# SW880-1/990-1
# SHOP MANUAL

SAKAI®

3498-6568A-0

# Introduction

This manual provides important information to familiarize you with safe operating and maintenance procedures for your SAKAI roller. Even though you may be familiar with similar equipment you must read and understand this manual before operating or servicing this unit.

Safety is everyone's business and it is one of your primary concerns. Knowing the guidelines presented in this manual will help provide for your safety, for the safety of those around you and for the proper operation and maintenance of the machine. Improper operation is dangerous and can result in injury or death.

Sakai Heavy Industries cannot foresee all possible circumstances or varying conditions to which the operator, serviceman or machine may be exposed to that might lead to a potential hazard. Therefore, the warnings and cautions listed in this manual and those placed on the machine are not intended to be all inclusive and liability for personal injury or damage to equipment or property cannot be assumed.

All information, specifications and illustrations in this publication are based on the product information available at the time that the publication was written. The contents may change without prior notice due to modifications of the model.

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# SAFETY

# 1. GENERAL SAFETY

## 1-1. Understanding the Safety Symbols and Words

The words DANGER, WARNING, and CAUTION are used with the safety-alert symbol. DANGER identifies the most serious hazard. When the symbols DANGER, WARNING and CAUTION are displayed, become alert. Your safety or those around you may be involved. NOTICE is used to provide important information that is not hazard related.

⚠DANGER: Indicates an imminently hazardous situation or condition which if not avoided can result in serious personal injury or death.

⚠WARNING: Indicates a potentially hazardous situation or condition which if not avoided can result in serious personal injury or death.

⚠CAUTION: Indicates a potentially hazardous situation or condition which if not avoided may result in moderate personal injury or damage to the machine or personal property.

(NOTICE): Indicates important information about operation or maintenance of the machine that may cause damage, breakdown, or shortened service life of the machine if you fail to observe or important point to maintain of quality in maintenance works.

★: Indicates standard value to judge whether measured value is good or not.

Items that indicate the weight of a part or equipment and require attention in wire selection and operating posture for slinging operation.

In the assembly operation, tightening torque in locations that require particular attention.

## 1-2. General

- Operators and maintenance personnel must be alert to recognize and avoid potential hazards. They should also have comprehensive training, the required skills and necessary tools to perform the job safely.
- The machine was built in accordance to the latest safety standards and recognized safety rules. Nevertheless, misuse of the machine may result in risk to life and limb of the user or nearby personnel and may cause damage to the machine or other property.
- The machine must only be used for its intended purpose as described in the Operator's Manual. It must be operated by safety-conscious persons who are fully aware of the risks involved when operating the machine. Any malfunctions especially those affecting the safety of the machine must be corrected immediately.

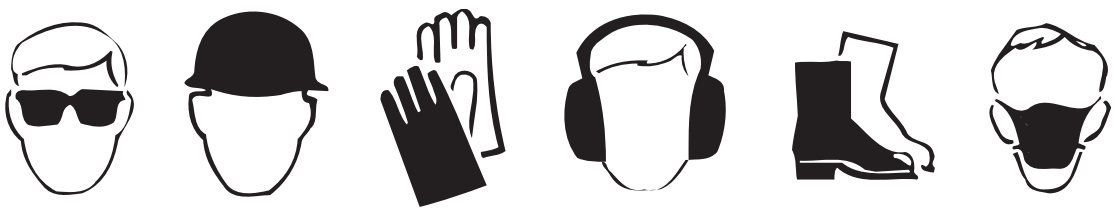
- The machine is designed specifically for the compaction of asphalt or soil road construction materials. Use of the machine for other purposes such as towing other equipment is considered contrary to the designated use. The manufacturer cannot be responsible or held liable for any damage resulting from such use. The risk for such use lies entirely with the user.
- Operating the machine within the limits of its designated use also involves compliance with the inspection and maintenance requirements contained in the Operation and Maintenance Manual.

## 1-3. Qualifications of Operators and Maintenance Personnel

- Work on the machine must be performed by qualified personnel only. Individual responsibilities of personnel regarding operation, maintenance, repair of the machine must be clearly stated.
- Define the operator's responsibilities; the operator should have authority to refuse instructions that are contrary to safety.
- Do not allow persons being trained to operate or perform maintenance on the machine without constant supervision by an experienced person.
- Work on the electrical system of the machine must be done only by an experienced person or under the guidance of a skilled electrician and according to electrical engineering rules and regulations.
- Work on the frame, brakes, hydraulic and steering systems must be performed by skilled personnel with special knowledge and training for such work.

## 1-4. Safety Practices and Policies

- Keep the manuals in the container provided on the machine. Manuals must always be available at the site where the machine is being used.
- The operator or user of the machine must be aware of all applicable or legal and mandatory regulations relevant to accident prevention and environmental protection. These regulations may also deal with handling of hazardous substances, the required proper personal safety and protective equipment and traffic or jobsite regulations.
- Machine operating instructions should also be supplemented with detailed instructions pertaining to the specific jobsite or work location.
- Always be sure the persons working on the machine have read the operating instructions and all safety precautions before beginning work. Reading safety instructions after work has already begun is too late.
- Wear close fitting garments and always tie back and secure long hair, also avoid wearing jewelry such as rings. Injury can result from loose clothing, hair or jewelry being caught up in the machinery or rotating parts.
- Use protective equipment as required by the circumstances or by law.



- Observe all safety instructions and warnings attached to the machine.
- Make sure all safety instructions and warnings on the machine are complete and perfectly legible.
- Stop the machine immediately in the event of any malfunction. Report any malfunction immediately to the supervisor or other person of authority.
- Never perform service or maintenance on the machine unless the drums or tires are adequately blocked, articulation lock bar and pin is in the locked position and the parking brake is applied.
- Never make any modifications to the machine which might affect safety without the manufacturer's approval.
- Always perform the recommended routine inspections and adjustments according to the prescribed intervals.

## 1-5. Pre Start Inspection

- Inspect your machine daily. Ensure that the routine maintenance and lubrication are properly performed. Repair or replace any malfunctioning, broken or missing parts before using the machine. Refer to the maintenance schedule in the Operator's Manual.
- Check that all instructions and safety stickers are in place and readable.
- Never fill the fuel tank with the engine running or while near an open flame or while smoking.
- Always clean up any spilled fuel.
- Check for any warning tags placed on the machine, do not operate the machine until all repairs have been made and warning tags have been removed by authorized personnel.
- Check the seat belt for wear or damage; inspect the belt hardware and fabric. Replace if hardware is damaged or the belt is frayed or nicked or stitching is loose. Check that mounting hardware is tight.
- Clean the steps and operating platform of dirt and foreign matter to reduce danger of slipping.
- Know how to shut-down or stop the machine immediately in case of emergency.
- Know the capabilities and limitations of the machine such as speed, gradeability, steering and braking.
- Be aware of the dimensions of the machine such as height, weight especially for transporting.

## 1-6. Safety Instructions

- Take all necessary precautions to ensure that the machine is used only when in a safe and reliable condition.
- Avoid any operational mode that might compromise safety.
- Operate the machine only if all protective and safety devices are in place and fully functional.
- Always use the hand rails and steps to get on and off your machine maintaining 3-point contact (using both hands).

## 1-7. Starting

- Start the machine only from the driver's seat and always wear the seat belt.
- Watch that the warning lights and indicators during start-up and shutdown are working in accordance with operating instructions.
- Watch that no one is in danger before starting and when moving the machine.
- Check that braking, steering, signals and lights are fully functional before starting work or traveling with the machine.

## 1-8. Operating

- Always make sure that there are no obstructions or persons in your line of travel before starting the compactor in motion.
- Never climb on and off the machine while it is in motion.
- Always remain seated with the seat belt fastened when traveling, compacting or loading or unloading the machine.
- Use caution and be very observant when operating in close quarters and congested areas.
- Obey all traffic regulations when working on public roads and make sure machine is compatible with these regulations.
- Never carry passengers.
- Know and use the hand signals for particular jobs and who has the responsibility for signaling.
- Do not work close to edges or in the vicinity of overhanging banks or on grades that could cause the compactor to slide or roll over. Avoid any areas that may be a risk to machine stability.
- Avoid side hill travel. Always operate up and down the slope. Always keep the propulsion (travel control) lever in low speed range when climbing or descending hills or steep grades.
- Make sure there is sufficient clearance when crossing underpasses, bridges and tunnels or when passing under overhead power lines.
- Never allow anyone to stand in the articulation area of the machine when the engine is running.
- Always look in all directions before reversing the direction of travel.
- Always switch on the lighting system (if equipped) during poor visibility conditions and after dark.
- Do not attempt to control the compactor travel speed with the throttle control. Maintain engine speed at the full operating RPM.
- Do not run the engine in a closed building for an extended period of time. Exhaust fumes can kill.

## 1-9. Stopping

- Always park the machine in a safe area on solid and level ground. If this is not possible, always park at a right angle to the slope and block the drums or tires.
- Do not leave the operator's platform with the engine running. Always move the travel lever to neutral position and apply the parking brake then turn the starter switch to OFF.
- Lock all lockable compartments.
- Park behind a safe barrier, use proper flags, and warning devices, especially when parking in areas of heavy traffic.

## 1-10. Maintenance

- In any performing any work concerning the operation, adjustment or modification of the machine or it's safety devices or any work related to maintenance, inspection or repair, always follow the start-up and shut-down procedures in the Operator's Manual and the Maintenance Manual.
- Ensure that the maintenance area is safe and secure.
- If the machine is shut down for maintenance or repair work it must be secured against inadvertent starting by removing the starter key and attaching a warning sign to the starter switch.


- The machine must be parked on stable and level ground with the drums or tires blocked to prevent inadvertent movement.
- Immediately after the engine has stopped, the exhaust system, engine, radiator coolant, engine oil, hydraulic fluid and other lubricants and components will be very hot. Fluids can be under pressure, removing the radiator cap or draining oil or changing filters can cause serious burns. Wait until the machine has cooled down.

- Use care when attaching and securing lifting tackle to individual parts and large assemblies being removed or repositioned for repair purposes to avoid the risk of accident. Use lifting devices that are in perfect condition and of sufficient lifting capacity. Never stand under suspended loads.

- Always use the proper tools and workshop equipment in good condition when performing maintenance or repairs on the machine.
- Always use specially designed safety ladders and working platforms when working above floor level. Never use machine parts as a climbing aid.

- Keep all steps, handles, handrails, platforms and ladders free from mud, dirt, grease, ice or snow.
- Clean the machine, especially threaded connections of any traces of oil or fuel before carrying out any maintenance or repairs. Never use aggressive detergents. Use lint free cleaning rags.
- Examine all fuel, lubricant and hydraulic fluid lines and connectors for leaks, loose connections chafe marks or damage after cleaning.
- Repair or replace defective parts immediately.
- Whenever possible, avoid servicing or maintenance when the engine is running unless the drums or tires are adequately blocked, the articulation lock bar is in the locked position and the parking brake is applied.
- Never fill the fuel tank with the engine running, while near an open flame or while smoking. Always clean up any spilled fuel.
- Ensure safe operation, optimum performance of the machine and its warranty by using only genuine SAKAI replacement parts.

- Use only the specified fluids and lubricants. Substitute only products known to be equivalent from reputable manufacturers.
- Disconnect the battery cables when working on the electrical system or when welding on the compactor.

- Be sure the battery area is well ventilated (clear of fumes) should it be necessary to connect a jumper cable or battery charger. Fumes can ignite from a spark and may explode.
- Be sure battery charger is OFF when making connections if charging is required.
- Use only original fuses with the specified rating. Switch off the machine immediately if trouble occurs in the electrical system.
- Work on the electrical system may only be carried out by a qualified electrician or by a specially trained person according to electrical engineering principles.
- Inspect the electrical equipment of the machine at regular intervals. Defects such as loose connections or burnt or scorched wires must be repaired or replaced immediately.
- Do not weld, flame cut or perform grinding on the machine unless expressly authorized, as there may be a risk of fire or explosion. Disconnect the battery when welding on the machine.
- Clean the machine and its surrounding from dust or other flammable substances and make sure the area is adequately ventilated before beginning welding, flame cutting or grinding operations.
- Inspect hydraulic hoses at regular intervals and immediately replace if they show signs of chafing, cracking, brittleness, deformation, blistering, fitting separation, leakage, corrosion or other damage which may affect their function or strength.
- Do not work on hydraulic system while the engine is running and the system is under pressure. The hydraulic system remains pressurized even after the engine has stopped.
- Do not disconnect hydraulic hoses or fittings until the pressure has been properly relieved.
- Wait until the systems and fluid have cooled down before disconnecting.
- Never use your hands to check for leaks when inspecting a hydraulic system. Use a piece of cardboard and always wear gloves and safety glasses.

- Get immediate medical attention if fluid has been injected under your skin. Fluid penetration from a pin hole leak can cause severe injury or death.
- Ensure that hydraulic lines and hoses are routed and fitted properly. Ensure that no connections are interchanged. All fittings, lengths and specifications of hoses must comply with the technical requirements.
- Observe all product safety regulations when handling fuel, oils, grease, engine coolant and other chemical substances. Be careful especially when these items are hot as there is a risk of burning or scalding.
- Operate internal combustion engines and fuel operated heating systems only in adequately ventilated premises. Before starting the engine in an enclosed area, make sure there is sufficient ventilation.

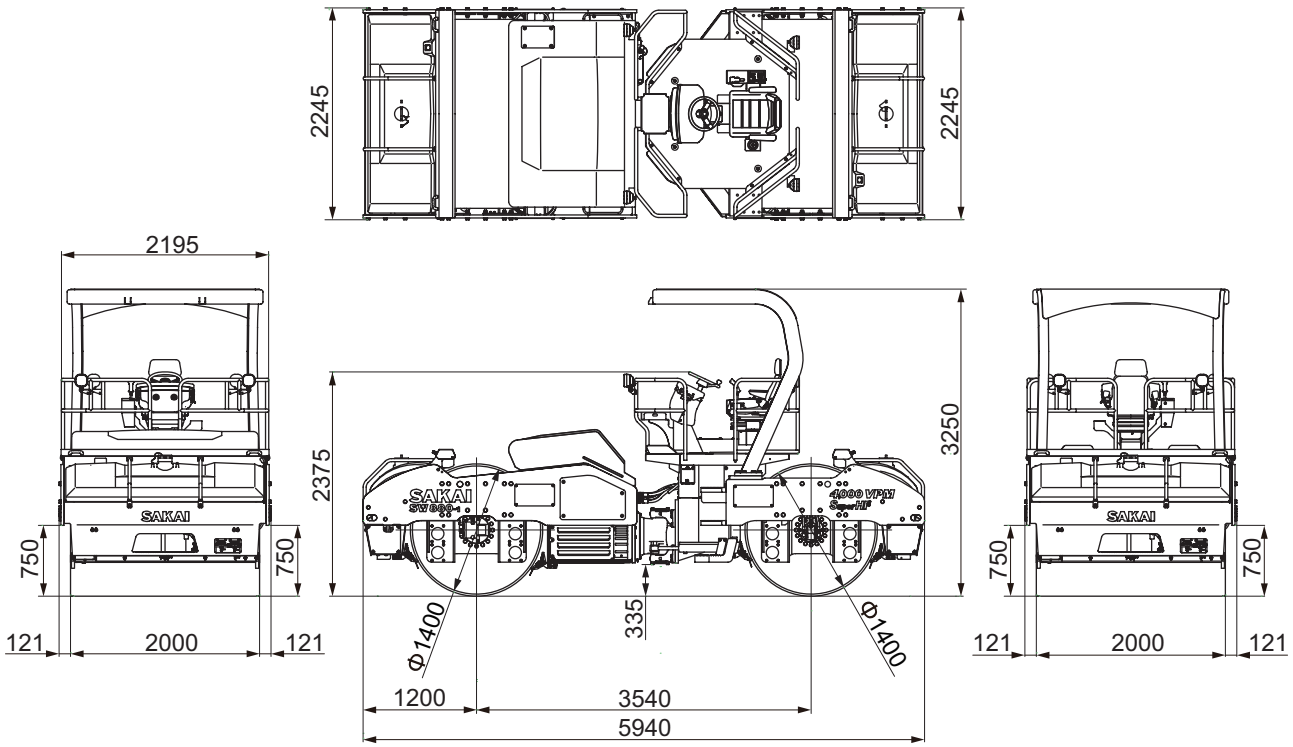
## 1-11. Transporting the Machine

- Use only suitable and approved trailers and haul vehicles and lifting equipment of sufficient capacity.
- Entrust to experienced personnel the fastening and lifting of loads and instructing of crane operators.
- Only experienced persons familiar with the operation of the machine may load and unload the machine.
- Use ramps or a loading dock when loading or unloading the machine. Ramps must be the proper strength, low angle and the proper height and width.
- Block the drums or tires (front and rear) of the hauling vehicle when loading and unloading the compactor. Ensure that the haul vehicle is on level ground and approach the loading ramps squarely to make sure that the compactor does not slide off the edge of the ramp.
- Keep the deck clear of mud, oil, ice or snow or other materials that can make the deck slippery.
- Position the compactor on the trailer or transport vehicle centered from side to side, and apply the brake. Shut off the engine and lock all lockable compartments.
- Block the drums or tires and lock the articulation lock bar. Chain the machine down properly using the appropriate tackle.
- Know the overall height of the compactor and hauling vehicle. Observe height and weight regulations and be sure you can pass safely at overhead obstructions.
- Obey all traffic regulations and be sure that the proper clearance flags, lights and warning signs including “Slow Moving Vehicle” emblem are displayed when traveling on public roads.
- Know the approximate stopping distance at any given speed.
- Drive Safely. Never turn corners at excessive speeds.

# SPECIFICATIONS

# 1. SPECIFICATION DATA

## 1-1. SW880-1

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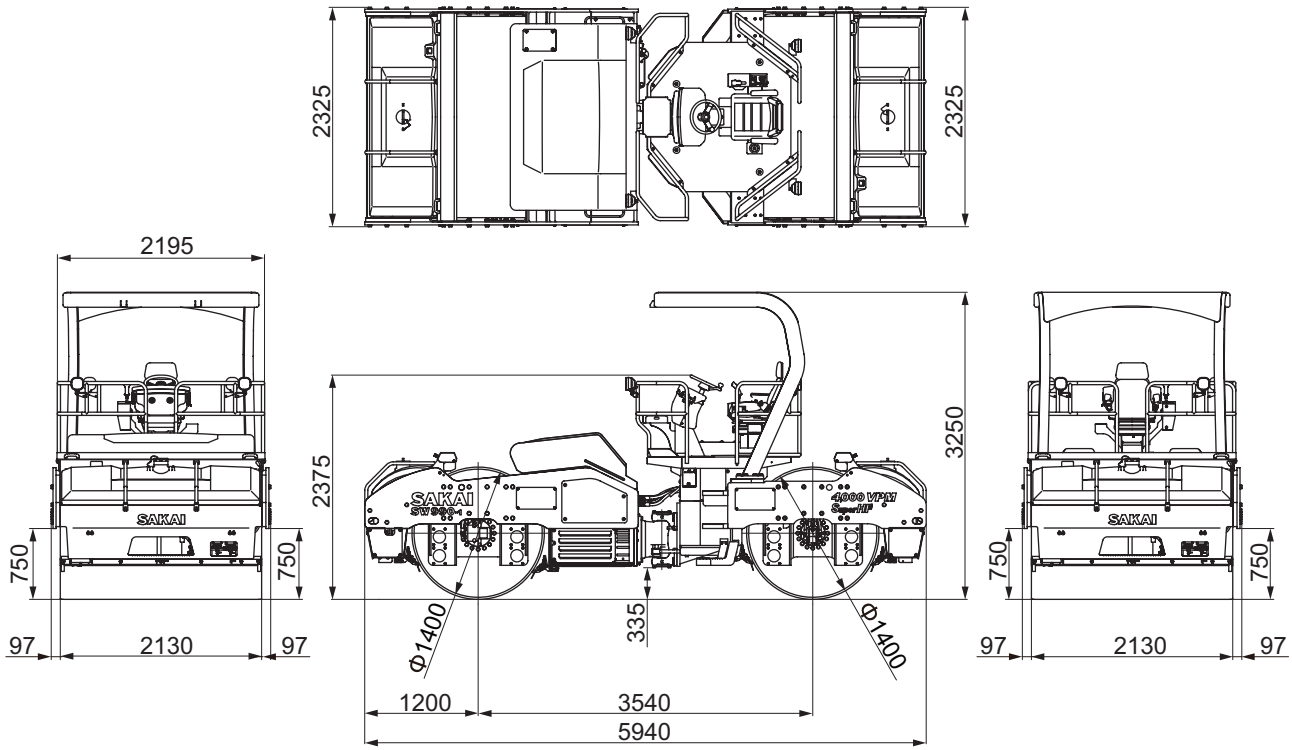
| | | | |
|---|---|---|---|
| Model & Type | Model | | SAKAI SW880-1 with ROPS |
| | Type | | VIBRATORY TANDEM ROLLER |
| Weight | Operating weight | without ballast | 12,870 kg ( 28,375 lbs. ) |
| | | with ballast | N/A kg ( N/A lbs. ) |
| | Maximum weight | | 13,590 kg ( 29,960 lbs. ) |
| | Shipping weight | with ROPS | 12,090 kg ( 26,655 lbs. ) |
| | | without ROPS | 11,540 kg ( 25,440 lbs. ) |
| | Load on front axle | | 6,340 kg ( 13,975 lbs. ) |
| | Load on rear axle | | 6,530 kg ( 14,395 lbs. ) |
| Dimensions | Overall length | | 5,940 mm ( 234 in. ) |
| | Overall width | | 2,245 mm ( 88 in. ) |
| | Overall height | with ROPS | 3,250 mm ( 128 in. ) |
| | | without ROPS | 2,375 mm ( 94 in. ) |
| | Wheelbase | | 3,540 mm ( 139 in. ) |
| | Compaction width | | 2,000 mm ( 79 in. ) |
| | Front drum | width × dia. | 2,000 mm × 1,400 mm × 22 mm (79 in. × 55 in. × 0.9 in.) |
| | Rear drum | width × dia. | 2,000 mm × 1,400 mm × 22 mm (79 in. × 55 in. × 0.9 in.) |
| | Minimum height above ground | | 335 mm ( 13.1 in. ) |
| | Kerb clearance | Left | 750 mm ( 29.6 in. ) |
| | | Right | 750 mm ( 29.6 in. ) |
| | Side clearance | Left | 121 mm ( 4.8 in. ) |
| | | Right | 121 mm ( 4.8 in. ) |
| | Leveling blade width | | N/A mm ( N/A in. ) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance | Vibrator system | Front | Centrifugal force | Low amplitude | 4,000 vpm | 160 kN | ( 35,970 lbs. ) |
| | | | | | 3,000 vpm | 90 kN | ( 20,230 lbs. ) |
| | | | | | 2,500 vpm | 63 kN | ( 14,160 lbs. ) |
| | | | | High amplitude | 3,000 vpm | 177 kN | ( 39,790 lbs. ) |
| | | | | | 2,500 vpm | 123 kN | ( 27,650 lbs. ) |
| | | | Frequency | Low amplitude | | 66.7 Hz | ( 4,000 vpm ) |
| | | | | | | 50.0 Hz | ( 3,000 vpm ) |
| | | | | | | 41.7 Hz | ( 2,500 vpm ) |
| | | | | High amplitude | | 50.0 Hz | ( 3,000 vpm ) |
| | | | | | | 41.7 Hz | ( 2,500 vpm ) |
| | | | Amplitude | Low amplitude | | 0.33 mm | ( 0.013 in. ) |
| | | | | High amplitude | | 0.64 mm | ( 0.025 in. ) |
| | | Rear | Centrifugal force | Low amplitude | 4,000 vpm | 160 kN | ( 35,970 lbs. ) |
| | | | | | 3,000 vpm | 90 kN | ( 20,230 lbs. ) |
| | | | | | 2,500 vpm | 63 kN | ( 14,160 lbs. ) |
| | | | | High amplitude | 3,000 vpm | 177 kN | ( 39,790 lbs. ) |
| | | | | | 2,500 vpm | 123 kN | ( 27,650 lbs. ) |
| | | | Frequency | Low amplitude | | 66.7 Hz | ( 4,000 vpm ) |
| | | | | | | 50.0 Hz | ( 3,000 vpm ) |
| | | | | | | 41.7 Hz | ( 2,500 vpm ) |
| | | | | High amplitude | | 50.0 Hz | ( 3,000 vpm ) |
| | | | | | | 41.7 Hz | ( 2,500 vpm ) |
| | | | Amplitude | Low amplitude | | 0.33 mm | ( 0.013 in. ) |
| | | | | High amplitude | | 0.64 mm | ( 0.025 in. ) |
| | Linear pressure | Static linear pressure | Front drum | | | 311 N/cm | ( 178 lbs./in. ) |
| | | | Rear drum | | | 320 N/cm | ( 183 lbs./in. ) |
| | | Dynamic linear pressure | Front drum | Low amplitude | 4,000 vpm | 1,111 N/cm | ( 634 lbs./in. ) |
| | | | | | 3,000 vpm | 761 N/cm | ( 434 lbs./in. ) |
| | | | | | 2,500 vpm | 626 N/cm | ( 357 lbs./in. ) |
| | | | | High amplitude | 3,000 vpm | 1,196 N/cm | ( 683 lbs./in. ) |
| | | | | | 2,500 vpm | 926 N/cm | ( 529 lbs./in. ) |
| | | | Rear drum | Low amplitude | 4,000 vpm | 1,120 N/cm | ( 640 lbs./in. ) |
| | | | | | 3,000 vpm | 770 N/cm | ( 440 lbs./in. ) |
| | | | | | 2,500 vpm | 635 N/cm | ( 363 lbs./in. ) |
| | | | | High amplitude | 3,000 vpm | 1,205 N/cm | ( 688 lbs./in. ) |
| | | | | | 2,500 vpm | 935 N/cm | ( 534 lbs./in. ) |
| | Speed | Number of speed shift | | | | 2 speed | |
| | | Speed range | | 1st | 4,000 vpm | 0 to 7.2 km/h | ( 0 to 4.5 mph ) |
| | | | | | 3,000 vpm | 0 to 5.5 km/h | ( 0 to 3.4 mph ) |
| | | | | | 2,500 vpm | 0 to 4.5 km/h | ( 0 to 2.8 mph ) |
| | | | | 2nd | | 0 to 11.0 km/h | ( 0 to 6.8 mph ) |
| | Gradeability *1 | | | without vibration | | 29 % | ( 16 ° ) |
| | Turning radius | Machine clearance radius inside | | | | 4.2 m | ( 166 in. ) |
| | | Machine clearance radius outside | | | | 6.4 m | ( 252 in. ) |
| | | Turning radius inside compacted surface | | | | 4.3 m | ( 170 in. ) |
| | | Turning radius outside compacted surface | | | | 6.3 m | ( 249 in. ) |
| | Steering / Oscillating angle | | | | | ± 36.7 ° / ± 6.5 ° | |

*1: The gradeability is the calculated value. It may vary based on the ground surface conditions.

| | | | |
|---|---|---|---|
| Engine | Name | | CUMMINS QSB4.5 (Diesel, EPA-Interim Tier 4) |
| | Model | | 4-cycle, Water-cooled, 4-cylinder in-line, overhead valve, direct injection type, with turbo charger |
| | Bore × Stroke | | 107 mm × 124 mm (4.213 in. × 4.882 in.) |
| | Displacement | | 4.457 L ( 272.0 cu.in ) |
| | Performance | Rated speed | 2,500 $min^{-1}$ ( 2,500 rpm ) |
| | | Rated output | 107.6 kW ( 144 HP ) |
| | | Max. torque | 624 N·m ( 460 lbf·ft ) at 1,500 $min^{-1}$ |
| | | Fuel consumption rate | 229 g/kW·h ( 0.376 lb/HP·h ) at 2,500 $min^{-1}$ |
| | | Fuel consumption | 30 L/h with full load ( 7.8 gal with full load ) |
| | Fuel system | Fuel | Diesel (ASTM D975-2D) |
| | | Fuel injection pump | Inline injection pump |
| | | Fuel injection time regulator | Full electrical control |
| | Lubrication system | Lubrication type | Full forced pressure feed |
| | | Oil filter type | Full flow plastic fiber element |
| | | Oil cooler type | Intergrated water cooled |
| | Air intake system | Air cleaner type | Dry |
| | Cooling system | Cooling type | Pressurized water forced circulation |
| | | Cooling fan type | Inhale |
| | Electrical system | Alternator | 12 V 130 A |
| | | Starter | 12 V 4.8 kW |
| | | Battery | 12 V (N/Aah, 760CCA) × 2 pcs. (12 V) |
| | Dry weight | | 390 kg (860 lbs.) |
| Drive system | Transmission | Type | Hydrostatic |
| | | Speed | 2 speed shifts |
| | Reverser | | Switching the direction of flow delivered from the variable pump |
| | Differential type | Front | N/A |
| | | Rear | N/A |
| | Final drive | Front | Planetary gear |
| | | Rear | Planetary gear |
| Vibration system | Power transmission type | | Hydraulic |
| | Vibrator type | | Double eccentric shafts |
| Brake system | Service brake | | Dynamic brake through hydrostatic drive system (F-N-R lever) |
| | Secondary brake (Emergency brake) | | Hydrostatic + Spring applied hydraulically released type (Brake pedal) |
| | Parking brake | | Spring applied hydraulically released type (Panel button) |
| Steering system | Power transmission type | | Hydraulic |
| | Steering type | | Articulated |
| Drum and tyres | Use | Front | Steel drum / Vibrate and drive / 1pc. |
| | | Rear | Steel drum / Vibrate and drive / 1pc. |
| | Suspension type | Front | Rubber isolation |
| | | Rear | Rubber isolation |
| Sprinkler system | Water spray type | | Pressurized |
| | Liquid spray type | | N/A |

# 1-2. SW990-1

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| | | | |
|---|---|---|---|
| Model & Type | Model | | SAKAI SW990-1 with ROPS |
| | Type | | VIBRATORY TANDEM ROLLER |
| Weight | Operating weight | without ballast | 13,250 kg ( 29,210 lbs. ) |
| | | with ballast | N/A kg ( N/A lbs. ) |
| | Maximum weight | | 13,980 kg ( 30,820 lbs. ) |
| | Shippng weight | with ROPS | 12,480 kg ( 27,515 lbs. ) |
| | | without ROPS | 11,930 kg ( 26,300 lbs. ) |
| | Load on front axle | | 6,520 kg ( 14,375 lbs. ) |
| | Load on rear axle | | 6,730 kg ( 14,835 lbs. ) |
| Dimensions | Overall length | | 5,940 mm ( 234 in. ) |
| | Overall width | | 2,325 mm ( 92 in. ) |
| | Overall height | with ROPS | 3,250 mm ( 128 in. ) |
| | | without ROPS | 2,375 mm ( 94 in. ) |
| | Wheelbase | | 3,540 mm ( 139 in. ) |
| | Compaction width | | 2,130 mm ( 84 in. ) |
| | Front drum | width × dia. | 2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.) |
| | Rear drum | width × dia. | 2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.) |
| | Minimum height above ground | | 335 mm ( 13.1 in. ) |
| | Kerb clearance | Left | 750 mm ( 29.6 in. ) |
| | | Right | 750 mm ( 29.6 in. ) |
| | Side clearance | Left | 97 mm ( 3.9 in. ) |
| | | Right | 97 mm ( 3.9 in. ) |
| | Leveling blade width | | N/A mm ( N/A in. ) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Performance | Vibrator system | Front | Centrifugal force | Low amplitude | 4,000 vpm | 173 kN ( 38,890 lbs. ) |
| | | | | | 3,000 vpm | 98 kN ( 22,030 lbs. ) |
| | | | | | 2,500 vpm | 68 kN ( 15,285 lbs. ) |
| | | | | High amplitude | 3,000 vpm | 185 kN ( 41,590 lbs. ) |
| | | | | | 2,500 vpm | 128 kN ( 28,775 lbs. ) |
| | | | Frequency | Low amplitude | | 66.7 Hz ( 4,000 vpm ) |
| | | | | | | 50.0 Hz ( 3,000 vpm ) |
| | | | | | | 41.7 Hz ( 2,500 vpm ) |
| | | | | High amplitude | | 50.0 Hz ( 3,000 vpm ) |
| | | | | | | 41.7 Hz ( 2,500 vpm ) |
| | | | Amplitude | Low amplitude | | 0.34 mm ( 0.013 in. ) |
| | | | | High amplitude | | 0.65 mm ( 0.026 in. ) |
| | | Rear | Centrifugal force | Low amplitude | 4,000 vpm | 173 kN ( 38,890 lbs. ) |
| | | | | | 3,000 vpm | 98 kN ( 22,030 lbs. ) |
| | | | | | 2,500 vpm | 68 kN ( 15,285 lbs. ) |
| | | | | High amplitude | 3,000 vpm | 185 kN ( 41,590 lbs. ) |
| | | | | | 2,500 vpm | 128 kN ( 28,775 lbs. ) |
| | | | Frequency | Low amplitude | | 66.7 Hz ( 4,000 vpm ) |
| | | | | | | 50.0 Hz ( 3,000 vpm ) |
| | | | | | | 41.7 Hz ( 2,500 vpm ) |
| | | | | High amplitude | | 50.0 Hz ( 3,000 vpm ) |
| | | | | | | 41.7 Hz ( 2,500 vpm ) |
| | | | Amplitude | Low amplitude | | 0.34 mm ( 0.013 in. ) |
| | | | | High amplitude | | 0.65 mm ( 0.026 in. ) |
| | Linear pressure | Static linear pressure | Front drum | | | 311 N/cm ( 171 lbs./in. ) |
| | | | Rear drum | | | 310 N/cm ( 177 lbs./in. ) |
| | | Dynamic linear pressure | Front drum | Low amplitude | 4,000 vpm | 1,112 N/cm ( 635 lbs./in. ) |
| | | | | | 3,000 vpm | 760 N/cm ( 434 lbs./in. ) |
| | | | | | 2,500 vpm | 619 N/cm ( 354 lbs./in. ) |
| | | | | High amplitude | 3,000 vpm | 1,169 N/cm ( 667 lbs./in. ) |
| | | | | | 2,500 vpm | 901 N/cm ( 515 lbs./in. ) |
| | | | Rear drum | Low amplitude | 4,000 vpm | 1,122 N/cm ( 641 lbs./in. ) |
| | | | | | 3,000 vpm | 770 N/cm ( 440 lbs./in. ) |
| | | | | | 2,500 vpm | 629 N/cm ( 359 lbs./in. ) |
| | | | | High amplitude | 3,000 vpm | 1,178 N/cm ( 673 lbs./in. ) |
| | | | | | 2,500 vpm | 911 N/cm ( 520 lbs./in. ) |
| | Speed | Number of speed shift | | | | 2 speed |
| | | Speed range | | 1st | 4,000 vpm | 0 to 7.2 km/h ( 0 to 4.5 mph ) |
| | | | | | 3,000 vpm | 0 to 5.5 km/h ( 0 to 3.4 mph ) |
| | | | | | 2,500 vpm | 0 to 4.5 km/h ( 0 to 2.8 mph ) |
| | | | | 2nd | | 0 to 11.0 km/h ( 0 to 6.8 mph ) |
| | Gradeability *1 | | | without vibration | | 28 % ( 15 ° ) |
| | Turning radius | Machine clearance radius inside | | | | 4.1 m ( 162 in. ) |
| | | Machine clearance radius outside | | | | 6.5 m ( 256 in. ) |
| | | Turning radius inside compacted surface | | | | 4.2 m ( 166 in. ) |
| | | Turning radius outside compacted surface | | | | 6.3 m ( 249 in. ) |
| | Steering / Oscillating angle | | | | | ± 36.7 ° / ± 6.5 ° |

*1: The gradeability is the calculated value. It may vary based on the ground surface conditions.

| | | | |
|---|---|---|---|
| Engine | Name | | CUMMINS QSB4.5 (Diesel, EPA-Interim Tier 4) |
| | Model | | 4-cycle, Water-cooled, 4-cylinder in-line, overhead valve, direct injection type, with turbo charger |
| | Bore × Stroke | | 107 mm × 124 mm (4.213 in. × 4.882 in.) |
| | Displacement | | 4.457 L ( 272.0 cu.in ) |
| | Performance | Rated speed | 2,500 $min^{-1}$ ( 2,500 rpm ) |
| | | Rated output | 122.6 kW ( 164 HP ) |
| | | Max. torque | 632 N·m ( 466 lbf·ft ) at 1,500 $min^{-1}$ |
| | | Fuel consumption rate | 229 g/kW·h ( 0.376 lb/HP·h ) at 2,500 $min^{-1}$ |
| | | Fuel consumption | 34 L/h with full load ( 8.9 gal with full load ) |
| | Fuel system | Fuel | Diesel (ASTM D975-2D) |
| | | Fuel injection pump | Inline injection pump |
| | | Fuel injection time regulator | Full electrical control |
| | Lubrication system | Lubrication type | Full forced pressure feed |
| | | Oil filter type | Full flow plastic fiber element |
| | | Oil cooler type | Intergrated water cooled |
| | Air intake system | Air cleaner type | Dry |
| | Cooling system | Cooling type | Pressurized water forced circulation |
| | | Cooling fan type | Inhale |
| | Electrical system | Alternator | 12 V 130 A |
| | | Starter | 12 V 4.8 kW |
| | | Battery | 12 V (N/Aah, 760CCA) × 2 pcs. (12 V) |
| | Dry weight | | 390 kg (860 lbs.) |
| Drive system | Transmission | Type | Hydrostatic |
| | | Speed | 2 speed shifts |
| | Reverser | | Switching the direction of flow delivered from the variable pump |
| | Differential type | Front | N/A |
| | | Rear | N/A |
| | Final drive | Front | Planetary gear |
| | | Rear | Planetary gear |
| Vibration system | Power transmission type | | Hydraulic |
| | Vibrator type | | Double eccentric shafts |
| Brake system | Service brake | | Dynamic brake through hydrostatic drive system (F-N-R lever) |
| | Secondary brake (Emergency brake) | | Hydrostatic + Spring applied hydraulically released type (Brake pedal) |
| | Parking brake | | Spring applied hydraulically released type (Panel button) |
| Steering system | Power transmission type | | Hydraulic |
| | Steering type | | Articulated |
| Drum and tyres | Use | Front | Steel drum / Vibrate and drive / 1pc. |
| | | Rear | Steel drum / Vibrate and drive / 1pc. |
| | Suspension type | Front | Rubber isolation |
| | | Rear | Rubber isolation |
| Sprinkler system | Water spray type | | Pressurized |
| | Liquid spray type | | N/A |

# 2. TABLE OF STANDARD VALUES

## 2-1. Engine

| Item | | Standard value | | Remarks |
|---|---|---|---|---|
| | | SW880-1 | SW990-1 | |
| Engine model | | CUMMINS QSB4.5 (Diesel, EPA-Interim Tier4) | | |
| Rated output | | 107.6/2,500 kW/min$^{-1}$ ( 144/2,500 HP/rpm ) | 122.0/2,500 kW/min$^{-1}$ ( 164/2,500 HP/rpm ) | |
| Maximum rpm under no load | | 2,500 rpm | | |
| Minimum rpm under no load | | 700 rpm | | |
| Cylinder head tightening torque | 1st | 90 N·m ( 66 lbf·ft ) | | |
| | 2nd | 90 N·m ( 66 lbf·ft ) | | |
| | 3rd | Tighten additional 90° | | |
| Intake manifold tightening torque | | 24 N·m ( 18 lbf·ft ) | | |
| Exhaust manifold tightening torque | | 43 N·m ( 32 lbf·ft ) | | |
| Valve clearance (intake) | | 0.254 mm ( 0.01 in. ) | | |
| Valve clearance (exhaust) | | 0.508 mm ( 0.02 in. ) | | |
| Crankcase blowby | | 101.6 mm of $H_2O$ ( 4.0 in. of $H_2O$ )<br>58 L/min ( 2.048 cfm ) | | Use mano meter |

## 2-2. Propulsion

| Item | | | Standard value | Remarks |
|---|---|---|---|---|
| Travel speed (Forward/reverse) | 1st | 4,000 vpm | 0 to 7.2 km/h ( 0 to 4.5 mph ) | |
| | | 3,000 vpm | 0 to 5.5 km/h ( 0 to 3.4 mph ) | |
| | | 2,500 vpm | 0 to 4.5 km/h ( 0 to 2.8 mph ) | |
| | 2nd | | 0 to 11 km/h ( 0 to 6.8 mph ) | |

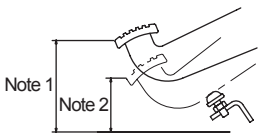
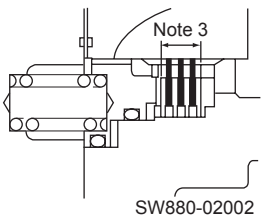
## 2-3. Hydraulic System

| Item | | | Standard value | Remarks |
|---|---|---|---|---|
| Propulsion | High pressure relief valve setting | | 40.2 ± 1.0 MPa ( 5,829 ± 145 psi ) | Differential pressure |
| | Cut off valve pressure setting | | 37.3 ± 1.0 MPa ( 5,409 ± 145 psi ) | Differential pressure |
| | Charge relief valve setting | | 2.5 ± 0.2 MPa ( 362 ± 29 psi ) | at 2,600 min$^{-1}$ |
| | Front motor flushing valve pressure setting | | 2.5 MPa ( 362 psi ) | |
| | Case pressure | Pump | 0.4 MPa ( 58 psi ) or less | |
| | | Front motor | 0.3 MPa ( 43.5 psi ) or less | |
| | | Rear motor | 0.3 MPa ( 43.5 psi ) or less | |
| | Brake release pressure | Gear box | — | |
| | | Rear motor | 1.5 MPa ( 218 psi ) or more | |
| | | Rear axle | — | |
| | Motor drainage | Front motor | 10.7 L/min ( 2.8 gal./min ) | |
| | | Rear motor | 10.7 L/min ( 2.8 gal./min ) | |
| Vibration | High pressure relief valve setting | | 81.5 ± 1.0 MPa ( 4,567 ± 145 psi ) | Differential pressure |
| | Charge relief valve setting | | 2.5 ± 0.2 MPa ( 362 ± 29 psi ) | at 2,600 min$^{-1}$ |
| | Case pressure | Pump | 0.4 MPa ( 58 psi ) or less | |
| | | Motor | 0.15 MPa ( 21.6 psi ) or less | |
| | Motor drainage | | 6.4 L/min ( 1.7 gal./min ) | |
| Steering oil pressure | | | 17.5 ± 1.0 MPa ( 2,538 ± 145 psi ) | (orbitroll relief pressure + charge relief pressure) |

## 2-4. Steering

| Item | Standard value | Remarks |
|---|---|---|
| Play in steering wheel | 5 to 10 mm ( 0.2 to 0.4 in. ) | Steering wheel circumference |
| | 0.5 mm ( 0.02 in. ) or less | Steering column shaft direction |

## 2-5. Brakes

| Item | Standard value | Remarks |
|---|---|---|
| Clearance between brake pedal and floorboard (as released) | 137 mm (5.4 in.)<br>Note 1: See dimensions |  <br>SW880-02001 |
| Clearance between brake pedal and floorboard (when pressed down) | 82 mm (3.2 in.)<br>Note 2: See dimensions | |
| Propulsion motor inner brake wear limit<br>Thickness of disc assembly (7 discs) | 18.5 to 19.1 mm (0.73 to 0.75 in.)<br>Note 3: See dimensions<br>Allowable when thickness is within this range.<br>Replace all 7 discs when thickness becomes 18.5 or less. |  <br>SW880-02002 |

## 2-6. Capacities

| Item | Standard value | Remarks |
|---|---|---|
| Engine oil pan | 12.0 L ( 3.2 gal. ) | |
| Fuel tank | 292 L ( 77.1 gal. ) | |
| Coolant | 21 L ( 5.5 gal. ) | |
| Gear box | 3.6 L ×2 ( 0.95 gal. ×2 ) | |
| Hydraulic oil tank | 61 L ( 16.1 gal. ) | |
| Vibrator case | 22 L ×2 ( 5.8 gal. ×2 ) | |
| Water spray tank | 600 L ×2 ( 158.5 gal. ×2 ) | |

# 3. FUEL AND LUBRICANTS SPECIFICATION

## 3-1. Rating

| Lubricant | Service classification | Ambient temp. and applicable viscosity rating | | | Applicable Standards |
|---|---|---|---|---|---|
| | | -15 to 30°C (5 to 86°F) Cold | 0 to 40°C (32 to 104°F) Moderate | 15 to 55°C (59 to 131°F) Tropical | |
| Engine oil | API grade CJ-4 | SAE15W-40 | SAE15W-40 | SAE15W-40 | MIL-L-2104B |
| Gear oil | API grade GL5 | SAE80W-90 | SAE90 | SAE140 | MIL-L-2105 |
| Hydraulic oil | Anti wear | ISO-VG32 Over VI 140 | ISO-VG46 Over VI 140 | ISO-VG68 Over VI 110 | ISO-3448 |
| Grease | Lithium type extreme pressure | | | | NLGI-2 |
| Fuel | Diesel oil | | | | ASTM D975-2D |

## 3-2. Recommended Lubricants

| Lubricant / Oil company | Engine oil API-CJ4 | Gear oil API GL 5 | Hydraulic oil ISO-VG 46 | Grease (NLGI-2) |
|---|---|---|---|---|
| CHEVRON | DELO 400 LE | RPM Universal Gear Lubricants | Rando HDZ 46 | Multifak EP 2 |
| BP | — | BP Energear HYPO-U | Bartran HV 46 | BP Energrease LS-EP 2 |
| CASTROL | Tection Extra | EXP Gear OILS | Castrol Hyspin AWH 46 | Castrol Spheerol ELP 2 |
| EXXON MOBIL | Mobil Delvac 1 ESP | Mobilube HD | Mobil DTE 10 Excel 46 | Mobilux EP 2 |
| SHELL | Shell Rimula R4 L | Shell Spirax S2 A 90 | Shell Tellus S2V 46 | Shell Alvania Greases EP 2 |

# 4. TIGHTENING TORQUE CHART

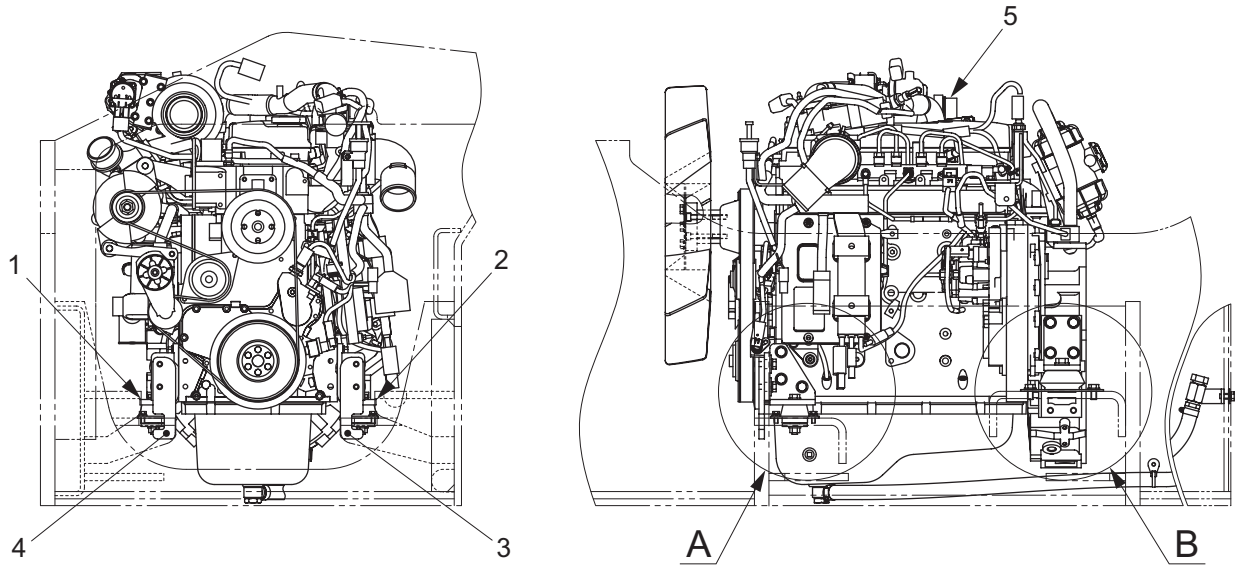
| N·m | (lbf·ft) |
|---|---|

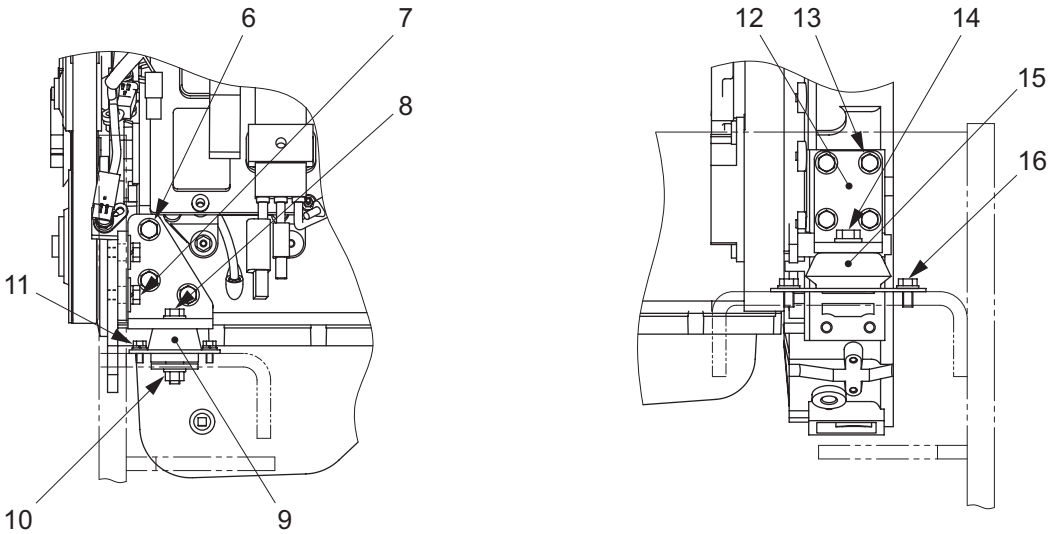
| | Nominal Dia. | Pitch | Strength Classification | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 6.8 | | 8.8 | | 10.9 | | 12.9 | |
| Metric coarse screw | 5 | 0.8 | 4.9 | (3.6) | 5.9 | (4.4) | 7.8 | (5.8) | 7.8 | (5.8) |
| | 6 | 1.0 | 7.8 | (5.8) | 9.8 | (7.2) | 13 | (9.6) | 13 | (9.6) |
| | 8 | 1.25 | 17 | (13) | 23 | (17) | 31 | (23) | 31 | (23) |
| | 10 | 1.5 | 39 | (29) | 49 | (36) | 59 | (44) | 59 | (44) |
| | 12 | 1.75 | 69 | (51) | 78 | (58) | 108 | (80) | 108 | (80) |
| | 14 | 2.0 | 98 | (72) | 127 | (94) | 167 | (123) | 167 | (123) |
| | 16 | 2.0 | 157 | (116) | 196 | (145) | 265 | (195) | 265 | (195) |
| | 18 | 2.5 | 196 | (145) | 245 | (181) | 343 | (253) | 343 | (253) |
| | 20 | 2.5 | 294 | (217) | 392 | (289) | 539 | (398) | 539 | (398) |
| | 22 | 2.5 | 441 | (325) | 539 | (398) | 686 | (506) | 686 | (506) |
| | 24 | 3.0 | 539 | (398) | 637 | (470) | 883 | (651) | 883 | (651) |
| | 27 | 3.0 | 785 | (579) | 981 | (724) | 1324 | (977) | 1324 | (977) |
| | 30 | 3.5 | 1079 | (796) | 1324 | (977) | 1765 | (1302) | 1765 | (1302) |
| Metric fine screw | 10 | 1.25 | 39 | (29) | 49 | (36) | 69 | (51) | 69 | (51) |
| | 12 | 1.25 | 69 | (51) | 88 | (65) | 118 | (87) | 118 | (87) |
| | 14 | 1.5 | 108 | (80) | 137 | (101) | 186 | (137) | 186 | (137) |
| | 16 | 1.5 | 167 | (123) | 206 | (152) | 284 | (209) | 284 | (209) |
| | 18 | 1.5 | 245 | (181) | 294 | (217) | 392 | (289) | 392 | (289) |
| | 20 | 1.5 | 343 | (253) | 441 | (325) | 588 | (434) | 588 | (434) |
| | 22 | 1.5 | 490 | (361) | 588 | (434) | 785 | (579) | 785 | (579) |
| | 24 | 2.0 | 588 | (434) | 735 | (542) | 981 | (724) | 981 | (724) |
| | 27 | 2.0 | 834 | (615) | 1030 | (760) | 1422 | (1049) | 1422 | (1049) |
| | 30 | 2.0 | 1177 | (868) | 1422 | (1049) | 1961 | (1446) | 1961 | (1446) |

# ENGINE AND CONTROLS

# 1. ENGINE

## 1-1. Engine Mount




DETAIL A

DETAIL B

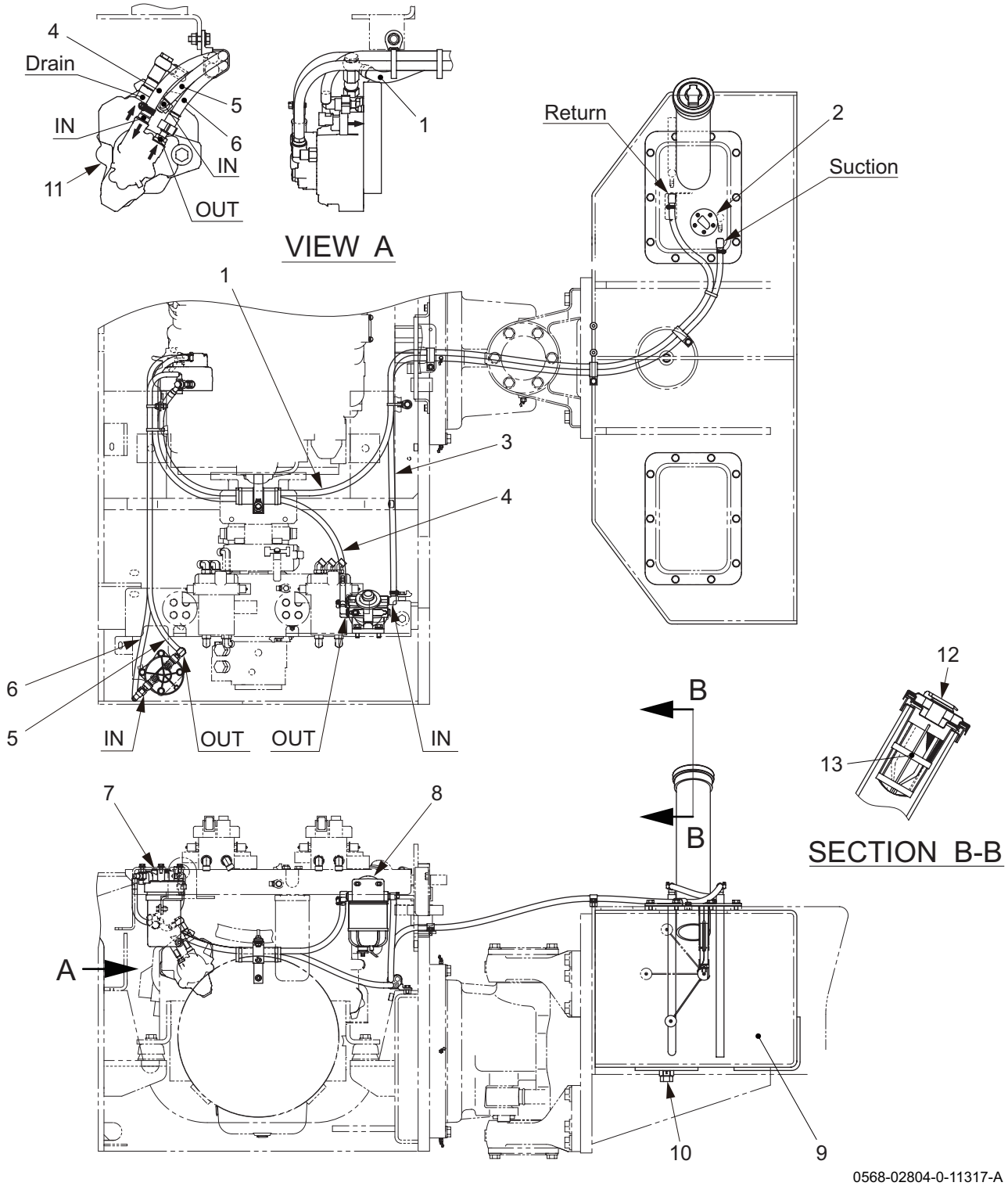
0568-01803-0-11414-A

(1) Bracket
(2) Bracket
(3) Base
(4) Base
(5) Engine
(6) Bolt : M12×35
(7) Bolt : M12×30
(8) Bolt : M12×80
(9) Damper
(10) Nut : M12
(11) Bolt : M 8×20
(12) Bracket
(13) Bolt : M12×35
(14) Bolt : M16×50
(15) Damper
(16) Bolt : M12×25

N•m

(6) Bolt M12×35 : 108 N·m ( 80 lbf·ft )
(7) Bolt M10×30 : 78 N·m ( 58 lbf·ft )
(8) Bolt M12×80 : 108 N·m ( 80 lbf·ft )
(11) Bolt M 8×20 : 31 N·m ( 23 lbf·ft )
(13) Bolt M12×35 : 108 N·m ( 80 lbf·ft )
(14) Bolt M16×50 : 265 N·m ( 195 lbf·ft )
(16) Bolt M12×25 : 108 N·m ( 80 lbf·ft )

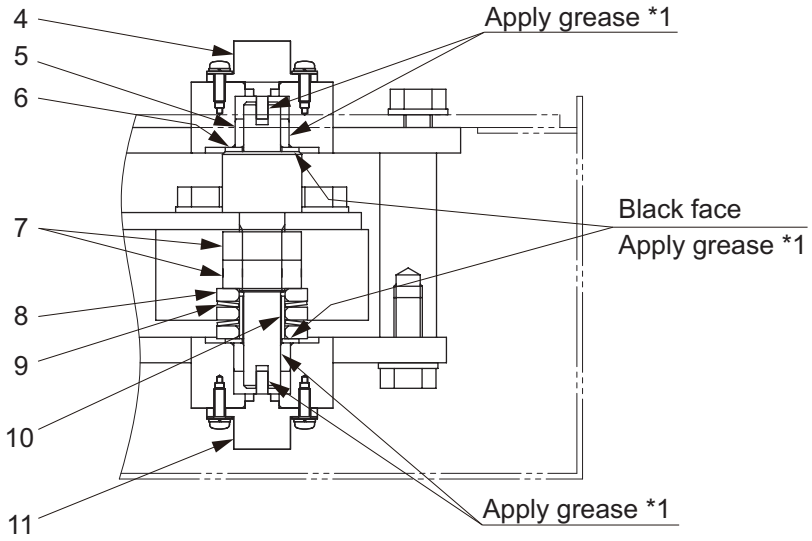
# 2. FUEL SYSTEM



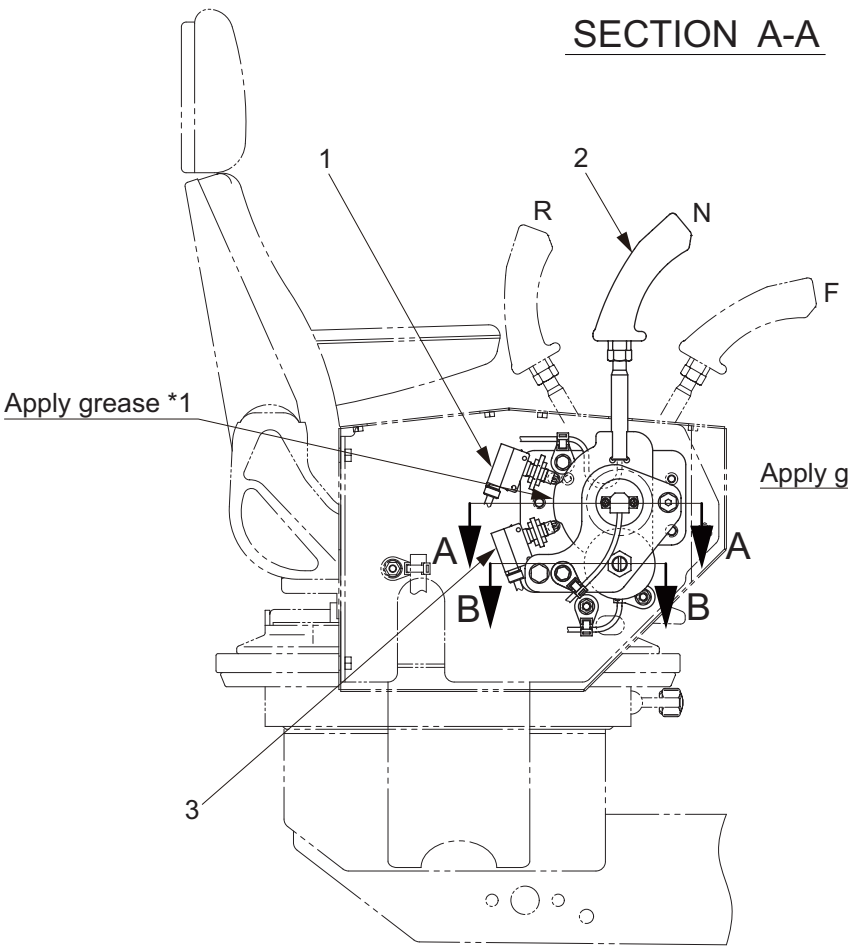

(1) Hose (Fuel gear pump drain → Fuel tank return)
(2) Fuel unit
(3) Hose (Fuel tank suction → Fuel pre-filter IN)
(4) Hose (Fuel pre-filter OUT → Fuel gear pump IN)
(5) Hose (Fuel filter OUT → Fuel gear pump IN)
(6) Hose (Fuel gear pump OUT → Fuel filter IN)
(7) Fuel filter
(8) Fuel pre-filter
(9) Fuel tank
(10) Plug
(11) Fuel gear pump
(12) Cap
(13) Filter

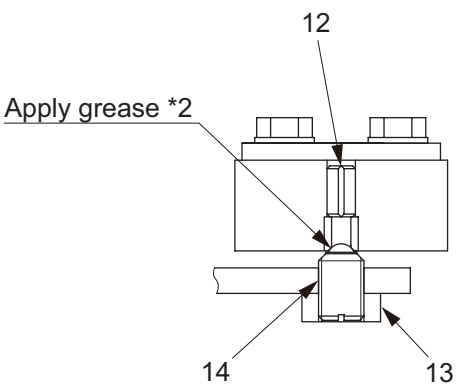
# 3. CONTROL SYSTEM

## 3-1. Forward-reverse Control




SECTION A-A




SECTION B-B

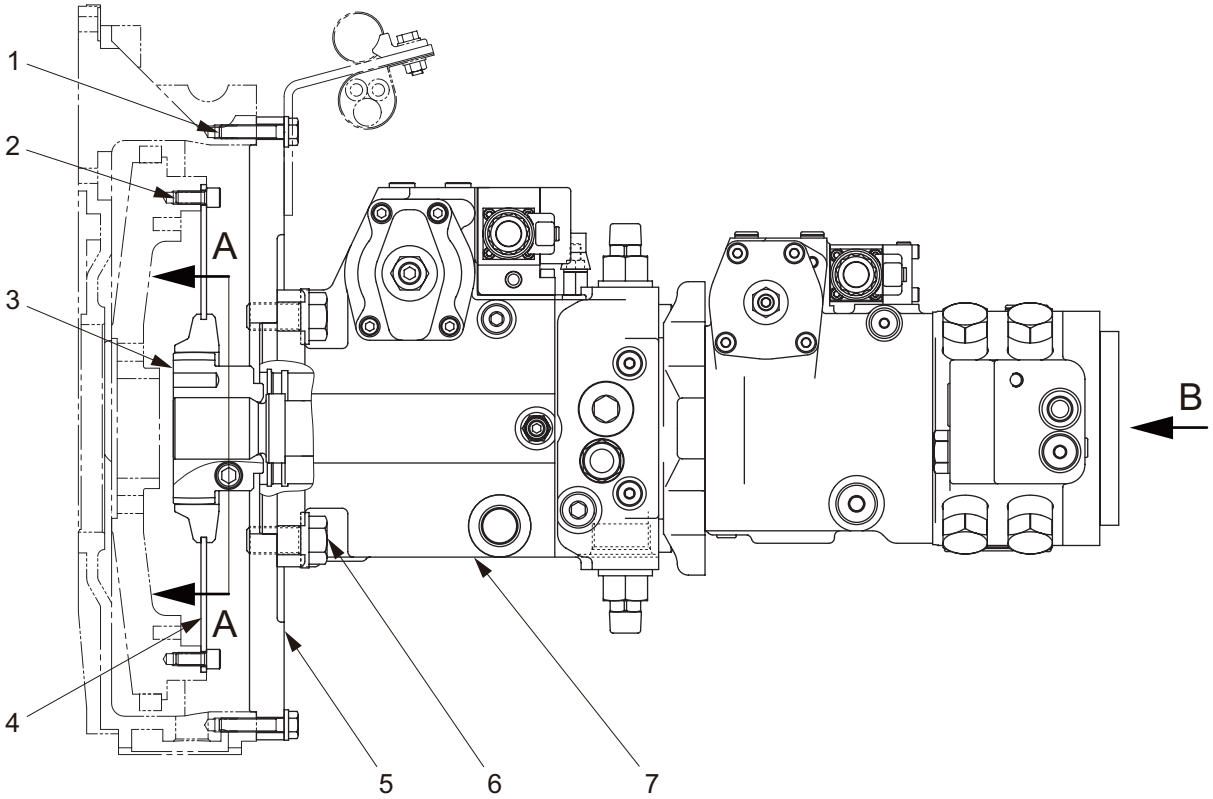
0568-12805-0-11265-A

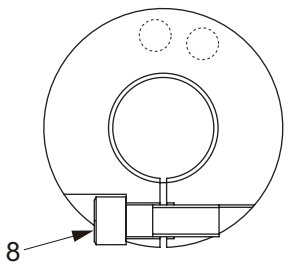
(1) F-R lever switch
(2) F-R lever
(3) Backup buzzer switch
(4) F-R lever potentiometer 2
(5) Bush
(6) Washer
(7) Nut
(8) Washer
(9) Disc spring
(10) Collar
(Do not apply grease)
(11) F-R lever potentiometer 1
(12) Spring pin
(13) Nut : M16
(14) Screw

*1: Lithium-based grease
*2: Molybdenum-based grease

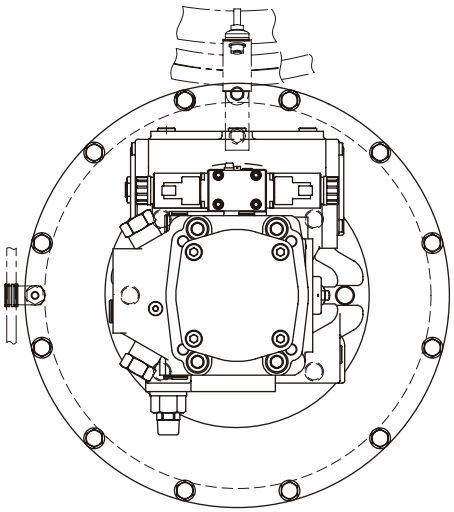
# 4. PUMP MOUNT

## 4-1. Pump Mount




SECTION A-A



VIEW B

0568-36808-0-11256-0

(1) Bolt : M10×50
(2) Bolt : 3/8-16UNC×22
(3) Hub
(4) Flange
(5) Housing : M12×80
(6) Bolt : M20×45
(7) Pump
(8) Bolt : M12×35

N•m

(1) Bolt M10×50 : 60 N·m ( 44 lbf·ft )
(2) Bolt 3/8-16UNC×22 : 69 N·m ( 51 lbf·ft )
(6) Bolt M20×45 : 539 N·m ( 398 lbf·ft )
(8) Bolt M12×35 : 86 N·m ( 63 lbf·ft )

## 4-1-1. Installation of pump

- When the pump has been removed from the engine for repair or replacement, reinstall it in accordance with the following procedure.

① Apply adequate amount of lithium-based grease to pump (7) and hub (3) splines.
② Attach hub (3) to pump (7) aligning it with end surface of shaft.

③ Secure hub (3) with bolt (8).

(8) Bolt M12×35 : 86 N·m (63 lbf·ft)

④ Secure flange (4) to engine flywheel with eight bolts (2).

(2) Bolt 3/8-16UNC×22 : 69 N·m (51 lbf·ft)

⑤ Position housing (5) as shown in the figure, and secure to engine flywheel housing with twelve bolts (1) and washers.

(1) Bolt M10×50 : 60 N·m (44 lbf·ft)

⑥ Engage hub (3) with flange (4).
⑦ Secure pump (7) to housing (5) with four bolts (6) and washers.

(6) Bolt M20×45 : 539 N·m (398 lbf·ft)

**(NOTICE)**

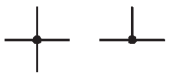
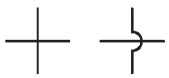
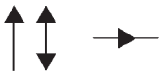
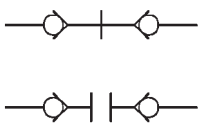
- **Bolt (2) is treated with thread-locking fluid. Use new thread-locking fluid treated bolt for installation.**

# HYDRAULIC SYSTEMS

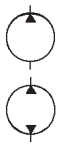
# 1. SYSTEM CIRCUIT DIAGRAM

## 1-1. Graphic Symbols for Hydraulic Circuits

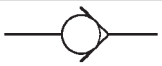
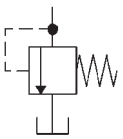
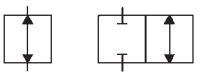
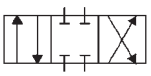
### Basic Symbols

| DESCRIPTION | SYMBOL |
|---|---|
| Lines: | |
| Main working |  |
| Pilot control |  |
| Drain or bleed |  |
| Lines, joining |  |
| Not connected |  |
| Component outline |  |
| Arrow indicates direction of flow. |  |
| Line with fixed restriction (orifice). |  |
| Test port, pressure measurement. |  |
| Temperature measurement gauge |  |
| Pressure measurement gauge |  |
| Reservoir (vented) |  |
| Filter or strainer |  |
| Heat exchanger, lines indicate flow of coolant. |  |
| Quick disconnect:<br>Connected with mechanically opened checks.<br>Disconnected. |  |
| Sloping arrow through a symbol at 45° indicates that a component can be adjusted or varied. |  |

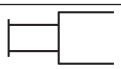
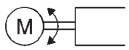
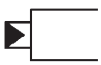
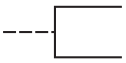
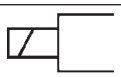
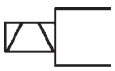
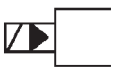
### Pump, Motors and Cylinders

| DESCRIPTION | SYMBOL |
|---|---|
| Hydraulic pumps:<br>Fixed displacement<br>Unidirectional<br>Bidirectional<br>Variable displacement<br>Unidirectional<br>Bidirectional<br>Variable displacement pressure compensated Unidirectional |      |
| Hydraulic Motor:<br>Unidirectional<br>Bidirectional |   |
| Double acting hydraulic cylinder<br>Differential cylinder |   |
| Electric motor |  |

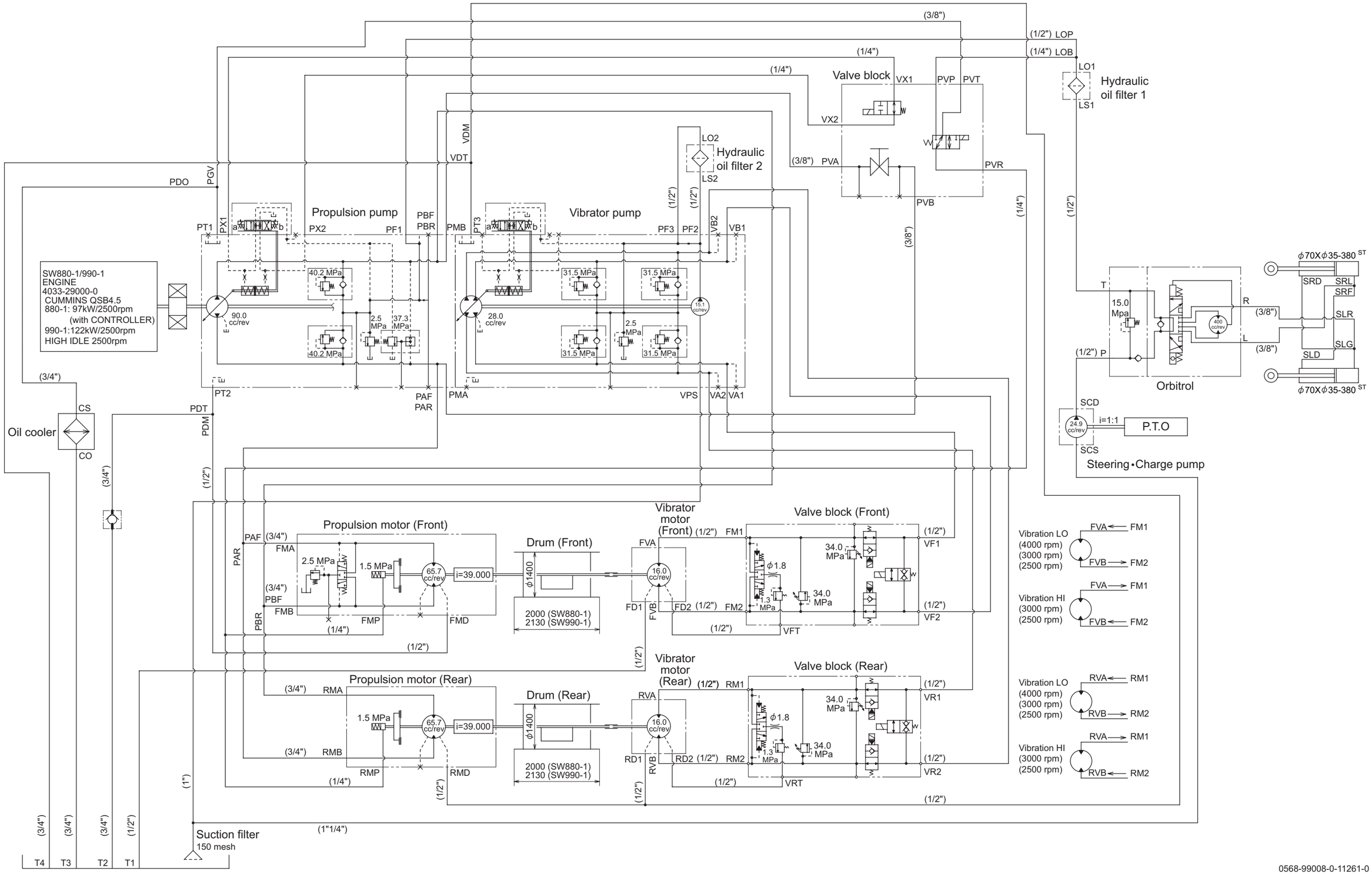
## Valves

| DESCRIPTION | SYMBOL |
|---|---|
| Check valve |  |
| Manual shut off (On-Off) |  |
| Pressure relief |  |
| Flow control, adjustable |  |
| Valve symbols:<br>The basic valve symbol one or more squares with lines representing flow paths and flow conditions between ports. |  |
| Multiple squares indicate a valve with as many distinct positions there are squares providing various flow path options for the fluid.<br>The multiple square moves to represent how flow paths change when the valving element is shifted within the component. |  |
| Valves with infinite positioning between certain limits are symbolized with lines parallel to the squares. |  |

## Methods of Operation

| DESCRIPTION | SYMBOL |
|---|---|
| Spring |  |
| Manual |  |
| Pressure compensated |  |
| Reversing motor |  |
| Pilot pressure:<br>Internal supply |  |
| Remote supply |  |
| Solenoid:<br>Single winding |  |
| Two windings operating in opposite directions. |  |
| Pilot directional valve is actuated by the solenoid. |  |

## 1-2. Hydraulic Circuit Diagram

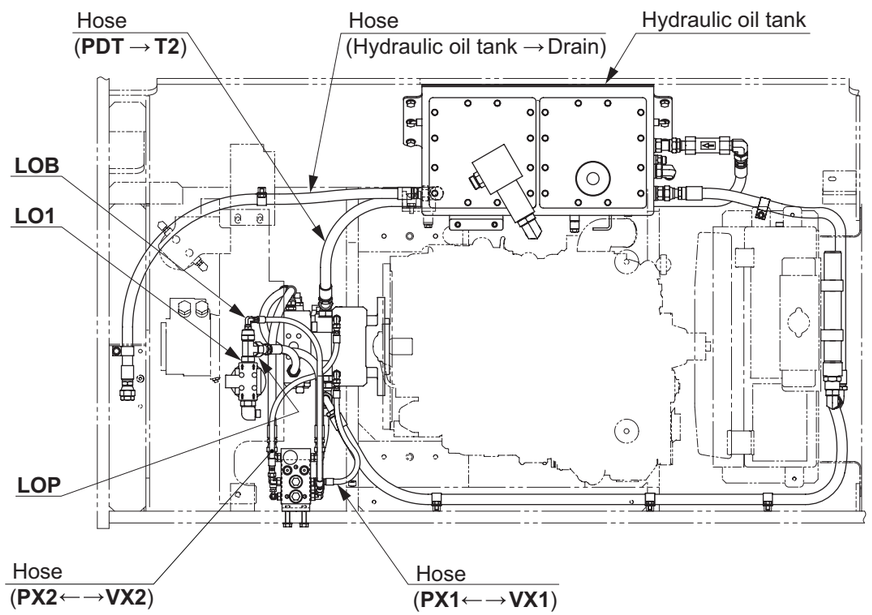


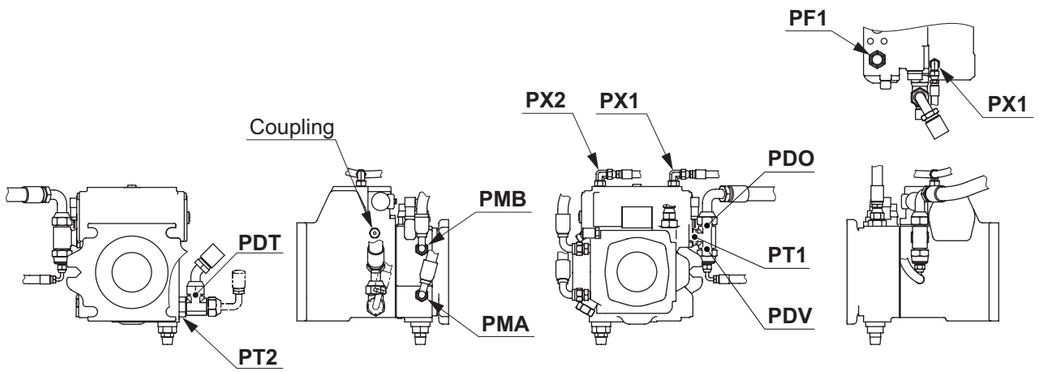

0568-99008-0-11261-0

# 2. PROPULSION HYDRAULIC SYSTEM

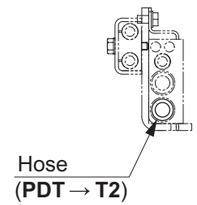
## 2-1. Propulsion Hydraulic Piping

### 2-1-1. Propulsion hydraulic piping (1)

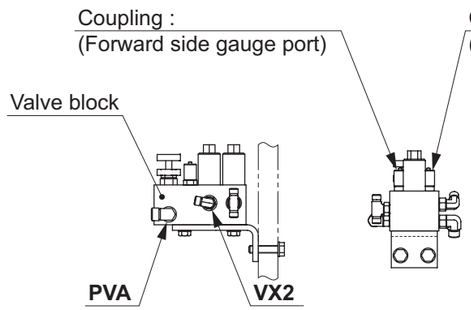


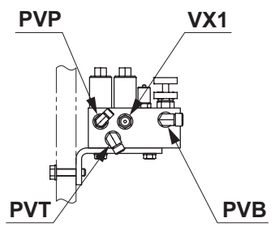



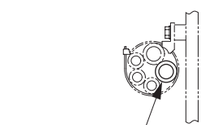

VIEW A




SECTION B-B

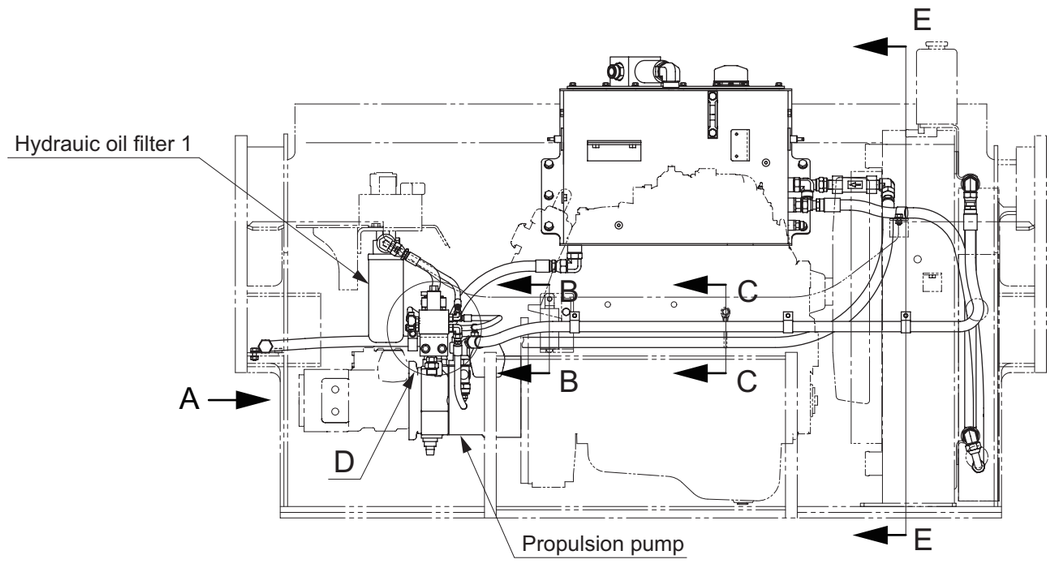


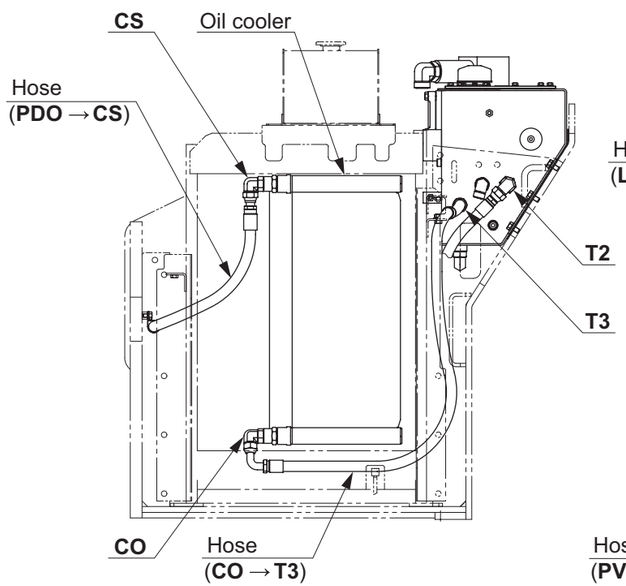



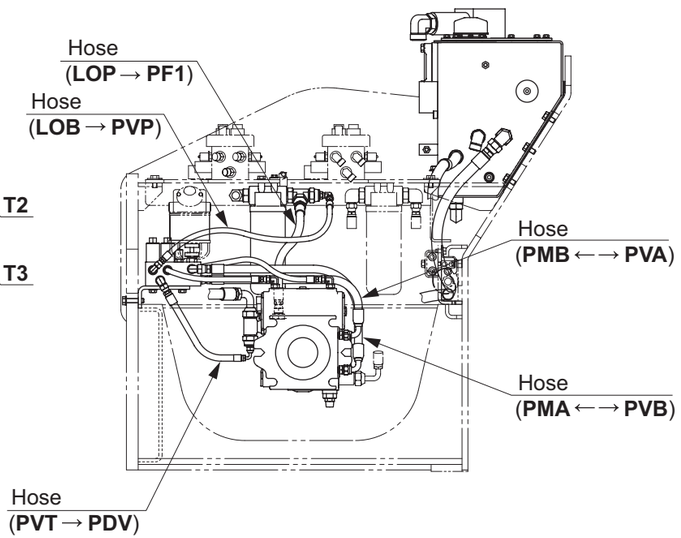




DETAIL D

SECTION C-C



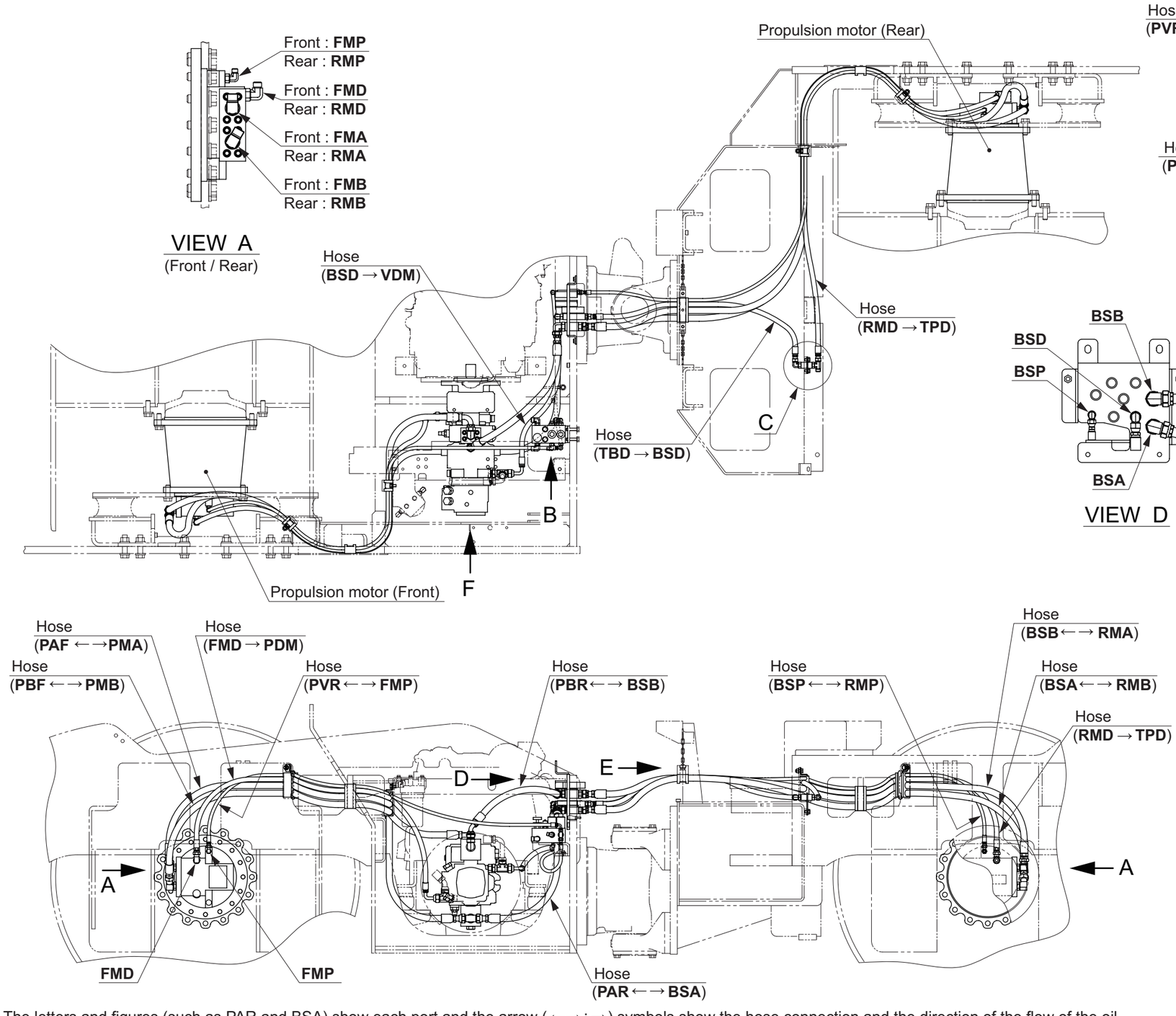




SECTION E-E

• The letters and figures (such as PVT and PDV) show each port and the arrow (←→; →) symbols show the hose connection and the direction of the flow of the oil.

## 2-1-2. Propulsion hydraulic piping (2)

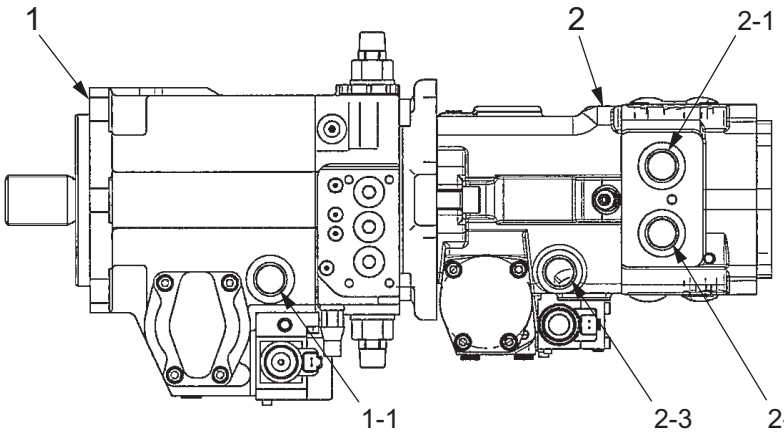


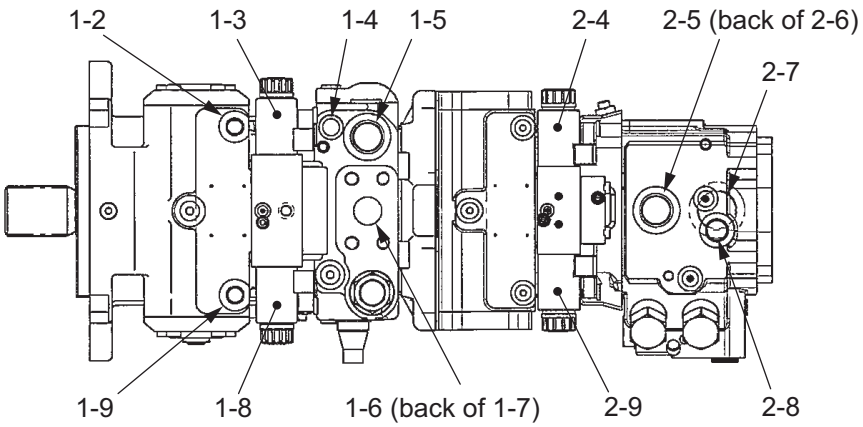

• The letters and figures (such as PAR and BSA) show each port and the arrow (⟷ ; →) symbols show the hose connection and the direction of the flow of the oil.

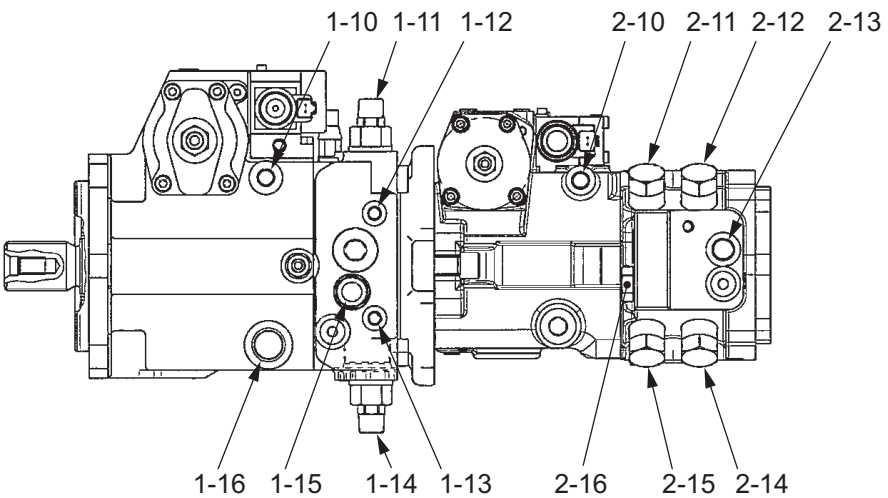
0568-36810-11258-0

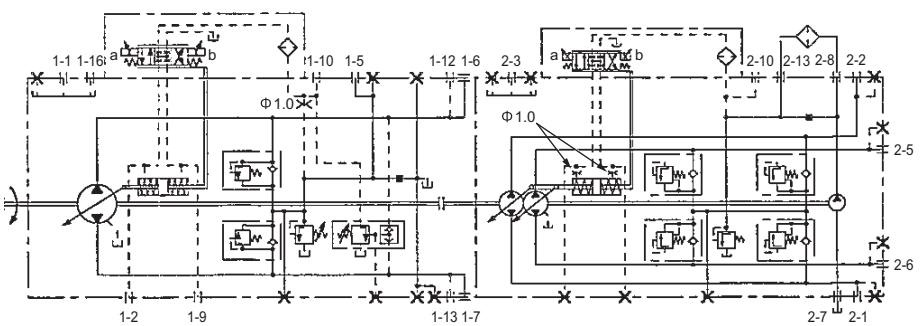
# 2-2. Hydraulic Component Specifications

## 2-2-1. Hydraulic pump assembly (propulsion + vibrator)




Pump circuit diagram

SW880-04001

(1) Propulsion pump

| | | | |
|---|---|---|---|
| (1-1) | Drain port | **[PT1]** | : 1 1/16-12UN |
| (1-2) | Servo pressure gauge port | **[PX1]** | : 9/16-18UNF |
| (1-3) | Propulsion pump proportional solenoid valve a (Reverse) | | |
| (1-4) | Cut off valve | | |
| (1-5) | Charge supply port | **[PF1]** | : 1 1/16-12UN |
| (1-6) | Port B (Forward) | **[PBF, PBR]** | : SAE 1” |
| (1-7) | Port A (Reverse) | **[PAF, PAR]** | : SAE 1” |
| (1-8) | Propulsion pump proportional solenoid valve b (Forward) | | |
| (1-9) | Servo pressure gauge port | **[PX2]** | : 9/16-18UNF |
| (1-10) | Control pressure port | | : 9/16-18UNF |
| (1-11) | High pressure relief valve (For Port B) | | |
| (1-12) | High pressure gauge port (For Port B) | **[PMB]** | : 7/16-20UNF |
| (1-13) | High pressure gauge port (For Port A) | **[PMA]** | : 7/16-20UNF |
| (1-14) | High pressure relief valve (For Port A) | | |
| (1-15) | Charge relief valve | | |
| (1-16) | Drain port | **[PT2]** | : 1 1/16-12UN |

Specifications

- Displacement : 90 $cm^3$/rev ( 5.49 cu.in./rev )
- High pressure relief valve pressure setting : 40.2 MPa ( 5,829 psi )
- Charge relief valve pressure setting : 2.5 MPa ( 363 psi ) (at 2,600 $min^{-1}$)
- Cut off valve pressure setting : 37.3 MPa ( 5,409 psi )

(2) Vibrator pump

| | | | |
|---|---|---|---|
| (2-1) | Port A2 (Rear low amplitude) | **[VA2]** | : 1 1/16-12UN |
| (2-2) | Port B2 (Rear high amplitude) | **[VB2]** | : 1 1/16-12UN |
| (2-3) | Drain port | **[PT3]** | : 1 1/16-12UN |
| (2-4) | Vibrator pump proportional solenoid valve a (High amplitude) | | |
| (2-5) | Port B1 (Front high amplitude) | **[VB1]** | : 1 1/16-12UN |
| (2-6) | Port A1 (Front low amplitude) | **[VA1]** | : 1 1/16-12UN |
| (2-7) | Charge pump suction port | **[VPS]** | : 1 5/16-12UN |
| (2-8) | Filter port (From filter) | **[PF2]** | : 3/4-16UNF |
| (2-9) | Vibrator pump proportional solenoid valve b (Low amplitude) | | |
| (2-10) | Control pressure gauge port | | : 9/16-18UNF |
| (2-11) | High pressure relief valve (For Port B1) | | |
| (2-12) | High pressure relief valve (For Port B2) | | |
| (2-13) | Filter port (To filter) | **[PF3]** | : 3/4-16UNF |
| (2-14) | High pressure relief valve (For Port A2) | | |
| (2-15) | High pressure relief valve (For Port A1) | | |
| (2-16) | Charge relief valve | | |

Specifications

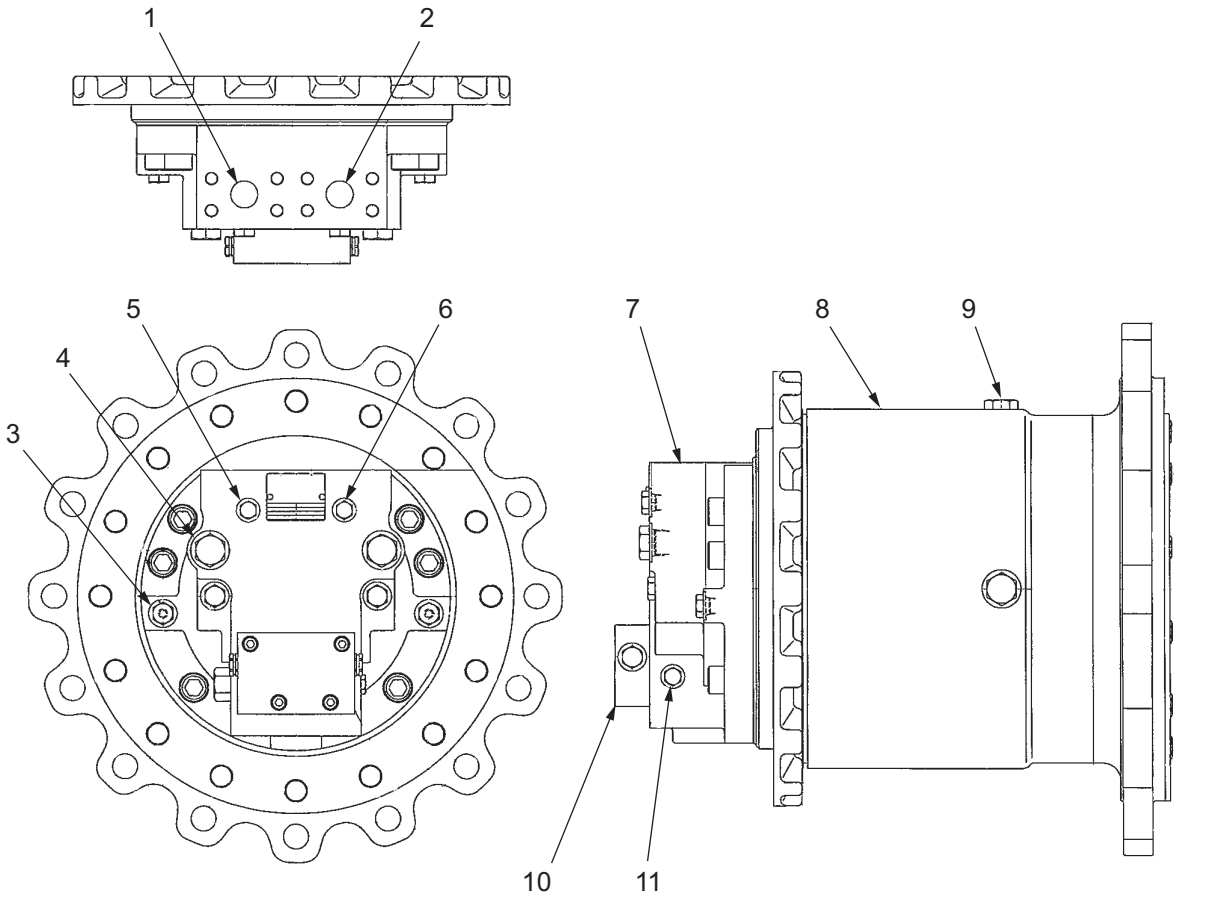
- Displacement : 56 $cm^3$/rev ( 3.42 cu.in./rev )
- High pressure relief valve pressure setting : 31.5 MPa ( 4,568 psi )
- Charge relief pressure setting : 2.5 MPa ( 363 psi ) (at 2,600 $min^{-1}$)

Charge pump (For vibration)

- Displacement : 15.1 $cm^3$/rev ( 0.92 cu.in./rev )

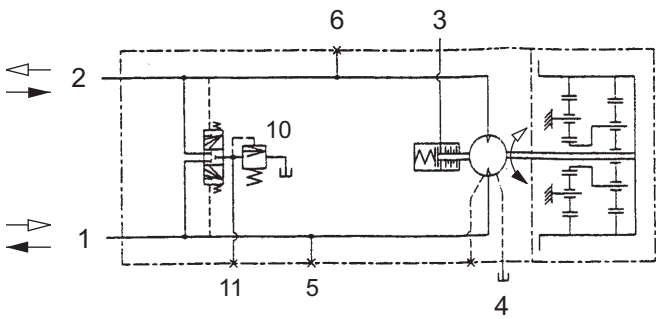
- Allowable pump case pressure : 0.4 MPa ( 58 psi ) or less
- Propulsion and vibrator pump assembly weight : 117.5 kg ( 259 lbs. )

## 2-2-2. Propulsion hydraulic motor (front)




SW800-Ⅱ-04005

(1) Port B (Forward) **[FMB]** : SAE 1”
(2) Port A (Reverse) **[FMA]** : SAE 1”
(3) Parking brake pilot port **[FMP]** : 9/16-18UNF
(4) Drain port **[FMD]** : 7/8-14UNF
(5) High pressure gauge port (For Port B) : 9/16-18UNF
(6) High pressure gauge port (For Port A) : 9/16-18UNF
(7) Motor
(8) Reduction gear
(9) Filler cap : 7/8-14UNF
(10) Shuttle valve
(11) Charge pressure gauge port : 7/16-20UNF




Motor circuit diagram

Flow of oil
•1→2 Clockwise rotation
•2→1 Counterclockwise rotation

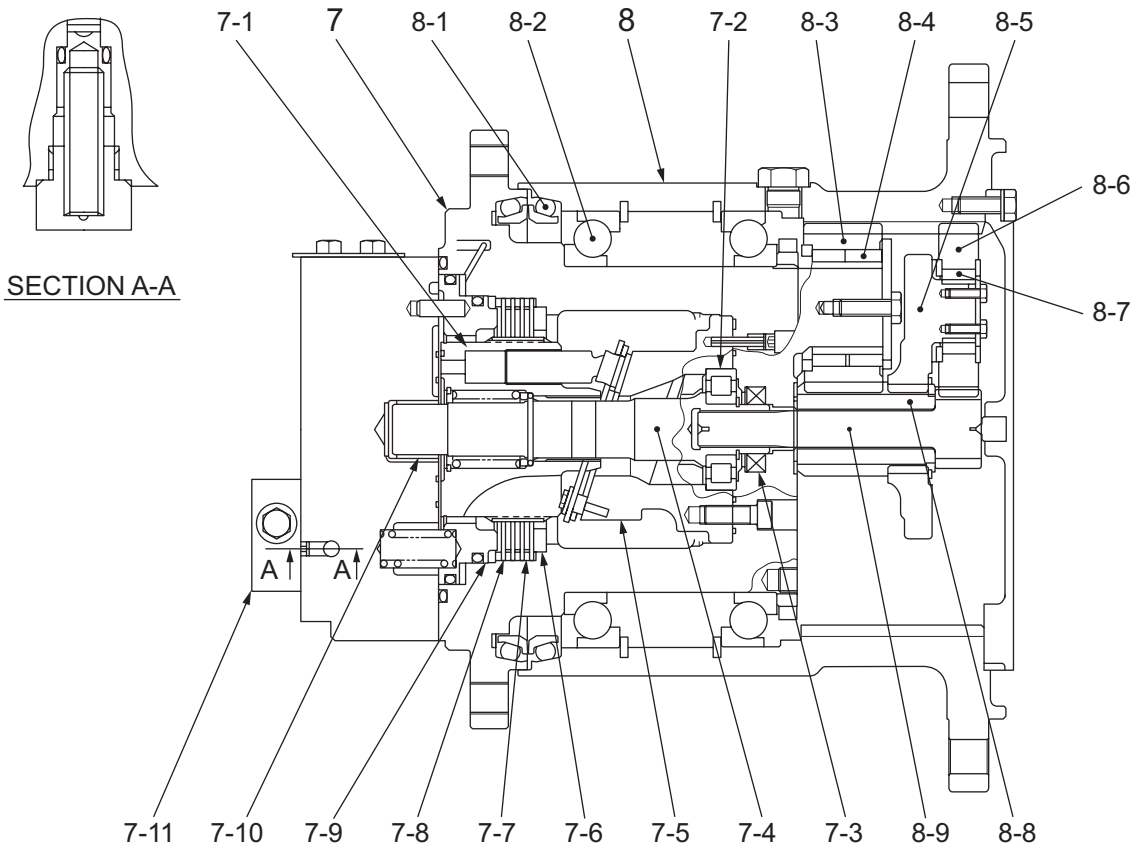
SW880-1-04002

Motor specifications
- Displacement : 65.7 cm$^3$/rev ( 4.0 cu.in./rev )
- Maximum working pressure : 41.8 MPa ( 6,063 psi )
- Brake release pressure : 1.5 MPa ( 218 psi )
- Allowable motor case pressure : 0.3 MPa ( 43.5 psi )

Reduction gear specifications
- Reduction ratio : 1/39.000

- Propulsion hydraulic motor weight : 191 kg ( 421 lbs. )

### 1) Internal structure of propulsion hydraulic motor (front)

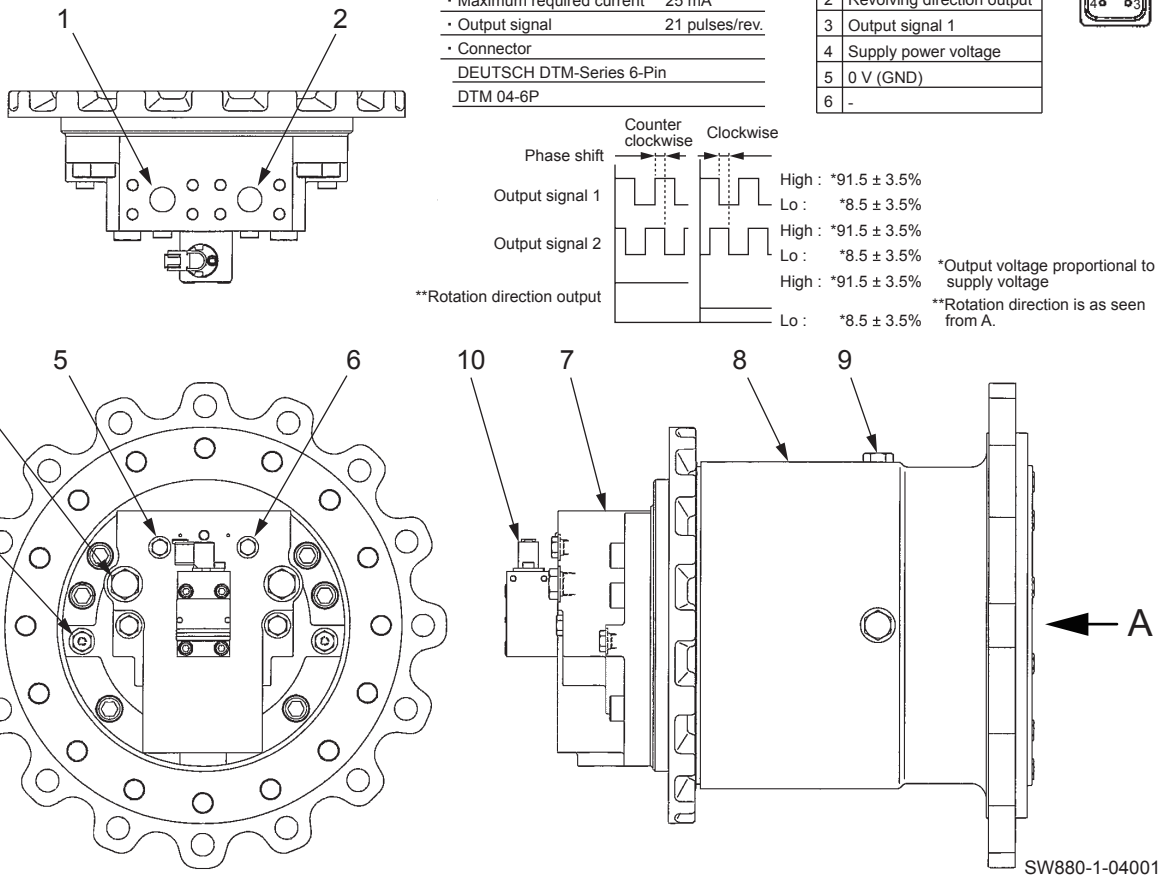



SW800-Ⅱ-04006

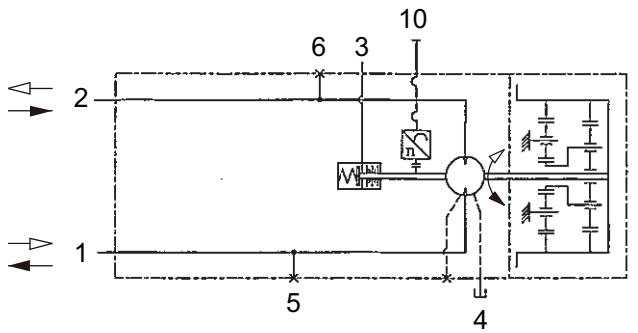
(7) Motor
- (7-1) Cylinder block kit
- (7-2) Bearing
- (7-3) Oil seal
- (7-4) Shaft
- (7-5) Swash plate assembly
- (7-6) Brake stopper
- (7-7) Friction plate
- (7-8) Separate plate
- (7-9) Piston brake
- (7-10) Journal bearing
- (7-11) Speed sensor

(8) Reduction gear
- (8-1) Floating seal kit
- (8-2) Angular bearing
- (8-3) Planetary gear 2nd
- (8-4) Needle roller
- (8-5) Carrier
- (8-6) Planetary gear 1st
- (8-7) Needle roller
- (8-8) Sun gear 2nd
- (8-9) Sun gear 1st

## 2-2-3. Propulsion hydraulic motor (rear)




(1) Port B (Forward) **[RMB]** : SAE 1”
(2) Port A (Reverse) **[RMA]** : SAE 1”
(3) Parking brake pilot port **[RMP]** : 9/16-18UNF
(4) Drain port **[RMD]** : 7/8-14UNF
(5) High pressure gauge port (For Port B) : 9/16-18UNF
(6) High pressure gauge port (For Port A) : 9/16-18UNF
(7) Motor
(8) Reduction gear
(9) Filler cap
(10) Speed sensor : 7/8-14UNF




Motor circuit diagram

Flow of oil
・1→2 Clockwise rotation
・2→1 Counterclockwise rotation

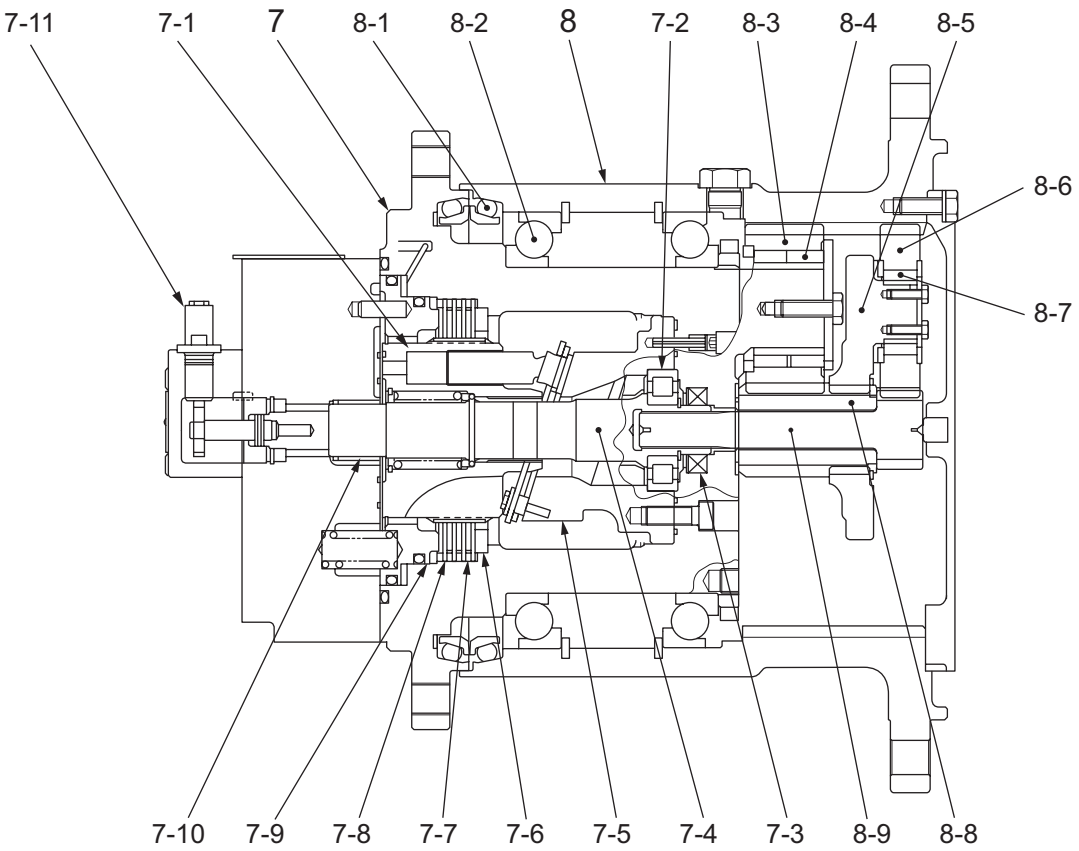
SW880-1-04003

Motor specifications
- Displacement : 65.7 cm$^3$/rev ( 4.0 cu.in./rev )
- Maximum working pressure : 41.8 MPa ( 6,063 psi )
- Brake release pressure : 1.5 MPa ( 218 psi )
- Allowable motor case pressure : 0.3 MPa ( 43.5 psi )

Reduction gear specifications
- Reduction ratio : 1/39.000

- Propulsion hydraulic motor weight : 192 kg ( 423 lbs. )

**1) Internal structure of propulsion hydraulic motor (rear)**

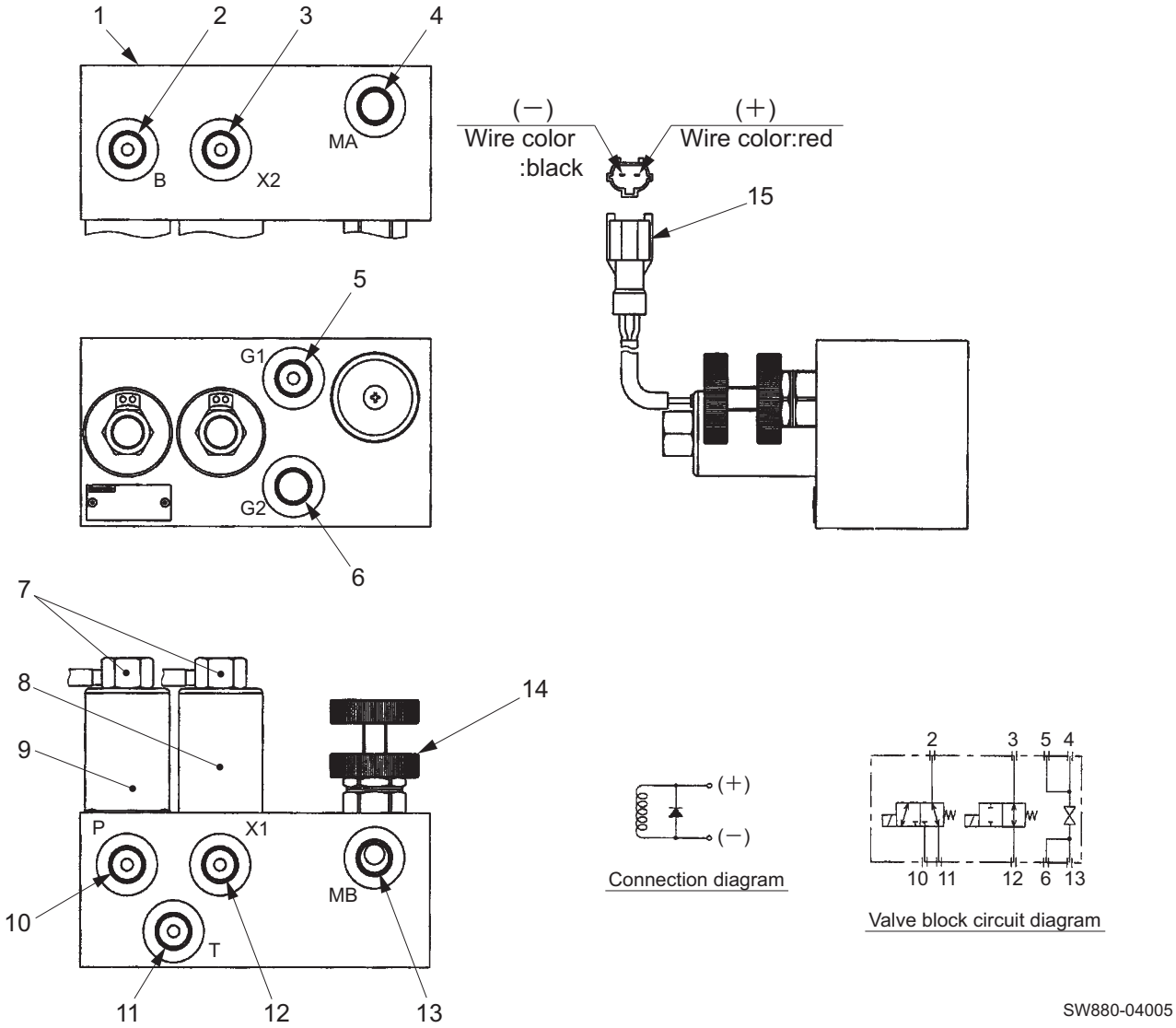



SW880-04004

(7) Motor
- (7-1) Cylinder block kit
- (7-2) Bearing
- (7-3) Oil seal
- (7-4) Shaft
- (7-5) Swash plate assembly
- (7-6) Brake stopper
- (7-7) Friction plate
- (7-8) Separate plate
- (7-9) Piston brake
- (7-10) Journal bearing
- (7-11) Speed sensor

(8) Reduction gear
- (8-1) Floating seal kit
- (8-2) Angular bearing
- (8-3) Planetary gear 2nd
- (8-4) Needle roller
- (8-5) Carrier
- (8-6) Planetary gear 1st
- (8-7) Needle roller
- (8-8) Sun gear 2nd
- (8-9) Sun gear 1st

## 2-2-4. Valve block




SW880-04005

(1) Body
(2) Port B **[PVR]** : 9/16-18UNF
(3) Port X2 **[VX2]** : 9/16-18UNF
(4) Port MA **[PVA]** : 9/16-18UNF
(5) Port G1 (Forward side) : 9/16-18UNF
(6) Port G2 (Reverse side) : 9/16-18UNF
(7) Nut
(8) Neutral solenoid valve
(9) Brake solenoid valve
(10) Port P **[PVP]** : 9/16-18UNF
(11) Port T **[PVT]** : 9/16-18UNF
(12) Port X1 **[VX1]** : 9/16-18UNF
(13) Port MB **[PVB]** : 9/16-18UNF
(14) Bypass valve
(15) Connector

N · m

| | | | |
|---|---|---|---|
| (7) Nut | : | 4.9 N·m | ( 3.6 lbf·ft ) |
| (8) Neutral solenoid valve | : | 34 ± 3 N·m | ( 25.1 ± 2.2 lbf·ft ) |
| (9) Brake solenoid valve | : | 34 ± 3 N·m | ( 25.1 ± 2.2 lbf·ft ) |
| (14) Bypass valve | : | 45 ± 6 N·m | ( 33.2 ± 4.4 lbf·ft ) |

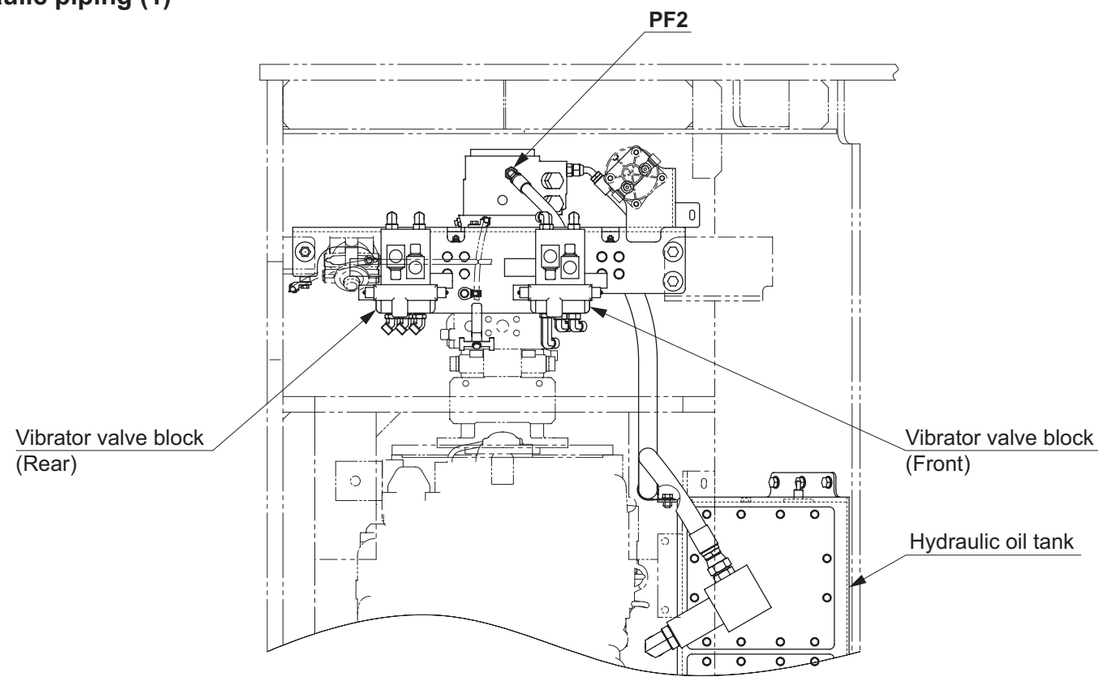
Specifications

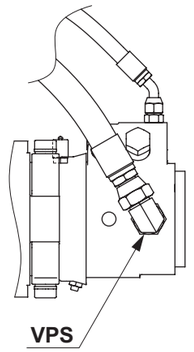
| | | | |
|---|---|---|---|
| • Rated pressure | : | 3.0 MPa | ( 435 psi ) (2, 3, 10, 11, 12) |
| | : | 35 MPa | ( 5,075 psi ) (4, 5, 6, 13) |
| • Rated flow | : | 10 L/min | ( 2.6 gal./min ) |
| • Weight | : | 6.4 kg | ( 14.1 lbs. ) |

# 3. VIBRATOR HYDRAULIC SYSTEM

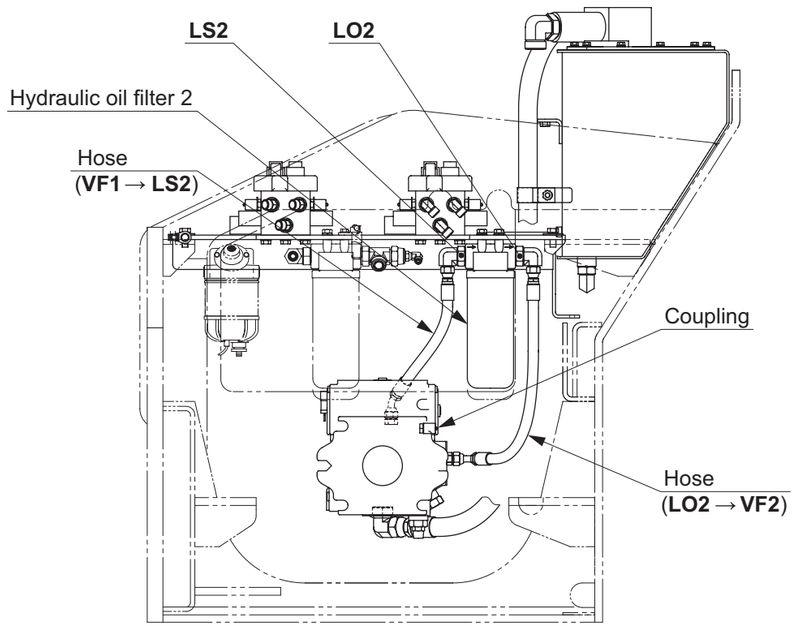
## 3-1. Vibrator Hydraulic Piping

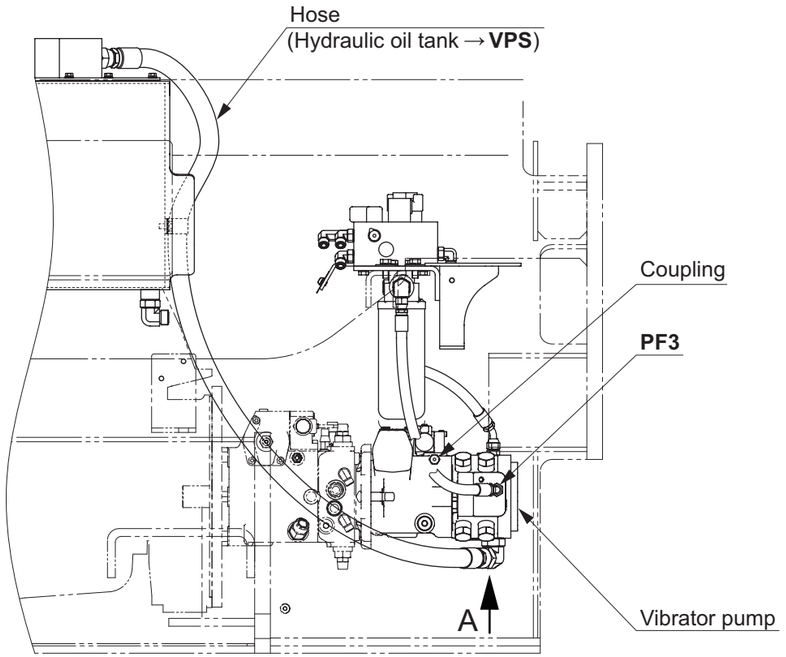
### 3-1-1. Vibrator hydraulic piping (1)



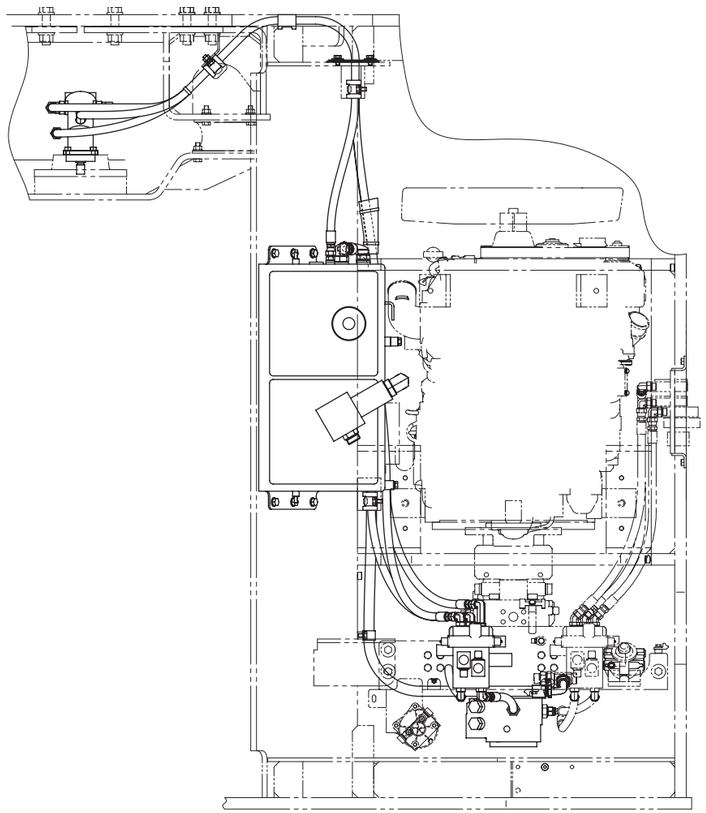

VIEW A

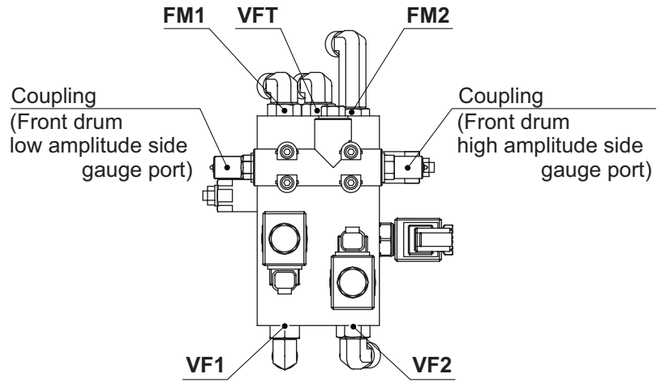


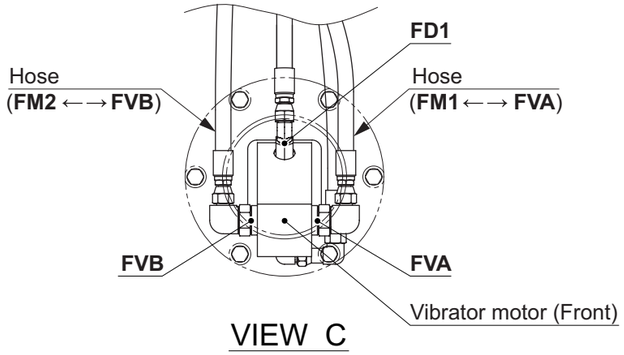

• The letters and figures (such as LO2 and VF2) show each port and the arrow (←→; →) symbols show the hose connection and the direction of the flow of the oil.

## 3-1-2. Vibrator hydraulic piping (2)

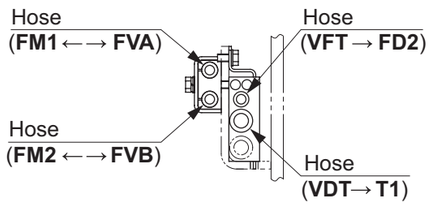




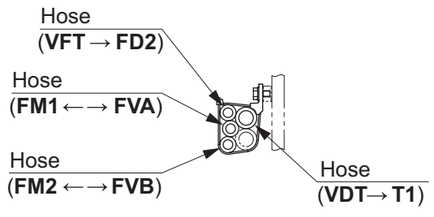

Vibrator valve block
(Front)



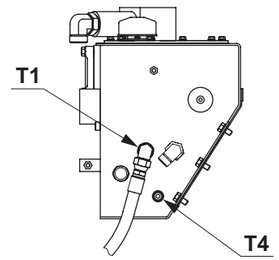

VIEW C



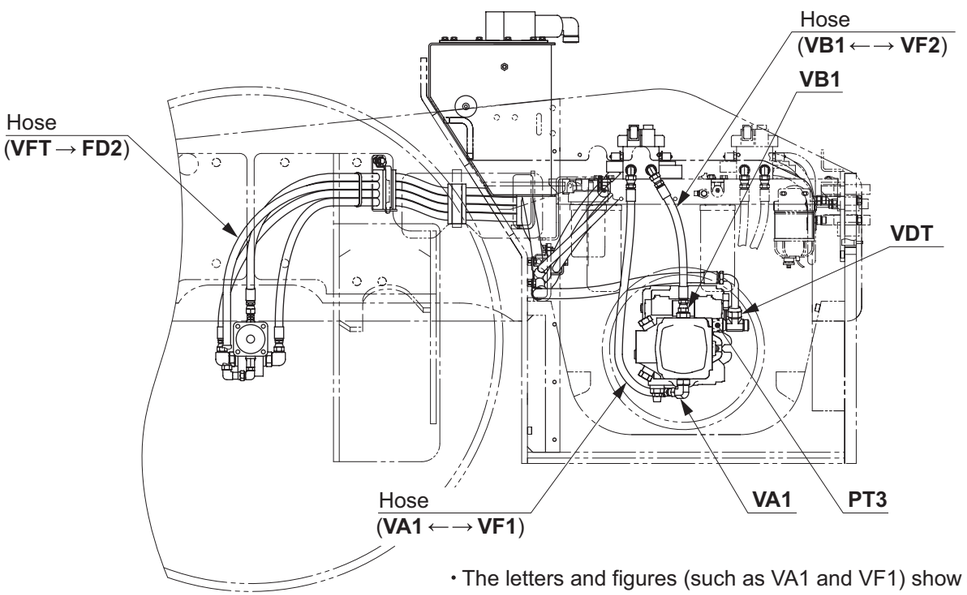

SECTION A-A

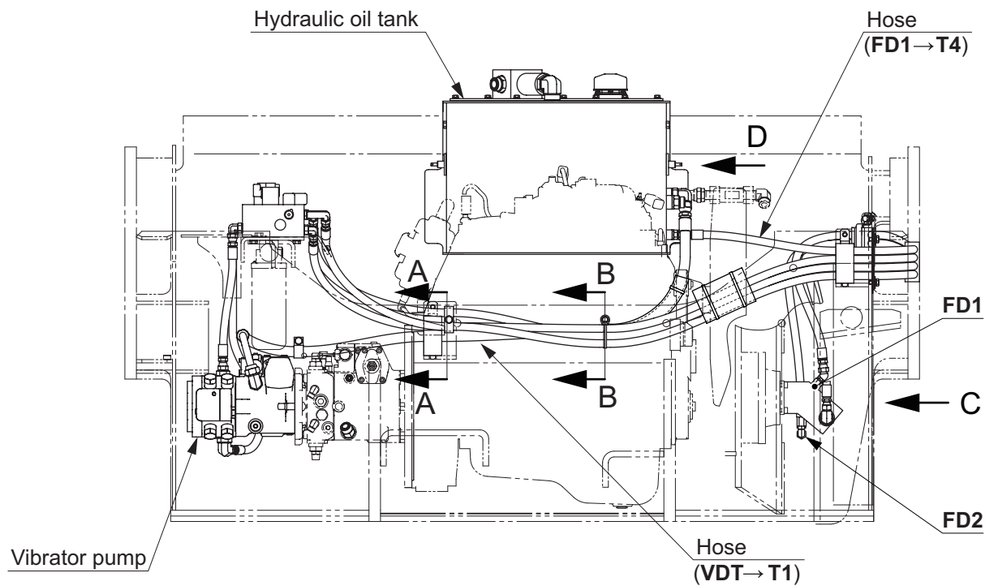



SECTION B-B




VIEW D

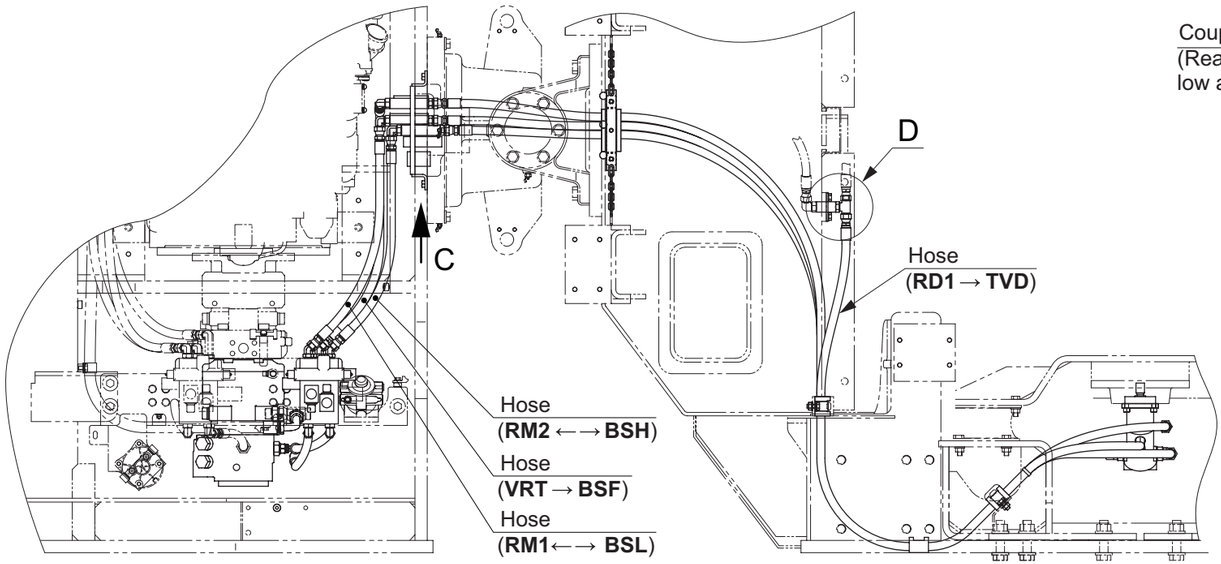


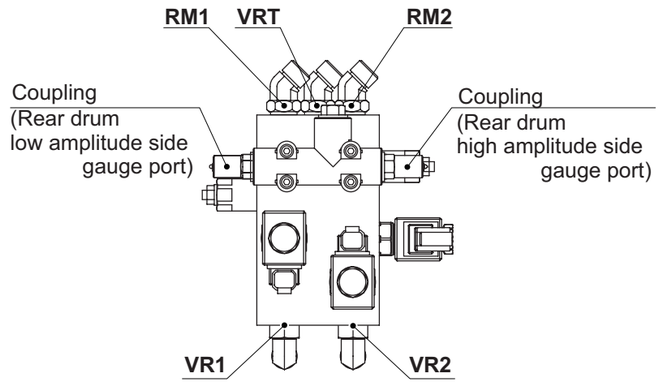




• The letters and figures (such as VA1 and VF1) show each port and the arrow (⟷; →) symbols show the hose connection and the direction of the flow of the oil.

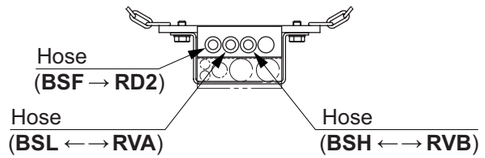
0568-49806-0-11260-A

## 3-1-3. Vibrator hydraulic piping (3)

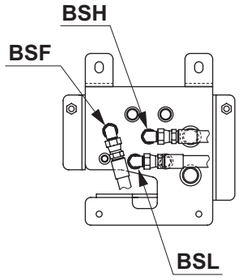


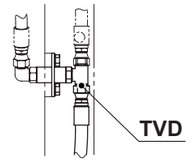

Vibrator valve block
(Rear)



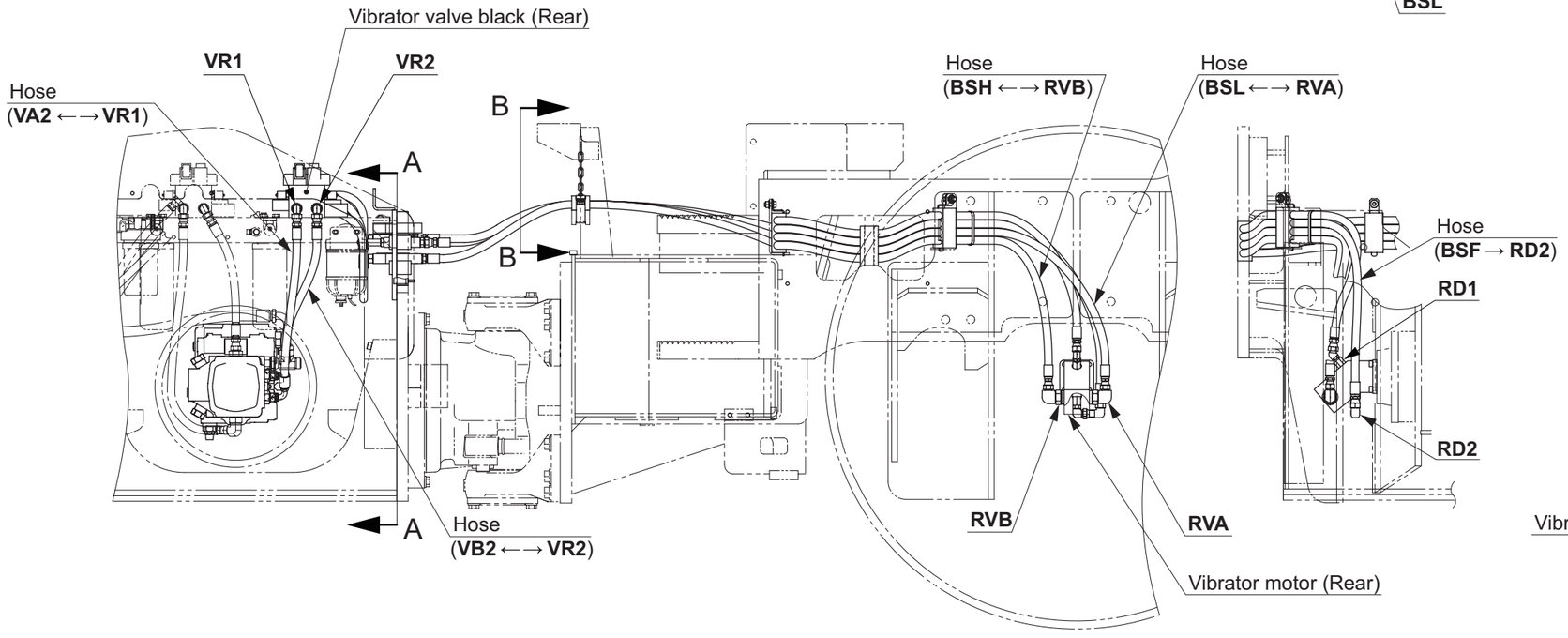

SECTION B-B

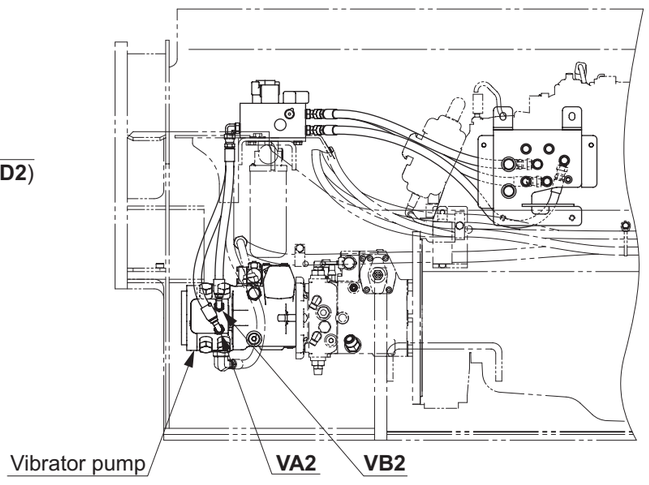



VIEW C




DETAIL D



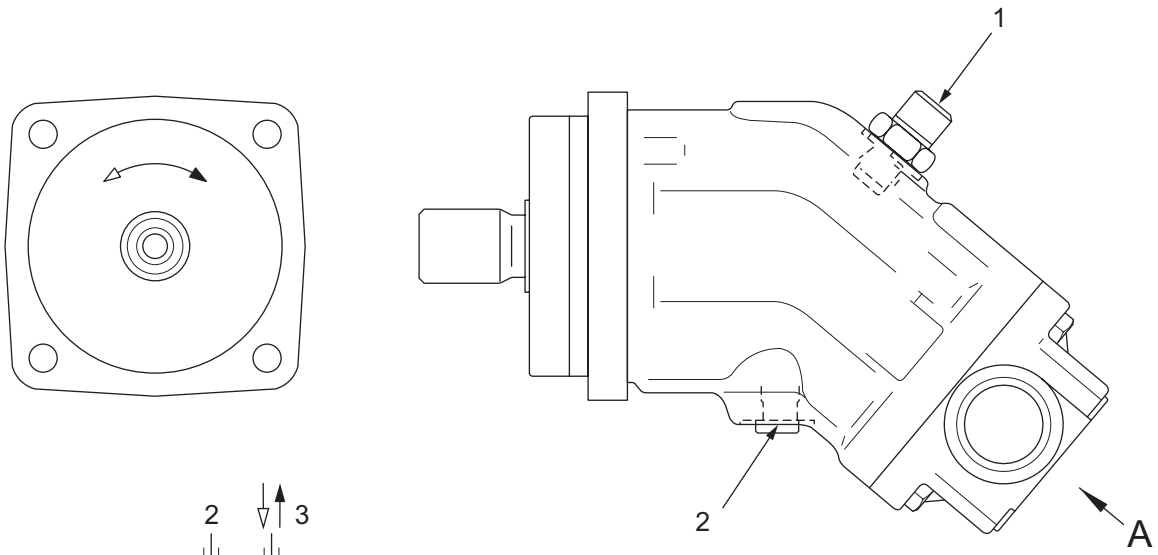



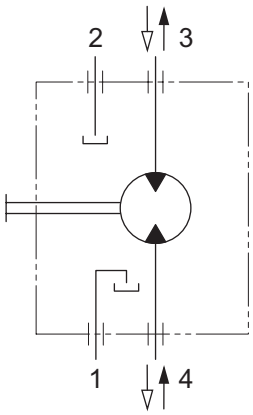

SECTION A-A

• The letters and figures (such as VB2 and VR2) show each port and the arrow (←→; →) symbols show the hose connection and the direction of the flow of the oil.

# 3-2. Hydraulic Component Specifications

## 3-2-1. Vibrator hydraulic motor

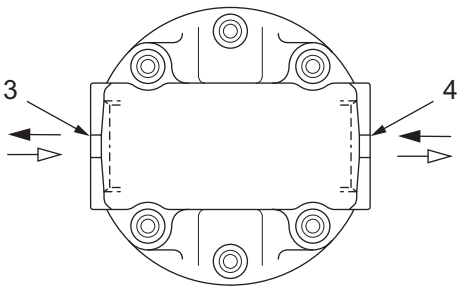



Motor circuit diagram

Flow of oil

- 4→3 Clockwise rotation
- 3→4 Counterclockwise rotation




VIEW A

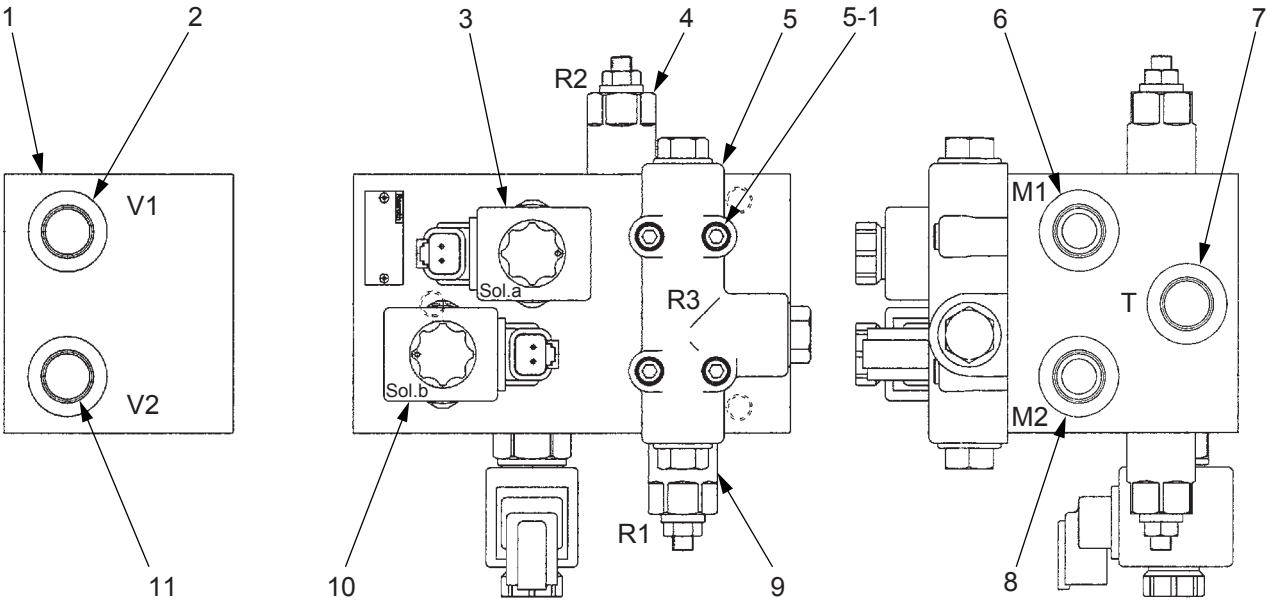
SW800-04015

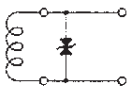
| | | | |
|---|---|---|---|
| (1) Drain port (T1) | **[FD1, RD1]** | : | G1/2 |
| (2) Drain port (T2) | **[FD2, RD2]** | : | M12×1.5 |
| (3) Port B | **[FVB, RVB]** | : | 1 1/16-12UN-2B |
| (4) Port A | **[FVA, RVA]** | : | 1 1/16-12UN-2B |

Specifications

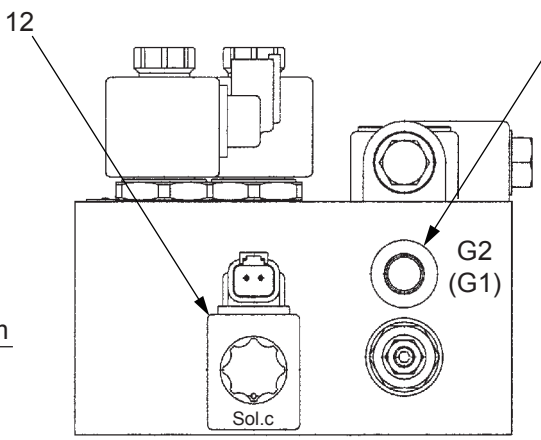
- Displacement : 16 $cm^3$/rev ( 0.98 cu.in./rev )
- Working pressure : 22.5 MPa ( 3,263 psi )
- Allowable motor case pressure : 0.15 MPa ( 21.6 psi )
- Weight : 5.4 kg ( 11.9 lbs. )

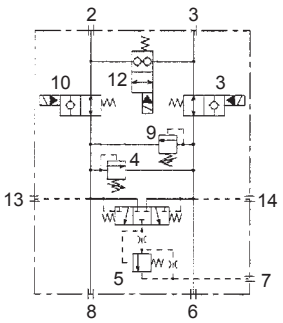
## 3-2-2. Vibrator valve block



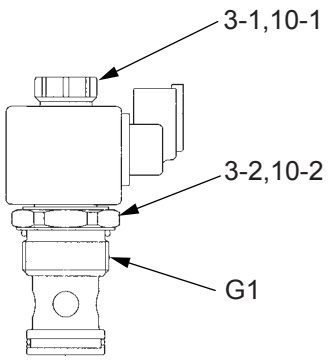



Electrical circuit diagram

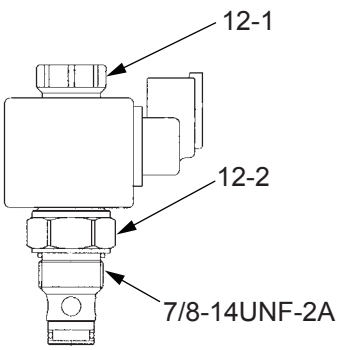


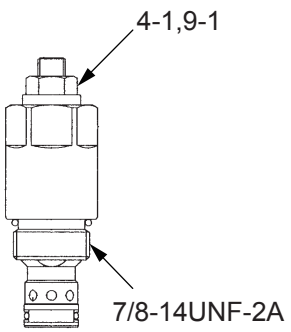

Valve block circuit diagram




(3),(10) Vibrator solenoid valve (a,b)




(12) Vibrator solenoid valve (c)




(4),(9) Relief valve (R1,R2)

SW880-04006

| | | | | |
|---|---|---|---|---|
| (1) | Body | | | |
| (2) | Port V1 | **[VF1, VR1]** | : | 3/4-16UNF |
| (3) | Vibrator solenoid valve (a) | | : | G1 |
| | (3-1) Nut | | | |
| | (3-2) Nut | | | |
| (4) | Relief valve R2 | | : | 7/8-14UNF |
| | (4-1) Nut | | | |
| (5) | Flushing valve R3 | | | |
| | (5-1) Bolt | | : | M6×30 |
| (6) | Port M1 | **[FM1, RM1]** | : | 3/4-16UNF |
| (7) | Port T | **[VFT, VRT]** | : | 3/4-16UNF |
| (8) | Port M2 | **[FM2, RM2]** | : | 3/4-16UNF |
| (9) | Relief valve R1 | | : | 7/8-14UNF |
| | (9-1) Nut | | | |
| (10) | Vibrator solenoid valve (b) | | : | G1 |
| | (10-1) Nut | | | |
| | (10-2) Nut | | | |
| (11) | Port V2 | **[VF2, VR2]** | : | 3/4-16UNF |
| (12) | Vibrator solenoid valve (c) | | : | 7/8-14UNF |
| | (12-1) Nut | | | |
| | (12-2) Nut | | | |
| (13) | Port G2 (High amplitude side) | | : | 9/16-18UNF |
| (14) | Port G1 (Low amplitude side) | | : | 9/16-18UNF |

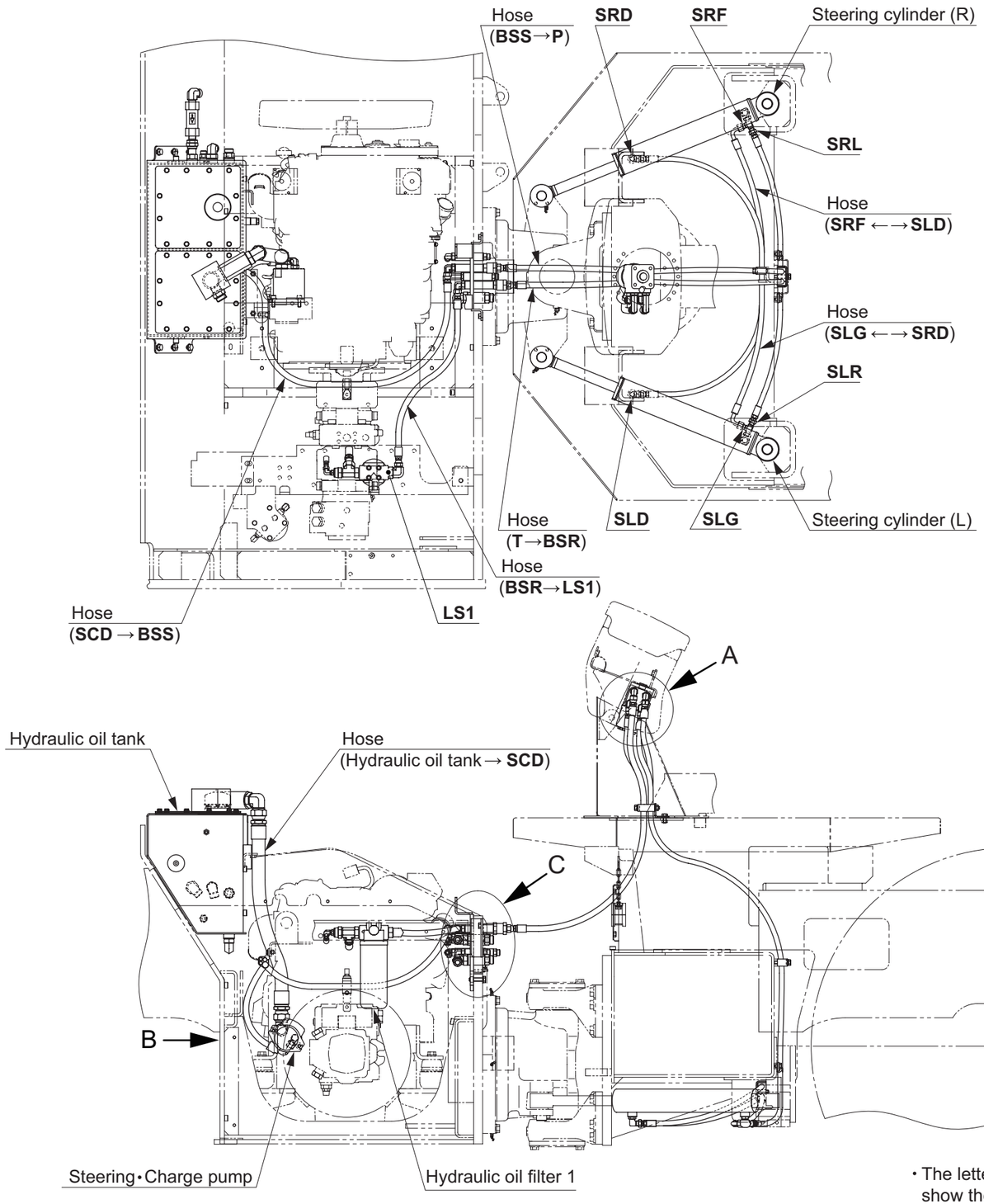

| | | | | | |
|---|---|---|---|---|---|
| (3-1) | Nut | : | 3.5 N·m | ( 2.6 lbf·ft | ) |
| (3-2) | Nut | : | 90 N·m | ( 66 lbf·ft | ) |
| (4) | Relief valve R2 | : | 44 N·m | ( 32 lbf·ft | ) |
| (4-1) | Nut | : | 13.5 N·m | ( 10 lbf·ft | ) |
| (5-1) | Bolt M6×30 | : | 14 N·m | ( 10 lbf·ft | ) |
| (9) | Relief valve R1 | : | 44 N·m | ( 32 lbf·ft | ) |
| (9-1) | Nut | : | 13.5 N·m | ( 10 lbf·ft | ) |
| (10-1) | Nut | : | 3.5 N·m | ( 2.6 lbf·ft | ) |
| (10-2) | Nut | : | 90 N·m | ( 66 lbf·ft | ) |
| (12-1) | Nut | : | 3.5 N·m | ( 2.6 lbf·ft | ) |
| (12-2) | Nut | : | 50 N·m | ( 37 lbf·ft | ) |

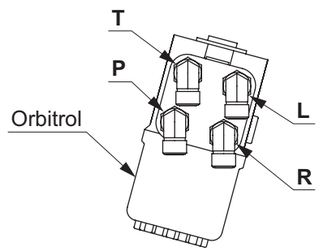
Specifications

| | | | | |
|---|---|---|---|---|
| • Rated pressure | : | 35 MPa | ( 5,075 psi | ) (2, 6, 8, 11, 13, 14) |
| | : | 0.5 MPa | ( 72 psi | ) (7) |
| • Rated flow | : | 70 L/min | ( 18.5 gal./min | ) |
| • Relief valve setting pressure | : | 34 MPa | ( 4,930 psi | ) (4, 9) |
| | : | 1.3 MPa | ( 145 psi | ) (5) |
| • Flushing flow rate | : | 9 ± 1 L/min | ( 2.4 ± 0.3 gal. | ) |
| • Weight | : | 13 kg | ( 28.7 lbs. | ) |

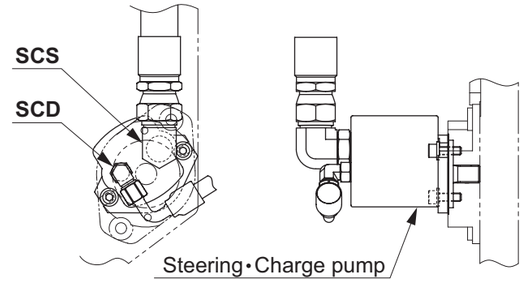
# 4. STEERING SYSTEM

## 4-1. Steering Hydraulic Piping

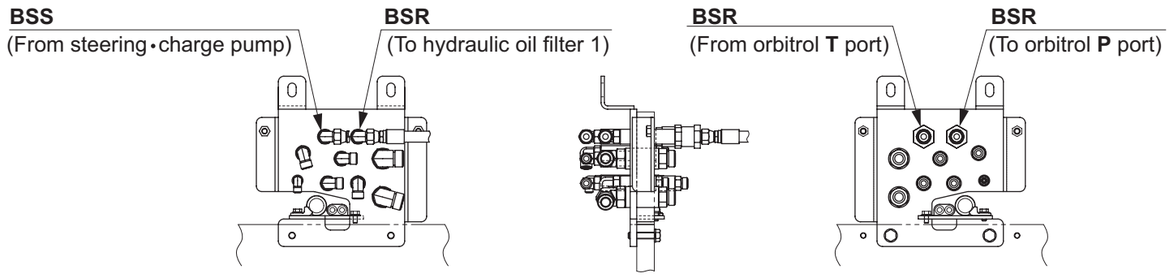


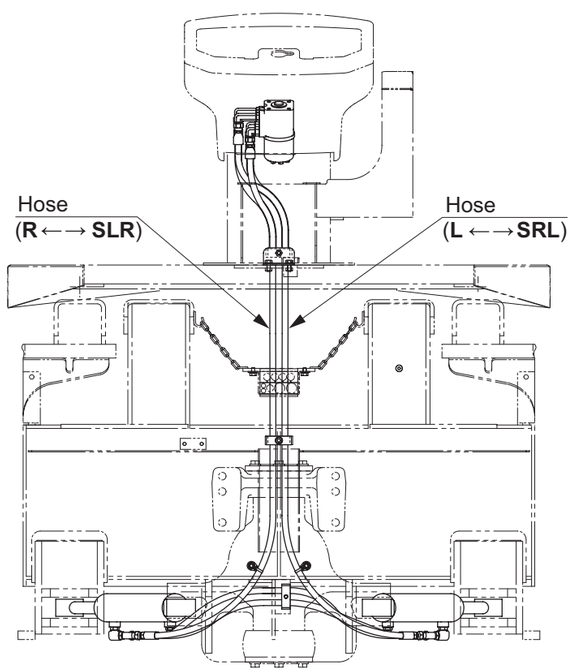

DETAIL A




VIEW B

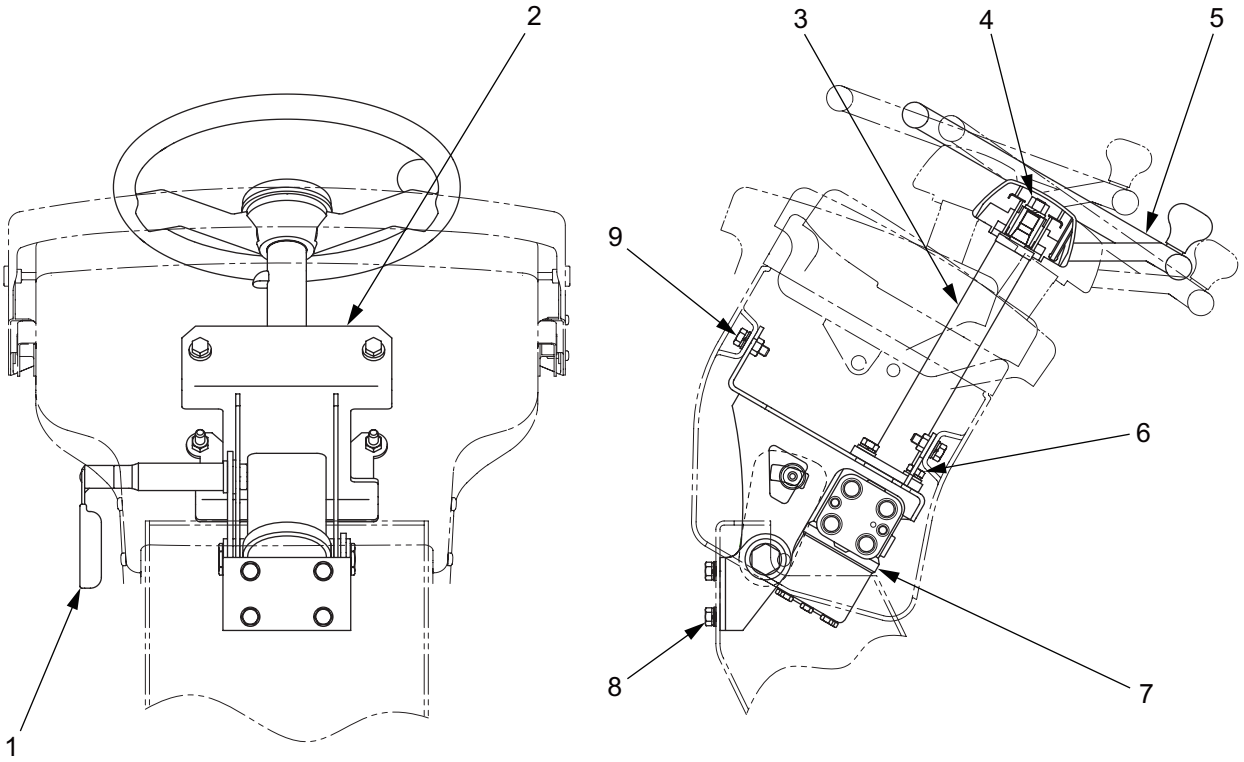



DETAIL C




・The letters and figures (such as SCD and BSS) show each port and the arrow (←→; →) symbols show the hose connection and the direction of the flow of the oil.

# 4-2. Steering Wheel




0431-32801-0-10036-A

(1) Tilt lock handle
(2) Tilt ASSY
(3) Column shaft
(4) Nut : M12 P=1.25
(5) Steering wheel
(6) Bolt : M10×35
(7) Orbitrol
(8) Bolt : M10×25
(9) Bolt : M10×25

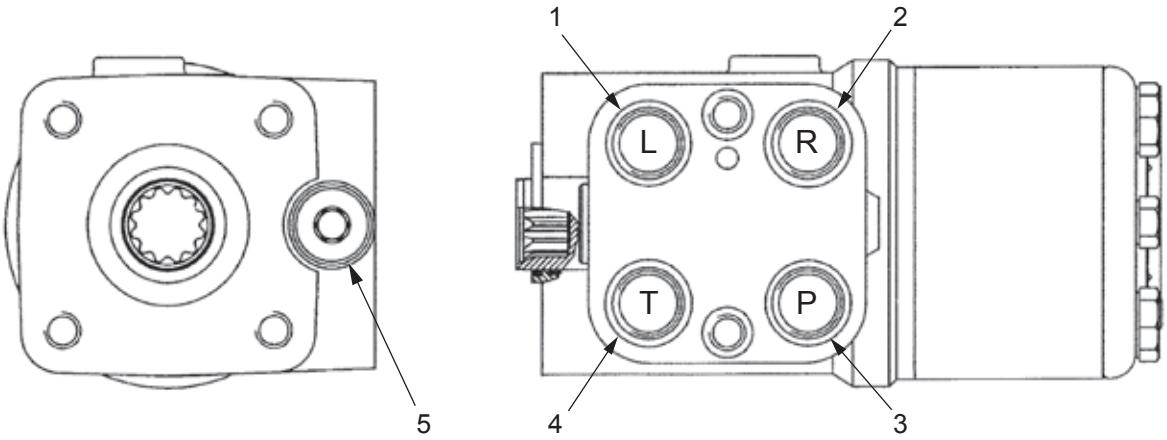
N·m

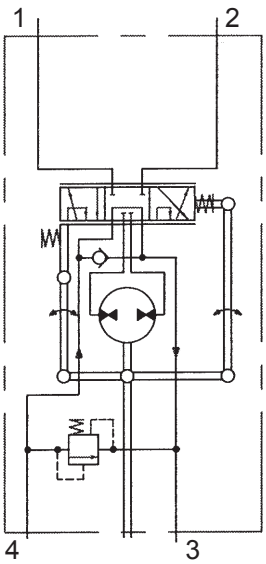
| | | | |
|---|---|---|---|
| (4) Nut M12 P=1.25 | : | 64 N·m | ( 47 lbf·ft ) |
| (6) Bolt M10×35 | : | 49 N·m | ( 36 lbf·ft ) |
| (8) Bolt M10×25 | : | 49 N·m | ( 36 lbf·ft ) |
| (9) Bolt M10×25 | : | 49 N·m | ( 36 lbf·ft ) |

• Steering wheel ASSY weight : 18 kg ( 40 lbs. )

# 4-3. Hydraulic Component Specifications

## 4-3-1. Orbitrol




Orbitrol circuit diagram

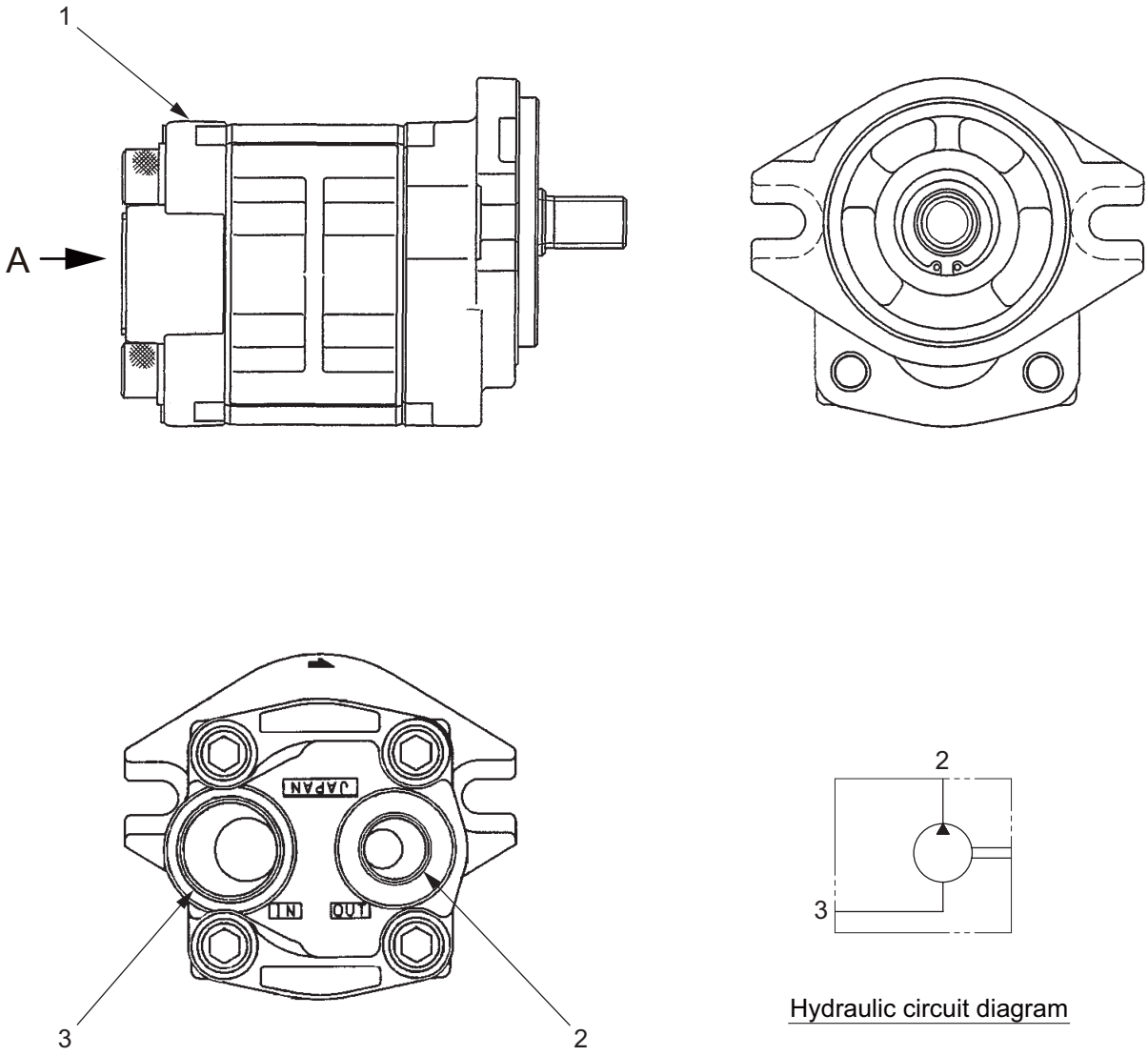
SW880-04007

(1) Port L **[L]** : 3/4-16UNF
(2) Port R **[R]** : 3/4-16UNF
(3) Port P **[P]** : 3/4-16UNF
(4) Port T **[T]** : 3/4-16UNF
(5) Relief valve

Specifications

- Displacement : 400 $cm^3$/rev ( 24.4 cu.in./rev )
- Relief valve setting : 15.0 MPa ( 2,175 psi )
- Weight : 8 kg ( 18 lbs. )

## 4-3-2. Steering • charge pump




SV540-04004

(1) Pump
(2) Outlet port **[SCD]** : 7/ 8-14UNF
(3) Inlet port **[SCS]** : 1 5/16-12UN

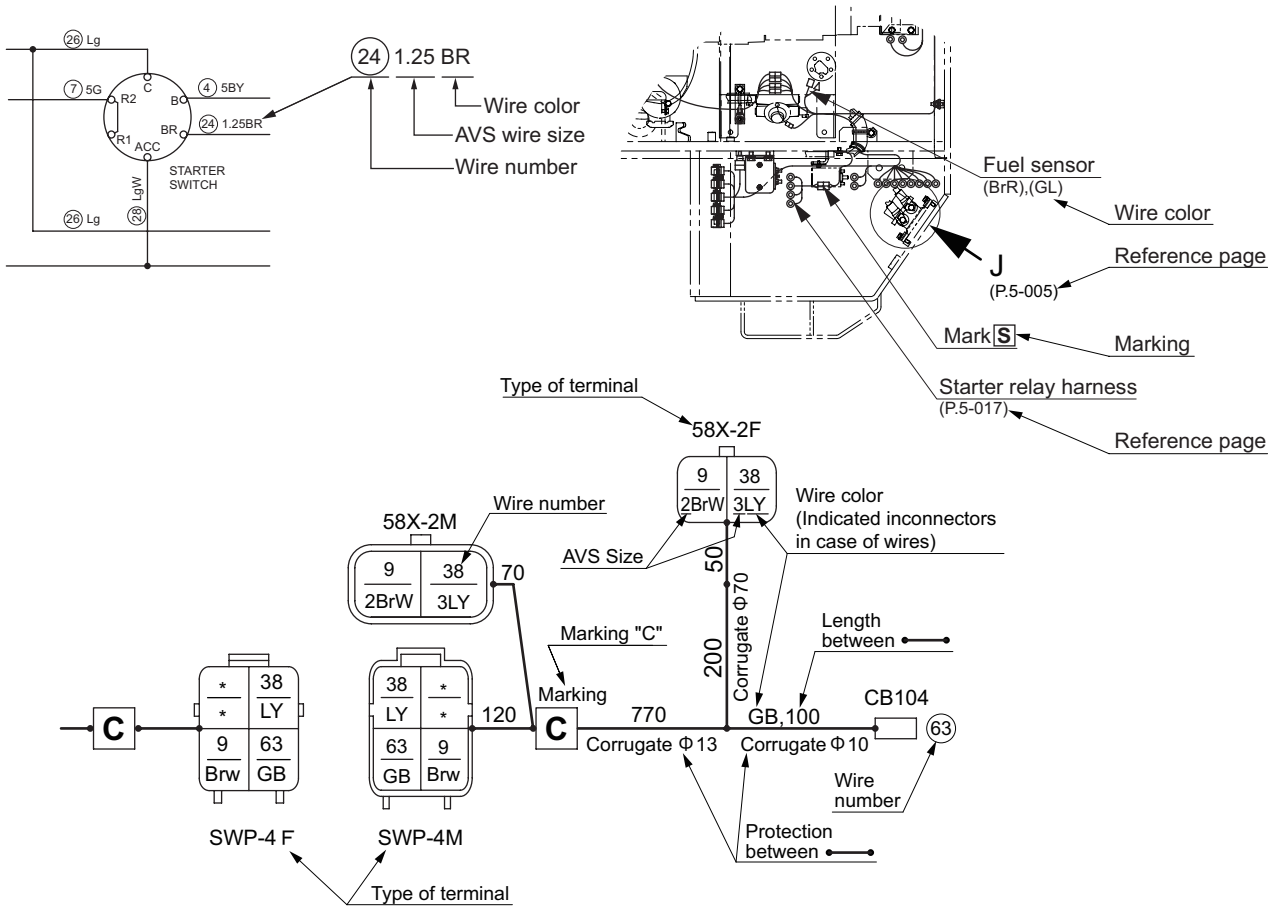
Specifications
- Displacement : 24.9 $cm^3$/rev ( 1.5 cu.in./rev )
- Rated pressure : 20.6 MPa ( 2,987 psi )
- Weight : 3.8 kg ( 8.4 lbs. )

# ELECTRICAL SYSTEM

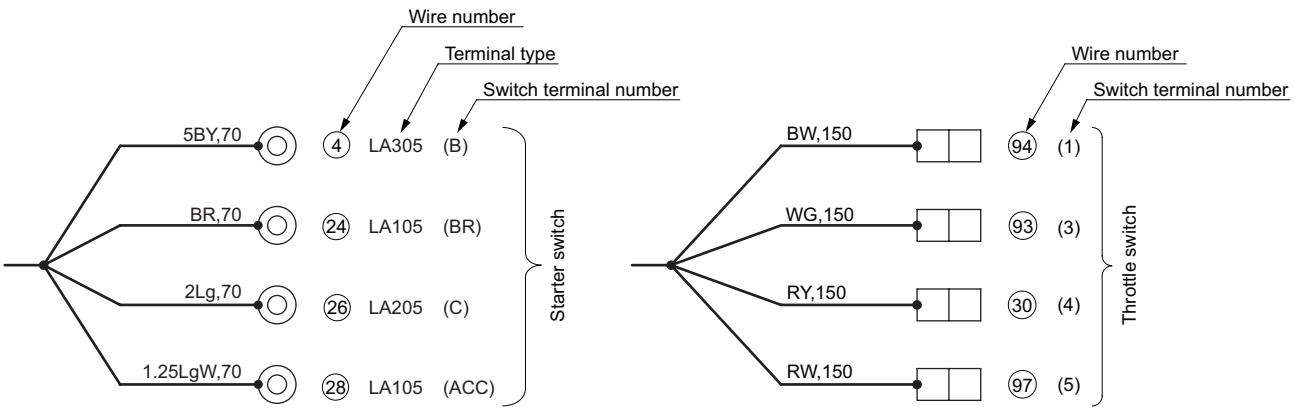
# 1. PRECAUTIONS FOR WORK

## 1-1. Wire Numbers, Wire Sizes, Wire Colors and Connectors Shown in Electrical Circuit Diagram, Wiring Harness Layout and Wiring Harnesses

- Codes used in electrical circuit diagrams give the following information.
- The wire size is AVS 0.85 unless otherwise specified.




- The pin or socket layout of mating connectors are symmetrical, either vertically or horizontally. When the connector valves are connected, the pin and socket that have the same number are connected.

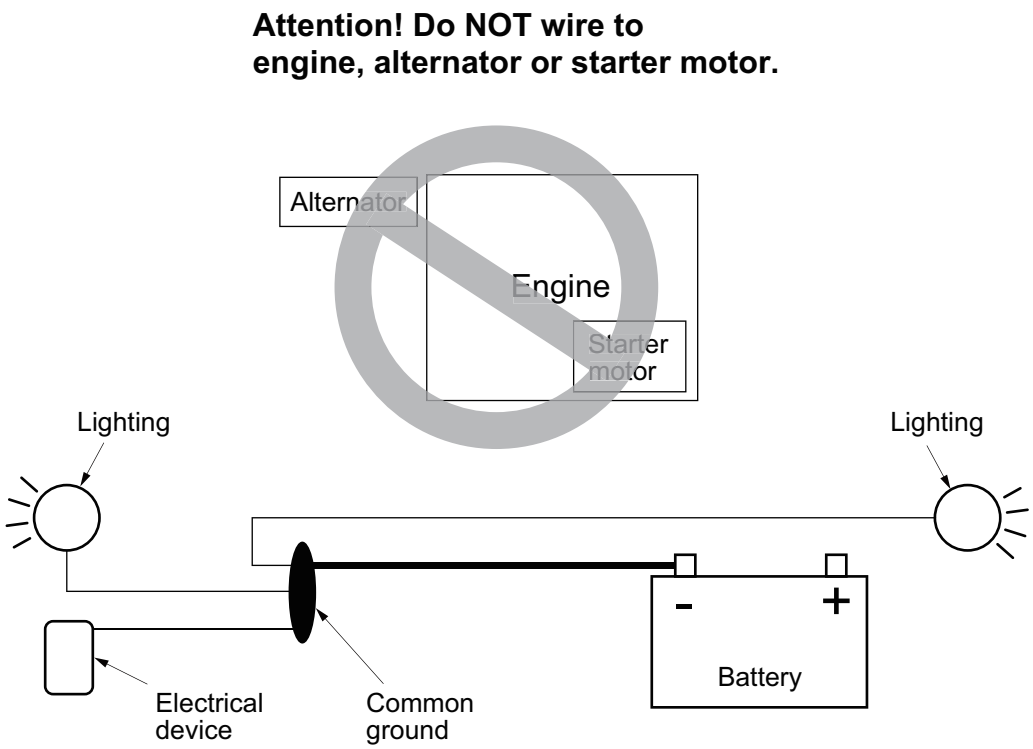


• Wire color code chart

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | Black | BW | Black/ White stripe | BY | Black/ Yellow stripe | BR | Black/ Red stripe | BG | Black/ Green stripe | BL | Black/ Blue stripe | | | O | Orange | YO | Yellow/ Orange stripe |
| W | White | WR | White/ Red stripe | WB | White/ Black stripe | WL | White/ Blue stripe | WY | White/ Yellow stripe | WG | White/ Green stripe | | | | | LO | Blue/ Orange stripe |
| R | Red | RW | Red/ White stripe | RB | Red/ Black stripe | RY | Red/ Yellow stripe | RG | Red/ Green stripe | RL | Red/ Blue stripe | | | | | GO | Green/ Orange stripe |
| G | Green | GW | Green/ White stripe | GR | Green/ Red stripe | GY | Green/ Yellow stripe | GB | Green/ Black stripe | GL | Green/ Blue stripe | | | Gy | Gray | GyR | Gray/ Red stripe |
| Y | Yellow | YR | Yellow/ Red stripe | YB | Yellow/ Black stripe | YG | Yellow/ Green stripe | YL | Yellow/ Blue stripe | YW | Yellow/ White stripe | | | | | GyL | Gray/ Blue stripe |
| Br | Brown | BrW | Brown/ White stripe | BrR | Brown/ Red stripe | BrY | Brown/ Yellow stripe | BrB | Brown/ Black stripe | BrG | Brown/ Green stripe | BrL | Brown/ Blue stripe | Sb | Sky blue | | |
| L | Blue | LW | Blue/ White stripe | LR | Blue/ Red stripe | LY | Blue/ Yellow stripe | LB | Blue/ Black stripe | LG | Blue/ Green stripe | | | P | Pink | PB | Pink/ Black stripe |
| Lg | Light green | LgR | Light green/ Red stripe | LgY | Light green/ Yellow stripe | LgB | Light green/ Black stripe | LgW | Light green/ White stripe | LgL | Light green/ Blue stripe | | | Pu | Purple | | |

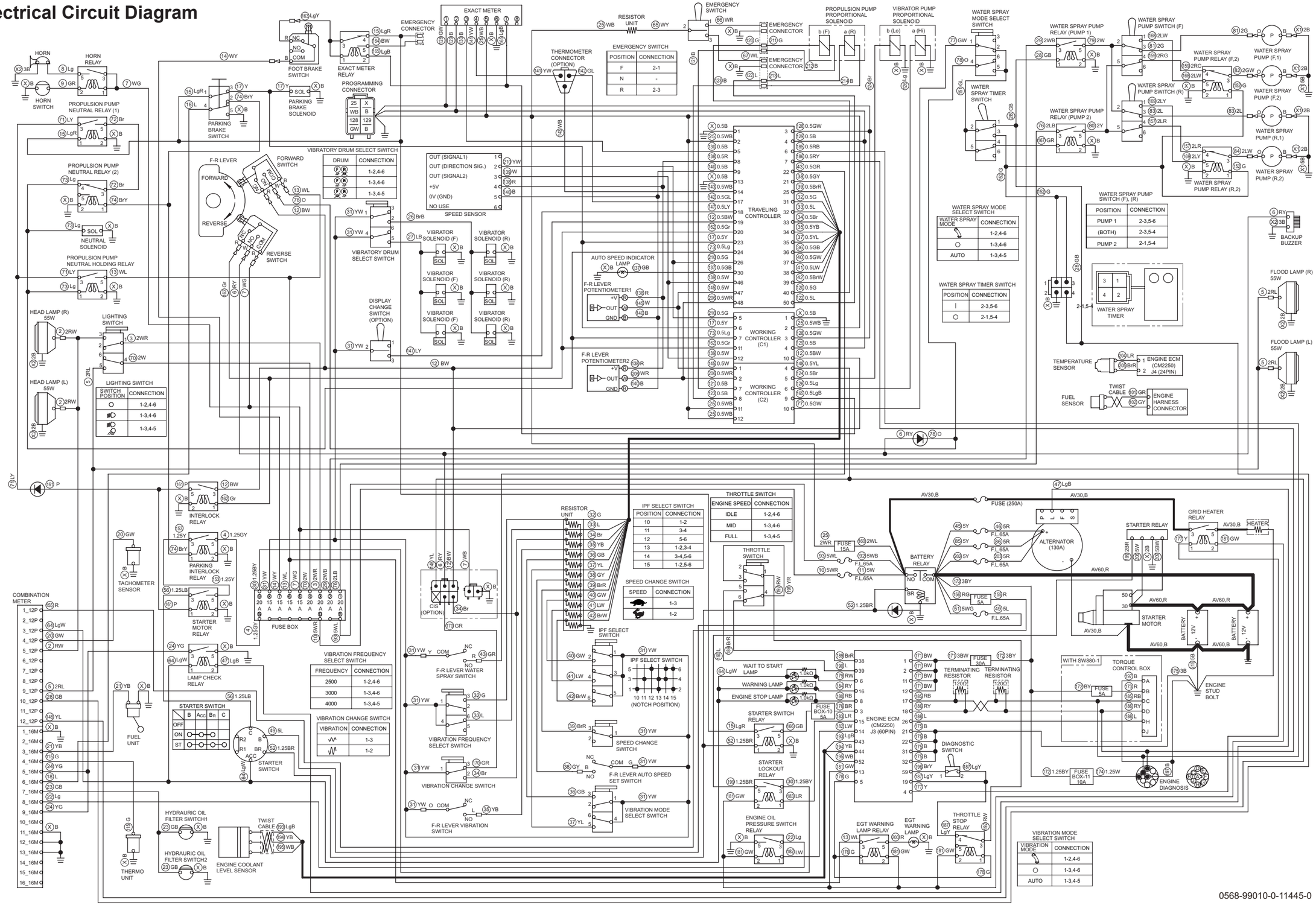
## 1-2. Electrical Equipment Installation

When wiring electrical components to this machine (for example, additional lighting or electrical devices), connect all grounds to a common ground location and then return to the negative side of the battery. Do not wire to the engine block, starter or alternator terminals. Reference picture is below.



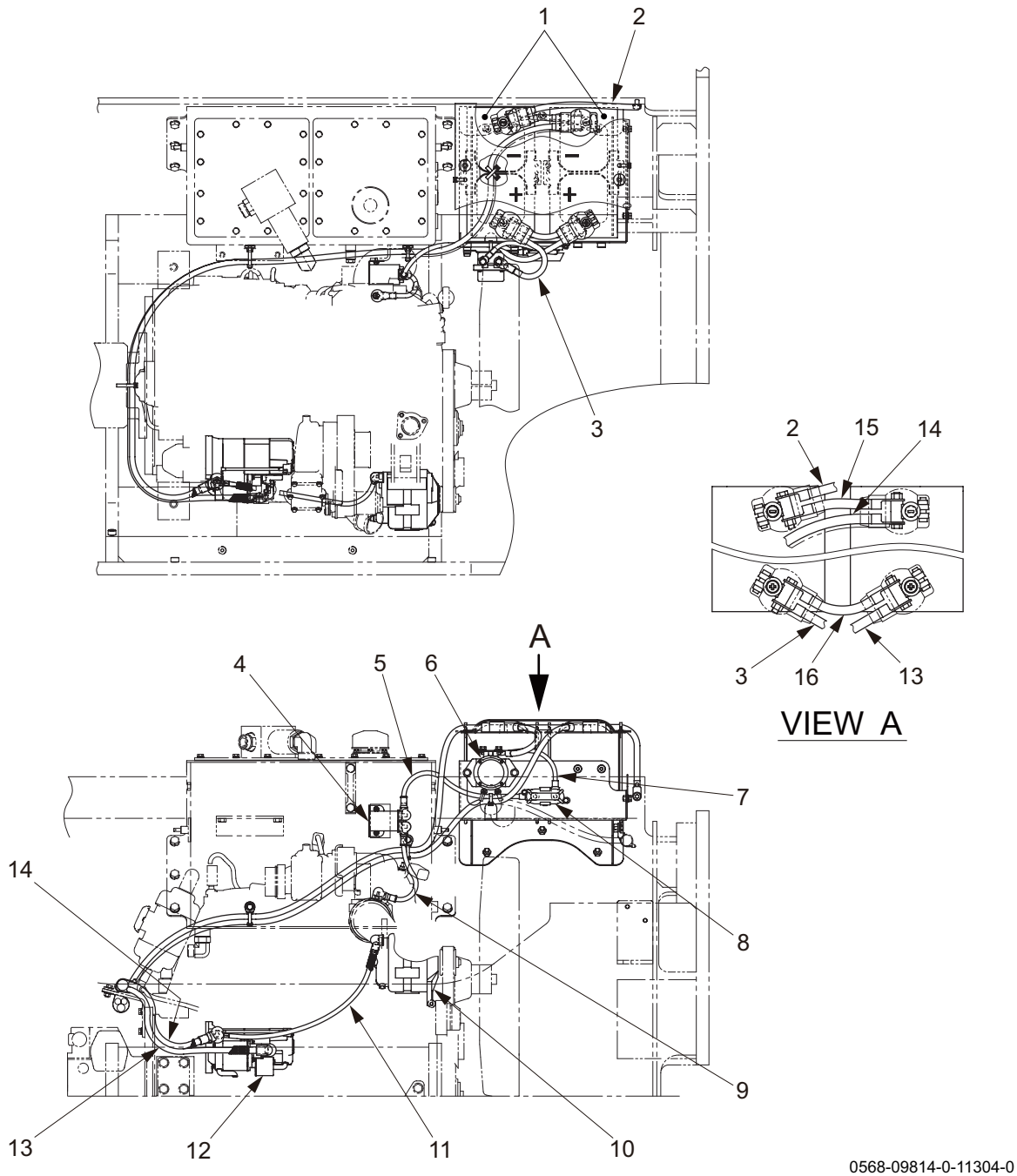
# 2. SYSTEM CIRCUIT DIAGRAM

## 2-1. Electrical Circuit Diagram



# 3. ELECTRICAL COMPONENTS

## 3-1. Battery Layout

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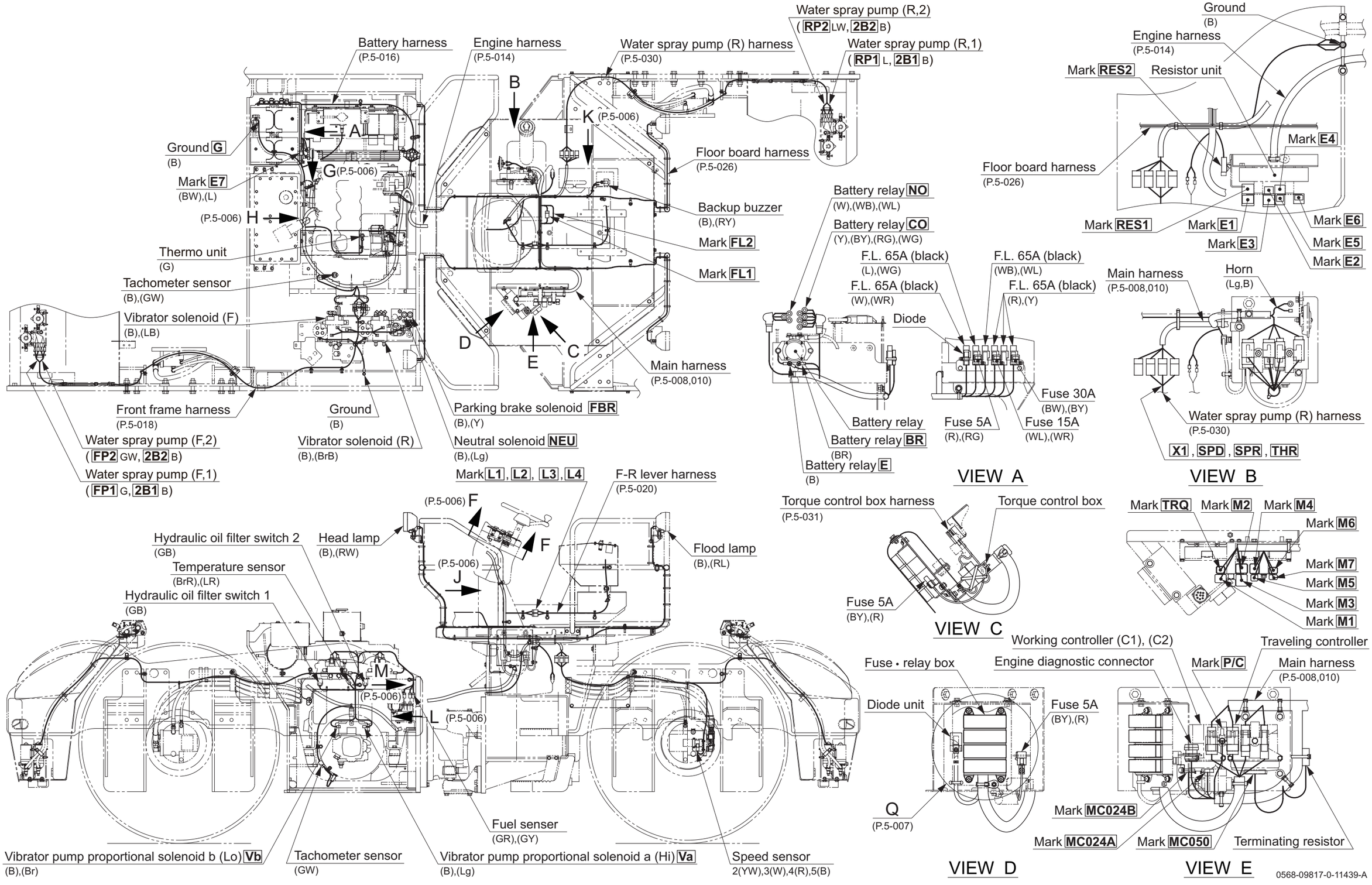
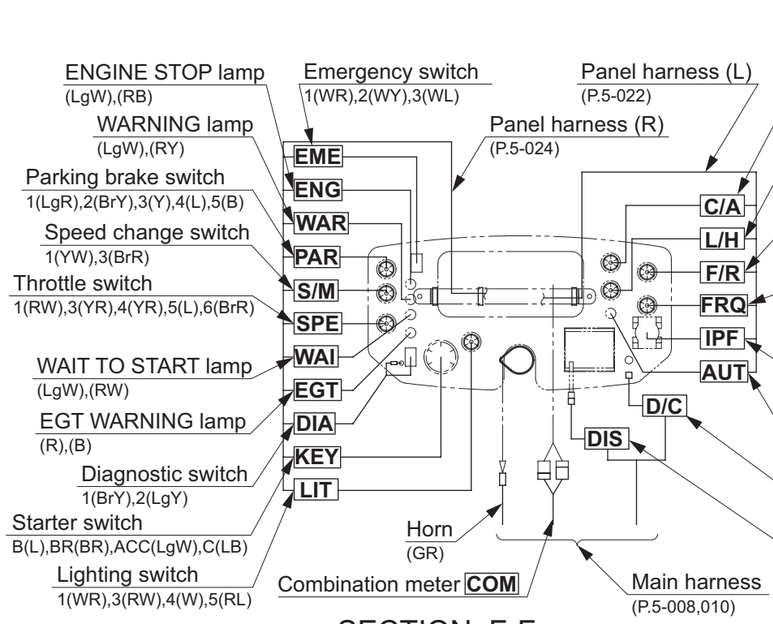
(1) Battery
(2) Cord (Battery (-) – Ground)
(3) Cord (Battery (+) – Battery relay (COM))
(4) Grid heater relay
(5) Cord (Fuse -Grid heater relay (terminal 3))
(6) Battery relay
(7) Cord (Battery relay (NO)-Fuse)
(8) Fuse (250A)
(9) Cord
(Grid heater relay (terminal 5) – Grid heater)
(10) Alternator
(11) Cord (Starter motor (Ground) – Alternator (-))
(12) Starter motor
(13) Cord (Battery (+) – Starter motor (terminal 30))
(14) Cord (Starter motor (Ground) – Battery (-))
(15) Cord (Battery (-) – Battery (-))
(16) Cord (Battery (+) – Battery (+))

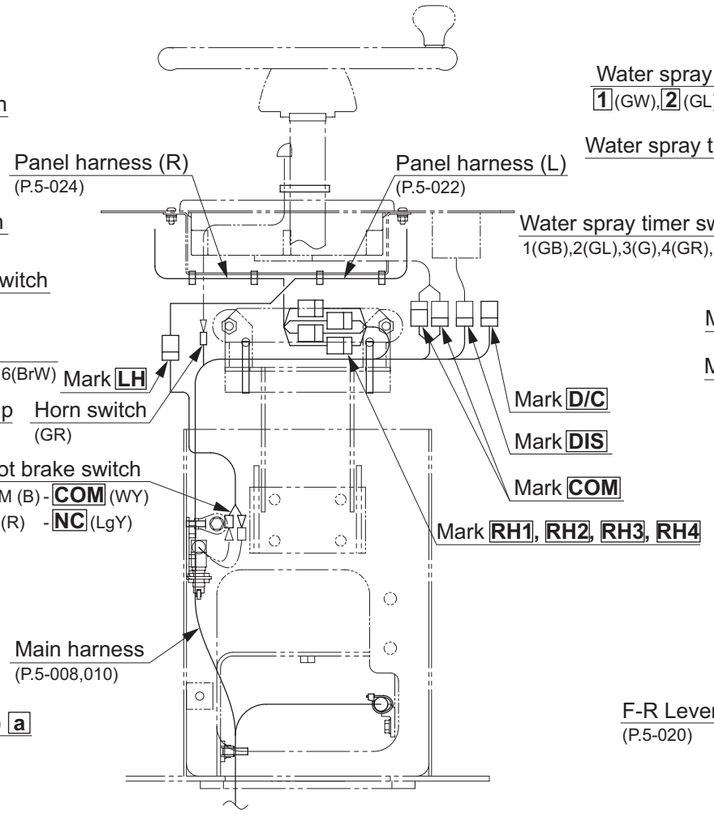
## 3-2. Wiring Harness Layout (1)



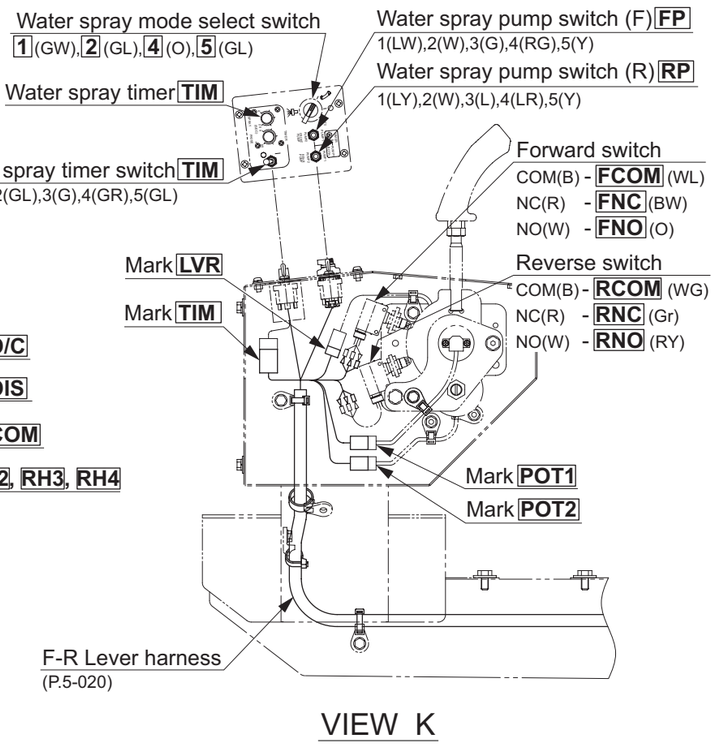
## 3-3. Wiring Harness Layout (2)




SECTION F-F




VIEW J

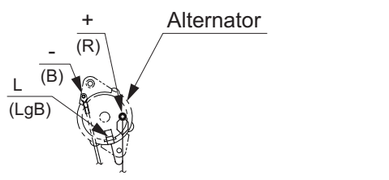



VIEW K

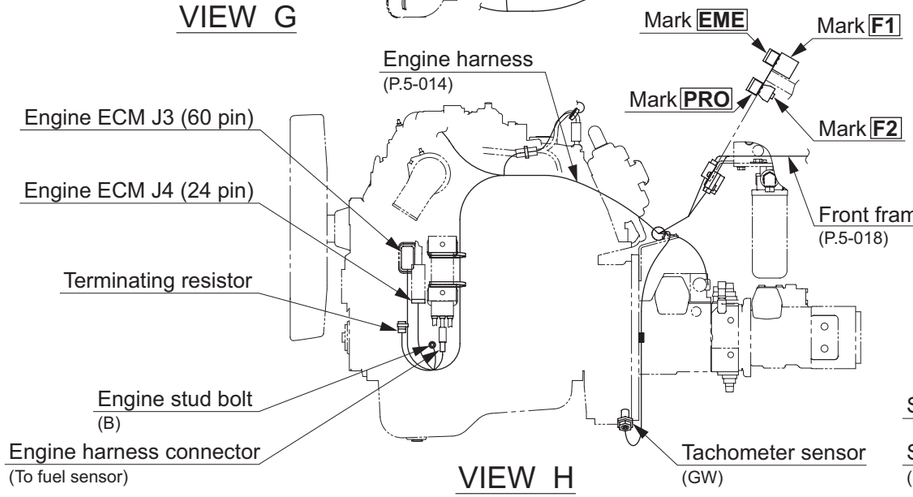



VIEW G

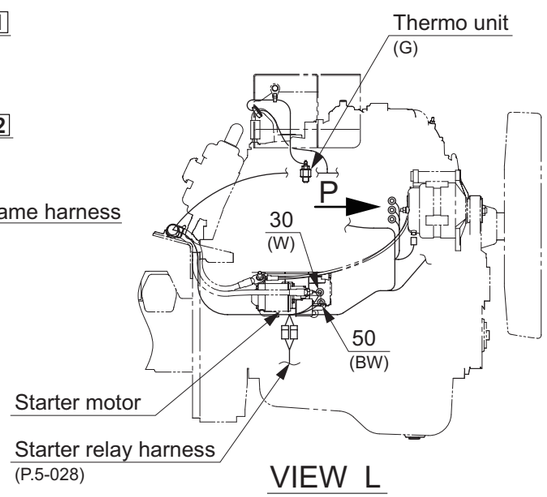


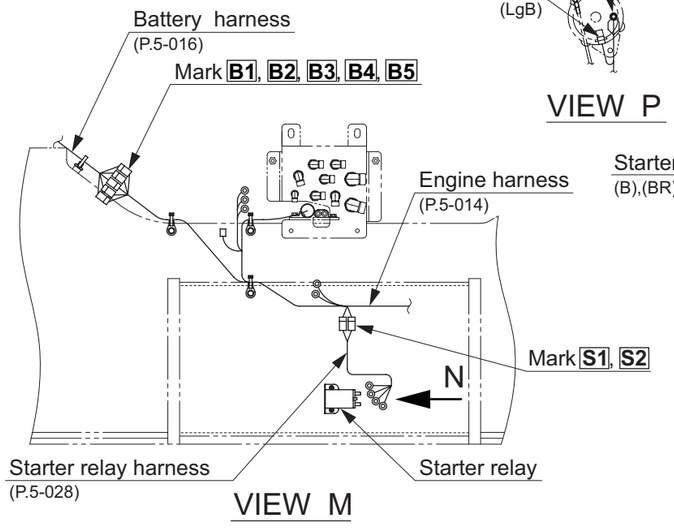

VIEW P



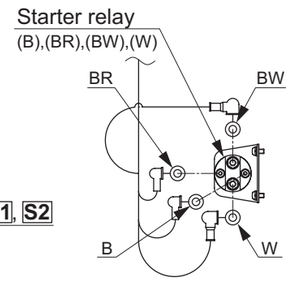

VIEW H




VIEW L




VIEW M




VIEW N

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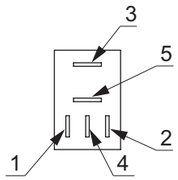
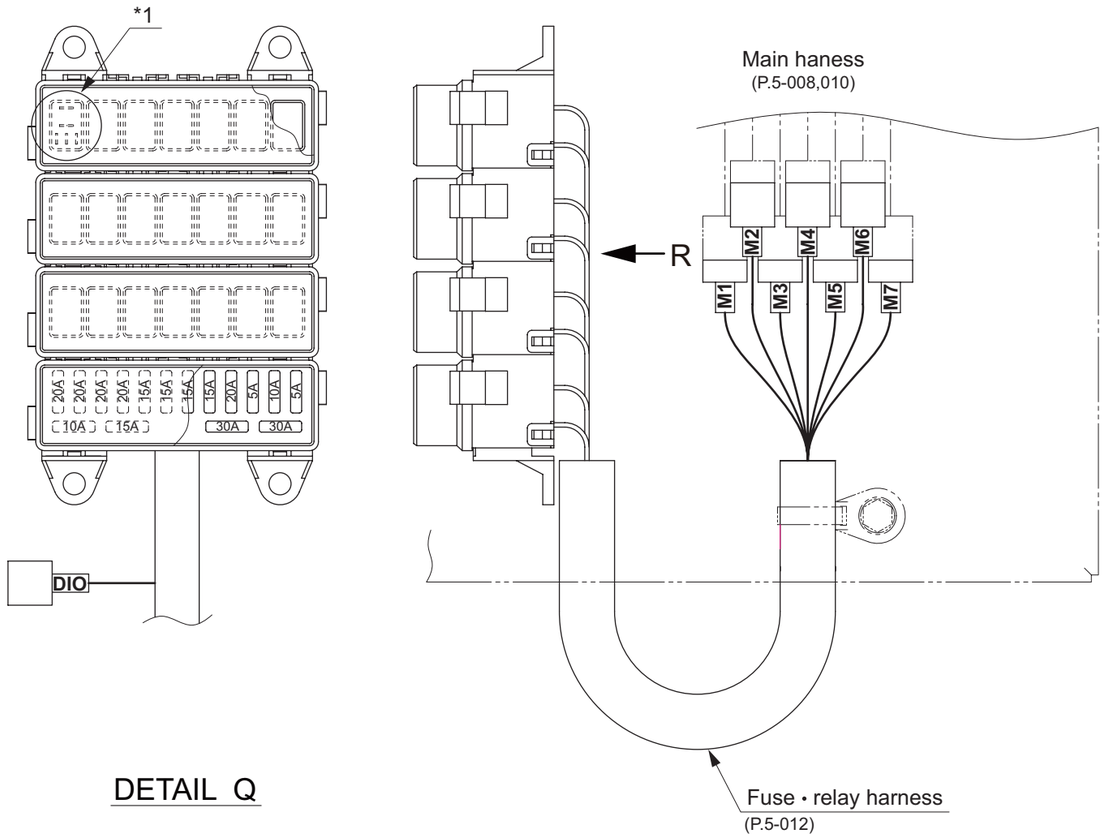
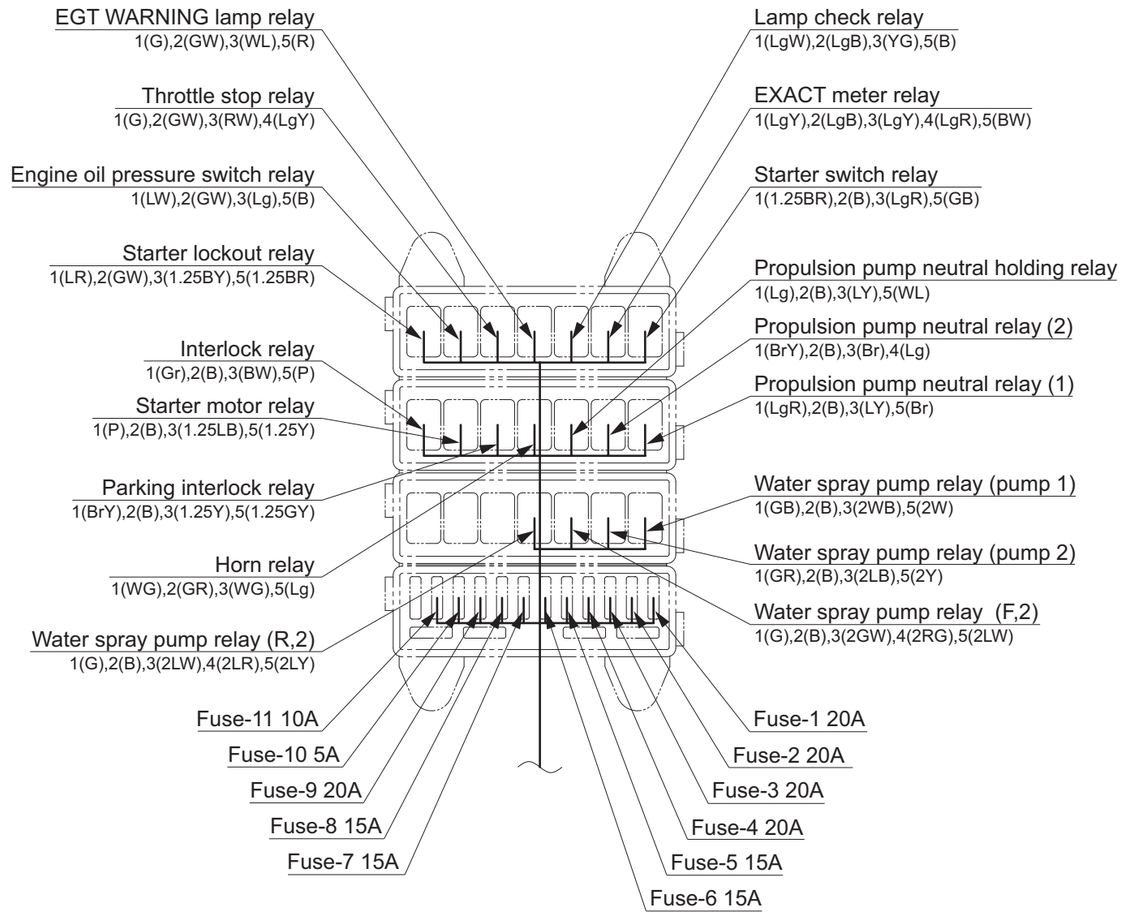
## 3-4. Wiring Harness Layout (3)




*1Relay connector




DETAIL Q




VIEW R

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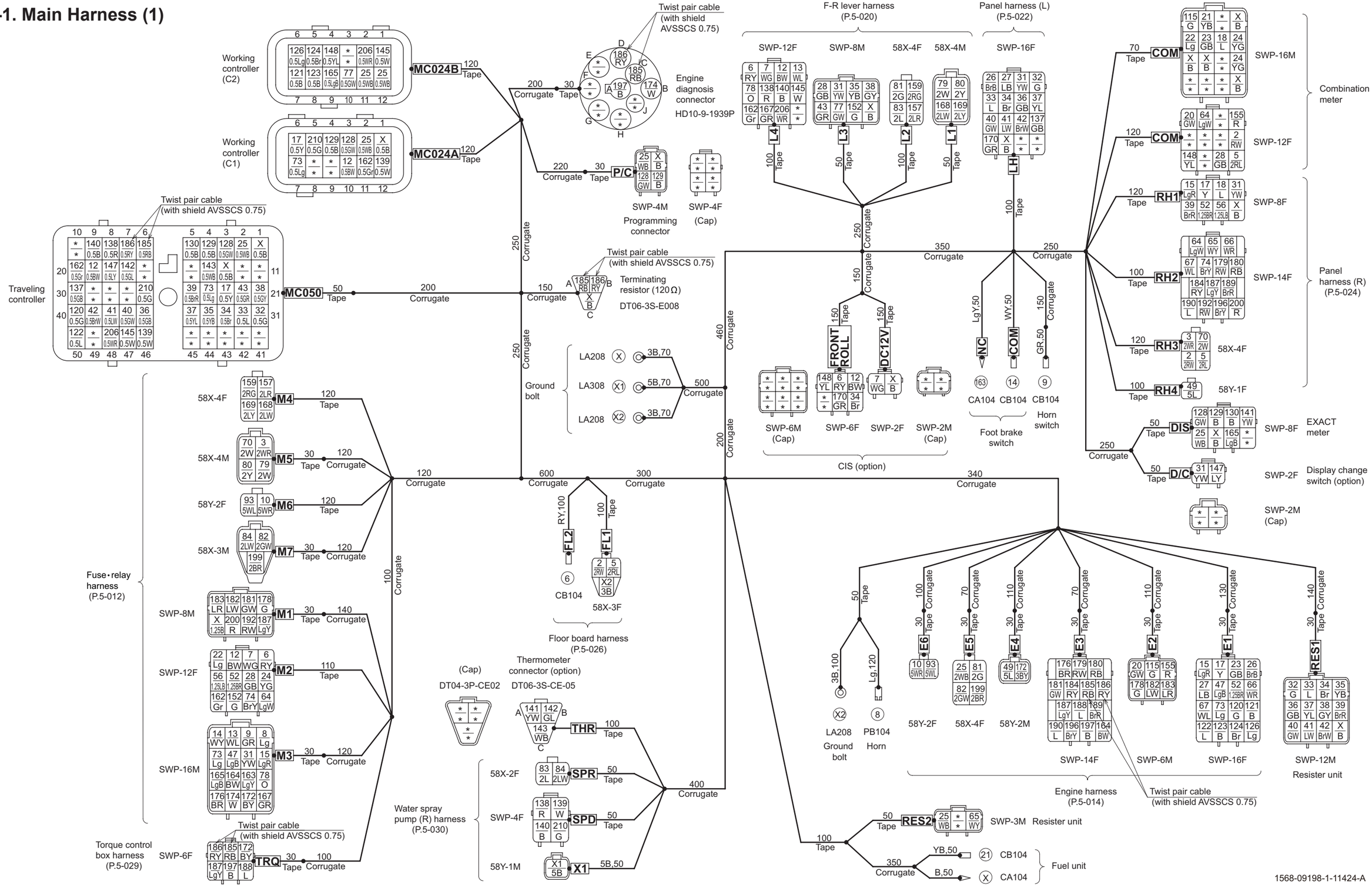
# 4. WIRING HARNESSES

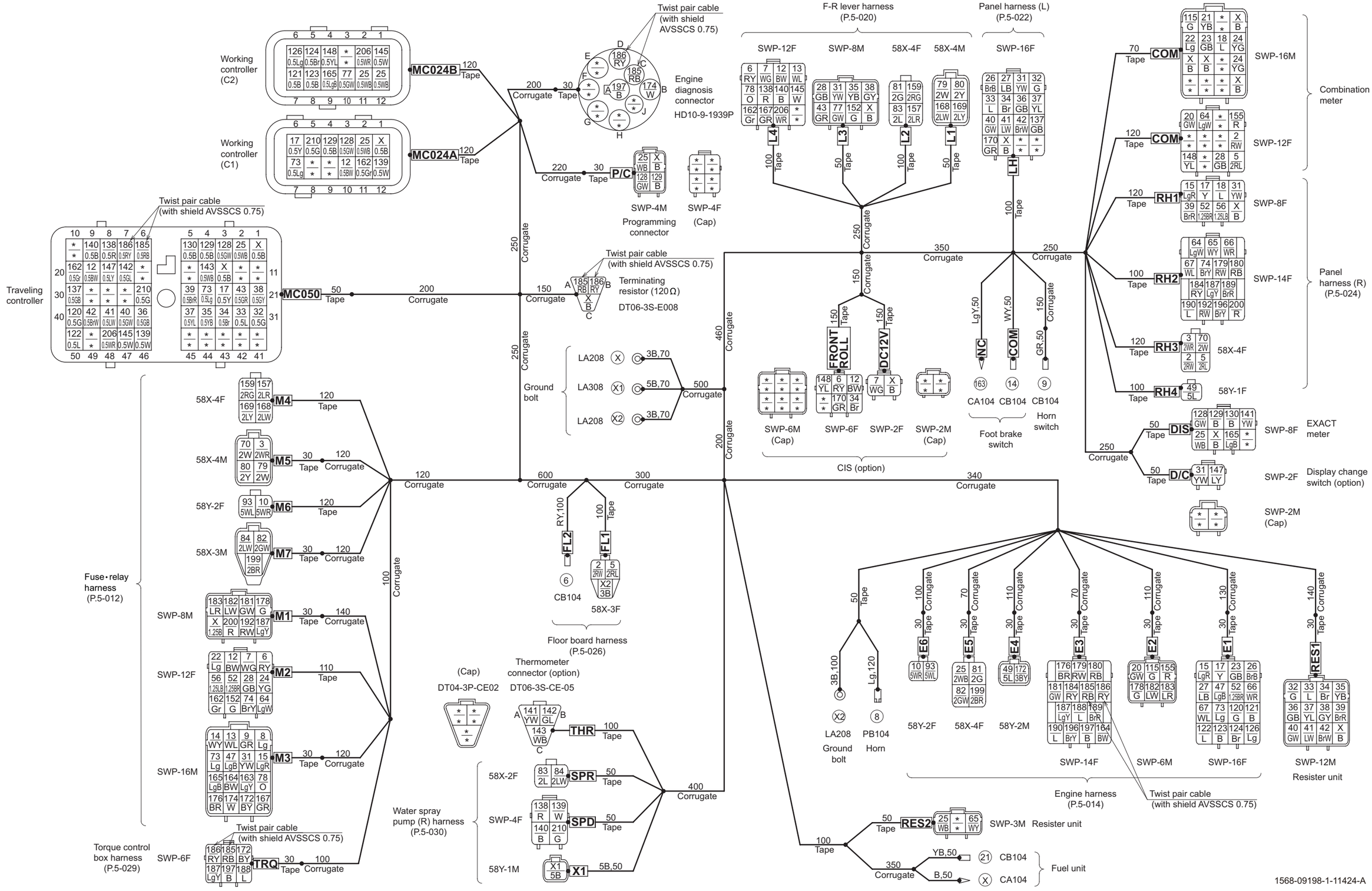
## 4-1. Main Harness (1)



| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| Ⓧ | B, 0.5B, 1.25B, 3B | 18 | **COM**-16M × 4, **DC12V**, **DIS**, **L3**, **LH**, **MC024A**, **MC050** × 2, **M1**, **P/C**, **RES1**, **RH1**, Fuel unit, Ground bolt, Terminating resistor (120Ω) |
| Ⓧ① | 5B | 2 | **X1**, Ground bolt |
| Ⓧ② | 3B | 3 | **FL1**, Ground bolt × 2 |
| ② | RW, 2RW | 3 | **COM**-12F, **FL1**, **RH3** |
| ③ | 2WR | 2 | **M5**, **RH3** |
| ⑤ | 2RL | 3 | **COM**-12F, **FL1**, **RH3** |
| ⑥ | RY | 4 | **FL2**, **FRONT ROLL**, **L4**, **M2** |
| ⑦ | WG | 3 | **DC12V**, **L4**, **M2** |
| ⑧ | Lg | 2 | **M3**, Horn |
| ⑨ | GR | 2 | **M3**, Horn switch |
| ⑩ | 5WR | 2 | **E6**, **M6** |
| ⑫ | BW, 0.5BW | 5 | **FRONT ROLL**, **L4**, **MC024A**, **MC050**, **M2** |
| ⑬ | WL | 2 | **L4**, **M3** |
| ⑭ | WY | 2 | **COM**, **M3** |
| ⑮ | LgR | 3 | **E1**, **M3**, **RH1** |
| ⑰ | Y, 0.5Y | 4 | **E1**, **MC024A**, **MC050**, **RH1** |
| ⑱ | L | 2 | **COM**-16M, **RH1** |
| ⑳ | GW | 2 | **COM**-12F, **E2** |
| ㉑ | YB | 2 | **COM**-16M, Fuel unit |
| ㉒ | Lg | 2 | **COM**-16M, **M2** |
| ㉓ | GB | 2 | **E1**, **COM**-16M |
| ㉔ | YG | 2 | **COM**-16M, **M2** |
| ㉕ | WB, 0.5WB, 2WB | 8 | **E5**, **DIS**, **MC024A**, **MC024B** × 2, **MC050**, **P/C**, **RES2** |
| ㉖ | BrB | 2 | **E1**, **LH** |
| ㉗ | LB | 2 | **E1**, **LH** |
| ㉘ | GB | 3 | **COM**-12F, **M2**, **L3** |
| ㉛ | YW | 5 | **D/C**, **L3**, **LH**, **M3**, **RH1** |
| ㉜ | G, 0.5G | 3 | **LH**, **MC050**, **RES1** |

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| ㉝ | L, 0.5L | 3 | **LH**, **MC050**, **RES1** |
| ㉞ | Br, 0.5Br | 4 | **FRONT ROLL**, **LH**, **MC050**, **RES1** |
| ㉟ | YB, 0.5YB | 3 | **L3**, **MC050**, **RES1** |
| ㊱ | GB, 0.5GB | 3 | **LH**, **MC050**, **RES1** |
| ㊲ | YL, 0.5YL | 3 | **LH**, **MC050**, **RES1** |
| ㊳ | GY, 0.5GY | 3 | **L3**, **MC050**, **RES1** |
| ㊴ | BrR, 0.5BrR | 3 | **MC050**, **RES1**, **RH1** |
| ㊵ | GW, 0.5GW | 3 | **LH**, **MC050**, **RES1** |
| ㊶ | LW, 0.5LW | 3 | **LH**, **MC050**, **RES1** |
| ㊷ | BrW, 0.5BrW | 3 | **LH**, **MC050**, **RES1** |
| ㊸ | GR, 0.5GR | 2 | **L3**, **MC050** |
| ㊼ | LgB | 2 | **E1**, **M3** |
| ㊾ | 5L | 2 | **E4**, **RH4** |
| ㊷ | 1.25BR | 3 | **E1**, **M2**, **RH1** |
| ㊻ | 1.25LB | 2 | **M2**, **RH1** |
| ㊹ | LgW | 3 | **COM**-12F, **M2**, **RH2** |
| ㊺ | WY | 2 | **RES2**, **RH2** |
| ㊻ | WR | 2 | **E1**, **RH2** |
| ㊼ | WL | 2 | **E1**, **RH2** |
| ㊿ | 2W | 2 | **M5**, **RH3** |
| ㋂ | Lg, 0.5Lg | 4 | **E1**, **M3**, **MC024A**, **MC050** |
| ㋃ | BrY | 2 | **M2**, **RH2** |
| ㋆ | GW, 0.5GW | 2 | **L3**, **MC024B** |
| ㋇ | O | 2 | **L4**, **M3** |
| ㋈ | 2W | 2 | **L1**, **M5** |
| ㋉ | 2Y | 2 | **L1**, **M5** |
| ㋊ | 2G | 2 | **E5**, **L2** |
| ㋋ | 2GW | 2 | **E5**, **M7** |
| ㋌ | 2L | 2 | **L2**, **SPR** |

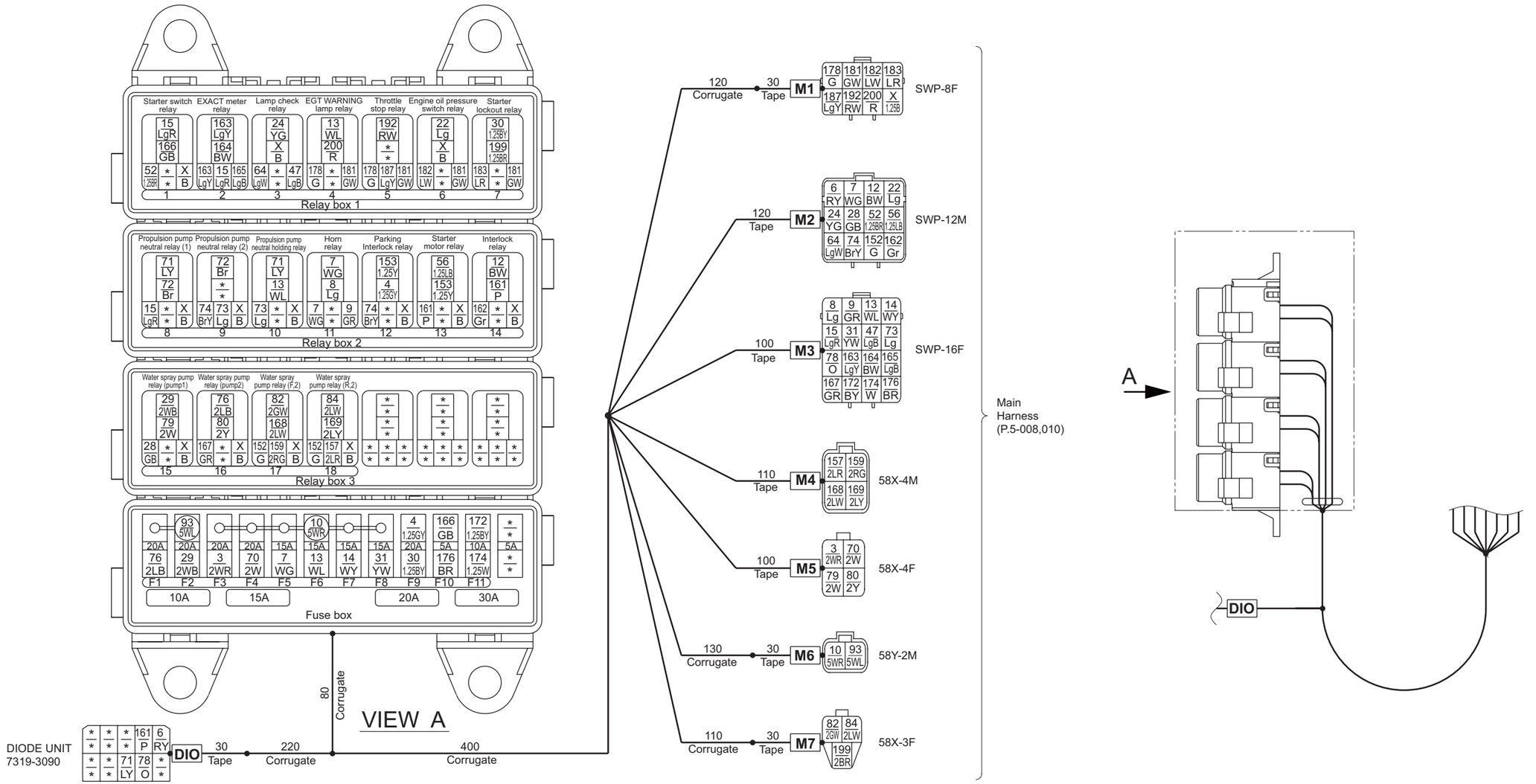
# 4-1. Main Harness (2)

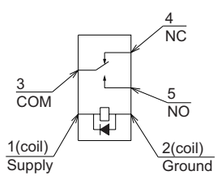


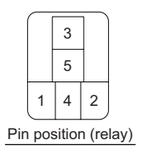
| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| ⑧④ | 2LW | 2 | M7, SPR |
| ⑨③ | 5WL | 2 | E6, M6 |
| ⑪⑤ | G | 2 | COM-16M, E2 |
| ⑫⓪ | G, 0.5G | 2 | E1, MC050 |
| ⑫① | B, 0.5B | 2 | E1, MC024B |
| ⑫② | L, 0.5L | 2 | E1, MC050 |
| ⑫③ | B, 0.5B | 2 | E1, MC024B |
| ⑫④ | Br, 0.5Br | 2 | E1, MC024B |
| ⑫⑥ | Lg, 0.5Lg | 2 | E1, MC024B |
| ⑫⑧ | GW, 0.5GW | 4 | DIS, MC024A, MC050, P/C |
| ⑫⑨ | B, 0.5B | 4 | DIS, MC024A, MC050, P/C |
| ⑬⓪ | B, 0.5B | 2 | DIS, MC050 |
| ⑬⑦ | GB, 0.5GB | 2 | LH, MC050 |
| ⑬⑧ | R, 0.5R | 3 | L4, MC050, SPD |
| ⑬⑨ | W, 0.5W | 3 | MC024A, MC050, SPD |
| ⑭⓪ | B, 0.5B | 3 | L4, MC050, SPD |
| ⑭① | YW | 2 | DIS, THR |
| ⑭② | GL, 0.5GL | 2 | MC050, THR |
| ⑭③ | WB, 0.5WB | 2 | MC050, THR |
| ⑭⑤ | W, 0.5W | 3 | L4, MC024B, MC050 |
| ⑭⑦ | LY, 0.5LY | 2 | D/C, MC050 |
| ⑭⑧ | YL, 0.5YL | 3 | COM-12F, FRONT ROLL, MC024B |
| ⑮② | G | 2 | L3, M2 |
| ⑮⑤ | R | 2 | COM-12F, E2 |
| ⑮⑦ | 2LR | 2 | L2, M4 |
| ⑮⑨ | 2RG | 2 | L2, M4 |
| ⑯② | Gr, 0.5Gr | 4 | L4, M2, MC024A, MC050 |
| ⑯③ | LgY | 2 | M3, NC |
| ⑯④ | BW | 2 | E3, M3 |

| NO. | SIZE, COLOR | | CONTACT POINTS | CONNECTION |
|---|---|---|---|---|
| ⑯⑤ | LgB, 0.5LgB | | 3 | DIS, M3, MC024B |
| ⑯⑦ | GR | | 2 | L4, M3 |
| ⑯⑧ | 2LW | | 2 | L1, M4 |
| ⑯⑨ | 2LY | | 2 | L1, M4 |
| ⑰⓪ | GR | | 2 | FRONT ROLL, LH |
| ⑰② | BY, 3BY | | 3 | E4, M3, TRQ |
| ⑰④ | W | | 2 | M3, Engine diagnosis connector |
| ⑰⑥ | BR | | 2 | E3, M3 |
| ⑰⑧ | G | | 2 | E2, M1 |
| ⑰⑨ | RW | | 2 | E3, RH2 |
| ⑱⓪ | RB | | 2 | E3, RH2 |
| ⑱① | GW | | 2 | E3, M1 |
| ⑱② | LW | | 2 | E2, M1 |
| ⑱③ | LR | | 2 | E2, M1 |
| ⑱④ | RY | | 2 | E3, RH2 |
| ⑱⑤ | RB, 0.5RB | Twist pair cable (with shield AVSSCS 0.75) | 5 | E3, MC050, TRQ, Engine diagnosis connector, Terminating resistor (120Ω) |
| ⑱⑥ | RY, 0.5RY | | 5 | E3, MC050, TRQ, Engine diagnosis connector, Terminating resistor (120Ω) |
| ⑱⑦ | LgY | | 3 | E3, M1, RH2 |
| ⑱⑧ | L | | 2 | E3, TRQ |
| ⑱⑨ | BrR | | 2 | E3, RH2 |
| ⑲⓪ | L | | 2 | E3, RH2 |
| ⑲② | RW | | 2 | M1, RH2 |
| ⑲⑥ | BrY | | 2 | E3, RH2 |
| ⑲⑦ | B | | 3 | E3, TRQ, Engine diagnosis connector |
| ⑲⑨ | 2BR | | 2 | E5, M7 |
| ⑳⓪ | R | | 2 | M1, RH2 |
| ⑳⑥ | WR, 0.5WR | | 3 | L4, MC024B, MC050 |
| ②①⓪ | G, 0.5G | | 3 | MC024A, MC050, SPD |

# 4-2. Fuse • Relay Harness

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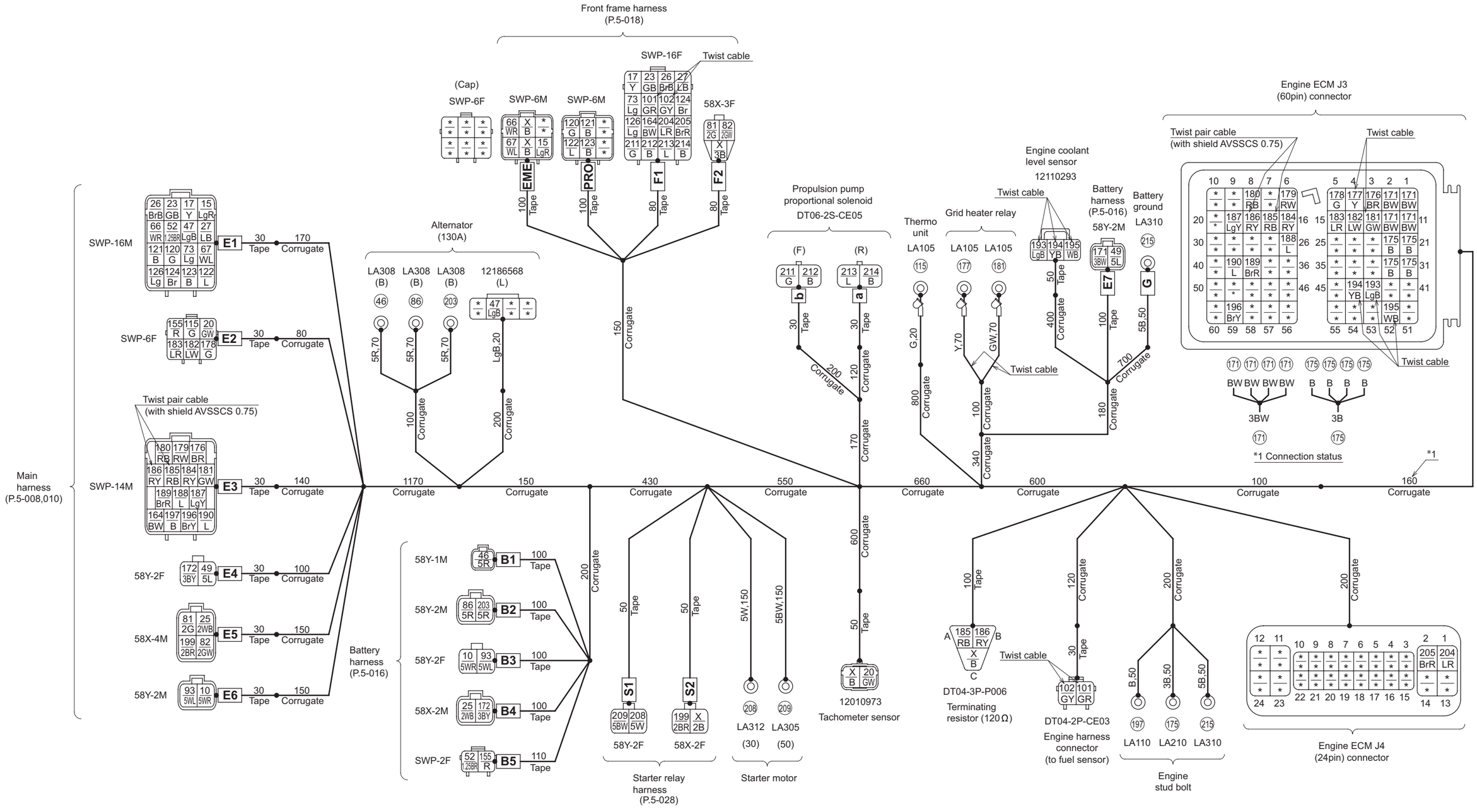
| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| Ⓧ | B,1.25B | 14 | M1, Relay box 1-1-2, 1-3-5, 1-6-5, 2-8-2, 2-9-2, 2-10-2, 2-12-2, 2-13-2, 2-14-2, 3-15-2, 3-16-2, 3-17-2, 3-18-2 |
| ③ | 2WR | 2 | M5, Fuse box-F3 |
| ④ | 1.25GY | 2 | Fuse box-F9, Relay box 2-12-5 |
| ⑥ | RY | 2 | DIO, M2 |
| ⑦ | WG | 4 | M2, Fuse box-F5, Relay box 2-11-1, 2-11-3 |
| ⑧ | Lg | 2 | M3, Relay box 2-11-5 |
| ⑨ | GR | 2 | M3, Relay box 2-11-2 |
| ⑩ | 5WR | 2 | M6, Fuse box-F6 |
| ⑫ | BW | 2 | M2, Relay box 2-14-3 |
| ⑬ | WL | 4 | M3, Fuse box-F6, Relay box 1-4-3, 2-10-5 |
| ⑭ | WY | 2 | M3, Fuse box-F7 |
| ⑮ | LgR | 4 | M3, Relay box 1-1-3, 1-2-4, 2-8-1 |
| ㉒ | Lg | 2 | M2, Relay box 1-6-3 |
| ㉔ | YG | 2 | M2, Relay box 1-3-3 |
| ㉘ | GB | 2 | M2, Relay box 3-15-1 |
| ㉙ | 2WB | 2 | Fuse box-F2, Relay box 3-15-3 |
| ㉚ | 1.25BY | 2 | Fuse box-F9, Relay box 1-7-3 |
| ㉛ | YW | 2 | M3, Fuse box-F8 |
| ㊼ | LgB | 2 | M3, Relay box 1-3-2 |
| ㊷ | 1.25BR | 2 | M2, Relay box 1-1-1 |
| ㊻ | 1.25LB | 2 | M2, Relay box 2-13-3 |
| ㊹ | LgW | 2 | M2, Relay box 1-3-1 |
| ㊿ | 2W | 2 | M5, Fuse box-F4 |
| ㉑ | LY | 3 | DIO, Relay box 2-8-3, 2-10-3 |
| ㉒ | Br | 2 | Relay box 2-8-5, 2-9-3 |
| ㉓ | Lg | 3 | M3, Relay box 2-9-4, 2-10-1 |
| ㉔ | BrY | 3 | M2, Relay box 2-9-1, 2-12-1 |
| ㉖ | 2LB | 2 | Fuse box-F1, Relay box 3-16-3 |
| ㉘ | O | 2 | DIO, M3 |

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| ㊾ | 2W | 2 | M5, Relay box 3-15-5 |
| ㊿ | 2Y | 2 | M5, Relay box 3-16-5 |
| (82) | 2GW | 2 | M7, Relay box 3-17-3 |
| (84) | 2LW | 2 | M7, Relay box 3-18-3 |
| (93) | 5WL | 2 | M6, Fuse box-F2 |
| (152) | G | 3 | M2, Relay box 3-17-1, 3-18-1 |
| (153) | 1.25Y | 2 | Relay box 2-12-3, 2-13-5 |
| (157) | 2LR | 2 | M4, Relay box 3-18-4 |
| (159) | 2RG | 2 | M4, Relay box 3-17-4 |
| (161) | P | 3 | DIO, Relay box 2-13-1, 2-14-5 |
| (162) | Gr | 2 | M2, Relay box 2-14-1 |
| (163) | LgY | 3 | M3, Relay box 1-2-1, 1-2-3 |
| (164) | BW | 2 | M3, Relay box 1-2-5 |
| (165) | LgB | 2 | M3, Relay box 1-2-2 |
| (166) | GB | 2 | Fuse box-F10, Relay box 1-1-5 |
| (167) | GR | 2 | M3, Relay box 3-16-1 |
| (168) | 2LW | 2 | M4, Relay box 3-17-5 |
| (169) | 2LY | 2 | M4, Relay box 3-18-5 |
| (172) | BY, 1.25BY | 2 | M3, Fuse box-F11 |
| (174) | W, 1.25W | 2 | M3, Fuse box-F11 |
| (176) | BR | 2 | M3, Fuse box-F10 |
| (178) | G | 3 | M1, Relay box 1-4-1, 1-5-1 |
| (181) | GW | 5 | M1, Relay box 1-4-2, 1-5-2, 1-6-2, 1-7-2 |
| (182) | LW | 2 | M1, Relay box 1-6-1 |
| (183) | LR | 2 | M1, Relay box 1-7-1 |
| (187) | LgY | 2 | M1, Relay box 1-5-4 |
| (192) | RW | 2 | M1, Relay box 1-5-3 |
| (199) | 1.25BR, 2BR | 2 | M7, Relay box 1-7-5 |
| (200) | R | 2 | M1, Relay box 1-4-5 |

# 4-3. Engine Harness

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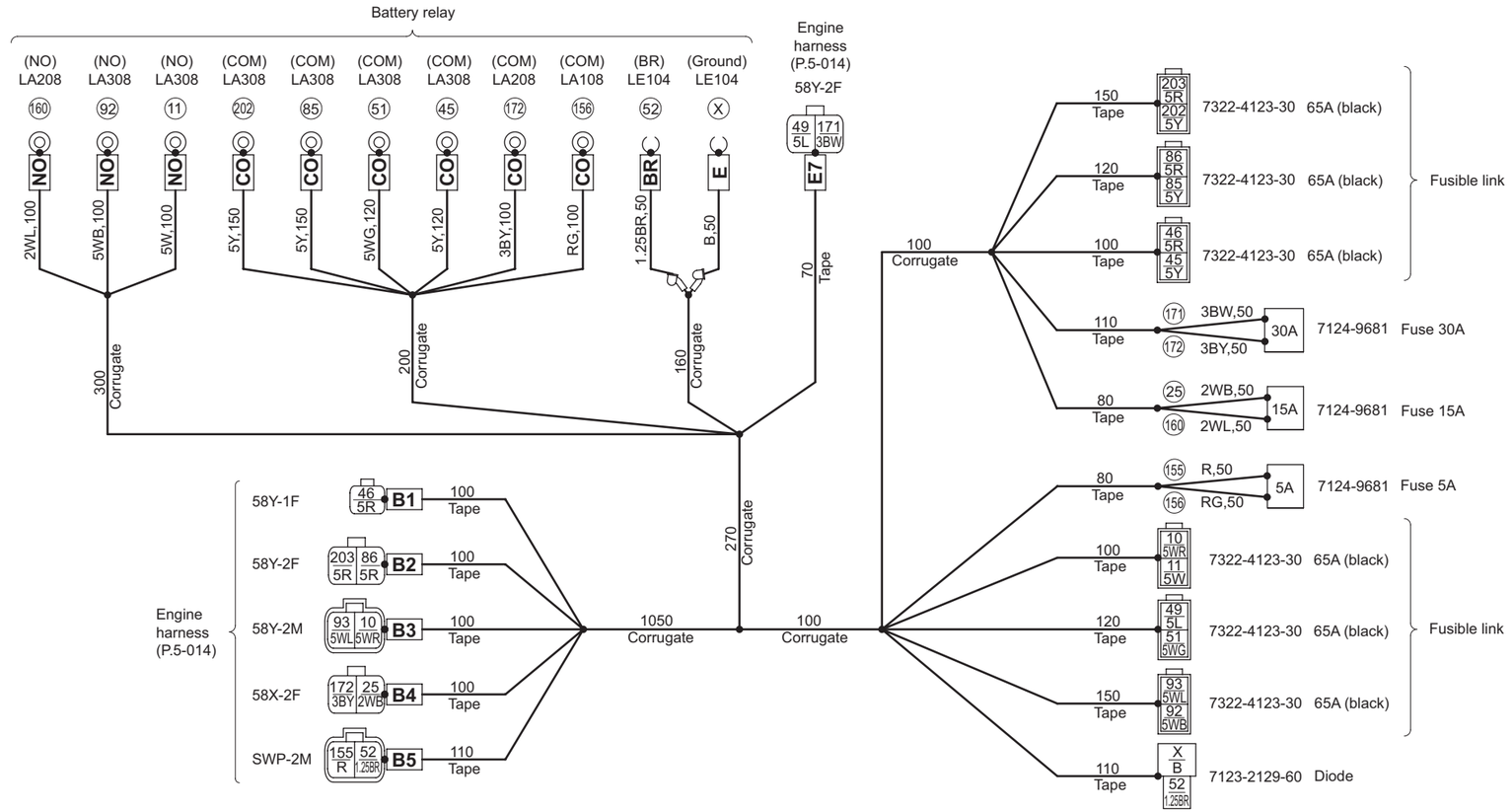
| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| Ⓧ | B, 2B, 3B | 6 | **EME** × 2, **F2**, **S2**, Tachometer sensor, Terminating resistor (120Ω) |
| ⑩ | 5WR | 2 | **B3**, **E6** |
| ⑮ | LgR | 2 | **E1**, **EME** |
| ⑰ | Y | 2 | **E1**, **F1** |
| ⑳ | GW | 2 | **E2**, Tachometer sensor |
| ㉓ | GB | 2 | **E1**, **F1** |
| ㉕ | 2WB | 2 | **B4**, **E5** |
| ㉖ | BrB | 2 | **E1**, **F1** |
| ㉗ | LB | 2 | **E1**, **F1** |
| ㊻ | 5R | 2 | **B1**, Alternator-B |
| ㊼ | LgB | 2 | **E1**, Alternator-L |
| ㊾ | 5L | 2 | **E4**, **E7** |
| ㊷ | 1.25BR | 2 | **B5**, **E1** |
| ㊻ | WR | 2 | **E1**, **EME** |
| ㊼ | WL | 2 | **E1**, **EME** |
| ㊸ | Lg | 2 | **E1**, **F1** |
| ㊶ | 2G | 2 | **E5**, **F2** |
| ㊷ | 2GW | 2 | **E5**, **F2** |
| ㊻ | 5R | 2 | **B2**, Alternator-B |
| ㊸ | 5WL | 2 | **B3**, **E6** |
| ㉑ | GR (Twist cable) | 2 | **F1**, Engine harness connector |
| ㉒ | GY (Twist cable) | 2 | **F1**, Engine harness connector |
| ㉕ | G | 2 | **E2**, Thermo unit |
| ㉚ | G | 2 | **E1**, **PRO** |
| ㉛ | B | 2 | **E1**, **PRO** |
| ㉜ | L | 2 | **E1**, **PRO** |
| ㉝ | B | 2 | **E1**, **PRO** |
| ㉞ | Br | 2 | **E1**, **F1** |
| ㉖ | Lg | 2 | **E1**, **F1** |
| ㉟ | R | 2 | **B5**, **E2** |
| ㊴ | BW | 2 | **E3**, **F1** |
| ㉛ | BW, 3BW | 5 | **E7**, Engine ECM J3 (60pin) connector-1, 2, 11, 12 |
| ㉜ | 3BY | 2 | **B4**, **E4** |

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| ㉕ | B, 3B | 5 | Engine ECM J3 (60pin) connector-21, 22, 31, 32, Engine stud bolt |
| ㉖ | BR | 2 | **E3**, Engine ECM J3 (60pin) connector-3 |
| ㉗ | Y (Twist cable) | 2 | Engine ECM J3 (60pin) connector-4, Grid heater relay |
| ㉘ | G | 2 | **E2**, Engine ECM J3 (60pin) connector-5 |
| ㉙ | RW | 2 | **E3**, Engine ECM J3 (60pin) connector-6 |
| ㉚ | RB | 2 | **E3**, Engine ECM J3 (60pin) connector-8 |
| ㉛ | GW (Twist cable) | 3 | **E3**, Engine ECM J3 (60pin) connector-13, Grid heater relay |
| ㉜ | LW | 2 | **E2**, Engine ECM J3 (60pin) connector-14 |
| ㉝ | LR | 2 | **E2**, Engine ECM J3 (60pin) connector-15 |
| ㉞ | RY | 2 | **E3**, Engine ECM J3 (60pin) connector-16 |
| ㉟ | RB (Twist pair cable (with shield AVSSCS 0.75)) | 3 | **E3**, Engine ECM J3 (60pin) connector-17, Terminating resistor (120Ω) |
| ㊱ | RY (Twist pair cable (with shield AVSSCS 0.75)) | 3 | **E3**, Engine ECM J3 (60pin) connector-18, Terminating resistor (120Ω) |
| ㊲ | LgY | 2 | **E3**, Engine ECM J3 (60pin) connector-19 |
| ㊳ | L | 2 | **E3**, Engine ECM J3 (60pin) connector-26 |
| ㊴ | BrR | 2 | **E3**, Engine ECM J3 (60pin) connector-38 |
| ㊵ | L | 2 | **E3**, Engine ECM J3 (60pin) connector-39 |
| ㊸ | LgB (Twist cable) | 2 | Engine coolant sensor, Engine ECM J3 (60pin) connector-43 |
| ㊹ | YB (Twist cable) | 2 | Engine coolant sensor, Engine ECM J3 (60pin) connector-44 |
| ㊺ | WB (Twist cable) | 2 | Engine coolant sensor, Engine ECM J3 (60pin) connector-52 |
| ㊻ | BrY | 2 | **E3**, Engine ECM J3 (60pin) connector-59 |
| ㊼ | B | 2 | **E3**, Engine stud bolt |
| ㊾ | 2BR | 2 | **E5**, **S2** |
| ㋂ | 5R | 2 | **B2**, Alternator-B |
| ㋃ | LR | 2 | **F1**, Engine ECM J4 (24pin) connector-1 |
| ㋄ | BrR | 2 | **F1**, Engine ECM J4 (24pin) connector-2 |
| ㋇ | 5W | 2 | **S1**, Starter motor-30 |
| ㋈ | 5BW | 2 | **S1**, Starter motor-50 |
| ㋊ | G | 2 | **b**, **F1** |
| ㋋ | B | 2 | **b**, **F1** |
| ㋌ | L | 2 | **a**, **F1** |
| ㋍ | B | 2 | **a**, **F1** |
| ㋎ | 5B | 2 | **G**, Engine stud bolt |

# 4-4. Battery Harness

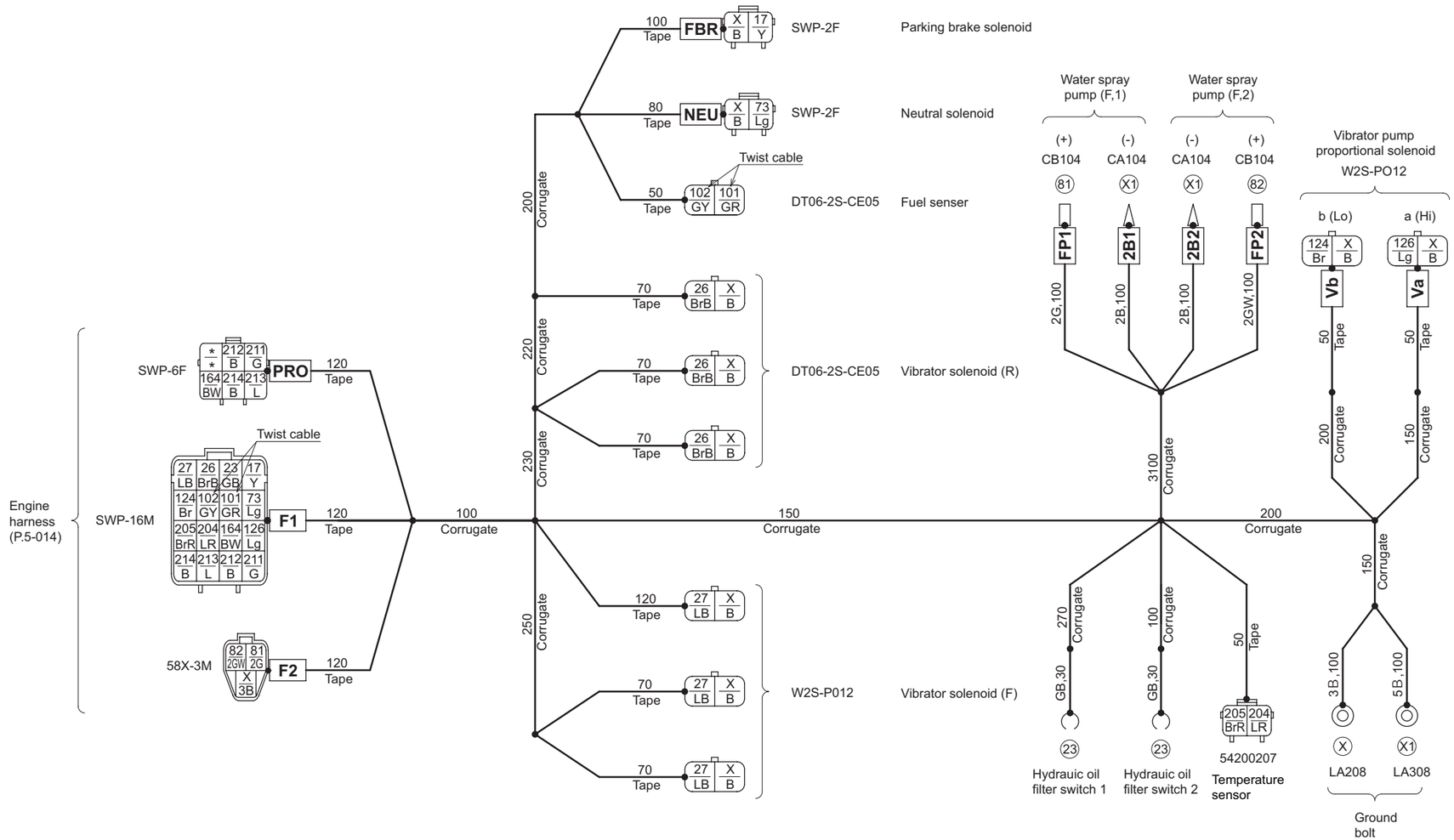



1568-09195-0-21407-0

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| Ⓧ | B | 2 | **E**, Diode |
| ⑩ | 5WR | 2 | **B3**, Fusible link 65A |
| ⑪ | 5W | 2 | **NO**, Fusible link 65A |
| ㉕ | 2WB | 2 | **B4**, Fuse 15A |
| ㊺ | 5Y | 2 | **CO**, Fusible link 65A |
| ㊻ | 5R | 2 | **B1**, Fusible link 65A |
| ㊾ | 5L | 2 | **E7**, Fusible link 65A |
| ㊿ | 5WG | 2 | **CO**, Fusible link 65A |
| (52) | 1.25BR | 3 | **B5**, **BR**, Diode |
| (85) | 5Y | 2 | **CO**, Fusible link 65A |

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| (86) | 5R | 2 | **B2**, Fusible link 65A |
| (92) | 5WB | 2 | **NO**, Fusible link 65A |
| (93) | 5WL | 2 | **B3**, Fusible link 65A |
| (155) | R | 2 | **B5**, Fuse 5A |
| (156) | RG | 2 | **CO**, Fuse 5A |
| (160) | 2WL | 2 | **NO**, Fuse 15A |
| (171) | 3BW | 2 | **E7**, Fuse 30A |
| (172) | 3BY | 3 | **B4**, **CO**, Fuse 30A |
| (202) | 5Y | 2 | **CO**, Fusible link 65A |
| (203) | 5R | 2 | **B2**, Fusible link 65A |

# 4-5. Front Frame Harness

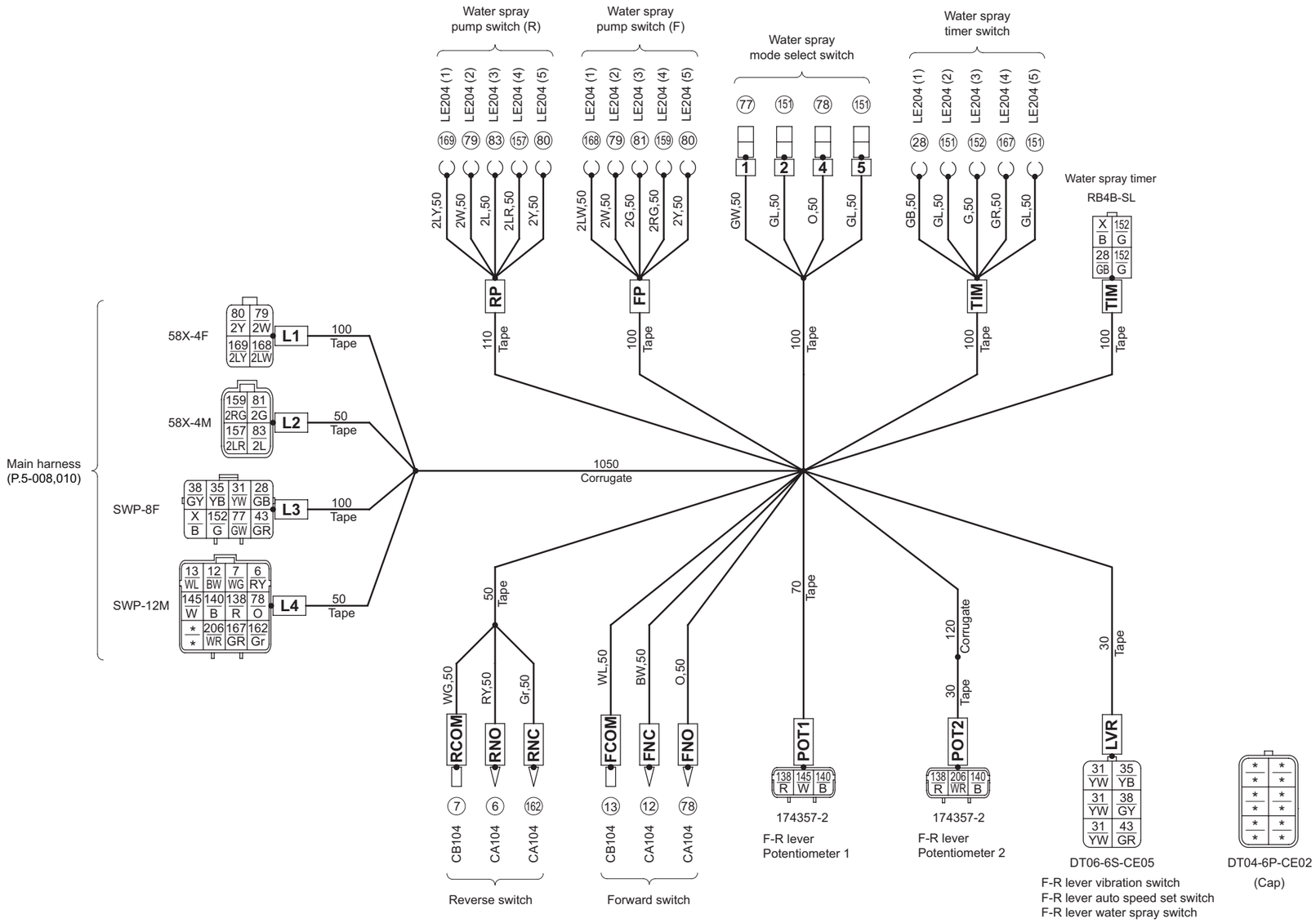



1568-09189-0-11385-0

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| Ⓧ | B, 3B | 12 | **F2**, **FBR**, **NEU**, **Va**, **Vb**, Ground bolt, Vibrator solenoid (F) × 3, Vibrator solenoid (R) × 3 |
| Ⓧ1 | 2B, 5B | 3 | **2B1**, **2B2**, Ground bolt |
| ⑰ | Y | 2 | **F1**, **FBR** |
| ㉓ | GB | 3 | **F1**, Hydraulic oil filter-1, -2 |
| ㉖ | BrB | 4 | **F1**, Vibrator solenoid (R) × 3 |
| ㉗ | LB | 4 | **F1**, Vibrator solenoid (F) × 3 |
| ㉝ | Lg | 2 | **F1**, **NEU** |
| ㉛ | 2G | 2 | **F2**, **FP1** |
| ㉜ | 2GW | 2 | **F2**, **FP2** |

| NO. | SIZE, COLOR | | CONTACT POINTS | CONNECTION |
|---|---|---|---|---|
| ⑩① | GR | Twist cable | 2 | **F1**, Fuel sensor |
| ⑩② | GY | | 2 | **F1**, Fuel sensor |
| ⑫④ | Br | | 2 | **F1**, **Vb** |
| ⑫⑥ | Lg | | 2 | **F1**, **Va** |
| ⑯④ | BW | | 2 | **F1**, **PRO** |
| ⑳④ | LR | | 2 | **F1**, Temperature sensor |
| ⑳⑤ | BrR | | 2 | **F1**, Temperature sensor |
| ㉑① | G | | 2 | **F1**, **PRO** |
| ㉑② | B | | 2 | **F1**, **PRO** |
| ㉑③ | L | | 2 | **F1**, **PRO** |
| ㉑④ | B | | 2 | **F1**, **PRO** |

# 4-6. F-R Lever Harness

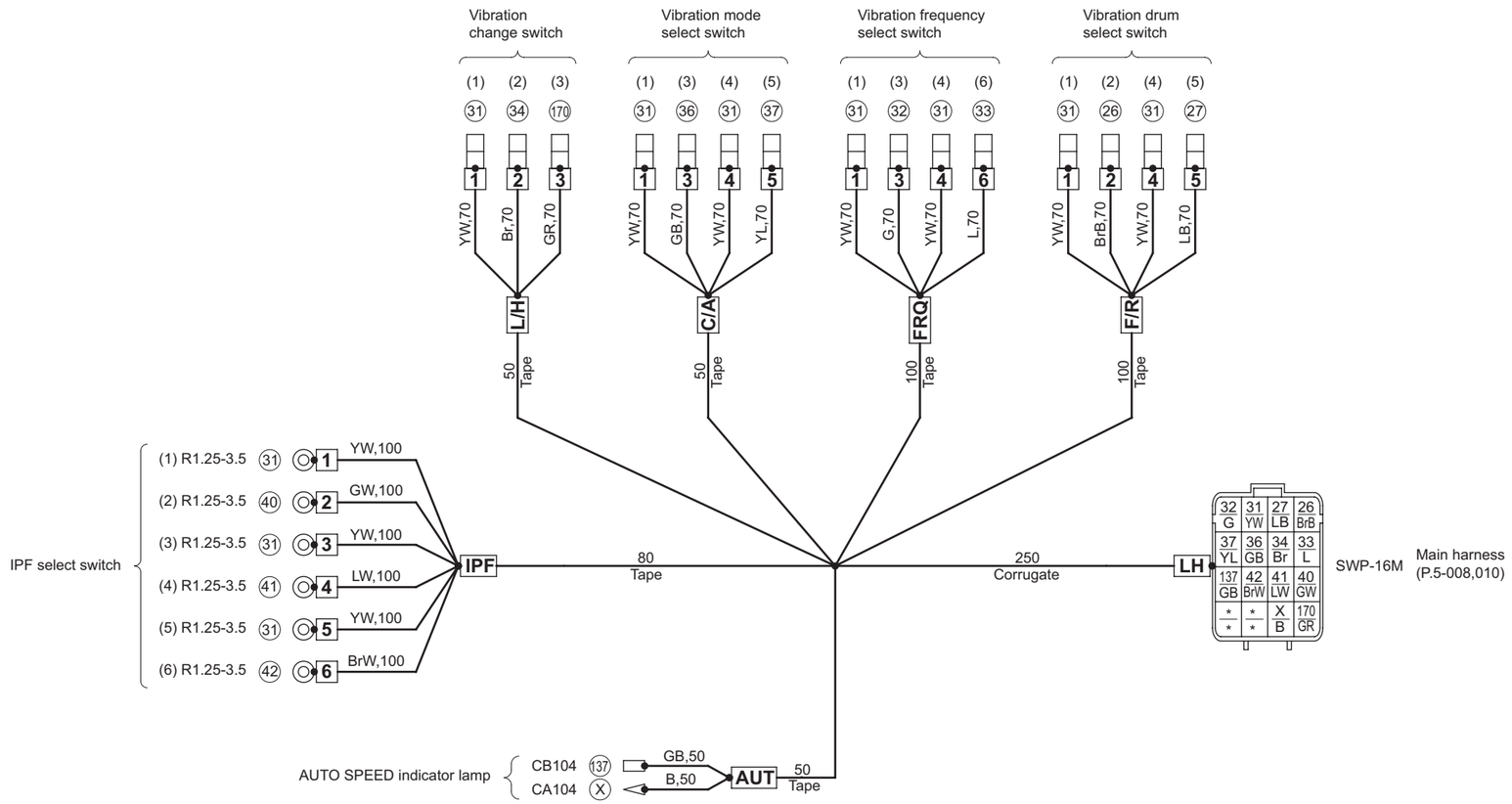



1568-09192-0-11392-0

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| Ⓧ | B | 2 | L3, TIM |
| ⑥ | RY | 2 | L4, RNO |
| ⑦ | WG | 2 | L4, RCOM |
| ⑫ | BW | 2 | FNC, L4 |
| ⑬ | WL | 2 | FCOM, L4 |
| ㉘ | GB | 3 | L3, TIM × 2 |
| ㉛ | YW | 4 | L3, LVR × 3 |
| ㉟ | YB | 2 | L3, LVR |
| ㊳ | GY | 2 | L3, LVR |
| ㊸ | GR | 2 | L3, LVR |
| ㊼ | GW | 2 | 1, L3 |
| ㊽ | O | 3 | 4, FNO, L4 |
| ㊾ | 2W | 3 | FP, L1, RP |
| ㊿ | 2Y | 3 | FP, L1, RP |

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| (81) | 2G | 2 | FP, L2 |
| (83) | 2L | 2 | L2, RP |
| (138) | R | 3 | L4, POT1, POT2 |
| (140) | B | 3 | L4, POT1, POT2 |
| (145) | W | 2 | L4, POT1 |
| (151) | GL | 4 | 2, 5, TIM × 2 |
| (152) | G | 4 | L3, TIM × 3 |
| (157) | 2LR | 2 | L2, RP |
| (159) | 2RG | 2 | FP, L2 |
| (162) | Gr | 2 | L4, RNC |
| (167) | GR | 2 | L4, TIM |
| (168) | 2LW | 2 | FP, L1 |
| (169) | 2LY | 2 | L1, RP |
| (206) | WR | 2 | L4, POT2 |

# 4-7. Panel Harness (L)

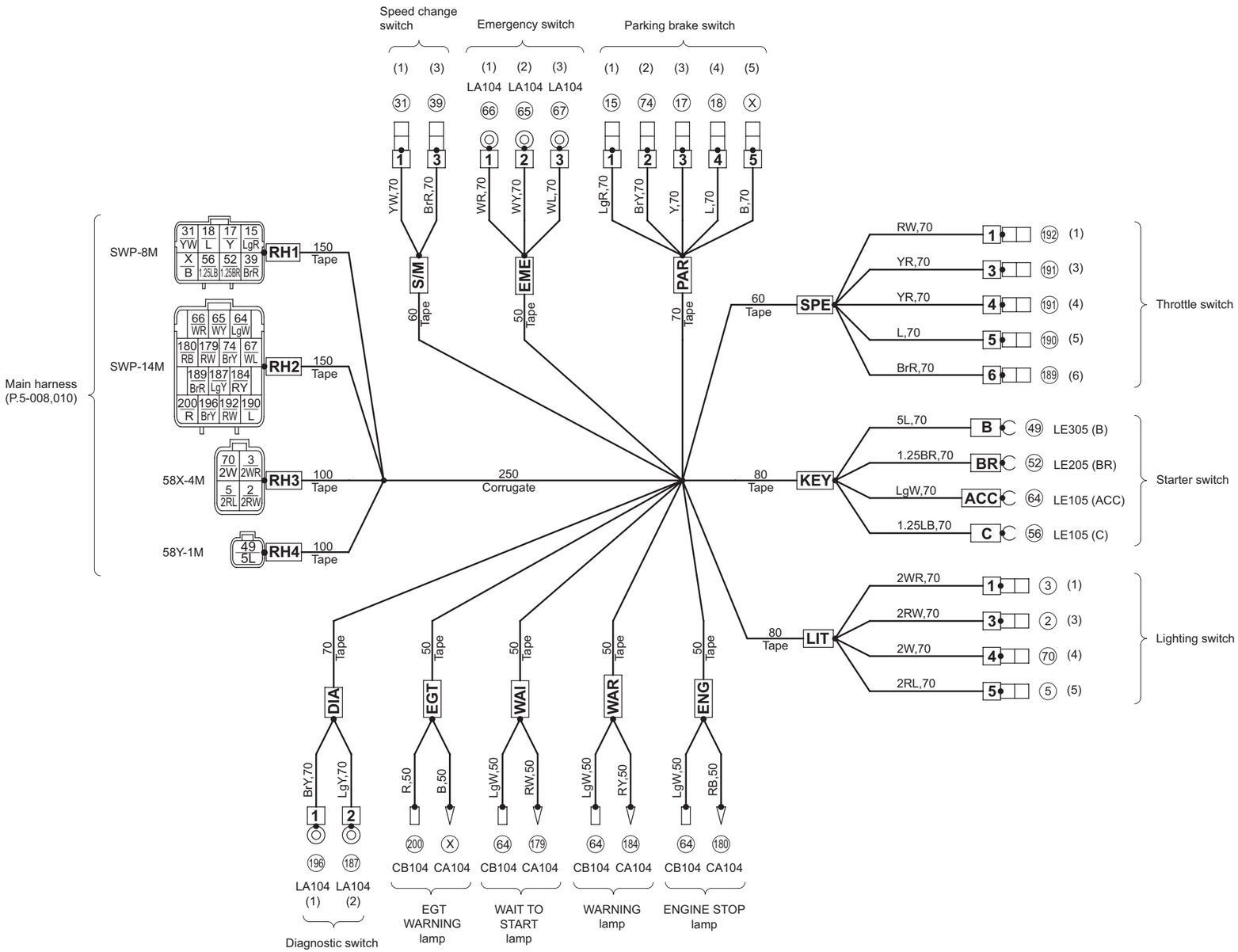



1568-09190-0-21386-0

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| Ⓧ | B | 2 | AUT, LH |
| ㉖ | BrB | 2 | F/R-2, LH |
| ㉗ | LB | 2 | F/R-5, LH |
| ㉛ | YW | 11 | C/A-1, -4, FRQ-1, -4, F/R-1, -4, IPF-1, -3, -5, LH, L/H-1 |
| ㉜ | G | 2 | FRQ-3, LH |
| ㉝ | L | 2 | FRQ-6, LH |
| ㉞ | Br | 2 | LH, L/H-2 |

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| ㊱ | GB | 2 | C/A-3, LH |
| ㊲ | YL | 2 | C/A-5, LH |
| ㊵ | GW | 2 | IPF-2, LH |
| ㊶ | LW | 2 | IPF-4, LH |
| ㊷ | BrW | 2 | IPF-6, LH |
| ㉗ | GB | 2 | AUT, LH |
| ㉚ | GR | 2 | LH, L/H-3 |

# 4-8. Panel Harness (R)

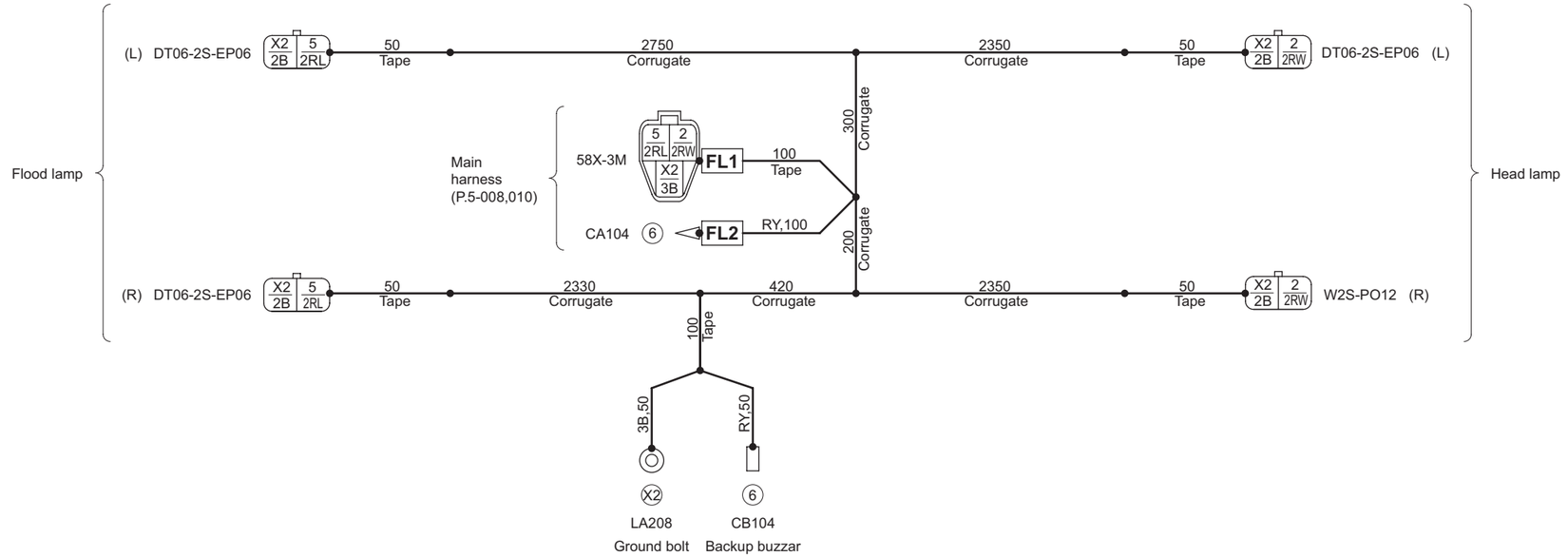



1568-09197-0-11417-0

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| Ⓧ | B | 3 | EGT, PAR-5, RH1 |
| ② | 2RW | 2 | LIT-3, RH3 |
| ③ | 2WR | 2 | LIT-1, RH3 |
| ⑤ | 2RL | 2 | LIT-5, RH3 |
| ⑮ | LgR | 2 | PAR-1, RH1 |
| ⑰ | Y | 2 | PAR-3, RH1 |
| ⑱ | L | 2 | PAR-4, RH1 |
| ㉛ | YW | 2 | RH1, S/M-1 |
| ㉟ | BrR | 2 | RH1, S/M-3 |
| ㊾ | 5L | 2 | KEY-B, RH4 |
| ㊷ | 1.25BR | 2 | KEY-BR, RH1 |
| ㊻ | 1.25LB | 2 | KEY-C, RH1 |
| ㊹ | LgW | 5 | ENG, KEY-ACC, RH2, WAI, WAR |
| ㊺ | WY | 2 | EME-2, RH2 |

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| ㊻ | WR | 2 | EME-1, RH2 |
| ㊼ | WL | 2 | EME-3, RH2 |
| ㊿ | 2W | 2 | LIT-4, RH3 |
| ㊹ | BrY | 2 | PAR-2, RH2 |
| ㉙ | RW | 2 | RH2, WAI |
| ㉚ | RB | 2 | ENG, RH2 |
| ㉞ | RY | 2 | RH2, WAR |
| ㉗ | LgY | 2 | DIA-2, RH2 |
| ㉙ | BrR | 2 | RH2, SPE-6 |
| ㉚ | L | 2 | RH2, SPE-5 |
| ㉛ | YR | 2 | SPE-3, -4 |
| ㉜ | RW | 2 | RH2, SPE-1 |
| ㉖ | BrY | 2 | DIA-1, RH2 |
| ㉀ | R | 2 | EGT, RH2 |

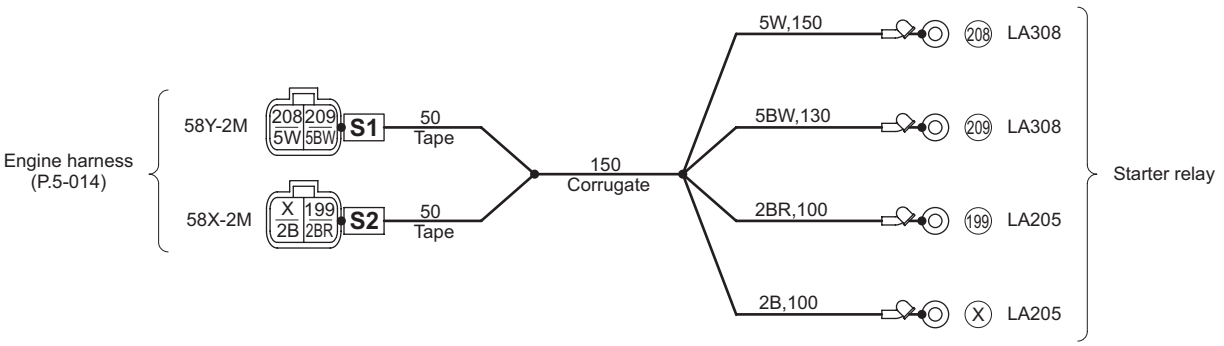
# 4-9. Floor Bord Harness




1568-09193-0-21395-0

| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| ⓧ② | 2B, 3B | 6 | **FL1**, Flood lamp (L), (R), Ground bolt, Head lamp (L), (R) |
| ② | 2RW | 3 | **FL1**, Head lamp (L), (R) |
| ⑤ | 2RL | 3 | **FL1**, Flood lamp (L), (R) |
| ⑥ | RY | 2 | **FL2**, Backup buzzer |

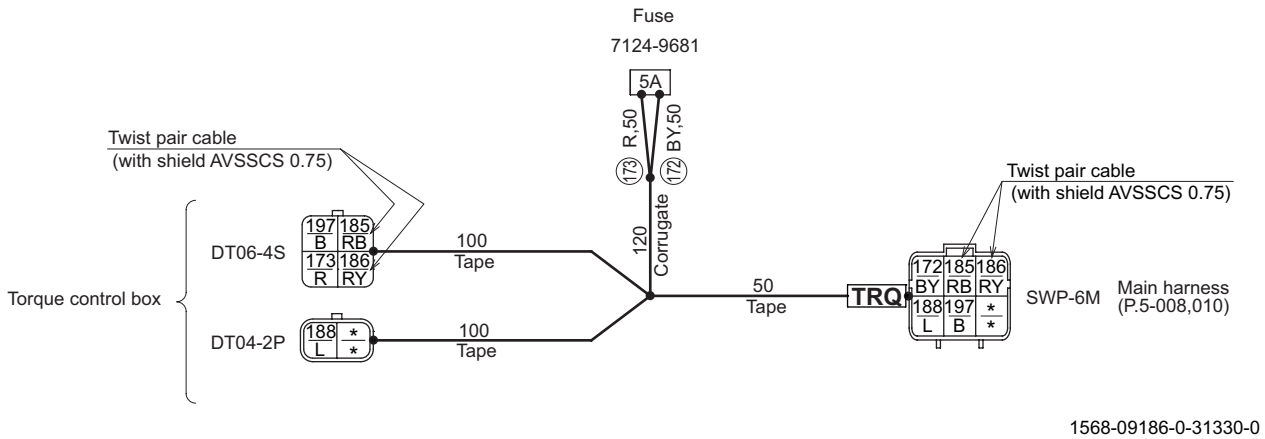
# 4-10. Starter Relay Harness




1568-09196-0-31409-0

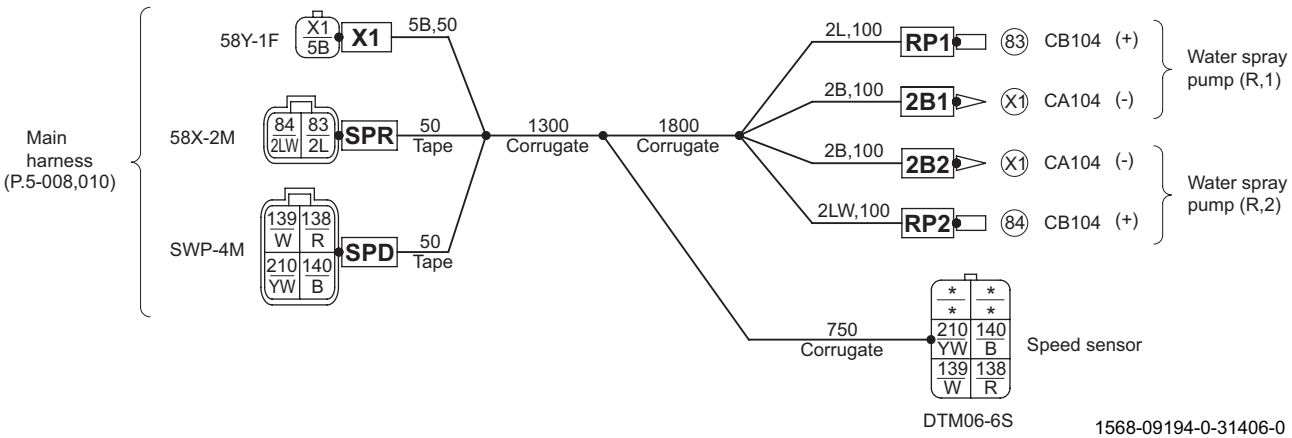
| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| Ⓧ | 2B | 2 | **S2**, Starter relay |
| ⑲⑨ | 2BR | 2 | **S2**, Starter relay |
| ②⓪⑧ | 5W | 2 | **S1**, Starter relay |
| ②⓪⑨ | 5BW | 2 | **S1**, Starter relay |

# 4-11. Torque Control Box Harness




| NO. | SIZE, COLOR | | CONTACT POINTS | CONNECTION |
|---|---|---|---|---|
| ⑫ | BY | | 2 | **TRQ**, Fuse 5A |
| ⑬ | R | | 2 | Fuse 5A, Torque control box |
| ⑮ | RB | Twist pair cable (with shield AVSSCS 0.75) | 2 | **TRQ**, Torque control box |
| ⑯ | RY | | 2 | **TRQ**, Torque control box |
| ⑱ | L | | 2 | **TRQ**, Torque control box |
| ⑲ | B | | 2 | **TRQ**, Torque control box |

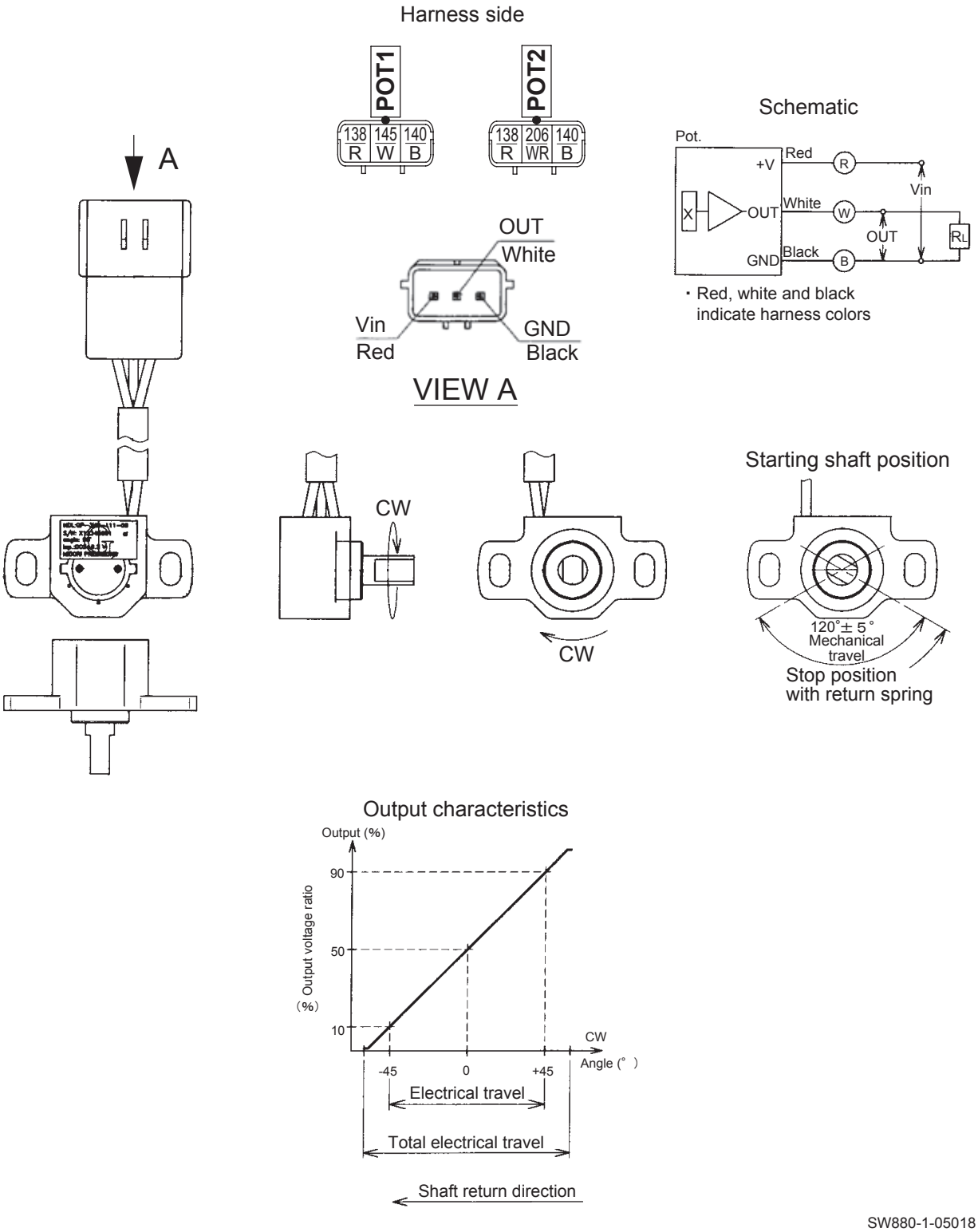
# 4-12. Water Spray Pump (R) Harness




| NO. | SIZE, COLOR | CONTACT POINTS | CONNECTION |
|---|---|---|---|
| X1 | 2B, 5B | 3 | **2B1**, **2B2**, **X1** |
| 83 | 2L | 2 | **RP1**, **SPR** |
| 84 | 2LW | 2 | **RP2**, **SPR** |
| 138 | R | 2 | **SPR**, Speed sensor |
| 139 | W | 2 | **SPR**, Speed sensor |
| 140 | B | 2 | **SPR**, Speed sensor |
| 210 | YW | 2 | **SPR**, Speed sensor |

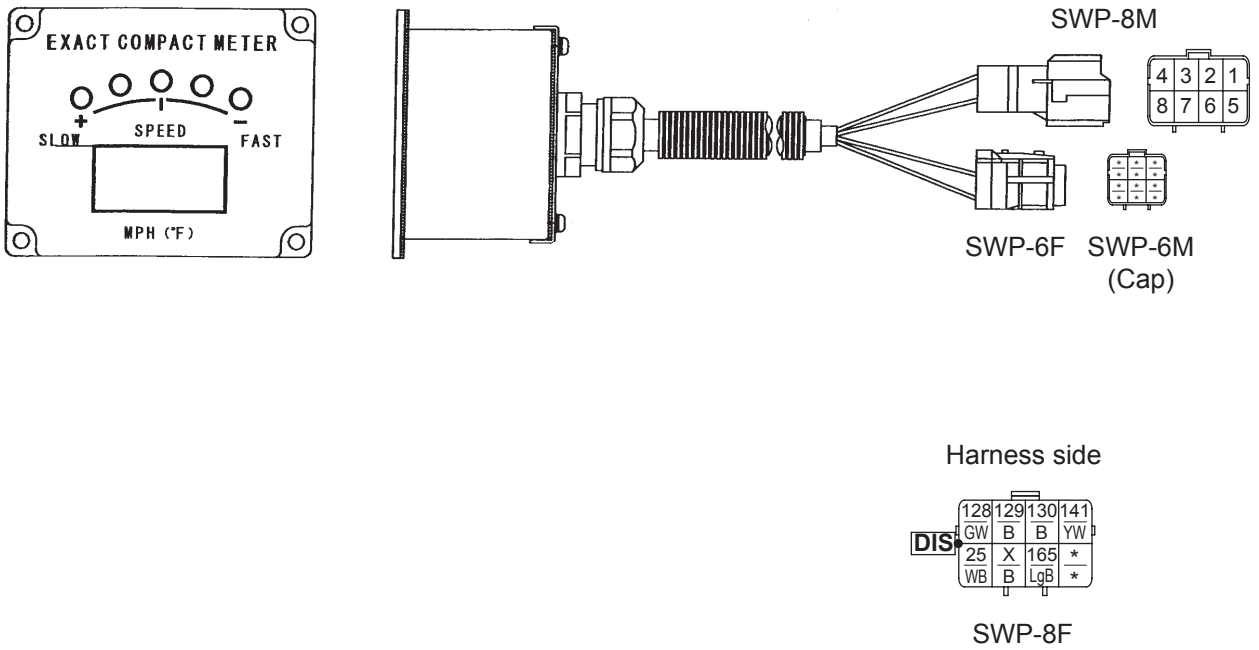
# 5. ELECTRICAL COMPONENT SPECIFICATIONS

## 5-1. Potentiometer



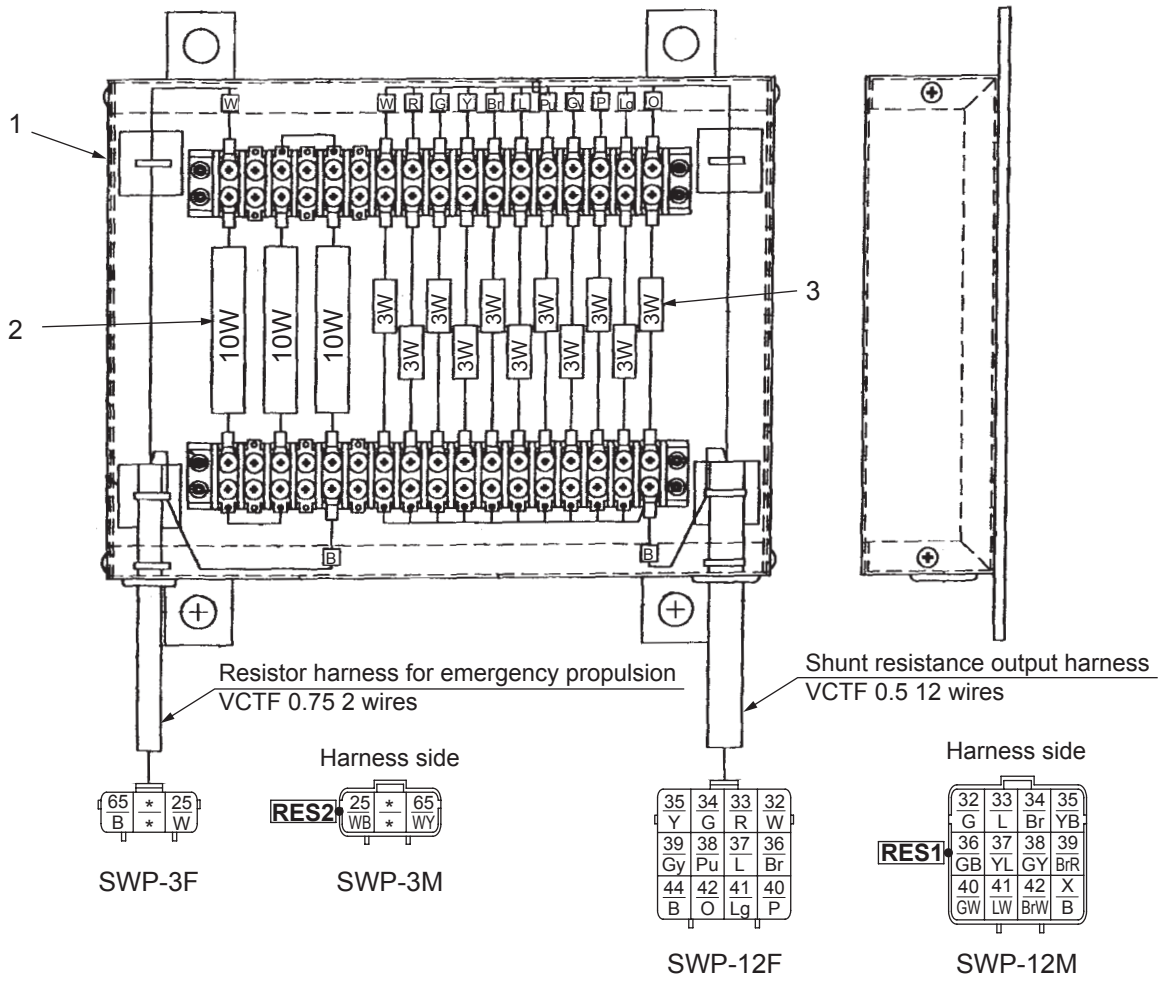

SW880-1-05018

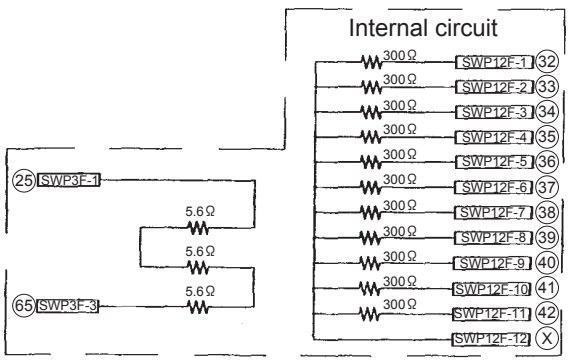
# 5-2. Exact Meter




| Pin NO. | Wire NO. | Function |
|---|---|---|
| 1 | ⑫⑧ | CAN + |
| 2 | ⑫⑨ | CAN - |
| 3 | ⑬⓪ | CAN GND |
| 4 | ⑭① | +12 V OUT |
| 5 | ㉕ | +12 V |
| 6 | Ⓧ | GND |
| 7 | ⑯⑤ | Exact meter relay |
| 8 | — | — |

# 5-3. Resistor Unit

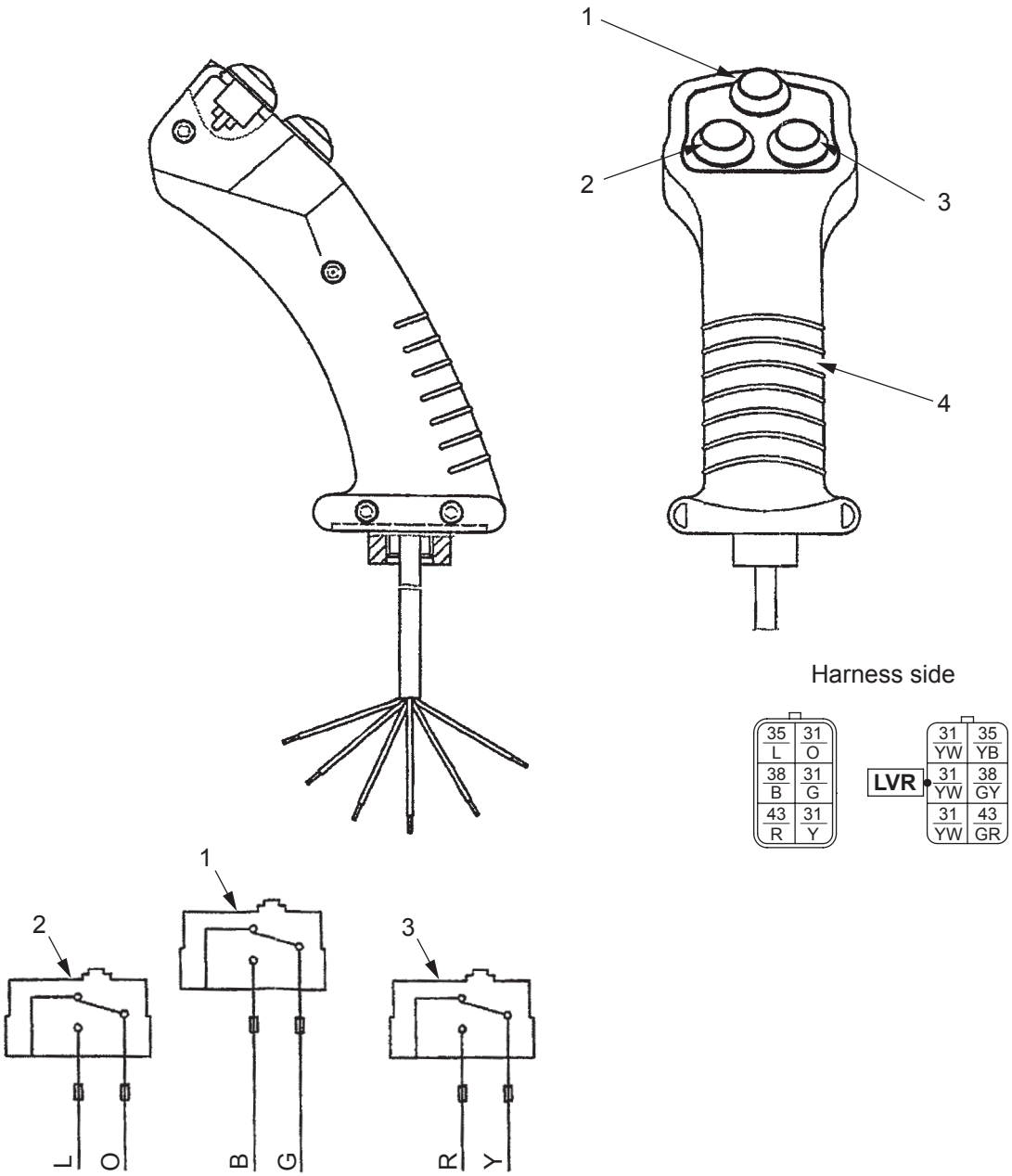



SW880-1-05015

(1) Case
(2) Cement resistor : 5.6 Ω 10 W
(3) Resistor : 300 Ω 3 W

# 5-4. Lever Switch

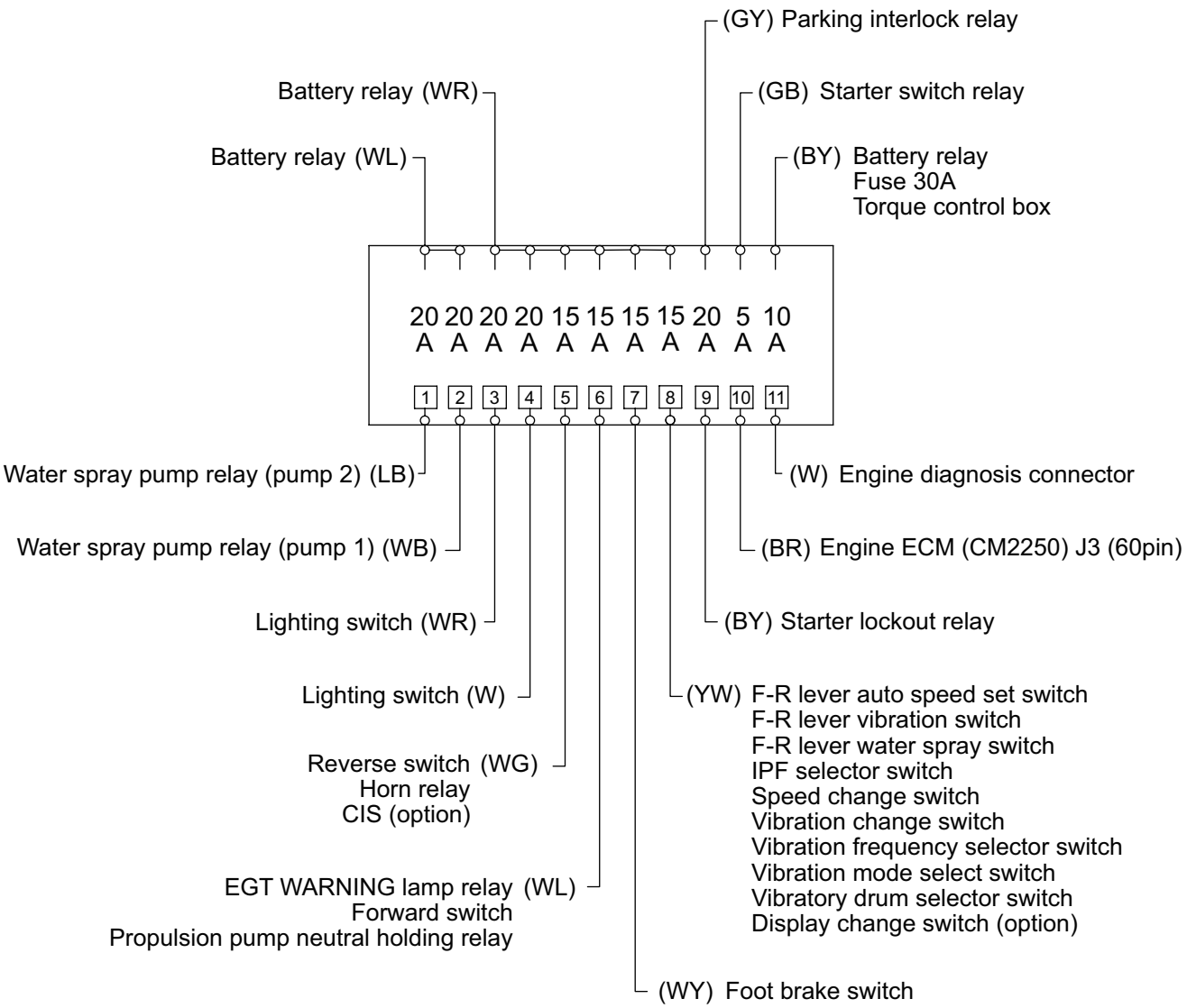



Electrical circuit

SW880-1-05019

(1) F-R lever auto speed set switch (White)
(2) F-R lever vibration switch (Green)
(3) F-R lever water spray switch (Blue)
(4) Handle

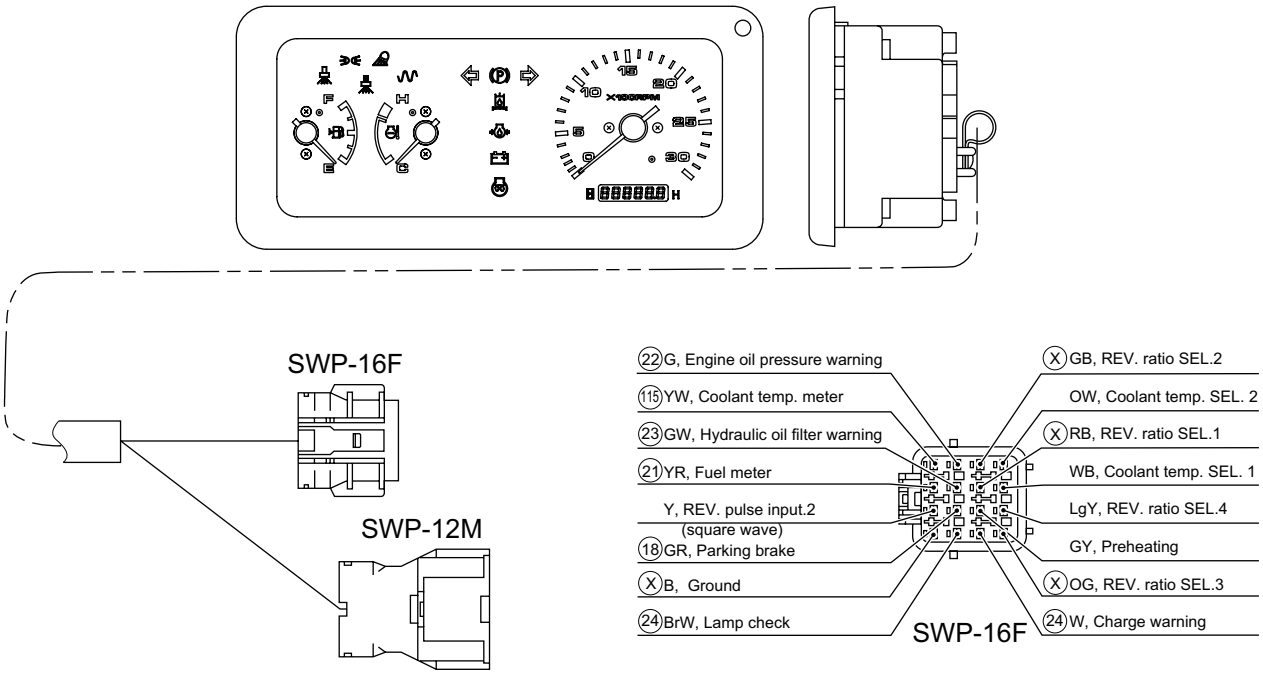
## 5-5. Fuse Box

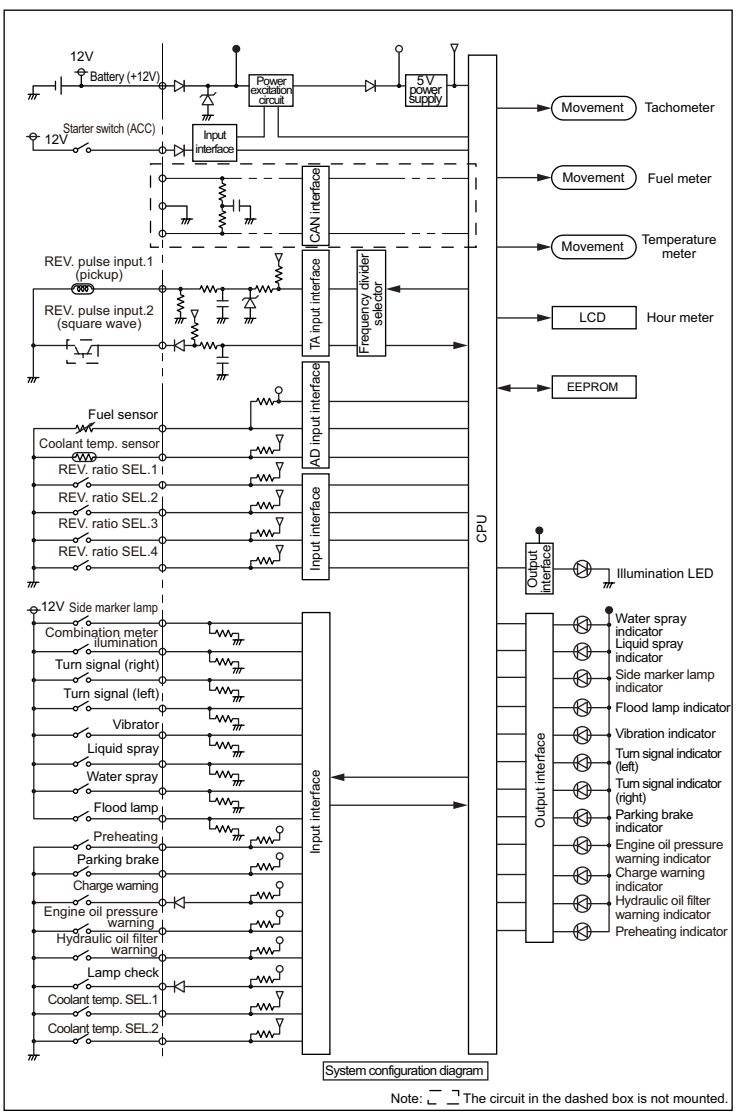



Harness color codes

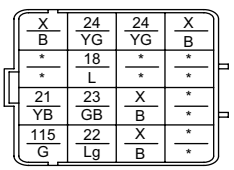
| | | | |
|---|---|---|---|
| BY | : Black/Yellow stripe | WY | : White/Yellow stripe |
| BR | : Black/Red stripe | WG | : White/Green stripe |
| W | : White | GY | : Green/Yellow stripe |
| WR | : White/Red stripe | GB | : Green/Black stripe |
| WB | : White/Black stripe | YW | : Yellow/White stripe |
| WL | : White/Blue stripe | LB | : Blue/Black stripe |

# 5-6. Combination Meter

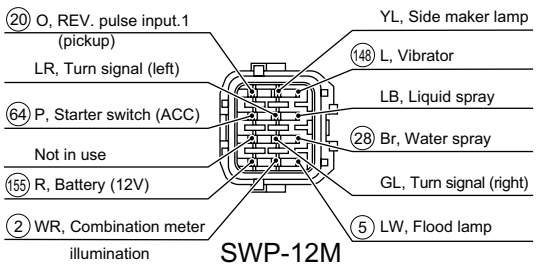


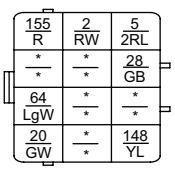

Harness side




SWP-16M




Harness side




SWP-12F

SW880-1-05016

# VIBRATORY DRUM

# 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 cotter pins, and lock plates with new parts.
- Properly bend split cotter 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.

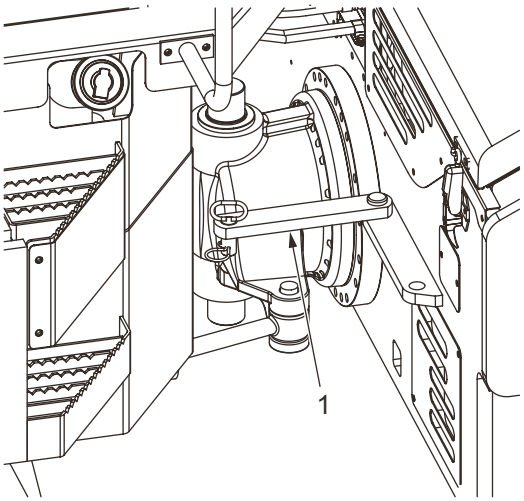
# 2. REMOVAL AND INSTALLATION OF VIBRATORY DRUM

## 2-1. Removal of Vibratory Drum

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

   Water spray tank : 600 L×2 (159 gal.×2)

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

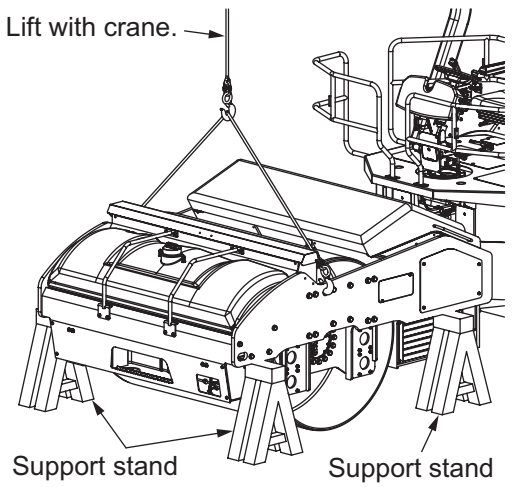


SW880-06001

**⚠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.**

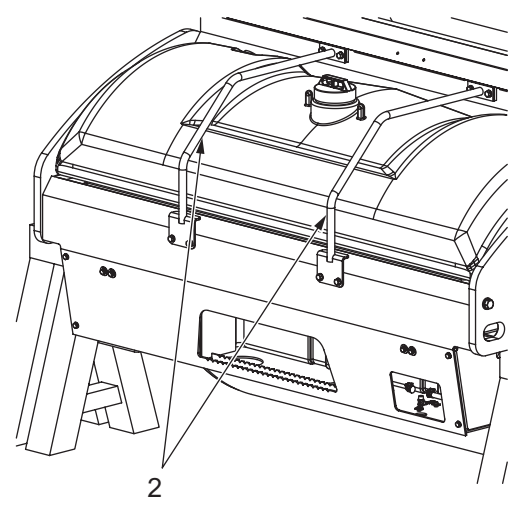
3) Lift the frames with a crane.
   • With the drum lifted a little off the ground, place support stands under both sides of each frame to hold the vehicle body in place. (The front and rear frames are structurally identical.)



SW880-06002

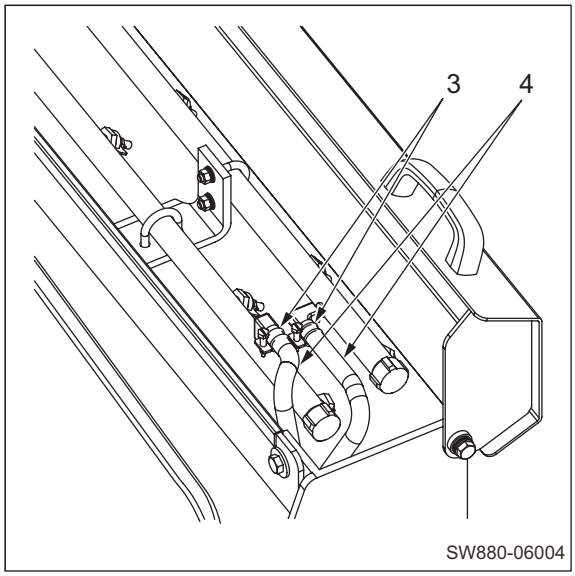
| kg | Front frame | Rear frame |
|---|---|---|
| SW880-1 : | 6,340 kg (13,975 lbs.) | 6,530 kg (14,395 lbs.) |
| SW990-1 : | 6,520 kg (14,375 lbs.) | 6,730 kg (14,835 lbs.) |

4) Remove the guard pipes (2).

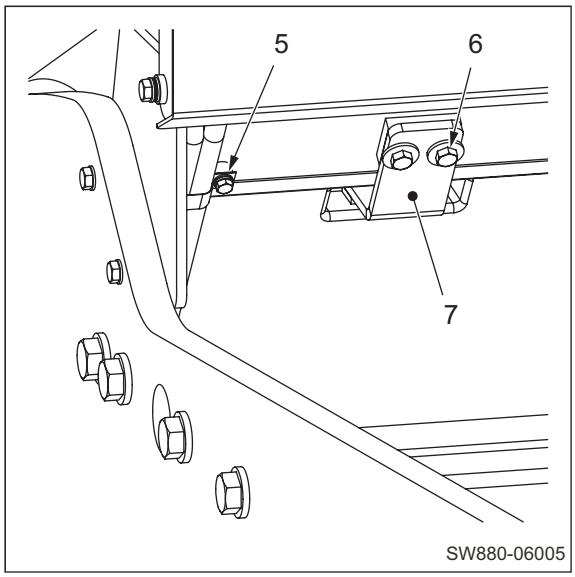


SW880-06003

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

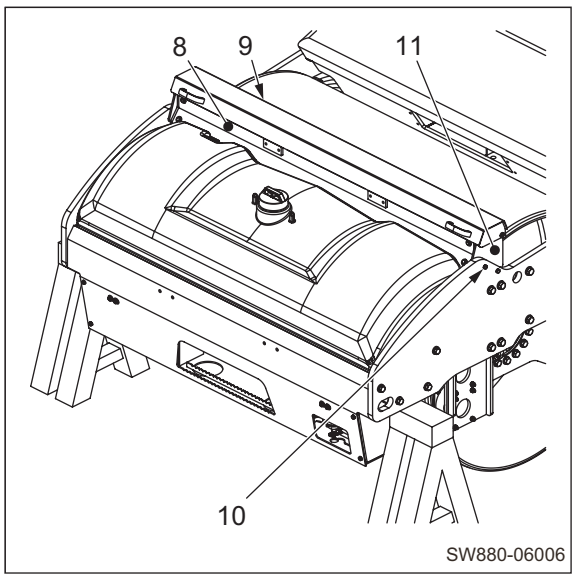



6) Remove the hose clamp (5).
   - Remove the two bolts (6) (left and right).
   - Pull out the tank stoppers (7) (left and right).

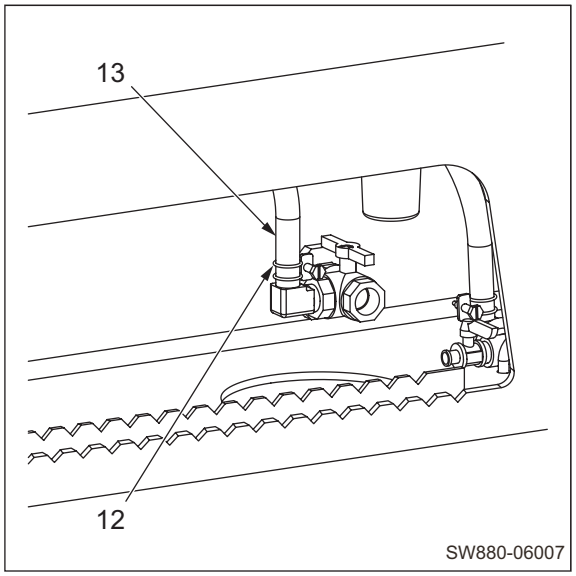



7) Lift the member (8) and water spray pipe cover (9) with a crane and hold them.
   - Remove the two bolts (10) (left and right).
   - Lift the member (8), water spray pipe cover (9) and the brackets (11) (left and right) and remove them.

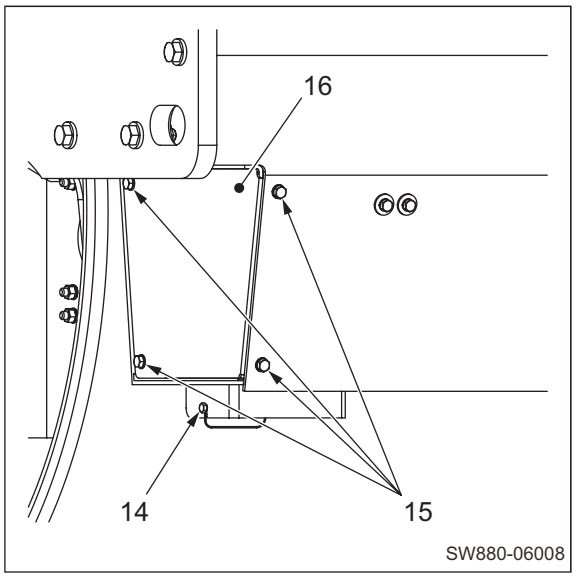
   Weight of parts to be lifted : 75 kg (165 lbs.)



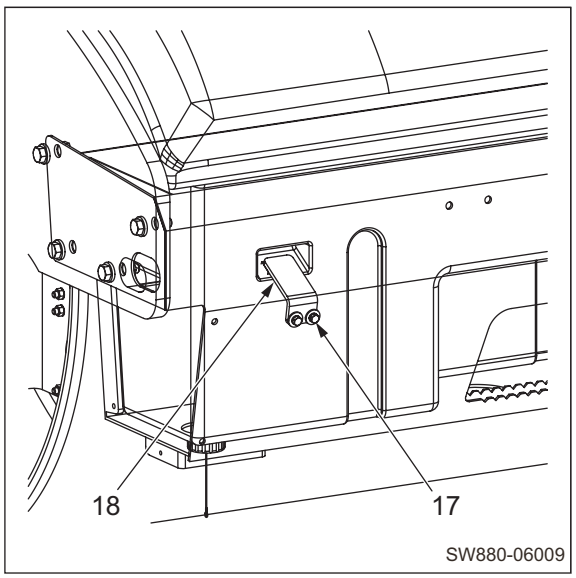
8) Loosen the hose clamp (12) at the outlet of the water tank.
   • Disconnect the water spray hose (13).




9) Remove the bolt (14) fixing the drain cap chain.
   • Remove the four cover fixing bolts (15) (left and right).
   • Remove the covers (16) (left and right).




10) Remove the two bolts (17) (left and right).
   • Pull out the tank stoppers (18) (left and right).

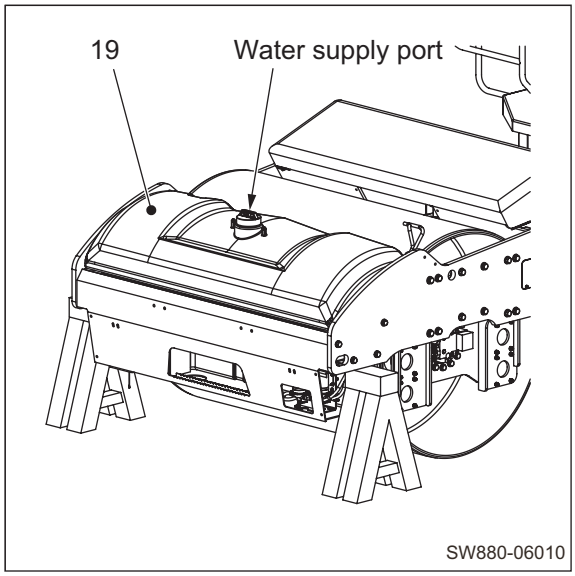


11) Lift the water tank (19) with a crane and remove it from the frame.

**(NOTICE)**

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

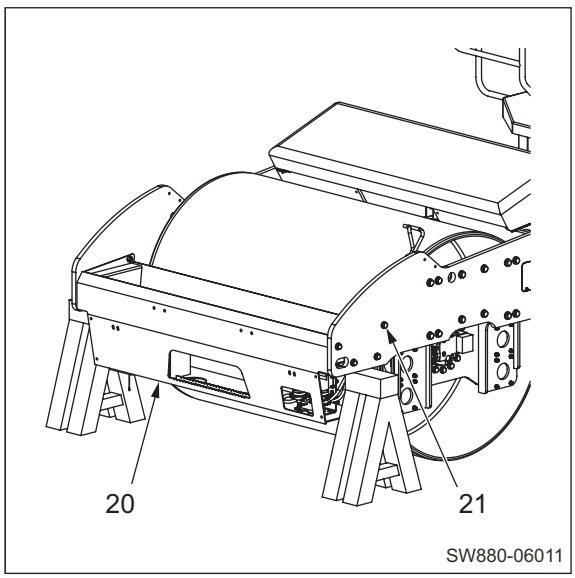
(19) Water tank : 50 kg (110 lbs.)




12) Lift the cross member (20) with a crane and hold it.

- Remove the four bolts (21) (left and right).
- Lift the cross member (20) and remove it from the frame.

(20) Cross member
SW880-1 : 185 kg (408 lbs.)
SW990-1 : 240 kg (529 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.**

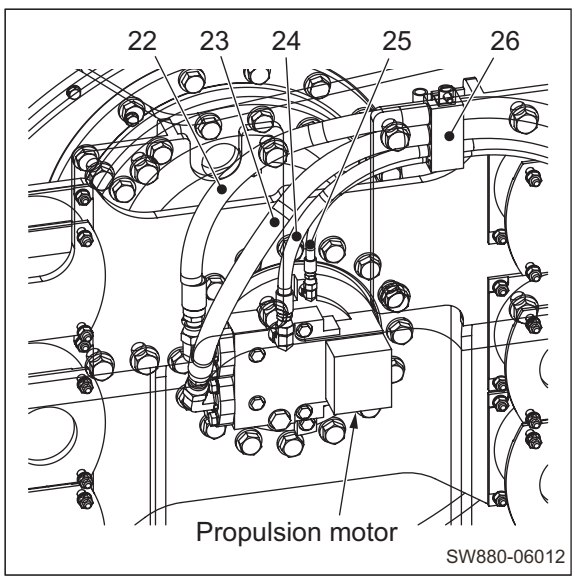
13) Disconnection of piping

① Propulsion motor piping

- Remove the hydraulic hose clamp (26).
- Disconnect the four hydraulic hoses (22), (23), (24) and (25) connecting to the propulsion motor.

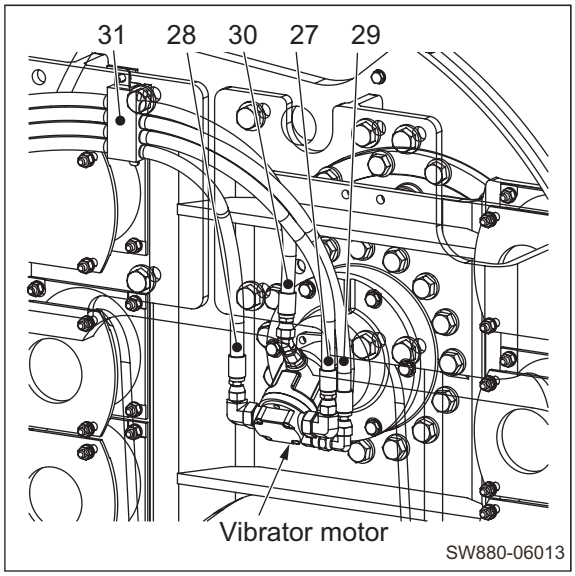
**(NOTICE)**

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



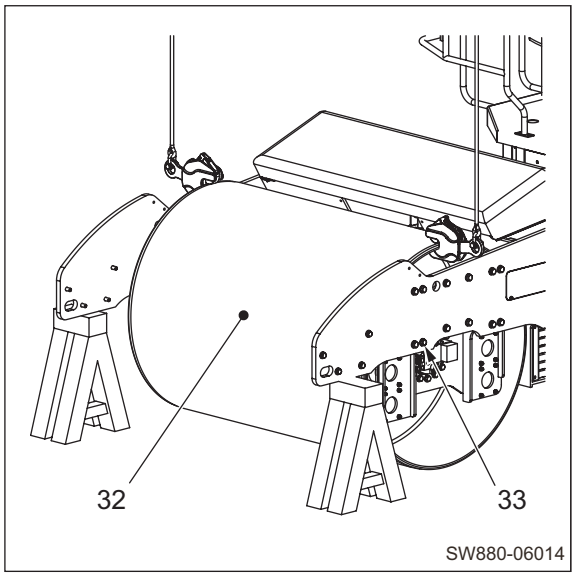
② Vibrator motor piping
- Remove the hydraulic hose clamp (31).
- Disconnect the four hydraulic hoses (27), (28), (29) and (30) connecting to the vibrator motor.

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

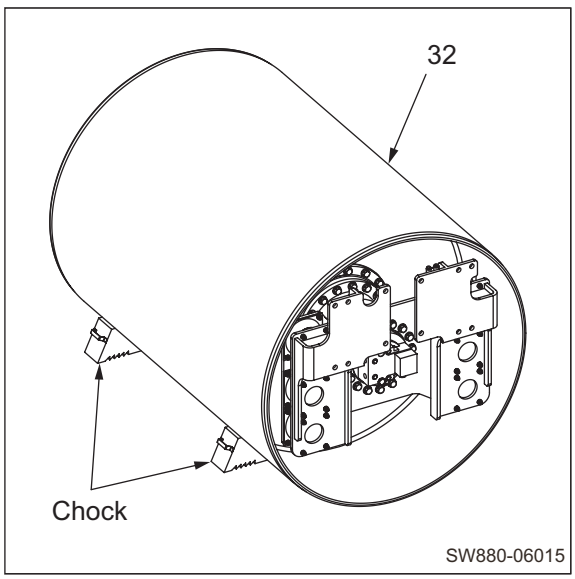



14) Remove twelve bolts (33).
15) Lift off vibratory drum (32) from frame.

(32) Drum
SW880-1 : 3,100 kg (6,834 lbs.)
SW990-1 : 3,215 kg (7,088 lbs.)




16) Put chocks or the like under the removed drum (32) to prevent it from moving.



## 2-2. Installation of Vibratory Drum

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


(21) Bolts M20×70 : 539 N·m (398 lbf·ft)
Cross member
(33) Bolts M22×90 : 685 N·m (506 lbf·ft)
Vibratory drum

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

**⚠WARNING**

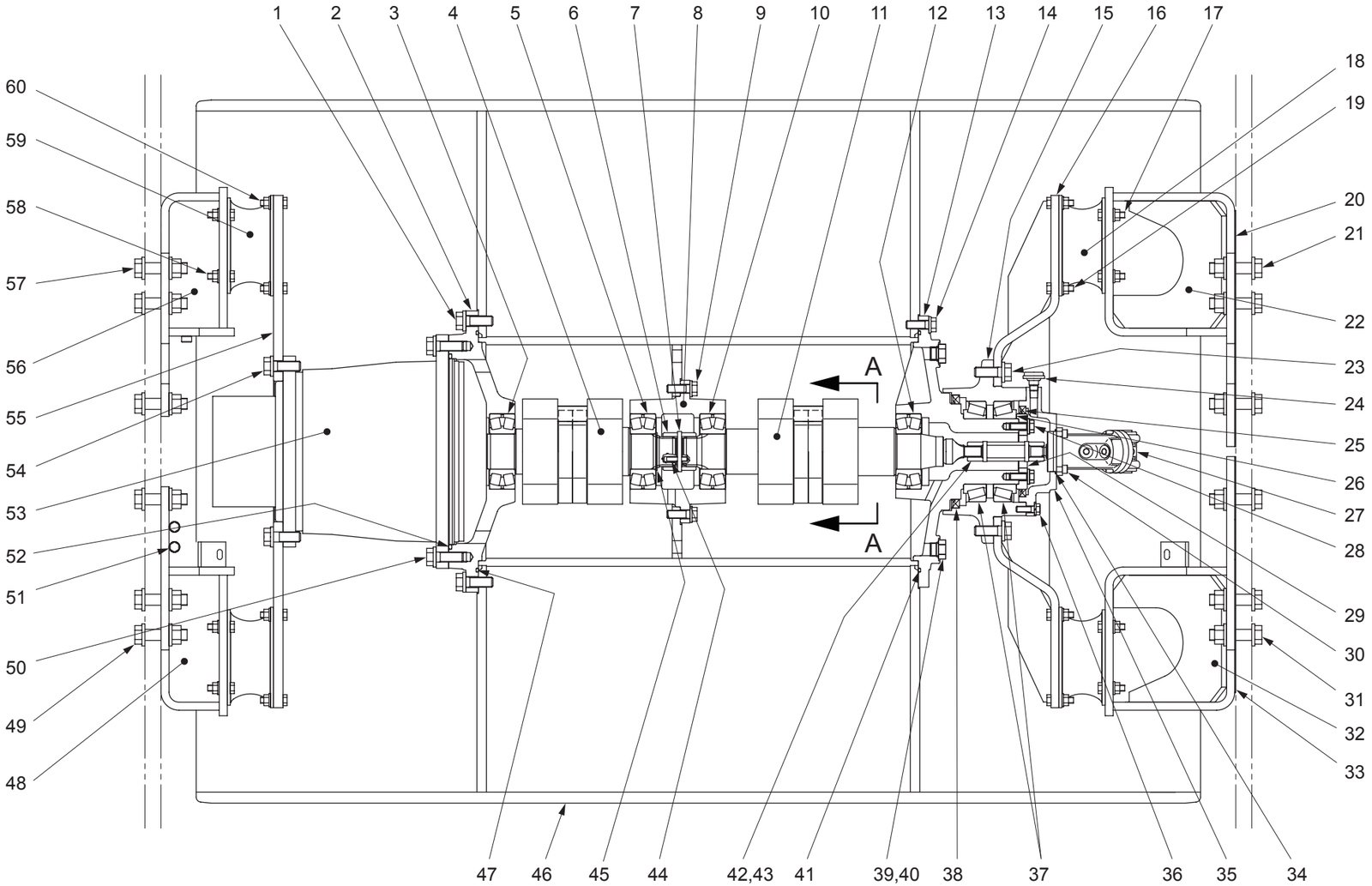
**If the engine is run at high speed or the cylinder is operated to full stroke when the engine is started for the first time after the work is completed, the piston packing or other items may be damaged by air entering into the cylinder.**

**(NOTICE)**

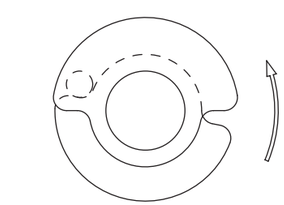
- **Fill the hydraulic oil tank to the specified level to make up for any oil leakage.**
- **Start the engine and circulate the oil through the piping. Then check the oil level again, ensuring that the oil is at the specified level.**

# 3. VIBRATORY DRUM ASSEMBLY

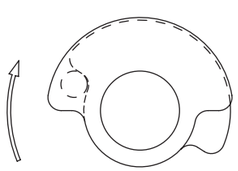
## 3-1. Vibratory Drum Assembly




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

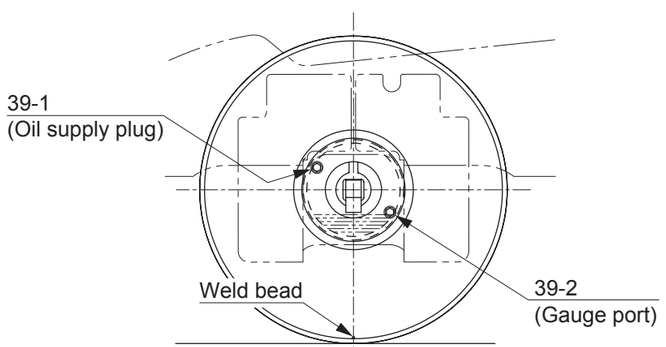


Vibration mode: Low
Motor counterclockwise rotation



Vibration mode: High
Motor clockwise rotation

SECTION A-A

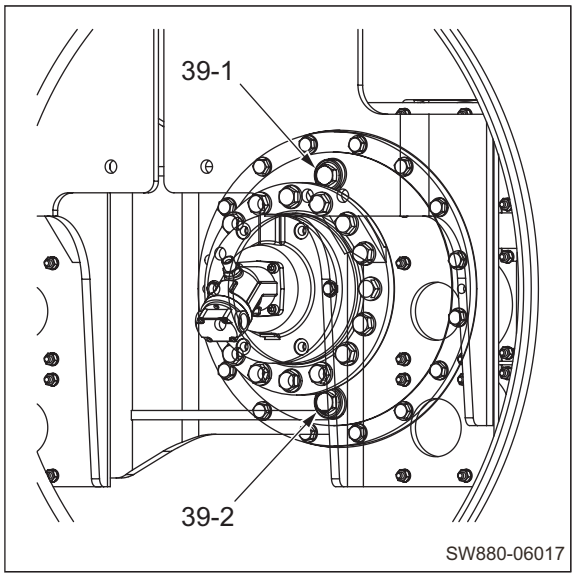



Vibrator motor

0568-43808-0-11410-0

# 4. DISASSEMBLY AND REASSEMBLY OF VIBRATORY DRUM

- The lead line numbers shown in the illustrations below are consistent with the part numbers of the vibratory drum shown on page 6-009.




## 4-1. Disassembly of Vibratory Drum

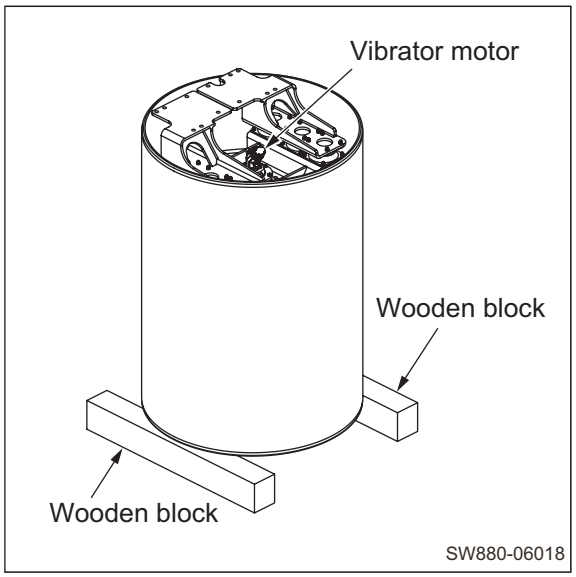
1) Remove the plugs (39-1) and (39-2).
   - Drain the gear oil in the vibrator case.
     - Quantity of gear oil : 22 L (5.8 gal.)

**⚠WARNING**

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

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

   Vibratory drum assembly
   SW880-1 : 3,100 kg (6,834 lbs.)
   SW990-1 : 3,215 kg (7,088 lbs.)

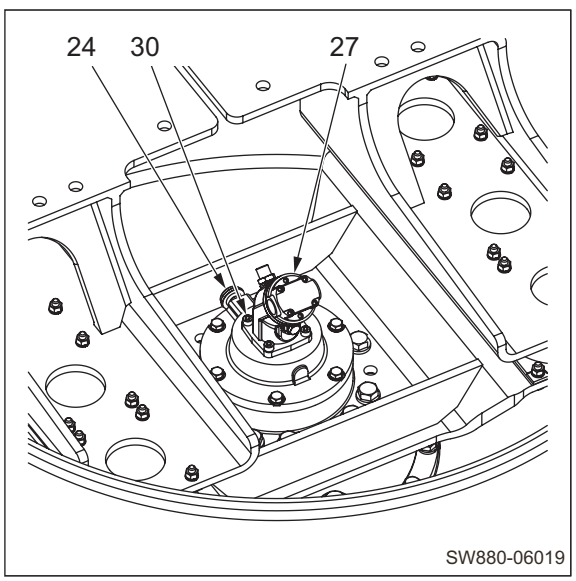



**⚠WARNING**

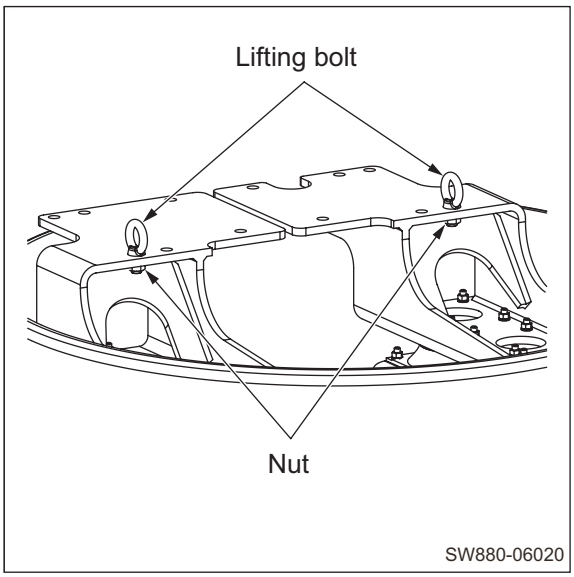
**Carry out the work in an unstrained posture using a work stool or the like.**

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

   (27) Vibrator motor : 7 kg (15 lbs.)



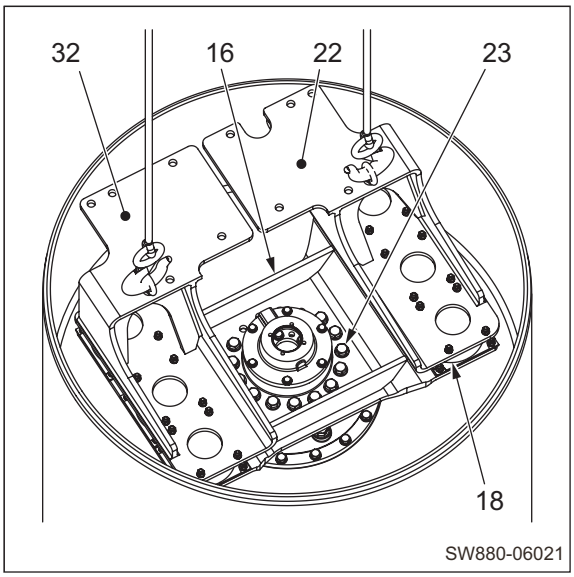
4) Install lifting bolts and nuts (M22) as shown on the right.



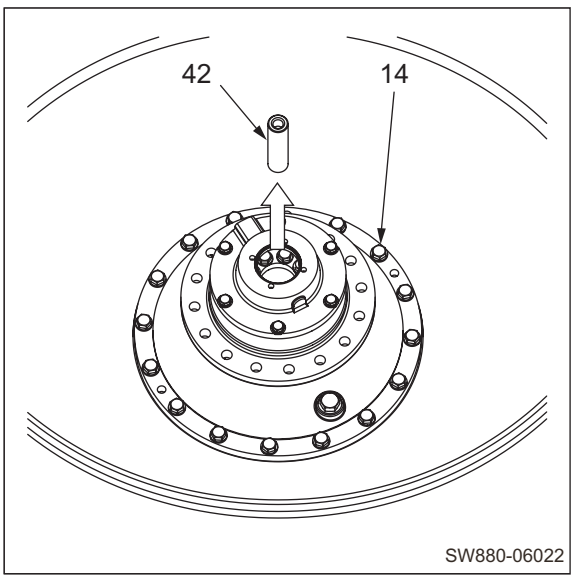

5) Remove the sixteen bolts (23).
   • Lift the brackets (22) and (32), damper (18) and bracket (16) together with a crane and remove them.

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

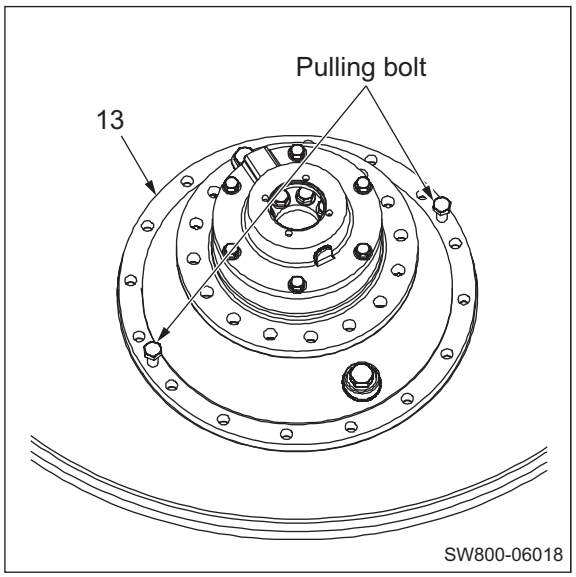
(16), (18), (22) and (32) Total weight of parts to be lifted : 290 kg (639 lbs.)




6) Pull out the sleeve (42).
   • Remove the sixteen bolts (14).



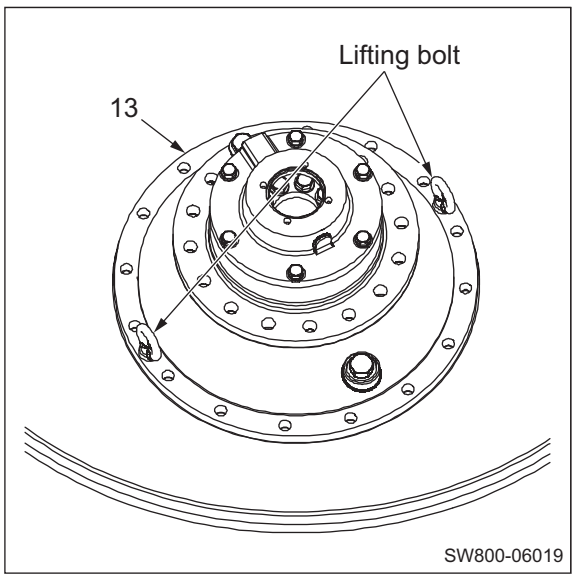
7) Using the two pulling bolts (M16×50), lift the axle shaft (13).




**⚠WARNING**

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

8) Install lifting bolts (M16) on the axle shaft (13).

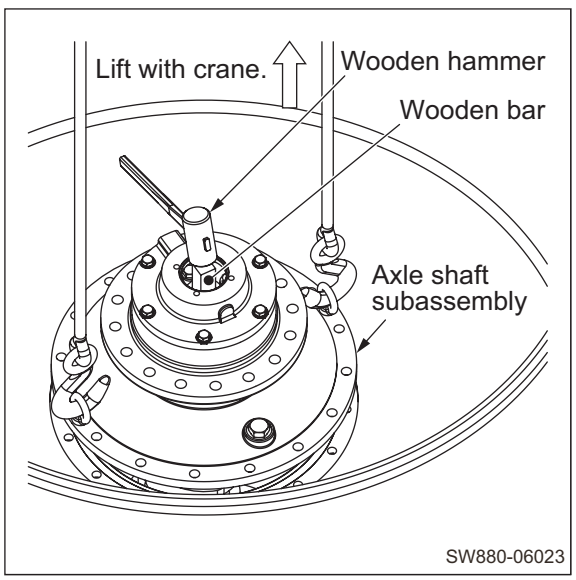



9) Slowly lift the axle shaft subassembly with a crane to remove it.

**(NOTICE)**

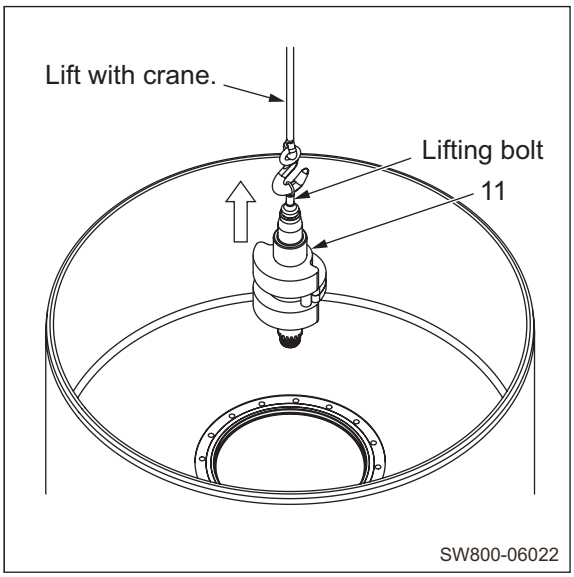
- **In order not to lift the eccentric shaft together with the axle shaft subassembly, tap on the eccentric shaft end with a wooden hammer via a wooden bar during lifting.**

Axle shaft subassembly : 140 kg (309 lbs.)

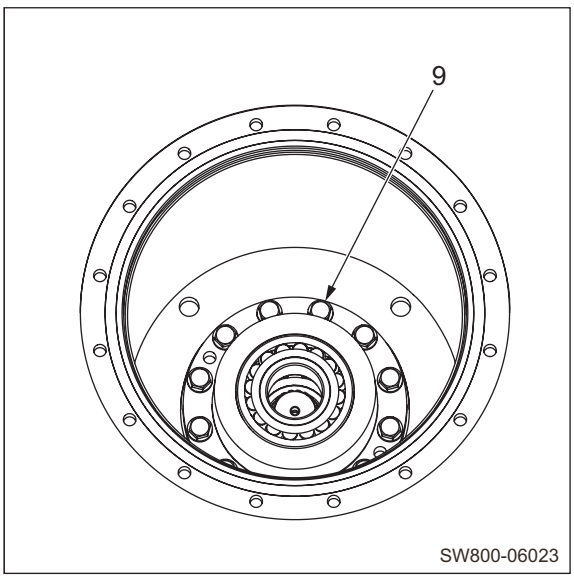


10) Attach a lifting bolt (M8) to the end of the eccentric shaft (11) and lift the eccentric shaft to remove it.

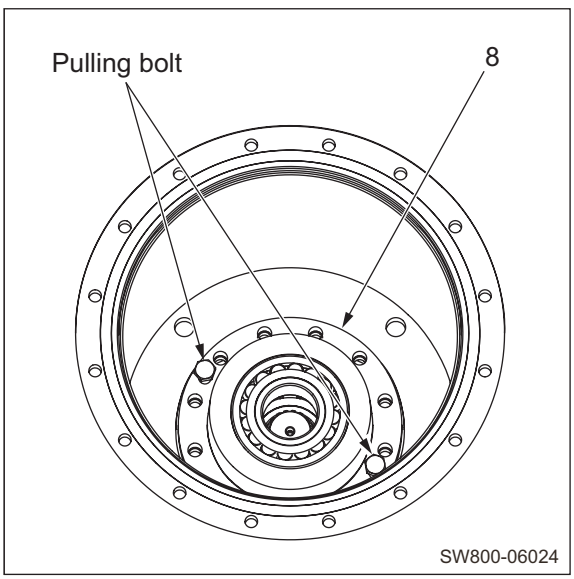
(11) Eccentric shaft : 60 kg (132 lbs.)



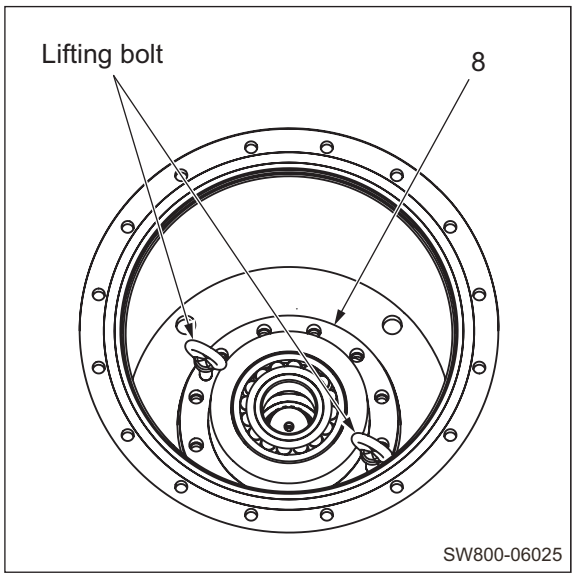

11) Remove the twelve bolts (9).




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

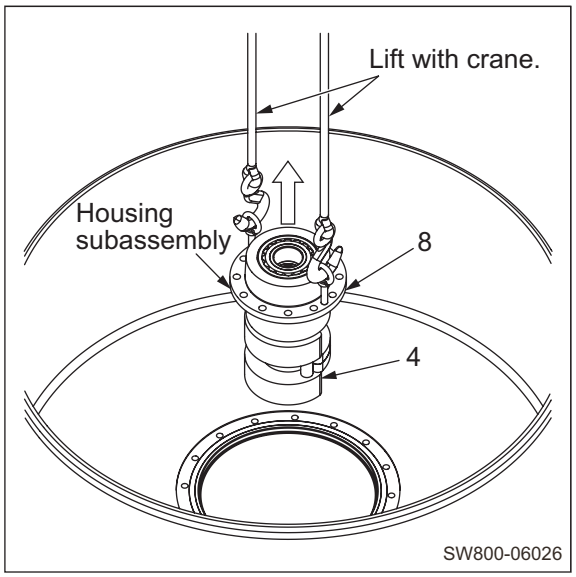


13) Install lifting bolts (M16) on the housing (8).




14) Lift the housing subassembly with a crane to remove it.

(8) and (4) Total weight of parts to be lifted : 100 kg (220 lbs.)

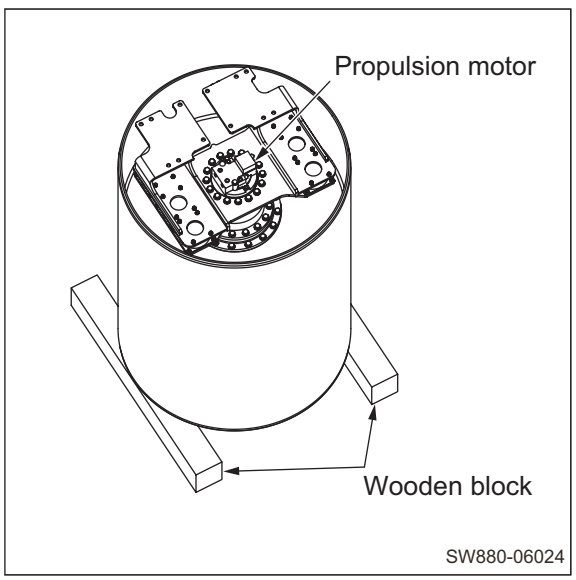



**⚠WARNING**

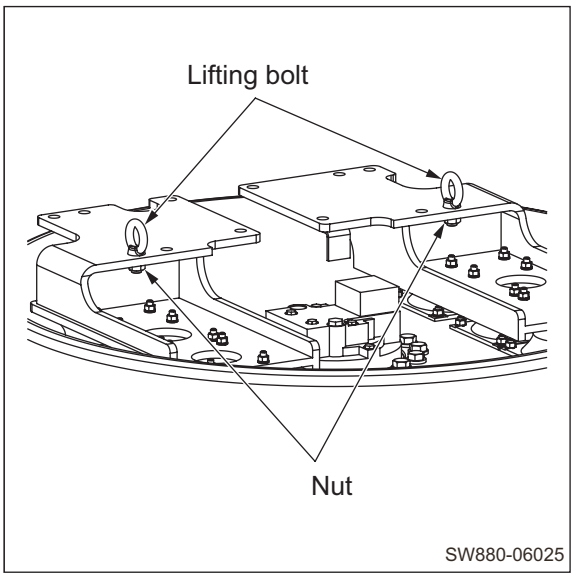
**Be careful because reversing the vibratory drum is dangerous work. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.**

15) Lift the vibratory drum with a crane and reverse it. Then, stand the drum with its propulsion motor side facing up.

Weight of vibratory drum in the illustrated condition :
SW880-1 : 2,570 kg (5,666 lbs.)
SW990-1 : 2,640 kg (5,820 lbs.)



16) Install lifting bolts and nuts (M22) as shown on the right.



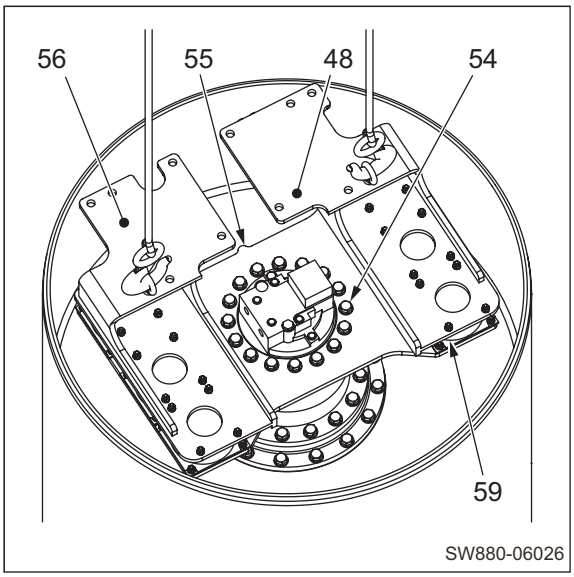

17) Remove the sixteen bolts (54).

- Lift the brackets (48) and (56), damper (59) and plate (55) together with a crane to remove them.

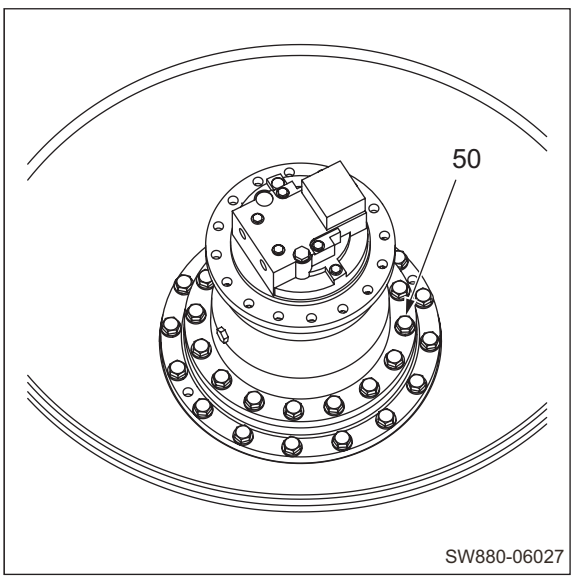
**(NOTICE)**

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

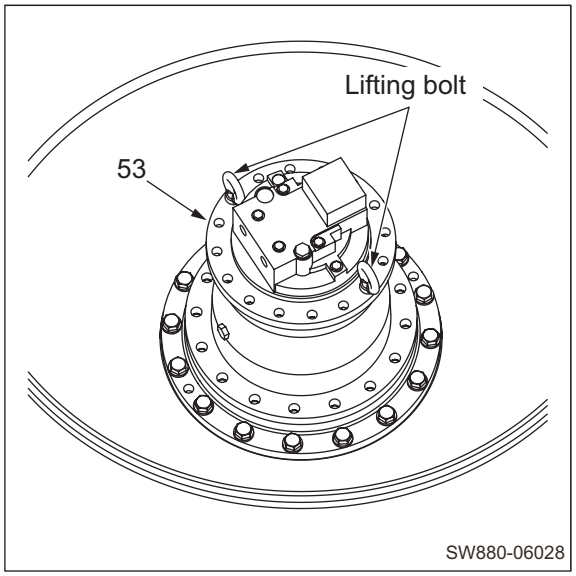
(48), (55), (56) and (59) Total weight of parts to be lifted : 250 kg (551 lbs.)




18) Remove the sixteen bolts (50).

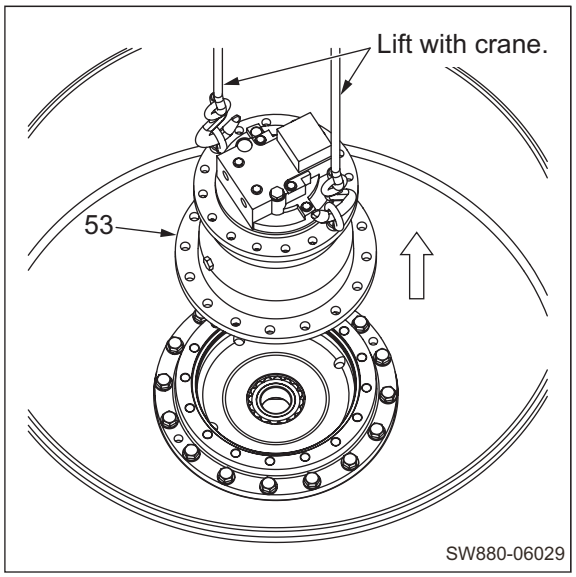


19) Install lifting bolts (M20) on the propulsion motor (53).

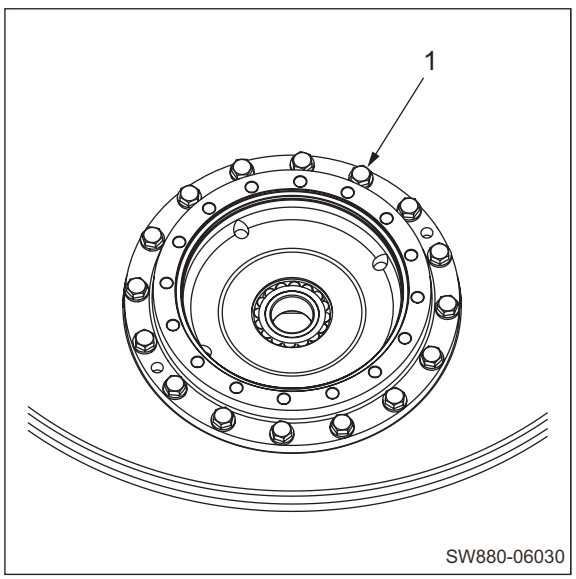



20) Lift the propulsion motor (53) with a crane to remove it.

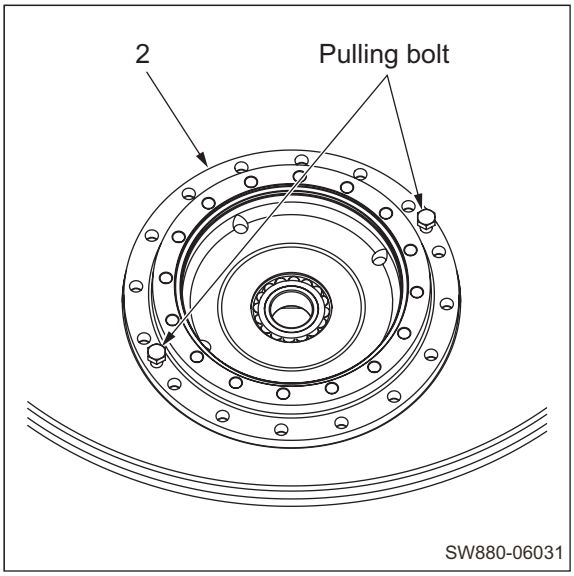
(53) Propulsion motor : 200 kg (441 lbs.)



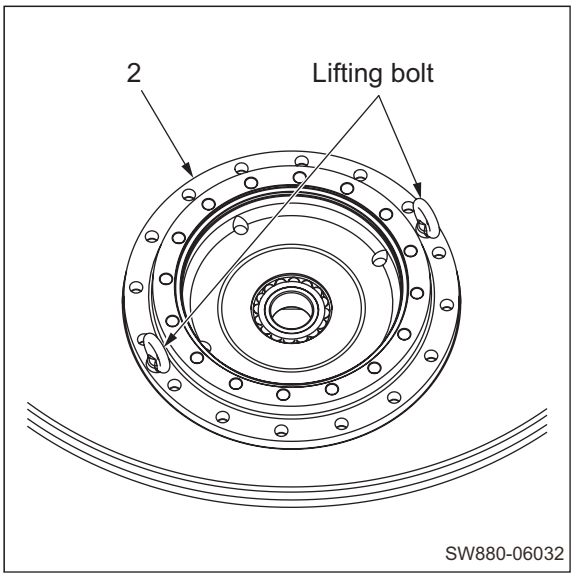

21) Remove the sixteen bolts (1).



22) Using two pulling bolts (M20×50), lift the housing (2).

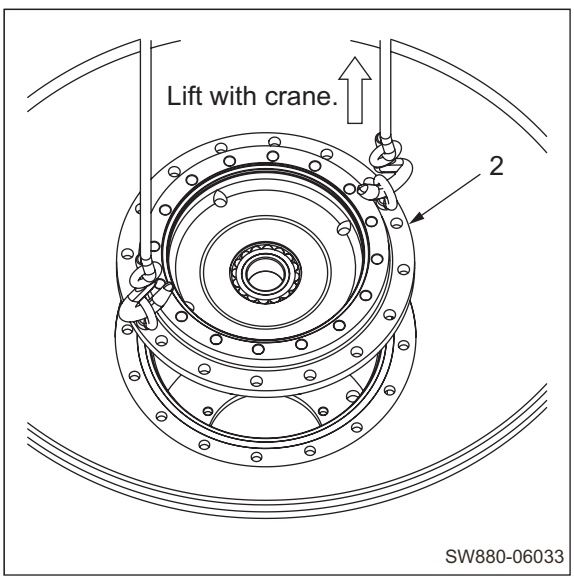



23) Install lifting bolts (M20) on the housing (2).

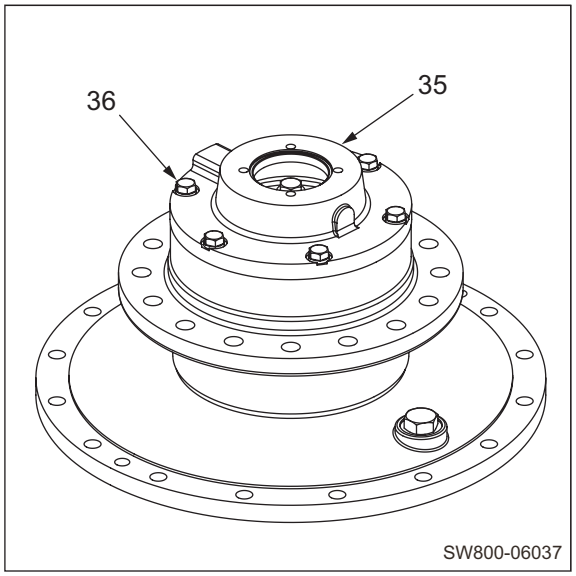



24) Lift the housing (2) with a crane to remove it.

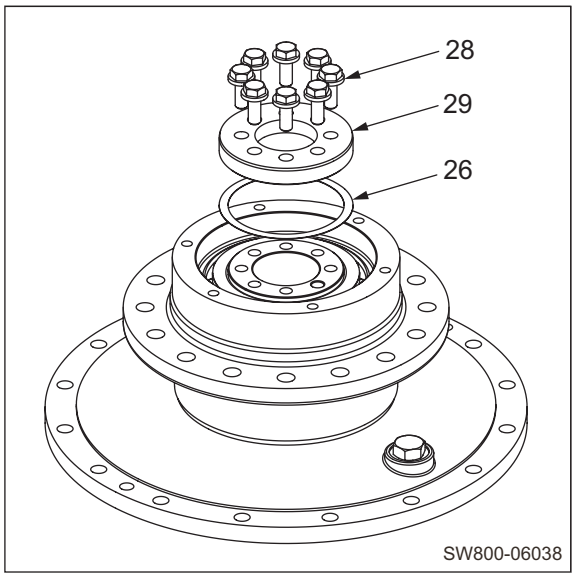
kg (2) Housing : 80 kg (176 lbs.)



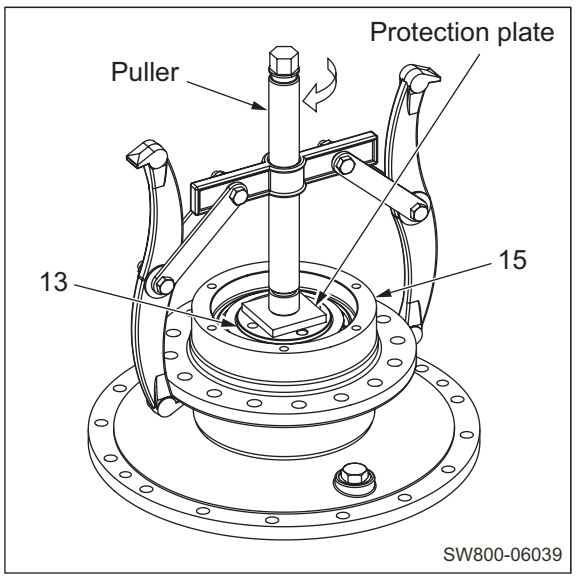
25) Shown on the right is the axle shaft subassembly removed from the vibratory drum.
- Remove the six bolts (36).
- Remove the cover (35).



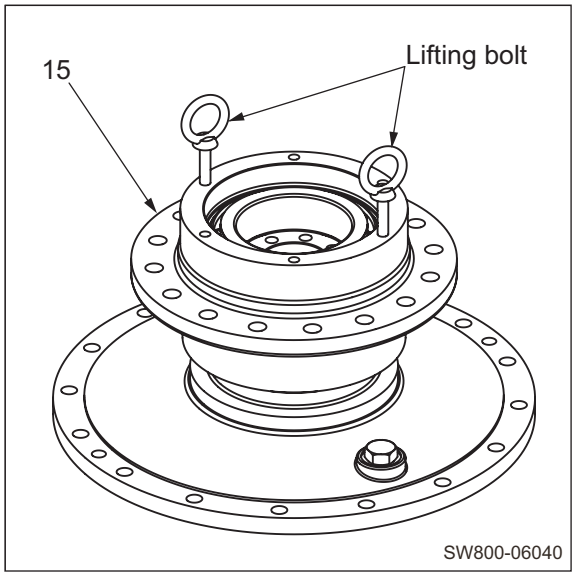

26) Remove the eight bolts (28).
- Remove the cover (29) and shim (26).




27) Place a protection plate on the end face of the axle shaft (13) and set a puller on the housing (15). Separate the housing (15) together with the roller bearing from the axle shaft (13).

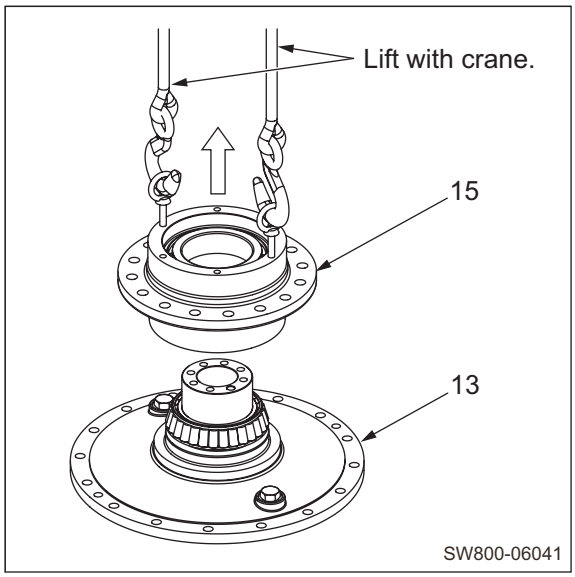


28) Install lifting bolts (M12) on the housing (15).



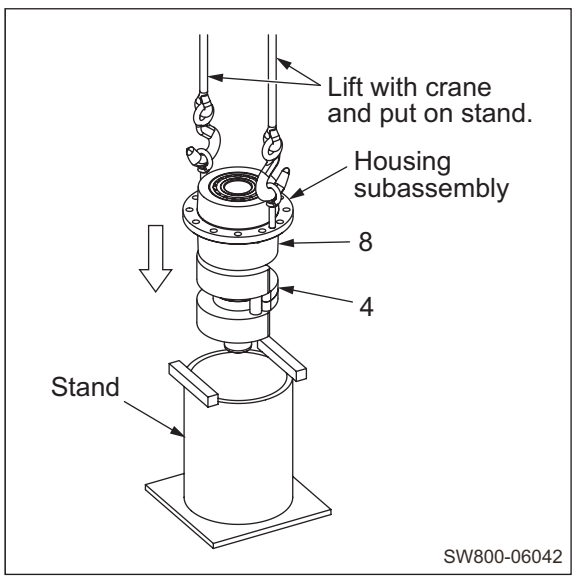

29) Lift the housing (15) with a crane to separate it from the axle shaft (13).

(15) Housing : 50 kg (110 lbs.)

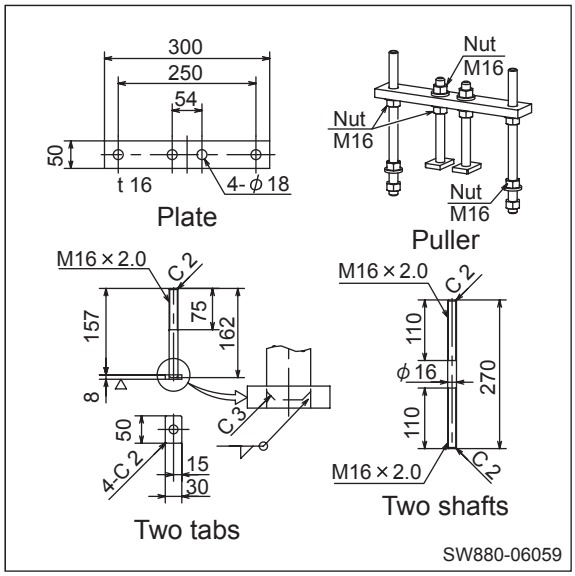


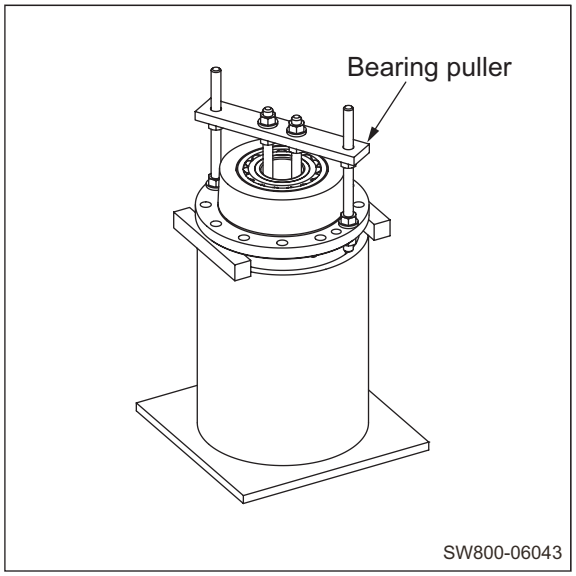

30) Put the housing subassembly on a stand as shown.

(8) and (4) Total weight of parts to be lifted : 100 kg (220 lbs.)



31) Set up a bearing puller on the stand.

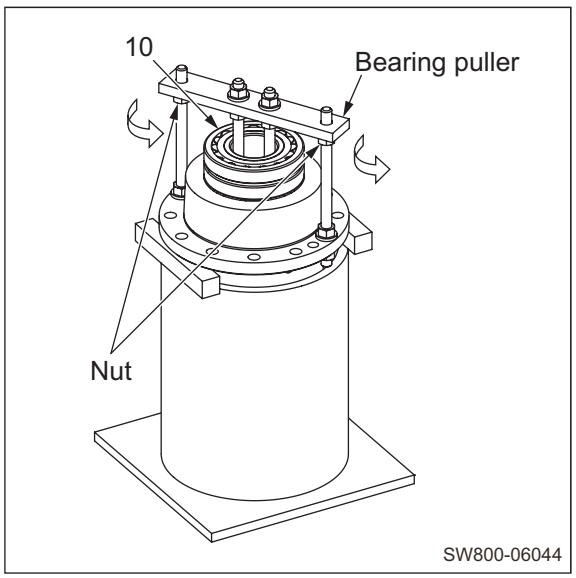


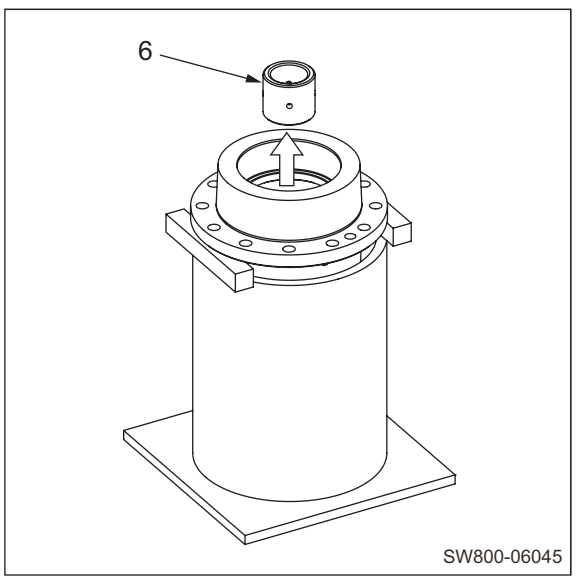

32) Turn the nuts of the bearing puller counterclockwise to remove the vibrator bearing (10).

**(NOTICE)**

- **To prevent the inner race of the vibrator bearing (10) from tilting, alternately turn the nuts on both sides of the puller.**

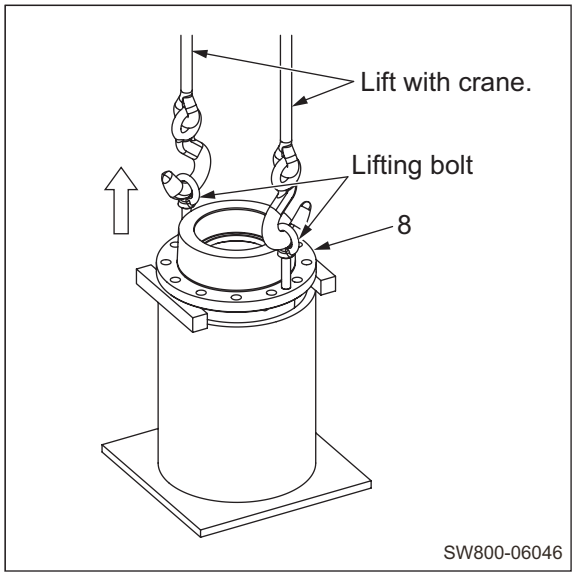



33) Remove the sleeve (6).

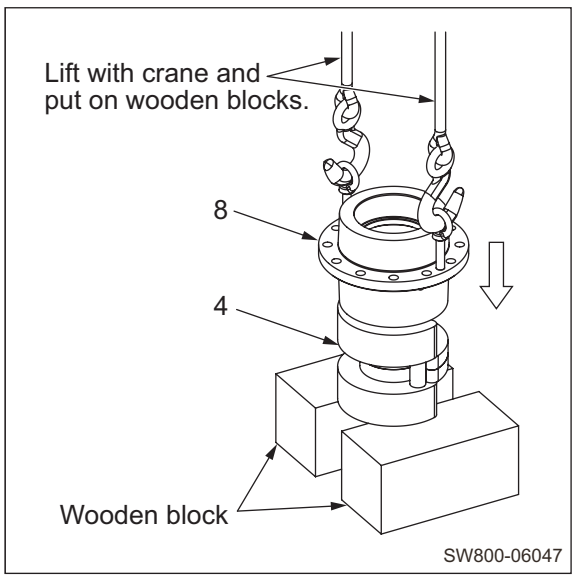


34) Install lifting bolts (M16) and lift the housing (8) with a crane.

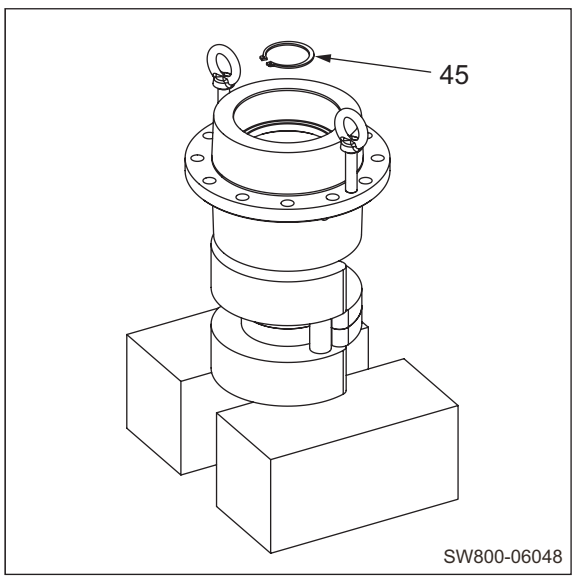
(8) Housing : 95 kg (209 lbs.)




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

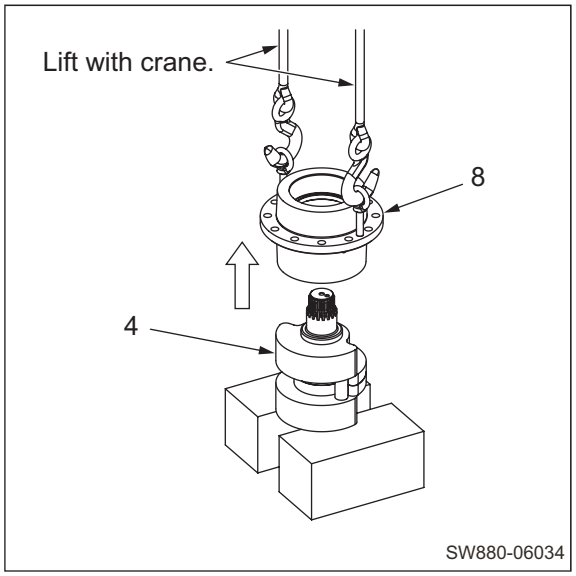



36) Remove the retaining ring (45).

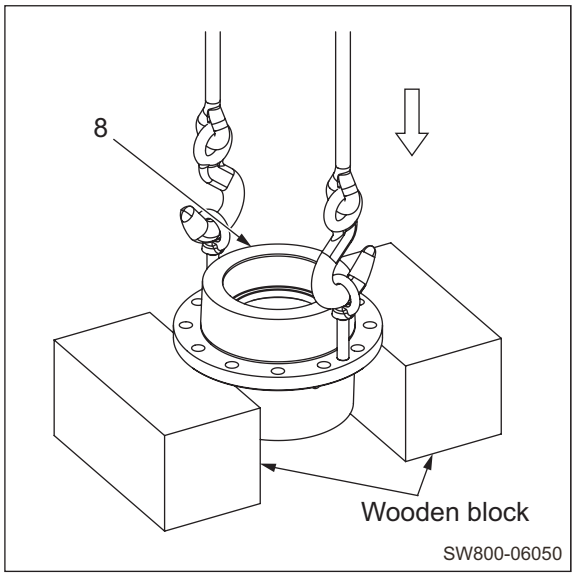


37) Lift the housing (8) with a crane to separate it from the eccentric shaft (4).

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



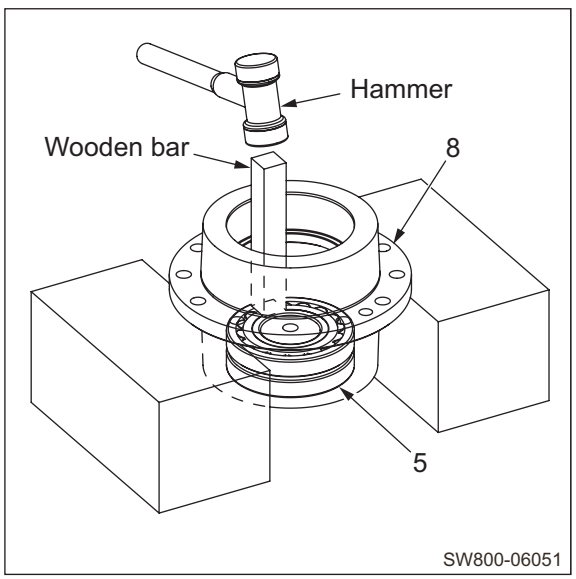

38) Put the housing (8) on wooden blocks.




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

**(NOTICE)**

- **Be careful not to damage the bearing.**



# 4-2. Reassembly of Vibratory Drum

**(NOTICE)**

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

1) Housing subassembly

① Apply a thin coat of gear oil to the surface to which the vibrator bearing (3) will be press-fitted.

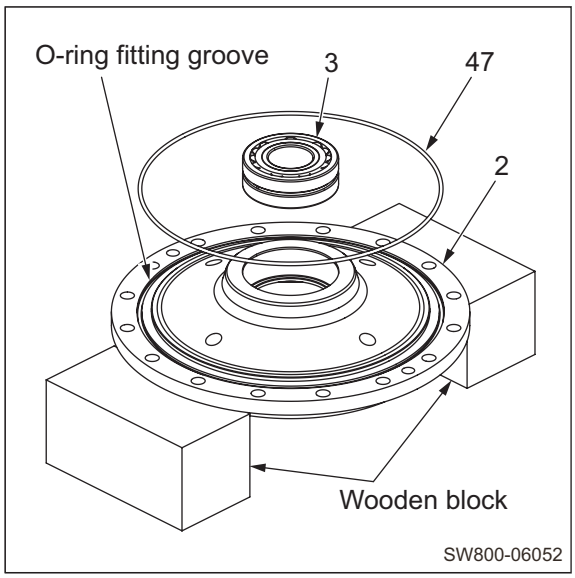
- Drive the vibrator bearing (3) into the housing (2).

**(NOTICE)**

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

② Apply a thin coat of grease to the O-ring (47).

- Install the O-ring (47) in the O-ring fitting groove in the housing (2).



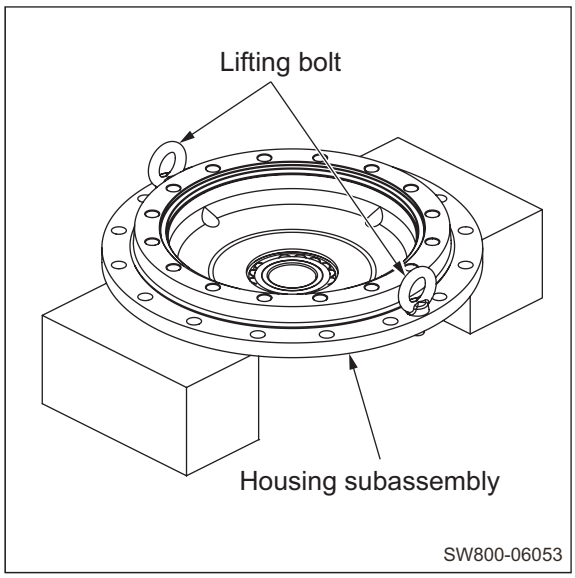

**⚠WARNING**

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

③ Lift the housing subassembly with a crane and reverse it.

- Install lifting bolts (M20).

kg Housing subassembly : 80 kg (176 lbs.)




**⚠WARNING**

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

2) Stand the drum (46) with its propulsion motor mounting side facing up.

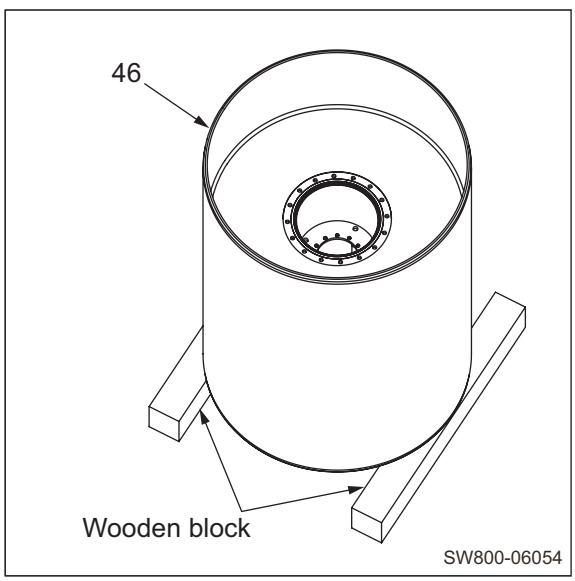
**(NOTICE)**

- **The side on which no weld bead is installed is the propulsion motor side.**

kg (46) Drum

SW880-1 : 2,070 kg (4,564 lbs.)

SW990-1 : 2,170 kg (4,784 lbs.)

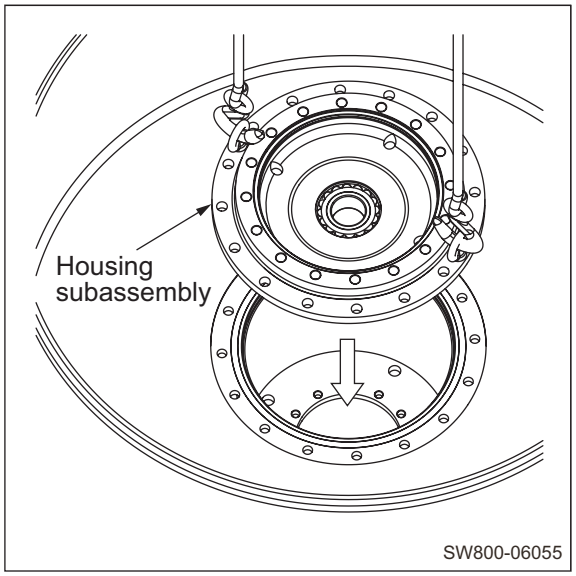


3) Lift the housing subassembly with a crane and install it in the vibratory drum.

**(NOTICE)**

- **When installing the housing subassembly, take care not to allow the O-ring to protrude from the fitting groove.**

Housing subassembly : 80 kg (176 lbs.)

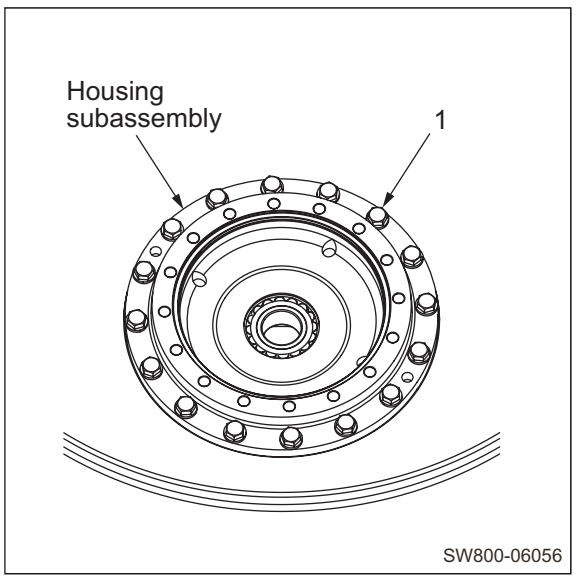



**⚠WARNING**

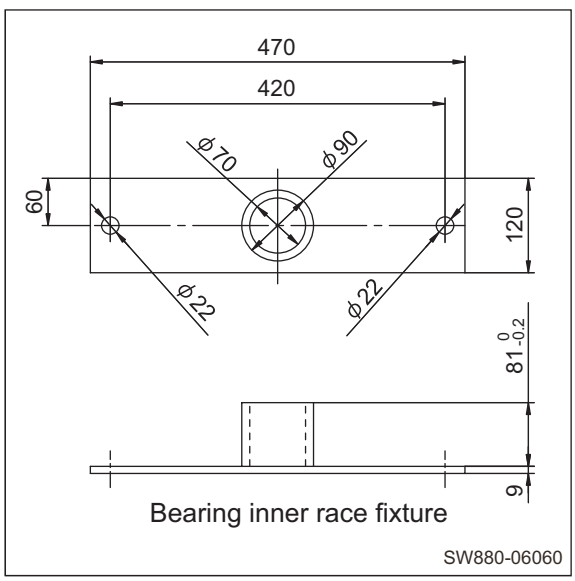
**Carry out the work in an unstrained posture using a work stool or the like.**

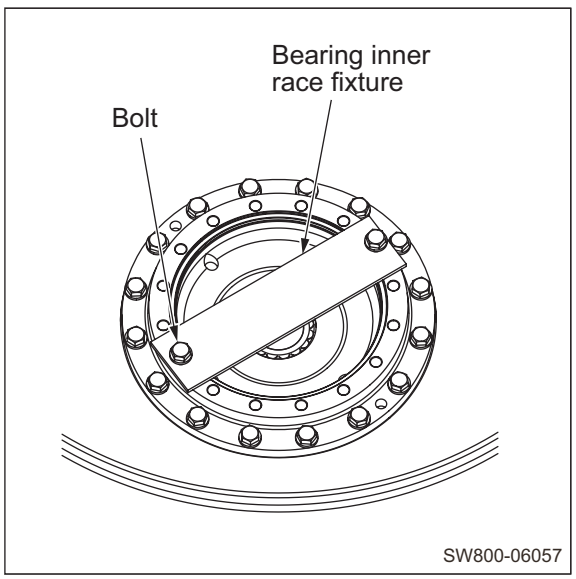
4) Secure the housing subassembly to the drum with the sixteen bolts (1) and washers.

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

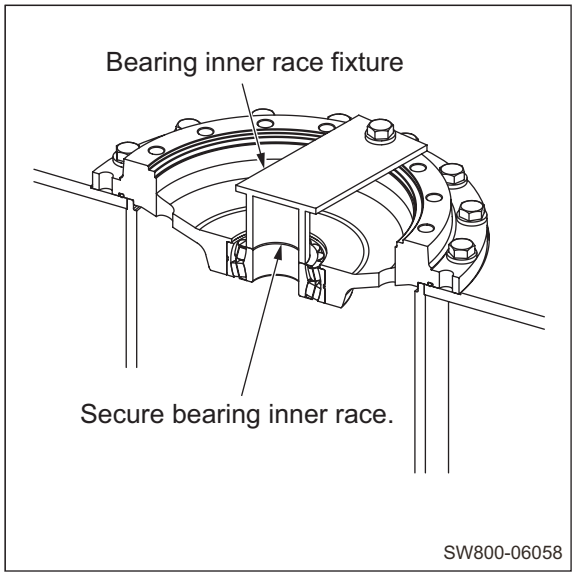



5) Attach a bearing inner race fixture to the housing subassembly with two bolts (M20×35) and washers.



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




**⚠WARNING**

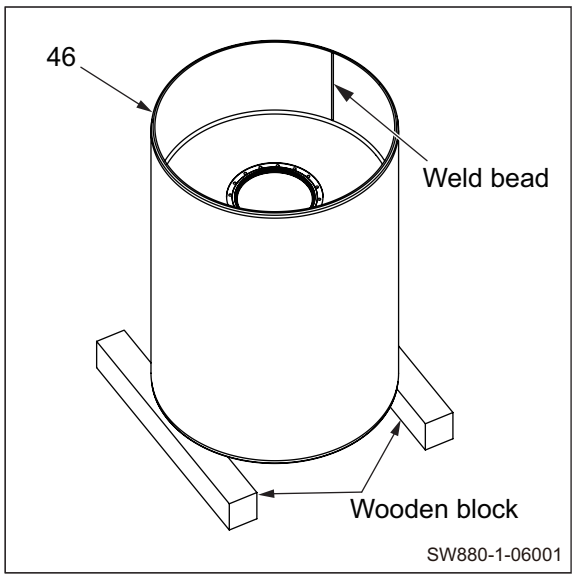
**Be careful because reversing the vibratory drum is dangerous work. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.**

7) Lift the drum (46) with a crane and reverse it. Then, stand the drum with its vibrator motor side facing up.

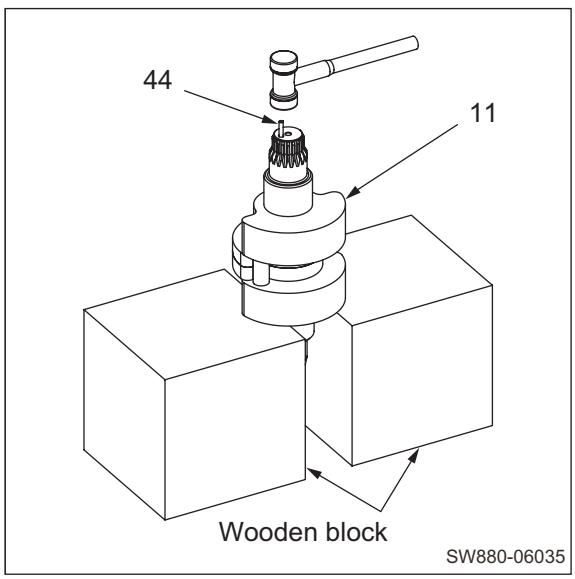
**(NOTICE)**

- **The side on which a weld bead is installed is the vibrator motor side.**

(46) Drum
SW880-1 : 2,150 kg (4,740 lbs.)
SW990-1 : 2,250 kg (4,960 lbs.)




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



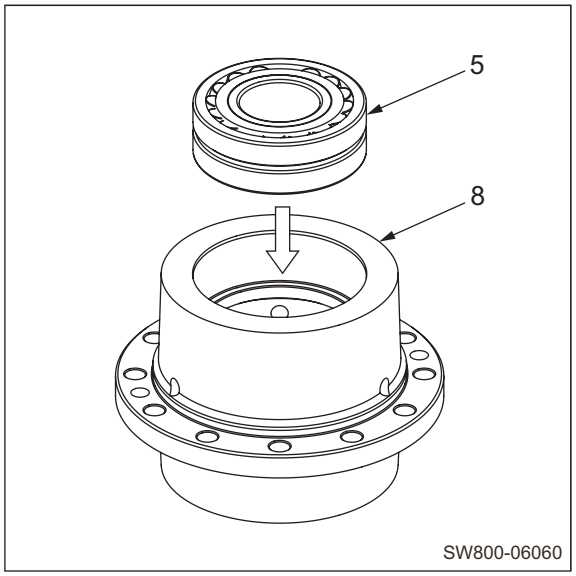
9) Eccentric shaft subassembly

① Apply a thin coat of gear oil to the surface to which the vibrator bearing (5) will be press-fitted.

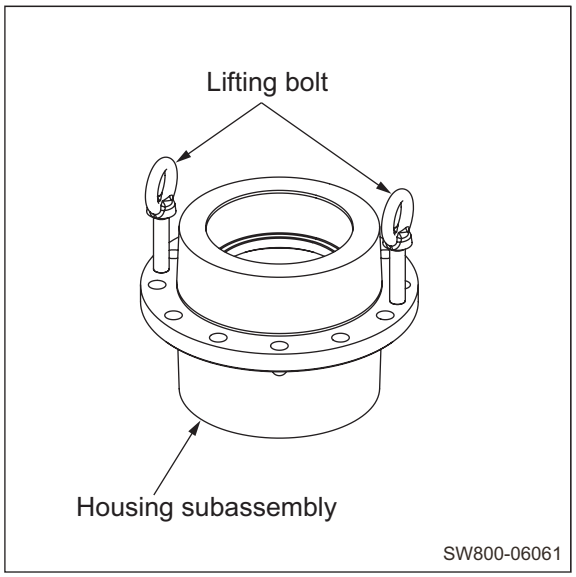
- Drive the vibrator bearing (5) into the housing (8).
- Apply a thin coat of gear oil to the inner surface of the bearing (5).

**(NOTICE)**

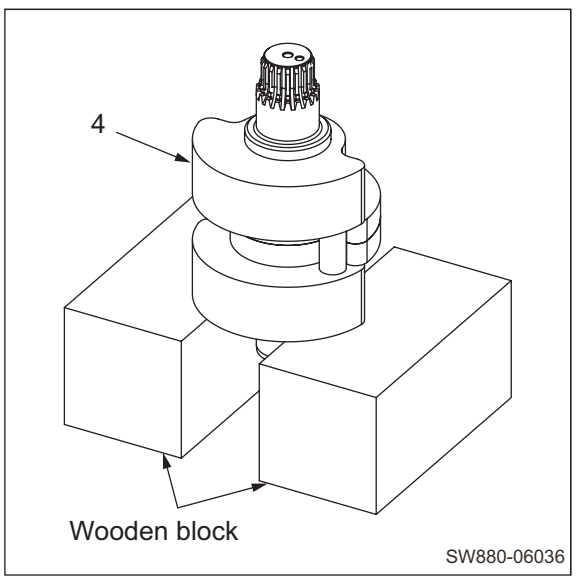
- **Take care not to damage the bearing when installing it.**




② Reverse the housing subassembly and install lifting bolts (M16) on it.



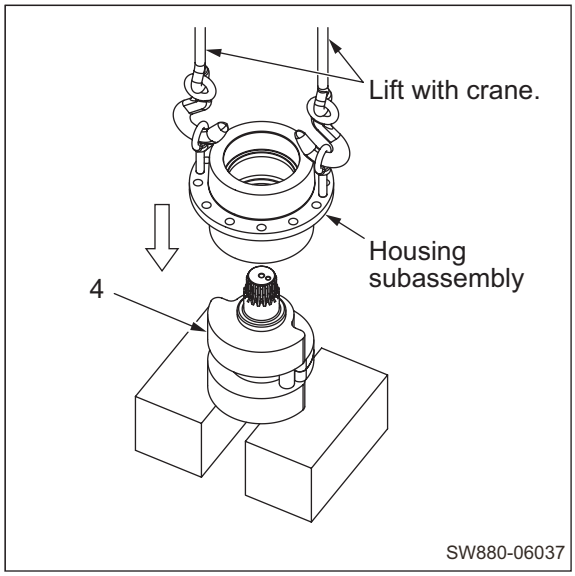

③ Put the eccentric shaft (4) (propulsion motor side) on the wooden blocks with its splined position facing up.



④ Apply a thin coat of gear oil to the bearing mounting surface of the eccentric shaft (4).
- Lift the housing subassembly with a crane and install it on the eccentric shaft (4).

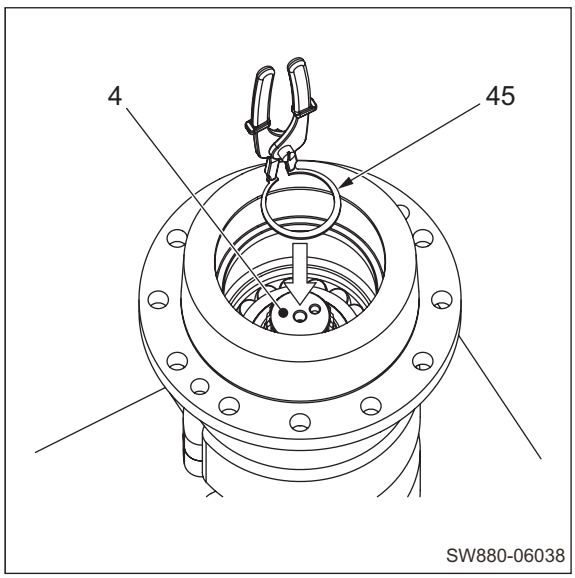
**(NOTICE)**
- **Install the housing subassembly taking care not to tilt the vibrator bearing inner race.**

Housing subassembly : 40 kg (88 lbs.)



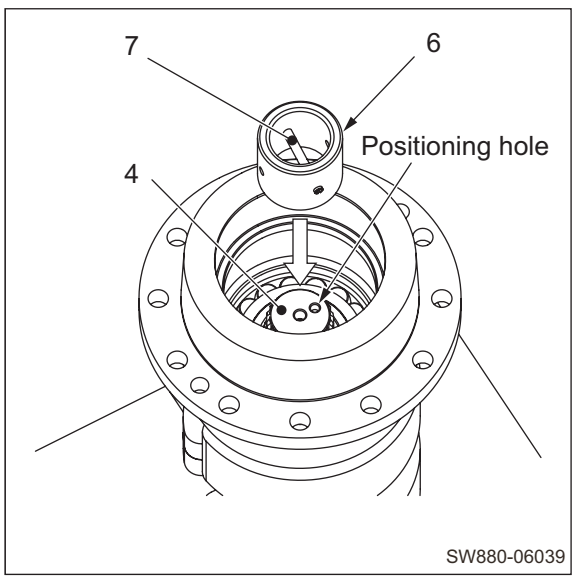

⑤ Install the retaining ring (45) on the eccentric shaft (4).

**(NOTICE)**
- **Confirm that the retaining ring (45) is securely fitted in the groove.**




⑥ Drive the spring pin (7) into the sleeve (6).
- Apply gear oil to the inner surface of the sleeve (6) and the splined portion of the eccentric shaft (4).
- Install the sleeve (6) on the eccentric shaft (4).

**(NOTICE)**
- **When installing the sleeve (6), take care not to plug the positioning hole in the eccentric shaft (4) with the spring pin (7).**

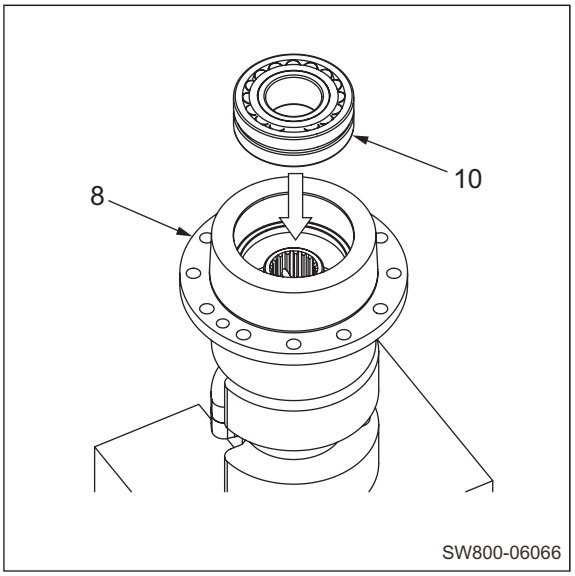


⑦ Apply a thin coat of gear oil to the surface to which the vibrator bearing (10) will be press-fitted.

- Drive the vibrator bearing (10) into the housing (8).

**(NOTICE)**

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



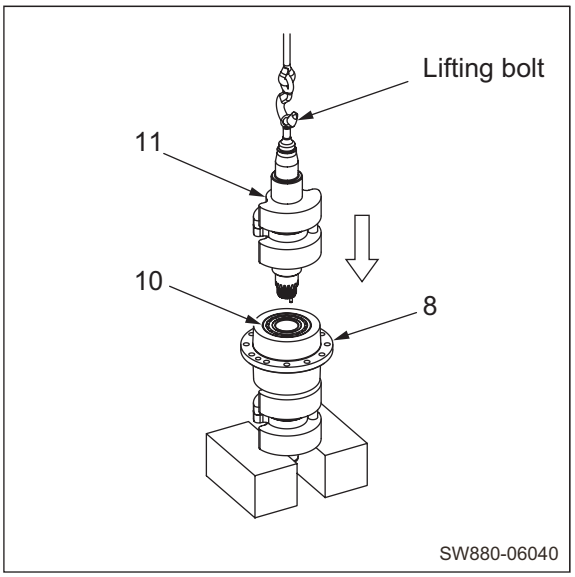

⑧ Install a lifting bolt (M8) on the shaft end of the eccentric shaft (11).

- Apply a thin coat of gear oil to the inner surface of the vibrator bearing (10) and the bearing mounting surface of the eccentric shaft (11).
- Slowly lower the eccentric shaft (11) with a crane and install it in the housing (8).

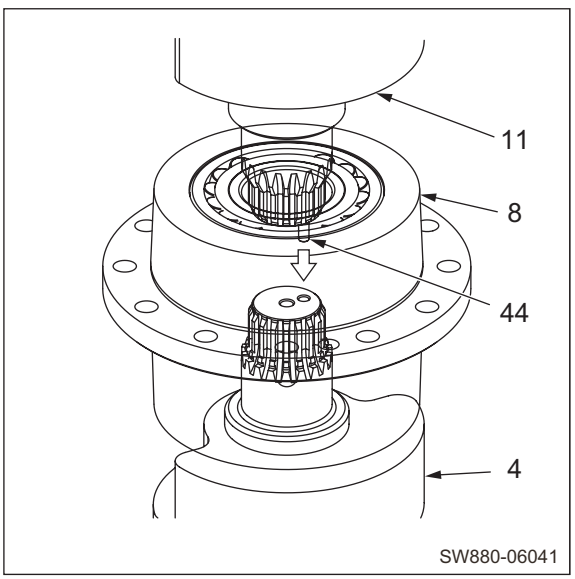
**(NOTICE)**

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

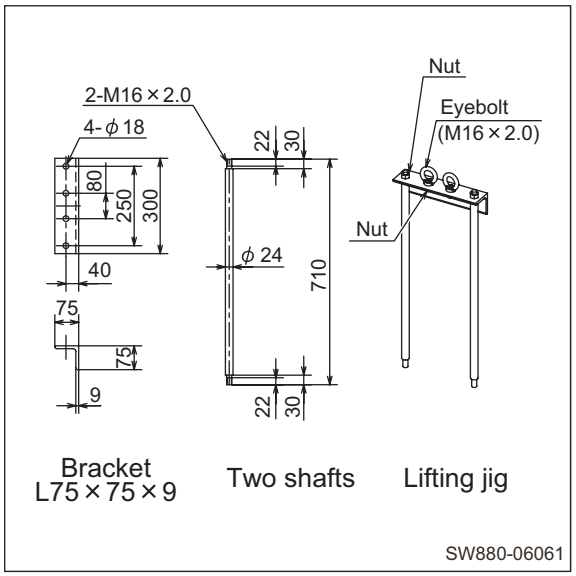
60 kg (11) Eccentric shaft : 60 kg (132 lbs.)

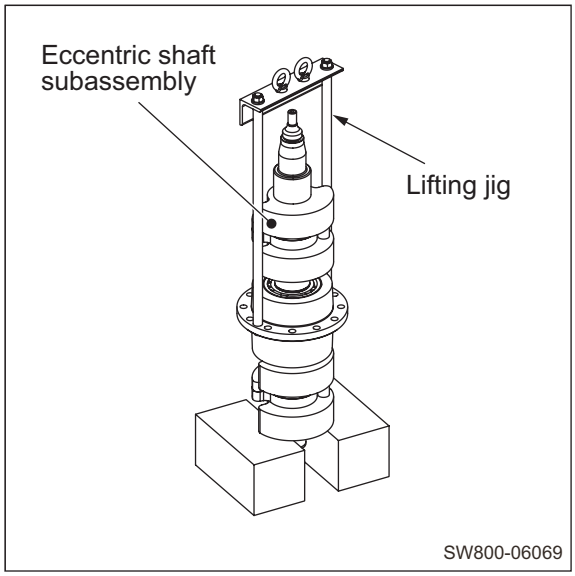



⑨ When installing the eccentric shaft (11) in the housing (8), insert the spring pin (44) on the shaft into the positioning hole in the eccentric shaft (4).



10) Attach a lifting jig to the eccentric shaft subassembly.

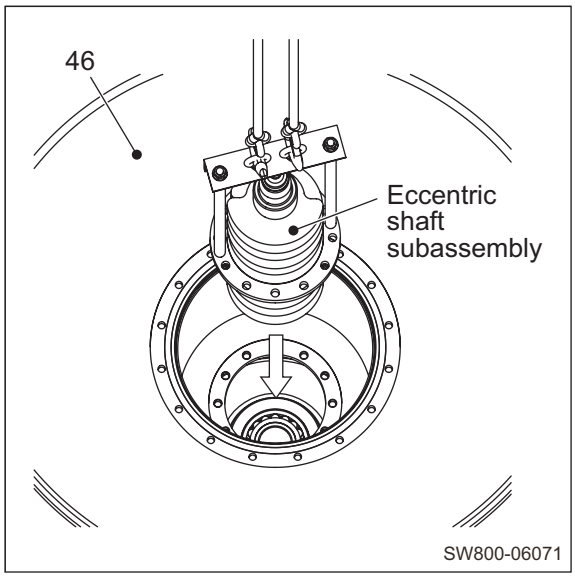



11) Apply gear oil to the bearing mounting surface of the eccentric shaft.

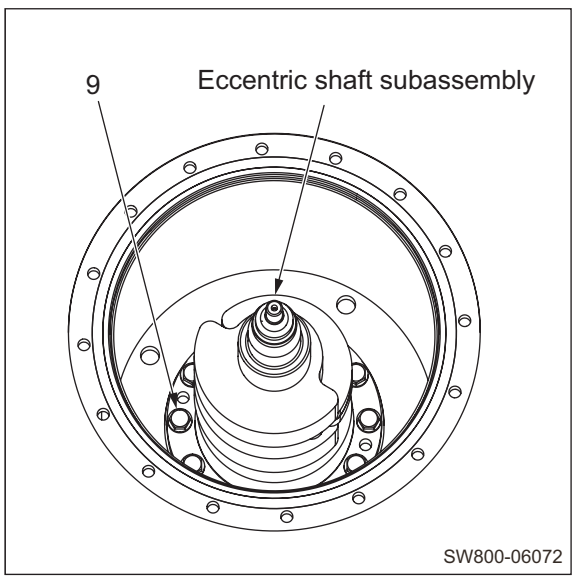
- Slowly lift the eccentric shaft subassembly with a crane and install it in the drum (46).

Eccentric shaft subassembly : 150 kg (331 lbs.)




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

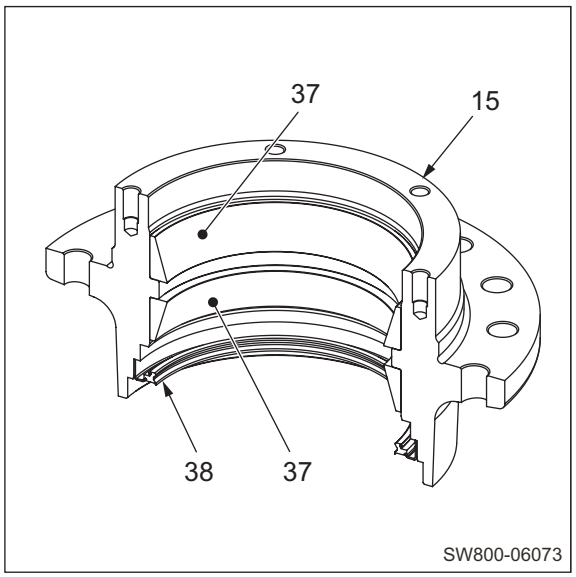
(9) Bolts M16×50 : 265 N·m (195 lbf·ft)



13) Axle shaft subassembly

13-1) Apply a thin coat of gear oil to the surface of the outer race of the roller bearing (37) to be press-fitted.

- Drive the outer race of the roller bearing (37) into the housing (15).
- Install the oil seal (38).
- Apply a thin coat of grease to the lip surface of the oil seal (38).

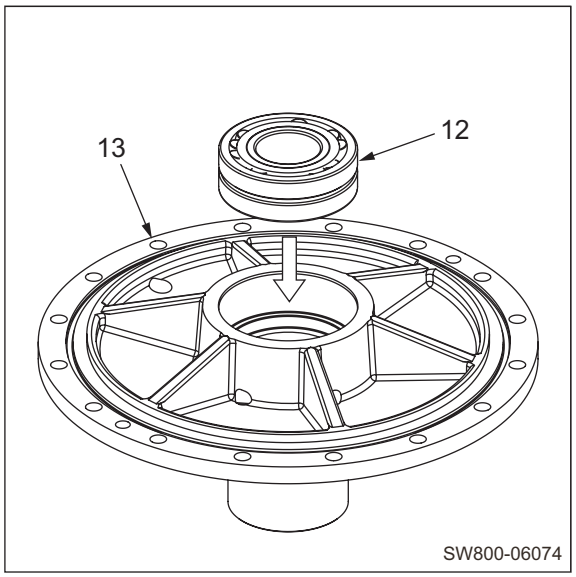



13-2) Apply a thin coat of gear oil to the surface of the vibrator bearing (12) to be press-fitted.

- Drive the vibrator bearing (12) into the axle shaft (13).

**(NOTICE)**

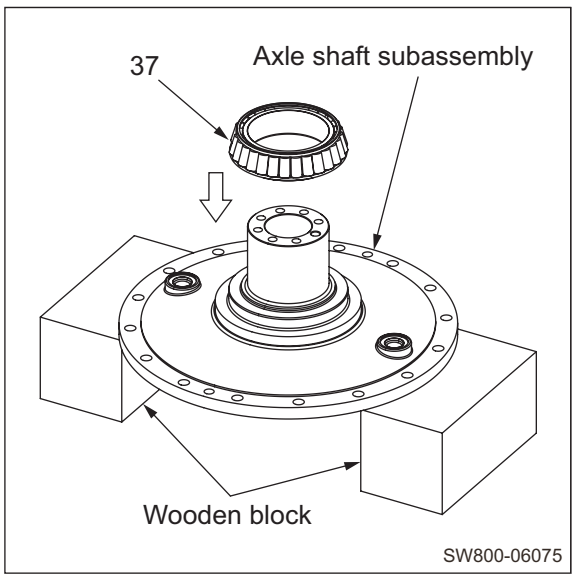
- **Take care not to damage the bearing when installing it.**



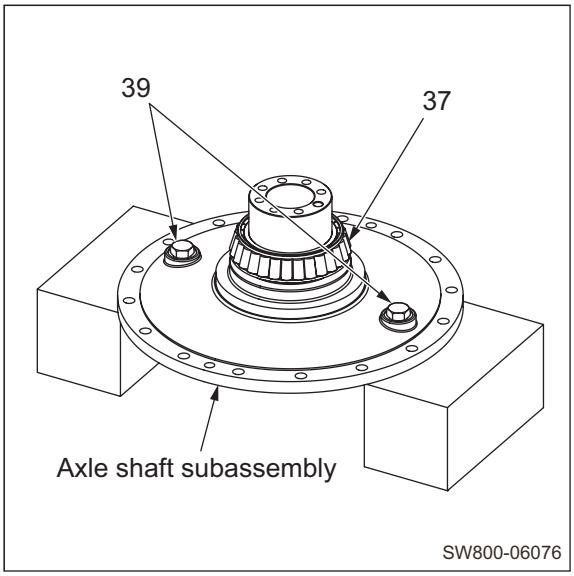

13-3) Lift the axle shaft subassembly with a crane and reverse it.

- Apply a thin coat of gear oil to the surface of the inner race of the roller bearing (37) to be press-fitted.
- Install the inner race of the roller bearing (37).

Axle shaft subassembly : 80 kg (176 lbs.)

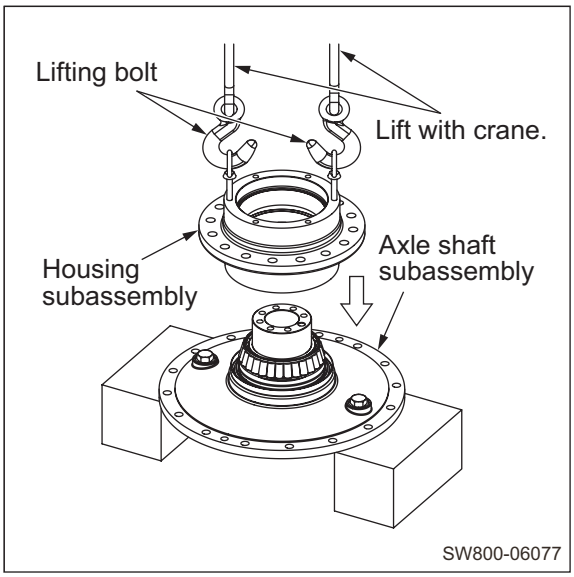


13-4) Install the plugs (39) on the axle shaft subassembly.
- Apply sufficient amount of lithium-based grease to the roller surface of the roller bearing (37).

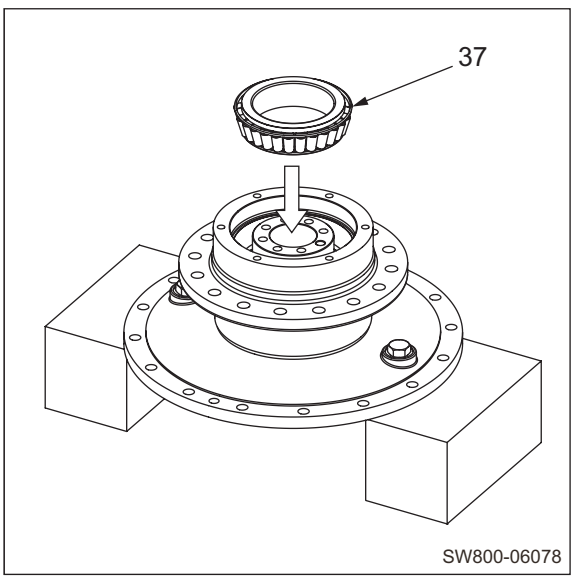



13-5) Install lifting bolts (M12) on the housing subassembly and lift it with a crane to joint it with the axle shaft subassembly.

Housing subassembly : 50 kg (110 lbs.)



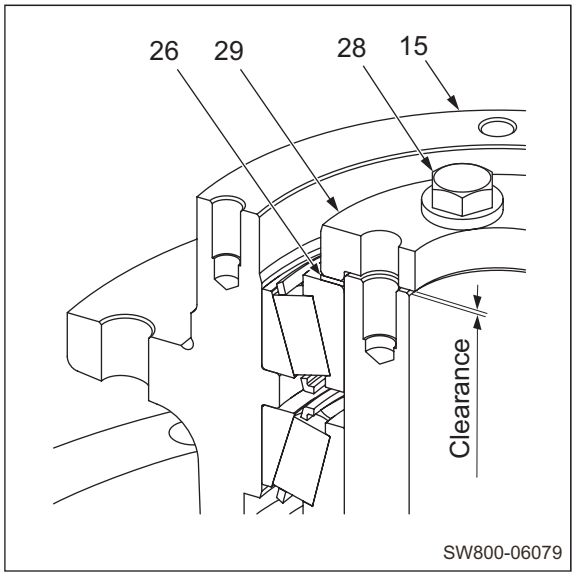

13-6) Apply sufficient amount of lithium-based grease to the roller surface of the inner race of the roller bearing (37).
- Drive the roller bearing (37) into the housing subassembly until the roller surface of its inner race comes into contact with the outer race.



13-7) Preload adjustment of roller bearing

① Install a shim (26) of about 1 mm (0.08 in.) on the axle shaft and install the cover (29). The shim provides a clearance between the end face of the axle shaft and the inner surface of the cover (29).

- Tighten the four bolts (28) with washers to a torque of 108 N·m (80 lbf·ft).
- Give the housing (15) two to three turns and tighten the bolts to a torque of 108 N·m (80 lbf·ft) again.
- Repeat this work several times until the tightening torque of the bolts no longer fluctuates.

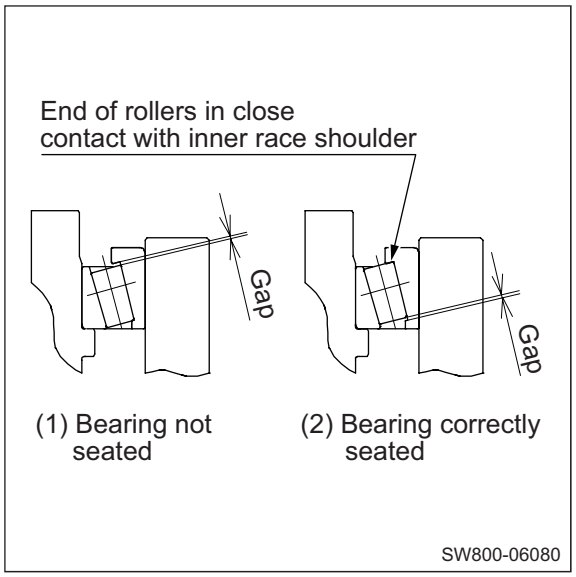



**(NOTICE)**

- **Tighten four of the eight bolts (28) alternately in the diagonal directions.**

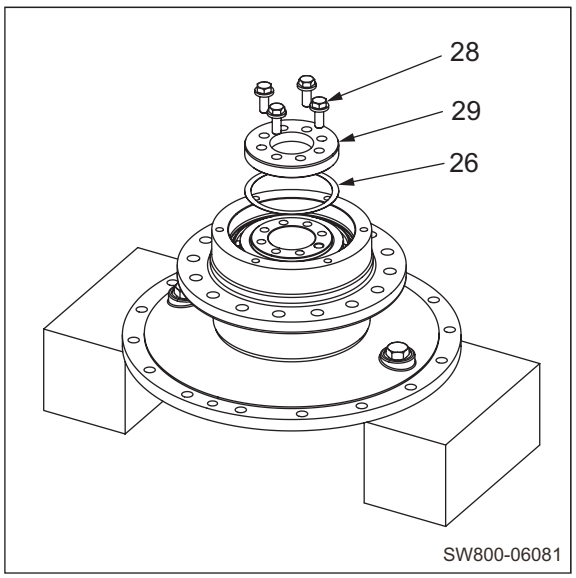
**(NOTICE)**

- **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.**



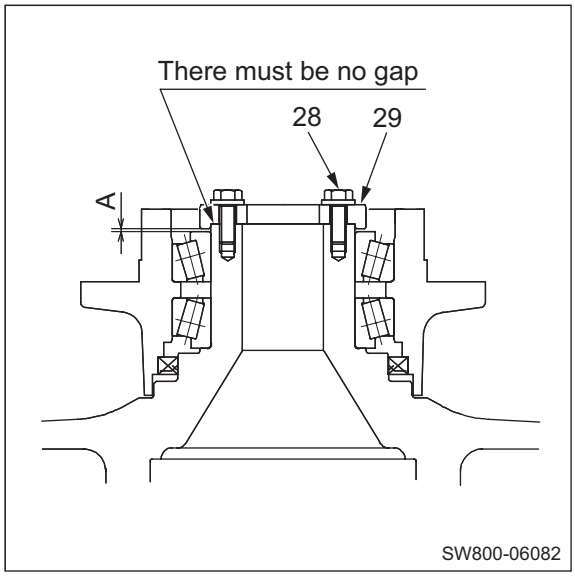

② Remove the four bolts (28).

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



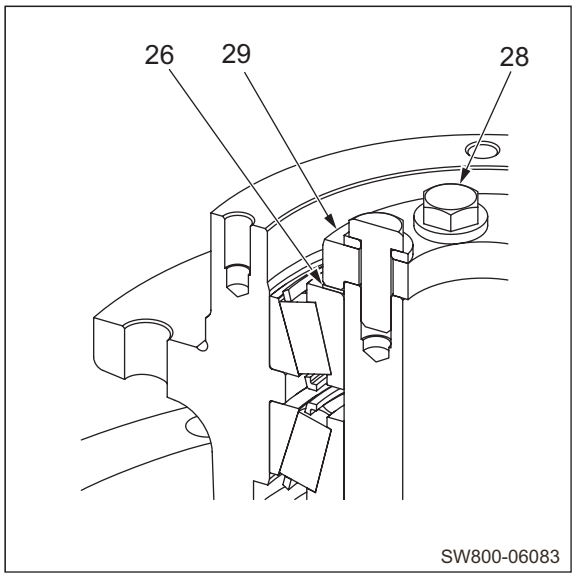
③ Without inserting shim, install the cover (29).
- Install washers to the four bolts (28) and tighten.
- Using a thickness gauge, measure the gap at dimension “A”.

★ Preload adjusting shim thickness = A + 0.1 mm (0.004 in.)

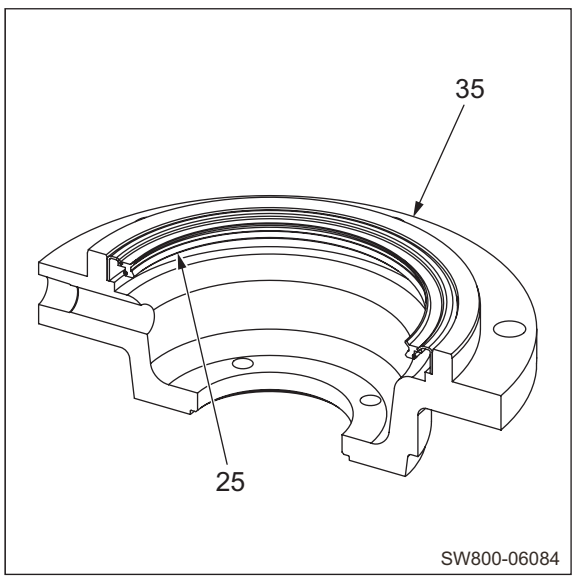



④ Remove the four bolts (28).
- Remove the cover (29).
- Install a shim of the preload adjusting shim thickness “A + 0.1 mm” and reinstall the cover (29). Then, secure the cover with the eight bolts (28) with washers.

N•m (28) Bolts M14×40 : 167 N·m (123 lbf·ft)

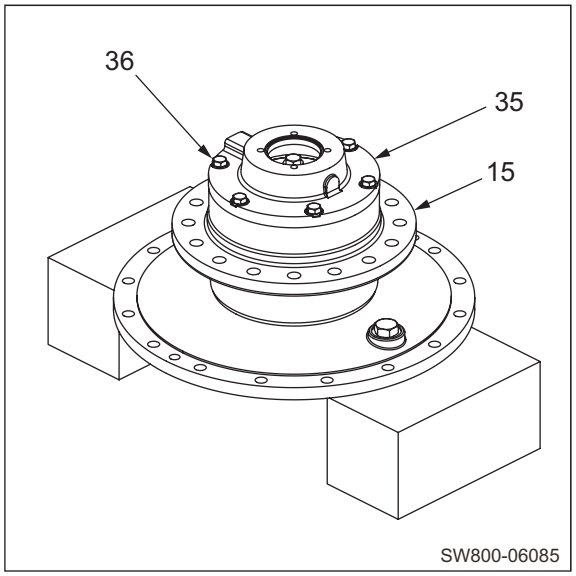



⑤ Install the oil seal (25) on the cover (35).
- Apply a thin coat of grease to the lip surface of the oil seal (25).
- Apply liquid packing to the mounting surface.

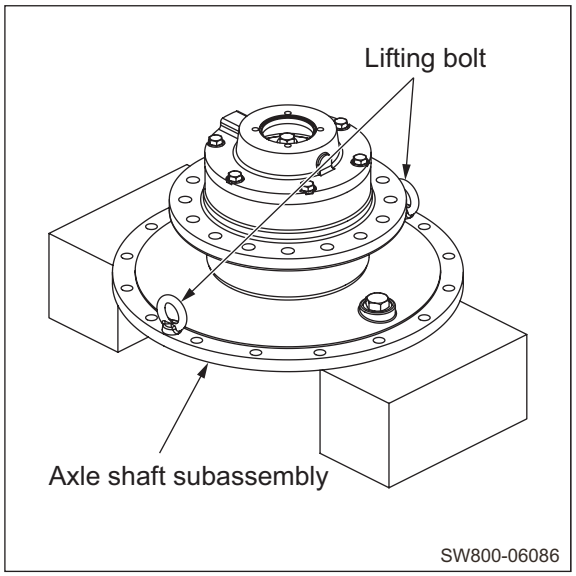


⑥ Secure the cover (35) to the housing (15) with the six bolts (36) and spring washers.

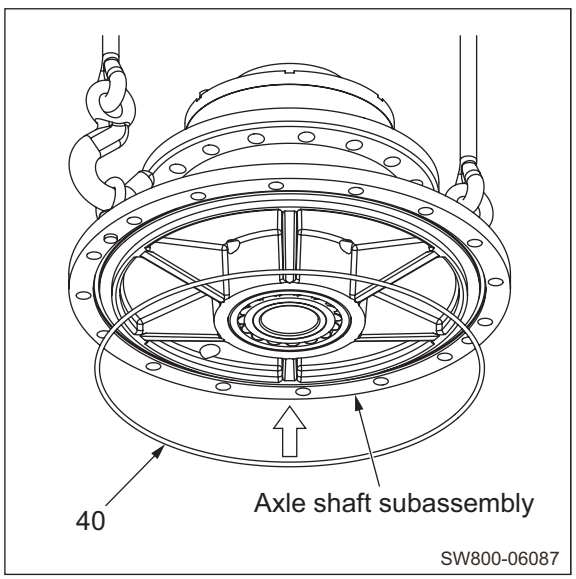
N•m (36) Bolts M12×40 : 108 N·m (80 lbf·ft)




14) Install lifting bolts (M16) on the axle shaft subassembly.



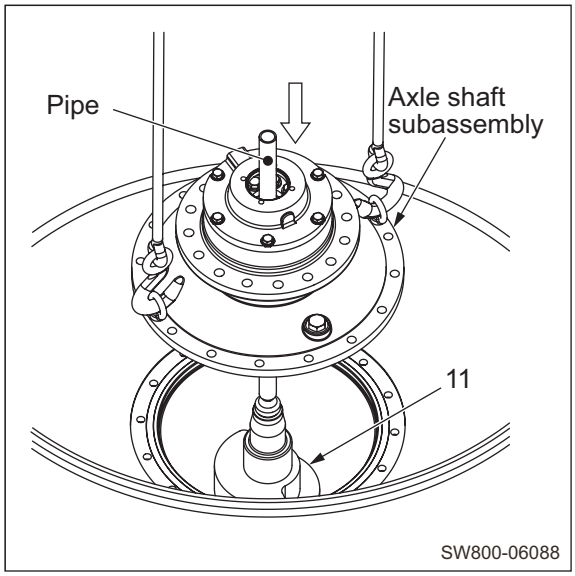

15) Apply a thin coat of grease to the entire periphery of the O-ring (40).
- Install the O-ring (40) on the axle shaft subassembly.



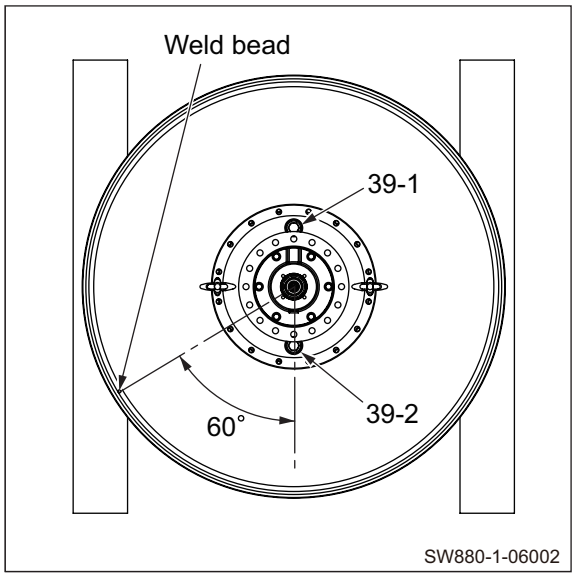
16) Lift the axle shaft subassembly with a crane and lower it slowly.
- Supporting the eccentric shaft (11) with a pipe or the like, align the center of the vibrator bearing inner race to that of the shaft.

**(NOTICE)**
- **Install the axle shaft taking care not to tilt the vibrator bearing.**
- **When installing the axle shaft, take care not to allow the O-ring to protrude from the fitting groove.**

Axle shaft subassembly : 140 kg (309 lbs.)

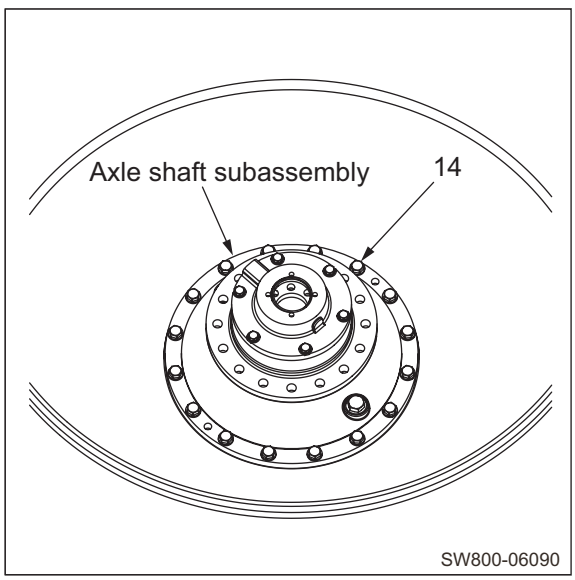



**(NOTICE)**
- **When installing the axle shaft subassembly, pay attention to the positional relationship between the weld bead on the drum and the plugs (39-1) and (39-2).**

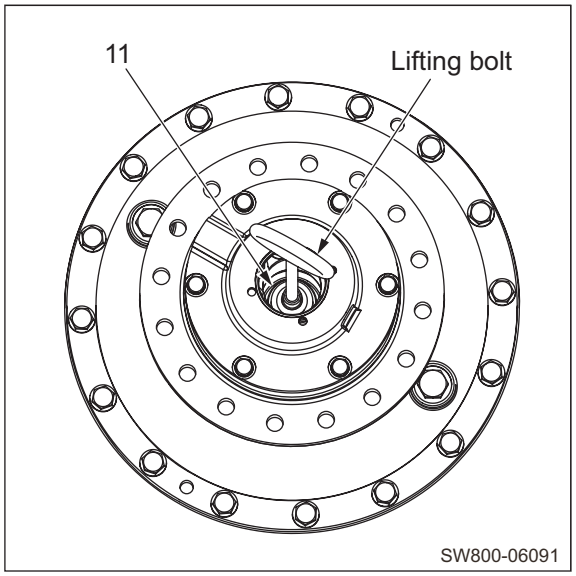



17) Secure the axle shaft subassembly to the drum with the sixteen bolts (14).

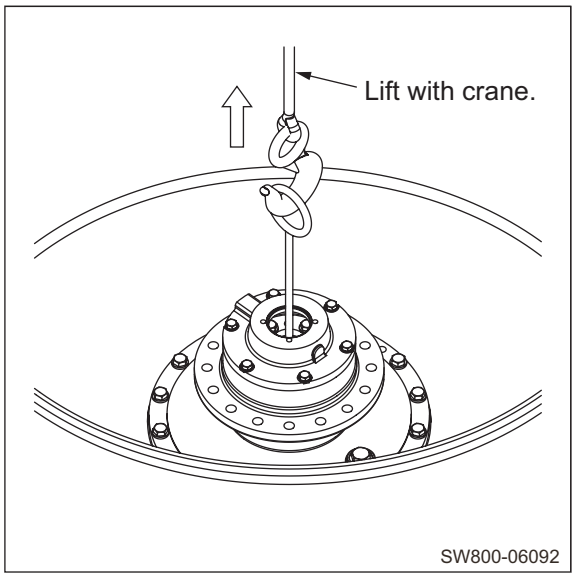
(14) Bolts M16×50 : 265 N·m (195 lbf·ft)



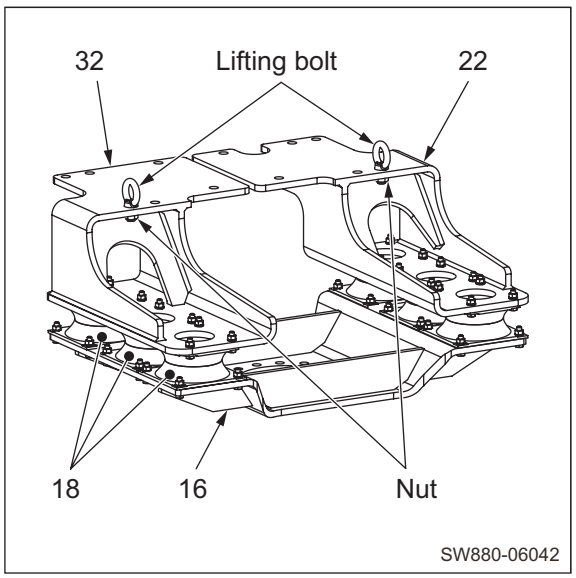
18) Install a lifting bolt (M8) on the shaft end of the eccentric shaft (11).




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

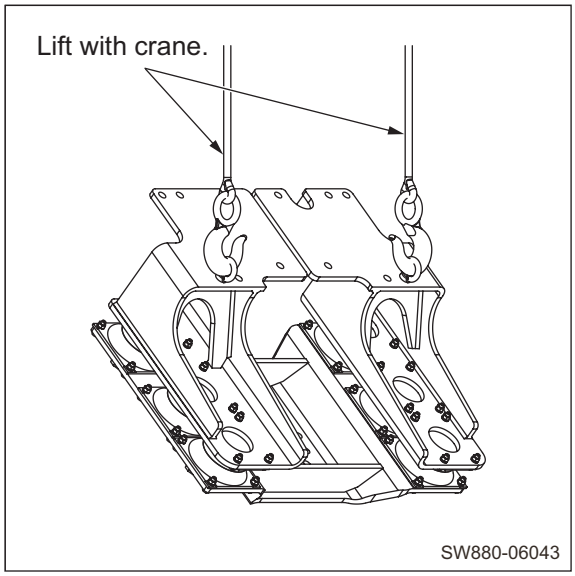



20) Install lifting bolts and nuts (M22) on a subassembly of the brackets (16), (22) and (32) and dampers (18) as shown on the right.



21) Lift the bracket subassembly with a crane.

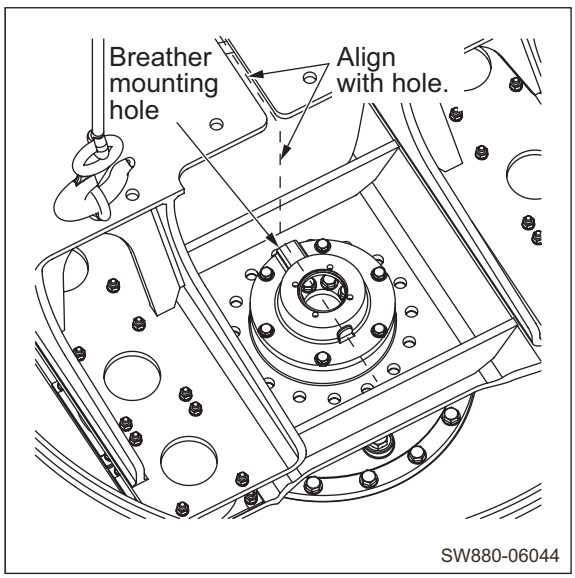
Bracket subassembly : 290 kg (639 lbs.)




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

**(NOTICE)**

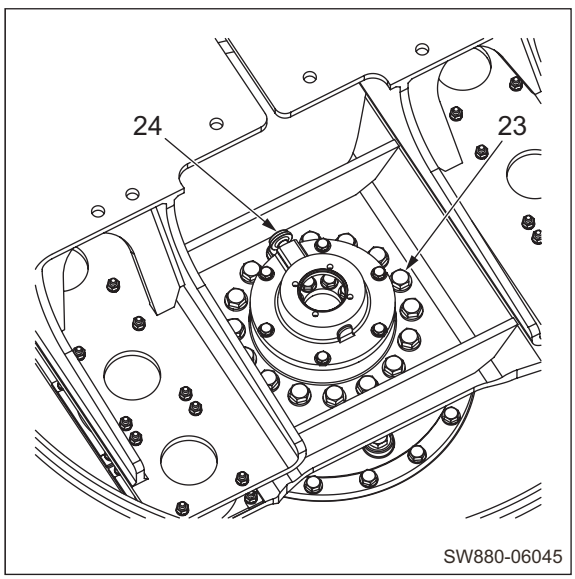
- **Be sure to install the bracket subassembly correctly in relation to the position of the breather mounting hole in the housing.**



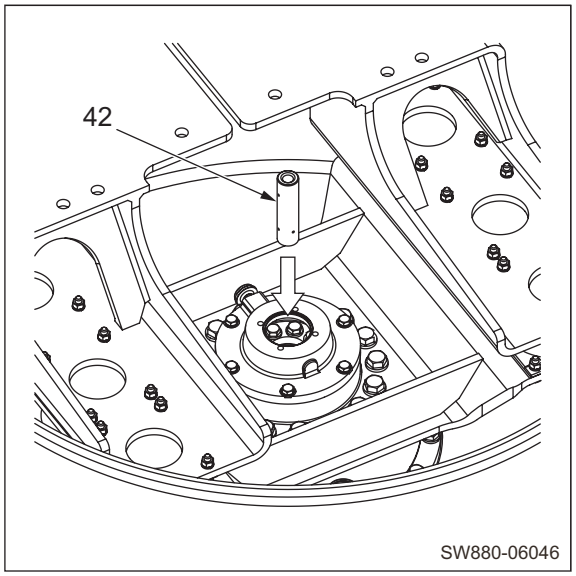

23) Secure the bracket subassembly to the housing with the sixteen bolts (23) and washers.

(23) Bolts M20×60 : 540 N·m (400 lbf·ft)

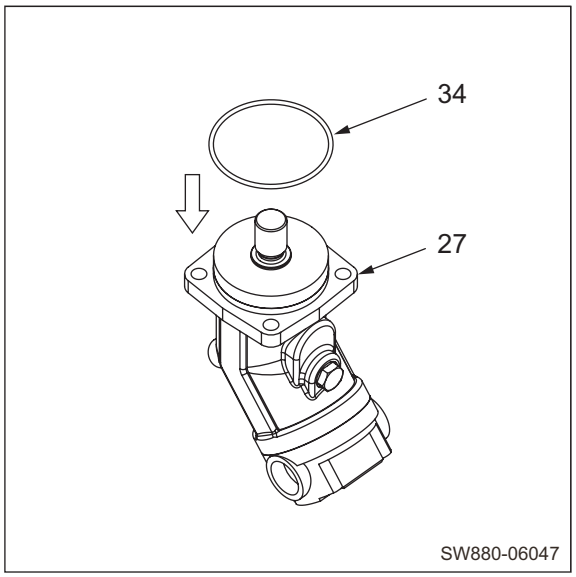
- Wind seal tape around the threaded portion of the breather (24).
- Install the breather (24).



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



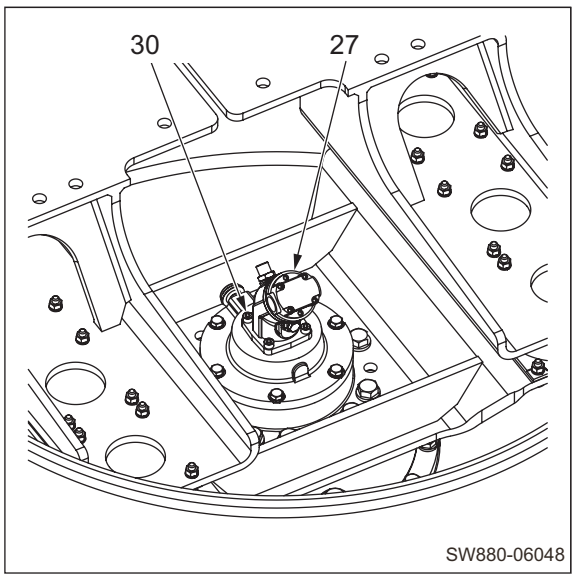

25) Apply a thin coat of grease to the O-ring (34).
- Install the O-ring (34) on the vibrator motor (27).




26) Secure the vibrator motor (27) in place with the four bolts (30).

**(NOTICE)**
- **When installing the vibrator motor, take care not to allow the O-ring to protrude from the fitting groove.**

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

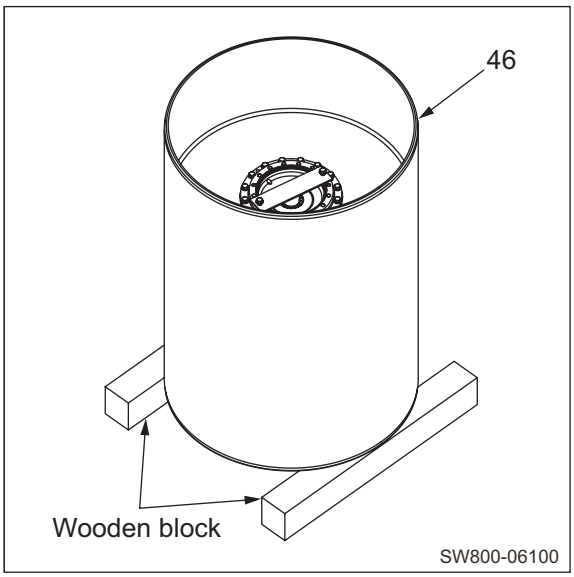


**WARNING**

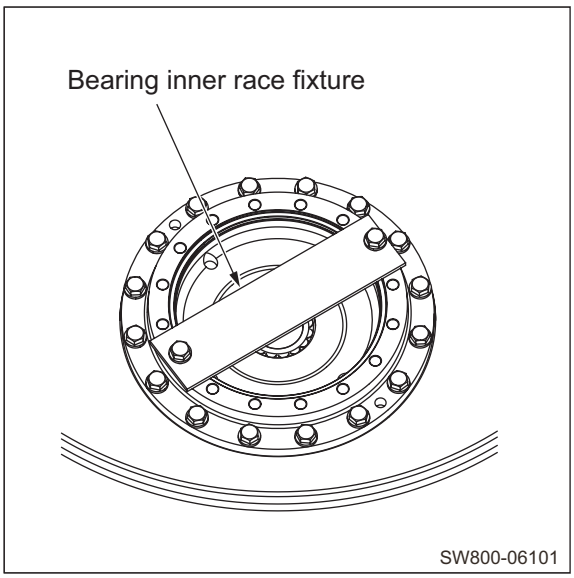
**Be careful because reversing the vibratory drum is dangerous work. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.**

27) Lift the drum (46) with a crane and reverse it. Then, stand the drum with the propulsion motor side facing up.

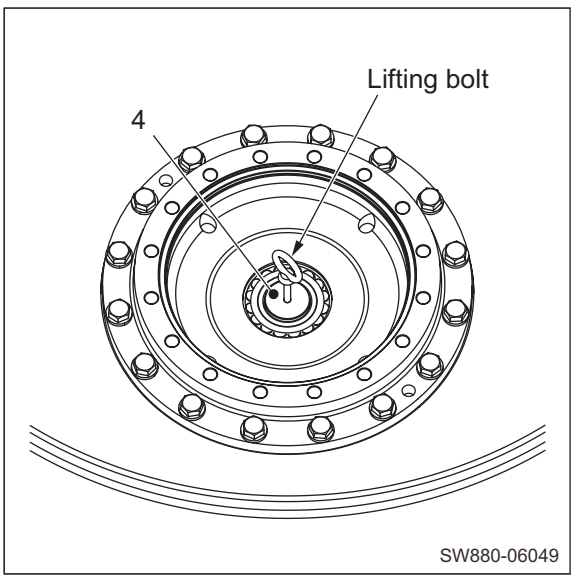
(46) Drum
SW880-1 : 2,690 kg (5,930 lbs.)
SW990-1 : 2,760 kg (6,085 lbs.)



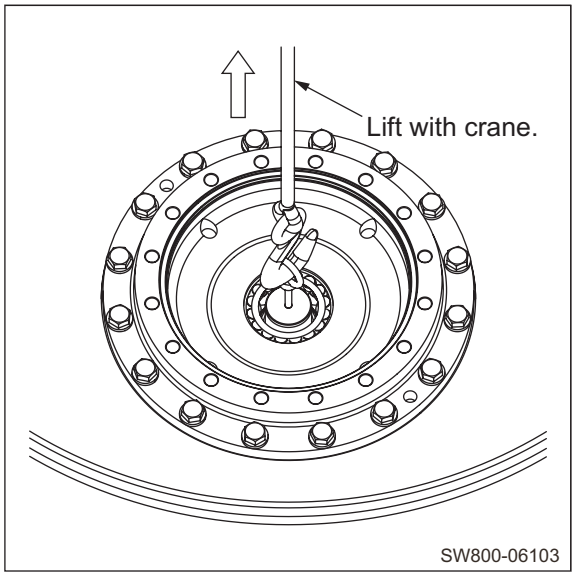

28) Remove the bearing inner race fixture.



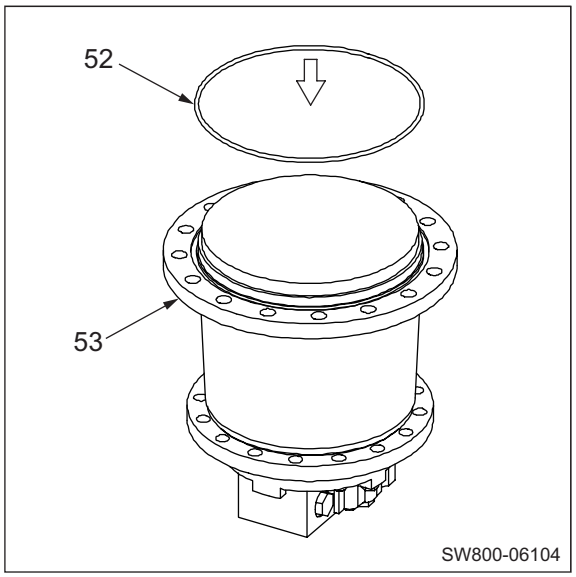

29) Install a lifting bolt (M10) on the shaft end of the eccentric shaft (4).



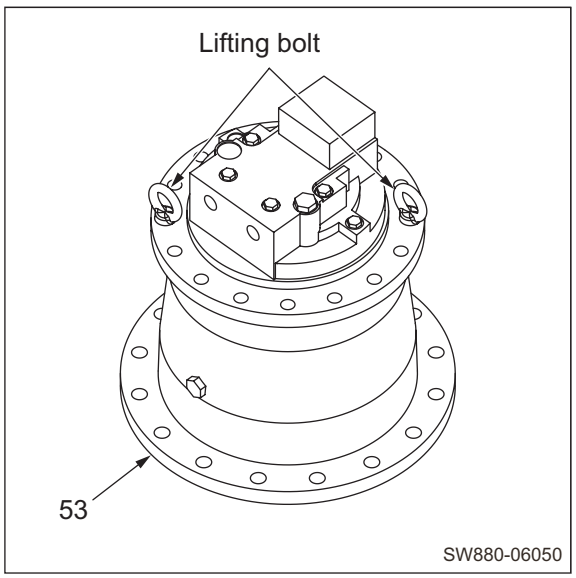
30) Slowly lift the eccentric shaft with a crane and check that there is an axial play of 1 to 2 mm (0.04 to 0.08 in.).




31) Apply a thin coat of grease to the O-ring (52).
- Install the O-ring (52) on the propulsion motor (53).




32) Install lifting bolts (M20) on the propulsion motor (53).

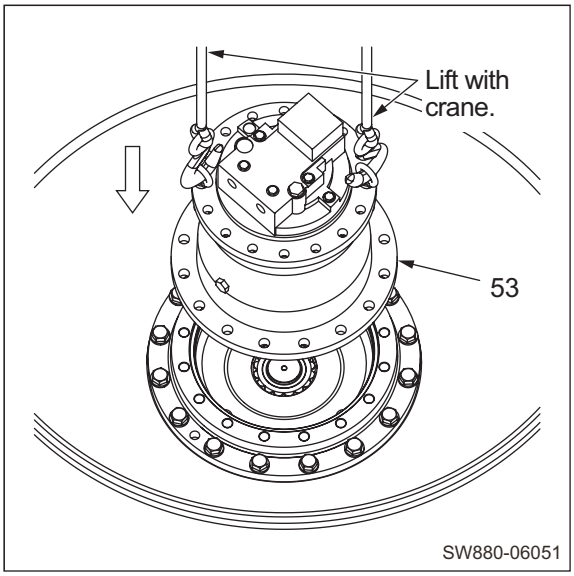


33) Slowly lift the propulsion motor (53) with a crane and install it in the drum.

**(NOTICE)**

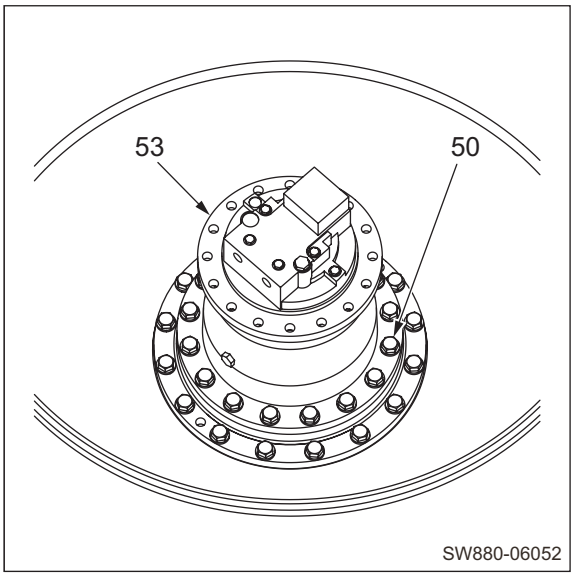
- **When installing the propulsion motor, take care not to allow the O-ring to protrude from the fitting groove.**

(53) Propulsion motor : 200 kg (441 lbs.)

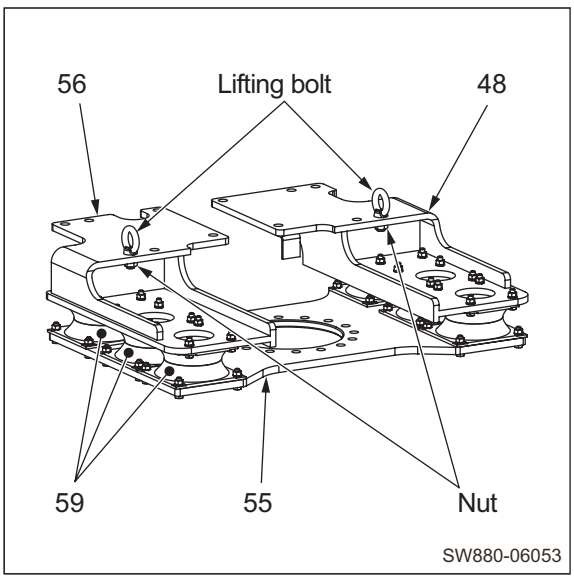



34) Secure the propulsion motor (53) with the bolts (50) and washers.

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

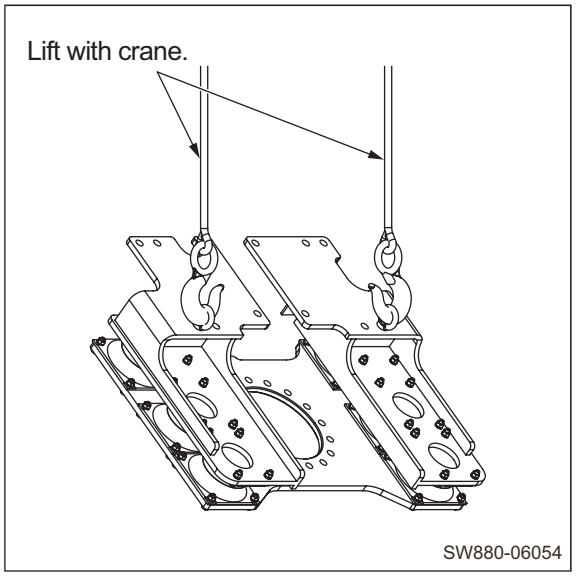



35) Install lifting bolts and nuts (M22) on a subassembly of the brackets (48) and (56), plate (55) and dampers (59) as shown on the right.



36) Lift the bracket subassembly with a crane.

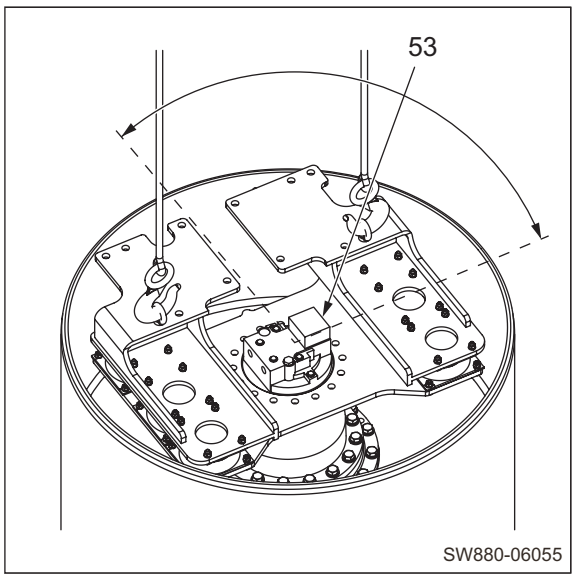
Bracket subassembly : 250 kg (551 lbs.)




37) Lower the bracket subassembly while keeping it level and install it on the spigot joint of the propulsion motor (53).

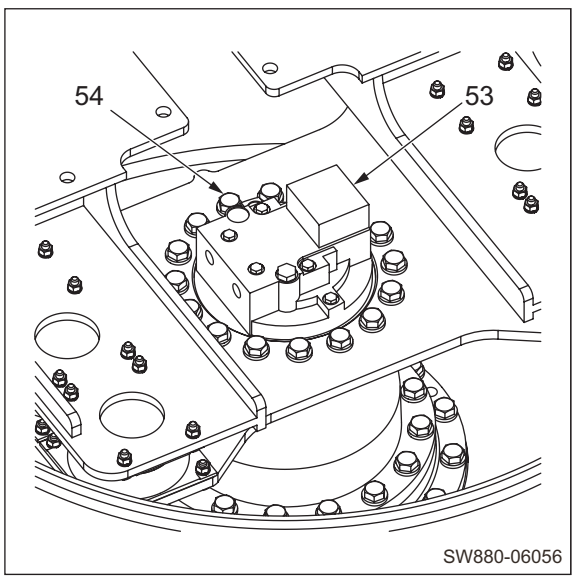
**(NOTICE)**

- **Be sure to install the bracket subassembly correctly in relation to the position of the propulsion motor (53).**



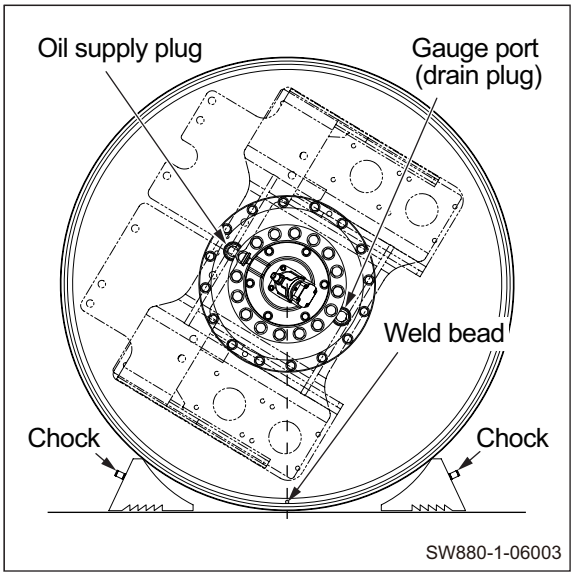

38) Secure the bracket subassembly to the propulsion motor (53) with the sixteen bolts (54) and washers.

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

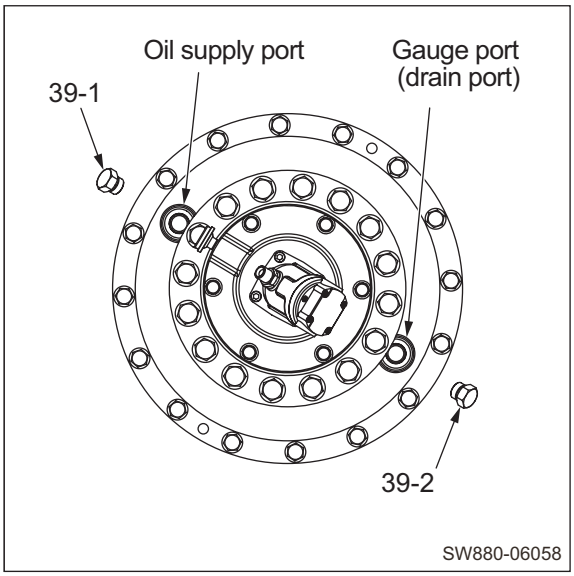


39) Lift the assembled drum assembly with a crane and lay it with the weld bead on the vibrator motor side facing down.
- Hold the drum assembly in place with chocks.

kg Drum assembly
SW880-1 : 3,100 kg (6,834 lbs.)
SW990-1 : 3,215 kg (7,088 lbs.)

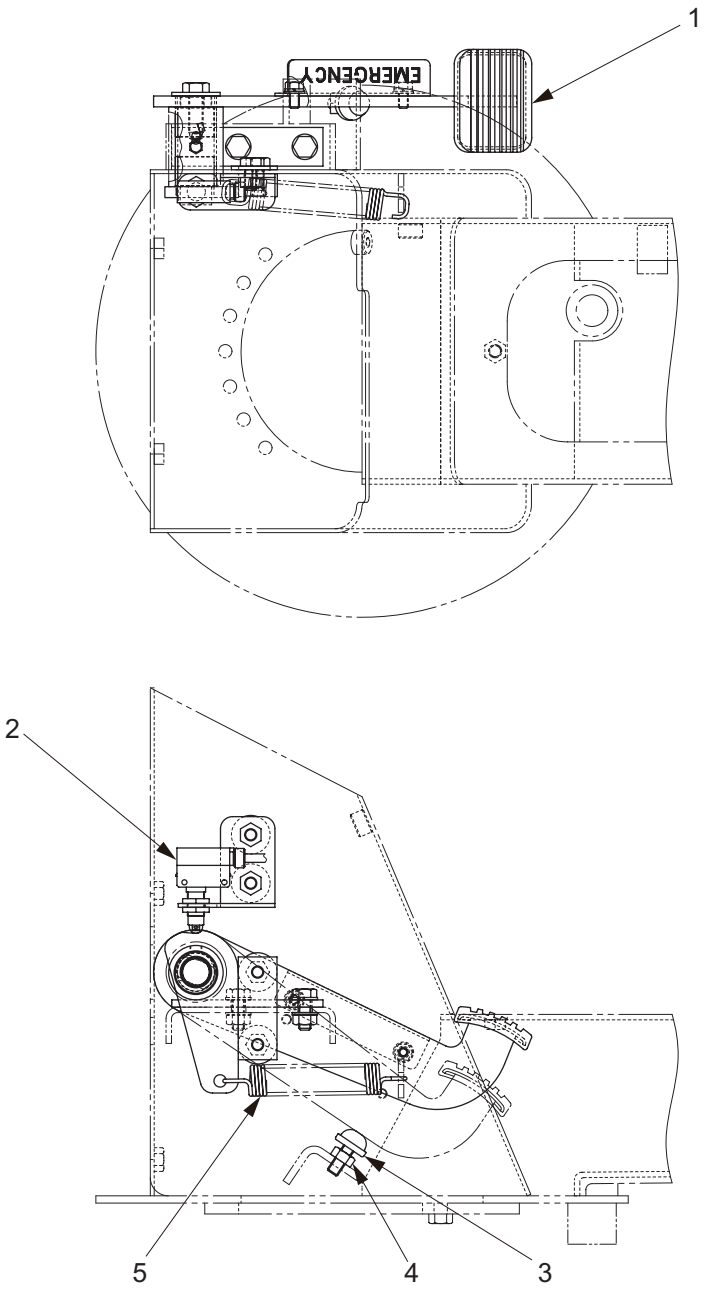



40) Remove the plugs (39-1) and (39-2).
- Supply gear oil from the oil supply port and check that the oil drips from the gauge port.
  - Gear oil : 22 L (5.8 gal.)
- Reinstall the plugs (39-1) and (39-2).



# BRAKE

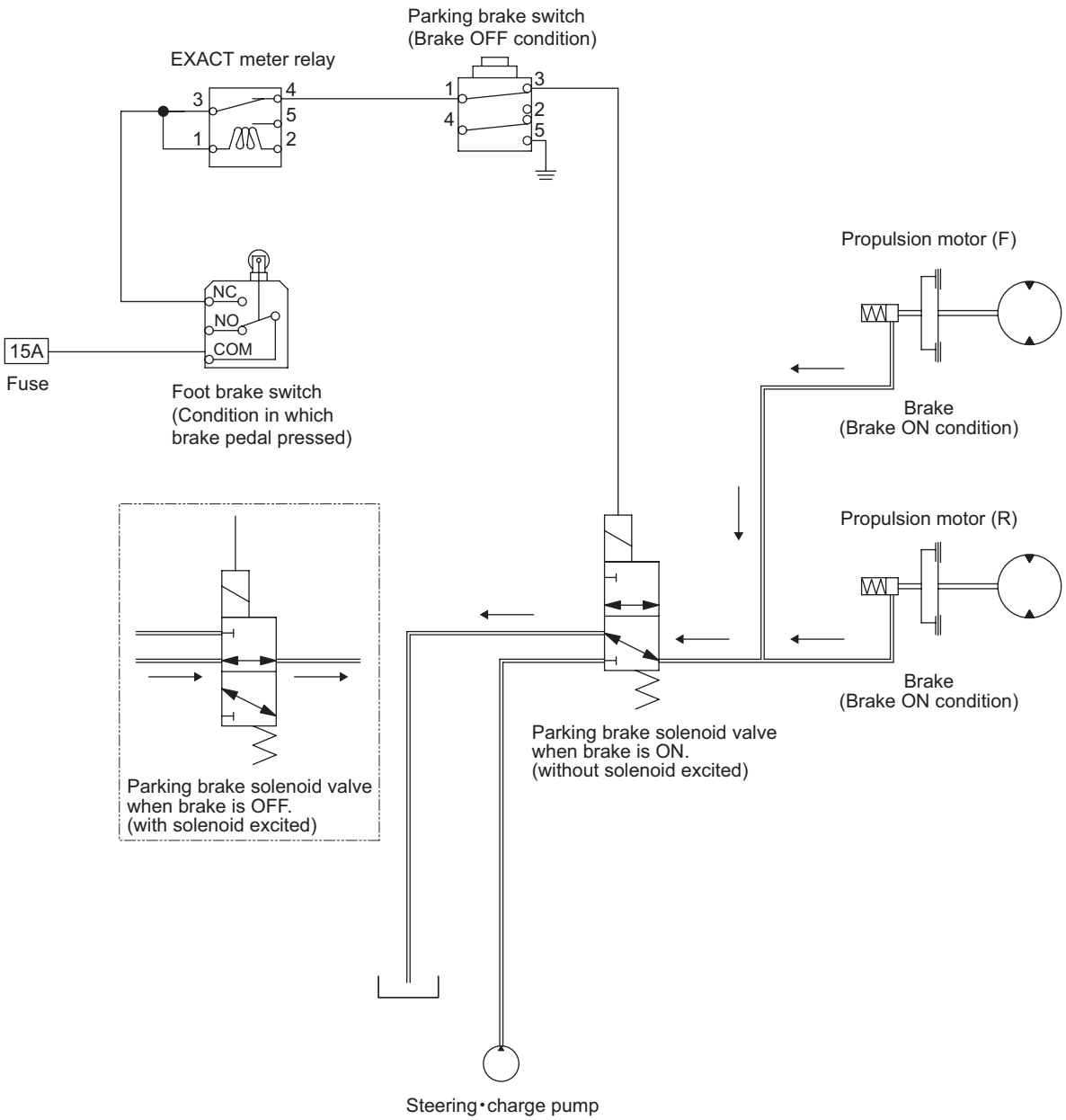
# 1. BRAKE PEDAL




0568-51803-0-11251-0

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

# 2. BRAKE SYSTEM



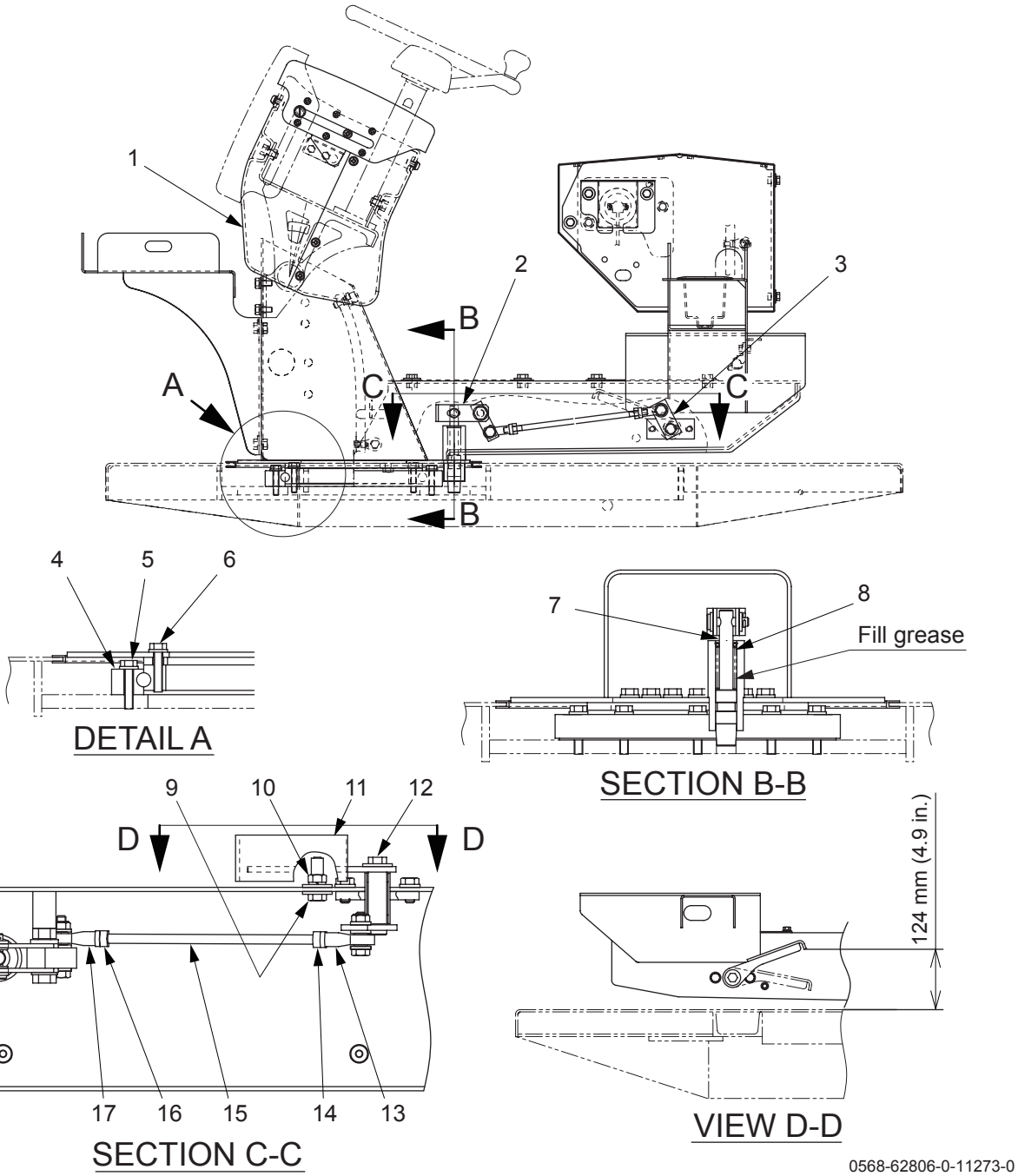

・ The arrow ( ⟶ ) symbol shows the direction of the hydraulic oil flow.

SW880-1-07001

# OPERATOR STATION

# 1. FLOORBOARD

## 1-1. Structure of Operator Station




0568-62806-0-11273-0

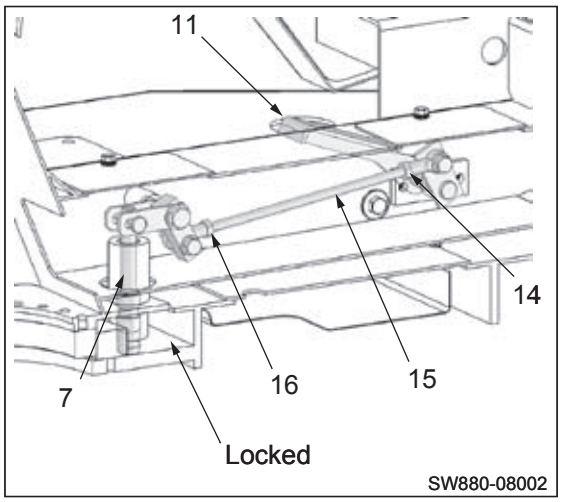
(1) Dashboard
(2) Lever
(3) Pin
(4) Swing bearing
(5) Bolt : M10×50
(6) Bolt : M10×50
(7) Pin
(8) Spring
(9) Bolt (pedal stopper) : M10×40
(10) Nut : M10
(11) Pedal
(12) Bolt : M10×20
(13) Rod end : M10 (left-hand thread)
(14) Nut : M10 (left-hand thread)
(15) Rod
(16) Nut : M10
(17) Rod end : M10

N•m

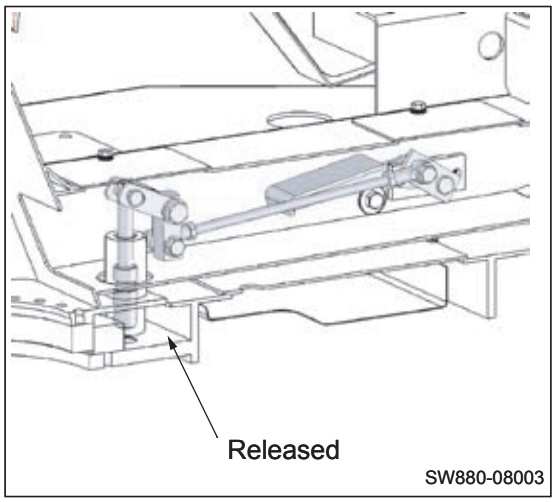
(5) Bolt M10×50 : 49 N·m (36 lbf·ft)
(6) Bolt M10×50 : 49 N·m (36 lbf·ft)
(12) Bolt M10×20 : 49 N·m (36 lbf·ft)

## 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

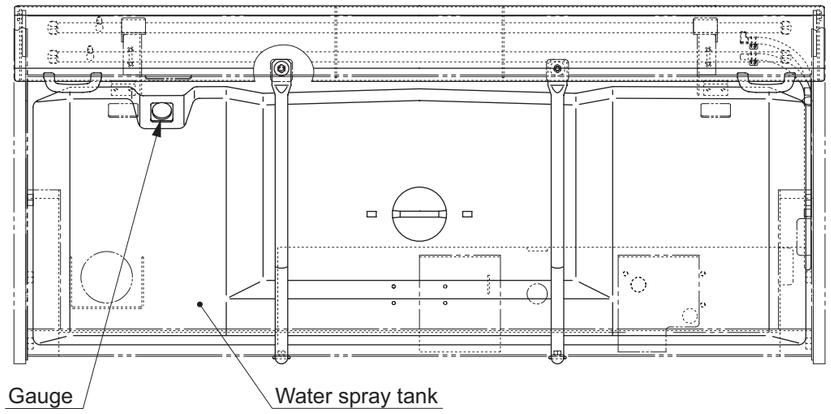


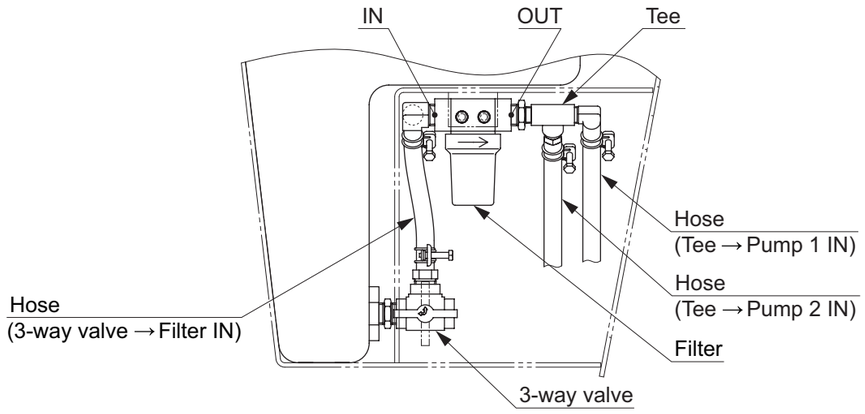

Pedal depressed

- 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).

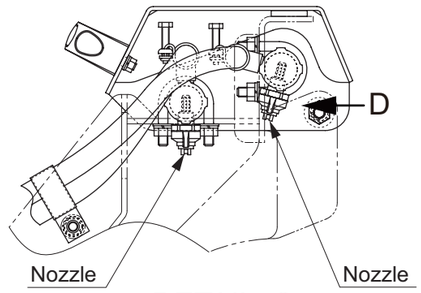
# WATER SPRAY SYSTEM

# 1. WATER SPRAY PIPING

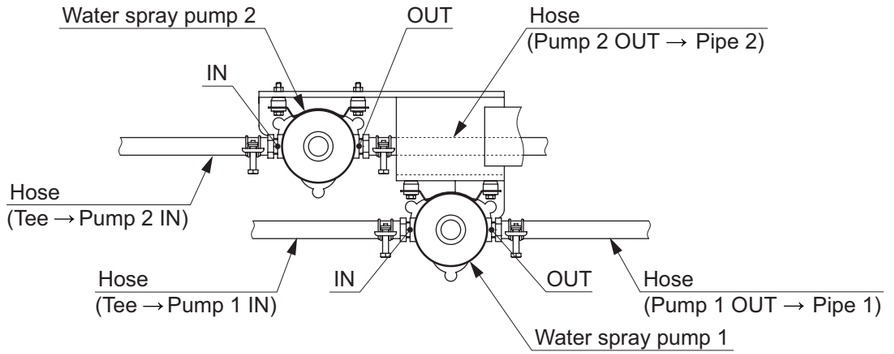


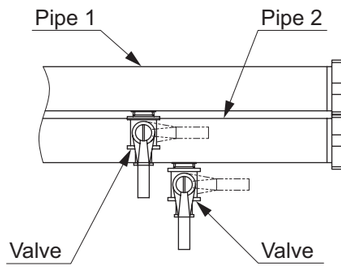

VIEW A



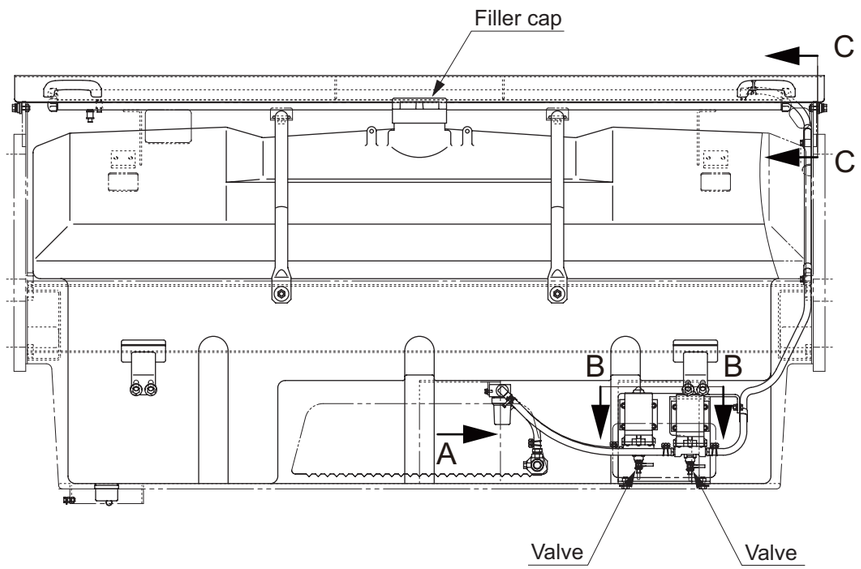

DETAIL C

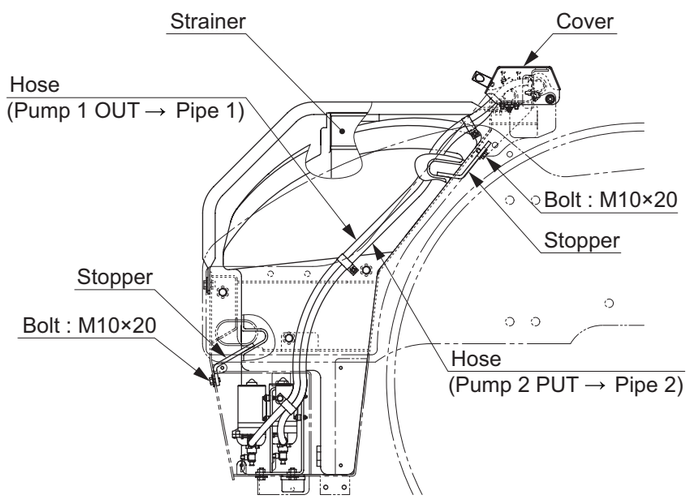


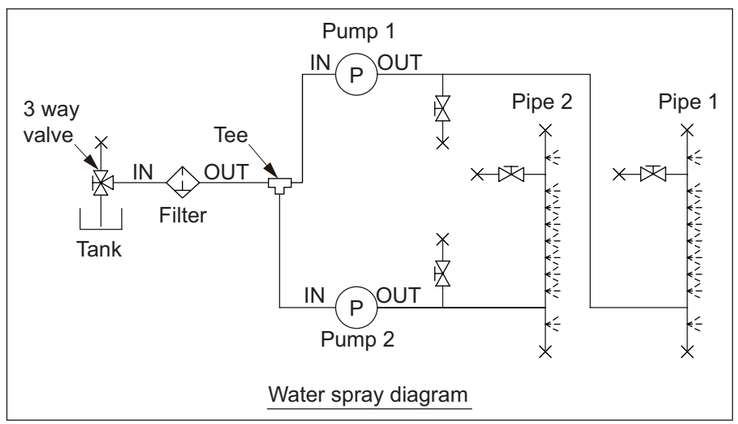

SECTION B-B




VIEW D




Water spray diagram

・The letters and figures (such as Pump 1 and Pipe 1) show each port and the arrow (→) symbols show the hose connection and the direction of the flow of the water.

# INSPECTION AND ADJUSTMENT

# 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.**

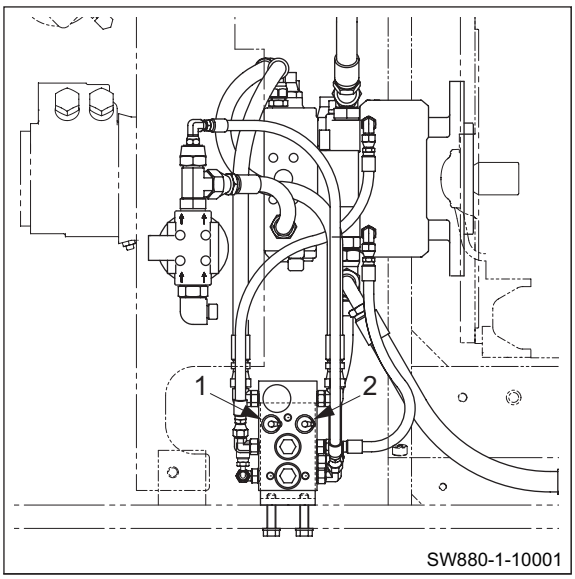
- Oil temperature during measurement: 50 ± 5°C (122 ± 9°F)

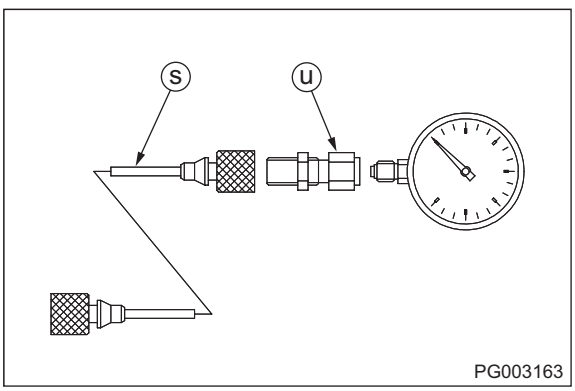
① Remove plugs from couplings (1) and (2) of valve block port G1 and G2. Attach pressure gauge with hose ⓢ and the connector ⓤ.

- Coupling : 9/16-18UNF×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ : M16×G3/8
- Forward side port G1 : (1)
- Reverse side port G2 : (2)
- Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)

② Set propulsion speed change switch to "🐢".
③ Set vibration frequency select switch to "2,500 vpm".
④ Start the engine and set throttle switch to the "Full".
⑤ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)
⑥ With propulsion load at maximum, slowly move F-R lever to the side to be measured.
- Then, read the pressure indicated by pressure gauge.

⑦ After measuring, promptly return F-R lever to "N".




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

**: 37.3 ± 1.0 MPa (5,409 ± 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.

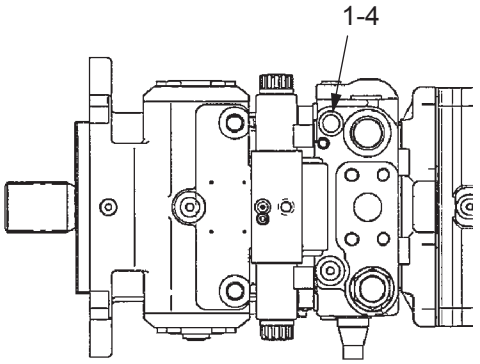
⑥ If a scratch is found on seat, replace cut off valve.

⑦ After adjustment, measure pressure again and check that pressure reaches maximum circuit pressure range.

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

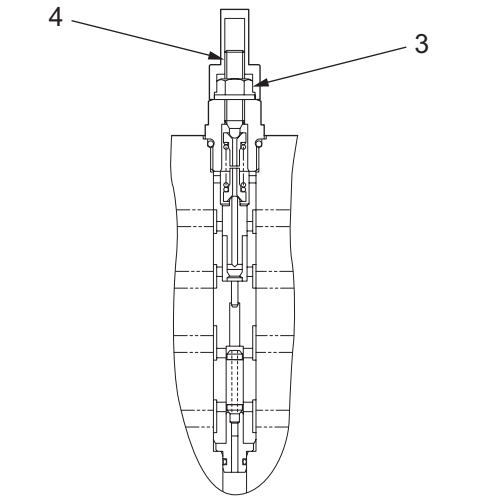
**(NOTICE)**

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




Propulsion pump

SW880-10002




SW800-09003

- The numbers such as “1-4” appearing in above illustrations is consistent with lead line numbers shown in illustration of propulsion pump in “2-2. Hydraulic Component Specifications” (page 4-006).

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

① Check nut (5) of high pressure relief valve (1-11) or (1-14) for evidence of having loosened.
- High pressure relief valve (1-11): Forward side
- High pressure relief valve (1-14): Reverse side

② If there is evidence of nut having loosened, adjust high pressure relief valve so that pressure becomes within maximum circuit pressure range while watching pressure gauge.
- To adjust pressure, loosen nut and turn adjustment screw (6).

Adjustment screw turned clockwise
: Pressure rise
Adjustment screw turned counterclockwise
: Pressure drop
Pressure change rate : 20 MPa/turn (2,900 psi/turn)

③ If there is no evidence of nut having loosened, remove high pressure relief valve.

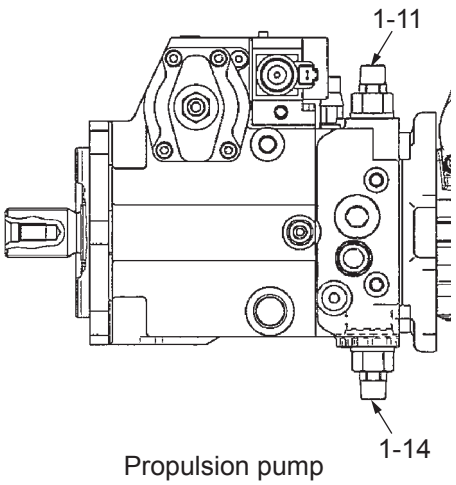
④ Check removed high pressure relief valve for trapped dirt and scratches on its seat.

⑤ If trapped dirt is present, disassemble and clean high pressure relief valve.

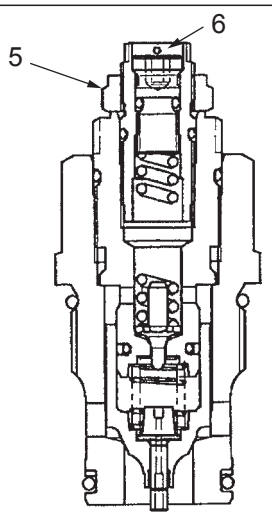
⑥ If a scratch is found on seat, replace high pressure relief valve.

⑦ After adjustment, measure pressure again and check that pressure reaches maximum circuit pressure range.

N·m (5) Nut : 20 N·m (15 lbf·ft)
(1-11) High pressure relief valve
(1-14) : 150 N·m (111 lbf·ft)



Propulsion pump
SW880-10003



High pressure relief valve
SW880-10006

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

- The numbers such as “1-11” and “1-14” appearing in above illustrations are consistent with lead line numbers shown in illustration of propulsion pump in “2-2. Hydraulic Component Specifications” (page 4-006).

# 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.

## 3-1. Measurement

- Oil temperature during measurement: 50 ± 5°C (122 ± 9°F)

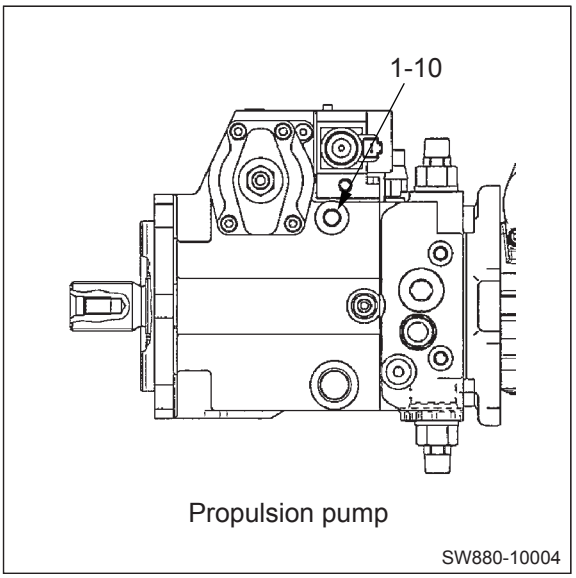
① Remove plug from coupling of propulsion pump (1-10). Attach pressure gauge with hose ⓢ and adapter ⓤ.
- Coupling : 9/16-18UNF×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ: M16×G3/8
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Apply parking brake by pressing parking brake switch button.

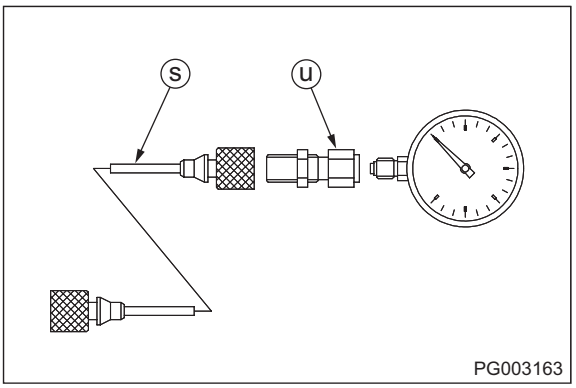
③ Start the engine and set throttle switch to “Full”.

- Then, read pressure indicated by pressure gauge.

**★ Standard charge relief valve setting**
**: 2.5 ± 0.2 MPa (362 ± 29 psi)**



Propulsion pump
SW880-10004



PG003163

- The number “1-10” appearing in above illustrations is consistent with lead line numbers shown in illustration of propulsion pump in “2-2. Hydraulic Component Specifications” (page 4-006).

## 3-2. Adjustment

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

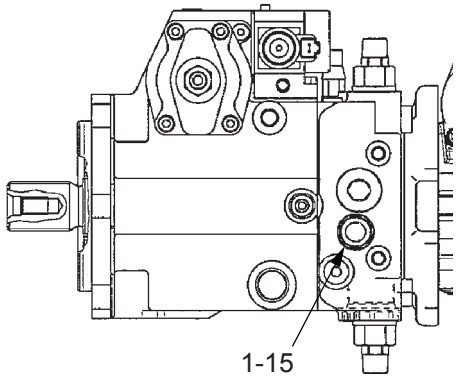
① Check nut (1) of charge relief valve (1-15) for evidence of having loosened.
② If there is evidence of nut having loosened, adjust charge relief valve so that pressure becomes within standard charge relief valve pressure setting range while watching pressure gauge.
- To adjust pressure, loosen nut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

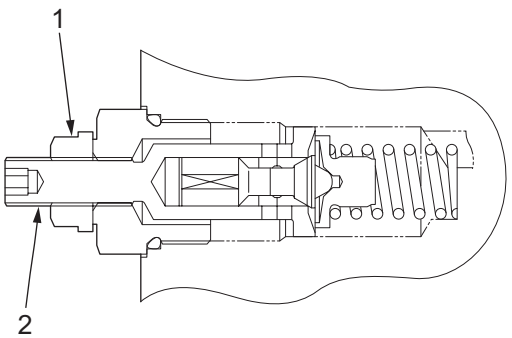
③ If there is no evidence of nut having loosened, remove charge relief valve.
④ Check the removed charge relief valve for trapped dirt and scratches on its seat.
⑤ If trapped dirt is present, disassemble and clean charge relief valve.
⑥ If a scratch is found on seat, replace charge relief valve.
⑦ After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

N·m (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.**



Propulsion pump
SW880-10005



Charge relief valve
SW800-09007

- The number “1-15” appearing in above illustrations is consistent with lead line numbers shown in illustration of propulsion pump in “2-2. Hydraulic Component Specifications” (page 4-006).

# 4. MEASUREMENT OF PROPULSION SERVO CIRCUIT PRESSURE

## 4-1. Measurement

- Oil temperature during measurement: 50 ± 5°C (122 ± 9°F)

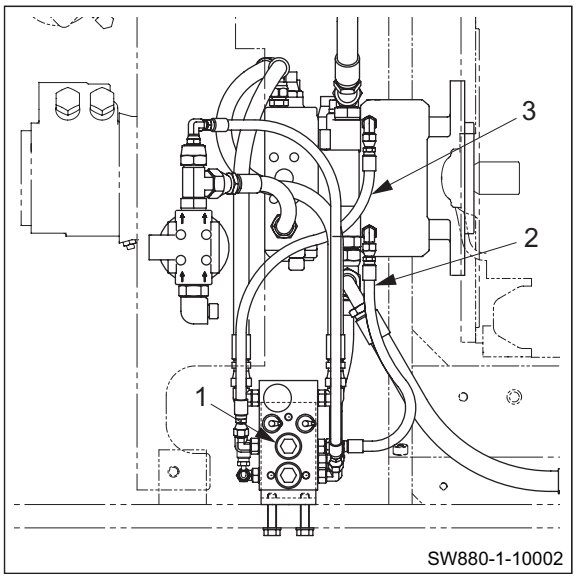
① Disconnect hoses (2) and (3) from neutral solenoid valve (1). Attach pressure gauge through adapter ⓦ .
- Adapter ⓦ : 4-4LOHL6G5TP (Parker part number)
- Pressure gauge: 0 to 5 MPa (0 to 725 psi)

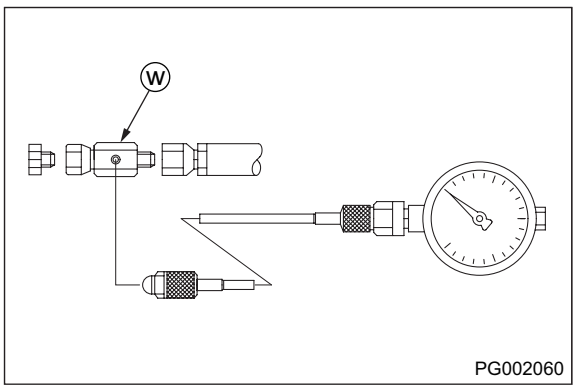
② Apply parking brake by pressing parking brake switch button.

③ Start the engine and set throttle switch to “Full”.

④ Operate F-R lever and then read pressure indicated by pressure gauge.
- With parking brake applied (ON), measured pressures of (2) and (3) are same.
- With parking brake released (OFF), measured pressures of (2) and (3) are different.

**★ Standard charge relief valve setting**
**: 2.5 ± 0.2 MPa (362 ± 29 psi)**



# 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 ± 5°C (122 ± 9°F)

① Disconnect brake release hose (1) from propulsion motor. Attach pressure gauge through adapter ⓦ .
- Adapter ⓦ : 4-4LOHL6G5TP (Parker part number)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is in “N” properly.

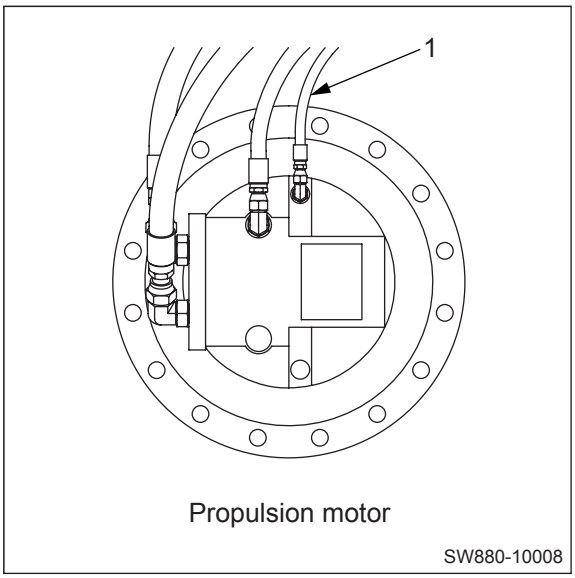
③ Apply parking brake by pressing parking brake switch button.

④ Start the engine and set throttle switch to “Full”.

⑤ Release parking brake by pressing parking brake switch button.

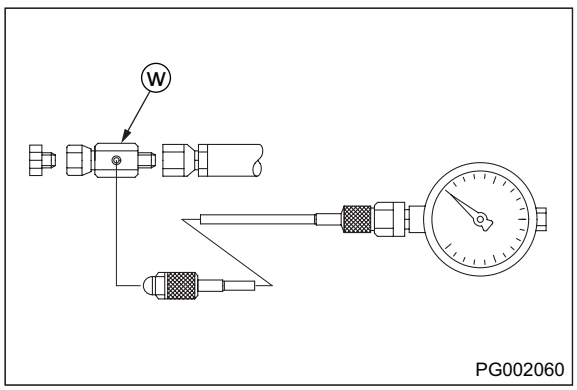
- Then, brake release pressure indicated by pressure gauge.

**★ Brake release pressure : 1.5 MPa (218 psi) or more**



Propulsion motor

SW880-10008



PG002060

# 6. MEASUREMENT AND INSPECTION 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 ± 5°C (122 ± 9°F)

① Remove plug from coupling (1), (2), (3) or (4) of vibrator valve blocks. Attach pressure gauge with hose ⓢ and connector ⓤ .

- Coupling : 9/16-18UNF×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ : M16×G3/8
- Front drum low-amplitude side gauge port : (1)
- Front drum high-amplitude side gauge port : (2)
- Rear drum low-amplitude side gauge port : (3)
- Rear drum high-amplitude side gauge port : (4)
- Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)

② Apply parking brake by pressing parking brake switch button.

③ Set vibration mode select switch to “ ”.

④ Set vibratory drum selector switch to “ Ⓕ Ⓡ ”.

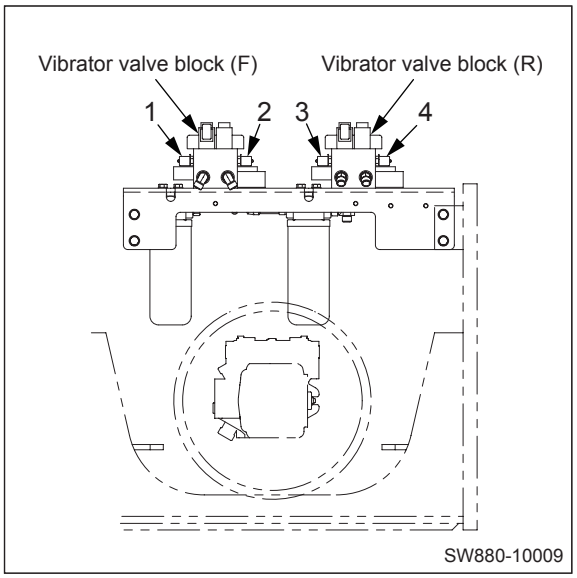
⑤ Start the engine and set throttle switch to “Full”.

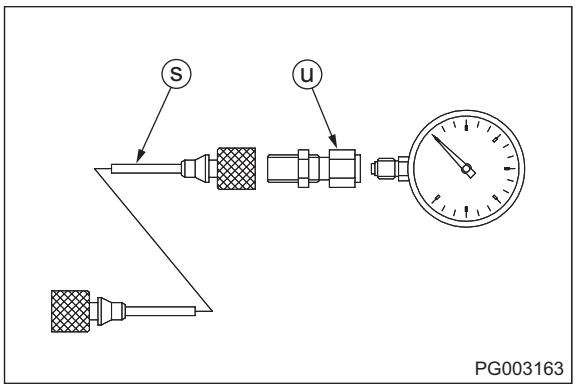
⑥ Press F-R lever vibration switch “ON”.

- Then, read pressure gauge for maximum value of vibrator circuit pressure.

⑦ Press F-R lever vibration switch “ON” as soon as measurement is finished.

**★ Maximum circuit pressure**
**(high pressure relief valve setting)**
**: 31.5 ± 1.0 MPa (4,567 ± 145 psi)**



# 6-2. Inspection

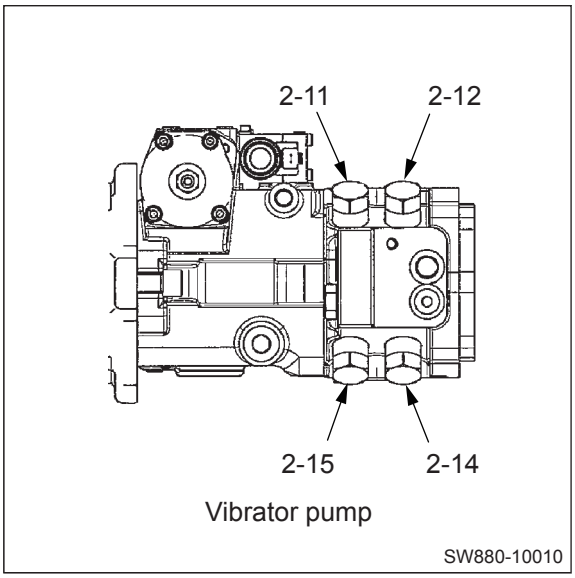
- If measurement results indicate the pressure deviating from maximum circuit pressure range, make an adjustment in accordance with procedure described below.

## 6-2-1. Inspection of high pressure relief valves installed in vibrator pump

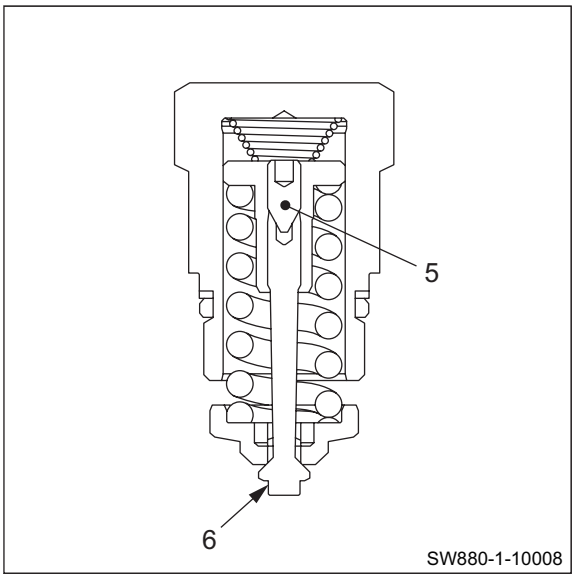
① Check high pressure relief valve (2-11), (2-12), (2-14) or (2-15) evidence of having loosened.
- High pressure relief valve (2-15)
  : Front drum low amplitude side
- High pressure relief valve (2-11)
  : Front drum high amplitude side
- High pressure relief valve (2-14)
  : Rear drum low amplitude side
- High pressure relief valve (2-12)
  : Rear drum high amplitude side

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 (5).
⑤ Turn adjustment screw (6) to adjust pressure.
Adjustment screw turned clockwise
: Pressure rise
Adjustment screw turned counterclockwise
: Pressure drop
Pressure change rate : 4.3 MPa/turn (623 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 inspection, measure pressure again and check that pressure reaches maximum circuit pressure range.

N・m (2-11) to (2-15) High pressure relief valve
: 160 N·m (118 lbf·ft)



Vibrator pump
SW880-10010



SW880-1-10008

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

- The numbers “2-11”, “2-12,” “2-14” and “2-15” appearing in above illustrations are consistent with lead line numbers shown in illustration of vibrator pump in “2-2. Hydraulic Component Specifications” (page 4-006).

## 6-2-2. Inspection of high pressure relief valves (port relief valves) installed in vibrator valve blocks in vibrator circuit

① Check nut (10) of high pressure relief valve (6), (7), (8) or (9) for evidence of having loosened.
- High pressure relief valve (7)
  : Front drum low amplitude side
- High pressure relief valve (6)
  : Front drum high amplitude side
- High pressure relief valve (9)
  : Rear drum low amplitude side
- High pressure relief valve (8)
  : Rear drum high amplitude side

② If there is evidence of nut having loosened, adjust high pressure relief valve so that pressure becomes within maximum circuit pressure range while watching pressure gauge.
- Before adjusting pressure, energize solenoid valve installed in vibrator valve block to have it function as a port relief valve.
- To adjust pressure, loosen nut and turn adjustment screw (11).

  Adjustment screw turned clockwise
  : Pressure rise
  Adjustment screw turned counterclockwise
  : Pressure drop
  Pressure change rate : 14 MPa/turn (2,030 psi/turn)

③ If there is no evidence of nut having loosened, remove high pressure relief valve.

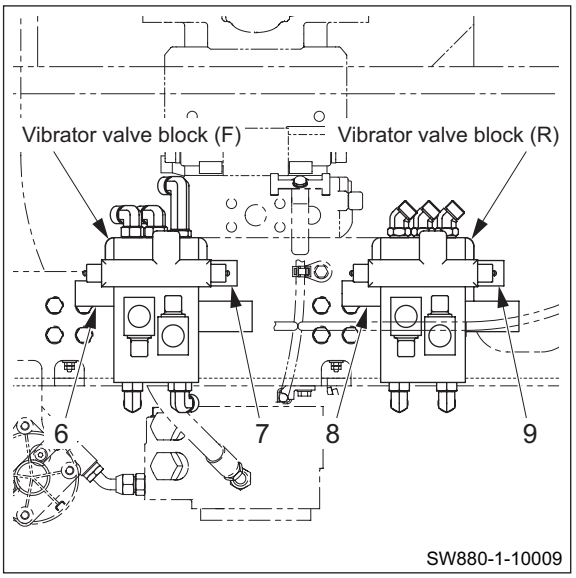
④ Check removed high pressure relief valve for trapped dirt and scratches on its seat.

⑤ If trapped dirt is present, disassemble and clean high pressure relief valve.

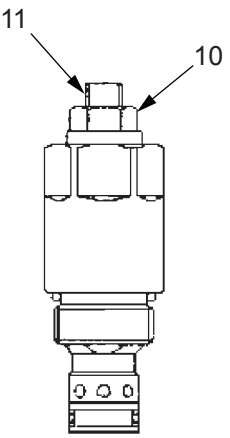
⑥ If a scratch is found on seat, replace high pressure relief valve.

⑦ After adjustment, measure pressure again and check that pressure reaches maximum circuit pressure range.

N·m (1) Nut : 13.5 ± 1.5 N·m (10 ± 1.1 lbf·ft)
(6) to (9) High pressure relief valve
: 44 ± 3 N·m (32 ± 2.2 lbf·ft)



SW880-1-10009



High pressure relief valve
SW880-10013

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

# 7. MEASUREMENT AND INSPECTION OF VIBRATOR CHARGE CIRCUIT PRESSURE

## 7-1. Measurement

- Oil temperature during measurement: 50 ± 5°C (122 ± 9°F)

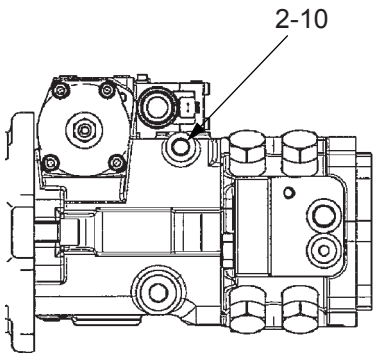
① Remove plug from coupling of control pressure gauge port (2-10). Attach pressure with hose ⓢ and the connector ⓤ.
- Coupling : 9/16-18UNF×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ: M16×G3/8
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Apply parking brake by pressing parking brake switch button.

③ Start the engine and set throttle switch to “Full”.

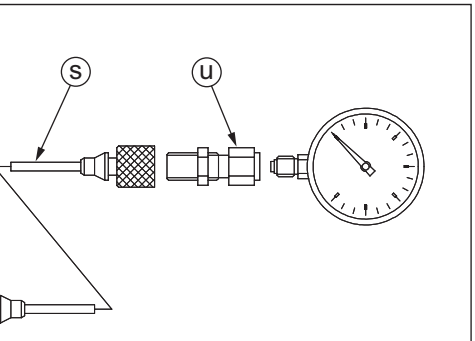
- Then, read pressure indicated by pressure gauge.

**★ Standard charge relief pressure setting**
**: 2.5 ± 0.2 MPa (362 ± 29 psi)**




Vibrator pump

SW880-10014




PG003163

- The numbers “2-10” appearing in above illustrations is consistent with lead line numbers shown in illustration of vibrator pump in “2-2. Hydraulic Component Specifications” (page 4-006).

## 7-2. Inspection

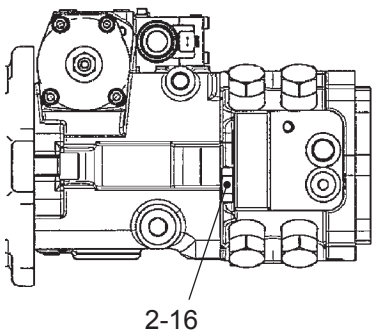
- If measurement results indicate the pressure deviating from standard charge relief pressure setting range, make an adjustment in accordance with procedure described below.

① Remove charge relief valve (2-16).
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 inspection, measure pressure again and check that pressure reaches standard charge relief pressure setting range.

N・m (2-16) Charge relief valve : 90 N·m (66 lbf·ft)

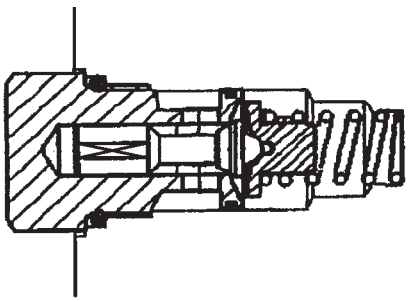
**(NOTICE)**

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




Vibrator pump

SW880-10015



Charge relief valve

SW880-10016

- The number “2-16” appearing in above illustrations is consistent with lead line numbers shown in illustration of vibrator pump in “2-2. Hydraulic Component Specifications” (page 4-006).

# 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 vehicle before operating the steering wheel.**

- Oil temperature during measurement: 50 ± 5°C (122 ± 9°F)

① Disconnect the hose (1) or (2) from cylinder. Attach pressure gauge through adapter ⓧ .

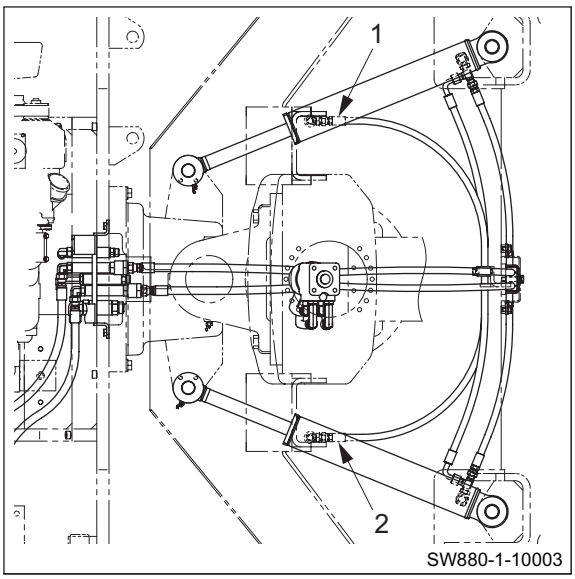
- Adapter ⓧ : 6-4LOHL6G5TP (Parker part number)
- Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

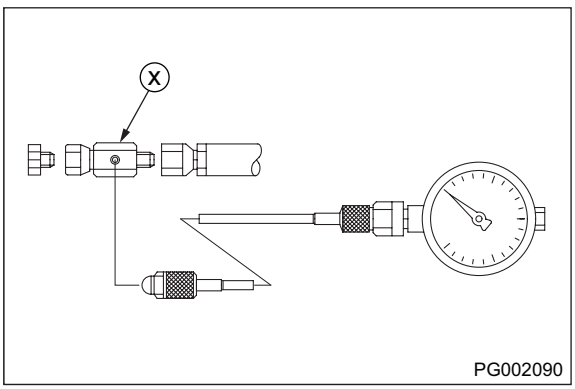
② Confirm that F-R lever is “N” properly.

③ Start the engine and set throttle switch to “Full”.

- Turn steering wheel to operate relief valve. Then, read pressure indicated by pressure gauge.

**★ Standard maximum circuit pressure (orbitrol relief pressure + charge relief pressure) : 17.5 ± 1.0 MPa (2,538 ± 145 psi)**



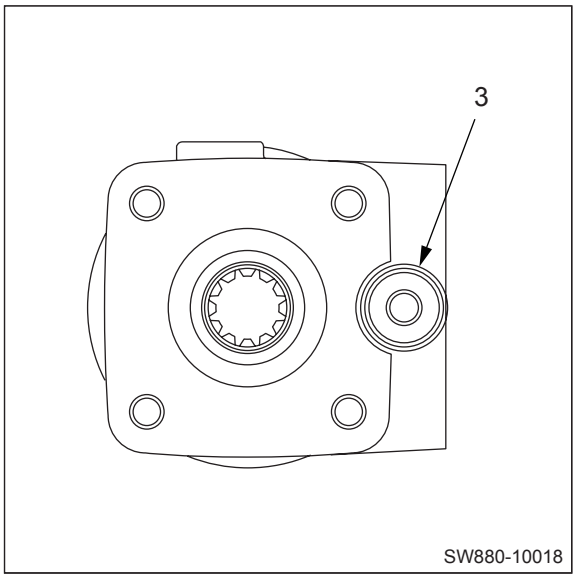
## 8-2. Inspection

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

① Remove relief valve (3) 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 ± 5°C (122 ± 9°F)

① Disconnect hose (1) from propulsion pump. Attach pressure gauge through adapter ⓚ .
- Adapter ⓚ : 12-4LOHL6G5TF (Parker part number)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

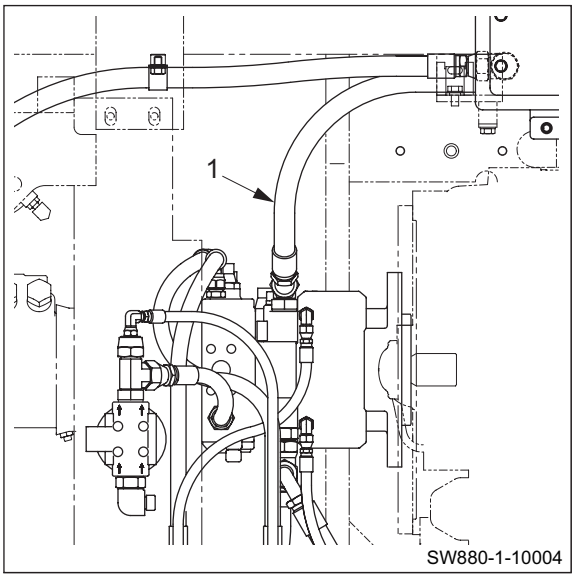
② Set propulsion speed change switch to “ 🐢 ”.

③ Set vibration frequency select switch to “2,500 vpm”.

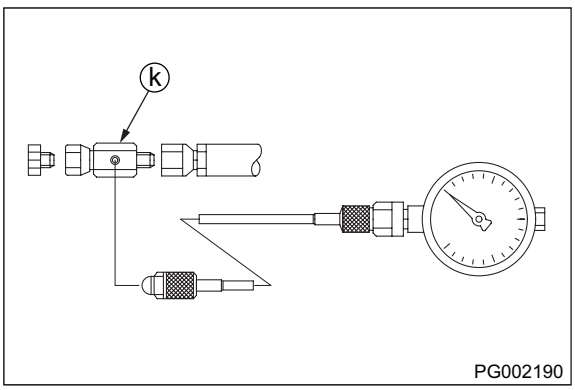
④ Start the engine and set throttle switch to “FULL”.

⑤ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

⑥ With propulsion load at maximum, measure pressure when speed change switch is in “ 🐢 ” and “ 🐇 ” and F-R lever is in “N”, “F”, and “R”, respectively.




**★ Allowable pump case pressure**
**: 0.4 MPa (58 psi) or less**



## 9-2. Measurement of Vibrator Pump Case Pressure

**⚠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 ± 5°C (122 ± 9°F)

① Disconnect hose (1) from vibrator pump. Attach pressure gauge through adapter ⓚ .
- Adapter ⓚ : 12-4LOHL6G5TF (Parker part number)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Apply parking brake by pressing parking brake switch button.

③ Set vibration mode select switch to “ ”.

④ Set vibratory drum selector switch to “ Ⓕ Ⓡ ”.

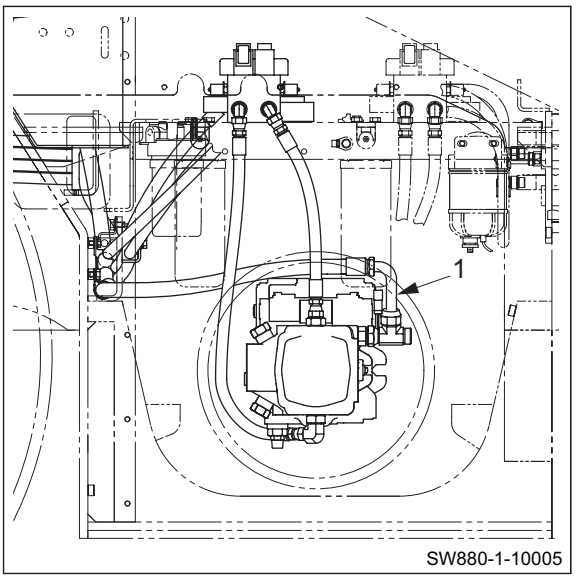
⑤ Start the engine and set throttle switch to “FULL”.

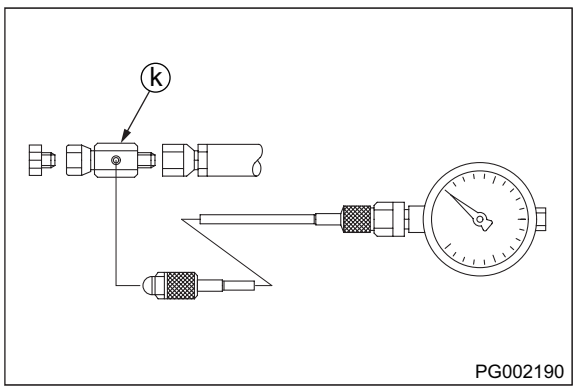
⑥ Press F-R lever vibration switch ON.

⑦ Measure pressure when vibration select switch is in “ ” and “ ” and vibration frequency select switch “2,500”, “3,000”, and “4,000”, respectively.

⑧ Press F-R lever vibration switch OFF as soon as measurement is finished.

**★ Allowable pump case pressure**
**: 0.4 MPa (58 psi) or less**



# 10. MEASUREMENT OF PROPULSION MOTOR CASE PRESSURE

## 10-1. Measurement

- Oil temperature during measurement : 50 ± 5°C (122 ± 9°F)

① Remove plug from drain port (1). Attach pressure gauge and adapter ⓙ .
- Adapter ⓙ : 7/8-14UNF
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

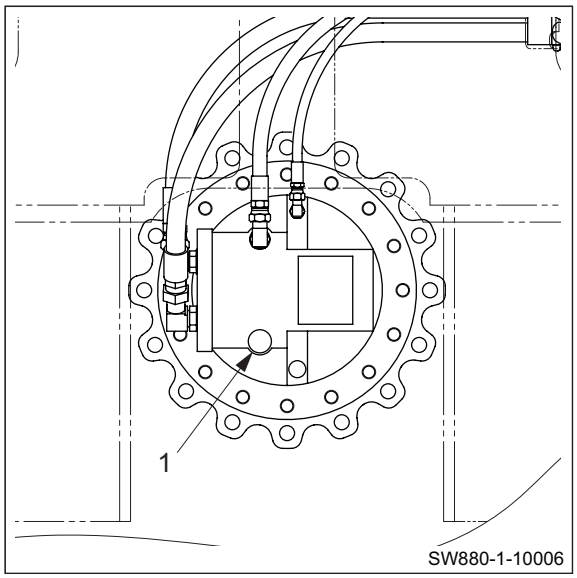
② Set propulsion speed change switch to “ 🐢 ”.

③ Set vibration frequency select switch to “2,500 vpm”.

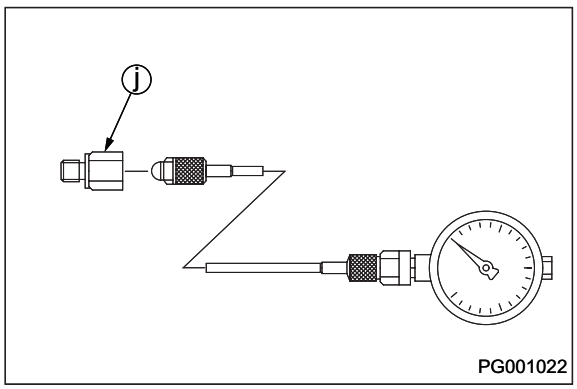
④ Start the engine and set throttle switch to “FULL”.

⑤ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

⑥ With propulsion load at maximum, measure pressure when speed change switch is in “ 🐢 ” and “ 🐇 ” and F-R lever is in “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

**⚠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 ± 5°C (122 ± 9°F)

① Disconnect hose (1) from propulsion pump. Attach pressure gauge through adapter ⓥ .
- Adapter ⓥ : 8-4LOHL6G5TP (Parker part number)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Apply parking brake by pressing parking brake switch button.

③ Set vibration mode select switch to “ ”.

④ Set vibratory drum selector switch to “ Ⓕ Ⓡ ”.

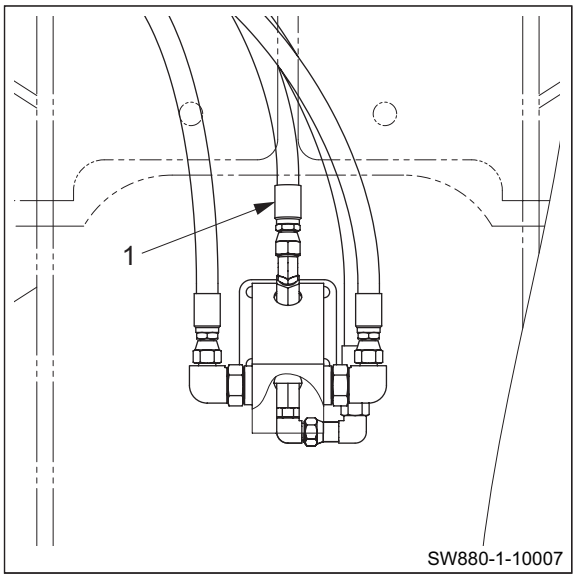
⑤ Start the engine and set throttle switch to “FULL”.

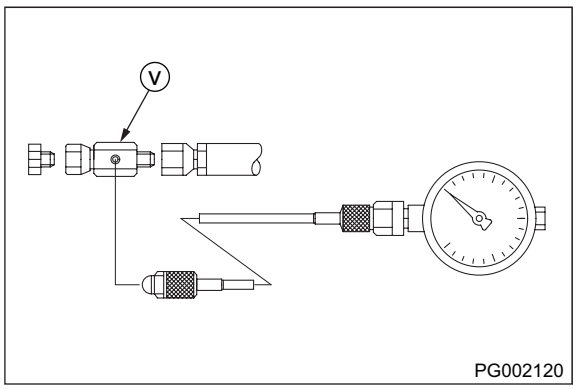
⑥ Press F-R lever vibration switch ON.

⑦ Measure pressure when vibration select switch is in “ ” and “ ”and vibration frequency select switch “2,500”, “3,000”, and “4,000”, respectively.

⑧ 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.**

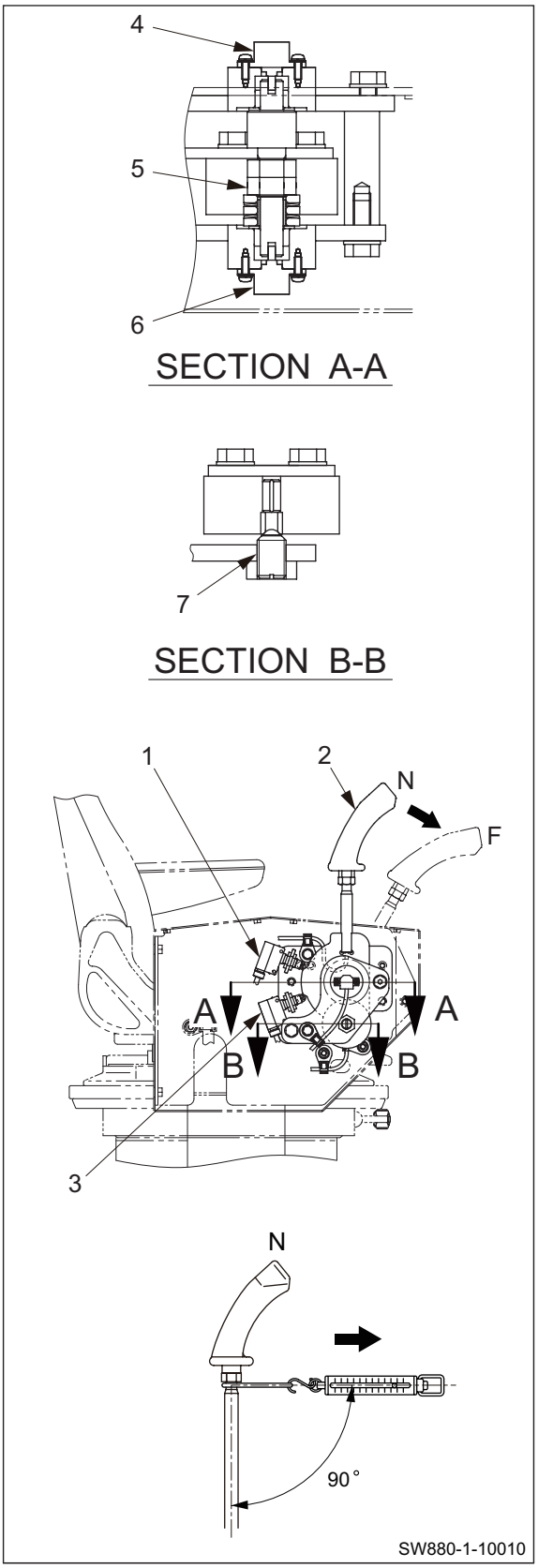
### 12-1-1. Adjustment of disc spring tension

**(NOTICE)**

- **Ends of forward switch (1) and reverse 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 ± 0.2 N (2.20 ± 0.45 lbf)**



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

**(NOTICE)**

- **Forward switch (1) and reverse switch (3) must be placed in contact with F-R lever cam.**
- **Apply lithium-based grease to forward switch and reverse 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.

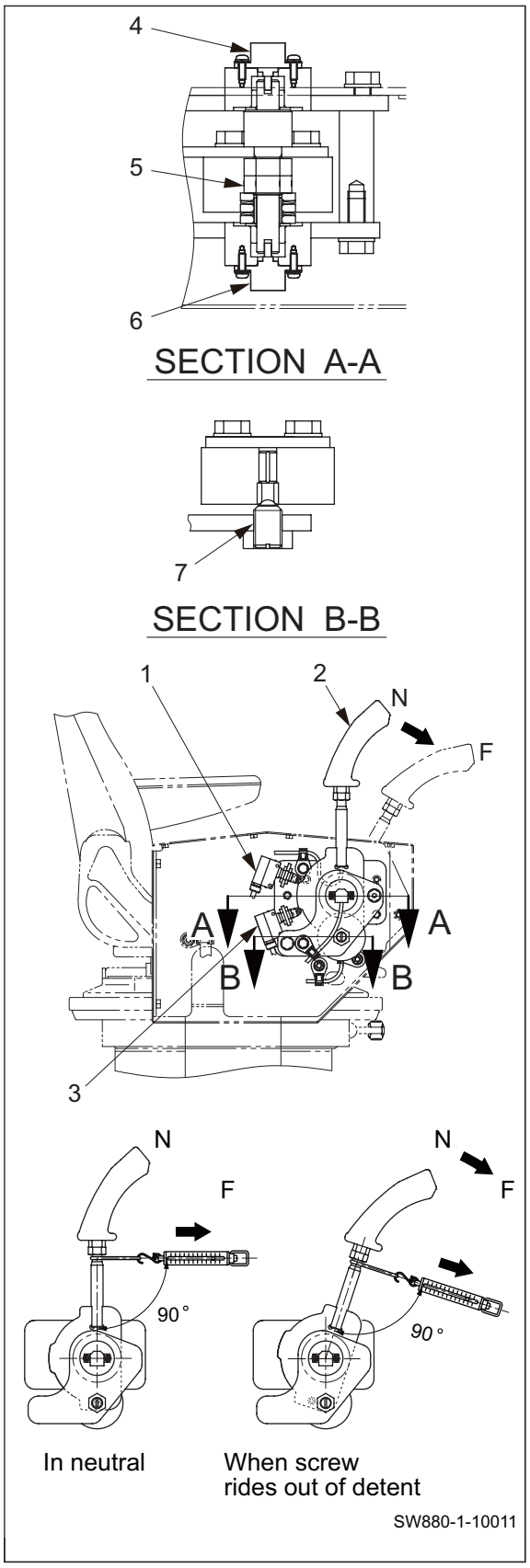
**★F-R lever operating force standard value when steel ball rides out of detent:**

**40.0 ± 0.2 N (9.0 ± 0.45 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.

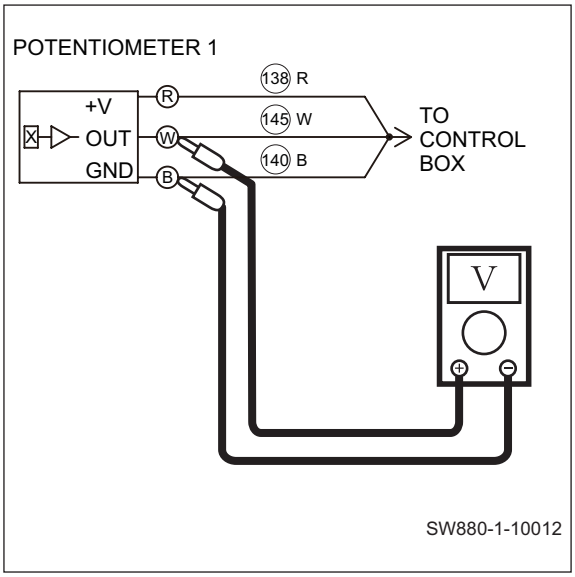
**★F-R lever operating force standard value**

**: 18.0 ± 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).

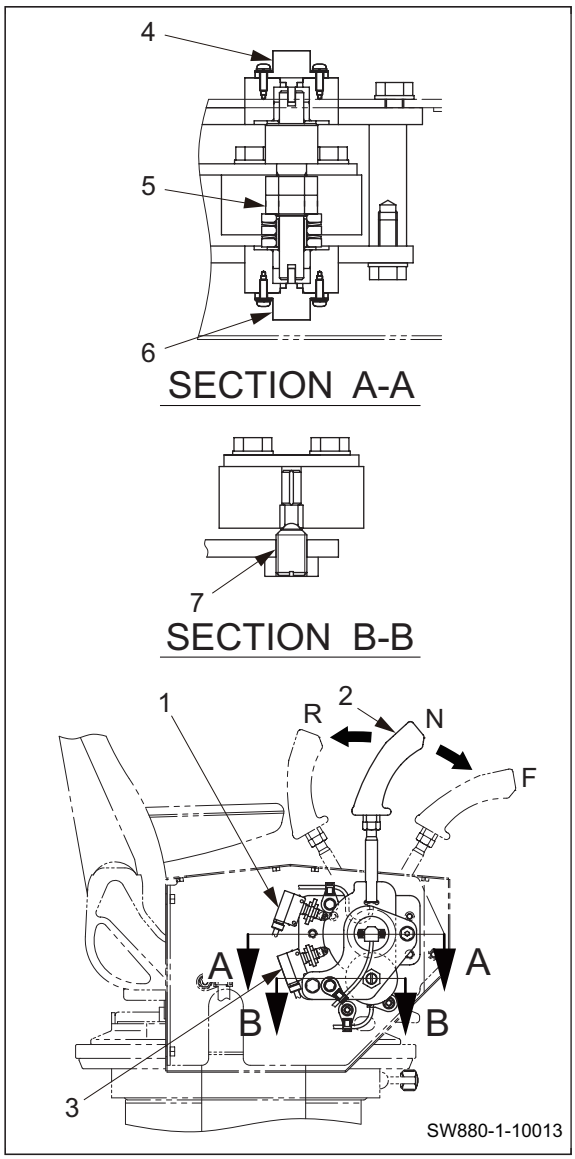
③ Adjust the angle of potentiometer 1 so that the mid-value between maximum and minimum voltages becomes 2.500 V, and the range (difference) between maximum and minimum voltages becomes 0.010 V.

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

Mid-value : (2.505 V + 2.495 V) ÷ 2 = 2.500 V

Range between maximum and minimum voltages : 2.505 – 2.495 = 0.010 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 forward switch operates

- The moment that forward switch turns ON/OFF can be monitored on water spray indicator lamp in combination meter. Water spray mode selector 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 forward direction.
③ Adjust with nut (8) of forward switch (1) so that water spray indicator lamp in combination meter illuminates when voltage reaches a value 0.080 V higher than mid-value measured in 9-2-1.

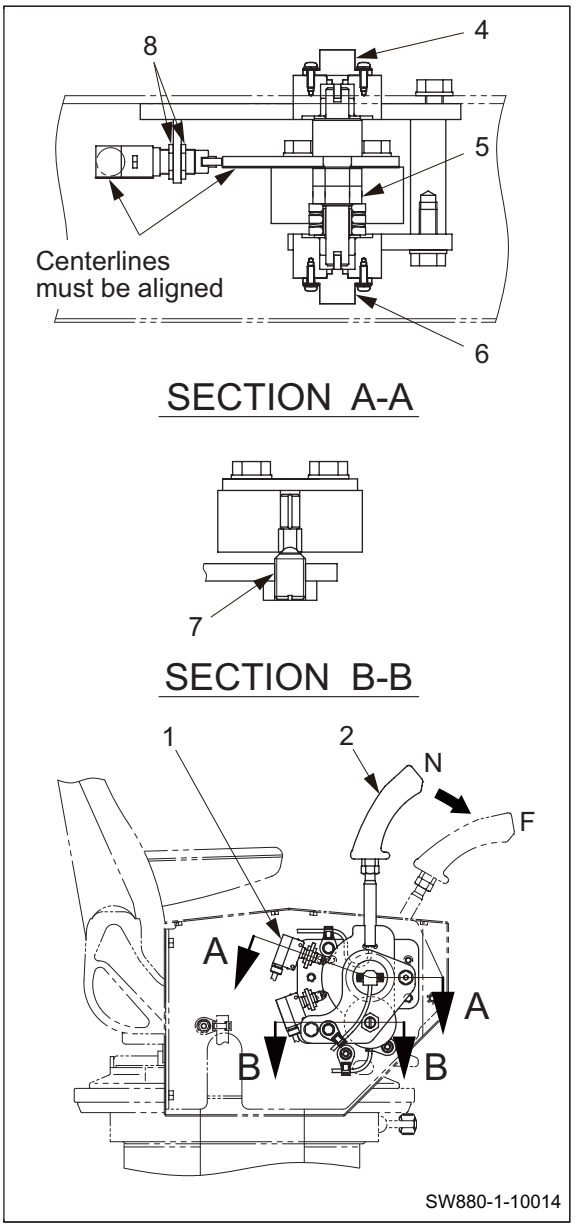
Example:

| | |
|---|---|
| Mid-value | : 2.500 V |
| Voltage when forward switch operates | : 2.500 – 0.080 = 2.420 V |

**(NOTICE)**

- **Acceptable range for voltage when forward switch operates is 2.415 to 2.425 V.**
- **Forward 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 forward 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 forward 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 reverse switch operates

- The moment that reverse switch turns ON/OFF can be monitored on water spray indicator lamp in combination meter. Water spray mode selector 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 reverse switch (3) so that water spray indicator lamp in combination meter illuminates when voltage reaches a value 0.080 V lower than mid-value measured in 9-2-1.

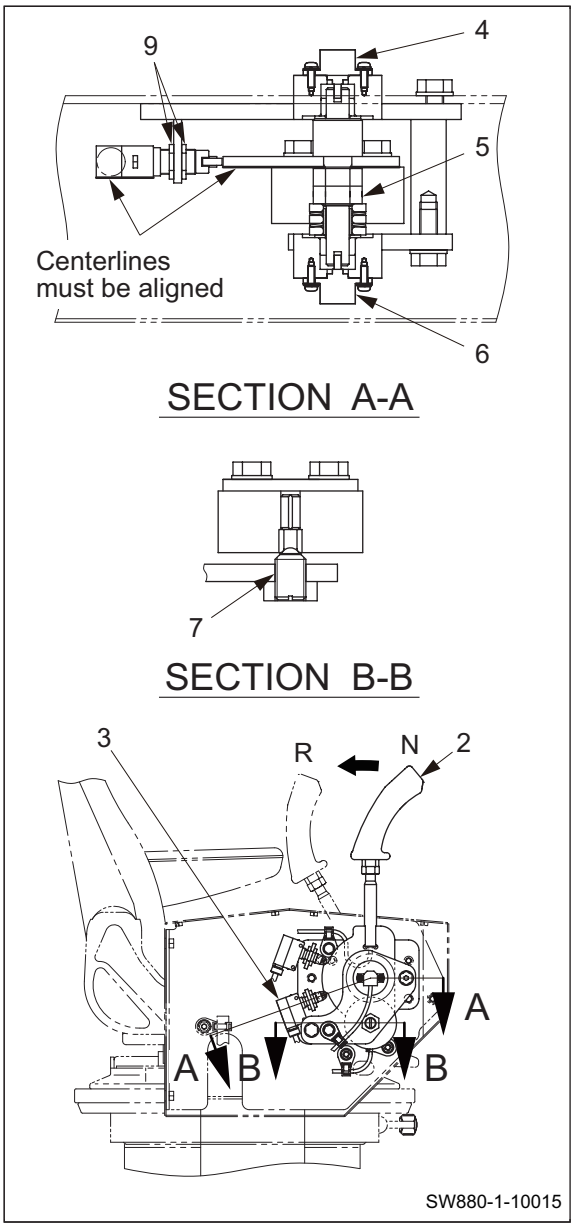
Example:

| | |
|---|---|
| Mid-value | : 2.500 V |
| Voltage when reverse switch operates | : 2.500 + 0.080 = 2.580 V |

**(NOTICE)**

- **Acceptable range for voltage when reverse switch operates is 2.575 to 2.585 V.**
- **Reverse 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 reverse 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 reverse 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.



# TROUBLESHOOTING

# 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.

## 1-4. Wire Number and Color Code

Refer to "1-1. Wire Numbers, Wire Sizes, Wire Colors and Connectors Shown in Electrical Circuit Diagram, Wiring Harness Layout and Wiring Harnesses" of ELECTRICAL SYSTEM.

# 2. ELECTRICAL SYSTEM TROUBLESHOOTING

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

**⚠ WARNING**

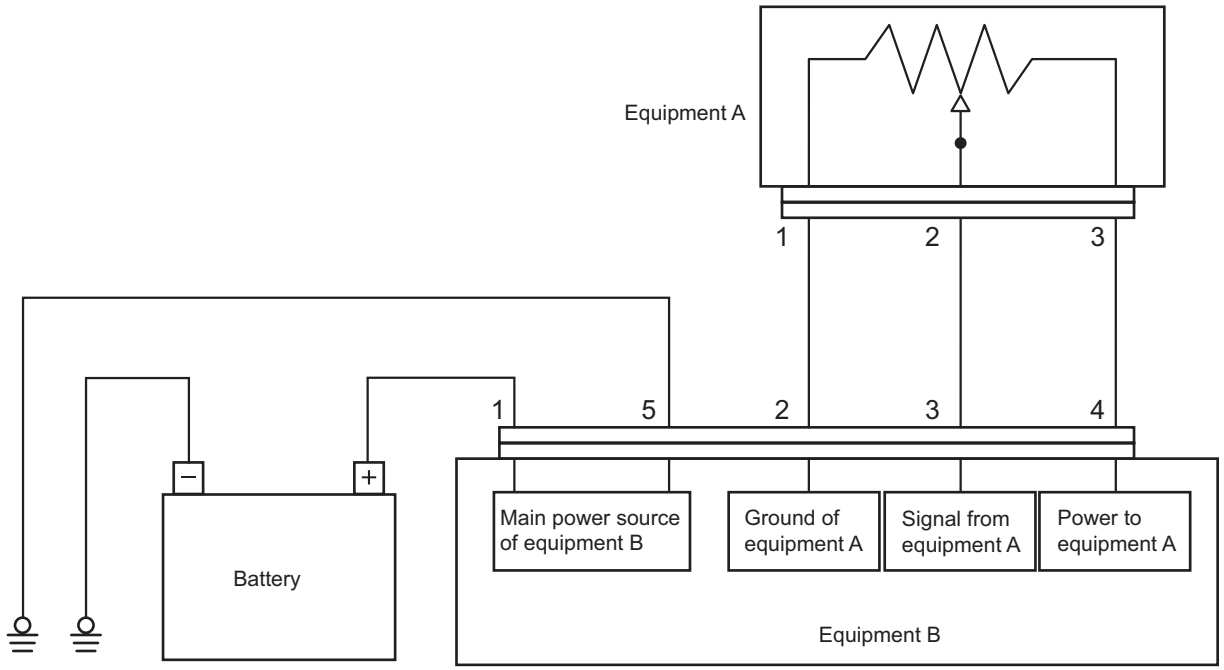
**Be very careful because equipment can return to normal during an inspection and suddenly operate properly when a failure occurs due to a faulty contact or other such cause.**

### 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.

## 2-1-2. Inspection procedures using a tester

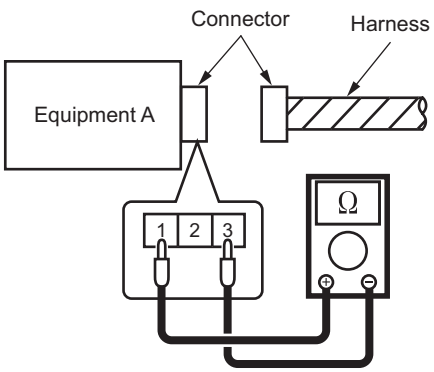
Some of the various inspection procedures are presented here for reference, using a sample circuit below.

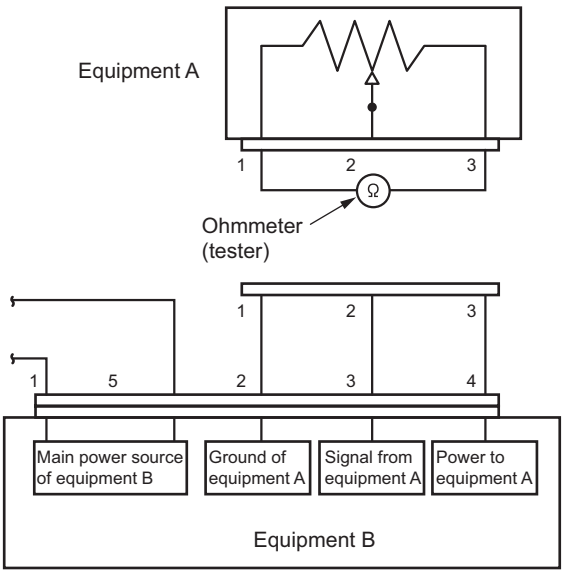



TS-10001

1) Measuring resistance using tester

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



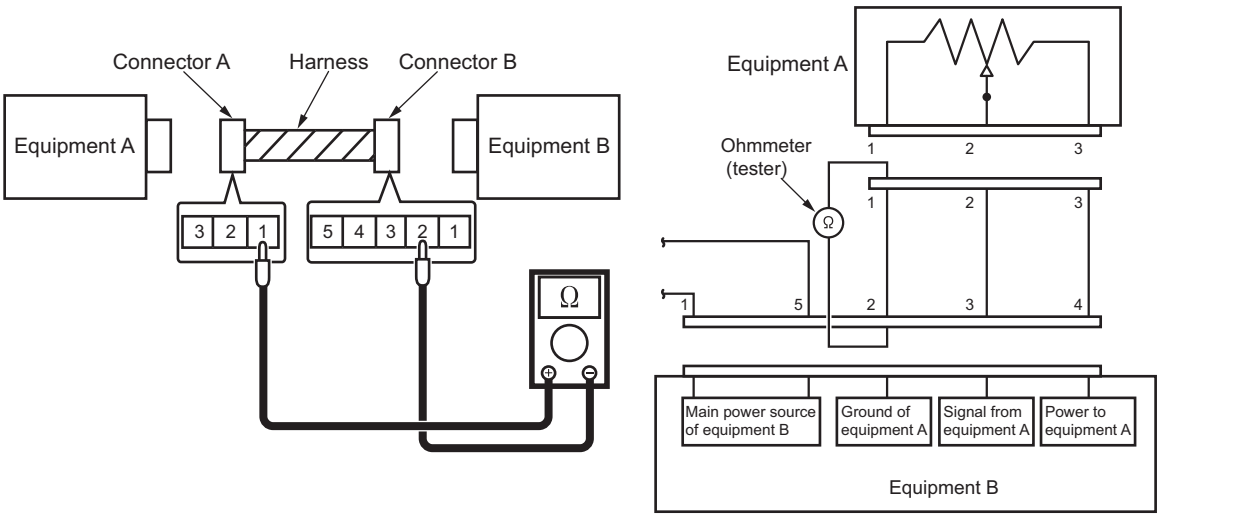

TS-10002

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)



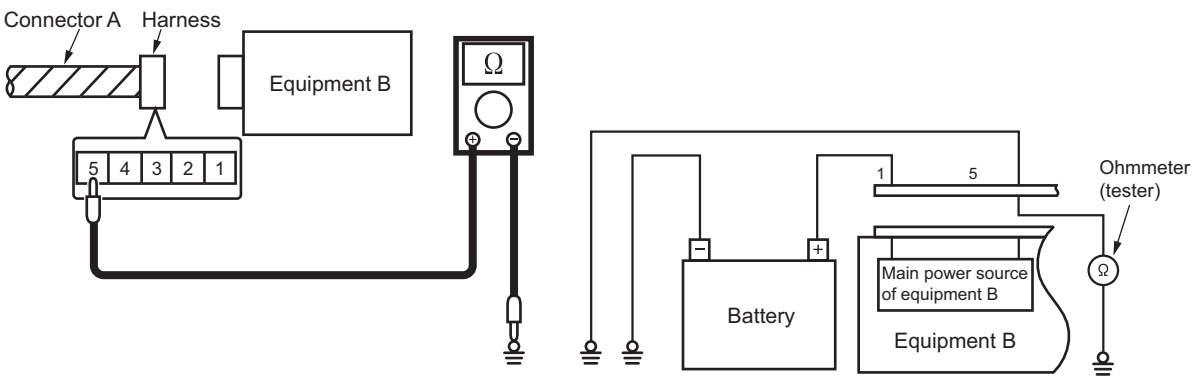

TS-10003

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 Ω (measured value)
If there is any abnormality in the harness such as broken wire: 10 Ω 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

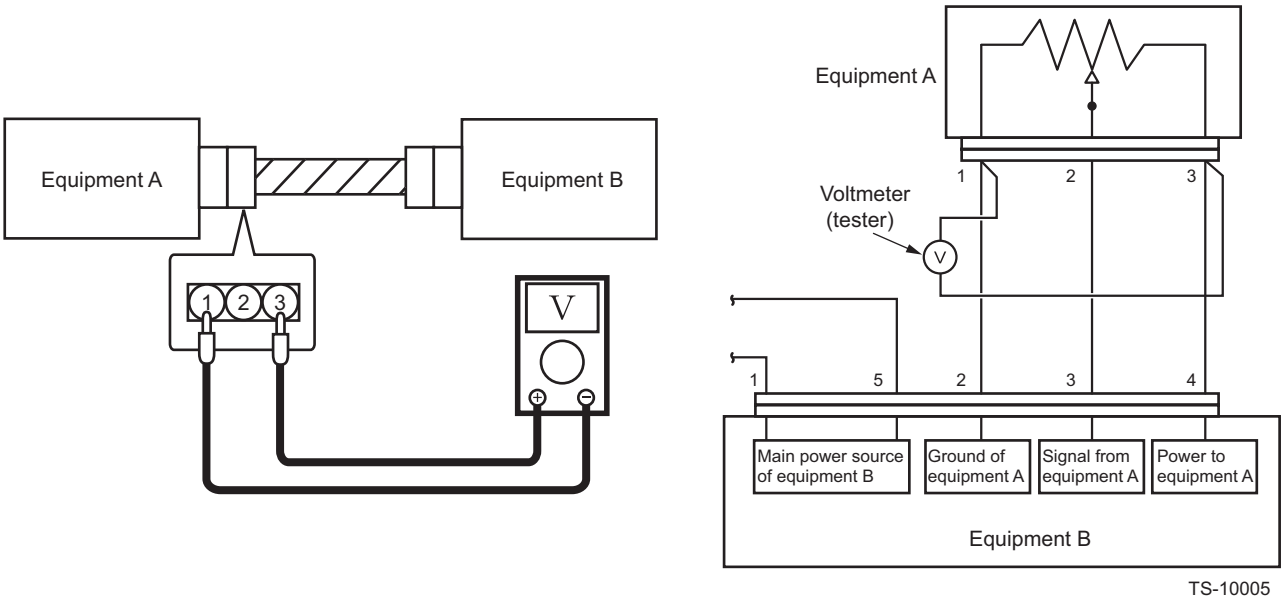
① Disconnect the connector of equipment B.
② Connect the test probe (+) to connector terminal 5 of equipment B and the test probe (-) to a machine ground point (the bolt fastening the ground terminal or an unpainted portion on the body) and measure the resistance. At this time, reversing the connector 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.**

2) Measuring voltage and current flowing using tester

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

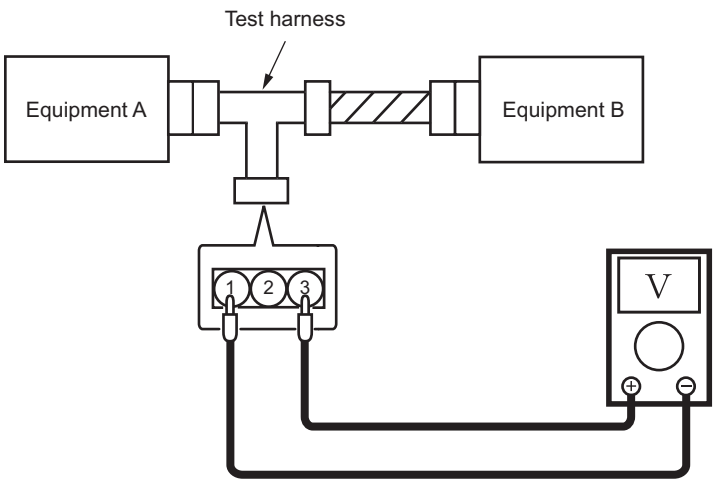



Inspection procedure

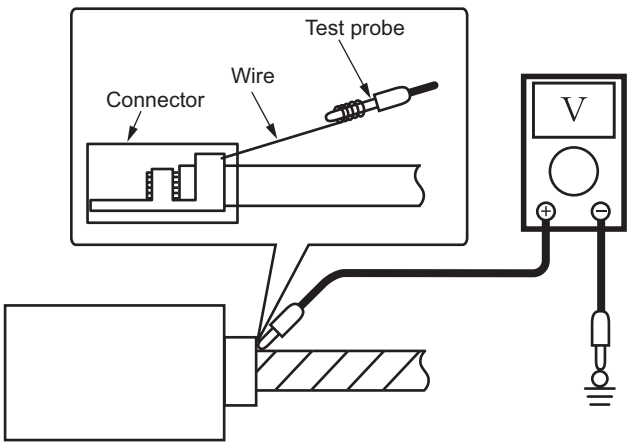
① Connect the connectors of equipment A and that of equipment B.

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.

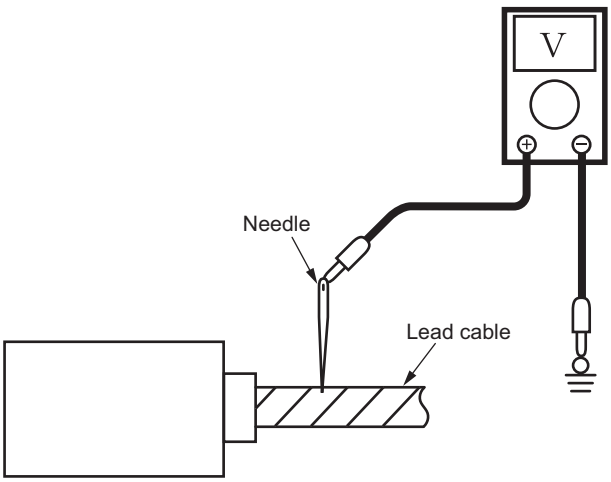
• Measurement using a test harness




• Measurement from the backside of connector




• Measurement on a lead cable




TS-10006

Measurement method

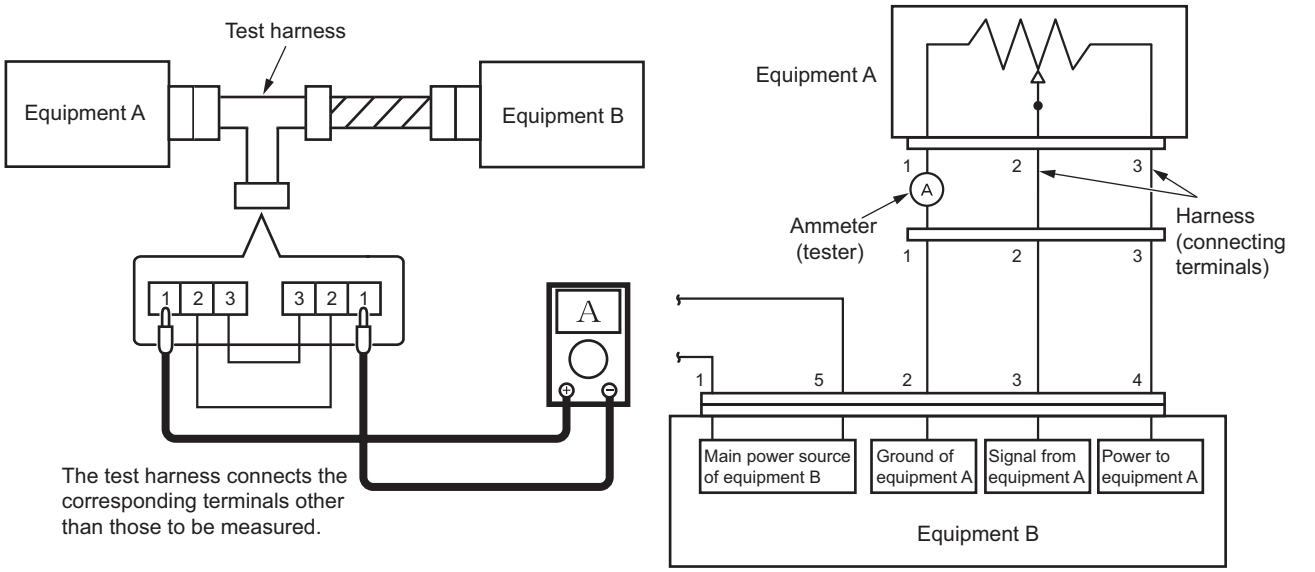
For measurement of voltage, connect the tester probes in parallel to the portion to be measured. Because the voltage can be measured only when the connector is connected in position, contact the tester probes to the terminals without disconnecting the connector. The following methods are available:

- 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. Fault Codes

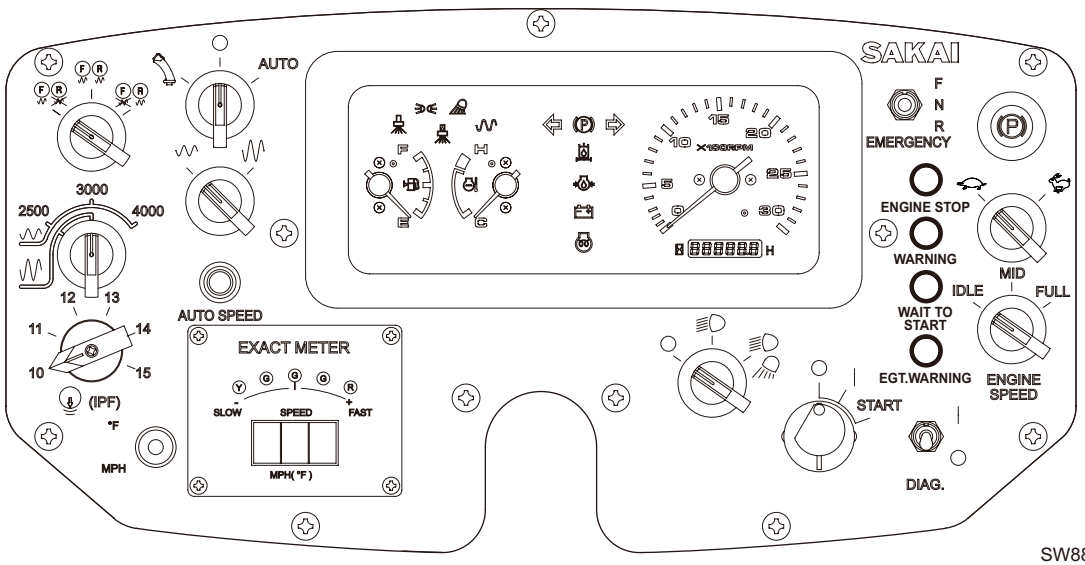
## 2-2-1. Fault detection

- Faults are detected while the starter switch is on, during the operation of the machine itself. If a fault becomes active (currently detected) at this time, a fault is logged in memory and a snapshot of engine parameters is logged. In addition, certain faults may illuminate the warning lamp (orange) or the stop lamp (red).

## 2-2-2. Fault lamps

- The controller systems use 4 indicator lamps: the "**ENGINE STOP**", "**WARNING**", "**WAIT TO START**" and "**EGT. WARNING**. If the starter switch is turned on but the diagnostic switch remains off, the indicator lamps will illuminate for approximately two seconds and then go off, one after the other, to verify they are working and wired correctly. They all go on and then go off one at a time, at an interval of approximately 0.5 seconds each.

  - "**ENGINE STOP**" Lamp - The "**ENGINE STOP**" lamp provides critical operator messages. These messages require immediate and decisive operator response. The "**ENGINE STOP**" lamp is also used to flash out diagnostic fault codes.
  - "**WARNING**" Lamp - The "**WARNING**" lamp provides important operator messages. These messages require timely operator attention. The "**WARNING**" lamp is also used to delineate diagnostics fault codes.
  - "**WAIT TO START**" Lamp - The "**WAIT TO START**" lamp indicates that the pre-start intake manifold heater warm-up sequence is active. A Cummins supplied grid heater will automatically heat the intake manifold based on the Intake Manifold Temperature when needed prior to engine starting. Intake manifold heating improves engine starting in cold temperatures and reduces white smoke.
  - "**EGT. WARNING**" Lamp - The "**EGT. WARNING**" lamp illuminates when the exhaust temperature becomes high. These messages require timely operator attention.




SW880-1-11001

## 2-2-3. Flash out of fault codes

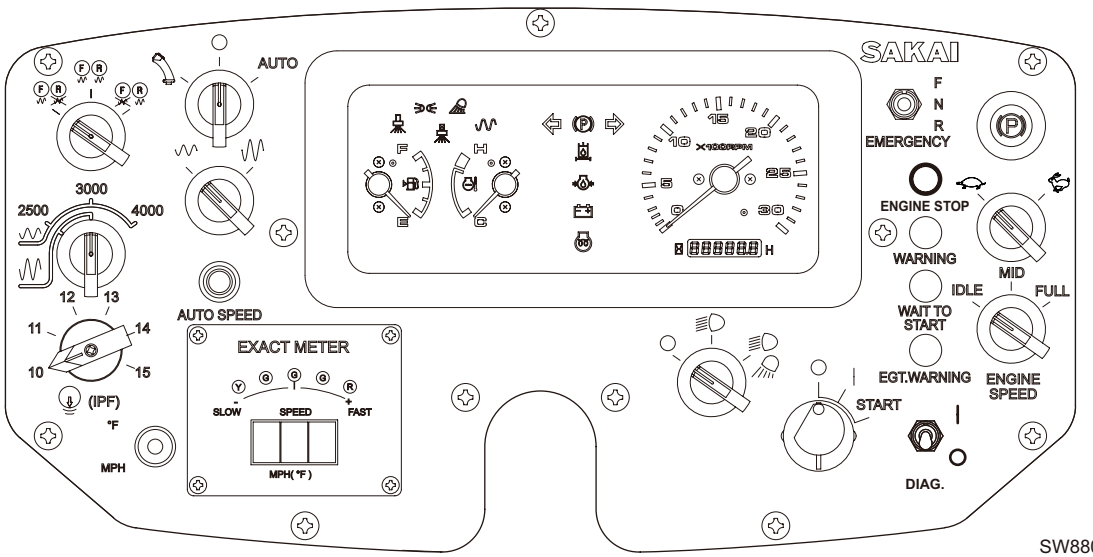
- Fault codes can be accessed in at least two different ways; using the electronic service tool or fault code flash out.
- Fault flash out mode can be entered through the use of a diagnostic switch. The diagnostic switch may also be multiplexed on the J1939 datalink.

Entering diagnostic mode:

1) To enter the fault flash out, the starter switch must be ON with the engine not running.
2) When a diagnostic switch is used to enter the mode, the ECM will automatically flash the first fault code after the switch is turned on. Each active fault shall flash out twice, wrapping around to the first fault code at the end.

Flashing of fault codes:

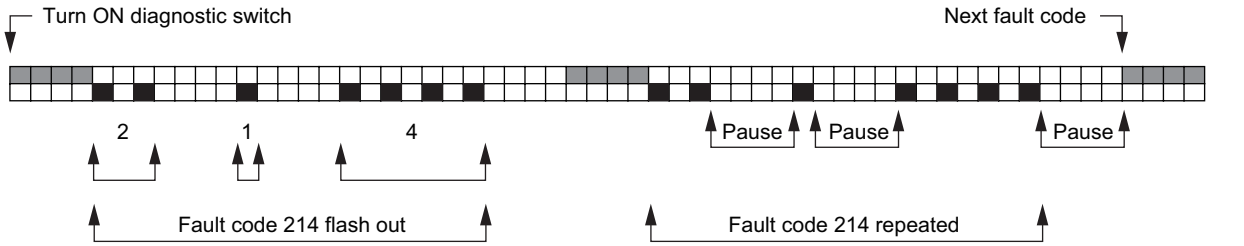
- The diagram below depicts the pattern of the fault code flash out scheme as indicated by the "**ENGINE STOP**" lamp. A blink is equivalent to the "**ENGINE STOP**" lamp being on for 0.5 seconds, and off for 0.5 seconds. A pause between fault code digits has duration of 2 seconds.




SW880-1-11002

**Example Fault Code Sequence**
**Fault Code 214 :**

Each block represents 0.5 seconds
= "WARNING" lamp ON
= "ENGINE STOP" lamp ON




SV412-09012

## 2-2-4. Fault code list

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 111 (Red) | Engine control module critical internal failure<br>• Bad intelligent device or component. | Engine may not start. |
| 115 (Red) | Engine magnetic crankshaft speed/position lost both of two signals<br>• Data erratic, intermittent, or incorrect. | Fueling to the injectors is disabled and the engine cannot be started. |
| 122 (Orange) | Intake manifold 1 pressure sensor circuit<br>• Voltage above normal or shorted to high source. | Derate in power output of the engine. |
| 123 (Orange) | Intake manifold 1 pressure sensor circuit<br>• Voltage below normal or shorted to low source. | Derate in power output of the engine. |
| 131 (Red) | Accelerator pedal or lever position sensor 1 circuit<br>• Voltage above normal or shorted to high source. | Severe derate in power output of the engine. Limp home power only. |
| 132 (Red) | Accelerator pedal or lever position sensor 1 circuit<br>• Voltage below normal or shorted to low source. | Severe derate in power output of the engine. Limp home power only. |
| 133 (Red) | Remote accelerator pedal or lever position sensor circuit<br>• Voltage above normal or shorted to high source. | Remote accelerator will not operate. Remote accelerator position will be set to zero percent. |
| 134 (Red) | Remote accelerator pedal or lever position sensor circuit<br>• Voltage below normal or shorted to low source. | Remote accelerator will not operate. Remote accelerator position will be set to zero percent. |
| 135 (Orange) | Engine oil rifle pressure 1 sensor circuit<br>• Voltage above normal or shorted to high source. | None on performance.<br>No engine protection for oil pressure. |
| 141 (Orange) | Engine oil rifle pressure 1 sensor circuit<br>• Voltage below normal or shorted to low source. | None on performance.<br>No engine protection for oil pressure. |
| 143 (Orange) | Engine oil rifle pressure<br>• Data valid but below normal operation range.<br>• Moderately severe level. | None on performance. |
| 144 (Orange) | Engine coolant temperature 1 sensor circuit<br>• Voltage above normal or shorted to high source. | Possible white smoke. Fan will stay ON if controlled by ECM No engine protection for engine coolant temperature. |
| 145 (Orange) | Engine coolant temperature 1 sensor circuit<br>• Voltage below normal or shorted to low source. | Possible white smoke. Fan will stay ON if controlled by ECM No engine protection for engine coolant temperature. |
| 146 (Orange) | Engine coolant temperature<br>• Data valid but above normal operation range.<br>• Moderately severe level. | Progressive power derate increasing in severity from time of alert. |
| 147 (Red) | Accelerator pedal or lever position 1 sensor circuit frequency<br>• Data valid but below normal operational range.<br>• Most severe level. | Severe derate in power output of the engine. Limp home power only. |

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 148 (Red) | Accelerator pedal or lever position sensor 1<br>• Data valid but above normal operational range.<br>• Most severe level. | Severe derate in power output of the engine. Limp home power only. |
| 151 (Red) | Engine coolant temperature<br>• Data valid but above normal operation range.<br>• Most severe level. | Progressive power derate increasing in severity from time of alert. If engine protection shutdown feature is enabled, engine will shut down 30 seconds after red stop lamp starts flashing. |
| 153 (Orange) | Intake manifold 1 temperature sensor circuit<br>• Voltage above normal or shorted to high source. | Possible white smoke. Fan will stay ON if controlled by ECM No engine protection for intake manifold air temperature. |
| 154 (Orange) | Intake manifold 1 temperature sensor circuit<br>• Voltage below normal or shorted to low source. | Possible white smoke. Fan will stay ON if controlled by ECM No engine protection for intake manifold air temperature. |
| 155 (Red) | Intake manifold 1 temperature<br>• Data valid but above normal operation range.<br>• Most severe level. | Progressive power derate increasing in severity from time of alert. If engine protection shutdown feature is enabled, engine will shut down 30 seconds after red stop lamp starts flashing. |
| 187 (Orange) | Sensor supply 2 circuit<br>• Voltage below normal or shorted to low source. | Engine power derate. |
| 195 (Orange) | Coolant level sensor 1 circuit<br>• Voltage above normal or shorted to high source. | None on performance. |
| 196 (Orange) | Coolant level sensor 1 circuit<br>• Voltage below normal or shorted to low source. | None on performance. |
| 197 (Orange) | Coolant level<br>• Data valid but below normal operation range.<br>• Moderately severe level. | None on performance. |
| 221 (Orange) | Barometric pressure sensor circuit<br>• Voltage above normal or shorted to high source. | Engine power derate. |
| 222 (Orange) | Barometric pressure sensor circuit<br>• Voltage below normal or shorted to low source. | Engine power derate. |
| 227 (Orange) | Sensor supply 2 circuit<br>• Voltage above normal or shorted to high source. | Engine power derate. |
| 234 (Red) | Engine Crankshaft speed/position<br>• Data valid but above normal operation range.<br>• Most severe level. | Fuel injection disabled until engine speed falls below the overspeed limit. |
| 235 (Red) | Coolant level<br>• Data valid but below normal operation range.<br>• Most severe level. | Progressive power derate increasing in severity from time of alert. If engine protection shutdown feature is enabled, engine will shut down 30 seconds after red stop lamp starts flashing. |
| 237 (Orange) | External speed input (Multiple unit synchronization)<br>• Data erratic, intermittent or incorrect. | Primary or secondary engine may stop running. |
| 238 (Orange) | Sensor supply 3 circuit<br>• Voltage below normal or shorted to low source. | Possible hard starting and rough running. |

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 239 (Orange) | Sensor supply 3 circuit<br>• Voltage above normal or shorted to high source. | Possible hard starting and rough running. |
| 241 (Orange) | Wheel based machine speed<br>• 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. |
| 245 (Orange) | Fan control circuit<br>• Voltage below normal or shorted to low source. | The fan can possibly stay on continuously or not run at all. |
| 271 (Orange) | Fuel pump pressurizing assembly 1 circuit<br>• Voltage below normal or shorted to low source. | Engine will run poorly at idle. Engine will have low power. Fuel pressure will be higher than commanded. |
| 272 (Orange) | Fuel pump pressurizing assembly 1 circuit<br>• Voltage above normal or shorted to high source. | Engine will not run or engine will run poorly. |
| 285 (Orange) | SAE J1939 multiplexing PGN timeout error<br>• Abnormal update rate. | One or more multiplexed devices will not operate properly. One or more symptoms will occur. |
| 286 (Orange) | SAE J1939 multiplexing configuration error<br>• Out of calibration. | At least one multiplexed device will not operate properly. |
| 288 (Red) | SAE J1939 multiplexing remote accelerator pedal or lever position sensor circuit<br>• Received network data in error. | The engine will not respond to the remote throttle. Engine may only idle. The primary or cab accelerator may be able to be used. |
| 292 (Red) | Auxiliary temperature sensor input 1<br>• Special instructions. | Possible engine derate. |
| 293 (Orange) | Auxiliary temperature sensor input #1 circuit<br>• Voltage above normal or shorted to high source. | None on performance. |
| 294 (Orange) | Auxiliary temperature sensor input #1 circuit<br>• Voltage below normal or shorted to low source. | None on performance. |
| 295 (Orange) | Barometric pressure<br>• Data erratic, intermittent or incorrect. | Engine power derate. |
| 296 (Red) | Auxiliary pressure sensor input 1<br>• Special instructions | Possible engine power derate. |
| 297 (Orange) | Auxiliary pressure sensor input #2 circuit<br>• Voltage above normal or shorted to high source. | None on performance. |
| 298 (Orange) | Auxiliary pressure sensor input #2 circuit<br>• Voltage below normal or shorted to low source. | None on performance. |
| 322 (Orange) | Injector solenoid driver cylinder 1 circuit<br>• Current below normal or open circuit. | Engine can misfire or possibly run rough. |
| 324 (Orange) | Injector solenoid driver cylinder 3 circuit<br>• Current below normal or open circuit. | Engine can misfire or possibly run rough. |
| 331 (Orange) | Injector solenoid driver cylinder 2 circuit<br>• Current below normal or open circuit. | Engine can misfire or possibly run rough. |
| 332 (Orange) | Injector solenoid driver cylinder 4 circuit<br>• Current below normal or open circuit. | Engine can misfire or possibly run rough. |

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 343 (Orange) | Electronic control module warning internal hardware failure<br>• Bad intelligent device or component. | Possible no noticeable performance effects, engine dying or hard starting. Fault information, trip information and maintenance monitor data can be inaccurate. |
| 349 (Orange) | Transmission output shaft speed<br>• Data valid but above normal operational range.<br>• Moderately severe level. | Engine will run off of a default auxiliary speed. |
| 351 (Orange) | Injector power supply<br>• Bad intelligent device or component. | Possible low power, engine misfire and/or engine will not start. |
| 352 (Orange) | Sensor supply 1 circuit<br>• Voltage below normal or shorted to low source. | Engine power derate. |
| 386 (Orange) | Sensor supply 1 circuit<br>• Voltage above normal or shorted to high source. | Engine power derate. |
| 415 (Red) | Engine oil rifle pressure<br>• Data valid but below normal operation range.<br>• Most severe level. | Progressive power derate increasing in severity from time if alert. If engine protection shutdown feature is enabled, engine will shut down 30 seconds after red engine stop lamp starts flashing. |
| 418 (Orange/ Blinking) | Water in fuel indicator<br>• Data valid but above normal operation range.<br>• Least severe level. | Possible white smoke, loss of power, or hard starting. |
| 428 (Orange) | Water in fuel indicator sensor circuit<br>• Voltage above normal or shorted to high source. | None on performance.<br>No water in fuel warning available. |
| 429 (Orange) | Water in fuel indicator sensor circuit<br>• Voltage below normal or shorted to low source. | None on performance.<br>No water in fuel warning available. |
| 431 (Orange) | Accelerator pedal or lever idle validation switch<br>• Data erratic, intermittent or incorrect. | Engine will only idle. |
| 432 (Red) | Accelerator pedal or lever idle validation switch circuit<br>• Out of calibration. | Engine will only idle. |
| 435 (Orange) | Engine oil rifle pressure<br>• Data erratic, intermittent or incorrect. | None on performance.<br>No engine protection for oil pressure. |
| 441 (Orange) | Battery 1 voltage<br>• Data valid but below normal operation range.<br>• Moderately severe level. | Engine may stop running or be difficult to start. |
| 442 (Orange) | Battery 1 voltage<br>• Data valid but above normal operation range.<br>• Moderately severe level. | Possible electrical damage to all electrical components. |
| 449 (Red) | Injector metering rail 1 pressure<br>• Data valid but above normal operation range.<br>• Most severe level. | None or possible engine noise associated with higher injection pressures (especially at idle or light load). Engine power is reduced. |
| 451 (Orange) | Injector metering rail 1 pressure sensor circuit<br>• Voltage above normal or shorted to high source. | Power and/or speed derate. |
| 452 (Orange) | Injector metering rail 1 pressure sensor circuit<br>• Voltage below normal or shorted to low source. | Power and/or speed derate. |

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 488 (Orange) | Intake manifold 1 temperature<br>• Data valid but above normal operation range.<br>• Moderately severe level. | Progressive power derate increasing in severity from time of alert. |
| 489 (Orange) | Transmission output shaft speed<br>• Data valid but below normal operational range.<br>• Moderately severe level. | ECM changes engine speed to a calibration dependent set point. |
| 497 (Orange) | Multiple unit synchronization switch circuit<br>• Data erratic, intermittent or incorrect. | Synchronization function of multiple unit is disabled. |
| 515 (Orange) | Sensor supply 6 circuit<br>• Voltage above normal or shorted to high source. | Possible reduced performance. |
| 516 (Orange) | Sensor supply 6 circuit<br>• Voltage below normal or shorted to low source. | Possible reduced performance. |
| 523 (Orange) | Intermediate (P.T.O) speed switch validation<br>• Data erratic, intermittent or incorrect. | Intermediate speed control switch may not operate correctly. |
| 527 (Orange) | Auxiliary input/output 2 circuit<br>• Voltage above normal or shorted to high source. | None on performance. |
| 528 (Orange) | Auxiliary alternate torque validation switch<br>• Data erratic, intermittent or incorrect. | Torque curve setting defaults to default curve. |
| 529 (Orange) | Auxiliary input/output 3 circuit<br>• Voltage above normal or shorted to high source. | None on performance. |
| 553 (Orange) | Injector metering rail 1 pressure<br>• Data valid but above normal operation range.<br>• Moderately severe level. | None or possible engine noise associated with higher injection pressures (especially at idle or light load). Engine power is reduced. |
| 555 (Orange) | Crankcase pressure<br>• Data valid but above normal operating range.<br>• Moderately severe level. | None on performance. |
| 556 (Red) | Crankcase pressure<br>• Data valid but above normal operational range.<br>• Most severe level. | Engine power derate. |
| 559 (Orange) | Injector metering rail 1 pressure<br>• Data valid but below normal operation range.<br>• Moderately severe level. | Possibly hard to start, low power or engine smoke. Engine could possibly not start. |
| 584 (Orange) | Starter relay driver circuit<br>• Voltage above normal or shorted to high source. | Either the engine will not start or the engine will not have starter lockout protection. |
| 585 (Orange) | Starter relay driver circuit<br>• Voltage below normal or shorted to low source. | The engine will not have starter lockout protection. |
| 595 (Orange) | Turbocharger 1 speed<br>• Data valid but above normal operating range.<br>• Moderately severe level. | No effect on engine performance. |
| 599 (Red) | Auxiliary commanded dual output shutdown<br>• Special instructions. | Engine will shutdown. |
| 649 (Orange/ Blinking) | Change lubricating oil and filter<br>• Condition exists. | Maintenance reminder only. |

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 687 (Orange) | Turbocharger 1 speed<br>• Data valid but below normal operating range.<br>• Moderately severe level. | Engine power derate. The ECM uses an estimated turbocharger speed. |
| 689 (Orange) | Engine crankshaft speed/position<br>• Data erratic, intermittent or incorrect. | Engine power derate. |
| 691 (Orange) | Turbocharger 1 compression intake temperature circuit<br>• Voltage above normal or shorted to high source. | Engine power derate. |
| 692 (Orange) | Turbocharger 1 compression intake temperature circuit<br>• Voltage below normal or shorted to low source. | Engine power derate. |
| 731 (Orange) | Engine speed/position camshaft and crankshaft misalignment<br>• Mechanical system not responding or out of adjustment. | Engine will run derated.<br>Hard start and rough idle possible. |
| 778 (Orange) | Engine camshaft speed/position sensor<br>• Data erratic, intermittent or incorrect. | Engine can run rough. Possibly poor starting capability. Engine runs using primary engine position sensor. |
| 1117 (None) | Power supply lost with starter switch ON<br>• Data erratic, intermittent or incorrect. | Possible no noticeable performance effects, engine dying or hard starting. Fault information, trip information and maintenance monitor data can be inaccurate. |
| 1239 (Orange) | Accelerator pedal or lever position sensor 2 circuit<br>• Voltage above normal or shorted to high source. | Severe derate in power output of the engine. Limp home power only. |
| 1241 (Orange) | Accelerator pedal or lever position sensor 2 circuit<br>• Voltage below normal or shorted to low source. | Severe derate in power output of the engine. Limp home power only. |
| 1242 (Red) | Accelerator pedal or lever position sensor 1<br>• Data erratic, intermittent or incorrect. | The engine will only idle. |
| 1515 (Red) | SAE J1939 multiplexed accelerator pedal or lever sensor system<br>• Received network data in error. | The engine will only idle. |
| 1539 (Orange) | Auxiliary pressure sensor input 1 circuit<br>• Voltage above normal or shorted to high source. | None on performance. |
| 1621 (Orange) | Auxiliary pressure sensor input 1 circuit<br>• Voltage below normal or shorted to low source. | None on performance. |
| 1695 (Orange) | Sensor supply 5<br>• Voltage above normal or shorted to high source. | Severe derate in power output of the engine. Limp home power only. |
| 1696 (Orange) | Sensor supply 5<br>• Voltage below normal or shorted to low source. | Severe derate in power output of the engine. Limp home power only. |
| 1843 (Orange) | Crankcase pressure circuit<br>• Voltage above normal or shorted to high source. | No engine protection for high crankcase pressure. |

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 1844 (Orange) | Crankcase pressure circuit<br>• Voltage below normal or shorted to low source. | No engine protection for high crankcase pressure. |
| 1896 (Orange) | EGR valve controller<br>• Out of calibration | EGR valve actuation will be disabled. |
| 1898 (Orange) | VGT actuator controller<br>• Out of calibration | Low intake manifold pressure. The VGT will be in the open position. |
| 1911 (Orange) | Injector metering rail 1 pressure<br>• Data valid but above normal operation range<br>• Most severe level. | None or possible engine noise associated with higher injection pressure (especially at idle or light load) or possible power interruption associated with dump valve reset. |
| 1938 (Orange) | ECU power output supply voltage 1<br>• Data valid but below normal operating range.<br>• Moderately severe level. | None on performance. |
| 1942 (Orange) | Crankcase pressure<br>• Data erratic, intermittent or incorrect. | None on performance. |
| 1961 (Orange) | EGR valve control circuit over temperature<br>• Data valid but above normal operating range.<br>• Least severe level. | EGR valve operation will be disabled. |
| 1974 (Orange/ Blinking) | Crankcase pressure<br>• Data valid but above normal operating range.<br>• Least severe level. | None on performance. |
| 2182 (Orange) | Engine brake actuator driver 1 circuit<br>• Voltage above normal or shorted to high source. | Engine brake on cylinders 1, 2 and 3 can not be activated. |
| 2183 (Orange) | Engine brake actuator driver 1 circuit<br>• Voltage below normal or shorted to low source. | Engine brake on cylinders 1, 2 and 3 can not be activated. |
| 2185 (Orange) | Sensor supply 4 circuit<br>• Voltage above normal or shorted to high source. | Engine will only idle. |
| 2186 (Orange) | Sensor supply 4 circuit<br>• Voltage below normal or shorted to low source. | Engine will only idle. |
| 2195 (Red) | Auxiliary equipment sensor input 3 engine protection critical<br>• Special instructions. | Engine may shutdown. |
| 2272 (Orange) | EGR valve position circuit<br>• Voltage below normal or shorted to low source. | EGR valve actuation will be disabled. |
| 2288 (None) | Turbocharger 1 speed<br>• Data valid but above normal operating range.<br>• Least severe level. | Engine power derate to lower the turbocharger speed. |
| 2311 (Orange) | Electronic fuel injection control valve circuit<br>• Condition exists. | Possible low power. |
| 2321 (None) | Engine crankshaft speed/position<br>• Data erratic, intermittent or incorrect. | Engine may exhibit misfire as control switches from the primary to the backup speed sensor. Engine power is reduced while the engine operates on the backup speed sensor. |
| 2322 (None) | Engine camshaft speed/position sensor<br>• Data erratic, intermittent or incorrect. | None on performance. |

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 2349 (Orange) | EGR valve control circuit<br>• Current below normal or open circuit. | EGR valve actuation will be disabled. |
| 2353 (Orange) | EGR valve control circuit<br>• Current above normal or grounded circuit. | EGR valve actuation will be disabled. |
| 2357 (Orange) | EGR valve control circuit<br>• Mechanical system not responding or out of adjustment. | EGR valve actuation will be disabled. |
| 2363 (Orange) | Engine brake actuator driver output 2 circuit<br>• Voltage below normal or shorted to low source. | Engine brake on cylinders 4, 5 and 6 can not be activated. |
| 2367 (Orange) | Engine brake actuator driver output 2 circuit<br>• Voltage above normal or shorted to high source. | Engine brake on cylinders 4, 5 and 6 can not be activated. |
| 2372 (Orange) | Fuel filter differential pressure<br>• Data valid but above normal operating range.<br>• Moderately severe level. | Engine can possibly have low power. |
| 2373 (Orange) | Exhaust gas pressure sensor circuit<br>• Voltage above normal or shorted to high source. | None on performance. |
| 2374 (Orange) | Exhaust gas pressure sensor circuit<br>• Voltage below normal or shorted to low source. | None on performance. |
| 2375 (Orange) | Exhaust gas recirculation temperature sensor circuit<br>• Voltage above normal or shorted to high source. | EGR valve actuation will be disabled. |
| 2376 (Orange) | Exhaust gas recirculation temperature sensor circuit<br>• Voltage below normal or shorted to low source. | EGR valve actuation will be disabled. |
| 2377 (Orange) | Fan control circuit<br>• Voltage above normal or shorted to high source. | The fan may stay on continuously or not run at all. |
| 2448 (Orange/ Blinking) | Coolant level<br>• Data valid but below normal operating range.<br>• Least severe level. | None on performance. |
| 2554 (Orange) | Exhaust gas pressure<br>• Data erratic, intermittent or incorrect. | The ECM will estimate the exhaust gas pressure. |
| 2555 (Orange) | Engine intake air heater 1 circuit<br>• Voltage above normal or shorted to high source. | The intake air heats may be ON or OFF at all the time. |
| 2556 (Orange) | Engine intake air heater 1 circuit<br>• Voltage below normal or shorted to low source. | The intake air heats may be ON or OFF at all the time. |
| 2557 (Orange) | Auxiliary PWM driver #1<br>• Voltage above normal or shorted to high source. | Can not control transmission. |
| 2558 (Orange) | Auxiliary PWM driver #1<br>• Voltage below normal or shorted to low source. | Can not control transmission. |

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 2646 (Orange) | Engine coolant temperature<br>• Condition exists. | EGR valve actuation will be disabled. |
| 2765 (None) | Engine injector bank 1 barcodes<br>• Out of calibration. | None on performance. |
| 2961 (None) | Exhaust gas recirculation temperature<br>• Data valid but above normal operating range.<br>• Least severe level. | Slight fueling derate to bring EGR temperature under the maximum limit. |
| 2973 (Orange) | Intake manifold 1 pressure<br>• Data erratic, intermittent or incorrect. | Engine power derate. |
| 3186 (Orange) | Tachograph output shaft speed<br>• Abnormal update rate. | None on performance. |
| 3213 (Orange) | Tachograph output shaft speed<br>• Received network data in error. | None on performance. |
| 3326 (Red) | SAE J1939 multiplexed accelerator pedal or lever sensor system<br>• Abnormal update rate. | Engine will only idle. |
| 3328 (Orange) | Transmission output shaft speed<br>• Abnormal update rate. | None on performance. |
| 3418 (Orange) | Transmission output shaft speed<br>• Received network data in error. | None on performance. |
| 3525 (Orange) | Wheel-based vehicle speed<br>• Received network data in error. | None on performance. |
| 3526 (Orange) | Wheel-based vehicle speed<br>• Abnormal update rate. | None on performance. |
| 3527 (Red) | Accelerator pedal or lever idle validation switch<br>• Received network data in error. | Engine will only idle. |
| 3528 (Red) | Accelerator pedal or lever idle validation switch<br>• Abnormal update rate. | Engine will only idle. |
| 3616 (None) | Engine VGT nozzle position<br>• Mechanical system not responding or out of adjustment. | Engine power may be derated. |
| 3697 (Red) | Engine control module calibration memory<br>• Bad intelligent device or component. | Engine may not start. |
| 3724 (Orange) | Battery 1 voltage<br>• Data valid but below normal operating range.<br>• Least severe level. | EGR valve actuation will be disabled. |
| 3727 (None) | High pressure common rail fuel pressure relief valve<br>• Mechanical system not responding or out of adjustment. | Possible low power or power interruption associated with relief valve reset. |
| 3737 (None) | Engine starter mode overcrank protection<br>• Condition exists. | Starter operation is prohibited until the starter motor has adequately cooled. |
| 3741 (Orange) | High pressure common rail fuel pressure relief valve<br>• Data valid but above normal operational range.<br>• Most severe level. | Engine may run rough, may stop running, may not start or may be difficult to start. |
| 3765 (Orange) | Auxiliary temperature sensor input 2 circuit<br>• Voltage above normal or shorted to high source. | None on performance. |

| Fault code (Lamp) | Reason | Effect |
|---|---|---|
| 3766 (Orange) | Auxiliary temperature sensor input 2 circuit<br>• Voltage below normal or shorted to low source. | None on performance. |

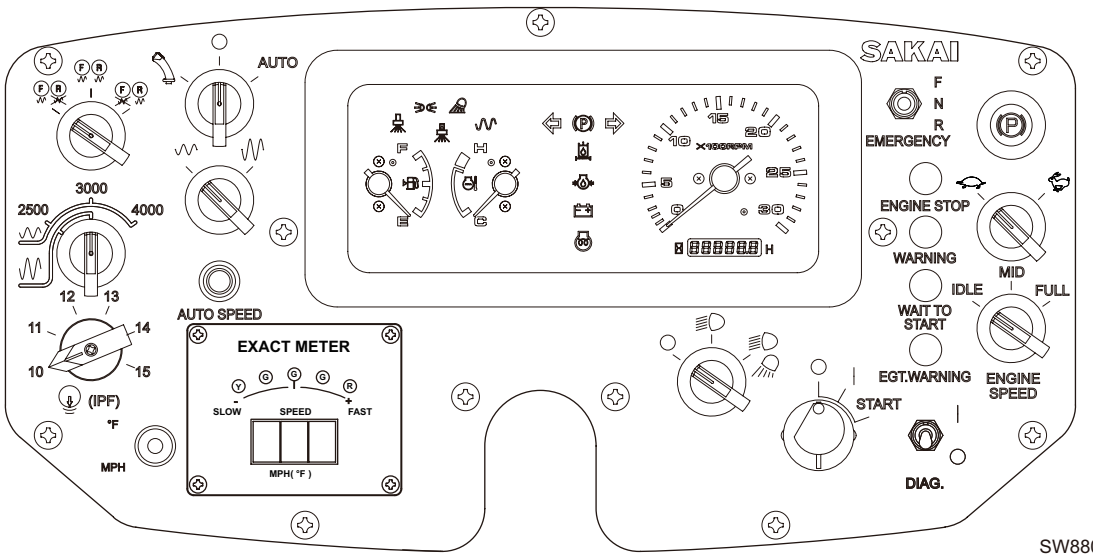
**(NOTICE)**

- **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 multiple display (Exact meter).

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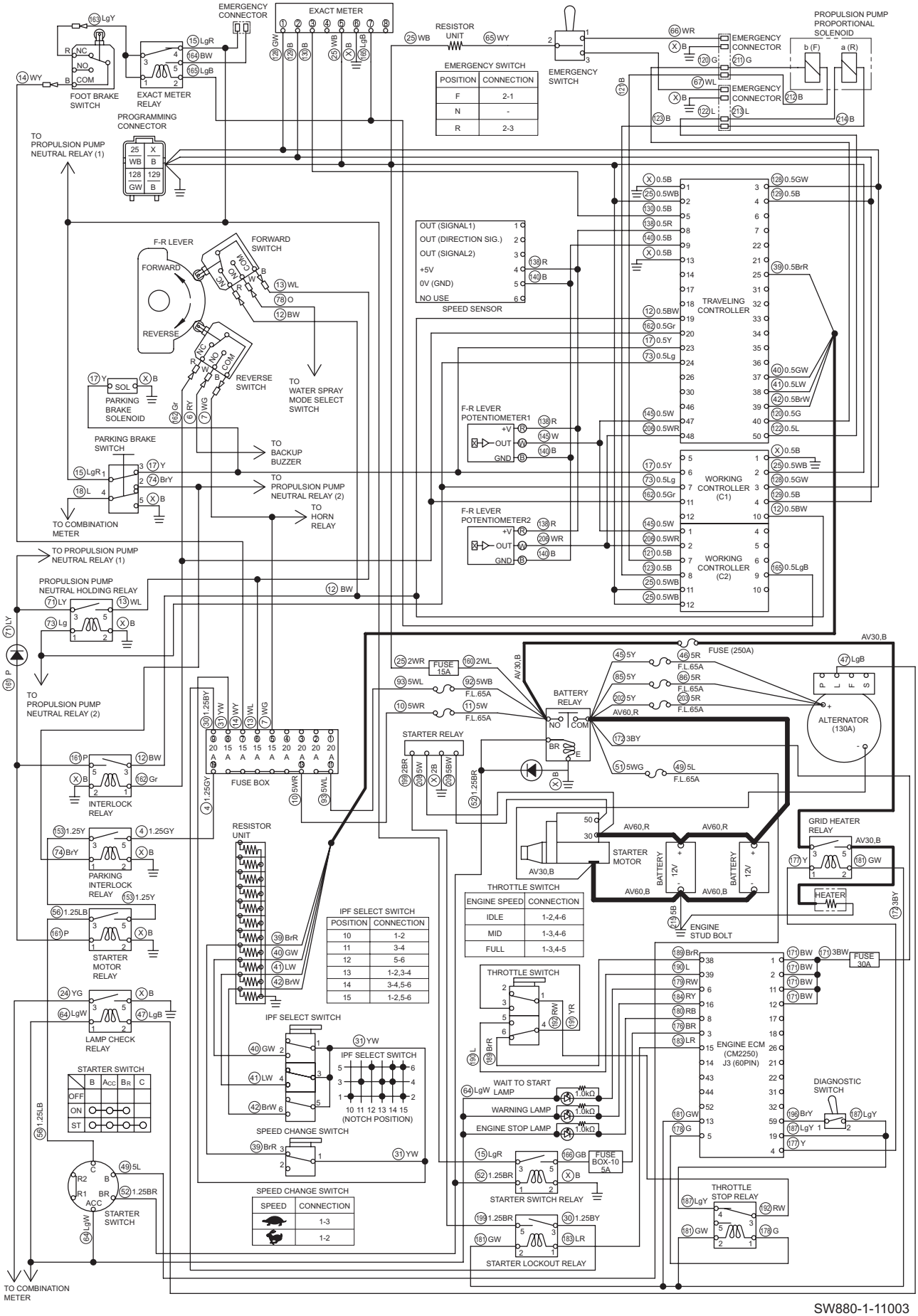
## 2-3-2. Error code list

| Error code | Description | Symptom |
|---|---|---|
| E01 | Faulty potentiometer inside F-R lever. | Engine stop. |
| E02 | | |
| E03 | Faulty forward and reverse switch. | |
| E04 | | |
| E05 | | |
| E06 | | |
| E11 | Faulty speed sensor. | Engine stop (only auto speed mode). |
| | | Impact frequency lamp does not light. |
| | | Automatic speed function does not operate. |
| | | Vehicle speed is not displayed. |
| 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). |
| 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 vibration proportional solenoid a (Hi) output current. | Vibration does not occur. |
| E34 | Faulty vibration 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 | | |
| E61 | Faulty potentiometer 1. | |
| E62 | | |
| E63 | | |
| E64 | | |
| E65 | Faulty potentiometer 2. | |
| E66 | | |
| E67 | | |
| E68 | | |

# Fig.: 2-4-1

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# 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) 1/17

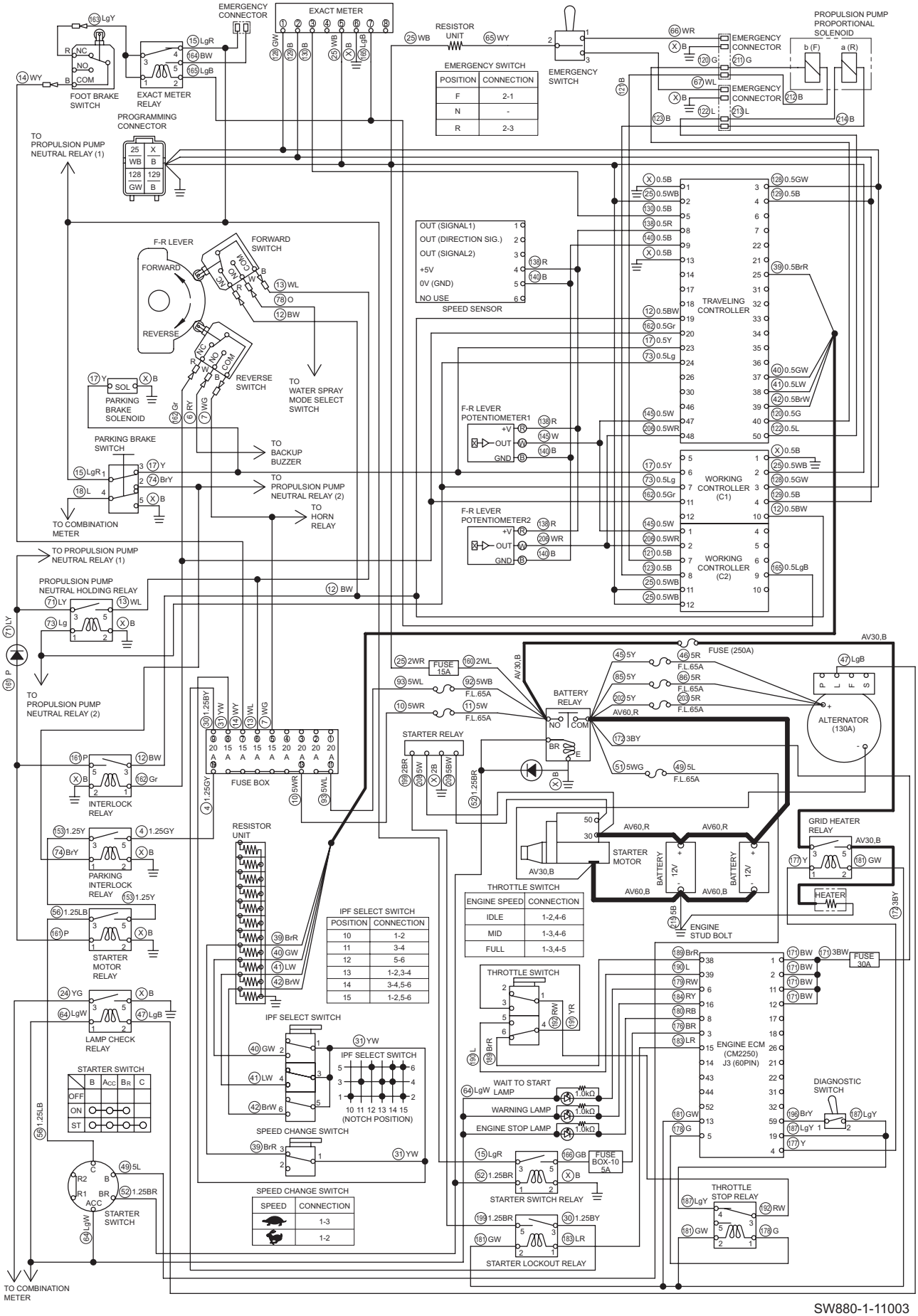
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| Pon | 1. Connector | • Check forward switch connector, reverse switch connector and traveling controller connector terminal 19, 20, working controller (C1) connector terminal 10, 11 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistances between switches and traveling controller terminal wires.<br>• Forward switch terminal NC wire BW and traveling controller terminal 19 wire BW, working controller (C1) terminal 10 wire BW<br>• Reverse switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller (C1) terminal 11 wire Gr<br>Standard resistance : 10 Ω or less<br>(2) Measure resistances between switches and fuse box terminal wires.<br>• Forward switch terminal COM wire WL and fuse box terminal 6 wire WL<br>• Reverse switch terminal COM wire WG and fuse box terminal 5 wire WG<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Forward Switch | • When starter switch is OFF and F-R lever is “N”, check continuity between forward switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>• If there is no continuity, forward switch is faulty. | Replace forward switch. |
| | 4. Reverse Switch | • When starter switch is OFF and F-R lever is “N”, check continuity between reverse switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>• If there is no continuity, reverse switch is faulty. | Replace reverse switch. |

# Fig.: 2-4-1

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## 2-4-1. Engine will not start (Starter motor does not run) 2/17

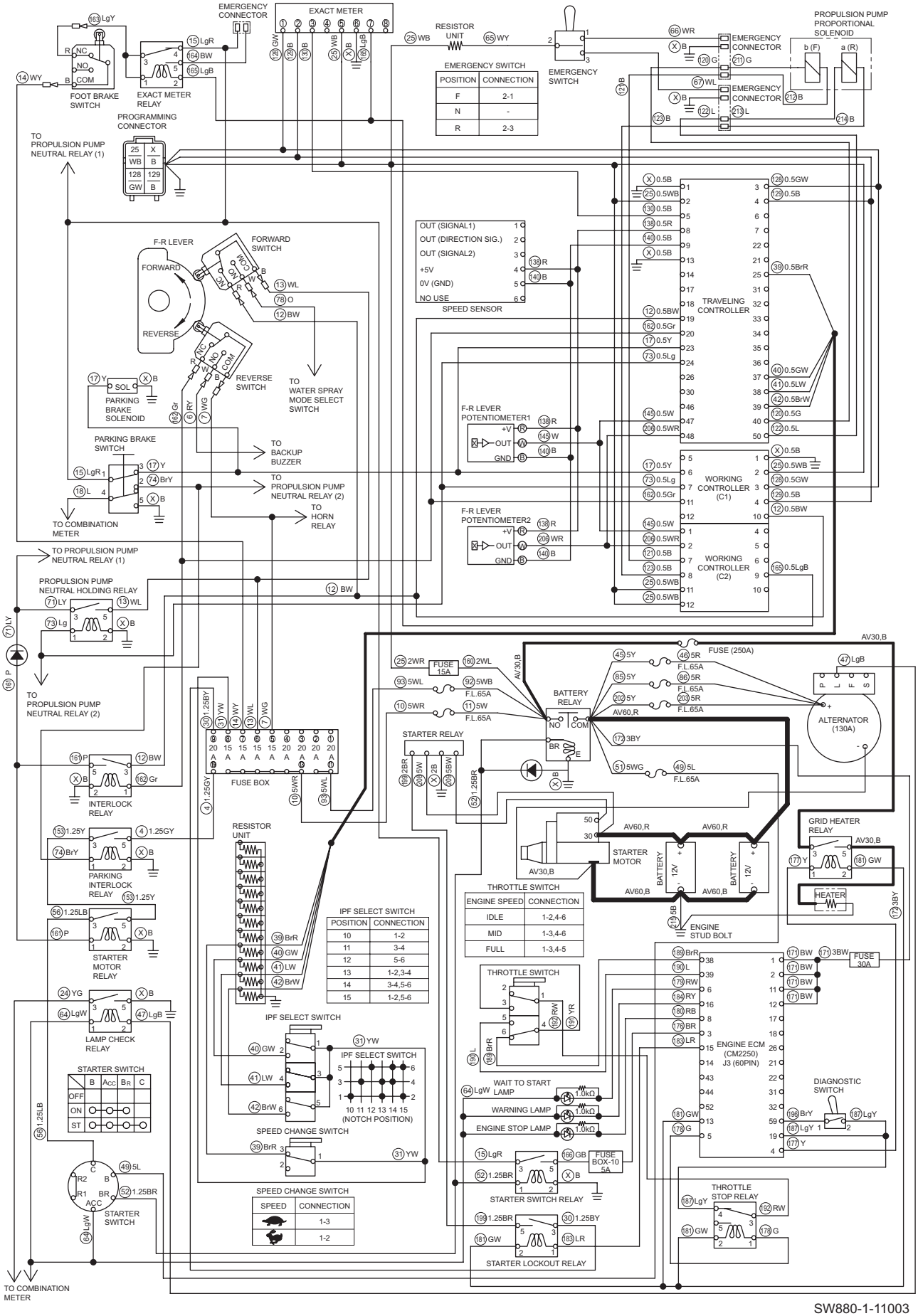
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| Pon | 5. Traveling/ Working Controller | • If error code Pon is displayed and no abnormality is found in connector, harness, forward switch and reverse switch in above inspection, traveling/working controller is faulty. | Replace traveling/ working controller. |
| | 6. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, place F-R lever “F” or “N”.<br>② Set starter switch to ON.<br>③ When F-R lever is “F” or “N”, traveling/working controller cannot be initialized. Exact meter will continuously display Pon.<br>④ Return F-R lever to “N”.<br>⑤ When traveling/working controller initialization is completed, display will change from Pon to vehicle speed. Machine is in normal state. | |

# Fig.: 2-4-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| SPEED SENSOR | |
|---|---|
| OUT (SIGNAL1) | 1 |
| OUT (DIRECTION SIG.) | 2 |
| OUT (SIGNAL2) | 3 |
| +5V | 4 |
| 0V (GND) | 5 |
| NO USE | 6 |

| 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 |

| THROTTLE SWITCH | |
|---|---|
| ENGINE SPEED | CONNECTION |
| IDLE | 1-2,4-6 |
| MID | 1-3,4-6 |
| FULL | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| STARTER SWITCH | B | ACC | BR | C |
|---|---|---|---|---|
| OFF | | | | |
| ON | ● | | ● | |
| ST | ● | ● | ● | |

SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 3/17

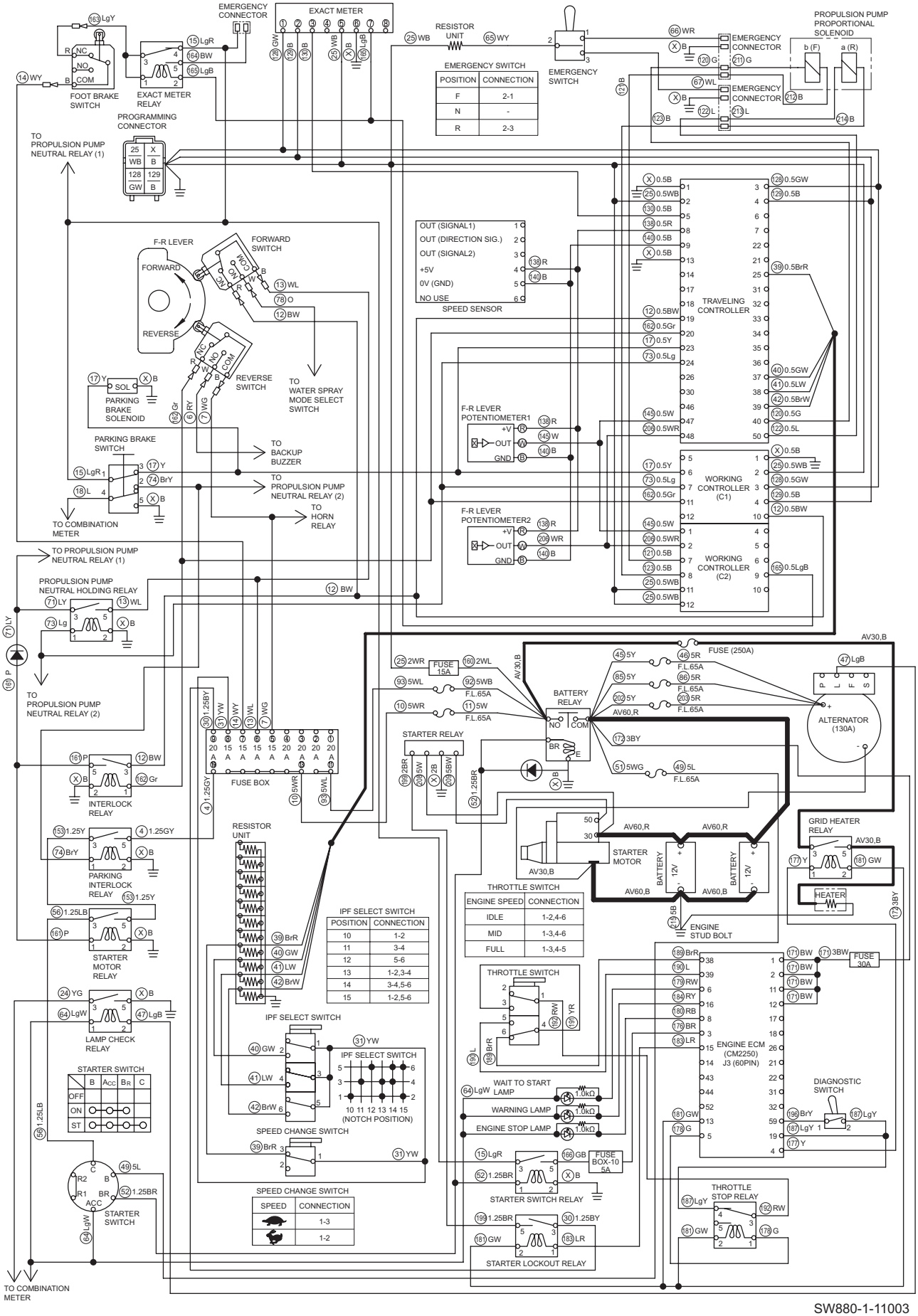
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E01 or E02 | 1. Connector | • Check F-R lever potentiometer 1, 2 connector and traveling controller connector terminal 8, 9, 47, 48, working controller (C2) connector terminal 1, 2 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between F-R lever potentiometer and traveling/working controller terminal wires.<br>• F-R lever potentiometer 1 terminal wire R and traveling controller terminal 8 wire R<br>• F-R lever potentiometer 1 terminal wire W and traveling controller terminal 47 wire W, working controller (C2) terminal 1 wire W<br>• F-R lever potentiometer 1 terminal wire B and traveling controller terminal 9 wire B<br>• F-R lever potentiometer 2 terminal wire R and traveling controller terminal 8 wire R<br>• F-R lever potentiometer 2 terminal wire WR and traveling controller terminal 48 wire WR, working controller (C2) terminal 2 wire WR<br>• F-R lever potentiometer 2 terminal wire B and traveling controller terminal 9 wire B<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. F-R Lever Potentiometer 1 | (1) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal inlet wire R and ground terminal 1 wire B.<br>Standard voltage : 5 ± 0.5 V<br>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal outlet wire W and ground terminal 1 wire B.<br>① When F-R lever is “N”<br>Standard voltage : 2.5 ± 0.015 V<br>② When F-R lever is “F”<br>Standard voltage : 1.2 ± 0.02 V<br>③ When F-R lever is “R”<br>Standard voltage : 3.8 ± 0.02 V<br>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 1 adjustment is faulty. | Adjust F-R lever potentiometer 1 or replace it even if measurement is out of standard after adjustment. |

# Fig.: 2-4-1




SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 4/17

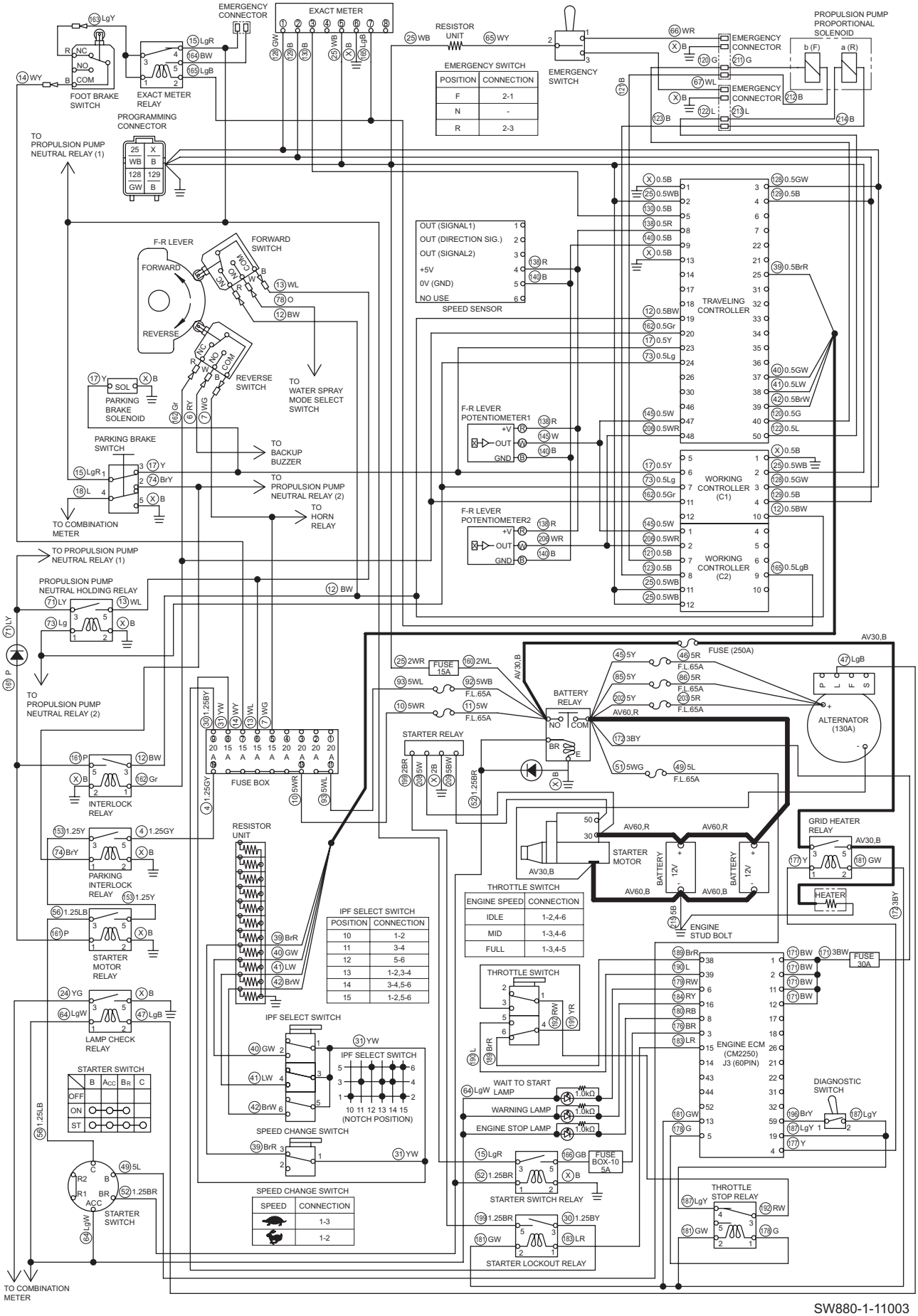
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

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 | (1) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal inlet wire R and ground terminal 1 wire B.<br>Standard voltage : 5 ± 0.5 V<br>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal outlet wire WR and ground terminal 1 wire B.<br>① When F-R lever is “N”<br>Standard voltage : 2.5 ± 0.015 V<br>② When F-R lever is “F”<br>Standard voltage : 3.8 ± 0.02 V<br>③ When F-R lever is “R”<br>Standard voltage : 1.2 ± 0.02 V<br>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 2 adjustment is faulty. | Adjust F-R lever potentiometer 2 or replace it even if measurement is out of standard after adjustment. |
| | 5. Traveling Controller | (1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between traveling controller terminal 8 outlet wire R (positive side) and 9 wire B (ground side).<br>Standard voltage : 5 ± 0.5 V<br>• If above item (1) is OK and item (2) is NG, 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.<br>② Place F-R lever “N”.<br>③ Exact meter will display vehicle speed (0.0).<br>If E01 or E02 is displayed, check above items again.<br>④ Place F-R lever “F” or “N”.<br>⑤ Exact meter will still display vehicle speed (0.0).<br>Machine is in normal state.<br>If display changes to E01 or E02, check above items again. | |

# Fig.: 2-4-1




SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 5/17

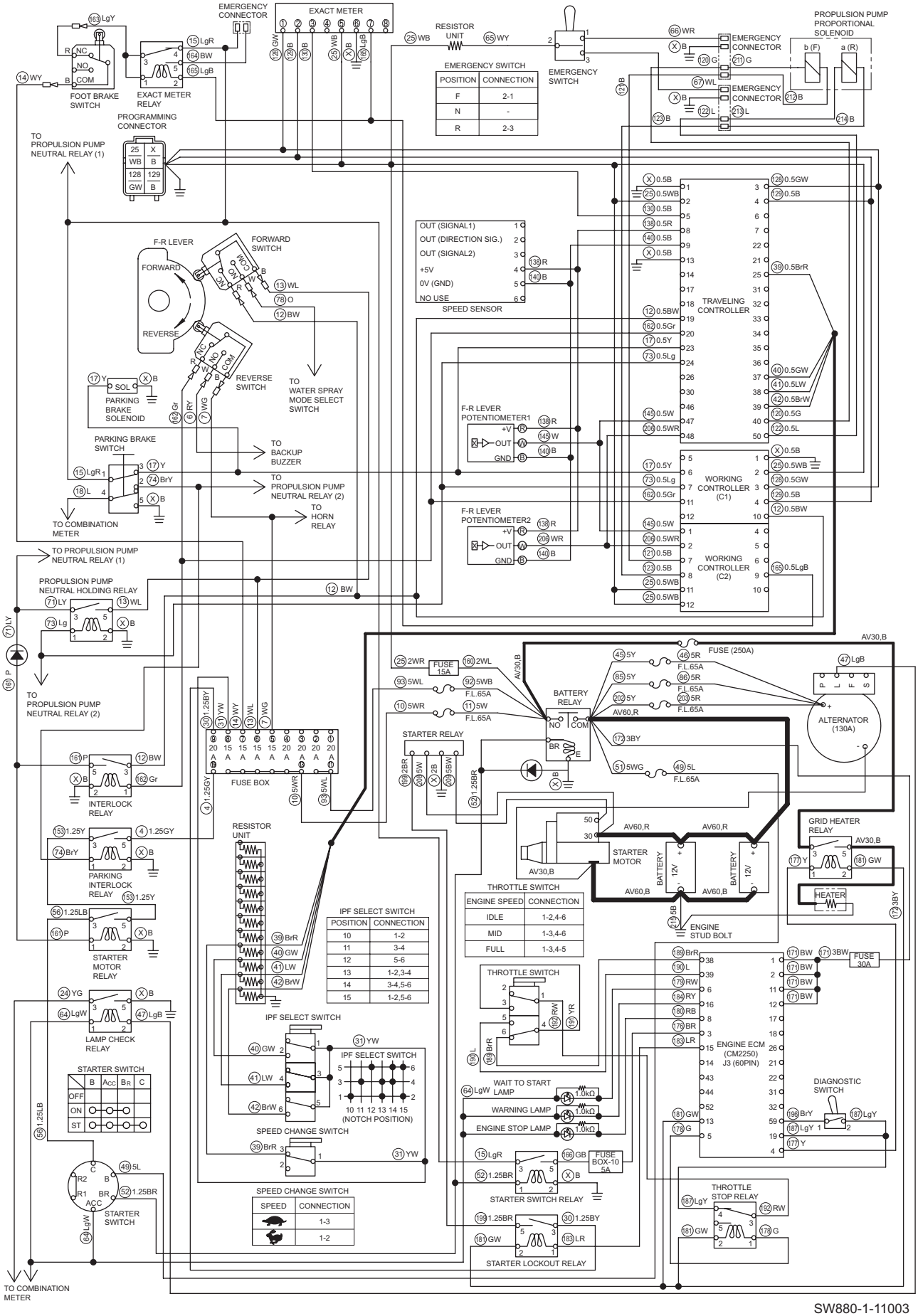
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E03 or E04 | 1. Connector | • Check forward switch connector and traveling controller connector terminal 19, working controller (C1) connector terminal 10 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistance between forward switch connector terminal NC wire BW and traveling controller terminal 19 wire BW, working controller (C1) terminal 10 wire BW.<br>Standard resistance : 10 Ω or less<br>(2) Measure resistance between forward switch connector terminal COM wire WL and fuse box terminal 6 wire WL.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Forward Switch | (1) When starter switch is OFF and F-R lever is “N”, check continuity between forward switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>(2) When starter switch is OFF and F-R lever is “F”, check continuity between forward switch terminal COM and terminal NC.<br>There is no continuity in normal condition.<br>• If above item (1) or (2) is NG, forward switch is faulty. | Replace forward switch. |
| | 4. Traveling/ Working Controller | • 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. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Exact meter will display E03 or E04.<br>When E03 is displayed:<br>③ Move F-R lever in “F”.<br>Exact meter display will change from E03 to vehicle speed (0.0).<br>If display does not change to vehicle speed, check above items again.<br>④ Return F-R lever to “N”.<br>Machine is in normal state.<br>When E04 is displayed:<br>③ Place F-R lever “N”.<br>Exact meter display will change from E04 to vehicle speed (0.0). Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-4-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| THROTTLE SWITCH | |
|---|---|
| ENGINE SPEED | CONNECTION |
| IDLE | 1-2,4-6 |
| MID | 1-3,4-6 |
| FULL | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| | 1-3 |
| | 1-2 |

## 2-4-1. Engine will not start (Starter motor does not run) 6/17

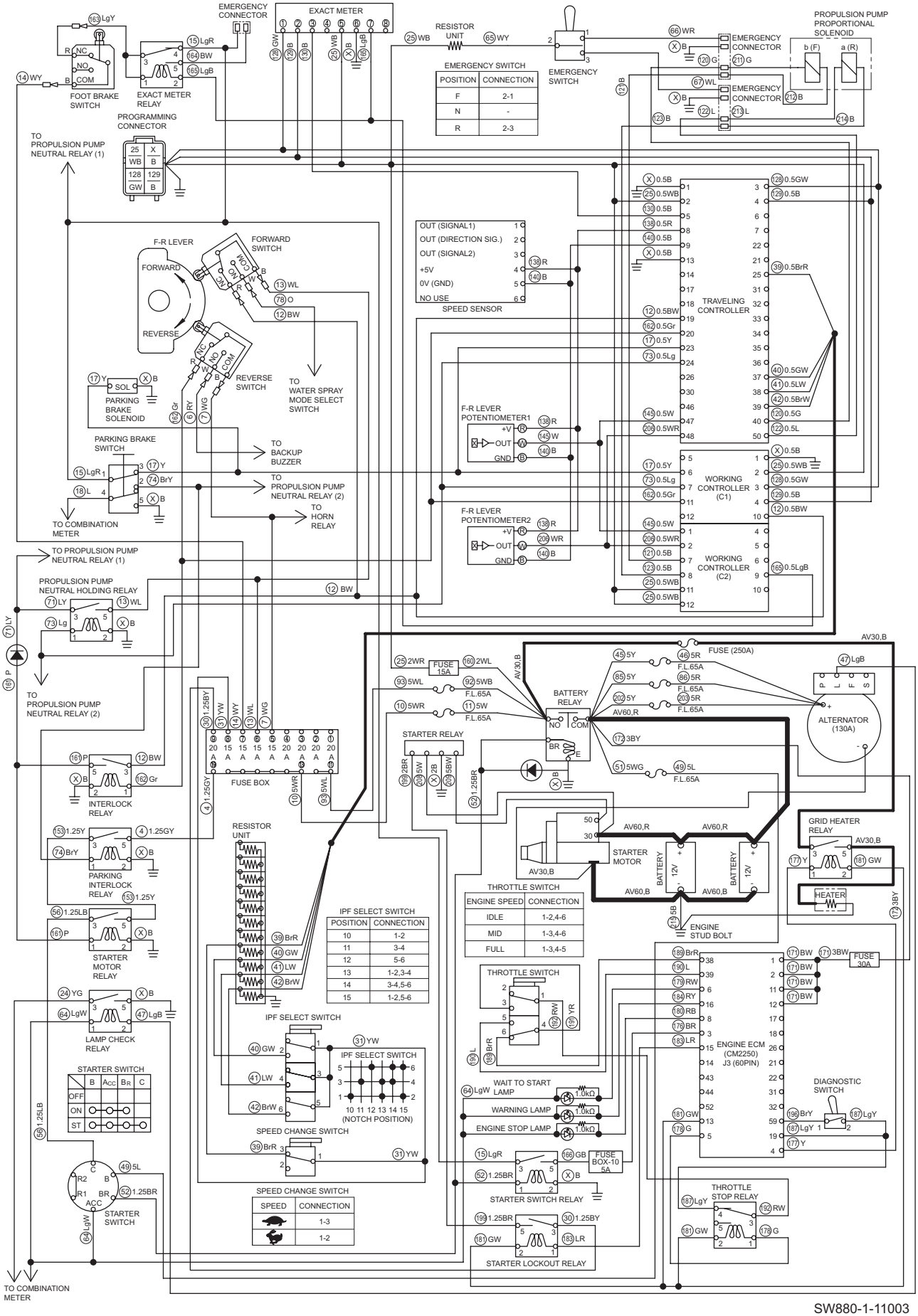
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E05 or E06 | 1. Connector | • Check reverse switch connector and traveling controller connector terminal 20, working controller (C1) connector terminal 11 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistance between reverse switch terminal NC wire Gr and traveling controller connector terminal 20 wire Gr.<br>Standard resistance : 10 Ω or less<br>(2) Measure resistance between reverse switch terminal COM wire WG and fuse box terminal 5 wire WG.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Reverse Switch | (1) When starter switch is OFF and F-R lever is “N”, check continuity between reverse switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>(2) When starter switch is OFF and F-R lever is “R”, check continuity between reverse switch terminal COM and terminal NC.<br>There is no continuity in normal condition.<br>• If above item (1) or (2) is NG, reverse switch is faulty. | Replace reverse switch. |
| | 4. Traveling/ Working Controller | • If error code E05 or E06 is displayed and no abnormality is found in connector, harness and reverse switch in above inspection, traveling/working controller is faulty. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Exact meter will display E05 or E06.<br>When E05 is displayed:<br>③ Place F-R lever “N”.<br>Exact meter display will change from E05 to vehicle speed (0.0). Machine is in normal state.<br>If display does not change to vehicle speed, check above items again.<br>When E06 is displayed:<br>③ Move F-R lever in “R”.<br>Exact meter display will change from E06 to vehicle speed (0.0).<br>If display does not change to vehicle speed, check above items again.<br>④ Return F-R lever to “N”. Machine is in normal state. | |

# Fig.: 2-4-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| THROTTLE SWITCH | |
|---|---|
| ENGINE SPEED | CONNECTION |
| IDLE | 1-2,4-6 |
| MID | 1-3,4-6 |
| FULL | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐇 | 1-3 |
| 🐢 | 1-2 |

## 2-4-1. Engine will not start (Starter motor does not run) 7/17

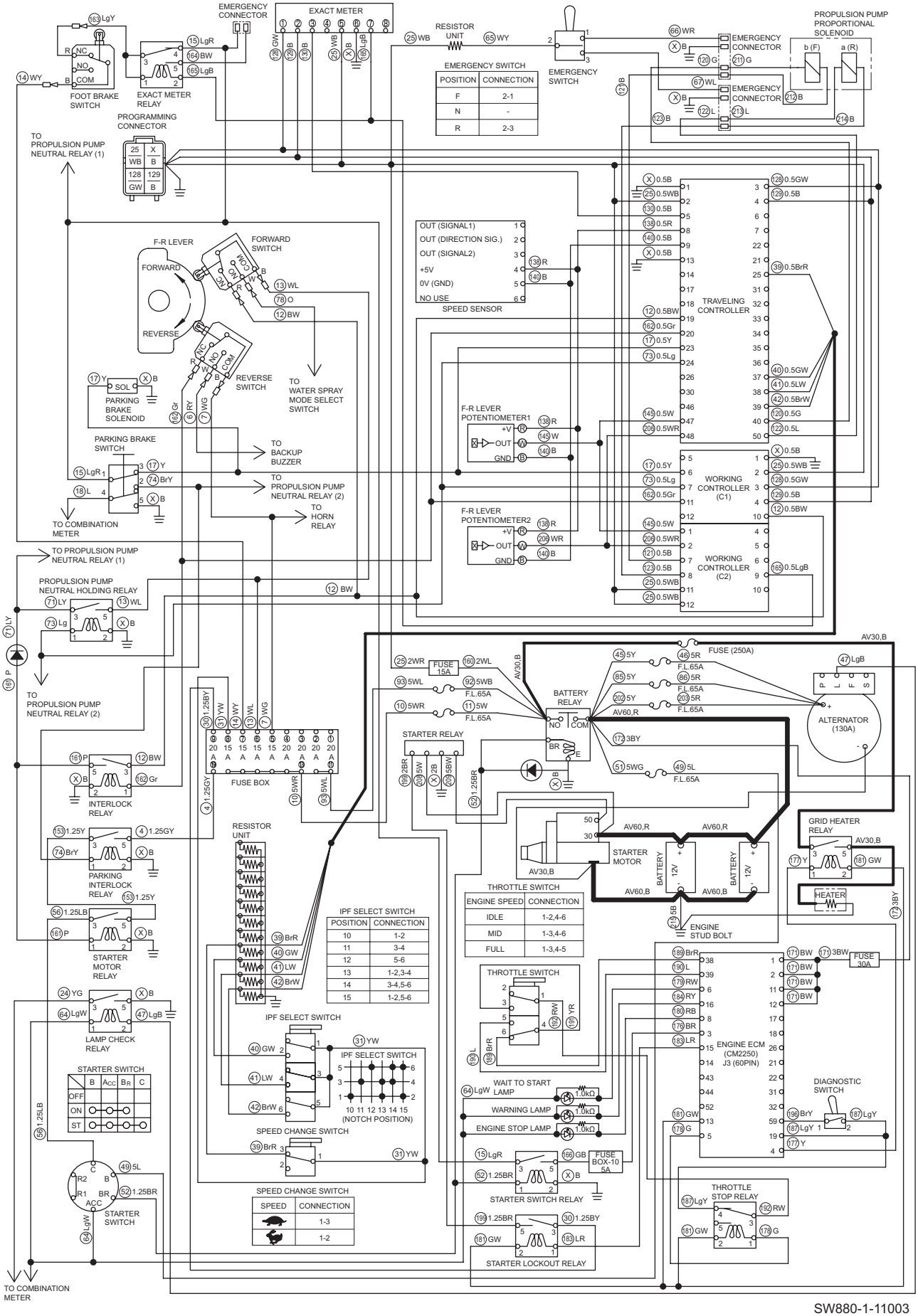
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E31 or E32 | 1. Connector | • Check propulsion pump proportional solenoid connector and traveling controller connector terminal 40, 50, working controller (C2) connector terminal 7, 8 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between propulsion pump proportional solenoid and traveling controller terminal wires.<br>• Propulsion pump proportional solenoid b wire G and traveling controller terminal 40 wire G<br>• Propulsion pump proportional solenoid a wire L and traveling controller terminal 50 wire L<br>• Propulsion pump proportional solenoid a, b wire B and working controller (C2) terminal 7 and 8 wires B<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty.<br><br>• Disconnect connectors and check continuity between propulsion pump proportional solenoid terminal wires.<br>• Terminal wire No.120 wire G and terminal wire No.121 wire B<br>• Terminal wire No.122 wire L and terminal wire No.123 wire B<br>• If there is continuity, harness is faulty. | Replace harness. |
| | 3. Propulsion Pump Proportional Solenoid a (R) or b (F) | • Disconnect harness and measure resistance of coils.<br>Standard resistance: 5.5 Ω<br>• If resistance is abnormal, propulsion pump proportional solenoid a (R) or b (F) is faulty. | Replace propulsion pump proportional solenoid. |

# Fig.: 2-4-1


EMERGENCY CONNECTOR
EXACT METER
RESISTOR UNIT
EMERGENCY SWITCH
PROPULSION PUMP PROPORTIONAL SOLENOID
FOOT BRAKE SWITCH
EXACT METER RELAY
PROGRAMMING CONNECTOR
TO PROPULSION PUMP NEUTRAL RELAY (1)
F-R LEVER
FORWARD SWITCH
REVERSE SWITCH
PARKING BRAKE SOLENOID
PARKING BRAKE SWITCH
TO BACKUP BUZZER
TO PROPULSION PUMP NEUTRAL RELAY (2)
TO HORN RELAY
TO COMBINATION METER
SPEED SENSOR
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
F-R LEVER POTENTIOMETER1
F-R LEVER POTENTIOMETER2
PROPULSION PUMP NEUTRAL HOLDING RELAY
FUSE (250A)
BATTERY RELAY
ALTERNATOR (130A)
STARTER RELAY
FUSE BOX
INTERLOCK RELAY
PARKING INTERLOCK RELAY
STARTER MOTOR RELAY
LAMP CHECK RELAY
RESISTOR UNIT
IPF SELECT SWITCH
SPEED CHANGE SWITCH
STARTER SWITCH
STARTER MOTOR
GRID HEATER RELAY
HEATER
ENGINE STUD BOLT
THROTTLE SWITCH
WAIT TO START LAMP
WARNING LAMP
ENGINE STOP LAMP
ENGINE ECM (CM2250) J3 (60PIN)
DIAGNOSTIC SWITCH
STARTER SWITCH RELAY
THROTTLE STOP RELAY
STARTER LOCKOUT RELAY
FUSE 30A
FUSE BOX-10 5A
SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 8/17

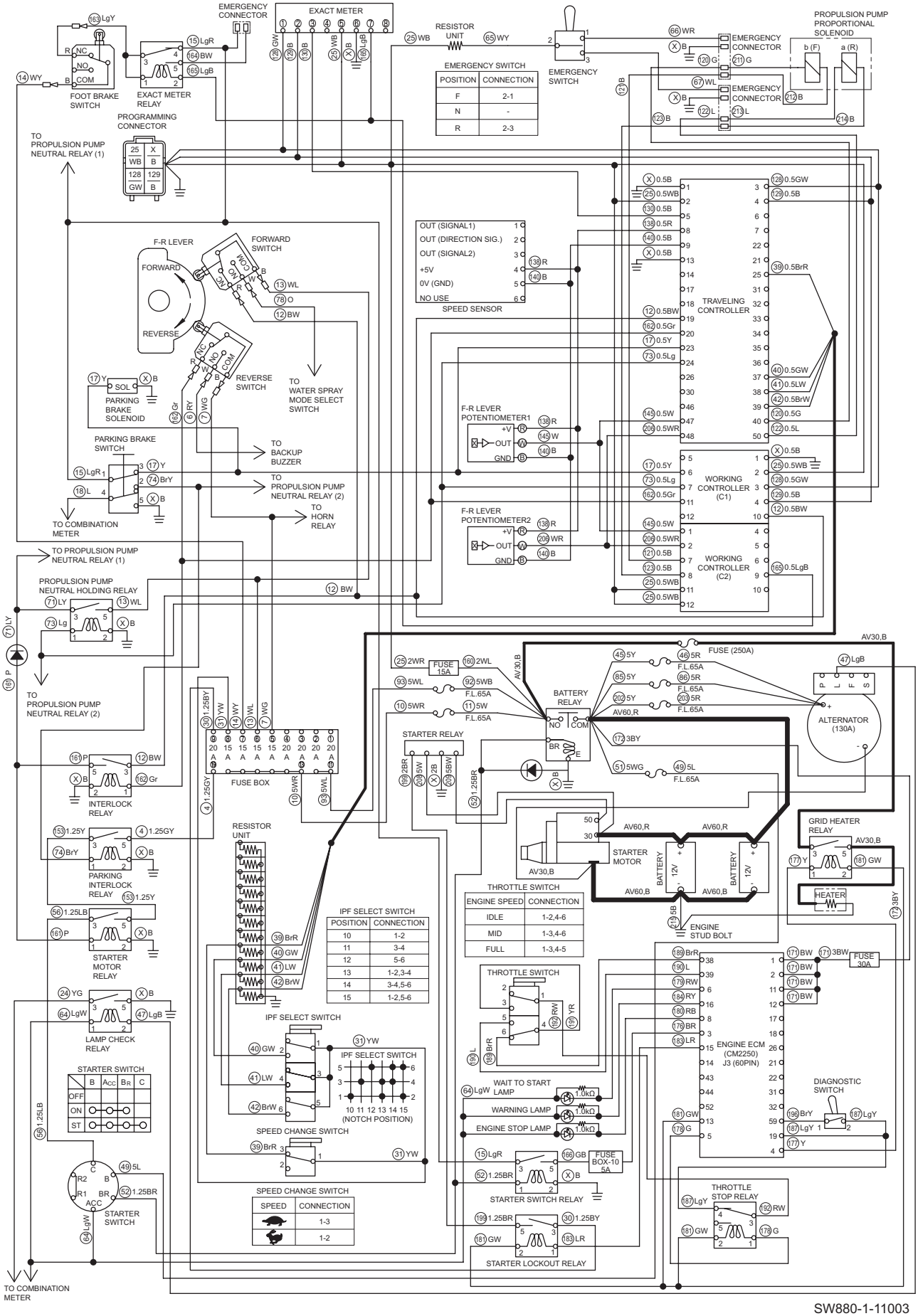
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

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 | (1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wire.<br>• Traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B<br>• Working controller (C1) power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B<br>• Working controller (C2) power supply terminal 11, 12 inlet wire WB and working controller (C1) ground terminal 1 outlet wire B<br>Standard voltage : 12 V or more<br>(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).<br>• Propulsion pump proportional solenoid b (F) wire G (positive side) and wire B (ground side)<br>• Propulsion pump proportional solenoid a (R) wire L (positive side) and wire B (ground side)<br>• While measuring current, operate F-R lever from “N” to “F” or “R”.<br>Standard current: 0 mA (“N”)<br>Standard current: 390 mA or more (at vehicle start moving)<br>Standard current: 1,350 mA or less (“F” or “R”)<br>• If item (1) is OK and item (2) is NG, traveling/working controller is faulty. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>③ Exact meter will display vehicle speed.<br>If display does not change to vehicle speed, check above items again.<br>In case of E31:<br>④ Move F-R lever in “F”.<br>Exact meter will still display vehicle speed. Machine is in normal state.<br>If E31 is displayed again, check above items again.<br>In case of E32:<br>④ Move F-R lever in “R”.<br>Exact meter will still display vehicle speed. Machine is in normal state.<br>If E32 is displayed again, check above items again. | |

# Fig.: 2-4-1




SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 9/17

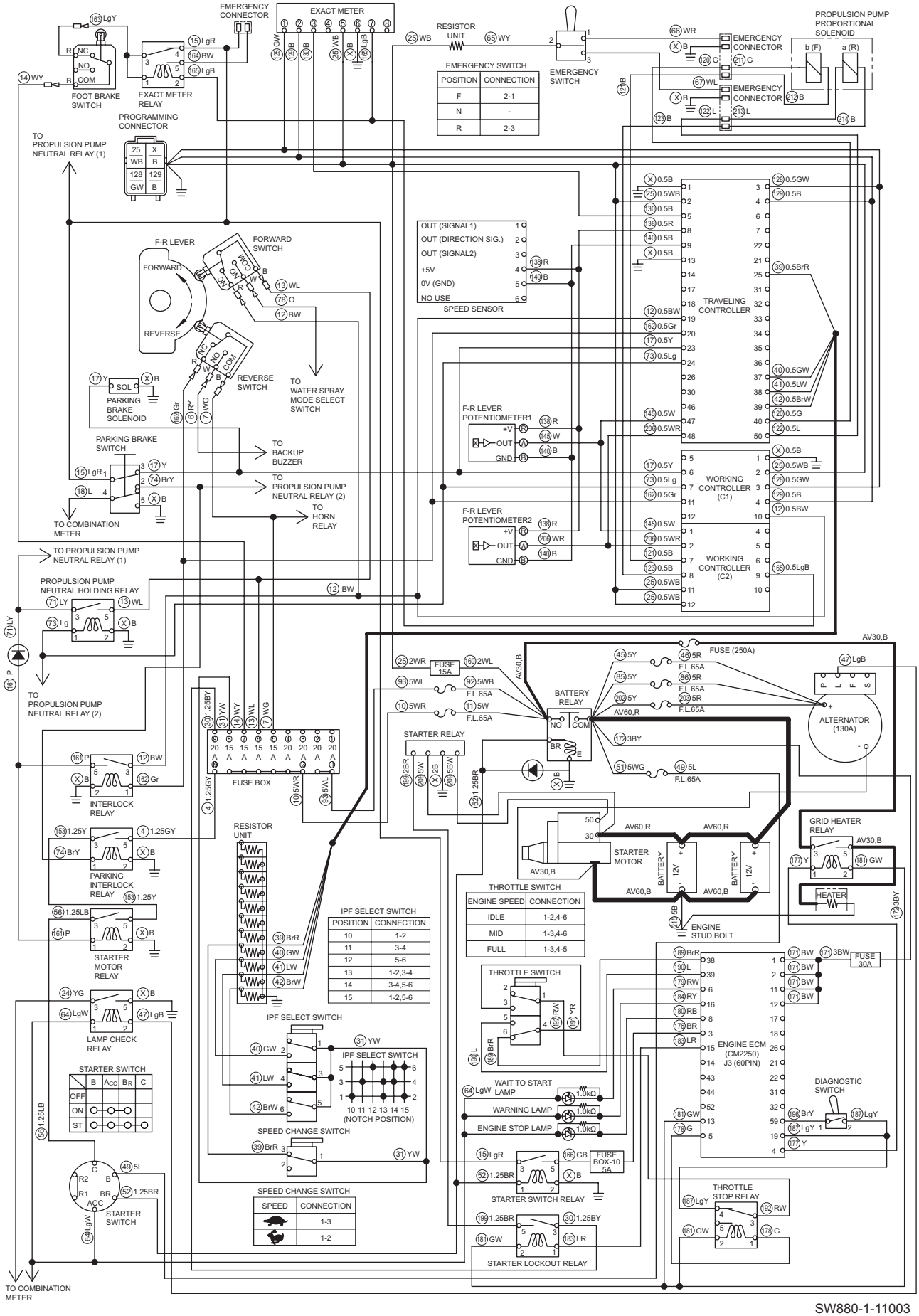
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E42 | 1. Connector | • Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between exact meter and traveling controller terminal wires.<br>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller (C2) terminal 4 wire B<br>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Traveling Controller | • When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>• If voltage is abnormal, traveling controller is faulty. | Replace traveling controller. |
| | 4. CAN Communication | • 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.<br>• Traveling controller is faulty. | Replace traveling controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-4-1


EMERGENCY CONNECTOR
EXACT METER
RESISTOR UNIT
EMERGENCY SWITCH
PROPULSION PUMP PROPORTIONAL SOLENOID
FOOT BRAKE SWITCH
EXACT METER RELAY
PROGRAMMING CONNECTOR
TO PROPULSION PUMP NEUTRAL RELAY (1)
F-R LEVER
FORWARD SWITCH
REVERSE SWITCH
PARKING BRAKE SOLENOID
PARKING BRAKE SWITCH
TO WATER SPRAY MODE SELECT SWITCH
TO BACKUP BUZZER
TO PROPULSION PUMP NEUTRAL RELAY (2)
TO HORN RELAY
TO COMBINATION METER
SPEED SENSOR
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
F-R LEVER POTENTIOMETER1
F-R LEVER POTENTIOMETER2
PROPULSION PUMP NEUTRAL HOLDING RELAY
FUSE (250A)
BATTERY RELAY
ALTERNATOR (130A)
STARTER RELAY
FUSE BOX
INTERLOCK RELAY
PARKING INTERLOCK RELAY
STARTER MOTOR RELAY
LAMP CHECK RELAY
RESISTOR UNIT
IPF SELECT SWITCH
SPEED CHANGE SWITCH
STARTER SWITCH
STARTER MOTOR
GRID HEATER RELAY
HEATER
ENGINE STUD BOLT
THROTTLE SWITCH
WAIT TO START LAMP
WARNING LAMP
ENGINE STOP LAMP
ENGINE ECM (CM2250) J3 (60PIN)
DIAGNOSTIC SWITCH
STARTER SWITCH RELAY
STARTER LOCKOUT RELAY
THROTTLE STOP RELAY
FUSE 30A
FUSE BOX-10 5A
EMERGENCY SWITCH
POSITION CONNECTION
F 2-1
N -
R 2-3
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
SPEED CONNECTION
1-3
1-2
THROTTLE SWITCH
ENGINE SPEED CONNECTION
IDLE 1-2,4-6
MID 1-3,4-6
FULL 1-3,4-5
STARTER SWITCH
OFF
ON
ST
10 11 12 13 14 15 (NOTCH POSITION)
SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 10/17

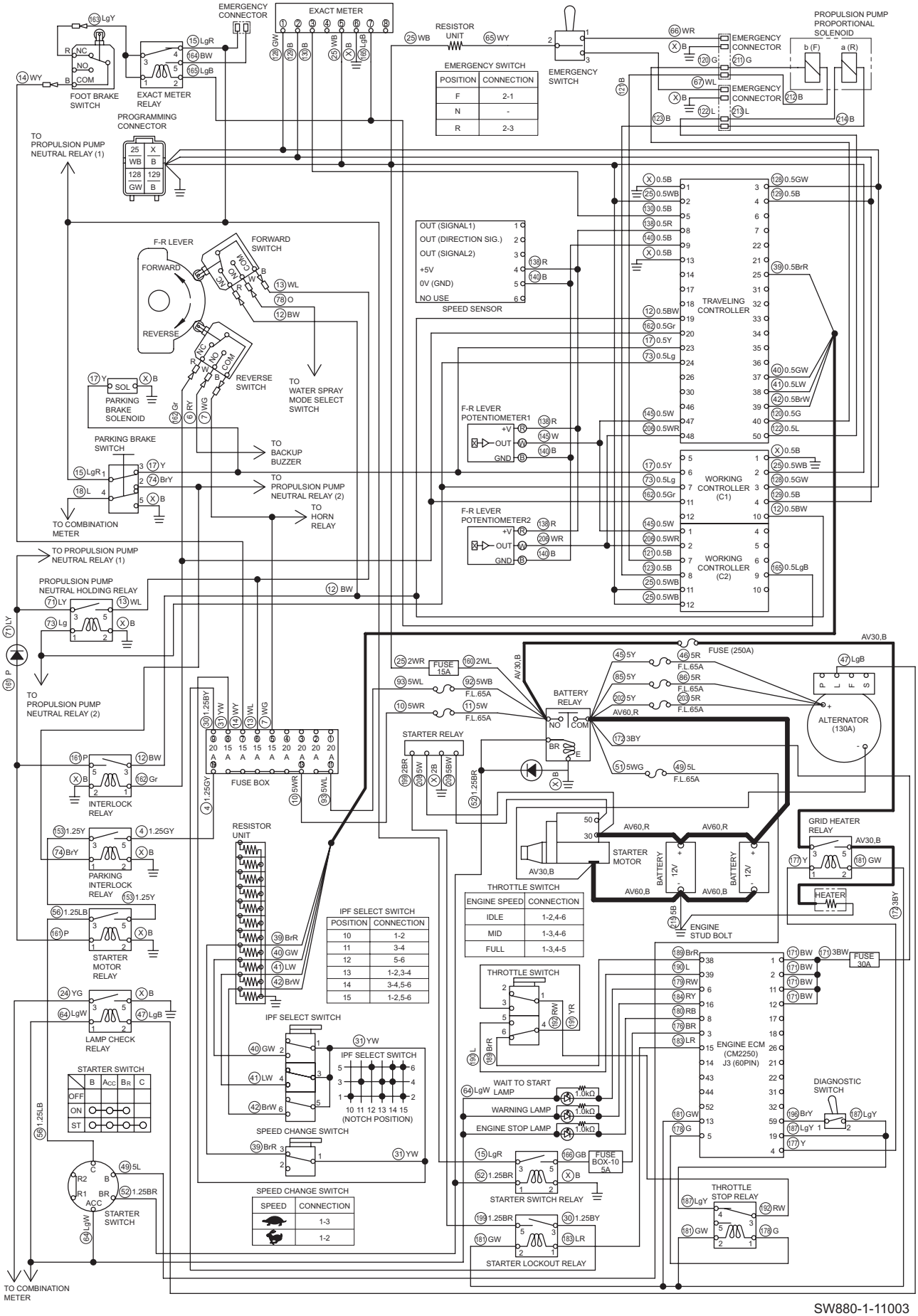
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E43 | 1. Connector | • Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between exact meter and traveling controller terminal wires.<br>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller (C2) terminal 4 wire B<br>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Exact Meter | • When starter switch is ON, measure voltage between exact meter terminal 5 outlet wire WB and ground terminal 6 wire B.<br>Standard voltage : 12 V or more<br>• If voltage is abnormal, exact meter is faulty. | Replace exact meter. |
| | 4. CAN Communication | • 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.<br>• Traveling controller is faulty. | Replace traveling controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-4-1




SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 11/17

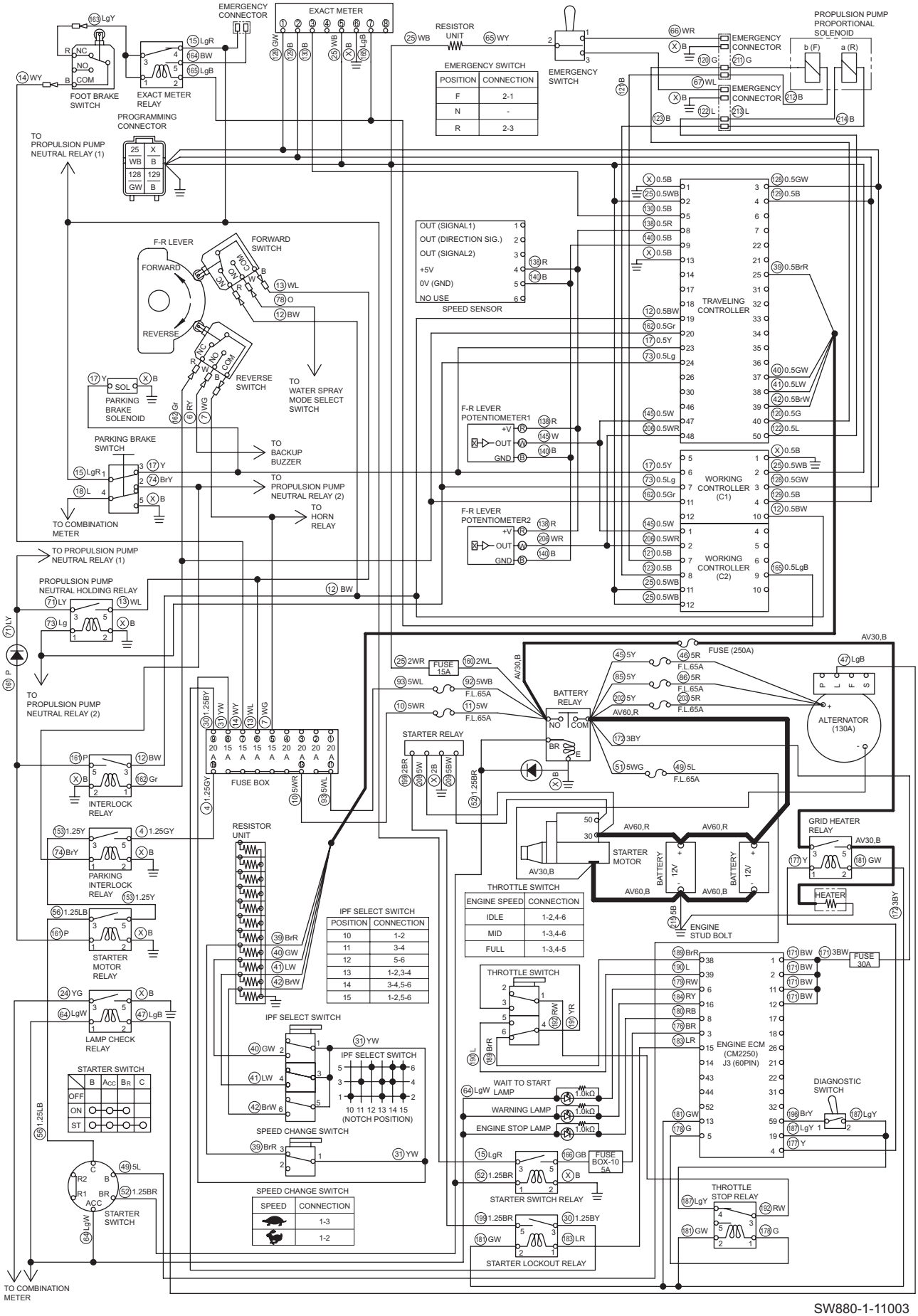
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E44, E45 | 1. Connector | • Check exact meter connector terminal 1, 2, 7 and working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between exact meter and working controller terminal wires.<br>• Exact meter terminal 1 wire GW and working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and working controller (C1) terminal 4 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Working Controller | (1) When starter switch is ON, measure voltage between working controller (C1) power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between working controller (C2) power supply terminal 11, 12 inlet wire WB and working controller (C1) ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON, measure voltage between working controller (C2) terminal 9 inlet wire LgB and working controller (C1) ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>• If above items (1), (2) are OK and (3) is NG, working controller (C1) is faulty. | Replace working controller. |
| | 4. CAN Communication (E44 only) | • 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.<br>• Working controller is faulty. | Replace working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-4-1




SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 12/17

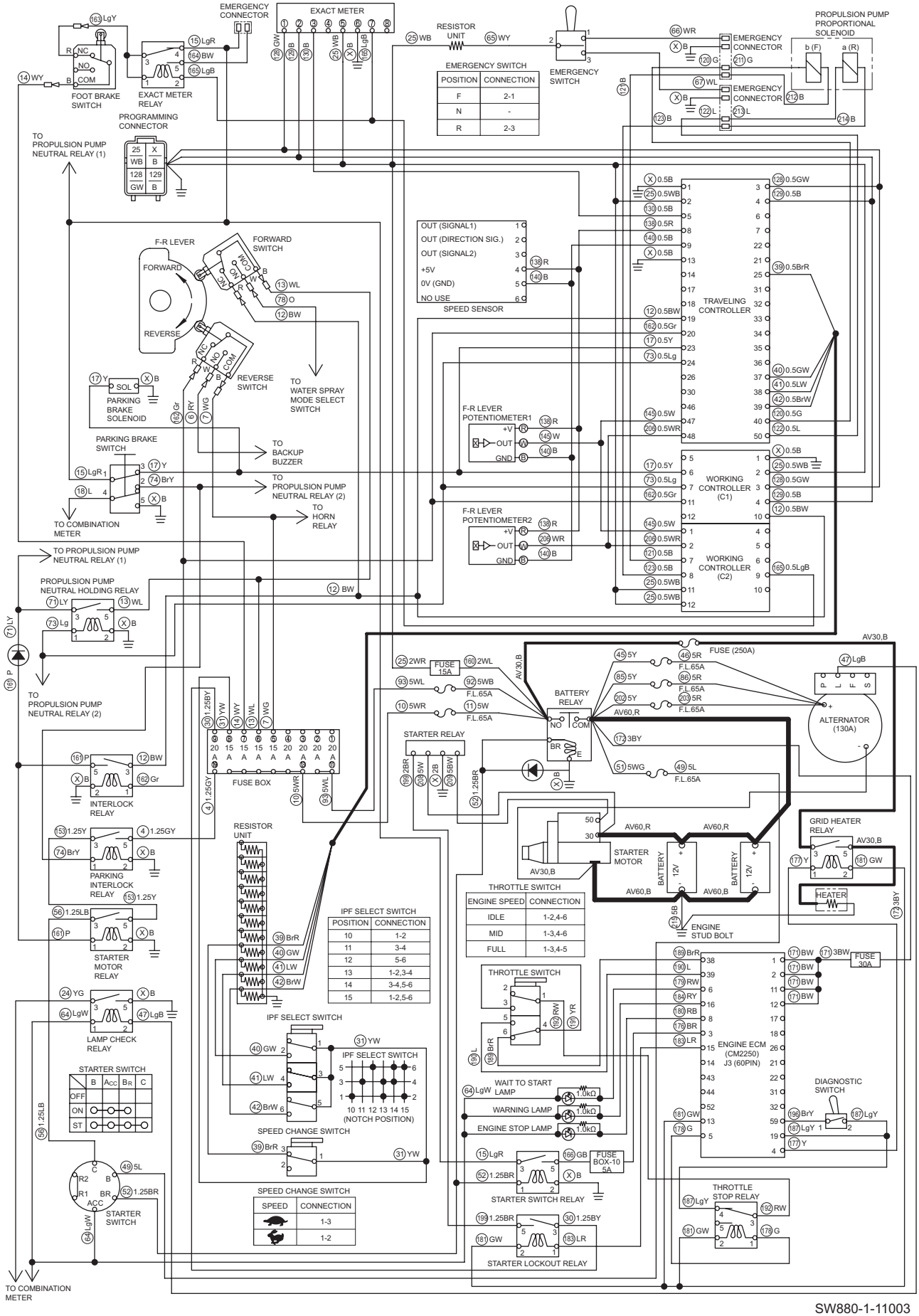
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E61 to E68 | 1. Connector | • Check F-R lever potentiometer 1, 2 connector and traveling controller connector terminal 8, 9, 47, 48, working controller (C2) connector terminal 1, 2 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between F-R lever potentiometer 1, 2 and traveling/working controller terminal wires.<br>• F-R lever potentiometer 1 terminal wire R and traveling controller terminal 8 wire R<br>• F-R lever potentiometer 1 terminal wire W and traveling controller terminal 47 wire W, working controller (C2) terminal 1 wire W<br>• F-R lever potentiometer 1 terminal wire B and traveling controller terminal 9 wire B<br>• F-R lever potentiometer 2 terminal wire R and traveling controller terminal 8 wire R<br>• F-R lever potentiometer 2 terminal WR and traveling controller terminal 48 wire WR, working controller (C2) terminal 2 wire WR<br>• F-R lever potentiometer 2 terminal B wire B and traveling controller terminal 9 wire B<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. F-R Lever Potentiometer 1 | (1) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal inlet wire R and ground terminal outlet wire B.<br>Standard voltage : 5 ± 0.5 V<br>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal outlet wire W and ground terminal wire B.<br>① When F-R lever is “N”<br>Standard voltage : 2.5 ± 0.015 V<br>② When F-R lever is “F”<br>Standard voltage : 1.2 ± 0.02 V<br>③ When F-R lever is “R”<br>Standard voltage : 3.8 ± 0.02 V<br>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 1 adjustment is faulty. | Adjust F-R lever potentiometer 1 or replace it even if measurement is out of standard after adjustment. |
| | 4. F-R Lever Potentiometer 2 | (1) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal inlet wire R and ground terminal outlet wire B.<br>Standard voltage : 5 ± 0.5 V<br>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal outlet wire W and ground terminal wire B.<br>① When F-R lever is “N”<br>Standard voltage : 2.5 ± 0.015 V<br>② When F-R lever is “F”<br>Standard voltage : 3.8 ± 0.02 V<br>③ When F-R lever is “R”<br>Standard voltage : 1.2 ± 0.02 V<br>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 2 adjustment is faulty. | Adjust F-R lever potentiometer 2 or replace it even if measurement is out of standard after adjustment |

# Fig.: 2-4-1




SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 13/17

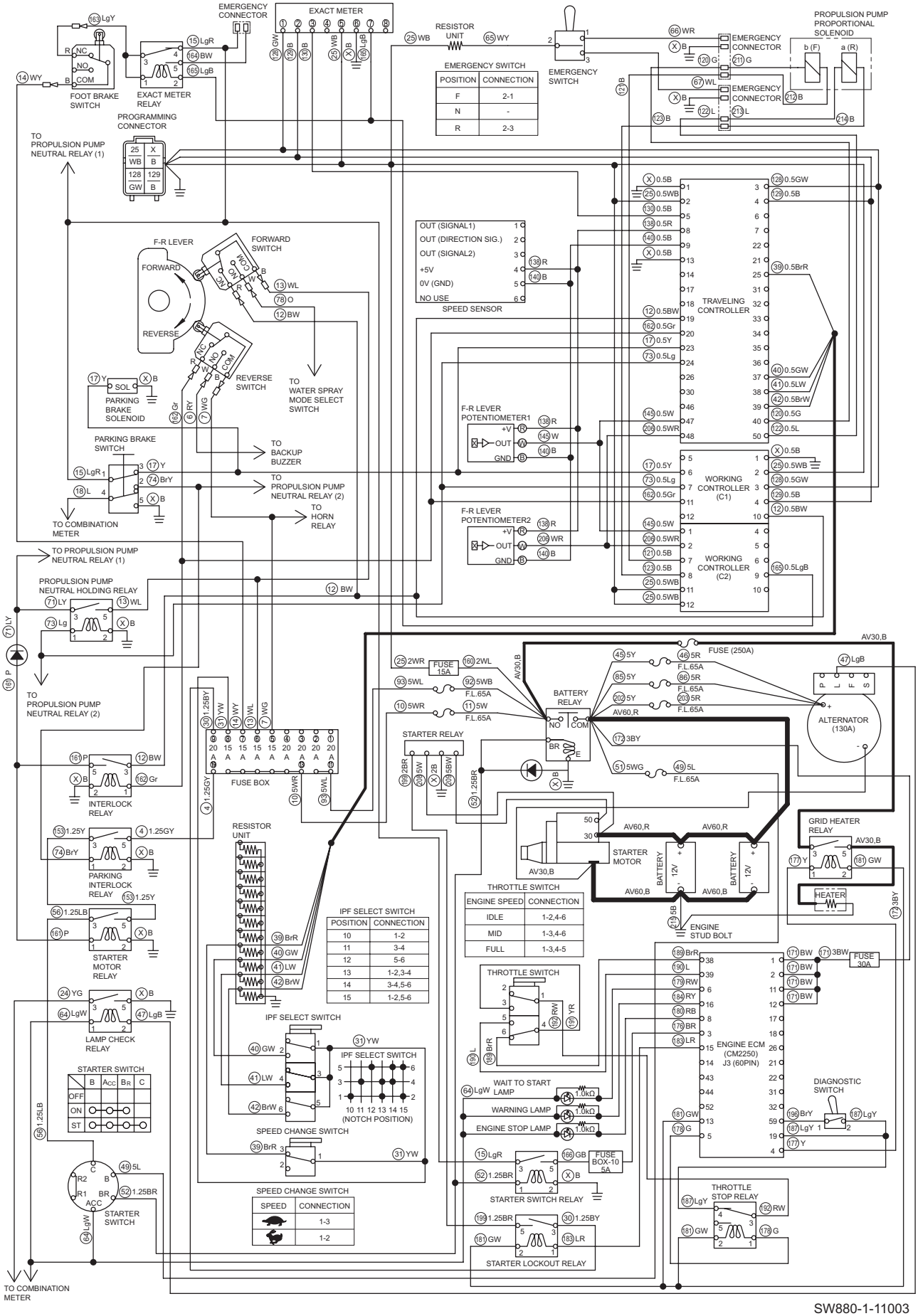
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E61 to E68 | 5. Traveling Controller | (1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between traveling controller terminal 8 outlet wire R (positive side) and 9 wire B (ground side).<br>Standard voltage : 5 ± 0.5 V<br>• If above item (1) is OK and item (2) is NG, 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.<br>② Place F-R lever “N”.<br>③ Exact meter will display vehicle speed (0.0).<br>If E61 to E68 is displayed, check above items again.<br>④ Place F-R lever in full forward or backward position.<br>⑤ Exact meter will still display vehicle speed (0.0).<br>Machine is in normal state.<br>If display changes to E61 to E68, check above items again. | |

# Fig.: 2-4-1




SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 14/17

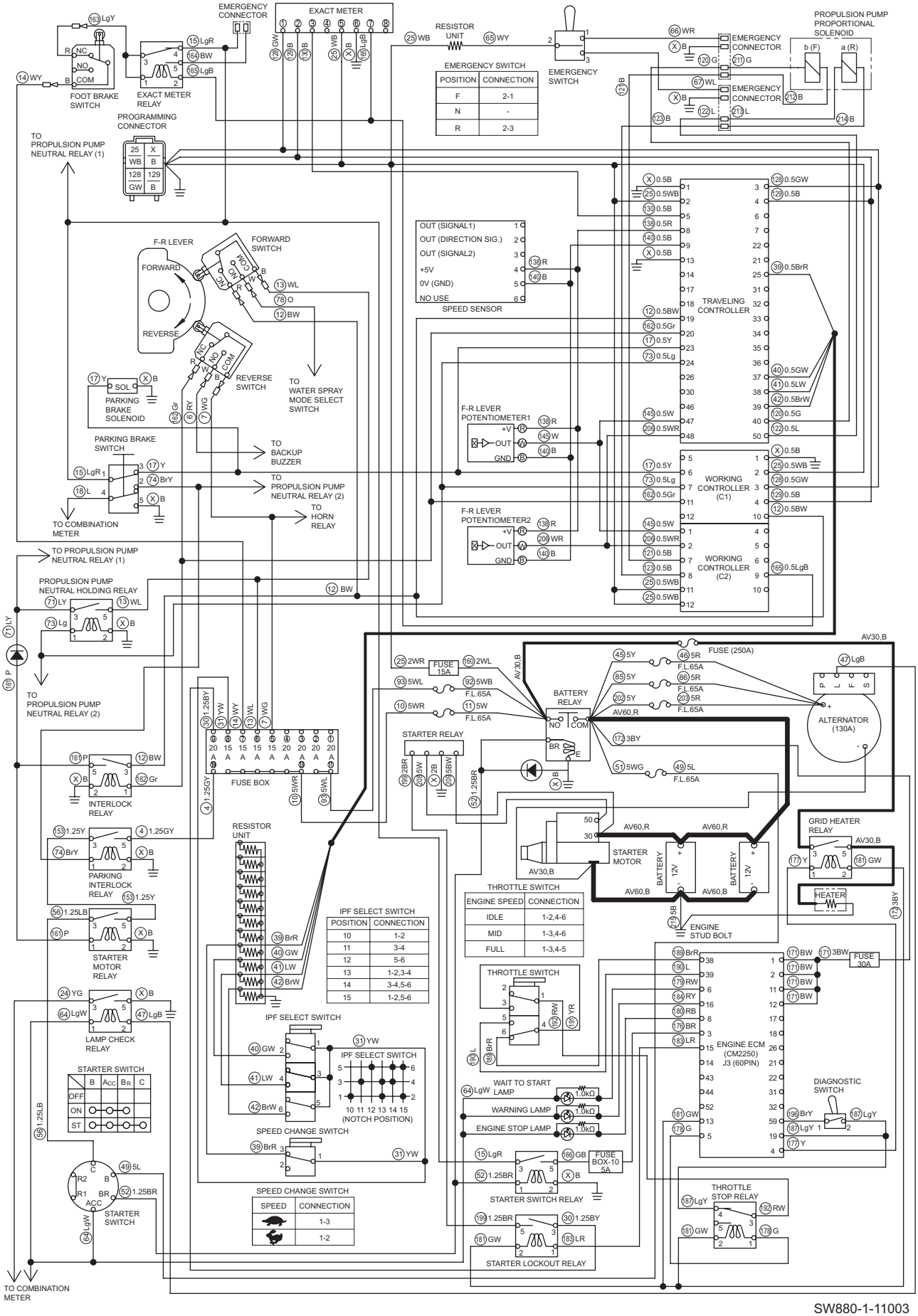
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

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

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Battery | • Measure battery voltage or specific gravity.<br>Standard voltage : 12 V or more<br>Standard gravity : 1.26 or more<br>• If value is below standard, battery capacity is insufficient. | Charge or replace battery. |
| 2. Starter Switch | • Check continuity between O-O according to starter switch connection table.<br>Switch is OK if there is continuity between connection O-O.<br>• If there is no continuity, starter switch is faulty. | Replace starter switch. |
| 3. Starter Motor | (1) When starter switch is ON, measure voltage between starter motor terminal 30 and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is START, measure voltage between starter motor terminal 50 and chassis ground.<br>Standard voltage : 12 V or more<br>• If starter motor does not run even though above items (1) and (2) are OK, starter motor is faulty. | Replace starter motor. |
| 4. Battery Relay | (1) When starter switch is OFF, measure voltage between battery relay primary terminal COM and chassis ground.<br>Standard resistance : 12 V or more<br>(2) When starter switch is ON, measure voltage between battery relay coil terminal BR inlet wire BR and coil ground terminal E.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON, measure voltage between battery relay secondary terminal NO and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, battery relay is faulty. | Replace battery relay. |
| 5. Starter Relay | (1) When starter switch is START, measure voltage between starter relay terminal inlet wire BR and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between starter relay terminal inlet wire W and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is START, measure voltage between starter relay terminal outlet wire BW and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, starter relay is faulty. | Replace starter relay. |

# Fig.: 2-4-1




SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 15/17

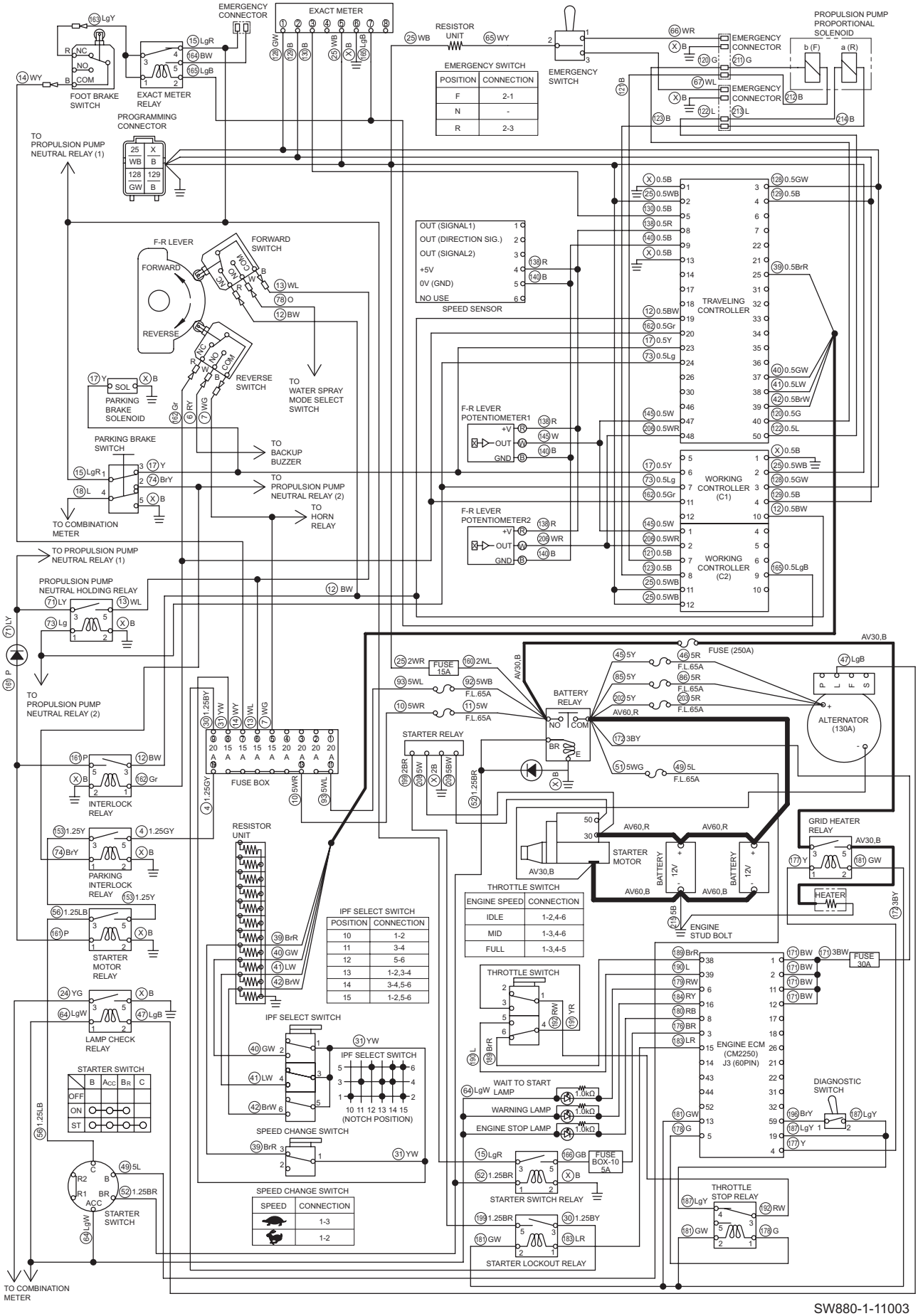
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

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

| Check point | Check/Cause | Action |
|---|---|---|
| 6. Forward Switch | (1) When starter switch is ON, measure voltage between forward switch terminal COM inlet wire WL and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between forward switch terminal NC outlet wire BW and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, forward switch is faulty. | Replace forward switch. |
| 7. Reverse Switch | (1) When starter switch is ON, measure voltage between reverse switch terminal COM inlet wire WG and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between reverse switch terminal NC outlet wire Gr and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, reverse switch is faulty. | Replace reverse switch. |
| 8. Interlock Relay | (1) When starter switch is ON, measure voltage between interlock relay terminal 1 inlet wire Gr and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between interlock relay terminal 3 inlet wire BW and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON, measure voltage between interlock relay terminal 5 outlet wire P and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, interlock relay is faulty. | Replace interlock relay. |
| 9. Starter Motor Relay | (1) When starter switch is ON, measure voltage between starter motor relay terminal 1 inlet wire P and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is START, measure voltage between Starter motor relay terminal 3 inlet wire LB and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is START, measure voltage between starter motor relay terminal 5 outlet wire Y and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, starter motor relay is faulty. | Replace starter motor relay. |

# Fig.: 2-4-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| THROTTLE SWITCH | |
|---|---|
| ENGINE SPEED | CONNECTION |
| IDLE | 1-2,4-6 |
| MID | 1-3,4-6 |
| FULL | 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 | |
|---|---|
| SPEED | CONNECTION |
| | 1-3 |
| | 1-2 |

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## 2-4-1. Engine will not start (Starter motor does not run) 16/17

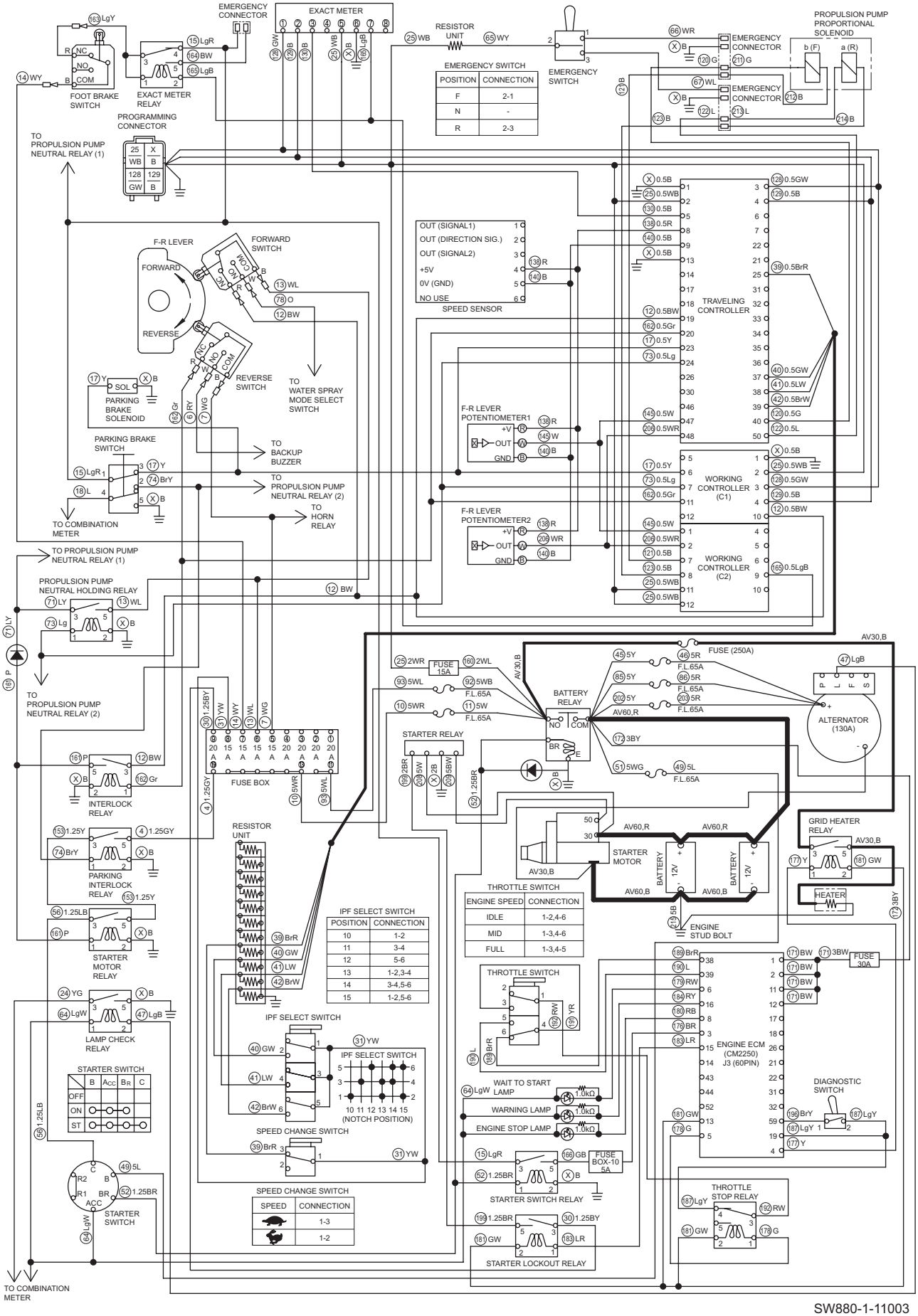
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

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

| Check point | Check/Cause | Action |
|---|---|---|
| 10. Foot Brake Switch | (1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire WY and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between foot brake switch terminal NC outlet wire LgY and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, forward switch is faulty. | Replace foot brake switch. |
| 11. Exact Meter Relay | (1) When starter switch is ON, measure voltage between exact meter relay terminal 1, 3 inlet wire LgY and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage of coil between exact meter relay terminal 1 and terminal 2.<br>There is no electricity in normal condition.<br>(3) When starter switch is ON, measure voltage between exact meter relay terminal 4 outlet wire LgR and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, exact meter relay is faulty. | Replace exact meter relay. |
| 12. Parking Brake Switch | (1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire LgR and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between parking brake switch terminal 2 outlet wire BrY and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, parking brake switch is faulty. | Replace parking brake switch. |
| 13. Parking Interlock Relay | (1) When starter switch is ON, measure voltage between parking interlock relay terminal 1 inlet wire BrY and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is START, measure voltage between parking interlock relay terminal 3 inlet wire Y and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is START, measure voltage between parking interlock relay terminal 5 outlet wire GY and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, parking interlock relay is faulty. | Replace parking interlock relay. |

# Fig.: 2-4-1




SW880-1-11003

## 2-4-1. Engine will not start (Starter motor does not run) 17/17

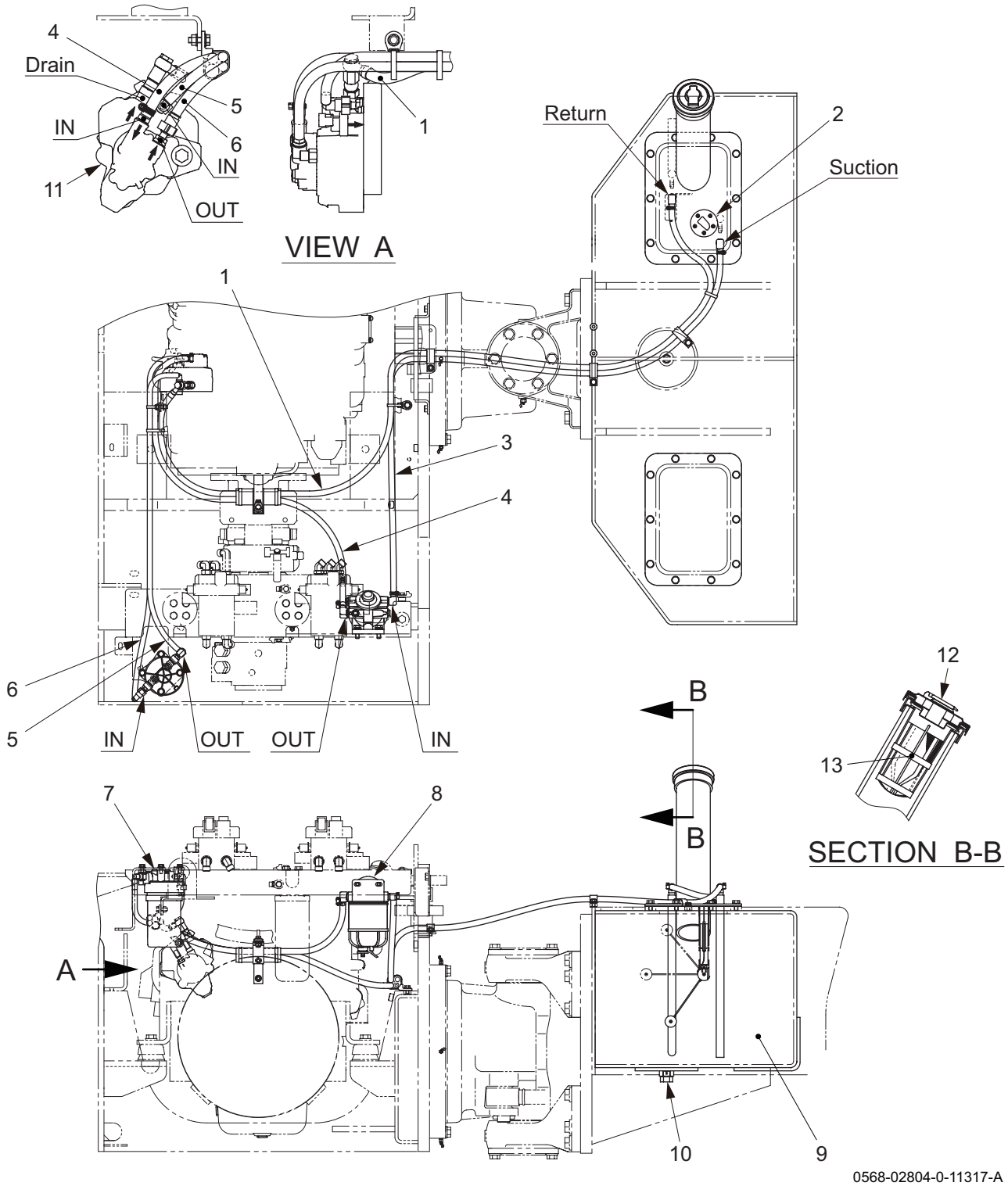
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

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

| Check point | Check/Cause | Action |
|---|---|---|
| 14. Starter Lockout Relay | (1) When starter switch is ON, measure voltage between starter lockout relay terminal 1 inlet wire LR and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is START, measure voltage between starter lockout relay terminal 3 inlet wire BY and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is START, measure voltage between starter lockout relay terminal 5 outlet wire BR and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, starter lockout relay is faulty. | Replace starter switch relay. |
| 15. Starter Switch Relay | (1) When starter switch is ON, measure voltage between starter switch relay terminal 1 inlet wire BR and chassis ground.<br>Standard resistance : 12 V or more<br>(2) When starter switch is ON, measure voltage between starter switch relay terminal 3 inlet wire LgR and chassis ground.<br>Standard resistance : 12 V or more<br>(3) When starter switch is ON, measure voltage between starter switch relay terminal 5 outlet wire GB and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, starter switch relay is faulty. | Replace starter switch relay. |
| 16. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

## Fig.: 2-4-2




(1) Hose (Fuel gear pump drain → Fuel tank return)
(2) Fuel unit
(3) Hose (Fuel tank suction → Fuel pre-filter IN)
(4) Hose (Fuel pre-filter OUT → Fuel gear pump IN)
(5) Hose (Fuel filter OUT → Fuel gear pump IN)
(6) Hose (Fuel gear pump OUT → Fuel filter IN)
(7) Fuel filter
(8) Fuel pre-filter
(9) Fuel tank
(10) Plug
(11) Fuel gear pump
(12) Cap
(13) Filter

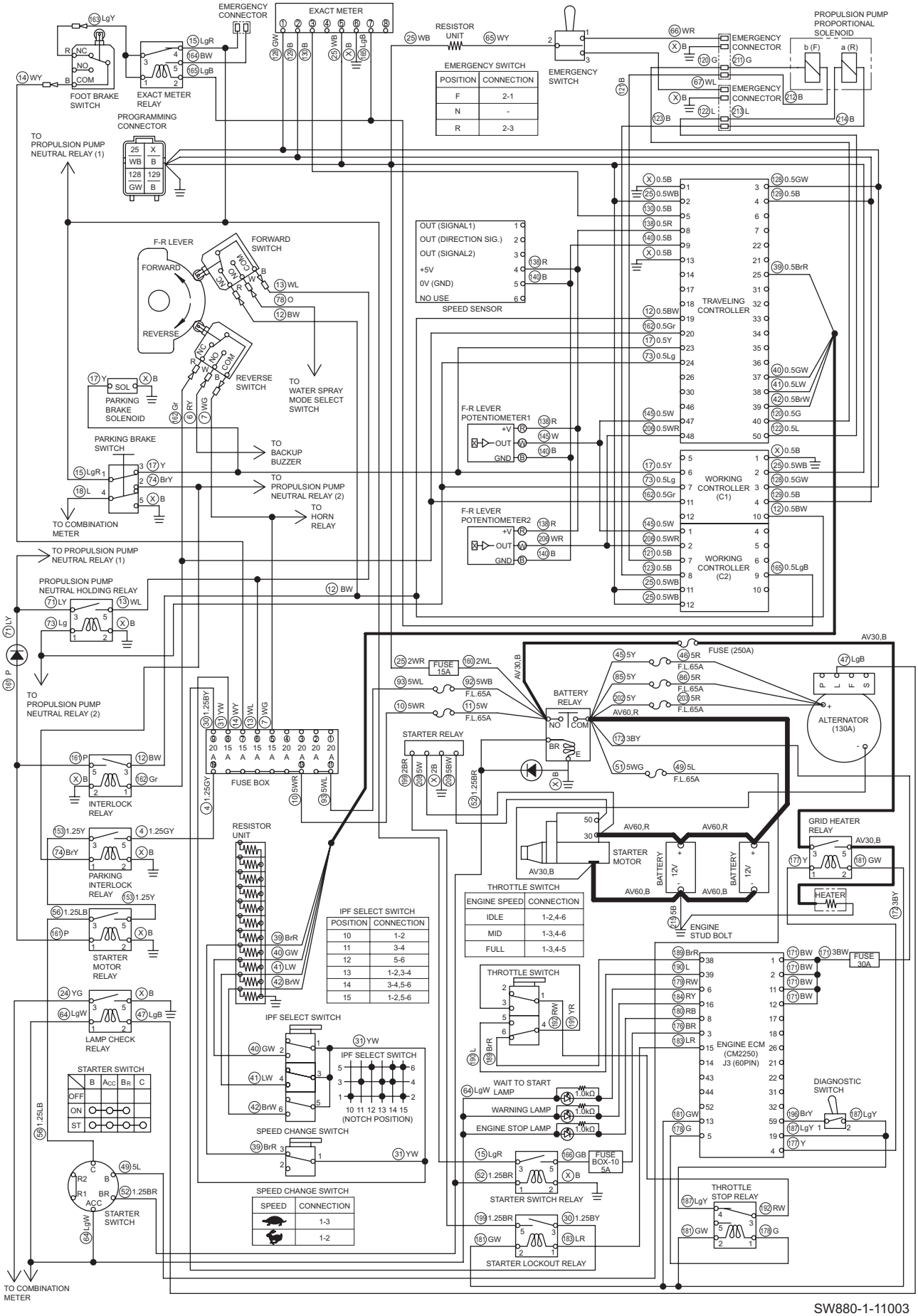
## 2-4-2. Engine will not start (But starter motor runs)

- In case of engine will not start while starter motor runs, generally trouble is caused by that fuel is not supplied, supply amount of fuel is extremely low, or selection of fuel is not appropriate.
- Check that fuel is supplied to inlet of fuel gear pump.

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

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Fuel Tank | • Check that fuel tank is filled with diesel oil.<br>• If quantity is low, fuel is not delivered to fuel system. | Fill tank with fuel. |
| | • Check that there is no water has entered fuel tank.<br>• If water has entered tank, engine does not start. | Drain water from tank. |
| | • Check that quality of diesel oil is sufficient.<br>• If oil does not meet standard, engine may fail. | Replace fuel in tank with an appropriate one. |
| 2. Water/ Fuel Pre-Filter/ Fuel Filter (Pressure Side) | • Check that water does not cover water-in-fuel (WIF) sensor in contaminant collection bowl.<br>• If water covers the sensor, engine may not start. | Drain water. |
| | • Check filter for clogging.<br>• Insufficient supply of proper fuel due to clogging of filter.<br><br>**(NOTICE)**<br>**• Air bleeding should be performed whenever filter is replaced.** | • Replace filter.<br>• Bleed filter. |
| 3. Fuel Gear Pump | • Disconnect hose connecting to fuel gear pump and check that fuel flows out of pump.<br>• If fuel does not flow out of pump, it is not delivered to fuel system.<br><br>**(NOTICE)**<br>**• Air bleeding should be performed whenever fuel gear pump is replaced.** | • Replace fuel gear pump.<br>• Bleed pump. |
| 4. Hoses Connecting Between Parts | • Check hoses for fuel leakage and clogging.<br>• Hose failure due to deterioration.<br><br>**(NOTICE)**<br>**• Air bleeding should be performed whenever fuel hose is replaced.** | Replace hose. |

# Fig.: 2-4-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| THROTTLE SWITCH | |
|---|---|
| ENGINE SPEED | CONNECTION |
| IDLE | 1-2,4-6 |
| MID | 1-3,4-6 |
| FULL | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| | 1-3 |
| | 1-2 |

## 2-4-3. No charging

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

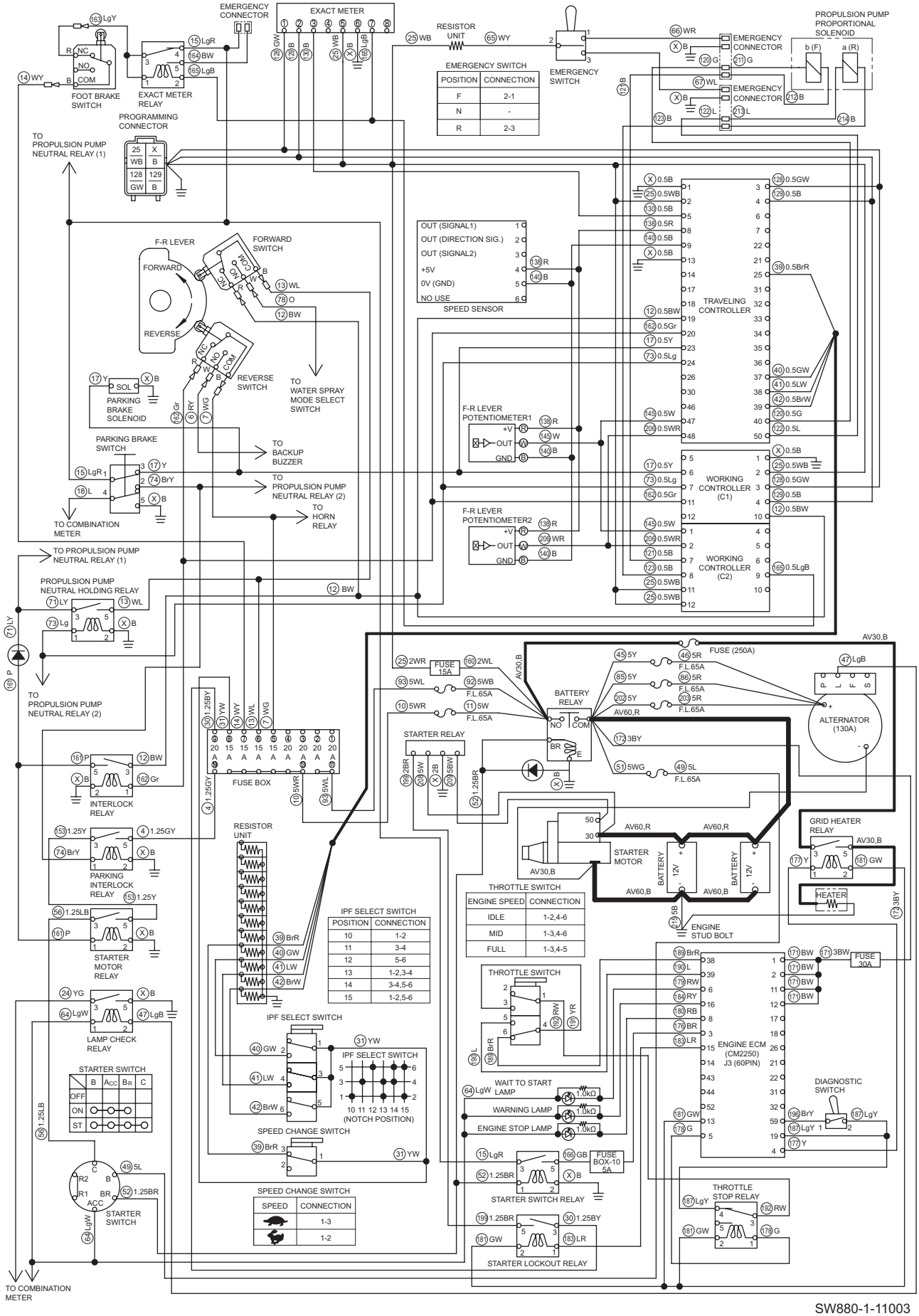
| Check point | Check/Cause | Action |
|---|---|---|
| 1. Alternator | • After starting engine, measure voltage between alternator terminal + wire R and chassis ground.<br>Standard voltage : At least intermediate engine speed, 14 V or more<br>• If voltage is lower than standard, alternator is faulty.<br>• If voltage is normal and battery is not charged, battery is faulty. | Replace alternator or battery. |

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

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

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Grid Heater | • When starter switch is ON, measure voltage between grid heater inlet wire B and chassis ground.<br>Standard voltage : 12 V or more<br>• If voltage is normal, grid heater is faulty. | Replace grid heater. |
| 2. Grid Heater Relay | (1) When starter switch is ON, measure voltage between grid heater relay terminal 1 inlet wire GW and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between grid heater relay terminal 3 inlet wire B and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON, measure voltage between grid heater relay terminal 5 outlet wire B and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, grid heater relay is faulty. | Replace grid heater relay. |
| 3. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty.<br><br>**(NOTICE)**<br>**• If any abnormality is found in shielded twisted wires, repair is not approved. Be sure to replace them.** | Repair or replace harness. |

# Fig.: 2-4-1

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## 2-4-5. Starter motor runs even when F-R lever is not at “N” and parking brake is not applied

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

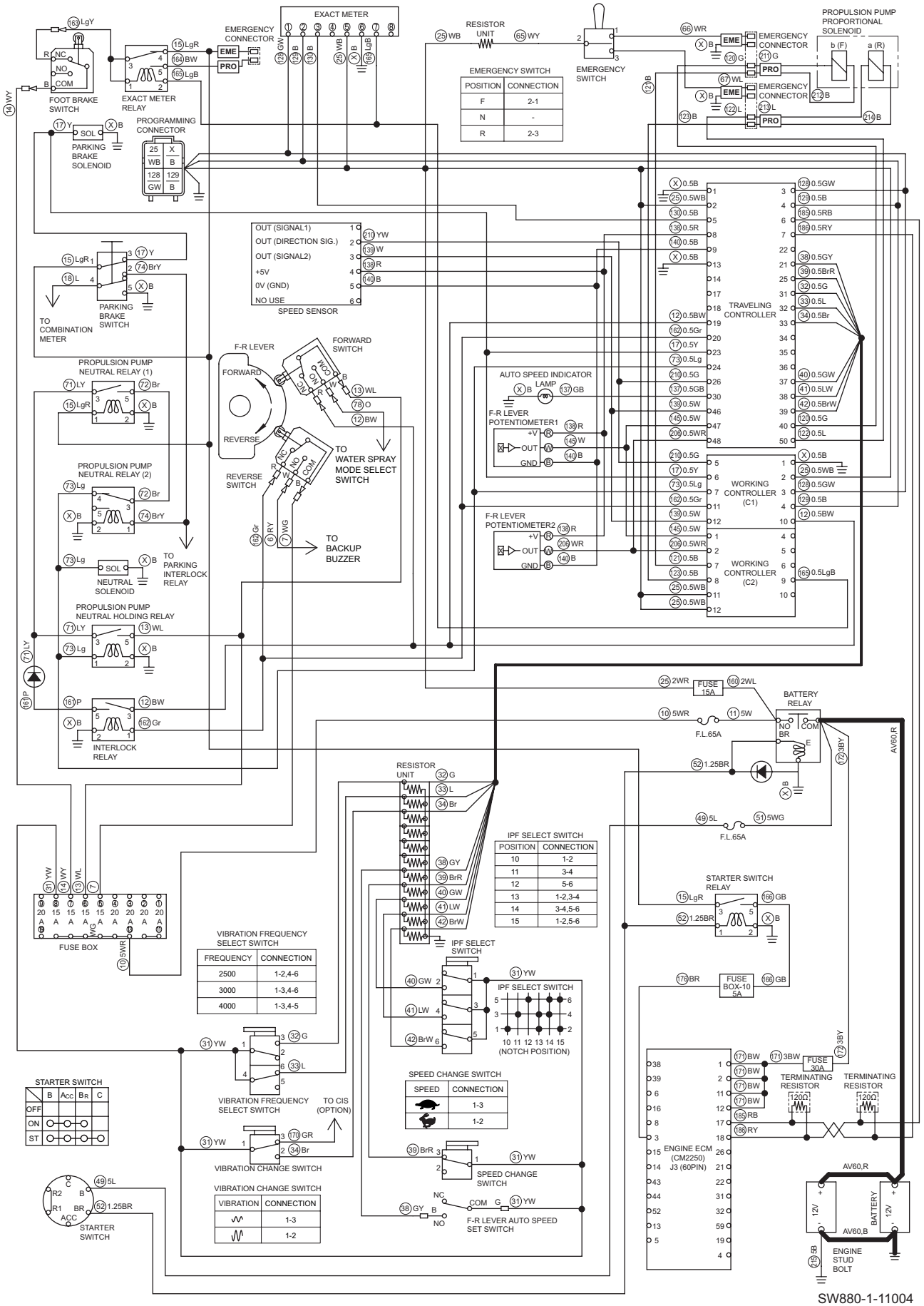
| Check point | Check/Cause | Action |
|---|---|---|
| 1. Forward Switch | • When starter switch is OFF and F-R lever is “F”, check continuity between forward switch terminal COM and terminal NC.<br>There is no continuity in normal condition.<br>• If there is continuity, forward switch is faulty. | Replace forward switch. |
| 2. Reverse Switch | • When starter switch is OFF and F-R lever is “R”, check continuity between reverse switch terminal COM and terminal NC.<br>There is no continuity in normal condition.<br>• If there is continuity, reverse switch is faulty. | Replace reverse switch. |
| 3. Parking Brake Switch | • When starter switch is OFF and parking brake switch is released position, check continuity between parking brake switch terminal 1 and 2.<br>There is no continuity in normal condition.<br>• If there is continuity, parking brake switch is faulty. | Replace parking brake switch. |

## 2-4-6. Engine speed cannot be switched

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

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Throttle Switch | (1) When throttle switch is “IDLE”, check continuity between throttle switch terminals 1 and 2, 4 and 6.<br>There is continuity in normal condition.<br>(2) When throttle switch is “MID”, check continuity between throttle switch terminals 1 and 3, 4 and 6.<br>There is continuity in normal condition.<br>(3) When throttle switch is “FULL”, check continuity between throttle switch terminals 1 and 3, 4 and 5.<br>There is continuity in normal condition.<br>• If above item (1), (2) or (3) is NG, throttle switch is faulty. | Replace throttle switch. |
| 2. Throttle Stop Relay | (1) When starter switch is ON, measure voltage between throttle stop relay terminal 1 inlet wire G and terminal 2 outlet wire GW.<br>There is no electricity in normal condition.<br>(2) When starter switch is ON, check continuity between throttle stop relay terminal 3 and terminal 4<br>There is continuity in normal condition.<br>• If above item (1) is OK and item (2) is NG, throttle stop relay is faulty. | Replace throttle stop relay. |
| 3. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | | | ○ |

# 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 1/11

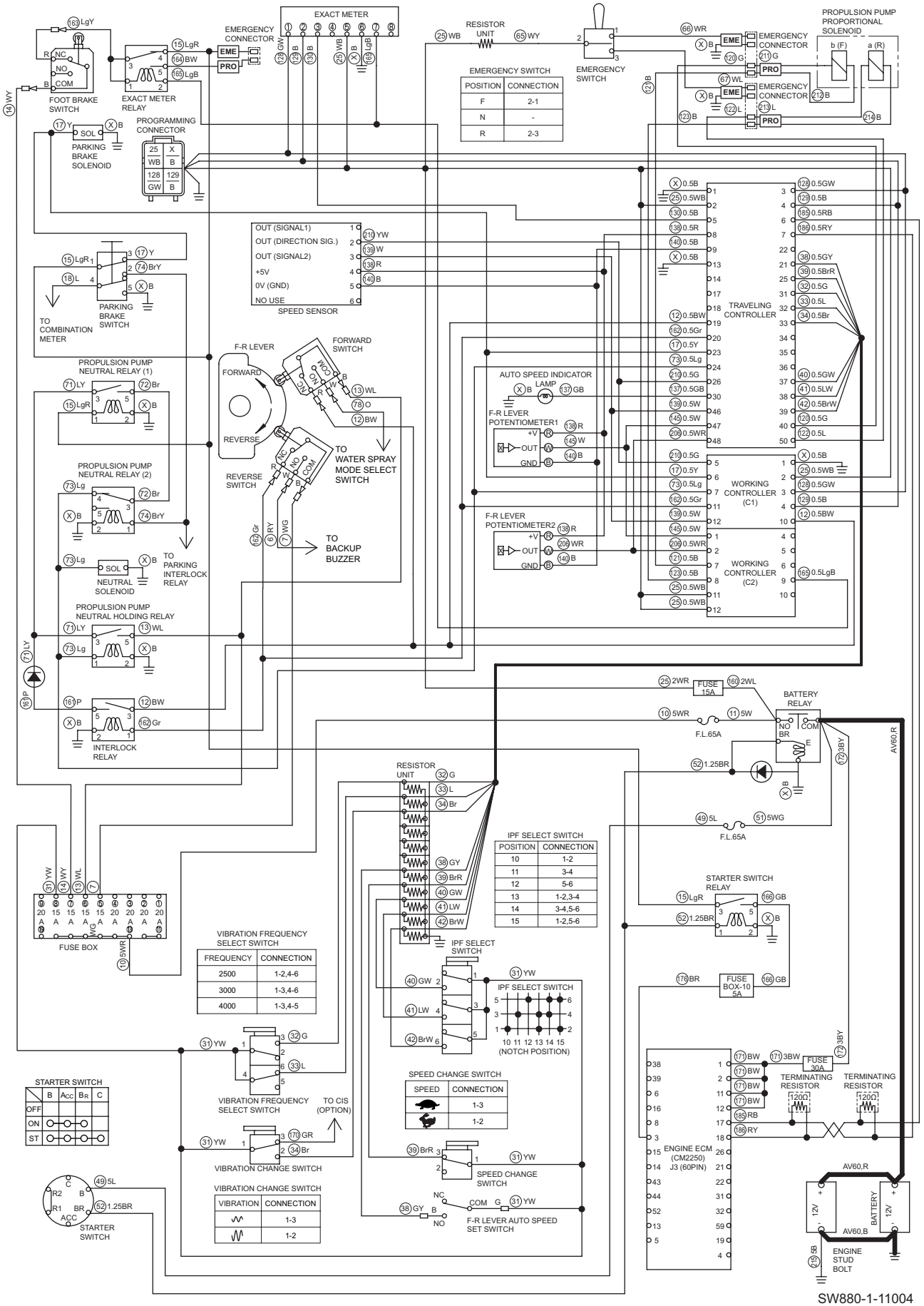
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E01 or E02 | 1. Connector | • Check F-R lever potentiometer 1, 2 connector and traveling controller connector terminal 8, 9, 47, 48, working controller (C2) connector terminal 1, 2 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between F-R lever potentiometer and traveling controller terminal wires.<br>• F-R lever potentiometer 1 terminal wire R and traveling controller terminal 8 wire R<br>• F-R lever potentiometer 1 terminal wire W and traveling controller terminal 47 wire W, working controller (C2) terminal 1 wire W<br>• F-R lever potentiometer 1 terminal wire B and traveling controller terminal 9 wire B<br>• F-R lever potentiometer 2 terminal wire R and traveling controller terminal 8 wire R<br>• F-R lever potentiometer 2 terminal wire WR and traveling controller terminal 48 wire WR, working controller (C2) terminal 2 wire WR<br>• F-R lever potentiometer 2 terminal wire B and traveling controller terminal 9 wire B<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. F-R Lever Potentiometer 1 | (1) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal inlet wire R and ground terminal 1 wire B.<br>Standard voltage : 5 ± 0.5 V<br>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal outlet wire W and ground terminal 1 wire B.<br>① When F-R lever is “N”<br>Standard voltage : 2.5 ± 0.015 V<br>② When F-R lever is “F”<br>Standard voltage : 1.2 ± 0.02 V<br>③ When F-R lever is “R”<br>Standard voltage : 3.8 ± 0.02 V<br>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 1 adjustment is faulty. | Adjust F-R lever potentiometer 1 or replace it even if measurement is out of standard after adjustment. |

# Fig.: 2-5-1




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

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| | 1-3 |
| | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| | 1-3 |
| | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | | | ○ |

## 2-5-1. Machine and engine suddenly stops 2/11

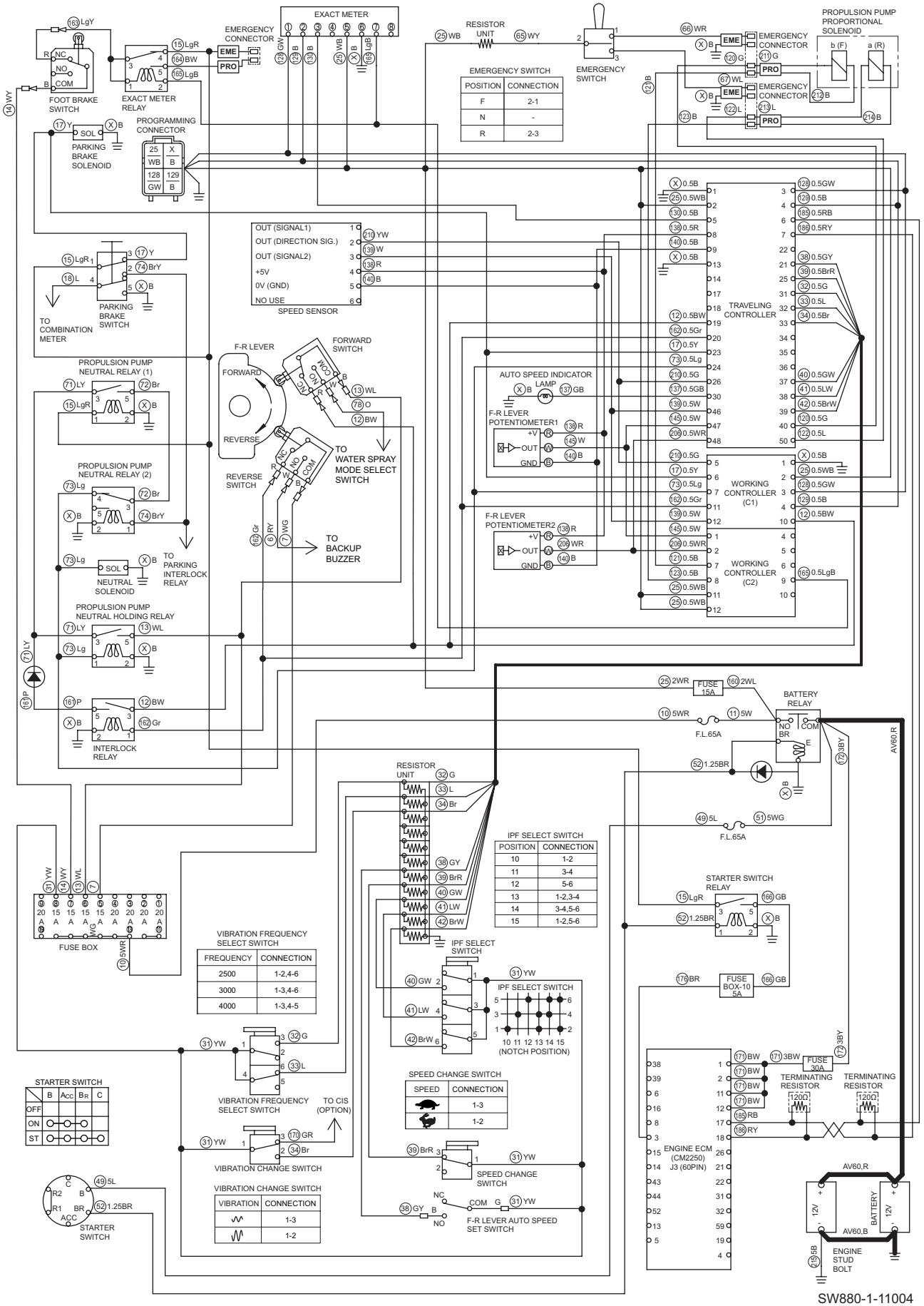
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

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

# Fig.: 2-5-1




SW880-1-11004

## 2-5-1. Machine and engine suddenly stops 3/11

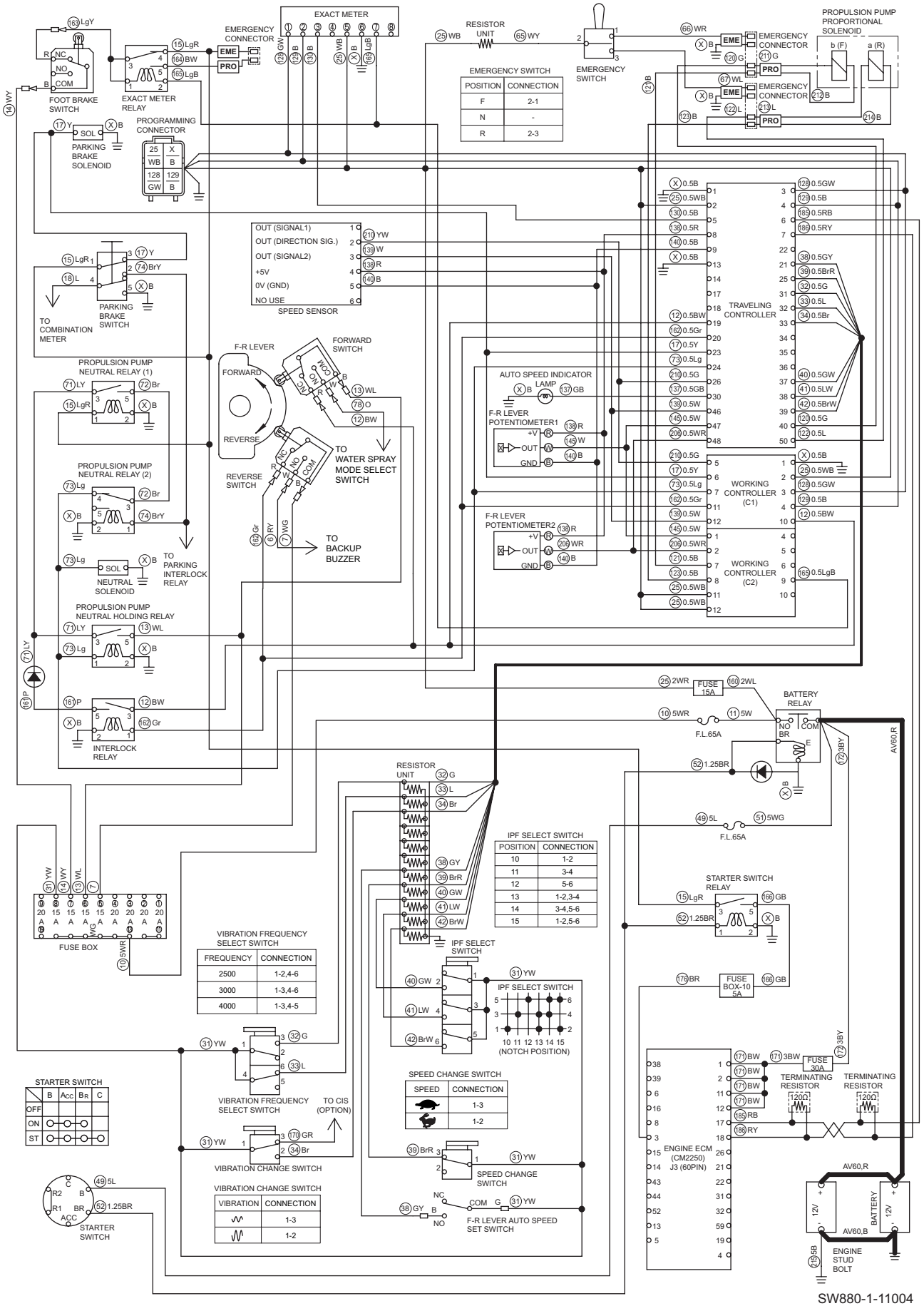
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E03 or E04 | 1. Connector | • Check forward switch connector and traveling controller connector terminal 19, working controller (C1) connector terminal 10 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistance between forward switch connector terminal NC wire BW and traveling controller connector terminal 19 wire BW, working controller (C1) connector terminal 10 wire BW.<br>Standard resistance : 10 Ω or less<br>(2) Measure resistance between forward switch connector terminal COM wire WL and fuse box terminal 6 wire WL.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Forward Switch | (1) When starter switch is OFF and F-R lever is “N”, check continuity between forward switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>(2) When starter switch is OFF and F-R lever is “F”, check continuity between forward switch terminal COM and terminal NC.<br>There is no continuity in normal condition.<br>• If above item (1) or (2) is NG, forward switch is faulty. | Replace forward switch. |
| | 4. Traveling/ Working Controller | • 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. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Exact meter will display E03 or E04.<br>When E03 is displayed:<br>③ Move F-R lever in “F”.<br>Exact meter display will change from E03 to vehicle speed (0.0).<br>If display does not change to vehicle speed, check above items again.<br>④ Return F-R lever to “N”.<br>Machine is in normal state.<br>When E04 is displayed:<br>③ Place F-R lever “N”.<br>Exact meter display will change from E04 to vehicle speed (0.0). Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| | 1-3 |
| | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| | 1-3 |
| | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | | ○ | ○ |

SW880-1-11004

## 2-5-1. Machine and engine suddenly stops 4/11

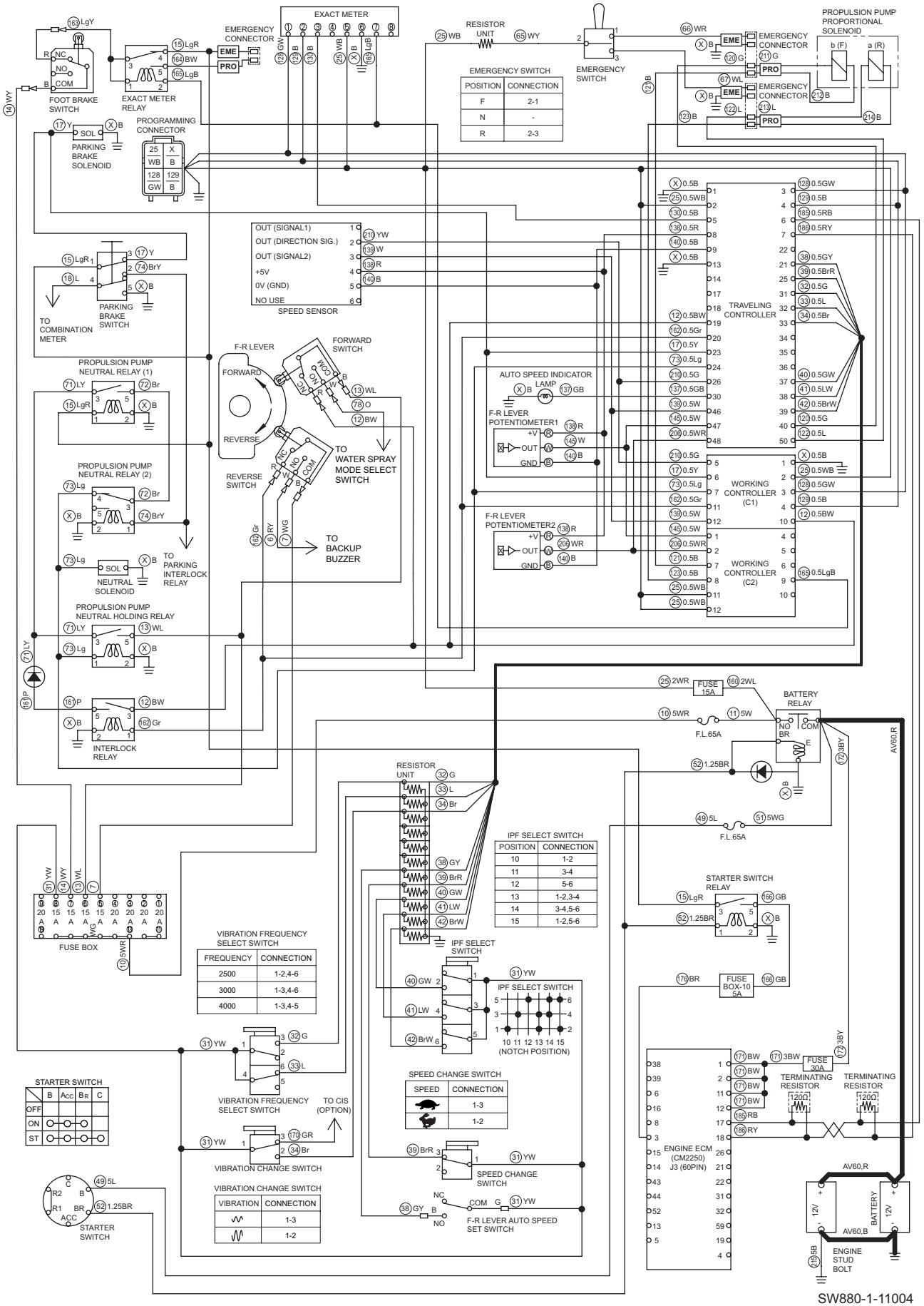
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E05 or E06 | 1. Connector | • Check reverse switch connector and traveling controller connector terminal 20, working controller (C1) connector terminal 11 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistance between reverse switch terminal NC wire Gr and traveling controller connector terminal 20 wire Gr.<br>Standard resistance : 10 Ω or less<br>(2) Measure resistance between reverse switch terminal COM wire WG and fuse box terminal 5 wire WG.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Reverse Switch | (1) When starter switch is OFF and F-R lever is “N”, check continuity between reverse switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>(2) When starter switch is OFF and F-R lever is “R”, check continuity between reverse switch terminal COM and terminal NC.<br>There is no continuity in normal condition.<br>• If above item (1) or (2) is NG, reverse switch is faulty. | Replace reverse switch. |
| | 4. Traveling/ Working Controller | • If error code E05 or E06 is displayed and no abnormality is found in connector, harness and reverse switch in above inspection, traveling/working controller is faulty. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Exact meter will display E05 or E06.<br>When E05 is displayed:<br>③ Place F-R lever “N”.<br>Exact meter display will change from E05 to vehicle speed (0.0). Machine is in normal state.<br>If display does not change to vehicle speed, check above items again.<br>When E06 is displayed:<br>③ Move F-R lever in “R”.<br>Exact meter display will change from E06 to vehicle speed (0.0).<br>If display does not change to vehicle speed, check above items again.<br>④ Return F-R lever to “N”. Machine is in normal state. | |

# Fig.: 2-5-1


EXACT METER
EMERGENCY CONNECTOR
EME
PRO
RESISTOR UNIT
EMERGENCY SWITCH
POSITION | CONNECTION
F | 2-1
N | -
R | 2-3
PROPULSION PUMP PROPORTIONAL SOLENOID
b (F)
a (R)
FOOT BRAKE SWITCH
EXACT METER RELAY
PROGRAMMING CONNECTOR
PARKING BRAKE SOLENOID
SPEED SENSOR
OUT (SIGNAL1)
OUT (DIRECTION SIG.)
OUT (SIGNAL2)
+5V
0V (GND)
NO USE
PARKING BRAKE SWITCH
TO COMBINATION METER
F-R LEVER
FORWARD
REVERSE
FORWARD SWITCH
REVERSE SWITCH
TO WATER SPRAY MODE SELECT SWITCH
TO BACKUP BUZZER
PROPULSION PUMP NEUTRAL RELAY (1)
PROPULSION PUMP NEUTRAL RELAY (2)
NEUTRAL SOLENOID
TO PARKING INTERLOCK RELAY
PROPULSION PUMP NEUTRAL HOLDING RELAY
INTERLOCK RELAY
AUTO SPEED INDICATOR
LAMP
F-R LEVER POTENTIOMETER1
F-R LEVER POTENTIOMETER2
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
FUSE 15A
BATTERY RELAY
F.L.65A
F.L.65A
STARTER SWITCH RELAY
FUSE BOX-10 5A
FUSE 30A
TERMINATING RESISTOR
TERMINATING RESISTOR
120Ω
120Ω
RESISTOR UNIT
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
IPF SELECT SWITCH
10 11 12 13 14 15
(NOTCH POSITION)
IPF SELECT SWITCH
VIBRATION FREQUENCY SELECT SWITCH
FREQUENCY | CONNECTION
2500 | 1-2,4-6
3000 | 1-3,4-6
4000 | 1-3,4-5
VIBRATION FREQUENCY SELECT SWITCH
TO CIS (OPTION)
VIBRATION CHANGE SWITCH
VIBRATION CHANGE SWITCH
VIBRATION | CONNECTION
1-3
1-2
SPEED CHANGE SWITCH
SPEED | CONNECTION
1-3
1-2
SPEED CHANGE SWITCH
F-R LEVER AUTO SPEED SET SWITCH
STARTER SWITCH
B | Acc | BR | C
OFF
ON
ST
STARTER SWITCH
ENGINE ECM (CM2250) J3 (60PIN)
BATTERY
ENGINE STUD BOLT
FUSE BOX
SW880-1-11004

## 2-5-1. Machine and engine suddenly stops 5/11

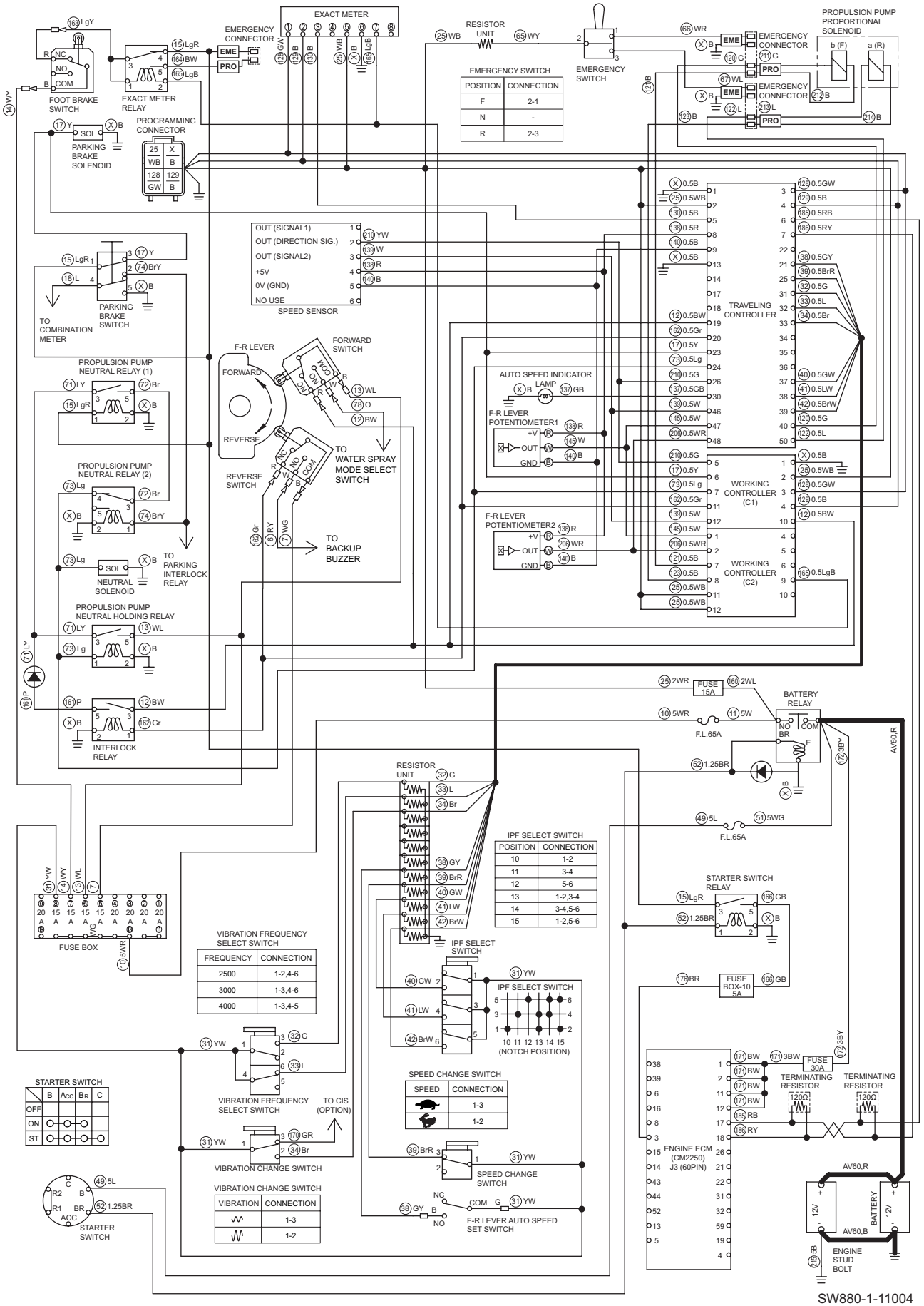
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E31 or E32 | 1. Connector | • Check propulsion pump proportional solenoid connector and traveling controller connector terminal 40, 50, working controller (C2) connector terminal 7, 8 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between propulsion pump proportional solenoid and traveling controller terminal wires.<br>• Propulsion pump proportional solenoid b wire G and traveling controller terminal 40 wire G<br>• Propulsion pump proportional solenoid a wire L and traveling controller terminal 50 wire L<br>• Propulsion pump proportional solenoid a, b wire B and working controller (C2) terminal 7 and 8 wires B<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty.<br><br>• Disconnect connectors and check continuity between propulsion pump proportional solenoid terminal wires.<br>• Terminal wire No.120 wire G and terminal wire No.121 wire B<br>• Terminal wire No.122 wire L and terminal wire No.123 wire B<br>• If there is continuity, harness is faulty. | Replace harness. |
| | 3. Propulsion Pump Proportional Solenoid a (R) or b (F) | • Disconnect harness and measure resistance of coils.<br>Standard resistance: 5.5 Ω<br>• If resistance is abnormal, propulsion pump proportional solenoid a (R) or b (F) is faulty. | Replace propulsion pump proportional solenoid. |

# Fig.: 2-5-1


EXACT METER
EMERGENCY CONNECTOR
RESISTOR UNIT
EMERGENCY SWITCH
PROPULSION PUMP PROPORTIONAL SOLENOID
FOOT BRAKE SWITCH
EXACT METER RELAY
PROGRAMMING CONNECTOR
PARKING BRAKE SOLENOID
SPEED SENSOR
PARKING BRAKE SWITCH
TO COMBINATION METER
F-R LEVER
FORWARD SWITCH
REVERSE SWITCH
TO WATER SPRAY MODE SELECT SWITCH
TO BACKUP BUZZER
PROPULSION PUMP NEUTRAL RELAY (1)
PROPULSION PUMP NEUTRAL RELAY (2)
NEUTRAL SOLENOID
TO PARKING INTERLOCK RELAY
PROPULSION PUMP NEUTRAL HOLDING RELAY
INTERLOCK RELAY
AUTO SPEED INDICATOR
F-R LEVER POTENTIOMETER1
F-R LEVER POTENTIOMETER2
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
BATTERY RELAY
FUSE 15A
F.L.65A
STARTER SWITCH RELAY
FUSE BOX-10 5A
FUSE 30A
TERMINATING RESISTOR
ENGINE ECM (CM2250) J3 (60PIN)
ENGINE STUD BOLT
BATTERY
FUSE BOX
RESISTOR UNIT
IPF SELECT SWITCH
VIBRATION FREQUENCY SELECT SWITCH
VIBRATION CHANGE SWITCH
SPEED CHANGE SWITCH
F-R LEVER AUTO SPEED SET SWITCH
STARTER SWITCH
TO CIS (OPTION)
EMERGENCY SWITCH
POSITION CONNECTION
F 2-1
N -
R 2-3
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
VIBRATION FREQUENCY SELECT SWITCH
FREQUENCY CONNECTION
2500 1-2,4-6
3000 1-3,4-6
4000 1-3,4-5
SPEED CHANGE SWITCH
SPEED CONNECTION
1-3
1-2
VIBRATION CHANGE SWITCH
VIBRATION CONNECTION
1-3
1-2
STARTER SWITCH
B Acc BR C
OFF
ON
ST
10 11 12 13 14 15 (NOTCH POSITION)
SW880-1-11004

## 2-5-1. Machine and engine suddenly stops 6/11

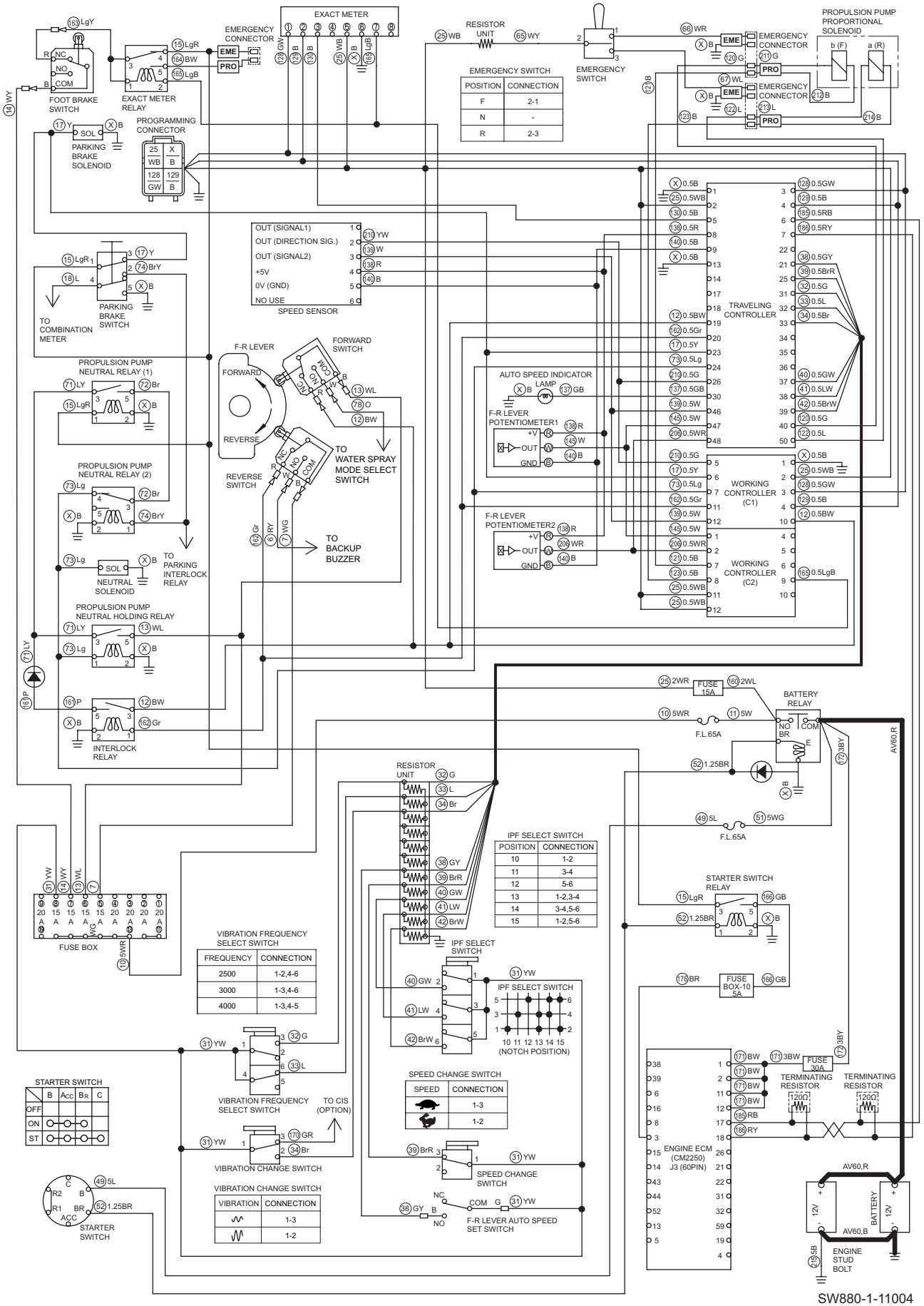
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E31 or E32 | 4. Traveling/ Working Controller | (1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wire.<br>• Traveling controller terminal power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B<br>• Working controller (C1) terminal power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B<br>• Working controller (C2) terminal, power supply terminal 11, 12 inlet wire WB and working controller (C1) ground terminal 1 outlet wire B<br>Standard voltage : 12 V or more<br>(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).<br>• Propulsion pump proportional solenoid b (F) wire G (positive side) and wire B (ground side)<br>• Propulsion pump proportional solenoid a (R) wire L (positive side) and wire B (ground side)<br>• While measuring current, operate F-R lever from “N” to “F” or “R”.<br>Standard current: 0 mA (“N”)<br>Standard current: 390 mA or more (at vehicle start moving)<br>Standard current: 1,350 mA or less (“F” or “R”)<br>• If item (1) is OK and item (2) is NG, traveling/working controller is faulty. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>③ Exact meter will display vehicle speed.<br>If display does not change to vehicle speed, check above items again.<br>In case of E31:<br>④ Move F-R lever in “F”.<br>Exact meter will still display vehicle speed. Machine is in normal state.<br>If E31 is displayed again, check above items again.<br>In case of E32:<br>④ Move F-R lever in “R”.<br>Exact meter will still display vehicle speed. Machine is in normal state.<br>If E32 is displayed again, check above items again. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | ○ | ○ | |
| ST | ○ | | ○ | ○ |

## 2-5-1. Machine and engine suddenly stops 7/11

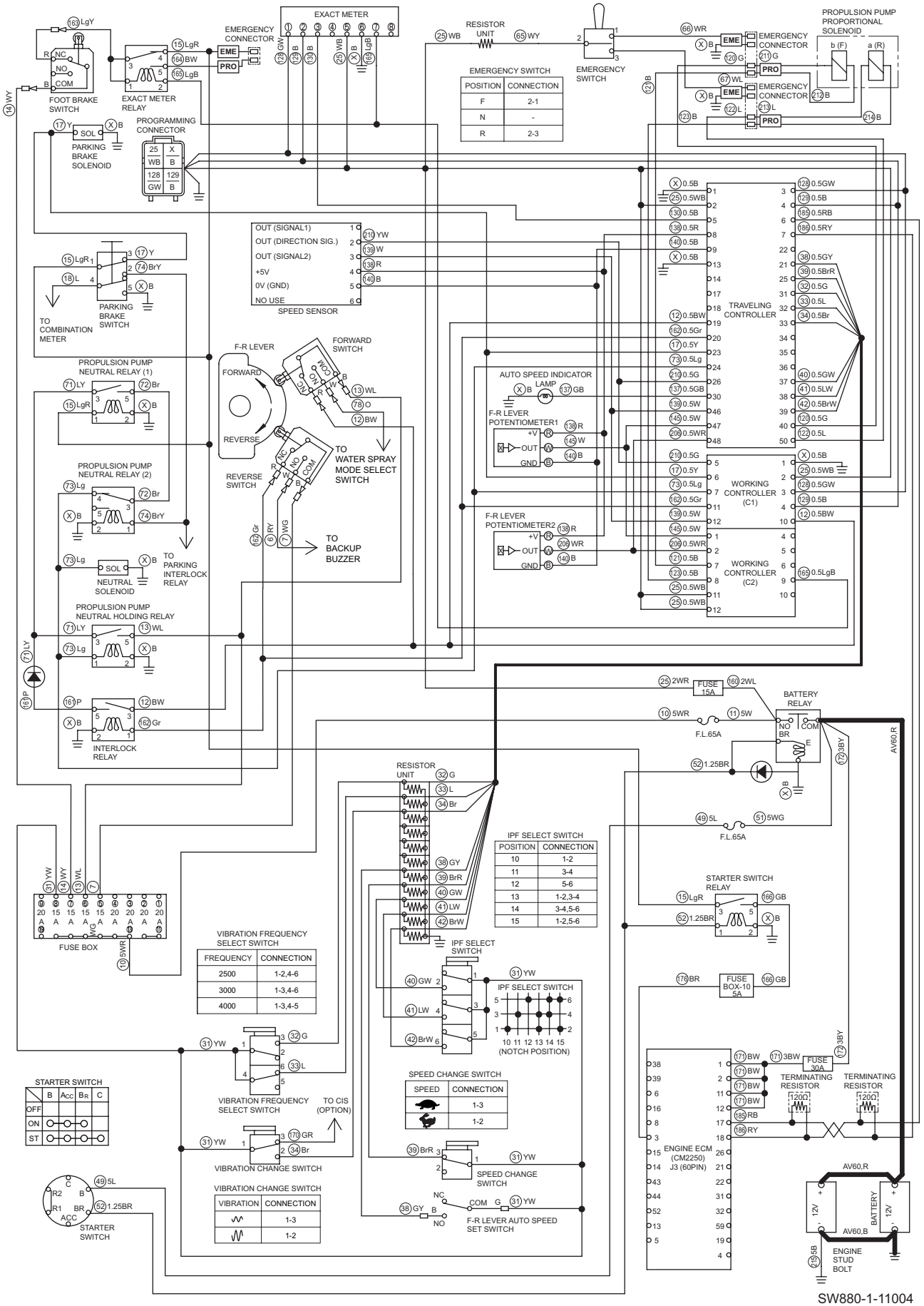
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E42 | 1. Connector | • Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between exact meter and traveling controller terminal wires.<br>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller (C2) terminal 4 wire B<br>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Traveling Controller | • When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>• If voltage is abnormal, traveling controller is faulty. | Replace traveling controller. |
| | 4. CAN Communication | • 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.<br>• Traveling controller is faulty. | Replace traveling controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | | | ○ |

## 2-5-1. Machine and engine suddenly stops 8/11

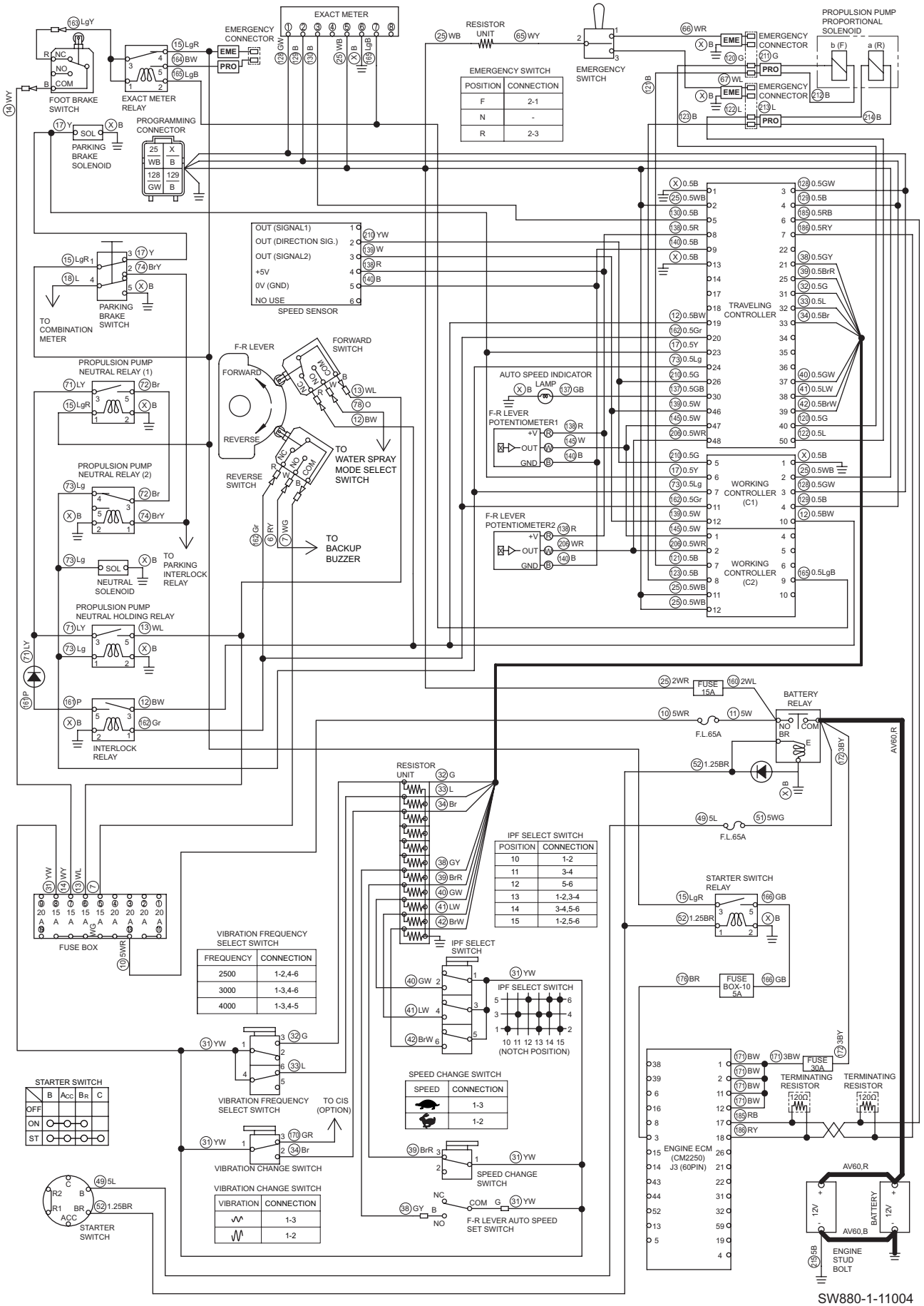
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E43 | 1. Connector | • Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between exact meter and traveling controller terminal wires.<br>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller (C2) terminal 4 wire B<br>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Exact Meter | • When starter switch is ON, measure voltage between exact meter terminal 5 outlet wire WB and ground terminal 6 wire B.<br>Standard voltage : 12 V or more<br>• If voltage is abnormal, exact meter is faulty. | Replace exact meter. |
| | 4. CAN Communication | • 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.<br>• Traveling controller is faulty. | Replace traveling controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-5-1


EXACT METER
EMERGENCY CONNECTOR
EME
PRO
RESISTOR UNIT
EMERGENCY SWITCH
PROPULSION PUMP PROPORTIONAL SOLENOID
FOOT BRAKE SWITCH
EXACT METER RELAY
PROGRAMMING CONNECTOR
PARKING BRAKE SOLENOID
SPEED SENSOR
OUT (SIGNAL1)
OUT (DIRECTION SIG.)
OUT (SIGNAL2)
+5V
0V (GND)
NO USE
PARKING BRAKE SWITCH
TO COMBINATION METER
F-R LEVER
FORWARD SWITCH
REVERSE SWITCH
TO WATER SPRAY MODE SELECT SWITCH
TO BACKUP BUZZER
PROPULSION PUMP NEUTRAL RELAY (1)
PROPULSION PUMP NEUTRAL RELAY (2)
NEUTRAL SOLENOID
TO PARKING INTERLOCK RELAY
PROPULSION PUMP NEUTRAL HOLDING RELAY
INTERLOCK RELAY
AUTO SPEED INDICATOR
LAMP
F-R LEVER POTENTIOMETER1
F-R LEVER POTENTIOMETER2
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
FUSE 15A
BATTERY RELAY
F.L.65A
F.L.65A
RESISTOR UNIT
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
IPF SELECT SWITCH
IPF SELECT SWITCH
10 11 12 13 14 15
(NOTCH POSITION)
STARTER SWITCH RELAY
FUSE BOX
VIBRATION FREQUENCY SELECT SWITCH
FREQUENCY | CONNECTION
2500 | 1-2,4-6
3000 | 1-3,4-6
4000 | 1-3,4-5
VIBRATION FREQUENCY SELECT SWITCH
TO CIS (OPTION)
VIBRATION CHANGE SWITCH
VIBRATION CHANGE SWITCH
VIBRATION | CONNECTION
1-3
1-2
SPEED CHANGE SWITCH
SPEED | CONNECTION
1-3
1-2
SPEED CHANGE SWITCH
F-R LEVER AUTO SPEED SET SWITCH
STARTER SWITCH
B | ACC | BR | C
OFF
ON
ST
STARTER SWITCH
FUSE BOX-10 5A
FUSE 30A
TERMINATING RESISTOR
TERMINATING RESISTOR
120Ω
120Ω
ENGINE ECM (CM2250) J3 (60PIN)
AV60,R
AV60,B
BATTERY
12V
12V
ENGINE STUD BOLT
SW880-1-11004

## 2-5-1. Machine and engine suddenly stops 9/11

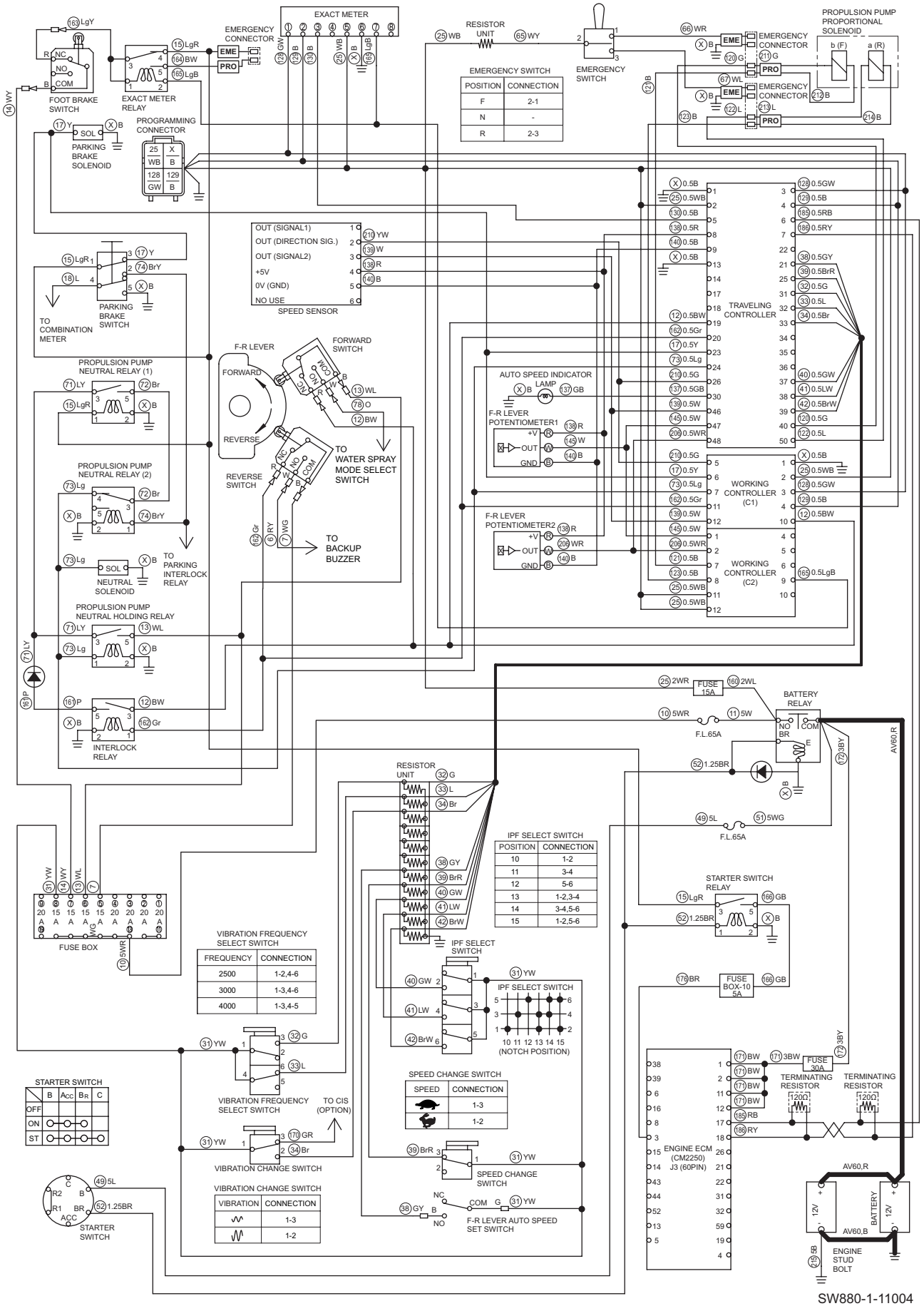
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E44, E45 | 1. Connector | • Check exact meter connector terminal 1, 2, 7 and working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between exact meter and working controller terminal wires.<br>• Exact meter terminal 1 wire GW and working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and working controller (C1) terminal 4 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Working Controller | (1) When starter switch is ON, measure voltage between working controller (C1) power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and (2) is NG, working controller (C1) is faulty.<br>(2) When starter switch is ON, measure voltage between working controller (C2) power supply terminal 11, 12 inlet wire WB and working controller (C1) ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON, measure voltage between working controller (C2) terminal 9 inlet wire LgB and working controller (C1) ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>• If above items (1), (2) are OK and (3) is NG, working controller (C1) is faulty. | Replace working controller. |
| | 4. CAN Communication (E44 only) | • 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.<br>• Working controller is faulty. | Replace working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-5-1




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

| 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 |

| FREQUENCY | CONNECTION |
|---|---|
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED | CONNECTION |
|---|---|
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION | CONNECTION |
|---|---|
| ∿ | 1-3 |
| ⩘ | 1-2 |

| | B | ACC | BR | C |
|---|---|---|---|---|
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | ○ | | ○ |

SW880-1-11004

## 2-5-1. Machine and engine suddenly stops 10/11

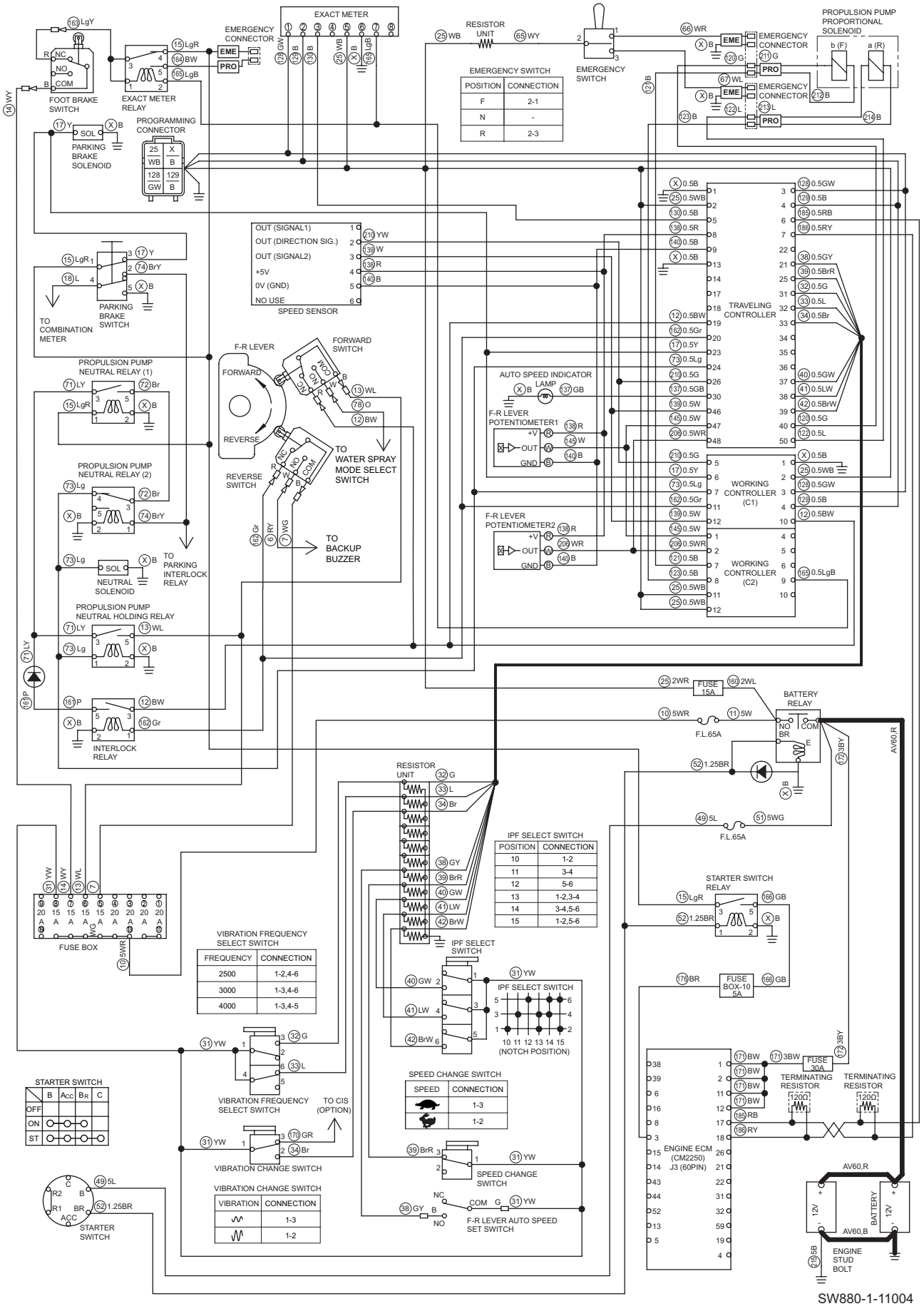
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E61 to E68 | 1. Connector | • Check F-R lever potentiometer 1, 2 connector and traveling controller connector terminal 8, 9, 47, 48, working controller (C2) connector terminal 1, 2 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between F-R lever potentiometer 1, 2 and traveling/working controller terminal wires.<br>• F-R lever potentiometer 1 terminal wire R and traveling controller terminal 8 wire R<br>• F-R lever potentiometer 1 terminal wire W and traveling controller terminal 47 wire W, working controller (C2) terminal 1 wire W<br>• F-R lever potentiometer 1, terminal wire B and traveling controller terminal 9 wire B<br>• F-R lever potentiometer 2 terminal wire R and traveling controller terminal 8 wire R<br>• F-R lever potentiometer 2 terminal WR and traveling controller terminal 48 wire WR, working controller (C2) terminal 2 wire WR<br>• F-R lever potentiometer 2 terminal B wire B and traveling controller terminal 9 wire B.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. F-R Lever Potentiometer 1 | (1) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal inlet wire R and ground terminal outlet wire B.<br>Standard voltage : 5 ± 0.5 V<br>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal outlet wire W and ground terminal wire B.<br>① When F-R lever is “N”<br>Standard voltage : 2.5 ± 0.015 V<br>② When F-R lever is “F”<br>Standard voltage : 1.2 ± 0.02 V<br>③ When F-R lever is “R”<br>Standard voltage : 3.8 ± 0.02 V<br>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 1 adjustment is faulty. | Adjust F-R lever potentiometer 1 or replace it even if measurement is out of standard after adjustment. |
| | 4. F-R Lever Potentiometer 2 | (1) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal inlet wire R and ground terminal outlet wire B.<br>Standard voltage : 5 ± 0.5 V<br>(2) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal outlet wire W and ground terminal wire B.<br>① When F-R lever is “N”<br>Standard voltage : 2.5 ± 0.015 V<br>② When F-R lever is “F”<br>Standard voltage : 3.8 ± 0.02 V<br>③ When F-R lever is “R”<br>Standard voltage : 1.2 ± 0.02 V<br>• If above item (1) is OK and any of measurements in item (2) is NG, F-R lever potentiometer 2 adjustment is faulty. | Adjust F-R lever potentiometer 2 or replace it even if measurement is out of standard after adjustment. |

# Fig.: 2-5-1




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

| FREQUENCY | CONNECTION |
|---|---|
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| 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 | CONNECTION |
|---|---|
| | 1-3 |
| | 1-2 |

| VIBRATION | CONNECTION |
|---|---|
| | 1-3 |
| | 1-2 |

## 2-5-1. Machine and engine suddenly stops 11/11

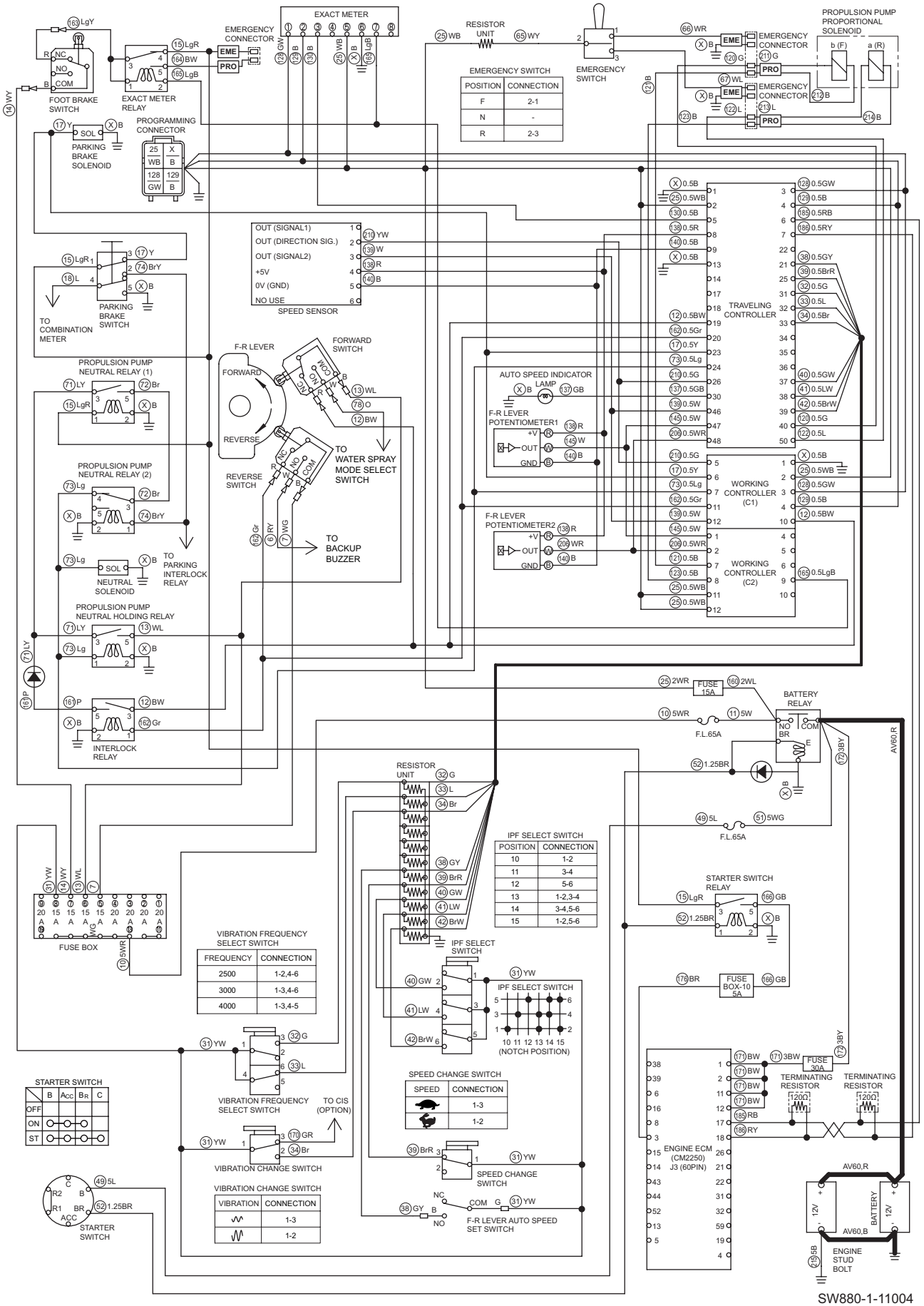
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E61 to E68 | 5. Traveling Controller | (1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between traveling controller terminal 8 outlet wire R (positive side) and 9 wire B (ground side).<br>Standard voltage : 5 ± 0.5 V<br>• If above item (1) is OK and item (2) is NG, 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.<br>② Place F-R lever “N”.<br>③ Exact meter will display vehicle speed (0.0). If E61 to E68 is displayed, check above items again.<br>④ Place F-R lever in full forward or backward position.<br>⑤ Exact meter will still display vehicle speed (0.0). Machine is in normal state. If display changes to E61 to E68, check above items again. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

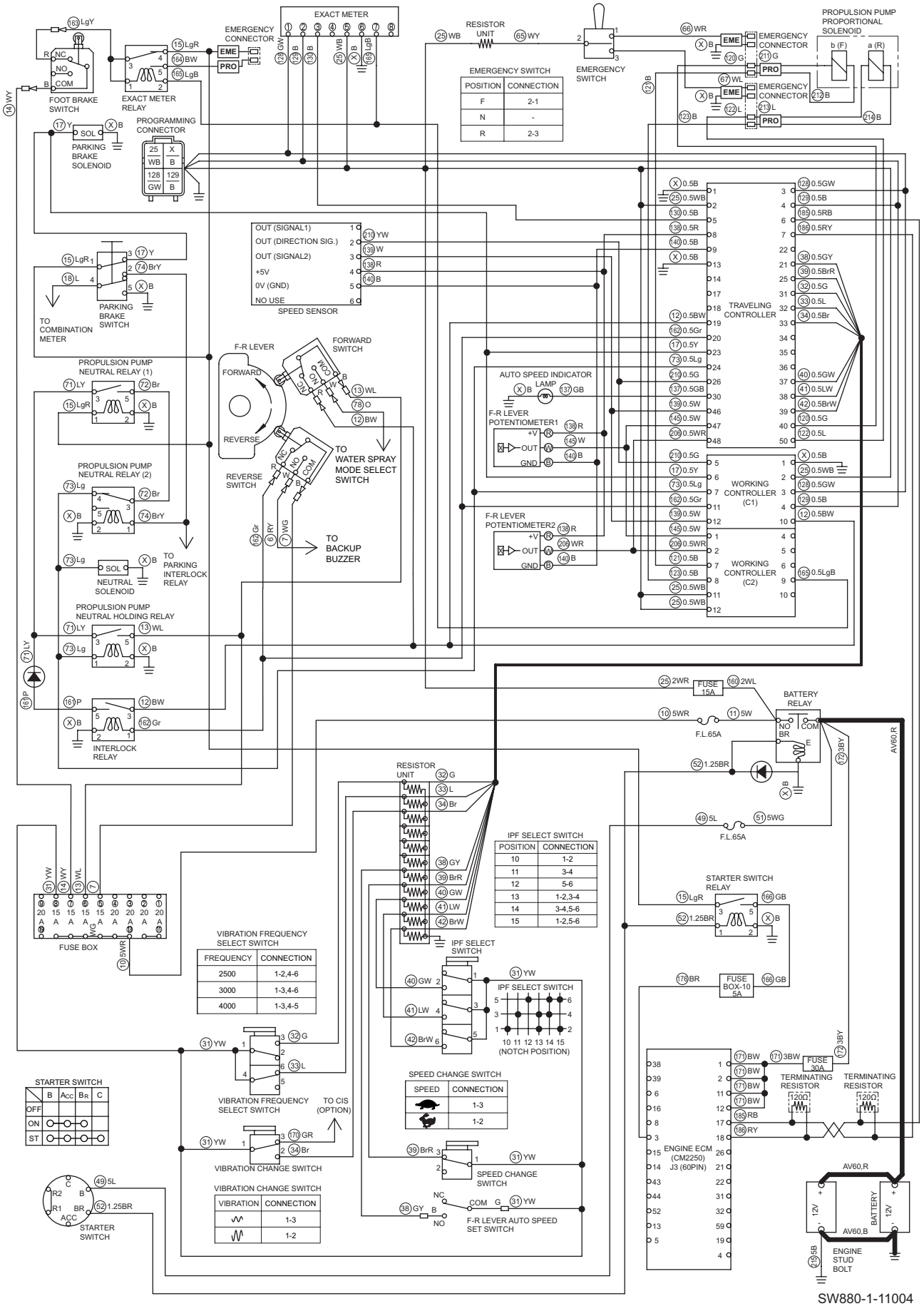
## 2-5-2. Machine and engine suddenly stops in automatic speed mode 1/2

- 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.: 2-5-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E11 | 1. Connector | • Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller (C1) connector terminal 5, 12 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between speed sensor and traveling controller terminal wires.<br>• Speed sensor terminal 2 wire YW and traveling controller terminal 26 wire G, working controller (C1) terminal 5 wire G<br>• Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller (C1) terminal 12 wire W<br>• Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R<br>• Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | 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 outlet wire B.<br>Standard voltage : 5 ± 0.25 V<br>(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.<br>Standard pulse : 21 pulses/rotation<br>• If above item (1) is OK and item (2) is NG, speed sensor is faulty. | Replace speed sensor. |
| | 4. Traveling/ Working Controller | • 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. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, start engine.<br>② Exact meter will display E11.<br>③ Move F-R lever “F” or “R” and run machine.<br>④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | | | ○ |

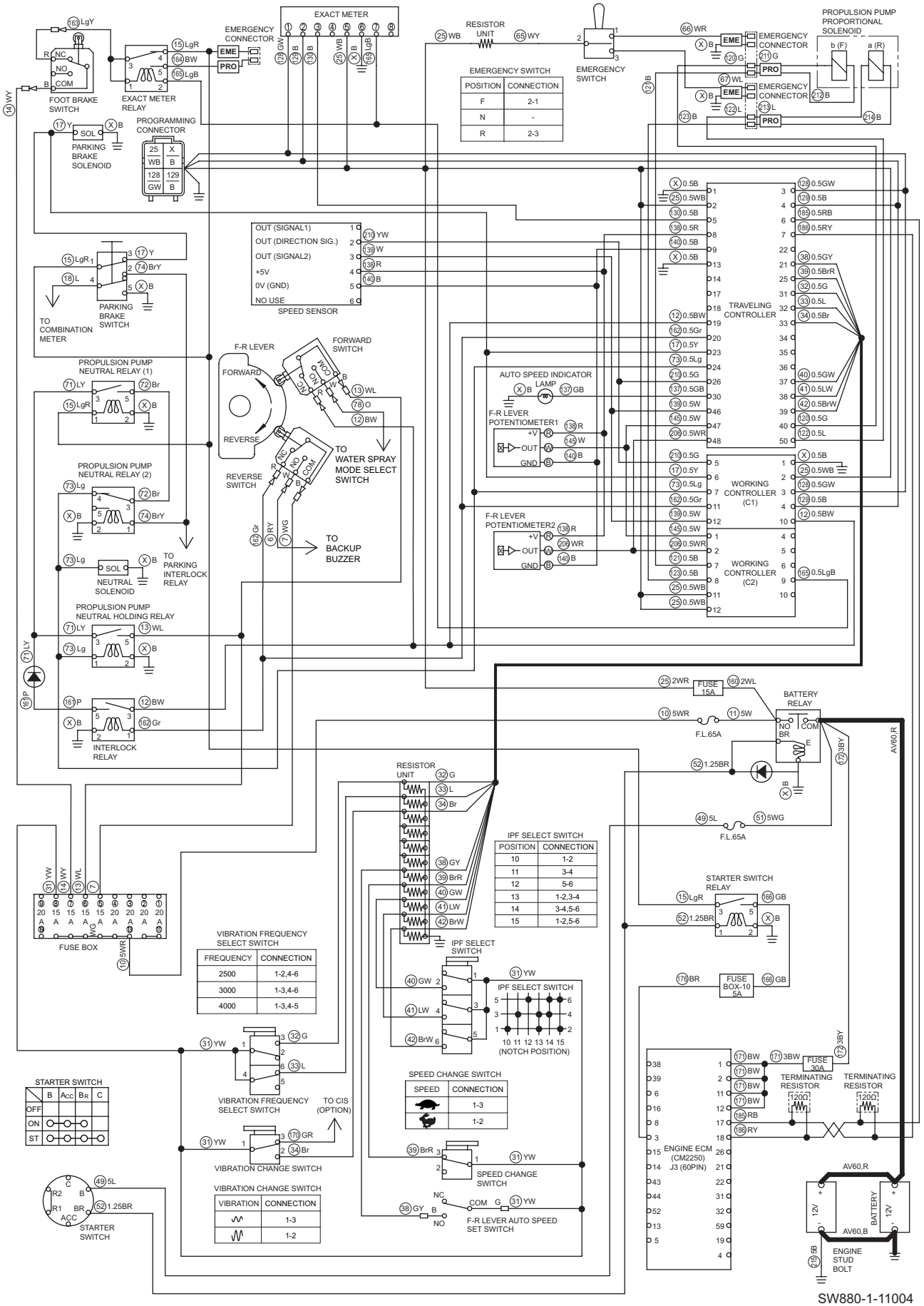
## 2-5-2. Machine and engine suddenly stops in automatic speed mode 2/2

- 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.: 2-5-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E41 | 1. Connector | • Check engine ECM connector terminal 17, 18 and traveling controller connector terminal 6, 7 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between engine ECM and traveling controller terminal wires.<br>  • Engine ECM terminal 17 wire RB and traveling controller terminal 6 wires RB<br>  • Engine ECM terminal 18 wire RY and traveling controller terminal 7 wire RY<br>  Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty.<br><br>**(NOTICE)**<br>**• Since shielded twist wires are used for traveling controller terminal harness, repair is not approved. Be sure to replace them.** | Replace harness. |
| | 3. CAN Communication | • Faulty CAN communication.<br><br>**(NOTICE)**<br>**• Check if any CAN-related blink code for engine is issued. If no blink code is issued, traveling controller is faulty.** | Replace traveling controller. |
| | 4. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>③ Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-5-1




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

| 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 |

| FREQUENCY | CONNECTION |
|---|---|
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED | CONNECTION |
|---|---|
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION | CONNECTION |
|---|---|
| ∿ | 1-3 |
| ⩘ | 1-2 |

| | B | ACC | BR | C |
|---|---|---|---|---|
| OFF | | | | |
| ON | ○ | ○ | ○ | |
| ST | ○ | | ○ | ○ |

SW880-1-11004

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

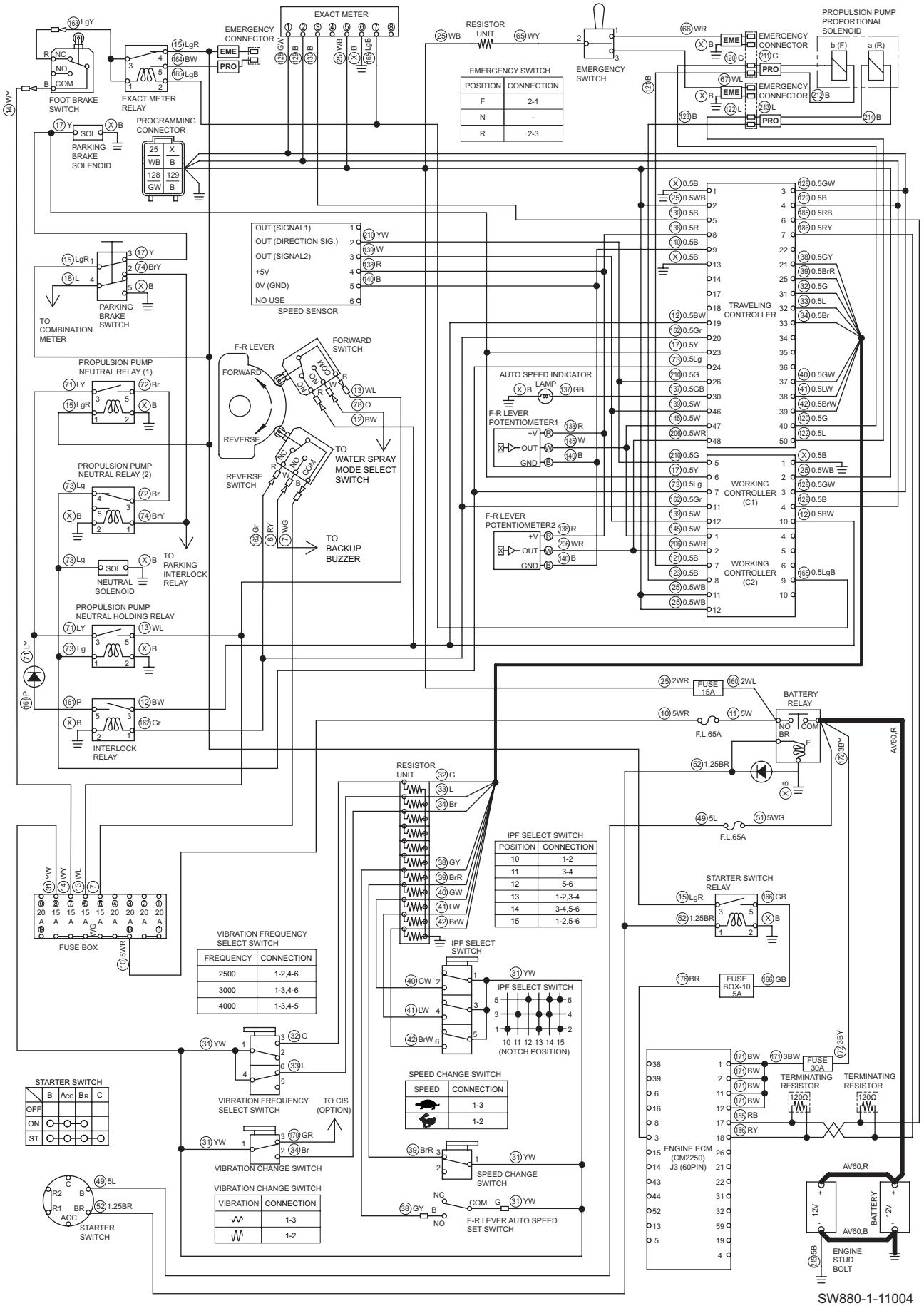
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| Pon | 1. Connector | • Check forward switch connector, reverse switch connector and traveling controller connector terminal 19, 20, working controller (C1) connector terminal 10, 11 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistances between switches and traveling controller terminal wires.<br>• Forward switch terminal NC wire BW and traveling controller terminal 19 wire BW, working controller (C1) terminal 10 wire BW<br>• Reverse switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller (C1) terminal 11 wire Gr<br>Standard resistance : 10 Ω or less<br>(2) Measure resistances between switches and fuse box terminal wires.<br>• Forward switch terminal COM wire WL and fuse box terminal 6 wire WL<br>• Reverse switch terminal COM wire WG and fuse box terminal 5 wire WG<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Forward Switch | • When starter switch is OFF and F-R lever is “N”, check continuity between forward switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>• If there is no continuity, forward switch is faulty. | Replace forward switch. |
| | 4. Reverse Switch | • When starter switch is OFF and F-R lever is “N”, check continuity between reverse switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>• If there is no continuity, reverse switch is faulty. | Replace reverse switch. |
| | 5. Traveling/ Working Controller | • If error code Pon is displayed and no abnormality is found in connector, harness, forward switch and reverse switch in above inspection, traveling/working controller is faulty. | Replace traveling/ working controller. |
| | 6. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, place F-R lever “F” or “N”.<br>② Set starter switch to ON.<br>③ When F-R lever is “F” or “N”, traveling/working controller cannot be initialized. Exact meter will continuously display Pon.<br>④ Return F-R lever to “N”.<br>⑤ When traveling/working controller initialization is completed, display will change from Pon to vehicle speed. Machine is in normal state. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | ○ | | ○ |

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

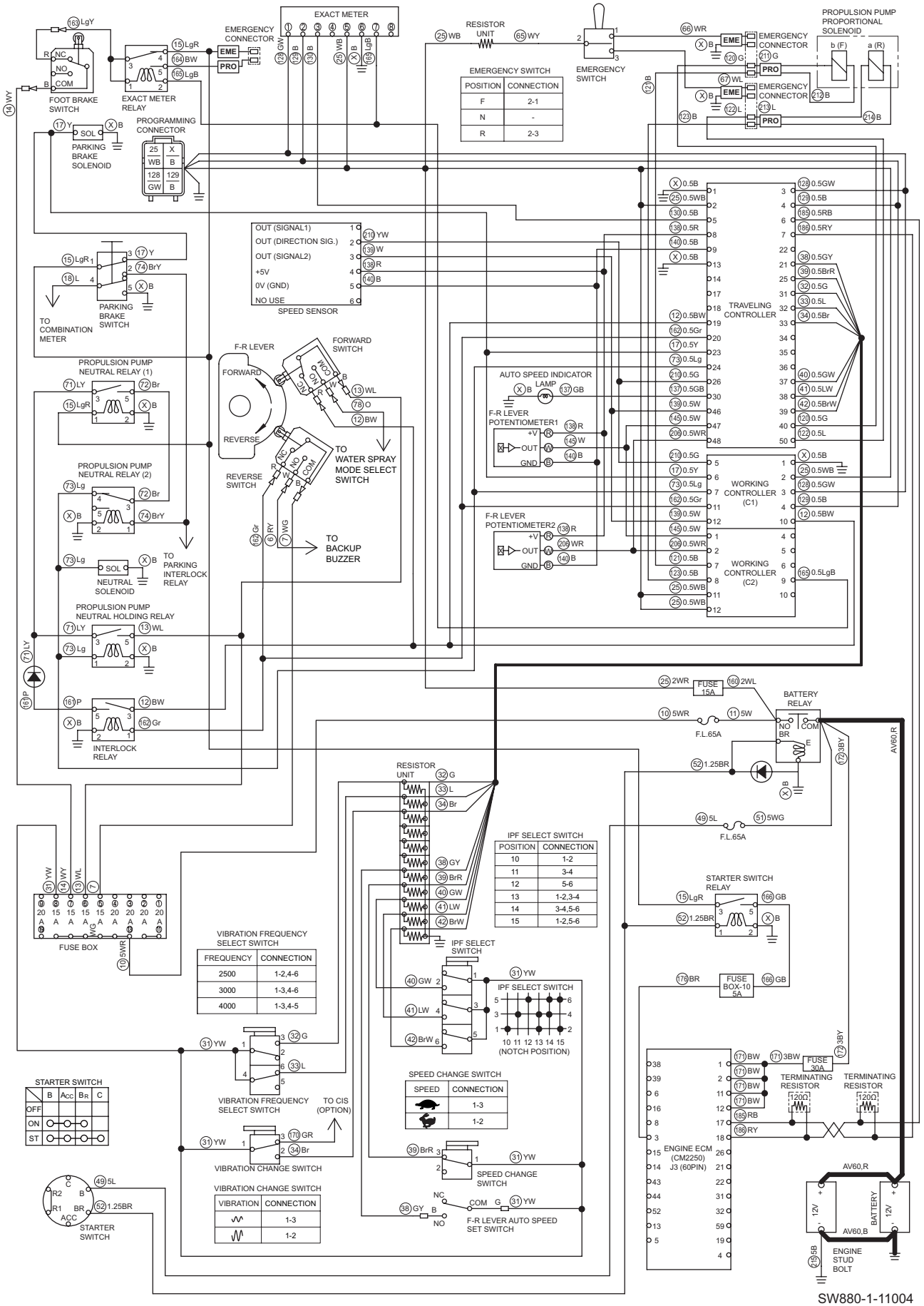
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E03 | 1. Connector | • Check forward switch connector and traveling controller connector terminal 19, working controller (C1) connector terminal 10 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistance between forward switch connector terminal NC wire BW and traveling controller terminal 19 wire BW, working controller (C1) terminal 10 wire BW.<br>Standard resistance : 10 Ω or less<br>(2) Measure resistance between forward switch connector terminal COM wire WL and fuse box terminal 6 wire WL.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Forward Switch | (1) When starter switch is OFF and F-R lever is “N”, check continuity between forward switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>(2) When starter switch is OFF and F-R lever is “F”, check continuity between forward switch terminal COM and terminal NC.<br>There is no continuity in normal condition.<br>• If above item (1) or (2) is NG, forward switch is faulty. | Replace forward switch. |
| | 4. Traveling/ Working Controller | • 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. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Exact meter will display E03.<br>③ Move F-R lever in “F”.<br>Exact meter display will change from E03 to vehicle speed (0.0).<br>If display does not change to vehicle speed, check above items again.<br>④ Return F-R lever to “N”.<br>Machine is in normal state. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | Acc | BR | C |
| OFF | | | | |
| ON | ○ | ○ | ○ | |
| ST | ○ | | ○ | ○ |

SW880-1-11004

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

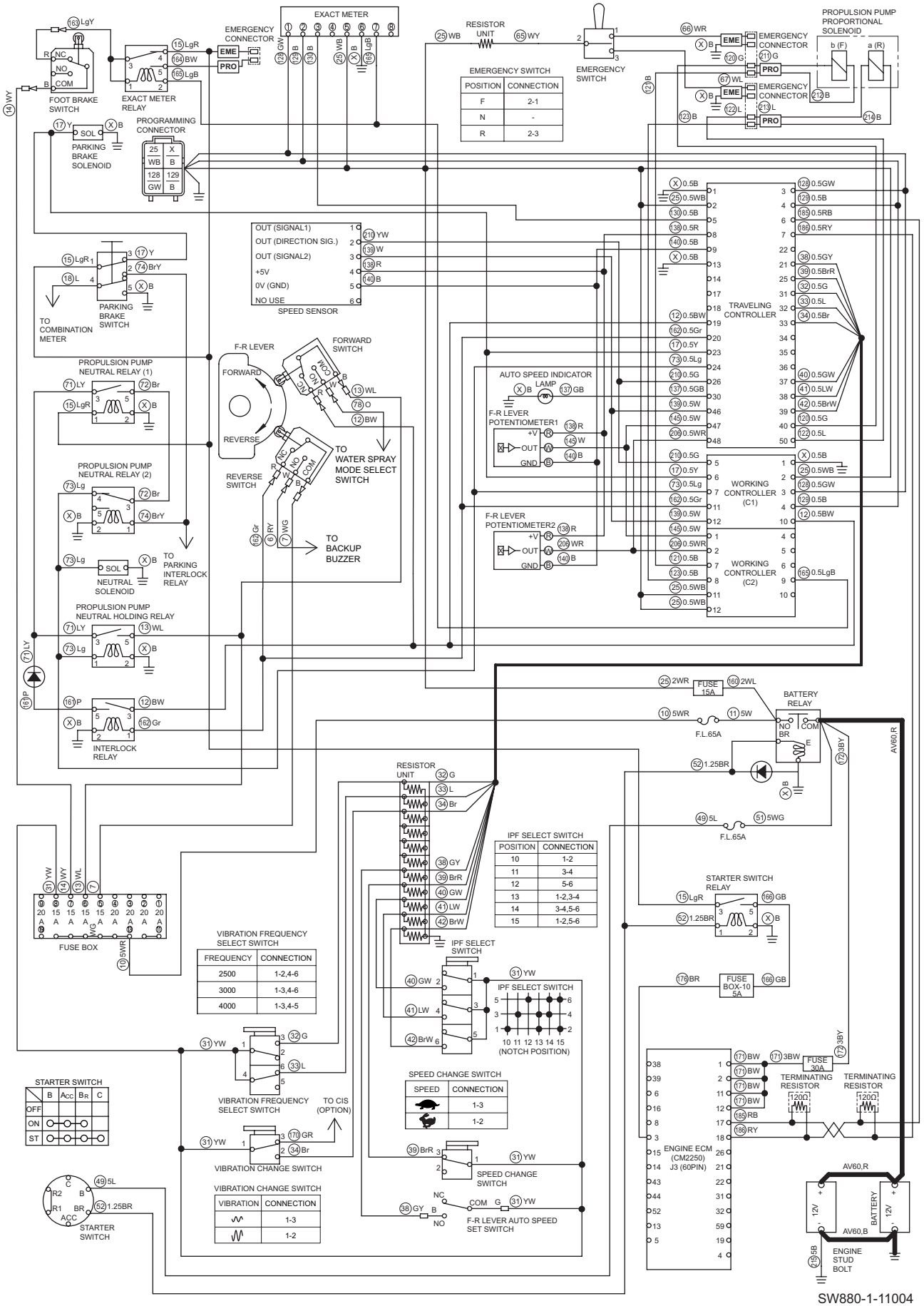
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E06 | 1. Connector | • Check reverse switch connector and traveling controller connector terminal 20, working controller (C1) connector terminal 11 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistance between reverse switch terminal NC wire Gr and traveling controller connector terminal 20 wire Gr.<br>Standard resistance : 10 Ω or less<br>(2) Measure resistance between reverse switch terminal COM wire WG and fuse box terminal 5 wire WG.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Reverse Switch | (1) When starter switch is OFF and F-R lever is “N”, check continuity between reverse switch terminal COM and terminal NC.<br>There is continuity in normal condition.<br>(2) When starter switch is OFF and F-R lever is “F”, check continuity between reverse switch terminal COM and terminal NC.<br>There is no continuity in normal condition.<br>• If above item (1) or (2) is NG, reverse switch is faulty. | Replace reverse switch. |
| | 4. Traveling/ Working Controller | • If error code E06 is displayed and no abnormality is found in connector, harness and reverse switch in above inspection, traveling/working controller is faulty. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Exact meter will display E06.<br>③ Move F-R lever in “R”.<br>Exact meter display will change from E06 to vehicle speed (0.0).<br>If display does not change to vehicle speed, check above items again.<br>④ Return F-R lever to “N”. Machine is in normal state. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| | 1-3 |
| | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| | 1-3 |
| | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | | | ○ |

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

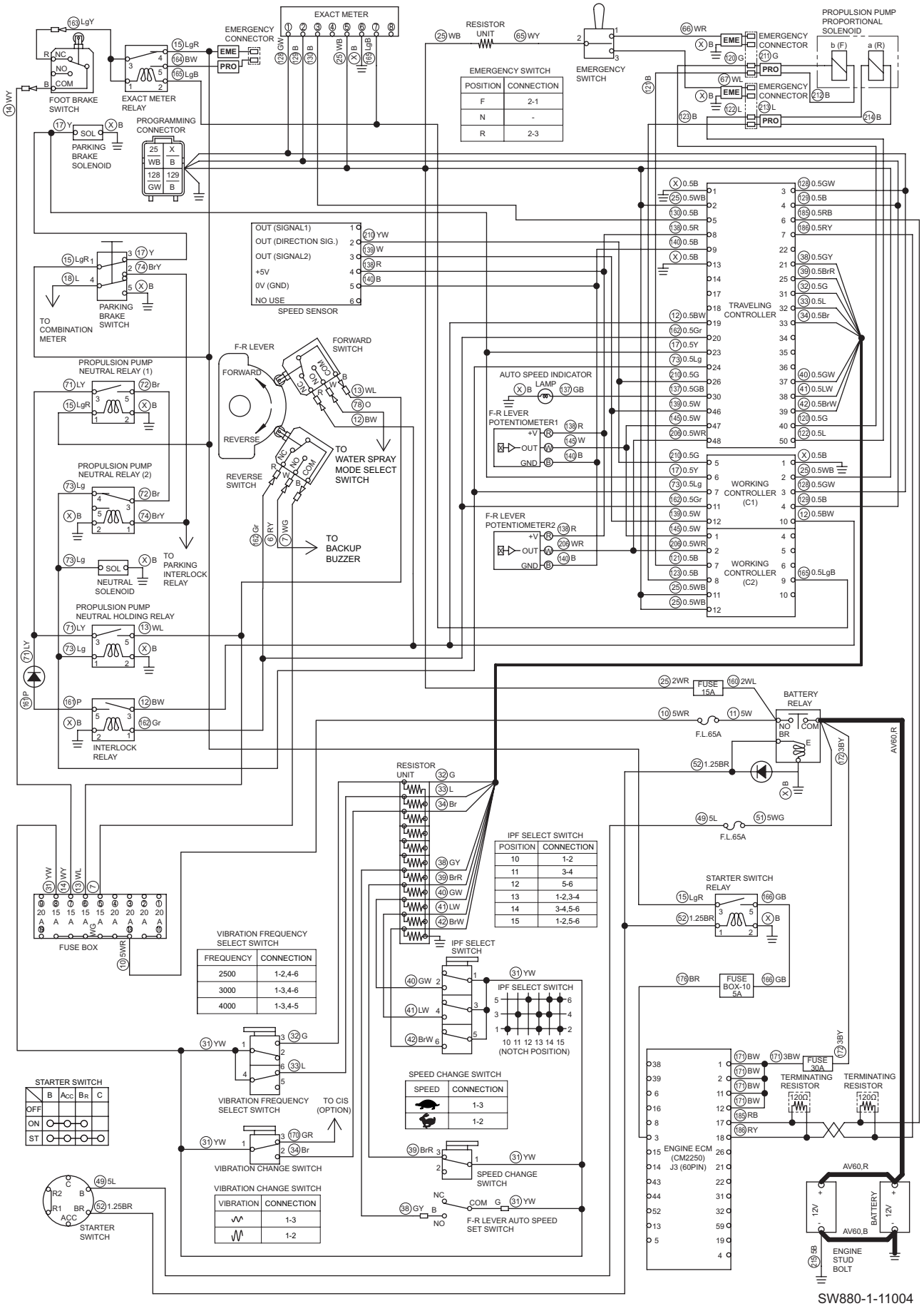
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

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

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E43 | 1. Connector | • Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between exact meter and traveling controller terminal wires.<br>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller (C2) terminal 4 wire B<br>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Exact Meter | • When starter switch is ON, measure voltage between exact meter terminal 5 outlet wire WB and ground terminal 6 wire B.<br>Standard voltage : 12 V or more<br>• If voltage is abnormal, exact meter is faulty. | Replace exact meter. |
| | 4. CAN Communication | • 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.<br>• Exact meter on transmission side or traveling/working controller is faulty. | Replace exact meter or traveling/working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever in “N”.<br>Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-5-1




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

| 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 |

| FREQUENCY | CONNECTION |
|---|---|
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED | CONNECTION |
|---|---|
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION | CONNECTION |
|---|---|
| ∿ | 1-3 |
| ⩘ | 1-2 |

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

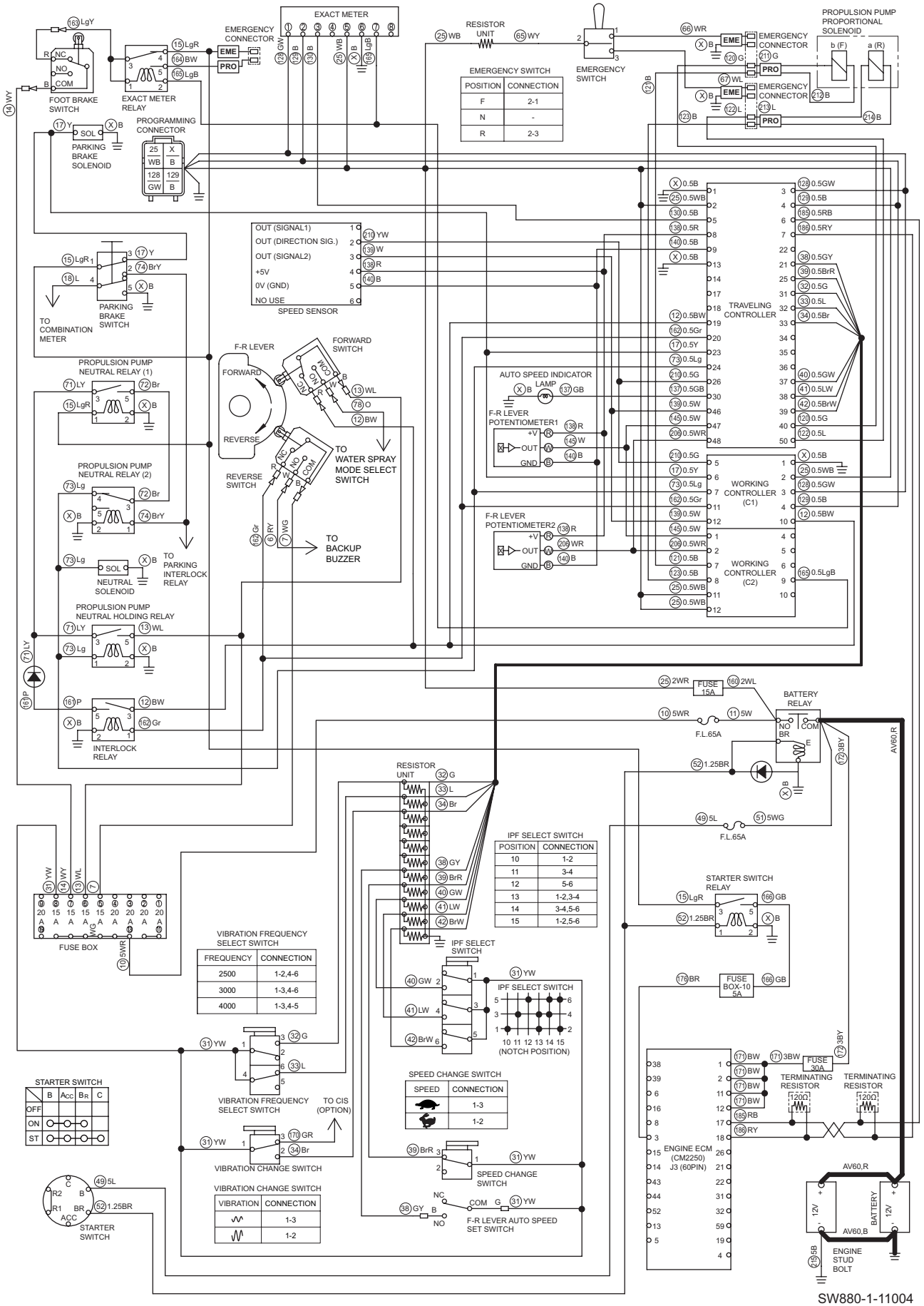
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

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

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Neutral Solenoid | • Disconnect harness and measure resistance of coil.<br>Standard resistance : 12.3 Ω<br>• If resistance is abnormal, neutral solenoid is faulty. | Replace neutral solenoid. |
| 2. Propulsion Pump Neutral Relay (1) | (1) When starter switch is ON, measure voltage between propulsion pump neutral relay (1) terminal 1 inlet wire LgR and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between propulsion pump neutral relay (1) terminal 3 inlet wire LY and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON, measure voltage between propulsion pump neutral relay (1) terminal 5 outlet wire Br and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, propulsion pump neutral relay (1) is faulty. | Replace propulsion pump neutral relay (1). |
| 3. Propulsion Pump Neutral Relay (2) | (1) When starter switch is ON, measure voltage between propulsion pump neutral relay (2) terminal 1 inlet wire BrY and chassis ground.<br>There is no current in normal condition.<br>(2) When starter switch is ON, measure voltage between propulsion pump neutral relay (2) terminal 3 inlet wire Br and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON, measure voltage between propulsion pump neutral relay (2) terminal 4 outlet wire Lg and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, propulsion pump neutral relay (2) is faulty. | Replace propulsion pump neutral relay (2). |
| 4. Propulsion Pump Neutral Holding Relay | (1) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 1 inlet wire Lg and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 5 inlet wire WL and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 3 outlet wire LY and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, propulsion pump neutral relay (2) is faulty. | Replace propulsion pump neutral holding relay. |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | | | ○ |

## 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

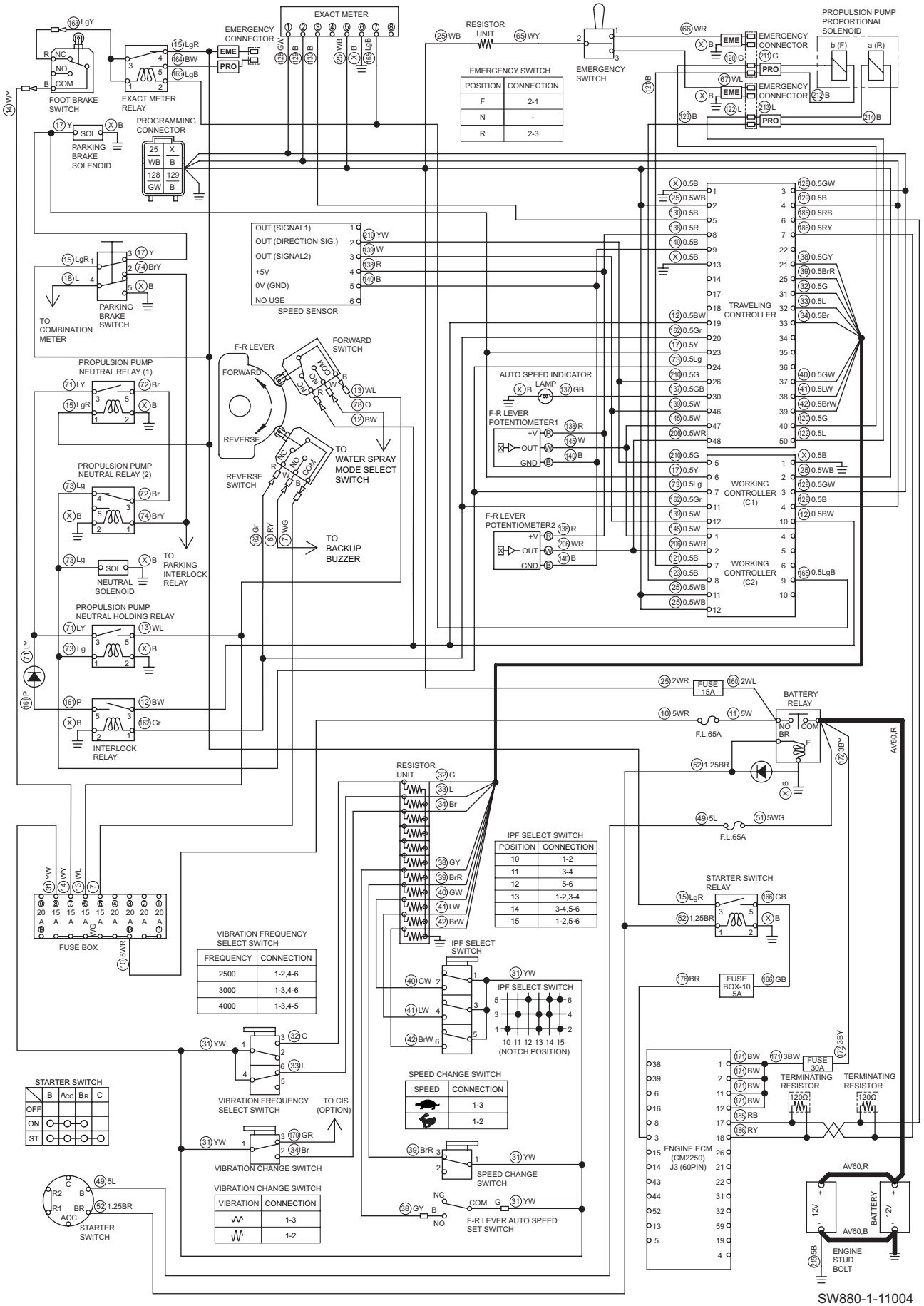
**Reference Fig.: 2-5-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 5. Exact Meter (CAN Communication) | • 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.<br>• Exact meter on transmission side or traveling/working controller is faulty.<br><br>**(NOTICE)**<br>**• See check procedures for error code E43.** | Replace exact meter or traveling/working controller. |
| 6. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | 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




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | ○ | ○ | |
| ST | ○ | | ○ | ○ |

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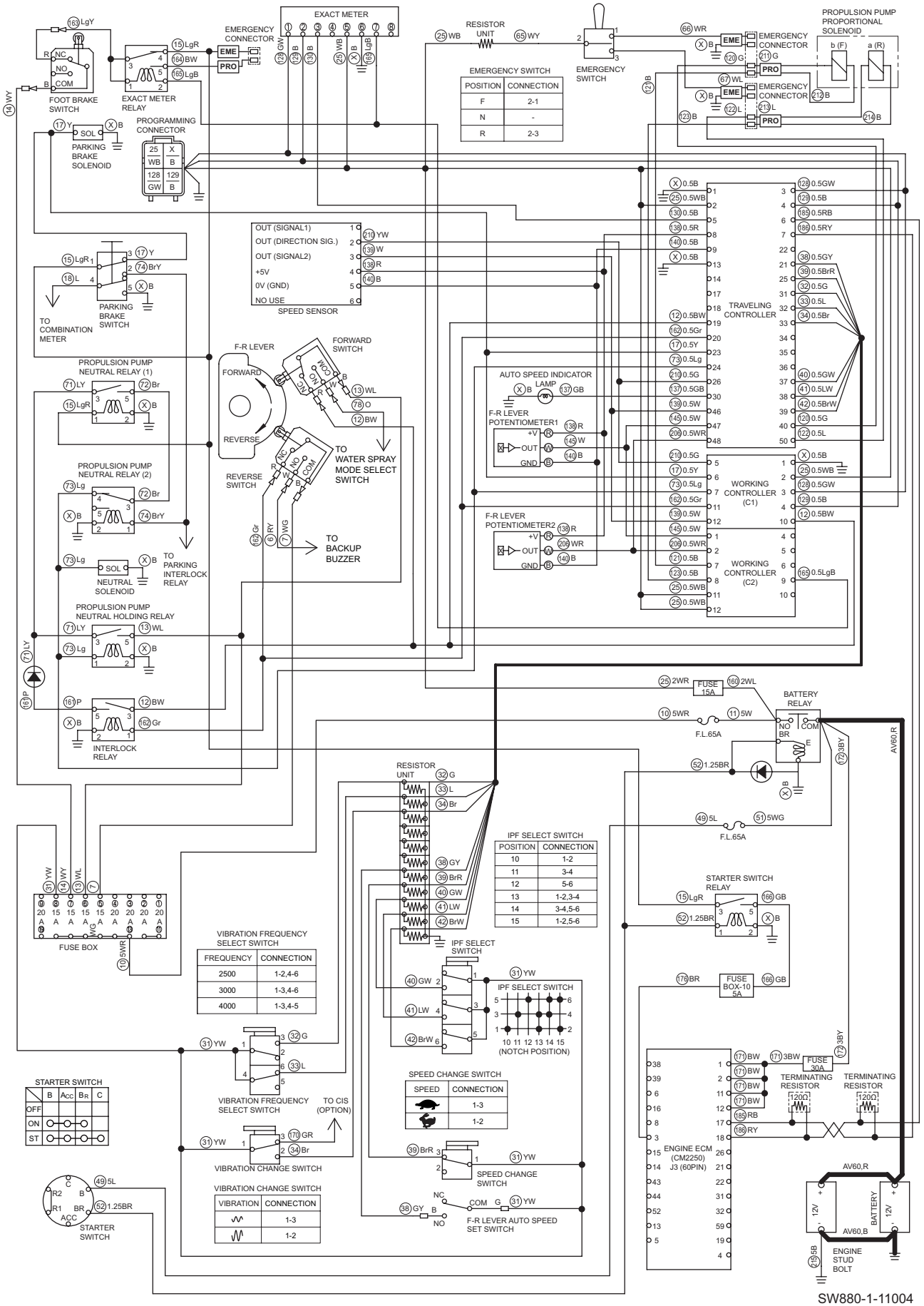
## 2-5-4. Machine speed cannot be changed

- 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 | (1) When starter switch is ON, measure voltage between speed change switch terminal 1 inlet wire YW and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>There is no electricity in normal condition.<br>• If above item (1) is OK and item (2) or (3) is NG, speed change switch is faulty. | Replace speed change switch. |
| 2. Resistor Unit | • Measure resistance between resistor unit wire No. 39 wire BrR and ground wire.<br>Standard resistance : 300 Ω<br>• If resistance is abnormal, resistor unit is faulty.<br><br>**(NOTICE)**<br>**• Resistor unit is used to stabilize contact of switch.** | Replace resistor unit. |
| 3. Traveling Controller | (1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and speed change switch is "🐢", measure voltage between traveling controller terminal 25 inlet wire BrR and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>• If items (1) and (2) are OK, traveling controller is faulty. | Replace traveling controller. |
| 4. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | Acc | BR | C |
| OFF | | | | |
| ON | ○ | ○ | ○ | ○ |
| ST | ○ | | ○ | ○ |

## 2-5-5. Auto speed function does not work 1/9

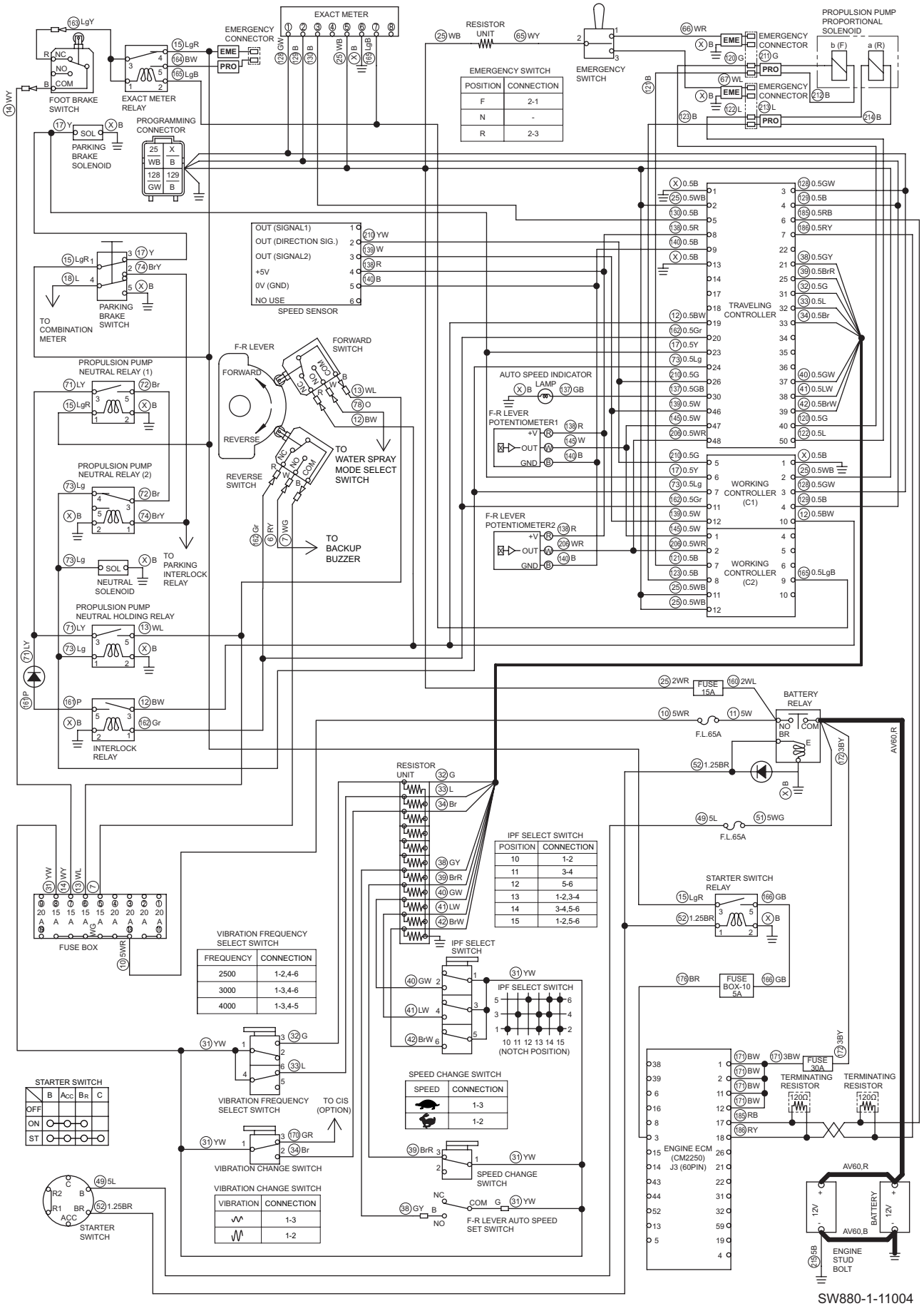
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢") 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 | • Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller (C1) connector terminal 5, 12 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between speed sensor and traveling/working controller terminal wires.<br>• Speed sensor terminal 2 wire YW and traveling controller terminal 26 wire G, working controller (C1) terminal 5 wire G<br>• Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller (C1) terminal 12 wire W<br>• Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R<br>• Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | 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 outlet wire B.<br>Standard voltage : 5 ± 0.25 V<br>(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.<br>Standard pulse : 21 pulses/rotation<br>• If above item (1) is OK and item (2) is NG, speed sensor is faulty. | Replace speed sensor. |
| | 4. Traveling/ Working Controller | • 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. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, start engine.<br>② Exact meter will display E11.<br>③ Move F-R lever "F" or "R" and run machine.<br>④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-5-1




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

| 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 |

| FREQUENCY | CONNECTION |
|---|---|
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED | CONNECTION |
|---|---|
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION | CONNECTION |
|---|---|
| ∿ | 1-3 |
| ⩙ | 1-2 |

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## 2-5-5. Auto speed function does not work 2/9

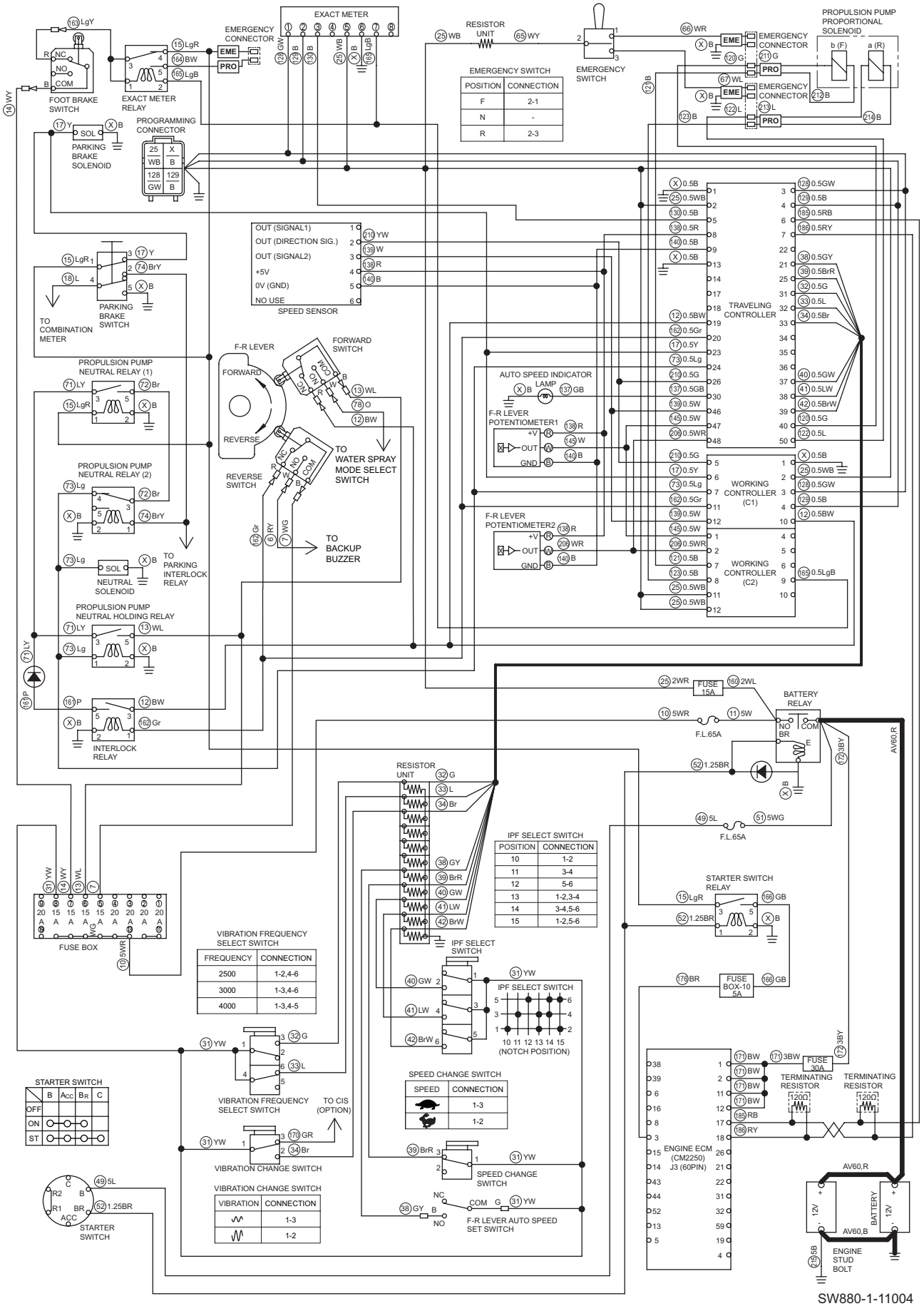
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢") 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 | • Check vibration frequency select switch, vibration change switch and traveling controller connector terminal 31, 32, 33 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistances between switches and traveling controller terminal wires.<br>• Vibration frequency select switch terminal 3 wire G and traveling controller terminal 31 wire G<br>• Vibration frequency select switch terminal 6 wire L and traveling controller terminal 32 wire L<br>• Vibration change switch terminal 2 wire Br and traveling controller terminal 33 wire Br<br>Standard resistance : 10 Ω or less<br>(2) Measure resistances between switches and fuse box terminal wires.<br>• Vibration frequency select switch terminal 1, 4 wires YW and fuse box terminal 8 wire YW<br>• Vibration change switch terminal 1 wire YW and fuse box terminal 8 wire YW<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Vibration Frequency Select Switch | (1) When starter switch is ON, measure voltage between vibration frequency select switch terminal 1, 4 inlet wires YW and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>• Vibration frequency select switch terminal 3 outlet wire G and chassis ground.<br>• Vibration frequency select switch terminal 6 outlet wire L and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2), (3) or (4) is NG, vibration frequency select switch is faulty. | Replace vibration frequency select switch. |

## Fig.: 2-5-1




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

| FREQUENCY | CONNECTION |
|---|---|
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| 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 | CONNECTION |
|---|---|
| | 1-3 |
| | 1-2 |

| VIBRATION | CONNECTION |
|---|---|
| | 1-3 |
| | 1-2 |

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## 2-5-5. Auto speed function does not work 3/9

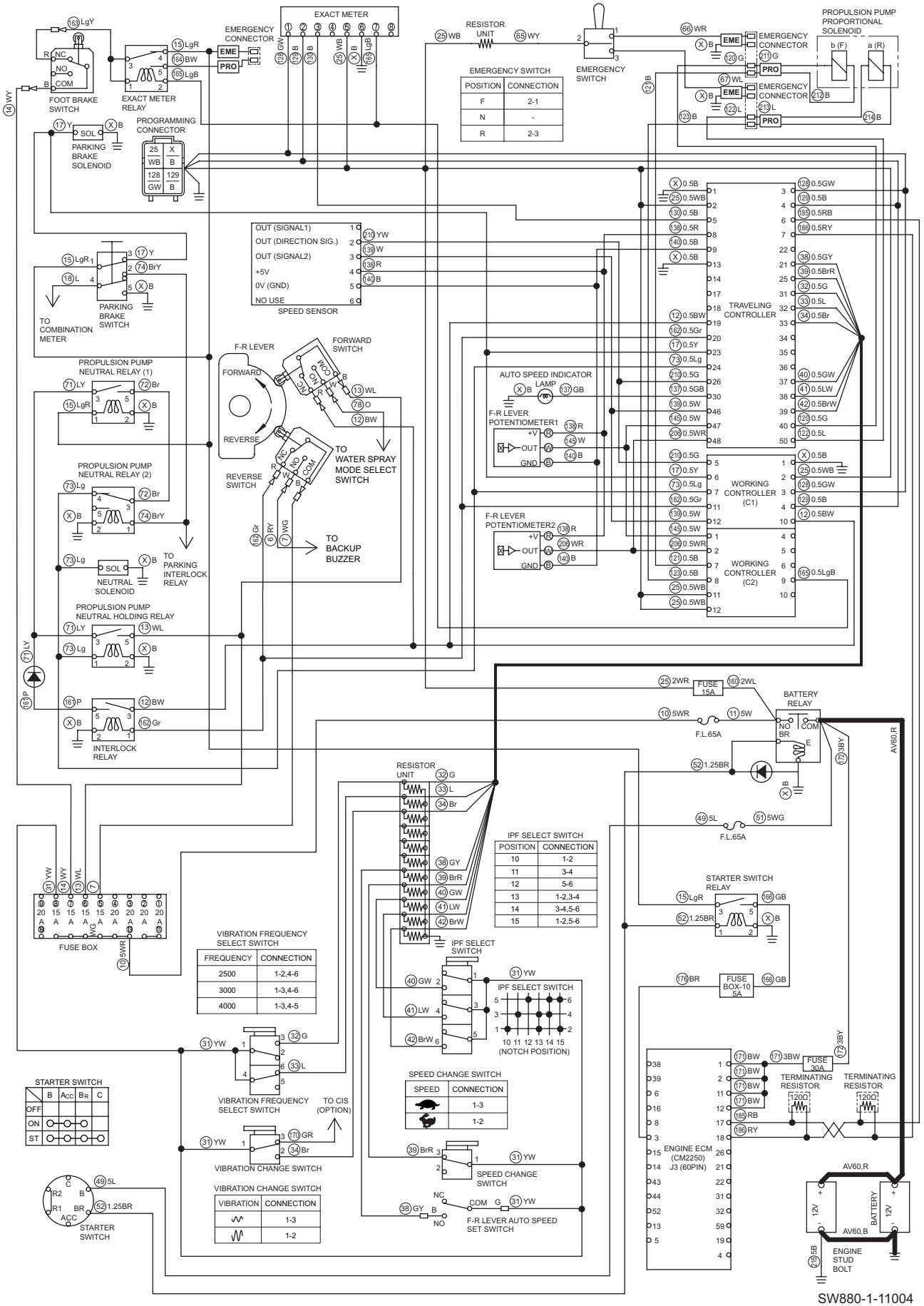
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to “ ”.
  (Automatic speed function is disabled when speed change switch is “ ”.)
- Check that speed can be changed by speed change switch between operation speed (“ ”) and 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 Change Switch | (1) When starter switch is ON, measure voltage between vibration change switch terminal 1 inlet wire YW and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and vibration change switch is “ ”, measure voltage between vibration change switch terminal 3 outlet wire GR and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON and vibration change switch is “ ”, measure voltage between vibration change switch terminal 2 outlet wire Br and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) or (3) is NG, vibration change switch is faulty. | Replace vibration change switch. |
| | 5. Resistor Unit | • Measure resistances between resistor unit wires and ground wire.<br>• Resistor unit wire No. 32 wire G and ground wire<br>• Resistor unit wire No. 33 wire L and ground wire<br>• Resistor unit wire No. 34 wire Br and ground wire<br>Standard resistance : 300 Ω<br>• If resistance is abnormal, resistor unit is faulty.<br><br>**(NOTICE)**<br>**• Resistor unit is used to stabilize contact of switch.** | Replace resistor unit. |

# Fig.: 2-5-1

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## 2-5-5. Auto speed function does not work 4/9

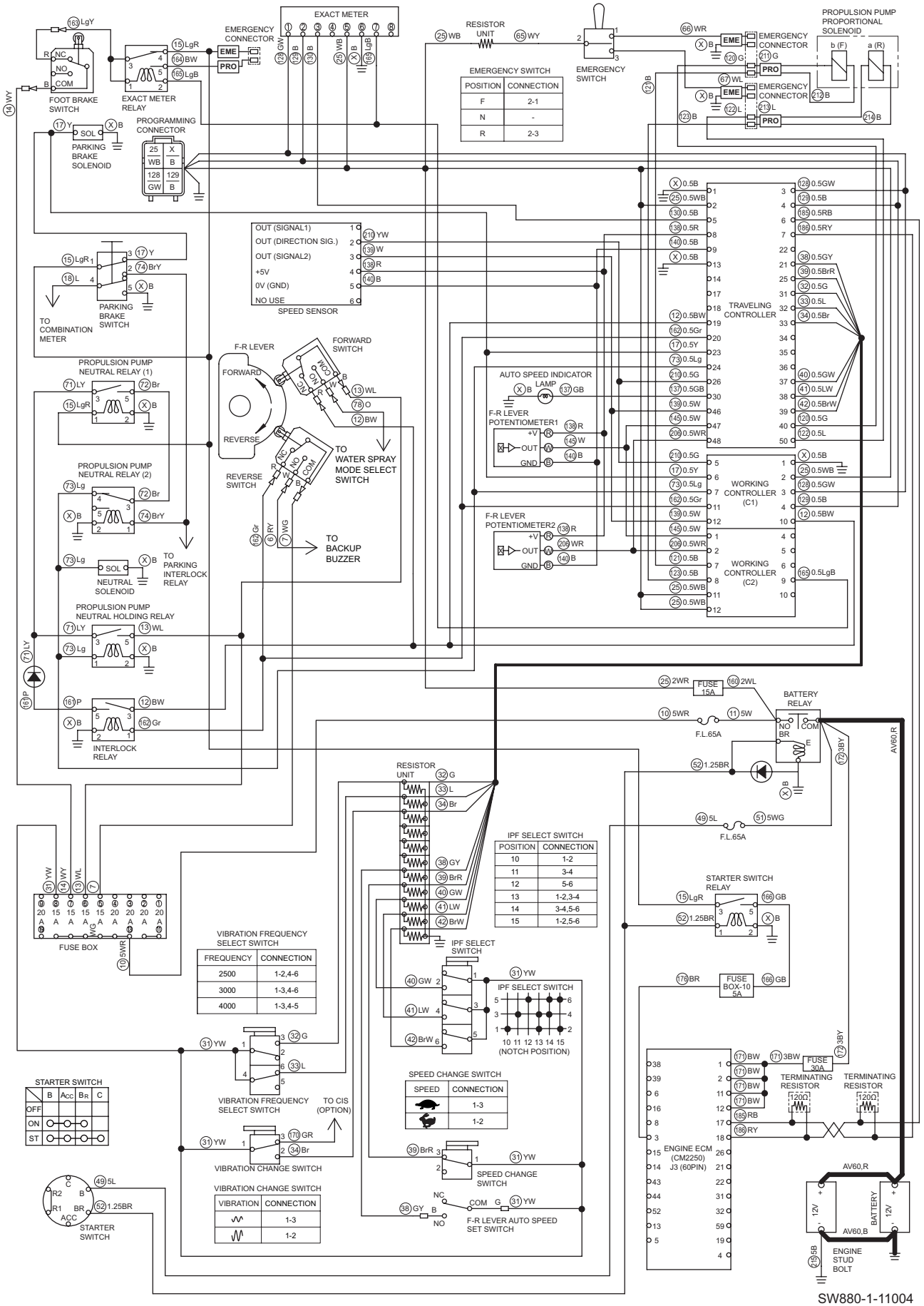
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to “”.
  (Automatic speed function is disabled when speed change switch is “ ”.)
- Check that speed can be changed by speed change switch between operation speed (“”) and 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 | 6. Traveling Controller | (1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between traveling controller terminal 32 inlet wire L and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between traveling controller terminal wires.<br>• Traveling controller terminal 31 inlet wire G and terminal 1 wire B<br>• Traveling controller terminal 32 inlet wire L and terminal 1 wire B<br>Standard voltage : 12 V or more<br>(4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between traveling controller terminal 31 inlet wire G and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(5) When starter switch is ON and vibration change switch is “ ”, measure voltage between traveling controller terminal 33 inlet wire Br and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>• If above items (1), (2), (3), (4) and (5) 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.<br>② Exact meter will display vehicle speed.<br>③ Check all combinations of vibration frequency select switch and vibration change switch positions.<br>Exact meter will still display vehicle speed. Machine is in normal state.<br>If display changes form vehicle speed to E21, check above items again. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | ○ | ○ | ○ |
| ST | ○ | | ○ | ○ |

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## 2-5-5. Auto speed function does not work 5/9

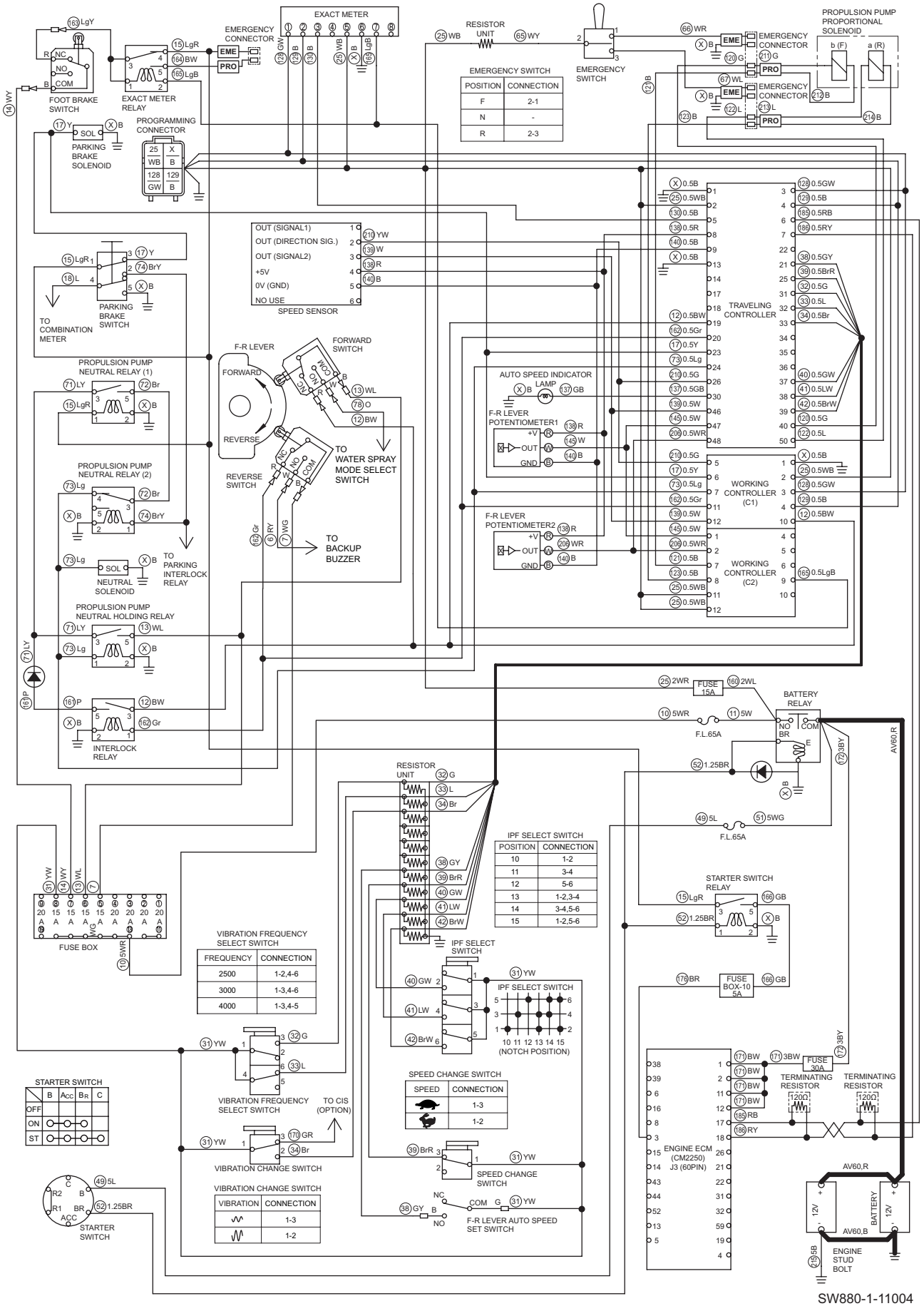
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢") 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 | • Check IPF select switch connector and traveling controller connector terminal 37, 38, 39 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistances between IPF select switch and traveling controller terminal wires.<br>• IPF select switch terminal 2 wire GW and traveling controller terminal 37 wire GW<br>• IPF select switch terminal 4 wire LW and traveling controller terminal 38 wire LW<br>• IPF select switch terminal 6 wire BrW and traveling controller terminal 39 wire BrW<br>Standard resistance : 10 Ω or less<br>(2) Measure resistances between IPF select switch terminal 1, 3, 5 wires YW and fuse box terminal 8 wire YW.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | ○ | | ○ |

## 2-5-5. Auto speed function does not work 6/9

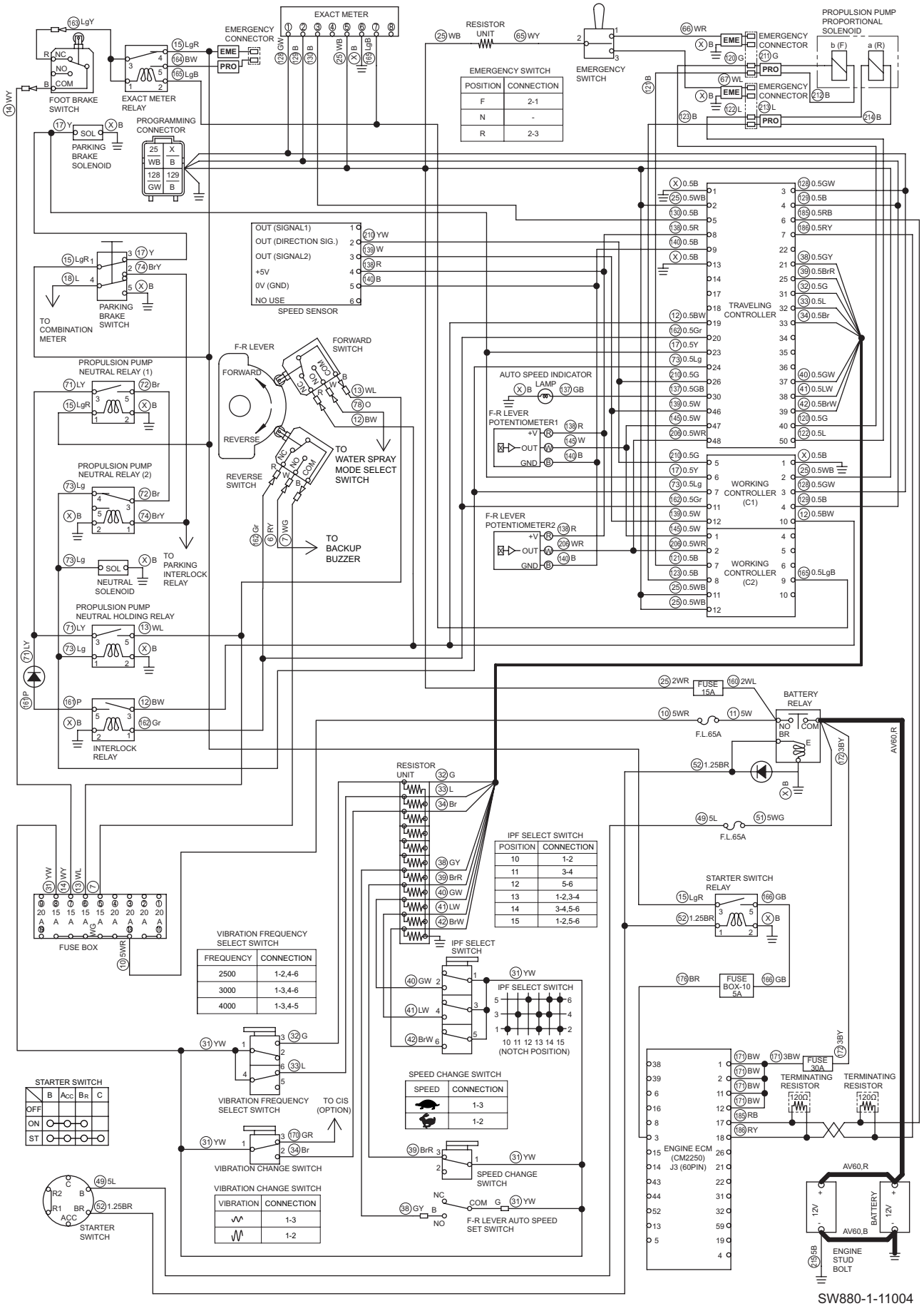
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢") 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 | (1) When starter switch is ON, measure voltage between IPF select switch terminal 1, 3, 5 inlet wires YW and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and any of items (2) through (7) is NG, IPF select switch is faulty. | Replace IPF select switch. |
| | 4. Resistor Unit | • Measure resistances between resistor unit wires and ground wire.<br>• Resistor unit wire No.40 wire GW and ground wire<br>• Resistor unit wire No.41 wire LW and ground wire<br>• Resistor unit wire No.42 wire BrW and ground wire<br>Standard resistance : 300 Ω<br>• If resistance is abnormal, resistor unit is faulty.<br><br>**(NOTICE)**<br>**• Resistor unit is used to stabilize contact of switch.** | Replace resistor unit. |

# Fig.: 2-5-1


EXACT METER
EMERGENCY CONNECTOR
EME
PRO
RESISTOR UNIT
EMERGENCY SWITCH
PROPULSION PUMP PROPORTIONAL SOLENOID
FOOT BRAKE SWITCH
EXACT METER RELAY
PROGRAMMING CONNECTOR
PARKING BRAKE SOLENOID
SPEED SENSOR
OUT (SIGNAL1)
OUT (DIRECTION SIG.)
OUT (SIGNAL2)
+5V
0V (GND)
NO USE
PARKING BRAKE SWITCH
TO COMBINATION METER
F-R LEVER
FORWARD SWITCH
REVERSE SWITCH
TO WATER SPRAY MODE SELECT SWITCH
TO BACKUP BUZZER
TO PARKING INTERLOCK RELAY
PROPULSION PUMP NEUTRAL RELAY (1)
PROPULSION PUMP NEUTRAL RELAY (2)
NEUTRAL SOLENOID
PROPULSION PUMP NEUTRAL HOLDING RELAY
INTERLOCK RELAY
AUTO SPEED INDICATOR
LAMP
F-R LEVER POTENTIOMETER1
F-R LEVER POTENTIOMETER2
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
FUSE 15A
BATTERY RELAY
F.L.65A
STARTER SWITCH RELAY
FUSE BOX-10 5A
FUSE 30A
TERMINATING RESISTOR
120Ω
ENGINE ECM (CM2250) J3 (60PIN)
BATTERY
ENGINE STUD BOLT
FUSE BOX
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
VIBRATION FREQUENCY SELECT SWITCH
FREQUENCY | CONNECTION
2500 | 1-2,4-6
3000 | 1-3,4-6
4000 | 1-3,4-5
VIBRATION CHANGE SWITCH
VIBRATION | CONNECTION
SPEED CHANGE SWITCH
SPEED | CONNECTION
1-3
1-2
F-R LEVER AUTO SPEED SET SWITCH
STARTER SWITCH
B | Acc | BR | C
OFF
ON
ST
SW880-1-11004

## 2-5-5. Auto speed function does not work 7/9

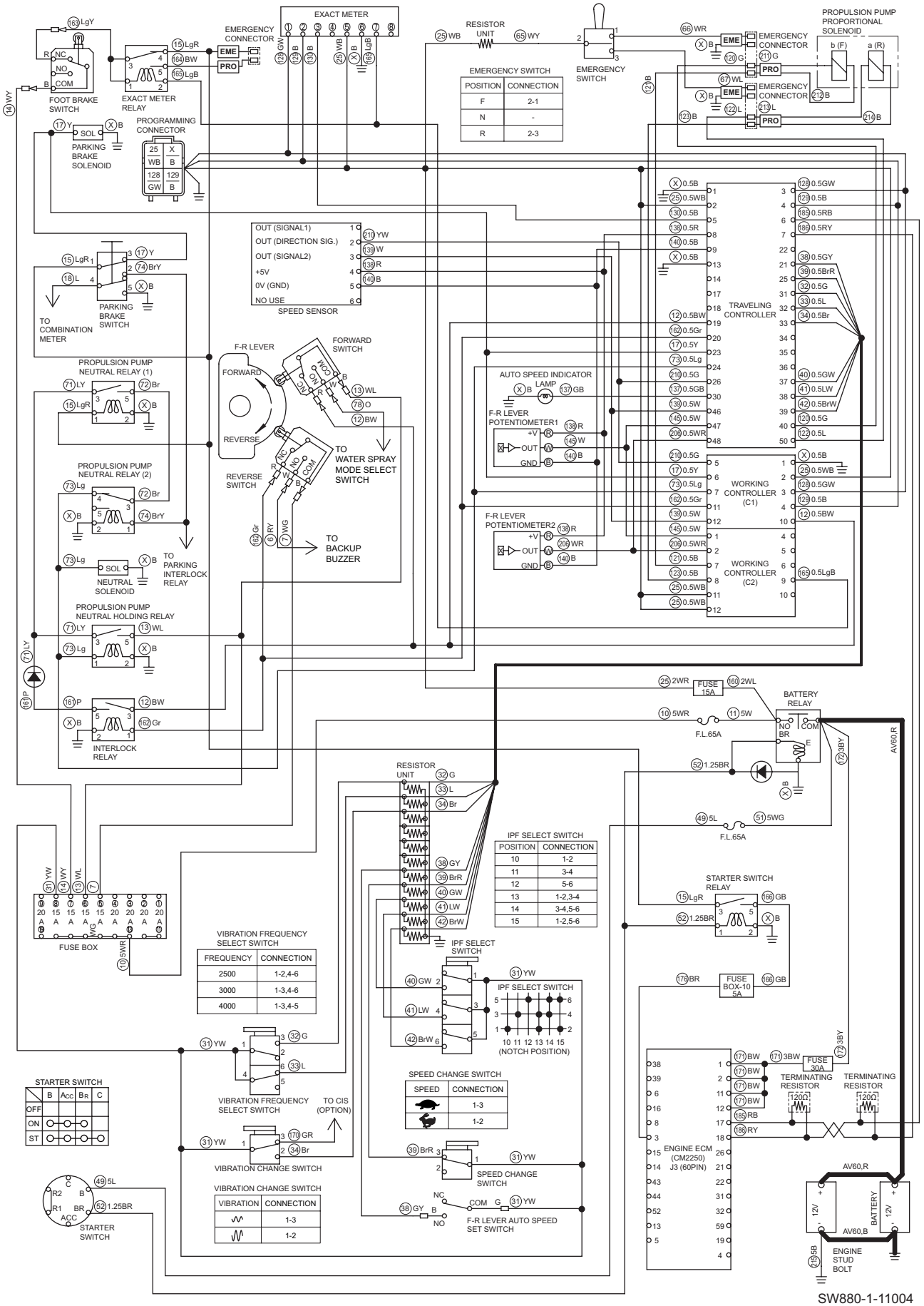
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to “🐢”.
  (Automatic speed function is disabled when speed change switch is “🐇”.)
- Check that speed can be changed by speed change switch between operation speed (“🐢”) and 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 WB and ground terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and IPF select switch is “10”, measure voltage between traveling controller terminal 37 inlet wire GW and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON and IPF select switch is “11”, measure voltage between traveling controller terminal 38 inlet wire LW and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(4) When starter switch is ON and IPF select switch is “12”, measure voltage between traveling controller terminal 39 inlet wire BrW and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(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 terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(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 terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(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 terminal 1 wire B.<br>Standard voltage : 12 V or more<br>• 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.<br>② Exact meter will display vehicle speed.<br>③ Check all positions of IPF select switch.<br>Exact meter will still display vehicle speed. Machine is in normal state.<br>If display changes form vehicle speed to E22, check above items again. | |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | ○ | | ○ |

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## 2-5-5. Auto speed function does not work 8/9

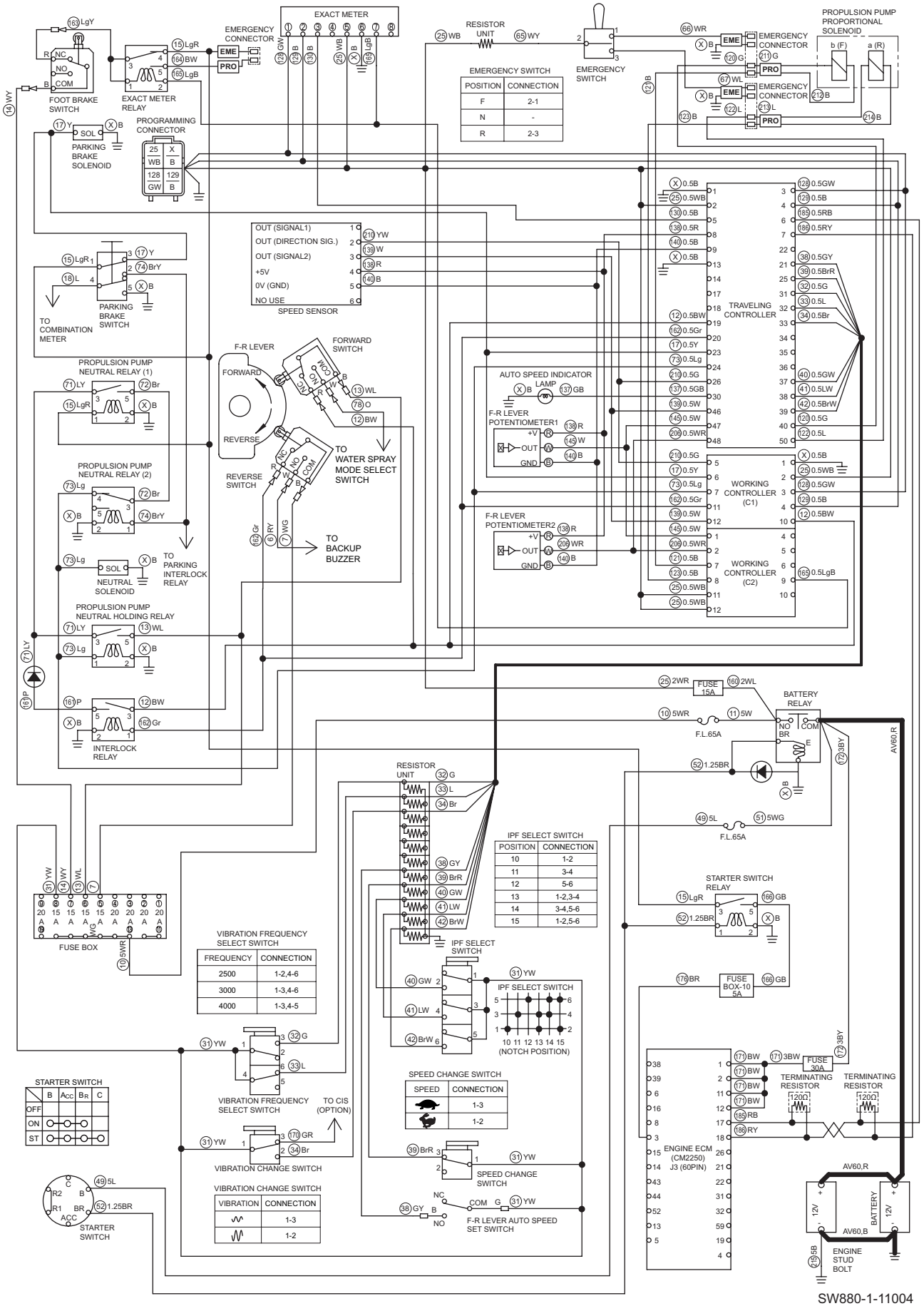
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢") 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 | • Check engine ECM connector terminal 17, 18 and traveling controller terminal 6, 7 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between engine ECM and traveling controller terminal wires.<br>  • Engine ECM terminal 17 wire RB and traveling controller terminal 6 wire RB<br>  • Engine ECM terminal 18 wire RY and traveling controller terminal 7 wire RY<br>  Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty.<br><br>**(NOTICE)**<br>**• Since shielded twist wires are used for traveling controller terminal harness, repair is not approved. Be sure to replace them.** | Replace harness. |
| | 3. CAN Communication | • Faulty CAN communication.<br><br>**(NOTICE)**<br>**• Check if any CAN-related blink code for engine is issued. If no blink code is issued, traveling controller is faulty.** | Replace traveling controller. |
| | 4. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever "N".<br>③ Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-5-1




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

| FREQUENCY | CONNECTION |
|---|---|
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| 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 | CONNECTION |
|---|---|
| | 1-3 |
| | 1-2 |

| VIBRATION | CONNECTION |
|---|---|
| | 1-3 |
| | 1-2 |

| | B | ACC | BR | C |
|---|---|---|---|---|
| OFF | | | | |
| ON | ○ | | ○ | |
| ST | ○ | ○ | | |

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## 2-5-5. Auto speed function does not work 9/9

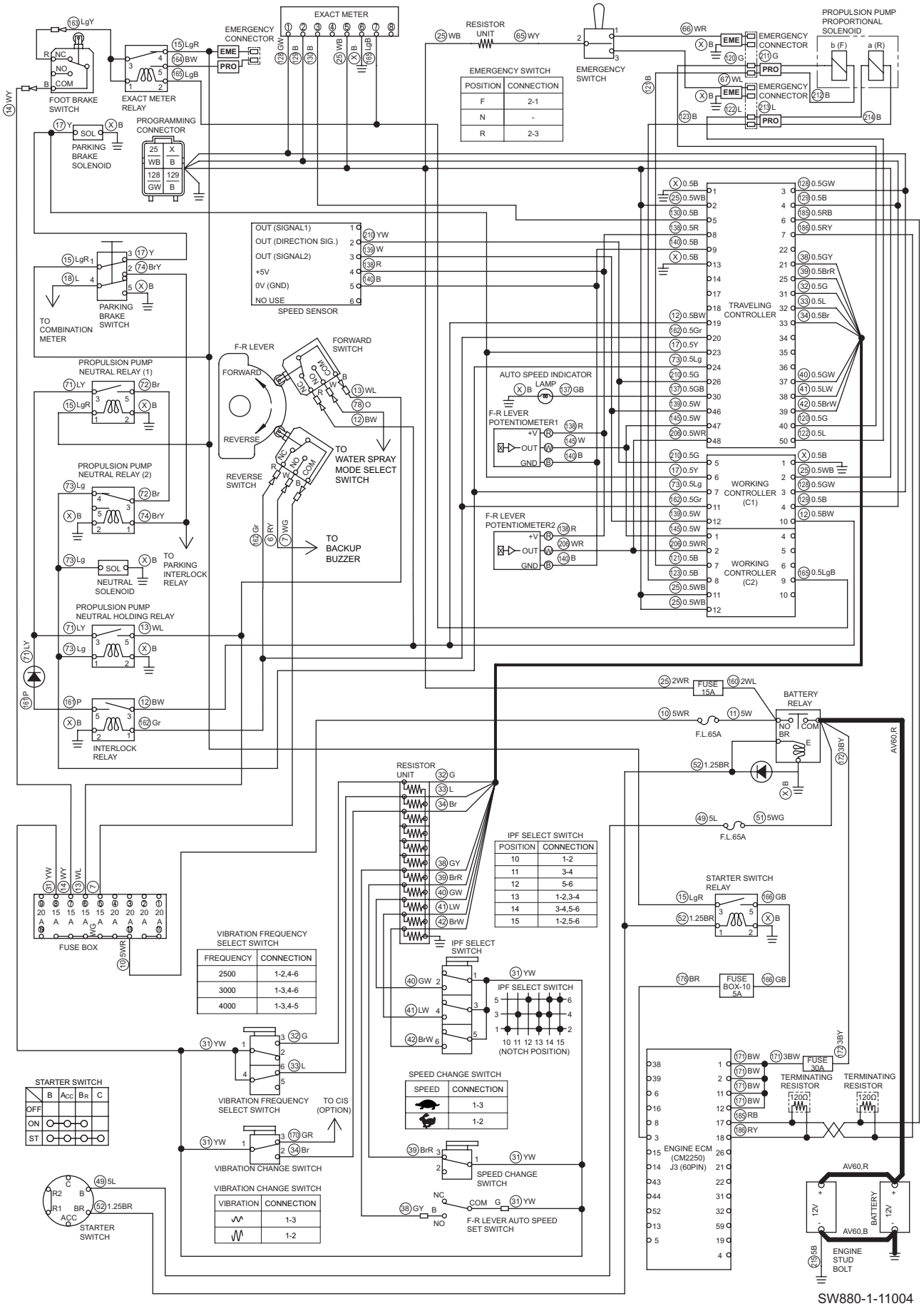
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to “  ”.
  (Automatic speed function is disabled when speed change switch is “  ”.)
- Check that speed can be changed by speed change switch between operation speed (“  ”) 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 | (1) When starter switch is ON, measure voltage between F-R lever auto speed set switch terminal COM inlet wire YW and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, F-R lever auto speed set switch is faulty. | Replace F-R lever auto speed set switch. |
| 2. Resistor Unit | • Measure resistance between resistor unit wire No.38 wire GY and ground wire.<br>Standard resistance : 300 Ω<br>• If resistance is abnormal, resistor unit is faulty.<br><br>**(NOTICE)**<br>**• Resistor unit is used to stabilize contact of switch.** | Replace resistor unit. |
| 3. Traveling Controller | (1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(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 terminal 1 wire B.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and no error code is displayed, traveling controller is faulty. | Replace traveling controller. |
| 4. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | ○ | | ○ |

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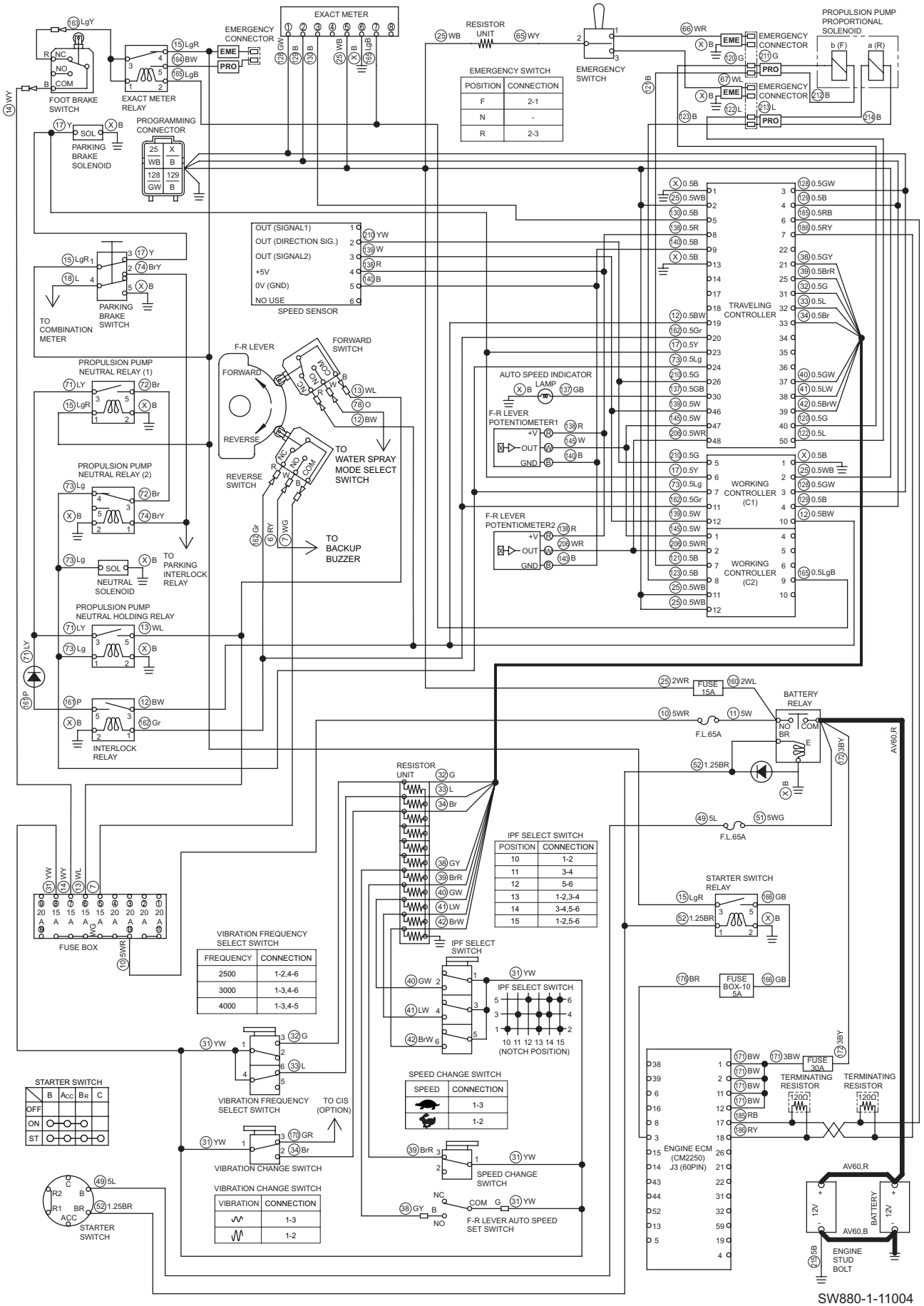
## 2-5-6. Brake cannot be released

- 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.: 2-5-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Parking Brake Solenoid | • Disconnect harness and measure resistance of coil.<br>Standard voltage : 12.3 Ω<br>• If measured resistance is abnormal, parking brake solenoid is faulty. | Replace parking brake solenoid. |
| 2. Parking Brake Switch | (1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire LgR and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire Y and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, parking brake switch is faulty. | Replace parking brake switch. |
| 3. Exact Meter Relay | (1) When starter switch is ON, measure voltage between exact meter relay terminal 1, 3 inlet wire LgY and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage of coil between exact meter relay terminal 1 and terminal 2.<br>There is no electricity in normal condition.<br>(3) When starter switch is ON, measure voltage between exact meter relay terminal 4 outlet wire LgR and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, exact meter relay is faulty. | Replace exact meter relay. |
| 4. Foot Brake Switch | (1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire WY and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between foot brake switch terminal NC outlet wire LgY and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, foot brake switch is faulty. | Replace foot brake switch. |
| 5. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-5-1




| EMERGENCY SWITCH | |
|---|---|
| POSITION | CONNECTION |
| F | 2-1 |
| N | - |
| R | 2-3 |

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | ○ | ○ | |
| ST | ○ | | ○ | ○ |

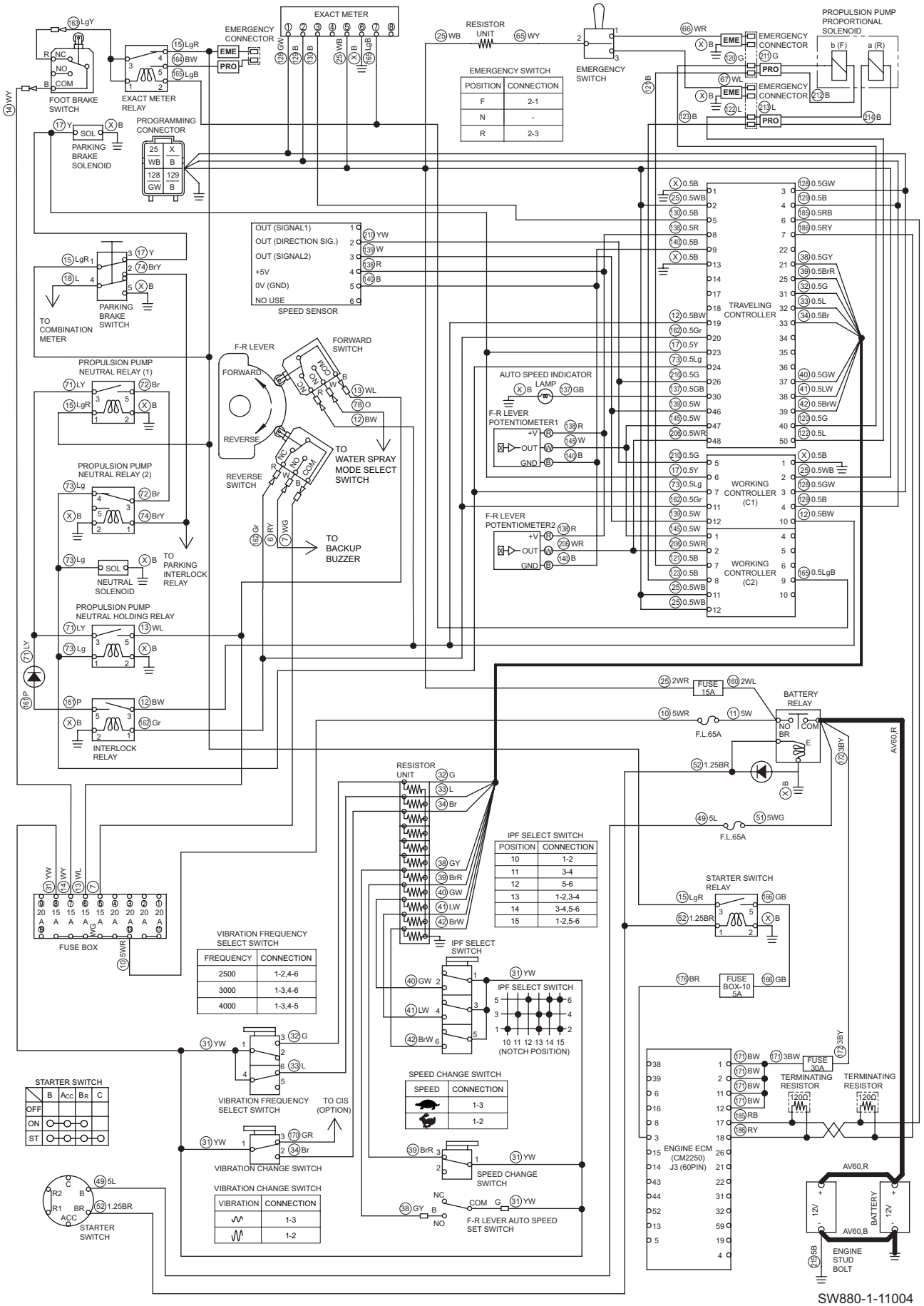
## 2-5-7. Brake does not work

- 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.: 2-5-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Parking Brake Solenoid | • Disconnect harness and measure resistance of coil.<br>Standard voltage : 12.3 Ω<br>• If measured resistance is abnormal, parking brake solenoid is faulty. | Replace parking brake solenoid. |
| 2. Parking Brake Switch | • When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire Y and chassis ground.<br>There is no electricity in normal condition.<br>• If there is electricity, parking brake switch is faulty. | Replace parking brake switch. |
| 3. Exact Meter Relay | • When starter switch is ON, measure voltage between exact meter relay terminal 4 outlet wire LgR and chassis ground.<br>There is no electricity in normal condition.<br>• If there is electricity, exact meter relay is faulty. | Replace exact meter relay. |
| 4. Foot Brake Switch | • When starter switch is ON, measure voltage between foot brake switch terminal NC outlet wire LgY and chassis ground.<br>There is no electricity in normal condition.<br>• If there is electricity, parking brake switch is faulty. | Replace foot brake switch. |
| 5. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-5-1




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

| 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 |

| VIBRATION FREQUENCY SELECT SWITCH | |
|---|---|
| FREQUENCY | CONNECTION |
| 2500 | 1-2,4-6 |
| 3000 | 1-3,4-6 |
| 4000 | 1-3,4-5 |

| SPEED CHANGE SWITCH | |
|---|---|
| SPEED | CONNECTION |
| 🐢 | 1-3 |
| 🐇 | 1-2 |

| VIBRATION CHANGE SWITCH | |
|---|---|
| VIBRATION | CONNECTION |
| ∿ | 1-3 |
| ⩙ | 1-2 |

| STARTER SWITCH | | | | |
|---|---|---|---|---|
| | B | ACC | BR | C |
| OFF | | | | |
| ON | ○ | | ○ | ○ |
| ST | ○ | | | ○ |

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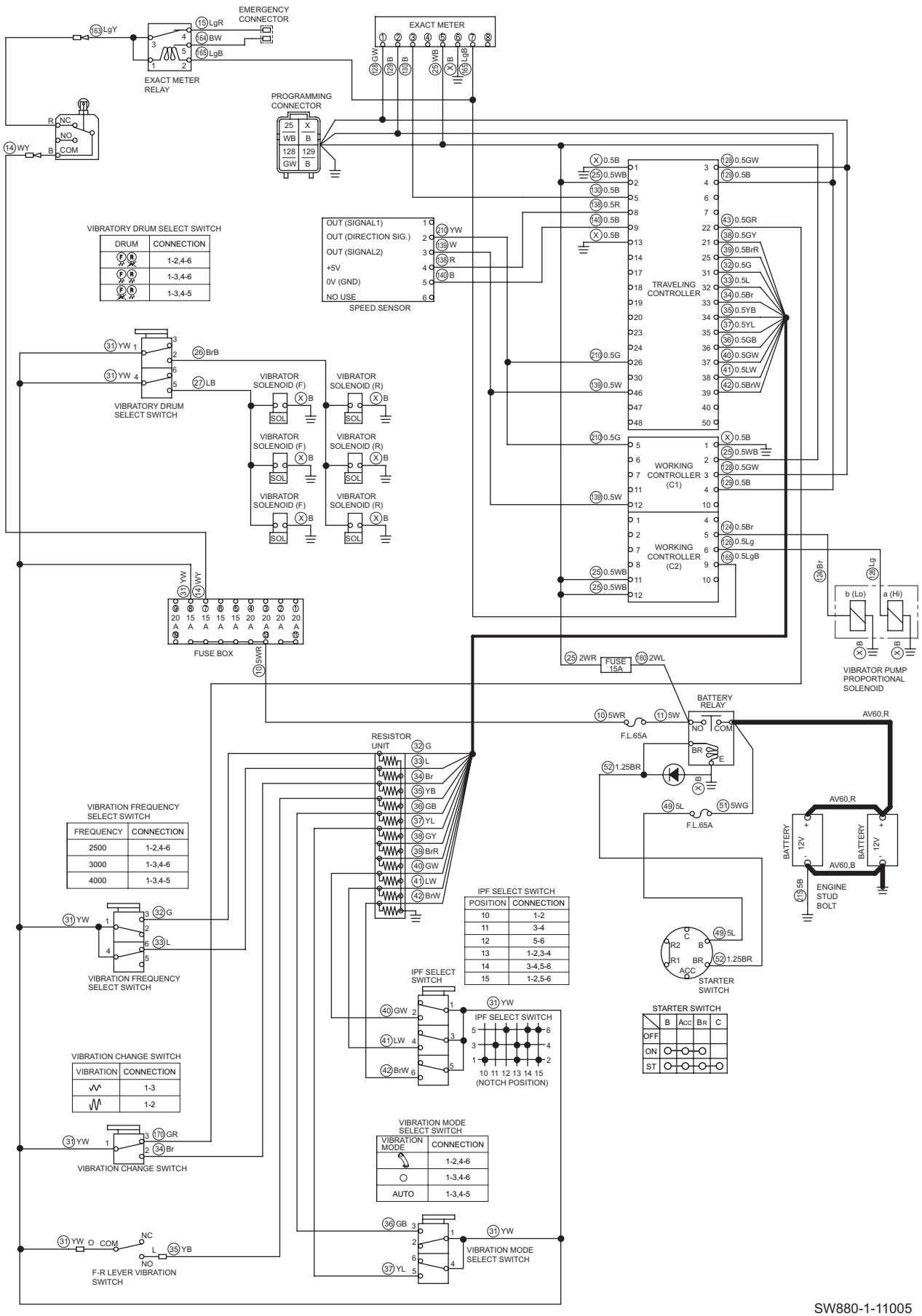
## 2-5-8. Emergency exit propulsion switch does not work

- Disconnect SWP-6F PRO (P.5-006) connector from engine harness side and connect emergency switch connector SWP-6F EME (P.5-006).

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

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Propulsion Pump Proportional Solenoid a (R) or b (F) | • Disconnect harness for propulsion pump proportional solenoid a (R) or b (F) and measure resistance of coils.<br>Standard voltage : 5.5 Ω<br>• If measured resistance is abnormal, propulsion pump proportional solenoid a (R) or b (F) is faulty. | Replace propulsion pump proportional solenoid. |
| 2. Emergency Switch | (1) When starter switch is ON, measure voltage between emergency switch terminal 2 inlet wire WY and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and emergency switch is “F”, measure voltage between emergency switch terminal 1 outlet wire WR and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON and emergency switch is “R”, measure voltage between emergency switch terminal 3 outlet wire WL and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) or (3) is NG, emergency switch is faulty. | Replace emergency switch. |
| 3. Resistor Unit | • Measure resistance between resistor unit terminal wire WB and terminal wire WY.<br>Standard resistance : 15 Ω<br>• If resistance is abnormal, resistor unit is faulty. | Replace resistor unit. |
| 4. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-6-1

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# 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 1/3

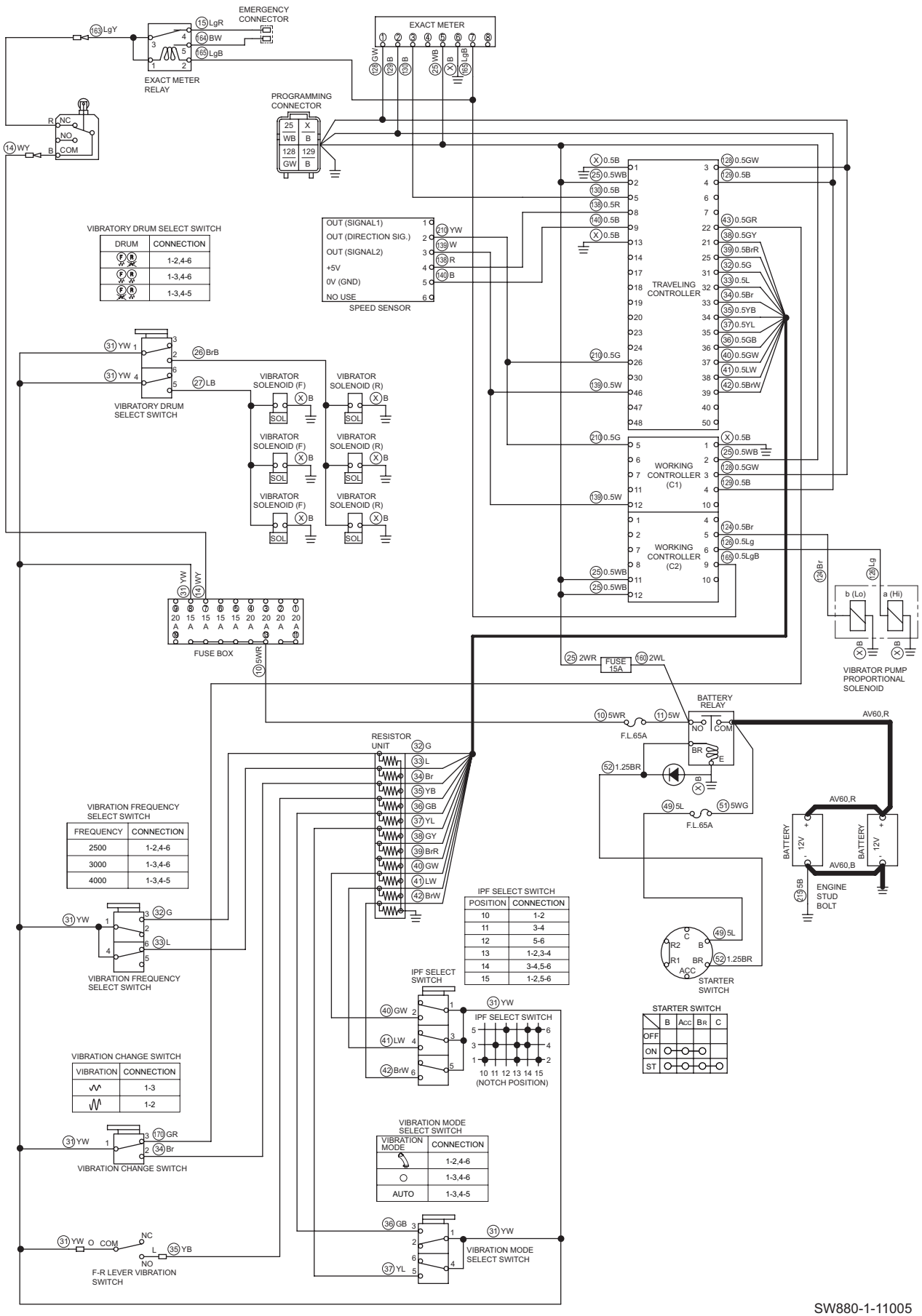
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Vibration mode select switch to “  ” (continuous mode).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E33 or E34 | 1. Connector | • Check vibrator pump proportional solenoid connector and working controller (C2) connector terminal 5, 6 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between vibrator pump proportional solenoid and working controller (C2) terminal wires.<br>• Vibrator pump proportional solenoid b (Lo) wire Br and working controller (C2) terminal 5 wire Br<br>• Vibrator pump proportional solenoid a (Hi) wire Lg and working controller (C2) terminal 6 wire Lg<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Vibrator Pump Proportional Solenoid a (Hi), b (Lo) | (1) Disconnect harness and measure resistance of coils.<br>Standard resistance: 5.5 Ω<br>(2) Check vibrator pump proportional solenoid a (Hi) and b (Lo) terminal wire B is grounded.<br>• If above item (1) or (2) is NG, vibrator pump proportional solenoid a (Hi) or b (Lo) is faulty. | Replace vibrator pump proportional solenoid |

# Fig.: 2-6-1

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## 2-6-1. No vibration occurs 2/3

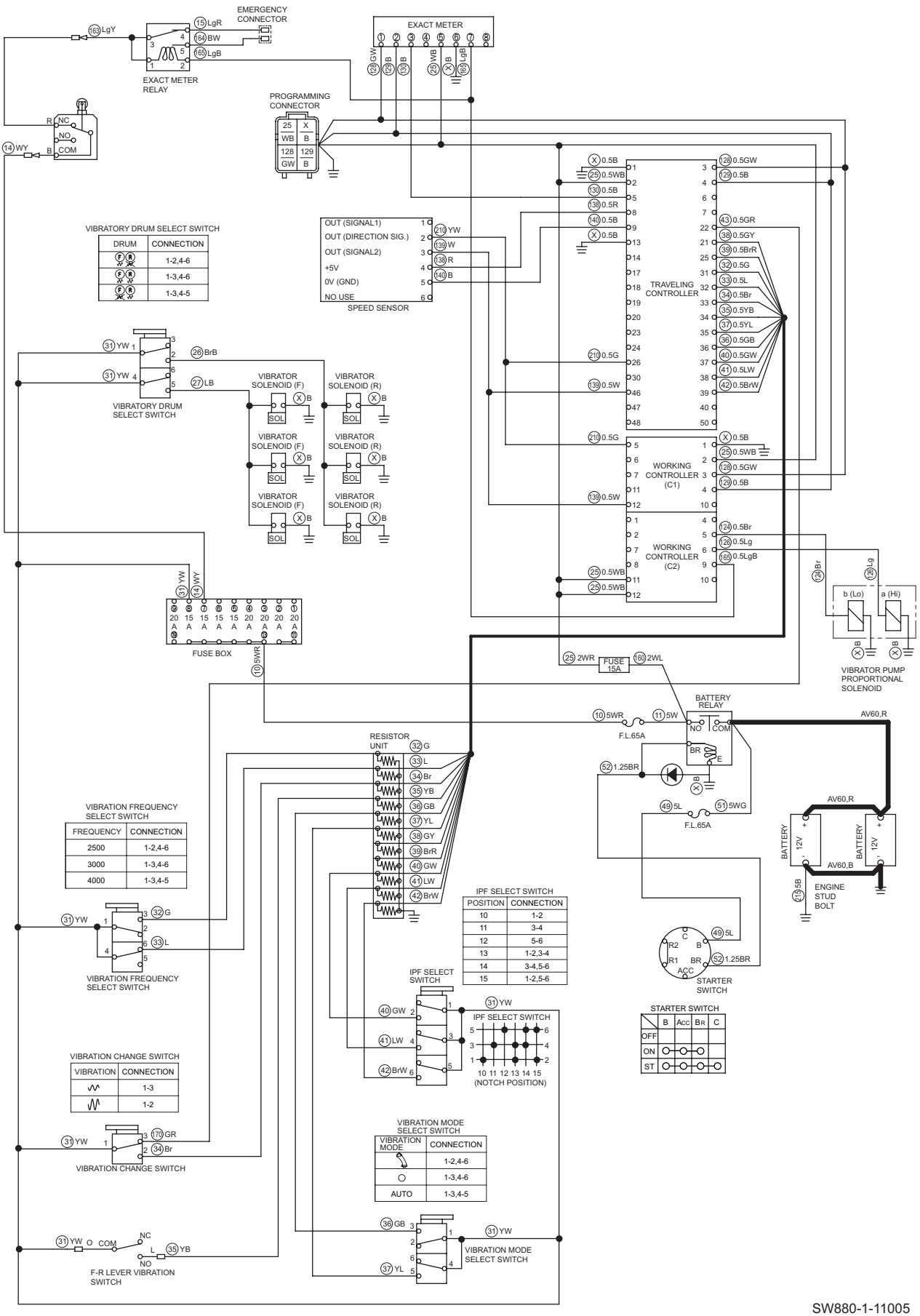
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Set vibration mode select switch to “ ” (continuous mode).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig.: 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E33 or E34 | 4. Traveling/ Working Controller | (1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wire.<br>• Traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B<br>• Working controller (C1) power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B<br>• Working controller (C2) power supply terminal 11, 12 inlet wires WB and working controller (C1) ground terminal 1 outlet wire B<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and measure current between vibration pump proportional solenoid terminal wires (positive side) and B (ground side).<br>• Vibrator pump proportional solenoid a (Hi) wire Lg (positive side) and wire B (ground side)<br>• Vibrator pump proportional solenoid b (Lo) wire Br (positive side) and wire B (ground side)<br>While measuring current, operate vibration frequency select switch, vibration mode select switch and vibration change switch as below.<br>• 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 vpm and vibration change switch is “ ”.<br>Standard current: Solenoid a (Hi): 960 mA<br>Solenoid b (Lo): 200 mA<br>• 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 vpm and vibration change switch is “ ”.<br>Standard current: Solenoid a (Hi): 200 m<br>Solenoid b (Lo): 1150 mA<br>• Vibration mode select switch is “ ” (Vibration is OFF)<br>Standard current: Solenoid a (Hi): 200 mA<br>Solenoid b (Lo): 200 mA<br>• If item (1) is OK and item (2) is NG, traveling/working controller is faulty.<br>**(NOTICE)**<br>**• Since current value is output in PWM, standard value shown above represent a maximum instantaneous value.** | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>③ Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-6-1

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## 2-6-1. No vibration occurs 3/3

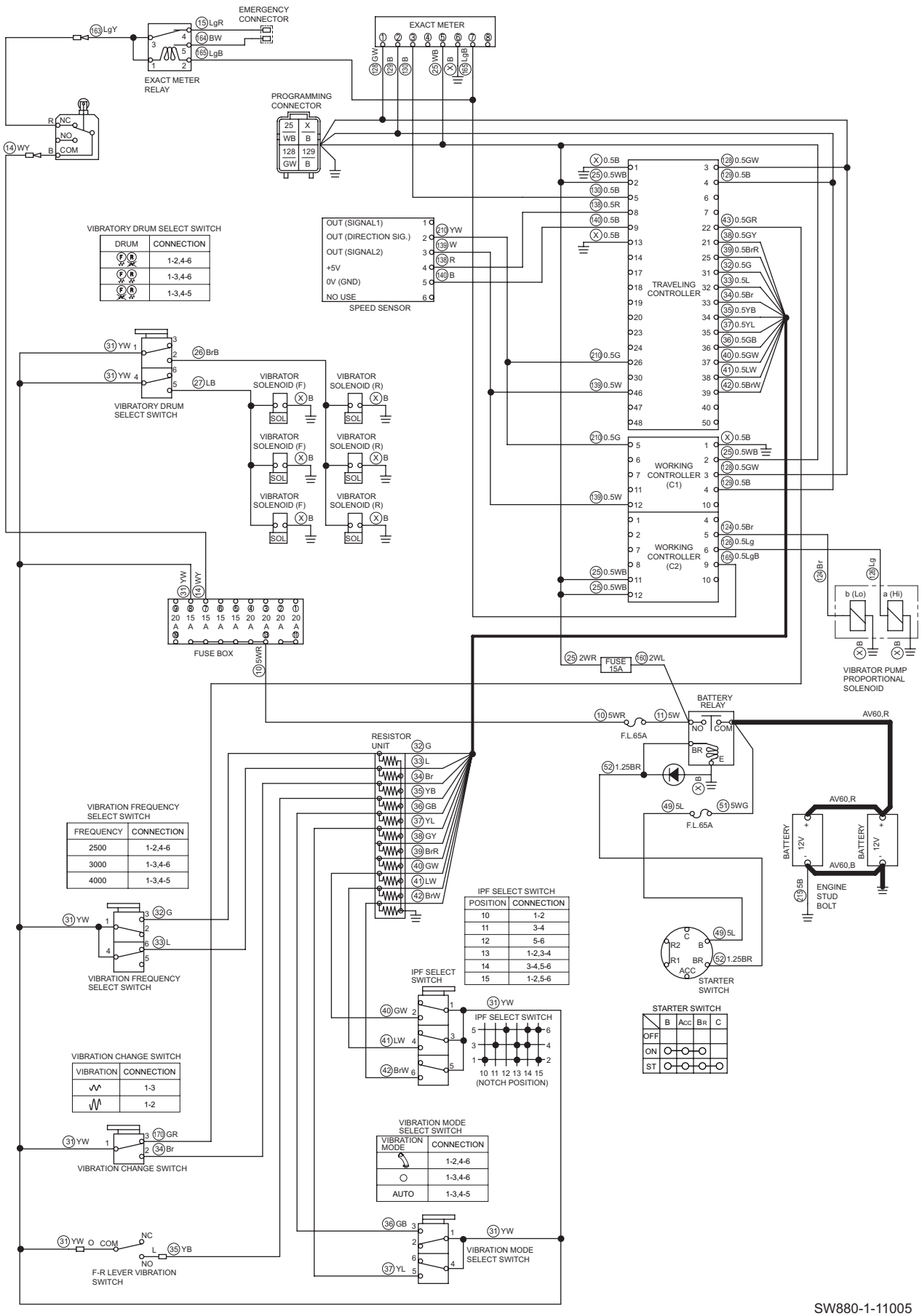
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Vibration mode select switch to“  ”.
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig.: 2-6-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Vibration Mode Select Switch | (1) When starter switch is ON, measure voltage between vibration mode select switch terminal 1, 4 inlet wires YW and chassis ground.<br>Standard voltage: 12 V or more<br>(2) When starter switch is ON, measure voltage between vibration mode select switch terminal wires and chassis ground.<br>• Vibration mode select switch terminal 3 outlet wire GB and chassis ground.<br>• Vibration mode select switch terminal 5 outlet wire YL and chassis ground.<br>There is no electricity in normal condition.<br>• If above item (1) is OK and electricity is found in item (2), vibration mode select switch is faulty. | Replace vibration mode select switch. |
| 2. F-R Lever Vibration Switch | • Depress F-R lever vibration switch and check continuity between F-R lever vibration switch terminal COM and NO.<br>There is continuity in normal condition.<br>• If there is no continuity, vibration F-R lever vibration switch is faulty.<br><br>**(NOTICE)**<br>**• Pressing F-R lever vibration switch turns on vibration and vibration is turned off when switch is pressed again.** | Replace F-R vibration lever switch. |
| 3. Resistor Unit | • Measure resistance between resistor unit wire No.35 wire YB and ground wire.<br>Standard resistance: 300 Ω<br>• If resistance is abnormal, the resistor unit is faulty.<br><br>**(NOTICE)**<br>**• Resistor unit is used to stabilize contact of switch.** | Replace resistor unit. |
| 4. Traveling Controller | • When starter switch is ON and depress F-R lever vibration switch, measure voltage between traveling controller terminal 34 inlet wire YB and terminal 1 wire B.<br>Standard voltage: 12 V or more<br>• If display shows no error code and the above item is OK, traveling controller is faulty. | Replace traveling controller. |
| 5. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance: 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-6-1

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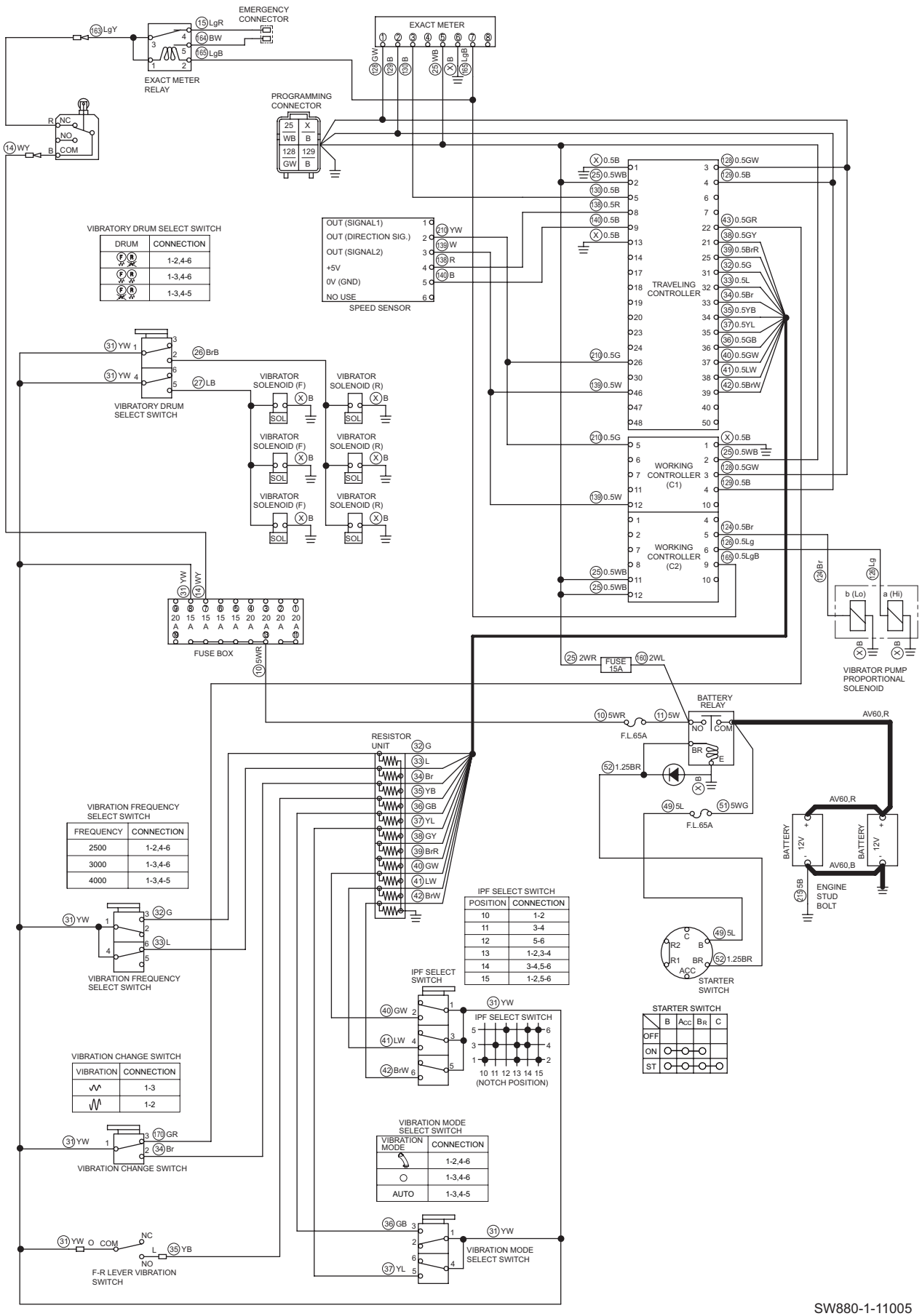
## 2-6-2. Vibration frequency cannot be switched 1/3

- Set vibration mode select switch to “  ” (continuous mode).
- Vibration frequency select switch is fixed at 4000 vpm, vibration change switch is “ ⋀⋀ ” when frequency cannot be switched.
- Check whether exact meter multiple display shows any error code.

**Reference Fig.: 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E21 | 1. Connector | • Check vibration frequency select switch, vibration change switch and traveling controller connector terminal 31, 32, 33 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistances between switches and traveling controller terminal wires.<br>• Vibration frequency select switch terminal 3 wire G and traveling controller terminal 31 wire G<br>• Vibration frequency select switch terminal 6 wire L and traveling controller terminal 32 wire L<br>• Vibration change switch terminal 2 wire Br and traveling controller terminal 33 wire Br.<br>Standard resistance : 10 Ω or less<br>(2) Measure resistances between switches and fuse box terminal wires.<br>• Vibration frequency select switch terminal 1, 4 wires YW, vibration change switch terminal 1 wire YW and fuse box terminal 8 wire YW.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Vibration Frequency Select Switch | (1) When starter switch is ON, measure voltage between vibration frequency select switch terminal 1, 4 inlet wires YW and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>• Vibration frequency select switch terminal 3 outlet wire G and chassis ground.<br>• Vibration frequency select switch terminal 6 outlet wire L and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and any of items (2) through (4) is NG, vibration frequency select switch is faulty. | Replace vibration frequency select switch. |

# Fig.: 2-6-1

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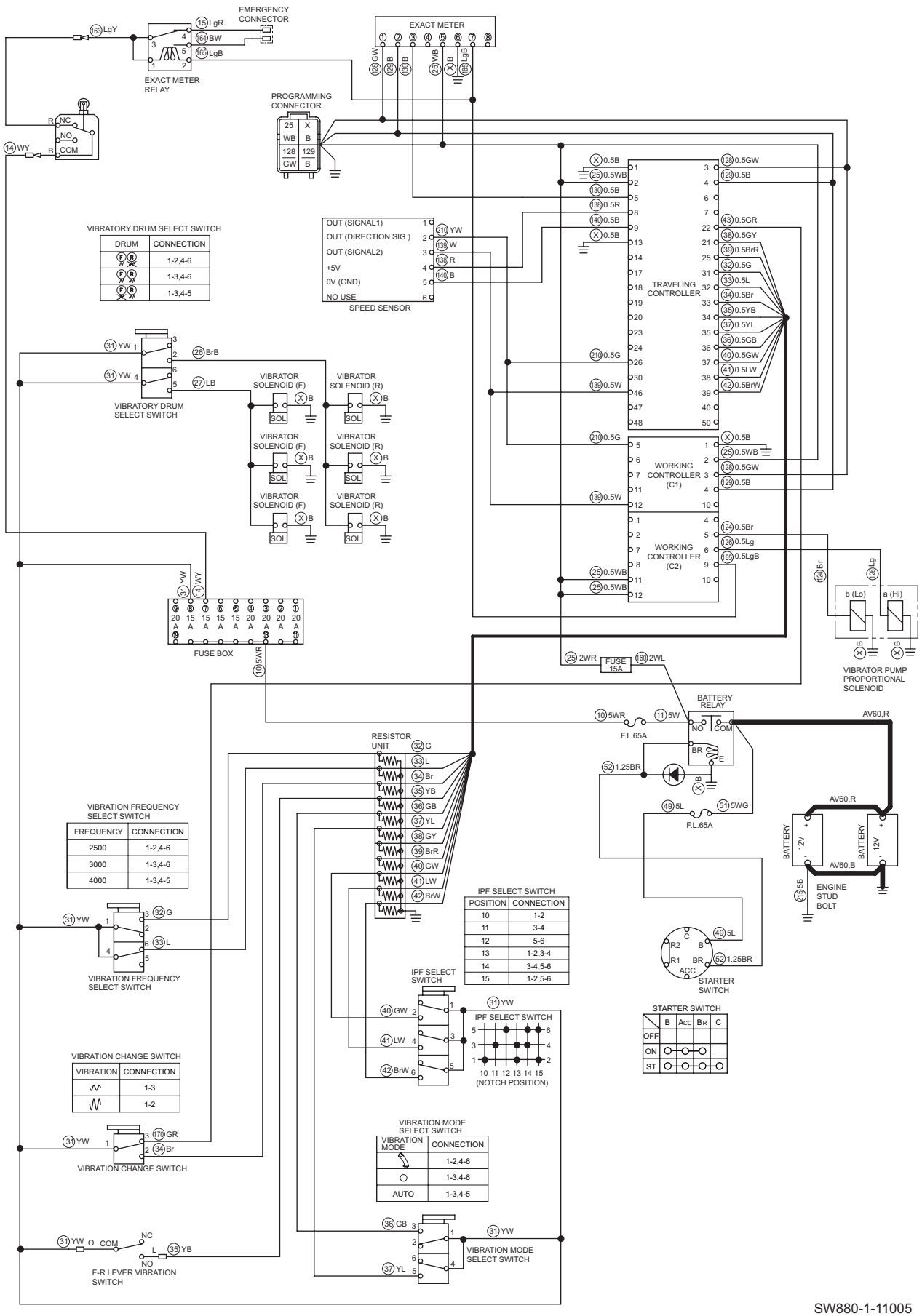
## 2-6-2. Vibration frequency cannot be switched 2/3

- Set vibration mode select switch to “  ” (continuous mode).
- Vibration frequency select switch is fixed at 4000 vpm, vibration change switch is “  ” when frequency cannot be switched.
- Check whether exact meter multiple display shows any error code.

**Reference Fig.: 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E21 | 4. Vibration Change Switch | (1) When starter switch is ON, measure voltage between vibration change switch terminal 1 inlet wire YW and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and vibration change switch is “  ”, measure voltage between vibration change switch terminal 2 outlet wire Br and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, vibration change switch is faulty. | Replace vibration change switch |
| | 5. Resistor Unit | • Measure resistance between resistor unit wires and ground wire.<br>• Resistor unit wire No.32 wire G and ground wire.<br>• Resistor unit wire No.33 wire L and ground wire.<br>• Resistor unit wire No.34 wire Br and ground wire.<br>Standard resistance : 300 Ω<br>• If resistance is abnormal, resistor unit is faulty.<br><br>**(NOTICE)**<br>**• Resistor unit is used to stabilize contact of switch.** | Replace resistor unit. |

# Fig.: 2-6-1


EMERGENCY CONNECTOR
EXACT METER
EXACT METER RELAY
PROGRAMMING CONNECTOR
VIBRATORY DRUM SELECT SWITCH
DRUM | CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
SPEED SENSOR
OUT (SIGNAL1)
OUT (DIRECTION SIG.)
OUT (SIGNAL2)
+5V
0V (GND)
NO USE
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
VIBRATORY DRUM SELECT SWITCH
VIBRATOR SOLENOID (F)
VIBRATOR SOLENOID (R)
FUSE BOX
FUSE 15A
VIBRATOR PUMP PROPORTIONAL SOLENOID
b (Lo)
a (Hi)
BATTERY RELAY
F.L.65A
RESISTOR UNIT
VIBRATION FREQUENCY SELECT SWITCH
FREQUENCY | CONNECTION
2500 | 1-2,4-6
3000 | 1-3,4-6
4000 | 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
10 11 12 13 14 15
(NOTCH POSITION)
VIBRATION CHANGE SWITCH
VIBRATION | CONNECTION
1-3
1-2
VIBRATION MODE SELECT SWITCH
VIBRATION MODE | CONNECTION
1-2,4-6
1-3,4-6
AUTO
1-3,4-5
F-R LEVER VIBRATION SWITCH
STARTER SWITCH
B | Acc | Br | C
OFF
ON
ST
AV60,R
AV60,B
BATTERY 12V
ENGINE STUD BOLT
SW880-1-11005

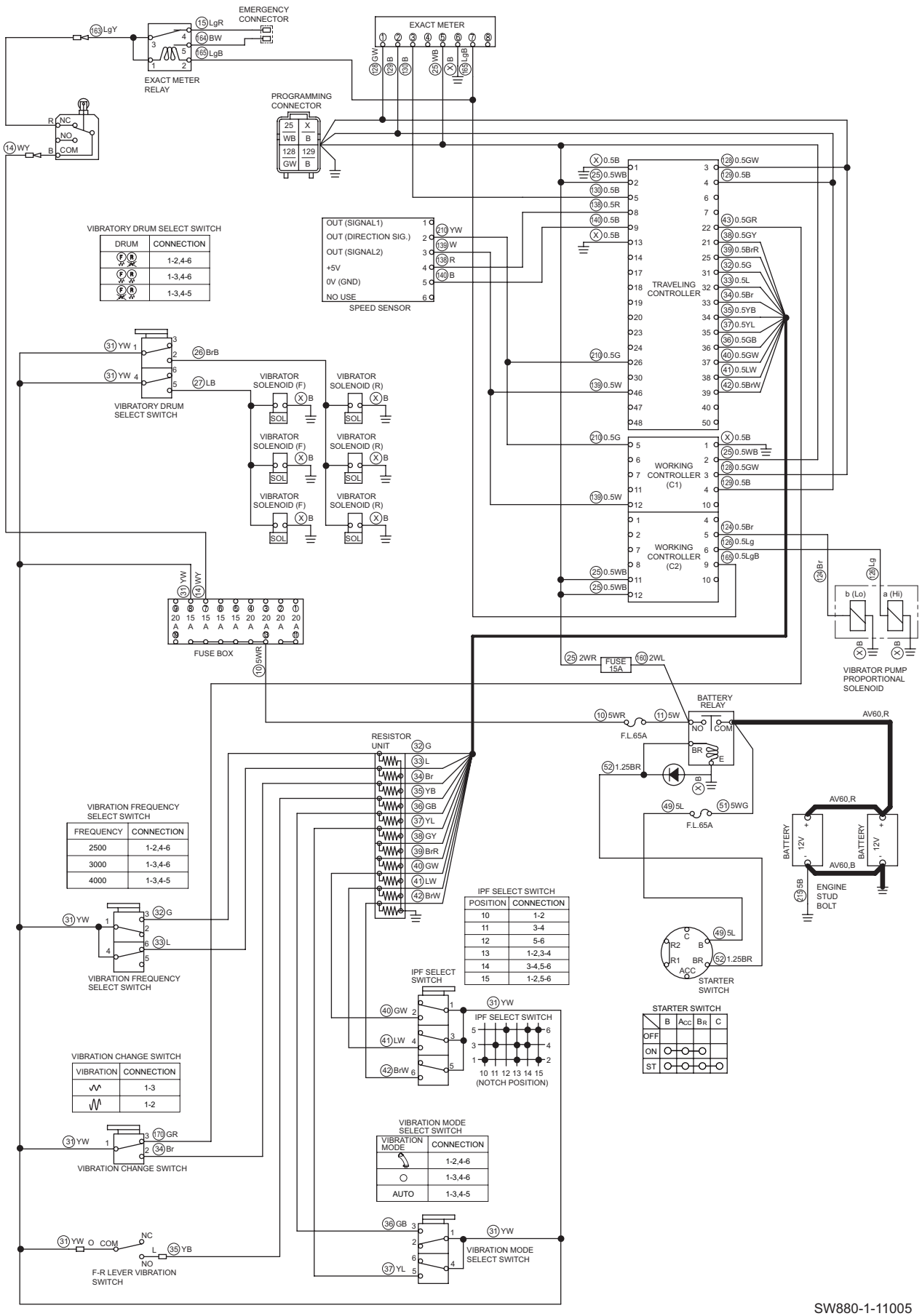
## 2-6-2. Vibration frequency cannot be switched 3/3

- Set vibration mode select switch to “  ” (continuous mode).
- Vibration frequency select switch is fixed at 4000 vpm, vibration change switch is “  ” when frequency cannot be switched.
- Check whether exact meter multiple display shows any error code.

**Reference Fig.: 2-6-1**

| 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 WB and ground terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between traveling controller terminal 32 inlet wire L and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between traveling controller terminal wires.<br>• Traveling controller terminal 31 inlet wire G and terminal 1 wire B<br>• Traveling controller terminal 32 inlet wire L and terminal 1 wire B<br>Standard voltage : 12 V or more<br>(4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between traveling controller terminal 31 inlet wire G and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(5) When starter switch is ON and vibration change switch is “  ”, measure voltage between traveling controller terminal 33 inlet wire Br and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>• If above items (1), (2), (3), (4) and (5) 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.<br>② Exact meter will display vehicle speed.<br>③ Check all combinations of vibration frequency select switch and vibration change switch positions.<br>Exact meter will still display vehicle speed. Machine is normal state.<br>If display changes form vehicle speed to E21, check above items again. | |

# Fig.: 2-6-1

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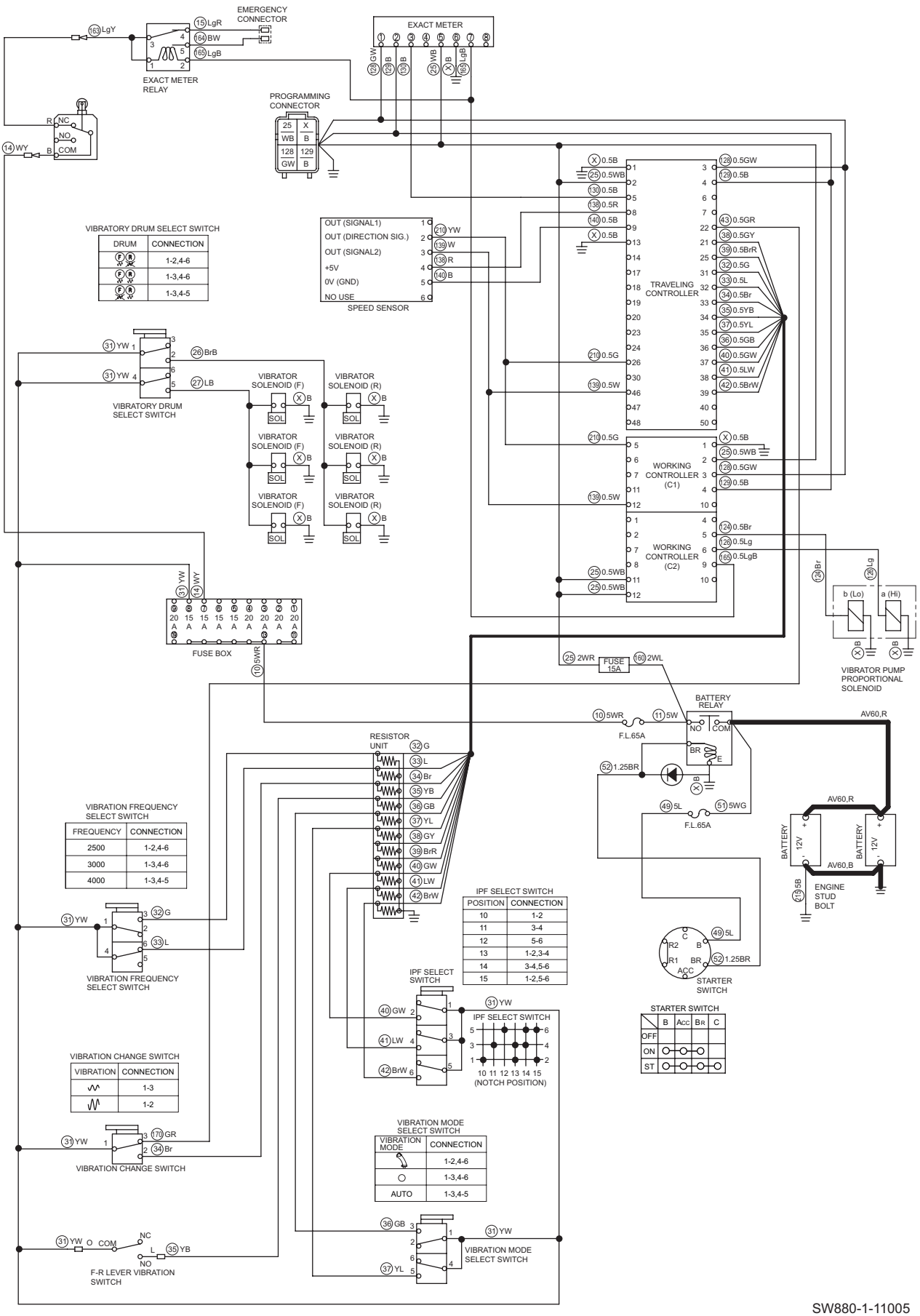
## 2-6-3. Continuous/automatic vibration mode cannot be switched 1/2

**Reference Fig. : 2-6-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Vibration Mode Select Switch | (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.<br>Standard voltage : 12 V<br>(2) When starter switch is ON and vibration mode select switch is “  ”, measure voltage between vibration mode select switch terminal wires and chassis ground.<br>• Vibration mode select switch terminal 3 outlet wire GB and chassis ground.<br>• Vibration mode select switch terminal 5 outlet wire YL and chassis ground.<br>There is no electricity in normal condition.<br>(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.<br>• Vibration mode select switch terminal 3 outlet wire GB and chassis ground.<br>• Vibration mode select switch terminal 5 outlet wire YL and chassis ground.<br>Standard voltage : 12 V<br>• If above item (1) is OK and item (2) or (3) is NG, vibration mode select switch is faulty. | Replace vibration mode select switch. |
| 2. Resistor Unit | • Measure resistance between resistor unit wires and ground wire.<br>• Resistor unit wire No.36 inlet wire GB and ground wire B.<br>• Resistor unit wire No.37 wire YL and ground wire B.<br>Standard resistance : 300 Ω<br>• If resistance is abnormal, resistor unit is faulty.<br><br>**(NOTICE)**<br>**• Resistor unit is used to stabilize contact of switch.** | Replace resistor unit. |

# Fig.: 2-6-1

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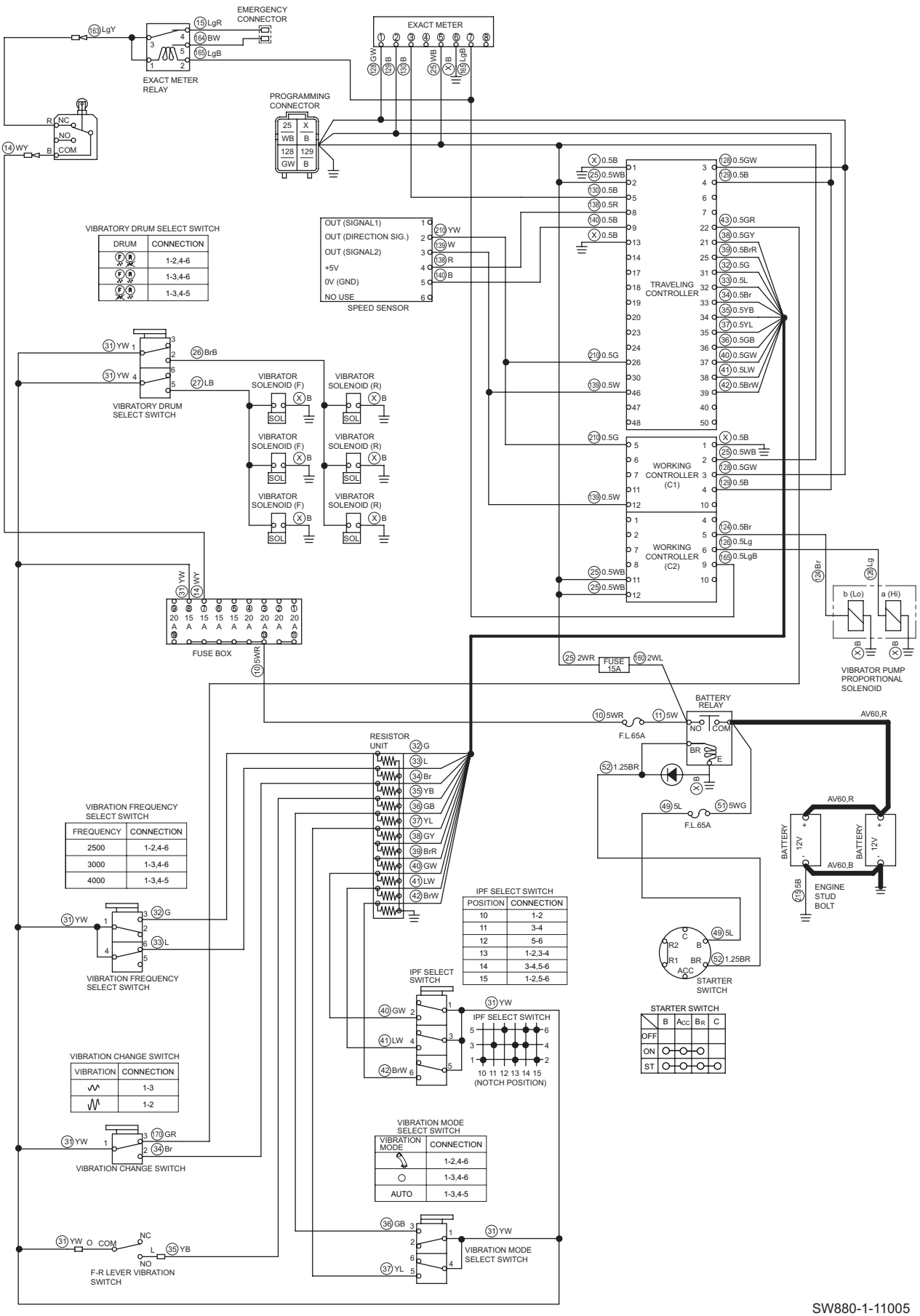
## 2-6-3. Continuous/automatic vibration mode cannot be switched 2/2

**Reference Fig. : 2-6-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 3. Traveling Controller | (1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and vibration mode select switch is “  ”, measure voltage between traveling controller terminal wires and terminal 1 wire B.<br>• Traveling controller terminal 36 inlet wire GB and terminal 1 wire B.<br>• Traveling controller terminal 35 inlet wire YL and terminal 1 wire B.<br>There is no electricity in normal condition.<br>(3) When starter switch is ON and vibration mode select switch is “AUTO”, measure voltage between traveling controller terminal wires and terminal 1 wire B.<br>• Traveling controller terminal 36 inlet wire GB and terminal 1 wire B.<br>• Traveling controller terminal 35 inlet wire YL and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>• If above item (1), (2) or (3) is OK, traveling controller is faulty. | Replace traveling controller. |
| 4. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-6-1

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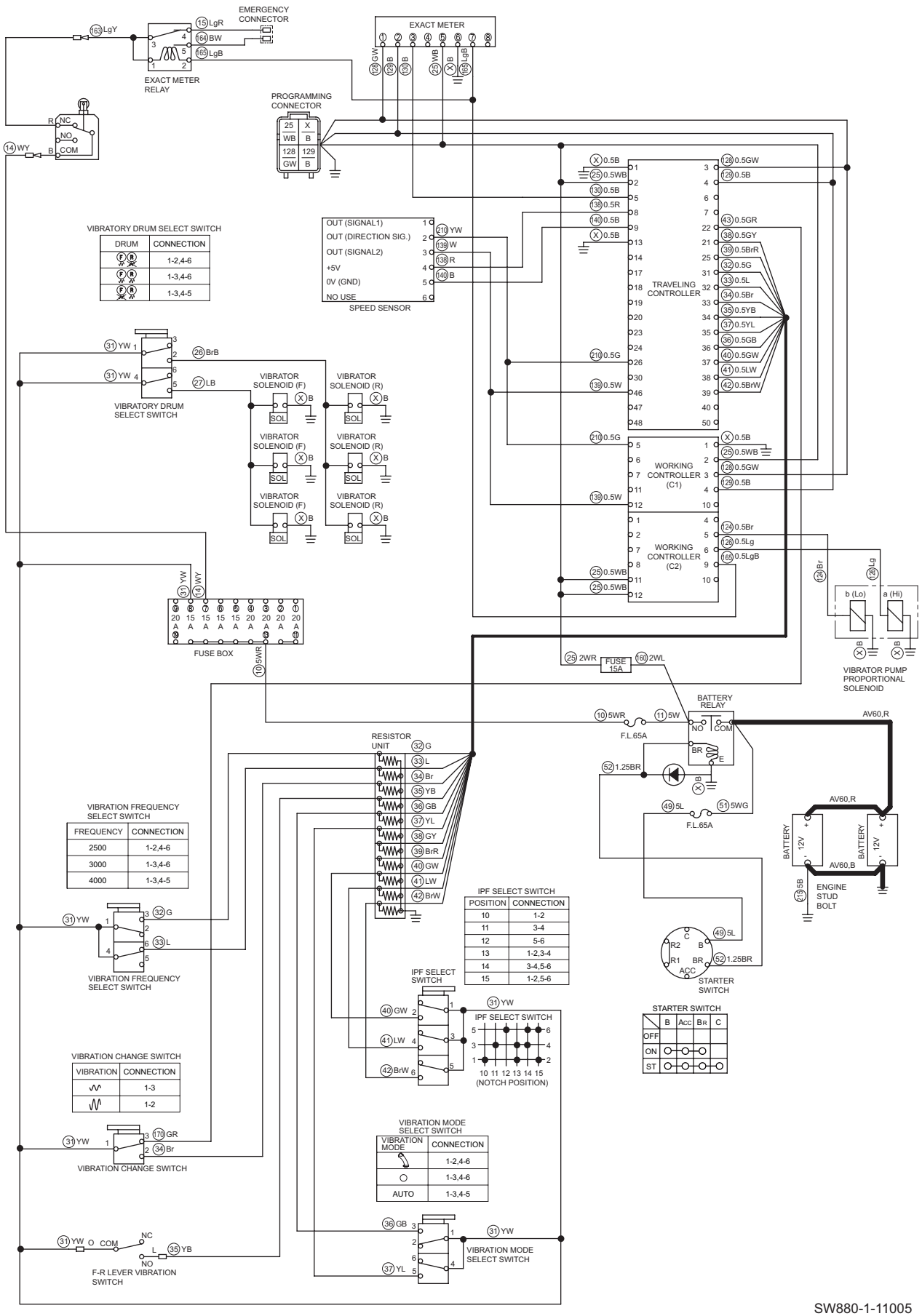
## 2-6-4. Front and rear vibratory drums cannot perform one-drum vibration

**Reference Fig. : 2-6-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Vibrator Solenoid (F) or (R) (3 each for front and rear) | • Disconnect each harness of vibrator solenoid (F) or (R) (3 each for front and rear) in front or rear drum and measure resistance of coil.<br>Standard resistance : 7.2 Ω<br>• If resistance is abnormal, vibrator solenoid (F) or (R) is faulty. | Replace vibrator solenoid (F) or (R). |
| 2. Vibratory Drum Select Switch | (1) When starter switch is ON, measure voltage between vibratory drum select switch terminal 1, 4 inlet wires YW and chassis ground.<br>Standard voltage: 12 V<br>(2) When starter switch is ON and vibratory drum select switch is " (F)(R) ", measure voltage between vibratory drum select switch terminal wires and chassis ground.<br>• Vibratory drum select switch terminal 2 outlet wire BrB and chassis ground.<br>• Vibratory drum select switch terminal 5 outlet wire LB and chassis ground.<br>There is no electricity in normal condition.<br>(3) When starter switch is ON and vibratory drum select switch is " (F)(R) ", measure voltage between vibratory drum select switch terminal 2 outlet wire BrB and chassis ground.<br>Standard voltage : 12 V<br>(4) When starter switch is ON and vibratory drum select switch is " (F)(R) ", measure voltage between vibratory drum select switch terminal 5 outlet wire LB and chassis ground.<br>Standard voltage : 12 V<br>• If above item (1) is OK and any of items (2) through (4) is NG, vibratory drum select switch is faulty. | Replace vibratory drum select switch. |
| 3. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-6-1

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# 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 1/9

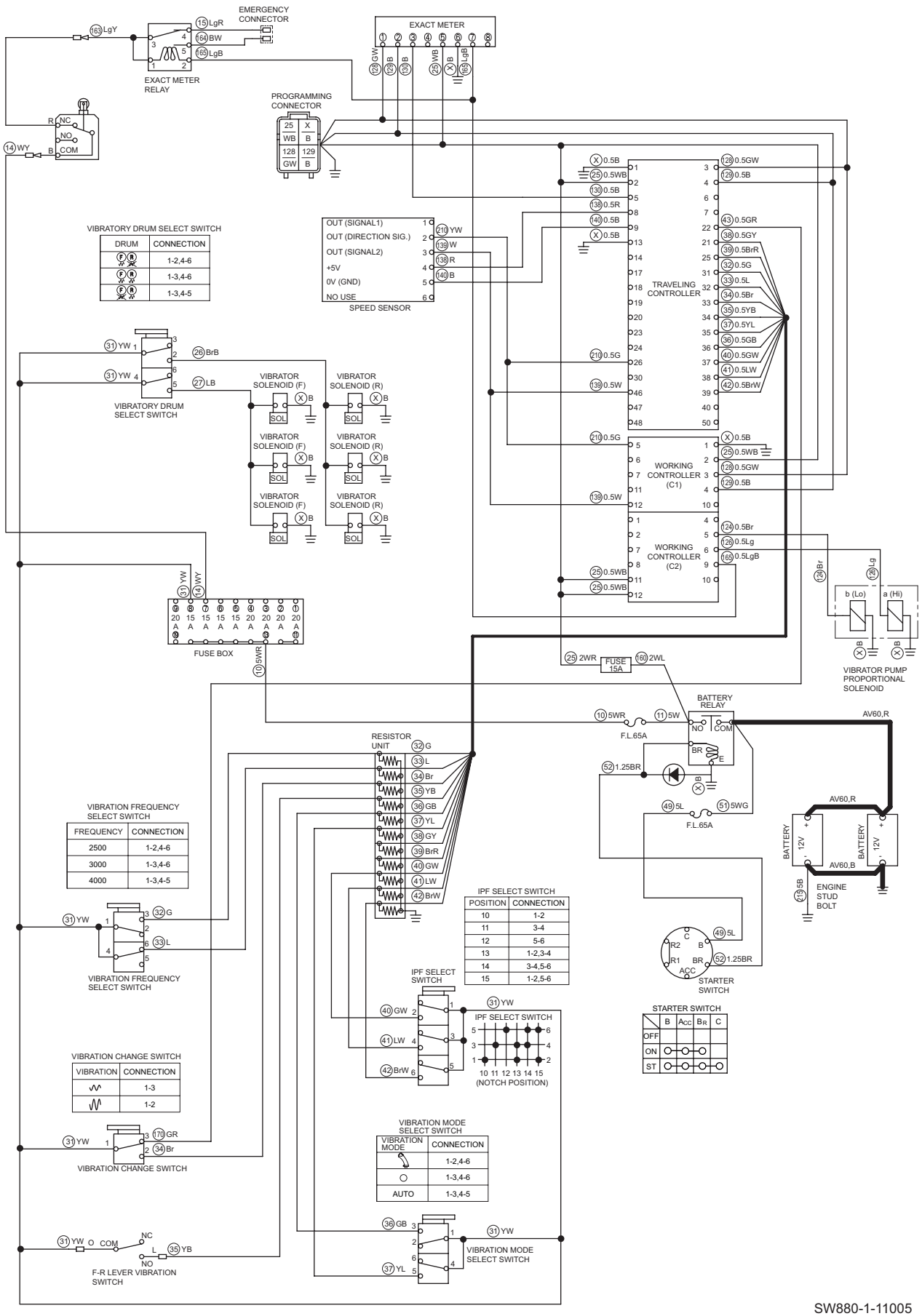
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E11 | 1. Connector | • Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller (C1) connector terminal 5, 12 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between speed sensor and traveling/working controller terminal wires.<br>• Speed sensor terminal 2 wire YW and traveling controller terminal 26 wire G, working controller (C1) terminal 5 wire G<br>• Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller (C1) terminal 12 wire G<br>• Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R<br>• Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | 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 outlet wire B.<br>Standard voltage : 5 ± 0.25 V<br>(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.<br>Standard pulse : 21 pulses/rotation<br>• If above item (1) is OK and item (2) is NG, speed sensor is faulty. | Replace speed sensor. |
| | 4. Traveling/ Working Controller | • 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. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, start engine.<br>② Exact meter will display E11.<br>③ Move F-R lever “F” or “R” and run machine.<br>④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-6-1




SW880-1-11005

## 2-7-1. Exact meter indicator lamp does not illuminate while driving 2/9

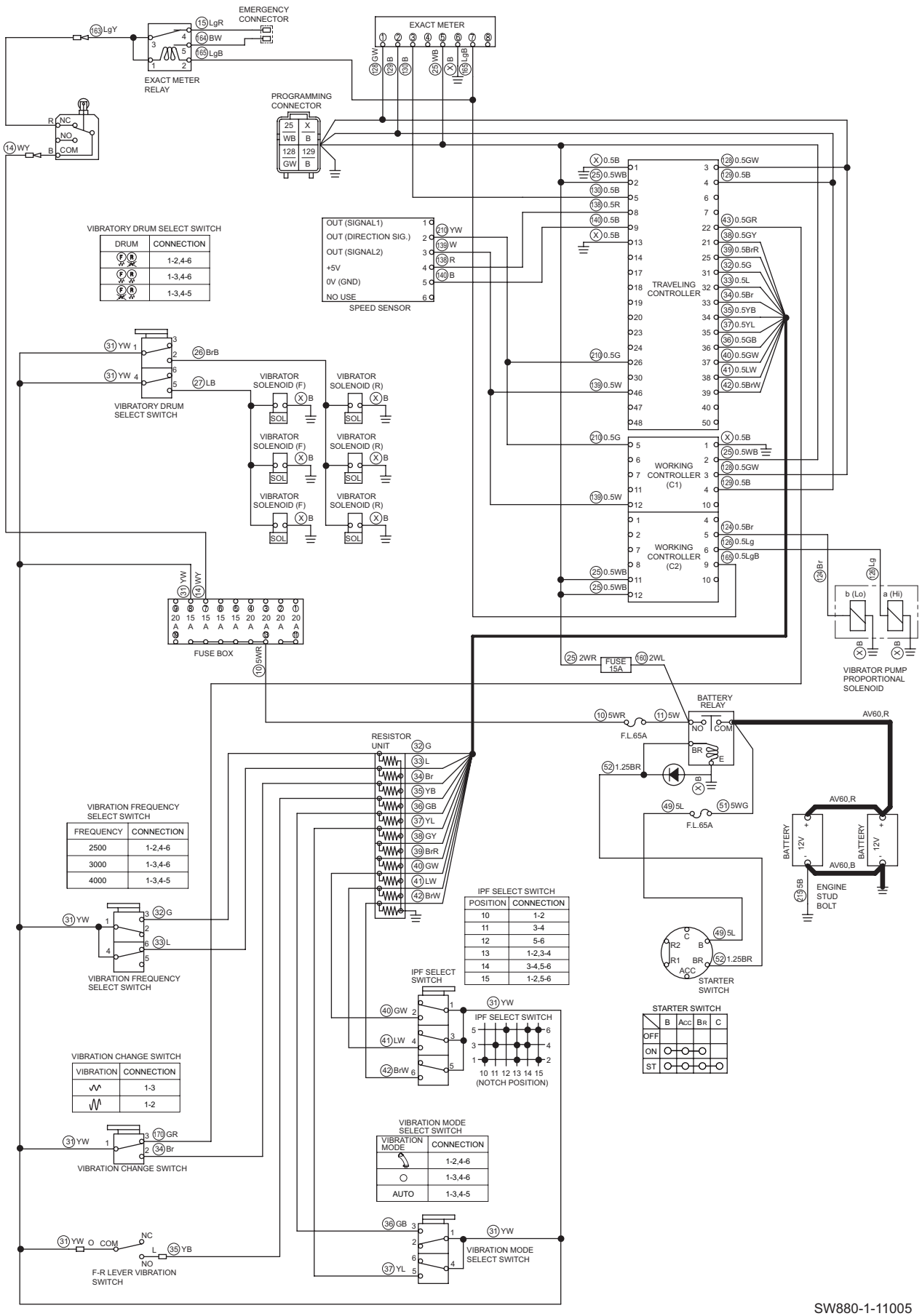
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E21 | 1. Connector | • Check vibration frequency select switch, vibration change switch and traveling controller connector terminal 31, 32, 33 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistances between switches and traveling controller terminal wires.<br>• Vibration frequency select switch terminal 3 wire G and traveling controller terminal 31 wire G<br>• Vibration frequency select switch terminal 6 wire L and traveling controller terminal 32 wire L<br>• Vibration change switch terminal 2 wire Br and traveling controller terminal 33 wire Br<br>Standard resistance : 10 Ω or less<br>(2) Measure resistances between switches and fuse box terminal wires.<br>• Vibration frequency select switch terminal 1, 4 wires YW, vibration change switch terminal 1 wire YW and fuse box terminal 8 wire YW<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | 3. Vibration Frequency Select Switch | (1) When starter switch is ON, measure voltage between vibration frequency select switch terminal 1, 4 inlet wires YW and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON, vibration frequency select switch is “3000”, measure voltage between vibration frequency select switch terminal wires and chassis ground.<br>• Vibration frequency select switch terminal 3 outlet wire G and chassis ground.<br>• Vibration frequency select switch terminal 6 outlet wire L and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2), (3) or (4) is NG, vibration frequency select switch is faulty. | Replace vibration frequency select switch. |

# Fig.: 2-6-1




SW880-1-11005

## 2-7-1. Exact meter indicator lamp does not illuminate while driving 3/9

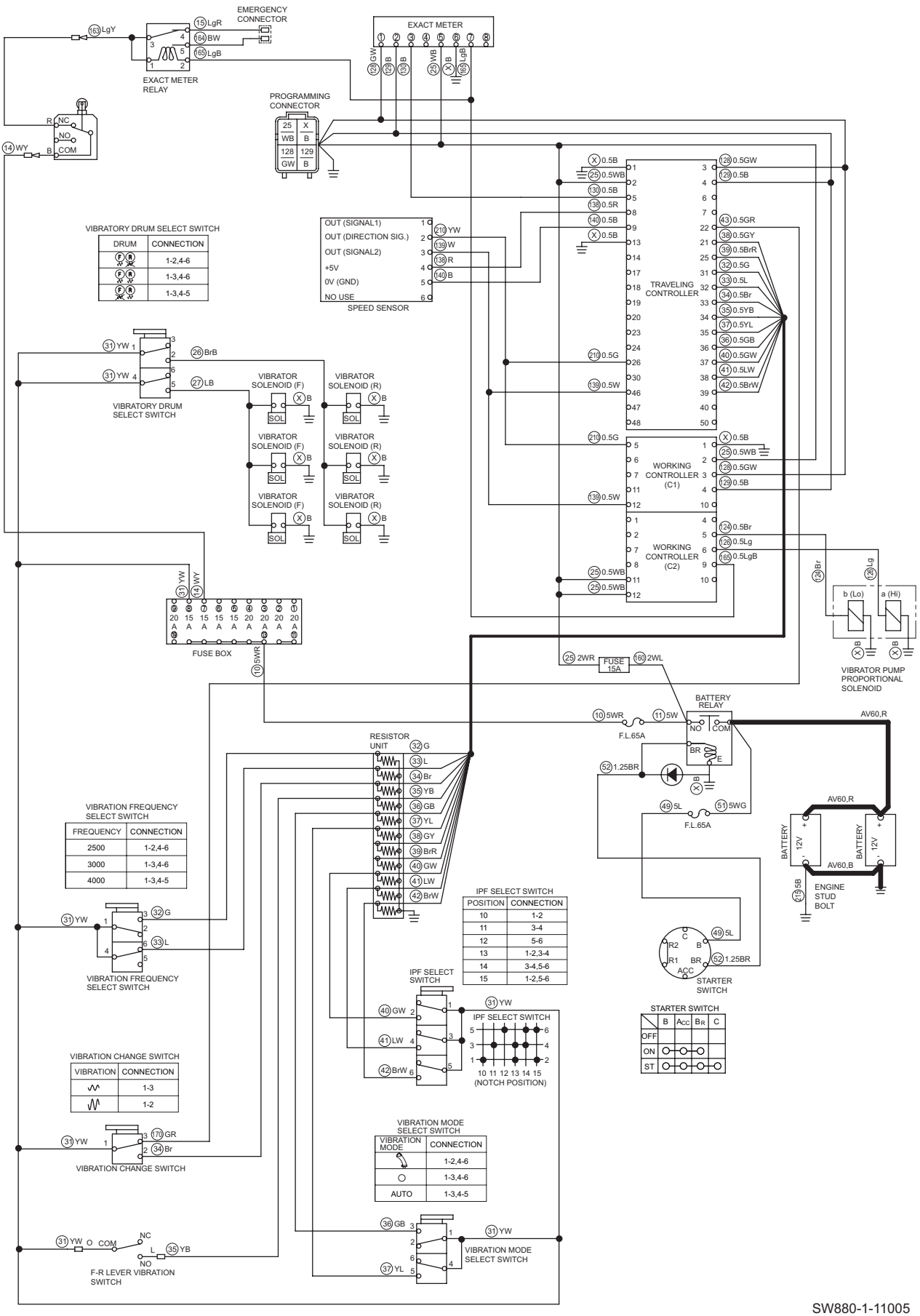
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E21 | 4. Vibration Change Switch | (1) When starter switch is ON, measure voltage between vibration change switch terminal 1 inlet wire YW and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and vibration change switch is “ ∿ ”, measure voltage between vibration change switch terminal 3 outlet wire GR and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON and vibration change switch is “ ⩘ ” measure voltage between vibration change switch terminal 2 outlet wire Br and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) or (3) is NG, vibration change switch is faulty. | Replace vibration change switch. |
| | 5. Resistor Unit | • Measure resistances between resistor unit wires and ground wire.<br>• Resistor unit wire No.32 wire G and ground wire<br>• Resistor unit wire No.33 wire L and ground wire<br>• Resistor unit wire No.34 wire Br and ground wire<br>Standard resistance : 300 Ω<br>• If resistance is abnormal, resistor unit is faulty.<br><br>**(NOTICE)**<br>**• Resistor unit is used to stabilize contact of switch.** | Replace resistor unit. |

# Fig.: 2-6-1




SW880-1-11005

## 2-7-1. Exact meter indicator lamp does not illuminate while driving 4/9

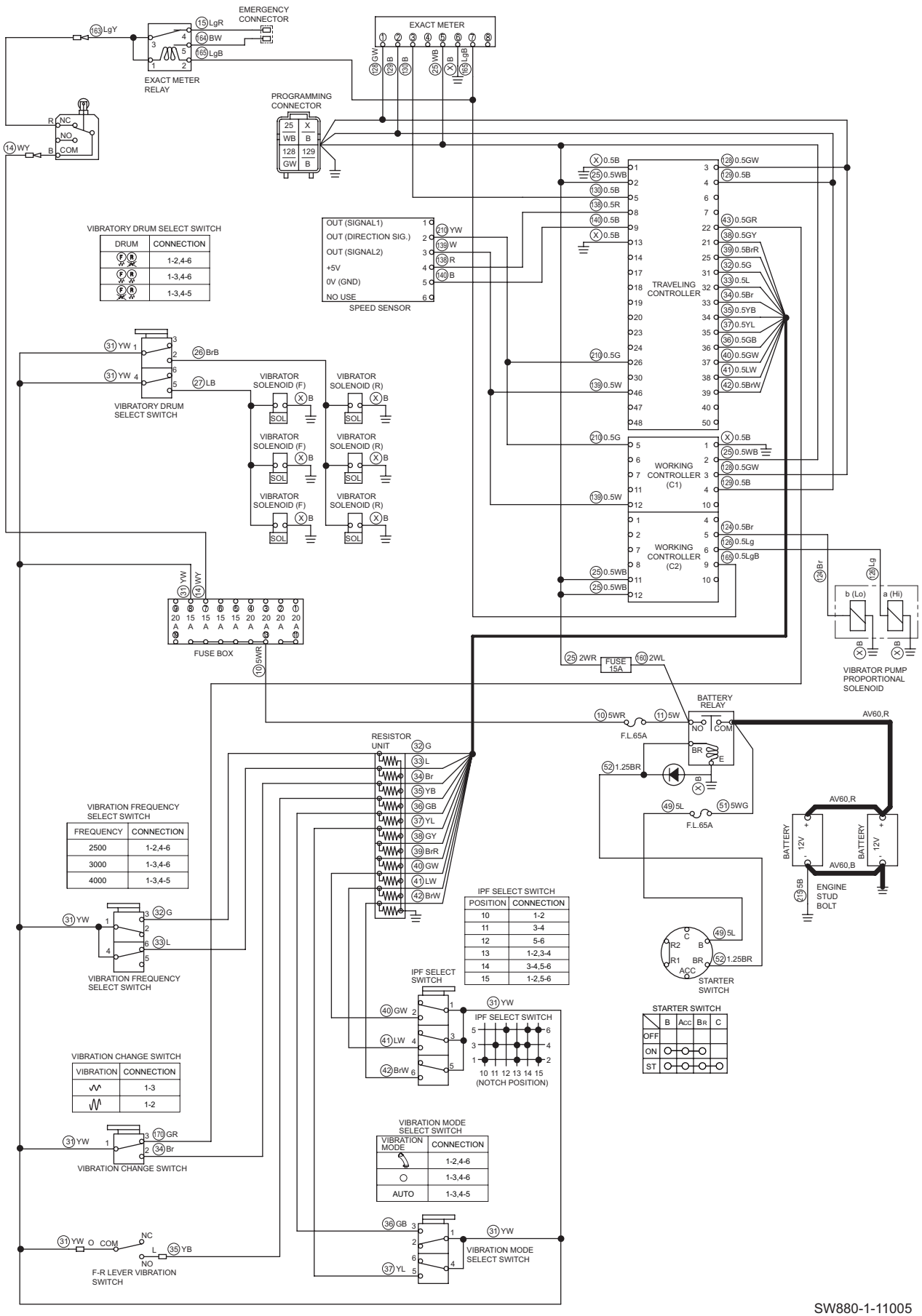
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| 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 WB and ground terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between traveling controller terminal 32 inlet wire L and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between traveling controller terminal wires.<br>• Traveling controller terminal 31 inlet wire G and terminal 1 wire B<br>• Traveling controller terminal 32 inlet wire L and terminal 1 wire B<br>Standard voltage : 12 V or more<br>(4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between traveling controller terminal 31 inlet wire G and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(5) When starter switch is ON and vibration change switch is “  ” measure voltage between traveling controller terminal 33 inlet wire Br and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>• If above items (1), (2), (3), (4) and (5) 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.<br>② Exact meter will display vehicle speed.<br>③ Check all combinations of vibration frequency select switch and vibration change switch positions.<br>Exact meter will still display vehicle speed. Machine is in normal state.<br>If display changes form vehicle speed to E21, check above items again. | |

# Fig.: 2-6-1


EMERGENCY CONNECTOR
EXACT METER
EXACT METER RELAY
PROGRAMMING CONNECTOR
VIBRATORY DRUM SELECT SWITCH
DRUM | CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
SPEED SENSOR
OUT (SIGNAL1)
OUT (DIRECTION SIG.)
OUT (SIGNAL2)
+5V
0V (GND)
NO USE
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
VIBRATORY DRUM SELECT SWITCH
VIBRATOR SOLENOID (F)
VIBRATOR SOLENOID (R)
FUSE BOX
FUSE 15A
VIBRATOR PUMP PROPORTIONAL SOLENOID
BATTERY RELAY
F.L.65A
RESISTOR UNIT
VIBRATION FREQUENCY SELECT SWITCH
FREQUENCY | CONNECTION
2500 | 1-2,4-6
3000 | 1-3,4-6
4000 | 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
10 11 12 13 14 15 (NOTCH POSITION)
STARTER SWITCH
VIBRATION CHANGE SWITCH
VIBRATION | CONNECTION
1-3
1-2
VIBRATION MODE SELECT SWITCH
VIBRATION MODE | CONNECTION
1-2,4-6
1-3,4-6
AUTO | 1-3,4-5
F-R LEVER VIBRATION SWITCH
AV60,R
AV60,B
BATTERY
ENGINE STUD BOLT
SW880-1-11005

## 2-7-1. Exact meter indicator lamp does not illuminate while driving 5/9

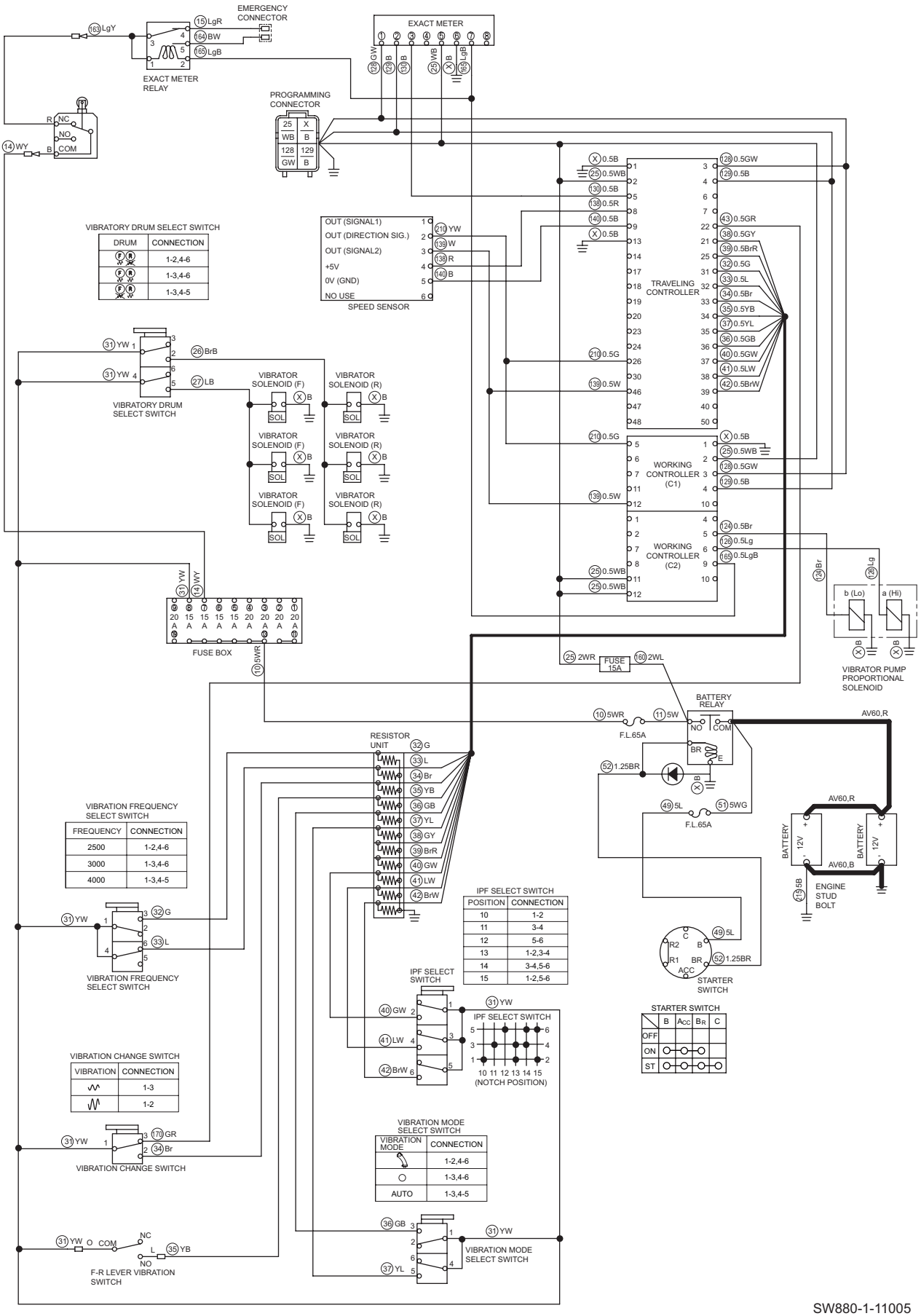
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E22 | 1. Connector | • Check IPF select switch connector and traveling controller connector terminal 37, 38, 39 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | (1) Measure resistances between IPF select switch and traveling controller terminal wires.<br>• IPF select switch terminal 2 wire GW and traveling controller terminal 37 wire GW<br>• IPF select switch terminal 4 wire LW and traveling controller terminal 38 wire LW<br>• IPF select switch terminal 6 wire BrW and traveling controller terminal 39 wire BrW<br>Standard resistance : 10 Ω or less<br>(2) Measure resistances between IPF select switch terminal 1, 3, 5 wires YW and fuse box terminal 8 wire YW.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-6-1




SW880-1-11005

## 2-7-1. Exact meter indicator lamp does not illuminate while driving 6/9

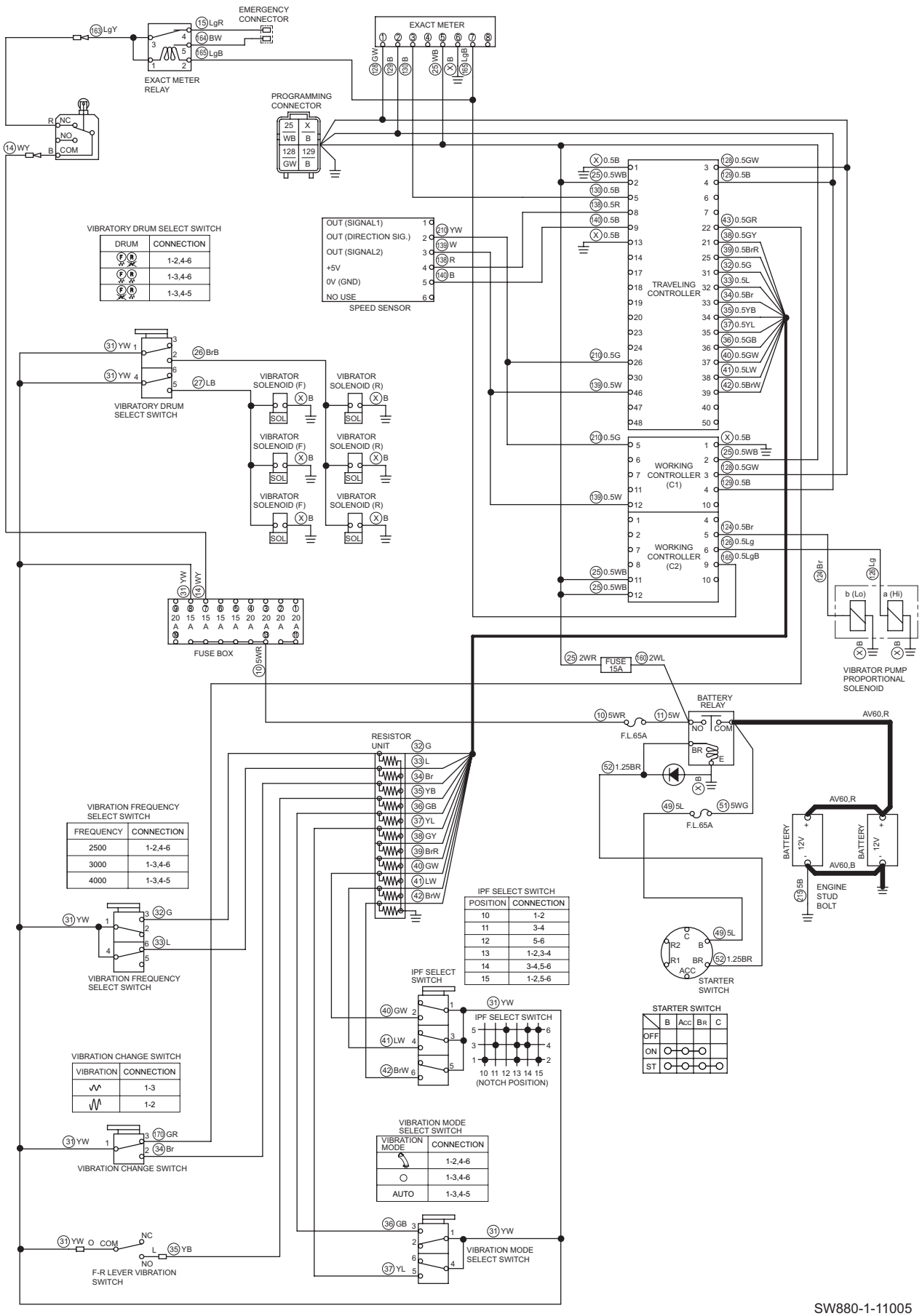
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E22 | 3. IPF Select Switch | (1) When starter switch is ON, measure voltage between IPF select switch terminal 1, 3, 5 inlet wires YW and chassis ground.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and any of items (2) through (7) is NG, IPF select switch is faulty. | Replace IPF select switch. |
| | 4. Resistor Unit | • Measure resistances between resistor unit wires and ground wire.<br>• Resistor unit wire No.40 wire GW and ground wire<br>• Resistor unit wire No.41 wire LW and ground wire<br>• Resistor unit wire No.42 wire BrW and ground wire<br>Standard resistance : 300 Ω<br>• If resistance is abnormal, resistor unit is faulty.<br><br>**(NOTICE)**<br>**• Resistor unit is used to stabilize contact of switch.** | Replace resistor unit. |

# Fig.: 2-6-1




SW880-1-11005

## 2-7-1. Exact meter indicator lamp does not illuminate while driving 7/9

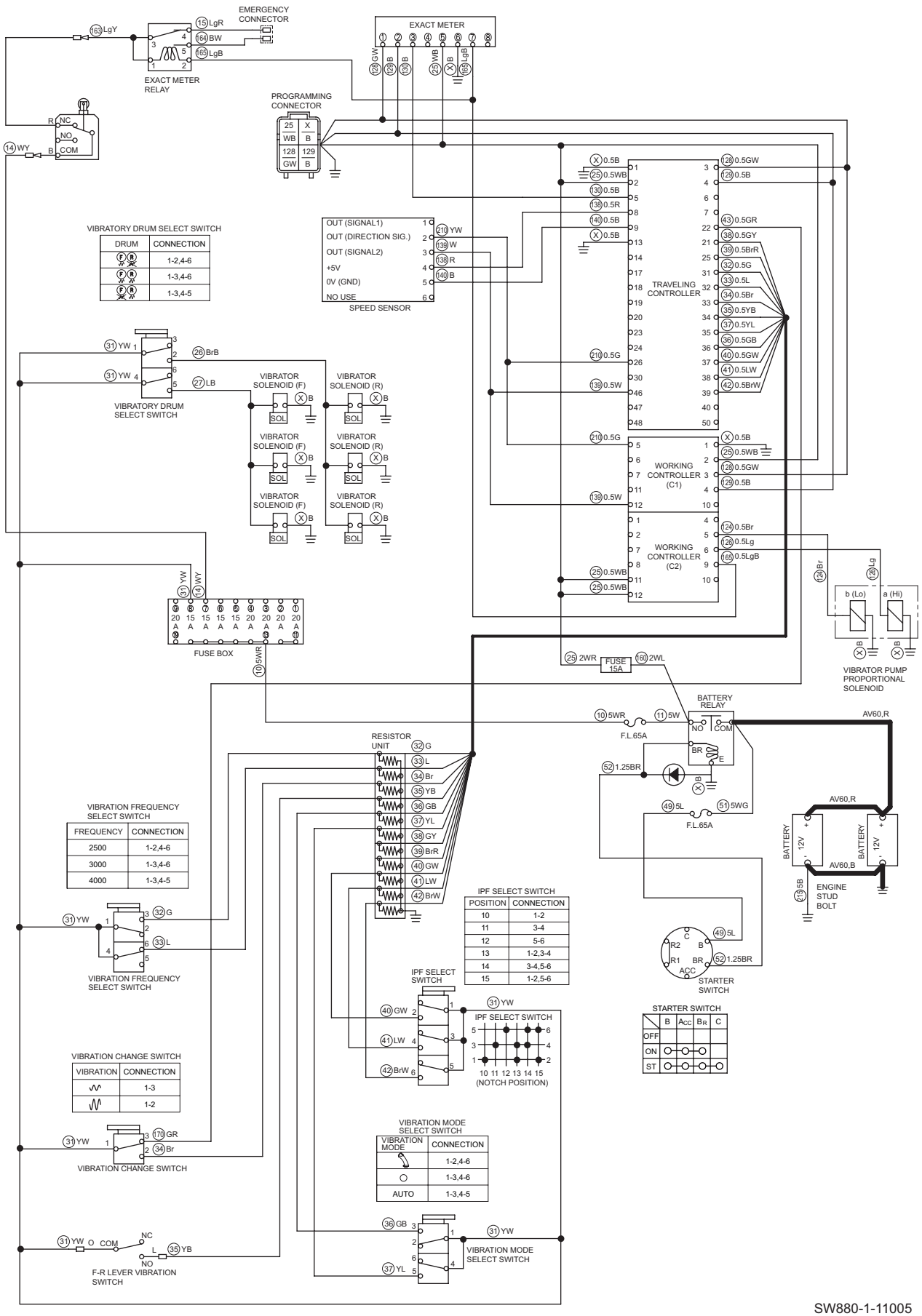
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| 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 WB and ground terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and IPF select switch is “10”, measure voltage between traveling controller terminal 37 inlet wire GW and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON and IPF select switch is “11”, measure voltage between traveling controller terminal 38 inlet wire LW and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(4) When starter switch is ON and IPF select switch is “12”, measure voltage between traveling controller terminal 39 inlet wire BrW and terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(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 terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(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 terminal 1 wire B.<br>Standard voltage : 12 V or more<br>(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 terminal 1 wire B.<br>Standard voltage : 12 V or more<br>• 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.<br>② Exact meter will display vehicle speed.<br>③ Check all positions of IPF select switch.<br>Exact meter will still display vehicle speed. Machine is in normal state.<br>If display changes form vehicle speed to E22, check above items again. | |

# Fig.: 2-6-1




SW880-1-11005

## 2-7-1. Exact meter indicator lamp does not illuminate while driving 8/9

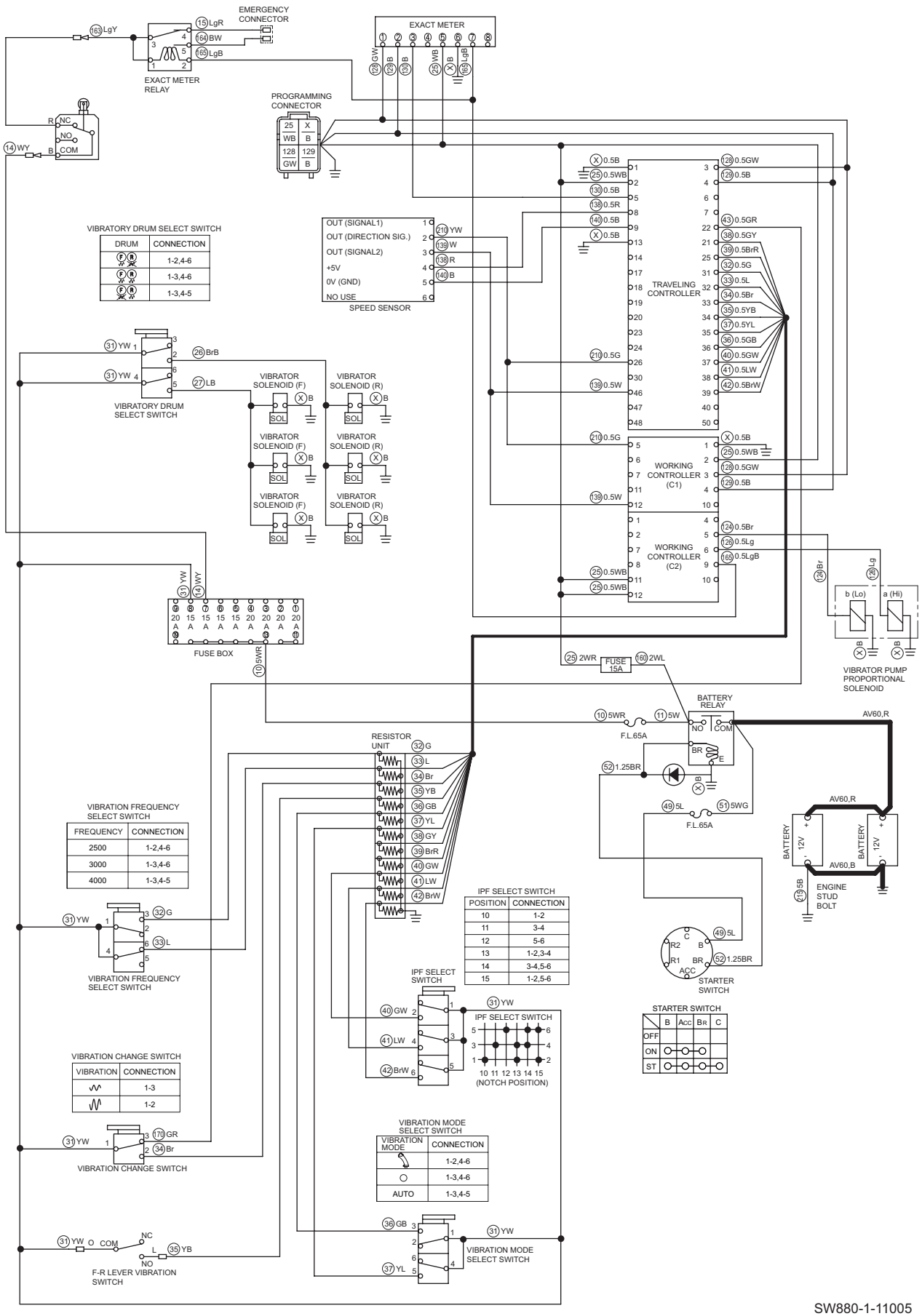
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E43 | 1. Connector | • Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between exact meter and traveling controller terminal wires.<br>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller (C2) terminal 4 wire B<br>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Exact Meter | • When starter switch is ON, measure voltage between exact meter terminal 5 outlet wire WB and ground terminal 6 wire B.<br>Standard voltage : 12 V or more<br>• If voltage is abnormal, exact meter is faulty. | Replace exact meter. |
| | 4. CAN Communication | • 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.<br>• Traveling controller is faulty. | Replace traveling controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-6-1




SW880-1-11005

## 2-7-1. Exact meter indicator lamp does not illuminate while driving 9/9

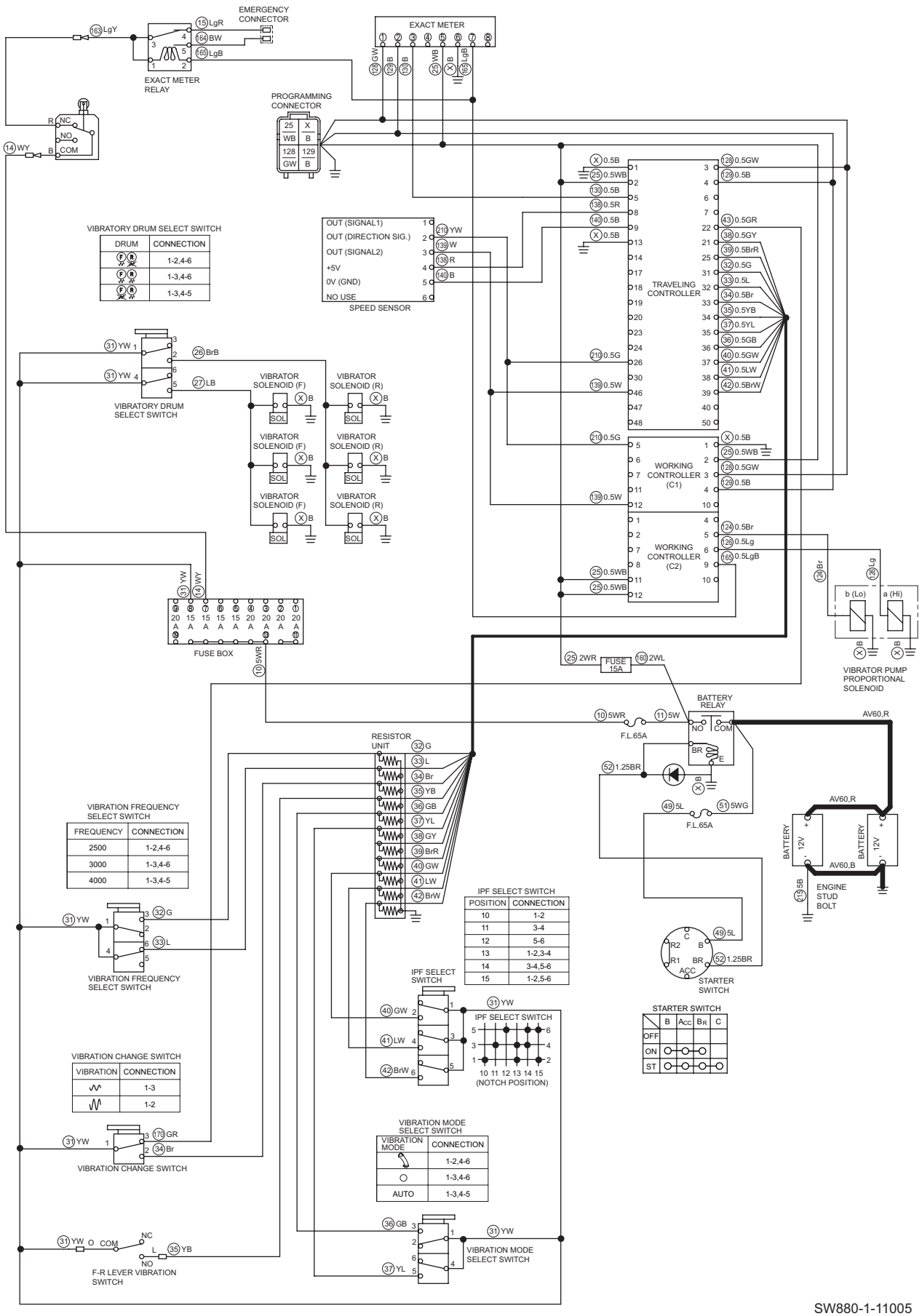
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

**Reference Fig. : 2-6-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Connector | • Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| 2. Harness | • Measure resistances between exact meter and traveling controller terminal wires.<br>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller (C2) terminal 4 wire B<br>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| 3. Exact Meter Multiple Display | • 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. | Replace exact meter multiple display or traveling controller. |

# Fig.: 2-6-1




SW880-1-11005

## 2-7-2. No vehicle speed indication on display 1/3

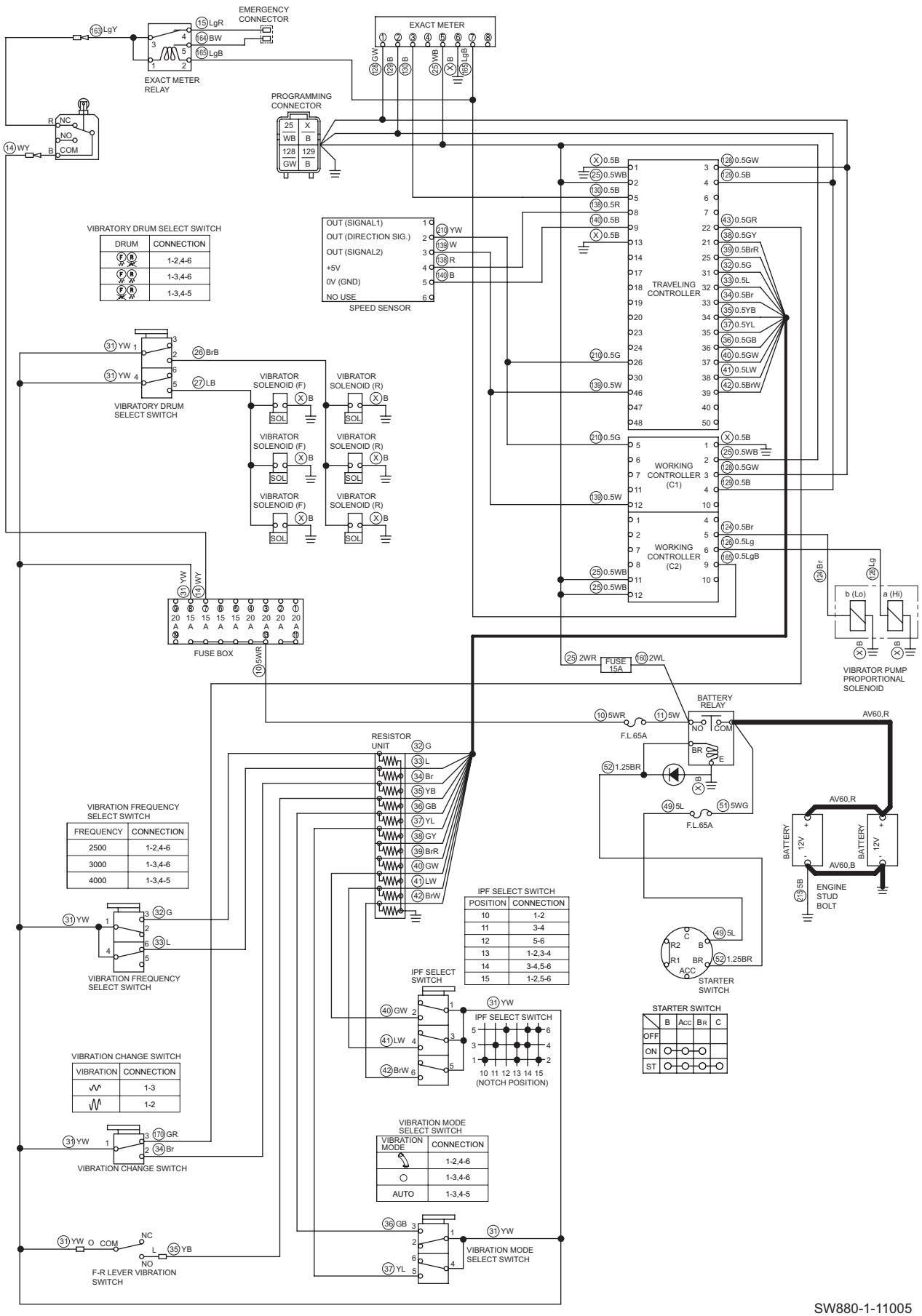
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E11 | 1. Connector | • Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller (C1) connector terminal 5, 12 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between speed sensor and traveling/working controller terminal wires.<br>• Speed sensor terminal 2 wire YW and traveling controller terminal 26 wire G, working controller (C1) terminal 5 wire G<br>• Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller (C1) terminal 12 wire W<br>• Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R<br>• Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | 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 outlet wire B.<br>Standard voltage : 5 ± 0.25 V<br>(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.<br>Standard pulse : 21 pulses/rotation<br>• If above item (1) is OK and item (2) is NG, speed sensor is faulty. | Replace speed sensor. |
| | 4. Traveling/ Working Controller | • 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. | Replace traveling/ working controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, start engine.<br>② Exact meter will display E11.<br>③ Move F-R lever “F” or “R” and run machine.<br>④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-6-1




SW880-1-11005

## 2-7-2. No vehicle speed indication on display 2/3

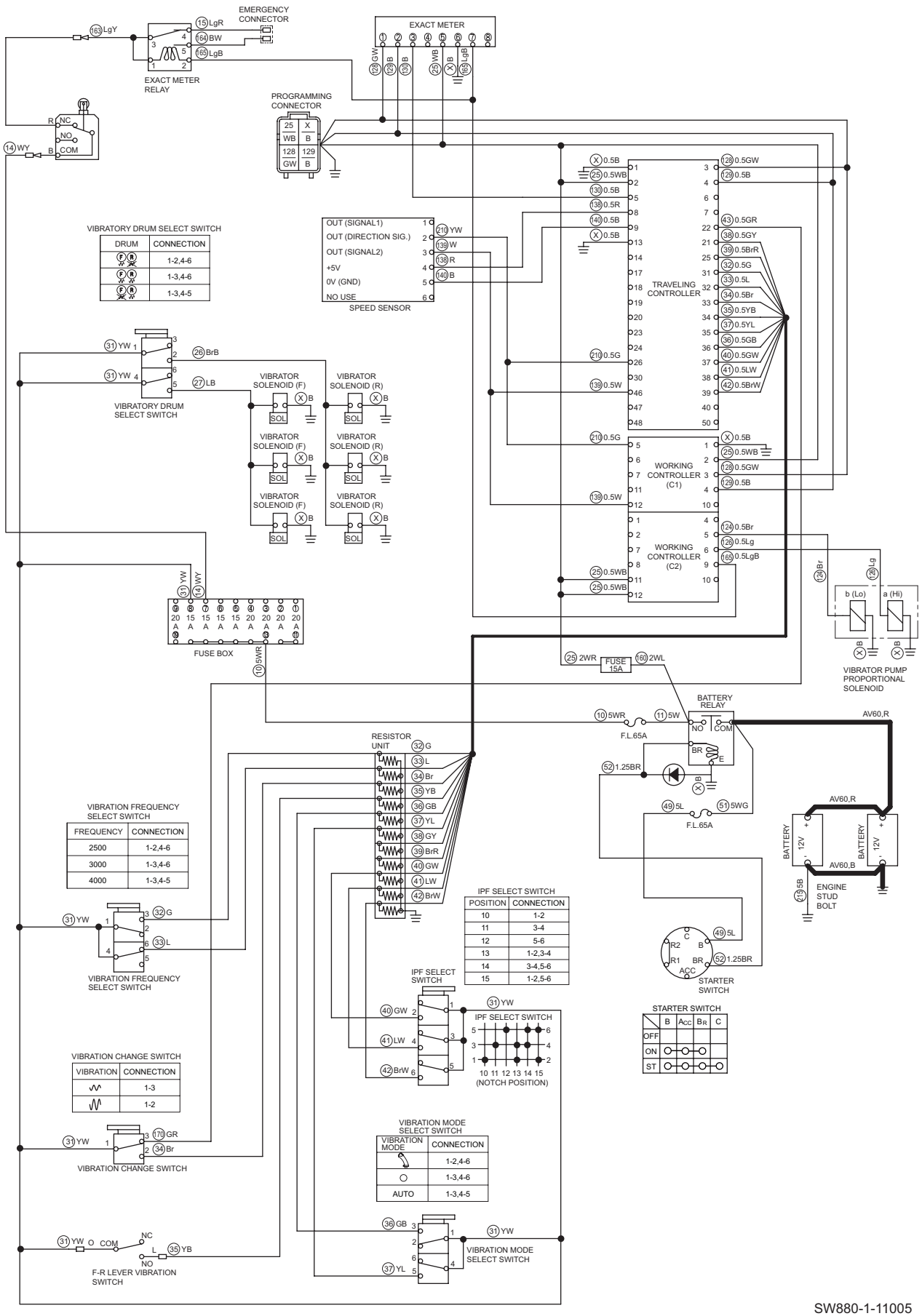
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

**Reference Fig. : 2-6-1**

| Error code | Check point | Check/Cause | Action |
|---|---|---|---|
| E43 | 1. Connector | • Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| | 2. Harness | • Measure resistances between exact meter and traveling controller terminal wires.<br>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller (C2) terminal 4 wire B<br>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| | 3. Exact Meter | • When starter switch is ON, measure voltage between exact meter terminal 5 outlet wire WB and ground terminal 6 wire B.<br>Standard voltage : 12 V or more<br>• If voltage is abnormal, exact meter is faulty. | Replace exact meter. |
| | 4. CAN Communication | • 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.<br>• Traveling controller is faulty. | Replace traveling controller. |
| | 5. Clearing Error Code and Judging OK/NG after Repair | ① When repair is complete, set starter switch to ON.<br>② Place F-R lever “N”.<br>Exact meter will display vehicle speed. Machine is in normal state.<br>If display does not change to vehicle speed, check above items again. | |

# Fig.: 2-6-1




SW880-1-11005

## 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. : 2-6-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Connector | • Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller (C1) connector terminal 3, 4, working controller (C2) connector terminal 9 for corrosion, breakage, bending and looseness.<br>• If any abnormality is found, connector is faulty. | Replace connector or terminal. |
| 2. Harness | • Measure resistances between exact meter and traveling controller terminal wires.<br>• Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller (C1) terminal 3 wire GW<br>• Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller (C2) terminal 4 wire B<br>• Exact meter terminal 3 wire B and traveling controller terminal 5 wire B<br>• Exact meter terminal 7 wire LgB and working controller (C2) terminal 9 wire LgB<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Replace harness. |
| 3. Exact Meter Multiple Display | • 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. | Replace exact meter multiple display or traveling controller. |

# Fig.: 2-8-1

WATER SPRAY MODE SELECT SWITCH

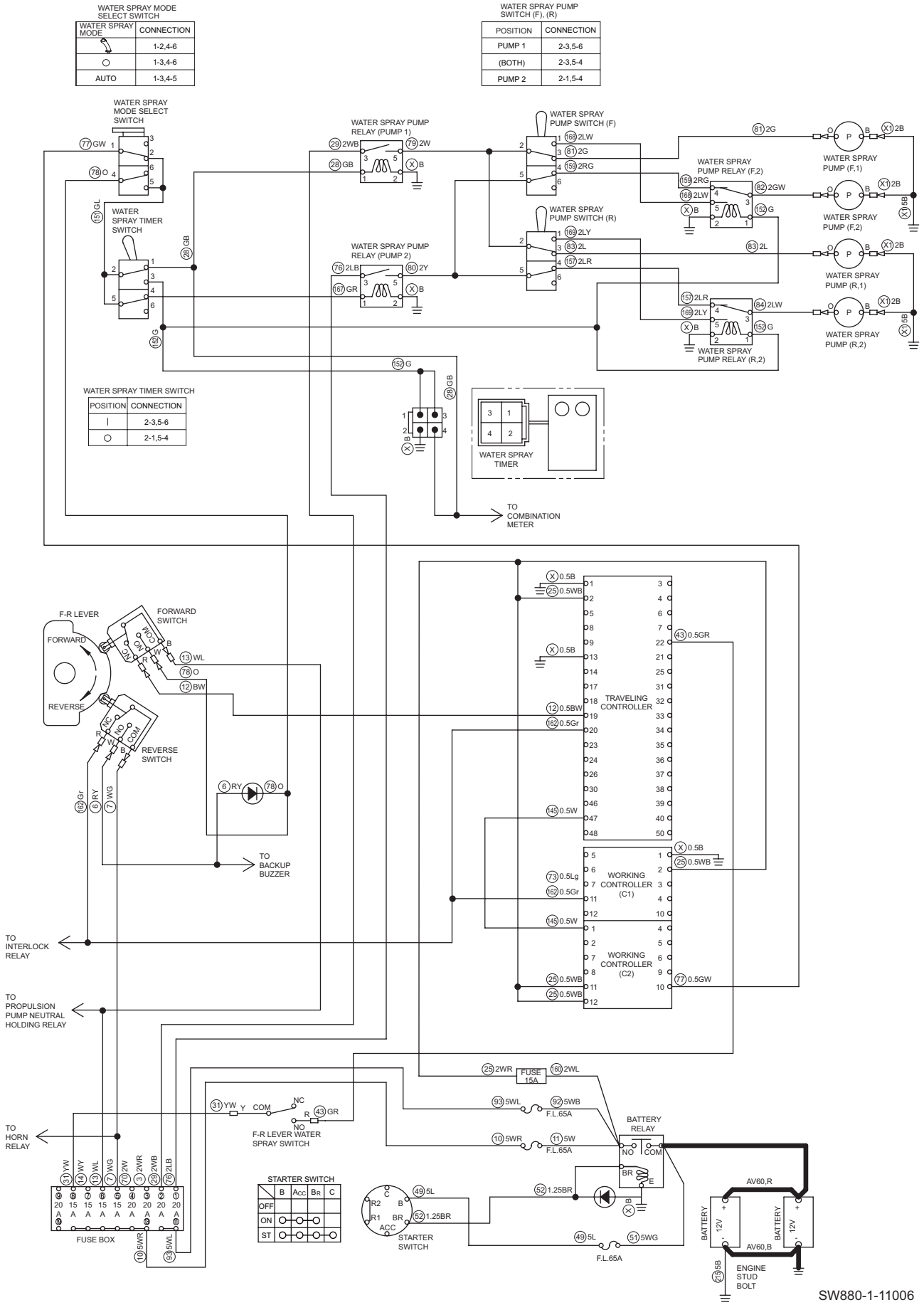
| WATER SPRAY MODE | CONNECTION |
|---|---|
| | 1-2,4-6 |
| ○ | 1-3,4-6 |
| AUTO | 1-3,4-5 |

WATER SPRAY PUMP SWITCH (F), (R)

| POSITION | CONNECTION |
|---|---|
| PUMP 1 | 2-3,5-6 |
| (BOTH) | 2-3,5-4 |
| PUMP 2 | 2-1,5-4 |

WATER SPRAY TIMER SWITCH

| POSITION | CONNECTION |
|---|---|
| \| | 2-3,5-6 |
| ○ | 2-1,5-4 |




SW880-1-11006

# 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) | (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.<br>• Water spray pump (F, 1) inlet wire: G<br>• Water spray pump (F, 2) inlet wire: GW<br>• Water spray pump (R,1) inlet wire: L<br>• Water spray pump (R,2) inlet wire: LW<br>Standard voltage: 12 V or more<br>(2) Check if grounding of each water spray pump is normal.<br>• If above items (1) and (2) are OK and water spray pump does not operate, water spray pump is faulty.<br><br>**(NOTICE)**<br>**• There are a total of four water spray pumps, two each for front and rear drums.**<br>**• Pressing F-R lever water spray switch turns on power and power is turned off when switch is pressed again.** | Replace the water spray pump (F, 1), (F, 2), (R, 1) or (R, 2). |
| 2. F-R Lever Water Spray Switch | • Depress F-R lever water spray switch and check continuity between F-R lever water spray switch terminal COM and NO.<br>There is continuity in normal condition.<br>• If there is no continuity, F-R lever water spray switch is faulty.<br><br>**(NOTICE)**<br>**• Pressing F-R lever water spray switch turns on power and power is turned off when switch is pressed again.** | Replace F-R lever water spray switch. |
| 3. Water Spray Mode Select Switch | (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.<br>Standard voltage : 12 V<br>(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.<br>Standard voltage : 12 V<br>• If above item (1) is OK and item (2) is NG, water spray mode select switch is faulty. | Replace water spray mode select switch. |

# Fig.: 2-8-1

WATER SPRAY MODE SELECT SWITCH

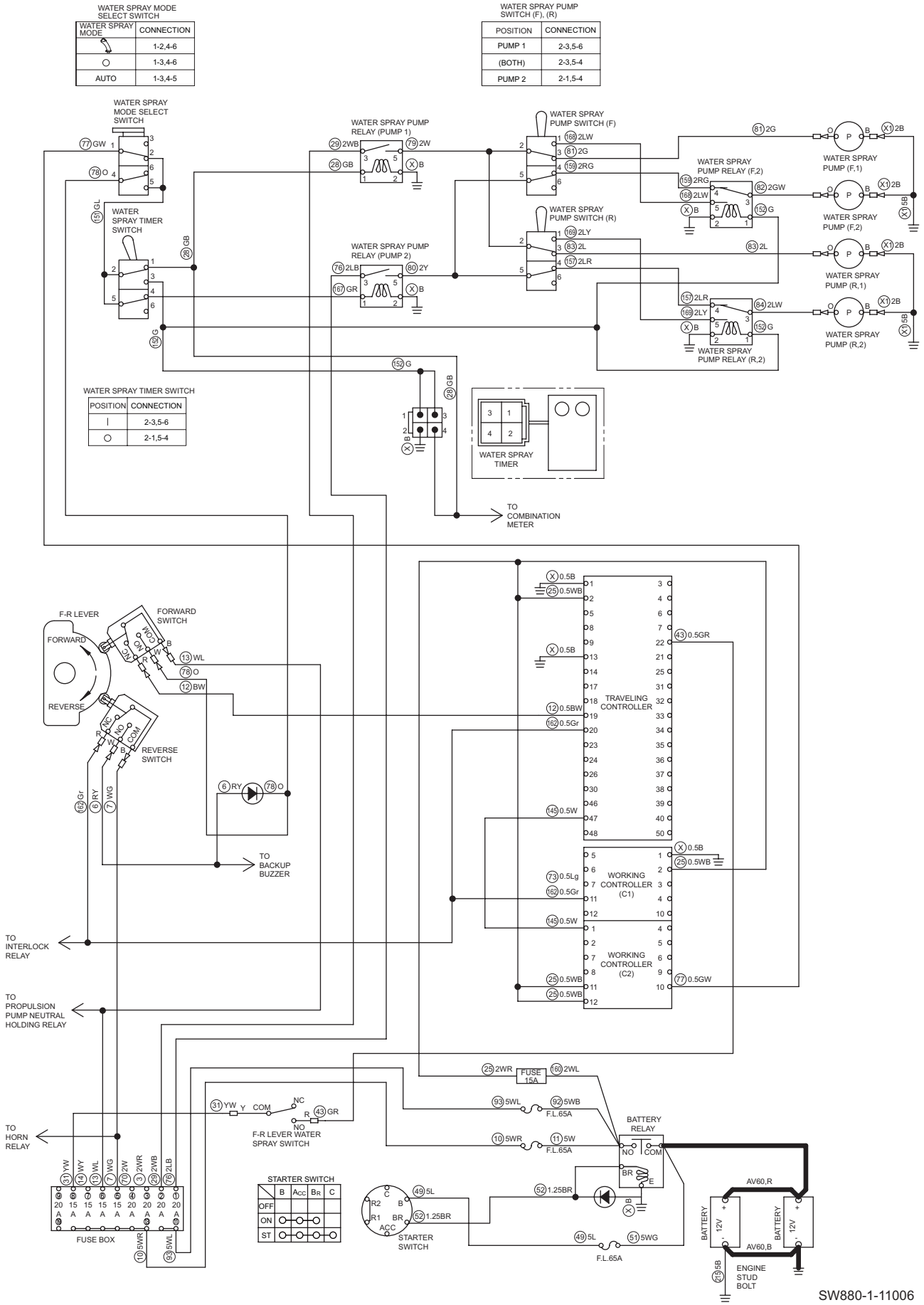
| WATER SPRAY MODE | CONNECTION |
|---|---|
| | 1-2,4-6 |
| ○ | 1-3,4-6 |
| AUTO | 1-3,4-5 |

WATER SPRAY PUMP SWITCH (F), (R)

| POSITION | CONNECTION |
|---|---|
| PUMP 1 | 2-3,5-6 |
| (BOTH) | 2-3,5-4 |
| PUMP 2 | 2-1,5-4 |

WATER SPRAY TIMER SWITCH

| POSITION | CONNECTION |
|---|---|
| \| | 2-3,5-6 |
| ○ | 2-1,5-4 |




SW880-1-11006

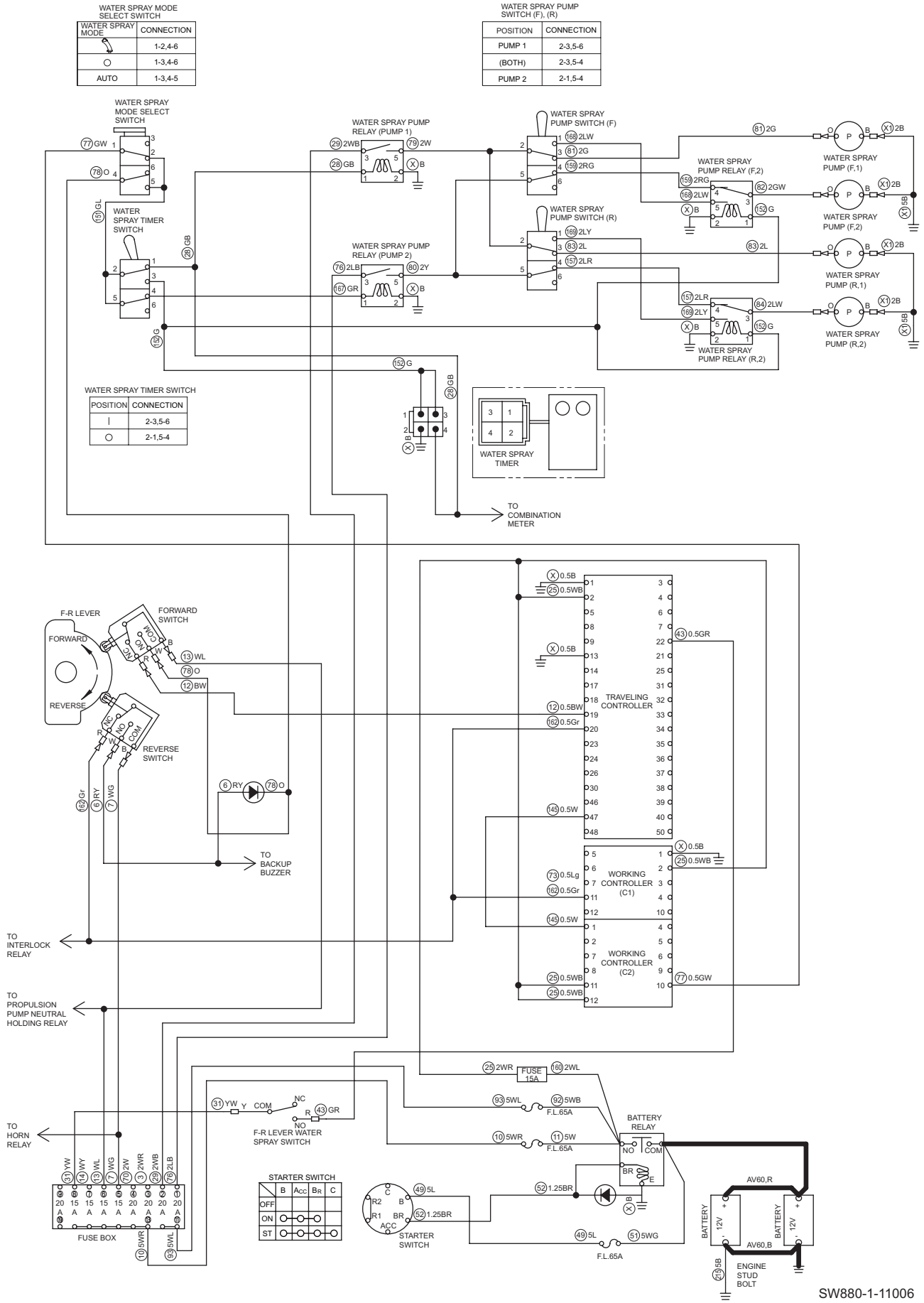
## 2-8-1. Continuous water spray does not operate 2/4

- 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 | (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.<br>Standard voltage : 12 V<br>(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.<br>Standard voltage : 12 V<br>(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.<br>Standard voltage: 12 V<br>• If above item (1) is OK and item (2) or (3) is NG, water spray timer switch is faulty. | Replace water spray timer switch. |
| 5. Water Spray Pump Relay (Pump 1) | (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.<br>Standard voltage : 12 V<br>(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.<br>Standard voltage : 12 V<br>(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.<br>Standard voltage : 12 V<br>• If above items (1) and (2) are OK and item (3) is NG, water spray pump relay (pump 1) is faulty. | Replace water spray pump relay (pump 1). |
| 6. Water Spray Pump Relay (Pump 2) | (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.<br>Standard voltage : 12 V<br>(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.<br>Standard voltage : 12 V<br>(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.<br>Standard voltage : 12 V<br>• If above items (1) and (2) are OK and item (3) is NG, water spray pump relay (pump 2) is faulty. | Replace water spray pump relay (pump 2). |

# Fig.: 2-8-1


WATER SPRAY MODE SELECT SWITCH
WATER SPRAY MODE | CONNECTION
1-2,4-6
○ 1-3,4-6
AUTO 1-3,4-5
WATER SPRAY PUMP SWITCH (F), (R)
POSITION | CONNECTION
PUMP 1 2-3,5-6
(BOTH) 2-3,5-4
PUMP 2 2-1,5-4
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY PUMP RELAY (PUMP 1)
WATER SPRAY PUMP RELAY (PUMP 2)
WATER SPRAY PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
WATER SPRAY PUMP RELAY (F,2)
WATER SPRAY PUMP RELAY (R,2)
WATER SPRAY PUMP (F,1)
WATER SPRAY PUMP (F,2)
WATER SPRAY PUMP (R,1)
WATER SPRAY PUMP (R,2)
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
| 2-3,5-6
○ 2-1,5-4
WATER SPRAY TIMER
TO COMBINATION METER
F-R LEVER
FORWARD
REVERSE
FORWARD SWITCH
REVERSE SWITCH
TO BACKUP BUZZER
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
TO INTERLOCK RELAY
TO PROPULSION PUMP NEUTRAL HOLDING RELAY
TO HORN RELAY
F-R LEVER WATER SPRAY SWITCH
FUSE 15A
F.L.65A
BATTERY RELAY
FUSE BOX
STARTER SWITCH
STARTER SWITCH
AV60,R
AV60,B
BATTERY 12V
ENGINE STUD BOLT
SW880-1-11006

## 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) | (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.<br>Standard voltage : 12 V<br>(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.<br>• Center position (both pumps)<br>Water spray pump switch (F) terminal 3 outlet wire G and chassis ground<br>Water spray pump switch (F) terminal 4 outlet wire RG and chassis ground<br>Standard voltage : 12 V<br>• If above item (1) is OK and item (2) is NG, water spray pump switch (F) is faulty. | Replace water spray pump switch (F). |
| 8. Water Spray Pump Switch (R) | (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.<br>Standard voltage : 12 V<br>(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.<br>• Center position (both pumps)<br>Water spray pump switch (R) terminal 3 outlet wire L and chassis ground<br>Water spray pump switch (R) terminal 4 outlet wire LR and chassis ground<br>Standard voltage : 12 V<br>• If above item (1) is OK and item (2) is NG, water spray pump switch (R) is faulty. | Replace water spray pump switch (R). |
| 9. Water Spray Pump Relay (F, 2) | (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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, water spray pump relay (F, 2) relay is faulty. | Replace water spray pump relay (F, 2). |

# Fig.: 2-8-1

WATER SPRAY MODE SELECT SWITCH

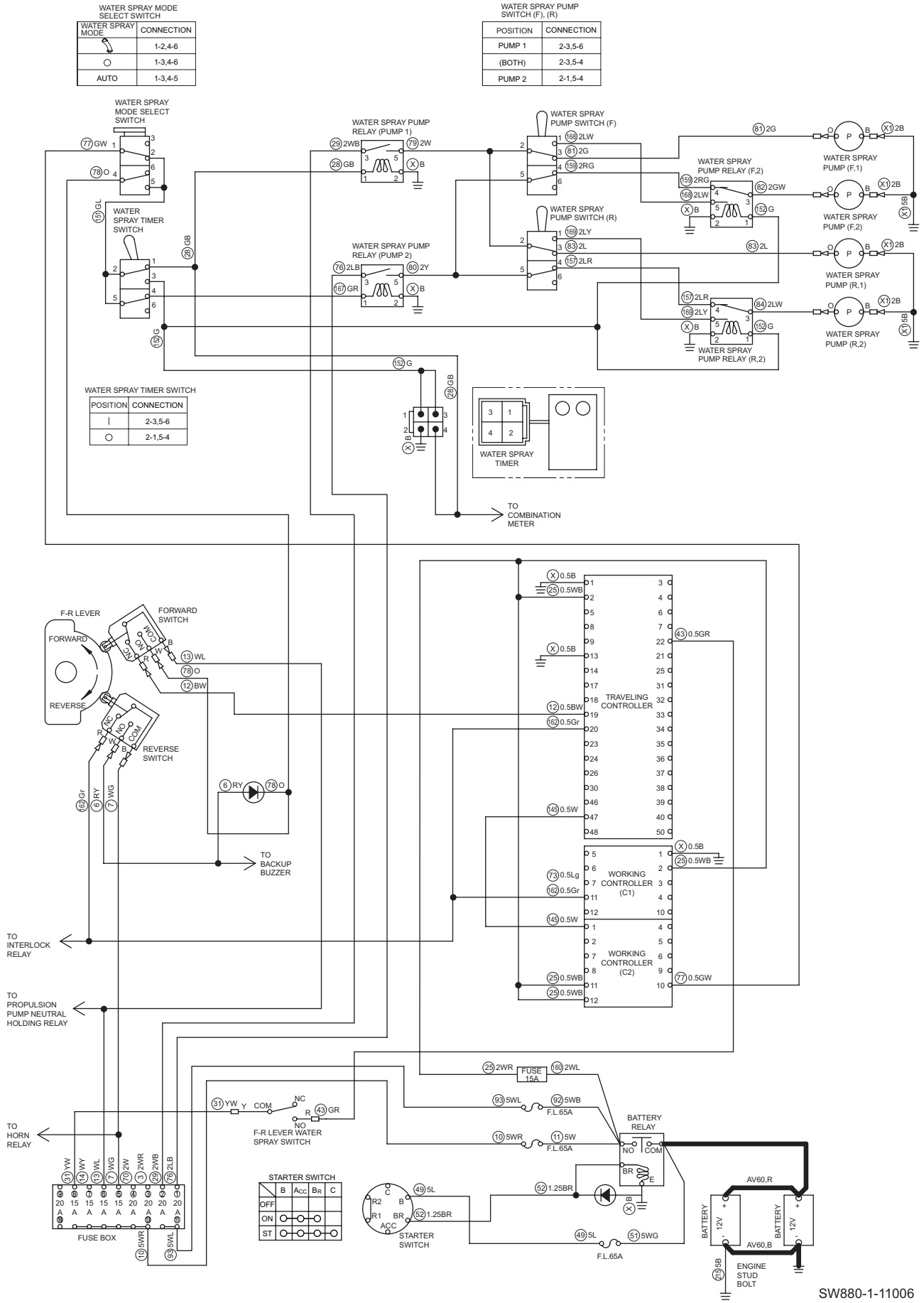
| WATER SPRAY MODE | CONNECTION |
|---|---|
| | 1-2,4-6 |
| ○ | 1-3,4-6 |
| AUTO | 1-3,4-5 |

WATER SPRAY PUMP SWITCH (F), (R)

| POSITION | CONNECTION |
|---|---|
| PUMP 1 | 2-3,5-6 |
| (BOTH) | 2-3,5-4 |
| PUMP 2 | 2-1,5-4 |

WATER SPRAY TIMER SWITCH

| POSITION | CONNECTION |
|---|---|
| \| | 2-3,5-6 |
| ○ | 2-1,5-4 |




SW880-1-11006

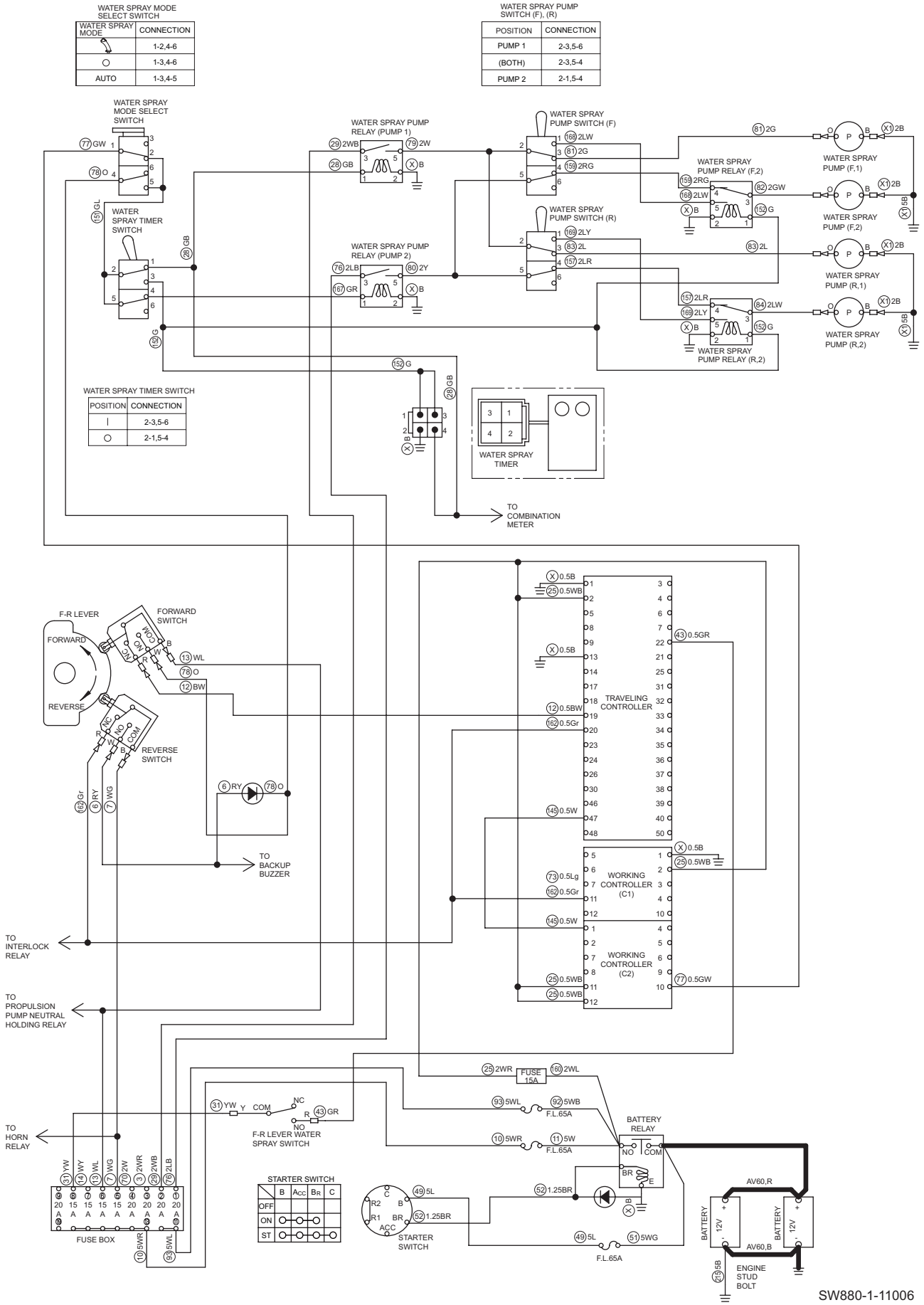
## 2-8-1. Continuous water spray does not operate 4/4

- 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) | (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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, water spray pump relay (R, 2) is faulty. | Replace water spray pump relay (R, 2). |
| 11. Traveling/Working Controller | (1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wires.<br>• Traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B.<br>• Working controller (C1) power supply terminal 2 inlet wire WB and ground terminal 1 outlet wire B.<br>• Working controller (C2) power supply terminal 11, 12 inlet wires WB and working controller (C1) ground terminal 1 outlet wire B.<br>Standard voltage : 12 V or more<br>(2) When the 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.<br>Standard voltage : 12 V<br>(3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between working controller (C2) terminal 10 outlet wire GW and chassis ground.<br>Standard voltage : 12 V<br>• If above items (1) and (2) are OK and item (3) is NG, traveling controller is faulty. | Replace traveling/ working controller. |
| 12. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-8-1


WATER SPRAY MODE SELECT SWITCH
WATER SPRAY MODE | CONNECTION
1-2,4-6
○ 1-3,4-6
AUTO 1-3,4-5
WATER SPRAY PUMP SWITCH (F), (R)
POSITION | CONNECTION
PUMP 1 2-3,5-6
(BOTH) 2-3,5-4
PUMP 2 2-1,5-4
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY PUMP RELAY (PUMP 1)
WATER SPRAY PUMP RELAY (PUMP 2)
WATER SPRAY PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
WATER SPRAY PUMP RELAY (F,2)
WATER SPRAY PUMP RELAY (R,2)
WATER SPRAY PUMP (F,1)
WATER SPRAY PUMP (F,2)
WATER SPRAY PUMP (R,1)
WATER SPRAY PUMP (R,2)
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
| 2-3,5-6
○ 2-1,5-4
WATER SPRAY TIMER
TO COMBINATION METER
F-R LEVER
FORWARD
REVERSE
FORWARD SWITCH
REVERSE SWITCH
TO BACKUP BUZZER
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
TO INTERLOCK RELAY
TO PROPULSION PUMP NEUTRAL HOLDING RELAY
TO HORN RELAY
F-R LEVER WATER SPRAY SWITCH
FUSE 15A
F.L.65A
BATTERY RELAY
STARTER SWITCH
STARTER SWITCH
FUSE BOX
AV60,R
AV60,B
BATTERY
ENGINE STUD BOLT
SW880-1-11006

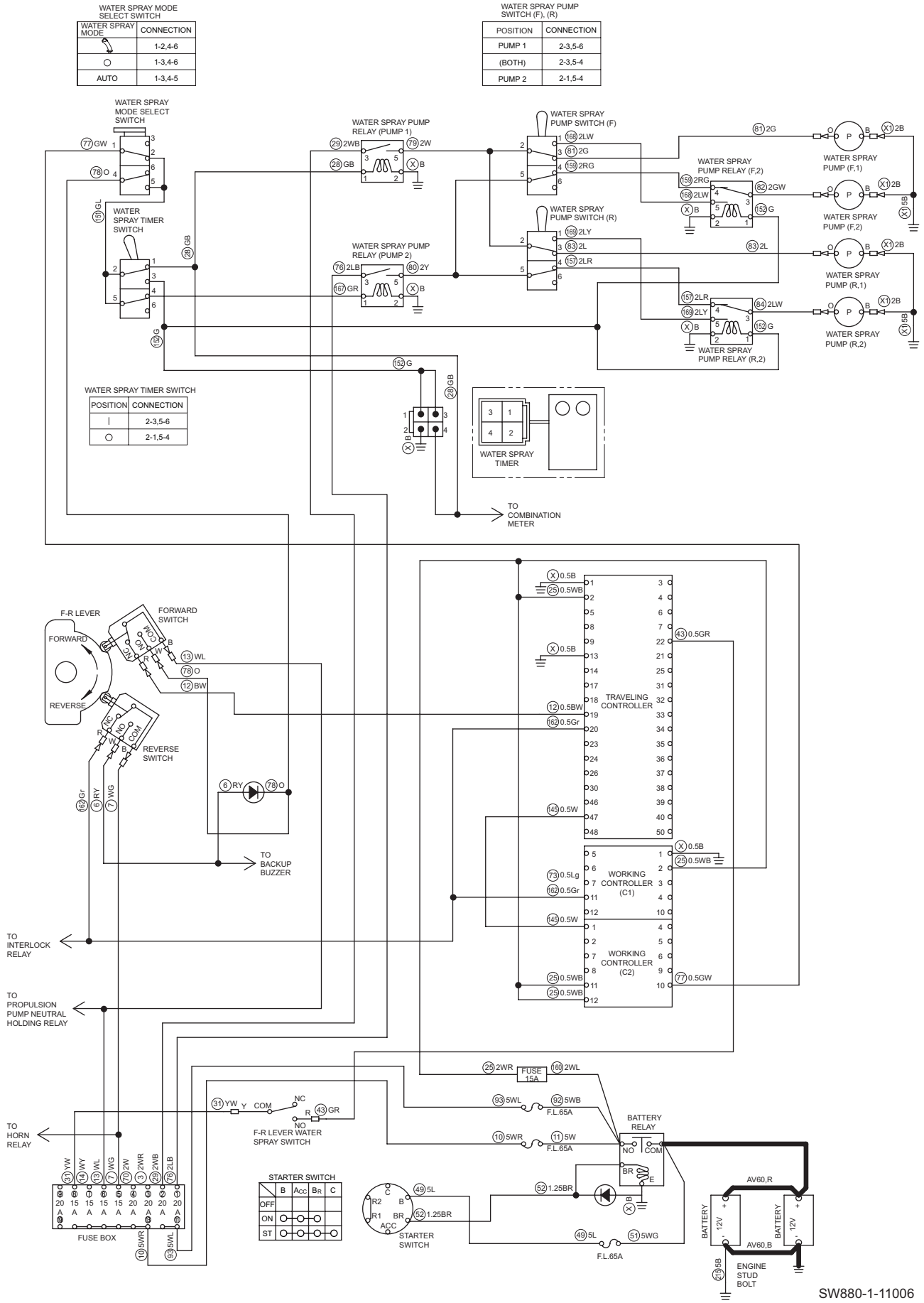
## 2-8-2. Continuous water spray works, but intermittent water spray does not operate 1/2

- 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 | (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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• 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. | Replace water spray timer. |
| 2. Water Spray Timer Switch | (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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, water spray timer switch is faulty. | Replace water spray timer switch. |
| 3. Water Spray Pump (F, 2) | (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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, water spray pump (F, 2) is faulty. | Replace water spray pump (F, 2). |

# Fig.: 2-8-1


WATER SPRAY MODE SELECT SWITCH
WATER SPRAY MODE | CONNECTION
1-2,4-6
○ 1-3,4-6
AUTO 1-3,4-5
WATER SPRAY PUMP SWITCH (F), (R)
POSITION | CONNECTION
PUMP 1 2-3,5-6
(BOTH) 2-3,5-4
PUMP 2 2-1,5-4
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY PUMP RELAY (PUMP 1)
WATER SPRAY PUMP RELAY (PUMP 2)
WATER SPRAY PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
WATER SPRAY PUMP RELAY (F,2)
WATER SPRAY PUMP RELAY (R,2)
WATER SPRAY PUMP (F,1)
WATER SPRAY PUMP (F,2)
WATER SPRAY PUMP (R,1)
WATER SPRAY PUMP (R,2)
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
| 2-3,5-6
○ 2-1,5-4
WATER SPRAY TIMER
TO COMBINATION METER
F-R LEVER
FORWARD
REVERSE
FORWARD SWITCH
REVERSE SWITCH
TO BACKUP BUZZER
TRAVELING CONTROLLER
WORKING CONTROLLER (C1)
WORKING CONTROLLER (C2)
TO INTERLOCK RELAY
TO PROPULSION PUMP NEUTRAL HOLDING RELAY
TO HORN RELAY
F-R LEVER WATER SPRAY SWITCH
FUSE 15A
F.L.65A
BATTERY RELAY
FUSE BOX
STARTER SWITCH
STARTER SWITCH
AV60,R
AV60,B
BATTERY 12V
ENGINE STUD BOLT
SW880-1-11006

## 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) | (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.<br>Standard voltage: 12 V or more<br>(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.<br>Standard voltage: 12 V or more<br>(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.<br>Standard voltage: 12 V or more<br>• If above items (1) and (2) are OK and item (3) is NG, water spray pump (R, 2) is faulty. | Replace water spray pump (R, 2). |
| 5. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance: 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-8-1

WATER SPRAY MODE SELECT SWITCH

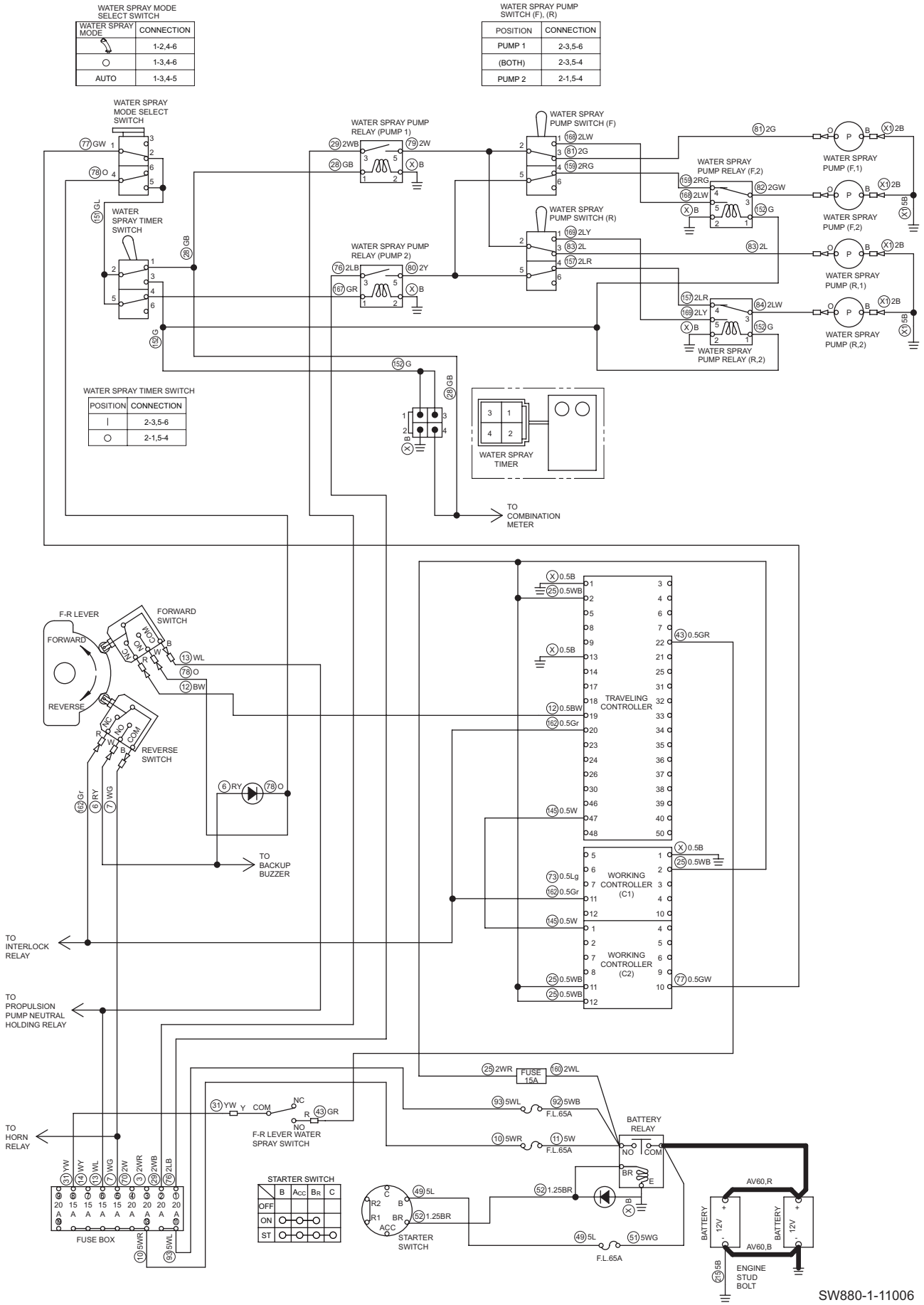
| WATER SPRAY MODE | CONNECTION |
|---|---|
| | 1-2,4-6 |
| ○ | 1-3,4-6 |
| AUTO | 1-3,4-5 |

WATER SPRAY PUMP SWITCH (F), (R)

| POSITION | CONNECTION |
|---|---|
| PUMP 1 | 2-3,5-6 |
| (BOTH) | 2-3,5-4 |
| PUMP 2 | 2-1,5-4 |

WATER SPRAY TIMER SWITCH

| POSITION | CONNECTION |
|---|---|
| \| | 2-3,5-6 |
| ○ | 2-1,5-4 |




SW880-1-11006

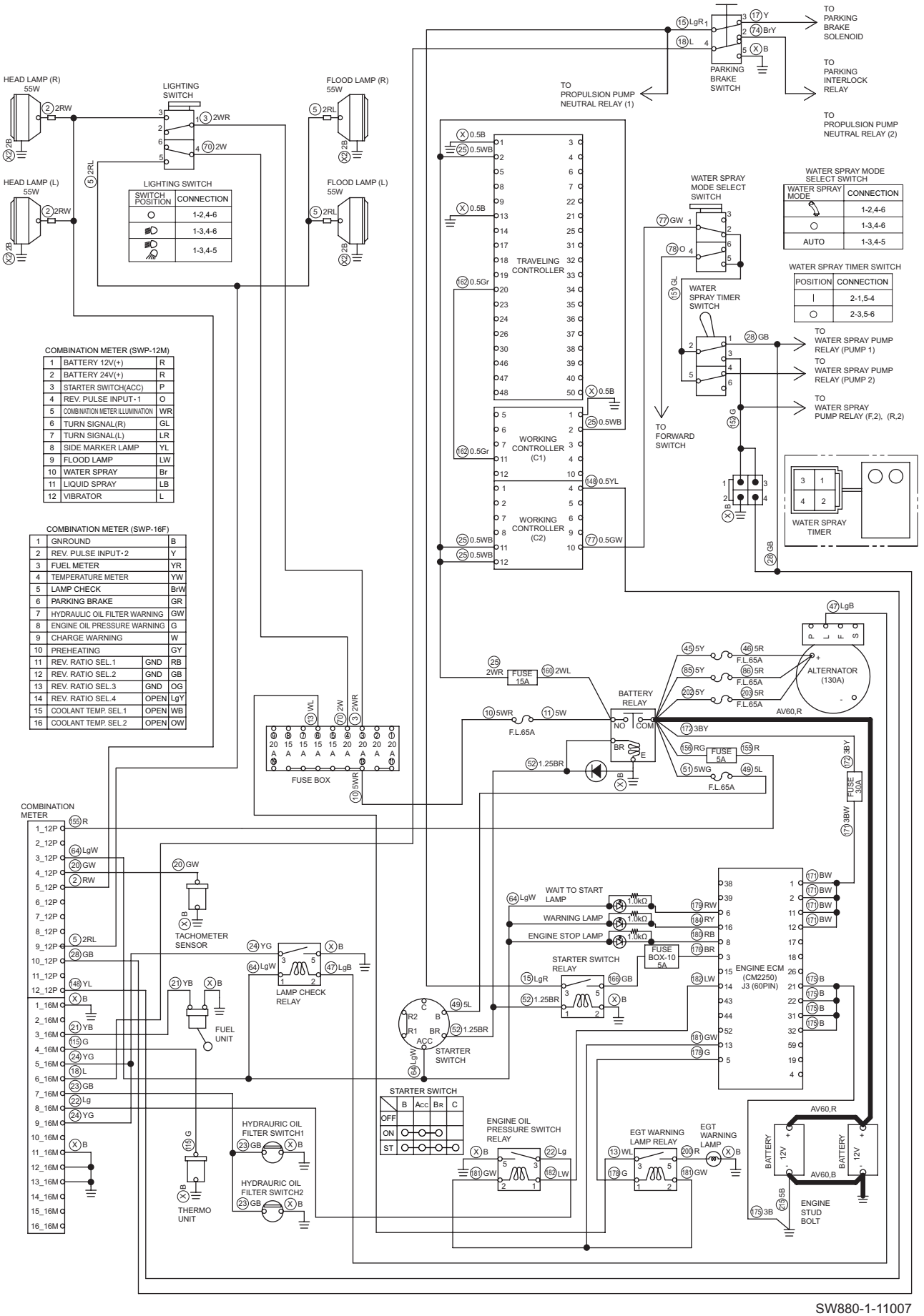
## 2-8-3. Continuous water spray works, but automatic water spray does not operate

- 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. Forward Switch | (1) When starter switch is OFF and F-R lever is “N”, check continuity between forward switch terminal COM and NC.<br>There is continuity in normal condition.<br>(2) When starter switch is OFF and F-R lever is “F”, check continuity between forward switch terminal COM and NO.<br>There is continuity in normal condition.<br>• If above item (1) or (2) is NG, forward switch is faulty. | Replace forward switch. |
| 2. Reverse Switch | (1) When starter switch is OFF and F-R lever is “N”, check continuity between reverse switch terminal COM and NC.<br>There is continuity in normal condition.<br>(2) When starter switch is OFF and F-R lever is “R”, check continuity between reverse switch terminal COM and NO.<br>There is continuity in normal condition<br>• If above item (1) or (2) is NG, reverse switch is faulty. | Replace reverse switch. |
| 3. Water Spray Mode Select Switch | (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.<br>Standard voltage : 12 V<br>(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.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, water spray mode select switch is faulty. | Replace water spray mode select switch. |
| 4. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-9-1

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# 2-9. Lighting

Check following items before troubleshooting.

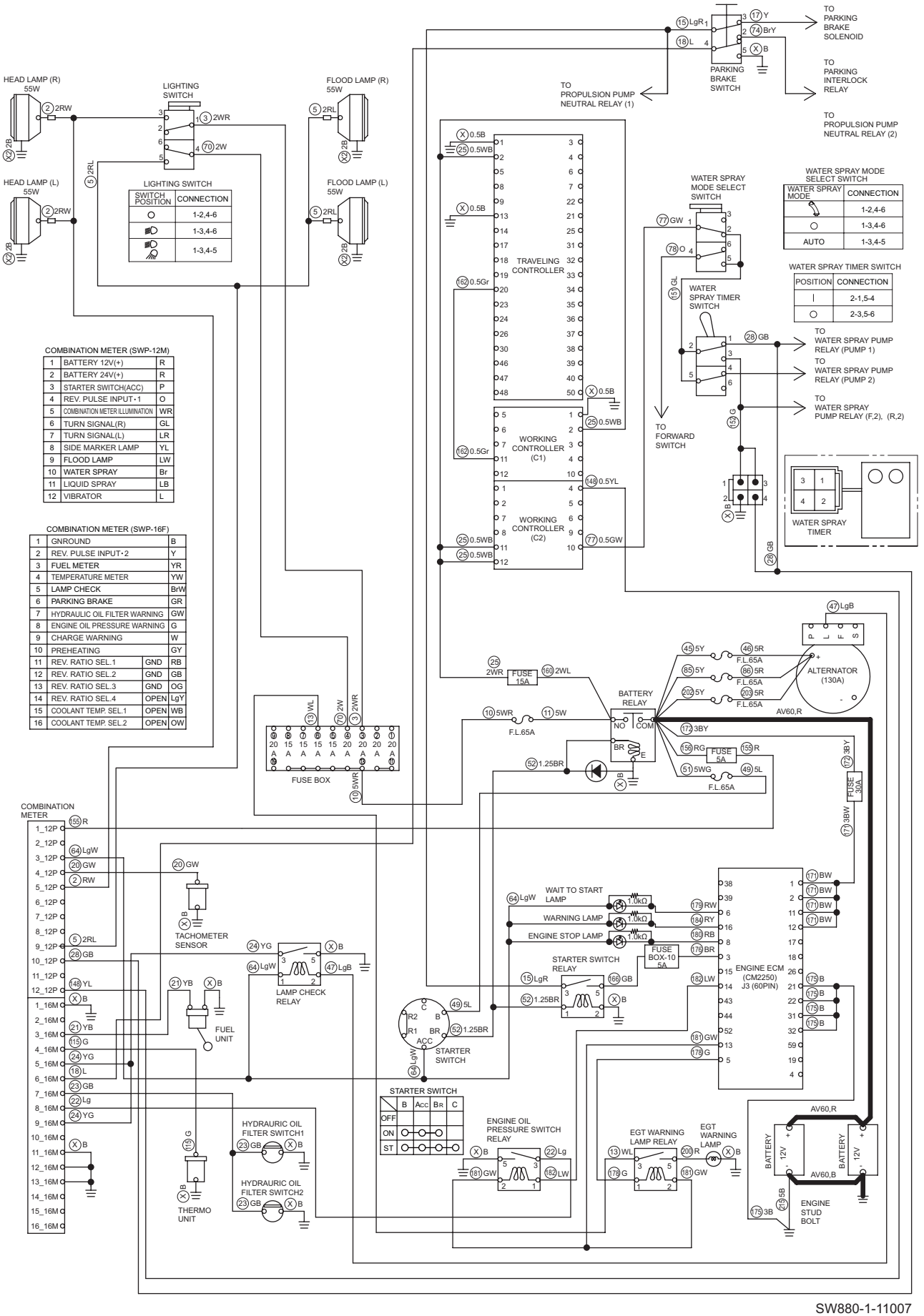
- No blown fuse and power is applied up to fuses.
- When measuring voltage and current without disconnecting connectors, refer to “measuring voltage and current following using tester” (P. 11-006 to P. 11-008).
- Check any ground circuit which belongs to components to be checked.

## 2-9-1. Head lamp and flood lamp do not light

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Each Bulb | • Check that none of the lamp bulbs is burned out or has a contact failure.<br>• Bulb is faulty or poorly connected. | Replace each bulb. |
| 2. Lighting Switch | (1) When starter switch is ON, measure voltage between lighting switch terminal 1 inlet wire WR, terminal 4 inlet wire W and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and lighting switch is “ ”, measure voltage between lighting switch terminal 3 outlet wire RW and chassis ground.<br>Standard voltage : 12 V or more<br>(3) When starter switch is ON and lighting switch is “ ”, measure voltage between lighting switch terminal 5 outlet wire RL and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) or (3) is NG, lighting switch is faulty. | Replace lighting switch. |
| 3. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-9-1

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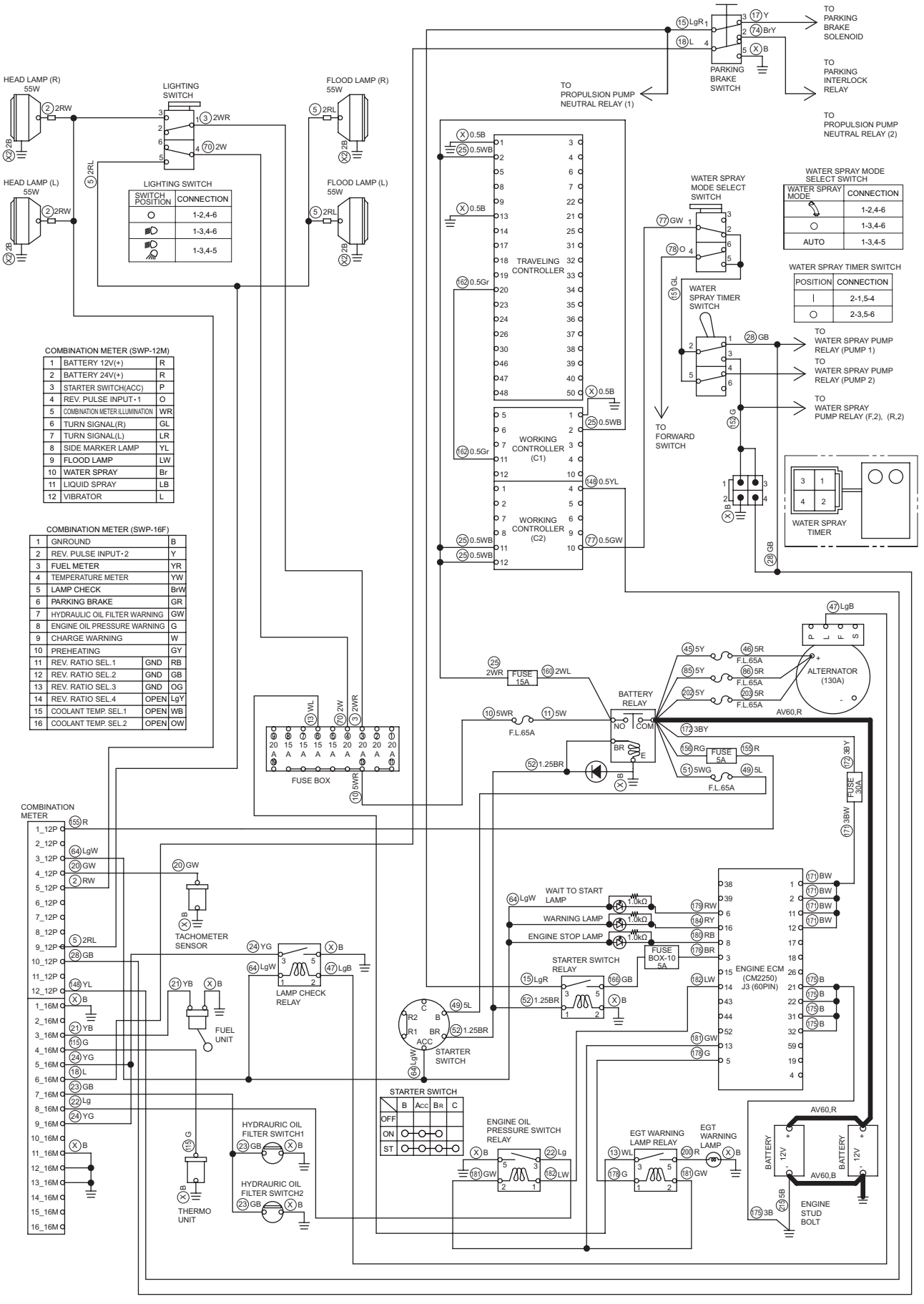
## 2-9-2. Combination meter warning lamp or indicator lamp is abnormal

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Harness | • Disconnect connectors between combination meter and lamp check relay.<br>• Measure resistance between terminals and chassis ground.<br>  • Combination meter connector terminal wire No. 24 wire YG and chassis ground<br>  • Lamp check relay terminal 3 wire YG and chassis ground<br>  Standard resistance : 100 kΩ or more<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| 2. Lamp Check Relay | (1) When starter switch is ON, measure voltage between lamp check relay terminal 1 inlet wire LgW and chassis ground.<br>  Standard voltage : 12 V or more<br>(2) After starting engine, measure voltage between lamp check relay terminal 2 outlet wire LgB and chassis ground.<br>  Standard voltage : 12 V or more<br>(3) After starting engine, check continuity between lamp check relay terminal 3 and terminal 5.<br>  There is no continuity in normal condition.<br>• If above items (1) and (2) are OK and item (3) is NG, lamp check relay is faulty.<br>• If above item (2) is NG, alternator is faulty. | Repair or replace lamp check relay or alternator. |
| 3. Combination Meter (Lamp check) | (1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>  • Battery terminal wire No. 155 inlet wire R and ground terminal wire B<br>  • Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B<br>  Standard voltage : 12 V or more<br>(2) When starter switch is ON, check that parking brake indicator lamp, hydraulic oil filter warning lamp, engine oil pressure warning lamp and electrical charge warning lamp illuminate and then go out after starting engine.<br>• If above item (1) is OK and the item (2) is NG, combination meter is faulty.<br><br>**(NOTICE)**<br>**• Since engine cannot start unless parking brake switch is applied and F-R lever is “N”, parking brake indicator lamp does not go out even after starting engine.** | Replace combination meter. |

# Fig.: 2-9-1

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## 2-9-3. Tachometer reading is abnormal

**Reference Fig. : 2-9-1**

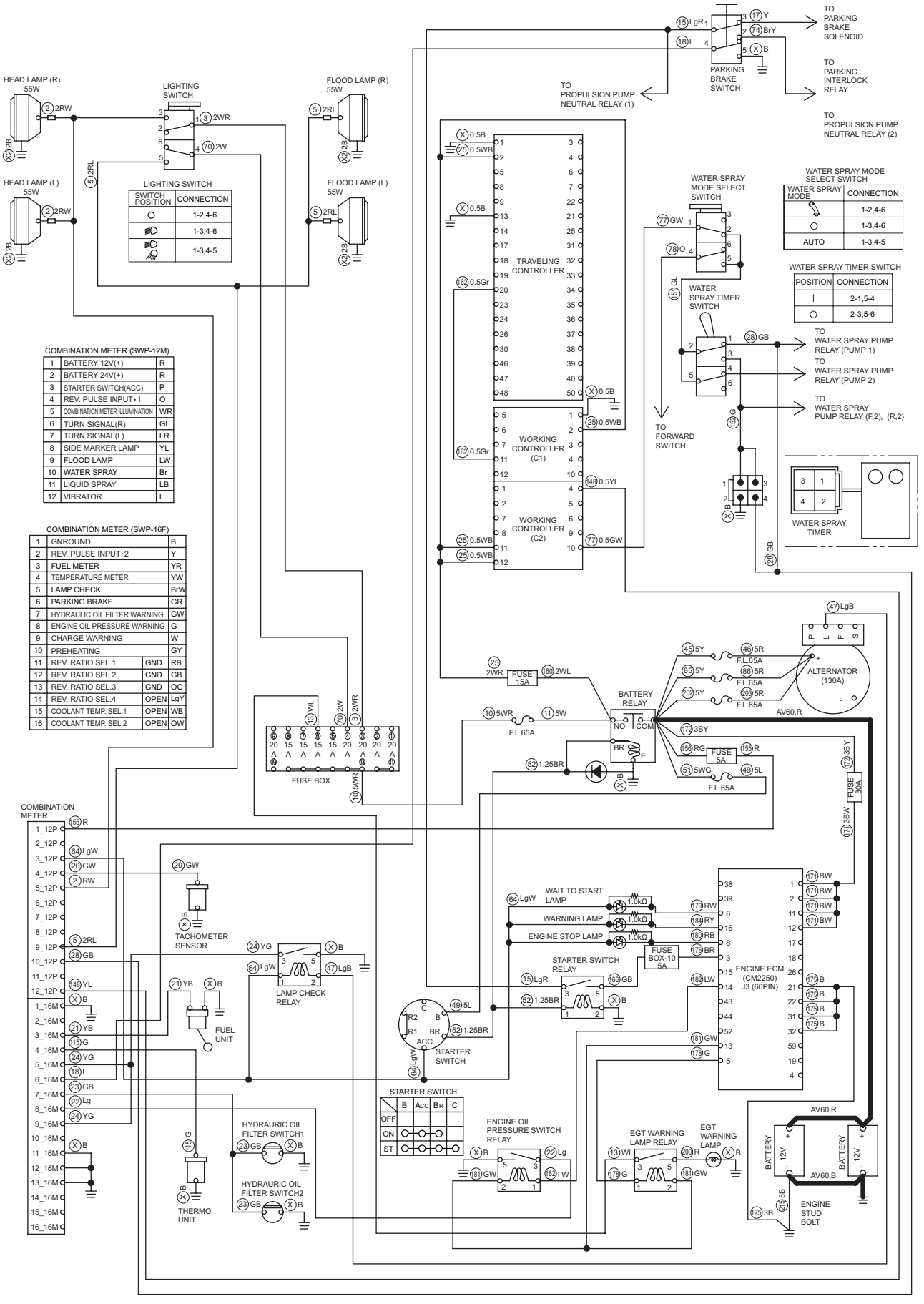
| Check point | Check/Cause | Action |
|---|---|---|
| 1. Combination Meter (Tachometer) | (1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>• Battery terminal wire No. 155 inlet wire R and ground terminal wire B<br>• Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B<br>Standard voltage : 12 V or more<br>(2) Check that combination meter terminal wire B (rev. ratio 1, 2 and 3) are grounded.<br>(3) Start engine and measure pulse between combination meter rev. pulse input. 1 terminal wire No. 20 inlet wire GW and chassis ground.<br>Standard pulse : 127 pulses/rotation of engine<br>• If above items (1) and (2) are OK and pulse is NG in item (3), tachometer sensor is faulty.<br>• If above items (1) and (2) are OK and tachometer reading is NG in item (3), combination meter is faulty. | Replace tachometer sensor or combination meter. |
| 2. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

## 2-9-4. Hour meter is abnormal

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Combination Meter (Hour meter) | • When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>• Battery terminal wire No. 155 inlet wire R and ground terminal wire B<br>• Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B<br>Standard voltage : 12 V or more<br>• If no abnormality is found, combination meter is faulty. | Replace combination meter. |

# Fig.: 2-9-1

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## 2-9-5. Temperature meter is abnormal

**Reference Fig. : 2-9-1**

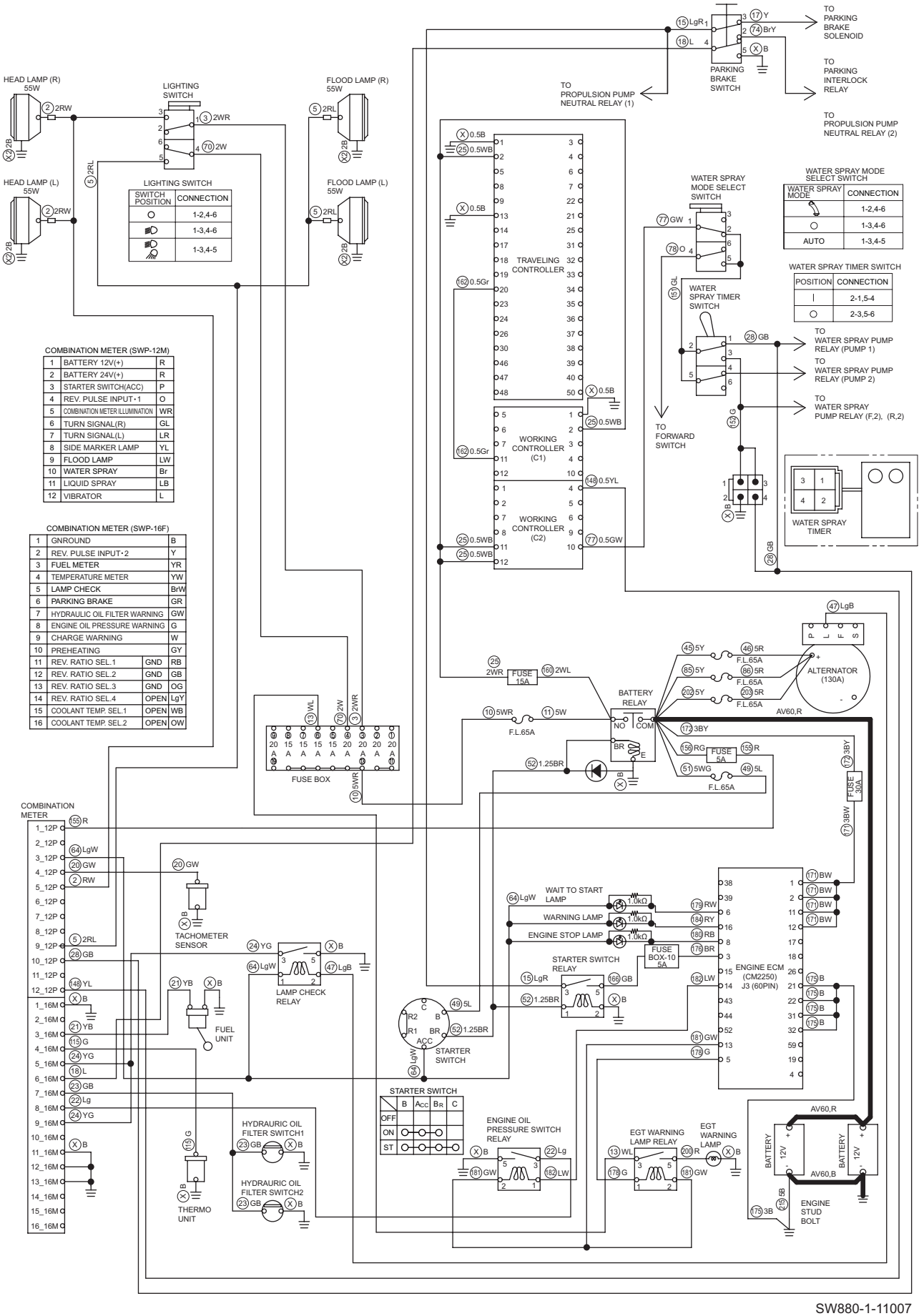
| Check point | Check/Cause | Action |
|---|---|---|
| 1. Thermo Unit | • Disconnect harness and measure resistance of thermo unit.<br>Standard resistance :<br>164.6 Ω [(at unit temperature of 50°C (122°F)]<br>26.44 Ω [(at unit temperature of 103°C (217°F)]<br>• If resistance is abnormal, thermo unit is faulty. | Replace thermo unit. |
| 2. Combination Meter (Temperature meter) | • When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>• Battery terminal wire No. 155 inlet wire R and ground terminal wire B<br>• Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B<br>Standard voltage : 12 V or more<br>• If no abnormality is found, combination meter is faulty. | Replace combination meter. |
| 3. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

## 2-9-6. Fuel meter is abnormal

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Fuel Unit | • Disconnect harness and measure resistance of fuel unit.<br>Standard resistance :<br>13.5 Ω (with float in “F”)<br>80.0 Ω (with float in “E”)<br>• If resistance is abnormal, fuel unit is faulty. | Replace fuel unit. |
| 2. Combination Meter (Fuel meter) | • When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>• Battery terminal wire No. 155 inlet wire R and ground terminal wire B<br>• Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B<br>Standard voltage : 12 V or more<br>• If no abnormality is found, combination meter is faulty. | Replace combination meter. |
| 3. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

# Fig.: 2-9-1

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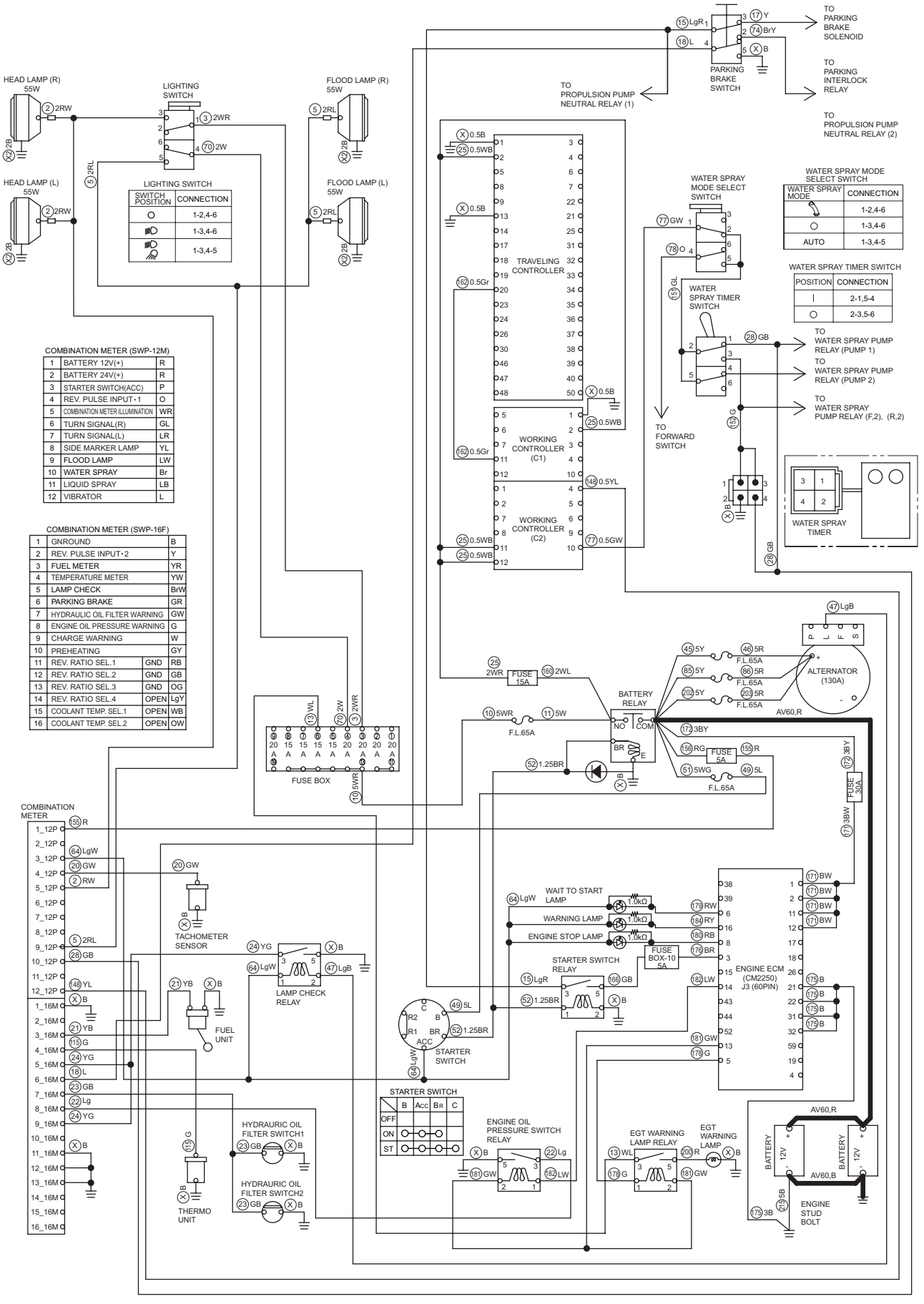
## 2-9-7. Hydraulic oil filter warning lamp remains ON

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Harness | • Disconnect connectors between hydraulic oil filter switch 1, 2 and combination meter.<br>• Measure resistance between terminal and chassis ground.<br>  • Hydraulic oil filter switch 1 or 2 terminal wire GB and chassis ground.<br>  • Combination meter connector terminal wire No. 23 wire GB and chassis ground.<br>  Standard resistance : 100 kΩ or more<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| 2. Hydraulic Oil Filter Switch 1 or 2 | • When starter switch is OFF, check continuity between hydraulic oil filter switch 1 or 2 inlet terminal and chassis ground.<br>  There is no continuity in normal condition.<br>• If there is continuity, hydraulic oil filter switch 1 or 2 is faulty. | Replace hydraulic oil filter switch 1 or 2. |
| 3. Combination Meter (Hydraulic oil filter warning indicator lamp) | (1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>  • Battery terminal inlet wire No. 155 inlet wire R and ground terminal wire B.<br>  • Starter switch terminal inlet wire No. 64 inlet wire LgW and ground terminal wire B.<br>  Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between combination meter hydraulic oil filter warning terminal outlet wire GB and chassis ground.<br>  There is no electricity in normal condition.<br>• If above items (1) and (2) are OK and no abnormality is found in hydraulic oil filter switch 1 or 2 but hydraulic oil filter warning lamp remains on after starting engine, combination meter is faulty. | Replace combination meter. |

# Fig.: 2-9-1

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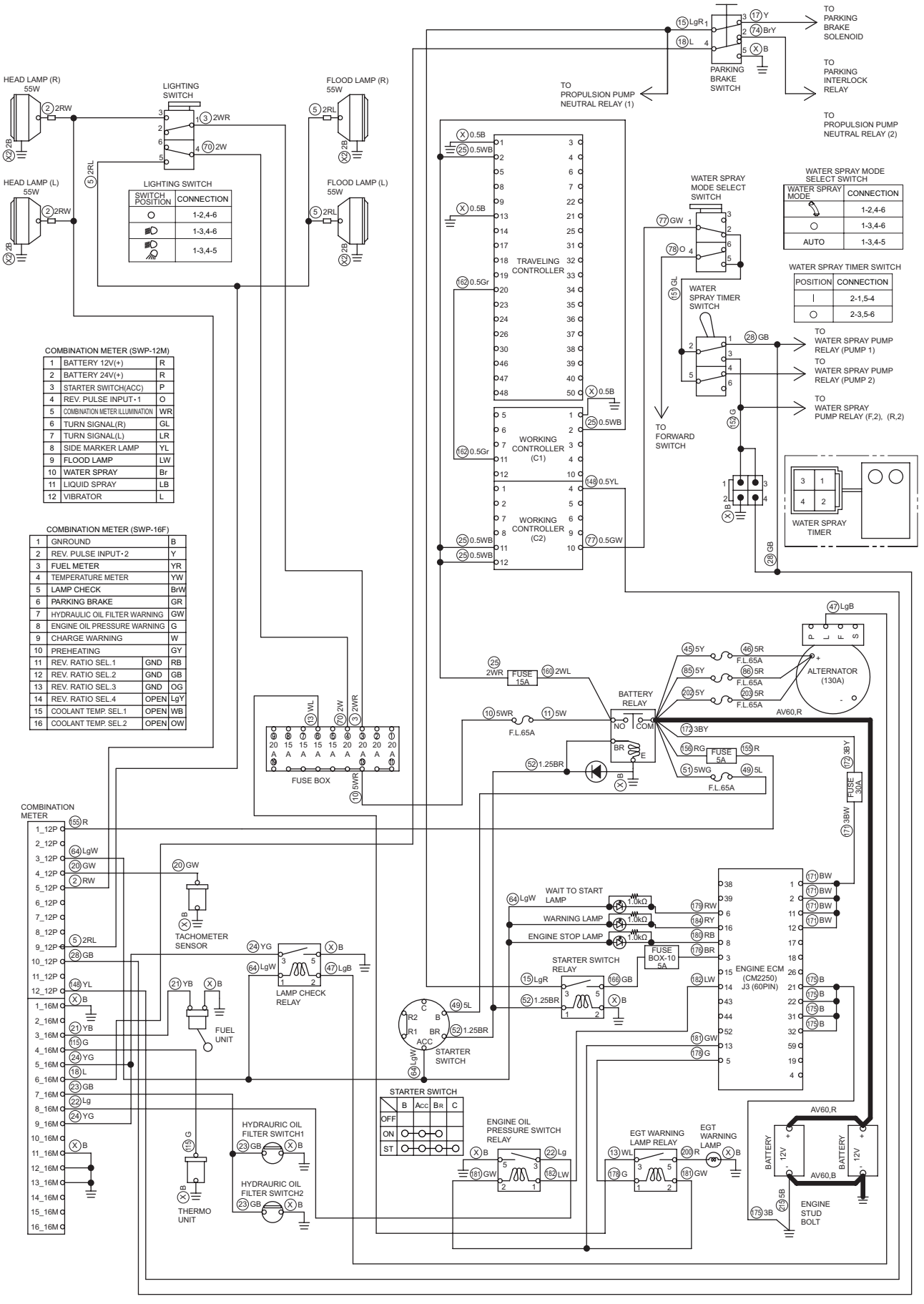
## 2-9-8. Engine oil pressure warning lamp remains ON

• Check whether engine check lamps show no fault code.

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Harness | • Disconnect connectors between engine ECM, engine oil pressure switch relay and combination meter.<br>• Measure resistance between terminals and chassis ground.<br>  • Engine ECM terminal 13 wire GW and chassis ground.<br>  • Engine oil pressure switch relay terminal 2 wire GW and chassis ground.<br>  • Engine ECM for oil pressure terminal 14 wire LW and chassis ground.<br>  • Engine oil pressure switch relay terminal 1 wire LW and chassis ground.<br>  • Combination meter connector terminal wire No. 22 wire Lg and chassis ground.<br>  • Engine oil pressure switch relay terminal 3 wire Lg and chassis ground.<br>  Standard resistance : 100 kΩ or more<br>• If resistance is abnormal, harness is faulty.<br><br>**(NOTICE)**<br>**• If any abnormality is found in shielded twisted wires, repair is not approved. Be sure to replace them.** | Repair or replace harness. |
| 2. Engine Oil Pressure Switch Relay | (1) When starter switch is ON, measure voltage between engine oil pressure switch relay terminal 1 inlet wire LW and chassis ground.<br>  There is no electricity in normal condition.<br>(2) When starter switch is ON, check continuity between engine oil pressure switch relay terminal 3 and terminal 5.<br>  There is no continuity in normal condition.<br>• If above item (1) is OK and item (2) is NG, engine oil pressure switch relay is faulty. | Replace engine oil pressure switch relay. |
| 3. Combination Meter (Engine oil pressure warning indicator lamp) | (1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>  • Battery terminal inlet wire No. 155 inlet wire R and ground terminal wire B.<br>  • Starter switch terminal inlet wire No. 64 inlet wire LgW and ground terminal wire B.<br>  Standard voltage : 12 V or more<br>(2) When starter switch is ON, measure voltage between combination meter engine oil pressure warning terminal wire No. 22 outlet wire Lg (engine oil pressure warning terminal) and chassis ground.<br>  There is no electricity in normal condition.<br>• If above items (1) and (2) are OK and no fault code is shown but engine oil pressure warning lamp remains on after starting engine, combination meter is faulty. | Replace combination meter. |

# Fig.: 2-9-1

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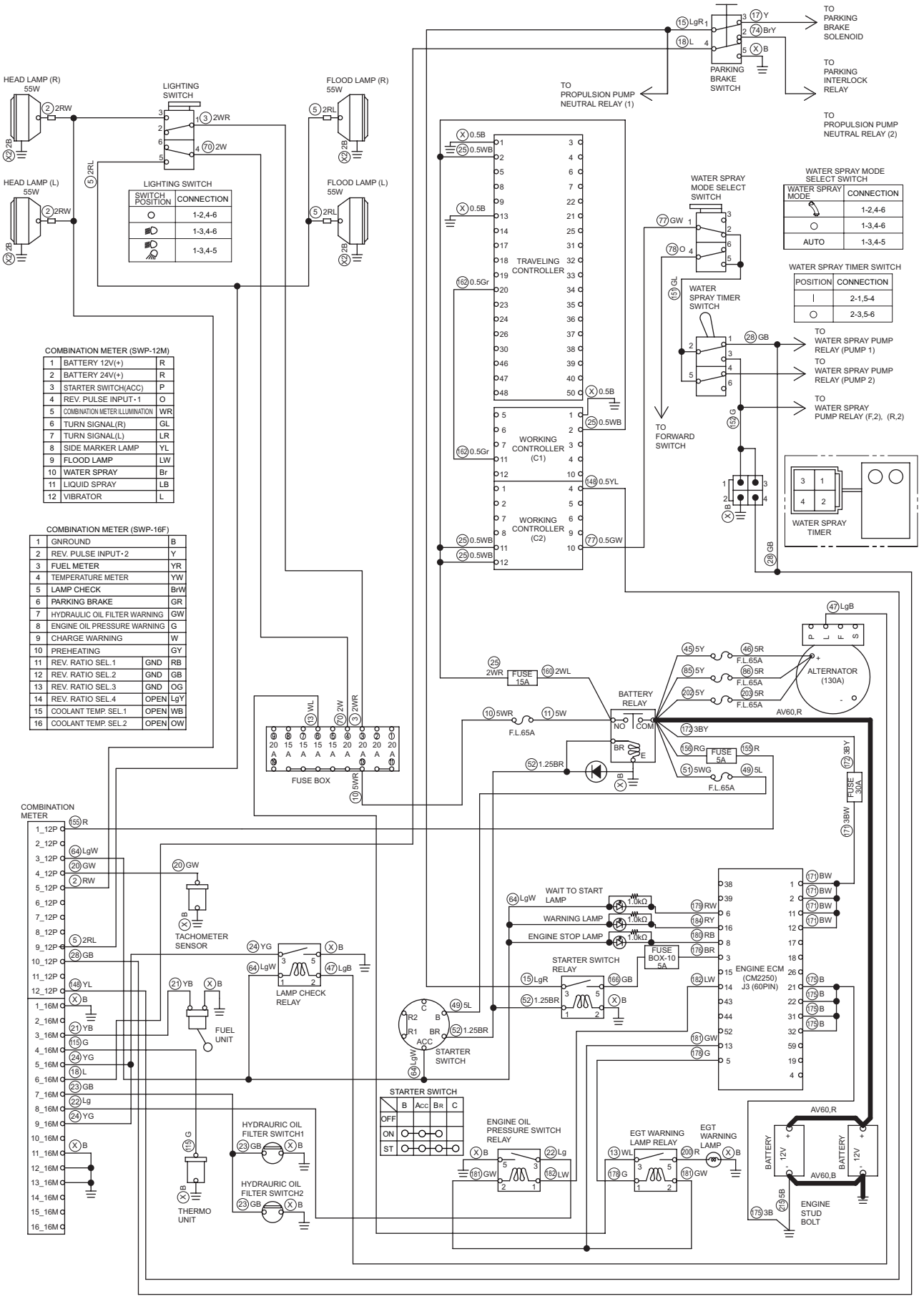
## 2-9-9. Charge warning lamp remains ON

• Check with starting engine.

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Harness | • Disconnect connectors between alternator L terminal and lamp check relay terminal 2.<br>• Measure resistance between terminals and chassis ground.<br>• Alternator L terminal and chassis ground<br>• Lamp check relay terminal 2 and chassis ground<br>Standard resistance : 100 kΩ or more<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| 2. Lamp Check Relay | (1) Measure voltage between lamp check relay terminal 2 inlet wire LgB and chassis ground.<br>Standard voltage : 12 V or more<br>(2) Check continuity between lamp check relay terminal 3 and terminal 5.<br>There is no continuity in normal condition.<br>• If above item (1) is OK and item (2) is NG, lamp check relay is faulty. | Replace lamp check relay. |

# Fig.: 2-9-1

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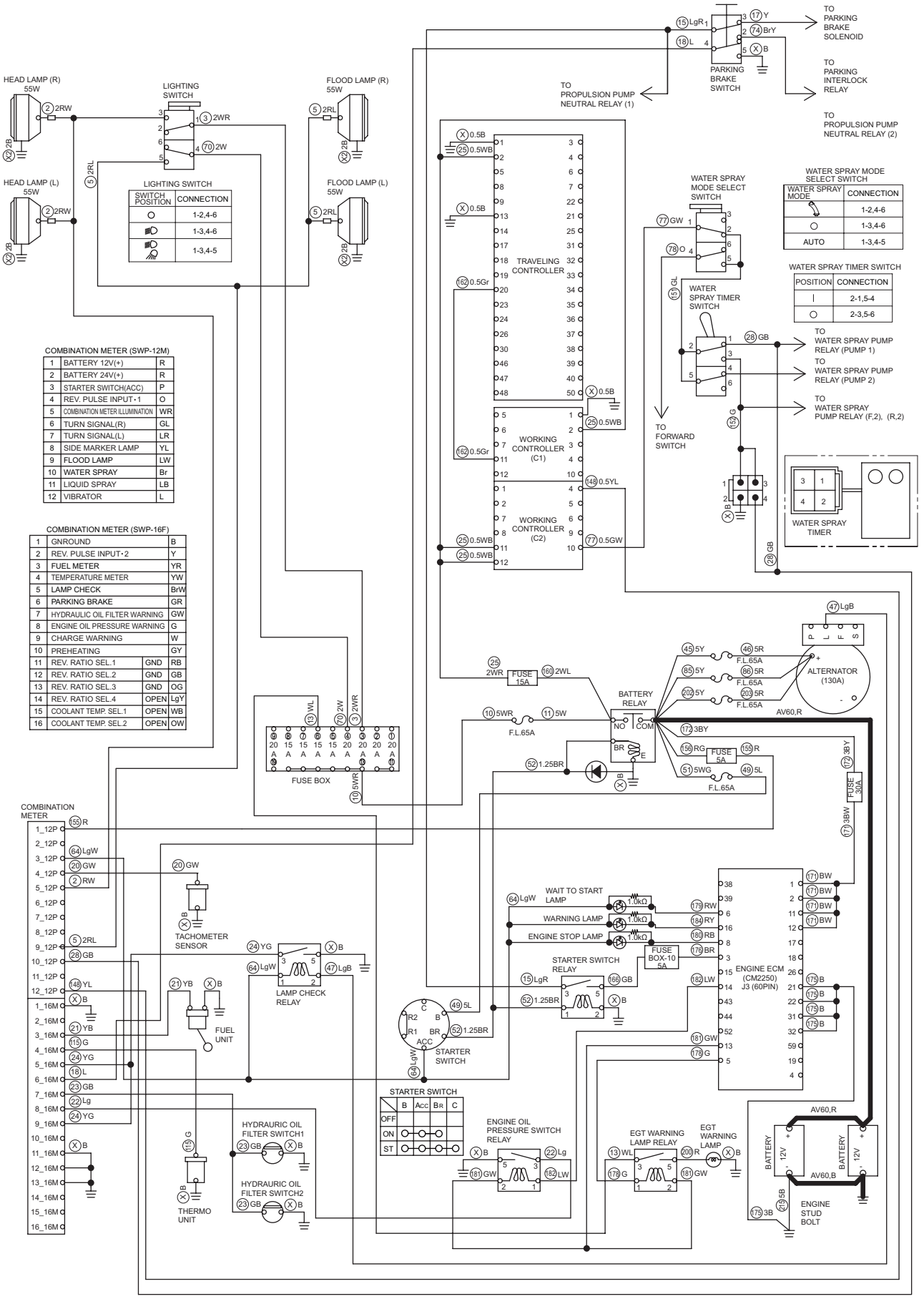
## 2-9-10. Vibration indicator lamp does not light

• Check that vibrator can be operated.

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Harness | • Measure resistance between working controller (C2) connector terminal 4 and combination meter connector terminal wire No. 148 wire YL.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| 2. Working Controller | (1) When starter switch is ON, measure voltage between working controller (C1) power supply terminal 2 inlet wire WB, working controller (C2) power supply terminal 11, 12 inlet wires WB and working controller (C1), (C2) ground terminal 1 wires B.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and vibration mode select switch is “  ” or “AUTO”, measure voltage between working controller (C2) output terminal 4 outlet wire YL and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, working controller (C2) is faulty. | Replace working controller. |
| 3. Combination Meter (Vibration indicator lamp) | (1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>• Battery terminal wire No. 155 inlet wire R and ground terminal wire B<br>• Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and vibration mode select switch is “  ” or “AUTO”, measure voltage between combination meter terminal wire No. 148 inlet wire YL (vibration terminal) and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and vibration indicator lamp does not light, combination meter is faulty. | Replace combination meter. |

# Fig.: 2-9-1

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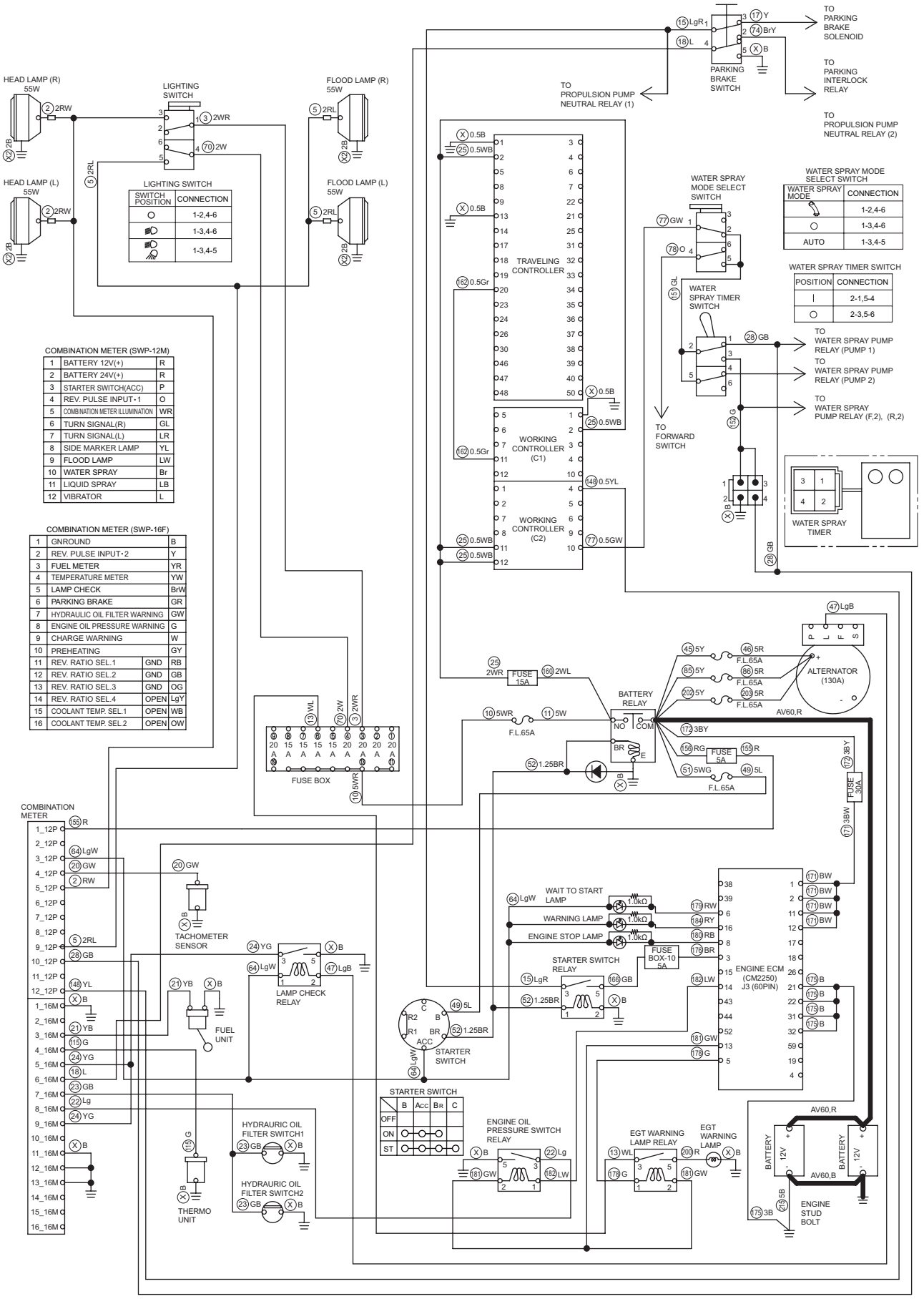
## 2-9-11. Water spray indicator lamp does not light

• Check that water spray pump can be operated.

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Harness | • Measure resistance between water spray timer switch terminal 1 wire GB and combination meter connector terminal wire No. 28 wire GB.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| | • Measure resistance between water spray timer terminal 4 wire GB and combination meter connector terminal wire No. 28 wire GB.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| 2.Combination Meter (Water spray indicator lamp) | (1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>• Battery terminal wire No. 155 inlet wire R and ground terminal wire B<br>• Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B<br>Standard voltage : 12 V or more<br>(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.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK, combination meter is faulty. | Replace combination meter. |

# Fig.: 2-9-1

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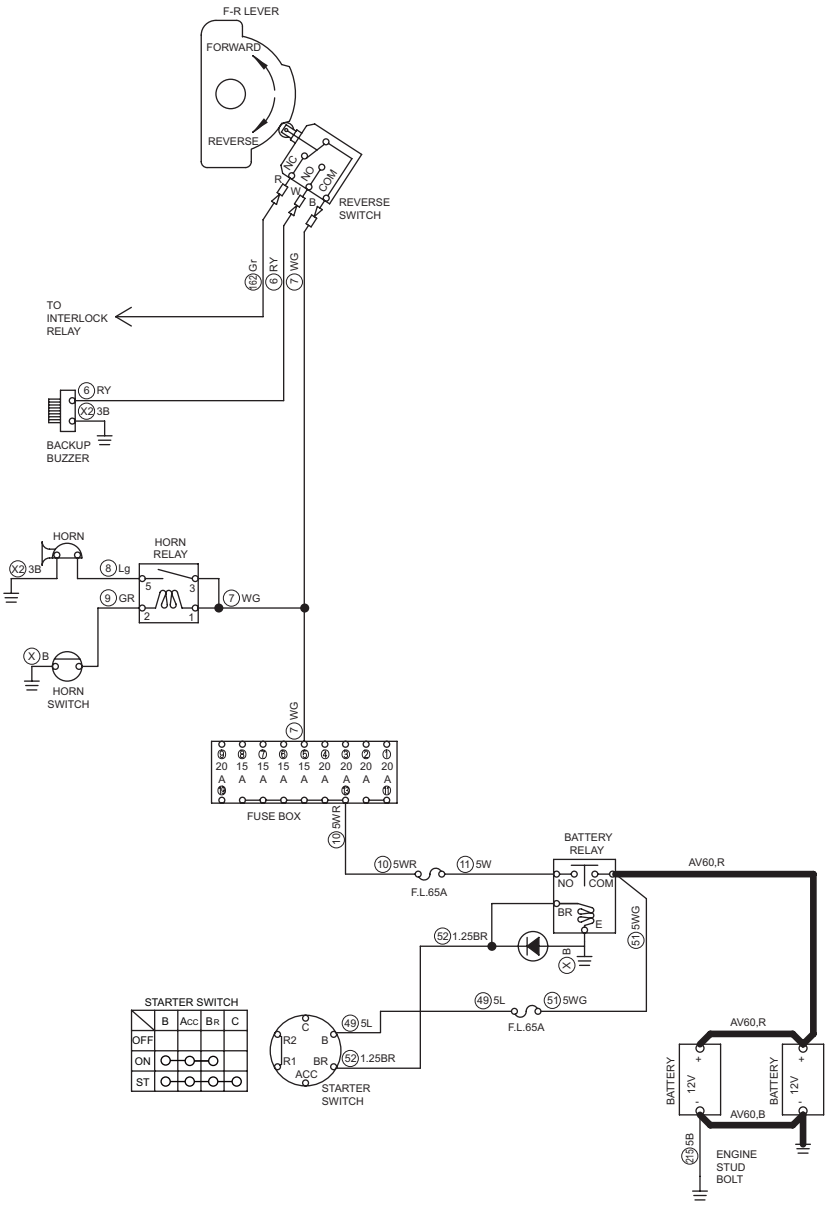
## 2-9-12. Parking brake indicator lamp does not light

**Reference Fig. : 2-9-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Harness | • Measure resistance between parking brake switch terminal 4 wire L and combination meter connector terminal wire No. 18 wire L.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |
| 2. Parking Brake Switch | • When parking brake is applied, check continuity between parking brake switch terminal 4 and 5.<br>There is continuity in normal condition.<br>• If there is no continuity, parking brake switch is faulty. | Replace parking brake switch. |
| 3. Combination Meter (Parking brake indicator lamp) | (1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.<br>• Battery terminal wire No. 155 inlet wire R and ground terminal wire B<br>• Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and parking brake is applied, measure voltage between combination meter parking brake terminal wire No. 18 outlet wire L (parking brake terminal) and chassis ground.<br>Standard voltage : 12 V or more<br>• If above items (1) and (2) are OK and parking brake indicator lamp does not light, combination meter is faulty. | Replace combination meter. |

## Fig.: 2-10-1

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## 2-9-13. Horn does not sound

**Reference Fig. : 2-10-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Horn | • Disconnect horn and directly connect battery positive terminal to horn terminal wire Lg side and negative terminal to horn terminal wire B side.<br>• If horn does not sound, horn is faulty. | Replace horn. |
| 2. Horn Switch | • When horn switch is pressed, check continuity between horn switch terminals.<br>There is continuity is normal condition.<br>• If there is no continuity, horn switch is faulty. | Replace horn switch. |
| 3. Horn Relay | (1) When starter switch is ON, measure voltage between horn relay terminal 1, 3 inlet wire WG and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and horn switch is pressed, measure voltage between horn relay terminal 5 outlet wire Lg and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, horn relay is faulty. | Replace horn relay. |
| 4. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | Repair or replace harness. |

## 2-9-14. Backup buzzer does not sound

**Reference Fig. : 2-10-1**

| Check point | Check/Cause | Action |
|---|---|---|
| 1. Backup Buzzer | • 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.<br>• If backup buzzer does not sound, backup buzzer is faulty. | Replace backup buzzer. |
| 2. Reverse Switch | (1) When starter switch is ON, measure voltage between reverse switch terminal COM inlet wire WG and chassis ground.<br>Standard voltage : 12 V or more<br>(2) When starter switch is ON and F-R lever is “R”, measure voltage between reverse switch terminal NO outlet wire RY and chassis ground.<br>Standard voltage : 12 V or more<br>• If above item (1) is OK and item (2) is NG, reverse switch is faulty. | Replace reverse switch. |
| 3. Harness Connecting Between Terminals | • Measure resistance of harness connecting between terminals.<br>Standard resistance : 10 Ω or less<br>• If resistance is abnormal, harness is faulty. | 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. Propulsion Charge Circuit Pressure | Propulsion pump does not discharge oil because charge pressure is low. | • Measure charge pressure.<br>• If low, check and adjust charge relief valve or replace it if necessary. |
| | Charge pressure decreases due to pressure leakage from pressure cut off valve. | Check and adjust pressure cut off valve or replace if necessary. |
| | 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.<br>• Parking brake solenoid valve<br>• Speed change solenoid valve | • When solenoid is energized, check if oil flows in return circuit to tank.<br>• If oil is flowing, repair solenoid valve 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. | Measure pressure in servo cylinder chamber. If low, repair propulsion pump proportional solenoid valve or replace it if necessary. |
| 5. Neutral Solenoid Valve | If spool of neutral solenoid valve is stuck, pressure in both sides of servo cylinder chamber is equalized. This causes propulsion pump unable to discharge oil. | Measure pressure in servo cylinder chambers. If pressure is equal in both chambers, repair neutral solenoid valve or replace it if necessary. |
| 6. Suction Filter for Steering • Charge Pump | Steering • 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 pressure cut off valve is low. | Measure propulsion circuit pressure. If low, check and adjust pressure cut off valve or replace it if necessary. |
| | Circuit does not obtain required pressure because setting pressure of high pressure relief is low. | • Measure propulsion circuit pressure.<br>• If low, check and adjust multifunction valve or replace it if necessary. |
| 8. Propulsion Motor | Propulsion circuit pressure is not held in propulsion motor case. | If pressure in propulsion motor case is not within allowable range, repair propulsion motor or replace it if necessary. |
| | Internal leakage of propulsion motor. | • Measure drain quantity from propulsion motor.<br>• If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary. |
| | Sticking of brake discs causes brakes to remain applied. | Replace brake discs. |

## 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. | • Measure discharge flow rate of propulsion pump with flow meter.<br>• If discharge flow rate is not within specified range, repair propulsion pump or replace it if necessary. |
| | 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. | If pressure in propulsion pump case is not within allowable range, repair propulsion pump or replace it if necessary. |
| 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. | • Measure brake release pressure.<br>• If low, repair or replace propulsion motor. |
| 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 |
|---|---|---|
| High Pressure Relief Valve | • Low circuit pressure due to incorrect high pressure relief setting or internal leakage of high pressure relief valve. | • Interchange two high pressure relief valves.<br>• If faulty condition is accordingly reversed, check and adjust high pressure relief valve or replace it if necessary. |

## 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. Propulsion Charge Circuit Pressure | Stroke of propulsion pump swash plate is small because charge pressure is low, decreasing discharge rate of propulsion pump. | • Measure charge pressure.<br>• If low, check and adjust charge relief valve or replace it if necessary. |
| | 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.<br>• Parking brake solenoid valve | • When solenoid is energized, check if oil flows in return circuit to tank.<br>• If oil is flowing, repair solenoid valve or replace it if necessary. |
| 3. 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. |

## 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. | • Measure propulsion motor inlet pressure.<br>• If low, check and adjust multifunction valve or replace it if necessary. |
| | Propulsion circuit pressure is not held in propulsion motor case. | If pressure in propulsion motor case is not within allowable range, repair propulsion motor or replace it if necessary. |
| | Output of propulsion motor decreases and number of revolutions decreases due to internal leakage of propulsion motor. | • Measure drain quantity from propulsion motor.<br>• If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary. |
| 5. Propulsion Pump | Discharge flow rate is insufficient due to efficiency degradation of propulsion pump. | • Measure discharge flow rate of propulsion pump with flow meter.<br>• If discharge flow rate is not within specified range, repair propulsion pump or replace it if necessary. |
| | 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. | If pressure in propulsion pump case is not within allowable range, repair propulsion pump or replace it if necessary. |

## 3-2-4. Machine does not stop completely with F-R lever in “N”

| Check point | Cause | Check/Action |
|---|---|---|
| 1. Propulsion Pump Proportional Solenoid Valve | Neutral adjustment for propulsion pump proportional solenoid valve is inappropriate. | Check and adjust propulsion pump proportional solenoid valve or replace it if necessary. |
| 2. Servo Cylinder | Faulty servo cylinder or faulty pump swash plate setting. | Repair propulsion pump or replace it if necessary. |

## 3-2-5. 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. | • Measure propulsion circuit pressure.<br>• If low, increase relief setting pressure. |
| | If load is excessively heavy, relief valve opens, causing temperature of hydraulic oil in circuit to rise. | • Measure propulsion circuit pressure.<br>• If high, decrease propulsion load. |
| 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. |

## 3-2-6. Abnormal noise from propulsion system

| Check point | Cause | Check/Action |
|---|---|---|
| 1. Axle Bearings | Axle bearings supporting front and rear drums are damaged. | Replace axle 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. Charge Circuit Pressure | If charge pressure is low, brake cannot be released completely, which causes brake drag. | • Measure charge pressure.<br>• If low, check and adjust charge relief valve or replace it if necessary. |
| 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. | • Measure charge pressure.<br>• If low, check and adjust charge relief valve or replace it if necessary. |
| | Insufficient vibrator charge pump discharge. | Repair vibrator charge pump or replace it if necessary. |
| 3. Vibrator Pump Proportional Solenoid Valve | Vibrator pump cannot discharge oil because proportional pressure reducing valve does not shift. | Repair vibrator pump proportional solenoid valve or replace them if necessary. |
| 4. Suction Filter for Vibrator Charge Pump | Vibrator charge pump flow is reduced due to clogged filler. | Clean suction filter or replace it if necessary. |
| 5. Vibrator Circuit Pressure | Circuit does not obtain required pressure because setting pressure of high pressure check relief is low. | • Measure vibrator circuit pressure.<br>• If low, check and clean high pressure check relief valve or replace it if necessary. |
| 6. Vibrator Solenoid Valve (for Bypassing) | Vibrator pressure is bypassed because vibrator solenoid valve spool does not switch. | If vibrator solenoid valve spool does not switch, repair vibrator solenoid valve or replace it if necessary. |
| 7. 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. | • Measure drain quantity from vibrator motor.<br>• If drain quantity is larger than standard value, repair vibrator motor or replace it if necessary. |
| | Output torque is not transmitted due to worn spline of vibrator motor output shaft. | Replace vibrator motor. |
| 8. Vibrator Pump | Insufficient discharge rate from vibrator pump due to reduced efficiency of vibrator pump. | • Measure discharge flow rate of vibrator pump with flow meter.<br>• If discharge flow rate is not within specified range, repair vibrator pump or replace it if necessary. |
| | 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. | If pressure in vibrator pump case is not within allowable range, repair vibrator pump or replace it if necessary. |

### 3-3-2. Only front or rear vibratory drum can vibrate (two-drum vibration cannot be performed)

| Check point | Cause | Check/Action |
|---|---|---|
| 1. Vibrator Solenoid Valve (for Bypassing) | 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. | • Measure drain quantity from vibrator motor.<br>• If drain quantity is larger than standard value, repair vibrator motor or replace it if necessary. |
| | 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

| 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. | • Measure charge pressure.<br>• If low, check and adjust charge relief valve or replace it if necessary. |
| | Insufficient vibrator charge pump discharge. | Repair vibrator charge pump or replace it if necessary. |
| 3. Vibrator Solenoid Valve (for Bypassing) | 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 Vibrator Charge Pump | Vibrator charge pump flow is reduced due to clogged filler. | Clean suction filter or replace it if necessary. |
| 5. Vibrator Motor | Vibrator motor inlet pressure is low. | • Measure vibrator motor inlet pressure.<br>• If low, check and clean high pressure check relief valve or replace it if necessary. |
| | 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. |
| | Decrease in vibrator motor rpm due to internal leakage in vibrator motor. | • Measure drain quantity from vibrator motor.<br>• If drain quantity is larger than standard value, repair vibrator motor or replace it if necessary. |
| 6. Vibrator Pump | Insufficient discharge rate from vibrator pump due to reduced efficiency of vibrator pump. | • Measure discharge flow rate of vibrator pump with flow meter.<br>• If discharge flow rate is not within specified range, repair vibrator pump or replace it if necessary. |
| | 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. | If pressure in vibrator pump case is not within allowable range, repair vibrator pump or replace it if necessary. |

### 3-3-4. Amplitude does not switch between high and low

| Check point | Cause | Check/Action |
|---|---|---|
| 1. Vibrator Pump Proportional Solenoid Valve | Only high or low side proportional pressure reducing valve works. | Repair vibrator pump proportional solenoid valve or replace them if necessary. |
| 2. Servo Control Valve | Servo control valve spool shifts only in one direction. | Repair servo control valve spool or replace it if necessary. |

### 3-3-5. Vibrator does not stop

| Check point | Cause | Check/Action |
|---|---|---|
| 1. Servo Control Valve | Servo control valve spool does not return to neutral position. | • Measure vibrator high/low circuit pressure.<br>• If not equal, check and adjust servo control valve or replace it if necessary. |
| 2. Vibrator Pump | Vibrator pump swash place does not return to neutral position. | Repair vibrator pump or replace it if necessary. |

### 3-3-6. 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. | • Measure vibrator circuit pressure.<br>• If low, check and clean relief valve or replace it if necessary. |
| | If load is excessively heavy, relief valve opens, causing temperature of hydraulic oil in circuit to rise. | • Measure vibrator circuit pressure.<br>• If high, decrease vibration load. |
| 5. Suction Filter for Vibrator Charge Pump | Load of vibrator 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. |

## 3-3-7. 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 Vibrator Charge Pump | Cavitation is occurring in vibrator 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 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. | • Measure steering circuit pressure.<br>• If low, check and clean relief valve or replace it if necessary. |
| | 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. | • Measure steering circuit pressure.<br>• If low, replace steering • charge pump. |
| 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. | • Measure steering circuit pressure.<br>• If low, check and adjust relief valve or replace it if necessary. |
| 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. | • Measure steering circuit pressure.<br>• If low, replace steering • charge pump. |

### 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. | • Measure steering circuit pressure.<br>• If low, replace relief valve. |
| | If load is excessively heavy, relief valve is open, causing temperature of hydraulic oil in circuit to rise. | • Measure steering circuit pressure.<br>• If high, decrease steering load. |
| 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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