

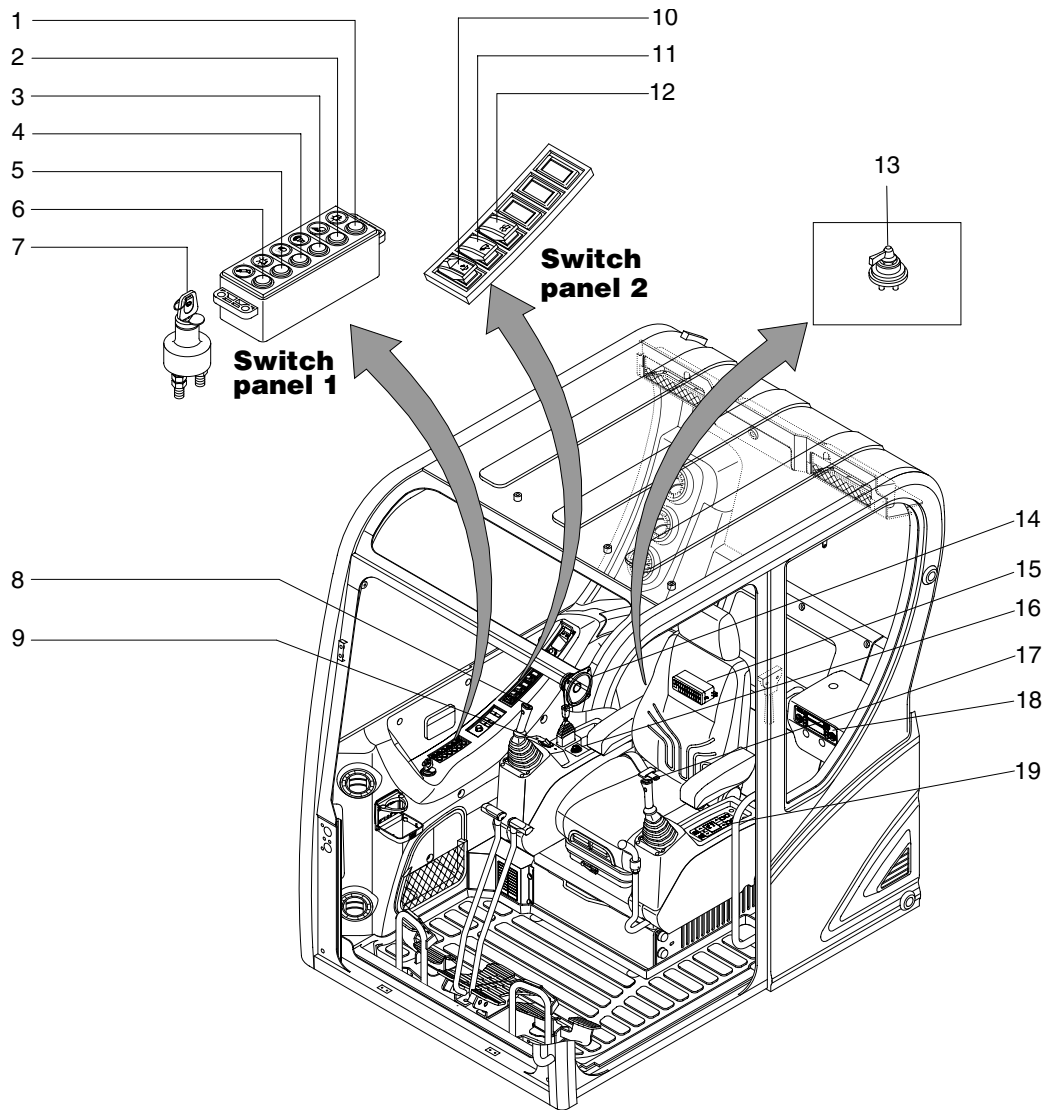
SECTION 4 ELECTRICAL SYSTEM

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SECTION 4 ELECTRICAL SYSTEM

GROUP 1 COMPONENT LOCATION

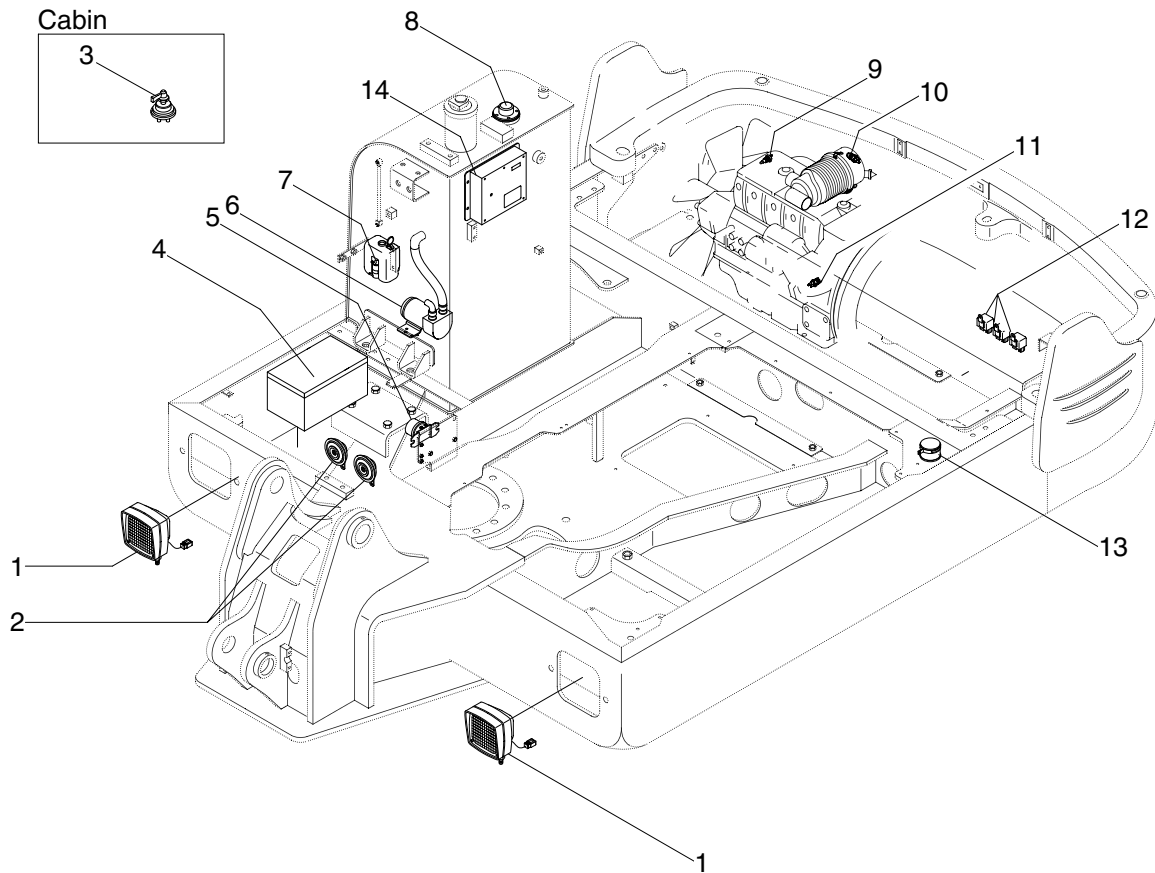
1. LOCATION 1



5594EL02

- | | | | | | |
|---|--------------------------|----|--------------------------|----|----------------------------|
| 1 | Head light switch | 8 | Breaker operation switch | 15 | Fuse box |
| 2 | Work light switch | 9 | Accel dial switch | 16 | Cigar lighter |
| 3 | Travel alarm switch | 10 | Quick clamp switch | 17 | Horn switch |
| 4 | Cab light switch | 11 | Wiper switch | 18 | Radio & CD/MP3 player |
| 5 | Beacon switch | 12 | Washer switch | 19 | Aircon & heater controller |
| 6 | Breaker selection switch | 13 | Master switch | | |
| 7 | Start switch | 14 | Speaker | | |

2. LOCATION 2



5594EL03

- | | | | | | |
|---|---------------|----|--------------------|----|----------------------------|
| 1 | Lamp | 6 | Fuel filler pump | 11 | Engine oil pressure switch |
| 2 | Horn | 7 | Washer pump | 12 | Relays |
| 3 | Master switch | 8 | Fuel sender | 13 | Travel alarm buzzer |
| 4 | Battery | 9 | Temperature sender | 14 | MCU |
| 5 | Battery relay | 10 | Air clearer switch | | |

GROUP 2 MONITORING SYSTEM

1. OUTLINE

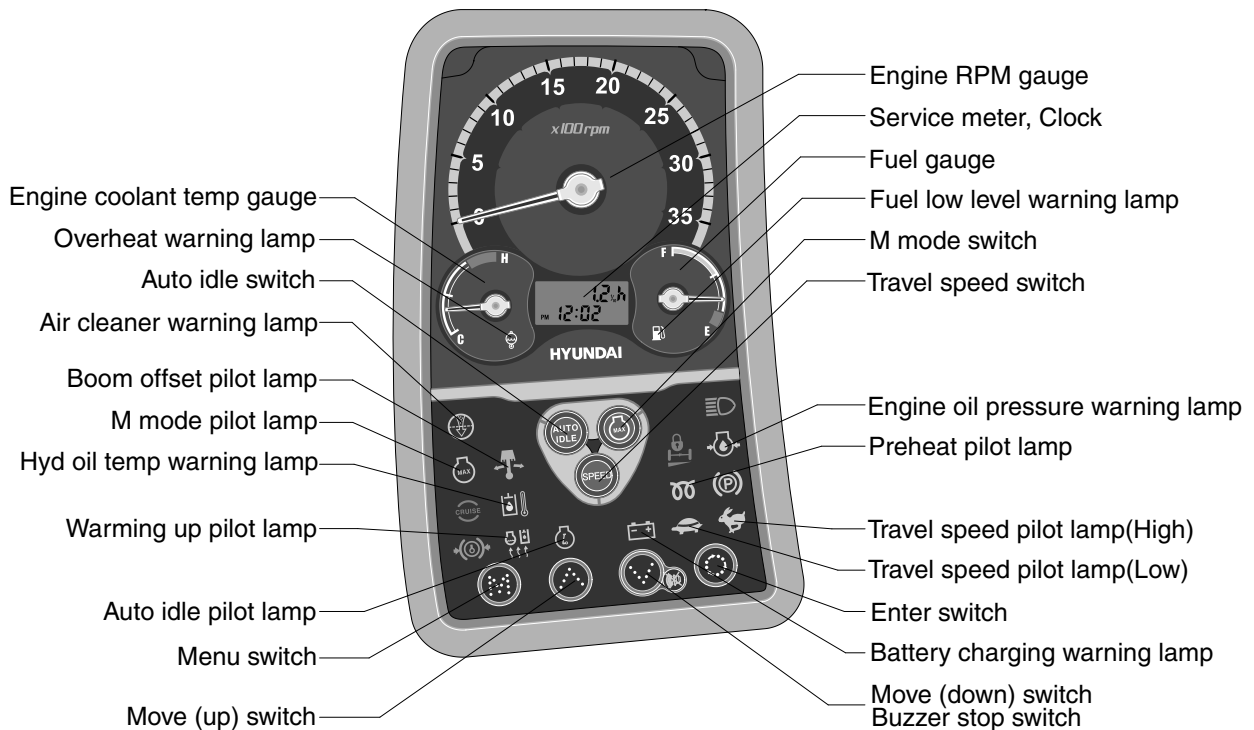
Monitoring system consists of the monitor part and switch part.

The monitor part gives warnings when any abnormality occurs in the machine and informs the condition of the machine.

Various select switches are built into the monitor panel, which act as the control portion of the machine control system.

2. CLUSTER

1) MONITOR PANEL



5593CD02

2) CLUSTER CHECK PROCEDURE

(1) Start key : ON

① Check monitor initial 6 seconds

- a. All lamps light up.
- b. Buzzer sound.

② Check monitor after 3 seconds : Indicate machine condition

- a. Tachometer : 0 rpm
- b. Fuel gauge : Pointed at appropriate level
- c. Engine coolant temperature gauge : Pointed at appropriate level
- d. Warning lamp
 - ※ During start key ON the engine oil pressure lamp and battery charging lamp go on, but it is not abnormal.
 - ※ When engine coolant temperature below 30°C, the warming up lamp lights up and then operating the preheat switch.

(2) Start of engine

① Check machine condition

- a. Tachometer pointed at present rpm
- b. Gauge and warning lamp : Indicate at present condition.
 - ※ When normal condition : All warning lamp OFF
- c. Travel speed pilot lamp : Low (turtle)

② When abnormal condition

- a. The lamp lights up and the buzzer sounds.
- b. If BUZZER STOP switch is pressed, buzzer sound is canceled but the lamp light up until normal condition.

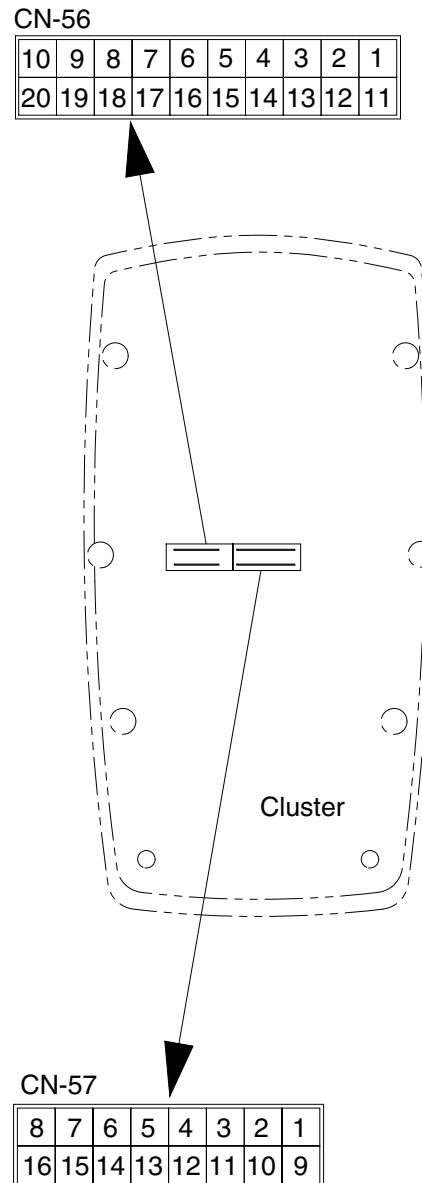
3. CLUSTER CONNECTOR

1) CN-56 CONNECTOR

No.	Signal	Input/Output
1	Null	-
2	Null	-
3	Alternator signal	Input
4	Null	-
5	Tacho signal	Input
6	Anti-restart signal	Output
7	Pre-heat signal	Output
8	Travel relay	Output
9	Power 12V	-
10	Power IG 12V	-
11	Travel signal	Input
12	Illumination	Input
13	Null	-
14	Null	-
15	Fuel level sender	Input
16	Hyd oil temp sendor	Input
17	Water temp sender	Input
18	GND	-
19	GND	-
20	GND	-

2) CN-57 CONNECTOR

No.	Signal	Input/Output
1	Null	-
2	Engine oil pressure switch	Input
3	Hyd oil temp sendor	Input
4	Boom swing signal	-
5	Null	-
6	Null	-
7	Null	-
8	Null	-
9	Program dump	-
10	Null	-
11	COM-GND	Input
12	RS232-RX	Input
13	RS232-TX	Output
14	RS485-RX	Input
15	RS485-TX	Output
16	Over heat signal	Input

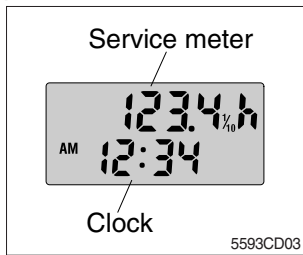


5594EL15

4. CLUSTER FUNCTION

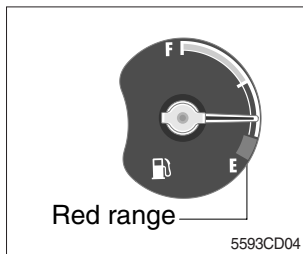
1) GAUGES AND DISPLAYS



(1) LCD display



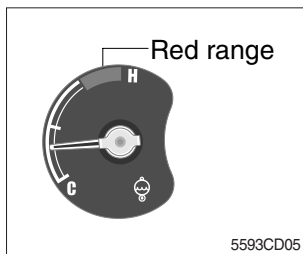
- ① **Service meter** : This meter shows the total operation hours of the machine.
 - ※ Always ensure the operating condition of the meter during the machine operation.
 - ※ The last unit $\frac{4}{10}$ indicates 1/10 of 4 hours.
(for example : $\frac{1}{10}$ indicates 6 minutes)
- ② **Clock** : This displays the current time.
 - ※ Refer to the "menu switch" for the setting time/ESL switch.


(2) Fuel gauge



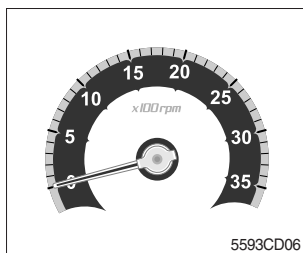
- ① This gauge indicates the amount of fuel in the fuel tank.
- ② Fill the fuel when the red range or warning lamp  blinks.
- ※ **If the gauge indicate the red range or warning lamp  ON. Even though the machine is on the normal condition, check the electric device as that can be caused by the poor connection of electricity or sensor.**

(3) Engine coolant temperature gauge



- ① This indicates the temperature of coolant.
- ② When the red range pointed or warning lamp  blinks, engine do not abruptly stop but run it at medium speed to allow it to cool gradually, then stop it.
Check the radiator and engine.
- ※ **If the engine is stopped without cooled down running, the temperature of engine parts will rise suddenly, this could cause severe engine trouble.**

(4) Engine rpm gauge



- ① This gauge displays the number of engine revolutions per minute.

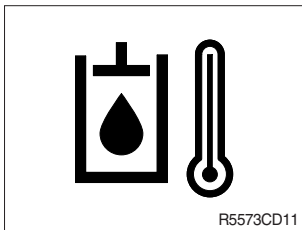
2) WARNING AND PILOT LAMPS

(1) Fuel low level warning lamp



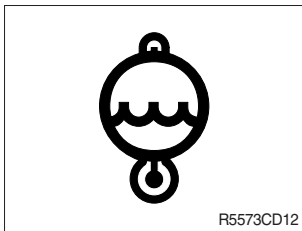
- ① This lamp blinks and the buzzer sounds when the level of fuel is below 18 l (4.8 U.S. gal).
- ② Fill the fuel immediately when the lamp blinks.

(2) Hydraulic oil temperature warning lamp



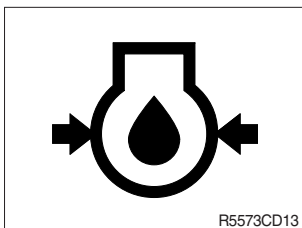
- ① This warning lamp operates and the buzzer sounds when the temperature of hydraulic oil is over 105°C (221°F).
- ② Check the hydraulic oil level when the lamp blinks.
- ③ Check for debris between oil cooler and radiator.

(3) Overheat warning lamp



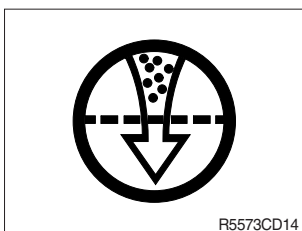
- ① This lamp blinks and the buzzer sounds when the temperature of coolant is over the normal temperature 110°C (230°F).
- ② Check the cooling system when the lamp blinks.

(4) Engine oil pressure warning lamp



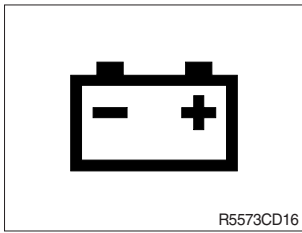
- ① This lamp blinks and the buzzer sounds after starting the engine because of the low oil pressure.
- ② If the lamp blinks during engine operation, shut OFF engine immediately. Check oil level.

(5) Air cleaner warning lamp



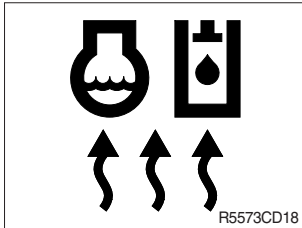
- ① This lamp blinks and the buzzer sounds when the filter of air cleaner is clogged.
- ② Check the filter and clean or replace it.

(6) Battery charging warning lamp



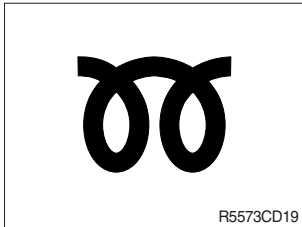
- ① This lamp blinks and the buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.
- ② Check the battery charging circuit when this lamp blinks during engine operation.

(7) Warming up pilot lamp



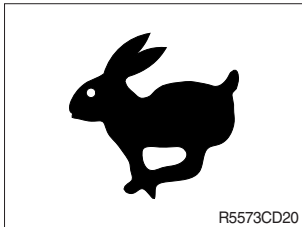
- ① This lamp is turned ON when the coolant temperature is below 30°C (86°F).
- ② The automatic warming up is cancelled when the engine coolant temperature is above 30°C, or when 10 minutes have passed since starting.

(8) Preheat pilot lamp



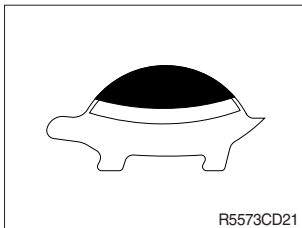
- ① When engine preheating switch is turned ON, pilot lamp comes ON.
- ② Refer to the preheating switch for details.

(9) Travel speed pilot lamp (high)



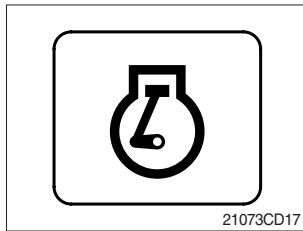
- ① When this lamp turned ON, the machine travel high speed.
- ② Refer to the travel speed select switch for details.

(10) Travel speed pilot lamp (low)



- ① When this lamp turned ON, the machine travel low speed.
- ② Refer to the travel speed select switch for details.

(11) Auto idel pilot lamp



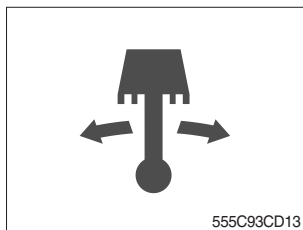
- ① If the control lever and pedal are not moved for several seconds with auto idle switch pressed, the indicator illuminates and engine speed is decelerated.
- ② If the auto idle switch is pressed once more or the control lever or pedal is moved, the indicator turns off and the number of engine revolution is turned to the previous condition.

(12) M mode pilot lamp



- ① This lamp is ON when the M mode switch is pressed.
- ② Engine is operated with a maximum speed.

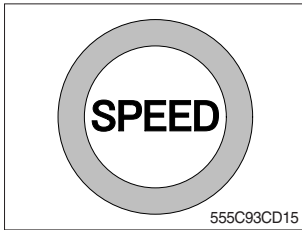
(13) Boom offset pilot lamp



- ① This lamp is ON when the boom offset switch is pressed.

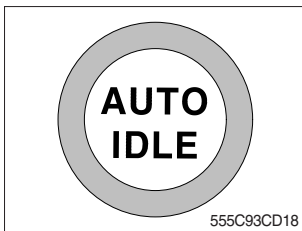
3) SWITCHES

(1) Travel speed control switch



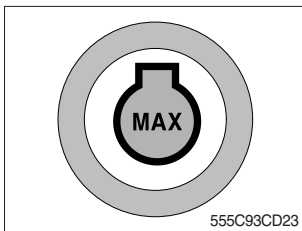
- ① This switch is to control the travel speed which is changed to high speed (rabbit mark) by pressing the switch and low speed (turtle mark) by pressing it again.

(2) Auto idle switch



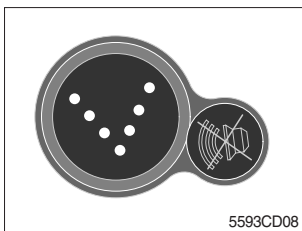
- ① This switch is used to actuate or cancel the auto idle function.
- ② When the switch actuated and all control levers and pedals are at neutral position, engine speed will be lowered automatically to save fuel consumption.

(3) M mode switch



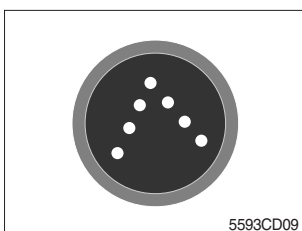
- ① This switch is used to maximum power.
- ② When this switch is pressed, the M mode pilot lamp is ON or OFF.

(4) Move (down) & buzzer stop switch



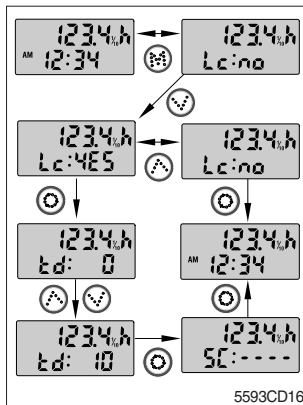
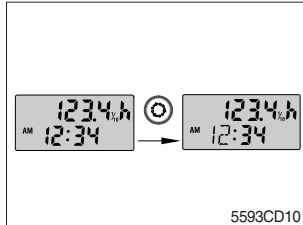
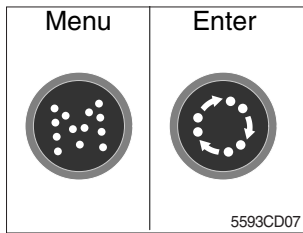
- ① When the starting switch is turned ON first, normally the alarm buzzer sounds for 6 seconds during lamp check operation.
- ② The lamp lights ON and the buzzer sounds when the machine has a problem.
In this case, press this switch and buzzer stops, but the lamp lights until the problem is cleared.
- ③ This switch is used to move down or decrease input value.
※ Refer to page 4-11.

(5) Move (up) switch



- ① This switch is used to move up or increase input value.
※ Refer to page 4-11.

(6) Menu and enter switch



① These switches are used to set time or set ESL (Engine Start Limit) function.

- The Enter button (⊙) is used to select a function.
- The Menu button (⊗) is used to select a menu or return to the time display menu.

② Setting time

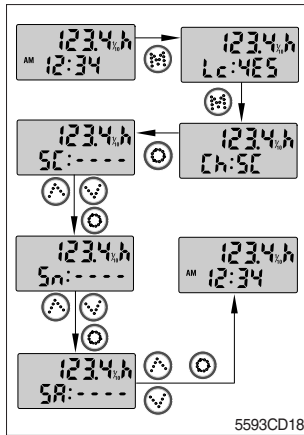
- Press Enter button (⊙) to set time, then the screen will be changed to a display for time setting as a following picture and time cipher will blink.
- **Set hours** : When the cipher for hour blinks, press up (⬆) or down (⬇) button and set the hour.
- **Set minutes**: When the cipher for minute blinks, press up (⬆) or down (⬇) button and set the minute.

③ Set ESL (Engine Start Limit) function

- Press Menu button (⊗), the display is changed from the time display menu to ESL function menu.
- Select YES or NO by Move button (⬆, ⬇) and set the ESL function by the Enter button (⊙).
 - YES : ESL function is activated.
 - NO : ESL function is cancelled.

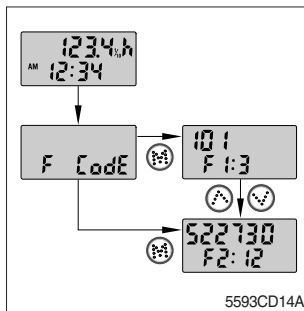
④ Set the interval time

- Select ESL function to YES and press the Enter button (⊙), then the display is changed to the interval time set menu.
- Set the interval time by move button (⬆, ⬇) and press the Enter button (⊙).
- You can finish setting the interval time by inputting the password and pressing the Enter button (⊙) once more.
- Interval times : 5 kinds (0, 10, 30, 60 minutes, 1day)
- ※ If the ESL function is set to YES, the password is required when a operator starting engine first.
But the operator can restart the engine within the interval time period without inputting the password.



⑤ Change password

- Select ESL function to YES and press the Menu button (⊗), the display is shifted to the password change menu.
 - Input a new password (Sn : - - - -) after enter the current password successfully (SC : - - - -).
 - Push enter (⊗) button for a second to finish the setting after the new password is entered once again (SA : - - - -).
 - When the setting is done, the display will blink 3 times and return to the time display screen.



⑥ Check machine and engine diagnostic codes

- If the F : Code is displayed on the LCD display, you can check faults of the machine and/or engine.
- The machine fault code is displayed by pressing the Menu button (⊗) and the engine fault code is displayed by pressing the Menu button (⊗) once more.
- Other fault codes can be displayed by using the Move up / down button (⬆, ⬇).

※ Refer to the following pages for the fault codes.

⑦ Machine fault code

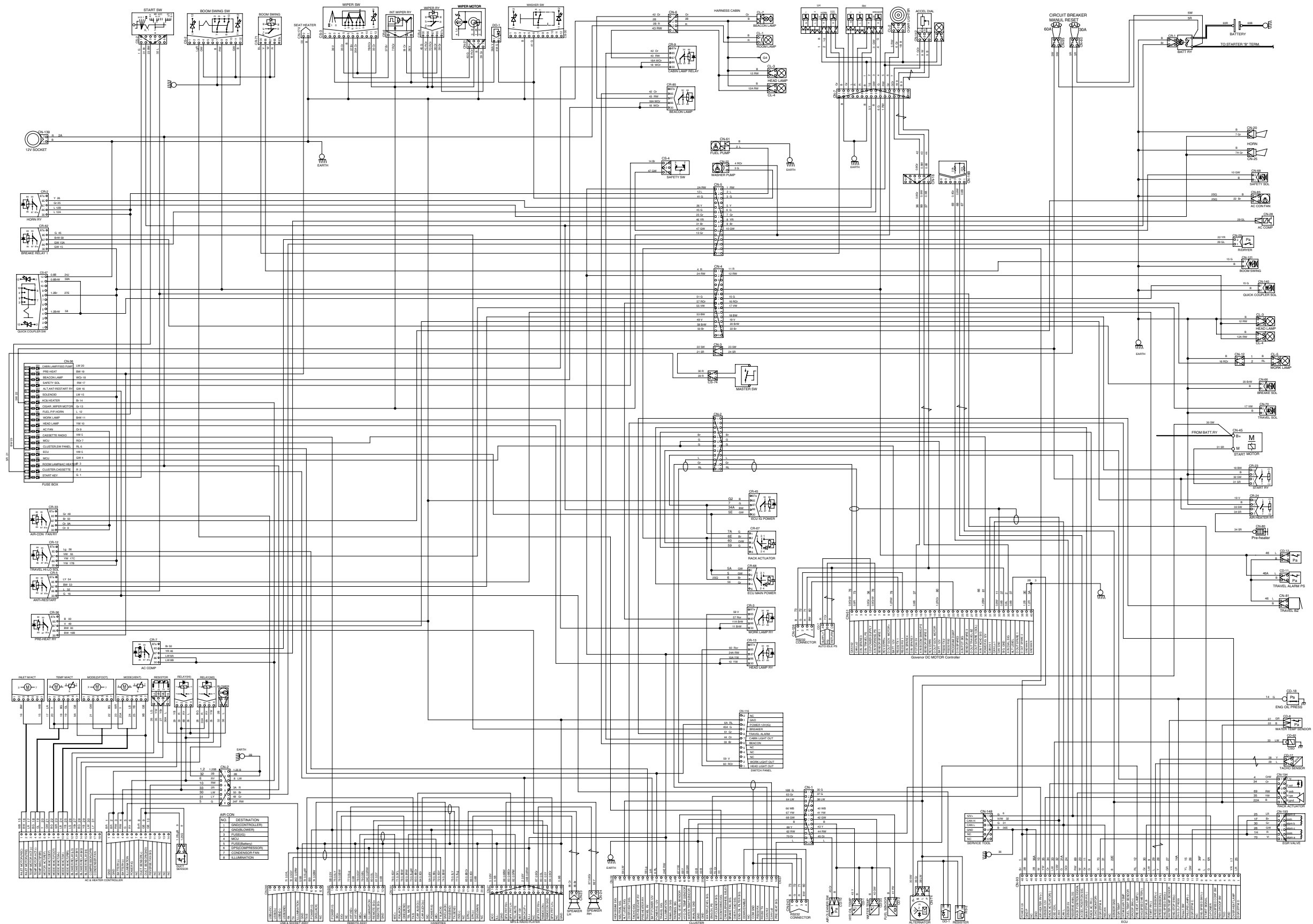
Fault code		Description
HCESPN	FMI	
101	3	Hydraulic oil temperature sensor circuit - voltage above normal or shorted to high source (or open circuit)
	4	Hydraulic oil temperature sensor circuit - voltage below normal or shorted to low source
105	0	Working pressure sensor data above normal range (or open 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

⑧ Engine fault code

Fault code		Description
YANMAR SPN	FMI	
1210	4	Engine fuel rack position sensor : shorted to low source
	3	Engine fuel rack position sensor : shorted to high source
91	4	Accelerator pedal position sensor "A" : shorted to low source
	3	Accelerator pedal position sensor "A" : shorted to high source
	2	Accelerator pedal position sensor "A" : intermittent fault
	1	Accelerator pedal position sensor "A" : below normal operational range (SAE J1843)
	0	Accelerator pedal position sensor "A" : above normal operational range (SAE J1843)
	15	Accelerator pedal position sensor "A" : not available (SAE J1843)
29	4	Accelerator pedal position sensor "B" : shorted to low source
	3	Accelerator pedal position sensor "B" : shorted to high source
	2	Accelerator pedal position sensor "B" : intermittent fault
	1	Accelerator pedal position sensor "B" : below normal operational range (SAE J1843)
	0	Accelerator pedal position sensor "B" : above normal operational range (SAE J1843)
	8	Accelerator pedal position sensor "B" : communication fault
	15	Accelerator pedal position sensor "B" : not available (SAE J1843)
108	4	Barometric pressure sensor : shorted to low source
	3	Barometric pressure sensor : shorted to high source
	2	Barometric pressure sensor : intermittent fault
1136	4	E-ECU internal temperature sensor : shorted to low source
	3	E-ECU internal temperature sensor : shorted to high source
	2	E-ECU internal temperature sensor : intermittent fault
	0	E-ECU internal temperature : too high
110	4	Engine coolant temperature sensor : shorted to low source
	3	Engine coolant temperature sensor : shorted to high source
	2	Engine coolant temperature sensor : intermittent fault
	0	Engine coolant temperature : too high
1079	4	Sensor 5V : shorted to low source
	3	Sensor 5V : shorted to high source
	2	Sensor 5V : intermittent fault
158	1	E-ECU system voltage : too low
	0	E-ECU system voltage : too high
1078	4	Engine fuel injection pump speed sensor : shorted to low source
522402	4	Auxiliary speed sensor : shorted to low source
522241	4	Engine fuel rack actuator relay : open circuit
	3	Engine fuel rack actuator relay : short circuit
	7	Engine fuel rack actuator relay : mechanical malfunction
	2	Engine fuel rack actuator relay : intermittent fault
522243	4	Air heater relay : open circuit
	3	Air heater relay : short circuit
	2	Air heater relay : intermittent fault

Fault code		Description
YANMAR SPN	FMI	
522242	4	Cold start device : open circuit
	3	Cold start device : short circuit
	2	Cold start device : intermittent fault
522251	4	EGR stepping motor "A" : open circuit
	3	EGR stepping motor "A" : short circuit
522252	4	EGR stepping motor "B" : open circuit
	3	EGR stepping motor "B" : short circuit
522253	4	EGR stepping motor "C" : open circuit
	3	EGR stepping motor "C" : short circuit
522254	4	EGR stepping motor "D" : open circuit
	3	EGR stepping motor "D" : short circuit
100	4	Oil pressure switch : shorted to low source
	1	Oil pressure : too low
167	4	Battery charge switch : shorted to low source
	1	Battery charge : charge warning
522314	0	Engine coolant temperature : abnormal temperature
522323	0	Air cleaner : mechanical malfunction
522329	0	Oily water separator : mechanical malfunction
190	0	Engine speed : over speed condition
638	4	Engine fuel rack actuator : shorted to low source
	3	Engine fuel rack actuator : shorted to high source
	7	Engine fuel rack actuator : mechanical malfunction
639	12	High speed CAN communication : communication fault
630	2	E-ECU internal fault : EEPROM check sum error (data set 2)
	12	E-ECU internal fault : EEPROM error
628	12	E-ECU internal fault : flashROM check sum error (main software)
	2	E-ECU internal fault : flashROM check sum error (data set 1)
	2	E-ECU internal fault : flashROM check sum error (data set 2)
1485	4	E-ECU main relay : shorted to low source
522727	12	E-ECU internal fault : cyclic redundancy check of sub-CPU error
	12	E-ECU internal fault : acknowledgement of sub-CPU error
	12	E-ECU internal fault : communication with sub-CPU error
522728	12	E-ECU internal fault : engine map data version error
522730	12	Immobilizer : CAN communication fault
	8	Immobilizer : pulse communication fault
1202	2	Immobilizer : system fault

GROUP 3 ELECTRICAL CIRCUIT



MEMORANDUM

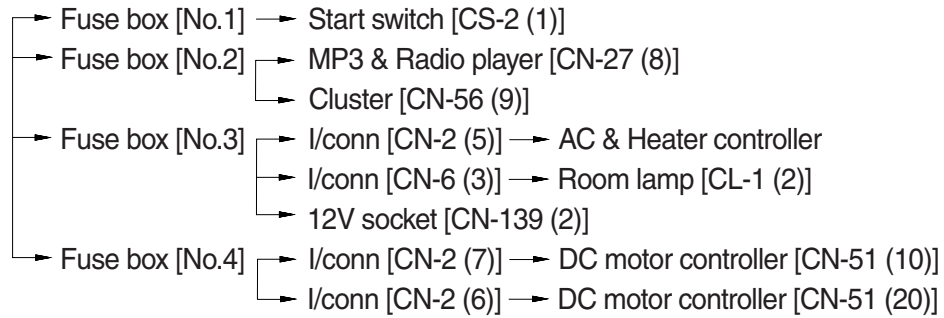
1. POWER CIRCUIT

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 → Battery relay → Fusible link (CN-60) → I/conn [CN-3 (2)] → Master switch [CS-74]



※ I/conn : Intermediate connector

2) CHECK POINT

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

※ GND : Ground

2. STARTING CIRCUIT

1) OPERATING FLOW

Battery (+) terminal → Battery relay [CR-1] → Fusible link [CN-60]
 → I/conn [CN-3 (2)] → Master switch [CS-74] → Fuse box No.1 → Start key [CS-2 (1)]

※ Start switch : ON

→ Start switch ON [CS-2 (2)] → ECU IG power relay [CR-45 (86)]
 → I/conn [CN-5 (9)] →
 Battery relay [CR-1]: Battery relay operating (all power is supplied with the electric component)
 → Start switch ON [CS-2 (3)] → Fuse box (all power is supplied with electric component)

※ Start switch : START

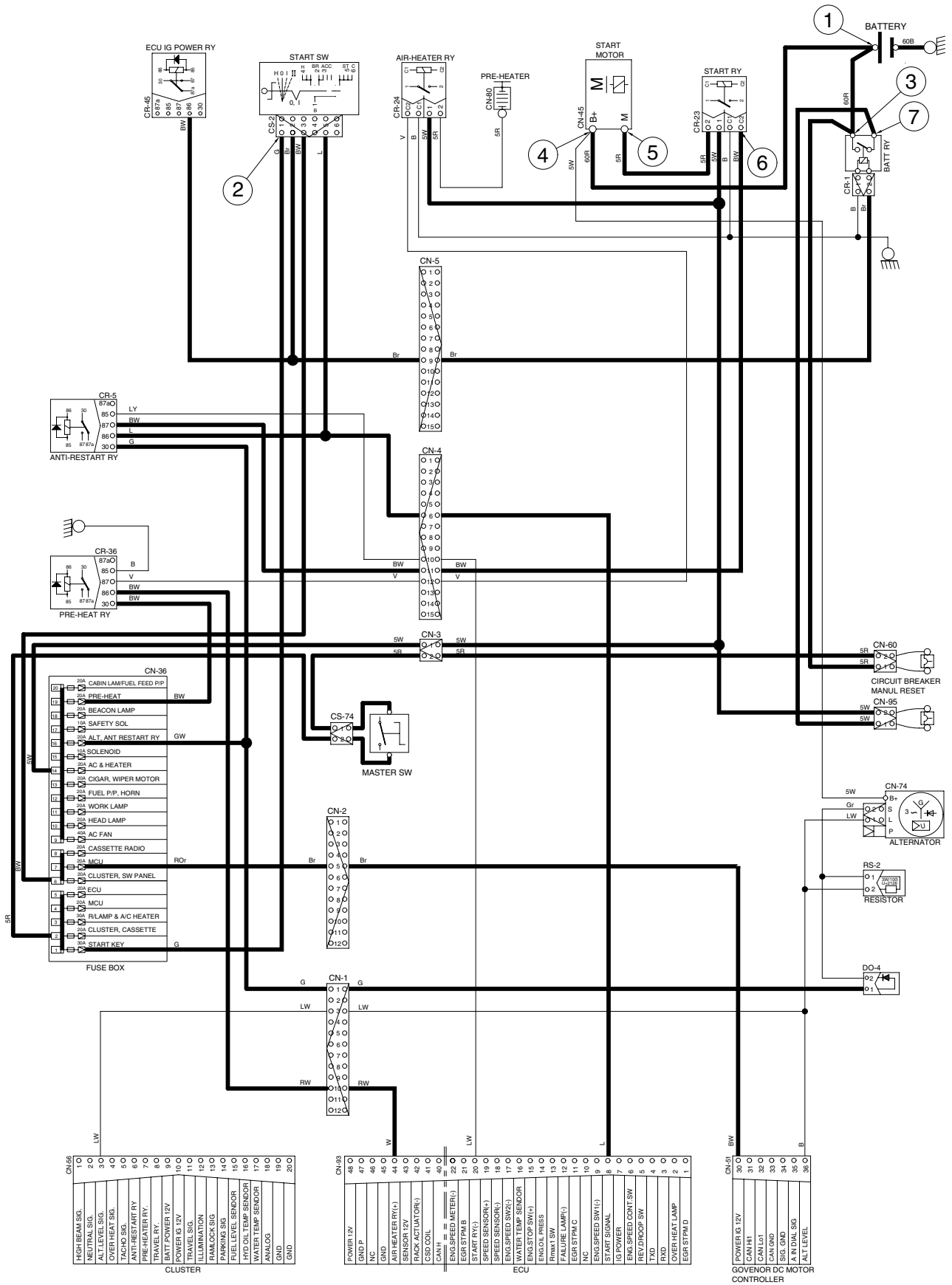
Start switch START [CS-2 (5)] → Anti-restart relay [CR-5 (86) → (87)] → I/conn [CN-4 (11)]
 → Start relay [CR-23 (C2) → (2)] → Starter motor operating
 → I/conn [CN-4 (6)] → ECU [CN-93 (8)]

2) CHECK POINT

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

※ GND : Ground

STARTING CIRCUIT



5594EL05

3. CHARGING CIRCUIT

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

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

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

1) OPERATING FLOW

(1) Warning flow

Alternator "L" terminal → I/conn [CN-1 (3)] → Cluster [CN-56 (3)] → Cluster warning lamp
 ↘ Governor DC motor controller [CN-51 (36)]

(2) Charging flow

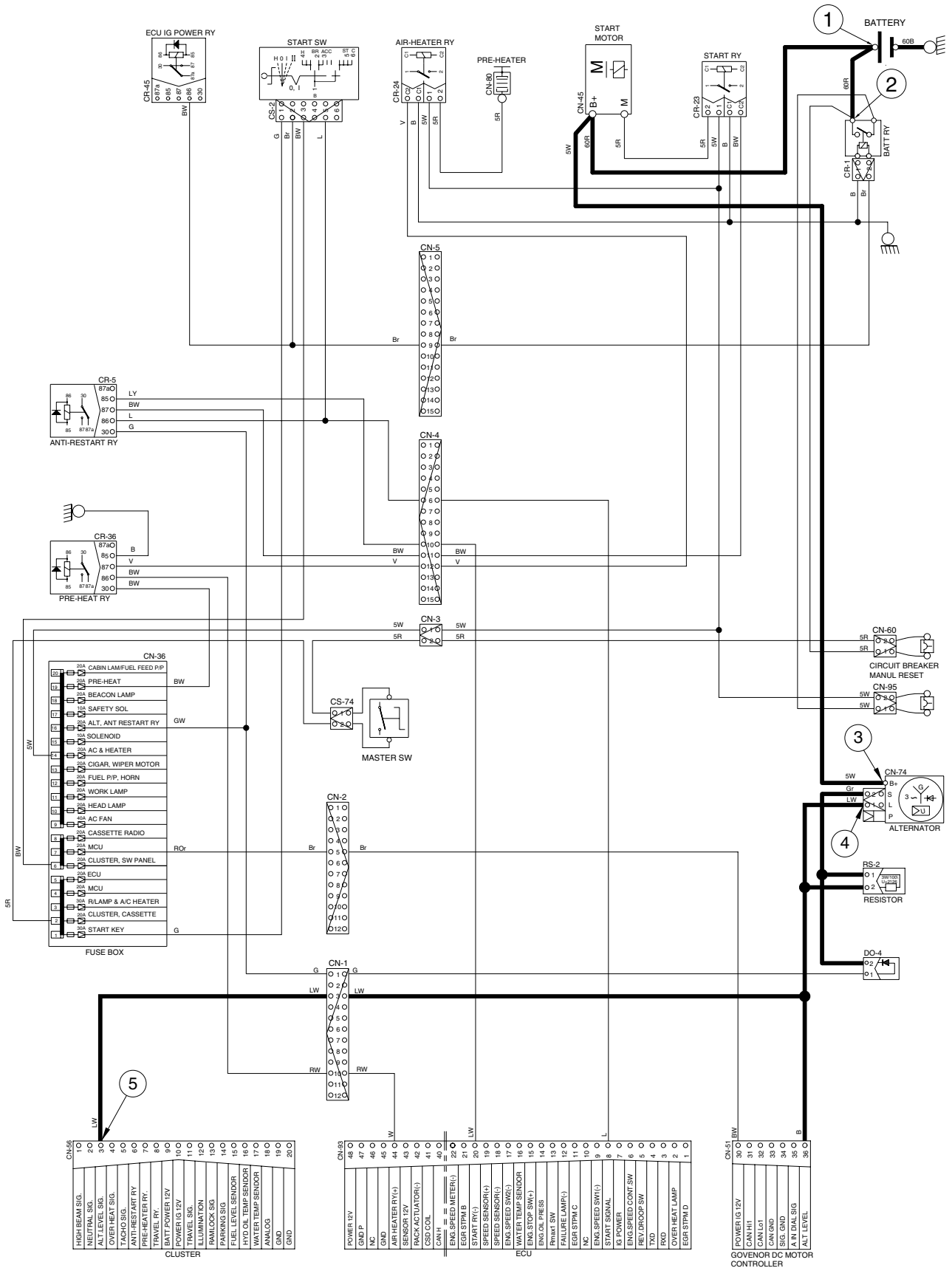
Alternator "B+" terminal → Battery relay → Battery (+) terminal

2) CHECK POINT

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

※ GND : Ground

CHARGING CIRCUIT



5594EL06

4. HEAD AND WORK LAMP CIRCUIT

1) OPERATING FLOW

Fuse box (No.10) → Head lamp relay [CR-13 (86) → (85)] → Switch panel [CN-116 (1)]

Fuse box (No.11) → Work lamp relay [CR-3 (86) → (85)] → Switch panel [CN-116 (21)]

(1) Head lamp switch ON

Head lamp switch ON [CN-116(1)] → Head lamp relay [CR-13 (85) → (87)]

→ I/conn [CN-4 (2)] → Head lamp ON [CL-3, 4 (2)]

→ I/conn [CN-5 (1)] → I/conn [CN-7 (11)] → Cigar lighter [CL-2 (1)]

→ Remote controller illumination ON [CN-245 (9)]

→ MP3 & Radio player illumination ON [CN-27 (9)]

→ USB & Socket illumination ON [CN-246 (7)]

→ Cluster illumination ON [CN-56 (12)]

→ I/conn [CN-2 (8)] → AC/Heater controller illumination ON

(2) Work lamp switch ON

Work light switch ON [CN-116 (2)] → Work lamp [CR-3 (85) → (87)] → I/conn [CN-4 (8)]

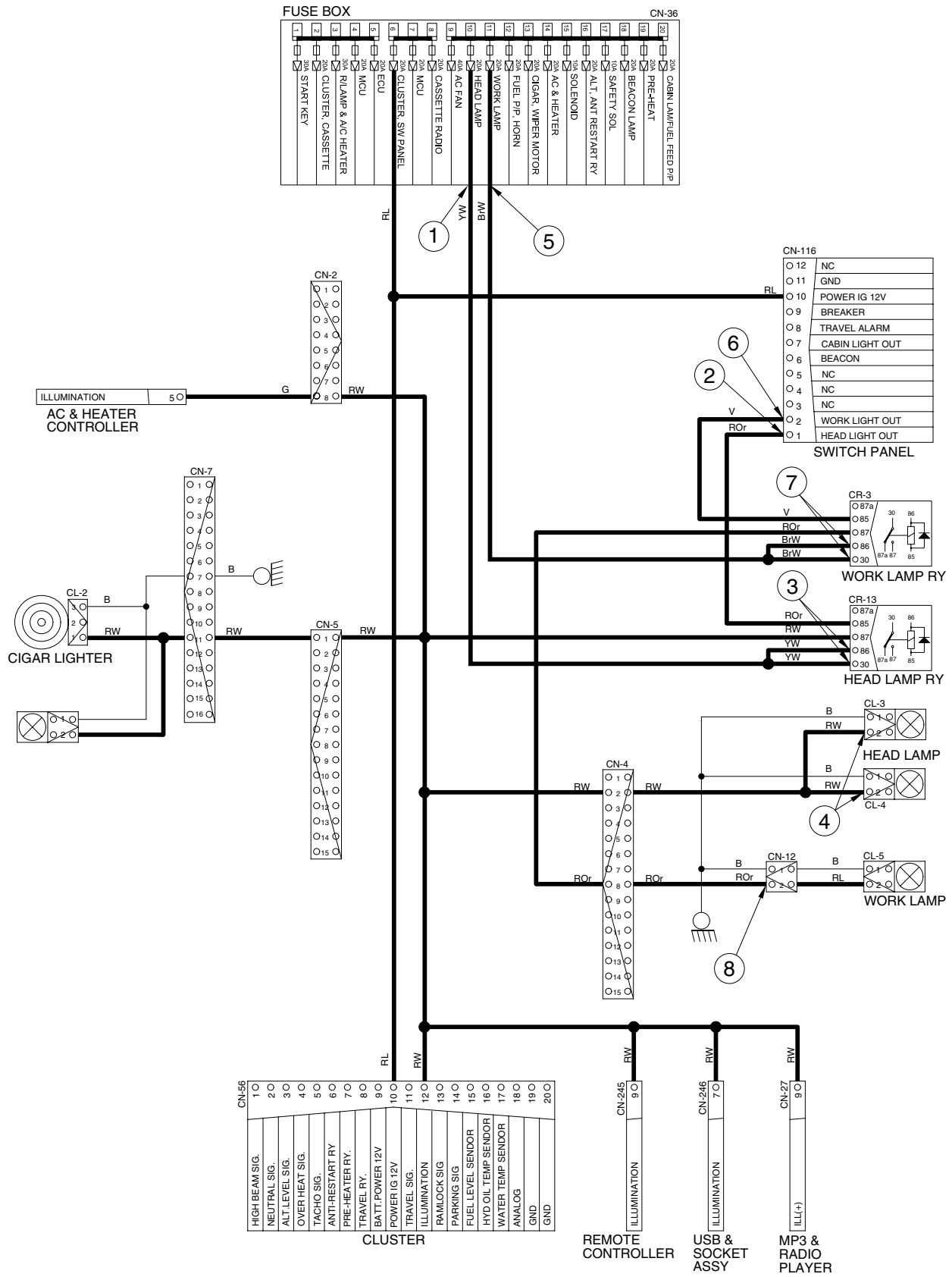
I/conn [CN-12 (2)] → Work lamp ON [CL-5 (2)]

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 (head light)	10~12.5V
STOP	ON	⑤ - GND (fuse box) ⑥ - GND (switch power input) ⑦ - GND (switch power output) ⑧ - GND (work light)	10~12.5V

※ GND : Ground

HEAD AND WORK LAMP CIRCUIT



5. BEACON LAMP AND CAB LAMP CIRCUIT

1) OPERATING FLOW

Fuse box (No.18) → Beacon lamp relay [CR-85(30) → (85)] → Switch panel [CN-116 (6)]

Fuse box (No.20) → Cab lamp relay [CR-9 (30) → (85)] → Switch panel [CN-116 (7)]

(1) Beacon lamp switch ON

Beacon lamp switch ON [CN-116 (6)] → Beacon lamp relay [CR-85 (87)] → I/conn [CN-6 (1)]

→ Beacon lamp ON [CL-7]

(2) Cab lamp switch ON

Cab lamp switch ON [CN-116 (7)] → Cab lamp relay [CR-9 (87)] → I/conn [CN-6 (4)]

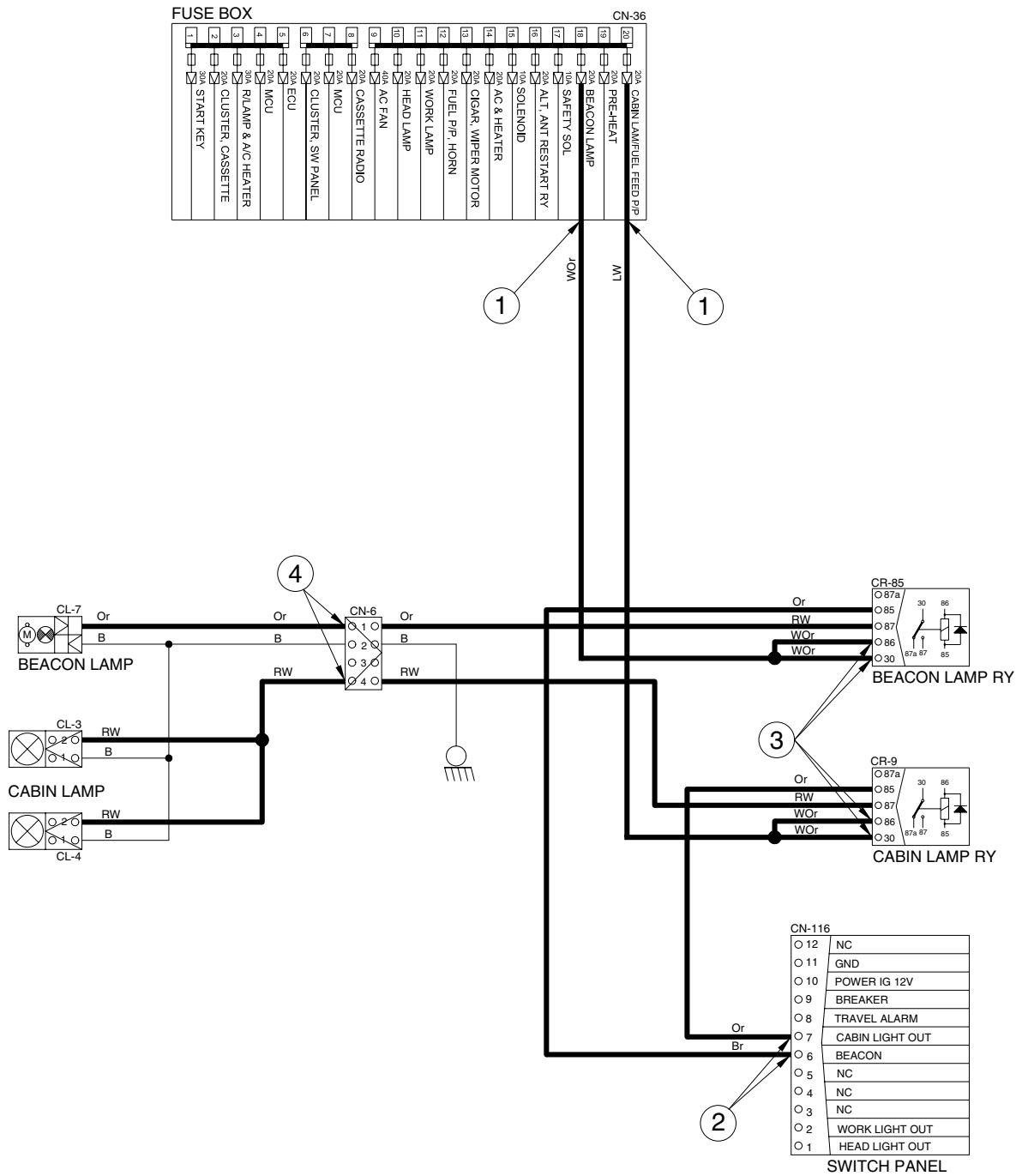
→ Cab lamp ON [CL-3, 4]

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)	10~12.5V

※ GND : Ground

BEACON LAMP CIRCUIT

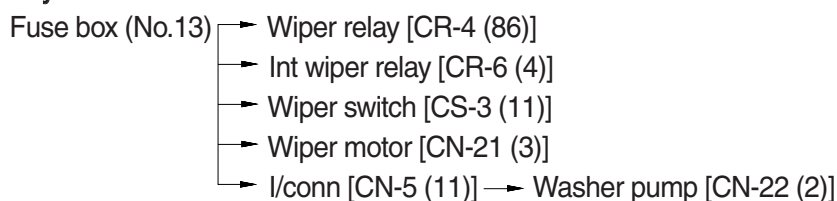


5594EL08

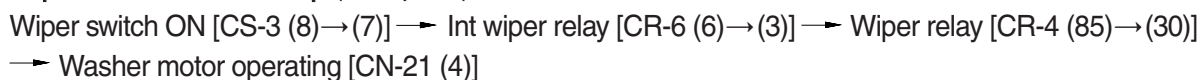
6. WIPER AND WASHER CIRCUIT

1) OPERATING FLOW

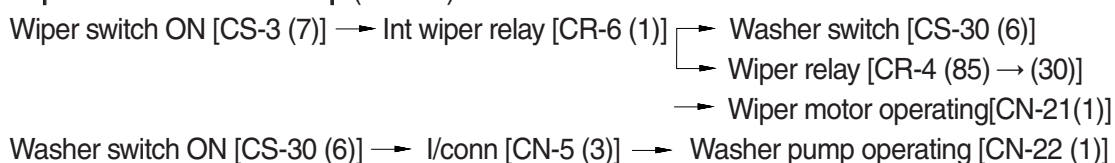
(1) Key switch ON



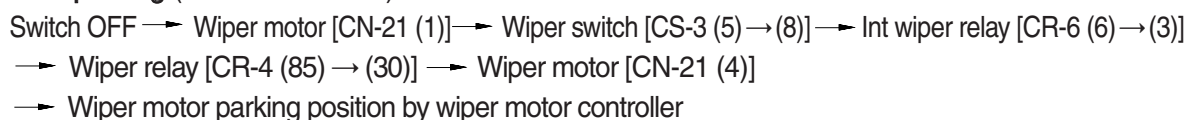
(2) Wipe switch ON : 1st step (low speed)



(3) Wiper switch ON : 2nd step (washer)



(4) Auto parking (when switch OFF)

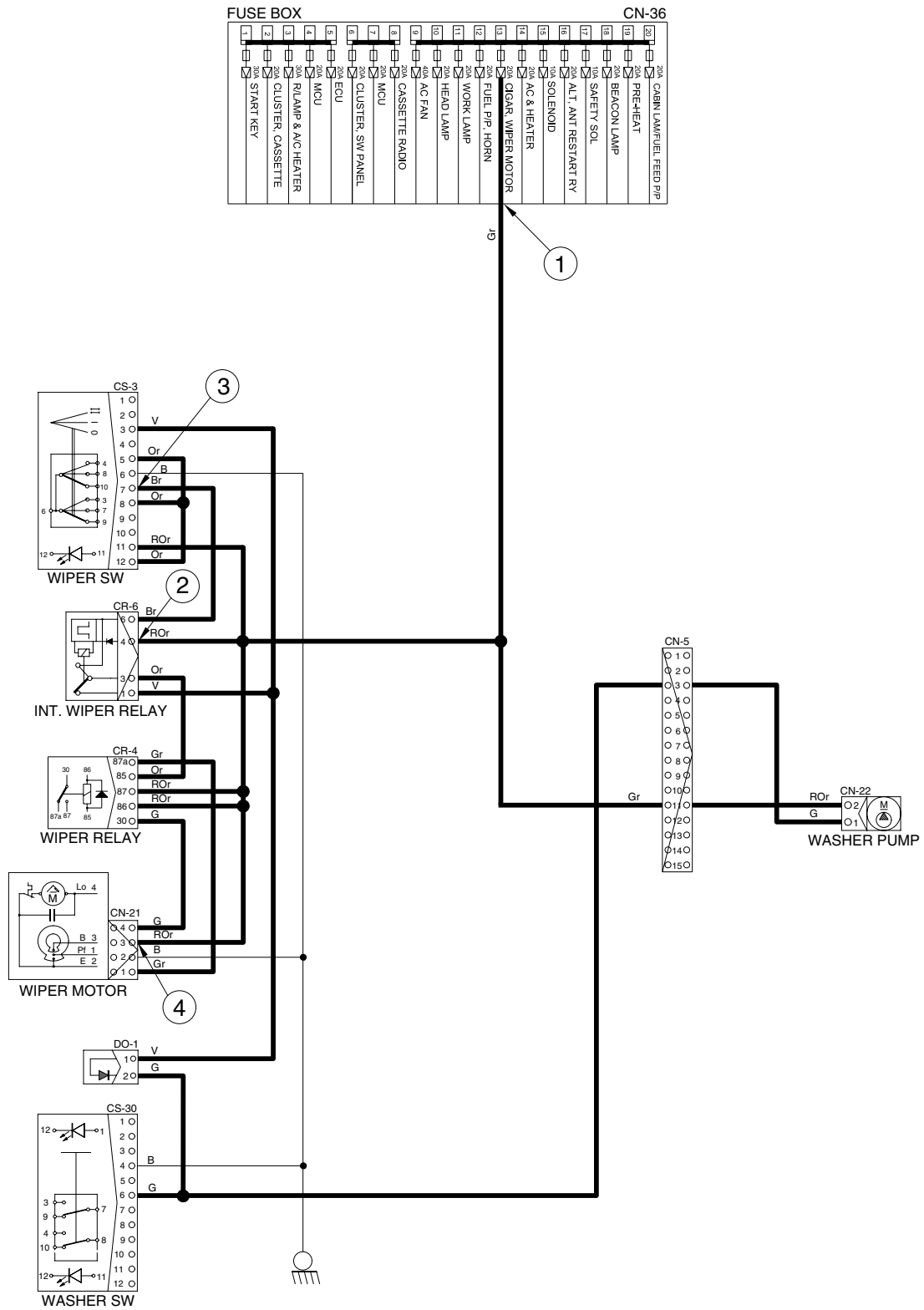


2) CHECK POINT

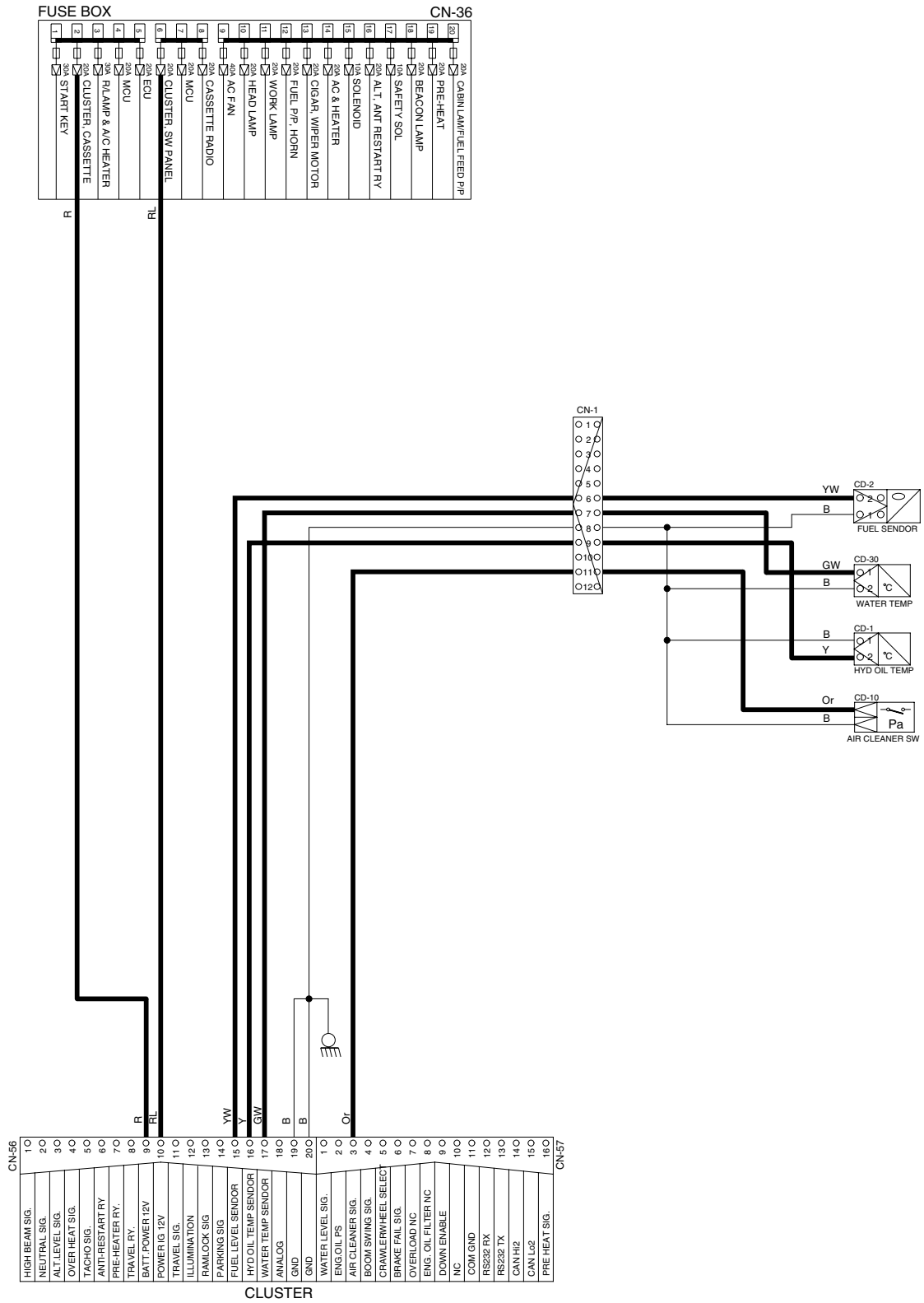
Engine	Start switch	Check point	Voltage
STOP	ON	① - GND (fuse box) ② - GND (switch power input) ③ - GND (switch power output) ④ - GND (wiper motor)	10~12.5V

※ GND : Ground

WIPER AND WASHER CIRCUIT

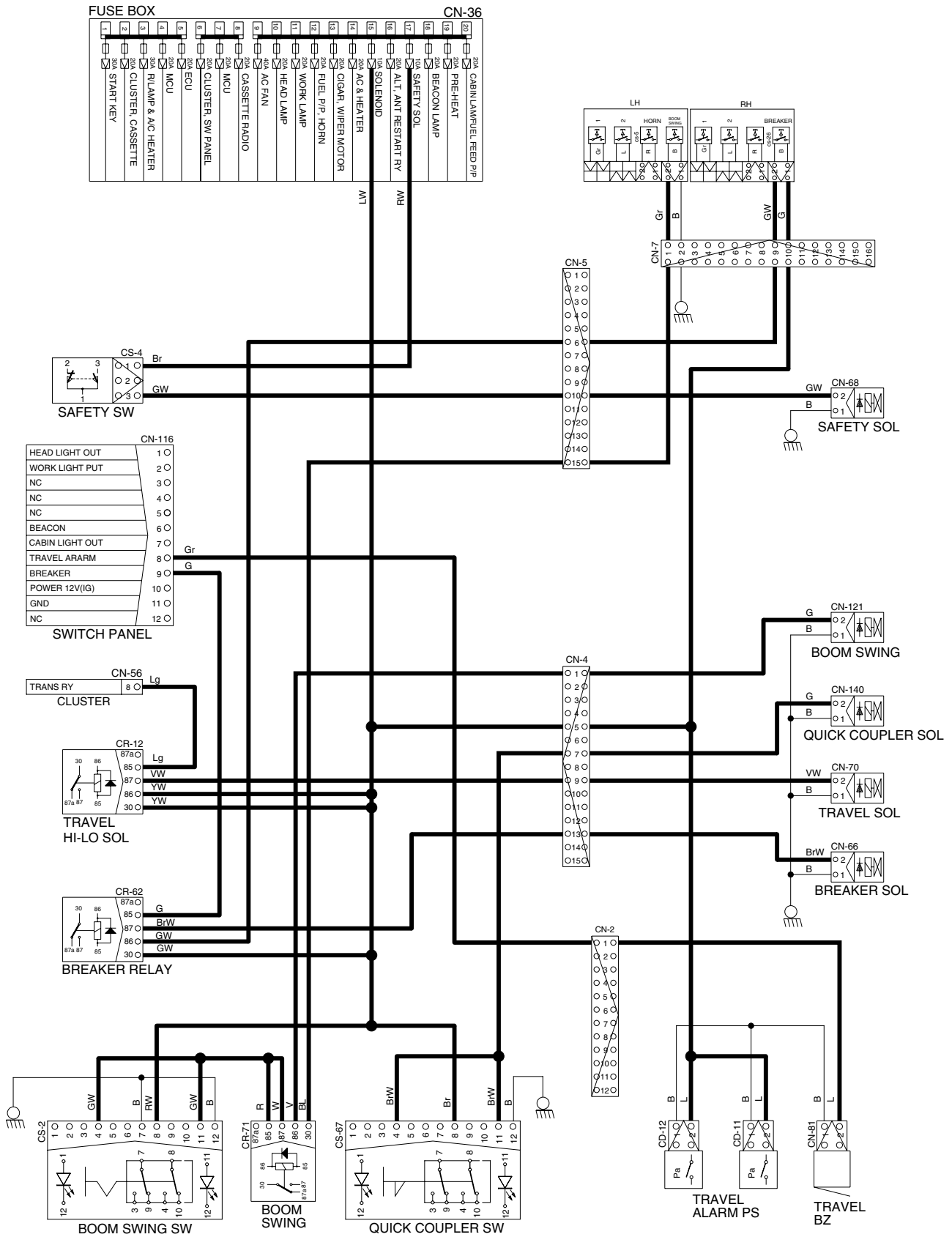


MONITORING CIRCUIT

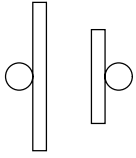
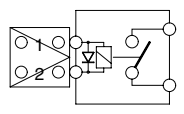
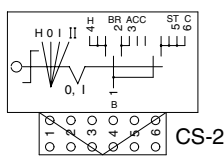
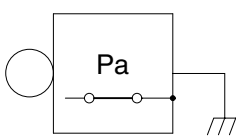
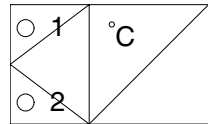


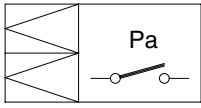
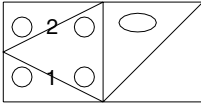
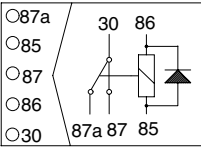
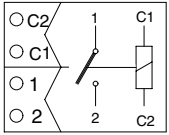
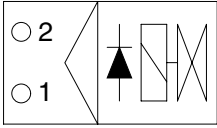
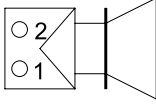
5594EL10

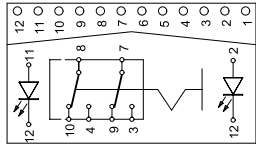
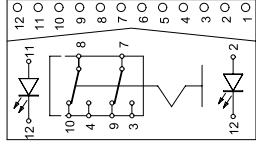
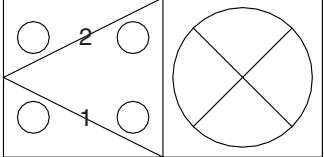
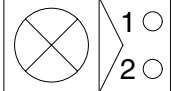
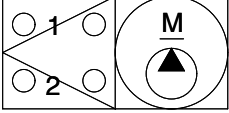
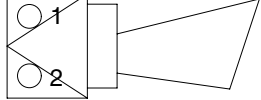
ELECTRIC CIRCUIT FOR HYDRAULIC

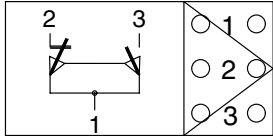
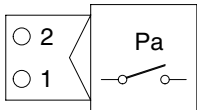
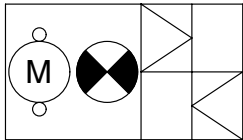
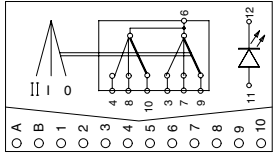
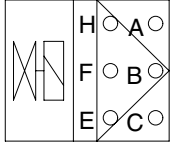
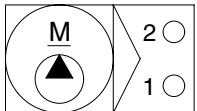


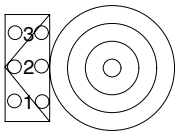
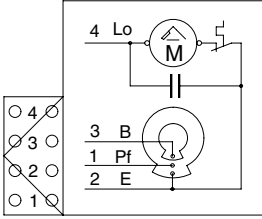
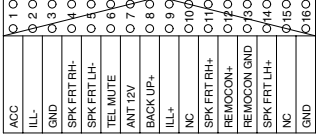
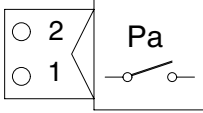
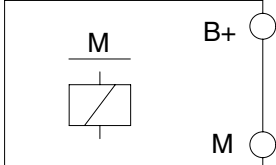
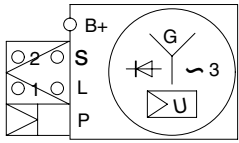
GROUP 4 ELECTRICAL COMPONENT SPECIFICATION

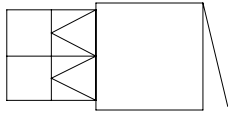
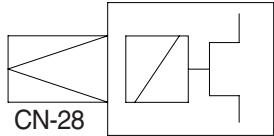
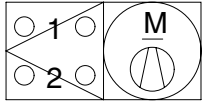
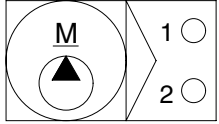
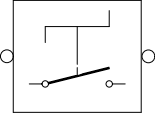
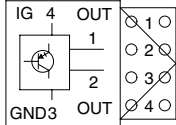
Part name	Symbol	Specification	Check
Battery		12V × 100Ah	※ Check specific gravity 1.280 over : over charged 1.280 ~ 1.250 : normal 1.250 below : recharging
Battery relay	 CR-1	Rated load : 12V 100A (continuity) 1000A (30 second)	※ Check coil resistance Normal : about 12 Ω ※ Check contact Normal : ∞ Ω
Start key	 CS-2	12V	※ Check contact OFF : ∞ Ω (for each terminal) ON : 0 Ω (for terminal 1-3 and 1-2) START : 0 Ω (for terminal 1-5)
Pressure switch (for engine oil)	 CD-18	0.5 kgf/cm ² (N.C TYPE)	※ Check resistance Normal : 0 Ω (CLOSE)
Temperature sensor	 CD-8	0.5 kgf/cm ² (N.C TYPE)	※ Check resistance 50°C : 804 Ω 80°C : 310 Ω 100°C : 180 Ω

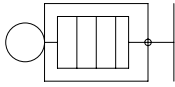
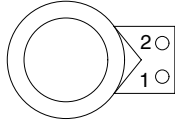
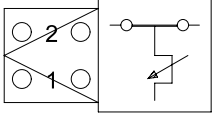
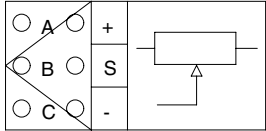
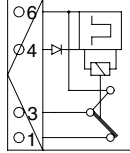
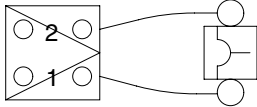
Part name	Symbol	Specification	Check
Air cleaner pressure switch	 <p>CD-10</p>	Pressure: 635mmH ₂ O (N.O TYPE)	※ Check contact Normal : ∞ Ω
Fuel sender	 <p>CD-2</p>	-	※ Check resistance Full : 100 Ω Low : 500 Ω Empty warning : 700 Ω
Relay	 <p>CR-2 CR-3 CR-4 CR-5 CR-7 CR-9 CR-12 CR-13 CR33 CR-36 CR-62 CR-85</p>	12V 20A	※ Check resistance Normal : about 200 Ω (for terminal 85-86) : 0 Ω (for terminal 30-87a) : ∞ Ω (for terminal 30-87)
Relay	 <p>CR-23 CR-24 CR-47</p>	12V 60A	※ Rated coil current 1.2±0.3A
Solenoid valve	 <p>CN-66 CN-68 CN-70 CN-140</p>	12V 1A	※ Check resistance Normal : 15~25 Ω (for terminal 1-2)
Speaker	 <p>CN-23(LH) CN-24(RH)</p>	4 Ω 20W	※ Check resistance Normal : 4 Ω

Part name	Symbol	Specification	Check
Boom swing switch	 <p>CS-2</p>	12V 16A	※ Check contact Normal OFF - $\infty \Omega$ (for terminal 1-5,2-6) - 0Ω (for terminal 5-7,6-8)
Quick clamp switch	 <p>CS-67</p>	12V 16A	※ Check contact Normal OFF - $\infty \Omega$ (for terminal 1-5,2-6) - 0Ω (for terminal 5-7,6-8)
Lamp	 <p>CL-3 CL-4 CL-5</p>	12V 55W (H3 TYPE)	※ Check disconnection Normal : 1.2Ω
Room lamp	 <p>CL-1</p>	12V 10W	※ Check disconnection Normal : a few Ω
Fuel filler pump	 <p>CN-145</p>	12V 35 l / min	※ Check operation Supply power (for terminal 1) : 12V
Horn	 <p>CN-20 CN-25</p>	12V	100±5dB

Part name	Symbol	Specification	Check
Safety switch	 <p>CS-4</p>	Micro	※ Check contact Normal : 0 Ω (for terminal A-B) : ∞ Ω (for terminal A-C) Operating : ∞ Ω (for terminal A-B) : 0 Ω (for terminal A-C)
Pressure switch	 <p>CD-7 CD-11 CD-12</p>	10bar (N.C type)	※ Check contact Normal : 0.1 Ω
Beacon lamp	 <p>CL-7</p>	12V (Strobe type)	※ Check disconnection Normal : a few Ω
Wiper switch	 <p>CS-3</p>	12V 16A	※ Check contact Normal : ∞ Ω
Fuel cut-off	 <p>CN-79</p>	12V	※ Check operation Rated full current : 12V 33A Rated hold current : 12V 0.8A
Washer pump	 <p>CN-22</p>	12V 3.8A	※ Check contact Normal : 3 Ω (for terminal 1-2)

Part name	Symbol	Specification	Check
Cigar lighter	 <p>CL-2</p>	12V 10A 1.4W	※ Check coil resistance Normal : about 1MΩ ※ Check contact Normal : ∞ Ω Operating time : 5~15sec
Wiper motor	 <p>CN-21</p>	12V 3A	※ Check contact Normal : 6 Ω (for terminal 2-6)
Radio & CD/MP3 player	 <p>CN-27</p>	24V 2A	※ Check voltage 20 ~ 25V (for terminal 1-3, 3-8)
Receiver dryer	 <p>CN-29</p>	12V	※ Check contact Normal : 0 Ω
Starter	 <p>CN-45</p>	12V	※ Check contact Normal : 0.1 Ω
Alternator	 <p>CN-74</p>	12V 55A	※ Check contact Normal : 0 Ω (for terminal B ⁺ -1) Normal : 24 ~ 27.5V

Part name	Symbol	Specification	Check
Travel buzzer	 <p>CN-81</p>	12V	-
Compressor	 <p>CN-28</p>	12V 38W	-
Air con fan motor	 <p>CN-83</p>	12V 8.5A	-
Fuel feed pump	 <p>CN-145</p>	12V	-
Master switch		12V 1000A	-
Timer		12V	-

Part name	Symbol	Specification	Check
Preheater	 CN-80	12V 42A 500W	-
12V socket	 CN-139	12V 120W	-
Duct sensor		1°C OFF 4°C ON	※ Check resistance Normal : 0 Ω (for terminal 1-2) the atmosphere temp : over 4°C
Accel dial	 CN-142	-	※ Check resistance Normal : about 5k Ω (for terminal A-C) ※ Check voltage Normal : about 5V (for terminal A-C) : 2~4.5V (for terminal C-B)
Int wiper relay	 CR-6	12V 12A	-
Circuit breaker manual reset	 CN-60 CN-95	12V, 30A (CN-65) 12V, 60A (CN-95)	-

GROUP 5 CONNECTORS

1. CONNECTOR DESTINATION

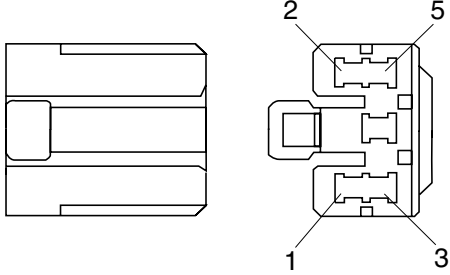
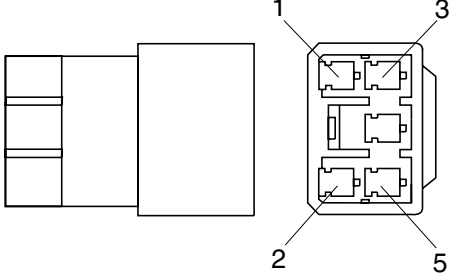
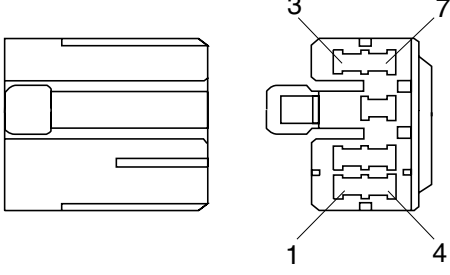
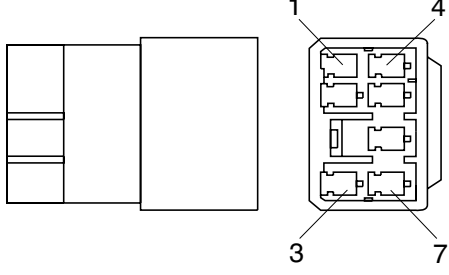
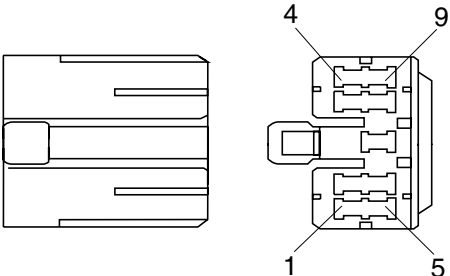
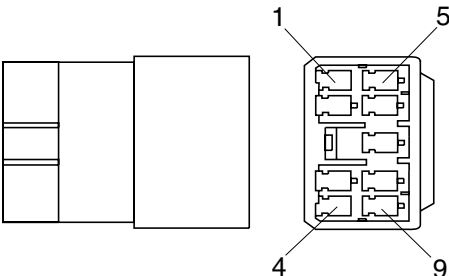
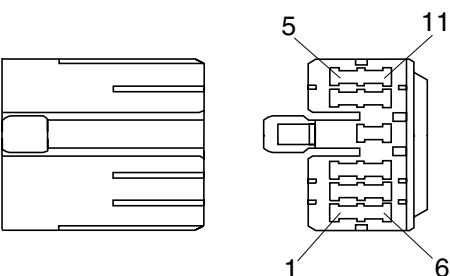
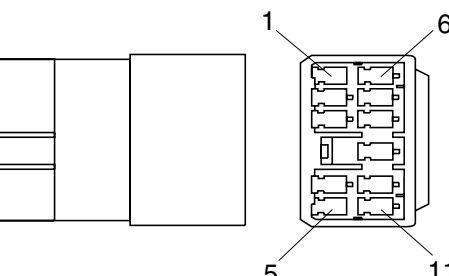
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-1	AMP	12	Cabin room harness - Main harness	S816-012002	S816-112002
CN-2	AMP	12	Aircon harness - Cabin room harness	S816-012002	S816-112002
CN-3	YAZAKI	2	Fusible link - Fuse box	S813-030201	S813-130201
CN-4	AMP	15	Cabin room harness - Main harness	2-85262-1	368301-1
CN-5	AMP	15	Cabin room harness - Main harness	2-85262-1	368301-1
CN-6	DEUTSCH	4	Cabin harness - Cabin room lamp harness	DT06-4S-EP06	DT04-4P-E005
CN-7	AMP	10	Console harness - Main harness	S816-010002	S816-110002
CN-12	AMP	2	Boom harness - Work lamp harness	S816-002002	S816-102002
CN-20	DEUTSCH	2	Horn	DT06-2S-EP06	-
CN-21	AMP	4	Wiper harness	180900-0	-
CN-22	KET	2	Washer tank	MG640605	-
CN-23	MOLEX	2	Speaker LH	MG610070	-
CN-24	MOLEX	2	Speaker RH	MG610070	-
CN-25	DEUTSCH	2	Horn	DT06-2S-EP06	-
CN-27	-	16	Cassette radio	PK145-16017	-
CN-28	AMP	1	Air-con comp	S810-001202	-
CN-29	KET	2	Receiver dryer	MG640795	-
CN-36	-	-	Fuse box	21L7-00250	-
CN-45	TERM	1	Starter	ST710246-2	-
CN-48	AMP	40	MCU	DRC26-40SA	-
CN-51	AMP	3	Hour meter	S816-003002	S816-103002
CN-55	AMP	2	Travel alarm PS	S816-002002	S816-102002
CN-56	AMP	12	Cluster	175967-2	-
CN-57	AMP	16	Cluster	175966-2	-
CN-60	YAZAKI	2	Fusible link	-	7122-4125-50
CN-61	TERM	1	Fuel filler pump	S822-014000	S822-114000
CN-66	DEUTSCH	2	Breaker solenoid	DT06-2S-EP06	-
CN-68	DEUTSCH	2	Safety solenoid	DT06-2S-EP06	-
CN-70	DEUTSCH	2	Travel HI-LO solenoid	DT06-2S-EP06	-
CN-74	KET	2	Alternator	ST710285-2	-
CN-76	KET	6	DC motor	MG640515-4	-
CN-79	YAZAKI	3	Fuel cut-off solenoid	S813-060300	-
CN-80	AMP	1	Pre heater	ST710384-2	-

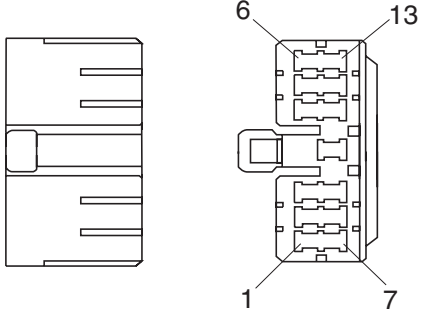
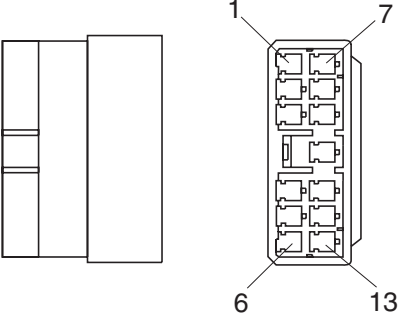
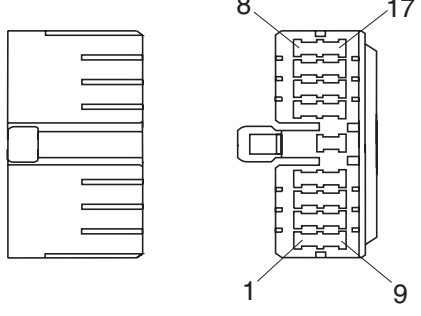
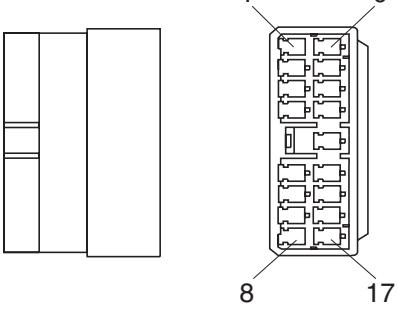
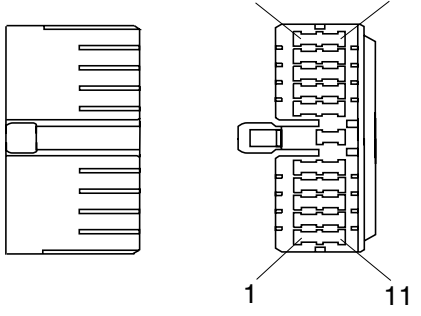
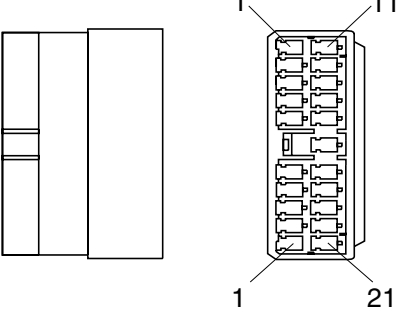
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-81	DEUTSCH	2	Travel buzzer	DT06-2S-EP06	DT04-2P-E005
CN-83	AMP	2	Air-con fan	MG640188-5	-
CN-92	KET	1	Anti-restart relay	S814-001100	-
CN-95	YAZAKI	2	Fusible link	-	S813-130201
CN-116	AMP	12	Switch panel	368542-1	-
CN-139	AMP	2	12V socket	S810-002202	-
CN-140	DEUTSCH	2	Quick coupler	DT06-2S-EP06	DT04-2P-E005
CN-142	DEUTSCH	3	Accel dial	DT06-3S-EP06	-
CN-144	KET	20	Handfree	MG610240	-
CN-145	KET	2	Fuel feed pump	7123-6423-30	-
CN-170	AMP	2	Seat heat switch	12162017	-
CN-245	AMP	12	Remote controller assy	368542-1	-
CN-246	AMP	12	USB & Socket assy	174045-2	-
CN-258	KET	1	Aircon comp power	MG640944-5	MG650943-5
CN-263	DEUTSCH	2	Aircon comp relay	DT06-2S-EP06	DT04-2P-E005
· LAMP					
CL-1	KET	2	Room lamp	MG610392	-
CL-2	AMP	3	Cigar light	S810-003202	-
CL-3	DEUTSCH	2	Head lamp	DT06-2S-EP06	DT04-2P-E005
CL-4	DEUTSCH	2	Head lamp	DT06-2S-EP06	DT04-2P-E005
CL-5	DEUTSCH	2	Work lamp	180923-0	-
CL-7	-	1	Beacon lamp	-	S822-114000
CL-9	DEUTSCH	1	Cabin lamp	DT06-2S-EP06	-
CL-10	DEUTSCH	1	Cabin lamp	DT06-2S-EP06	-
· RELAY					
CR-1	AMP	2	Battery relay	S816-002002	S816-102002
CR-2	AMP	4	Horn relay	S810-004002	-
CR-5	AMP	4	Anti-restart relay	S810-004002	-
CR-6	AMP	6	Int wiper relay	S810-006002	-
CR-12	AMP	4	Travel relay	S810-004002	-
CR-23	KET	2	Start relay	S814-002001	-
CR-24	KET	2	Air heater relay	S814-002001	-
CR-33	AMP	4	Air-con fan relay	S810-004002	-
CR-36	AMP	4	Pre-heater relay	S810-004002	-
CR-47	KET	2	Fuel cut-off relay	S814-002001	-
CR-50	KET	4	Timer relay	MG610047-5	-
· SENDER					
CD-1	AMP	2	Hydraulic temp sender	85202-1	-
CD-2	AMP	2	Fuel sender	-	S816-102002

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CD-7	DEUTSCH	3	Auto idle pressure switch	DT06-3S-EP06	-
CD-10	KET	1	Air cleaner switch	ST730057-2	-
CD-11	-	2	Travel pressure switch	MG640795	-
CD-12	-	2	Travel pressure switch	MG640795	-
CD-18	AMP	1	Engine oil pressure	ST710345-1	-
CD-30	AMP	2	Water temp	85202-1	-
CD-45	-	2	WIF sensor	-	S816-102003
DO-1	-	2	Diode	21EA-50570	-
DO-2	-	2	Diode	21EA-50570	-
DO-3	-	2	Diode	21EA-50570	-
· SWITCH					
CS-2	KET	6	Start key switch	S814-006000	-
CS-3	SWF	12	Wiper switch	585790	-
CS-4	AMP	3	Safety switch	S816-003002	-
CS-5	-	1	Horn-LH switch	-	DT04-2P-E005
CS-26	DEUTSCH	2	Breaker switch	DT06-2S-EP06	-
CS-67	SWF	10	Quick coupler switch	589790	-
CS-74	YAZAKI	2	Master switch	S813-030201	S813-130201
CS-99	SWF	12	Auto idle switch	589790	-

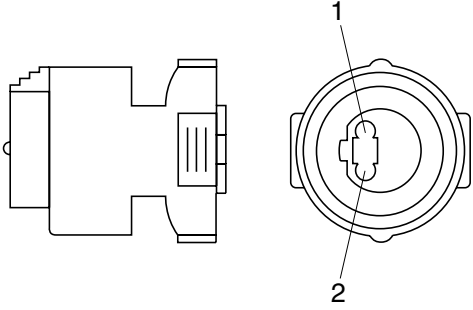
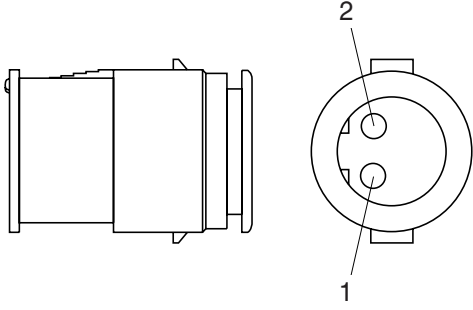
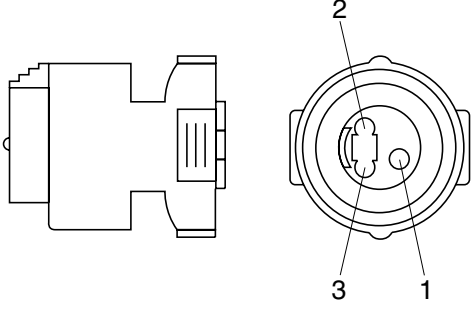
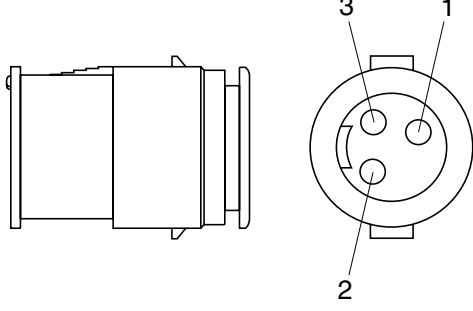
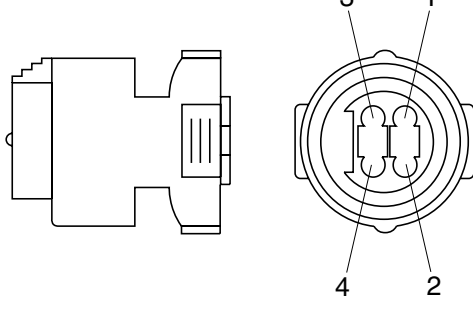
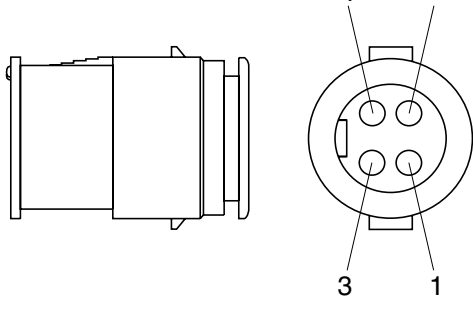
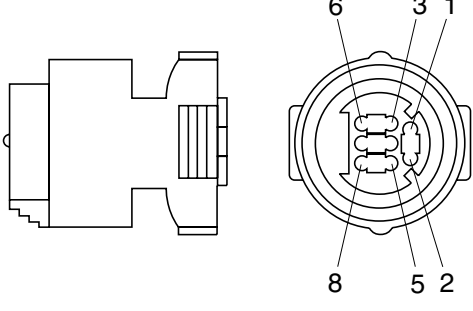
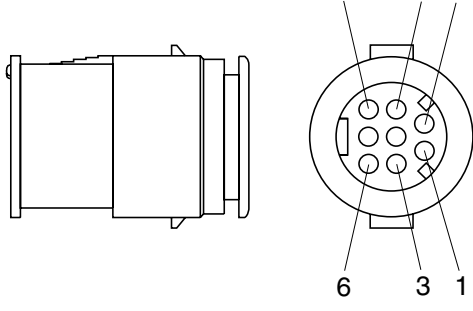
2. CONNECTION TABLE FOR CONNECTORS

1) PA TYPE CONNECTOR

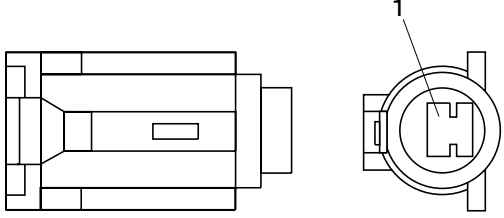
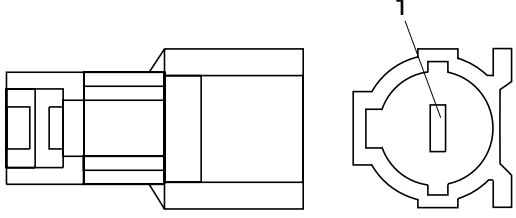
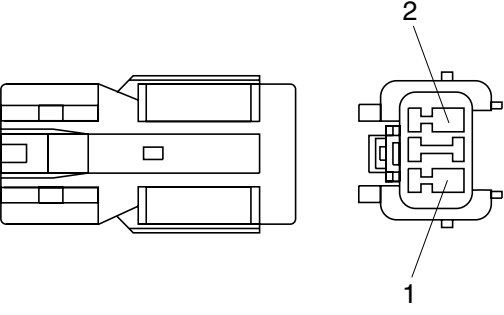
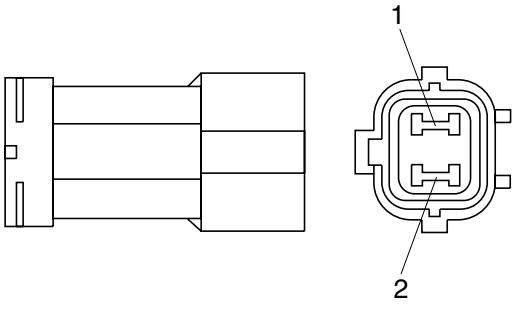
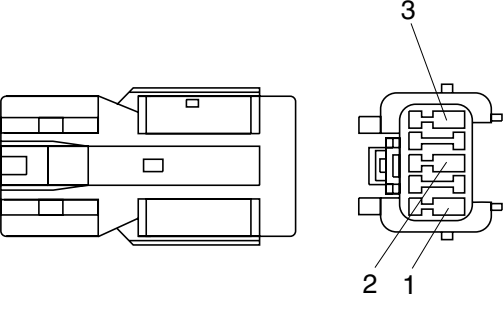
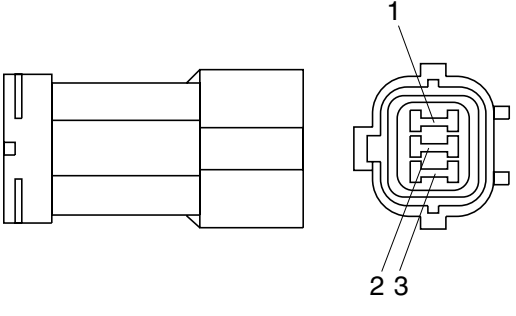
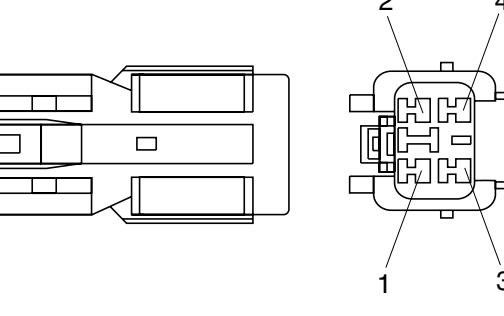
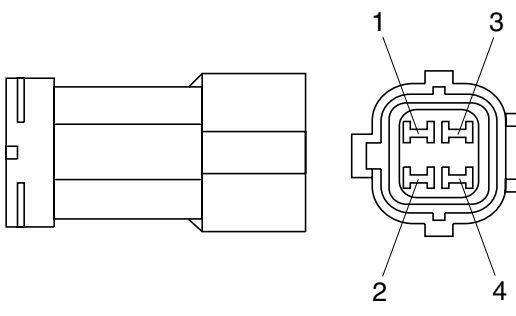
No. of pin	Receptacle connector (female)	Plug connector (male)
5	 <p style="text-align: center;">S811-005002</p>	 <p style="text-align: center;">S811-105002</p>
7	 <p style="text-align: center;">S811-007002</p>	 <p style="text-align: center;">S811-107002</p>
9	 <p style="text-align: center;">S811-009002</p>	 <p style="text-align: center;">S811-109002</p>
11	 <p style="text-align: center;">S811-011002</p>	 <p style="text-align: center;">S811-111002</p>

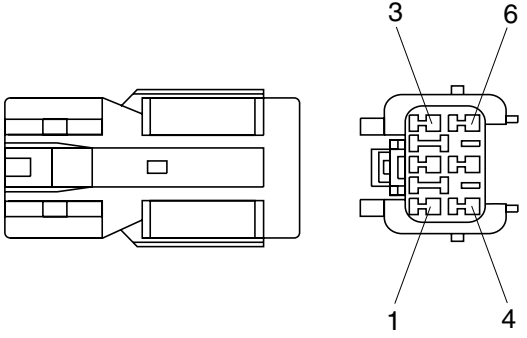
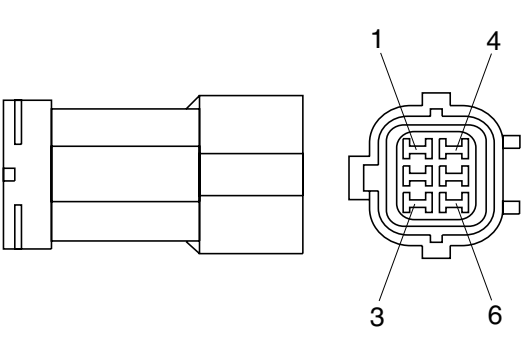
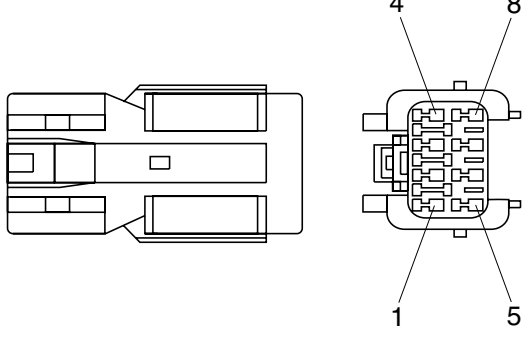
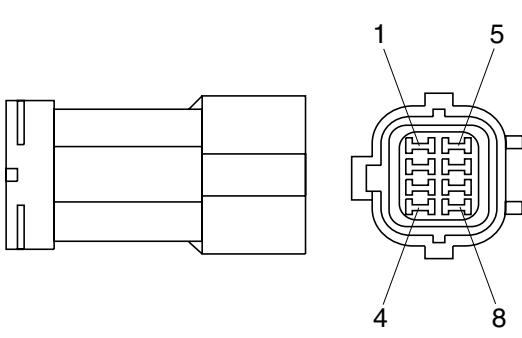
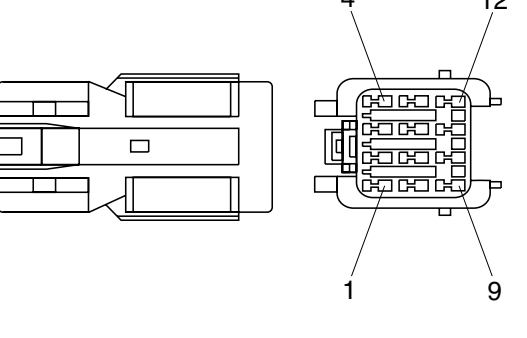
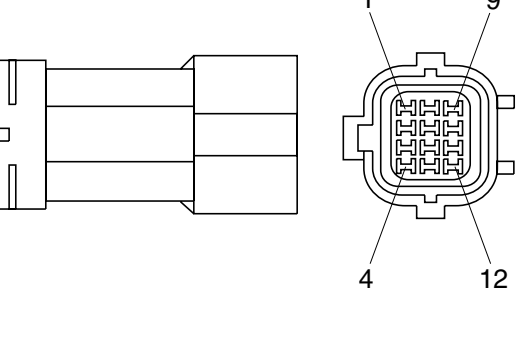
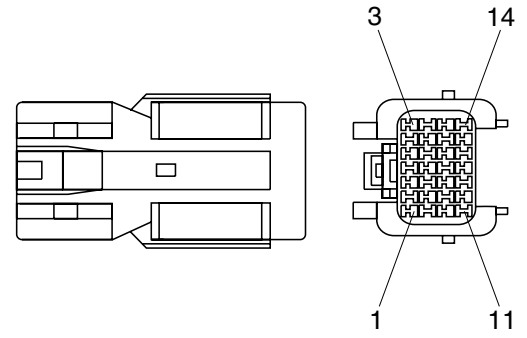
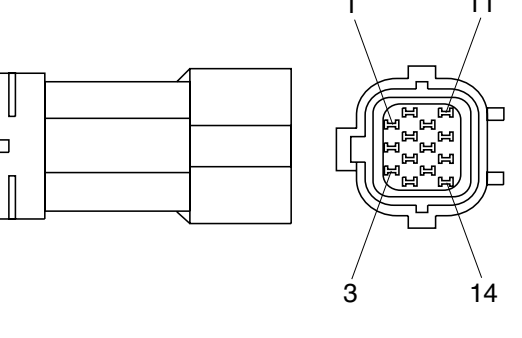
No. of pin	Receptacle connector (female)	Plug connector (male)
13	 <p data-bbox="689 638 837 672">S811-013002</p>	 <p data-bbox="1248 638 1396 672">S811-113002</p>
17	 <p data-bbox="689 1052 837 1086">S811-017002</p>	 <p data-bbox="1248 1052 1396 1086">S811-117002</p>
21	 <p data-bbox="689 1456 837 1489">S811-021002</p>	 <p data-bbox="1248 1456 1396 1489">S811-121002</p>

2) J TYPE CONNECTOR

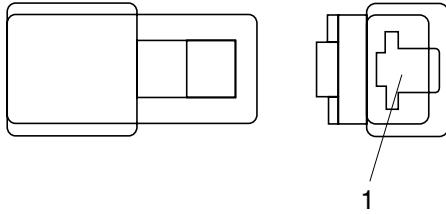
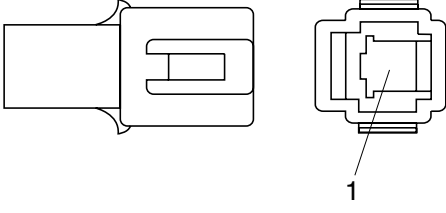
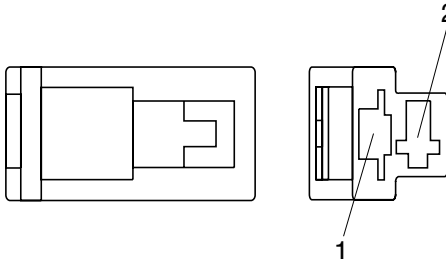
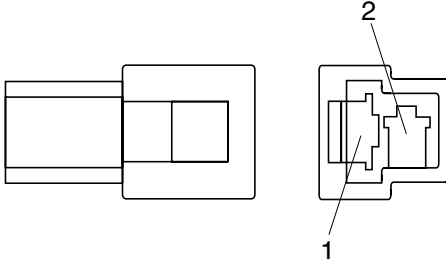
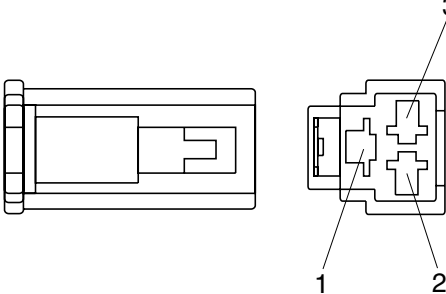
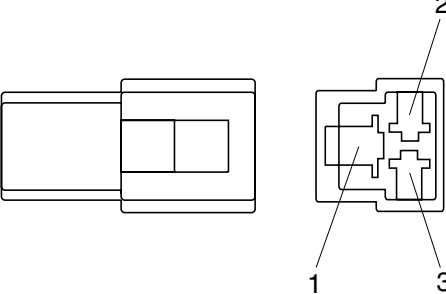
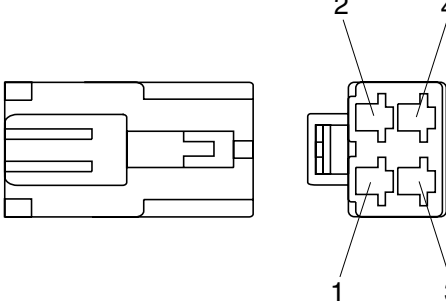
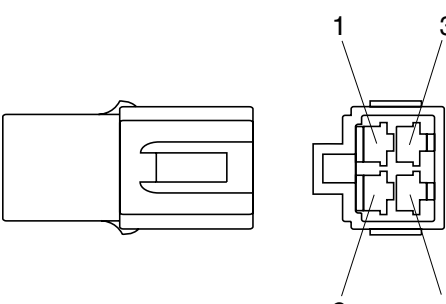
No. of pin	Receptacle connector (female)	Plug connector (male)
2	 <p style="text-align: center;">S816-002001</p>	 <p style="text-align: center;">S816-102001</p>
3	 <p style="text-align: center;">S816-003001</p>	 <p style="text-align: center;">S816-103001</p>
4	 <p style="text-align: center;">S816-004001</p>	 <p style="text-align: center;">S816-104001</p>
8	 <p style="text-align: center;">S816-008001</p>	 <p style="text-align: center;">S816-108001</p>

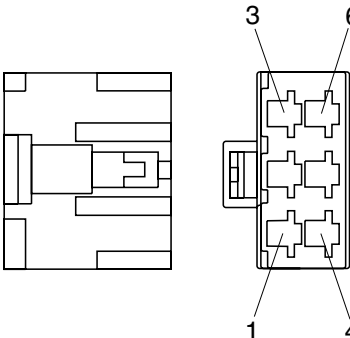
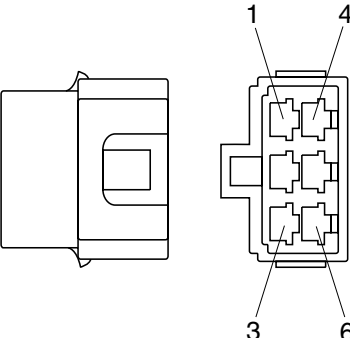
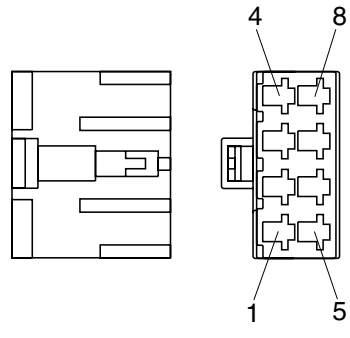
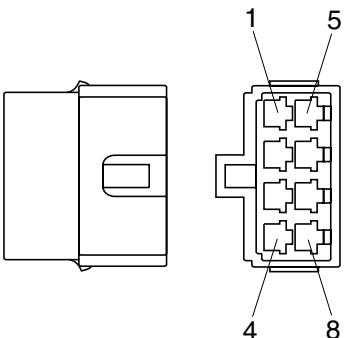
3) SWP TYPE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 <p data-bbox="687 680 836 712">S814-001000</p>	 <p data-bbox="1241 680 1390 712">S814-101000</p>
2	 <p data-bbox="687 1088 836 1120">S814-002000</p>	 <p data-bbox="1241 1088 1390 1120">S814-102000</p>
3	 <p data-bbox="687 1496 836 1527">S814-003000</p>	 <p data-bbox="1241 1496 1390 1527">S814-103000</p>
4	 <p data-bbox="687 1904 836 1935">S814-004000</p>	 <p data-bbox="1241 1904 1390 1935">S814-104000</p>

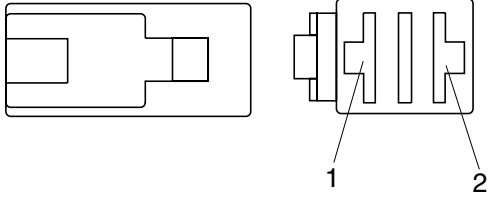
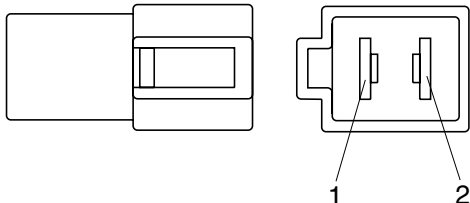
No. of pin	Receptacle connector (female)	Plug connector (male)
6	 <p data-bbox="686 638 837 672">S814-006000</p>	 <p data-bbox="1244 638 1396 672">S814-106000</p>
8	 <p data-bbox="686 1041 837 1075">S814-008000</p>	 <p data-bbox="1244 1041 1396 1075">S814-108000</p>
12	 <p data-bbox="686 1444 837 1478">S814-012000</p>	 <p data-bbox="1244 1444 1396 1478">S814-112000</p>
14	 <p data-bbox="686 1848 837 1881">S814-014000</p>	 <p data-bbox="1244 1848 1396 1881">S814-114000</p>

4) CN TYPE CONNECTOR

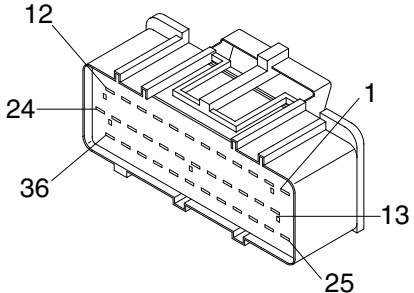
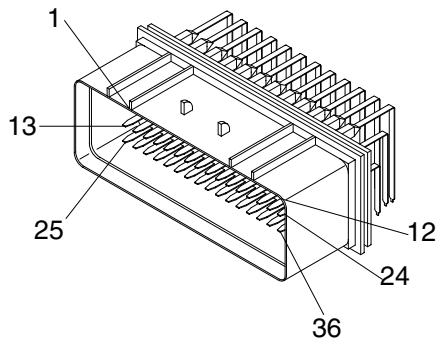
No. of pin	Receptacle connector (female)	Plug connector (male)
1	 <p data-bbox="686 683 837 712">S810-001202</p>	 <p data-bbox="1244 683 1396 712">S810-101202</p>
2	 <p data-bbox="686 1086 837 1115">S810-002202</p>	 <p data-bbox="1244 1086 1396 1115">S810-102202</p>
3	 <p data-bbox="686 1489 837 1518">S810-003202</p>	 <p data-bbox="1244 1489 1396 1518">S810-103202</p>
4	 <p data-bbox="686 1892 837 1921">S810-004202</p>	 <p data-bbox="1244 1892 1396 1921">S810-104202</p>

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 <p data-bbox="686 638 837 672">S810-006202</p>	 <p data-bbox="1244 638 1396 672">S810-106202</p>
8	 <p data-bbox="686 1041 837 1075">S810-008202</p>	 <p data-bbox="1244 1041 1396 1075">S810-108202</p>

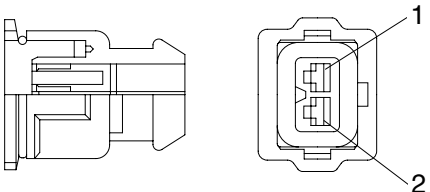
5) 375 FASTEN TYPE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 <p style="text-align: center;">S810-002402</p>	 <p style="text-align: center;">S810-102402</p>

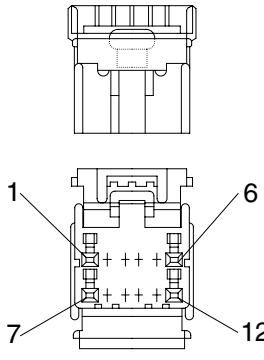
6) AMP ECONOSEAL CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
36	 <p style="text-align: center;">344111-1</p>	 <p style="text-align: center;">344108-1</p>

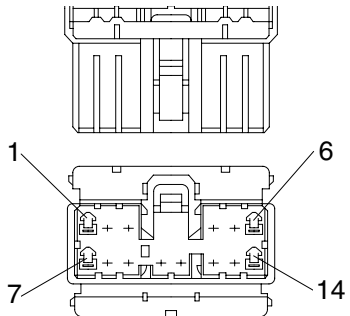
7) AMP TIMER CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 <p style="text-align: center;">85202-1</p>	

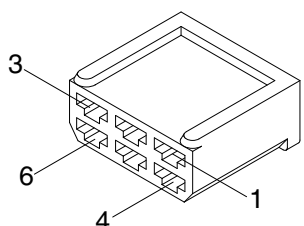
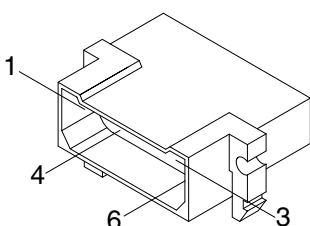
8) AMP 040 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
12	 <p style="text-align: right;">174045-2</p>	

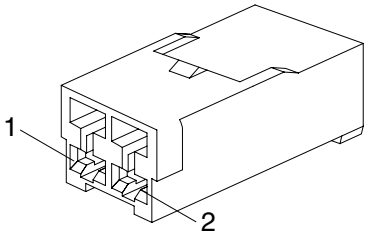
9) AMP 070 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
14	 <p style="text-align: right;">173852</p>	

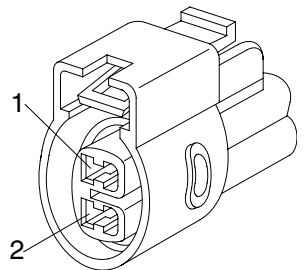
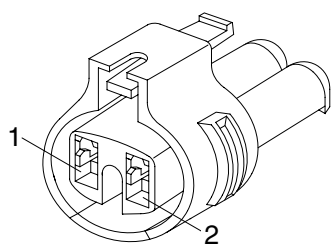
10) AMP FASTIN - FASTON CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 <p style="text-align: right;">925276-0</p>	 <p style="text-align: right;">480003-9</p>

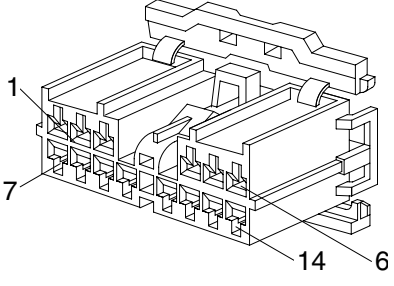
11) KET 090 CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 <p data-bbox="710 672 837 705">MG610070</p>	

12) KET 090 WP CONNECTORS

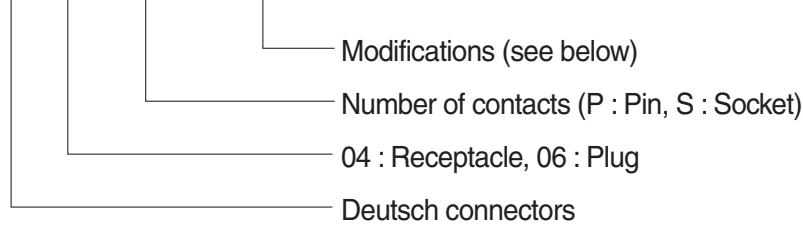
No. of pin	Receptacle connector (female)	Plug connector (male)
2	 <p data-bbox="710 1265 837 1299">MG640605</p>	
2	 <p data-bbox="710 1668 837 1702">MG640795</p>	

13) KET SDL CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
14	 <p data-bbox="715 680 837 707">MG610406</p>	

14) DEUTSCH DT CONNECTORS

DT 06 - 3S - ★★☆☆



※ Modification

E003 : Standard end cap - gray

E004 : Color of connector to be black

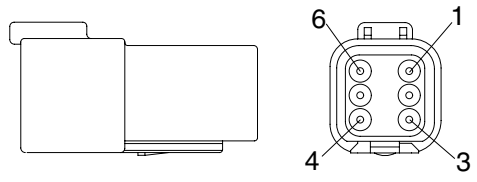
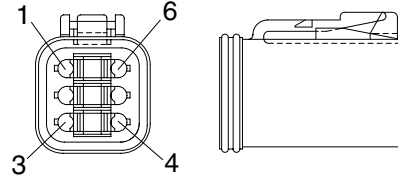
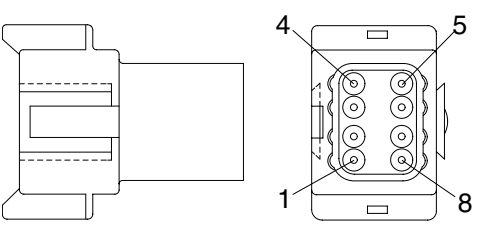
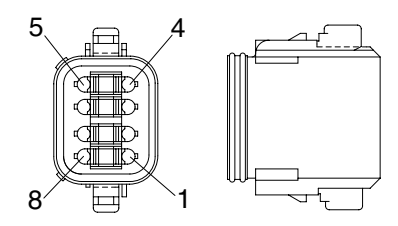
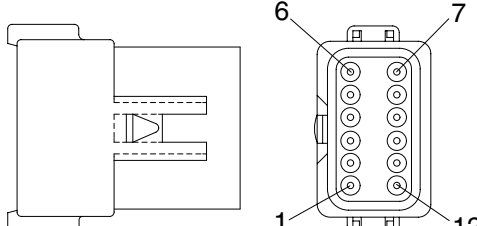
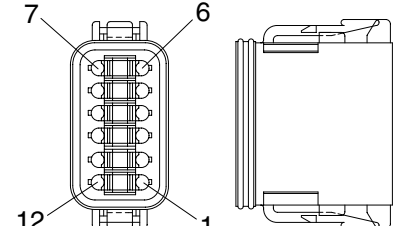
E005 : Combination - E004 & E003

EP04 : End cap

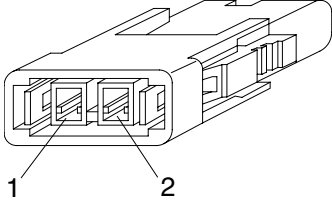
EP06 : Combination P012 & EP04

P012 : Front seal enhancement - connectors color to black for 2, 3, 4 & 6pin

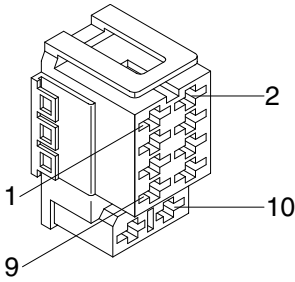
No. of pin	Receptacle connector (female)	Plug connector (male)
2	<p>DT06-2S</p>	<p>DT06-2P</p>
3	<p>DT06-3S</p>	<p>DT06-3P</p>
4	<p>DT06-4S</p>	<p>DT06-4P</p>

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 <p style="text-align: right;">DT06-6S</p>	 <p style="text-align: right;">DT06-6P</p>
8	 <p style="text-align: right;">DT06-8S</p>	 <p style="text-align: right;">DT06-8P</p>
12	 <p style="text-align: right;">DT06-12S</p>	 <p style="text-align: right;">DT06-12P</p>

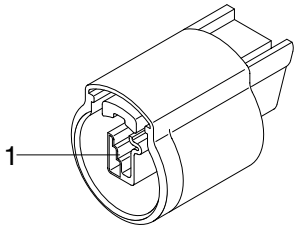
15) MOLEX 2CKTS CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 <p style="text-align: right;">35215-0200</p>	

16) ITT SWF CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
10	 <p style="text-align: right;">SWF593757</p>	

17) MWP NMWP CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 <p style="text-align: right;">NMWP01F-B</p>	