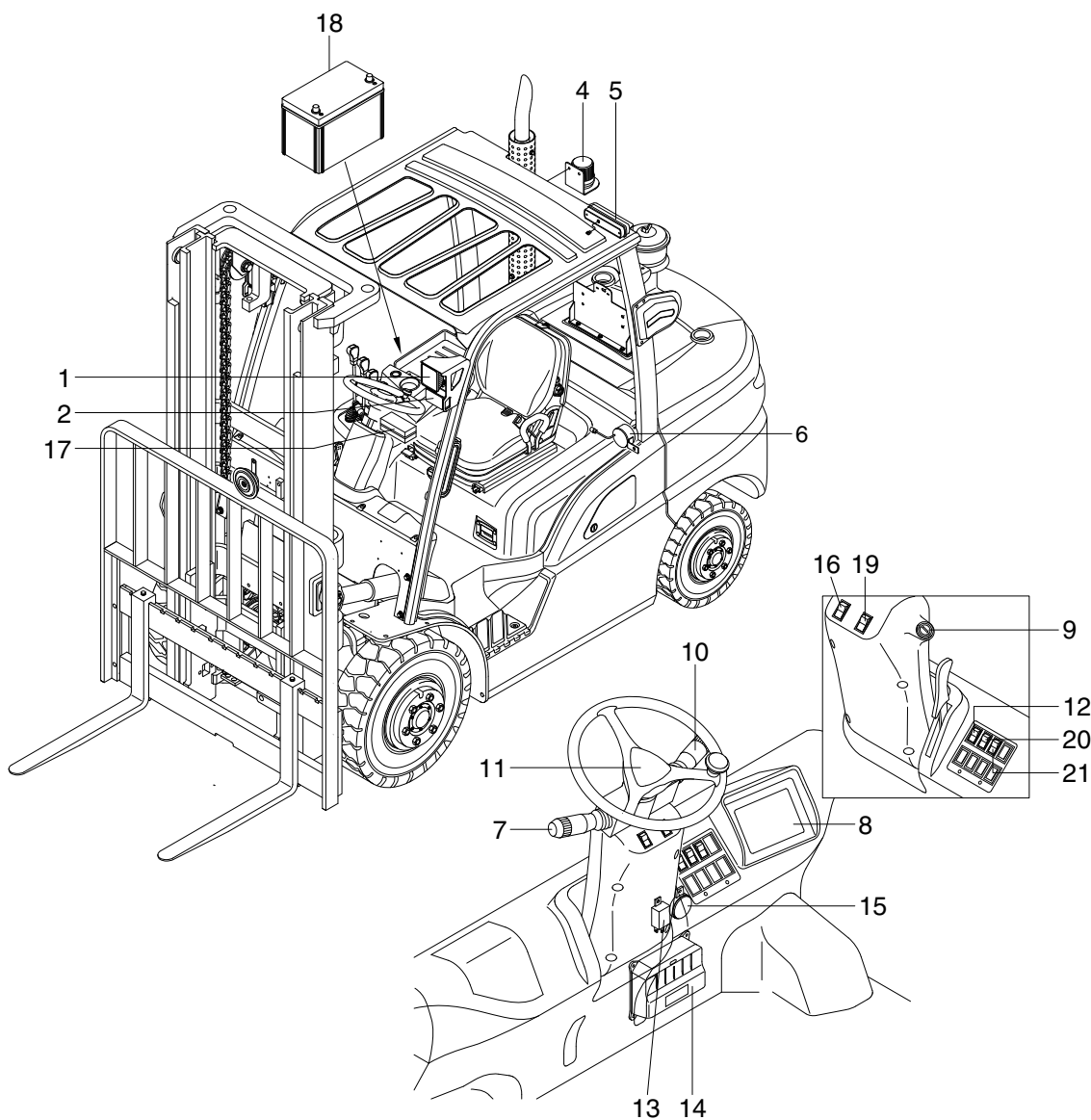


SECTION 7 ELECTRICAL SYSTEM

Group 1	Component location	7-1
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SECTION 7 ELECTRICAL SYSTEM

GROUP 1 COMPONENT LOCATION

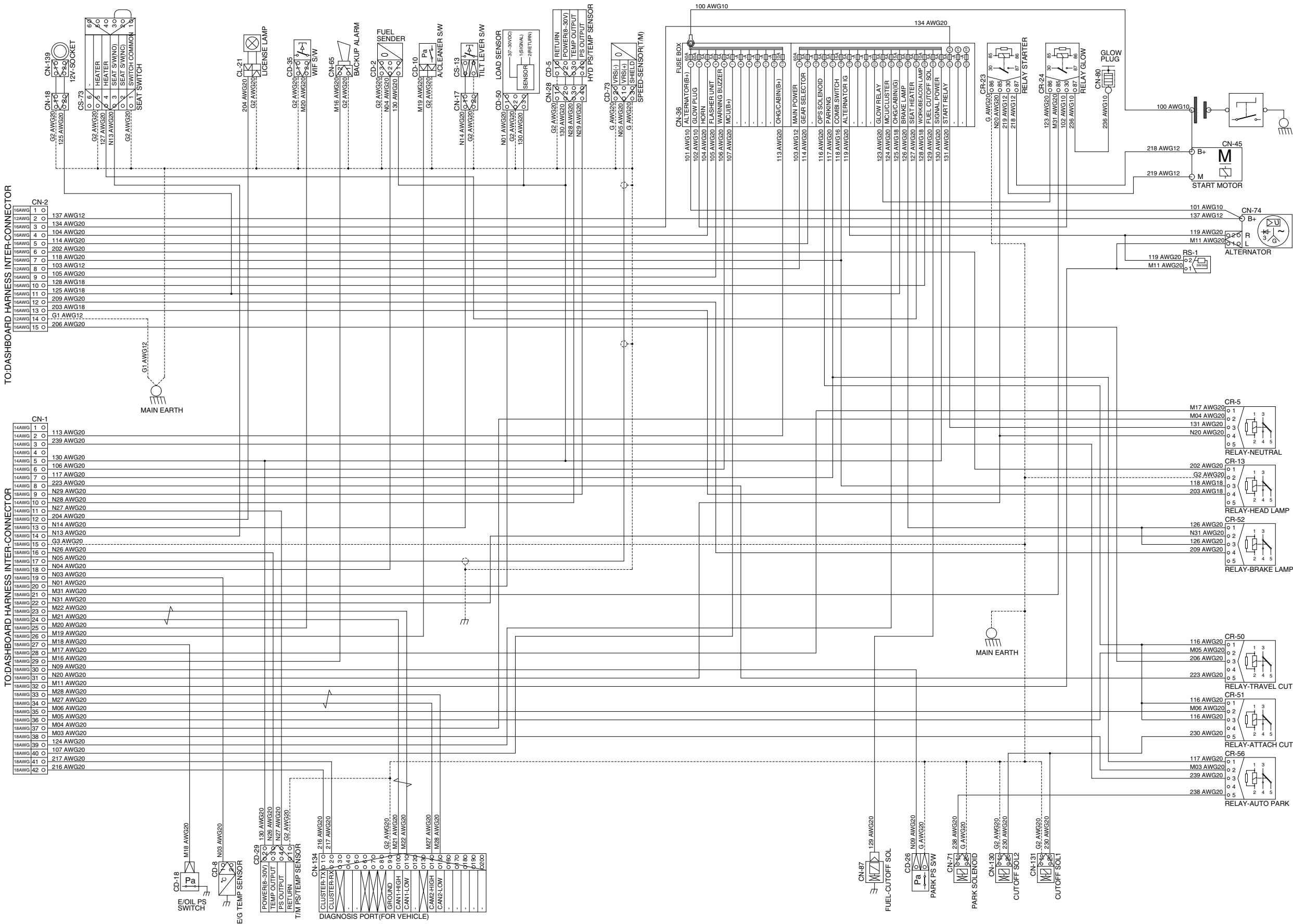


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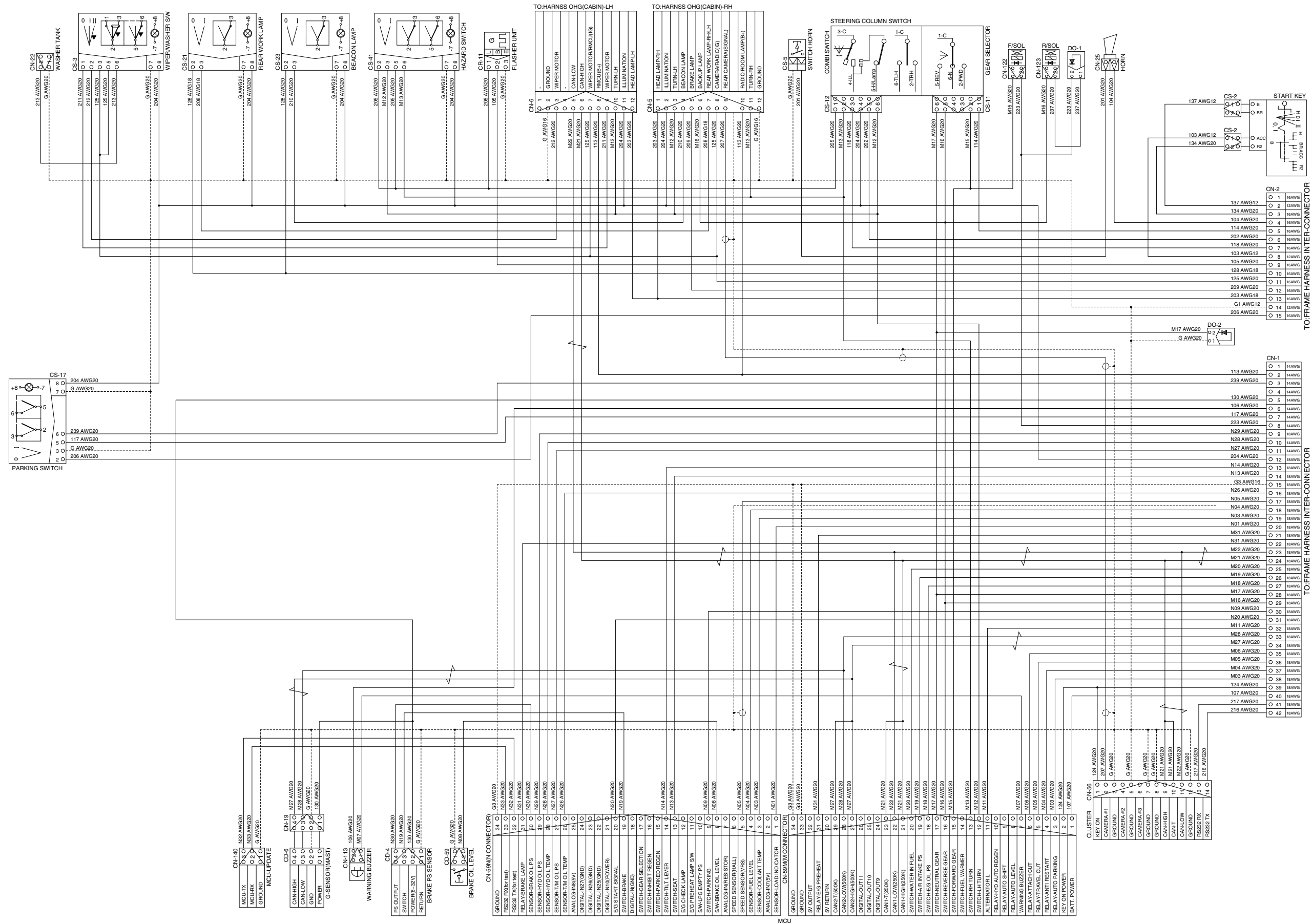
- | | | |
|-------------------------|---------------------------|-----------------------------|
| 1 Head lamp | 9 Start switch | 15 Buzzer |
| 2 Turn signal lamp | 10 Head lamp switch | 16 Hazard lamp switch (opt) |
| 3 Horn assembly | Illumination lamp | 17 Fuse box |
| 4 Beacon lamp (opt) | Turn signal switch | 18 Battery |
| 5 Combination lamp | 11 Horn button | 19 Parking switch |
| 6 Back buzzer | 12 Work lamp switch (opt) | 20 Beacon switch (opt) |
| 7 Forward-reverse lever | 13 Flasher unit | 21 Wiper switch (opt) |
| 8 Cluster | 14 MCU | |

GROUP 2 ELECTRICAL CIRCUIT

• ELECTRICAL CIRCUIT (1/3)

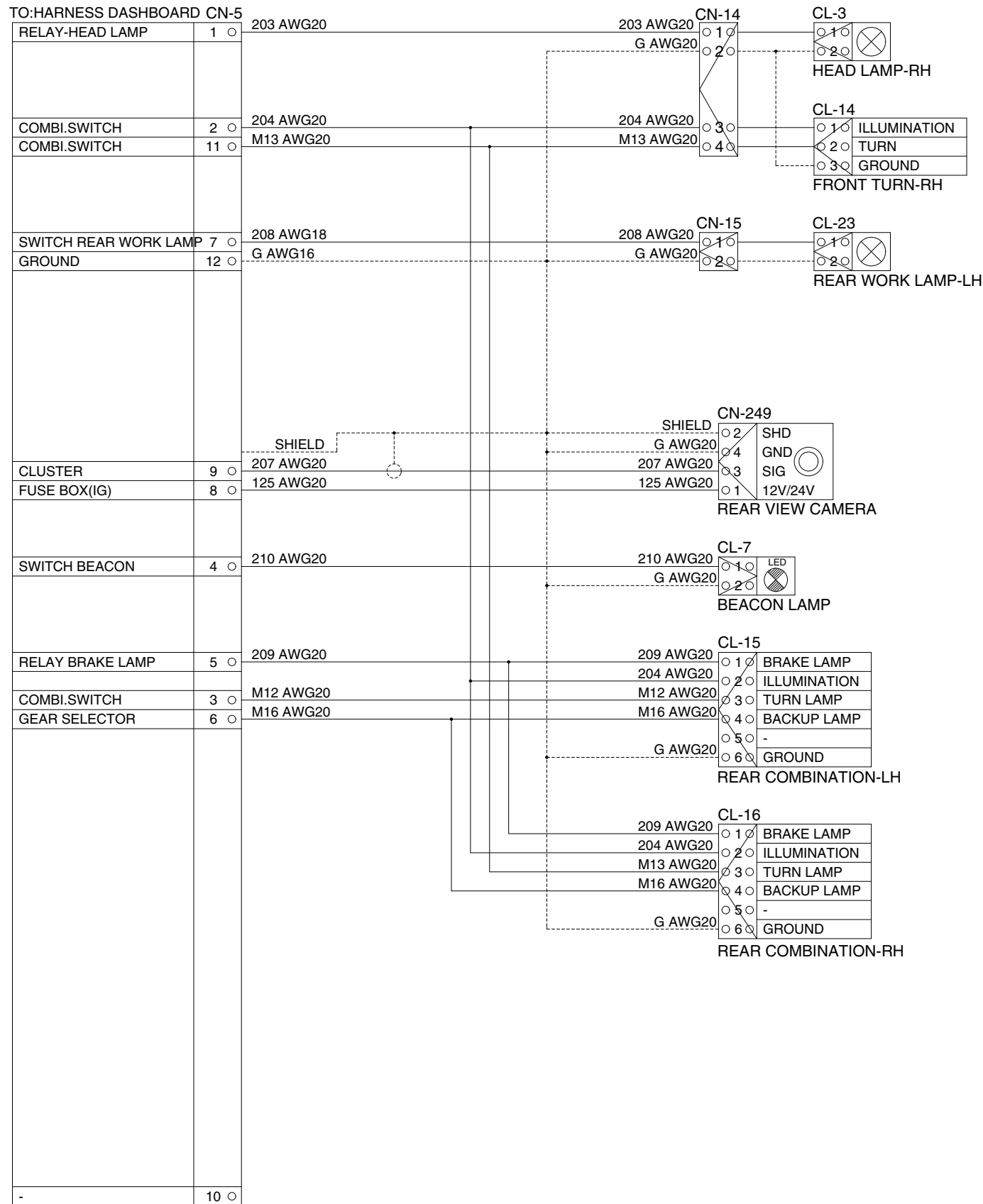


- ELECTRICAL CIRCUIT (2/3)

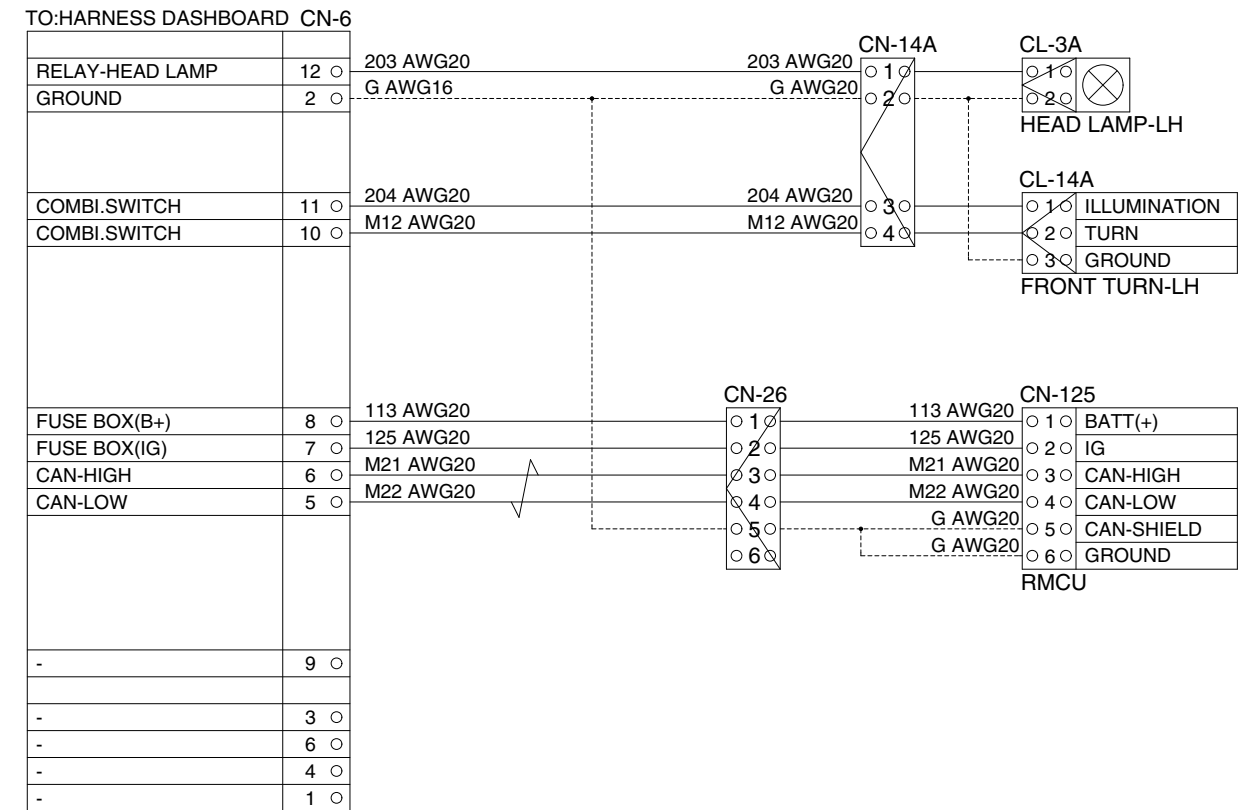


- ELECTRICAL CIRCUIT (3/3)

*ELEC.DIAGRAM OF HARNESS OHG-RH



*ELEC.DIAGRAM OF HARNESS OHG-LH





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+)]

→ Glow relay [CR-24] → Glow plug

→ Start relay [CR-23]

→ Fuse box [CN-36 (1)] → Alternator [CN-74 (B+)] → I/conn [CN-2 (2)]

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

→ Fuse box [No.4] → I/conn [CN-2 (4)] → Horn [CN-25]

→ Fuse box [No.5] → I/conn [CN-2 (9)] → Flasher unit [CR-11 (2) → (1)]

→ Hazard switch [CS-41 (2, 5)]

→ Combi switch [CS-12 (9)]

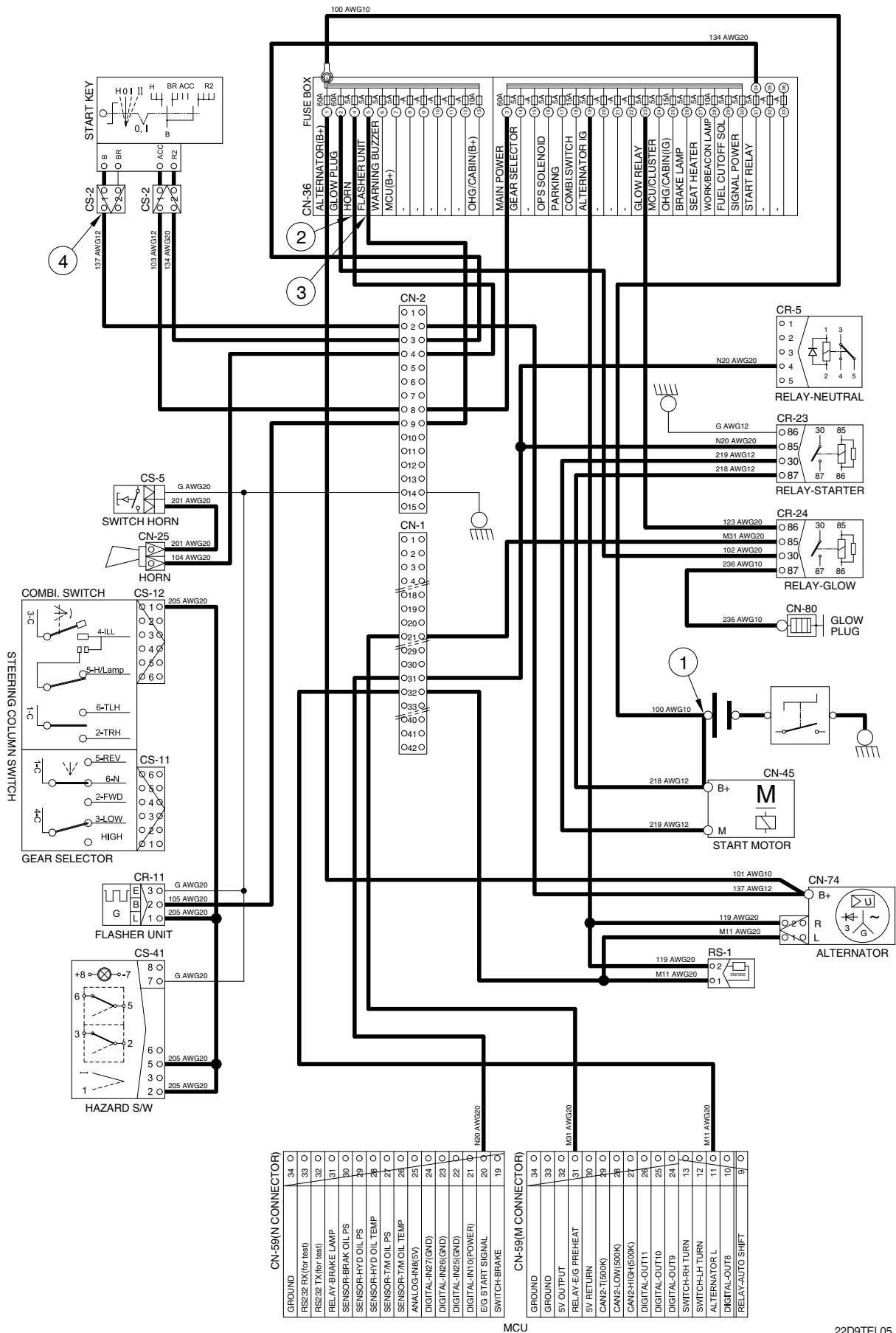
2) CHECK POINT

Engine	Key switch	Check point	Voltage
OFF	OFF	① - GND (Battery(+)) ② - GND (Fuse No.4) ③ - GND (Fuse No.5) ④ - GND (Start key)	12V

※ GND : Ground

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

POWER CIRCUIT



※ 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+)]

└→ Fuse box [CN-36 (1)] → Alternator [CN-74 (B+)] → I/conn [CN-2 (2)] → Start switch [CS-2 (1)]
└→ Start relay [CR-23]

※ The engine can be started only when the gearshift is in neutral position.

(1) When start key switch is in ON position

Start switch ON [CS-2 (2)] → I/conn [CN-2 (8)] → Fuse box [No.3] → Main power

(2) When start key switch is START position

Start switch START [CS-2 (2)] → I/conn [CN-2 (3)] → Fuse box [No. 34 → 31]

→ Neutral relay [CR-5(3) → (4)]
└→ Start relay [CR-23]
└→ I/conn [CN-1 (31)] → ECU [CN-59 (20)]

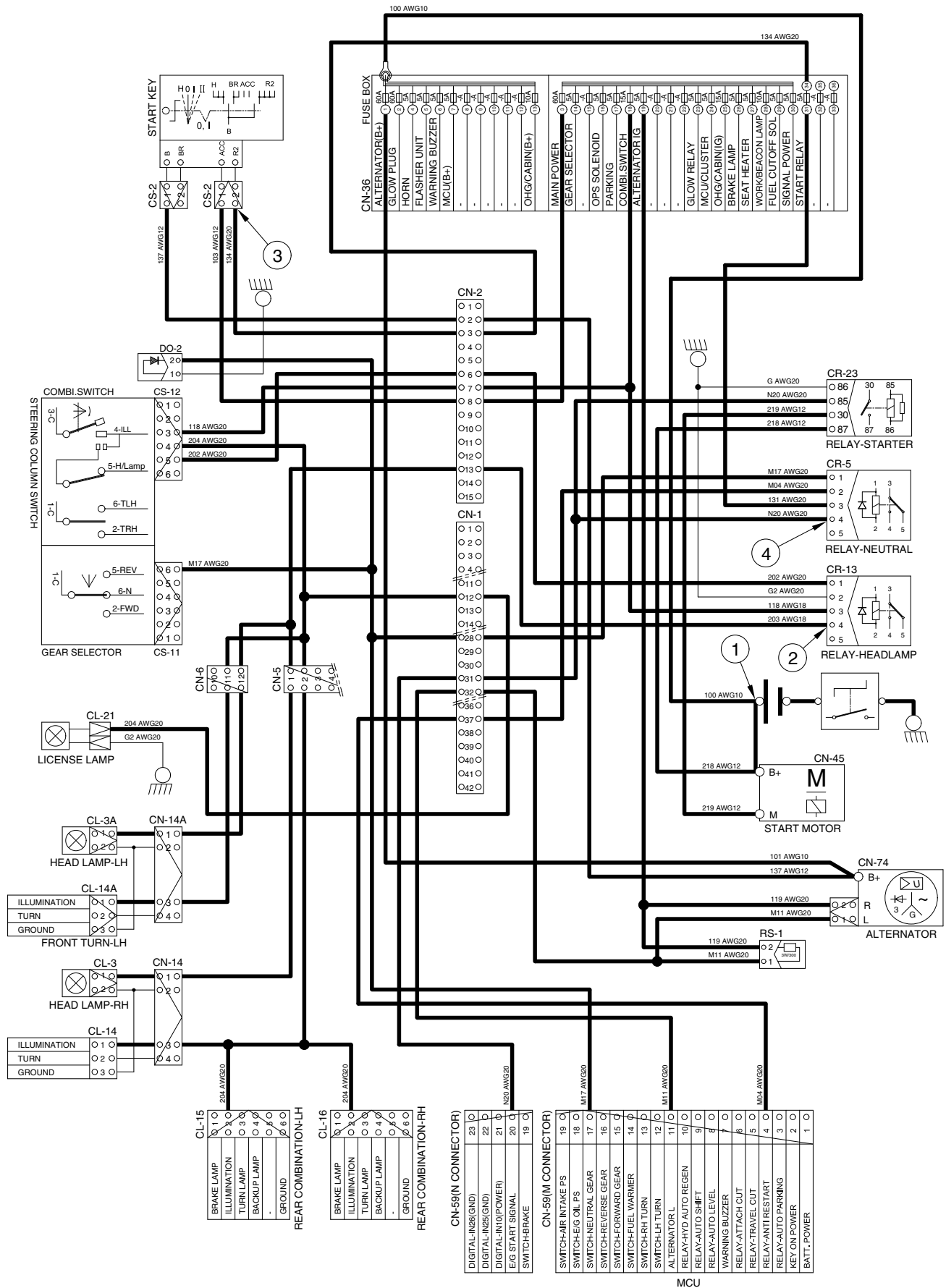
2) CHECK POINT

Engine	Key switch	Check point	Voltage
Running	ON	① - GND (Battery B+) ② - GND (Start key) ③ - GND (Neutral relay)	12V

※ GND : Ground

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

STARTING CIRCUIT



22D9TEL06

※ 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 fuse box.

1) OPERATING FLOW

(1) Warning flow

Alternator [CN-74 (L)] → I/conn [CN-1 (32)] → MCU [CN-59 (11)]

(2) Charging flow

Alternator [CN-74 (B+)] → Fuse box [CN-36 (1)] → Starter [CN-45 (B+)] → Battery (+) terminal
→ Charging

2) CHECK POINT

Engine	Key switch	Check point	Voltage
ON	ON	① - GND (Alternator B+) ② - GND (Start switch) ③ - GND (Cluster)	12V

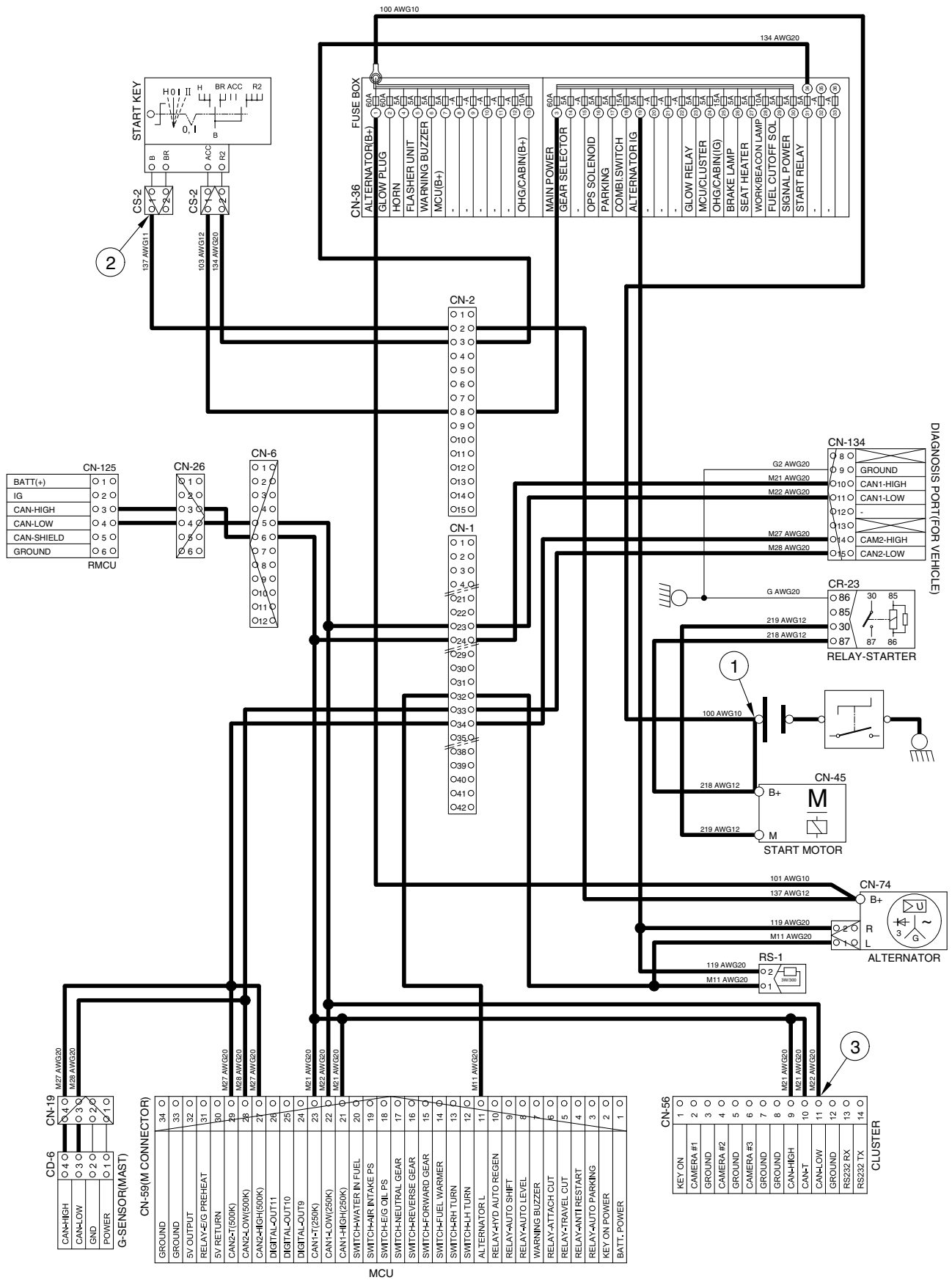
※ GND : Ground

※ 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

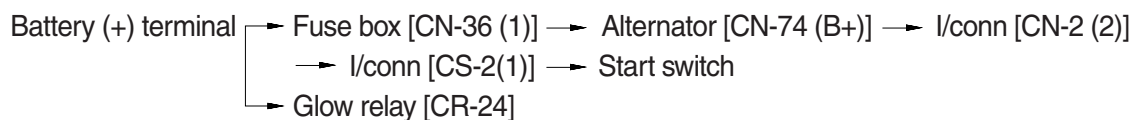


※ The circuit diagram may differ from the equipment, so please check before a repair.

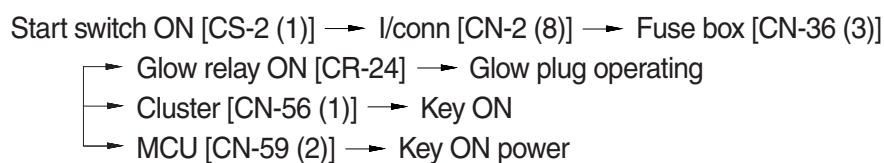
4. PREHEATING CIRCUIT

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

1) OPERATING FLOW



※ 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.



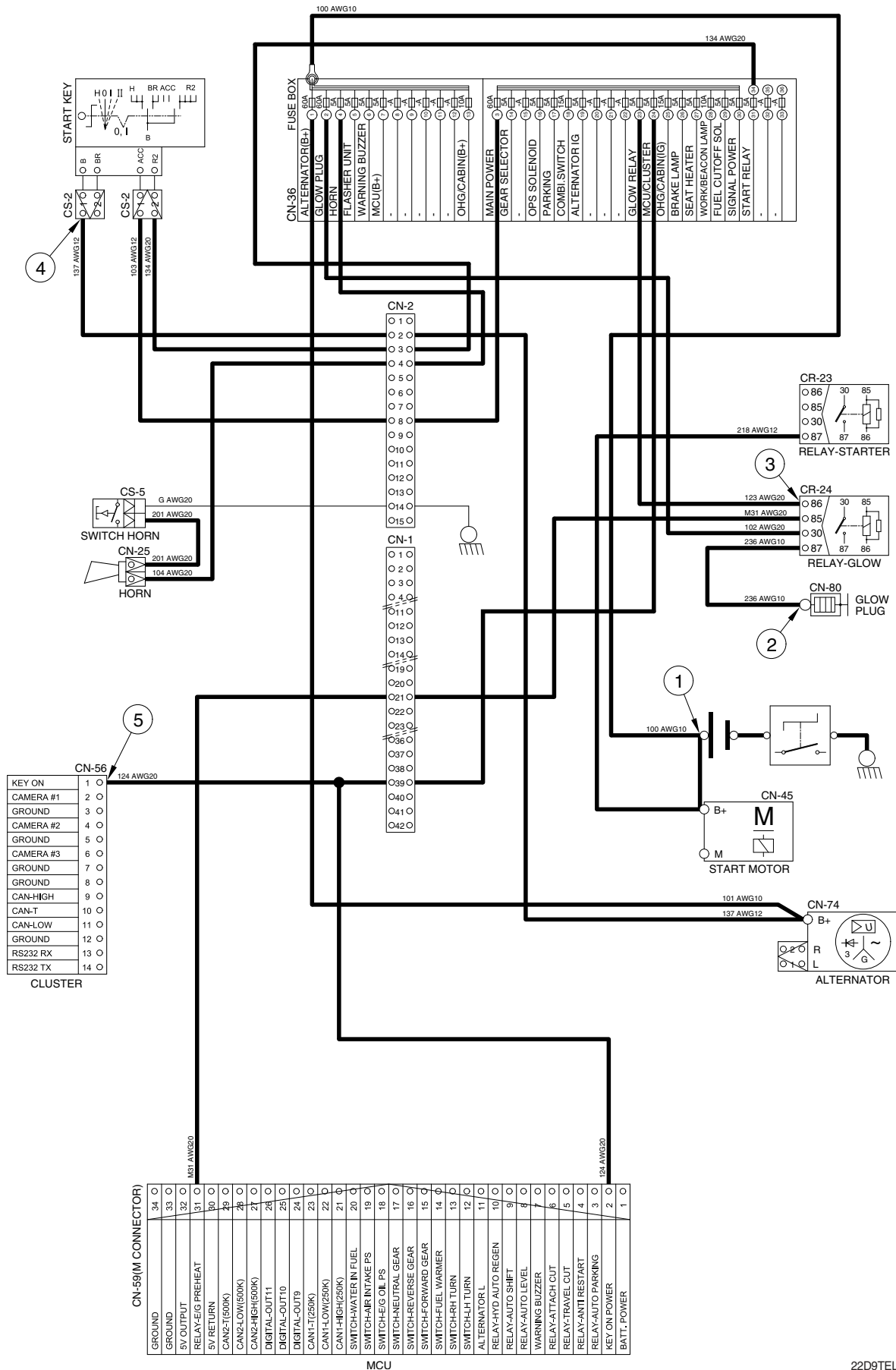
2) CHECK POINT

Engine	Key switch	Check point	Voltage
Stop	HEAT	① - GND (Battery B+) ② - GND (Glow plug) ③ - GND (Glow relay) ④ - GND (Start switch) ⑤ - GND (Cluster)	12V

※ 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 COMPONENT SPECIFICATION

No	Part name	Qty	Specification	Remark												
1	Battery	1	12V MF80CT RC : 130 min CCA : 630A													
2	Working lamp	1	12V, 55W													
3	License lamp	1	12V, 10W													
4	Rear combination lamp (LED)	2	12V, 1.6W (T/S) 12V, 1.1W (Back) 12V, 0.2W (Tail) 12V, 1.1W (Stop)													
5	Head lamp	2	12V, 55W													
6	Flasher lamp	2	12V (Posi : 0.5W, T/Signal : 2.2W)													
7	Beacon lamp (opt)	1	12V, Max. 1.210A													
8	Beacon lamp - LED (opt)	1	12V, Max. 0.800A													
9	Camera (opt)		12V, Max. 1.32W													
10	Flasher unit	1	12V, 85±10C/M, (23W+23W)×2+3W×2													
11	Backup alarm	1	12V, 90±5dB, 60±10C/M													
12	Horn	1	12V, MAX 3.5A, 108~118dB													
13	Fuel level sender	1	Reed switch - Magnet type <table><tr><td>Float indicate</td><td>E</td><td>4/8</td><td>F</td></tr><tr><td>Resistance [Ω]</td><td>700</td><td>350</td><td>50</td></tr><tr><td>Allowance [Ω]</td><td>0+5%</td><td>±5%</td><td>0-5%</td></tr></table>	Float indicate	E	4/8	F	Resistance [Ω]	700	350	50	Allowance [Ω]	0+5%	±5%	0-5%	
Float indicate	E	4/8	F													
Resistance [Ω]	700	350	50													
Allowance [Ω]	0+5%	±5%	0-5%													
14	Cluster	1	12V, 15W													
15	12V socket	1	12V, 120W													
16	G-sensor (opt) (Mast angle)	1	12V, 5W													
17	Master switch		180A													
18	Gear selector switch	1	12V, (Resistive load max 12V/3.5A)													
19	Combination switch	1	12V, Direction : Resistive load max 12V/3.5A Multi switch : Resistive load max 12V/2A													
20	Parking brake switch	1	12V, 20A													
21	Hazard switch	1	12V, 20A													
22	Start switch	1	DC 12V													
23	Rear work lamp switch (opt)	1	12V, 20A													
24	Beacon lamp switch (opt)	1	12V, 20A													
25	Front wiper/washer switch (opt)	1	12V, 20A													
26	Relay (4P)	2	12V, 20A													
27	Relay (5P)	2	12V, 20A													

GROUP 4 CONNECTOR DESTINATION

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-1	AMP	42	I/conn (Dashboard harness-frame harness)	936421	936429
CN-2	AMP	15	I/conn (Dashboard harness-frame harness)	2-85262-1	368301-1
CN-5	KET	12	I/conn (Dashboard harness-OMG harness-RH)	-	MG640348
CN-6	KET	12	I/conn (Dashboard harness-OMG harness-LH)	-	MG640348
CN-17	KET	2	I/conn (Frame harness-tilt lever switch)	MG610320	-
CN-18	AMP	2	I/conn (Dashboard harness-socket)	174352-2	-
CN-19	AMP	4	I/conn (Dashboard harness-G sensor)	174257-2	174259-2
CN-25	AMP	1	Horn	171809-1	-
CN-28	KET	4	Hyd oil PS/temp sensor	MG610331	MG640333
CN-45	AMP	1	Start motor M	171809-2	-
CN-56	AMP	14	Cluster	776273-2	-
CN-59N	AMP	34	Machine control unit	4-1437290-1	-
CN-59M	AMP	34	Machine control unit	4-1437290-0	-
CN-65	KET	2	Back buzzer	-	MG640322
CN-71	DEUTSCH	2	Parking solenoid	DT06-2S	-
CN-74	KET	2	Alternator	MG640188-4	-
CN-80	-	-	Glow plug	S820-304000	-
CN-87	KET	1	Fuel cut off solenoid	MG610041	-
CN-113	KET	2	OPSS buzzer	MG610320	-
CN-122	DEUTSCH	2	Forward solenoid	DT06-2S	-
CN-123	DEUTSCH	2	Reverse solenoid	DT06-2S	-
CN-130	PACKARD	2	Cut off solenoid 2 (Tilt, lift)	12015792	12047670
CN-131	PACKARD	2	Cut off solenoid 1 (Lift, down)	12015792	12047670
CN-134	KET	20	Engine diagnosis port	MG652863	-
CN-139	KET	2	12V socket	MG610043	-
CN-140	KET	3	Machine control unit update	MG610327	-
CN-249	AMP	4	Rear view camera	174257-2	174259-2
Switch					
CS-2	KET	2	Start switch	MG610281	MG620281
CS-3	CARLING	10	Wiper/washer switch	21HN-56300	-
CS-5	KET	3	Horn switch	-	MG640329
CS-11	DEUTSCH	6	Gear selector	DT06-6S	-
CS-12	DEUTSCH	6	Combination switch	DT06-6S-P012	-
CS-13	KET	1	Tilt lever switch	ST730018-3	ST750036-3
CS-17	CARLING	10	Parking switch	21HN-56300	-
CS-21	CARLING	10	Work lamp switch	21HN-56300	-

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CS-23	CARLING	10	Beacon lamp switch	21HN-56300	-
CS-41	DAEDONG	10	Harzard switch	250-10PRG	-
CS-73	DEUTSCH	6	Seat switch	DT06-6S	-
Lamp					
CL-3	KET	1	Head lamp - RH	ST730018-3	ST750036-3
CL-3A	KET	1	Head lamp - LH	ST730018-3	ST750036-3
CL-7	DEUTSCH	1	Beacon lamp	DT06-2S	DT04-2P
CL-14	AMP	3	Front turn lamp - RH	936187-3	-
CL-14A	AMP	3	Front turn lamp - LH	936187-3	-
CL-15	DAEDONG	6	Combination lamp-LH	110-6PR	-
CL-16	DAEDONG	6	Combination lamp-RH	110-6PR	-
CL-21	KET	2	License lamp	ST730018-3	ST750036-3
CL-23	DAEDONG	2	Working lamp	110-2PR	-
Relay					
CR-5	OMRON	5	Neutral relay	21HN-55510	-
CR-11	KET	3	Flasher unit relay	312_GIHUNG_3P	-
CR-13	OMRON	5	Head lamp relay	21HN-55510	-
CR-23	AMP	4	Starter relay	21HN-55520	-
CR-24	AMP	4	Glow relay	21HN-55520	-
CR-50	OMRON	5	Travel cut relay	21HN-55510	-
CR-51	OMRON	5	Attach cut relay	21HN-55510	-
CR-52	OMRON	5	Brake lamp relay	21HN-55510	-
CR-56	OMRON	5	Auto park relay	21HN-55510	-
Sensor and pressure switch					
CD-2	KET	3	Fuel level sensor	S810-003201	-
CD-4	DEUTSCH	4	Brake oil pressure switch sensor	DT06-4S	-
CD-6	DEUTSCH	4	G-sensor	DT06-4S	-
CD-8	KET	2	Temp sender (For MCU)	MG610043	-
CD-10	KET	1	Air cleaner switch	ST730057-2	-
CD-18	AMP	1	Engine oil pressure sender	171809-2	-
CD-26	AMP	1	Parking PS switch	171809-2	-
CD-29	DEUTSCH	4	T/M oil PS/temp sensor	DT06-4S	-
CD-35	KET	2	Water in fuel switch	MG640165	-
CD-50	DEUTSCH	3	Load sensor	DTM06-3S	DTM04-3P
CD-59	KET	2	Brake oil level	MG610281	-
CD-73	AMP	3	Speed sensor	85205-1	-
Diode					
DO-01	QPL		Diode	21EA-50550	-

GROUP 5 TROUBLESHOOTING

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.	- Check and repair. - Recharge battery.
Heater signal does not become red.	- Faulty wiring. - Glow plug damaged.	- Check and repair. - Replace
Engine oil pressure caution lamp does not light when engine is stopped (with starting switch left in "ON" position).	- Caution lamp defective. - Caution lamp switch defective.	- Replace - Replace