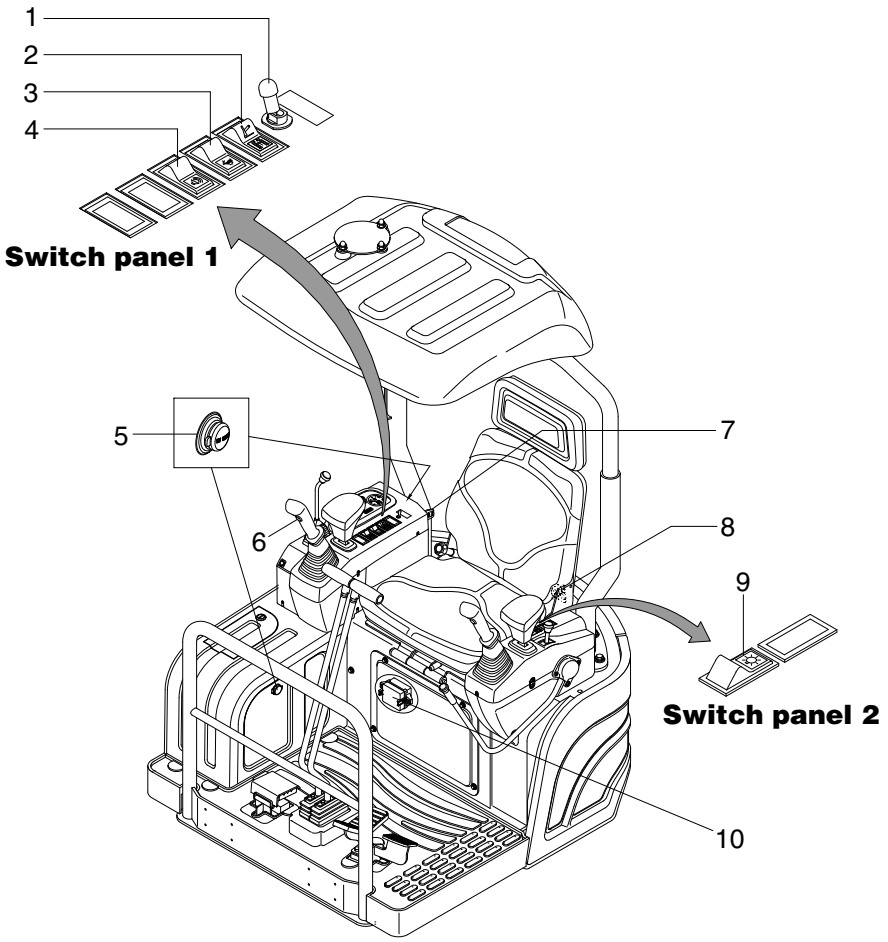
SECTION 4 ELECTRICAL SYSTEM

GROUP 1 COMPONENT LOCATION

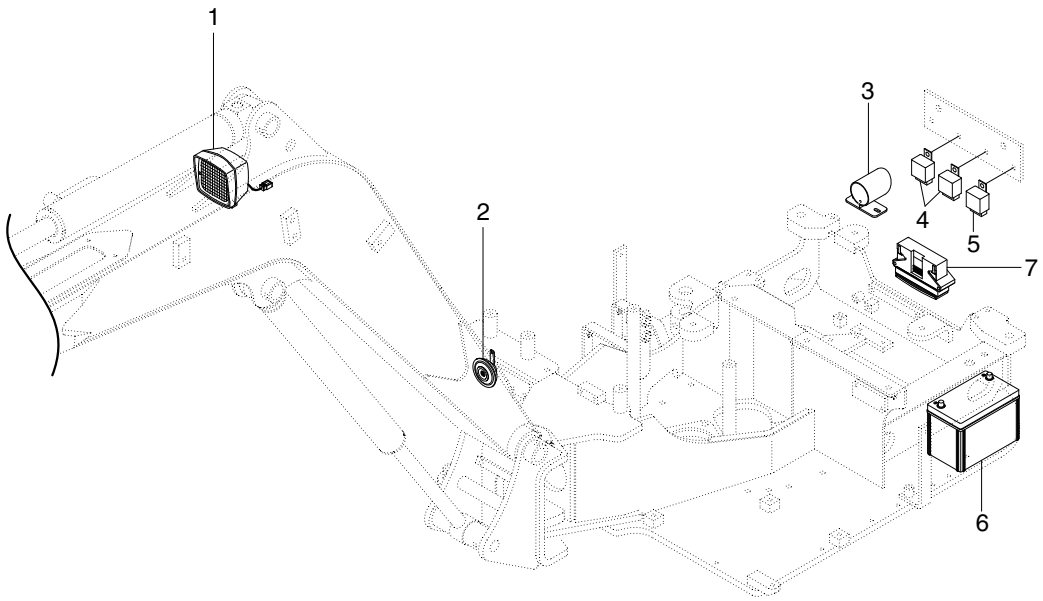
1. LOCATION 1



17Z9A4EL02

1	Quick clamp toggle switch	6	Horn switch
2	Select switch	7	Start switch
3	Travel speed control switch	8	Emergency engine stop switch
4	Travel alarm switch	9	Main light switch
5	12V socket	10	Fuse box

2. LOCATION 2



17Z9A4EL01

1	Work lamp	4	Power relay	7	Controller
2	Horn	5	Relay		
3	Travel alarm buzzer	6	Battery		

GROUP 2 MONITORING SYSTEM

1. OUTLINE

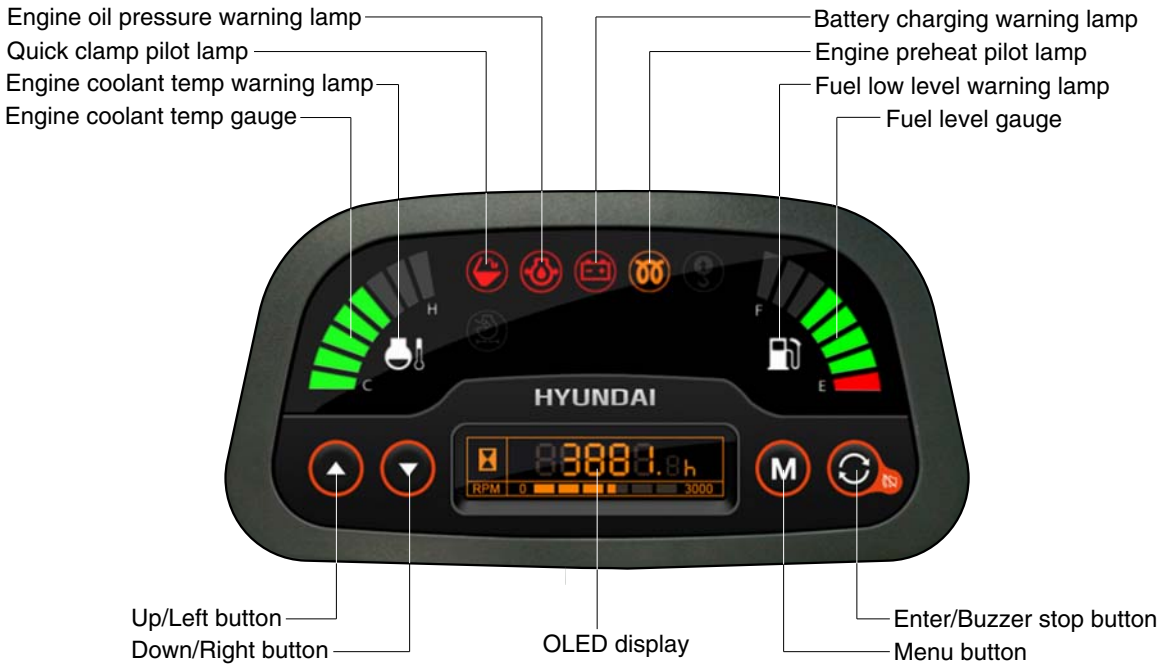
Monitoring system consists of the monitor part and switch part.

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



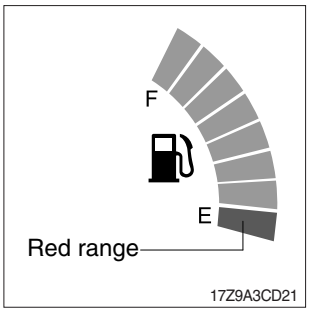
17Z9A3CD03

2) GAUGES AND DISPLAYS

(1) Service meter

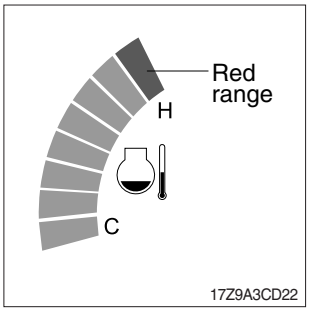
① This meter shows the total operation hours of the machine.
② Always ensure the operating condition of the meter during the machine operation.
Inspect and service the machine based on hours as indicated in chapter 6, maintenance.

(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 illuminates 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



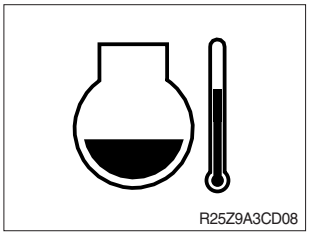
① This indicates the temperature of coolant.
・Red range : Above 115°C (239°F)
② When the red range pointed or warning lamp ON, engine do not abruptly stop but run it at medium speed to allow it to cool gradually, then stop it.
Check the radiator and engine.
※ **If the engine is stopped without cooled down running, the temperature of engine parts will rise suddenly, this could cause severe engine trouble.**

3) WARNING AND PILOT LAMPS

(1) Fuel low level warning lamp

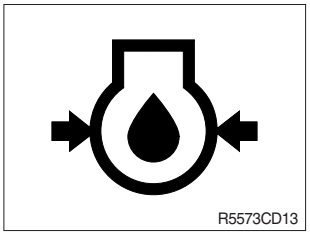
① This lamp blinks and buzzer sounds when the level of fuel is below 5.0 ℓ (1.3 U.S. gal).
② Fill the fuel immediately when the lamp blinks.

(2) Engine coolant temperature warning lamp



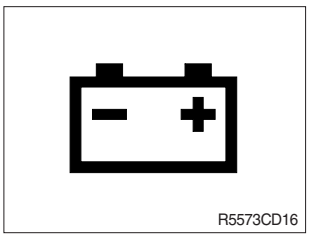
① This lamp blinks and buzzer sounds when the temperature of coolant is over the normal temperature 115°C (239°F) .
② Check the cooling system when the lamp blinks.

(3) Engine oil pressure warning lamp



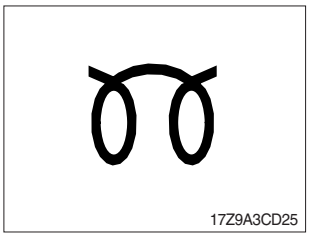
① This lamp blinks and buzzer sounds after starting the engine because of the low oil pressure.
② If the lamp blinks during engine operation, shut OFF engine immediately. Check oil level.

(4) Battery charging warning lamp



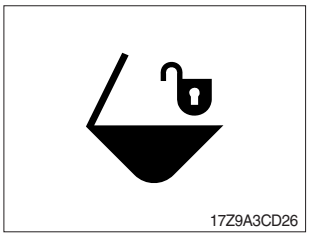
① This lamp blinks and buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.
② Check the battery charging circuit when this lamp blinks during engine operation.

(5) Engine preheat pilot lamp



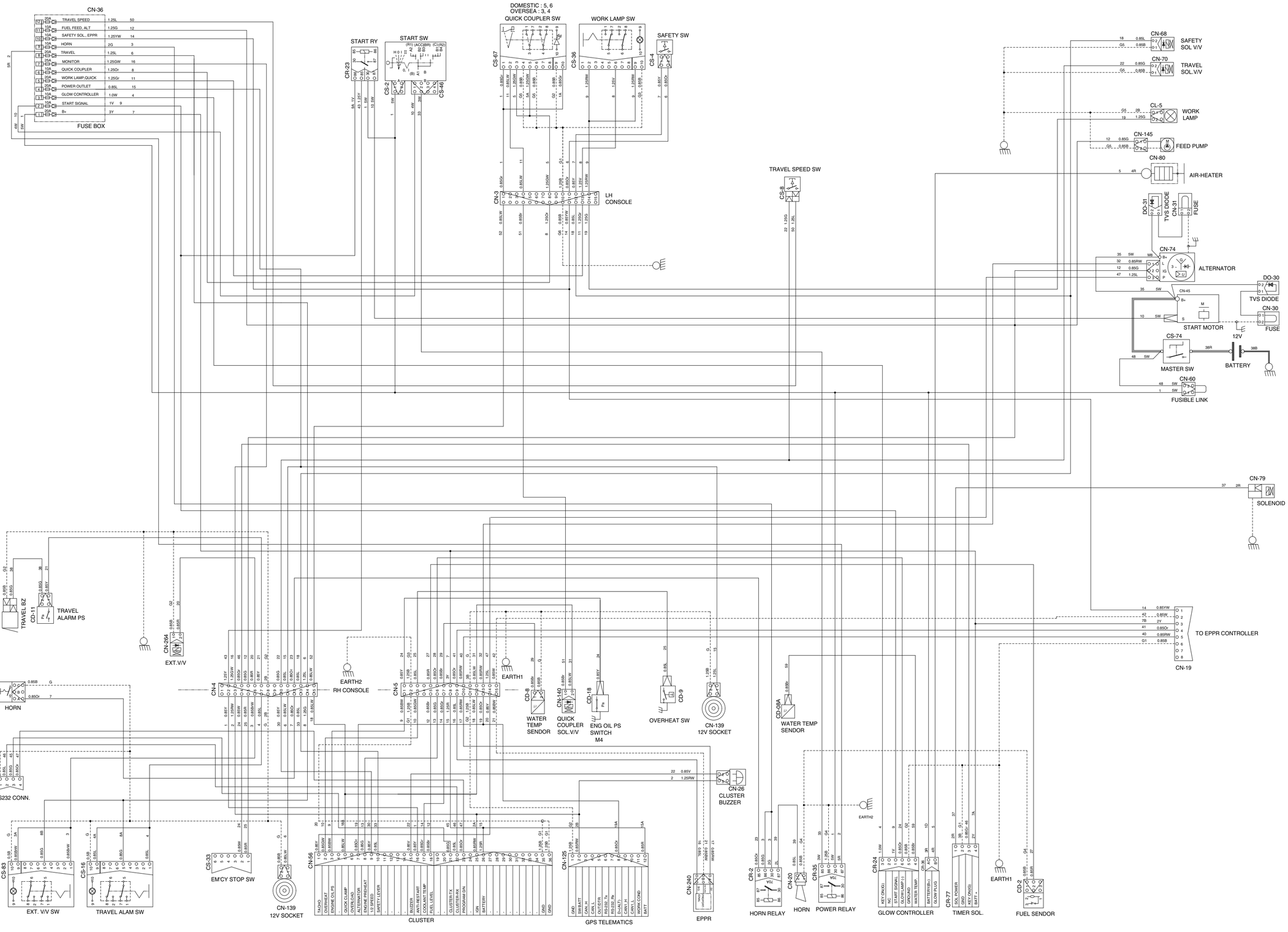
① When the start switch turn to HEAT position, pilot lamp comes ON.
② Refer to the page 4-4 for details.

(6) Quick clamp lock pilot lamp



① When the quick clamp switch turned ON, this lamp turn ON and the buzzer sounds.
② This lamp turned OFF and the buzzer stop when the quick clamp switch turned OFF.

· ELECTRICAL CIRCUIT (CANOPY TYPE)



20MJ-23102

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 → Fusible link (CN-60) → Start switch [CS-2 (1)]
Fusible link (CN-60) → Fuse box [No.1] →
Fuse box [No.1] → I/conn [CN-5 (8)] → Cluster [CN-56 (26)]
Fuse box [No.1] → Timer solenoid [CN-77 (4)]

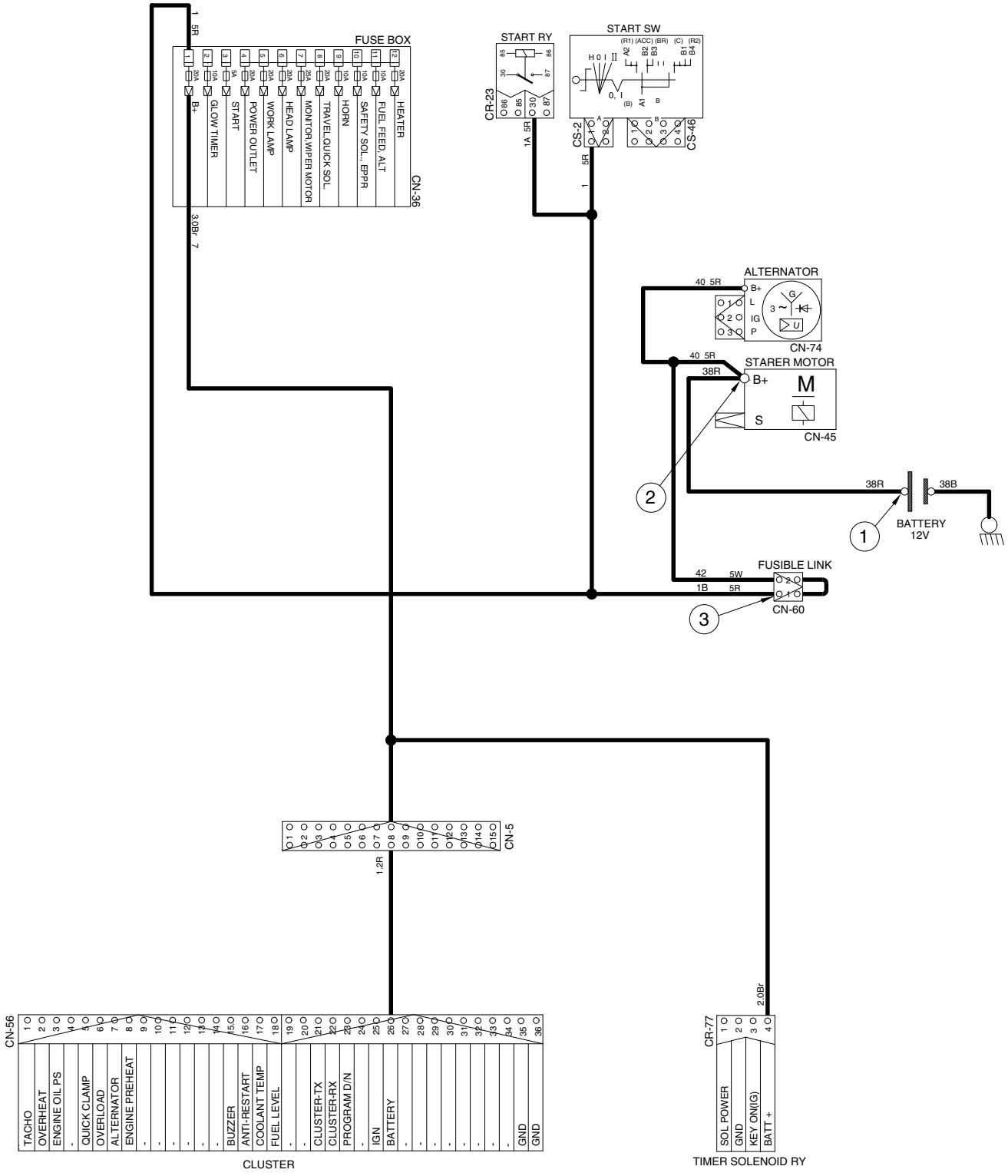
※ I/conn : Intermediate connector

2) CHECK POINT

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

※ GND : Ground

POWER CIRCUIT



17Z9A4EL04

2. STARTING CIRCUIT

1) OPERATING FLOW

Battery(+) terminal → Fusible link [CN-60]
- → Start switch [CS-2 (1)]
- → Fuse box No.1
- → Power relay [CR-35 (30)]
- → Start relay [CR-23 (30)]

※ **Start switch : HEAT**

Start switch [CS-2 (2)] → Preheater [CN-80]
→ Fuse box [CN-36 (2)] → Glow timer [CR-24 (4)]

※ **Start switch : ON**

Start switch [CS-46 (2)] → Power relay [CR-35 (30) → (87)]
→ Fuse box [all power is supplied with electric component)

※ **Start switch : START**

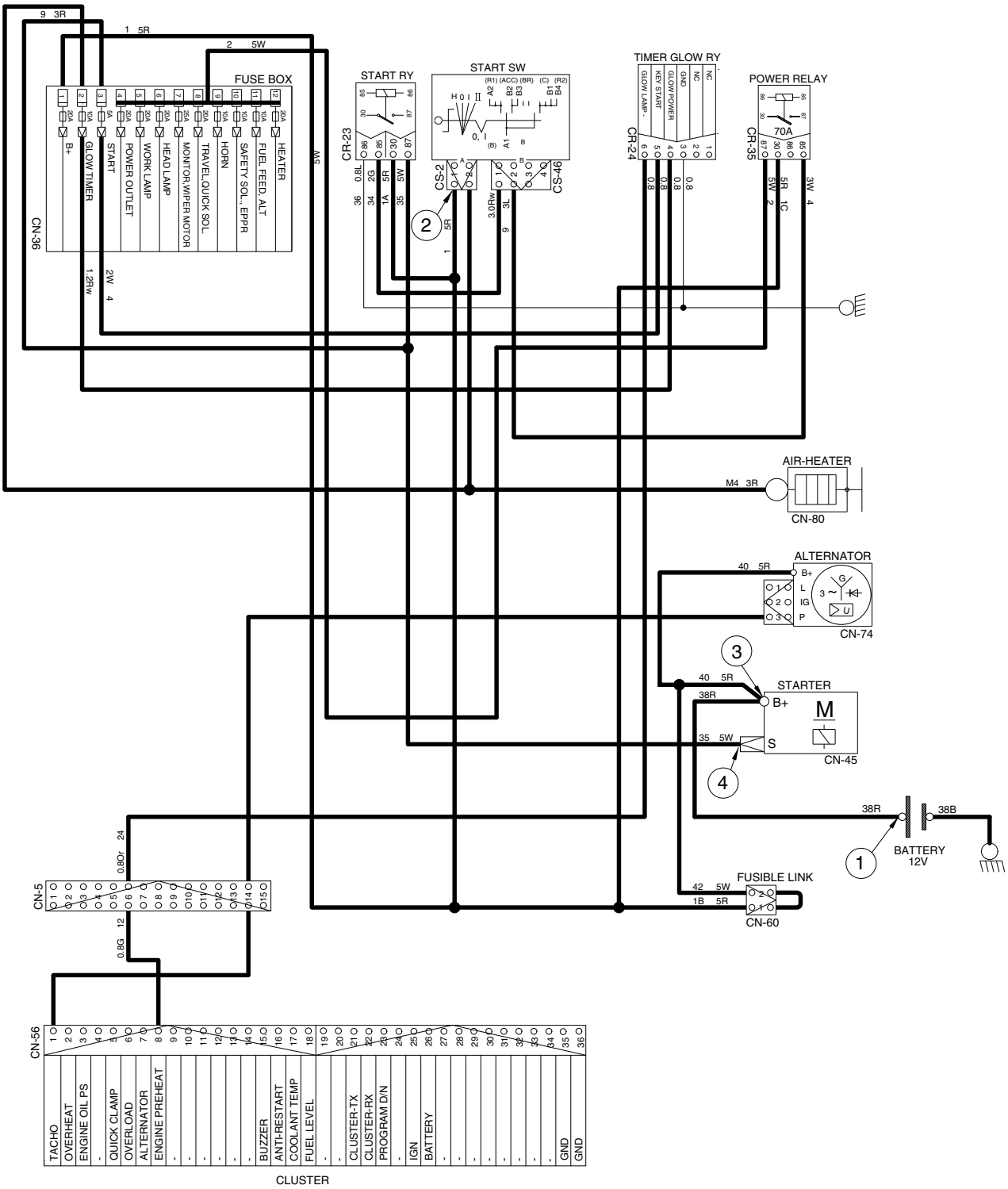
Start switch START [CS-46 (1)] → Start relay [CR-23 (30) → (87)] → Starter [CN-45 (S)] → Start motor operating

2) CHECK POINT

Engine	Start switch	Check point	Voltage
Operating	Start	① - GND (Battery) ② - GND (Start key) ③ - GND (Starter B^+) ④ - GND (Starter S)	10~12.5 V

※ GND : Ground

STARTING CIRCUIT



17Z9A4EL05

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.

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-5 (13)] → Cluster [CN-56 (7)] → Cluster warning lamp ON

(2) Charging flow

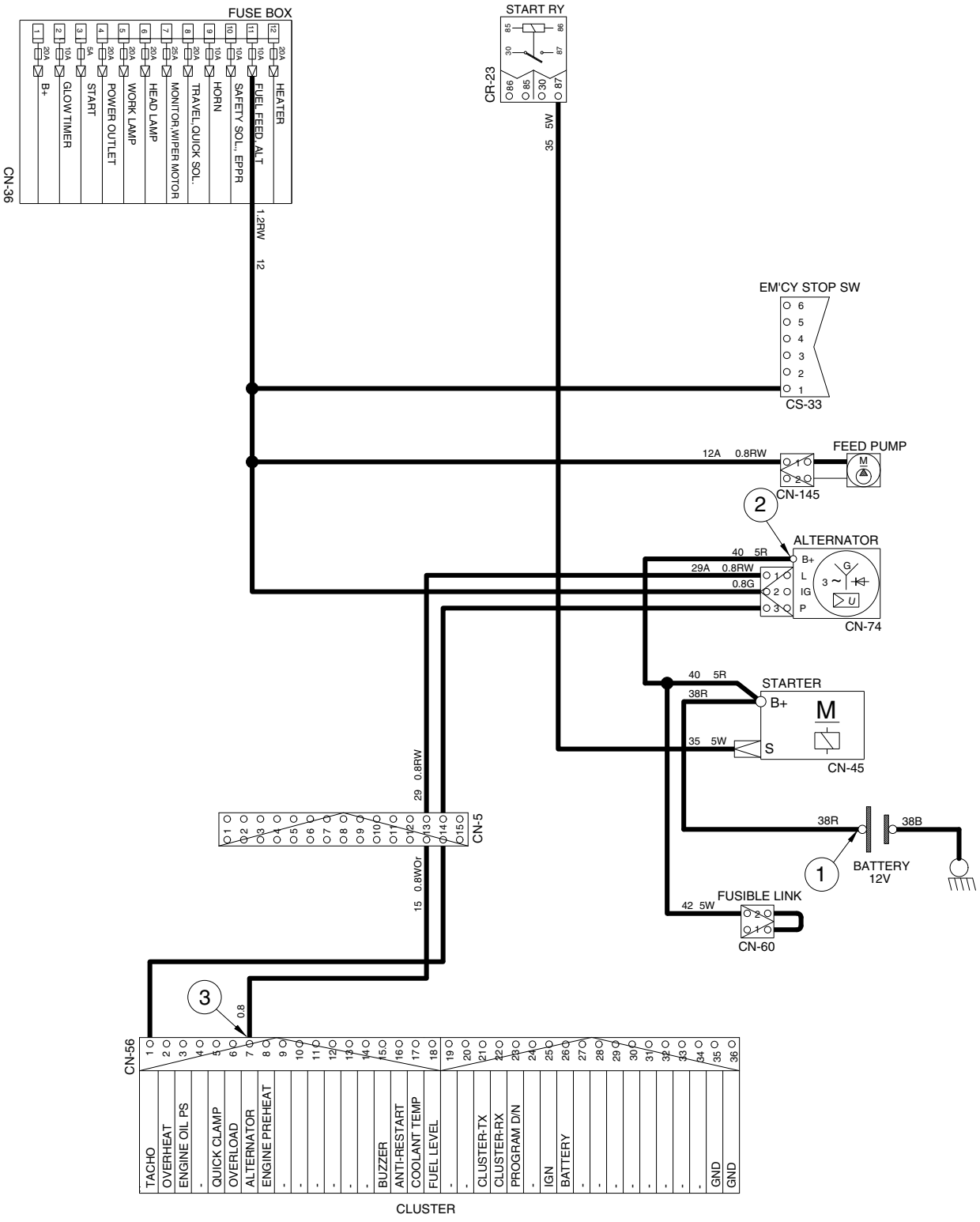
Alternator "B^+" terminal → Battery(+) terminal

2) CHECK POINT

Engine	Start switch	Check point	Voltage
ON	ON	① - GND (Battery voltage) ② - GND (Alternator B^+ terminal) ③ - GND (Cluster)	10~12.5 V

※ GND : Ground

CHARGING CIRCUIT



17Z9A4EL06

4. WORK LIGHT CIRCUIT

1) OPERATING FLOW

Fuse box (No.6) → I/conn [CN-3 (8)] → Light switch [CS-21 (1)]
Fuse box (No.5) → I/conn [CN-3 (13)] → Light switch [CS-21 (4)]

(1) Main light switch ON : 1st step

Main light switch ON [CS-21 (5)] → Main light switch illumination ON [CS-21 (9)]

(2) Main light switch ON : 2nd step

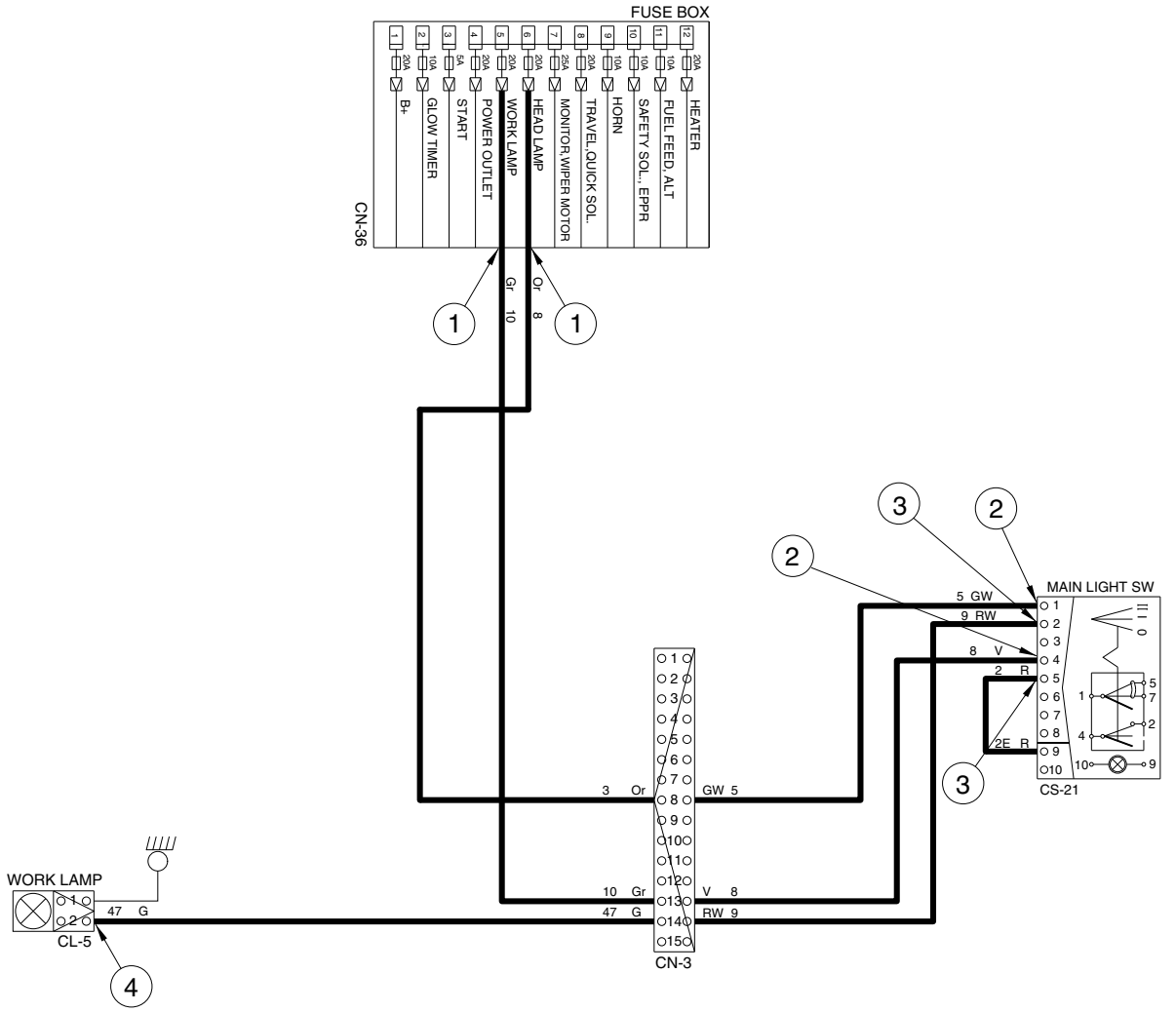
Main light switch ON [CS-21 (2)] → I/conn [CN-3 (14)] → Work light ON [CL-5 (2)]

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 (Work light)	10~12.5 V

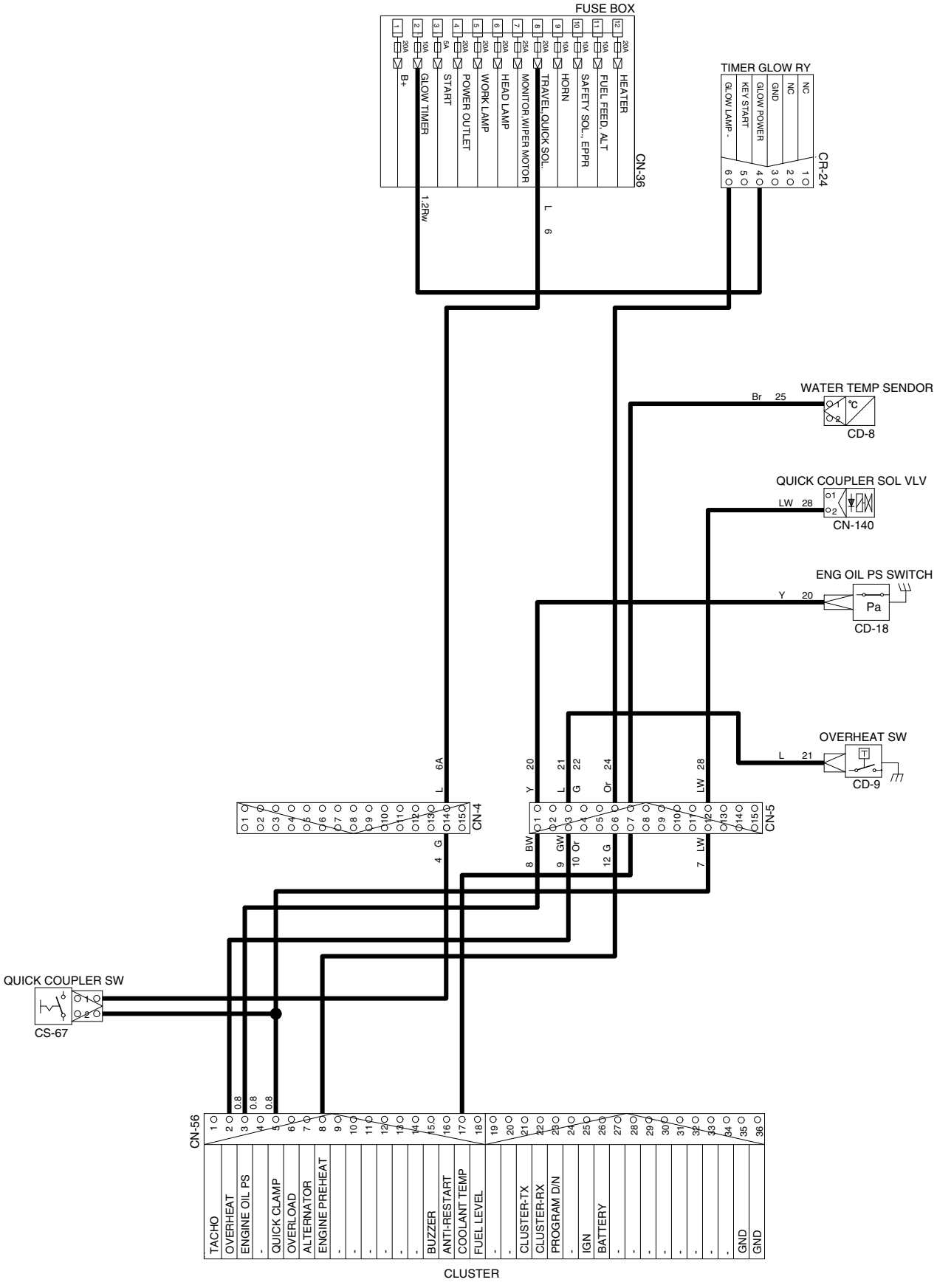
※ GND : Ground

WORK LAMP CIRCUIT



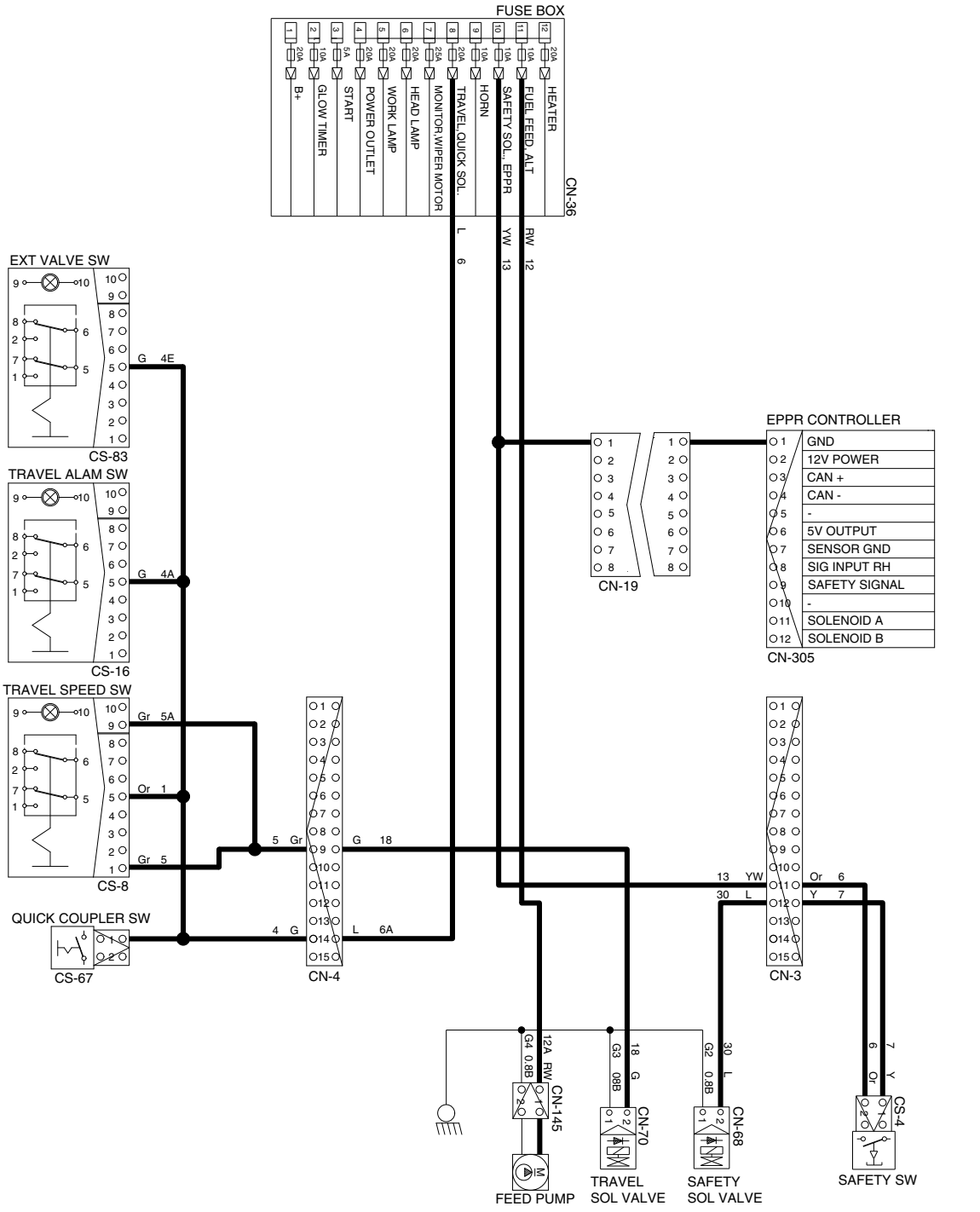
17Z9A4EL07

MONITORING CIRCUIT



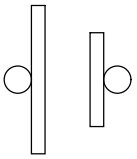
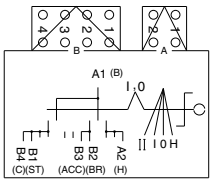
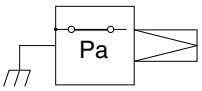
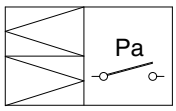
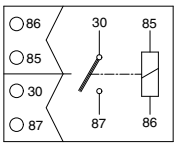
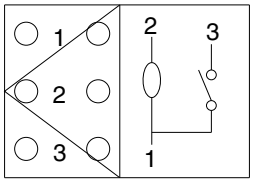
17Z9A4EL08

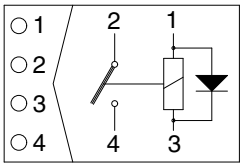
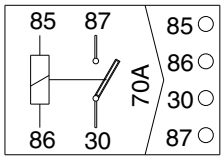
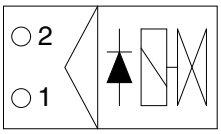
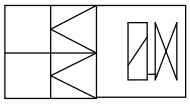
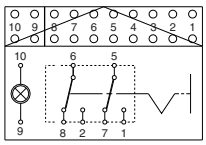
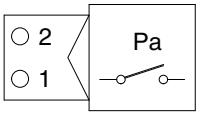
ELECTRIC CIRCUIT FOR HYDRAULIC

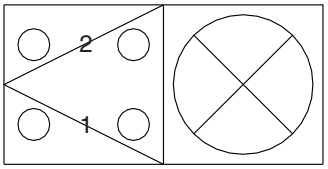
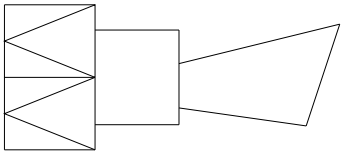
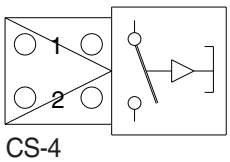
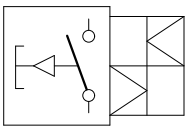
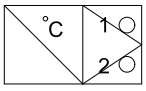
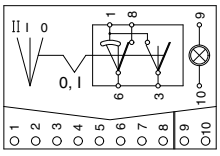


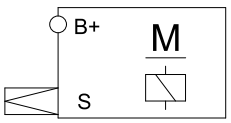
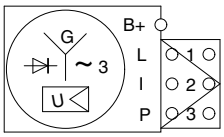
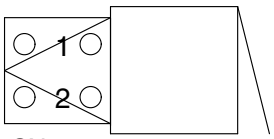
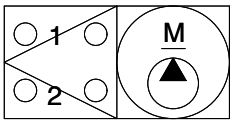
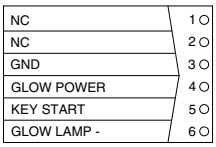
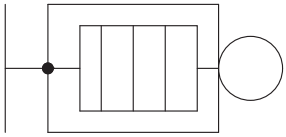
17Z9A4EL09

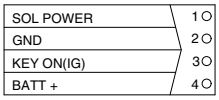
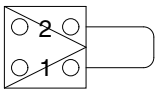
GROUP 4 ELECTRICAL COMPONENT SPECIFICATION

Part name	Symbol	Specification	Check
Battery		12V × 45Ah	※ Check specific gravity 1.280 over : Over charged 1.280 ~ 1.250 : Normal 1.250 below : Recharging
Start key	 CS-2 CS-46	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/cm² (N.C TYPE)	※ Check resistance Normal : 0 Ω (CLOSE)
Air cleaner pressure switch	 CD-10	Pressure: 635 mmH₂O (N.O TYPE)	※ Check contact Normal : ∞ Ω
Start relay	 CR-23	12V 60A	※ Rated coil current 1.2±0.3A
Fuel sender	 CD-2	-	※ Check resistance Full : 30 Ω Low : 100 Ω Empty warning : 200 Ω

Part name	Symbol	Specification	Check
Horn relay	 CR-2	12V 20A	※ Check resistance Normal : About 200 Ω (for terminal 1-3) : 0 Ω (for terminal 2-4)
Power relay	 CR-35	12V 70A	※ Rated coil current 1.2±0.3 A
Solenoid valve	 CN-70 CN-68 CN-140 CN-238 CN-239 CN-264	12V 1A	※ Check resistance Normal : 15~25 Ω (for terminal 1-2)
Solenoid valve (engine stop)	 CN-79	12V	※ Coil resistance : 1.8 Ω
Switch (looking type)	 CS-8 CS-16 CS-83	12V 16A	※ Check contact Normal OFF - ∞ Ω (for terminal 1-5,2-6) - 0 Ω (for terminal 5-7,6-8)
Pressure switch	 CD-11	10bar (N.C type)	※ Check contact Normal : 0.1 Ω

Part name	Symbol	Specification	Check
Lamp	 CL-5	12V 55W (H3 TYPE)	※ Check disconnection Normal : 1.2 Ω
Horn	 CN-20	12V 6A	132±5 dB
Safety switch	 CS-4	Micro 12V 15A	※ Check contact Normal : 0 Ω Operating : ∞ Ω
Horn switch	 CS-5	12V 10A	※ Check contact Normal : 0 Ω
Water temp sender	 CD-8	-	※ Check contact 50°C : 0.748~0.904 Ω 67°C : 0.538~0.650 Ω 102°C : 0.185~0.167 Ω 110°C : 0.143~0.130 Ω 135°C : 0.076~0.100 Ω
Light switch	 CS-21	12V 16A	※ Check contact Normal : ∞ Ω

Part name	Symbol	Specification	Check
Starter	 CN-45	12V	※ Check contact Normal : 0.1 Ω
Alternator	 CN-74	12V 40A	※ Check contact Normal : 0 Ω (For terminal B^+-1) Normal : 10 ~ 12.5V
Travel alarm	 CN-81	12V	-
Fuel feed pump	 CN-145	12V	-
Glow timer	 CR-24	12V	-
Air-heater	 CN-80	12V 42A 500W	-

Part name	Symbol	Specification	Check
Control time relay	 CR-77	12V	-
Fusible link	 CN-60	27A	※ Check coil resistance Normal : 3.26m Ω /m

GROUP 5 CONNECTORS

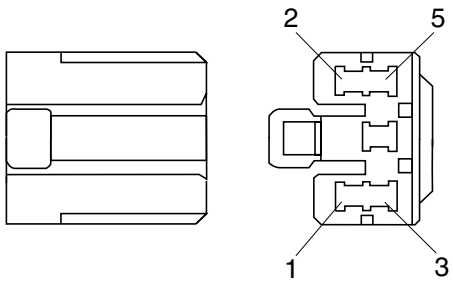
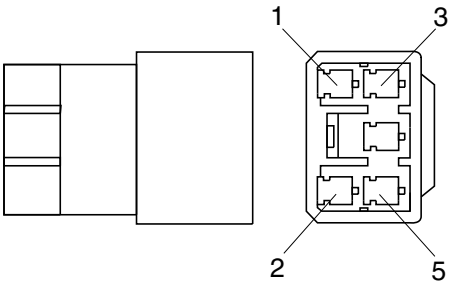
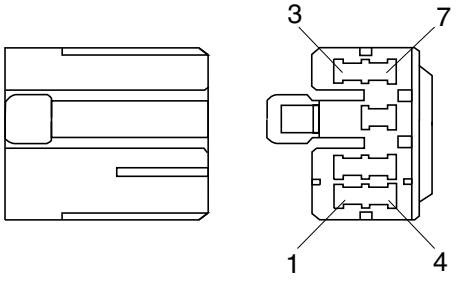
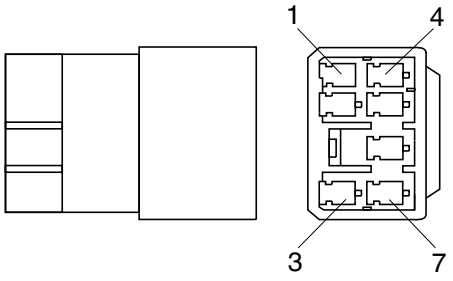
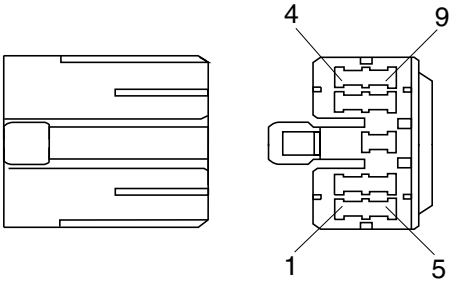
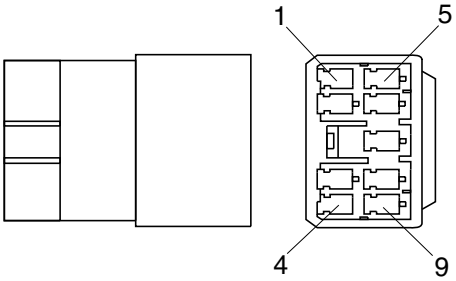
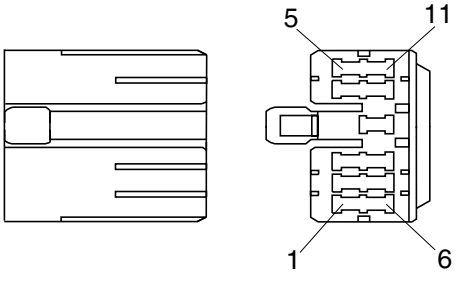
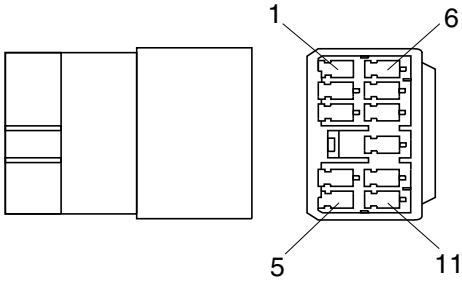
1. CONNECTOR DESTINATION

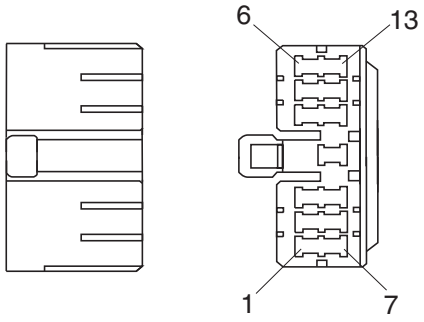
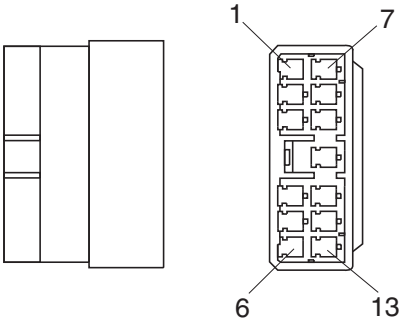
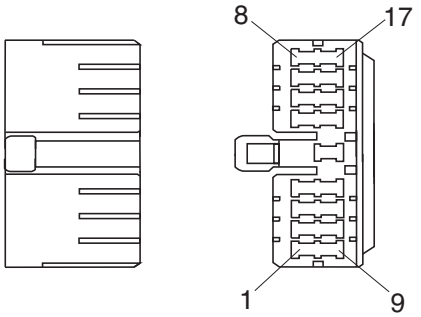
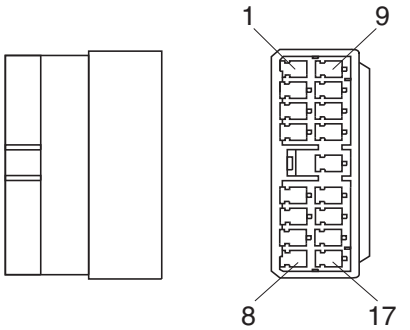
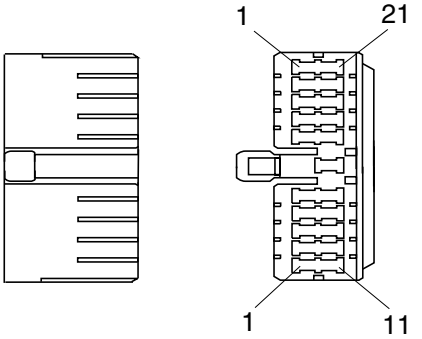
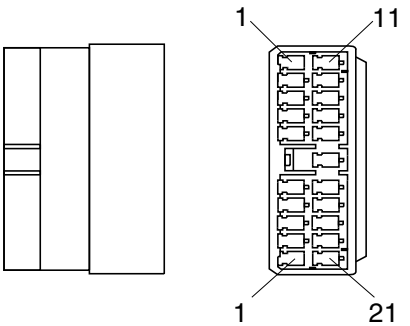
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-3	AMP	15	I/conn (main harness-LH console harness)	2-85262-1	368301-1
CN-4	AMP	15	I/conn (main harness-RH console harness)	2-85262-1	368301-1
CN-5	AMP	15	I/conn (RH console harness-main harness)	2-85262-1	368301-1
CN-20	DEUTSCH	2	Horn	DT06-2S-P012	-
CN-36	-	-	Fuse box body	F12890010	-
CN-45	RING TERM	1	Starter	ST710258-2	-
	YAZAKI	1	Starter	7123-2115	-
CN-56	AMP	20	Cluster	175967-2	-
	AMP	16		175966-2	-
CN-60	AMP	2	Fusible link	-	S831-130200
CN-68	DEUTSCH	2	Safety solenoid	DT06-2S-P012	-
CN-70	DEUTSCH	2	Travel Hi-Lo solenoid	DT06-2S-P012	-
CN-74	SUMITOMO	3	Alternator	6189-0442	-
	RING TERM	1		S820-306002	-
CN-80	-	1	Pre heater	7323-3010	-
CN-81	SWP	1	Travel buzzer	S822-014000	S822-114000
CN-140	DEUTSCH	2	Quick clamp	DT06-2S-P012	DT04-2P-E004
CN-145	YAZAKI	2	Fuel feed pump	7122-2820	-
CN-264	DEUTSCH	1	Extension valve	DT06-2S-P012	-
LAMP					
CL-2	AMP	3	Power outlet	174200-1	-
CL-5	DEUTSCH	2	Work lamp	DT06-2S-P012	DT04-2P-E004
RELAY					
CR-2	AMP	4	Horn relay	S810-004202	-
CR-23	KET	4	Start relay	612017-5	-
CR-24	YAZAKI	6	Glow timer relay	7123-2262	-
CR-35	KET	4	Power relay	MG612017-5	-
CR-77	YAZAKI	4	Timer solenoid relay	7123-2446	-
CR-79	YAZAKI	1	Engine stop solenoid relay	7122-2215	-
SENSOR					
CD-2	AMP	3	Fuel sender	S816-003002	S816-102002
CD-8	AMP	2	Water temp sender	85202-1	-
CD-9	AMP	1	Overheat switch	172320-2	-
CD-11	KET	2	Travel pressure switch	MG640795	-
CD-18	RING TERM	1	Engine oil pressure	GP110021	-

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
SWITCH					
CS-2	KET	4	Start switch	MG651926	-
CS-4	AMP	2	Safety switch	-	S814-102001
CS-5	-	1	Horn switch	S822-014000	-
	-	1		-	S822-114000
CS-8	SWF	10	Travel speed switch	583757	-
CS-16	SWF	10	Travel alarm switch	583757	-
CS-21	SWF	10	Light switch	593757	-
CS-24	SUMITOMO	8	EPPR switch	6195-0051	-
CS-46	-	2	Start switch	S813-030201	-
CS-67	AMP	2	Quick clamp switch	174352-2	-
CS-83	SWF	10	Extension valve switch	583757	-

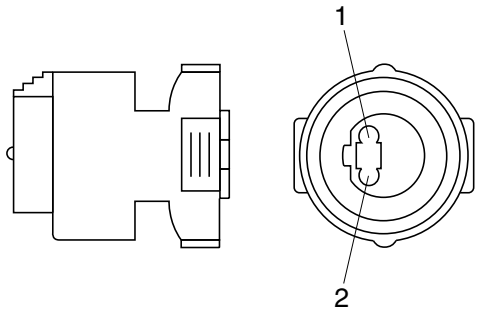
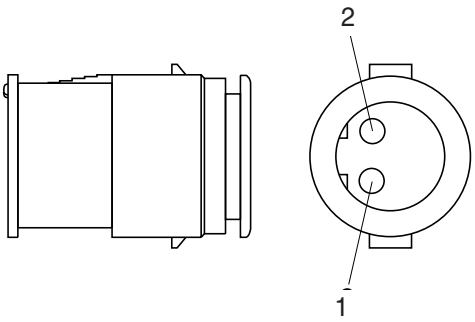
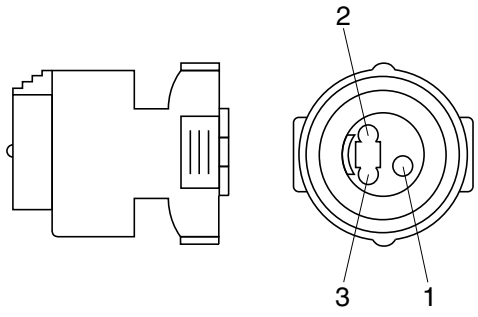
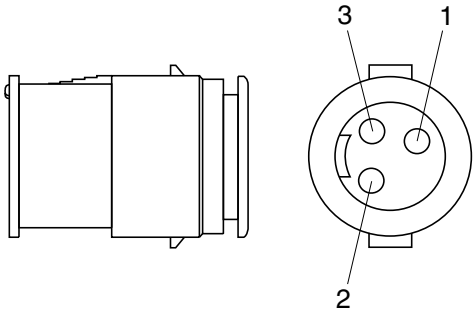
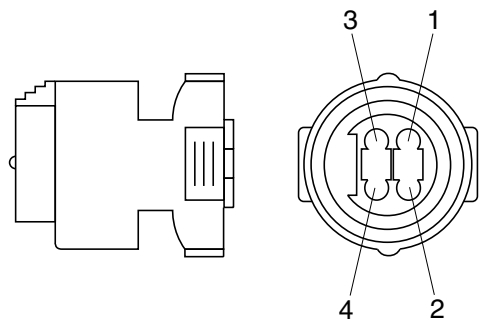
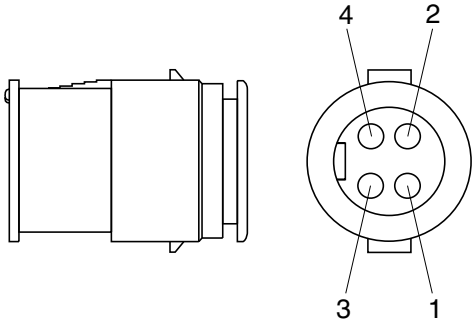
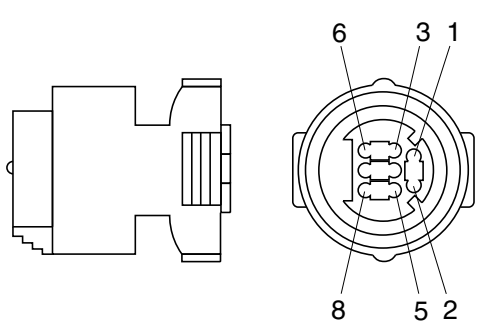
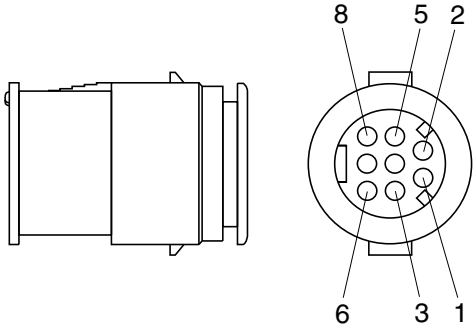
2. CONNECTION TABLE FOR CONNECTORS

1) PA TYPE CONNECTOR

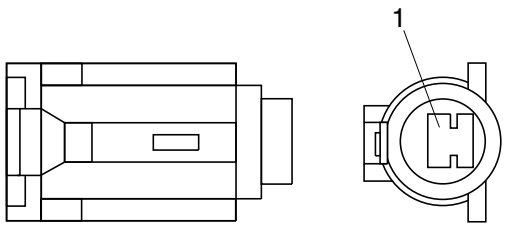
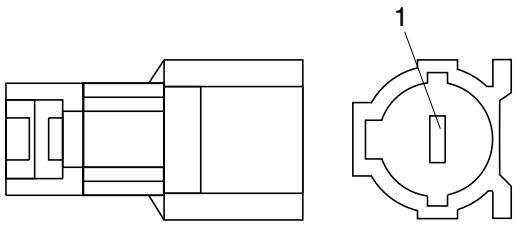
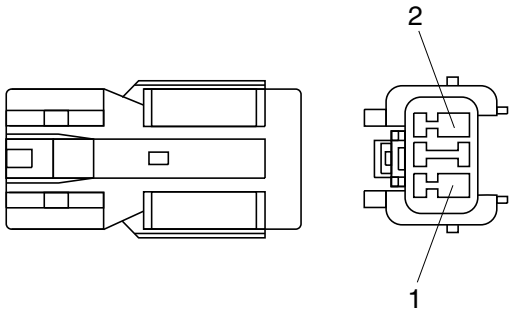
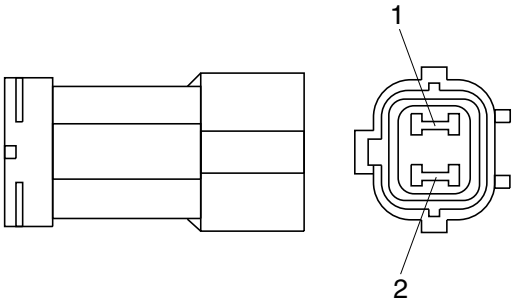
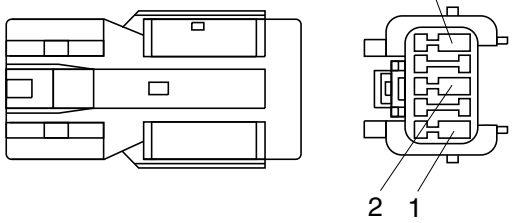
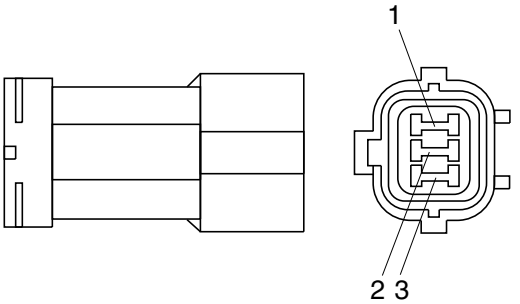
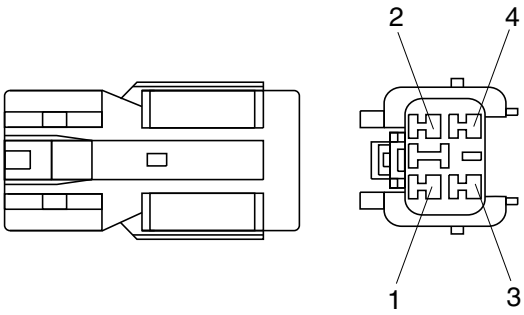
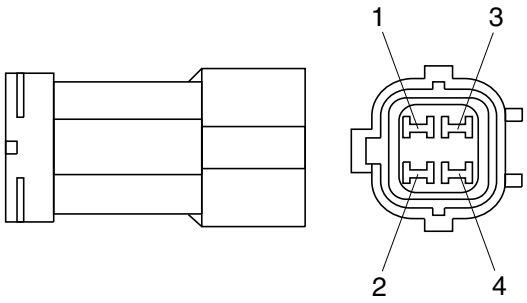
No. of pin	Receptacle connector (female)	Plug connector (male)
5	 S811-005002	 S811-105002
7	 S811-007002	 S811-107002
9	 S811-009002	 3S811-109002
11	 S811-011002	 S811-111002

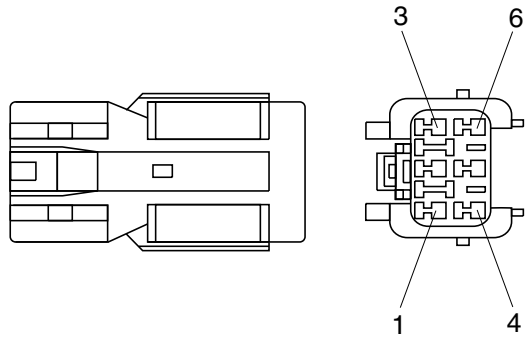
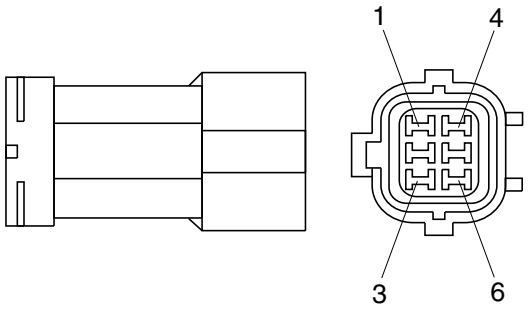
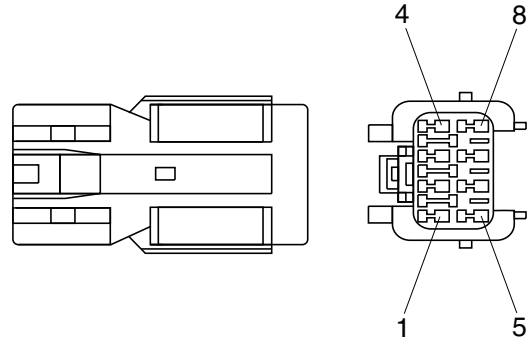
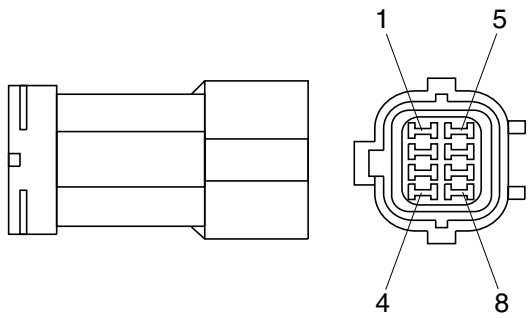
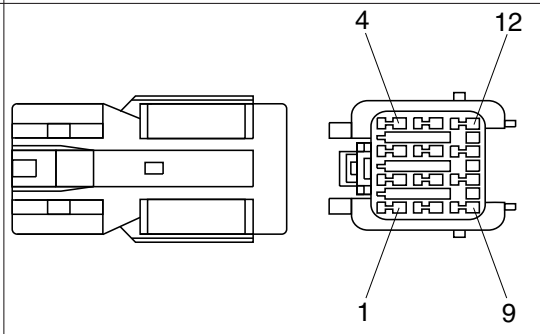
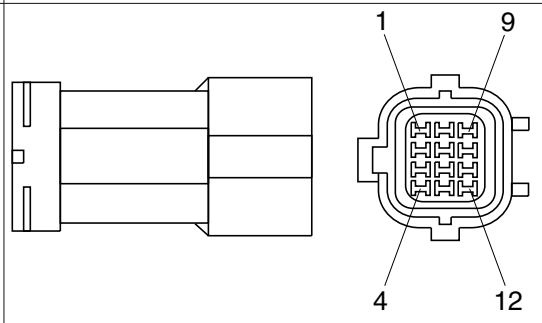
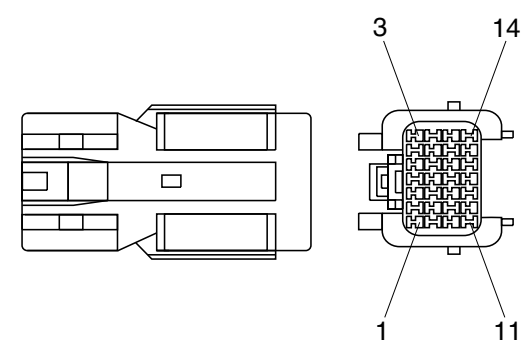
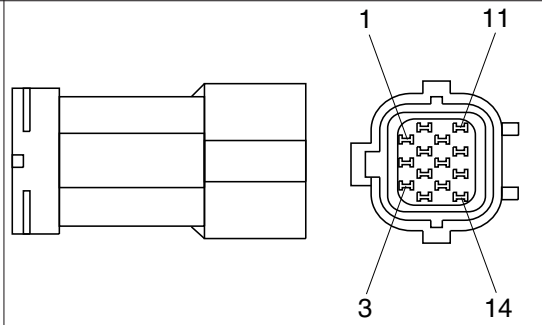
No. of pin	Receptacle connector (female)	Plug connector (male)
13	 S811-013002	 S811-113002
17	 S811-017002	 S811-117002
21	 S811-021002	 S811-121002

2) J TYPE CONNECTOR

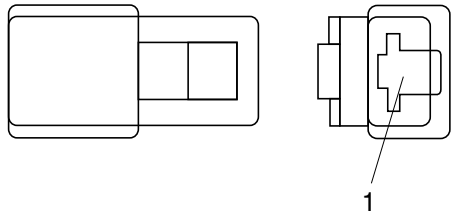
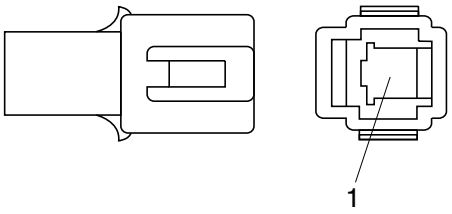
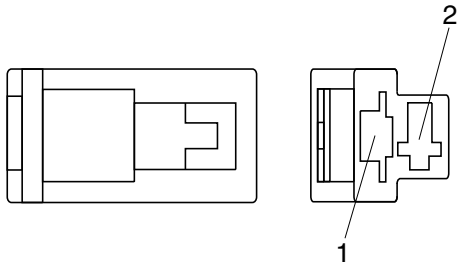
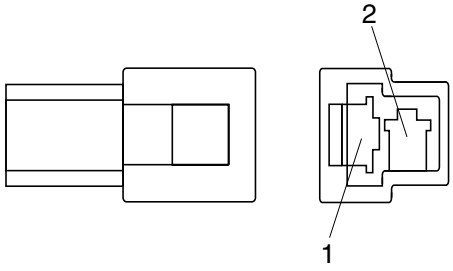
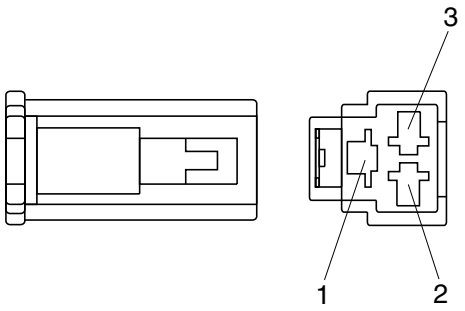
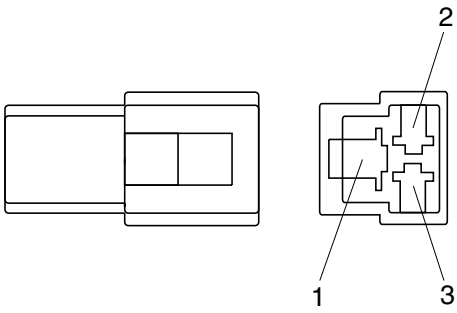
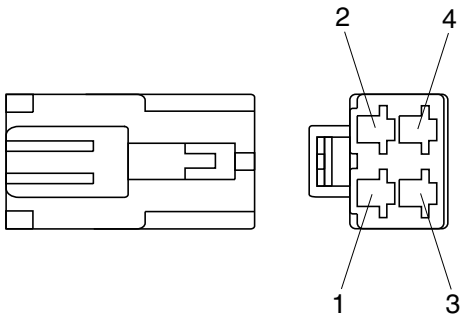
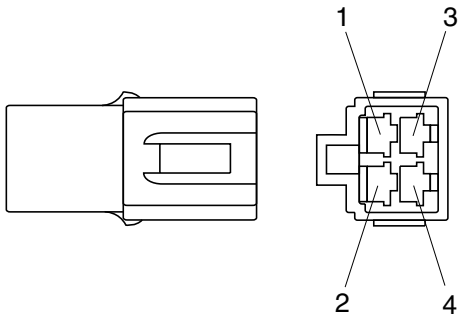
No. of pin	Receptacle connector (female)	Plug connector (male)
2	 S816-002001	 S816-102001
3	 S816-003001	 S816-103001
4	 S816-004001	 S816-104001
8	 S816-008001	 S816-108001

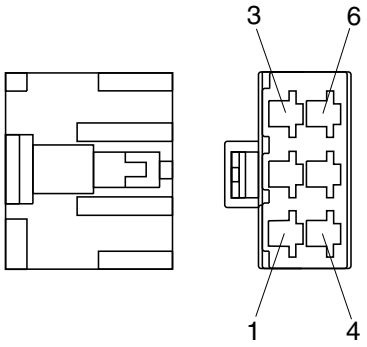
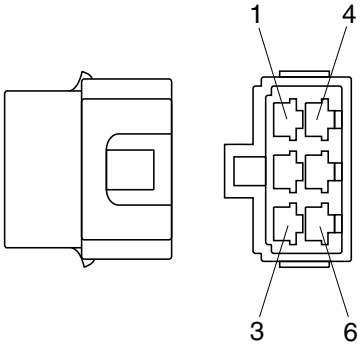
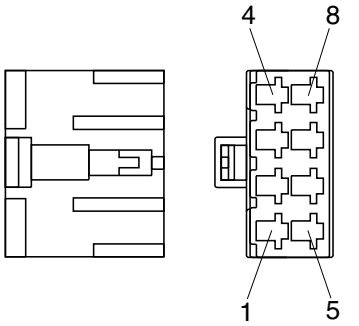
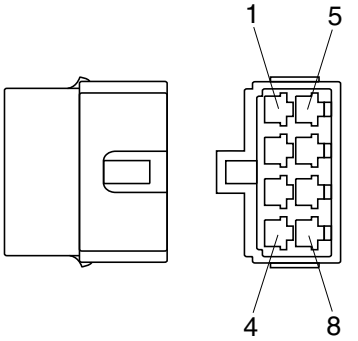
3) SWP TYPE CONNECTOR

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

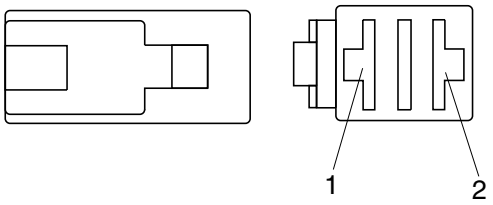
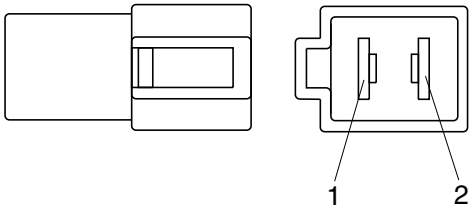
No. of pin	Receptacle connector (female)	Plug connector (male)
6	 S814-006000	 S814-106000
8	 S814-008000	 S814-108000
12	 S814-012000	 S814-112000
14	 S814-014000	 S814-114000

4) CN TYPE CONNECTOR

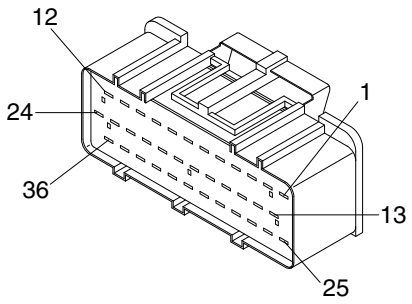
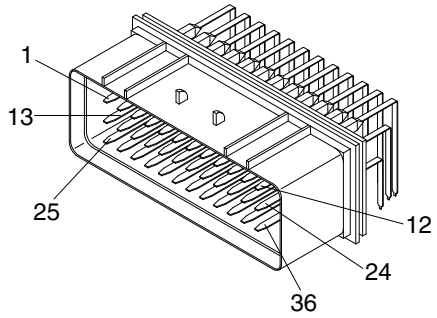
No. of pin	Receptacle connector (female)	Plug connector (male)
1	 S810-001202	 S810-101202
2	 S810-002202	 S810-102202
3	 S810-003202	 S810-103202
4	 S810-004202	 S810-104202

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

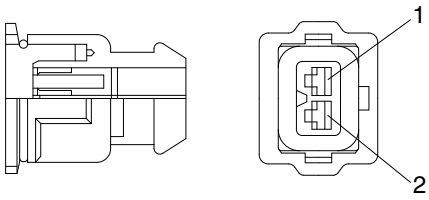
5) 375 FASTEN TYPE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 S810-002402	 S810-102402

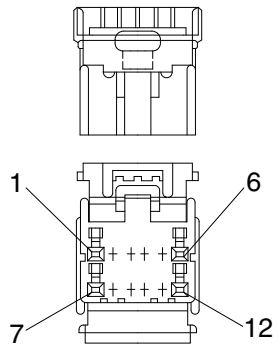
6) AMP ECONOSEAL CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
36	 344111-1	 344108-1

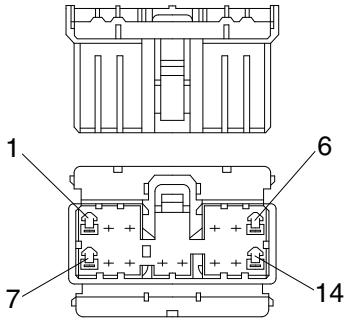
7) AMP TIMER CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 85202-1	

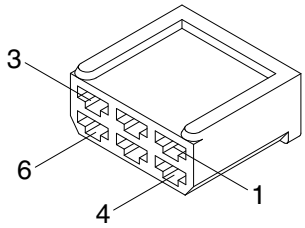
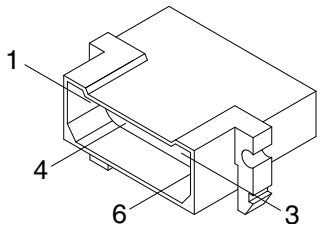
8) AMP 040 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
12	 174045-2	

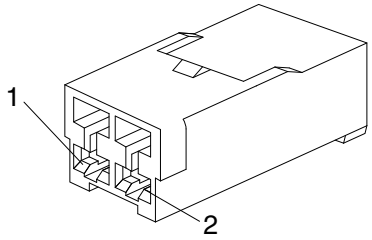
9) AMP 070 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
14	 173852	

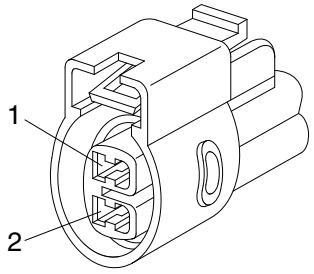
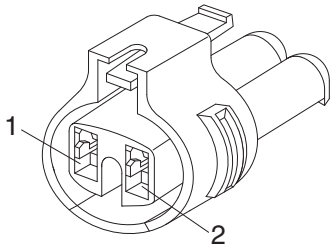
10) AMP FASTIN - FASTON CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 925276-0	 480003-9

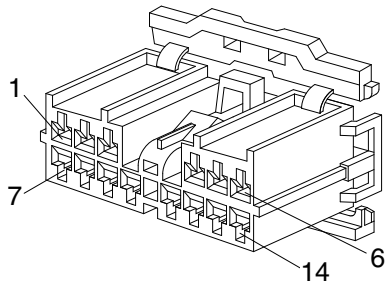
11) KET 090 CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 MG610070	

12) KET 090 WP CONNECTORS

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 MG640605	
2	 MG640795	

13) KET SDL CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
14	 MG610406	

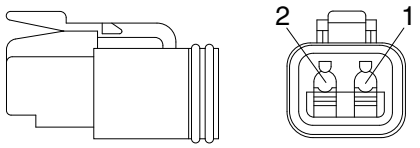
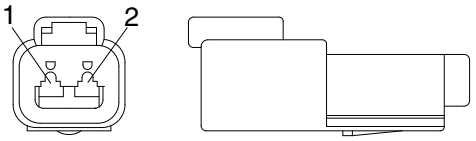
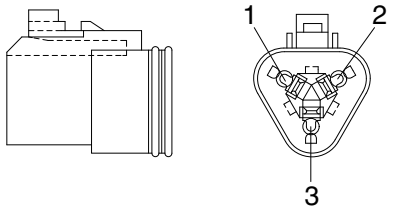
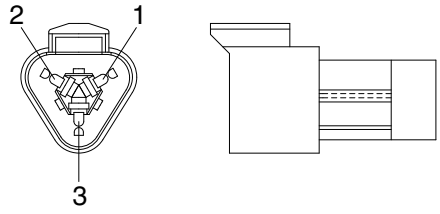
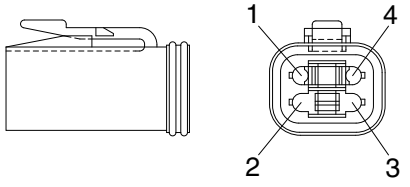
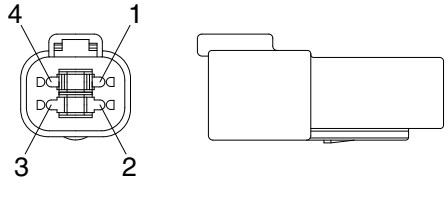
14) DEUTSCH DT CONNECTORS

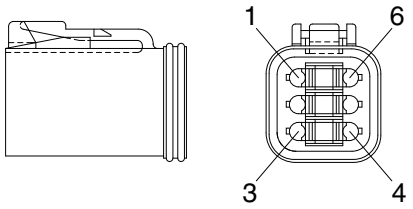
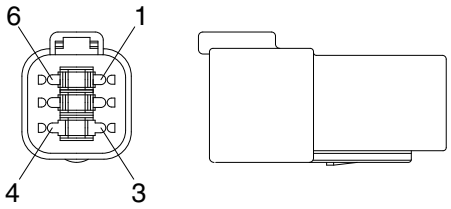
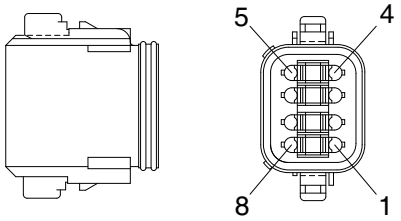
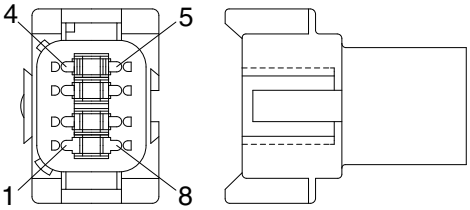
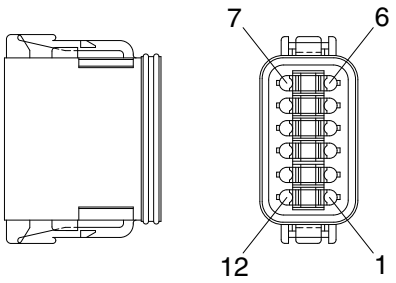
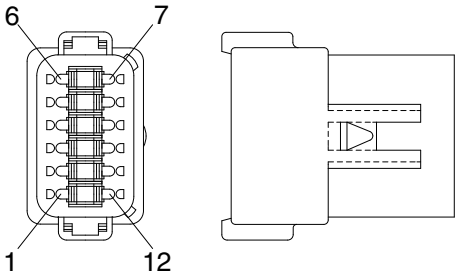
DT 06 - 3S - ★★★★

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

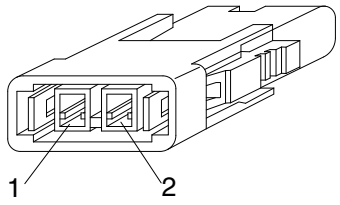
※ Modification

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

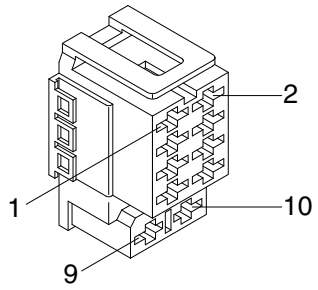
No. of pin	Receptacle connector (female)	Plug connector (male)
2	 DT06-2S	 DT04-2P
3	 DT06-3S	 DT04-3P
4	 DT06-4S	 DT04-4P

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 DT06-6S	 DT04-6P
8	 DT06-8S	 DT04-8P
12	 DT06-12S	 DT04-12P

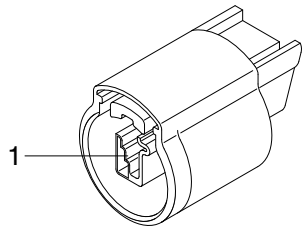
15) MOLEX 2CKTS CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 35215-0200	

16) ITT SWF CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
10	 SWF593757	

17) MWP NMWP CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 NMWP01F-B	