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1. SPECIFICATIONS

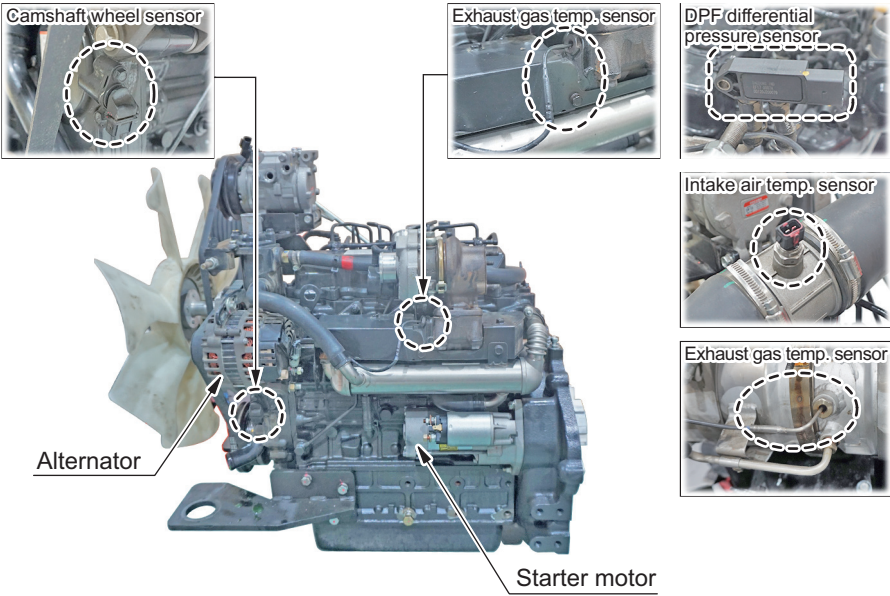
ITEM	SPECIFICATION
Battery	12V 110Ah
Alternator	13.5V 75A
Starter motor	12V 2.5kW
Slow-blow fuse	30A(Start), 40A(Engine), 60A(Lamp), 70A(Power 2), 80A(Preheat), 100A(Power 1)
Engine oil pressure switch	0.5 kgf/cm ²
Crankshaft wheel sensor	Operating voltage : 4 ~ 24 VDC
DPF differential pressure sensor	Operating voltage : 4.75 ~ 5.25 VDC
Intake air temperature sensor (T1)	Temperature range : -40°C ~ 250°C
MCU	Operating voltage : 8 ~ 16 VDC
Buzzer	Rated voltage : 6 ~ 24 VDC
Twin relay (For motor)	Operating voltage : 10 ~ 15 VDC
Oil temperature sensor	Operating temperature : -30°C ~ 130°C
Escort unit	Operating voltage : 10 ~ 16 VDC
Relay (70A)	Operating voltage : 9 ~ 16 VDC
Flash unit	Operating voltage : 9 ~ 15 VDC
Horn	12V 2.5A 105 ~ 118 dB(A)
Turn signal lamp, tail lamp	12V P21W, 5W
Brake lamp, turn signal lamp, tail lamp	12V P21W, P21/5W
Work lamp	LED
Number plate lamp	12V 3W
Room lamp	12V 10W

SAFETY FIRST	ENGINE	DRIVING & CHASSIS	HYDRAULIC SYSTEM	ELECTRIC SYSTEM	CABIN	INDEX
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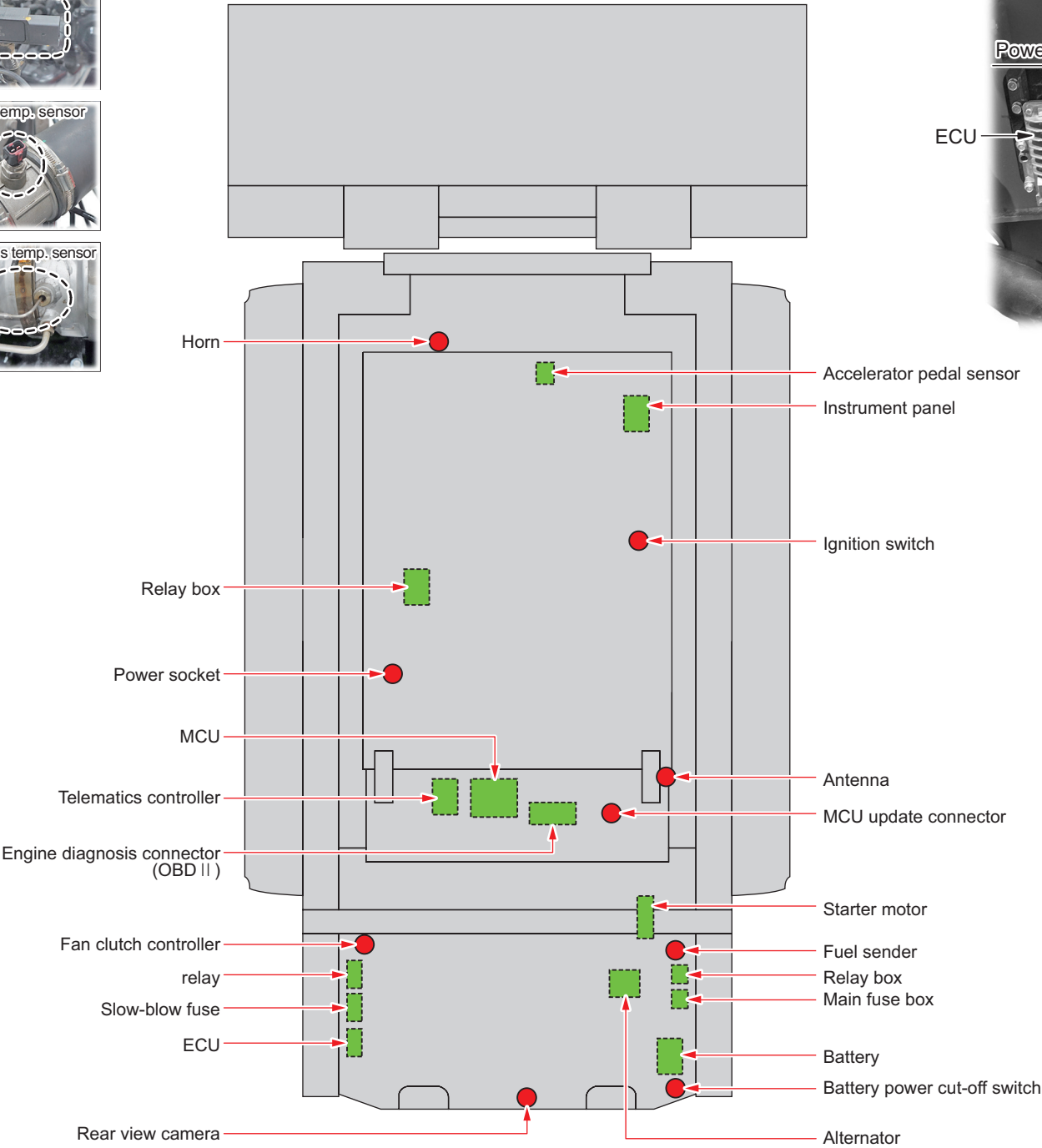
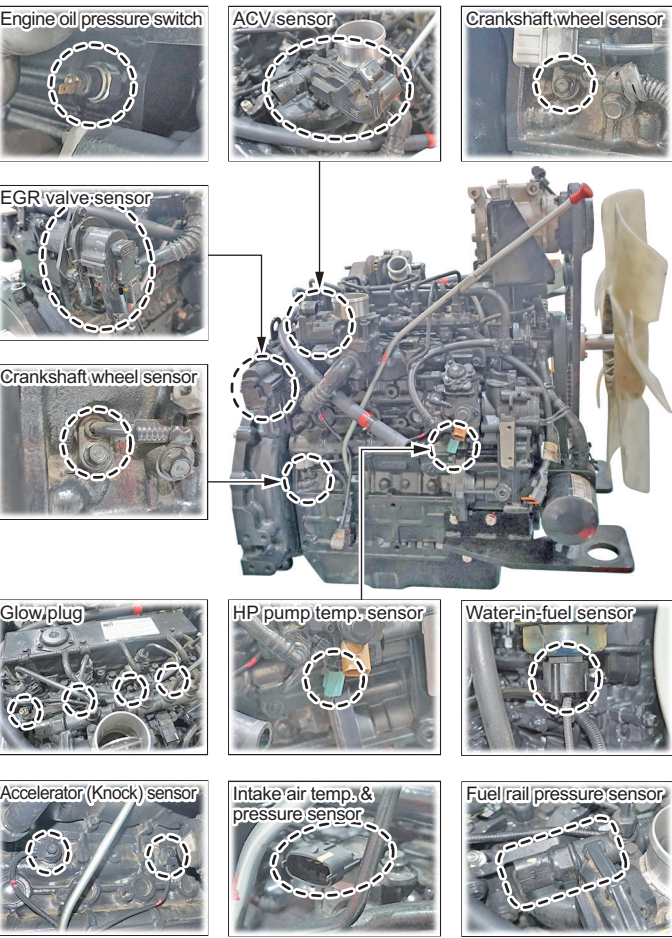


2.2 LOCATION OF ELECTRONIC COMPONENTS

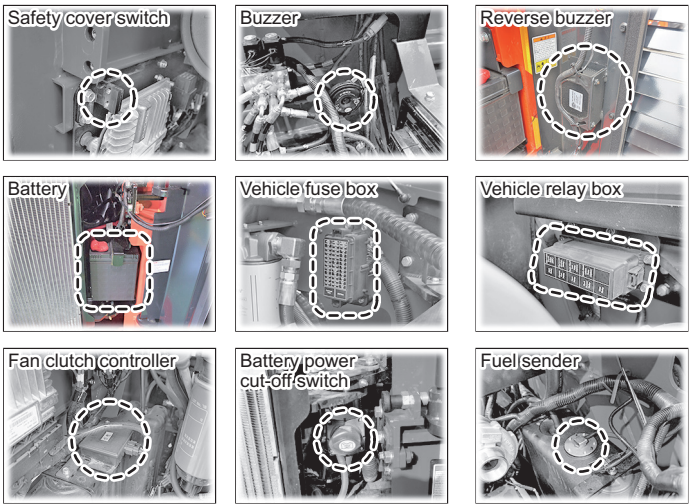
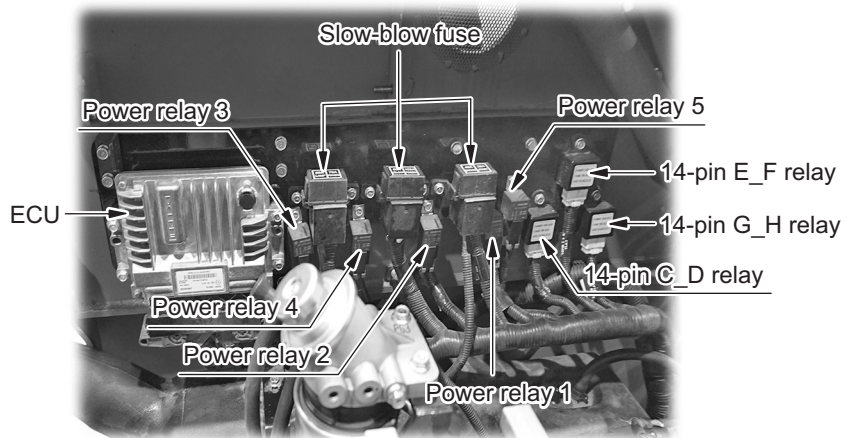
ENGINE (LH)



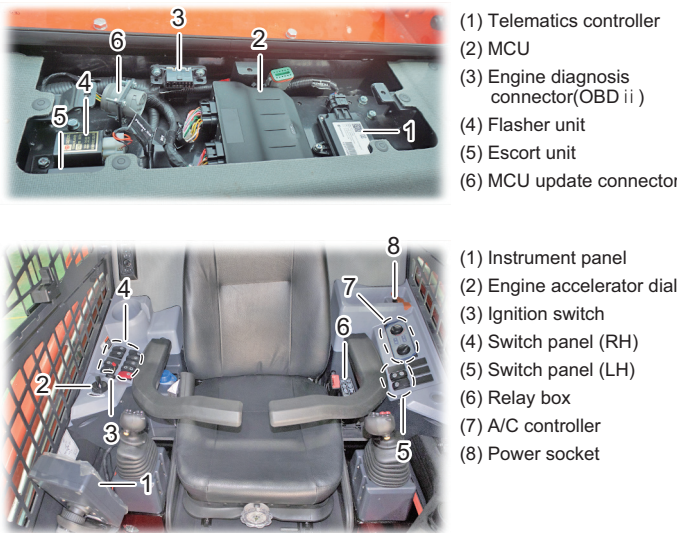
ENGINE (RH)



ENGINE ROOM



DRIVER'S SEAT



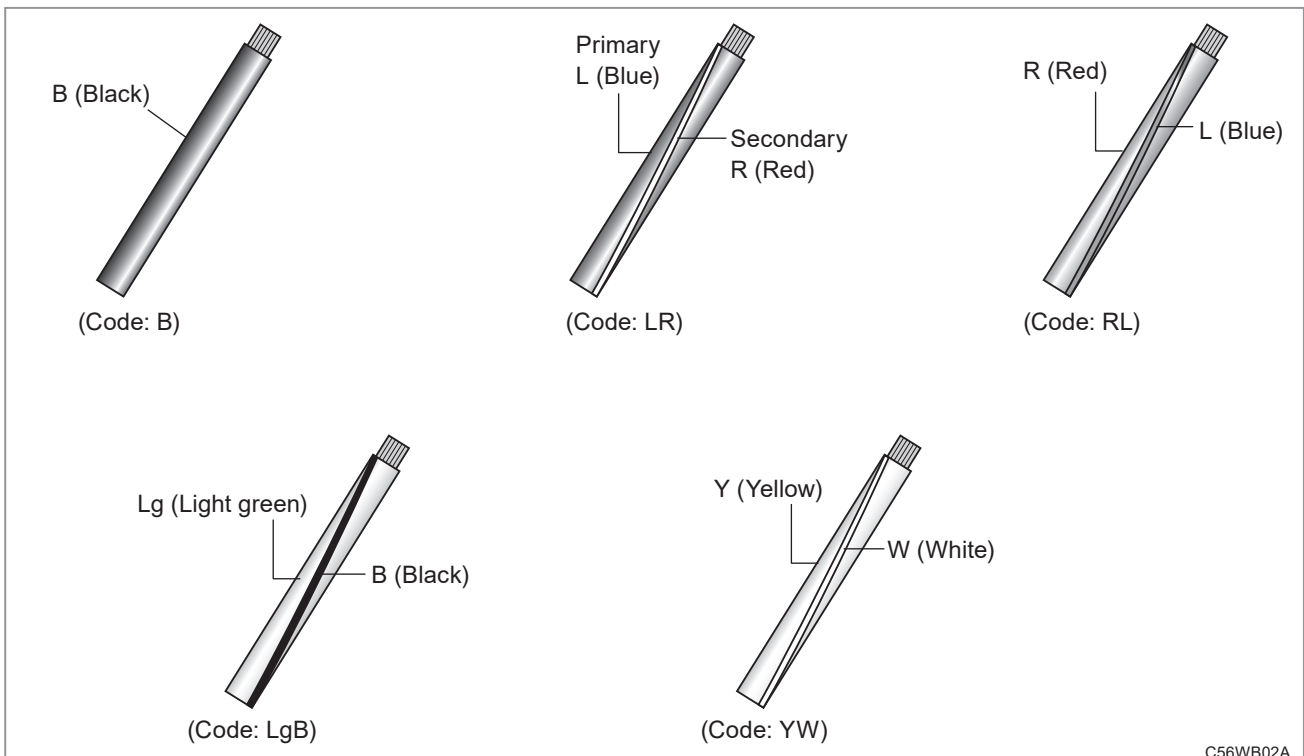
3. WIRING IDENTIFICATION

3.1 WIRING COLOR IDENTIFICATION

The color codes in the following table are marked on every wiring in the wiring diagrams. It is necessary to have full knowledge of the color codes in order to understand circuit diagrams when checking actual wirings based on circuit diagrams.

Code	Color	Code	Color
B	Black	R	Red
Lg	Light Green	Gr	Gray
W	White	G	Green
L	Blue	Y	Yellow
P	Pink	Br	Brown
Or	Orange	BR	Black/Red
BW	Black/White	BG	Black/Green
BY	Black/Yellow	RB	Red/Black
RW	Red/White	RG	Red/Green
RL	Red/Blue	RY	Red/Yellow
LgB	Light Green/Black	LgR	Light Green/Red
LgW	Light Green/White	LgY	Light Green/Yellow
GrY	Gray/Yellow	WB	White/Black
WR	White/Red	WL	White/Blue
WY	White/Yellow	GR	Green/Red
GW	Green/White	GL	Green/Blue
GOr	Green/Orange	LW	Blue/White
LY	Blue/Yellow	YB	Yellow/Black
YR	Yellow/Red	YW	Yellow/White
YG	Yellow/Green	YL	Yellow/Blue
YBr	Yellow/Brown	PB	Pink/Black
BrR	Brown/Red	BrW	Brown/White

The following figures are examples for colors according to the codes.



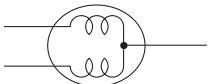
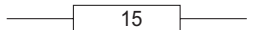
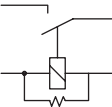
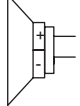
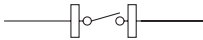
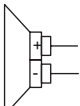
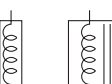
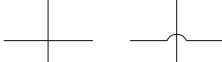
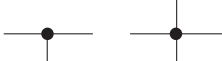
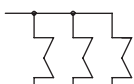
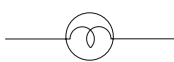
C56WB02A

3.2 CROSS SECTIONAL AREA OF WIRING

All wirings in circuit diagrams are marked with their colors and cross sectional area so that mechanics can understand wiring thickness with ease.

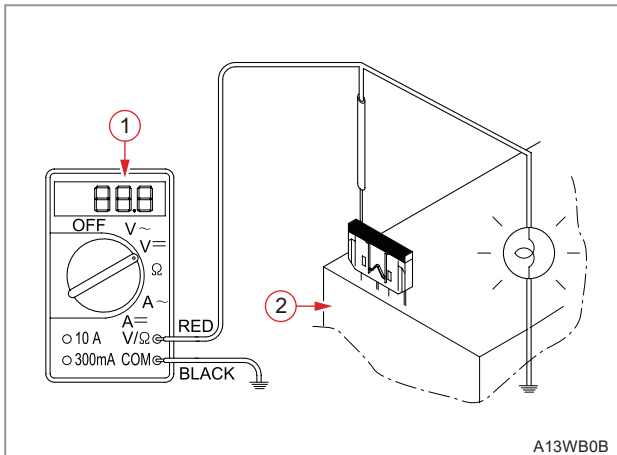
For example, "5.0 R" refers to a red wiring with 5 mm² of cross sectional area. Therefore, the diameter of the wiring with 5 mm² of the cross sectional area is 2.523 mm.

3.3 SYMBOLS FOR ELECTRIC COMPONENTS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Fuse		Double bulb
	Fuse (15 A)		Diode
	Motor		Relay
	Switch (Normally Open Type)		Buzzer
	Switch (Normally Close Type)		Safety switch
	Ground (Wire)		Reverse buzzer
	Ground (Chassis)		Resistor
	Coil		Solenoid
	Battery		Horn
	Disconnected wire		Speaker
	Connected wire		Glow plug Fuel heater
	Lamp		Sensor

3.4 FUSE

3.4.1 INSPECTION

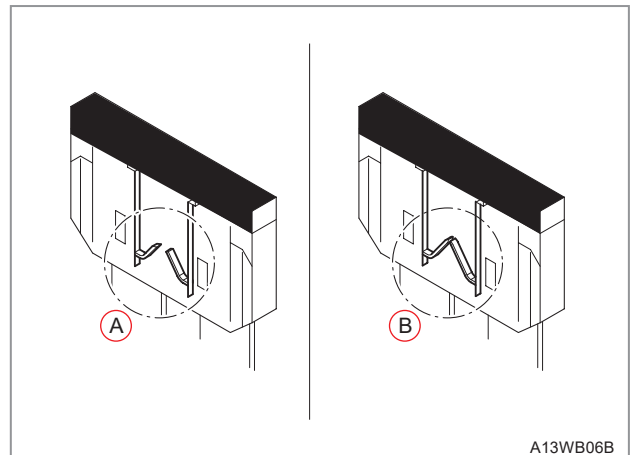


(1) Tester

(2) Fuse box

The blade type fuse can be checked without pulling it out from the fuse box. When connecting the lead wires from the test lamp to the test lead wire and grounding, the test lamp should light up.

3.4.2 CAUSE FOR BLOWN FUSE



(1) Blown fuse due to excessive current

(2) Blown fuse due to heat fatigue

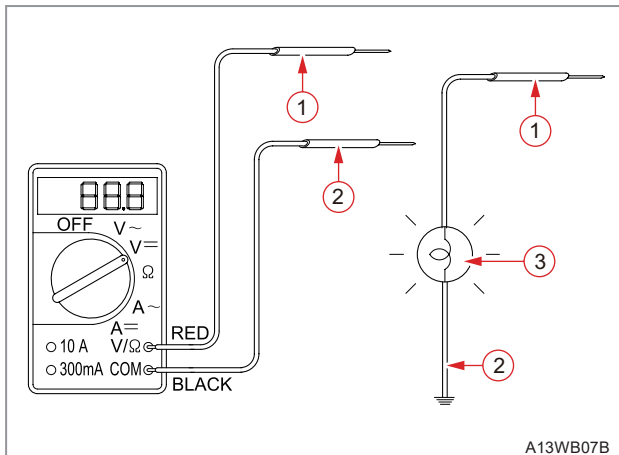
OVER-CURRENT

1. When a fuse is blown due to over-current, do not simply replace the fuse.
2. Check if there is any abnormal condition or open circuit in any electric device.
3. Correct the cause for a blown fuse first, and then replace the blown fuse with a new one with the rated capacity.
4. If using a fuse with a different capacity, its wiring or related components can be damaged.

FREQUENTLY REPEATED ON/OFF STATUS CHANGE

1. This can degrade parts' durability. Avoid excessively repeated operation.
2. Replace the fuse with a new one with the rated capacity.

3.5 ELECTRIC DEVICE DIAGNOSIS



(1) Tester

(2) Ground

(3) Test lamp

An electric circuit consists of power, switch, relay, load, ground, etc. It can be checked by various methods, such as voltage check, open circuit check and continuity check.

VOLTAGE INSPECTION

With the ignition switch in the "ON" position, measure the voltage between the terminals to be tested with a tester. Connect the red lead of a tester to the electric load and the black lead to the chassis or ground to measure voltage.

TEST LAMP CHECK

Ground one lead of a test lamp and connect the other lead to an electric load. The test lamp should turn on and a voltage value should be detected by a tester. If a circuit is intact but an electric device is faulty, start troubleshooting from the closest connector with the voltage test and visual check.

4. ELECTRIC COMPONENTS

4.1 ENGINE ROOM

4.1.1 BATTERY

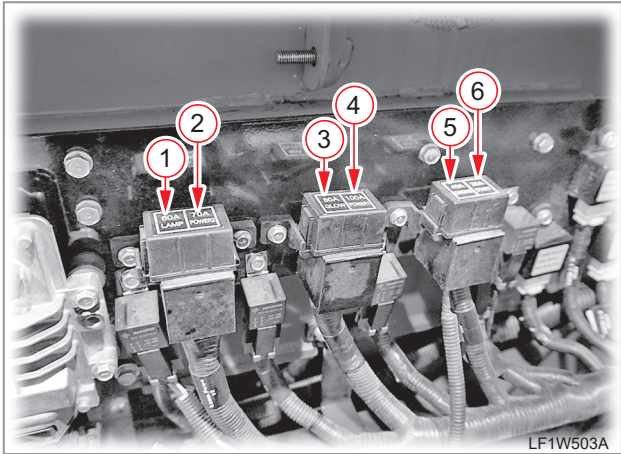


Open the rear cover, the battery is installed on the right hand side. A lead-acid battery is used, which is rechargeable by supplying electricity from outside.

- Capacity : 12V 110Ah

4.1.2 FUSE BOX

SLOW-BLOW FUSE

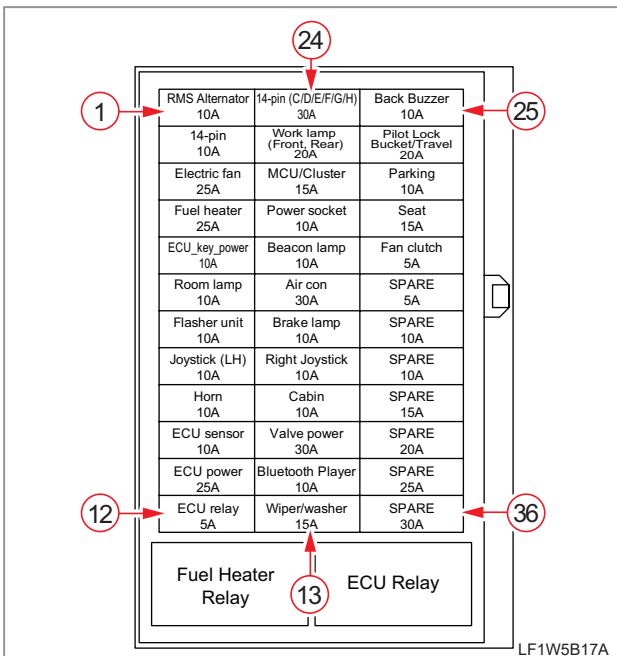
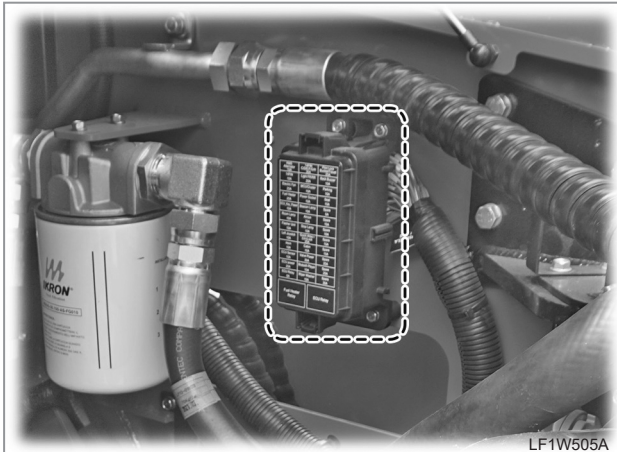


- (1) Lamp power fuse (60A)
- (2) Power 2 fuse (70A)
- (3) Preheat power fuse (80A)
- (4) Power 1 fuse (100A)
- (5) Engine power fuse (40A)
- (6) Ignition power fuse (30A)

Six slow-blow fuses are installed on the frame in the left side of the engine compartment and they are connected to the main wiring. If any electric system does not operate while the battery operates properly, the slow-blow fuse should be checked. If the replaced fuse is blown again, there is a short circuit between the direct B line (power from the battery) and the chassis.

FUSE	COMPONENT TO DIAGNOSE
Lamp	RCV (LH), Horn relay, Flasher unit, Room lamp, Power relay 2
Power 2	Power relay 4, Power socket, 14-pin
Preheat	Power relay 1, Glow plug
Power 1	Alternator, Ignition switch, A/C, Cabin, Fuel heater
Engine	ECU relay, ECU
Ignition	Starter relay

MAIN FUSE BOX



The main fuse box is installed on the right side of the engine room.

It protects systems from excessive electric load.

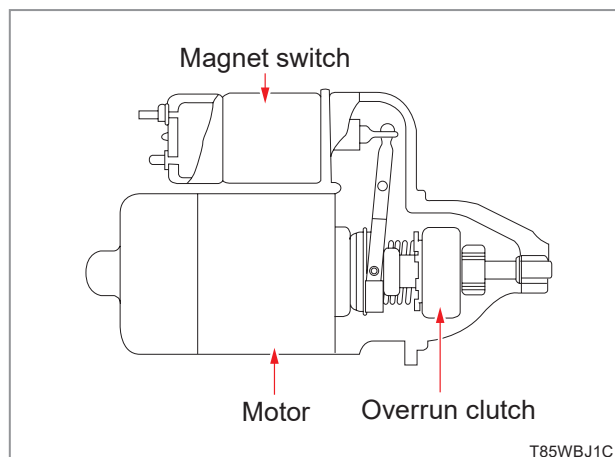
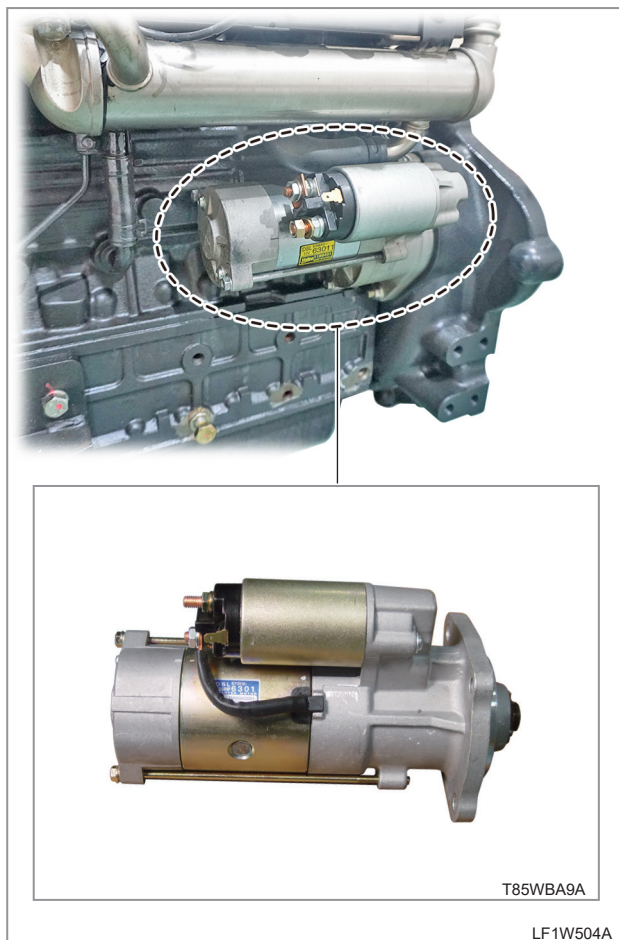
If the current through the fuse is over the specified capacity, the conductor of the fuse is blown to protect controller and circuit.

If the fuse is blown, find the cause and replace it with new one with the same capacity.

CONDITIONS	RESULT
110% of rated current is applied	The fuse is not blown.
130% of rated current is applied	The fuse is blown within 60 seconds.
150% of rated current is applied	The regular fuse is blown within 15 seconds and the fuse for over 30 A is blown within 30 seconds.

NO	CAPACITY	FUNCTION
1	10A	RMS Alternator
2	10A	14-pin
3	25A	Electric fan
4	25A	Fuel heater
5	10A	ECU_key_power
6	10A	Room lamp
7	10A	Flasher unit
8	10A	Joystick (LH)
9	10A	Horn
10	10A	ECU sensor
11	25A	ECU power
12	5A	ECU relay
13	15A	Wiper/washer
14	10A	Bluetooth Player
15	30A	Valve power
16	10A	Cabin
17	10A	Right Joystick
18	10A	Brake lamp
19	30A	Air con
20	10A	Beacon lamp
21	10A	Power socket
22	15A	MCU/Cluster
23	20A	Work lamp (Front, Rear)
24	30A	14-pin (C/D/E/F/G/H)
25	10A	Back buzzer
26	20A	Pilot lock Bucket/Travel
27	10A	Parking
28	15A	Seat
29	5A	Fan clutch
30	5A	SPARE
31	10A	SPARE
32	10A	SPARE
33	15A	SPARE
34	20A	SPARE
35	25A	SPARE
36	30A	SPARE

4.1.3 STARTER MOTOR



The start motor is divided by three sections:

- Motor - Generates torque for cranking the engine.
- Magnet switch - Engages the ring gear with the pinion gear and turns current ON and OFF.
- Overrun clutch - Transfers torque from the start motor to the engine, and blocks engine turning torque to the start motor if the engine rotates faster than the start motor, i.e. the engine is started, for protection of the start motor.

ENGINE START SYSTEM INSPECTION

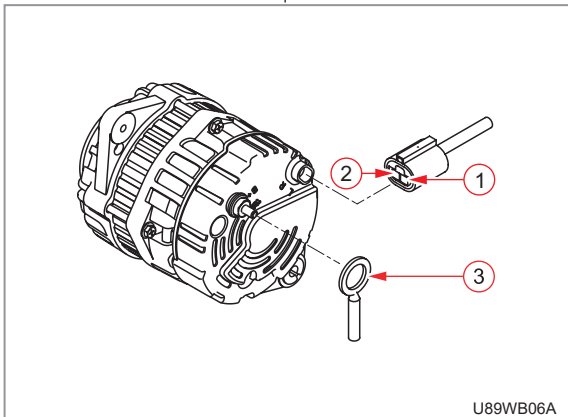
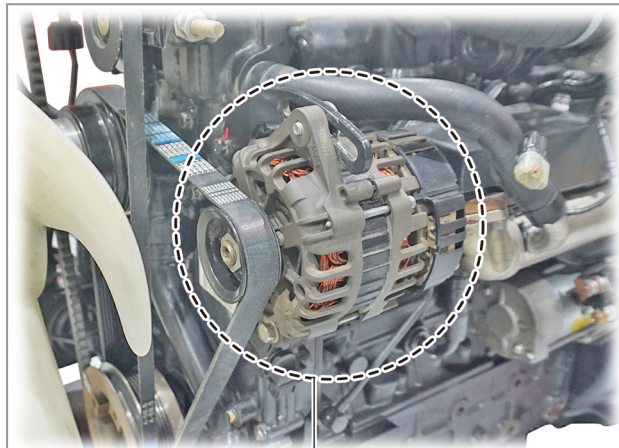
ITEM	CAUSE	SOLUTION
The start motor runs but the engine does not crank	Damaged clutch pinion gear or defective start motor	Replace the start motor
	Damaged flywheel ring gear	Replace the flywheel
	Open related circuit	Repair
The start motor keeps running	Defective start motor	Repair or replace
	Defective ignition switch	Replace
The engine cannot crank	Low battery charging voltage	Charge or replace
	Loose, corroded or worn battery cable	Repair or replace
	Defective start motor or open circuit	
	Defective ignition switch or blown power fuse	Replace the ignition switch or fuse.
	Poor engine ground	Repair
The engine cranks slowly	Low battery charging voltage	Charge or replace
	Loose, corroded or worn battery cable	Repair or replace
	Defective start motor	

4.1.4 ALTERNATOR

There are some components, such as Head lamp, start motor, engine stop solenoid and glow plug, which need a lot of electricity. The alternator supplies power to such components and charges the battery which stores electricity for the tractor.

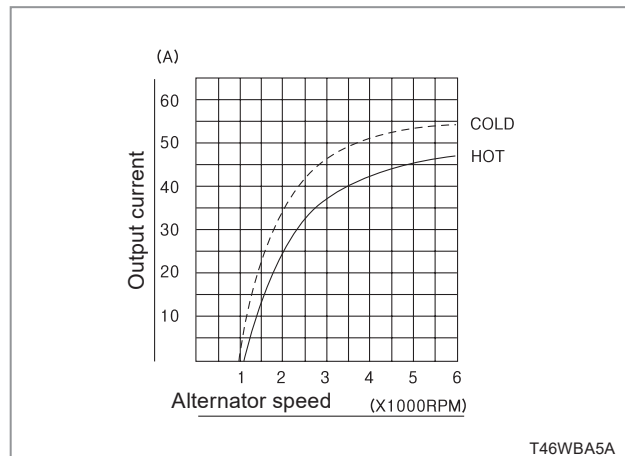
Therefore, the alternator correlates with the battery and electric loads and it is an original source of electricity for the entire tractor.

TEST



- (1) 2P No. 1 connector (3) Battery power
(2) 2P No. 2 connector

PERFORMANCE CURVE OF ALTERNATOR



As shown in the performance curve in the above figure, the alternator does not generate power until its speed reaches 1,200 rpm. This minimum revolution speed is called "Cut In Speed".

If the alternator's speed is below the cut in speed, the alternator does not generate power and the charge warning lamp does not go off.

Also, the output performance changes as the output current (A) changes according to the coil's temperature (cold and hot). Therefore, the average curve for the cold and hot conditions is presented as guaranteed performance.

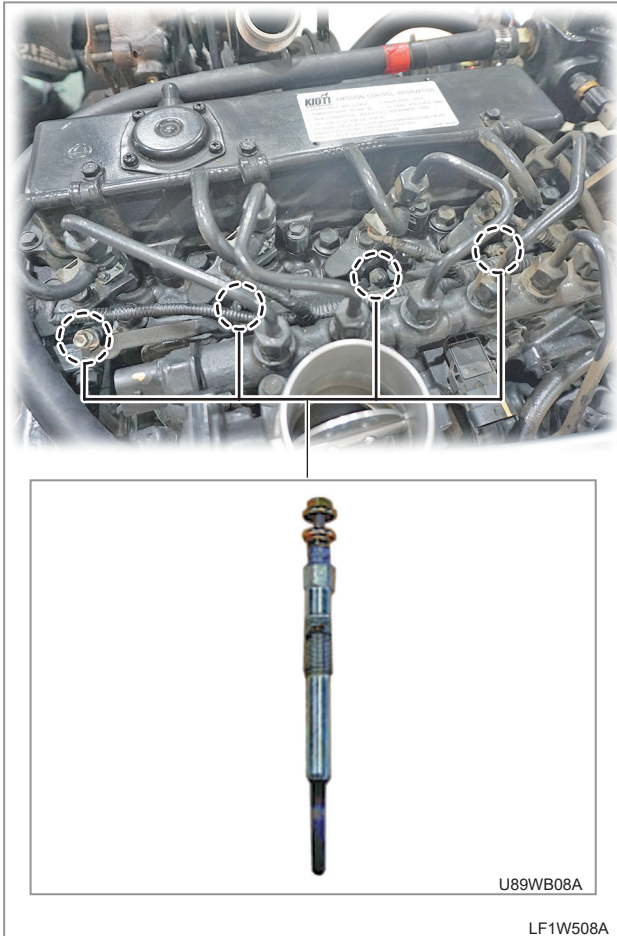
In general, the alternator's pulley ratio is determined to maximize the alternator output in the rated maximum output of the engine.

Item	Tester Connection		Location	Result
	Red Lead	Black Lead		
DC Voltage	2P No. 1 connector	Chassis (GND)	Ignition switch ON	DC 12V
	2P No. 2 connector	Chassis (GND)	Ignition switch in ST	DC12 ~ 14.7 V
	2P No. 1 connector	2P No. 2 connector	Ignition switch ON	DC 12 V

CHARGING SYSTEM INSPECTION

ITEM	CAUSE	SOLUTION
The charge warning lamp does not illuminate with the ignition switch in the ON position (engine stopped)	Defective alternator regulator	Replace the alternator
	Open/Blown charge warning lamp, fuse or wiring	Replace or repair the charge warning lamp/fuse
	Defective ignition switch	Replace the ignition switch
	Poor alternator circuit ground	Repair
The charge warning lamp does not go off after the engine is started (frequent battery charging required)	Defective alternator regulator	Replace the alternator
	Corroded or worn battery cable	Repair or replace the cable
	Loose alternator drive belt	Adjust the belt tension or replace the belt
	Defective wiring	Repair or replace
The battery is discharged	Loose alternator drive belt	Adjust the belt tension or replace the belt
	Poor connection of related circuit or open circuit	Tighten the connection or repair open circuit
	Defective alternator regulator	Replace the alternator
	Expired battery	Replace the battery
	Poor ground	Repair
The battery is over-charged	Defective alternator regulator	Replace the alternator
	Defective alternator regulator	Replace the alternator
	Defective voltage detecting wiring	Repair or replace

4.1.5 GLOW PLUG



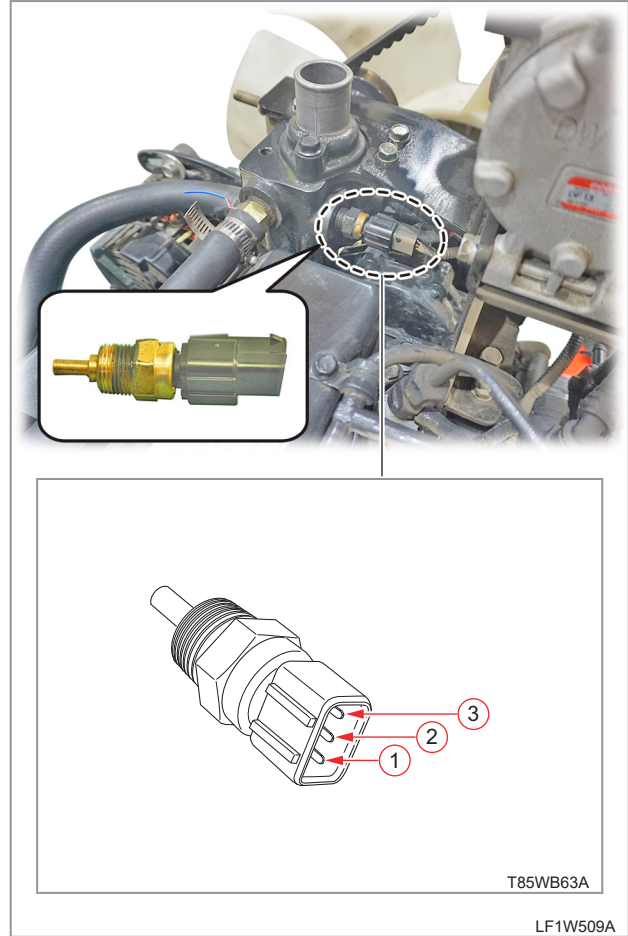
The glow plug is installed in the engine cylinder head close to the nozzle.

It is installed in each cylinder as one of the ignition system component to heat air in the combustion chamber for cold start. Max. 20 A of current flows through the glow plug in 4 seconds after voltage is generated. When its temperature rises to 800°C at this time, it is normal.

TEST

Item	Location	Tester Connection		Result
		Red Lead	Black Lead	
Resistance	Connector disconnected	Connector No. 1	Ground	0.5 Ω
DC Voltage	Ignition switch ON (below 0°C)	Connector No. 1	Ground	DC 12 V

4.1.6 COOLANT TEMPERATURE SENSOR



- (1) Temperature sensor terminal (-)
- (2) Gauge unit terminal (+)
- (3) Temperature sensor terminal (+)

The coolant temperature sensor is installed to the side of the coolant flange.

This sensor detects the engine coolant temperature and sends the automatic preheat signal to the cluster temperature gauge and display unit.

This sensor is used to show the driver the current engine temperature.

RESISTANCE OF GAUGE UNIT SENSOR

Temperature (°C) (°F)	60	85	110	125
	140	185	230	257
Resistance (Ω)	125	48	24	15

RESISTANCE OF TEMPERATURE SENSOR

Temperature (°C)	Resistance (kΩ)
-40	48.14
-20	15.48 ± 1.35
0	5.790
20	2.45 ± 0.14
40	1.148
60	0.5865
80	0.3222
100	0.1884
110	0.1471 ± 0.002
120	0.1163

※ The reference value of the temperature sensor for preheat relay output is 30°C (86°F).

4.1.7 ENGINE OIL PRESSURE SWITCH

The engine oil pressure switch is installed to the top of the start motor on the left rear section of the engine.

When $0.5 \pm 0.1 \text{ kg/cm}^2$ (7 psi ± 1.4 psi) or less of pressure is built in the engine oil system, this switch's contact point is connected to send a warning signal to the instrument cluster.

TEST

Item	Tester Connection		Position	Result
	Red Lead	Black Lead		
Resistance	Oil switch contact	Chassis (GND)	Oil lamp ON on instrument cluster	Continuity (0 Ω)

4.1.8 ECU

SAFETY FIRST

ENGINE

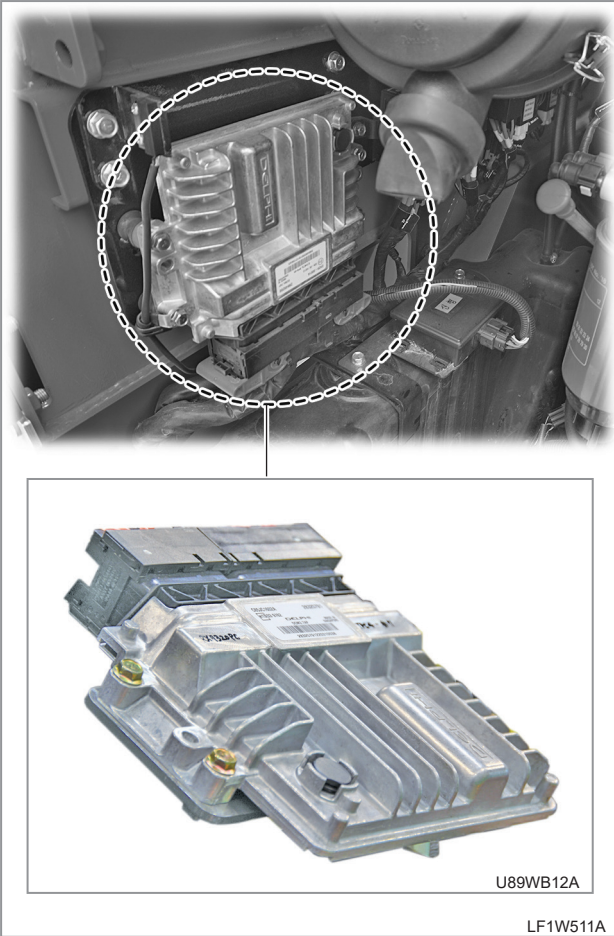
DRIVING & CHASSIS

HYDRAULIC SYSTEM

ELECTRIC SYSTEM

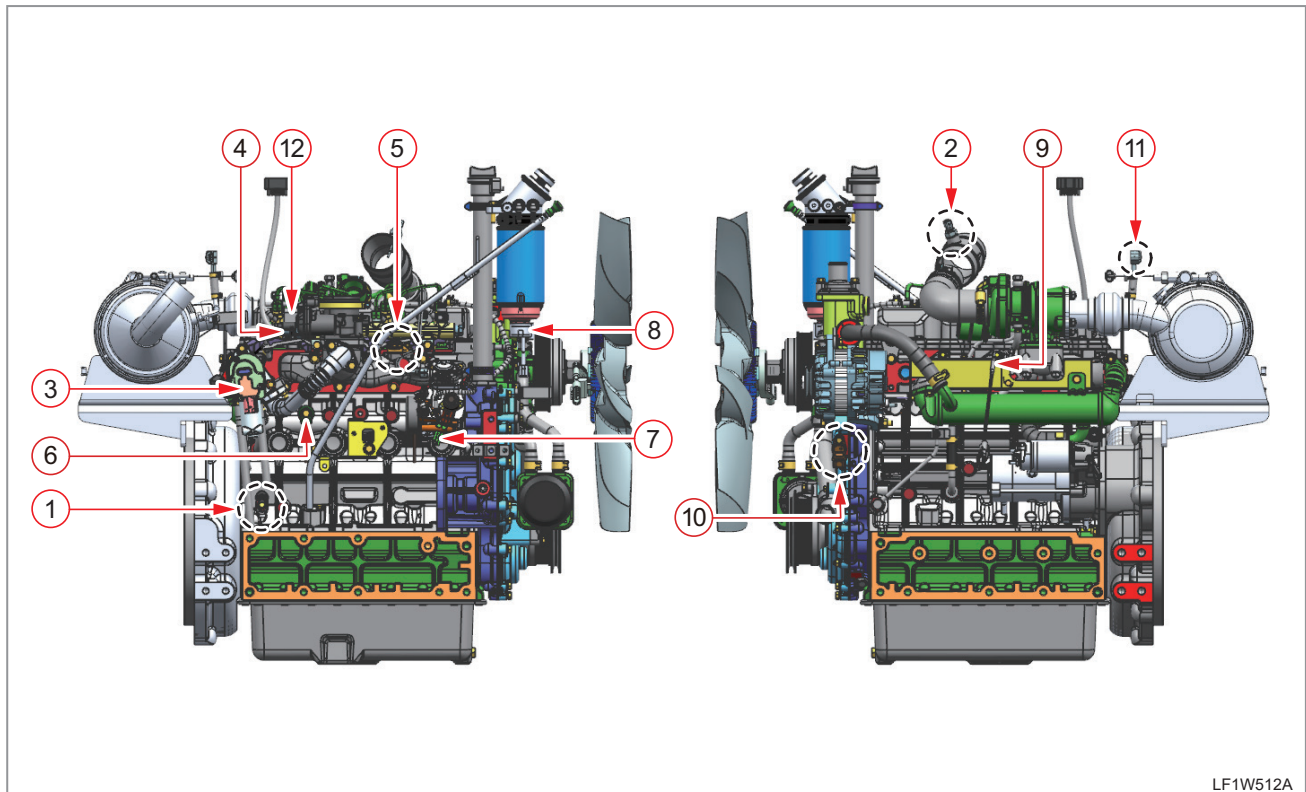
CABIN

INDEX



The ECU (Electronic Control Unit) is installed on the rear right side of the engine. The ECU receives information from various sensors installed in the engine to optimize combustion in order to enhance engine performance and fuel consumption.

4.1.9 SENSORS AND RELAYS



LF1W512A

- | | |
|--|---------------------------------------|
| (1) Crankshaft wheel sensor | (8) Water-in-fuel sensor |
| (2) Intake air pressure sensor (T1) | (9) Exhaust gas temperature sensor |
| (3) EGR valve sensor | (10) Camshaft wheel sensor |
| (4) Fuel rail pressure sensor | (11) DPF differential pressure sensor |
| (5) Intake air temperature & pressure sensor | (12) Air control valve sensor |
| (6) Accelerator (Knock) sensor | |
| (7) High-pressure fuel pump temperature sensor | |

SAFETY FIRST

ENGINE

DRIVING & CHASSIS

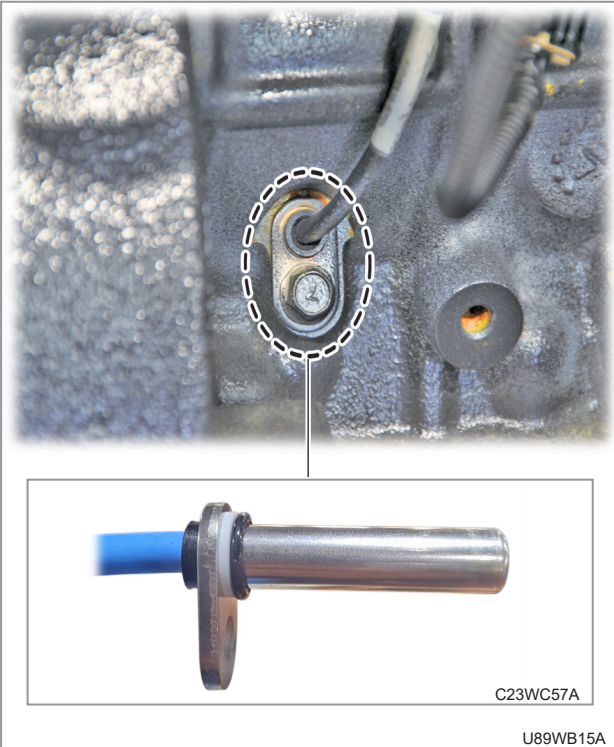
HYDRAULIC SYSTEM

ELECTRIC SYSTEM

CABIN

INDEX

CRANKSHAFT WHEEL SENSOR



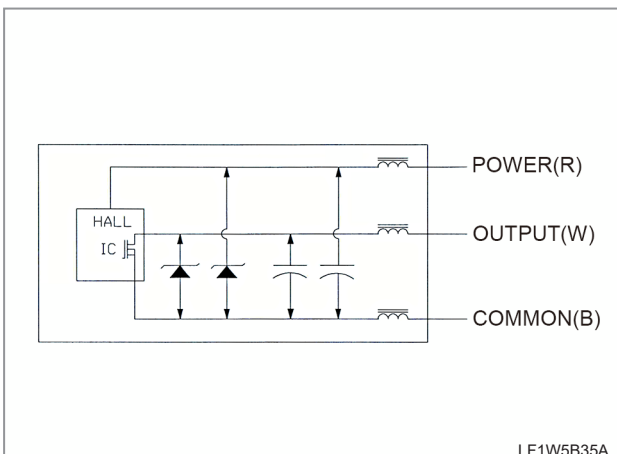
The crankshaft wheel sensor is installed to the edge on the lower right side of the engine next to the transmission.

- Supplied power: 4 ~ 24 VDC
- Supplied current: 6 mA
- Output current: 30 mA

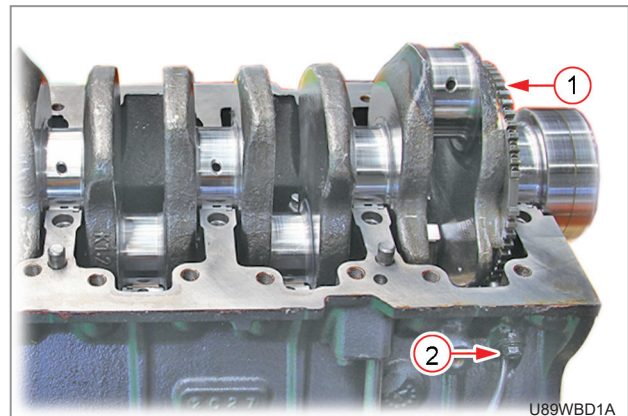
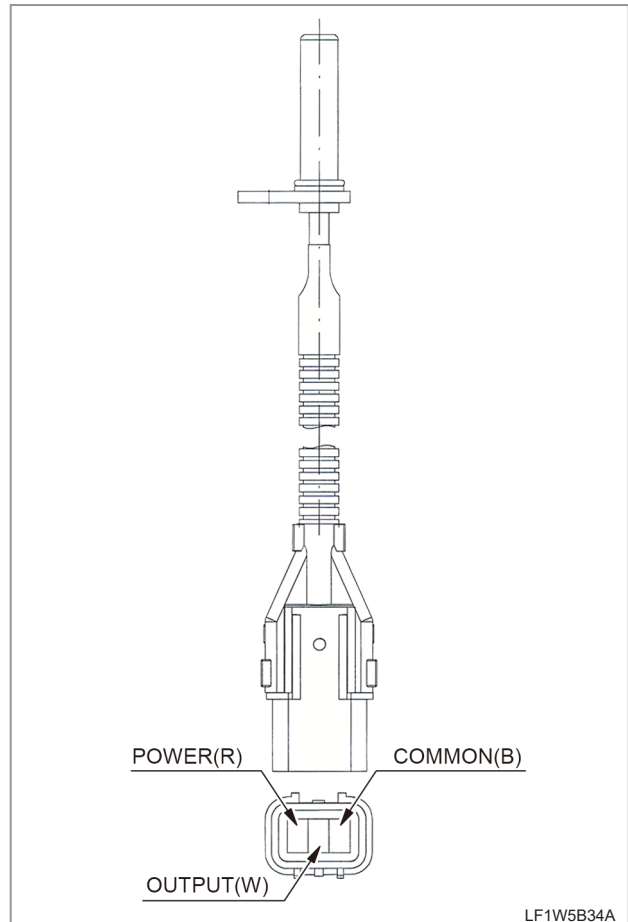
⚠ CAUTION

- When installing the crankshaft wheel sensor to the engine block, be careful not to miss the O-rings.

► CIRCUIT DIAGRAM



► CONNECTOR

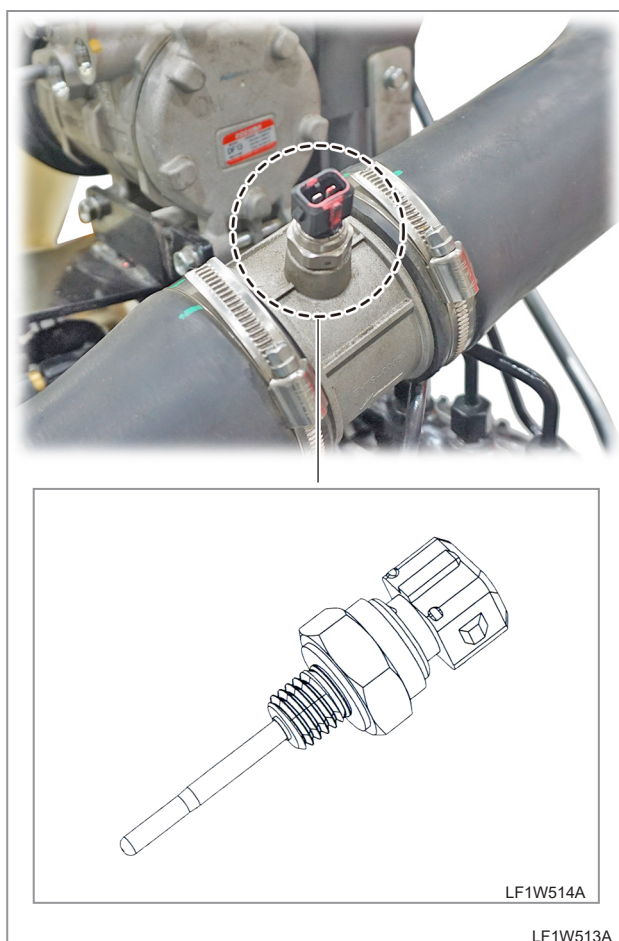


- (1) Crankshaft sensitive wheel
- (2) Crankshaft wheel sensor

The crankshaft wheel sensor is a magnetic pick-up type and it is supplied with 5 V power. It outputs sine waveform according to the change in magnetic field occurred by rotation of the crankshaft. Then, the position/speed of the crankshaft can be determined by the current value through the changed resistance value.

The crankshaft wheel sensor detects the position of each piston and sends this information to the ECU which then uses this information to set the injection timing and amount.

INTAKE AIR TEMPERATURE SENSOR (T1)



The intake air temperature sensor is installed on the intake hose which is connected the turbo charger.

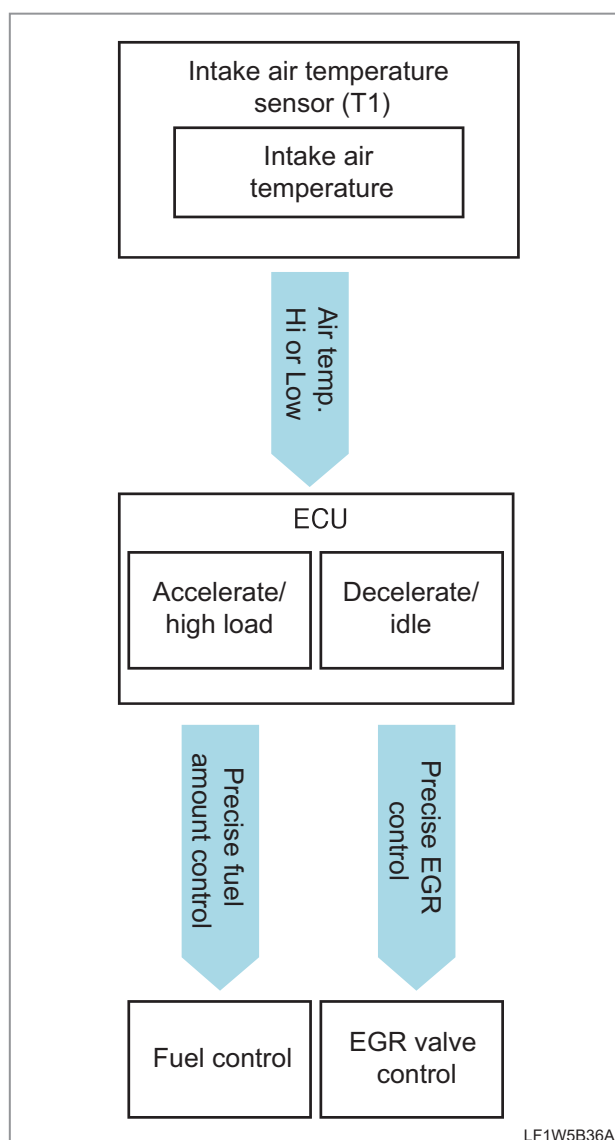
It measures the amount and temperature of the intake air and sends these information to the ECU which then uses these information to set the injection amount and timing. The intake air amount information is also used as a primary condition for the EGR control.

- It measures the amount and temperature of the air drawn into the engine.
- Its measurement is used as an important information to determine the fuel injection amount for theoretical air-fuel ratio control.
- Its measurement is also used as a feedback signal for EGR valve control.
- Intake air temperature - output as digital/analogue
- Temperature detection range of the element :
-40°C ~ 250°C

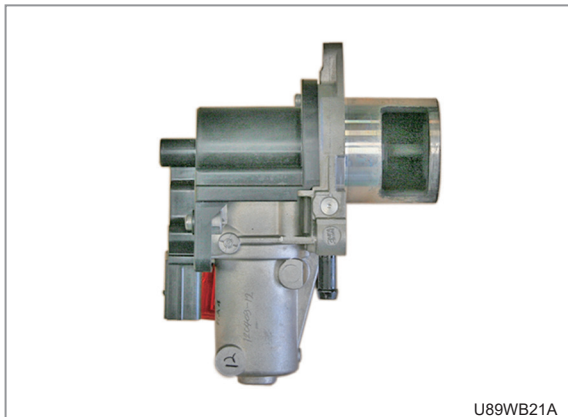
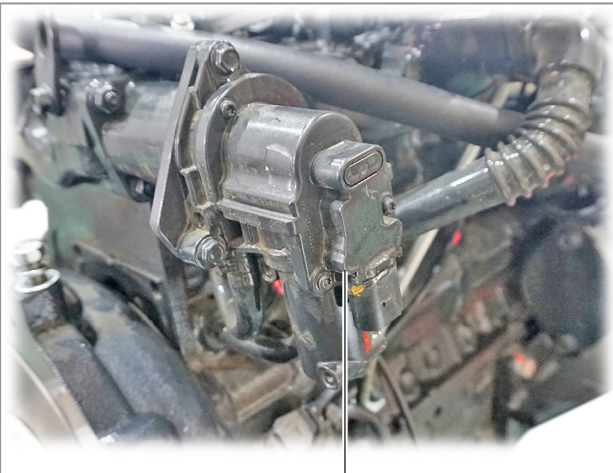
► RESISTANCE BY TEMPERATURE

Temp [°C]	R min [kΩ]	R cent [kΩ]	R max [kΩ]
-40	192.11	204.12	216.68
0	26.500	27.598	28.716
25	9.7000	10.000	10.300
85	1.3810	1.4510	1.5240
100	0.9165	0.9672	1.0200
150	0.2741	0.2927	0.3123
200	0.1022	0.1102	0.1187
250	0.0451	0.0490	0.0532

► INPUT/OUTPUT DIAGRAM



EGR VALVE SENSOR

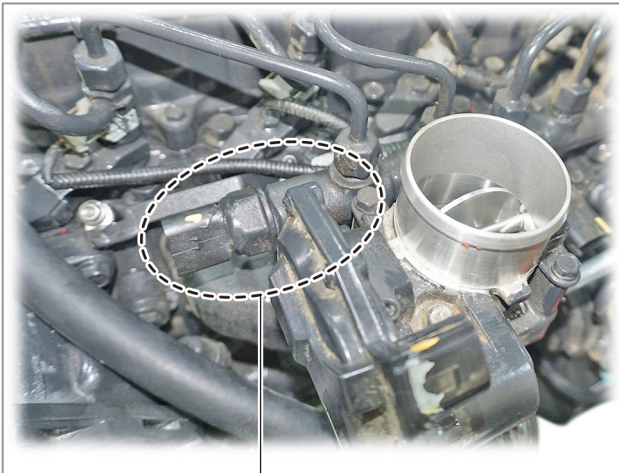


U89WB21A

LF1W515A

The EGR (Exhaust Gas Recirculation) valve sends some of exhaust gas back into the cylinder through the intake port to decrease the combustion temperature during ignition in order to decrease NOx (Nitrogen Oxides) in exhaust gas. The EGR valve sensor detects the position of the valve so that the EGR valve can control the air intake amount.

FUEL RAIL PRESSURE SENSOR

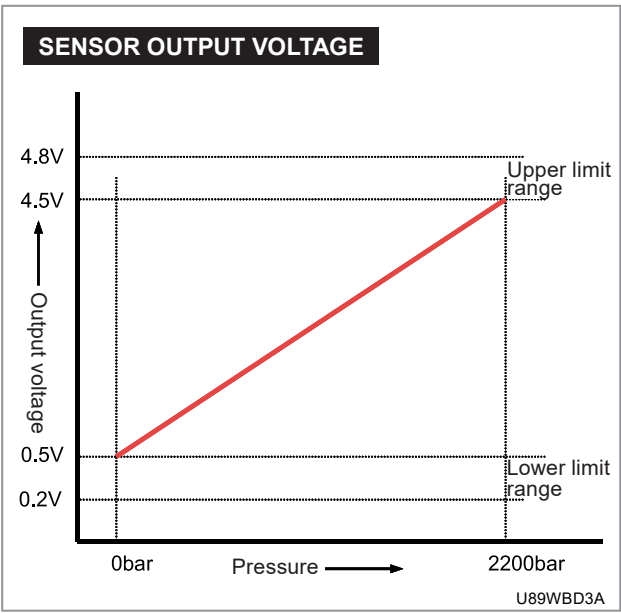


U89WB23A

LF1W516A

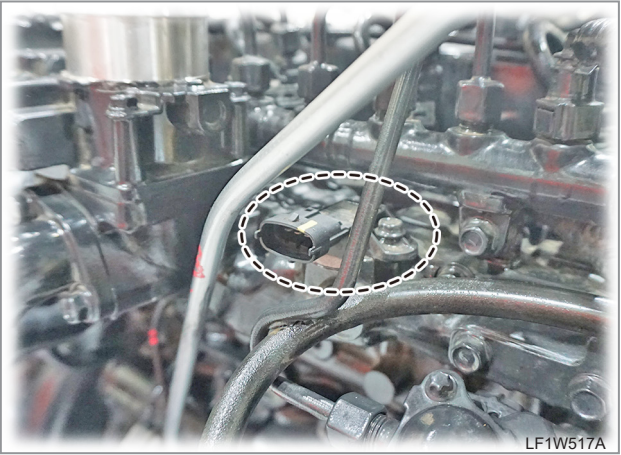
The fuel rail pressure sensor is installed to the side of the fuel rail. The fuel rail is a device to convert the fuel pressure signal into a electric signal, amplify it and supply it to the ECU. The fuel rail pressure is determined based on the engine RPM, engine torque, barometric pressure, coolant temperature, intake air temperature, etc. Once the fuel rail pressure is determined, it is controlled by the IMV. Then, the fuel rail pressure sensor is used to detect the fuel rail pressure and set the opening amount of the IMV. The fuel rail pressure sensor can measure the fuel pressure from 0 up to 2,200 bars.

► FUEL RAIL PRESSURE SENSOR CHARACTERISTICS



Sensor supply voltage		$5 \pm 0.1 \text{ V}$
Sensor output voltage	At 2,200 bars	$4.5 \pm 0.125 \text{ V}$
	At 0 bar	$0.5 \pm 0.04 \text{ V}$
Faulty range	At 0 - 1,000 bars	$\pm 1.0\%$ or more
	At 1,000 - 1,800 bars	$\pm 1.6\%$ or more

INTAKE AIR TEMPERATURE & PRESSURE SENSOR



The intake air pressure sensor and temperature sensor are installed on the intake manifold side by side.

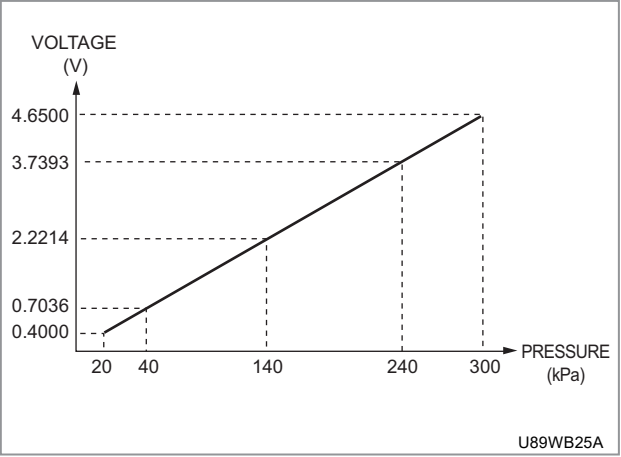
The intake air pressure sensor detects the pressure of air drawn in forcibly by the turbocharger precisely for use as important information to determine the optimal fuel injection amount.

Also, the intake air temperature sensor detects the temperature of the intake air by its resistor which its resistance value is changed by changes in the air temperature. This information is used to identify the exact air mass and adjust the fuel injection amount accordingly for optimum operation.

► INTAKE AIR TEMPERATURE & PRESSURE SENSOR (PRESSURE SENSING)

Guaranteed pressure range	20 ~ 300 kPa
Guaranteed temperature range	-40°C ~ 125°C
Guaranteed supplying power	4.75 ~ 5.25 V
Max. current consumption	12.5 mA

- Pressure sensor output characteristics $V_s = 5 \text{ V}$

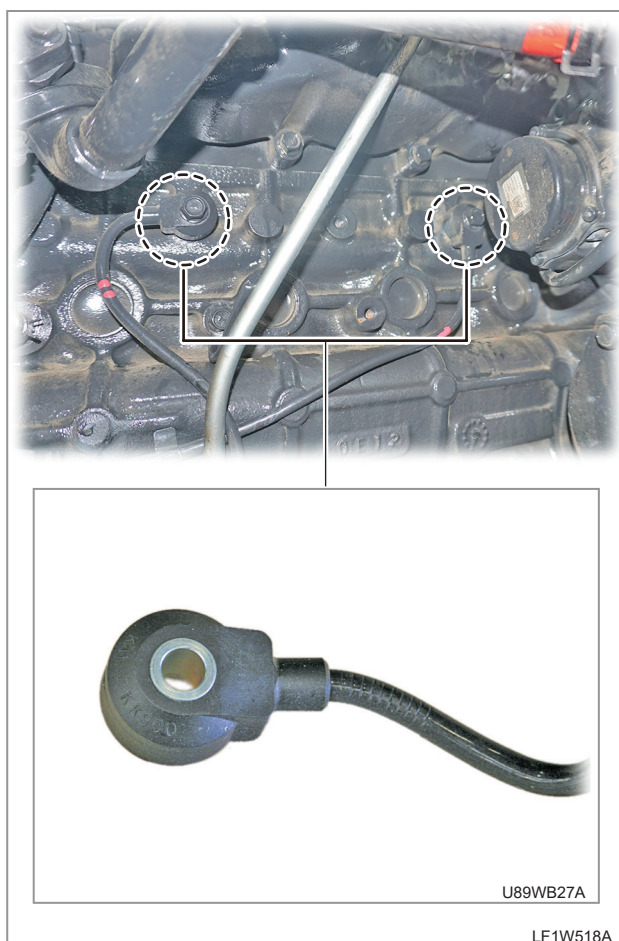


► INTAKE AIR TEMPERATURE SENSOR

Applied temperature range (continuous)	-40°C ~ 200°C
Supplied power	5 ± 4% VDC

• PROBE CHARACTERISTICS

TEMPERATURE (°C)	RESISTANCE (Ω)			TEMP. TOL. (± °C)
	MINIMUM	NORMAL	MAXIMUM	
-40	36,308	39,650	42,992	1.5
-20	12,890	13,844	14,798	1.4
0	5,179	5,489	5,799	1.3
20	2,316	2,419	2,522	1.1
25	1,925	2,000	2,075	1.0
50	805.8	833	860.2	1.0
80	326.7	336.1	345.5	1.0
100	190.7	197.3	203.8	1.3
150	60.93	63.77	66.61	2.2
180	34.45	36.26	38.08	2.8
200	24.49	25.87	27.25	3.3

ACCELERATOR (KNOCK) SENSOR

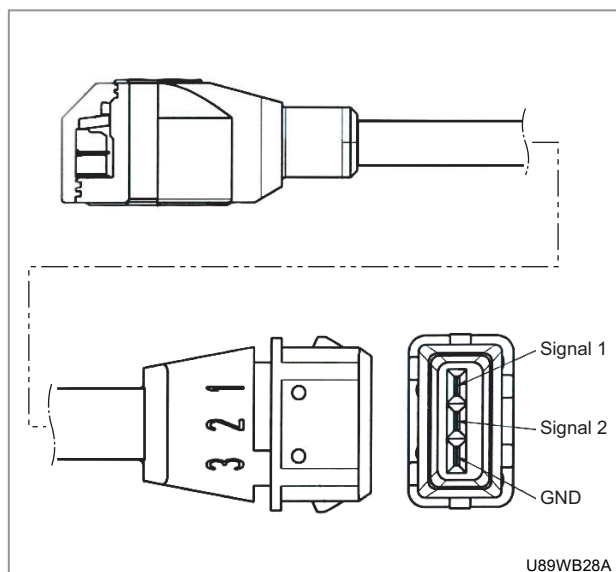
Two acceleration (knock) sensors are installed to the engine cylinder block (intake manifold side).

When engine knocking occurs, the piston or connecting rod is vibrated and, in a severe condition, hitting a metallic object is heard. The knock sensor is to detect this knocking condition due to abnormal combustion.

This sensor has a piezo-electric element fixed to the diaphragm to detect vibration of the engine occurred by abnormal combustion, and the diaphragm is fixed to the base.

Also, it is also used to control idle stability and detect injector's faulty condition to illuminate the engine warning lamp and adjust the pilot injection amount precisely.

If the acceleration (knock) sensor malfunctions, the ECU calibrates the injection timing based on the engine RPM, intake air amount and coolant temperature.

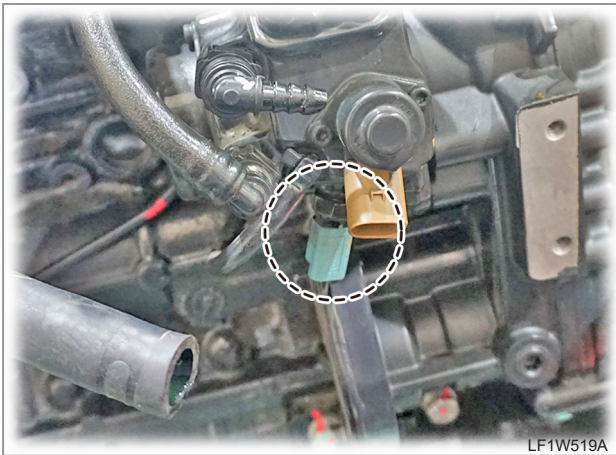
► CONNECTOR**► KNOCK SENSOR CHARACTERISTICS**

When the engine temperature is low, it outputs a high value due to a large fuel injection amount and vibration. However, after the engine is warmed up, its signal value is decreased.

The 1st knock sensor outputs signals for the 1st and 2nd cylinders while the 2nd knock sensor outputs signals for the 3rd and 4th cylinders.

Insulation resistance	Min. 1 MΩ
Resonance frequency	25 kHz
Operating temperature range	-40 ~ 150°C
Output voltage	26 ± 8 mV/g (at 5 kHz)
	22 ~ 37 mV/g (3~10kHz)
	22 ~ 57 mV/g (10~20kHz)

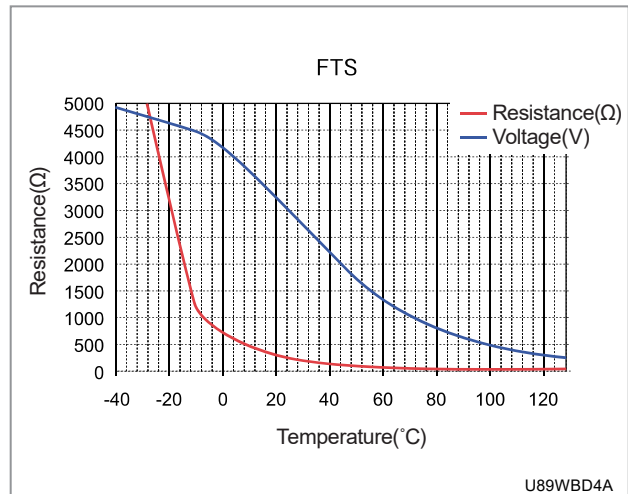
HIGH-PRESSURE FUEL PUMP TEMPERATURE SENSOR



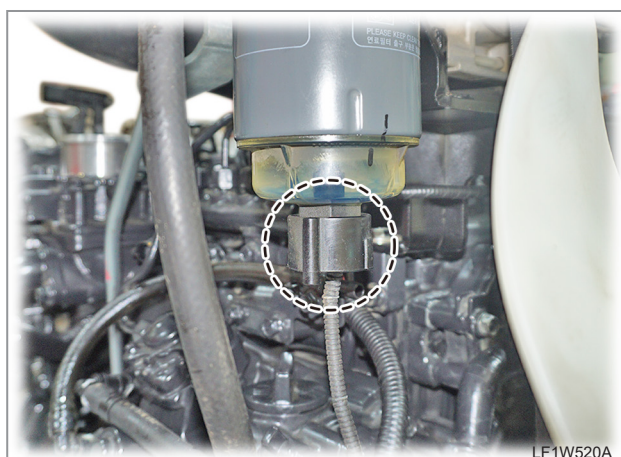
The high-pressure fuel pump temperature sensor is installed right below the IMV (Inlet Metering Valve) of the high-pressure fuel pump. This temperature sensor detects the inlet temperature of the high-pressure fuel pump and sends this information to the ECU. Generally, the temperature of returning fuel rises quite a lot in the common rail diesel engine. In this case, lubrication film of fuel is destroyed so its lubricating performance is deteriorated, resulting in possible damage of the high-pressure fuel pump. Therefore, when the fuel temperature rises over the specified level, this information is sent from the temperature sensor to the ECU which then adjusts the fuel injection amount to control the engine RPM in order to prevent further fuel temperature increase.

It also measures the fuel temperature to decrease the opening amount of the IMV in case of overheating condition in order to decrease the amount of compressed fuel and prevent a further rise of the fuel temperature. The fuel temperature sensor is a NTC resistor type and is installed between the low-pressure line and high-pressure line in the high-pressure pump. It uses 5 V power to generate its output voltage.

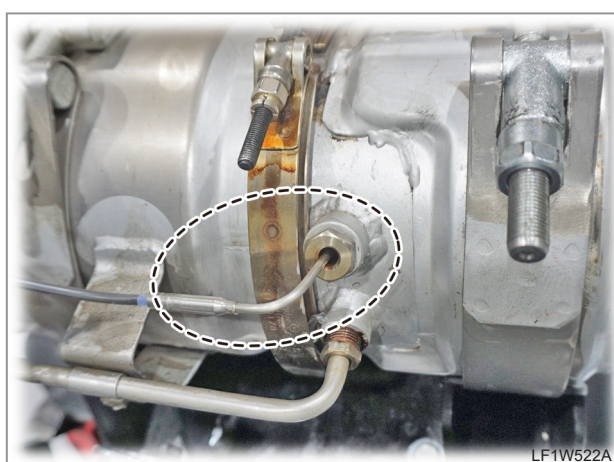
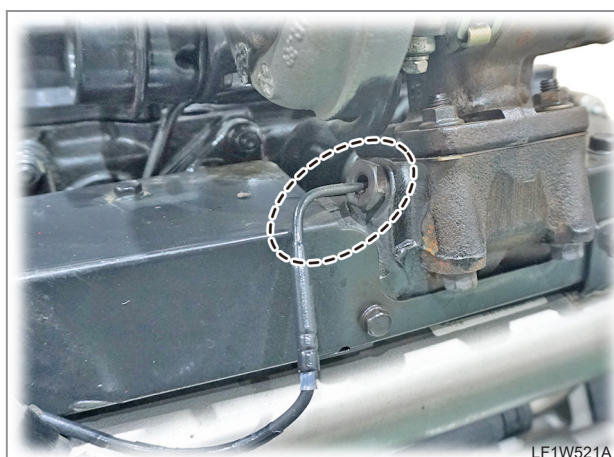
► FUEL TEMPERATURE SENSOR CHARACTERISTICS



Temperature (°C)	Resistance (Ω)	Voltage (V)
-40	75,789	4.903
-10	12,462	4.463
0	7,355	4.153
10	4,481	3.746
20	2,812	3.261
40	1,199	2.221
70	394	1.040
90	206	0.604
120	87	0.276
140	52	0.171

WATER-IN-FUEL SENSOR

The water-in-fuel sensor is installed under the fuel filter. When water enters the engine fuel system, it can damage the high-pressure fuel pump, filter and injector and cause poor engine starting performance and malfunction. Therefore, when water is collected (45cc or more) on the bottom of the fuel filter, this water-in-fuel sensor sends a signal to the instrument cluster which then turns on the water-in-fuel warning lamp. Make sure to drain water from the pre-filter in this case.

EXHAUST GAS TEMPERATURE SENSOR

The exhaust gas temperature sensors are installed to the side of the exhaust manifold (front exhaust temperature sensor) and to the CCRT (Catalyzed Continuously Regenerating Trap) (rear exhaust temperature sensor).

It is also installed to the outlet of the DOC (Diesel Oxidation Catalyst) to detect the temperature in the DOC for determination of overheating condition.

When the engine is overheated (over 900°C to 950°C), the DOC is melted, increasing soot in exhaust gas.

Therefore, when the exhaust gas temperature rises over a certain level, the exhaust gas temperature sensor sends a signal to the ECU which then controls the EGR operation to decrease the temperature in the combustion chamber in order to prevent overheating of the catalyst and decrease the exhaust gas temperature.

- FRONT EXHAUST TEMPERATURE SENSOR

The front exhaust temperature sensor is installed in the exhaust manifold. It uses the change in resistance occurred by the exhaust gas temperature change, converts it to the voltage value, and send this information to the engine ECU.

To prevent turbocharger damage in the post-injection process, it is used to limit the fuel injection amount at a high exhaust gas temperature.

- REAR EXHAUST TEMPERATURE SENSOR

The rear exhaust temperature sensor measures the temperature of exhaust gas passing through the DPF. If this temperature in the DPF regenerating section is low (below approx. 600°C), the engine ECU decreases the amount of intake air and increases the post-injection duration based on this information to increase the temperature of exhaust gas.

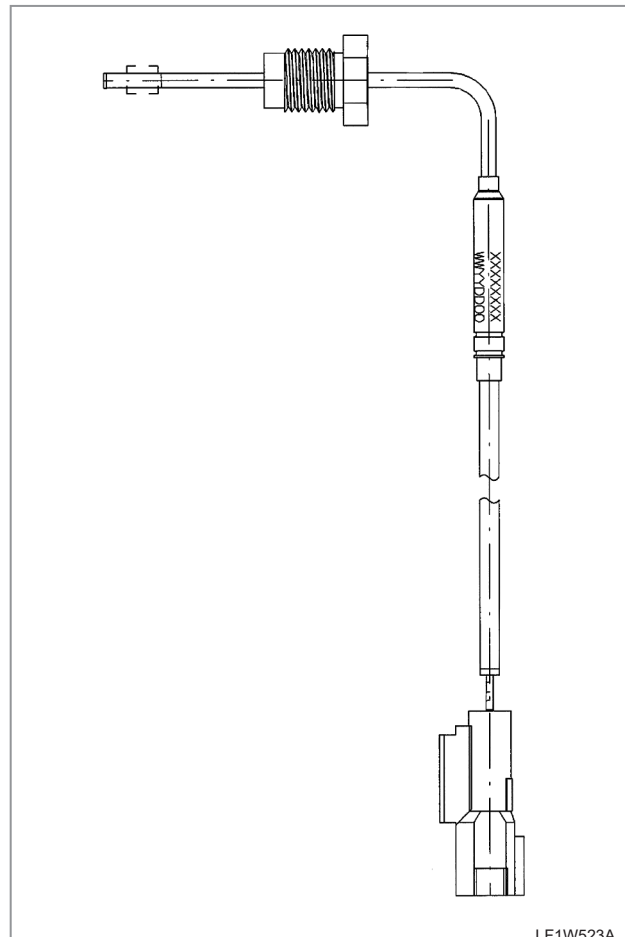
In other words, this sensor determines whether the CCRT is at a proper temperature for regeneration and sets the post-injection amount accordingly.

- Input data
 - Min. operating temperature of probe tip: 1000°C
 - Supplied power: 5 ± 0.1 VDC
- Output data
 - Type: passive
 - Max. current: 2.5 mA

► RESISTANCE BY MEASURED TEMPERATURE

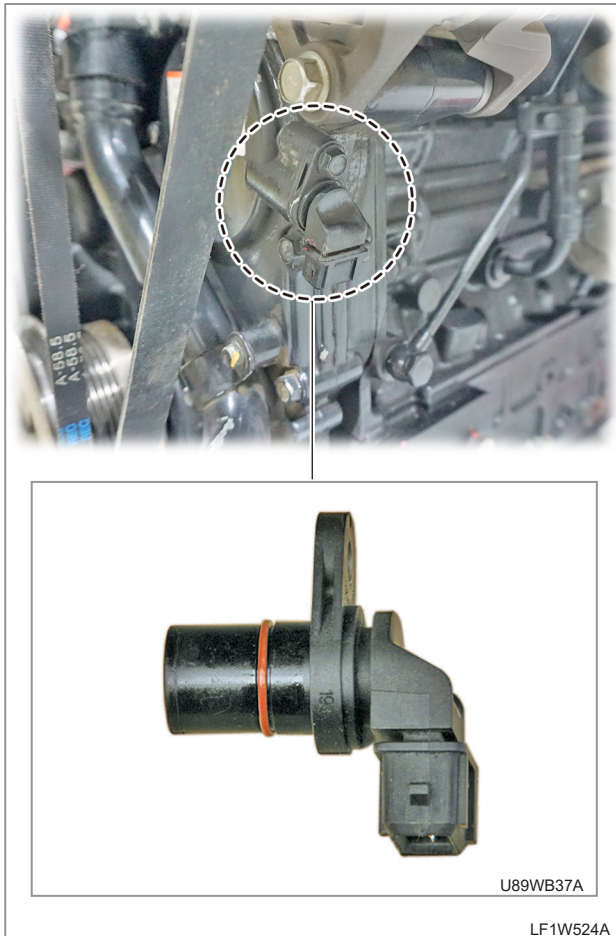
Temp (°C)	RT(Ω) RW = 1.0 Ω	VO (V)
-40	170.20	0.727
0	201.27	0.838
25	220.07	0.902
50	239.30	0.965
100	276.78	1.084
150	313.62	1.194
200	349.90	1.296
250	385.59	1.391
300	420.75	1.481
400	488.72	1.641
500	554.88	1.784
600	618.07	1.910
700	678.91	2.022
800	739.02	2.125
850	767.46	2.171

► CONNECTOR



LF1W523A

CAMSHAFT WHEEL SENSOR



The camshaft wheel sensor is installed to the side of the gear case in the front section of the engine.

This sensor is aligned with the operating trajectory of the camshaft wheel to detect the rotating condition of the camshaft. It supplies information about cylinder stroke or position to the ECU to control the fuel injection timing.

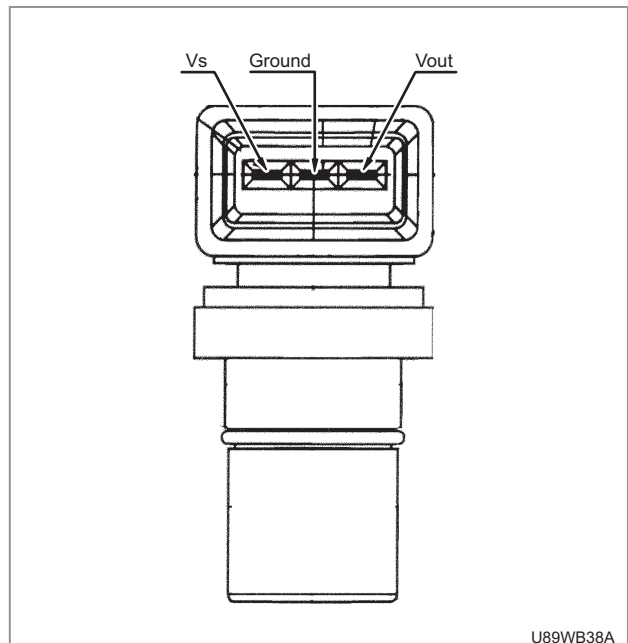
The camshaft rotates at a half speed of the crankshaft. When the piston moves toward TDC while controlling the intake and exhaust valves of the engine, this sensor detects the position of the camshaft to check whether a particular cylinder is at the compression stroke or exhaust stroke.

Especially, when the engine is initially started, it is hard to identify the stroke condition of a particular cylinder only with information from the crankshaft wheel sensor. Therefore, information from the camshaft wheel sensor is necessary to identify the accurate stroke condition of cylinders after the engine is initially started.

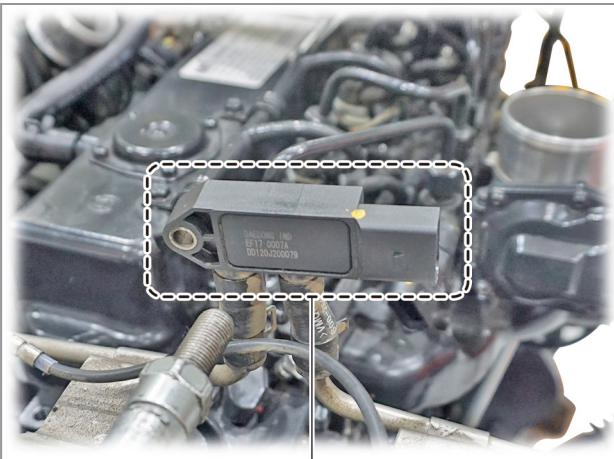
On the other hand, after the engine is started, information from the crankshaft wheel sensor is fed to the ECU which then learns conditions of every cylinder in the engine. Therefore, afterwards the engine can keep running even when the camshaft wheel sensor is malfunctioning.

- Operating temperature range: $-40^{\circ}\text{C} \sim 150^{\circ}\text{C}$
- Possible speed range: 15 ~ 4,000 rpm
- Supplied power (Vs): 6 ~ 24 VDC
- Supplied current: Max. 10 mA
- Output (Vout): Max. 24 VDC
Max. 20 mA

► CONNECTOR



DPF DIFFERENTIAL PRESSURE SENSOR

ST5W344A
LF1W525A

The DPF differential pressure sensor is installed on the top of the CCRT (Catalyzed Continuously Regenerating Trap).

The CCRT is mainly composed of the DOC (Diesel Oxidation Catalyst) and DPF (Diesel Particulate Filter). When exhaust gas passes through this trap, hydrocarbon soot called PM (Particulate Material) is accumulated in the DPF.

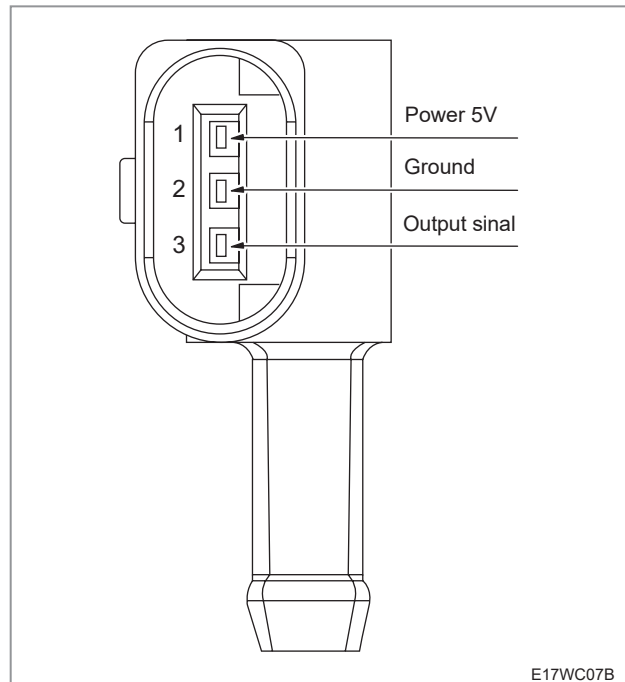
If excessive PM is accumulated, air passage is blocked, resulting in high pressure difference between the front and back of the DPF. The differential pressure sensor detects this pressure difference and sends this information to the ECU.

If a certain amount of PMs is detected in the CCRT, the post-injection is performed to increase the temperature of the DOC to 450 to 500°C in order to regenerate (oxidize) PMs.

The post-injection process is activated only when the amount of PMs is over the specification. In a normal condition, the PM amount is monitored.

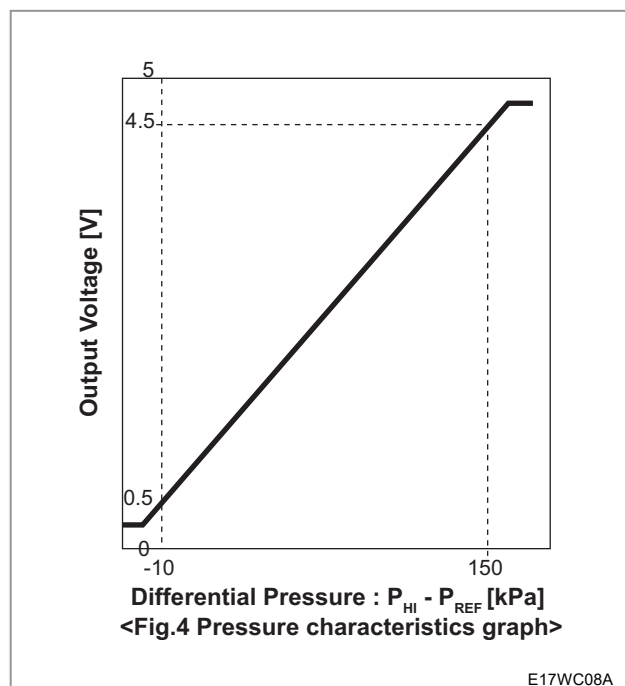
- Supplied power: 4.75 ~ 5.25 VDC
- Supplied current: Max. 10 mA
- Operating temperature range: -40°C ~ 145°C
- Operating pressure range (difference between ports): -10 ~ 150 kPa
- Pressure range in normal mode (each port): 50 ~ 250 kPa

► CONNECTOR



E17WC07B

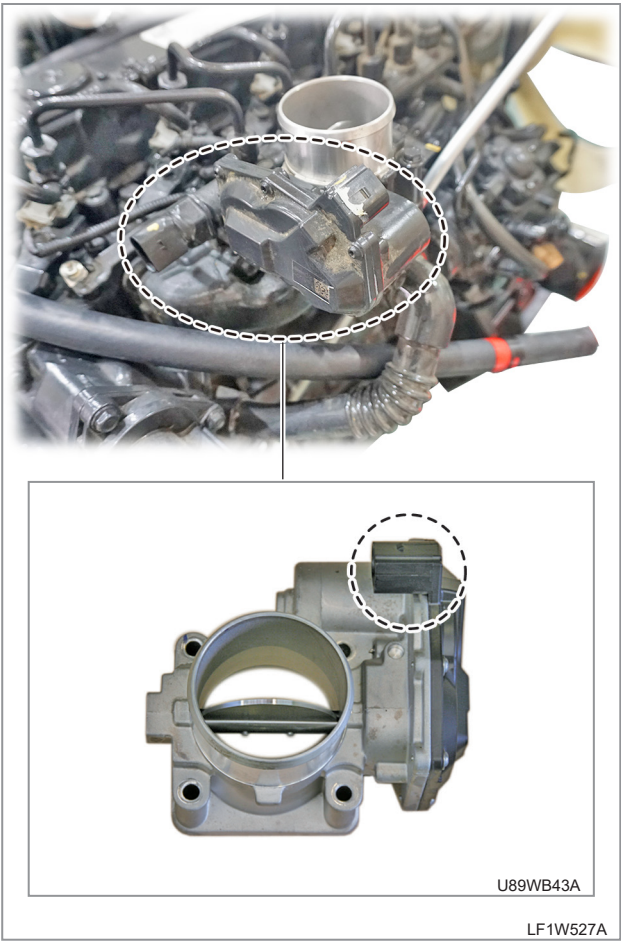
► DIFFERENTIAL PRESSURE SENSOR CHARACTERISTICS



E17WC08A

The differential pressure sensor detects the pressure difference between the inlet and outlet of the CCRT and sends a signal value of 0.5 to 4.5 V to the ECU. The larger the pressure difference between the inlet port and outlet port is, the closer the signal value gets to 4.5 V. The smaller the pressure difference is, the closer the signal value gets to 0.5 V.

AIR CONTROL VALVE SENSOR

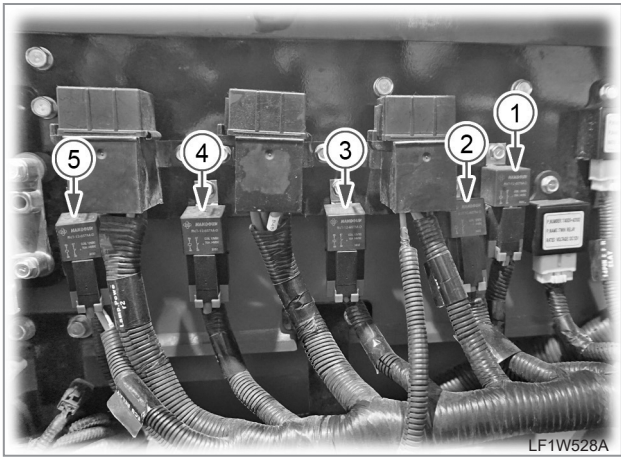


The air control valve sensor is installed to the air control valve between the turbocharger intake hose and intake manifold flange.

The air control valve adjusts the amount of air entering the intake manifold. The operating angle of the blade at its inlet is changed according to the depressed amount of the accelerator pedal to control the intake air amount into the engine.

Therefore, this sensor detects the opening angle of the blade and sends this information to the ECU which then adjust the fuel injection amount accordingly.

RELAY (70A)

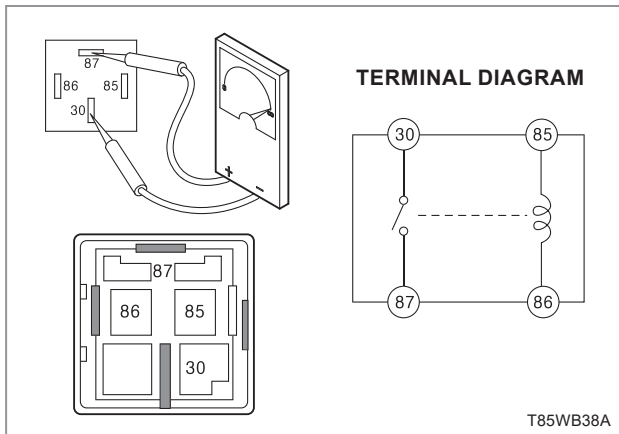


- (1) Power relay 5
- (2) Power relay 1
- (3) Power relay 2
- (4) Power relay 4
- (5) Power relay 3

Relays (70A) are installed side by side on the panel at the left side of the engine compartment and supply power to individual elements.

Power relay 1	Glow plug
Power relay 2	Reverse buzzer, Air suspension seat, Beacon lamp
Power relay 3	Wiper motor
Power relay 4	14-pin, Power socket, Motor fan
Power relay 5	Air conditioner

TEST



To perform the relay test, disconnect the relay from the wiring.

Check the resistance and continuity within the resistance range (Ω) of a tester.

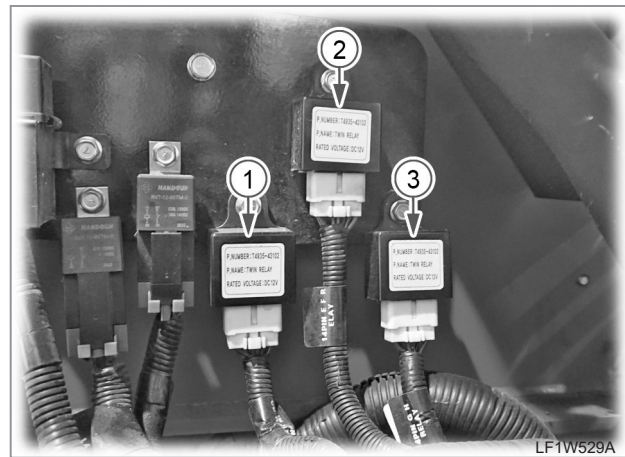
Numbers on the auxiliary relay terminals indicate corresponding coil and contact.

- Capacity: 12 V 70 A

Item	Measuring point with tester		Result
	Red Lead	Black Lead	
Resistance (Ω)	Relay No. 85	Relay No. 86	86 Ω
	Relay No. 30	Relay No. 87	No continuity

※ When measuring resistance, red and black tester leads can be interchangeable.

TWIN RELAY

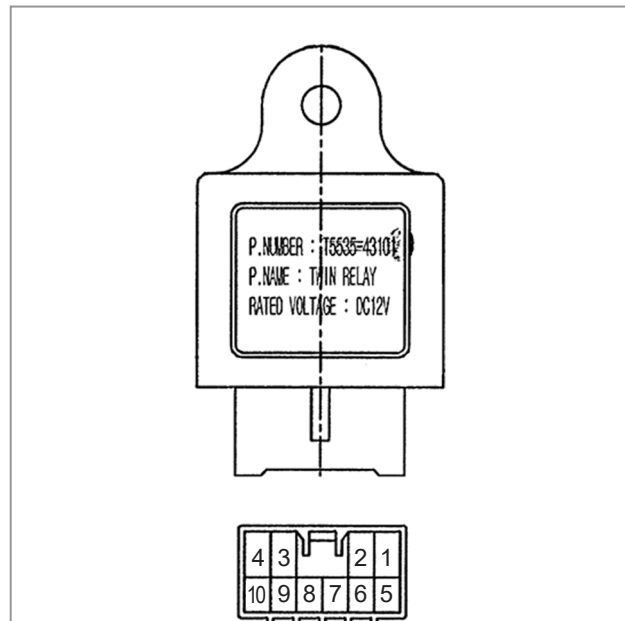


- (1) 14-pin C-D relay
- (2) 14-pin E-F relay

- (3) 14-pin G-H relay

Twin relays are installed on the upper panel at the left side of the engine compartment and supply power to the corresponding 14-pin connectors.

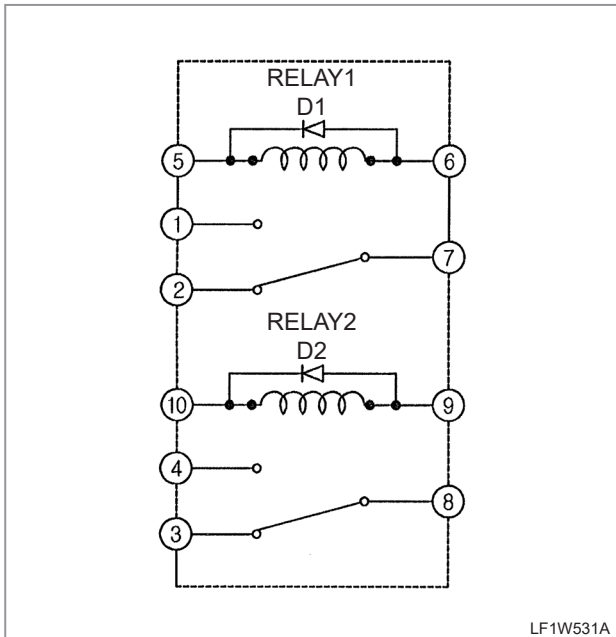
► CONNECTOR



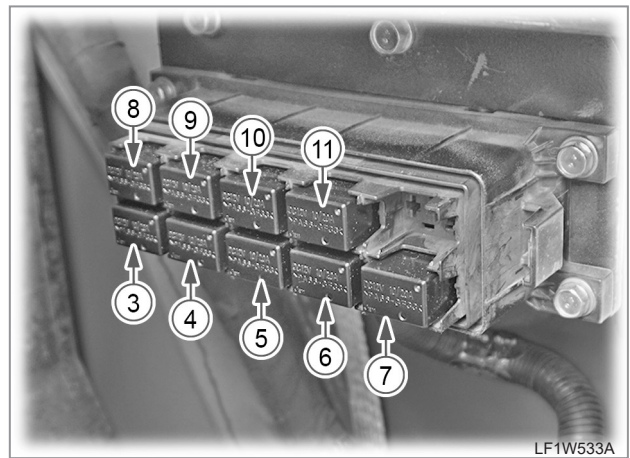
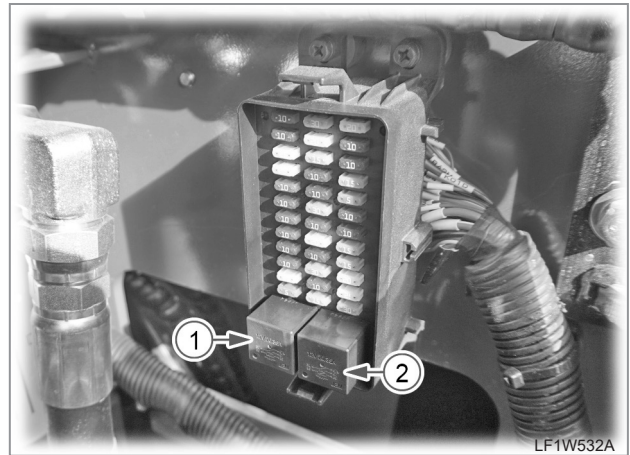
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	RELAY1 N.O	6	RELAY1 COIL-
2	RELAY1 N.C	7	RELAY1 COM.
3	RELAY2 N.C	8	RELAY2 COM.
4	RELAY2 N.O	9	RELAY2 COIL-
5	RELAY1 COIL+	10	RELAY2 COIL+

LF1W530A

► CIRCUIT

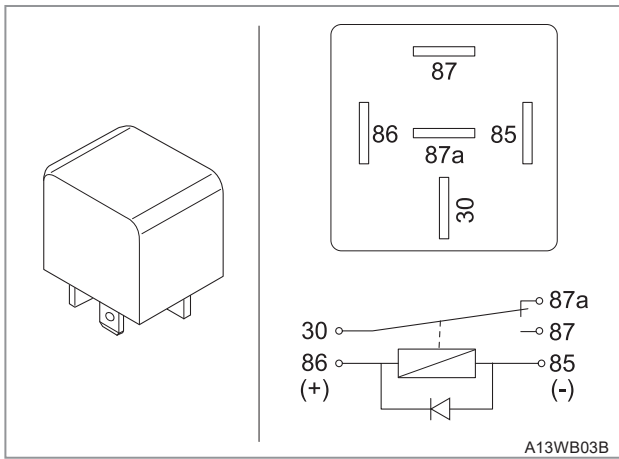


5P / 4P RELAY



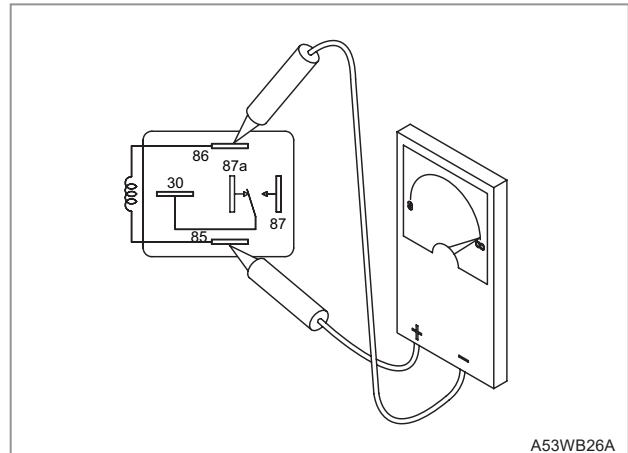
- (1) Fuel heater relay (5P)
- (2) ECU relay (5P)
- (3) Start relay (4P)
- (4) Electric fan relay (4P)
- (5) Horn relay (4P)
- (6) Reverse buzzer relay (4P)
- (7) Stop relay(4P)
- (8) Pilot lock driving relay (4P)
- (9) Pilot lock bucket relay (4P)
- (10) Quick attachment lock relay (Option)(4P)
- (11) Quick attachment release relay (Option)(4P)

These relays are installed at the right side of engine compartment to supply power to the fuel heater, ECU and start motor.

5P RELAY

The 5P relay consists of 3 terminals, and terminal 30 and 87a, and the terminal No. 30 and 87 are decoupled in a normal condition (relay "OFF"). When supplying power (DC 12 V) to the terminal No 86 and 85, the terminal 30 and 87a will be decoupled, and the terminal 30 and 87 will be coupled, resulting in continuity.

Terminal \ Load	Resistance	Lamp	Inductance
N.O. type (Terminal No. 30 and 87)	40 A	30 A	30 A
N.C. type (Terminal No. 30 and 87a)	30 A	20 A	20 A

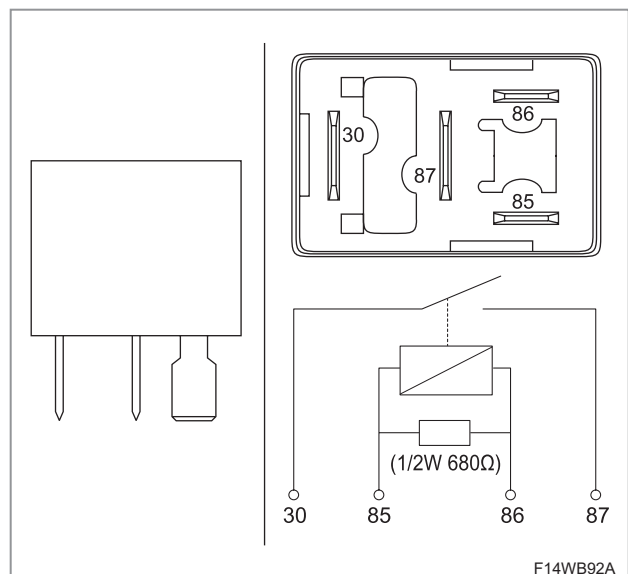
► TEST

To perform the relay test, disconnect the relay from the wiring.

Check the resistance and continuity within the resistance range (Ω) of a tester.

Numbers on the auxiliary relay terminals indicate corresponding coil and contact.

Item	Measuring point with tester		Result
	Red Lead	Black Lead	
Resistance	Relay No. 85	Relay No. 86	84 Ω
	Relay No. 30	Relay No. 87a	Continuity
	Relay No. 30	Relay No. 87	No continuity

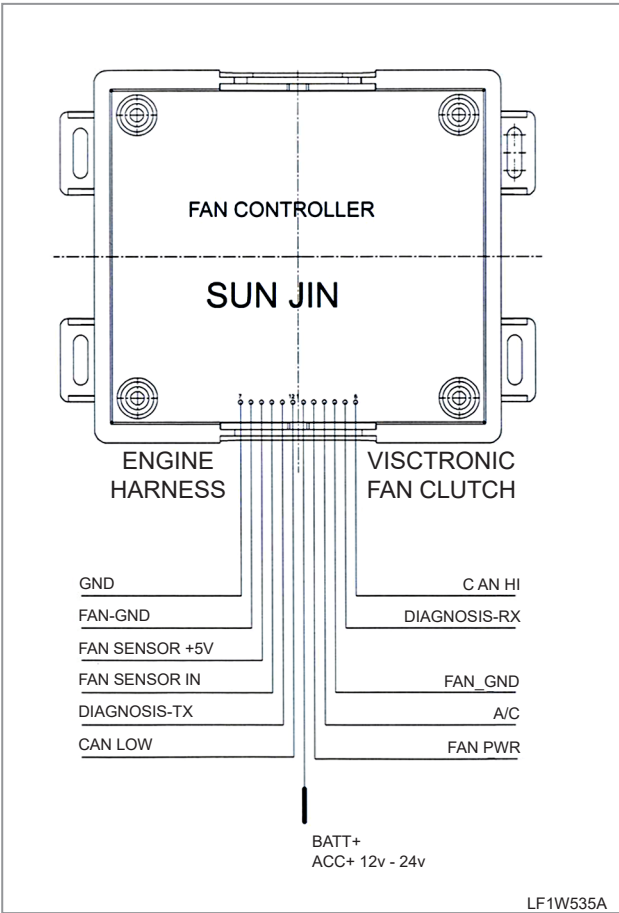
4P RELAY

FAN CLUTCH CONTROLLER



The fan clutch controller is installed at the lower left side of the engine compartment.

This controller is connected to the engine wiring and fan clutch wiring, to control the fan clutch according to the input signals reflecting temperature changes.

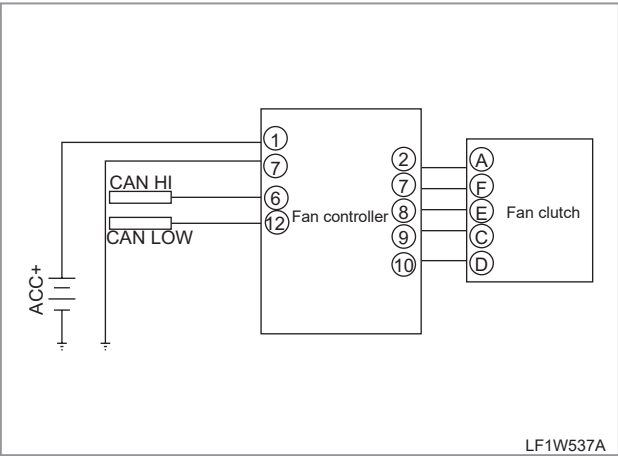


► CONNECTOR

CONTROLLER SIDE

MATING

► CIRCUIT

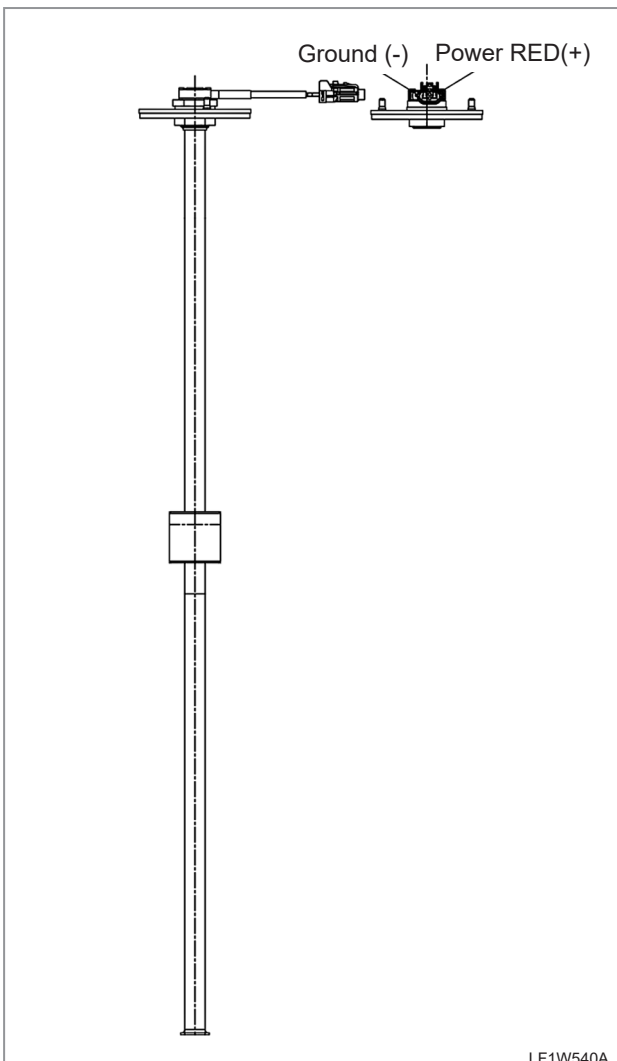


FUEL SENDER

LF1W539A

The fuel sender is installed on the top of the fuel tank from the right side of the engine room.

The sensor float goes up or down along with the fuel in the fuel tank as the resistance at the ground circuit of the fuel gauge changes.

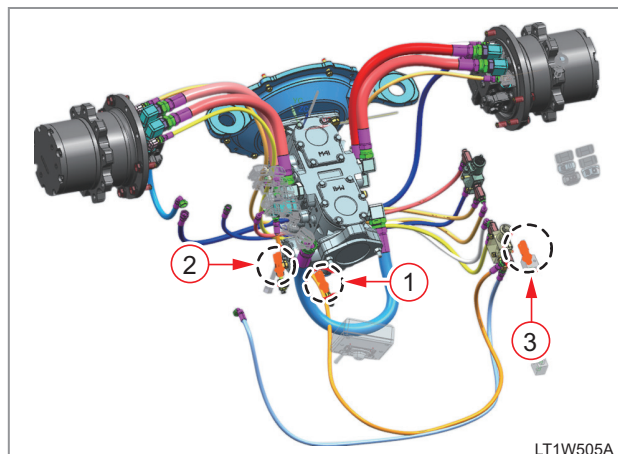
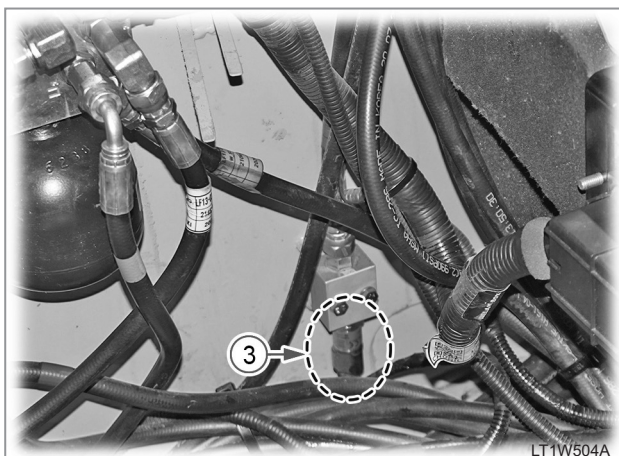
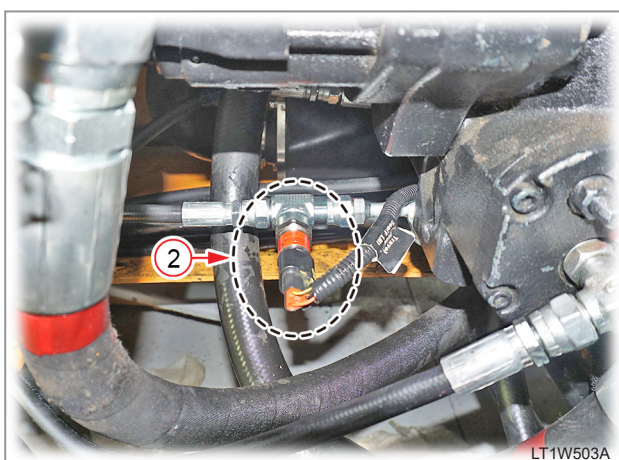
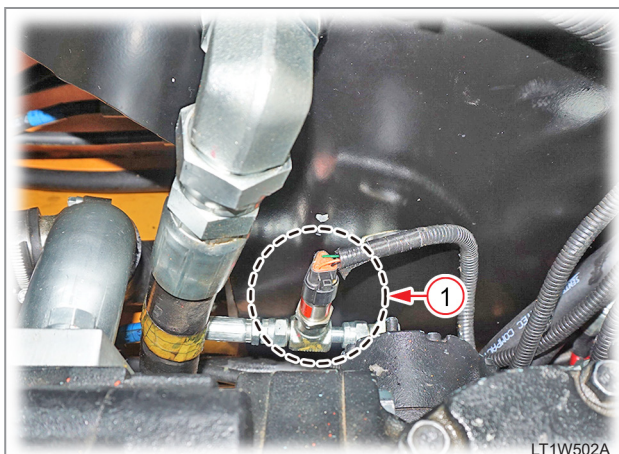
► CONNECTOR

LF1W540A

► RESISTANCE BY FLOATER POSITION

Resistance by floater position (H)	
H (mm)	Resistance value (Ω)
<69	3.3 ± 1.05
80	6.6 ± 1.0
124	9.9 ± 1.15
168	15 ± 1.23
189	20.1 ± 1.31
210	25.2 ± 1.38
231	29.9 ± 1.45
252	35 ± 1.53
273	40.1 ± 1.61
294	44.8 ± 1.68
315	49.9 ± 1.75
336	55 ± 1.83
357	60.1 ± 1.91
378	64.8 ± 7.98
399	69.9 ± 2.05
420	75 ± 2.13
441	80.1 ± 2.21
462	84.8 ± 2.28
483	89.9 ± 2.35
504	95 ± 2.43
525	100.1 ± 2.51
543	110.1 ± 2.66

DRIVING PRESSURE SENSOR



(1) Forward (RH)
(2) Forward (LH)

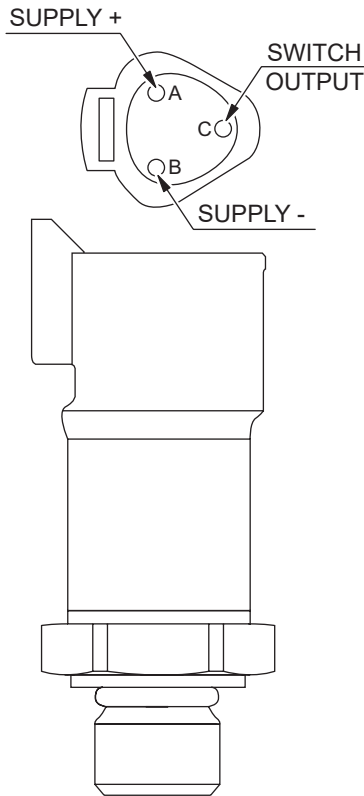
(3) Reverse

Each forward LH/RH driving pressure sensor is mounted on the hydraulic hose that is connected to the forward LH/RH driving sides of the RCV (LH) on the right side of the HST pump, while the reverse LH/RH driving pressure sensors are mounted on the side of the pilot rock valve, connected to the reverse LH/RH driving sides of the RCV (LH) with the hydraulic hoses. These sensors detect the pressure of the discharged flow according to the operation displacement of the RCV (LH) operating lever.

(Switch point : 5 bar)

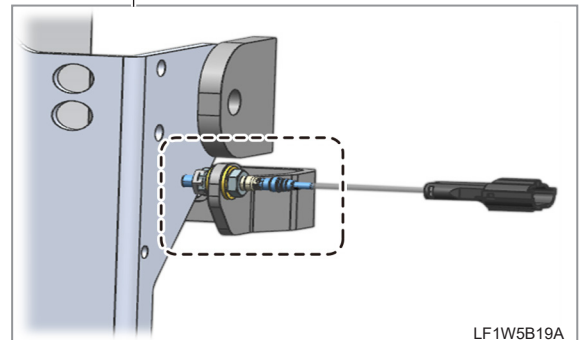
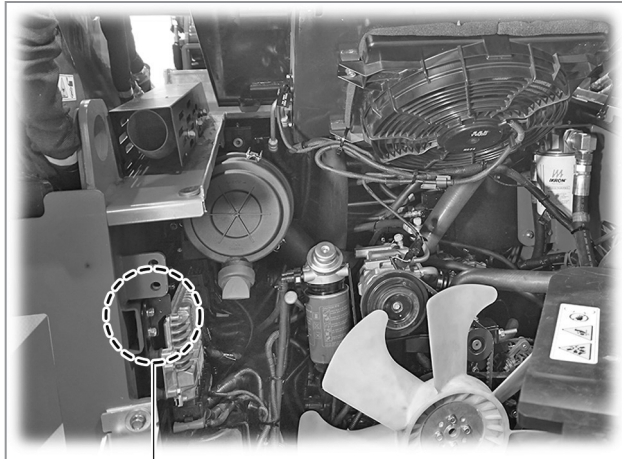
► CONNECTOR

SENSOR



LF1W543A

SAFETY COVER SWITCH (SAFETY SENSOR)



LF1W5B19A

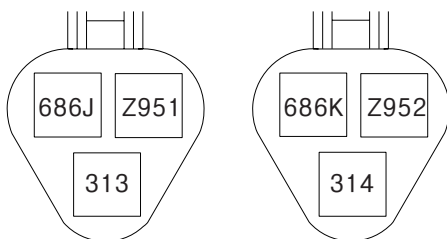
LF1W5B18A

The safety cover switch is installed at the upper left side at the engine compartment entrance. This can be accessed by opening the rear cover.

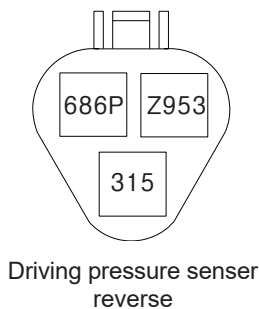
This switch automatically stops the engine when the rear cover and then the cooler unit are opened.

► CONNECTOR

WIRING

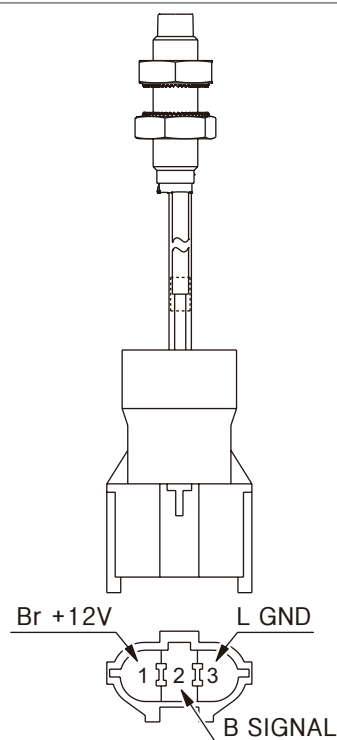


Driving pressure sense forward (LH) Driving pressure sensor forward (RH)



Driving pressure sensor reverse

LF1W544A



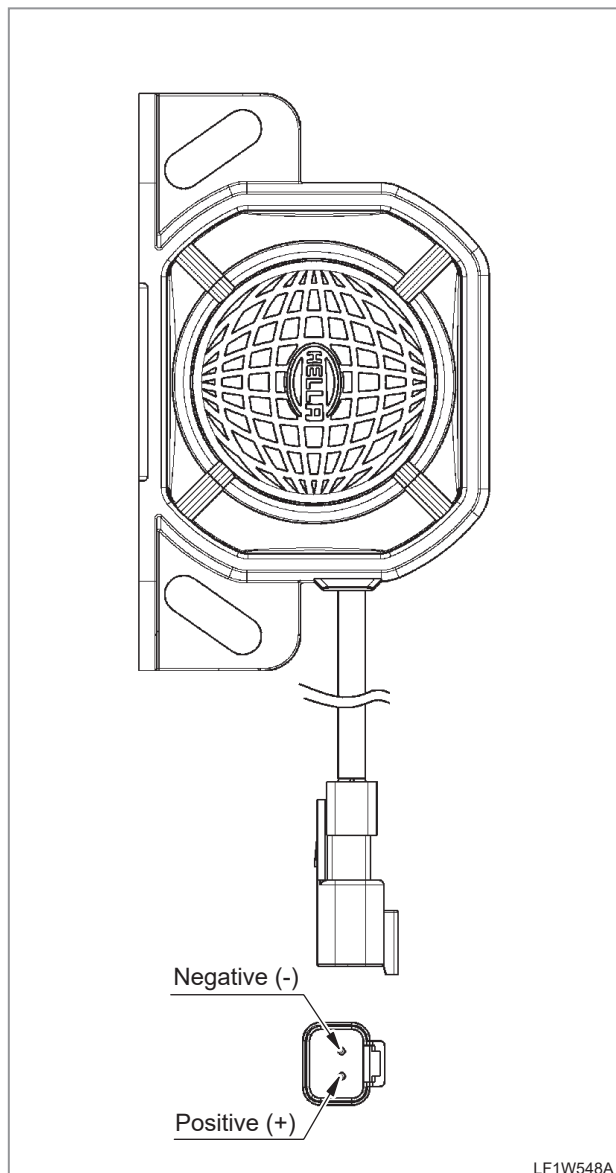
LF1W5B20A

REVERSE BUZZER

LF1W547A

The reverse driving buzzer is installed on the edge inside of the rear cover and it automatically sounds the alarm when the equipment is moving backwards.

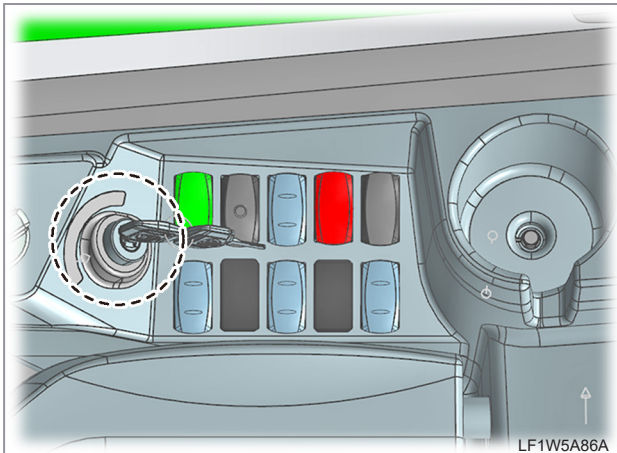
- Warning volume : 107 ± 5 dB(A)

► CONNECTOR

LF1W548A

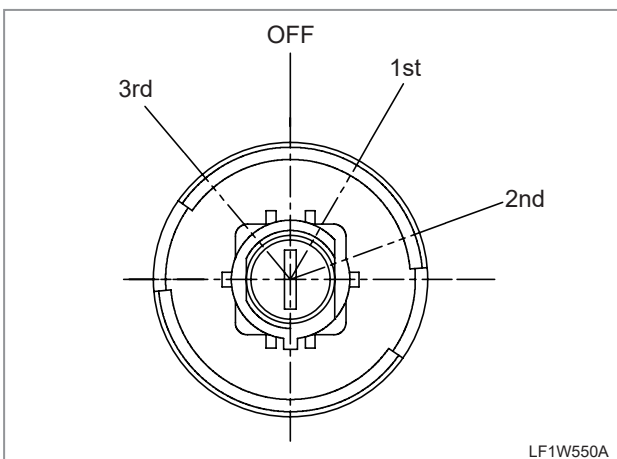
4.2 CABIN & CHASSIS

4.2.1 IGNITION SWITCH



The ignition switch is installed on the right side panel of the driver's seat.

IGNITION SWITCH OPERATION



1. The "Preheat (3 steps)" position is on the left from the "OFF" position while the other positions are on the right from it.
2. When the key switch is released and returned from the "PREHEAT (3rd)" position to the "OFF" position or from the "START (ST)" position to the "ON" position, it is automatically returned to the corresponding position by the load of its spring.

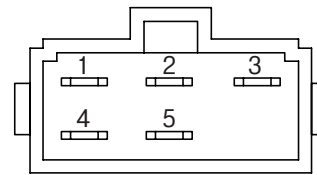
IGNITION SWITCH TEST

Disconnect the ignition switch from the wiring connector.

Use an ohmmeter (Ω) to test the switch.

- With the ignition switch in the "3rd" position, there will be continuity between the (BR), (ACC) and (R1) terminals.
 - With the ignition switch in the "OFF" position, the continuity will not exist between any of the terminals.
 - With the ignition switch in the "1st" position, there will be continuity between the (B), (BR) and (ACC) terminals.
 - With the ignition switch in the "2nd" position, there will be continuity between the (B), (BR), (ACC) and (C) terminals.
- ※ If the test results are not as outlined above, replace the ignition switch.

CONNECTOR & CIRCUIT

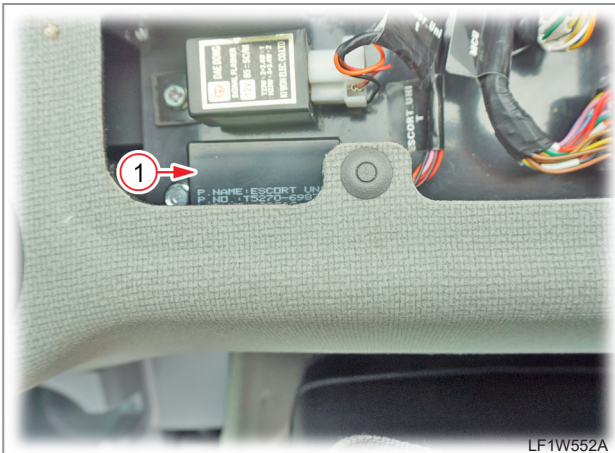


1	B	Battery	AUX 3.0 R
2	R1	Glow	AVSS 0.85 B/R
3	ACC	Light, radio etc	AVSS 1.25 R/L
4	BR	Battery relay	AVX 3.0 W
5	C	Start relay	AVSS 0.85 B/W

LF1W551A

Key	Terminal (Symbol)				
	Battery (B)	Battery relay (BR)	Light, radio etc (ACC)	Glow plug (R1)	Start relay (C)
3 Step	○	○	○	○	
OFF	○				
1 Step	○	○	○		
2 Step	○	○	○	○	○

4.2.2 ESCORT UNIT



The escort unit (1) is installed under the top cover behind the driver's seat.

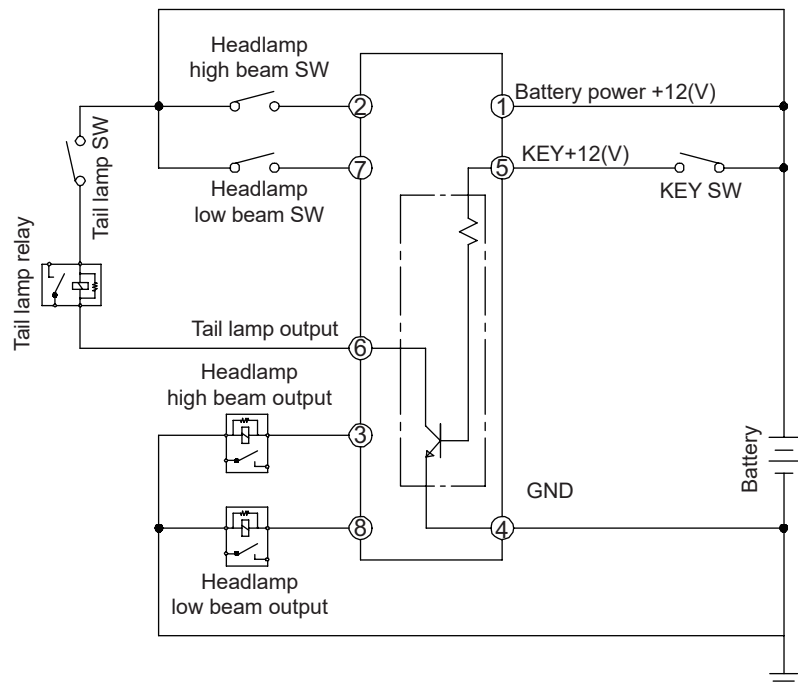
The escort unit keeps the headlamps (work lamp) ON for approx. 30 seconds and then turns them off if the engine is stopped with them ON.

- Rated voltage : DC 12V
- Operating voltage : DC 10 ~ 16V

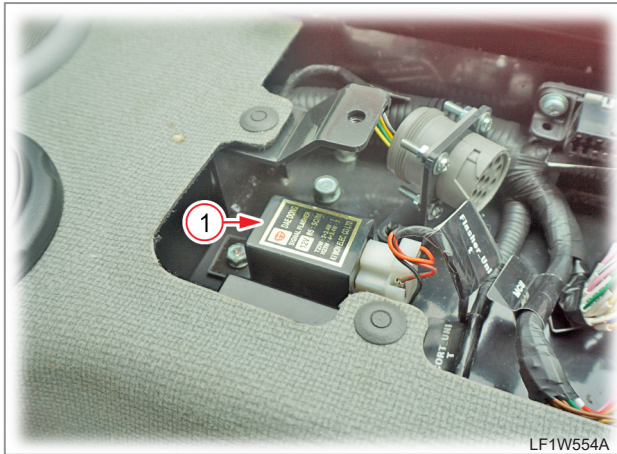
CONNECTOR & CIRCUIT

1		2	3
4	5	6	7
8			

No.	Function
1	Battery power +12V
2	Headlamp high beam SW
3	Headlamp high beam output
4	GND
5	KEY +12[V]
6	Tai lamp output (-)
7	Headlamp low beam SW
8	Headlamp low beam output



4.2.3 FLASHER

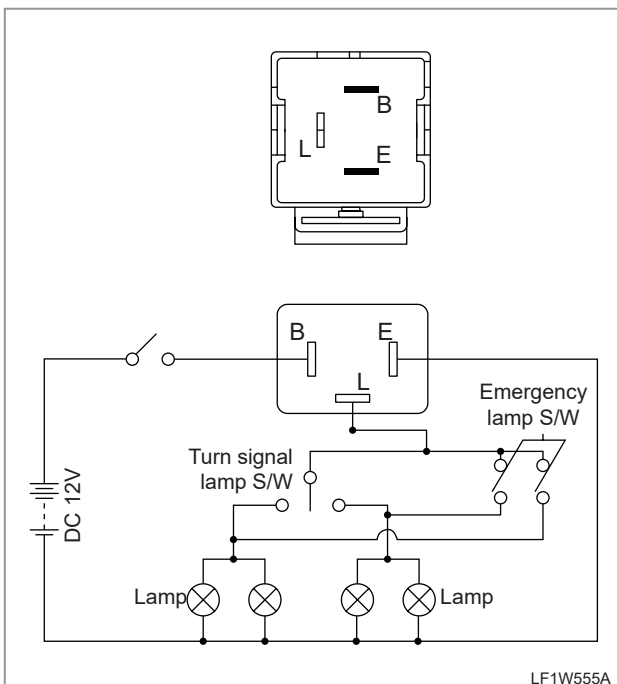


LF1W554A

The flasher unit (1) is installed under the top cover behind the driver's seat; this flickers the lamps when the hazard warning flasher switch or turn signal lamp switch is operated.

As the flasher unit is directly connected to the battery, it can operate without the key in the ignition switch. It is designed to flash the lamp faster to inform a driver if a bulb of any turn signal lamp is blown.

CONNECTOR & CIRCUIT

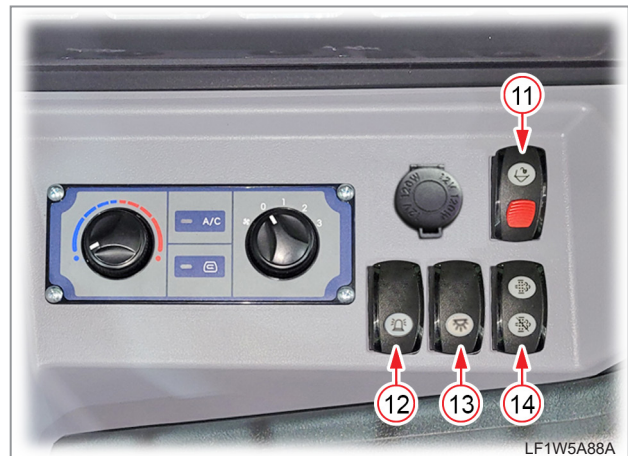


LF1W555A

4.2.4 SWITCH PANEL



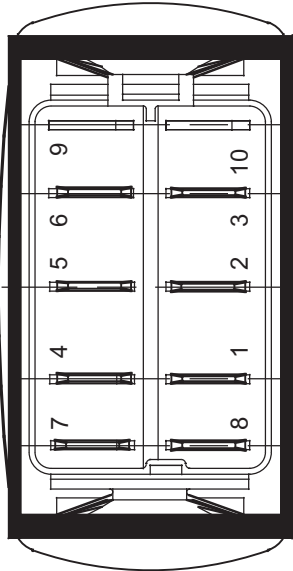
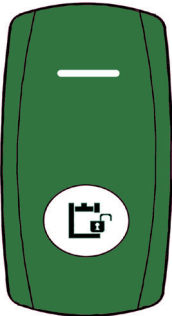
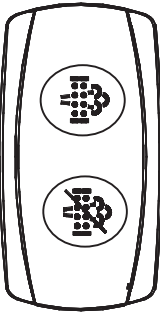
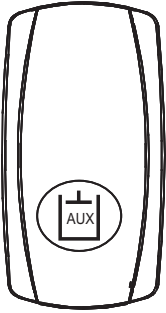
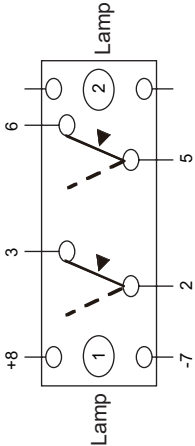
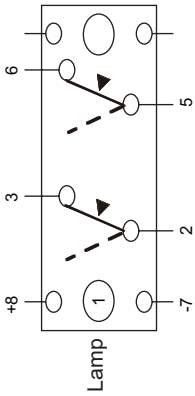
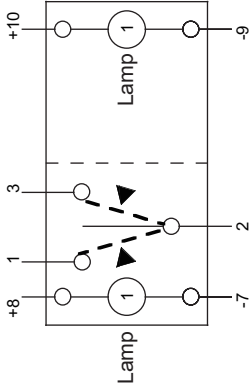
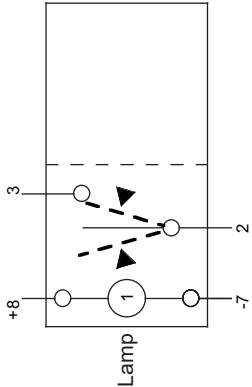
LF1W5A87A



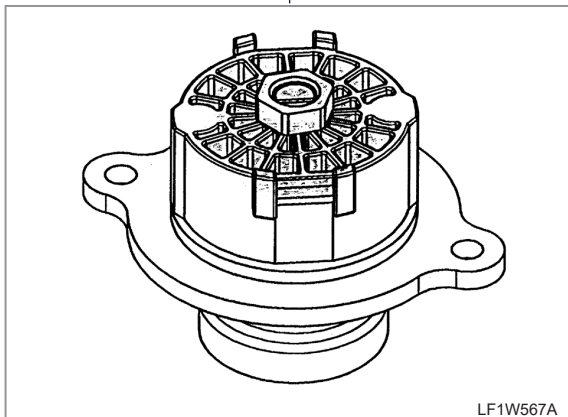
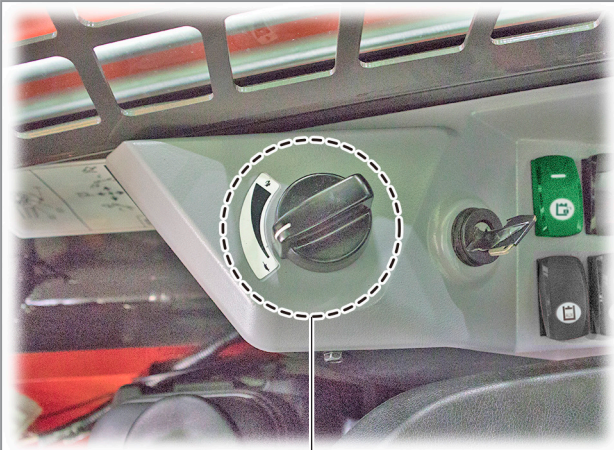
LF1W5A88A

No	Switch	Function
1	Reset (Green)	Driving system release
2	Main light	Front, Rear work lamp ON, OFF
3	Turn signal lamp	Turn signal lamp operation
4	Parking (Red)	Parking brake emgagement
5	Wiper/Washer	Wiper, washerr operation
6	AUX	External implement flow rate / power supply
7	High flow (Option)	Supplying additional flow to equipment when needed
8	Hydraulic lock	Blocking operating hydraulic line
9	Self leveling (Option)	Maintaining balance when lifting or lowering the bucket
10	Hazard lamp	Emergency lamp operation
11	Quick attachment	Loader removal, installation
12	Beacon lamp	Beacon lamp operation
13	Room lamp	Room lamp ON, OFF
14	DPF regeneration	DPF regeneration and stop

SWITCH CIRCUIT DIAGRAM

 LF1W558A				
RESET SWITCH	PARKING BRAKE SWITCH	DPF SWITCH	AUX. HYDRAULIC SWITCH	
 POS 1 POS 2 POS 3 LF1W5A89A	 POS 1 POS 2 POS 3 LF1W5A90A	 POS 1 POS 2 POS 3 LF1W5A60A	 POS 1 POS 2 POS 3 LF1W5A64A	
 LF1W5A92A	 LF1W5A91A	 LF1W5A62A	 LF1W5A65A	

4.2.5 ENGINE ACCELERATOR DIAL



LF1W567A

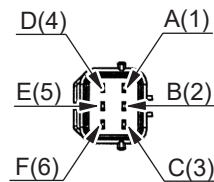
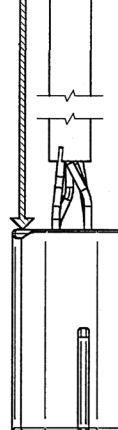
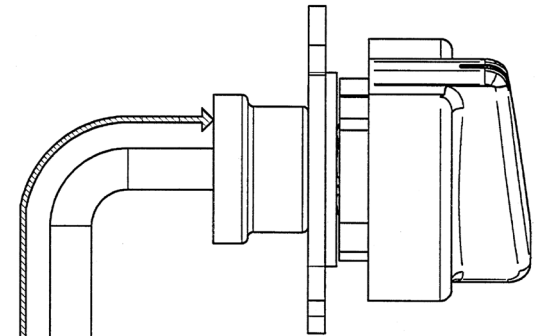
LF1W5A93A

The engine accelerator dial is installed on the panel on the right side of the driver's seat. It detects the amount of movement of the accelerator dial and sends this information to the ECU which then adjusts the fuel injection amount and timing accordingly.

Two sensors are integrated into one unit. The sensor 1 detects the main displacement of the lever while the sensor 2 detects any faulty condition. If the difference between the main displacement signal and auxiliary displacement signal is over the specified level, the ECU sends a fault signal.

**REMARKS**

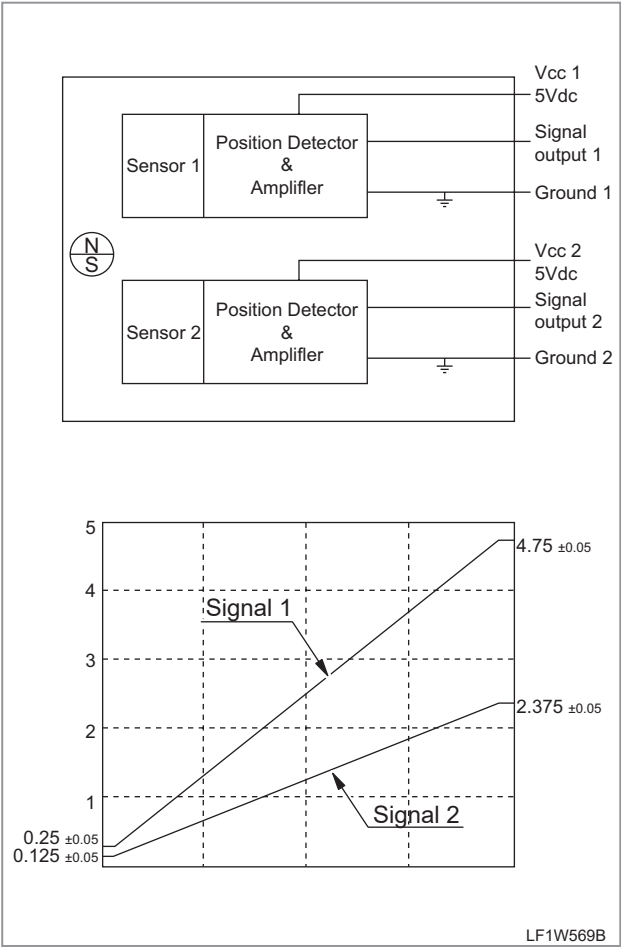
- If the difference between the signal 1 and signal 2 is over 15 %, it is determined as a fault and this error is displayed on the instrument cluster.

CONNECTOR

PIN POSITION	FUNCTION	LEAD COLOR
A(1)	Vcc1 5Vdc	Red
B(2)	Signal ouyput 1	Green
C(3)	Ground 1	Black
D(4)	Vcc2 5Vdc	White
E(5)	Signal ouyput 2	Orange
F(6)	Ground 2	Violet

LF1W568A

CIRCUIT



4.2.6 ACCELERATOR PEDAL SENSOR



The accelerator pedal sensor is installed on the accelerator pedal. This sensor detects the depressed amount of the accelerator pedal and sends this information to the ECU when then controls the engine accordingly. This sensor is a double potentiometer type with two sensors integrated into one unit for a complementary measure. The 1st sensor detects the depressed amount of the pedal for determination of the fuel injection amount and timing while the 2nd sensor compares its value with the value from the 1st sensor for accurate operation.

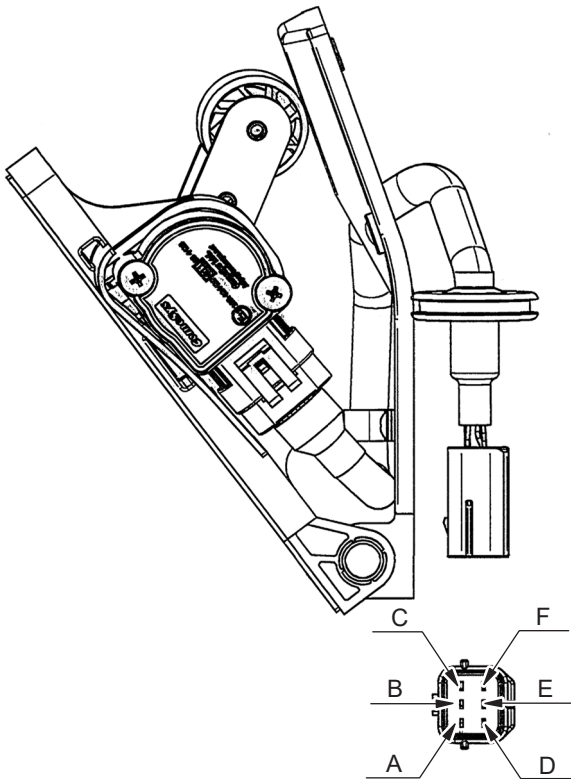
If the 1st or 2nd sensor is defective, the ECU stores the corresponding DTC and responsiveness to acceleration demand is deteriorated, resulting in difficult engine RPM rise.



REMARKS

- If the difference between the signal 1 and signal 2 is over 15 %, it is determined as a fault and this error is displayed on the instrument cluster.

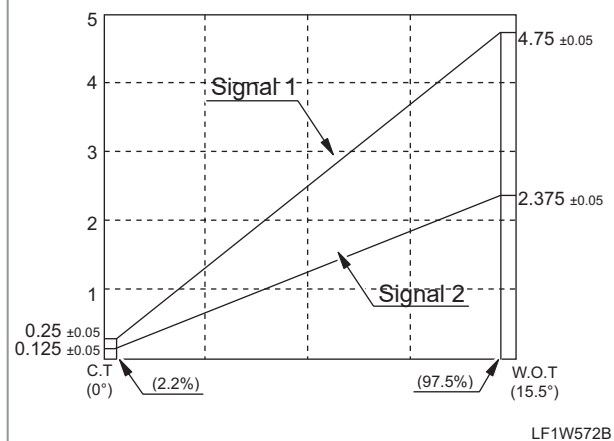
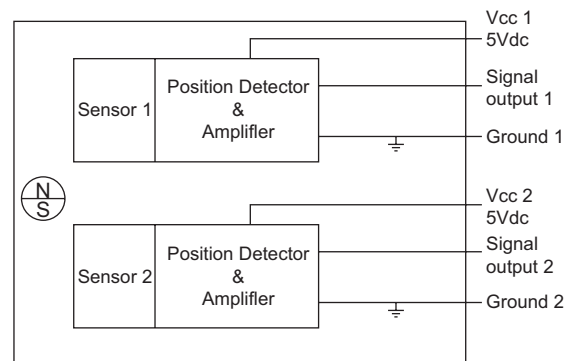
CONNECTOR



PIN LOCATION	DESCRIPTION	COLOR
A	Power Input, Vcc1	Red
B	Pedal Signal Output, Vs1	Green
C	Ground 1 (Signal 1)	Black
D	Power Input, Vcc2	White
E	Pedal Signal Output, Vs2	Orange
F	Ground 2 (Signal 2)	Violet

LF1W571A

CIRCUIT



4.2.7 RELAY BOX

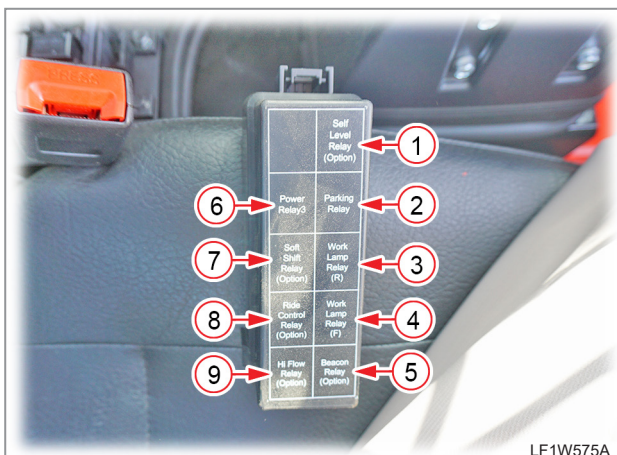


LF1W573A



LF1W574A

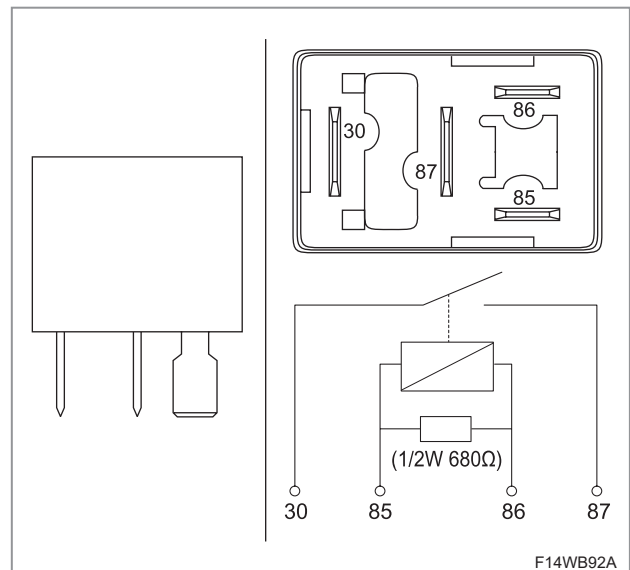
The relay box is installed on the left lower side of the driver's seat.



LF1W575A

- (1) Self level relay (Option)
- (2) Parking relay
- (3) Work lamp relay (Rear)
- (4) Work lamp relay (Front)
- (5) Beacon lamp relay (Option)
- (6) Power relay 3
- (7) Soft shift relay (Option)
- (8) Ride control relay (Option)
- (9) High flow relay (Option)

CONNECTOR & CIRCUIT



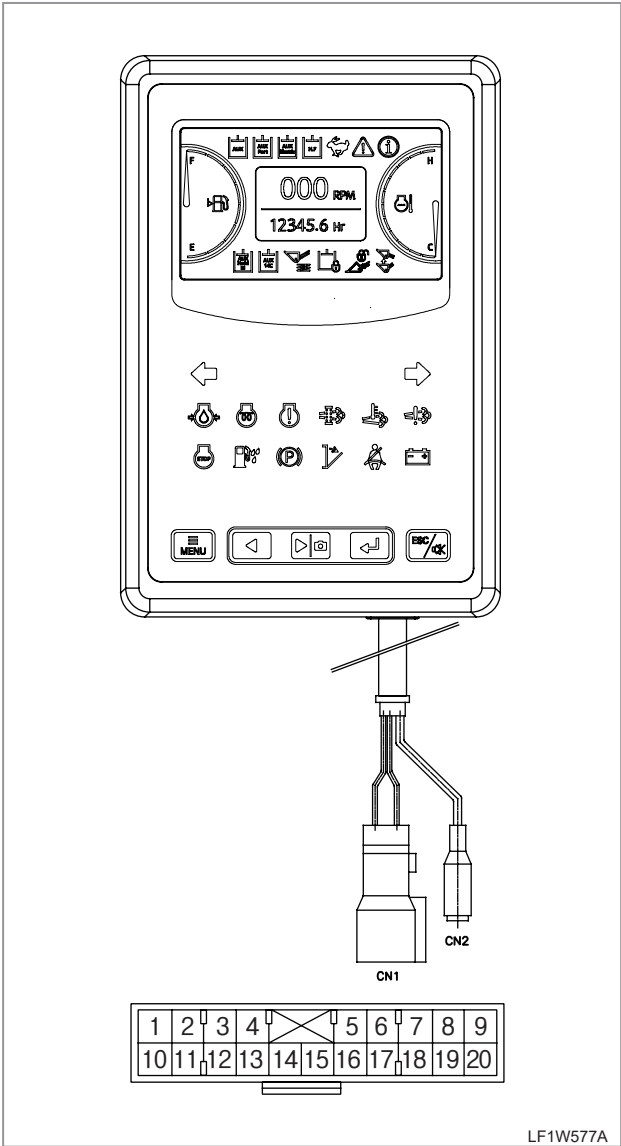
F14WB92A

4.2.8 INSTRUMENT PANEL

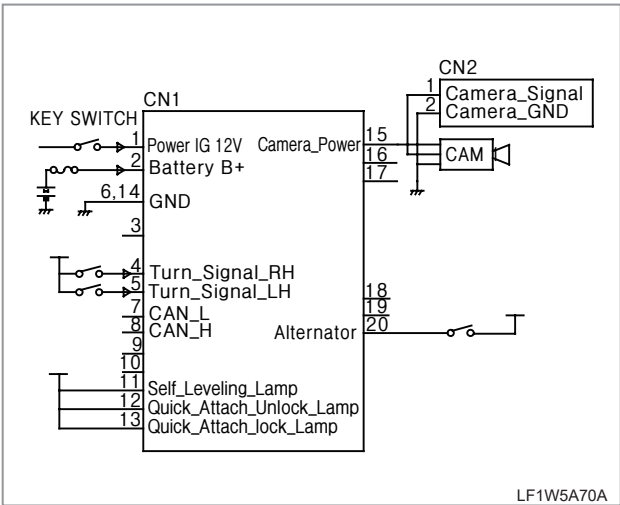


The instrument panel is installed on the right front side of the driver's seat.

CONNECTOR & CIRCUIT

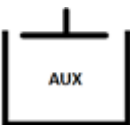
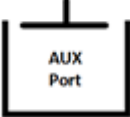
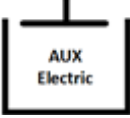
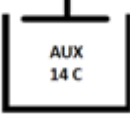
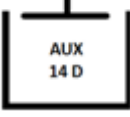
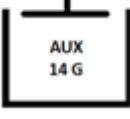
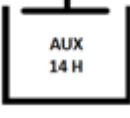


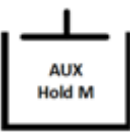
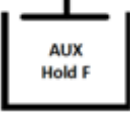
NO	FUNCTION	LEAD COLOR
1	Power IG 12V	R
2	Battery B+	R/W
3	-	-
4	Turn Signal RH	R/B
5	Turn Signal LH	Gr
6	GND	B
7	CAN_L	W/L
8	CAN_H	Y
9	-	-
10	Buzzer	W/R
11	Self Leveling Lamp	G
12	Quick Attach Unlock Lamp	Y/R
13	Quick Attach lock Lamp	Br/W
14	GND	B
15	Camera Power	R/Y
16	-	-
17	-	-
18	-	-
19	-	-
20	Alternator	R/G



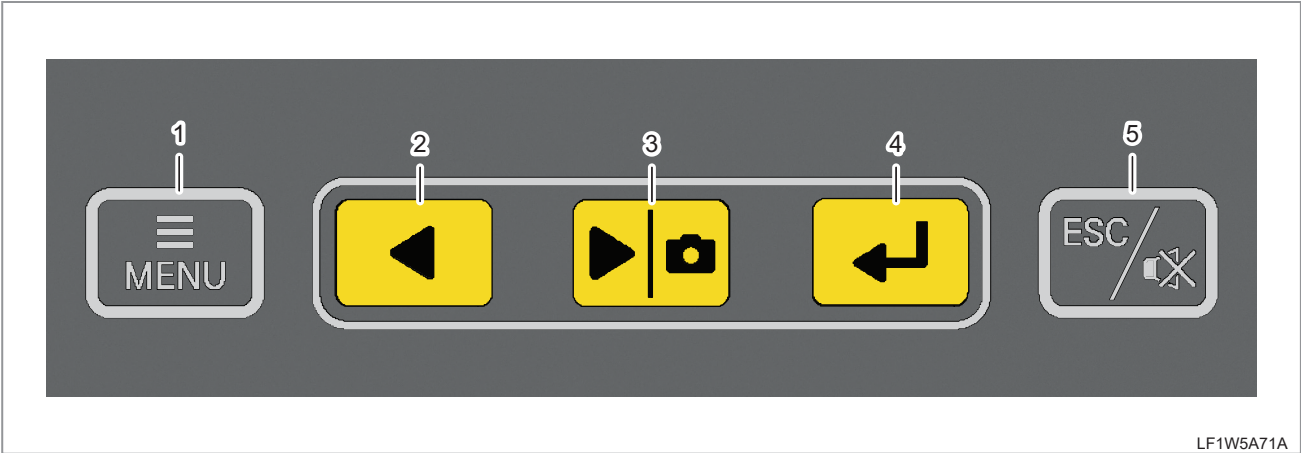
CONFIGURATION AND SYMBOL

SYMBOL	FUNCTION	SYMBOL	FUNCTION
	Water-In-Fuel warning lamp		Parking lamp
	Check engine warning lamp 1		Safety cover lamp
	Check engine warning lamp 2		Right turn signal lamp
	Emissions system warning lamp		Left turn signal lamp
	Glow lamp		Battery charge warning lamp
	DPF regeneration lamp		Engine coolant gauge
	DPF under way lamp(재생진행)		Engine coolant lamp
	Oil pressure lamp		Tachometer
	Engine shut down		Hoermeter
	Caution lamp		Fuel level gauge
	Safety lamp		Fuel level lamp

SYMBOL	FUNCTION
	Fluid high temp. warning lamp
	Ride control lamp
	Aux. lamp
	Aux. hydraulic lamp
	Aux. electric port lamp
	14-pin C lamp
	14-pin D lamp
	14-pin G lamp
	14-pin H lamp
	14-pin E lamp
	14-pin F lamp

SYMBOL	FUNCTION
	Aux. hydraulic port M lamp
	Aux. hydraulic port F lamp
	2 speed lamp
	Self leveling lamp
	High flow lamp
	Hydraulic lock system lamp
	Quick attachment un-lock lamp
	Quick attachment lock lamp
	Consumables replacement
	Communication warning light

MAIN & SUB MENU



LF1W5A71A

- (1) Menu switch
- (2) Left menu button
- (3) Right menu button / Camera button
- (4) Enter button
- (5) ESC / Buzzer stop button

No	Item	Function	Remarks
1	MENU	When pressing this button on the home screen, the sub menu is displayed. When pressing this button on the sub-menu screen, the corresponding item is selected and its input value can be adjusted.	While controlling the function within each sub menu, pressing this button lets you move to the next sub menu.
2, 3	 	The button to select functions and adjust (increase or decrease) input values within the sub-menu	When the camera button is selected, the rear camera image is on regardless of the driving direction.
4		The button to enter the desired function and set input values within the sub menu	-
5	ESC/ BUZZER OFF	The button to move back to the previous menu screen or to cancel the current function	Press and hold the button to move to the home screen immediately. Press the button while the buzzer sounds to turn the buzzer off.

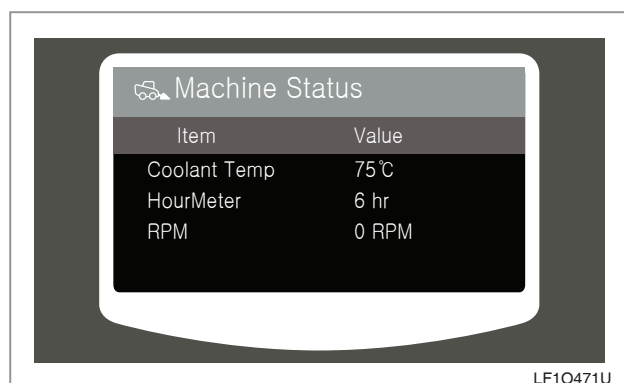
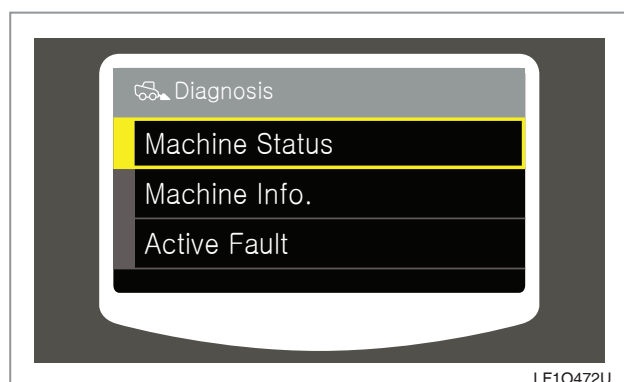
► STRUCTURE

Main menu	Sub menu	Description
Diagnosis function	Machine condition	Displaying coolant temperature, hour meter, RPM, etc.
	Machine information	Displaying instrument panel & MCU version, model name, etc.
	Current fault	Displaying current fault status list of the engine and machine
Maintenance function	Engine start inhibition setting	Engine start inhibition setting, password change or password display
	Consumables management	Changing oil/filters replacement intervals and checking elapsed time
	A/S contact	Displaying and changing A/S telephone number
	Administrator menu	Displaying fault history and mode change
Configuration	Brightness settings	Brightness manual/automatic (day, night) settings
	Time settings	Current time settings
	Unit settings	Temperature (°F/°C)
	Language settings	Korean, English
	Camera settings	Reverse gear-linked function ON/OFF

※ Press the menu button to activate the sub-menu.

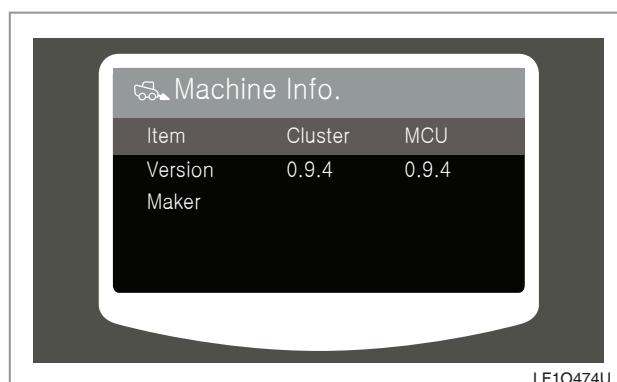
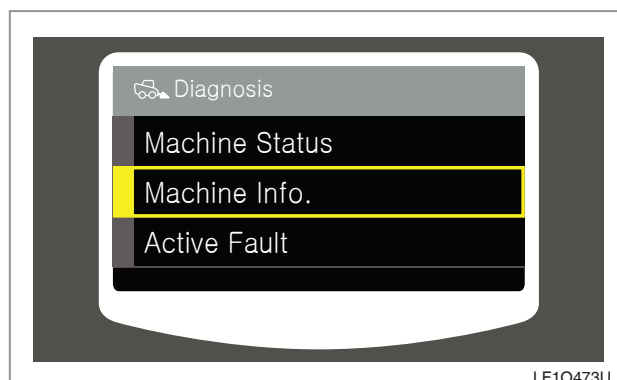
► DIAGNOSIS FUNCTION

① MACHINE STATUS



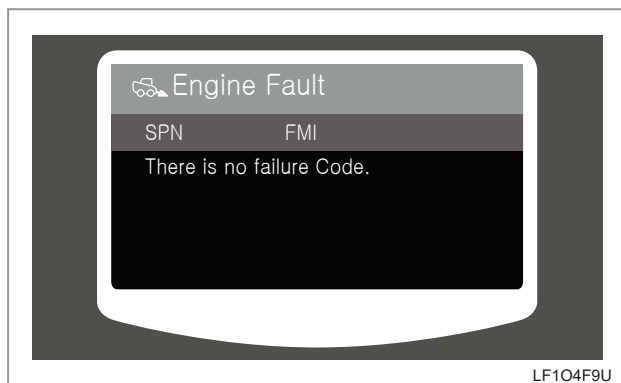
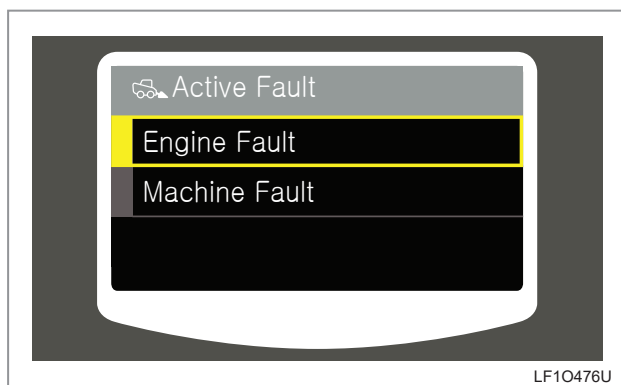
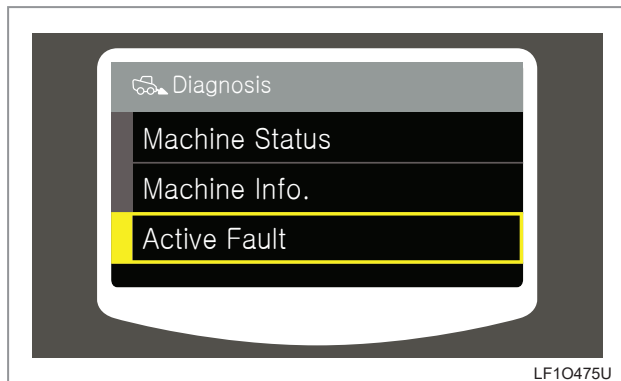
- The status of the machine is displayed.

② MACHINE INFORMATION



- You can check the version of the instrument panel and MCU as well as the machine's model name.

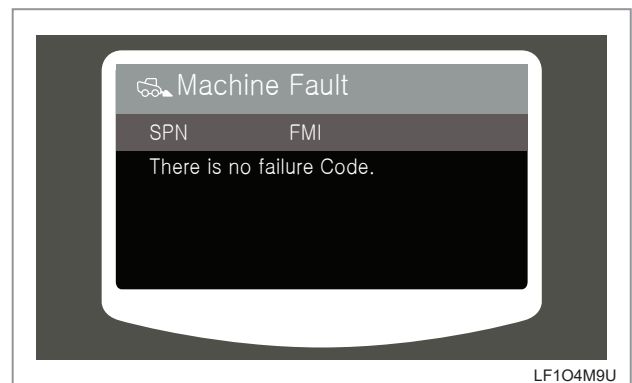
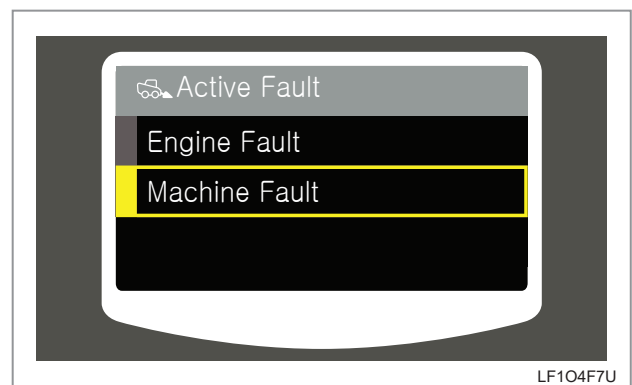
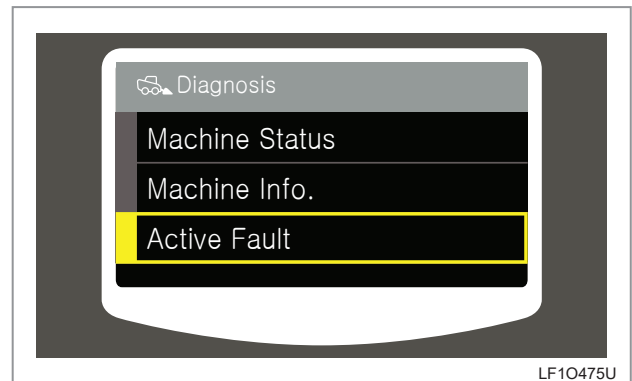
③ CURRENT FAULT



- You can check the current fault of the engine.

**REMARKS**

- In case of related codes, contact a dealer nearby to get it checked.



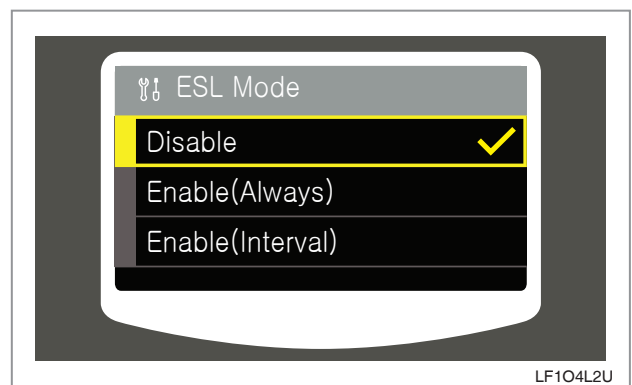
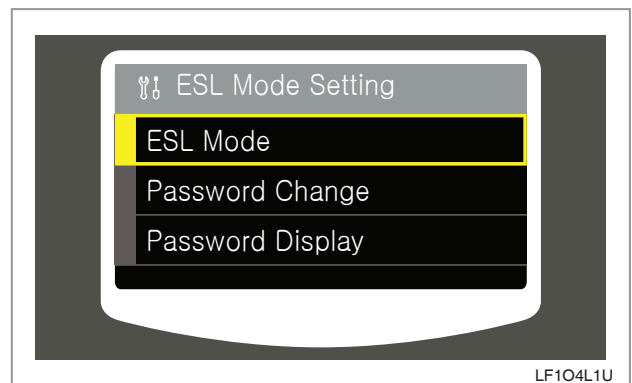
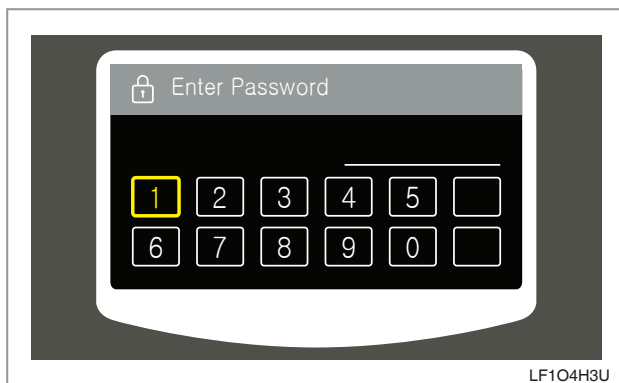
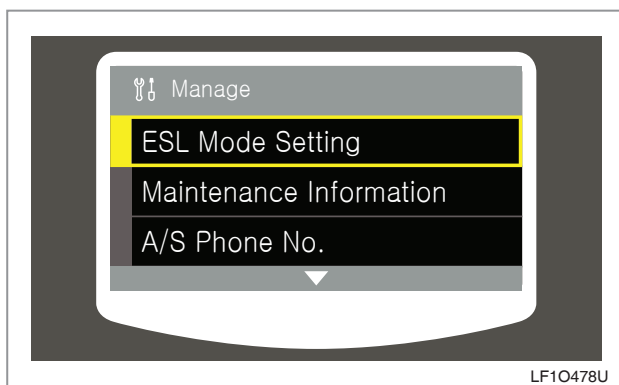
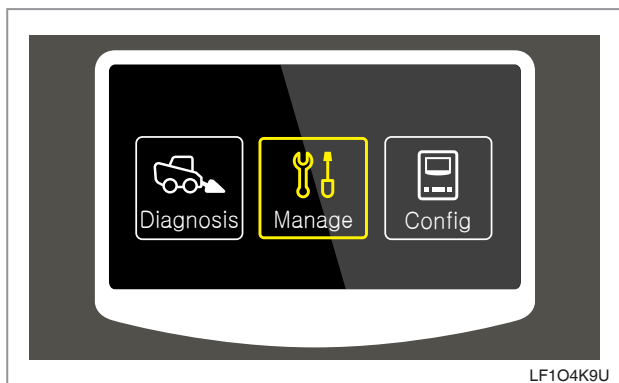
- You can check the current fault of the machine.

**REMARKS**

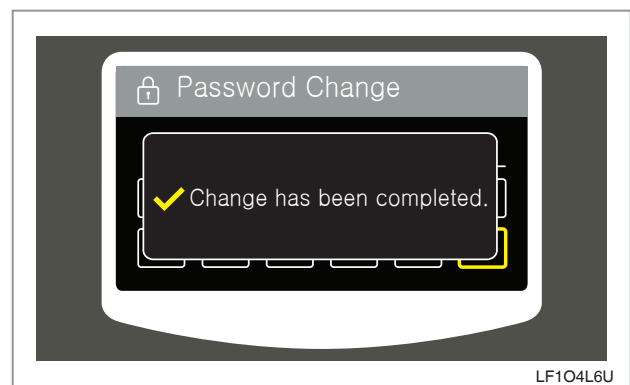
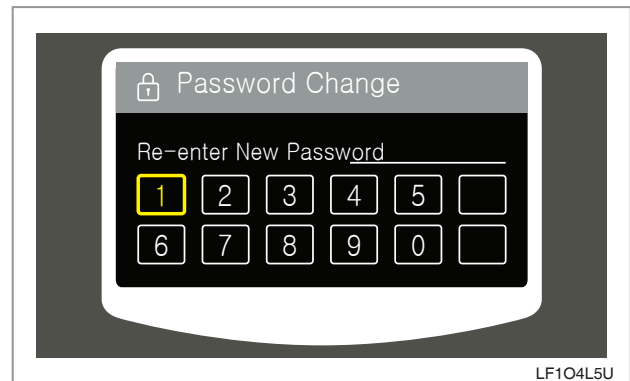
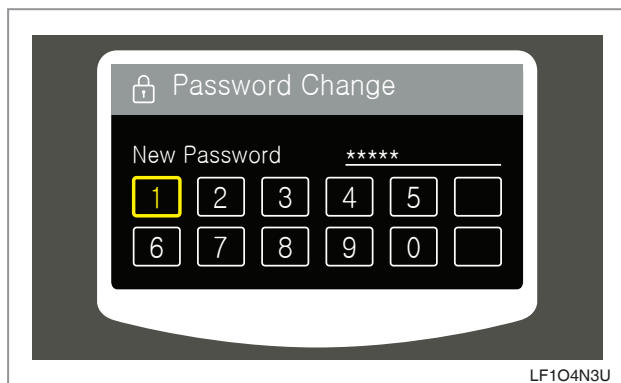
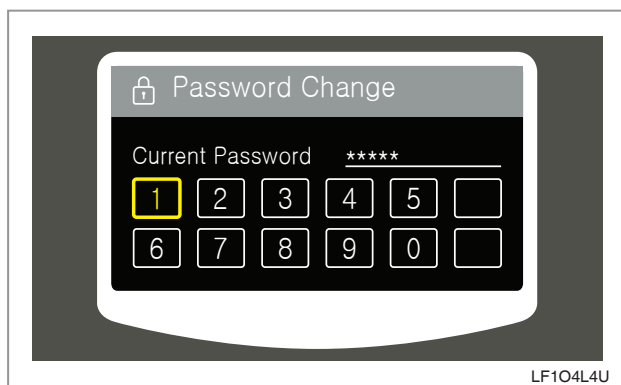
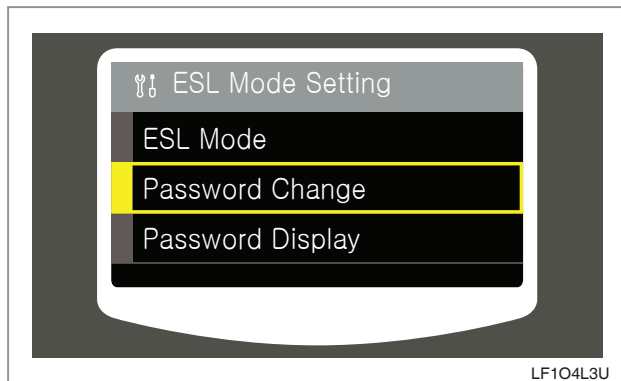
- In case of related codes, contact a dealer nearby to get it checked.

► MAINTENANCE FUNCTION

① ENGINE START INHIBITION SETTING

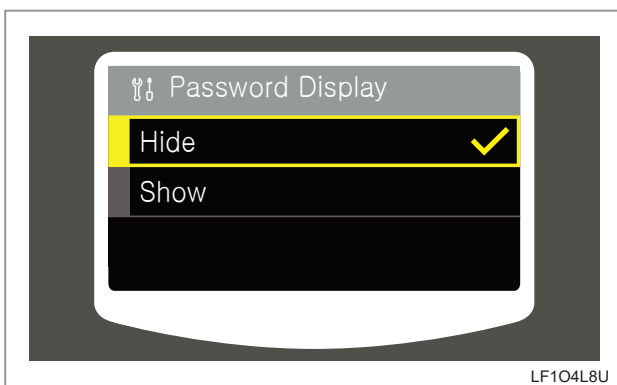
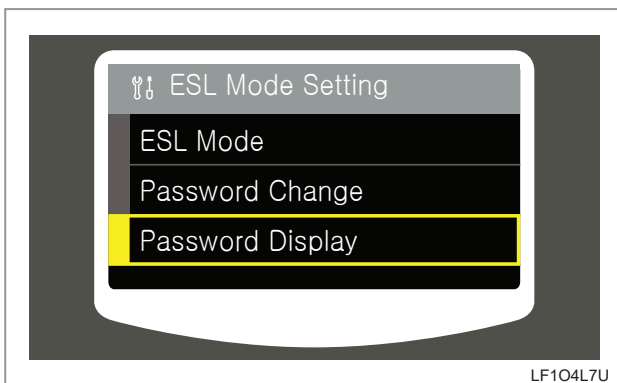


- Engine start inhibition setting

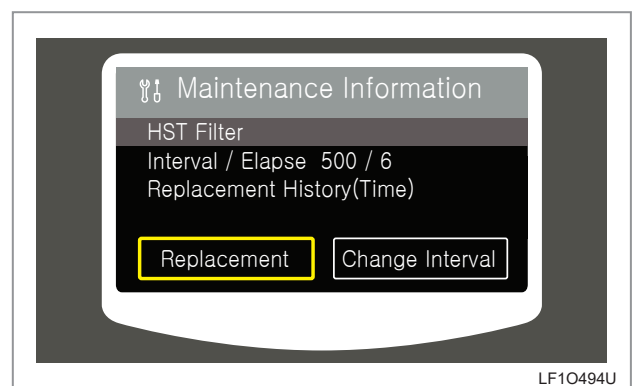
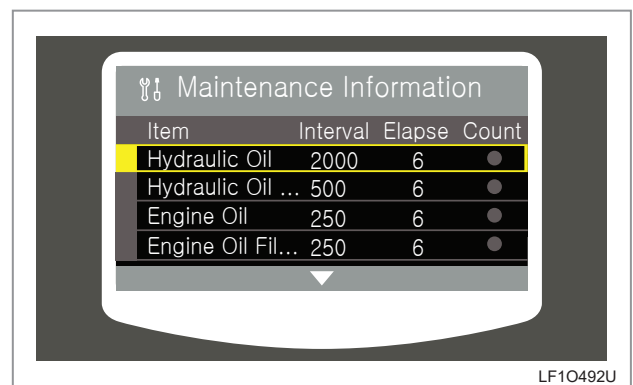
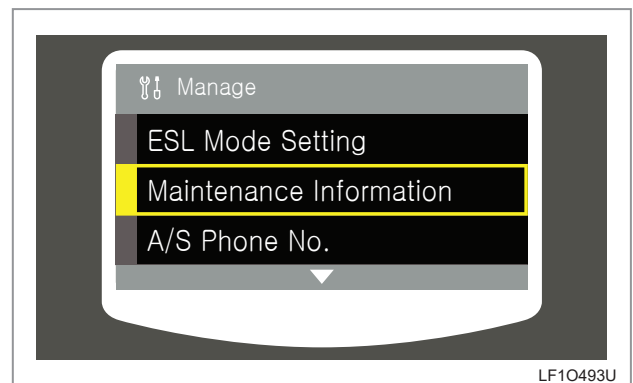


- Password change

② CONSUMABLES MANAGEMENT

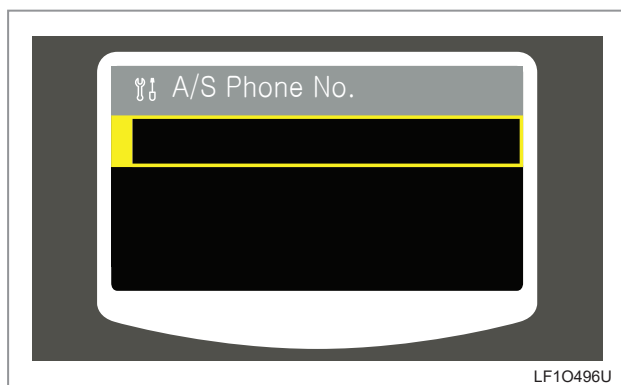
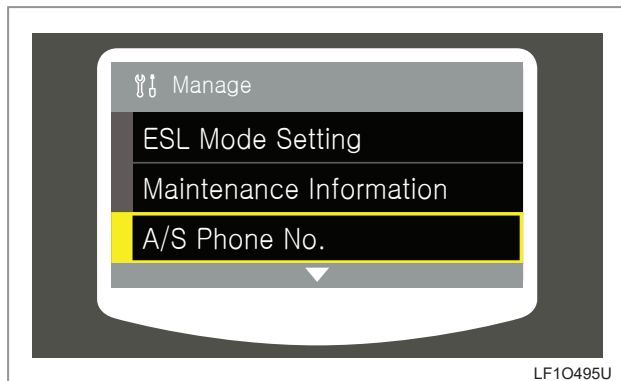


- Password display



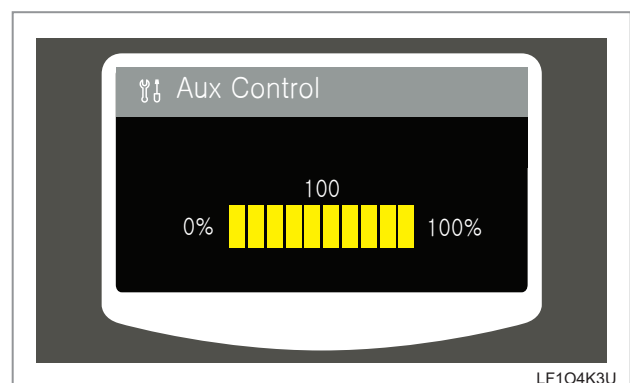
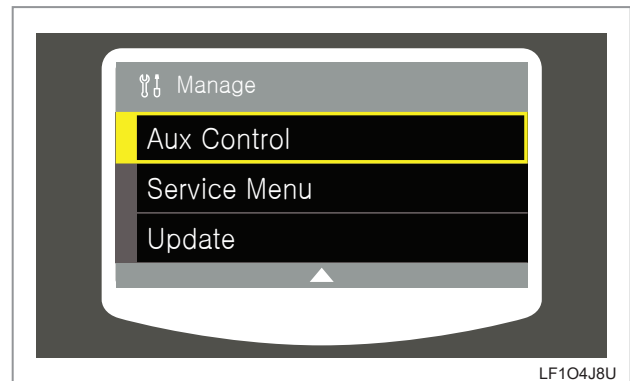
- Elapsed time
- Replacement interval
- Replacement frequency
- Replacement

③ A/S CONTACT



- You can check and change the A/S contact details.

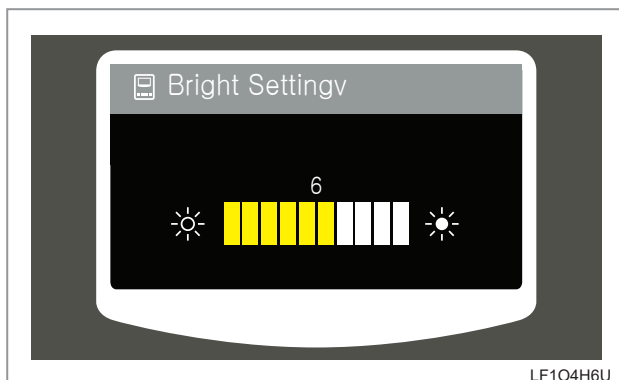
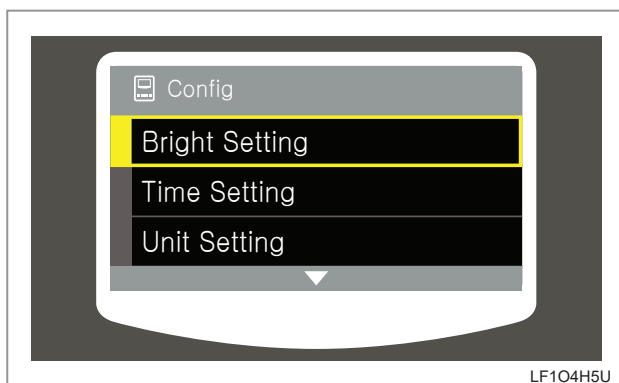
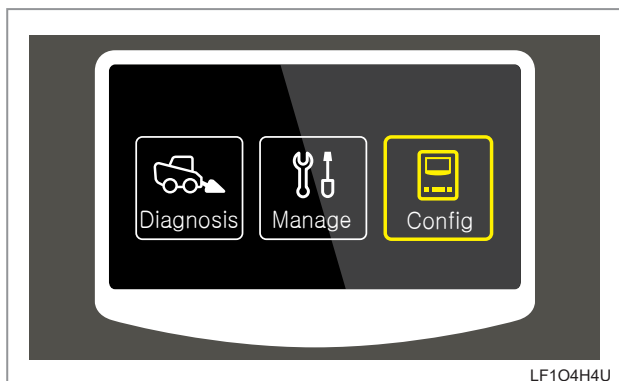
④ HYDRAULIC CONTROL



- Hydraulic control: The amount of hydraulic flow delivered to the external hydraulic implement can be controlled.
- AUX HOLD M : The amount of flow sent to the male coupler can be set by percentage, using the ◀ ▶ buttons in the instrument panel.
- AUX HOLD F: The amount of flow sent to the female coupler can be set by percentage, using the ◀ ▶ buttons in the instrument panel.

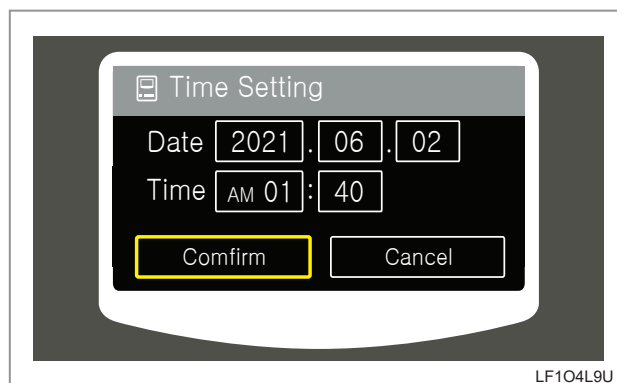
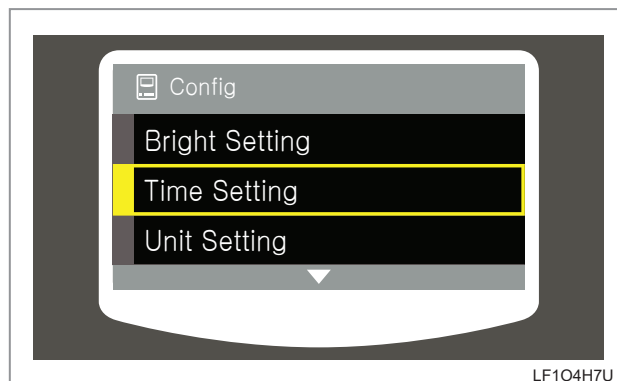
► CONFIGURATIONS

① BRIGHTNESS SETTINGS



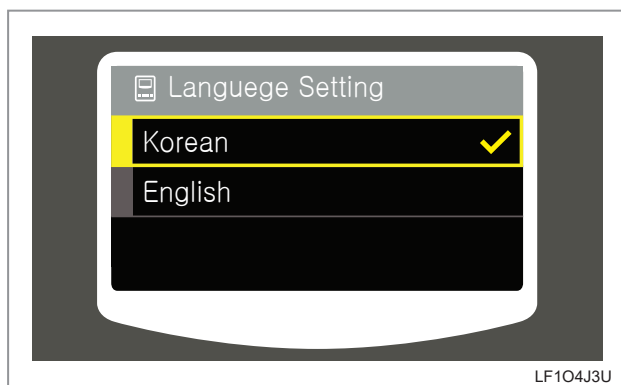
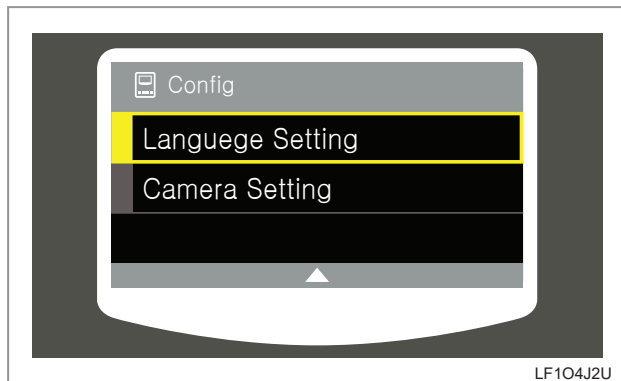
- Manual
- Automatic
- Daytime duration setting

② TIME SETTINGS



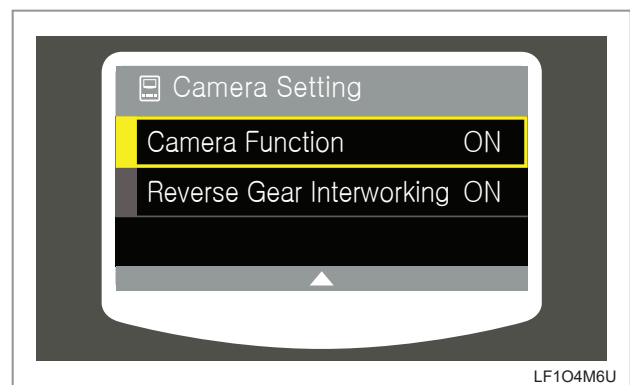
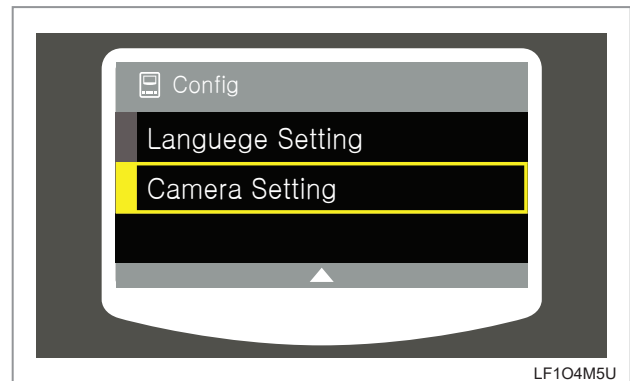
- The time can be set. (Year, Month, Day, Hour, Minute)

③ LANGUAGE SETTINGS



- The desired language can be selected. Once a language is selected, all information is displayed in that language.

④ CAMERA SETTINGS



- You can set the camera function on or off (optional).
- You can turn the reverse gear linked function on or off.
- Reverse gear linked function: When the vehicle is in reverse, the camera mode is automatically displayed on the main screen.

MACHINE DIAGNOSIS (DTC)

1) CHECKING THE MONITOR



1. Check if the  or  warning lamp is illuminated on the monitor.



3. Press the Enter button () to select the 'Diagnosis' function.



2. Press the MENU button.



4. Press the Enter button () to select the "Current fault".



LF104C7U

5. Press the Enter button () to select the "Machine fault".



LF104C9U

7. Verify and check the diagnosis details.

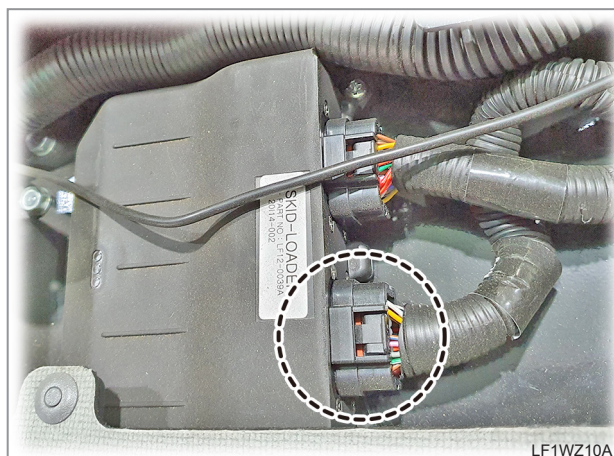
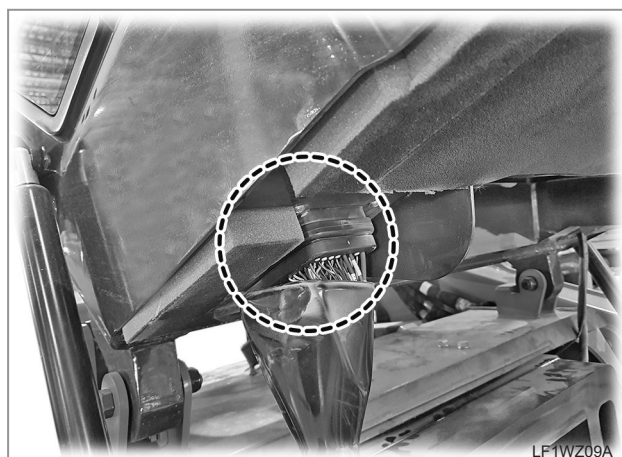


LF104C8U

6. Check the DTC code and press the Enter button ().

2) DTC CODE

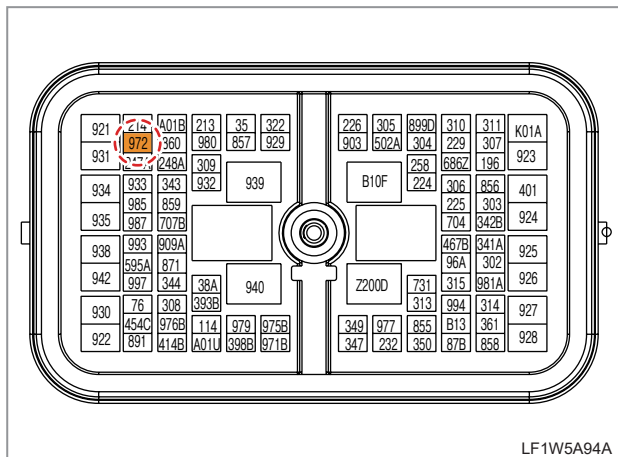
NO	DTC		Diagnosis	Part that might have failed	Relative wiring No.			Warning lamp
	DDSPN	FMI						
1	101	3	Oil temperature sensor and wiring voltage higher than normal range or having short circuit > 4.9 V maintained	Oil temp. sensor, Oil temp. sensor wiring	972	Z992		
		4	Oil temperature sensor and wiring voltage below normal range or having short circuit < 0.1V maintained					
	-	-	Warning lamp ON when oil temperature exceeds 90°C					
2	301	3	Fuel level sensor circuit - Voltage above normal or shorted to high source (or open circuit)	Fuel sender wiring	987	-	-	
		4	Fuel level sensor circuit - Voltage below normal or shorted to low source					
3	705	0	Battery voltage high	Battery wiring	B31A	B10	B13A	
		1	Battery voltage low					
4	707	1	Alternator voltage low (or open circuit)	Fuse (R-terminal power)	B13A			
				ALTERNATOR				
				WIRING HARNESS				
5	841	2	ECU communication error	ECU	247A	248A		
				MCU				
				CLUSTER				
				WIRING HARNESS				

2-1) DIAGNOSIS BY DTC CODES**2-1-1) DDSPN - 101 / FMI - 3, 4****FIGURE OF RELATED PART****► OIL TEMPERATURE SENSOR CONNECTOR****► MCU WIRING CONNECTOR****► MIN WIRING + CABIN WIRING CONNECTOR****DIAGNOSIS PROCEDURES****► CHECKING VOLTAGE OF THE OIL TEMPERATURE SENSOR**

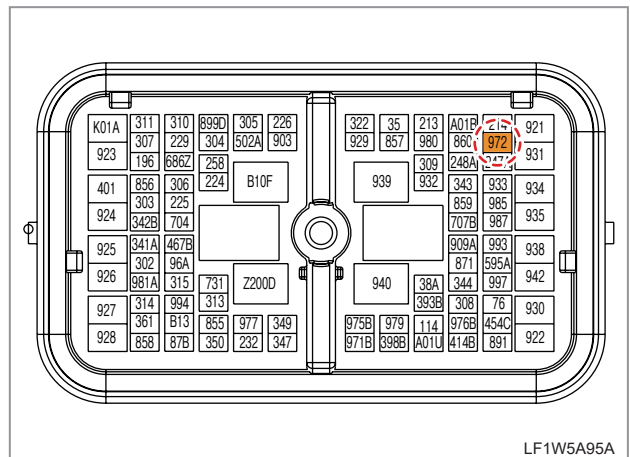
- Start key ON → Measure the voltage of the oil temperature sensor (if the measurement is over 4.9V) → Replace the oil temperature sensor
- Start key ON → Measure the voltage of the oil temperature sensor (if the measurement is below 0.1V) → Replace the oil temperature sensor

INFORMATION OF RELATED WIRING HARNESS

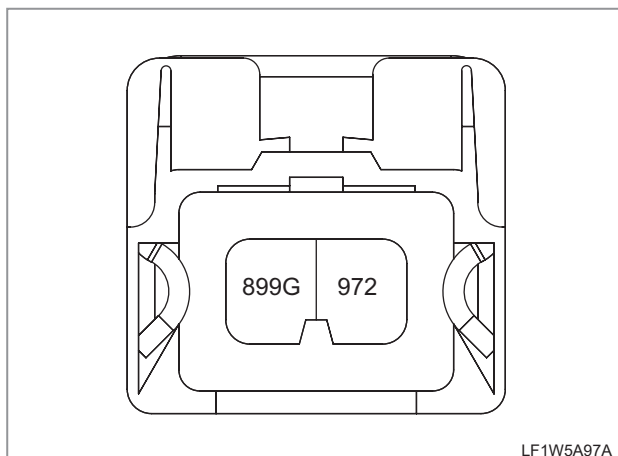
► MAIN WIRING (CABIN WIRING) CONNECTOR



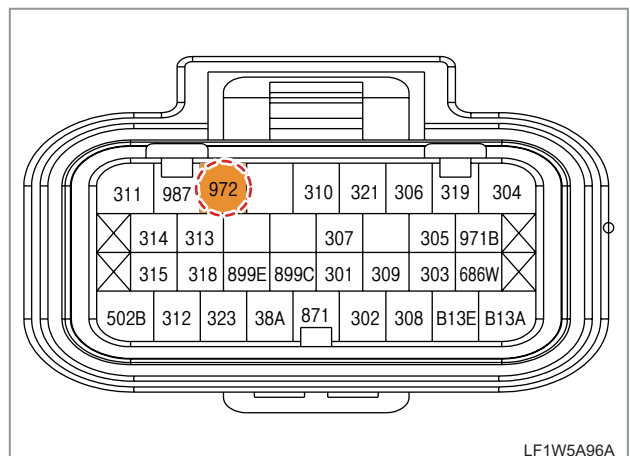
► CABIN WIRING (MAIN WIRING) CONNECTOR



► OIL TEMPERATURE SENSOR CONNECTOR



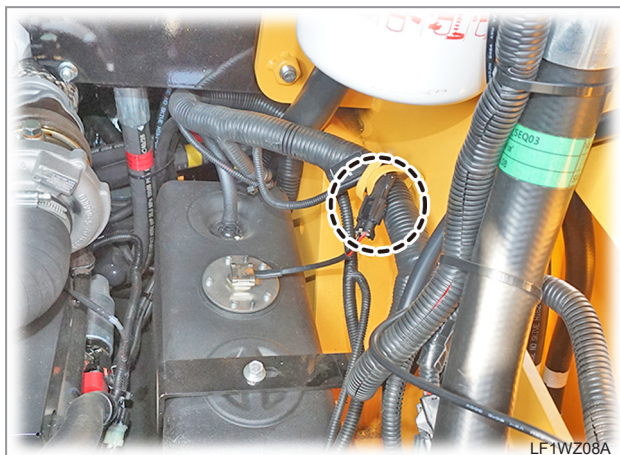
► MCU WIRING CONNECTOR



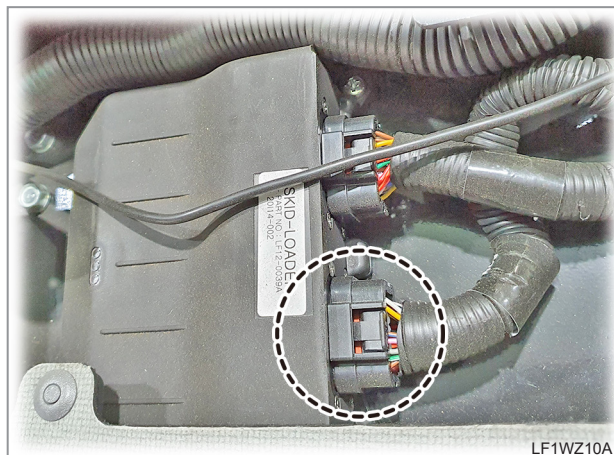
2-1-2) DDSPN - 301 / FMI - 3, 4

FIGURE OF RELATED PART

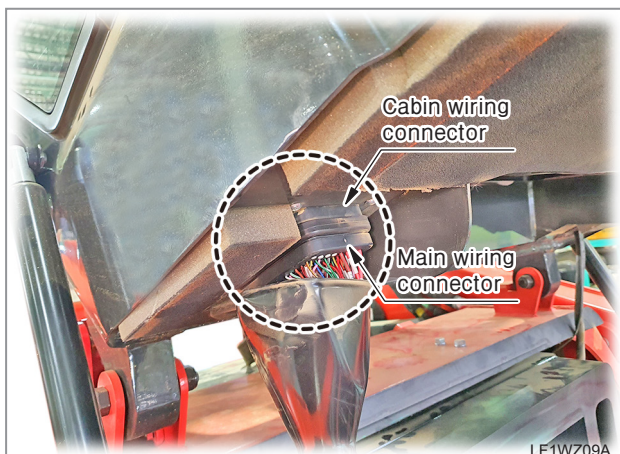
► FUEL SENDER CONNECTOR



► MCU WIRING CONNECTOR



► MAIN WIRING + CABIN WIRING CONNECTOR



DIAGNOSIS PROCEDURES

► STEP 1 : CHECKING RESISTANCE OF THE FUEL SENDER

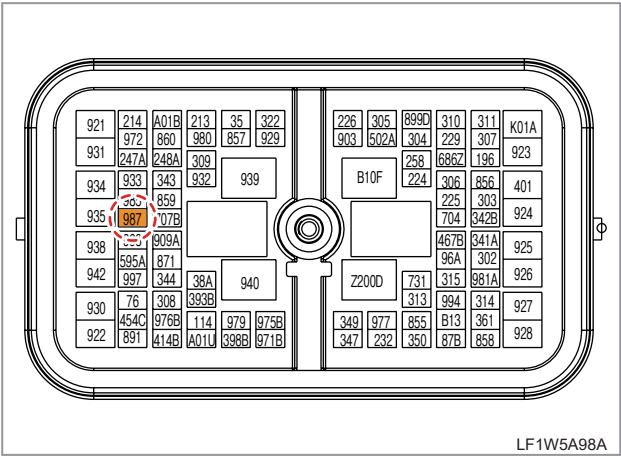
- Start key OFF → Disconnect the fuel sender connector → Measure the resistance ($3\Omega \sim 110\Omega$) → Replace the fuel sender if the measurement is excessive.

► STEP 2 : CHECKING THE WIRING IF THE RESISTANCE IS NORMAL (PIN-TO-PIN INSPECTION)

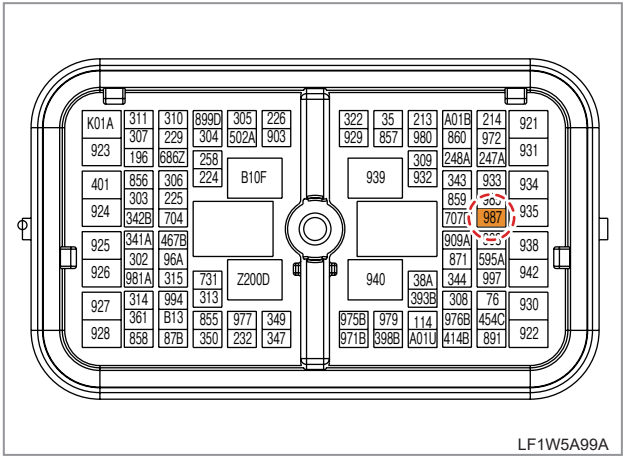
- Start key OFF → Check for continuity between the oil sender connector (Pin #987) and main (cabin) wiring connector (Pin #987)
- Start key OFF → Check for continuity between the cabin (main) wiring connector (Pin #987) and MCU wiring connector (Pin #987) → In case of no continuity, replace the wiring

INFORMATION OF RELATED WIRING HARNESS

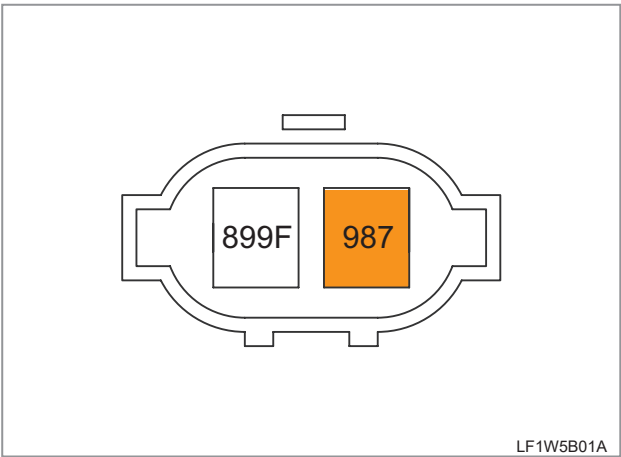
► MAIN WIRING (CABIN WIRING) CONNECTOR



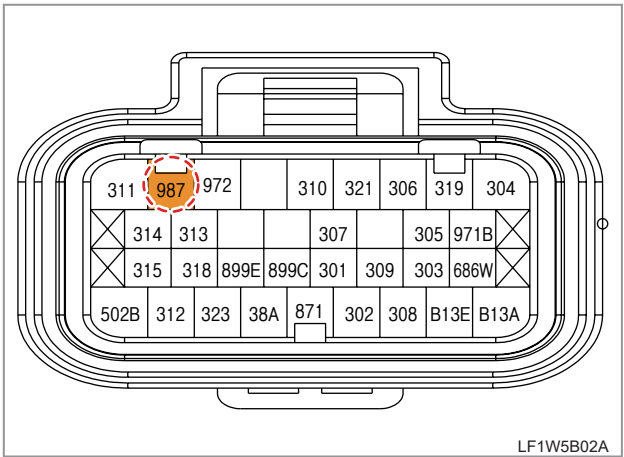
► CABIN WIRING (MAIN WIRING) CONNECTOR



► FUEL SENDER CONNECTOR



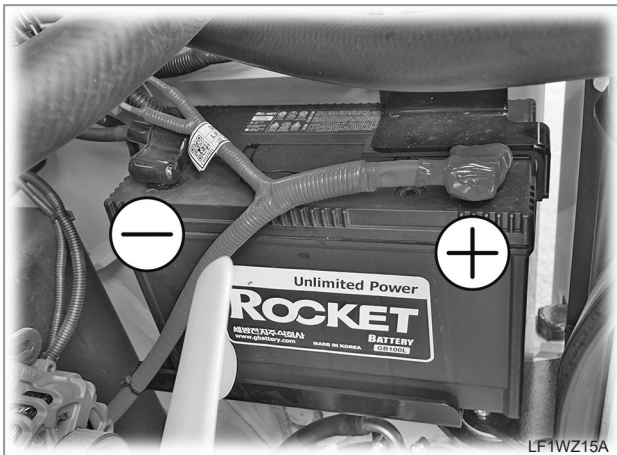
► MCU WIRING CONNECTOR



2-1-3) DDSPN - 705 / FMI - 0, 1

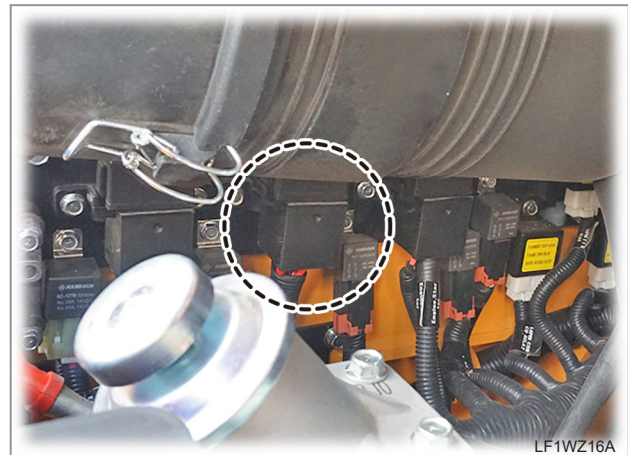
FIGURE OF RELATED PART

► BATTERY



LF1WZ15A

► SLOW BLOW FUSE



LF1WZ16A

DIAGNOSIS PROCEDURES

► STEP 1

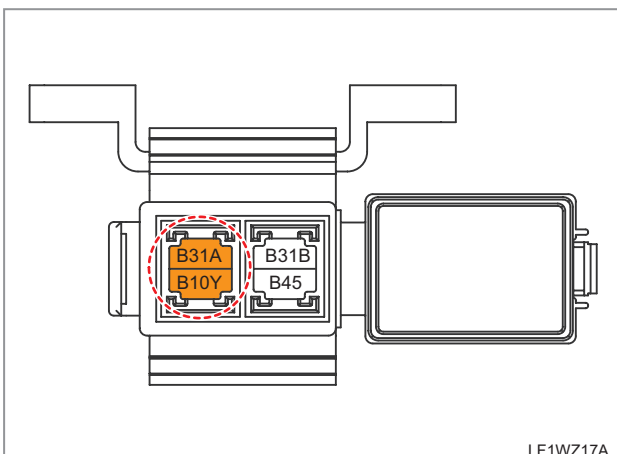
- Start key OFF → Disconnect the (-) and (+) battery terminals and measure the voltage (acceptable operation voltage for engine start: 12.3 ~ 12.9V) → Replace the battery if abnormal voltage is measured

► STEP 2

- If the voltage is acceptable, check the slow-blow fuse (power: 100A) and cabin fuse (10A) → If abnormal, replace them with those with the same capacity

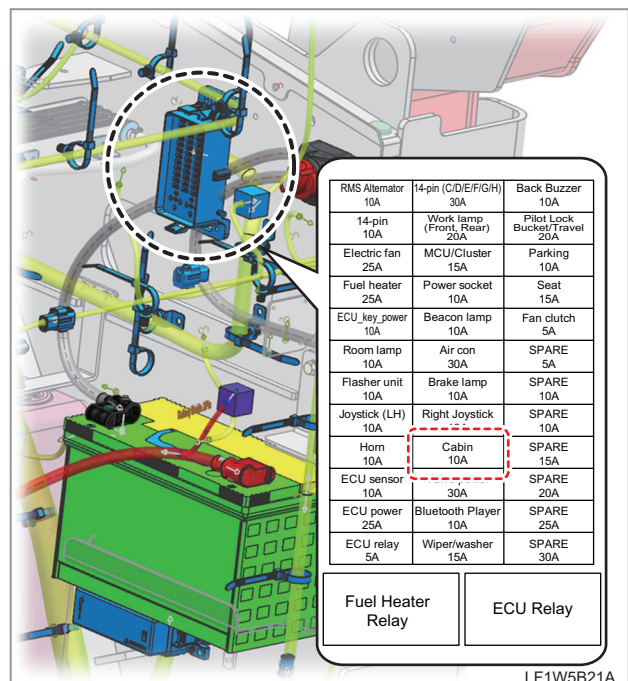
INFORMATION OF RELATED WIRING HARNESS

► SLOW BLOW FUSE (POWER : 100A)



LF1WZ17A

► CABIN FUSE (10A)

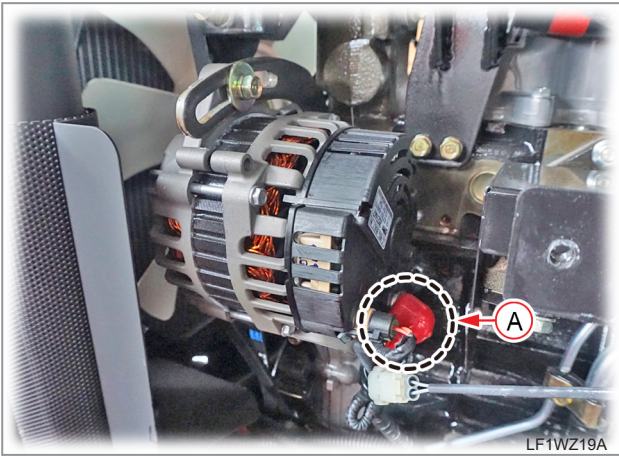


LF1W5B21A

2-1-4) DDSPN - 707 / FMI - 1

FIGURE OF RELATED PART

▶ ALTERNATOR BATTERY DIRECT B+



▶ FAN BELT

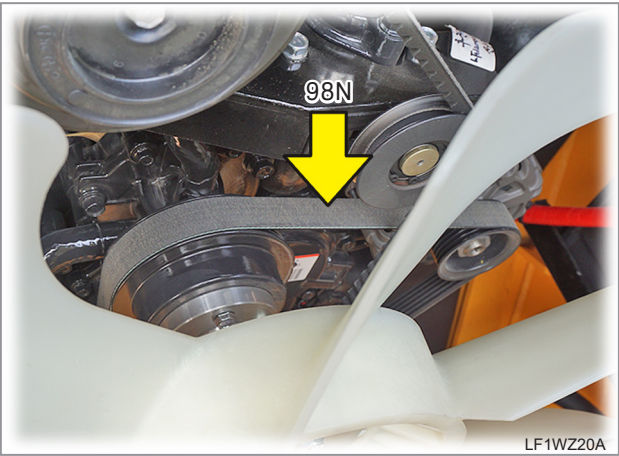


FIGURE OF RELATED PART

▶ STEP 1

- Start key OFF → Check the tightening state of the B+ connection (A) of the alternator and battery

▶ STEP 2

- Check for continuity between the body of alternator and vehicle body

▶ STEP 3

- Check the tension of the fan belt (press the point between the fan drive pulley and alternator with force of 98N and see whether the belt is deflected for 7 ~ 9 mm)

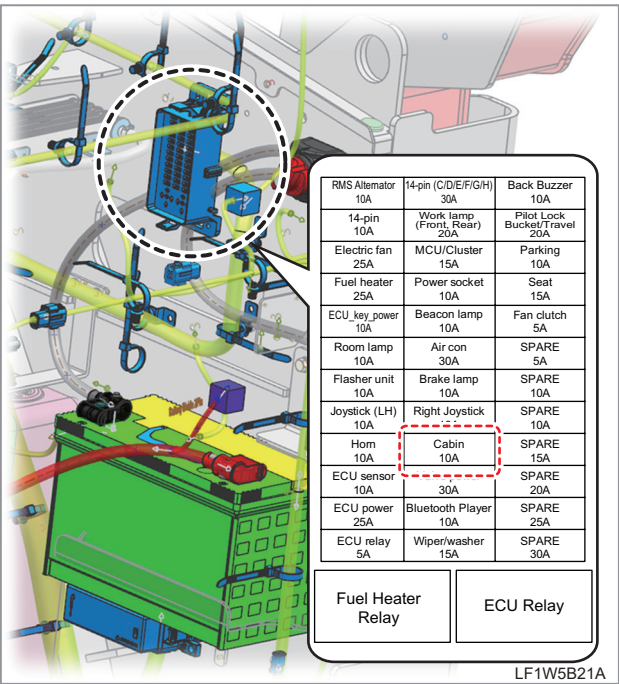
▶ STEP 4

- Check the cabin fuse (10A)

▶ STEP 5

- If normal, replace the alternator with a new one

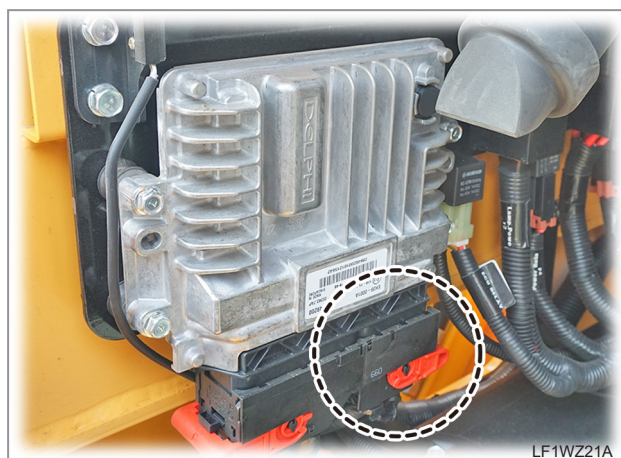
FIGURE OF RELATED PART



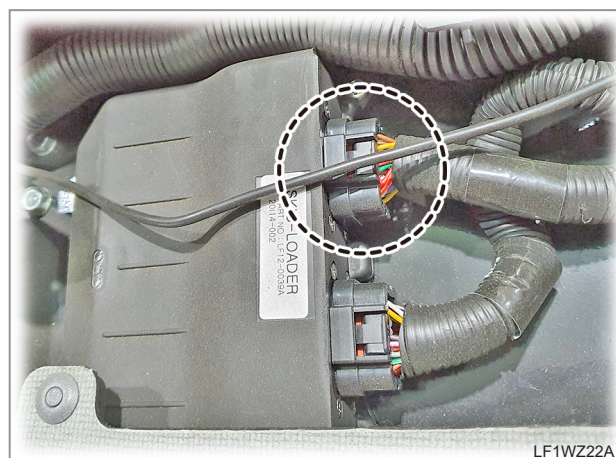
2-1-5) DDSPN - 841 / FMI - 2

FIGURE OF RELATED PART

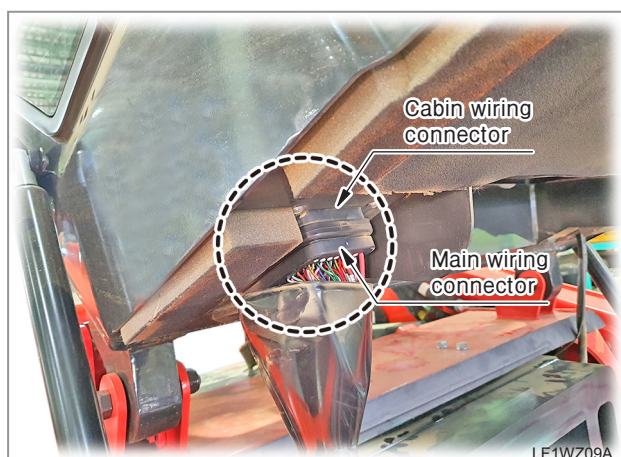
► ECU WIRING CONNECTOR



► MCU WIRING CONNECTOR



► MAIN WIRING + CABIN WIRING CONNECTOR



DIAGNOSIS PROCEDURES

► STEP 1 : CHECKING THE WIRING (PIN TO PIN)

- Start key OFF → Check for continuity between the ECU wiring connector (Pin #247A) and main wiring connector (Pin #247A)
- Start key OFF → Check for continuity between the ECU wiring connector (Pin #248A) and main wiring connector (Pin #248A)
- Start key OFF → Check for continuity between the cabin wiring connector (Pin #247A) and MCU wiring connector (Pin #247A)
- Start key OFF → Check for continuity between the cabin wiring connector (Pin #248A) and MCU wiring connector (Pin #248A)

► STEP 2 : CHECKING THE ENGINE DTC CODES

► ECU WIRING CONNECTOR

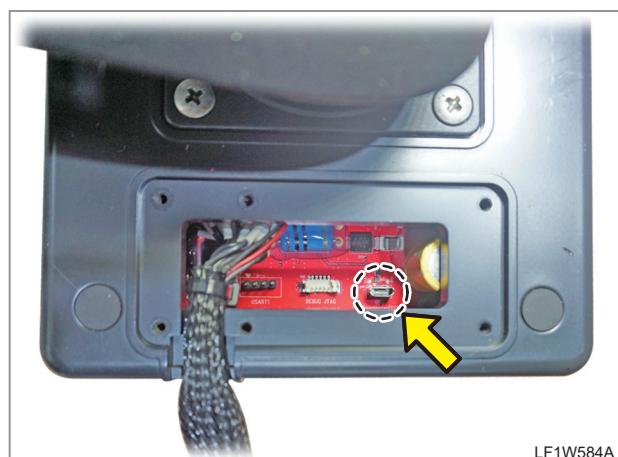
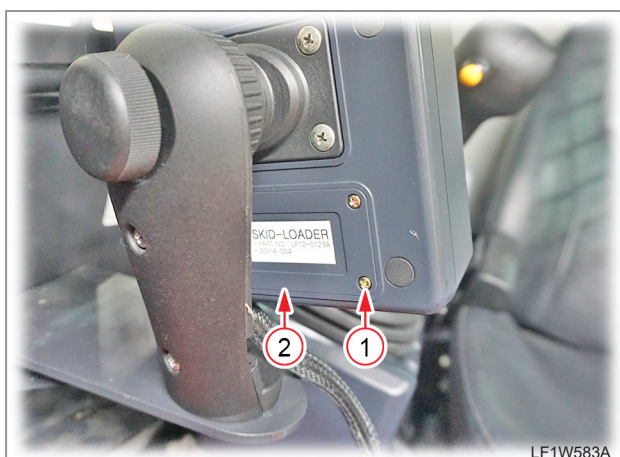


LF1W5B05A

LF1W5B04A

LF1W5B06A

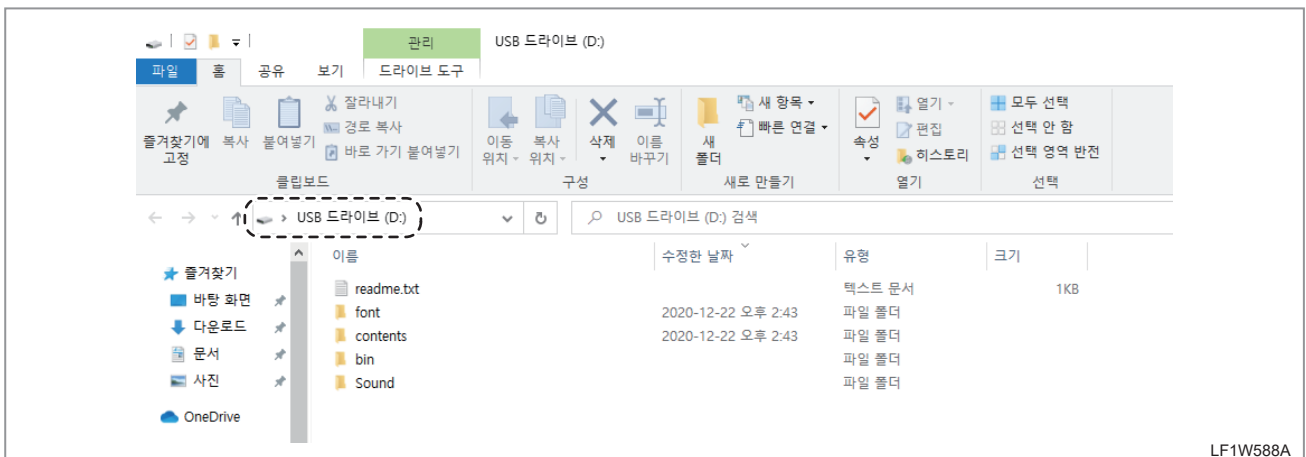
UPDATE



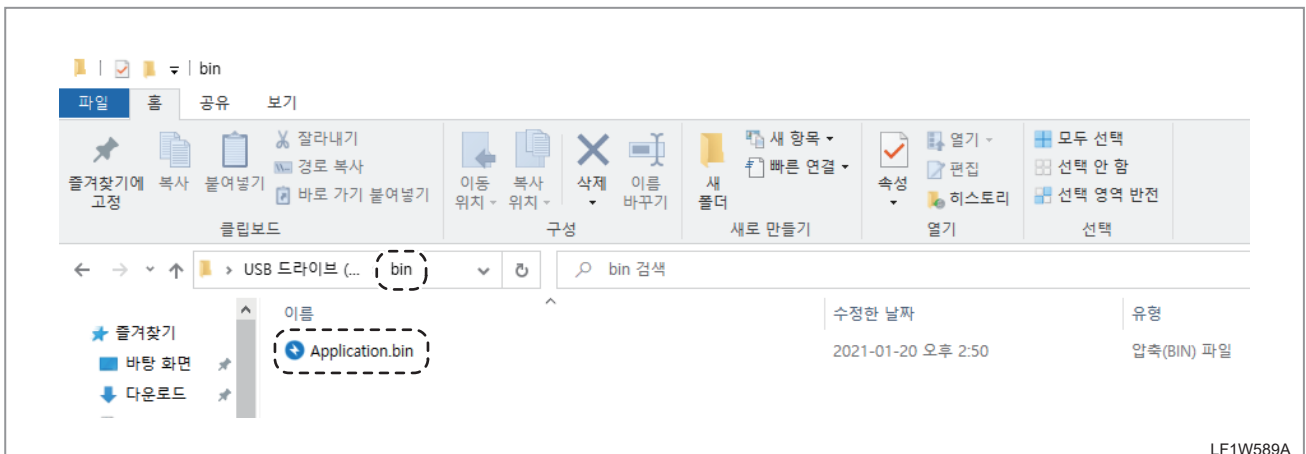
1. Unscrew the cover mounting screws (1) at the lower back of the dashboard to remove the cover (2).



2. Insert a micro 5-pin USB cable to the USB port at the lower back of the dashboard, and then connect the cable to the PC.



3. With the power off Press the two arrow buttons (◀, ▶) simultaneously. Then, supply the power (Key ON) and access the USB drive.



4. Copy and paste the bin file to be downloaded into the "bin" folder of the USB drive. (Delete the old file.) At this time, the file name must be Application.bin.



LF1W590A



LF1W591A

5. With the power OFF, press the  and  buttons simultaneously for approx. 2 seconds and turn the power ON.

6. Once the update is started and completed, the system automatically restarts.

REMARKS

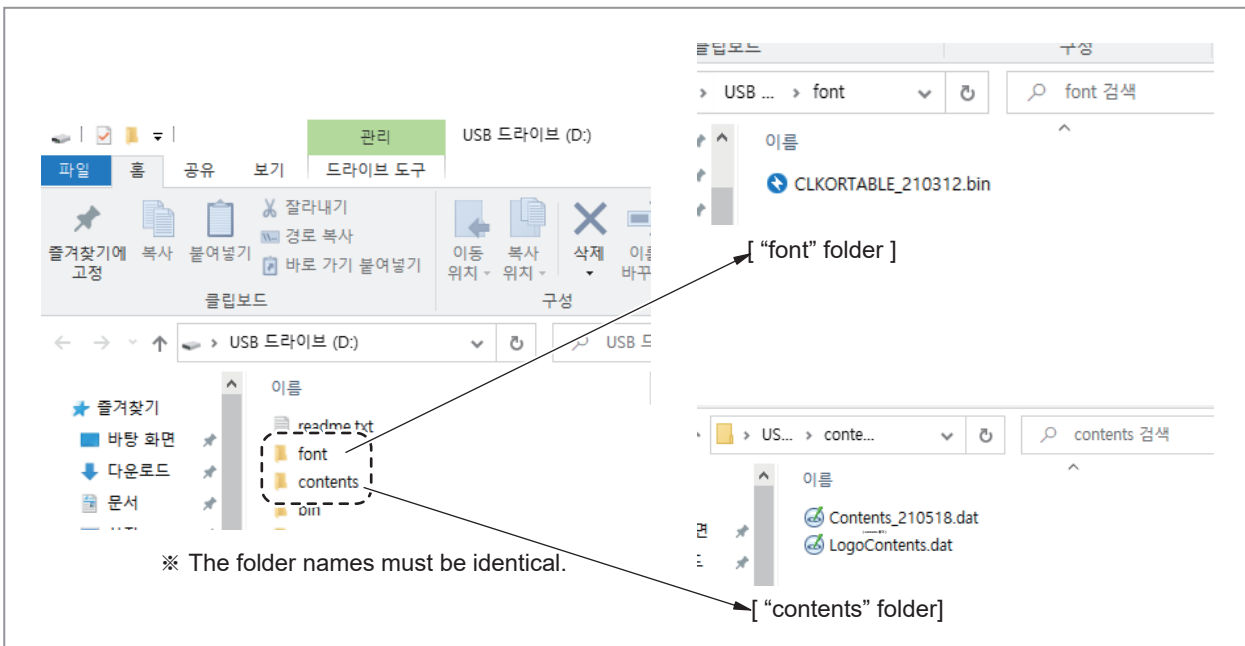
COPYING AND PASTING THE IMAGE CONTENTS & FONT

▶ FONT

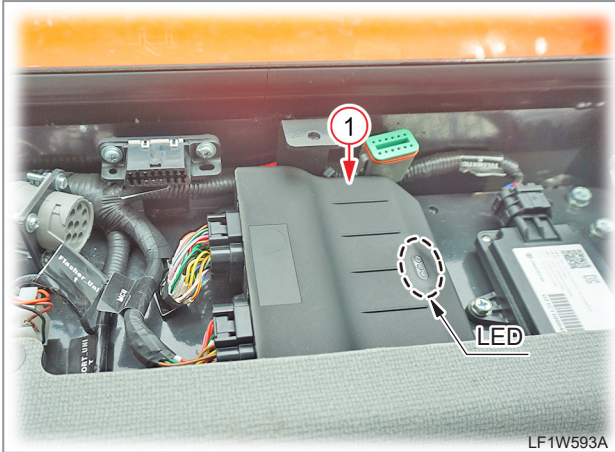
- Copy and paste the .bin file into the “font” folder of the USB drive. (Delete the old CLKORTABLE_XXXXX.BIN file.)
- Restart the power.

▶ CONTENTS

- Copy and paste the .dat file into the “contents” folder of the USB drive. (Delete the old contents_XXXXX.dat file.)
- Restart the power.



4.2.9 MCU (MICRO CONTROLLER UNIT)

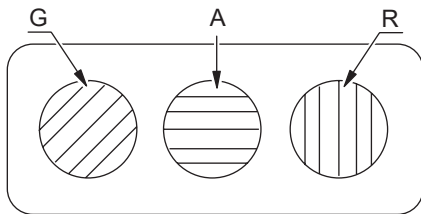


The MCU (1) is located under the top cover behind the driver's seat.

The MCU controls the operation of equipment components by receiving signals from various sensors, such as battery power, various switches and hydraulic system.

- Rated voltage: 12 VDC
- Operating voltage: 8 ~ 16 VDC
- Operating temperature: -40°C ~ 150°C

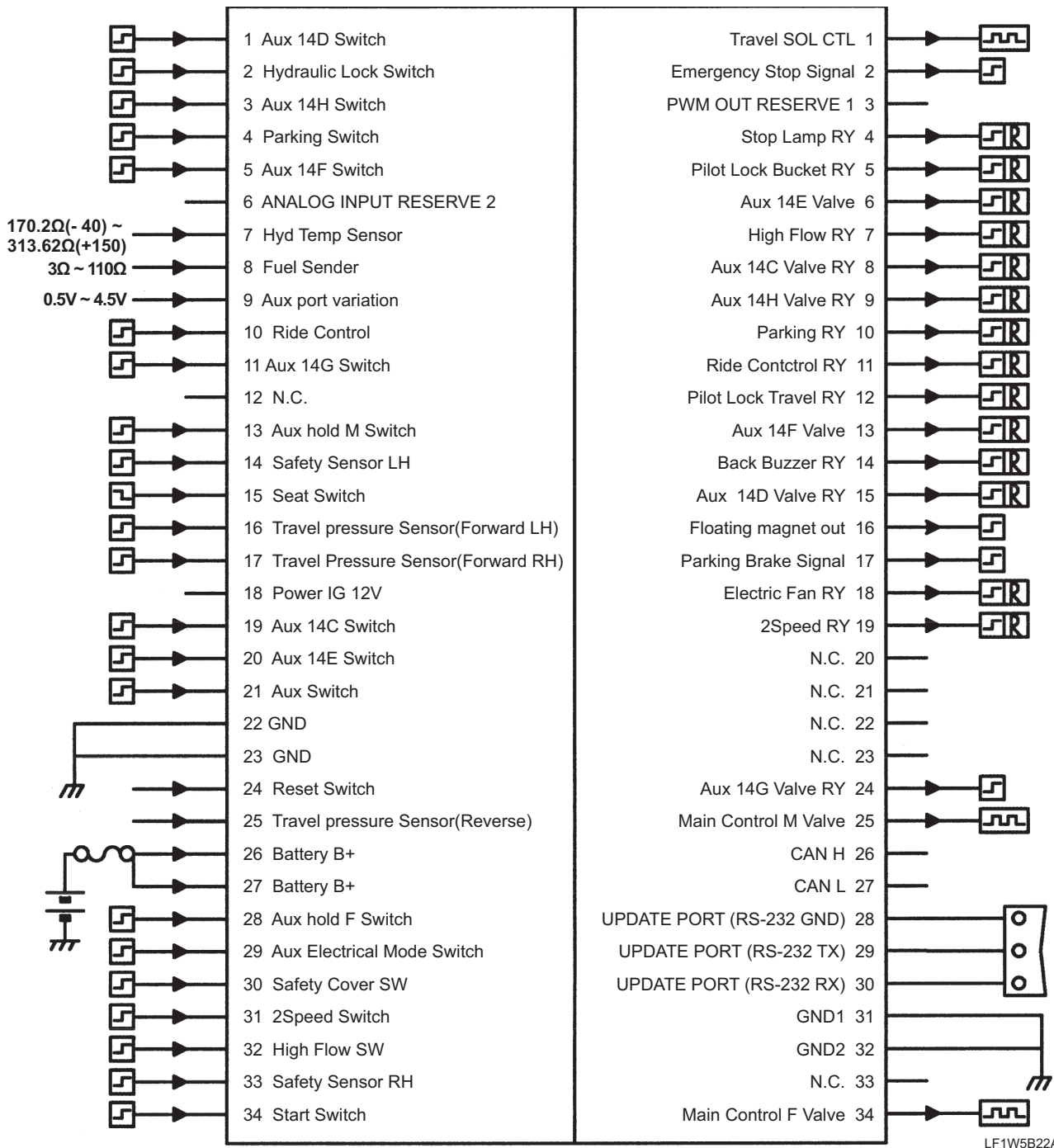
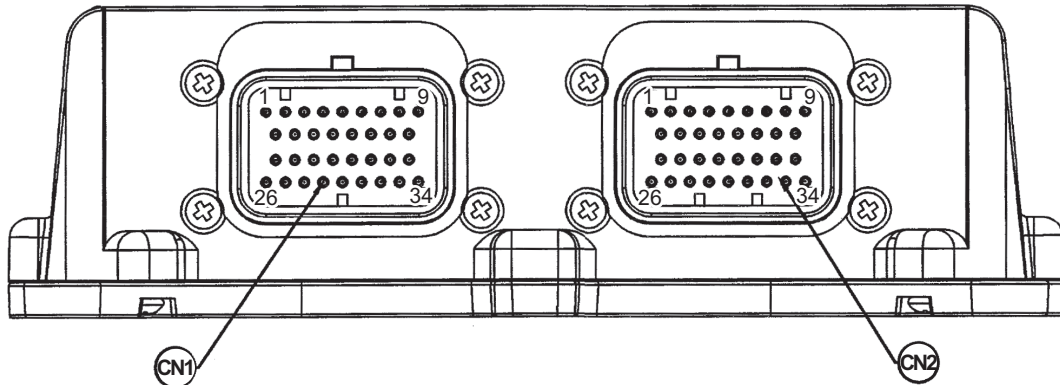
LED SPECIFICATIONS



GREEN	AMBER	RED	Description
ON	OFF	OFF	Normal Operation
OFF	OFF	ON	CPU Error
ON	ON	OFF	Communication Error
OFF	OFF	OFF	Power Off

LF1W594A

CONNECTOR & CIRCUIT



LF1W5B22A

► INPUT/OUTPUT SPECIFICATIONS

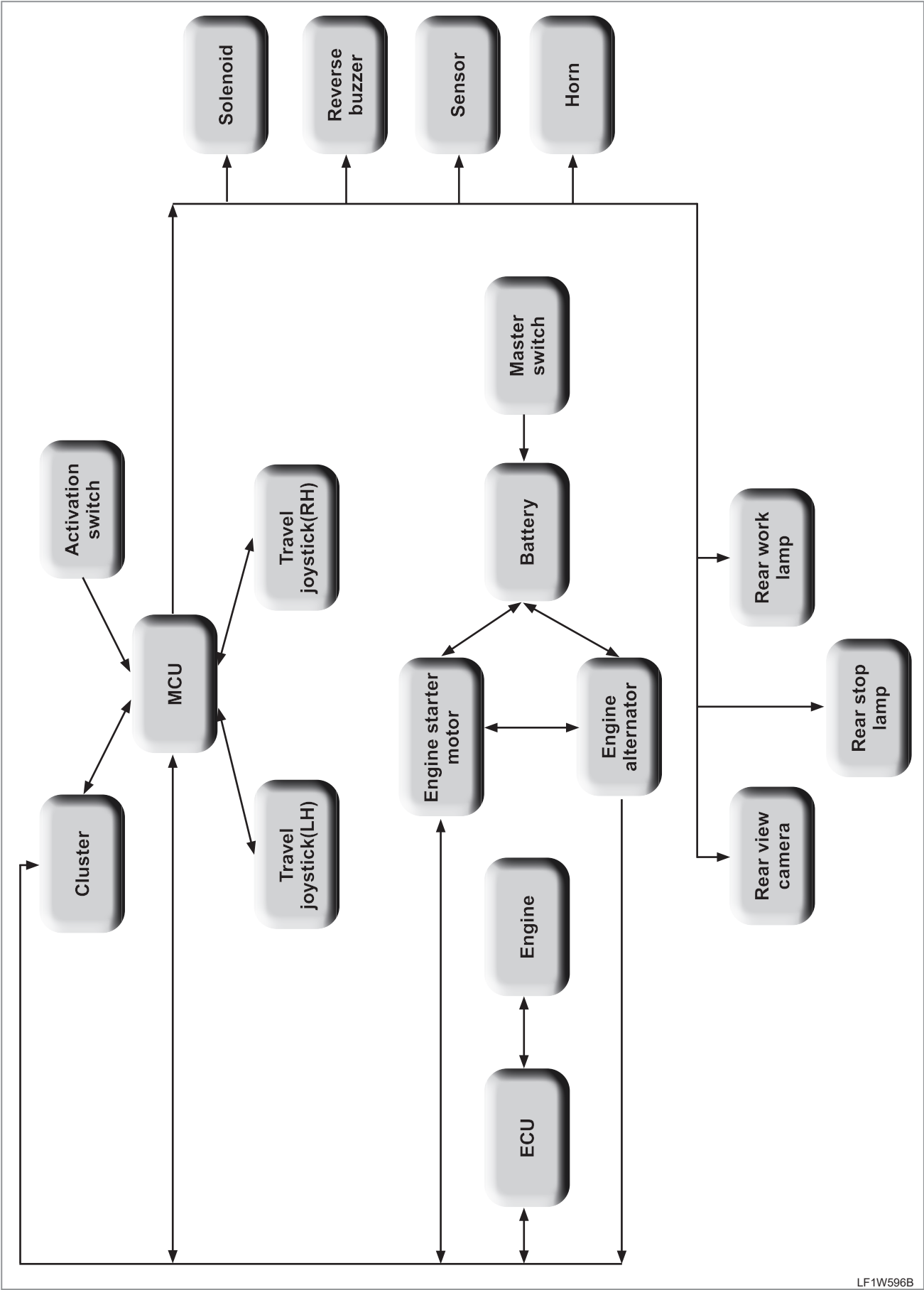
Function	INPUT (Connector CN1)				REMARK
	NO.	Terminal name	Condition	Logic	
Power	26	Battery B+	12V	8 ~ 16V	
	27	Battery B+	12V	8 ~ 16V	
Key Switch	18	Power IG 12V	OFF-> ON (12V)	8 ~ 16V	LED lamp "ON" (Green)
AUX	21	Aux Switch	OFF -> ON (12V)	Icon "ON" in the LCD	
	29	Aux Electrical Mode Switch	OFF -> ON (12V)	Icon "ON" in the LCD	
	19	Aux 14C Switch	OFF -> ON (12V)	Icon "ON" in the LCD CN2-8 +12V output	
	1	Aux 14D Switch	OFF -> ON (12V)	Icon "ON" in the LCD CN2-15 +12V output	
	20	Aux 14E Switch	OFF-> ON (12V)	Icon "ON" in the LCD CN2-6 +12V output	
	5	Aux 14F Switch	OFF -> ON (12V)	Icon "ON" in the LCD CN2-13 +12V output	
	11	Aux 14G Switch	OFF -> ON (12V)	Icon "ON" in the LCD CN2-24+12V output	
	3	Aux 14H Switch	OFF -> ON (12V)	Icon "ON" in the LCD CN2-9 +12V output	
	13	Aux hold M switch	OFF-> ON (12V)	Icon "ON" in the LCD CN2-25 +12V output	
	28	Aux hold F switch	OFF -> ON (12V)	Icon "ON" in the LCD CN2-34 +12V output	
Travel	16	Travel Pressure Sensor (Forward Lh)	OFF -> ON (12V)		When "N" position, Back Buzzer : OFF Stop LAMP : ON
	17	Travel Pressure Sensor (Forward Rh)	OFF -> ON (12V)		
	25	Travel Pressure Sensor (Reverse)	OFF-> ON (12V)	CN2-14 +12V output	When "R" position, Back Buzzer : ON Stop LAMP : OFF

Digital	2	Hyd Lock Switch	OFF -> ON (12V)		
	10	Ride Control	OFF-> ON (12V)	Icon "ON" in the LCD CN2-11 +12V output	
	4	Parking Switch	OFF-> ON (12V)	Icon "ON" in the LCD CN2-10 +12V output	
	24	Reset Switch	OFF -> ON (12V)	CN2-5, 12, 17 +12V output	
	30	Safety Cover switch	OFF -> ON (12V)	LAMP "ON" CN2-2 +12V output	
	31	2 Speed Switch	OFF-> ON (12V)	Icon "ON" in the LCD CN2-7 +12V output	
	32	Hlgh Flow switch	OFF -> ON (12V)	Icon "ON" in the LCD CN2-19 +12V output	
	15	Seat switch	OPEN -> LOW(0V)	LAMP "ON"	
	14	Safety Sensor LH	OFF -> ON (12V)	LAMP "ON"	
	33	Safety Sensor RH	OFF -> ON (12V)	LAMP "ON"	
	34	Start Switch	OFF -> ON (12V)	LAMP "ON" CN2-18 +12V output	
Ananlog	7	Hyd Temp Sensor	48KΩ ~ 160Ω	Temperature display on the LCD	
		Hyd Temp Sensor High	322Ω or less	Icon "ON" in the LCD	
	8	Fuel Sender	3Ω - 110.3Ω	Fuel level display on the LCD	
		Fuel Sender Empty	110Ω or less	Icon "ON" in the LCD	
	9	Aux Port Variation	0.5 - 4.5V Center : 2.5V	Icon "ON" in the LCD	

► RESISTANCE VALUE OF THE HYD TEMP. SENSOR (Only reference value)

Temp (°C)	-40	0	25	50	100	150	200
RESISTANCE (Ω)	170.20	201.27	220.07	5.790	276.78	313.62	349.90

MCU DIAGRAM



LF1W596B

MCU SAFETY SENSOR LOGIC

INPUT			OUTPUT
Safety Sensor LH (A14)	Safety Sensor RH (A33)	SEAT SWITCH (A15)	
ON (Safety bar "DOWN", 12V)	ON (Safety bar "DOWN", 12V)	ON (When sit down, 1 sec or more, GND)	Standby "Reset" signal (A14 ON and A33 ON and A15 ON)
		OFF (When stand up, 3 sec or more, OPEN)	Parking valve output ON, Hydraulic lock valve output ON
	OFF (Safety bar "UP", GND)	ON (When sit down, 1 sec or more, GND)	Parking valve output ON, Hydraulic lock valve output ON
		OFF (When stand up, 3 sec or more, OPEN)	Parking valve output ON, Hydraulic lock valve output ON
OFF (Safety bar "UP", GND)	ON (Safety bar "DOWN", 12V)	ON (When sit down, 1 sec or more, GND)	Parking valve output ON, Hydraulic lock valve output ON
		OFF (When stand up, 3 sec or more, OPEN)	Parking valve output ON, Hydraulic lock valve output ON
	OFF (Safety bar "UP", GND)	ON (When sit down, 1 sec or more, GND)	Parking valve output ON, Hydraulic lock valve output ON
		OFF (When stand up, 3 sec or more, OPEN)	Parking valve output ON, Hydraulic lock valve output ON

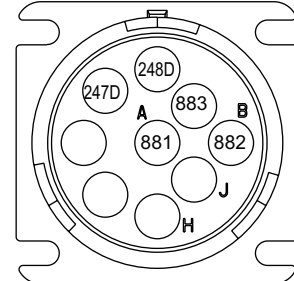
MCU FIRMWARE UPDATE

MCU UPDATE CONNECTOR



COMPOSITION OF CONNECTOR PIN

CN118_MCU_Service



HD10-9-96P

CONNECTING CABLE



LF1W596A

SAFETY FIRST

ENGINE

DRIVING & CHASSIS

HYDRAULIC SYSTEM

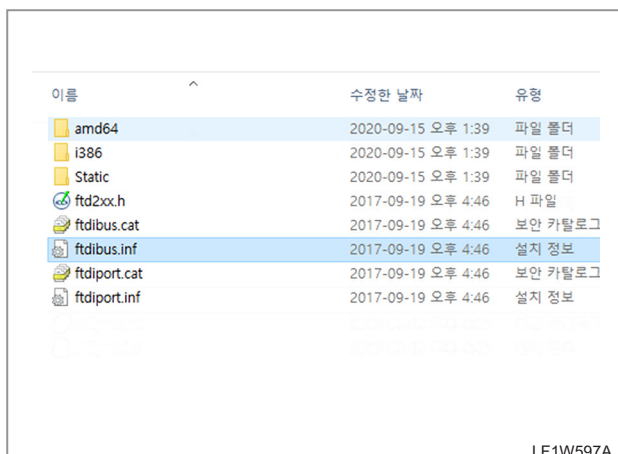
ELECTRIC SYSTEM

CABIN

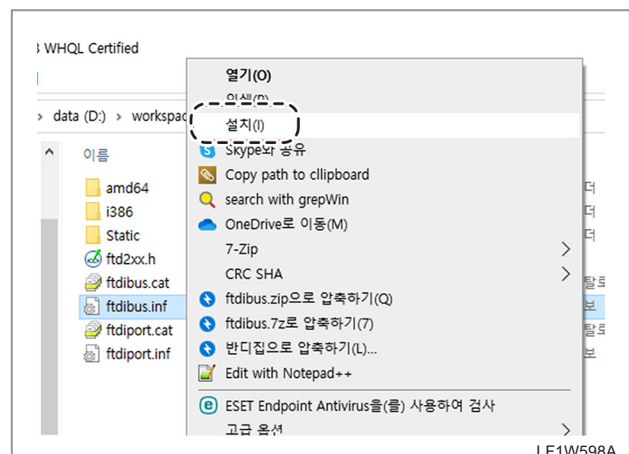
INDEX

1) PREPARING THE USB DRIVER

1-1) INSTALLING RS232 TO USB DRIVER (TO INSTALLATION FILE)



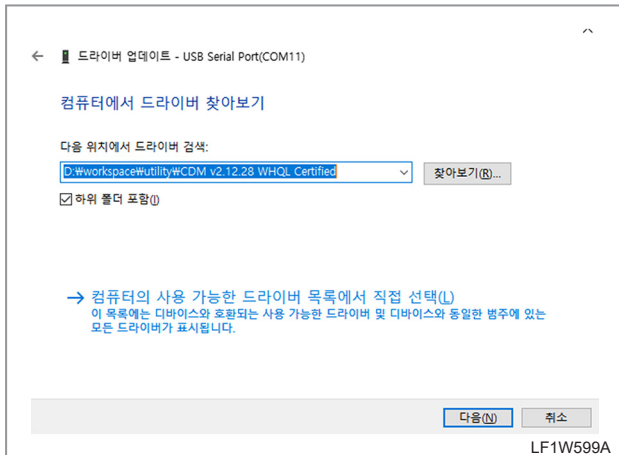
LF1W597A



LF1W598A

If a COM port is recognized, this step can be omitted.

1-2) INSTALLING RS232 TO USB DRIVER (DRIVER UPDATE)



If a COM port is recognized, this step can be omitted.

1-3) CONFIRMING INSTALLATION OF RS232 TO USB DRIVER (DEVICE MANAGER)

The USB serial port should be displayed under the port (COM & LPT) in the Device Manager of the Windows system. Otherwise, firmware update cannot proceed.

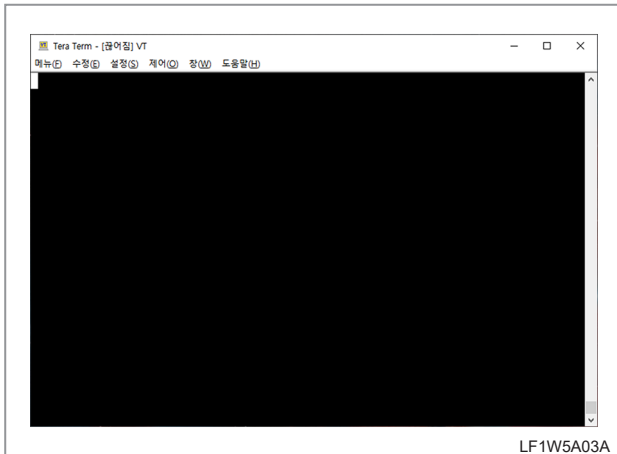
If this doesn't appear on the Device Manager, re-install the USB driver.



※ Here, the COM Port is port no.11 on the Device Manager.

2) INSTALLING THE EXECUTABLE PROGRAM AND CONNECTING TO THE PC

2-1) DOWNLOADING, INSTALLING AND RUNNING TERA TERM



The program can be downloaded at <https://tera-term.softonic.kr/>.

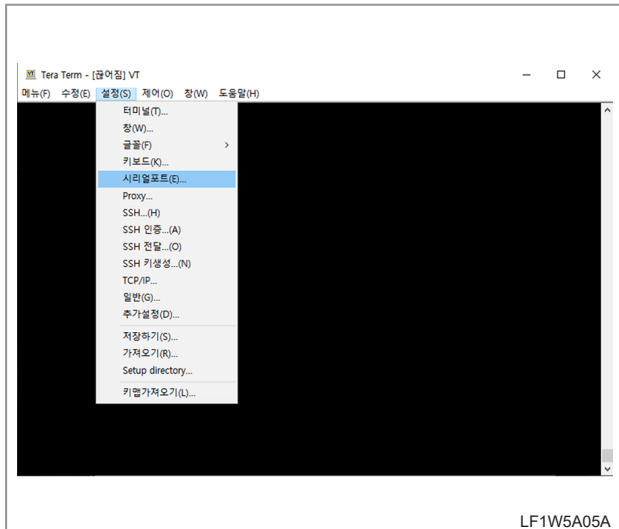
※ Install the program. (This free software is open to anyone for use.)

2-2) CONNECTING YOUR VEHICLE TO PC

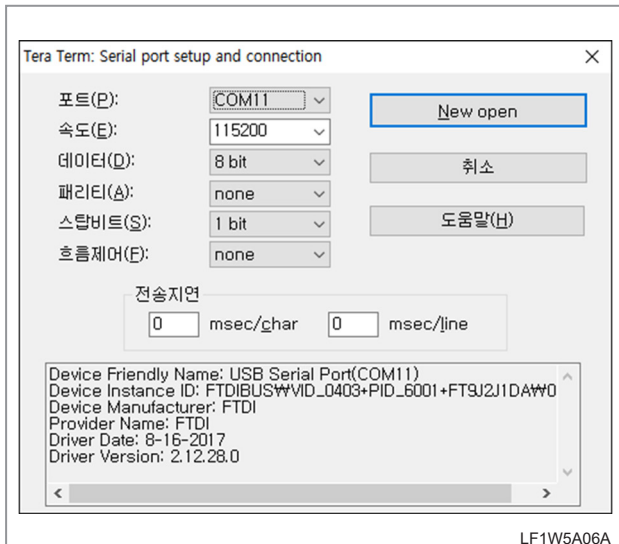


1. Unscrew the 3 bolts on the back of the seat and connect to the circular connector (HD16-9-96S).
2. Connect the RS232 connector (DB9-FEMALE) to the RS232-USB gender.
3. Connect to the PC with the USB drive.

3) SETUP



LF1W5A05A

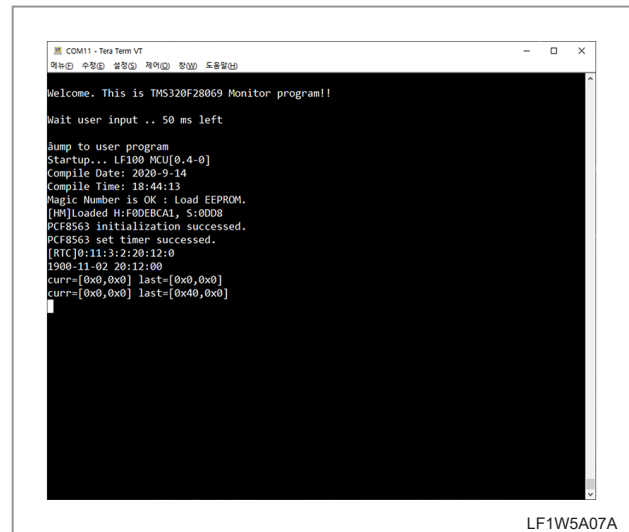


LF1W5A06A

Set the COM Port as shown in the above setup screen.

- The port number can be found at the Device Manager. (Refer to “1-3) Confirming installation of RS232 to USB driver (device manager).”)
- Set the Speed to “115200 bps.”
- Set the Data to “8 bit.”
- Set the Parity to “none.”
- Set the Stop Bit to “1 bit.”
- Set the Flow Control to “none.”
- After setup, press the “New open” button to open the port.

4) CHECKING CONNECTION BETWEEN PC AND MCU POWER

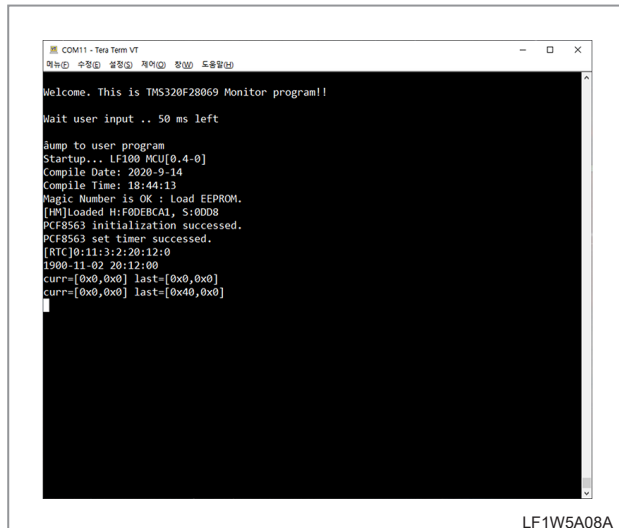


LF1W5A07A

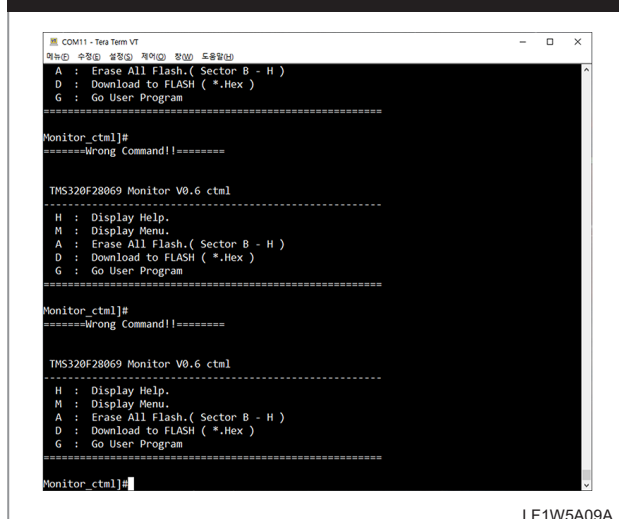
1. Once the COM Port is connected and the MCU board is supplied with 12V power, the logs are output on the screen through UART as shown in the figure. This screen confirms that the MCU board and PC are successfully connected.
2. Once this screen appears, you can move on to the next step.
3. Check the log starting with “Start...” on the screen.
4. Turn the start key to the OFF position.

5) ENTERING THE FIRMWARE UPDATE MODE

1. The MCU firmware can be updated only when the program enters the download mode during booting.
2. Press and hold the Ctrl+C keys on Tera Term while the MCU is turned off. This sends Ctrl+C command to the USB drive.
3. Once 12V power is supplied to the MCU, it enters the download mode during booting.

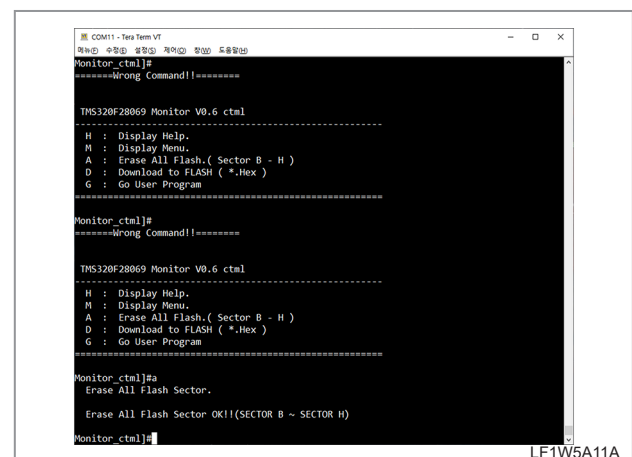
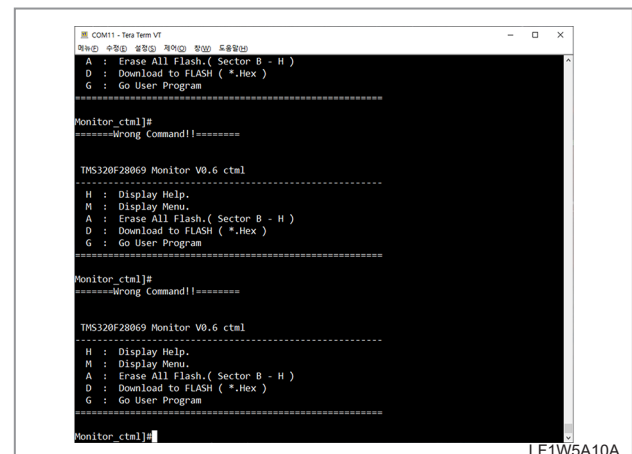


ENTERING THE FIRMWARE UPDATE SCREEN

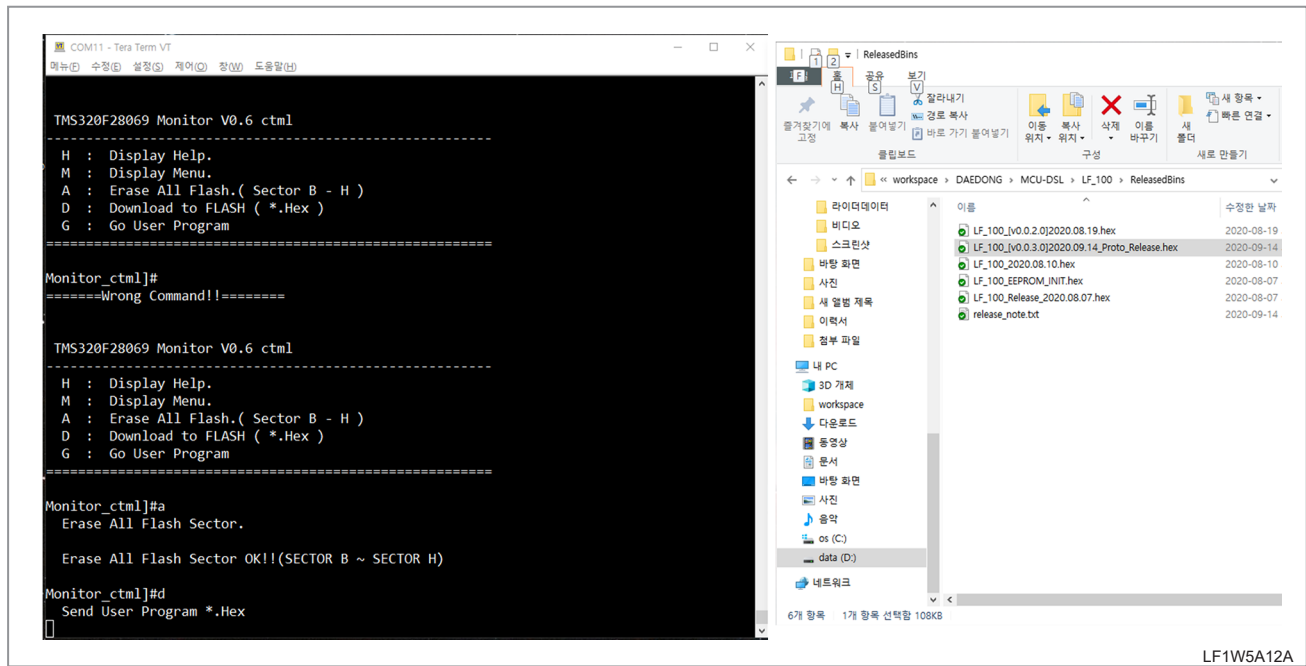


- An update screen will appear when power is supplied to the MCU while pressing and holding Ctrl+C keys on the keyboard.

6) DELETING THE USERS PROGRAM AND MEMORY AND ENTERING THE DOWNLOAD MODE



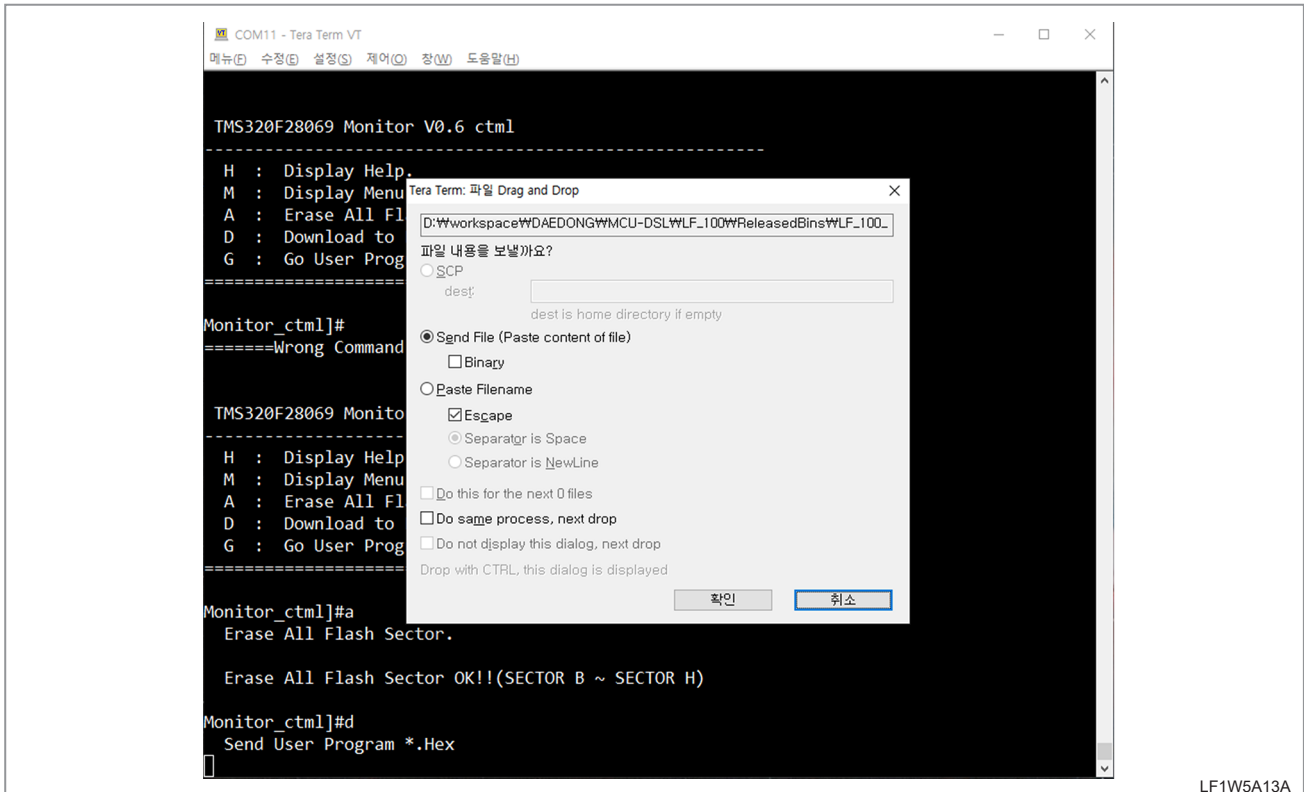
1. The program can be downloaded only if the old users program is deleted.
Hence, press the 'A'/'a' key to execute the "Erase All Flash" command.
2. Pressing the 'A' or 'a' key will delete the users program. (Erase ALL)
The old program must be first deleted to use the new program.
Press the 'A' key to delete the users program.
3. When the following string appears, deletion is completed.
To enter the download mode, press the 'D' or 'd' key.



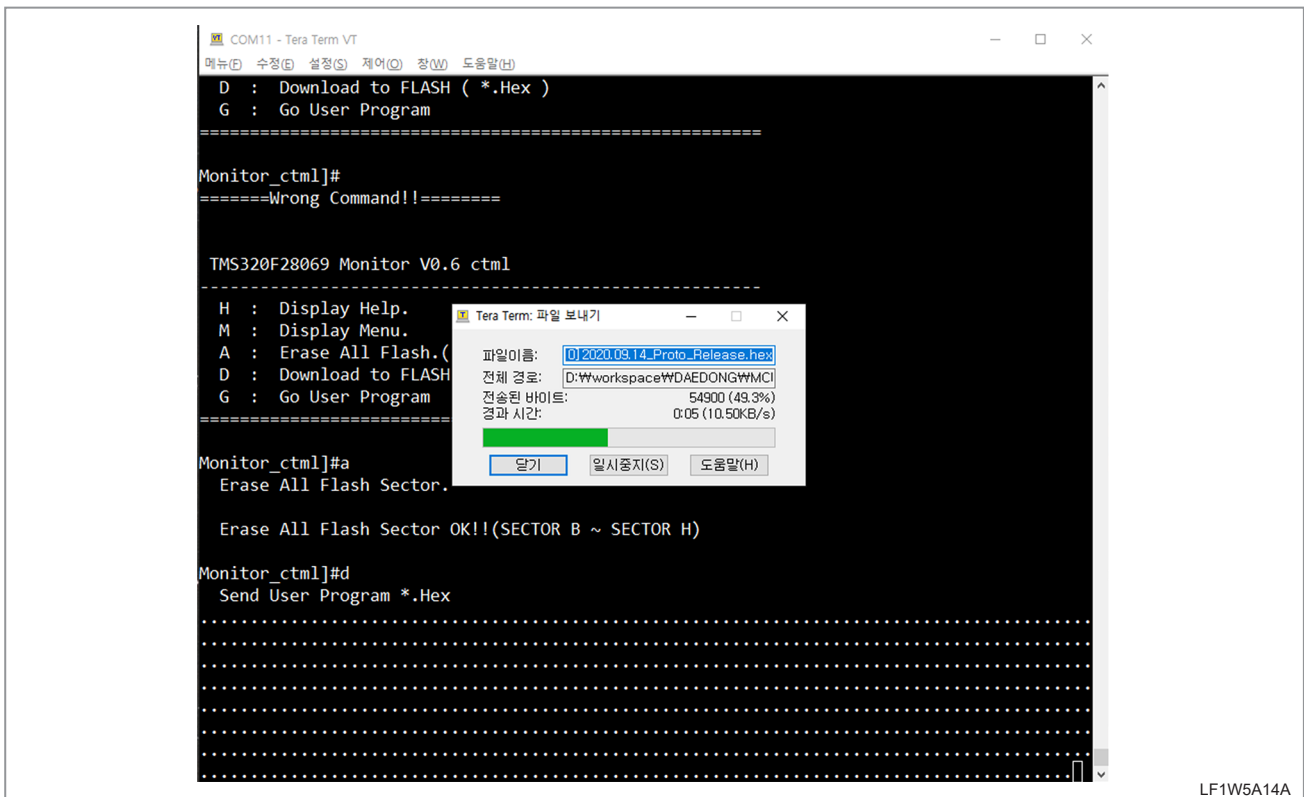
LF1W5A12A

- Once the 'd' key is pressed, "Send User Program *.Hex" is displayed on the screen. Then, drag and drop the Hex file to be downloaded onto the Tera Term.

7) SETTING THE FILE TRANSFER

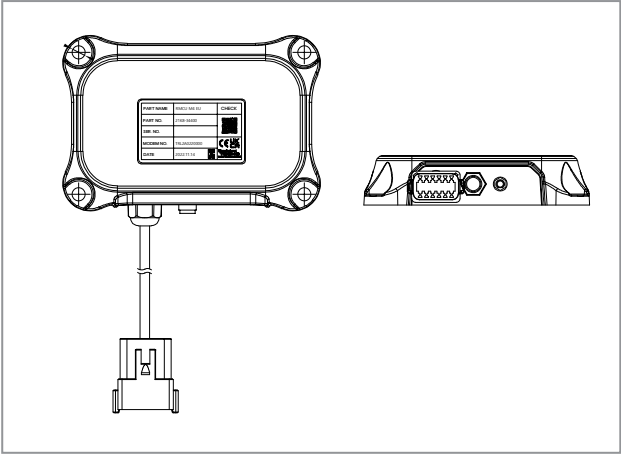


1. The default setting is shown in the figure. After confirming all the settings, press the OK button.



2. Wait until all the files are transferred.
Wait until the Send file window disappears.
Do not disconnect the cable or touch the USB cable while this task is ongoing. This may cause a download failure.
If failed, the process has to be restarted from the beginning.

4.2.10 TELEMETICS CONTROLLER

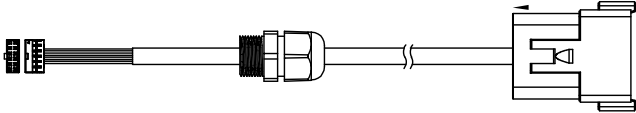
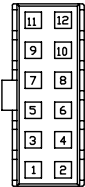
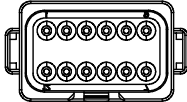
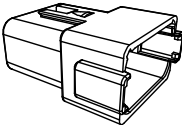


The telematics controller is located under the top cover behind the driver’s seat.

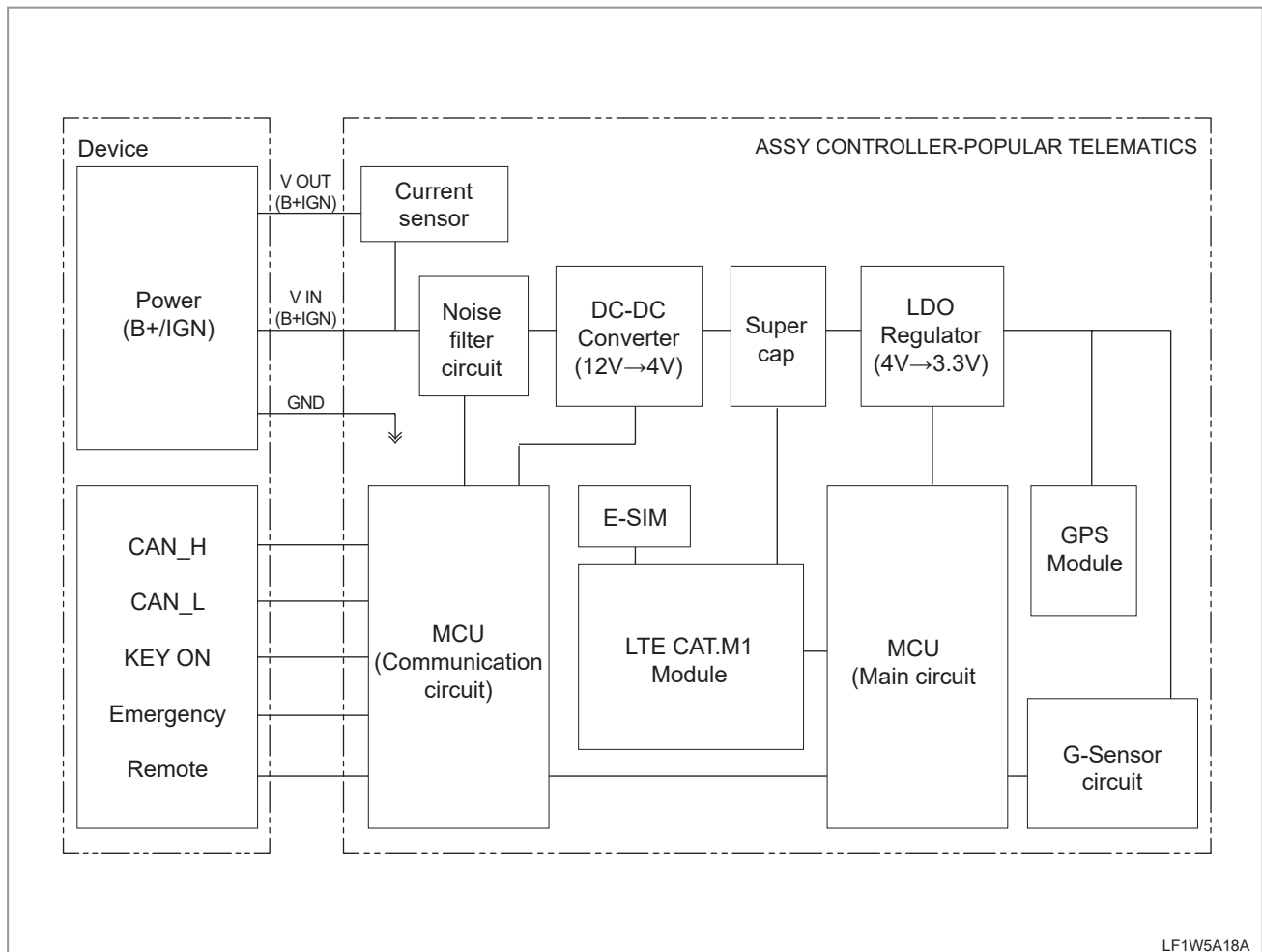
This controller confirms the location of the equipment with GPS, controls remote operation and manages emergency states.

- Rated voltage: 12/24 VDC
- Operating voltage: 8 ~ 32 VDC
- Operating temperature: -40°C ~ 85°C

CONNECTOR

					
CONNECTOR : MOLEX 51110-1251 PIN : MOLEX 87396-8051			Deutsch DT04-12P, AWG 18		
	NO.	NAME	 	NO.	NAME
	1	Battery		1	Battery
	2	Key_IG		2	Key_IG
	3	RS232_TX_2		3	CAN_High
	4	RS232_RX_2		4	RS232_TX_1
	5	RS232_GND		5	RS232_GND
	6	MAIN GND		6	RS232_TX_2
	7	D/O(KEY_CONTROL)		7	RS232_RX_2
	8	D/I(DOOR S/W)		8	D/O(KEY_CONTROL)
	9	RS232_TX_1		9	RS232_RX_1
	10	RS232_RX_1		10	D/I(DOOR S/W)
	11	CAN_HIGH		11	CAN_Low
	12	CAN_LOW		12	MAIN GND

SCHEMATIC DIAGRAM

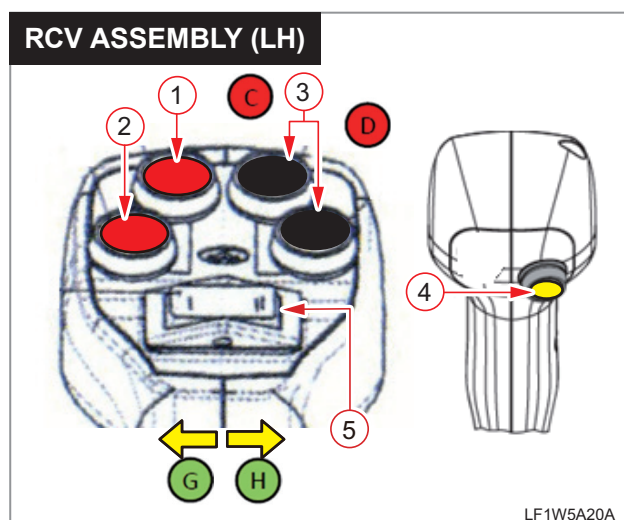


4.2.11 RCV ASSEMBLY (LH) (RH)

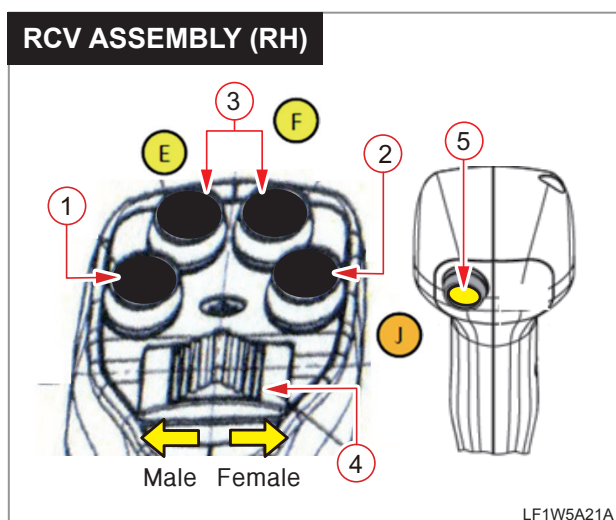


(1) RCV assembly (LH)

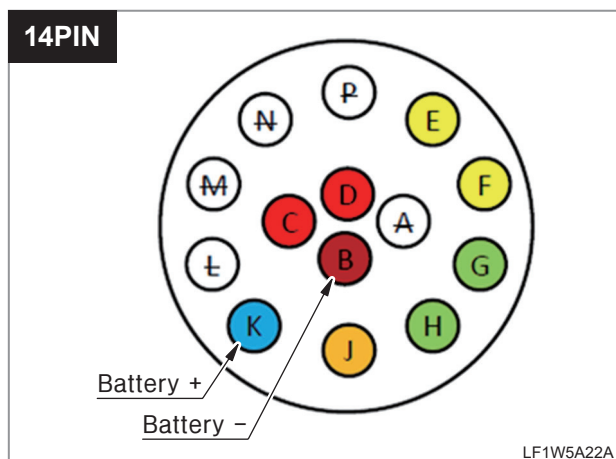
(2) RCV assembly (RH)



- (1) Horn (ON/OFF push button)
- (2) Ride control (ON/OFF push button)
- (3) Aux 1 (Electric, ON/OFF push button)
- (4) 2-speed (ON/OFF push button)
- (5) Aux 3 (Electric, on/off, FNR Rocker switch)

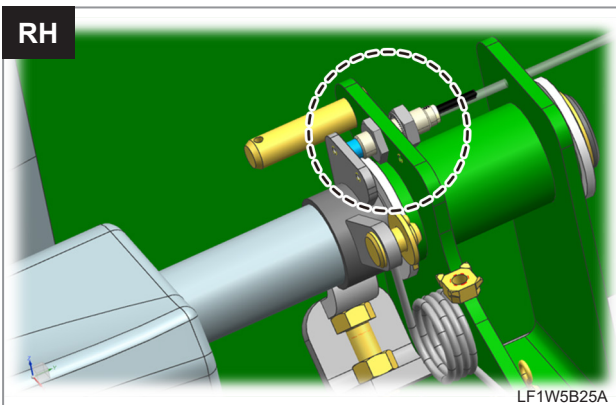
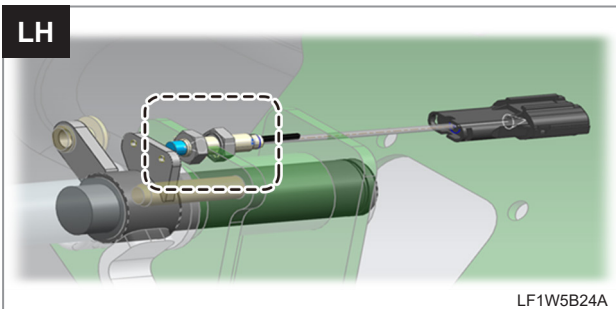


- (1) Aux hold switch (ON/OFF push button)
- (2) Aux hold switch (ON/OFF push button)
- (3) Aux 2(Electric, ON/OFF push button)
- (4) Aux port variable switch (Proportional roller)
- (5) Aux electrical mode change switch(ON/OFF push button)



The RCV assembly (LH) operates the functions related to steering and driving while the RCV assembly (RH) operates the boom and bucket.

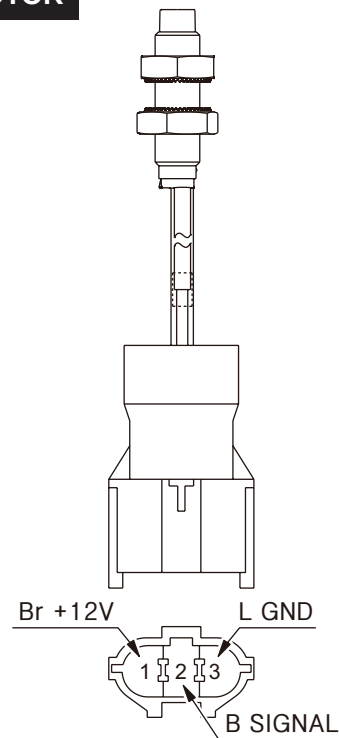
4.2.12 SAFETY SENSOR (SAFETY BAR)



The safety sensors are mounted on both ends of the safety bar of the driver's seat. The output of the parking valve and hydraulic lock valve is turned ON or OFF according to the raising or lowering state of the safety bar.

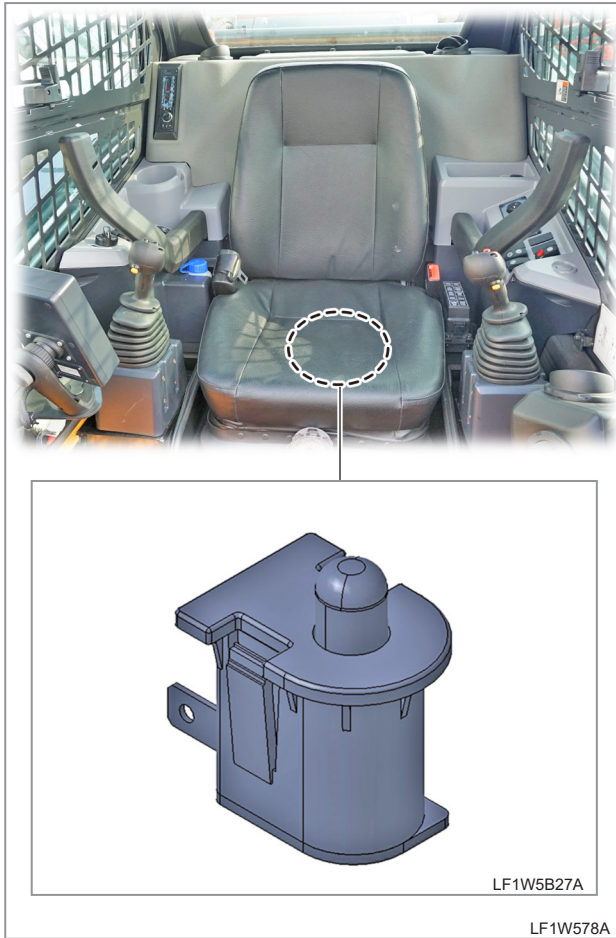
When the safety bar is raised, the parking brake is applied and the hydraulic line is locked to prevent unexpected accidents from operation of the machine.

CONNECTOR

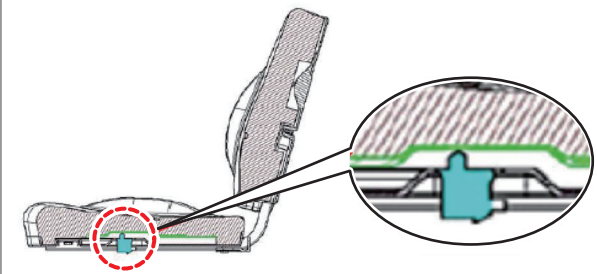


LF1W5B20A

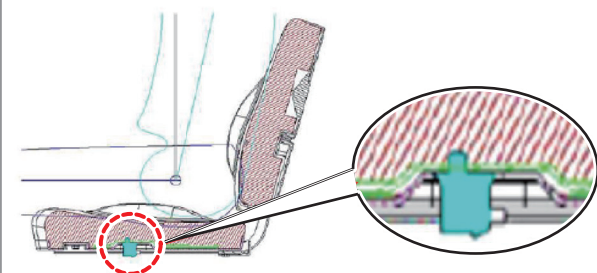
4.2.13 SEAT SWITCH



The seat switch is mounted inside of the seat bottom. When the driver is seated or not seated on the seat, the switch plunger is actuated to start the engine or to stop the engine. In addition, the engine stops automatically when the driver is not seated on the seat and it exceeds 3 seconds during driving.

ENGINE OFF

ST5WC06A

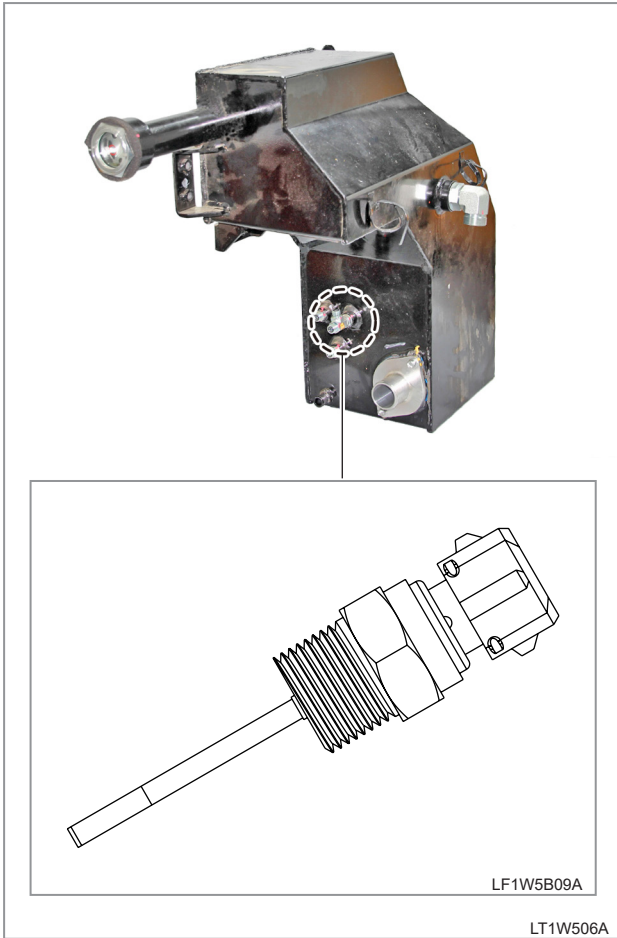
ENGINE ON

ST5WC07A

TEST

Connect the tester (ohmmeter) to the two terminals of the seat switch and check the continuity by pressing the plunger. If the plunger does not conduct when it is pressed, or conduction occurs when does not press the plunger, there is a problem with the seat switch. Replace the seat switch with a new one.

4.2.14 OIL TEMPERATURE SENSOR



The oil temperature sensor is located on the front of the oil tank on the right side from the driver's seat. It detects oil temperature in the oil tank and sends a signal to the MCU. Normally, a warning lamp on the dashboard will be illuminated if the temperature exceeds 90°C.

- Operating temperature: -40°C ~ 150°C

RESISTANCE BY TEMPERATURE

Temp. (°C)	Resistance value (Ω)
-40	170.20
0	201.27
25	220.07
50	239.30
100	276.78
150	313.62

4.2.15 HORN



The horn is installed on the front upper frame in the cabin.

- Horn volume : 105 ~ 118 dB(A)

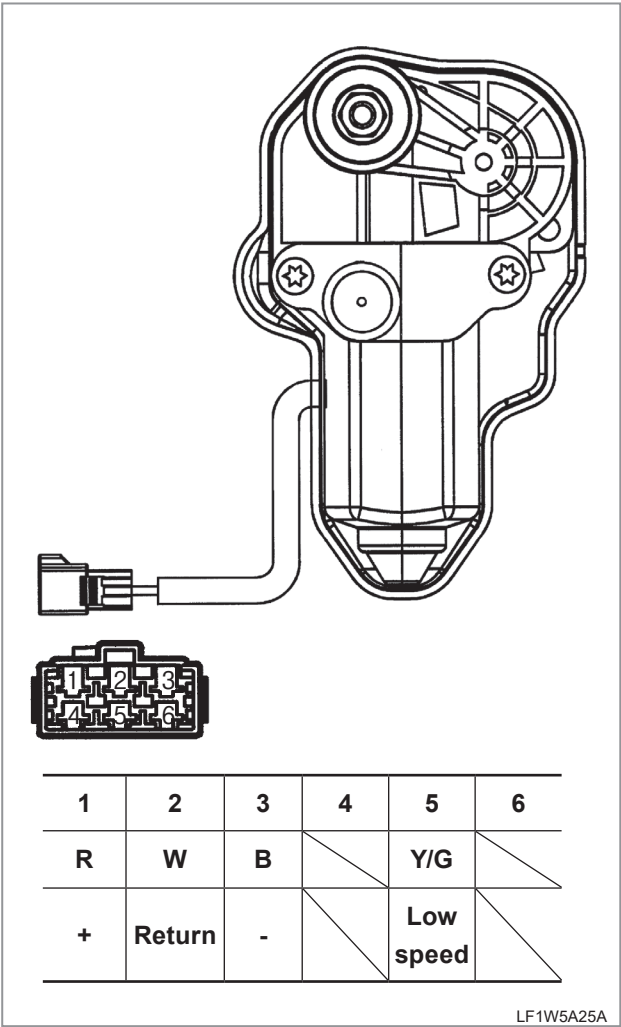
4.2.16 WIPER MOTOR



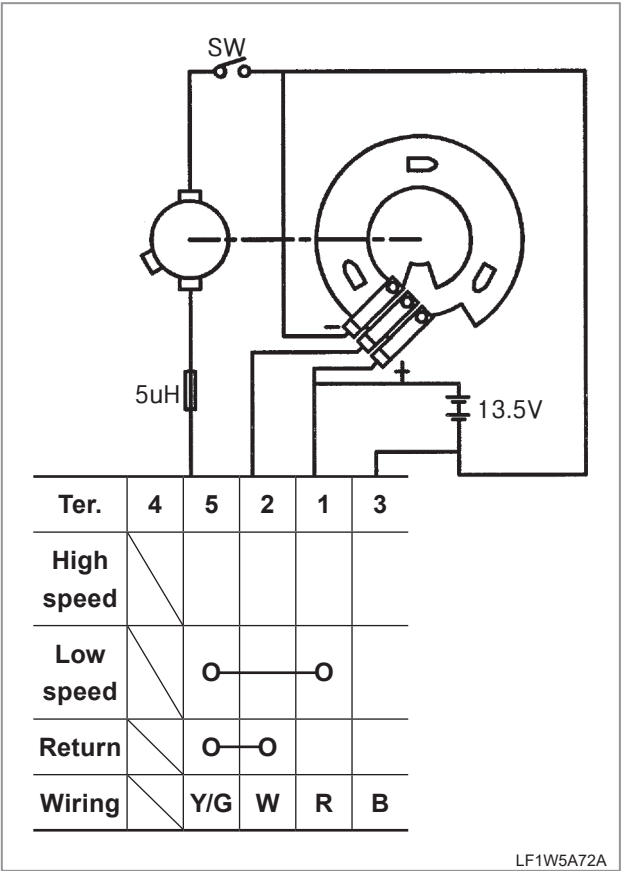
The wiper motor is installed on the side of the front glass door.

- Rotation angle : 120° ±3°

CONNECTOR



CIRCUIT



4.3 LAMPS (BULB REPLACEMENT)

4.3.1 LED WORK LAMP

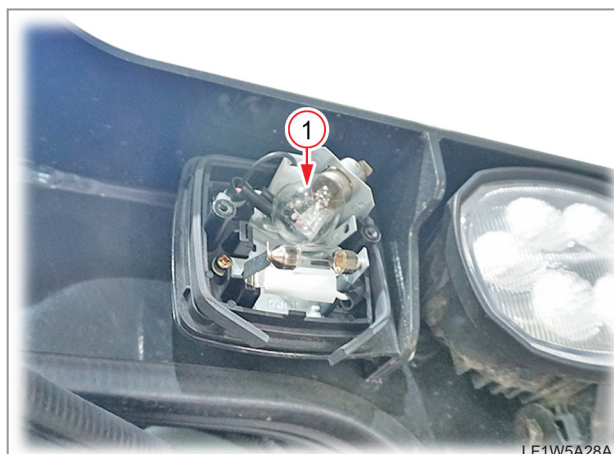


1. Unscrew the lower bracket mounting nut (1) of the work lamp.
2. Disconnect the wiring connector and replace the LED work lamp assembly.

4.3.2 TURN SIGNAL LAMP

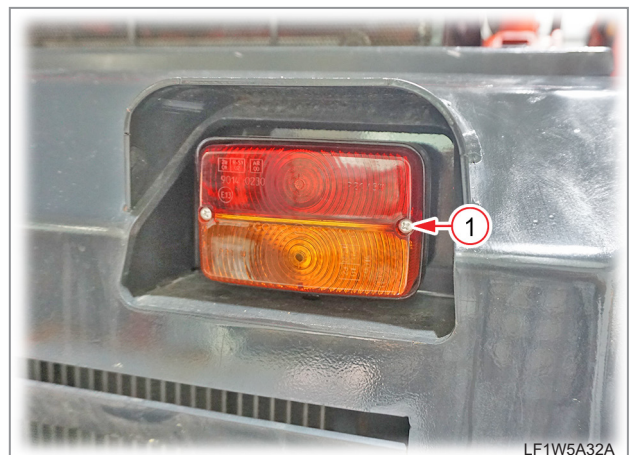
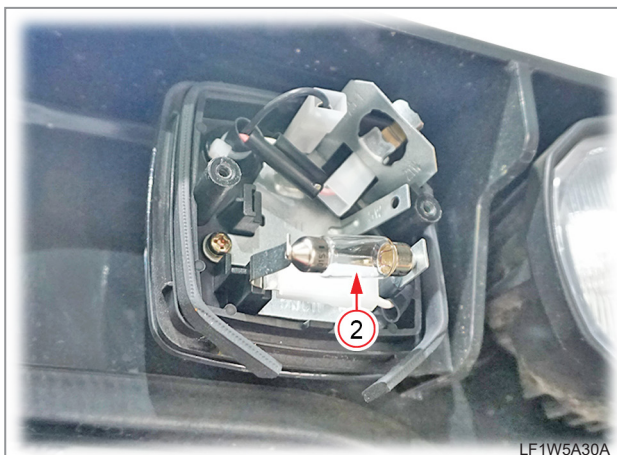


1. Unscrew lens mounting screws (1) to remove the lens.

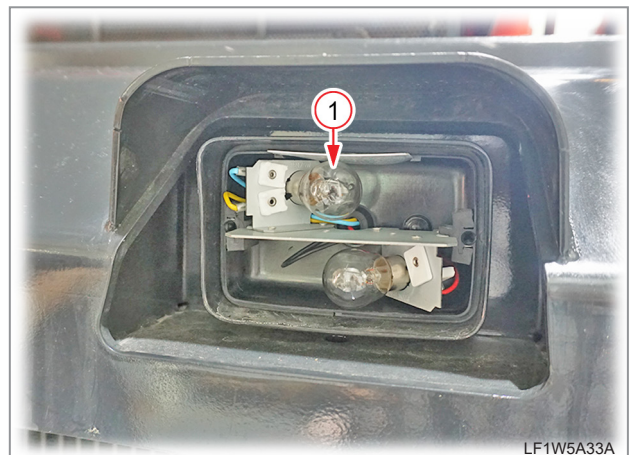


2. Remove the turn signal lamp bulb (1) by turning it and replace it with a new bulb if necessary.
 - Bulb specification: 12V 21W

4.3.3 BRAKE LAMP (REAR LAMP) / TURN SIGNAL LAMP



1. Unscrew the tail lamp lens mounting screws (1) on the rear cover.



3. Remove the tail lamp bulb (2) and replace it with a new bulb if necessary.

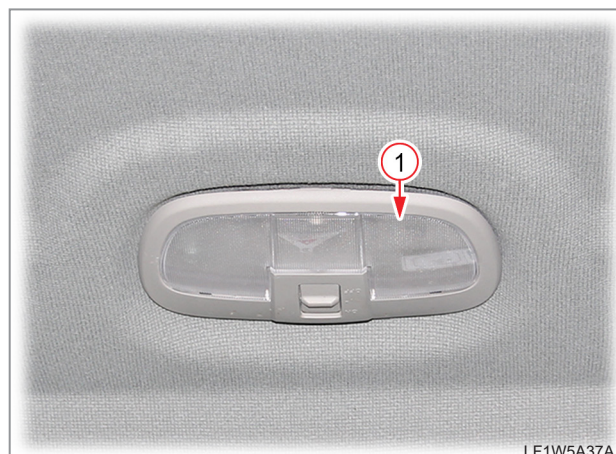
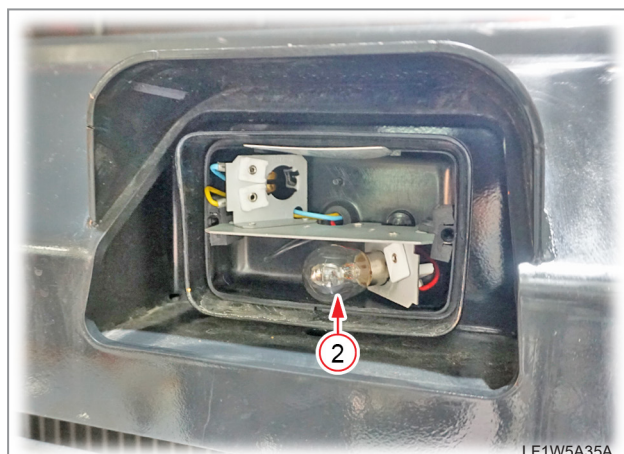
- Bulb specification: 12V 5W



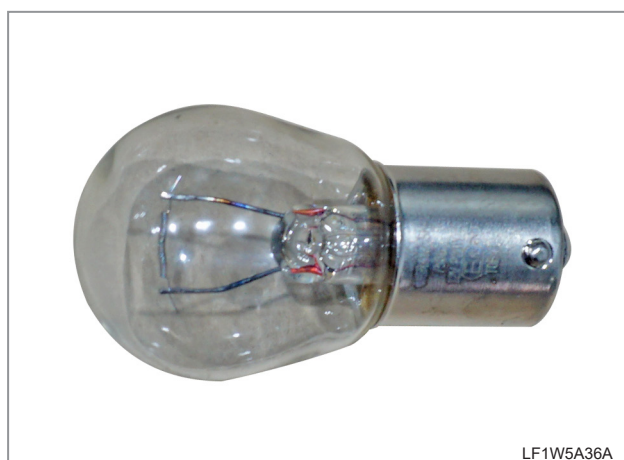
2. Remove the brake lamp (tail lamp) bulb (1) by turning it and replace it with a new one if necessary.

- Bulb specification: 12V P21/5W

4.3.4 ROOM LAMP

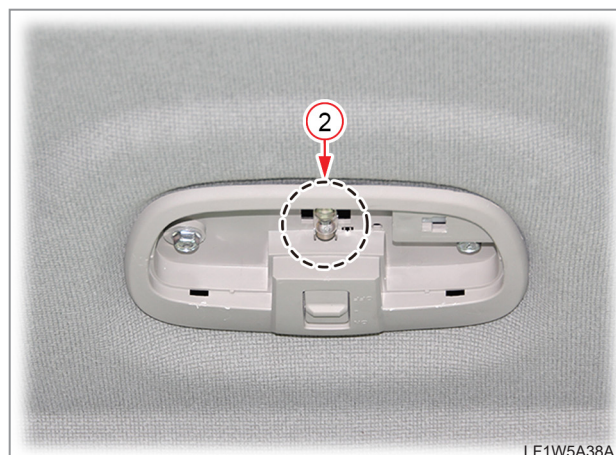


1. Using a flat-bladed screwdriver, pry off the edge of the interior lamp lens to remove the lens (1).



3. Remove the turn signal lamp bulb (2) by pressing and turning it and replace it with a new one if necessary.

- Bulb specification: 12V P21W

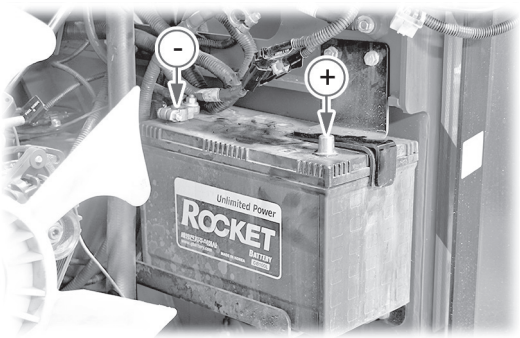
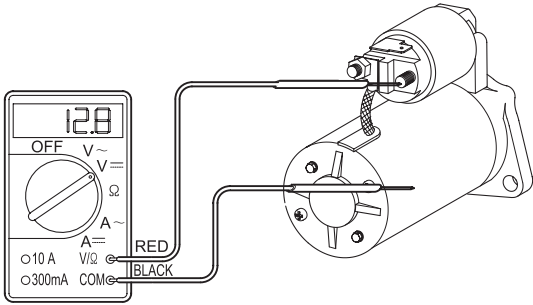
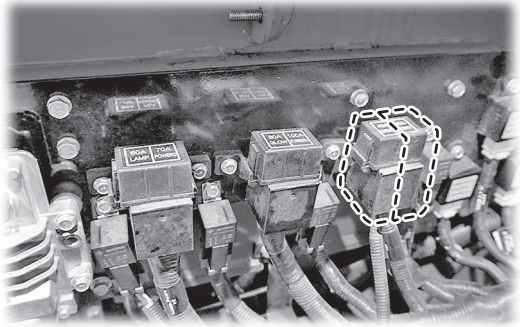
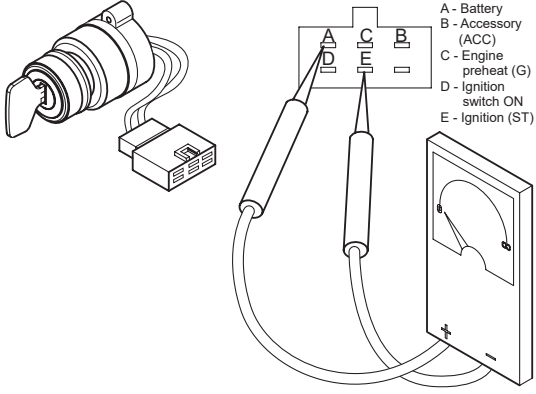


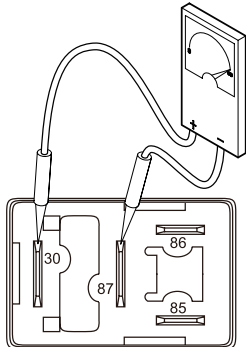
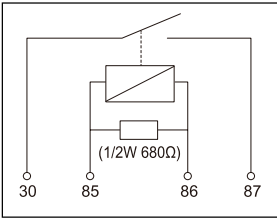
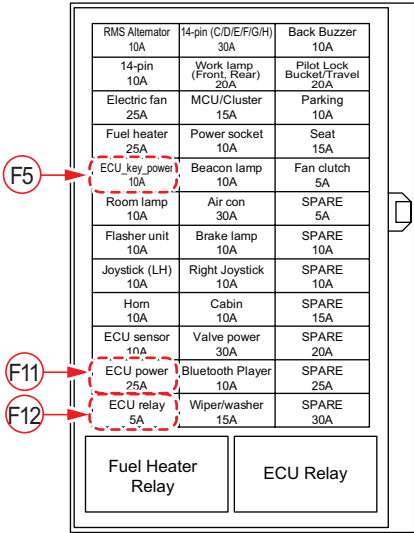
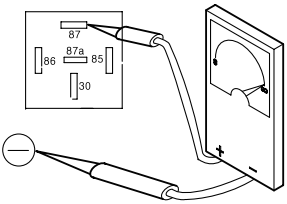
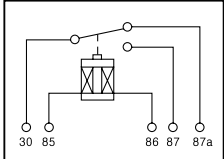
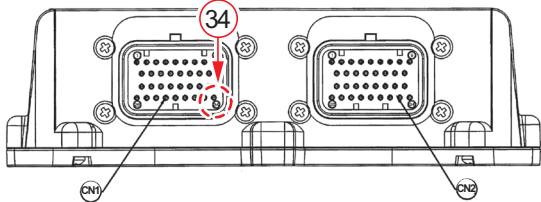
2. Remove the interior lamp lens (2) and replace it with a new one if necessary.

- Bulb specification: 12V 10W

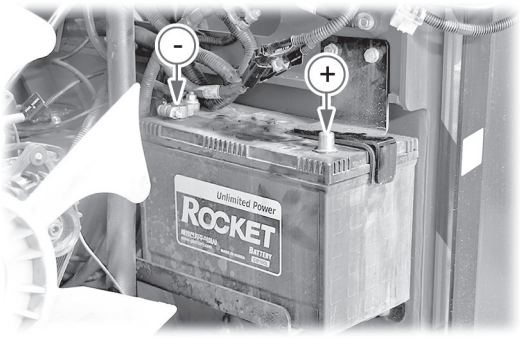
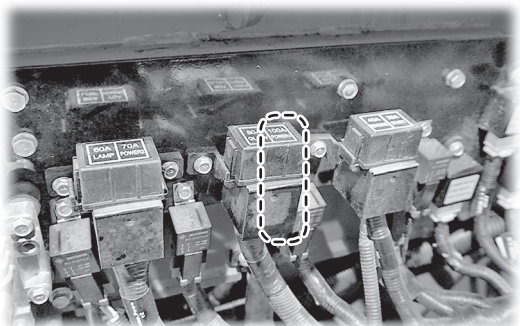
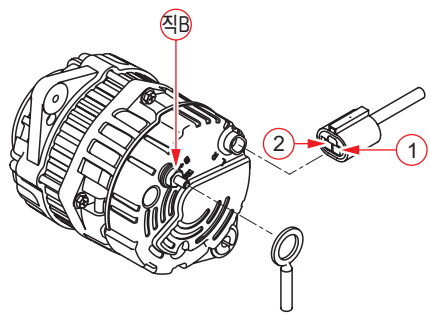
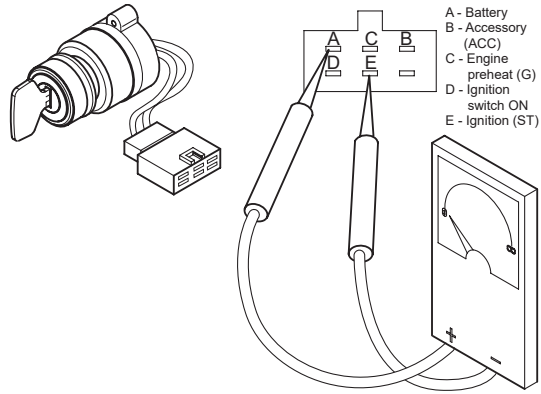
5. TROUBLESHOOTING

5.1 WHEN THE ENGINE CANNOT BE STARTED

CHECK POINT	CHECK METHOD	REMARKS
1. Check the battery voltage	- Measure the voltage between battery (+) and (-) terminals using a tester - Result: 11.8 ~ 12.9 V. - However, the voltage may be over this range if it is measured immediately after turning the engine off.	 LF1W5A47A
2. Battery terminal of start motor	1. Check the battery cable connection. - The voltage between the terminal M of start motor and chassis should be approximately same to the battery voltage. - Check for corrosion. 2. Checking when voltage is not supplied - Check the battery cable connection.	 T85WBD6A
3. Slow-blow fuse	1. Fuse engagement 2. Check the main fuse for short circuit. - Rated capacity: 30 A (Start) - Rated capacity: 40 A (Engine)	 LF1W5A48A
4. Ignition switch	- Check for proper connection "OFF" position: No connection "ACC/ON" position: A-B-D "PREHEAT" position: A-C-D "ST" position: A-D-E	 T85WBD8A

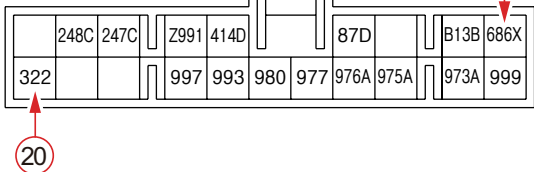
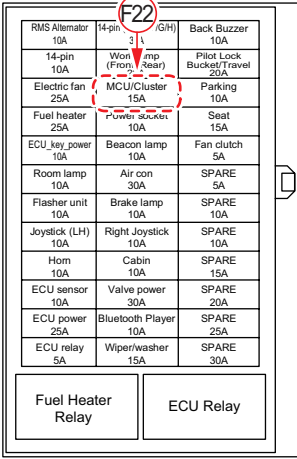
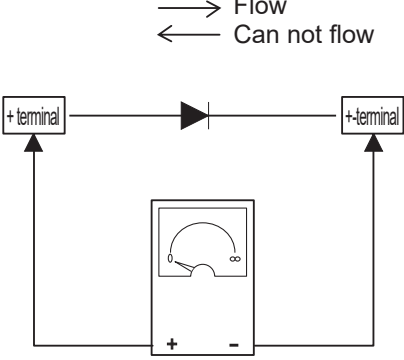
CHECK POINT	CHECK METHOD	REMARKS
5. Starter relay	- When connecting power to terminals No. 85 and 86 : Check continuity between terminals No. 87 and 30. - When do not connecting power to terminals No.85 and 86: Check contiuity between terminals No.87 and 30.	 Terminal Diagram  LF1W5A49A
6. Main fuse box	- Check the fuse for short circuit. F12 : 5A (ECU_relay coil fuse) F11 : 25A (ECU_ Power fuse) F5 : 10A (ECU_key fuse) - If it has a short circuit, replace it with a new one with the rated capacity.	 LF1W5B28A
7. Check ECU power relay	Voltage inspection With the ignition switch ON, measure the voltage between the connector No. 87 and vehicle body. It should be 12 V.	 Terminal Diagram  H89WBM5A
8. Check MCU	Voltage inspection With the ignition switch ON, measure the voltage between the connector No. 34 (CN1) and vehicle body. It should be 12 V.	 LF1W5A51A
9. Check ECU	- ECU - Camshaft sensor - Crankshaft wheel sensor - IMV - Fuel rail pressure sensor - Injector	Refer to the engine troubleshooting manual. (Check for error codes.)

5.2 WHEN THE SYSTEM IS NOT CHARGED

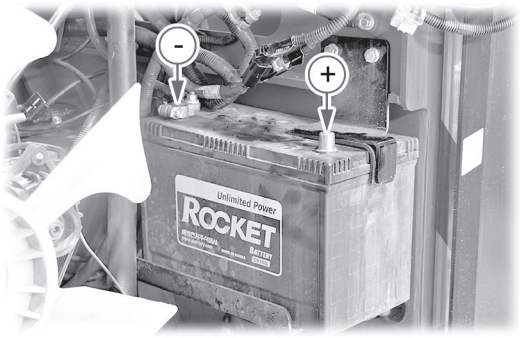
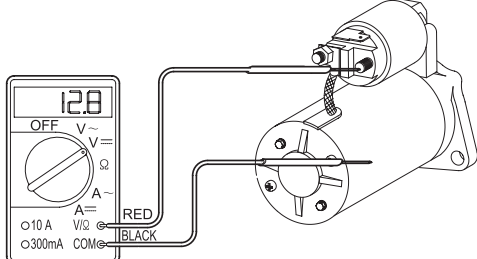
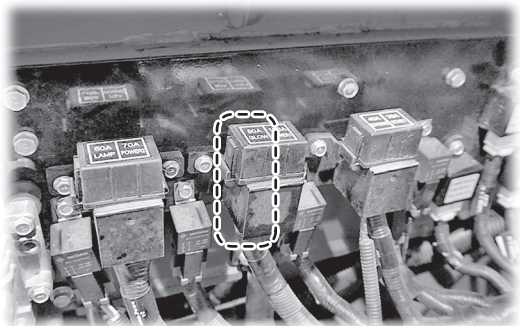
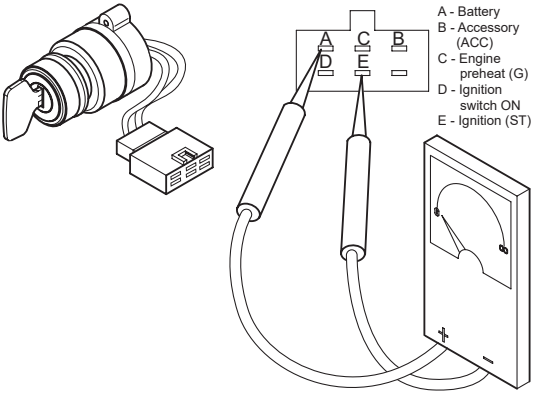
CHECK POINT	CHECK METHOD	REMARKS
1. Battery voltage	- Measure the voltage between the battery (+) and (-) terminals using a tester. - Result: 11.8 ~ 12.9 V. However, the voltage may be over this range if it is measured immediately after turning the engine off.	 LF1W5A47A
2. Slow-blow fuse	- Check the fuse engagement status. - Check if the slow blow fuse is blown. Rated current: 100 A (Power1)	 LF1W5A53A
3. Regulator operating power	- With the KEY ON, measure the voltage between the terminal No.1 (P) of the connector and alternator body (ground). Normal: 12 V - Measure the voltage between the terminal No.1 and No.2 of the connector 2P. Normal: 12 V	 H89WBK2A
4. Ignition switch	Check proper connection with it in "ON" position: A-B-D	 T85WBD8A A - Battery B - Accessory (ACC) C - Engine preheat (G) D - Ignition switch ON E - Ignition (ST)

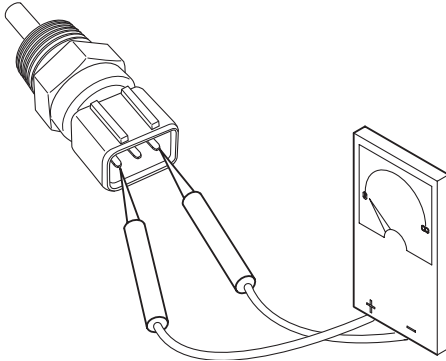
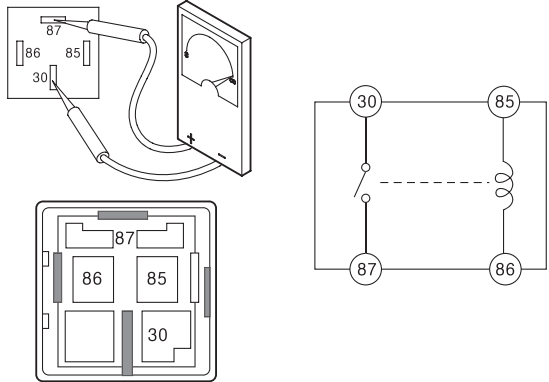
NORMAL OPERATING CONDITION

- Before starting the engine (ignition switch in "ON" position): Charge warning lamp ON
- After starting the engine: Charge warning lamp OFF

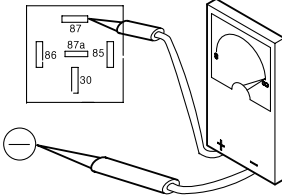
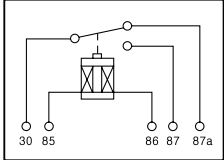
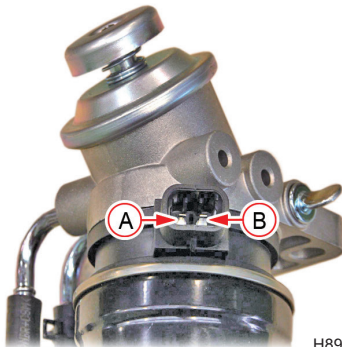
Check point	Check method	Remarks
1. Charge warning lamp (on cluster)	1. Check the voltage. - Voltage between the terminal No. 1 of the A connector (cluster) and terminal 20 of the A connector with the key "ON" Voltage: It should be 12 V.	 LF1W5A54A
2. Charge warning lamp	1. Visual check	 LF1W5A55A
3. Check the fuse.	1. Check the F22 fuse : 15 A for MCU/Cluster	 LF1W5B29A
4. Diode	1. Check the diode. Check if current flows from the positive pole to the negative pole of the diode.	 T85WBF0A

5.3 WHEN THE SYSTEM IS NOT PREHEATED AUTOMATICALLY

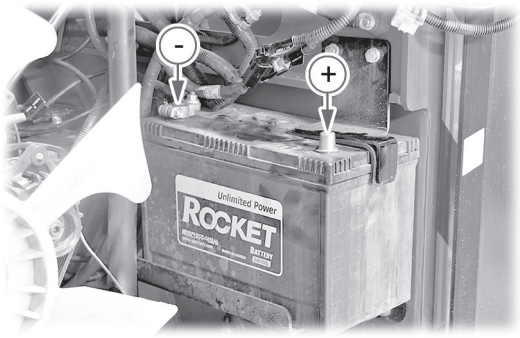
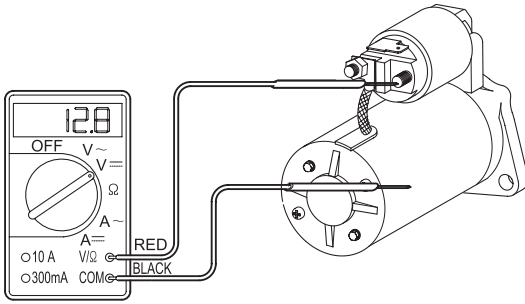
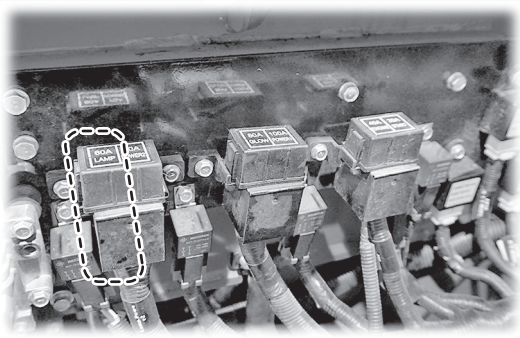
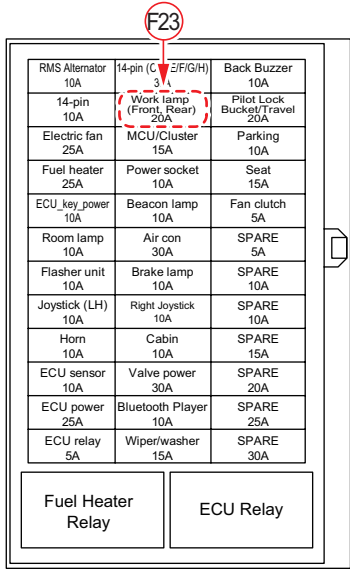
Check point	Check method	Remarks
1. Battery voltage	1. Measure the voltage between the battery (+) and (-) terminals using a tester 2. Result: 11.8 ~ 12.9 V. However, the voltage may be over this range if it is measured immediately after turning the engine off.	 LF1W5A47A
2. Battery terminal of starter motor	1. Check the battery cable connection. - The voltage between the terminal M of start motor and chassis should be approximately same to the battery voltage. - Check for corrosion. 2. Checking when voltage is not supplied - Check the battery cable connection.	 T85WBD6A
3. Slow-blow fuse	1. Check the fuse engagement status. 2. Check if slow-blow fuse is blown : Rated capacity - 80 A	 LF1W5A58A
4. Ignition switch	1. Check the ignition switch connection. "ON" position: A-B-D "PREHEAT" position: A-C-D	 T85WBD8A

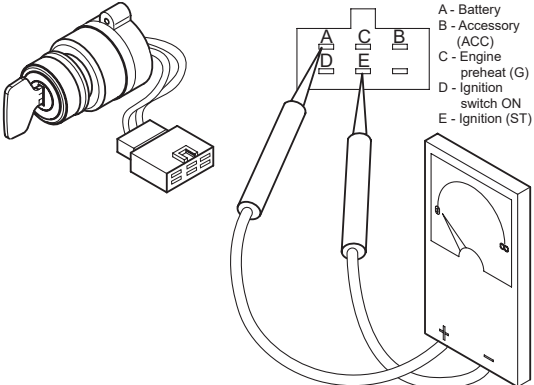
Check point	Check method	Remarks
5. ECU	- Check for the glow plug relay driver and glow lamp LSD of the ECU	Refer to "ECU troubleshooting" manual
6. Coolant temperature sensor	1. Check the coolant temperature sensor resistance. Approx. 2.45 k Ω (at 20°C)	 T85WBF5A
7. Preheat relay	1. When connecting power to terminals No. 85 and 86 (Preheating operation) - Check continuity between terminals No. 87 and 30.	 T85WB38A
8. Glow plug	1. Check resistance of the glow plug coil (0.43 Ω). - Resistance ∞ (Ω): Open coil - Resistance 0 (Ω): short circuit	 T85WBF2A
9. Check ECU	- ECU error	Refer to the engine troubleshooting manual. (Check for error codes.)

REMARKS

Check point	Check method	Remarks
1. Check fuel heater relay (5P)	1. Voltage inspection With the ignition switch ON, measure the voltage between the connector No. 87 and vehicle body. It should be 12 V.	  H89WBM5A
2. Check fuel heater	1. Voltage inspection Measure the voltage between the terminals A and B with the ignition switch ON. It should be 12 V.	 H89WBM8A

5.4 WHEN WORK LAMP CANNOT BE OPERATED

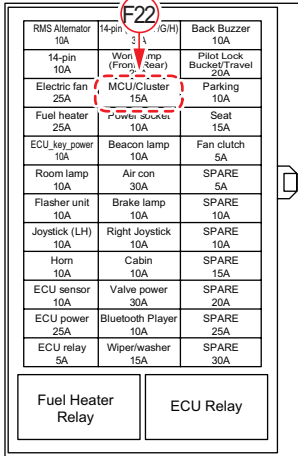
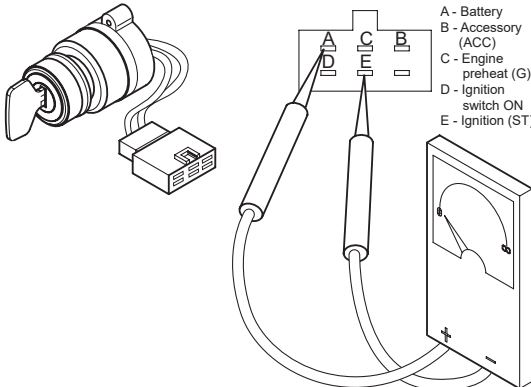
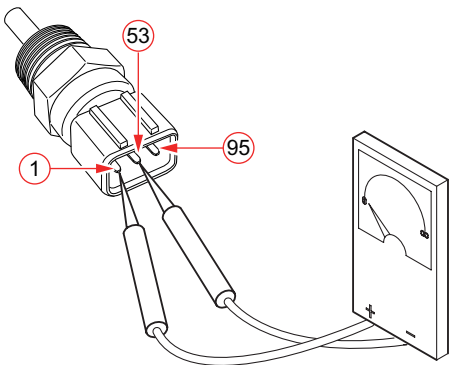
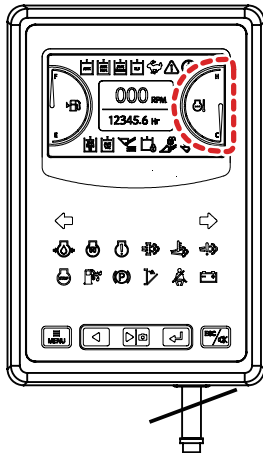
Check point	Check method	Remarks
1. Check the battery voltage	1. Measure the voltage between the battery (+) and (-) terminals using a tester. - Result: 11.8 ~ 12.9 V However, the voltage may be over this range if it is measured immediately after turning the engine off.	 LF1W5A47A
2. Battery terminal of start motor	1. Check the battery cable connection. - The voltage between the terminal M of the start motor and chassis should be approximately same to the battery voltage. - Corrosion 2. Checking when voltage is not supplied - Check the battery cable connection. - Continue to the next step.	 T85WBD6A
3. Slow-blow fuse	1. Check the fuse engagement status. 2. Check if slow-blow fuse is blown : Rated capacity - 60 A	 LF1W5A73A
4. Check the fuse	1. Check the fuse engagement status. 2. Check if the fuse is blown. Head lamp fuse 20 A (F23)	 LF1W5B30A

Check point	Check method	Remarks
5. Ignition switch	1. Check proper connection with it in "ON" position: A-B-D	 A - Battery B - Accessory (ACC) C - Engine preheat (G) D - Ignition switch ON E - Ignition (ST) T85WBD8A

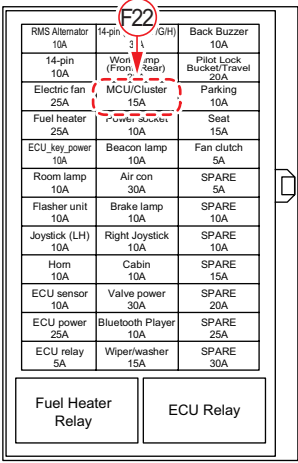
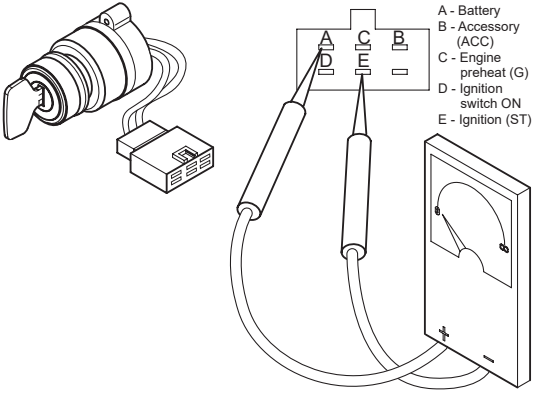
INDEX

Check point	Check method	Remarks
1. Fuse	1. Check the fuse engagement status. 2. Check that the cluster fuse capacity is 15 A(F22).	LF1W5B29A
2. Ignition switch	1. Check proper connection with it in "ON" position: A-B-D	T85WBD8A
3. Fuel sender	1. Measure the resistance between two terminals of the fuel sender connector after disconnecting wiring and fuel sender connector. - Empty: 110 Ω - Full: 3 Ω	LF1W5A66A
4. Fuel gauge on instrument panel	1. Check the instrument cluster wiring (gauge signal wiring) and the ground wiring for proper connection - The pointer moves slowly to the Full point if it is normal.	LF1W5A67A

5.6 TEMPERATURE GAUGE OPERATION

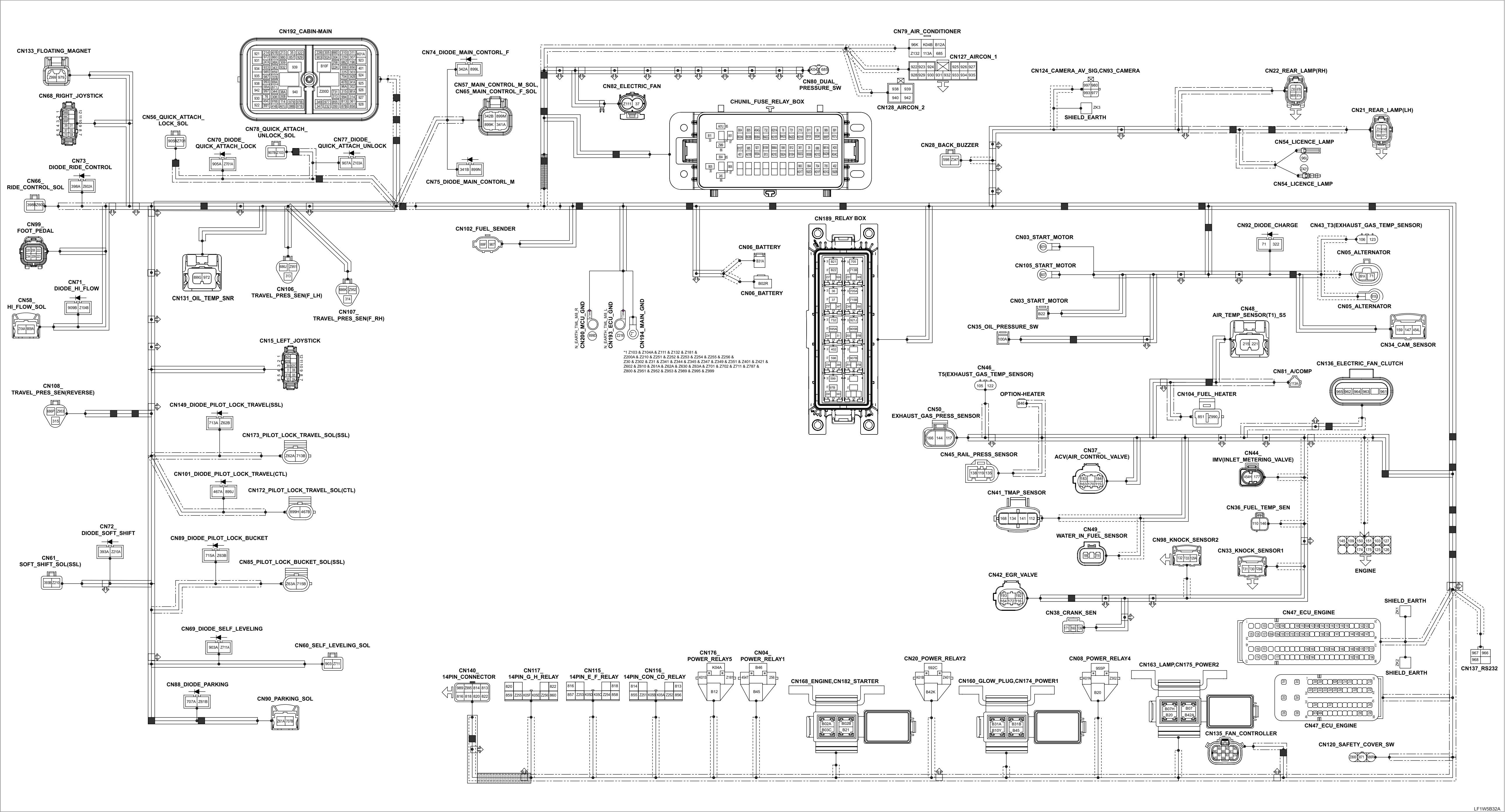
Check point	Check method	Remarks								
1. Fuse	1. Check the fuse engagement status. 2. Check that the cluster fuse capacity is 15 A (F22).	 LF1W5B29A								
2. Ignition switch	1. Check proper connection with it in "ON" position: A-B-D	 T85WBD8A								
3. Temperature sensor	1. Measure the resistance of the temperature sensor after disconnecting the connector. <table><tr><td>Temp.</td><td>85℃</td><td>110℃</td><td>125℃</td></tr><tr><td>Resistance</td><td>48.4Ω</td><td>24Ω</td><td>(15.2Ω)</td></tr></table> * The value in the blank is reference value.	Temp.	85℃	110℃	125℃	Resistance	48.4Ω	24Ω	(15.2Ω)	 T85WBK5B
Temp.	85℃	110℃	125℃							
Resistance	48.4Ω	24Ω	(15.2Ω)							
4. Temperature gauge on instrument cluster	1. Check the instrument cluster wiring (sensor signal wiring) and the ground wiring for proper connection - The pointer slowly moves up when it is normal.	 LF1W5A68A								

5.7 HOUR METER OPERATION

Check point	Check method	Remarks
1. Fuse	1. Check the fuse engagement status. 2. Check that the cluster fuse capacity is 15 A (F22).	 LF1W5B29A
2. Ignition switch	1. Check proper connection with it in "ON" position: A-B-D	 T85WBD8A
3. Crank sensor	1. The engine revolution is calculated from the point without two teeth on the crank sensor wheel.	Refer to "ECU troubleshooting" manual
4. ECU	1. Check for engine hour meter of the ECU	Refer to "ECU troubleshooting" manual

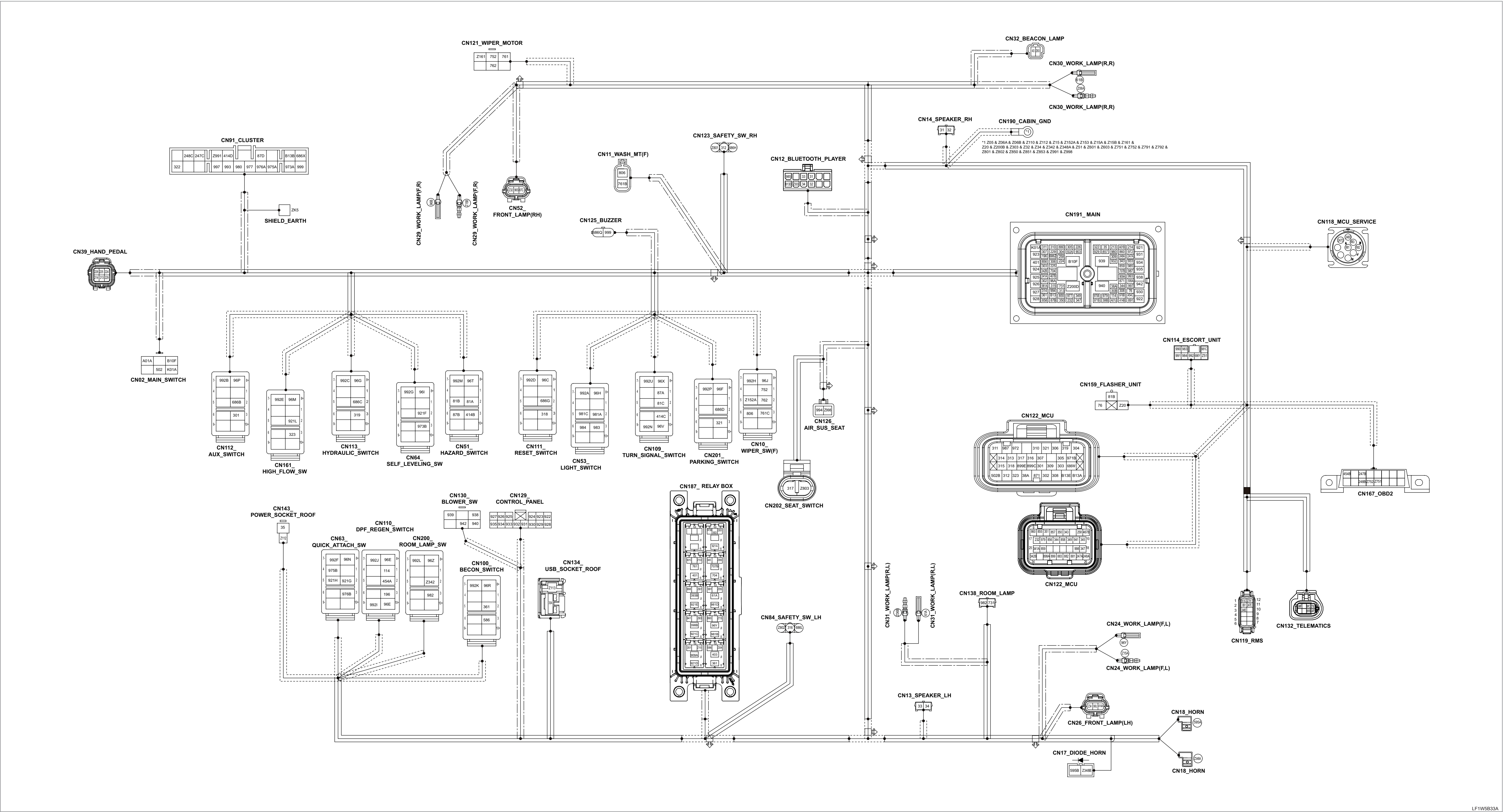
6. WIRING DIAGRAM

6.1 MAIN



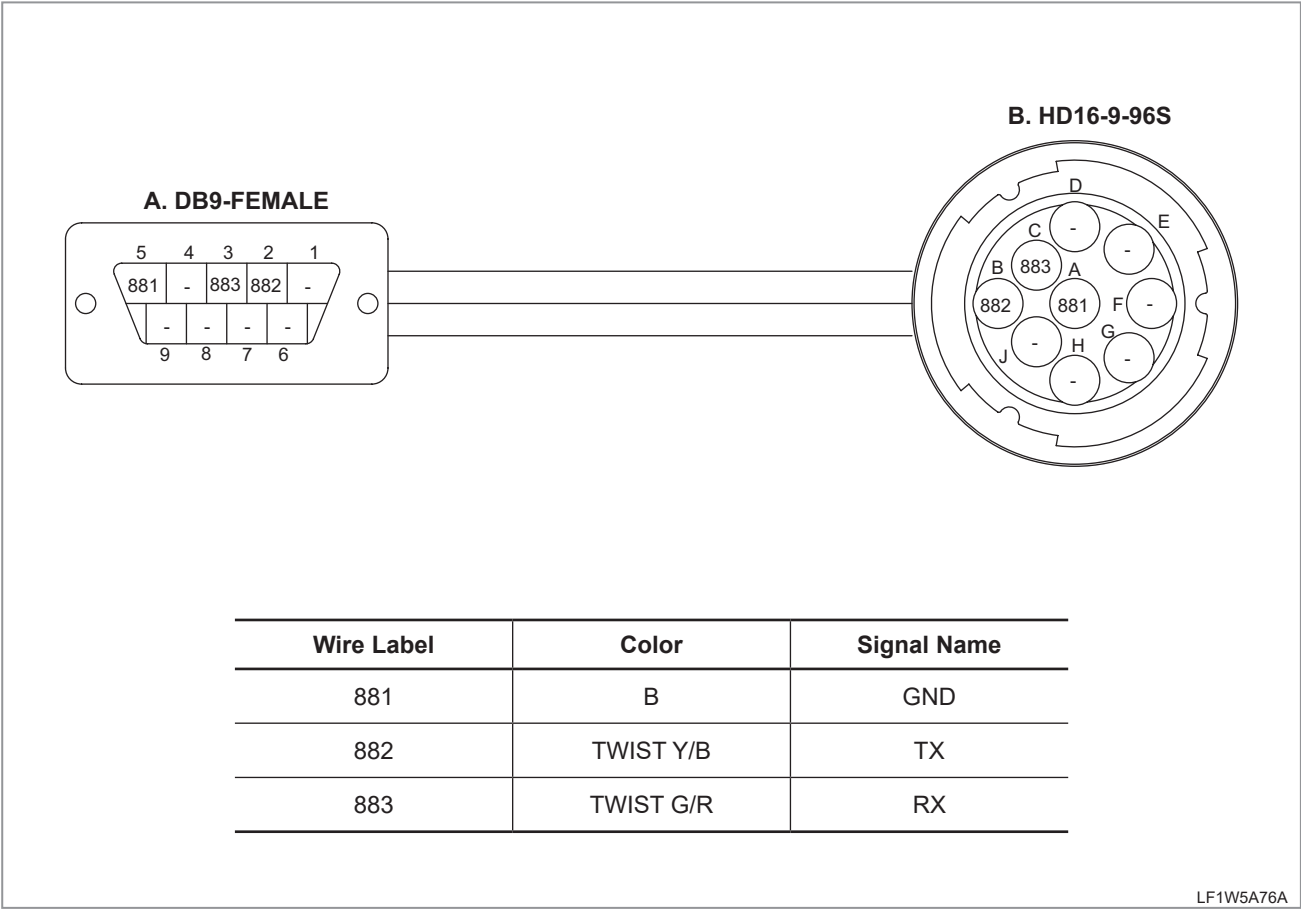
Wire Label	Color	Signal Name	Wire Label	Color	Signal Name	Wire Label	Color	Signal Name	Wire Label	Color	Signal Name	Wire Label	Color	Signal Name	Wire Label	Color	Signal Name	Wire Label	Color	Signal Name
35	W	Battery_12V_38	159	R/Y	CAM_Shaft_Position_Sensor	308	W	Aux_Hold_F_Switch	713A	R/G	Diode2	931	Y/R	AIRCON_PANEL	B07H	R	Power2	Z30	B	GND
36	L	Battery_12V_36	160	R/B	Crank_Sensor_Signal	309	Or	14PinE	713B	R/G	Pilot_Lock_Travel_RY2	932	L/Y	AIRCON_PANEL	B10F	R/W	Battery_12V	Z31	B	GND
37	L	Battery_12V_37	163	G/R	Intake_Throttle_Position_Sensor	310	Br/L	14PinF	715A	Lg	Diode2	933	Or	AIRCON_PANEL	B10H	R/W	Key_On1D	Z61A	B	GND
38A	R	UP_NO	164	P/B	EGR(Sensor 5V)	311	W/G	Aux_Port_Variable_Switch	715B	Lg	Pilot_Lock_Bucket_RY2	934	L/R	AIRCON_PANEL	B10I	R/W	HEATER_RELAY	Z61B	B	Diode1
51	P	Horn	166	R/G	Exhaust Gas Delta Press. 5V	313	Y/B	Travel_Pressure_SNSR_FW_LH	731	R/Y	Room_Lamp	935	B	AIRCON_PANEL	B10T	R/W	Battery_12V_3	Z62A	B	GND
71	P	Charge Signal	168	B	IMTS Return	314	G/B	Travel_Pressure_SNSR_FW_RH	732	R/G	Horn_Relay1	938	B/Y	AIRCON_PANEL	B10U	R/W	Alternator_Diode	Z62B	B	Diode1
76	Or	Flasher_Unit_12V	169	B	Water_In_Fuel_Sensor_Return	315	L/B	Travel_Pressure_SNSR_Reverse	813	G/R	14PIN D POW	939	B	AIRCON_PANEL	B10W	R/W	Battery_12V_	Z63A	B	GND
87B	R/B	Turn RH Signal1	170	B	Intake_Throttle_Position_Sensor_Gnd	322	R/G	Alternator	814	G/Y	14PIN C POW	940	Y/B	AIRCON_PANEL	B10Y	R/W	Battery_12V_2	Z63B	B	Diode1
96A	W	Lamp_Tail_Lamp1	171	B	Crank_Sensor_Return	341A	W/B	Main_Control_M_Valve	816	G	14PIN E POW	942	B/W	AIRCON_PANEL	B11	R/G	HEATER_RELAY	Z103	B	GND
96K	W	Lamp 12V	172	B	Gnd	341B	W/B	Diode2	818	G/Y	14PIN F POW	955A	R	Battery_12V_26	B12	R	Key_On1D	Z103A	B	Diode1
96L	W	License_Lamp	174	B	Fuel_Injector_LSD2B	342A	Y/L	Diode2	820	G/L	14PIN G POW	955B	R	Battery_12V_26	B12A	R	Aircon B+	Z104A	B	GND
96W	W	Rear_Tail_Lamp_RH	175	B	Fuel_Injector_LSD1B	342B	Y/L	Main_Control_F_Valve	822	L/B	14PIN H POW	955K	R	Battery_12V_35	B13	R/B	Battery_12V	Z104B	B	Diode1
97A	R/B	Rear_Stop_Lamp_RH	177	B	Inlet_Metering_Valve_PWM	343	G/L	Stop_Lamp	851	R/G	FUEL_HEATER	955P	R	Battery_12V_25	B20	R	Power_relay4_1	Z111	B	GND
97B	R/B	Stop_Relay2	183	B/Y	Intake_Throttle(H_Bridge_Neg)	344	Br/L	Back_Buzzer	855	Br/B	14PIN C COIL	960	R/Y	FAN_VCC	B21	R	Starter1	Z132	B	GND
97C	R/B	Rear_Stop_Lamp_LH	184	R/L	Intake_Throttle(H_Brdige_Pos)	347	W/G	Electric_Fan_RY	856	Br/R	14PIN D COIL	961	R/G	FAN_PWR	B22	R	Starter2	Z181	B	GND
100A	W/R	Oil SW signal	192	Gr	EGR(H_Bridge_Pos)	349	P	Rock_Travel_RY_Coil	857	Br/Y	14PIN E COIL	962	B/W	FAN_SPD_GND	B31A	R	Battery_B+	Z200A	B	GND
103	R/G	Fuel_Injector_HSDA2	193	W	EGR(H_Bridge_Neg)	350	Or	Lock_Bucket_RY_Coil	858	Br/Y	14PIN F COIL	963	L/W	FAN_SPD_5V	B31B	R	Battery +12V	Z200D	B	GND
105	R	Exhaust_Gas_Temperature_Sensor1	196	Gr	DPF_Regen_Inhibit_Switch	361	Y/L	Beacon_Relay1	859	Br/L	14PIN G COIL	964	P	FAN_SPD_SIG	B42A	R	Battery_12V_13	Z210	B	Gnd
106	R	Exhaust_Gas_Temperature_Sensor2	201	R	Protected_Battery1	393A	Y	Diode2	860	Br	14PIN H COIL	965	B/Y	FAN_PWR_GND	B42C	R	Horn_Fuse	Z210A	B	Diode1
109	Y/R	Coolant_Temperature_Sensor	202	B	Gnd	393B	Y	Soft_Shift_Relay2	871	G	OPC SW	966	G	RS232_GND	B42D	R	Room_Lamp_Fuse	Z216	B	Gnd
110	G/R	Fuel_Temperature_Sensor	203	R	Protected_Battery2	398A	Y	Diode2	891	Y	RMS KEY IG	967	L	TX	B42G	R	Flasher_Unit_Fuse	Z251	B	GND
112	R/G	Intake_Manifold_Pressure_Sensor	204	B	Gnd	398B	Y	Ride_Control_Relay2	891A	Y	Key_On10A	968	W	RX	B42H	R	VBB_L	Z252	B	GND
113A	G	Comp	205	R	Protected_Battery3	401	R	Wiper_Washer_Fuse	899D	B	MCU_GND	971B	P	Ride_Control	B42K	R	Battery_12V_13	Z253	B	GND
113B	G	A/C_Switch	206	B	Gnd	402	Gr	Back_Buzzer_Relay1	899D	B	MCU_GND	972	Y/R	OIL_TEMP	B42M	R	Light_Lamp1_Fuse	Z254	B	GND
114	R/L	Forced_DPF_Regeneration_Switch	208	Y	Foot_Accel	414B	Gr	Turn LH Signal1	899F	B	MCU_GND	975B	Y/R	Quick_Attah_Unlock_RY_Coil	B45	R	Glow Power B+	Z255	B	GND
115	L/Y	Intake_Throttle_Position_Feedback	209	Y	Foot_Accel	454C	Y/R	OBD2_DPF_Switch_Input2	899G	B	MCU_GND	976B	Br/R	Quick_Attah_Lock_RY_Coil	B46	R	Glow Plug ON Signal	Z256	B	GND
116	W	EGR(Sensor Signal)	213	G	Hand Accelerator Track 2, Signal	454G	Y/R	ECU_Sensor_Fuse2	899H	B	MCU_GND	977	B	Camera_GND	K01A	R	key_On1A	Z302	B	Gnd
117	R	Exhaust Gas Delta Press. Output	214	B	Hand Accelerator Track 2, Return	454H	Y/R	Inlet_Metering_Valve1	899J	B	MCU_GND	977A	B	Camera_GND	K01B	R	CLUSTER_FUSE	Z341	B	Gnd
118	R/Y	Water_In_Fuel_Sensor_Signal	215	W	Air_Inlet_Temperature	454L	Y/R	Inlet_Metering_Valve2	899K	B	MCU_GND	979	R/Y	floating_mag.12v	K01C	R	Key_On1C	Z344	B	Gnd
119	B	GND	219	R/G	Key_Switch_Input	454T	Y/R	Glow_Relay_Coil	899L	B	MCU_GND	980	R	Camera_Power	K01D	R	CLUSTER_FUSE	Z345	B	Gnd
122	B	Exhaust Gas Temp. Sen. GND	220	B	Foot_Accel	467A	R/Y	Travel_SoL_CTL	899M	B	MCU_GND	981A	P	Light_Switch_Input2A	K01E	R	RIGHT_JOYSTICK_FUSE	Z347	B	Gnd
123	B	Exhaust Gas Temp. Sen. GND	221	B	AMF_Frequency_Gnd	467B	R/Y	Travel_SoL_CTL	899N	B	MCU_GND	985	Lg	ACC1B	K01F	R	Key_On1M	Z349	B	Gnd
125	B	Fuel_Injector_LSD2A	222	R/B	Foot_Accel	502A	W/R	Key_Start_2	899P	B	MCU_GND	987	Y/R	FUEL_SENDER	K01G	R	Pilot_Lock_Travel_Fuse	Z351	B	Gnd
126	B	Fuel_Injector_LSD1A	223	R/B	Foot_Accel	502H	W/R	Key_Start_3	903	Y	Battery_12V_29	989	Gr	14PIN 12V	K01H	R	Key_On10A	Z401	B	Gnd
127	R/B	Fuel_Injector_HSDA1	224	R/G	Hand VREF1 PPS1 5V	592A	R	Stop_Lamp_Fuse	903A	Y	Diode2	993	Vo	AV1_GND	K01J	R	RMS_Fuse	Z421	B	Gnd
128A	B	Accelerometer1_Screen	225	G	Hand Pedal Position Sensor1	592B	R	Back_Buzzer_Fuse	905A	L/Y	Diode2	994	R/B	SEAT_POWER	K01M	R	Key_On1M	Z602	B	Gnd
128B	B	Shield GND	226	B	Hand PPS1 Return	592C	R	Stop_Lamp_Fuse	905B	L/Y	Quick_Attah_Lock_RY2	995P	R	14Pin	K01N	R	Key_On1N	Z602A	B	Diode1
129A	B	Accelerometer2_Screen	229	R/G	Hand VREF2 PPS2 5V	592D	R	Stop_Lamp_Fuse	907A	W	Diode2	996A	Gr	RIGHT_JOYSTICK_INPUT	K01R	R	Left_Joystick_Fuse	Z610	B	Gnd
129B	B	Shield GND	232	W/G	Parking_Relay3	592G	R	Beacon_Lamp_Fuse	907B	W	Quick_Attah_Unlock_RY2	996B	Gr	Key_On1W	K01S	R	Power_Relay5_Coil	Z630	B	Gnd
130	Y/B	Accelerometer1_Return	234	B	Foot_Accel	595A	R/G	Horn_Relay2	909A	Gr	Hi_Flow_Relay2	996C	Gr	Key_On5K	K01T	R	FAN_KEY_ON	Z701	B	Gnd
131	Y	Accelerometer1	237	Br/R	Stater_Motor_Inhibit_Relay	598	Gr	Back_Buzzer_Relay2	909B	Gr	Diode2	997	W	AV1	K04A	R/W	ILL+	Z701A	B	Diode1
132	Y	Accelerometer2	245	B	ECU_Main_Power_Relay	599	Br	Stop_Relay1	921	R	Battery_12V_28	A01B	Lg	ACC1B	K04B	R/W	ILL+	Z702	B	GND
133	Y/B	Accelerometer2_Return	247A	W/L	MCU_CAN_L	685	Y	COMPRESSURE_PW	921	R	Battery_12V_28	A01U	Lg	HEATER_RELAY_COIL	K04C	R/W	KEY ON	Z711	B	Gnd
134	Y/R	Intake_Air_Temperature_Sensor	247G	W/L	FAN_CAN_L	686	Or	MCU_IG	921J	R	Quick_Attah_Lock_RY1	B02A	R	Engine_B+	K04Z	R/W	Dual_Pressure_Switch_Input	Z711A	B	Diode1
135	R/L	Rail_Pressure_Sensor_Output_Signal	248A	Y	MCU_CAN_H	686J	Or	Travel_Pres_Sen(F_LH)	921K	R	Quick_Attah_Unlock_RY1	B02B	R	Engine_B+	K05	G/R	14PIN D POW	Z787	B	GND
138	R/G	Rail_Pressure_Sensor_Supply_Voltage	248G	Y	FAN_CAN_H	686K	Or	Travel_Pres_Sen(F_LH)	922	R	AIRCON_PANEL	B02R	R	Battery_B+	K05A	G/R	14PIN D POW	Z800	B	GND
139	R/Y	VREF1_Crank_Sensor	256	B	Glow_Plug_Relay_Driver	686P	Or	Travel_Pres_Sen(F_LH)	923	R/W	AIRCON_PANEL	B03A	R	ECU_Relay_Coil	K05B	G/R	14PIN C POW	Z951	B	GND
141	R/B	VREF_INPRES	258	R/Y	Engine_Emergency_Stop_Signal	686R	Or	OPC SW	924	L	AIRCON_PANEL	B03B	R	ECU_Power_Relay	K05C	G/R	14PIN F POW	Z952	B	GND
144	B	VREFGND	302	G	Aux_Electrical_Mode_Change	686Z	Or	MCU_IG	925	Y	AIRCON_PANEL	B03C	R	ECU_Relay_Coil	K05D	G/R	14PIN E POW	Z953	B	GND
145	B	Coolant_Temperature_Return	303	R	14PinC	704	Br/B	Parking_Relay1	926	G	AIRCON_PANEL	B04	W	ECU_Relay_Coil	K05E	G/R	14PIN H POW	Z989	B	GND
146	B	Sensor_Return_GND	304	Br	14PinD	705	R/B	Pilot_Lock_Travel_RY1	927	B/W	AIRCON_PANEL	B05	R	ECU_Power_Relay	K05F	G/R	14PIN G POW	Z990	B	GND
147	B	CAM_Shaft_Position_Sensor_Return	305	Lg	14PinG	705A	R/B	Pilot_Lock_Bucket_RY1	928	Lg	AIRCON_PANEL	B06	R	ECU_Relay2	K201A	W/R	LEFT_JOYSTICK_INPUT	Z995	B	GND
150	W/B	Fuel_Injector_HSDB4	306	Gr	14PinH	707A	Y/R	Diode2	929	G/W	AIRCON_PANEL	B06A	R	ECU_Sensor_Fuse1	K201B	W/R	UP_NO	Z999	B	GND
151	R/L	Fuel_Injector_HSDA3	307	P	Aux_Hold_M_Switch	707B	Y/R	Parking_Relay2	930	L/W	AIRCON_PANEL	B07	R	Starter_B+	K201C	W/R	Joystick_KeyOn			

6.2 CABIN



Wire Label	Color	Signal Name	Wire Label	Color	Signal Name	Wire Label	Color	Signal Name	Wire Label	Color	Signal Name	Wire Label	Color	Signal Name	Wire Label	Color	Signal Name
31	Br	CD_Player3	247B	W/L	OBD_CAN_L	403	R/Y	Beacon_Lamp	891C	Y	Battery_B+	980	R	Camera_Power	Z05	B	GND
32	B	CD_Player4	247C	W/L	CLUSTER_CAN_L	414A	Gr	FRONT_TURN_LAMP_LH	899	B	MCU_GND	981A	P	Light_Switch_Input2A	Z06A	B	GND
33	Br	CD_Player5	247D	W/L	CANL	414B	Gr	Turn LH Signal1	899A	B	MCU_GND	981A	P	Light_Switch_F	Z06B	B	GND
34	B	CD_Player6	247E	W/L	RMS CAN L	414C	Gr	Turn LH Signal2	899B	B	MCU_GND	981B	P	Light_Switch_Input2A	Z15	B	GND
35	W	Battery_12V_38	247F	W/L	TEL_CAN_L	414D	Gr	Turn_Signal_LH_Cluster	899C	B	MCU_GND	981C	P	Light_Switch_R	Z15A	B	GND
35A	W	USB_POWER	248A	Y	MCU_CAN_H	454A	Y/R	DPF_Switch_Signal	899D	B	MCU_GND	981C	P	FRONT_WORKING_LAMP(B+)	Z15B	B	GND
38A	R	UP_NO	248B	Y	OBC_CAN_H	454B	Y/R	OBD2_DPF_Switch_Input1	899E	B	MCU_GND	981D	P	Work_Lamp_Relay_R1	Z20	B	GND
61A	R	Work_Lamp_Relay_R2	248C	Y	CLUSTER_CAN_H	454C	Y/R	OBD2_DPF_Switch_Input2	903	Y	Battery_12V_29	982	R/Y	ROOM_LAMP	Z32	B	GND
61B	R	Lamp 12V	248D	Y	CANH	467B	R/Y	Travel_Sol_CTL	909A	Gr	Hi_Flow_Relay2	983	R/Y	Work_Lamp_Relay_F_Coil	Z34	B	GND
76	Or	Flasher_Unit_12V	248E	Y	RMS CAN H	502	W/R	Key_Start_1	921	R	Battery_12V_28	984	Br	Work_Lamp_Relay_R_Coil	Z51	B	GND
81A	R/G	Hazard_Switch_Input2	248F	Y	TEL_CAN_H	502A	W/R	Key_Start_2	921A	R	Battery_12V_27	985	Lg	ACC1B	Z110	B	GND
81B	R/G	Flasher_Unit_Signal	258	R/Y	Engine_Emergency_Stop_Signal	502B	W/R	Start_Switch	921C	R	POWER	987	Y/R	FUEL_SENDER	Z112	B	GND
81C	R/G	Turn_Signal_Switch_Input	301	Y	Aux_Switch	586	P	Beacon_Relay_Coil	921D	R	Hi_Flow_Fuse	990	R/Y	FRONT_WORK_LAMP_RELAY(+)	Z113	B	GND
87A	R/B	Turn RH Signal2	302	G	Aux_Electrical_Mode_Change	595A	R/G	Horn_Relay2	921E	R	Soft_Shift_Fuse	991	Y/R	REAR_WORKING_LAMP_RELAY(+)	Z152A	B	GND
87B	R/B	Turn RH Signal1	303	R	14PinC	595B	R/G	Diode2	921F	R	Self_Leveling_SW_Input2	992	B/R	WORK_LAMP_SWITCH_LED(-)	Z153	B	GND
87C	R/B	FRONT_TURN_LAMP_RH	304	Br	14PinD	686A	Or	Safety_Switch_Input	921G	R	Quick_Attach_SW_Input2	992A	B/R	WORK_LAMP_SWITCH_LED(-)	Z161	B	GND
87D	R/B	Turn_Signal_RH_Cluster	305	Lg	14PinG	686B	Or	Safety_Switch_Input	921H	R	Quick_Attach_SW_Input5	992B	B/R	TAIL_LAMP(-)	Z200B	B	GND
96A	W	Lamp_Tail_Lamp1	306	Gr	14PinH	686C	Or	Reset_Switch_Input	921L	R	High_Flow_SW_Input2	992C	B/R	TAIL_LAMP(-)	Z200D	B	GND
96B	W	Work_Lamp_FR	307	P	Aux_Hold_M_Switch	686D	Or	Reset_Switch_Input	922	R	AIRCON_PANEL	992D	B/R	TAIL_LAMP(-)	Z303	B	Gnd
96C	W	OVERRIDE_SWTICH_LAMP	308	W	Aux_Hold_F_Switch	686G	Or	Safety_Switch_Input	923	R/W	AIRCON_PANEL	992E	B/R	TAIL_LAMP(-)	Z304	B	GND
96E	W	Regen_SW_Lamp	309	Or	14PinE	686H	Or	Safety_Switch_Input	924	L	AIRCON_PANEL	992F	B/R	TAIL_LAMP(-)	Z342	B	Gnd
96E	W	Regen_SW_Lamp	310	Br/L	14PinF	686L	Or	MCU_POWER	925	Y	AIRCON_PANEL	992G	B/R	TAIL_LAMP(-)	Z348A	B	Gnd
96F	W	Regen_SW_Lamp	311	W/G	Aux_Port_Variable_Switch	686Q	Or	BUZZER	926	G	AIRCON_PANEL	992H	B/R	TAIL_LAMP(-)	Z348B	B	Diode1
96G	W	HYD_LOCK_SW_LAMP	312	L/G	Safety_Switch	686W	Or	MCU_IG	927	B/W	AIRCON_PANEL	992I	B/R	TAIL_LAMP(-)	Z601	B	Gnd
96H	W	Light_Switch_Lamp	313	Y/B	Travel_Pressure_SNSR_FW_LH	686X	Or	Key_On1V	928	Lg	AIRCON_PANEL	992J	B/R	TAIL_LAMP(-)	Z603	B	Gnd
96I	W	SELF_LEVELING_SW_LAMP	314	G/B	Travel_Pressure_SNSR_FW_RH	686Y	Or	KEY_ON	929	G/W	AIRCON_PANEL	992K	B/R	TAIL_LAMP(-)	Z751	B	Gnd
96J	W	Wiper_Washer_SW_Lamp	315	L/B	Travel_Pressure_SNSR_Reverse	686Z	Or	MCU_IG	930	L/W	AIRCON_PANEL	992L	B/R	TAIL_LAMP(-)	Z752	B	Gnd
96M	W	HI_FLOW_SW_LAMP	316	G	Safety_SW_LH	704	Br/B	Parking_Relay1	931	Y/R	AIRCON_PANEL	992M	B/R	TAIL_LAMP(-)	Z791	B	GND
96N	W	QUICK_ATTACH_SW_LAMP	317	L	Seat_SW	707B	Y/R	Parking_Relay2	932	L/Y	AIRCON_PANEL	992N	B/R	Turn Signal SW Lamp(L)	Z792	B	GND
96P	W	AUX_SWITCH_LAMP	318	Y/W	Reset_Switch	731	R/Y	Room_Lamp	933	Or	AIRCON_PANEL	992P	B/R	PARKING_LAMP	Z801	B	GND
96R	W	Beacon_SW_Lamp	319	G/W	Hydraulic_Lock_Switch	752	G	Wiper_Relay1	934	L/R	AIRCON_PANEL	992U	B/R	Turn Signal SW Lamp(R)	Z802	B	GND
96S	W	Front_Tail_Lamp_RH	321	P/G	Parking_Switch	761	Y	Wiper_Relay_Coil	935	B	AIRCON_PANEL	993	Vo	AV1_GND	Z803	B	GND
96T	W	Hazard_Switch_Lamp_Input	322	R/G	Alternator	761B	Y	Wash_M(F) 12V	938	B/Y	AIRCON_PANEL	994	R/B	SEAT_POWER	Z850	B	Gnd
96U	W	Front_Tail_Lamp_LH	323	Y/G	High_Flow_Switch	761C	Y	Wiper_Relay2	939	B	AIRCON_PANEL	997	W	AV1	Z851	B	Gnd
96V	W	Front_Tail_Lamp_LH	341A	W/B	Main_Control_M_Valve	762	R	Wiper_Relay_Coil	940	Y/B	AIRCON_PANEL	998	Gr	2Speed_Coil	Z853	B	Gnd
96X	W	Front_Tail_Lamp_LH	342B	Y/L	Main_Control_F_Valve	806	G/B	Wash_M(F) SW	941	L/W	RIDE CONTROL RY	999	B/Y	BUZZER(-)	Z991	B	GND
96Y	W	Work_Lamp_Relay_F2	343	G/L	Stop_Lamp	855	Br/B	14PIN C COIL	942	B/W	AIRCON_PANEL	A01A	Lg	ACC1A	Z998	B	GND
96Z	R/B	ROOM_LAMP	344	Br/L	Back_Buzzer	856	Br/R	14PIN D COIL	971B	P	RIDE CONTROL	A01B	Lg	ACC1B			
114	R/L	Forced_DPF_Regeneration_Switch	345	P/L	Parking_Sol_RY_Coil	857	Br/Y	14PIN E COIL	972	Y/R	OIL_TEMP	A01C	Lg	ACC1C			
196	Gr	DPF_Regen_Inhibit_Switch	347	W/G	Electric_Fan_RY	858	Br/Y	14PIN F COIL	973A	G	Self_Leveling_Lamp	A01U	Lg	HEATER_RELAY_COIL			
213	G	Hand Accelerator Track 2, Signal	349	P	Rock_Travel_RY_Coil	859	Br/L	14PIN G COIL	973B	G	Self_Leveling_Relay_Coil	B10F	R/W	Battery_12V			
214	B	Hand Accelerator Track 2, Return	350	Or	Lock_Bucket_RY_Coil	860	Br	14PIN H COIL	975A	Y/R	Quick_Attach_Unlock_Lamp	B13	R/B	Battery_12V			
224	R/G	Hand VREF1 PPS1 5V	351	Y	High_Flow_RY_Coil	871	G	OPC SW	975B	Y/R	Quick_Attah_Unlock_RY_Coil	B13A	R/B	MCU_B+			
225	G	Hand Pedal Position Sensor1	361	Y/L	High_Flow_RY_Coil	881	B	GND	976A	Br/R	Quick_Attach_lock_Lamp	B13B	R/B	B+			
226	B	Hand PPS1 Return	361	Y/L	High_Flow_RY_Coil	882	Y/B	232TX	976B	Br/R	Quick_Attah_Lock_RY_Coil	B13C	R/B	RMS B+			
229	R/G	Hand VREF2 PPS2 5V	393B	Y	Soft_Shift_Relay2	883	G/R	232RX	977	B	Camera_GND	B13D	R/B	B+			
232	W/G	Parking_Relay3	398B	Y	Ride_Control_Relay2	891	Y	RMS KEY IG	977C	B	CAMERA_GND(SHIELD)	B13E	R/B	Battery_B+			
247A	W/L	MCU_CAN_L	401	R	Wiper_Washer_Fuse	891B	Y	key_on	979	R/Y	floating_mag.12v	K01A	R	key_On1A			

6.3 MCU UPDATE



SAFETY FIRST

ENGINE

DRIVING & CHASSIS

HYDRAULIC SYSTEM

ELECTRIC SYSTEM

CABIN

INDEX

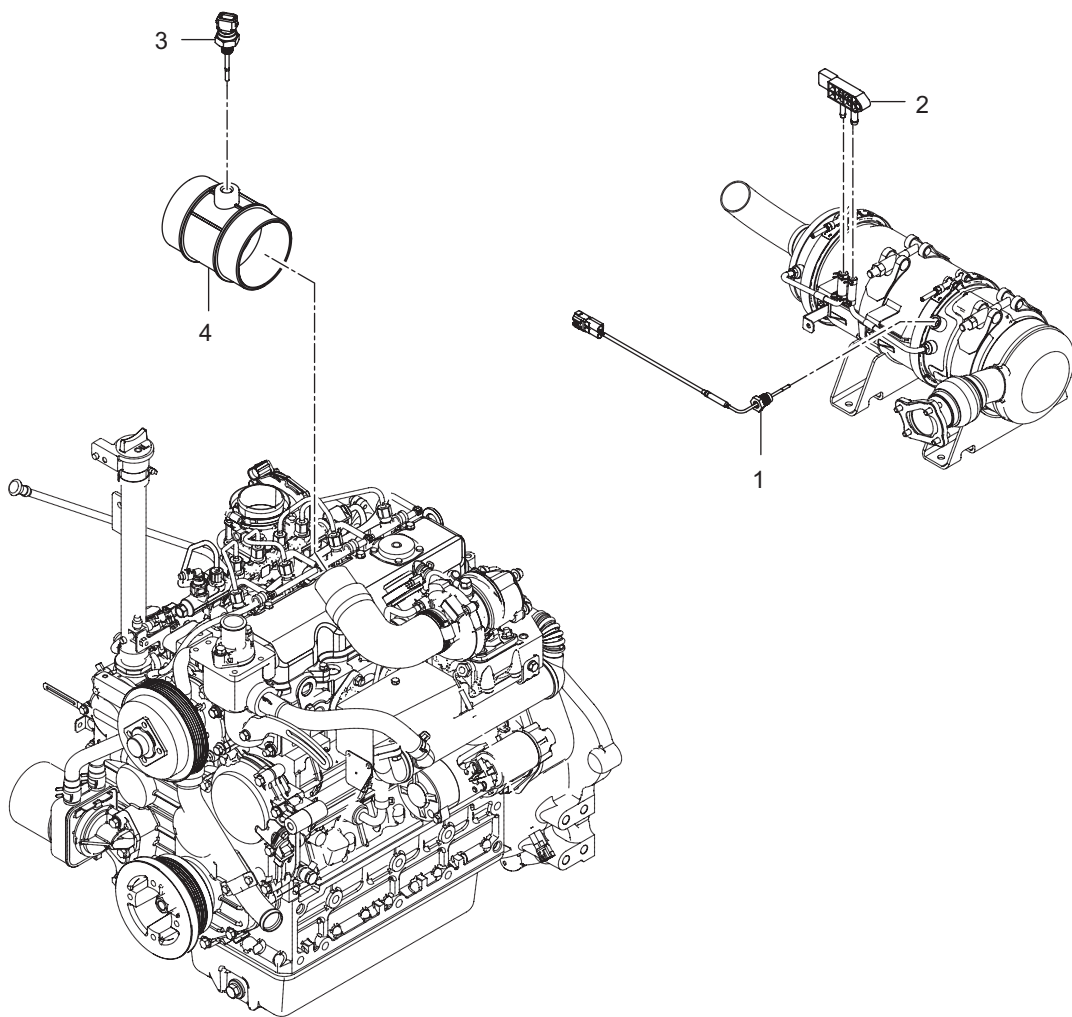
7. EXPLODED VIEW



REMARKS

- The manufacturing parts are subject to change without notice. Therefore, check the parts catalog or electronic manual for latest information.

7.1 LF1-G311007 ENGINE ELECTRICAL GROUP

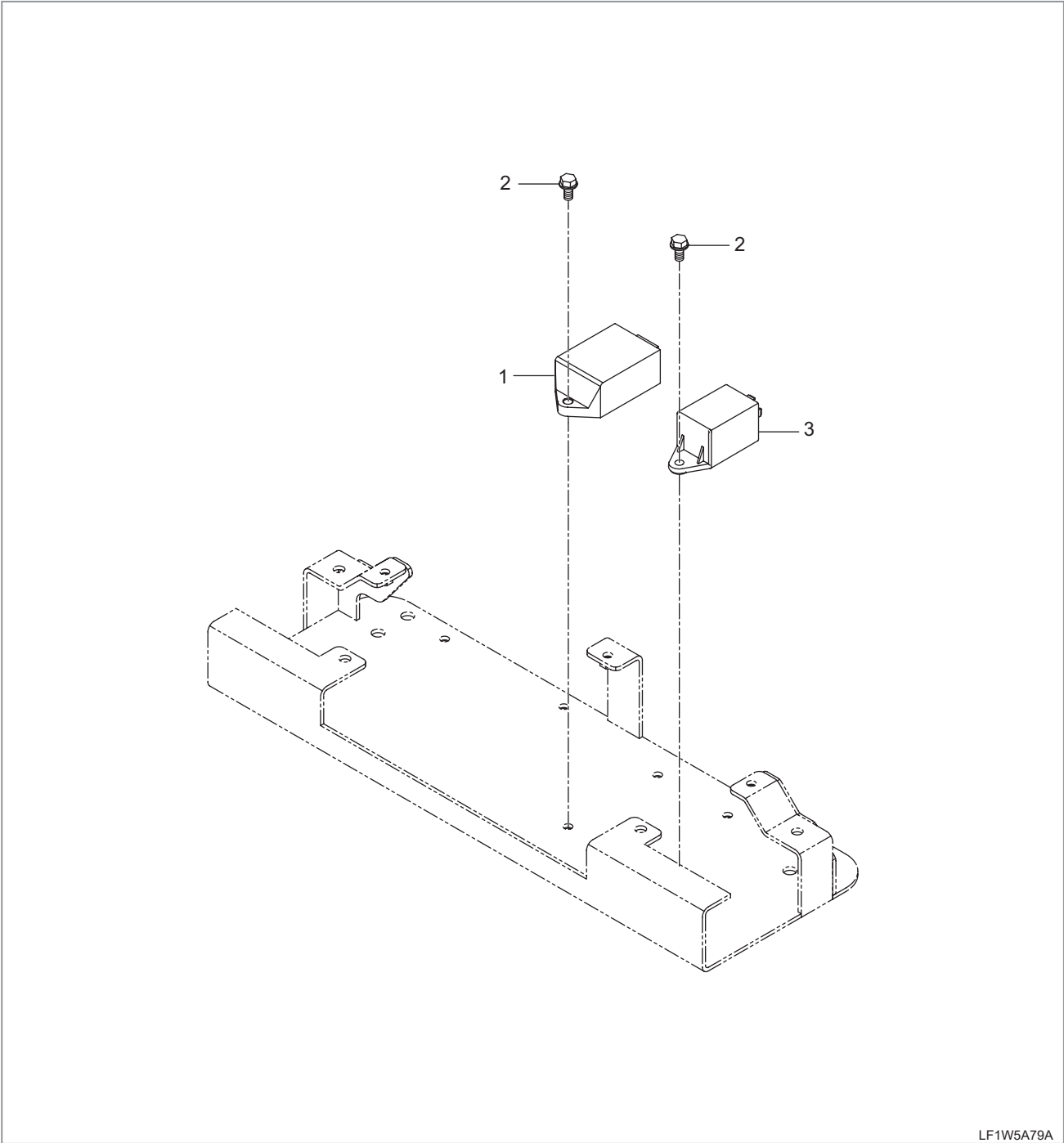


LF1W5A78A

COMPONENTS

- | | |
|------------------------------------|-------------------------------------|
| (1) Exhaust Gas Temperature Sensor | (3) Assy Sensor, Intake Air Temp-T1 |
| (2) Sensor, DPF Diff Press | (4) Housing-Intake Temp Sensor |

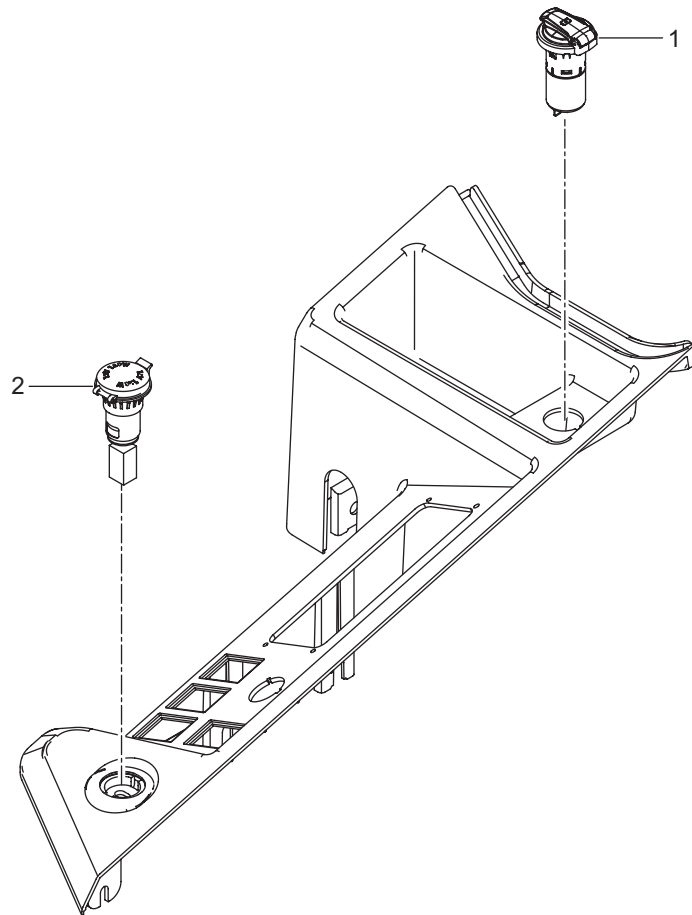
7.2 LF1-G327001 LIGHT CONTROL GROUP



COMPONENTS

- (1) Escort Unit
- (2) Flaner Bolt
- (3) Unit, Flasher

7.3 LF1-G328002 POWER SOCKET GROUP



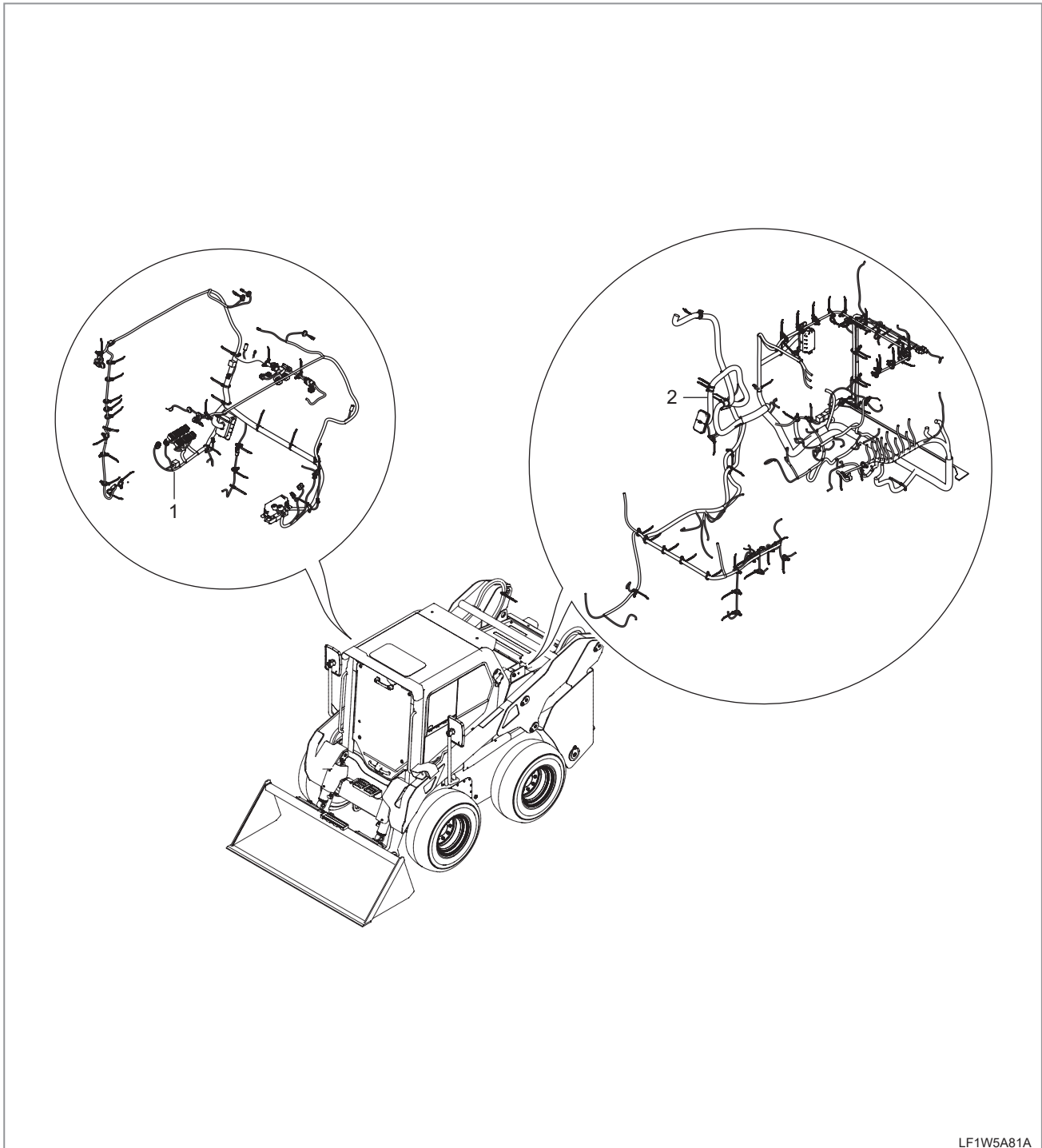
LF1W5A80A

COMPONENTS

(1) Power Outlet Ass'y(12V)

(2) Socket-USB

7.4 LF1-G331001 WIRE HARNESS GROUP

**COMPONENTS**

(1) Wire Harness, Main

(2) Wire Harness, Cabin

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DRIVING & CHASSIS

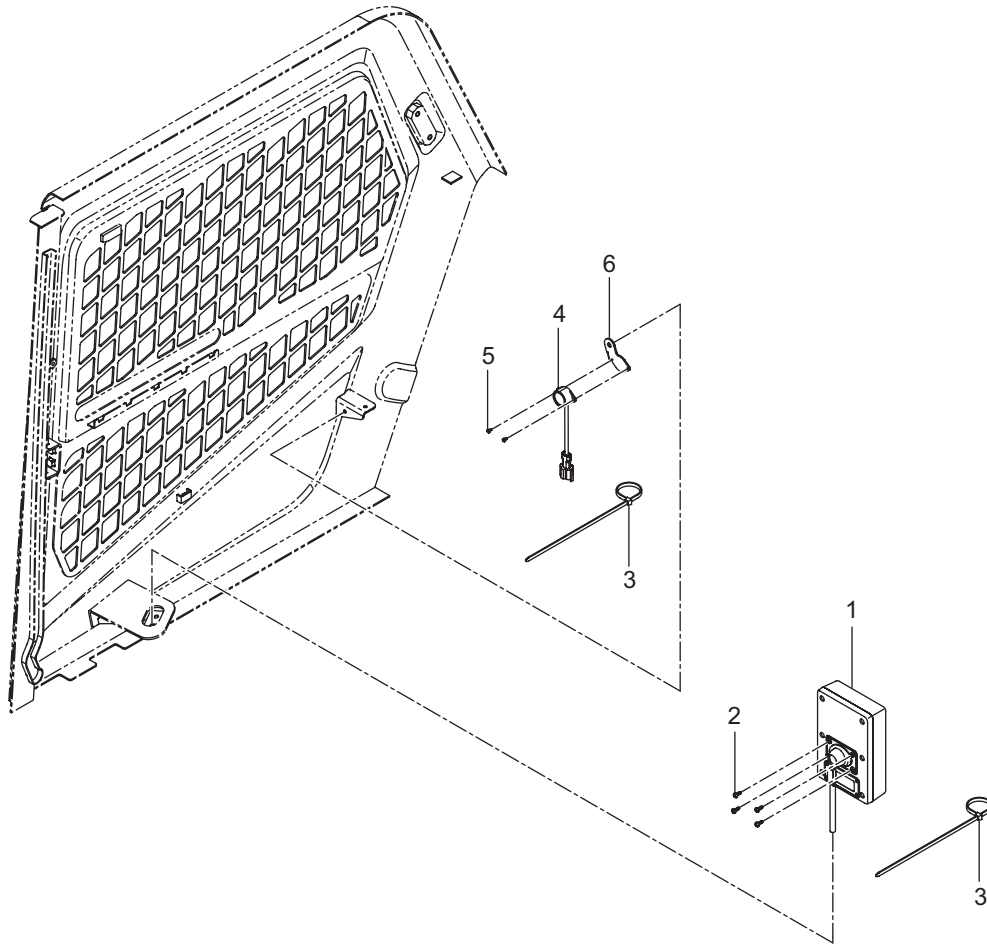
HYDRAULIC SYSTEM

ELECTRIC SYSTEM

CABIN

INDEX

7.5 LF1-G332002 CLUSTER CONTROL GROUP

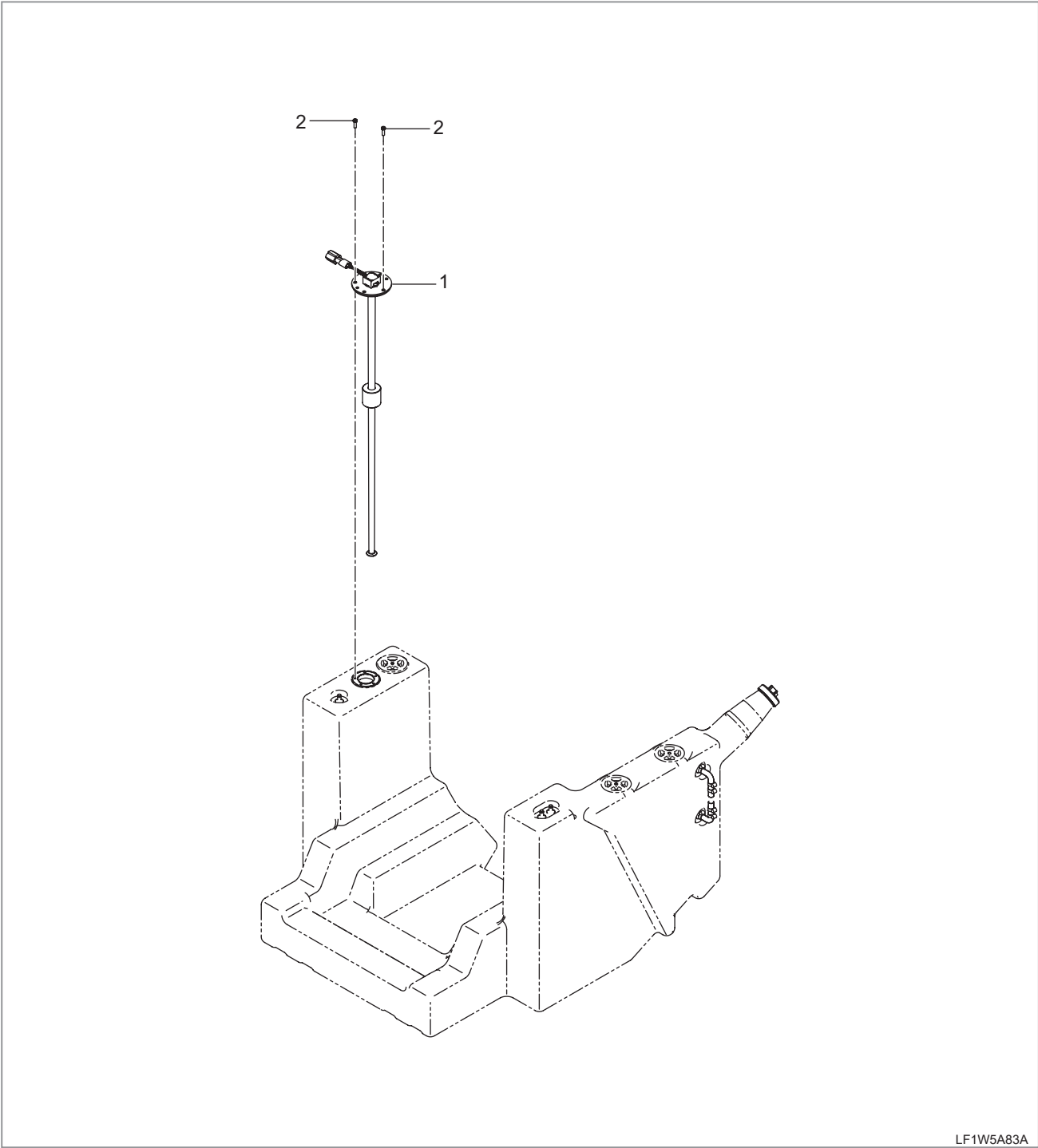


LF1W5A82A

COMPONENTS

- | | | |
|-----------------------|-----------------|-------------------|
| (1) Cluster | (3) Cord Band | (5) Screw |
| (2) Screw With Washer | (4) Assy Buzzer | (6) Plate, Buzzer |

7.6 LF1-G332501 FUEL SENDER GROUP



COMPONENTS

(1) Sender, Fuel

(2) Screw With Washer

SAFETY FIRST

ENGINE

DRIVING & CHASSIS

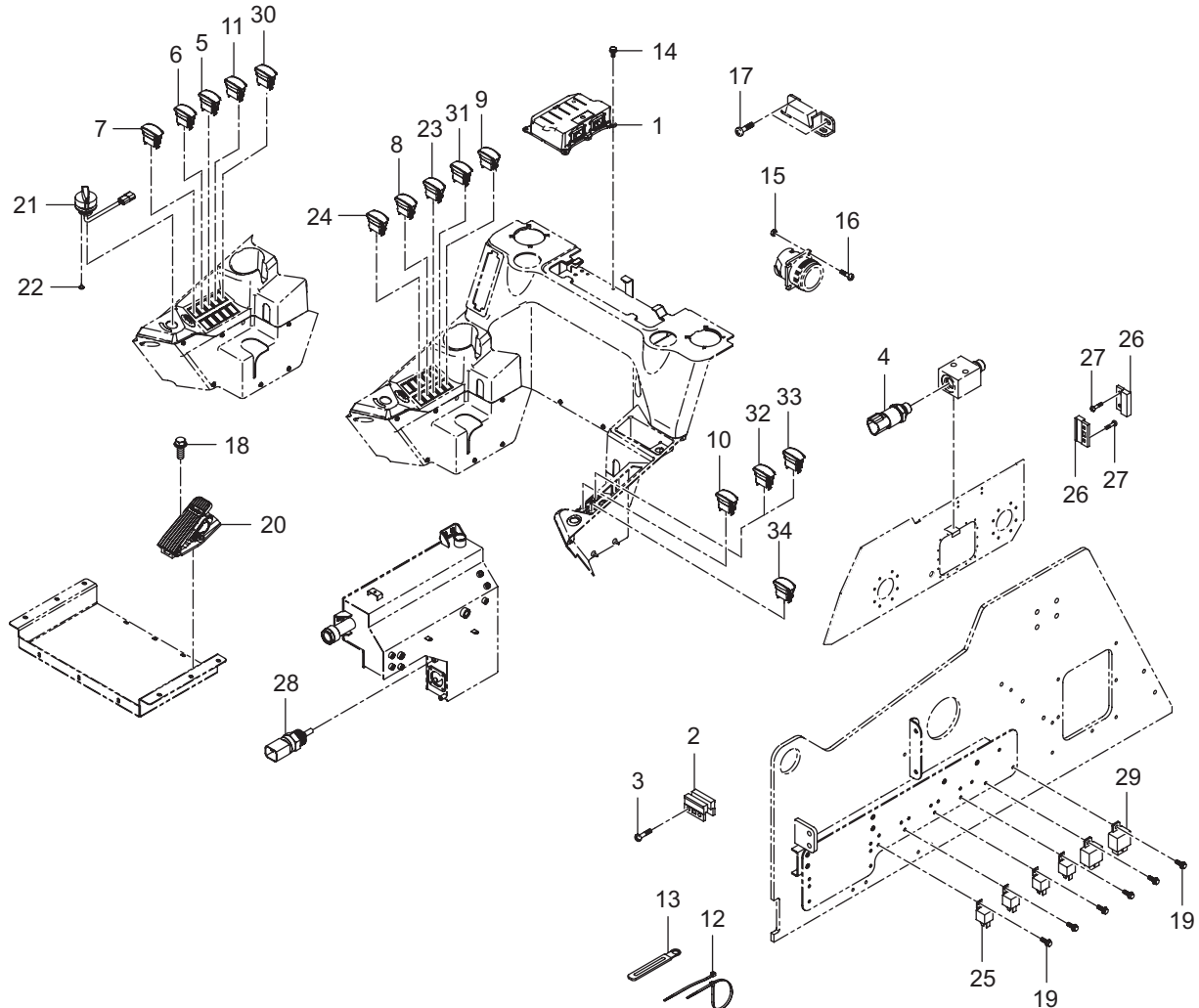
HYDRAULIC SYSTEM

ELECTRIC SYSTEM

CABIN

INDEX

7.7 LF1-G333501 VEHICLE CONTROL GROUP



LF1W5B13A

COMPONENTS

- | | | |
|----------------------------|------------------------------|-----------------------------|
| (1) MCU | (13) Wir'g Clamp | (25) Relay 70A |
| (2) Sensor, Safety | (14) Flaner Bolt | (26) Sensor, Safety |
| (3) Screw | (15) Nut | (27) Screw |
| (4) Travel Pressure Sensor | (16) Screw | (28) Oil Thermometer Sensor |
| (5) Switch, Turn Signal | (17) Screw | (29) Twin Relay, Motor |
| (6) Switch, Light | (18) Bolt, Washer | (30) Switch, Wiper/Washer |
| (7) Reset Switch | (19) Bolt, Flange | (31) Switch, Self leveling |
| (8) Switch, High Flow | (20) Pedal, Foot Acltr-Lf100 | (32) Switch, Room lamp |
| (9) Hazard Switch | (21) Accel Dial | (33) Switch, Beacon |
| (10) Switch, DPF-Regen | (22) Taping Screw(M4xI8) | (34) Switch, Quick Attach |
| (11) Switch, Parking | (23) Hydraulic Lock Switch | |
| (12) Cord Band | (24) Aux Switch | |