GROUP 2 MONITORING SYSTEM

1. OUTLINE

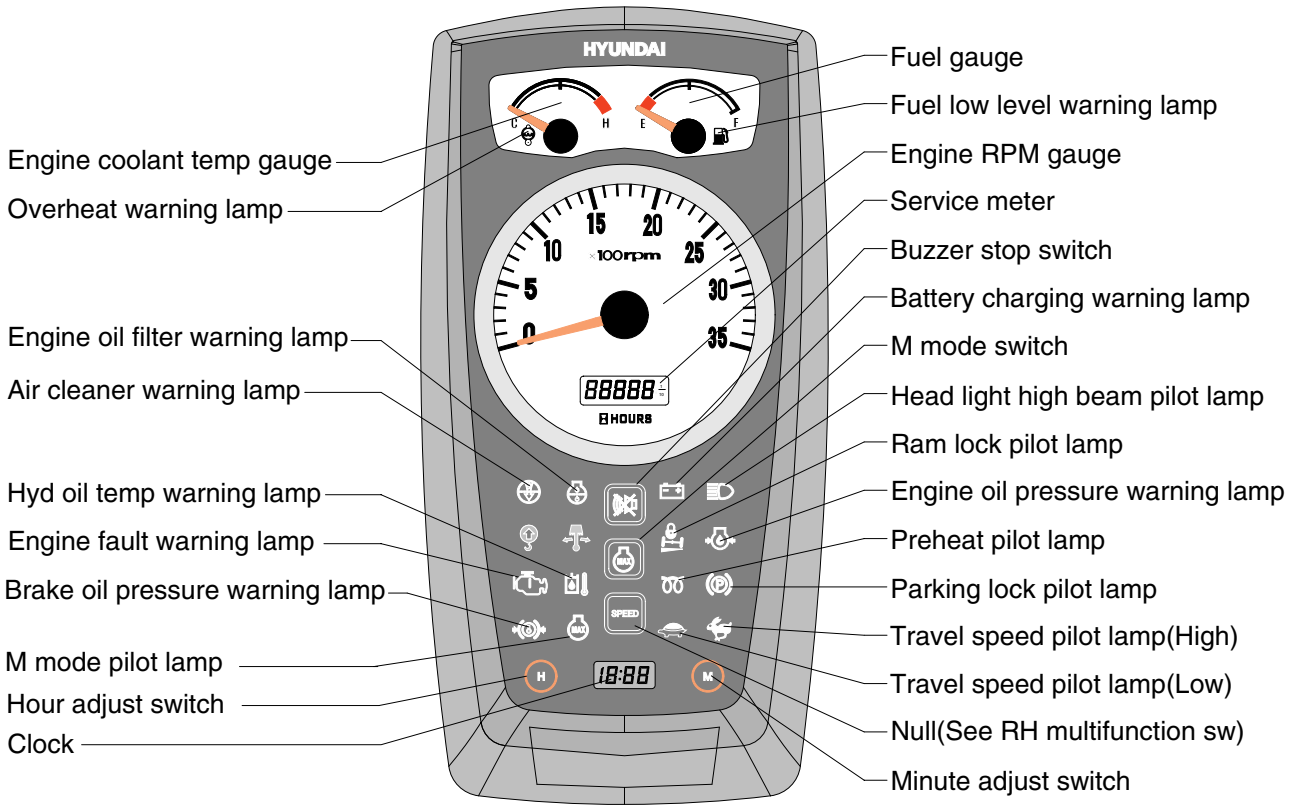
Monitoring system consists of the monitor part and switch part.

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



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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.

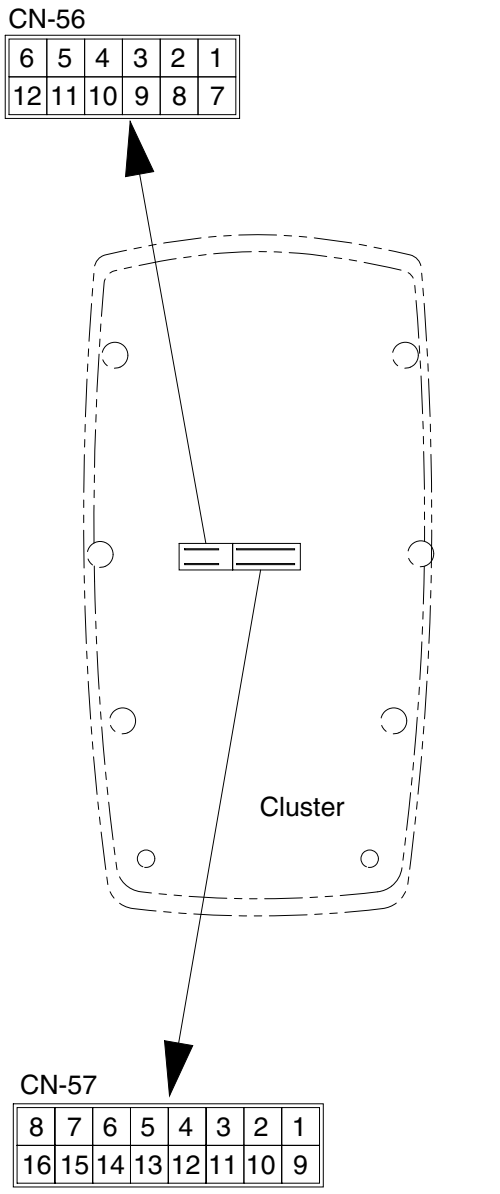
3. CLUSTER CONNECTOR

1) CN-56 CONNECTOR

No.	Signal	Input/ Output
1	Power IG 12V	-
2	Power 12V	-
3	Fuel level sender	Input
4	Water temp sender	Input
5	Tacho signal	Input
6	GND	-
7	GND	-
8	GND(sensor)	-
9	Travel relay	Output
10	Pre-heat signal	Output
11	M mode	Output
12	Crawler / Wheel	-

2) CN-57 CONNECTOR

No.	Signal	Input/ Output
1	Air cleaner signal	Input
2	Hyd oil temp sendor	Input
3	Engine oil pressure switch	Input
4	Alternator level	Input
5	High beam signal	-
6	Engine fault	-
7	Engine oil filter	-
8	Over load switch	-
9	Brake fail pressure switch	-
10	Boom swing signal	-
11	Travel signal	-
12	Parking signal	-
13	RAM lock signal	-
14	Illumination	Input
15	Neutral signal	-
16	Over heat signal	-



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4. CLUSTER FUNCTION

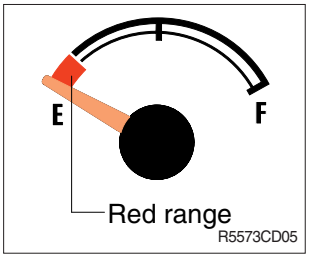
1) GAUGES AND DISPLAYS

(1) Service meter

① This meter shows the total operation hours of the machine.

② Always ensure the operating condition of the meter during the machine operation.
Inspect and service the machine based on hours as indicated in chapter 6, **maintenance**.

(2) Fuel gauge

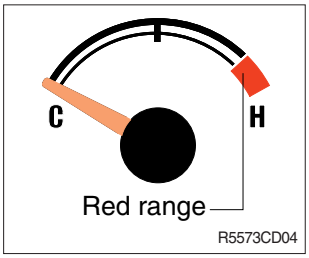


① This gauge indicates the amount of fuel in the fuel tank.

② Fill the fuel when the red range or warning lamp ON.

※ **If the gauge indicates 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

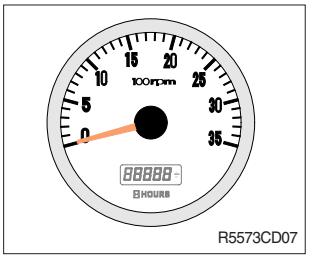


① This indicates the temperature of coolant.
· Red range : Above 105°C(221°F)

② When the red range pointed or warning lamp ON, 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.

(5) Clock

① This displays the current time.

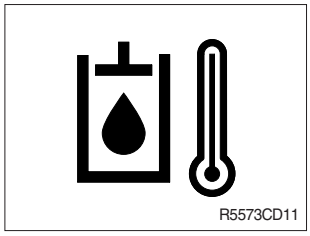
② Refer to the hour/minute adjust switch for adjusting time.

2) WARNING AND PILOT LAMPS

(1) Fuel low level warning lamp

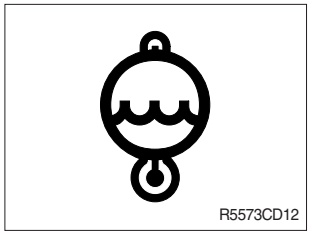
① This lamp blinks and the buzzer sounds when the level of fuel is below 13 ℓ (3.4U.S. gal).
② Fill the fuel immediately when the lamp blinks.

(2) Hydraulic oil temperature warning lamp



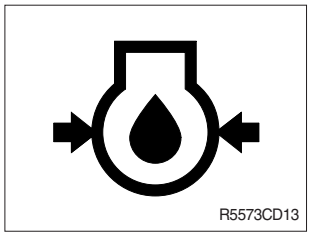
① This warning lamp operates and the buzzer sounds when the temperature of hydraulic oil is over 105 ℃(221 ℉) .
② Check the hydraulic oil level when the lamp blinks.
③ Check for debris between oil cooler and radiator.

(3) Overheat warning lamp



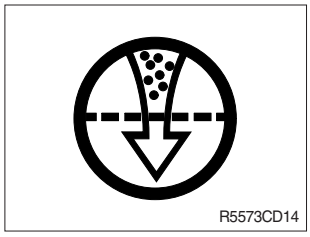
① This lamp blinks and the buzzer sounds when the temperature of coolant is over the normal temperature 110℃(230℉) .
② Check the cooling system when the lamp blinks.

(4) Engine oil pressure warning lamp



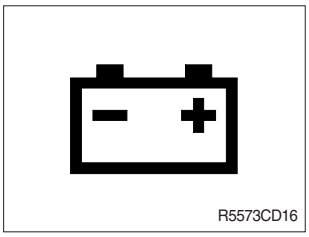
① This lamp blinks and the buzzer sounds after starting the engine because of the low oil pressure.
② If the lamp blinks during engine operation, shut OFF engine immediately. Check oil level.

(5) Air cleaner warning lamp



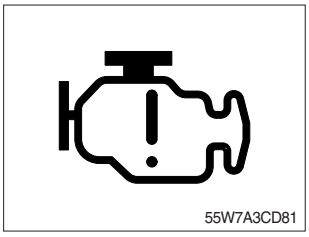
① This lamp blinks and the buzzer sounds when the filter of air cleaner is clogged.
② Check the filter and clean or replace it.

(6) Battery charging warning lamp



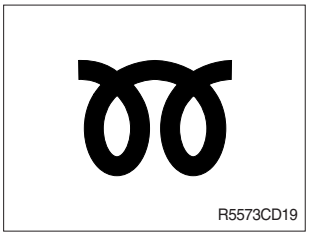
① This lamp blinks and the buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.
② Check the battery charging circuit when this lamp blinks during engine operation.

(7) Engine fault warning lamp



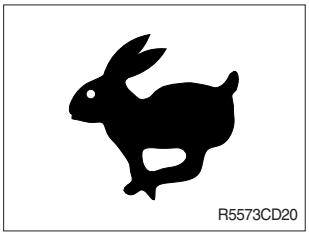
① This lamp is ON and the buzzer sounds when the ECM on the engine is abnormal.
② Check the ECM of the engine.
※ **Check the fault code by the Yanmar Engine Diagnostic Service Tool(YEDST).**
Refer to our web(CERES) for ECM(Electronic control manual) of TNV Engine.

(8) Preheat pilot lamp



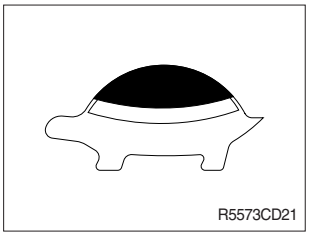
① When engine preheating switch is turned ON, pilot lamp cames ON.
② Refer to the preheating switch for details.

(9) Travel speed pilot lamp(High)



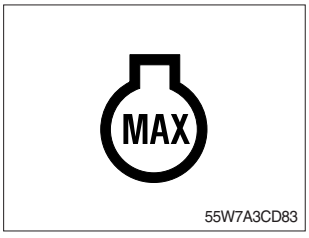
① When this lamp turned ON, the machine travel high speed.
② Refer to the travel speed select switch for details.

(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.

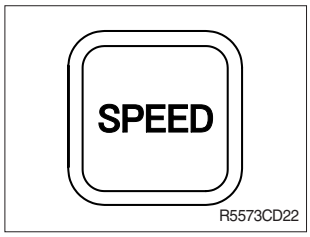
(11) M mode pilot lamp



① This lamp is ON when the M mode switch is pressed.

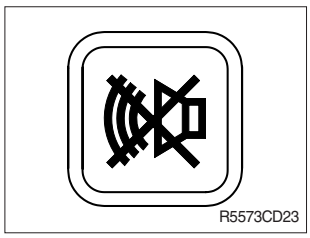
3) SWITCHES

(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) Buzzer stop switch

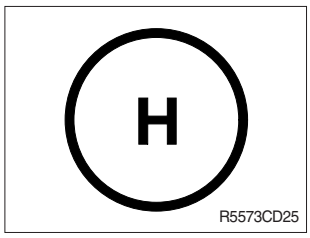


① When the starting switch is turned ON first, normally the alarm buzzer sounds for 6 seconds during lamp check operation.
② The red lamp lights ON and the buzzer sounds when the machine has a problem.
In this case, press this switch and buzzer stops, but the red lamp lights until the problem is cleared.

(3) M mode switch

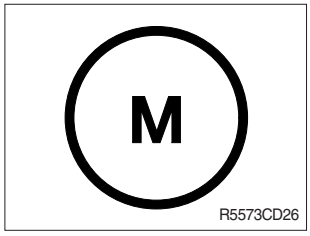
① This switch is used to maximum power.
② When this switch is pressed, the M mode pilot lamp is ON.

(4) Hour adjust switch



① This switch is used to adjust hour.
② The switch is pressed, hour is increased.

(5) Minute adjust switch



① This switch is used to adjust minute.
② The switch is pressed, minute is increased.

MEMORANDUM


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

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)]

- → Fuse box [No.1] → Start switch[CS-2(1)]
- → Fuse box [No.2]
  - → Cassette radio[CN-27(11)]
  - → I/conn[CN-6(3)] → Room lamp[CL-1(2)]
  - → I/conn[CN-5(1)] → I/conn[CN-7(5)] → 12V socket[CN-139(2)]
- → Fuse box [No.3] → Cluster[CN-56(2)]
- → Fuse box [No.4]
  - → ECU IG power[CR-45(30)]
  - → ECU main power[CR-68(1)]

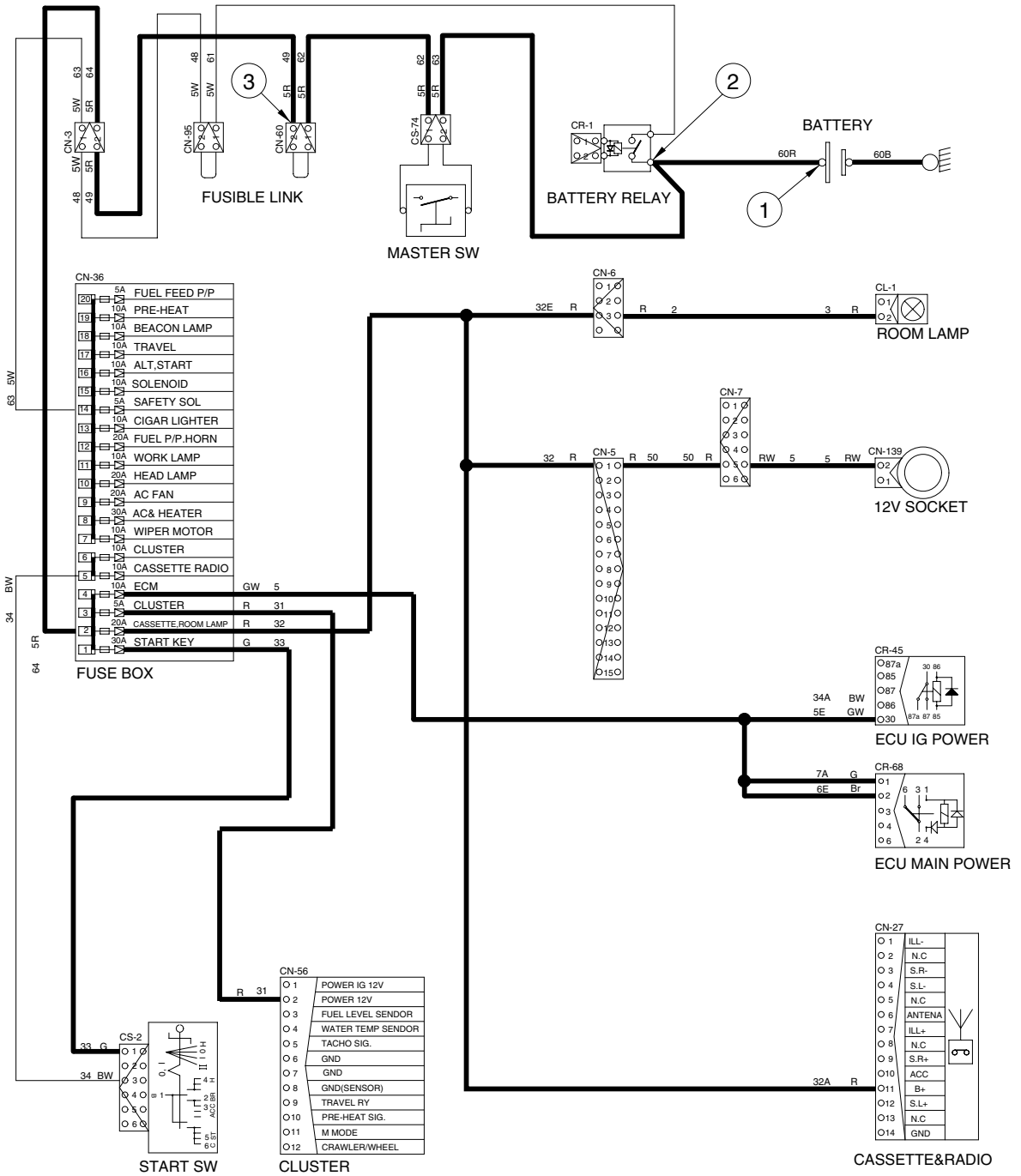
※ I/conn : Intermediate connector

2) CHECK POINT

Engine	Start switch	Check point	Voltage
OFF	OFF	① - GND (Battery) ② - GND (Battery) ③ - GND (Fusible link)	10~12.5V

※ GND : Ground

POWER CIRCUIT



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2. STARTING CIRCUIT

1) OPERATING FLOW

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

※ Start switch : ON

- Start switch ON [CS-2(1)] → I/conn [CN-2(1)] →
  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

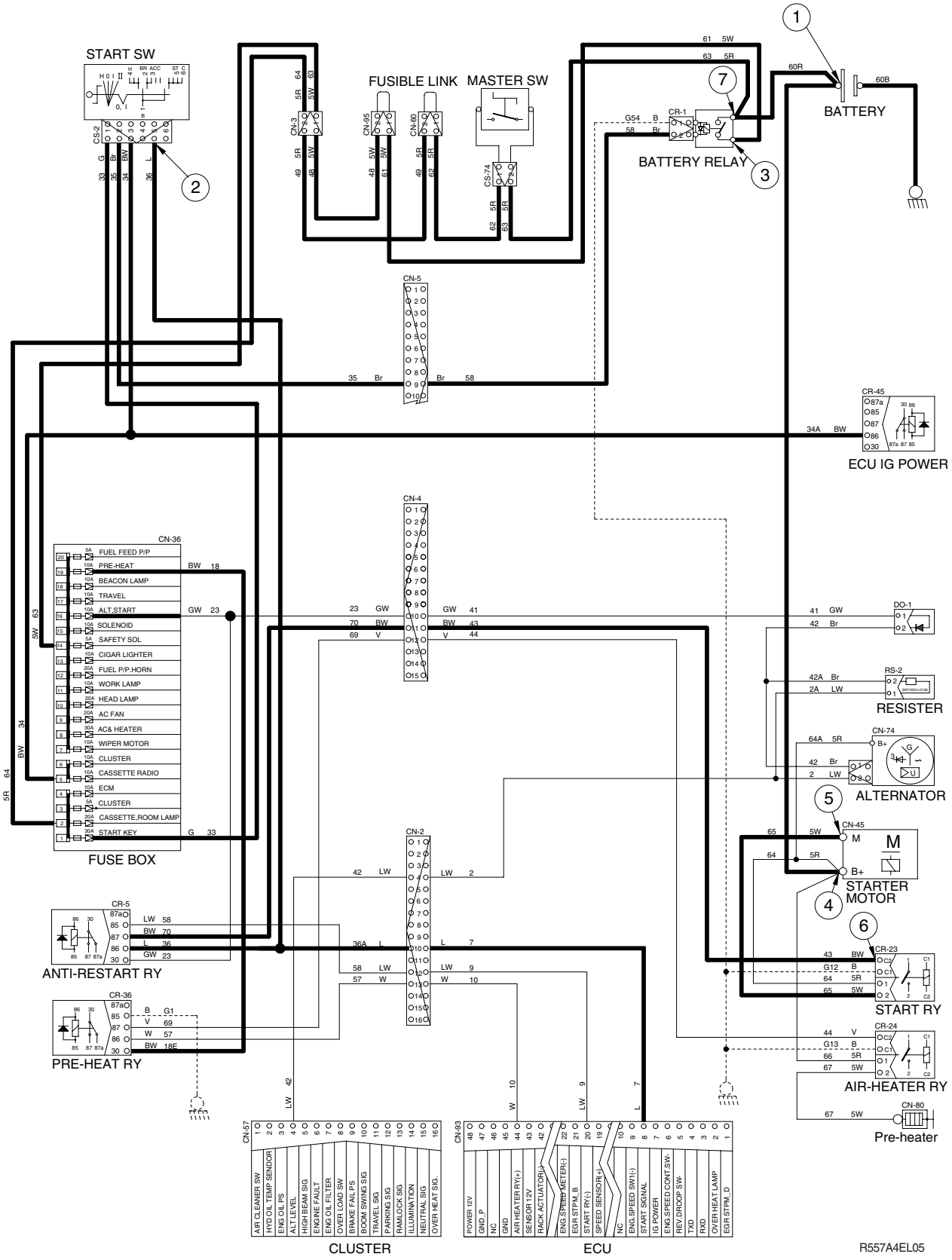
Start switch START [CS-2(5)]
- → Anti-restart relay [CR-5(86) → (87)] → I/conn [CN-4(11)]
  → Start relay [CR-23(C2) → (2)] → Starter motor operating
- → I/conn [CN-2(10)] → ECU[CN-93(8)]

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



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-2(4)] → Cluster [CN-57(4)] → Cluster warning lamp

(2) Charging flow

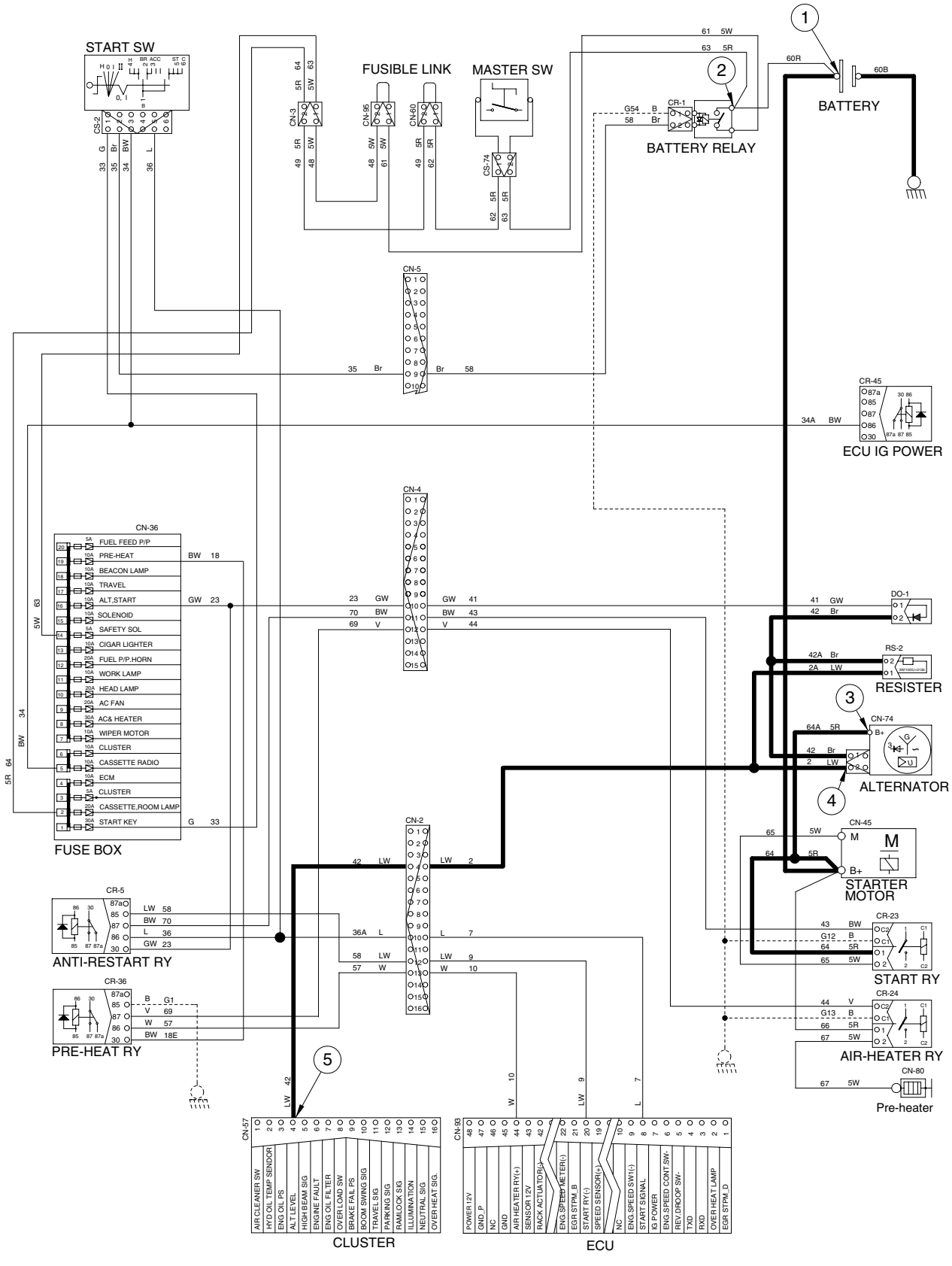
Alternator "B^+" terminal → Battery relay → Battery(+) terminal

2) CHECK POINT

Engine	Start switch	Check point	Voltage
ON	ON	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



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4. HEAD AND WORK LIGHT CIRCUIT

1) OPERATING FLOW

Fuse box (No.10) → Light switch[CS-21(1)] → Head lamp[CR-13(30)]
Fuse box (No.11) → Light switch[CS-21(4)] → Work lamp[CR-3(30)]

(1) Main light switch ON

Head light switch ON [CS-21(5)] → Head lamp[CR-13(86) → (87)] → I/conn[CN-4(2)]
→ Head lamp ON [CL-3, 4(2)]

(2) Main light switch ON

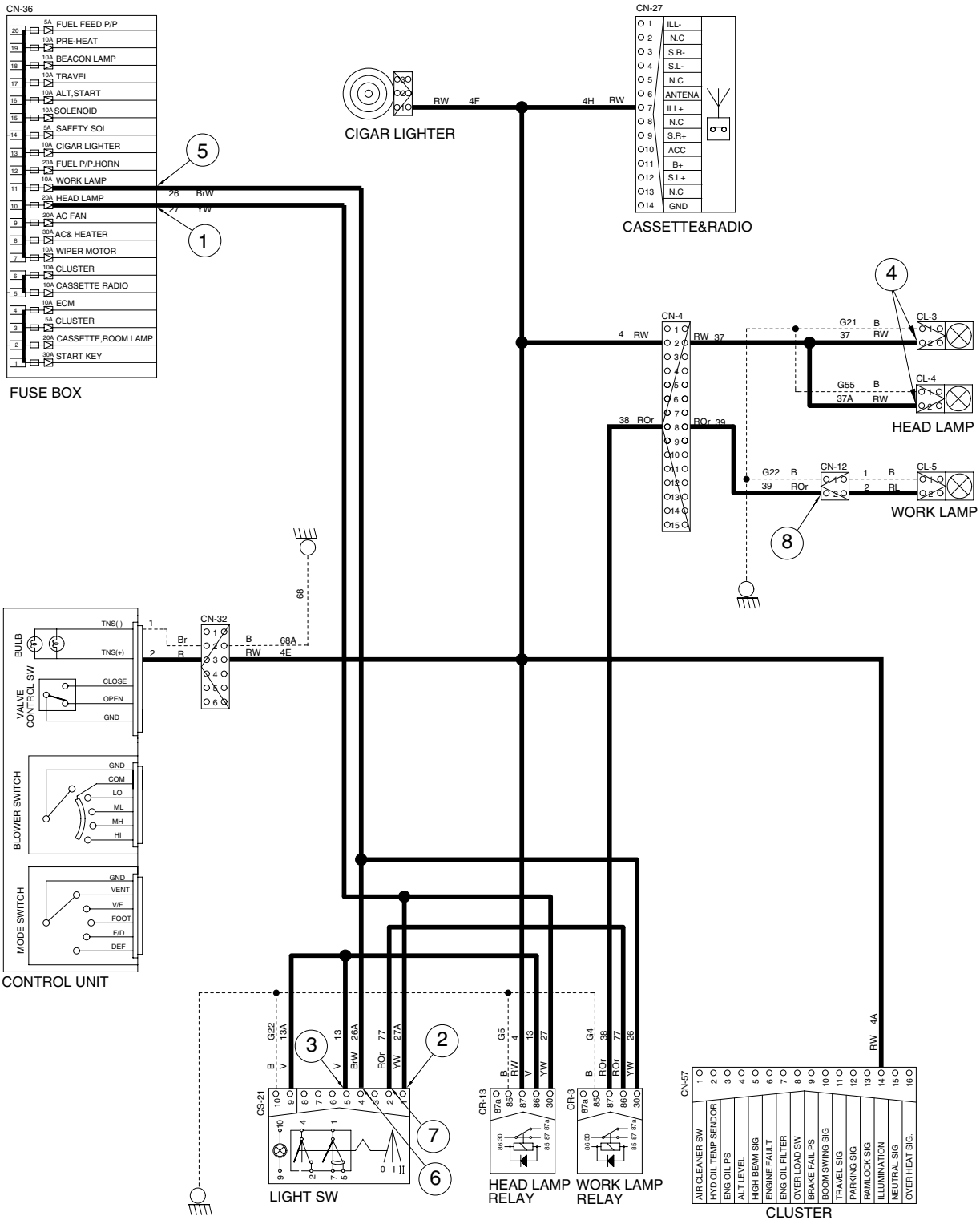
Work light switch ON [CS-21(2)] → Work lamp[CR-3(86) → (87)] → I/conn[CN-4(8)]
→ I/conn[CN-12(2)] → Work lamp ON [CL-5(2)]

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



R557A4EL07

5. BEACON LAMP CIRCUIT

1) OPERATING FLOW

Fuse box (No.18) → Beacon lamp switch[CS-23(5)]

(1) Beacon lamp switch ON

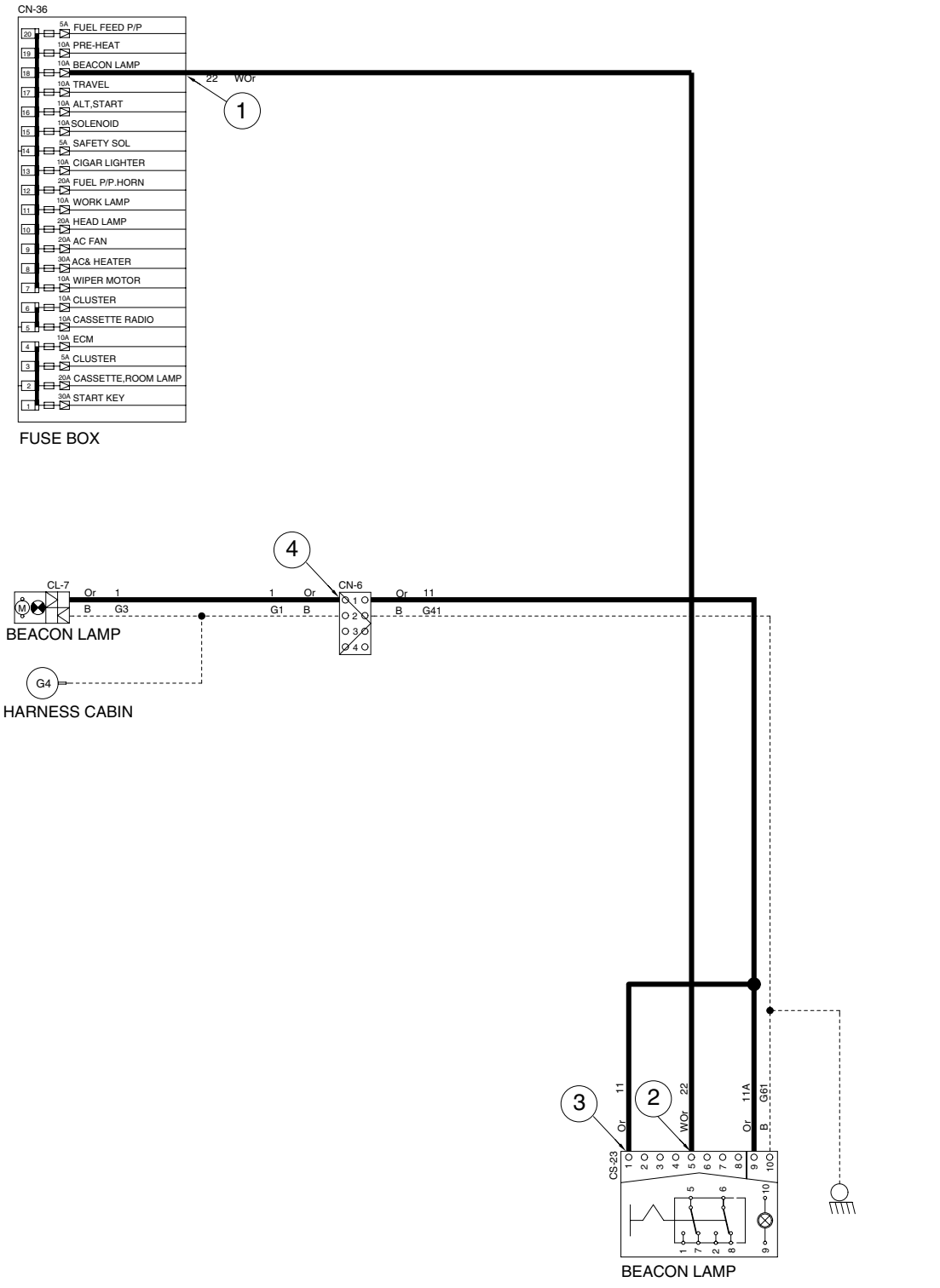
Beacon lamp switch ON [CS-23(1)] → Switch Indicator lamp ON [CS-23(9)
→ I/conn[CN-6(1) → Beacon lamp ON [CL-7]

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 lamp)	10~12.5V

※ GND : Ground

BEACON LAMP CIRCUIT



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6. WIPER AND WASHER CIRCUIT

1) OPERATING FLOW

(1) Key switch ON

Fuse box (No.7) → Wiper relay [CR-4(86)]
→ Int wiper relay [CR-6(4)]
→ Wiper switch [CS-3(10)]
→ Wiper motor [CN-21(3)]
→ I/conn [CN-5(4)] → Washer pump[CN-22(2)]

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

Wiper switch ON [CS-3(6)] → Int wiper relay [CR-6(6)→(3)] → Wiper relay[CR-4(85)→(30)] → Washer motor operating[CN-21(4)]

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

Wiper switch ON [CS-3(5)→(2)] → Int wiper relay[CR-6(1)] → Washer switch[CS-30(1)]
→ Wiper relay[CR-4((85)→(30)]
→ Wiper motor operating[CN-21(1)]

Washer switch ON [CS-30(1)] → I/conn[CN-5(3)] → Washer pump operating[CN-22(1)]

(4) Auto parking(When switch OFF)

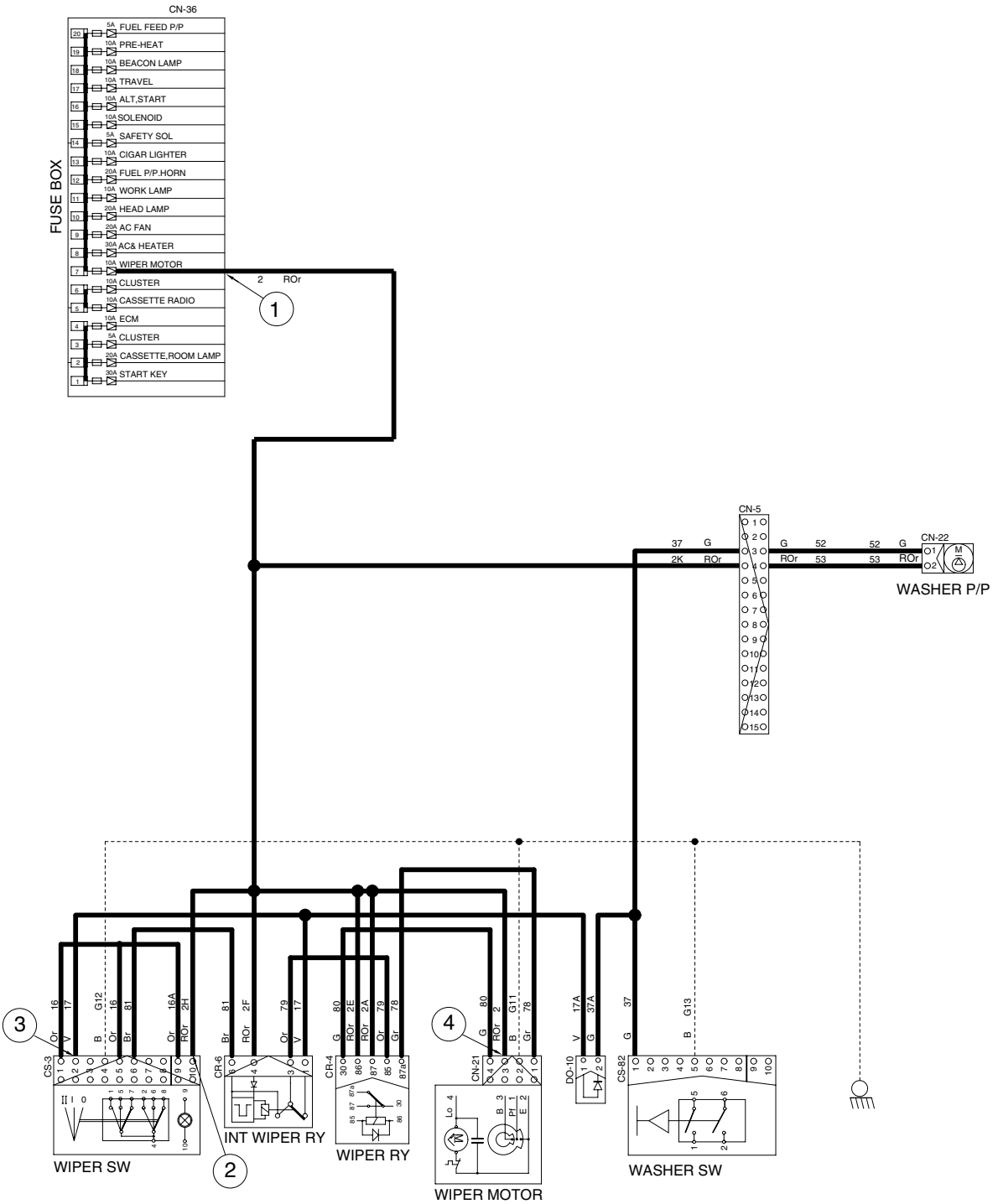
Switch OFF → Wiper motor[CN-21(1)] → Wiper switch[CS-3(2)→(6)] → Int wiper relay[CR-6(63)→(3)]
→ Wiper relay[CR-4(85)→(30)] → Wiper motor[CN-21(4)]
→ Wiper motor parking position by wiper motor controller

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



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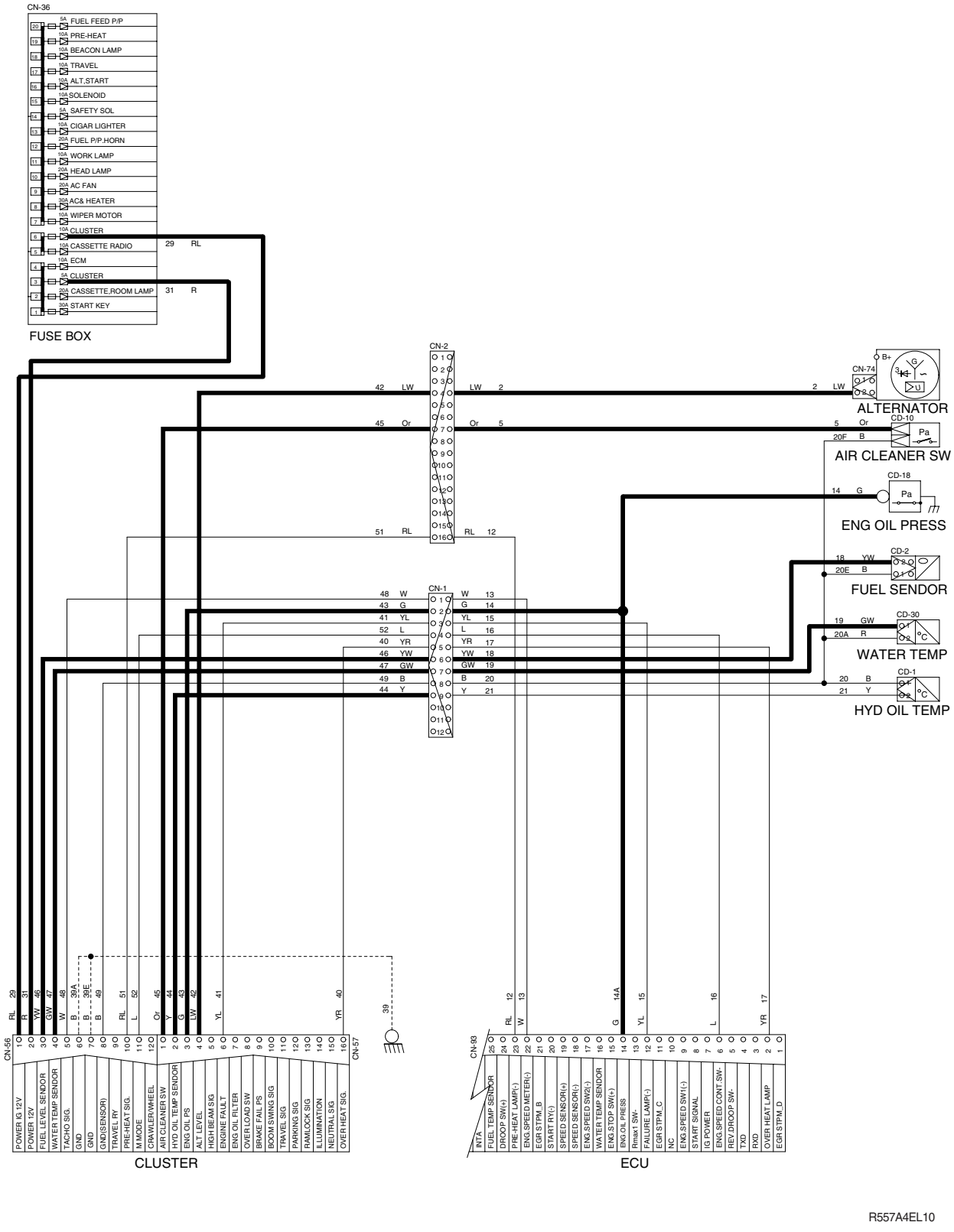
MONITORING CIRCUIT



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ELECTRIC CIRCUIT FOR HYDRAULIC