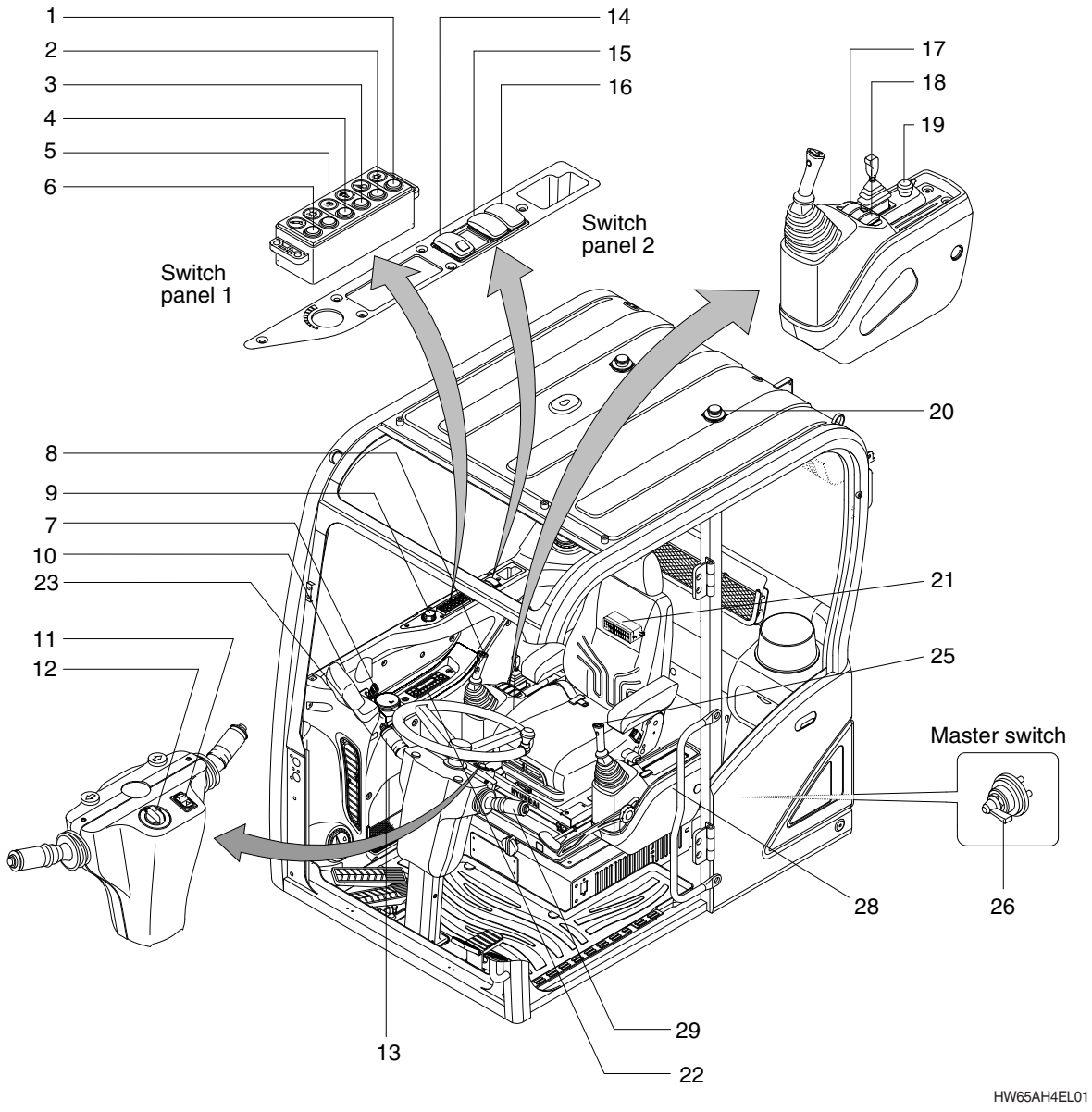
SECTION 4 ELECTRICAL SYSTEM

Group 1 Component Location 4-1
Group 2 Monitoring system 4-3
Group 3 Electrical Circuit 4-62
Group 4 Electrical Component Specification 4-82
Group 5 Connectors 4-90
Group 6 Fault codes 4-110

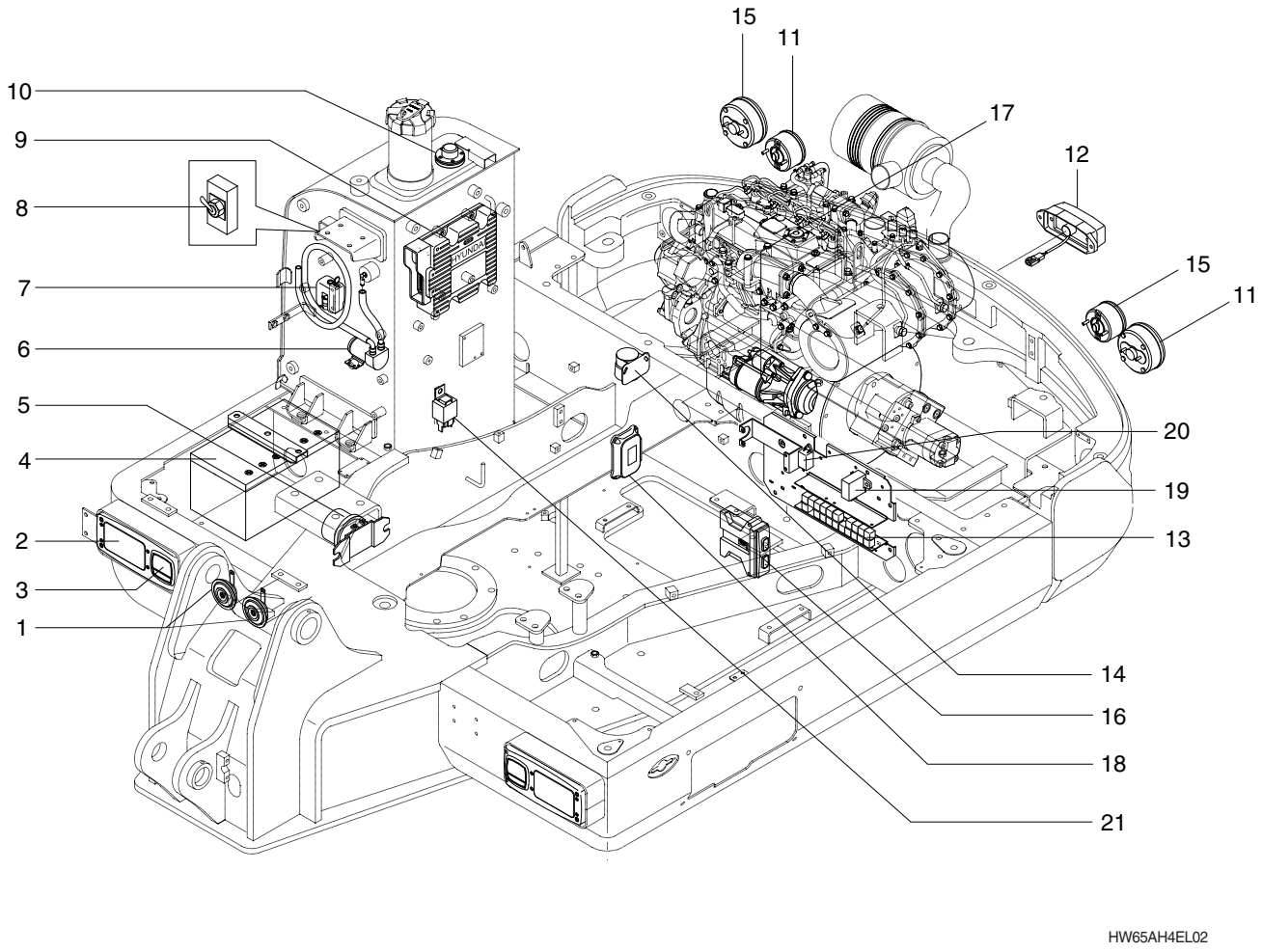
GROUP 1 COMPONENT LOCATION

1. LOCATION 1



1	Head light switch	11	Hazard switch	21	Fuse box
2	Work light switch	12	Select switch	22	Radio & USB player
3	Travel alarm switch	13	Multifunction switch (RH)	23	Service moter
4	Cab light switch	14	Auto ram lock switch	25	Horn switch
5	Beacon switch (opt)	15	Auto cruise switch	26	Master switch
6	Breaker selection switch (opt)	16	Overload switch (opt)	27	Aircon and heater switch
7	Start switch	17	DPF switch	28	Travel alarm switch
8	Breaker operation switch	18	Quick coypler switch (opt)	29	Multifunction switch (LH)
9	Accel dial switch	19	12V socket		
10	Cluster	20	Speaker		

2. LOCATION 2



HW65AH4EL02

1	Horn	8	Filler pump toggle switch	15	Reverse lamp
2	Head lamp	9	Machine control unit (MCU)	16	AVCU
3	Flasher position lamp	10	Fuel sender	17	Alternator
4	Battery	11	Combination lamp	18	RMCU
5	Battery relay	12	Number plate lamp	19	Int wiper relay
6	Fuel filler pump	13	12V mini relay	20	Flaher unit
7	Washer pump	14	Travel alarm buzzer	21	Power relay

GROUP 2 MONITORING SYSTEM

1) STRUCTURE

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

※ **The cluster installed on this machine does not entirely guarantee the condition of the machine. Daily inspection should be performed according to chapter 6, Maintenance.**

※ **When the cluster provides a warning immediately check the problem, and perform the required action.**

HW65AH4EL100D

※ **The warning lamp pops up, lights ON (on the left-top side) and the buzzer sounds when the machine has a problem.**
The warning lamp lights ON until the problem is cleared. Refer to page 4-6 for details.

2) GAUGE

(1) Operation screen

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

HX60A3CD101A

1	Engine coolant temp gauge	3	Fuel level gauge	5	Accel dial
2	Hydraulic oil temp gauge	4	Engine rpm gauge	6	Clinometer

(2) Engine coolant temperature gauge

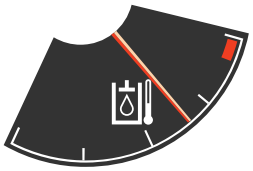
290F3CD53

① This gauge indicates the temperature of coolant.
- Black range : General state
- Red range : Engine overheated state

② If the indicator is in the red range or lamp lights ON in red, turn OFF the engine and check the engine cooling system.

※ If the gauge indicates the red range or lamp lights ON even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor or connector, and poor grounding of the instrument, etc.

(3) Hydraulic oil temperature gauge



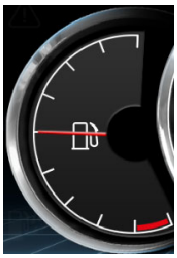
290F3CD54

① This gauge indicates the temperature of hydraulic oil.
- Black range : 40-105˚C (104-221˚F)
- Red range : Above 105˚C (221˚F)

② If the indicator is in the red range or lamp lights ON in red, reduce the load on the system. If the gauge stays in the red range, stop the machine and check the cause of the problem.

※ If the gauge indicates the red range or lamp lights ON in red even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.

(4) Fuel level gauge



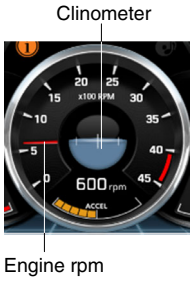
HX60A3CD55A

① This gauge indicates the amount of fuel in the fuel tank.
- Black range : 9% or more
- Red range : below 9%

② Fill the fuel when in the red range, or lamp lights ON in red.

※ **If the gauge indicates the red range or lamp lights ON in red even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.**

(5) Engine rpm gauge and clinometer



HX60A3CD105K

① This displays the engine speed.

② This displays the tilt of machine.

(6) Accel dial gauge

290F3CD59

① This gauge indicates the level of accel dial from 0 to 10 step.

3) COMMUNICATION ERROR AND LOW VOLTAGE WARNING POP-UP

(1) Communication error pop-up

HX60A3CD107A

① Cluster displays this communication error pop-up when it has communication error with MCU.

② Communication error pop-up displays at operation screen only. Just buzzer alarm at the other screen.

③ If communication with MCU become normal state, it will disappear automatically.

(2) Low voltage warning pop-up

HX60A3CD108

① Cluster displays this low voltage warning pop-up when the battery voltage is low.

② Low voltage warning pop-up displays at operation screen only. Just buzzer alarm at the other screen.

③ This pop-up will disappear with using touch screen or buzzer stop switch. While the battery voltage is low, buzzer sounds every minute.

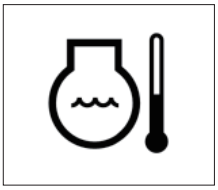
④ When the battery voltage is higher than 11.5 V, the pop-up off.

4) WARNING LAMPS

HW65AH3CD109C

※ Each warning lamp on the left-top of the LCD pops up on the center of LCD and the buzzer sounds when the each warning is happened. The pop-up warning lamp moves to the original position and lights up when the buzzer stop switch is pushed or the pop-up is touched. And the buzzer stops. Refer to page 4-19 for the switch.

(1) Engine coolant temperature warning lamp



290F3CD61

① The warning light is turned ON and buzzer is sounded when the engine coolant temperature is overheated.

② The engine speed is also decreased unless the coolant temperature is reduced again. Here, do not turn OFF the engine. When the engine is turned OFF, the coolant temperature is overheated even more to cause engine rattle due to the surge.

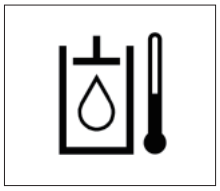
※ Check the temperature gauge of the engine coolant. The coolant is overheated when the gauge in the red range. Here, the coolant temperature warning lamp is turned ON, and the engine speed is decreased automatically.

The engine performs 'low-speed idle" run until the gauge is returned to the black range. Even when the gauge returns to the black range, do not turn OFF the engine, and perform idle run additionally for 3~5 min. Ignoring this may cause surge from the heat to result in damage to the engine.

The reason for idle run of the engine is to disperse the overheated heat slowly to reduce the temperature.

After proper measures are finished check the coolant level again, and inspect whether the fan belt is loose, and whether there are any foreign substances around the radiator. When the coolant temperature returns to normal temperature, the engine speed is restored to normal speed again.

(2) Hydraulic oil temperature warning lamp



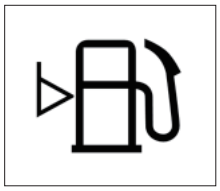
290F3CD62

① This warning lamp pops up on the center of LCD and the buzzer sounds when the hydraulic oil temperature is over 105˚C.

② The pop-up lamp moves to the original position and lights ON when the buzzer stop switch is pushed or pop-up is touched. Also, the buzzer stops and lamp keeps ON.

③ Check the hydraulic oil level and hydraulic oil cooling system.

(3) Fuel level warning lamp



290F3CD63

① This warning lamp lights up and the buzzer sounds when the level of fuel is below 9%.
② Fill the fuel immediately when the lamp is ON.

(4) Emergency warning lamp

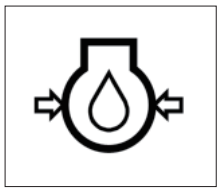
290F3CD64

① This warning lamp pops up and the buzzer sounds when each of the below warnings occurs.
- MCU input voltage abnormal
- Accel dial circuit abnormal or open

※ The pop-up warning lamp moves to the original position and lights ON when the buzzer stop switch is pushed or pop-up is touched. Also the buzzer will stop.
This is same as following warning lamps.

② When this warning lamp lights up, machine must be checked and serviced immediately.

(5) Engine oil pressure warning lamp

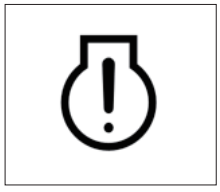


290F3CD65

① This warning lamp lights up when the engine oil pressure is low.
② If the lamp lights up, shut off the engine immediately. Check oil level.

※ Serious damage can be caused to the engine when the engine is operated continuously while the warning lamp is turned ON.

(6) Check engine warning lamp

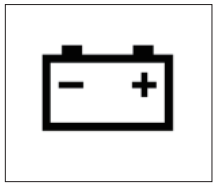


290F3CD66

① Warning lamp is turned ON when the engine must be checked.

※ When the warning lamp is turned ON, stop the machine and find the cause for repair.

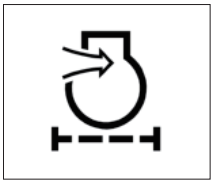
(7) Battery charging warning lamp



290F3CD67

① This warning lamp lights up when the battery charging voltage is low.
② Check the battery charging circuit when this lamp lights up.

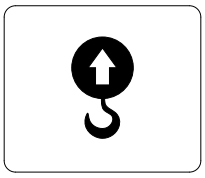
(8) Air cleaner warning lamp



290F3CD68

① This warning lamp lights up when the air cleaner is clogged.
② Check, clean or replace the filter.

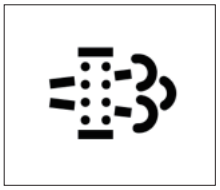
(9) Overload warning lamp (opt)



21093CD36

① When the machine is overloaded, the overload warning lamp lights up when the overload switch is ON. (if equipped)
② Reduce the machine load.
Initiate a manual regeneration

(10) DPF (Diesel Particulate Filter) Warning Lamp



290F3CD70

① This lamp is turned ON or OFF to inform that regeneration is required.
② For details, please refer to the after-treatment system below.

※ After-treatment System

The after-treatment system uses DOG and DPF to satisfy the exhaust regulations.
The oxidation catalyst of DOG reduces the emission of hydrocarbon and carbon monoxide through the catalyst, and the particle materials (PM) discharged from the engine are collected.
DPF regeneration is composed of "forced regeneration" during driving and "manual regeneration" performed by the driver.
When the regeneration is not performed successfully according to the procedure, warning lamp relevant to the each operating condition is turned ON.
When the warning lamp is turned ON, park the machine on a safe place, and perform the regeneration process manually according to the following procedure.
The warning lamp is turned OFF when the regeneration process is performed successfully.

DPF regeneration mode is classified into the following stages according to the soot accumulation level on the DPF.

- Soot level of 80% or less : Normal operating condition
- Soot level of 80~100% : AUTO regeneration during driving
- Soot level of 100~120% : Regeneration initiated by the driver (Manual Regeneration)
- Soot level of 120% or more : Inquiry to the Service Center or agent required
  (DPF warning lamp turned OFF, check engine warning lamp turned ON, engine power reduced)

⚠ Engine power can be reduced when the regeneration process is not performed manually after the warning lamp is turned ON.

※ **DPF Regeneration Procedure**

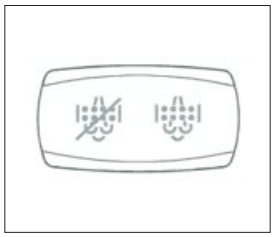
Procedure	Soot Amount	DPF Warning Lamp	Check engine warning lamp	Decrease in Torque	Remark
1	Less than 99%	-	-	-	No action (Manual regeneration according to the equipment)
2	100~105%	-	-	-	Regeneration is started. Performed in high temperature (560~640˚C)
3	106~110%	Blinking slowly	-	-	Forced regeneration induced (Alarm)
4	111~120%	Blinking slowly	Turned ON	Torque reduced weakly	Forced regeneration induced (Decrease in Torque)
5	121% or more	Blinking quickly	Blinking	Torque reduced severely	Regeneration is inactivated. Inquire to the service center or to the agent to start the service regeneration to solve the decrease in torque

- DPF warning lamp is turned ON when the DPF soot exceeds 100%.
- DPF warning lamp is blinked when the DPF soot level exceeds 105%.
- When the DPF soot level exceeds 111%, the DPF warning lamp blinks slowly, and the check engine warning lamp is turned ON to reduce the engine power.
- When the DPF soot level exceeds 121%, the DPF warning lamp blinks slowly, and the check engine warning lamp is turned ON to reduce the engine power.

- DPF regeneration is composed of the active regeneration occurred during driving and forced regeneration activated manually by the driver.
- When the DPF soot level is less than 105%, active regeneration is activated automatically during driving.
  However, the system informs the driver to perform forced regeneration manually when the level is 105% or more.
  The check engine warning lamp is turned ON when the level is 120% or more, and engine power is reduced to 50%. The driver must inquire to the service center or to the agent.

- DPF soot level of 105% or less : Active regeneration
- DPF soot level of 105~120% : Forced regeneration + Engine power reduced
- DPF soot level of 105~120% : Driver is informed that forced regeneration is required.
- DPF soot level of 120% or more : Regeneration not possible, and inquiry required to the service center or to the agent

※ Manual (Forced) DPF regeneration method



HW65A3CD24K

DPF regeneration procedure is activated manually by the driver when the driver selects to initiate the regeneration procedure.
Because the operating condition is inappropriate for the hot engine exhaust temperature (Ex.: Work near the inflammable materials), manual regeneration may be required if the driver prohibited the active regeneration procedure for long period.

① Manual regeneration condition
- Coolant (Engine oil) temperature : 40 ˚C or more
- Engine RPM: Low-speed idle run
- Parking brake must be applied (Only relevant to the wheel-type machine)
- When the soot concentration is accumulated to 20% or more

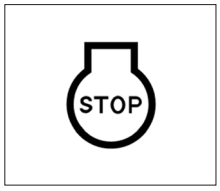
② Manual (Forced) regeneration procedure
Park the machine on a well-ventilated area, and keep away from inflammable materials to set the machine as shown below.
- Operate the machine until the engine coolant and oil temperature becomes 40˚C or more.
- Engine speed is set to low speed.
- Put the gear lever on neutral, and apply the parking brake. (Only relevant to wheel-type machine)
- Safety lever is placed on the locking position.
- When the regeneration mode is in "Prohibit", DPF switch is pressed to the manual regeneration position.

③ Regeneration switch is activated to initiate the regeneration procedure.

※ DPF warning lamp is lighted on the monitor.
While the engine speed is in low speed, the speed is increased gradually to 2000 RPM, and the regeneration procedure is initiated.
Manual regeneration can be continued for maximum of 30 min. or more according to the soot accumulation amount.
HEST lamp is lighted during the regeneration, and HEST lamp is turned OFF when regeneration is stopped.

※ The driver can stop the manual regeneration by lifting the safety lever to the "Release Lock" position, or by pressing the DPF switch to the "Prohibit" position.

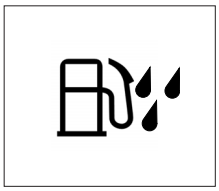
(11) Stop engine warning lamp



290F3CD252

① If this warning lamp lights up, stop the engine immediately and check the engine.
② Check the fault codes on the monitor.
※ **Please contact your HD Hyundai Construction Equipment service center or local dealer.**

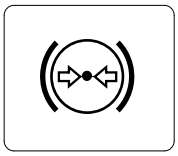
(12) Water in fuel warning lamp



HX60A3CD110

① This warning lamp lights up when the water separator is full of water or malfunctioning.
② When this lamp lights up, stop the machine and drain water from the water separator.

(13) Brake oil pressure warning lamp



55I3CD95A

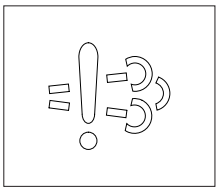
① This warning lamp lights up when the oil pressure of service brake drops below the normal range.
② When the lamp lights up, stop the engine and check for its cause.
※ **Do not operate until any problems are corrected.**

(14) Seat belt reminder warning lamp

300A3CD25

① When operator does not fasten the operator's seat belt, the seat belt reminder warning lamp pops up and the buzzer sounds.
② Fasten the seat belt.

(15) Exhaust System Failure Warning Lamp



HW60A3CD53A

① This warning lamp is turned ON in 3 cases such as when the quantitative distribution is stopped, poor reagent quality and monitoring malfunction, etc.

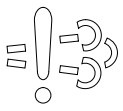
② Please refer to the exhaust gas control system below.

※ Exhaust Gas Control System

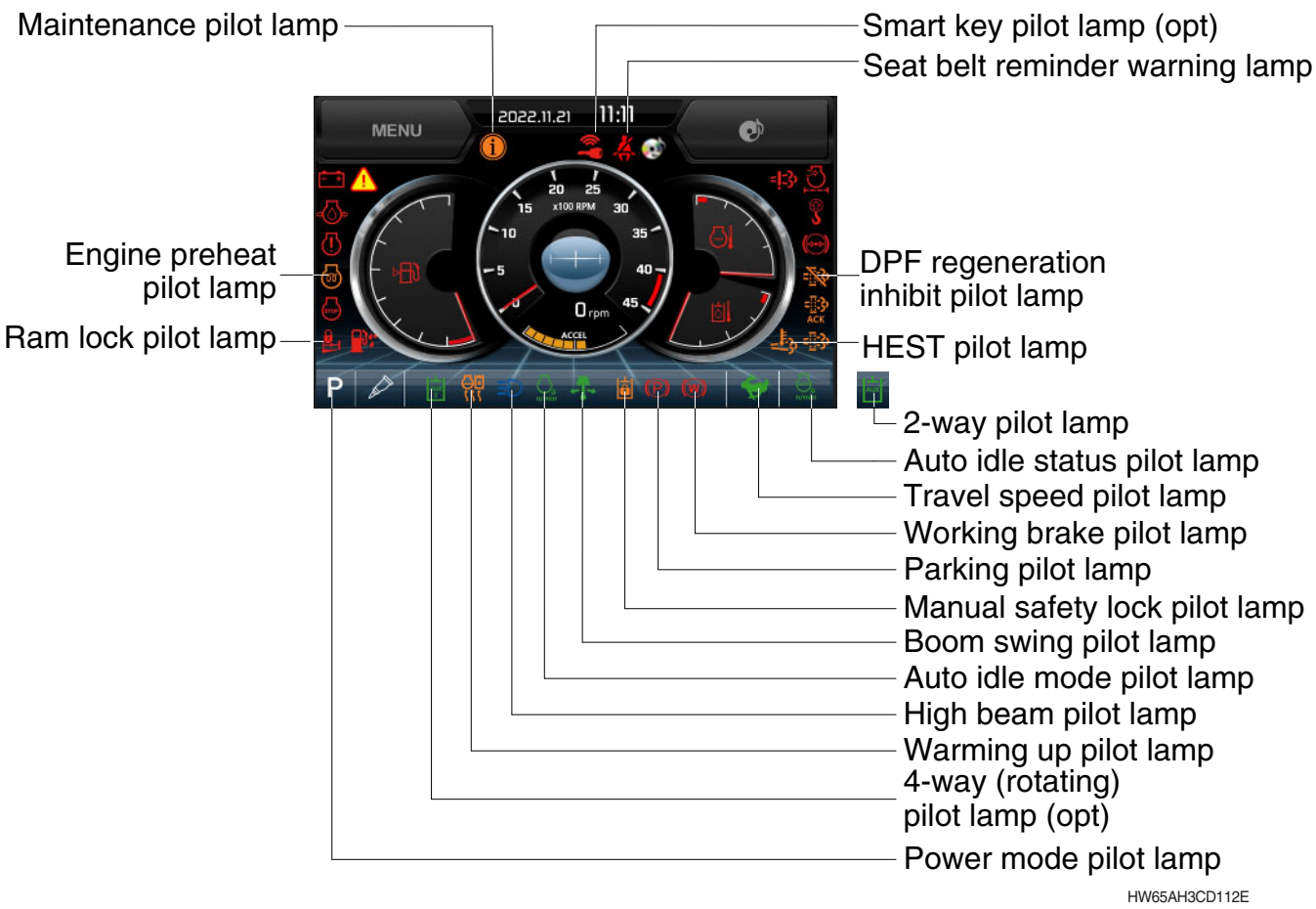
This machine is equipped with the engine exhaust gas emission control system that satisfies the exhaust gas emission regulations. The owner/driver has the responsibility of proper operation and maintenance on the exhaust control system provided in the guaranteed provisions related to emission.

The engine exhaust system is mounted on the DPF. DPF is a emission reduction device that reduces the diesel particulate matter or soot from the exhaust gas of the diesel engine. DPF is stored until the particulate matter is combusted. The process of combustion and elimination of the stored particulate matter is referred to as "Regeneration". After the regeneration process is completed, residue is remaining, and it must be removed from the DPF regularly.

⚠ The temperature of the exhaust gas and components of the exhaust system are in very high temperature during regeneration. There are risks of fire or burn, and it can also result in death, severe injury or property loss. Inflammable materials and explosive gas must be kept far away from the exhaust system during regeneration.

Item	Stage	Reducing Agent Level/Time	Notification Method	Decrease in Torque	Symbol
EGR Valve Problem	Warning	Immediately	Always	-	
	Level 1	+36 hours	Blinking slowly	Torque Limit : ~25%	
	Serious	+64 hours (100 hours)	Blinking quickly + Buzzer	Torque Limit : ~50% Speed Limit : 60%	

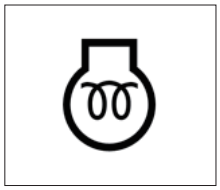
5) PILOT LAMPS



(1) Mode pilot lamps

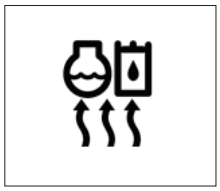
No	Mode	Pilot lamp	Selected mode
1	Power mode	P	Heavy duty power work mode
		S	Standard power mode
2	Travel mode		Low speed traveling
			High speed traveling
3	Auto idle mode		Auto idle mode
			Auto idle status

(2) Preheat pilot lamp


290F3CD79

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

(3) Warming up pilot lamp

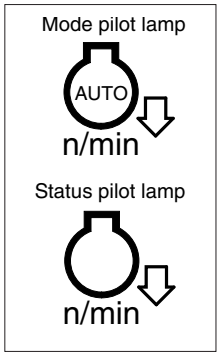


290F3CD80

① This lamp is lights up when the coolant temperature is below 30˚C (86˚F).

② The automatic warming up is cancelled when the engine coolant temperature is above 30˚C (86˚F), or when 10 minutes have passed since starting the engine.

(4) Auto idle status/ mode pilot lamp



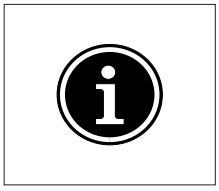
85A3CD106

① The auto idle mode pilot lamp will light up when the idle mode is selected.

② The auto idle status pilot lamp will be ON when all levers and pedals are in the neutral position, and the auto idle mode is selected.

③ One of the lever or pedal is operated, the status lamp will go OFF and the engine speed returns to the previous conditions.

(5) Maintenance pilot lamp



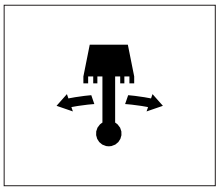
HX60A3CD116

① This lamp lights up when consumable parts are in need of replacement. It means that the change or replacement interval of parts is 30 hours from the required change interval.

② Check the message in maintenance information of main menu. Also, this lamp lights up for 3 minutes when the start switch is switched to the ON position.

※ **Refer to page 4-24.**

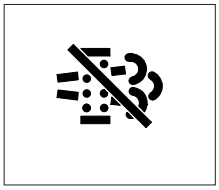
(6) Boom swing pilot lamp



HX603CD82

① This lamp lights up when the boom offset switch is pressed.

(7) DPF regeneration inhibit warning lamp

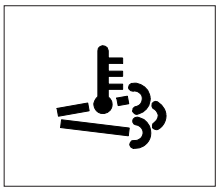


85A3CD107

① This warning lamp indicates, the DPF switch is pushed to the inhibit position, therfore automatic and manual regeneration can not occur.

※ **Refer to page 4-41 for the DPF switch.**

(8) HEST (High exhaust system temperature) warning lamp



85A3CD109

① This warning lamp indicates, when illuminated, that exhaust temperatures are high due to regeneration of the DPF.
② The lamp will also illuminate during a manual regeneration.
③ When this lamp is illuminated, be sure the exhaust pipe outlet is not directed at any surface or material that can melt, burn, or explode.

⚠ When this lamp is illuminated, the exhaust gas temperature could reach 600˚C [1112˚F], which is hot enough to ignite or melt common materials, and to burn people.

※ The lamp does not signify the need for any kind of equipment or engine service; It merely alerts the equipment operator to high exhaust temperatures. It is common for the lamp to illuminate on and off during normal equipment operation as the engine completes regeneration cycles.

(9) Parking pilot lamp

210WF3CD05

① This lamp lights up when the the parking switch is set to the parking position.

※ Refer to the page 4-41.

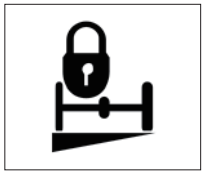
(10) Working brake pilot lamp

210WF3CD07

① This lamp lights up when the working brake switch is set to working position.

※ Refer to page 4-41

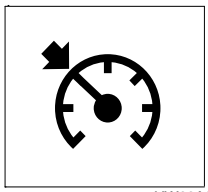
(11) Ram lock pilot lamp



210WF3CD04

① This lamp lights up when the ram lock switch is set to the LOCK position.
② Also, this lamp lights up when the select switch is set to the parking position or the brake pedal is applied in the traveling.

(12) Cruise pilot lamp



HW60A3CD46

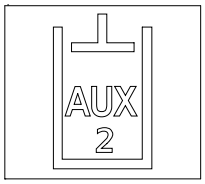
① This lamp lights up when the auto-cruise of panel switch is pressed.
Refer to the page 4-40.

(13) High beam pilot lamp

210WF3CD06

① The lamp lights up when the head lamp switch is set to the high beam position or passing conditions.
② When passing other machines ahead, this lamp must be used for a few seconds to give other machines warning for a few seconds.

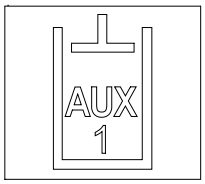
(14) 4-way (rotating) pilot lamp (opt)



HW60A3CD48A

① This lamp lights up when the boom swing selection switch is set to the rotator (not used boom swing) and the 4-way operation switch on the LH control lever is pressed.
※ **Refer to the page 4-43.**

(15) 2-way pilot lamp



HW65A3CD49

① This lamp lights up when the option flow control function is activated in the cluster.
※ **Refer to the page 4-24.**

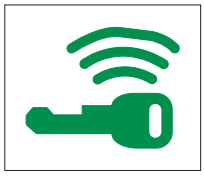
(16) Manual safety lock pilot lamp

140WA3CD37

① This lamp lights up when the safety knob is set to the LOCK position.

※ **Refer to the operator's manual page 3-47 for the safety knob.**

(17) Smart key pilot lamp (opt)



300A3CD36A

① This lamp lights up when the engine is started by the start button.

② This lamp is red when the a authentication fails, it will be green when it authentication is successful.

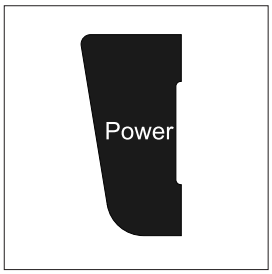
※ **Refer to the page 4-28.**

6) SWITCHES

HW65AH3CD117D

※ **When the switches are selected, the pilot lamps are displayed on the LCD. Refer to the page 3-12 for details.**

(1) Power mode switch

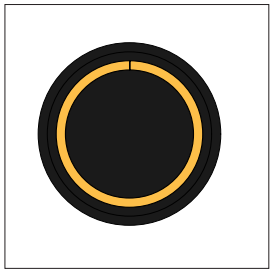


HX60A3CD118

① This switch is to select the machine power mode and when pressed, the power mode pilot lamp will be displayed on the section of the monitor.
- P : Heavy duty power work.
- S : Standard power work.

② The pilot lamp changes S → P → S in this order.

(2) Select switch



HX60A3CD119

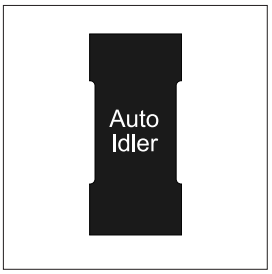
① This switch is used to select or change the menu or input value.

② Knob push
- Short (below 0.5 sec) : Select menu

③ Knob rotation

This knob changes menu and input value.
- Right turning : Down direction / Increase input value
- Left turning : Up direction / Decreased input value

(3) Auto idle switch

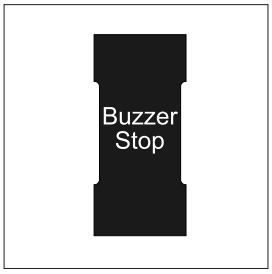


HX60A3CD120

① This switch is used to activate or cancel the auto idle function.

※ **Refer to the page 4-13 for details.**

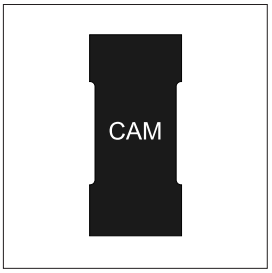
(4) Buzzer stop switch



HX60A3CD121

① The buzzer sounds when the machine has a problem.
In this case, push this switch and buzzer stops, but the warning lamp lights up until the problem is cleared.

(5) Camera switch

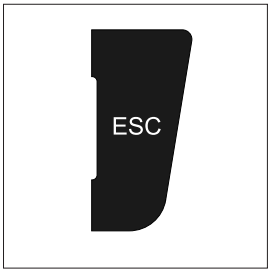


HX60A3CD122

① In the operation screen, pushing this switch will display the view of the camera on the machine (if equipped).

※ **Please refer to page 4-35 for the camera.**

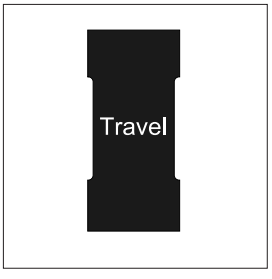
(6) Escape switch



HX60A3CD123

① This switch is used to return to the previous menu or parent menu.

(7) Travel speed control switch



HX60A3CD104

① This switch is used to select the travel speed alternatively.

- : Low speed
- : High speed

※ **Do not change the setting of the travel speed switch while machine is moving. Machine stability may be adversely affected.**

⚠ **Serious injury or death can result from sudden changes in machine stability.**

7) MAIN MENU

Main menu screen

HX60A3CD124A

Tap MENU or Press

Press

Sub menu screen

HW60AH3CD125A

※ Please refer to the select switch, page 4-18 for selection and change of menus and input values.

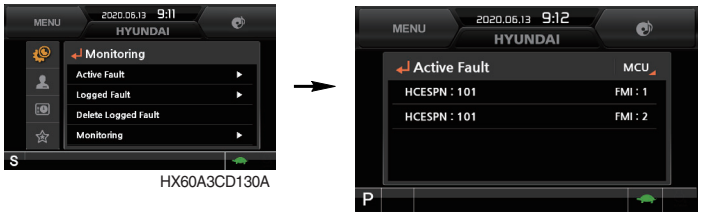
※ In the operation screen, tap MENU or press the select switch to access the sub-menu screen.

(1) Structure

No	Main menu	Sub menu	Description
1	 Monitoring 55I3CD51A	Active fault - Machine Active fault - Engine Logged fault - Machine/engine Delete logged fault Monitoring - Machine Monitoring - Switch Monitoring - Output	MCU ECU MCU, ECU MCU, ECU Engine rpm, oil temp, voltage and pressure etc. Digital switch status Digital output status
2	 Management 55I3CD51B	Maintenance information Option flow control ESL mode setting Change password Machine information A/S phone number Cluster update CAN update Service menu	Elapsed time, Change interval, Replacement etc. Opt attch set, Proportional flow control set, Confifirmation ESL mode setting Password change Cluster, MCU, Engine, Machine A/S phone number, A/S phone number change Application, System Program download, Update Power shift, Operating hour, Gauge type, Rpm, AVCU set, Language update etc
3	 Display 55I3CD51C	Clock Brightness Unit Language	Current time set Manual, Auto Temperature, Pressure, Flow, Distance, Volumn 22 kinds
4	 Utilities 55I3CD51D	Entertainment Camera setting Clinometer setting Manual Emergency mode Quick cooling mode	Video/music file playing Setup of number of active cameras, display sequences, and camera numbers Initializing slope sensor Display cluster manual Back-up switch for failed cluster switch and accel dial To maximize engine cooling performance

(2) Monitoring

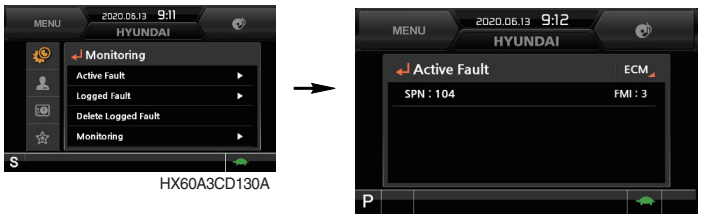
① Active fault - Machine



HX60A3CD130A HX60A3CD131A

· The active faults of the machine MCU can be checked by this menu.

② Active fault - Engine



HX60A3CD130A HX60A3CD133A

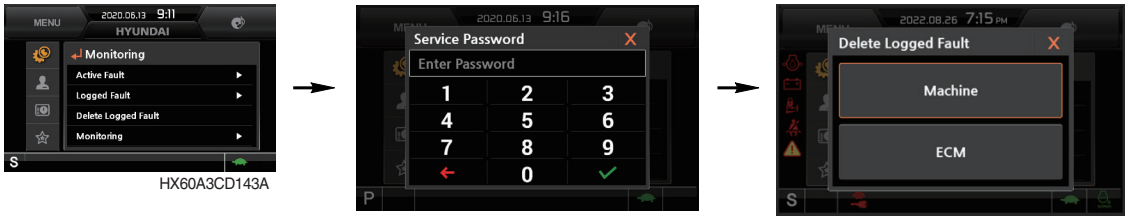
· The active faults of the engine ECU can be checked by this menu.

③ Logged fault - Machine/ Engine

HX60A3CD134A HX60A3CD135A HX60A3CD136A

· The logged faults of the machine MCU or engine ECU can be checked by this menu.
· This menu can be used only HCE service man.

④ Delete logged fault

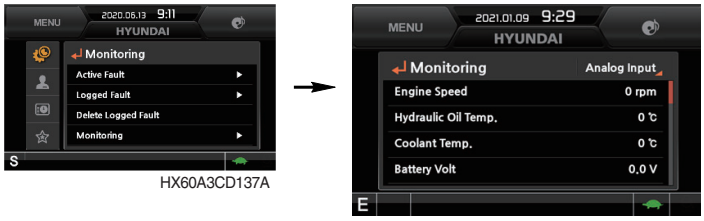


HX60A3CD143A HX60A3CD144A HW60AH3CD145A

HX60A3CD146A HW60AH3CD147A

· The logged faults of the MCU, engine ECU can be deleted by this menu.
(It is possible under the engine stop conditions)

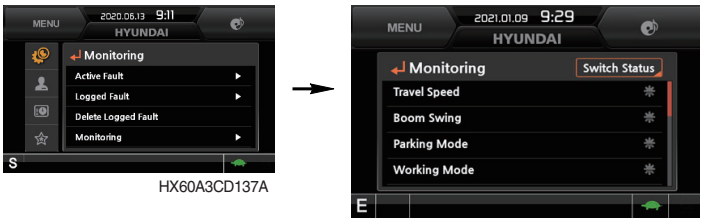
⑤ Monitoring (machine status)



HX60A3CD137A HX60A3CD138A

· The machine status such as the engine rpm, oil temperature, voltage and pressure etc. can be checked by this menu.

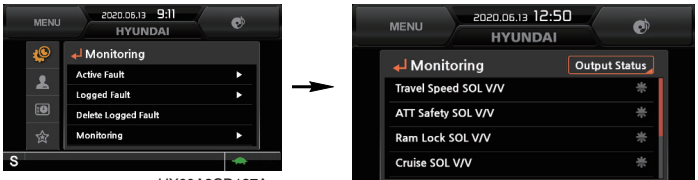
⑥ Monitoring (switch status)



HX60A3CD137A HX60A3CD140A

· The digital switch status of the machine can be checked by this menu.
· The activated switch will display in blue color.

⑦ **Monitoring** (output status)



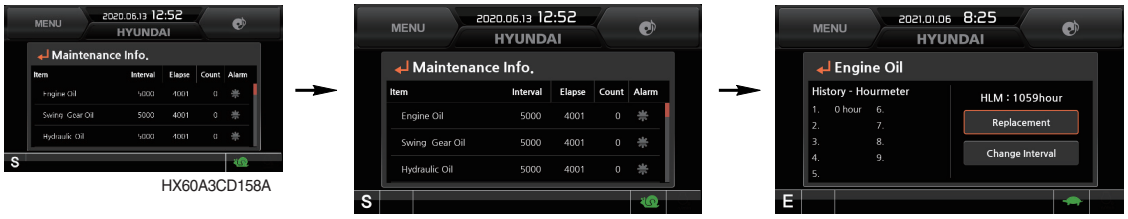
HX60A3CD137A

HX60A3CD142A

- The digital output status of the machine can be checked by this menu.
- The digital output status will display in blue color.

(3) Management

① Maintenance information



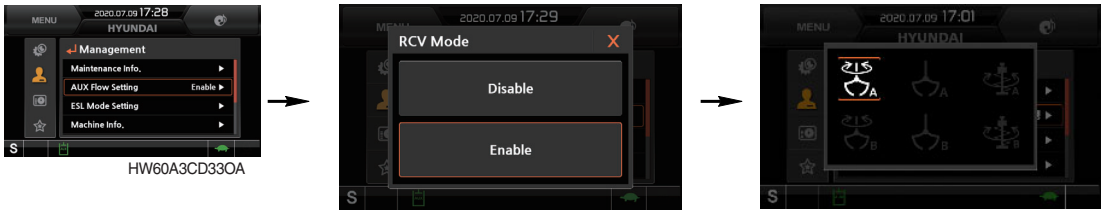
HX60A3CD158A HX60A3CD199K HX60A3CD157A

- Elapsed time : Display the elapsed time after the maintenance.
- Change interval : The change intervals can be changed in hour increments of 50.
- Change history : Display the change history for the maintenance.
- Replacement : The elapsed time will be reset to zero (0).
- Change or replace interval

※ **Refer to the operator's manual page 6-16.**

② Option flow control

a. Option attach selection



HW60A3CD33OA HW60A3CD41OA HW60A3CD42O

- Three kinds of option attachment can be selected by this menu.
  - ⓐ Rotary grapple (4-way)
  - ⓑ Grapple (2-way)
  - ⓒ Auger (2-way)

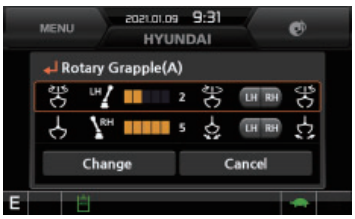
※ **There are two user modes (type A or B) in each option attachment.**

b. Proportional flow control setting

The preferable value of each option attachment can be set by this menu.

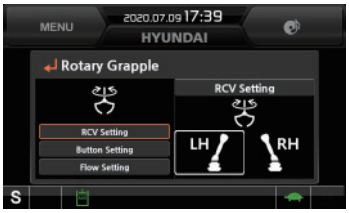
a) Rotary setting

HW60A3CD42O



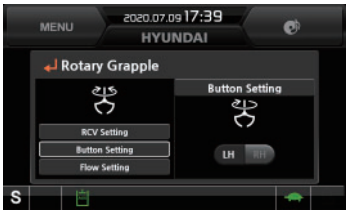
HW60A3CD51OA

· Select rotary
RCV, button and flow can be set by this menu



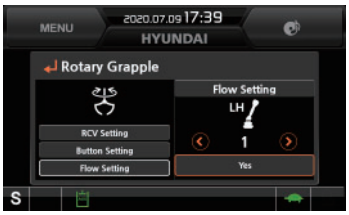
HW60A3CD52OA

· RCV setting
– Enable set LH or RH RCV for rotary operation.
– Select LH for rotary → RH set for grapple automatically



HW60A3CD53OA

· Button setting (CW rotation)
– Select LH for CW rotation → RH set for CCW rotation automatically

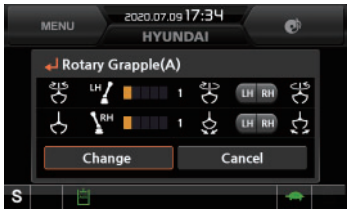


HW60A3CD54OA

· Flux setting
– Enable set from level 1 to level 5.

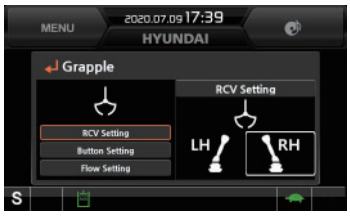
b) Grapple setting

HW60A3CD42O



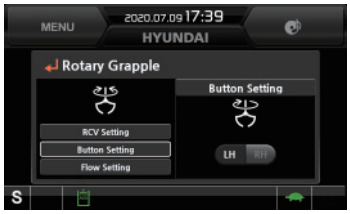
HW60A3CD61OA

· Select grapple
RCV, button and flow can be set by this menu



HW60A3CD62OA

· RCV setting
– Enable set LH or RH RCV for grapple operation.
– Select LH for grapple → RH set for rotary automatically



HW60A3CD63OA

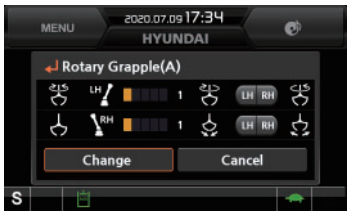
· Button setting (Close)
– Select RH for Close → LH set for open automatically

HW60A3CD72OA

HW60A3CD64OA

· Flow setting
– Enable set from level 1 to level 5.

HW60A3CD42O



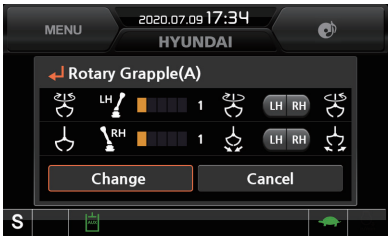
HW60A3CD71OA

· Flow setting value can be saved by pressing change button.

※ Setting value saved once, it memorized in each icon and the last setting value is activated.
※ Saved setting can be used by pressing Icon button only.
※ There are two kinds (A and B) in each option attach setting and six kinds of option attach setting can be saved totally (2 of 4-way, 4 of 2-way).

c) Confifirmation

HX60A3CD81OA



HW60A3CD71OA

※ Symbol ( ) is activated on the low side of main screen when option attach function is used.

※ Previous setting value can be checked by following procedure.

– Menu > Management > option attach

a) Rotary setting

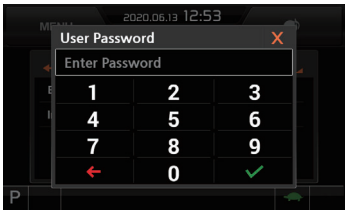
– Rotary RCV : LH
– Rotary flow level : 3
– CW rotation : LH
– CCW rotation : RH

b) Grapple setting

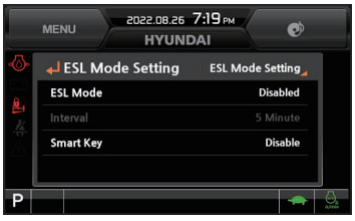
– Grapple RCV : RH
– Grapple flow level : 3
– Open : LH
– Close : RH

③ ESL mode setting

HX60A3CD148A



HX60A3CD149A



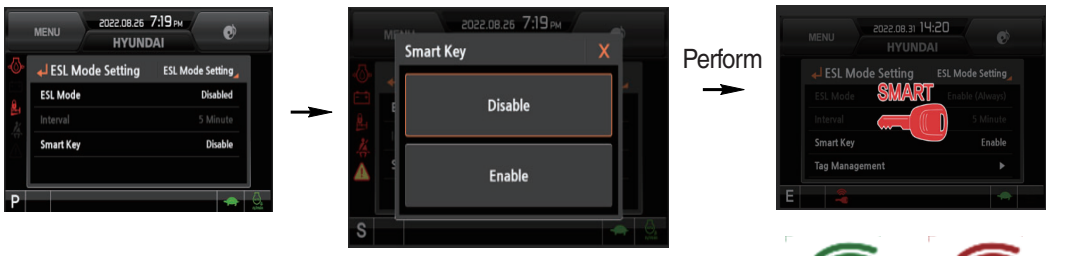
HW60AH3CD150A

– ESL : Engine Starting Limit
– ESL mode is designed to be a theft deterrent or will prevent the unauthorized operation of the machine.
– When you Enable the ESL mode, the password will be required when the starting switch is turned to the on position.
– Disable : ESL function is disabled and password is not required to start engine.
Enable (always) : The password is required whenever the operator starts engine.
Interval : The password is required when the operator starts engine first. But the operator can restart the engine within the interval time without inputting the password.

※ The interval time can be set to a maximum 4 hours.

※ Default password : 00000
Password length : 5~10 digits

Start Limit - Smart Key Setting (When smart key is installed)



Authentication successful

Authentication failed

- **Smart Key Exclusive**

  When the Smart key option (optional) is installed, Smart key menu is shown, and performance or non-performance of Smart key authentication can be set through the Smart key menu.

  When the Smart key is not in the cabin, the approval procedure is rejected, and password must be entered.

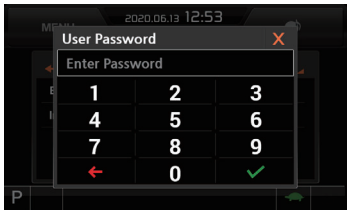
Start Limit - Tag Management

- The tag management menu is activated only when the Smart key menu is set through performance. Tag can be registered or deleted.
  - · When registering the tag : Locate only the tag preferred for registration inside the cabin.
  - · When deleting the tag : All registered tags are deleted.

④ Password change

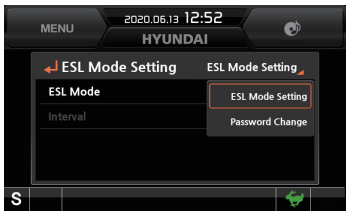
– The password is 5~10 digits.

HX60A3CD151A



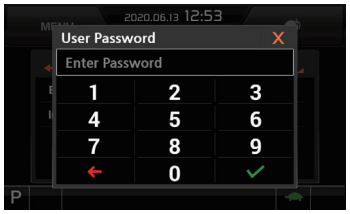
HX60A3CD149A

Enter the current password



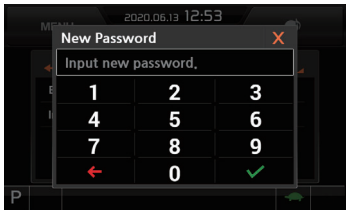
HX60A3CD153A

Select the password change



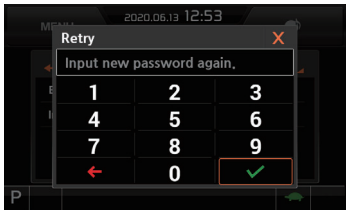
HX60A3CD149A

Enter the new password



HX60A3CD155A

Enter the new password again

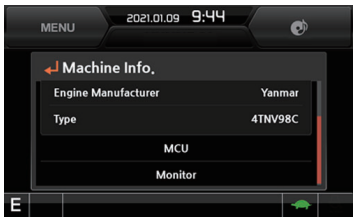


HX60A3CD156A

Saved the new password in the MCU

⑤ Machine information

HX60A3CD160A



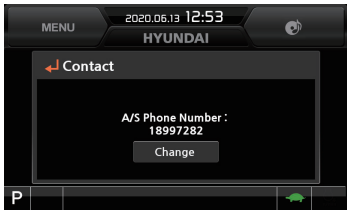
HX60A3CD161A

HX60A3CD162A

· The information of the cluster, machine MCU and engine and machine checked by this menu.

⑥ A/S phone number

HX60A3CD163A

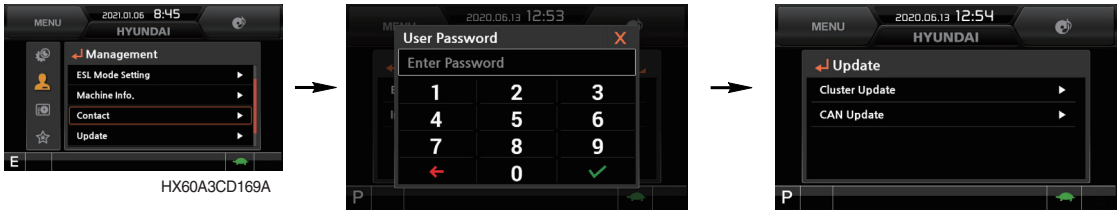


HX60A3CD164A

HX60A3CD165A

· The A/S phone number can be checked and changed.

⑦ Cluster update



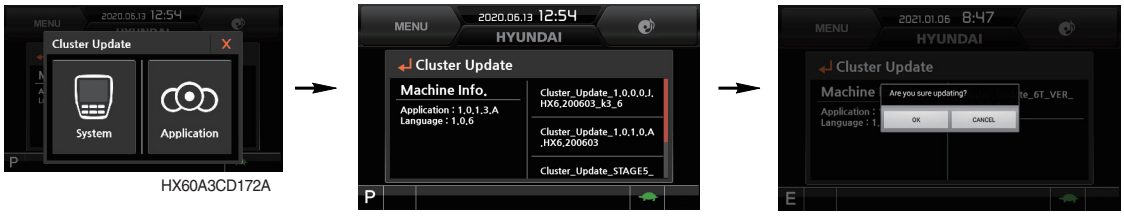
HX60A3CD169A HX60A3CD149A HX60A3CD170A

Enter the user password Select the cluster update

· The cluster and CAN device can be updated by this menu.

※ **Do not turn power off while updating.**

a. Application update



HX60A3CD172A HX60A3CD173A HX60A3CD174A

Select application item Select file to update Select OK

HX60A3CD176 HX60A3CD175A

Completed In process

b. System update

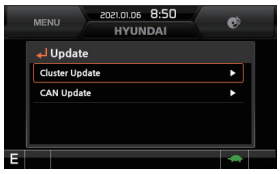
HX60A3CD177A HX60A3CD173A HX60A3CD174A

Select system item Select file to update Select OK

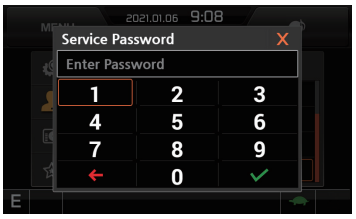
HX60A3CD176 HX60A3CD175A

Completed In process

⑧ CAN update

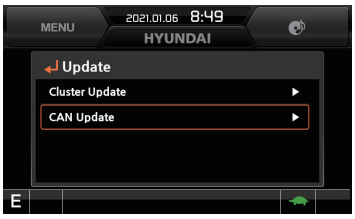


HX60A3CD169A



HX60A3CD149A

Enter the user password



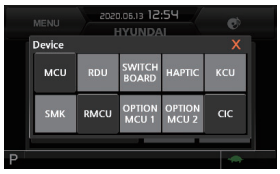
HX60A3CD179A

Enter the CAN password again

· The application program can be downloaded and updated by this menu.

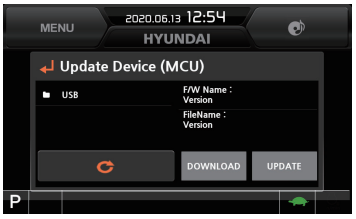
※ **Do not turn power off while updating.**

a. Download



HX60A3CD180A

Select update device

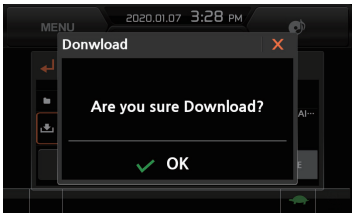


HX60A3CD181A

Select download

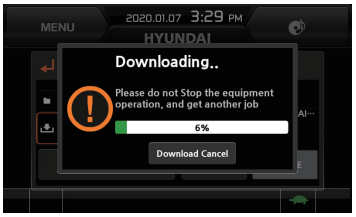
HX60A3CD182A

Select download after choose update file



HX60A3CD183A

Confirm download



HX60A3CD184A

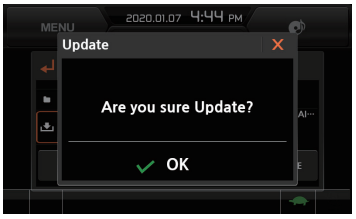
Stop download when select the cancel

HX60A3CD185A

b. Update

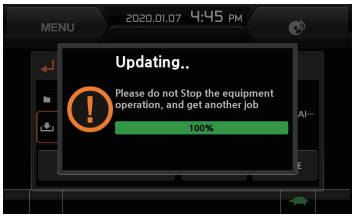
HX60A3CD186A

Select update after the download.



HX60A3CD187A

Confirm the update

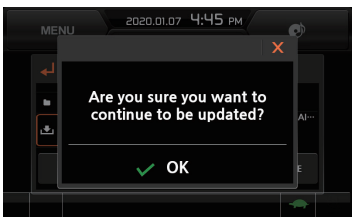


HX60A3CD188A

In process update

HX60A3CD175A

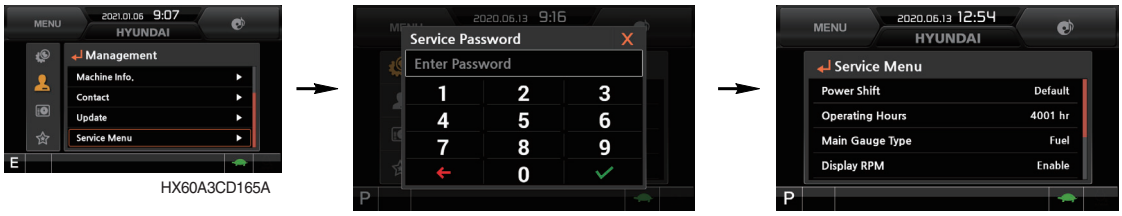
Completed update



HX60A3CD190A

Select the OK to update another application program

⑨ Service menu



HX60A3CD165A HX60A3CD144A HX60A3CD168A

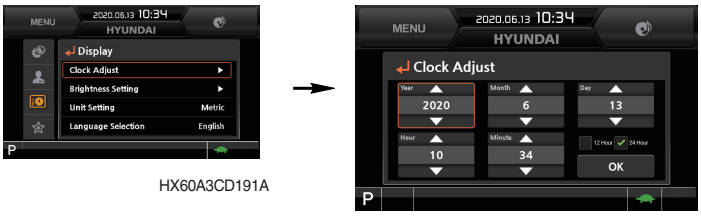
Enter the manager password

- Power shift : Power shift mode (default/option can be set by this menu.
- Operating hours : Operating hours in individual modes since the machine line out can be checked by this menu.
- Main gauge type : The engine rpm or fuel level gauge can be display on the main gauge of the main screen by this menu.
- Display RPM : Display the numeric value of engine rpm on the main gauge of the main screen can be set by this menu.
- AVCU setting : Standard, 2-Way or 4-Way dependent upon the machine options can be selected by this menu.
- Adding language : The language displayed on the cluster can be update by this menu when it is required to correct language.

※ This menu can be used only HCE service man. Do not attempt unauthorized adjustment.

(4) Display

① Clock adjust

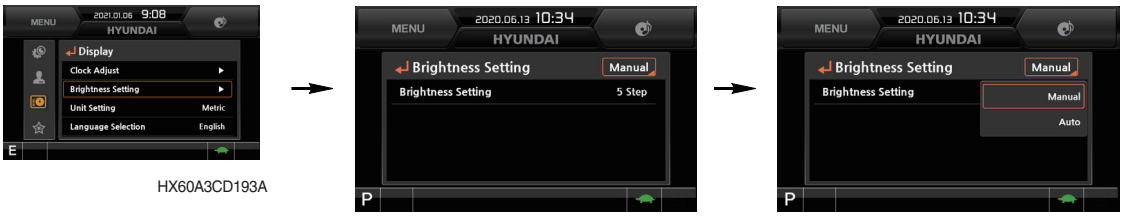


HX60A3CD191A

HX60A3CD192A

- The first row of boxes indicate Year/Month/Day.
- The second row shows the current time. (AM, PM/0:00~12:59)

② Brightness

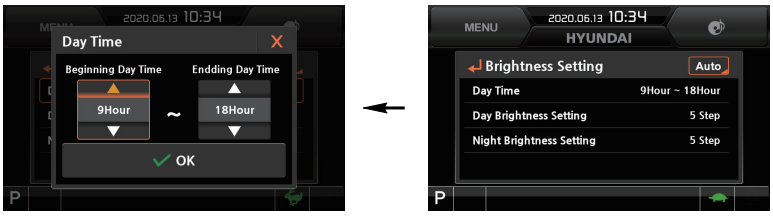


HX60A3CD193A

HX60A3CD194A

HX60A3CD195A

Manual (1st~10th step)



HX60A3CD197A

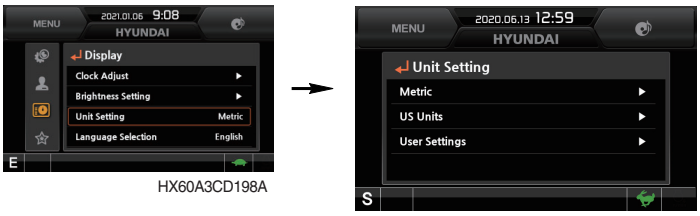
Auto (day/night)

HX60A3CD196A

Auto (day time)

- If "Auto" is chosen, brightness for day and night can be set accordingly. Also, users can define which day time interval. (Set day starting time and ending time)

③ Unit set



HX60A3CD198A

HX60A3CD199A

– Metric units : Units change to metric units.
– US units : Units change to U.S. units
– User setting : Units change to user setting units

Item	Metric units	U.S. units	User setting
Temperature	˚C	˚F	˚C, ˚F
Distance	km	mile	km, mile
Pressure	bar	Mpa	bar, Mpa, kgf/cm^2, psi
Flow	lpm	gpm	lpm, gpm
Volume	l	gal	l, gal

④ Language selection

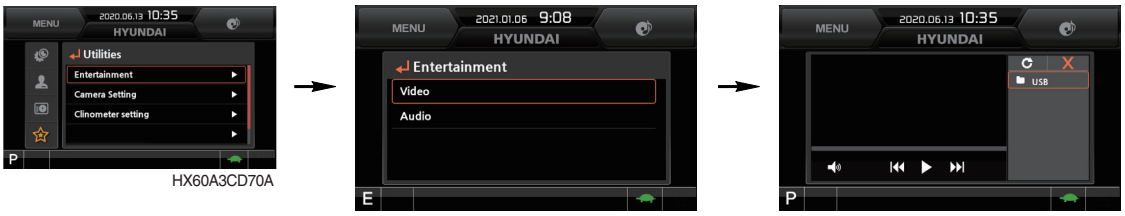
HX60A3CD200A

HX60A3CD201A

· User can select preferable language (22 languages) and all displays are changed the selected language.

(5) Utilities

① Entertainment



HX60A3CD70A

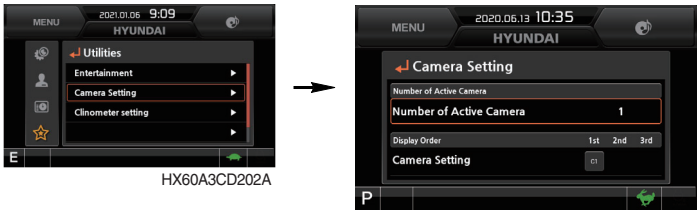
HX60A3CD208A

HX60A3CD209A

- Play MP4 or codec file of external hard disk through USB port.
- The USB port is located left side of the cluster.
- Over 1100 engine rpm, the screen turns into the operation screen with MP4 or codec file playing for the safety. The video is played again when the engine revolution is 1100 rpm or less.

⚠ **The video play is prohibited for the safety reason when the machine is operated.**

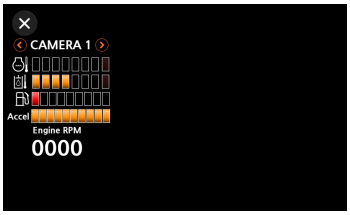
② Camera setting



HX60A3CD202A

HX60A3CD203A

- Three cameras can be installed on the machine and display order can be set by this menu.
- If the camera is not equipped, this menu is not useful.
- Turning the select switch in clockwise direction, the next ordered will be shown and in counter-clockwise direction, the previously ordered will be shown. Also, the camera channel can be changed by touching the screen.
- Display change to reduction size or display is not visible by pushing the select switch or touch the screen.
  (display reduction size → hiding → display)



HX60A3CD204

- The camera display is terminated by pressing the ESC switch or touch the X icon on the screen.

■ Rear / RH view camera UI setting (Option)

1) Camera control switch

– Select the CAM switch to activate Rear / RH view camera from the beginning screen.
– While in that mode, select the ESC switch to return to the home screen.

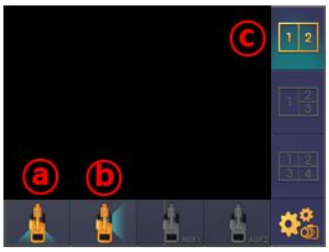
2) Cam image control (CIC) mode

– Touch ⓐ(Rear), ⓑ(RH) button on screen to set single-view camera mode.
– Touch ⓒ(2CH-split-view) button to set split-view camera mode.

ⓐ (Rear)

ⓑ (RH)

ⓒ (2CH Split-view)



Rear / RH view option

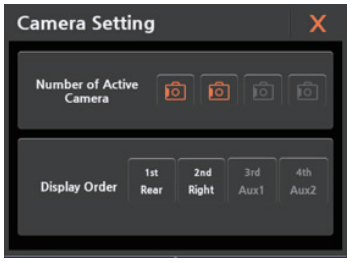
3) Split-view Camera order setting

– Touch ⓓ (camera setting) button to set split-view camera order.

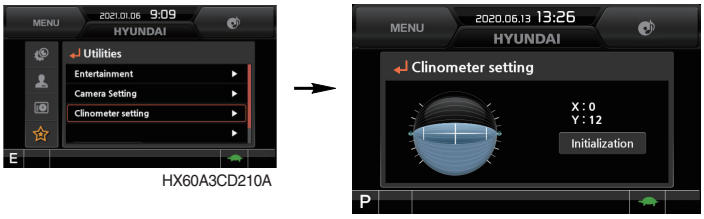
ⓓ(Camera Setting)

Rear / RH view option

– You can change spilt-view camera order on display order menu.



③ Clinometer setting

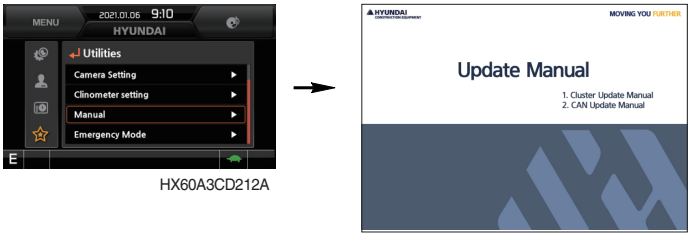


HX60A3CD210A

HX60A3CD211A

· When the machine is on the flatland, if you touch "initialization" on cluster, the values of X, Y will reset to "O".
· You can confirm tilt of machine in cluster's operating screen.

④ Manual

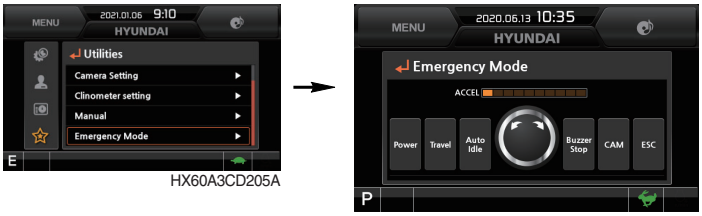


HX60A3CD212A

HX60A3CD213A

· Manual of the cluster can be read on the monitor.

⑤ Emergency mode



HX60A3CD205A

HX60A3CD206A

· When switches of the monitor and the accel dial fails, switches are displayed on LCD, and you are allowed to perform operation by touching the screen.
· Such operation is allowed only on this mode screen.

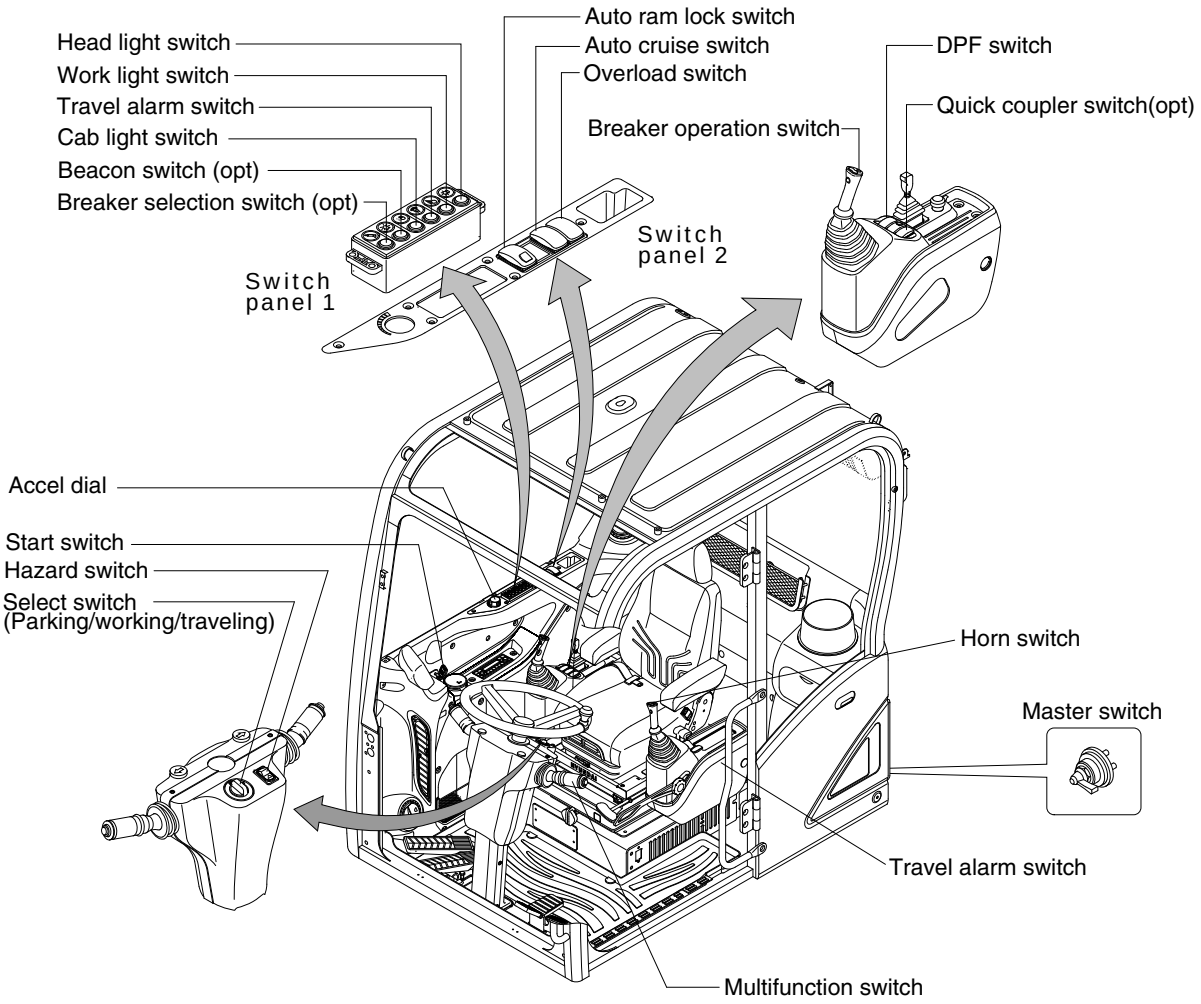
⑥ Quick Cooling Mode

HW60AH3CD205A

HW60AH3CD206A

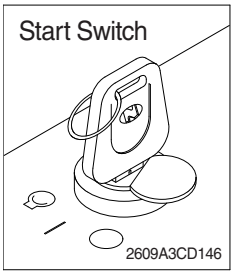
· While the machine is stopped and discontinued with operation, engine can be operated in maximum RPM for maximum rotation of the radiator fan. (Max. for 5 minutes)
- Setting : When the machine is stopped, the safety lever is lowered to set the quick cooling mode in the locked state
- Release : Released when the operating time exceeds 5 minutes, when the safety lever is cleared, and when the quick cooling mode release button is pressed

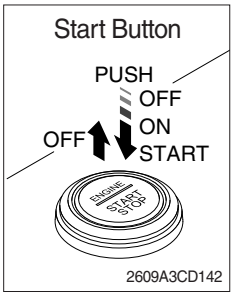
4. SWITCHES



HW65AH3CD02-2A

1) START SWITCH AND BUTTON (OPTIONAL)





Start button and Smart key tag (Optional)

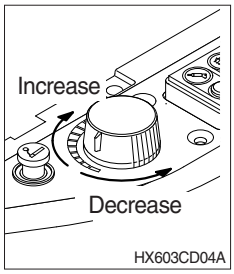
(1) There are 3 switches of OFF, ON and START.

- ◯ (OFF) : As the position possible for inserting and removing the key, engine is stopped when the key is in the OFF position while the engine is operating.
- | (ON) : The overall machine system is operated.
- ⚷ (START) : It is used to start the engine. Remove your hand after engine is started.

※ When the start switch is turned ON in the winter season, the coolant temperature is detected to operate the fuel heater automatically, and the fuel is heated.
When the start switch is turned ON, the engine is started in 1~2 minutes. More time may be required according to the outdoor temperature.

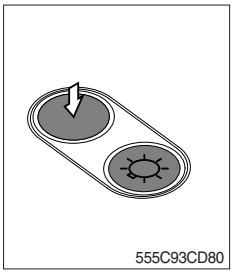
※ To maintain the electrical and hydraulic functions, and to prevent machine damage, the start switch is placed on the ON position when the engine is operating.

2) ACCEL DIAL



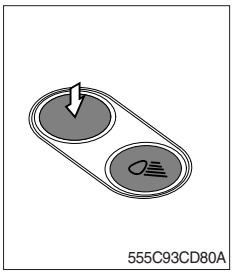
(1) There are 10 dial setting.
(2) Setting 1 is low idle and setting 10 is high idle.
- By rotating the accel dial to right : Engine speed increased.
- By rotating the accel dial to left : Engine speed decreased.

3) HEAD LIGHT SWITCH



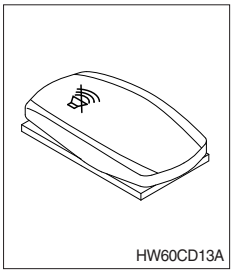
(1) This switch is used to operate the head light.
- Press the switch once, the head light comes ON and the pilot lamp ON.
- Press the switch once more, the head light and pilot lamp turn off.

4) WORK LIGHT



(1) This switch is used to operate the work light.
- Press the switch once, the work light comes ON and the pilot lamp ON.
- Press the switch once more, the work light and pilot lamp turn off.

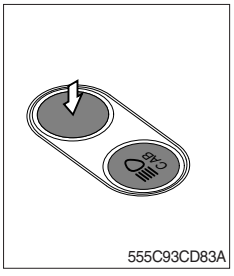
5) FORWARD TRAVEL ALARM SELECTION SWITCH



(1) Warning sound on forward travel of the machine can be selected. (ON/OFF)

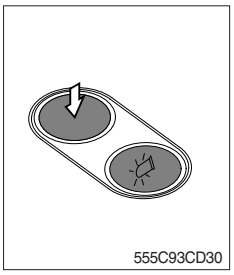
※ **Alarm is not sounded during forward travel when the switch is pressed forward.**

6) CAB LIGHT SWITCH



(1) This switch turns on the cab light on the cab.

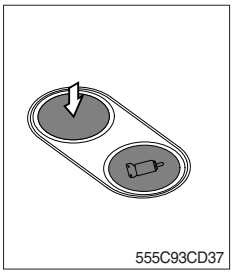
7) BEACON SWITCH (opt)



(1) This switch turns ON the rotary light on the cab.

(2) The below indicator lamp is turned ON when operating this switch.

8) BREAKER SELECTION SWITCH (opt)



(1) This switch is used to operate breaker.

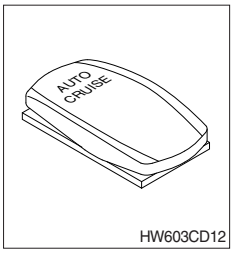
※ **The breaker operates only when this switch is pressed.**

9) QUICK COUPLER SWITCH (opt)

(1) This switch is used to engage or disengage the moving hook on quick clamp.

※ **Refer to the operator's manual page 8-10 for details.**

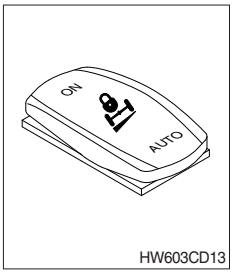
10) AUTO-CRUISE SWITCH



(1) When selected, this switch allows the user to drive at high speed with a constant pause at the speed selected by the uwer when selected.

(2) This switch is released when the brake pedal is pressed.

11) AUTO RAM LOCK SWITCH



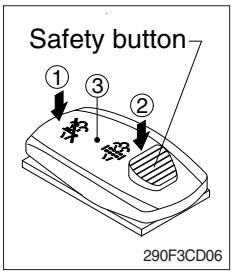
(1) This switch activate front axle oscillation cylinder to locking position for increase of stability.

· ON : Set front axle to locking position for excavation work or travels even ground. Also, the ram lock pilot lamp comes ON at the travel pilot lamp.

· AUTO : Set front axle to locking or unlocking as table.

Select switch (parking/working/ traveling)	Ram lock	Conditions
Parking (P)	Locking	· Always
Traveling (T)	Unlocking	· Always
Working (W)	Locking	· FNR lever in neutral position · Service brake pedal is depressed.
	Unlocking	· FNR lever in forward/reverse position and service brake pedal is not depressed. · 2 way pedal is equipped and service brake pedal is not depressed.

12) DPF (Diesel Particulate Filter) Switch



(1) This switch is used to select the regeneration function on DPF.

(2) Prohibit Switch (①)

① When set to the prohibit position, the AUTO or manual DPF regeneration is not allowed.

② It is used to prevent DPF regeneration when operating the machine in the environment that is dangerous in high temperature.

③ This position is recommended for operation limited to only when it becomes dangerous in high temperature.

④ Even when the DPF regeneration switch is in “Prohibit” position, initialization/forced regeneration can be requested according to the condition, and the warning lamp can be turned ON or OFF.

: The DPF regeneration indicating lamp can be blinking on the cluster.

: The DPF warning lamp may be turned ON or blinking.

(3) AUTO Position (③)

In this position, DPF regeneration is performed automatically.

(4) Manual Regeneration Position (②)

① In this position, the machine is not used while the engine is in low-speed idle run, and manual DPF regeneration is performed when the DPF soot level is in the sufficient level to permit regeneration.

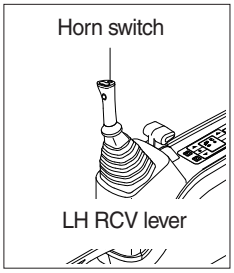
② While the DPF regeneration is performed, the HEST lamp is turned ON.

※ **For details, please refer to page 4-9.**

※ **The safety button must be pulled back to move to the manual position (②).**

In addition, it is returned to AUTO position when released from the manual position (s

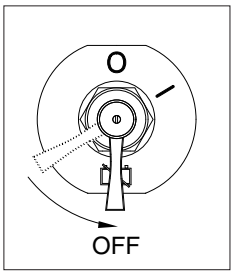
13) HORN SWITCH



HX603CD21

(1) This switch is at the top of left side control lever.
On pressing, the horn sounds.

14) MASTER SWITCH



35Z9A3CD36

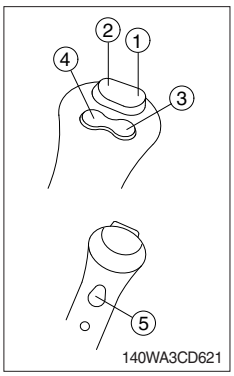
(1) This switch is used to shut off the entire electrical system.

(2) I : The battery remains connected to the electrical system.
O : The battery is disconnected to the electrical system.

※ **Never turn the master switch to O (OFF) with the engine running. It could result in engine and electrical system damage.**

15) LH RCV LEVER SWITCH

(1) Proportional type



The switches on the LH RCV lever is function as below.

① CW rotating switch

When this switch is pressed, the boom swing or clockwise rotating

② will operate.

CCW rotating switch

When this switch is pressed, the boom swing or counterclockwise

③ rotating will operate.

Horn switch

④ When this switch is pressed, the horn will sound.

Ram lock switch

This switch activates only automatic mode.

When the control lever switch is pressed for 5 seconds, the front axle is locked.

⑤ The indicator lamp lights up when this switch is activated.

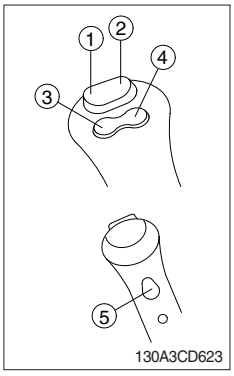
Boom swing/rotating switch (opt)

This switch is used to operate boom swing or rotation (if equipped rotating piping).

· Switch and flow can be set on cluster.

16) RH RCV LEVER SWITCH

(1) Proportional type



The switches on the RH RCV lever is function as below.

① **2-way clamp switch**

When this switch is pressed, the clamp will only operate when the crusher operation mode is selected.

② **2-way release switch**

When this switch is pressed, the release or breaker will operate when the crusher operation mode or breaker operation mode is selected.

③ **Proportional type ON/OFF switch**

The 4-way operation is activated only by turning on the proportional control ON/OFF switch located on the left control level.

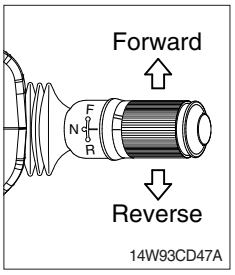
④ Breaker

When this switch is pressed, the breaker will only operate when the breaker operation mode is selected.

⑤ None

17) RH MULTI FUNCTION SWITCH

(1) FNR lever



① This lever changes travel direction of machine.
- **F** : Machine moves forward
- **N** : Neutral position
- **R** : Machine moves backward

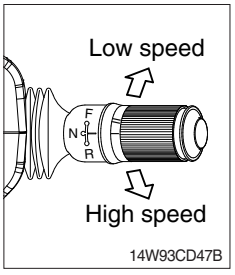
⚠ Travel direction will be reversed if lower structure is positioned with dozer in front.

② The warning buzzer sounds when the lever is in the reverse position.

⚠ If this lever is not in the neutral position, engine does not started.

⚠ Be sure to stop the machine when changing the direction forward or backward while traveling.

(2) Travel speed switch

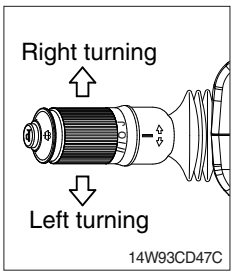


① This switch is for selecting travelling speed between high and low.
- Low speed (—) : 11.3 km/hr (7.0 mph), turtle mark
- High speed (=) : 30 km/hr (19.0 mph), rabbit mark

⚠ In case of changing the travel speed, be sure to stop the machine completely.

18) LH MULTI FUNCTION SWITCH

(1) Direction indication lamp switch

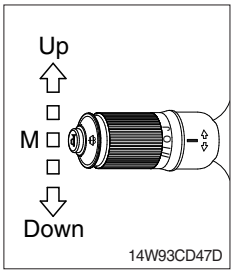


① This switch is used to warn or signal the turning direction of the machine to other machines or equipment.

② Push the lever to forward for turning right ( ), pull the lever to backward for turning left ( ).

③ The turning pilot lamp comes ON at the travel pilot lamp on the steering column.

(2) Dimmer switch

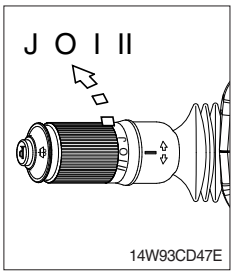


① This switch is used to turn the head lights direction.

② Switch positions.
- Up ( ) : To flash for passing
- Middle ( ) : Head lights low beam ON
- Down ( ) : Head lights high beam ON

③ If you release the switch when it's in up position, the switch will return to middle.

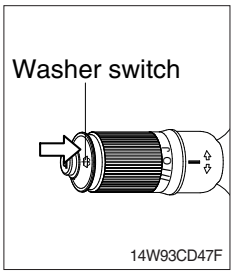
(3) WIPER SWITCH



① When the switch is in J position, the wiper moves intermittently.

② When placed in I or II position, the wiper moves continuously.

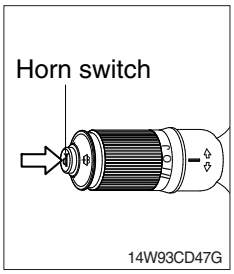
(4) WASHER SWITCH



① If you push the grip of the lever, washer liquid will be sprayed and the wiper will be activated 2-3 times.

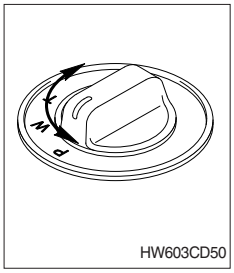
※ **Check the quantity of washer liquid in the tank. If the level of the washer liquid is LOW, add the washer liquid (in cold, winter days) or water. The capacity of tank is 1.5 liter.**

(5) HORN SWITCH



① This switch is at the end of left side multifunction switch. On pressing, the horn sounds.

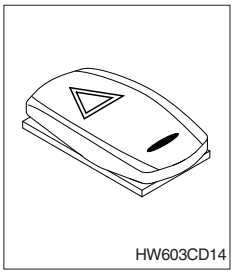
19) SELECT SWITCH (parking / working / traveling)



HW603CD50

(1) This switch is used to select the operation mode as below.
- Parking (Ⓟ) : The parking brake is applied.
- Working (W) : The machine needs to be working.
- Traveling (T) : The machine needs to be traveling.

20) HAZARD SWITCH


HW603CD14

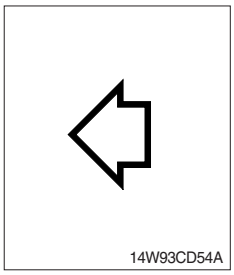
(1) Use for parking, or roading machine.

(2) LH and RH turn signal lamps come ON at the same time by this switch.

※ **If the switch is left ON for a long time, the battery may be discharged.**

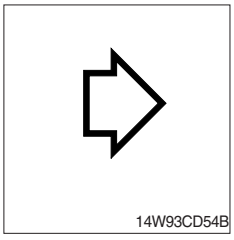
21) TURNING PILOT LAMP

(1) Left turning pilot lamp


14W93CD54A

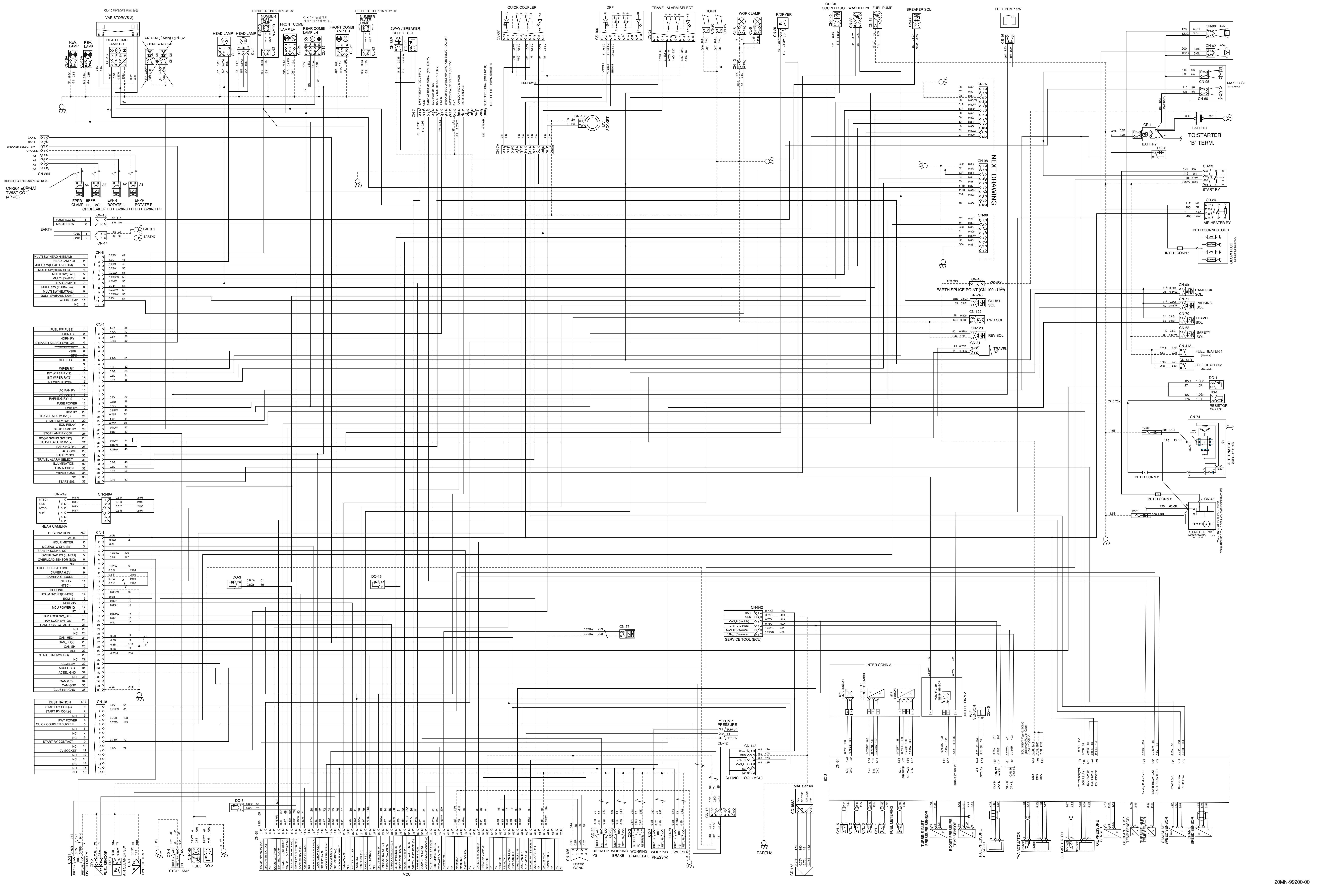
(1) This lamp flashes with sound when the LH multifunction switch is move to backward position.

(2) Right turning pilot lamp

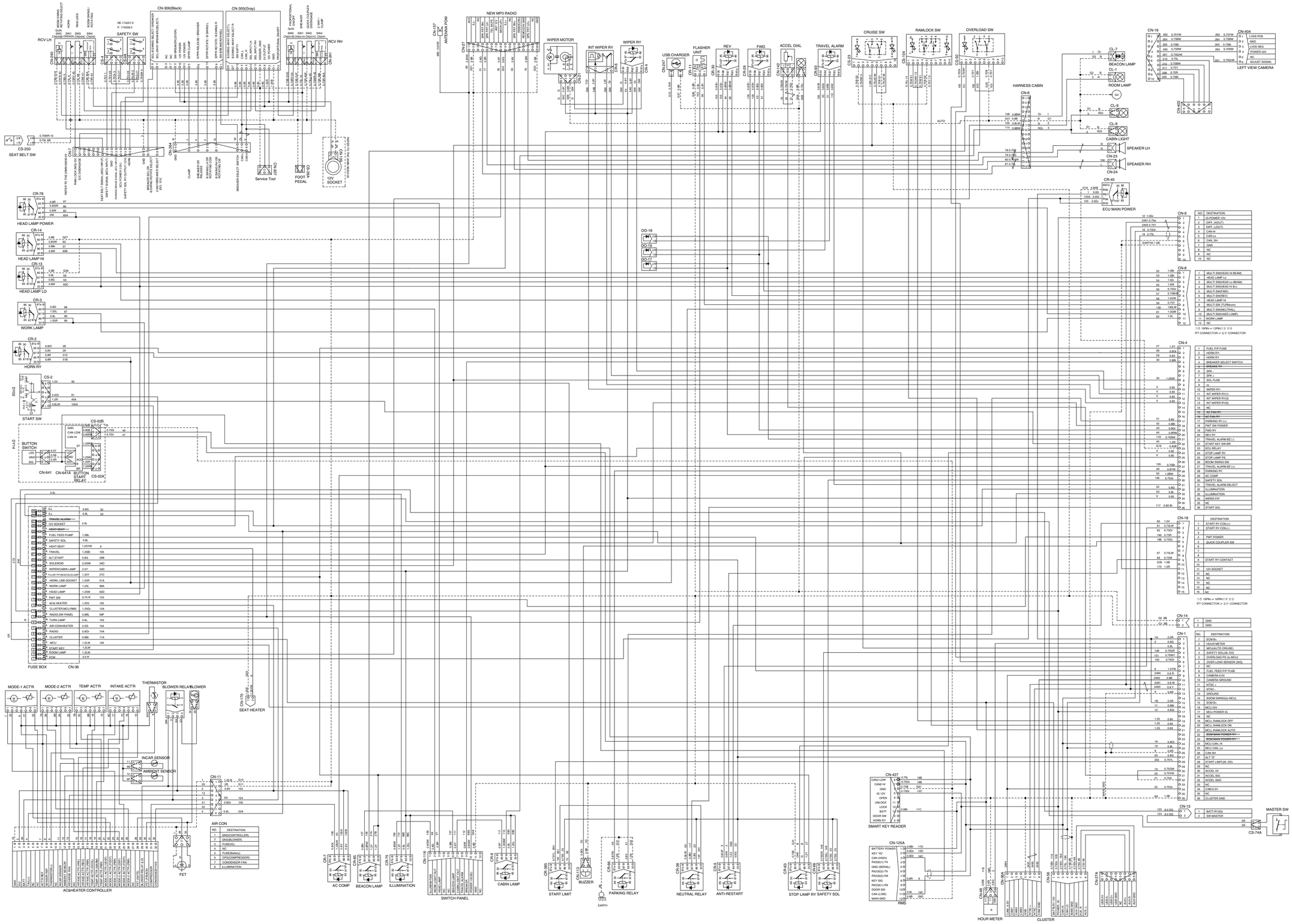

14W93CD54B

① This lamp flashes with sound when the LH multifunction switch is
② move to forward position.

· ELECTRICAL CIRCUIT (1/3)

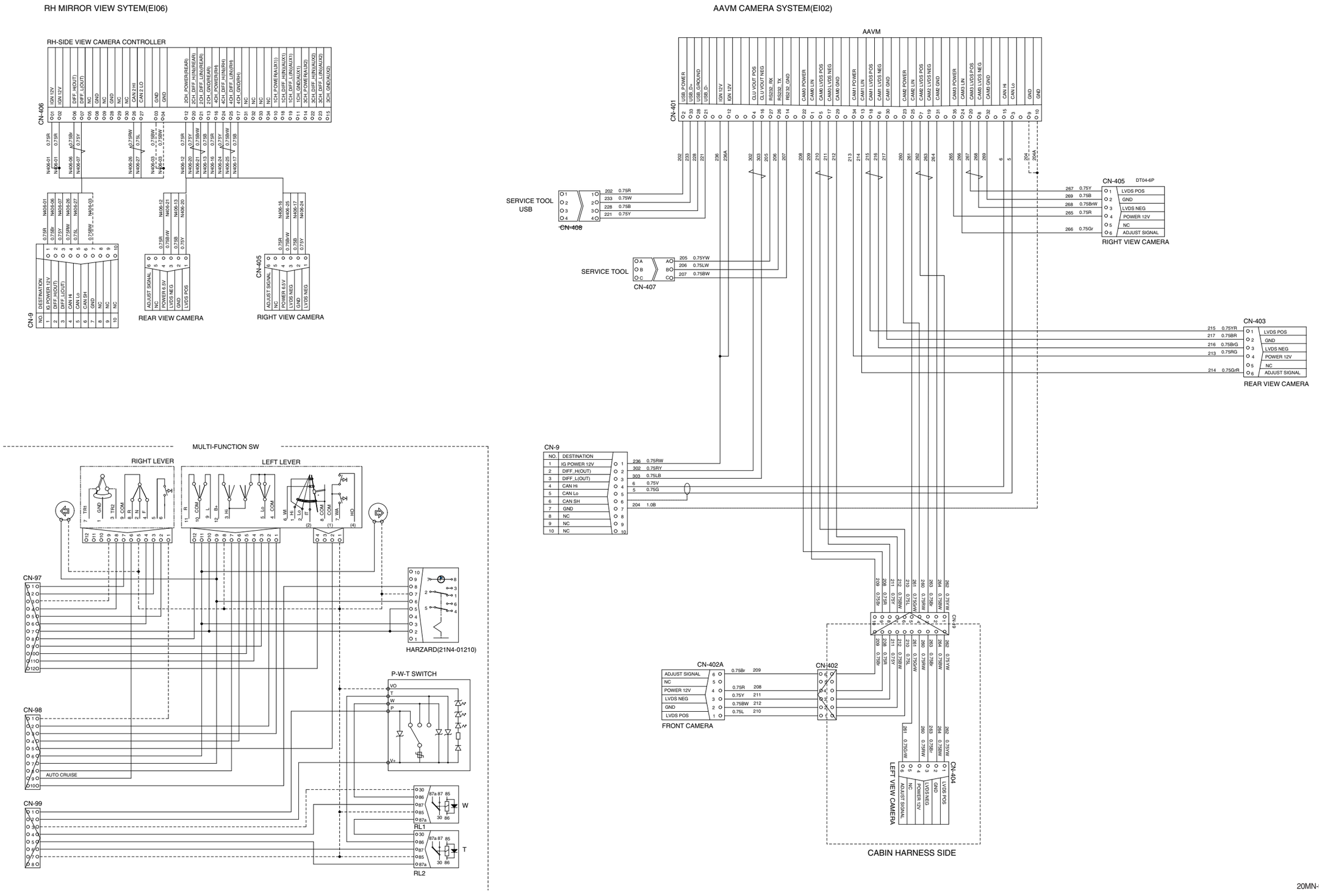


· ELECTRICAL CIRCUIT (2/3)



20MN-99100-00

ELECTRICAL CIRCUIT (3/3)



MEMORANDUM

1. POWER CIRCUIT

The negative terminal of battery is grounded to the machine chassis.

When the start switch is in the OFF position, the current flows from the positive battery terminal as shown below.

1) OPERATING FLOW

Battery [B+] → Battery relay [CR-1] → Maxi fuse (CN-60) → I/conn [CN-13 (2)] → Master switch [CS-74A]

- → Fuse box [No.1] → ECU main power [CR-45 (30, 86)]
- → Fuse box [No.2] → I/conn [CN-6 (7)] → Room lamp [CL-1 (2)]
- → Fuse box [No.3] → Start switch [CS-2 (1)]
- → Fuse box [No.4] → I/conn [CN-1 (16)] → MCU [CN-51 (22)]
- → Fuse box [No.5]
  - → Cluster [CN-56 (1)]
  - → Hour meter [CN-48 (1)]
  - → RMS [CN-125A (1)]
  - → Smart key reader [CN-427 (12)]
- → Fuse box [No.6] → New MP3 radio [CN-27 (8)]
- → Fuse box [No.7] → I/conn [CN-11 (5)]
  - → Aircon & heater controller [3]
  - → Blow relay [2]
- → Fuse box [No.8] → Flasher unit [CR-11 (2)]

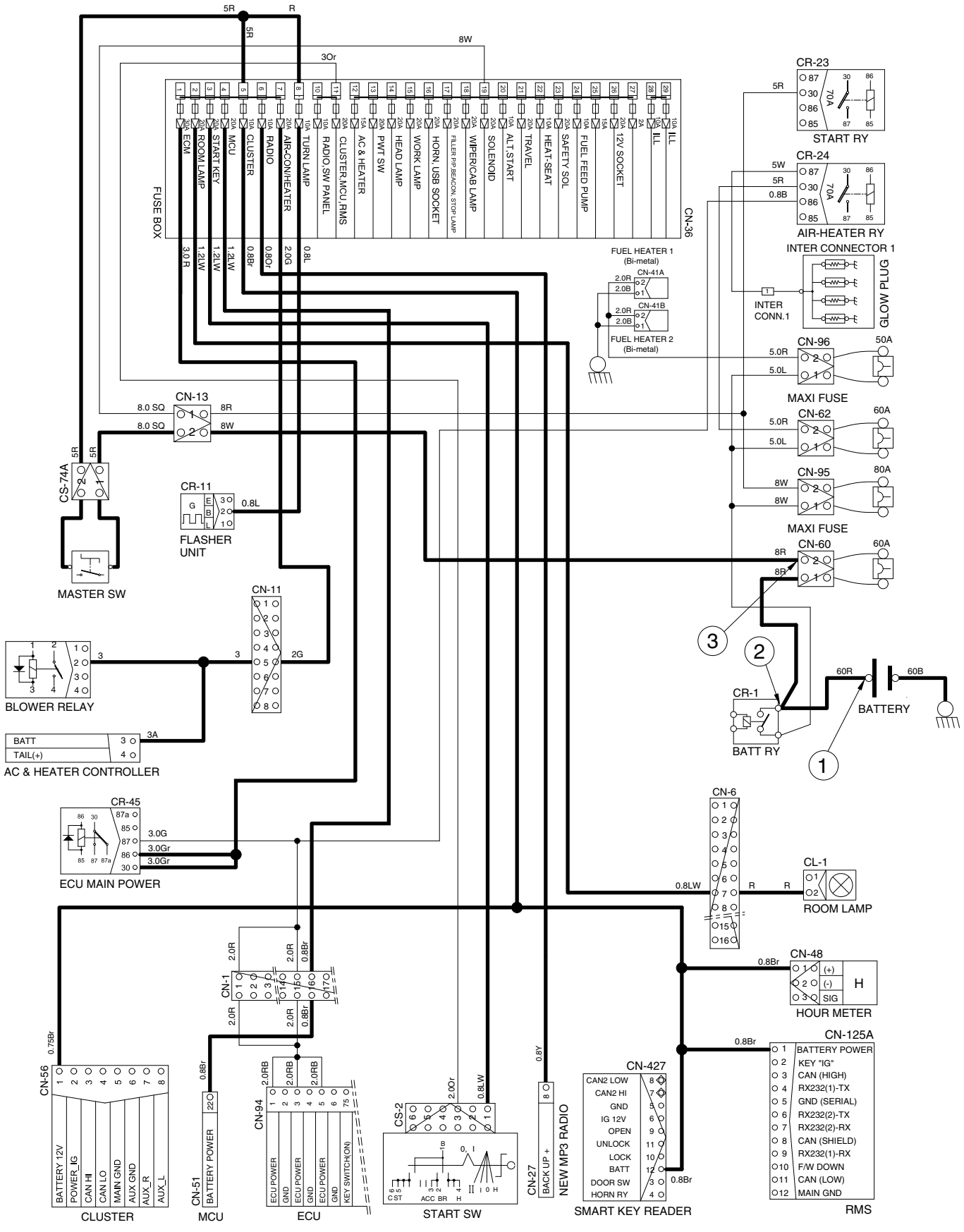
※ I/conn : Intermediate connector

2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	OFF	① - GND (battery) ② - GND (relay) ③ - GND (maxi fuse)	10~12.5V

※ GND : Ground

POWER CIRCUIT



HW65AH4EL05

2. STARTING CIRCUIT

1) OPERATING FLOW

Battery (+) terminal → Battery relay [CR-1] → Maxi fuse [CN-60]
→ I/conn [CN-13 (2)] → Master switch [CS-74A] → Fuse box No.3 → Start sw [CS-2 (1)]

(1) Start switch : ON

→ Start switch ON [CS-2 (2)] → I/conn [CN-4 (22)]
→ ECU [CN-94 (1-75)]
→ Battery relay [CR-1] : Battery relay operating (all power is supplied with the electric component)
→ Start switch ON [CS-2 (3)] → Fuse box No.11 → I/conn [CN-1 (7)] → MCU [CN-51 (23)]

(2) Start switch : START

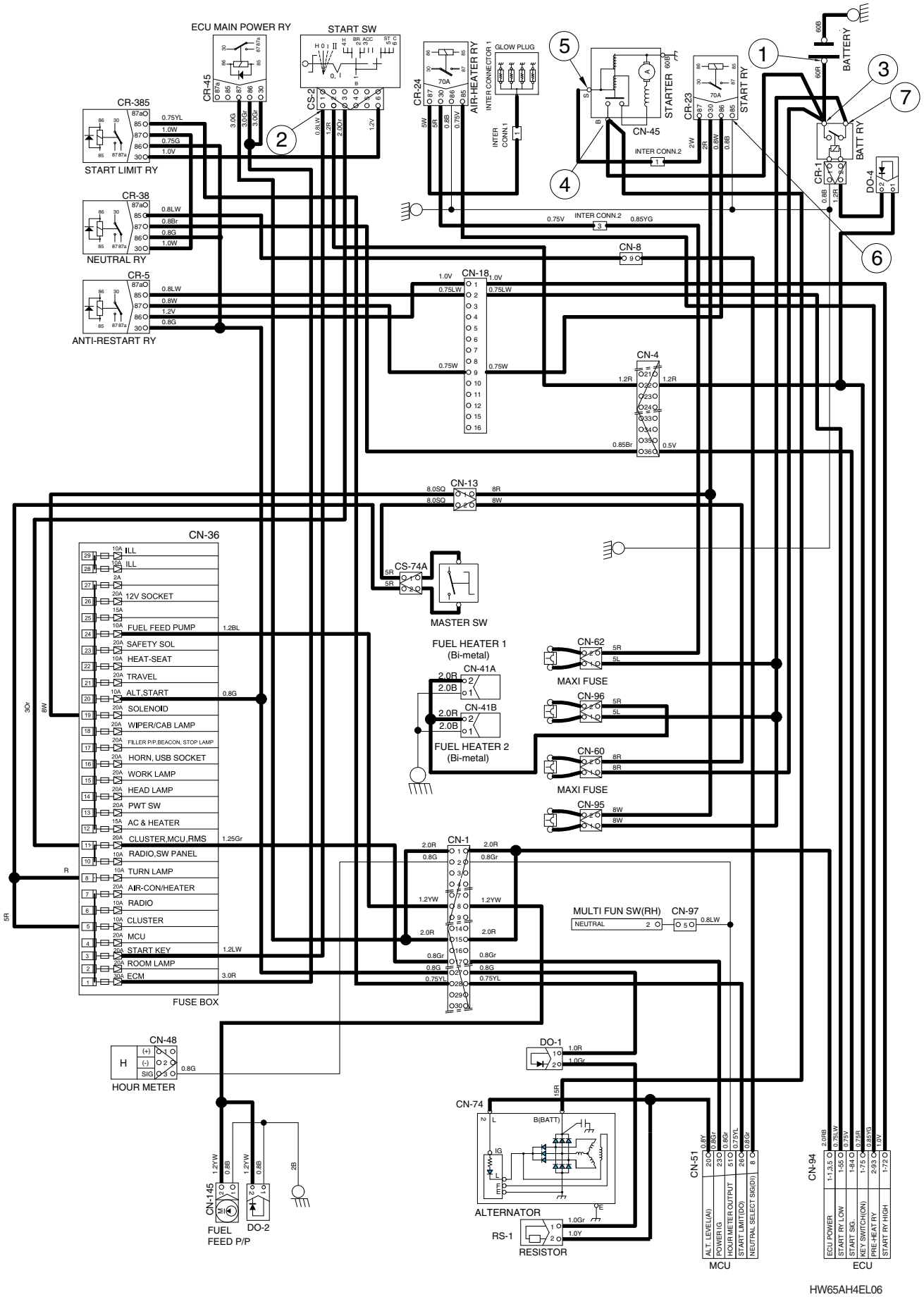
Start switch START [CS-2 (6)] → Start limit relay [CR-385 (30→87)] → Neutral relay [CR-38 (30→87)]
→ ECU [CN-94 (1-84)→(1-72)] → I/conn [CN-18 (1)]
→ Anti-restart relay [CR-5 (86)→(87)] → I/conn [CN-18 (9)]
→ Start relay [CR-23 (85)→(87)] → Start motor operating

2) CHECK POINT

Engine	Start switch	Check point	Voltage
Operating	Start	① - GND (battery B^+) ② - GND (start switch) ③ - GND (battery relay M4) ④ - GND (starter B) ⑤ - GND (starter S) ⑥ - GND (start relay) ⑦ - GND (battery relay M8)	10~12.5V

※ GND : Ground

STARTING CIRCUIT



HW65AH4EL06

3. CHARGING CIRCUIT

When the starter is activated and the engine is started, the operator releases the start switch to the ON position.

Charging current generated by operating the alternator flows into the battery through the battery relay (CR-1).

The current also flows from the alternator to each electrical component and controller through the fuse box.

1) OPERATING FLOW

(1) **Warning flow**

Alternator [CN-74 (L)] → MCU alternator level [CN-51 (20)]
→ Cluster charging warning lamp (via CAN interface)

(2) Charging flow

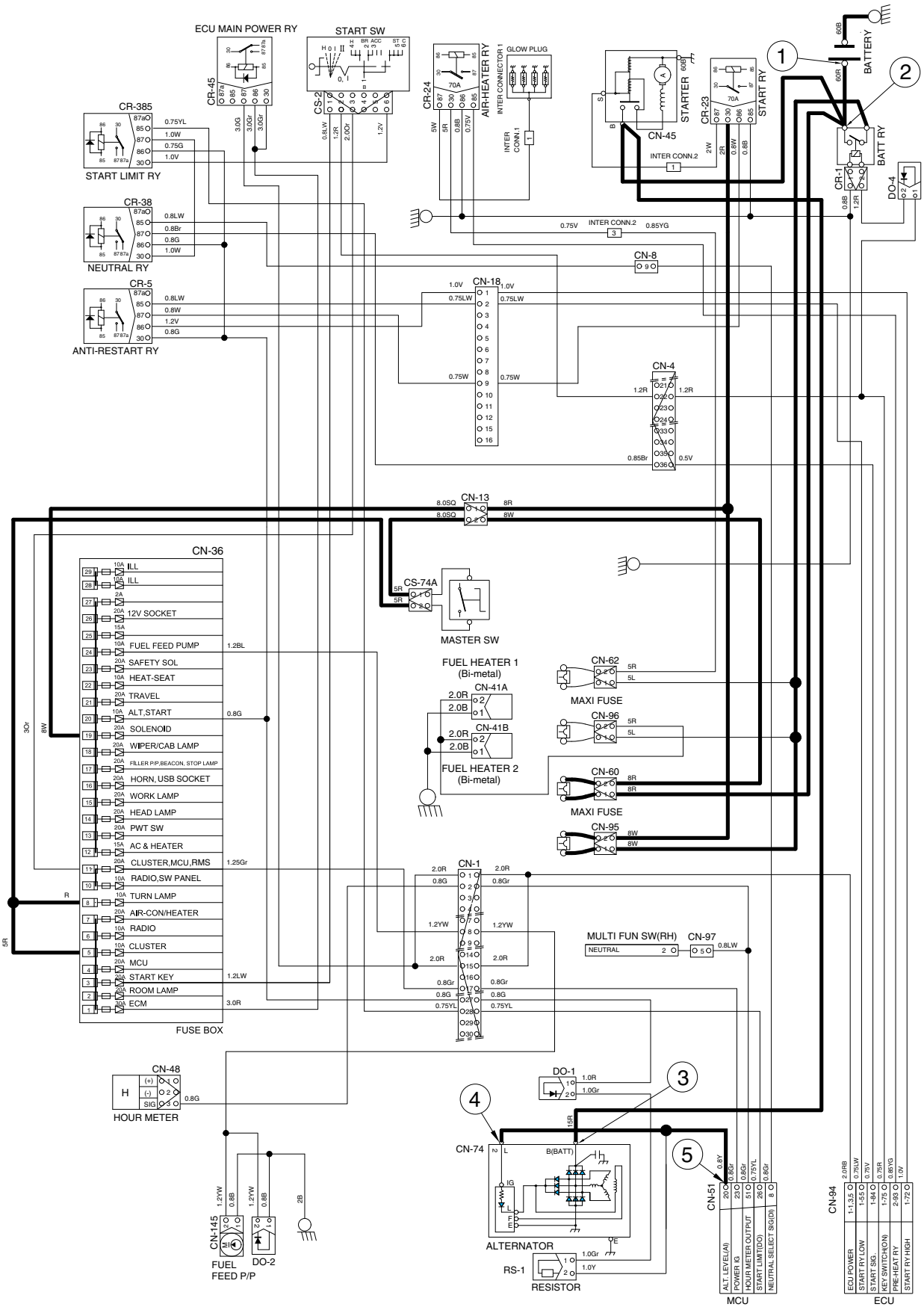
Alternator [CN-74 (B)] → Starter [CN-45 (B)] → Battery relay [CR-1]
→ Battery (+) terminal
→ Maxi fuse [CN-60] → I/conn [CN-13 (2)] → Master switch [CS-74A]
→ Fuse box [CN-36 No.1~8]
→ Maxi fuse [CN-95] → I/conn [CN-13 (1)] → Fuse box [CN-36 No. 12~27]

2) CHECK POINT

Engine	Start switch	Check point	Voltage
Operating	ON	① - GND (battery B^+) ② - GND (battery relay) ③ - GND (alternator B terminal) ④ - GND (alternator L terminal) ⑤ - GND (MCU)	10~12.5V

※ GND : Ground

CHARGING CIRCUIT



HW65AH4EL07

4. HEAD LAMP AND WORK LAMP CIRCUIT

1) OPERATING FLOW

Fuse box (No.14) ┬→ Head lamp Hi relay [CR-14 (30)]
├→ Head lamp Low relay [CR-13 (30)]
├→ Head lamp power relay [CR-78 (30)]
└→ I/conn [CN-8 (4)] → I/conn [CN-97 (8)] → Multifunction sw left lever [(12)]

Fuse box (No.15) → Work lamp relay [CR-3 (30, 86)]

Fuse box (No.10) → Switch panel [CN-116 (10)]

(1) Head lamp switch ON : Mult function sw [LH, dimmer sw (Middle)]

Head lamp switch ON [CN-116 (3)] → Head lamp power relay [CR-78 (85)→(87)]
→ I/conn [CN-8 (11)] → I/conn [CN-97 (11)] → Multifunction sw left lever [(4)→(5)]
→ I/conn [CN-97 (10)] → I/conn [CN-8 (3)] → Head light low relay [CR-13 (86)→(87)]
→ I/conn [CN-8 (2)] → Head light ON [CL-3 (1), CL-4 (1)] : Head light ON

(2) Head lamp switch ON : Mult function sw [LH, dimmer sw (Down)]

Head lamp switch [CN-116 (3)] → Head lamp power relay [CR-78 (85)→(87)]
→ I/conn [CN-8 (11)] → I/conn [CN-97 (11)] → Multifunction sw left lever [(4)→(3)]
→ I/conn [CN-97 (9)] → I/conn [CN-8 (1)]
→ Head light high relay [CR-14 (86)→(87)] → I/conn [CN-8 (7)]
┬→ Head light ON [CL-3 (2), CL-4 (2)] : Head light high beam ON
└→ MCU [CN-51 (37)] → Cluster high bean pilot lamp ON [Via CAN interface]

(3) Work lamp switch ON :

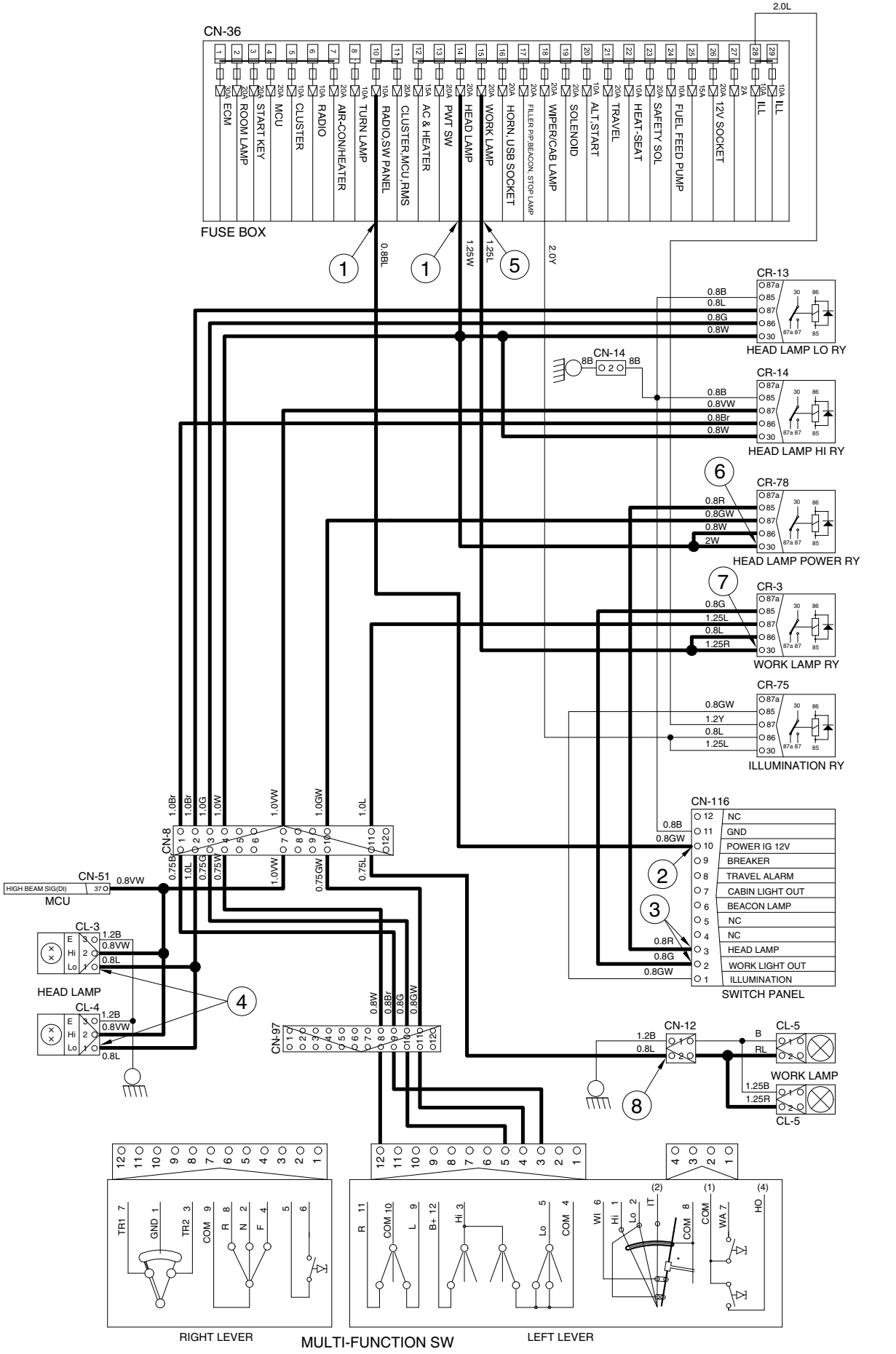
Work lamp switch ON [CS-116 (2)] → Work lamp relay [CR-3 (85)→(87)] → I/conn [CN-8 (11)]
→ I/conn [CN-12 (2)] → Work lamp ON [CL-5 (2)] : Work lamp ON

2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	ON	① - GND (fuse box) ② - GND (switch power input) ③ - GND (switch power output) ④ - GND (head light) ⑤ - GND (fuse box) ⑥ - GND (head lamp power relay input) ⑦− GND (work lamp relay input) ⑧ - GND (head lamp Lo/Hi relay input) ⑨ - GND (work light)	10~12.5V

※ GND : Ground

HEAD LAMP AND WORK LAMP CIRCUIT



HW65AH4EL08

5. BEACON LAMP AND CAB LAMP CIRCUIT

1) OPERATING FLOW

Fuse box (No.17) → Beacon lamp relay [CR-85 (30, 86)]
Fuse box (No.18) → Cab lamp relay [CR-9 (30, 86)]
Fuse box (No.10) → Switch panel [CR-116 (10)]

(1) Beacon lamp switch ON

Switch panel [CN-116 (6)] → Beacon lamp relay [CR-85 (85)→(87)] → I/conn [CN-6 (5)] → Beacon lamp [CL-7]

(2) Cab lamp switch ON

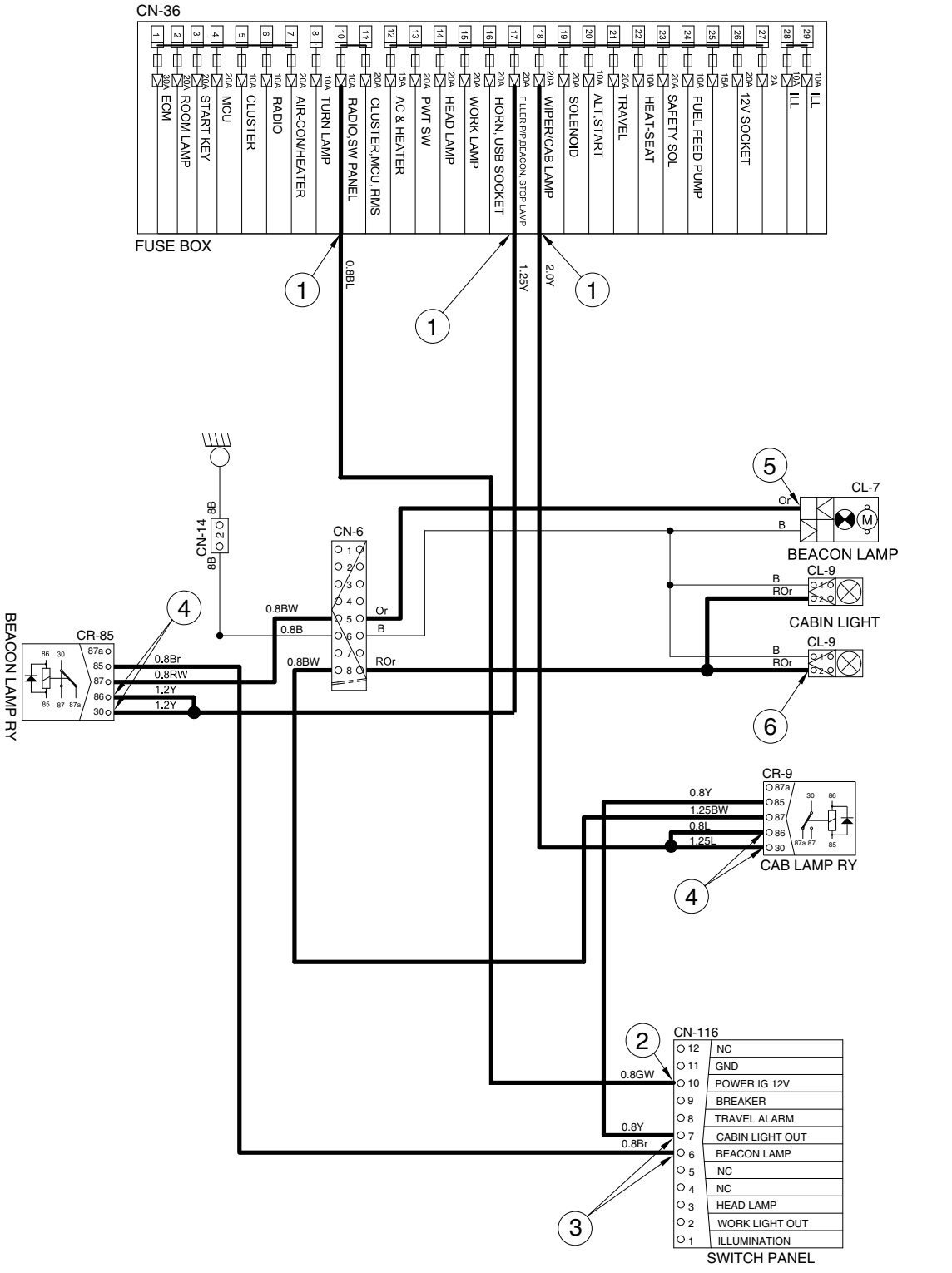
Switch panel [CN-116 (7)] → Cab lamp relay [CR-9 (85)→(87)] → I/conn [CN-6 (8)] → Cab light [CL-9 (2)]

2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	ON	① - GND (fuse box) ② - GND (switch power input) ③ - GND (switch power output) ④ - GND (beacon & cab lamp relay power input) ⑤ - GND (beacon lamp) ⑥ - GND (cab lamp)	10~12.5V

※ GND : Ground

BEACON AND CAB LAMP CIRCUIT



HW65AH4EL09

6. WIPER AND WASHER CIRCUIT

1) OPERATING FLOW

(1) Key switch ON

Fuse box (No.8) → Wiper motor [CN-21 (3)]
→ Int wiper relay [CR-6 (3)]
→ Wiper relay [CR-4 (86)]
→ Wiper relay [CR-4 (87)]
→ I/conn [CN-4 (34)] → Washer pump [CN-22 (2)]

Fuse box (No.4) → I/conn [CN-8 (4)] → I/conn [CN-97 (8)] → Multifunction sw [LH lewer (21)]

(2) Wiper switch ON : 1st step (intermittent)

Multifunction switch left lever (2) → I/conn [CN-98 (5)] → I/conn [CN-4 (13)]
→ Int wiper relay [CR-6 (4)→(2)]
→ I/conn [CN-4 (12)] → I/conn [CN-98 (4)] → Multifunction switch left lever (6)→(2)
→ I/conn [CN98 (2)] → I/conn [CN-4 (10)]
→ Wiper relay [CR-4 (87)→(30)] → Wiper motor [CN-21 (4)] : Wiper motor operating

(3) Wiper switch ON : 2nd or 3rd step

Multifunction switch left lever (2) → I/conn [CN-98 (2)] → I/conn [CN-4 (10)]
→ Wiper relay [CR-4 (85)] : Wiper relay operating → Wiper relay [CR-4 (87)→(30)]
→ Wiper motor operating [CN-21 (1)] : Wiper motor operating

(4) Auto parking (when switch OFF)

Wiper switch OFF → Wiper relay OFF
→ Int wiper relay OFF
→ Wiper motor [CN-21 (3)→(1)] → Wiper relay [CR4 (87a)→(30)]
→ Wiper motor [CN-21 (4)] : Wiper motor parking position

(5) Washer switch ON

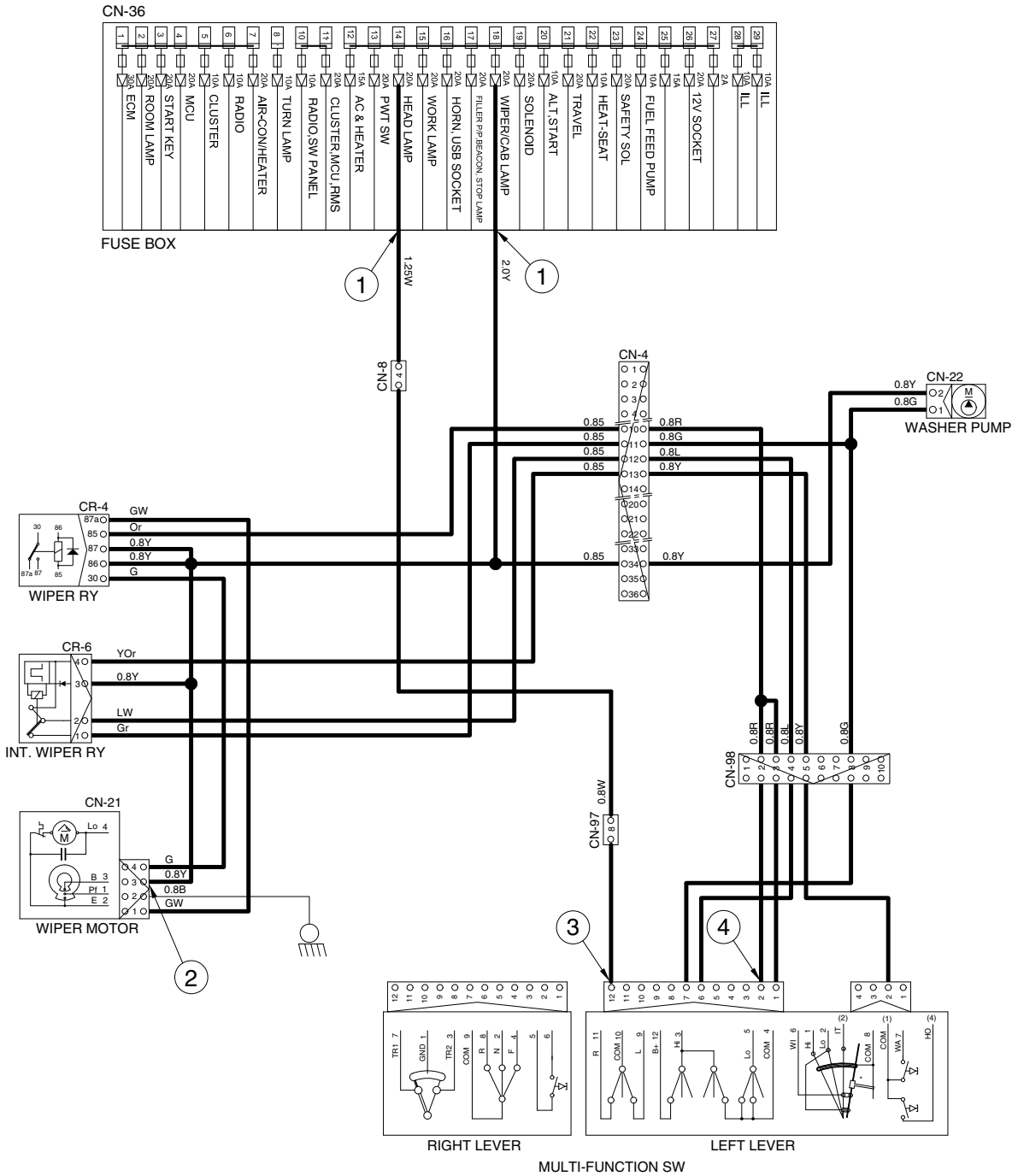
Multifunction sw left lever (7) → I/conn [CN-98 (8)] → Washer pump [CN-22 (1)] : Washer pump operating
Multifunction switch left lever (2) → I/conn [CN-98 (2)] → I/conn [CN-4 (10)]
→ Wiper relay [CR-4 (85)] : Wiper relay operating → Wiper relay [CR-4 (87)→(30)]
→ Wiper motor operating [CN-21 (1)] : Wiper motor operating

2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	ON	① - GND (fuse box) ② - GND (wiper motor) ③ - GND (switch power input) ④ - GND (switch power output)	10~12.5V

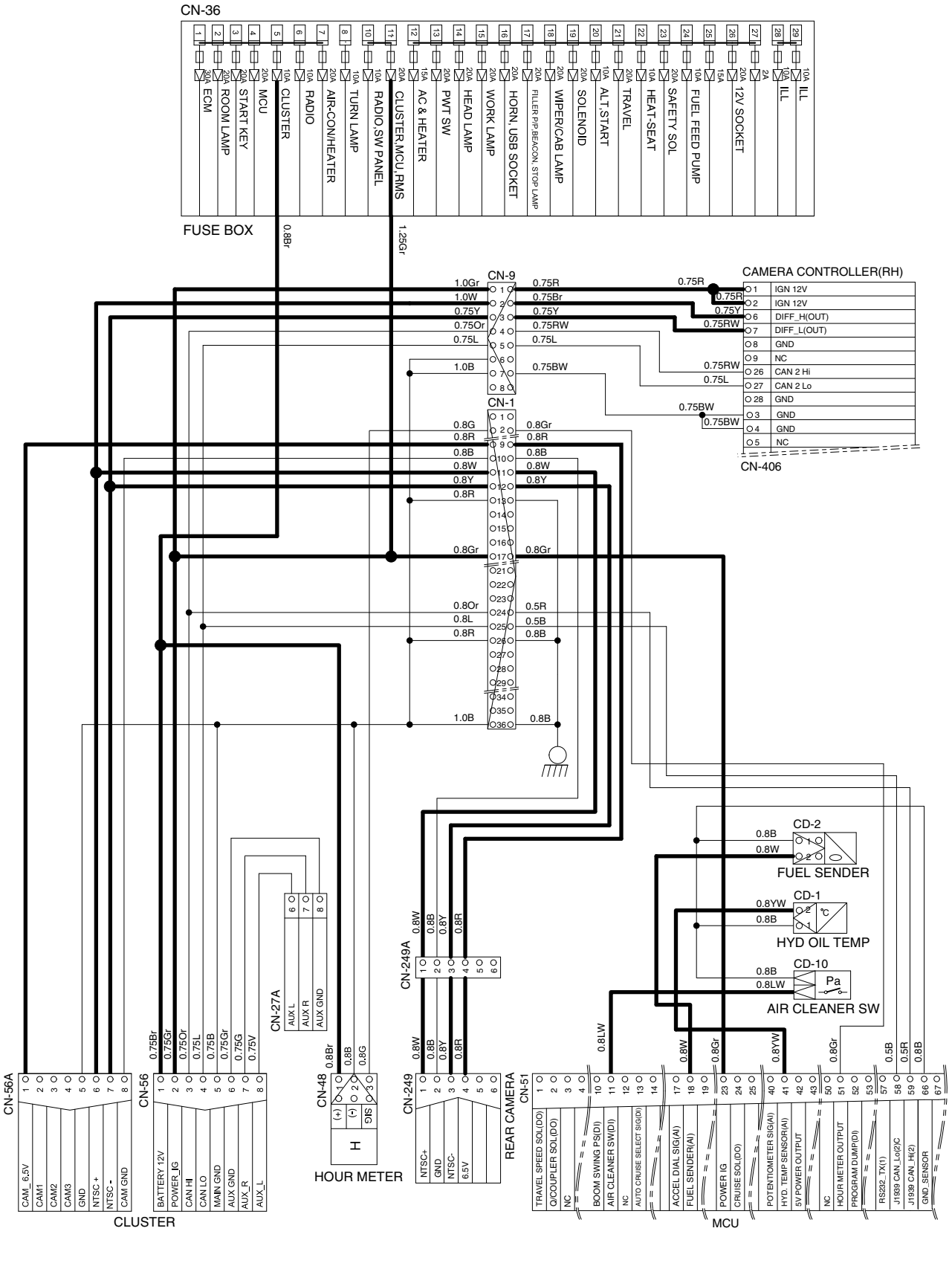
※ GND : Ground

WIPER AND WASHER CIRCUIT



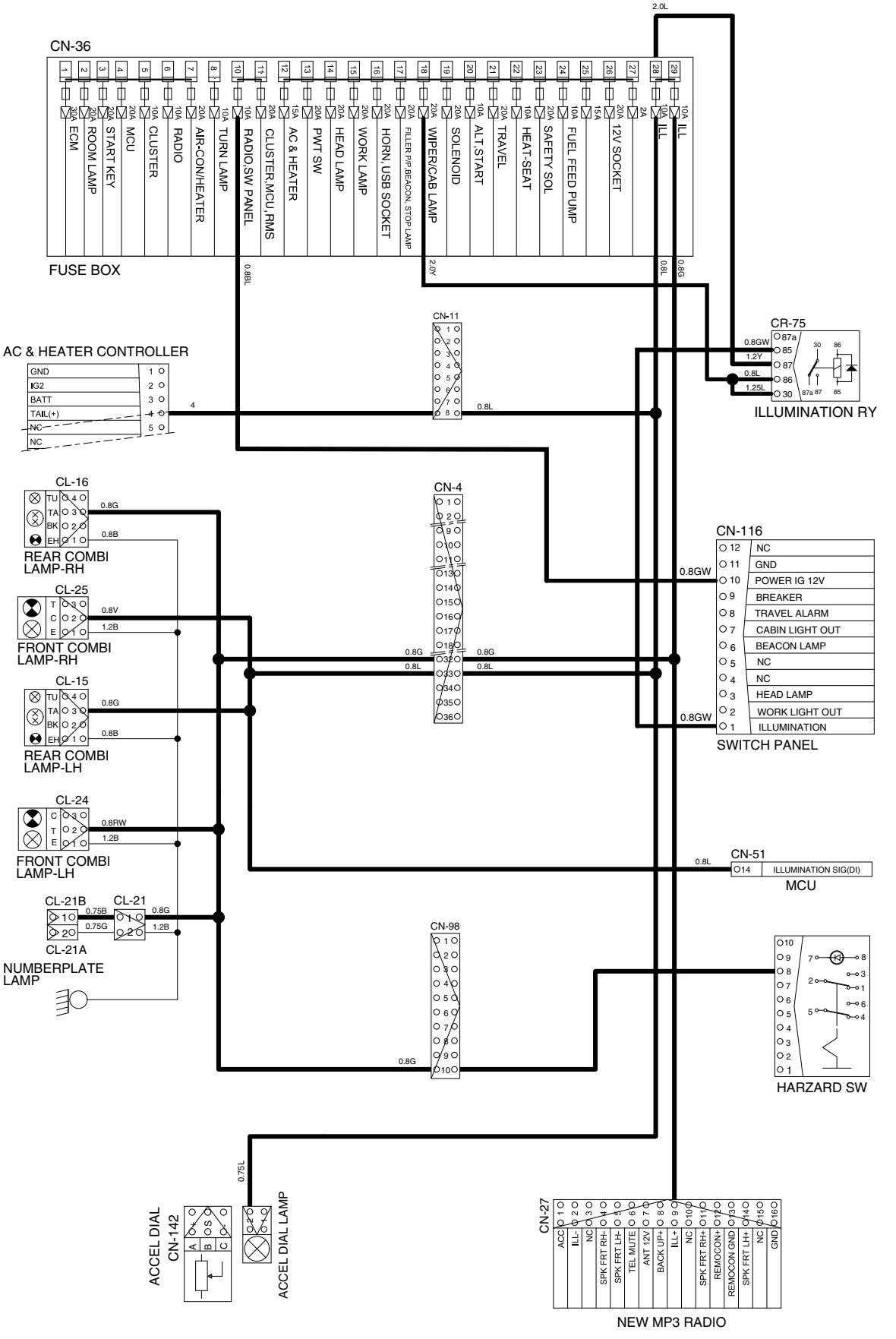
HW65AH4EL10

MONITORING CIRCUIT



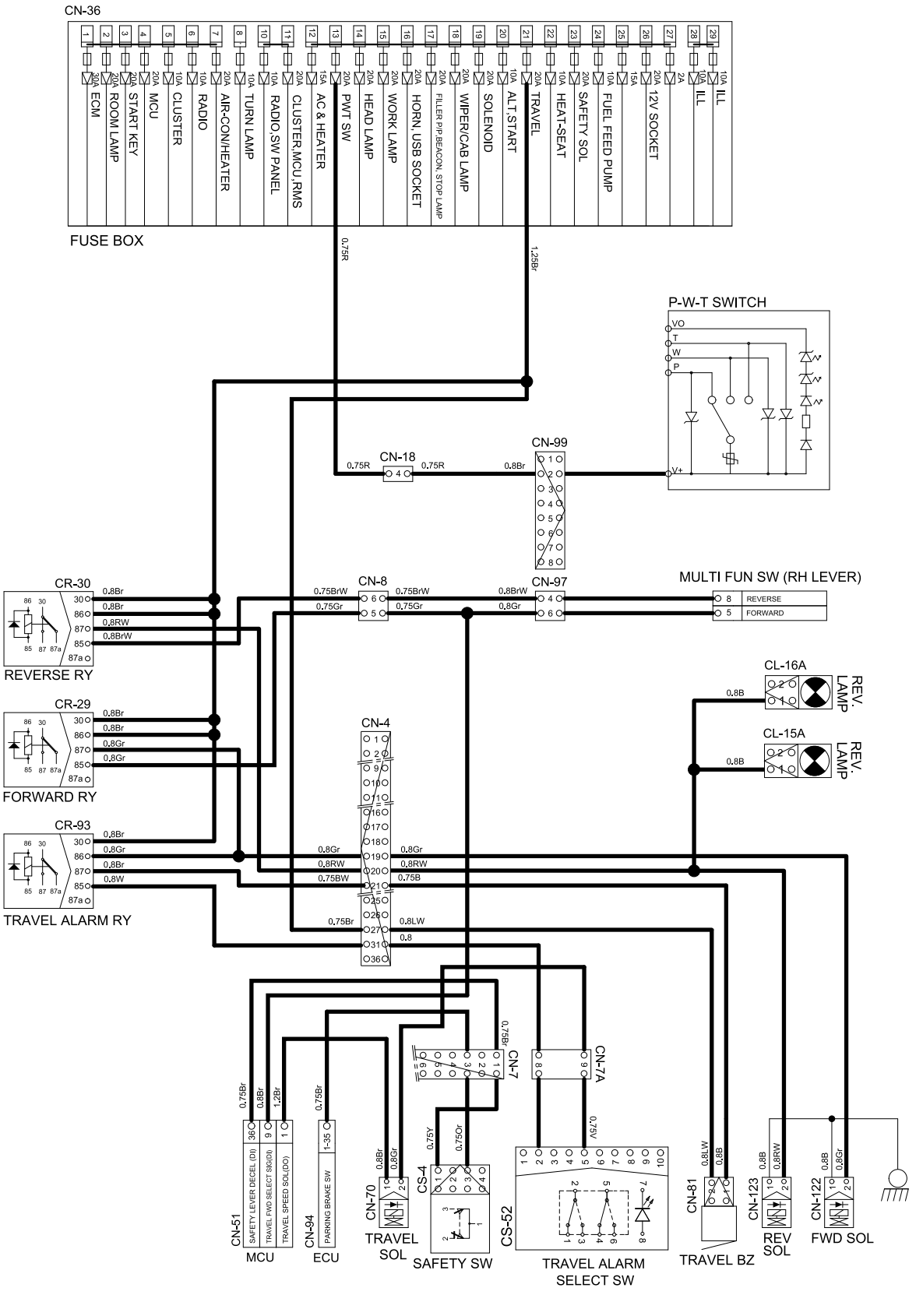
HW65AH4EL11

ILLUMINATION CIRCUIT



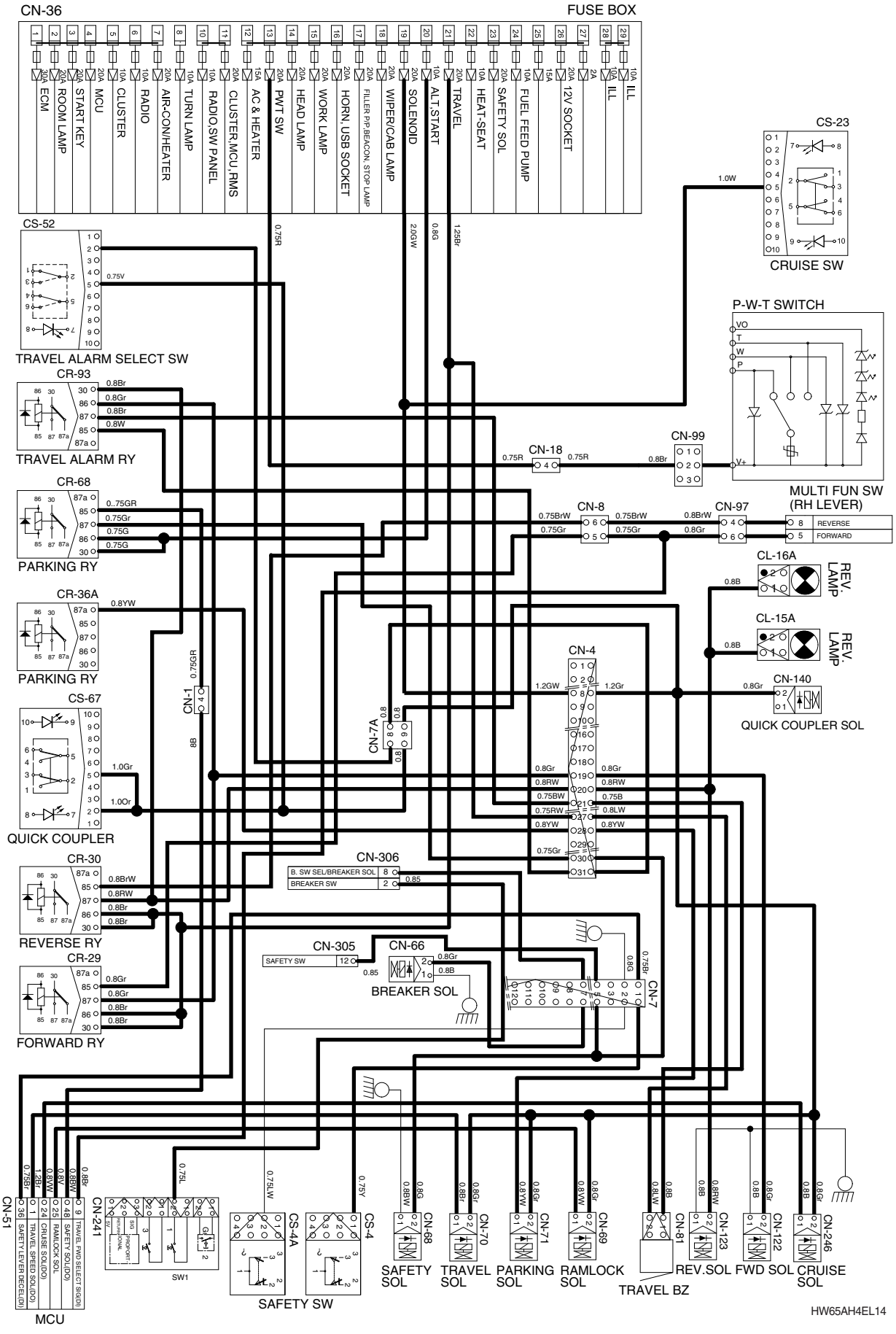
HW65AH4EL12

COMBINATION LAMP CIRCUIT

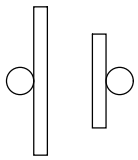
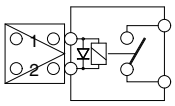
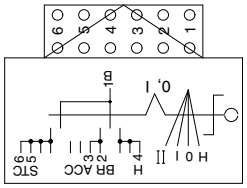
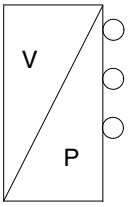
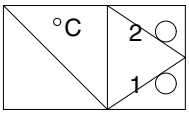
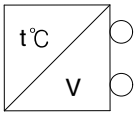


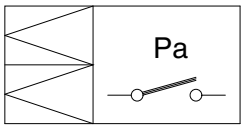
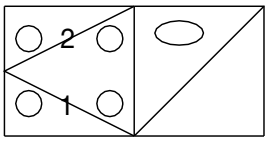
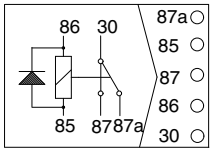
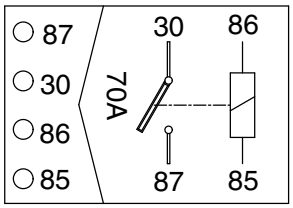
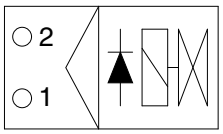
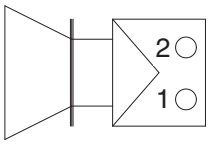
HW65AH4EL13

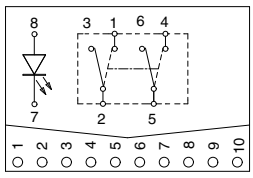
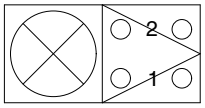
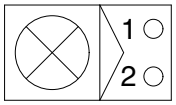
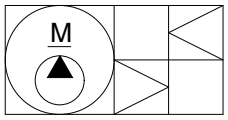
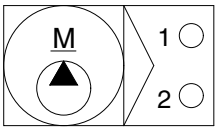
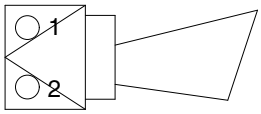
ELECTRIC CIRCUIT FOR HYDRAULIC

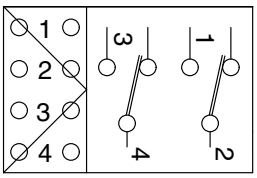
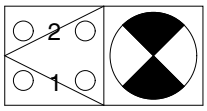
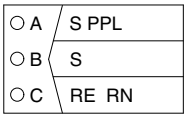
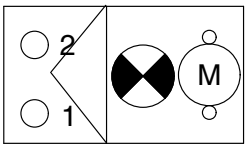
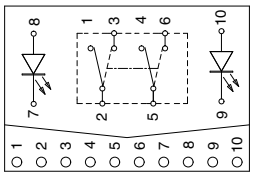
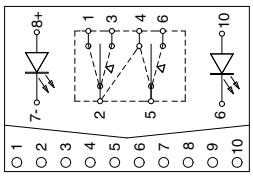


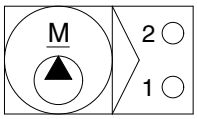
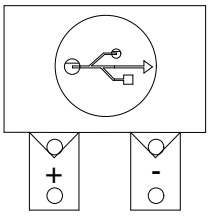
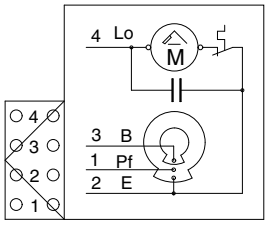
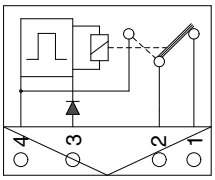
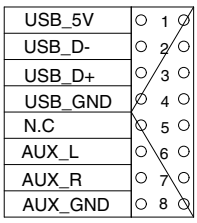
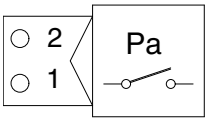
GROUP 4 ELECTRICAL COMPONENT SPECIFICATION

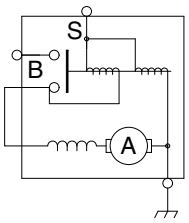
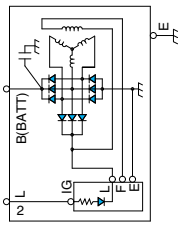
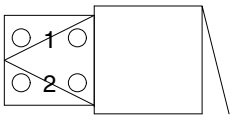
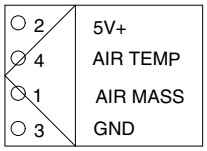
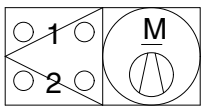
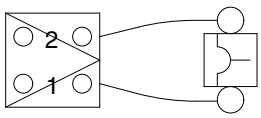
Part name	Symbol	Specification	Check
Battery		12V × 100Ah	※ Check specific gravity 1.280 over : Over charged 1.280 ~ 1.250 : Normal 1.250 below : Recharging
Battery relay	 CR-1	Rated load : 12V 100A (continuity) 1000A (30 second)	※ Check coil resistance Normal : about 12Ω ※ Check contact Normal : ∞Ω
Start switch	 CS-2	12V	※Check contact OFF : ∞Ω (for each terminal) ON : 0Ω (for terminal 1-3 and 1-2) START : 0Ω (for terminal 1-6)
Pressure switch (for engine oil)	 V P	0.5 kgf/cm² (N.C TYPE)	–
Hydraulic temperature sensor	 °C 2 1 CD-1	-	※ Check resistance 50˚C : 804Ω 80˚C : 310Ω 100˚C : 180Ω
Coolant temperature sensor	 t℃ V		※ Check resistance 50˚C : 804Ω 80˚C : 310Ω 100˚C : 180Ω

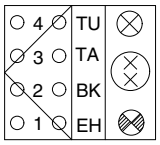
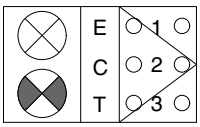
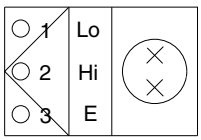
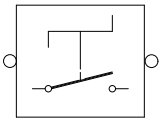
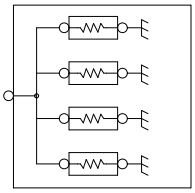
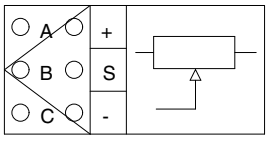
Part name	Symbol	Specification	Check
Air cleaner pressure switch	 CD-10	Pressure: 635mmH_2O (N.O TYPE)	※ Check contact Normal : ∞Ω
Fuel sender	 CD-2	-	※ Check resistance Full : 100Ω Low : 500Ω Empty warning :700Ω
Relay	 CR-2 CR-3 CR-4 CR-5 CR-7 CR-9 CR-13 CR-14 CR-29 CR-30 CR-38 CR-45 CR-63 CR-66 CR-68 CR-75 CR-78 CR-85 CR-385	12V 20A	※ Check resistance Normal : About 200Ω (for terminal 85-86) : 0Ω(for terminal 30-87a)
Relay (start, air heater)	 CR-23 CR-24	12V 70A	※ Rated coil current 1.2±0.3A
Solenoid valve	 CN-66 CN-66P CN-68 CN-69 CN-70 CN-71 CN-122 CN-123 CN-140 CN-246	12V 1A	※ Check resistance Normal : 15~25Ω (for terminal 1-2)
Speaker	 CN-23(LH) CN-24(RH)	4Ω 20W	※Check resistance Normal : 4Ω

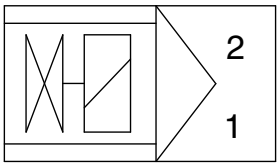
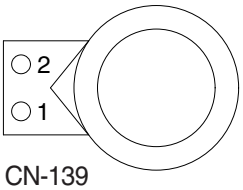
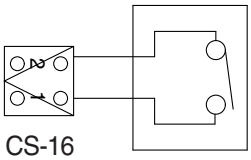
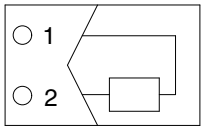
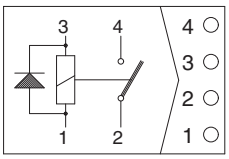
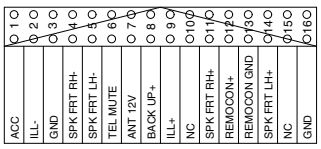
Part name	Symbol	Specification	Check
Travel alarm select switch	 CS-50 CS-52	12V 16A	※ Check contact Normal OFF - ∞Ω(for terminal 2-1, 5-4) - 0Ω(for terminal 2-3, 5-6)
Work lamp	 CL-5 CL-9	12V LED (ABL type)	※ Check disconnection Normal : A few Ω
Room lamp	 CL-1	12V 10W	※ Check disconnection Normal : A few Ω
Fuel filler pump	 CN-61	12V 35 ℓ/min	※Check operation Supply power(for terminal 1) : 12V
Fuel feed pump	 CN-145	12V	-
Horn	 CN-20 CN-25	12V	100±5dB

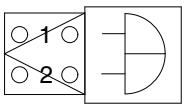
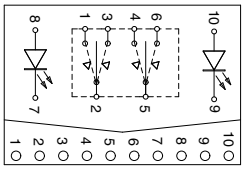
Part name	Symbol	Specification	Check
Safety switch	 CS-4 CS-4A	Micro	※ Check contact Normal : ∞Ω(for terminal 1-2, 3-4)
Reverse lamp	 CL-15A CL-16A	12V	※ Check disconnection. Normal : A few Ω
Pressure sensor	 CD-3 CD-4 CD-7 CD-31 CD-32 CD-38 CD-42 CD-73	8-30V	※ Check contact Normal : 0.1Ω
Beacon lamp	 CL-7	12V LED (17W) (Double flash)	※ Check disconnection Normal : A few Ω
Cruise switch	 CS-23 CS-67	12V 16A	※ Check contact Normal OFF - ∞Ω (for terminal 2-3, 5-6) - 0Ω (for terminal 2-1, 5-4)
Ram lock switch	 CS-104	12V 16A	※ Check contact Normal OFF - ∞Ω (for terminal 2-1, 2-3, 5-4, 5-6)

Part name	Symbol	Specification	Check
Washer pump	 CN-22	12V 3.8A	※Check contact Normal : 3Ω(for terminal 1-2)
USB charger	 CN-247	12V 3.1A	※Check coil resistance Normal : About 1MΩ ※ Check contact Normal : ∞Ω Operating time : 5~15sec
Wiper motor	 CN-21	12V 3A	※Check contact Normal : 6Ω(for terminal 2-6)
Int wiper relay	 CR-6	12V 12A	–
Radio & USB player	 CN-27A	12V 3A	※ Check voltage 10 ~ 12.5V (for terminal 10-14,11-14)
Receiver dryer	 CN-29	12V	※ Check contact Normal : - OFF : ∞Ω (for terminal 1-2)

Part name	Symbol	Specification	Check
Starter		12V 2.5kW	※ Check contact Normal : 0.1Ω
Alternator	 CN-74	12V 100A	※ Check contact Normal : 0Ω (for terminal B-L) Normal : 10 ~ 12.5V
Travel buzzer		12V	-
MAP sensor	 CD-158A	5V	-
Air con blower		12V 8.5A	-
Maxi fuse	 CN-60 CN-62 CN-95 CN-96	12V, 50A (CN-96) 12V, 60A (CN-60, 62) 12V, 80A (CN-95)	-

Part name	Symbol	Specification	Check
Rear combination lamp-LH, RH	 CL-15 CL-16	12V 21W×2 12V 21/5W	※Normal : 4.8Ω (for terminal 1-4) Normal : 2.1Ω (for terminal 2-4, 4-5, 4-6)
Front combination lamp-LH, RH	 CL-24 CL-25	12V 21W 12V 5W	※Normal : 4.8Ω (for terminal 1-2) Normal : 2.1Ω (for terminal 2-3)
Head lamp -LH, RH	 CL-3 CL-4	12V 60/55W	※Normal : 1.0Ω (for terminal 1-3, 2-3) Normal : 1.5Ω (for terminal 1-2)
Master switch	 CS-74A	12V 1000A	-
Glow plug		-	-
Accel dial	 CN-142	-	※ Check resistance Normal : about 5kΩ (for terminal A-C) ※ Check voltage Normal : about 5V (for terminal A-C) : 2-4.5V (for terminal C-B)

Part name	Symbol	Specification	Check
EPPR vlave	 A1, A2, A3, A4	-	-
12V socket	 CN-139	12V 120W	-
Fuel pump switch	 CS-16	-	-
Resistor	 RS-1	1W 47Ω	※ Check resistance A-B : 47Ω
Relay (air con blower)		12V 20A	※ Check resistance Normal : About 200Ω (for terminal 1-3) 0 Ω (for terminal 2-4)
New MP3 radio	 CN-27	12V 2A	※Check voltage 10~16V (for terminal 1-3, 3-8)

Part name	Symbol	Specification	Check
Quick clamp buzzer	 CN-113	12V 60mA 65dB Min	-
DPF switch	 CS-100	12V 16A	※ Check resistance Normal OFF -∞Ω (for terminal 2-1, 2-3, 5-4, 5-6)

GROUP 5 CONNECTORS

1. CONNECTOR DESTINATION

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-1	AMP	36	I/conn (Main harness-Cab room harness)	1743059-2	1743062-2
CN-4	AMP	36	I/conn (Cab room harness-Main harness)	1743059-2	1743062-2
CN-6	AMP	16	I/conn (Frame harness-Cabin harness)	368047-1	368050
CN-7	AMP	16	I/conn (Main harness-Console harness)	368047-1	368050
CN-7A	AMP	12	I/conn (Main harness-Console harness)	174661-2	-
CN-8	AMP	12	I/conn (Cab room harness-Cab harness)	174661-2	S816-112002
CN-9	AMP	12	I/conn (Cab room harness-AAVM harness)	174655-2	174657-2
CN-11	DEUTSCH	8	I/conn (Cab room harness-Aircon harness)	DT06-8S-EP06	-
CN-12	AMP	2	I/conn (Main harness-Boom harness)	S816-002002	S816-102002
CN-13	KET	2	Master switch	S813-030201	MG620558-5
CN-14	KET	2	Earth	MG610557	MG620558
CN-16	AMP	6	Emergency engine start	S816-006002	S816-106002
CN-16A	AMP	6	Emergency engine start	S816-006002	-
CN-18	AMP	16	I/conn (Main harness-Cab room harness)	368047-1	368050-1
CN-19	AMP	10	Cabin lamp	174655-2	174657-2
CN-20	DEUTSCH	2	Horn	DT06-2S-EP06	-
CN-21	-	4	Wiper motor	180900-0	-
CN-22	KET	2	Washer tank	MG640605	-
CN-23	KET	2	Speaker LH	MG610070	-
CN-24	KET	2	Speaker RH	MG610070	-
CN-25	DEUTSCH	2	Horn	DT06-2S-EP06	-
CN-27	-	16	Radio/USB player	PK145-16017	-
CN-27A	-	8	Radio/USB player	-	S816-108002
CN-29	KET	2	Receiver dryer	MG640795	-
CN-36	-	-	Fuse box	21MN-55010	-
CN-41A	DELPHI	2	Fuse heater	15300027	-
CN-41B	DELPHI	2	Fuse heater	15300027	-
CN-45	MOLEX	RING TERM	Starter	MK238-10	-
CN-48	-	3	Hour meter	-	-
CN-51	AMP	70	MCU	1-968879-1	-
CN-56	AMP	8	Cluster	-	S816-106002
CN-56A	AMP	8	Cluster	174982-2	-
CN-60	MTA	2	Maxi fuse assy	21K6-03270	03.01060
CN-61	DEUTSCH	2	Fuel filler pump	DT06-2S-EP06	DT04-2P-E005
CN-62	MTA	2	Maxi fuse assy	21K6-03270	03.01060
CN-66	DEUTSCH	2	Breaker solenoid	DT06-2S-EP06	DT04-2P-E005
CN-66P	DEUTSCH	2	2-way/breaker select solenoid	DT06-2S-EP06	DT04-2P-E005
CN-68	DEUTSCH	2	Safety solenoid	DT06-2S-EP06	-

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-69	DEUTSCH	2	Ram lock solenoid	DT06-2S-EP06	-
CN-70	DEUTSCH	2	Travel solenoid	DT06-2S-EP06	-
CN-71	DEUTSCH	2	Parking solenoid	DT06-2S-EP06	-
CN-74	DONGA	RING TERM	Alternator	S820-408000	-
CN-75	DEUTSCH	2	Main pump EPPR	DT06-2S-EP06	DT04-2P-E005
CN-80	YAZAKI	1	Air heater	7323-3010	-
CN-81	DEUTSCH	2	Travel buzzer	DT06-2S-EP06	DT04-2P-E005
CN-94	BOSCH	91	ECU	1 928 405 452	-
CN-95	KET	2	Fusible link	21K6-03270	03.01050
CN-96	MTA	2	Maxi fuse assy	21K6-03270	03.01050
CN-97	AMP	12	Multifunction switch	S816-012002	S816-112002
CN-98	AMP	10	Multifunction switch	S816-010002	S816-110002
CN-99	AMP	8	Multifunction switch	S816-008002	S816-108002
CN-100	KET	1	ECU ground	MG640944-5	-
CN-113	-	2	Buzzer	S810-002202	-
CN-116	AMP	12	Switch panel	368542-1	-
CN-122	DEUTSCH	2	Forward solenoid	DT06-2S-EP06	-
CN-123	DEUTSCH	2	Reverse solenoid	DT06-2S-EP06	-
CN-125A	DEUTSCH	12	RMCU	DT06-126-P021	DT04-12PA-P021
CN-126	DEUTSCH	4	RS232	DT06-4S-EP06	DT06-4P
CN-139	AMP	2	12V socket	172434-2	-
CN-140	DEUTSCH	2	Quick clamp solenoid	DT06-2S-EP06	DT04-2P-E005
CN-142	DEUTSCH	3	Accel dial	DT06-3S-EP06	-
CN-142A	DEUTSCH	2	Accel dial indicator	174352-2	-
CN-145	DEUTSCH	2	Fuel feed pump	DT06-2S-EP06	-
CN-148	DEUTSCH	6	Service tool	DT06-6S-EP06	DT04-6P-E005
CN-157	-	1	Antena power	S822-014000	-
CN-170	PACKARD	2	Seat heat switch	12052641	-
CN-240	DEUTSCH	3	4-way/boom swing switch	DT06-3S-E006	-
CN-240A	DEUTSCH	2	Horn switch	-	DT04-2P-E005
CN-240B	DEUTSCH	2	Swing/rotating select switch	DT06-2S-E006	-
CN-240C	DEUTSCH	1	Ram lock switch	-	ST750036-3
CN-241	DEUTSCH	3	2-way/clamp switch	DT06-3S-EP06	-
CN-241A	DEUTSCH	2	2-way/clamp switch	-	DT04-2P-E005
CN-241B	DEUTSCH	2	2-way/clamp switch	DT06-2S-EP06	-
CN-241C	-	1	2-way/clamp switch	DT06-3S-EP06	-
CN-246	DEUTSCH	2	Cruise solenoid	-	ST750036-3
CN-247	AMP	1	USB charger	171809	-
CN-249A	AMP	6	Rear camera	DT06-6S-EP06	DT04-6P-E005
CN-264	DEUTSCH	8	I/conn (RH console harness-Main harness)	DT06-8S	DT04-8P-E004

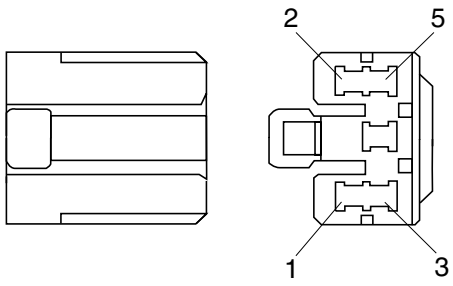
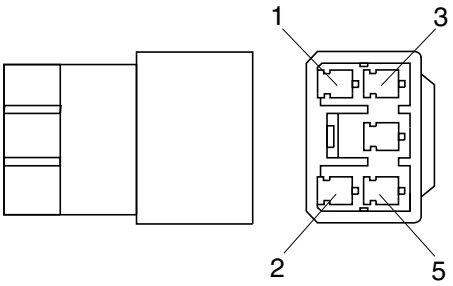
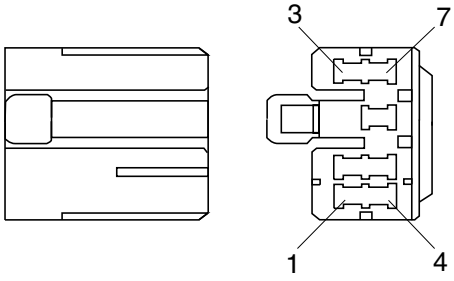
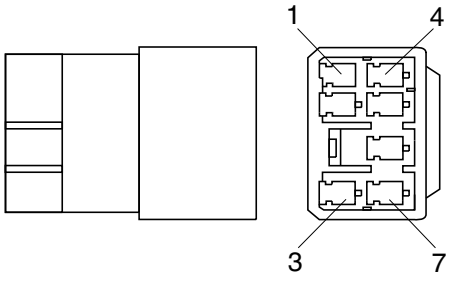
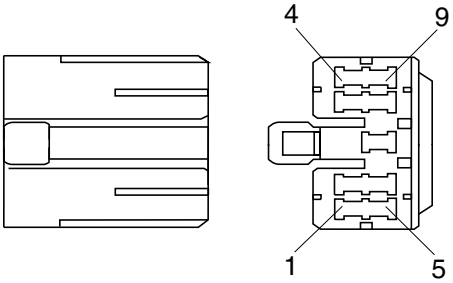
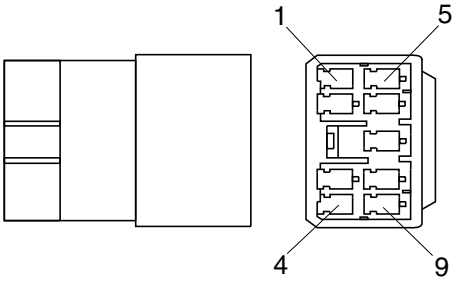
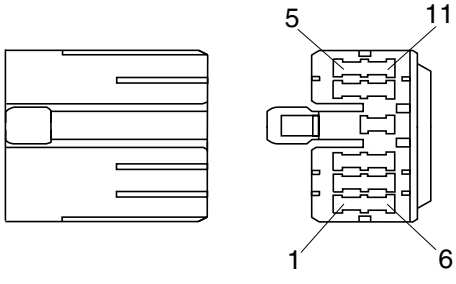
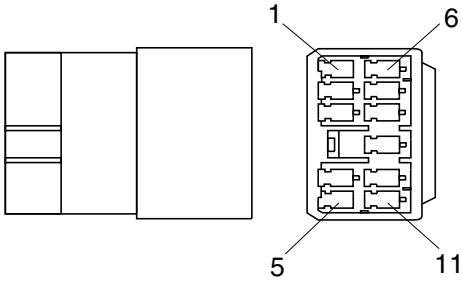
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-305	DEUTSCH	12	AVCU	DTM-06-12SA	-
CN-306	DEUTSCH	12	AVCU	DTM-06-12SB	-
CN-307	DEUTSCH	3	Service tool	DT06-3S-EP06	DT04-2P-E005
CN-403	DEUTSCH	6	Front camera	DT06-6S-EP06	DT04-6P-E005
CN-404	DEUTSCH	6	LH camera	DT06-6S-EP06	DT04-6P-E005
CN-427	-	12	Smart key reader	5559-12R	5559-12P
CN-542	DEUTSCH	6	Service tool (ECU)	DT06-6S-EP06	DT04-6P-E005
CN-641	KET	3	Button key	MG641035	-
CN-641B	KET	3	Button key-input	MG651032	-
CN-A1	DEUTSCH	2	EPPR- Rotate or boom swing RH	DT06-2S-EP06	-
CN-A2	DEUTSCH	2	EPPR- Rotate or boom swing LH	DT06-2S-EP06	-
CN-A3	DEUTSCH	2	EPPR- Release or breaker	DT06-2S-EP06	-
CN-A4	DEUTSCH	2	EPPR- Clamp	DT06-2S-EP06	-
CN-INTER 1	KET	1	Inter connection 1	-	MG643800
CN-INTER 2	KET	6	Inter connection 2	-	MG610513
CN-INTER 3	DEUTSCH	12	Inter connection 3	-	DT04-12P-E005
· LAMP					
CL-1	KET	2	Room lamp	MG610392	-
CL-2	AMP	3	Cigar lighter	S810-003201	-
CL-3	KET	3	Head lamp	S810-003702	-
CL-4	KET	3	Head lamp	S810-003702	-
CL-5	DEUTSCH	2	Work lamp	DT06-2S-EP06	-
CL-7	DEUTSCH	2	Beacon lamp	DT06-2S-EP06	DT04-2P-E005
CL-9	DEUTSCH	2	Cabin lamp	DT06-2S-EP06	DT04-2P-E005
CL-10	DEUTSCH	2	Cabin lamp	DT06-2S-EP06	DT04-2P-E005
CL-15	AMP	4	Rear combination lamp-LH	282088-1	-
CL-15A	AMP	2	Reverse lamp	282080-1	-
CL-16	AMP	4	Rear combination lamp-RH	282088-1	-
CL-16A	AMP	2	Reverse lamp	282080-1	-
CL-21	AMP	2	Number plate lamp	174463-1	174460-1
CL-21A	KET	1	Licence lamp	ST30057-2	-
CL-21B	KET	1	Licence lamp	ST30057-2	-
CL-24	KET	3	Front combination lamp-LH	S814-003001	-
CL-25	KET	3	Front combination lamp-RH	S814-003001	-
· RELAY					
CR-1	DONGA	RING TERM	Battery relay (IG)	S820-408000	-
CR-1	AMP	2	Battery relay	S816-002002	S816-102002
CR-1	DONGA	RING TERM	Battery relay (B+)	S820-408000	-
CR-2	HELLA	5	Horn relay	SJA003526-001	-
CR-3	HELLA	5	Work lamp relay	SJA003526-001	-

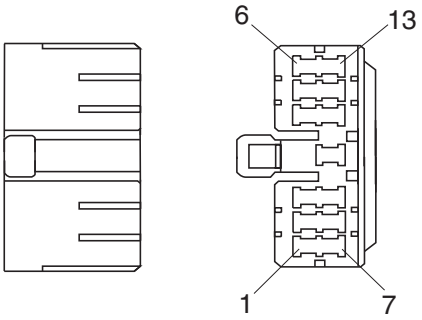
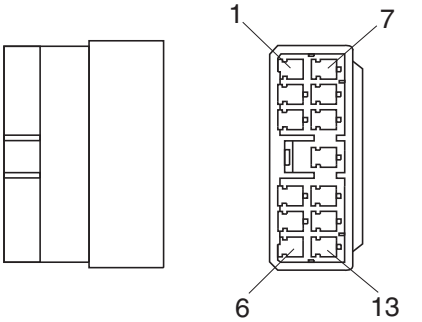
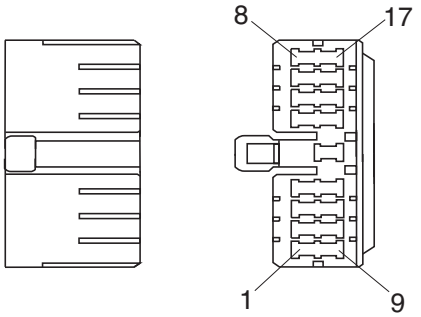
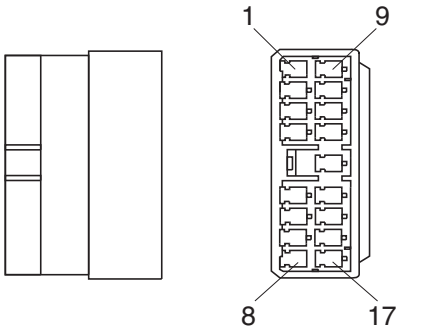
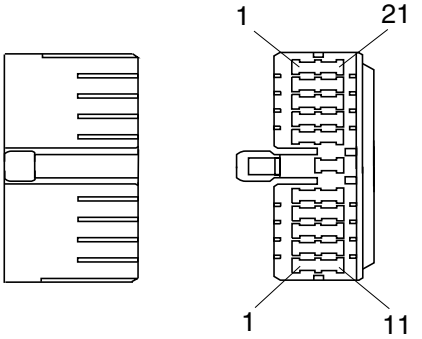
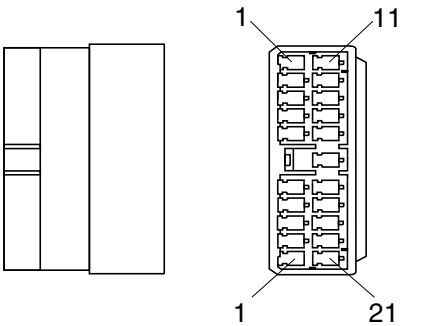
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CR-4	HELLA	5	Wiper relay	SJA003526-001	-
CR-5	HELLA	5	Anti-restart relay	SJA003526-001	-
CR-6	KET	4	Int wiper relay	MG652999	-
CR-7	HELLA	5	Aircon comp relay	SJA003526-001	-
CR-9	HELLA	5	Cabin lamp relay	SJA003526-001	-
CR-11	AMP	3	Flasher unit relay	180913	-
CR-13	HELLA	5	Head lamp low relay	SJA003526-001	-
CR-14	HELLA	5	Head lamp high relay	SJA003526-001	-
CR-23	KET	4	Start relay	MG612017-5	-
CR-24	KET	4	Air heater relay	MG612017-5	-
CR-29	HELLA	5	Forward relay	SJA003526-001	-
CR-30	HELLA	5	Reverse relay	SJA003526-001	-
CR-36A	HELLA	4	Pre-heater relay	SJA003526-001	-
CR-38	HELLA	5	Neutral relay	SJA003526-001	-
CR-45	HELLA	5	ECU power relay	SJA003526-001	-
CR-63	HELLA	5	Stop lamp relay	SJA003526-001	-
CR-66	HELLA	5	Parking relay	SJA003526-001	-
CR-67	CARLING	10	Quick coupler relay	VC2-01	-
CR-68	AMP	5	Safety solenoid relay	S816-002002	-
CR-75	HELLA	5	Illumination relay	SJA003526-001	-
CR-78	HELLA	5	Head lamp relay	SJA003526-001	-
CR-85	HELLA	5	Beacon lamp relay	SJA003526-001	-
CR-93	HELLA	5	Travel relay	SJA003526-001	-
CR-385	HELLA	5	Start limit relay	SJA003526-001	-
· SENDER					
CD-1	AMP	2	Hydraulic temp sender	85202-1	-
CD-2	AMP	2	Fuel sender	-	S816-102002
CD-3	DEUTSCH	3	Brake oil pressure switch	DT06-3S-EP06	-
CD-4	DEUTSCH	3	Stop lamp pressure switch	DT06-3S-EP06	-
CD-7	DEUTSCH	3	Working pressure switch	DT06-3S-EP06	-
CD-10	AMP	2	Air cleaner switch	85202-1	-
CD-31	DEUTSCH	3	Overload pressure switch	DT06-3S-EP06	DT04-3P-E005
CD-32	DEUTSCH	3	Boom up pressure switch	DT06-3S-EP06	-
CD-38	DEUTSCH	3	Working brake pressure switch	DT06-3S-EP06	-
CD-42	DEUTSCH	3	P1 pump pressure switch	DT06-3S-EP06	-
CD-45	DEUTSCH	2	WIF switch	DT06-2S-EP06	-
CD-73	DEUTSCH	3	Forward pressure switch	DT06-3S-EP06	-
CD-158A	AMP	4	MAF sensor	1-1718645-1	1-1564559-1

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
· SWITCH					
CS-2	KET	6	Start key switch	S814-006000	-
CS-2B	DEUTSCH	3	BKCU (CAN)	DT06-3S-EP06	DT04-3P-E005
CS-4	AMP	3	Safety switch	174257-2	-
CS-4A	-	4	Safety switch	-	174259-2
CS-16	KET	2	Fuel pump switch	174352-2	174354-2
CS-23	CALING	10	Auto cruise switch	VC2-01	-
CS-26A	AMP	2	Foot pedal	174352-2	S816-103002
CS-50	CARLING	10	Overload switch	VC2-01	-
CS-52	CARLING	10	Travel alarm select switch	VC2-01	-
CS-67	CARLING	10	Quick clamp switch	VC2-01	-
CS-74	-	2	Master switch	MG620557	-
CS-100	CARLING	10	DPF switch	VC2-01	-
CS-104	CARLING	10	Ram lock switch	VC2-01	-
CS-250	DEUTSCH	2	Seat belt alarm	DT06-2S-EP06	DT04-2P-E005
· DIODE					
DO-1	AMP	2	Diode (alternator)	S816-002002	21EA-50550
DO-2	AMP	2	Diode (fuel feed pump)	S816-002002	21EA-50550
DO-3	AMP	2	Diode (neutral)	S816-002002	21EA-50550
DO-3	AMP	2	Diode (MCU)	S816-002002	21EA-50550
DO-3A	AMP	2	Diode (MCU)	S816-002002	21EA-50550
DO-4	AMP	2	Diode (battery relay)	S816-002002	21EA-50550
DO-17	AMP	2	Diode (travel)	174352-2	21EA-50570
DO-18	AMP	2	Diode (travel)	174352-2	21EA-50570
DO-19	AMP	2	Diode (travel)	174352-2	21EA-50570
DO-20	AMP	2	Diode (2way/breaker)	S816-002002	21EA-50550

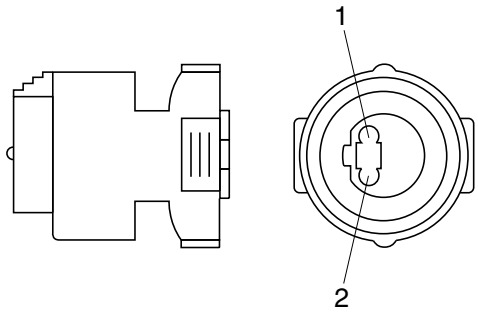
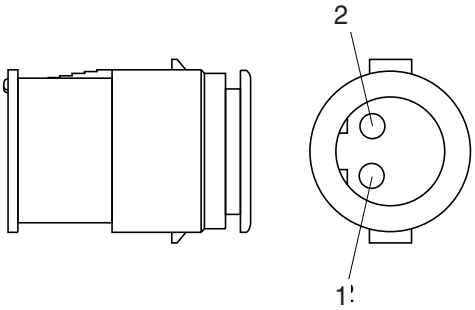
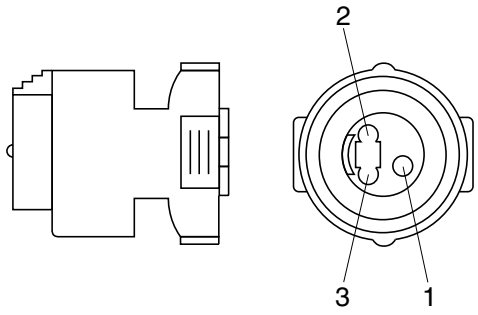
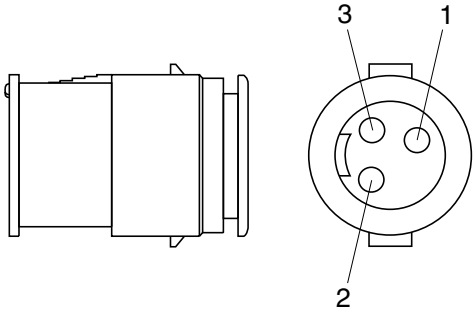
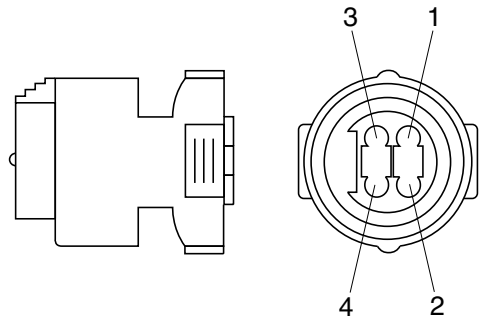
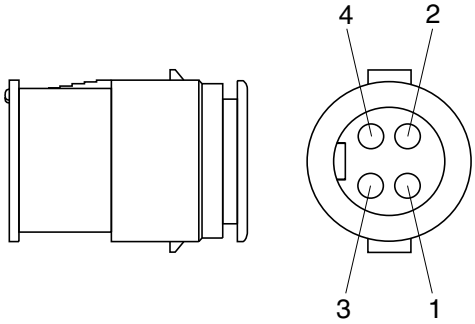
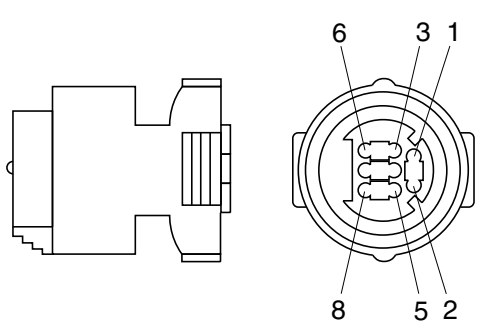
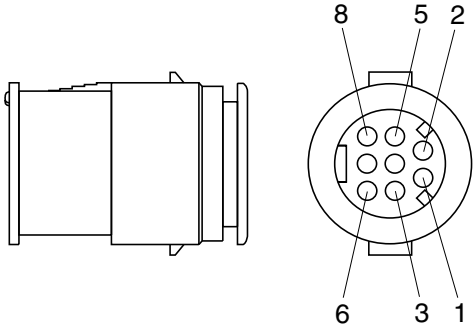
2. CONNECTION TABLE FOR CONNECTORS

1) PA TYPE CONNECTOR

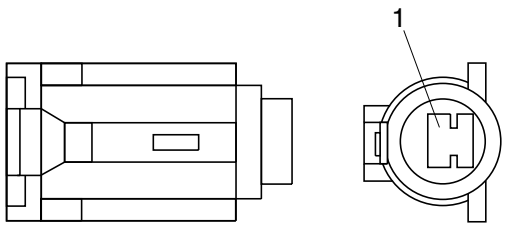
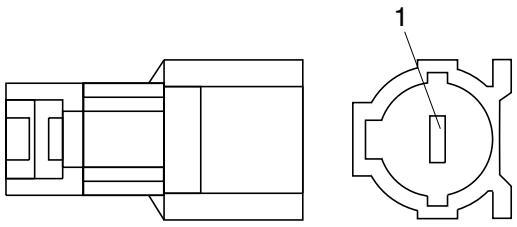
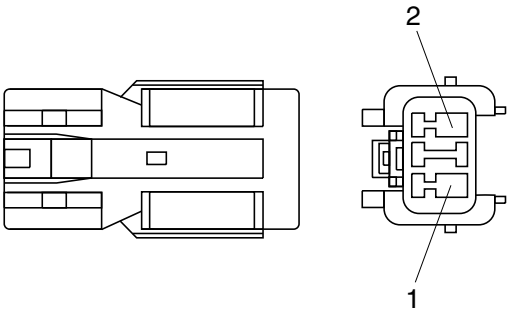
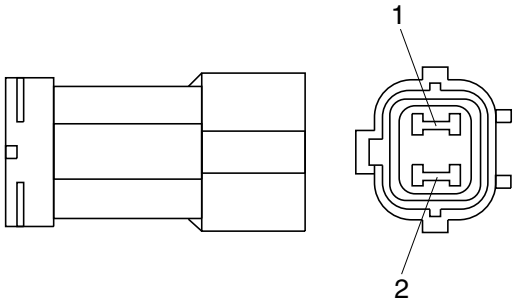
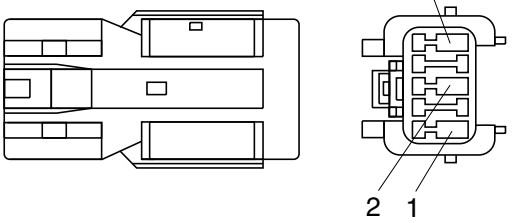
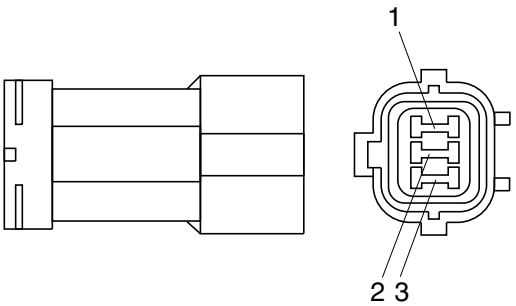
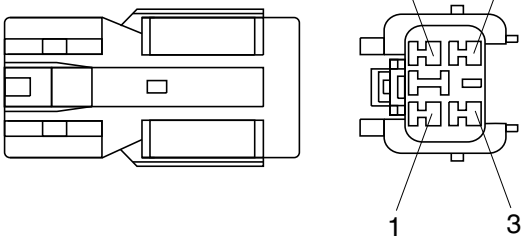
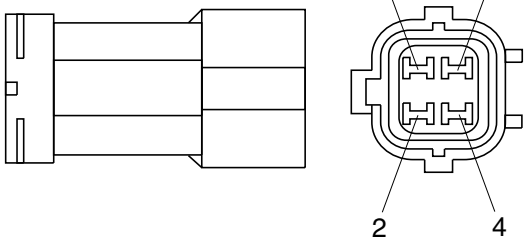
No. of pin	Connector (female)	Connector (male)
5	 S811-005002	 S811-105002
7	 S811-007002	 S811-107002
9	 S811-009002	 3S811-109002
11	 S811-011002	 S811-111002

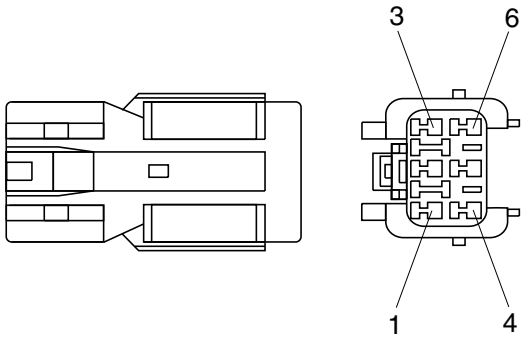
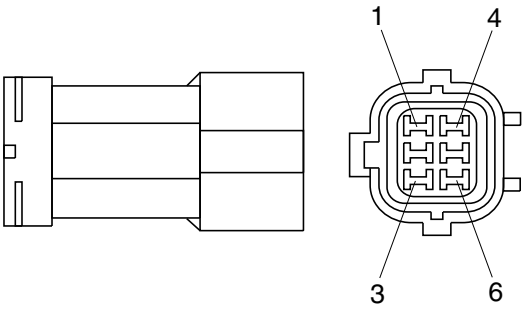
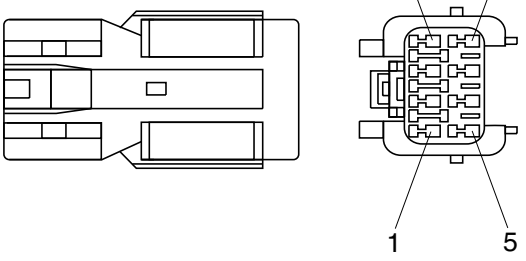
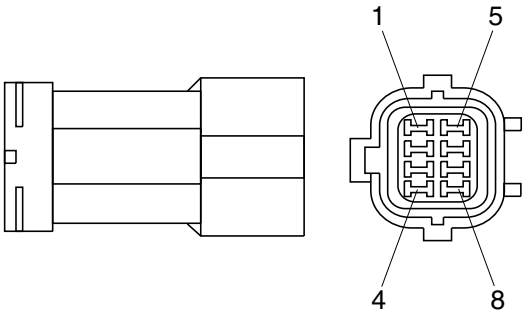
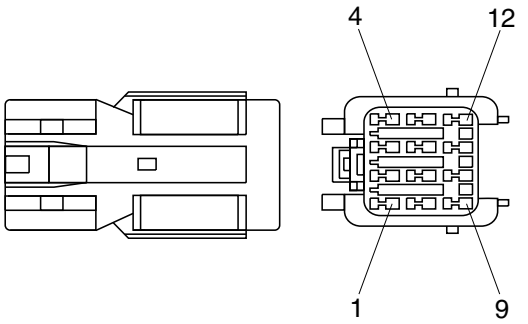
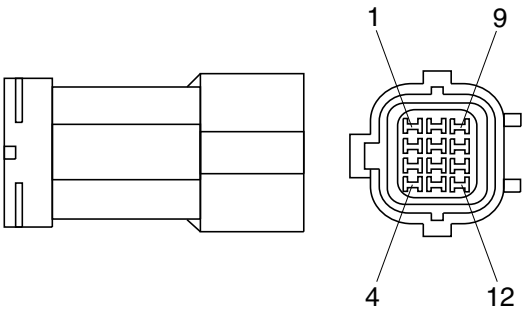
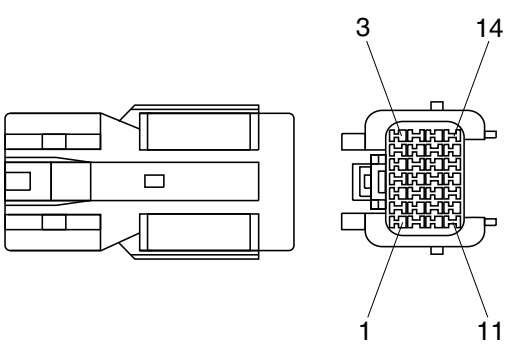
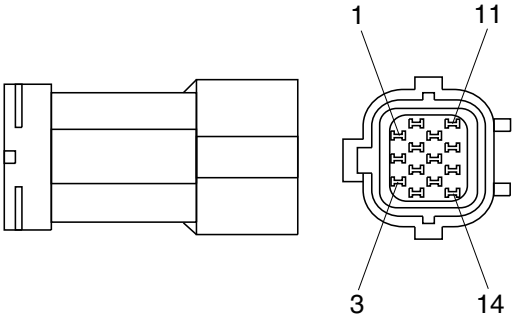
No. of pin	Connector (female)	Connector (male)
13	 S811-013002	 S811-113002
17	 S811-017002	 S811-117002
21	 S811-021002	 S811-121002

2) J TYPE CONNECTOR

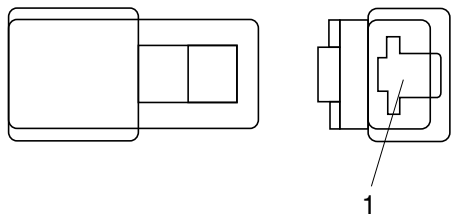
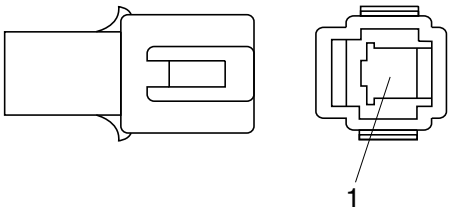
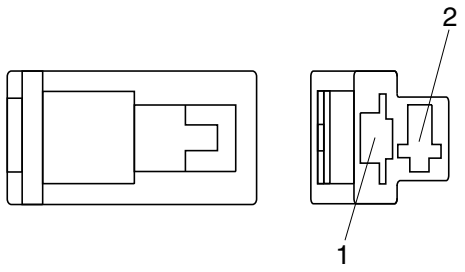
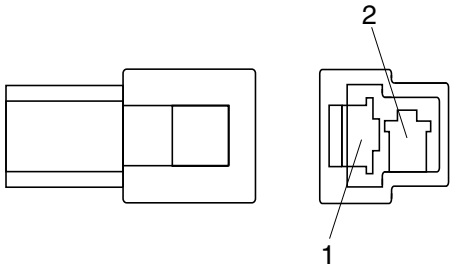
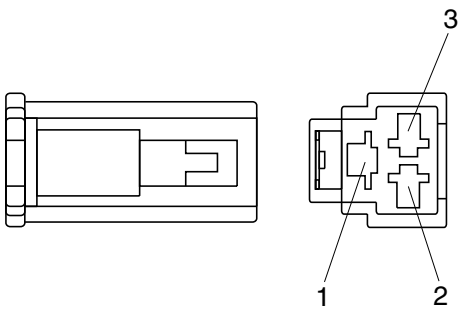
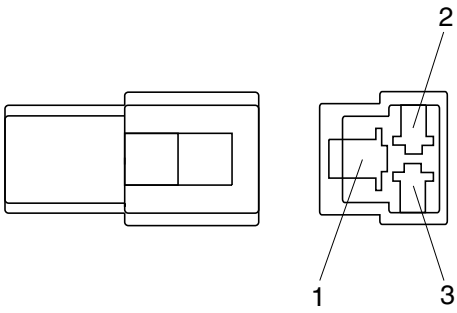
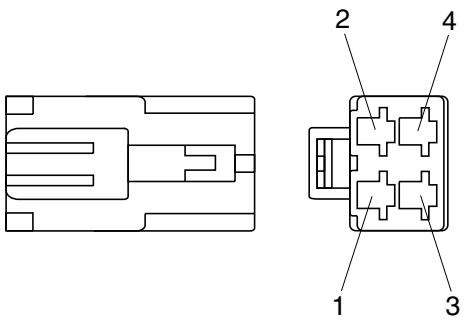
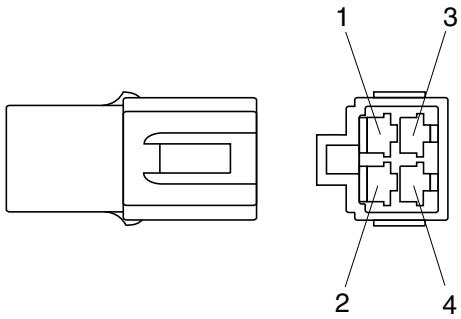
No. of pin	Connector (female)	Connector (male)
2	 S816-002001	 S816-102001
3	 S816-003001	 S816-103001
4	 S816-004001	 S816-104001
8	 S816-008001	 S816-108001

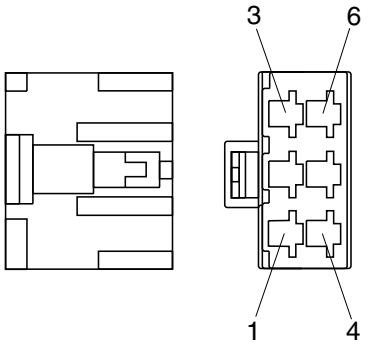
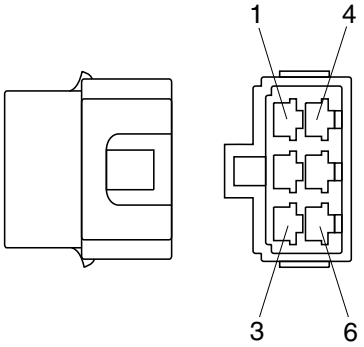
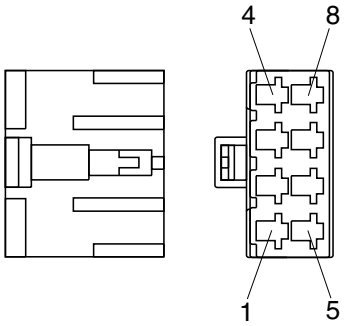
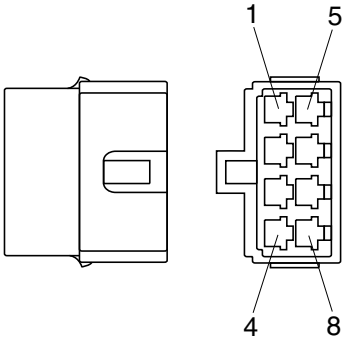
3) SWP TYPE CONNECTOR

No. of pin	Connector (female)	Connector (male)
1	 S814-001000	 S814-101000
2	 S814-002000	 S814-102000
3	 S814-003000	 S814-103000
4	 S814-004000	 S814-104000

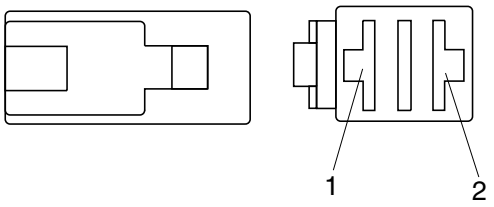
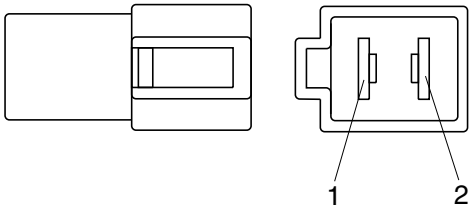
No. of pin	Connector (female)	Connector (male)
6	 S814-006000	 S814-106000
8	 S814-008000	 S814-108000
12	 S814-012000	 S814-112000
14	 S814-014000	 S814-114000

4) CN TYPE CONNECTOR

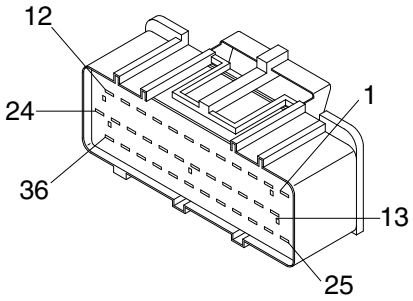
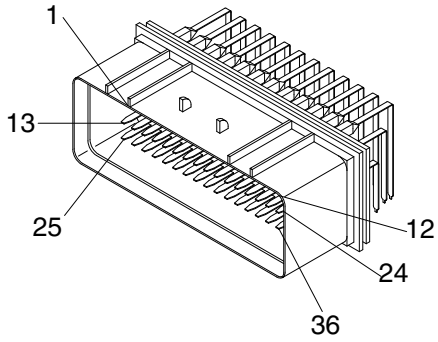
No. of pin	Connector (female)	Connector (male)
1	 S810-001202	 S810-101202
2	 S810-002202	 S810-102202
3	 S810-003202	 S810-103202
4	 S810-004202	 S810-104202

No. of pin	Connector (female)	Connector (male)
6	 S810-006202	 S810-106202
8	 S810-008202	 S810-108202

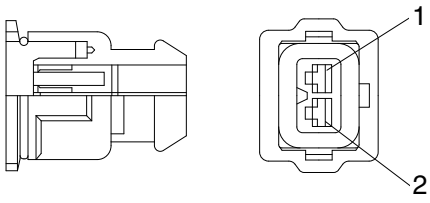
5) 375 FASTEN TYPE CONNECTOR

No. of pin	Connector (female)	Connector (male)
2	 S810-002402	 S810-102402

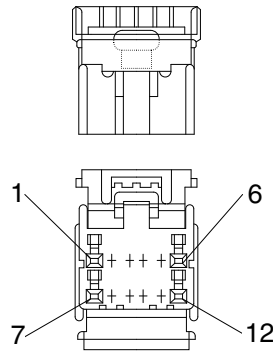
6) AMP ECONOSEAL CONNECTOR

No. of pin	Connector (female)	Connector (male)
36	 344111-1	 344108-1

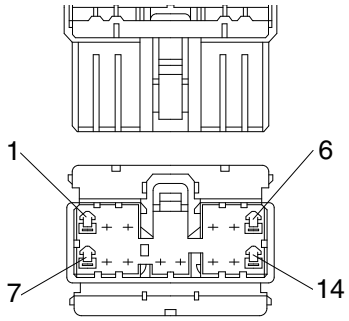
7) AMP TIMER CONNECTOR

No. of pin	Connector (female)	Connector (male)
2	 85202-1	

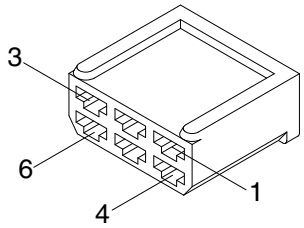
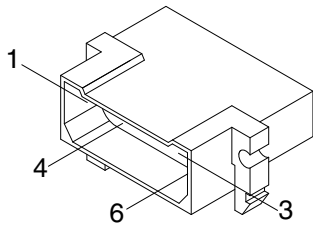
8) AMP 040 MULTILOCK CONNECTOR

No. of pin	Connector (female)	Connector (male)
12	 174045-2	

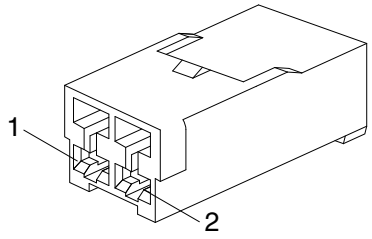
9) AMP 070 MULTILOCK CONNECTOR

No. of pin	Connector (female)	Connector (male)
14	 173852	

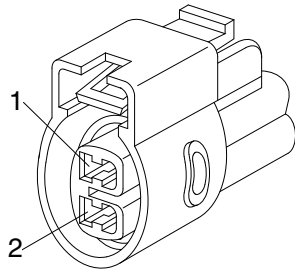
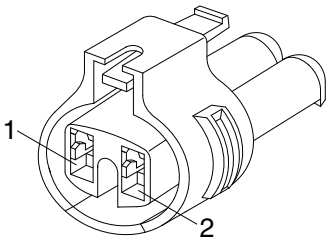
10) AMP FASTIN - FASTON CONNECTOR

No. of pin	Connector (female)	Connector (male)
6	 925276-0	 480003-9

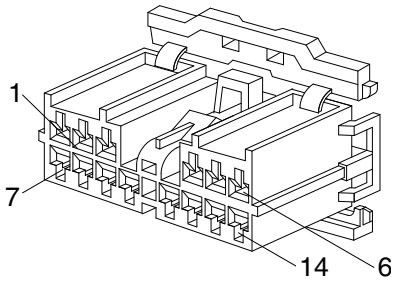
11) KET 090 CONNECTOR

No. of pin	Connector (female)	Connector (male)
2	 MG610070	

12) KET 090 WP CONNECTORS

No. of pin	Connector (female)	Connector (male)
2	 MG640605	
2	 MG640795	

13) KET SDL CONNECTOR

No. of pin	Connector (female)	Connector (male)
14	 MG610406	

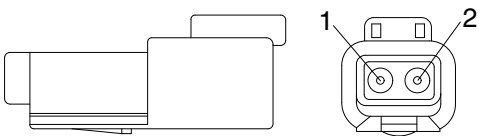
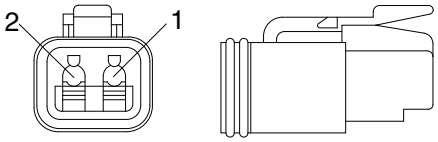
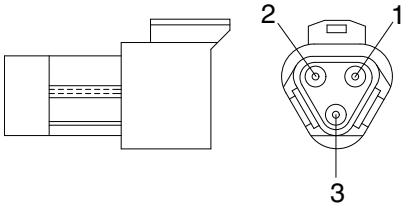
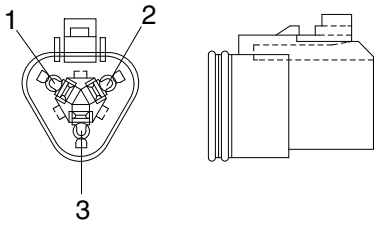
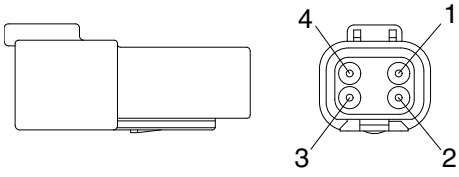
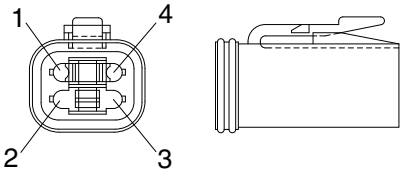
14) DEUTSCH DT CONNECTORS

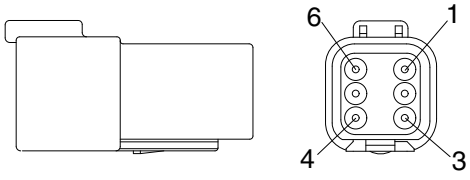
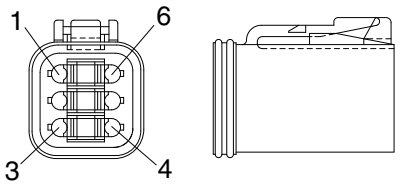
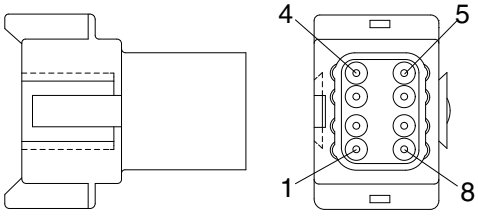
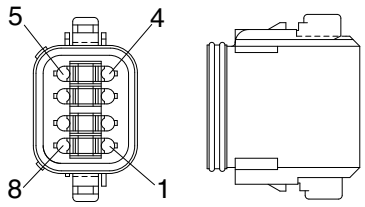
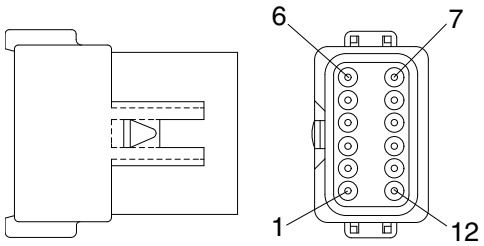
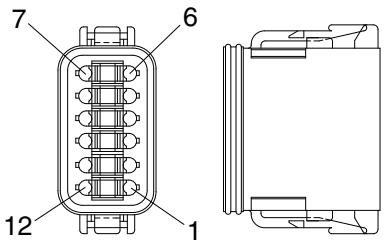
DT 06 - 3S - ★★★★

- ★★★★ : Modifications (see below)
- 3S : Number of contacts (P : Pin, S : Socket)
- 06 : 04 : Receptacle, 06 : Plug
- DT : Deutsch connectors

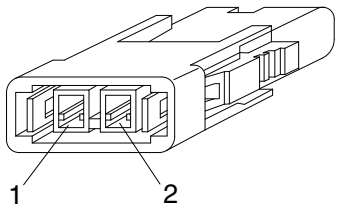
※ Modification

E003 : Standard end cap - gray
E004 : Color of connector to be black
E005 : Combination - E004 & E003
EP04 : End cap
EP06 : Combination P012 & EP04
P012 : Front seal enhancement - connectors color to black for 2, 3, 4 & 6pin

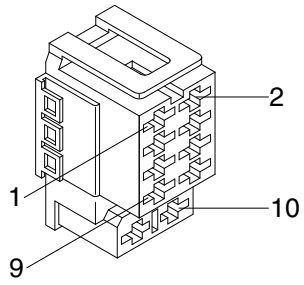
No. of pin	Connector (female)	Connector (male)
2	 DT06-2S	 DT06-2P
3	 DT06-3S	 DT06-3P
4	 DT06-4S	 DT06-4P

No. of pin	Connector (female)	Connector (male)
6	 DT06-6S	 DT06-6P
8	 DT06-8S	 DT06-8P
12	 DT06-12S	 DT06-12P

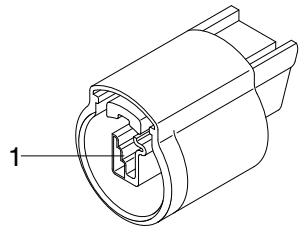
15) MOLEX 2CKTS CONNECTOR

No. of pin	Connector (female)	Connector (male)
2	 35215-0200	

16) ITT SWF CONNECTOR

No. of pin	Connector (female)	Connector (male)
10	 SWF593757	

17) MWP NMWP CONNECTOR

No. of pin	Connector (female)	Connector (male)
1	 NMWP01F-B	

GROUP 6 FAULT CODES

1. MACHINE FAULT CODE

Fault code		Description
HCESPN	FMI	
101	3	Hydraulic oil temperature sensor circuit - voltage above normal or shorted to high source (or open circuit)
	4	Hydraulic oil temperature sensor circuit - voltage below normal or shorted to low source
105	0	Working pressure sensor data above normal range (or open circuit)
	1	Working pressure sensor data below normal range
	2	Working pressure sensor data error
	4	Working pressure sensor circuit - voltage below normal, or shorted to low source
108	0	Travel oil pressure sensor data above normal range (or open circuit)
	1	Travel oil pressure sensor data below normal range
	2	Travel oil pressure sensor data error
	4	Travel oil pressure sensor circuit - voltage below normal or shorted to low source
122	0	Overload pressure sensor data above normal range (or open circuit)
	1	Overload pressure sensor data below normal range
	2	Overload pressure sensor data error
	3	Overload pressure sensor circuit - voltage below normal or shorted to low source
301	3	Fuel level sensor circuit - voltage above normal or shorted to high source (or open circuit)
	4	Fuel level sensor circuit - voltage below normal or shorted to low source
503	0	Brake pressure sensor data above normal range (or open circuit)
	1	Brake pressure sensor data below normal range
	2	Brake pressure sensor data error
	4	Brake pressure sensor data - voltage below normal or shorted to low source
505	0	Working brake pressure sensor data above normal range (or open circuit)
	1	Working brake pressure sensor data below normal range
	2	Working brake pressure sensor data error
	4	Working brake pressure sensor circuit - voltage below normal, or shorted to low source
530	0	Travel fwd pilot pressure sensor data above normal range (or open circuit)
	1	Travel fwd pilot pressure sensor data below normal range
	2	Travel fwd pilot pressure sensor data error
	4	Travel fwd pilot pressure sensor circuit - voltage below normal, or shorted to low source
	14	Travel fwd pilot pressure sensor circuit - special instructions
	16	Travel fwd pilot pressure sensor circuit - voltage valid but above normal operational range
701	4	Hour meter circuit - voltage below normal, or shorted to low source
705	0	MCU input voltage high
	1	MCU input voltage low
707	1	Alternator node I voltage low (or open circuit)
714	3	Acc. dial circuit - voltage above normal, or shorted to high source (or open circuit)
	4	Acc. dial circuit - voltage below normal, or shorted to low source
840	2	Cluster communication data error
841	2	ECM communication data error
IDSP		Water in fuel warning
Lo bat		Low battery warning

2. ENGINE FAULT CODE

Fault code		Description	
YANMAR SPN	FMI	Area	Status
522400	2	Crankshaft speed sensor	Crankshaft signal error
	5		No signal from crankshaft
522401	2	Camshaft speed sensor	Camshaft signal error
	5		No signal from camshaft
	7		Angle offset error
523249	5	Crankshaft speed sensor, Camshaft speed sensor	Crankshaft/camshaft, speed sensor non-input (simultaneous)
91	3	Accelerator sensor 1	Accelerator sensor 1 error (voltage high)
	4		Accelerator sensor 1 error (voltage low)
28	3	Accelerator sensor 2	Accelerator sensor 2 error (voltage high)
	4		Accelerator sensor 2 error (voltage low)
522624	7	Accelerator sensor 1 + 2	Dual accelerator sensor error (closed position)
522623	7		Dual accelerator sensor error (open position)
29	3	Accelerator sensor 3	Accelerator sensor 3 error (voltage high)
	4		Accelerator sensor 3 error (voltage low)
	8	Pulse sensor	Pulse accelerator sensor error (pulse communication)
28	0	Accelerator sensor 3	Accelerator sensor 3 error (foot pedal in open position)
	1		Accelerator sensor 3 error (foot pedal in closed position)
51	3	Intake throttle position sensor	Intake throttle position sensor error (voltage high)
	4		Intake throttle position sensor error (voltage low)
102	3	EGR low pressure side pressure sensor	ERG low pressure side pressure sensor error (excessive sensor output)
	4		ERG low pressure side pressure sensor error (insufficient sensor output)
	13		ERG low pressure side pressure sensor error (abnormal learning value)
	10		ERG low pressure side pressure sensor error (detected value error)
1209	3	EGR pressure sensor (high-pressure side)	ERG high pressure side pressure sensor error (excessive sensor output)
	4		ERG high pressure side pressure sensor error (insufficient sensor output)
	13		ERG high pressure side pressure sensor error (abnormal learning value)
	10		ERG high pressure side pressure sensor error (detected value error)
110	3	Engine coolant temperature sensor	Engine coolant temperature sensor error (excessive sensor output)
	4		Engine coolant temperature sensor error (insufficient sensor output)
	10		Engine coolant temperature sensor error (detected value error)
	0		Engine coolant temperature high (overheat)
172	3	Ambient air temperature sensor	Ambient air temperature sensor error (voltage high)
	4		Ambient air temperature sensor error (voltage low)

Fault code		Description	
YANMAR SPN	FMI	Area	Status
174	3	Fuel temperature sensor	Fuel temperature sensor error (voltage high)
	4		Fuel temperature sensor error (voltage low)
	0		Fuel temperature high
157	3	Rail pressure sensor	Rail pressure sensor error (voltage high)
	4		Rail pressure sensor error (voltage low)
3251	3	DPF differential pressure sensor	DPF differential pressure sensor error (excessive sensor output)
	4		DPF differential pressure sensor abnormal rise in differential pressure
	0		DPF differential pressure sensor error abnormal rise in differential pressure
	13		DPF differential pressure sensor error (abnormal learning value)
4795	31	DPF substrate/DPF differential pressure sensor	DPF substrate/DPF differential pressure sensor error (DPF substrate removal/DPF differential pressure sensor detected value error)
3609	3	DPF high pressure side pressure sensor	DPF high pressure side pressure sensor error (excessive sensor output)
	4		DPF high pressure side pressure sensor error (insufficient sensor output)
	10		DPF high pressure side pressure sensor error (detected value error)
3242	3	DPF intermediated temperature sensor	DPF inlet temperature sensor error (excessive sensor output)
	4		DPF inlet temperature sensor error (insufficient sensor output)
	10		DPF inlet temperature sensor error (detected value error)
	0		DPF inlet temperature sensor abnormal temperature (abnormally high)
3250	3	DPF intermediate temperature sensor	DPF intermediate temperature sensor error (excessive
	4		DPF intermediate temperature sensor error (insufficient sensor output)
	10		DPF intermediate temperature sensor error (detected value error)
	1		DPF intermediate temperature sensor abnormal temperature (abnormally low)
108	3	Atmospheric pressure sensor	Atmospheric pressure sensor error (excessive sensor output)
	4		Atmospheric pressure sensor error (insufficient sensor output)
	10		Atmospheric pressure sensor error (characteristic error)
173	3	Exhaust manifold temperature sensor	Exhaust manifold temperature sensor error (excessive sensor output)
	4		Exhaust manifold temperature sensor error (insufficient sensor output)
	10		Exhaust manifold temperature sensor error (detected value error)
1485	7	Main relay	Main relay contact sticking
	2		Main relay early opening

Fault code		Description	
YANMAR SPN	FMI	Area	Status
522243	5	Starting aid relay	Starting aid relay disconnection
	6		Starting aid relay relay GND short circuit
654	5	Injector (No.1 cylinder)	Disconnection (injector-specific)
	6		Coil short circuit
	3		Short circuit
653	5	Injector (No.2 cylinder)	Disconnection (injector-specific)
	6		Coil short circuit
	3		Short circuit
652	5	Injector (No.3 cylinder)	Disconnection (injector-specific)
	11		Coil short circuit
	3		Short circuit
651	5	Injector (No.4 cylinder)	Disconnection (injector-specific)
	6		Coil short circuit
	3		Short circuit
4257	12	All injectors	Injector drive IC error
2797	6		Injector drive circuit (Bank1) shotrt circuit (4TN: common circuit for No.1, No4 and all 3TN cylinders)
2798	6		Injector drive circuit (Bank2) short circuit (4TN: circuit for No.2 and 3 cylinders)
523462	13	Injector (correction value)	Inujector (No.1 cylinder) correction value error
523463	13		Inujector (No.2 cylinder) correction value error
523464	13		Inujector (No.3 cylinder) correction value error
522465	13		Inujector (No.4 cylinder) correction value error
522571	3	SCV (MPROP)	SCV (MPROP) L side VB short circuit
	6		SCV (MPROP) L side GND short circuit
633	3		SCV (MPROP) H side VB short circuit
	6		SCV (MPROP) H side GND short circuit
	5		SCV (MPROP) disconnection
522572	6		SCV (MPROP) drive current (high level)
	11		SCV (MPROP) pump overload error
157	0	Rail pressure error	Rail pressure too high
	18		Rail pressure deviation error (low rail pressure)
	15		Rail pressure deviation errer (high rail pressure)
	16	PLV (common rail pressure limit valve)	PLV open valve
523469	0		Rail pressure fault (The times of PLV valve opening error)
523470	0		Rail pressure fault (The time of PLV valve opening error)
523489	0		Rail pressure fault (The actual rail pressure is too high during PRV limp home)
523498	9		Rail pressure fault (contrilled rail pressure error after PLV valve opening)
523491	0	Rail pressure control	Rail pressure fault (injector B/F temperature error during PLV4 limp home)
523460	7		Rail pressure fault (operation time error during RPS limp home)

Fault code		Description	
YANMAR SPN	FMI	Area	Status
190	16	Overspeed	Overspeed
2950	5	Intake throttle drive circuit	No-load of throttle valve drive H bridge circuit
	3		Power short circuit of throttle valve drive H bridge output 1
	4		GND short circuit of throttle valve drive H bridge output 1
	6		Overload on the drive H bridge circuit of throttle valve
2951	3		VB power short circuit of throttle valve drive H bridge output 2
	4		GND short circuit of throttle valve drive H bridge output 1
2950	7		Throttle valve sticking (sticking open)
2951	7		Throttle valves sticking (sticking closed)
522596	9	CAN 2	TSC1 (SA1) reception timeout
522597	9		TSC1 (SA2) reception timeout
522599	9		Y_ECR1 reception timeout
522600	9		Y_EC reception timeout
522601	9		Y_RSS reception timeout
237	31		VI_ reception timeout
	13		VI_ reception data error
522609	9		Y_ETCP1 reception timeout
522618	9		EBC1 reception timeout
522619	9		Y_DPFIF reception timeout
522730	12		Immobilzer error (CAN communication)
1202	2		Immobilizer error (system)
522610	9	CAN 1	CAN 1 (for EGR): reception timeout from the EGR valve
522611	9		CAN 1 (for exhaust throttle): receptiom timeout
2791	0	EGR valve	EGR overvoltage error
	1		EGR low voltage error
	7		EGR feedback error
	9		EGR ECM data error
	12		Disconnection in EGR motor coils
522579	12		Short circuit in EGR motor coils
522580	12		EGR position sensor error
522581	7		EGR valve sticking error
522183	7		EGR initialization error
522184	1		EGR high temperature thermistor error
522617	1		EGR low temperature thermistor error
522746	12		EGR target value out of range
522747	12	Exhaust throttle	Exhaust throttle (voltage fault)
522748	12		Exhaust throttle (motor fault)
522749	12		Exhaust throttle (sensor system fault)
	12		Exhaust throttle (MPU fault)
522750	12		Exhaust throttle (PCB fault)
522751	19		Exhaust throttle (CAN fault)

Fault code		Description	
YANMAR SPN	FMI	Area	Status
630	12	EEPROM	EEPROM memory deletion error
522576	12		EEPROM memory reading error
522578	12		EEPROM memory writing error
522585	12	ECU internal fault	CY 146 SPI communication fault
522588	12		Excessive voltage of supply 1
522589	12		Insufficient voltage of supply 1
522590	12		Sensor supply voltage error 1
522591	12		Sensor supply voltage error 2
522592	12		Sensor supply voltage error 3
522744	4		Actuator drive circuit 1 short to ground
522994	4		Actuator drive circuit 2 short to ground
523471	6		Actuator drive circuit 3 chort to ground
523473	12		AD converter fault 1
523474	12		AD converter fault 2
523475	12		External monitoring IC and CPU fault 1
523476	12		External monitoring IC and CPU fault 2
523477	12		ROM fault
523478	12		Shutoff path fault 1
523479	12		Shutoff path fault 2
523480	12		Shutoff path fault 3
523481	12		Shutoff path fault 4
523482	12		Shutoff path fault 5
523483	12		Shutoff path fault 6
523484	12		Shutoff path fault 7
523485	12		Shutoff path fault 8
523486	12		Shutoff path fault 9
523487	12		Shutoff path fault 10
523488	0		Recognition error of engine speed
3059	5	Breather heater (optional parts for 4TNV86CT and 4TNV98CT)	Breather heater disconnection
	4		Breather heater short circuit (GND)
	3		Breather heater short circuit (VB)
522323	0	Air cleaner switch	Air cleaner clogged alarm
522329	0	Water weparator switch	Water separator alarm
167	5	Charge switch	Charge switch disconnection
	1		Charge alarm
100	4	Oil pressure switch	Oil pressure switch disconnection
	1		Low oil pressure alarm
522573	0	DPF	Excessive PM accumulation (method C)
522574	0		Excessive PM accumulation (method P)
522575	7		Regeneration falure (stationary regeneration failure)
522577	11		Regeneration failure (staonary regeneration not performed)
3250	0	DPF intermediate temperature sensor	DPF intermediate temperature sensor abnormal rise in temperature (post-injection malfunction)

Fault code		Description	
YANMAR SPN	FMI	Area	Status
3720	16	DPF OP interface	Ash cleaning request 1
	0		Ash cleaning request 2
3719	16		Stationary regeneration standby
	0		Backup mode
3695	14		Reset regeneration is inhibited
3719	9		Regeneration faulure (recovery regeneration failure)
	7		Recovery regeneration is inhibited