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# **VIBRATORY DRUM**

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# 1. PRECAUTIONS FOR DISASSEMBLY AND REASSEMBLY

- When removing, installing, disassembling or reassembling the unit, observe the general precautions described below.
- 1) Precautions for removal work
    - Coolant that contains antifreeze should be treated as a chemical, and must not be drained carelessly on the ground.
    - To prevent dust from getting into disconnected hoses and tubes, cover them with a plug or similar means.
    - When draining oil, use a receptacle with sufficient capacity to receive it.
    - Before proceeding with the work, look for matchmarks that show the installation location. For reassembly, place matchmarks in the required locations to prevent errors. Then remove.
    - When disconnecting wiring connectors, hold the connector components so that unreasonable force is not applied to the wires.
    - Label wires and hoses to ensure correct installation location.
    - Confirm the number and thickness of shims prior to storage.
    - When lifting parts, use lifting equipment of sufficient capacity.
    - When separating parts by using pull bolts, tighten the bolts alternately.
    - Before removing a unit, clean its surrounding area. Then after removal, cover it to prevent dust and other substances from getting in.
    - Before removing piping for hydraulic oil or coolant, or removing related parts, satisfactorily release internal pressure.
  - 2) Precautions for installation work
    - Tighten bolts and nuts (sleeve nuts) to the specified torque (screw tightening torque table).
    - When installing hoses, do not twist them or allow them to interfere with other parts.
    - Replace gaskets, O-rings, split pins, and lock plates with new parts.
    - Properly bend split pins and lock plates.
    - When applying an adhesive, first clean and remove oil/grease from the surfaces properly. Then apply two or three drops to the threaded areas.
    - When applying a liquid gasket, first clean and remove oil/grease from the application surface properly, and confirm that the surface is free of dust and damage. Then apply the product evenly.
    - Clean parts well. Repair scratches, dents, burrs, rust, etc.
    - Apply grease to rotating and sliding components.
    - Apply gear oil to the surfaces of press-fit parts.
    - After installing snap rings, confirm that they are properly seated in the grooves.
    - Connect wiring connectors securely after cleaning off adhering oil, dust and water.
    - Use lifting bolts that are not fatigued or deformed. Screw them in fully.
    - When tightening a split flange, tighten screws alternately to prevent uneven tightening.
    - Before installing hydraulic parts, confirm that they are free of damage and dust, etc.

### 3) Precautions when work is completed

- If coolant has been drained, securely retighten the drain valve and fill with coolant (mixing in long-life coolant) to the specified level. Start the engine and allow the coolant to circulate through the piping. Then add coolant again to the specified level.
- If hydraulic equipment has been removed and reinstalled, fill with hydraulic oil to the specified level. Start the engine and allow the oil to circulate through the piping. Then add oil again to the specified level.

## 2. VIBRATORY DRUM

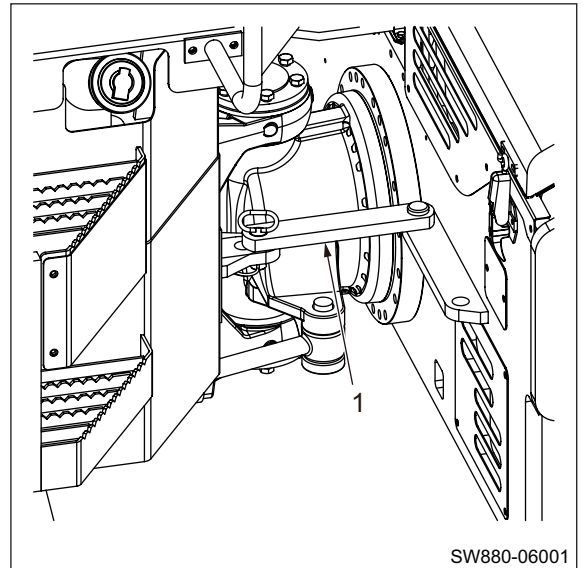
### 2-1. Removal and Installation of Vibratory Drum

#### 2-1-1. Removal of vibratory drum

- 1) Prior to disassembly of vibratory drum, completely drain water spray tank.

Water spray tank : 600 L×2 ( 158.5 gal.×2 )

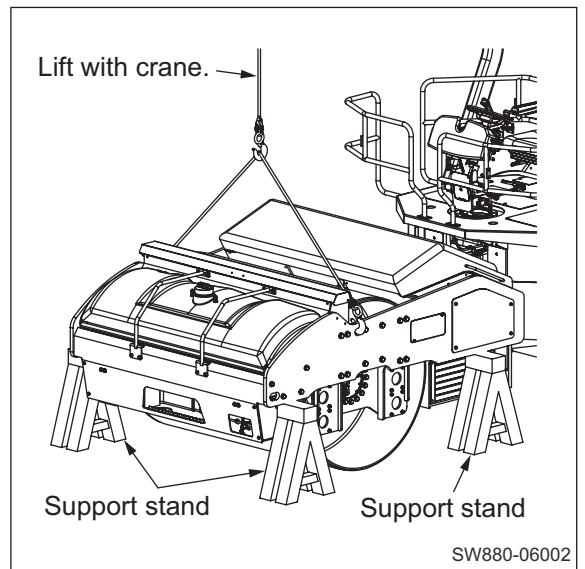
- 2) Joint front frame and rear frame with steering lock bar (1).



### **⚠ WARNING**

When lifting the vehicle body, use an appropriate hoist of sufficient strength. Confirm that the surrounding area is safe, and work in a natural, unstrained posture. Also, to firmly secure the vehicle body, use a support stand of sufficient strength.

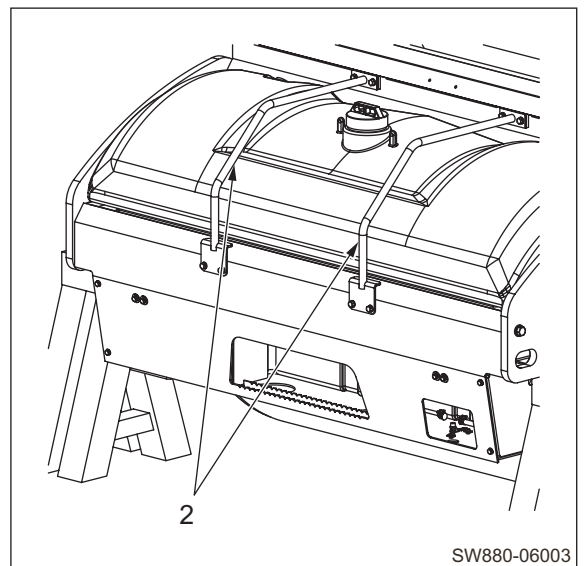
- 3) Lift frames with a crane.
  - With drum lifted a little off ground, place support stands under both sides of each frame to hold vehicle body in place. (The front and rear frames are structurally identical.)



kg

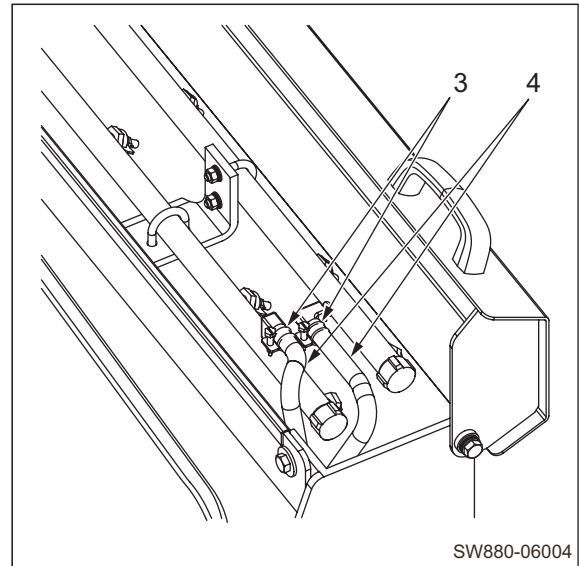
	Front frame	Rear frame
SW884	: 6,350 kg (14,000 lbs.)	6,540 kg (14,420 lbs.)
SW994	: 6,530 kg (14,395 lbs.)	6,740 kg (14,860 lbs.)
SW884ND	: 6,520 kg (14,375 lbs.)	6,710 kg (14,795 lbs.)
SW994ND	: 6,690 kg (14,750 lbs.)	6,900 kg (15,210 lbs.)

- 4) Remove guard pipes (2).

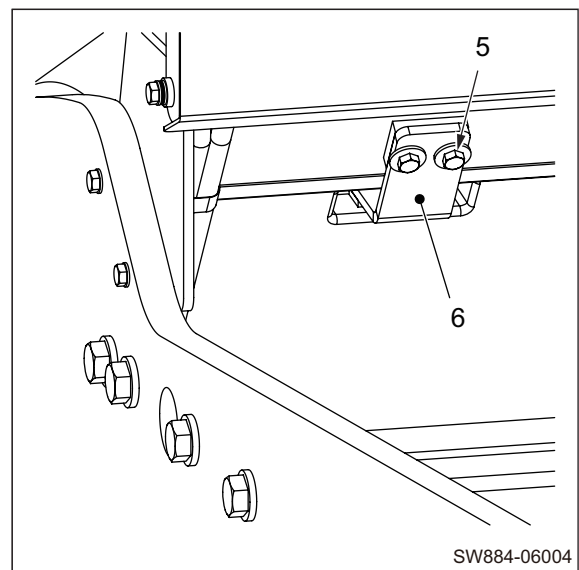


## VIBRATORY DRUM

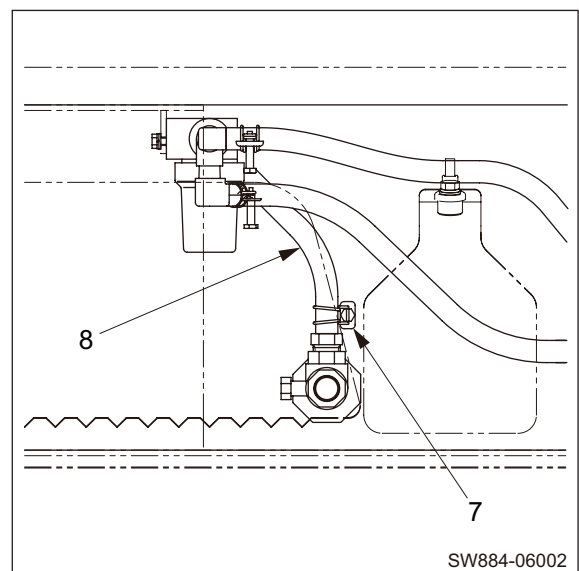
- 5) Loosen hose clamps (3) and remove water spray hoses (4).



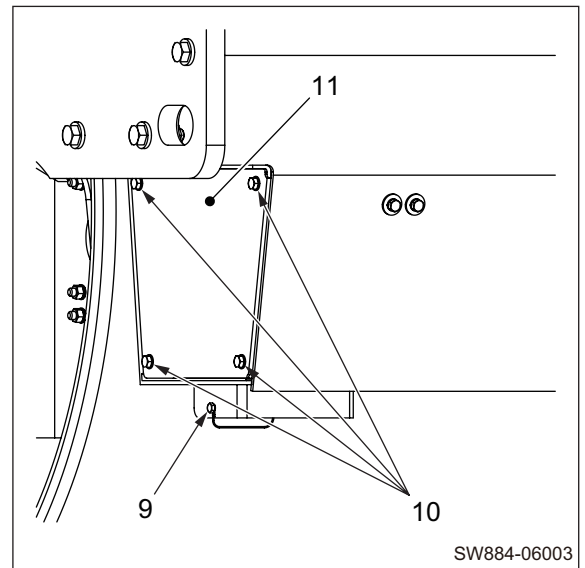
- 6) Remove two bolts (5) (left and right).  
• Pull out tank stoppers (6) (left and right).



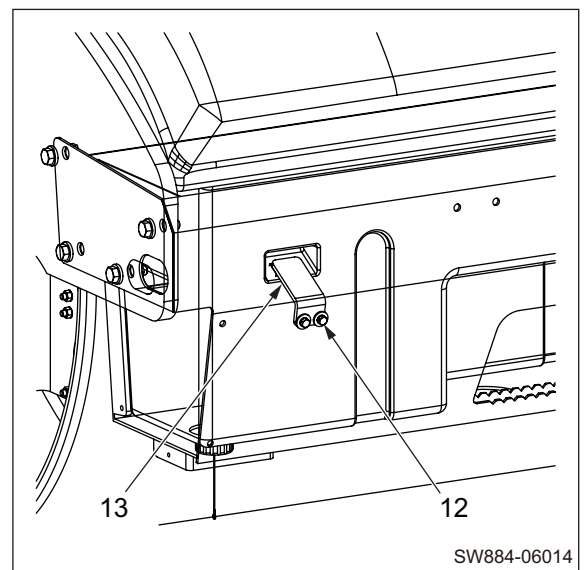
- 7) Loosen hose clamp (7) at outlet of water tank.  
• Disconnect water spray hose (8).



- 8) Remove bolt (9) fixing drain cap chain.
- Remove four cover fixing bolts (10) (left and right).
  - Remove covers (11) (left and right).




- 9) Remove two bolts (12) (left and right).
- Pull out tank stoppers (13) (left and right).

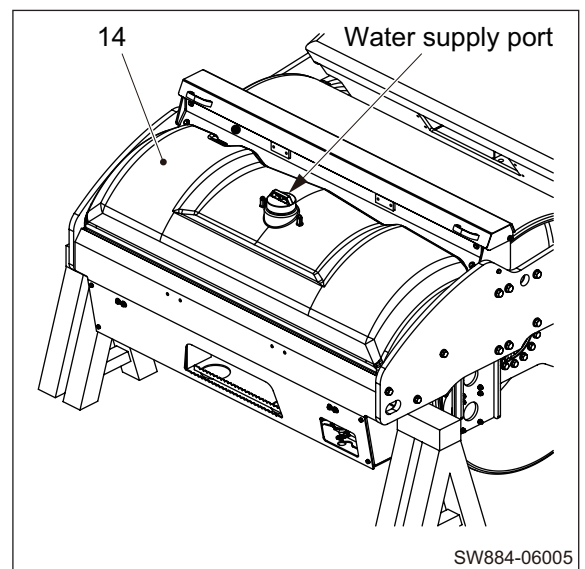


- 10) Lift water tank (14) with a crane and remove it from frame.

**(NOTICE)**

- **Lift the water tank at the water supply port so as not to damage the tank.**

 (14) Water tank : 50 kg (110 lbs.)



## VIBRATORY DRUM

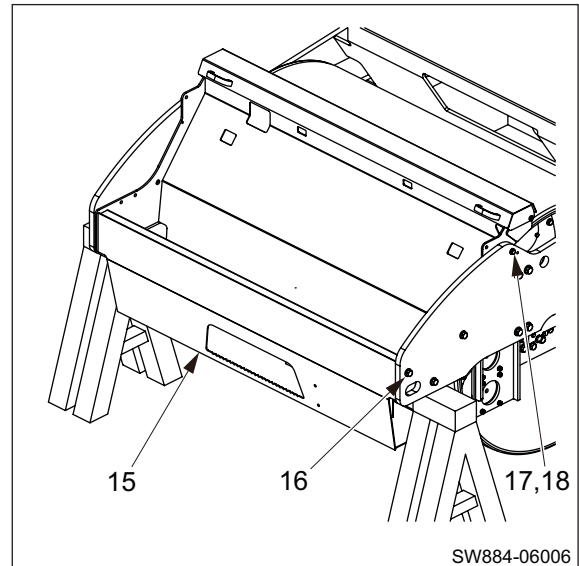
- 11) Lift cross member (15) with a crane and hold it.
- Remove three bolts (16) (left and right).
  - Remove bolts (17) and nuts (18) (left and right).
  - Lift cross member (15) and remove it from frame.



(15) Cross member

SW884/884ND : 295 kg (650 lbs.)

SW994/994ND : 345 kg (761 lbs.)



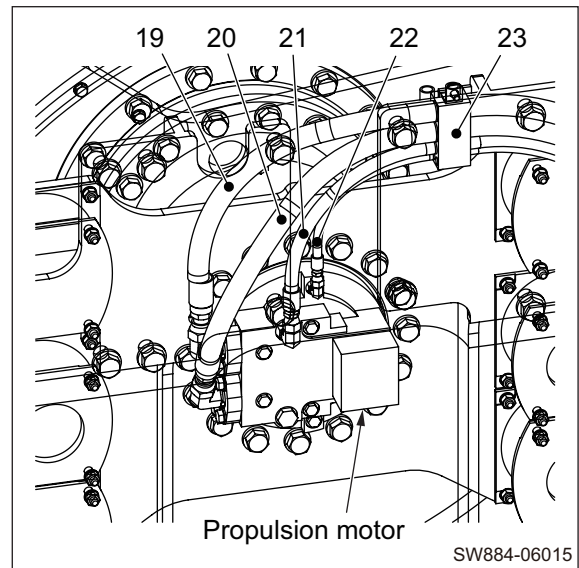
### **WARNING**

The hydraulic oil in the vehicle is hot and compressed immediately after the vehicle is stopped. Disconnecting the hydraulic hoses in this condition can cause burns. Wait for the hydraulic oil to cool down before starting the work.

- 12) Disconnection of piping

① Propulsion motor piping

- Remove hydraulic hose clamp (23).
- Disconnect four hydraulic hoses (19), (20), (21) and (22) connecting to propulsion motor.

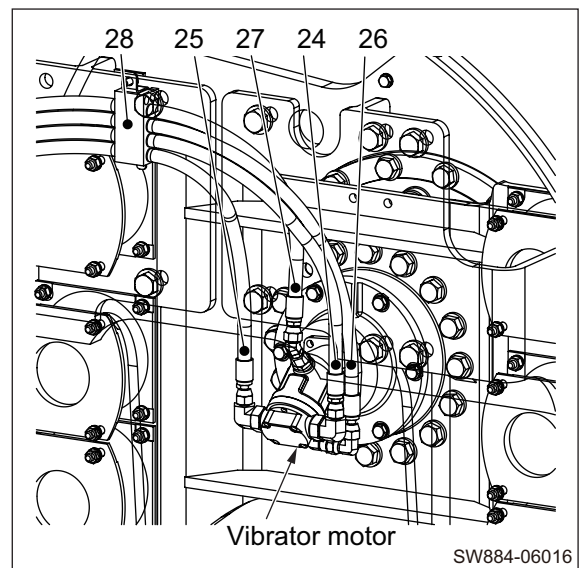


(NOTICE)

- Plug both ends of the disconnected hoses or implement other actions to prevent entry of foreign matter.

② Vibrator motor piping

- Remove hydraulic hose clamp (28).
- Disconnect four hydraulic hoses (24), (25), (26) and (27) connecting to the vibrator motor.



(NOTICE)

- Plug both ends of the disconnected hoses or implement other actions to prevent entry of foreign matter.



13) Remove twelve bolts (30).

- Lift off vibratory drum (29) from frame.

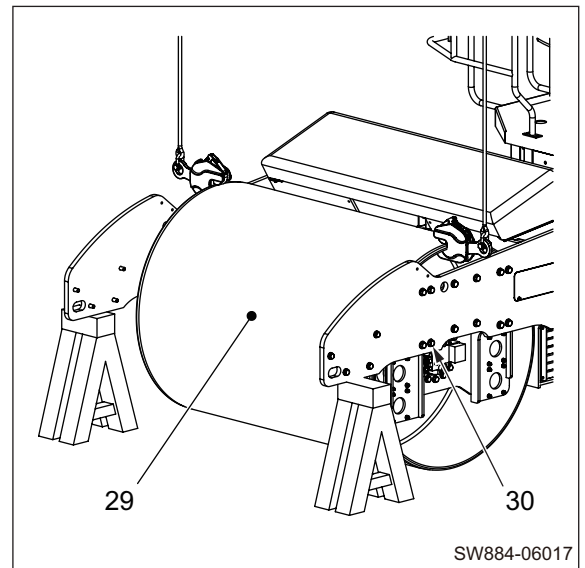
$\mathfrak{J}_{kg}$  (29) Drum

SW884 : 3,380 kg (7,452 lbs.)

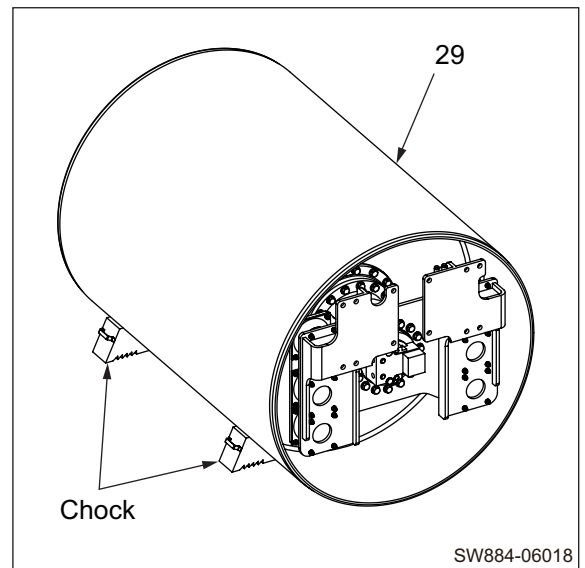
SW994 : 3,505 kg (7,727 lbs.)

SW884ND : 3,640 kg (8,025 lbs.)

SW994ND : 3,755 kg (8,278 lbs.)



14) Put chocks or like under removed drum (29) to prevent it from moving.



### 2-1-2. Installation of vibratory drum

- 1) Install vibratory drum in reverse order in which it was removed.
  - Tightening torques for bolts where particular care is required when installing vibratory drum.



- (16) Bolts M20× 70 : 539 N·m (398 lbf-ft)  
(SW884/884ND : Cross member)
- (16) Bolts M20×110 : 539 N·m (398 lbf-ft)  
(SW994/994ND : Cross member)
- (30) Nuts M22 : 685 N·m (505 lbf-ft)  
(Vibratory drum)

- 2) Upon installing vibratory drum, pay particular attention to following precaution.

### **WARNING**

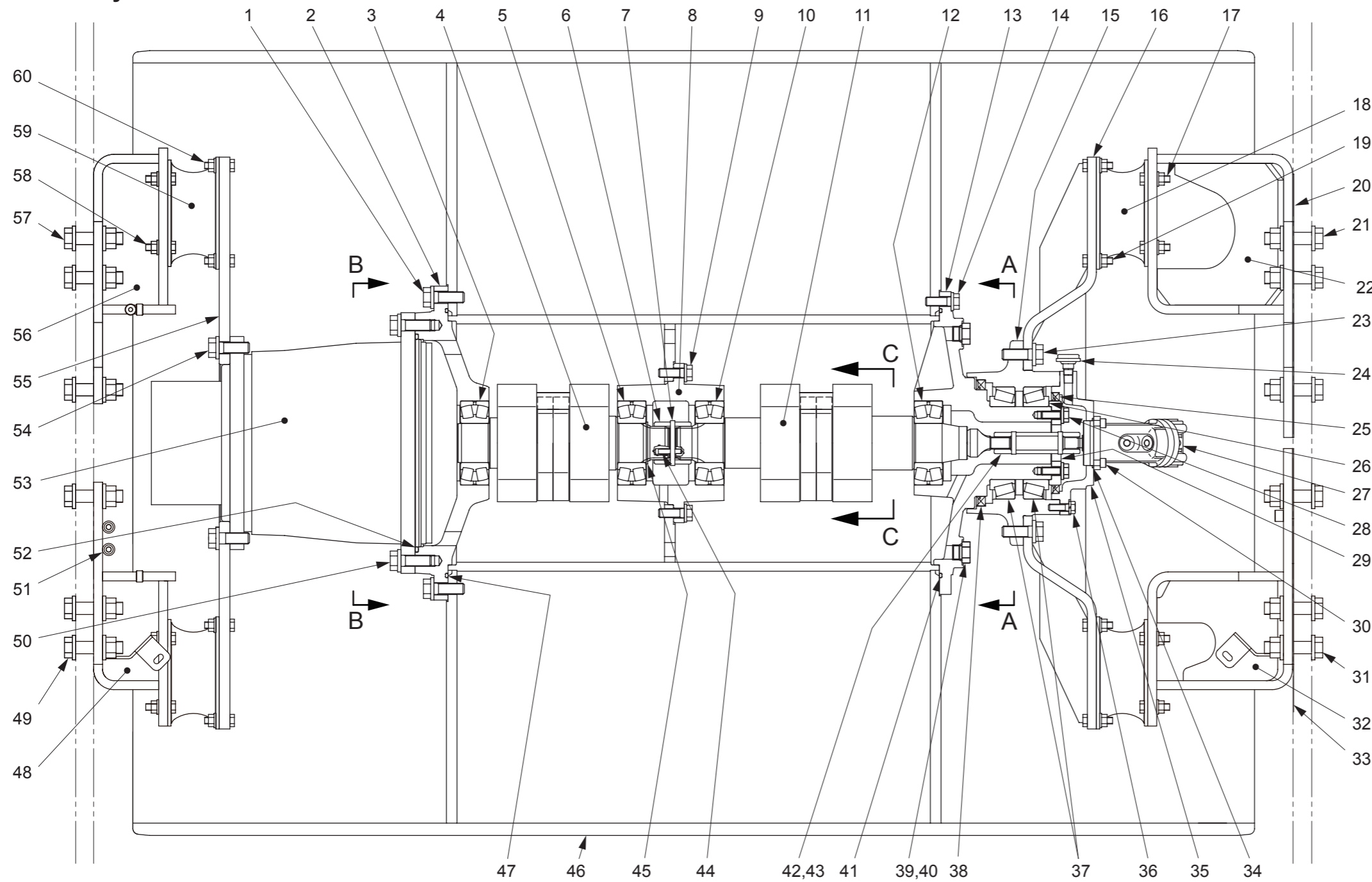
**If the engine is run at high speed or the cylinder is operated to full stroke when the engine is started for the first time after the work is completed, the piston packing or other items may be damaged by air entering into the cylinder.**

#### (NOTICE)

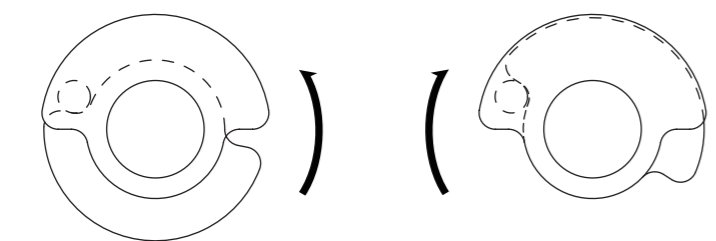
- Fill the hydraulic oil tank to the specified level to make up for any oil leakage.
- Start the engine and circulate the oil through the piping. Then check the oil level again, ensuring that the oil is at the specified level.

### 3. VIBRATORY DRUM ASSY (SW884/994)

#### 3-1. Vibratory Drum ASSY



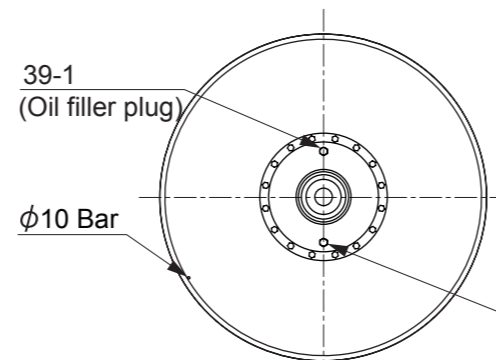
- |                       |         |                       |          |
|-----------------------|---------|-----------------------|----------|
| (1) Bolt              | :M20×60 | (31) Bolt             | :M22×90  |
| (2) Housing           |         | (32) Bracket          |          |
| (3) Vibrator bearing  |         | (33) Shim             |          |
| (4) Eccentric shaft   |         | (34) O-ring           |          |
| (5) Vibrator bearing  |         | (35) Cover            |          |
| (6) Sleeve            |         | (36) Bolt             | :M12×40  |
| (7) Spring pin        |         | (37) Roller bearing   |          |
| (8) Housing           |         | (38) Oil seal         |          |
| (9) Bolt              | :M16×50 | (39) Plug             |          |
| (10) Vibrator bearing |         | (40) O-ring           |          |
| (11) Eccentric shaft  |         | (41) O-ring           |          |
| (12) Vibrator bearing |         | (42) Sleeve           |          |
| (13) Axle shaft       |         | (43) Spring pin       |          |
| (14) Bolt             | :M16×50 | (44) Spring pin       |          |
| (15) Housing          |         | (45) Retaining ring   |          |
| (16) Bracket          |         | (46) Drum             |          |
| (17) Bolt             | :M12×45 | (47) O-ring           |          |
| (18) Damper           |         | (48) Bracket          |          |
| (19) Bolt             | :M12×45 | (49) Bolt             | :M22×90  |
| (20) Shim             |         | (50) Bolt             | :M20×60  |
| (21) Bolt             | :M22×90 | (51) Bolt             | :M10×100 |
| (22) Bracket          |         | (52) O-ring           |          |
| (23) Bolt             | :M20×60 | (53) Propulsion motor |          |
| (24) Breather         |         | (54) Bolt             | :M20×60  |
| (25) Oil seal         |         | (55) Plate            |          |
| (26) Shim             |         | (56) Bracket          |          |
| (27) Vibrator motor   |         | (57) Bolt             | :M22×90  |
| (28) Bolt             | :M14×40 | (58) Bolt             | :M12×45  |
| (29) Cover            |         | (59) Damper           |          |
| (30) Bolt             | :M10×30 | (60) Bolt             | :M12×45  |



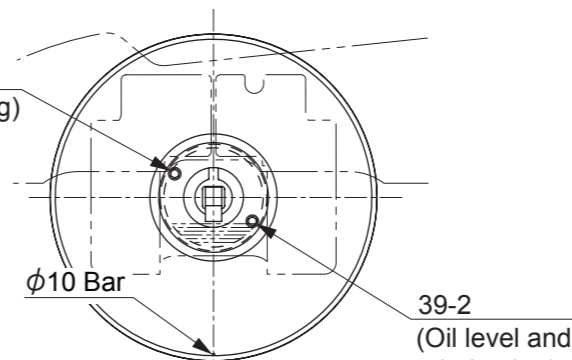
Vibration mode: Low  
Counterclockwise rotation

Vibration mode: High  
Clockwise rotation

SECTION C-C



SECTION B-B



SECTION A-A

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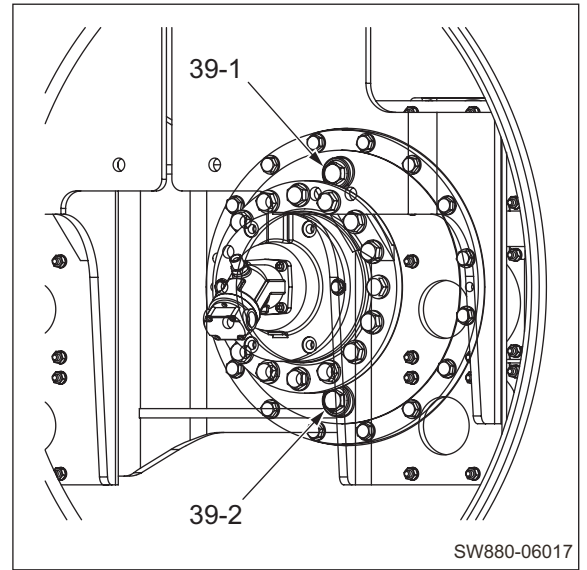


### 3-2. Disassembly and Reassembly of Vibratory Drum

- Lead line numbers shown in illustrations for the following vibratory drum disassembly and reassembly procedures are constant with part numbers of vibratory drum ASSY shown on page 6-009.

#### 3-2-1. Disassembly of vibratory drum

- 1) Remove plugs (39-1) and (39-2).
  - Drain gear oil.
  - Quantity of gear oil : 22 L (5.8 gal.)
  - Install plugs.

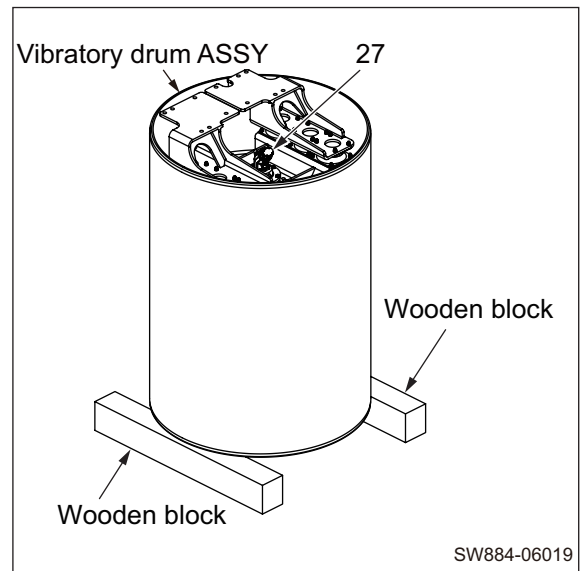


**⚠ WARNING**

When standing the drum, use wooden blocks of sufficient strength to securely support the drum.

- 2) Lift vibratory drum ASSY with a crane and stand it with its vibrator motor (27) side facing up as shown on the right.

$\mathfrak{J}_{kg}$  Vibratory drum ASSY  
 SW884 : 3,360 kg (7,407 lbs.)  
 SW994 : 3,485 kg (7,683 lbs.)

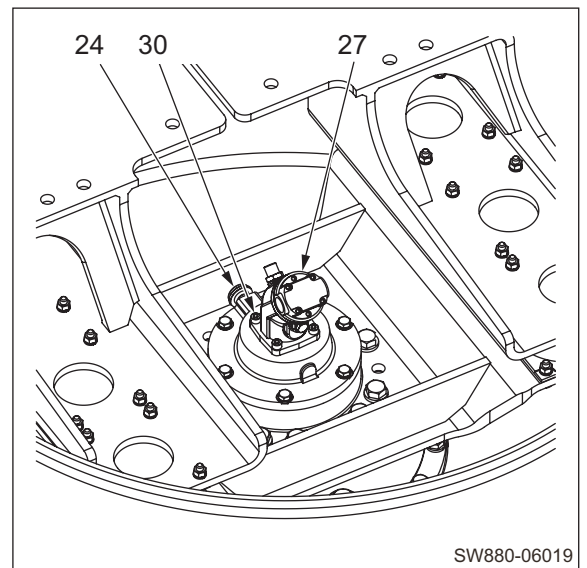


**⚠ WARNING**

Carry out the work in an unstrained posture using a work stool or the like.

- 3) Remove bolts (30).
  - Remove vibrator motor (27).
  - Remove breather (24).

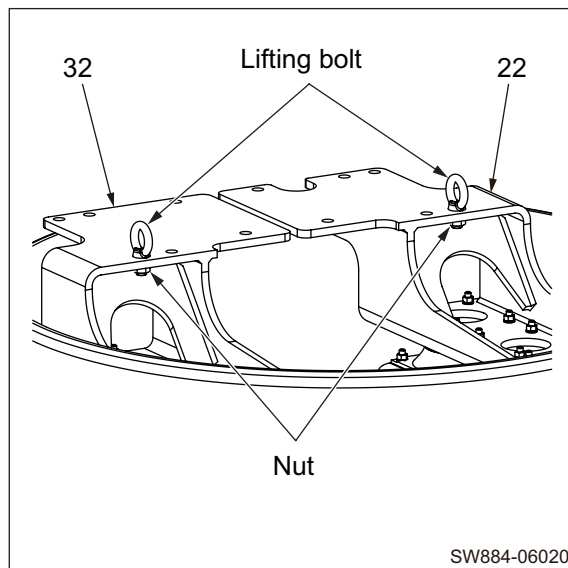
$\mathfrak{J}_{kg}$  (27) Vibrator motor : 6 kg (13 lbs.)



**WARNING**

When installing lifting bolts, screw them with nuts.


- 4) Install lifting bolts (M22) to brackets (22) and (32) with nuts.

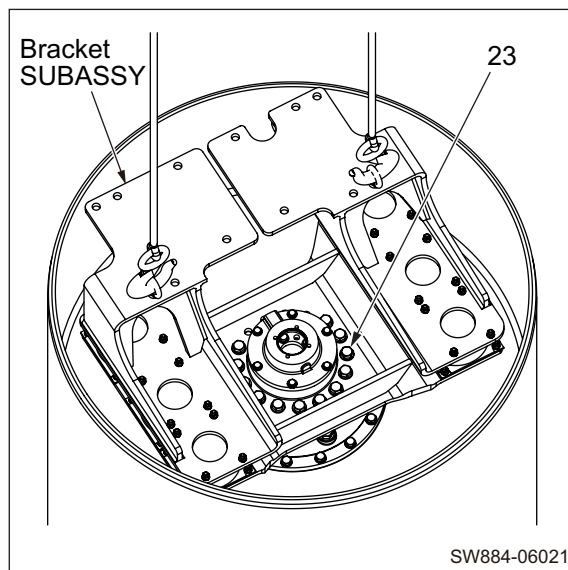


- 5) Remove bolts (23).
  - Remove bracket SUBASSY.

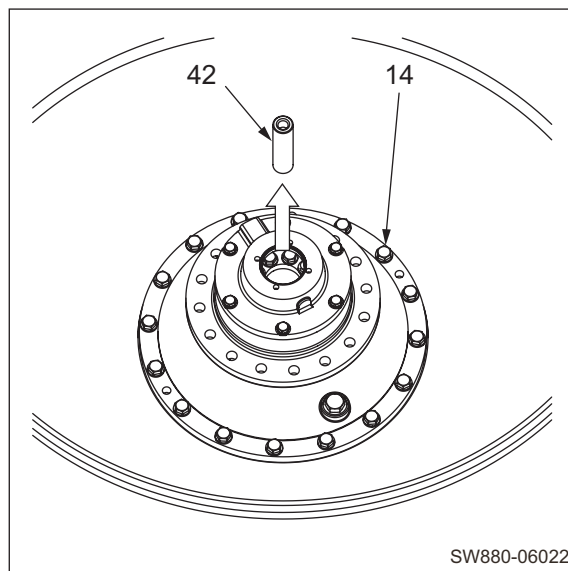
**(NOTICE)**

- Since parts cannot be lifted in a level position in the illustrated state, lift them using a support or like until spigot joint of housing is disengaged.

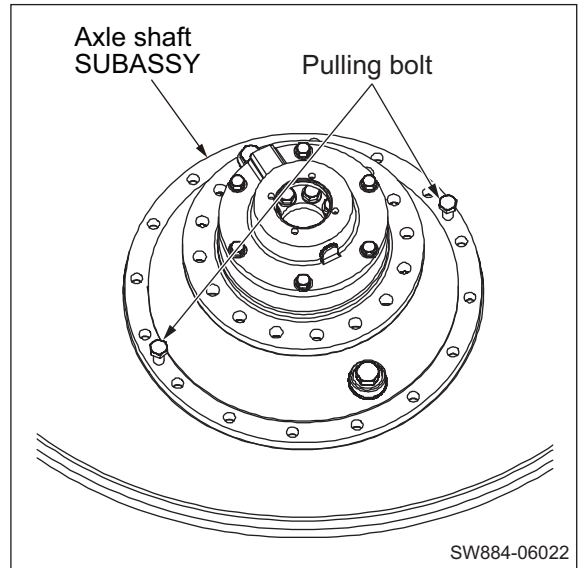
 **kg** Bracket SUBASSY  
 SW884 : 285 kg (628 lbs.)  
 SW994 : 290 kg (639 lbs.)



- 6) Remove sleeve (42).
  - Remove bolts (14).

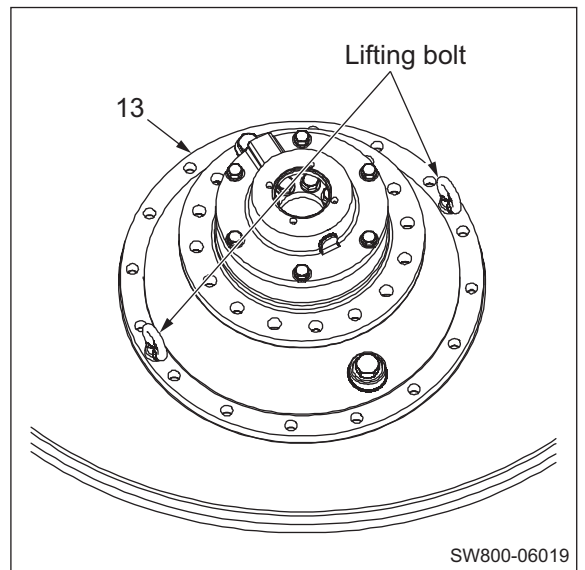


7) Lift axle shaft SUBASSY using two pulling bolts (M16×50).



**⚠ WARNING**  
 When installing lifting bolts, screw in the threads fully before using.

8) Install lifting bolts (M16) to axle shaft (13).



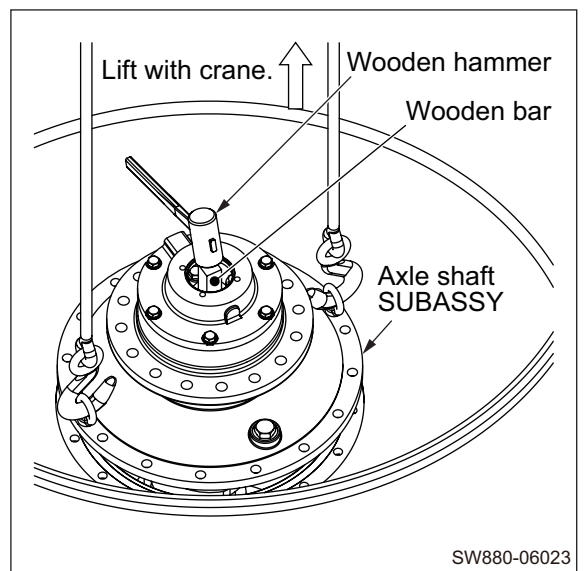
9) Remove axle shaft SUBASSY.

$\mathfrak{J}_{kg}$  Axle shaft SUBASSY : 135 kg (298 lbs.)

**(NOTICE)**

- In order not to lift eccentric shaft together with axle shaft SUBASSY, tap on the eccentric shaft end with a wooden hammer via a wooden bar during lifting.


(To step 25))



## ⚠ WARNING

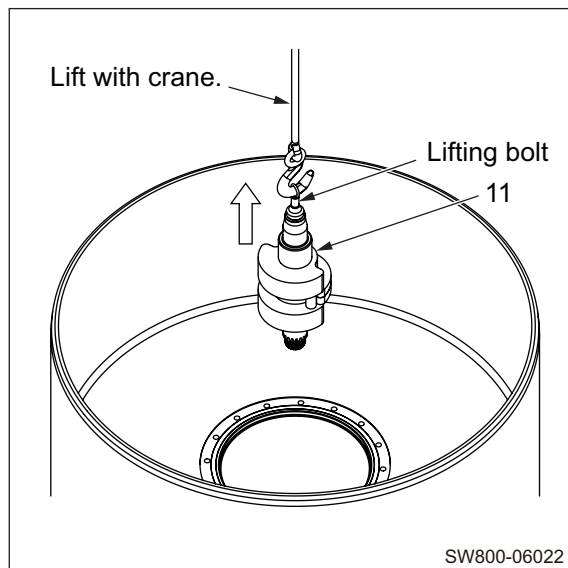
Take care not to get your fingers caught in movable weights.

- 10) Install a lifting bolt (M8) to eccentric shaft (11).
- Remove eccentric shaft.

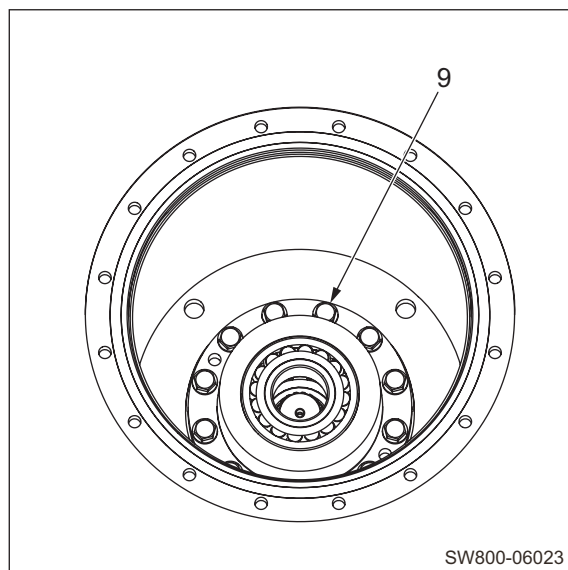
 (11) Eccentric shaft : 55 kg (121 lbs.)

### (NOTICE)

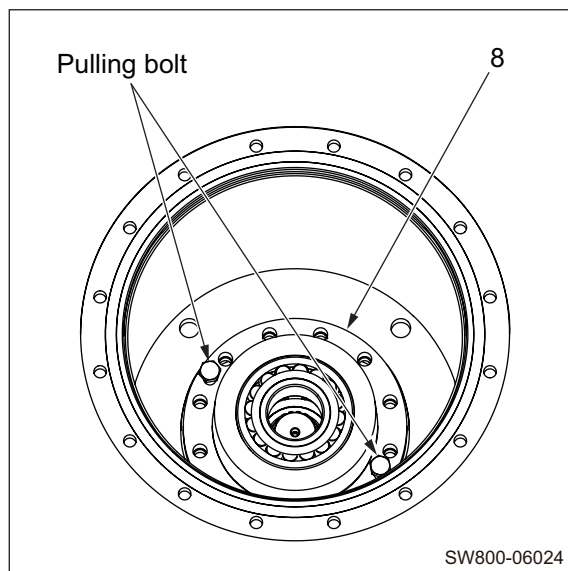
- Put the movable weight at its outmost position.



- 11) Remove bolts (9).

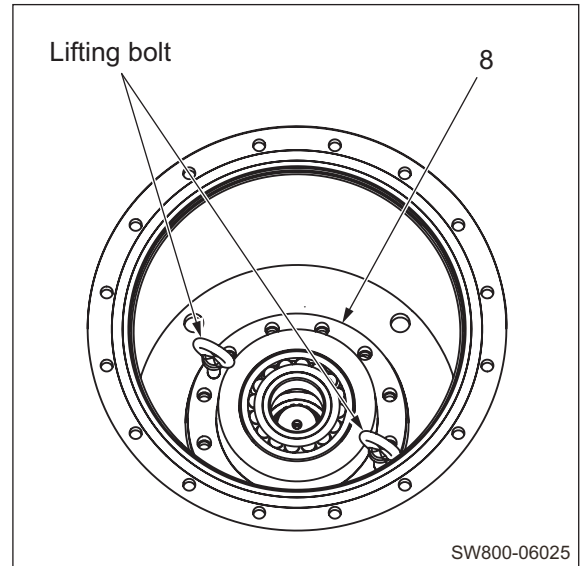


- 12) Lift housing (8) using two pulling bolts (M16×50).





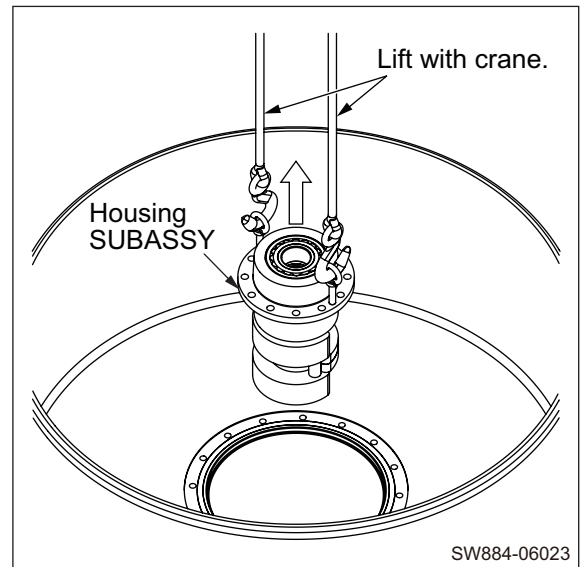
13) Install lifting bolts (M16) to housing (8).



14) Remove housing SUBASSY.

$\text{J}_{kg}$  Housing SUBASSY : 90 kg (198 lbs.)

(To step 30))

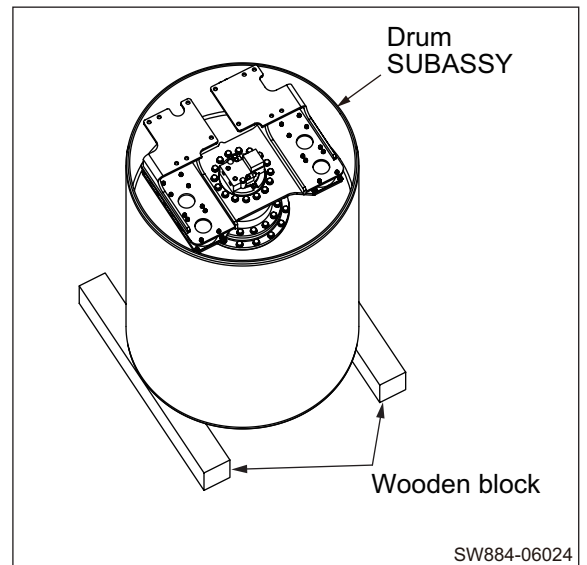


**⚠ WARNING**

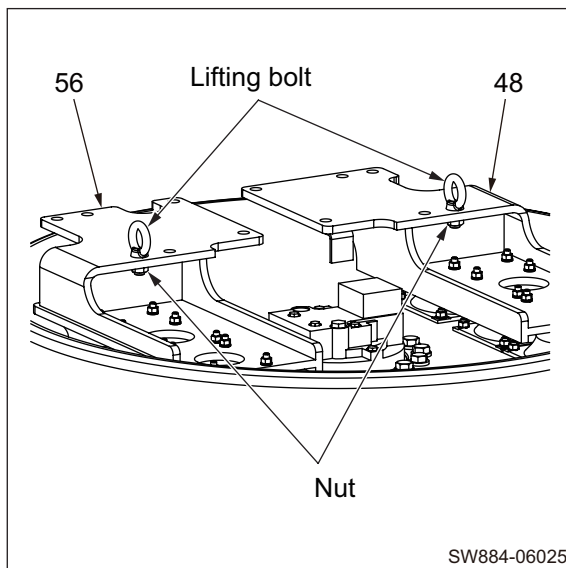
Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

15) Reverse drum SUBASSY.

$\text{J}_{kg}$  Drum SUBASSY  
 SW884 : 2,780 kg (6,129 lbs.)  
 SW994 : 2,900 kg (6,393 lbs.)



16) Install lifting bolts (M22) to brackets (48) and (56) with nuts.




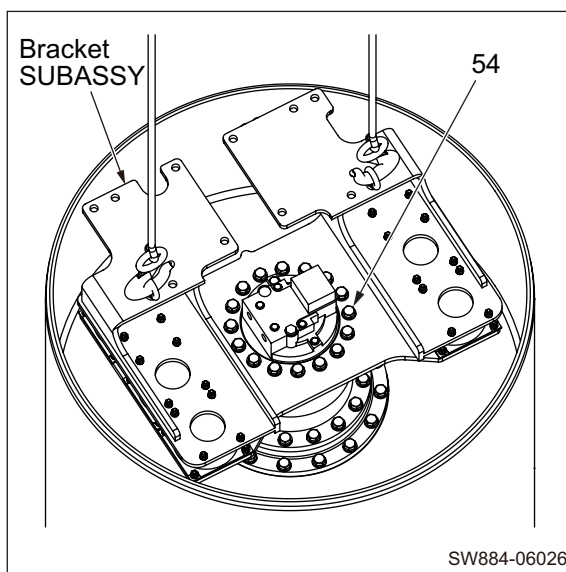
17) Remove bolts (54).

- Remove bracket SUBASSY.

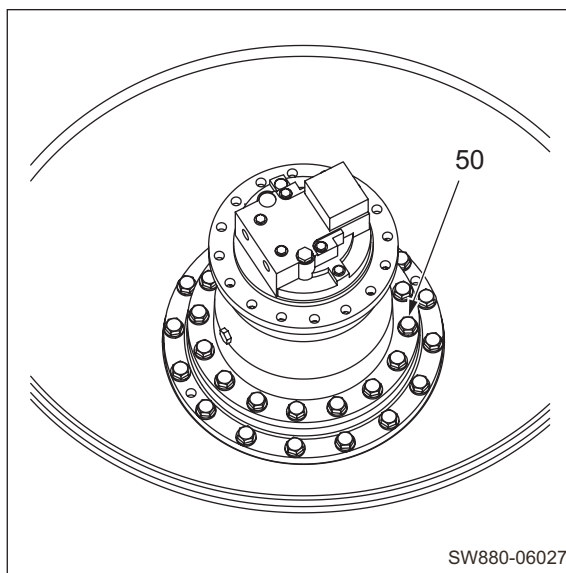
**(NOTICE)**

- Since parts cannot be lifted in a level position in the illustrated state, lift them using a support or like until spigot joint of housing is disengaged.

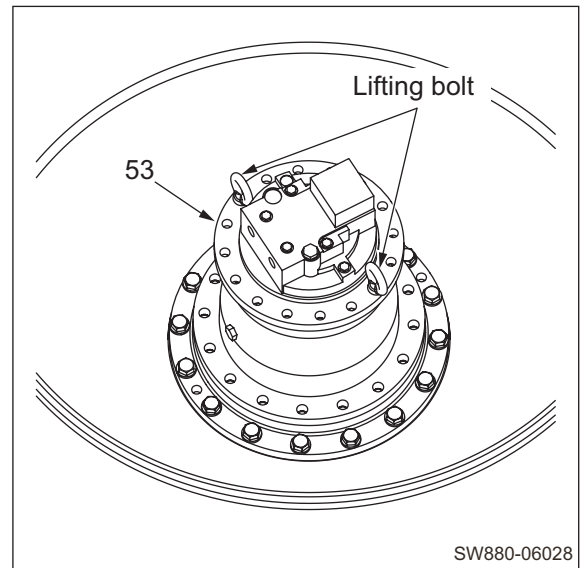
  $k_g$  Bracket SUBASSY  
 SW884 : 230 kg (507 lbs.)  
 SW994 : 240 kg (529 lbs.)



18) Remove bolts (50).

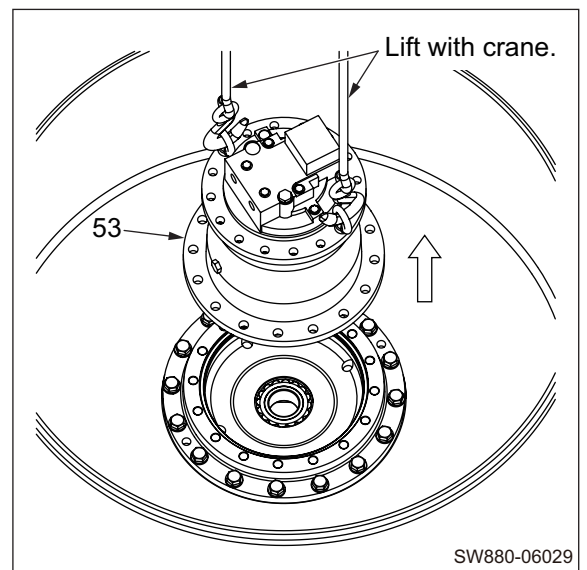


19) Install lifting bolts (M20) to propulsion motor (53).

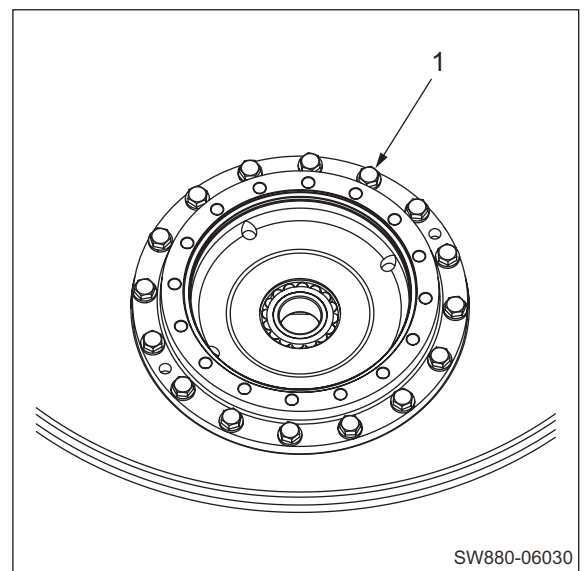


20) Remove propulsion motor (53).

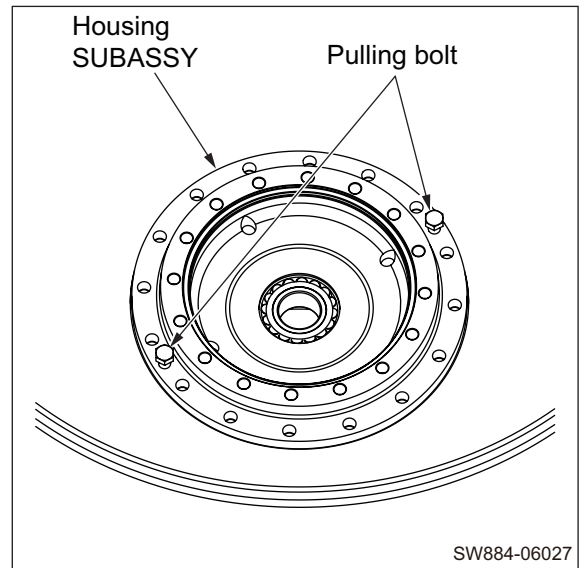
$\mathfrak{J}_{kg}$  (53) Propulsion motor : 215 kg (474 lbs.)



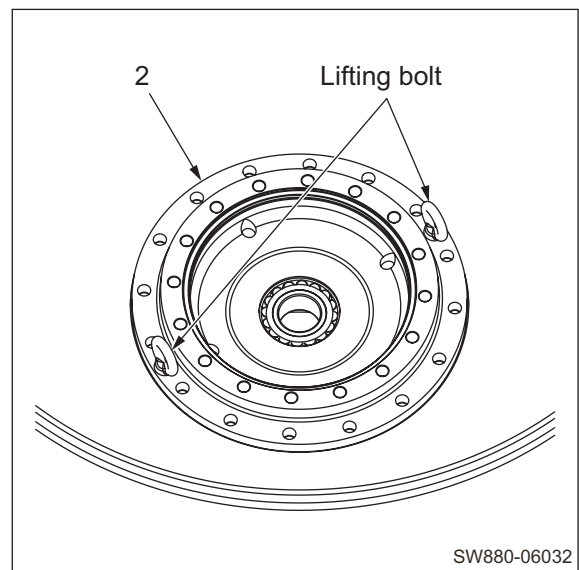
21) Remove bolts (1).



22) Lift housing SUBASSY using two pulling bolts (M20×50).

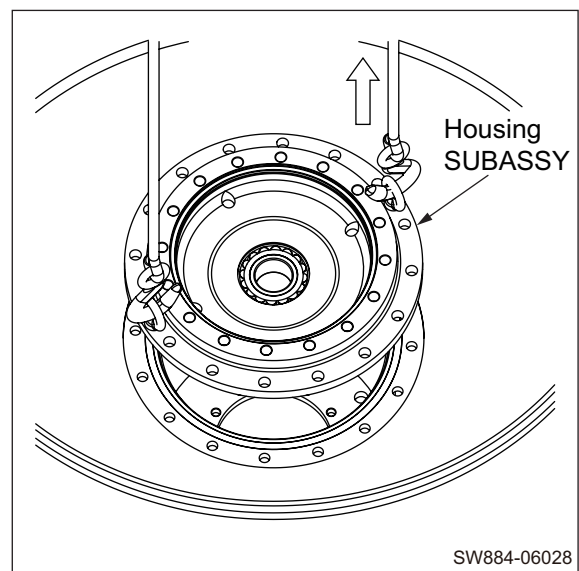


23) Install lifting bolts (M20) to housing (2).



24) Remove housing SUBASSY.

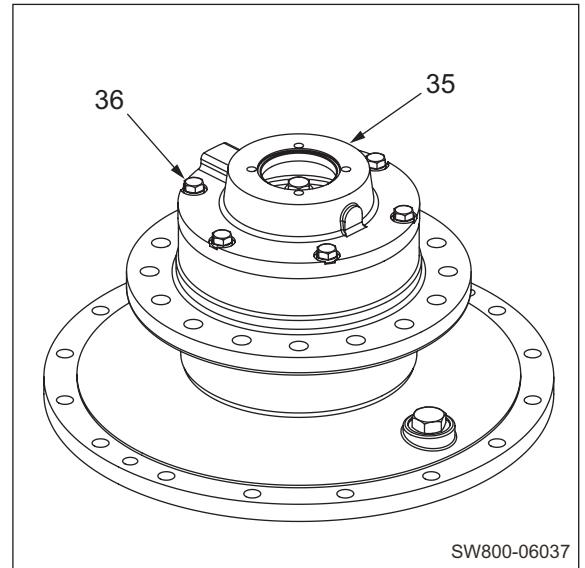
  $k_g$  Housing SUBASSY : 75 kg (165 lbs.)



## 25) Disassembly of axle shaft SUBASSY

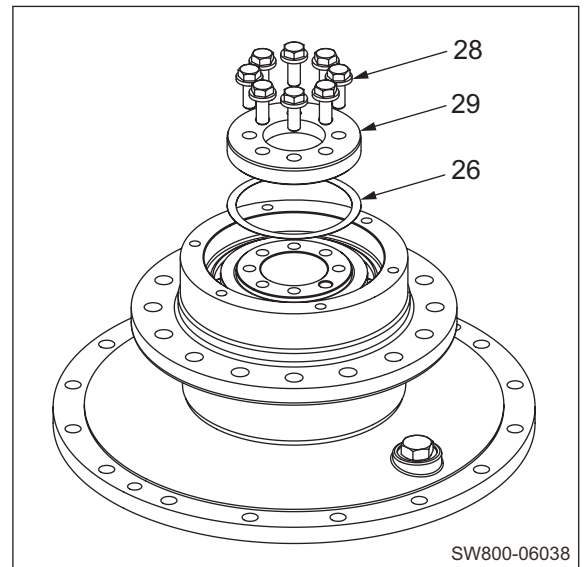
(From step 9))

- Remove bolts (36).
- Remove cover (35).



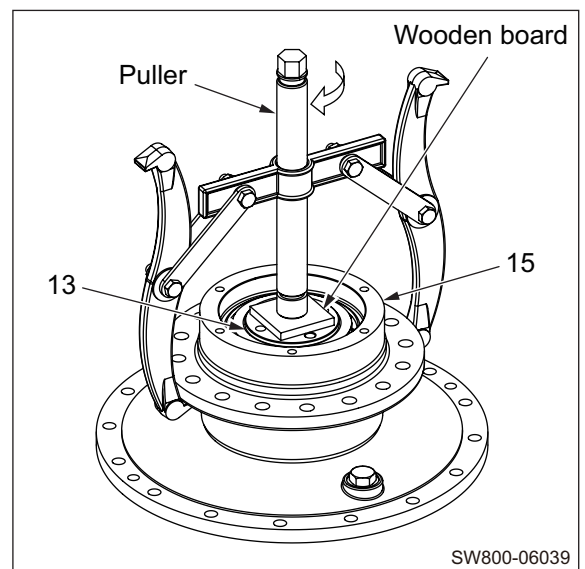
## 26) Remove bolts (28).

- Remove cover (29).
- Remove shim (26).

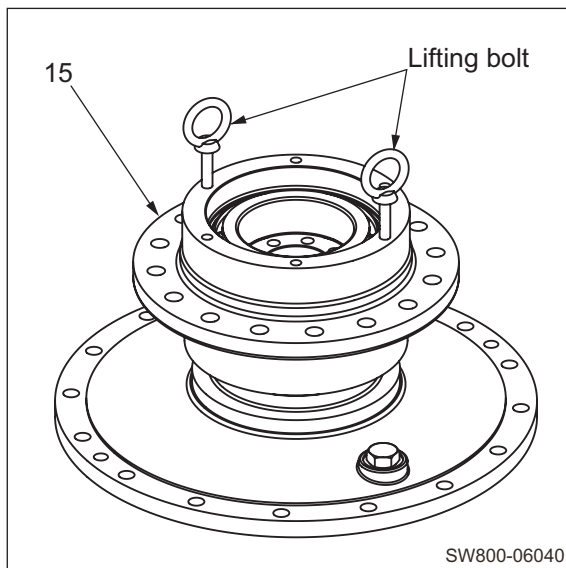


## 27) Put a piece of wooden board on end of axle shaft (13).


- Set a puller on housing (15).
- Remove housing SUBASSY with roller bearing from axle shaft SUBASSY.

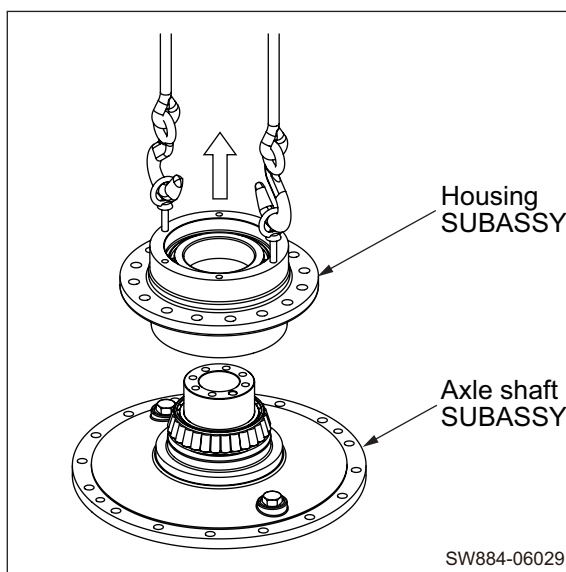


28) Install lifting bolts (M12) to housing (15).




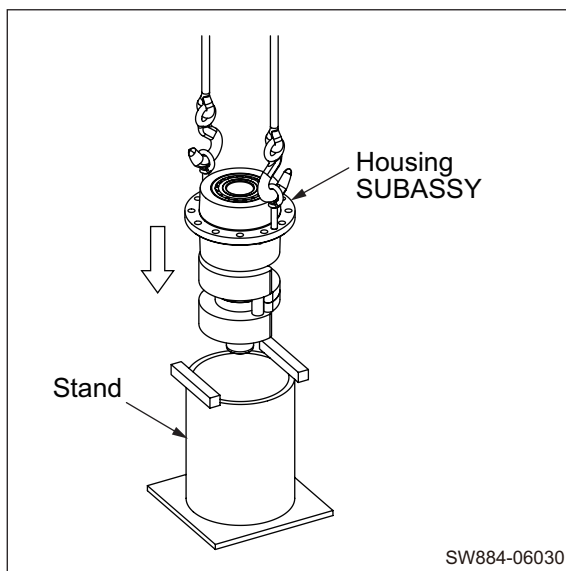
29) Remove housing SUBASSY from axle shaft SUBASSY.

 Housing SUBASSY : 45 kg (99 lbs.)

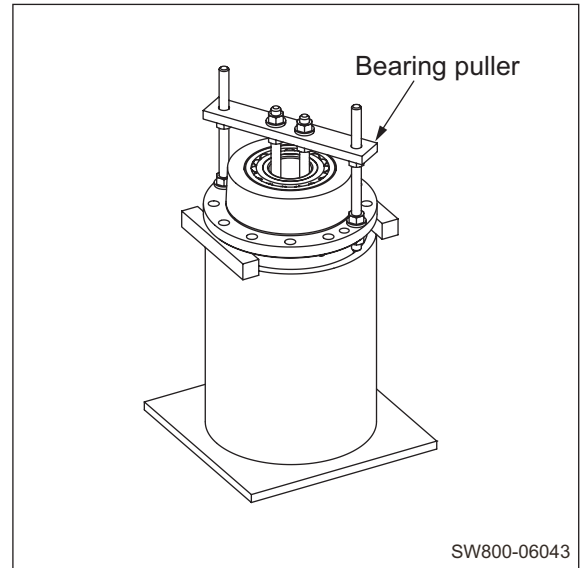
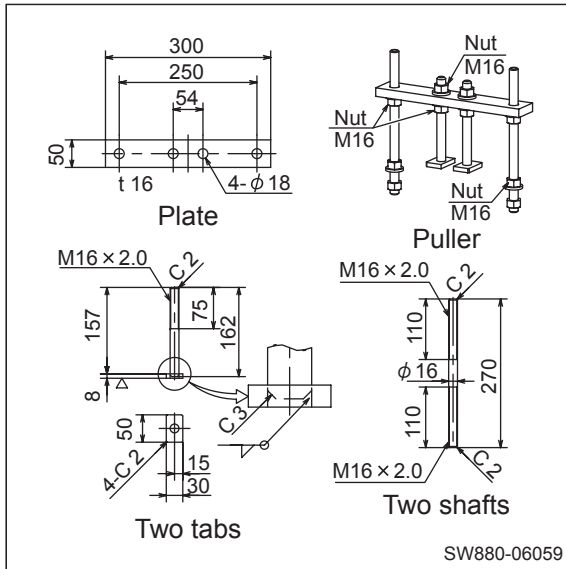


30) Put housing SUBASSY on a stand as shown.  
(From step 14))

 Housing SUBASSY : 90 kg (198 lbs.)



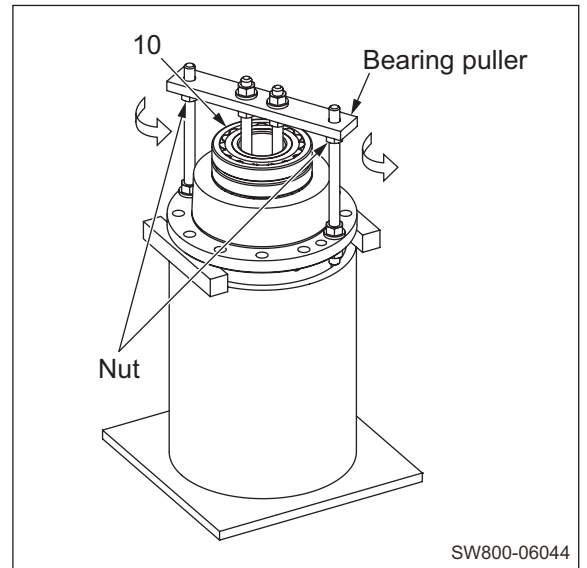
31) Set up a bearing puller.



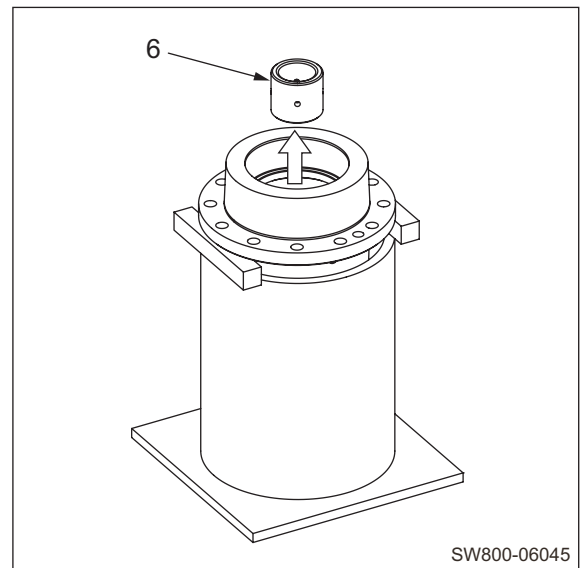
32) Turn nuts of bearing puller counterclockwise to remove vibrator bearing (10).

**(NOTICE)**

- To prevent the inner race of the vibrator bearing from tilting, alternately turn the nuts on both sides of the puller.



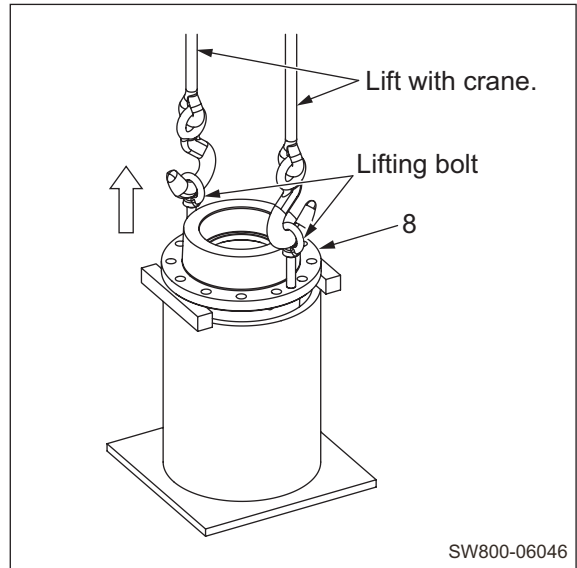
33) Remove sleeve (6).



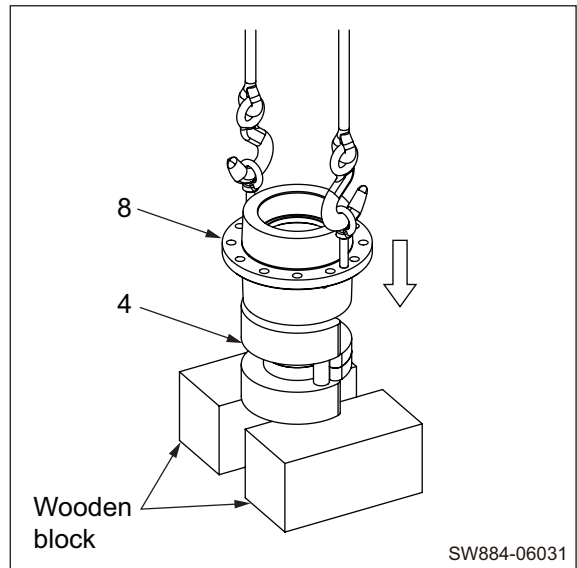
34) Install lifting bolts (M16) to housing (8).

- Remove housing.

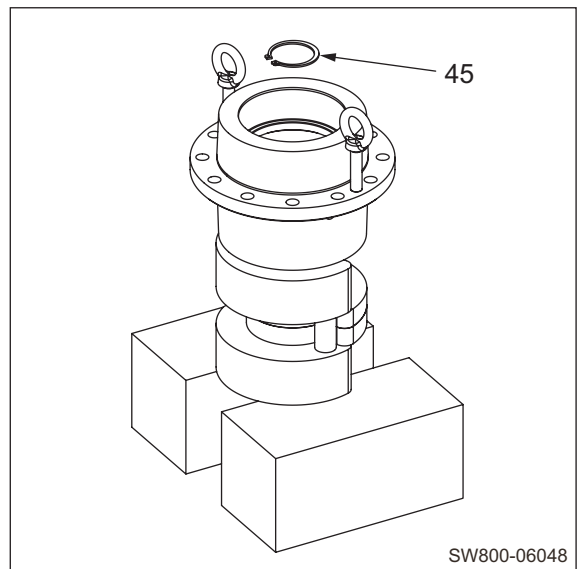
$\mathfrak{J}_{kg}$  (8) Housing : 85 kg (187 lbs.)



35) Put housing (8) and eccentric shaft (4) lifted with a crane on wooden blocks.




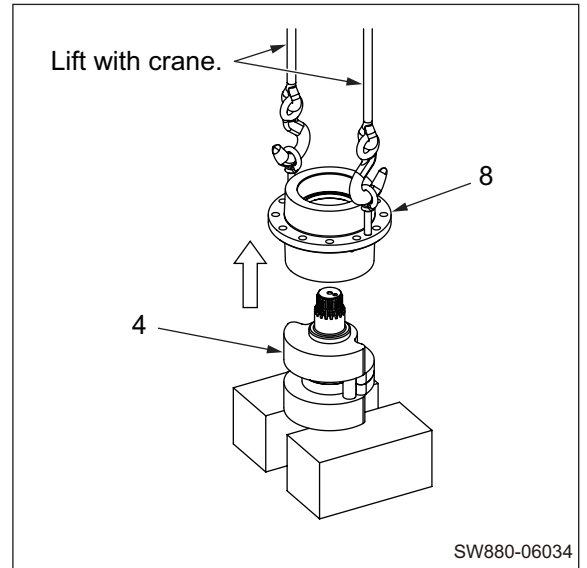
36) Remove retaining ring (45).



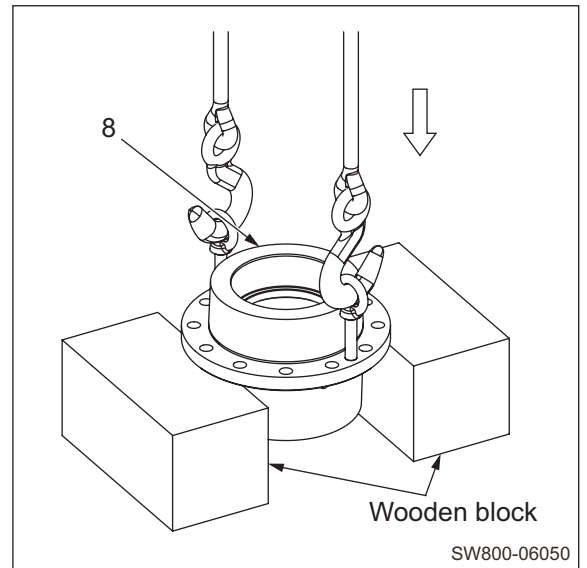


37) Remove housing (8) from eccentric shaft (4).

 (8) Housing : 40 kg (88 lbs.)



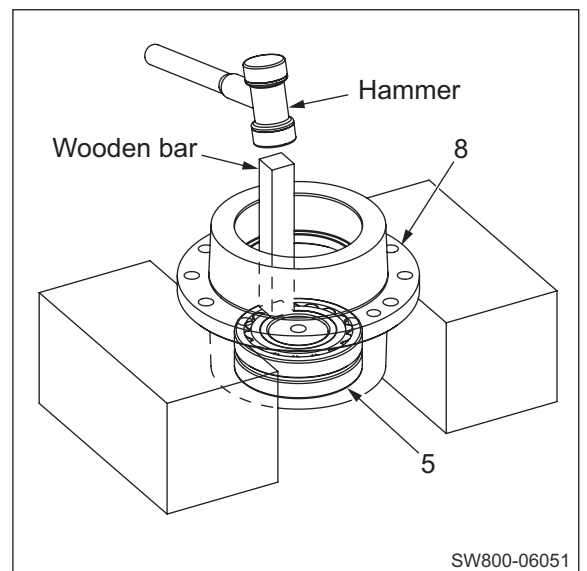
38) Put housing (8) on wooden blocks.



39) Tap on the bearing (5) with a hammer via a wooden bar or like to remove it from housing (8).

**(NOTICE)**

- Be careful not to damage the bearing.



### 3-2-2. Reassembly of vibratory drum

- Before reassembling, clean disassembled parts well and check that there is no abnormality.


#### **WARNING**

- When standing the drum, use wooden blocks of sufficient strength to securely support the drum.
- Carry out the work in an unstrained posture using a work stool or the like.

- 1) Lift drum (46) with a crane and put it with propulsion motor side facing up.

#### (NOTICE)

- The side on which no  $\phi 10$  round bar is installed is the propulsion motor side.

 (46) Drum

SW884 : 2,245 kg (4,949 lbs.)

SW994 : 2,355 kg (5,192 lbs.)

- 2) Reassembly of housing SUBASSY

- Apply a coat of gear oil to housing (2) at where vibrator bearing will be press-fitted.
- Drive vibrator bearing (3).

#### (NOTICE)


- Take care not to damage the bearing when installing it.

- Apply grease to O-ring (47).
- Install O-ring to housing.

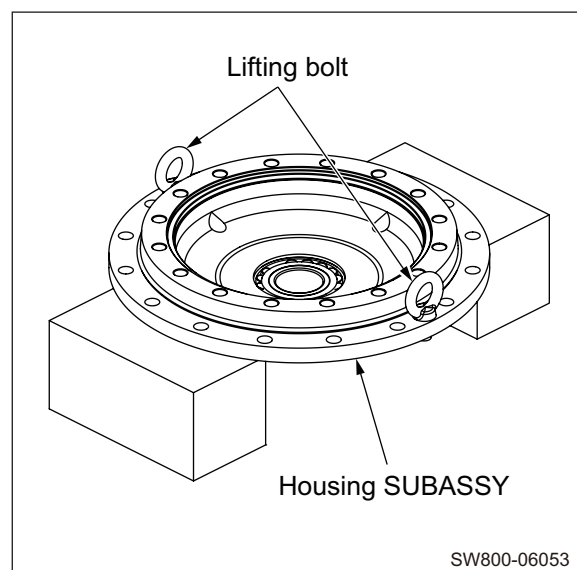
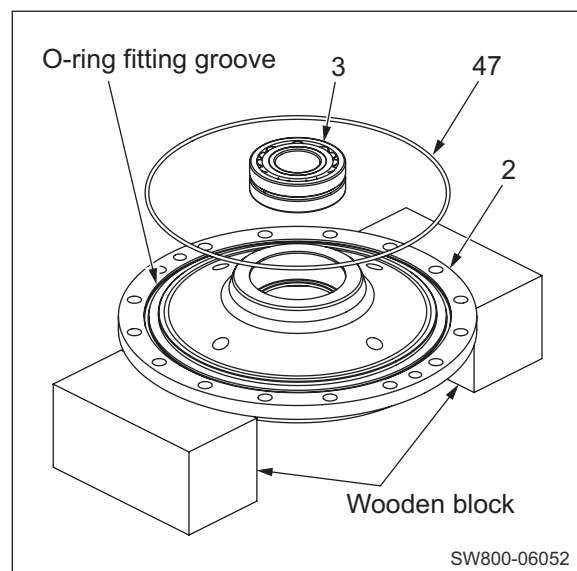
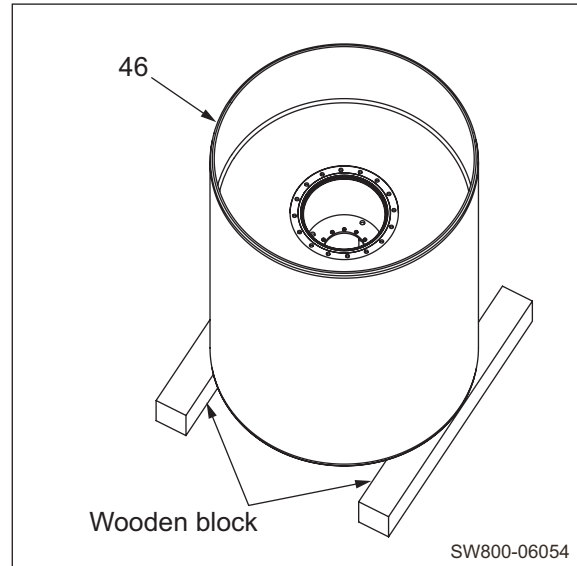
#### **WARNING**

When installing lifting bolts, screw in the threads fully before using.


- Reverse housing SUBASSY.

 Housing SUBASSY : 75 kg (165 lbs.)

- Install lifting bolts (M20) to housing (2).

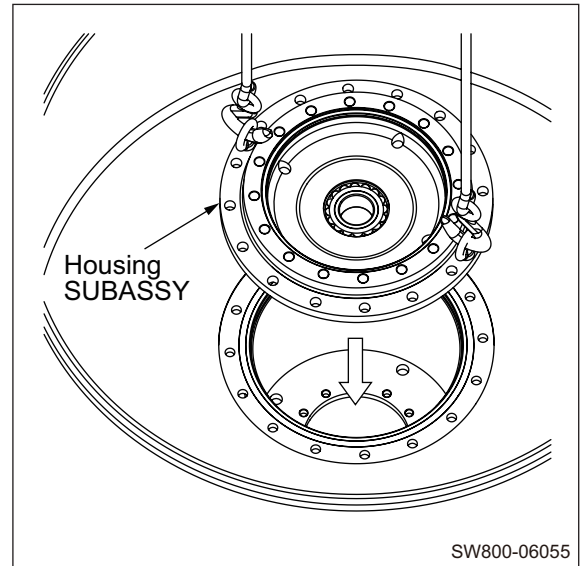


3) Install housing SUBASSY.


 Housing SUBASSY : 75 kg (165 lbs.)

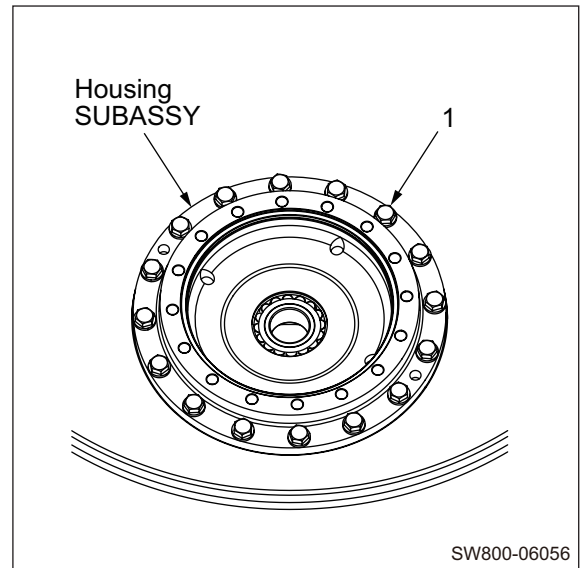
**(NOTICE)**

- Take care not to let O-ring to protrude from its groove.

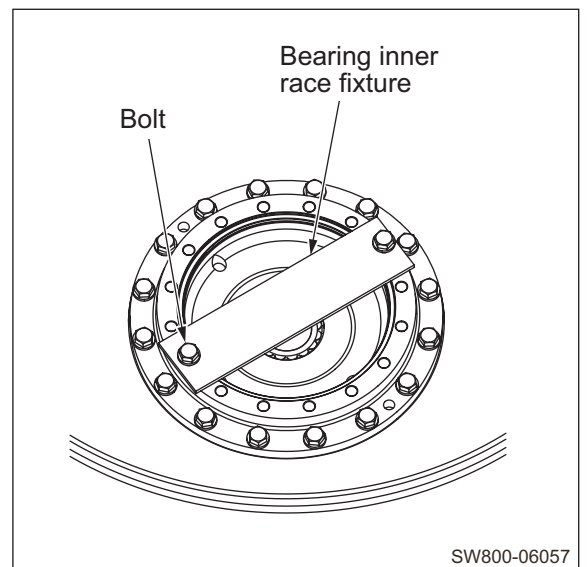
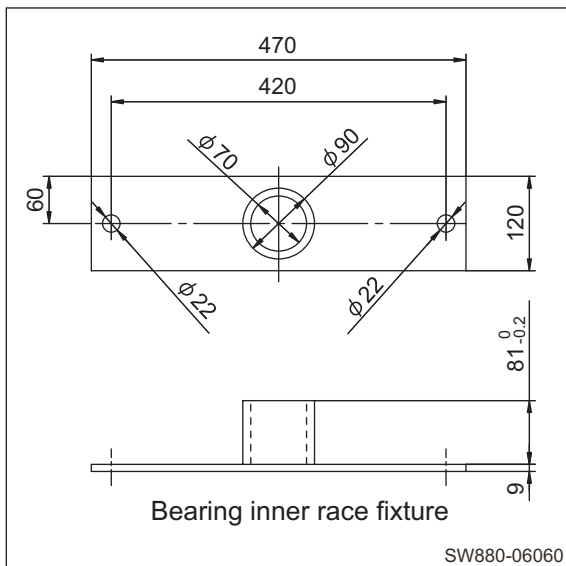


4) Secure housing SUBASSY with sixteen bolts (1) and washers.

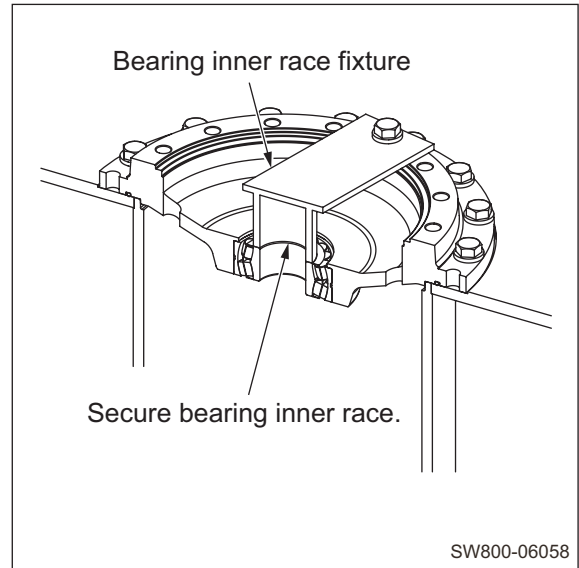
 (1) Bolts M20×60 : 540 N·m (398 lbf·ft)



5) Attach a bearing inner race fixture to housing SUBASSY with two bolts (M20×35) and washers.



- 6) Shown on right is a sectional view of housing SUBASSY to which bearing inner race fixture is attached.



**⚠ WARNING**

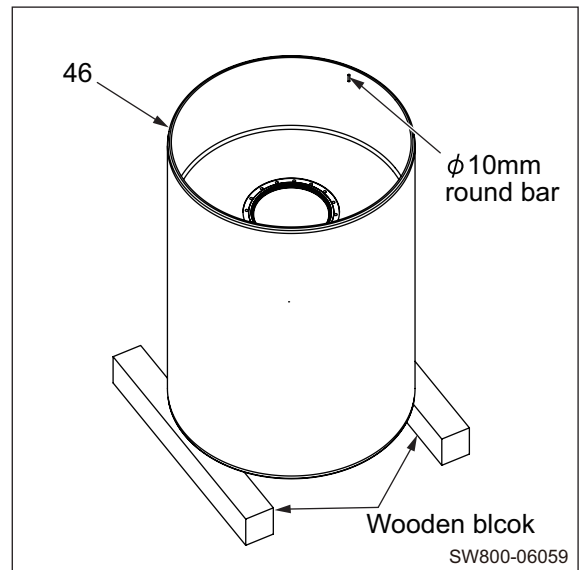
Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

- 7) Reverse drum SUBASSY.

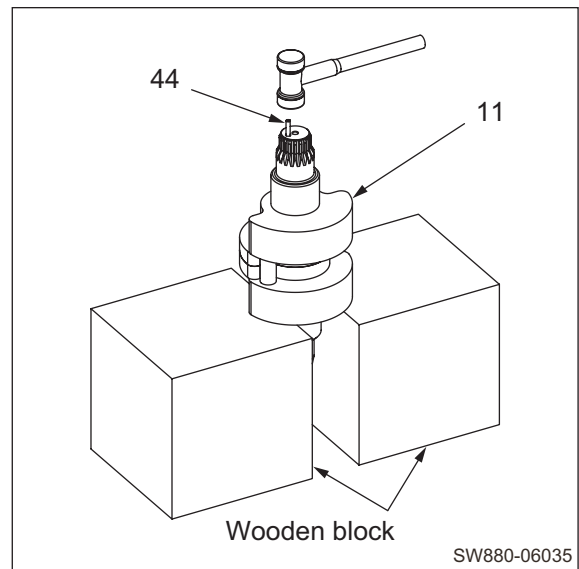
**(NOTICE)**

- The side on which a  $\phi 10$  round bar is installed is the vibrator motor side.

 Drum SUBASSY  
 SW884 : 2,335 kg (5,148 lbs.)  
 SW994 : 2,440 kg (5,379 lbs.)



- 8) Put eccentric shaft (11) (vibrator motor side) on wooden blocks with its splined portion facing up.
- Drive spring pin (44).

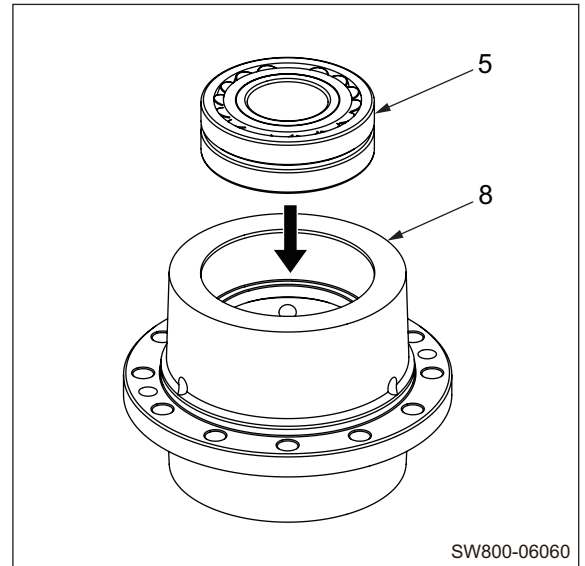


## 9) Reassembly of eccentric shaft SUBASSY

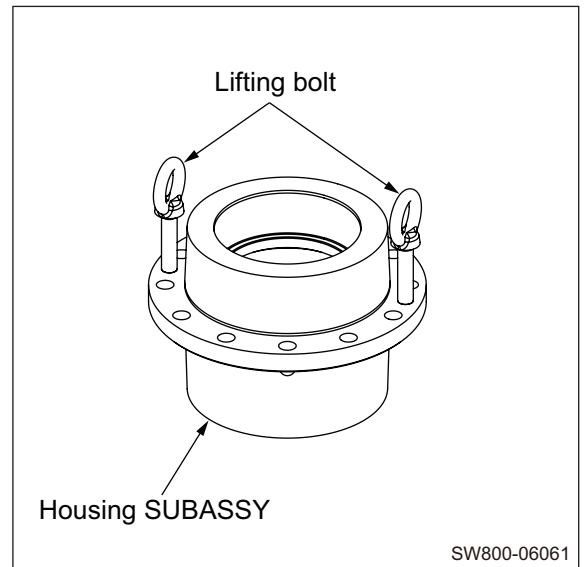
- ① Apply a coat of gear oil to housing (8) at where bearing will be press-fitted.
  - Drive vibrator bearing (5).
  - Apply a coat of gear oil to inner surface of vibrator bearing.

**(NOTICE)**

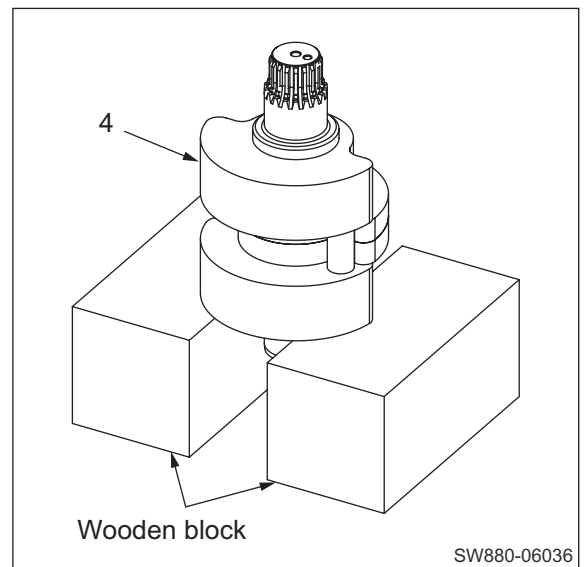
- Take care not to damage the bearing when installing it.



- ② Reverse housing SUBASSY and install lifting bolts (M16) to housing (8).




- ③ Put eccentric shaft (4) (propulsion motor side) on wooden blocks with its splined position facing up.

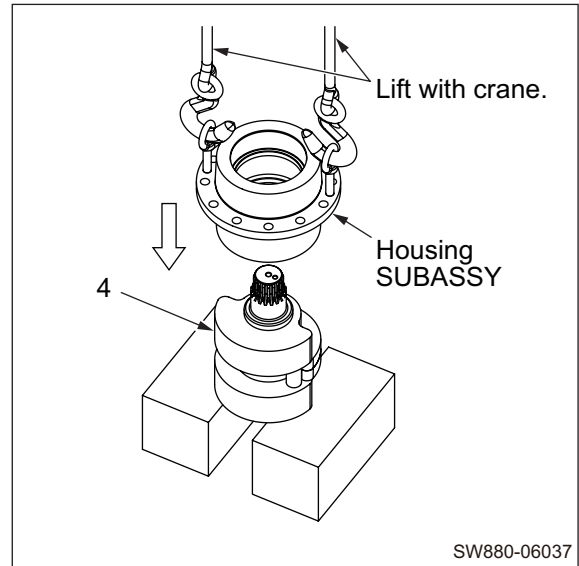


- ④ Apply a coat of gear oil to eccentric shaft (4) at where bearing will be installed.
- Install housing SUBASSY.

**(NOTICE)**

- Install the housing SUBASSY taking care not to tilt the vibrator bearing inner race.

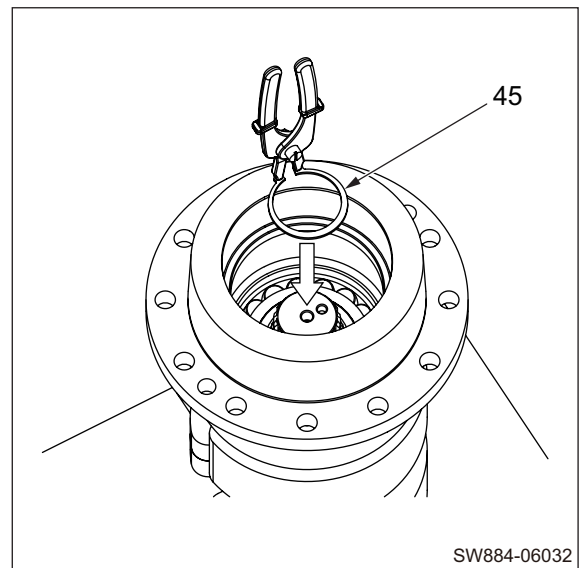
  $J_{kg}$  Housing SUBASSY : 40 kg (88 lbs.)



- ⑤ Install retaining ring (45).

**(NOTICE)**

- Confirm that the retaining ring is securely fitted in the groove.

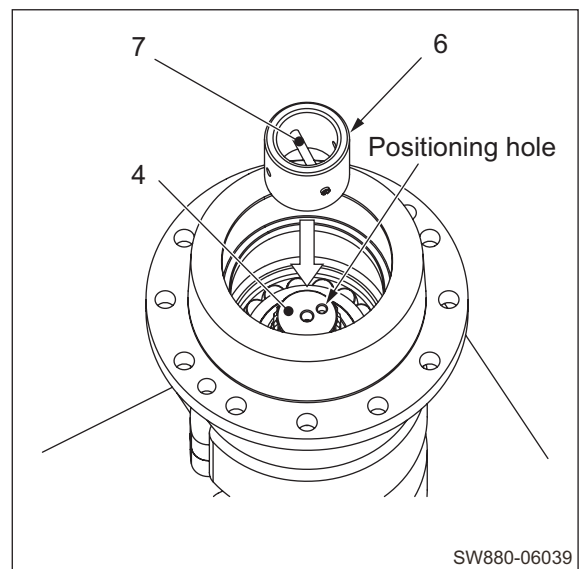


- ⑥ Drive spring pin (7) into sleeve (6).

- Apply gear oil to inner surface of sleeve.
- Apply gear oil to splined portion of eccentric shaft (4).
- Install sleeve.

**(NOTICE)**

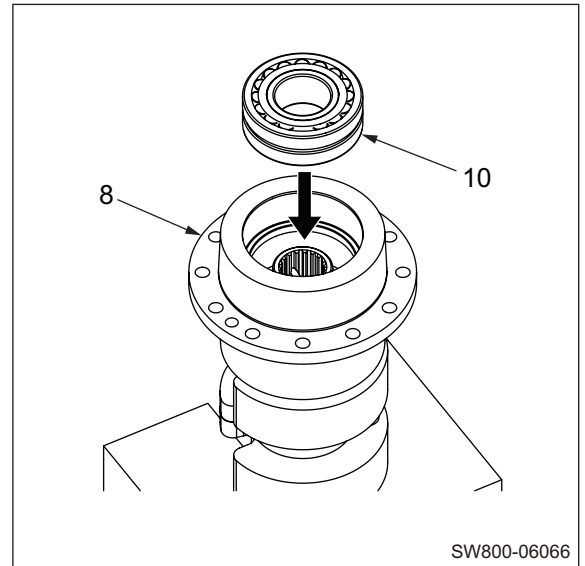
- When installing the sleeve, take care not to plug the positioning hole in the eccentric shaft with the spring pin.



- ⑦ Apply a coat of gear oil to housing (8) at where bearing will be press-fitted.
- Drive vibrator bearing (10).

**(NOTICE)**


- **Take care not to damage the bearing when installing it.**

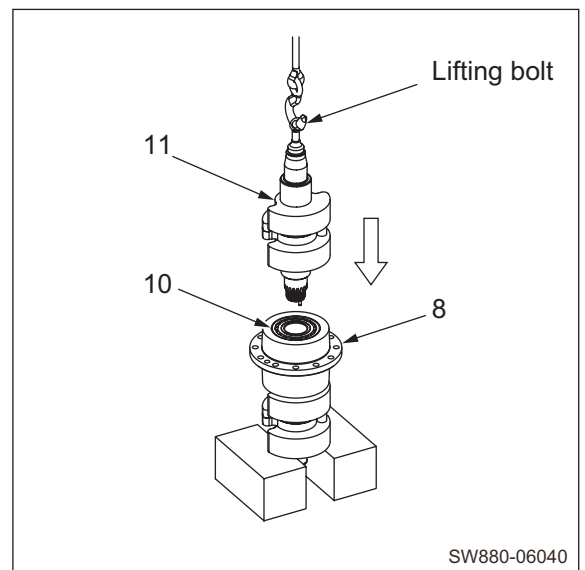


- ⑧ Install a lifting bolt (M8) to eccentric shaft (11).
- Apply a coat of gear oil to eccentric shaft at where bearing will be installed.
  - Install eccentric shaft.

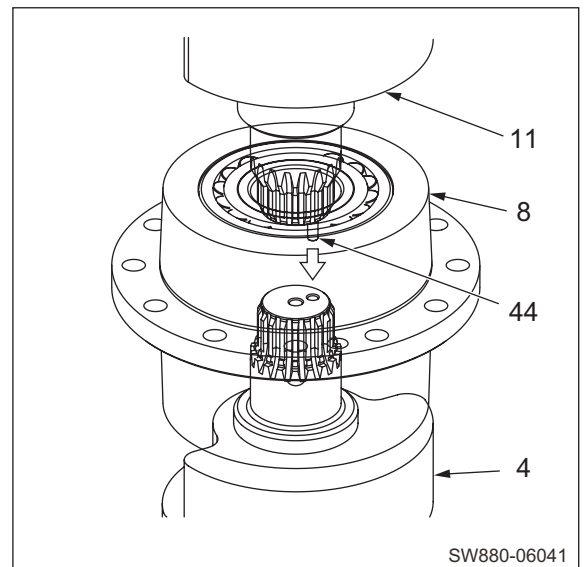
**(NOTICE)**

- **Install the eccentric shaft taking care not to tilt the vibrator bearing (10) inner race.**

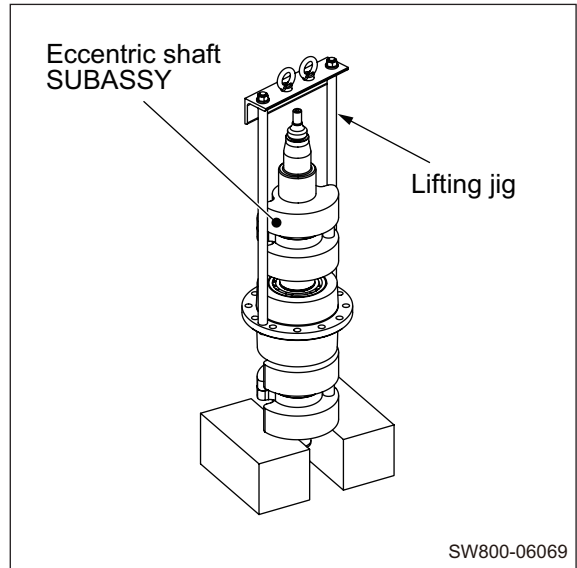
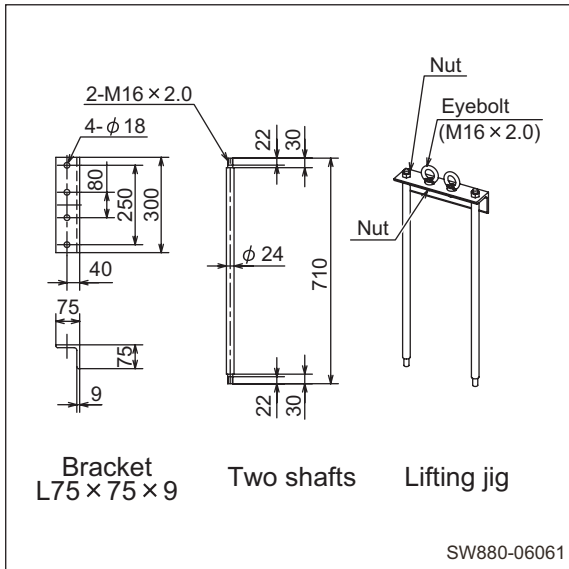
 (11) Eccentric shaft : 55 kg (121 lbs.)



- ⑨ When installing eccentric shaft (11) in housing (8), insert spring pin (44) on shaft into positioning hole in eccentric shaft (4).



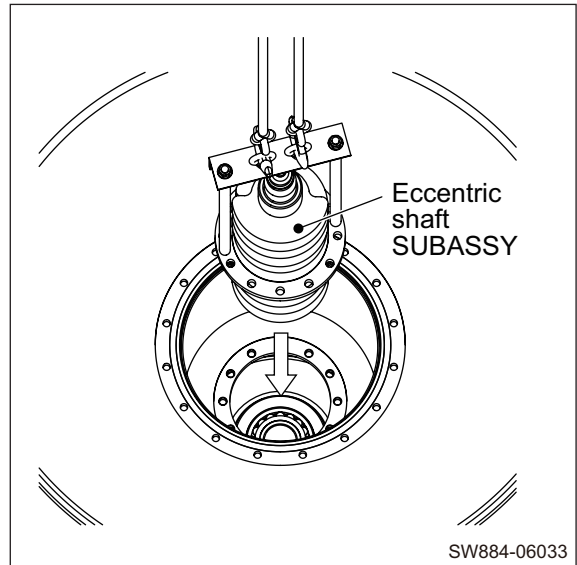
10) Attach a lifting jig to eccentric shaft SUBASSY.




11) Apply a coat of gear oil to eccentric shaft SUBASSY at where bearing will be installed.

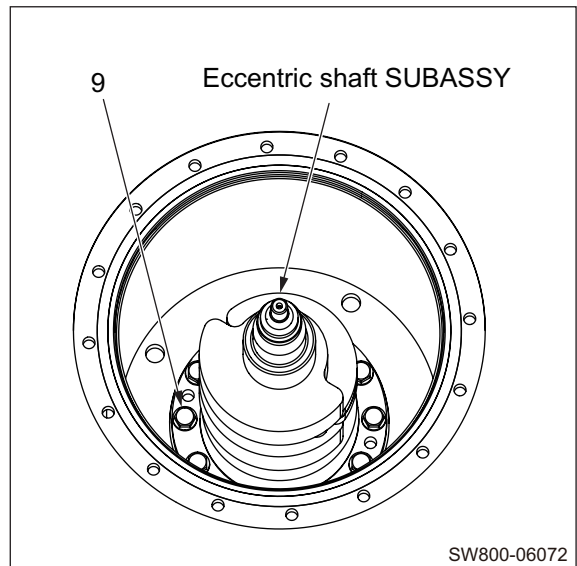
- Slowly lift eccentric shaft SUBASSY with a crane and install it to drum SUBASSY.

  $k_g$  Eccentric shaft SUBASSY : 155 kg (342 lbs.)



12) Secure eccentric shaft SUBASSY to drum with twelve bolts (9) and washers.

 (9) Bolts M16x50 : 265 N·m (195 lbf-ft)





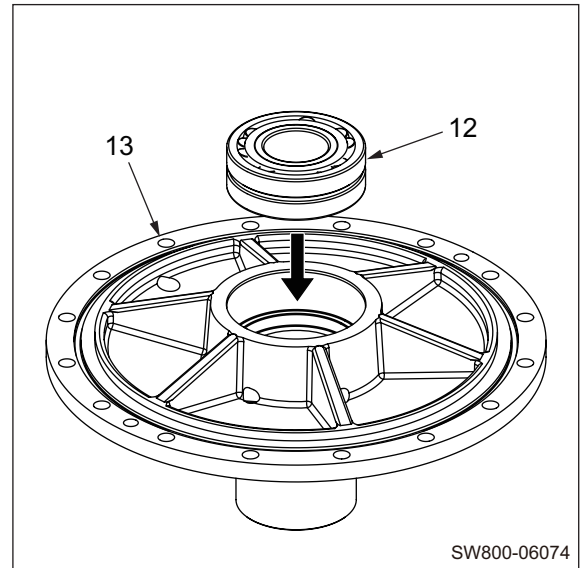
13) Reassembly of axle shaft SUBASSY

13-1) Apply a coat of gear oil to axle shaft (13) at where bearing will be press-fitted.

- Drive vibrator bearing (12).

(NOTICE)

- Take care not to damage the bearing when installing it.



SW800-06074

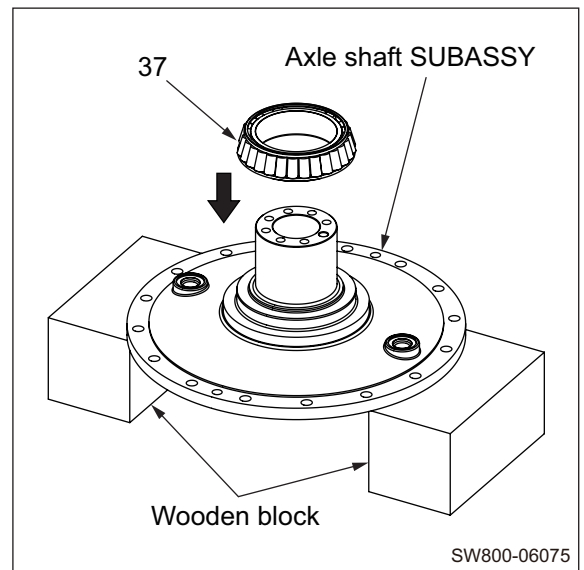
**⚠ WARNING**

Wear heat resistant gloves when handling heated parts to avoid burns.

13-2) Reverse axle shaft SUBASSY.

$\text{kg}$  Axle shaft SUBASSY : 75 kg (165 lbs.)

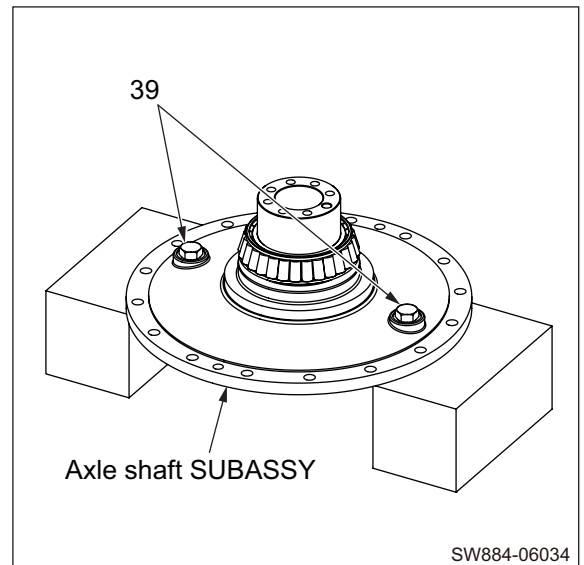
- Heat up roller bearing (37) inner race by using a ring heater or the like.
- Apply a coat of gear oil to axle shaft at where bearing inner race will be press-fitted.
- Drive in heated roller bearing inner race.
- Apply sufficient amount of lithium-based grease to rollers of roller bearing inner race.



SW800-06075

13-3) Apply grease to O-rings for plugs (39).

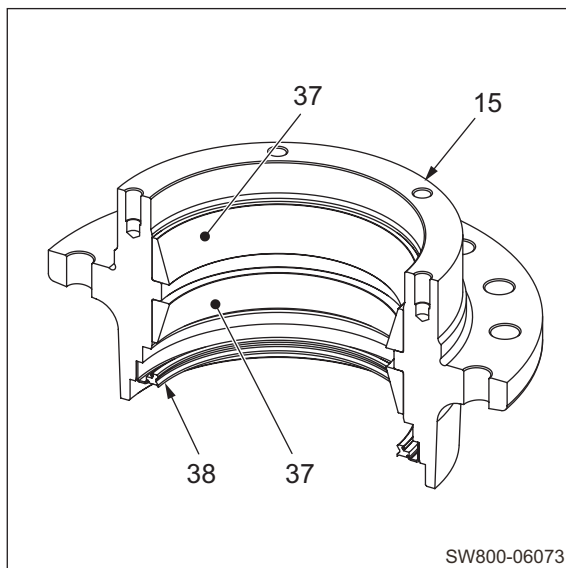
- Install plugs.



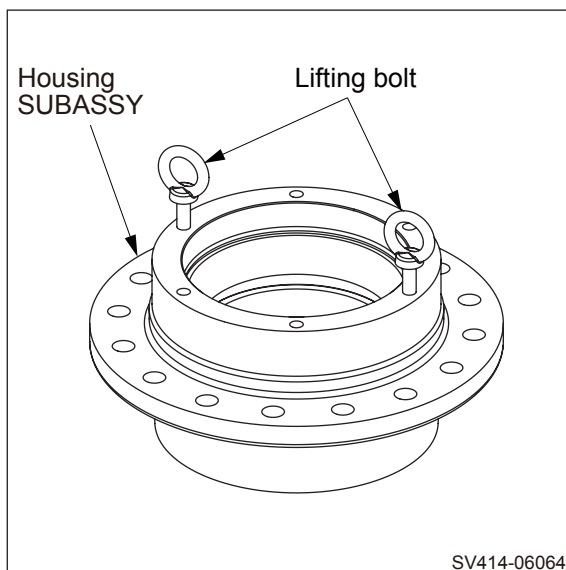
SW884-06034

13-4) Apply a coat of gear oil to roller bearings (37) outer race mounting surface of housing (15).


- Drive roller bearing outer races.
- Apply liquid packing to periphery of oil seal (38).
- Drive oil seal.
- Apply grease to lip of oil seal.

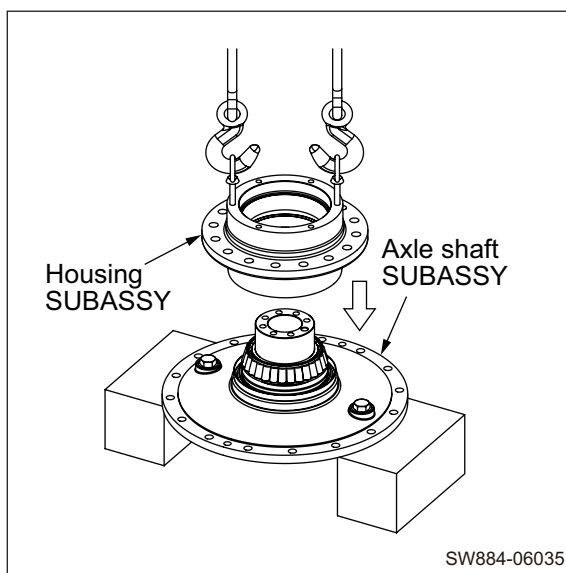


13-5) Install lifting bolts (M12).



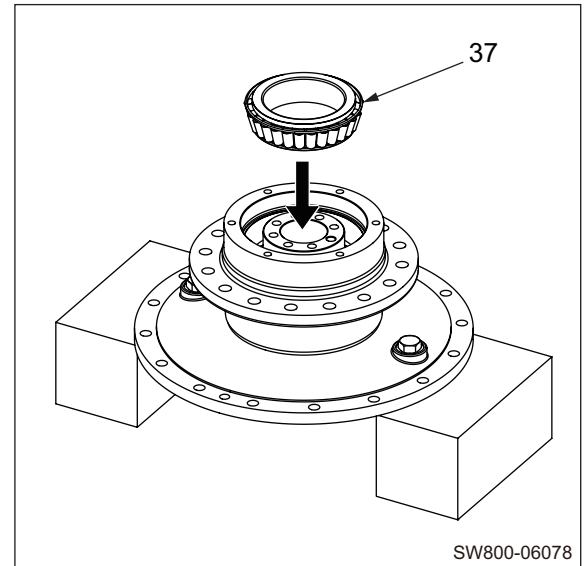
13-6) Install housing SUBASSY to axle shaft SUBASSY.

 Housing SUBASSY : 40 kg (88 lbs.)



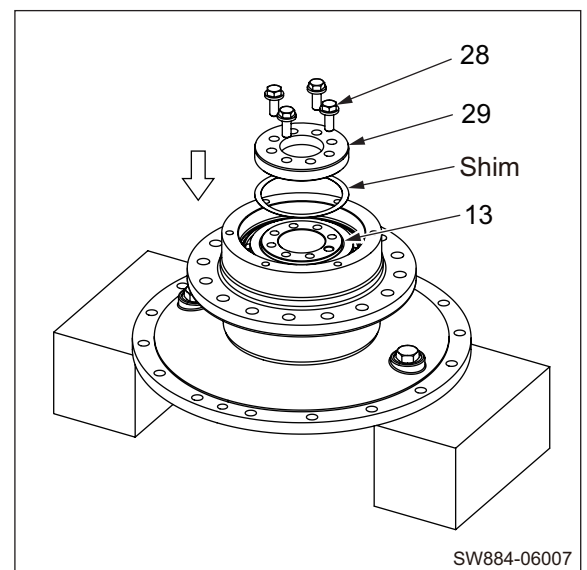
13-7) Apply sufficient amount of lithium-based grease to rollers of roller bearing (37) inner race.

- Drive in roller bearing inner race until rollers come in contact with outer race.



13-8) Preload adjustment of roller bearing

- ① Install a shim of about 1 mm (0.04 in.) and secure cover (29) to axle shaft (13) with four bolts (28) and washers.

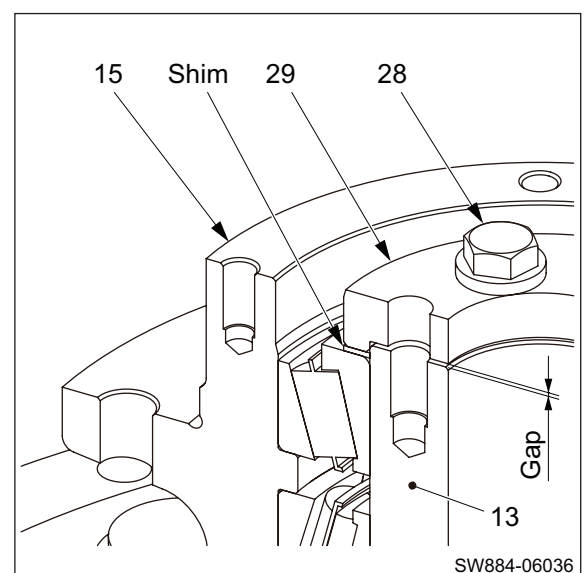


- ② A gap will remain between end of axle shaft (13) and inside of cover (29).

- Tighten bolts (28) to a torque of 30 N·m (22 lbf·ft).
- Give housing (15) two to three turns.
- Tighten bolts to a torque of 30 N·m (22 lbf·ft) again.
- Repeat this work several times until tightening torque of bolts no longer fluctuates.

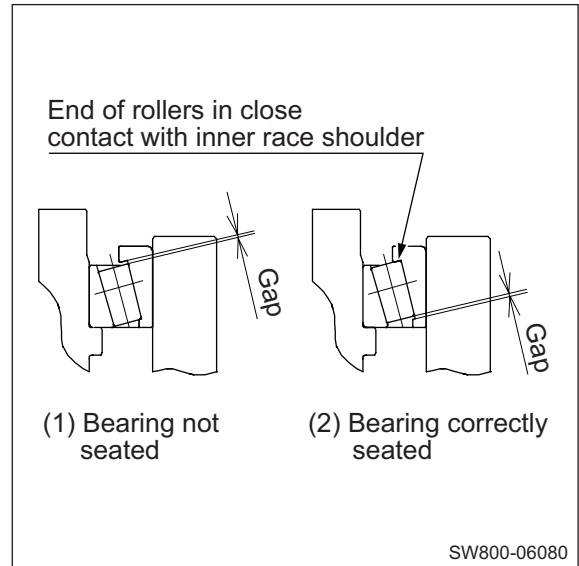
**(NOTICE)**

- Tighten the bolts alternately in diagonal directions.



**(NOTICE)**

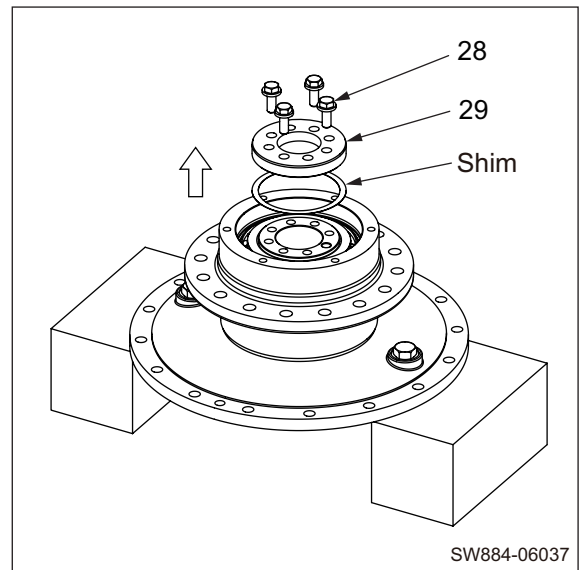
- Push in the inner race while rotating the bearing. Otherwise, even strongly trying to push the inner race, the bearing rollers will not be pushed up and therefore bearing will not be seated.



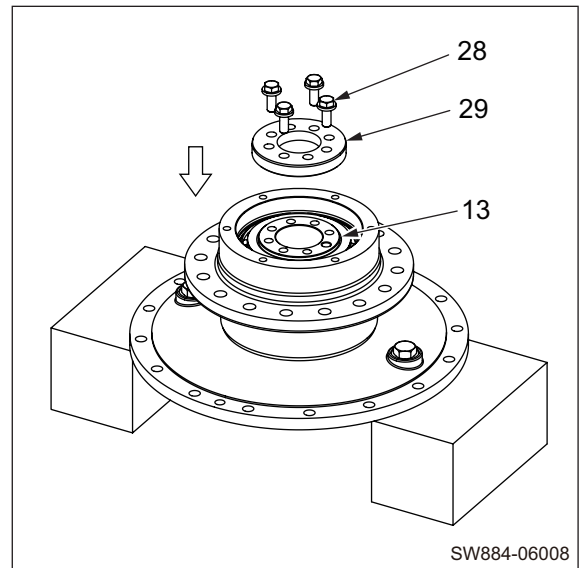
- ③ Remove bolts (28).
- Remove cover (29).
  - Remove shim.

**(NOTICE)**

- Do not turn the housing after the cover is removed.

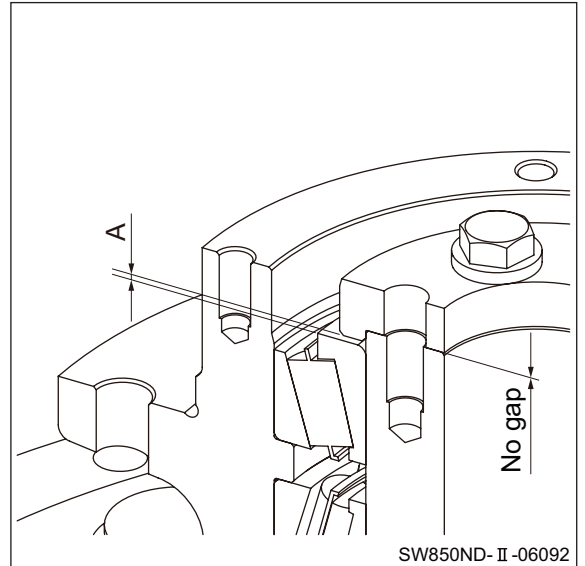


- ④ Without inserting shim, install cover (29).
- Install washers to four bolts (28) and tighten.



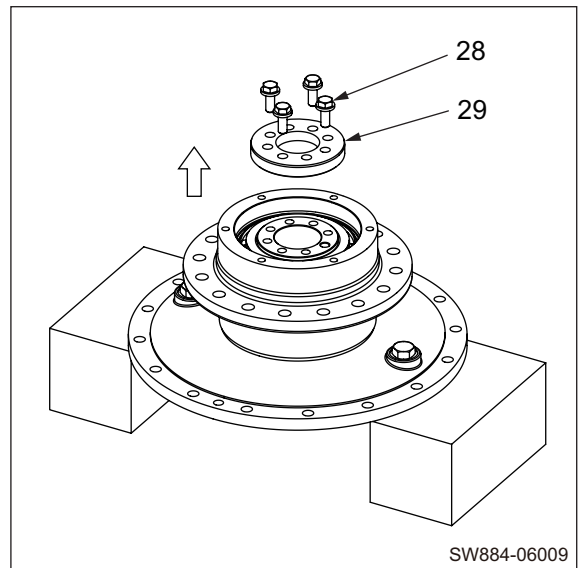
⑤ Using a thickness gauge, measure clearance “A”.

★ Preload adjusting shim thickness =  $A + 0.2 \text{ mm (0.008 in.)}$



⑥ Remove bolts (28).

- Remove cover (29).



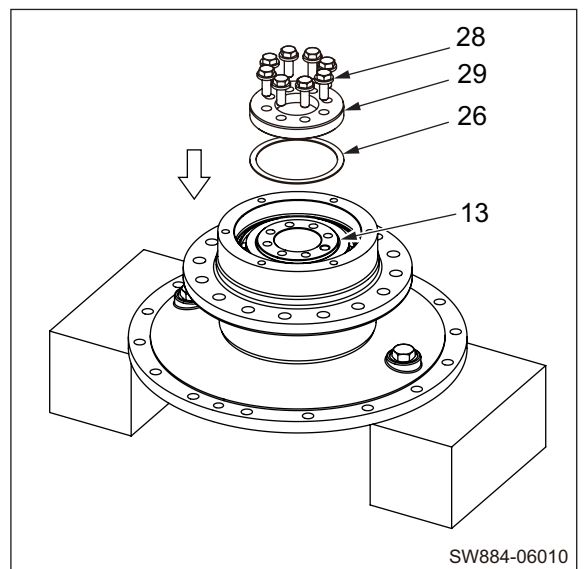
⑦ Install shim (26) of preload adjusting shim thickness

= “ $A + 0.2 \text{ mm (0.008 in.)}$ ”.

- Secure cover (29) to axle shaft (13) with eight bolts (28) and washers.

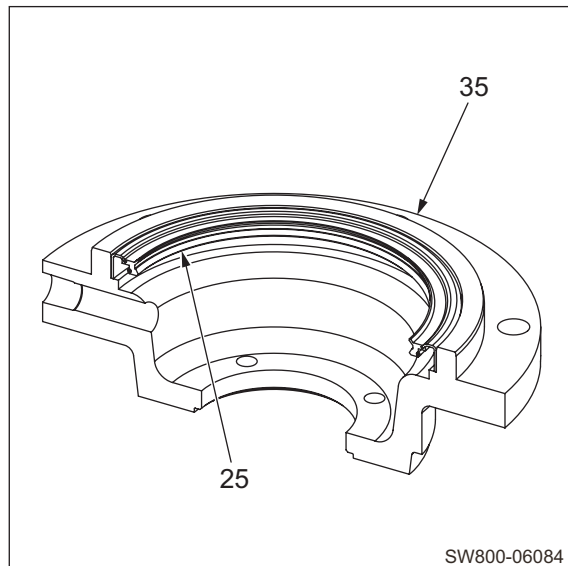


(28) Bolts M14×40 : 170 N·m (125 lbf·ft)



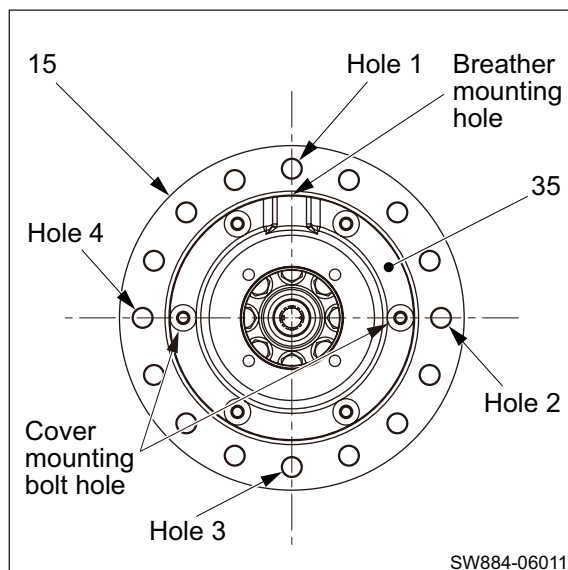
13-9) Apply liquid packing to periphery of oil seal (25).

- Drive in oil seal (35).
- Apply grease to lip of oil seal.



**(NOTICE)**

- The four holes in housing (15), breather mounting hole in cover (35), and cover mounting bolt holes must be arranged as shown on the right.

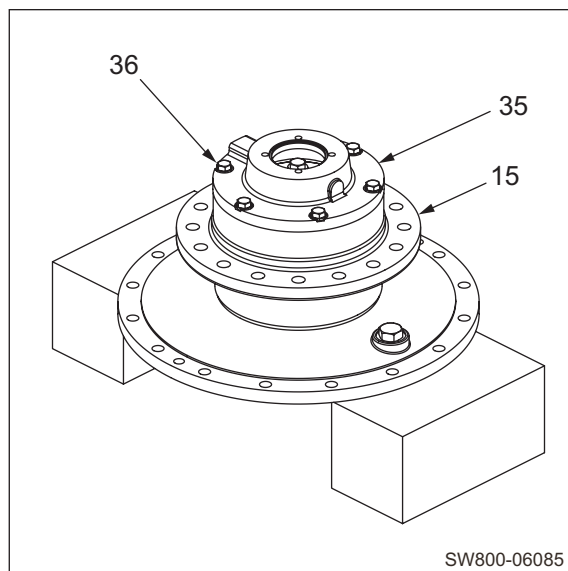


13-10) Apply a coat liquid packing to housing (15) at where cover (35) will be installed.

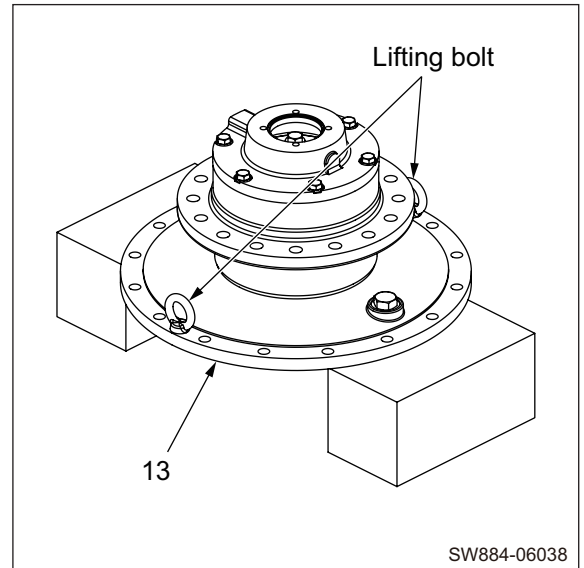
- Secure cover to housing with six bolts (36) and spring washers.



(36) Bolts M12×40 : 110 N·m (81 lbf·ft)



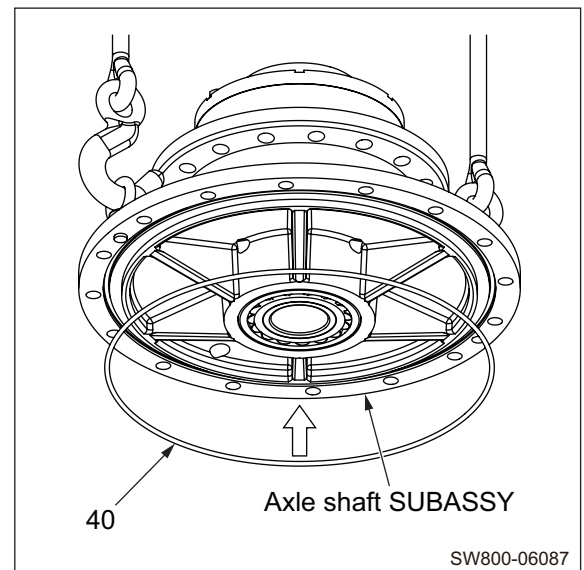
14) Install lifting bolts (M16) to axle shaft (13).



15) Lift axle shaft SUBASSY.

$\mathfrak{J}_{kg}$  Axle shaft SUBASSY : 135 kg (298 lbs.)

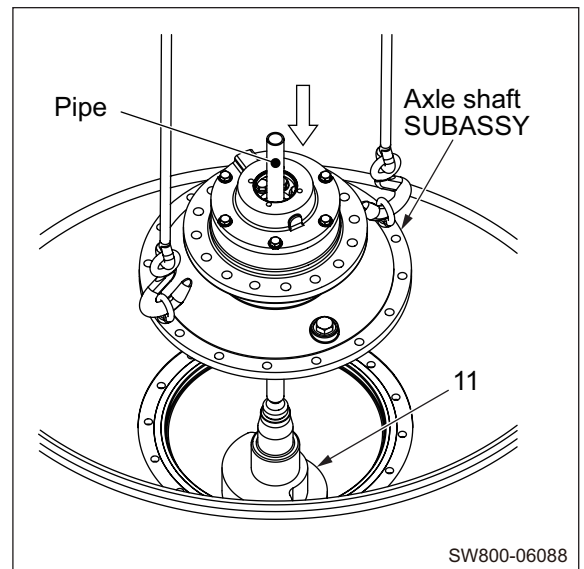
- Apply grease to O-ring (40).
- Install O-ring.



16) Lower axle shaft SUBASSY on mounting surface of drum (46).

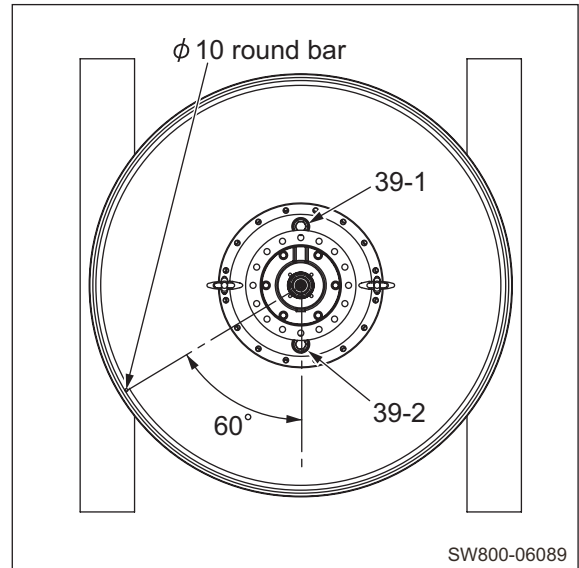
**(NOTICE)**

- Support the eccentric shaft (11) with a pipe or the like, to prevent tilting of the vibrator bearing inner race during installation.
- Take care not to let O-ring to protrude from its groove.



**(NOTICE)**

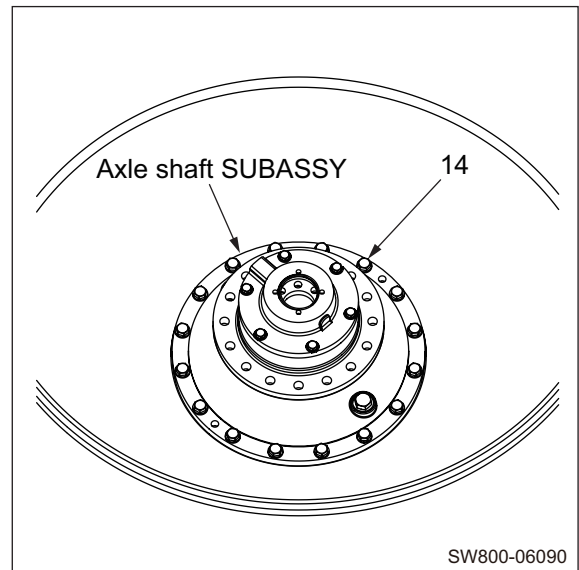
- When installing the axle shaft SUBASSY, pay attention to the positional relationship between the  $\phi 10$  round bar on the drum and the plugs (39-1) and (39-2).



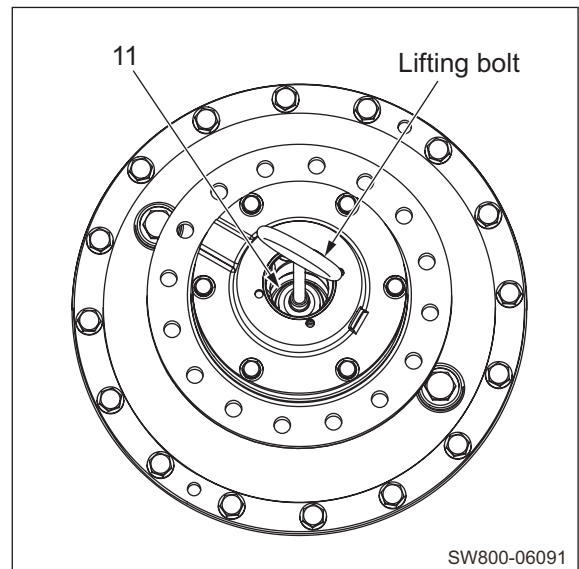
- 17) Secure axle shaft SUBASSY with sixteen bolts (14) and washers.



(14) Bolts M16×50 : 265 N·m (195 lbf·ft)

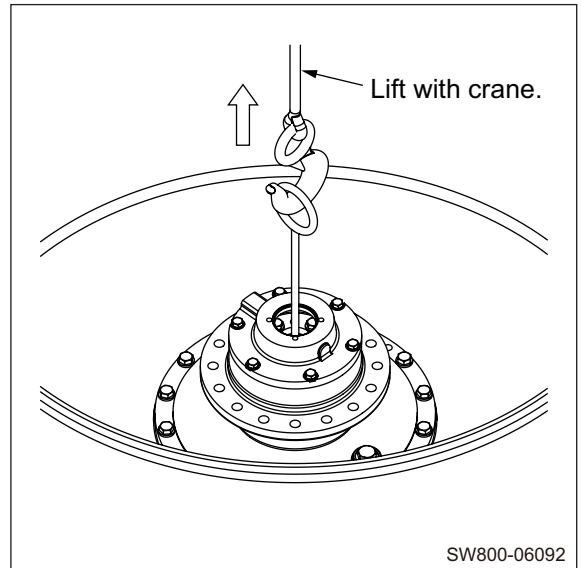


- 18) Install a lifting bolt (M8) to end of eccentric shaft (11).





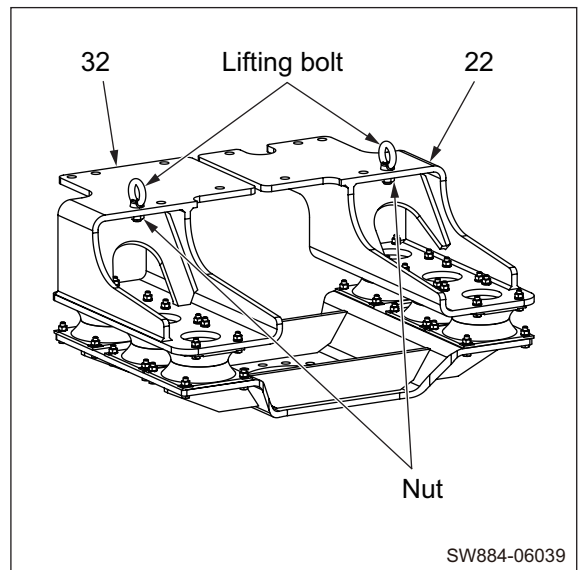
19) Slowly lift eccentric shaft with a crane and check that there is an axial play of 1 to 2 mm (0.04 to 0.08 in.).



**⚠ WARNING**

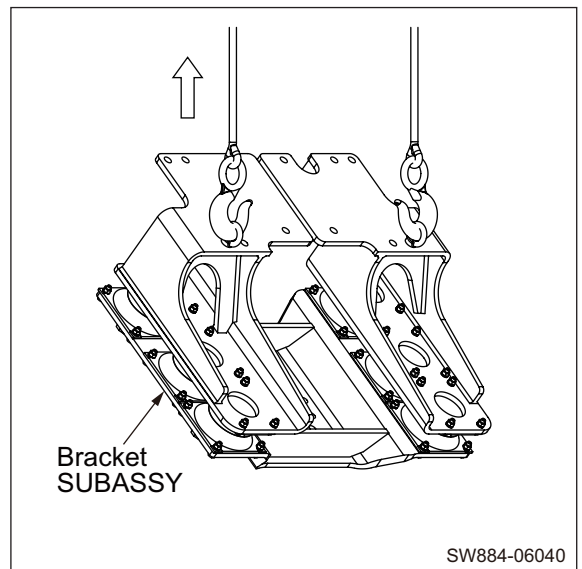
When installing lifting bolts, screw them with nuts.

20) Install lifting bolts (M22) to brackets (22) and (32) with nuts.



21) Lift bracket SUBASSY.

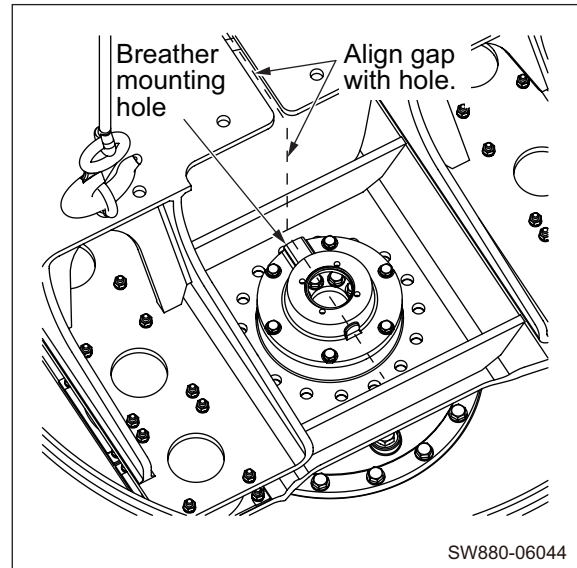
**kg** Bracket SUBASSY  
 SW884 : 285 kg (628 lbs.)  
 SW994 : 290 kg (639 lbs.)



22) Lower bracket SUBASSY while keeping it level and install it on spigot joint of housing.

**(NOTICE)**

- Since the bracket SUBASSY cannot be lowered in a level position, lower them using a support or like.
- Be sure to install the bracket SUBASSY correctly in relation to the position of the breather mounting hole in the cover.

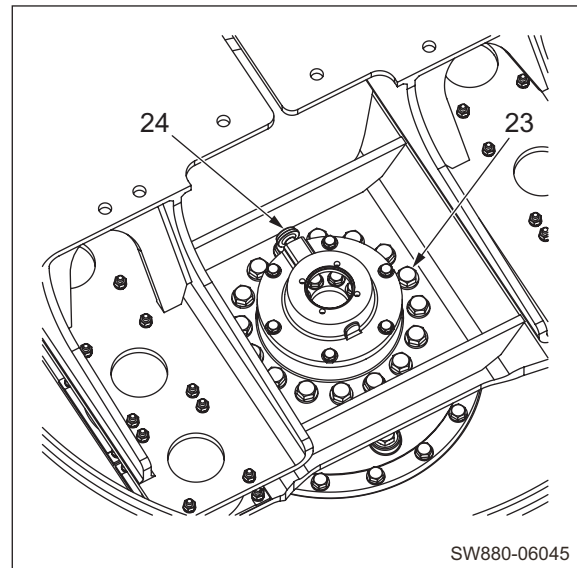


23) Secure bracket SUBASSY with sixteen bolts (23) and washers.

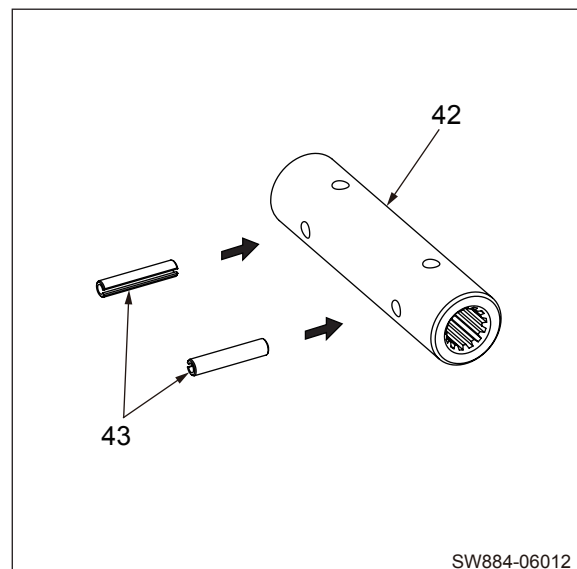


(23) Bolts M20×60 : 540 N·m (398 lbf·ft)

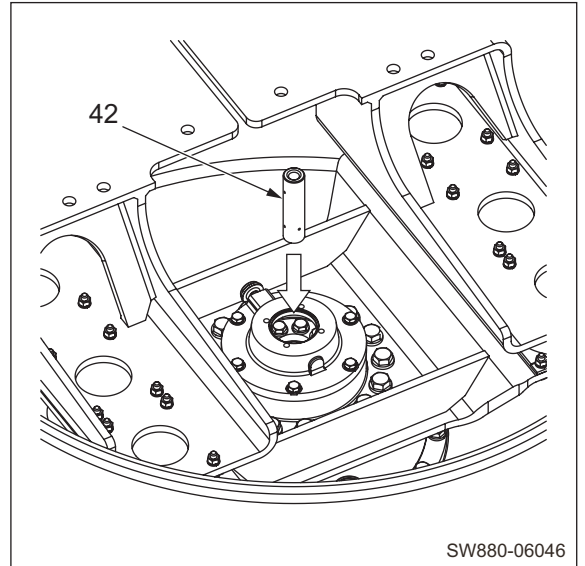
- Wind seal tape around threaded portion of breather (24).
- Install breather.



24) Drive two spring pins (43) into sleeve (42).

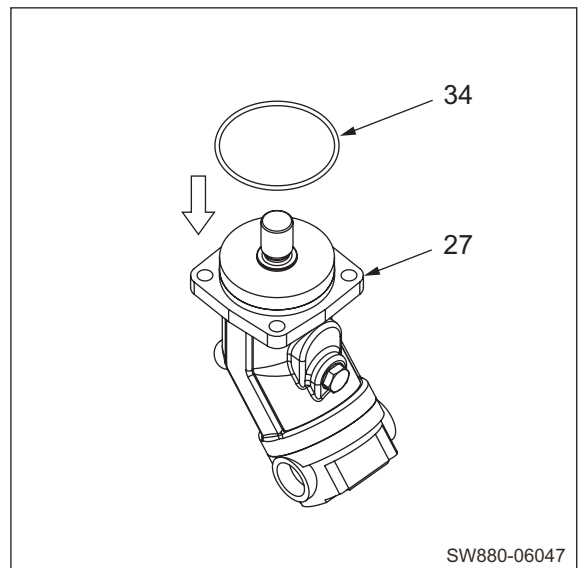


- 25) Apply molybdenum-based grease to splined portion of sleeve (42).
- Fit sleeve to splined portion on eccentric shaft end.




SW880-06046


- 26) Apply grease to O-ring (34).
- Install O-ring to vibrator motor (27).



SW880-06047

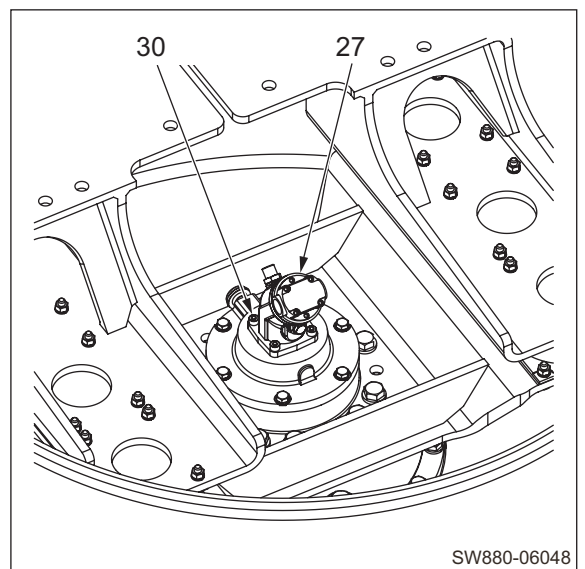
- 27) Secure vibrator motor (27) to cover (29) with four bolts (30).

 (27) Vibrator motor : 6 kg (13 lbs.)

 (30) Bolts M10×30 : 60 N·m (44 lbf·ft)

**(NOTICE)**

- Take care not to let O-ring to protrude from its groove.




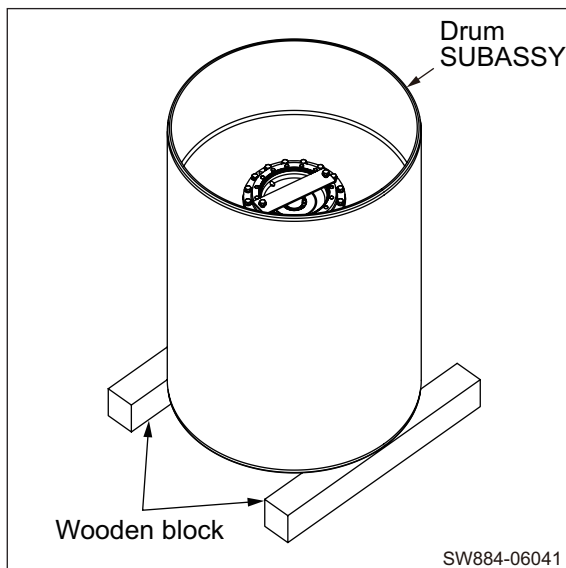
SW880-06048

**⚠ WARNING**

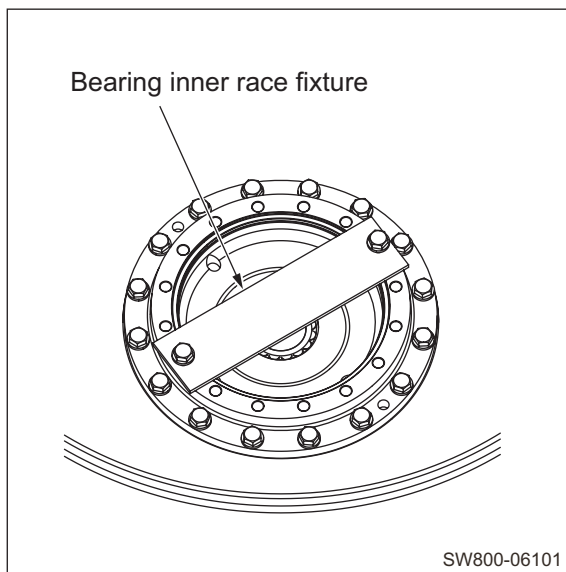
Be careful because reversing the drum involves risk.  
 Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

28) Reverse drum SUBASSY.

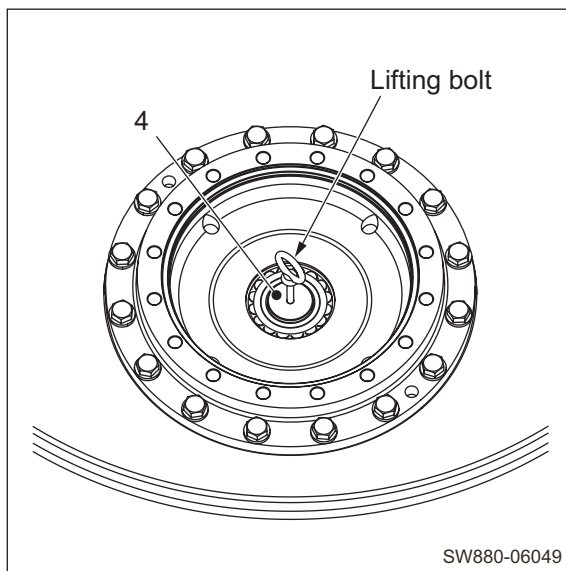
 **kg** Drum SUBASSY  
 SW884 : 2,910 kg (6,415 lbs.)  
 SW994 : 3,025 kg (6,669 lbs.)



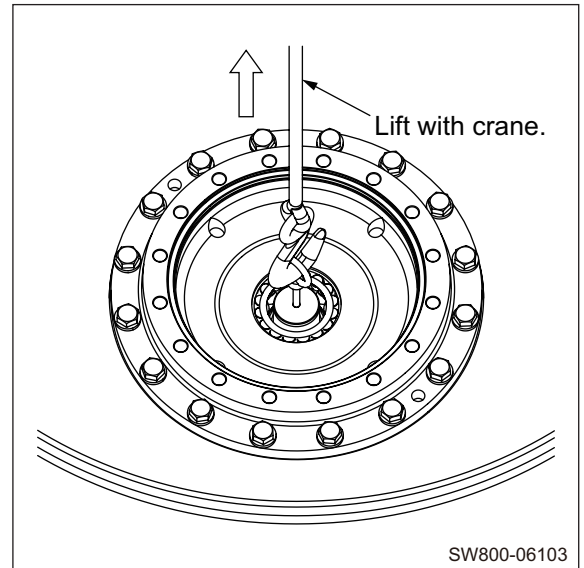
29) Remove bearing inner race fixture.



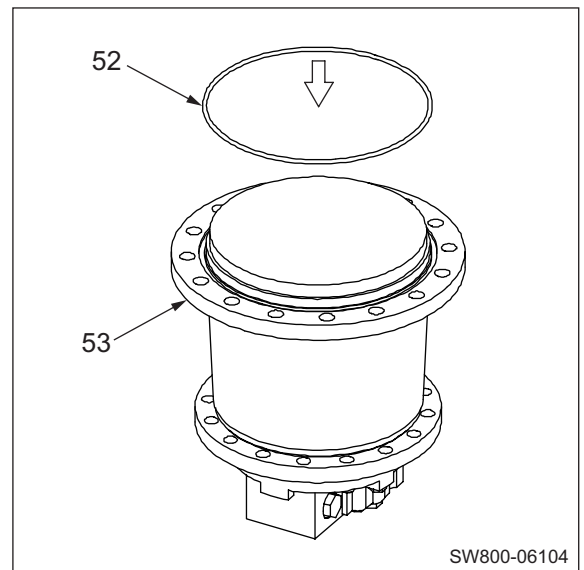
30) Install a lifting bolt (M10) to end of eccentric shaft (4).



31) Slowly lift eccentric shaft with a crane and check that there is an axial play of 1 to 2 mm (0.04 to 0.08 in.).



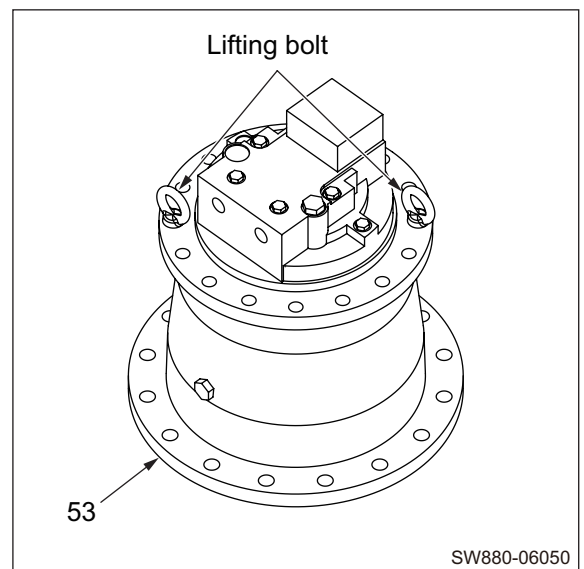
32) Apply grease to O-ring (52).  
 • Install O-ring to propulsion motor (53).




33) Reverse propulsion motor (53).

$\mathfrak{J}_{kg}$  (53) Propulsion motor : 215 kg (474 lbs.)

• Install lifting bolts (M20).

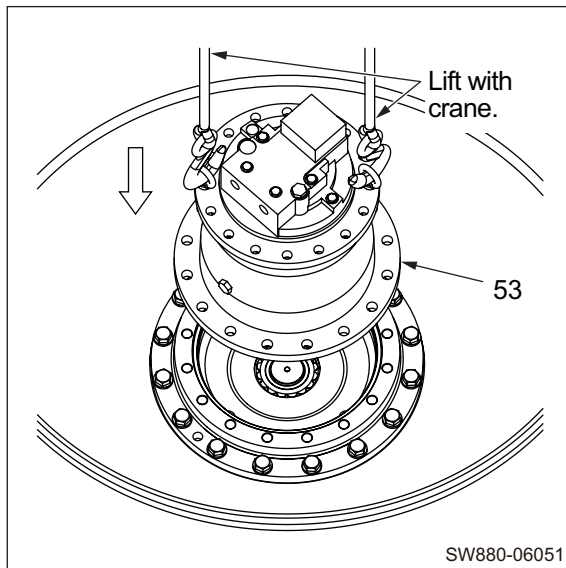


34) Install propulsion motor (53).


 (53) Propulsion motor : 215 kg (474 lbs.)

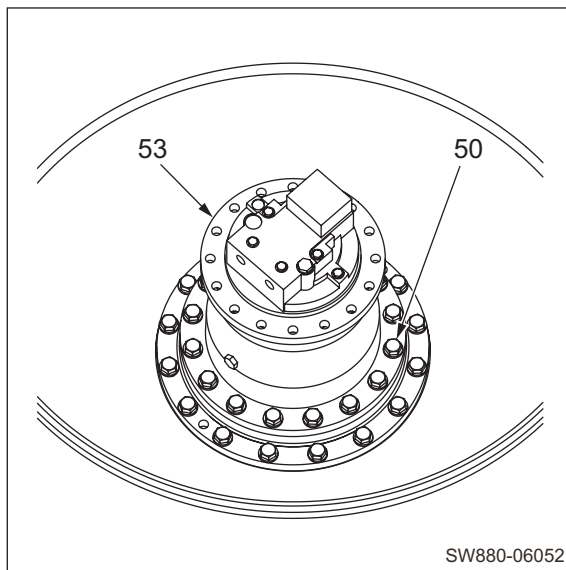
**(NOTICE)**

- Take care not to let O-ring to protrude from its groove.

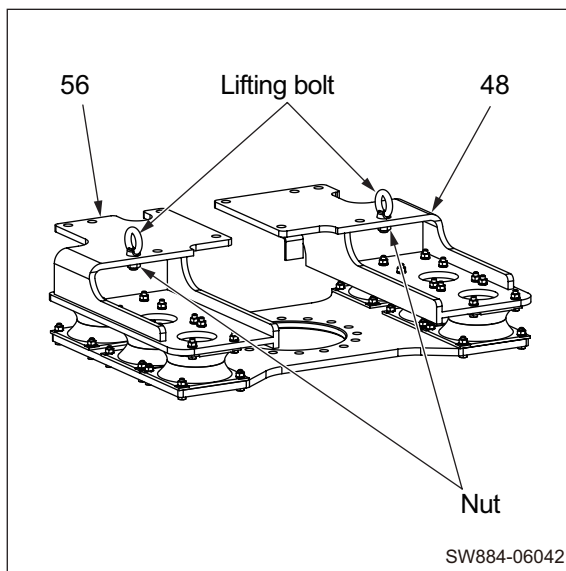


35) Secure propulsion motor (53) with sixteen bolts (50) and washers.

 (50) Bolts M20×60 : 540 N·m (398 lbf-ft)



36) Install lifting bolts (M22) to brackets (48) and (56) with nuts.



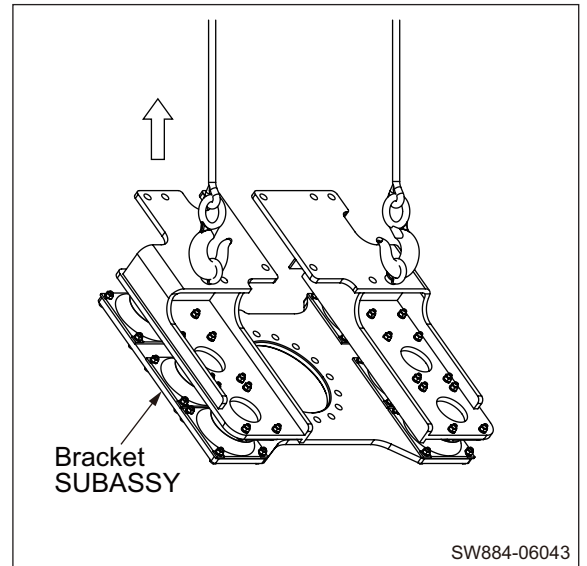
37) Lift bracket SUBASSY.



Bracket SUBASSY

SW884 : 230 kg (507 lbs.)

SW994 : 240 kg (529 lbs.)

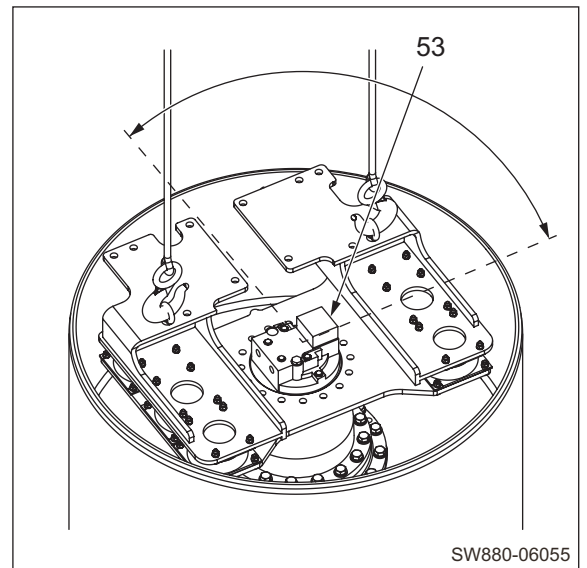


SW884-06043

38) Lower bracket SUBASSY while keeping it level and install it on spigot joint of propulsion motor (53).

**(NOTICE)**

- Since the bracket SUBASSY cannot be lowered in a level position, lower them using a support or like.
- Be sure to install the bracket SUBASSY correctly in relation to the position of the propulsion motor.

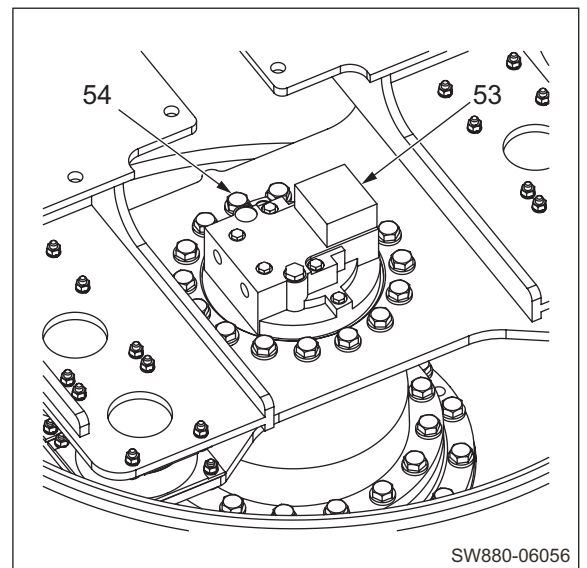


SW880-06055

39) Secure bracket SUBASSY with sixteen bolts (54) and washers.




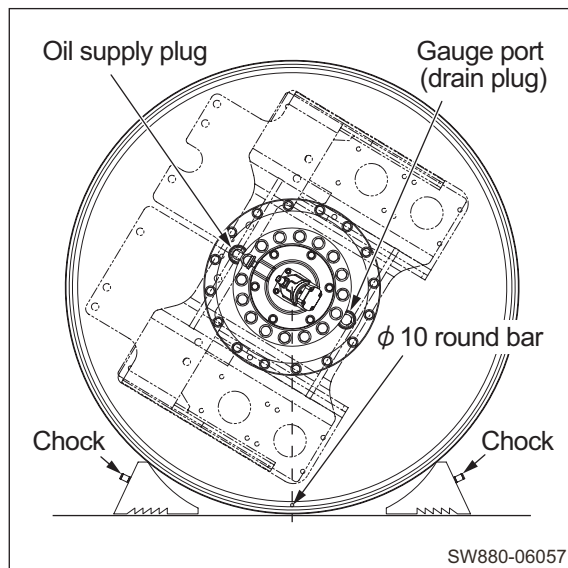
(54) Bolts M20×60 : 540 N·m (398 lbf-ft)



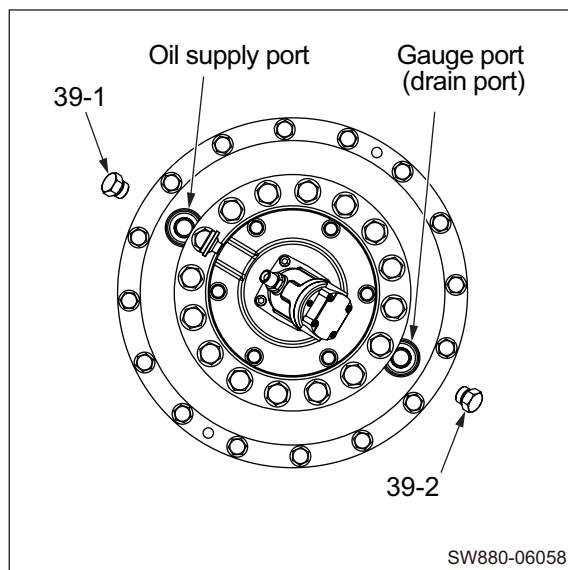
SW880-06056

- 40) Lift vibratory drum ASSY with a crane and lay it with  $\phi 10$  round bar on vibrator motor side facing down.
- Hold with chocks.

  $k_g$  Vibratory drum ASSY  
 SW884 : 3,360 kg (7,407 lbs.)  
 SW994 : 3,485 kg (7,683 lbs.)



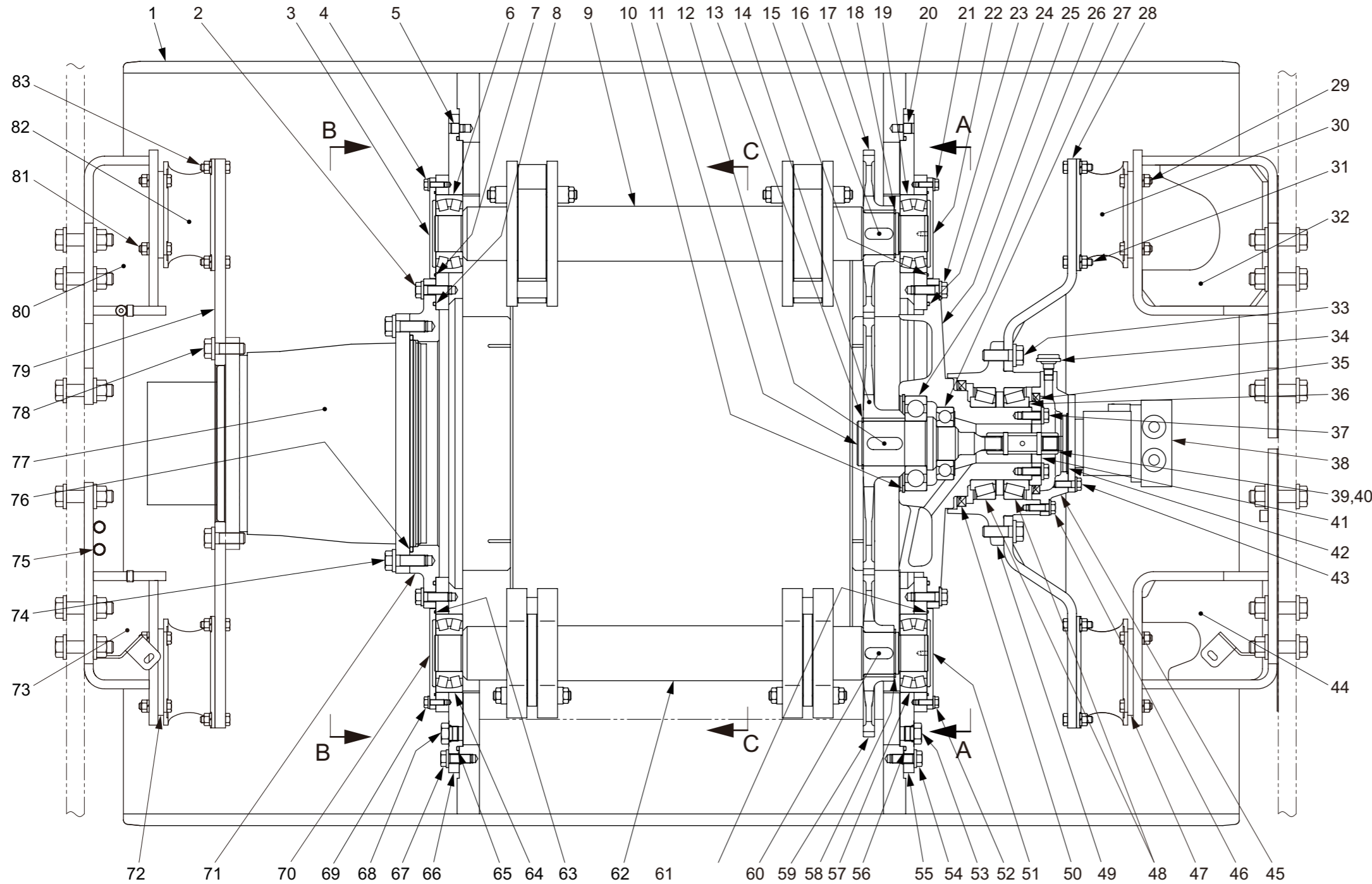
- 41) Remove plugs (39-1) and (39-2).
- Supply gear oil from oil supply port.
  - Check that oil drips from gauge port.
  - Gear oil : 22 L (5.8 gal.)
  - Install plugs.



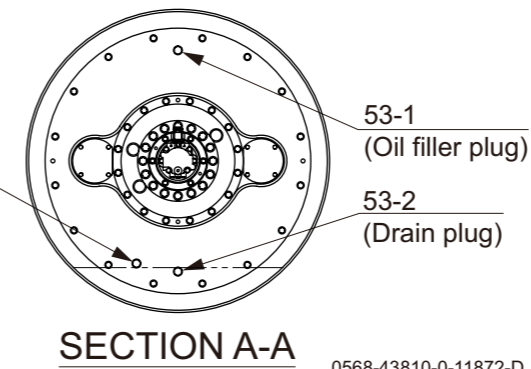
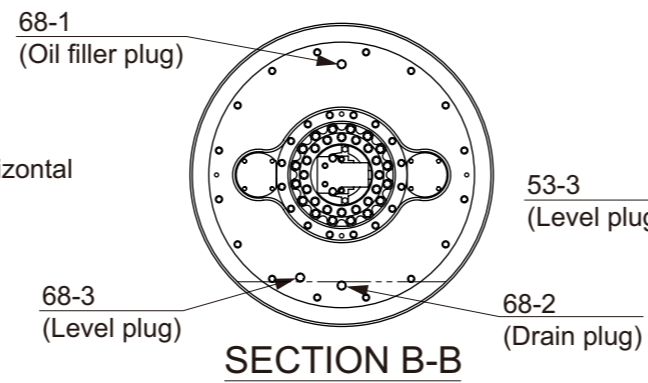
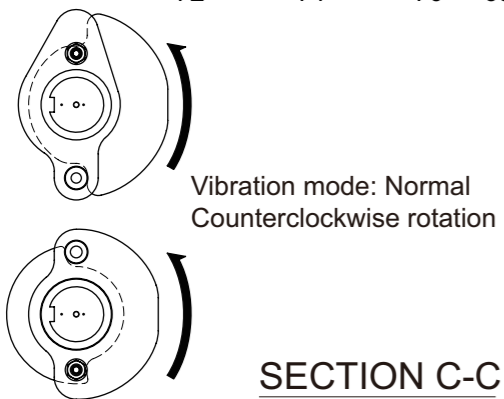


# 4. VIBRATORY DRUM ASSY (SW884ND/994ND)

## 4-1. Vibratory Drum ASSY



- |                       |                       |
|-----------------------|-----------------------|
| (1) Drum              | (47) Plate            |
| (2) Bolt : M16×50     | (48) Roller bearing   |
| (3) Cover             | (49) Housing          |
| (4) Bolt : M10×30     | (50) Oil seal         |
| (5) Pin               | (51) Cover            |
| (6) Vibrator bearing  | (52) Bolt : M10×30    |
| (7) O-ring            | (53) Plug             |
| (8) O-ring            | (54) Bolt : M16×45    |
| (9) Eccentric shaft   | (55) Housing          |
| (10) Retaining ring   | (56) O-ring           |
| (11) Shaft            | (57) Vibrator bearing |
| (12) Sunk key         | (58) Retaining ring   |
| (13) Retaining ring   | (59) Gear             |
| (14) Gear             | (60) Sunk key         |
| (15) O-ring           | (61) O-ring           |
| (16) Sunk key         | (62) Eccentric shaft  |
| (17) Gear             | (63) O-ring           |
| (18) Retaining ring   | (64) Vibrator bearing |
| (19) Vibrator bearing | (65) O-ring           |
| (20) Pin              | (66) Housing          |
| (21) Bolt : M10×30    | (67) Bolt : M16×45    |
| (22) Cover            | (68) Plug             |
| (23) Bolt : M16×50    | (69) Bolt : M10×30    |
| (24) O-ring           | (70) Cover            |
| (25) Axle shaft       | (71) Housing          |
| (26) Ball bearing     | (72) Plate            |
| (27) Ball bearing     | (73) Bracket          |
| (28) Bracket          | (74) Bolt : M20× 60   |
| (29) Bolt : M12×45    | (75) Bolt : M10×100   |
| (30) Damper           | (76) O-ring           |
| (31) Bolt : M12×45    | (77) Propulsion motor |
| (32) Bracket          | (78) Bolt : M20×60    |
| (33) Bolt : M20×60    | (79) Plate            |
| (34) Breather         | (80) Bracket          |
| (35) Oil seal         | (81) Bolt : M12×45    |
| (36) Shim             | (82) Damper           |
| (37) Bolt : M14×40    | (83) Bolt : M12×45    |
| (38) Vibrator motor   |                       |
| (39) Sleeve           |                       |
| (40) Spring pin       |                       |
| (41) Cover            |                       |
| (42) O-ring           |                       |
| (43) Bolt : M12×40    |                       |
| (44) Bracket          |                       |
| (45) Cover            |                       |
| (46) Bolt : M12×40    |                       |



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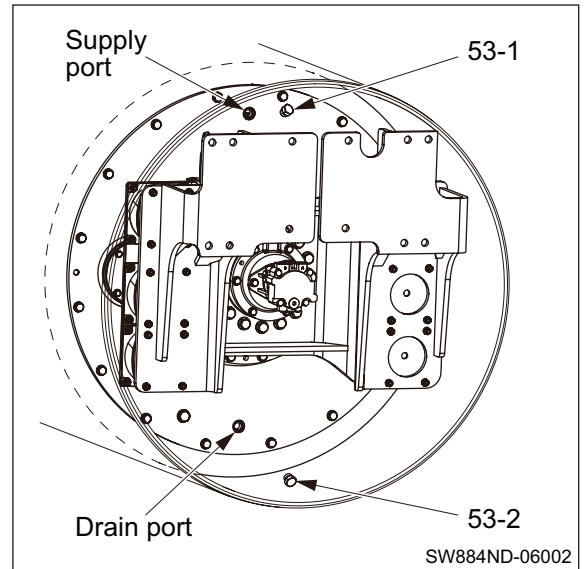


## 4-2. Disassembly and Reassembly of Vibratory Drum

- Lead line numbers shown in illustrations for the following vibratory drum disassembly and reassembly procedures are constant with part numbers of vibratory drum ASSY shown on page 6-046.

### 4-2-1. Disassembly of vibratory drum


- 1) Remove plugs (53-1) and (53-2).
  - Drain gear oil.
  - Quantity of gear oil : 75 L (19.8 gal.)
  - Install plugs.

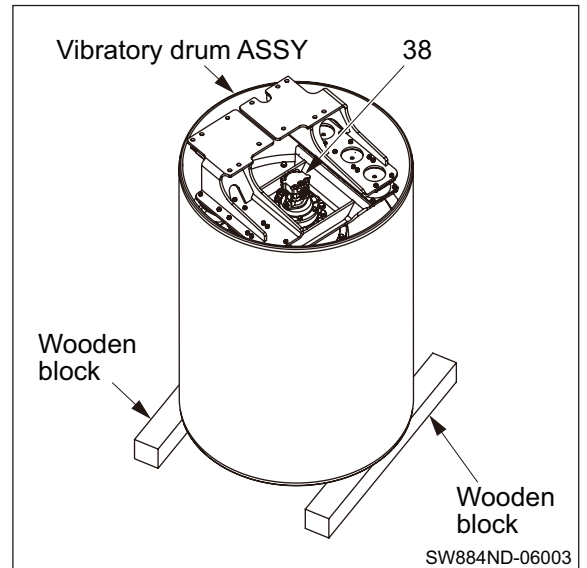


### **⚠ WARNING**

When standing the drum, use wooden blocks of sufficient strength to securely support the drum.

- 2) Lift vibratory drum ASSY with a crane and stand it with its vibrator motor (38) side facing up as shown on the right.


 Vibratory drum ASSY  
 SW884ND : 3,490 kg (7,694 lbs.)  
 SW994ND : 3,610 kg (7,959 lbs.)

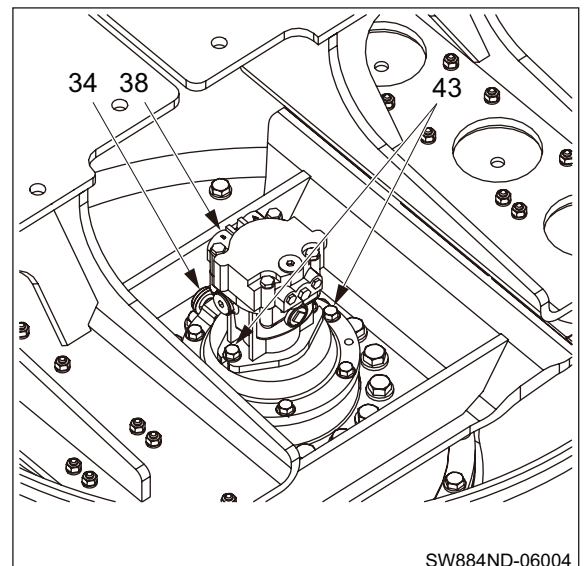


### **⚠ WARNING**

Carry out the work in an unstrained posture using a work stool or the like.

- 3) Remove bolts (43).
  - Remove vibrator motor (38).
  - Remove breather (34).

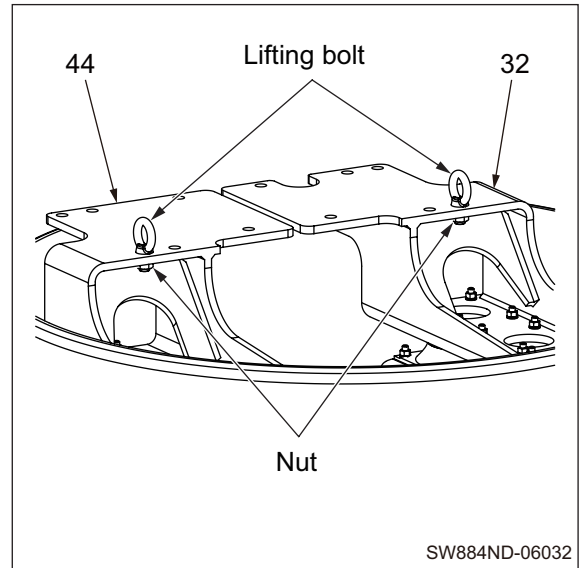
 (38) Vibrator motor : 15 kg (33 lbs.)



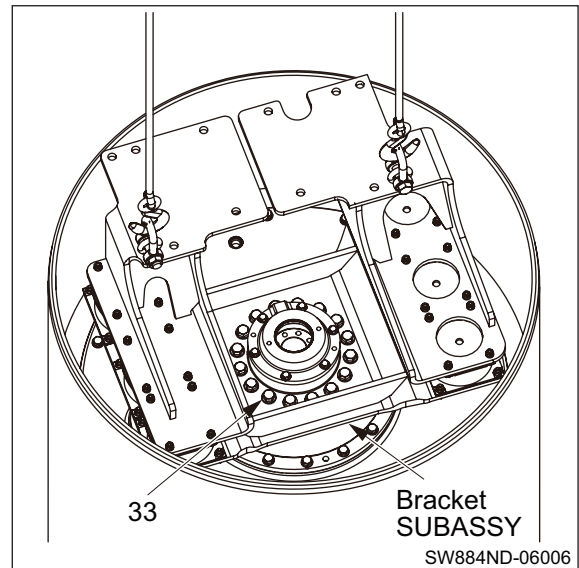
**⚠ WARNING**

When installing lifting bolts, screw them with nuts.

- 4) Install lifting bolts (M22) to brackets (32) and (44) with nuts.



- 5) Remove bolts (33).



- 6) Remove bracket SUBASSY.

**(NOTICE)**

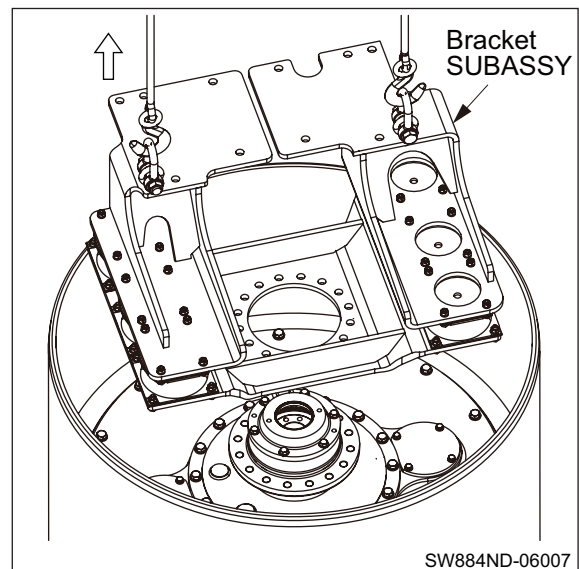
- Since parts cannot be lifted in a level position in the illustrated state, lift them using a support or like until spigot joint of housing is disengaged.



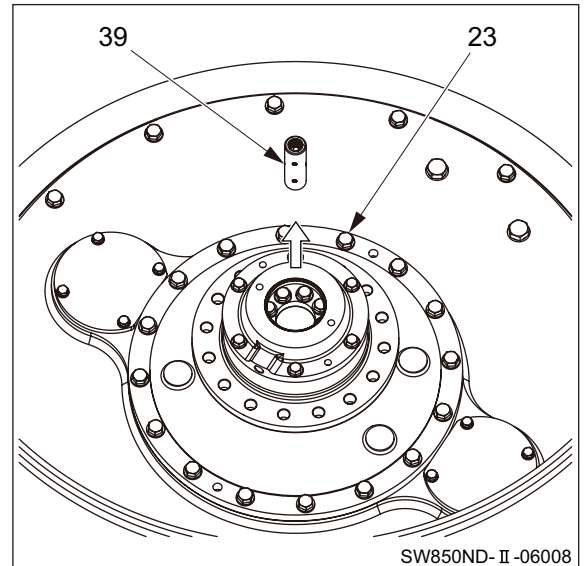
Bracket SUBASSY

SW884ND : 290 kg (639 lbs.)

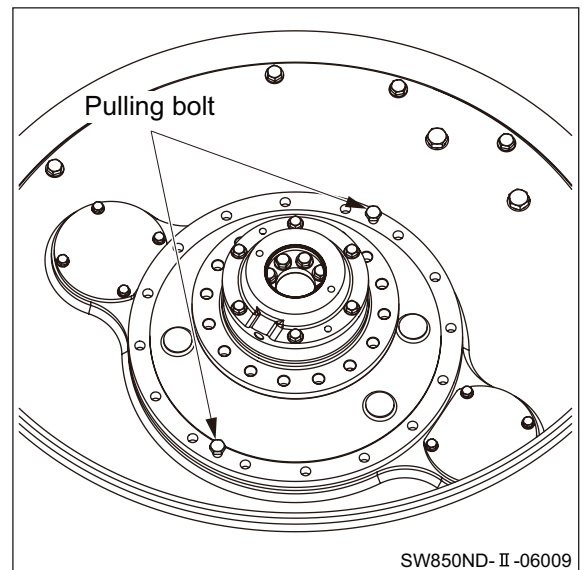
SW994ND : 295 kg (650 lbs.)



- 7) Remove sleeve (39).
  - Remove bolts (23).



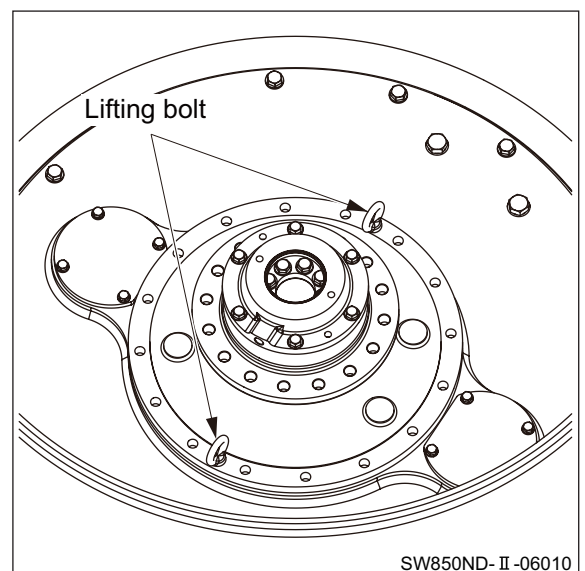
- 8) Lift axle shaft SUBASSY using two pulling bolts (M16×50).



## **⚠ WARNING**

When installing lifting bolts, screw in the threads fully before using.

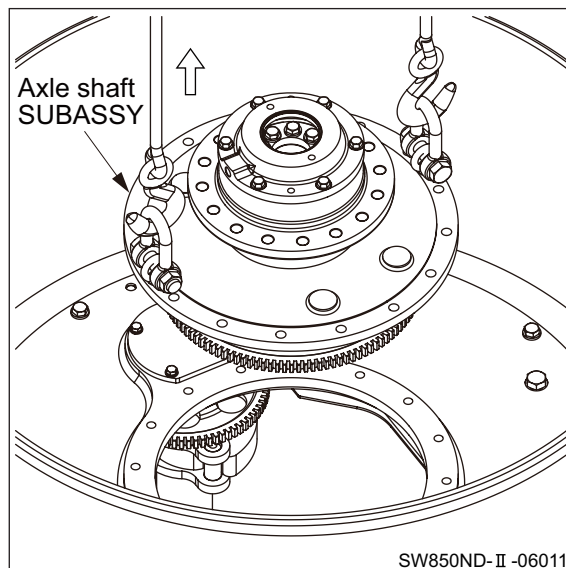
- 9) Install lifting bolts (M16).



10) Remove axle shaft SUBASSY.

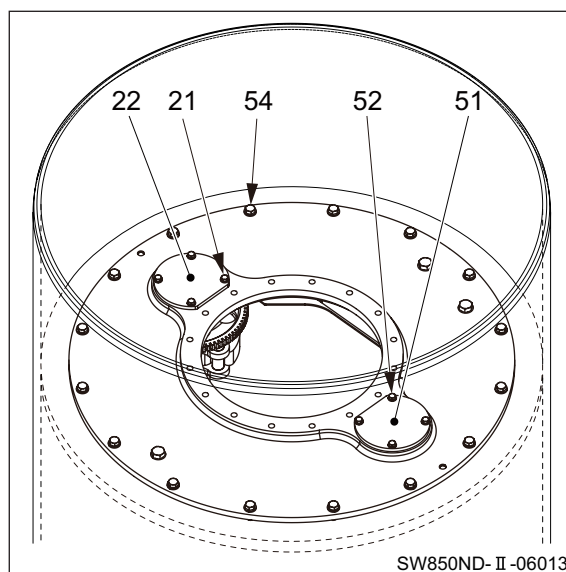
 Axle shaft SUBASSY : 185 kg (408 lbs.)

(To step 26))

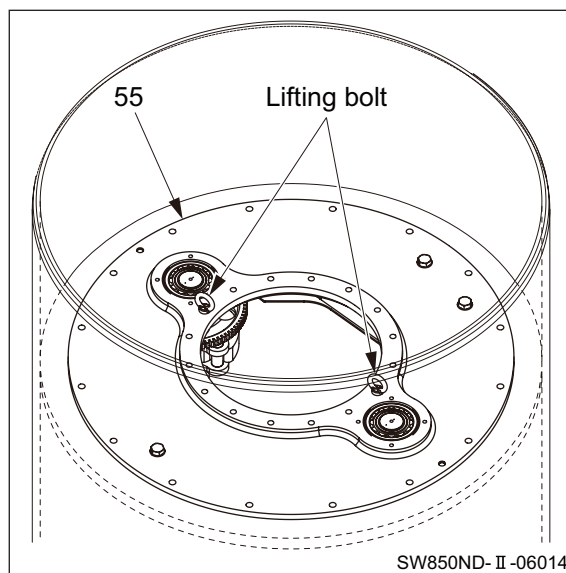


11) Remove bolts (21) and (52).

- Remove covers (22) and (51).
- Remove bolts (54).



12) Install lifting bolts (M16) to housing (55).

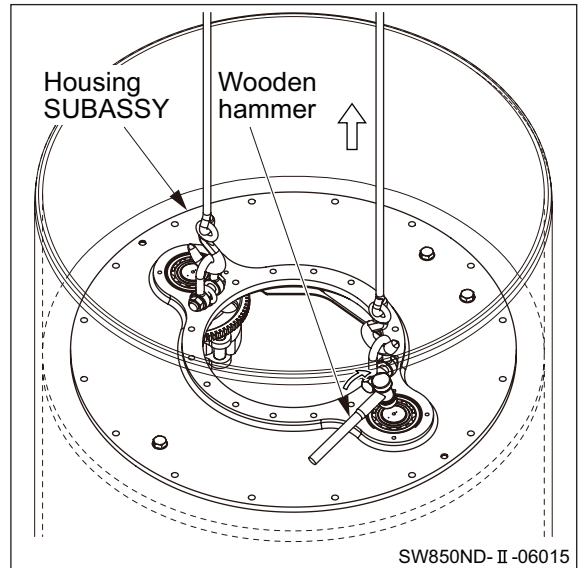


13) Remove housing SUBASSY.

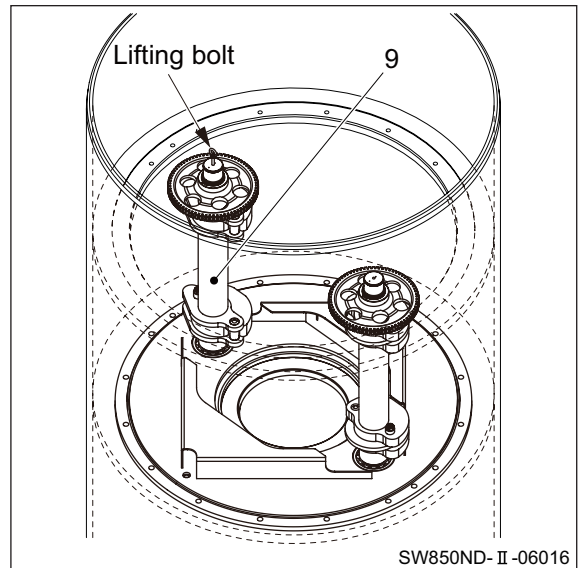
 Housing SUBASSY : 220 kg (485 lbs.)

**(NOTICE)**

- In order not to lift eccentric shaft together with housing SUBASSY, tap on the eccentric shaft ends alternately with a wooden hammer during lifting.




14) Install a lifting bolt (M8) to eccentric shaft (9).



**⚠ WARNING**

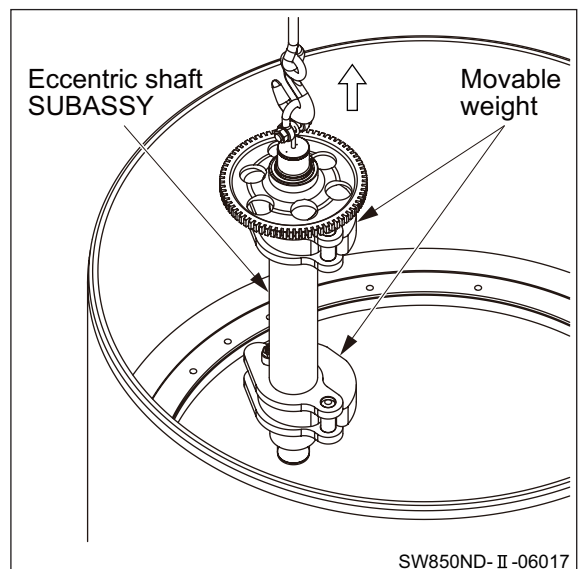
Take care not to get your fingers caught in movable weights.

15) Remove eccentric shaft SUBASSY.

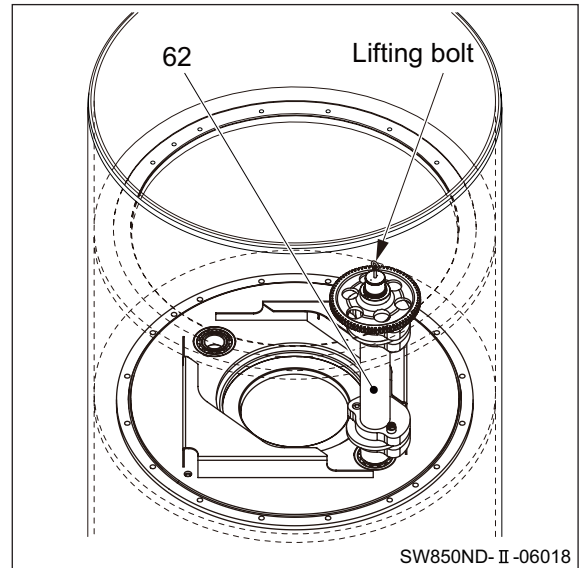
 Eccentric shaft SUBASSY : 95 kg (209 lbs.)

**(NOTICE)**

- Put the movable weight at its outmost position.



16) Install a lifting bolt (M8) to eccentric shaft (62).

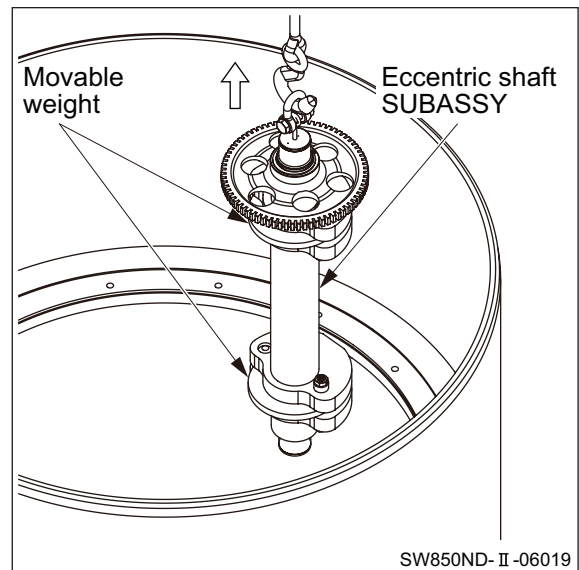


17) Remove eccentric shaft SUBASSY.

$\text{kg}$  Eccentric shaft SUBASSY : 95 kg (209 lbs.)

**(NOTICE)**

- Put the movable weight at its outmost position.

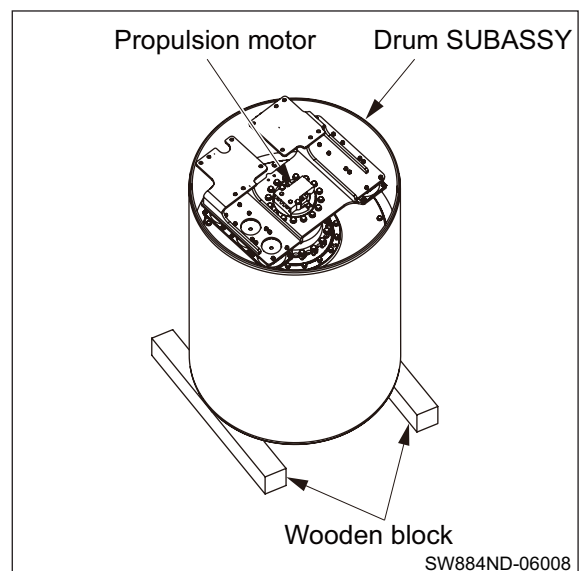


**⚠ WARNING**

Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

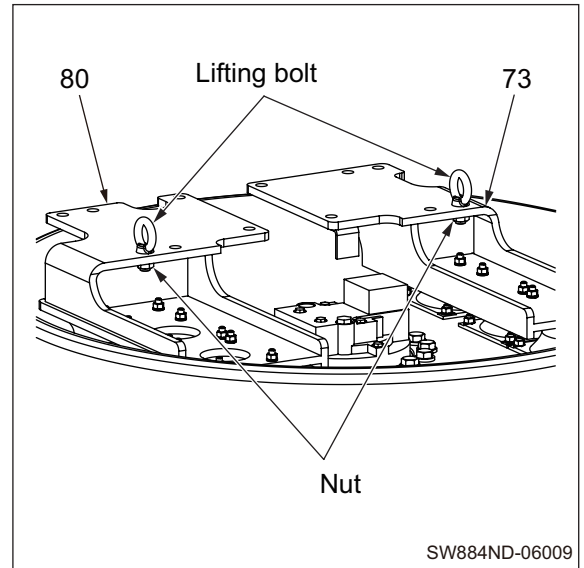
18) Reverse drum SUBASSY.

$\text{kg}$  Drum SUBASSY  
 SW884ND : 2,575 kg (5,677 lbs.)  
 SW994ND : 2,685 kg (5,919 lbs.)





19) Install lifting bolts (M22) to brackets (73) and (80) with nuts.

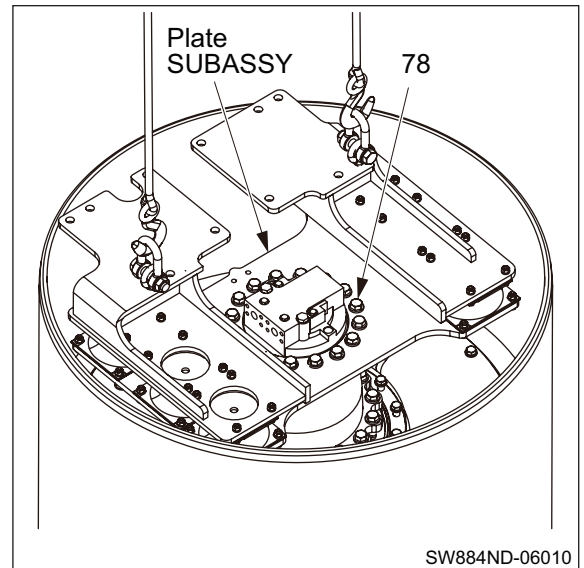


20) Lift plate SUBASSY.


- Remove bolts (78).

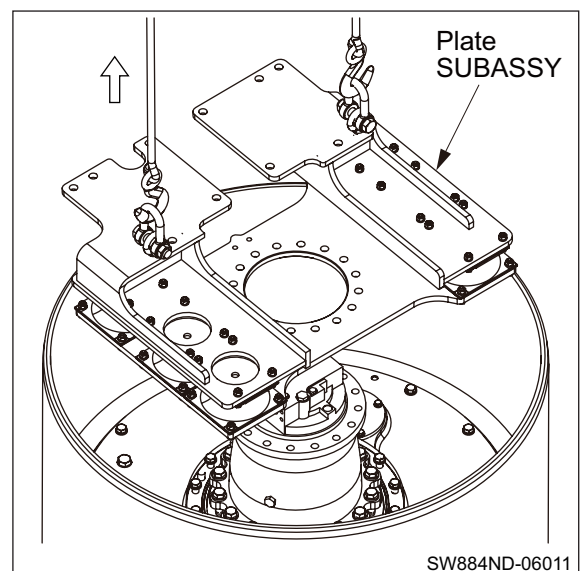
**(NOTICE)**

- Since parts cannot be lifted in a level position in the illustrated state, lift them using a support or like until spigot joint of housing is disengaged.



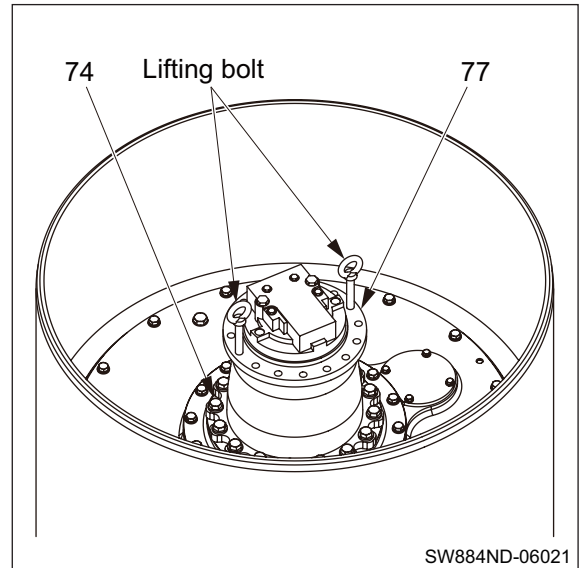
21) Remove plate SUBASSY.

-  Plate SUBASSY  
 SW884ND : 230 kg (507 lbs.)  
 SW994ND : 240 kg (529 lbs.)



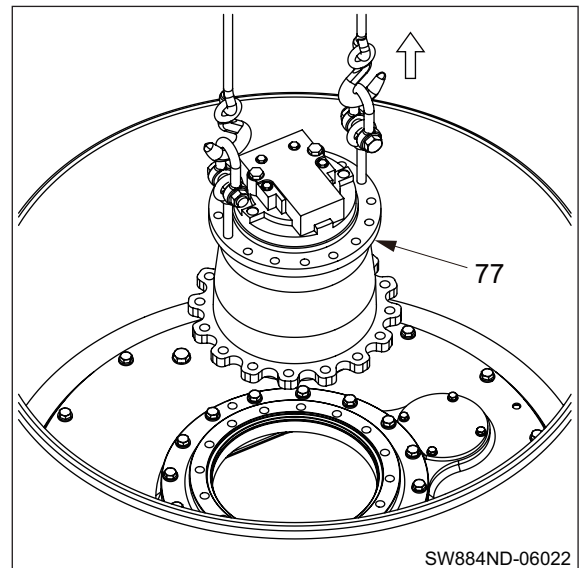
22) Install lifting bolts (M20) to propulsion motor (77).

- Remove bolts (74).



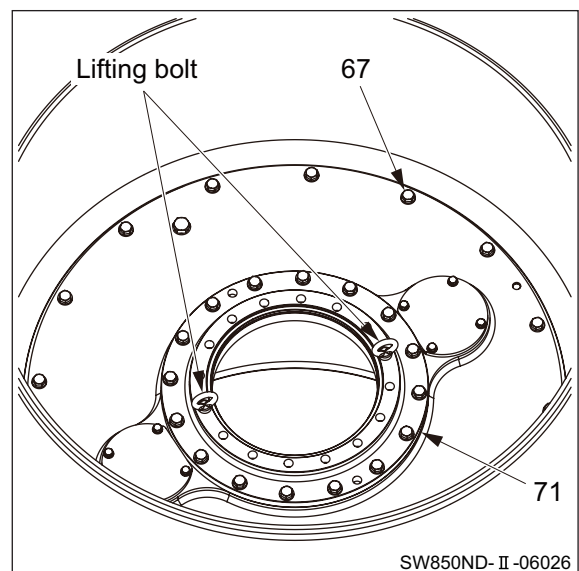
23) Remove propulsion motor (77).

$\mathcal{J}_{kg}$  (77) Propulsion motor : 215 kg (474 lbs.)




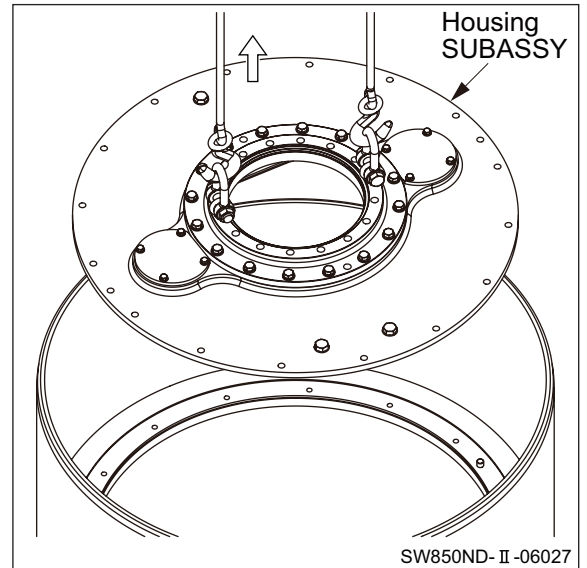
24) Install lifting bolts (M20) to housing (71).

- Remove bolts (67).



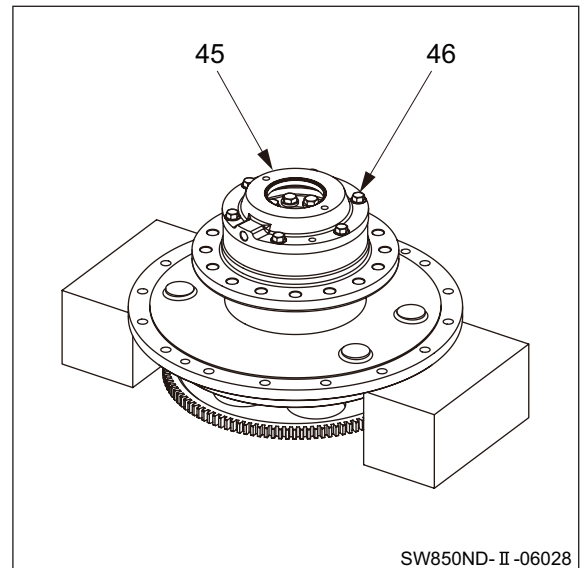
25) Remove housing SUBASSY.

 Housing SUBASSY : 280 kg (617 lbs.)



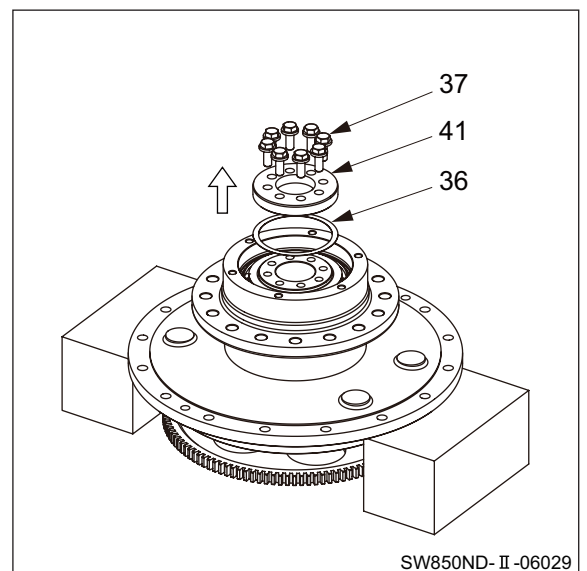
26) Disassembly of axle shaft SUBASSY  
(From step 10))

- Remove bolts (46).
- Remove cover (45).

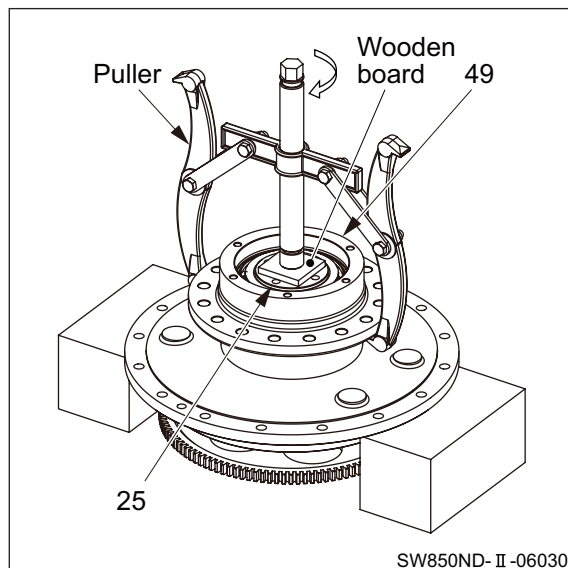


27) Remove bolts (37).

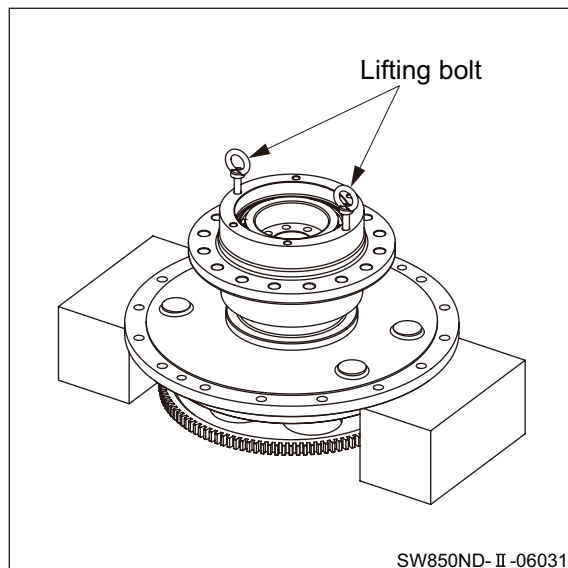
- Remove cover (41).
- Remove shim (36).



- 28) Put a piece of wooden board on end of axle shaft (25).
- Set a puller on housing (49).
  - Remove housing SUBASSY with roller bearing from axle shaft SUBASSY.

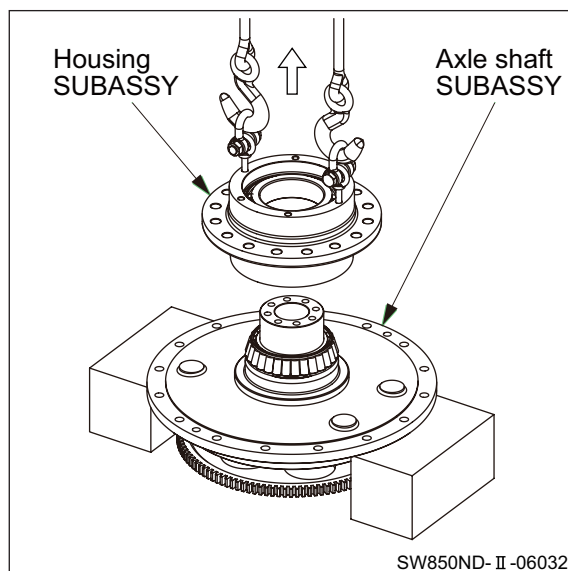


- 29) Install lifting bolts (M12).

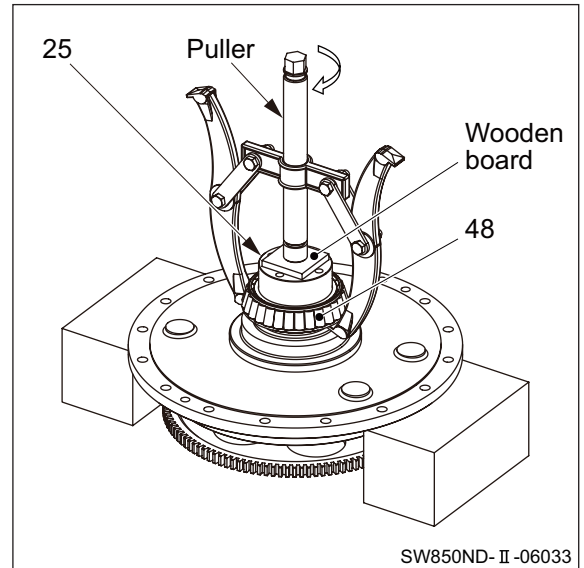


- 30) Remove housing SUBASSY from axle shaft SUBASSY.

$\mathfrak{J}_{kg}$  Housing SUBASSY : 45 kg (99 lbs.)

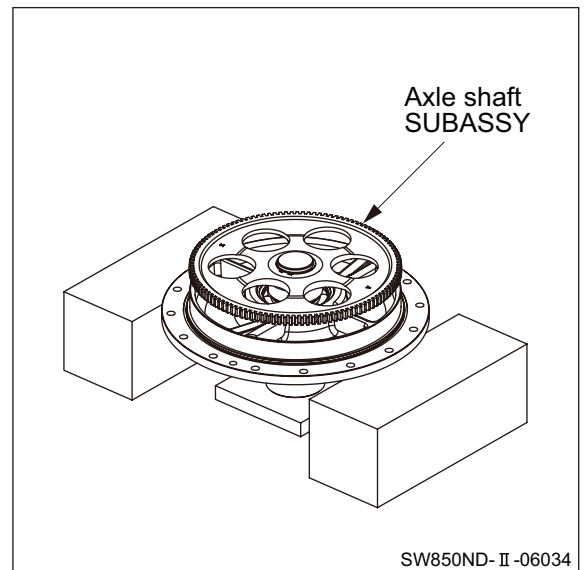


- 31) Put a piece of wooden board on end of axle shaft (25).
- Set a puller on roller bearing (48) inner race.
  - Remove roller bearing inner race from axle shaft SUBASSY.

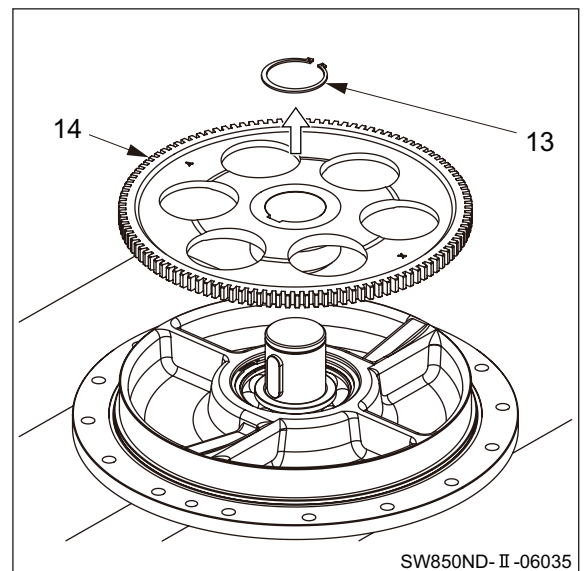


- 32) Reverse axle shaft SUBASSY.

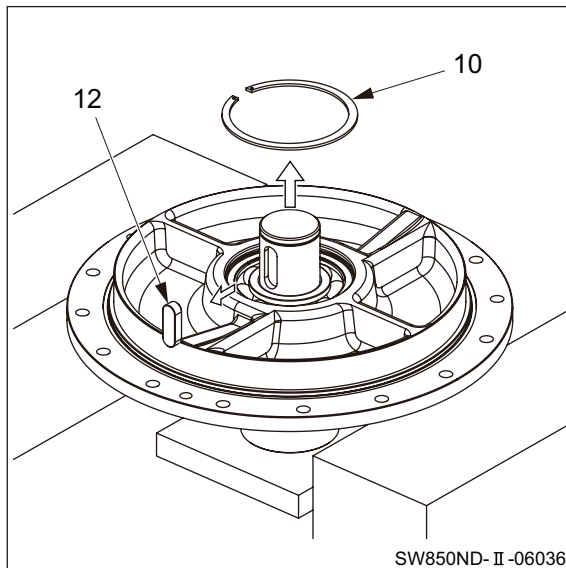
$J_{kg}$  Axle shaft SUBASSY : 125 kg (276 lbs.)



- 33) Remove retaining ring (13).
- Remove gear (14).

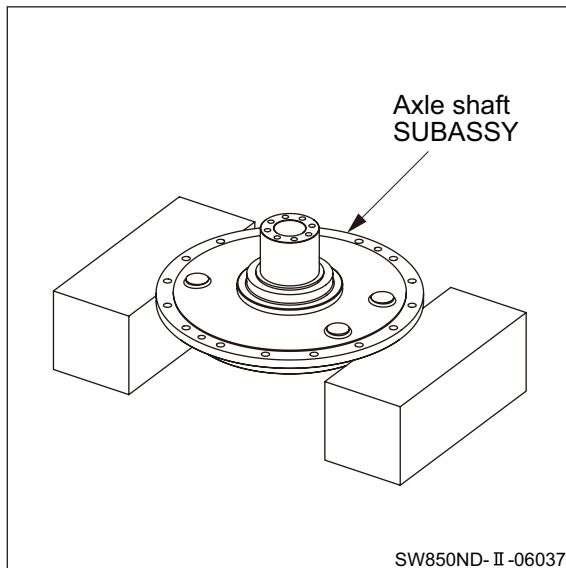


- 34) Remove sunk key (12).  
 • Remove retaining ring (10).

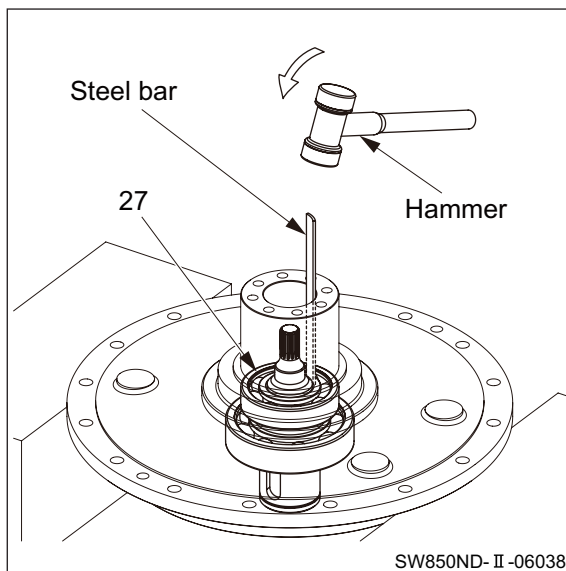


- 35) Reverse axle shaft SUBASSY.

$\mathcal{J}_{kg}$  Axle shaft SUBASSY : 105 kg (231 lbs.)



- 36) Strike on ball bearing (27) inner race by using a steel bar, and remove shaft SUBASSY.




**4-2-2. Reassembly of vibratory drum**

- Before reassembling, clean disassembled parts well and check that there is no abnormality.

**⚠ WARNING**

- When standing the drum, use wooden blocks of sufficient strength to securely support the drum.
- Carry out the work in an unstrained posture using a work stool or the like.

1) Lift drum (1) with a crane and put it in an upright position.

 (1) Drum

SW884ND : 1,840 kg (4,056 lbs.)

SW994ND : 1,940 kg (4,277 lbs.)

2) Reassembly of housing SUBASSY

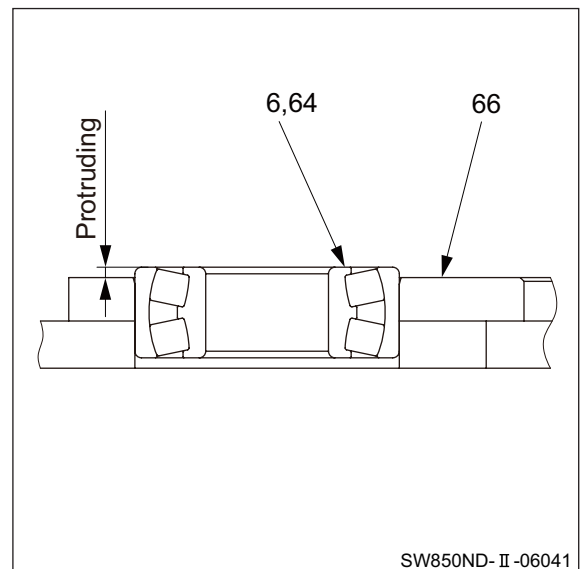
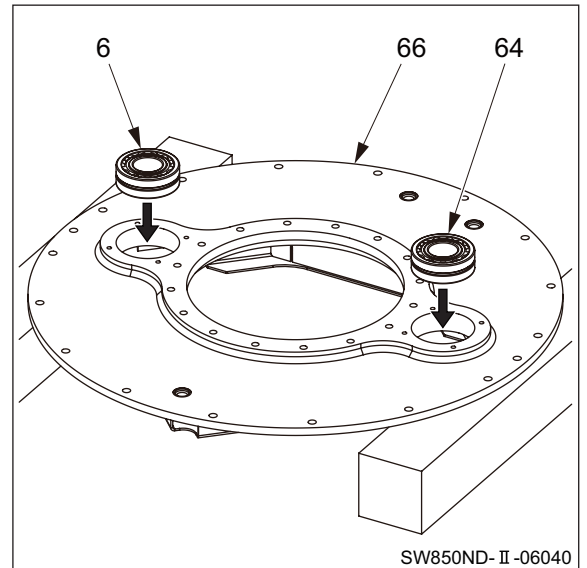
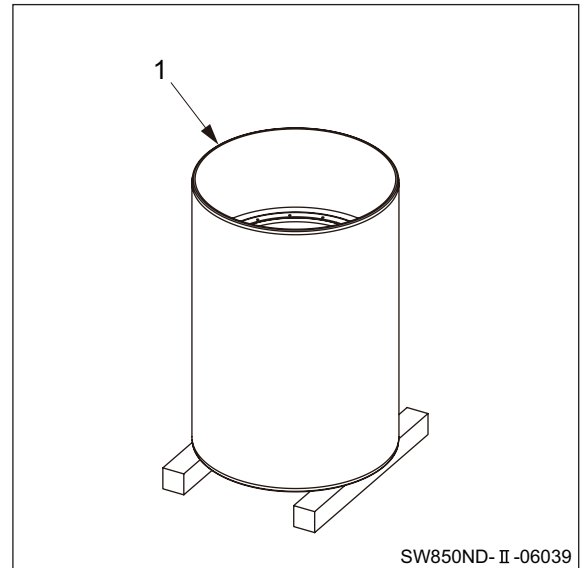
2-1) Apply a coat of gear oil to housing (66) at where vibrator bearings will be press-fitted.

- Drive vibrator bearings (6) and (64).

**(NOTICE)**

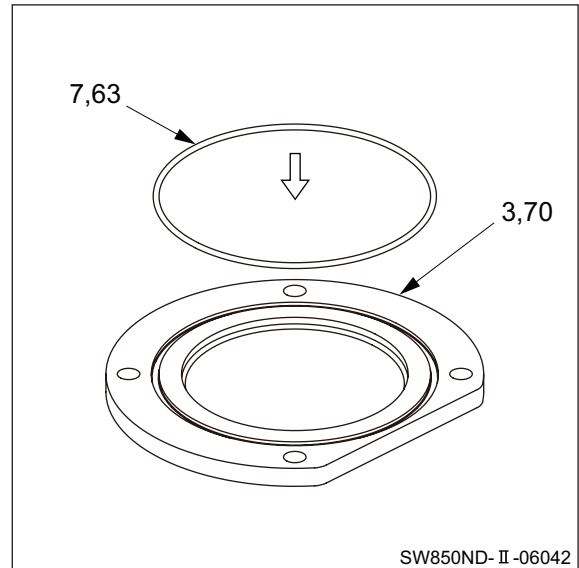
- Take care not to damage the bearings when installing them.

2-2) Stop driving in vibrator bearings (6) and (64) when they come to a position slightly protruding from the boss surface of housing (66) to avoid driving in too much.



2-3) Apply grease to O-rings (7) and (63).

- Install O-rings to covers (3) and (70).

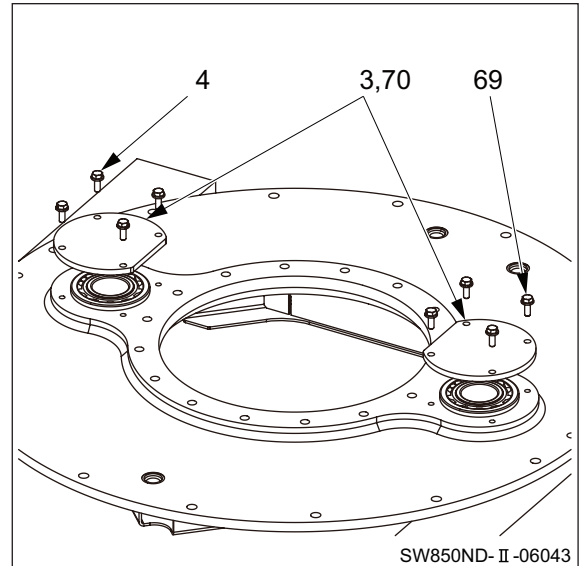


2-4) Apply a coat liquid packing to housing SUBASSY at where covers (3) and (70) will be installed.

- Place covers while making sure to orient them in the correct direction.
- Install four bolts (4), (69) to press in bearings.

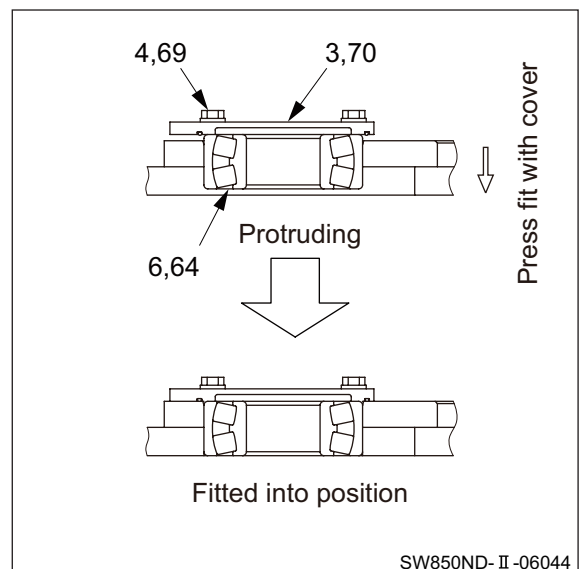
**(NOTICE)**

- Take care not to let O-ring to protrude from its groove.
- Bolts are treated with thread-locking fluid. Use new thread-locking fluid treated bolts for installation.



2-5) Press in and secure bearings (6) and (64) with covers (3) and (70).

 (4) and (69) Bolts M10×30 : 59 N·m (44 lbf·ft)

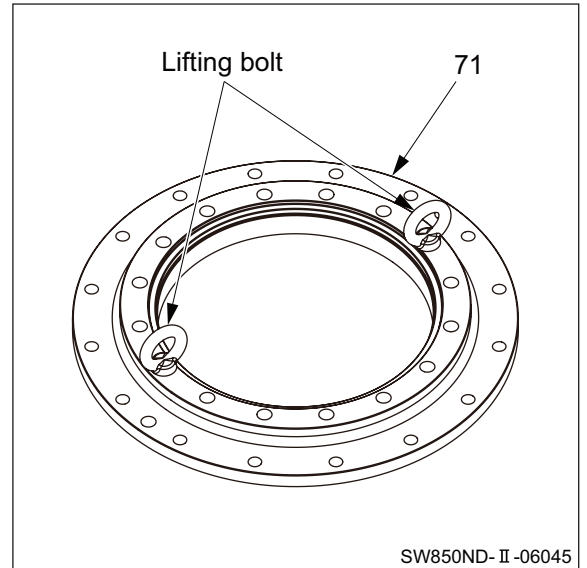




**⚠ WARNING**

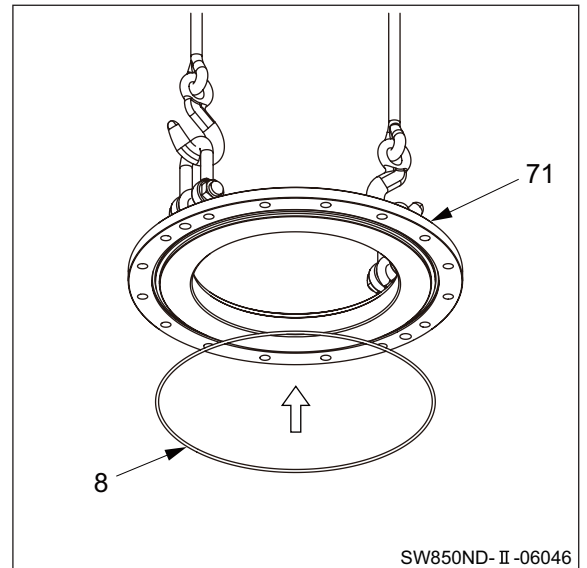
When installing lifting bolts, screw in the threads fully before using.

2-6) Install lifting bolts (M20) to housing (71).




2-7) Lift housing (71).

- Apply grease to O-ring (8).
- Install O-ring to housing.



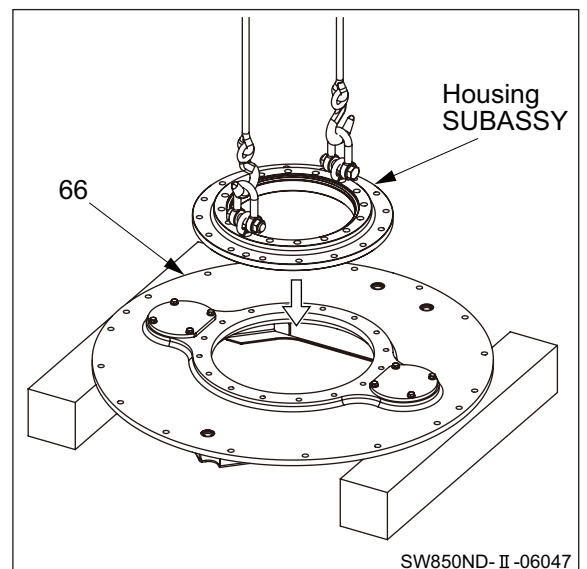
2-8) Apply a coat of liquid packing to housing (66) at where housing SUBASSY will be installed.

- Install housing SUBASSY.

 kg Housing SUBASSY : 45 kg (99 lbs.)

**(NOTICE)**

- Take care not to let O-ring to protrude from its groove.



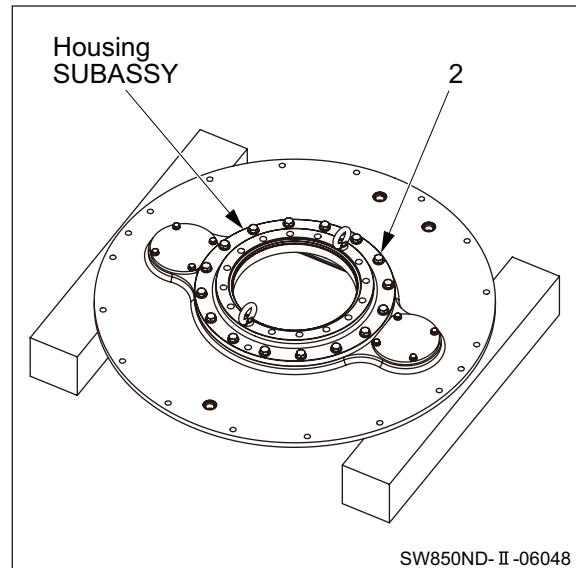
2-9) Secure housing SUBASSY with sixteen bolts (2) and washers.



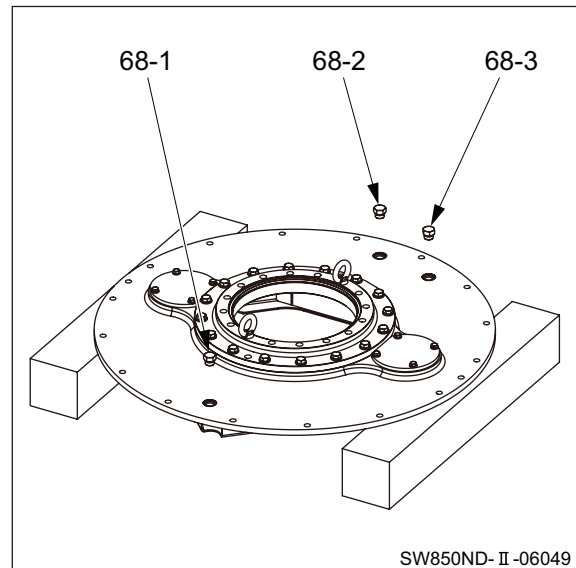
(2) Bolts M16×50 : 265 N·m (195 lbf·ft)

**(NOTICE)**

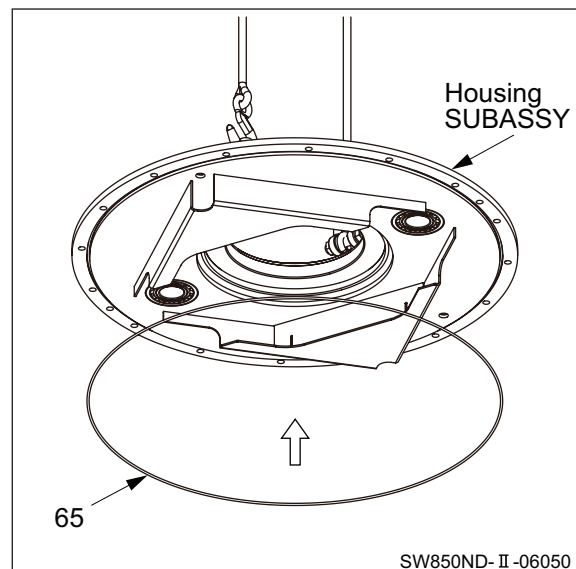
- Bolts are treated with thread-locking fluid. Use new thread-locking fluid treated bolts for installation.




- 3) Apply grease to O-rings for plugs (68-1), (68-2), and (68-3).
- Install plugs.



- 4) Lift housing SUBASSY.
- Apply grease to O-ring (65).
  - Install O-ring.

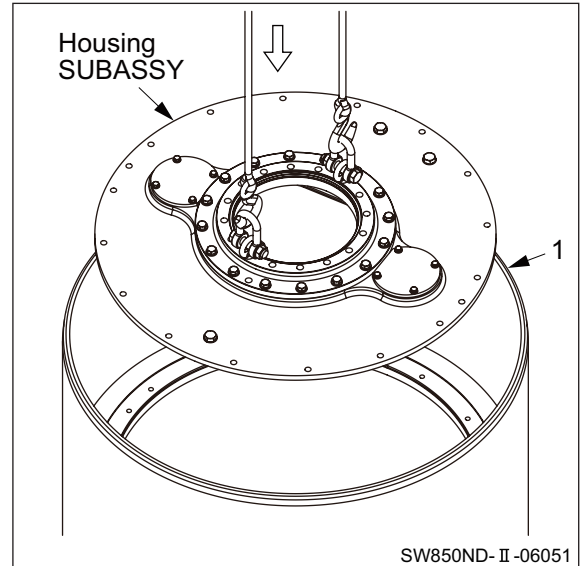


5) Install housing SUBASSY.

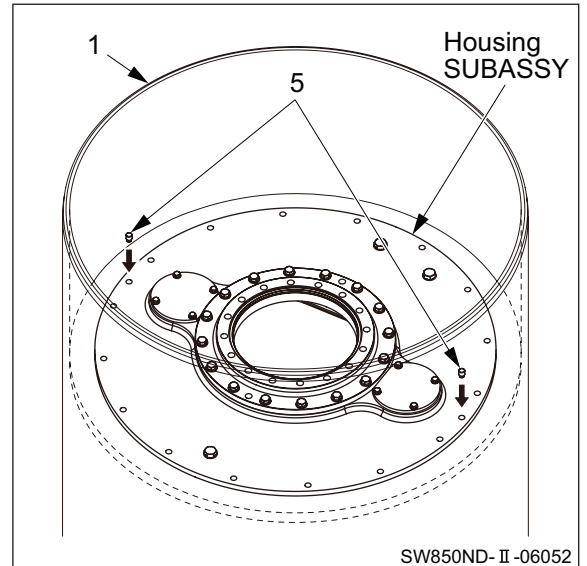
 Housing SUBASSY : 275 kg (606 lbs.)

**(NOTICE)**


- Take care not to let O-ring to protrude from its groove.



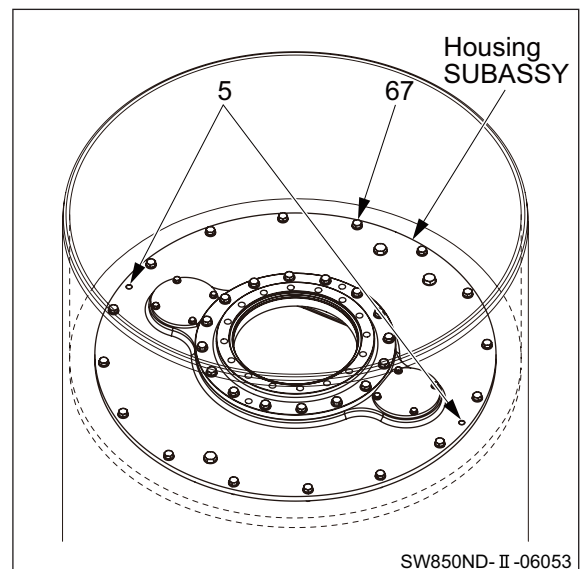
6) Drive in two locating pins (5) for housing SUBASSY and drum (1) temporarily.



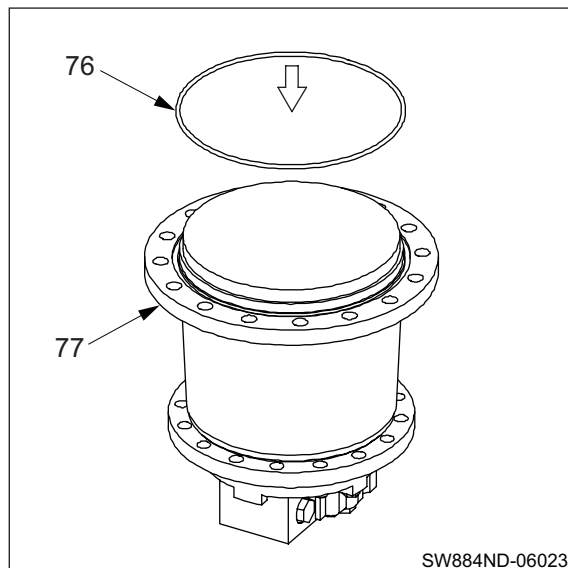
7) Secure housing SUBASSY with sixteen bolts (67) and washers.

 (67) Bolts M16×45 : 265 N·m (195 lbf·ft)

- Drive in locating pins (5) again.



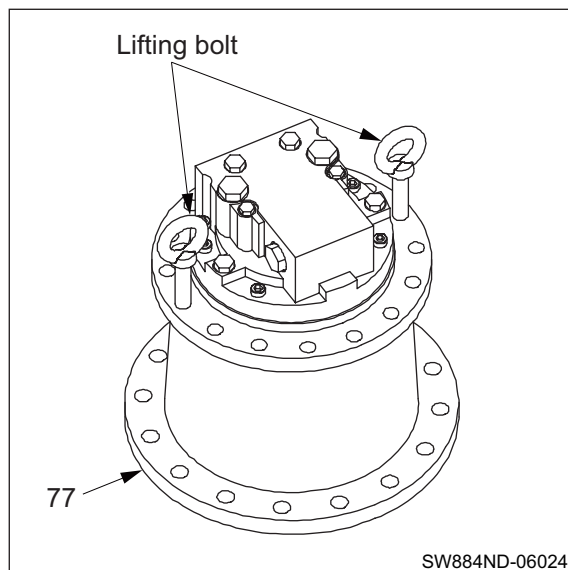
- 8) Apply grease to O-ring (76).  
 • Install O-ring to propulsion motor (77).



- 9) Reverse propulsion motor (77).

$\mathfrak{J}_{kg}$  (77) Propulsion motor : 215 kg (474 lbs.)

- Install lifting bolts (M20).

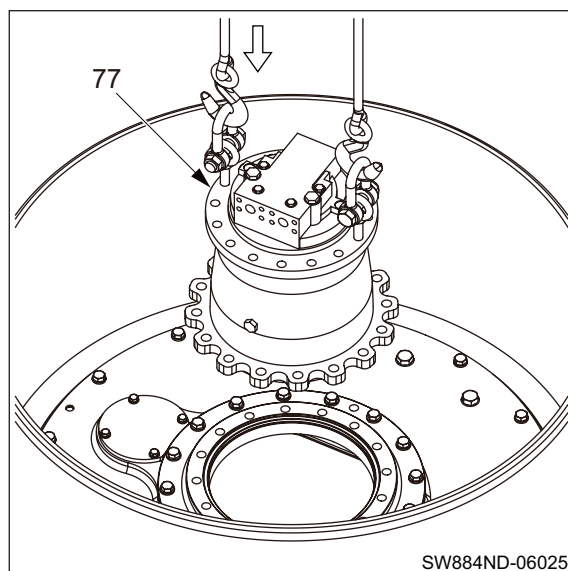


- 10) Install propulsion motor (77).


$\mathfrak{J}_{kg}$  (77) Propulsion motor : 215 kg (474 lbs.)

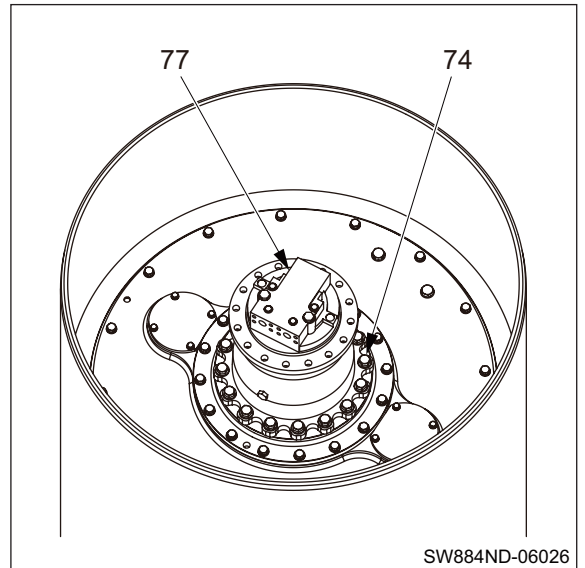
**(NOTICE)**

- Take care not to let O-ring to protrude from its groove.



11) Secure propulsion motor (77) with sixteen bolts (74) and washers.

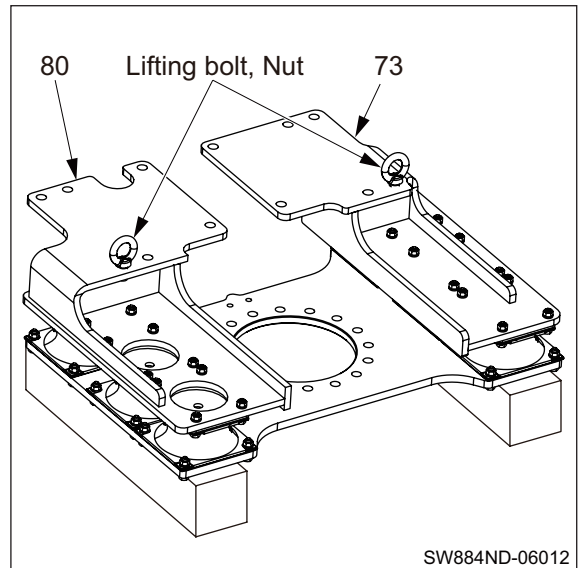
 (74) Bolts M20×60 : 539 N·m (398 lbf·ft)




**⚠ WARNING**

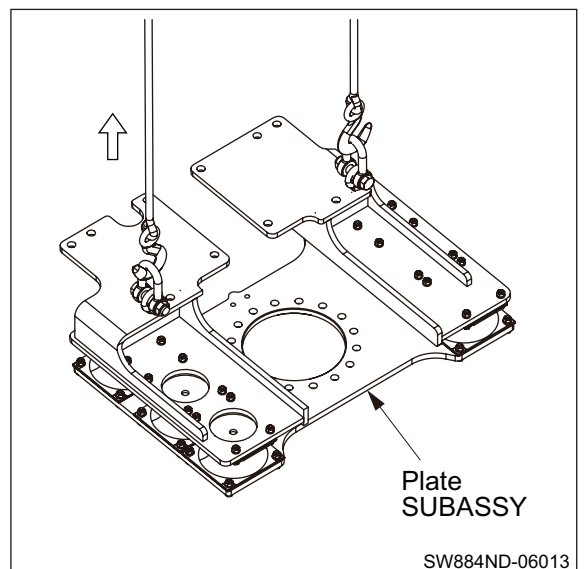
When installing lifting bolts, screw them with nuts.

12) Install lifting bolts (M22) to brackets (73) and (80) with nuts.



13) Lift plate SUBASSY.

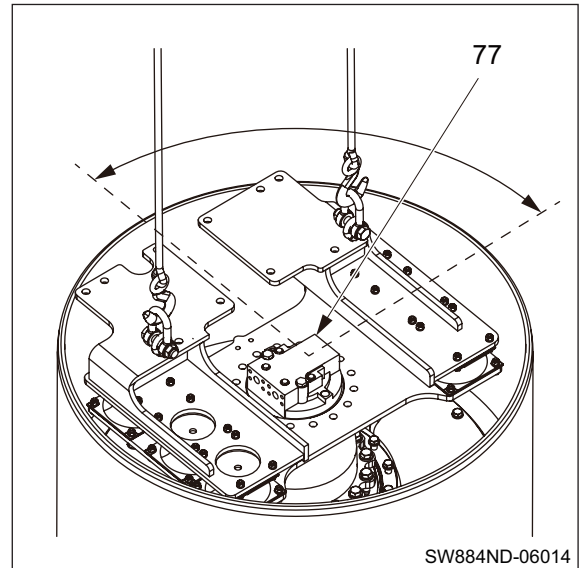
  $J_{kg}$  Plate SUBASSY  
 SW884ND : 230 kg (507 lbs.)  
 SW994ND : 240 kg (529 lbs.)



14) Lower plate SUBASSY while keeping it level and install it on spigot joint of propulsion motor (77).

**(NOTICE)**

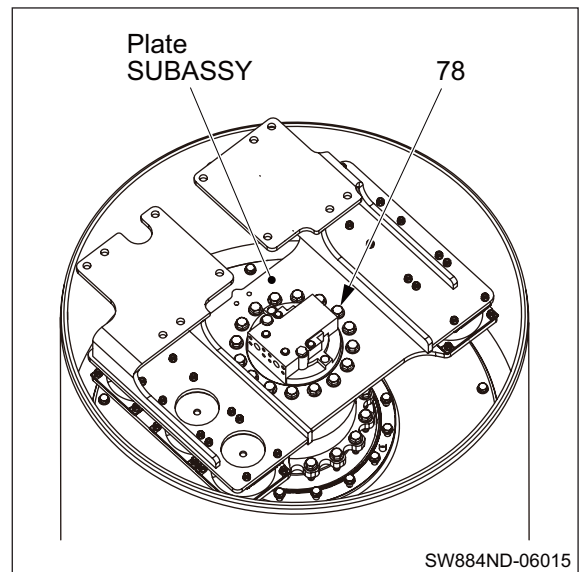
- Since the plate SUBASSY cannot be lowered in a level position, lower them using a support or like.
- Be sure to install the plate SUBASSY correctly in relation to the position of the propulsion motor.



15) Secure plate SUBASSY with sixteen bolts (78) and washers.



(78) Bolts M20×60 : 539 N·m (398 lbf-ft)



**⚠ WARNING**

Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

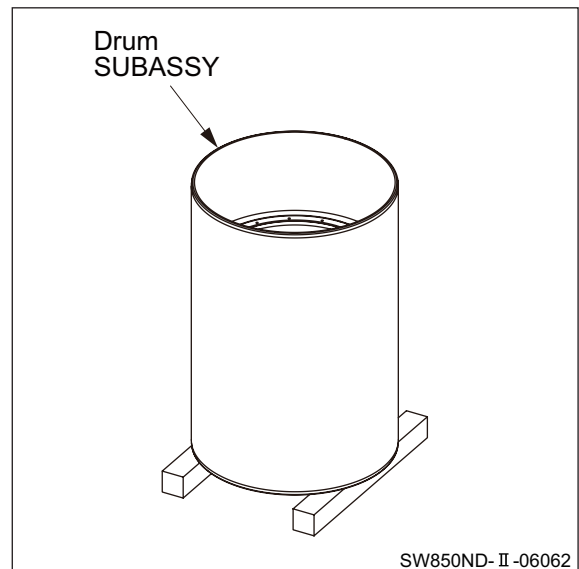
16) Reverse drum SUBASSY.



Drum SUBASSY

SW884ND : 2,575 kg (5,677 lbs.)

SW994ND : 2,685 kg (5,919 lbs.)



**⚠ WARNING**

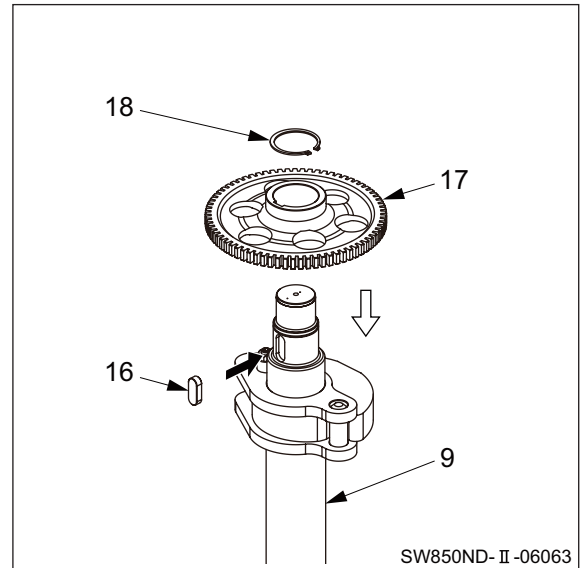
Wear heat resistant gloves when handling heated parts to avoid burns.

17) Heat up gear (17) by using a ring heater or the like.

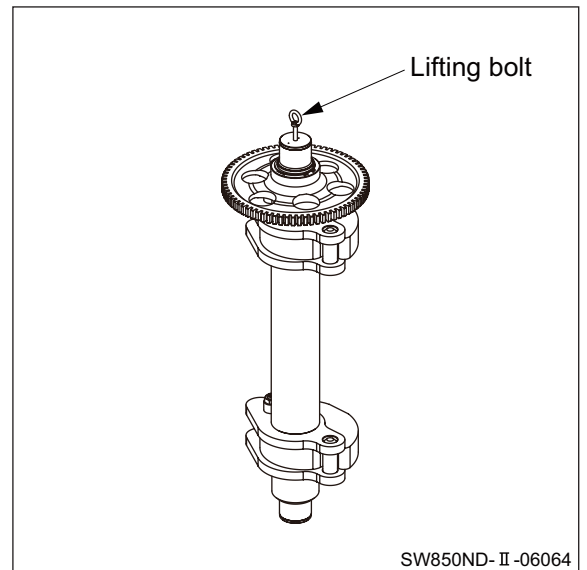
- Drive sunk key (16) into eccentric shaft (9).
- Install heated gear.
- Install retaining ring (18).

**(NOTICE)**

- **Make sure that the retaining ring is fitted completely in its groove.**



18) Install a lifting bolt (M8).




**⚠ WARNING**

Take care not to get your fingers caught in movable weights.

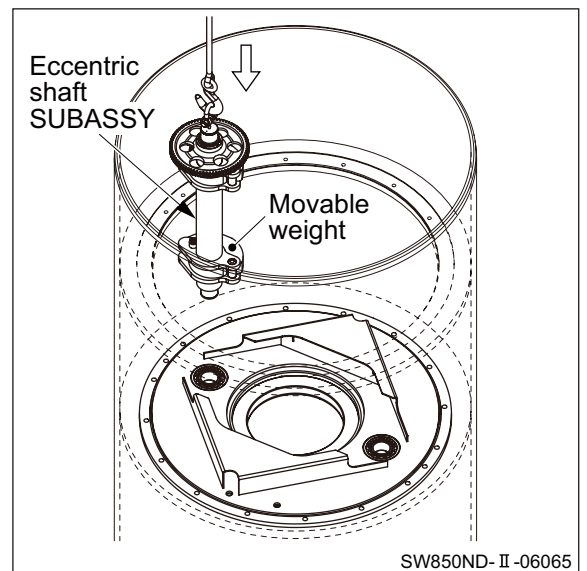
19) Apply a coat of gear oil to eccentric shaft SUBASSY at where bearing will be installed.

- Install eccentric shaft SUBASSY to drum SUBASSY.

 Eccentric shaft SUBASSY : 95 kg (209 lbs.)

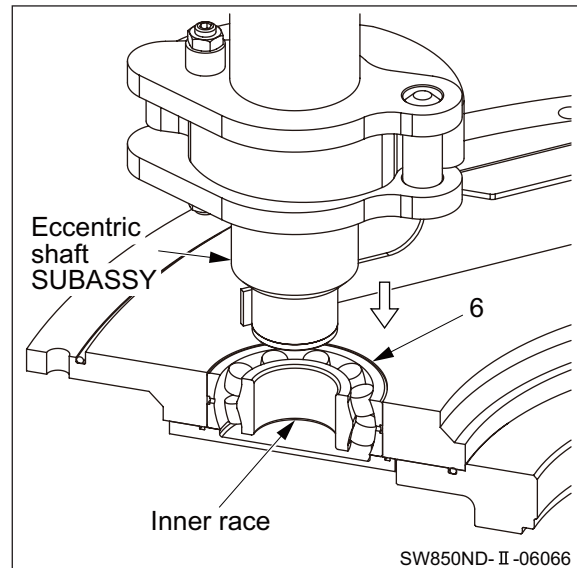
**(NOTICE)**

- **Put the movable weight at its outmost position.**



**(NOTICE)**

- Insert eccentric shaft SUBASSY into vibrator bearing (6) while taking care not to tilt vibrator bearing inner race.
- After inserting the eccentric shaft SUBASSY into the bearing, lay the eccentric shaft SUBASSY against the inner wall of the drum so that it will not fall down.

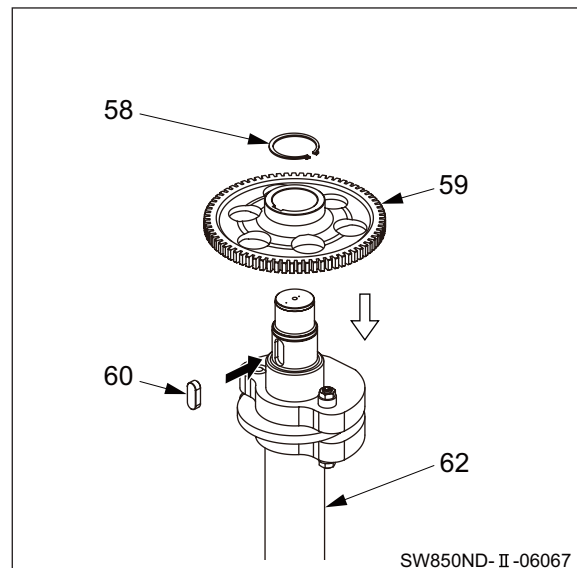


20) Heat up gear (59) by using a ring heater or the like.

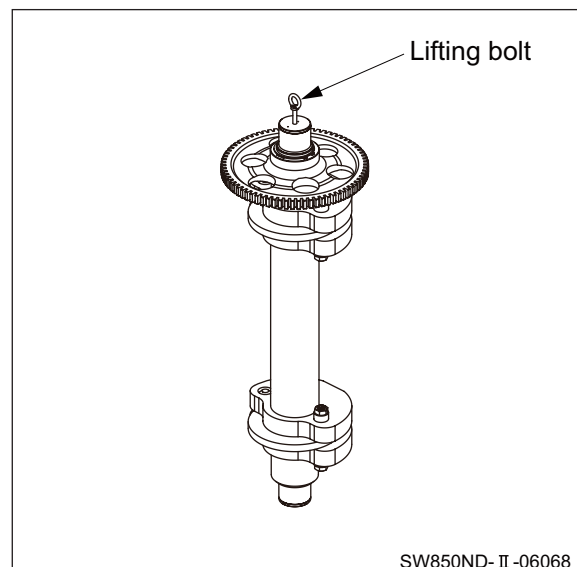
- Drive sunk key (60) into eccentric shaft (62).
- Install heated gear.
- Install retaining ring (58).

**(NOTICE)**

- Make sure that the retaining ring is fitted completely in its groove.




21) Install a lifting bolt (M8).





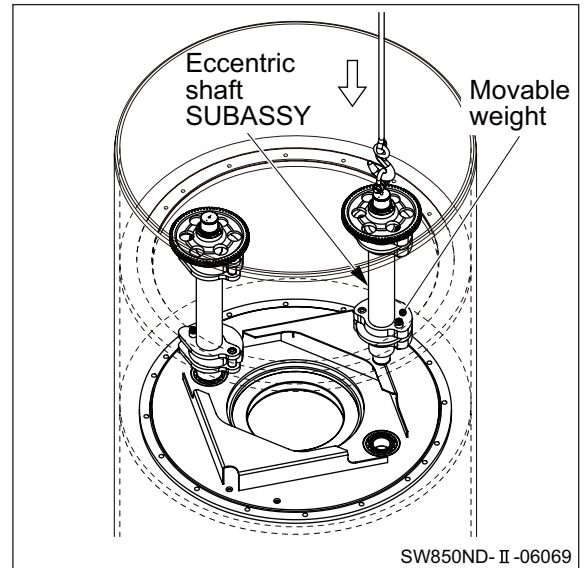
22) Apply a coat of gear oil to eccentric shaft SUBASSY at where bearing will be installed.

- Install eccentric shaft SUBASSY to drum SUBASSY.

 Eccentric shaft SUBASSY : 95 kg (209 lbs.)

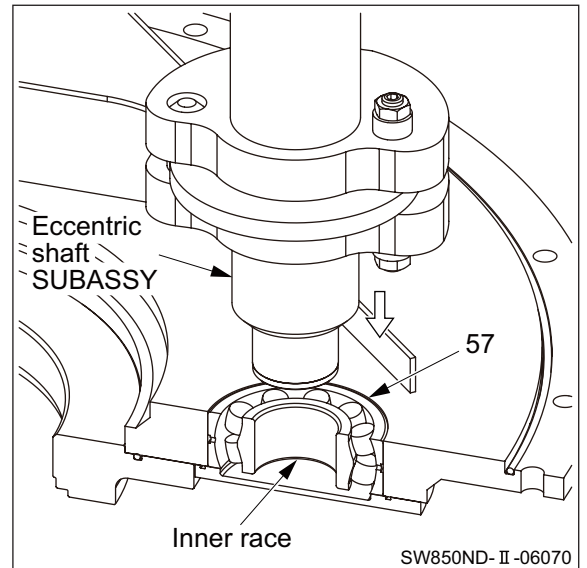
**(NOTICE)**

- Put the movable weight at its outmost position.



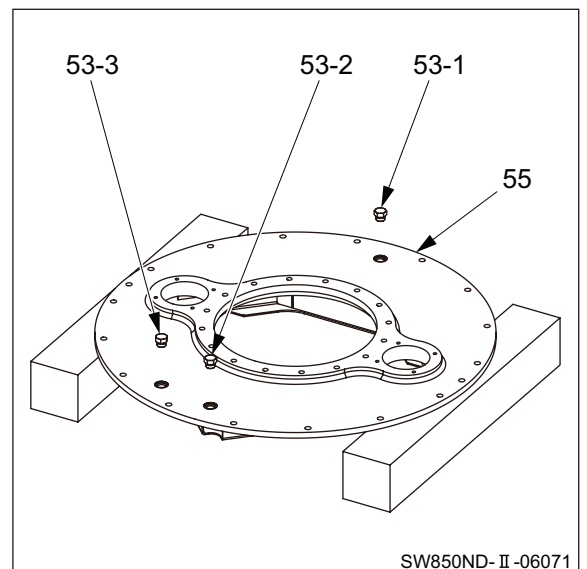
**(NOTICE)**

- Insert eccentric shaft SUBASSY into vibrator bearing (57) while taking care not to tilt vibrator bearing inner race.
- After inserting the eccentric shaft SUBASSY into the vibrator bearing, lay the eccentric shaft SUBASSY against the inner wall of the drum so that it will not fall down.

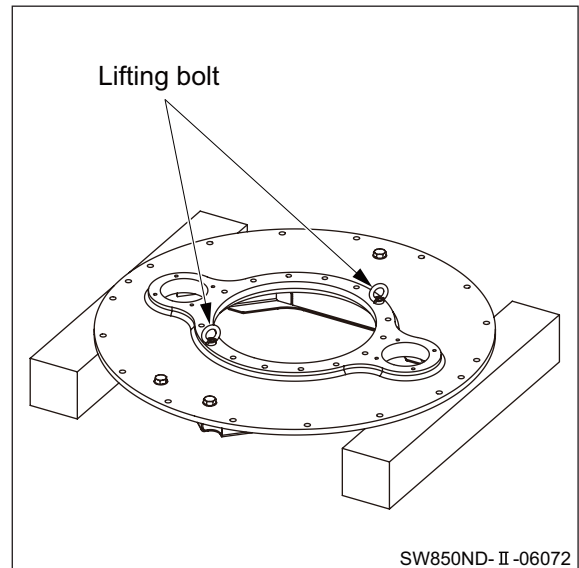


23) Apply grease to O-rings for plugs (53-1), (53-2), and (53-3).

- Install plugs to housing (55).



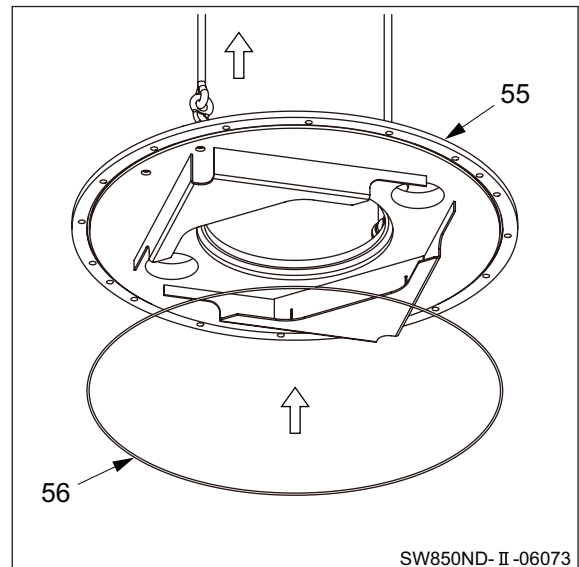
24) Install lifting bolts (M10).



25) Lift housing (55).

$\mathfrak{J}_{kg}$  (55) Housing : 215 kg (474 lbs.)

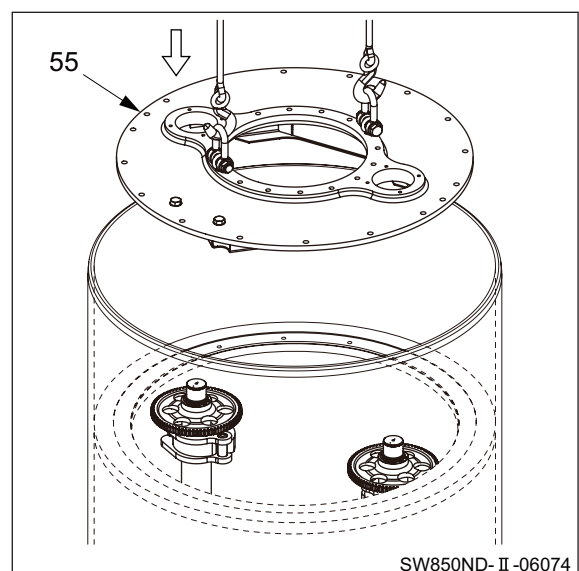
- Apply grease to O-ring (56).
- Install O-ring to housing.



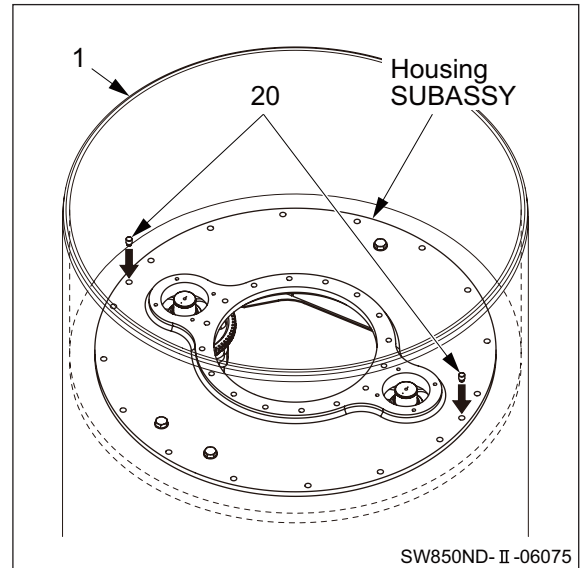
26) Install housing (55).

**(NOTICE)**

- Take care not to let O-ring to protrude from its groove.



27) Drive in two locating pins (20) for housing SUBASSY and drum (1) temporarily.

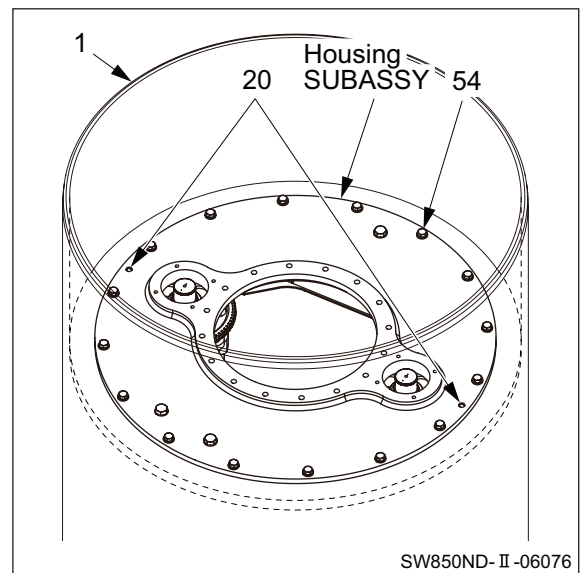


28) Secure housing SUBASSY to drum (1) with sixteen bolts (54) and washers.



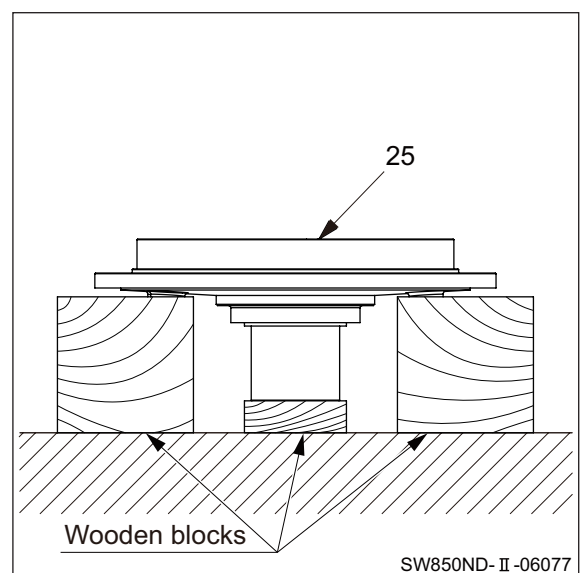
(54) Bolts M16×45 : 265 N·m (195 lbf·ft)

- Drive in locating pins (20) again.



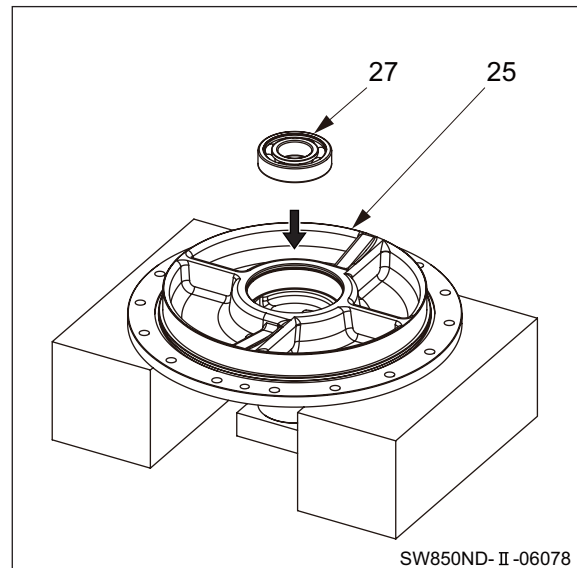
29) Reassembly of axle shaft SUBASSY

29-1) Fix axle shaft (25) with wooden blocks.



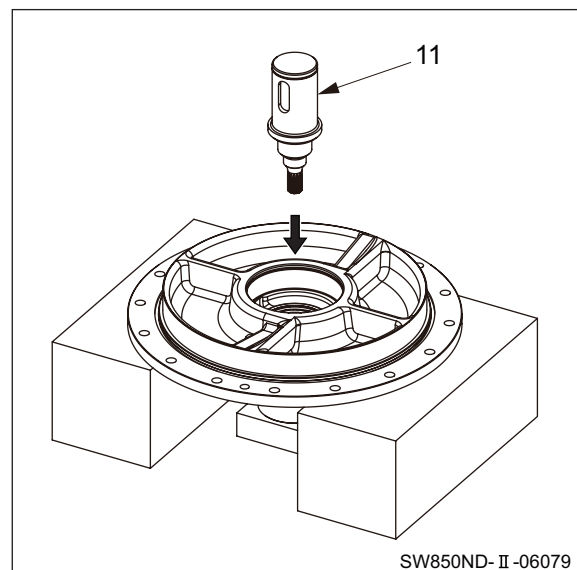
29-2) Apply a coat of gear oil to axle shaft (25) at where bearing will be press-fitted.

- Drive ball bearing (27).



29-3) Apply a coat of gear oil to bearing mounting surface of shaft (11).

- Drive in shaft.

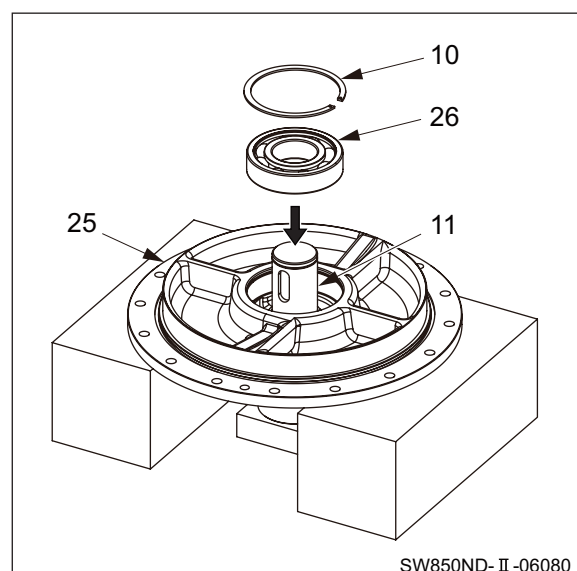


29-4) Apply a coat of gear oil to axle shaft (25) at where bearing will be press-fitted and to drive shaft (11) at where bearing will be installed.

- Drive ball bearing (26).
- Install retaining ring (10).

**(NOTICE)**

- Make sure that the retaining ring is fitted completely in its groove.

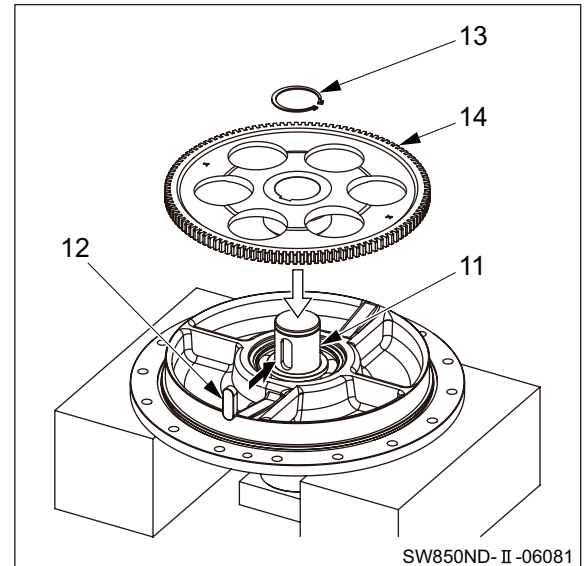


29-5) Heat up gear (14) by using a ring heater or the like.

- Drive sunk key (12) to shaft (11).
- Install heated gear.
- Install retaining ring (13).

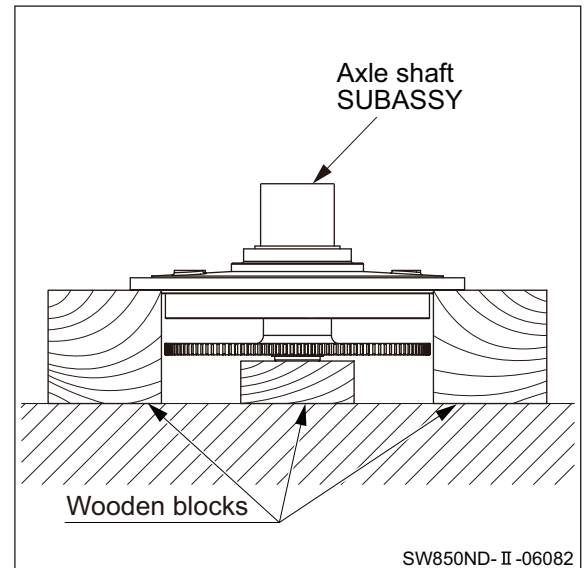
**(NOTICE)**

- **Make sure that the retaining ring is fitted completely in its groove.**



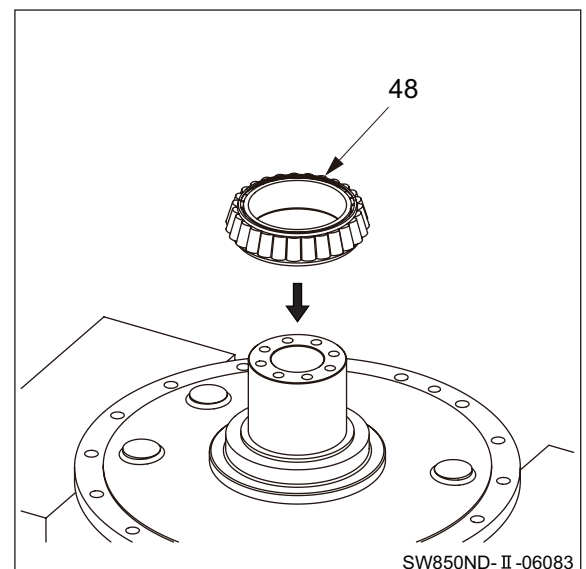
29-6) Reverse axle shaft SUBASSY.

$\mathfrak{J}_{kg}$  Axle shaft SUBASSY : 125 kg (276 lbs.)



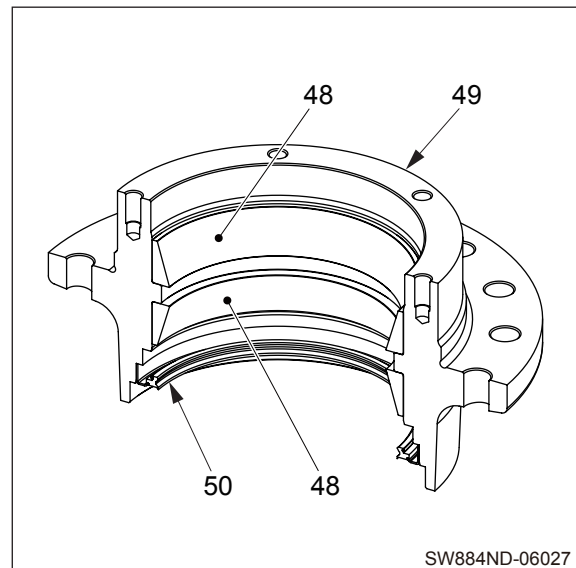
29-7) Heat up roller bearing (48) inner race by using a ring heater or the like.

- Apply a coat of gear oil to axle shaft at where bearing inner race will be press-fitted.
- Drive in heated roller bearing inner race.
- Apply sufficient amount of lithium-based grease to rollers of roller bearing inner race.

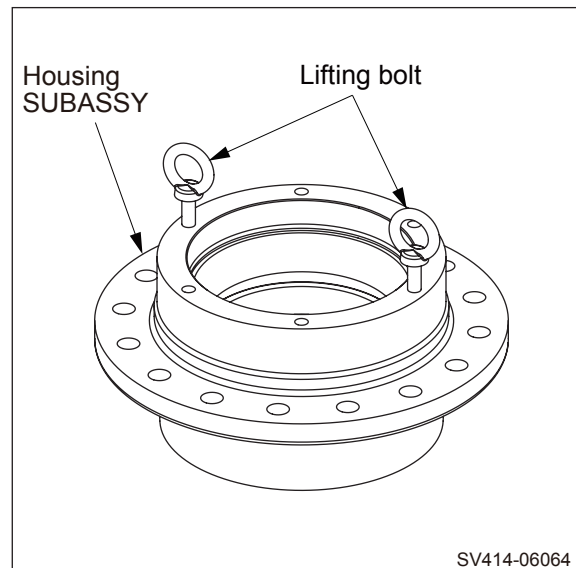


29-8) Apply a coat of gear oil to roller bearings (48) outer race mounting surface of housing (49).

- Drive roller bearing outer races.
- Apply liquid packing to periphery of oil seal (50).
- Drive oil seal.
- Apply grease to lip of oil seal.

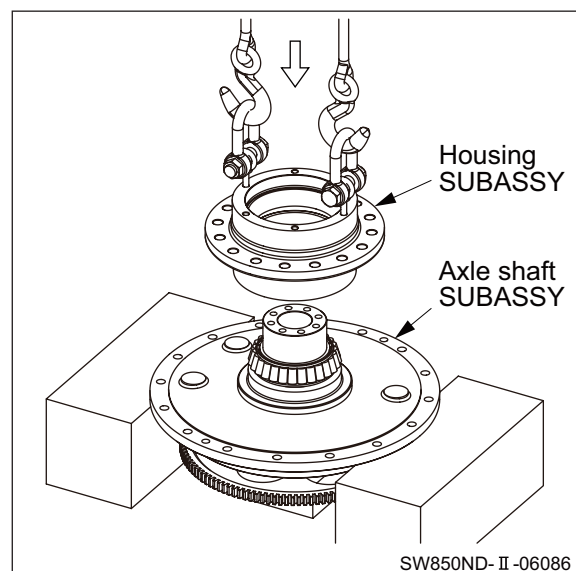


29-9) Install lifting bolts (M12).



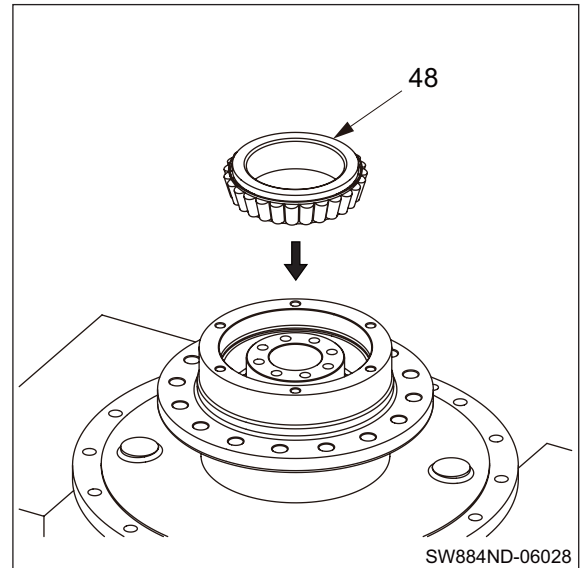
29-10) Install housing SUBASSY to axle shaft SUBASSY.

$\mathcal{J}_{kg}$  Housing SUBASSY : 40kg (88 lbs.)



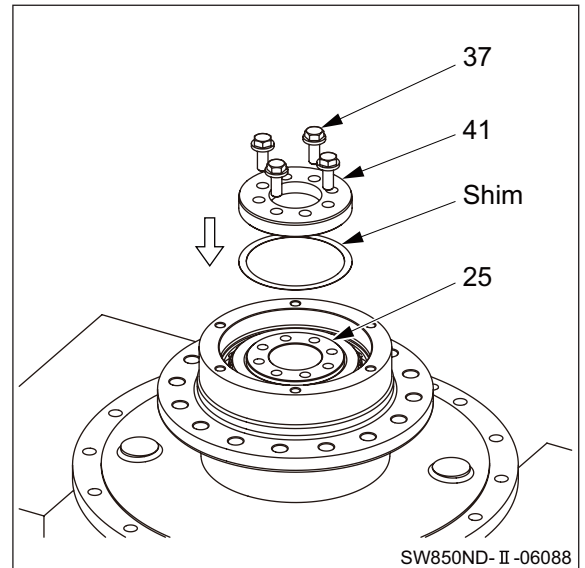
29-11) Apply sufficient amount of lithium-based grease to rollers of roller bearing (48) inner race.

- Drive in roller bearing inner race until rollers come in contact with outer race.



29-12) Preload adjustment of roller bearing

- ① Install a shim of about 1 mm (0.04 in.) and secure cover (41) to axle shaft (25) with four bolts (37) and washers.

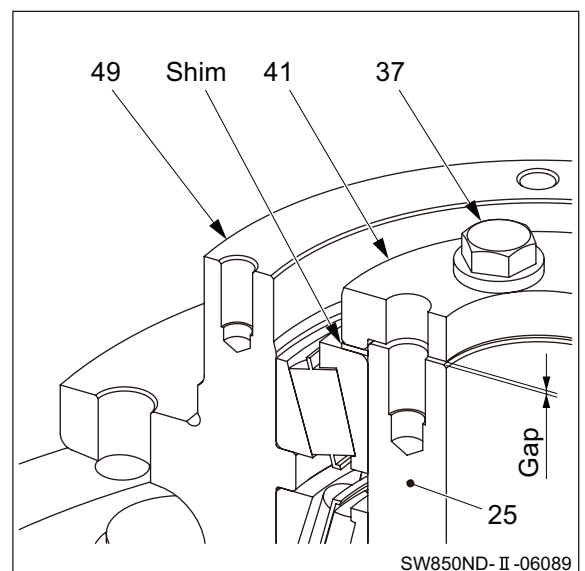


- ② A gap will remain between end of axle shaft (25) and inside of cover (41).

- Tighten bolts (37) to a torque of 30 N·m (22 lbf·ft).
- Give housing (49) two to three turns.
- Tighten bolts to a torque of 30 N·m (22 lbf·ft) again.
- Repeat this work several times until tightening torque of bolts no longer fluctuates.

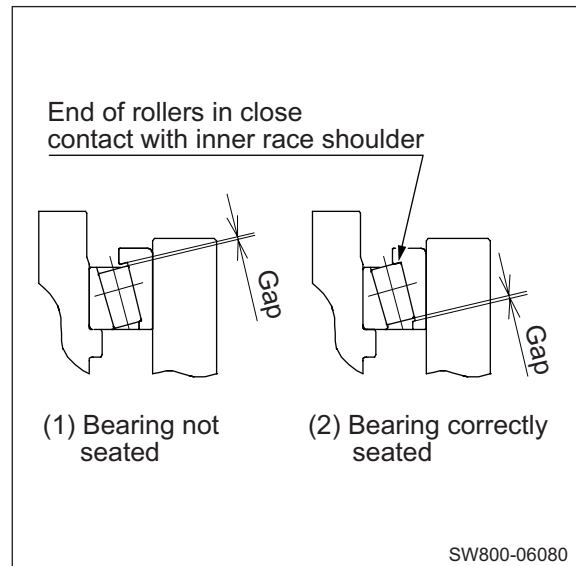
**(NOTICE)**

- Tighten the bolts alternately in diagonal directions.



**(NOTICE)**

- Push in the inner race while rotating the bearing. Otherwise, even strongly trying to push the inner race, the bearing rollers will not be pushed up and therefore bearing will not be seated.

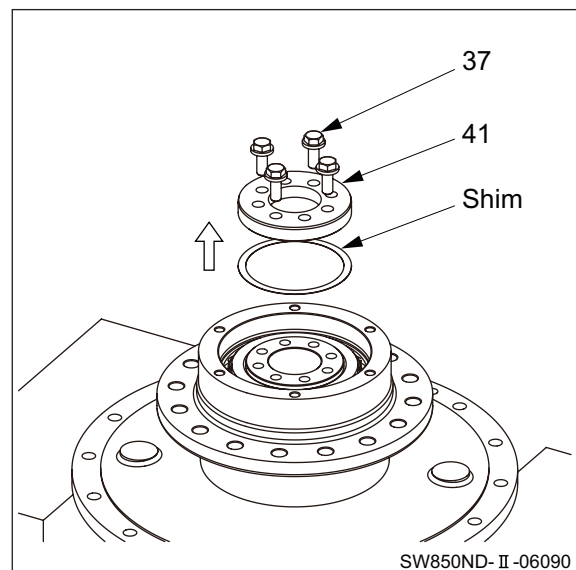


③ Remove bolts (37).

- Remove cover (41).
- Remove shim.

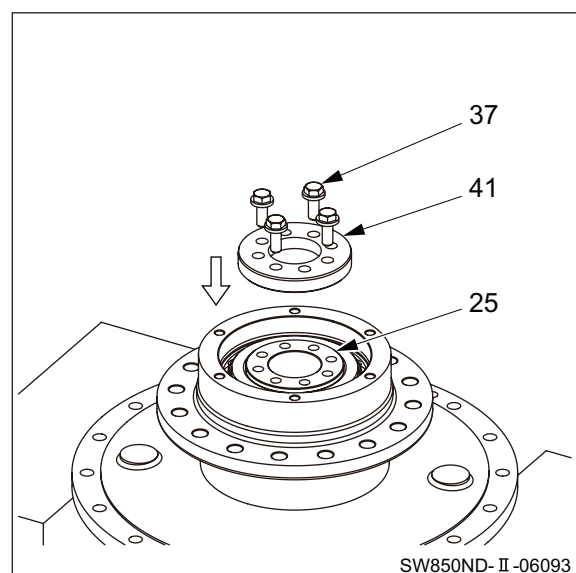
**(NOTICE)**

- Do not turn the housing after the cover is removed.



④ Without inserting shim, install cover (41).

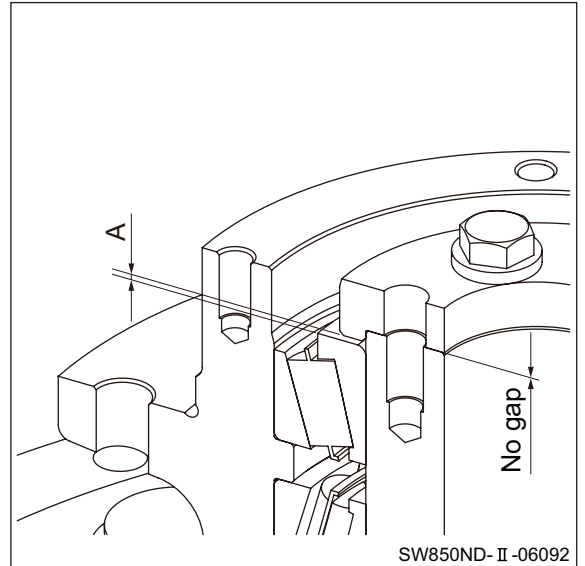
- Install washers to four bolts (37) and tighten.



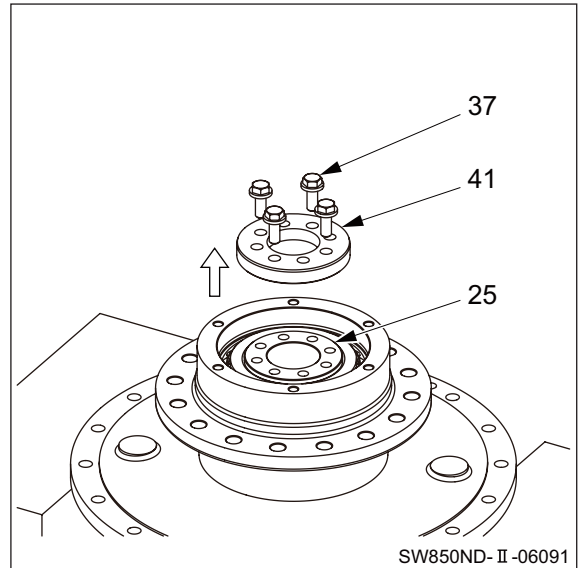


⑤ Using a thickness gauge, measure clearance “A”.


★ Preload adjusting shim thickness =  $A + 0.2 \text{ mm (0.008 in.)}$

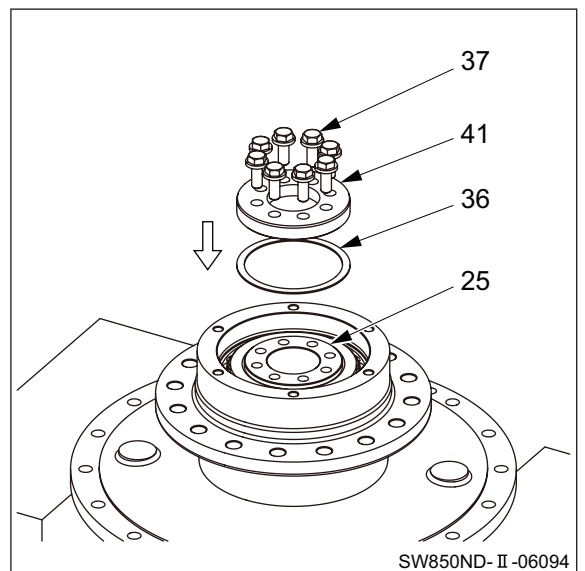


⑥ Remove bolts (37).  
 • Remove cover (41).



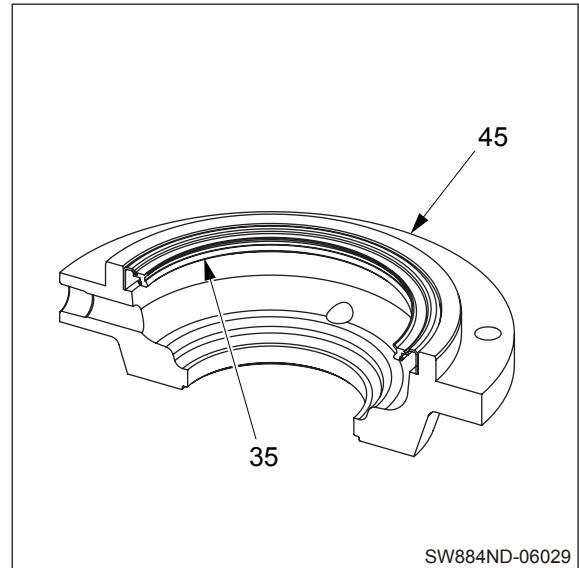
⑦ Install shim (36) of preload adjusting shim thickness = “ $A + 0.2 \text{ mm (0.008 in.)}$ ”.  
 • Secure cover (41) to axle shaft (25) with eight bolts (37) and washers.

 (37) Bolts M14×40 : 170 N·m (125 lbf·ft)



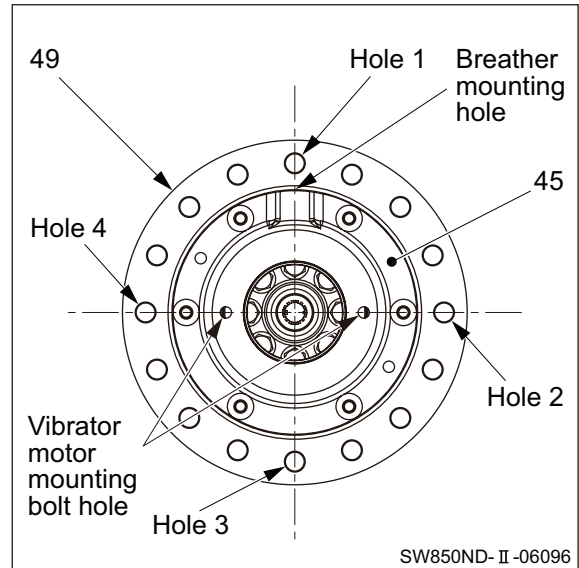
29-13) Apply liquid packing to periphery of oil seal (35).

- Drive in oil seal to cover (45).
- Apply grease to lip of oil seal.



**(NOTICE)**

- The four holes in housing (49), breather mounting hole in cover (45), and vibrator motor mounting bolt holes must be arranged as shown on the right.

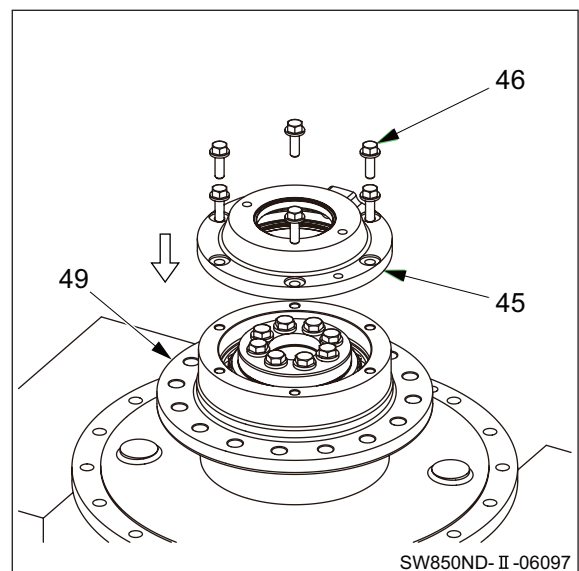


29-14) Apply a coat liquid packing to housing (49) at where cover (45) will be installed.

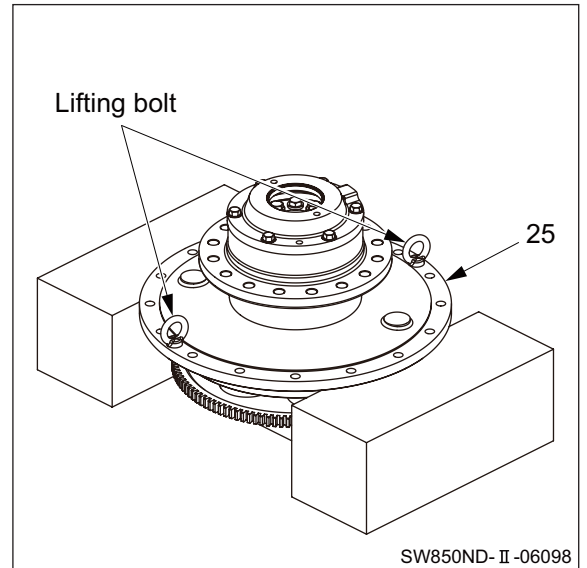
- Secure cover to housing with six bolts (46) and washers.



(46) Bolts M12×40 : 110 N·m (81 lbf·ft)



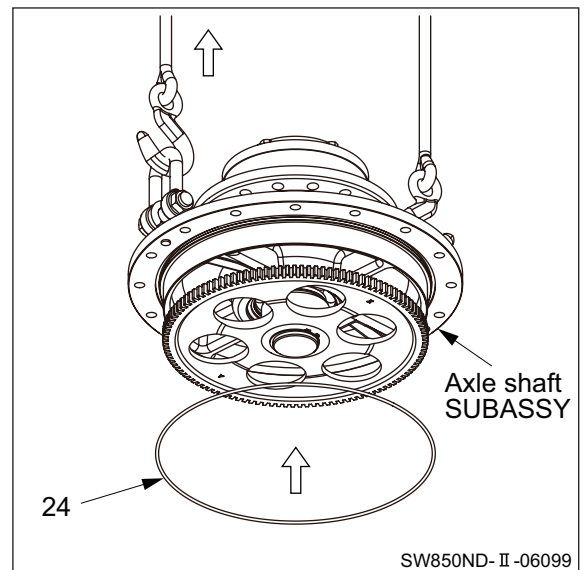
30) Install lifting bolts (M16) to axle shaft (25).



31) Lift axle shaft SUBASSY.

$\mathfrak{J}_{kg}$  Axle shaft SUBASSY : 185 kg (408 lbs.)

- Apply grease to O-ring (24).
- Install O-ring.

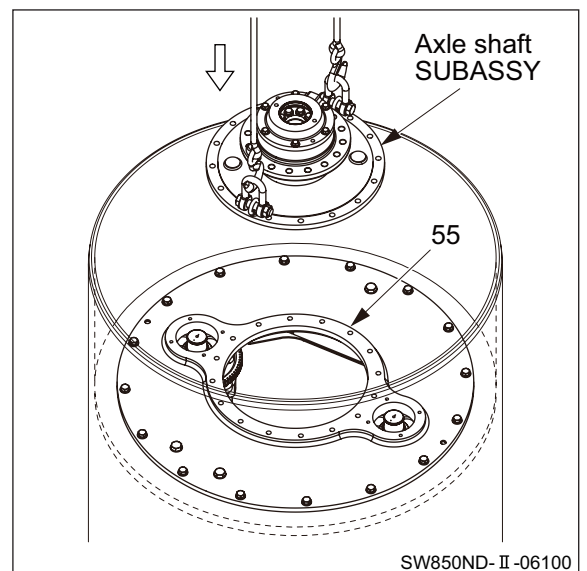


32) Apply a coat of liquid packing to housing (55) at where axle shaft SUBASSY will be installed.

- Lower axle shaft SUBASSY on mounting surface of housing.

**(NOTICE)**

- Take care not to let O-ring to protrude from its groove.



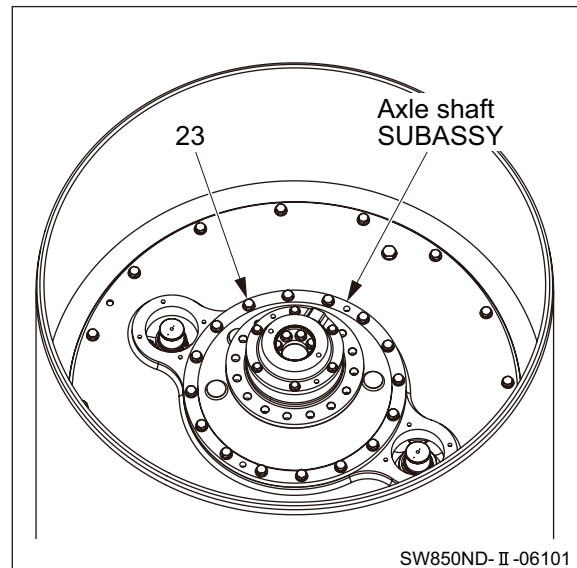
33) Secure axle shaft SUBASSY with sixteen bolts (23) and washers.



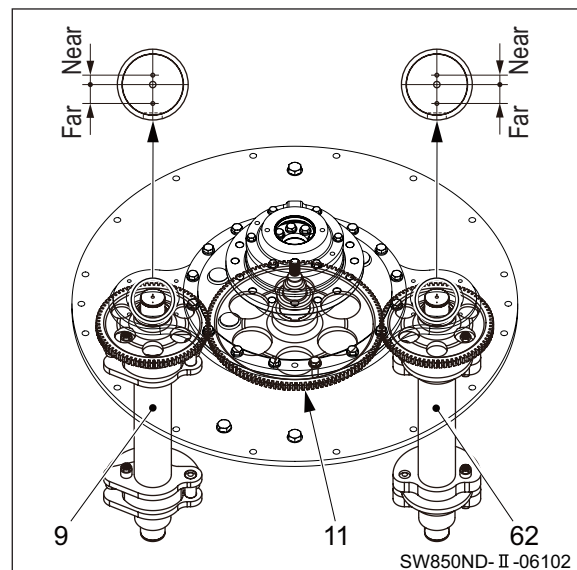
(23) Bolts M16×50 : 265 N·m (195 lbf-ft)

**(NOTICE)**

- Bolts are treated with thread-locking fluid. Use new thread-locking fluid treated bolts for installation.



34) Make sure that punch marks on shaft (11) of eccentric shafts (9) and (62) are as shown right.

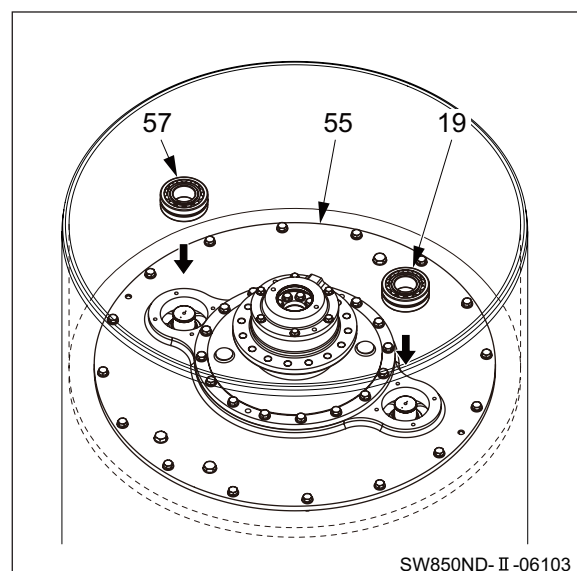


35) Apply a coat of gear oil to housing (55) at where bearings will be press-fitted and to eccentric shafts at where bearings will be installed.

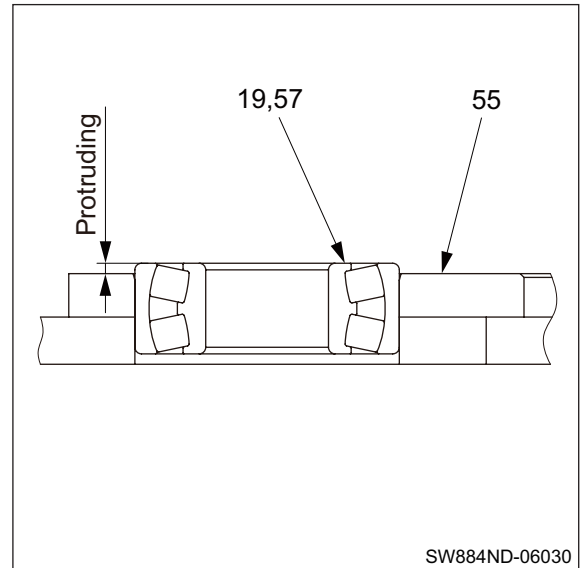
- Drive in vibrator bearings (19) and (57).

**(NOTICE)**

- Take care not to damage the bearings when installing them.

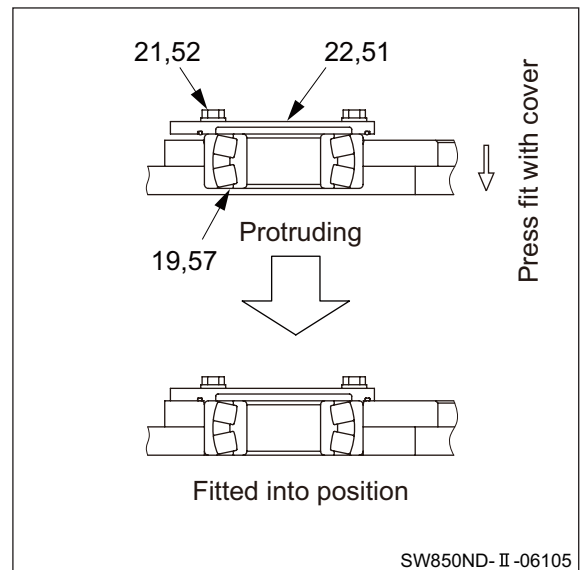


36) Stop driving in vibrator bearings (19) and (57) when they come to a position slightly protruding from the boss surface of housing (55) to avoid driving in too much.

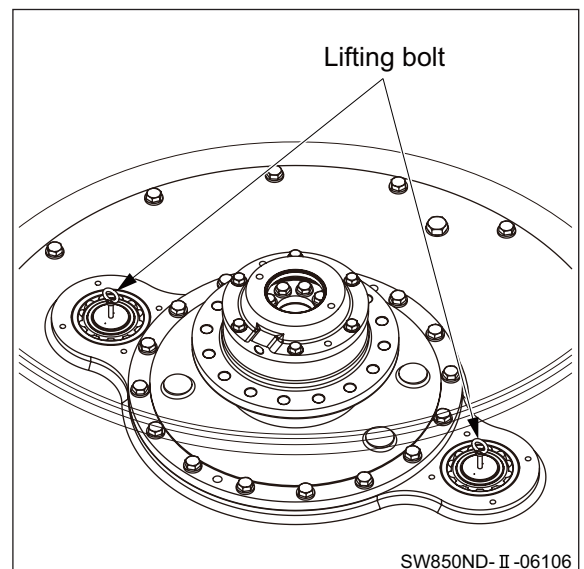


37) Press fit slightly protruding vibrator bearings (19) and (57) into place by securing covers (22) and (51) with four bolts (21), (52), and washers.

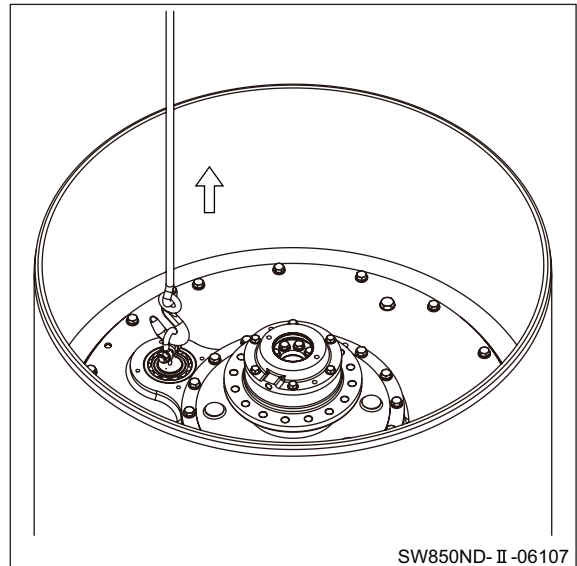
- After press fitting, remove covers to make sure that vibrator bearings are not protruding.



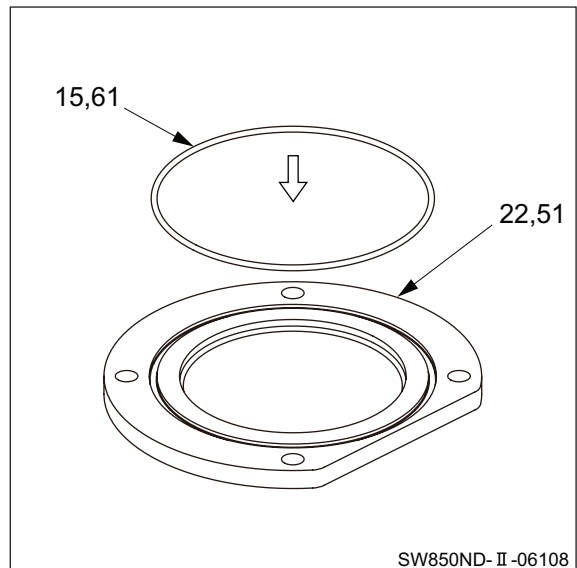
38) Install lifting bolts (M8) to end of eccentric shafts.



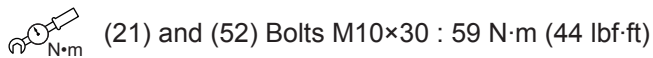
39) Slowly lift eccentric shaft with a crane and check that there is an axial play of 1.6 to 4 mm (0.06 to 0.16 in.).



40) Apply grease to O-rings (15) and (61).  
 • Install O-rings to covers (22) and (51).

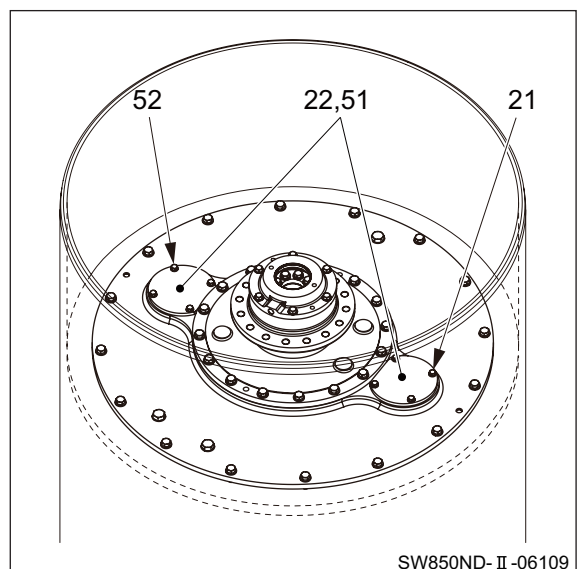


41) Apply a coat liquid packing to housing SUBASSY at where covers (22) and (51) will be installed.  
 • Secure covers to four bolts (21), (52), and washers.

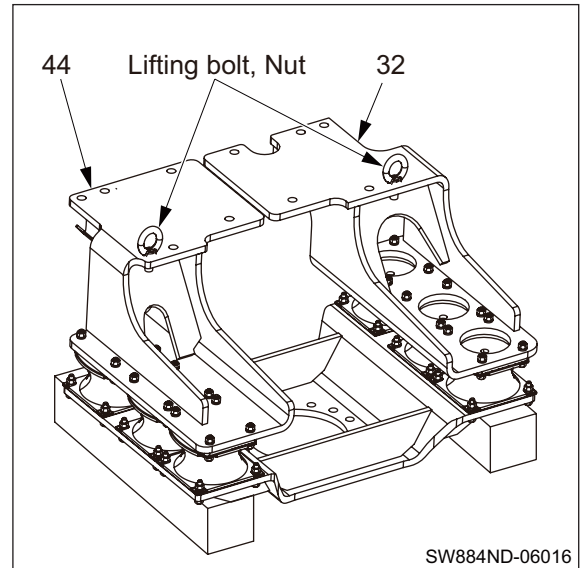


**(NOTICE)**


- Take care not to let O-ring to protrude from its groove.
- Bolts are treated with thread-locking fluid. Use new thread-locking fluid treated bolts for installation.

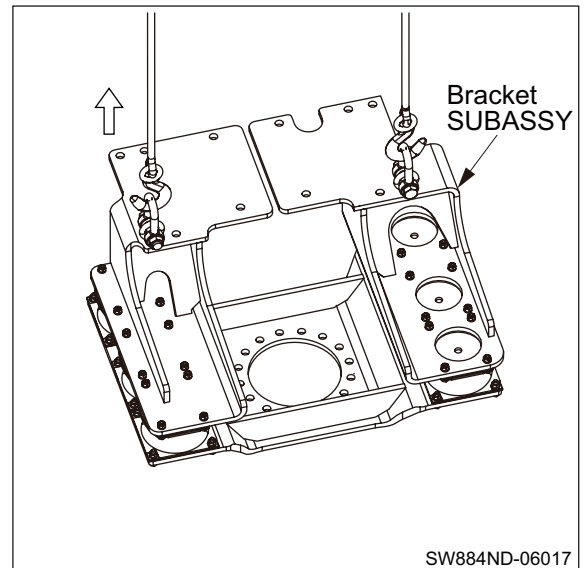


42) Install lifting bolts (M22) to brackets (32) and (44) with nuts.



43) Lift bracket SUBASSY.

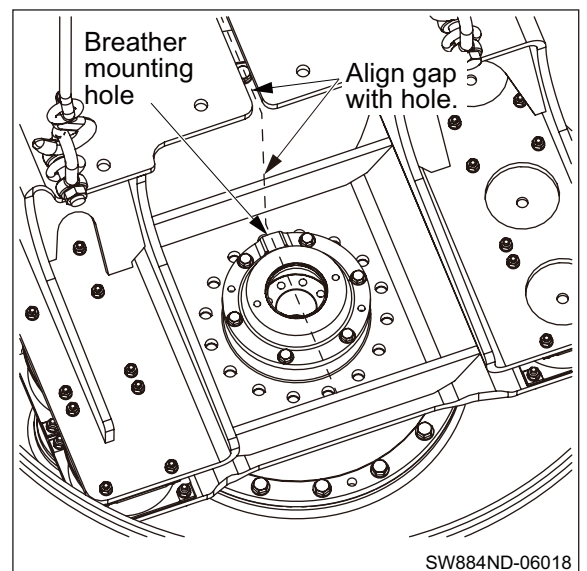
 Bracket SUBASSY  
 SW884ND : 290 kg (639 lbs.)  
 SW994ND : 295 kg (650 lbs.)



44) Lower bracket SUBASSY while keeping it level and install it on spigot joint of housing.

**(NOTICE)**

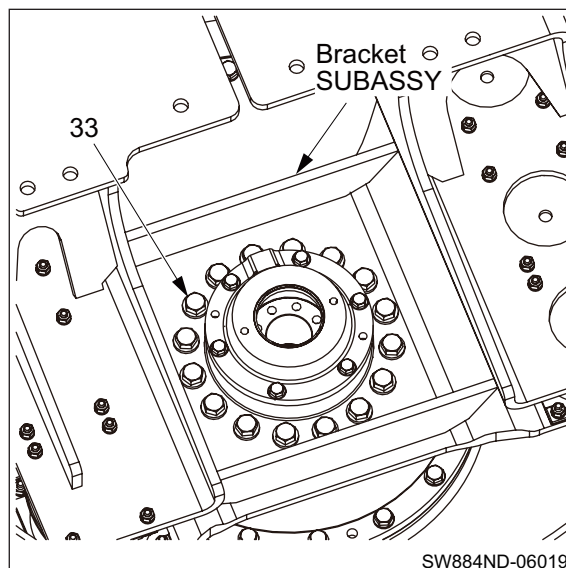
- Since the bracket SUBASSY cannot be lowered in a level position, lower them using a support or like.
- Be sure to install the bracket SUBASSY correctly in relation to the position of the breather mounting hole in the cover.



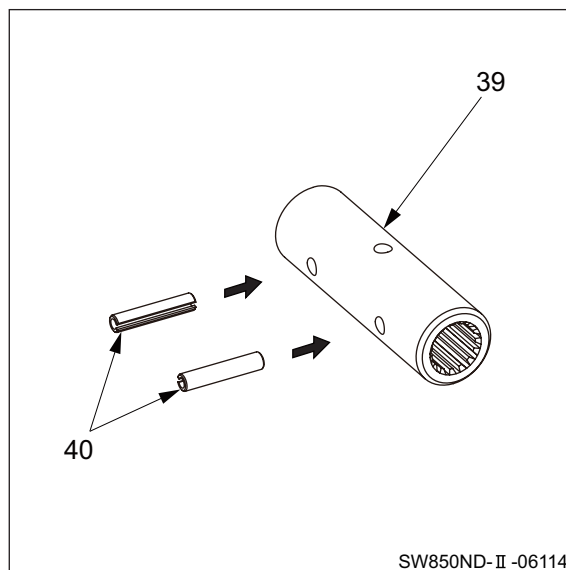
45) Secure bracket SUBASSY with sixteen bolts (33) and washers.



(33) Bolts M20×60 : 539 N·m (398 lbf-ft)

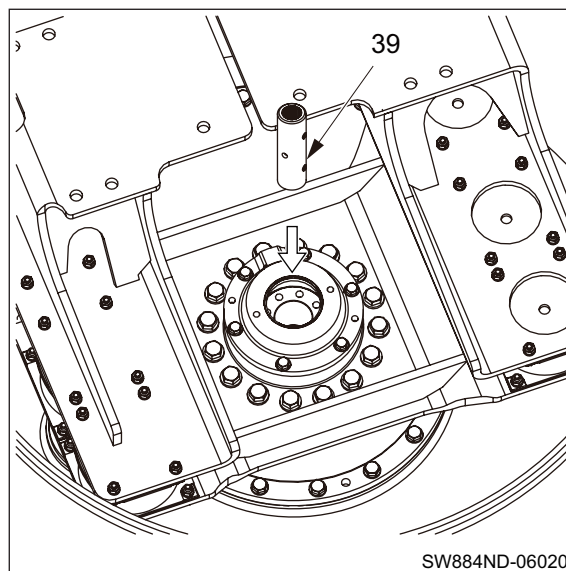


46) Drive two spring pins (40) into sleeve (39).



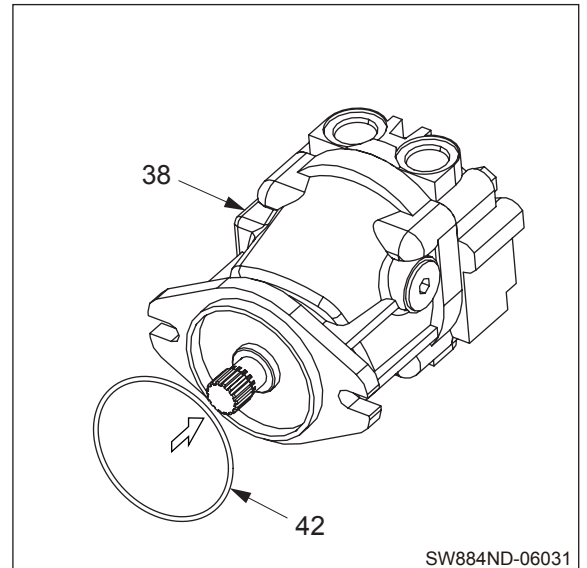
47) Apply molybdenum-based grease to splined portion of sleeve (39).

- Fit sleeve (39) to splined portion on drive shaft end.







- 48) Apply grease to O-ring (42).
- Install O-ring (42) to vibrator motor (38).



SW884ND-06031

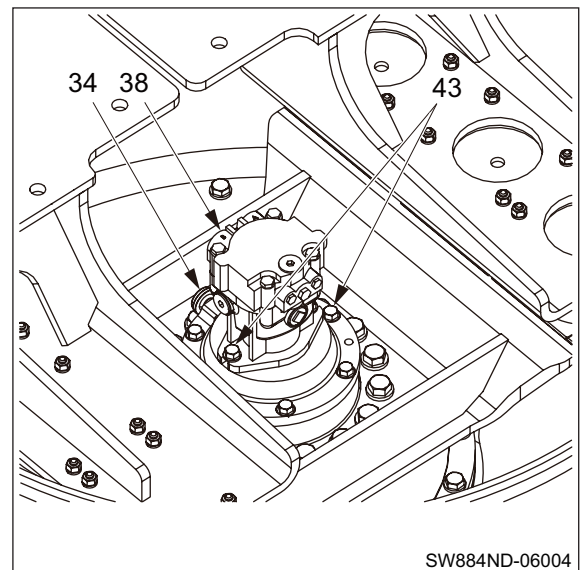
- 49) Wind seal tape around threaded portion of breather (34).
- Install breather.
  - Secure vibrator motor (38) to cover (45) with two bolts (43) and washers.

 (38) Vibrator motor : 15 kg (33 lbs.)

 (43) Bolts M12×40 : 108 N·m (80 lbf·ft)


**(NOTICE)**

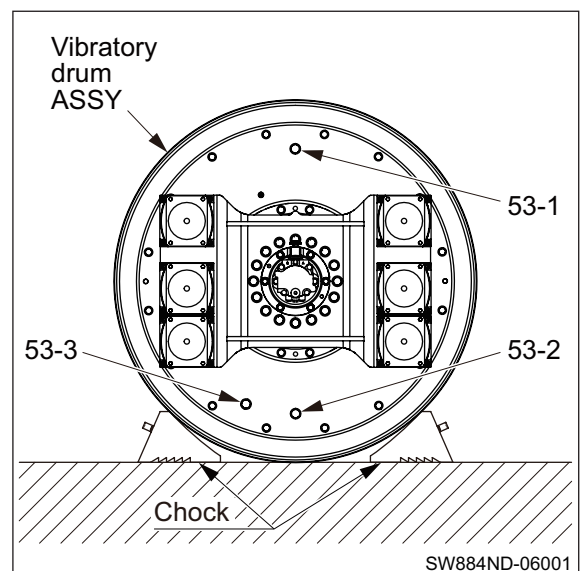
- Take care not to let O-ring to protrude from its groove.



SW884ND-06004

- 50) Lay vibratory drum ASSY with plugs (53-1), (53-2), and (53-3) positioned as shown on the right.
- Hold with chocks.

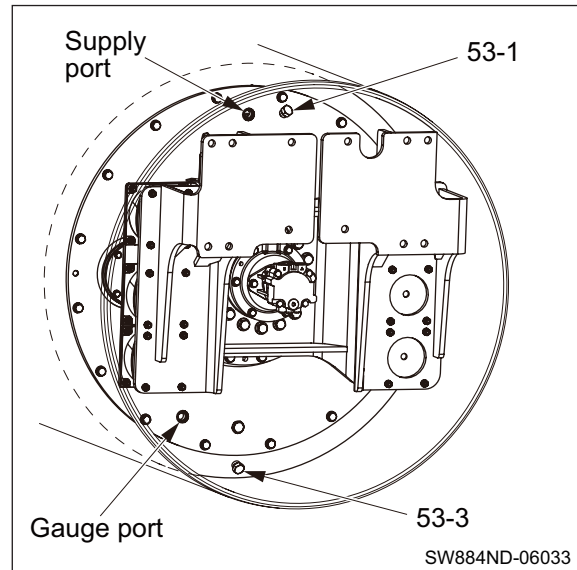
 Vibratory drum ASSY  
 SW884ND : 3,490 kg (7,694 lbs.)  
 SW994ND : 3,610 kg (7,959 lbs.)



SW884ND-06001

51) Remove plugs (53-1) and (53-3).

- Supply gear oil from oil supply port.
- Check that oil drips from gauge port.
  - Quantity of gear oil : 75 L (19.8 gal.)
- Install plugs.



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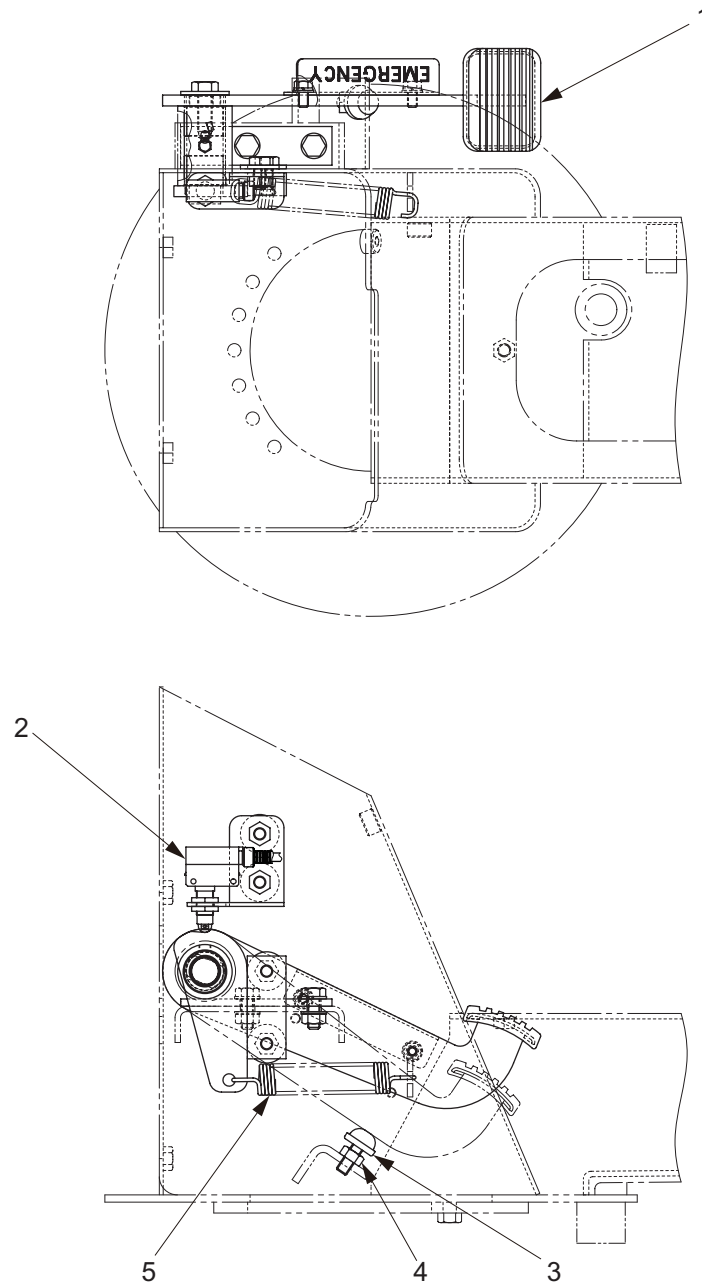
**BRAKE**

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# 1. BRAKE PEDAL

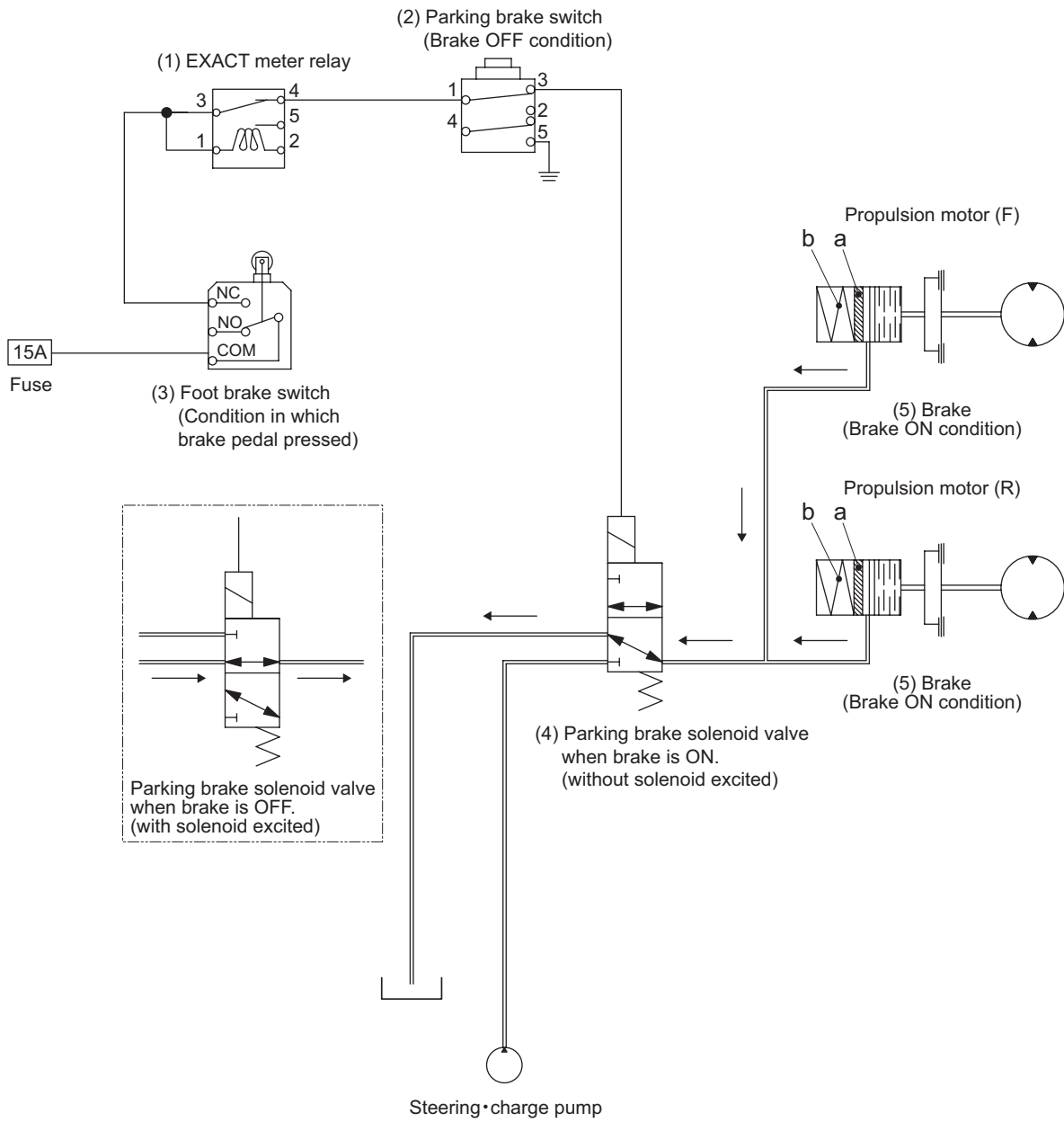


- (1) Brake pedal
- (2) Foot brake switch
- (3) Stopper bolt : M10×25 P=1.25
- (4) Nut : M10 P=1.25
- (5) Return spring

0568-51803-0-11251-C

# BRAKE

Fig.: Brake circuit



• The arrow (→) symbol shows the direction of the hydraulic oil flow.

SW880-1-07001

## 2. BRAKE SYSTEM

### 2-1. Description and Operation of Brake Circuit

#### Description

- Made up of EXACT meter relay (1), parking brake switch (2), foot brake switch (3), parking brake solenoid valve (4) and brake (5). The foot brake switch is ON with the brake pedal released and OFF if pushed down on.

#### Operation

##### To release parking brake:

- When parking brake switch (2) is set to the OFF position, the contacts of parking brake switch (2) close the circuit to parking brake solenoid valve (4) and breaks the circuit to the brake indicator lamp.
- This leads the pressurized fluid through parking brake solenoid valve (4) to pistons (a) of brake (5) to compress springs (b). Brake is freed.

##### To apply parking brake (Brake pedal not depressed):

- If parking brake switch (2) is put in the ON position, the contacts of parking brake switch (2) break the circuit to parking brake solenoid valve (4) and close the brake indicator lamp circuit.
- This stops feeding the fluid from parking brake solenoid valve (4) to brake (5). Springs (b) move pistons (a) toward the brake discs and plates so that they make a close contact with each other. The brake is applied. The indicator lamp comes on simultaneously.

##### When brake pedal is pushed down on:

- If brake pedal is depressed, foot brake switch (3) is switched off to break the circuit to parking brake switch (2). This applies the brake even if parking brake switch is in the OFF position.

##### To disengage the brake when towing:

- Turn the bypass valve clockwise to engage the drive.
- For the bypass valve location refer to page 4-005.





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# **OPERATOR STATION**

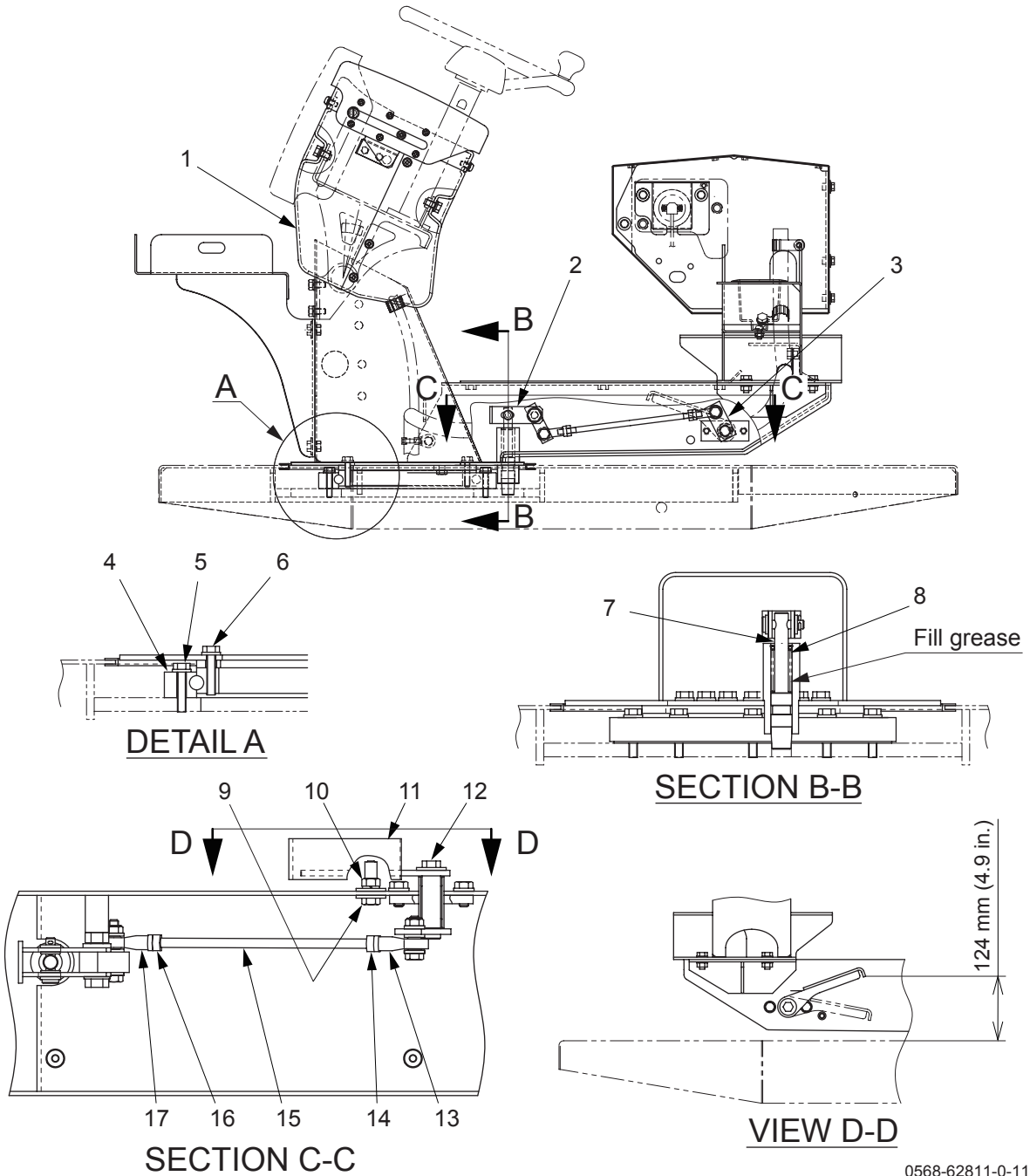
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# 1. FLOORBOARD

## 1-1. Structure of Operator Station



0568-62811-0-11992-0

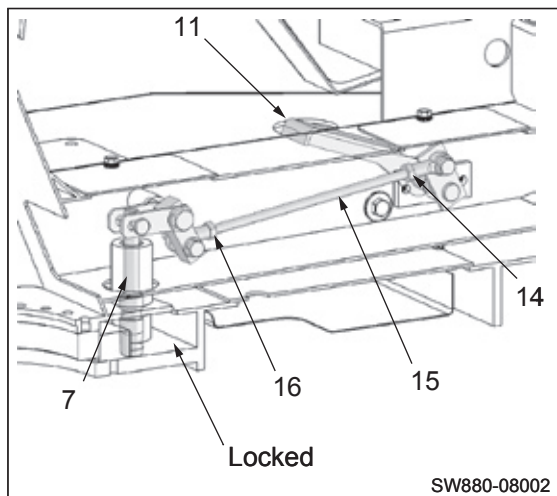
- |                          |          |              |                          |
|--------------------------|----------|--------------|--------------------------|
| (1) Dashboard            |          | (10) Nut     | : M10                    |
| (2) Lever                |          | (11) Pedal   |                          |
| (3) Pin                  |          | (12) Bolt    | : M10×20                 |
| (4) Swing bearing        |          | (13) Rod end | : M10 (left-hand thread) |
| (5) Bolt                 | : M10×50 | (14) Nut     | : M10 (left-hand thread) |
| (6) Bolt                 | : M10×50 | (15) Rod     |                          |
| (7) Pin                  |          | (16) Nut     | : M10                    |
| (8) Spring               |          | (17) Rod end | : M10                    |
| (9) Bolt (pedal stopper) | : M10×40 |              |                          |



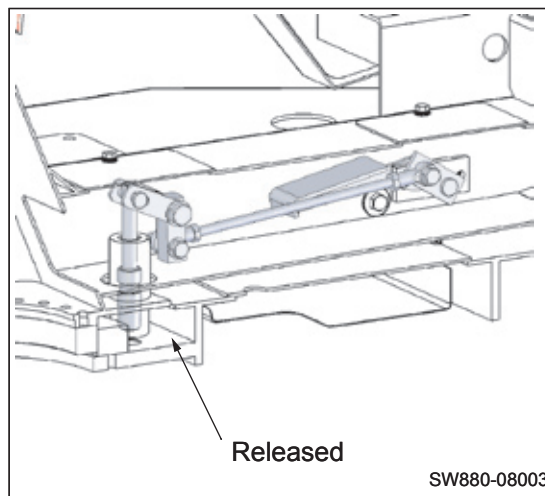
(12) Bolt M10×20 : 49 N·m (36 lbf·ft)

## 1-2. Adjustment of Swivel Lock Release Pedal

- ① Loosen the nuts (14) and (16).
- ② Insert the pin (7) into the fixing hole to lock the pedal.
- ③ Using the rod (15), adjust the pedal height in the locked condition.  
★ Pedal height: 124 mm (4.9 in.)
- ④ With the pedal still locked, check that there is no looseness in the dashboard.
- ⑤ Depress the pedal (11) and check that the lock is smoothly released.
- ⑥ If the above checks ( ④ and ⑤ ) show no problem, tighten the nuts (14) and (16) to fix the pedal.



Pedal released



Pedal depressed

- The numbers in parentheses that appear in the above sentences and the numbers in the above illustrations are consistent with the lead line numbers shown in “1-1. Structure of Operator Station” (page 8-001).

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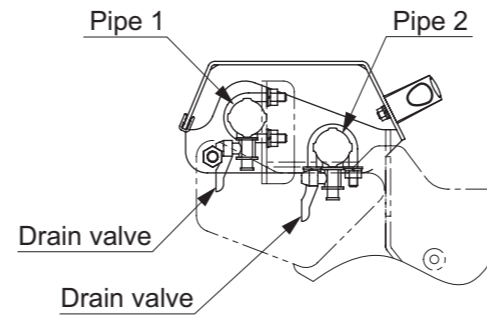
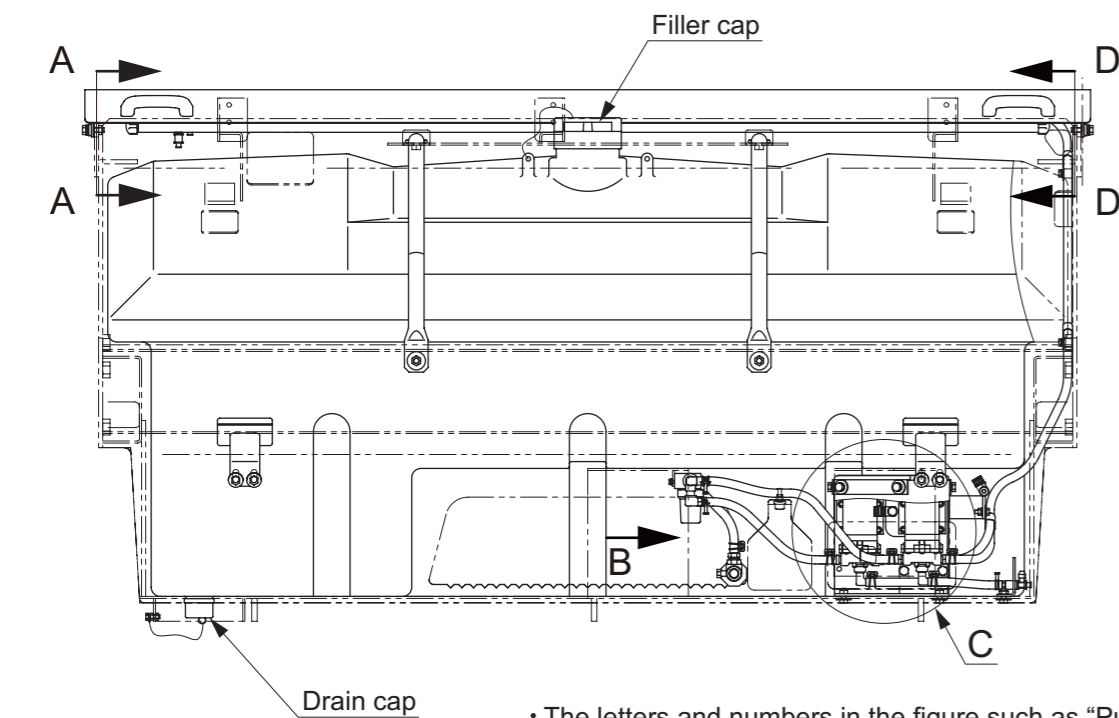
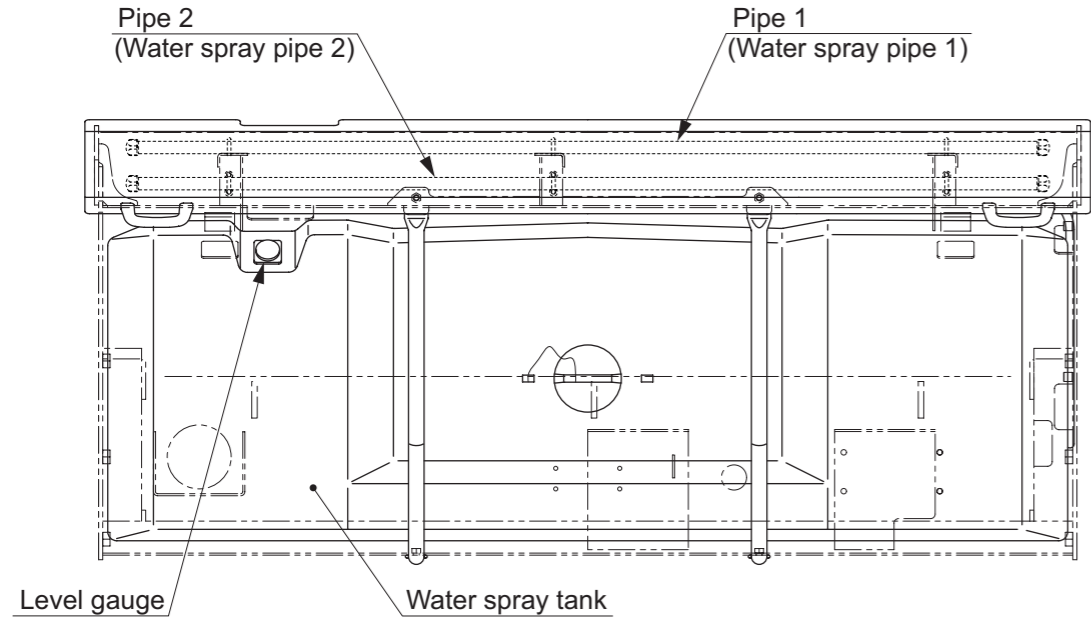
# **WATER SPRAY SYSTEM**

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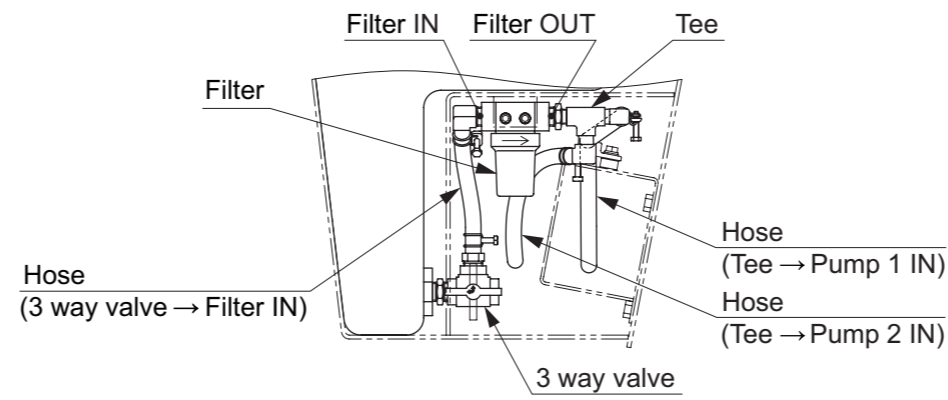
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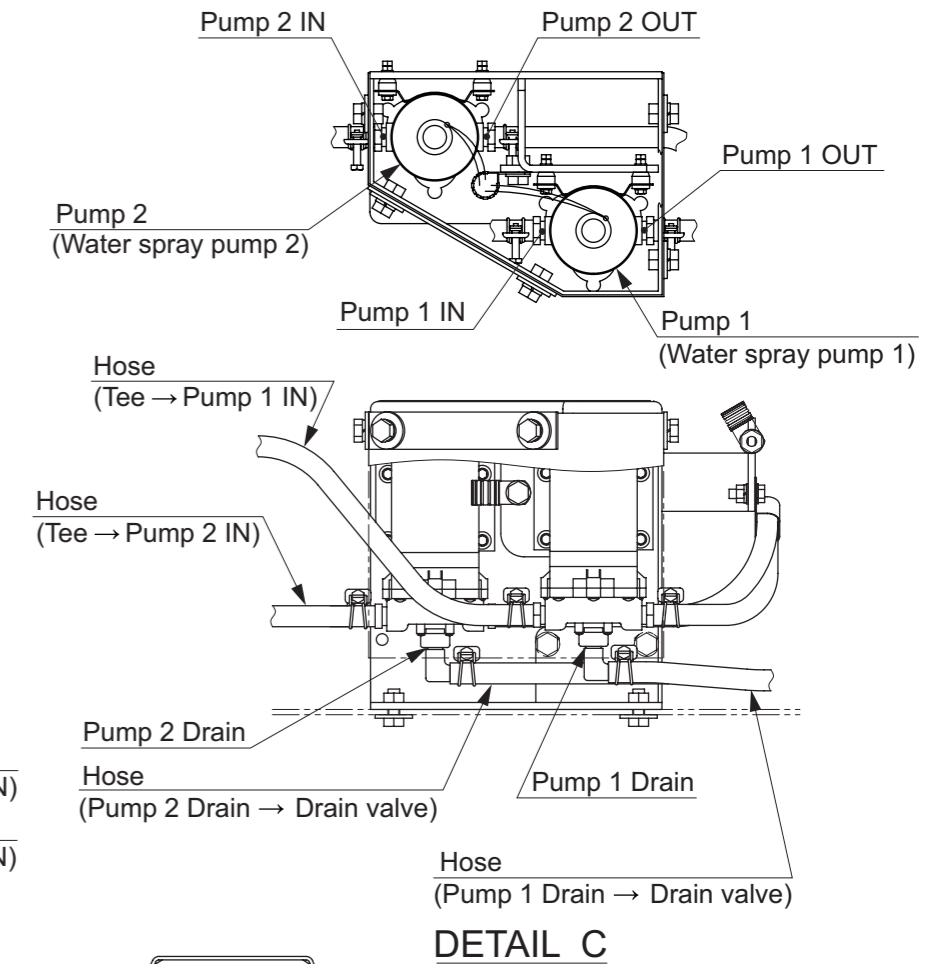
# 1. WATER SPRAY PIPING



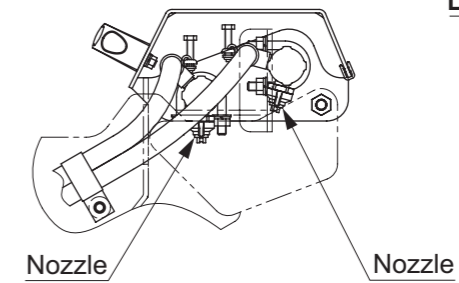
VIEW A-A



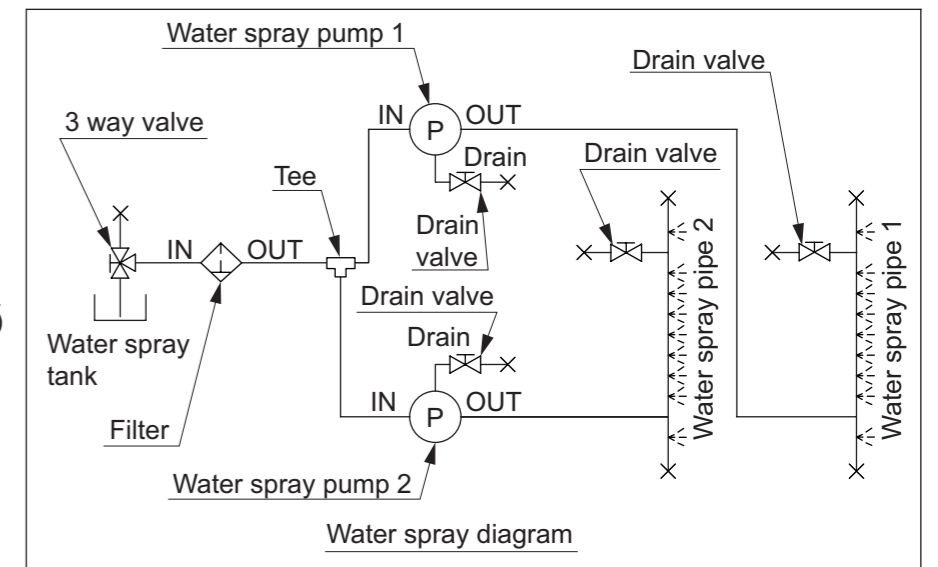
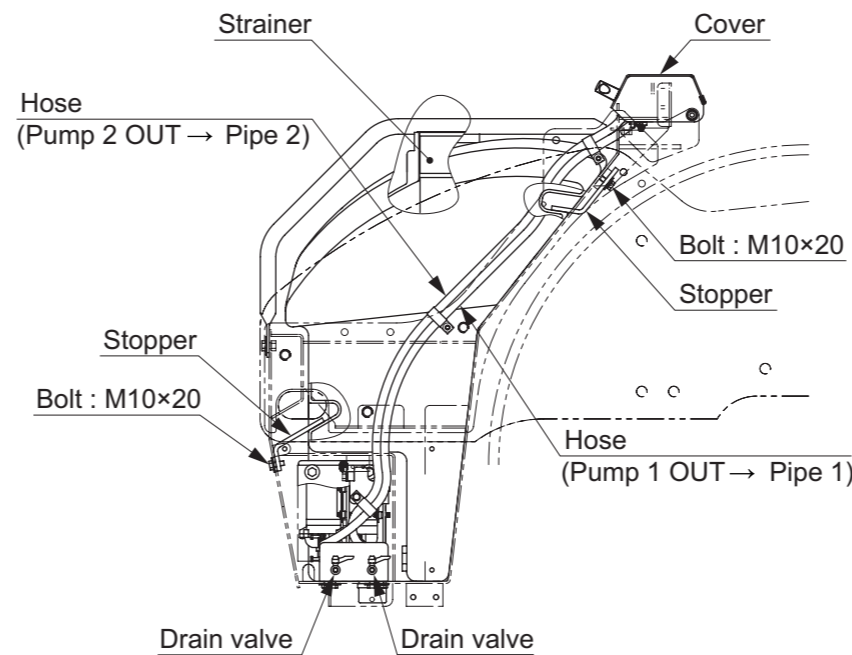
VIEW B



DETAIL C



VIEW D-D



Water spray diagram

- The letters and numbers in the figure such as "Pump 2 OUT" and "Pipe 2" show each port.
- Arrow "→" symbols show the hose connection and the direction of the flow of the water.





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# **INSPECTION AND ADJUSTMENT**

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# 1. INSPECTION AND ADJUSTMENT

## 1-1. Safety Precautions for Inspection and Adjustment

### WARNING

Unexpected machine movement may cause a serious accident. When inspecting the machine while the engine is running, always follow the instructions below.

- Park the machine on level, flat ground.
- Apply the parking brake.
- Set chocks in front and behind each drum or tire.
- Make sure that service personnel are given the appropriate information at the appropriate time.
- Make sure that no one can enter any hazardous area.

### CAUTION

Do not work on the hydraulic system while the engine is running and the system is hot and under pressure. Do not disconnect hydraulic hoses or fittings until the system has cooled and pressure has been properly relieved.

Before removing any plugs from the pressure measurement ports, always release any residual pressure from the piping and open the cap of the fluid tank to release and pressure.

### WARNING

Inadvertent starting the engine may cause a serious accident.

When inspecting the engine, make sure to exchange the appropriate cues and hand signal with the person at the operator station to avoid any accidents.

### CAUTION

Before inspecting inside of the engine compartment, always stop the engine.

Contact with the fan, V-belt or exhaust system parts while the engine is running may cause serious injury.

## 1-2. Preparation for Inspection and Adjustment

- Prepare the necessary measuring instruments. In addition, particularly when measuring pressure values, make sure to prepare the appropriate hoses, adapters and a plug removal tool for the pressure reading port.
- Make sure that the instruments to be used operate normally.  
When handling the instruments, exercise sufficient caution not to drop or apply any impact to them. Doing so may adversely affect the calibration. Another important point is to inspect the instruments regularly. An instrument that does not start from the appropriate zero point may give an inaccurate reading.

## 1-3. Precautions for Inspection and Adjustment

- When performing inspections and adjustments, pay special attention to safety.
- For each inspection, always take three measurements for each measurement point. If the measurements significantly differ, the measurement method may be incorrect. In such a case, take measurements once again and calculate their average.

## 1-4. Warm-up

- Machinery will not exhibit their true performance under the cold condition. Before taking measurements, always warm up the engine and make sure that the fluid and engine coolant are warmed to their specified normal operating temperatures.

## 1-5. Inspection and Adjustment of Engine Related Items

- Refer to shop manual of engine manufacturer for inspection and adjustment of engine itself.

## 2. MEASUREMENT AND ADJUSTMENT OF PROPULSION CIRCUIT PRESSURE

### 2-1. Measurement

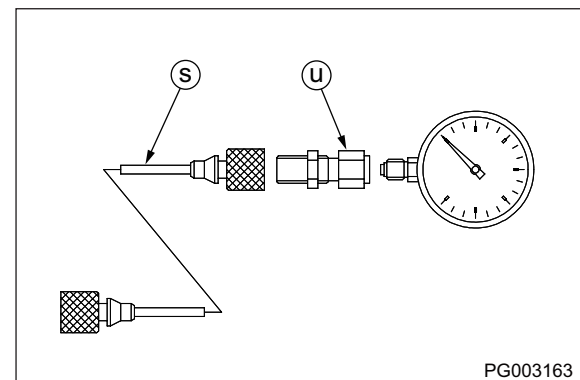
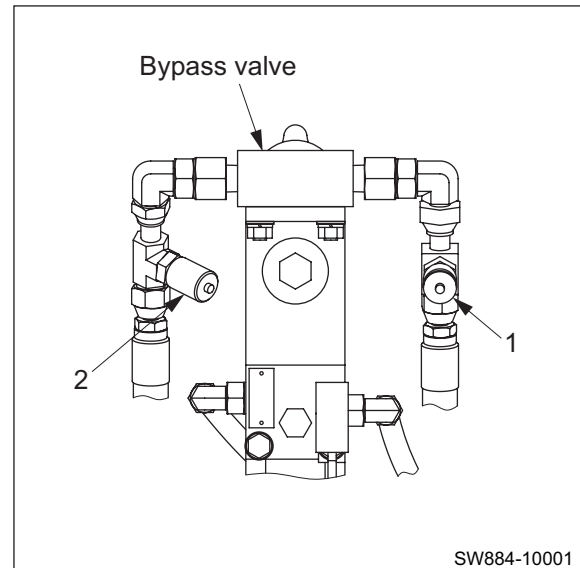
#### **⚠ WARNING**

Confirm that the parking brake works properly before measurement.

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )
- ① Remove plugs from couplings (1) and (2). Attach pressure gauge with hose (S) and connector (U).
  - Coupling : 7/16-20UNF×M16
  - Adapter for hose (S) : M16 P=2.0
  - Pressure gauge connector (U) : M16×G3/8
  - High pressure gauge port (Forward) : (2)
  - High pressure gauge port (Reverse) : (1)
  - Pressure gauge : 0 to 50 MPa  
(0 to 7,250 psi)
- ② Confirm that F-R lever is "N".
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Set propulsion speed change switch to "🐢".
- ⑤ Set vibration frequency select switch to "2,500 vpm".
- ⑥ Start the engine and set throttle switch to "Full".
- ⑦ Establish a condition in which machine propulsion load becomes maximum.  
(Pressure does not build up unless propulsion load is applied.)
- ⑧ With propulsion load at maximum, slowly move F-R lever to the side to be measured.
- ⑨ Read pressure indicated by pressure gauge.
- ⑩ After measuring, promptly return F-R lever to "N".

#### ★ Maximum circuit pressure (cut off valve setting)

:  $40.2 \pm 1.0$  MPa ( $5,829 \pm 145$  psi)



## 2-2. Adjustment

- If measurement results indicate the pressure deviating from maximum circuit pressure range, make an adjustment in accordance with procedure described below.

### 2-2-1. If pressures on both forward and reverse sides deviate from maximum circuit pressure range by same value

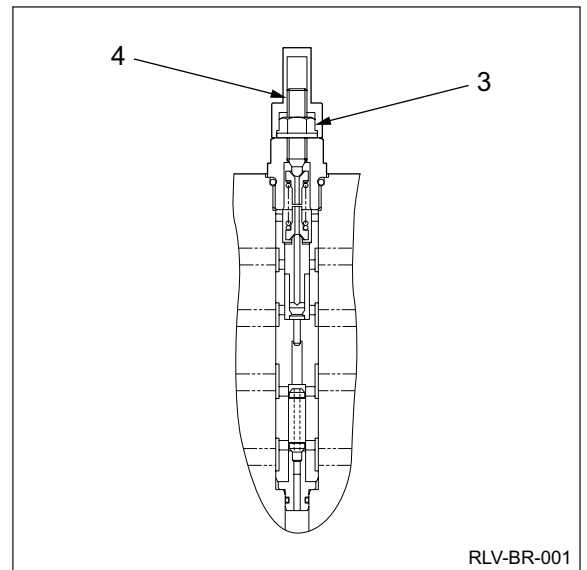
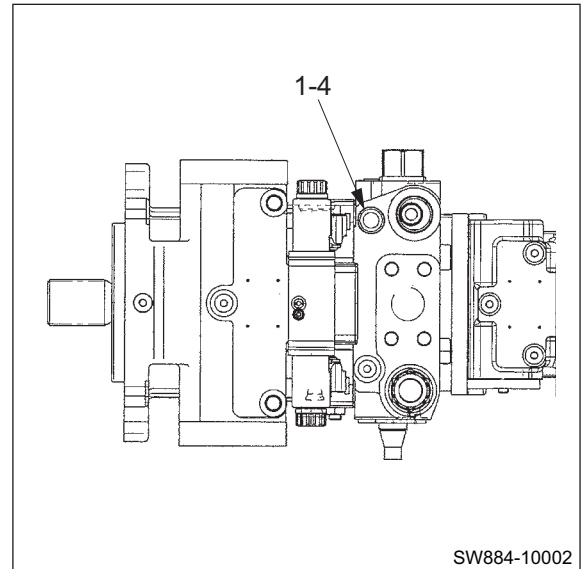
- ① Check nut (3) of cut off valve (1-4) for evidence of having loosened.
  - ② If there is evidence of nut having loosened, adjust cut off valve so that pressure becomes within maximum circuit pressure range while watching pressure gauge.
    - To adjust pressure, loosen nut and turn adjustment screw (4).
- Adjustment screw turned clockwise  
: Pressure rise
- Adjustment screw turned counterclockwise  
: Pressure drop
- Pressure change rate : 10 MPa/turn (1,450 psi/turn)
- ③ If there is no evidence of nut having loosened, remove cut off valve.
  - ④ Check removed cut off valve for trapped dirt and scratches on its seat.
  - ⑤ If trapped dirt is present, disassemble and clean cut off valve.
  - ⑥ If a scratch is found on seat, replace cut off valve.
  - ⑦ After adjustment, measure pressure again and check that pressure reaches maximum circuit pressure range.



- (3) Nut : 22 N·m (16 lbf·ft)  
(1-4) Cut off valve : 35 N·m (26 lbf·ft)


#### (NOTICE)

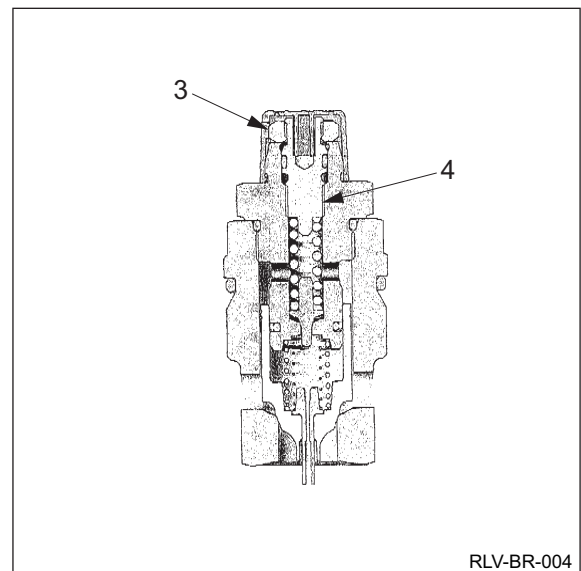
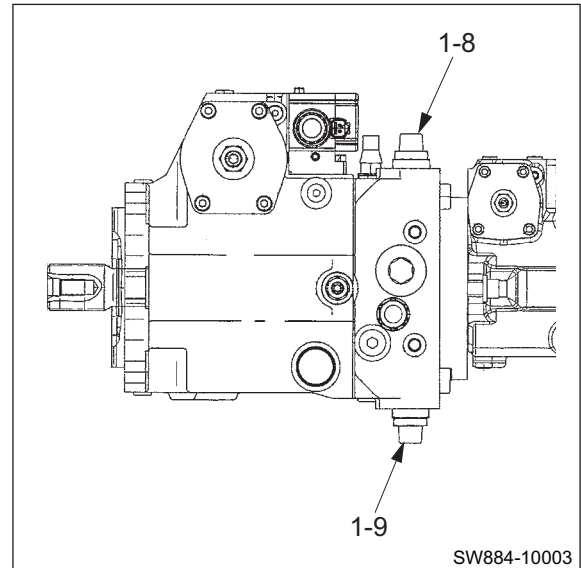
- **Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.**
- The number “1-4” appearing in above illustrations is consistent with lead line numbers shown in illustration of hydraulic pump assembly in “2-2. Hydraulic Component Specifications” (P.4-007).



**2-2-2. If pressure on either forward or reverse side deviates from maximum circuit pressure range**

- ① Check high pressure relief valve (1-8) or (1-9) for evidence of having loosened.
  - High pressure relief valve (Forward) : (1-8)
  - High pressure relief valve (Reverse) : (1-9)
- ② If there is evidence of high pressure relief valve having loosened, adjust it so that pressure becomes within maximum circuit pressure range while watching pressure gauge.
- ③ Remove high pressure relief valve.
- ④ Remove lock screw (3).
- ⑤ Turn adjustment screw (4) to adjust pressure.
  - Adjustment screw turned clockwise : Pressure rise
  - Adjustment screw turned counterclockwise : Pressure drop
  - Pressure change rate : 28 MPa/turn (4,060 psi/turn)
- ⑥ If there is no evidence of high pressure relief valve having loosened, remove it.
- ⑦ Check removed high pressure relief valve for trapped dirt and scratches on its seat.
- ⑧ If trapped dirt is present, disassemble and clean high pressure relief valve.
- ⑨ If a scratch is found on seat, replace high pressure relief valve.
- ⑩ After adjustment, measure pressure again and check that pressure reaches maximum circuit pressure range.

-  (3) Lock screw : 20 N·m (14.8 lbf-ft)  
 (1-8) High pressure relief valve  
 (1-9) High pressure relief valve : 200 N·m (148 lbf-ft)



**(NOTICE)**

- Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.
- The number “1-8” and “1-9” appearing in above illustrations are consistent with lead line numbers shown in illustration of hydraulic pump assembly in “2-2. Hydraulic Component Specifications” (P.4-007).

## 3. MEASUREMENT AND ADJUSTMENT OF PROPULSION

### CHARGE CIRCUIT PRESSURE

- Since oil in charge circuit is supplied from steering circuit, confirm that steering operation is normal before measurement.
- Ensure that neutral positions of F-R lever and hydraulic pump ASSY are aligned.

#### 3-1. Measurement

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )

① Remove plug from coupling (1). Attach pressure gauge with hose (S) and connector (U) .

- Coupling : 7/16-20UNF×M16
- Adapter for hose (S) : M16 P=2.0
- Pressure gauge connector (U) : M16×G3/8
- Pressure gauge : 0 to 25 MPa  
(0 to 3,625 psi)

② Confirm that F-R lever is "N".

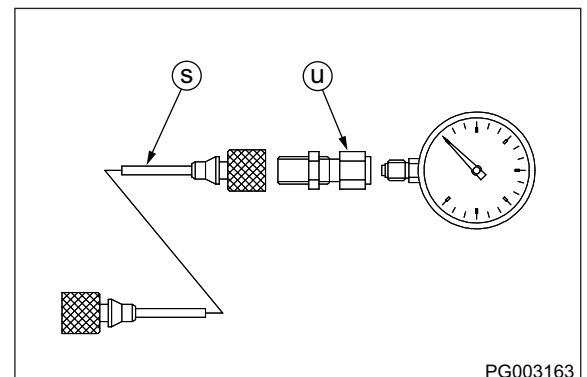
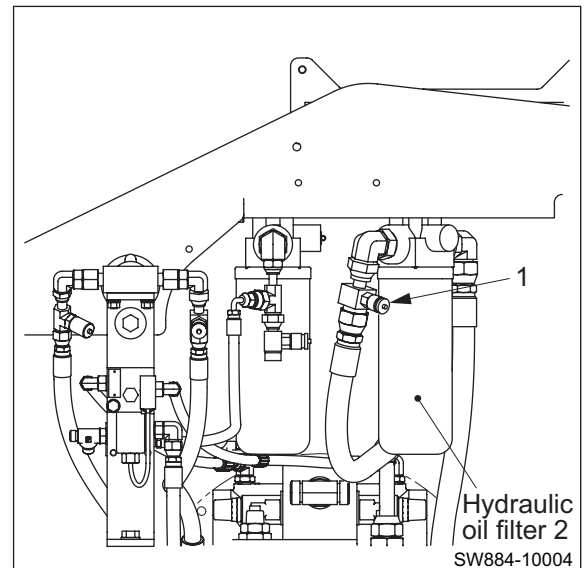
③ Apply parking brake by pressing parking brake switch button.

④ Start the engine and set throttle switch to "Full".

⑤ Read pressure indicated by pressure gauge.

★ **Standard charge relief valve setting**

**:  $2.5 \pm 0.2$  MPa ( $363 \pm 29$  psi)**



### 3-2. Adjustment

- If measurement results indicate the pressure deviating from standard charge relief pressure setting range, make an adjustment in accordance with procedure described below.

- ① Check nut (1) of charge relief valve (1-15) for evidence of having loosened.
  - ② If there is evidence of nut having loosened, adjust charge relief valve so that pressure becomes within standard charge relief valve setting range while watching pressure gauge.
- To adjust pressure, loosen nut and turn adjustment screw (2).

Adjustment screw turned clockwise

: Pressure rise

Adjustment screw turned counterclockwise

: Pressure drop

Pressure change rate : 0.4 MPa/turn (58 psi/turn)

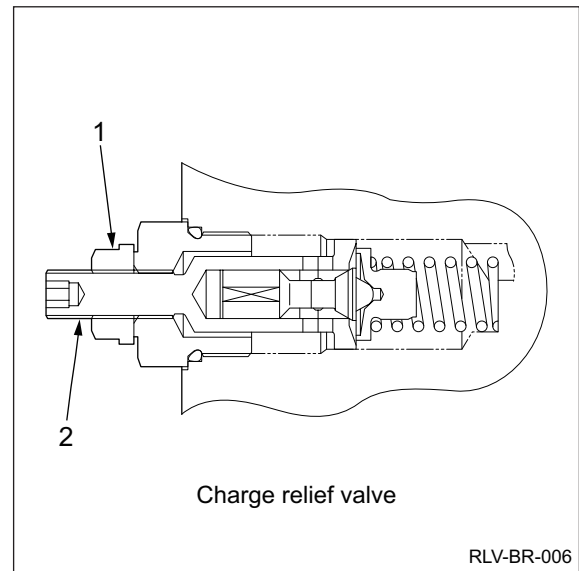
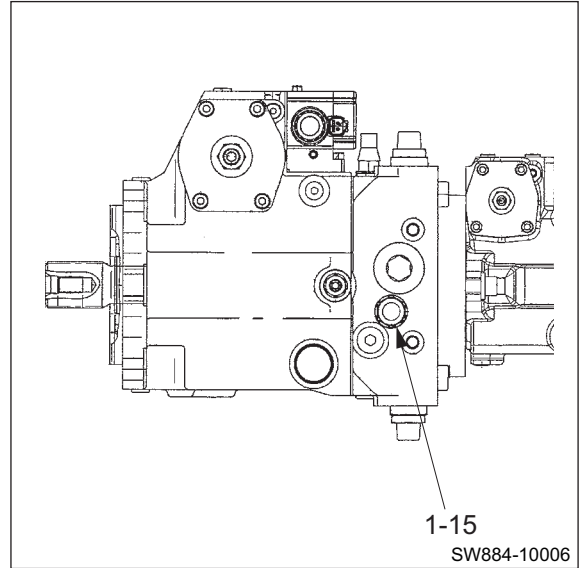
- ③ If there is no evidence of nut having loosened, remove it.
- ④ Check removed charge relief valve for trapped dirt and scratches on its seat.
- ⑤ If trapped dirt is present, disassemble and clean charge relief valve.
- ⑥ If a scratch is found on seat, replace charge relief valve.
- ⑦ After adjustment, measure pressure again and check that pressure reaches standard charge relief valve setting range.



- |                            |                      |
|----------------------------|----------------------|
| (1) Nut                    | : 44 N·m (32 lbf-ft) |
| (1-15) Charge relief valve | : 70 N·m (52 lbf-ft) |

**(NOTICE)**

- **Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.**



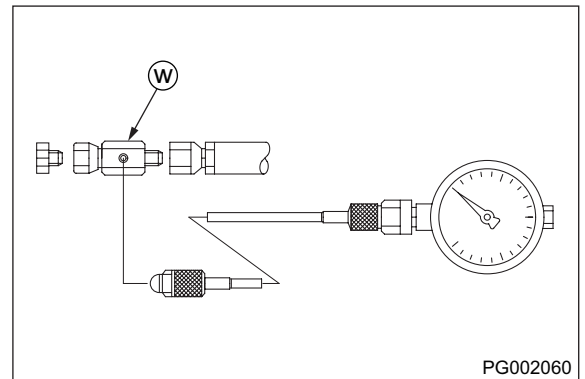
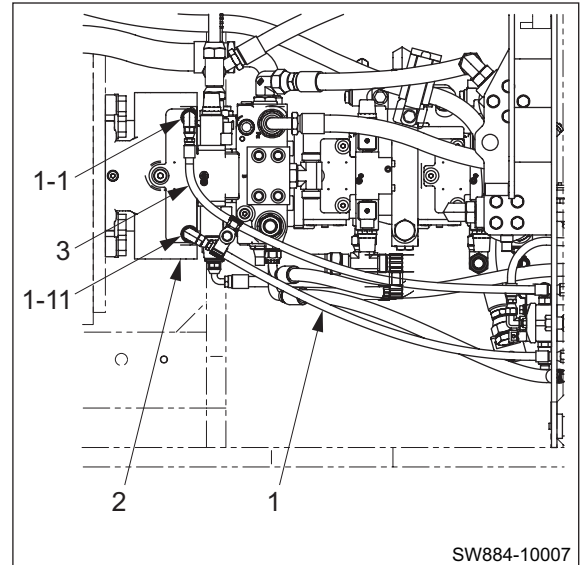
- The number “1-15” appearing in above illustrations is consistent with lead line numbers shown in illustration of hydraulic pump assembly in “2-2. Hydraulic Component Specifications” (P.4-007).



## 4. MEASUREMENT OF PROPULSION SERVO CIRCUIT PRESSURE

### 4-1. Measurement

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )
- ① Disconnect hoses (1) and (3) from propulsion pump (2).  
Attach pressure gauge through adapter (W) .
  - Adapter (W) : 4-4LOHL6G5TP (Parker part number)
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Confirm that F-R lever is "N".
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Start the engine and set throttle switch to "Full".
- ⑤ Operate F-R lever and then read pressure indicated by pressure gauge.
  - With parking brake applied (ON), measured pressures of (1-1) and (1-11) are same.
  - With parking brake released (OFF), measured pressures of (1-1) and (1-11) are different.



#### ★ Standard charge relief pressure setting

:  $2.5 \pm 0.2$  MPa ( $362 \pm 29$  psi)

- The numbers "1-1" and "1-11" appearing in above illustrations are consistent with lead line numbers shown in illustration of hydraulic pump assembly in "2-2. Hydraulic Component Specifications" (P.4-007).

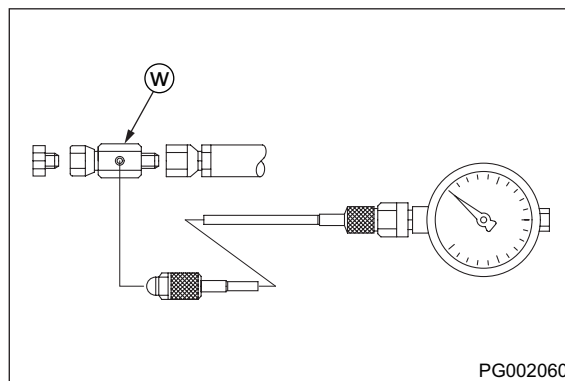
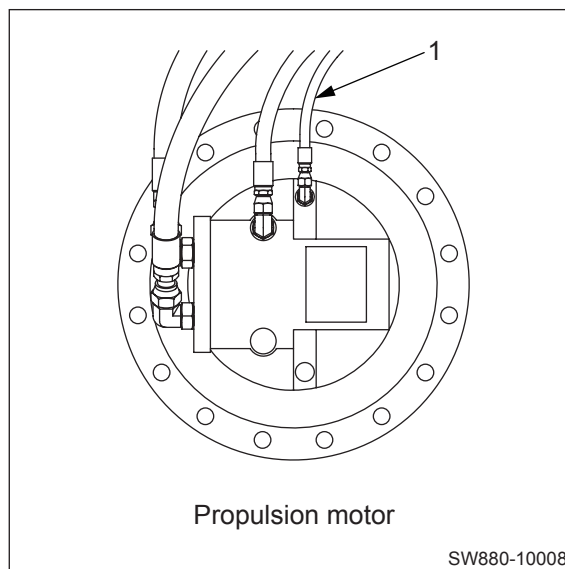
## 5. MEASUREMENT OF PARKING BRAKE RELEASE PRESSURE

- Since oil in charge circuit is supplied from steering circuit, confirm that steering operation is normal before measurement.

### 5-1. Measurement

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )
- ① Disconnect hose (1) from propulsion motor. Attach pressure gauge through adapter (W) .
  - Adapter (W) : 4-4LOHL6G5TP (Parker part number)
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Confirm that F-R lever is "N".
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Start the engine and set throttle switch to "Full".
- ⑤ Release parking brake by pressing parking brake switch button.
- ⑥ Read brake release pressure indicated by pressure gauge.

★ Brake release pressure : More than 1.5 MPa (218 psi)



## 6. MEASUREMENT AND ADJUSTMENT OF VIBRATOR CIRCUIT PRESSURE

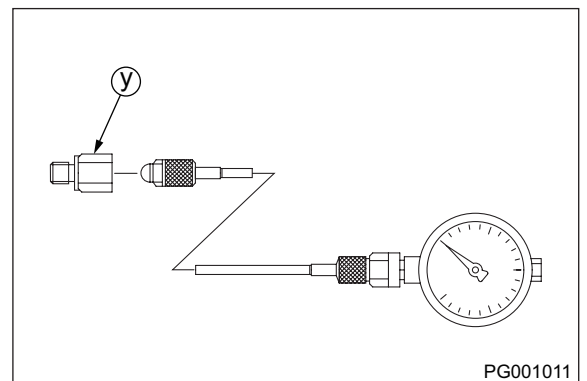
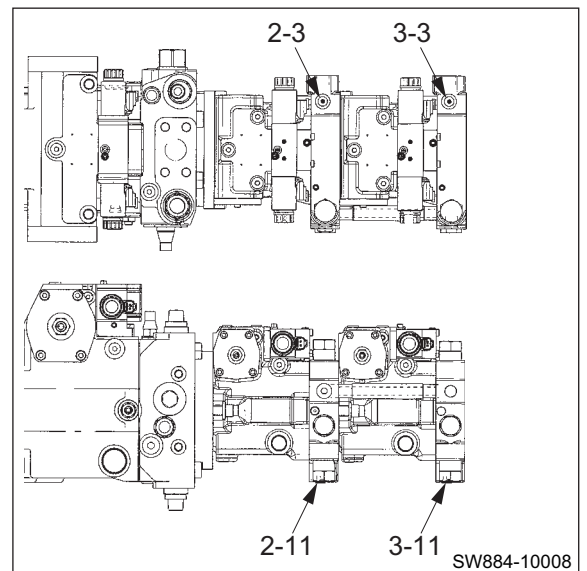
### 6-1. Measurement

#### **CAUTION**

Take care not to operate the vibratory drum for a longer period of time than necessary with the machine stationary. Otherwise, the vibrator bearing could be seized.

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )
- ① Remove plugs from high pressure gauge port (2-3),(2-11),(3-3) and (3-11) of vibrator pump (F),(R). Attach pressure gauge with adapter (Y) .
  - Adapter (Y) : 7/16-20UNF
  - High pressure gauge port : (2-3),(3-3)  
(Low amplitude/Oscillation)
  - High pressure gauge port : (2-11),(3-11)  
(High amplitude/Normal)
  - Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)
- ② Confirm that F-R lever is "N".
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Set vibratory drum select switch to " F R " .
- ⑤ Set vibration mode change switch to " " .
- ⑥ Start the engine and set throttle switch to "Full".
- ⑦ Press F-R lever vibration switch ON.
- ⑧ Read pressure gauge for maximum value of vibrator circuit pressure.
- ⑨ Press F-R lever vibration switch OFF as soon as measurement is finished.

★ **Maximum circuit pressure (cut off valve setting)**  
:  $31.5 \pm 1.0 \text{ MPa}$  ( $4,568 \pm 145 \text{ psi}$ )




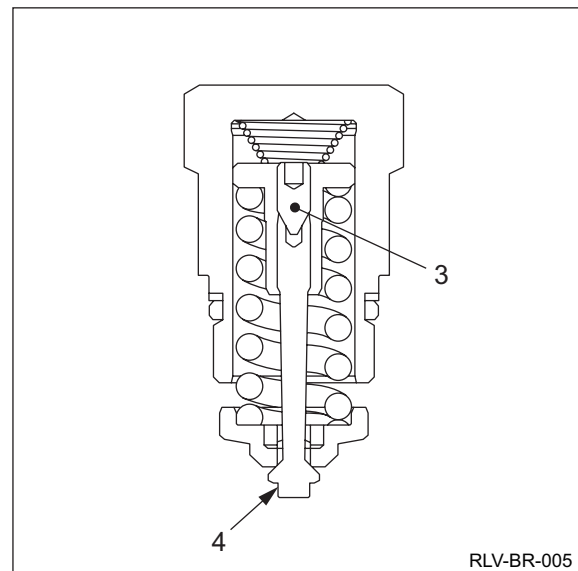
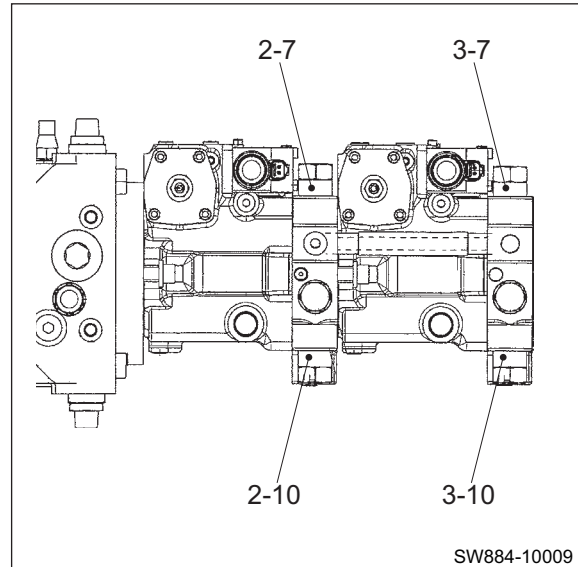
- The numbers "2-3", "2-11", "3-3" and "3-11" appearing in above illustrations are consistent with lead line numbers shown in illustration of hydraulic pump assembly in "2-2. Hydraulic Component Specifications" (P.4-007).

## 6-2. Adjustment

- If measurement results indicate the pressure deviating from maximum circuit pressure range, make an adjustment in accordance with procedure described below.

- ① Check high pressure relief valve (2-7), (2-10), (3-7), or (3-10) for evidence of having loosened.
  - High pressure relief valve : (2-7),(3-7)  
(High amplitude/Normal)
  - High pressure relief valve : (2-10),(3-10)  
(Low amplitude/Oscillation)
- ② If there is evidence of high pressure relief valve having loosened, adjust it so that pressure becomes within maximum circuit pressure range while watching pressure gauge.
- ③ Remove high pressure relief valve.
- ④ Remove lock screw (3).
- ⑤ Turn adjustment screw (4) to adjust pressure.
  - Adjustment screw turned clockwise  
: Pressure rise
  - Adjustment screw turned counterclockwise  
: Pressure drop
  - Pressure change rate : 4.5 MPa/turn (653 psi/turn)
- ⑥ If there is no evidence of high pressure relief valve having loosened, remove it.
- ⑦ Check removed high pressure relief valve for trapped dirt and scratches on its seat.
- ⑧ If trapped dirt is present, disassemble and clean high pressure relief valve.
- ⑨ If a scratch is found on seat, replace high pressure relief valve.
- ⑩ After adjustment, measure pressure again and check that pressure reaches maximum circuit pressure range.

- 
- (3) Lock screw : 6.5 N·m (4.8 lbf-ft)  
 (2-7),(2-10)  
 (3-7),(3-10) High pressure relief valve : 160 N·m (118 lbf-ft)



### (NOTICE)

- **Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.**

- The numbers “2-7”, “2-10”, “3-7”, and “3-10” appearing in above illustrations are consistent with lead line numbers shown in illustration of hydraulic pump assembly in “2-2. Hydraulic Component Specifications” (P.4-007).

## 7. MEASUREMENT AND ADJUSTMENT OF VIBRATOR

### CHARGE CIRCUIT PRESSURE

- Since oil in charge circuit is supplied from steering circuit, confirm that steering operation is normal before measurement.
- Ensure that neutral positions of F-R lever and hydraulic pump ASSY are aligned.

#### 7-1. Measurement

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )

① Remove plug from coupling (1). Attach pressure gauge with hose (S) and connector (U) .

- Coupling : 9/16-18UNF×M16
- Adapter for hose (S) : M16 P=2.0
- Pressure gauge connector (U) : M16×G3/8
- Pressure gauge : 0 to 25 MPa  
(0 to 3,625 psi)

② Confirm that F-R lever is "N".

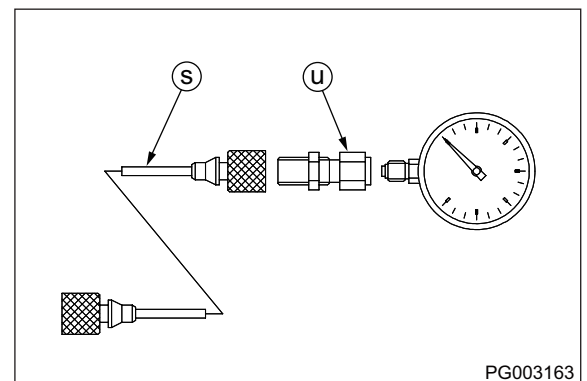
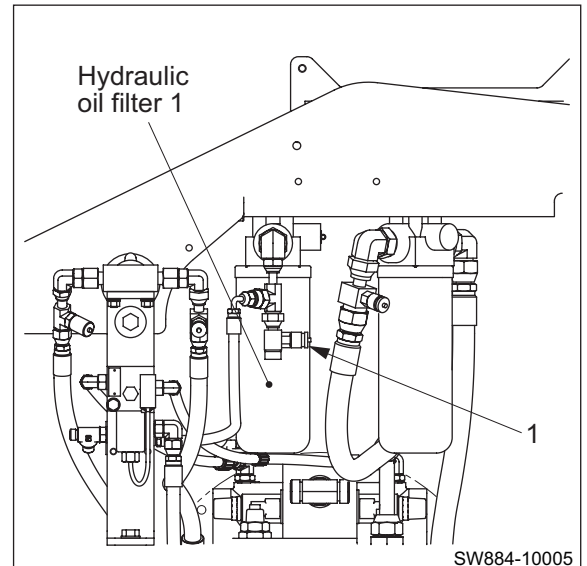
③ Apply parking brake by pressing parking brake switch button.

④ Start the engine and set throttle switch to "Full".

⑤ Read pressure indicated by pressure gauge.

#### ★ Standard charge relief valve setting

:  $2.5 \pm 0.2 \text{ MPa}$  ( $363 \pm 29 \text{ psi}$ )



## 7-2. Adjustment

- If measurement results indicate the pressure deviating from standard charge relief pressure setting range, make an adjustment in accordance with procedure described below.

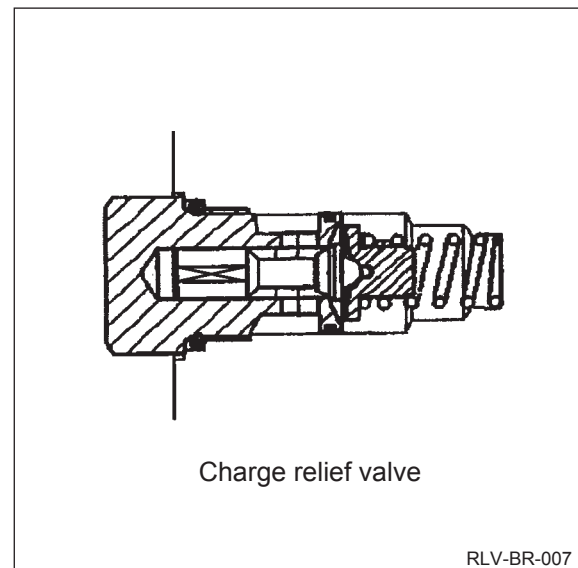
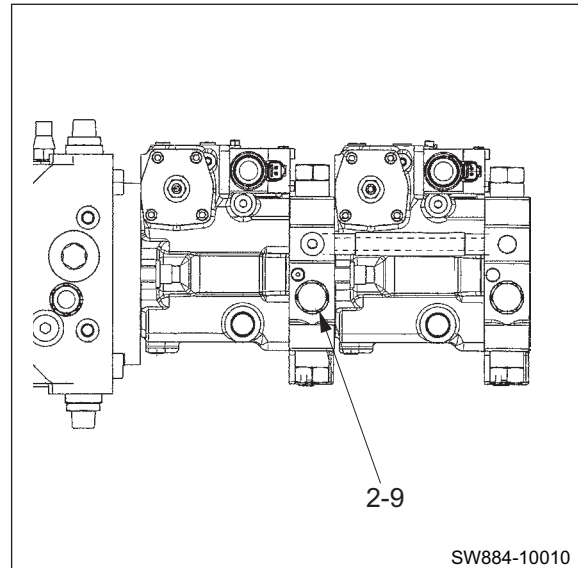
- ① Remove charge relief valve (2-9).
- ② Check removed charge relief valve for trapped dirt and other abnormalities.
- ③ If trapped dirt is present, disassemble and clean charge relief valve.
- ④ If pressure still deviates from standard charge pressure setting range after valve is disassembled and cleaned, replace charge relief valve.
- ⑤ After adjustment, measure pressure again and check that pressure reaches standard charge relief valve setting range.



(2-9) Charge relief valve : 90 N·m (66 lbf·ft)

### (NOTICE)

- Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.



- The number “2-9” appearing in above illustrations is consistent with lead line numbers shown in illustration of hydraulic pump assembly in “2-2. Hydraulic Component Specifications” (P.4-007).

## 8. MEASUREMENT AND INSPECTION OF STEERING

### CIRCUIT PRESSURE

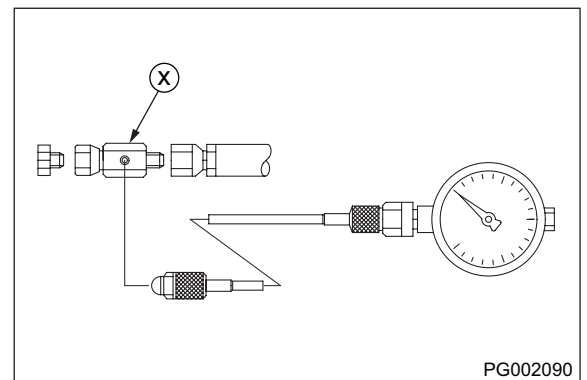
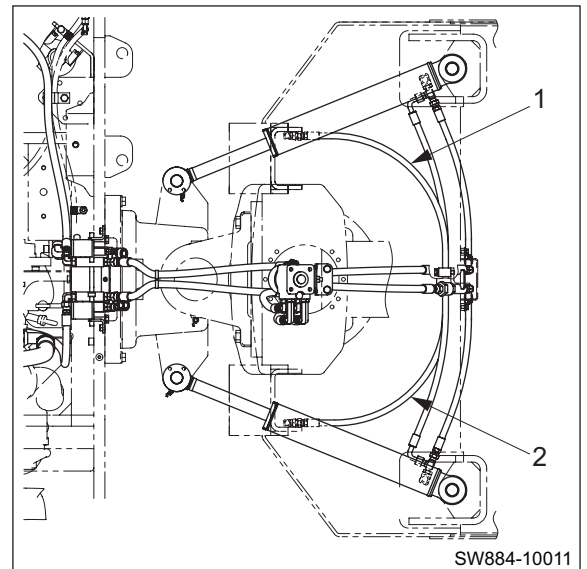
#### 8-1. Measurement

#### **⚠ WARNING**

Make sure that there is no person around the articulated portion of the machine before operating the steering wheel.

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )
- ① Disconnect the hose (1) or (2) from steering cylinder.  
Attach pressure gauge through adapter (X) .
  - Adapter (X) : 6-4LOHL6G5TP (Parker part number)
  - Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)
- ② Confirm that F-R lever is "N".
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Start the engine and set throttle switch to "Full".
- ⑤ Turn steering wheel to operate relief valve.
- ⑥ Read pressure indicated by pressure gauge.

★ **Standard maximum circuit pressure**  
(orbitroll relief pressure + charge relief pressure)  
:  $17.5 \pm 1.0 \text{ MPa}$  ( $2,538 \pm 145 \text{ psi}$ )



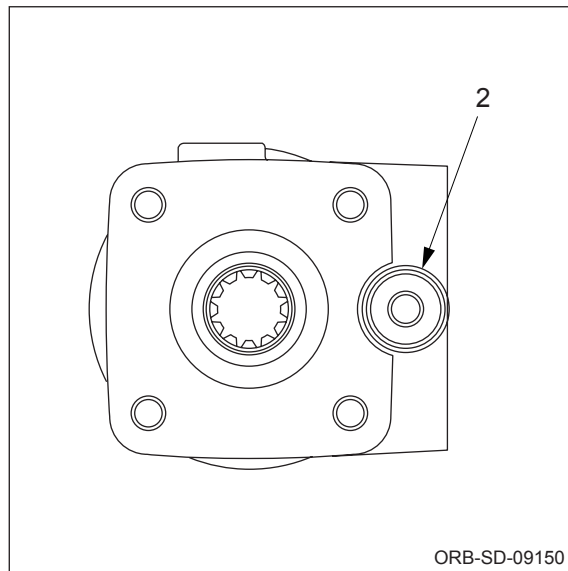
### 8-2. Inspection

- If measurement results indicate the pressure deviating from standard maximum circuit pressure range, make an adjustment in accordance with procedure described below.

- ① Remove relief valve (2) from orbitrol.
- ② Check removed relief valve for trapped dirt, scratches on its seat and other abnormalities.
- ③ If trapped dirt is present, disassemble and clean relief valve.
- ④ If a scratch or any other abnormality is found on seat, replace relief valve.
- ⑤ After inspection, measure pressure again and check that pressure reaches standard maximum circuit pressure range.

#### (NOTICE)




- **Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.**





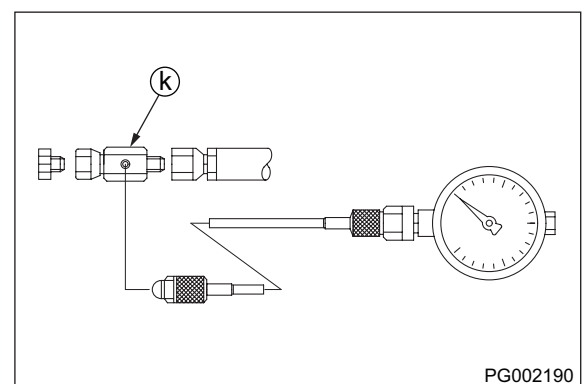
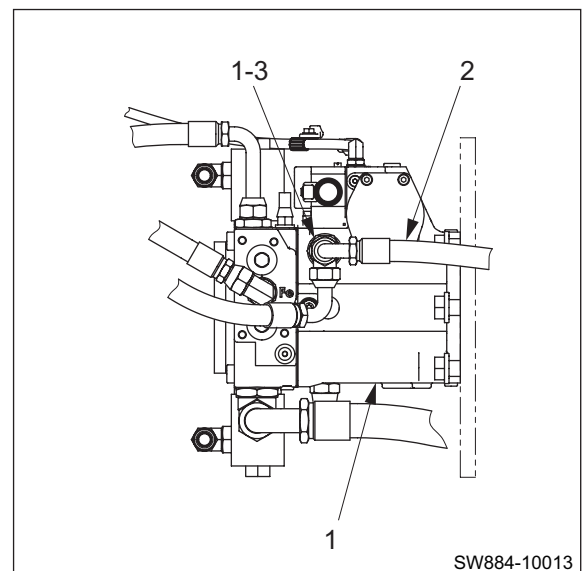
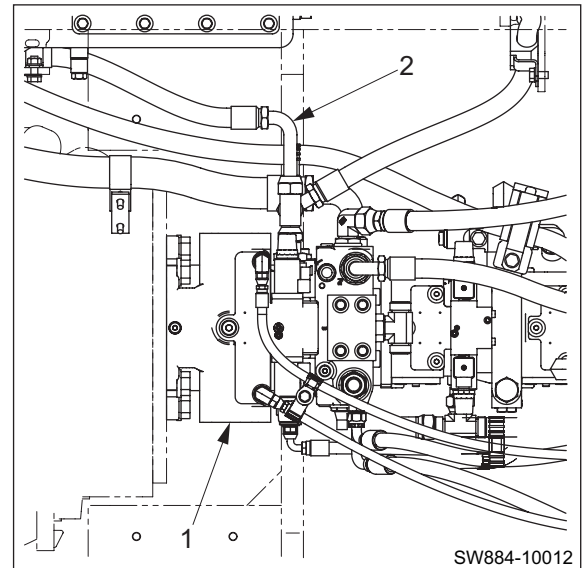
## 9. MEASUREMENT OF HYDRAULIC PUMP CASE PRESSURE

### 9-1. Measurement of Propulsion Pump Case Pressure

- Oil temperature during measurement :  $50 \pm 5^\circ\text{C}$  ( $122 \pm 9^\circ\text{F}$ )
- ① Disconnect hose (2) from propulsion pump (1) drain port (1-3). Attach pressure gauge through adapter (K) .
  - Adapter (K) : 12-4LOHL6G5TF  
(Parker part number)
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Confirm that F-R lever is “N”.
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Set speed change switch to “”.
- ⑤ SW884/994 : Set vibration frequency select switch to “2,500 vpm”.
- ⑥ Start the engine and set throttle switch to “Full”.
- ⑦ Establish a condition in which machine propulsion load becomes maximum.  
(Pressure does not build up unless propulsion load is applied.)
- ⑧ With propulsion load at maximum, measure pressure when speed change switch is “” and “” and F-R lever is “N”, “F”, and “R”, respectively.

★ Allowable pump case pressure

: 0.4 MPa (58.0 psi) or less



- The number “1-3” appearing in above illustrations is consistent with lead line numbers shown in illustration of hydraulic pump assembly in “2-2. Hydraulic Component Specifications” (P.4-007).

## 9-2. Measurement of Vibrator Pump (F) Case Pressure

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )

① Disconnect hose (2) from vibrator pump (F) (1) drain port (3-12). Attach pressure gauge through adapter (K) .

- Adapter (K) : 12-4LOHL6G5TF  
(Parker part number)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is "N".

③ Apply parking brake by pressing parking brake switch button.

④ Set vibratory drum select switch to "F R".

⑤ Set vibration mode select switch to " ".

⑥ Start the engine and set throttle switch to "Full".

⑦ Press F-R lever vibration switch ON.

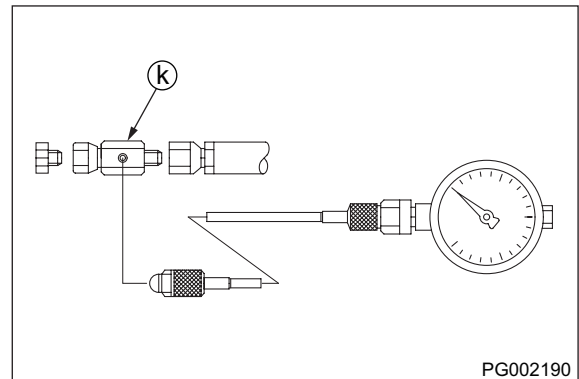
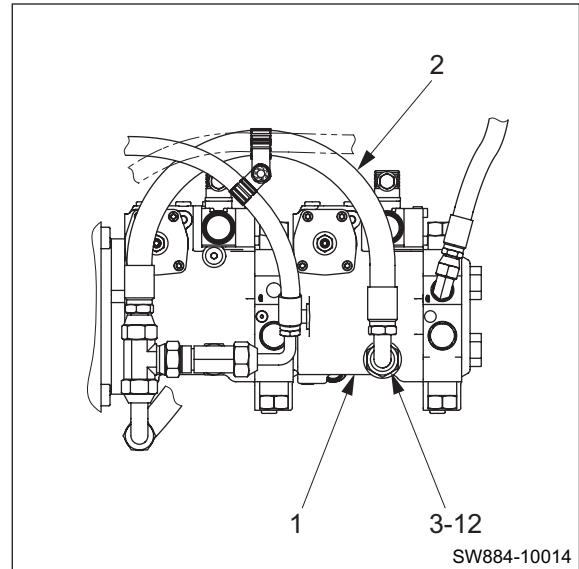
⑧ • SW884/994 : Measure pressure when vibration switch is " " and " " and vibration frequency select switch "2,500", "3,000", and "4,000", respectively.

- SW884ND/994ND : Measure pressure when vibration switch is " " and " " , respectively.

⑨ Press F-R lever vibration switch OFF as soon as measurement is finished.







### ★ Allowable pump case pressure

: 0.4 MPa (58.0 psi) or less



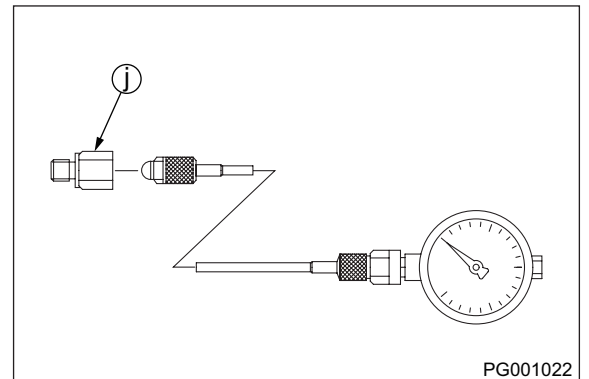
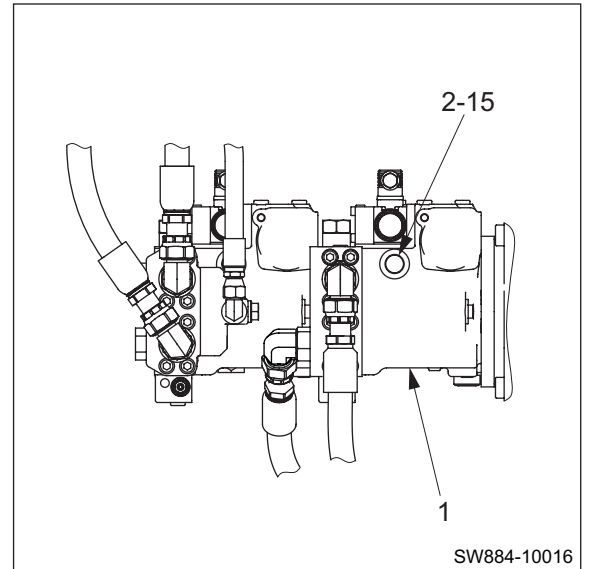
- The number "3-12" appearing in above illustrations is consistent with lead line numbers shown in illustration of hydraulic pump assembly in "2-2. Hydraulic Component Specifications" (P.4-007).

### 9-3. Measurement of Vibrator Pump (R) Case Pressure

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )
- ① Remove plug from vibrator pump (R) (1) drain port (2-15).  
Attach pressure gauge with adapter ① . Attach pressure gauge with adapter ① .
  - Adapter ① : 7/8-14UNF
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Confirm that F-R lever is "N".
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Set vibratory drum select switch to "  ".
- ⑤ Set vibration mode select switch to "  ".
- ⑥ Start the engine and set throttle switch to "Full".
- ⑦ Press F-R lever vibration switch ON.
- ⑧ • SW884/994 : Measure pressure when vibration switch is "  " and "  " and vibration frequency select switch "2,500", "3,000", and "4,000", respectively.  
• SW884ND/994ND : Measure pressure when vibration switch is "  " and "  ", respectively.
- ⑨ Press F-R lever vibration switch OFF as soon as measurement is finished.

★ Allowable pump case pressure

: 0.4 MPa (58.0 psi) or less



- The number "2-15" appearing in above illustrations is consistent with lead line numbers shown in illustration of hydraulic pump assembly in "2-2. Hydraulic Component Specifications" (P.4-007).

# 10. MEASUREMENT OF PROPULSION MOTOR CASE PRESSURE

## 10-1. Measurement

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )

① Remove plug from drain port (1). Attach pressure gauge with adapter ① .

- Adapter ① : 7/8-14UNF
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is "N".

③ Apply parking brake by pressing parking brake switch button.

④ Set speed change switch to "🐢".

⑤ SW884/994 : Set vibration frequency select switch to "2,500 vpm".

⑥ Start the engine and set throttle switch to "Full".

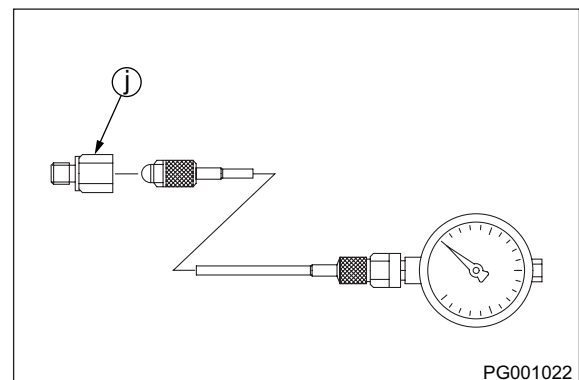
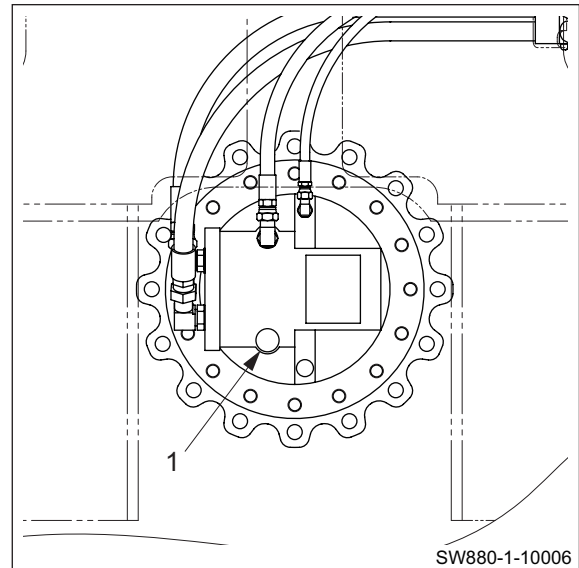
⑦ Establish a condition in which machine propulsion load becomes maximum.

(Pressure does not build up unless propulsion load is applied.)

⑧ With propulsion load at maximum, measure pressure when speed change switch is "🐢" and "🐎" and F-R lever is "N", "F", and "R", respectively.

### ★ Allowable motor case pressure

: 0.3 MPa (43.5 psi) or less






# 11. MEASUREMENT OF VIBRATOR MOTOR CASE PRESSURE

## 11-1. Measurement (SW884/994)

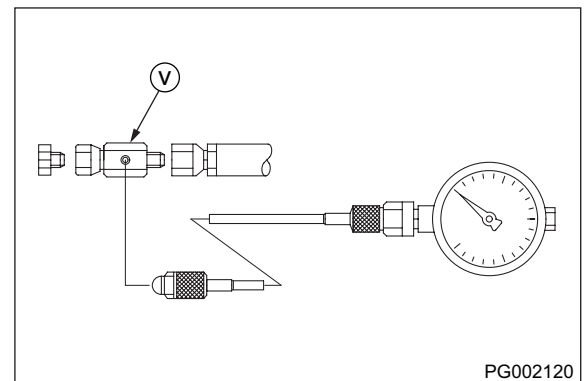
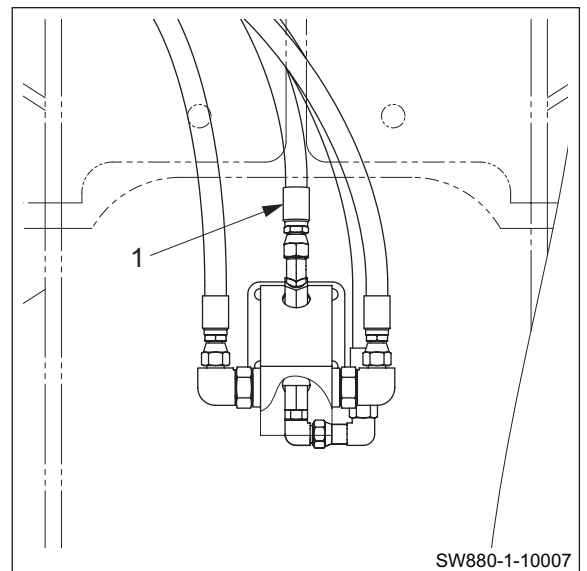
### ⚠ CAUTION

Take care not to operate the vibratory drum for a longer period of time than necessary with the machine stationary. Otherwise, the vibrator bearing could be seized.

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )
- ① Disconnect hose (1) from vibrator motor. Attach pressure gauge through adapter (V) .
  - Adapter (V) : 8-4LOHL6G5TP  
(Parker part number)
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Confirm that F-R lever is "N".
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Set vibratory drum select switch to " F R " .
- ⑤ Set vibration mode change switch to "  " .
- ⑥ Start the engine and set throttle switch to "Full".
- ⑦ Press F-R lever vibration switch ON.
- ⑧ Measure pressure when vibration switch is "  " and "  " and vibration frequency select switch "2,500", "3,000", and "4,000", respectively.
- ⑨ Press F-R lever vibration switch OFF as soon as measurement is finished.

#### ★ Allowable motor case pressure

: 0.15 MPa (21.6 psi) or less



## 11-2. Measurement (SW884ND/994ND)

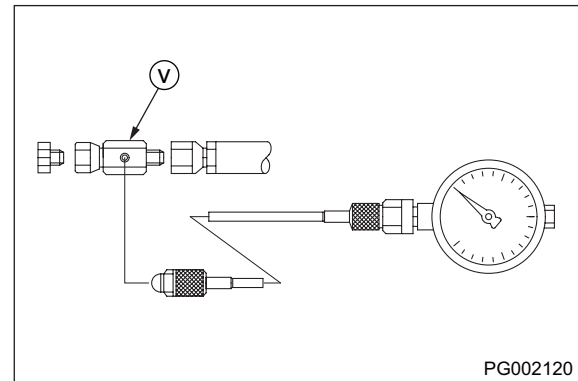
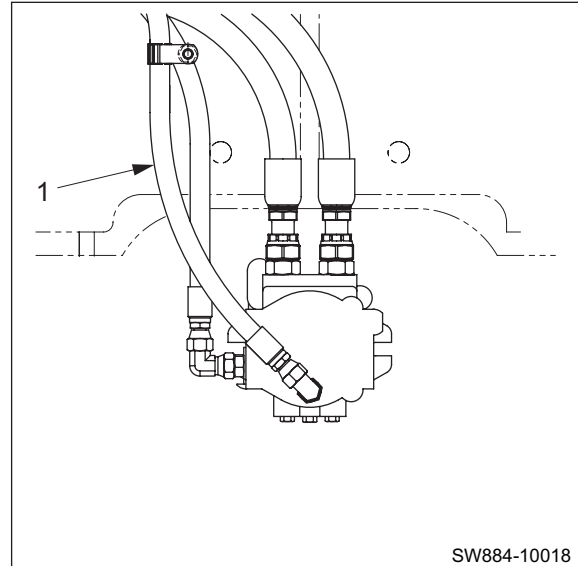
### **CAUTION**

Take care not to operate the vibratory drum for a longer period of time than necessary with the machine stationary. Otherwise, the vibrator bearing could be seized.

- Oil temperature during measurement :  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 9^{\circ}\text{F}$ )
- ① Disconnect hose (1) from vibrator motor. Attach pressure gauge through adapter (V) .
  - Adapter (V) : 8-4LOHL6G5TP  
(Parker part number)
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Confirm that F-R lever is "N".
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Set vibratory drum select switch to "F R".
- ⑤ Set vibration mode change switch to "↙".
- ⑥ Start the engine and set throttle switch to "Full".
- ⑦ Press F-R lever vibration switch ON.
- ⑧ Measure pressure when vibration switch is "Ⓜ" and "Ⓣ", respectively.
- ⑨ Press F-R lever vibration switch OFF as soon as measurement is finished.

★ Allowable motor case pressure

: 0.15 MPa (21.6 psi) or less



## 12. ADJUSTMENT OF F-R LEVER POTENTIOMETER

- When replacing potentiometer, make adjustments in accordance with procedures described below.

### 12-1. Adjustment of F-R Lever Operating Force

#### (NOTICE)

- After tightening adjusting bolt or nut, move F-R lever (2) in both directions to its full stroke positions several times before measuring F-R lever operating force.
- When taking measurements, always pull F-R lever with a spring balance, etc. fastened to lever at a right angle.

#### 12-1-1. Adjustment of disc spring tension

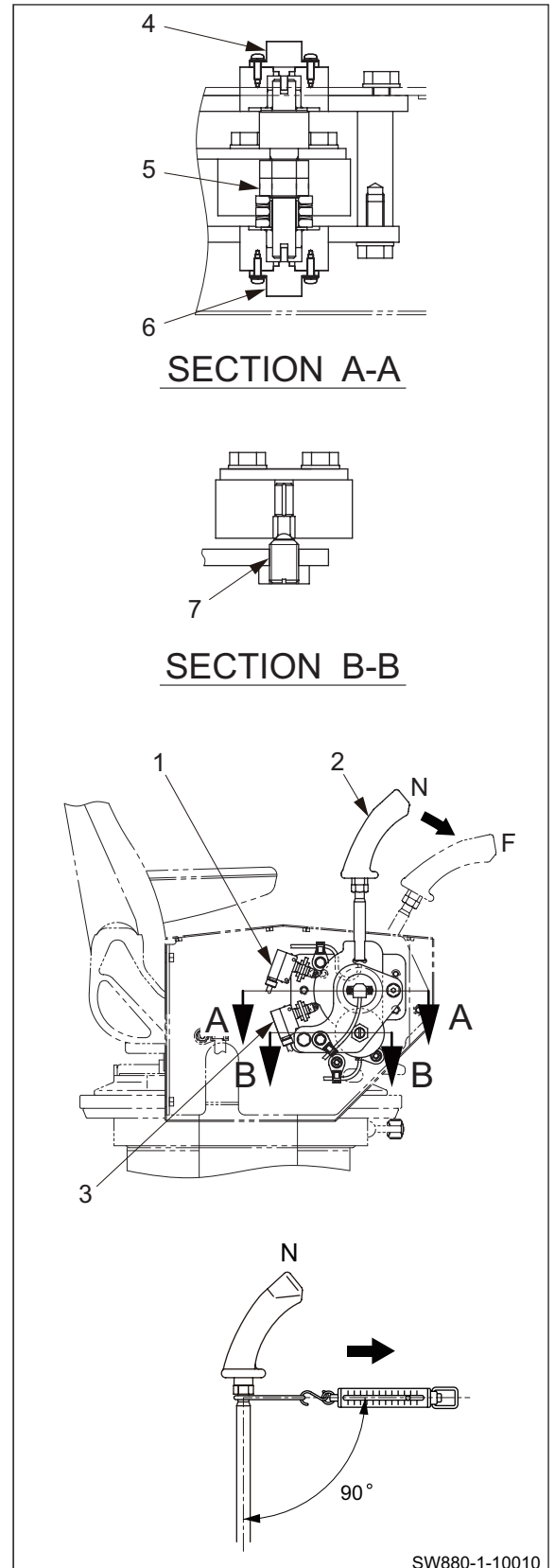
#### (NOTICE)

- Ends of F-R lever switch (1) and backup buzzer switch (3) must not be in contact with F-R lever cam.
- Screw (7) must not be in contact with F-R lever.
- Apply lithium-based grease to shaft of potentiometer 1 (4) and potentiometer 2 (6).

- ① Place F-R lever in the temporary neutral position.
- ② Adjust with nut (5) so that F-R lever operating force reading becomes the following standard value when F-R lever is moved toward forward position.

#### ★ F-R lever operating force standard value

:  $1.0 \pm 0.2 \text{ N}$  ( $0.22 \pm 0.05 \text{ lbf}$ )



## 12-1-2. Adjustment of steel ball thrust

**(NOTICE)**

- F-R lever switch (1) and backup buzzer switch (3) must be placed in contact with F-R lever cam.
- Apply lithium-based grease to F-R lever switch and backup buzzer switch at their surfaces that slide on F-R lever cam.
- Apply molybdenum-based grease to screw.

① Temporarily adjust with screw (7) so that F-R lever operating force reading becomes the following standard value when F-R lever (2) is moved from neutral toward forward position and screw rides out of detent in F-R lever cam.

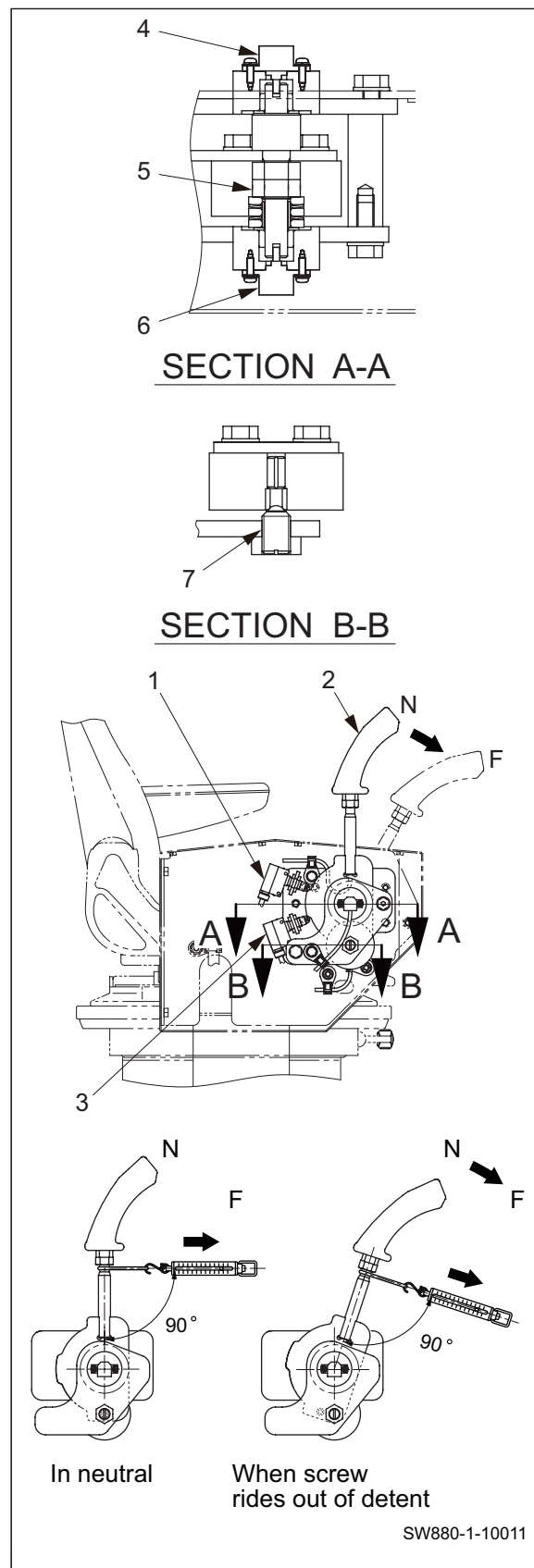
**★ F-R lever operating force standard value when steel ball rides out of detent:**

**40.0 ± 0.2 N (9.0 ± 0.05 lbf)**

② Adjust with screw (7) so that F-R lever operating force reading becomes the following standard value when F-R lever is moved further toward forward position after screw rides out of detent.

**★ F-R lever operating force standard value**

**: 18.0 ± 2 N (4.0 ± 0.45 lbf)**





## 12-2. Adjustment of Potentiometer

- Voltage at potentiometer must be measured with connector connected. For details about taking measurements, refer to TROUBLESHOOTING, 2-1-2 Inspection procedures using a tester, 2) Measuring voltage using tester (page 11-006).
- Connect positive probe of tester to W (white) wire and negative probe to B (black) wire of potentiometer.

### 12-2-1. Adjustment of potentiometer 1 voltage when F-R lever is in “N”

- Prior to taking measurements, make sure that potentiometer 1 (6) is seated in notch of F-R lever (2), and operate F-R lever in both directions to its full stroke positions several times.

- ① Set starter switch to ON.
- ② Operate F-R lever as follows and then take a measurement of voltage at potentiometer 1 when F-R lever is placed in “N”.
  - Move F-R lever in both directions to its full stroke positions and then quickly return lever to “N”.
  - Move F-R lever toward reverse until screw rides out of detent, and then release lever slowly (reverse direction only).
- ③ Adjust angle of potentiometer 1 so that middle value between maximum and minimum voltages becomes 2.500 V, and range (difference) between maximum and minimum voltages becomes 0.010 V.

Example: When maximum voltage is 2.505 V and minimum voltage is 2.495 V

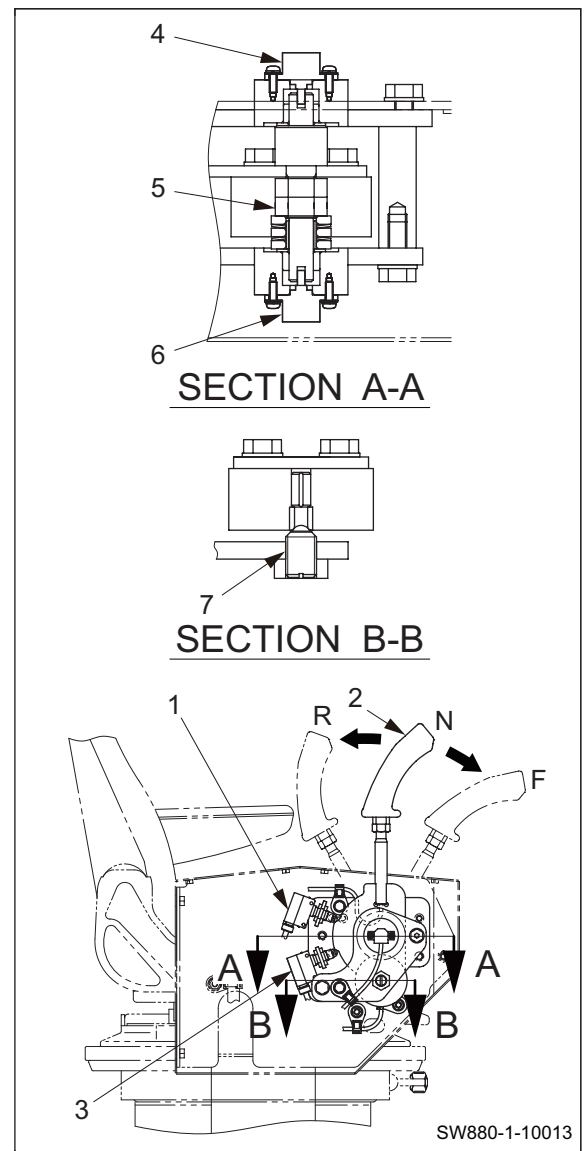
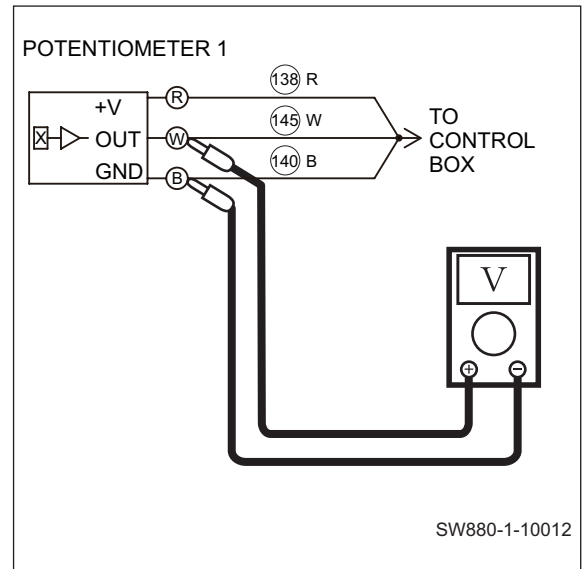
Middle value :  $(2.505 \text{ V} + 2.495 \text{ V}) \div 2 = 2.500 \text{ V}$

Range between maximum and minimum voltages :  $2.505 - 2.495 = 0.010 \text{ V}$

Adjust the voltage at potentiometer 2 (4) when F-R lever is placed in “N” in the same manner.

#### (NOTICE)

- Range between maximum and minimum voltages must not be wider than 0.020 V (acceptable range for mid-value: 2.485 to 2.515 V). If range extends beyond limits, make an adjustment by loosening disc spring tension adjusting nut (5) and tightening screw (7). F-R lever operating force must not deviate from standard value.
- Voltage values should be rounded off to three decimal places.



## 12-2-2. Adjustment of potentiometer 1 voltage when F-R lever switch operates

- The moment that F-R lever switch turns ON/OFF can be monitored on water spray indicator lamp in combination meter. Water spray mode select switch must be placed in "AUTO", and water spray timer switch must be turned OFF (placed in "○").

- Set starter switch to ON.
- Move F-R lever (2) in forward direction.
- Adjust with nut (8) of F-R lever switch (1) so that water spray indicator lamp in combination meter illuminates when voltage reaches a value 0.080 V higher than middle value measured in 12-2-1.

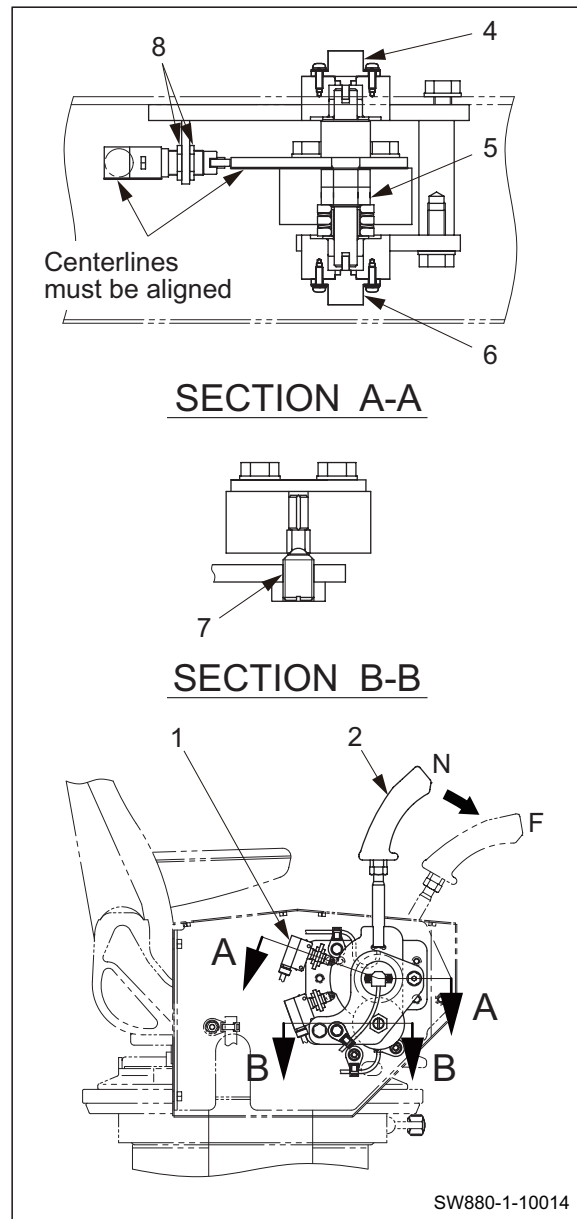
Example:

Middle value : 2.500 V

Voltage when F-R lever switch :  $2.500 - 0.080 = 2.420$  V operates

### (NOTICE)

- Acceptable range for voltage when F-R lever switch operates is 2.415 to 2.425 V.
  - F-R lever switch must be installed with its centerline aligned with centerline of F-R lever cam.
- After adjustments are made, make sure about following points.
    - F-R lever cam must not push in F-R lever switch until it bottoms when F-R lever is moved toward forward position.
    - F-R lever must automatically return to neutral when F-R lever is released at a position slightly beyond F-R lever switch operating point. If lever does not return automatically, make an adjustment by loosening disc spring tension adjusting nut (5) and tightening screw (7). F-R lever operating force must not deviate from standard value.



### 12-2-3. Adjustment of potentiometer 1 voltage when backup buzzer switch operates

- The moment that backup buzzer switch turns ON/OFF can be monitored on water spray indicator lamp in combination meter. Water spray mode select switch must be placed in "AUTO", and water spray timer switch must be turned OFF (placed in "○").

- ① Set starter switch to ON.
- ② Move F-R lever (2) in reverse direction.
- ③ Adjust with nut (9) of backup buzzer switch (3) so that water spray indicator lamp in combination meter illuminates when voltage reaches a value 0.080 V lower than middle value measured in 12-2-1.

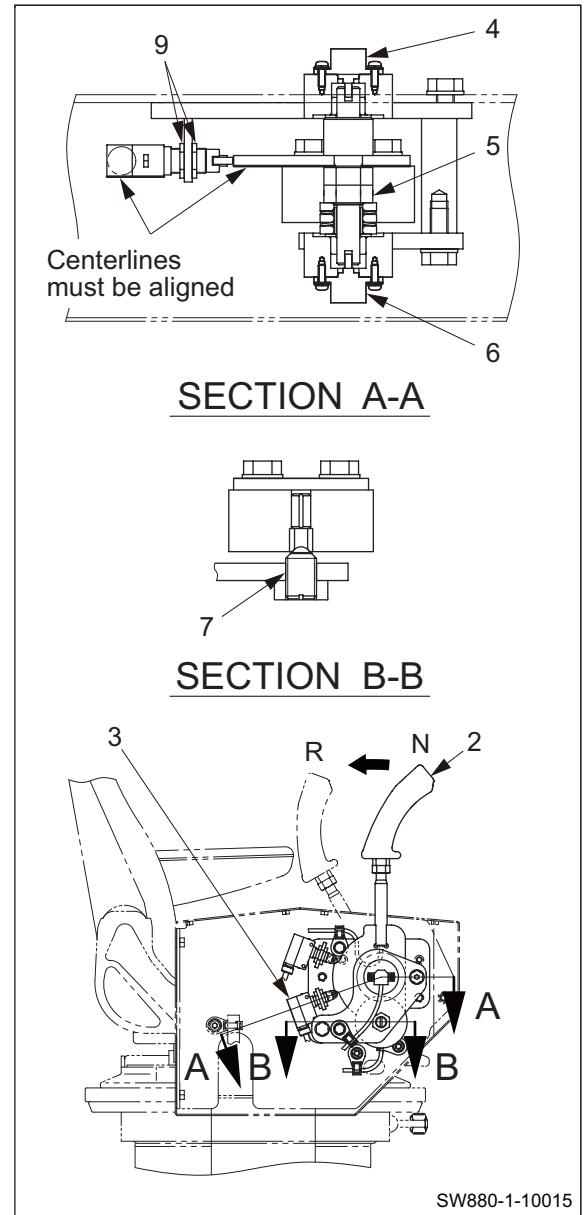
Example:

Middle value : 2.500 V

Voltage when backup buzzer switch operates :  $2.500 + 0.080 = 2.580$  V

#### (NOTICE)

- Acceptable range for voltage when backup buzzer switch operates is 2.575 to 2.585 V.
  - Backup buzzer switch must be installed with its centerline aligned with centerline of F-R lever cam.
- ④ After adjustments are made, make sure about following points.
    - F-R lever cam must not push in backup buzzer switch until it bottoms when F-R lever is moved toward reverse position.
    - F-R lever must automatically return to neutral when F-R lever is released at a position slightly beyond backup buzzer switch operating point. If lever does not return automatically, make an adjustment by loosening disc spring tension adjusting nut (5) and tightening screw (7). F-R lever operating force must not deviate from standard value.





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# **TROUBLESHOOTING**

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# 1. TROUBLESHOOTING

## 1-1. Safety Precautions for Troubleshooting

### WARNING

Unexpected machine movement may cause a serious accident. When inspecting the machine while the engine is running, always follow the instructions below.

- Park the machine on level, flat ground.
- Apply the parking brake.
- Set chocks in front and behind each drum or tire.
- Make sure that service personnel are given the appropriate information at the appropriate time.
- Make sure that no one can enter any hazardous area.

### CAUTION

Do not work on the hydraulic system while the engine is running and the system is hot and under pressure. Do not disconnect hydraulic hoses or fittings until the system has cooled and pressure has been properly relieved.

Before removing any plugs from the pressure measurement ports, always release any residual pressure from the piping and open the cap of the fluid tank to release and pressure.

### WARNING

Inadvertent starting the engine may cause a serious accident.

When inspecting the engine, make sure to exchange the appropriate cues and hand signal with the person at the operator station to avoid any accidents.

### CAUTION

Before inspecting inside of the engine compartment, always stop the engine.

Contact with the fan, V-belt or exhaust system parts while the engine is running may cause serious injury.

## 1-2. Important Information for Troubleshooting

Before conducting troubleshooting, it is important to carefully read the operation manual and workshop manual and understand the electric circuits for each component as well as the structure and function of each system. Sufficient knowledge of the systems will enable you to identify a possible cause much faster. A fault or problem may seem to be related to many different factors. To identify the true cause, some experience is needed. To perform the appropriate troubleshooting, it is important to learn not only the normal operations of the systems but also the possible symptoms that may occur when an abnormal condition is present.

This chapter explains the possible causes and remedies for likely incidents taken from past experience.

### 1-3. Before Starting

The information in this section is provided to assist the troubleshooter in understanding the systems and quickly determine the causes when operating abnormalities occur.

The following steps are recommended:

1. If not familiar with the machine, study the Operator's Manual and this Shop Manual.
2. Check with the operator for full details of the trouble, ask questions.
3. Verify the trouble by warming up the machine and operating it. Check the problem yourself.
4. Identify the problem with either a mechanical, hydraulic or electrical system source.
5. Isolate the problem to a particular component or circuit.
6. Eliminate the simplest or easiest to check possibilities first to prevent unnecessary disassembly of components.
7. Following repair or replacement of any parts, perform operational tests to verify that the problem has been eliminated and the performance of all the systems is normal.



## 2. ELECTRICAL SYSTEM TROUBLESHOOTING

### 2-1. When Performing Electrical System Fault Diagnosis

#### **WARNING**

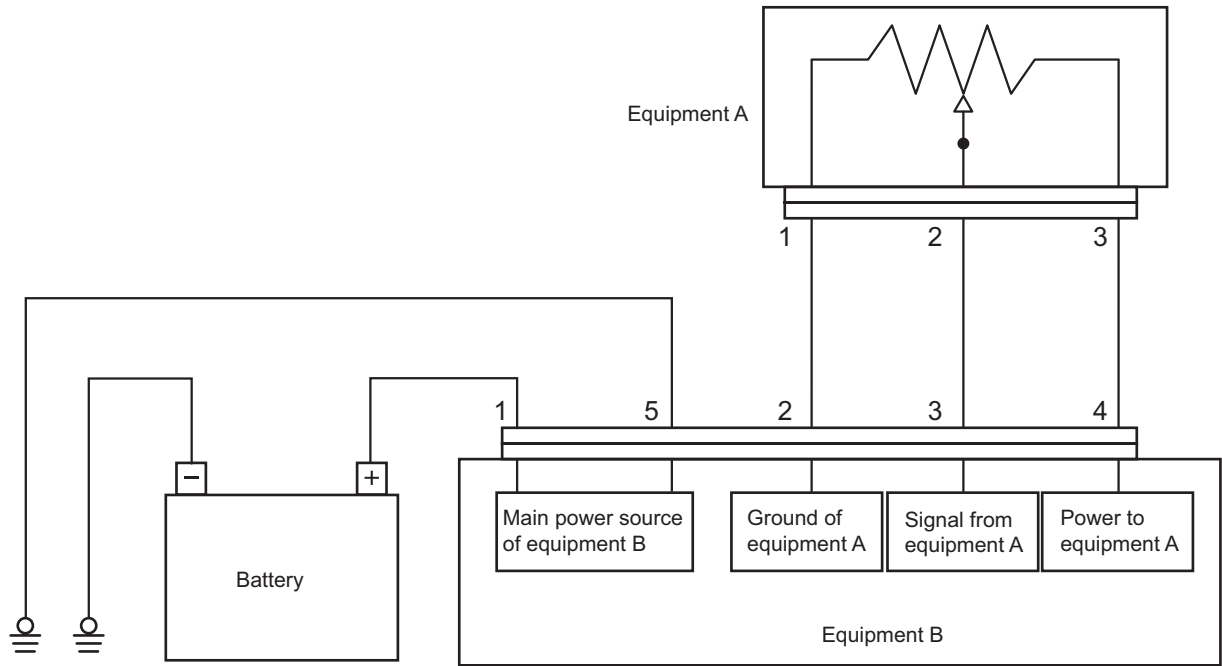
Be very careful because equipment can return to normal during an inspection and suddenly operate properly when a failure occurs due to a faulty contact or other such cause.

#### 2-1-1. Precautions to take during electrical circuit fault diagnosis

- When disconnecting or connecting a connector, be sure to turn the power supply OFF. (Electronic control parts such as the engine control unit, in particular, could be damaged internally.)
- Since connectors are not numbered, be sure to affix alignment marks so that you can restore them to their original condition.
- Before making a diagnosis, check related connectors for faulty connections. (Check by disconnecting and reconnecting related connectors several times.)
- Before proceeding to the next step, be sure to return the disconnected connectors to their original condition.
- When diagnosing a circuit (measuring the voltage, resistance, continuity and current), move related wiring and connectors several times, and check whether the tester's numerical values change. (If values change, faulty contact in the circuit is possible.)
- Do not ground the circuit of the control unit or apply voltage to it unless otherwise specified.
- For information of wire number, wire size, and wire color used in the sample circuit diagrams, refer to "1-1. Wire Numbers, Wire Sizes, Wire Colors and Connectors Shown in Electrical Circuit Diagram, Wiring Harness Layout and Wiring Harnesses" (P.5-001).

2-1-2. Inspection procedures using a tester

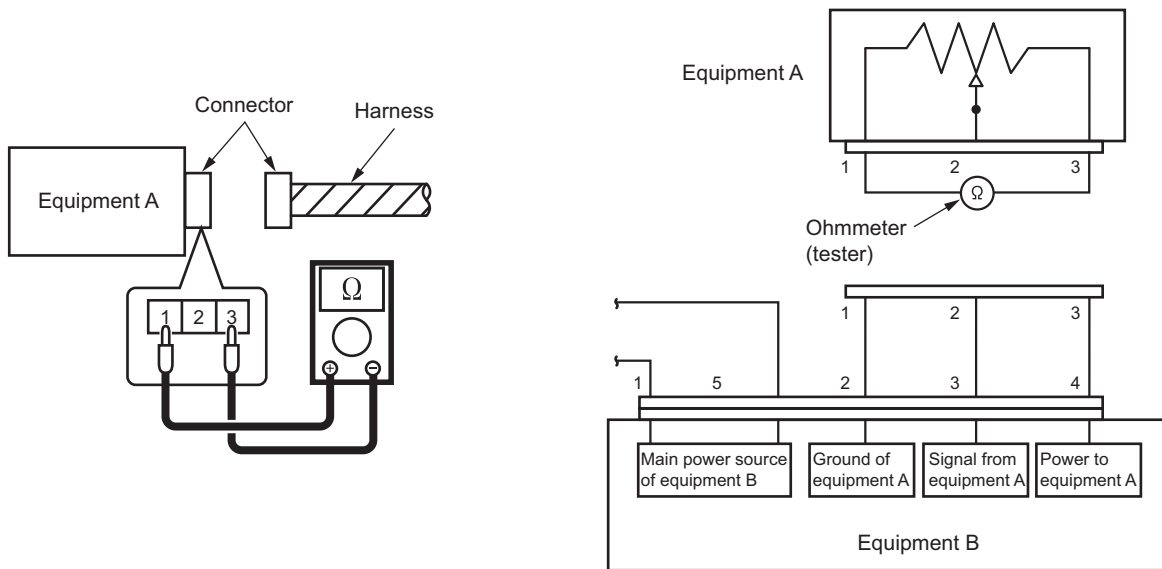
Some of the various inspection procedures are presented here for reference, using a sample circuit below.



TS-10001

1) Measuring resistance using tester

1-1) Measuring resistance of equipment A (measuring resistance between terminals 1 and 3)

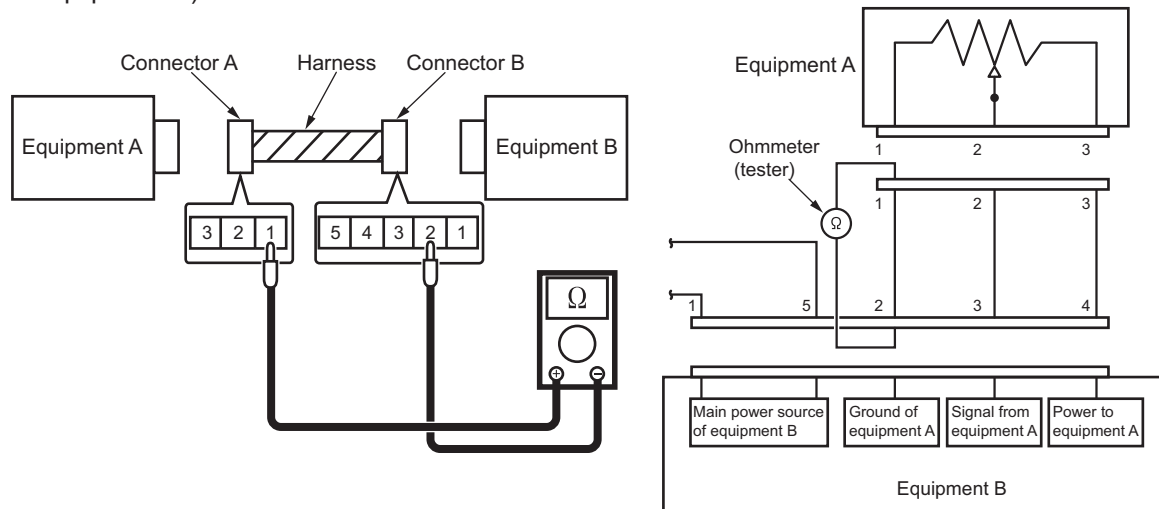


TS-10002

Inspection procedure

- ① Disconnect the connector of equipment A.
- ② Connect the test probe (+) to connector terminal 1 of equipment A and the test probe (-) to connector terminal 3 of equipment A and measure the resistance. At this time, reversing the connector terminals between the probes (+) and (-) does not make any difference in the measurement.

- 1-2) Measuring resistance of harness (measuring resistance between terminal 1 of equipment A and terminal 2 of equipment B)



TS-10003

#### Inspection procedure

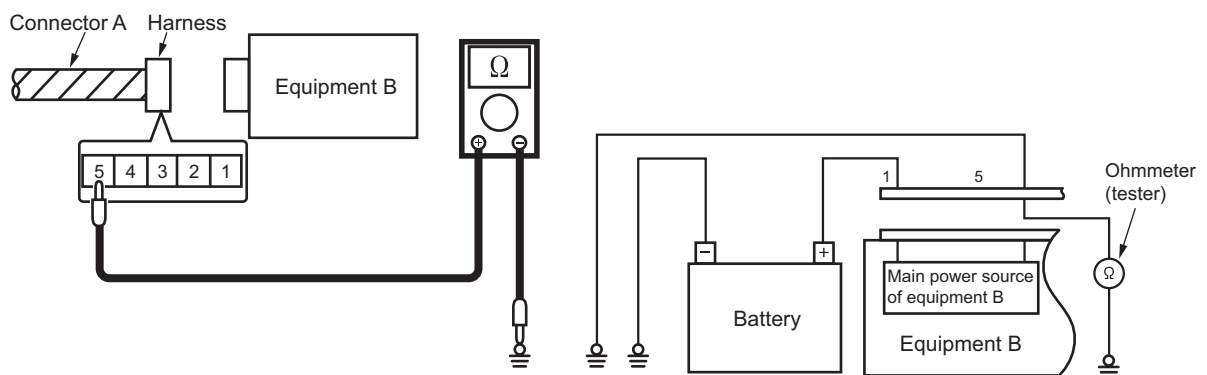
- ① Disconnect the connectors of equipment A and equipment B.
- ② Connect the test probe (+) to connector terminal 1 of equipment A and the test probe (-) to connector terminal 2 of equipment B and measure the resistance. At this time, reversing the connector terminals between the probes (+) and (-) does not make any difference in the measurement.

#### Criteria for harness defects

When there is no abnormality in the harness: Less than 10  $\Omega$  (measured value)

If there is any abnormality in the harness such as broken wire: 10  $\Omega$  or higher (measured value)

- 1-3) Measuring resistance of grounding wire (measuring resistance between terminal 5 of equipment B and ground)



TS-10004

#### Inspection procedure

- ① Disconnect the connector of equipment B.
- ② Connect the test probe (+) to connector terminal 5 of equipment B and the test probe (-) to a machine ground point (the bolt fastening the ground terminal or an unpainted portion on the body) and measure the resistance. At this time, reversing the connector terminals between the probes (+) and (-) does not make any difference in the measurement.

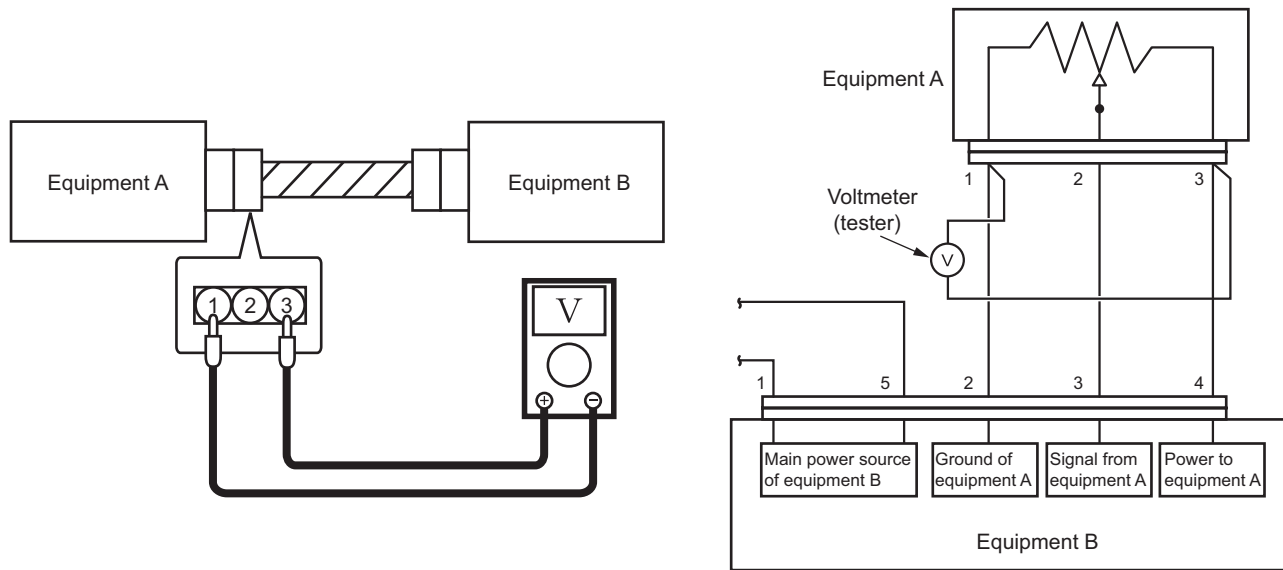
#### (NOTICE)

- When measuring the resistance, connect the test probes to both ends of the portion to be measured. Make also sure that no voltage is applied to the portion to be measured.
- When measuring the internal resistance of equipment, be sure first to disconnect all harnesses from the equipment.
- When measuring the resistance of a harness, disconnect the equipment connected to both ends of the harness.

## TROUBLESHOOTING

### 2) Measuring voltage and current flowing using tester

#### 2-1) Measuring voltage of equipment A (measuring voltage between terminals 1 and 3)

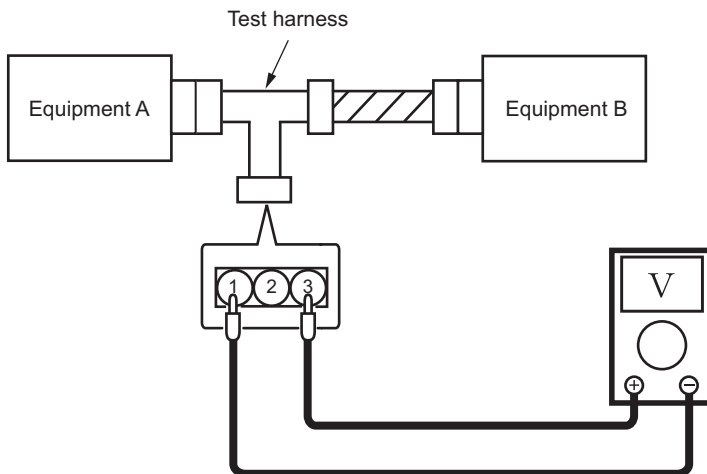


TS-10005

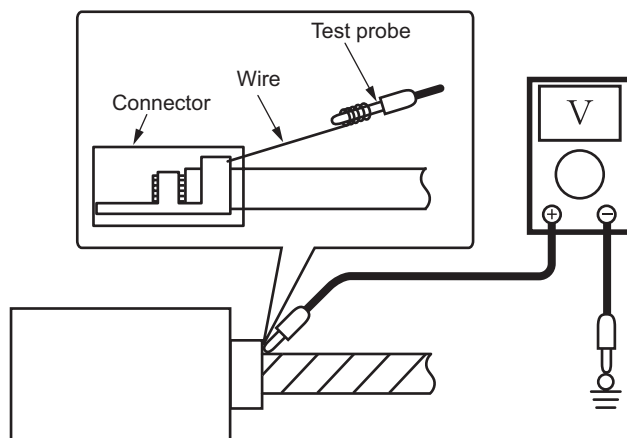
#### Inspection procedure

- ① Connect the connectors of equipment A and that of equipment B.
- ② Connect the test probe (+) to connector terminal 3 of equipment A and the test probe (-) to connector terminal 1 of equipment A and measure the voltage. Note that reversing the connector terminals between the probes (+) and (-) changes the result of the measurement. Be sure to connect the probe (+) to the power source side and the probe (-) to the ground side.

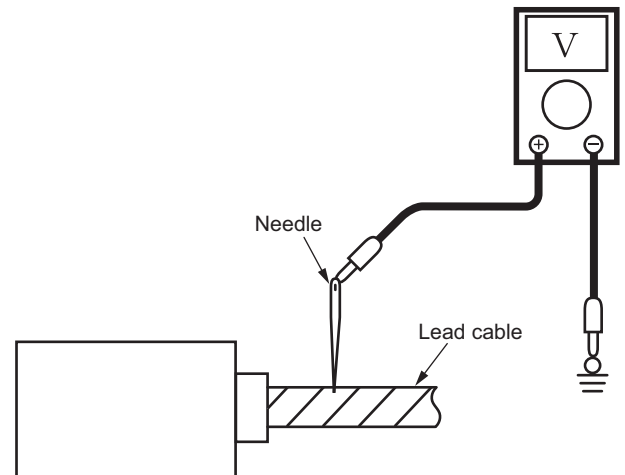
- Measurement using a test harness



- Measurement from the backside of connector



- Measurement on a lead cable



TS-10006

#### Measurement method

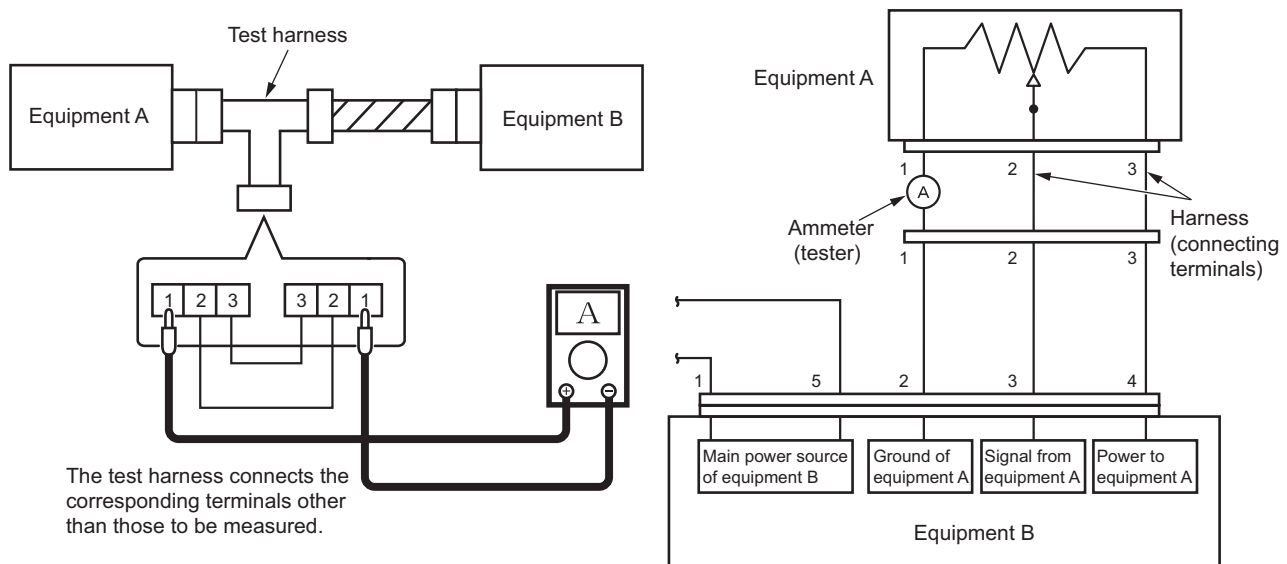
For measurement of voltage, connect the tester probes in parallel to the portion to be measured. Because the voltage can be measured only when the connector is connected in position, contact the tester probes to the terminals without disconnecting the connector. The following methods are available:

- Measurement using a test harness
  - Prepare the test harness for the measurement.
- Measurement from the backside of connector
  - Insert a wire from the backside of the connector.
- Measurement on a lead cable
  - Remove the bundling tape from the harness to separate each cable, and stick the needle into the relevant cable.

#### (NOTICE)

- Except for preparing the test harness, proper protection must be made after the measurement to prevent corrosion in the connector terminals or harnesses.

- 2-2) Measuring current flowing from equipment B to equipment A  
 (measuring current between terminal 2 of equipment B and terminal 1 of equipment A)



TS-10007

### Inspection procedure

- ① Disconnect the connector of equipment A and connect the test harness.
- ② Connect the test probe (+) to connector terminal 1 (harness side) of equipment A and the test probe (-) to connector terminal 1 (equipment side) of equipment A and measure the current. Note that reversing the connector terminals between the probes (+) and (-) changes the result of the measurement. Be sure to connect the probe (+) to the power source side and the probe (-) to the ground side.

### Measurement method

When measuring the current, connect the tester in series to the portion to be measured. Because the current cannot be measured when the connector is connected in position, disconnect the connector to allow the test probe to connect between the terminals.

## 2-1-3. Inspection of electrical system

Operate the applicable switches and turn the relays ON and OFF. Ultimately, if the solenoid valve operates (makes a sound) and the pump runs, the electrical system is OK.

If there is a failure (fault), narrow the range of the inspection to the six broad steps described below.

### 1) Ground inspection

- Check for disconnected or loose ground. If rust or corrosion is present (which can cause faulty contact), remove the rust.

### 2) Fuse inspection

2-1) Check for blown fuses, disconnections and corrosion. (A fatigue open circuit cannot be identified visually. Use a tester for checking.)

#### 2-2) If a fuse is blown

Check whether a pump or valve (that is supposed to be protected by a blown fuse) burned, and whether there is a burning odor.

Especially if the pump and valve are not burned, check the harness for signs of burning. If it is burned, replace it.

If a fuse is blown and a relay along the pathway has failed, replace it. And if there is a timer, replace the timer, too. If a switch visually appears to be unsatisfactory (burned, melted, etc.) even though it operates, replace it.

- Simply replacing a fuse may not eliminate the true cause of a problem, and over current may flow again. Also, if over current secondarily causes an electrical path to fail (such as a wiring meltdown inside a solenoid valve), current will not flow. Thus, a fuse may not be blown out, but it also will not operate. If you do not know the location of burning or of an odor, investigate as described follows.

#### 2-3) How to find cause of failure when fuse blown is reproduced

- ① Turn the starter switch OFF, and remove the connector from the load (valve, pump).
- ② Referring to the circuit diagram, remove electrical parts that are connected to the circuit, such as relays, timers and diodes.
- ③ Turn the starter switch ON, and see whether the conditions can be reproduced (fuse is blown).
- ④ If a fuse is blown, a part such as a relay may have caused a short between the previous harness and ground (vehicle body). (Replace the harness.) If the conditions are not reproduced, check for signs of burning (odor) on the removed electrical parts.
- ⑤ If there is no problem, turn the starter switch OFF and reattach the parts.
- ⑥ Turn the starter switch ON and try again.
- ⑦ If a fuse is blown with this action, the problem was caused by a short between the harness and ground (vehicle body) that followed the attached electrical part. (Replace the harness.)
- ⑧ If the conditions are not reproduced, turn the starter switch OFF, and connect the loads (valve and pump) one at a time. Turn the starter switch ON and try again to see whether the fuse blown is reproduced.
- ⑨ If the fuse blown is reproduced, whatever was added at that time (including a harness added electrically) will be the cause of the failure.
  - Even if the fuse is not blown and the valve or pump is not burned, the valve or pump may be damaged electrically and may not operate. There may simply be a disconnection in the interior or an abnormal heat-up.
  - Even if the fuse is not blown, abnormal heat-up (hot enough to cause burns if touched) may occur if a relay, timer, diode or other semiconductor fails.

### 3) Connector inspection

- Is a connector disconnected or loose?
- Check that pins are not snapped or corroded.
- If faulty contact is suspected

Turn the starter switch OFF. Then disconnect and check the connectors (including relay and switch sockets).

If the terminal has no luster, faulty contact due to oxidation can be suspected. Therefore, polish the terminal by inserting and removing the connector (relay, switch) repeatedly at least five times. (Luster will return.)

### 4) Relay inspection (Check ON/OFF operation by sound.)

- Conduct without running the engine. (If you run the engine, you cannot hear the sound of operation.)

Sound heard : A relay failure occurred.

No sound heard : Using a tester, check the harness.

Sound heard : A relay failure occurred.

Still no sound : Using a tester, check the harness.

Continuity : Turn the starter switch OFF temporarily, disconnect the relay and check for continuity between the harness-side grounding terminal (color: black) and vehicle body ground. (If there is none, replace the harness.)

Voltage : With the relay disconnected, turn the starter switch ON and turn the operating switch ON. 24 V (or 12 V) (between vehicle body ground) should not reach the relay coil input terminal. Confirm this. Identify the location (section) to which 24 V (or 12 V) reaches. Then replace the harness or take other action.

### 5) Solenoid valve inspection (Check ON/OFF operation by sound.)

- Conduct without running the engine. (If you run the engine, you cannot hear the sound of operation.)

Sound heard : The electrical system is normal.

No sound heard : Check with a tester.

Continuity : ① Turn the starter switch OFF temporarily, disconnect the connector and check for continuity between the harness-side grounding terminal (color: black) and vehicle body ground. (If there is none, replace the harness.)

: ② Is the solenoid valve coil burnt?

(Turn the starter switch OFF, disconnect the connector and check the resistance between the solenoid valve terminals.)

Voltage : With the connector disconnected, turn the starter switch ON and check whether 24 V (or 12 V) exists between the harness-side connector and vehicle body ground.

If YES : Replace the valve.

If NO : Investigate and identify the location (section) to which 24 V (or 12 V) reaches. Then replace the harness or take other action.

### 6) Harness check

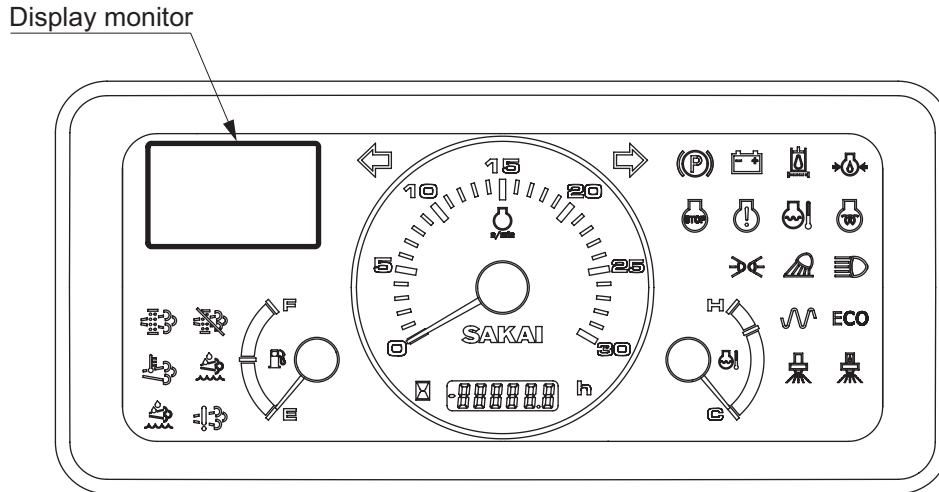
- If an incomplete disconnection inside the harness is suspected, wiggle (move) the harness during the relay inspection and solenoid valve inspection to see whether the relay (valve) operates incorrectly.
- Check for burned areas of the harness.
- Turn the starter switch OFF, disconnect the connector and check the continuity, referring to the circuit diagram and wiring coloring.



## 2-2. Engine Diagnosis Trouble Code

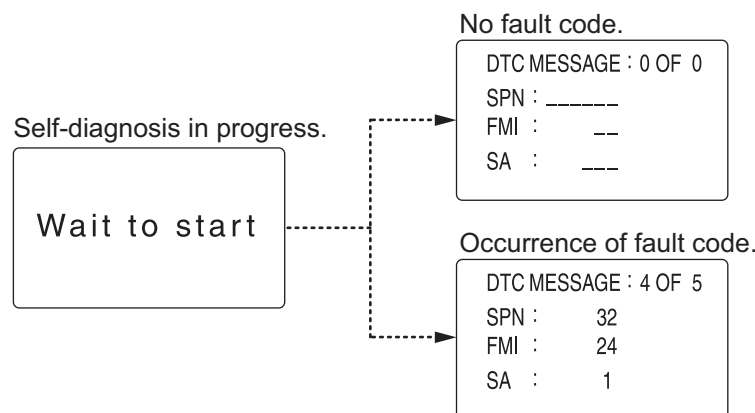
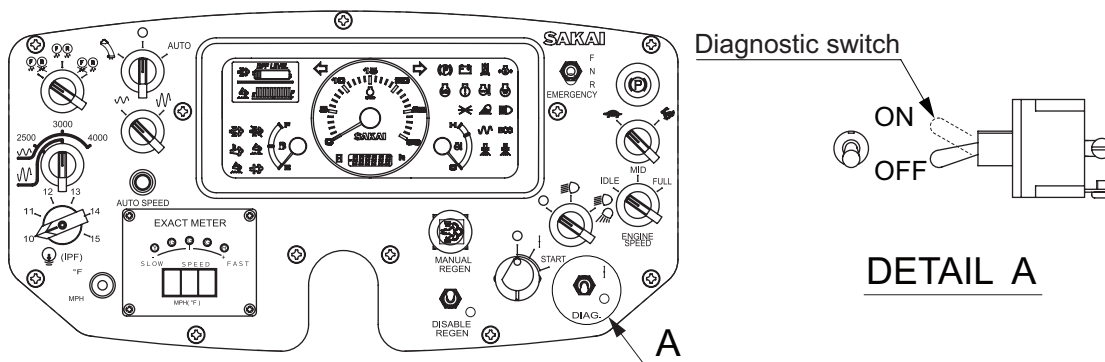
### 2-2-1. Description of fault code (SPN,FMI)

- When a fault code (SPN,FMI) occurs, display a fault code on the display monitor in the combination meter.



SV544-09001

- Fault codes can be accessed in at least two different ways; using the electronic service tool or a method of displaying it on a display monitor in a combination meter.
- To check the fault code occurring in the electronic fuel system / protection system of the engine on the display monitor, set the diagnostic switch to "ON" and set the start switch to "ON".
- After the diagnosis is ended, set the diagnostic switch to "OFF".



SW884-11010

## TROUBLESHOOTING

### 2-2-2. Fault code list

SPN	FMI	Cummins Description	Effect	
27	4	EGR Valve Position Circuit • Voltage below normal or shorted to low source.	• Possible reduced engine performance.	
51	3	Engine Intake Throttle Actuator Position Sensor Circuit • Voltage above normal or shorted to high source.		
	4	Engine Intake Throttle Actuator Position Sensor Circuit • Voltage below normal or shorted to low source.		
84	2	Wheel-Based Vehicle Speed • Data erratic, intermittent, or incorrect.	• Engine speed limited to maximum engine speed without VSS parameter value. • Cruise control, gear-down protection, and road speed governor will not work.	
	9	Wheel-Based Vehicle Speed • Abnormal update rate.		
	10	Wheel-Based Vehicle Speed Sensor Circuit tampering has been detected • Abnormal change rate.		
	19	Wheel-Based Vehicle Speed • Received network data in error.		
91	0	Accelerator Pedal or Lever Position Sensor 1 • Data valid but above normal operation range. • Most severe level.	• The engine will operate in limp home mode.	
	1	Accelerator Pedal or Lever Position 1 Sensor Circuit Frequency • Data valid but below normal operation range. • Most severe level.		
	2	Accelerator Pedal or Lever Position Sensor 1 • Data erratic, intermittent, or incorrect.	• Engine will only idle.	
	3	3	Accelerator Pedal or Lever Position Sensor 1 Circuit • Voltage above normal or shorted to high source.	• The engine will operate in limp home mode.
		4	Accelerator Pedal or Lever Position Sensor 1 Circuit • Voltage below normal or shorted to low source.	
	9	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System • Abnormal update rate.	• Engine will only idle.	
	19	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System • Received network data in error.		

SPN	FMI	Cummins Description	Effect
97	3	WIF Indicator Sensor Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	WIF Indicator Sensor Circuit • Voltage below normal or shorted to low source.	
	15	WIF Indicator • Data valid but above normal operation range. • Least severe level.	
	16	WIF Indicator • Data valid but above normal operation range. • Moderately severe level.	
100	1	Engine Oil Rifle Pressure • Data valid but below normal operation range. • Most severe level.	• Progressive power derate increasing in severity from time of alert. • If engine protection shutdown feature is enabled, engine will shut down.
	2	Engine Oil Rifle Pressure • Data erratic, intermittent, or incorrect.	
	3	Engine Oil Rifle Pressure 1 Sensor Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	Engine Oil Rifle Pressure 1 Sensor Circuit • Voltage below normal or shorted to low source.	
	18	Engine Oil Rifle Pressure • Data valid but below normal operation range. • Moderately severe level.	
102	2	Intake Manifold 1 Pressure • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	3	Intake Manifold 1 Pressure Sensor Circuit • Voltage above normal or shorted to high source.	
	4	Intake Manifold 1 Pressure Sensor Circuit • Voltage below normal or shorted to low source.	
	18	Intake Manifold 1 Pressure • Data valid but below normal operation range. • Moderately severe level.	

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
105	0	Intake Manifold 1 Temperature • Data valid but above normal operation range. • Most severe level.	<ul style="list-style-type: none"> <li>Progressive power derate increasing in severity from time of alert.</li> <li>If engine protection shutdown feature is enabled, engine will shut down.</li> </ul>
	3	Intake Manifold 1 Temperature Sensor Circuit • Voltage above normal or shorted to high source.	<ul style="list-style-type: none"> <li>Fan will stay ON if controlled by the ECM.</li> </ul>
	4	Intake Manifold 1 Temperature Sensor Circuit • Voltage below normal or shorted to low source.	
	15	Intake Manifold 1 Temperature • Data valid but above normal operation range. • Least severe level.	<ul style="list-style-type: none"> <li>Progressive power derate increasing in severity from time of alert.</li> <li>If engine protection shutdown feature is enabled, engine will shut down.</li> </ul>
	16	Intake Manifold 1 Temperature • Data valid but above normal operation range. • Moderately severe level.	<ul style="list-style-type: none"> <li>Progressive power derate increasing in severity from time of alert.</li> </ul>
	18	Intake Manifold 1 Temperature • Data valid but below normal operation range. • Moderately severe level.	<ul style="list-style-type: none"> <li>None on performance.</li> </ul>
107	15	Engine Air Filter Differential Pressure • Data valid but above normal operation range. • Least severe level.	
	16	Engine Air Filter Differential Pressure • Data valid but above normal operation range. • Moderately severe level.	
108	3	Barometric Pressure Sensor Circuit • Voltage above normal or shorted to high source.	<ul style="list-style-type: none"> <li>Possible reduced engine performance.</li> </ul>
	4	Barometric Pressure Sensor Circuit • Voltage below normal or shorted to low source.	
110	0	Engine Coolant Temperature • Data valid but above normal operation range. • Most severe level.	<ul style="list-style-type: none"> <li>Progressive power derate increasing in severity from time of alert.</li> <li>If engine protection shutdown feature is enabled, engine will shut down.</li> </ul>
	2	Engine Coolant Temperature • Data erratic, intermittent, or incorrect.	<ul style="list-style-type: none"> <li>None on performance.</li> </ul>
	3	Engine Coolant Temperature 1 Sensor Circuit • Voltage above normal or shorted to high source.	<ul style="list-style-type: none"> <li>Fan will stay ON if controlled by the ECM.</li> </ul>
	4	Engine Coolant Temperature 1 Sensor Circuit • Voltage below normal or shorted to low source.	
	16	Engine Coolant Temperature • Data valid but above normal operation range. • Moderately severe level.	<ul style="list-style-type: none"> <li>Progressive power derate increasing in severity from time of alert.</li> <li>If engine protection shutdown feature is enabled, engine will shut down.</li> </ul>
	31	Engine Coolant Temperature • Engine coolant temperature was above a threshold.	<ul style="list-style-type: none"> <li>Possible reduced engine performance.</li> </ul>

SPN	FMI	Cummins Description	Effect
111	1	Coolant Level • Data valid but below normal operation range. • Most severe level.	• Engine will be shut down.
	3	Coolant Level Sensor 1 Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	Coolant Level Sensor 1 Circuit • Voltage below normal or shorted to low source.	
	9	Coolant Level Sensor • Abnormal update rate.	• Possible reduced engine performance.
	17	Coolant Level • Data valid but below normal operation range. • Least severe level.	• None on performance.
	18	Coolant Level • Data valid but below normal operation range. • Moderately severe level.	• Possible reduced engine performance.
	19	Coolant Level Sensor • Received network data in error.	
157	0	Injector Metering Rail 1 Pressure • Data valid but above normal operation range. • Most severe level.	
	3	Injector Metering Rail 1 Pressure Sensor Circuit • Voltage above normal or shorted to high source.	• Progressive power derate increasing in severity from time of alert. • If engine protection shutdown feature is enabled, engine will shut down.
	4	Injector Metering Rail 1 Pressure Sensor Circuit • Voltage below normal or shorted to low source.	
	16	Injector Metering Rail 1 Pressure • Data valid but above normal operation range. • Moderately severe level.	• Possible reduced engine performance.
	18	Injector Metering Rail 1 Pressure • Data valid but below normal operation range. • Moderately severe level.	• Engine will not run or engine will run poorly.
168	15	Battery 1 Voltage • Data valid but above normal operation range. • Least severe level.	• None on performance.
	16	Battery 1 Voltage • Data valid but above normal operation range. • Moderately severe level.	
	17	Battery 1 Voltage • Data valid but below normal operation range. • Least severe level.	• Engine may stop running or be difficult to start. • Possible reduced engine performance.
	18	Battery 1 Voltage • Data valid but below normal operation range. • Moderately severe level.	• Engine may stop running or be difficult to start.

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
190	0	Engine Crankshaft Speed/Position • Data valid but above normal operation range. • Most severe level.	• Possible reduced engine performance.
	2	Engine Crankshaft Speed/Position • Data erratic, intermittent, or incorrect.	
	16	Engine Crankshaft Speed/Position • Data valid but above normal operation range. • Moderately severe level.	• Engine will be shut down.
191	9	Transmission Output Shaft Speed • Abnormal update rate.	• None on performance.
	16	Transmission Output Shaft Speed • Data valid but above normal operation range. • Moderately severe level.	• Engine power derate.
	18	Transmission Output Shaft Speed • Data valid but below normal operation range. • Moderately severe level.	• Possible reduced engine performance.
	19	Transmission Output Shaft Speed • Received network data in error.	• None on performance.
237	13	Vehicle Identification Number • Out of calibration.	
411	2	EGR Valve Differential Pressure • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	3	EGR Valve Differential Pressure Sensor Circuit • Voltage above normal or shorted to high source.	
	4	EGR Valve Differential Pressure Sensor Circuit • Voltage below normal or shorted to low source.	
412	3	EGR Valve Temperature Sensor Circuit • Voltage above normal or shorted to high source.	
	4	EGR Valve Temperature Sensor Circuit • Voltage below normal or shorted to low source.	
	15	EGR Valve Temperature • Data valid but above normal operation range. • Least severe level.	
	16	EGR Valve Temperature • Data valid but above normal operation range. • Moderately severe level.	
441	3	Auxiliary Temperature Sensor Input 1 Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	Auxiliary Temperature Sensor Input 1 Circuit • Voltage below normal or shorted to low source.	
	14	Auxiliary Temperature Sensor Input 1 • The input has exceeded the calibrated limit. • Out of calibration.	• Engine power derate.

SPN	FMI	Cummins Description	Effect
442	3	Auxiliary Temperature Sensor Input 2 Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	Auxiliary Temperature Sensor Input 2 Circuit • Voltage below normal or shorted to low source.	
521	2	Brake Pedal Position • Data erratic, intermittent, or incorrect.	
558	2	Accelerator Pedal or Lever Idle Validation Switch • Data erratic, intermittent, or incorrect.	• Engine will only idle.
	13	Accelerator Pedal or Lever Idle Validation Switch Circuit • Out of calibration.	• Engine will be shut down.
	19	Accelerator Pedal or Lever Idle Validation Switch • Received network data in error.	• Engine will only idle.
563	31	Anti-Lock Braking (ABS) Active	• Adaptive cruise control will not operate. • Standard cruise control may not operate.
597	3	Brake Switch Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	Brake Switch Circuit • Voltage below normal or shorted to low source.	
611	2	Auxiliary Intermediate (PTO) Speed Switch Validation • Data erratic, intermittent, or incorrect.	• One or more multiplexed devices will not operate properly.
612	2	Engine Magnetic Speed/Position Lost Both of Two Signals • Data erratic, intermittent, or incorrect.	• Engine will be shut down or not start.
625	9	Proprietary Datalink Error (OEM/Vehicle Datalink) • Abnormal update rate.	• The immobilizer anti-theft system will not operate properly. • Engine not start.
629	12	Engine Control Module Warning Internal Hardware Failure • Bad intelligent device or component. • Critical internal failure.	• Engine may not start or may be difficult to start. • Possible reduced engine performance.
630	12	Engine Control Module Calibration Memory • Bad intelligent device or component.	• Engine may not start or may be difficult to start.
633	31	Electronic Fuel Injection Control Valve Circuit • Fuel pump actuator circuit resistance is too high or too low, or an intermittent connection has been detected.	• Possible reduced engine performance.
639	9	SAE J1939 Multiplexing PGN Timeout Error • Abnormal update rate.	• One or more multiplexed devices will not operate properly.
	13	SAE J1939 Multiplexing Configuration Error • Out of calibration.	
640	14	Auxiliary Commanded Dual Output Shutdown • The engine protection limit has been exceeded.	• Engine will be shut down.

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
647	3	Fan Control Circuit • Voltage above normal or shorted to high source.	• The fan can be ON or OFF all the time.
	4	Fan Control Circuit • Voltage below normal or shorted to low source.	
649	3	Engine Exhaust Back Pressure Regulator Control Circuit • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
	4	Engine Exhaust Back Pressure Regulator Control Circuit • Voltage below normal or shorted to low source.	
	5	Engine Exhaust Back Pressure Regulator Control Circuit • Current below normal or open circuit.	
651	5	Injector Solenoid Driver Cylinder 1 Circuit • Current below normal or open circuit.	
	13	Injector Solenoid Driver Cylinder 1 • Out of calibration.	
652	5	Injector Solenoid Driver Cylinder 2 Circuit • Current below normal or open circuit.	
	13	Injector Solenoid Driver Cylinder 2 • Out of calibration.	
653	5	Injector Solenoid Driver Cylinder 3 Circuit • Current below normal or open circuit.	
	13	Injector Solenoid Driver Cylinder 3 • Out of calibration.	
654	5	Injector Solenoid Driver Cylinder 4 Circuit • Current below normal or open circuit.	
	13	Injector Solenoid Driver Cylinder 4 • Out of calibration.	
677	3	Engine Starter Motor Relay Circuit • Voltage above normal or shorted to high source.	• Engine will not start or the engine will not have starter lockout protection.
	4	Engine Starter Motor Relay Circuit • Voltage below normal or shorted to low source.	
697	3	Auxiliary PWM Driver 1 Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	Auxiliary PWM Driver 1 Circuit • Voltage below normal or shorted to low source.	
701	14	Auxiliary Input/Output 1 Circuit • No communications on the J1939 data link.	• Engine power derate.



SPN	FMI	Cummins Description	Effect
702	3	Auxiliary Input/Output 2 Circuit • Voltage above normal or shorted to high source.	• None on performance.
	5	Auxiliary Input/Output 2 Circuit • Current below normal or open circuit.	
	6	Auxiliary Input/Output 2 Circuit • Current above normal or ground circuit.	
703	3	Auxiliary Input/Output 3 Circuit • Voltage above normal or shorted to high source.	
723	2	Engine Camshaft Speed / Position Sensor • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	7	Engine Speed / Position Camshaft and Crankshaft Misalignment • Mechanical system not responding properly or out of adjustment.	
729	3	Engine Intake Air Heater 1 Circuit • Voltage above normal or shorted to high source.	• The intake air heaters can be ON or OFF all the time.
	4	Engine Intake Air Heater 1 Circuit • Voltage below normal or shorted to low source.	
974	3	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit • Voltage above normal or shorted to high source.	• Remote accelerator will not operate.
	4	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit • Voltage below normal or shorted to low source.	
	19	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Position Sensor System • Received network data in error.	
976	2	PTO Governor State • Data erratic, intermittent, or incorrect.	• At least one multiplexed device will not operate properly.
1075	3	Electric Lift Pump for Engine Fuel Supply • Voltage above normal or shorted to high source.	• Engine may stop running or be difficult to start.
	4	Electric Lift Pump for Engine Fuel Supply • Voltage below normal or shorted to low source.	
1081	9	Engine Wait to Start Lamp • Abnormal update rate.	• None on performance.

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
1172	3	Turbocharger 1 Compressor Intake Temperature Circuit • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
	4	Turbocharger 1 Compressor Intake Temperature Circuit • Voltage below normal or shorted to low source.	
1176	2	Turbocharger 1 Compressor Intake Pressure • Data erratic, intermittent, or incorrect.	
	3	Turbocharger 1 Compressor Intake Pressure Circuit • Voltage above normal or shorted to high source.	
	4	Turbocharger 1 Compressor Intake Pressure Circuit • Voltage below normal or shorted to low source.	
1194	13	Anti-theft Encryption Seed • Out of calibration.	
1195	2	Antitheft Password Valid Indicator • Data erratic, intermittent, or incorrect.	
1209	2	Exhaust Gas Pressure 1 • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	3	Exhaust Gas Pressure Sensor 1 Circuit • Voltage above normal or shorted to high source.	
	4	Exhaust Gas Pressure Sensor 1 Circuit • Voltage below normal or shorted to low source.	
1267	3	Idle Shutdown Vehicle Accessories Relay Driver Circuit • Voltage above normal or shorted to high source.	• Vehicle accessories or ignition bus loads controlled by the idle shutdown relay will not power up.
	4	Idle Shutdown Vehicle Accessories Relay Driver Circuit • Voltage below normal or shorted to low source.	
1347	3	Engine Fuel Pump Pressurizing Assembly 1 Circuit • Voltage above normal or shorted to high source.	• Engine will not run or engine will run poorly.
	4	Engine Fuel Pump Pressurizing Assembly 1 Circuit • Voltage below normal or shorted to low source.	• Possible reduced engine performance.
1377	2	Multiple Unit Synchronization Switch • Data erratic, intermittent, or incorrect.	• Various optional switch inputs to the ECM may not operate correctly.
1378	31	Engine Oil Change Interval	• None on performance.

SPN	FMI	Cummins Description	Effect
1387	3	Auxiliary Pressure Sensor Input 1 Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	Auxiliary Pressure Sensor Input 1 Circuit • Voltage below normal or shorted to low source.	
1388	3	Auxiliary Pressure Sensor Input 2 Circuit • Voltage above normal or shorted to high source.	
	4	Auxiliary Pressure Sensor Input 2 Circuit • Voltage below normal or shorted to low source.	
	14	Auxiliary Pressure Sensor Input 2 • The engine protection limit has been exceeded.	
1569	31	Engine Protection Torque Derate • Critical fault codes related to engine operation are active.	• Possible reduced engine performance.
1623	9	Tachograph Output Shaft Speed • Abnormal update rate.	• None on performance.
	13	Tachograph Output Shaft Speed • Out of calibration.	
	19	Tachograph Output Shaft Speed • Received network data in error.	
1639	0	Fan Speed • Data valid but above normal operation range. • Most severe level.	• Possible reduced engine performance.
	1	Fan Speed • Data valid but below normal operation range. • Most severe level.	
	2	Fan Speed • Data erratic, intermittent, or incorrect.	• The fan can be ON or OFF all the time.
	15	Fan Speed • Data valid but above normal operation range. • Least severe level.	• Possible reduced engine performance.
	17	Fan Speed • Data valid but below normal operation range. • Least severe level.	
1675	31	Engine Starter Mode Overcrank Protection • The starter motor has been temporarily disabled in order to prevent starter damage.	• Starter operation is prohibited until the starter motor has adequately cooled.

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
1761	1	Aftertreatment 1 Diesel Exhaust Fluid Tank Level • Data valid but below normal operation range. • Most severe level.	• Possible reduced engine performance.
	3	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit • Voltage above normal or shorted to high source.	
	4	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit • Voltage below normal or shorted to low source.	
	9	Aftertreatment 1 Diesel Exhaust Fluid Tank Level • Abnormal update rate.	• One or more multiplexed devices will not operate properly.
	10	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor • Abnormal change rate.	• Possible reduced engine performance.
	11	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor • Root cause not known.	
	13	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor • Out of calibration.	• None on performance.
	17	Aftertreatment Diesel Exhaust Fluid Tank Level • Data valid but below normal operation range. • Least severe level.	
18	Aftertreatment Diesel Exhaust Fluid Tank Level • Data valid but below normal operation range. • Moderately severe level.		
2623	3	Accelerator Pedal or Lever Position Sensor 2 Circuit • Voltage above normal or shorted to high source.	• The engine will operate in limp home mode.
	4	Accelerator Pedal or Lever Position Sensor 2 Circuit • Voltage below normal or shorted to low source.	
2630	3	Engine Charge Air Cooler Outlet Temperature • Voltage above normal or shorted to high source.	• None on performance.
	4	Engine Charge Air Cooler Outlet Temperature • Voltage below normal or shorted to low source.	
2789	15	Turbocharger Turbine Intake Temperature • Data valid but above normal operation range. • Least severe level.	• Possible reduced engine performance.

SPN	FMI	Cummins Description	Effect
2791	5	EGR Valve Control Circuit • Current below normal or open circuit.	• Possible reduced engine performance.
	6	EGR Valve Control Circuit • Current above normal or ground fault.	
	7	EGR Valve Control Circuit • Mechanical system not responding properly or out of adjustment.	
	13	EGR Valve Controller • Out of calibration.	
	15	EGR Valve Control Circuit Calculated Over Temperature • Data valid but above normal operation range. • Least severe level.	
2797	13	Engine Injector Bank 1 Barcodes • Out of calibration.	• None on performance.
3031	2	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	3	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor • Voltage above normal or shorted to high source.	
	4	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor • Voltage below normal or shorted to low source.	
	9	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature • Abnormal update rate.	• Engine power derate.
	11	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature • Root cause not known.	
	13	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor • Out of calibration.	
3216	2	Aftertreatment 1 Intake NOx Sensor • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	4	Aftertreatment 1 Intake NOx Sensor Circuit • Voltage below normal or shorted to low source.	
	9	Aftertreatment 1 Intake NOx Sensor • Abnormal update rate.	
	10	Aftertreatment 1 Intake NOx Sensor • Abnormal change rate.	• None on performance.
	13	Aftertreatment 1 Intake NOx • Out of calibration.	
	20	Aftertreatment 1 Intake NOx Sensor • Data not rational. • Drifted high.	

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
3218	2	Aftertreatment 1 Intake NOx Sensor Power Supply • Data erratic, intermittent, or incorrect.	• None on performance.
3226	2	Aftertreatment 1 Outlet NOx Sensor • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	4	Aftertreatment 1 Outlet NOx Sensor Circuit • Voltage below normal or shorted to low source.	
	9	Aftertreatment 1 Outlet NOx Sensor • Abnormal update rate.	
	10	Aftertreatment 1 Outlet NOx Sensor • Abnormal change rate.	• None on performance.
	13	Aftertreatment 1 Outlet NOx Sensor • Out of calibration.	
	20	Aftertreatment 1 Outlet NOx Sensor • Data not rational. • Drifted high.	• Possible reduced engine performance.
3228	2	Aftertreatment 1 Outlet NOx Sensor Power Supply • Data erratic, intermittent, or incorrect.	• None on performance.
3246	3	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature Sensor Circuit • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
3361	2	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Temperature • Data erratic, intermittent, or incorrect.	
	3	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit • Voltage above normal or shorted to high source.	
	4	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit • Voltage below normal or shorted to low source.	
3362	31	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Input Lines • Aftertreatment diesel exhaust fluid dosing unit is unable to prime.	
3363	3	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater Circuit • Voltage above normal or shorted to high source.	
	4	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater Circuit • Voltage below normal or shorted to low source.	
	7	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater • Mechanical system not responding properly or out of adjustment.	

SPN	FMI	Cummins Description	Effect
3363	16	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater • Data valid but above normal operation range. • Moderately severe level.	• None on performance.
	18	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater • Data valid but below normal operation range. • Moderately severe level.	• Possible reduced engine performance.
3364	2	Aftertreatment Diesel Exhaust Fluid Quality • Data erratic, intermittent, or incorrect.	• Engine power derate.
	3	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
	4	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit • Voltage below normal or shorted to low source.	
	7	Aftertreatment Diesel Exhaust Fluid Quality Sensor • Mechanical system not responding properly or out of adjustment.	• Engine power derate.
	9	Aftertreatment Diesel Exhaust Fluid Quality • Abnormal update rate.	
	10	Aftertreatment Diesel Exhaust Fluid Quality • Abnormal change rate.	
	11	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit • Root cause not known.	
	12	Aftertreatment Diesel Exhaust Fluid Quality Sensor • Bad intelligent device or component.	
	13	Aftertreatment Diesel Exhaust Fluid Quality • Out of calibration.	• Possible reduced engine performance.
	15	Aftertreatment Diesel Exhaust Fluid Quality • Data valid but above normal operation range. • Least severe level.	
	18	Aftertreatment Diesel Exhaust Fluid Quality • Data valid but below normal operation range. • Moderately severe level.	
	19	Aftertreatment Diesel Exhaust Fluid Quality • Received network data in error.	• None on performance.
	3509	3	Sensor Power Supply 1 Circuit • Voltage above normal or shorted to high source.
4		Sensor Power Supply 1 Circuit • Voltage below normal or shorted to low source.	

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
3510	3	Sensor Power Supply 2 Circuit • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
	4	Sensor Power Supply 2 Circuit • Voltage below normal or shorted to low source.	
3511	3	Sensor Power Supply 3 Circuit • Voltage above normal or shorted to high source.	• Engine will not run or engine will run poorly.
	4	Sensor Power Supply 3 Circuit • Voltage below normal or shorted to low source.	
3512	3	Sensor Power Supply 4 Circuit • Voltage above normal or shorted to high source.	• Engine will only idle.
	4	Sensor Power Supply 4 Circuit • Voltage below normal or shorted to low source.	
3513	3	Sensor Power Supply 5 • Voltage above normal or shorted to high source.	• The engine will operate in limp home mode.
	4	Sensor Power Supply 5 • Voltage below normal or shorted to low source.	
3514	3	Sensor Power Supply 6 Circuit • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
	4	Sensor Power Supply 6 Circuit • Voltage below normal or shorted to low source.	
3515	10	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 • Abnormal change rate.	• Possible reduced engine performance.
	11	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 • Root cause not known.	
3521	11	Aftertreatment 1 Diesel Exhaust Fluid Property • Root cause not known.	• Engine power derate.
3597	2	Power Supply Lost With Ignition On • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	12	Injector Power Supply • Bad intelligent device or component.	
	17	ECU Power Output Supply Voltage 1 • Data valid but below normal operation range. • Least severe level.	
	18	ECU Power Output Supply Voltage 1 • Data valid but below normal operation range. • Moderately severe level.	



SPN	FMI	Cummins Description	Effect
3695	2	Aftertreatment Regeneration Inhibit Switch • Data erratic, intermittent, or incorrect.	
3750	14	Aftertreatment 1 Diesel Particulate Filter Conditions Not Met for Active Regeneration • Aftertreatment temperatures are not warm enough for aftertreatment injection.	• Possible frequent need for aftertreatment regeneration.
4094	31	NOx Limits Exceeded Due to Insufficient Reagent Quality • Diesel exhaust fluid quality is not sufficient enough to provide adequate NOx reduction.	• Possible reduced engine performance.
4096	31	Aftertreatment Diesel Exhaust Fluid Tank Empty	
4185	31	Overspeed Shutdown Relay Driver Diagnostic Has Detected an Error	• The overspeed shutdown lamp will not turn on.
4186	31	Low Oil Pressure (LOP) Shutdown Relay Driver Diagnostic Has Detected an Error	• The low oil pressure (LOP) shutdown lamp will not turn on.
4334	2	Aftertreatment 1 Diesel Exhaust Fluid Pressure • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	3	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor Circuit • Voltage above normal or shorted to high source.	
	4	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor Circuit • Voltage below normal or shorted to low source.	
	16	Aftertreatment 1 Diesel Exhaust Fluid Pressure • Data valid but above normal operation range. • Moderately severe level.	
	18	Aftertreatment 1 Diesel Exhaust Fluid Pressure • Data valid but below normal operation range. • Moderately severe level.	
4337	10	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature • Abnormal change rate.	• None on performance.
4340	3	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
	4	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit • Voltage below normal or shorted to low source.	
	5	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit • Current below normal or open circuit.	

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
4342	3	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
	4	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit • Voltage below normal or shorted to low source.	
	5	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit • Current below normal or open circuit.	
4344	3	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 Circuit • Voltage above normal or shorted to high source.	
	4	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 Circuit • Voltage below normal or shorted to low source.	
	5	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 Circuit • Current below normal or open circuit.	
4360	0	Aftertreatment 1 SCR Intake Temperature • Data valid but above normal operation range. • Most severe level.	• Progressive power derate increasing in severity from time of alert. • If engine protection shutdown feature is enabled, engine will shut down.
	2	Aftertreatment 1 SCR Intake Temperature Sensor • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	3	Aftertreatment 1 SCR Intake Temperature Sensor Circuit • Voltage above normal or shorted to high source.	
	4	Aftertreatment 1 SCR Intake Temperature Sensor Circuit • Voltage below normal or shorted to low source.	
	15	Aftertreatment 1 SCR Intake Temperature • Data valid but above normal operation range. • Least severe level.	
	16	Aftertreatment 1 SCR Intake Temperature • Data valid but above normal operation range. • Moderately severe level.	• Progressive power derate increasing in severity from time of alert. • If engine protection shutdown feature is enabled, engine will shut down.

SPN	FMI	Cummins Description	Effect
4363	0	Aftertreatment 1 SCR Outlet Temperature • Data valid but above normal operation range. • Most severe level.	• Possible reduced engine performance.
	2	Aftertreatment 1 SCR Outlet Temperature Sensor • Data erratic, intermittent, or incorrect.	
	3	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit • Voltage above normal or shorted to high source.	
	4	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit • Voltage below normal or shorted to low source.	
	16	Aftertreatment 1 SCR Outlet Temperature • Data valid but above normal operation range. • Moderately severe level.	
4364	17	Aftertreatment SCR Catalyst Conversion Efficiency • Data valid but below normal operation range. • Least severe level.	
	18	Aftertreatment SCR Catalyst Conversion Efficiency • Data valid but below normal operation range. • Moderately severe level.	
4376	3	Aftertreatment Diesel Exhaust Fluid Return Valve • Voltage above normal or shorted to high source.	• None on performance.
	4	Aftertreatment Diesel Exhaust Fluid Return Valve • Voltage below normal or shorted to low source.	
	7	Aftertreatment Diesel Exhaust Fluid Return Valve • Mechanical system not responding properly or out of adjustment.	
4792	14	Aftertreatment 1 SCR Catalyst System • The incorrect SCR system has been installed.	• Engine will be shut down.
4794	31	Aftertreatment 1 SCR Catalyst System Missing	• Possible reduced engine performance.
5024	10	Aftertreatment 1 Intake NOx Sensor Heater • Abnormal change rate.	• None on performance.
5031	10	Aftertreatment 1 Outlet NOx Sensor Heater • Abnormal change rate.	
5245	31	Aftertreatment 1 SCR Operator Inducement Active • Critical SCR related fault codes have been active.	• Possible reduced engine performance.
5246	-	Aftertreatment 1 SCR Operator Inducement • Data valid but above normal operation range. • Most severe level.	• Engine power derate.

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
5394	5	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Circuit • Current below normal or open circuit.	• Possible reduced engine performance.
	7	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 • Mechanical system not responding properly or out of adjustment.	
5484	3	Engine Fan Clutch 2 Control Circuit • Voltage above normal or shorted to high source.	• The fan can be ON or OFF all the time.
	4	Engine Fan Clutch 2 Control Circuit • Voltage below normal or shorted to low source.	
5491	3	Aftertreatment Diesel Exhaust Fluid Line Heater Relay Circuit • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
	4	Aftertreatment Diesel Exhaust Fluid Line Heater Relay Circuit • Voltage below normal or shorted to low source.	
5571	0	High Pressure Common Rail Fuel Pressure Relief Valve • Data valid but above normal operation range. • Most severe level.	• Engine may stop running or be difficult to start.
	7	High Pressure Common Rail Fuel Pressure Relief Valve • Mechanical system not responding properly or out of adjustment.	• Possible reduced engine performance.
	15	High Pressure Common Rail Fuel Pressure Relief Valve • Data valid but above normal operation range. • Least severe level.	
5603	9	Cruise Control Disable Command • Abnormal update rate.	• None on performance.
5625	2	Engine Exhaust Back Pressure Regulator Position • Data erratic, intermittent, or incorrect.	• Possible reduced engine performance.
	3	Engine Exhaust Back Pressure Regulator Position Sensor Circuit • Voltage above normal or shorted to high source.	
	4	Engine Exhaust Back Pressure Regulator Position Sensor Circuit • Voltage below normal or shorted to low source.	
5626	7	Engine Exhaust Back Pressure Regulator • Mechanical system not responding properly or out of adjustment.	• None on performance.
	13	Engine Exhaust Back Pressure Regulator • Out of calibration.	• Possible reduced engine performance.

SPN	FMI	Cummins Description	Effect
5743	3	Aftertreatment SCR Temperature Sensor • Voltage above normal or shorted to high source.	• Possible reduced engine performance.
	4	Aftertreatment SCR Temperature Sensor • Voltage below normal or shorted to low source.	
	9	Aftertreatment SCR Temperature Sensor • Abnormal update rate.	
	11	Aftertreatment SCR Temperature Sensor • Root cause not known.	
	12	Aftertreatment SCR Temperature Sensor • Bad intelligent device or component.	
	16	Aftertreatment SCR Temperature Sensor • Data valid but above normal operation range. • Moderately severe level.	
5745	3	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit 1 Heater Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit 1 Heater Circuit • Voltage below normal or shorted to low source.	• Possible reduced engine performance.
	17	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit 1 Heater • Data valid but below normal operation range. • Least severe level.	
	18	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit 1 Heater • Data valid but below normal operation range. • Moderately severe level.	
5746	3	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay Circuit • Voltage above normal or shorted to high source.	
	4	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay Circuit • Voltage below normal or shorted to low source.	
5798	10	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature • Abnormal change rate.	
6303	3	Engine Coolant Level 2 Sensor • Voltage above normal or shorted to high source.	• None on performance.
	4	Engine Coolant Level 2 Sensor • Voltage below normal or shorted to low source.	

## TROUBLESHOOTING

SPN	FMI	Cummins Description	Effect
6655	3	Maintain ECU Power Lamp Circuit • Voltage above normal or shorted to high source.	• None on performance.
	4	Maintain ECU Power Lamp Circuit • Voltage below normal or shorted to low source.	
6799	2	Engine Fan Blade Pitch • Data erratic, intermittent, or incorrect.	
	3	Engine Fan Blade Pitch Position Sensor Circuit • Voltage above normal or shorted to high source.	
	4	Engine Fan Blade Pitch Position Sensor Circuit • Voltage below normal or shorted to low source.	
	7	Engine Fan Blade Pitch • Mechanical system not responding properly or out of adjustment.	
6802	31	Aftertreatment 1 Diesel Exhaust Fluid Dosing System Frozen • Diesel exhaust fluid dosing system was unable to prime when the ambient air temperature was low.	
6881	9	SCR Operator Inducement Override Switch • Abnormal update rate.	• One or more multiplexed devices will not operate properly.
	13	SCR Operator Inducement Override Switch • Out of calibration.	
6918	31	SCR System Cleaning Inhibited Due to Inhibit Switch • Cleaning of the SCR system has been prevented due to the permit switch being disabled.	• None on performance.
6928	31	SCR System Cleaning Inhibited Due to System Timeout	

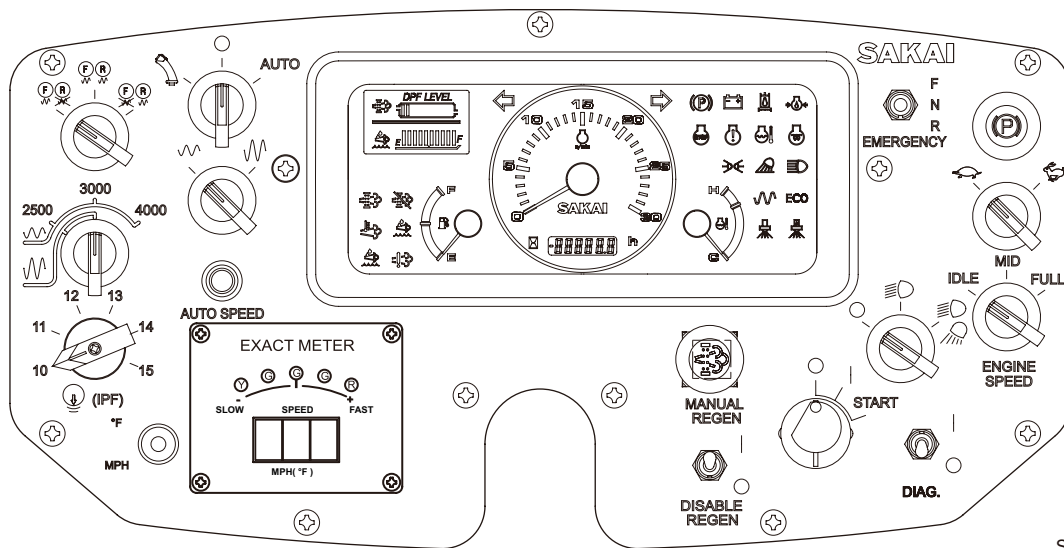
### (NOTICE)

- For details, refer to “Service information” of engine manufacturer.

## 2-3. Error Codes

### 2-3-1. Description of error codes

- The traveling/working controller constantly monitors the input and output status to control each system.
- The traveling/working controller performs the system diagnostics function. When any system problem is detected, it displays the corresponding error code like as “E01” on the EXACT METER.



SW884-11009

### 2-3-2. Error code list

Error code	Description	Symptom
E01, E02	Faulty potentiometer inside F-R lever.	Engine stop.
E03, E04	Faulty F-R lever switch.	
E05, E06	Faulty backup buzzer switch.	
E07	Faulty speed sensor or traveling controller. (auto speed abnormality)	An error code is displayed.
E11	Faulty speed sensor. (speed sensor pulse is not detected)	Engine stop (only auto speed mode).
		Impact frequency lamp does not light.
		Automatic speed function does not operate.
		Vehicle speed is not displayed.
E12	Faulty speed sensor. (when F-R lever is “N”, it detected a speed sensor pulse)	Engine stop.
E15	Faulty road surface temperature sensor.	Display does not switch to temperature indication.
E21	Faulty frequency or amplitude selector switch (three input signals).	Automatic speed function does not operate.
		Vibration amplitude or frequency cannot be changed (Fixed in 4000 vpm).

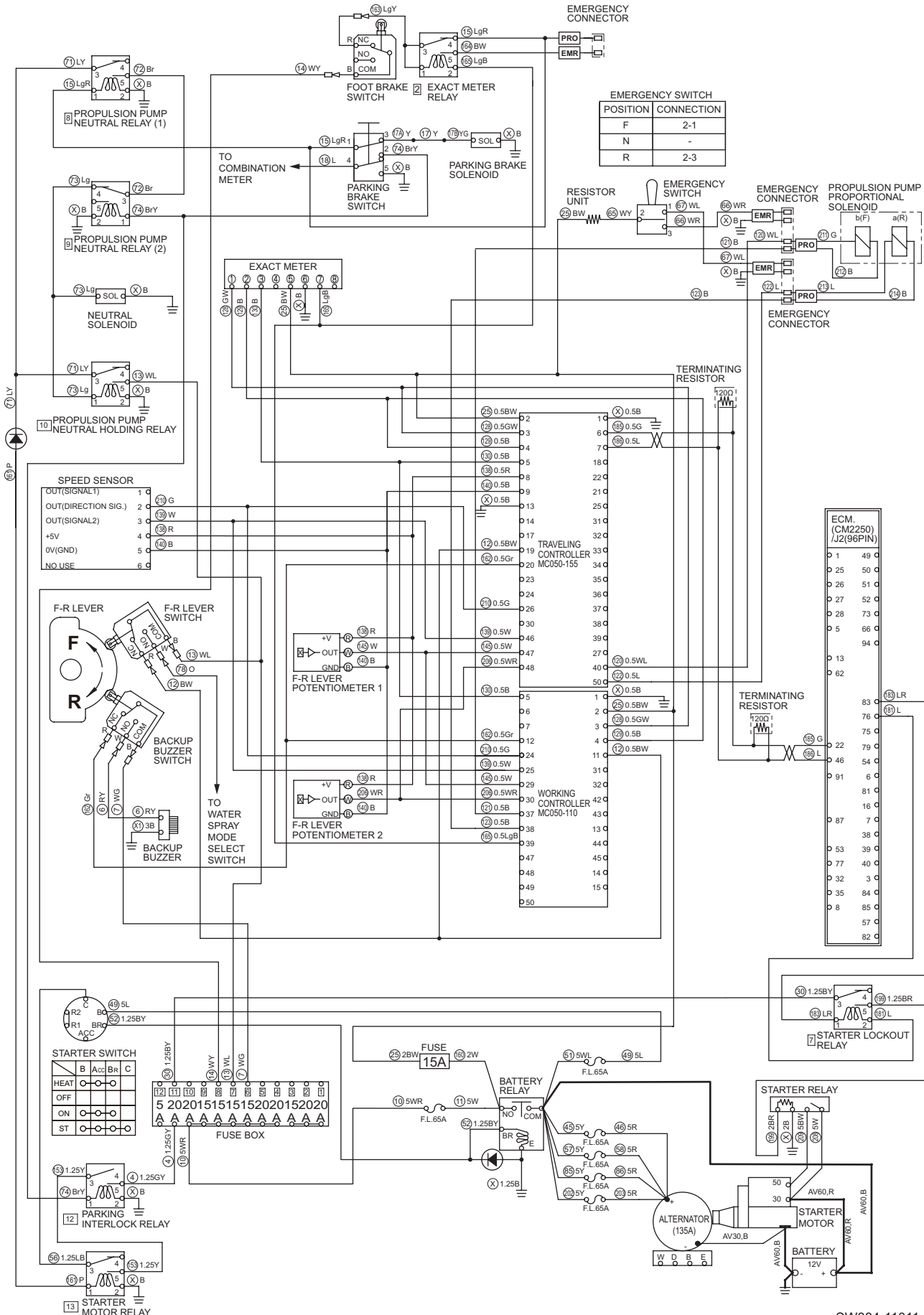
## TROUBLESHOOTING

Error code	Description	Symptom
E22	Faulty IPF selector switch (three input signals).	Automatic speed function does not operate. IPF number cannot be changed (Fixed in IPF12).
E31	Faulty propulsion pump proportional solenoid (F) output current.	Engine stop.
E32	Faulty propulsion pump proportional solenoid (R) output current.	
E33	Faulty vibrator pump (F) proportional solenoid a (Hi) output current.	Vibration does not occur.
E34	Faulty vibrator pump (F) proportional solenoid b (Lo) output current.	
E35	Faulty vibrator pump (R) proportional solenoid a (Hi) output current.	Vibration does not occur.
E36	Faulty vibrator pump (R) proportional solenoid b (Lo) output current.	
E41	Faulty CAN communication.	Engine stop (only auto speed mode).
		Automatic speed function does not operate.
		Tachometer in combination meter does not work.
E42	Faulty traveling controller.	Engine stop.
E43	Faulty exact meter.	
E44	Faulty working controller.	
E45		
E88	Mismatch of parameter values of the traveling controller and working controller.	Running stop.
E00	Parking brake switch is OFF and F-R lever is in "F" or "R" or brake pedal is depressed.	Engine does not start.





Fig.: 2-4-1



SW884-11011

## 2-4. Engine

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.
- When measuring voltage and current without disconnecting connectors, refer to “Measuring voltage and current flowing using tester” (P.11-006 to P.11-008).
- Check any ground circuit which belongs to components to be checked.
- Engine check lamp must not be lighting. If engine check lamp lights, refer to “Service information” of engine manufacturer.

### 2-4-1. Engine will not start (Starter motor does not run) 1/15

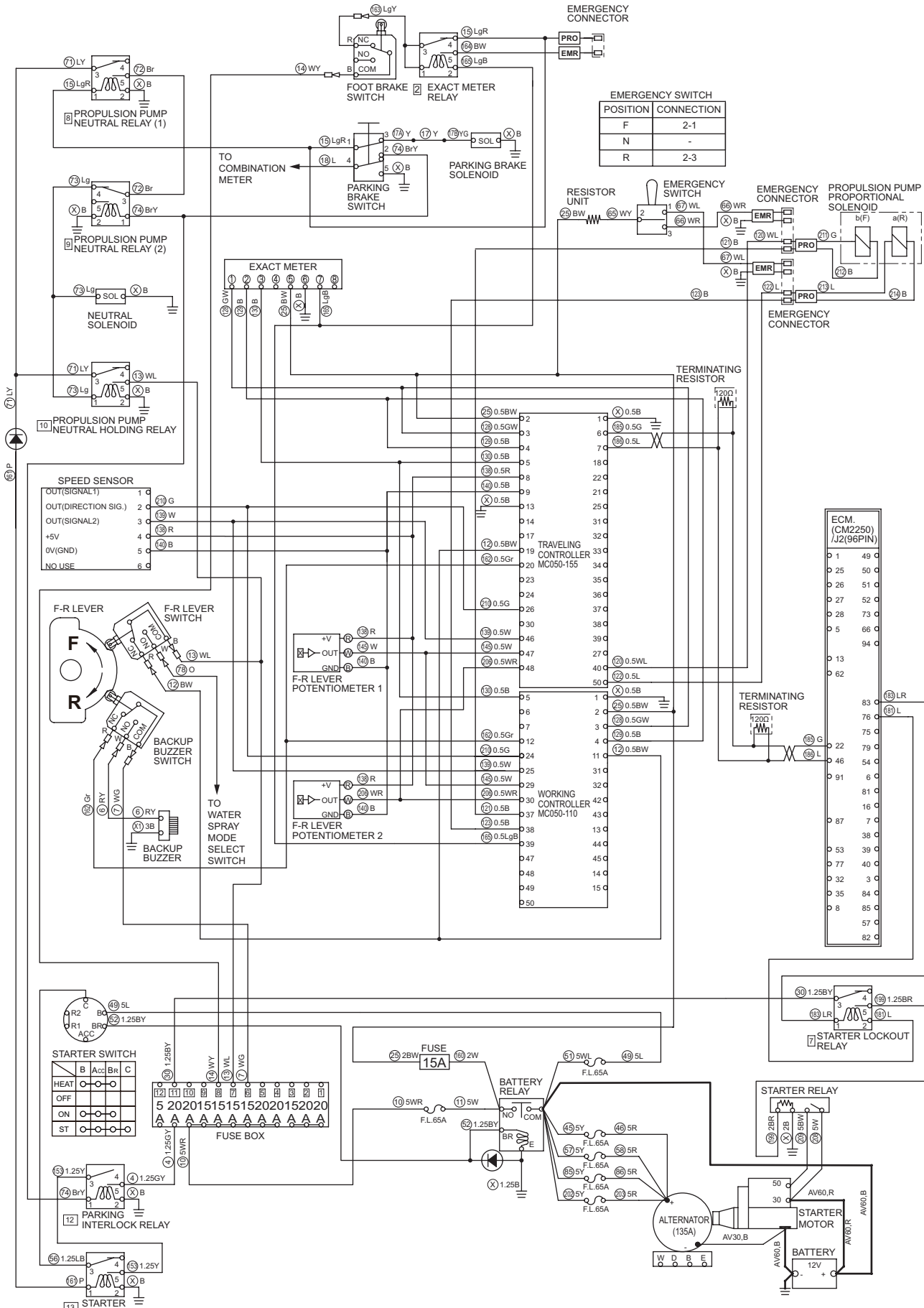
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

#### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
Pon	1. Connector	<ul style="list-style-type: none"> <li>• Check F-R lever switch connector, backup buzzer switch connector and traveling controller connector terminal 19, 20, working controller connector terminal 11, 12 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistances between switches and traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• F-R lever switch terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW</li> <li>• Backup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller terminal 12 wire Gr</li> </ul> <p>Standard resistance : 10 Ω or less</p> <p>(2) Measure resistances between switches and fuse box terminal wires.</p> <ul style="list-style-type: none"> <li>• F-R lever switch terminal COM wire WL and fuse box terminal 7 wire WL</li> <li>• Backup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG</li> </ul> <p>Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. F-R lever switch	<ul style="list-style-type: none"> <li>• When starter switch is OFF, check continuity between F-R lever switch terminal COM and terminal NC.</li> </ul> <p>There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If there is no continuity, F-R lever switch is faulty.</li> </ul>	Replace F-R lever switch.
	4. Backup buzzer switch	<ul style="list-style-type: none"> <li>• When starter switch is OFF, check continuity between backup buzzer switch terminal COM and terminal NC.</li> </ul> <p>There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If there is no continuity, backup buzzer switch is faulty.</li> </ul>	Replace backup buzzer switch.

Fig.: 2-4-1



**2-4-1. Engine will not start (Starter motor does not run) 2/15**

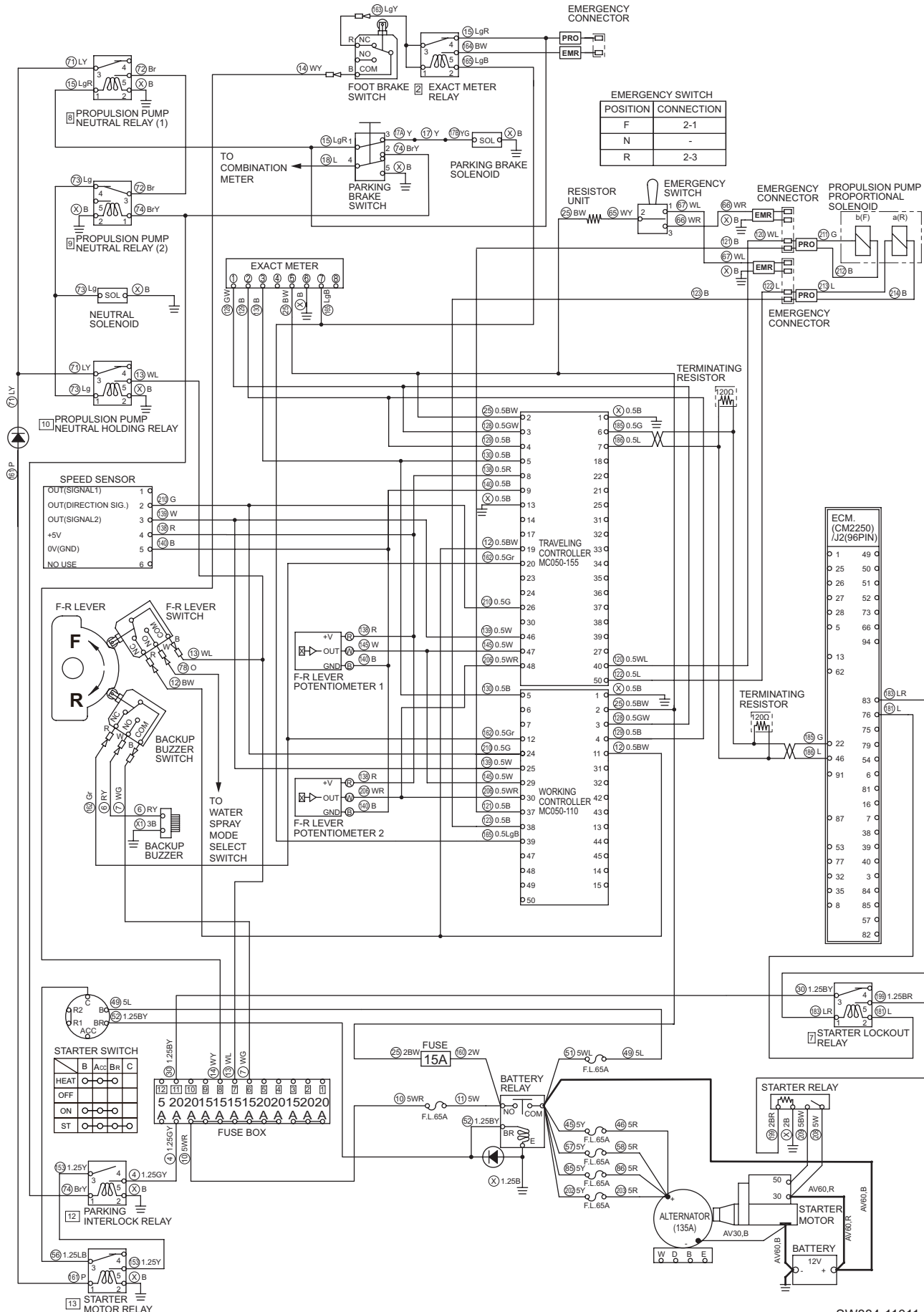
- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
Pon	5. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code Pon is displayed and no abnormality is found in connector, harness, F-R lever switch and backup buzzer switch in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/ working controller.
	6. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, place F-R lever "F" or "N".</li> <li>② Set starter switch to ON.</li> <li>③ When F-R lever is "F" or "N", traveling/working controller cannot be initialized. Exact meter will continuously display Pon.</li> <li>④ Return F-R lever to "N".</li> <li>⑤ When traveling/working controller initialization is completed, display will change from Pon to vehicle speed. Machine is in normal state.</li> </ol>	

Fig.: 2-4-1



POSITION	CONNECTION
F	2-1
N	-
R	2-3

**2-4-1. Engine will not start (Starter motor does not run) 3/15**

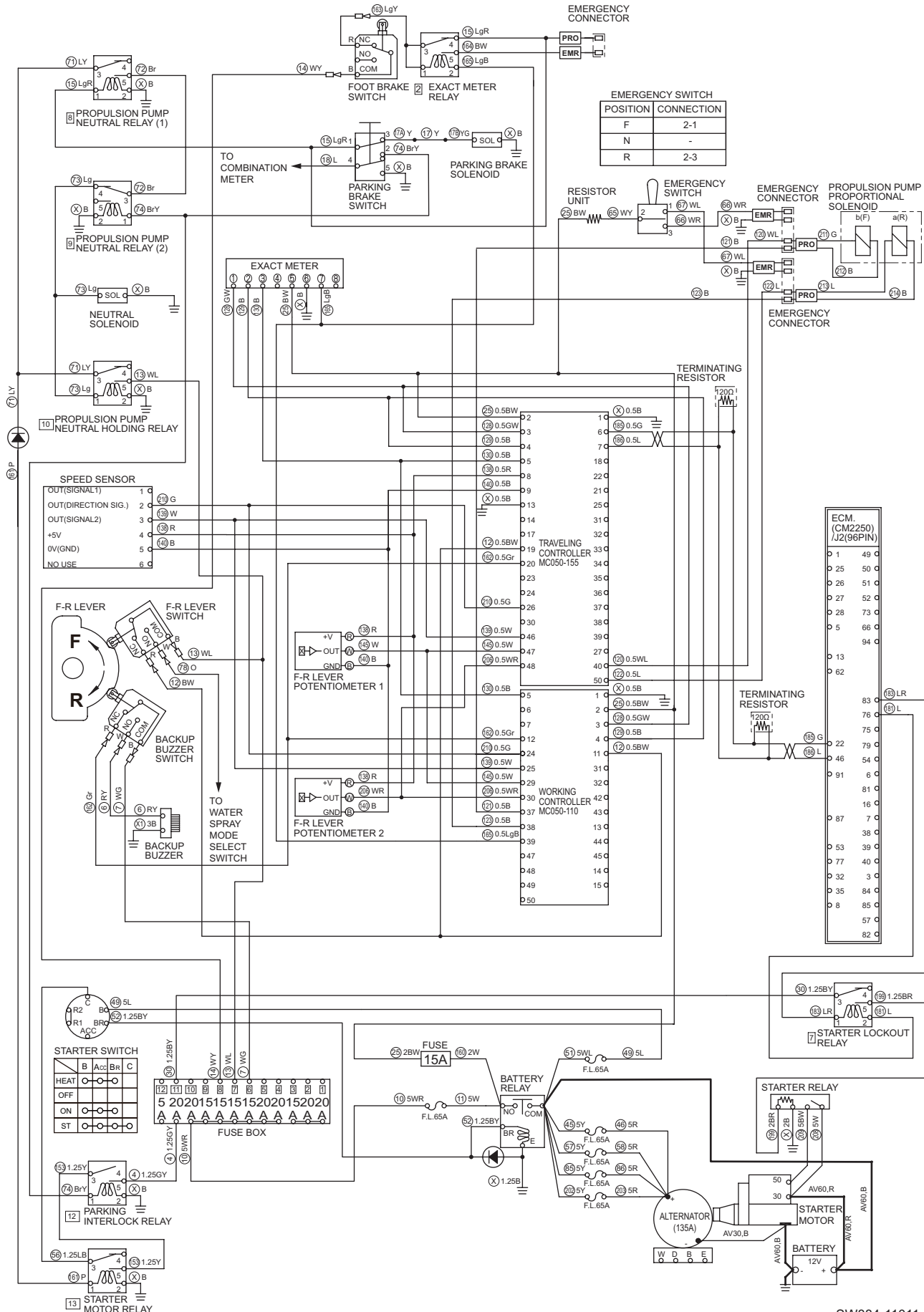
- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E01 or E02	1. Connector	<ul style="list-style-type: none"> <li>• Check F-R lever potentiometer 1, 2 connector and traveling controller connector terminal 8, 9, 47, 48, working controller connector terminal 29, 30 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between F-R lever potentiometer and traveling/working controller terminal wires.</li> <li>• F-R lever potentiometer 1 terminal wire R and traveling controller terminal 8 wire R</li> <li>• F-R lever potentiometer 1 terminal wire W and traveling controller terminal 47 wire W, working controller terminal 29 wire W</li> <li>• F-R lever potentiometer 1 terminal wire B and traveling controller terminal 9 wire B</li> <li>• F-R lever potentiometer 2 terminal wire R and traveling controller terminal 8 wire R</li> <li>• F-R lever potentiometer 2 terminal wire WR and traveling controller terminal 48 wire WR, working controller terminal 30 wire WR</li> <li>• F-R lever potentiometer 2 terminal wire B and traveling controller terminal 9 wire B</li> </ul> <p>Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. F-R Lever Potentiometer 1	<p>(1) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal inlet wire R and ground terminal wire B. Standard voltage : <math>5 \pm 0.5</math> V</p> <p>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal outlet wire W and ground terminal wire B.</p> <p>① When F-R lever is "N" Standard voltage : <math>2.5 \pm 0.015</math> V</p> <p>② When F-R lever is "F" Standard voltage : <math>1.2 \pm 0.02</math> V</p> <p>③ When F-R lever is "R" Standard voltage : <math>3.8 \pm 0.02</math> V</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 1 adjustment is faulty.</li> </ul>	Adjust F-R lever potentiometer 1 or replace it even if measurement is out of standard after adjustment.

Fig.: 2-4-1



EMERGENCY SWITCH

POSITION	CONNECTION
F	2-1
N	-
R	2-3



**2-4-1. Engine will not start (Starter motor does not run) 4/15**

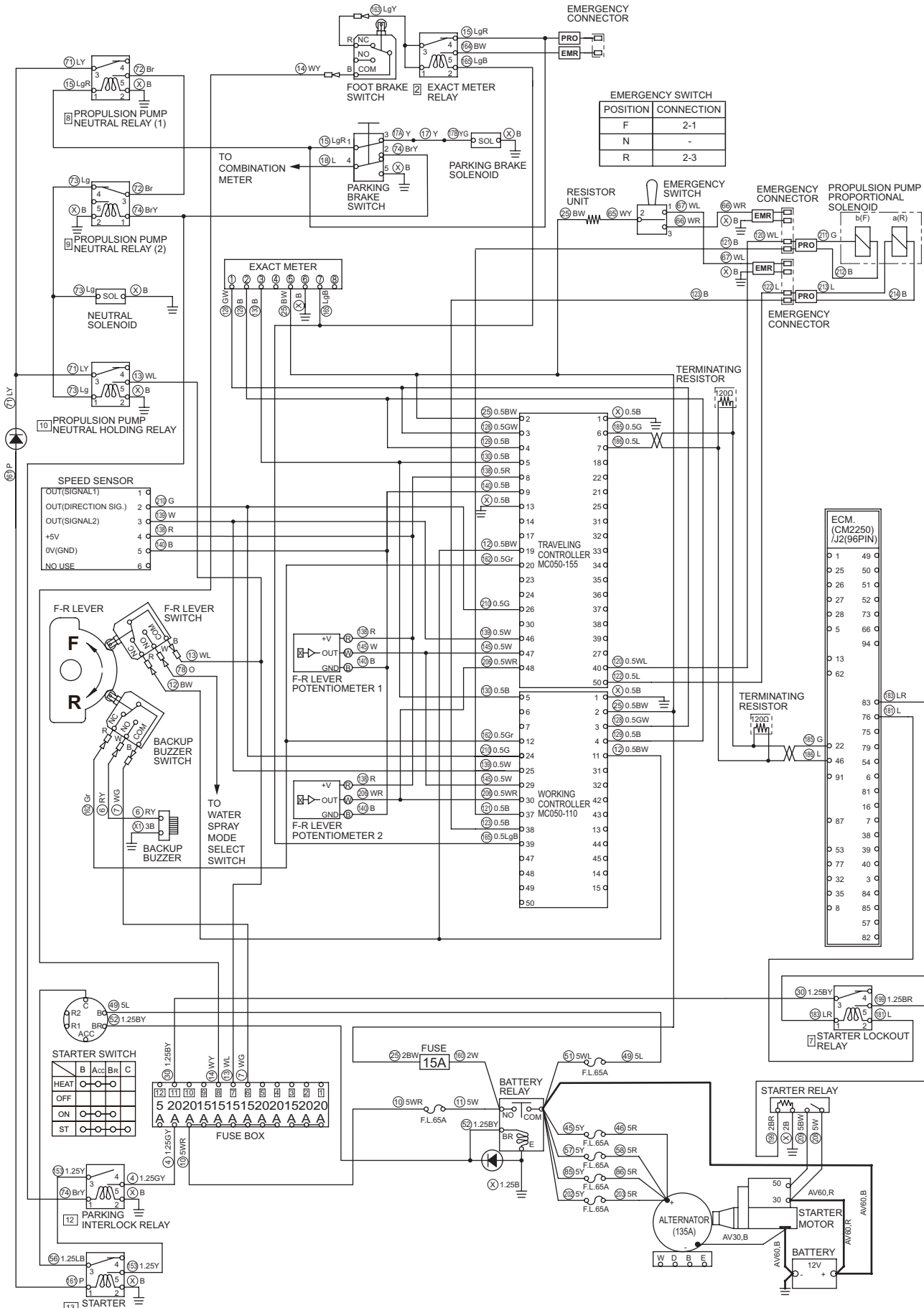
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E01 or E02	4. F-R Lever Potentiometer 2	<p>(1) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal inlet wire R and ground terminal wire B. Standard voltage : <math>5 \pm 0.5</math> V</p> <p>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal outlet wire WR and ground terminal wire B.</p> <p>① When F-R lever is “N” Standard voltage : <math>2.5 \pm 0.015</math> V</p> <p>② When F-R lever is “F” Standard voltage : <math>3.8 \pm 0.02</math> V</p> <p>③ When F-R lever is “R” Standard voltage : <math>1.2 \pm 0.02</math> V</p> <p>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 2 adjustment is faulty.</p>	Adjust F-R lever potentiometer 2 or replace it even if measurement is out of standard after adjustment.
	5. Traveling Controller	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between traveling controller terminal 8 outlet wire R (positive side) and 9 wire B (ground side). Standard voltage : <math>5 \pm 0.5</math> V</p> <p>• If above item (1) is OK and item (2) is NG, traveling controller is faulty.</p>	Replace traveling controller.
	6. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Place F-R lever “N”.</p> <p>③ Exact meter will display vehicle speed (0.0). If E01 or E02 is displayed, check above items again.</p> <p>④ Place F-R lever “F” or “N”.</p> <p>⑤ Exact meter will still display vehicle speed (0.0). Machine is in normal state. If display changes to E01 or E02, check above items again.</p>	

Fig.: 2-4-1



**2-4-1. Engine will not start (Starter motor does not run) 5/15**

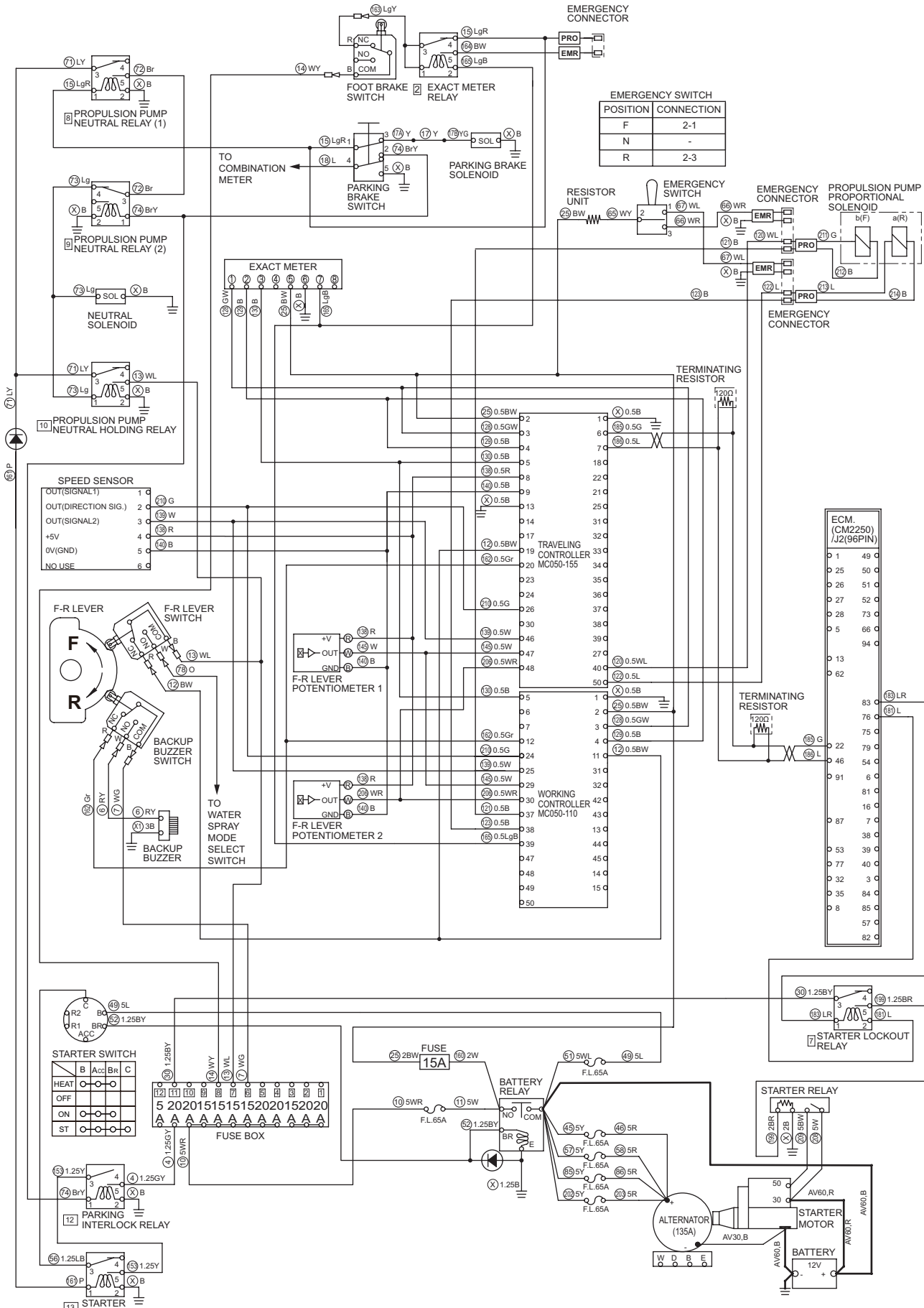
- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E03 or E04	1. Connector	<ul style="list-style-type: none"> <li>• Check F-R lever switch connector and traveling controller connector terminal 19, working controller connector terminal 11 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistance between F-R lever switch connector terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW. Standard resistance : 10 Ω or less</p> <p>(2) Measure resistance between F-R lever switch connector terminal COM wire WL and fuse box terminal 7 wire WL. Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. F-R lever switch	<p>(1) When starter switch is OFF, check continuity between F-R lever switch terminal COM and terminal NC. There is continuity in normal condition.</p> <p>(2) When starter switch is OFF and F-R lever is "F", check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, F-R lever switch is faulty.</li> </ul>	Replace F-R lever switch.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E03 or E04 is displayed and no abnormality is found in connector, harness and F-R lever switch in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/ working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Exact meter will display E03 or E04.</p> <p>When E03 is displayed:</p> <p>③ Move F-R lever in "F". Exact meter display will change from E03 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again.</p> <p>④ Return F-R lever to "N". Machine is in normal state.</p> <p>When E04 is displayed:</p> <p>③ Place F-R lever "N". Exact meter display will change from E04 to vehicle speed (0.0). Machine is in normal state. If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-4-1



EMERGENCY SWITCH

POSITION	CONNECTION
F	2-1
N	-
R	2-3

**2-4-1. Engine will not start (Starter motor does not run) 6/15**

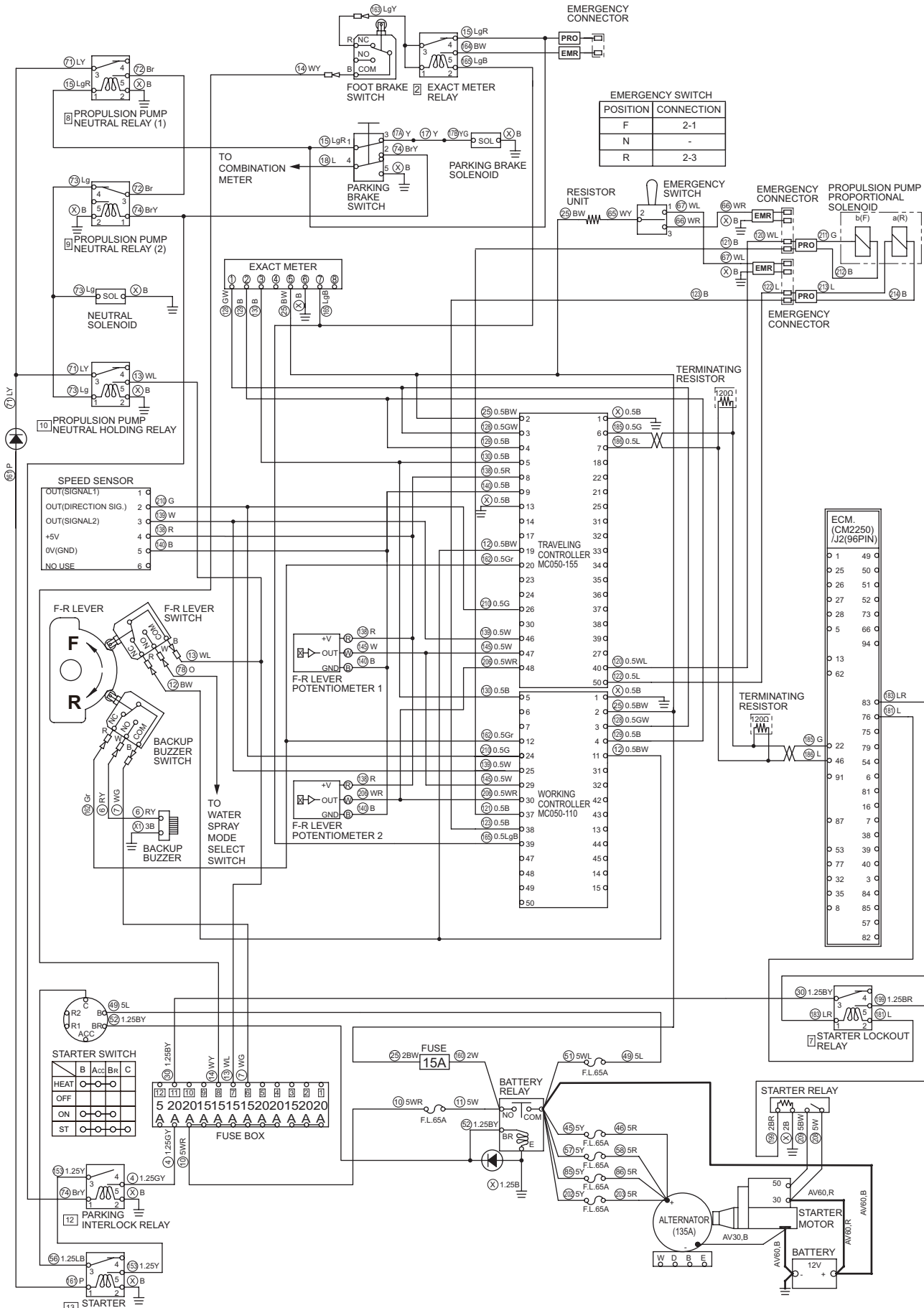
- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E05 or E06	1. Connector	<ul style="list-style-type: none"> <li>• Check backup buzzer switch connector and traveling controller connector terminal 20, working controller connector terminal 12 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistance between backup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller terminal 12 wire Gr. Standard resistance : 10 Ω or less</p> <p>(2) Measure resistance between backup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG. Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Backup buzzer switch	<p>(1) When starter switch is OFF, check continuity between backup buzzer switch terminal COM and terminal NC. There is continuity in normal condition.</p> <p>(2) When starter switch is OFF and F-R lever is "R", check continuity between backup buzzer switch terminal COM and terminal NC. There is no continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, backup buzzer switch is faulty.</li> </ul>	Replace backup buzzer switch.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E05 or E06 is displayed and no abnormality is found in connector, harness and backup buzzer switch in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Exact meter will display E05 or E06.</p> <p>When E05 is displayed:</p> <p>③ Place F-R lever "N". Exact meter display will change from E05 to vehicle speed (0.0). Machine is in normal state. If display does not change to vehicle speed, check above items again.</p> <p>When E06 is displayed:</p> <p>③ Move F-R lever in "R". Exact meter display will change from E06 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again.</p> <p>④ Return F-R lever to "N". Machine is in normal state.</p>	

Fig.: 2-4-1



**2-4-1. Engine will not start (Starter motor does not run) 7/15**

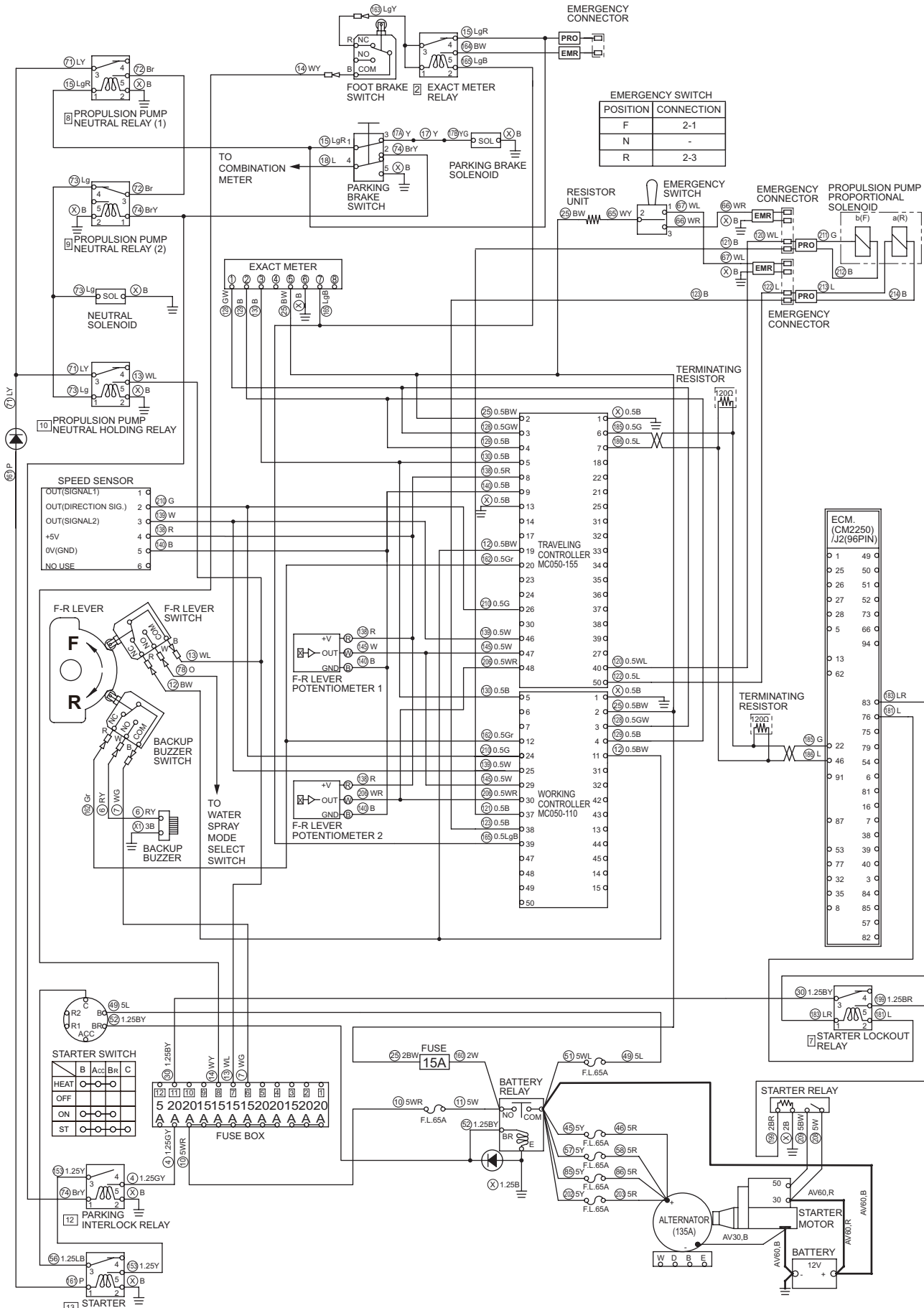
- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E31 or E32	1. Connector	<ul style="list-style-type: none"> <li>• Check propulsion pump proportional solenoid connector and traveling controller connector terminal 40, 50, working controller connector terminal 37, 38 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between propulsion pump proportional solenoid and traveling controller terminal wires.</li> <li>• Propulsion pump proportional solenoid b wire G and traveling controller terminal 40 wire G</li> <li>• Propulsion pump proportional solenoid a wire L and traveling controller terminal 50 wire L</li> <li>• Propulsion pump proportional solenoid a, b wire B and working controller terminal 37 and 38 wires B Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> <li>• Disconnect connectors and check continuity between propulsion pump proportional solenoid terminal wires.</li> <li>• Terminal wire No.120 wire G and terminal wire No.121 wire B</li> <li>• Terminal wire No.122 wire L and terminal wire No.123 wire B</li> <li>• If there is continuity, harness is faulty.</li> </ul>	Replace harness.
	3. Propulsion Pump Proportional Solenoid a (R) or b (F)	<ul style="list-style-type: none"> <li>• Disconnect harness and measure resistance of coils. Standard resistance: 5.5 <math>\Omega</math></li> <li>• If resistance is abnormal, propulsion pump proportional solenoid a (R) or b (F) is faulty.</li> </ul>	Replace propulsion pump proportional solenoid.

Fig.: 2-4-1





## 2-4-1. Engine will not start (Starter motor does not run) 8/15

- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig.: 2-4-1


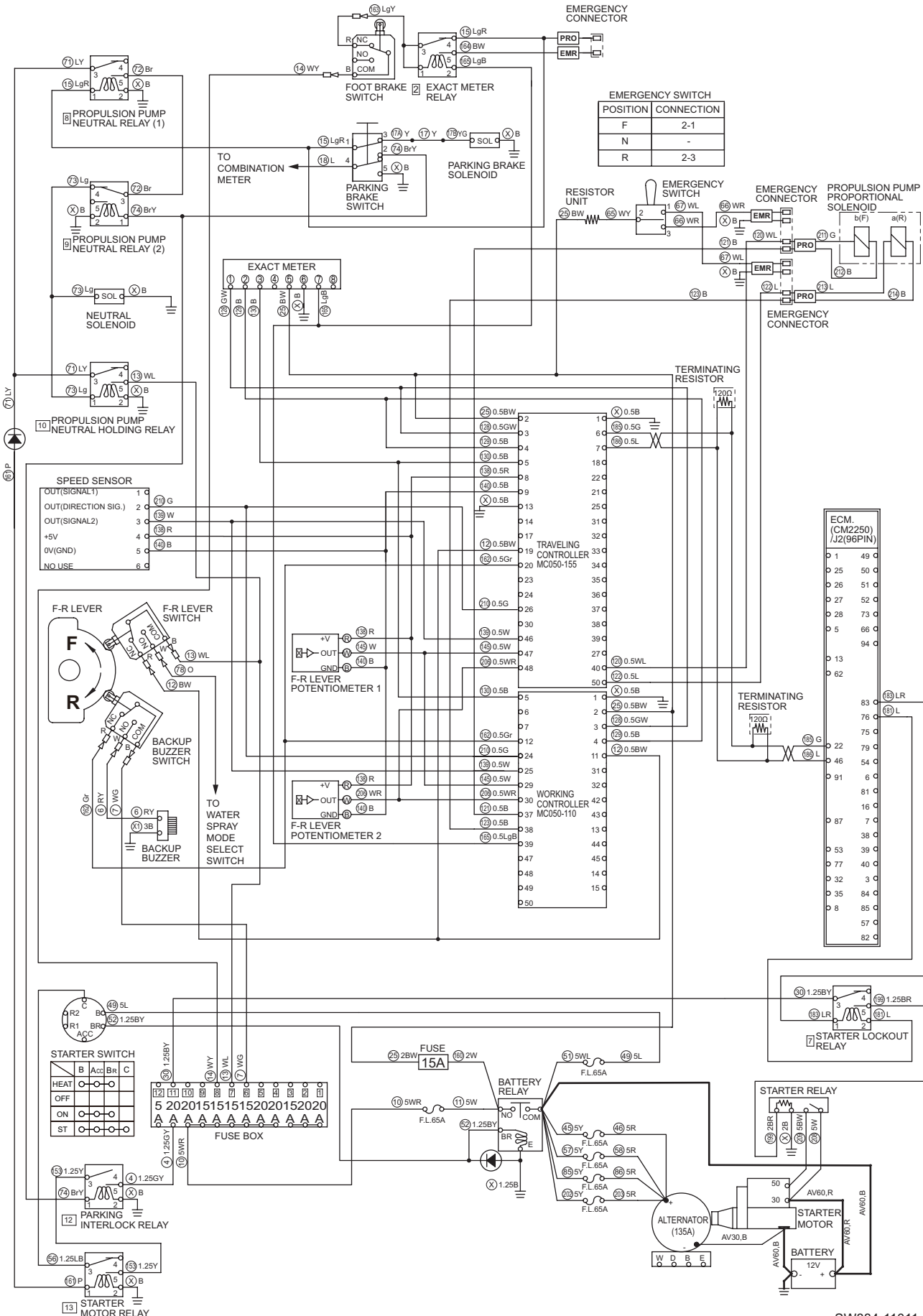
Error code	Check point	Check/Cause	Action
E31 or E32	4. Traveling/ Working Controller	<p>(1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wire.</p> <ul style="list-style-type: none"> <li>• Traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B</li> <li>• Working controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is "ON" and speed change switch is "  ", measure current between propulsion pump proportional solenoid terminal wires (positive side) and B (ground side).</p> <ul style="list-style-type: none"> <li>• Propulsion pump proportional solenoid b (F) wire G (positive side) and wire B (ground side)</li> <li>• Propulsion pump proportional solenoid a (R) wire L (positive side) and wire B (ground side)</li> </ul> <p>• While measuring current, operate F-R lever from "N" to "F" or "R".</p> <p>Standard current: 0 mA ("N") Standard current: 390 mA or more (at vehicle start moving) Standard current: 1,350 mA or less ("F" or "R")</p> <p>• If item (1) is OK and item (2) is NG, traveling/working controller is faulty.</p>	Replace traveling/ working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Place F-R lever "N".</p> <p>③ Exact meter will display vehicle speed. If display does not change to vehicle speed, check above items again.</p> <p>In case of E31:</p> <p>④ Move F-R lever in "F". Exact meter will still display vehicle speed. Machine is in normal state. If E31 is displayed again, check above items again.</p> <p>In case of E32:</p> <p>④ Move F-R lever in "R". Exact meter will still display vehicle speed. Machine is in normal state. If E32 is displayed again, check above items again.</p>	

Fig.: 2-4-1



**2-4-1. Engine will not start (Starter motor does not run) 9/15**

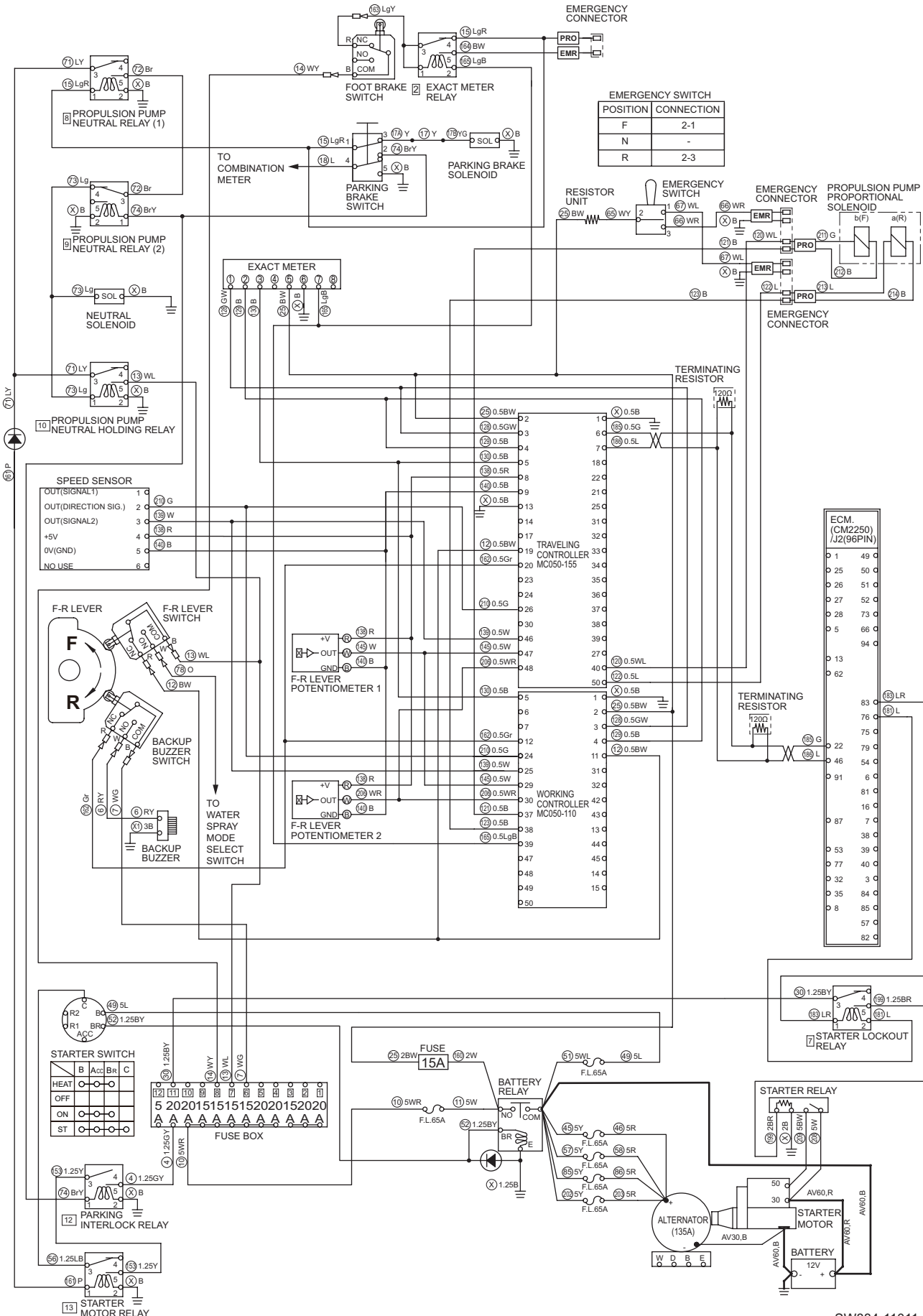
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E42	1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and traveling controller terminal wires.</li> <li>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B</li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Traveling Controller	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B.</li> <li>Standard voltage : 12 V or more</li> <li>• If voltage is normal, traveling controller is faulty.</li> </ul>	Replace traveling controller.
	4. CAN Communication	<ul style="list-style-type: none"> <li>• A normally operating traveling controller sends connection verification signals to exact meter every 0.1 second. Exact meter cannot receive connection verification signals that are regularly sent from traveling controller for 0.5 continuous second while operating.</li> <li>• Traveling controller is faulty.</li> </ul>	Replace traveling controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, set starter switch to ON.</li> <li>② Place F-R lever "N".</li> </ol> <p>Exact meter will display vehicle speed. Machine is in normal state.</p> <p>If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-4-1



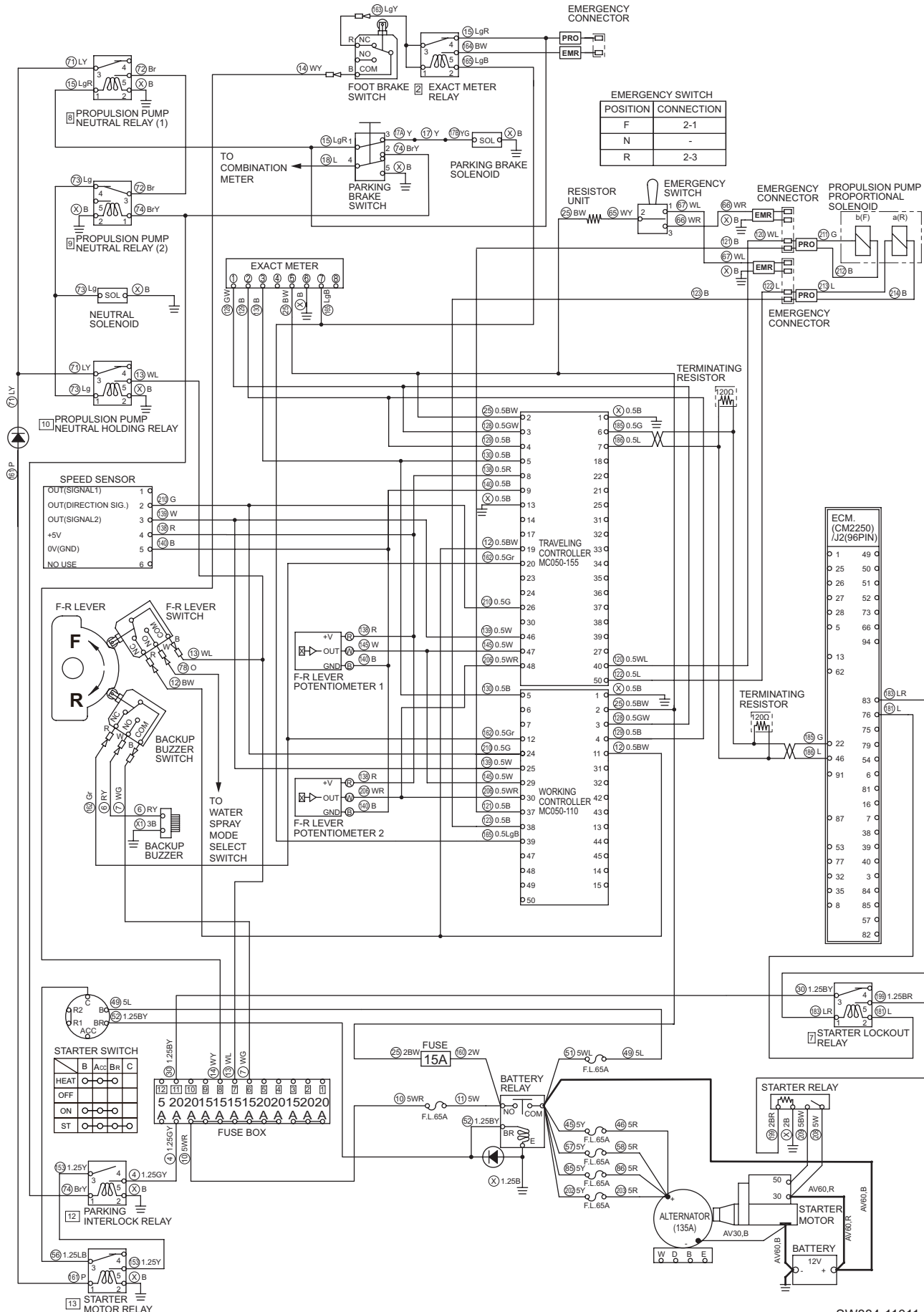
**2-4-1. Engine will not start (Starter motor does not run) 10/15**

- Starter motor runs for only 2 seconds when starter switch is turned to START.
  - Check whether exact meter multiple display shows any error code.
- 1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E43	1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and traveling controller terminal wires.</li> <li>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Exact Meter	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between exact meter terminal 5 inlet wire BW and ground terminal 6 wire B.</li> <li>Standard voltage : 12 V or more</li> <li>• If voltage is normal, exact meter is faulty.</li> </ul>	Replace exact meter.
	4. CAN Communication	<ul style="list-style-type: none"> <li>• A normally operating traveling controller sends connection verification signals to exact meter every 0.1 second. Exact meter cannot receive connection verification signals that are regularly sent from traveling controller for 1 continuous second while operating.</li> <li>• Traveling controller is faulty.</li> </ul>	Replace traveling controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, set starter switch to ON.</li> <li>② Place F-R lever "N".</li> </ol> <p>Exact meter will display vehicle speed. Machine is in normal state.</p> <p>If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-4-1



EMERGENCY SWITCH

POSITION	CONNECTION
F	2-1
N	-
R	2-3

ECM (CM2250) / J2(96PIN)

1	49 C
25	50 C
26	51 C
27	52 C
28	73 C
5	66 C
13	94 C
62	
83	LR
76	L
75	C
74	C
46	54 C
91	6 C
8	81 C
16	7 C
87	7 C
38	38 C
53	39 C
77	40 C
32	3 C
35	84 C
8	85 C
57	57 C
82	C

**2-4-1. Engine will not start (Starter motor does not run) 11/15**

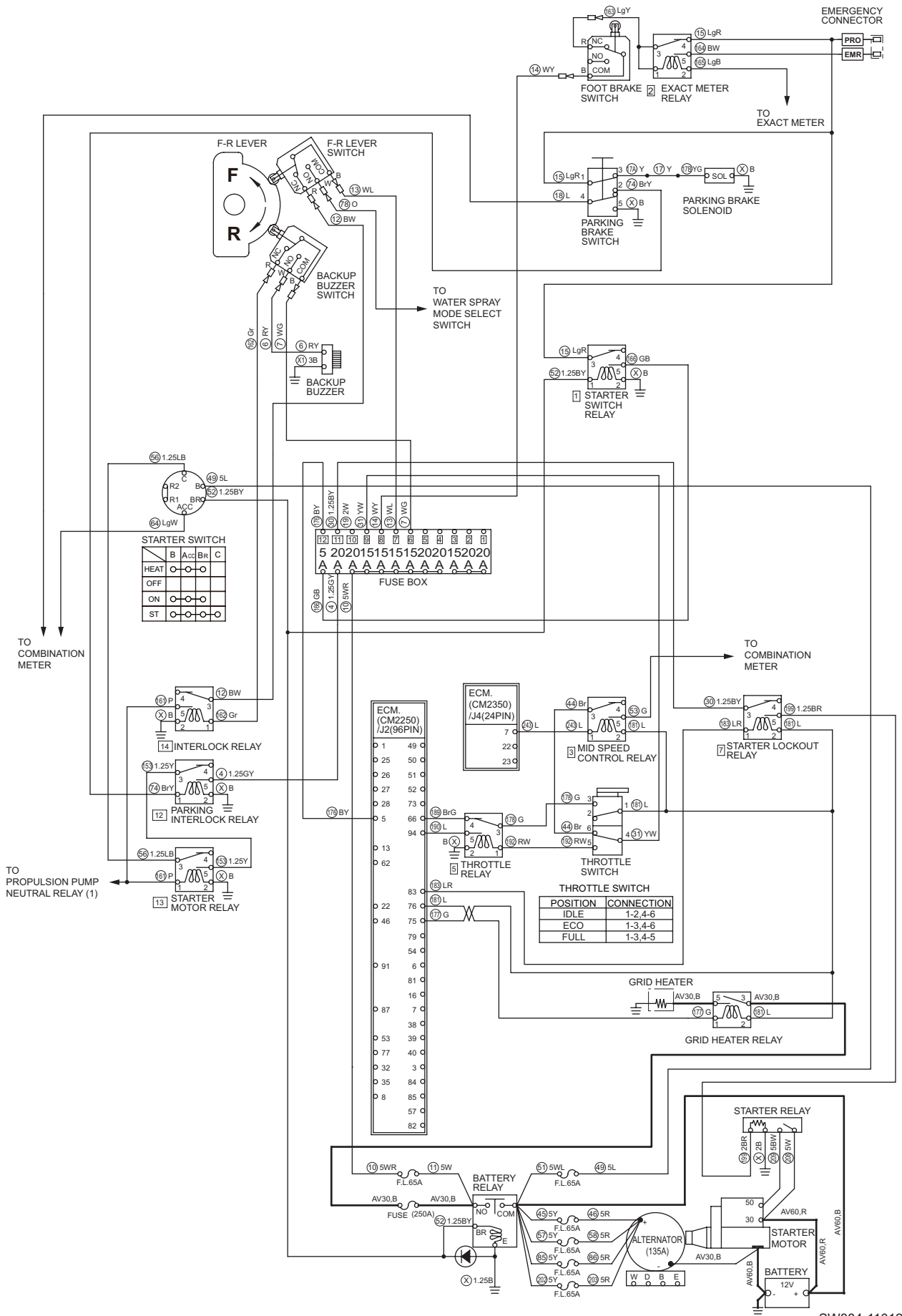
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E44, E45	1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 7 and working controller connector terminal 3, 4, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and working controller terminal wires.</li> <li>• Exact meter terminal 1 wire GW and working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and working controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and working controller terminal 5 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Working Controller	<p>(1) When starter switch is ON, measure voltage between working controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between working controller terminal 39 inlet wire LgB and working controller ground terminal 1 wire B. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) is OK and (2) is NG, working controller is faulty.</li> </ul>	Replace working controller.
	4. CAN Communication (E44 only)	<ul style="list-style-type: none"> <li>• A normally operating working controller sends connection verification signals to exact meter every 0.1 second. Exact meter cannot receive connection verification signals that are regularly sent from working controller for 1 continuous second while operating.</li> <li>• Working controller is faulty.</li> </ul>	Replace working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Place F-R lever "N". Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-4-2



SW884-11012



**2-4-1. Engine will not start (Starter motor does not run) 12/15**

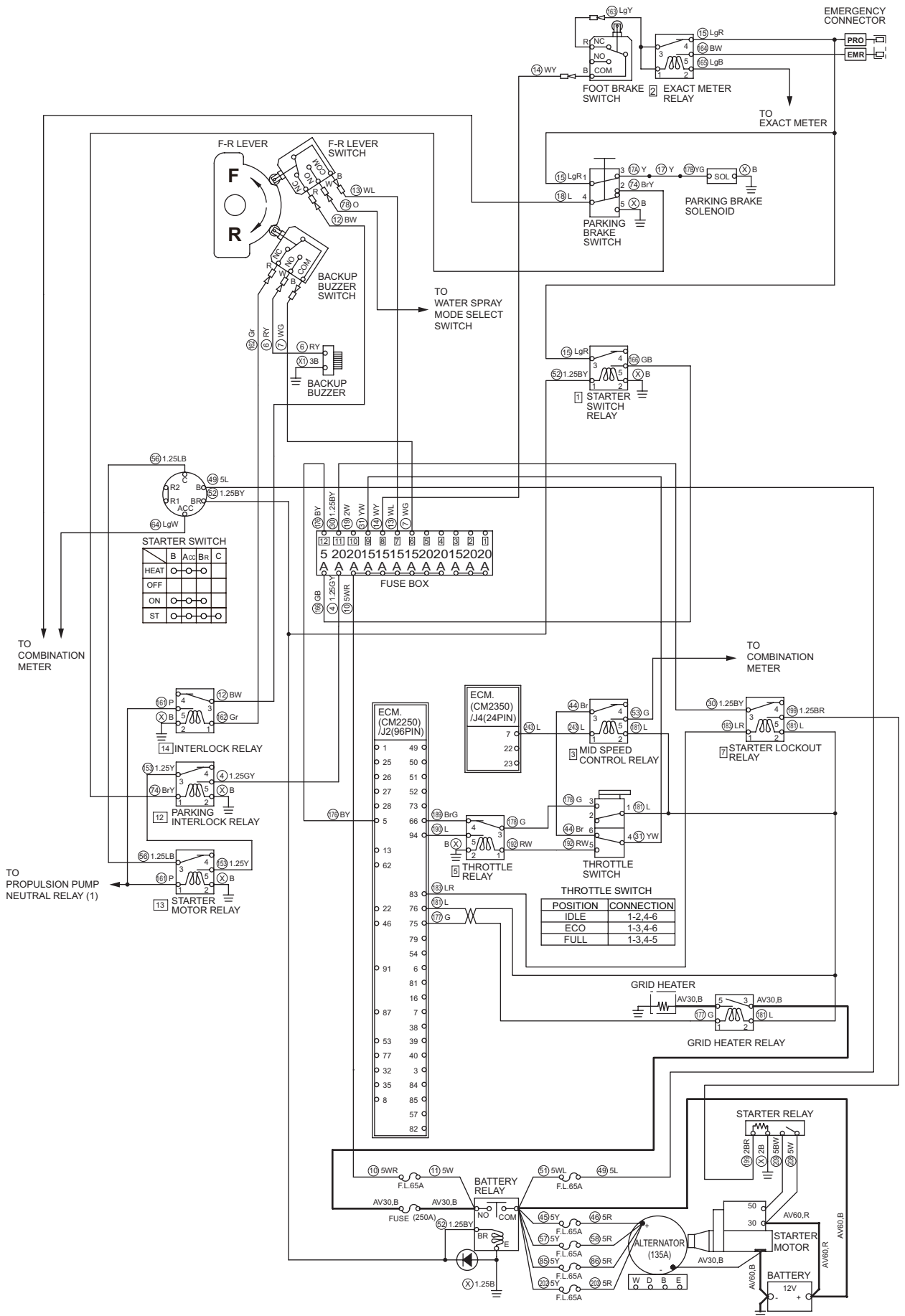
- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig.: 2-4-2**

Check point	Check/Cause	Action
1. Battery	<ul style="list-style-type: none"> <li>• Measure battery voltage or specific gravity. Standard voltage : 12 V or more Standard gravity : 1.26 or more</li> <li>• If value is below standard, battery capacity is insufficient.</li> </ul>	Charge or replace battery.
2. Starter Switch	<ul style="list-style-type: none"> <li>• Check continuity between O-O according to starter switch connection table. Switch is OK if there is continuity between connection O-O.</li> <li>• If there is no continuity, starter switch is faulty.</li> </ul>	Replace starter switch.
3. Starter Motor	<p>(1) When starter switch is ON, measure voltage between starter motor terminal 30 and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is START, measure voltage between starter motor terminal 50 and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If starter motor does not run even though above items (1) and (2) are OK, starter motor is faulty.</li> </ul>	Replace starter motor.
4. Battery Relay	<p>(1) When starter switch is OFF, measure voltage between battery relay primary terminal COM and chassis ground. Standard resistance : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between battery relay coil terminal BR inlet wire BR and coil ground terminal E. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between battery relay secondary terminal NO and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, battery relay is faulty.</li> </ul>	Replace battery relay.
5. Starter Relay	<p>(1) When starter switch is START, measure voltage between starter relay terminal inlet wire BR and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between starter relay terminal inlet wire W and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is START, measure voltage between starter relay terminal outlet wire BW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, starter relay is faulty.</li> </ul>	Replace starter relay.

Fig.: 2-4-2



SW884-11012

**2-4-1. Engine will not start (Starter motor does not run) 13/15**

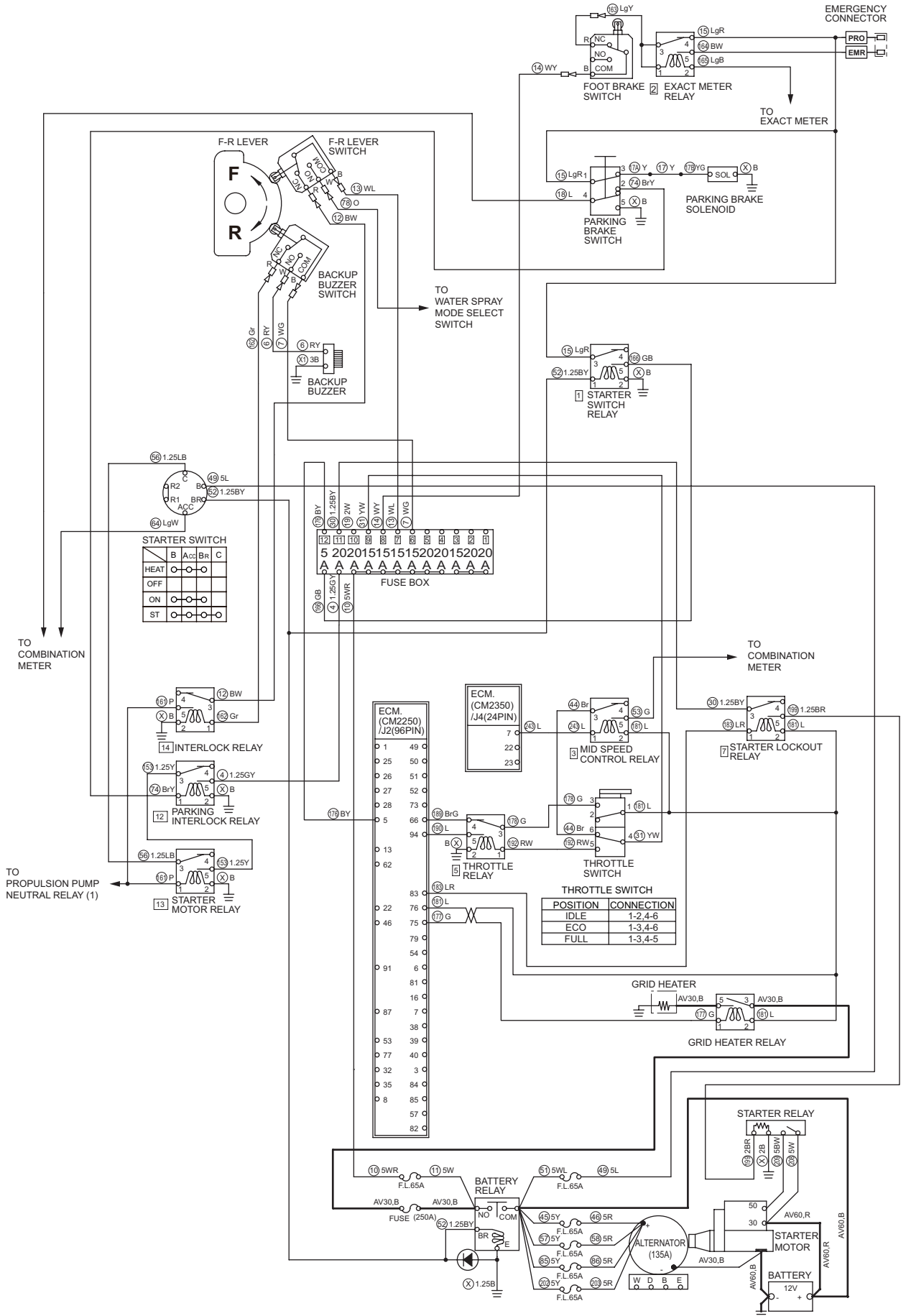
- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig.: 2-4-2**

Check point	Check/Cause	Action
6. F-R lever switch	<p>(1) When starter switch is ON, measure voltage between F-R lever switch terminal COM inlet wire WL and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between F-R lever switch terminal NC outlet wire BW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, F-R lever switch is faulty.</li> </ul>	Replace F-R lever switch.
7. Backup buzzer switch	<p>(1) When starter switch is ON, measure voltage between backup buzzer switch terminal COM inlet wire WG and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between backup buzzer switch terminal NC outlet wire Gr and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, backup buzzer switch is faulty.</li> </ul>	Replace backup buzzer switch.
8. <span style="border: 1px solid black; padding: 0 2px;">14</span> Interlock Relay	<p>(1) When starter switch is ON, measure voltage between interlock relay terminal 1 inlet wire Gr and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between interlock relay terminal 3 inlet wire BW and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between interlock relay terminal 5 outlet wire P and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, interlock relay is faulty.</li> </ul>	Replace interlock relay.
9. <span style="border: 1px solid black; padding: 0 2px;">13</span> Starter Motor Relay	<p>(1) When starter switch is ON, measure voltage between starter motor relay terminal 1 inlet wire P and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is START, measure voltage between Starter motor relay terminal 3 inlet wire LB and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is START, measure voltage between starter motor relay terminal 5 outlet wire Y and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, starter motor relay is faulty.</li> </ul>	Replace starter motor relay.

Fig.: 2-4-2



SW884-11012

**2-4-1. Engine will not start (Starter motor does not run) 14/15**

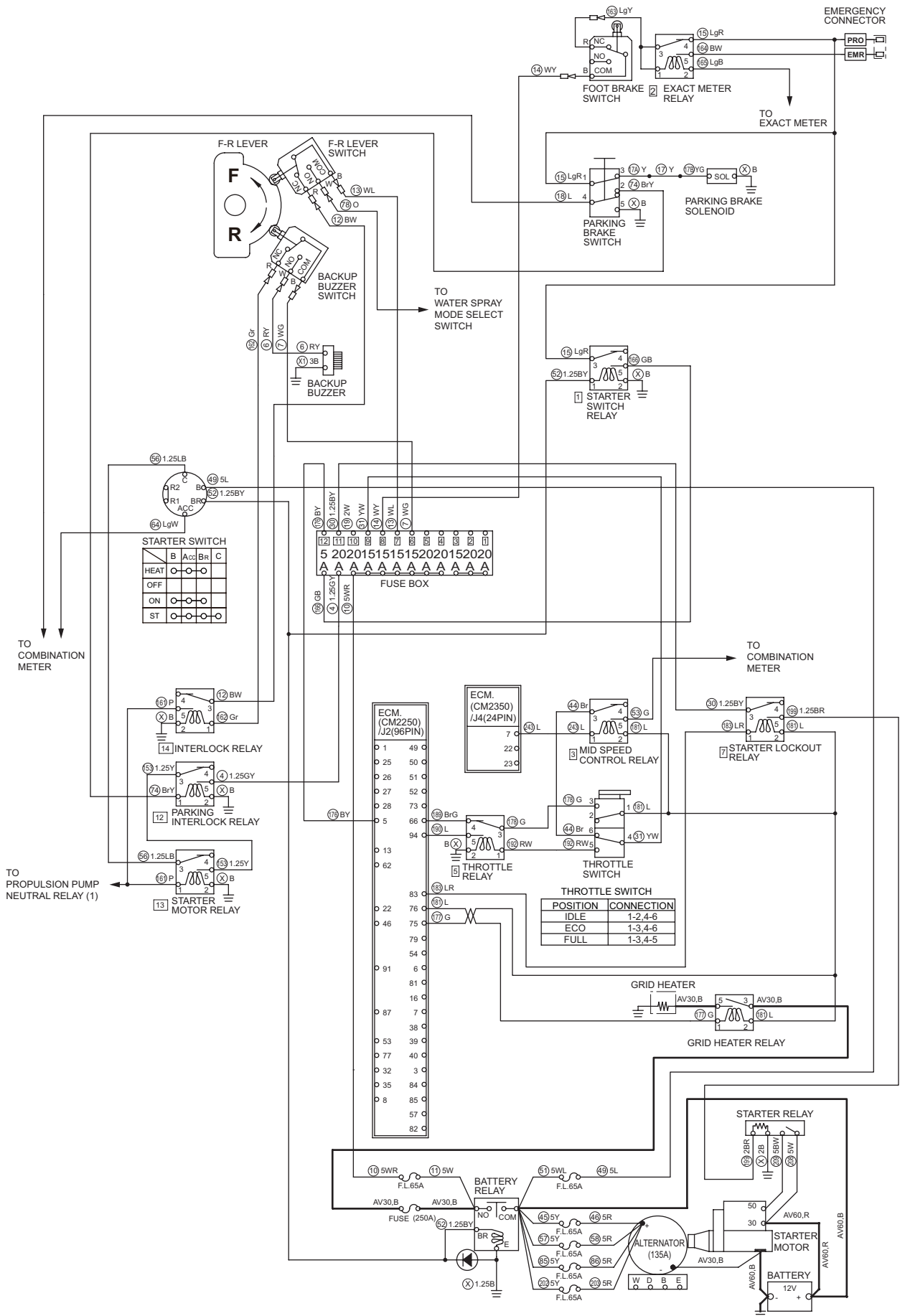
- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig.: 2-4-2**

Check point	Check/Cause	Action
10. Foot Brake Switch	<p>(1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire WY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between foot brake switch terminal NC outlet wire LgY and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, foot brake switch is faulty.</li> </ul>	Replace foot brake switch.
11. <span style="border: 1px solid black; padding: 0 2px;">2</span> Exact Meter Relay	<p>(1) When starter switch is ON, measure voltage between exact meter relay terminal 1, 3 inlet wire LgY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage of coil between exact meter relay terminal 1 and terminal 2. There is no electricity in normal condition.</p> <p>(3) When starter switch is ON, measure voltage between exact meter relay terminal 4 outlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, exact meter relay is faulty.</li> </ul>	Replace exact meter relay.
12. Parking Brake Switch	<p>(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between parking brake switch terminal 2 outlet wire BrY and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, parking brake switch is faulty.</li> </ul>	Replace parking brake switch.
13. <span style="border: 1px solid black; padding: 0 2px;">12</span> Parking Interlock Relay	<p>(1) When starter switch is ON, measure voltage between parking interlock relay terminal 1 inlet wire BrY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is START, measure voltage between parking interlock relay terminal 3 inlet wire Y and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is START, measure voltage between parking interlock relay terminal 5 outlet wire GY and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, parking interlock relay is faulty.</li> </ul>	Replace parking interlock relay.

Fig.: 2-4-2



SW884-11012

**2-4-1. Engine will not start (Starter motor does not run) 15/15**

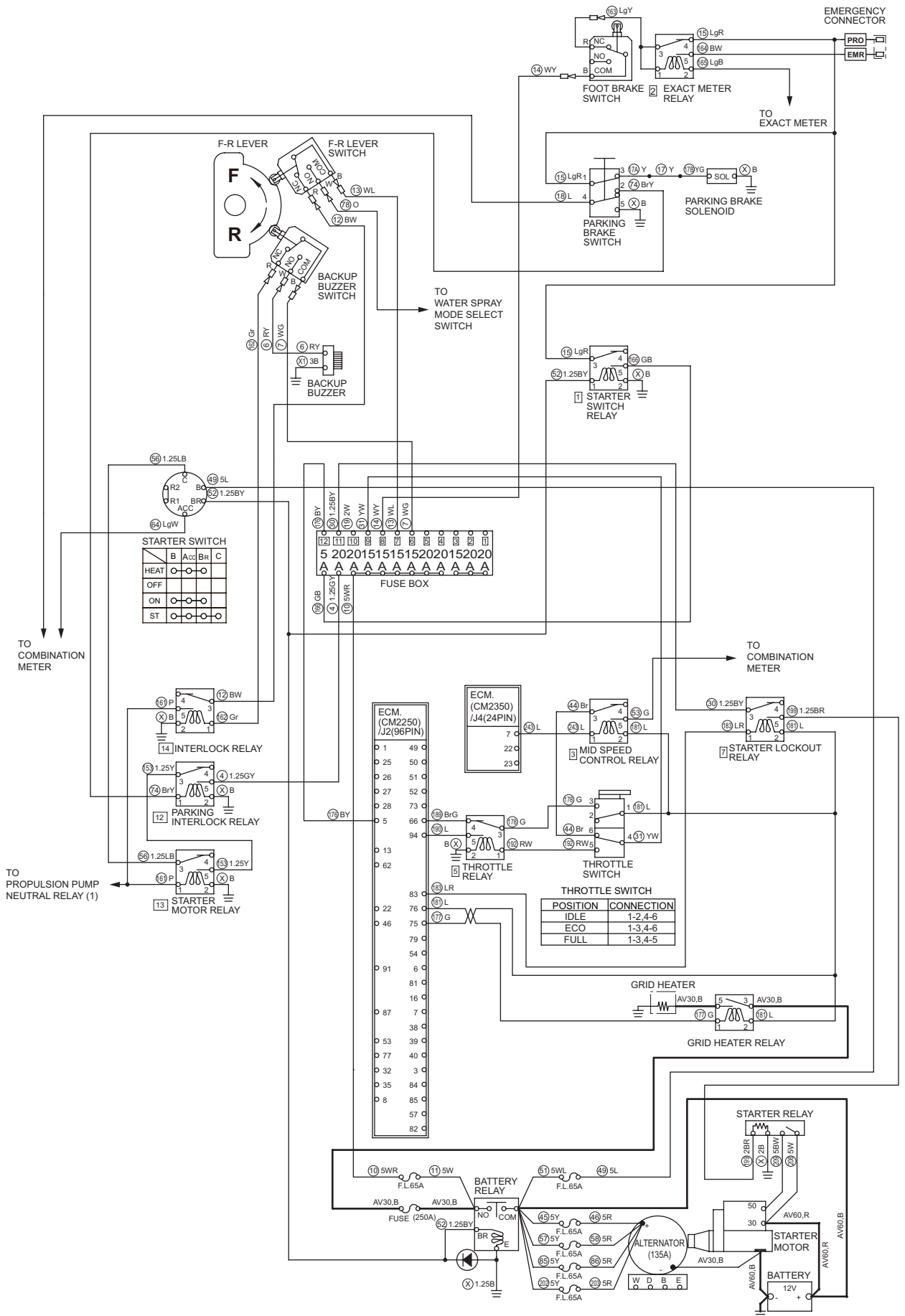
- F-R lever must be in "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig.: 2-4-2**

Check point	Check/Cause	Action
14. <input type="checkbox"/> 7 Starter Lockout Relay	<p>(1) When starter switch is ON, measure voltage between starter lockout relay terminal 1 inlet wire LR and 2 outlet wire L. Standard voltage : 12 V or more</p> <p>(2) When starter switch is START, measure voltage between starter lockout relay terminal 3 inlet wire BY and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is START, measure voltage between starter lockout relay terminal 5 outlet wire BR and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, starter lockout relay is faulty.</li> </ul>	Replace starter lockout relay.
15. <input type="checkbox"/> 1 Starter Switch Relay	<p>(1) When starter switch is ON, measure voltage between starter switch relay terminal 1 inlet wire BY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between starter switch relay terminal 3 inlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between starter switch relay terminal 5 outlet wire GB and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, starter switch relay is faulty.</li> </ul>	Replace starter switch relay.
16. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-4-2



SW884-11012



**2-4-2. No charging**

Reference Fig.: 2-4-2

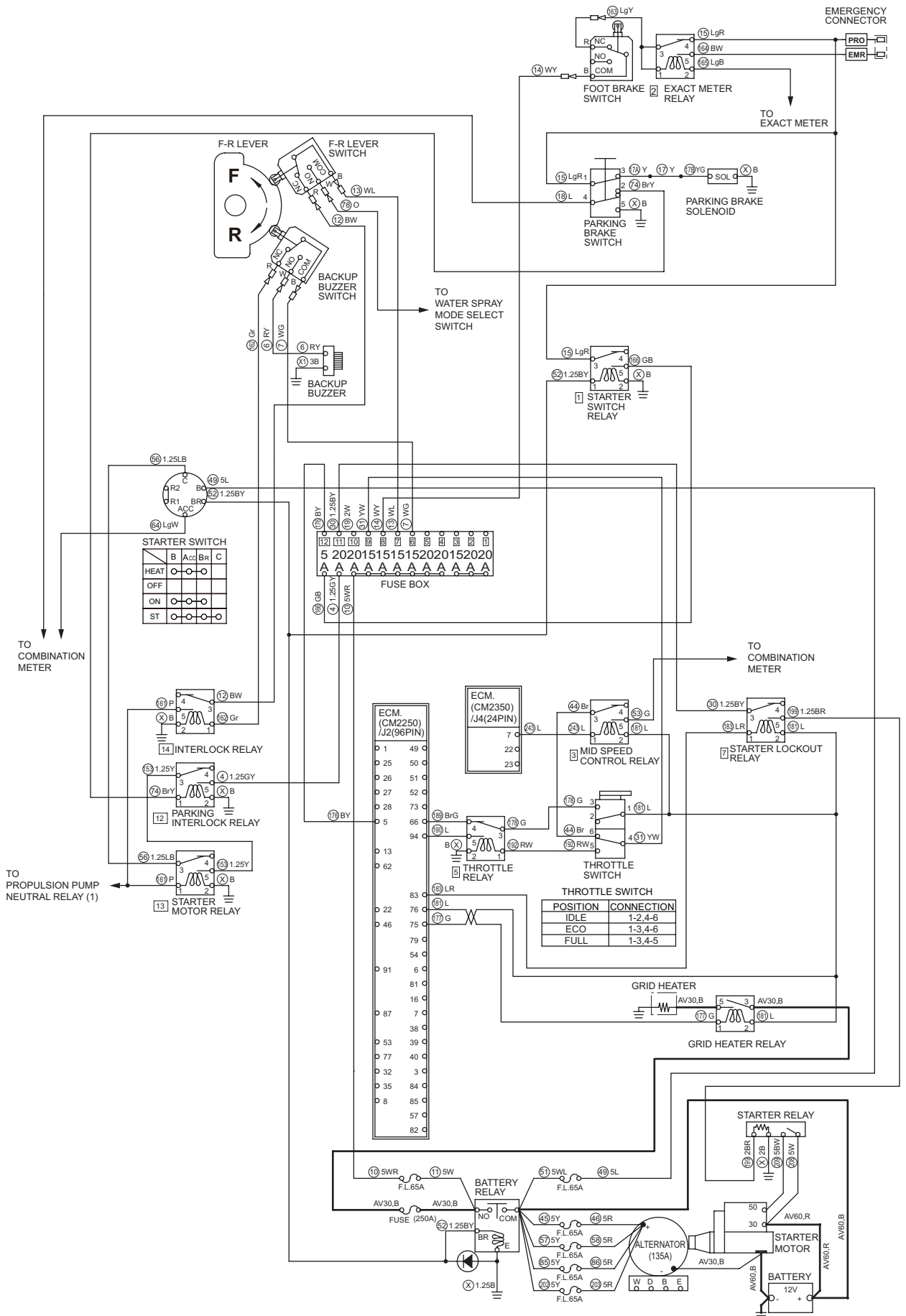
Check point	Check/Cause	Action
1. Alternator	<ul style="list-style-type: none"> <li>• After starting engine, measure voltage between alternator terminal + wire R and chassis ground. Standard voltage : At least intermediate engine speed, 14 V or more</li> <li>• If voltage is lower than standard, alternator is faulty.</li> <li>• If voltage is normal and battery is not charged, battery is faulty.</li> </ul>	Replace alternator or battery.

**2-4-3. Grid heater does not work (Engine starting performance is bad in cold weather)**

Reference Fig. : 2-4-2

Check point	Check/Cause	Action
1. Grid Heater Relay	<p>(1) When starter switch is ON, measure voltage between grid heater relay terminal 1 inlet wire G and 2 outlet wire L. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between grid heater relay terminal 3 inlet wire B and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between grid heater relay terminal 5 outlet wire B and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, grid heater relay is faulty.</li> </ul>	Replace grid heater relay.
2. Grid Heater	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between grid heater inlet wire B and chassis ground. Standard voltage : 12 V or more</li> <li>• If voltage is normal, grid heater is faulty.</li> </ul>	Replace grid heater.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>If any abnormality is found in shielded twisted wires, repair is not approved. Be sure to replace them.</b></li> </ul>	Repair or replace harness.

Fig.: 2-4-2



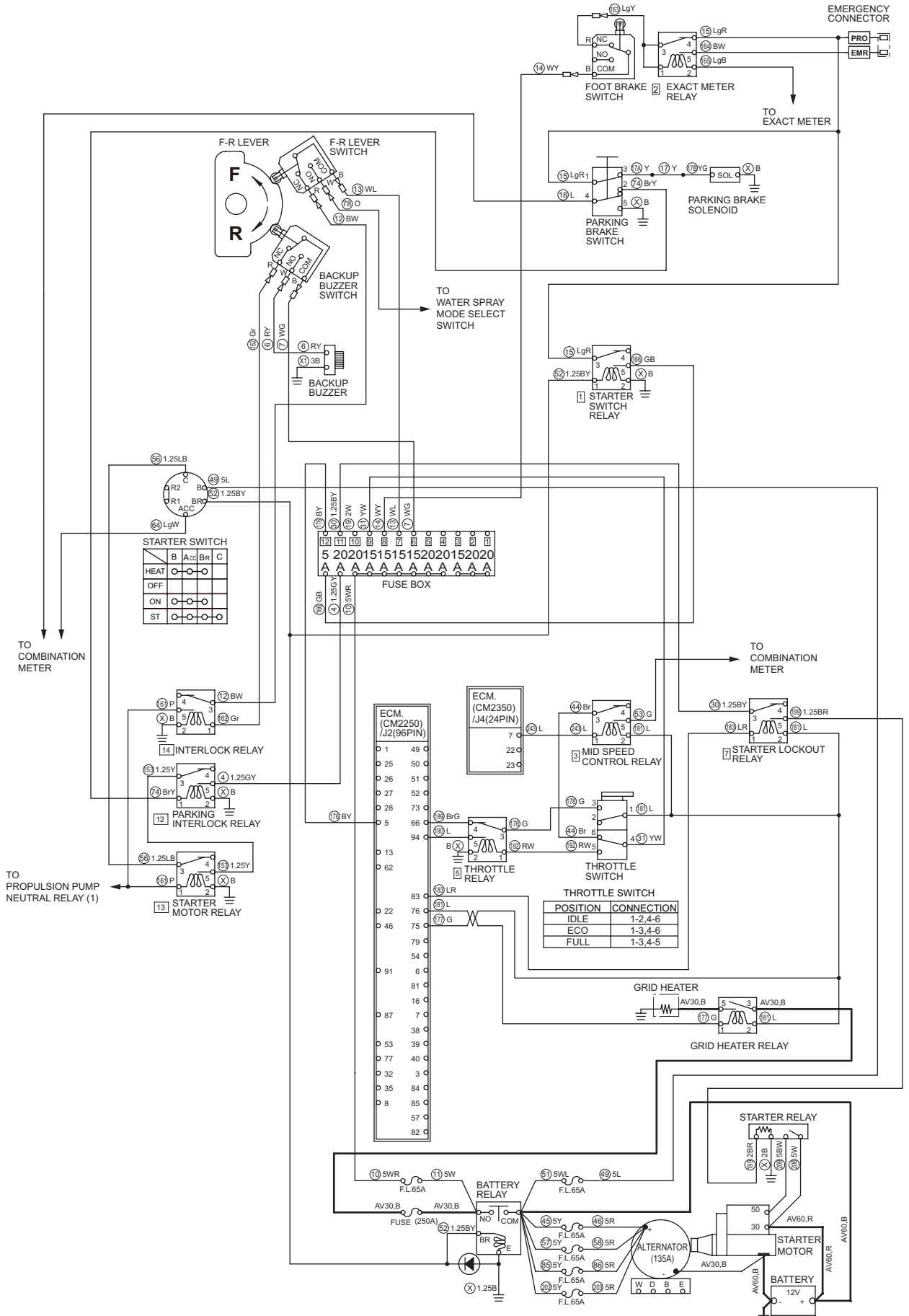
SW884-11012

## 2-4-4. Starter motor runs even when F-R lever is not at “N” and parking brake is not applied

Reference Fig.: 2-4-2

Check point	Check/Cause	Action
1. F-R lever switch	<ul style="list-style-type: none"> <li>• When starter switch is OFF and F-R lever is “F”, check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition.</li> <li>• If there is continuity, F-R lever switch is faulty.</li> </ul>	Replace F-R lever switch.
2. Backup buzzer switch	<ul style="list-style-type: none"> <li>• When starter switch is OFF and F-R lever is “R”, check continuity between backup buzzer switch terminal COM and terminal NC. There is no continuity in normal condition.</li> <li>• If there is continuity, backup buzzer switch is faulty.</li> </ul>	Replace backup buzzer switch.
3. Parking Brake Switch	<ul style="list-style-type: none"> <li>• When starter switch is OFF and parking brake switch is released position, check continuity between parking brake switch terminal 1 and 2. There is no continuity in normal condition.</li> <li>• If there is continuity, parking brake switch is faulty.</li> </ul>	Replace parking brake switch.

Fig.: 2-4-2



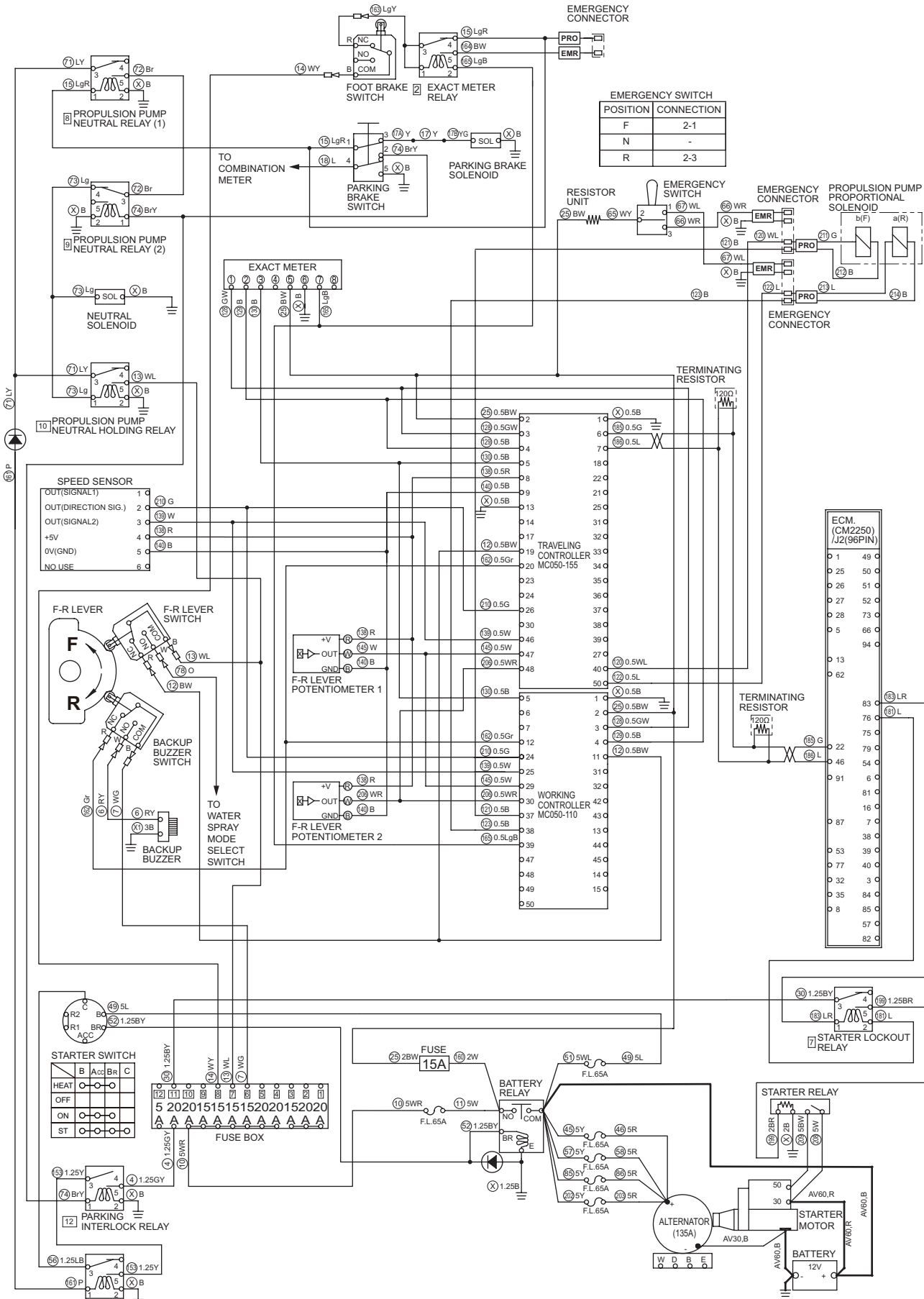
SW884-11012

## 2-4-5. Engine speed cannot be switched

Reference Fig. : 2-4-2

Check point	Check/Cause	Action
1. Throttle Switch	<p>(1) When throttle switch is "IDLE", check continuity between throttle switch terminals 1 and 2, 4 and 6. There is continuity in normal condition.</p> <p>(2) When throttle switch is "MID", check continuity between throttle switch terminals 1 and 3, 4 and 6. There is continuity in normal condition.</p> <p>(3) When throttle switch is "FULL", check continuity between throttle switch terminals 1 and 3, 4 and 5. There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1), (2) or (3) is NG, throttle switch is faulty.</li> </ul>	Replace throttle switch.
2. <span style="border: 1px solid black; padding: 0 2px;">5</span> Throttle Relay	<p>(1) When starter switch is ON, measure voltage between throttle relay terminal 1 inlet wire RW and terminal 2 outlet wire B. There is no electricity in normal condition.</p> <p>(2) When starter switch is ON, check continuity between throttle relay terminal 3 and terminal 4. There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, throttle relay is faulty.</li> </ul>	Replace throttle relay.
3. <span style="border: 1px solid black; padding: 0 2px;">3</span> Mid Speed Control Relay	<p>(1) When starter switch is ON, measure voltage between mid speed control relay terminal 1 inlet wire L and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and throttle switch is "ECO", check continuity between throttle relay terminal 3 and terminal 5. There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, throttle relay is faulty.</li> </ul>	Replace mid speed control relay.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-4-1



## 2-5. Propulsion

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.
- When measuring voltage and current without disconnecting connectors, refer to “Measuring voltage and current flowing using tester” (P.11-006 to P.11-008).
- Check any ground circuit which belongs to components to be checked.

### 2-5-1. Machine and engine suddenly stops 1/9

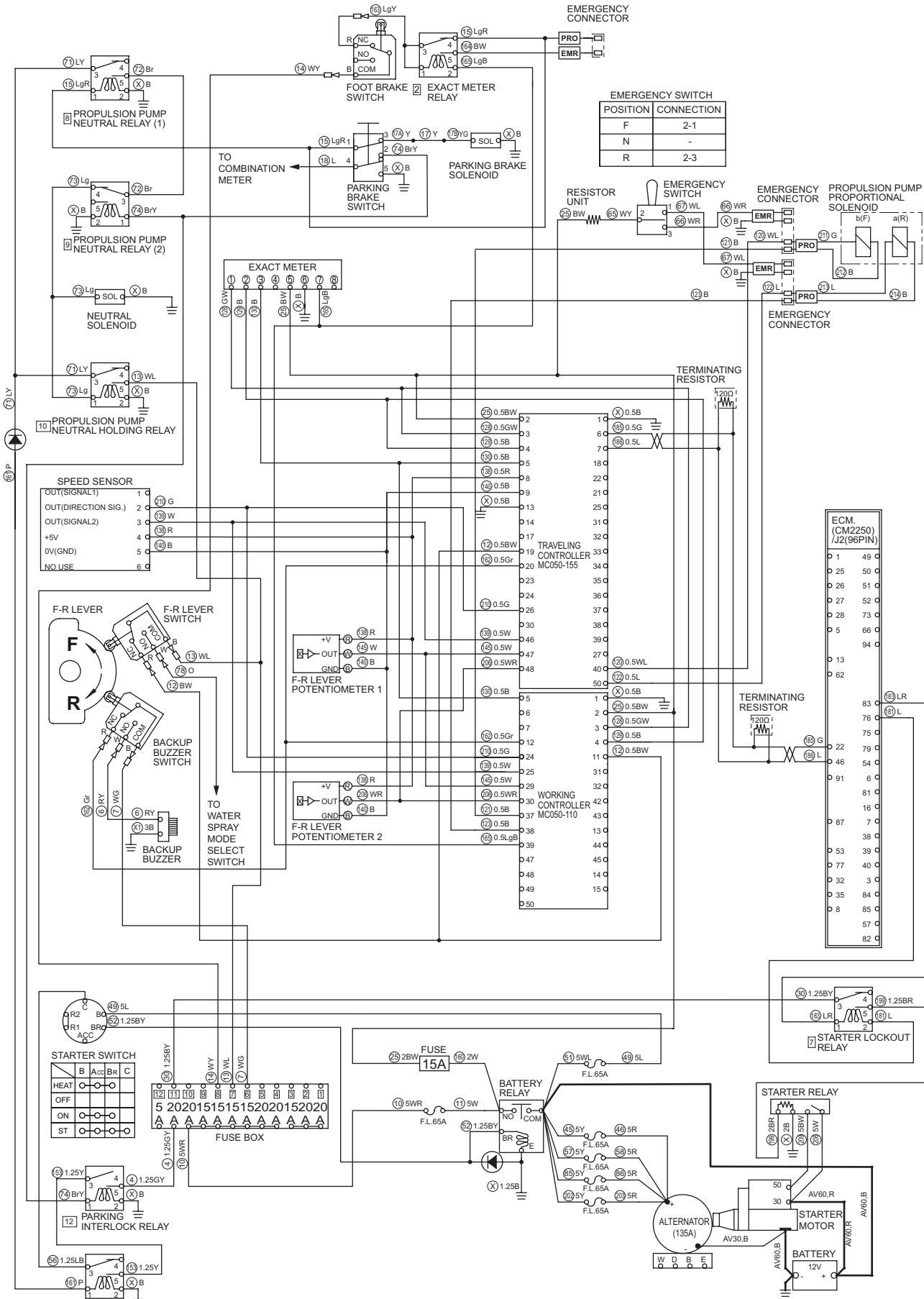
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E01 or E02	1. Connector	<ul style="list-style-type: none"> <li>• Check F-R lever potentiometer 1, 2 connector and traveling controller connector terminal 8, 9, 47, 48, working controller connector terminal 29, 30 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between F-R lever potentiometer and traveling controller terminal wires.</li> <li>• F-R lever potentiometer 1 terminal wire R and traveling controller terminal 8 wire R</li> <li>• F-R lever potentiometer 1 terminal wire W and traveling controller terminal 47 wire W, working controller terminal 29 wire W</li> <li>• F-R lever potentiometer 1 terminal wire B and traveling controller terminal 9 wire B</li> <li>• F-R lever potentiometer 2 terminal wire R and traveling controller terminal 8 wire R</li> <li>• F-R lever potentiometer 2 terminal wire WR and traveling controller terminal 48 wire WR, working controller terminal 30 wire WR</li> <li>• F-R lever potentiometer 2 terminal wire B and traveling controller terminal 9 wire B</li> </ul> <p>Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. F-R Lever Potentiometer 1	<p>(1) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal inlet wire R and ground terminal wire B. Standard voltage : <math>5 \pm 0.5</math> V</p> <p>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal outlet wire W and ground terminal wire B.</p> <p>① When F-R lever is “N” Standard voltage : <math>2.5 \pm 0.015</math> V</p> <p>② When F-R lever is “F” Standard voltage : <math>1.2 \pm 0.02</math> V</p> <p>③ When F-R lever is “R” Standard voltage : <math>3.8 \pm 0.02</math> V</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 1 adjustment is faulty.</li> </ul>	Adjust F-R lever potentiometer 1 or replace it even if measurement is out of standard after adjustment.

Fig.: 2-4-1





## 2-5-1. Machine and engine suddenly stops 2/9

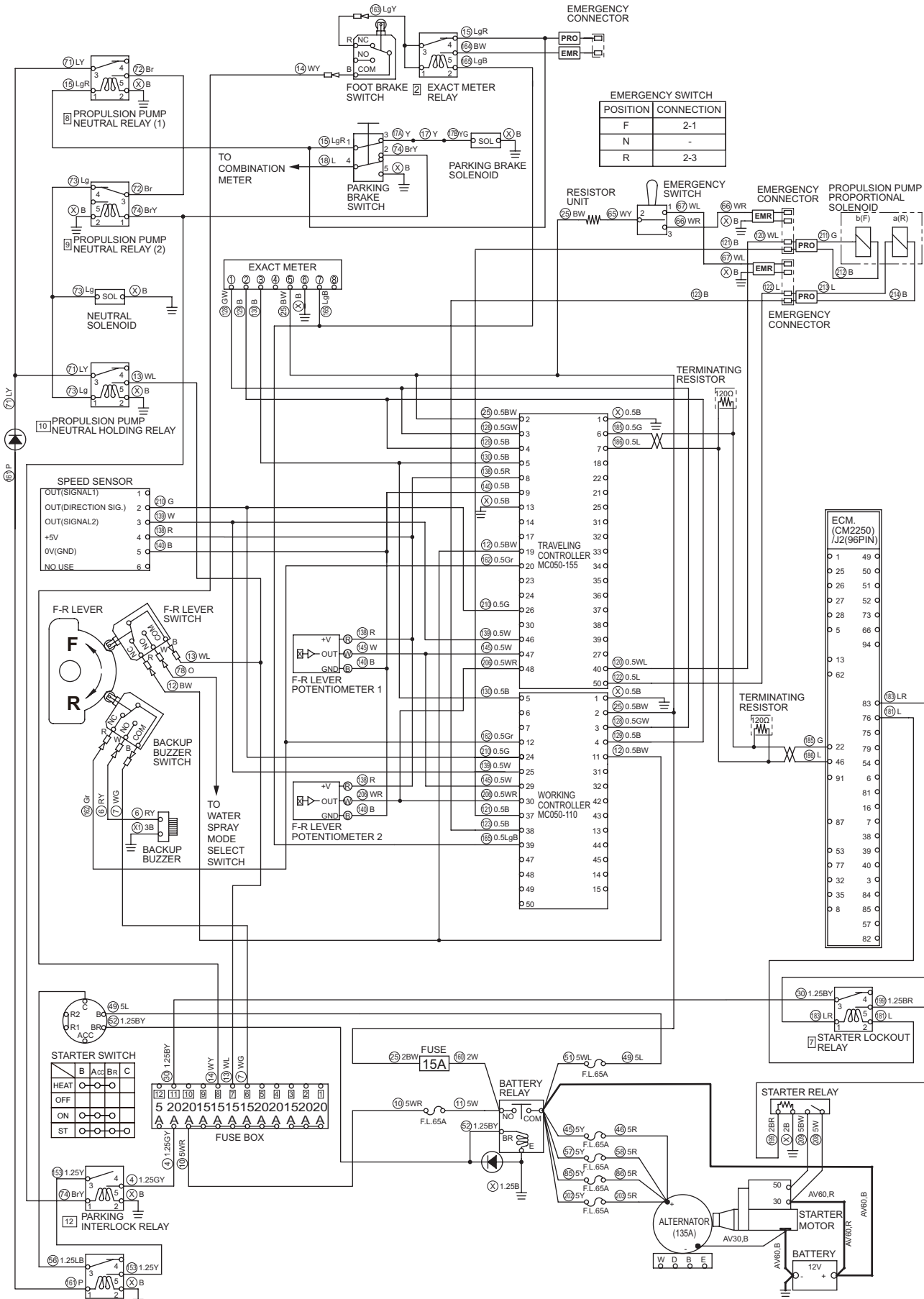
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E01 or E02	4. F-R Lever Potentiometer 2	<p>(1) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal inlet wire R and ground terminal wire B. Standard voltage : <math>5 \pm 0.5</math> V</p> <p>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal outlet wire WR and ground terminal wire B.</p> <p>① When F-R lever is "N" Standard voltage : <math>2.5 \pm 0.015</math> V</p> <p>② When F-R lever is "F" Standard voltage : <math>3.8 \pm 0.02</math> V</p> <p>③ When F-R lever is "R" Standard voltage : <math>1.2 \pm 0.02</math> V</p> <p>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 2 adjustment is faulty.</p>	Adjust F-R lever potentiometer 2 or replace it even if measurement is out of standard after adjustment.
	5. Traveling Controller	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between traveling controller terminal 8 outlet wire R (positive side) and 9 wire B (ground side). Standard voltage : <math>5 \pm 0.5</math> V</p> <p>• If above item (1) is OK and item (2) is NG, traveling controller is faulty.</p>	Replace traveling controller.
	6. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Place F-R lever "N".</p> <p>③ Exact meter will display vehicle speed (0.0). If E01 or E02 is displayed, check above items again.</p> <p>④ Place F-R lever "F" or "N".</p> <p>⑤ Exact meter will still display vehicle speed (0.0). Machine is in normal state. If display changes to E01 or E02, check above items again.</p>	

Fig.: 2-4-1



## 2-5-1. Machine and engine suddenly stops 3/9

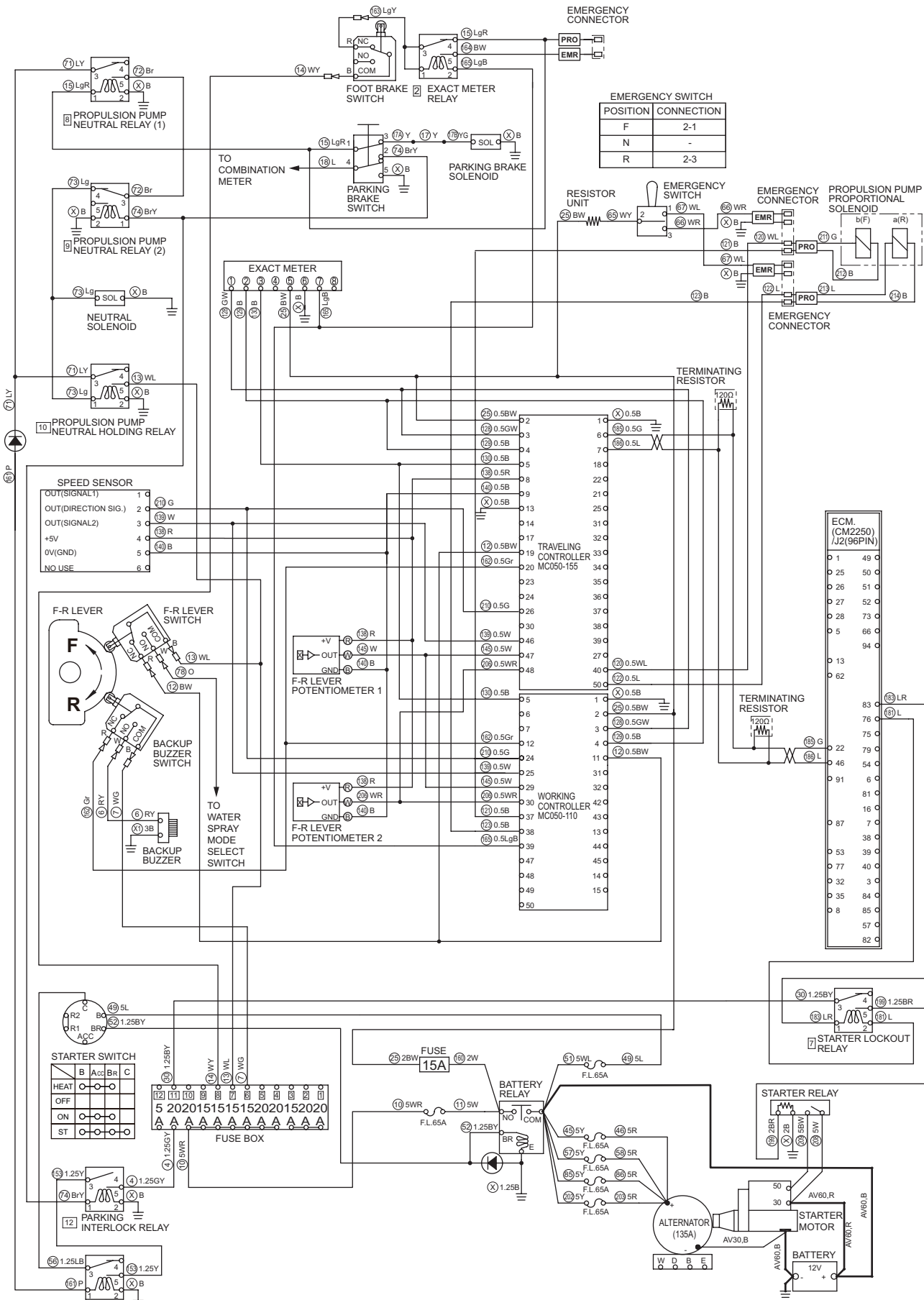
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E03 or E04	1. Connector	<ul style="list-style-type: none"> <li>• Check F-R lever switch connector and traveling controller connector terminal 19, working controller connector terminal 11 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistance between F-R lever switch connector terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW. Standard resistance : 10 Ω or less</p> <p>(2) Measure resistance between F-R lever switch connector terminal COM wire WL and fuse box terminal 7 wire WL. Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. F-R lever switch	<p>(1) When starter switch is OFF and F-R lever is "N", check continuity between F-R lever switch terminal COM and terminal NC. There is continuity in normal condition.</p> <p>(2) When starter switch is OFF and F-R lever is "F", check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, F-R lever switch is faulty.</li> </ul>	Replace F-R lever switch.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E03 or E04 is displayed and no abnormality is found in connector, harness and F-R lever switch in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Exact meter will display E03 or E04.</p> <p>When E03 is displayed:</p> <p>③ Move F-R lever in "F". Exact meter display will change from E03 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again.</p> <p>④ Return F-R lever to "N". Machine is in normal state.</p> <p>When E04 is displayed:</p> <p>③ Place F-R lever "N". Exact meter display will change from E04 to vehicle speed (0.0). Machine is in normal state. If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-4-1



## 2-5-1. Machine and engine suddenly stops 4/9

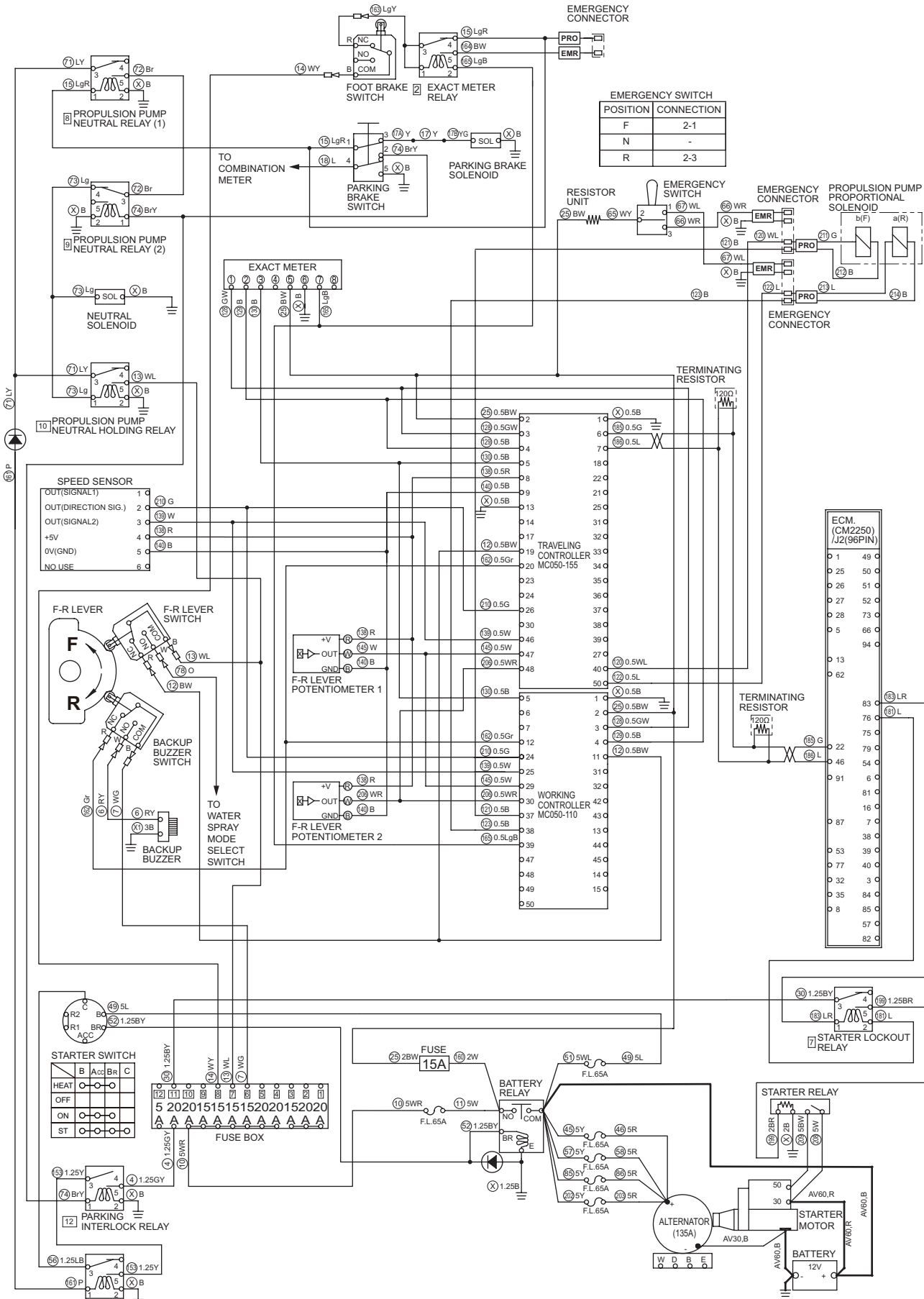
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E05 or E06	1. Connector	<ul style="list-style-type: none"> <li>• Check backup buzzer switch connector and traveling controller connector terminal 20, working controller connector terminal 12 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistance between backup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller terminal 12 wire Gr. Standard resistance : 10 Ω or less</p> <p>(2) Measure resistance between backup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG. Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Backup buzzer switch	<p>(1) When starter switch is OFF and F-R lever is "N", check continuity between backup buzzer switch terminal COM and terminal NC. There is continuity in normal condition.</p> <p>(2) When starter switch is OFF and F-R lever is "R", check continuity between backup buzzer switch terminal COM and terminal NC. There is no continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, backup buzzer switch is faulty.</li> </ul>	Replace backup buzzer switch.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E05 or E06 is displayed and no abnormality is found in connector, harness and backup buzzer switch in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Exact meter will display E05 or E06.</p> <p>When E05 is displayed:</p> <p>③ Place F-R lever "N". Exact meter display will change from E05 to vehicle speed (0.0). Machine is in normal state. If display does not change to vehicle speed, check above items again.</p> <p>When E06 is displayed:</p> <p>③ Move F-R lever in "R". Exact meter display will change from E06 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again.</p> <p>④ Return F-R lever to "N". Machine is in normal state.</p>	

Fig.: 2-4-1



**2-5-1. Machine and engine suddenly stops 5/9**

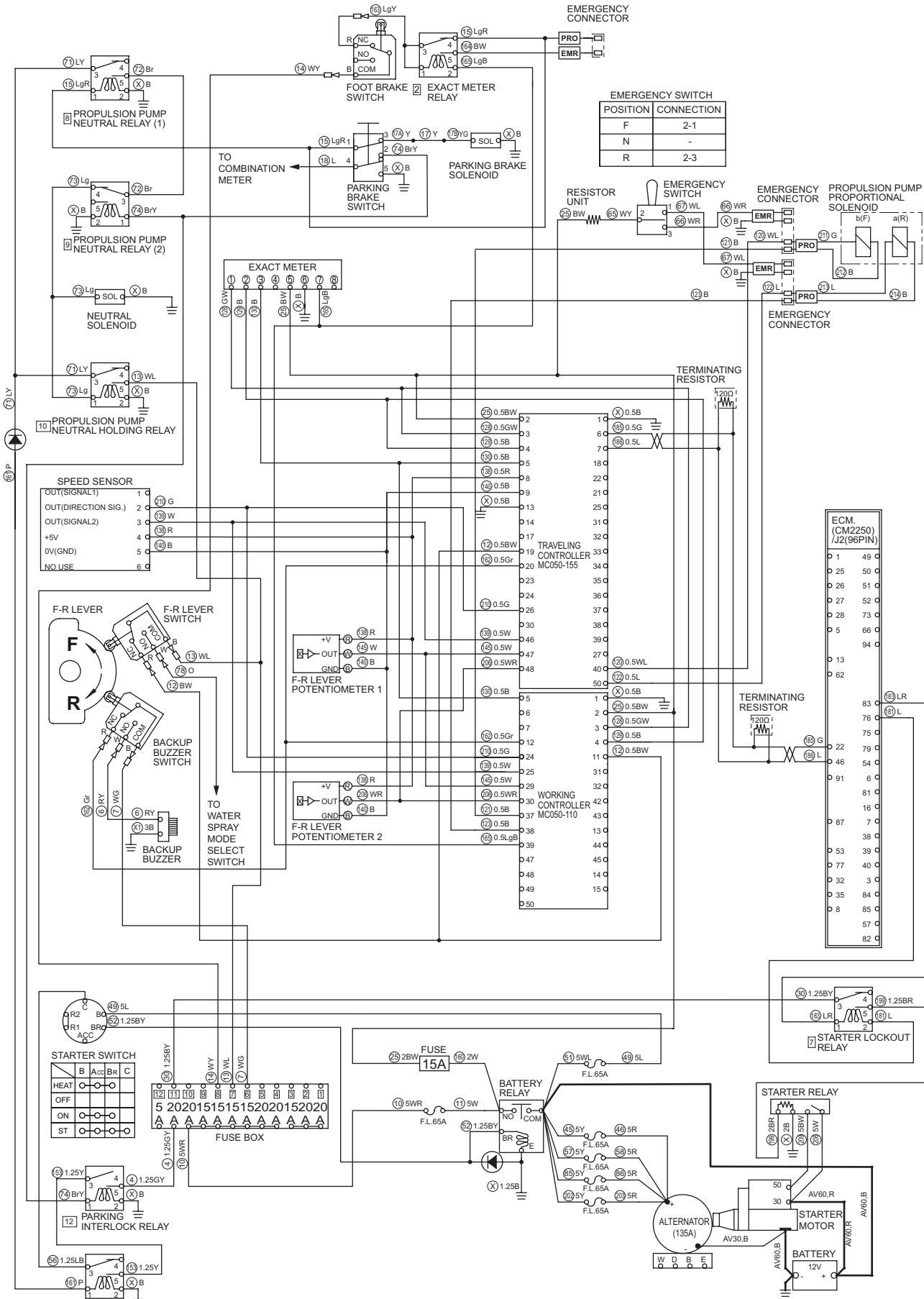
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E31 or E32	1. Connector	<ul style="list-style-type: none"> <li>• Check propulsion pump proportional solenoid connector and traveling controller connector terminal 40, 50, working controller connector terminal 37, 38 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between propulsion pump proportional solenoid and traveling controller terminal wires.               <ul style="list-style-type: none"> <li>• Propulsion pump proportional solenoid b wire G and traveling controller terminal 40 wire G</li> <li>• Propulsion pump proportional solenoid a wire L and traveling controller terminal 50 wire L</li> <li>• Propulsion pump proportional solenoid a, b wire B and working controller terminal 37 and 38 wires B</li> </ul>               Standard resistance : 10 <math>\Omega</math> or less             </li> <li>• If resistance is abnormal, harness is faulty.</li> <li>• Disconnect connectors and check continuity between propulsion pump proportional solenoid terminal wires.               <ul style="list-style-type: none"> <li>• Terminal wire No.120 wire G and terminal wire No.121 wire B</li> <li>• Terminal wire No.122 wire L and terminal wire No.123 wire B</li> </ul> </li> <li>• If there is continuity, harness is faulty.</li> </ul>	Replace harness.
	3. Propulsion Pump Proportional Solenoid a (R) or b (F)	<ul style="list-style-type: none"> <li>• Disconnect harness and measure resistance of coils. Standard resistance: 5.5 <math>\Omega</math></li> <li>• If resistance is abnormal, propulsion pump proportional solenoid a (R) or b (F) is faulty.</li> </ul>	Replace propulsion pump proportional solenoid.

Fig.: 2-4-1





## 2-5-1. Machine and engine suddenly stops 6/9

- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig.: 2-4-1


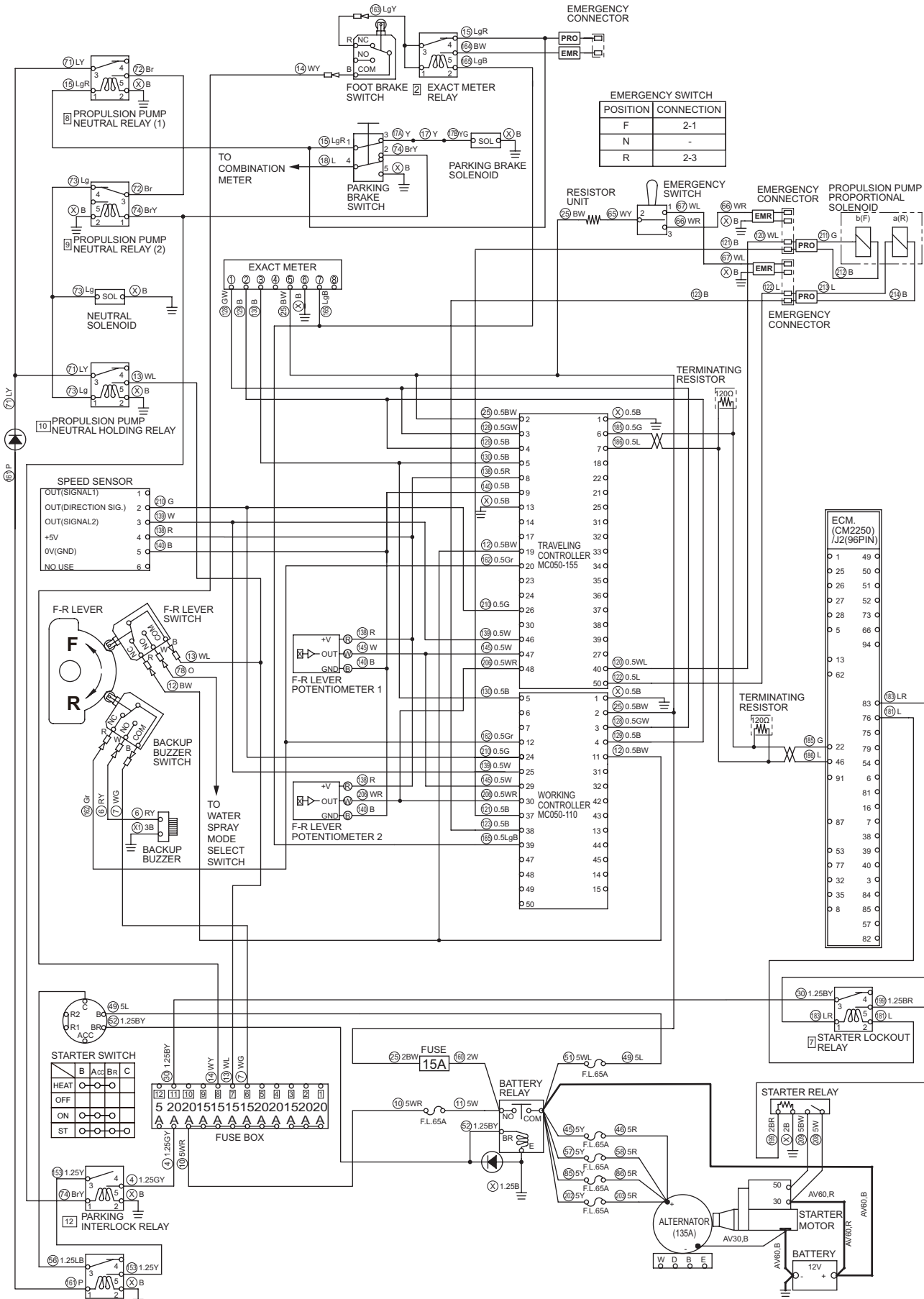
Error code	Check point	Check/Cause	Action
E31 or E32	4. Traveling/ Working Controller	<p>(1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wire.</p> <ul style="list-style-type: none"> <li>• Traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B</li> <li>• Working controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is "ON" and speed change switch is "  ", measure current between propulsion pump proportional solenoid terminal wires (positive side) and B (ground side).</p> <ul style="list-style-type: none"> <li>• Propulsion pump proportional solenoid b (F) wire G (positive side) and wire B (ground side)</li> <li>• Propulsion pump proportional solenoid a (R) wire L (positive side) and wire B (ground side)</li> </ul> <p>• While measuring current, operate F-R lever from "N" to "F" or "R".</p> <p>Standard current: 0 mA ("N") Standard current: 390 mA or more (at vehicle start moving) Standard current: 1,350 mA or less ("F" or "R")</p> <p>• If item (1) is OK and item (2) is NG, traveling/working controller is faulty.</p>	Replace traveling/ working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Place F-R lever "N".</p> <p>③ Exact meter will display vehicle speed. If display does not change to vehicle speed, check above items again.</p> <p>In case of E31:</p> <p>④ Move F-R lever in "F". Exact meter will still display vehicle speed. Machine is in normal state. If E31 is displayed again, check above items again.</p> <p>In case of E32:</p> <p>④ Move F-R lever in "R". Exact meter will still display vehicle speed. Machine is in normal state. If E32 is displayed again, check above items again.</p>	

Fig.: 2-4-1



## 2-5-1. Machine and engine suddenly stops 7/9

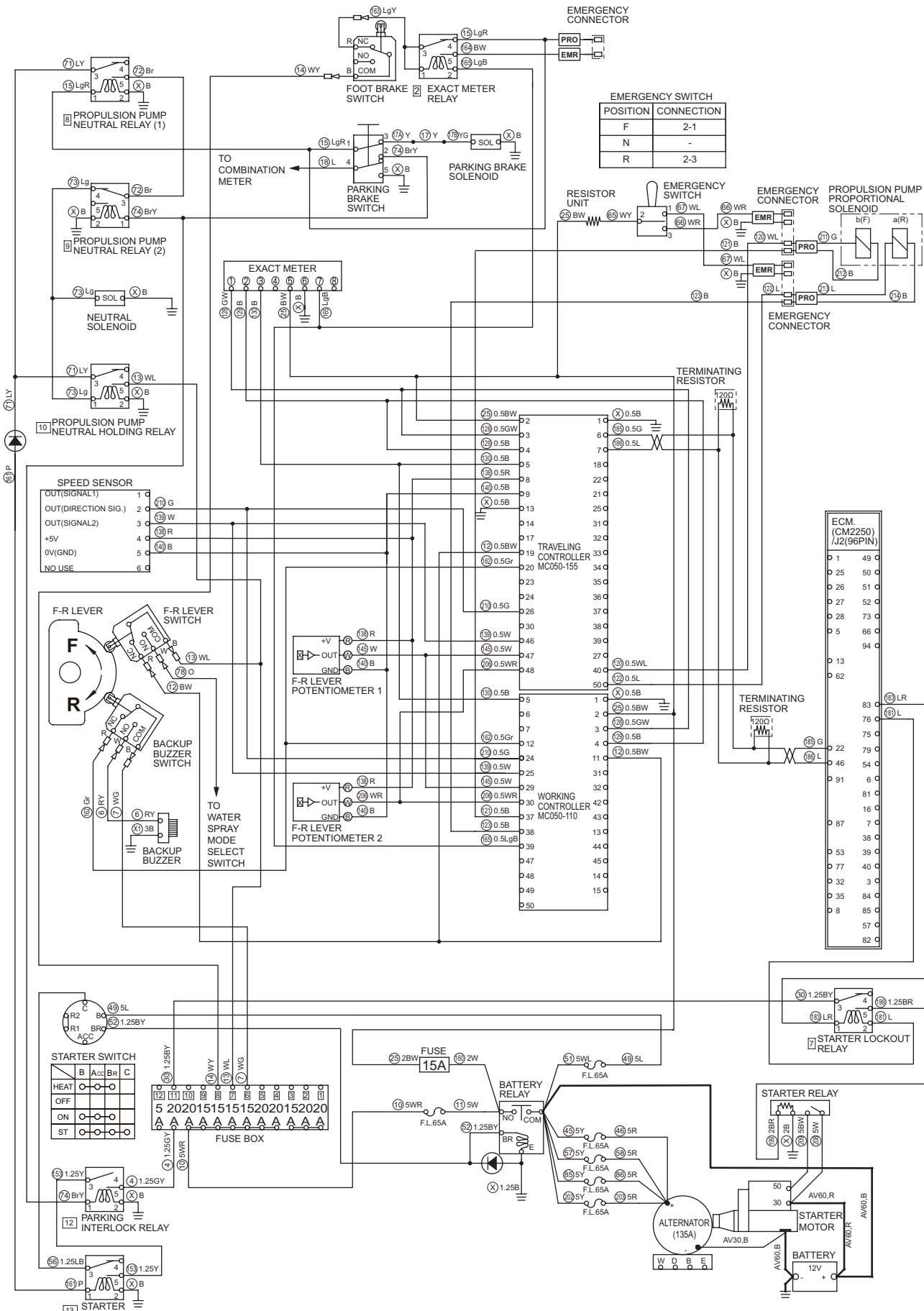
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E42	1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and traveling controller terminal wires.</li> <li>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Traveling Controller	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B.</li> <li>Standard voltage : 12 V or more</li> <li>• If voltage is abnormal, traveling controller is faulty.</li> </ul>	Replace traveling controller.
	4. CAN Communication	<ul style="list-style-type: none"> <li>• A normally operating traveling controller sends connection verification signals to exact meter every 0.1 second. Exact meter cannot receive connection verification signals that are regularly sent from traveling controller for 0.5 continuous second while operating.</li> <li>• Traveling controller is faulty.</li> </ul>	Replace traveling controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, set starter switch to ON.</li> <li>② Place F-R lever "N".</li> </ol> <p>Exact meter will display vehicle speed. Machine is in normal state.</p> <p>If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-4-1



## 2-5-1. Machine and engine suddenly stops 8/9

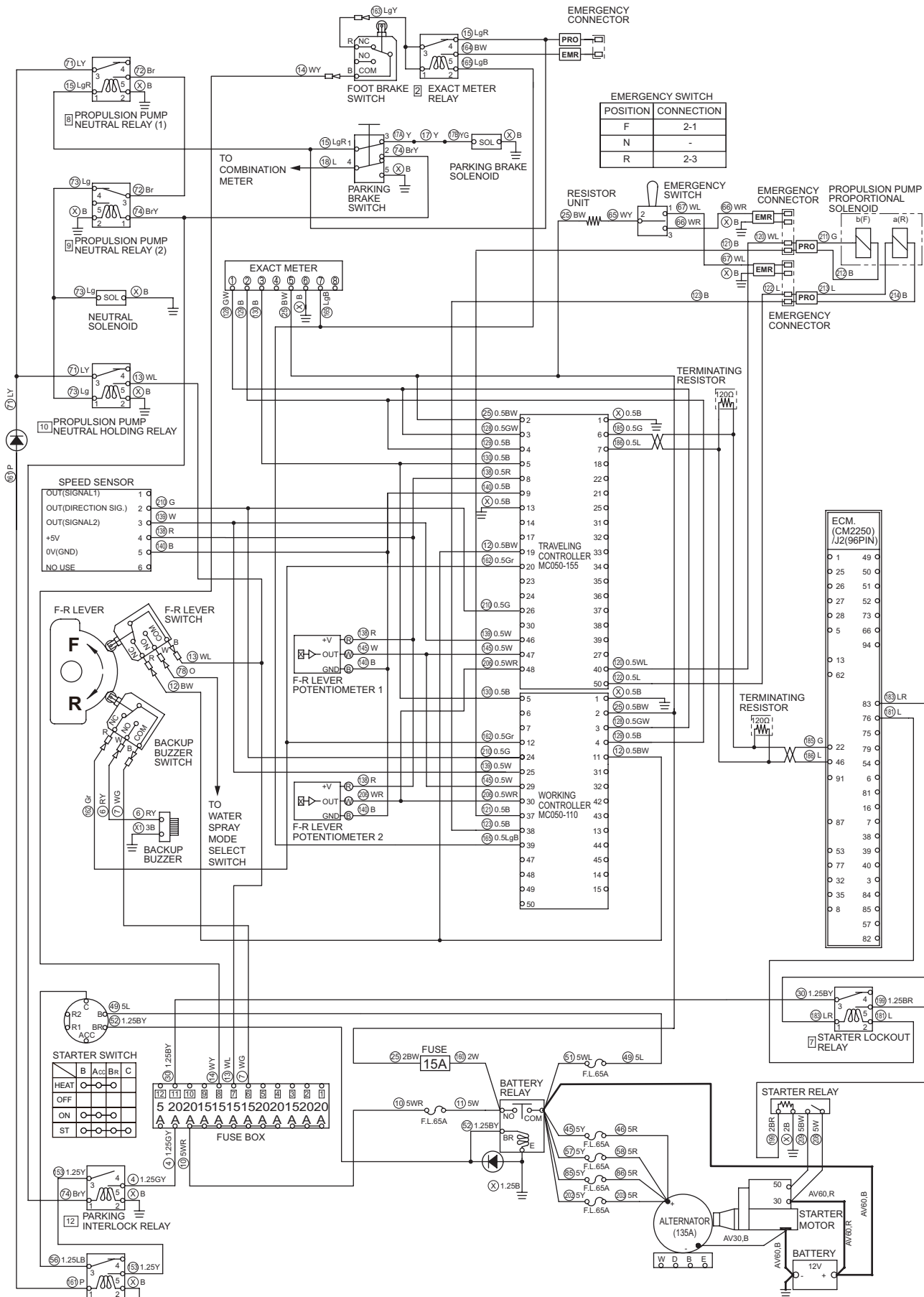
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E43	1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and traveling controller terminal wires.</li> <li>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Exact Meter	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between exact meter terminal 5 inlet wire BW and ground terminal 6 wire B.</li> <li>Standard voltage : 12 V or more</li> <li>• If voltage is abnormal, exact meter is faulty.</li> </ul>	Replace exact meter.
	4. CAN Communication	<ul style="list-style-type: none"> <li>• A normally operating traveling controller sends connection verification signals to exact meter every 0.1 second. Exact meter cannot receive connection verification signals that are regularly sent from traveling controller for 1 continuous second while operating.</li> <li>• Traveling controller is faulty.</li> </ul>	Replace traveling controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, set starter switch to ON.</li> <li>② Place F-R lever "N".</li> </ol> <p>Exact meter will display vehicle speed. Machine is in normal state.</p> <p>If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-4-1



## 2-5-1. Machine and engine suddenly stops 9/9

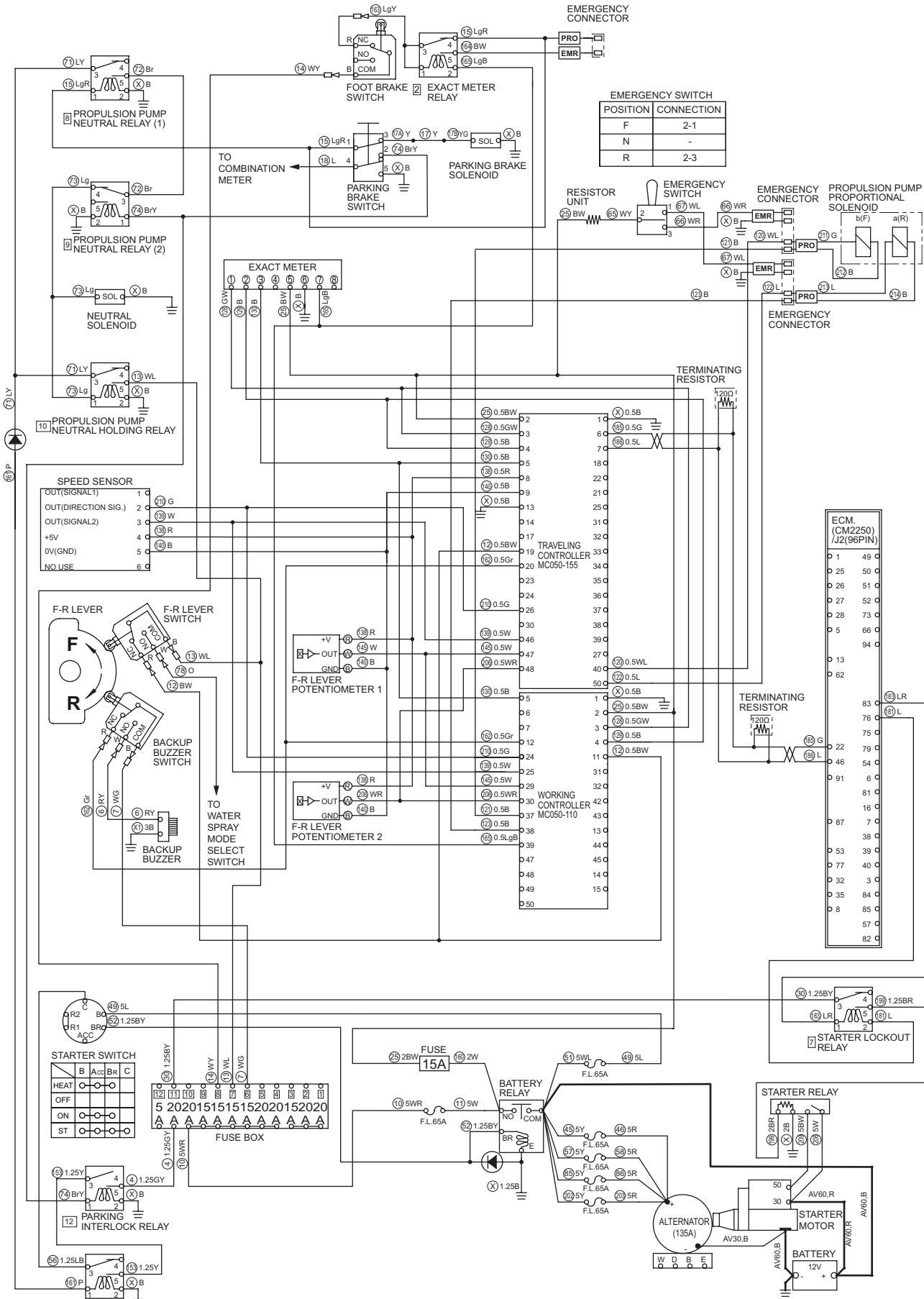
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E44, E45	1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 7 and working controller connector terminal 3, 4, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and working controller terminal wires.</li> <li>• Exact meter terminal 1 wire GW and working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and working controller terminal 4 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Working Controller	<p>(1) When starter switch is ON, measure voltage between working controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B.</p> <p>Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and (2) is NG, working controller is faulty.</li> </ul> <p>(2) When starter switch is ON, measure voltage between working controller terminal 39 inlet wire LgB and working controller ground terminal 1 wire B.</p> <p>Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) is OK and (2) is NG, working controller is faulty.</li> </ul>	Replace working controller.
	4. CAN Communication (E44 only)	<ul style="list-style-type: none"> <li>• A normally operating working controller sends connection verification signals to exact meter every 0.1 second. Exact meter cannot receive connection verification signals that are regularly sent from working controller for 1 continuous second while operating.</li> <li>• Working controller is faulty.</li> </ul>	Replace working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Place F-R lever "N".</p> <p>Exact meter will display vehicle speed. Machine is in normal state.</p> <p>If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-4-1





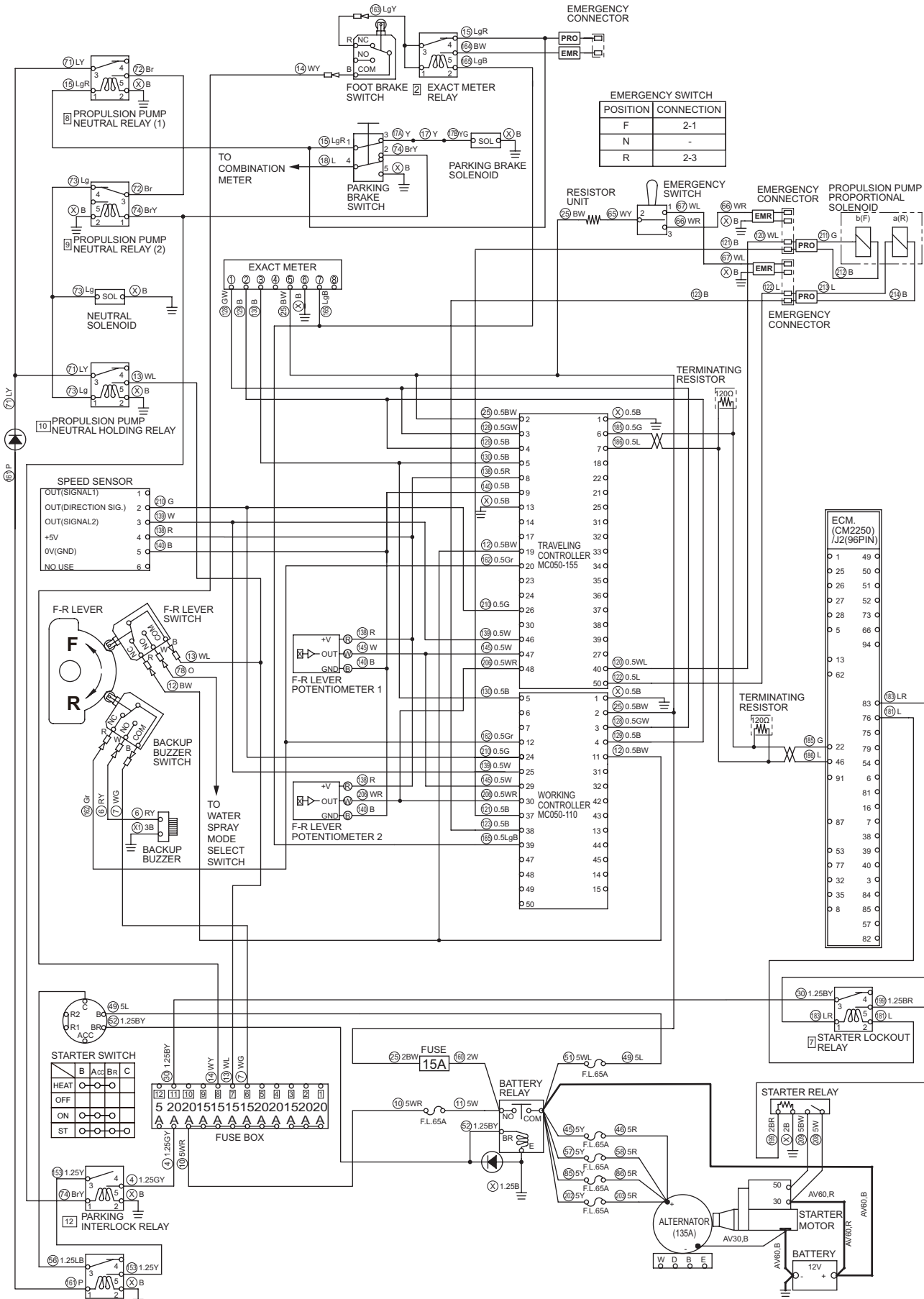
## 2-5-2. Machine and engine suddenly stops in automatic speed mode 1/2

- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.
- If error code E11 is displayed while running manual speed mode, machine will be movable regardless of the display.

### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E11	1. Connector	<ul style="list-style-type: none"> <li>• Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller connector terminal 24, 25 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between speed sensor and traveling controller terminal wires.               <ul style="list-style-type: none"> <li>• Speed sensor terminal 2 wire G and traveling controller terminal 26 wire G, working controller terminal 24 wire G</li> <li>• Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller terminal 25 wire W</li> <li>• Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R</li> <li>• Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B</li> </ul> </li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Speed Sensor	(1) When starter switch is ON, measure voltage between speed sensor terminal 4 inlet wire R and ground terminal 5 wire B. Standard voltage : 5 $\pm$ 0.25 V (2) Start engine and rotate vibratory drum. Measure pulse between speed sensor terminal 3 outlet wire W and ground terminal 5 wire B with a pulse meter. Standard pulse : 21 pulses/rotation <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, speed sensor is faulty.</li> </ul>	Replace speed sensor.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E11 is displayed and no abnormality is found in connector, harness and speed sensor in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	① When repair is complete, start engine. ② Exact meter will display E11. ③ Move F-R lever "F" or "R" and run machine. ④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1



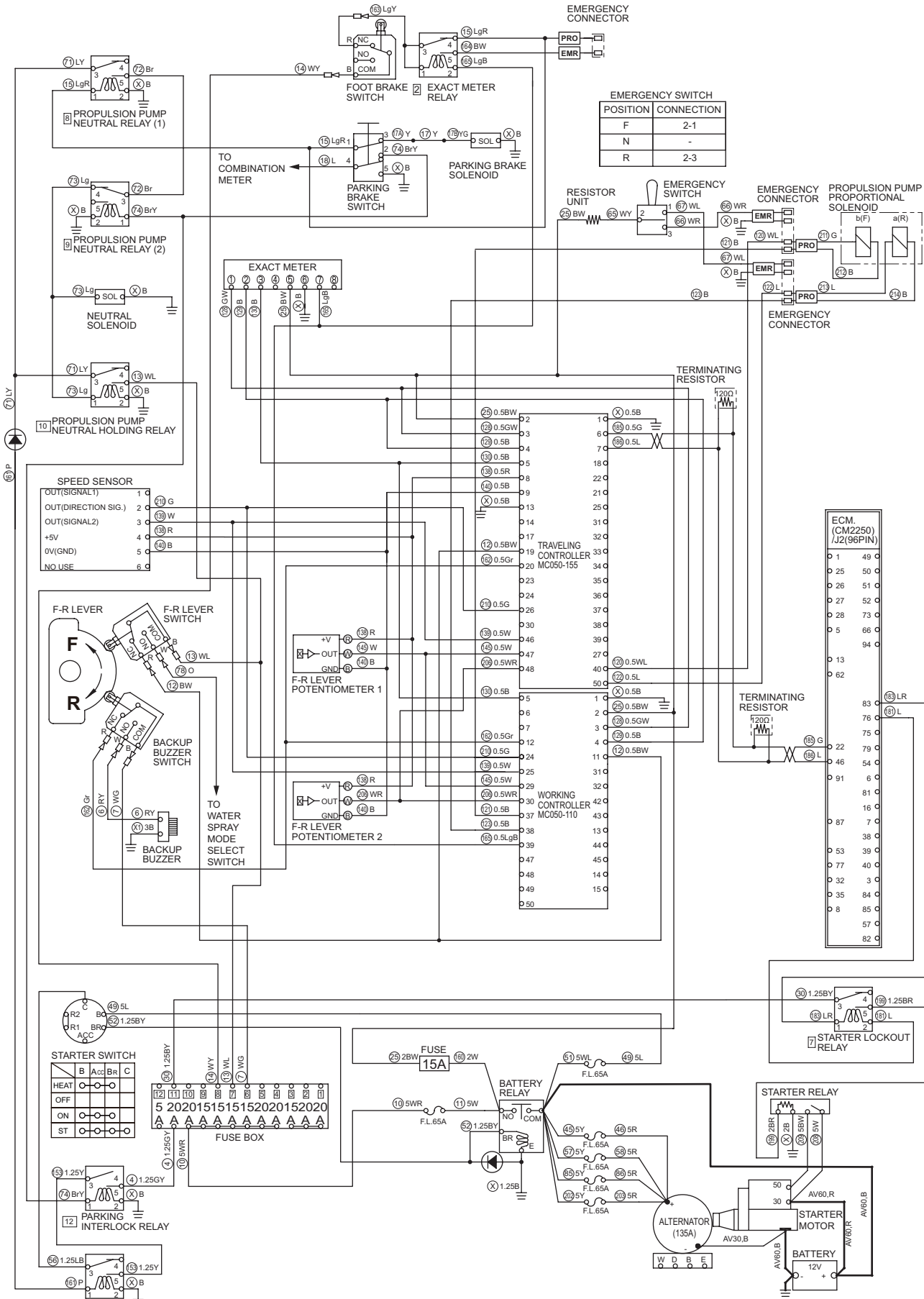
## 2-5-2. Machine and engine suddenly stops in automatic speed mode 2/2

- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.
- If error code E41 is displayed while running manual speed mode, machine will be movable but tachometer will not operate.

### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E41	1. Connector	<ul style="list-style-type: none"> <li>• Check engine ECM connector terminal 22, 46 and traveling controller connector terminal 6, 7 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between engine ECM and traveling controller terminal wires.</li> <li>• Engine ECM terminal 22 wire G and traveling controller terminal 6 wire G</li> <li>• Engine ECM terminal 46 wire L and traveling controller terminal 7 wire L</li> <li>Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Since shielded twist wires are used for traveling controller terminal harness, repair is not approved. Be sure to replace them.</b></li> </ul>	Replace harness.
	3. CAN Communication	<ul style="list-style-type: none"> <li>• Faulty CAN communication.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Check if any CAN-related blink code for engine is issued. If no blink code is issued, traveling controller is faulty.</b></li> </ul>	Replace traveling controller.
	4. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, set starter switch to ON.</li> <li>② Place F-R lever "N".</li> <li>③ Exact meter will display vehicle speed. Machine is in normal state.</li> </ol> <p>If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-4-1



EMERGENCY SWITCH

POSITION	CONNECTION
F	2-1
N	-
R	2-3

ECM (CM2250) / J2(96PIN)

1	48 C
25	50 C
26	51 C
27	52 C
28	73 C
73	3 C
66	6 C
94	0 C
13	13 C
62	0 C
83	15 LR
76	0 C
75	0 C
79	0 C
46	54 C
91	6 C
81	0 C
16	0 C
87	7 C
38	0 C
53	39 C
77	40 C
32	3 C
35	84 C
8	85 C
57	0 C
82	0 C

### 2-5-3. Machine moves neither forward nor backward 1/6

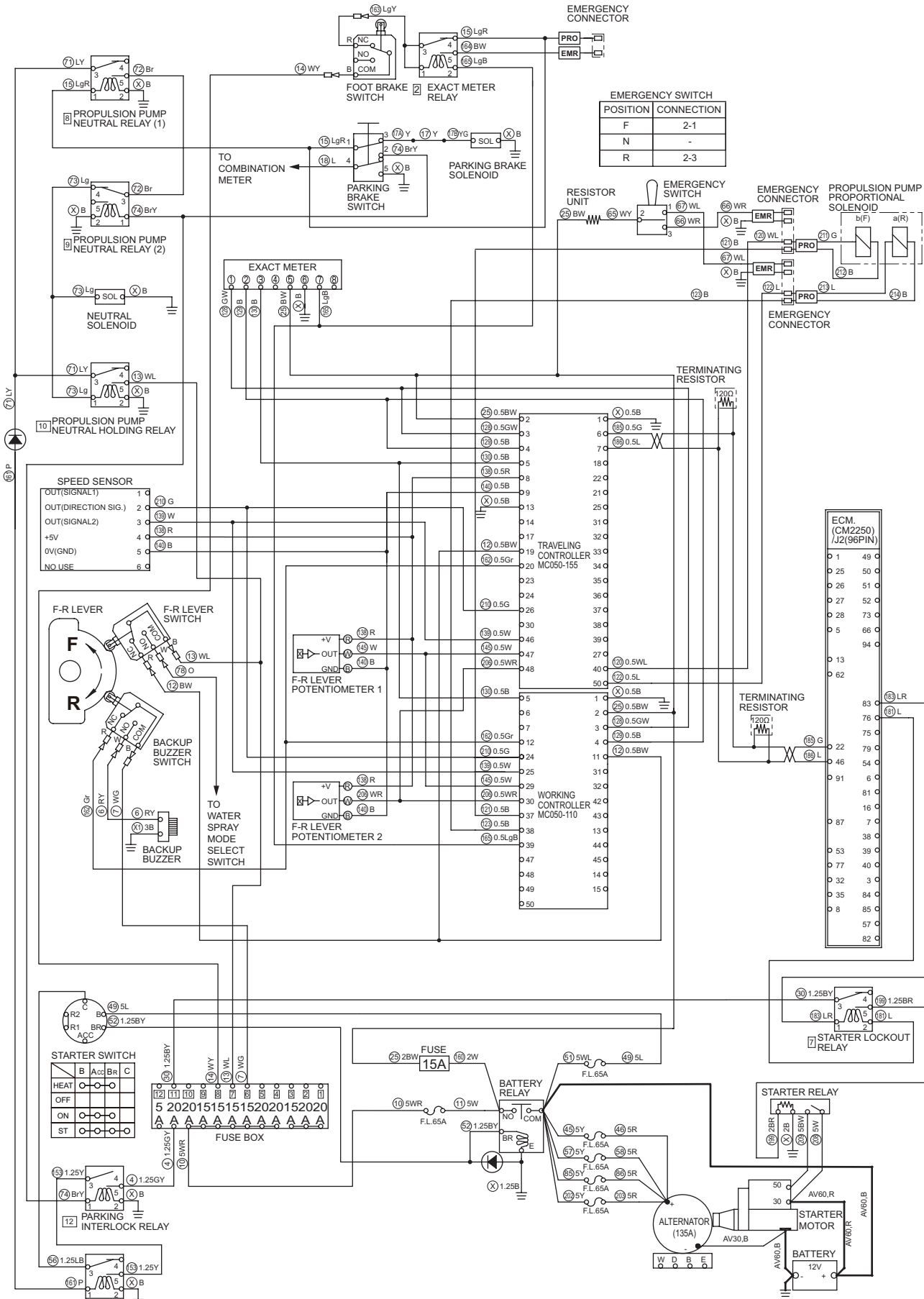
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

#### Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
Pon	1. Connector	<ul style="list-style-type: none"> <li>• Check F-R lever switch connector, backup buzzer switch connector and traveling controller connector terminal 19, 20, working controller connector terminal 11, 12 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistances between switches and traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• F-R lever switch terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW</li> <li>• Backup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller terminal 12 wire Gr</li> </ul> <p>Standard resistance : 10 Ω or less</p> <p>(2) Measure resistances between switches and fuse box terminal wires.</p> <ul style="list-style-type: none"> <li>• F-R lever switch terminal COM wire WL and fuse box terminal 7 wire WL</li> <li>• Backup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG</li> </ul> <p>Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. F-R lever switch	<ul style="list-style-type: none"> <li>• When starter switch is OFF and F-R lever is "N", check continuity between F-R lever switch terminal COM and terminal NC.</li> </ul> <p>There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If there is no continuity, F-R lever switch is faulty.</li> </ul>	Replace F-R lever switch.
	4. Backup buzzer switch	<ul style="list-style-type: none"> <li>• When starter switch is OFF and F-R lever is "N", check continuity between backup buzzer switch terminal COM and terminal NC.</li> </ul> <p>There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If there is no continuity, backup buzzer switch is faulty.</li> </ul>	Replace backup buzzer switch.
	5. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code Pon is displayed and no abnormality is found in connector, harness, F-R lever switch and backup buzzer switch in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/working controller.
	6. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, place F-R lever "F" or "N".</li> <li>② Set starter switch to ON.</li> <li>③ When F-R lever is "F" or "N", traveling/working controller cannot be initialized. Exact meter will continuously display Pon.</li> <li>④ Return F-R lever to "N".</li> <li>⑤ When traveling/working controller initialization is completed, display will change from Pon to vehicle speed. Machine is in normal state.</li> </ol>	

Fig.: 2-4-1



**2-5-3. Machine moves neither forward nor backward 2/6**

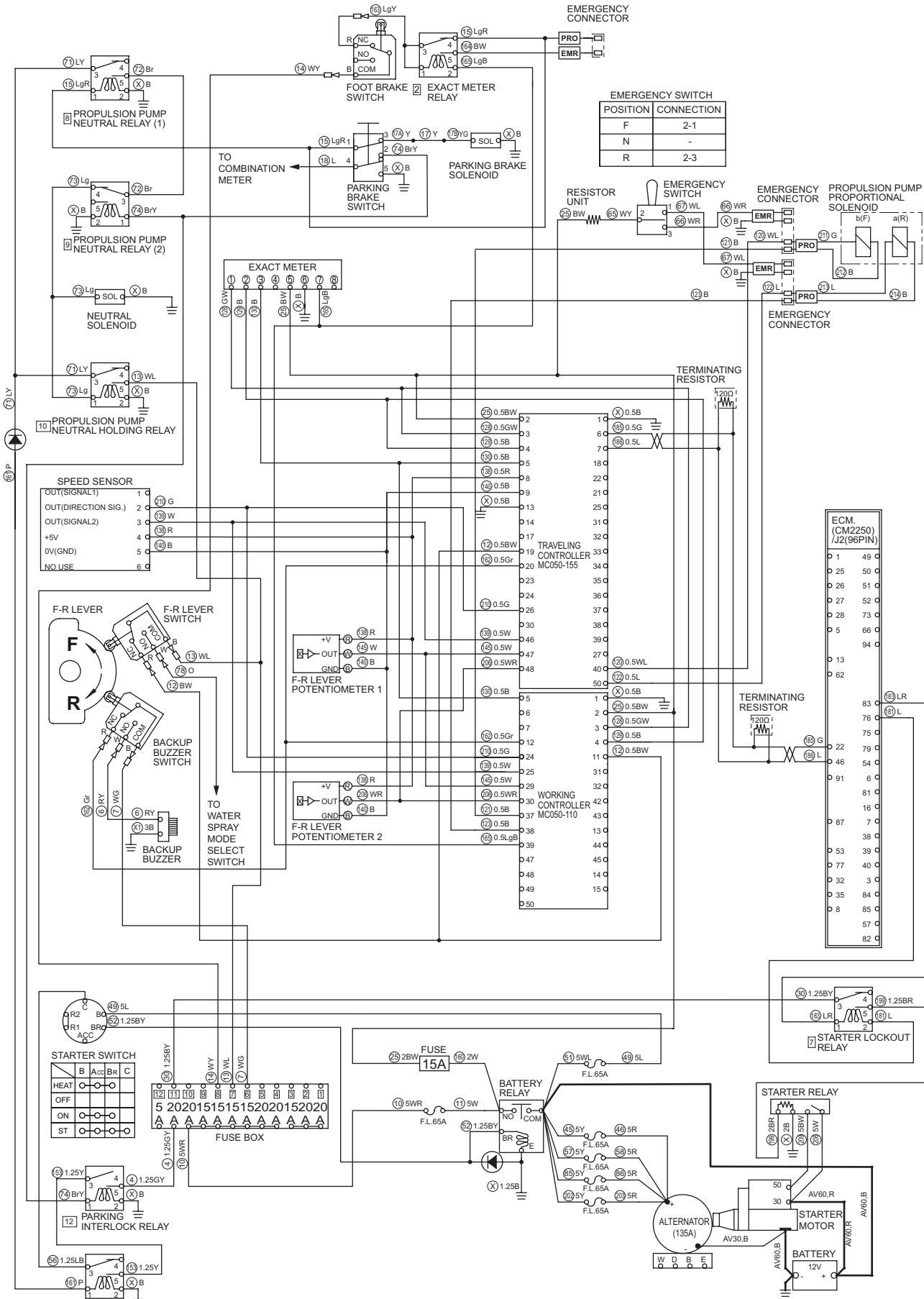
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E03	1. Connector	<ul style="list-style-type: none"> <li>• Check F-R lever switch connector and traveling controller connector terminal 19, working controller connector terminal 11 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistance between F-R lever switch connector terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW. Standard resistance : 10 Ω or less</p> <p>(2) Measure resistance between F-R lever switch connector terminal COM wire WL and fuse box terminal 7 wire WL. Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. F-R lever switch	<p>(1) When starter switch is OFF and F-R lever is "N", check continuity between F-R lever switch terminal COM and terminal NC. There is continuity in normal condition.</p> <p>(2) When starter switch is OFF and F-R lever is "F", check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, F-R lever switch is faulty.</li> </ul>	Replace F-R lever switch.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E03 is displayed and no abnormality is found in connector, harness and F-R lever switch in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Exact meter will display E03.</p> <p>③ Move F-R lever in "F". Exact meter display will change from E03 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again.</p> <p>④ Return F-R lever to "N". Machine is in normal state.</p>	

Fig.: 2-4-1





**2-5-3. Machine moves neither forward nor backward 3/6**

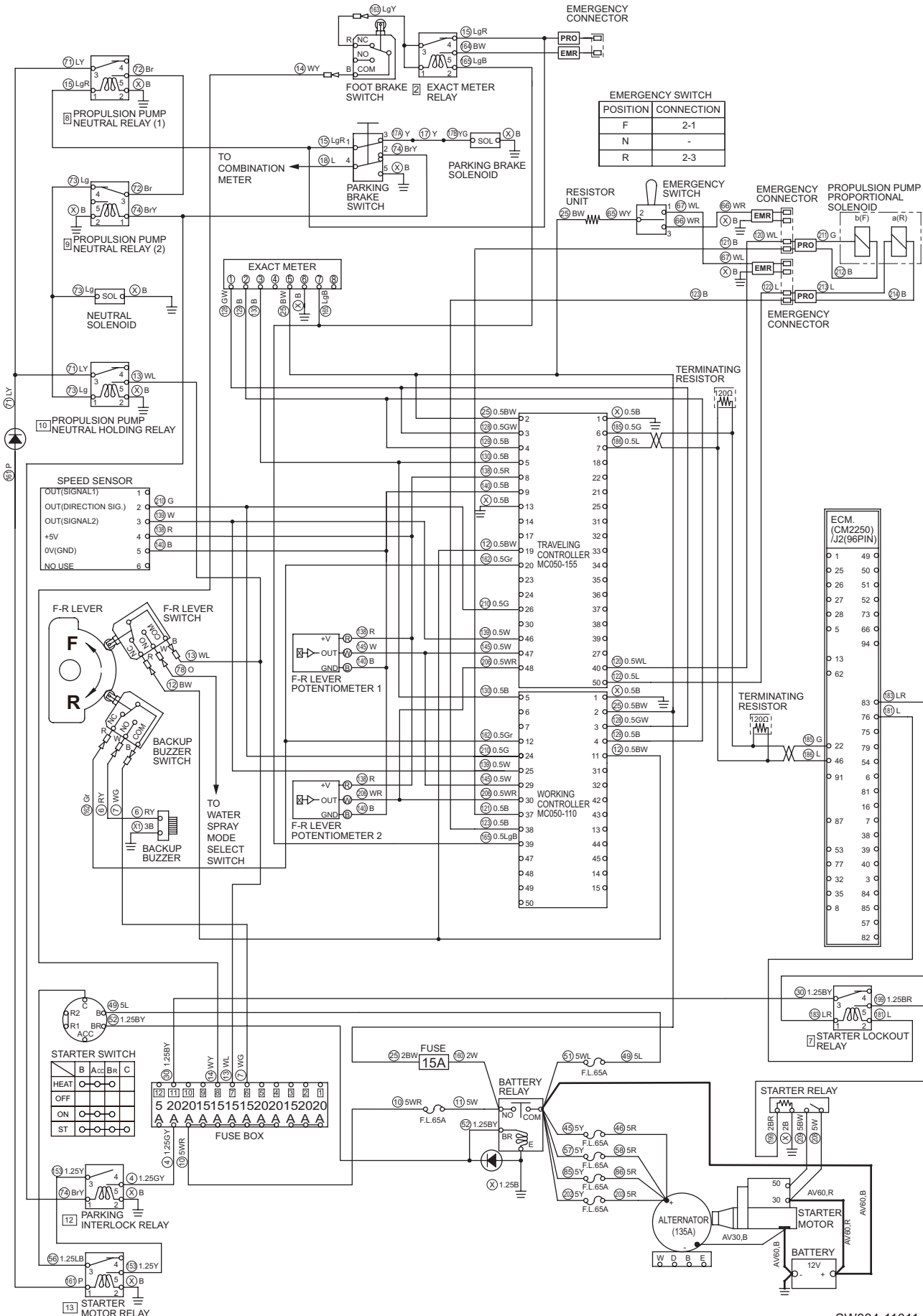
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E06	1. Connector	<ul style="list-style-type: none"> <li>• Check backup buzzer switch connector and traveling controller connector terminal 20, working controller connector terminal 12 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistance between backup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr. Standard resistance : 10 Ω or less</p> <p>(2) Measure resistance between backup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG. Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Backup buzzer switch	<p>(1) When starter switch is OFF and F-R lever is "N", check continuity between backup buzzer switch terminal COM and terminal NC. There is continuity in normal condition.</p> <p>(2) When starter switch is OFF and F-R lever is "F", check continuity between backup buzzer switch terminal COM and terminal NC. There is no continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, backup buzzer switch is faulty.</li> </ul>	Replace backup buzzer switch.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E06 is displayed and no abnormality is found in connector, harness and backup buzzer switch in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/ working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Exact meter will display E06.</p> <p>③ Move F-R lever in "R". Exact meter display will change from E06 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again.</p> <p>④ Return F-R lever to "N". Machine is in normal state.</p>	

Fig.: 2-4-1



**2-5-3. Machine moves neither forward nor backward 4/6**

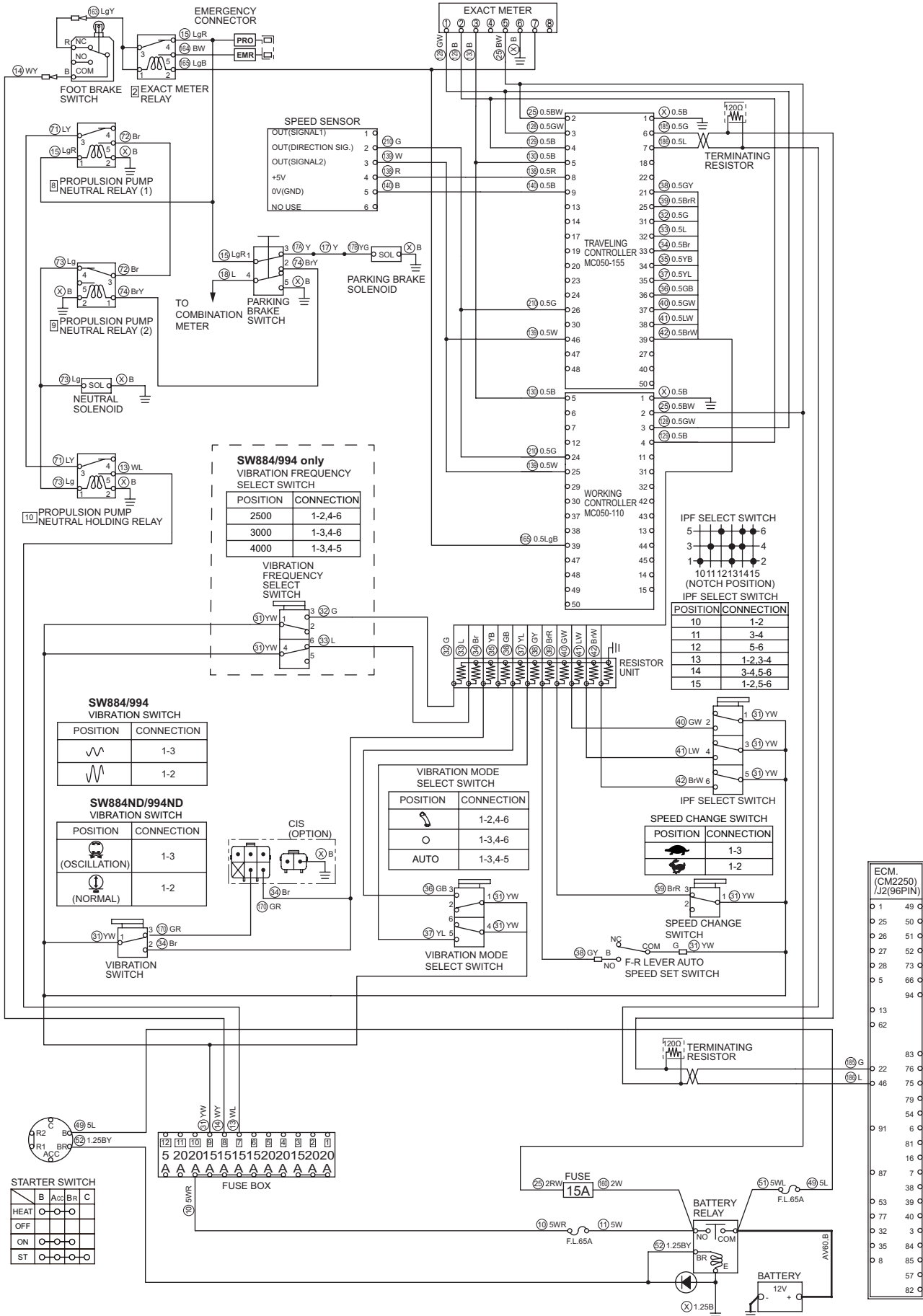
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-4-1**

Error code	Check point	Check/Cause	Action
E43	1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and traveling controller terminal wires.</li> <li>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> </ul> <p style="text-align: center;">Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Exact Meter	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between exact meter terminal 5 inlet wire BW and ground terminal 6 wire B.</li> </ul> <p style="text-align: center;">Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If voltage is abnormal, exact meter is faulty.</li> </ul>	Replace exact meter.
	4. CAN Communication	<ul style="list-style-type: none"> <li>• A normally operating exact meter sends connection verification signals to traveling/working controller every 0.1 second. Traveling/working controller could not receive connection verification signals that were regularly sent from exact meter for 1 continuous second.</li> <li>• Exact meter on transmission side or traveling/working controller is faulty.</li> </ul>	Replace exact meter or traveling/working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Place F-R lever in "N".</p> <p>Exact meter will display vehicle speed. Machine is in normal state.</p> <p>If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-5-1



**2-5-3. Machine moves neither forward nor backward 5/6**

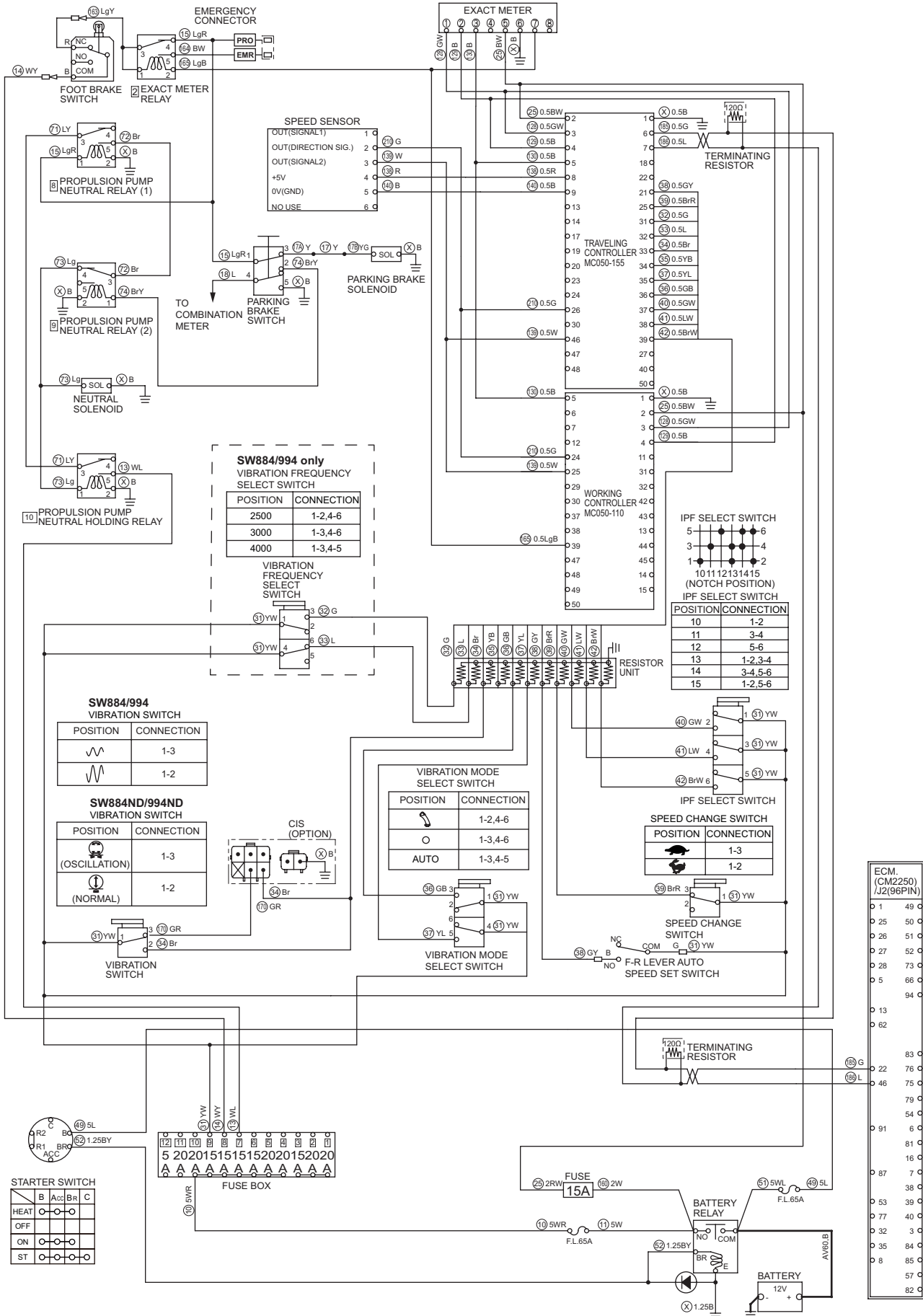
- F-R lever must be in "N".
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig.: 2-5-1**

Check point	Check/Cause	Action
1. Neutral Solenoid	<ul style="list-style-type: none"> <li>• Disconnect harness and measure resistance of coil. Standard resistance : 12.3 Ω</li> <li>• If resistance is abnormal, neutral solenoid is faulty.</li> </ul>	Replace neutral solenoid.
2. <b>8</b> Propulsion Pump Neutral Relay (1)	<p>(1) When starter switch is ON, measure voltage between propulsion pump neutral relay (1) terminal 1 inlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between propulsion pump neutral relay (1) terminal 3 inlet wire LY and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between propulsion pump neutral relay (1) terminal 5 outlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, propulsion pump neutral relay (1) is faulty.</li> </ul>	Replace propulsion pump neutral relay (1).
3. <b>9</b> Propulsion Pump Neutral Relay (2)	<p>(1) When starter switch is ON, measure voltage between propulsion pump neutral relay (2) terminal 1 inlet wire BrY and chassis ground. There is no current in normal condition.</p> <p>(2) When starter switch is ON, measure voltage between propulsion pump neutral relay (2) terminal 3 inlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between propulsion pump neutral relay (2) terminal 4 outlet wire Lg and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, propulsion pump neutral relay (2) is faulty.</li> </ul>	Replace propulsion pump neutral relay (2).
4. <b>10</b> Propulsion Pump Neutral Holding Relay	<p>(1) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 1 inlet wire Lg and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 5 inlet wire WL and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 3 outlet wire LY and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, propulsion pump neutral relay (2) is faulty.</li> </ul>	Replace propulsion pump neutral holding relay.

Fig.: 2-5-1



**2-5-3. Machine moves neither forward nor backward 6/6**

- F-R lever must be in "N".
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

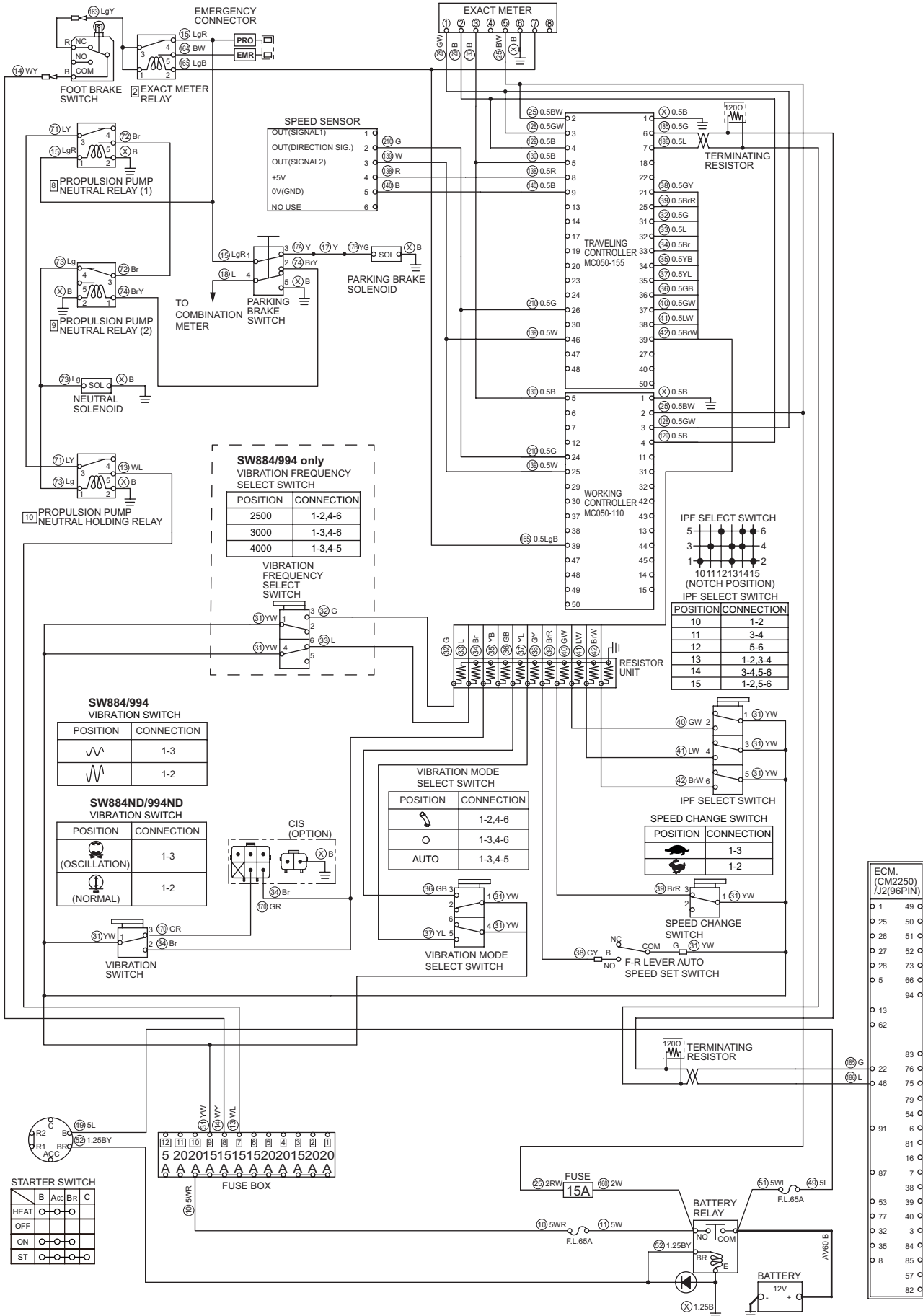
**Reference Fig.: 2-5-1**

Check point	Check/Cause	Action
5. Exact Meter (CAN Communication)	<ul style="list-style-type: none"> <li>• A normally operating exact meter sends connection verification signals to traveling/working controller every 0.1 second. Traveling/working controller could not receive connection verification signals that were regularly sent from exact meter for 1 continuous second.</li> <li>• Exact meter on transmission side or traveling/working controller is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>See check procedures for error code E43.</b></li> </ul>	Replace exact meter or traveling/working controller.
6. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

**(NOTICE)**

- If standard voltage cannot be measured with terminals of neutral relay (1), (2) and neutral holding relay, in particular, check relevant harness.

Fig.: 2-5-1





## 2-5-4. Machine speed cannot be changed

- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).

### Reference Fig.: 2-5-1




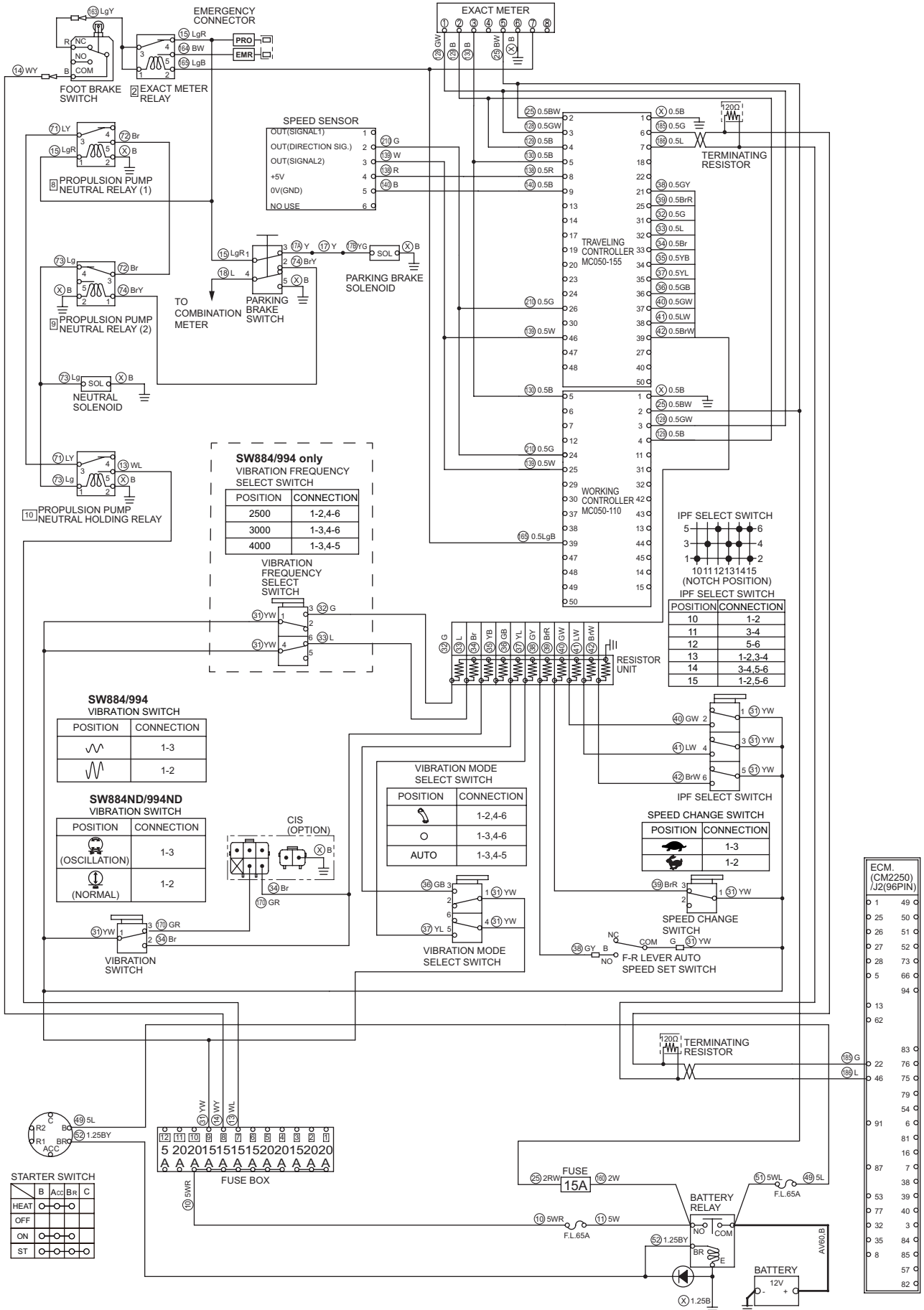




Check point	Check/Cause	Action
1. Speed Change Switch	<p>(1) When starter switch is ON, measure voltage between speed change switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and speed change switch is “”, measure voltage between speed change switch terminal 3 outlet wire BrR and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and speed change switch is “”, measure voltage between speed change switch terminal 3 outlet wire BrR and chassis ground. There is no electricity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) or (3) is NG, speed change switch is faulty.</li> </ul>	Replace speed change switch.
2. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistance between resistor unit wire No. 39 wire BrR and ground wire. Standard resistance : 300 Ω</li> <li>• If resistance is abnormal, resistor unit is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Resistor unit is used to stabilize contact of switch.</b></li> </ul>	Replace resistor unit.
3. Traveling Controller	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and speed change switch is “”, measure voltage between traveling controller terminal 25 inlet wire BrR and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If items (1) and (2) are OK, traveling controller is faulty.</li> </ul>	Replace traveling controller.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-5-1



### 2-5-5. Auto speed function does not work 1/10

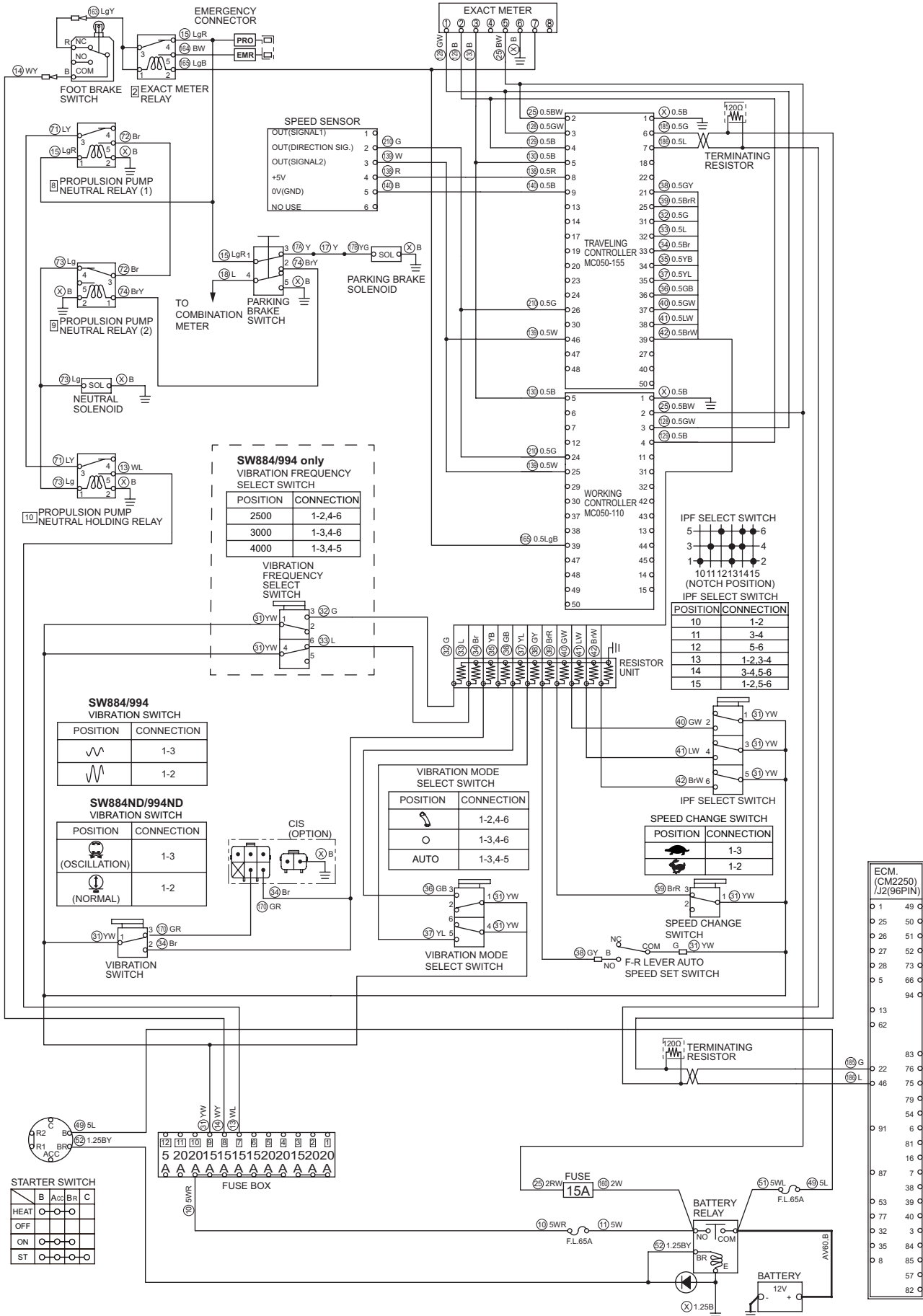
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
- Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
- Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code





#### Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E11	1. Connector	<ul style="list-style-type: none"> <li>• Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller connector terminal 24, 25 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between speed sensor and traveling/working controller terminal wires.</li> <li>• Speed sensor terminal 2 wire G and traveling controller terminal 26 wire G, working controller terminal 24 wire G</li> <li>• Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller terminal 25 wire W</li> <li>• Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R</li> <li>• Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B</li> <li>Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Speed Sensor	<p>(1) When starter switch is ON, measure voltage between speed sensor terminal 4 inlet wire R and ground terminal 5 wire B. Standard voltage : <math>5 \pm 0.25</math> V</p> <p>(2) Start engine and rotate vibratory drum. Measure pulse between speed sensor terminal 3 outlet wire W and ground terminal 5 wire B with a pulse meter. Standard pulse : 21 pulses/rotation</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, speed sensor is faulty.</li> </ul>	Replace speed sensor.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E11 is displayed and no abnormality is found in connector, harness and speed sensor in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/ working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, start engine.</li> <li>② Exact meter will display E11.</li> <li>③ Move F-R lever “F” or “R” and run machine.</li> <li>④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.</li> </ol>	

Fig.: 2-5-1



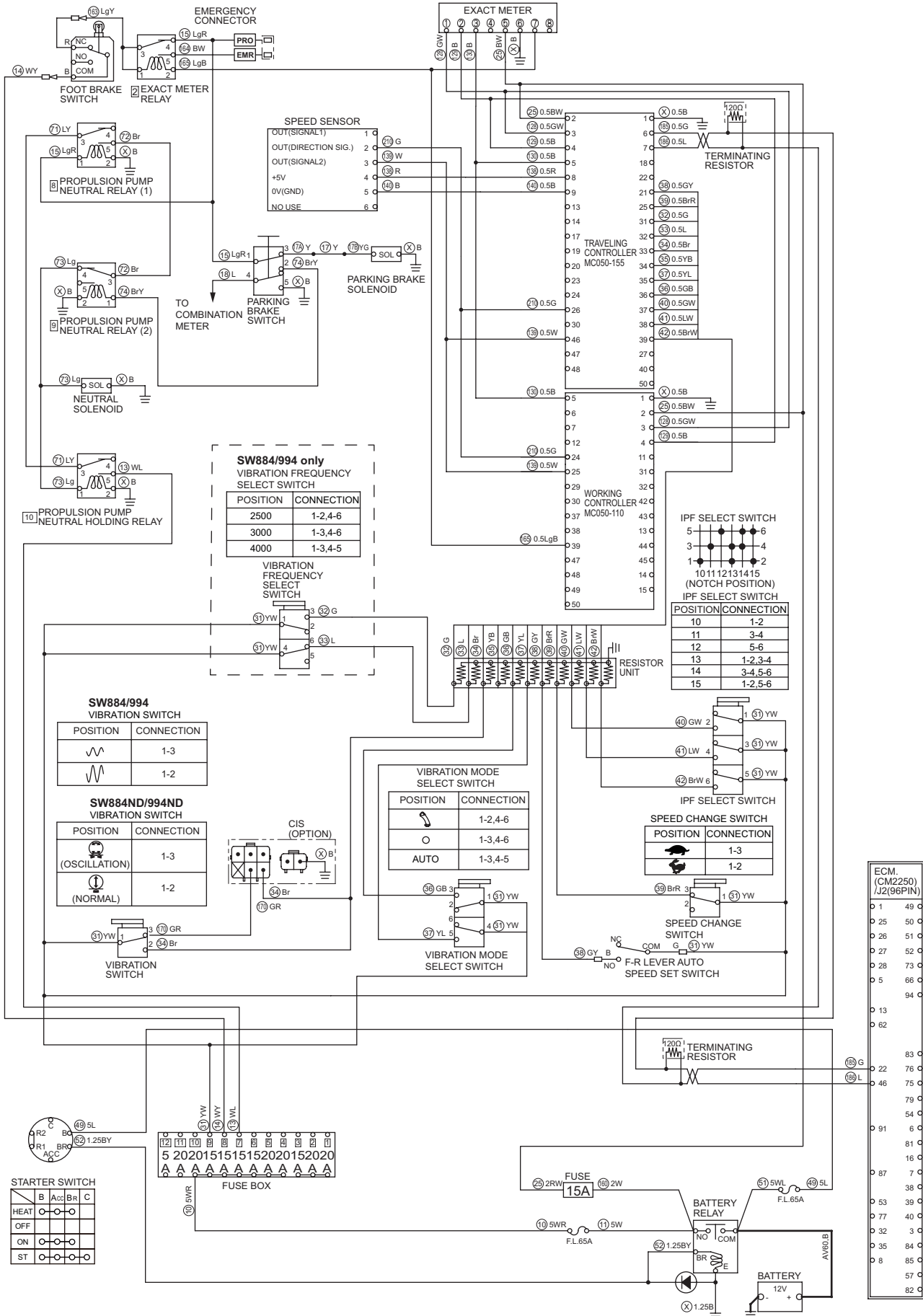
## 2-5-5. Auto speed function does not work 2/10

- Parking brake switch must be released.
  - Foot brake switch must be ON (Brake pedal is not depressed).
  - Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
  - Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
  - Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
  - Check whether exact meter multiple display shows any error code.
- 1) When display shows any error code





### Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E21	1. Connector	<ul style="list-style-type: none"> <li>• Check vibration frequency select switch, vibration switch and traveling controller connector terminal 31, 32, 33 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistances between switches and traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• Vibration frequency select switch terminal 3 wire G and traveling controller terminal 31 wire G</li> <li>• Vibration frequency select switch terminal 6 wire L and traveling controller terminal 32 wire L</li> <li>• Vibration switch terminal 2 wire Br and traveling controller terminal 33 wire Br Standard resistance : 10 Ω or less</li> </ul> <p>(2) Measure resistances between switches and fuse box terminal wires.</p> <ul style="list-style-type: none"> <li>• Vibration frequency select switch terminal 1, 4 wires YW and fuse box terminal 9 wire YW</li> <li>• Vibration switch terminal 1 wire YW and fuse box terminal 9 wire YW Standard resistance : 10 Ω or less</li> </ul> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Vibration Frequency Select Switch (SW884/994 only)	<p>(1) When starter switch is ON, measure voltage between vibration frequency select switch terminal 1, 4 inlet wires YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between vibration frequency select switch terminal 6 outlet wire L and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between vibration frequency select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Vibration frequency select switch terminal 3 outlet wire G and chassis ground</li> <li>• Vibration frequency select switch terminal 6 outlet wire L and chassis ground Standard voltage : 12 V or more</li> </ul> <p>(4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between vibration frequency select switch terminal 3 outlet wire G and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2), (3) or (4) is NG, vibration frequency select switch is faulty.</li> </ul>	Replace vibration frequency select switch.

Fig.: 2-5-1



### 2-5-5. Auto speed function does not work 3/10

- Parking brake switch must be released.
  - Foot brake switch must be ON (Brake pedal is not depressed).
  - Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
  - Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
  - Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
  - Check whether exact meter multiple display shows any error code.
- 1) When display shows any error code

#### Reference Fig.: 2-5-1





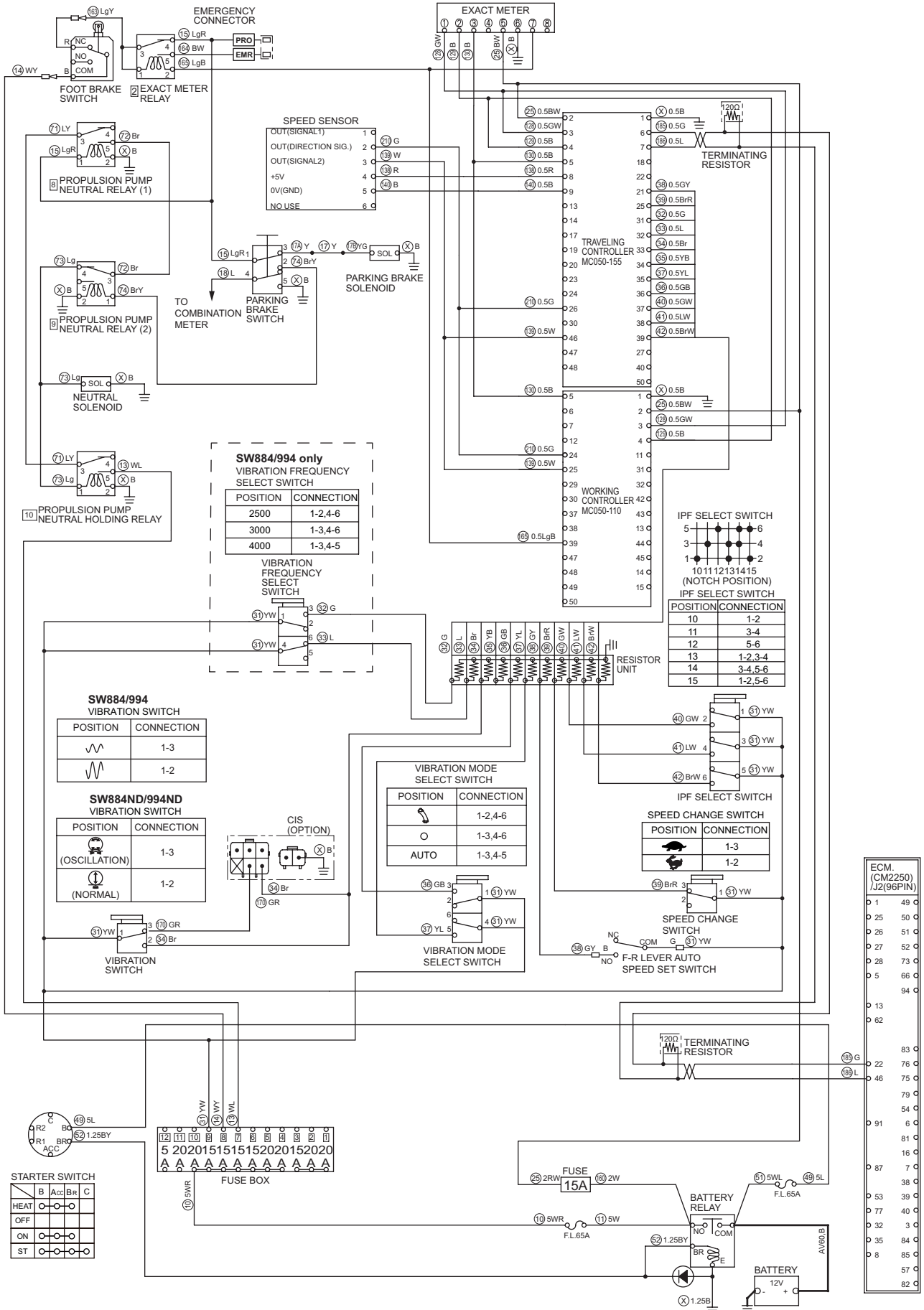




Error code	Check point	Check/Cause	Action
E21	4. Vibration Switch (SW884/994)	<p>(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 3 outlet wire GR and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <p>• If above item (1) is OK and item (2) or (3) is NG, vibration switch is faulty.</p>	Replace vibration switch.
	5. Vibration Switch (SW884ND/994ND)	<p>(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 3 outlet wire GR and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <p>• If above item (1) is OK and item (2) or (3) is NG, vibration switch is faulty.</p>	Replace vibration switch.
	6. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistances between resistor unit wires and ground wire.</li> <li>• Resistor unit wire No. 32 wire G and ground wire (SW884/994 only)</li> <li>• Resistor unit wire No. 33 wire L and ground wire (SW884/994 only)</li> <li>• Resistor unit wire No. 34 wire Br and ground wire Standard resistance : 300 Ω</li> <li>• If resistance is abnormal, resistor unit is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• Resistor unit is used to stabilize contact of switch.</li> </ul>	Replace resistor unit.

Fig.: 2-5-1





### 2-5-5. Auto speed function does not work 4/10

- Parking brake switch must be released.
  - Foot brake switch must be ON (Brake pedal is not depressed).
  - Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
  - Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
  - Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
  - Check whether exact meter multiple display shows any error code.
- 1) When display shows any error code

#### Reference Fig.: 2-5-1


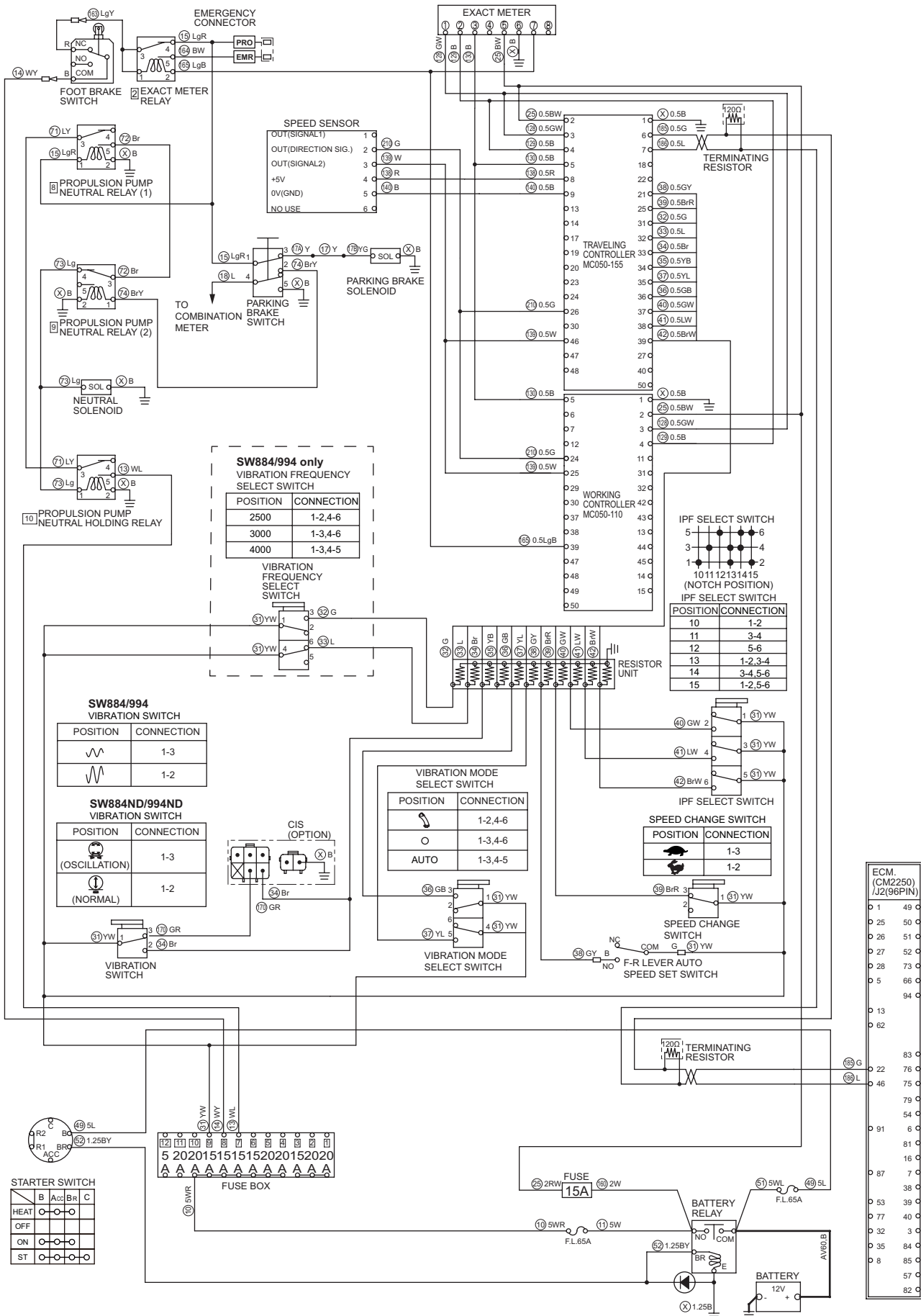




Error code	Check point	Check/Cause	Action
E21	7. Traveling Controller (SW884/994)	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between traveling controller terminal 32 inlet wire L and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• Traveling controller terminal 31 inlet wire G and ground terminal 1 wire B</li> <li>• Traveling controller terminal 32 inlet wire L and ground terminal 1 wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between traveling controller terminal 31 inlet wire G and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(5) When starter switch is ON and vibration switch is “”, measure voltage between traveling controller terminal 33 inlet wire Br and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1), (2), (3), (4) and (5) are OK, traveling controller is faulty.</li> </ul>	Replace traveling controller.

Fig.: 2-5-1



### 2-5-5. Auto speed function does not work 5/10

- Parking brake switch must be released.
  - Foot brake switch must be ON (Brake pedal is not depressed).
  - Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
  - Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
  - Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
  - Check whether exact meter multiple display shows any error code.
- 1) When display shows any error code

#### Reference Fig.: 2-5-1


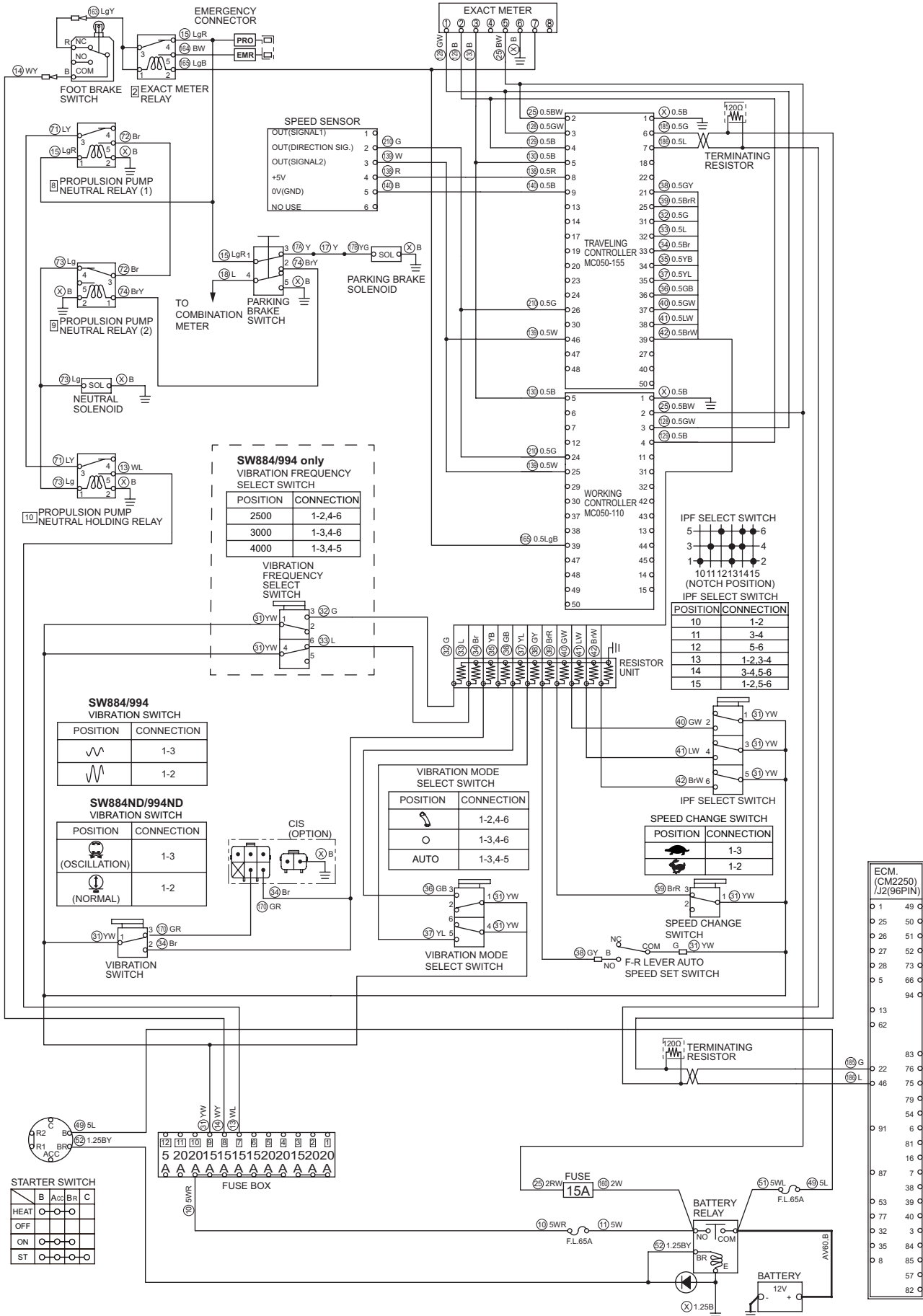




Error code	Check point	Check/Cause	Action
E21	8. Traveling Controller (SW884ND/994ND)	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and vibration switch is “  ”, measure voltage between traveling controller terminal 33 inlet wire Br and ground terminal 1 wire B. Standard voltage : 12 V or more • If above items (1) and (2) are OK, traveling controller is faulty.	Replace traveling controller.
	9. Clearing Error Code and Judging OK/NG after Repair	① When repair is complete, set starter switch to ON. ② Exact meter will display vehicle speed. ③ Check all combinations of vibration frequency select switch and vibration switch positions. Exact meter will still display vehicle speed. Machine is in normal state. If display changes form vehicle speed to E21, check above items again.	

Fig.: 2-5-1



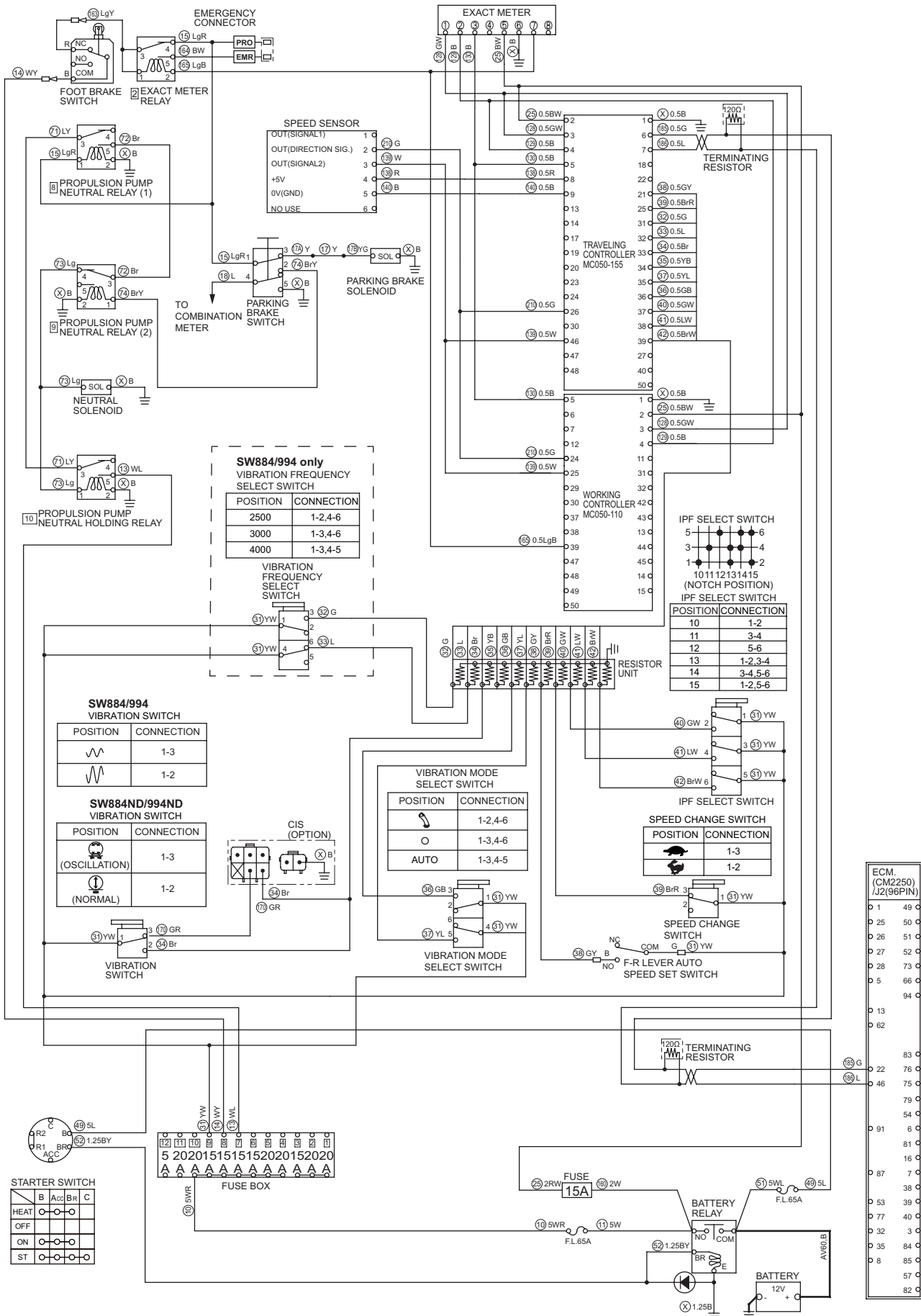
### 2-5-5. Auto speed function does not work 6/10

- Parking brake switch must be released.
  - Foot brake switch must be ON (Brake pedal is not depressed).
  - Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
  - Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
  - Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
  - Check whether exact meter multiple display shows any error code.
- 1) When display shows any error code





#### Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E22	1. Connector	<ul style="list-style-type: none"> <li>• Check IPF select switch connector and traveling controller connector terminal 37, 38, 39 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistances between IPF select switch and traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• IPF select switch terminal 2 wire GW and traveling controller terminal 37 wire GW</li> <li>• IPF select switch terminal 4 wire LW and traveling controller terminal 38 wire LW</li> <li>• IPF select switch terminal 6 wire BrW and traveling controller terminal 39 wire BrW</li> </ul> <p style="padding-left: 20px;">Standard resistance : 10 Ω or less</p> <p>(2) Measure resistances between IPF select switch terminal 1, 3, 5 wires YW and fuse box terminal 9 wire YW.</p> <p style="padding-left: 20px;">Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-5-1



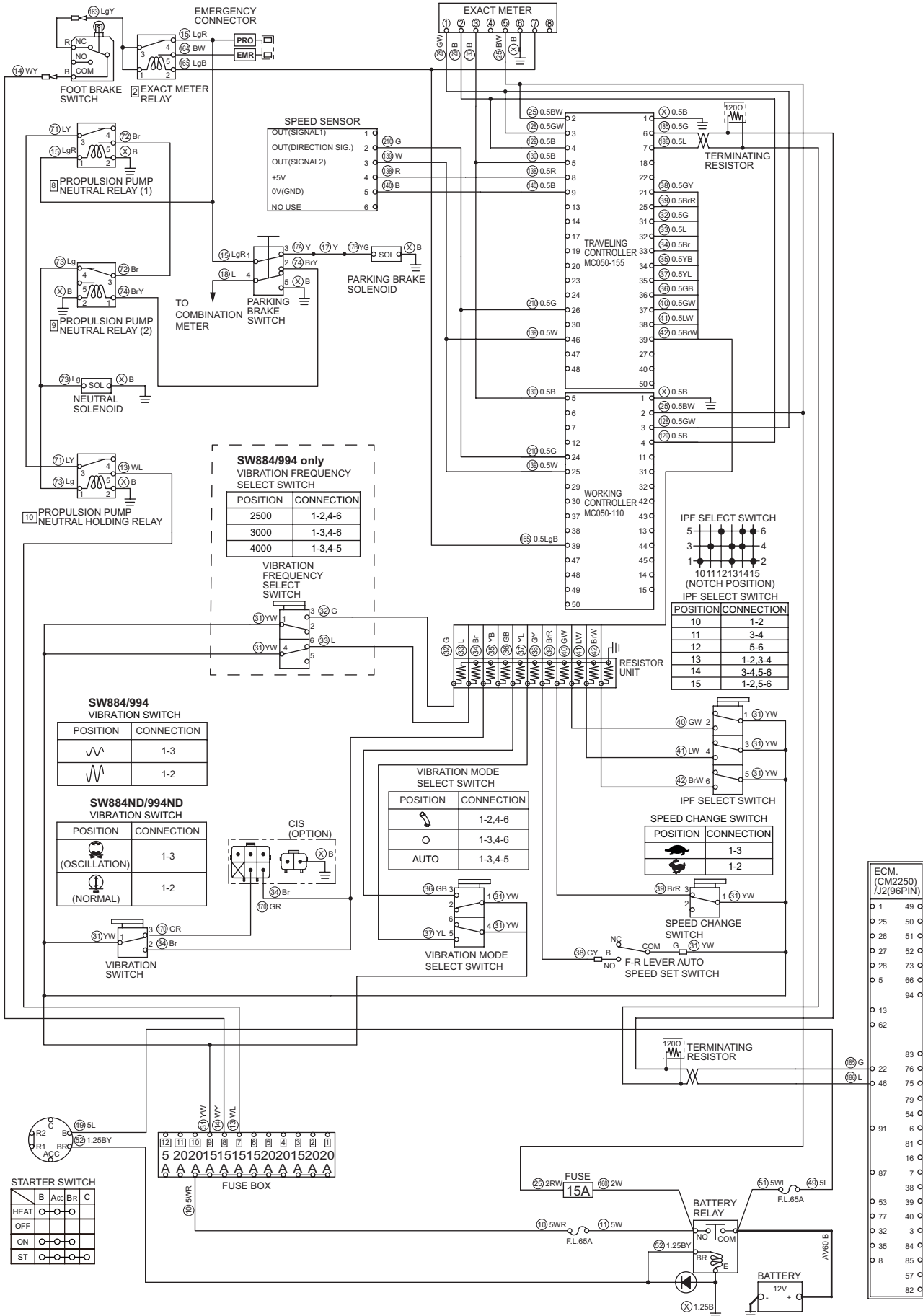
### 2-5-5. Auto speed function does not work 7/10

- Parking brake switch must be released.
  - Foot brake switch must be ON (Brake pedal is not depressed).
  - Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
  - Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
  - Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
  - Check whether exact meter multiple display shows any error code.
- 1) When display shows any error code

#### Reference Fig.: 2-5-1





Error code	Check point	Check/Cause	Action
E22	3. IPF Select Switch	<p>(1) When starter switch is ON, measure voltage between IPF select switch terminal 1, 3, 5 inlet wires YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and IPF select switch is “10”, measure voltage between IPF select switch terminal 2 outlet wire GW and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and IPF select switch is “11”, measure voltage between IPF select switch terminal 4 outlet wire LW and chassis ground. Standard voltage : 12 V or more</p> <p>(4) When starter switch is ON and IPF select switch is “12”, measure voltage between IPF select switch terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more</p> <p>(5) When starter switch is ON and IPF select switch is “13”, measure voltage between IPF select switch terminal 2 outlet wire GW, terminal 4 outlet wire LW and chassis ground. Standard voltage : 12 V or more</p> <p>(6) When starter switch is ON and IPF select switch is “14”, measure voltage between IPF select switch terminal 4 outlet wire LW, terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more</p> <p>(7) When starter switch is ON and IPF select switch is “15”, measure voltage between IPF select switch terminal 2 outlet wire GW, terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more</p> <p>• If above item (1) is OK and any of items (2) through (7) is NG, IPF select switch is faulty.</p>	Replace IPF select switch.
	4. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistances between resistor unit wires and ground wire. <ul style="list-style-type: none"> <li>• Resistor unit wire No.40 wire GW and ground wire</li> <li>• Resistor unit wire No.41 wire LW and ground wire</li> <li>• Resistor unit wire No.42 wire BrW and ground wire</li> </ul> </li> <li>Standard resistance : 300 Ω</li> <li>• If resistance is abnormal, resistor unit is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• Resistor unit is used to stabilize contact of switch.</li> </ul>	Replace resistor unit.

Fig.: 2-5-1





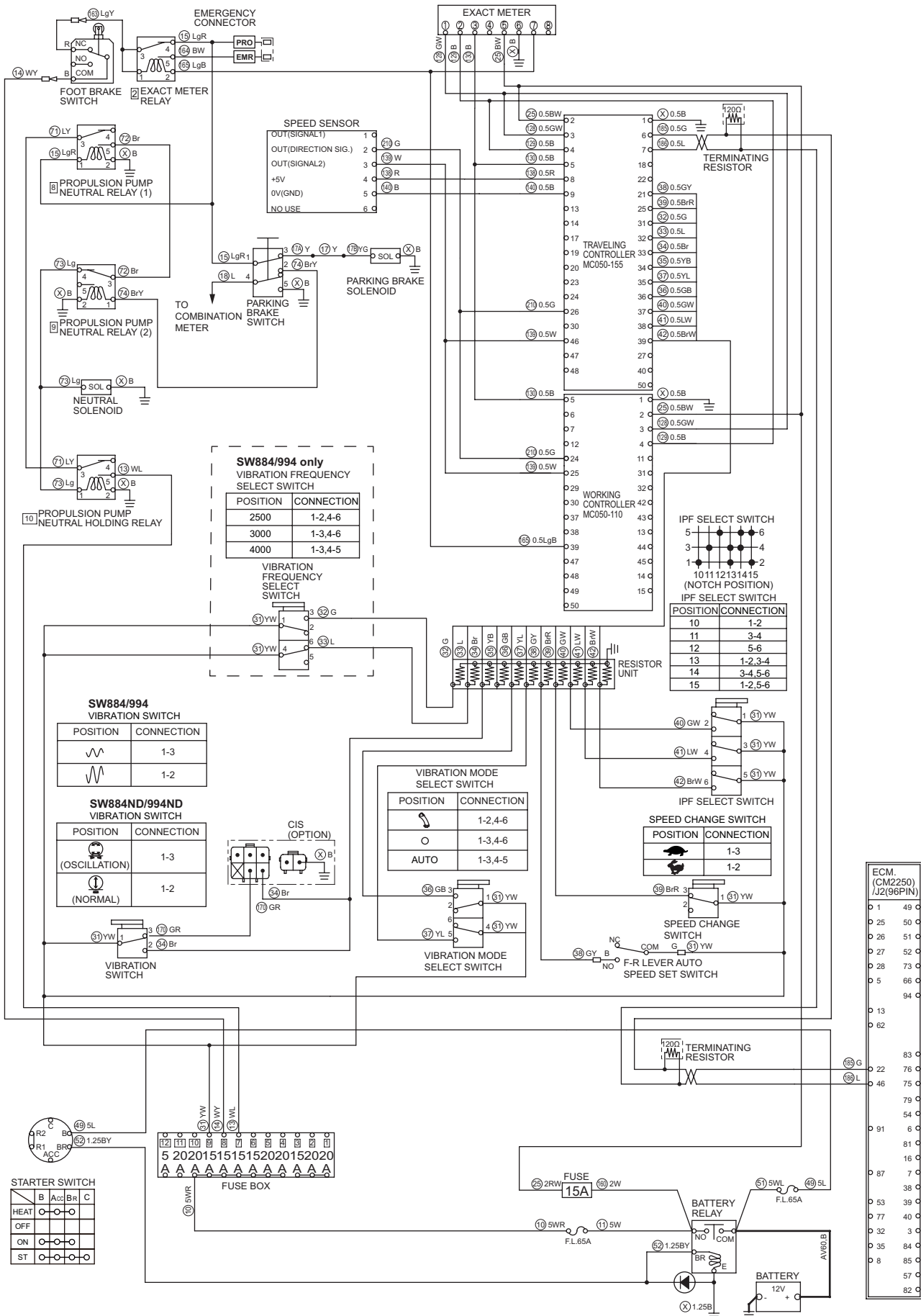
### 2-5-5. Auto speed function does not work 8/10

- Parking brake switch must be released.
  - Foot brake switch must be ON (Brake pedal is not depressed).
  - Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
  - Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
  - Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
  - Check whether exact meter multiple display shows any error code.
- 1) When display shows any error code





#### Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E22	5. Traveling Controller	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and IPF select switch is “10”, measure voltage between traveling controller terminal 37 inlet wire GW and ground terminal 1 wire B. Standard voltage : 12 V or more (3) When starter switch is ON and IPF select switch is “11”, measure voltage between traveling controller terminal 38 inlet wire LW and ground terminal 1 wire B. Standard voltage : 12 V or more (4) When starter switch is ON and IPF select switch is “12”, measure voltage between traveling controller terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more (5) When starter switch is ON and IPF select switch is “13”, measure voltage between traveling controller terminal 37 inlet wire GW, terminal 38 inlet wire LW and ground terminal 1 wire B. Standard voltage : 12 V or more (6) When starter switch is ON and IPF select switch is “14”, measure voltage between traveling controller terminal 38 inlet wire LW, terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more (7) When starter switch is ON and IPF select switch is “15”, measure voltage between traveling controller terminal 37 inlet wire GW, terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more • If all of items (1) through (7) are OK, traveling controller is faulty.	Replace traveling controller.
	6. Clearing Error Code and Judging OK/NG after Repair	① When repair is complete, set starter switch to ON. ② Exact meter will display vehicle speed. ③ Check all positions of IPF select switch. Exact meter will still display vehicle speed. Machine is in normal state. If display changes from vehicle speed to E22, check above items again.	

Fig.: 2-5-1



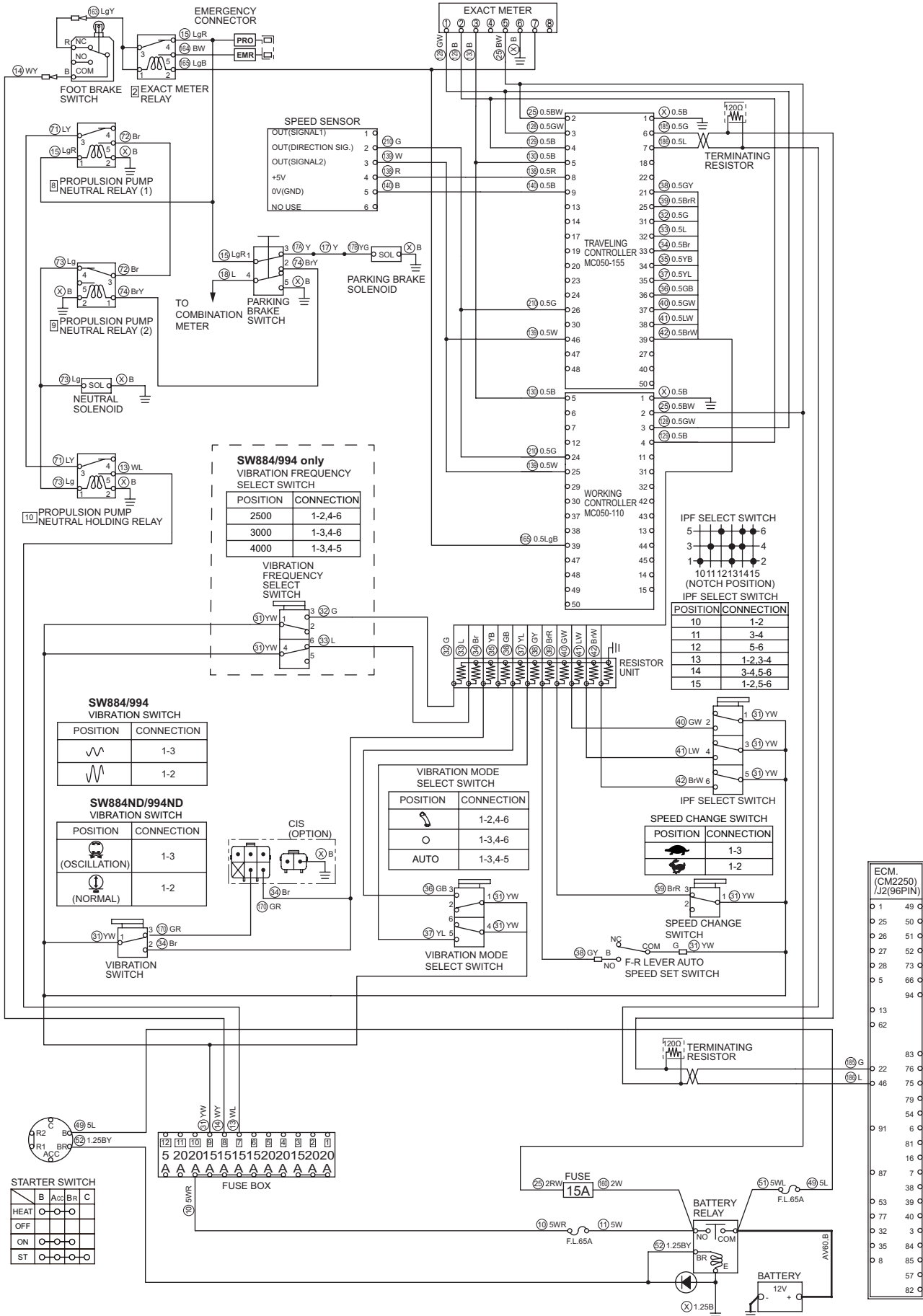
### 2-5-5. Auto speed function does not work 9/10

- Parking brake switch must be released.
  - Foot brake switch must be ON (Brake pedal is not depressed).
  - Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
  - Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
  - Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
  - Check whether exact meter multiple display shows any error code.
- 1) When display shows any error code





#### Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E41	1. Connector	<ul style="list-style-type: none"> <li>• Check engine ECM connector terminal 22, 46 and traveling controller connector terminal 6, 7 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between engine ECM and traveling controller terminal wires.</li> <li>• Engine ECM terminal 22 wire G and traveling controller terminal 6 wire G</li> <li>• Engine ECM terminal 46 wire L and traveling controller terminal 7 wire L Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Since shielded twist wires are used for traveling controller terminal harness, repair is not approved. Be sure to replace them.</b></li> </ul>	Replace harness.
	3. CAN Communication	<ul style="list-style-type: none"> <li>• Faulty CAN communication.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Check if any CAN-related blink code for engine is issued. If no blink code is issued, traveling controller is faulty.</b></li> </ul>	Replace traveling controller.
	4. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, set starter switch to ON.</li> <li>② Place F-R lever “N”.</li> <li>③ Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.</li> </ol>	

Fig.: 2-5-1



### 2-5-5. Auto speed function does not work 10/10

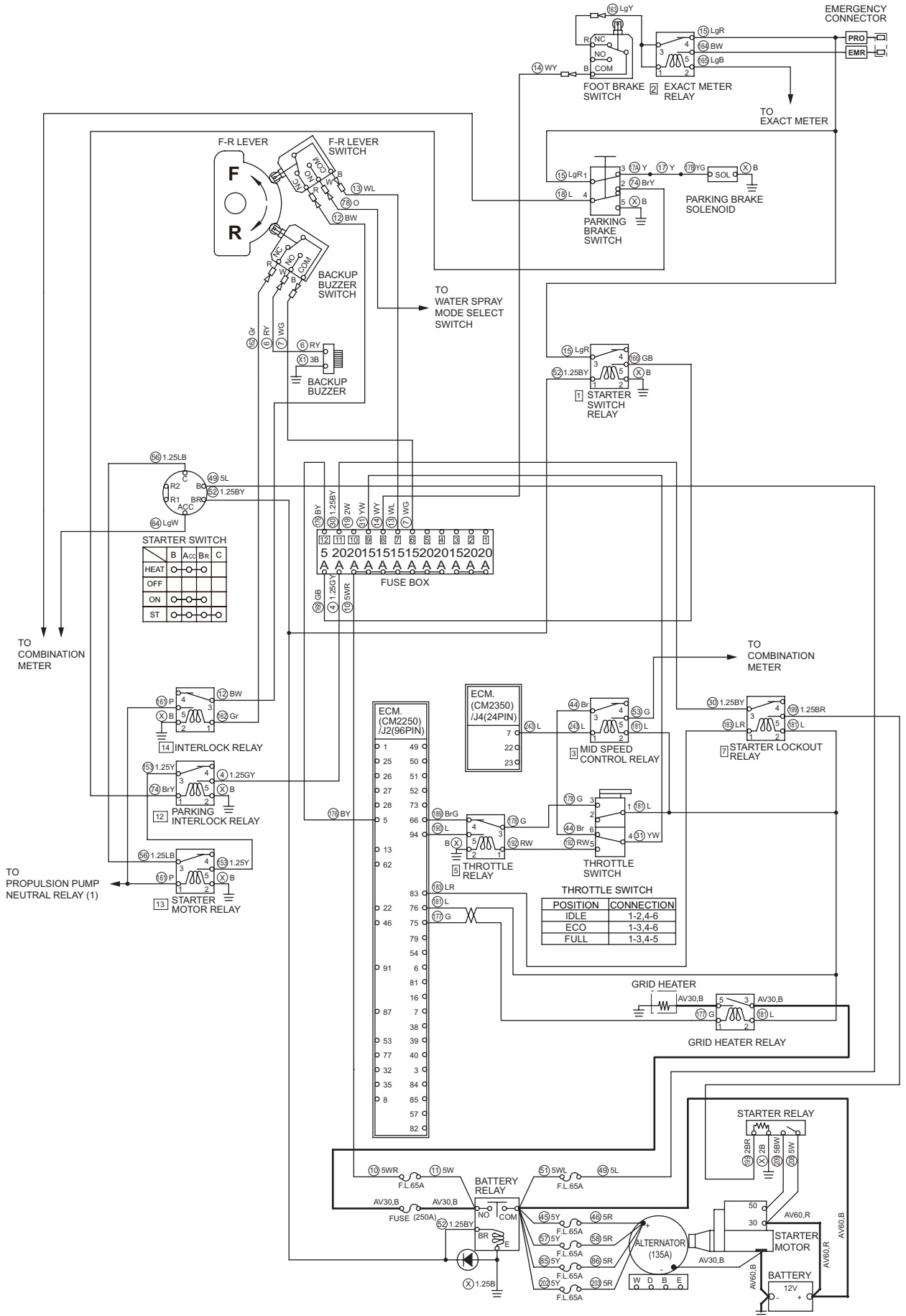
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to “”.  
(Automatic speed function is disabled when speed change switch is “”.)
- Check that speed can be changed by speed change switch between operation speed (“”) and traveling speed (“”).
- Set throttle switch to “FULL”.  
(Automatic speed function is disabled when throttle switch is in any other position than “FULL”.)
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

#### Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. F-R Lever Auto Speed Set Switch	<p>(1) When starter switch is ON, measure voltage between F-R lever auto speed set switch terminal COM inlet wire YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and F-R lever auto speed set switch is ON, measure voltage between F-R lever auto speed set switch terminal NO outlet wire GY and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, F-R lever auto speed set switch is faulty.</li> </ul>	Replace F-R lever auto speed set switch.
2. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistance between resistor unit wire No.38 wire GY and ground wire. Standard resistance : 300 Ω</li> <li>• If resistance is abnormal, resistor unit is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Resistor unit is used to stabilize contact of switch.</b></li> </ul>	Replace resistor unit.
3. Traveling Controller	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and F-R lever auto speed set switch is ON, measure voltage between traveling controller terminal 21 inlet wire GY and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and no error code is displayed, traveling controller is faulty.</li> </ul>	Replace traveling controller.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-4-2



SW884-11012

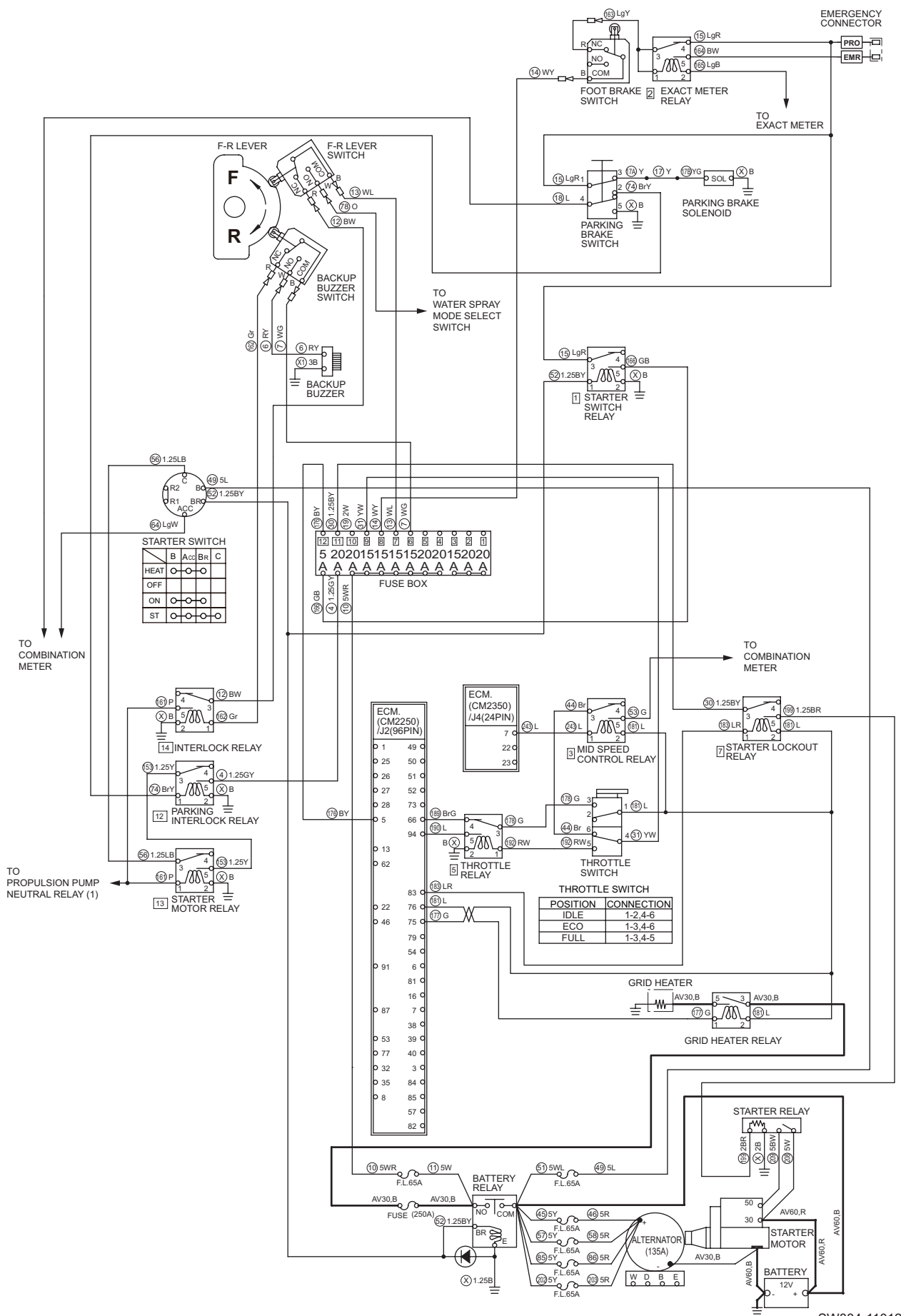
## 2-5-6. Brake cannot be released

- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows no error code.

### Reference Fig.: 2-4-2

Check point	Check/Cause	Action
1. Parking Brake Solenoid	<ul style="list-style-type: none"> <li>• Disconnect harness and measure resistance of coil. Standard voltage : 12.3 Ω</li> <li>• If measured resistance is abnormal, parking brake solenoid is faulty.</li> </ul>	Replace parking brake solenoid.
2. Parking Brake Switch	<p>(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire Y and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, parking brake switch is faulty.</li> </ul>	Replace parking brake switch.
3. <span style="border: 1px solid black; padding: 0 2px;">2</span> Exact Meter Relay	<p>(1) When starter switch is ON, measure voltage between exact meter relay terminal 1, 3 inlet wire LgY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage of coil between exact meter relay terminal 1 and terminal 2. There is no electricity in normal condition.</p> <p>(3) When starter switch is ON, measure voltage between exact meter relay terminal 4 outlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, exact meter relay is faulty.</li> </ul>	Replace exact meter relay.
4. Foot Brake Switch	<p>(1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire WY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between foot brake switch terminal NC outlet wire LgY and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, foot brake switch is faulty.</li> </ul>	Replace foot brake switch.
5. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-4-2



SW884-11012



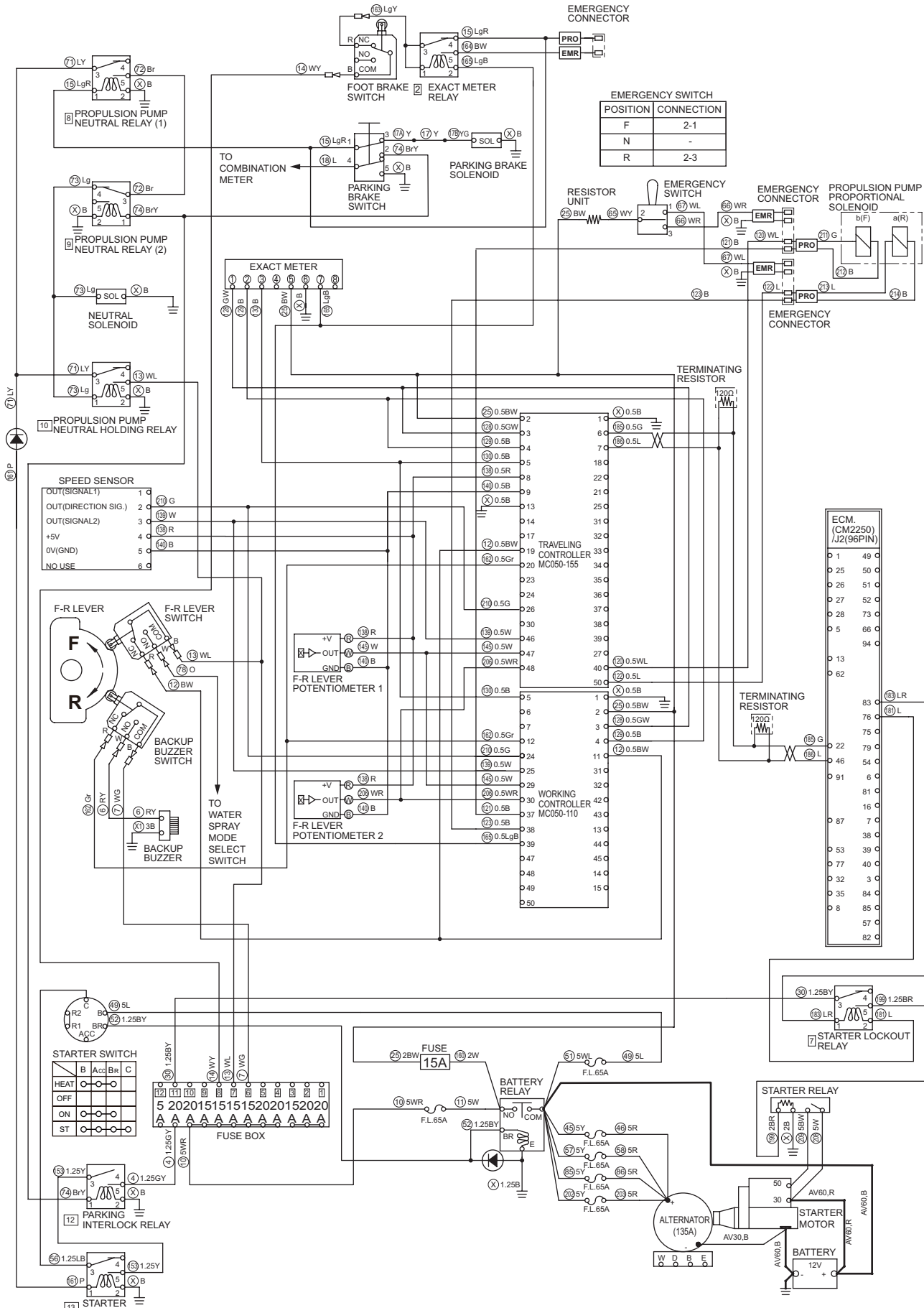
**2-5-7. Brake does not work**

- Parking brake switch must be applied.
- Foot brake switch must be OFF (Brake pedal is depressed)
- Check whether exact meter multiple display shows no error code.

**Reference Fig.: 2-4-2**

Check point	Check/Cause	Action
1. Parking Brake Solenoid	<ul style="list-style-type: none"> <li>• Disconnect harness and measure resistance of coil. Standard voltage : 12.3 Ω</li> <li>• If measured resistance is abnormal, parking brake solenoid is faulty.</li> </ul>	Replace parking brake solenoid.
2. Parking Brake Switch	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire Y and chassis ground. There is no electricity in normal condition.</li> <li>• If there is electricity, parking brake switch is faulty.</li> </ul>	Replace parking brake switch.
3. Exact Meter Relay	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between exact meter relay terminal 4 outlet wire LgR and chassis ground. There is no electricity in normal condition.</li> <li>• If there is electricity, exact meter relay is faulty.</li> </ul>	Replace exact meter relay.
4. Foot Brake Switch	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between foot brake switch terminal NC outlet wire LgY and chassis ground. There is no electricity in normal condition.</li> <li>• If there is electricity, foot brake switch is faulty.</li> </ul>	Replace foot brake switch.
5. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-4-1



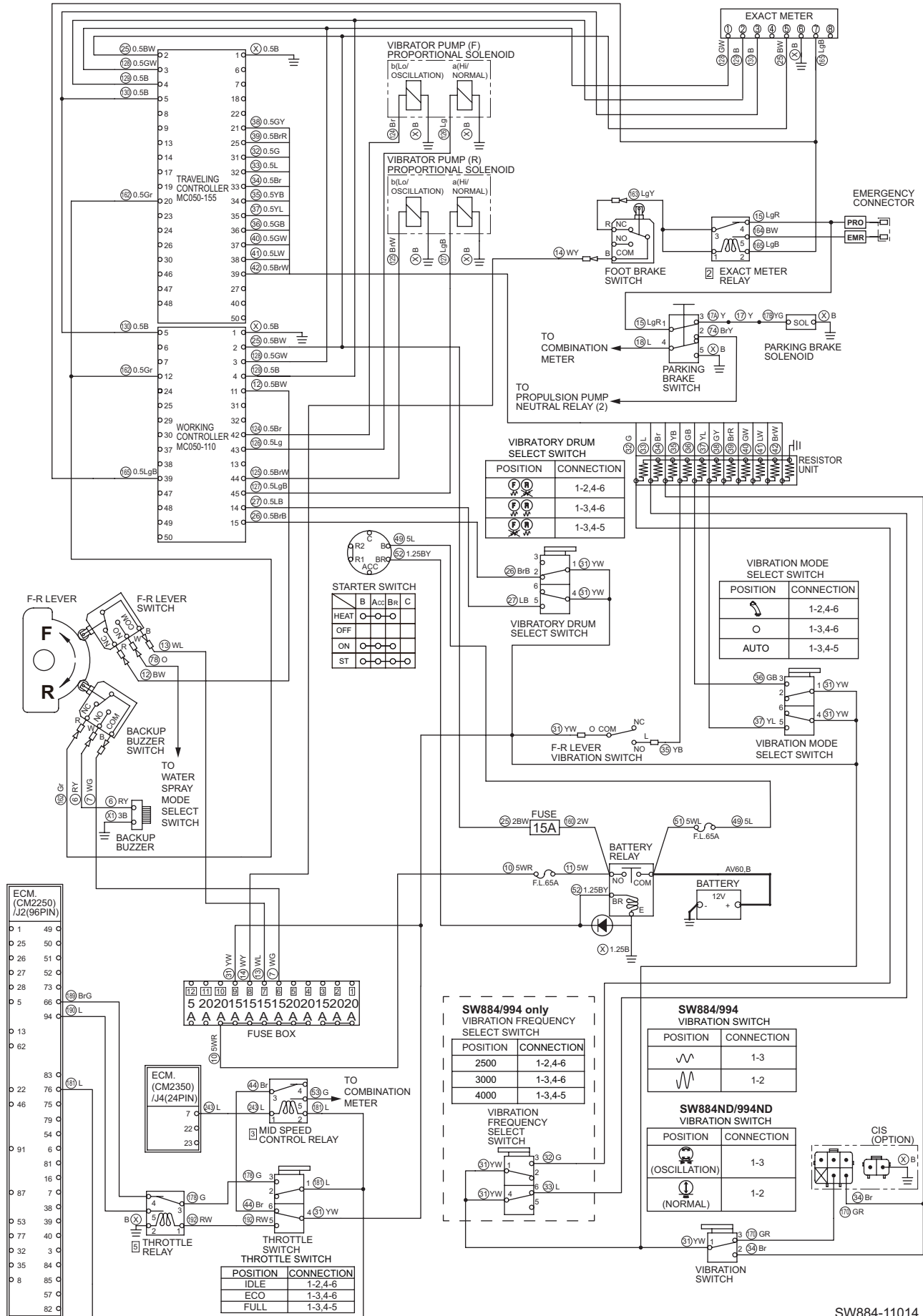
## 2-5-8. Emergency exit propulsion switch does not work

- Disconnect SWP-6F **PRO** (P.5-005, 006) connector from engine harness side and connect emergency switch connector SWP-6F **EMR** (P.5-005, 006).

### Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Propulsion Pump Proportional Solenoid a (R) or b (F)	<ul style="list-style-type: none"> <li>• Disconnect harness for propulsion pump proportional solenoid a (R) or b (F) and measure resistance of coils. Standard voltage : 5.5 <math>\Omega</math></li> <li>• If measured resistance is abnormal, propulsion pump proportional solenoid a (R) or b (F) is faulty.</li> </ul>	Replace propulsion pump proportional solenoid.
2. Emergency Switch	<ol style="list-style-type: none"> <li>(1) When starter switch is ON, measure voltage between emergency switch terminal 2 inlet wire WY and chassis ground. Standard voltage : 12 V or more</li> <li>(2) When starter switch is ON and emergency switch is "F", measure voltage between emergency switch terminal 1 outlet wire WL and chassis ground. Standard voltage : 12 V or more</li> <li>(3) When starter switch is ON and emergency switch is "R", measure voltage between emergency switch terminal 3 outlet wire WR and chassis ground. Standard voltage : 12 V or more</li> </ol> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) or (3) is NG, emergency switch is faulty.</li> </ul>	Replace emergency switch.
3. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistance between resistor unit terminal wire BW and terminal wire WY. Standard resistance : 15 <math>\Omega</math></li> <li>• If resistance is abnormal, resistor unit is faulty.</li> </ul>	Replace resistor unit.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-6-1




## 2-6. Vibration

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.
- When measuring voltage and current without disconnecting connectors, refer to “Measuring voltage and current flowing using tester” (P.11-006 to P.11-008).
- Check any ground circuit which belongs to components to be checked.
- Engine check lamp must not be lighting. If engine check lamp lights, refer to “Service information” of engine manufacturer.
- Throttle switch to “FULL”.

### 2-6-1. No vibration occurs 1/5

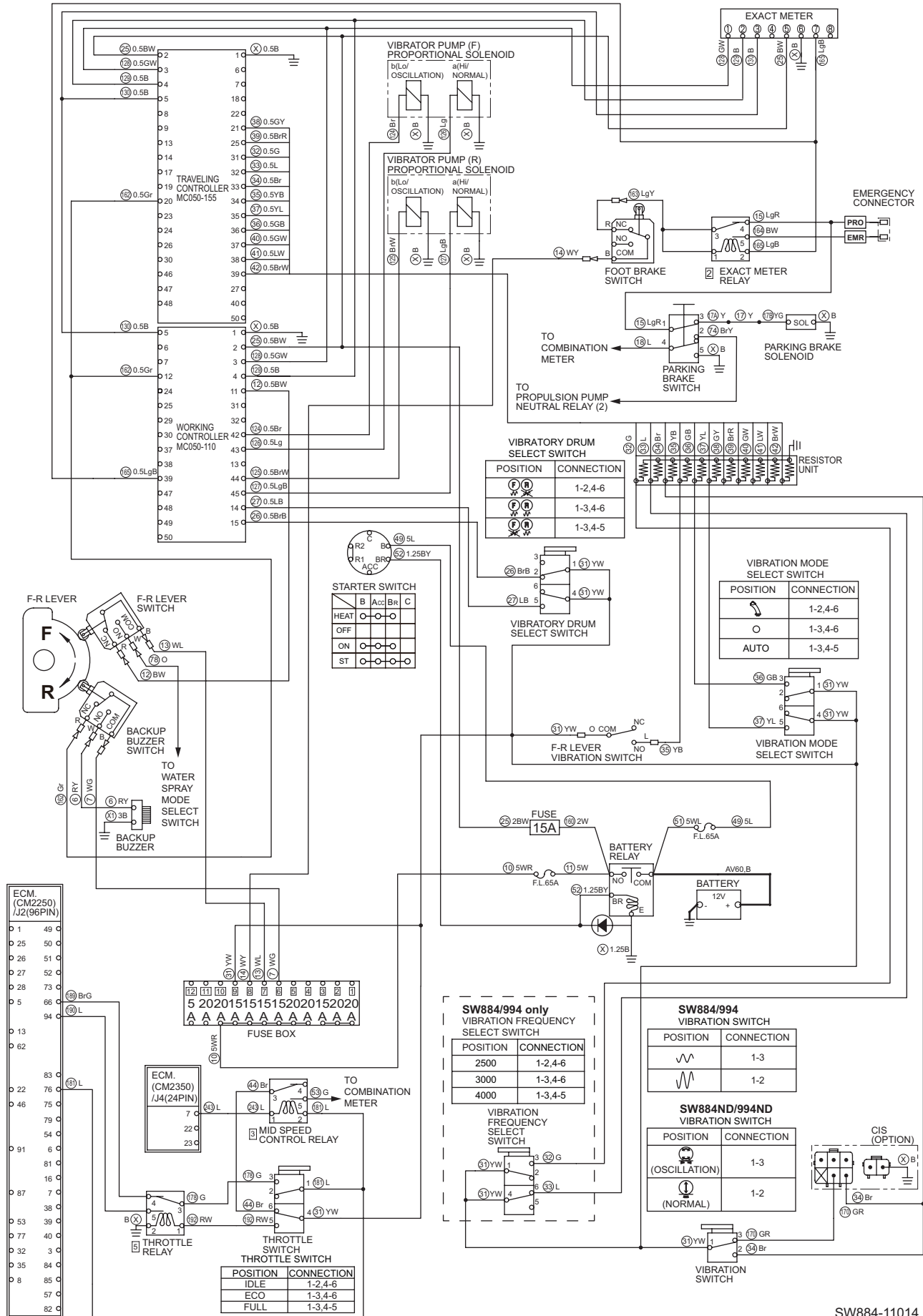
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Vibration mode select switch to “” (continuous mode).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

#### Reference Fig.: 2-6-1

Error code	Check point	Check/Cause	Action
E33, E34, E35 or E36	1. Connector	<ul style="list-style-type: none"> <li>• Check vibrator pump (F) proportional solenoid connector, vibrator pump (R) proportional solenoid connector and working controller connector terminal 42, 43, 44, 45, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between vibrator pump (F) proportional solenoid, vibrator pump (R) proportional solenoid and working controller terminal wires.</li> <li>• Vibrator pump (F) proportional solenoid b (Lo) wire Br and working controller terminal 42 wire Br</li> <li>• Vibrator pump (F) proportional solenoid a (Hi) wire Lg and working controller terminal 43 wire Lg</li> <li>• Vibrator pump (R) proportional solenoid b (Lo) wire BrW and working controller terminal 44 wire BrW</li> <li>• Vibrator pump (R) proportional solenoid a (Hi) wire LgB and working controller terminal 45 wire LgB</li> <li>Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Vibrator Pump (F) Proportional Solenoid a (Hi), b (Lo)	(1) Disconnect harness and measure resistance of coils. Standard resistance: 5.5 Ω (2) Check vibrator pump (F) proportional solenoid a (Hi) and b (Lo) terminal wire B is grounded. <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, vibrator pump (F) proportional solenoid a (Hi) or b (Lo) is faulty.</li> </ul>	Replace vibrator pump (F) proportional solenoid
	4. Vibrator Pump (R) Proportional Solenoid a (Hi), b (Lo)	(1) Disconnect harness and measure resistance of coils. Standard resistance: 5.5 Ω (2) Check vibrator pump (R) proportional solenoid a (Hi) and b (Lo) terminal wire B is grounded. <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, vibrator pump (R) proportional solenoid a (Hi) or b (Lo) is faulty.</li> </ul>	Replace vibrator pump (R) proportional solenoid

Fig.: 2-6-1



**2-6-1. No vibration occurs 2/5**

- F-R lever must be in “N”.
- Parking brake switch must be released.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-6-1**





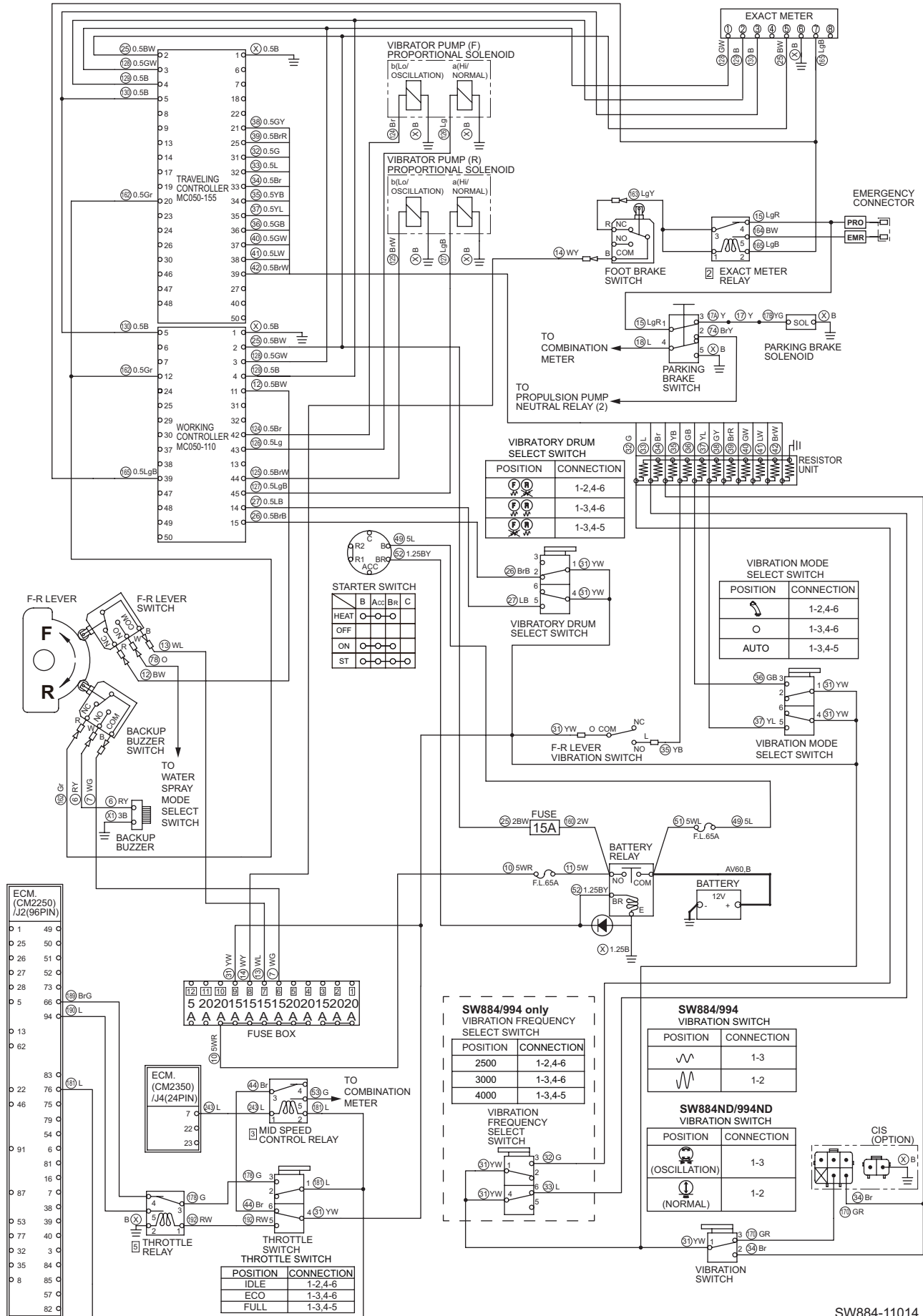
Error code	Check point	Check/Cause	Action
E33, E34, E35 or E36	5. Traveling/ Working Controller (SW884/994)	<p>(1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wire.</p> <ul style="list-style-type: none"> <li>• Traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B</li> <li>• Working controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and measure current between vibrator pump (F)/(R) proportional solenoid terminal wires (positive side) and B (ground side).</p> <ul style="list-style-type: none"> <li>• Vibrator pump (F) proportional solenoid a (Hi) wire Lg (positive side) and wire B (ground side)</li> <li>• Vibrator pump (F) proportional solenoid b (Lo) wire Br (positive side) and wire B (ground side)</li> <li>• Vibrator pump (R) proportional solenoid a (Hi) wire LgB (positive side) and wire B (ground side)</li> <li>• Vibrator pump (R) proportional solenoid b (Lo) wire BrW (positive side) and wire B (ground side)</li> </ul> <p>While measuring current, operate vibration frequency select switch, vibration mode select switch and vibration switch as below.</p> <ul style="list-style-type: none"> <li>• Vibration mode select switch is “” (continuous mode) and depress F-R lever vibration switch more than 0.05 second, vibration frequency select switch is 3000 rpm and vibration switch is “”.</li> <p style="margin-left: 40px;">Standard current: Solenoid a (Hi): 960 mA Solenoid b (Lo): 200 mA</p> <li>• Vibration mode select switch is “” (continuous mode) and depress F-R lever vibration switch more than 0.05 second, vibration frequency select switch is 4000 rpm and vibration switch is “”.</li> <p style="margin-left: 40px;">Standard current: Solenoid a (Hi): 200 mA Solenoid b (Lo): 1150 mA</p> <li>• Vibration mode select switch is “○” (Vibration is OFF).</li> <p style="margin-left: 40px;">Standard current: Solenoid a (Hi): 200 mA Solenoid b (Lo): 200 mA</p> </ul> <p>• If item (1) is OK and item (2) is NG, traveling/working controller is faulty.</p> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Since current value is output in PWM, standard value shown above represent a maximum instantaneous value.</b></li> </ul>	Replace traveling/ working controller.

Fig.: 2-6-1





## 2-6-1. No vibration occurs 3/5

- F-R lever must be in “N”.
- Parking brake switch must be released.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig.: 2-6-1





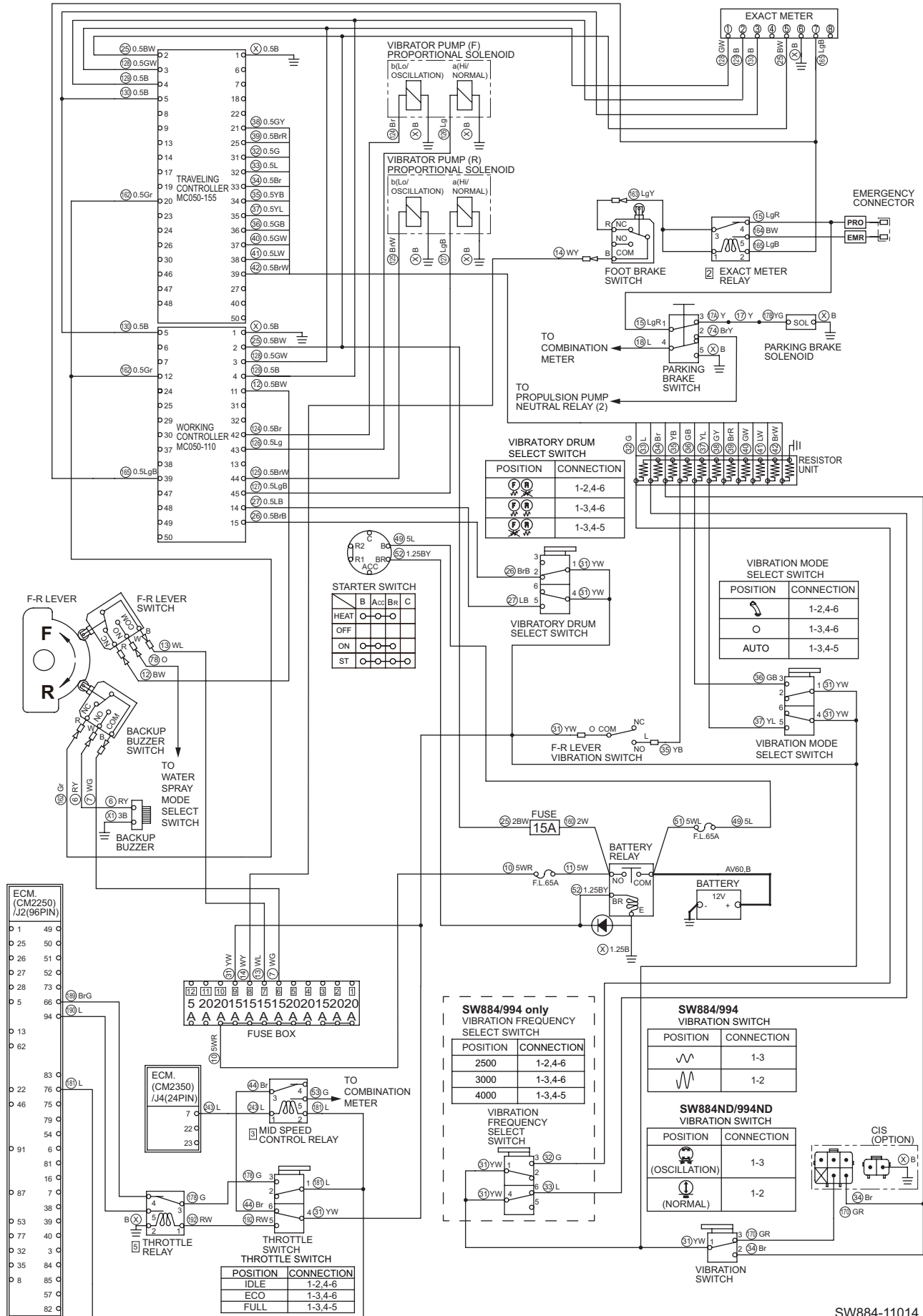
Error code	Check point	Check/Cause	Action
E33, E34, E35 or E36	5. Traveling/ Working Controller (SW884ND/ 994ND)	<p>(1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wire.</p> <ul style="list-style-type: none"> <li>• Traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B</li> <li>• Working controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and measure current between vibrator pump (F)/(R) proportional solenoid terminal wires (positive side) and B (ground side).</p> <ul style="list-style-type: none"> <li>• Vibrator pump (F) proportional solenoid a (NORMAL) wire Lg (positive side) and wire B (ground side)</li> <li>• Vibrator pump (F) proportional solenoid b (OSCILLATION) wire Br (positive side) and wire B (ground side)</li> <li>• Vibrator pump (R) proportional solenoid a (NORMAL) wire LgB (positive side) and wire B (ground side)</li> <li>• Vibrator pump (R) proportional solenoid b (OSCILLATION) wire BrW (positive side) and wire B (ground side)</li> </ul> <p>While measuring current, operate vibration mode select switch and vibration switch as below.</p> <ul style="list-style-type: none"> <li>• Vibration mode select switch is “” (continuous mode) and depress F-R lever vibration switch more than 0.05 second and vibration switch is “”.</li> <p style="margin-left: 40px;">Standard current: Solenoid a (NORMAL): 960 mA Solenoid b (OSCILLATION): 200 mA</p> <li>• Vibration mode select switch is “” (continuous mode) and depress F-R lever vibration switch more than 0.05 second and vibration switch is “”.</li> <p style="margin-left: 40px;">Standard current: Solenoid a (NORMAL): 200 mA Solenoid b (OSCILLATION): 1150 mA</p> <li>• Vibration mode select switch is “○” (Vibration is OFF)</li> <p style="margin-left: 40px;">Standard current: Solenoid a (NORMAL): 200 mA Solenoid b (OSCILLATION): 200 mA</p> <li>• If item (1) is OK and item (2) is NG, traveling/working controller is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Since current value is output in PWM, standard value shown above represent a maximum instantaneous value.</b></li> </ul>	Replace traveling/ working controller.

Fig.: 2-6-1



**2-6-1. No vibration occurs 4/5**

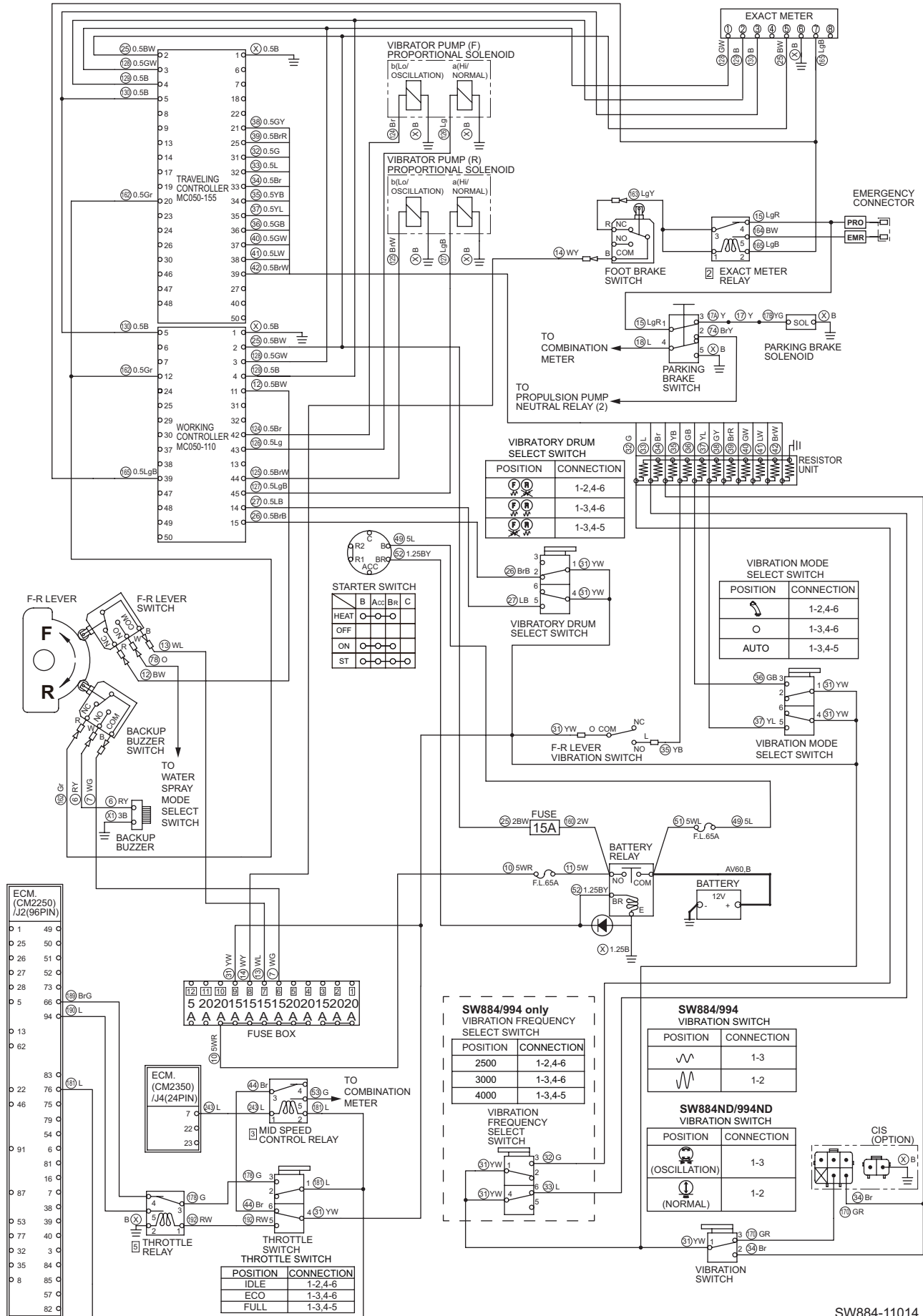
- F-R lever must be in "N".
- Parking brake switch must be released.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-6-1**

Error code	Check point	Check/Cause	Action
E33, E34, E35 or E36	6. Clearing Error Code and Judging OK/NG after Repair	① When repair is complete, set starter switch to ON. ② Place F-R lever "N". ③ Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-6-1



**2-6-1. No vibration occurs 5/5**

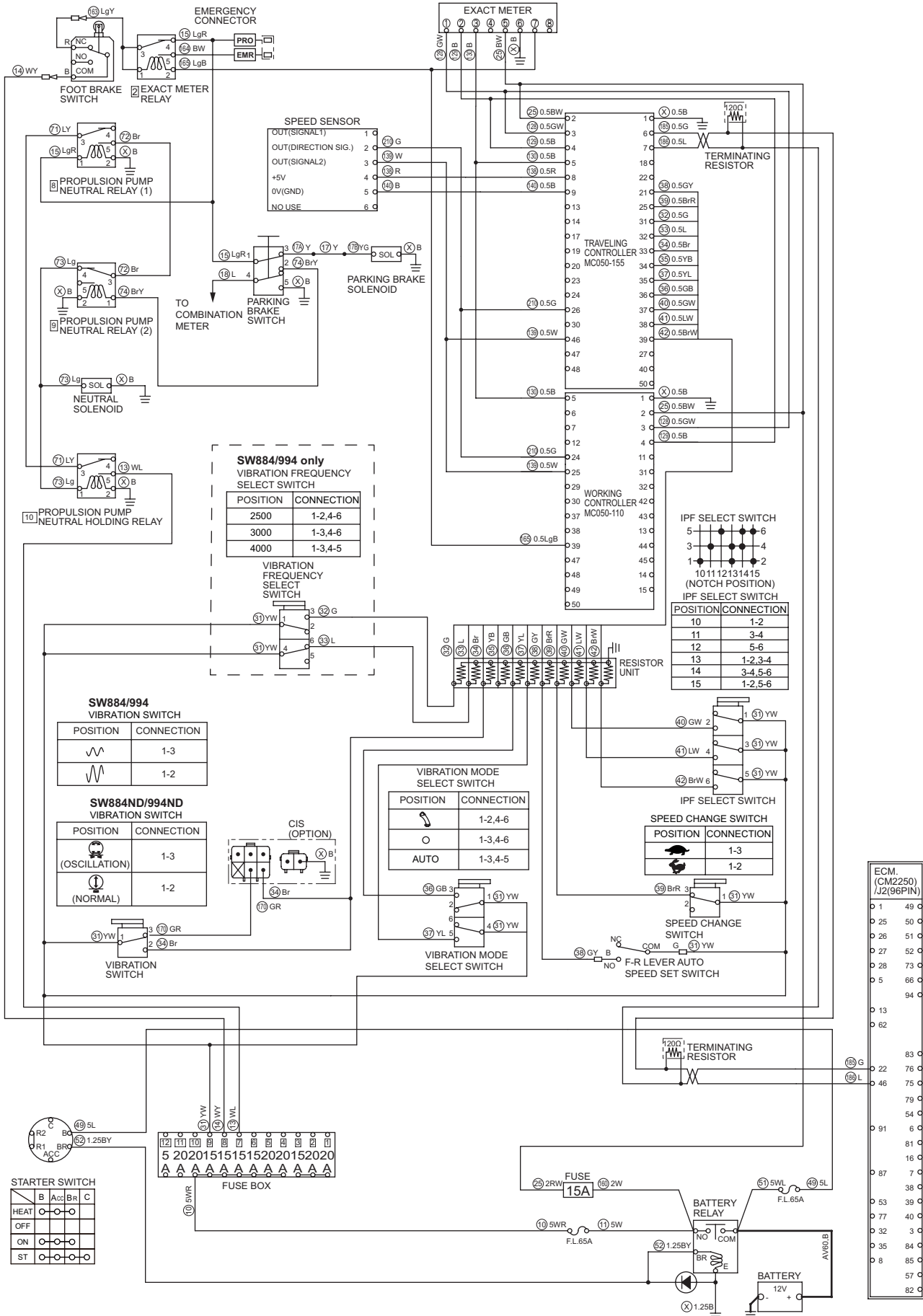
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig.: 2-6-1**


Check point	Check/Cause	Action
1. Vibration Mode Select Switch	<p>(1) When starter switch is ON, measure voltage between vibration mode select switch terminal 1, 4 inlet wires YW and chassis ground. Standard voltage: 12 V or more</p> <p>(2) When starter switch is ON and vibration mode select switch to “” (continuous mode), measure voltage between vibration mode select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Vibration mode select switch terminal 3 outlet wire GB and chassis ground</li> <li>• Vibration mode select switch terminal 5 outlet wire YL and chassis ground</li> </ul> <p>There is no electricity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and electricity is found in item (2), vibration mode select switch is faulty.</li> </ul>	Replace vibration mode select switch.
2. F-R Lever Vibration Switch	<ul style="list-style-type: none"> <li>• Depress F-R lever vibration switch and check continuity between F-R lever vibration switch terminal COM and NO. There is continuity in normal condition.</li> <li>• If there is no continuity, F-R lever vibration switch is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Pressing F-R lever vibration switch turns on vibration and vibration is turned off when switch is pressed again.</b></li> </ul>	Replace F-R vibration lever switch.
3. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistance between resistor unit wire No.35 wire YB and ground wire. Standard resistance: 300 Ω</li> <li>• If resistance is abnormal, the resistor unit is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Resistor unit is used to stabilize contact of switch.</b></li> </ul>	Replace resistor unit.
4. Traveling Controller	<ul style="list-style-type: none"> <li>• When starter switch is ON and depress F-R lever vibration switch, measure voltage between traveling controller terminal 34 inlet wire YB and ground terminal 1 wire B. Standard voltage: 12 V or more</li> <li>• If display shows no error code and the above item is OK, traveling controller is faulty.</li> </ul>	Replace traveling controller.
5. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance: 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-5-1



SW884-11013

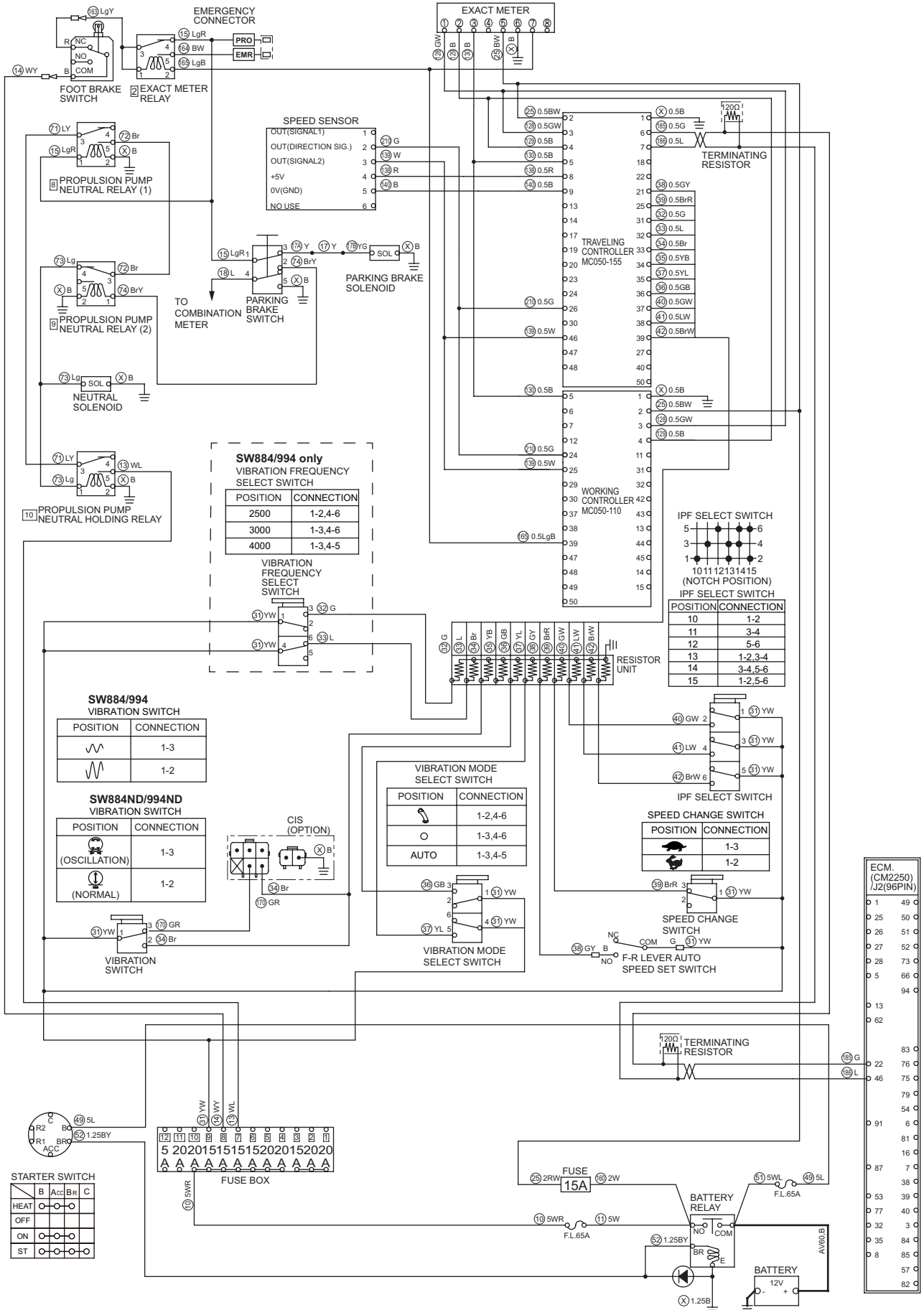
**2-6-2. Vibration frequency cannot be switched (SW884/994) 1/3**

- Set vibration mode select switch to “” (continuous mode).
- Vibration frequency select switch is fixed at 4000 vpm, vibration switch is “ $\sqrt{\wedge}$ ” when frequency cannot be switched.
- Check whether exact meter multiple display shows any error code.

**Reference Fig.: 2-5-1**



Error code	Check point	Check/Cause	Action
E21	1. Connector	<ul style="list-style-type: none"> <li>• Check vibration frequency select switch, vibration switch and traveling controller connector terminal 31, 32, 33 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistances between switches and traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• Vibration frequency select switch terminal 3 wire G and traveling controller terminal 31 wire G</li> <li>• Vibration frequency select switch terminal 6 wire L and traveling controller terminal 32 wire L</li> <li>• Vibration switch terminal 2 wire Br and traveling controller terminal 33 wire Br</li> </ul> <p>Standard resistance : 10 <math>\Omega</math> or less</p> <p>(2) Measure resistances between switches and fuse box terminal wires.</p> <ul style="list-style-type: none"> <li>• Vibration frequency select switch terminal 1, 4 wires YW, vibration switch terminal 1 wire YW and fuse box terminal 9 wire YW</li> </ul> <p>Standard resistance : 10 <math>\Omega</math> or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Vibration Frequency Select Switch	<p>(1) When starter switch is ON, measure voltage between vibration frequency select switch terminal 1, 4 inlet wires YW and chassis ground.</p> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between vibration frequency select switch terminal 6 outlet wire L and chassis ground.</p> <p>Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between vibration frequency select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Vibration frequency select switch terminal 3 outlet wire G and chassis ground</li> <li>• Vibration frequency select switch terminal 6 outlet wire L and chassis ground</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between vibration frequency select switch terminal 3 outlet wire G and chassis ground.</p> <p>Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and any of items (2) through (4) is NG, vibration frequency select switch is faulty.</li> </ul>	Replace vibration frequency select switch.

Fig.: 2-5-1





## 2-6-2. Vibration frequency cannot be switched (SW884/994) 2/3

- Set vibration mode select switch to “” (continuous mode).
- Vibration frequency select switch is fixed at 4000 vpm, vibration switch is “” when frequency cannot be switched.
- Check whether exact meter multiple display shows any error code.

### Reference Fig.: 2-5-1


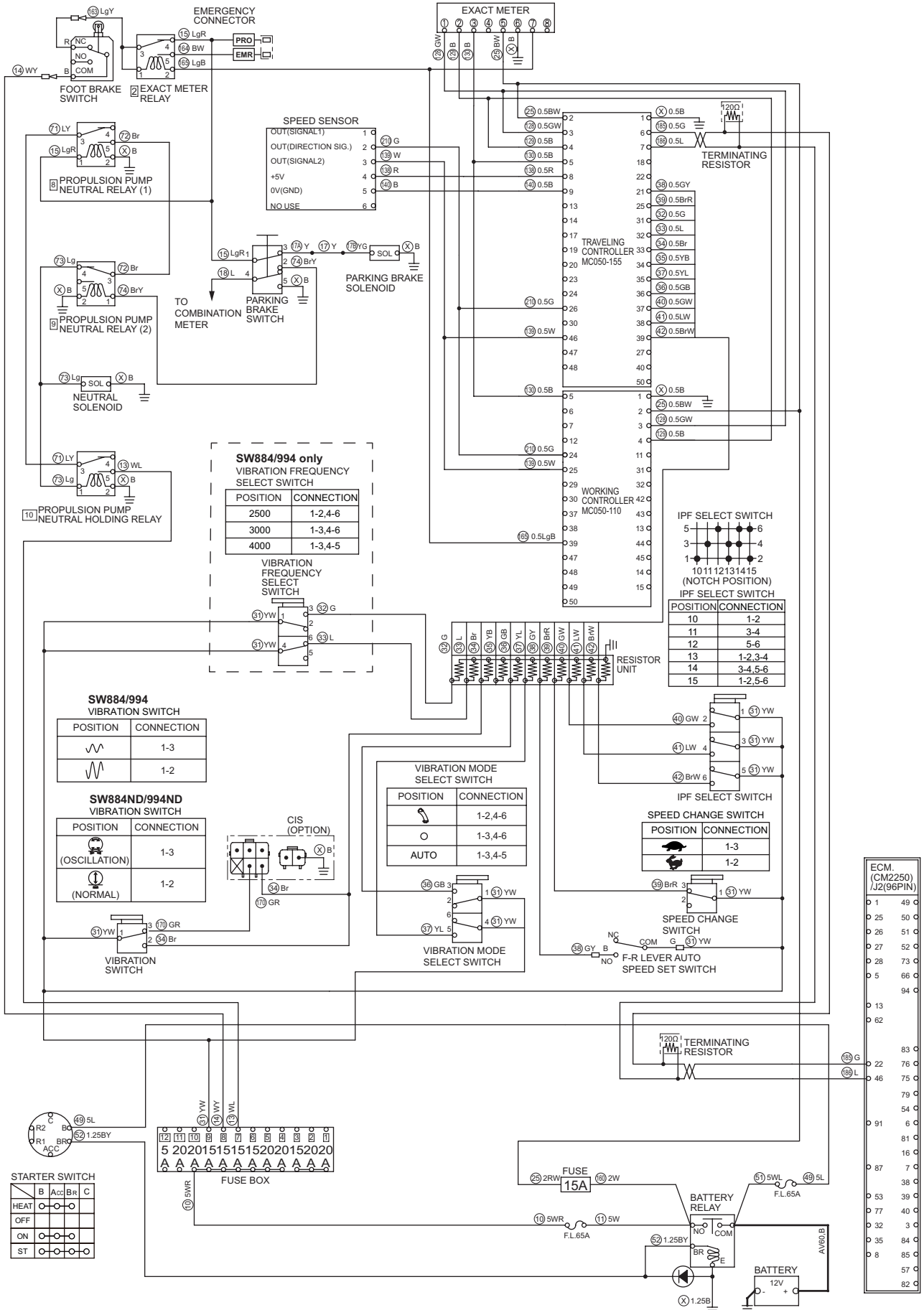


Error code	Check point	Check/Cause	Action
E21	4. Vibration switch	<p>(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, vibration switch is faulty.</li> </ul>	Replace vibration switch
	5. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistance between resistor unit wires and ground wire. <ul style="list-style-type: none"> <li>• Resistor unit wire No.32 wire G and ground wire</li> <li>• Resistor unit wire No.33 wire L and ground wire</li> <li>• Resistor unit wire No.34 wire Br and ground wire</li> </ul> </li> <li>Standard resistance : 300 Ω</li> <li>• If resistance is abnormal, resistor unit is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• Resistor unit is used to stabilize contact of switch.</li> </ul>	Replace resistor unit.

Fig.: 2-5-1



**2-6-2. Vibration frequency cannot be switched (SW884/994) 3/3**

- Set vibration mode select switch to “” (continuous mode).
- Vibration frequency select switch is fixed at 4000 vpm, vibration switch is “” when frequency cannot be switched.
- Check whether exact meter multiple display shows any error code.

**Reference Fig.: 2-5-1**


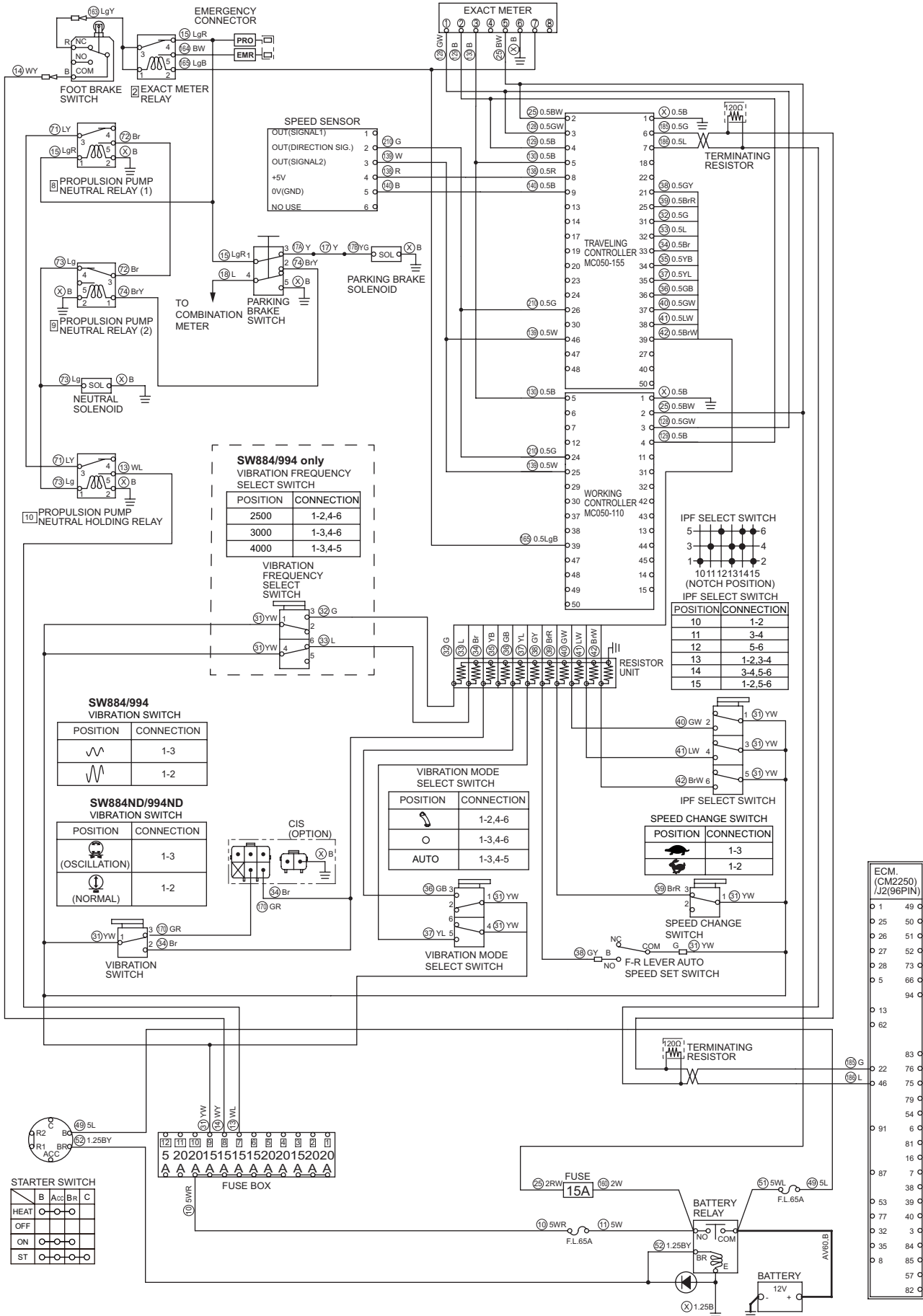


Error code	Check point	Check/Cause	Action
E21	6. Traveling Controller	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between traveling controller terminal 32 inlet wire L and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• Traveling controller terminal 31 inlet wire G and ground terminal 1 wire B</li> <li>• Traveling controller terminal 32 inlet wire L and ground terminal 1 wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between traveling controller terminal 31 inlet wire G and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(5) When starter switch is ON and vibration switch is “”, measure voltage between traveling controller terminal 33 inlet wire Br and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1), (2), (3), (4) and (5) are OK, traveling controller is faulty.</li> </ul>	Replace traveling controller.
	7. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Exact meter will display vehicle speed.</p> <p>③ Check all combinations of vibration frequency select switch and vibration switch positions. Exact meter will still display vehicle speed. Machine is normal state. If display changes form vehicle speed to E21, check above items again.</p>	

Fig.: 2-5-1



### 2-6-3. Vibration type cannot be switched (SW884ND/994ND) 1/2

- Set vibration mode select switch to “” (continuous mode).
- Vibration switch is “” when vibration type cannot be switched.
- Check whether exact meter multiple display shows any error code.

#### Reference Fig.: 2-5-1


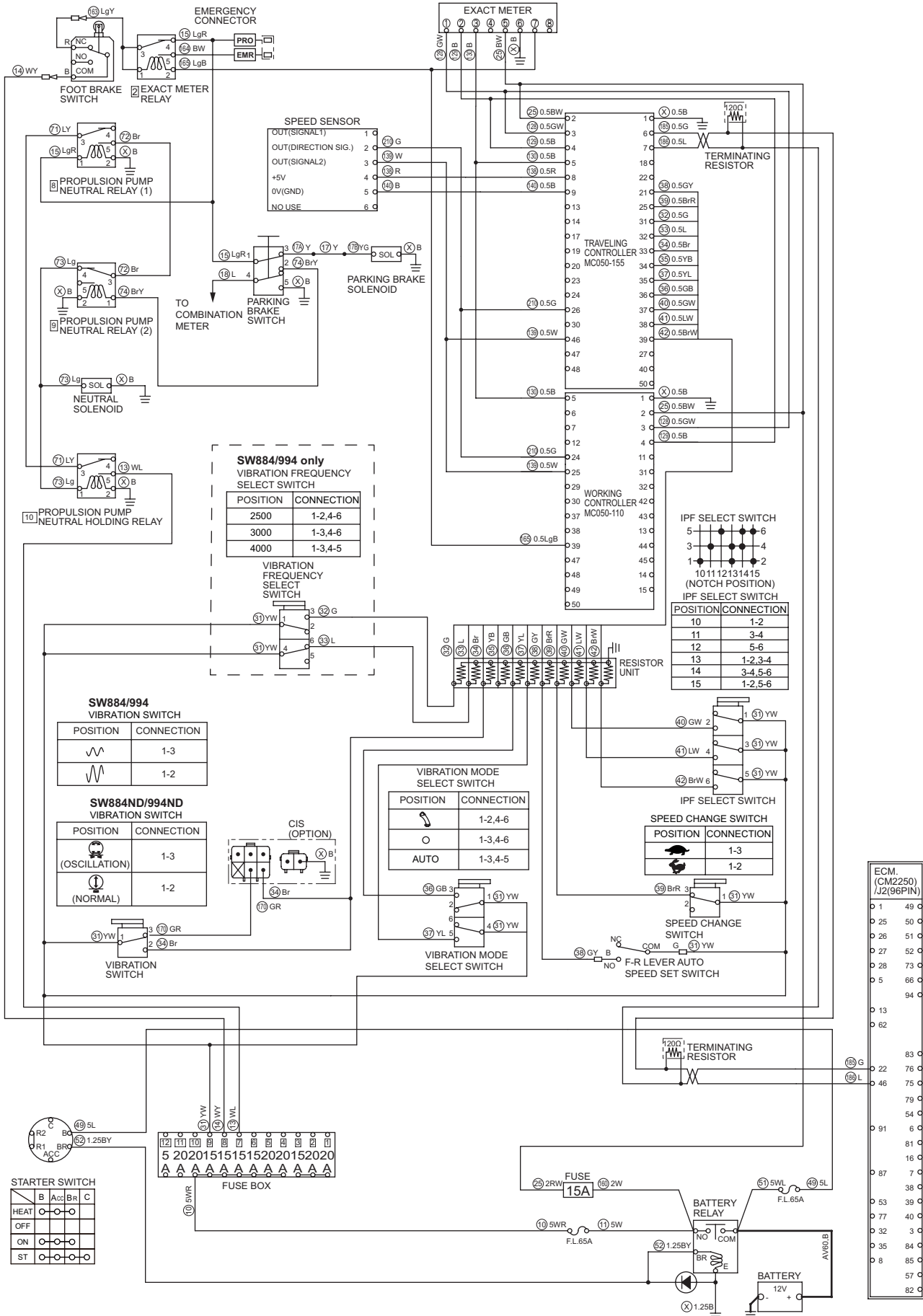


Error code	Check point	Check/Cause	Action
E21	1. Connector	<ul style="list-style-type: none"> <li>• Check vibration frequency select switch, vibration switch and traveling controller connector terminal 33 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistances between switches and traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• Vibration switch terminal 2 wire Br and traveling controller terminal 33 wire Br Standard resistance : 10 Ω or less</li> </ul> <p>(2) Measure resistances between switches and fuse box terminal wires.</p> <ul style="list-style-type: none"> <li>• Vibration switch terminal 1 wire YW and fuse box terminal 9 wire YW Standard resistance : 10 Ω or less</li> </ul> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	4. Vibration switch	<p>(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, vibration switch is faulty.</li> </ul>	Replace vibration switch
	5. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistance between resistor unit wire No.34 wire Br and ground wire. Standard resistance : 300 Ω</li> <li>• If resistance is abnormal, resistor unit is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Resistor unit is used to stabilize contact of switch.</b></li> </ul>	Replace resistor unit.

Fig.: 2-5-1



### 2-6-3. Vibration type cannot be switched (SW884ND/994ND) 2/2

- Set vibration mode select switch to “” (continuous mode).
- Vibration switch is “” when vibration type cannot be switched.
- Check whether exact meter multiple display shows any error code.

#### Reference Fig.: 2-5-1


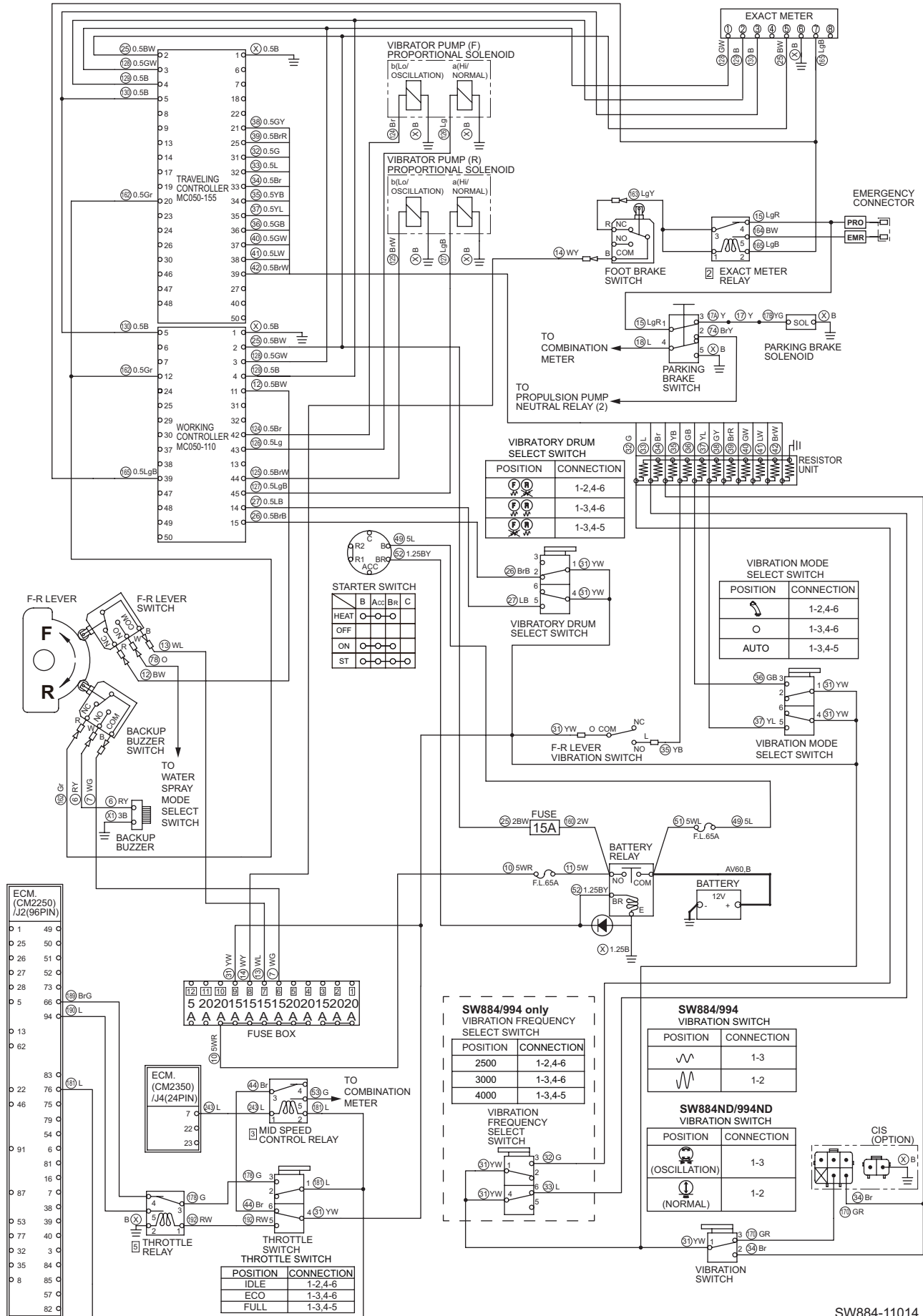
Error code	Check point	Check/Cause	Action
E21	6. Traveling Controller	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and vibration switch is “  ”, measure voltage between traveling controller terminal 33 inlet wire Br and ground terminal 1 wire B. Standard voltage : 12 V or more • If above items (1) and (2) are OK, traveling controller is faulty.	Replace traveling controller.
	7. Clearing Error Code and Judging OK/NG after Repair	① When repair is complete, set starter switch to ON. ② Exact meter will display vehicle speed. ③ Check all combinations of vibration frequency select switch and vibration switch positions. Exact meter will still display vehicle speed. Machine is normal state. If display changes form vehicle speed to E21, check above items again.	

Fig.: 2-6-1





## 2-6-4. Continuous/automatic vibration mode cannot be switched 1/2

Reference Fig. : 2-6-1



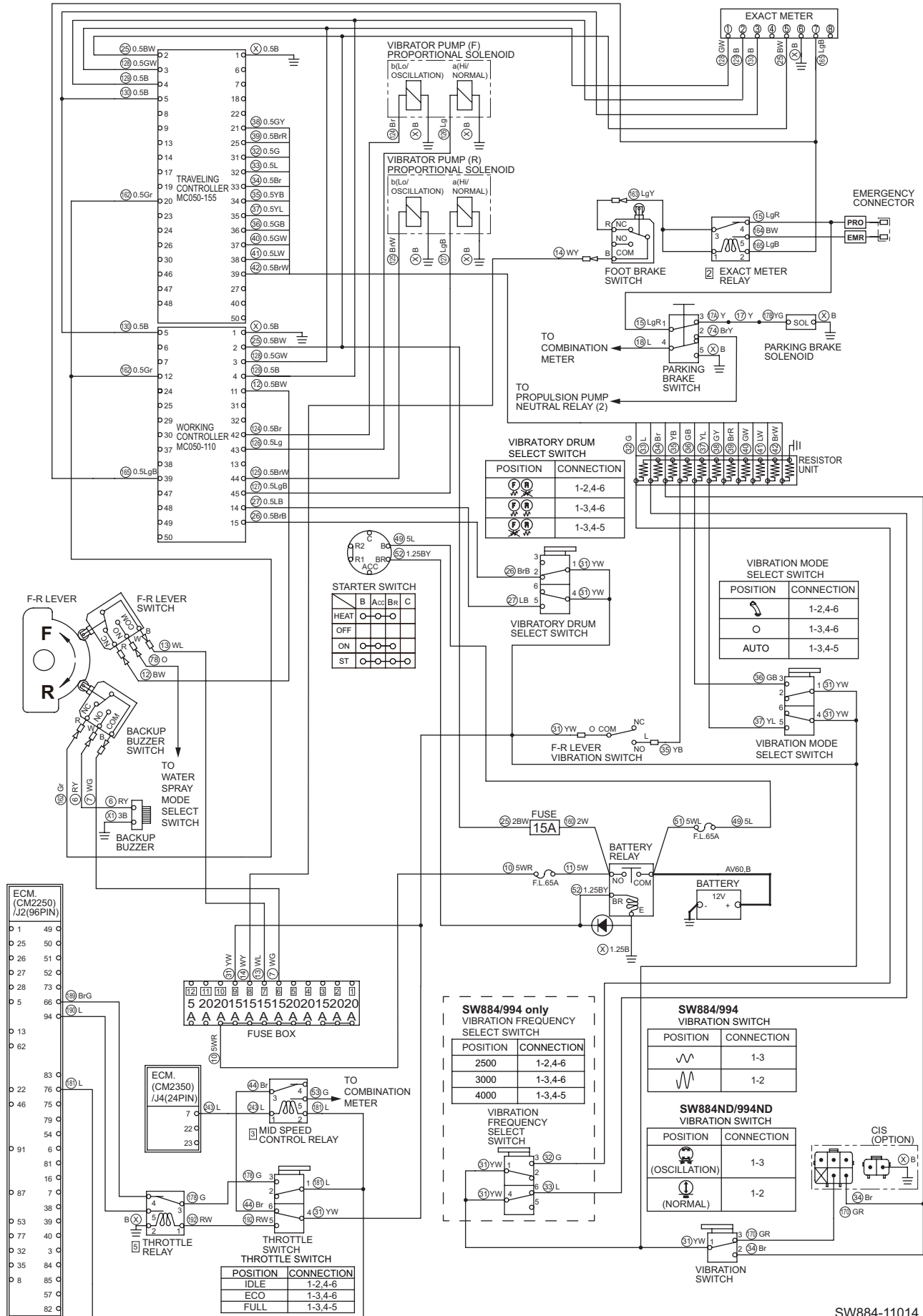
Check point	Check/Cause	Action
1. Vibration Mode Select Switch	<p>(1) When starter switch is ON and vibration mode select switch is "  ", measure voltage between vibration mode select switch terminal 1, 4 inlet wires YW and chassis ground. Standard voltage : 12 V</p> <p>(2) When starter switch is ON and vibration mode select switch is "  ", measure voltage between vibration mode select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Vibration mode select switch terminal 3 outlet wire GB and chassis ground</li> <li>• Vibration mode select switch terminal 5 outlet wire YL and chassis ground</li> </ul> <p>There is no electricity in normal condition.</p> <p>(3) When starter switch is ON and vibration mode select switch is "AUTO", measure voltage between vibration mode select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Vibration mode select switch terminal 3 outlet wire GB and chassis ground</li> <li>• Vibration mode select switch terminal 5 outlet wire YL and chassis ground</li> </ul> <p>Standard voltage : 12 V</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) or (3) is NG, vibration mode select switch is faulty.</li> </ul>	Replace vibration mode select switch.
2. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistance between resistor unit wires and ground wire. <ul style="list-style-type: none"> <li>• Resistor unit wire No.36 inlet wire GB and ground wire</li> <li>• Resistor unit wire No.37 wire YL and ground wire</li> </ul> <p>Standard resistance : 300 Ω</p> </li> <li>• If resistance is abnormal, resistor unit is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Resistor unit is used to stabilize contact of switch.</b></li> </ul>	Replace resistor unit.

Fig.: 2-6-1



**2-6-4. Continuous/automatic vibration mode cannot be switched 2/2**

Reference Fig. : 2-6-1


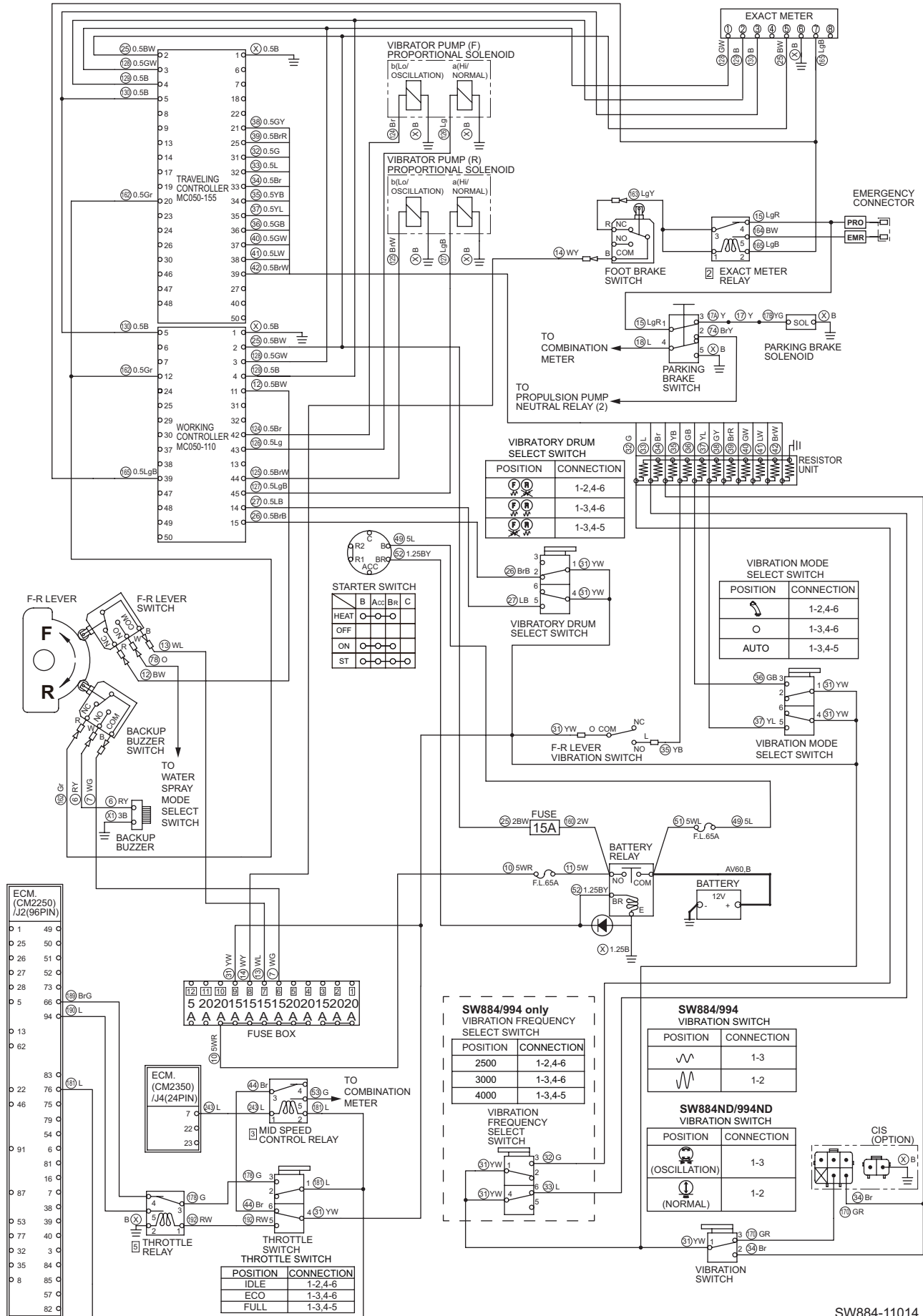
Check point	Check/Cause	Action
3. Traveling Controller	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration mode select switch is "  ", measure voltage between traveling controller terminal wires and ground terminal 1 wire B.</p> <ul style="list-style-type: none"> <li>• Traveling controller terminal 36 inlet wire GB and ground terminal 1 wire B</li> <li>• Traveling controller terminal 35 inlet wire YL and ground terminal 1 wire B</li> </ul> <p>There is no electricity in normal condition.</p> <p>(3) When starter switch is ON and vibration mode select switch is "AUTO", measure voltage between traveling controller terminal wires and ground terminal 1 wire B.</p> <ul style="list-style-type: none"> <li>• Traveling controller terminal 36 inlet wire GB and ground terminal 1 wire B</li> <li>• Traveling controller terminal 35 inlet wire YL and ground terminal 1 wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1), (2) or (3) is OK, traveling controller is faulty.</li> </ul>	Replace traveling controller.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-6-1



## 2-6-5. Front and rear vibratory drums cannot perform one-drum vibration

Reference Fig. : 2-6-1




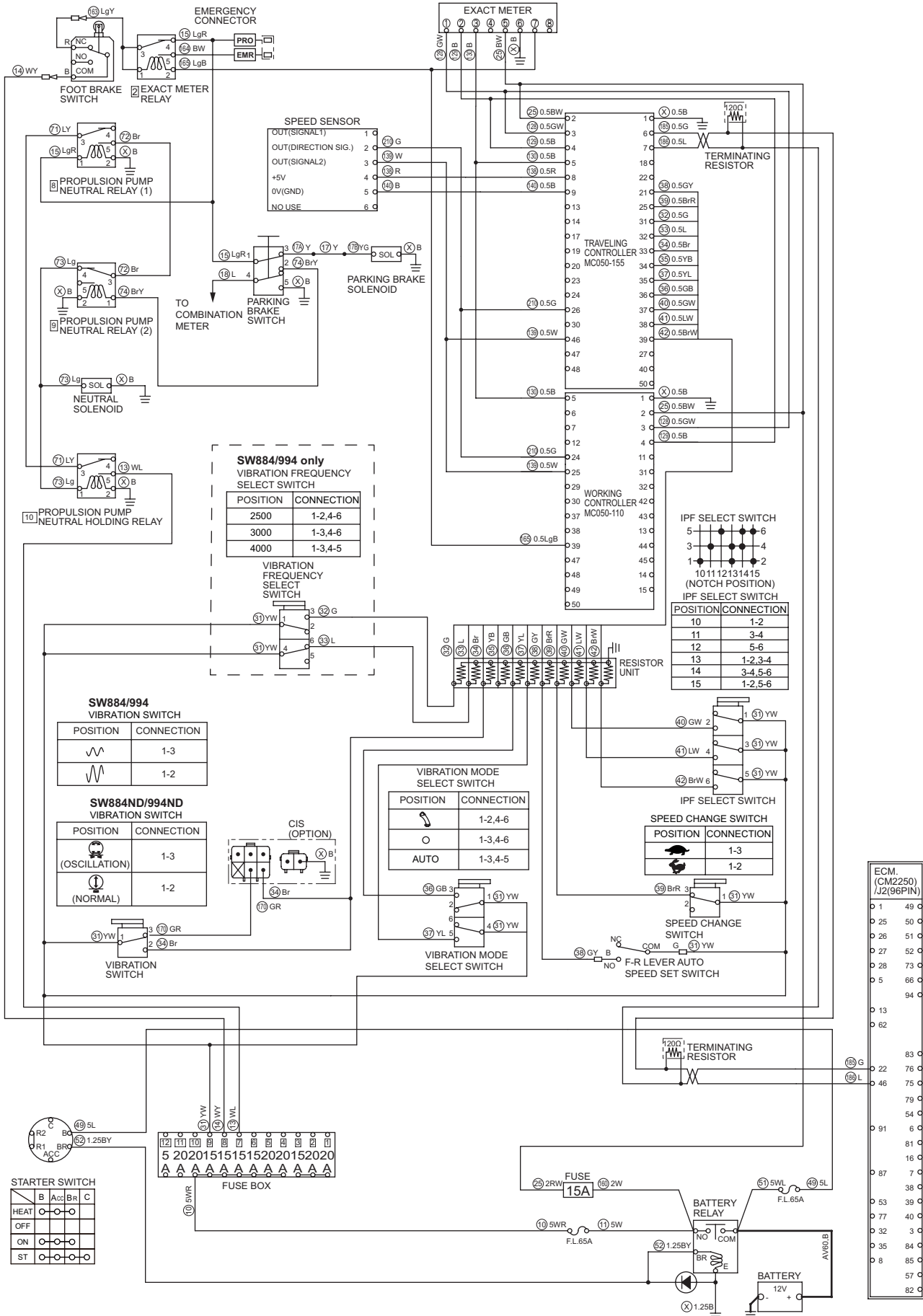
Check point	Check/Cause	Action
1. Vibratory Drum Select Switch	<p>(1) When starter switch is ON, measure voltage between vibratory drum select switch terminal 1, 4 inlet wires YW and chassis ground. Standard voltage: 12 V</p> <p>(2) When starter switch is ON and vibratory drum select switch is “”, measure voltage between vibratory drum select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Vibratory drum select switch terminal 2 outlet wire BrB and chassis ground</li> <li>• Vibratory drum select switch terminal 5 outlet wire LB and chassis ground</li> </ul> <p>There is no electricity in normal condition.</p> <p>(3) When starter switch is ON and vibratory drum select switch is “”, measure voltage between vibratory drum select switch terminal 2 outlet wire BrB and chassis ground. Standard voltage : 12 V</p> <p>(4) When starter switch is ON and vibratory drum select switch is “”, measure voltage between vibratory drum select switch terminal 5 outlet wire LB and chassis ground. Standard voltage : 12 V</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and any of items (2) through (4) is NG, vibratory drum select switch is faulty.</li> </ul>	Replace vibratory drum select switch.
2. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-5-1



## 2-7. Exact Meter

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.

### (NOTICE)

- If any abnormality is found in shielded twisted wires, be sure to replace them.

### 2-7-1. Exact meter indicator lamp does not illuminate while driving 1/10

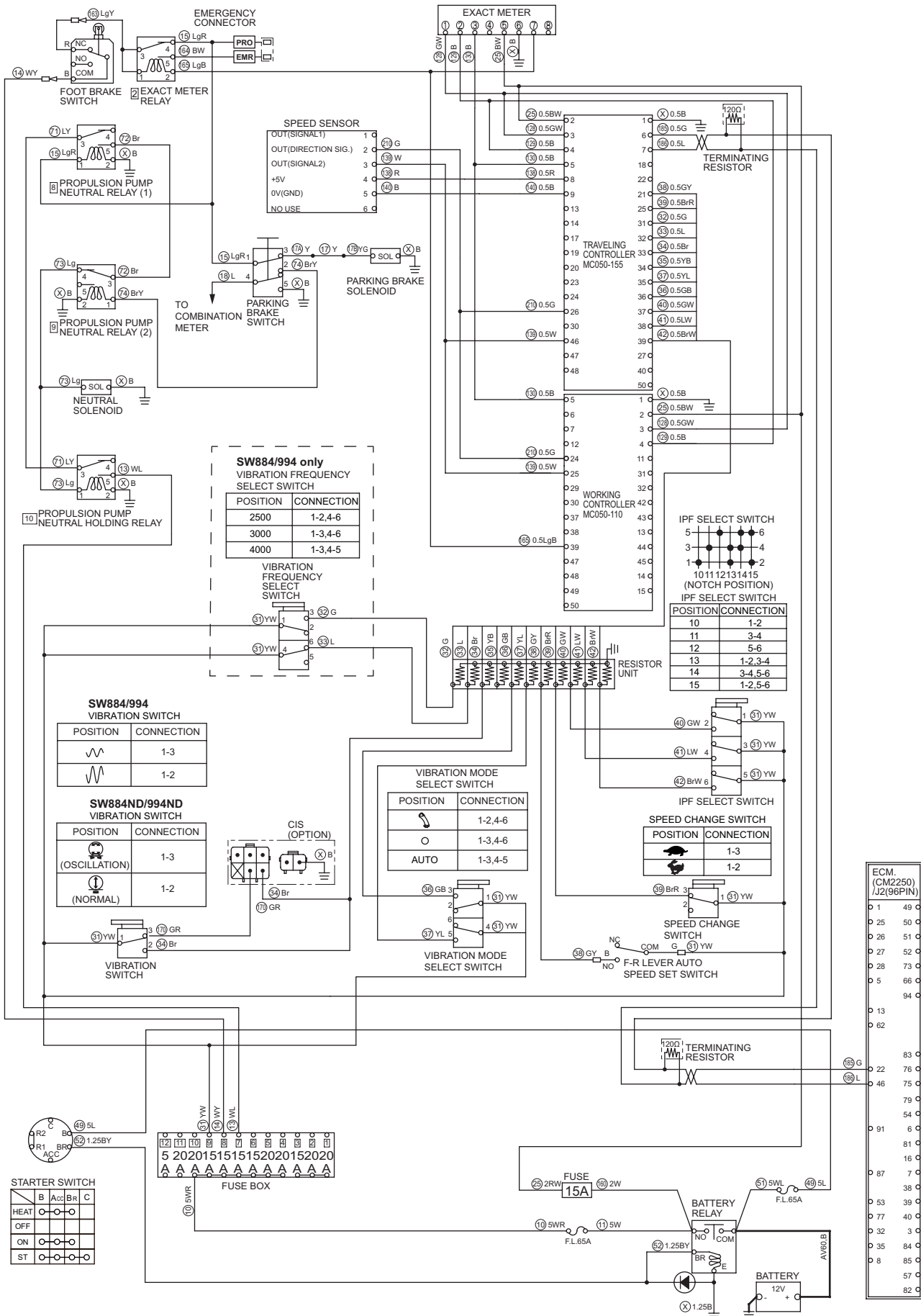
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to "FULL".
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

#### Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E11	1. Connector	<ul style="list-style-type: none"> <li>• Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller connector terminal 24, 25 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between speed sensor and traveling/working controller terminal wires.               <ul style="list-style-type: none"> <li>• Speed sensor terminal 2 wire G and traveling controller terminal 26 wire G, working controller terminal 24 wire G</li> <li>• Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller terminal 25 wire W</li> <li>• Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R</li> <li>• Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B</li> </ul> </li> <li>Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Speed Sensor	<p>(1) When starter switch is ON, measure voltage between speed sensor terminal 4 inlet wire R and ground terminal 5 wire B. Standard voltage : <math>5 \pm 0.25</math> V</p> <p>(2) Start engine and rotate vibratory drum. Measure pulse between speed sensor terminal 3 outlet wire W and ground terminal 5 wire B with a pulse meter. Standard pulse : 21 pulses/rotation</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, speed sensor is faulty.</li> </ul>	Replace speed sensor.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E11 is displayed and no abnormality is found in connector, harness and speed sensor in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/ working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, start engine.</li> <li>② Exact meter will display E11.</li> <li>③ Move F-R lever "F" or "R" and run machine.</li> <li>④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.</li> </ol>	

Fig.: 2-5-1





**2-7-1. Exact meter indicator lamp does not illuminate while driving 2/10**

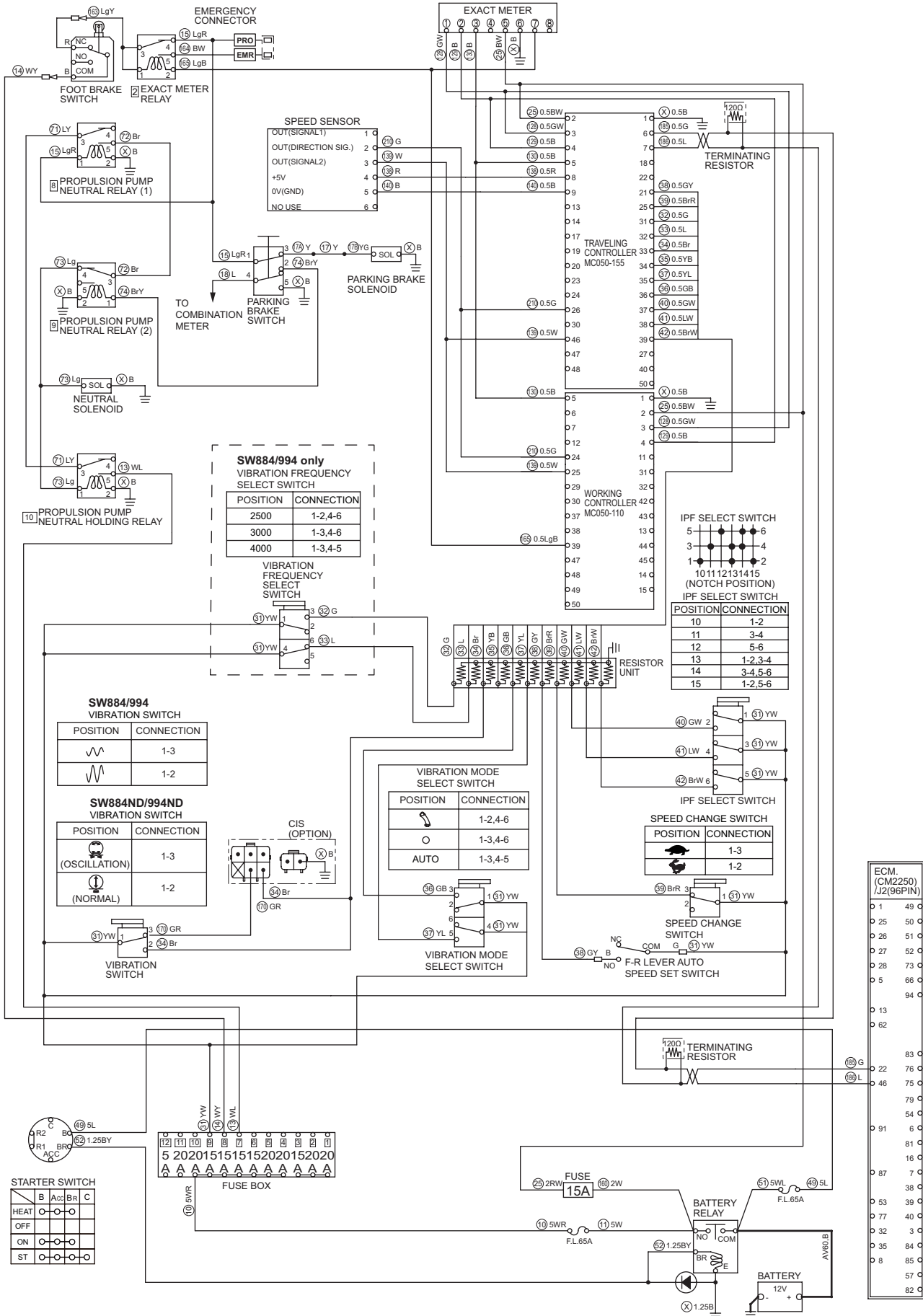
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-5-1**

Error code	Check point	Check/Cause	Action
E21	1. Connector	<ul style="list-style-type: none"> <li>• Check vibration frequency select switch, vibration switch and traveling controller connector terminal 31, 32, 33 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistances between switches and traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• Vibration frequency select switch terminal 3 wire G and traveling controller terminal 31 wire G (SW884/994 only)</li> <li>• Vibration frequency select switch terminal 6 wire L and traveling controller terminal 32 wire L (SW884/994 only)</li> <li>• Vibration switch terminal 2 wire Br and traveling controller terminal 33 wire Br</li> </ul> <p>Standard resistance : 10 Ω or less</p> <p>(2) Measure resistances between switches and fuse box terminal wires.</p> <ul style="list-style-type: none"> <li>• Vibration frequency select switch terminal 1, 4 wires YW and fuse box terminal 9 wire YW (SW884/994 only)</li> <li>• Vibration switch terminal 1 wire YW and fuse box terminal 9 wire YW</li> </ul> <p>Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Vibration Frequency Select Switch (SW884/994 only)	<p>(1) When starter switch is ON, measure voltage between vibration frequency select switch terminal 1, 4 inlet wires YW and chassis ground.</p> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, vibration frequency select switch is “2500”, measure voltage between vibration frequency select switch terminal 6 outlet wire L and chassis ground.</p> <p>Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, vibration frequency select switch is “3000”, measure voltage between vibration frequency select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Vibration frequency select switch terminal 3 outlet wire G and chassis ground</li> <li>• Vibration frequency select switch terminal 6 outlet wire L and chassis ground</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(4) When starter switch is ON, vibration frequency select switch is “4000”, measure voltage between vibration frequency select switch terminal 3 outlet wire G and chassis ground.</p> <p>Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2), (3) or (4) is NG, vibration frequency select switch is faulty.</li> </ul>	Replace vibration frequency select switch.

Fig.: 2-5-1



## 2-7-1. Exact meter indicator lamp does not illuminate while driving 3/10

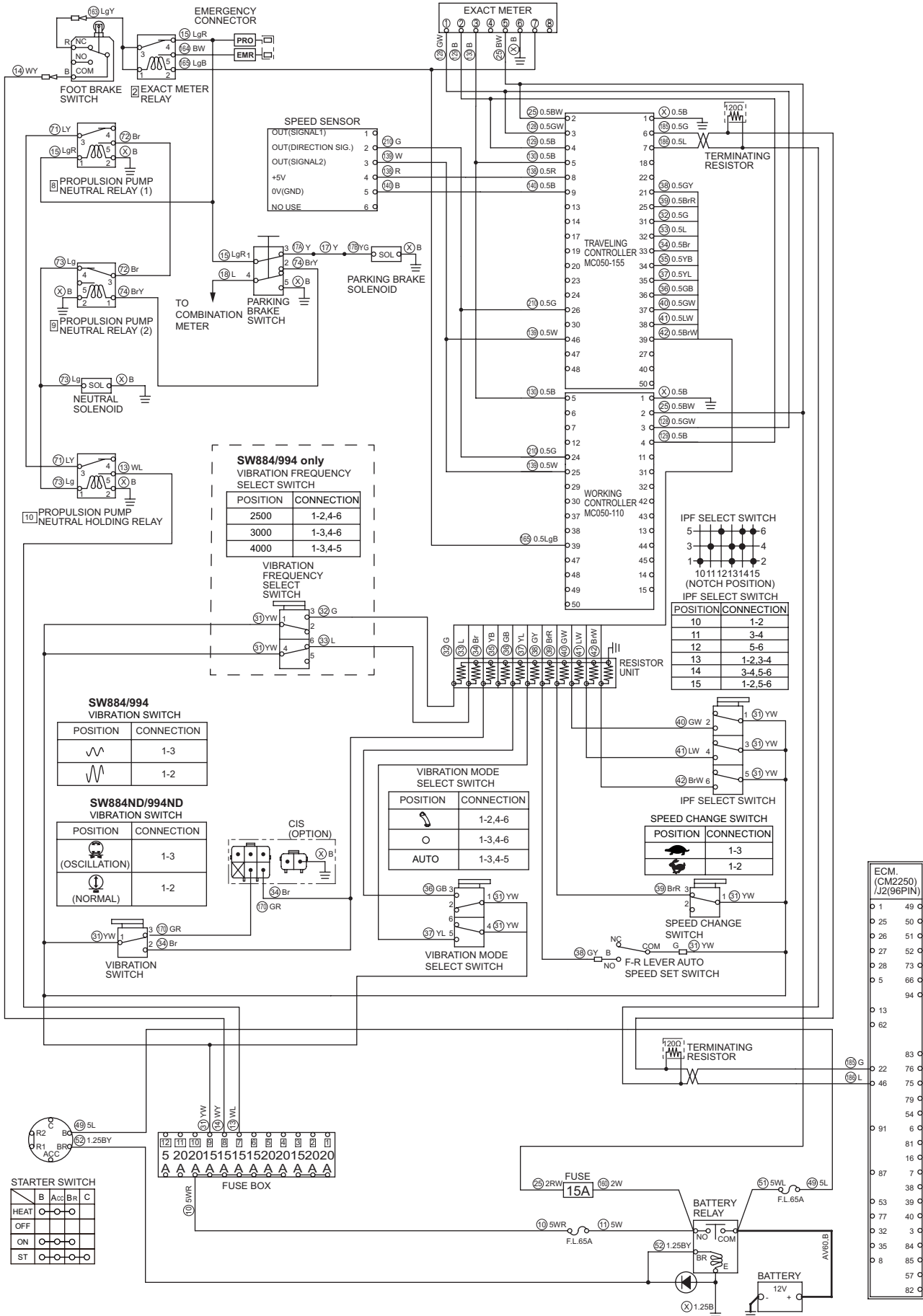
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E21	4. Vibration Switch (SW884/994)	<p>(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 3 outlet wire GR and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <p>• If above item (1) is OK and item (2) or (3) is NG, vibration switch is faulty.</p>	Replace vibration switch.
	5. Vibration Switch (SW884ND/994ND)	<p>(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 3 outlet wire GR and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration switch is “”, measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <p>• If above item (1) is OK and item (2) or (3) is NG, vibration switch is faulty.</p>	Replace vibration switch.
	6. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistances between resistor unit wires and ground wire.</li> <li>• Resistor unit wire No. 32 wire G and ground wire (SW884/994 only)</li> <li>• Resistor unit wire No. 33 wire L and ground wire (SW884/994 only)</li> <li>• Resistor unit wire No. 34 wire Br and ground wire Standard resistance : 300 Ω</li> </ul> <p>• If resistance is abnormal, resistor unit is faulty.</p> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• Resistor unit is used to stabilize contact of switch.</li> </ul>	Replace resistor unit.

Fig.: 2-5-1



**2-7-1. Exact meter indicator lamp does not illuminate while driving 4/10**

- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-5-1**


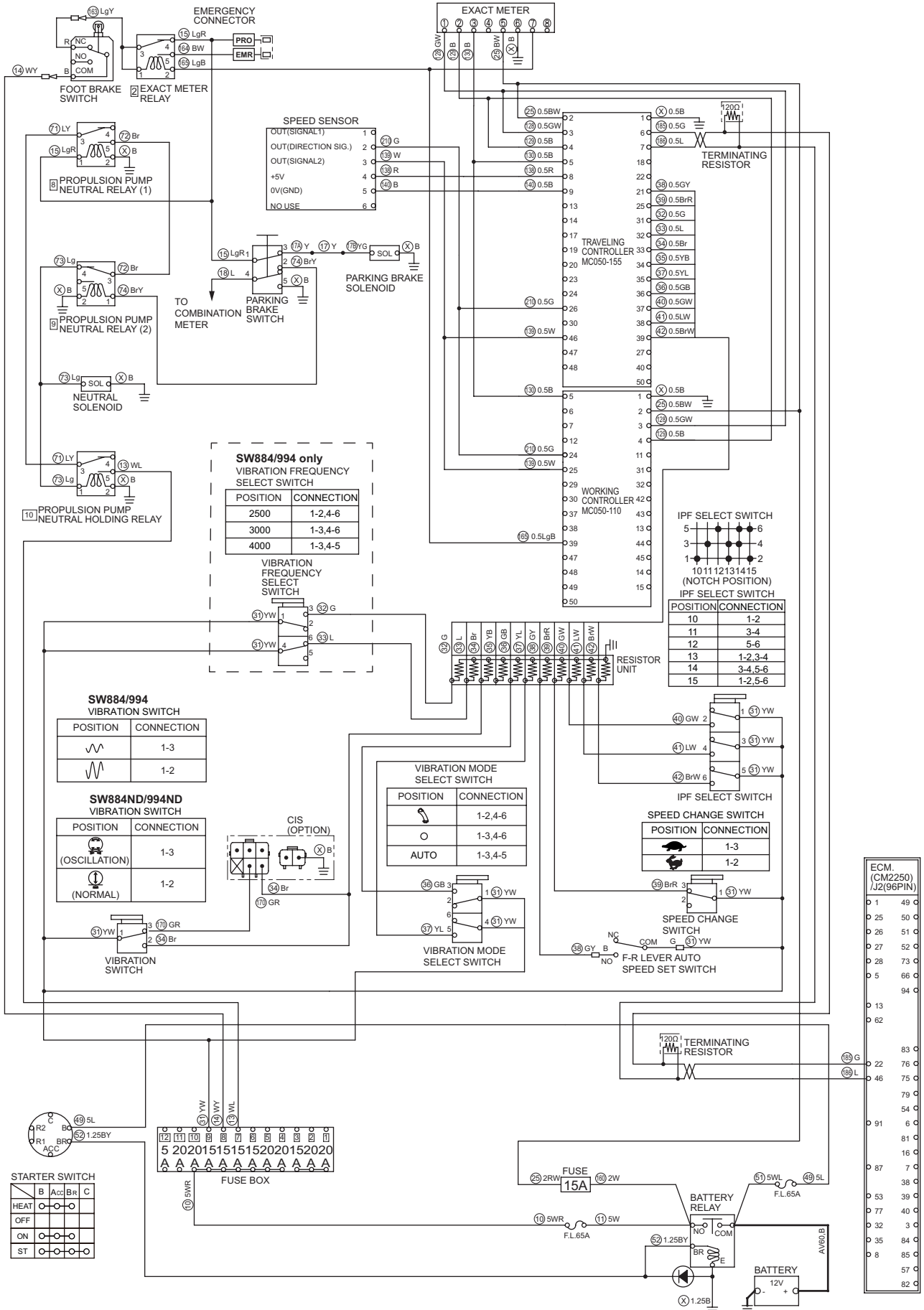
Error code	Check point	Check/Cause	Action
E21	6. Traveling Controller (SW884/994)	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between traveling controller terminal 32 inlet wire L and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• Traveling controller terminal 31 inlet wire G and ground terminal 1 wire B</li> <li>• Traveling controller terminal 32 inlet wire L and ground terminal 1 wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between traveling controller terminal 31 inlet wire G and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(5) When starter switch is ON and vibration switch is “11-166</p>	

Fig.: 2-5-1



**2-7-1. Exact meter indicator lamp does not illuminate while driving 5/10**

- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-5-1**


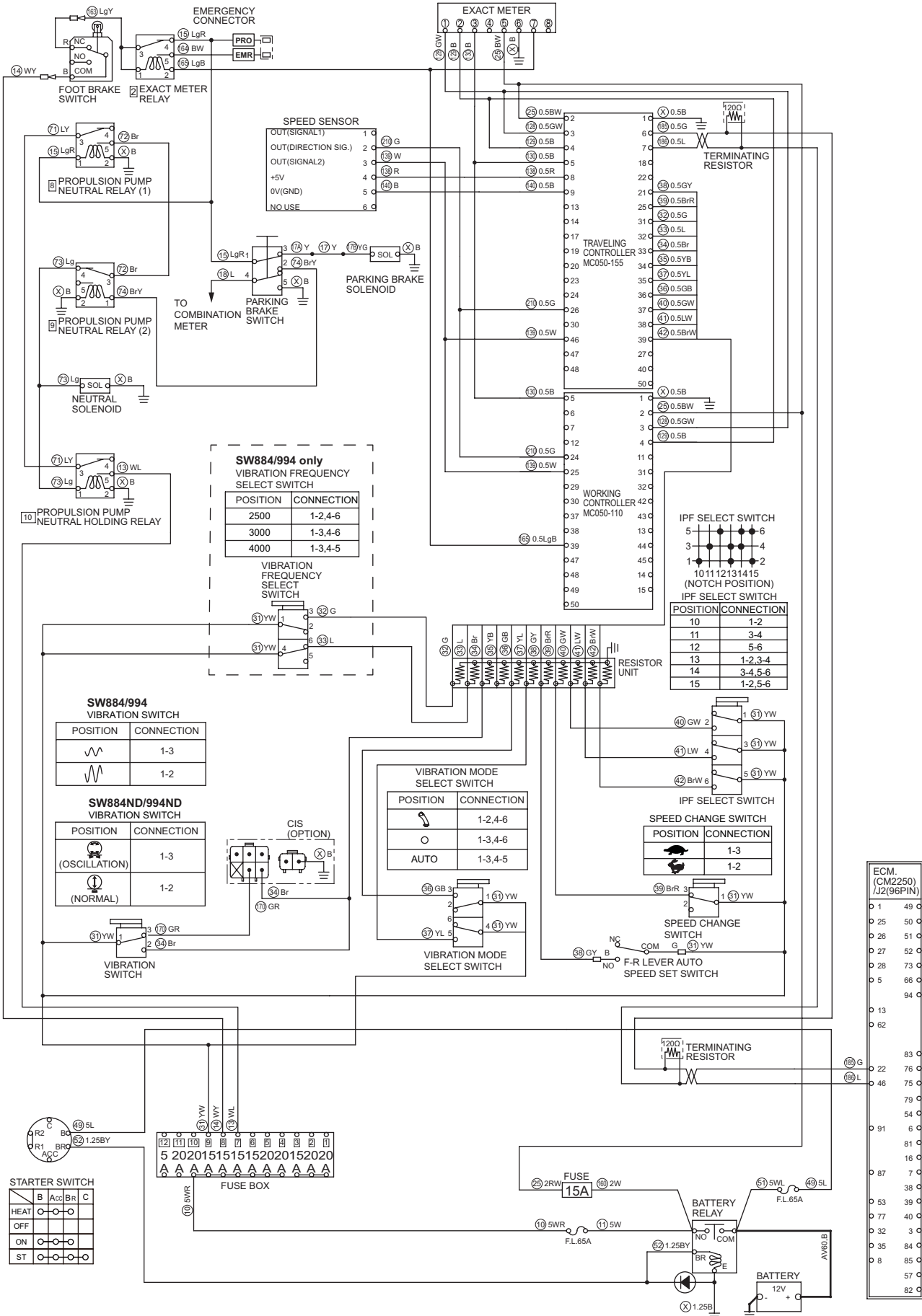
Error code	Check point	Check/Cause	Action
E21	8. Traveling Controller (SW884ND/994ND)	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration switch is “”, measure voltage between traveling controller terminal 33 inlet wire Br and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>• If above items (1) and (2) are OK, traveling controller is faulty.</p>	Replace traveling controller.
	9. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Exact meter will display vehicle speed.</p> <p>③ Check all combinations of vibration frequency select switch and vibration switch positions. Exact meter will still display vehicle speed. Machine is in normal state. If display changes from vehicle speed to E21, check above items again.</p>	

Fig.: 2-5-1





**2-7-1. Exact meter indicator lamp does not illuminate while driving 6/10**

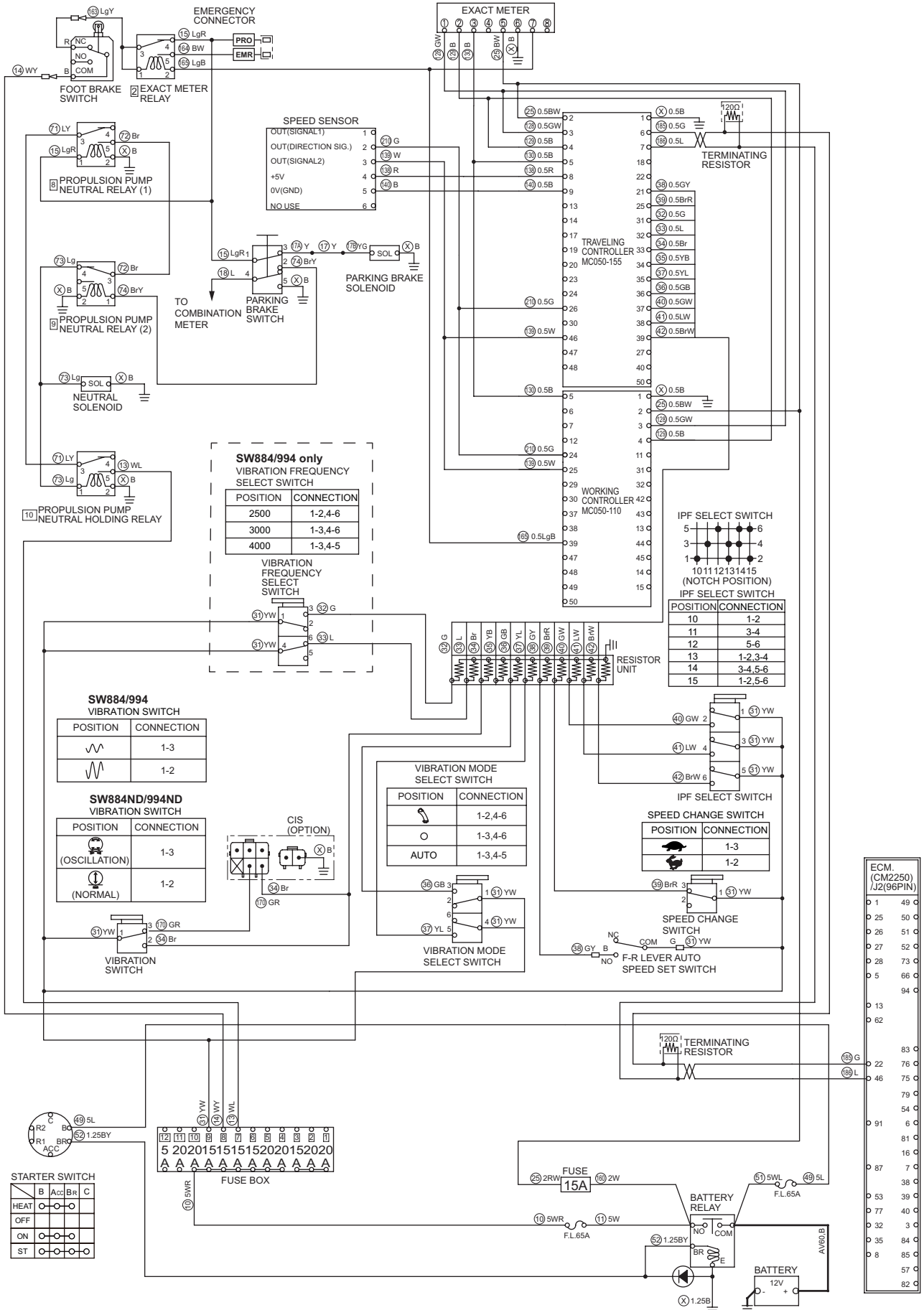
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-5-1**

Error code	Check point	Check/Cause	Action
E22	1. Connector	<ul style="list-style-type: none"> <li>• Check IPF select switch connector and traveling controller connector terminal 37, 38, 39 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<p>(1) Measure resistances between IPF select switch and traveling controller terminal wires.</p> <ul style="list-style-type: none"> <li>• IPF select switch terminal 2 wire GW and traveling controller terminal 37 wire GW</li> <li>• IPF select switch terminal 4 wire LW and traveling controller terminal 38 wire LW</li> <li>• IPF select switch terminal 6 wire BrW and traveling controller terminal 39 wire BrW</li> </ul> <p>Standard resistance : 10 Ω or less</p> <p>(2) Measure resistances between IPF select switch terminal 1, 3, 5 wires YW and fuse box terminal 9 wire YW.</p> <p>Standard resistance : 10 Ω or less</p> <ul style="list-style-type: none"> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-5-1



## 2-7-1. Exact meter indicator lamp does not illuminate while driving 7/10

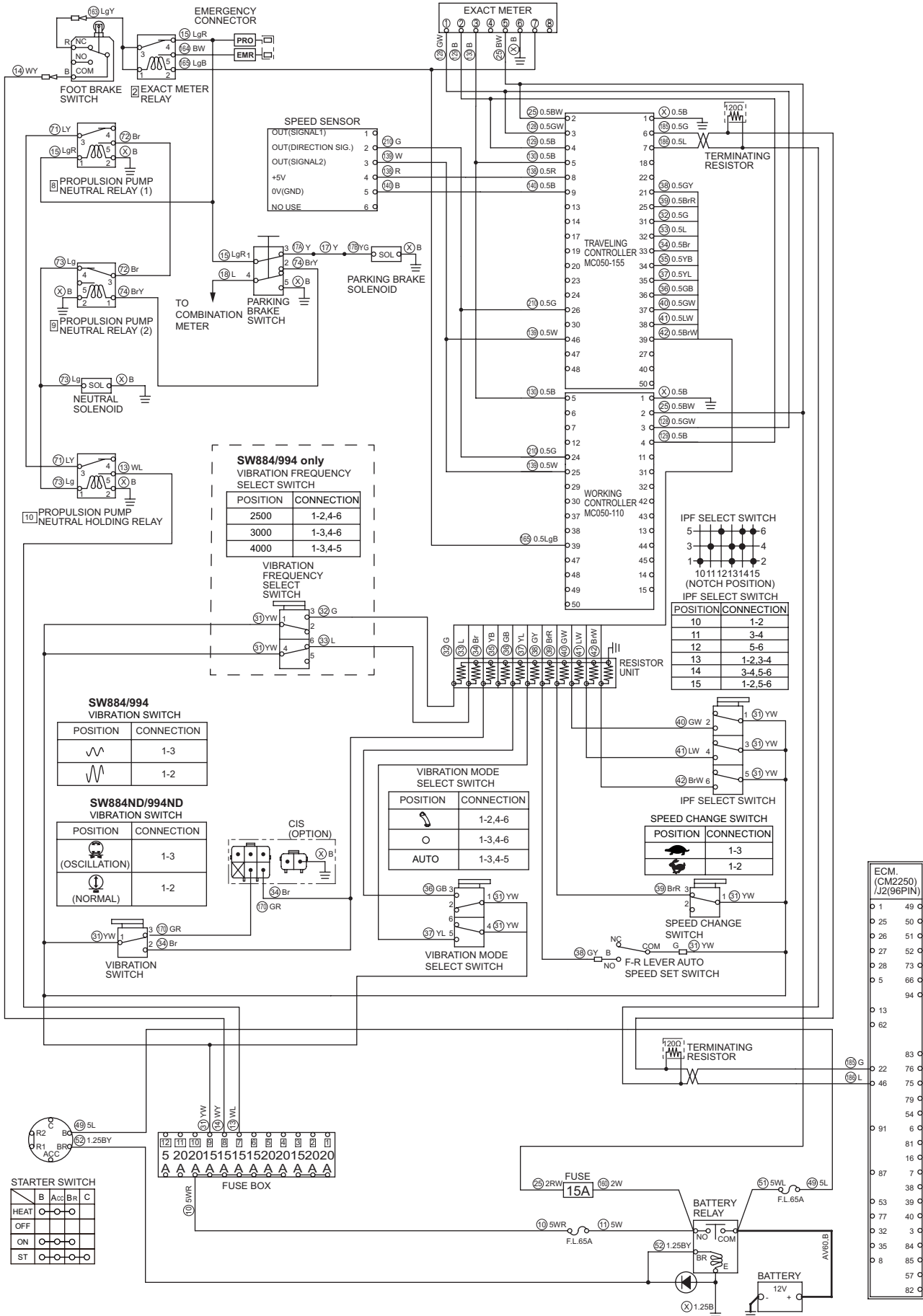
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

### Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E22	3. IPF Select Switch	<p>(1) When starter switch is ON, measure voltage between IPF select switch terminal 1, 3, 5 inlet wires YW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and IPF select switch is “10”, measure voltage between IPF select switch terminal 2 outlet wire GW and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and IPF select switch is “11”, measure voltage between IPF select switch terminal 4 outlet wire LW and chassis ground. Standard voltage : 12 V or more</p> <p>(4) When starter switch is ON and IPF select switch is “12”, measure voltage between IPF select switch terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more</p> <p>(5) When starter switch is ON and IPF select switch is “13”, measure voltage between IPF select switch terminal 2 outlet wire GW, terminal 4 outlet wire LW and chassis ground. Standard voltage : 12 V or more</p> <p>(6) When starter switch is ON and IPF select switch is “14”, measure voltage between IPF select switch terminal 4 outlet wire LW, terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more</p> <p>(7) When starter switch is ON and IPF select switch is “15”, measure voltage between IPF select switch terminal 2 outlet wire GW, terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and any of items (2) through (7) is NG, IPF select switch is faulty.</li> </ul>	Replace IPF select switch.
	4. Resistor Unit	<ul style="list-style-type: none"> <li>• Measure resistances between resistor unit wires and ground wire. <ul style="list-style-type: none"> <li>• Resistor unit wire No.40 wire GW and ground wire</li> <li>• Resistor unit wire No.41 wire LW and ground wire</li> <li>• Resistor unit wire No.42 wire BrW and ground wire</li> </ul> </li> <li>• Standard resistance : 300 Ω</li> <li>• If resistance is abnormal, resistor unit is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Resistor unit is used to stabilize contact of switch.</b></li> </ul>	Replace resistor unit.

Fig.: 2-5-1



**2-7-1. Exact meter indicator lamp does not illuminate while driving 8/10**

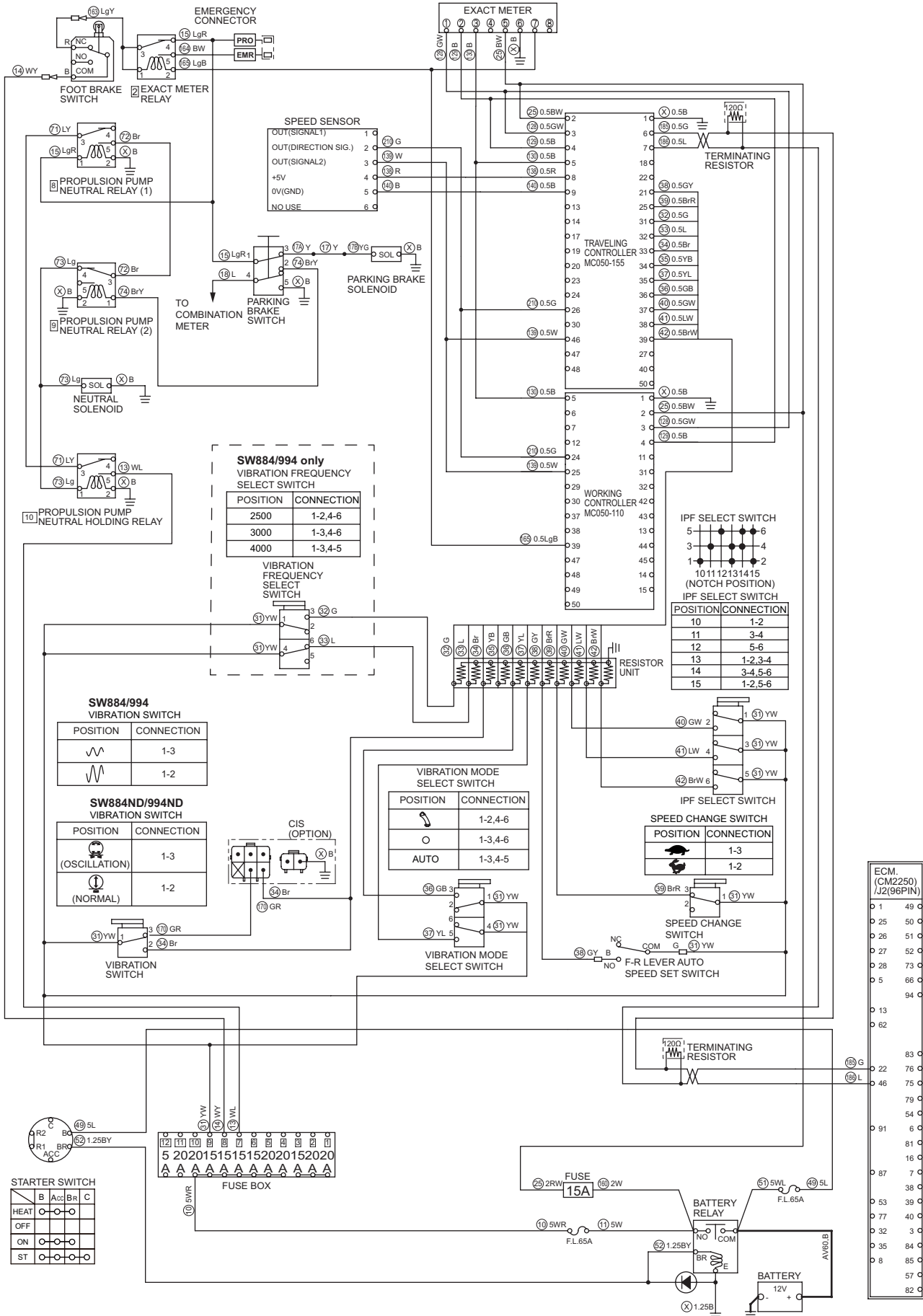
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-5-1**

Error code	Check point	Check/Cause	Action
E22	5. Traveling Controller	<p>(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and IPF select switch is “10”, measure voltage between traveling controller terminal 37 inlet wire GW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and IPF select switch is “11”, measure voltage between traveling controller terminal 38 inlet wire LW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(4) When starter switch is ON and IPF select switch is “12”, measure voltage between traveling controller terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(5) When starter switch is ON and IPF select switch is “13”, measure voltage between traveling controller terminal 37 inlet wire GW, terminal 38 inlet wire LW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(6) When starter switch is ON and IPF select switch is “14”, measure voltage between traveling controller terminal 38 inlet wire LW, terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>(7) When starter switch is ON and IPF select switch is “15”, measure voltage between traveling controller terminal 37 inlet wire GW, terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more</p> <p>• If all of items (1) through (7) are OK, traveling controller is faulty.</p>	Replace traveling controller.
	6. Clearing Error Code and Judging OK/NG after Repair	<p>① When repair is complete, set starter switch to ON.</p> <p>② Exact meter will display vehicle speed.</p> <p>③ Check all positions of IPF select switch. Exact meter will still display vehicle speed. Machine is in normal state. If display changes form vehicle speed to E22, check above items again.</p>	

Fig.: 2-5-1



**2-7-1. Exact meter indicator lamp does not illuminate while driving 9/10**

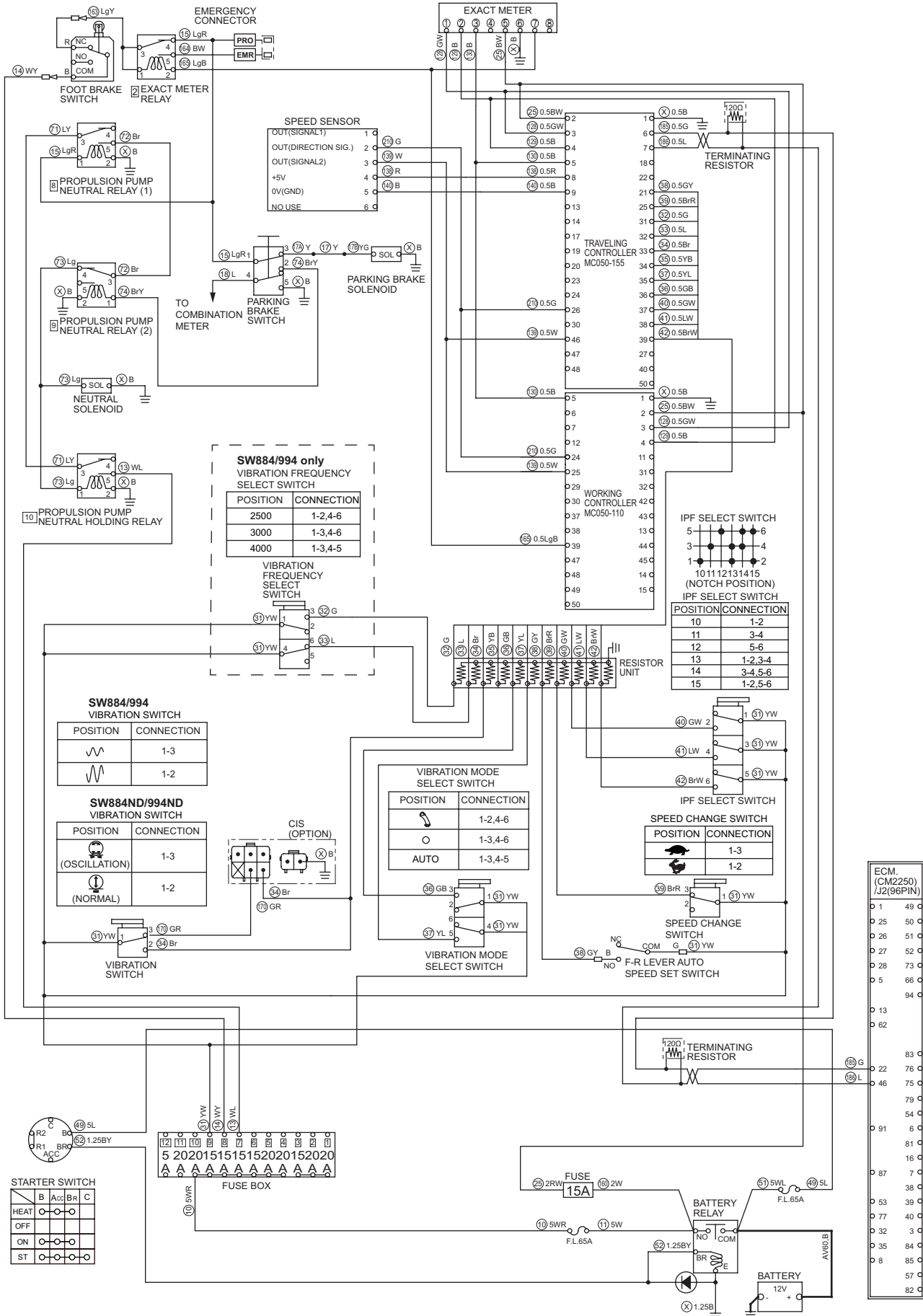
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-5-1**

Error code	Check point	Check/Cause	Action
E43	1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and traveling controller terminal wires.</li> <li>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> <li>Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Exact Meter	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between exact meter terminal 5 inlet wire BW and ground terminal 6 wire B.</li> <li>Standard voltage : 12 V or more</li> <li>• If voltage is abnormal, exact meter is faulty.</li> </ul>	Replace exact meter.
	4. CAN Communication	<ul style="list-style-type: none"> <li>• A normally operating traveling controller sends connection verification signals to exact meter every 0.1 second. Exact meter cannot receive connection verification signals that are regularly sent from traveling controller for 1 continuous second while operating.</li> <li>• Traveling controller is faulty.</li> </ul>	Replace traveling controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, set starter switch to ON.</li> <li>② Place F-R lever “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.</li> </ol>	

Fig.: 2-5-1





**2-7-1. Exact meter indicator lamp does not illuminate while driving 10/10**

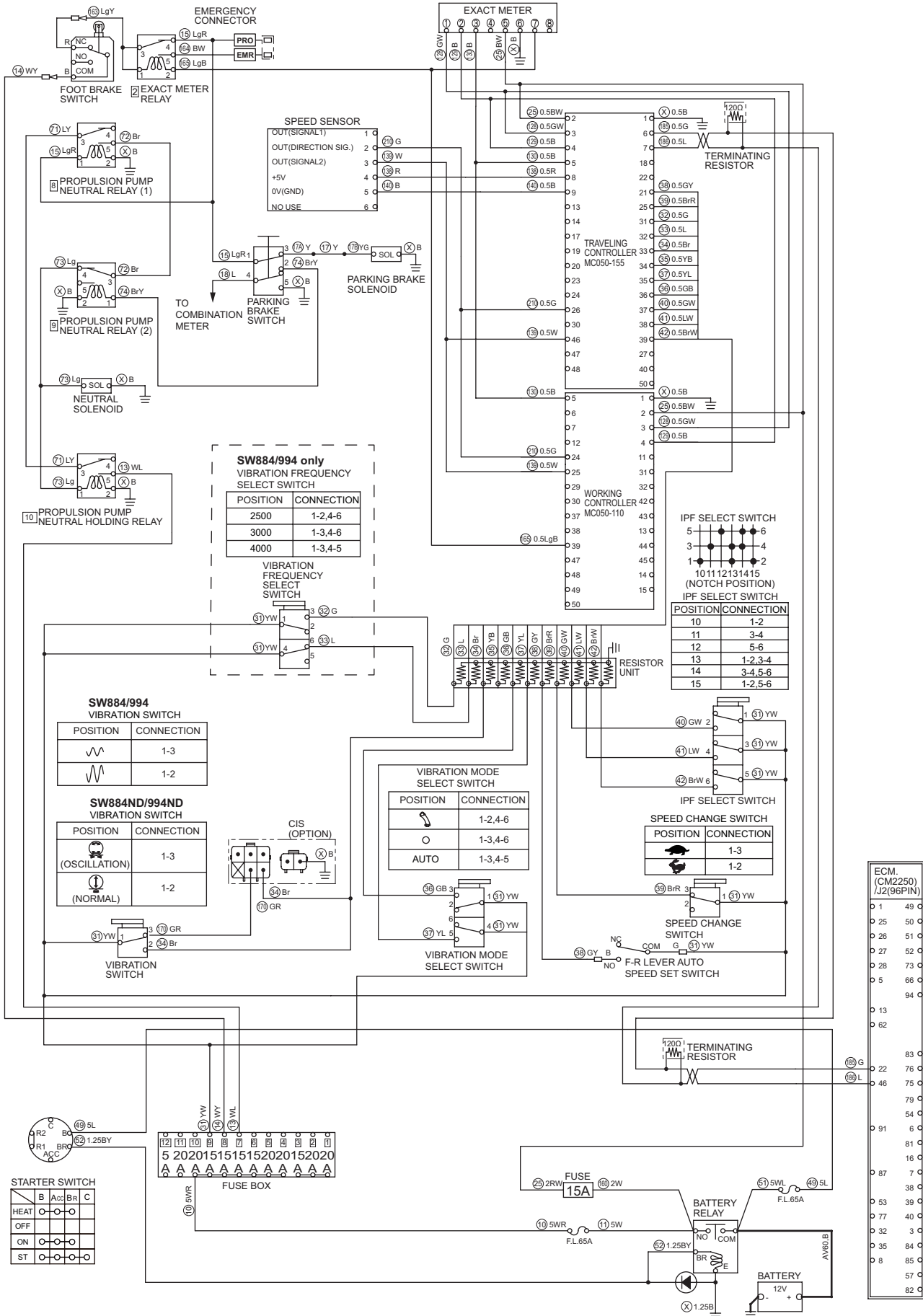
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to "FULL".
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig. : 2-5-1**

Check point	Check/Cause	Action
1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and traveling controller terminal wires.               <ul style="list-style-type: none"> <li>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> </ul> </li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
3. Exact Meter Multiple Display	<ul style="list-style-type: none"> <li>• If no abnormality is found in connector and harness in above inspections and error code E43 is not displayed, exact meter multiple display or traveling controller is faulty.</li> </ul>	Replace exact meter multiple display or traveling controller.

Fig.: 2-5-1



**2-7-2. No vehicle speed indication on display 1/3**

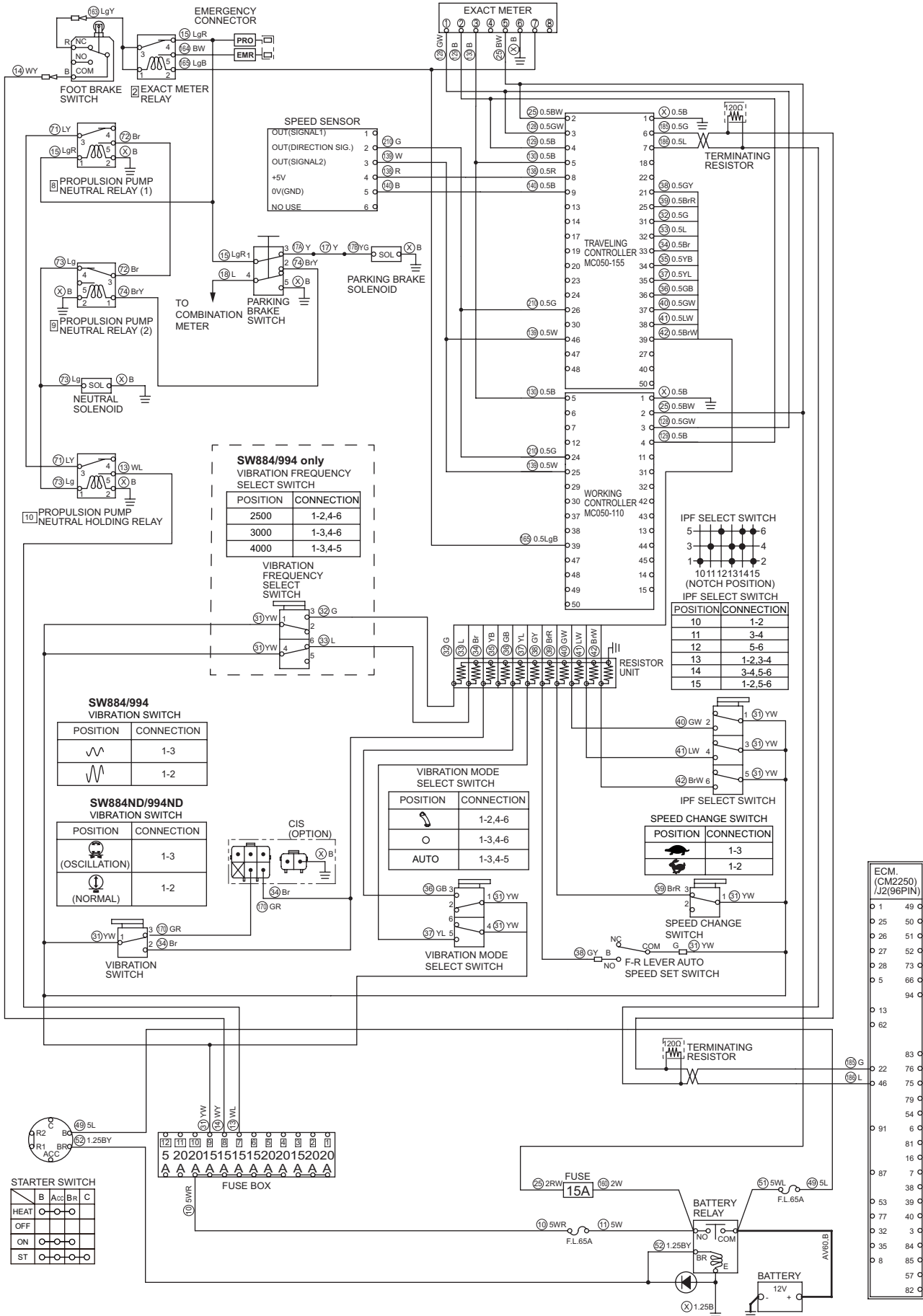
- Set engine throttle switch to "FULL".
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-5-1**

Error code	Check point	Check/Cause	Action
E11	1. Connector	<ul style="list-style-type: none"> <li>• Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller connector terminal 24, 25 for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between speed sensor and traveling/working controller terminal wires.               <ul style="list-style-type: none"> <li>• Speed sensor terminal 2 wire G and traveling controller terminal 26 wire G, working controller terminal 24 wire G</li> <li>• Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller terminal 25 wire W</li> <li>• Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R</li> <li>• Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B</li> </ul> </li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	3. Speed Sensor	<p>(1) When starter switch is ON, measure voltage between speed sensor terminal 4 inlet wire R and ground terminal 5 outlet wire B. Standard voltage : 5 <math>\pm</math> 0.25 V</p> <p>(2) Start engine and rotate vibratory drum. Measure pulse between speed sensor terminal 3 outlet wire W and terminal 5 outlet wire B with a pulse meter. Standard pulse : 21 pulses/rotation</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, speed sensor is faulty.</li> </ul>	Replace speed sensor.
	4. Traveling/ Working Controller	<ul style="list-style-type: none"> <li>• If error code E11 is displayed and no abnormality is found in connector, harness and speed sensor in above inspection, traveling/working controller is faulty.</li> </ul>	Replace traveling/ working controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, start engine.</li> <li>② Exact meter will display E11.</li> <li>③ Move F-R lever "F" or "R" and run machine.</li> <li>④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state.</li> </ol> <p>If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-5-1



**SW884/994 only**  
VIBRATION FREQUENCY SELECT SWITCH

POSITION	CONNECTION
2500	1-2,4-6
3000	1-3,4-6
4000	1-3,4-5

**SW884/994**  
VIBRATION SWITCH

POSITION	CONNECTION
	1-3
	1-2

**SW884ND/994ND**  
VIBRATION SWITCH

POSITION	CONNECTION
(OSCILLATION)	1-3
(NORMAL)	1-2

VIBRATION MODE SELECT SWITCH

POSITION	CONNECTION
	1-2,4-6
O	1-3,4-6
AUTO	1-3,4-5

IPF SELECT SWITCH

POSITION	CONNECTION
10	1-2
11	3-4
12	5-6
13	1-2,3-4
14	3-4,5-6
15	1-2,5-6

SPEED CHANGE SWITCH

POSITION	CONNECTION
	1-3
	1-2

ECM (CM2250) / J2 (96PIN)

1	49 C
25	50 C
26	51 C
27	52 C
28	73 C
5	66 C
	94 C
13	
62	
	83 C
22	76 C
46	75 C
	79 C
	54 C
91	6 C
	81 C
	73 C
	16 C
87	7 C
	38 C
53	39 C
77	40 C
32	3 C
35	84 C
8	85 C
	57 C
	82 C

**2-7-2. No vehicle speed indication on display 2/3**

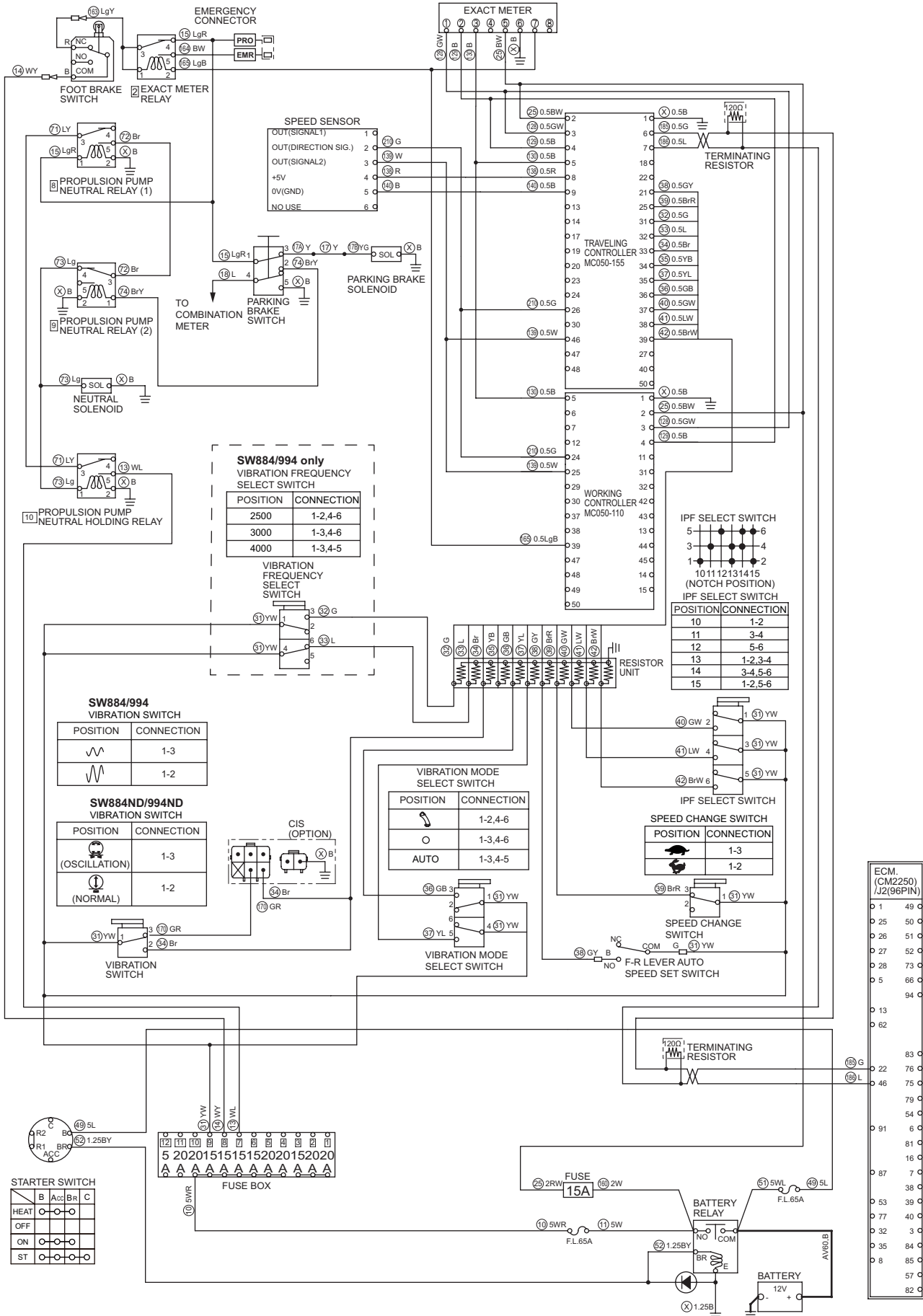
- Set engine throttle switch to "FULL".
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-5-1**

Error code	Check point	Check/Cause	Action
E43	1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
	2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and traveling controller terminal wires.</li> <li>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
	3. Exact Meter	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between exact meter terminal 5 outlet wire BW and ground terminal 6 wire B.</li> <li>Standard voltage : 12 V or more</li> <li>• If voltage is abnormal, exact meter is faulty.</li> </ul>	Replace exact meter.
	4. CAN Communication	<ul style="list-style-type: none"> <li>• A normally operating traveling controller sends connection verification signals to exact meter every 0.1 second. Exact meter cannot receive connection verification signals that are regularly sent from traveling controller for 1 continuous second while operating.</li> <li>• Traveling controller is faulty.</li> </ul>	Replace traveling controller.
	5. Clearing Error Code and Judging OK/NG after Repair	<ol style="list-style-type: none"> <li>① When repair is complete, set starter switch to ON.</li> <li>② Place F-R lever "N".</li> </ol> <p>Exact meter will display vehicle speed. Machine is in normal state.</p> <p>If display does not change to vehicle speed, check above items again.</p>	

Fig.: 2-5-1



**2-7-2. No vehicle speed indication on display 3/3**

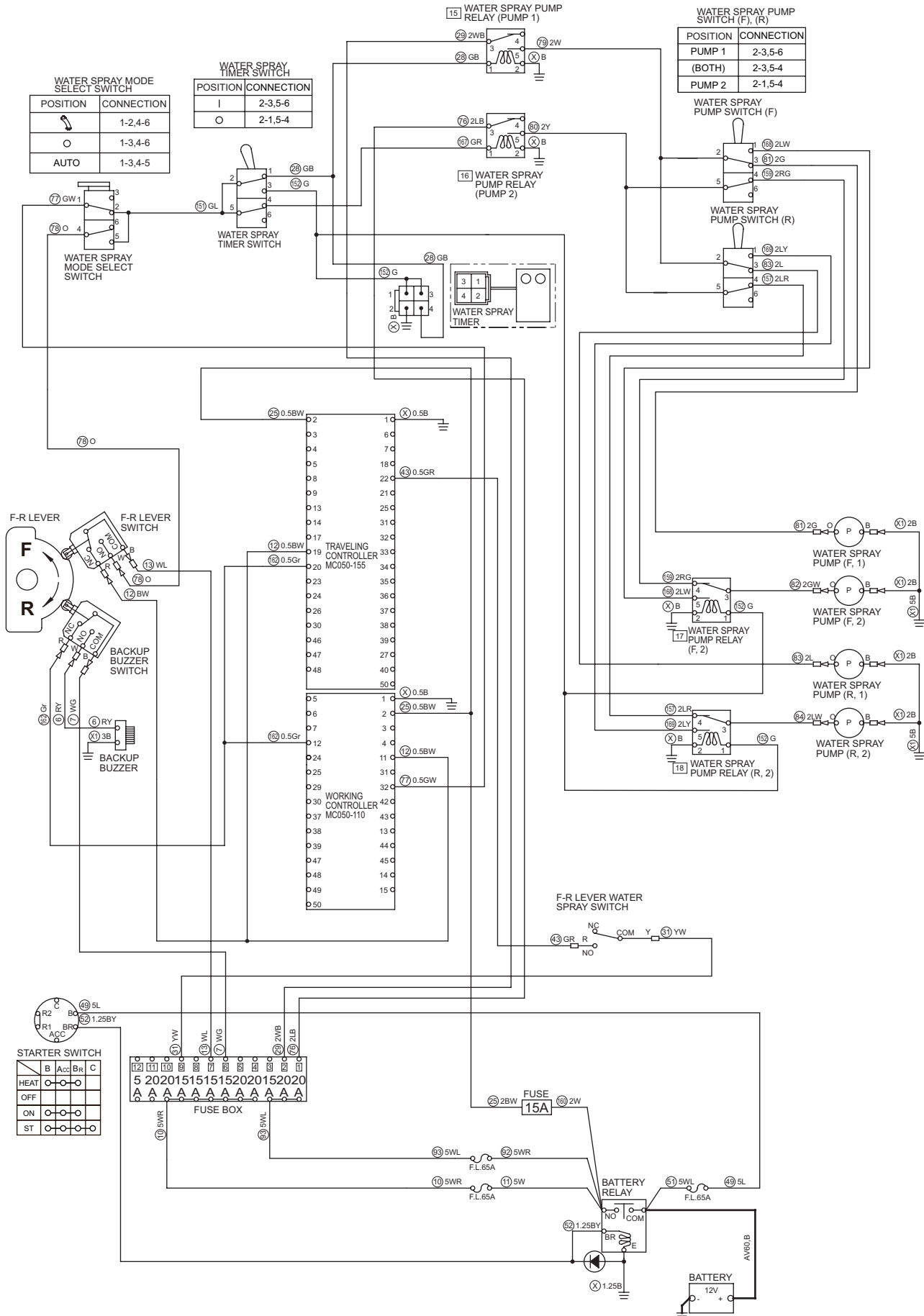
- Set engine throttle switch to "FULL".
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig. : 2-5-1**

Check point	Check/Cause	Action
1. Connector	<ul style="list-style-type: none"> <li>• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness.</li> <li>• If any abnormality is found, connector is faulty.</li> </ul>	Replace connector or terminal.
2. Harness	<ul style="list-style-type: none"> <li>• Measure resistances between exact meter and traveling controller terminal wires.               <ul style="list-style-type: none"> <li>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW</li> <li>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B</li> <li>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B</li> <li>• Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB</li> </ul> </li> <li>Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Replace harness.
3. Exact Meter Multiple Display	<ul style="list-style-type: none"> <li>• If no abnormality is found in connector and harness in above inspections and error code E43 is not displayed, exact meter multiple display or traveling controller is faulty.</li> </ul>	Replace exact meter multiple display or traveling controller.

Fig.: 2-8-1







## 2-8. Water Spray

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.

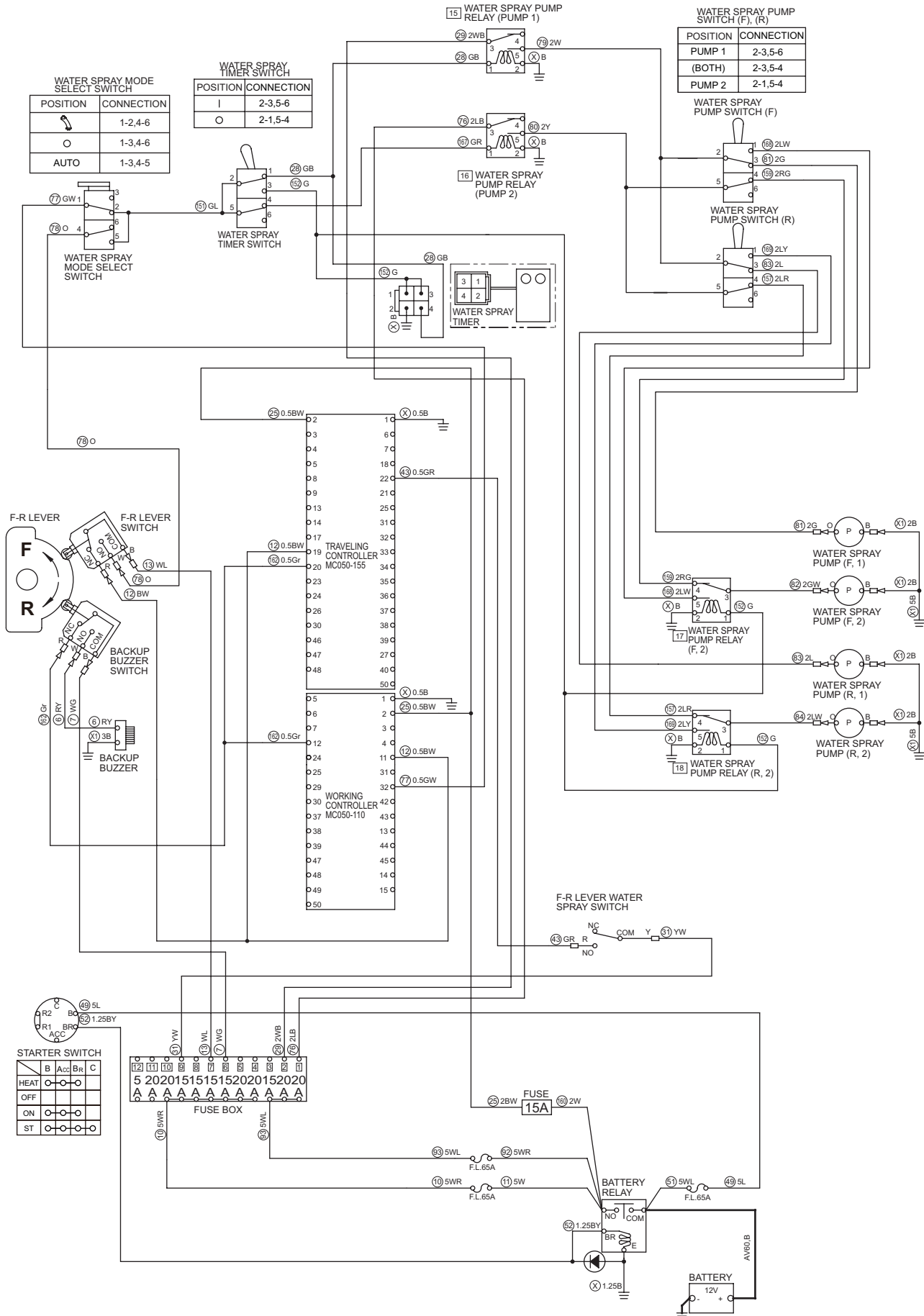
### 2-8-1. Continuous water spray does not operate 1/4

- Water spray mode select switch must be “”.
- Water spray timer switch must be “”.
- Set water spray pump switch to simultaneous spray.



#### Reference Fig. : 2-8-1

Check point	Check/Cause	Action
1. Water Spray Pump (F, 1), (F, 2), (R, 1) or (R, 2)	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump terminal inlet wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Water spray pump (F, 1) inlet wire: G</li> <li>• Water spray pump (F, 2) inlet wire: GW</li> <li>• Water spray pump (R, 1) inlet wire: L</li> <li>• Water spray pump (R, 2) inlet wire: LW</li> </ul> <p>Standard voltage: 12 V or more</p> <p>(2) Check if grounding of each water spray pump is normal.</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and water spray pump does not operate, water spray pump is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>There are a total of four water spray pumps, two each for front and rear drums.</b></li> <li>• <b>Pressing F-R lever water spray switch turns on power and power is turned off when switch is pressed again.</b></li> </ul>	Replace the water spray pump (F, 1), (F, 2), (R, 1) or (R, 2).
2. F-R Lever Water Spray Switch	<ul style="list-style-type: none"> <li>• Depress F-R lever water spray switch and check continuity between F-R lever water spray switch terminal COM and NO.</li> </ul> <p>There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If there is no continuity, F-R lever water spray switch is faulty.</li> </ul> <p><b>(NOTICE)</b></p> <ul style="list-style-type: none"> <li>• <b>Pressing F-R lever water spray switch turns on power and power is turned off when switch is pressed again.</b></li> </ul>	Replace F-R lever water spray switch.
3. Water Spray Mode Select Switch	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray mode select switch terminal 1 inlet wire GW and chassis ground.</p> <p>Standard voltage : 12 V</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray mode select switch terminal 2 outlet wire GL and chassis ground.</p> <p>Standard voltage : 12 V</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, water spray mode select switch is faulty.</li> </ul>	Replace water spray mode select switch.

Fig.: 2-8-1



### 2-8-1. Continuous water spray does not operate 2/4

- Water spray mode select switch must be “”.
- Water spray timer switch must be “”.
- Set water spray pump switch to simultaneous spray.

#### Reference Fig. : 2-8-1



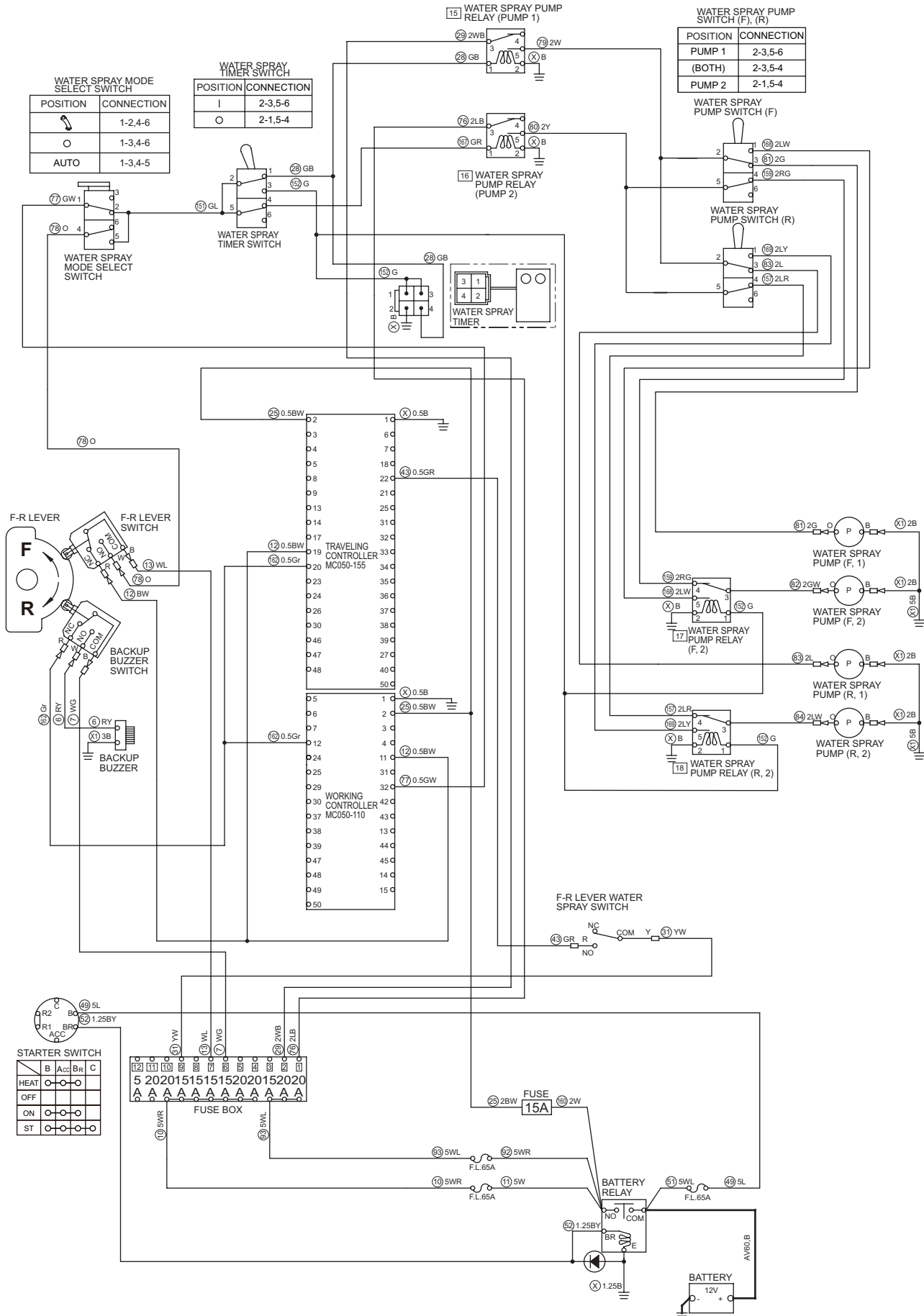

Check point	Check/Cause	Action
4. Water Spray Timer Switch	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer switch terminal 2, 5 inlet wires GL and chassis ground. Standard voltage : 12 V</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer switch terminal 1 outlet wire GB and chassis ground. Standard voltage : 12 V</p> <p>(3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer switch terminal 4 outlet wire GR and chassis ground. Standard voltage: 12 V</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) or (3) is NG, water spray timer switch is faulty.</li> </ul>	Replace water spray timer switch.
5.  Water Spray Pump Relay (Pump 1)	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 1) terminal 1 inlet wire GB and chassis ground. Standard voltage : 12 V</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 1) terminal 3 inlet wire WB and chassis ground. Standard voltage : 12 V</p> <p>(3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 1) terminal 5 outlet wire W and chassis ground. Standard voltage : 12 V</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, water spray pump relay (pump 1) is faulty.</li> </ul>	Replace water spray pump relay (pump 1).
6.  Water Spray Pump Relay (Pump 2)	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 2) terminal 1 inlet wire GR and chassis ground. Standard voltage : 12 V</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 2) terminal 3 inlet wire LB and chassis ground. Standard voltage : 12 V</p> <p>(3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 2) terminal 5 outlet wire Y and chassis ground. Standard voltage : 12 V</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, water spray pump relay (pump 2) is faulty.</li> </ul>	Replace water spray pump relay (pump 2).

Fig.: 2-8-1



### 2-8-1. Continuous water spray does not operate 3/4

- Water spray mode select switch must be “”.
- Water spray timer switch must be “○”.
- Set water spray pump switch to simultaneous spray.

#### Reference Fig. : 2-8-1


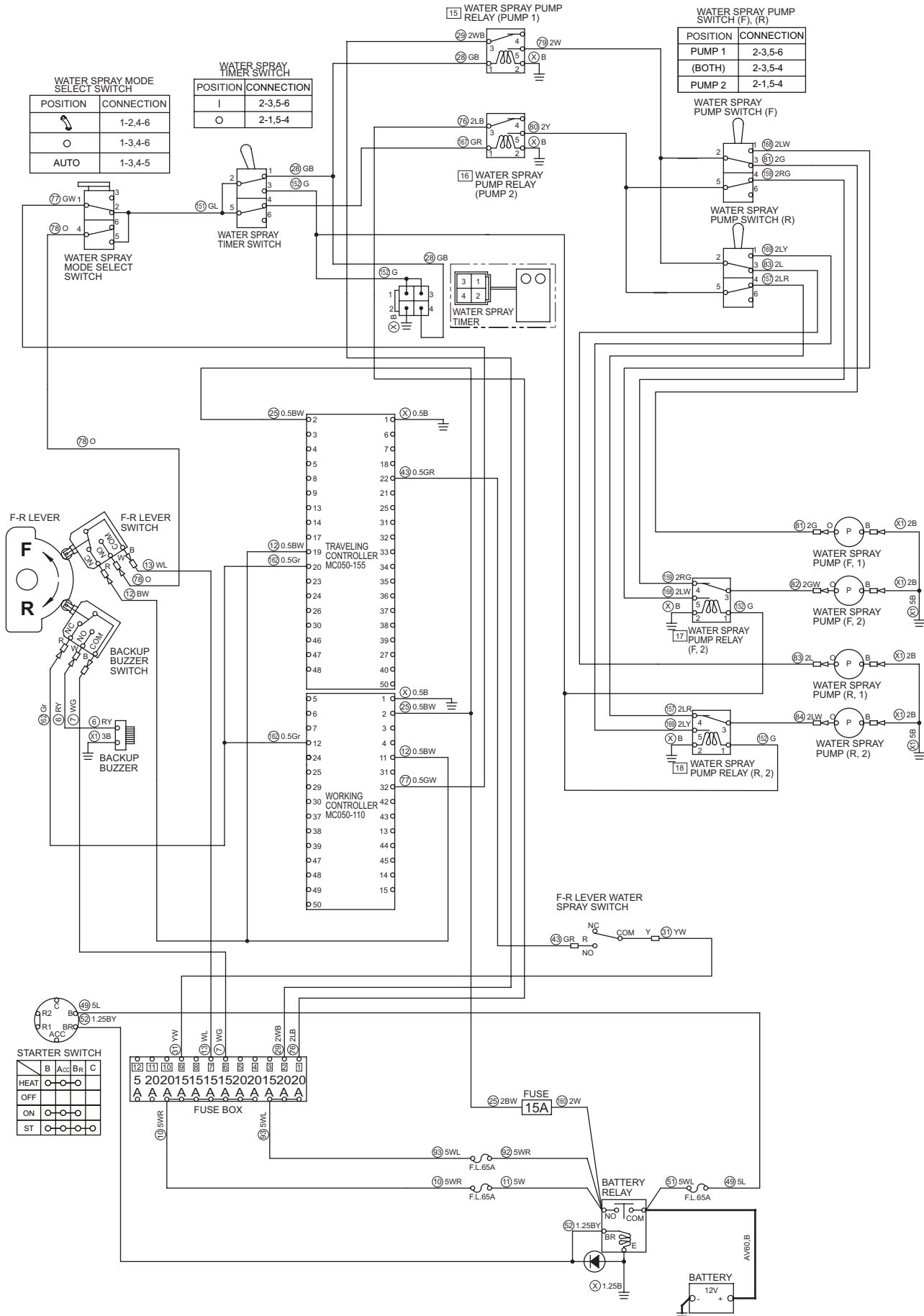

Check point	Check/Cause	Action
7. Water Spray Pump Switch (F)	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump switch (F) terminal 2 inlet wire W, terminal 5 inlet wire Y and chassis ground. Standard voltage : 12 V</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump switch (F) terminal wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Center position (both pumps) Water spray pump switch (F) terminal 3 outlet wire G and chassis ground Water spray pump switch (F) terminal 4 outlet wire RG and chassis ground Standard voltage : 12 V</li> <li>• If above item (1) is OK and item (2) is NG, water spray pump switch (F) is faulty.</li> </ul>	Replace water spray pump switch (F).
8. Water Spray Pump Switch (R)	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump switch (R) terminal 2 inlet wire W, terminal 5 inlet wire Y and chassis ground. Standard voltage : 12 V</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump switch (R) terminal wires and chassis ground.</p> <ul style="list-style-type: none"> <li>• Center position (both pumps) Water spray pump switch (R) terminal 3 outlet wire L and chassis ground Water spray pump switch (R) terminal 4 outlet wire LR and chassis ground Standard voltage : 12 V</li> <li>• If above item (1) is OK and item (2) is NG, water spray pump switch (R) is faulty.</li> </ul>	Replace water spray pump switch (R).
9.  Water Spray Pump Relay (F, 2)	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump (F, 2) relay terminal 4 inlet wire RG and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump (F, 2) relay terminal 3 outlet wire GW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, water spray pump relay (F, 2) relay is faulty.</li> </ul>	Replace water spray pump relay (F, 2).

Fig.: 2-8-1



### 2-8-1. Continuous water spray does not operate 4/4

- Water spray mode select switch must be “”.
- Water spray timer switch must be “○”.
- Set water spray pump switch to simultaneous spray.

#### Reference Fig. : 2-8-1


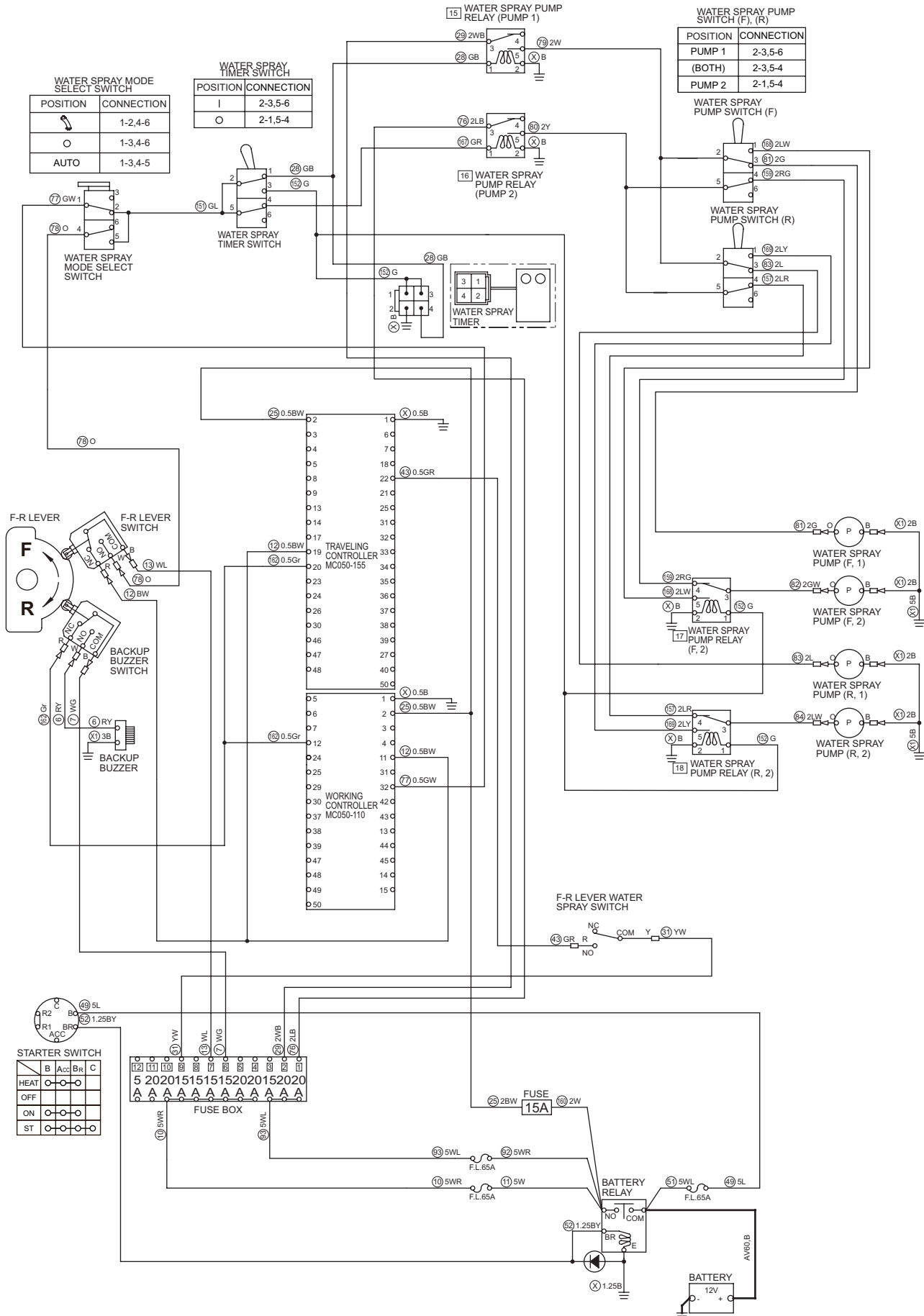

Check point	Check/Cause	Action
10.  Water Spray Pump Relay (R, 2)	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (R, 2) terminal 4 inlet wire LR and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (R, 2) terminal 3 outlet wire LW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, water spray pump relay (R, 2) is faulty.</li> </ul>	Replace water spray pump relay (R, 2).
11. Traveling/Working Controller	<p>(1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wires.</p> <ul style="list-style-type: none"> <li>• Traveling controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B.</li> <li>• Working controller power supply terminal 2 inlet wire BW and ground terminal 1 wire B.</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between traveling controller terminal 22 inlet wire GR and chassis ground. Standard voltage : 12 V</p> <p>(3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between working controller terminal 32 outlet wire GW and chassis ground. Standard voltage : 12 V</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, traveling controller is faulty.</li> </ul>	Replace traveling/working controller.
12. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-8-1





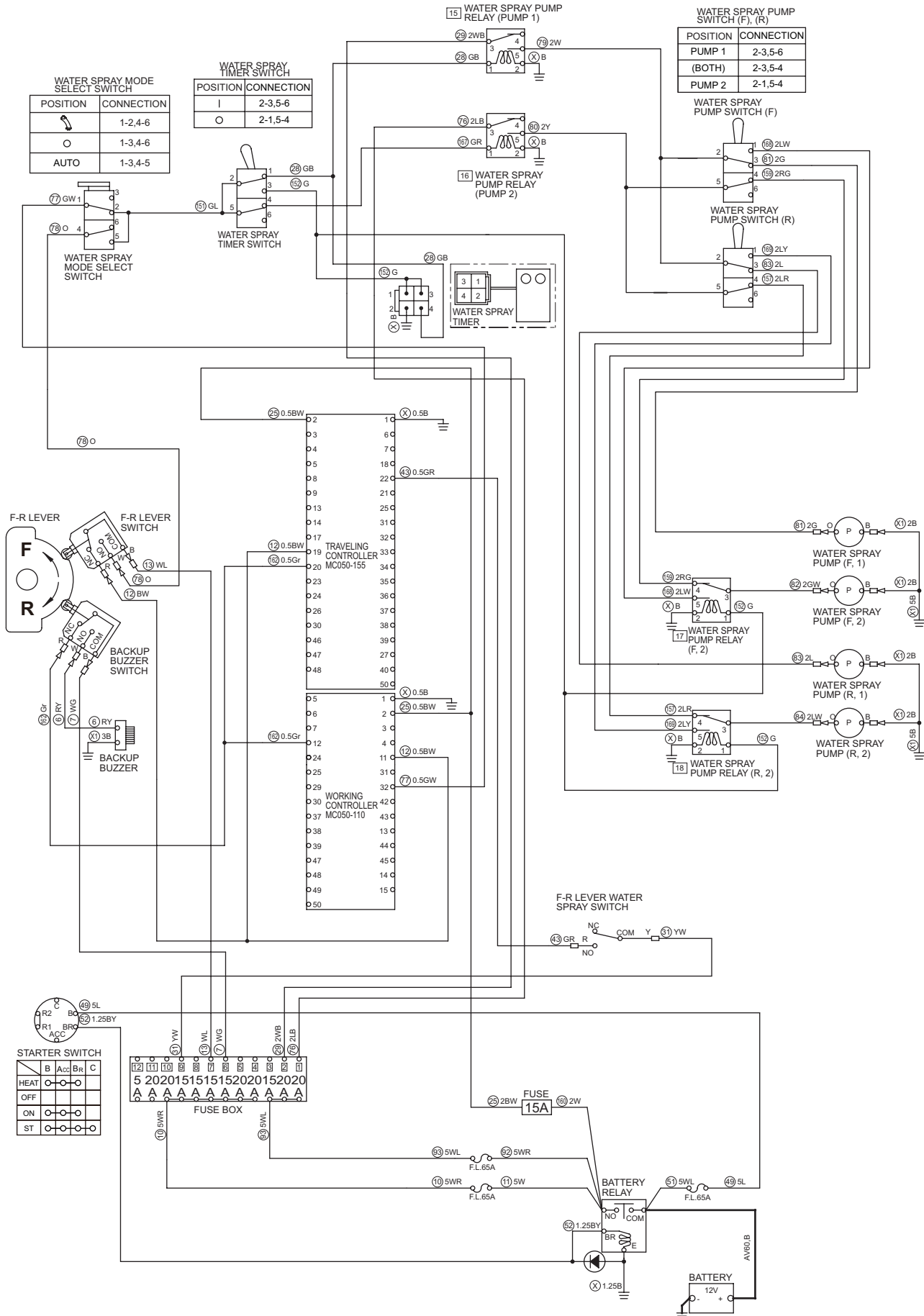
**2-8-2. Continuous water spray works, but intermittent water spray does not operate 1/2**

- Water spray mode select switch must be “”.
- Water spray timer switch must be “I”.
- Set water spray pump switch to “PUMP 2”.


**Reference Fig. : 2-8-1**

Check point	Check/Cause	Action
1. Water Spray Timer	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer terminal 1, 3 inlet wires G and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer terminal 4 outlet wire GB and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG with no abnormality found in grounding of water spray timer, water spray timer is faulty.</li> </ul>	Replace water spray timer.
2. Water Spray Timer Switch	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer switch terminal 2 inlet wire GL and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer switch terminal 3 outlet wire G and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, water spray timer switch is faulty.</li> </ul>	Replace water spray timer switch.
3. Water Spray Pump (F, 2)	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (F, 2) terminal 1 inlet wire G and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (F, 2) terminal 5 inlet wire LW and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (F, 2) terminal 3 outlet wire GW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, water spray pump (F, 2) is faulty.</li> </ul>	Replace water spray pump (F, 2).

Fig.: 2-8-1



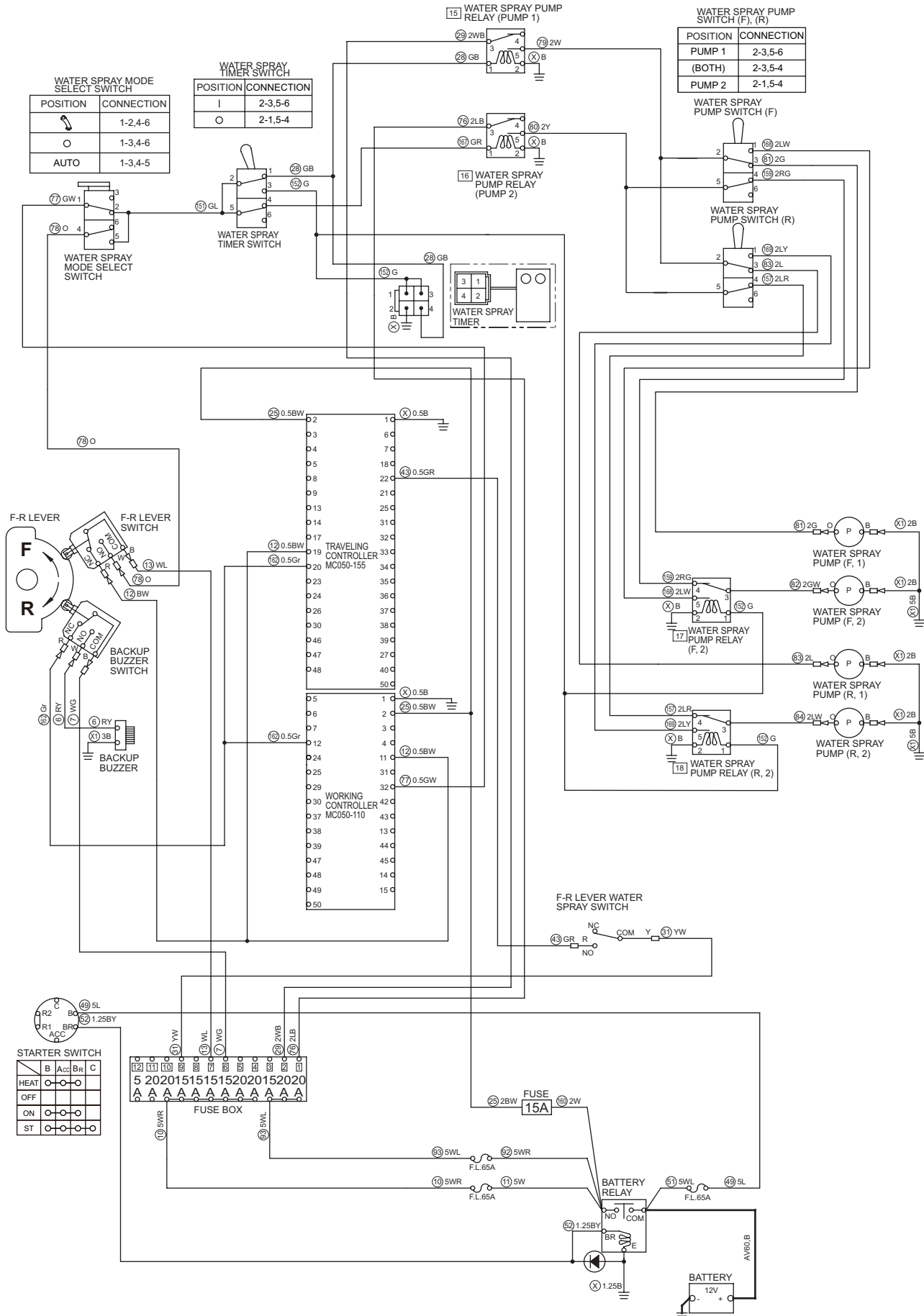
**2-8-2. Continuous water spray works, but intermittent water spray does not operate 2/2**

- Water spray mode select switch must be “”.
- Water spray timer switch must be “ I ”.
- Set water spray pump switch to “PUMP 2”.

**Reference Fig. : 2-8-1**

Check point	Check/Cause	Action
4. Water Spray Pump (R, 2)	<p>(1) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (R, 2) terminal 1 inlet wire G and chassis ground. Standard voltage: 12 V or more</p> <p>(2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (R, 2) terminal 5 inlet wire LY and chassis ground. Standard voltage: 12 V or more</p> <p>(3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (R, 2) terminal 3 outlet wire LW and chassis ground. Standard voltage: 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and item (3) is NG, water spray pump (R, 2) is faulty.</li> </ul>	Replace water spray pump (R, 2).
5. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance: 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-8-1



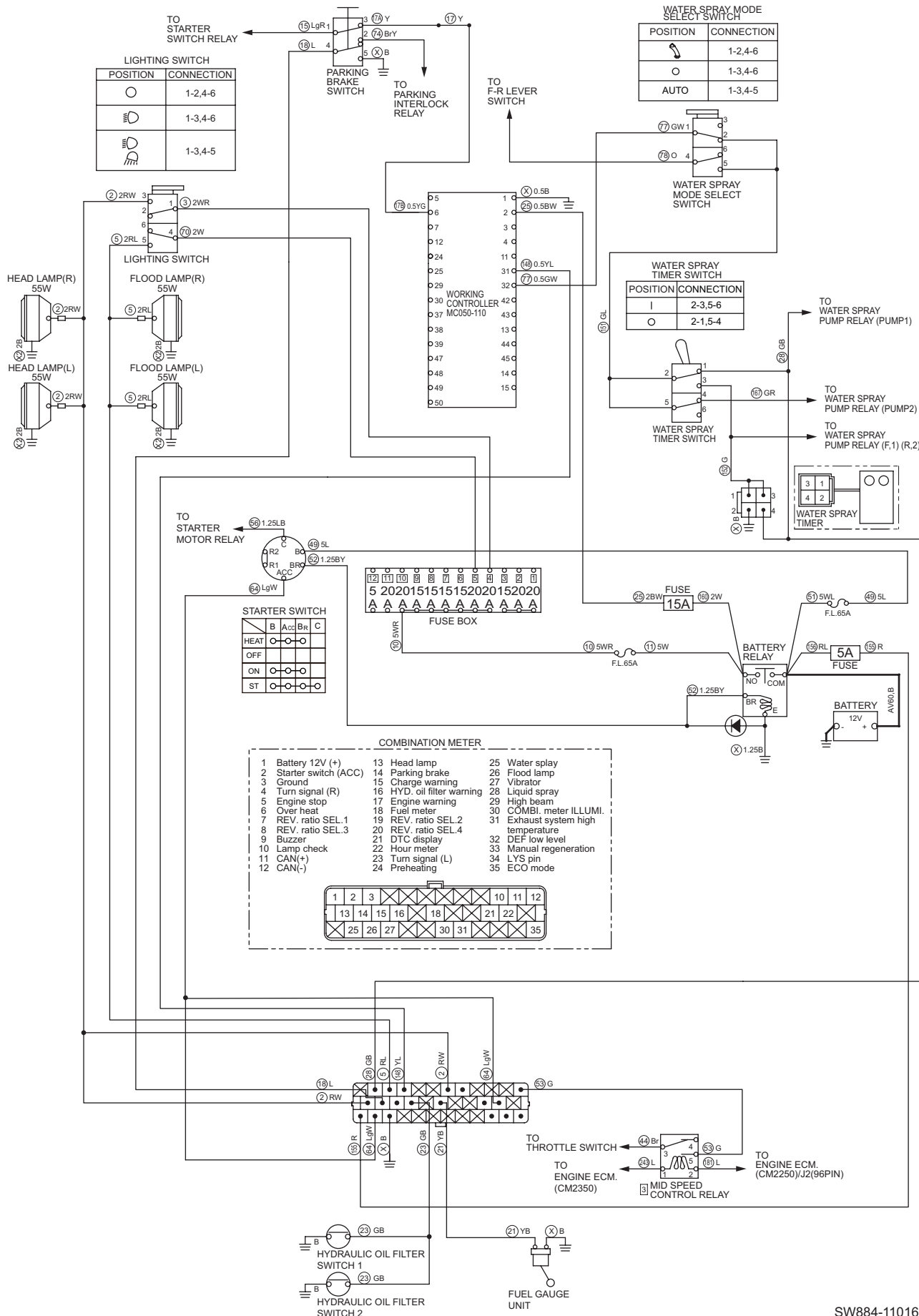
### 2-8-3. Continuous water spray works, but automatic water spray does not operate

- Water spray mode select switch must be "AUTO".
- Water spray timer switch must be "○".
- Set water spray pump switch to simultaneous spray.

#### Reference Fig. : 2-8-1

Check point	Check/Cause	Action
1. F-R lever switch	<p>(1) When starter switch is OFF and F-R lever is "N", check continuity between F-R lever switch terminal COM and NC. There is continuity in normal condition.</p> <p>(2) When starter switch is OFF and F-R lever is "F", check continuity between F-R lever switch terminal COM and NO. There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, F-R lever switch is faulty.</li> </ul>	Replace F-R lever switch.
2. Backup buzzer switch	<p>(1) When starter switch is OFF and F-R lever is "N", check continuity between backup buzzer switch terminal COM and NC. There is continuity in normal condition.</p> <p>(2) When starter switch is OFF and F-R lever is "R", check continuity between backup buzzer switch terminal COM and NO. There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above item (1) or (2) is NG, backup buzzer switch is faulty.</li> </ul>	Replace backup buzzer switch.
3. Water Spray Mode Select Switch	<p>(1) When starter switch is ON and F-R lever is "F" or "R", measure voltage between water spray mode select switch terminal 4 inlet wire O and chassis ground. Standard voltage : 12 V</p> <p>(2) When starter switch is ON and F-R lever is "F" or "R", measure voltage between water spray mode select switch terminal 5 outlet wire GL and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, water spray mode select switch is faulty.</li> </ul>	Replace water spray mode select switch.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-9-1



## 2-9. Lighting

Check following items before troubleshooting.

- No blown fuse and power is applied up to fuses.
- When measuring voltage and current without disconnecting connectors, refer to “measuring voltage and current following using tester” (P. 11-006 to P. 11-008).
- Check any ground circuit which belongs to components to be checked.

### 2-9-1. Head lamp and flood lamp do not light

Reference Fig. : 2-9-1



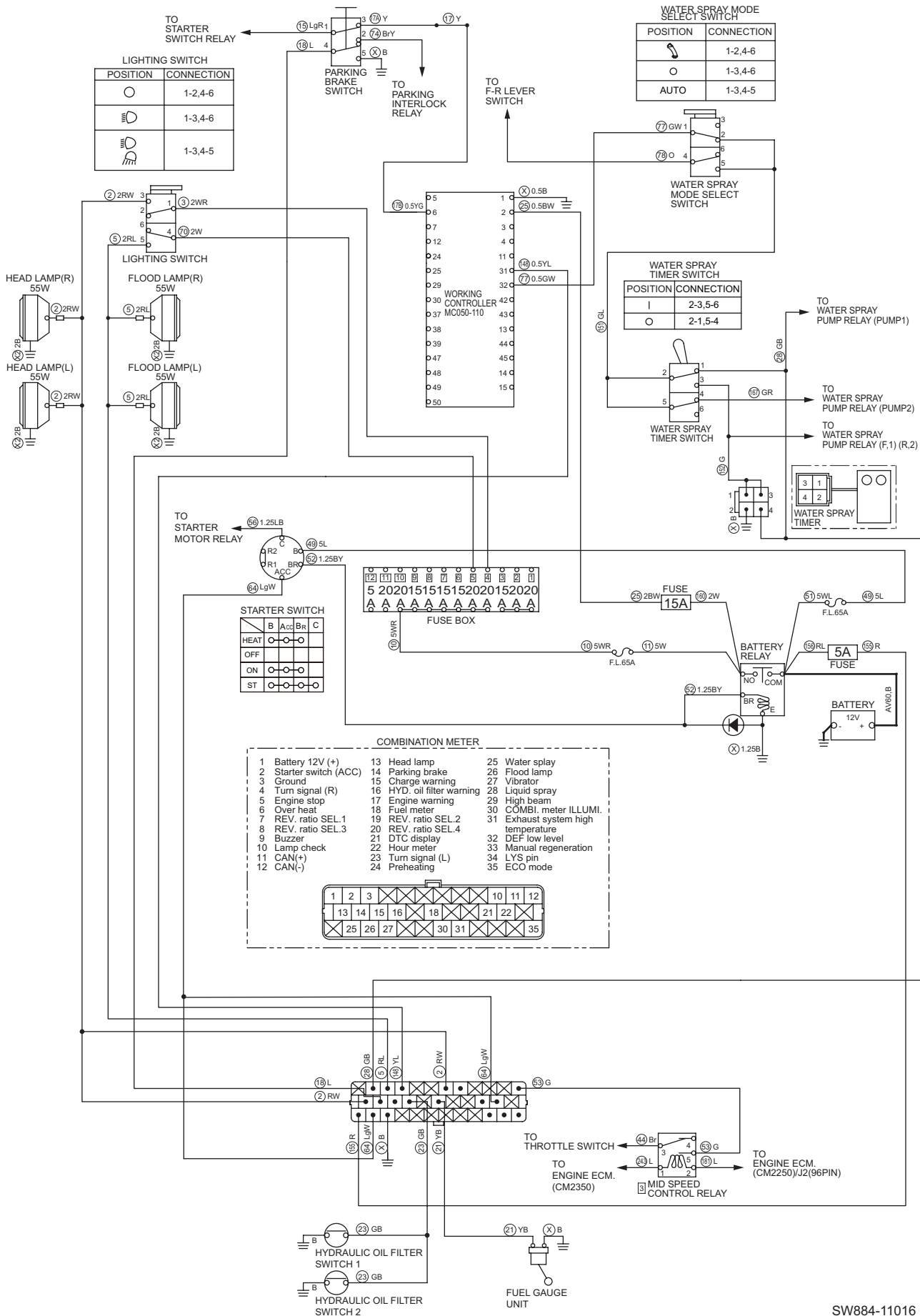
Check point	Check/Cause	Action
1. Each Bulb	<ul style="list-style-type: none"> <li>• Check that none of the lamp bulbs is burned out or has a contact failure.</li> <li>• Bulb is faulty or poorly connected.</li> </ul>	Replace each bulb.
2. Lighting Switch	<p>(1) When starter switch is ON, measure voltage between lighting switch terminal 1 inlet wire WR, terminal 4 inlet wire W and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and lighting switch is “”, measure voltage between lighting switch terminal 3 outlet wire RW and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and lighting switch is “”, measure voltage between lighting switch terminal 5 outlet wire RL and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) or (3) is NG, lighting switch is faulty.</li> </ul>	Replace lighting switch.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-9-1



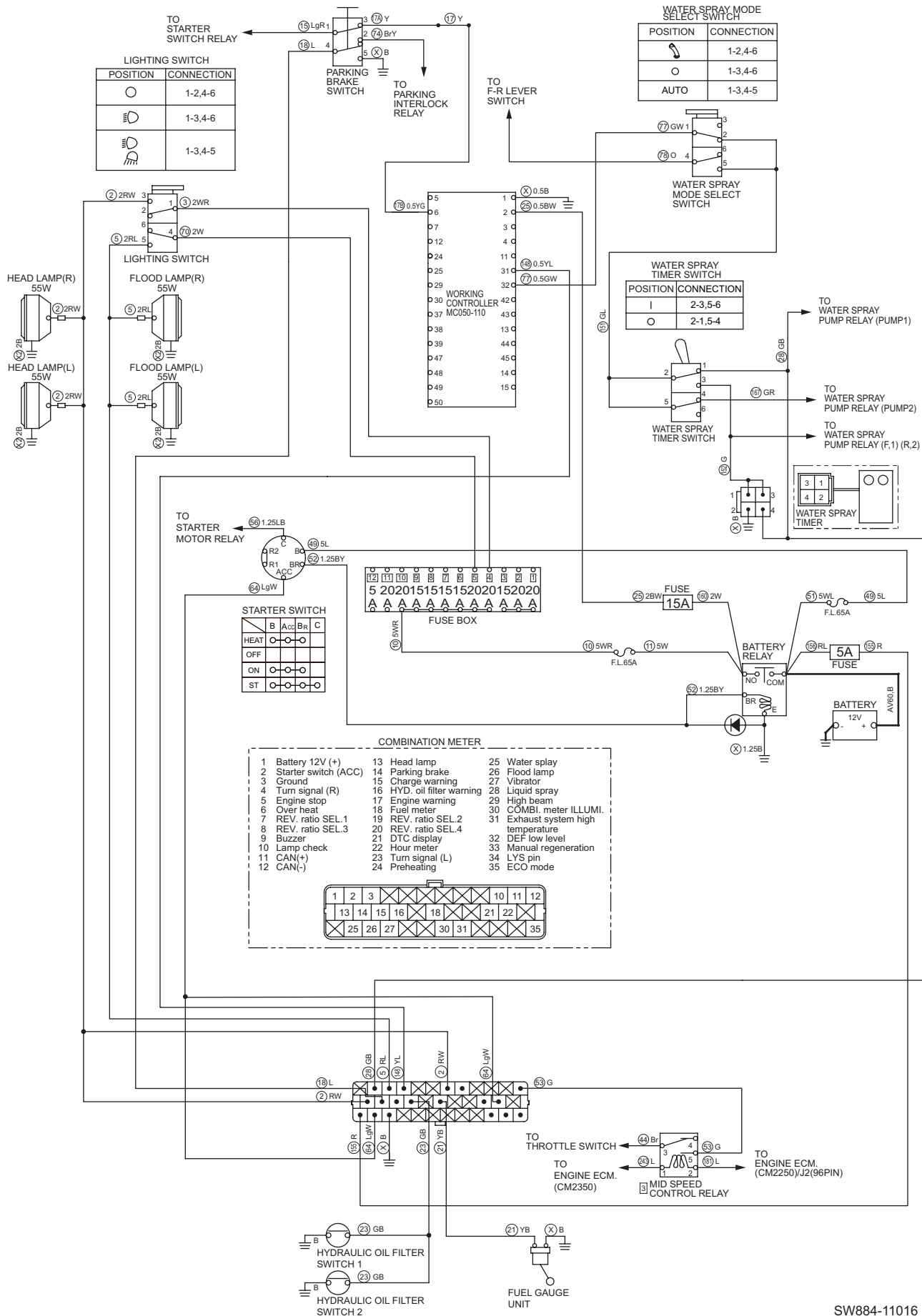


**2-9-2. Illumination of combination meter does not light**

Reference Fig. : 2-9-1

Check point	Check/Cause	Action
1. Harness	<ul style="list-style-type: none"> <li>• Disconnect connectors between combination meter and lighting switch.</li> <li>• Measure resistance between terminals and chassis ground.               <ul style="list-style-type: none"> <li>• Combination meter connector terminal wire No.2 wire RW and chassis ground</li> <li>Standard resistance: 100 kΩ or more</li> </ul> </li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
2. Combination Meter (Combination meter illumination)	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.               <ul style="list-style-type: none"> <li>• Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B</li> <li>• Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B</li> <li>• Combination meter combination meter illumination terminal wire No.2 inlet wire RW and chassis ground</li> <li>Standard voltage : 12 V or more</li> </ul> </li> <li>• If above items are OK and combination meter illumination does not turn on, combination meter is faulty.</li> </ul>	Replace combination meter.

Fig.: 2-9-1



**2-9-3. Hour meter is abnormal**

Reference Fig. : 2-9-1

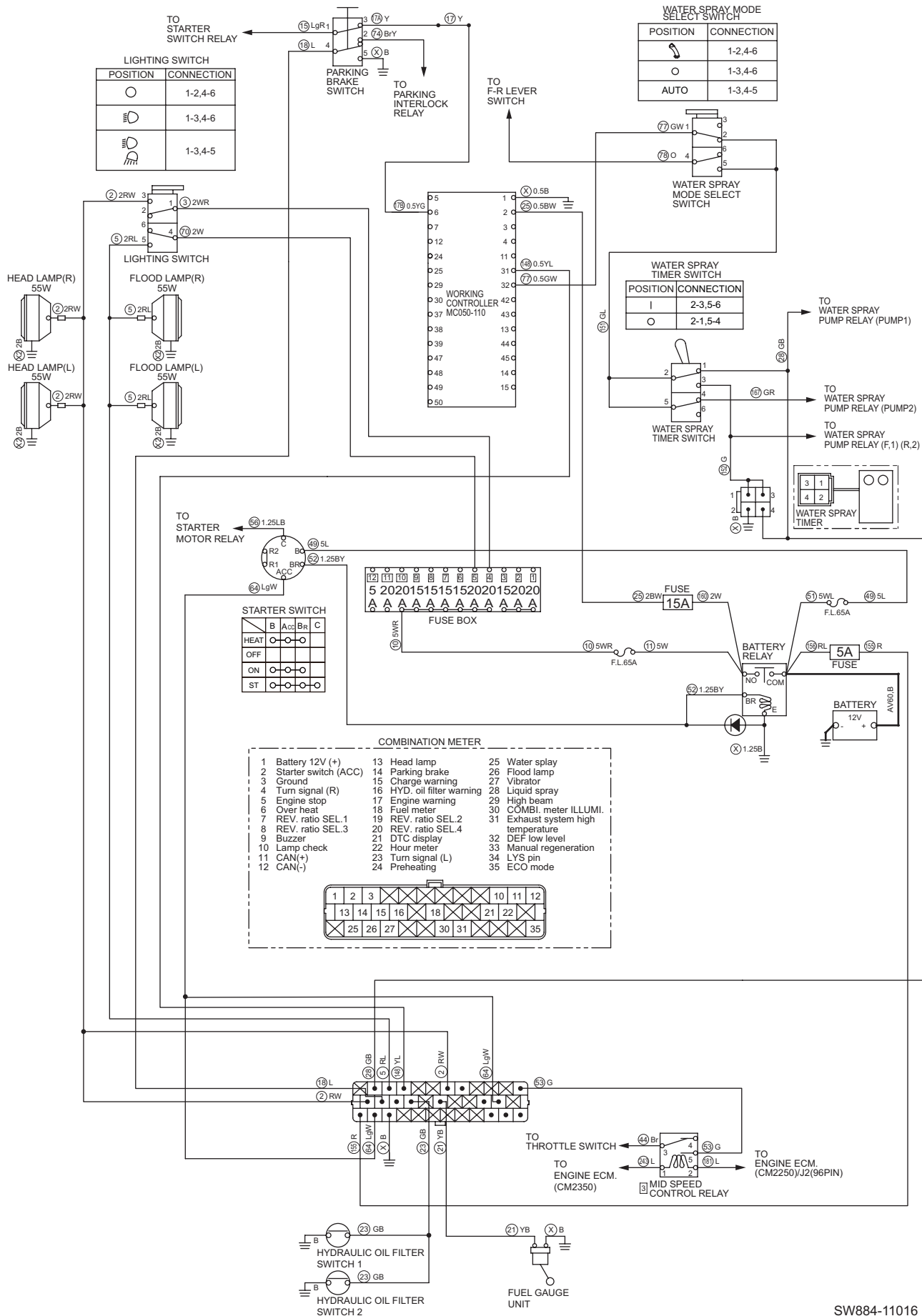
Check point	Check/Cause	Action
1. Combination Meter (Hour meter)	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.               <ul style="list-style-type: none"> <li>• Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B</li> <li>• Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B</li> </ul>               Standard voltage : 12 V or more             </li> <li>• If no abnormality is found, combination meter is faulty.</li> </ul>	Replace combination meter.

**2-9-4. Fuel meter is abnormal**

Reference Fig. : 2-9-1

Check point	Check/Cause	Action
1. Fuel Gauge Unit	<ul style="list-style-type: none"> <li>• Disconnect harness and measure resistance of fuel gauge unit. Standard resistance : 13.5 <math>\Omega</math> (with float in "F") 80 <math>\Omega</math> (with float in "E")</li> <li>• If resistance is abnormal, fuel gauge unit is faulty.</li> </ul>	Replace fuel gauge unit.
2. Combination Meter (Fuel meter)	<ul style="list-style-type: none"> <li>• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.               <ul style="list-style-type: none"> <li>• Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B</li> <li>• Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B</li> </ul>               Standard voltage : 12 V or more             </li> <li>• If no abnormality is found, combination meter is faulty.</li> </ul>	Replace combination meter.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

Fig.: 2-9-1

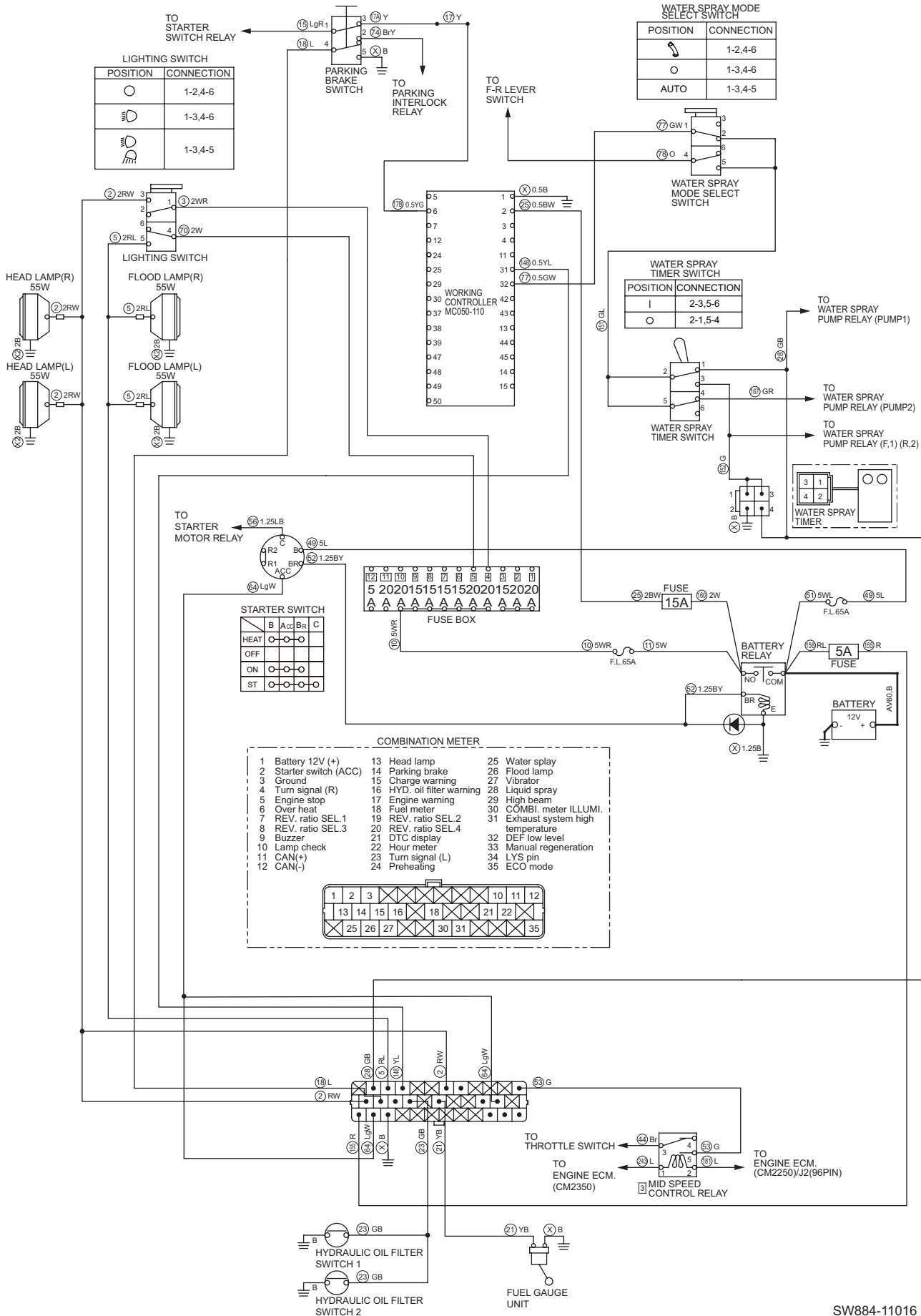


**2-9-5. Hydraulic oil filter warning lamp remains ON**

Reference Fig. : 2-9-1

Check point	Check/Cause	Action
1. Harness	<ul style="list-style-type: none"> <li>• Disconnect connectors between hydraulic oil filter switch 1, 2 and combination meter.</li> <li>• Measure resistance between terminal and chassis ground.               <ul style="list-style-type: none"> <li>• Hydraulic oil filter switch 1 or 2 terminal wire GB and chassis ground</li> <li>• Combination meter connector terminal wire No. 23 wire GB and chassis ground</li> </ul>               Standard resistance : 100 kΩ or more             </li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
2. Hydraulic Oil Filter Switch 1 or 2	<ul style="list-style-type: none"> <li>• When starter switch is OFF, check continuity between hydraulic oil filter switch 1 or 2 terminal inlet wire GB and chassis ground.               <ul style="list-style-type: none"> <li>There is no continuity in normal condition.</li> </ul> </li> <li>• If there is continuity, hydraulic oil filter switch 1 or 2 is faulty.</li> </ul>	Replace hydraulic oil filter switch 1 or 2.
3. Combination Meter (Hydraulic oil filter warning)	<p>(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.</p> <ul style="list-style-type: none"> <li>• Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B</li> <li>• Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B</li> </ul> <p style="padding-left: 20px;">Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between combination meter hydraulic filter terminal outlet wire No.23 wire GB and chassis ground.</p> <p style="padding-left: 20px;">Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK but hydraulic oil filter warning lamp remains on after starting engine, combination meter is faulty.</li> </ul>	Replace combination meter.

Fig.: 2-9-1



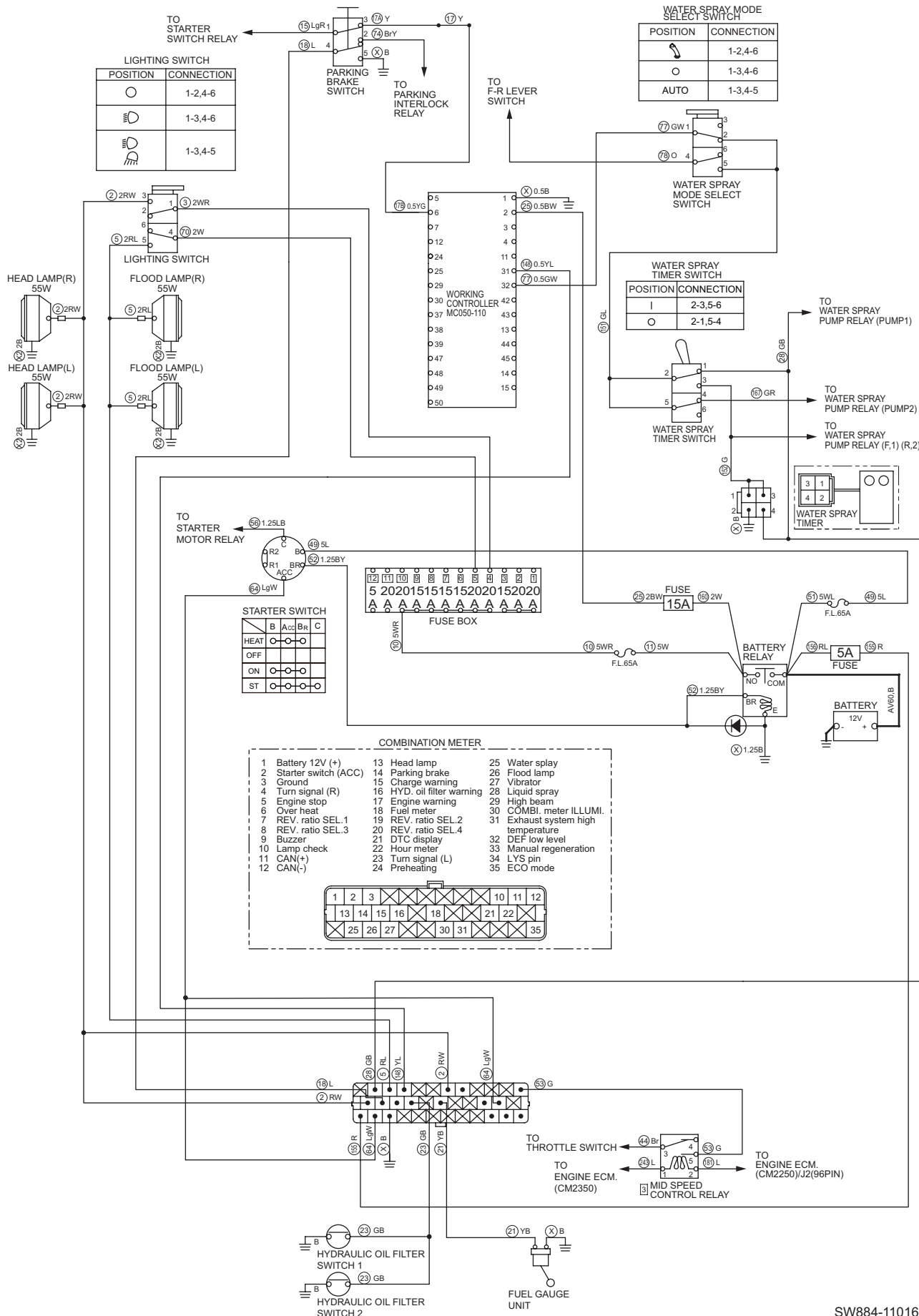
**2-9-6. Vibration indicator lamp does not light**

- Check that vibrator can be operated.

**Reference Fig. : 2-9-1**

Check point	Check/Cause	Action
1. Harness	<ul style="list-style-type: none"> <li>• Measure resistance between working controller terminal 31 wire YL and combination meter connector terminal wire No. 148 wire YL. Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
2. Combination Meter (Vibration indicator lamp)	<p>(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.</p> <ul style="list-style-type: none"> <li>• Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B</li> <li>• Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration mode change switch is "CONT" and vibration select switch is not "○", measure voltage between combination meter vibration terminal wire No.148 inlet wire YL and chassis ground.</p> <p>Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and vibration indicator lamp does not light, combination meter is faulty.</li> </ul>	Replace combination meter.

Fig.: 2-9-1





## 2-9-7. Water spray indicator lamp does not light

- Check that water spray pump can be operated.

Reference Fig. : 2-9-1


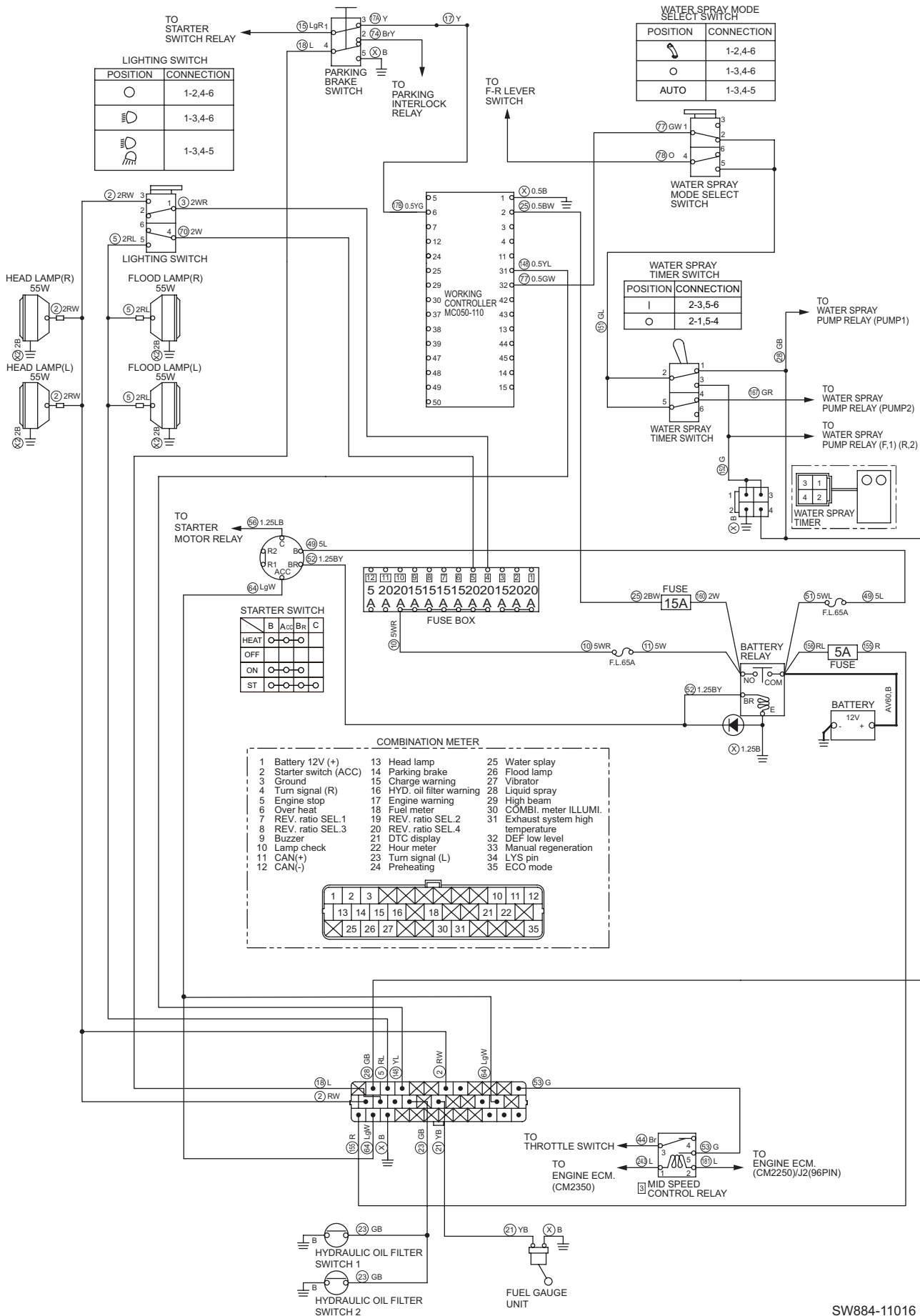
Check point	Check/Cause	Action
1. Harness	<ul style="list-style-type: none"> <li>• Measure resistance between water spray timer switch terminal 1 wire GB and combination meter connector terminal wire No. 28 wire GB. Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
	<ul style="list-style-type: none"> <li>• Measure resistance between water spray timer terminal 4 wire GB and combination meter connector terminal wire No. 28 wire GB. Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
2. Combination Meter (Water spray indicator lamp)	<p>(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.</p> <ul style="list-style-type: none"> <li>• Battery terminal wire No. 155 inlet wire R and ground terminal wire B</li> <li>• Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and water spray mode select switch is "  " or "AUTO", measure voltage between combination meter terminal wire No. 28 inlet wire GB (water spray terminal) and chassis ground.</p> <p>Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK, combination meter is faulty.</li> </ul>	Replace combination meter.

Fig.: 2-9-1



## 2-9-8. ECO mode indicator lamp does not light

- Check that vibrator can be operated.
- Vibration mode change switch must be “CONT”.
- Vibration L-H change switch must not be “○”.
- Throttle switch must be “ECO”.

### Reference Fig. : 2-9-1

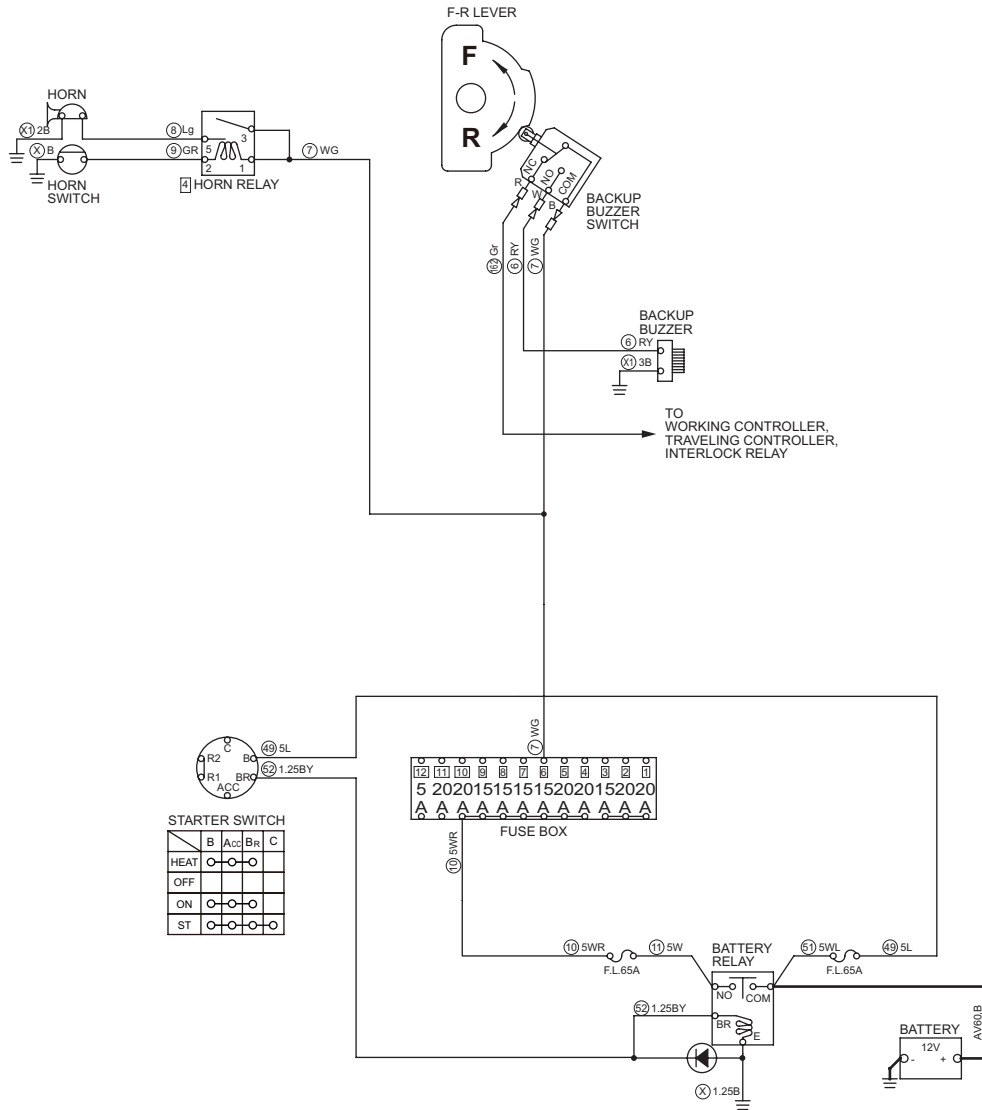
Check point	Check/Cause	Action
1. Harness	<ul style="list-style-type: none"> <li>• Measure resistance between mid speed control relay terminal 5 wire G and combination meter connector terminal wire No.53 wire G. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
2. Combination Meter (ECO lamp)	<p>(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.</p> <ul style="list-style-type: none"> <li>• Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B</li> <li>• Starter switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between combination meter vibration terminal wire No.53 inlet wire G and chassis ground.</p> <p>Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and ECO lamp does not light, combination meter is faulty.</li> </ul>	Replace combination meter.

## 2-9-9. Parking brake indicator lamp does not light

### Reference Fig. : 2-9-1

Check point	Check/Cause	Action
1. Harness	<ul style="list-style-type: none"> <li>• Measure resistance between parking brake switch terminal 4 wire L and combination meter connector terminal wire No.18 wire L. Standard resistance : 10 Ω or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.
2. Parking Brake Switch	<ul style="list-style-type: none"> <li>• When parking brake is applied, check continuity between parking brake switch terminal 4 and 5. There is continuity in normal condition.</li> <li>• If there is no continuity, parking brake switch is faulty.</li> </ul>	Replace parking brake switch.
3. Combination Meter (Parking brake indicator lamp)	<p>(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.</p> <ul style="list-style-type: none"> <li>• Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B</li> <li>• Starter switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B</li> </ul> <p>Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and parking brake is applied, check continuity between combination meter parking brake terminal wire No.18 inlet wire L and chassis ground.</p> <p>There is continuity in normal condition.</p> <ul style="list-style-type: none"> <li>• If above items (1) and (2) are OK and parking brake indicator lamp does not light, combination meter is faulty.</li> </ul>	Replace combination meter.

Fig.: 2-9-2



**2-9-10. Horn does not sound**

Reference Fig. : 2-9-2

Check point	Check/Cause	Action
1. Horn	<ul style="list-style-type: none"> <li>• Disconnect horn and directly connect battery positive terminal to horn terminal wire Lg side and negative terminal to horn terminal wire B side.</li> <li>• If horn does not sound, horn is faulty.</li> </ul>	Replace horn.
2. Horn Switch	<ul style="list-style-type: none"> <li>• When horn switch is pressed, check continuity between horn switch terminals. There is continuity is normal condition.</li> <li>• If there is no continuity, horn switch is faulty.</li> </ul>	Replace horn switch.
3. Horn Relay	<p>(1) When starter switch is ON, measure voltage between horn relay terminal 1, 3 inlet wire WG and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and horn switch is pressed, measure voltage between horn relay terminal 5 outlet wire Lg and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, horn relay is faulty.</li> </ul>	Replace horn relay.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

**2-9-11. Backup buzzer does not sound**

Reference Fig. : 2-9-2

Check point	Check/Cause	Action
1. Backup Buzzer	<ul style="list-style-type: none"> <li>• Disconnect backup buzzer and directly connect battery positive terminal to backup buzzer terminal wire RY side and negative terminal to backup buzzer terminal wire B side.</li> <li>• If backup buzzer does not sound, backup buzzer is faulty.</li> </ul>	Replace backup buzzer.
2. Backup buzzer switch	<p>(1) When starter switch is ON, measure voltage between backup buzzer switch terminal COM inlet wire WG and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and F-R lever is "R", measure voltage between backup buzzer switch terminal NO outlet wire RY and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> <li>• If above item (1) is OK and item (2) is NG, backup buzzer switch is faulty.</li> </ul>	Replace backup buzzer switch.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> <li>• Measure resistance of harness connecting between terminals. Standard resistance : 10 <math>\Omega</math> or less</li> <li>• If resistance is abnormal, harness is faulty.</li> </ul>	Repair or replace harness.

## 3. HYDRAULIC SYSTEM TROUBLESHOOTING

### 3-1. When Performing Hydraulic System Troubleshooting

- The largest factor in the majority of failures of hydraulic devices operating under conditions of higher pressure and greater precision is the entry of dirt (foreign substances) into the hydraulic circuit. Particular caution is required when supplying hydraulic oil or when disassembling and assembling hydraulic devices.

#### 1) Pay attention to the work environment.

As much as possible, avoid performing tasks such as supplying hydraulic oil, replacing filters and repair work on rainy days, when there is strong wind, or in locations where there is much dust.

#### 2) Disassembly and maintenance work in the field

There is the danger of dust entry when disassembly and maintenance work for hydraulic components is performed in the field. In addition, because performance verification after repairs are completed is difficult, replacement of the entire assembly is preferred. Perform disassembly and maintenance of hydraulic components in a special room protected from dust, and use special testers to verify the performance.

#### 3) Sealing of openings

Use caps, tape, plastic bags or other means to seal the openings of removed pipes and components in order to prevent foreign substances from entering. Never leave the openings exposed or put a shop cloth into them. There is the danger of foreign substances entering or of leaking oil causing environmental contamination. Do not dispose of waste oil on-site. Either deliver it to the customer and request disposal or take it back with you and dispose of it.

#### 4) Prevent entry of foreign substances when supplying oil.

Take care that foreign substances do not enter when supplying hydraulic oil. Clean the oil supply port and the area around it, as well as the supply pump, oilcan and other items. A more reliable method is to use oil cleaning equipment, which can filter out the contamination that occurred during storage.

#### 5) Change hydraulic oil while the temperature is still high.

All oils, including hydraulic oil, flow more readily when they are warm. Higher temperatures also make it easier to eject the sludge and other substances outside the circuit together with the oil. For these reasons, oil changes should be performed while the oil temperature is high. When changing the oil, it is necessary to drain out as much of the old hydraulic oil as possible. (In addition to the hydraulic oil tank, also drain the oil from the filter and circuit drain plugs.) If old hydraulic oil remains in the system, the contaminants and sludge in the old oil will mix with the new oil and shorten the hydraulic oil lifetime.

## 3-2. Propulsion System

If a problem occurs in the propulsion systems such as the propulsion pump, propulsion motor and brakes, determine the cause and carry out action as required, according to the following general troubleshooting items.

### (NOTICE)

- When checking whether or not the pressure is correct, refer to the pressure standard value for each hydraulic circuit.

### 3-2-1. Machine moves neither forward nor backward 1/2

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Bypass Valve	Bypass valve is open.	Close bypass valve.
3. Charge Circuit Pressure	Propulsion pump does not discharge oil because charge pressure is low.	<ul style="list-style-type: none"> <li>• Measure charge pressure.</li> <li>• If low, check and adjust charge relief valve or replace it if necessary.</li> </ul>
	Charge pressure decreases due to pressure leakage from cut off valve.	Check and adjust cut off valve or replace it if necessary.
	Insufficient propulsion charge pump discharge.	Repair propulsive charge pump or replace it if necessary.
4. Propulsion Pump Proportional Solenoid Valve	Propulsion pump cannot discharge oil because oil does not flow into servo cylinder chamber due to faulty propulsion pump proportional solenoid valve.	<ul style="list-style-type: none"> <li>• Measure pressure in servo cylinder chamber.</li> <li>• If low, repair propulsion pump proportional solenoid valve or replace it if necessary.</li> </ul>
5. Neutral Solenoid Valve	If spool of servo bypass solenoid valve is stuck, pressure in both sides of servo cylinder chamber is equalized. This causes propulsion pump unable to discharge oil.	<ul style="list-style-type: none"> <li>• Measure pressure in servo cylinder chambers.</li> <li>• If pressure is equal in both chambers, repair servo bypass solenoid valve or replace it if necessary.</li> </ul>
6. Suction Filter for Propulsion Charge Pump	Propulsion charge pump flow is reduced due to clogged filter.	Clean suction filter or replace it if necessary.
7. Propulsion Circuit Pressure	Pump does not discharge oil because setting pressure of cut off valve is low.	<ul style="list-style-type: none"> <li>• Measure propulsion circuit pressure.</li> <li>• If low, check and adjust cut off valve or replace it if necessary.</li> </ul>
	Circuit does not obtain required pressure because setting pressure of high pressure relief is low.	<ul style="list-style-type: none"> <li>• Measure propulsion circuit pressure.</li> <li>• If low, check and adjust high pressure relief valve or replace it if necessary.</li> </ul>
8. Propulsion Motor	Propulsion circuit pressure is not held in propulsion motor case.	<ul style="list-style-type: none"> <li>• Measure propulsion motor case pressure.</li> <li>• If case pressure is not within allowable pressure, repair propulsion motor or replace it if necessary.</li> </ul>
	Internal leakage of propulsion motor.	<ul style="list-style-type: none"> <li>• Measure drain quantity from propulsion motor.</li> <li>• If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary.</li> </ul>
	Sticking of disc brakes causes brakes to remain applied.	<ul style="list-style-type: none"> <li>• Replace disc brakes.</li> </ul>

**3-2-1. Machine moves neither forward nor backward 2/2**

Check point	Cause	Check/Action
9. Propulsion Pump	Discharge flow rate is insufficient due to efficiency degradation of propulsion pump.	<ul style="list-style-type: none"> <li>• Measure discharge flow rate of propulsion pump with flow meter.</li> <li>• If discharge flow rate is not within specified range, repair propulsion pump or replace it if necessary.</li> </ul>
	Discharge flow rate is insufficient due to wear of propulsion pump drive shaft splines.	Replace propulsion pump.
	Propulsion circuit pressure is not held in propulsion pump case.	<ul style="list-style-type: none"> <li>• Measure propulsion pump case pressure.</li> <li>• If case pressure is not within allowable pressure, repair propulsion pump or replace it if necessary.</li> </ul>
10. Parking Brake Solenoid Valve	Brake remains applied because spool of parking brake solenoid valve does not shift.	Repair parking brake solenoid valve or replace it if necessary.
11. Brake Inlet Pressure	Brake cannot be released because brake inlet pressure is low.	<ul style="list-style-type: none"> <li>• Measure brake release pressure.</li> <li>• If low, repair or replace propulsion motor.</li> </ul>
12. Flange	Drive torque is not transmitted to pump due to faulty flange.	Replace flange.

**3-2-2. Machine moves in one direction only (forward or backward)**

Check point	Cause	Check/Action
1. High Pressure Relief Valve	Low circuit pressure due to incorrect high pressure relief setting or internal leakage of high pressure relief valve.	<ul style="list-style-type: none"> <li>• Interchange two high pressure relief valves.</li> <li>• If faulty condition is accordingly reversed, check and adjust high pressure relief valve or replace it if necessary.</li> </ul>

**3-2-3. Slow machine speed or small drive force 1/2**

Check point	Cause	Check/Action
1. Bypass Valve	Bypass valve is slightly open.	Close bypass valve completely.
2. Charge Circuit Pressure	Stroke of propulsion pump swash plate is small because charge pressure is low, decreasing discharge rate of propulsion pump.	<ul style="list-style-type: none"> <li>• Measure charge pressure.</li> <li>• If low, check and adjust charge relief valve or replace it if necessary.</li> </ul>
	Insufficient propulsion charge pump discharge.	Repair propulsion charge pump or replace it if necessary.
3. Suction Filter for Propulsion Charge Pump	Flow rate of propulsion charge pump decreases as well as charge pressure decreases due to clogged filter.	Clean suction filter or replace it if necessary.



**3-2-3. Slow machine speed or small drive force 2/2**

Check point	Cause	Check/Action
4. Propulsion Motor	Propulsion motor inlet pressure is low.	<ul style="list-style-type: none"> <li>• Measure propulsion motor inlet pressure.</li> <li>• If low, check and adjust high pressure relief valve or replace it if necessary.</li> </ul>
	Propulsion circuit pressure is not held in propulsion motor case.	<ul style="list-style-type: none"> <li>• Measure propulsion motor case pressure.</li> <li>• If case pressure is not within allowable pressure, repair propulsion motor or replace it if necessary.</li> </ul>
	Output of propulsion motor decreases and number of revolutions decreases due to internal leakage of propulsion motor.	<ul style="list-style-type: none"> <li>• Measure drain quantity from propulsion motor.</li> <li>• If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary.</li> </ul>
5. Propulsion Pump	Discharge flow rate is insufficient due to efficiency degradation of propulsion pump.	<ul style="list-style-type: none"> <li>• Measure discharge flow rate of propulsion pump with flow meter.</li> <li>• If discharge flow rate is not within specified range, repair propulsion pump or replace it if necessary.</li> </ul>
	Discharge flow rate is insufficient due to wear of propulsion pump drive shaft splines.	Replace propulsion pump.
	Propulsion circuit pressure is not held in propulsion pump case.	<ul style="list-style-type: none"> <li>• Measure propulsion pump case pressure.</li> <li>• If case pressure is not within allowable pressure, repair propulsion pump or replace it if necessary.</li> </ul>

**3-2-4. Machine speed cannot be switched**

Check point	Cause	Check/Action
1. Propulsion Pump Swash Plate Stroke Cylinder	Faulty propulsion pump swash plate stroke cylinder.	Repair propulsion pump or replace it if necessary.

**3-2-5. Machine does not stop completely with F-R lever in “N”**

Check point	Cause	Check/Action
1. Servo Control Valve	Servo control valve neutral position adjustment failure.	Check and adjust servo control valve or replace it if necessary.
2. Propulsion Pump Servo Cylinder	Faulty propulsion pump servo cylinder or faulty pump swash plate setting.	Repair propulsion pump or replace it if necessary.

**3-2-6. Propulsion system is overheating**

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Oil Cooler	Cooling efficiency is reduced due to clogged oil cooler fins.	Clean oil cooler fins.
3. Flushing Valve	Hydraulic oil in propulsion closed circuit is insufficiently cooled due to flushing valve shuttle spool sticking.	Repair flushing valve or replace it if necessary.
	Hydraulic oil in propulsion closed circuit is insufficiently cooled because flushing valve relief setting pressure is excessively high.	Check dust or damage in flushing relief valve and replace it if necessary.
	Hydraulic oil in propulsion closed circuit is insufficiently cooled due to flushing valve relief valve poppet sticking.	Clean flushing relief valve or replace it if necessary.
4. Propulsion Circuit Pressure	If circuit pressure setting is excessively low, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	<ul style="list-style-type: none"> <li>• Measure propulsion circuit pressure.</li> <li>• If low, increase relief setting pressure.</li> </ul>
	If load is excessively heavy, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	<ul style="list-style-type: none"> <li>• Measure propulsion circuit pressure.</li> <li>• If high, decrease propulsion load.</li> </ul>
5. Suction Filter for Propulsion Charge Pump	Load of propulsion charge pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean suction filter or replace it if necessary.
6. Hydraulic Oil Filter 2	Charge circuit pressure increases due to clogged filter.	Clean hydraulic oil filter 2 or replace it if necessary.

**3-2-7. Abnormal noise from propulsion system**

Check point	Cause	Check/Action
1. Roller Bearings	Roller bearings supporting front and rear drums are damaged.	Replace roller bearings.
2. Hydraulic Hose Clamp	Vibrator sound of hydraulic hose is generated because clamp securing hydraulic hose is loose.	Tighten bolts of loose hydraulic hose clamp to specified torque.
3. Suction Filter for Propulsion Charge Pump	Cavitation is occurring in propulsion charge pump due to clogged filter.	Clean suction filter or replace it if necessary.
4. Charge Circuit Pressure	If charge pressure is low, brake cannot be released completely, which causes brake drag.	<ul style="list-style-type: none"> <li>• Measure charge pressure.</li> <li>• If low, check and adjust charge relief valve or replace it if necessary.</li> </ul>
5. Propulsion Motor	Internal bearing of propulsion motor is damaged.	Repair propulsion motor or replace it if necessary.

### 3-3. Vibrator System

If a problem occurs in the vibrator systems such as the vibrator pump, vibrator motor and vibrator solenoid valve, determine the cause and carry out action as required, according to the following general troubleshooting items.

**(NOTICE)**

- **When checking whether or not the pressure is correct, refer to the pressure standard value for each hydraulic circuit.**

#### 3-3-1. No vibration

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Charge Circuit Pressure	Vibrator pump does not discharge oil due to low charge pressure.	<ul style="list-style-type: none"> <li>• Measure charge pressure.</li> <li>• If low, check and adjust charge relief valve or replace it if necessary.</li> </ul>
	Insufficient steering • charge pump discharge.	Repair steering • charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Parking brake solenoid valve	<ul style="list-style-type: none"> <li>• When solenoid is energized, check if oil flows in return circuit to tank.</li> <li>• If oil is flowing, repair solenoid valve or replace it if necessary.</li> </ul>
3. Suction Filter for Steering • Charge Pump	Steering • charge pump flow is reduced due to clogged filler.	Clean suction filter or replace it if necessary.
4. Vibrator Circuit Pressure	Circuit does not obtain required pressure because setting pressure of high pressure relief is low.	<ul style="list-style-type: none"> <li>• Measure vibrator circuit pressure.</li> <li>• If low, check and adjust high pressure relief valve or replace them if necessary.</li> </ul>
5. Vibrator Solenoid Valve	Vibrator pump cannot discharge oil because spool of vibrator solenoid valve does not shift.	Repair vibrator solenoid valve or replace it if necessary.
6. Vibrator Motor	Vibrator circuit pressure is not held in vibrator motor case.	<ul style="list-style-type: none"> <li>• Measure vibrator motor case pressure.</li> <li>• If case pressure is not within allowable pressure, repair vibrator motor or replace it if necessary.</li> </ul>
	Internal leakage of vibrator motor.	<ul style="list-style-type: none"> <li>• Measure drain quantity from vibrator motor.</li> <li>• If drain quantity is larger than standard value, repair vibrator motor or replace it if necessary.</li> </ul>
	Output torque is not transmitted due to worn spline of vibrator motor output shaft.	Replace vibrator motor.
7. Vibrator Pump	Insufficient discharge rate from vibrator pump due to reduced efficiency of vibrator pump.	<ul style="list-style-type: none"> <li>• Measure discharge flow rate of vibrator pump with flow meter.</li> <li>• If discharge flow rate is not within specified range, repair vibrator pump or replace it if necessary.</li> </ul>
	Insufficient pump discharge due to wear of vibrator pump drive shaft spline.	Replace vibrator pump.
	Vibrator circuit pressure is not held in vibrator pump case.	<ul style="list-style-type: none"> <li>• Measure vibrator pump case pressure.</li> <li>• If case pressure is not within allowable pressure, repair vibrator pump or replace it if necessary.</li> </ul>

**3-3-2. Vibration wheel does not switch**

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibrator pressure is bypassed because vibrator solenoid valve spool does not switch.	If the vibrator solenoid valve spool does not switch, repair vibrator solenoid valve or replace it if necessary.
2. Vibrator Motor	Vibrator circuit pressure is not held in vibrator motor case.	If pressure in vibrator motor case is not within allowable range, repair vibrator motor or replace it if necessary.
	Internal leakage of vibrator motor.	<ul style="list-style-type: none"> <li>• Measure drain quantity from vibrator motor.</li> <li>• If drain quantity is larger than standard value, repair vibrator motor or replace it if necessary.</li> </ul>
	Output torque is not transmitted due to worn spline of vibrator motor output shaft.	Replace vibrator pump.

**3-3-3. Vibrator frequency is too low 1/2**

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Charge Circuit Pressure	Stroke of vibrator pump swash plate is small because charge pressure is low, decreasing discharge rate of vibrator pump.	<ul style="list-style-type: none"> <li>• Measure charge pressure.</li> <li>• If low, check and adjust charge relief valve or replace it if necessary.</li> </ul>
	Insufficient steering • charge pump discharge.	Repair steering • charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Parking brake solenoid valve	<ul style="list-style-type: none"> <li>• When solenoid is energized, check if oil flows in return circuit to tank.</li> <li>• If oil is flowing, repair solenoid valve or replace it if necessary.</li> </ul>
3. Vibrator Solenoid Valve	Vibrator pressure is bypassed due to internal leakage of vibrator solenoid valve.	Repair vibrator solenoid valve or replace it if necessary.
4. Suction Filter for Steering • Charge Pump	Flow rate of steering • charge pump decreases as well as charge pressure decreases due to clogged filter.	Clean suction filter or replace it if necessary.
5. Vibrator Motor	Vibrator motor inlet pressure is low.	<ul style="list-style-type: none"> <li>• Measure vibrator motor inlet pressure.</li> <li>• If low, check and adjust high pressure relief valve or replace it if necessary.</li> </ul>
	Vibrator circuit pressure is not held in vibrator motor case.	<ul style="list-style-type: none"> <li>• Measure vibrator motor case pressure.</li> <li>• If case pressure is not within allowable pressure, repair vibrator motor or replace it if necessary.</li> </ul>
	Decrease in vibrator motor rpm due to internal leakage in vibrator motor.	<ul style="list-style-type: none"> <li>• Measure drain quantity from vibrator motor.</li> <li>• If drain quantity is larger than standard value, repair vibrator motor or replace it if necessary.</li> </ul>

**3-3-3. Vibrator frequency is too low 2/2**

Check point	Cause	Check/Action
6. Vibrator Pump	Insufficient discharge rate from vibrator pump due to reduced efficiency of vibrator pump.	<ul style="list-style-type: none"> <li>• Measure discharge flow rate of vibrator pump with flow meter.</li> <li>• If discharge flow rate is not within specified range, repair vibrator pump or replace it if necessary.</li> </ul>
	Insufficient pump discharge due to wear of vibrator pump drive shaft spline.	Replace vibrator pump.
	Vibrator circuit pressure is not held in vibrator pump case.	<ul style="list-style-type: none"> <li>• Measure vibrator pump case pressure.</li> <li>• If case pressure is not within allowable pressure, repair vibrator pump or replace it if necessary.</li> </ul>

**3-3-4. Vibration mode does not switch**

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibrator solenoid valve spool shifts only in one direction.	Repair vibrator solenoid valve or replace it if necessary.

**3-3-5. Vibratory drum does not changeover vibrating**

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibratory drum does not changeover vibrating because spool of vibrator solenoid valve does not change.	Repair vibrator solenoid valve or replace it if necessary.

**3-3-6. Vibrator does not stop**

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibrator solenoid valve spool does not return to neutral position.	Repair vibrator solenoid valve or replace it if necessary.
2. Vibrator Pump	Vibrator pump swash plate does not return to neutral position.	Repair or replace vibrator pump or replace it if necessary.

**3-3-7. Vibrator system is overheating**

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Oil Cooler	Cooling efficiency is reduced due to clogged oil cooler fins.	Clean oil cooler fins.
3. Flushing Valve	Hydraulic oil in vibrator closed circuit is insufficiently cooled due to flushing valve shuttle spool sticking.	Repair flushing valve or replace it if necessary.
	Hydraulic oil in vibrator closed circuit is insufficiently cooled because flushing valve relief setting pressure is excessively high.	Check dust or damage in flushing relief valve and replace it if necessary.
	Hydraulic oil in vibrator closed circuit is insufficiently cooled due to flushing valve relief valve poppet sticking.	Clean flushing relief valve or replace it if necessary.
4. Vibrator Circuit Pressure	If circuit pressure setting is excessively low, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	<ul style="list-style-type: none"> <li>• Measure vibrator circuit pressure.</li> <li>• If low, increase relief setting pressure.</li> </ul>
	If load is excessively heavy, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	<ul style="list-style-type: none"> <li>• Measure vibrator circuit pressure.</li> <li>• If high, decrease vibration load.</li> </ul>
5. Suction Filter for Steering • Charge Pump	Load of steering • charge pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean suction filter or replace it if necessary.
6. Hydraulic Oil Filter 1	Charge circuit pressure increases due to clogged filter.	Clean hydraulic oil filter 1 or replace it if necessary.

**3-3-8. Abnormal noise from vibrator system**

Check point	Cause	Check/Action
1. Vibrator Bearings	Vibrator bearings supporting eccentric shaft are damaged.	Replace vibrator bearings.
2. Hydraulic Hose Clamp	Vibrator sound of hydraulic hose is generated because clamp securing hydraulic hose is loose.	Tighten bolts of loose hydraulic hose clamp to specified torque.
3. Suction Filter for Steering • Charge Pump	Cavitation is occurring in steering • charge pump due to clogged filter.	Clean suction filter or replace it if necessary.
4. Vibrator Motor	Internal bearing of vibrator motor is damaged.	Repair vibrator motor or replace it if necessary.

### 3-4. Steering System

If a problem occurs in the steering systems such as the steering • charge pump and orbitrol, determine the cause and carry out action as required, according to the following general troubleshooting items.

**(NOTICE)**

- **When checking whether or not the pressure is correct, refer to the pressure standard value for each hydraulic circuit.**

#### 3-4-1. Steering wheel is hard to turn

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Orbitrol	Relief valve is open or setting pressure is low.	<ul style="list-style-type: none"> <li>• Measure steering circuit pressure.</li> <li>• If low, check and clean relief valve or replace it if necessary.</li> </ul>
	Flow to steering cylinder circuit is insufficient due to leakage from check valve.	Check and clean check valve or replace it if necessary.
	Spool and sleeve of orbitrol are contaminated or clearance is incorrect.	Check and clean orbitrol or replace it if necessary.
3. Steering Circuit Pressure	Pressure in return circuit from orbitrol increases due to clogged charging hydraulic oil filter 1.	Clean hydraulic oil filter 1 or replace it if necessary.
4. Steering Cylinder	Cylinder thrust decreases due to internal leakage of steering cylinder.	Repair steering cylinder or replace it if necessary.
5. Suction Filter for Steering • Charge Pump	Steering • charge pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
6. Steering • Charge Pump	Discharging pressure is insufficient due to efficiency degradation of steering • charge pump.	<ul style="list-style-type: none"> <li>• Measure steering circuit pressure.</li> <li>• If low, replace steering • charge pump.</li> </ul>
7. Steering Column	Column shaft and orbitrol shaft center are misaligned.	Align column shaft with orbitrol shaft center or replace it if necessary.
	Column shaft bearing is worn or damaged.	Repair column shaft or replace it if necessary.

#### 3-4-2. Steering response is slow

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Orbitrol	Oil is bypassing because relief valve is open.	<ul style="list-style-type: none"> <li>• Measure steering circuit pressure.</li> <li>• If low, check and clean relief valve or replace it if necessary.</li> </ul>
3. Steering Cylinder	Internal leakage of steering cylinder.	Repair steering cylinder or replace it if necessary.
4. Suction Filter for Steering • Charge Pump	Steering • charge pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
5. Steering • Charge Pump	Discharging pressure is insufficient due to efficiency degradation of steering • charge pump.	<ul style="list-style-type: none"> <li>• Measure steering circuit pressure.</li> <li>• If low, replace steering • charge pump.</li> </ul>

**3-4-3. Steering wheel backlash or play is large**

Check point	Cause	Check/Action
1. Steering Column	Spline of column shaft or orbitrol is worn.	Replace column shaft or orbitrol.
	Column shaft bearings are worn.	Replace column shaft bearings.
2. Steering Wheel	Serration (spline) of wheel or column shaft is worn.	Replace wheel or column shaft.

**3-4-4. Steering system is overheating**

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Oil Cooler	Cooling efficiency is reduced due to clogged oil cooler fins.	Clean oil cooler fins.
3. Steering Circuit Pressure	If circuit pressure setting is excessively low, relief valve is open, causing temperature of hydraulic oil in circuit to rise.	<ul style="list-style-type: none"> <li>• Measure steering circuit pressure.</li> <li>• If low, replace relief valve.</li> </ul>
	If load is excessively heavy, relief valve is open, causing temperature of hydraulic oil in circuit to rise.	<ul style="list-style-type: none"> <li>• Measure steering circuit pressure.</li> <li>• If high, decrease steering load.</li> </ul>
4. Suction Filter for Steering • Charge Pump	Load of steering • charge pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean suction filter or replace it if necessary.

**3-4-5. Abnormal noise from steering system**

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Pump suction pressure is high because oil level of hydraulic oil tank is low, causing cavitation in steering circuit system.	Fill tank until correct oil level is obtained.
2. Steering Circuit	Cavitation is caused by air in circuit.	Bleed circuit.
3. Hydraulic Hose Clamp	Vibrator sound of hydraulic hose is generated because clamp securing hydraulic hose is loose.	Tighten bolts of loose hydraulic hose clamp to specified torque.
4. Suction Filter for Steering • Charge Pump	Cavitation is occurring in steering • charge pump due to clogged filter.	Clean suction filter or replace it if necessary.





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**SHOP MANUAL**

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