Valve Control : Current Below Normal	Motorized Valve - Test
2791-6	Engine Exhaust Gas Recirculation (EGR) Valve Control : Current Above Normal	Motorized Valve - Test
2791-7	Engine Exhaust Gas Recirculation (EGR) Valve Control : Not Responding Properly	Motorized Valve - Test
2797-6	Engine Injector Group 1 : Current Above Normal	Injector Solenoid - Test
2797-7	Engine Injector Group 1 : Not Responding Properly	Injector Solenoid - Test
2798-6	Engine Injector Group 2 : Current Above Normal	Injector Solenoid - Test
2840-12	ECU Instance : Failure	ECM Memory - Test
2840-14	ECU Instance : Special Instruction	Relay - Test (ECM Main Relay)

J1939 Code	Description	Refer to Procedure
2880-2	Engine Operator Primary Intermediate Speed Select : Erratic, Intermittent, or Incorrect	Mode Selection - Test/Switch Circuits - Test (Throttle Switch)
2880-3	Engine Operator Primary Intermediate Speed Select : Voltage Above Normal	Mode Selection - Test/Switch Circuits - Test (Throttle Switch)
2880-4	Engine Operator Primary Intermediate Speed Select : Voltage Below Normal	Mode Selection - Test/Switch Circuits - Test (Throttle Switch)
2970-2	Accelerator Pedal 2 Low Idle Switch : Erratic, Intermittent, or Incorrect	Idle Validation - Test
3217-3	Aftertreatment #1 Intake O2 : Voltage Above Normal	Oxygen Level - Test
3217-4	Aftertreatment #1 Intake O2 : Voltage Below Normal	Oxygen Level - Test
3217-5	Aftertreatment #1 Intake O2 : Current Below Normal	Oxygen Level - Test
3217-6	Aftertreatment #1 Intake O2 : Current Above Normal	Oxygen Level - Test
3217-12	Aftertreatment #1 Intake O2 : Failure	Oxygen Level - Test
3217-13	Aftertreatment #1 Intake O2 : Out of Calibration	Oxygen Level - Test
3217-15	Aftertreatment #1 Intake O2 : High - least severe (1)	Oxygen Level - Test
3219-15	Aftertreatment #1 Intake Gas Sensor at Temperature : High - least severe (1)	Oxygen Level - Test
3219-17	Aftertreatment #1 Intake Gas Sensor at Temperature : Low - least severe (1)	Oxygen Level - Test
3222-3	Aftertreatment #1 Intake Gas Sensor Heater : Voltage Above Normal	Oxygen Level - Test
3222-4	Aftertreatment #1 Intake Gas Sensor Heater : Voltage Below Normal	Oxygen Level - Test
3222-5	Aftertreatment #1 Intake Gas Sensor Heater : Current Below Normal	Oxygen Level - Test
3242-0	Particulate Trap Intake Gas Temperature : High - most severe (3)	Sensor Signal (Analog, Passive) - Test
3242-3	Particulate Trap Intake Gas Temperature : Voltage Above Normal	Sensor Signal (Analog, Passive) - Test
3242-4	Particulate Trap Intake Gas Temperature : Voltage Below Normal	Sensor Signal (Analog, Passive) - Test
3251-0	Particulate Trap Differential Pressure : High - most severe (3)	Diesel Particulate Filter Collects Excessive Soot
3251-3	Particulate Trap Differential Pressure : Voltage Above Normal	Sensor Signal (Analog, Active) - Test
3251-4	Particulate Trap Differential Pressure : Voltage Below Normal	Sensor Signal (Analog, Active) - Test

J1939 Code	Description	Refer to Procedure
3251-7	Particulate Trap Differential Pressure : Not Responding Properly	Diesel Particulate Filter Has Differential Pressure Problem
3251-10	Particulate Trap Differential Pressure : Abnormal Rate of Change	Diesel Particulate Filter Has Differential Pressure Problem
3251-16	Particulate Trap Differential Pressure : High - moderate severity (2)	Diesel Particulate Filter Collects Excessive Soot
3251-17	Particulate Trap Differential Pressure : Low - least severe (1)	Diesel Particulate Filter Has Differential Pressure Problem
3251-18	Particulate Trap Differential Pressure : Low - moderate severity (2)	Diesel Particulate Filter Has Differential Pressure Problem
3358-10	Engine Exhaust Gas Recirculation 1 Intake Pressure : Abnormal Rate of Change	NRS Mass Flow Rate Problem
3509-2	Sensor Supply Voltage 1 : Erratic, Intermittent, or Incorrect	Sensor Supply - Test
3510-2	Sensor Supply Voltage 2 : Erratic, Intermittent, or Incorrect	Sensor Supply - Test
3511-2	Sensor Supply Voltage 3 : Erratic, Intermittent, or Incorrect	Sensor Supply - Test
3697-5	Particulate Trap Lamp Command : Current Below Normal	Indicator Lamp - Test
3697-6	Particulate Trap Lamp Command : Current Above Normal	Indicator Lamp - Test
3698-5	Exhaust System High Temperature Lamp Command : Current Below Normal	Indicator Lamp - Test
3698-6	Exhaust System High Temperature Lamp Command : Current Above Normal	Indicator Lamp - Test
3702-5	Diesel Particulate Filter Active Regeneration Inhibited Status : Current Below Normal	Indicator Lamp - Test
3702-6	Diesel Particulate Filter Active Regeneration Inhibited Status : Current Above Normal	Indicator Lamp - Test
3719-0	Aftertreatment 1 Diesel Particulate Filter Soot Load Percent : High - most severe (3)	Diesel Particulate Filter Collects Excessive Soot
3719-16	Aftertreatment 1 Diesel Particulate Filter Soot Load Percent : High - moderate severity (2)	Diesel Particulate Filter Collects Excessive Soot
4765-3	Aftertreatment #1 Diesel Oxidation Catalyst Intake Gas Temperature : Voltage Above Normal	Sensor Signal (Analog, Passive) - Test
4765-4	Aftertreatment #1 Diesel Oxidation Catalyst Intake Gas Temperature : Voltage Below Normal	Sensor Signal (Analog, Passive) - Test

J1939 Code	Description	Refer to Procedure
5055-17	Engine Oil Viscosity : Low - least severe (1)	Oil Contains Fuel
5055-18	Engine Oil Viscosity : Low - moderate severity (2)	Oil Contains Fuel
5099-5	Engine Oil Pressure Low Lamp Data - Current Below Normal	Indicator Lamp - Test
5099-6	Engine Oil Pressure Low Lamp Data - Current Above Normal	Indicator Lamp - Test
5246-15	Aftertreatment SCR Operator Inducement Severity : High - least severe (1)	See Operator Inducement Codes
5246-16	Aftertreatment SCR Operator Inducement Severity : High - moderate severity (2)	See Operator Inducement Codes
5319-31	"Aftertreatment 1 Diesel Particulate Filter Incomplete Regeneration"	Diesel Particulate Filter Active Regeneration Was Interrupted
5324-7	Engine Glow Plug 1 : Not Responding Properly	Glow Plug Starting Aid - Test
5325-7	Engine Glow Plug 2 : Not Responding Properly	Glow Plug Starting Aid - Test
5326-7	Engine Glow Plug 3 : Not Responding Properly	Glow Plug Starting Aid - Test
5327-7	Engine Glow Plug 4 : Not Responding Properly	Glow Plug Starting Aid - Test
5357-31	Engine Fuel Injection Quantity Error for Multiple Cylinders	ECM Memory - Test
5419-5	Engine Throttle Actuator #1 : Current Below Normal	Motorized Valve - Test
5419-6	Engine Throttle Actuator #1 : Current Above Normal	Motorized Valve - Test
5419-7	Engine Throttle Actuator #1 : Not Responding Properly	Motorized Valve - Test
5571-2	High Pressure Common Rail Fuel Pressure Relief Valve : Erratic, Intermittent, or Incorrect	Fuel Rail Pressure Problem
5571-7	High Pressure Common Rail Fuel Pressure Relief Valve : Not Responding Properly	Fuel Rail Pressure Problem
5571-10	High Pressure Common Rail Fuel Pressure Relief Valve : Abnormal Rate of Change	Fuel Rail Pressure Problem
5571-14	High Pressure Common Rail Fuel Pressure Relief Valve : Special Instruction	Fuel Rail Pressure Problem
5571-16	High Pressure Common Rail Fuel Pressure Relief Valve : High - moderate severity (2)	Fuel Rail Pressure Problem
5826-15	Emission Control System Operator Inducement Severity : High - least severe (1)	See "Operator Inducement Codes"
5826-16	Emission Control System Operator Inducement Severity : High - moderate severity (2)	See "Operator Inducement Codes"

* Operator Inducement Codes

- If any of the diagnostic codes listed in table below are active, a 5246 or a 5826 diagnostic code will also be active.
- When a 5246 or a 5826 diagnostic code is active, the engine will be derated.
- In order to clear an active 5246 or a 5826 diagnostic code, first troubleshoot any active codes that are listed in table below. Once all other codes are cleared, cycle the start switch in order to clear the 5246 or 5826 diagnostic code.

27-3	27-4	102-3	102-4	102-20	102-21	105-3
105-4	108-3	108-4	157-0	157-2	157-16	157-18
173-3	173-4	1076-5	1076-6	1188-5	1209-3	1209-4
1239-0	2791-5	2791-6	2791-7	3251-3	3251-4	3251-7
3251-10	3251-18	3358-10	3509-2	3510-2	3511-2	4765-3
4765-4	5319-31	5419-7	5571-7	5571-16		

J1939 Codes

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 13 ENGINE CONTROL SYSTEM

1. MCU and ECM (Engine Control Module)



130ZF5MS101

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		Check if serial communication		
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

GROUP 14 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.

Mode	Pres	sure	Electric current	Engine rpm		
Wode		kgf/cm ² psi		(mA)	(at accel dial 10)	
	Р	8	114	290 ± 30	1850 ± 50	
Standard	S	10 ± 3	142 ± 40	$\textbf{330}\pm\textbf{30}$	1750 ± 50	
	E	12 ± 3	171 ± 40	360 ± 30	1650 ± 50	
	Р	0	0	160 ± 30	2100 ± 50	
Option	S	5 ± 3	73 ± 40	250 ± 30	$\textbf{2000} \pm \textbf{50}$	
	E	10 ± 3	142 ± 40	330 ± 30	1750 ± 50	

(3) Pressure and electric current value for each mode

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 \leftrightarrow option).

Management

· Service menu





290F3CD151

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

3) OPERATING PRINCIPLE

(1) Structure





- 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.





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.
- (5) Position the accel dial at 10.
- ⑥ If rpm display show approx 1750±50 rpm check electric current at bucket circuit relief position.
- ⑦ Check electric current at bucket circuit relief position.

(2) Check pressure at EPPR valve

- ① Remove plug and connect pressure gauge as figure.
 - · Gauge capacity : 0 to 50 kgf/cm² (0 to 725 psi)
- 2 Start engine.
- ③ Set S-mode and cancel auto decel mode.
- 4 Position the accel dial at 10.
- (5) If tachometer show approx 1750±50 rpm check pressure at relief position of bucket circuit by operating bucket control lever.
- 6 If pressure is not correct, adjust it.
- O 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



2 Support ring

Т

1

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±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.
 - \cdot Gauge capacity : 0 to 50 kgf/cm²

(0 to 725 psi)

- 2 Start engine.
- ③ Set S-mode and cancel auto decel mode.
- ④ If rpm display approx 1750±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 15 MONITORING SYSTEM

1. STRUCTURE

The cluster consists of LCD and switches as shown below. The LCD is to warn the operator in case of abnormal machine operation or conditions for the appropriate operation and inspection. Also, The LCD is to set and display for modes, monitoring and utilities with the switches. The switches or touch screen are to set the machine operation modes.

- * The cluster installed on this machine does not entirely guarantee the condition of the machine. Daily inspection should be performed according to chapter 6, Maintenance.
- % When the cluster provides a warning immediately check the problem, and perform the required action.



130ZF5MS102

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

The warning lamp lights up or blinks until the problem is cleared. Refer to page 5-60 for details.

- * This cluster is adjustable.
 - \cdot Vertical (forward/backward) : each 15°
 - \cdot Horizontal (left only) : 8°



2) CLUSTER CHECK PROCEDURE

(1) Start key : ON

① Check monitor

- a. Buzzer sounding for 4 seconds with HYUNDAI logo on cluster.
- $\ensuremath{\,\times\,}$ 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
 - e. DEF/AdBlue® 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 1000 rpm.
- * Others same as above.

③ When abnormal condition

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

3) CLUSTER CONNECTOR

(1) CN-56A

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

(2) CN-56B

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

NTSC : National Television System Committee



2) GAUGE

(1) Operation screen

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



- 1 RPM / Speed gauge
- 2 Engine coolant temperature gauge
- 3 Hydraulic oil temperature gauge
- 4 Fuel level gauge

- 5 Tripmeter display
- 6 Eco guage
- 7 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



① This display the engine speed.

(3) Engine coolant temperature gauge



- $(\ensuremath{\underline{1}})$ 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



 ${\scriptstyle (1)}$ This gauge indicates the temperature of hydraulic oil.

- · White range: 40-105°C(104-221°F)
- \cdot Red range : Above 105°C(221°F)
- ② If the indicator is in the red range or kill 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 i 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



(6) Tripmeter display

TripA

- $(\ensuremath{\underline{1}})$ 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 implicit 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.
- 1 This displays the engine the tripmeter.
- * Refer to page 5-88 for details.

(7) Eco gauge



290E3CD56

- 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
 - \cdot Yellow : Non-economy operation at a medium level.
 - · Red : Non-economy operation at a high level.

(8) Accel dial gauge



 $(\ensuremath{\underline{1}})$ This gauge indicates the level of accel dial.

3) WARNING LAMPS



130ZF3CD203

* 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	 The pop-up warning lamp moves to the original position and blinks, and the buzzer stops when ; the buzzer stop switch the lamp of the LCD is touched
₽≫₽	Warning lamp pops up on the center of the LCD and the buzzer sounds	 The pop-up warning lamp moves to the original position and light ON, and the buzzer stops when 2 seconds elapsed. * Refer to page 5-65 for details.
	Warning lamp pops up on the center of the LCD and the buzzer sounds	* Refer to page 5-61 for details.

※ Refer to page 5-72 for the buzzer stop switch.

AUTO IDLE Buzzer Stop

(1) Engine coolant temperature warning lamp



- ${\rm (I)}$ Engine coolant temperature warning is indicated two steps.
 - -103° C over : The \bigcirc lamp pops up and the buzzer sounds.
 - -107° C over : The $\widehat{(1)}$ lamp pops up and the buzzer sounds.
- ② The pop-up , 1 lamps move to the original position and blinks when the buzzer stop switch stops and , 1 lamps keep blink.
- 3 Check the cooling system when the lamps keep blink.

(2) Hydraulic oil temperature warning lamp



- $(\ensuremath{\underline{1}}$ Hydraulic oil temperature warning is indicated two steps.
 - 100°C over : The |amp pops up and the buzzer sounds.- 105°C over : The (1) lamp pops up and the buzzer sounds.
- ② The pop-up [☆]], ① lamps move to the original position and blinks when the buzzer stop switch when the buzzer stops and [☆]], ① lamps keep blink.
- 3 Check the hydraulic oil level and hydraulic oil cooling system.

(3) Fuel level warning lamp



- (\mbox{I}) 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



- 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) Battery charging warning lamp



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

(6) Air cleaner warning lamp



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

(7) Overload warning lamp (opt)



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

(8) Engine oil pressure warning lamp



- ① This warning lamp pops up and the buzzer sounds when the engine oil pressure is low.
- ② If the lamp ON, shut OFF the engine immediately. Check oil level.
- % But, when key-on status, the lamp is ON for initial lamp check.
- ③ If the lamp blinks, engine oil change and oil life reset are required.
- * Refer to page 5-64 for details.

(9) Engine stop warning lamp



290F3CD252

- ① This warning lamp pops up and the buzzer sounds when when the engine oil pressure is low.
- ② If the lamp blinks, shut OFF the engine immediately. Check oil level.
- ₩ Refer to page 5-64 for details.

(10) Engine check warning lamp



- ${\ensuremath{\textcircled{}}}$ The engine check warning lamp will activate as following condition.
 - a. The engine oil pressure is low.
 - b. The engine oil life has exceeded the maximum service limit.
- 2 Also, the engine stop warning lamp and engine oil pressure warning lamp will activated as table below

Engine warning lamp			
Engine check	Engine stop	Engine oil pressure	
[]	STOP	÷	State description
Off	Off	Off	Oil pressure and oil life OK
On	On	On (Engine running)	Low oil pressure during engine operation
Off	Off	Flash (2 Hz)	The engine oil change due soon. Triggered at *480 hours from last oil change reset. Pop-up window is seen in a cluster. Engine oil change due soon, Oil change is required. * Need to reset engine oil life after oil change. (Menu -> Menage -> Engine Oil Life Reset)
On	Off	Flash (2 Hz)	The engine oil life has reached the maximum recommended life. Triggered by the oil life algorithm. Pop-up window is seen in a cluster.
Flash	Off	Flash (2 Hz)	The engine oil life has exceeded the maximum allowable life for the monitored operating conditions. Engine derates. Triggered by the oil life algorithm. Recursive devices in a cluster Engine oil change due, Oil change is required. Engine derates, * Need to reset engine oil life after oil change. (Menu -> Manage -> Engine Oil Life Reset)
Off	Off	Flash (1 Hz)	Oil life reset confirmed. Flashes at 1 Hz until key cycle is reset

* Recommended time period between oil service intervals is 500 hrs.

* Method of the engine oil life reset

Once engine oil is changed, the oil life reset is required. To perform oil life reset, follow the procedure as below.

- (1) Turn the starting switch on without engine running.
- (2) Then press "Menu" \rightarrow "Manage" \rightarrow "Engine Oil Life Reset"
- (3) Press OK and Put "User Password".



- 130ZF3CD101
- (4) When the oil life reset is completed, the pop-up window below is seen, and oil pressure warning lamp flashes at 1 Hz until starting switch cycle is reset.
- (5) Turn the starting switch off and then starting switch on again to perform starting switch cycle reset.



(11) DPF (Diesel Particulate Filter) warning lamp



130ZF3CD219

- This warning lamp lights ON or BLINK when the regeneration is needed.
- ② When this lamp lights ON or BLINK, press the DPF switch to manual regeneration position (I) at least 2 seconds to initiate the manual DPF regeneration.
- ③ When the manual regeneration is started, the DPF lamp will be turned off and HEST lamp will be ON.
- * Consequences of delaying regeneration
 - Poor performance caused by increasing exhaust gas pressure.
 - Higher fuel consumption
 - Shorter filter lifetime
- Refer to the operator's manual page 3-39 for the DPF switch operation.

(12) DPF regeneration inhibit warning lamp



- This warning lamp lights ON or BLINK when pressing the DPF switch at inhibit position (II) at least 2 seconds.
- ② When this lamp lights ON or BLINK, the automatic or manual regeneration does not occur.
- ③ To clear the Inhibit lamp, pressing the DPF switch once again at inhibit position (II) at least 2 seconds.

(13) HEST (High Exhaust System Temperature) warning lamp



130ZF3CD221

- ① This warning lamp indicate high temperature of the exhaust system due to DPF regeneration.
- (2) The lamp will also illuminate during the manual DPF regeneration.
- ③ When this lamp is illuminated, be sure the exhaust pipe outlet is not directed at any surface or material that can be melted, burn, or explode.
- ▲ The exhaust gas temperature could reach 650 °C [1200 °F], which is hot enough to ignite or melt common materials, and to cause burns.
- ** The lamp does not signify the need for any kind of equipment or engine service; It just alerts the operator to high exhaust temperatures. It is common for the lamp to illuminate on and off during normal equipment operation as the engine completes DPF regeneration.

$\ensuremath{\overset{\scriptstyle \otimes}{_{\scriptstyle \sim}}}$ Below chart shows the lamp statuses at each conditions.

Condition	Engine check lamp	Engine stop warning lamp	DPF warning lamp	HEST warning lamp	DPF regen inhibit warning lamp	State description
	[]	STOP	= <u>:</u> ;}	£.3,		
Normal (soot low)	OFF	OFF	OFF	OFF	OFF	Normal operation (passive regeneration)
Regeneration disabled	OFF	OFF	OFF	OFF	ON	Regeneration disabled due to DPF regeneration inhibit switch activated
Regeneration	OFF	OFF	OFF	<u>ON</u>	OFF	High exhaust temperature lamp ON during active or manual regeneration. The lamp will turn OFF 1 min after regeneration is completed.
Soot midium	OFF	OFF	<u>ON</u>	OFF	OFF	DPF above 130% soot loading, warns the operator that regen- eration is required.
Soot high	Blink	OFF	<u>ON</u>	OFF	OFF	DPF above 180% soot loading. Engine power derates depen- dent on soot load. Regeneration is required.
Soot full	Blink	<u>ON</u>	<u>ON</u>	OFF	OFF	DPF above 250% soot loading. Engine will be locked at low idle. Contact the HD Hyundai Con- struction Equipment service center or a local dealer.

※ Manual DPF regeneration



- (1) Manual DPF regeneration can be performed when the below conditions are met.
- ① Engine running > 10 seconds
- ② Coolant temperature > 65 °C
- ③ Engine at low idle
- ④ Soot load >130% (when DPF lamp is ON)
- (5) Safety lever = Lock position
- A Manual DPF Regeneration must be performed when the machine is in a fireproof area.

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(P)

* To stop a manual DPF regeneration before it has completed, set the DPF switch to Inhibit position (II) or turn OFF the engine.

(2) Procedure

- 1) Park a machine in a fireproof area.
- ② Set the engine at a low idle.
- ③ Push the DPF switch to manual regeneration position (I) at least 2 seconds to initiate the manual DPF regeneration.
- * Refer to the operator's manual page 3-39 for the DPF switch operation.
- * The engine speed will accelerate automatically from low idle to 2000 rpm at a rate of 100 rpm/s. The engine speed shall be maintained for a period of 15 to 25 minutes depending on the initial soot load. Once the regeneration has completed the engine will drop to low idle.
- ④ The HEST warning lamp will light ON during the DPF regeneration.



HEST warning lamp ON



HEST warning lamp OFF

(5) The HEST warning lamp will light OFF 1 minute after the DPF regeneration is completed.

4) PILOT LAMPS



130ZF3CD274

(1) Mode pilot lamps

No	Mode	Pilot lamp	Selected mode
		Ρ	Heavy duty power work mode
1	Power mode	S	Standard power mode
		Е	Economy power mode
2	User mode	U	User preferable power mode
		B	General operation - IPC speed mode
		B	General operation - IPC balance mode
3	Work mode	B	General operation - IPC efficiency mode
		J.	Breaker operation mode
		ษ์	Crusher operation mode
4	Travel mode	-	Low speed traveling
4		5	High speed traveling
5	Auto idle mode	\square	Auto idle

(2) Power max pilot lamp



(3) Preheat pilot lamp



(4) Warming up pilot lamp



(5) Decel pilot lamp



(6) Fuel warmer pilot lamp



290F3CD82

- 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.
- $(\ensuremath{\mathbb J}$ Turning the start key switch ON position starts preheating in cold weather.
- 2 Start the engine after this lamp is OFF.
- 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.
- 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 3-37.
- 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



 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 5-81.

(8) Entertainment pilot lamp



- This lamp is on when audio or video files are playing.
 * Refer to the page 5-87.
- (9) Smart key pilot lamp (opt)



290F3CD214

- ${\rm (I)}$ 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 5-82.
5) SWITCHES



* When some of the switches are selected, the pilot lamps are displayed on the LCD. Refer to the page 5-68 for details.

(1) Power mode switch



(2) Work 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.
 - \cdot E : Economy power work.
- (2) The pilot lamp changes $E \rightarrow S \rightarrow P \rightarrow E$ in order.
- This switch is to select the machine work mode, which shifts from general operation mode to optional attachment operation mode.
 - \cdot \land : General operation mode
 - · Sreaker operation mode (if equipped)
 - \cdot for a crusher operation mode (if equipped)
 - \cdot Not installed : Breaker or crusher is not installed.
- * Refer to the operator's manual page 4-7 for details.

(3) User mode switch



(4) Travel speed switch



(5) Auto idle/ buzzer stop switch



(6) Escape/Camera switch



(7) Work light switch



- 1 This switch is used to memorize the current machine operating status in the MCU and activate the memorized user mode.
 - \cdot Memory : Push more than 2 seconds.
 - \cdot Action : Push within 2 seconds.
 - · Cancel : Push this switch once more within 2 seconds.
- 0 Refer to the page 5-76 for another set of user mode.
- ${\rm (1)}$ 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.
- $(\ensuremath{\underline{1}})$ This switch is used to activate or cancel the auto idle function.
 - \cdot Pilot lamp ON $\,$: Auto idle function is activated.
 - \cdot 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.
- $(\ensuremath{\mathbb D}$ This switch is used to return to the previous menu or parent menu.
- 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.
- 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



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

(9) Intermittent wiper switch



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

(10) Wiper switch



(11) washer switch



(12) Cab light 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.
- 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.
- 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



This switch turns ON the rotary light on the cab.
 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.
- 0 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.
 - \cdot ON : The travel alarm function is activated.
 - \cdot OFF $\,$: The travel alarm function is not activated.

(16) Main menu quick touch switch



This switch is to activate the main menu in the cluster.
 * Refer to the page 5-75.

(17) Entertainment quick touch switch



- $\ensuremath{\textcircled{}}$ 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 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



130ZF3CD202

(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 Engine oil life reset	General record, Hourly, Daily, Mode record Replacement, Change interval oils and filters ESL mode setting, Password change Model, MCU, Monitor, Switch controller, RMCU, Relay drive unit, FATC A/S phone number, A/S phone number change Power shift, Operating hour, IPC mode, Breaker mode pump acting, EPPR current level, Overload pressure Clinometer setting Cluster, ETC device Reset
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

(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.





290F3CD112

- · 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	1000	0
2	1400	1050	3
3	1500	1100 (auto decel)	6
4	1600	1130	9
5	1700	1150	12
6	1800	1180	16
7	1900	1200	20
8	2000	1230	26
9	2050	1250	32
10	2100	1280	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



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



- · 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 page 5-87.

6 Automatic engine shutdown (option)



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

\bigcirc Initial mode

🗲 Mode 🛛 🖗	上 回 合	I Initia	al Mode	
Vork Tool	Breaker>	4-1110		
I Mode Power		Key On I	init Mode	E Mode
Soom/Arm Speed	• ž	Accel, In	hit Mode Last Settin	g Value
Auto Power Boost	Disable	Accel, In	nit Step	0 Step
nitial Mode		\odot		
5				
	2005200122			

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



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

(3) Monitoring

1 Active fault



· The active faults of the MCU or engine ECM can be checked by this menu.

2 Logged fault

MENU SECTION OF THE AUTON	¢	MENU SS	2014-05-05 13:47 -40°C HYUNDAI	ø	MENU SS	2014-06-05 13:46 -40°C HYUNDAI	ø
Active Fault	11	Logg La	ed Fault	MCU	🚽 Logg	ed Fault	MCU
Logged Fault		HCESPN	105 MC	Water of the second sec	HCESPN :	105	FMI:0
Delete Logged Fault		HCESPN	105 EC	M _{ERE E}	HCESPN :	105	FMI:1
Monitoring	•	HCESPN	105	FMI:2	HCESPN :	105	FMI:2
U &-		HCESPN	105	FMI: 4	HCESPN :	105	FMI:4
290F	3CD128						
		UB	Annal State Lands		UB		
			2	90F3CD123			290F3CD

· The logged faults of the MCU or engine ECM can be checked by this menu.

③ Delete logged fault



· The logged faults of the MCU or engine ECM 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 \bigcirc are light ON.

(4) Management

1 Fuel rate information











210WF3CD16

· General record (A)

- Average fuel rate (left) (from "Reset" to now) Fuel consumption devided 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 relpace 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

3 Machine security



· ESL mode setting

- ESL : Engine Starting Limit
- ESL mode is desingned 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.





220S3CD137A



220S3CD138A

※ Default password : 00000 +

※Password length : (5~10 digits) +

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

Password change

- The password is 5~10 digits.







 IT:09
 20200512

 User rassword
 Imput password,

 1
 2
 3

 4
 5
 6

 7
 8
 9

 0

 E
 6

220S3CD135A

Enter the current password



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

- Smart key



- 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.
- $\cdot\,$ When deleting a tag : All registered tags are deleted.



Deleting





235F3CD002







235F3CD005

(4) Machine Information



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

(5) Contact (A/S phone number)



(6) Service menu

the former	Service Menu		-	Power Shift 🛛 🗙
ine information	Power Shift	Standard	P	dan side at
kt 🕨	Operating Hours	3991 hr	→	Standard
e Menu	SPC Mode	•	· FI	
neter setting 🛛 🕨	Breaker Mode Pump Acting	N 2		Option
	EPPR Control Level	•		
000E2CD140	Overload Pressure	►	-6	

290F3CD151

- · 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.

9 Engine oil life reset



(5) Display

1) Display item



- $\cdot\,$ 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.

$\textcircled{2} \operatorname{Clock}$



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



 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

ени 38 - 2014-06-05 1326 - 40°С НУUNDAI С	MENU S	28 40°C	MENU 40-05-13-29 -40*C	ø
💪 🚱 🤱 🚺 Display 🏤	Unit لي		Temperature	
Brightness >	Temperature	σ	T	_
Unit	Pressure	bar	P C	
Language English	Flow	Ipm O	F	
Screen Type A Type	Distance	km	r F	
290E3CD161	Date Format	yy.mm,dd	d	
2001000101	UB		UE	1 M 100
		290F3CD162		290F3CE

- · Temperature : $^{\circ}C \leftrightarrow ^{\circ}F$
- · Pressure : bar \leftrightarrow MPa \leftrightarrow kgf/cm²
- $:|\leftrightarrow$ gal · Volume
- · Flow : $lpm \leftrightarrow gpm$
- · Distance : km \leftrightarrow mile
- · Date format : $yy/mm/dd \leftrightarrow mm/dd/yy \leftrightarrow dd-mm-yy$

5 Language



290F3CD164

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



6 Screen type

(6) Utilities

① Entertainment



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



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

- $\cdot\,$ If the rear camera is not installed on the machine, set disable.
- · If the rear camera installed on the machine, set enable.



290F3CD255

290F3CD256

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



290F3CD221

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

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



Buzzer stop switch Escape switch

130ZF3CD244

- 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.



The beginning screen



AAVM mode

- 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.







· 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.

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.

st 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



145ZF3CD06

1) POWER OFF SWITCH



(1) This switch makes the system and the LED 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) AUTO SWITCH



- (1) Turn the starting switch to ON position, LCD lights ON. Auto air conditioner and heater system automatically keeps the optimum condition in accordance with operator's temperature configuration sensing ambient and cabin inside temperature.
- (2) This switch can restart system after system OFF.

3) AIR CONDITIONER SWITCH (compressor switch)



- (1) This switch turns the compressor and the LCD ON.
- (2) In accordance with the temperature sensed by duct (evaporator) sensor, compressor turns ON or OFF automatically.
- * 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.

4) 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.
 - $\cdot\,$ The maximum step or the minimum step beeps 5 times.
- (3) This switch makes the system ON.

5) TEMPERATURE CONTROL SWITCH



- (1) Setting temperature indication
- ① Type A : 17~32°C, scale : 1°C
- 2 Type B : Lo, 18~31°C, Hi, scale : 1°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	Max (Hi)	Recirculation	Vent
Max warm	OFF	Max (Hi)	Fresh	Foot

- (4) Temperature unit can be changed between celsius (°C) and fahrenheit (°F)
- ① Default status (°C)
- ② Push Up/Down temperature control switch simultaneously more than 5 second displayed temperature unit change (°C → °F)

6) MODE SWITCH



(1) Operating this switch, it beeps and displays symbol of each mode in order. (Vent \rightarrow Vent/Foot \rightarrow Def/Foot \rightarrow Def/Vent \rightarrow Def/Vent/Foot)

		Vent	Vent/Foot	Def/Foot	Def/Vent	Def/Vent/Foot
Mode s	witch	-6	d -			With the second
	А					
Outlet	В					
	С					

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

7) FRESH AIR/AIR RECIRCULATION SWITCH



- (1) It is possible to change the air-inlet method.
- ① Fresh air (🔟)

Inhaling air from the outside.

- * Check out the fresh air filter periodically to keep a good efficiency.
- ② 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 recirculation filter periodically to keep a good efficiency.

8) SELF DIAGNOSIS FUNCTION

(1) Procedure



3607A3CD69

(2) Error check

- The corresponding error code flickers on the setup temperature display panel, the other symbol will turn OFF.
- Error code flickers every 0.5 second.
- $\cdot\,$ If error code is more than two, each code flickers 2 times in sequence.
- · Error code

Error code	Description	Error code	Description
11	Cabin inside sensor	16	Mode actuator 1
12	Ambient sensor	17	Mode actuator 2
14	Duct (evaporator) sensor	18	Intake actuator
15	Temp actuator	-	-

(3) Fail safe function

Error description	Fail safe function		
Cabin inside sensor (11)	25°C alternate value control		
Ambient sensor (12)	20°C alternate value control		
Duct (evaporator) sensor (14)	1°C alternate value control		
Tomp actuator (15)	If opening amount is 0 %, the alternate value is 0 $\%$		
	If not, the alternate value is 100 %		
Mode actuator 1, 2 (16, 17)	The alternate value is vent		

GROUP 16 FUEL WARMER SYSTEM

1. SPECIFICATION

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

2. OPERATION

- The current of fuel warmer system is automatically controlled without thermostat according to fuel temperature.
- 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