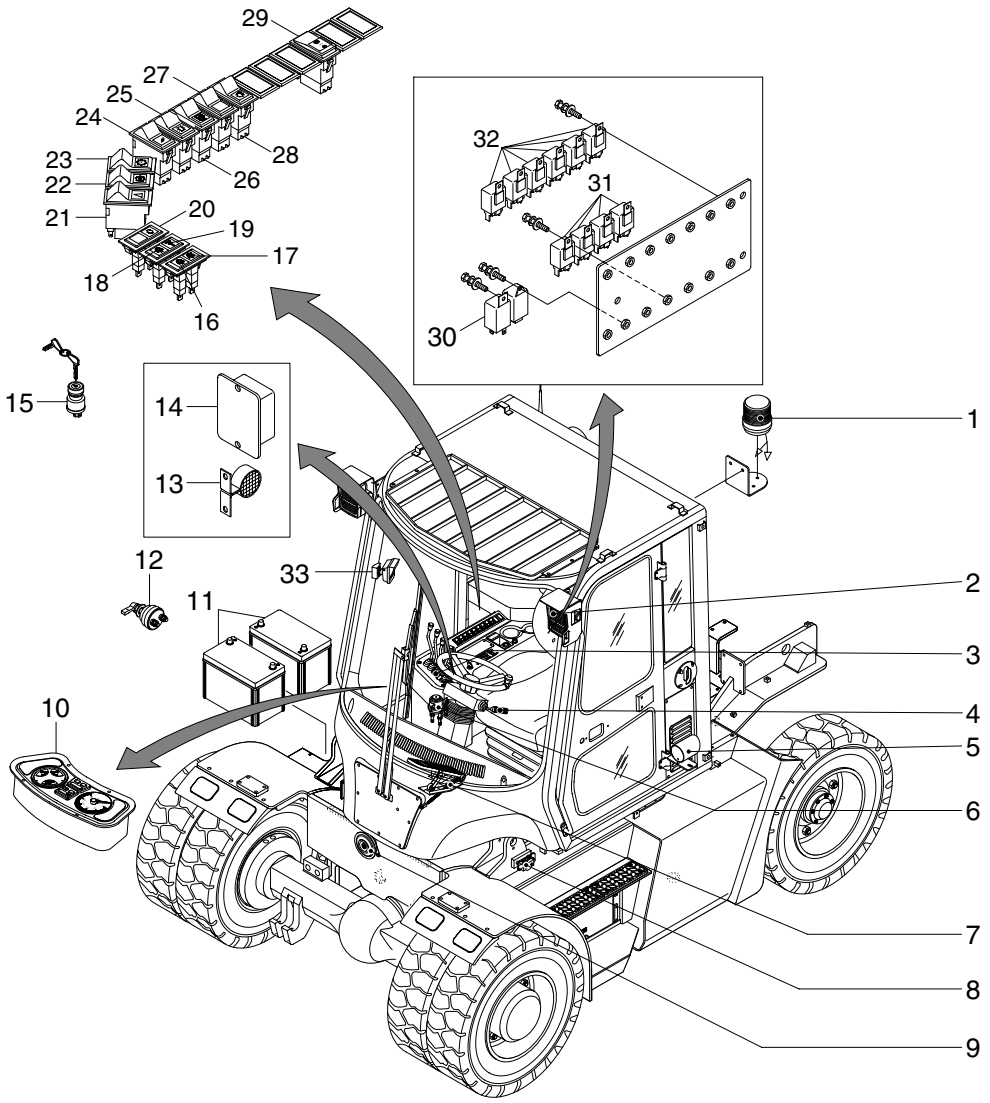
SECTION 7 ELECTRICAL SYSTEM

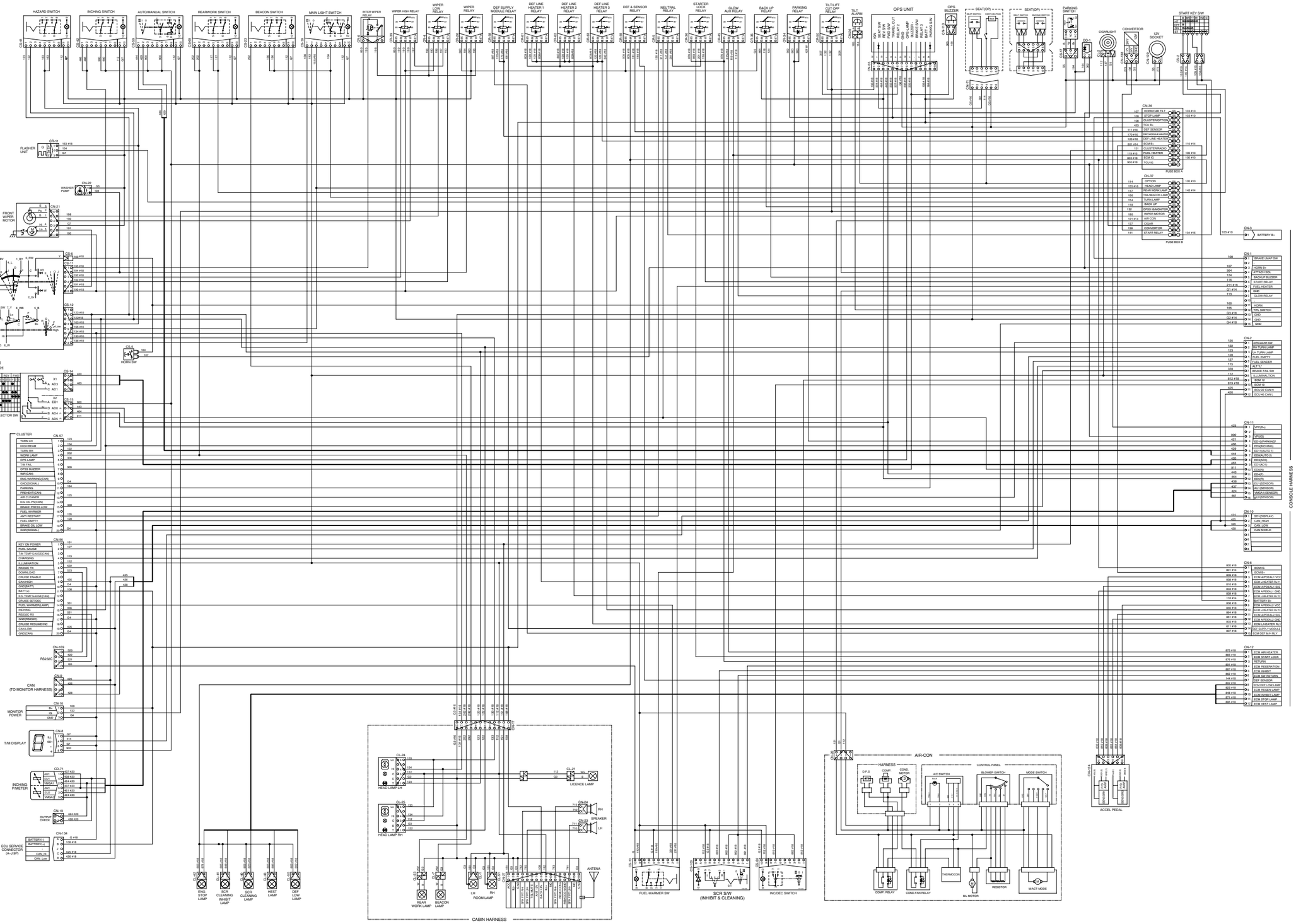
GROUP 1 COMPONENT LOCATION



80D9EL00

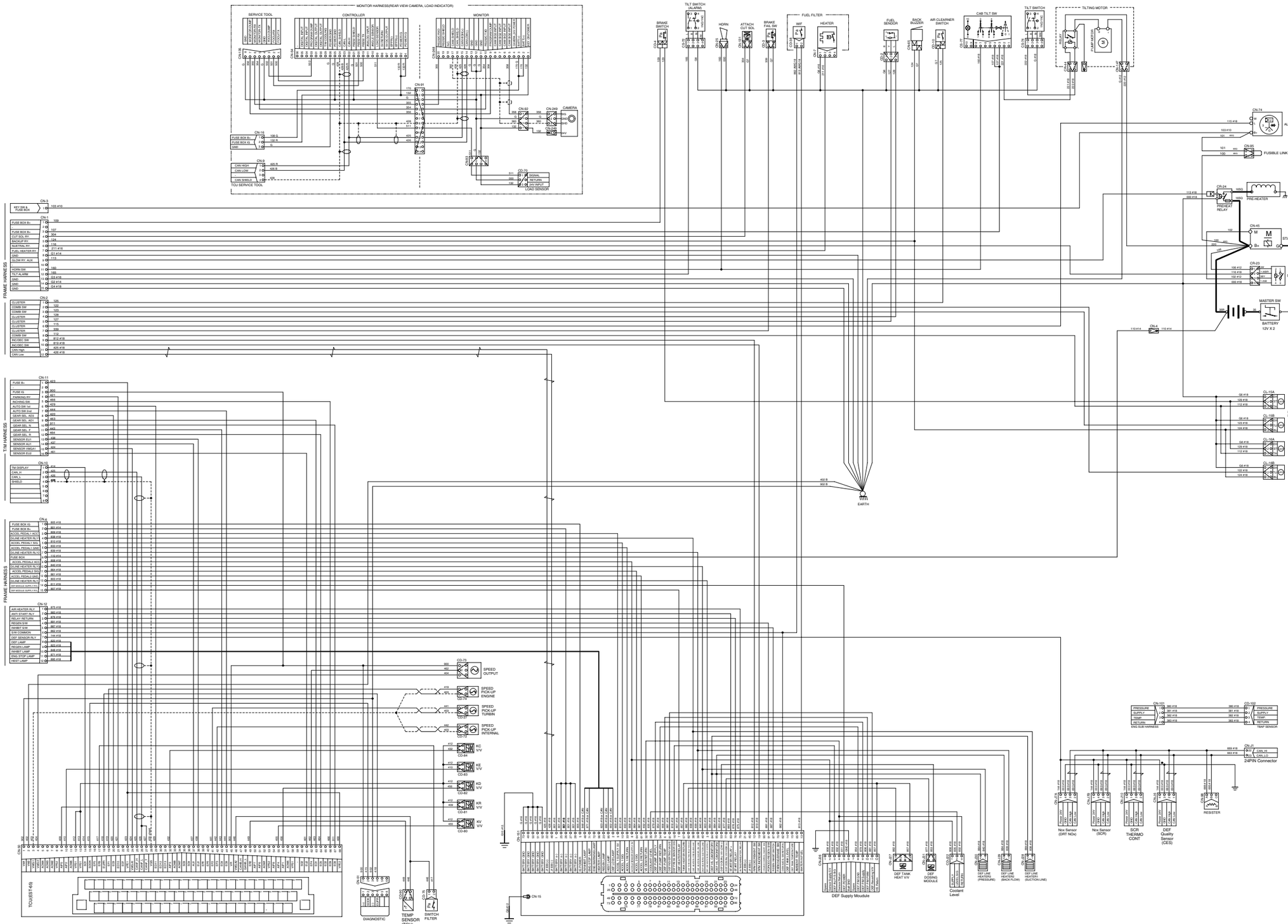
1	Beacon lamp	12	Master switch	23	Auto/Manual select switch
2	Work lamp	13	Buzzer	24	Rear work lamp switch
3	Combination switch	14	OPSS unit	25	Beacon switch
4	Gear selector	15	Start switch	26	Fuel heater switch
5	Backup alarm	16	SCR cleaning warning lamp	27	Main light switch
6	Start relay	17	SCR cleaning inhibit warning lamp	28	Inc/Decrement switch
7	Accelerator pedal	18	DEF low warning lamp	29	SCR cleaning switch
8	Micro switch	19	HEST warning lamp	30	Flasher unit
9	High horn	20	Engine stop warning lamp	31	Relay 5P
10	Cluster	21	Hazard switch	32	Relay 4P
11	Battery	22	Inching switch	33	Monitor assy

• ELECTRICAL CIRCUIT (1/2)



80D9EL01

• ELECTRICAL CIRCUIT (2/2)



80D9EL02

MEMORANDUM


Robex
HYUNDAI HEAVY INDUSTRIES CO., LTD.
CONSTRUCTION EQUIPMENT DIV.

1. POWER CIRCUIT

The negative terminal of the battery is grounded to the machine chassis.
When the start switch is in the off position, the current flows from the positive battery terminal.

1) OPERATING FLOW

- Battery(+) → Start motor [CN-45 (B+)]
  - Pre-heater relay [CR-24] → Pre-heater
  - Start relay [CR-23]
  - Fusible link [CN-95] → Alternator [CN-74 (B+)] → I/conn [CN-3]
    - Fuse box [CN-36 (1)]
      - Horn switch [CS-5]
      - I/conn [CN-1 (3)] → Cab tilting switch [CS-77]
    - Fuse box [CN-36 (2)] → I/conn [CN-1 (1)] → Brake switch [CD-4]
    - Fuse box [CN-36 (3)]
      - ECU service connector [CN-134]
      - Monitor power [CN-16]
      - Cluster [CN-56]
      - OPSS unit [CN-55]
      - OPSS buzzer [CN-113]
      - I/conn [CN-17] → OHG/Cabin hrness [CN-27]
    - Fuse box [CN-36 (4)] → I/conn [CN-11 (1)] → TCU [CN-50]
    - Fuse box [CN-36 (5)] → DEF & sensor relay [CR-59]
    - Fuse box [CN-36 (6)] → Neutral relay [CR-58]
  - Tilting motor [CN-147] → Tilting motor relay [CR-44]
    - Cab tilting switch [CS-77 (2)]
    - Tilt safety switch [CS-74 (1)]

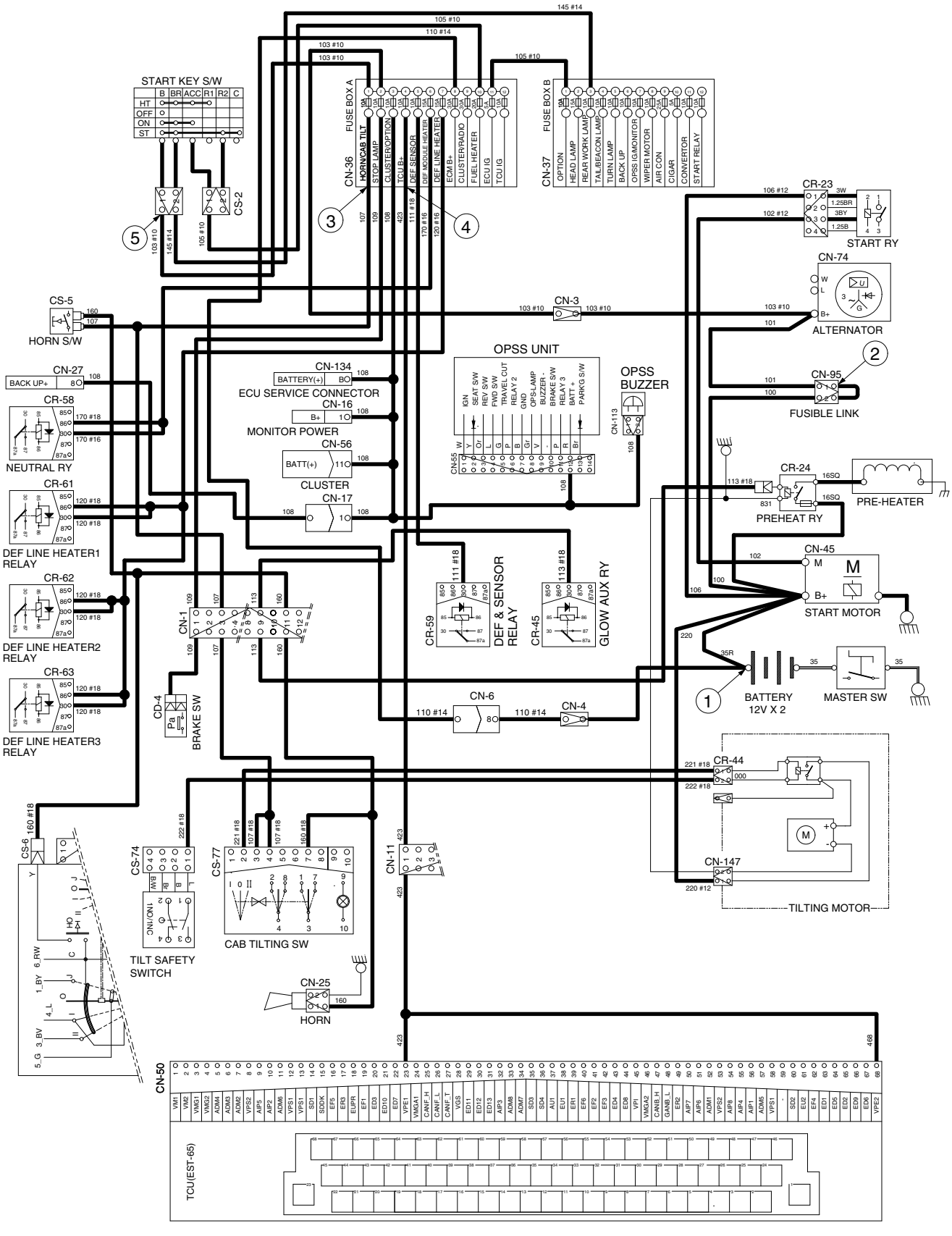
2) CHECK POINT

Engine	Key switch	Check point	Voltage
OFF	OFF	① - GND (Battery (+)) ② - GND (Fusible link) ③ - GND (Fuse No.1) ④ - GND (Fuse No.4) ⑤ - GND (Start key)	24V

※ GND : Ground

※ The circuit diagram may differ from the equipment, so please check before a repair.

POWER CIRCUIT



80D9EL03

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. STARTING CIRCUIT

1) OPERATING FLOW

Battery (+) terminal → Start motor [CN-45 (B+)]

→ Fusible link [CN-95] → Alternator [CN-74 (B+)] → I/conn [CN-3] → Fuse box [CN-36] → Start switch [CS-2 (1)]

→ Start relay [CR-23 (2)] → I/conn [CN-1 (6)] → Starter lock relay [CR-36 (87→30)] → Neutral relay [CR-5 (87→30)] → Fuse box B [CN-37 (12)] → Start switch [CS-2 (2)]

→ Pre-heater relay [CR-24] → Pre-heater

※ The engine can be started only when the gearshift is in neutral position.
The operator should be seated when starting.

(1) When start key switch is in ON position

Start switch ON [CS-2 (1)] → Fuse box A [No.8 →12] → Gear selector switch [CS-15 (A)]

(2) When start key switch is START position

Start switch START [CS-2 (2)] → Fuse box B [No. 12] → Neutral relay [CR-5 (30 → 87)] → Starter lock relay [CR-36 (30 → 87)] → I/conn [CN-1 (6)] → Start relay [CR-23]

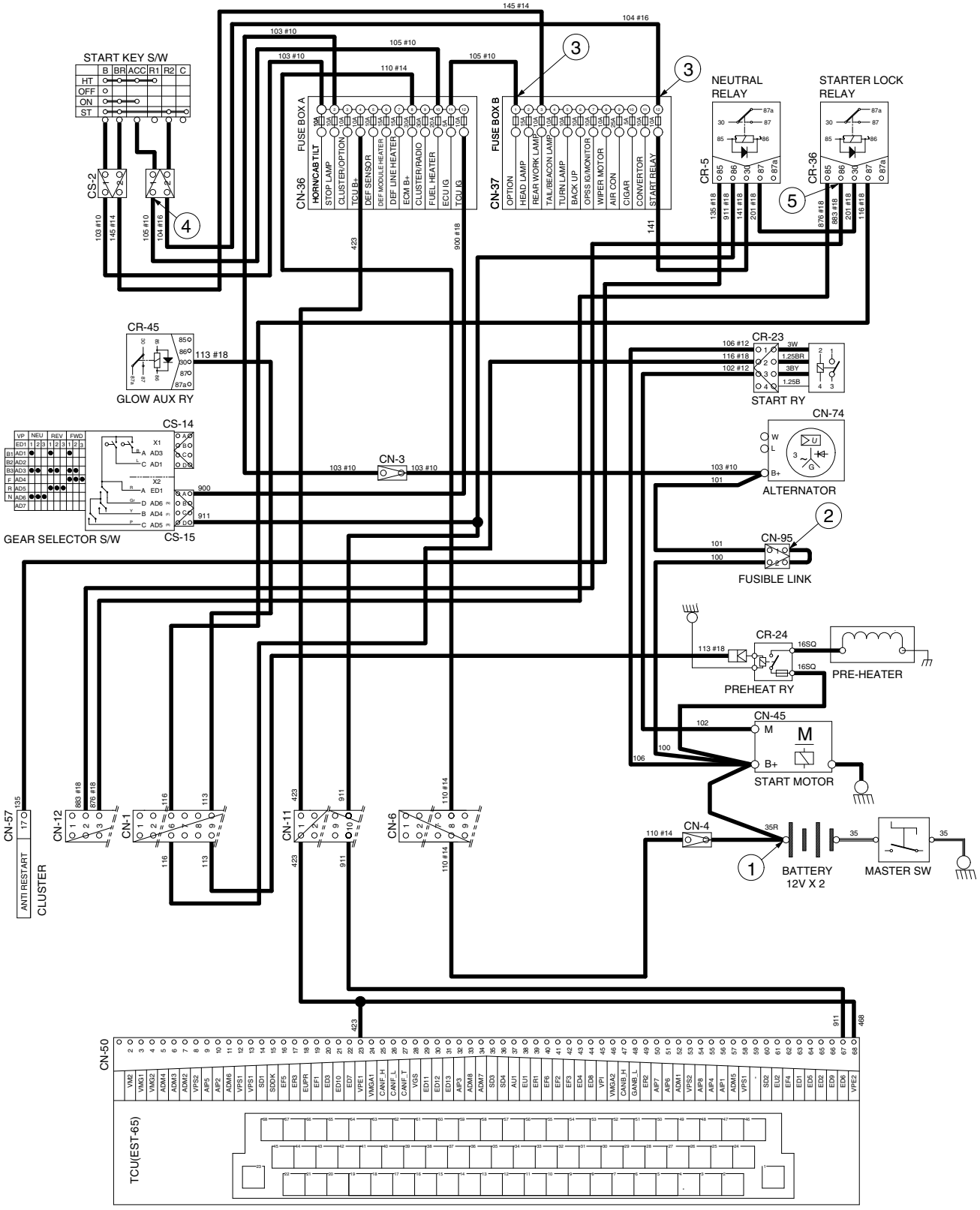
2) CHECK POINT

Engine	Key switch	Check point	Voltage
Running	ON	① - GND (Battery B+) ② - GND (Fusible link) ③ - GND (Fuse box B No.1, 12) ④ - GND (Start key) ⑤ - GND (Starter lock relay)	24V

※ GND : Ground

※ The circuit diagram may differ from the equipment, so please check before a repair.

STARTING CIRCUIT



80D9EL04

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. CHARGING CIRCUIT

When the starter is activated and the engine is started, the operator release the start switch to the ON position. Charging current generated by operating alternator flows into the battery.
The current also flows from alternator to each electrical component through the fusible link (CN-60) and the fuse box.

1) OPERATING FLOW

(1) Warning flow

Alternator [CN-74 (L)] → I/conn [CN-2 (6)] → Cluster charging lamp ON [CN-56 (4)]

(2) Charging flow

Alternator [CN-74 (B+)] → Fusible link [CN-95] → Starter [CN-45 (B+)] → Battery (+) terminal charging
Alternator [CN-74 (B+)] → I/conn [CN-3] → Fuse box [CN-36]

2) CHECK POINT

Engine	Key switch	Check point	Voltage
ON	ON	① - GND (Alternator B+) ② - GND (Start switch) ③ - GND (Cluster)	24V

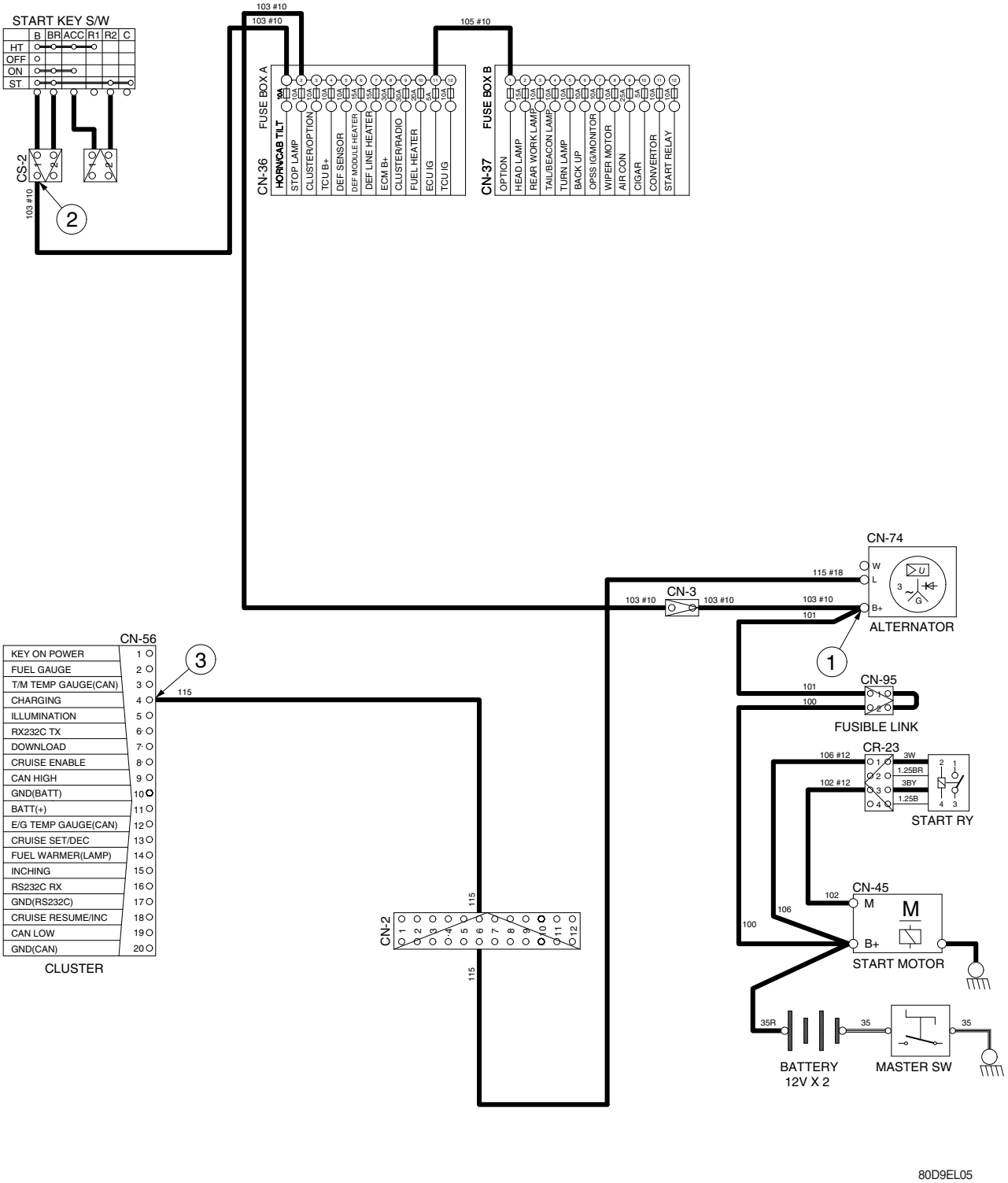
※ GND : Ground

※ Cautions

1. When using an arc welder, always disconnect the ground lead from the battery to prevent alternator or battery damage.
2. Attach the welding ground clamp as close to the weld area as possible to prevent welding current from damaging the bearings of the alternator.
3. Do not disconnect the battery when the engine is running. The voltage surge can damage the diode and resistors in the electrical system.
4. Do not disconnect an electric wire before the engine is stopped and the switches are OFF.

※ The circuit diagram may differ from the equipment, so please check before a repair.

CHARGING CIRCUIT



※ The circuit diagram may differ from the equipment, so please check before a repair.

4. PREHEATING CIRCUIT

Combustion chamber glow plugs are used in order to give satisfactory starting of low ambient temperatures.

1) OPERATING FLOW

Battery (+) terminal → Start motor [CN-45 (B+)]
→ Fusible link [CN-95] → Alternator [CN-74 (B+) → I/conn [CN-3] → Fuse box [CN-36]
→ Start switch (B)
→ Pre-heater relay [CR-24] → Pre-heater

※ When you turn the start switch to the ON position, the glow relay makes the glow plugs operated and the glow lamp of the cluster turned ON.

Start switch ON [CS-2 (1)]
→ Fuse box [10] → Fuel heater switch [CS-10 (5)→(2)] → Fuel warmer (Lamp) [CN-56 (14)]
→ Fuel heater switch [CS-10 (5)→(1)] → I/conn [CN-1 (7)]
→ Fuel heater [CN-7] → Start relay [CR-23]
→ Glow aux relay [CR-45 (30→87)] → I/conn [CN-1 (9)] → Pre-heater relay [CR-24]
→ Pre-heater

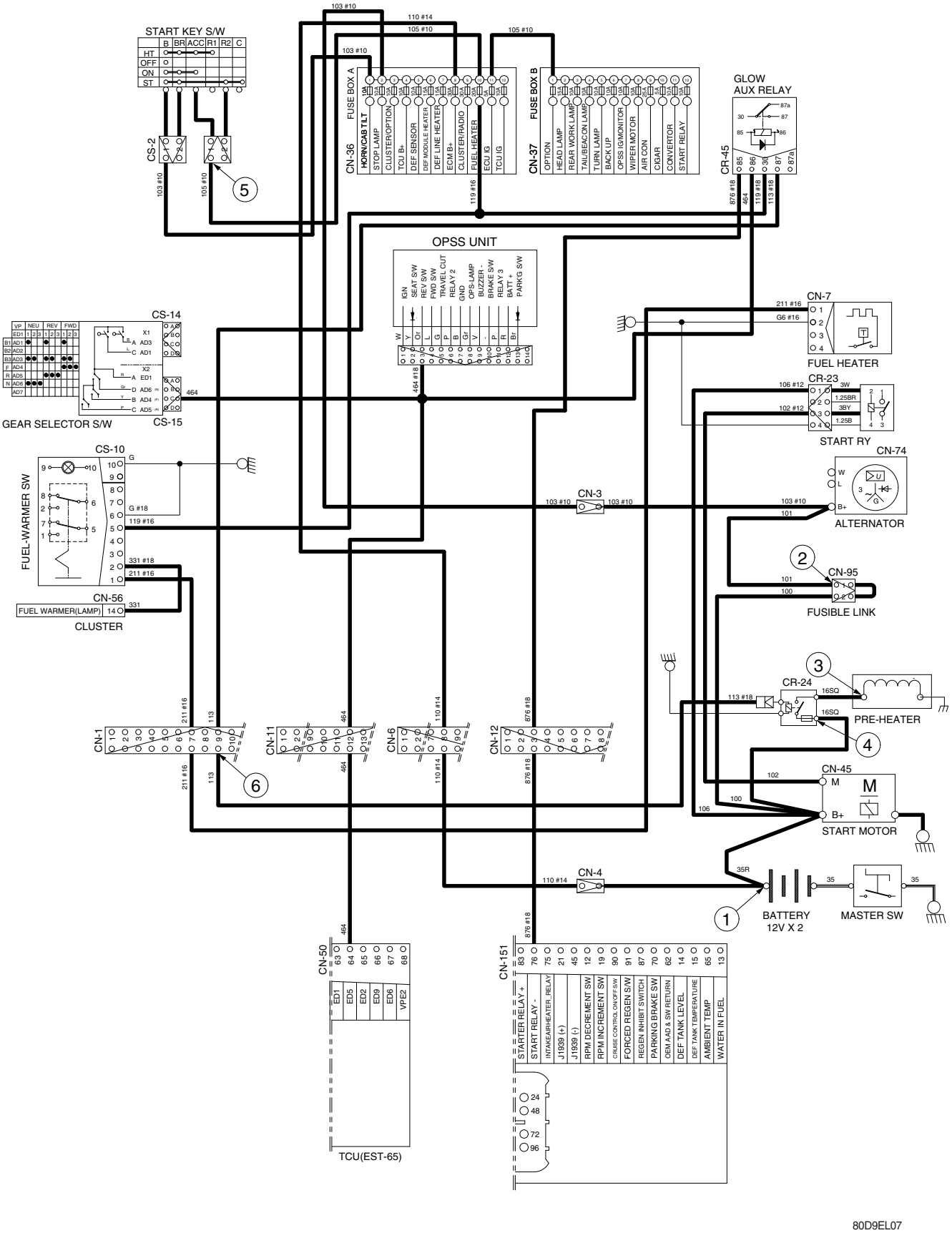
2) CHECK POINT

Engine	Key switch	Check point	Voltage
Stop	HEAT	① - GND (Battery B+) ② - GND (Fusible link) ③ - GND (Heater) ④ - GND (Heater relay) ⑤ - GND (Start switch) ⑥ - GND (Fuel heater)	24V

※ GND : Ground

※ The circuit diagram may differ from the equipment, so please check before a repair.

PREHEATING CIRCUIT



※ The circuit diagram may differ from the equipment, so please check before a repair.

GROUP 3 CLUSTER

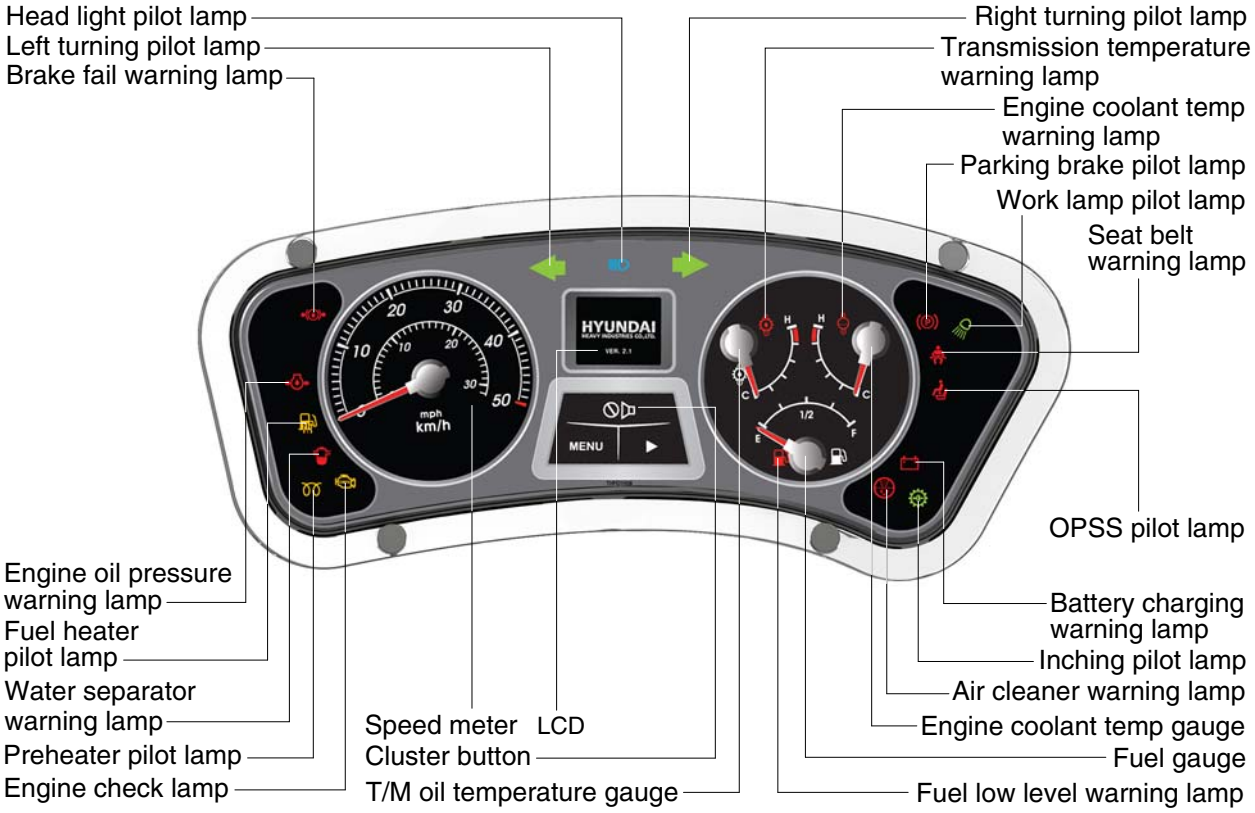
1) STRUCTURE

The gauges panel consists of gauges and monitors as shown below, to warn the operator in case of abnormal truck operation or conditions for the appropriate operation and inspection.

- Gauges : Indicate operating status of the truck.
- Warning lamp : Indicate abnormality of the truck.
- Pilot lamp : Indicate operating status of the truck.

※ **The monitor installed on this truck does not entirely guarantee the condition of the truck. Daily inspection should be performed according to chapter 7. PLANNED MAINTENANCE AND LUBRICATION of the operator's manual.**

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



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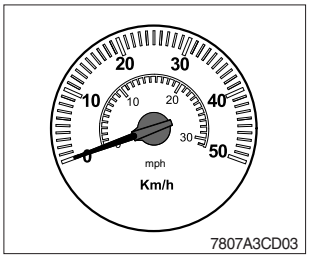
2) GAUGE

(1) Speed meter



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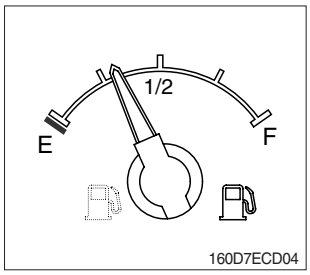
① The speedmeter displays the speed of truck in mph and km/h.

(2) Fuel gauge

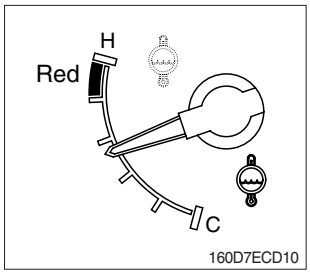


① This gauge indicates the amount of fuel in the fuel tank.

② Fill the fuel when the indicator moves E point, refuel as soon as possible to avoid running out of fuel.

※ **If the gauge indicates below E point even though the truck 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

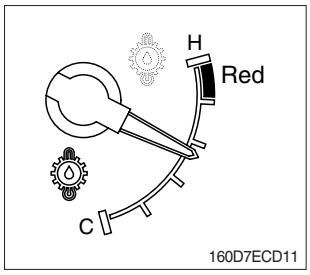


① This indicates the temperature of coolant.
- Red range : Above 104˚C (219˚F)

② Keep idling engine at low speed until the indicator is in the operating range.

③ If the indicator is in the red range, turn OFF the engine, check the radiator and engine.

(4) Transmission oil temperature gauge



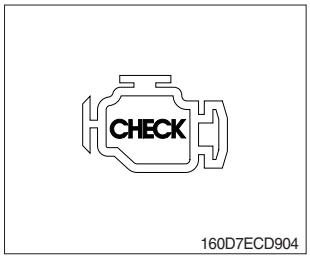
① This range indicates the temperature of transmission oil.
- Red range : Above 107˚C (225˚F)

② Keep idling engine at low speed until the indicator is in the operating range.

③ If the indicator is in the red range, it means the transmission is overheated. Be careful that the indicator does not move into the red range.

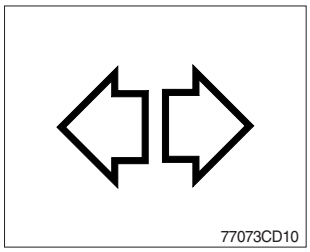
3) WARNING AND PILOT LAMP

(1) Engine check lamp



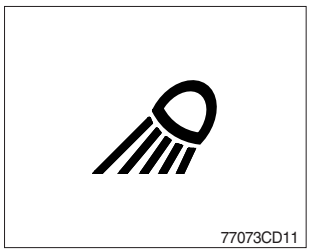
① This lamp light ON during a nonfatal engine system error. The engine can still be run, but the fault should be corrected as soon as possible.

(2) Direction pilot lamp



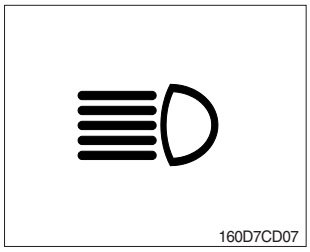
① This lamp flashes when the signal indicator lever is moved.

(3) Work lamp pilot lamp (rear)



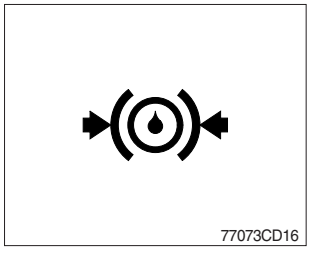
① This lamp lights ON when rear work lamp switch is pressed.

(4) Head light pilot lamp



① This lamp comes ON when the main light switch is operated to 2nd step.

(5) Brake fail warning lamp

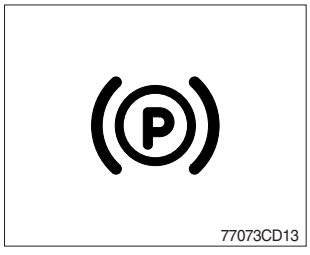


① The lamp lights ON when the oil pressure of service brake drops below the normal range.

② When the lamp is ON, stop the engine and check for its cause.

※ **Do not operate until the problems are corrected.**

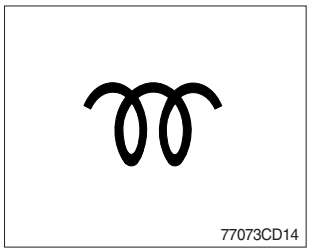
(6) Parking brake pilot lamp



① When the parking brake is actuated, the lamp lights ON.

※ **Check the lamp is OFF before driving.**

(7) Preheater pilot lamp



① This lamp lights ON when start switch is turned clockwise to the ON position. Light will turn off after approximately 15~45 seconds, depending on engine temperature, indicating that preheating is completed.

② When the lamp goes out the operator should start cranking the engine.

※ **Refer to page 5-12 of the operator's manual.**

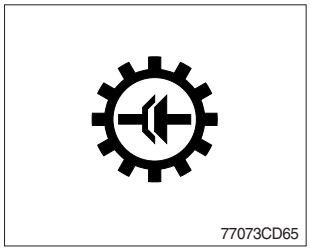
(8) OPSS pilot lamp (option)

① This signal lamp lights ON when the operator leaves the seat.

② Powered travel movement of the truck shall be possible only if the operator is in the normal operating position. Transmission will automatically shift to neutral upon the exiting of the operator.

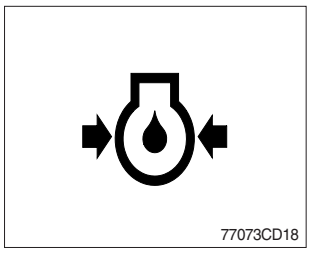
③ The forward/reverse lever must be cycled through neutral with the operator in the normal operating position to regain powered direction control.

(9) Inching pilot lamp



① When the inching switch is pressed, the lamp lights ON.

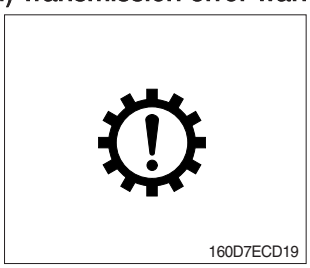
(10) Engine oil pressure warning lamp



① This lamp comes ON for a while after starting the engine because of the low oil pressure.

② If the lamp comes ON during engine operation, shut OFF engine immediately. Check oil level.

(11) Transmission error warning lamp



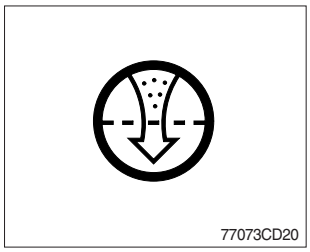
① This lamp lights ON and the T/M message display shows the error codes when an error occurs in the transmission.

② Immediately pull the truck to a convenient stop. Stop the engine. Investigate the cause.

※ **Consult a HYUNDAI dealer to investigate the cause.**

※ **Do not operate until the cause has been corrected.**

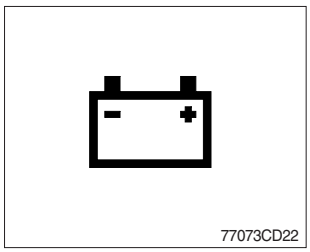
(12) Air cleaner warning lamp



① This lamp operates by the vacuum caused inside when the filter of air cleaner is clogged.

② Check the filter and clean or replace it when the lamp is ON.

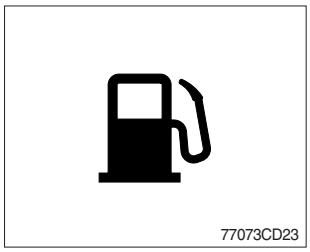
(13) Battery charging warning lamp



① This lamp is ON after key switch is turned ON.

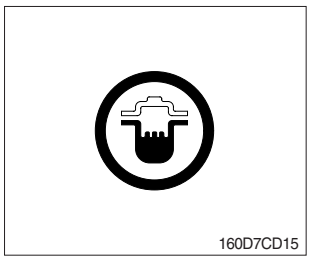
② Check the battery charging circuit when this lamp comes ON during engine operation.

(14) Fuel low level warning lamp



① Fill the fuel immediately when the lamp is turned ON.

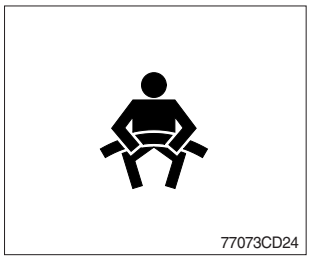
(15) Water in fuel warning lamp



① This lamp lights up when the water separators full of water or malfunctioning.

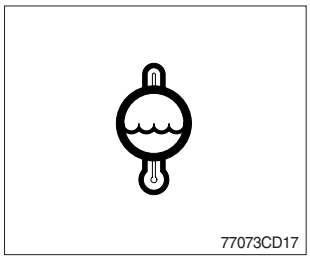
※ **When this lamp lights up, stop the truck and spill water out of the separator.**

(16) Seat belt warning lamp



① This lamp lights ON for the first five seconds after starting the truck.

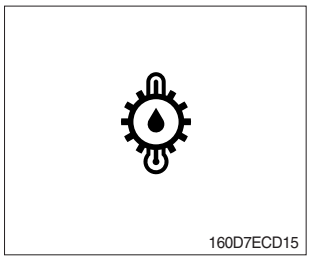
(17) Engine coolant temperature warning lamp



① This lamp is turned ON when the temperature of cooling water is over the normal temperature(104°C, 219°F).

② Check the cooling system when the lamp is ON.

(18) Transmission oil temperature warning lamp

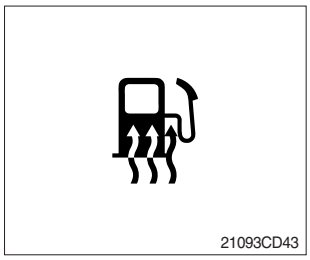


① This lamp informs the operator that transmission oil is above the specified temperature.

- Lamp ON : Abnormal
- Lamp OFF : Normal

※ **When this lamp lights up during operation, stop the engine and check the machine.**

(19) Fuel heater pilot lamp

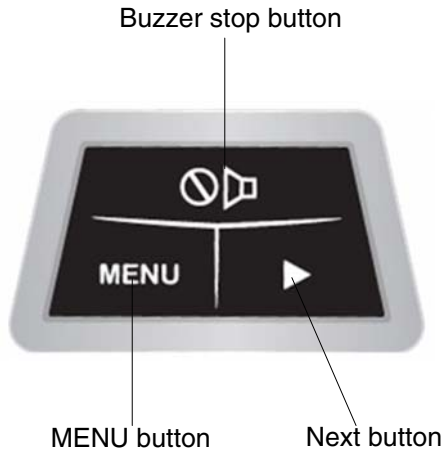


① This lamp is turned ON when the coolant temperature is below 10°C (50°F) or the hydraulic oil temperature 20°C (68°F).

② The automatic fuel warming is cancelled when the engine coolant temperature is above 60°C, or the hydraulic oil temperature is above 45°C since the start switch was ON position.

4) CLUSTER BUTTON

Each button has the following function.



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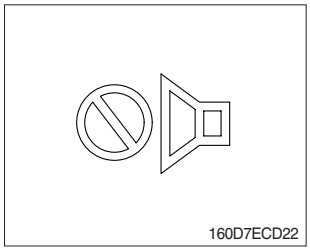
(1) Buzzer stop button

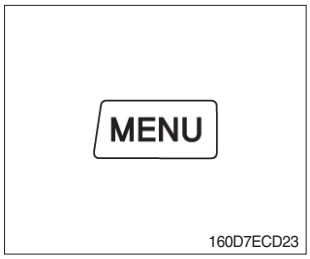


160D7ECD22

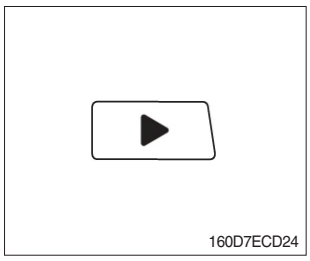
① This swich is used to stop the buzzer sound.

② Stop the buzzer when the switch is pressed.

(2) Menu and next button



160D7ECD23



160D7ECD24

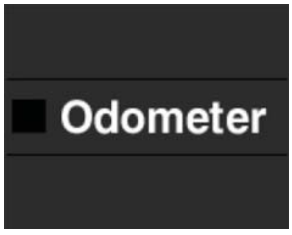
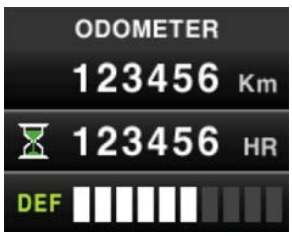
① This swiches are used to choose the model or display the engine error on the LCD.

② Model select mode

- The model is displayed on the LCD when the menu button MENU and next button ▶ are pressed simultaneously for some longer seconds.
- Please don't change your truck model identity because it is already pre-set on the truck before delivery.

5) LCD

LCD has the functions to display start mode, DEF, model select and engine error.

NO	Display	Name	Description
1		Start mode	- Display initialization state with HYUNDAI logo and program version.
2		DEF	1) Displays like this image.
			2) If you want display odometer, push + until odometer select mode is displayed.
			3) To display the odometer, push .
			4) When you choose the odometer, displays like this image during 8 seconds, and than rpm is display.
			

NO	Display	Name	Description
3		Model select	- On model select mode, displays like this image. ※ Refer to the page 7-19.
4		Engine error display	- In case of below 4 engine errors displays like this image. ※ Refer to the page 7-19.
			- In case of over 4 engine errors displays like this image.
			- To display next page in case of over 4 errors, press ▶.

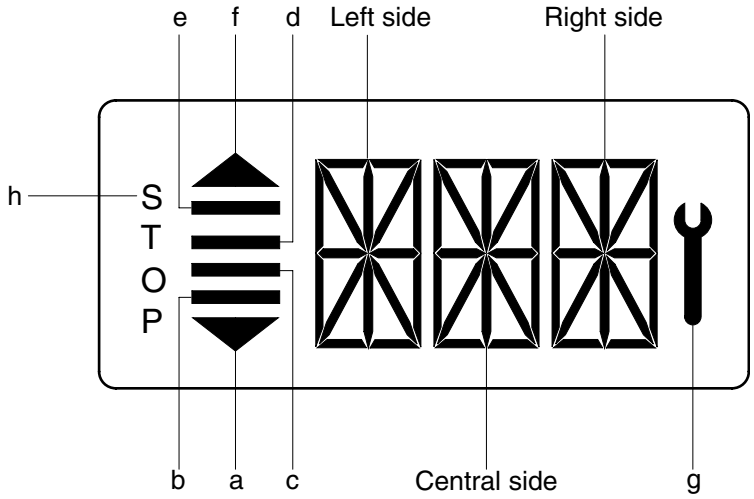
GROUP 4 TRANSMISSION MESSAGE INDICATOR

1) TRANSMISSION ERROR DISPLAY (ZF Transmission)

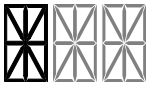
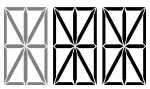
(1) Function

The display can be used with the gear selector (DW-3). It indicates speed and driving direction as well as the activated kickdown.

When driving in the automatic mode, a bar indicator gives additionally also information about the selected driving range; The automatic range is symbolized by arrows above and below the bar indicator. In case of possible errors in the system, a wrench appears on the display, combined with indication of the error number. Also sporadically occurring errors can be indicated.



7803A3CD33

1	Bars	a, f	Automatic range (up and down shifting)
		b, c, d,	Preselected gear
2	Left side		For the moment still without function
3	Central and Right side		On the two alphanumeric 16-segment display, the electric control unit issues the actual state of gear and driving direction. Besides, a two digit error code will be indicated via these two segment
4	Spanner	g	Electronic control unit recognized an error, is flashing
5	Letters STOP	h	Immediate stop is required (At the moment not activated)

※ **If it happens error codes, consult with Hyundai service center to repair the fault.**

(2) Display during operation

Symbol	Meaning	Remarks
F, N, R 1, 2, 3	Actual gear and direction Central side shows actual gear Right side shows actual direction	
NN (Central and right side)	Not neutral, waiting for neutral after power up or a severe fault	To engage a gear, first move shift selector to neutral position and again to F to R position
1 bar	Manual mode lst gear	
2 bar	Manual mode 2nd gear	
3 bar	Manual mode 3nd gear	
4 bars and 2 arrows	Automatic mode	a, f
Arrows (a, f) flashing	Kick down mode active	
	Transmission neutral	Cold start phase
Bars flashing	Downshift mode active	
Spanner flashing	At least on fault active	Select neutral to get fault code displayed
WT	Warning torque converter temperature	Changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner)
WS	Warning sump temperature	Changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner)
WE	Warning high engine speed	Changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner)
PN	Direction F or R selected while parking brake engaged	Transmission in neutral until parking brake is released. ※ Machine starts to move after release of parking brake.
F or R flashing	Direction F or R selected while turbine speed is to high	※ Gear will engage when turbine speed drops
EE flashing (central and right side)	No communication with display	

(3) Definition of the error codes

① Introduction

The error codes consists of two hexadecimal numbers.

The first number shows the type of signal, the second number shows signal and the type of the error.

② Description of error codes

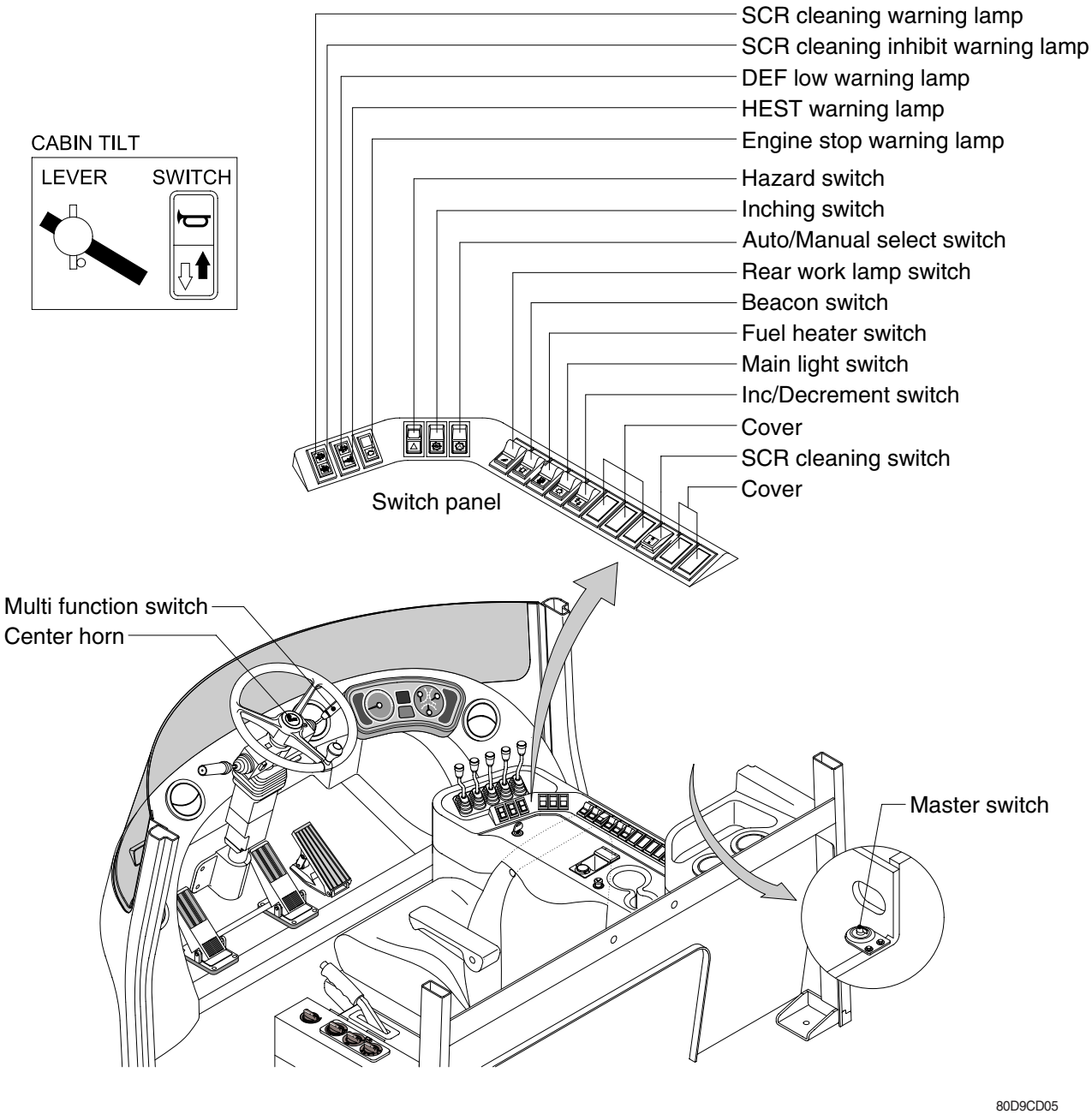
First No.	Meaning of number
1 hex	Digital input signals
2 hex	Analog input signals
3 hex	Speed signals
4 hex	Speed signals
7 hex	Analog current output signals
8 hex	Analog current output signals
9 hex	Digital output signals
A hex	Digital output signals
B hex	Clutch errors
D hex	Power supply
E hex	High speed signals
F hex	General errors

③ List of error codes

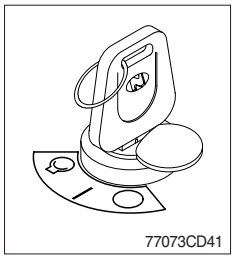
Number	Meaning of error code
11 hex	Logical error at gear range signal
12 hex	Logical error at direction select signal
21 hex	Short circuit to battery voltage at clutch cutoff input
22 hex	Short circuit to ground or open circuit at clutch cutoff input
25 hex	Short circuit to battery voltage or open circuit at temperature sensor input
26 hex	Short circuit to ground at temperature sensor input
31 hex	Short circuit to battery voltage at engine speed input
32 hex	Short circuit to ground or open circuit at engine speed input
33 hex	Logical error at engine speed input
34 hex	Short circuit to battery voltage at turbine speed input
35 hex	Short circuit to ground or open circuit at turbine speed input
36 hex	Logical error at turbine speed input
37 hex	Short circuit to battery voltage at internal speed input
38 hex	Short circuit to ground or open circuit at internal speed input
39 hex	Logical error at internal speed input

Number	Meaning of error code
3A hex	Short circuit to battery voltage or open circuit at output speed input
3B hex	Short circuit to ground or open circuit at output speed input
3C hex	Logical error at output speed input
71 hex	Short circuit to battery voltage at clutch KC
72 hex	Short circuit to ground at clutch KC
73 hex	Open circuit at clutch KC
74 hex	Short circuit to battery voltage at clutch KD
75 hex	Short circuit to ground at clutch KD
76 hex	Open circuit at clutch KD
77 hex	Short circuit to battery voltage at clutch KE
78 hex	Short circuit to ground at clutch KE
79 hex	Open circuit at clutch KE
84 hex	Short circuit to battery voltage at clutch KV
85 hex	Short circuit to ground at clutch KV
86 hex	Open circuit at clutch KV
87 hex	Short circuit to battery voltage at clutch KR
88 hex	Short circuit to ground at clutch KR
89 hex	Open circuit at clutch KR
91 hex	Short circuit to ground at relay reverse warning alarm
92 hex	Short circuit to battery voltage at relay reverse warning alarm
93 hex	Open circuit at relay reverse warning alarm
94 hex	Short circuit to ground at relay starter interlock
95 hex	Short circuit to battery voltage at relay starter interlock
96 hex	Open circuit at relay starter interlock
97 hex	Short circuit to ground at park brake solenoid
98 hex	Short circuit to battery voltage at park brake solenoid
99 hex	Open circuit at park brake solenoid
B1 hex	Slippage at clutch KC
B2 hex	Slippage at clutch KD
B3 hex	Slippage at clutch KE
B5 hex	Slippage at clutch KV
B6 hex	Slippage at clutch KR

Number	Meaning of error code
D1 hex	Short circuit to battery voltage at power supply for sensors
D2 hex	Short circuit to ground at power supply for sensors
D3 hex	Low voltage at battery
D4 hex	High voltage at battery
D5 hex	Error at valve power supply 1
D6 hex	Error at valve power supply 2
E5 hex	Communication failure on devicenet
F1 hex	General EEPROM fault
F2 hex	Configuration lost
F3 hex	Application error

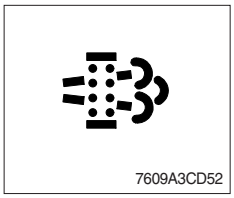


1) START SWITCH



(1) There are three positions, OFF, ON and START.
- ◯ (OFF) : None of electrical circuits activate.
- | (ON) : All the systems of truck operate.
- ◯ (START) : Use when starting the engine.
  Release key immediately after starting.

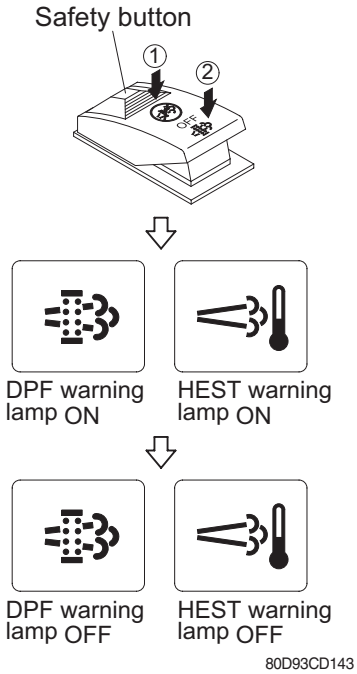
2) SCR (Selective Catalytic Reduction) CLEANING WARNING LAMP



① This lamp lights ON when the SCR cleaning is needed and lamp flashes when manual SCR cleaning is activeted as table below.

Condition	Warning lamp				Remark
	SCR cleaning lamp	DEF Low Lamp	Engine Check Lamp	Engine Stop Lamp	
SCR needs to be cleaned	On	-	-	-	1. Change to a more challenging duty cycle. 2. Perform manual SCR cleaning.
SCR needs to be cleaned immediately	On	-	On	-	Manual SCR cleaning is required.
Stationary SCR cleaning status	Flash	-	-	-	-
DEF level initial warning	-	On	-	-	DEF level 10% Engine error code 3497
DEF level critical warning	-	Flash	-	-	DEF level 5% Engine error code 3498
DEF level initial warning	-	Flash	On	-	DEF level 2.5% Engine error code 1673, 25% derate
DEF level secondary derate warning	-	Flash	On	-	DEF level 0% Engine error code 3547,3714 50% derate, 30 min.
DEF level final derate warning	-	Flash	On	On	Engine error code 3712 Contact Hyundai service center or dealer.

※ Manual SCR cleaning method



※ Manual SCR cleaning applies if the machine is in a fireproof area and there is no plan to turn off the machine during the SCR cleaning.

① Stop and park the machine.

② Pull the safety button and push the switch to position ② to initiate the manual SCR cleaning.

※ Refer to the page 7-31 for the switch operation.

※ The engine speed may increase during SCR cleaning and it will take approximately 20~60 minutes depending on condition.

③ The SCR cleaning lamp flash and HEST warning lamp will light on during the manual SCR cleaning function is operating.

④ The SCR cleaning and/or HEST warning lamp will light OFF when the SCR cleaning function is completed.

3) SCR CLEANING INHIBIT WARNING LAMP

① This warning lamp indicates, when illuminated, the SCR cleaning switch is pushed inhibit position, therefore automatic and manual SCR cleaning can not occur.

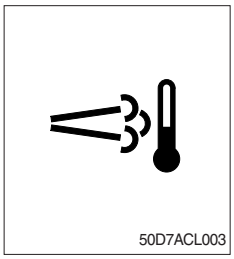
4) DEF (Diesel Exhaust Fluid) LOW WARNING LAMP

① This warning lamp indicates, when illuminated or flashing, that the diesel exhaust fluid level is low.

※ Add the diesel exhaust fluid into DEF tank.

※ Refer to the page 7-28 for detail.

5) HEST (High exhaust system temperature) WARNING LAMP



① This warning lamp indicates, when illuminated, that exhaust temperatures are high due to SCR cleaning.

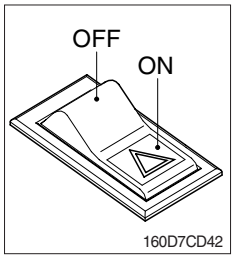
② The lamp will also illuminate during a manual SCR cleaning.

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 800℃ [1500℉], 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 will be common for the lamp to illuminate on and off during normal equipment operation as the engine completes regeneration.

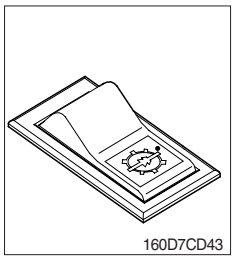
6) HAZARD SWITCH (OPTION)



(1) Use for parking, or loading truck.

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

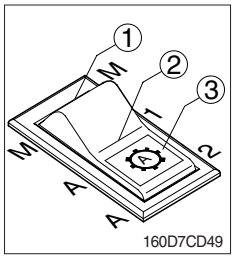
7) INCHING SWITCH



(1) If this switch is pressed, inching operation is applied to inching pedal.

(2) Also, inching lamp on the cluster is illuminated.

8) AUTO/MANUAL CHANGEOVER SWITCH



(1) Manual mode (①)

Press the top of the switch for the manual mode of the autoshift function. The operator selects the desired speed and the desired direction in the manual mode with the gear selector lever.

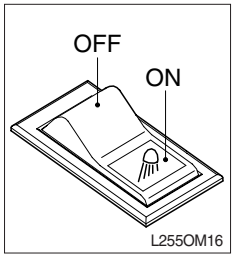
(2) Automatic 1st mode (②)

Place the switch in the middle position for the autoshift function changing from 1st to 3rd gear shift mode.

(3) Automatic 2nd mode (③)

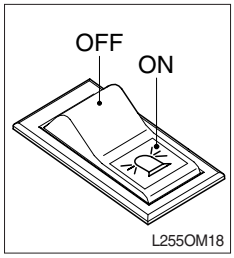
Press the bottom of the switch fully for the autoshift function changing from 2nd to 3rd gear shift mode.

9) WORK LAMP SWITCH



(1) This switch is used to operate the work lamps.
Press this switch to turn on work lamps.

10) BEACON SWITCH (OPTION)



(1) This switch turn ON the strobe light.

11) SCR (Selective Catalytic Reduction) SWITCH

(1) This switch is used to select the cleaning function of the SCR.

(2) Inhibit position (①)

① The inhibit position disallows any automatic or manual SCR cleaning.

② This may be used by operator to prevent SCR cleaning when the machine is operating in a hazardous environment is concerned about high temperature.

③ It is strongly recommended that the this position is only activated when high temperatures may cause a hazardous condition.

(3) OFF position

This position will initate a automatic SCR cleaning when needed.

(4) Manual SCR cleaning position (②)

① This position will only initate a manual SCR cleaning and the SCR cleaning lamp is illuminated.

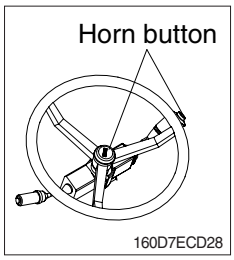
② HEST lamp will be illuminated during the entire SCR cleaning.

※ **Refer to the page 7-29 for details.**

※ **This switch can be move to the manual SCR cleaning position (②) only when the safety button is pulled to backward.**

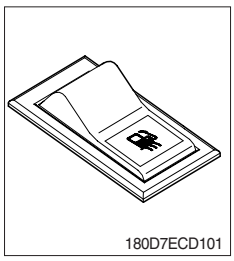
※ **Also, this switch return to the OFF position when released the manual SCR cleaning position (②).**

12) HORN BUTTON



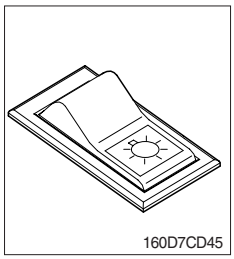
(1) If you press the button on the top of the multifunction switch and the center of the steering wheel, the horn will sound.

13) FUEL HEATER SWITCH



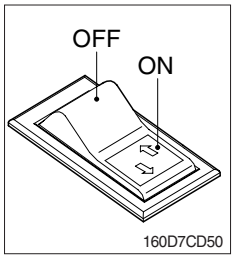
(1) This switch is used for the fuel heater of the pre-heater assy.

14) MAIN LIGHT SWITCH



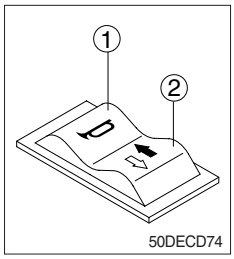
(1) This switch is used to operate the head light by one steps.
① First step : Tail lamp comes ON.
② Second step : Head lamp comes ON.

15) INC/DECREMENT SWITCH



(1) When engine running, the low rpm of engine increase or decrease by 25 rpm by operating this switch.
(2) Engine low rpm returns to normal value when engine restarted.

16) CABIN TILT SWITCH



(1) Horn ( )

By pressing position ①, the horn sounds and by releasing, the horn stops.

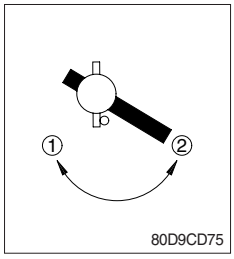
⚠ Sound the horn to warn near by personnel, before tilting the cabin.

(2) Tilting of the cabin (,)

Press the cabin tilt switch (②) in order to tilt the cabin to right side or return to original location.

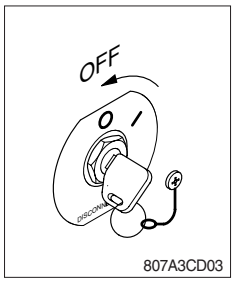
※ **Refer to page 7-18 for the tilting method of the cabin of the operator's manual.**

17) HAND PUMP LEVER



(1) This lever is used when tilting the cabin.
(2) Turn the hand pump lever to clockwise direction (①), the cabin shall be tilted to right side by the cabin tilt switch.
(3) Turn the hand pump lever to counterclockwise direction (②), the cabin shall be returned to original location by the cabin tilt switch.

18) MASTER SWITCH

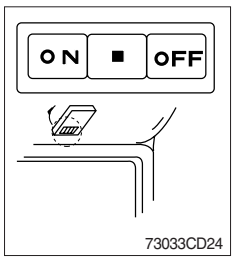


(1) This switch is used to shut off the entire electrical system.
When the machine is not operated for a long time, turn OFF the master switch for the safety purpose.

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

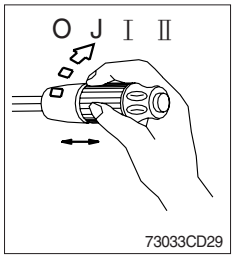
※ **Never turn the master switch to O (OFF) with the engine running. Engine and electrical system damage could result.**

19) CAB LAMP SWITCH



(1) This switch turns ON the cab room lamp.

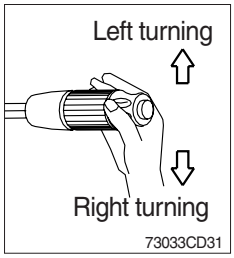
20) MULTI FUNCTION SWITCH



(1) Front wiper and washer 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.
③ 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 the tank is 1 liter.**



(2) Turning switch

① This switch is used to warn or signal the turning direction of the truck to other vehicles or equipment.
② Push the lever up for turning left, pull the lever down for turning right.

GROUP 6 COMPONENT SPECIFICATION

<table>
<tr><th>No</th><th>Part name</th><th>Qty</th><th>Specification</th></tr>
<tr><td>1</td><td>Battery</td><td>2</td><td>12V×72 AH
RC : 130 min
CCA : 630A</td></tr>
<tr><td>2</td><td>Working lamp</td><td>1</td><td>24V, 70W</td></tr>
<tr><td>3</td><td>License lamp</td><td>1</td><td>24V, 10W</td></tr>
<tr><td>4</td><td>Rear Combination lamp</td><td>2</td><td>24V, 21/5W (Turn signal)
24V, 10W (Tail)
24V, 10W (Stop)</td></tr>
<tr><td>5</td><td>Head lamp</td><td>2</td><td>24V, 70W</td></tr>
<tr><td>6</td><td>Flasher lamp</td><td>2</td><td>24V, 25/10W</td></tr>
<tr><td>7</td><td>Room lamp</td><td>1</td><td>24V, 10W</td></tr>
<tr><td>8</td><td>Cluster</td><td>1</td><td>24V, 10W</td></tr>
<tr><td>9</td><td>Rear view camera</td><td>1</td><td>24V, 2.5W</td></tr>
<tr><td>10</td><td>12V socket</td><td>1</td><td>12V, 10A</td></tr>
<tr><td>11</td><td>Cigar lighter</td><td>1</td><td>24V, 5A</td></tr>
<tr><td>12</td><td>Converter</td><td>1</td><td>24V, 10A</td></tr>
<tr><td>13</td><td>Relay (5P)</td><td>14</td><td>24V, 8A</td></tr>
<tr><td>14</td><td>Flasher Unit</td><td>1</td><td>24V, 85±10 CM, (21W + 21W) × 2 + 3W ×2</td></tr>
<tr><td>15</td><td>Back buzzer</td><td>1</td><td>24V, 90±5 dB, 60±10 C/M, 300 mA max.</td></tr>
<tr><td>16</td><td>Warning buzzer</td><td>1</td><td>24V, 200 mA, 90±5 dB (ℓ m)</td></tr>
<tr><td>17</td><td>OPSS buzzer</td><td>1</td><td>24V, 50 mA max. , 80~90 dB</td></tr>
<tr><td>18</td><td>Horn</td><td>1</td><td>24V, 1.5 A, 100 ~ 115 dB</td></tr>
<tr><td>19</td><td>Fuel level sender</td><td>1</td><td>
<table>
<tr><td>Float indicator</td><td>E</td><td>4/8</td><td>F</td></tr>
<tr><td>Resistance (Ω)</td><td>-</td><td>350</td><td>50</td></tr>
<tr><td rowspan="2">Tolerance (Ω)</td><td>+5%</td><td rowspan="2">5%</td><td>+0</td></tr>
<tr><td>-0</td><td>-5%</td></tr>
</table>
</td></tr>
<tr><td>20</td><td>Warning lamp</td><td>3</td><td>24V</td></tr>
<tr><td>21</td><td>Master switch</td><td>1</td><td>24V, 180A</td></tr>
<tr><td>22</td><td>Work lamp switch</td><td>1</td><td>24V, 8A</td></tr>
<tr><td>23</td><td>Hazard switch</td><td>1</td><td>24V, 8A</td></tr>
<tr><td>24</td><td>Beacon switch</td><td>1</td><td>24V, 8A</td></tr>
<tr><td>25</td><td>Start switch</td><td>1</td><td>24V, 60A</td></tr>
<tr><td>26</td><td>Start relay</td><td>1</td><td>24V, 300A</td></tr>
<tr><td>27</td><td>Tilt switch (cabin)</td><td>1</td><td>24V, 8A</td></tr>
<tr><td>28</td><td>Monitor</td><td>1</td><td>24V, 15W</td></tr>
<tr><td>29</td><td>Auto/Manual switch</td><td>1</td><td>24V, 8A</td></tr>
<tr><td>30</td><td>Clutch cut-off switch</td><td>1</td><td>24V, 8A</td></tr>
<tr><td>31</td><td>Main light switch</td><td>1</td><td>24V, 8A</td></tr>
<tr><td>32</td><td>Intermittent wiper relay</td><td>1</td><td>24V, 5A</td></tr>
<tr><td>33</td><td>OPSS unit</td><td>1</td><td>24V</td></tr>
</table>

No	Part name	Qty	Specification
34	Increase/Decrease switch	1	24V, 8A
35	Fuel warmer switch	1	24V, 8A
36	Inching switch	1	24V, 8A
37	SCR switch	1	24V, 8A
38	Beacon lamp	1	24V

GROUP 7 CONNECTOR DESTINATION

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-1	AMP	15	I/conn (Console harness-frame harness)	2-85262-1	368301-1
CN-2	AMP	12	I/conn (Frame harness-console harness)	174661-2	174663-2
CN-3	KET	1	I/conn (Frame harness-console harness)	MG640944-5	MG650943-5
CN-4	KET	1	Start cable	-	MG650943-5
CN-6	TYCO	15	I/conn (Console harness-frame harness)	2-85262-1	368301-1
CN-7	TYCO	4	Fuel filter heater	2-967325-3	-
CN-8	AMP	8	DPF harness	174982-2	-
		8	Transmission display	929504-3	-
CN-9	AMP	4	Harness monitor (CAN)	174257-2	-
CN-10	AMP	8	I/conn (Console harness-T/M harness)	174982-2	S816-108002
CN-11	AMP	15	I/conn (Console harness-T/M harness)	368047-1	S816-116002
CN-12	AMP	12	I/conn (Frame harness-console harness)	174661-2	174663-2
CN-13	MOLEX	12	I/conn (Frame harness-injector harness)	33472-1206	-
CN-16	AMP	3	Monitor power	174357-2	S816-103002
CN-17	TYCO/AMP	12	I/conn (Cabin harness-console harness)	174661-2	174663-2
CN-19	KET	2	Output check	MG610320	-
CN-20	KET	4	Aircon harness (Cabin)	MG641744-5	-
	AMP	6	Diagnostic	480704-0	-
CN-21	AMP	6	Wiper motor (Cabin)	936257-2	-
CN-22	KET	2	Washer tank (Cabin)	MG640605	-
CN-23	KET	2	LH speaker (Cabin)	MG610070	-
CN-24	KET	2	RH speaker (Cabin)	MG610070	-
CN-25	MOLEX	2	Horn	35825-0211	-
CN-26	KET	1	Tilt alarm	ST730018-3	ST750836-3
CN-27	KUM	16	CD/MP3 radio (Cabin)	PK145-16017	-
CN-36	-	-	Fuse box	21HF-10500	-
CN-37	-	-	Fuse box	21HF-10500	-
CN-45	KET	1	Start motor	S820-205000	-
CN-50	AMP	68	Transmission control unit	963598-1	-
CN-51	AMP	6	Diagnostic	-	926682-3
CN-54	AMP	36	Load indicator control unit	344111-1	-
CN-55	KET	14	OPSS unit	MG610350	-
CN-56	AMP	20	Cluster	174047-2	-
CN-57	AMP	20	Cluster	175967-2	-
CN-65	KET	1	Back buzzer	ST730018-3	-
CN-71	DEUTSCH	6	Seat switch	DT06-6S	-
CN-74	KET	1	Alternator	S820-105000	-
CN-95	KET	2	Fusible link	-	MG620558

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-98	DEUTSCH	3	Resistor	DT06-3S-EP06	-
CN-101	FRAMATOME	4	ENG TBAP	54200415	-
CN-113	KET	2	OPSS buzzer	MG610320	-
CN-124	AMP	6	Accelerator pedal	174262-2	-
CN-129	KET	2	12V socket	MG610043	-
CN-131	DEUTSCH	2	Attach cut solenoid	DT06-2S	-
CN-134	DEUTSCH	9	ECU service port	-	HD10-9-19399
CN-138	KET	3	Converter	MG610045	-
CN-147	KET	2	Cabin tilting pump motor	MG640188-4	-
CN-151	DELPHI	96	ECU J2	13964577	-
CN-169	DEUTSCH	4	RS232C	DT06-4S-EP06	DT04-4P-E005
CN-J1	FIC	24	ECU J1	F934000	-
CN-J6	DEUTSCH	4	DEF quality sensor	DT06-4S	-
CN-J7A	AMP	4	NOX sensor (Gray)	2-1418390-1	-
CN-J7B	AMP	4	NOX sensor	1-1418390-1	-
CN-J10	AMP	4	SCR thermo control	3-1418390-1	-
CN-J26	AMP	12	DEF supply module	2-1703639-1	-
CN-J27	AMP	4	DEF tank heater valve	1-967325-1	-
CN-J28	DEUTSCH	2	DEF pressure line	DT06-2S	-
CN-J29	DEUTSCH	2	DEF backflow line	DT06-2S	-
CN-J30	DEUTSCH	2	DEF suction line	DT06-2S	-
CN-J31	BOSCH	2	DEF dosing module	1928403874	-
Switch					
CS-2	KET	2	Start switch	MG610281	MG620282
CS-5	KET	2	Horn switch	MG640322	-
CS-5A	KET	2	Horn switch	MG610320	-
CS-5B	KET	1	Horn switch	S820-10500	-
CS-6	KET	1	Multi function switch	ST730018-3	-
CS-10	DAEDONG	10	Fuel warmer switch	250-10PRG	-
CS-11	KET	6	Combination switch	MG610335	-
CS-12	KET	8	Combination switch	MG610339	-
CS-14	PACKARD	4	Gear selector switch	-	12010974
CS-15	PACKARD	4	Gear selector switch	12015797	-
CS-17	KET	3	Parking brake switch	MG610045	-
CS-23	DAEDONG	10	Beacon switch	250-10PRG	-
CS-39	DAEDONG	10	Main light switch	250-10PRG	-
CS-41	DAEDONG	10	Hazard switch	250-10PRG	-
CS-42	DAEDONG	10	Inching switch	250-10PRG	-
CS-59	DAEDONG	10	Auto/Manual switch	250-10PRG	-
CS-64	DAEDONG	10	Increase/Decrease switch	250-10PRG	-

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CS-69	DAEDONG	10	Rear work switch	250-10PRG	-
CS-72	DEUTSCH	4	Tilt alarm switch	DT06-4S	DT04-4P
CS-74	DEUTSCH	4	Cabin tilting supply switch	DT06-4S	DT04-4P
CS-77	SWF	10	Cabin tilting switch	593757	
CS-100	SWF	12	SCR switch	589790	-
Lamp					
CL-2	KET	1	Cigar light	ST730018-3	ST750036-3
	AMP	1	Cigar light	172128-1	-
CL-7	KET	2	Beacon lamp	-	DT04-2P
CL-15A	AMP	3	ILLUM/Stop lamp (Black)	282087-1	-
CL-15B	DAEDONG	3	Turn/back up lamp	282087-2	-
CL-16A	AMP	3	ILLUM/Stop lamp (Black)	282087-1	-
CL-16B	AMP	3	Turn/back up lamp (Gray)	282087-2	-
CL-21	KET	1	License lamp	ST730018-3	ST750036-3
CL-23	KET	1	Rear work lamp	S822-014000	S822-114000
CL-24	DEUTSCH	6	Work lamp-LH	DT06-6S	-
CL-25	DEUTSCH	6	Work lamp-RH	DT06-6S	-
CL-40	SWF	2	Engine stop lamp	913328	-
CL-41	SWF	2	HEST lamp	913328	-
CL-42	SWF	2	SCR cleaning lamp	913328	-
CL-43	SWF	2	SCR cleaning inhibit lamp	913328	-
CL-50	SWF	2	DEF low lamp	913328	-
CL-51	KET	2	Room lamp (Cabin)	MG610392	-
Relay					
CR-4	KET	5	Wiper relay (Cabin)	MG640927	-
CR-5	KET	5	Neutral relay	MG640927	-
CR-6	KET	4	Intermittent wiper relay (Cabin)	MG610047	-
CR-11	-	3	Flasher unit relay	312-GIHUNG	-
CR-23	KET	4	Start relay	172134-1	-
CR-24	KET	1	Pre-heater relay	ST730018-3	-
CR-26	KET	5	Wiper pump relay (Cabin)	MG640927	-
CR-34	KET	5	Parking relay	MG640927	-
CR-35	KET	5	Back up relay	MG640927	-
CR-36	KET	5	Start lock relay	MG640927	-
CR-39	KET	5	Wiper high relay	MG640927	-
CR-44	AMP	2	Cabin tilting relay	174352-2	-
CR-45	KET	5	Glow aux relay	MG640927	-
CR-50	KET	5	Tilt/Lift cut-off relay	MG640927	-
CR-58	KET	5	DEF supply module relay	MG640927	-
CR-59	KET	5	DEF & sensor relay	MG640927	-

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CR-61	KET	5	DEF line heater-1 relay	MG640927	-
CR-62	KET	5	DEF line heater-2 relay	MG640927	-
CR-63	KET	5	DEF line heater-3 relay	MG640927	-
Sensor and pressure switch					
CD-2	KET	3	Fuel sendor	MG610045	-
CD-3	DEUTSCH	2	Brake fail pressure	-	DT04-2P
CD-4	AMP	1	Stop lamp switch	171809-2	-
CD-27	AMP	2	Turbin speed input	963040-3	-
CD-38	DEUTSCH	2	Water in fuel switch	DT06-2S	-
CD-71	AMP	6	Inching sensor	1-967616-1	-
CD-72	AMP	2	Gear train speed sensor	963040-3	-
CD-73	AMP	3	Output speed sensor	282087	-
CD-80	PACKARD	2	KV Solenoid	12162197	-
CD-81	PACKARD	2	KR Solenoid	12162197	-
CD-82	PACKARD	2	KD Solenoid	12162197	-
CD-83	PACKARD	2	KE Solenoid	12162197	-
CD-84	PACKARD	2	KC Solenoid	12162197	-
CD-90	AMP	2	Temp sensor	963040-3	-
CD-J22	DELPHI	3	Coolant level	12110293	-
DO-01	-	2	Diode	21EA-50550	-

Trouble symptom	Probable cause	Remedy
Lamps dimming even at maximum engine speed.	· Faulty wiring.	· Check for loose terminal and disconnected wire.
Lamps flicker during engine operation.	· Improper belt tension.	· Adjust belt tension.
Charge lamp does not light during normal engine operation.	· Charge lamp defective. · Faulty wiring.	· Replace. · Check and repair.
Alternator makes abnormal sounds.	· Alternator defective.	· Replace.
Starting motor fails to run.	· Faulty wiring. · Insufficient battery voltage.	· Check and repair. · Recharge battery.
Starting motor pinion repeats going in and out.	· Insufficient battery voltage.	· Recharge battery.
Excessively low starting motor speed.	· Insufficient battery voltage. · Starting motor defective.	· Recharge battery. · Replace
Starting motor comes to a stop before engine starts up.	· Faulty wiring. · Insufficient battery voltage.	· Recharge battery. · Replace
Heater signal does not become red.	· Faulty wiring. · Glow plug damaged.	· Check and repair. · Replace
Engine oil pressure caution lamp does not light when enigne is stopped (with starting switch left in "ON" position).	· Caution lamp defective. · Caution lamp switch defective.	· Replace · Replace