SW884/994

SHOP MANUAL

SAKAI®

3498-6568B-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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3. HYDRAULIC SYSTEM TROUBLESHOOTING

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.

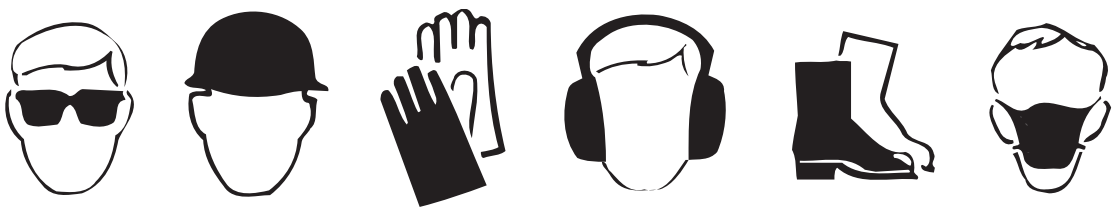
- The machine is designed specifically for the compaction of asphalt or soil road construction materials. Use of the machine for other purposes such as towing other equipment is considered contrary to the designated use. The manufacturer cannot be responsible or held liable for any damage resulting from 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.

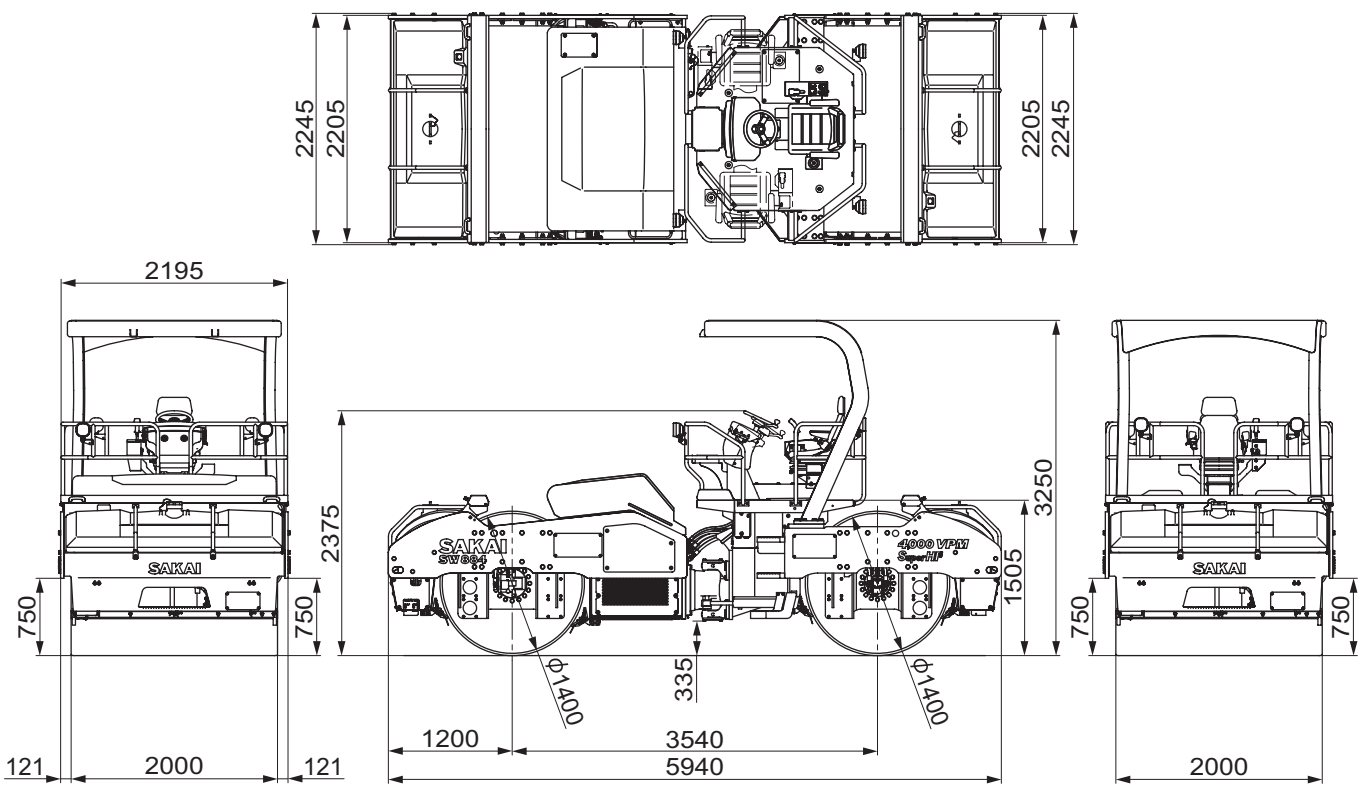
1-11. Transporting the Machine

- 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. SW884



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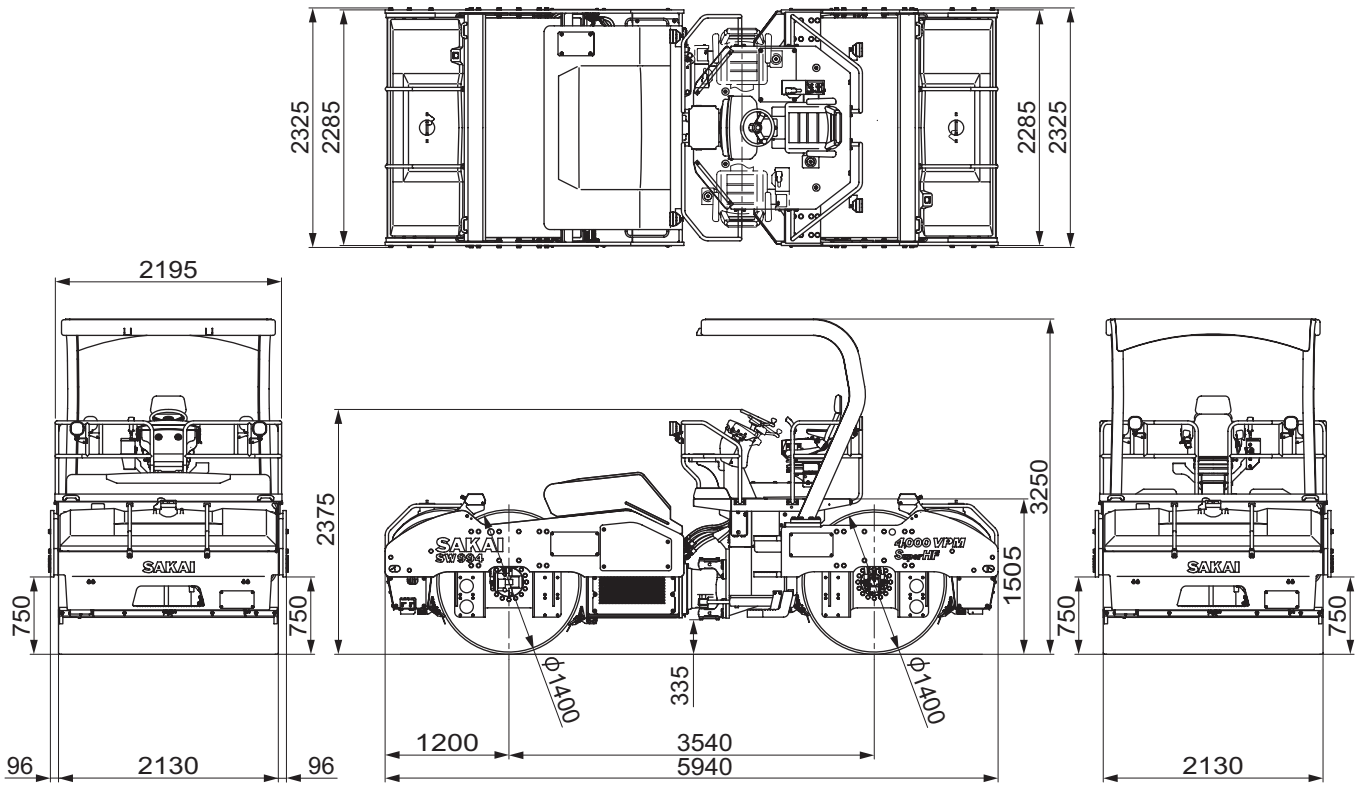
Model & Type	Model		SAKAI SW884 with ROPS
	Type		VIBRATORY TANDEM ROLLER
Weight	Operating weight	without ballast	12,890 kg (28,415 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		13,610 kg (30,005 lbs.)
	Shipping weight	with ROPS	12,110 kg (26,695 lbs.)
		without ROPS	11,560 kg (25,485 lbs.)
	Load on front axle		6,350 kg (14,000 lbs.)
	Load on rear axle		6,540 kg (14,420 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. × thickness	2,000 mm × 1,400 mm × 22 mm (79 in. × 55 in. × 0.9 in.)
	Rear drum	width × dia. × thickness	2,000 mm × 1,400 mm × 22 mm (79 in. × 55 in. × 0.9 in.)
	Ground clearance		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 lbf.)
					3,000 vpm	90 kN	(20,230 lbf.)
					2,500 vpm	63 kN	(14,160 lbf.)
				High amplitude	3,000 vpm	177 kN	(39,790 lbf.)
					2,500 vpm	123 kN	(27,650 lbf.)
			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 lbf.)
					3,000 vpm	90 kN	(20,230 lbf.)
					2,500 vpm	63 kN	(14,160 lbf.)
				High amplitude	3,000 vpm	177 kN	(39,790 lbf.)
					2,500 vpm	123 kN	(27,650 lbf.)
			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 lbf./in.)
			Rear drum			321 N/cm	(183 lbf./in.)
		Dynamic linear pressure	Front drum	Low amplitude	4,000 vpm	1,111 N/cm	(635 lbf./in.)
					3,000 vpm	761 N/cm	(435 lbf./in.)
					2,500 vpm	626 N/cm	(358 lbf./in.)
				High amplitude	3,000 vpm	1,196 N/cm	(683 lbf./in.)
					2,500 vpm	926 N/cm	(529 lbf./in.)
			Rear drum	Low amplitude	4,000 vpm	1,121 N/cm	(640 lbf./in.)
					3,000 vpm	771 N/cm	(440 lbf./in.)
					2,500 vpm	636 N/cm	(363 lbf./in.)
				High amplitude	3,000 vpm	1,206 N/cm	(688 lbf./in.)
					2,500 vpm	936 N/cm	(534 lbf./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			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 °	

1-2. SW994



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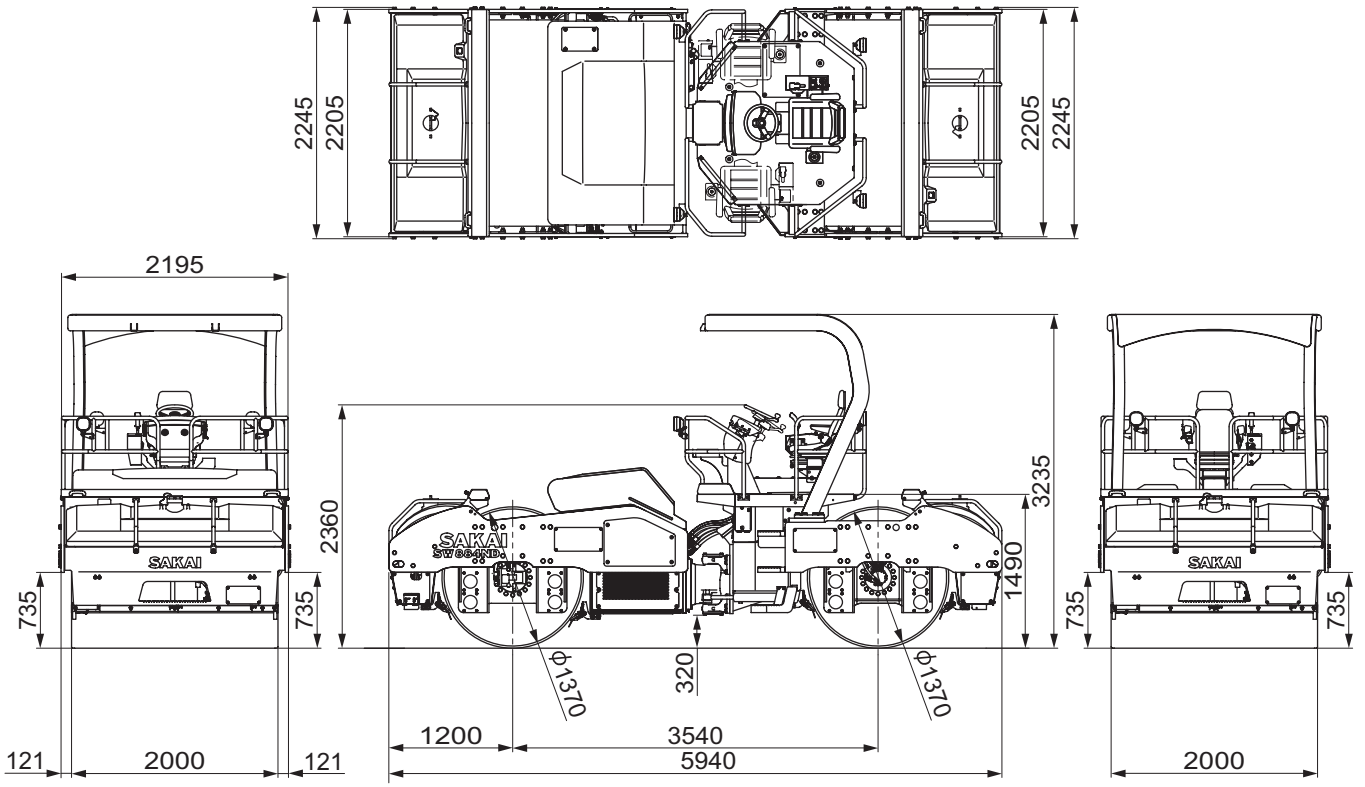
Model & Type	Model		SAKAI SW994 with ROPS
	Type		VIBRATORY TANDEM ROLLER
Weight	Operating weight	without ballast	13,270 kg (29,255 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		14,000 kg (30,865 lbs.)
	Shippng weight	with ROPS	12,500 kg (27,555 lbs.)
		without ROPS	11,950 kg (26,345 lbs.)
	Load on front axle		6,530 kg (14,395 lbs.)
	Load on rear axle		6,740 kg (14,860 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. × thickness	2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.)
	Rear drum	width × dia. × thickness	2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.)
	Ground clearance		335 mm (13.1 in.)
	Kerb clearance	Left	750 mm (29.6 in.)
		Right	750 mm (29.6 in.)
	Side clearance	Left	96 mm (3.8 in.)
		Right	96 mm (3.8 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 lbf.)
					3,000 vpm	98 kN	(22,030 lbf.)
					2,500 vpm	68 kN	(15,285 lbf.)
				High amplitude	3,000 vpm	185 kN	(41,590 lbf.)
					2,500 vpm	128 kN	(28,775 lbf.)
			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 lbf.)
					3,000 vpm	98 kN	(22,030 lbf.)
					2,500 vpm	68 kN	(15,285 lbf.)
				High amplitude	3,000 vpm	185 kN	(41,590 lbf.)
					2,500 vpm	128 kN	(28,775 lbf.)
			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			301 N/cm	(172 lbf./in.)
			Rear drum			310 N/cm	(177 lbf./in.)
		Dynamic linear pressure	Front drum	Low amplitude	4,000 vpm	1,113 N/cm	(635 lbf./in.)
					3,000 vpm	761 N/cm	(434 lbf./in.)
					2,500 vpm	620 N/cm	(354 lbf./in.)
				High amplitude	3,000 vpm	1,169 N/cm	(668 lbf./in.)
					2,500 vpm	902 N/cm	(515 lbf./in.)
			Rear drum	Low amplitude	4,000 vpm	1,123 N/cm	(641 lbf./in.)
					3,000 vpm	770 N/cm	(440 lbf./in.)
					2,500 vpm	630 N/cm	(359 lbf./in.)
				High amplitude	3,000 vpm	1,179 N/cm	(673 lbf./in.)
					2,500 vpm	911 N/cm	(520 lbf./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			without vibration		28 %	(15 °)
	Turning radius	Machine clearance radius inside				4.2 m	(166 in.)
		Machine clearance radius outside				6.5 m	(256 in.)
		Turning radius inside compacted surface				4.3 m	(170 in.)
		Turning radius outside compacted surface				6.4 m	(252 in.)
	Steering / Oscillating angle					± 36.7 ° / ± 6.5 °	

1-3. SW884ND



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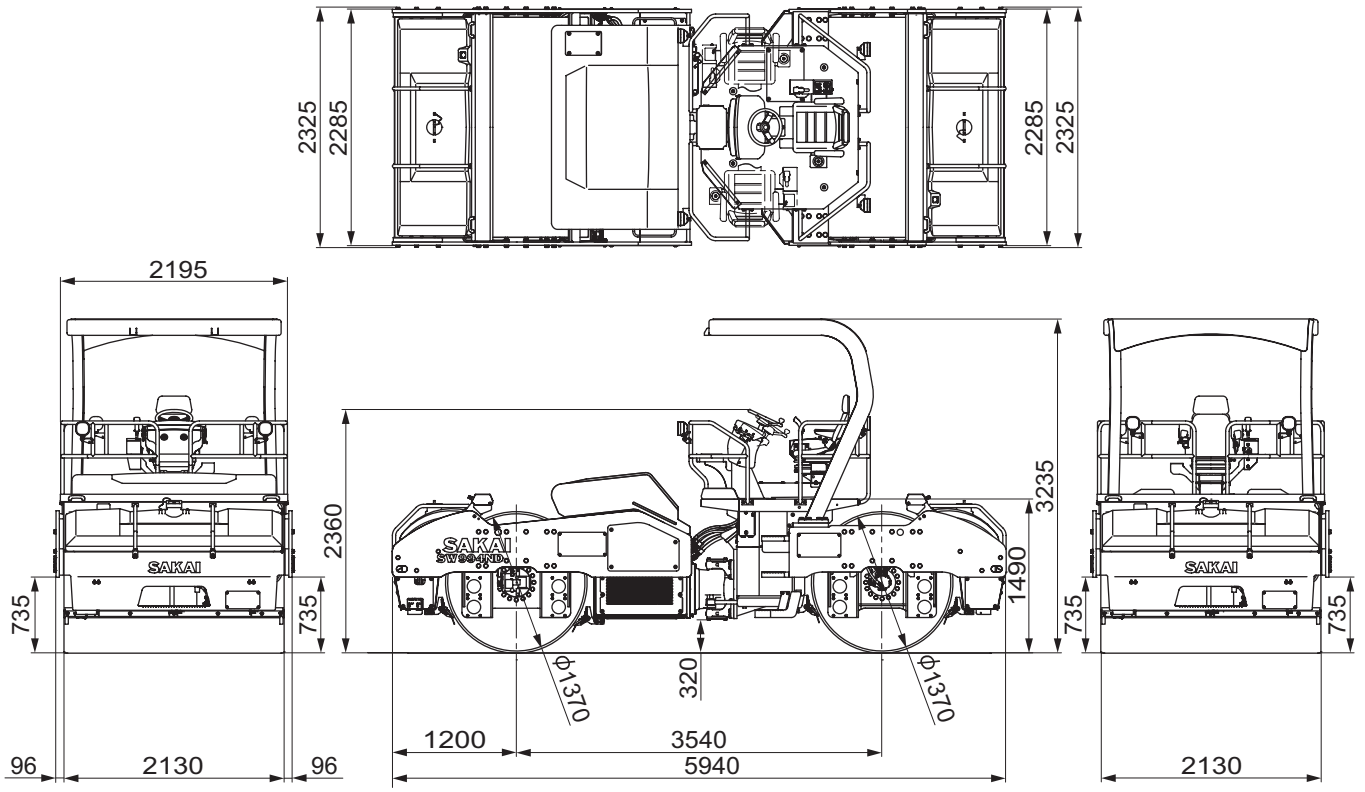
Model & Type	Model		SAKAI SW884ND with ROPS
	Type		VIBRATORY TANDEM ROLLER
Weight	Operating weight	without ballast	13,230 kg (29,165 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		13,950 kg (30,755 lbs.)
	Shippng weight	with ROPS	12,450 kg (27,445 lbs.)
		without ROPS	11,900 kg (26,235 lbs.)
	Load on front axle		6,520 kg (14,375 lbs.)
	Load on rear axle		6,710 kg (14,795 lbs.)
Dimensions	Overall length		5,940 mm (234 in.)
	Overall width		2,245 mm (88 in.)
	Overall height	with ROPS	3,235 mm (127 in.)
		without ROPS	2,360 mm (93 in.)
	Wheelbase		3,540 mm (139 in.)
	Compaction width		2,000 mm (79 in.)
	Front drum	width × dia. × thickness	2,000 mm × 1,370 mm × 21 mm (79 in. × 54 in. × 0.8 in.)
	Rear drum	width × dia. × thickness	2,000 mm × 1,370 mm × 21 mm (79 in. × 54 in. × 0.8 in.)
	Ground clearance		320 mm (12.5 in.)
	Kerb clearance	Left	735 mm (29.0 in.)
		Right	735 mm (29.0 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	Vibration		158 kN	(35,585 lbf.)
				Oscillation		172 kN	(38,600 lbf.)
			Frequency	Vibration		50.0 Hz	(3,000 vpm)
				Oscillation		46.7 Hz	(2,800 vpm)
			Amplitude	Vibration		0.55 mm	(0.022 in.)
				Oscillation		0.60 mm	(0.024 in.)
		Rear	Centrifugal force	Vibration		158 kN	(35,585 lbf.)
				Oscillation		172 kN	(38,600 lbf.)
			Frequency	Vibration		50.0 Hz	(3,000 vpm)
				Oscillation		46.7 Hz	(2,800 vpm)
			Amplitude	Vibration		0.55 mm	(0.022 in.)
				Oscillation		0.60 mm	(0.024 in.)
	Linear pressure	Static linear pressure	Front drum	Operating weight		320 N/cm	(183 lbf./in.)
			Rear drum	Operating weight		329 N/cm	(188 lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Vibration	1,111 N/cm	(635 lbf./in.)
			Rear drum	Operating weight	Vibration	1,121 N/cm	(640 lbf./in.)
	Speed	Number of speed shift				2 speed	
		Speed range		1st	Vibration	0 to 5.5 km/h	(0 to 3.4 mph)
					Oscillation	0 to 6.4 km/h	(0 to 4.0 mph)
				2nd		0 to 11.0 km/h	(0 to 6.8 mph)
	Gradeability			without vibration		28 %	(15 °)
	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 °	

1-4. SW994ND



0569-99010-0-10943-0

Model & Type	Model		SAKAI SW994ND with ROPS
	Type		VIBRATORY TANDEM ROLLER
Weight	Operating weight	without ballast	13,590 kg (29,960 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		14,320 kg (31,570 lbs.)
	Shippng weight	with ROPS	12,820 kg (28,265 lbs.)
		without ROPS	12,270 kg (27,050 lbs.)
	Load on front axle		6,690 kg (14,750 lbs.)
	Load on rear axle		6,900 kg (15,210 lbs.)
Dimensions	Overall length		5,940 mm (234 in.)
	Overall width		2,325 mm (92 in.)
	Overall height	with ROPS	3,235 mm (127 in.)
		without ROPS	2,360 mm (93 in.)
	Wheelbase		3,540 mm (139 in.)
	Compaction width		2,130 mm (84 in.)
	Front drum	width × dia. × thickness	2,130 mm × 1,370 mm × 21 mm (84 in. × 54 in. × 0.8 in.)
	Rear drum	width × dia. × thickness	2,130 mm × 1,370 mm × 21 mm (84 in. × 54 in. × 0.8 in.)
	Ground clearance		320 mm (12.5 in.)
	Kerb clearance	Left	735 mm (29.0 in.)
		Right	735 mm (29.0 in.)
	Side clearance	Left	96 mm (3.8 in.)
		Right	96 mm (3.8 in.)
	Leveling blade width		N/A mm (N/A in.)

Performance	Vibrator system	Front	Centrifugal force	Vibration		158 kN	(35,585 lbf.)
				Oscillation		172 kN	(38,600 lbf.)
			Frequency	Vibration		50.0 Hz	(3,000 vpm)
				Oscillation		46.7 Hz	(2,800 vpm)
			Amplitude	Vibration		0.54 mm	(0.021 in.)
				Oscillation		0.56 mm	(0.022 in.)
		Rear	Centrifugal force	Vibration		158 kN	(35,585 lbf.)
				Oscillation		172 kN	(38,600 lbf.)
			Frequency	Vibration		50.0 Hz	(3,000 vpm)
				Oscillation		46.7 Hz	(2,800 vpm)
			Amplitude	Vibration		0.54 mm	(0.021 in.)
				Oscillation		0.56 mm	(0.022 in.)
	Linear pressure	Static linear pressure	Front drum	Operating weight		308 N/cm	(176 lbf./in.)
			Rear drum	Operating weight		318 N/cm	(181 lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Vibration	1,051 N/cm	(600 lbf./in.)
			Rear drum	Operating weight	Vibration	1,061 N/cm	(606 lbf./in.)
	Speed	Number of speed shift				2 speed	
		Speed range		1st	Vibration	0 to 5.5 km/h	(0 to 3.4 mph)
					Oscillation	0 to 6.4 km/h	(0 to 4.0 mph)
				2nd		0 to 11.0 km/h	(0 to 6.8 mph)
	Gradeability			without vibration		28 %	(15 °)
	Turning radius	Machine clearance radius inside				4.2 m	(166 in.)
		Machine clearance radius outside				6.5 m	(256 in.)
		Turning radius inside compacted surface				4.3 m	(170 in.)
		Turning radius outside compacted surface				6.4 m	(252 in.)
	Steering / Oscillating angle					± 36.7 ° / ± 6.5 °	

1-5. Common Specifications

Engine	Name		CUMMINS QSF3.8 (Diesel, EPA-Tier 4)
	Model		4-cycle, Water-cooled, 4-cylinder in-line, overhead valve, direct injection type, with turbo charger
	Bore × Stroke		102 mm × 115 mm (4.02 in. × 4.53 in.)
	Displacement		3.800 L (229.0 cu.in)
	Performance	Rated speed	2,200 min^{-1}
		Rated output	97.0 kW (130 HP)
		Max. torque	488 N·m (360 lbf·ft) at 1,600 min^{-1}
		Fuel consumption rate	234 g/kW·h (0.385 lb/HP·h) at 2,200 min^{-1}
		Fuel consumption	27 L/h with full load (7.1 gal with full load)
	Fuel system	Fuel	Diesel (ASTM D975-2D)
		Fuel injection pump	Inline injection pump
		Fuel injection time regulator	All speed governor
	Lubrication system	Lubrication type	Full forced pressure feed
		Oil filter type	Full flow
		Oil cooler type	Integrated 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 135 A
		Starter	12 V 4.8 kW
		Battery	12 V (CCA1000) × 1 pcs. (12 V)
	Dry weight		348 kg (767 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
Engine model		CUMMINS QSF 3.8	
Rated output		97/2,200 kW/ min^{-1} (130/2,200 HP/ min^{-1})	
Max. rpm under no load		2,200 rpm	
Min. rpm under no load		900 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)	Use mano meter

2-2. Propulsion

Item				Standard value	Remarks
Travel speed (Forward/ reverse)	SW884/ 994	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)	
	SW884ND/ 994ND	1st	Vibration	0 to 5.5 km/h (0 to 3.4 mph)	
			Oscillation	0 to 6.4 km/h (0 to 4.0 mph)	
		2nd		0 to 11.0 km/h (0 to 6.8 mph)	

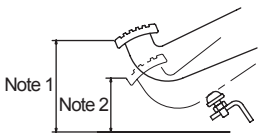
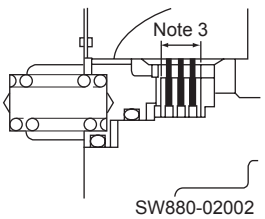
2-3. Hydraulic System

Item				Standard value	Remarks
Propulsion	High pressure relief valve setting			40.2 ± 1.0 MPa (5,829 ± 145 psi)	
	Cut off valve setting			37.3 ± 1.0 MPa (5,409 ± 29 psi)	
	Charge relief valve setting	Pump		2.5 ± 0.2 MPa (362 ± 29 psi)	
		Motor (F)		2.5 ± 0.2 MPa (362 ± 29 psi)	
	Case pressure	Pump		0.4 MPa (58.0 psi)	or less
		Motor		0.3 MPa (43.5 psi)	or less
	Brake release pressure			1.5 MPa (218 psi)	
	Motor drainage		SW884/994	10.7 L/min (2.8 gal./min)	
			SW884ND/994ND	10.9 L/min (2.9 gal./min)	
Vibration	High pressure relief valve setting			31.5 ± 1.0 MPa (4,567 ± 145 psi)	
	Charge relief valve setting	Pump (R)		2.5 ± 0.2 MPa (362 ± 29 psi)	
	Case pressure	Pump (F),(R)		0.4 MPa (58.0 psi)	
		Motor	SW884/994	0.15 MPa (21.8 psi)	or less
			SW884ND/994ND	0.17 MPa (24.7 psi)	or less
	Motor drainage		SW884/994	6.4 L/min (1.7 gal./min)	
			SW884ND/994ND	10.5 L/min (2.8 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)	132 mm (5.2 in.) Note 1: See dimensions	 SW880-02001
Clearance between brake pedal and floorboard (when pressed down)	75 mm (3.0 in.) Note 2: See dimensions	
Propulsion motor inner brake wear limit Thickness of disc assembly (7 discs)	18.5 to 19.1 mm (0.73 to 0.75 in.) Note 3: See dimensions Allowable when thickness is within this range. Replace all 7 discs when thickness becomes 18.5 or less.	 SW880-02002

2-6. Capacities

Item		Standard value	Remarks
Engine oil pan		11 L (2.9 gal.)	
Fuel tank		292 L (77.1 gal.)	
Coolant		22 L (5.8 gal.)	
Gear box		3.6 L × 2 (0.95 gal. × 2)	
Hydraulic oil tank		65 L (17.2 gal.)	
Vibrator case	SW884/994	22 L × 2 (5.8 gal. × 2)	
	SW884ND/994ND	75 L × 2 (19.8 gal. × 2)	
Water spray tank		600 L × 2 (158.5 gal. × 2)	
DEF tank		19 L (5.0 gal.)	

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	SAE5W-40	SAE5W-40	SAE5W-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
DEF	ISO22241-1 or AUS32				

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

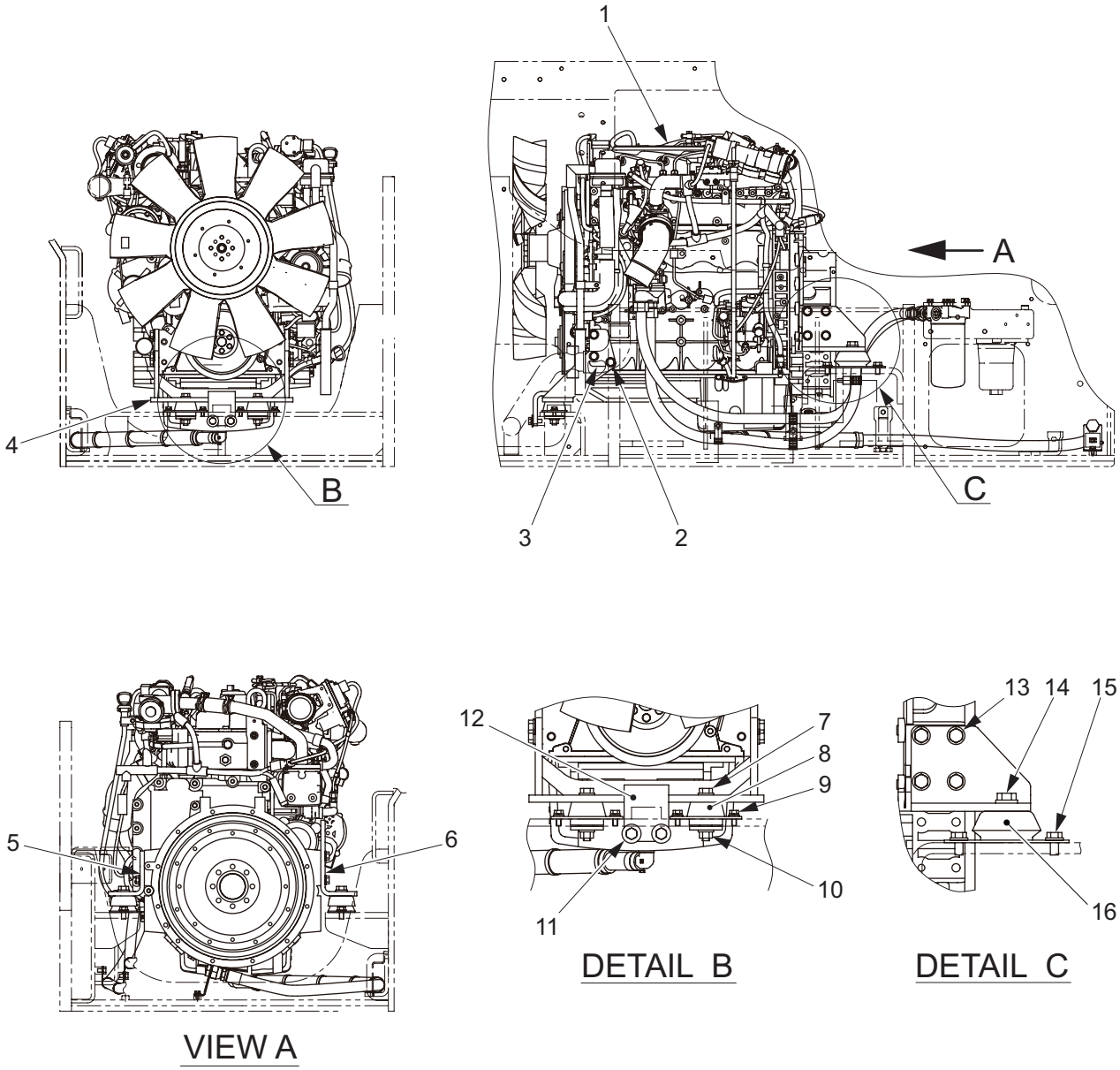
N·m	(lbf·ft)

	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



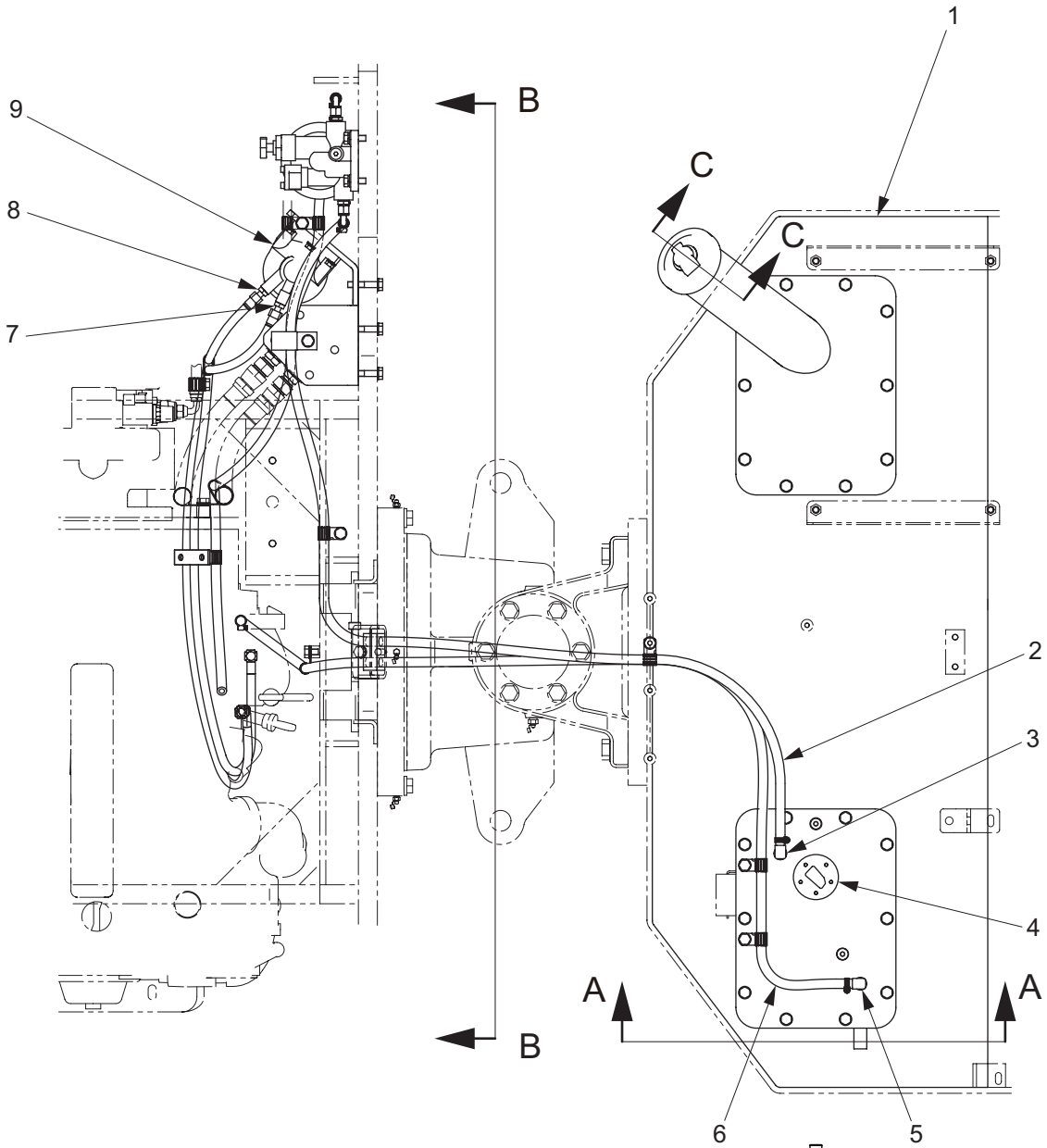
0568-01805-0-11972-C

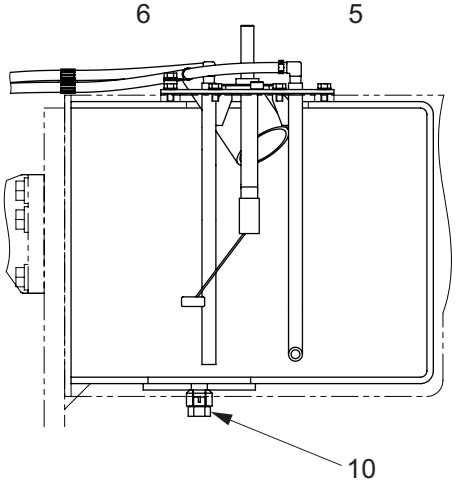
(1) Engine
(2) Bolt : M12×35
(3) Shim
(4) Bracket
(5) Bracket
(6) Bracket
(7) Bolt : M12×80
(8) Damper
(9) Bolt : M 8×20
(10) Nut : M12
(11) Bolt : M10×30
(12) Bracket
(13) Bolt : M12×35
(14) Bolt : M16×50
(15) Bolt : M12×25
(16) Damper

N·m

(2) Bolt M12×35 : 108 N·m (80 lbf·ft)
(9) Bolt M 8×20 : 31 N·m (23 lbf·ft)
(10) Nut M12 : 108 N·m (80 lbf·ft)
(13) Bolt M12×35 : 108 N·m (80 lbf·ft)
(14) Bolt M16×50 : 265 N·m (195 lbf·ft)
(15) Bolt M12×25 : 108 N·m (80 lbf·ft)

2. FUEL SYSTEM

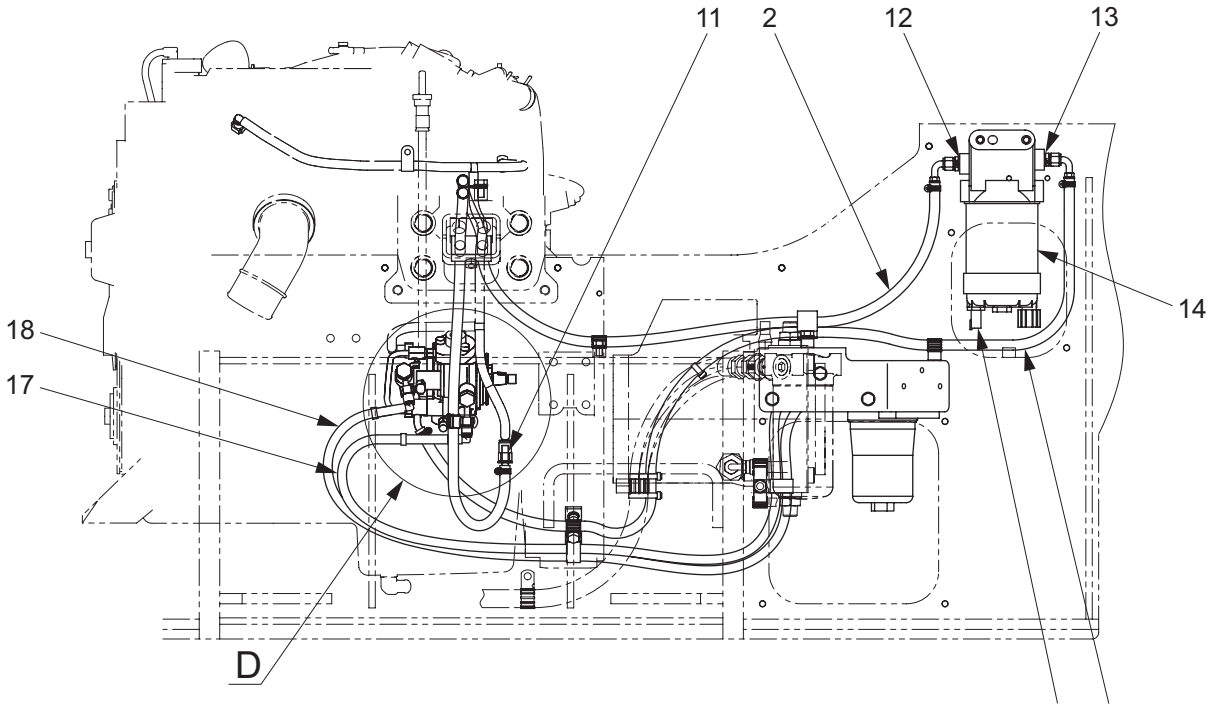




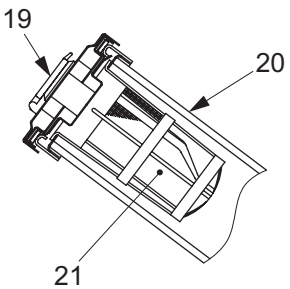
SECTION A-A

(1) Fuel tank
(2) Hose (3 → 12)
(3) Suction (fuel tank)
(4) Fuel gauge unit
(5) Return (fuel tank)
(6) Hose (11 → 5)
(7) OUT (main filter)
(8) IN (main filter)
(9) Main filter
(10) Drain plug (fuel tank)
(11) Return (engine)
(12) IN (pre-filter)
(13) OUT (pre-filter)
(14) Pre-filter
(15) Hose (13 → 24)
(16) WIF sensor
(17) Hose (7 → 23)
(18) Hose (25 → 8)
(19) Filler cap
(20) Fuel supply port
(21) Filter
(22) Fuel pump
(23) Suction (engine)
(24) IN (fuel pump)
(25) OUT (fuel pump)

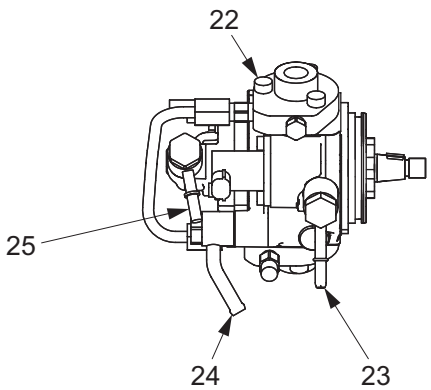
0568-02806-0-11973-D



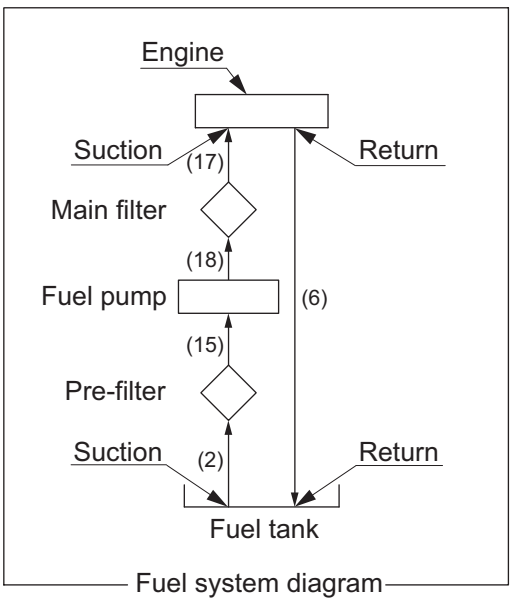
VIEW B-B



SECTION C-C



DETAIL D



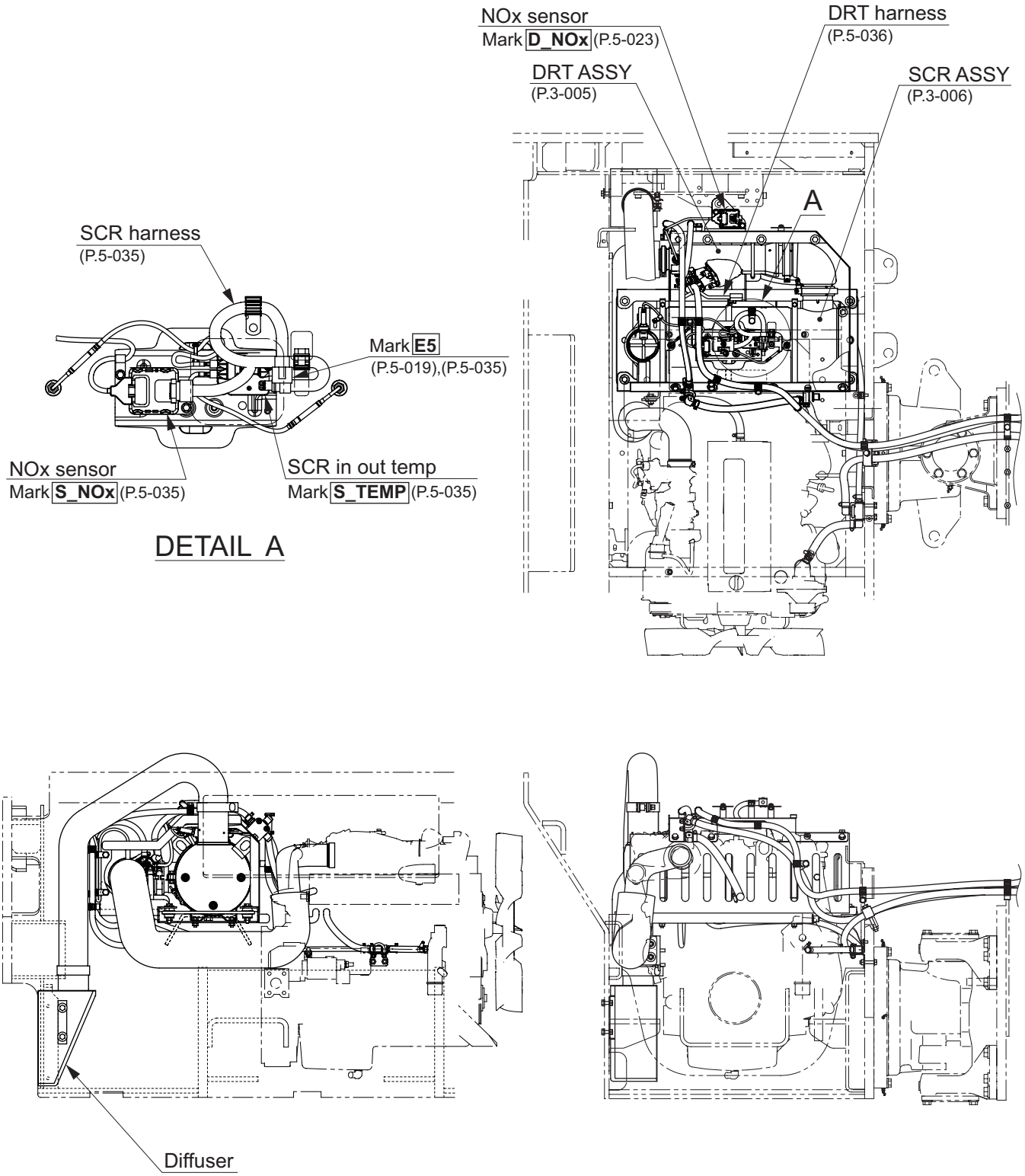
Fuel system diagram

• Arrow " → " symbols show the hose connection and the direction of the flow of the fuel.

0568-02806-0-11973-D

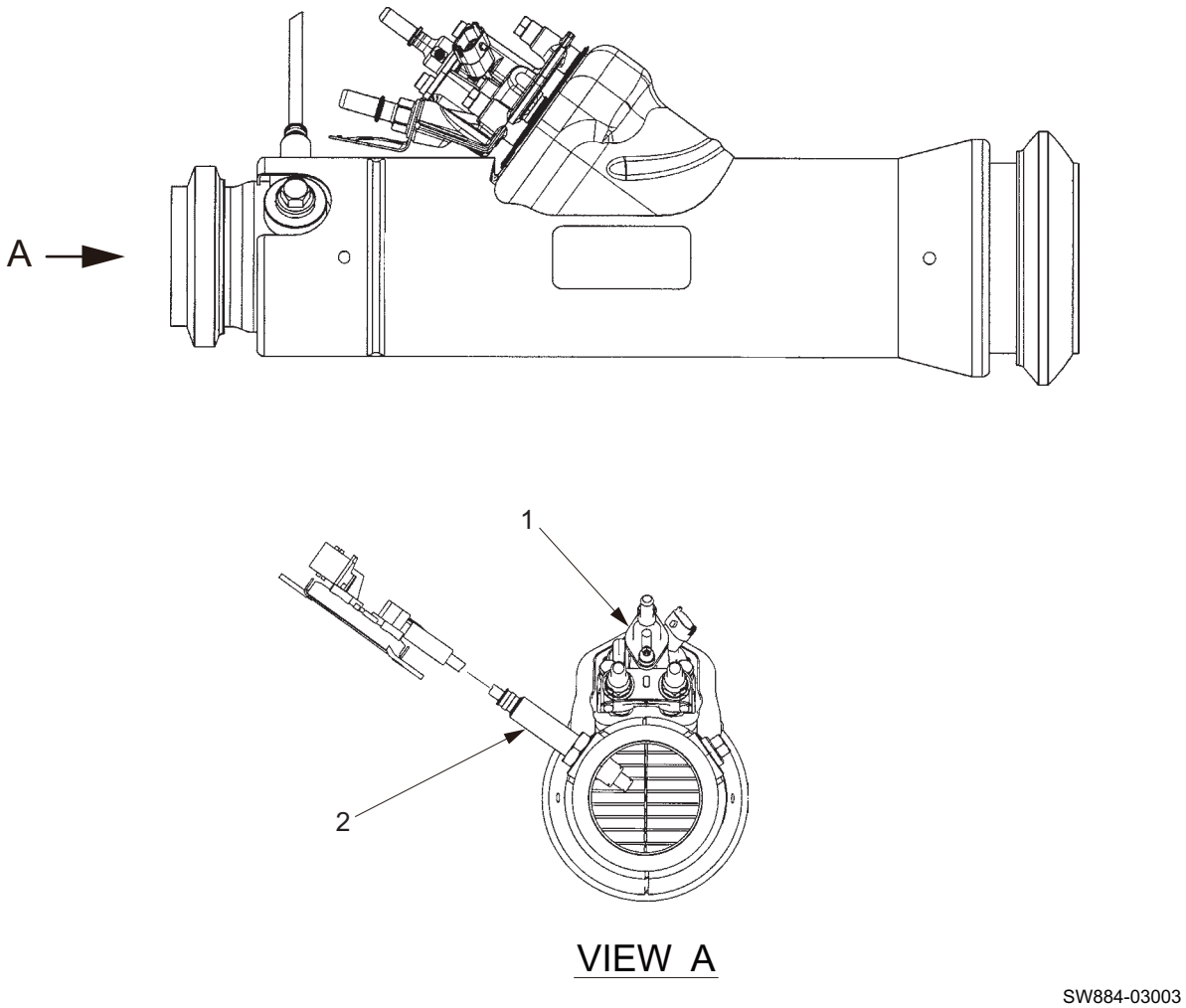
3. EXHAUST SYSTEM

3-1. Exhaust System



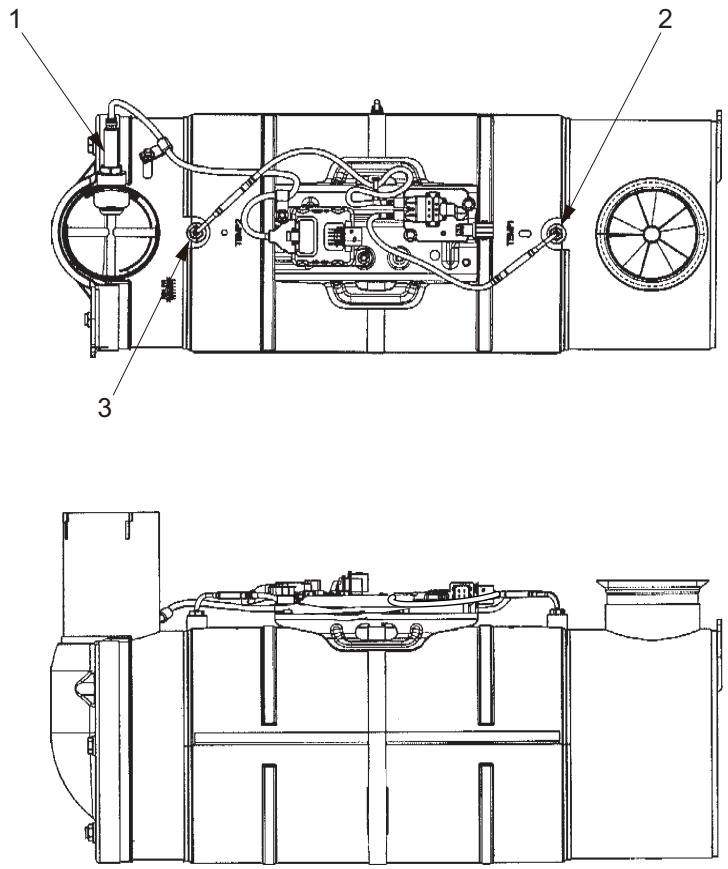
0568-05805-0-11976-E

3-1-1. DRT ASSY



(1) DEF dosing injector valve
(2) NOx sensor

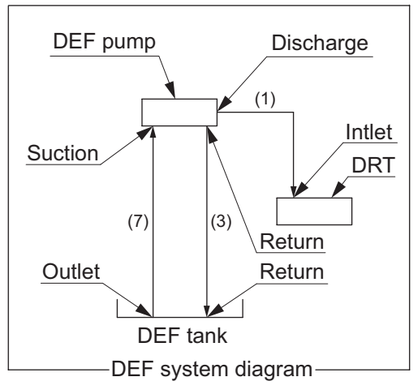
3-1-2. SCR ASSY



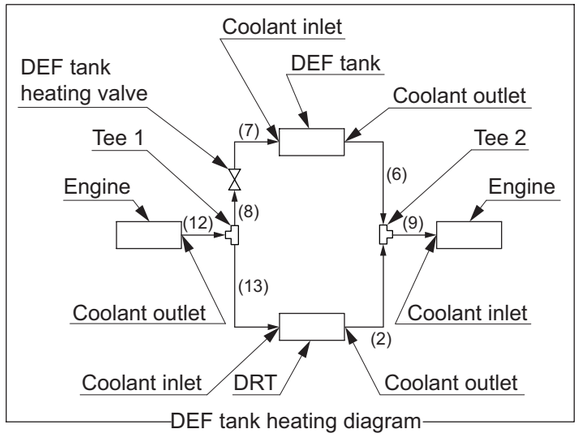
SW884-03004

(1) NOx sensor
(2) SCR in temperature sensor
(3) SCR out temperature sensor

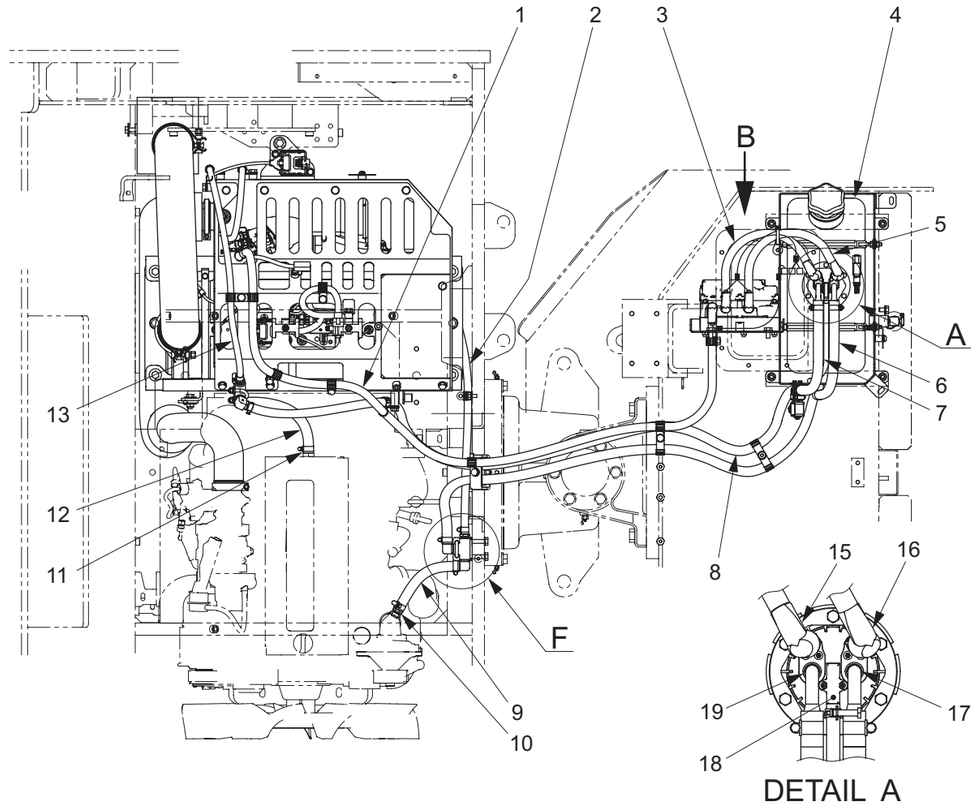
3-2. Urea Piping

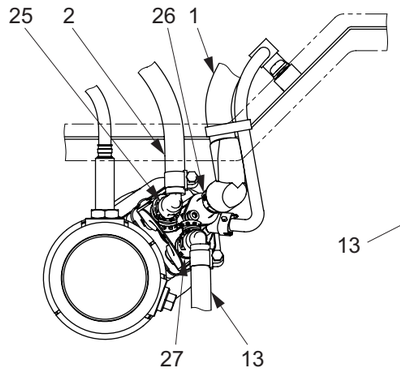


DEF system diagram

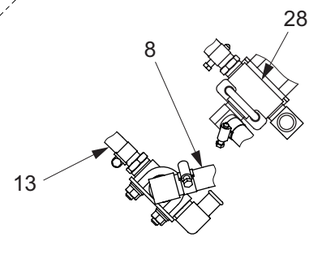


DEF tank heating diagram

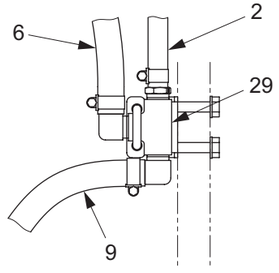




DETAIL D

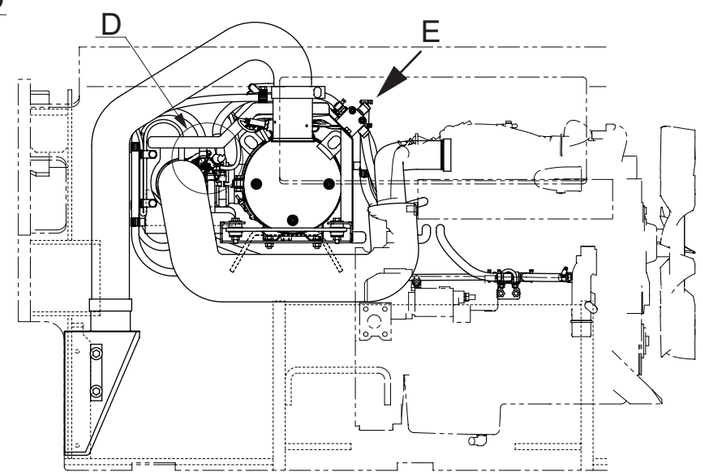


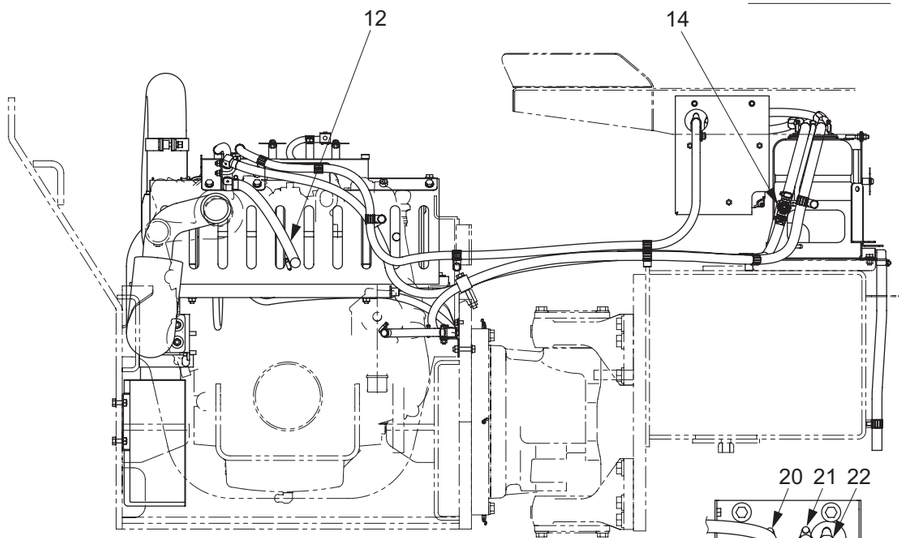
DETAIL E

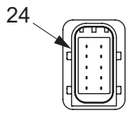


DETAIL F

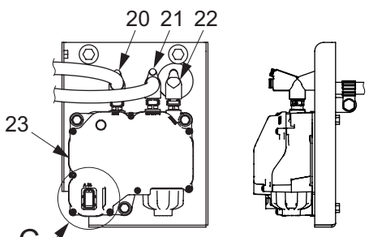
DETAIL A







DETAIL C



VIEW B

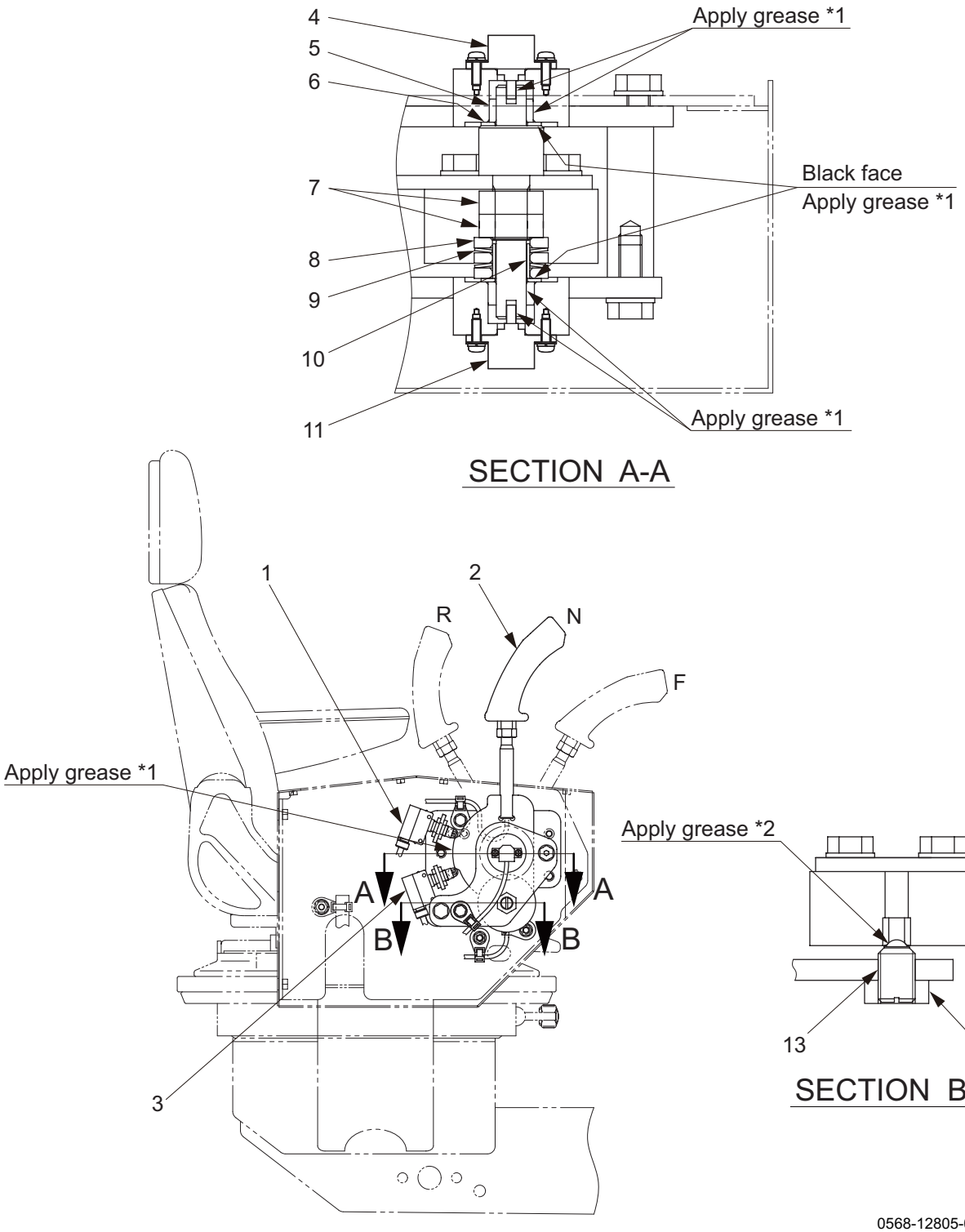
(1) Hose (22 ⇒ 26)
(2) Hose (25 → 29)
(3) Hose (21 ⇒ 15)
(4) DEF tank
(5) Hose (16 ⇒ 20)
(6) Hose (17 → 29)
(7) Hose (14 → 19)
(8) Hose (28 → 14)
(9) Hose (29 → 10)
(10) Coolant inlet (engine)
(11) Coolant outlet (engine)
(12) Hose (11 → 28)
(13) Hose (28 → 27)
(14) DEF tank heating valve
(15) Return (DEF tank)
(16) Outlet (DEF tank)
(17) Coolant outlet (DEF tank)
(18) Breather
(19) Coolant inlet (DEF tank)
(20) Suction (DEF pump)
(21) Return (DEF pump)
(22) Discharge (DEF pump)
(23) DEF pump
(24) DEF connector
(25) Coolant outlet (DRT)
(26) Inlet (DRT)
(27) Coolant inlet (DRT)
(28) Tee 1
(29) Tee 2

- Arrow " ⇒ " symbols show the hose connection and the direction of the flow of the DEF.
- Arrow " → " symbols show the hose connection and the direction of the flow of the coolant.

0568-05805-0-11976-E

4. CONTROL SYSTEM

4-1. Forward-reverse Control

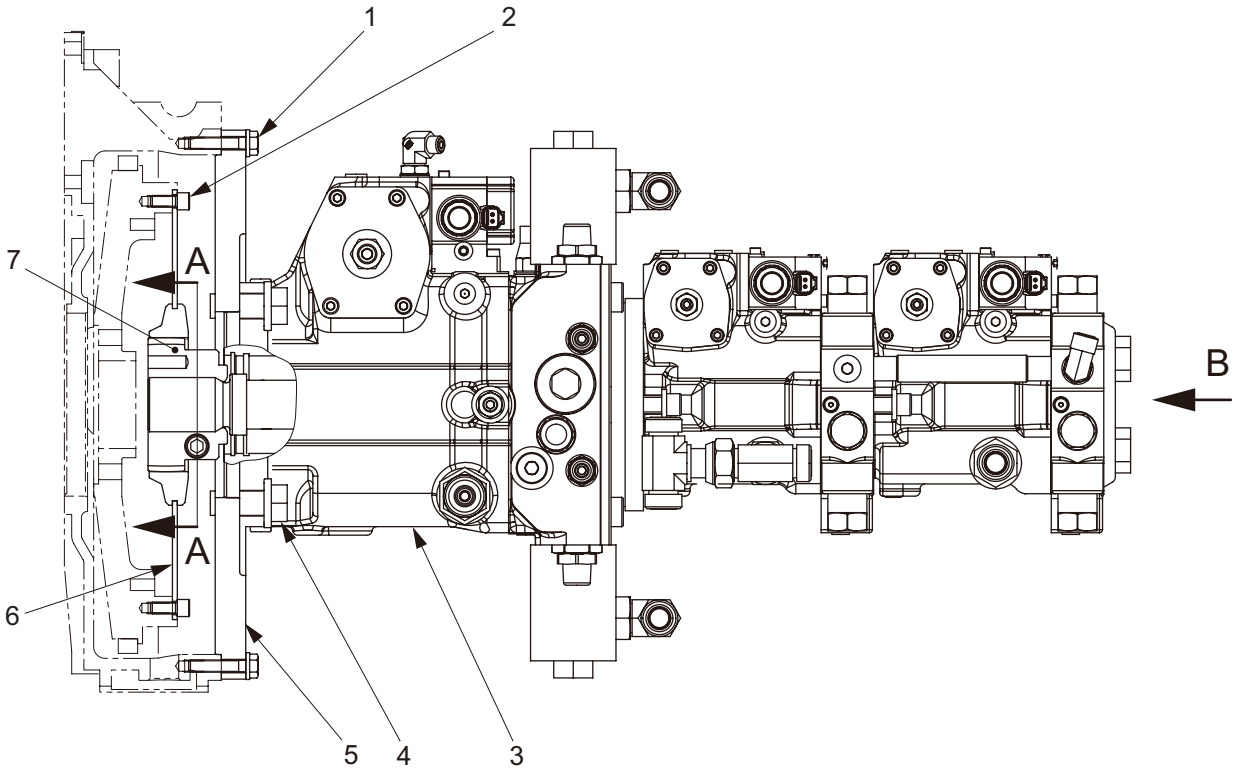


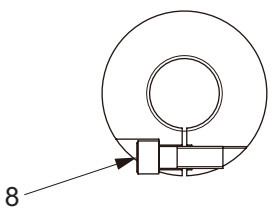
(1) F-R lever switch
(2) F-R lever
(3) Backup buzzer switch
(4) F-R lever potentiometer 2
(5) Bush
(6) Washer
(7) Nut : M16
(8) Washer
(9) Disc spring
(10) Collar (Do not apply grease)
(11) F-R lever potentiometer 1
(12) Nut : M16
(13) Screw : M16

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

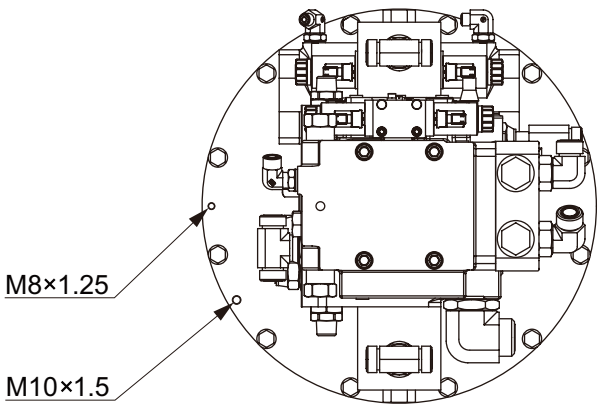
5. PUMP MOUNT

5-1. Pump Mount





SECTION A-A



VIEW B

0568-36812-0-11986-B

(1) Bolt : M10×50
(2) Bolt : 3/8-16UNC×22
(3) Pump
(4) Bolt : M20×50
(5) Housing
(6) Flange
(7) Hub
(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)
(4) Bolt M20×50 : 539 N·m (398 lbf·ft)
(8) Bolt M12×35 : 86 N·m (63 lbf·ft)

5-1-1. 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 grease to pump (3) and hub (7) splines.
② Attach hub (7) to pump (3) aligning it with end surface of shaft.
③ Secure hub (7) with bolts (8).

(8) Bolt M12×35 : 86 N·m (63 lbf·ft)

④ Position flange (6) as shown in the figure, and secure to flywheel with eight bolts (2).

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

(NOTICE)

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

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

(1) Bolt M10×50 : 60 N·m (44 lbf·ft)

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

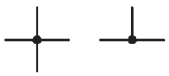
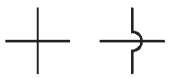
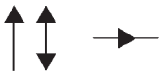
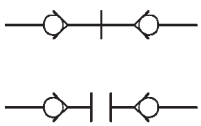
(4) Bolt M20×50 : 539 N·m (398 lbf·ft)

HYDRAULIC SYSTEMS

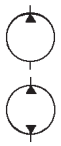
1. SYSTEM CIRCUIT DIAGRAM

1-1. Graphic Symbols for Hydraulic Circuits

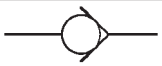
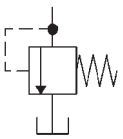
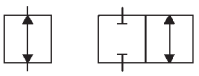
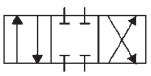
Basic Symbols

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: Connected with mechanically opened checks. Disconnected.	
Sloping arrow through a symbol at 45° indicates that a component can be adjusted or varied.	

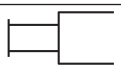
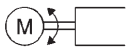
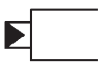
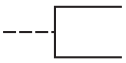
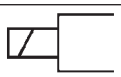
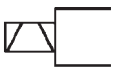
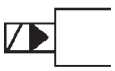
Pump, Motors and Cylinders

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

Valves

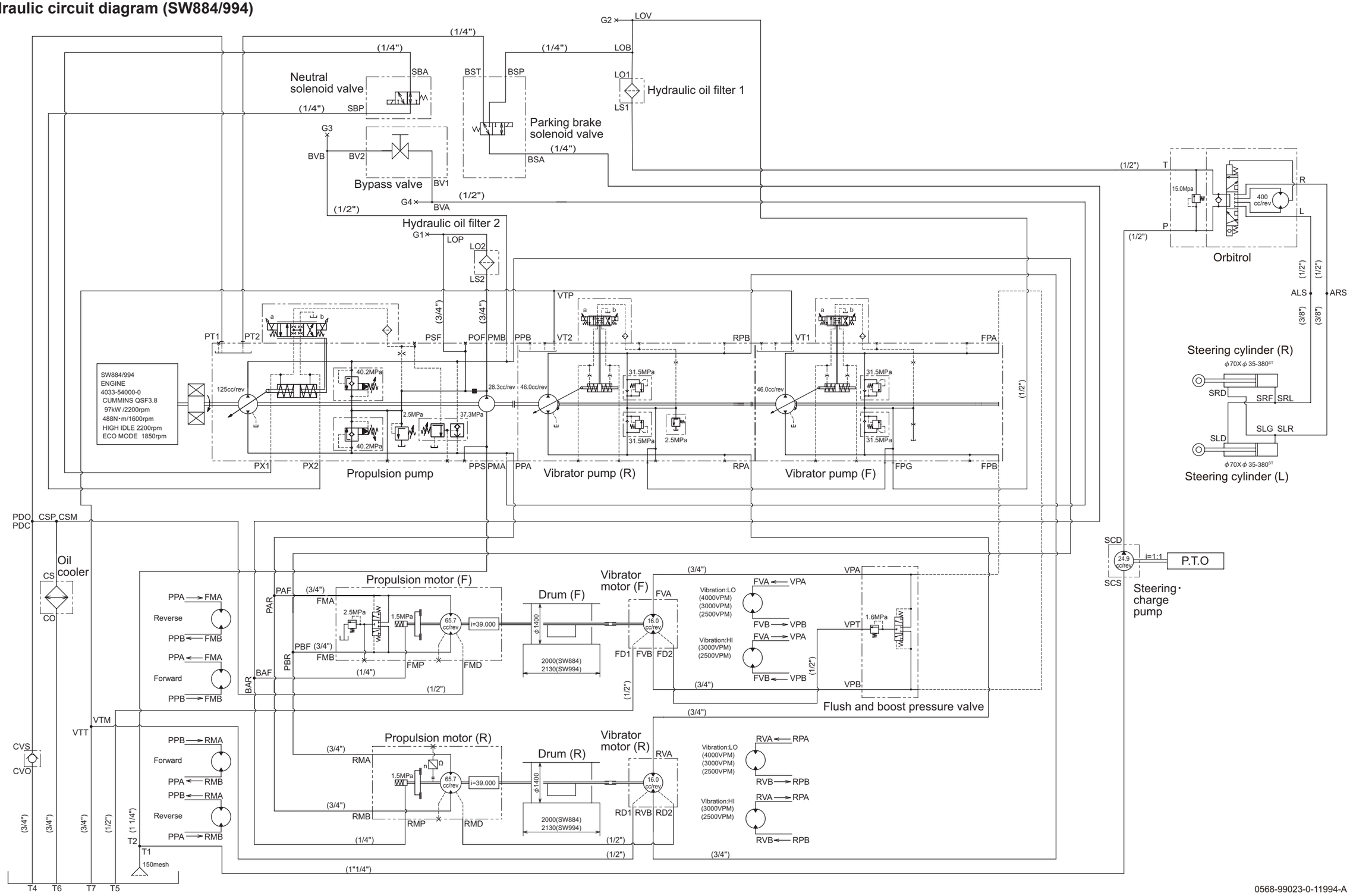
DESCRIPTION	SYMBOL
Check valve	
Manual shut off (On-Off)	
Pressure relief	
Flow control, adjustable	
Valve symbols: The basic valve symbol one or more squares with lines representing flow paths and flow conditions between ports.	
Multiple squares indicate a valve with as many distinct positions there are squares providing various flow path options for the fluid. 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

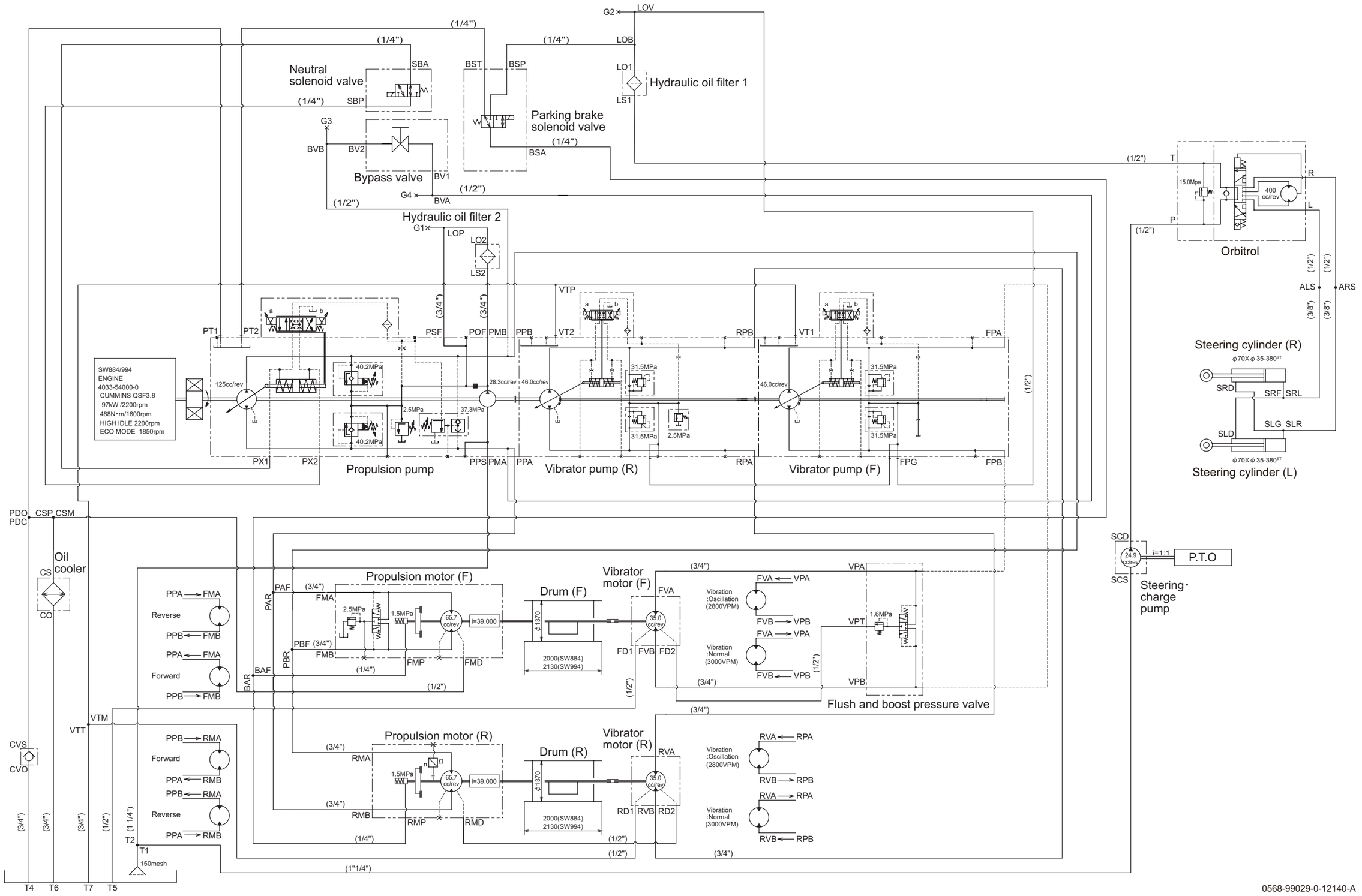
DESCRIPTION	SYMBOL
Spring	
Manual	
Pressure compensated	
Reversing motor	
Pilot pressure: Internal supply	
Remote supply	
Solenoid: Single winding	
Two windings operating in opposite directions.	
Pilot directional valve is actuated by the solenoid.	

1-2. Hydraulic Circuit Diagram

1-2-1. Hydraulic circuit diagram (SW884/994)



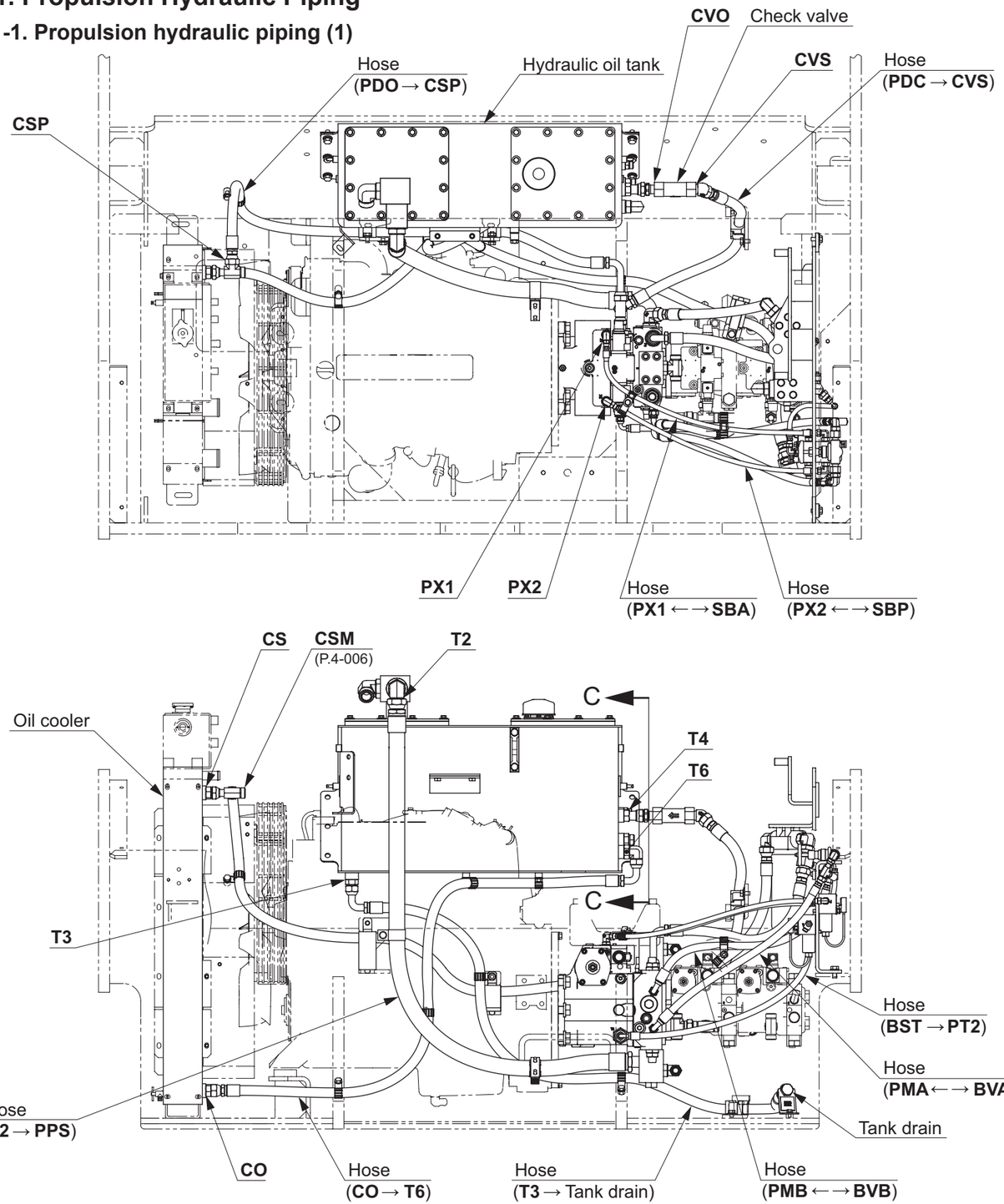
1-2-2. Hydraulic circuit diagram (SW884ND/994ND)

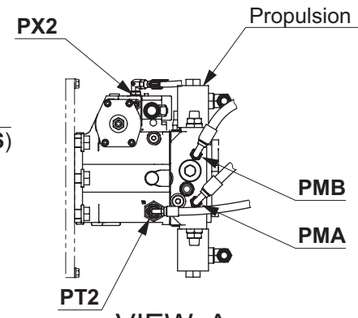


2. PROPULSION HYDRAULIC SYSTEM

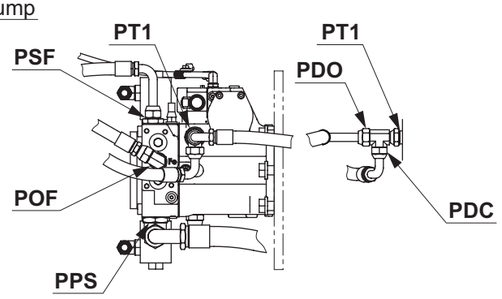
2-1. Propulsion Hydraulic Piping

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

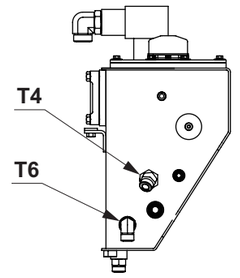




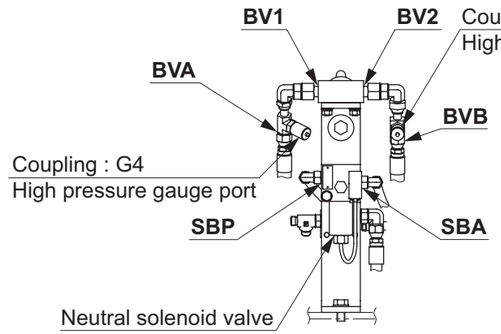
VIEW A



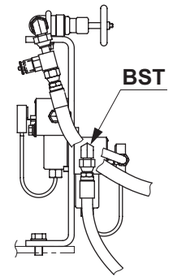
VIEW B

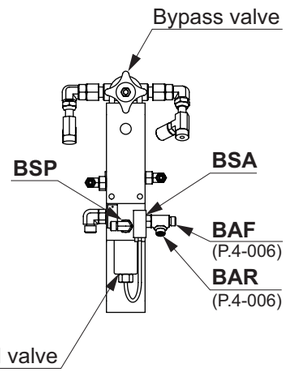


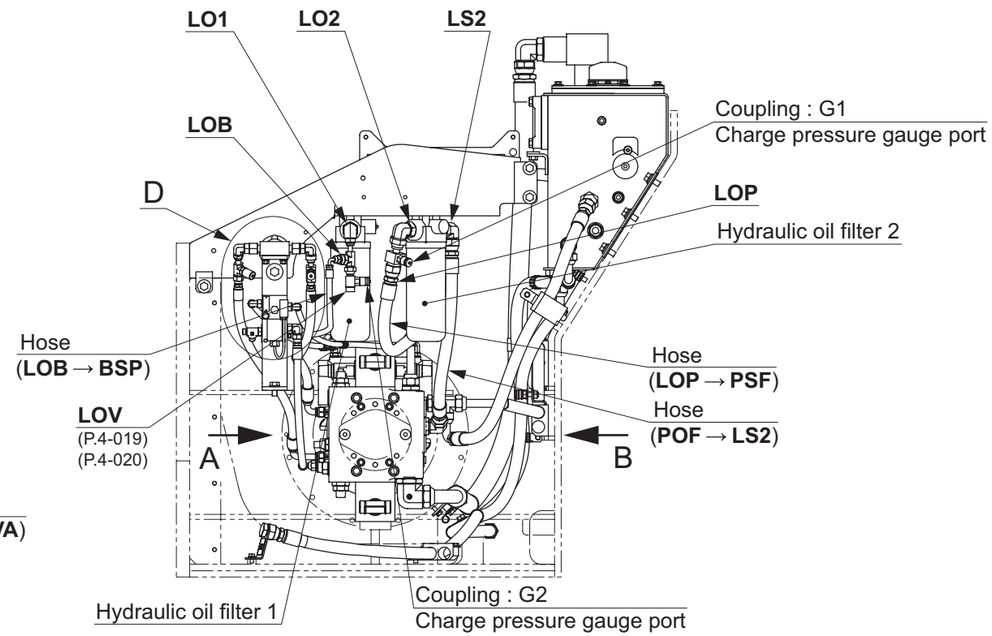
SECTION C-C



DETAIL D

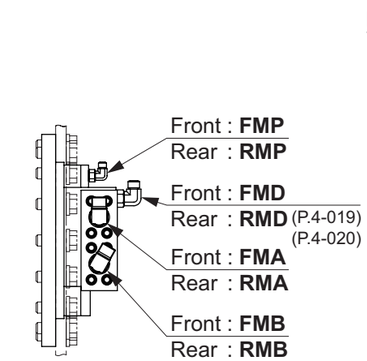




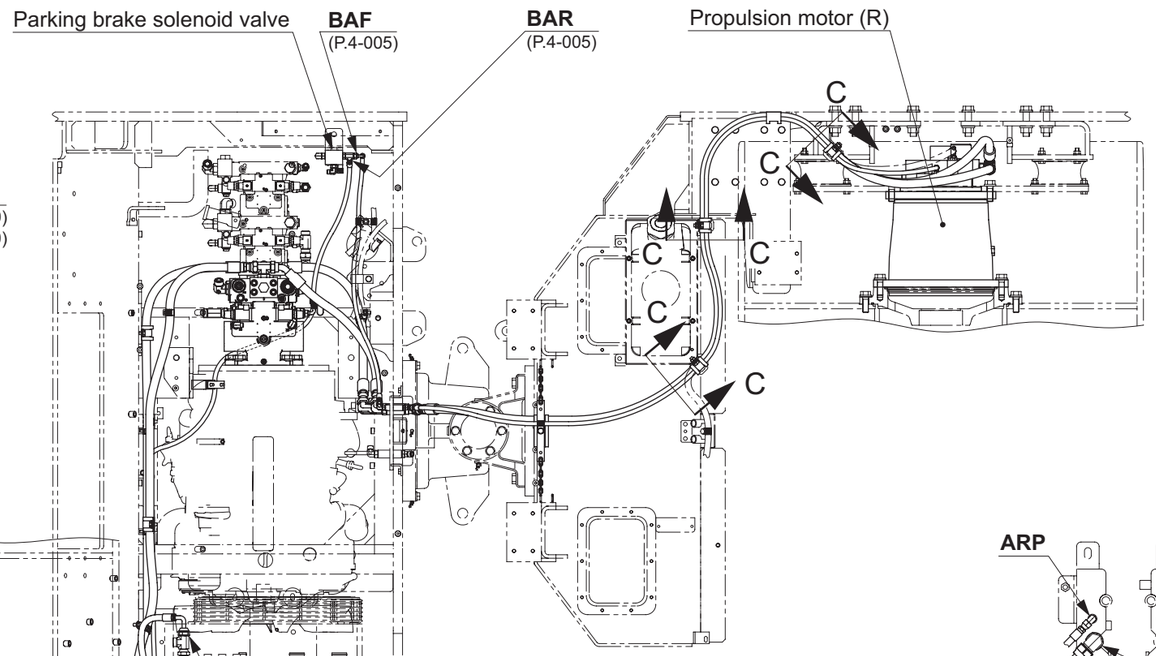


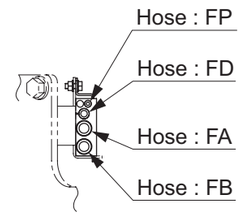
- The letters and numbers in the figure such as “PMA” and “BVA” show each port.
- Arrow “ ←→ ; → ” symbols show the hose connection and the direction of the flow of the oil.

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

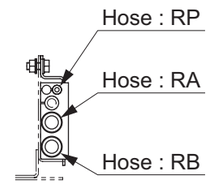


VIEW A
(Front / Rear)

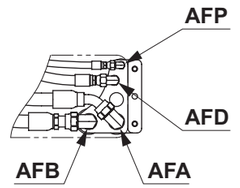




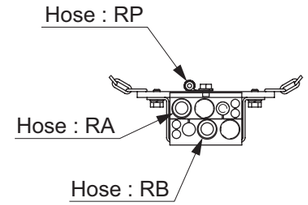
SECTION B-B



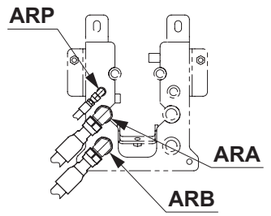
SECTION C-C



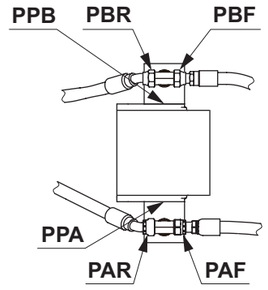
DETAIL D



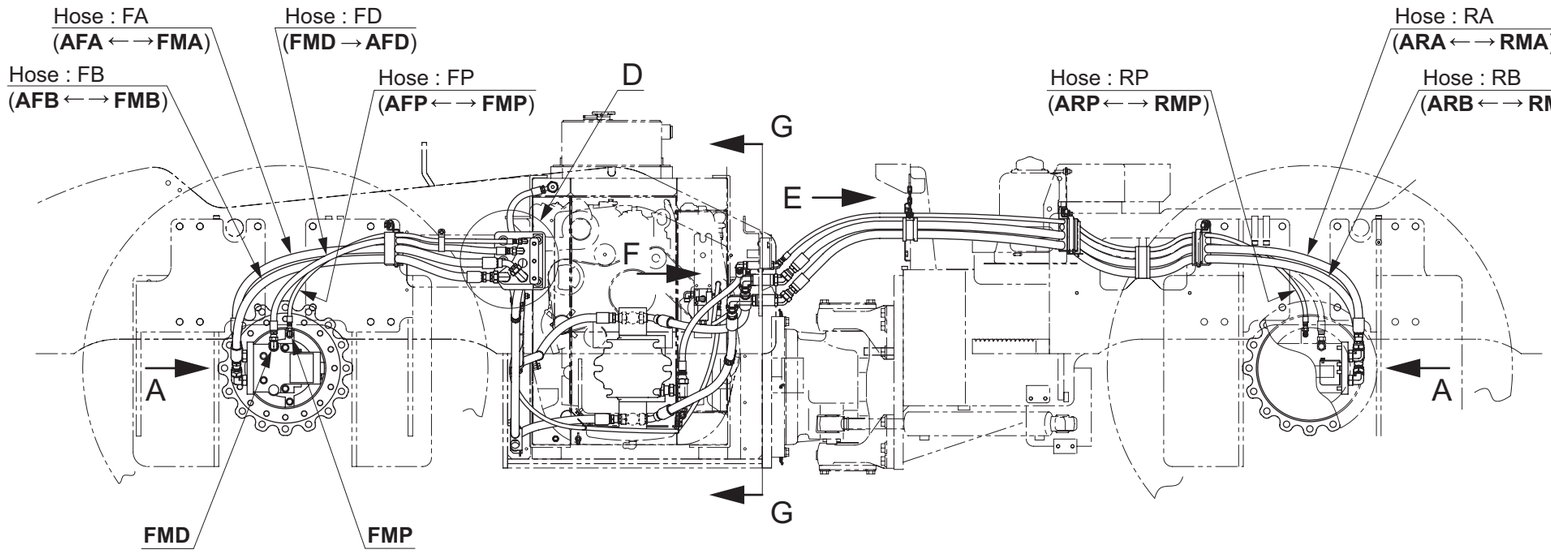
VIEW E

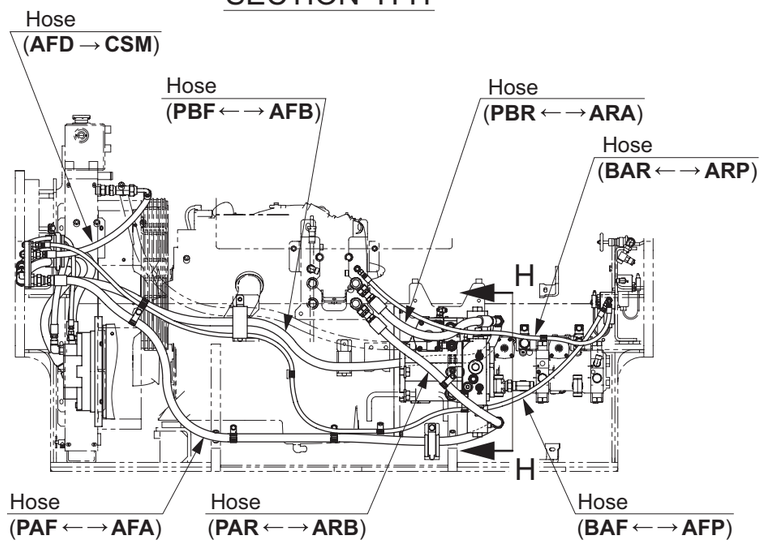


VIEW F



SECTION H-H



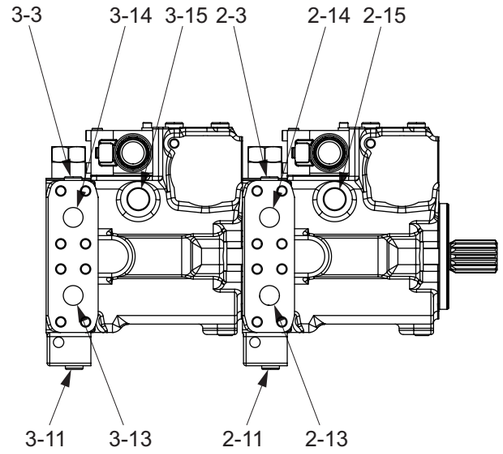


SECTION G-G

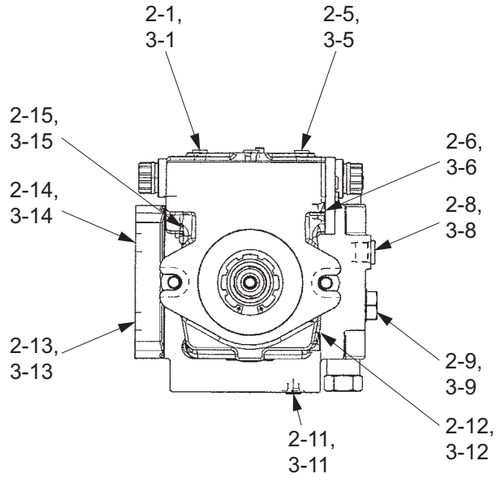
• The letters and numbers in the figure such as “ARB” and “RMB” show each port.
• Arrow “ ⟷ ; → ” symbols show the hose connection and the direction of the flow of the oil.

2-2. Hydraulic Component Specifications

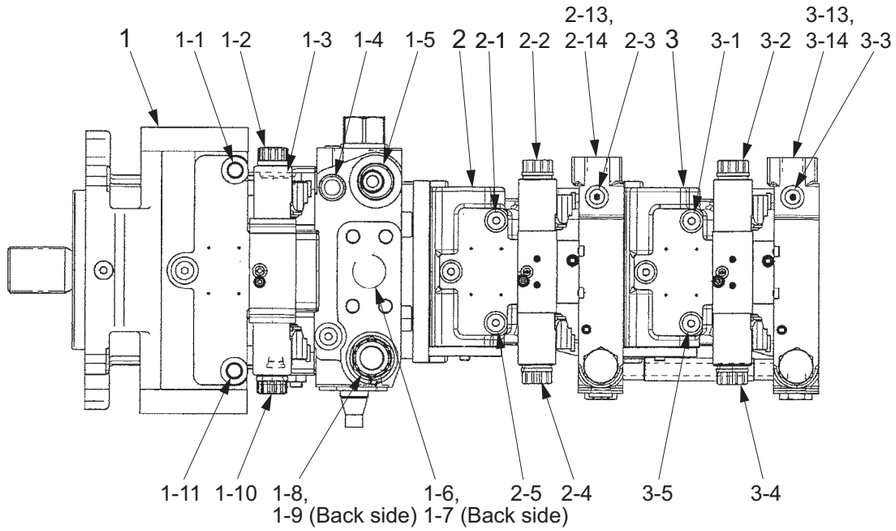
2-2-1. Hydraulic pump ASSY (propulsion + vibrator)

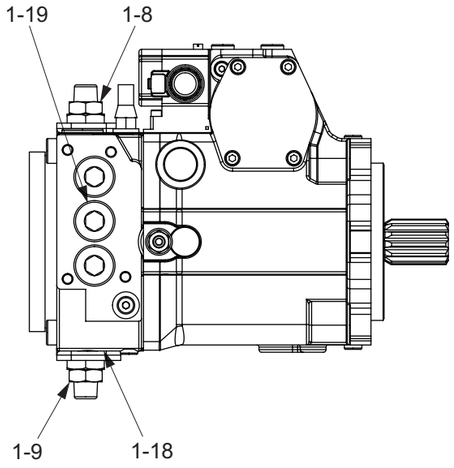


VIEW C

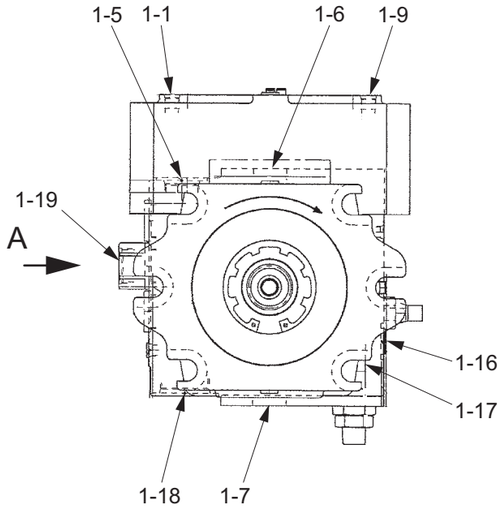


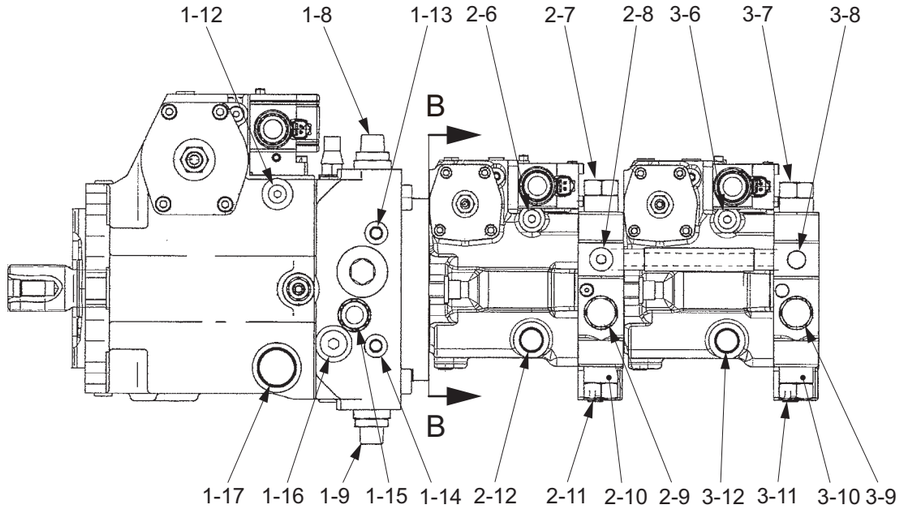
SECTION B-B

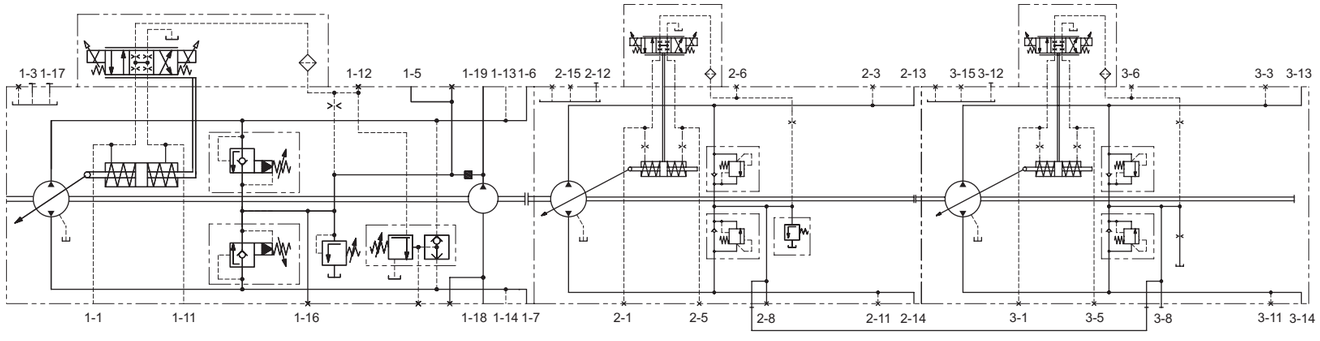




VIEW A







Pump circuit diagram

SW884-04001

(1) Propulsion pump

(1-1)	Servo pressure gauge port	**[PX1]**	:	9/16-18UNF
(1-2)	Solenoid valve a (Reverse)			
(1-3)	Drain port	**[PT1]**	:	1 5/16-12UN
(1-4)	Cut off valve			
(1-5)	Filter port (From filter)	**[PSF]**	:	1 5/16-12UN
(1-6)	Port B (Forward)	**[PPB]**	:	SAE 1 1/4”
(1-7)	Port A (Reverse)	**[PPA]**	:	SAE 1 1/4”
(1-8)	High pressure relief valve (For Port B)			
(1-9)	High pressure relief valve (For Port A)			
(1-10)	Solenoid valve b (Forward)			
(1-11)	Servo pressure gauge port	**[PX2]**	:	9/16-18UNF
(1-12)	Control pressure port		:	9/16-18UNF
(1-13)	High pressure gauge port (For Port B)	**[PMB]**	:	7/16-20UNF
(1-14)	High pressure gauge port (For Port A)	**[PMA]**	:	7/16-20UNF
(1-15)	Charge relief valve			
(1-16)	Charge pressure gauge port		:	7/ 8-14UNF
(1-17)	Drain port	**[PT2]**	:	1 5/16-12UN
(1-18)	Charge pump suction port	**[PPS]**	:	1 7/8-12UN
(1-19)	Filter port (To filter)	**[POF]**	:	1 5/16-12UN

Specifications

- Displacement
  - Propulsion pump : 125 cm^3/rev (7.63 cu.in./rev)
  - Charge pump : 28.3 cm^3/rev (1.73 cu.in./rev) (at 2,000 min^{-1})
- High pressure relief valve pressure setting : 40.2 MPa (5,829 psi)
- Charge relief valve pressure setting : 2.5 MPa (363 psi)
- Cut off valve pressure setting : 37.3 MPa (5,409 psi)

(2) Vibrator pump (R)

(2-1)	Servo pressure gauge port		:	7/16-20UNF
(2-2)	Solenoid valve a (High amplitude/Normal)*			
(2-3)	High pressure gauge port (For Port B)		:	7/16-20UNF
(2-4)	Solenoid valve b (Low amplitude/Oscillation)*			
(2-5)	Servo pressure gauge port		:	7/16-20UNF
(2-6)	Control pressure gauge port		:	9/16-18UNF
(2-7)	High pressure relief valve (For Port B)			
(2-8)	Charge pressure gauge port		:	3/ 4-16UNF
(2-9)	Charge relief valve			
(2-10)	High pressure relief valve (For Port A)			
(2-11)	High pressure gauge port (For Port A)		:	7/16-20UNF
(2-12)	Drain port	**[VT2]**	:	7/ 8-14UNF
(2-13)	Port A (Low amplitude/Oscillation)*	**[RPA]**	:	SAE 3/4”
(2-14)	Port B (High amplitude/Normal)*	**[RPB]**	:	SAE 3/4”
(2-15)	Drain port		:	7/ 8-14UNF

Specifications

- Displacement : 46 cm^3/rev (2.81 cu.in./rev)
- High pressure relief valve pressure setting : 31.5 MPa (4,568 psi)
- Charge relief pressure setting : 2.5 MPa (363 psi)

(3) Vibrator pump (F)

(3-1)	Servo pressure gauge port		:	7/16-20UNF
(3-2)	Solenoid valve a (High amplitude/Normal)*			
(3-3)	High pressure gauge port (For Port B)		:	7/16-20UNF
(3-4)	Solenoid valve b (Low amplitude/Oscillation)*			
(3-5)	Servo pressure gauge port		:	7/16-20UNF
(3-6)	Control pressure gauge port		:	9/16-18UNF
(3-7)	High pressure relief valve (For Port B)			
(3-8)	Charge pressure gauge port	**[FPG]**	:	3/ 4-16UNF
(3-9)	Locking set			
(3-10)	High pressure relief valve (For Port A)			
(3-11)	High pressure gauge port (For Port A)		:	7/16-20UNF
(3-12)	Drain port	**[VT1]**	:	7/ 8-14UNF
(3-13)	Port A (Low amplitude/Oscillation)*	**[FPA]**	:	SAE 3/4”
(3-14)	Port B (High amplitude/Normal)*	**[FPB]**	:	SAE 3/4”
(3-15)	Drain port		:	7/ 8-14UNF

Specifications

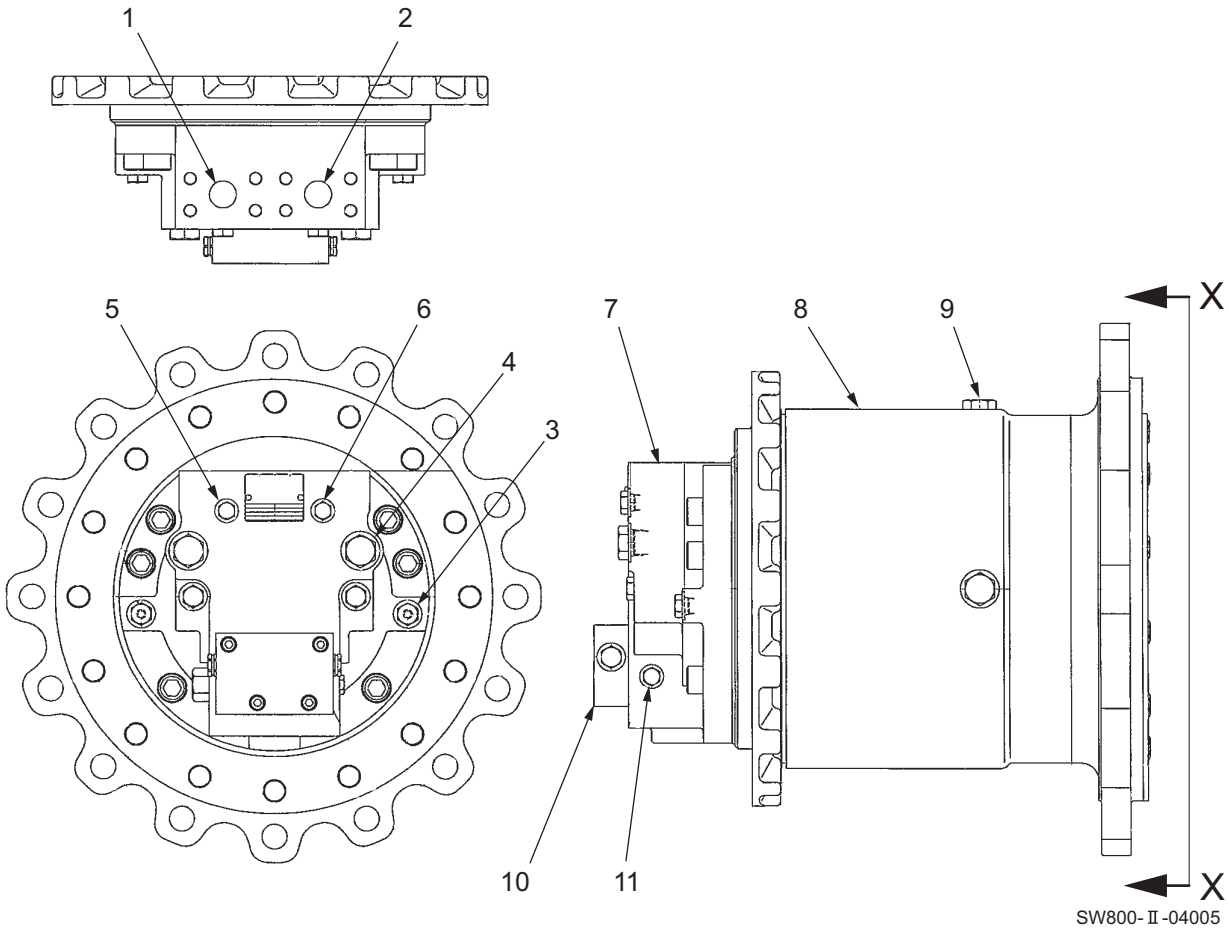
- Displacement : 46 cm^3/rev (2.81 cu.in./rev)
- High pressure relief valve pressure setting : 31.5 MPa (4,568 psi)

ASSY Specifications

- Allowable pump case pressure : 0.4 MPa (58 psi) or less
- Weight : 145 kg (320 lbs.)

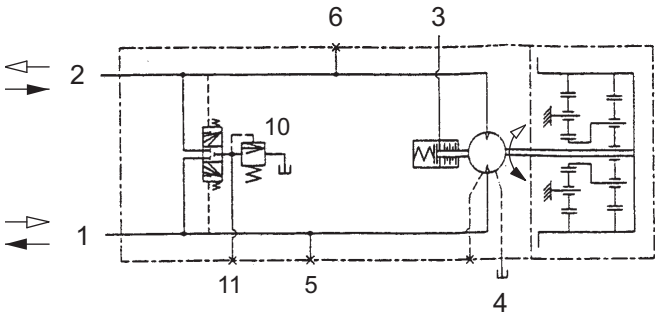
* : High amplitude, Low amplitude (STD type),
Normal, Oscillation (ND type)

2-2-2. Propulsion hydraulic motor (F)



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 (Rotation direction is when viewed in direction of X-X.)

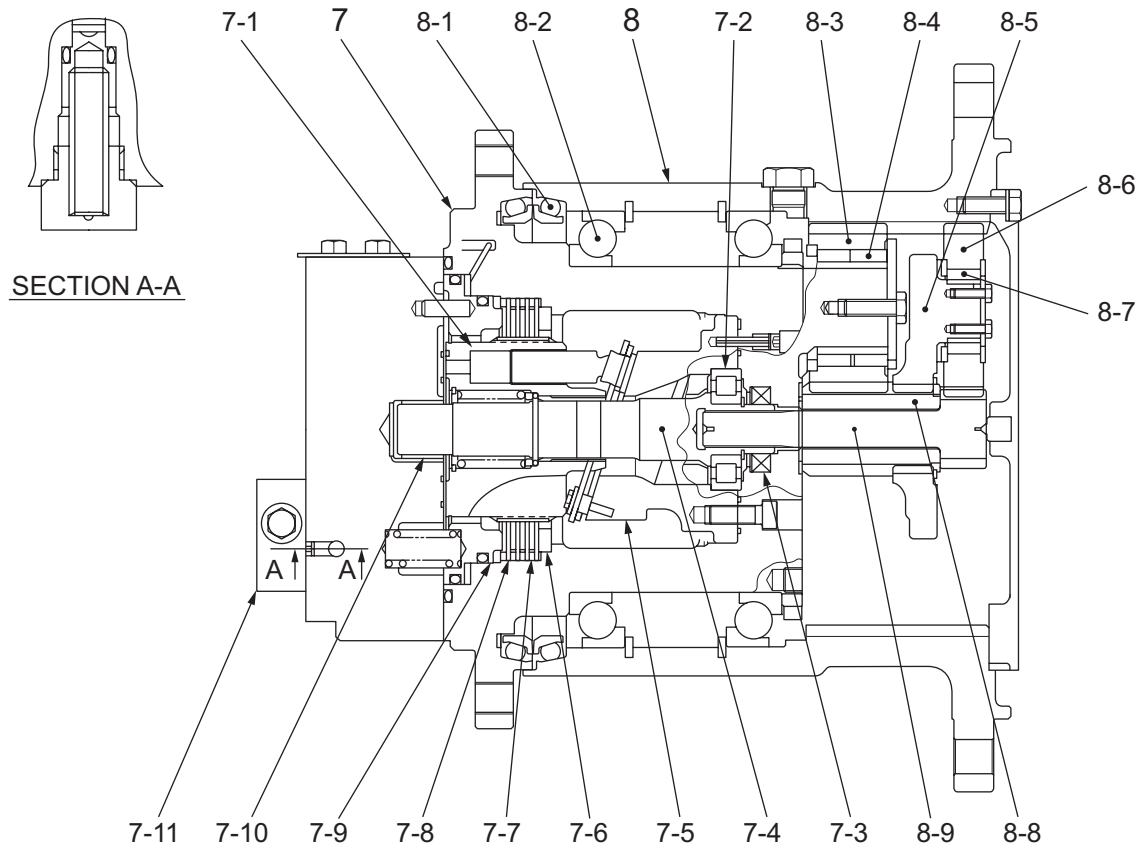
- 1→2 Clockwise rotation
- 2→1 Counterclockwise rotation

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 (F)

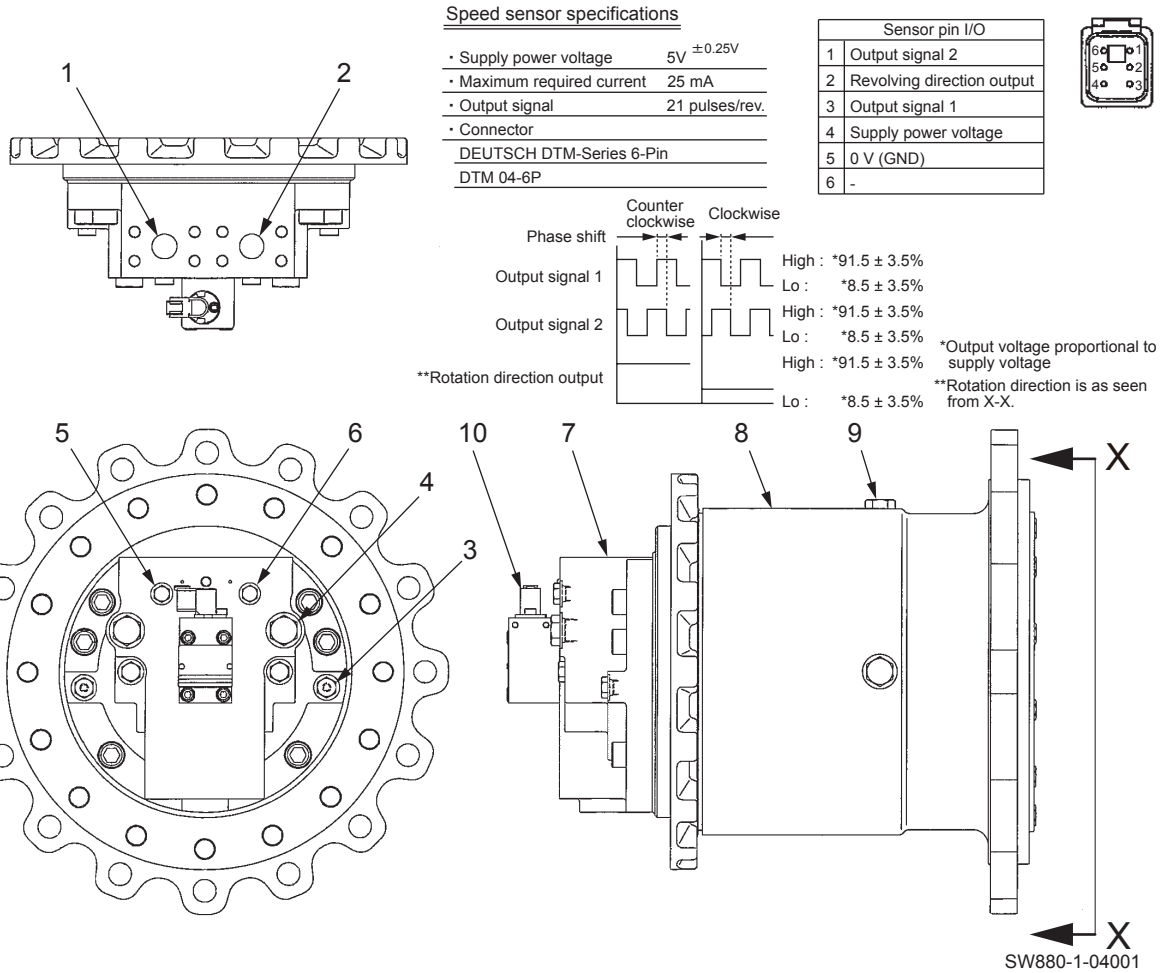


SW800-Ⅱ-04006

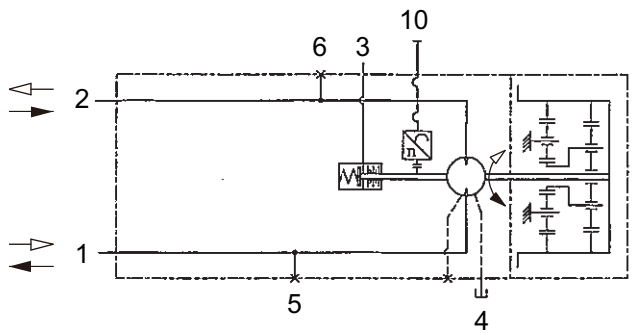
(7) Motor
- (7-1) Cylinder block kit
- (7-2) Bearing
- (7-3) Oil seal
- (7-4) Shaft
- (7-5) Swash plate assembly
- (7-6) Brake stopper
- (7-7) Friction plate
- (7-8) Separate plate
- (7-9) Piston brake
- (7-10) Journal bearing
- (7-11) Shuttle valve

(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 (R)



(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 (Rotation direction is when viewed in direction of X-X.)

•1→2 Clockwise rotation
•2→1 Counterclockwise rotation

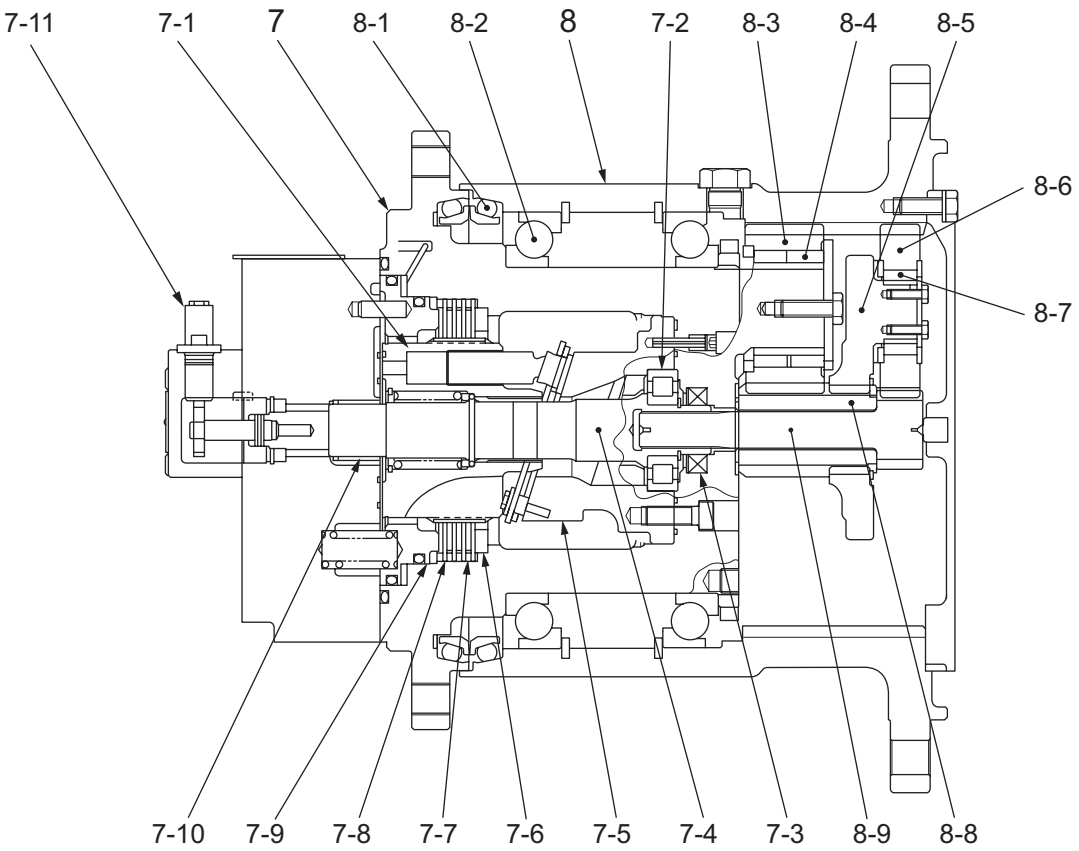
SW880-1-04003

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 (R)

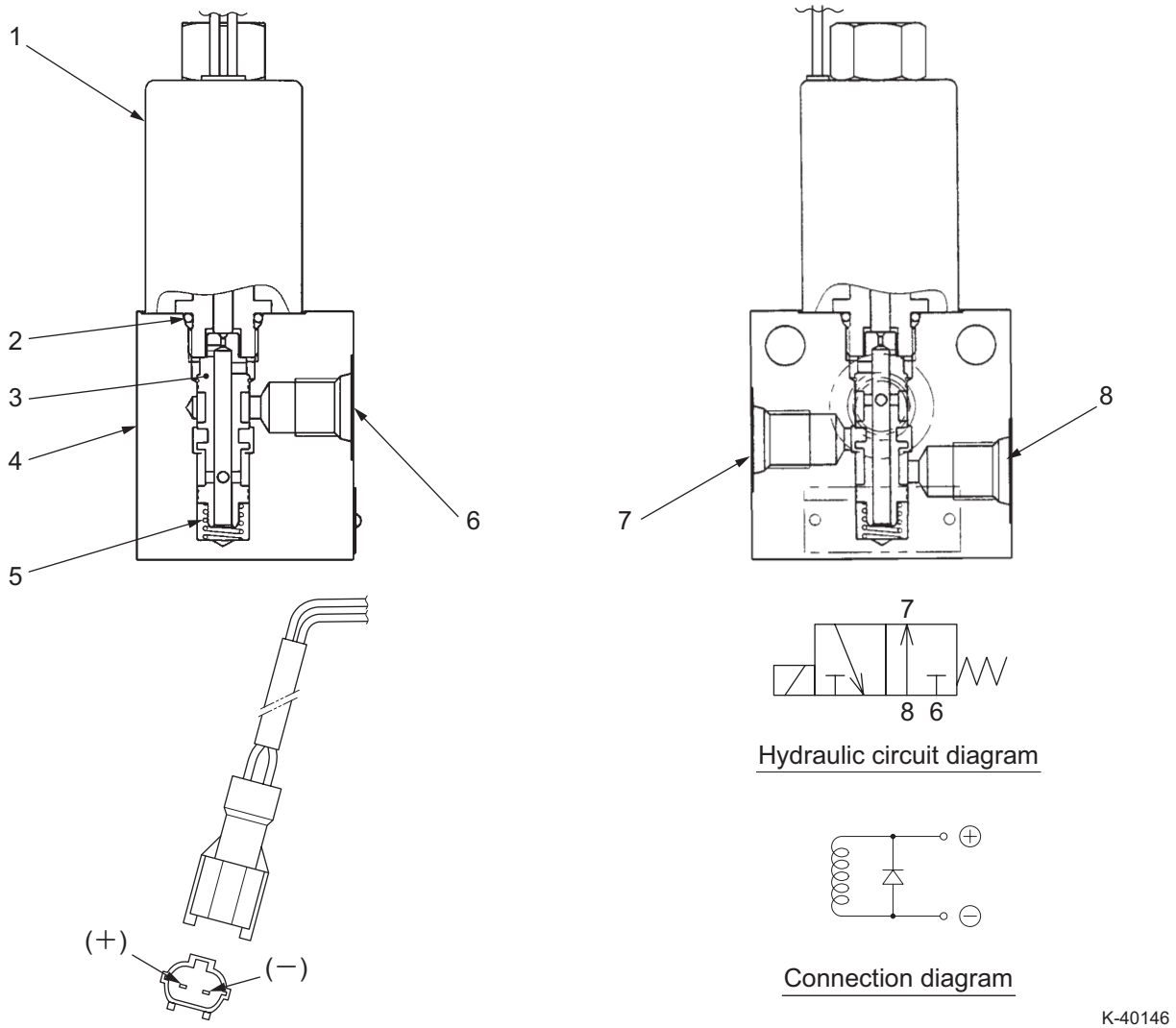


SW880-04004

(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

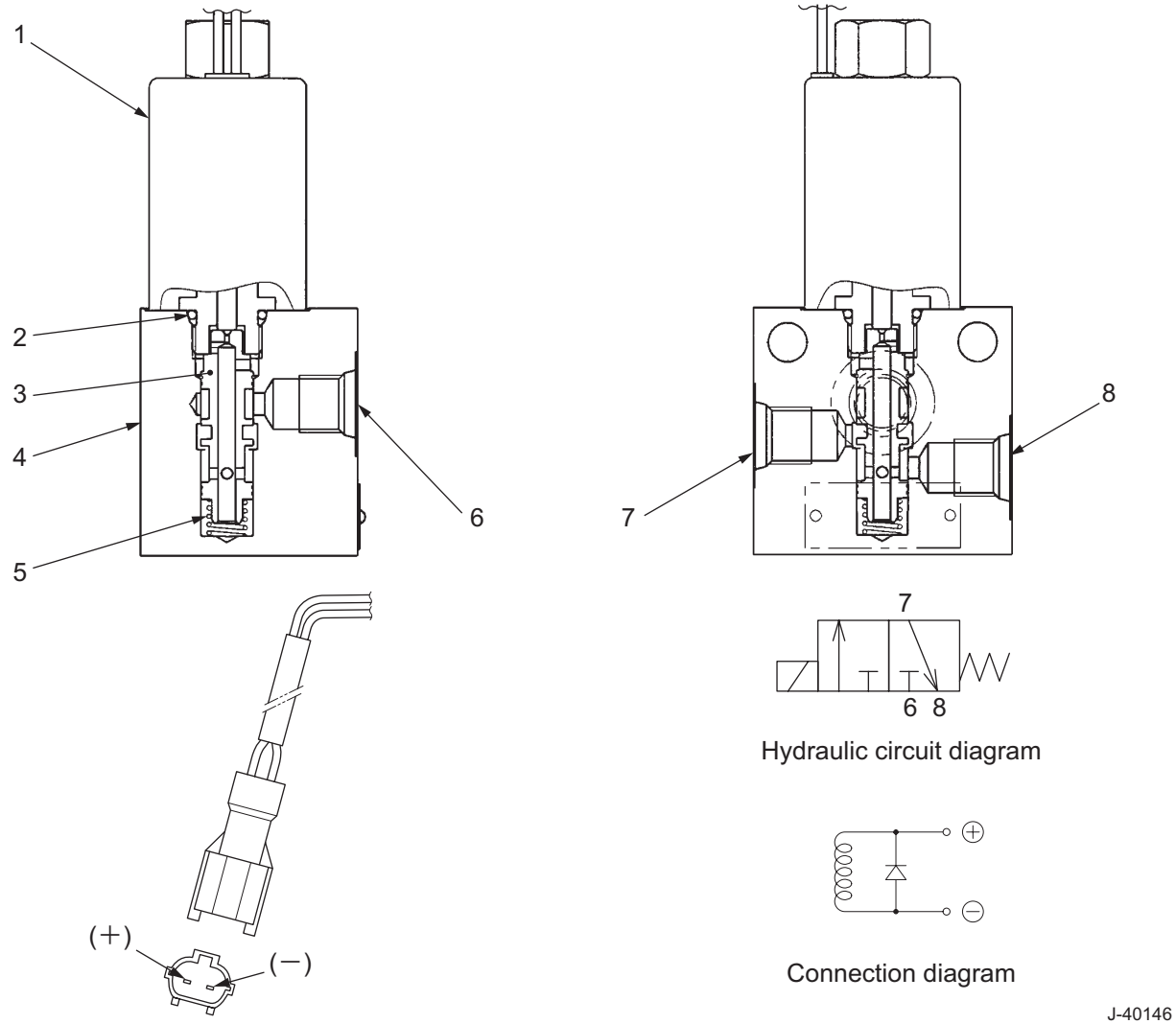
2-2-4. Neutral solenoid valve



(1) Solenoid
(2) O-ring (1B P14)
(3) Spool (K)
(4) Body
(5) Spring
(6) Port T : 9/16-18UNF-2B
(7) Port A **[SBA]** : 9/16-18UNF-2B
(8) Port P **[SBP]** : 9/16-18UNF-2B

Specifications
- Rated flow : 30 L/min (7.9 gal./min)
- Rated pressure : 4.9 MPa (710 psi) (7, 8)
  : 0.5 MPa (72.5 psi) (6)
- Weight : 1.5 kg (3.3 lbs.)

2-2-5. Parking brake solenoid valve



Hydraulic circuit diagram

Connection diagram

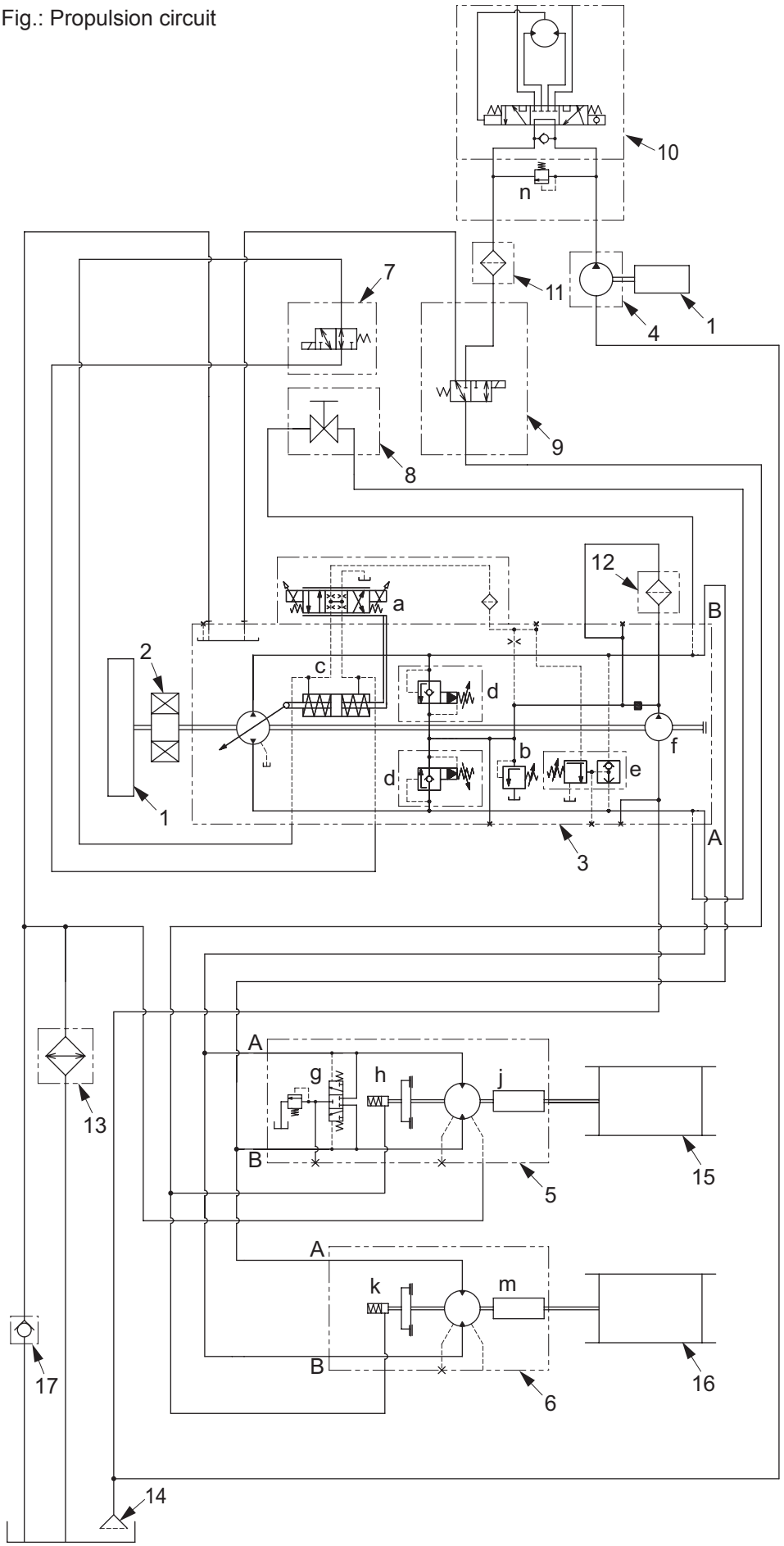
J-40146

(1) Solenoid
(2) O-ring (1B P14)
(3) Spool (J)
(4) Body
(5) Spring
(6) Port P **[BSP]** : 9/16-18UNF-2B
(7) Port A **[BSA]** : 9/16-18UNF-2B
(8) Port T **[BST]** : 9/16-18UNF-2B

Specifications

- Rated flow : 30 L/min (7.9 gal./min)
- Rated pressure : 4.9 MPa (710 psi) (6, 7)
  : 0.5 MPa (72.5 psi) (8)
- Weight : 1.5 kg (3.3 lbs.)

Fig.: Propulsion circuit



1. Engine
2. Coupling
3. Propulsion pump
   a. Control valve (forward-reverse)
   b. Charge relief valve
   c. Servo piston
   d. High pressure relief valves
   e. Cut off valve
   f. Charge pump
4. Steering•charge pump
5. Propulsion motor (F)
   g. Shuttle valve
   h. Brake
   j. Reduction gear
6. Propulsion motor (R)
   k. Brake
   m. Reduction gear
7. Neutral solenoid valve
8. Bypass valve
9. Parking brake solenoid valve
10. Orbitrol
    n. Relief valve
11. Hydraulic oil filter 1
12. Hydraulic oil filter 2
13. Oil cooler
14. Suction filter
15. Drum (F)
16. Drum (R)
17. Check valve

SW884-04002

2-3. Description and Operation of Propulsion System

Description

- Made up of propulsion pump (3), propulsion motor (F) (5), (R) (6), drum (F) (15), (R) (16), and parking brake solenoid valve (9).

Basic function of propulsion pump and motor

Propulsion pump:

- A piston pump is used. By varying swashplate angle which varies the piston stroke, forward travel, bringing to neutral and backing are achieved.

Propulsion motor:

- A fixed displacement piston motor is used.The displacement per rotation of the motor shaft is not variable.

Operation (It is assumed that the machine travels forward.)

- Assemblies such as pump ASSY and motor ASSY are indicated by numbers such as “1” and “2”, while component parts of assemblies are shown by small letters such as “a” and “b”.
- The parking brake is supposed to have been released.

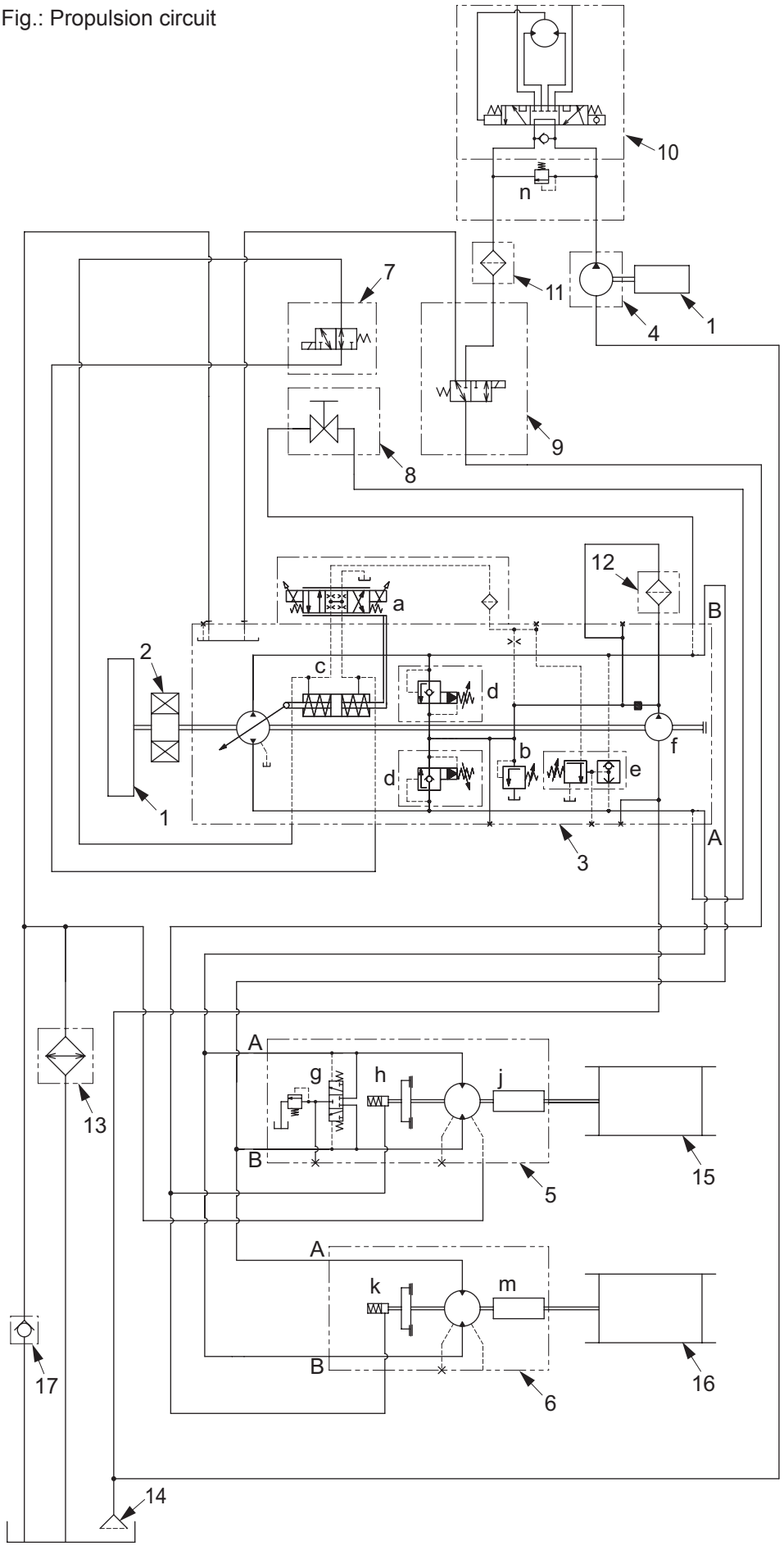
- Operation of the F-R lever forward puts pump control valve (a) into function. Servo piston (c) tilts the pump swashplate in the forward travel direction.
- Propulsion pump (3) discharges oil from its port B. Then the oil flow branches into two lines; one line connecting to port B in propulsion motor (5) and one line to port A in propulsion motor (6).
- The oil fed into the ports of the motors drives the motors, flowing out from the opposite side ports (port A in propulsion motor (5) and port B in propulsion motor (6)) and joins again to flow into port A in propulsion pump (3). At the same time, part of oil is drained to hydraulic oil tank via shuttle valve (g) and the motor casing.

(NOTE)

- **Because the propulsion circuit is a closed circuit, the relationship between the suction port and discharge port is reversed when the travel direction is reversed. (The direction of oil flow reversed.)**

- The power from propulsion motor (5), (6) is delivered to drums (15), (16) through reduction mechanism in reduction gear (j), (m).

Fig.: Propulsion circuit



1. Engine
2. Coupling
3. Propulsion pump
   a. Control valve (forward-reverse)
   b. Charge relief valve
   c. Servo piston
   d. High pressure relief valves
   e. Cut off valve
   f. Charge pump
4. Steering•charge pump
5. Propulsion motor (F)
   g. Shuttle valve
   h. Brake
   j. Reduction gear
6. Propulsion motor (R)
   k. Brake
   m. Reduction gear
7. Neutral solenoid valve
8. Bypass valve
9. Parking brake solenoid valve
10. Orbitrol
    n. Relief valve
11. Hydraulic oil filter 1
12. Hydraulic oil filter 2
13. Oil cooler
14. Suction filter
15. Drum (F)
16. Drum (R)
17. Check valve

SW884-04002

Two-step Speed selection (High-Low)

From Low to High:

- The pump discharge increases or decreases in proportion to the lever displacement.
- Tilt the F-R lever, the pump discharge increases and vehicle speed increases.

To release parking brake

- Propulsion motor (5), (6) contains brake (h), (k).
- Actuation of the brake switch on the instrument panel in the driver's station energizes parking brake solenoid valve (9). The oil under pressure is fed, via parking brake solenoid valve (9), into the brake cylinders.
- This moves the brake pistons against the compression spring load, releasing the brake.

Circuit protection against high pressure

- Cut off valve (e) is fitted in the propulsion pump. If the circuit pressure exceeds the setting of the valve, the valve functions and exerts oil pressure on the pump servo piston to reduce pump delivery.
- Decrease in delivery (travel speed reduction) lowers the circuit pressure.
- In addition to this cut off valve, the circuit includes high pressure relief valve (d) which opens to protect the circuit if the circuit pressure exceeds the permissible maximum of the cut off valve.

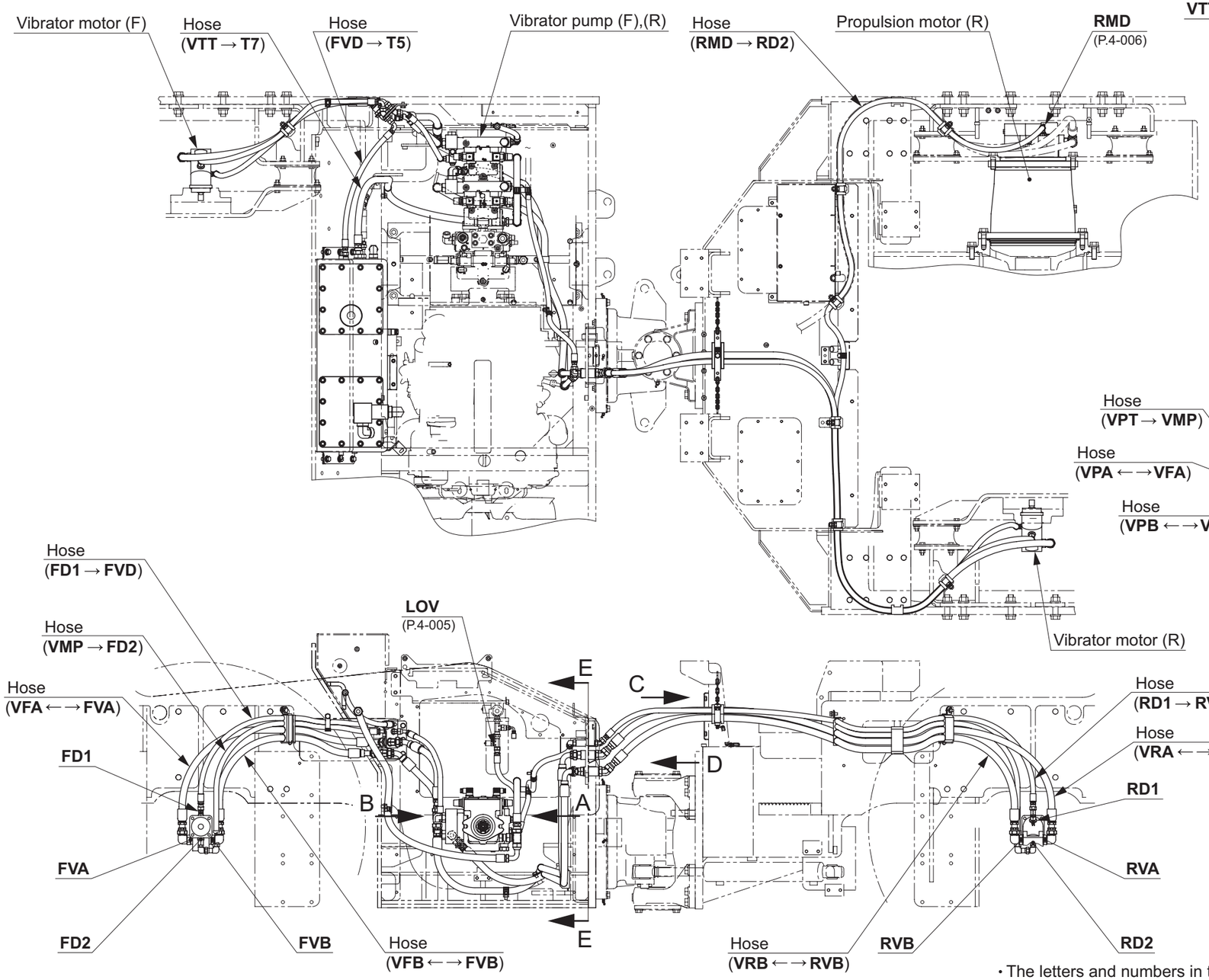
Charge circuit

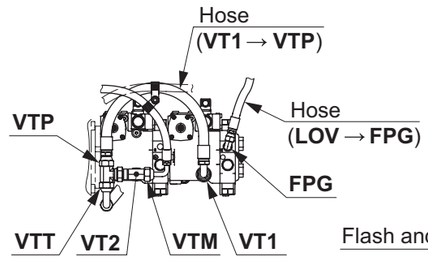
- The propulsion circuit is of a closed circuit, which needs feeding of oil into it for making up deficiency.
- In the charge circuit, oil from charge pump (f) goes to propulsion pump (3) via hydraulic oil filter 2 (12).
- Charge relief valve (b) built in propulsion pump (3) maintains the pressure to operate the pump swashplate when the F-R lever is in the neutral position. When travelling, shuttle valve (g) built in propulsion motor (5) performs oil renewal, cooling or removal of foreign material as well as keeping the necessary pressure to control the pump swashplate angle.
- For the "To disengage the brake when towing", refer to page 7-003.

3. VIBRATOR HYDRAULIC SYSTEM

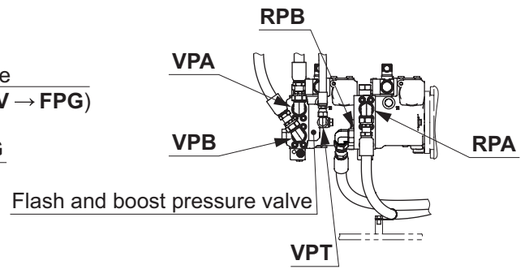
3-1. Vibrator Hydraulic Piping

3-1-1. Vibrator hydraulic piping (SW884/994)

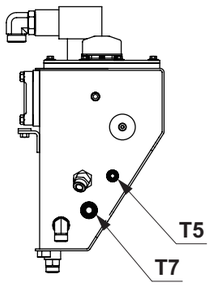




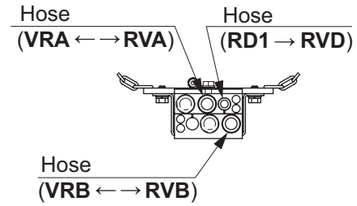
VIEW A



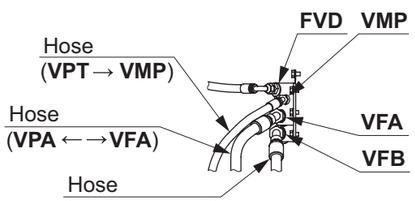
VIEW B



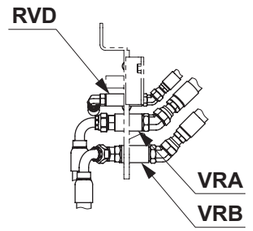
SECTION G-G

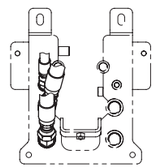


VIEW C

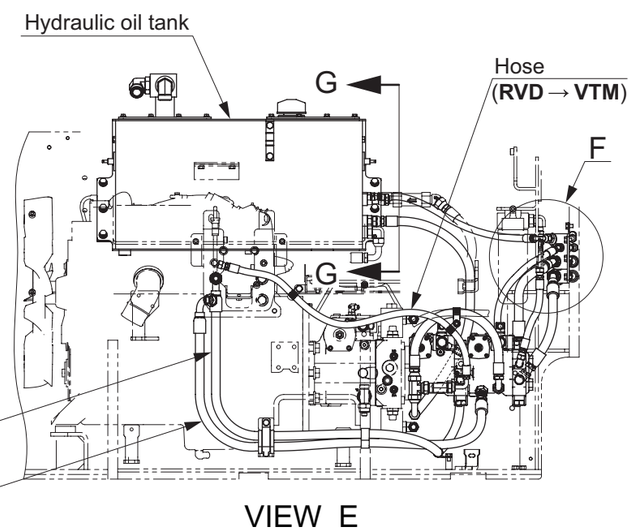


DETAIL F





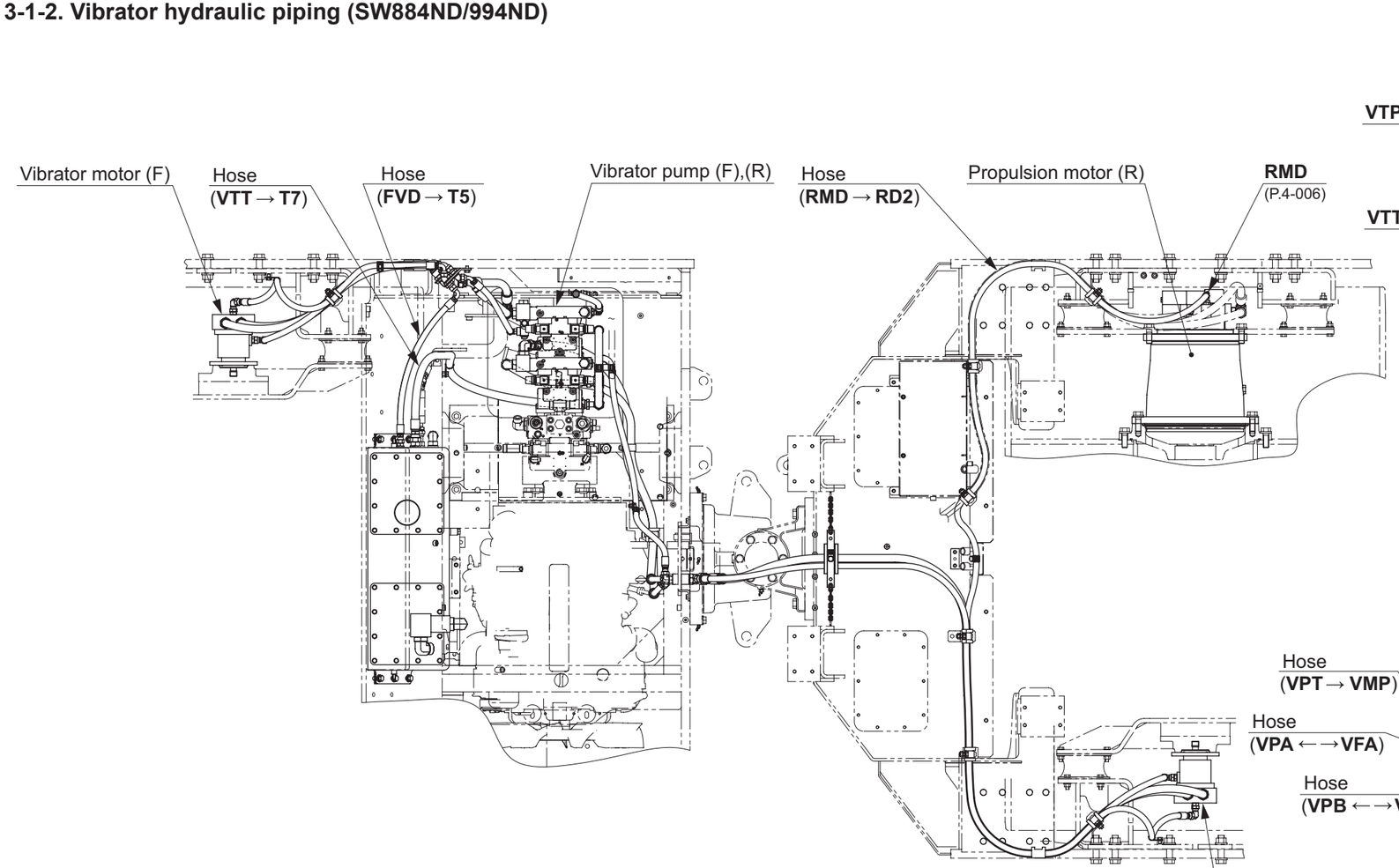
VIEW D

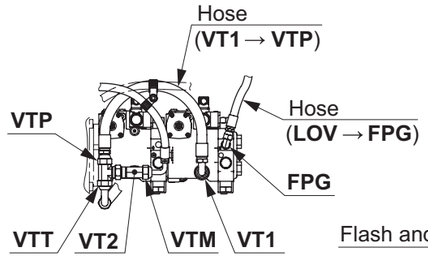


VIEW E

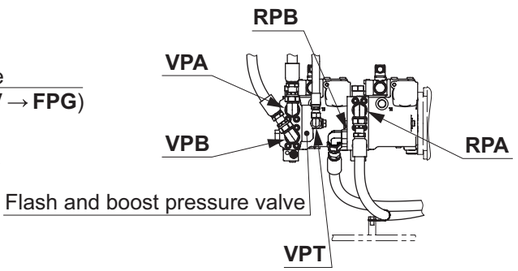
- The letters and numbers in the figure such as “VRA” and “RVA” show each port.
- Arrow “ ←→ ; → ” symbols show the hose connection and the direction of the flow of the oil.

3-1-2. Vibrator hydraulic piping (SW884ND/994ND)

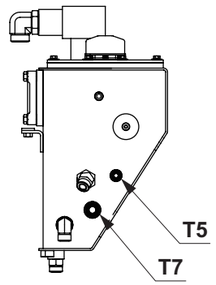




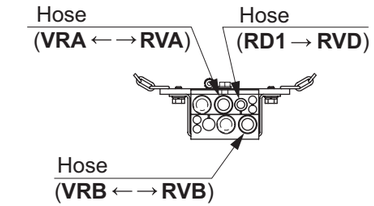
VIEW A



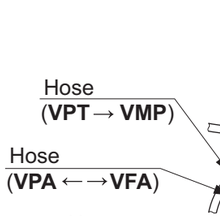
VIEW B



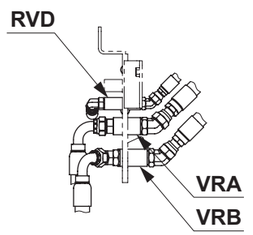
SECTION G-G

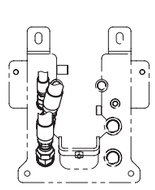


VIEW C

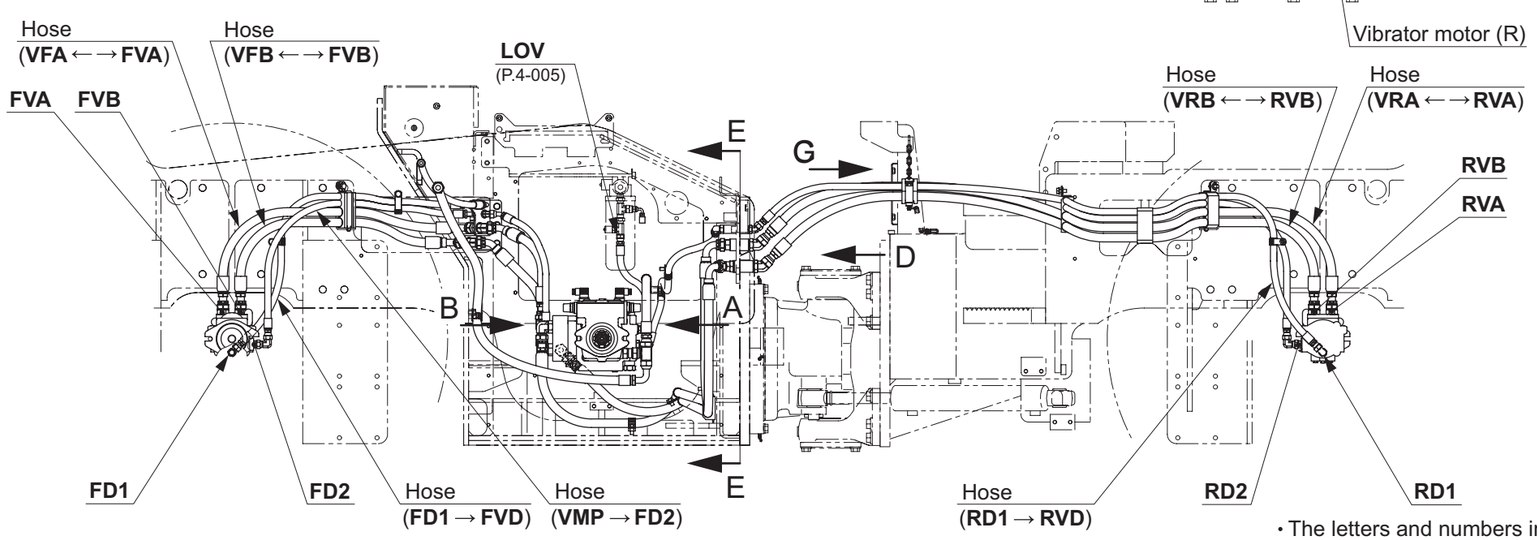


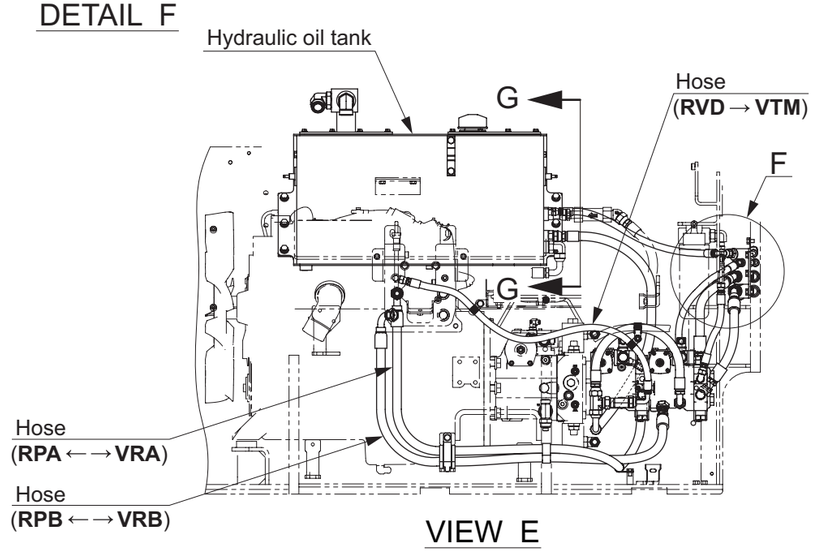
DETAIL F





VIEW D



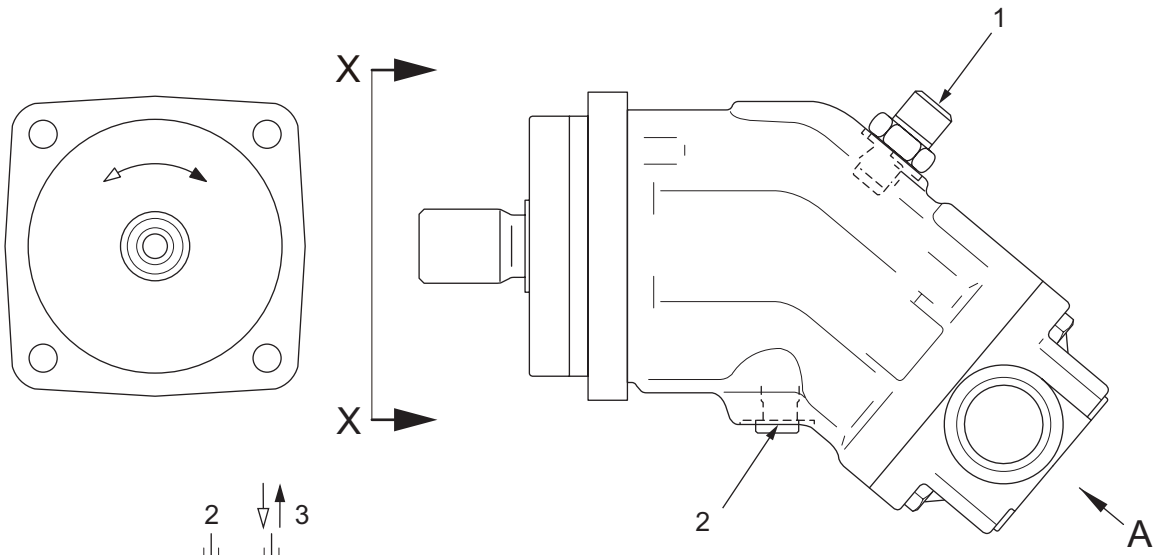


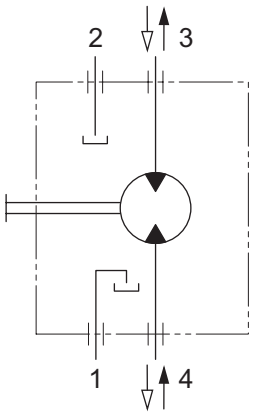
VIEW E

• The letters and numbers in the figure such as “VRA” and “RVA” show each port.
• 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 (SW884/994)

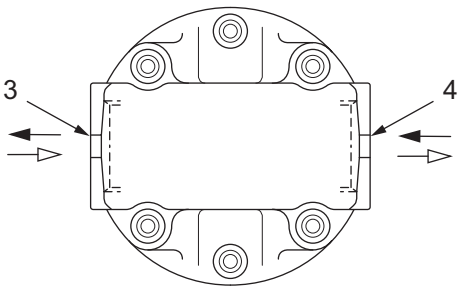




Motor circuit diagram

Flow of oil (Rotation direction is when viewed in direction of X-X.)

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



VIEW A

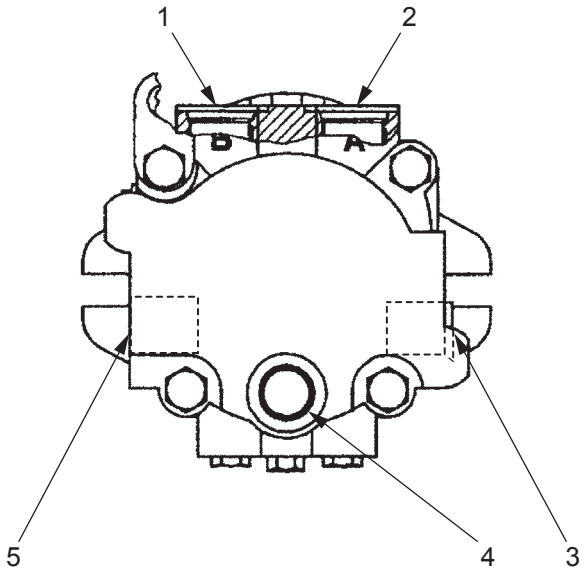
SW800-04015

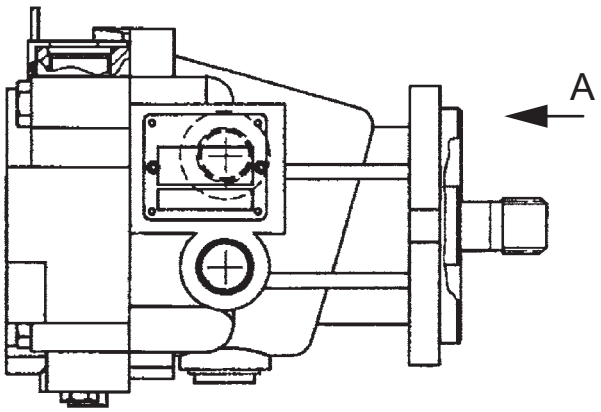
(1) Drain port (T1)	**[FD1][RD1]**	:	G1/2
(2) Drain port (T2)	**[FD2][RD2]**	:	M12×1.5
(3) Port B	**[FVB][RVB]**	:	1 1/16-12UN-2B
(4) Port A	**[FVA][RVA]**	:	1 1/16-12UN-2B

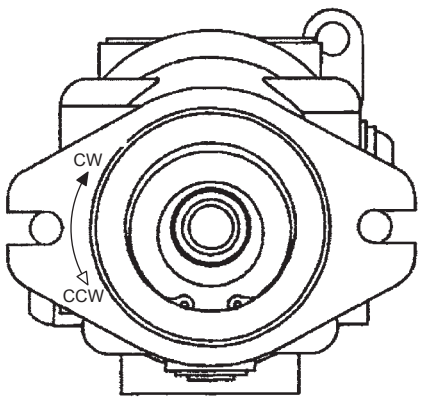
Specifications

- 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.)

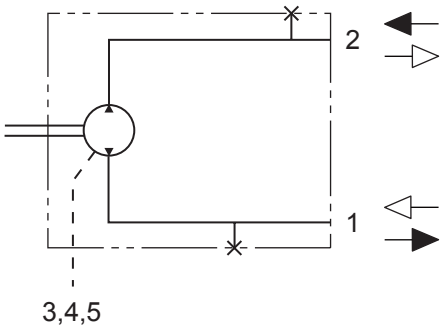
3-2-2. Vibrator hydraulic motor (SW884ND/994ND)







VIEW A



Motor circuit diagram

Flow of oil (Rotation direction is when viewed in direction of arrow A.)

- 2→1 Clockwise rotation
- 1→2 Counterclockwise rotation

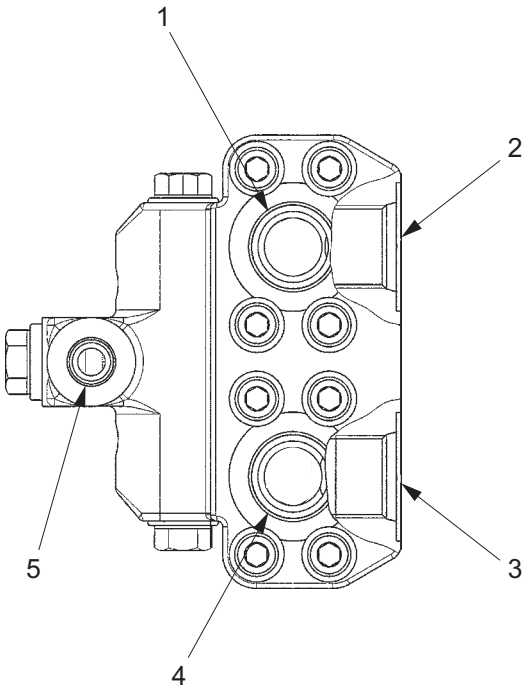
SV400-2-04012

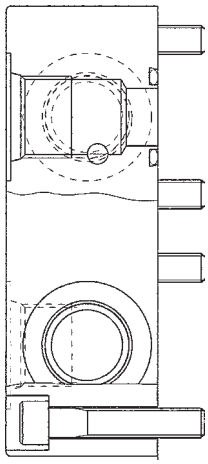
(1) Port B **[FVB][RVB]** : 1 1/16-12UN
(2) Port A **[FVA][RVA]** : 1 1/16-12UN
(3) Drain port : 7/ 8-14UNF
(4) Drain port **[FD1][RD1]** : 7/ 8-14UNF
(5) Drain port **[FD2][RD2]** : 7/ 8-14UNF

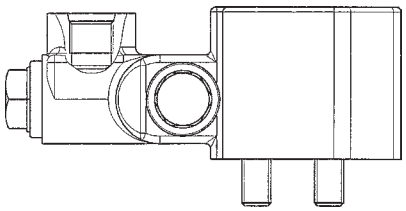
Specifications

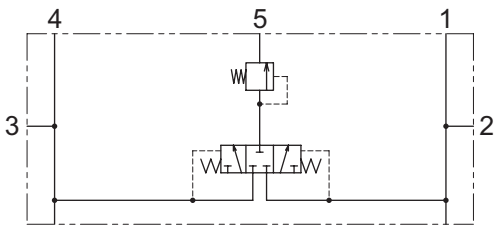
- Displacement : 35.0 cm^3/rev (2.1 cu.in.)
- Working pressure : 34.5 MPa (5,003 psi)
- Allowable motor case pressure : 0.17 MPa (24.7 psi)
- Weight : 11 kg (24.3 lbs.)

3-2-3. Flush and boost pressure valve









Hydraulic circuit diagram

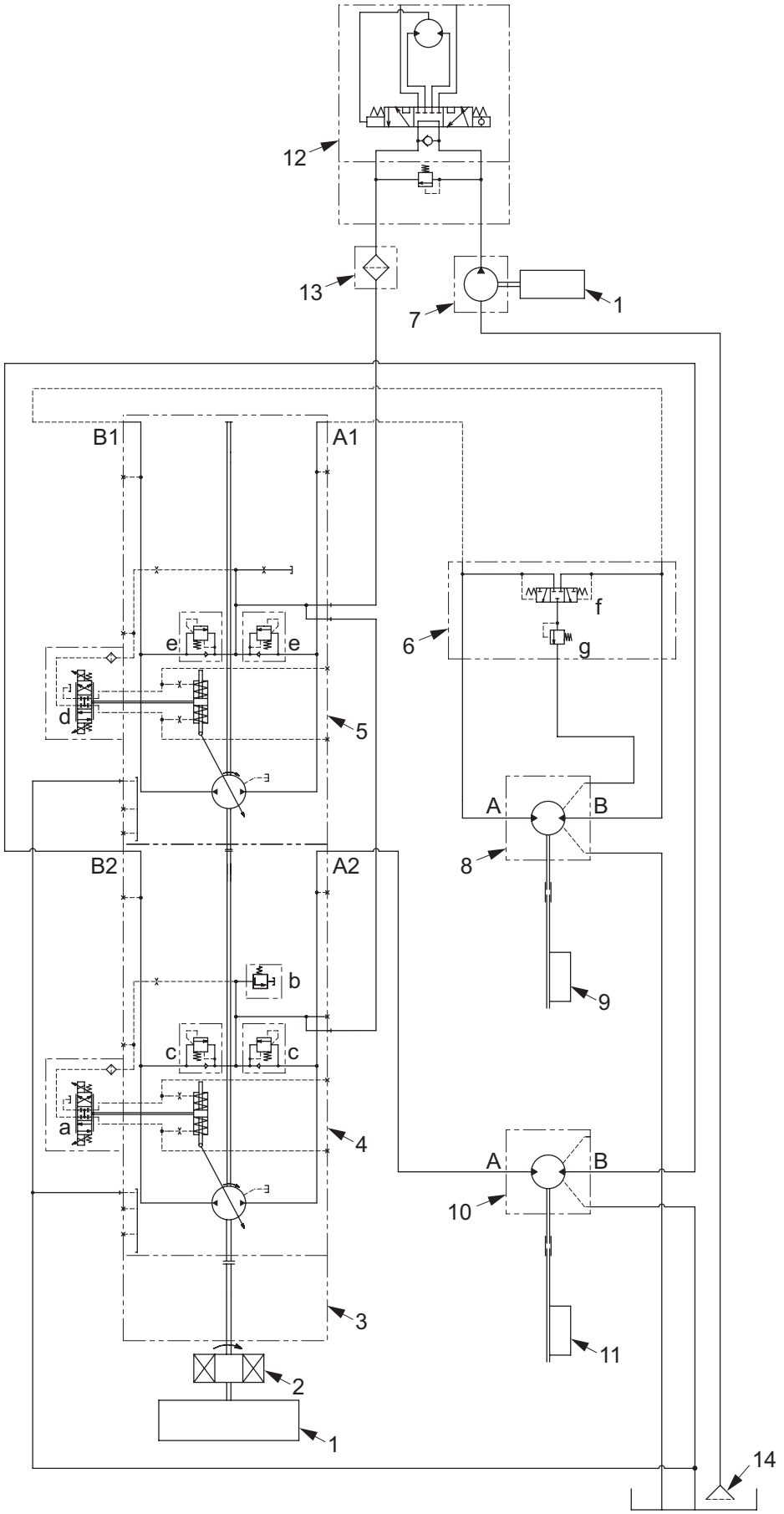
SW884-04005

(1) Port A **[VPA]** : 1 1/16-12UN
(2) Port A1 : 1 1/16-12UN
(3) Port B1 : 1 1/16-12UN
(4) Port B **[VPB]** : 1 1/16-12UN
(5) Port T **[VPT]** : 9/16-18UNF

Specifications

- Rated pressure : 40.0 MPa (5,800 psi)
- Flushing relief valve pressure setting : 1.6 MPa (232 psi)
- Weight : 3.0 kg (6.6 lbs.)

Fig.: Vibrator circuit



1. Engine
2. Coupling
3. Propulsion pump
4. Vibrator pump (R)
   a. Proportional solenoid valve
   b. Charge relief valve
   c. High pressure relief valves
5. Vibrator pump (F)
   d. Proportional solenoid valve
   e. High pressure relief valves
6. Flush and boost pressure valve
   f. Flushing valve
   g. Flushing relief valve
7. Steering•charge pump
8. Vibrator motor (F)
9. Vibrator (F)
10. Vibrator motor (R)
11. Vibrator (R)
12. Orbitrol
13. Hydraulic oil filter 1
14. Suction filter

SW884-04003

3-3. Description and Operation of Vibrator System

Description

- Made up of vibrator pump (F) (5), (R) (4), vibrator motor (F) (8), (R) (10), vibrator (F) (9) and (R) (11).

Basic function of vibrator pump and motor

Vibrator pump:

- A piston pump is in use. Varying the pump swashplate angle varies the piston stroke to select low amplitude/ oscillation, neutral and high amplitude/normal.

Vibrator motor:

- A fixed displacement piston motor is used.The displacement per rotation of the motor shaft is not variable.

Operation (It is assumed that HIGH amplitude/NORMAL is selected.)

- The operation of the vibration switch actuated proportional solenoid valve (a), (d) built in vibrator pump (4), (5) to discharge oil from the port B1, B2.
- Oil fed into the port B of the vibrator motor (8), (10) powers the motor and displaced from the opposite side port A, getting back to the port A1, A2 of vibrator pump.

(NOTE)

- **Because the vibrator system also uses a closed circuit (HST) like the propulsion circuit, every time the amplitude selection is changed from low amplitude to high or vice versa, the function of the pump inlet and outlet is reversed with each other.**
- **ND type switches oscillation and normal.**

- When the front drum is selected by the vibratory drum select switch, proportional solenoid valve (d) operates, only the vibrator pump (F) (5) discharges oil, the vibrator motor (F) (8) operates, and the vibrator (F) (9) rotates.
- When the rear drum is selected by the vibratory drum select switch, proportional solenoid valve (a) operates, only the vibrator pump (R) (4) discharges oil, the vibrator motor (R) (10) operates, and the vibrator (R) (11) rotates.
- When both drums are selected by the vibratory drum select switch, proportional solenoid valves (a), (d) operates, both vibrator pumps discharges oil, both vibrator motors operates, and both vibrators rotates.

Circuit protection against high pressure

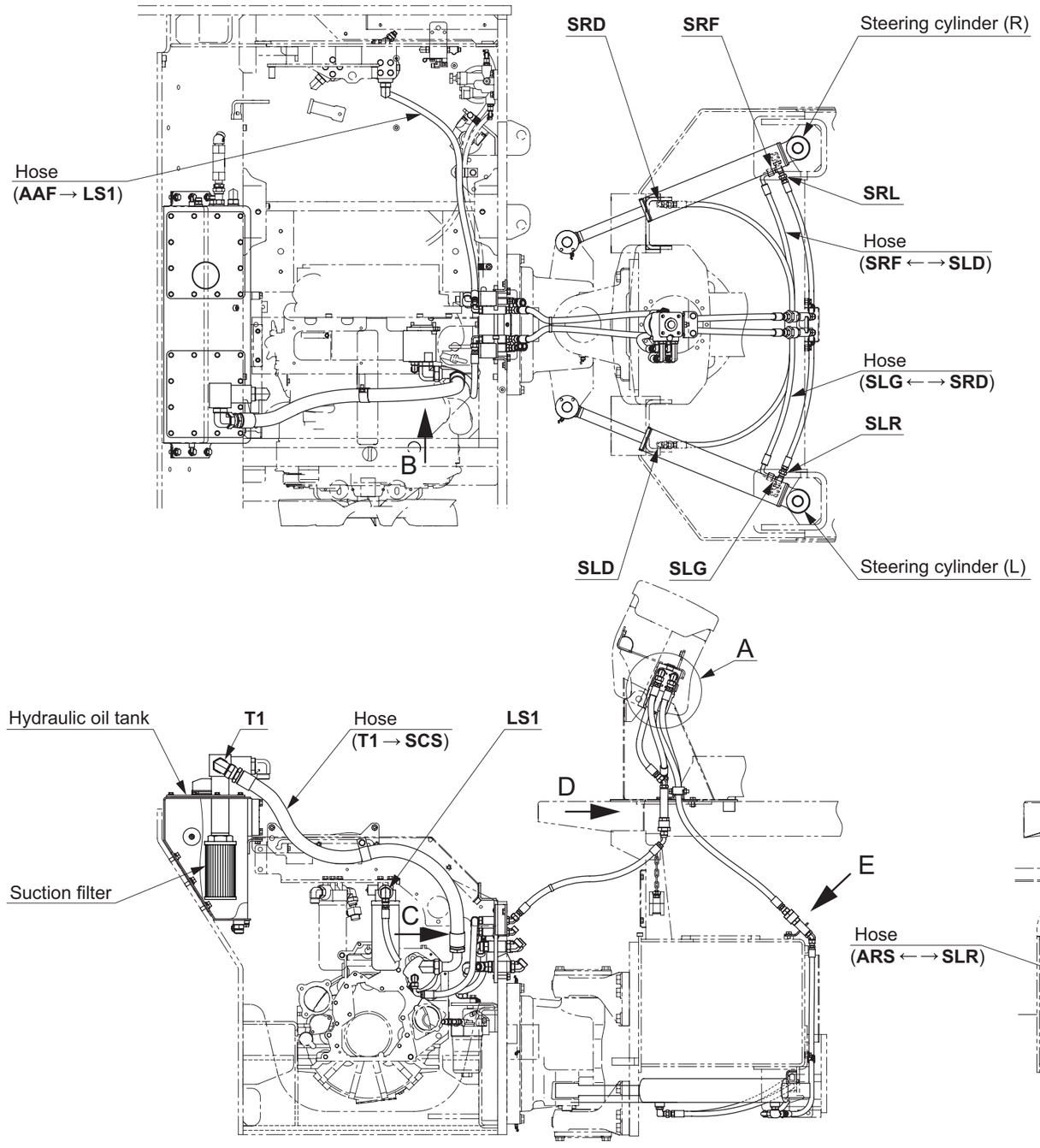
- High pressure relief valves (c), (e) built in the vibrator pump (4), (5) relieve pressure to protect the circuit when the pressure exceeds the setting of the valves.

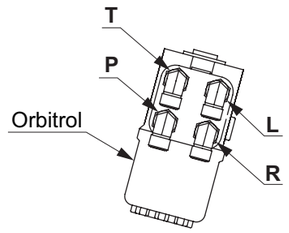
Charge circuit

- The vibrator circuit is also of a closed circuit, which needs feeding of oil into it for making up for deficiency and for other purposes.
- In the charge circuit, oil from steering • charge pump (7) flows into Orbitrol (12), then the whole amount of oil goes to vibrator pump (4), (5) via hydraulic oil filter 1 (13) irrespective of the steering wheel operation.
- Charge relief valve (b) maintains the charge pressure when the machine is not in motion. When travelling, the charge pressure is kept by the flushing relief valve (g).

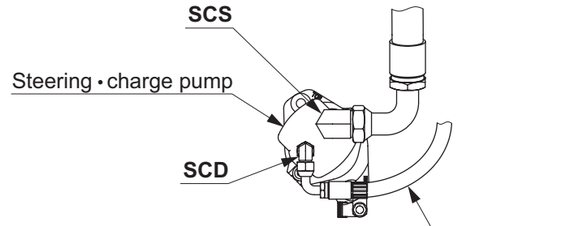
4. STEERING SYSTEM

4-1. Steering Hydraulic Piping

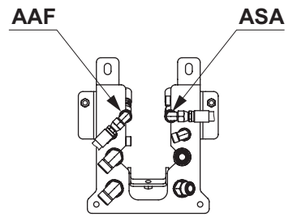




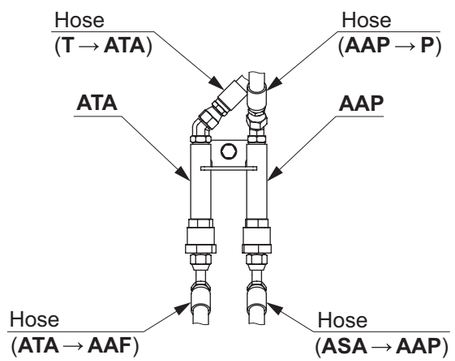
DETAIL A



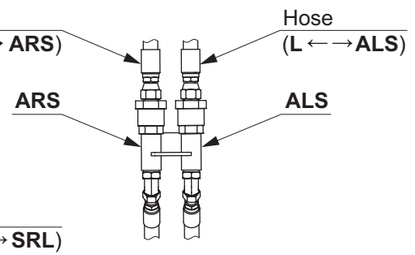
VIEW B



VIEW C



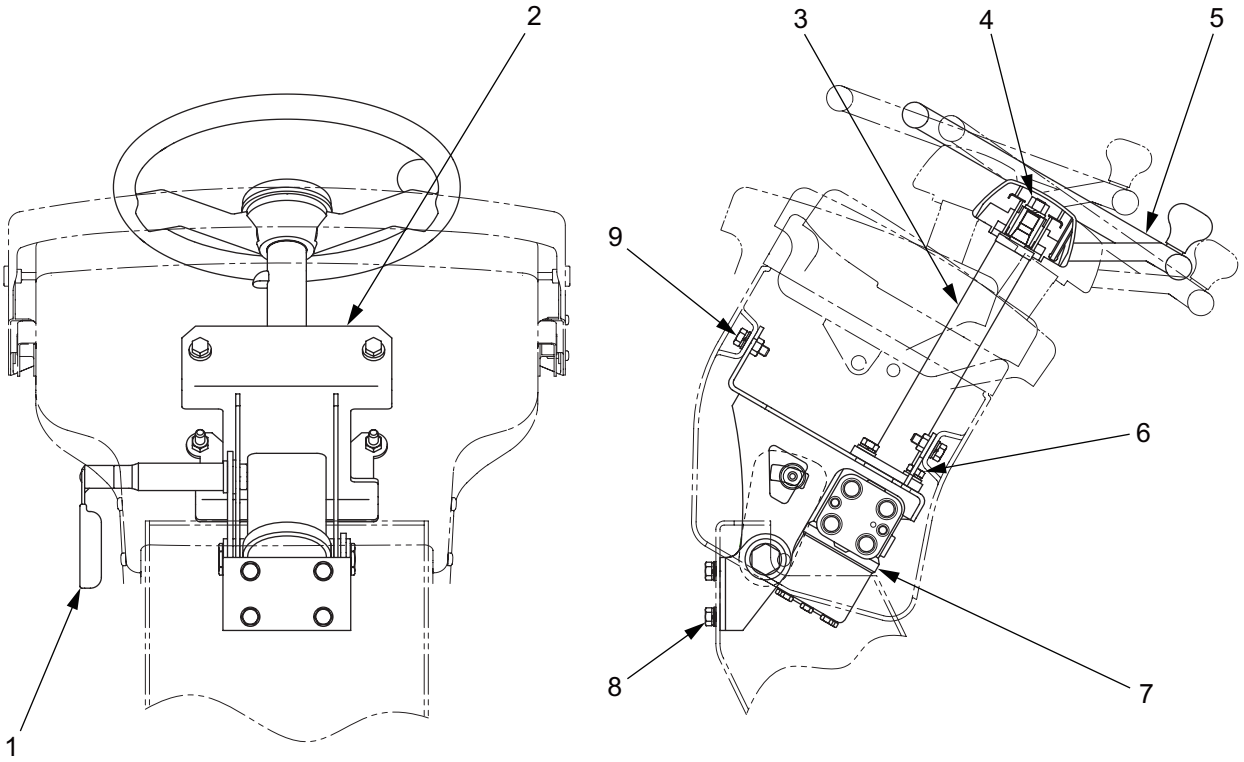
VIEW D



VIEW E

• The letters and numbers in the figure such as “ALS” and “SRL” show each port.
• Arrow “←→; →” symbols show the hose connection and the direction of the flow of the oil.

4-2. Steering Wheel



0431-32801-0-10036-C

(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

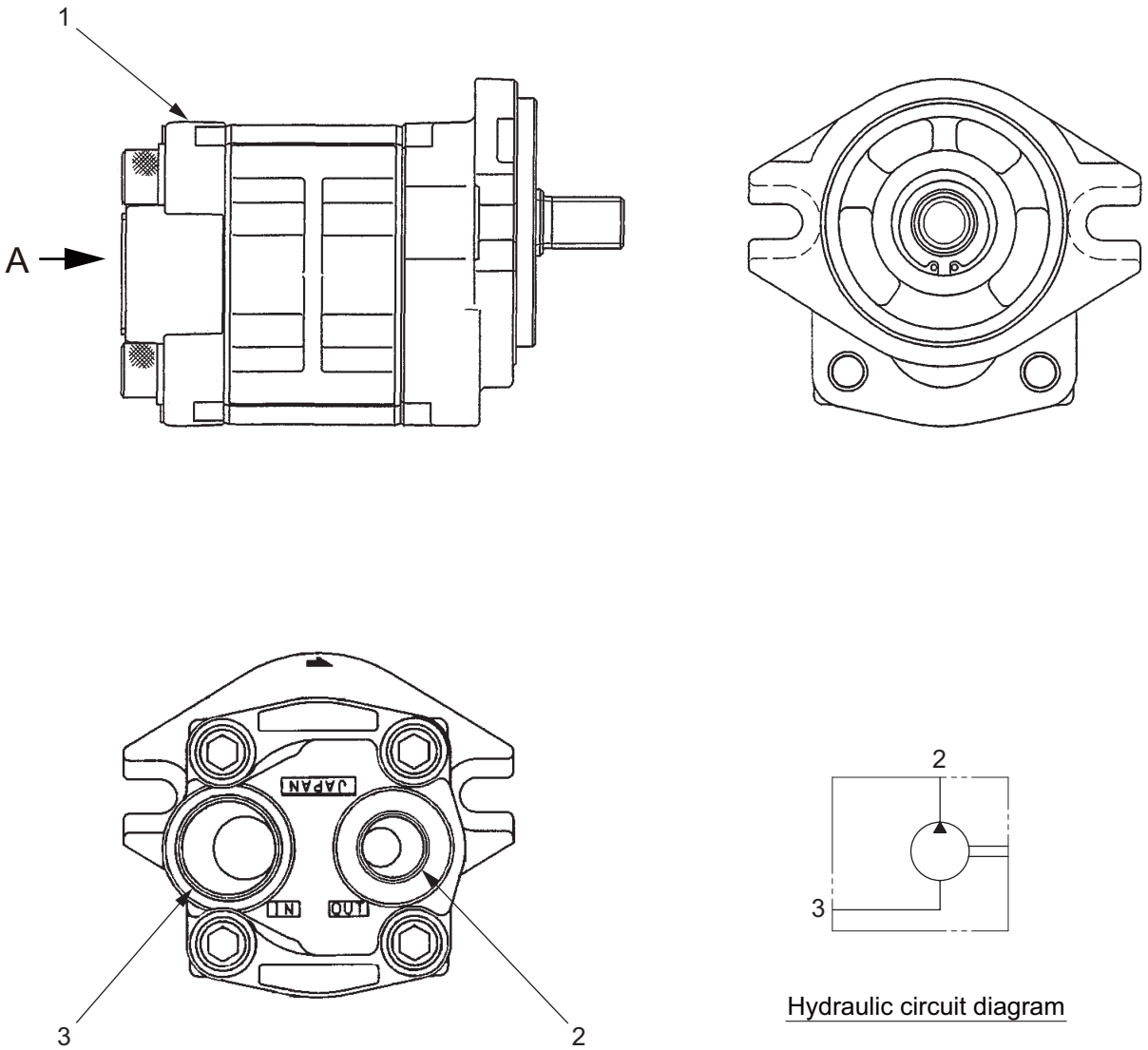
N・m

(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. Steering • charge pump

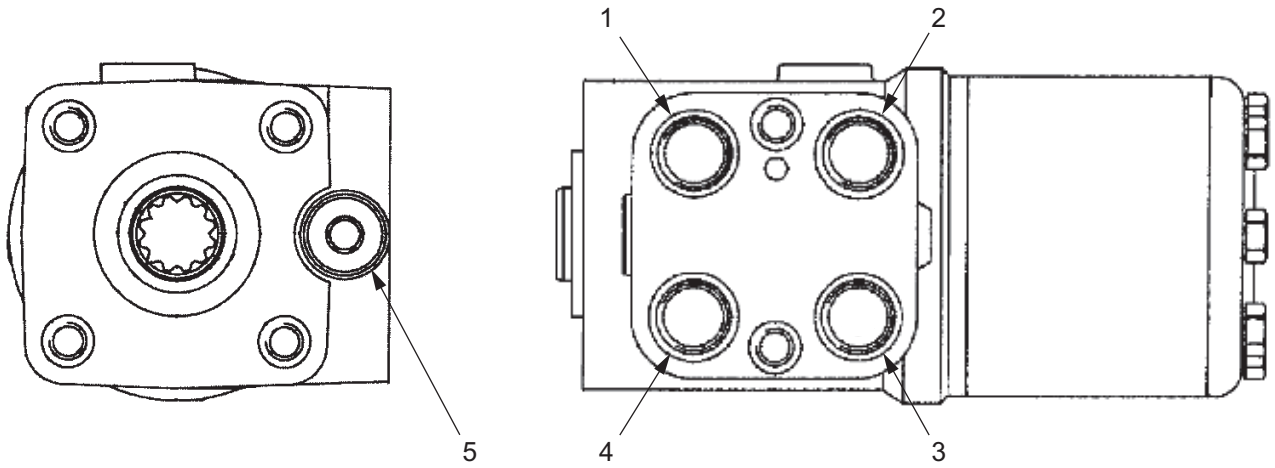


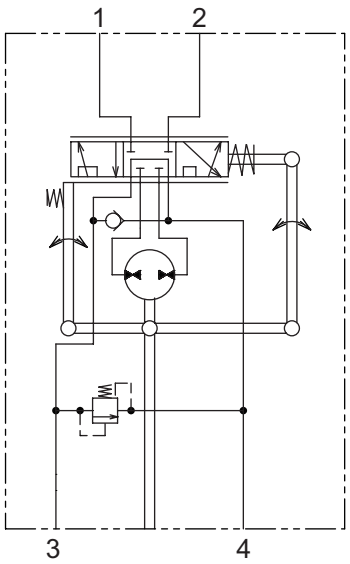
SV540-04004

(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.)

4-3-2. Orbitrol





Hydraulic circuit diagram

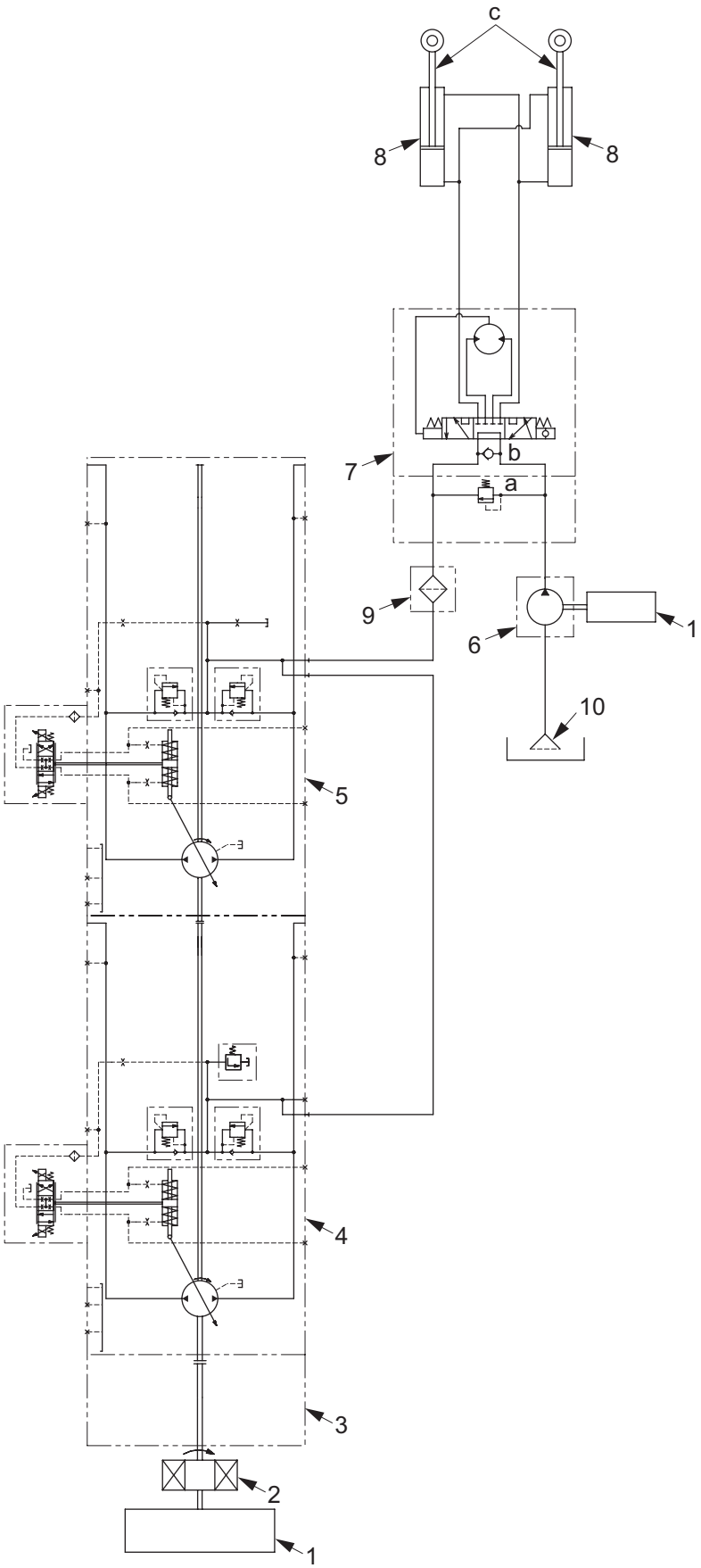
ORB-SD-04150

(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 pressure setting : 15.0 MPa (2,175 psi)
- Weight : 7 kg (15 lbs.)

Fig.: Steering circuit



1. Engine
2. Coupling
3. Propulsion pump
4. Vibrator pump (F)
5. Vibrator pump (R)
6. Steering•charge pump
7. Orbitrol
   a. Relief valve
   b. Check valve
8. Steering cylinders
   c. Piston rods
9. Hydraulic oil filter 1
10. Suction filter

SW884-04004

4-4. Description and Operation of Steering System

4-4-1. Description and operation of steering system

Description

- Made up of steering • charge pump (6), Orbitrol (7) steering cylinders (8) and hydraulic oil filter 1 (9).The steering mechanism is of an articulated type in which the machine frame is articulated at its center.

Operation

- The oil discharged from steering • charge pump (6) enters Orbitrol (7), and a certain quantity of oil that matches the handle turning direction and speed is supplied to steering cylinders (8).
- The oil that enters the steering cylinder shifts piston rod (c) to operate it, while the oil pushed out of the port on the opposite side returns to Orbitrol (7), flowing into the charge circuit of vibrator pump (4), (5) through hydraulic oil filter 1 (9).

- For the “Charge circuit”, refer to page 4-026.
- Relief valve (a) built in Orbitrol (7) opens to relieve the pressure if the system pressure exceeds the setting of the valve, thus protecting the circuit.

4-4-2. Structure and operation of Orbitrol

- Orbitrol used here is a load-sensing type, in which oil is supplied from the steering hydraulic pump according to the steering wheel rotating speed.

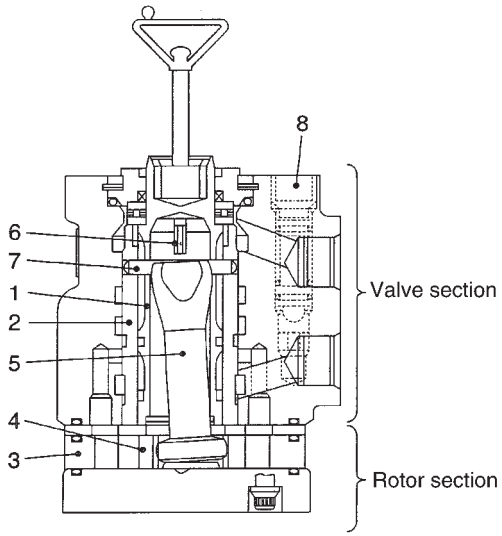
Structure

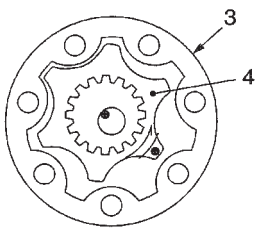
Valve section:

- The valve is a rotary-type direction changeover valve composed of spool (1) and sleeve (2), and the spline connects the steering wheel to spool (1).
- When the steering wheel is not operated, spool (1) and sleeve (2) are held at the neutral position by centering spring (6), and the oil groove of spool (1) is not aligned with the oil hole of sleeve (2), completely stopping the oil flow into the steering cylinder.
- When the steering wheel is operated, the oil groove of spool (1) is aligned with the oil hole of sleeve (2) to open the circuit, allowing the oil to flow into the steering cylinder.

Rotor section:

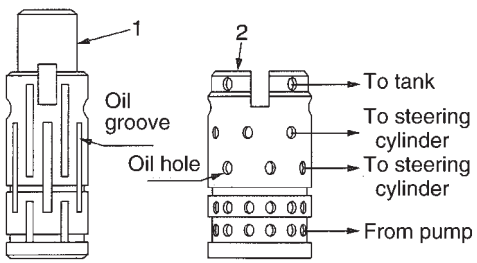
- The rotor is a kind of internal gear, functioning as a hydraulic motor when the valve section (spool and sleeve) opens.
- The rotation of rotor (4) is transmitted to the valve section by drive shaft (5), controlling the valve opening according to the steering wheel rotating speed.





1. Spool
2. Sleeve
3. Stator
4. Rotor
5. Drive shaft
6. Centering spring
7. Cross pin
8. Check valve

SV414-04006



SV414-04007

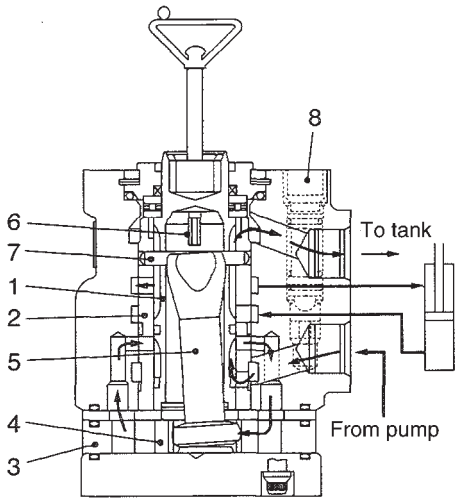
Operation

Neutral (when the steering wheel is not operated):

- Spool (1) and sleeve (2) in the valve section have a slit respectively, and centering spring (6) is set in the slit in combination with a flat spring.
- When steering wheel is not operated, spool (1) and sleeve (2) are held in the neutral position by centering spring (6).
- This Orbitrol is a load-sensing, non-load reaction normally-closed type valve. All the oil holes of the spool are out of place when Orbitrol is in the neutral position, and the flow of oil from the hydraulic pump into the steering cylinder is closed completely.

Swing (when the steering wheel is operated):

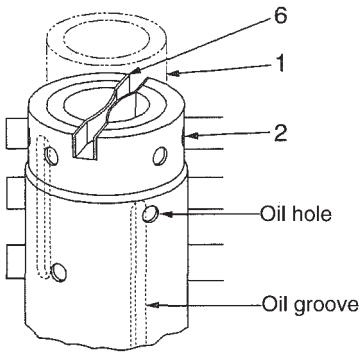
- All the ports of the valve section are closed when Orbitrol is in the neutral position. The oil in the rotor has been sealed up, and rotor (4) is fixed.
  Sleeve (2) is coupled with rotor (4) via cross pin (7) and drive shaft (5), and it is fixed also.
- When the steering wheel is operated, the turning force is applied to spool (1), contracting centering spring (6) that has been set in the slit.
  As a result, the oil groove of spool (1) is aligned with the oil hole of sleeve (2), opening the hydraulic circuit.
- Consequently, all the four ports (hydraulic pump, tank, and steering cylinder circuits on the right and left sides) open to permit oil to flow, and rotor (4) rotates.



1. Spool
2. Sleeve
3. Stator
4. Rotor
5. Drive shaft
6. Centering spring
7. Cross pin
8. Check valve

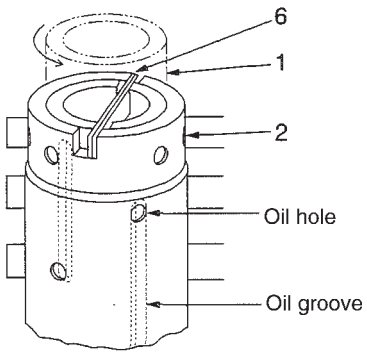
SV414-04009

Neutral



SV414-04008

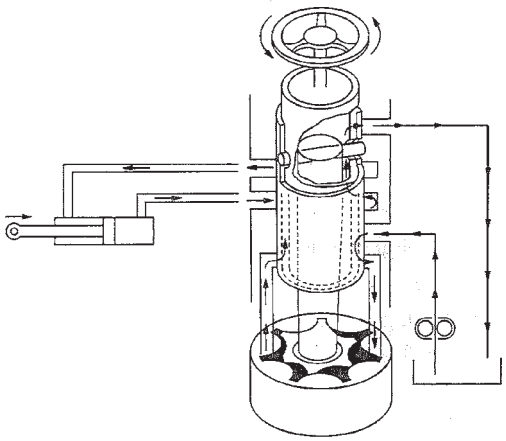
Swing



SV414-04010

Operation of feedback mechanism:

- When the steering wheel is operated and the centering spring generates the displacement angle (misalignment in the circumferential direction) between the spool and sleeve, the oil from the hydraulic pump enters Orbitrol to rotate the rotor, and the oil flows into the steering cylinder.
- As a result, the sleeve rotates slightly later than the spool, following the rotation of the spool. This phenomenon permits the spool to rotate continuously, permitting the steering wheel to turn and the vehicle to swing continuously.
- When the steering wheel operation is stopped, the spool stops rotation immediately, but the oil flows into Orbitrol if the displacement angle exists between the spool and sleeve, permitting the rotor to rotate continuously.
  This rotation allows the sleeve to catch up with the spool, closing the hydraulic circuit.
  Finally, the centering spring returns the spool and sleeve back to the neutral position, completely stopping the oil flow.



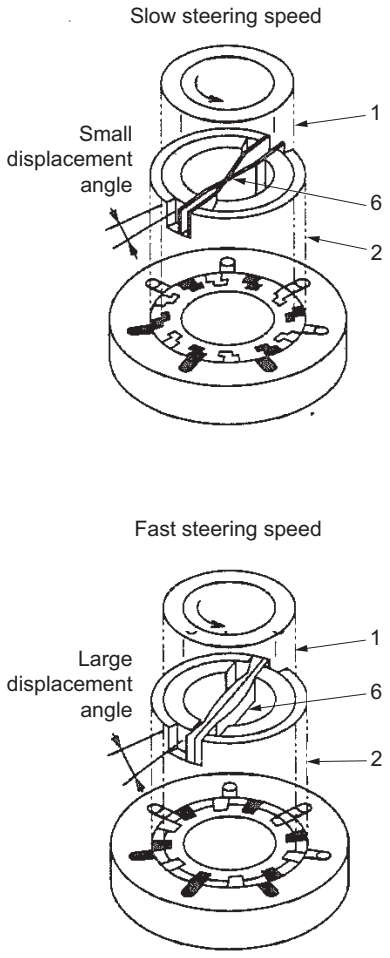
SV414-04011

Steering speed and flow control:

- In the steering mechanism, the flow to the steering cylinder must be increased or decreased according to the rotational speed of the steering wheel.
- Orbitrol controls the flow by changing the displacement angle between spool (1) and sleeve (2). In other words, sleeve (2) follows the rotation of spool (1) during the steering wheel operation, closing the hydraulic circuit.
- When rotational speed of the steering wheel increases, the delay of sleeve (2) (displacement angle) increases, increasing the flow.

Hydraulic pump flow and operating force:

- When the hydraulic pump discharge is sufficient, the steering operating force is used simply to overcome the sliding resistance of sleeve (2) and the rotor, permitting the steering wheel to rotate easily.
- When the hydraulic pump discharge is insufficient, the displacement angle between spool (1) and sleeve (2) reaches the maximum, reducing the quantity of oil flowing from the hydraulic pump into the rotor even if the hydraulic circuit opens widely, causing the rotor to rotate slowly.
- As a result, the spool rotation becomes faster than the rotor rotation to increase the displacement angel to a maximum extent, and the spool rotates the rotor via the cross pin and drive shaft. At that time, the rotor functions as a hydraulic pump, preventing the steering wheel from rotating smoothly.



1. Spool
2. Sleeve
6. Centering spring

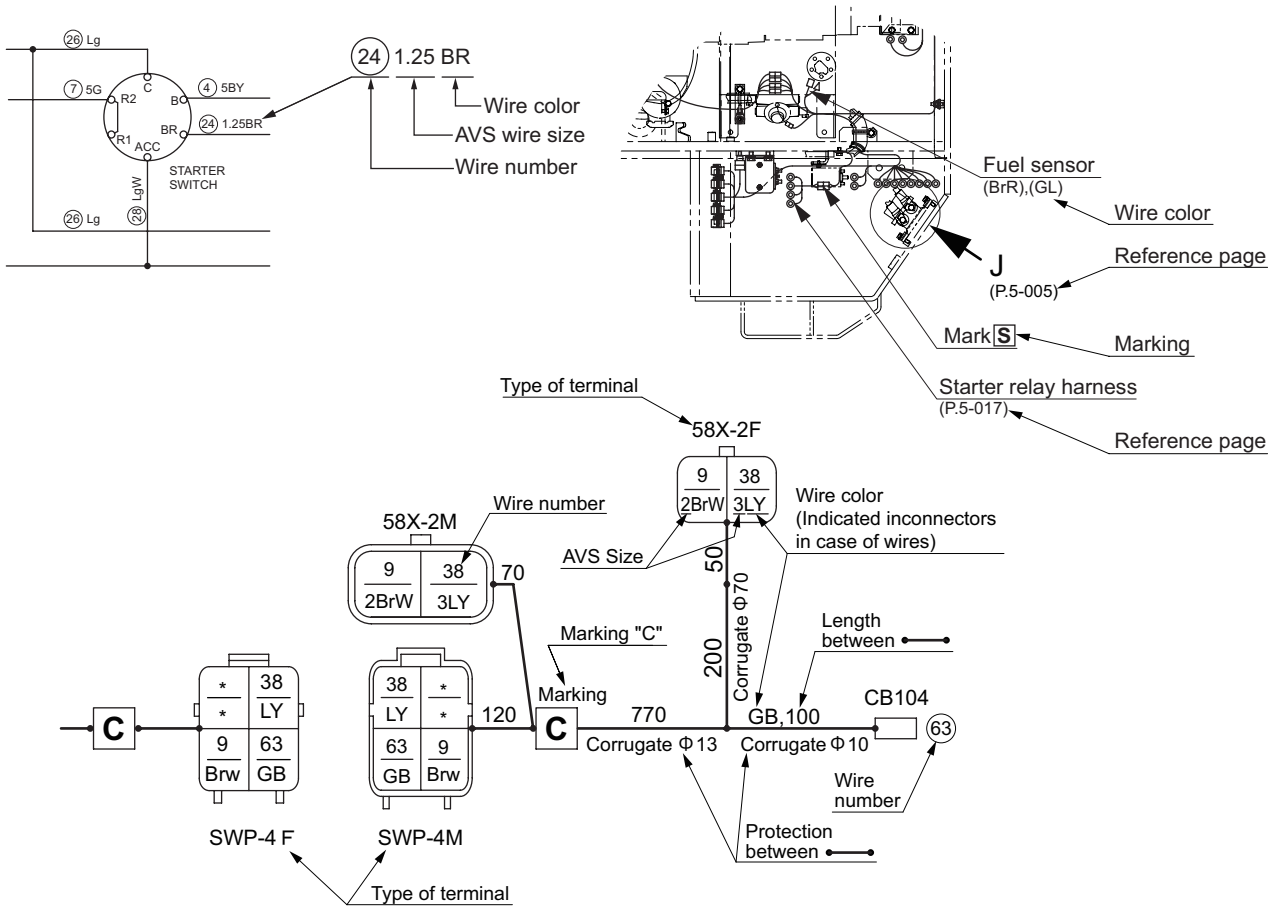
SV414-04012

ELECTRICAL SYSTEM

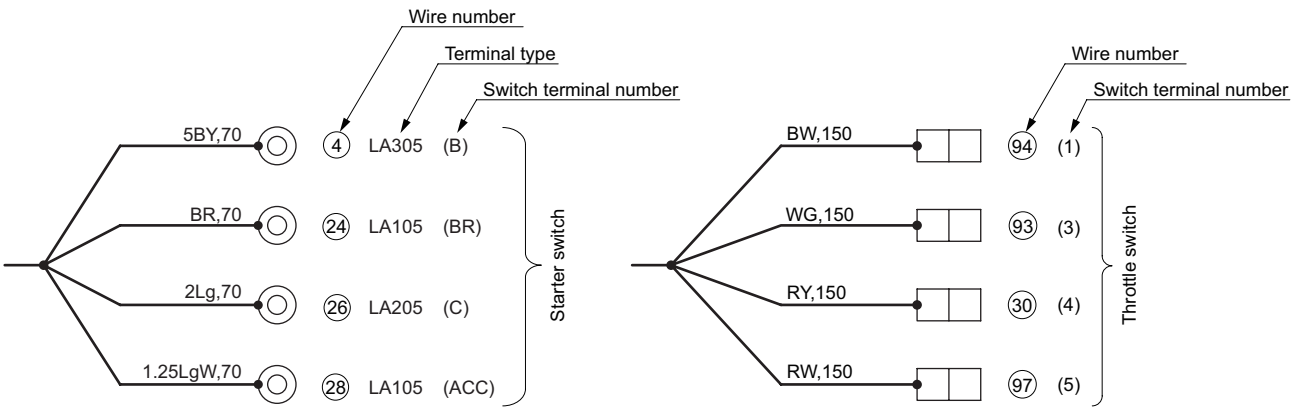
1. PRECAUTIONS FOR WORK

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.

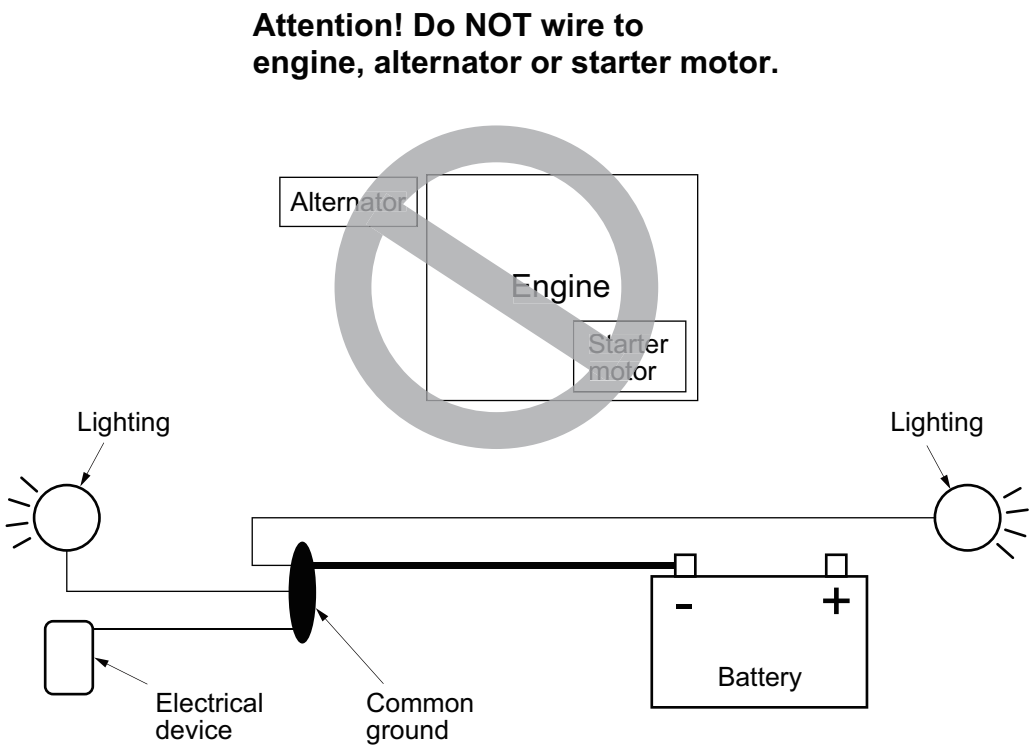


• Wire color code chart

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 (Gr)	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		

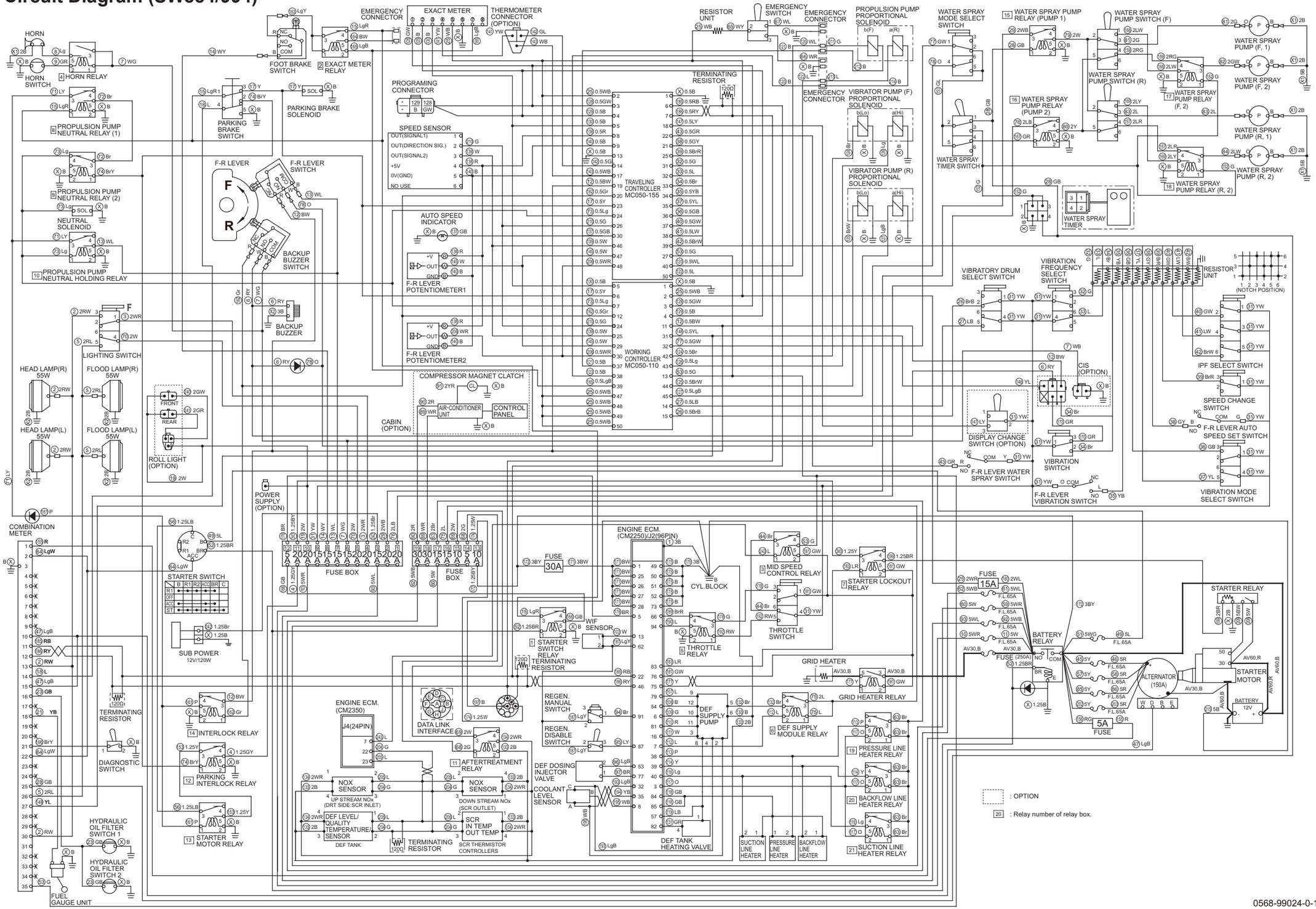
1-2. Electrical Equipment Installation

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.

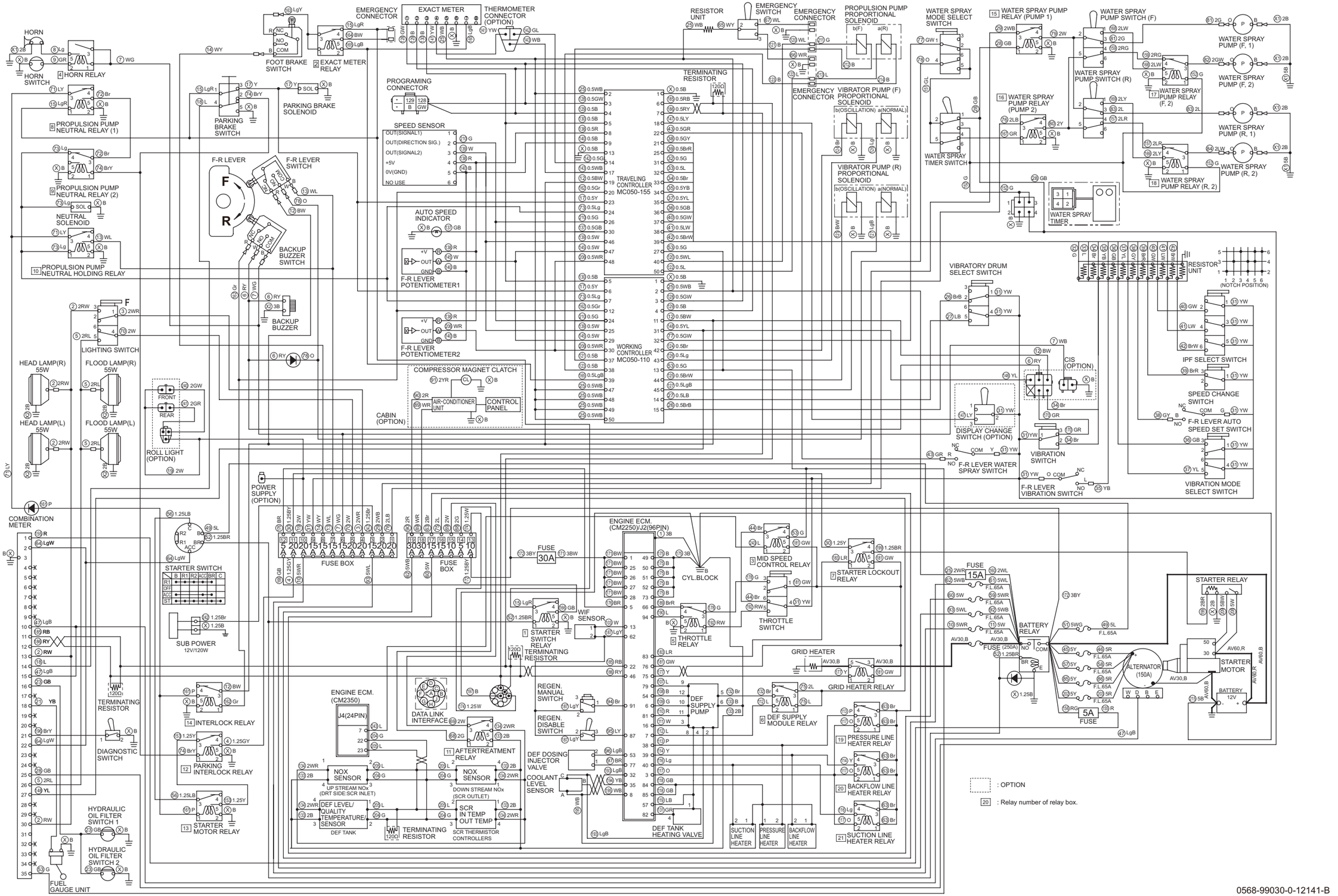


2. SYSTEM CIRCUIT DIAGRAM

2-1. Electrical Circuit Diagram (SW884/994)



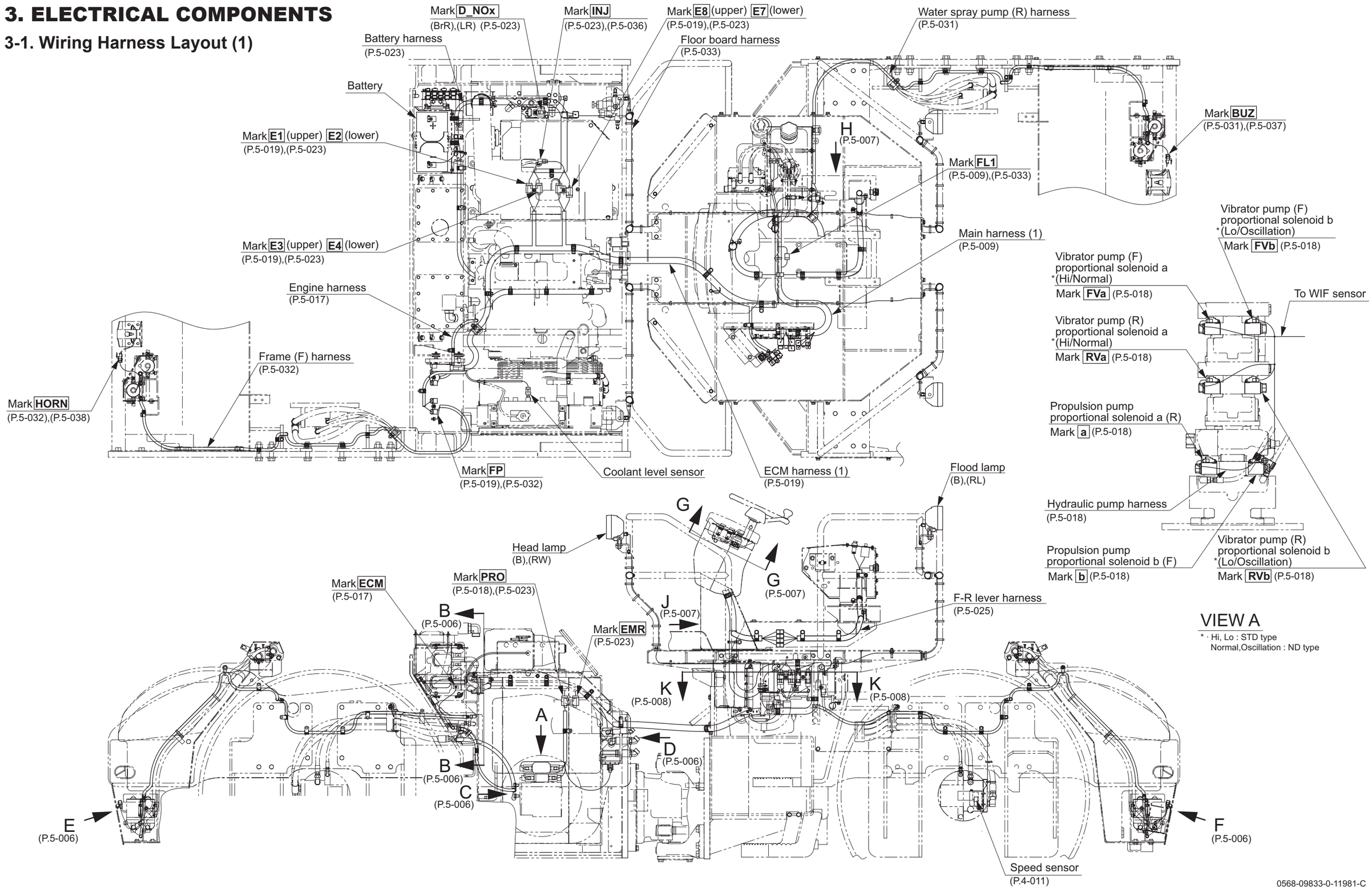
2-2. Electrical Circuit Diagram (SW884ND/994ND)



0568-99030-0-12141-B

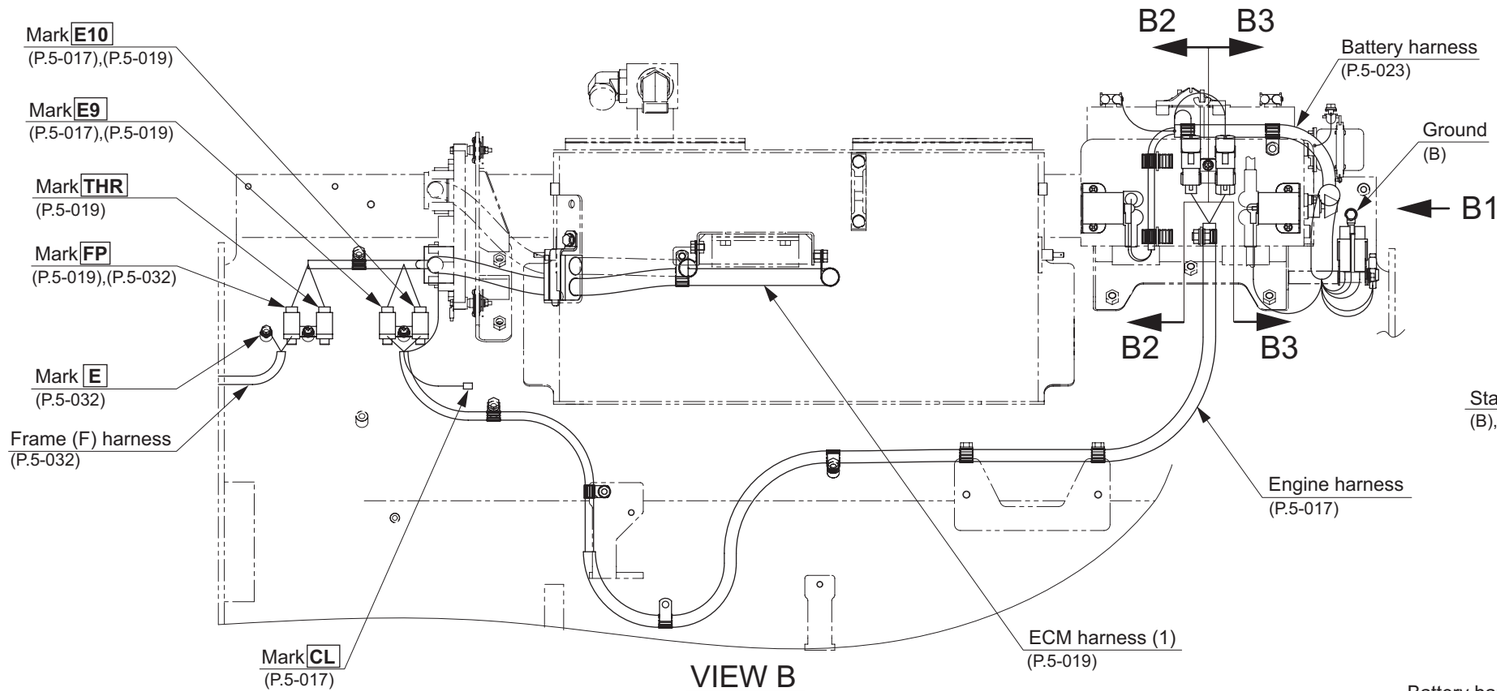
3. ELECTRICAL COMPONENTS

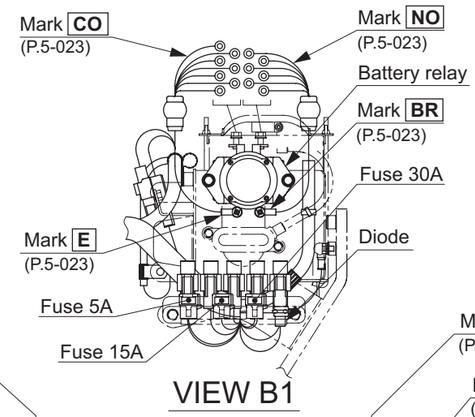
3-1. Wiring Harness Layout (1)

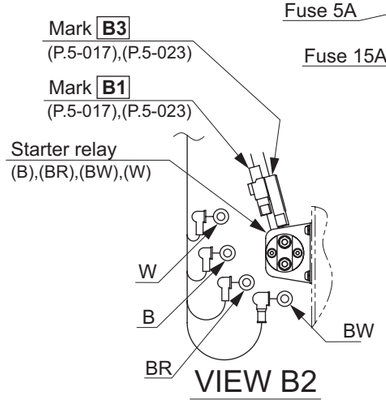


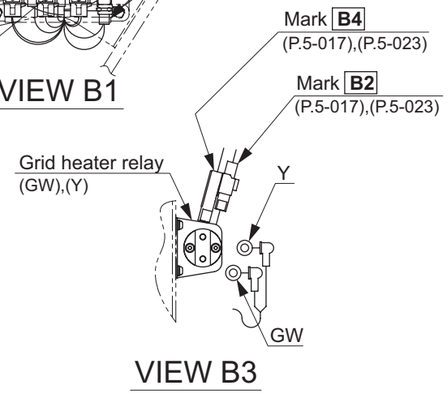
0568-09833-0-11981-C

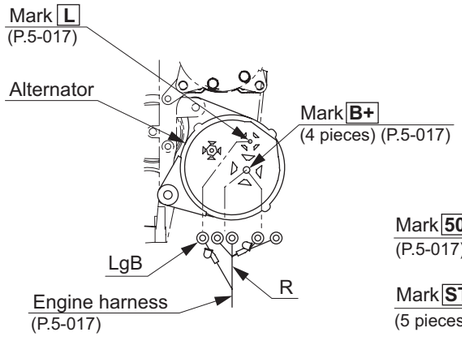
3-2. Wiring Harness Layout (2)

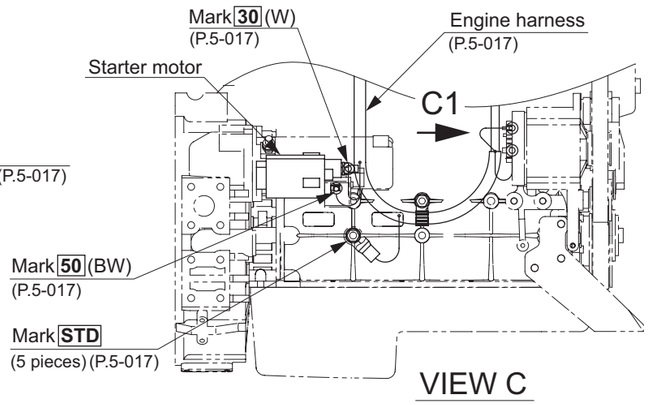


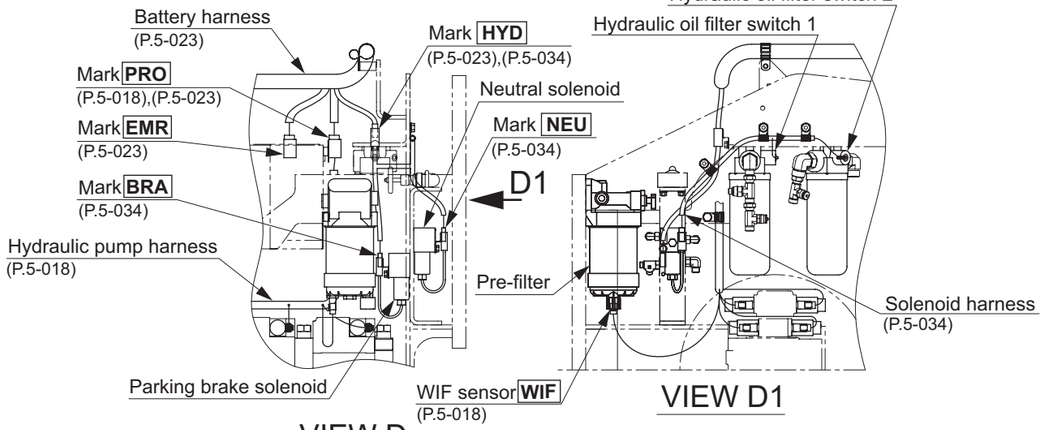


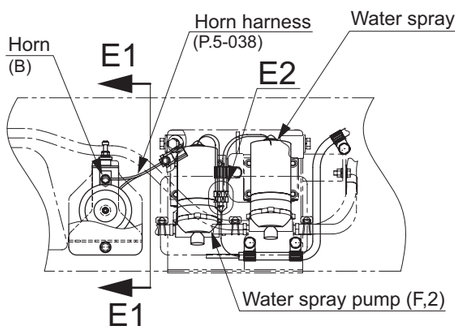


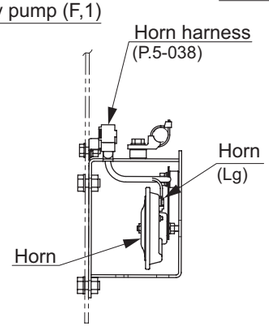


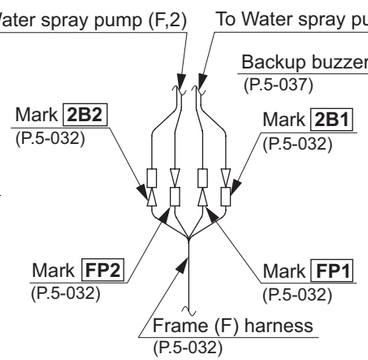


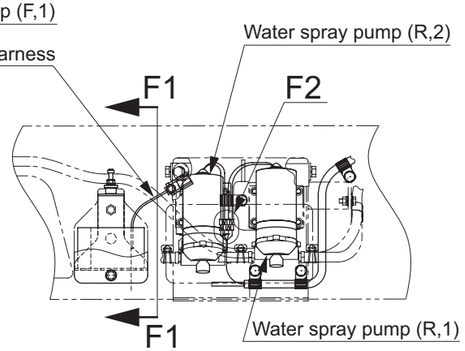


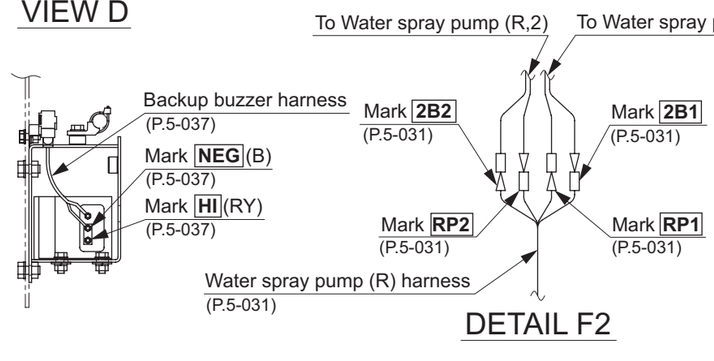






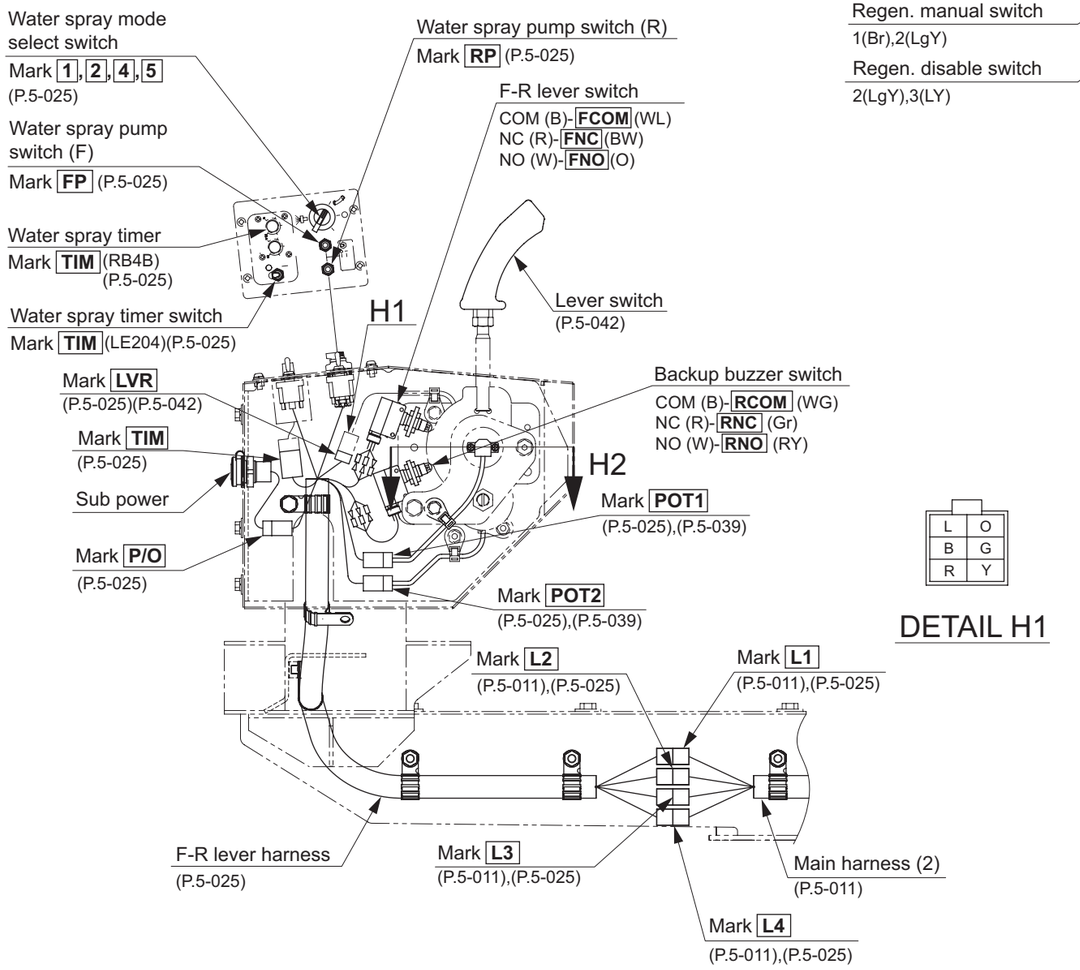




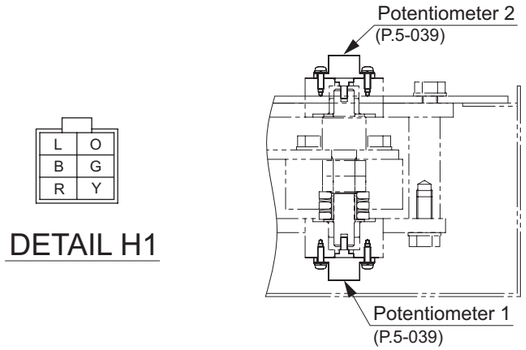


0568-09829-0-11977-0
0568-09833-0-11981-C
0568-09833-0-11982-C

3-3. Wiring Harness Layout (3)

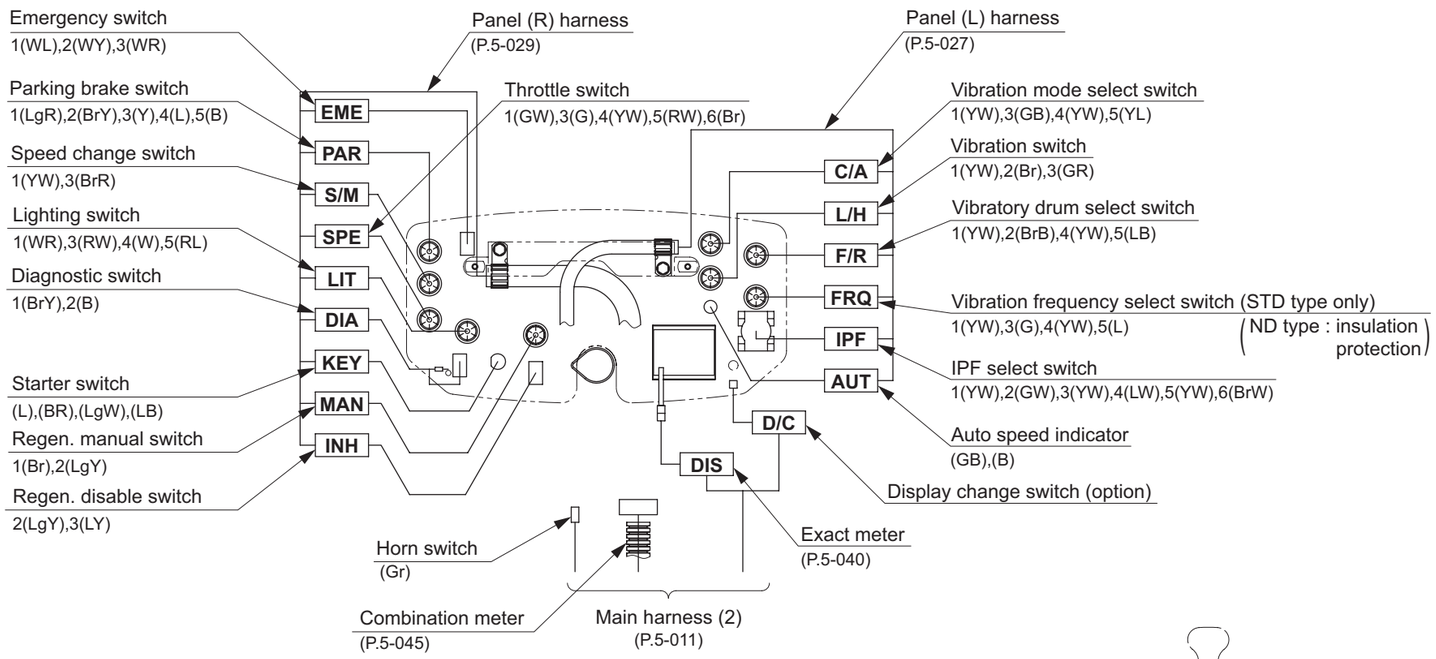


VIEW H

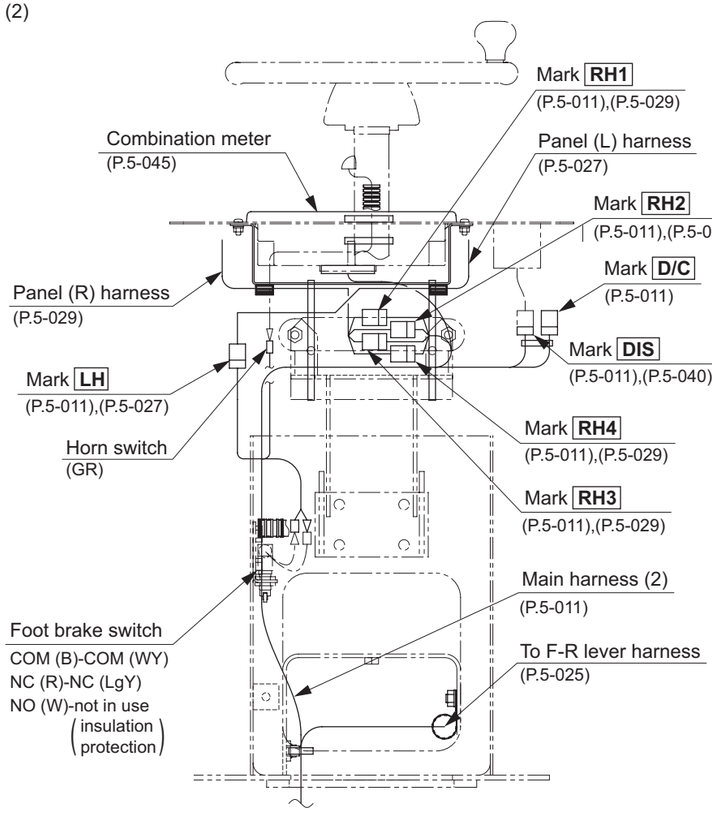


DETAIL H1

VIEW H2



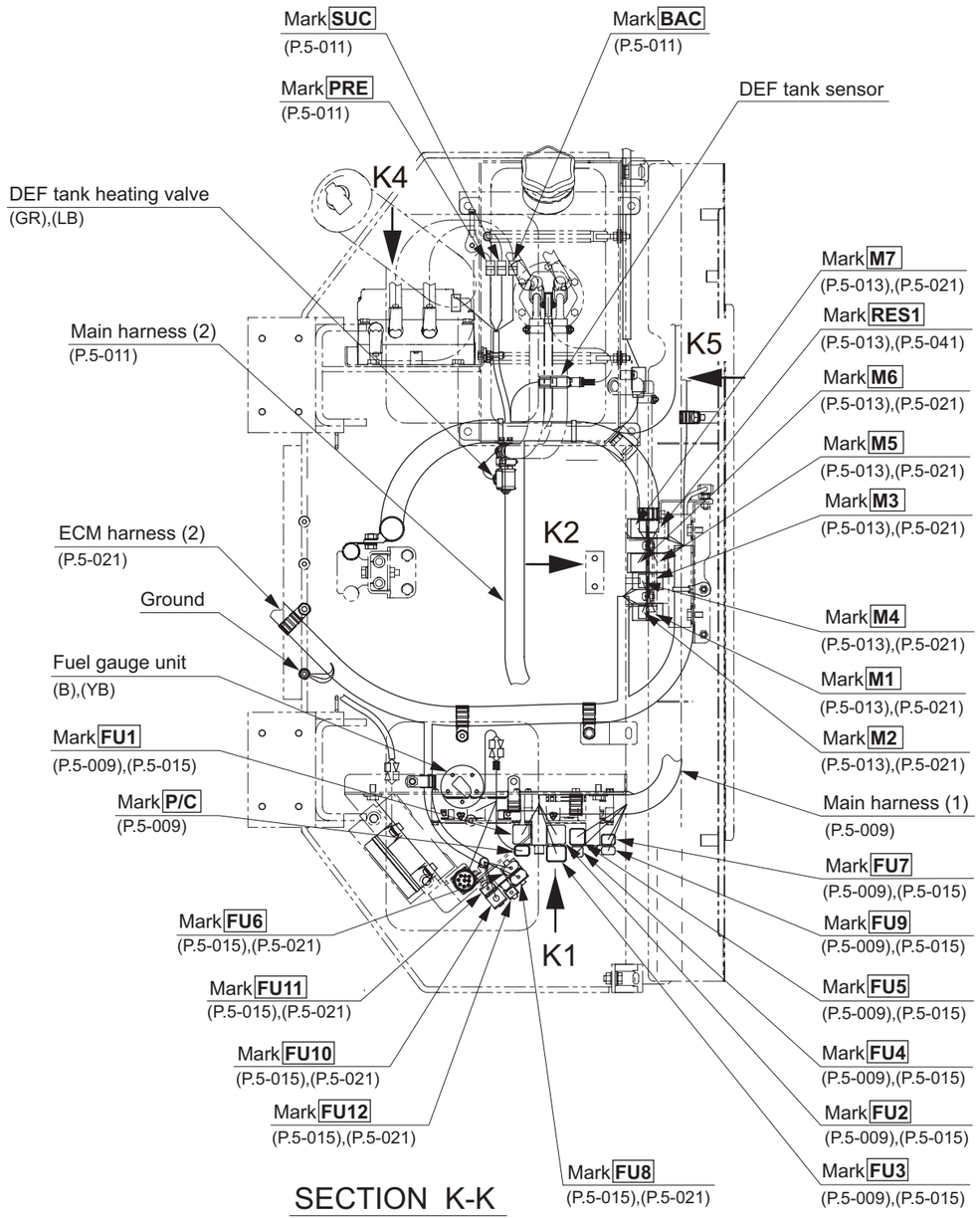
SECTION G-G



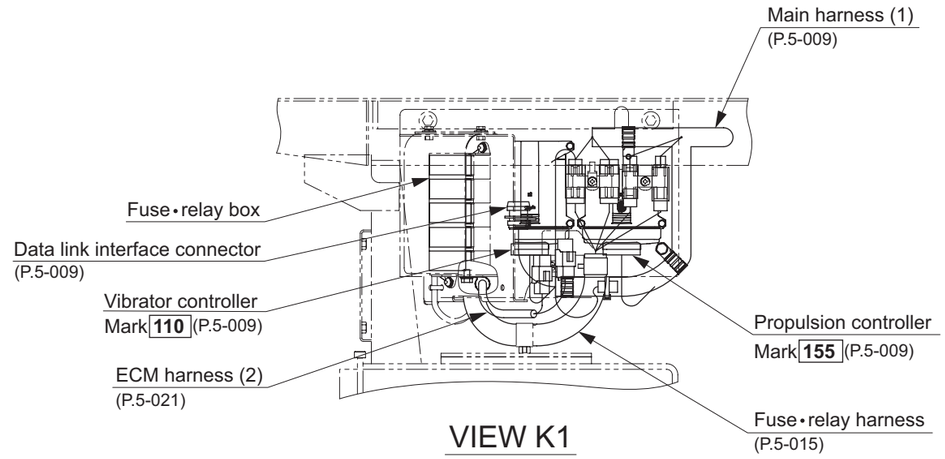
VIEW J

0568-09833-0-11982-C
0568-09839-0-12143-C
0568-12805-0-11265-C

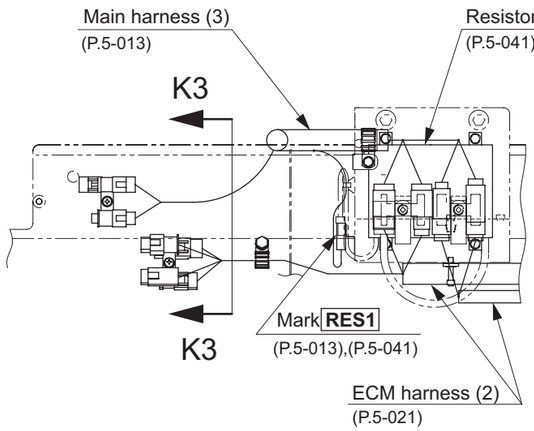
3-4. Wiring Harness Layout (4)



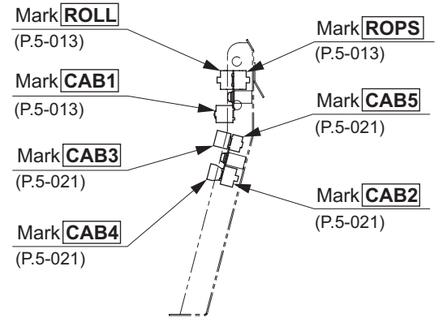
SECTION K-K



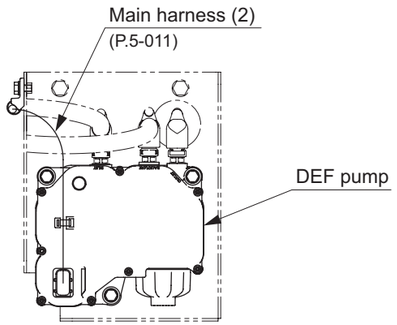
VIEW K1



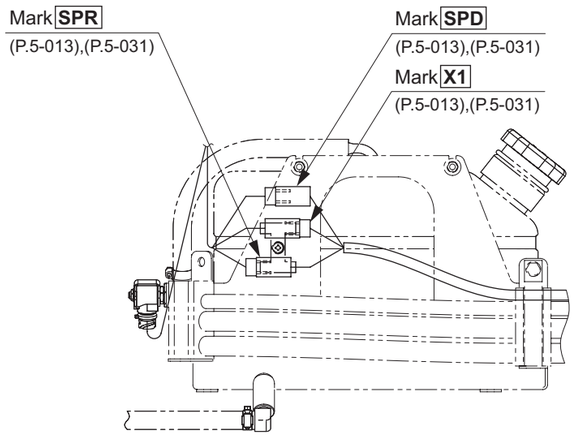
VIEW K2



VIEW K3



VIEW K4

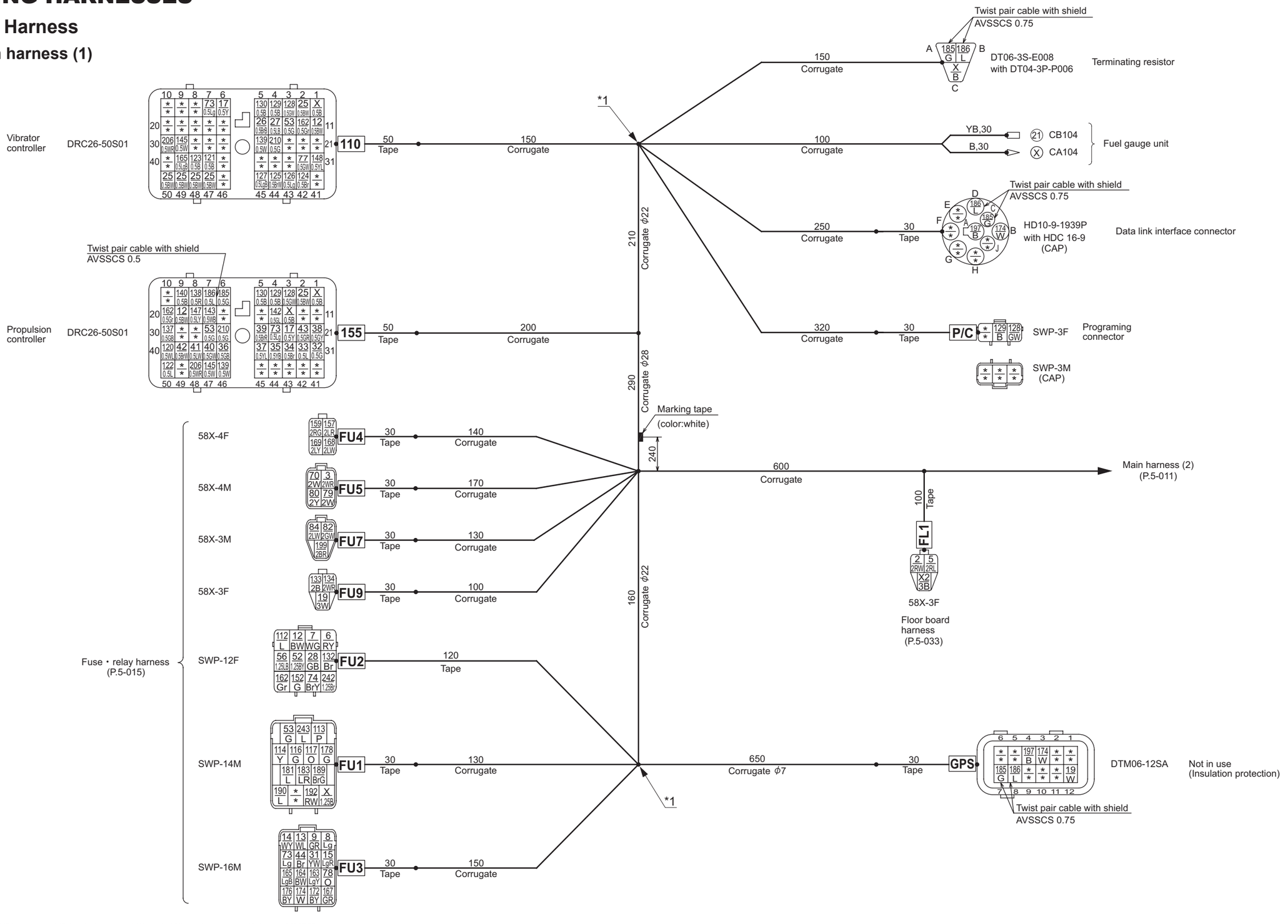


VIEW K5

4. WIRING HARNESSES

4-1. Main Harness

4-1-1. Main harness (1)



· The earth wire "X" between "*1" (main harness (1)) and "*2" (main harness (3)) use "AVS3".
· Where the numbers differ, wires of same color must not be united.

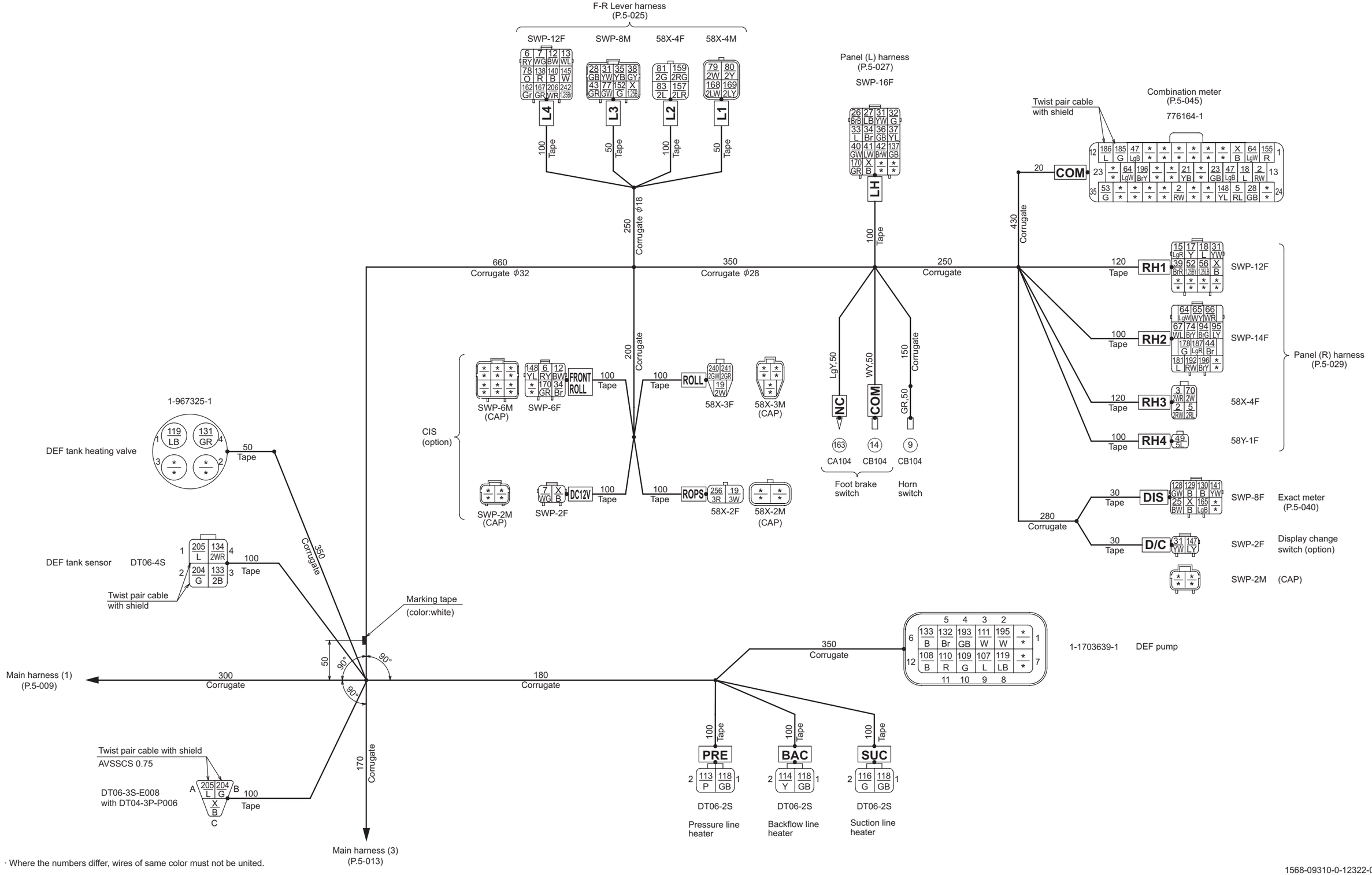
1568-09310-0-12322-0

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			Main Harness (1)		(2)	(3)
Ⓧ	B, 0.5B, 1.25B, 3B	15	110-1, 155-1, 13, FU1, Fuel gauge unit, Terminating resistor-C	6	7	2
Ⓧ2	3B	3	FL1	1		2
②	RW, 2RW	5	FL1	1	3	1
③	2WR	2	FU5	1	1	
⑤	RL, 2RL	4	FL1	1	2	1
⑥	RY	4	FU2	1	2	1
⑦	WG	3	FU2	1	2	
⑧	Lg	2	FU3	1		1
⑨	GR	2	FU3	1	1	
⑫	BW, 0.5BW	5	110-11, 155-19, FU2	3	2	
⑬	WL	2	FU3	1	1	
⑭	WY	2	FU3	1	1	
⑮	LgR	3	FU3	1	1	1
⑰	Y, 0.5Y	4	110-6, 155-23	2	1	1
⑲	W, 2W, 3W	4	FU9, GPS-12 (not in use)	2	2	
㉑	YB	2	Fuel gauge unit	1	1	
㉕	BW, 0.5BW, 2BW	9	110-2, 47, 48, 49, 50, 155-2	6	1	2
㉖	BrB, 0.5BrB	2	110-15	1	1	
㉗	LB, 0.5LB	2	110-14	1	1	
㉘	GB	3	FU2	1	2	
㉛	YW	5	FU3	1	4	
㉜	G, 0.5G	3	155-31	1	1	1
㉝	L, 0.5L	3	155-32	1	1	1
㉞	Br, 0.5Br	4	155-33	1	2	1
㉟	YB, 0.5YB	3	155-34	1	1	1
㊱	GB, 0.5GB	3	155-36	1	1	1
㊲	YL, 0.5YL	3	155-35	1	1	1
㊳	GY, 0.5GY	3	155-21	1	1	1
㊴	BrR, 0.5BrR	3	155-25	1	1	1
㊵	GW, 0.5GW	3	155-37	1	1	1
㊶	LW, 0.5LW	3	155-38	1	1	1
㊷	BrW, 0.5BrW	3	155-39	1	1	1
㊸	GR, 0.5GR	2	155-22	1	1	
㊹	Br	2	FU3	1	1	

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			Main Harness (1)		(2)	(3)
㊷	1.25BY	3	FU2	1	1	1
㊸	G, 0.5G	4	110-13, 155-27, FU1	3	1	
㊻	1.25LB	2	FU2	1	1	
㊿	2W	2	FU5	1	1	
㋂	Lg, 0.5Lg	4	110-7, 155-24, FU3	3		1
㋃	BrY	2	FU2	1	1	
㋆	GW, 0.5GW	2	110-32	1	1	
㋇	O	2	FU3	1	1	
㋈	2W	2	FU5	1	1	
㋉	2Y	2	FU5	1	1	
㋋	2GW	2	FU7	1		1
㋍	2LW	2	FU7	1		1
㋿	L	2	FU2	1		1
㌀	P	3	FU1	1	1	1
㌁	Y	3	FU1	1	1	1
㌃	G	3	FU1	1	1	1
㌄	O	2	FU1	1		1
㌇	WL, 0.5WL	2	155-40	1		1
㌈	B, 0.5B	2	110-37	1		1
㌉	L, 0.5L	2	155-50	1		1
㌊	B, 0.5B	2	110-38	1		1
㌋	Br, 0.5Br	2	110-42	1		1
㌌	BrW, 0.5BrW	2	110-44	1		1
㌍	Lg, 0.5Lg	2	110-43	1		1
㌎	LgB, 0.5LgB	2	110-45	1		1
㌏	GW, 0.5GW	4	110-3, 155-3, P/C	3	1	
㌐	B, 0.5B	4	110-4, 155-4, P/C	3	1	
㌑	B, 0.5B	3	110-5, 155-5	2	1	
㌒	Br	2	FU2	1	1	
㌓	B, 2B	4	FU9	1	2	1
㌔	2WR	3	FU9	1	1	1
㌗	GB, 0.5GB	2	155-30	1	1	
㌘	R, 0.5R	3	155-8	1	1	1
㌙	W, 0.5W	3	110-25, 155-46	2		1
㌚	B, 0.5B	3	155-9	1	1	1
㌜	GL, 0.5GL	2	155-14	1		1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			Main Harness (1)		(2)	(3)
㍃	WB, 0.5WB	2	155-17	1		1
㍅	W, 0.5W	3	110-29, 155-47	2	1	
㍇	LY, 0.5LY	2	155-18	1	1	
㍈	YL, 0.5YL	3	110-31	1	2	
㍌	G	2	FU2	1	1	
㍑	2LR	2	FU4	1	1	
㍓	2RG	2	FU4	1	1	
㍖	Gr, 0.5Gr	4	110-12, 155-20, FU2	3	1	
㍗	LgY	2	FU3	1	1	
㍘	BW	2	FU3	1		1
㍙	LgB, 0.5LgB	3	110-39, FU3	2	1	
㍛	GR	2	FU3	1	1	
㍜	2LW	2	FU4	1	1	
㍝	2LY	2	FU4	1	1	
㍠	BY, 1.25BY	2	FU3	1		1
㍢	W	3	FU3, Data link interface connector-B, GPS-3 (not in use)	3		
㍤	BY	2	FU3	1		1
㍦	G	2	RH2	1	1	
㍩	L	3	FU1	1	1	1
㍫	LR	2	FU1	1		1
㍭	G, 0.5G	6	155-6, Data link interface connector-C, Terminating resistor-A, GPS-7 (not in use)	4	1	1
㍮	L, 0.5L	6	155-7, Data link interface connector-D, Terminating resistor-B, GPS-8 (not in use)	4	1	1
㍱	BrG	2	FU1	1		1
㍲	L	2	FU1	1		1
㍴	RW	2	FU1	1	1	
㍽	B	3	Data link interface connector-A, GPS-4 (not in use)	2		1
㍿	2BR	2	FU7	1		1
㎆	WR, 0.5WR	3	110-30, 155-48	2	1	
㎊	G, 0.5G	3	110-24, 155-26	2		1
㎒	1.25Br	2	FU2	1	1	
㎓	L	2	FU1	1		1

4-1-2. Main harness (2)



· Where the numbers differ, wires of same color must not be united.

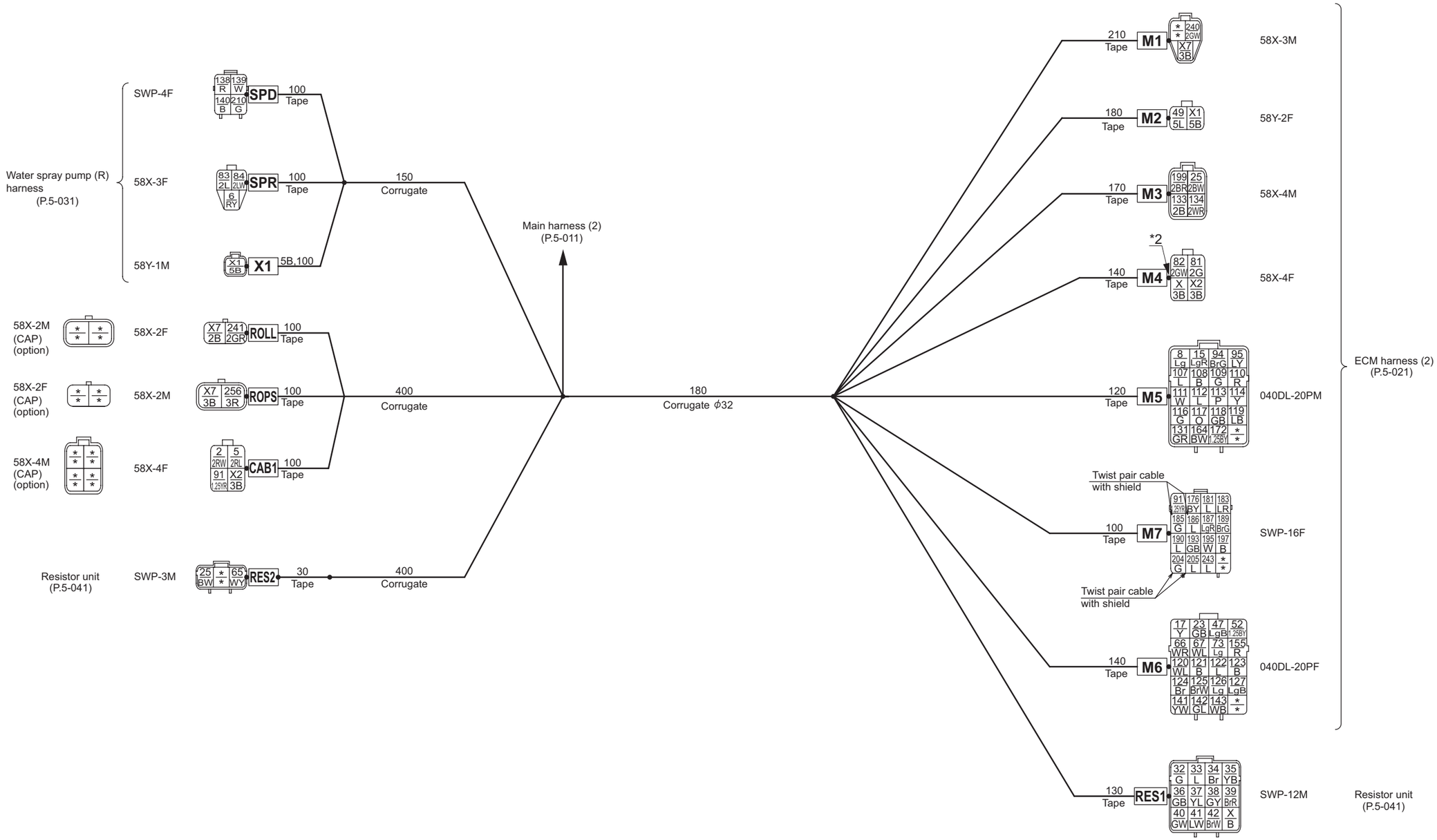
1568-09310-0-12322-0

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			(1)	Main Harness (2)		(3)
Ⓧ	B, 1.25B	15	6	**COM**-3, **DIS**, **L3**, **LH**, **RH1**, Terminating resistor-C, **DC12V** (option)	7	2
②	RW, 2RW	5	1	**COM**-13, 20, **RH3**	3	1
③	2WR	2	1	**RH3**	1	
⑤	RL, 2RL	4	1	**COM**-27, **RH3**	2	1
⑥	RY	4	1	**L4**, **FRONT ROLL** (option)	2	1
⑦	WG	3	1	**L4**, **DC12V** (option)	2	
⑨	GR	2	1	Horn switch	1	
⑫	BW	5	3	**L4**, **FRONT ROLL** (option)	2	
⑬	WL	2	1	**L4**	1	
⑭	WY	2	1	**COM**	1	
⑮	LgR	3	1	**RH1**	1	1
⑰	Y	4	2	**RH1**	1	1
⑱	L	2		**COM**-14, **RH1**	2	
⑲	2W, 3W	4	2	**ROPS** (option), **ROLL** (option)	2	
㉑	YB	2	1	**COM**-18	1	
㉓	GB	2		**COM**-16	1	1
㉕	BW	9	6	**DIS**	1	2
㉖	BrB	2	1	**LH**	1	
㉗	LB	2	1	**LH**	1	
㉘	GB	3	1	**COM**-25, **L3**	2	
㉛	YW	5	1	**L3**, **LH**, **RH1**, **D/C** (option)	4	
㉜	G	3	1	**LH**	1	1
㉝	L	3	1	**LH**	1	1
㉞	Br	4	1	**LH**, **FRONT ROLL** (option)	2	1
㉟	YB	3	1	**L3**	1	1
㊱	GB	3	1	**LH**	1	1
㊲	YL	3	1	**LH**	1	1
㊳	GY	3	1	**L3**	1	1
㊴	BrR	3	1	**RH1**	1	1
㊵	GW	3	1	**LH**	1	1
㊶	LW	3	1	**LH**	1	1
㊷	BrW	3	1	**LH**	1	1
㊸	GR	2	1	**L3**	1	
㊹	Br	2	1	**RH2**	1	
㊼	LgB	3		**COM**-10, 15	2	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			(1)	Main Harness (2)		(3)
㊾	5L	2		**RH4**	1	1
㊷	1.25BY	3	1	**RH1**	1	1
㊸	G	4	3	**COM**-35	1	
㊻	1.25LB	2	1	**RH1**	1	
㊹	LgW	3		**COM**-2, 22, **RH2**	3	
㊺	WY	2		**RH2**	1	1
㊻	WR	2		**RH2**	1	1
㊼	WL	2		**RH2**	1	1
㊿	2W	2	1	**RH3**	1	
㋃	BrY	2	1	**RH2**	1	
㋆	GW	2	1	**L3**	1	
㋇	O	2	1	**L4**	1	
㋈	2W	2	1	**L1**	1	
㋉	2Y	2	1	**L1**	1	
㋑	2G	2		**L2**	1	1
㋓	2L	2		**L2**	1	1
㋔	BrG	2		**RH2**	1	1
㋕	LY	2		**RH2**	1	1
㋗	L	2		DEF supply pump-9	1	1
㋘	B	2		DEF supply pump-12	1	1
㋙	G	2		DEF supply pump-10	1	1
㋚	R	2		DEF supply pump-11	1	1
㋛	W	2		DEF supply pump-3	1	1
㋝	P	3	1	**PRE**	1	1
㋞	Y	3	1	**BAC**	1	1
㋠	G	3	1	**SUC**	1	1
㋢	GB	4		**BAC**, **PRE**, **SUC**	3	1
㋣	LB	3		DEF supply pump-8, DEF tank heating valve-1	2	1
㋬	GW	4	3	**DIS**	1	
㋭	B	4	3	**DIS**	1	
㋮	B	3	2	**DIS**	1	
㋱	GR	2		DEF tank heating valve-4	2	
㋲	Br	2	1	DEF supply pump-5	1	
㋳	B, 2B	4	1	DEF supply pump-6, DEF tank sensor-3	2	1
㋴	2WR	3	1	DEF tank sensor-4	1	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			(1)	Main Harness (2)		(3)
㋷	GB	2	1	**LH**	1	
㋸	R	3	1	**L4**	1	1
㋺	B	3	1	**L4**	1	1
㋻	YW	2		**DIS**	1	1
㋿	W	3	2	**L4**	1	
㌇	LY	2	1	**D/C** (option)	1	
㌈	YL	3	1	**COM**-27, **FRONT ROLL** (option)	2	
㌌	G	2	1	**L3**	1	
㌏	R	2		**COM**-1	1	1
㌑	2LR	2	1	**L2**	1	
㌓	2RG	2	1	**L2**	1	
㌦	Gr	4	3	**L4**	1	
㌧	LgY	2	1	**NC**	1	
㌩	LgB	3	2	**DIS**	1	
㌫	GR	2	1	**L4**	1	
㌬	2LW	2	1	**L1**	1	
㌭	2LY	2	1	**L1**	1	
㌰	GR	2		**LH**, **FRONT ROLL** (option)	2	
㌸	G	2	1	**RH2**	1	
㍁	L	3	1	**RH2**	1	1
㍅	G	6	4	**COM**-11	1	1
㍆	L	6	4	**COM**-12	1	1
㍇	LgR	2		**RH2**	1	1
㍐	RW	2	1	**RH2**	1	
㍑	GB	2		DEF supply pump-4	1	1
㍓	W	2		DEF supply pump-2	1	1
㍔	BrY	2		**COM**-21, **RH2**	2	
㍬	G	3		DEF tank sensor-2, Terminating resistor-B	2	1
㍭	L	3		DEF tank sensor-1, Terminating resistor-A	2	1
㍮	WR	3	2	**L4**	1	
㍼	2GW	2		**ROLL** (option)	1	1
㍽	2GR	2		**ROLL** (option)	1	1
㍾	1.25Br	2	1	**L4**	1	
㏌	3R	2		**ROPS** (option)	1	1

4-1-3. Main harness (3)



· The earth wire "X" between "*1" (main harness (1)) and "*2" (main harness (3)) use "AVS3".
· Where the numbers differ, wires of same color must not be united.

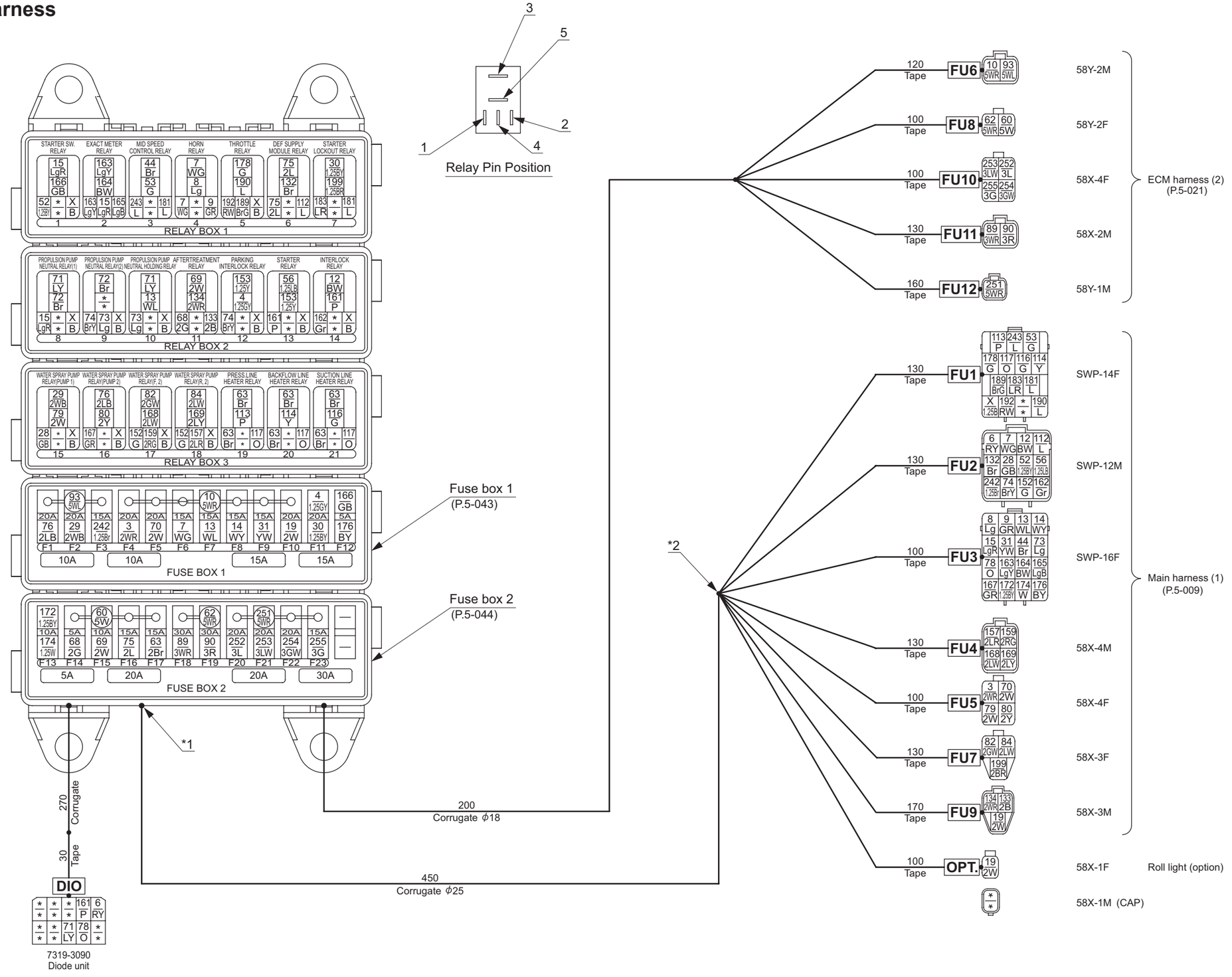
1568-09310-0-12322-0

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			(1)	(2)	Main Harness (3)	
Ⓧ	B, 3B	15	6	7	**M4**, **RES1**	2
Ⓧ1	5B	2			**M2**, **X1**	2
Ⓧ2	3B	3	1		**M4**, **CAB1** (option)	2
Ⓧ7	2B, 3B	3			**M1**, **ROLL** (option), **ROPS** (option)	3
②	2RW	5	1	3	**CAB1** (option)	1
⑤	2RL	4	1	2	**CAB1** (option)	1
⑥	RY	4	1	2	**SPR**	1
⑧	Lg	2	1		**M5**	1
⑮	LgR	3	1	1	**M5**	1
⑰	Y	4	2	1	**M6**	1
㉓	GB	2		1	**M6**	1
㉕	BW, 2BW	9	6	1	**M3**, **RES2**	2
㉜	G	3	1	1	**RES1**	1
㉝	L	3	1	1	**RES1**	1
㉞	Br	4	1	2	**RES1**	1
㉟	YB	3	1	1	**RES1**	1
㊱	GB	3	1	1	**RES1**	1
㊲	YL	3	1	1	**RES1**	1
㊳	GY	3	1	1	**RES1**	1
㊴	BrR	3	1	1	**RES1**	1
㊵	GW	3	1	1	**RES1**	1
㊶	LW	3	1	1	**RES1**	1
㊷	BrW	3	1	1	**RES1**	1
㊼	LgB	3		2	**M6**	1
㊾	5L	2		1	**M2**	1
㊷	1.25BY	3	1	1	**M6**	1
㊺	WY	2		1	**RES2**	1
㊻	WR	2		1	**M6**	1
㊼	WL	2		1	**M6**	1
㊸	Lg	4	3		**M6**	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			(1)	(2)	Main Harness (3)	
㉛	2G	2		1	**M4**	1
㉜	2GW	2	1		**M4**	1
㉝	2L	2		1	**SPR**	1
㉞	2LW	2	1		**SPR**	1
㉛	1.25YR	2			**M7**, **CAB1** (option)	2
㊹	BrG	2		1	**M5**	1
㊺	LY	2		1	**M5**	1
㉗	L	2		1	**M5**	1
㉘	B	2		1	**M5**	1
㉙	G	2		1	**M5**	1
㉚	R	2		1	**M5**	1
㉛	W	2		1	**M5**	1
㉜	L	2	1		**M5**	1
㉝	P	3	1	1	**M5**	1
㉞	Y	3	1	1	**M5**	1
㉖	G	3	1	1	**M5**	1
㉗	O	2	1		**M5**	1
㉘	GB	4		3	**M5**	1
㉙	LB	3		2	**M5**	1
㉚	WL	2	1		**M6**	1
㉛	B	2	1		**M6**	1
㉜	L	2	1		**M6**	1
㉓	B	2	1		**M6**	1
㉔	Br	2	1		**M6**	1
㉕	BrW	2	1		**M6**	1
㉖	Lg	2	1		**M6**	1
㉗	LgB	2	1		**M6**	1
㉛	GR	2		1	**M5**	1
㉝	2B	4	1	2	**M3**	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			(1)	(2)	Main Harness (3)	
㉞	2WR	3	1	1	**M3**	1
㉞	R	3	1	1	**SPD**	1
㉟	W	3	2		**SPD**	1
㊵	B	3	1	1	**SPD**	1
㊶	YW	2		1	**M6**	1
㊷	GL	2	1		**M6**	1
㊸	WB	2	1		**M6**	1
㊺	R	2		1	**M6**	1
㊹	BW	2	1		**M5**	1
㊷	1.25BY	2	1		**M5**	1
㊶	BY	2	1		**M7**	1
㊱	L	3	1	1	**M7**	1
㊳	LR	2	1		**M7**	1
㊵	G	6	4	1	**M7**	1
㊶	L	6	4	1	**M7**	1
㊷	LgR	2		1	**M7**	1
㊹	BrG	2	1		**M7**	1
㊵	L	2	1		**M7**	1
㊳	GB	2		1	**M7**	1
㊵	W	2		1	**M7**	1
㊷	B	3	2		**M7**	1
㊾	2BR	2	1		**M3**	1
㉔	G	3		2	**M7**	1
㉕	L	3		2	**M7**	1
㉚	G	3	2		**SPD**	1
㊵	2GW	2		1	**M1**	1
㊶	2GR	2		1	**ROLL** (option)	1
㊸	L	2	1		**M7**	1
㊻	3R	2		1	**ROPS** (option)	1

4-2. Fuse · Relay Harness



· The earth wire "X" between "*1" and "*2" use "AVS2".
· Where the numbers differ, wires of same color must not be united.

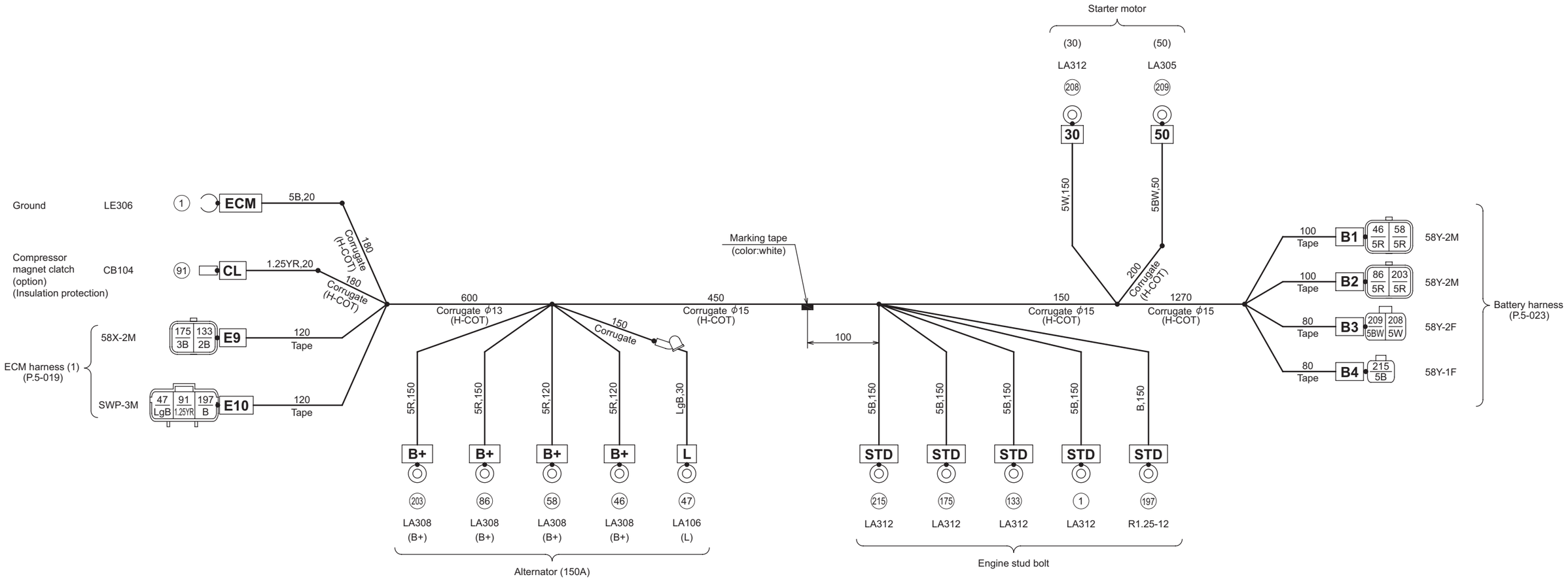
1568-09309-0-12320-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
Ⓧ	B, 1.25B	13	FU1, Relay box 1-1-2, 1-5-2, 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	FU5, Fuse box 1-F4
④	1.25GY	2	Fuse box 1-F11, Relay box 2-12-5
⑥	RY	2	DIO, FU2
⑦	WG	4	FU2, Fuse box 1-F6, Relay box 1-4-1, 3
⑧	Lg	2	FU3, Relay box 1-4-5
⑨	GR	2	FU3, Relay box 1-4-2
⑩	5WR	2	FU6, Fuse box 1-F7
⑫	BW	2	FU2, Relay box 2-14-3
⑬	WL	3	FU3, Fuse box 1-F7, Relay box 2-10-5
⑭	WY	2	FU3, Fuse box 1-F8
⑮	LgR	4	FU3, Relay box 1-1-3, 1-2-4, 2-8-1
⑲	2W	3	FU9, Fuse box 1-F10, OPT. (option)
㉘	GB	2	FU2, Relay box 3-15-1
㉙	2WB	2	Fuse box 1-F2, Relay box 3-15-3
㉚	1.25BY	2	Fuse box 1-F11, Relay box 1-7-3
㉛	YW	2	FU3, Fuse box 1-F9
㊹	Br	2	FU3, Relay box 1-3-3
㊷	1.25BY	2	FU2, Relay box 1-1-1
㊸	G	2	FU1, Relay box 1-3-5
㊻	1.25LB	2	FU2, Relay box 2-13-3
㊵	5W	2	FU8, Fuse box 2-F15
㊷	5WR	2	FU8, Fuse box 2-F19
㊸	Br, 2Br	7	Fuse box 2-F17, Relay box 3-19-1, 3, 3-20-1, 3, 3-21-1, 3
㊽	2G	2	Fuse box 2-F14, Relay box 2-11-1

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
㊾	2W	2	Fuse box 2-F15, Relay box 2-11-3
㊿	2W	2	FU5, Fuse box 1-F5
(71)	LY	3	DIO, Relay box 2-8-3, 2-10-3
(72)	Br	2	Relay box 2-8-5, 2-9-3
(73)	Lg	3	FU3, Relay box 2-9-4, 2-10-1
(74)	BrY	3	FU2, Relay box 2-9-1, 2-12-1
(75)	2L	3	Fuse box 2-F16, Relay box 1-6-1, 3
(76)	2LB	2	Fuse box 1-F1, Relay box 3-16-3
(78)	O	2	DIO, FU3
(79)	2W	2	FU5, Relay box 3-15-5
(80)	2Y	2	FU5, Relay box 3-16-5
(82)	2GW	2	FU7, Relay box 3-17-3
(84)	2LW	2	FU7, Relay box 3-18-3
(89)	3WR	2	FU11, Fuse box 2-F18
(90)	3R	2	FU11, Fuse box 2-F19
(93)	5WL	2	FU6, Fuse box 1-F2
(112)	L	2	FU2, Relay box 1-6-2
(113)	P	2	FU1, Relay box 3-19-5
(114)	Y	2	FU1, Relay box 3-20-5
(116)	G	2	FU1, Relay box 3-21-5
(117)	O	4	FU1, Relay box 3-19-2, 3-20-2, 3-21-2
(132)	Br	2	FU2, Relay box 1-6-5
(133)	2B	2	FU9, Relay box 2-11-2
(134)	2WR	2	FU9, Relay box 2-11-5
(152)	G	3	FU2, Relay box 3-17-1, 3-18-1
(153)	1.25Y	2	Relay box 2-12-3, 2-13-5
(157)	2LR	2	FU4, Relay box 3-18-4

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(159)	2RG	2	FU4, Relay box 3-17-4
(161)	P	3	DIO, Relay box 2-13-1, 2-14-5
(162)	Gr	2	FU2, Relay box 2-14-1
(163)	LgY	3	FU3, Relay box 1-2-1, 3
(164)	BW	2	FU3, Relay box 1-2-5
(165)	LgB	2	FU3, Relay box 1-2-2
(166)	GB	2	Fuse box 1-F12, Relay box 1-1-5
(167)	GR	2	FU3, Relay box 3-16-1
(168)	2LW	2	FU4, Relay box 3-17-5
(169)	2LY	2	FU4, Relay box 3-18-5
(172)	1.25BY	2	FU3, Fuse box 2-F13
(174)	W, 1.25W	2	FU3, Fuse box 2-F13
(176)	BY	2	FU3, Fuse box 1-F12
(178)	G	2	FU1, Relay box 1-5-3
(181)	L	3	FU1, Relay box 1-3-2, 1-7-2
(183)	LR	2	FU1, Relay box 1-7-1
(189)	BrG	2	FU1, Relay box 1-5-4
(190)	L	2	FU1, Relay box 1-5-5
(192)	RW	2	FU1, Relay box 1-5-1
(199)	1.25BR, 2BR	2	FU7, Relay box 1-7-5
(242)	1.25Br	2	FU2,Fuse box 1-F3
(243)	L	2	FU1, Relay box 1-3-1
(251)	5WR	2	FU12, Fuse box 2-F21
(252)	3L	2	FU10, Fuse box 2-F20
(253)	3LW	2	FU10, Fuse box 2-F21
(254)	3GW	2	FU10, Fuse box 2-F22
(255)	3G	2	FU10, Fuse box 2-F23

4-3. Engine Harness



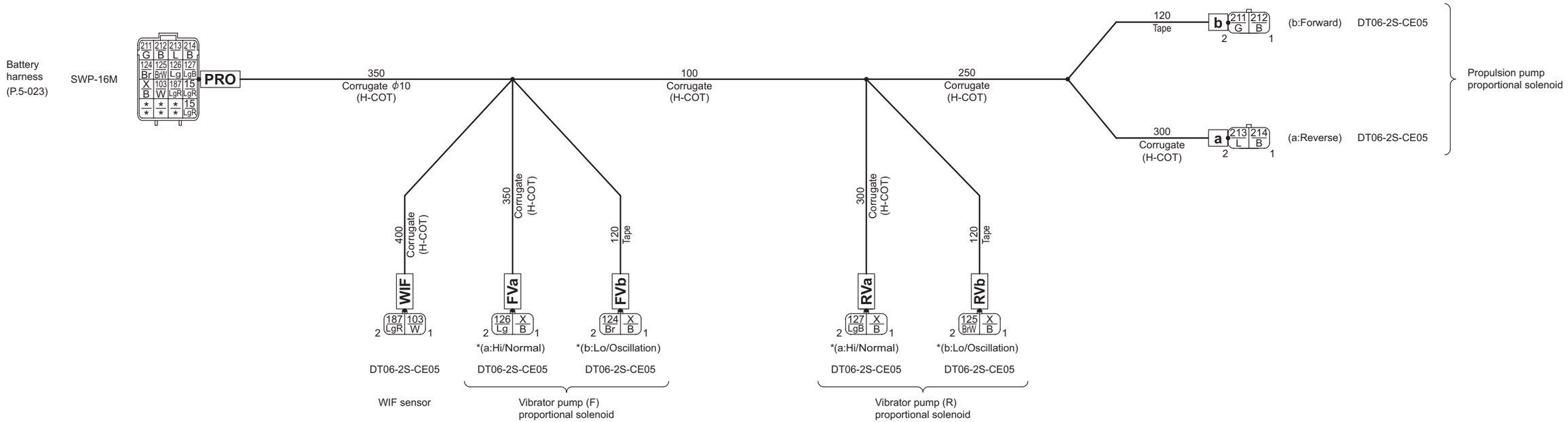
· Where the numbers differ, wires of same color must not be united.
· Make use of heat resistannce wire "AEX" equivalency product.

1568-09297-2-12261-B

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
①	5B	2	ECM, STD
㊻	5R	2	B1, B+
㊼	LgB	2	E10, L
㊽	5R	2	B1, B+
㊽	5R	2	B2, B+
㊾	1.25YR	2	CL, E10
㉝	2B, 5B	2	E9, STD

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
㉟	3B, 5B	2	E9, STD
㊼	B	2	E10, STD
㉓	5R	2	B2, B+
㉘	5W	2	30, B3
㉙	5BW	2	50, B3
㉛	5B	2	B4, STD

4-4. Hydraulic Pump Harness



· Where the numbers differ, wires of same color must not be united.
· Make use of heat resistannce wire "AEX" equivalency product.
* · Hi, Lo : STD type
Normal, Oscillation : ND type

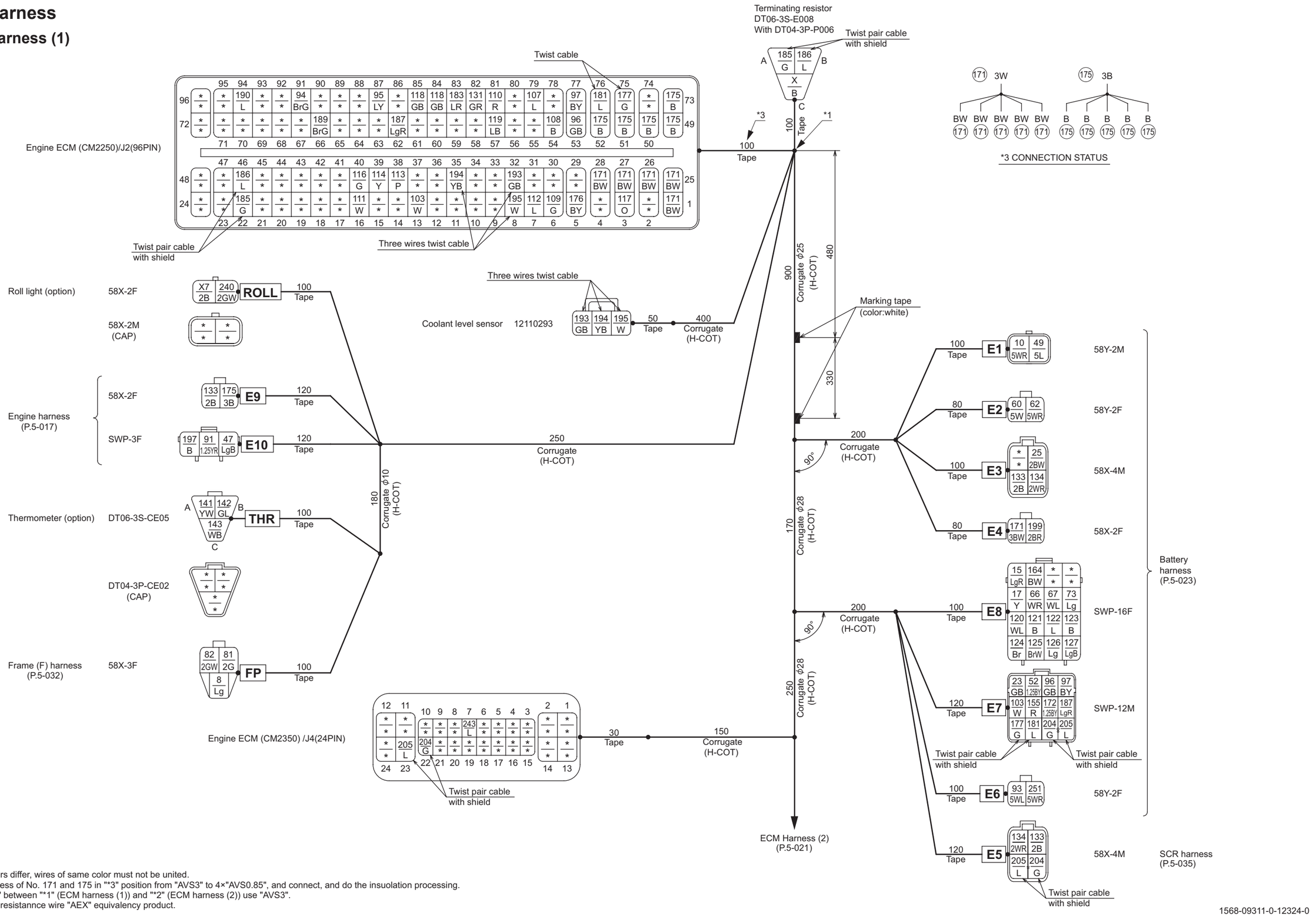
1568-09292-0-22244-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B	5	**FVa**, **FVb**, **PRO**, **RVa**, **RVb**
⑮	LgR	2	**PRO** × 2
⑩③	W	2	**PRO**, **WIF**
⑫④	Br	2	**FVb**, **PRO**
⑫⑤	BrW	2	**PRO**, **RVb**
⑫⑥	Lg	2	**FVa**, **PRO**

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑫⑦	LgB	2	**PRO**, **RVa**
⑱⑦	LgR	2	**PRO**, **WIF**
②①①	G	2	**b**, **PRO**
②①②	B	2	**b**, **PRO**
②①③	L	2	**a**, **PRO**
②①④	B	2	**a**, **PRO**

4-5. ECM Harness

4-5-1. ECM harness (1)



· Where the numbers differ, wires of same color must not be united.
· Change only harness of No. 171 and 175 in "*3" position from "AVS3" to 4×"AVS0.85", and connect, and do the insulation processing.
· The earth wire "X" between "*1" (ECM harness (1)) and "*2" (ECM harness (2)) use "AVS3".
· Make use of heat resistannce wire "AEX" equivalency product.

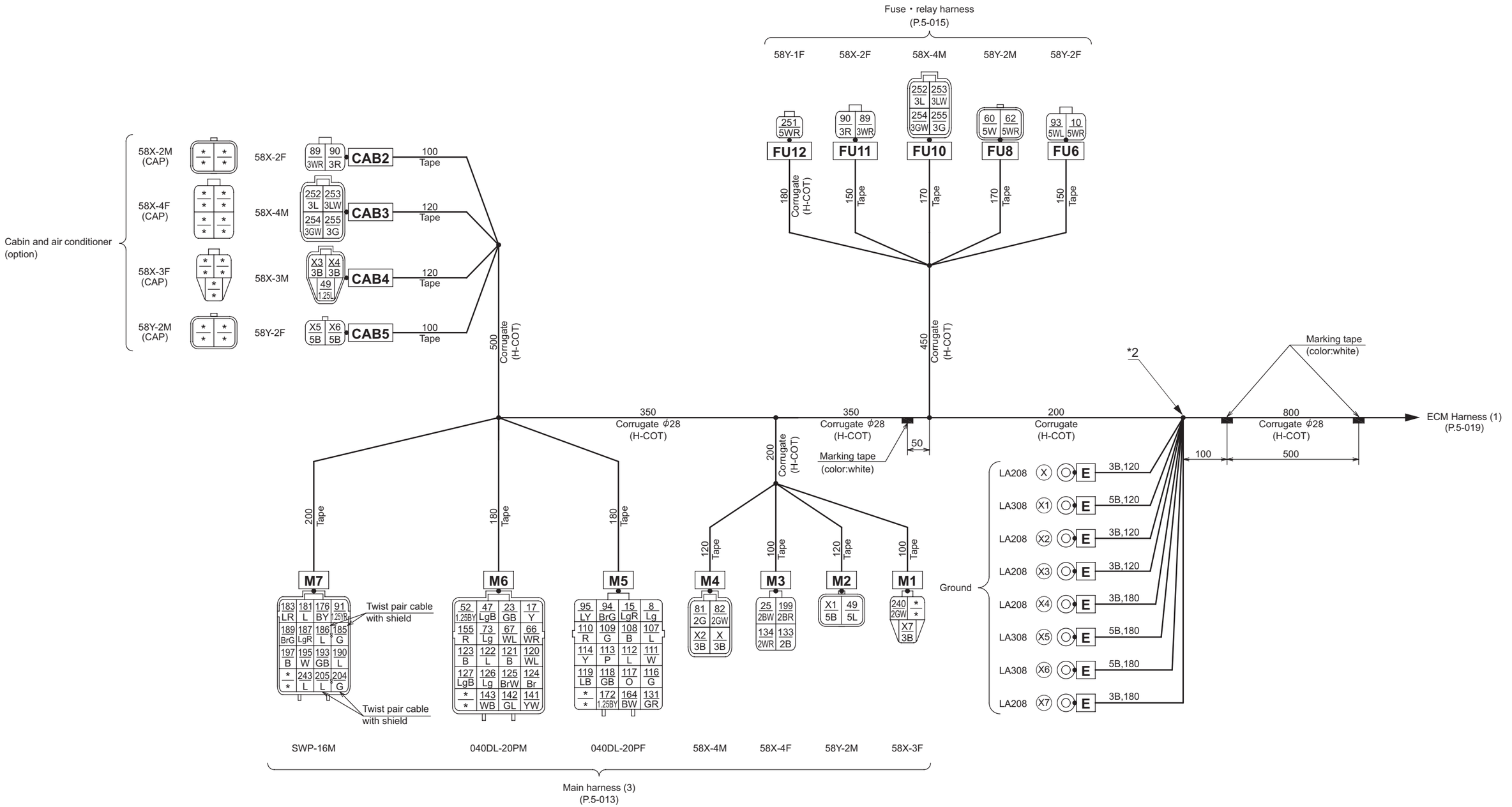
1568-09311-0-12324-0

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			ECM Harness (1)		(2)
Ⓧ	B, 3B	3	Terminating resistor-C	1	2
Ⓧ7	2B, 3B	3	**ROLL** (option)	1	2
⑧	Lg	2	**FP**	1	1
⑩	5WR	2	**E1**	1	1
⑮	LgR	2	**E8**	1	1
⑰	Y	2	**E8**	1	1
㉓	GB	2	**E7**	1	1
㉕	2BW	2	**E3**	1	1
㊼	LgB	2	**E10**	1	1
㊾	1.25L, 5L	3	**E1**	1	1
㊷	1.25BY	2	**E7**	1	1
㊵	5W	2	**E2**	1	1
㊷	5WR	2	**E2**	1	1
㊻	WR	2	**E8**	1	1
㊼	WL	2	**E8**	1	1
㊸	Lg	2	**E8**	1	1
㊶	2G	2	**FP**	1	1
㊷	2GW	2	**FP**	1	1
㊶	1.25YR	2	**E10**	1	1
㊸	5WL	2	**E6**	1	1
㊹	BrG	2	Engine ECM (96pin)-91	1	1
㊺	LY	2	Engine ECM (96pin)-87	1	1
㊻	GB	2	**E7**, Engine ECM (96pin)-53	2	
㊼	BY	2	**E7**, Engine ECM (96pin)-77	2	
㉓	W	2	**E7**, Engine ECM (96pin)-13	2	
㊼	L	2	Engine ECM (96pin)-79	1	1
㊽	B	2	Engine ECM (96pin)-54	1	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			ECM Harness (1)		(2)
㉙	G	2	Engine ECM (96pin)-6	1	1
㉚	R	2	Engine ECM (96pin)-81	1	1
㉛	W	2	Engine ECM (96pin)-16	1	1
㉜	L	2	Engine ECM (96pin)-7	1	1
㉝	P	2	Engine ECM (96pin)-38	1	1
㉞	Y	2	Engine ECM (96pin)-39	1	1
㉟	G	2	Engine ECM (96pin)-40	1	1
㊲	O	2	Engine ECM (96pin)-3	1	1
㊳	GB	3	Engine ECM (96pin)-84, 85	2	1
㊴	LB	2	Engine ECM (96pin)-57	1	1
㊵	WL	2	**E8**	1	1
㊶	B	2	**E8**	1	1
㊷	L	2	**E8**	1	1
㊸	B	2	**E8**	1	1
㊹	Br	2	**E8**	1	1
㊺	BrW	2	**E8**	1	1
㊻	Lg	2	**E8**	1	1
㊼	LgB	2	**E8**	1	1
㊶	GR	2	Engine ECM (96pin)-82	1	1
㊸	2B	4	**E3**, **E5**, **E9**	3	1
㊹	2WR	3	**E3**, **E5**	2	1
㊶	YW	2	**THR**-A (option)	1	1
㊷	GL	2	**THR**-B (option)	1	1
㊸	WB	2	**THR**-C (option)	1	1
㊺	R	2	**E7**	1	1
㊹	BW	2	**E8**	1	1
㊶	BW, 3BW	6	**E4**, Engine ECM (96pin)-1, 25, 26, 27, 28	6	

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			ECM Harness (1)		(2)
㊷	1.25BY	2	**E7**	1	1
㊺	B, 3B	6	**E9**, Engine ECM (96pin)-49, 50, 51, 52, 73	6	
㊻	BY	2	Engine ECM (96pin)-5	1	1
㊼	G	2	**E7**, Engine ECM (96pin)-75	2	
㊽	L	3	**E7**, Engine ECM (96pin)-76	2	1
㊸	LR	2	Engine ECM (96pin)-83	1	1
㊵	G	3	Engine ECM (96pin)-22, Terminating resistor-A	2	1
㊶	L	3	Engine ECM (96pin)-46, Terminating resistor-B	2	1
㊼	LgR	3	**E7**, Engine ECM (96pin)-62	2	1
㊾	BrG	2	Engine ECM (96pin)-66	1	1
㊿	L	2	Engine ECM (96pin)-94	1	1
㊸	GB	3	Coolant level sensor, Engine ECM (96pin)-32	2	1
㊹	YB	2	Coolant level sensor, Engine ECM (96pin)-35	2	
㊺	W	3	Coolant level sensor, Engine ECM (96pin)-8	2	1
㊼	B	2	**E10**	1	1
㊾	2BR	2	**E4**	1	1
㉔	G	4	**E5**, **E7**, Engine ECM J4 (24pin)-22	3	1
㉕	L	4	**E5**, **E7**, Engine ECM J4 (24pin)-23	3	1
㉔	2GW	2	**ROLL** (option)	1	1
㉓	L	2	Engine ECM J4 (24pin)-7	1	1
㉛	5WR	2	**E6**	1	1

4-5-2. ECM harness (2)



· Where the numbers differ, wires of same color must not be united.
· The earth wire "X" between "*1" (ECM harness (1)) and "*2" (ECM harness (2)) use "AVS3".
· Make use of heat resistannce wire "AEX" equivalency product.

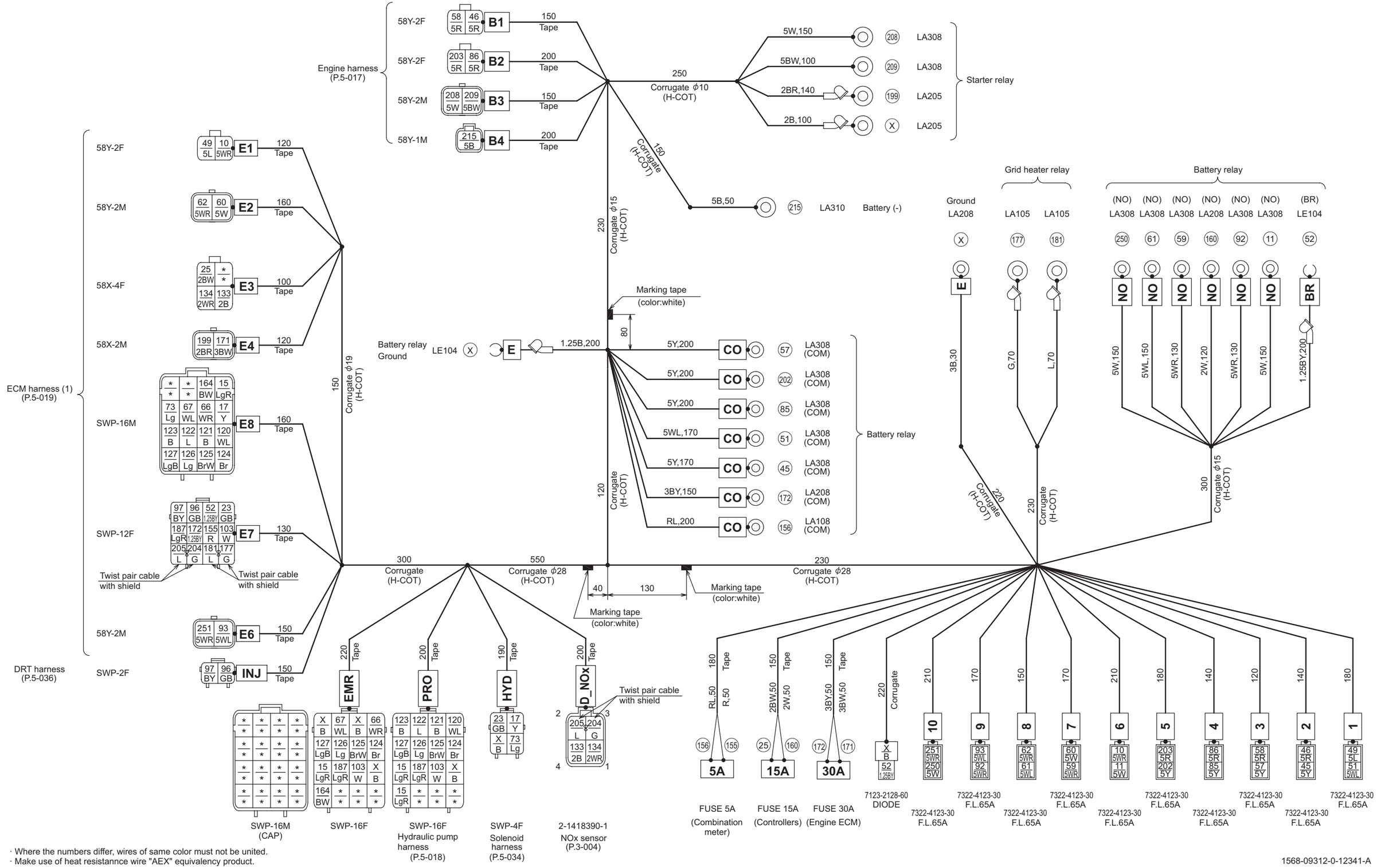
1568-09311-0-12324-0

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			(1)	ECM Harness (2)	
X	B, 3B	3	1	E, M4	2
X1	5B	2		E, M2	2
X2	3B	2		E, M4	2
X3	3B	2		CAB4, E	2
X4	3B, 5B	2		CAB4, E	2
X5	5B	2		CAB5, E	2
X6	5B	2		CAB5, E	2
X7	2B, 3B	3	1	E, M1	2
8	Lg	2	1	M5	1
10	5WR	2	1	FU6	1
15	LgR	2	1	M5	1
17	Y	2	1	M6	1
23	GB	2	1	M6	1
25	2BW	2	1	M3	1
47	LgB	2	1	M6	1
49	1.25L, 5L	3	1	CAB4, M2	1
52	1.25BY	2	1	M6	1
60	5W	2	1	FU8	1
62	5WR	2	1	FU8	1
66	WR	2	1	M6	1
67	WL	2	1	M6	1
73	Lg	2	1	M6	1
81	2G	2	1	M4	1
82	2GW	2	1	M4	1
89	3WR	2		CAB2, FU11	2
90	3R	2		CAB2, FU11	2
91	1.25YR	2	1	M7	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			(1)	ECM Harness (2)	
93	5WL	2	1	FU6	1
94	BrG	2	1	M5	1
95	LY	2	1	M5	1
107	L	2	1	M5	1
108	B	2	1	M5	1
109	G	2	1	M5	1
110	R	2	1	M5	1
111	W	2	1	M5	1
112	L	2	1	M5	1
113	P	2	1	M5	1
114	Y	2	1	M5	1
116	G	2	1	M5	1
117	O	2	1	M5	1
118	GB	3	2	M5	1
119	LB	2	1	M5	1
120	WL	2	1	M6	1
121	B	2	1	M6	1
122	L	2	1	M6	1
123	B	2	1	M6	1
124	Br	2	1	M6	1
125	BrW	2	1	M6	1
126	Lg	2	1	M6	1
127	LgB	2	1	M6	1
131	GR	2	1	M5	1
133	2B	4	3	M3	1
134	2WR	3	2	M3	1
141	YW	2	1	M6	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			(1)	ECM Harness (2)	
142	GL	2	1	M6	1
143	WB	2	1	M6	1
155	R	2	1	M6	1
164	BW	2	1	M5	1
172	1.25BY	2	1	M5	1
176	BY	2	1	M7	1
181	L	3	2	M7	1
183	LR	2	1	M7	1
185	G	3	2	M7	1
186	L	3	2	M7	1
187	LgR	3	2	M7	1
189	BrG	2	1	M7	1
190	L	2	1	M7	1
193	GB	3	2	M7	1
195	W	3	2	M7	1
197	B	2	1	M7	1
199	2BR	2	1	M3	1
204	G	4	3	M7	1
205	L	4	3	M7	1
240	2GW	2	1	M1	1
243	L	2	1	M7	1
251	5WR	2	1	FU12	1
252	3L	2		CAB3, FU10	2
253	3LW	2		CAB3, FU10	2
254	3GW	2		CAB3, FU10	2
255	3G	2		CAB3, FU10	2

4-6. Battery Harness



· Where the numbers differ, wires of same color must not be united.
· Make use of heat resistannce wire "AEX" equivalency product.

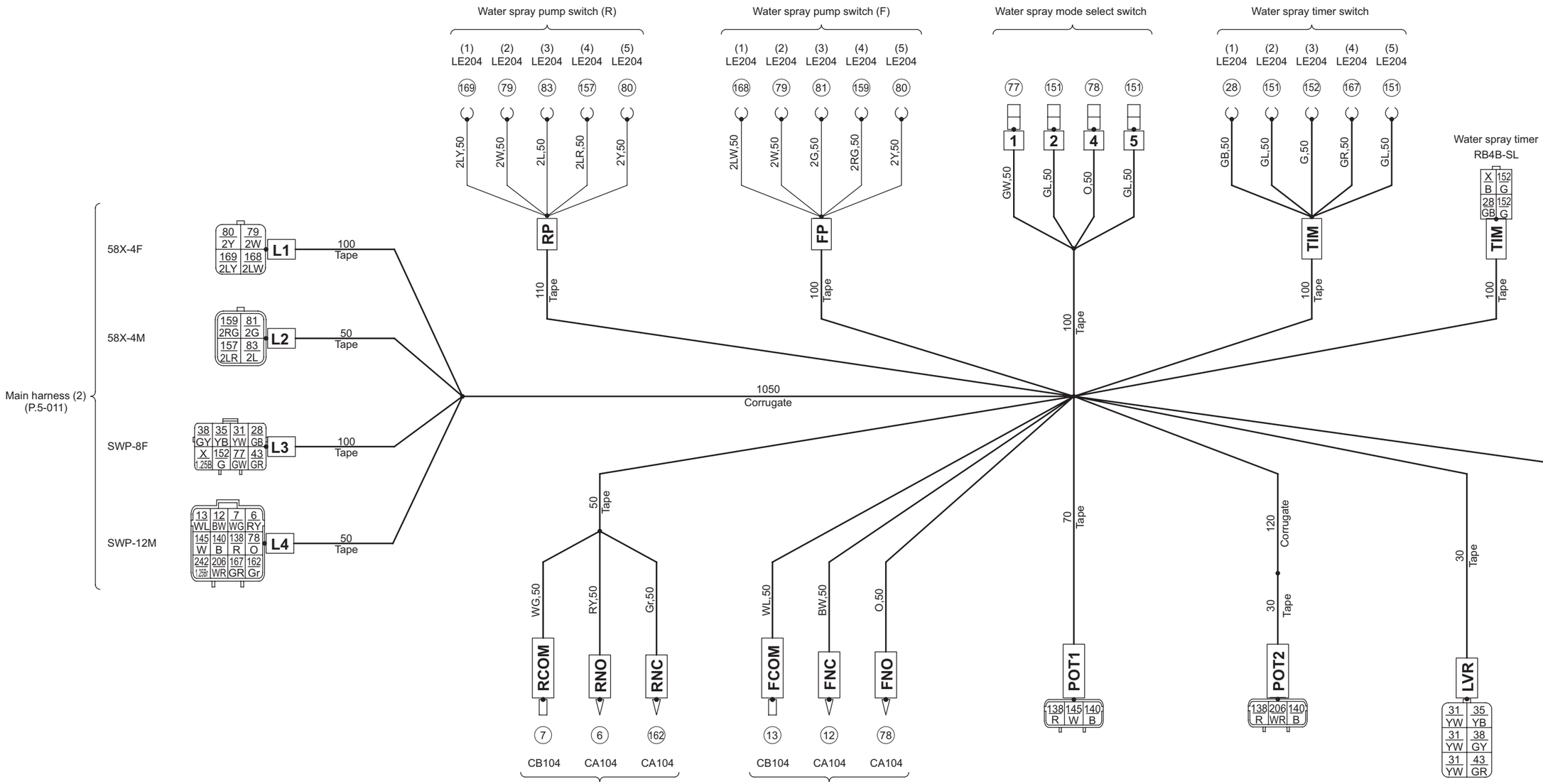
1568-09312-0-12341-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
Ⓧ	B, 1.25B, 2B, 3B	9	E × 2, EMR × 3, HYD, PRO, Diode, Starter relay
⑩	5WR	2	6, E1
⑪	5W	2	6, NO
⑮	LgR	4	E8, EMR, PRO × 2
⑰	Y	2	E8, HYD
㉓	GB	2	E7, HYD
㉕	2BW	2	E3, Fuse 15A
㊺	5Y	2	2, CO
㊻	5R	2	2, B1
㊾	5L	2	1, E1
㊿	5WL	2	1, CO
(52)	1.25BY	3	BR, E7, Diode
(57)	5Y	2	3, CO
(58)	5R	2	3, B1
(59)	5WR	2	7, NO
(60)	5W	2	7, E2
(61)	5WL	2	8, NO
(62)	5WR	2	8, E2
(66)	WR	2	E8, EMR

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(67)	WL	2	E8, EMR
(73)	Lg	2	E8, HYD
(85)	5Y	2	4, CO
(86)	5R	2	4, B2
(92)	5WR	2	9, NO
(93)	5WL	2	9, E6
(96)	GB	2	E7, INJ
(97)	BY	2	E7, INJ
(103)	W	3	E7, EMR, PRO
(120)	WL	2	E8, PRO
(121)	B	2	E8, PRO
(122)	L	2	E8, PRO
(123)	B	2	E8, PRO
(124)	Br	3	E8, EMR, PRO
(125)	BrW	3	E8, EMR, PRO
(126)	Lg	3	E8, EMR, PRO
(127)	LgB	3	E8, EMR, PRO
(133)	2B	2	D_NOX, E3
(134)	2WR	2	D_NOX, E3

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(155)	R	2	E7, Fuse 5A
(156)	RL	2	CO, Fuse 5A
(160)	2W	2	NO, Fuse 15A
(164)	BW	2	E8, EMR
(171)	3BW	2	E4, Fuse 30A
(172)	1.25BY, 3BY	3	CO, E7, Fuse 30A
(177)	G	2	E7, Grid heater relay
(181)	L	2	E7, Grid heater relay
(187)	LgR	3	E7, EMR, PRO
(199)	2BR	2	E4, Starter relay
(202)	5Y	2	5, CO
(203)	5R	2	5, B2
(204)	G	2	D_NOX, E7
(205)	L	2	D_NOX, E7
(208)	5W	2	B3, Starter relay
(209)	5BW	2	B3, Starter relay
(215)	5B	2	B4, Battery(-)
(250)	5W	2	10, NO
(251)	5WR	2	10, E6

4-7. F-R Lever Harness



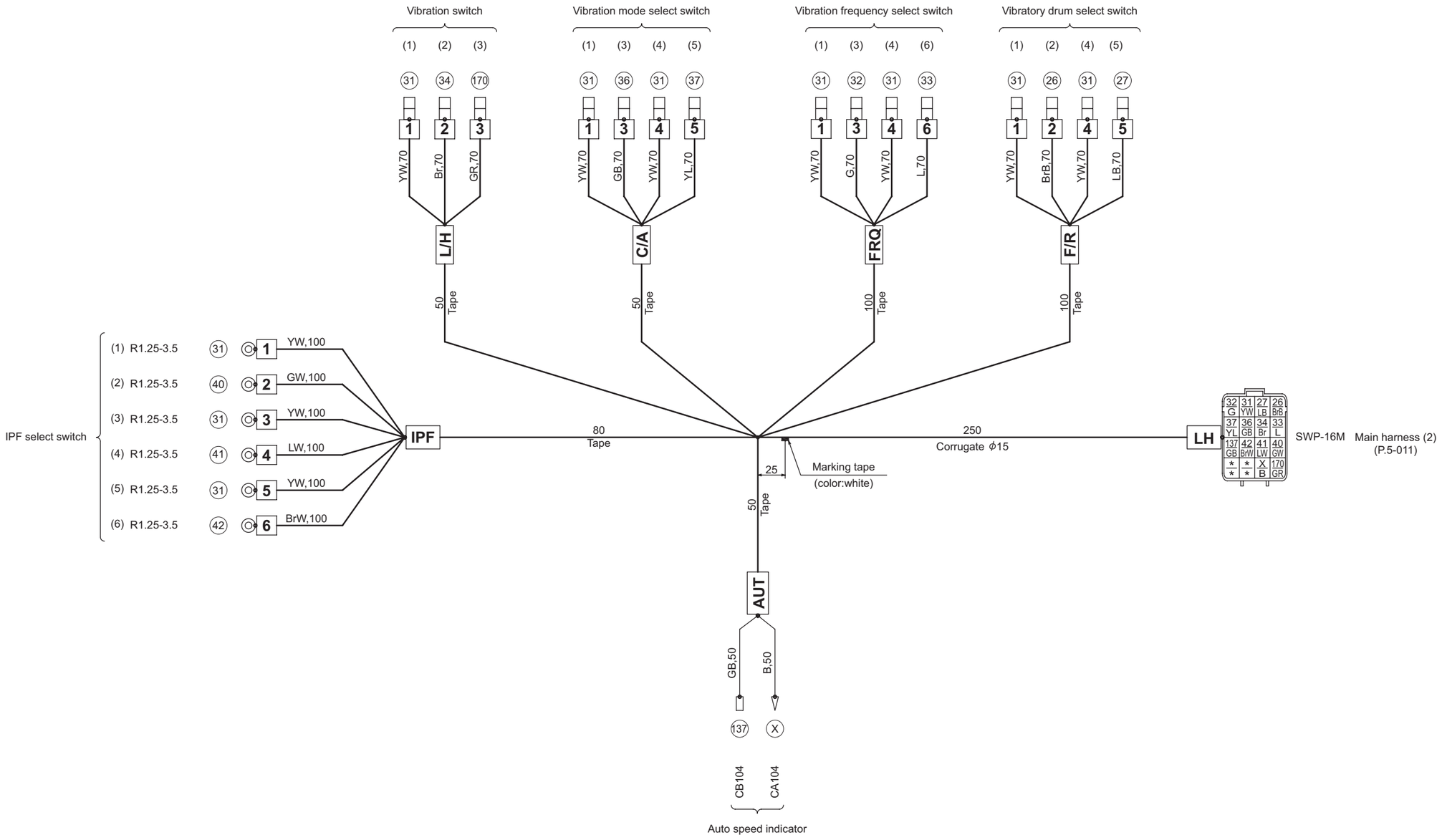
· Where the numbers differ, wires of same color must not be united.

1568-09298-0-12262-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
Ⓧ	B, 1.25B	3	L3, P/O, 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 (LE204), TIM (RB4B)
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
(81)	2G	2	FP, L2

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(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 (LE204) × 2
(152)	G	4	L3, TIM (LE204), TIM (RB4B) × 2
(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
(242)	1.25Br	2	L4, P/O

4-8. Panel (L) Harness

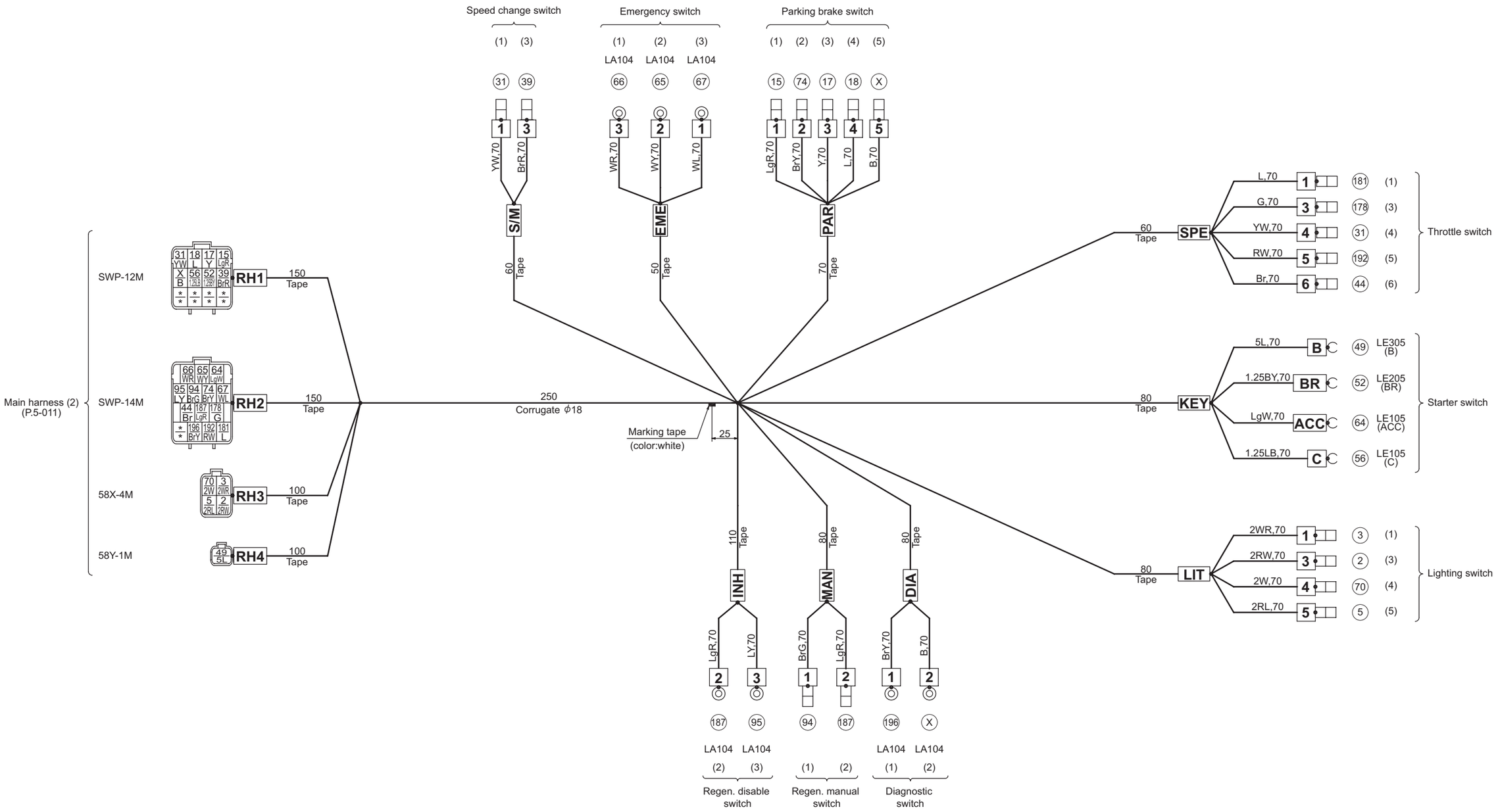


· Where the numbers differ, wires of same color must not be united.

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, F/R-1, -4, FRQ-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	L/H-2, LH

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

4-9. Panel (R) Harness

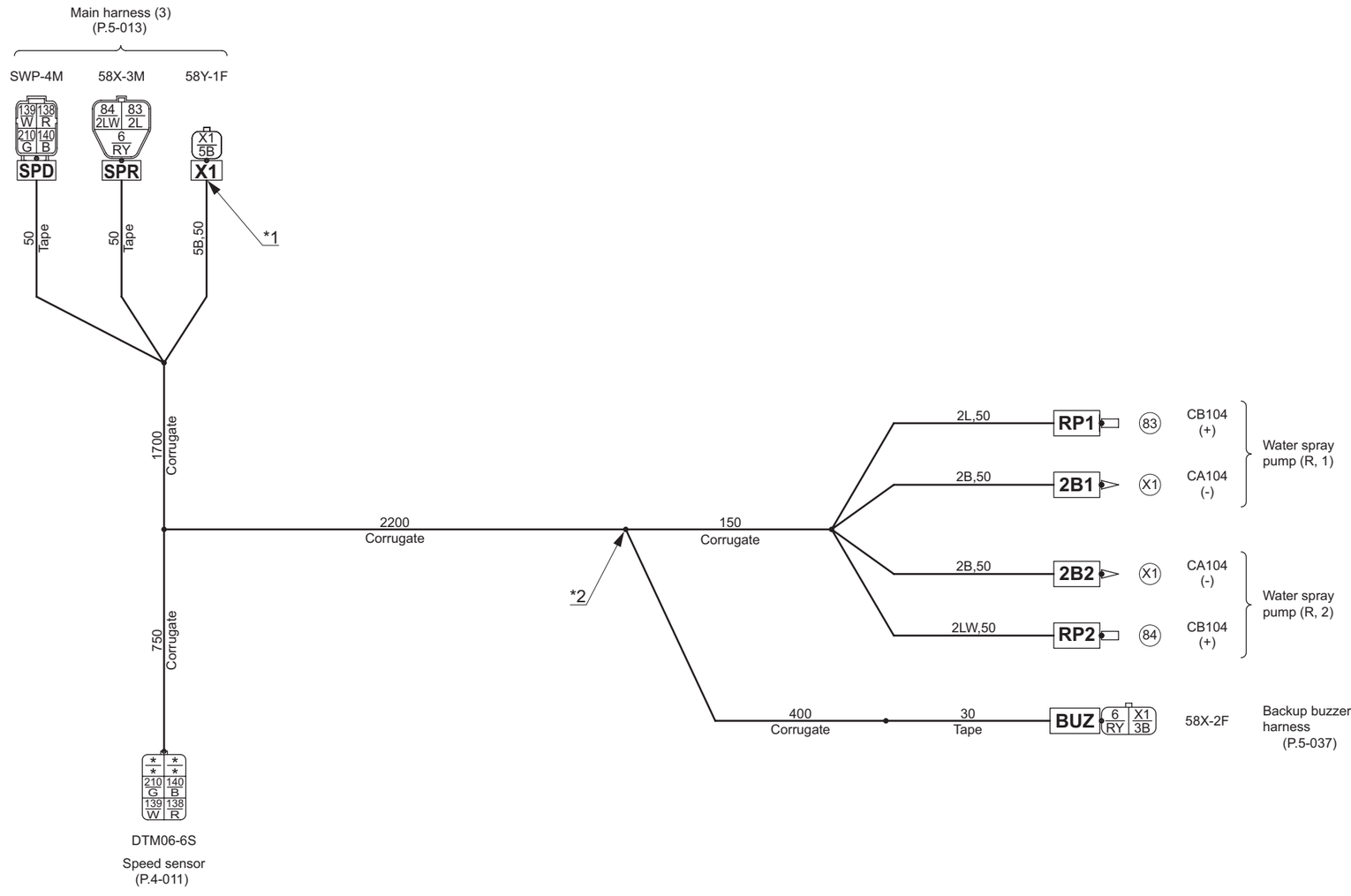


· Where the numbers differ, wires of same color must not be united.

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
Ⓧ	B	3	DIA-2, 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	3	RH1, S/M-1, SPE-4
㊴	BrR	2	RH1, S/M-3
㊹	Br	2	RH2, SPE-6
㊾	5L	2	KEY-B, RH4
㊷	1.25BY	2	KEY-BR, RH1
㊻	1.25LB	2	KEY-C, RH1

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
㊹	LgW	2	KEY-ACC, RH2
㊺	WY	2	EME-2, RH2
㊻	WR	2	EME-3, RH2
㊼	WL	2	EME-1, RH2
㊿	2W	2	LIT-4, RH3
㉞	BrY	2	PAR-2, RH2
㉞	BrG	2	MAN-1, RH2
㊺	LY	2	INH-3, RH2
㉛	G	2	RH2, SPE-3
㉛	L	2	RH2, SPE-1
㉛	LgR	3	INH-2, MAN-2, RH2
㉜	RW	2	RH2, SPE-5
㉜	BrY	2	DIA-1, RH2

4-10. Water Spray Pump (R) Harness



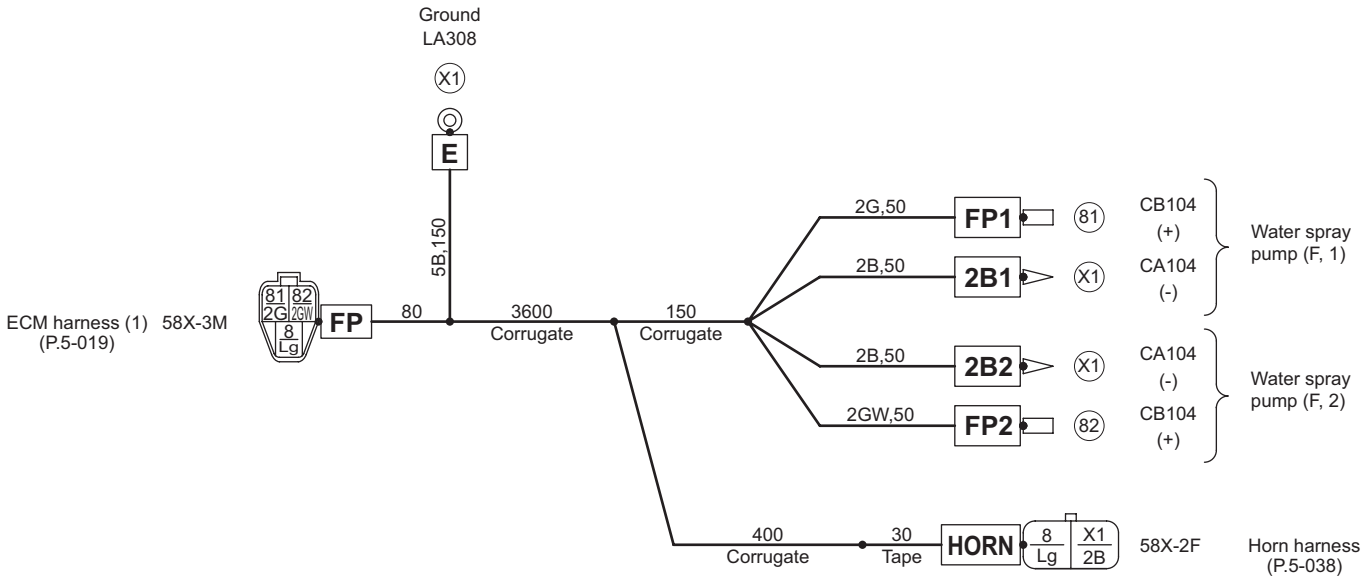
· The earth wire "X1" between "*1" and "*2" use "AVS5".

1568-09304-0-22298-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X1	2B, 3B, 5B	4	**2B1**, **2B2**, **BUZ**, **X1**
6	RY	2	**BUZ**, **SPR**
83	2L	2	**RP1**, **SPR**
84	2LW	2	**RP2**, **SPR**

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
138	R	2	**SPD**, Speed sensor
139	W	2	**SPD**, Speed sensor
140	B	2	**SPD**, Speed sensor
210	G	2	**SPD**, Speed sensor

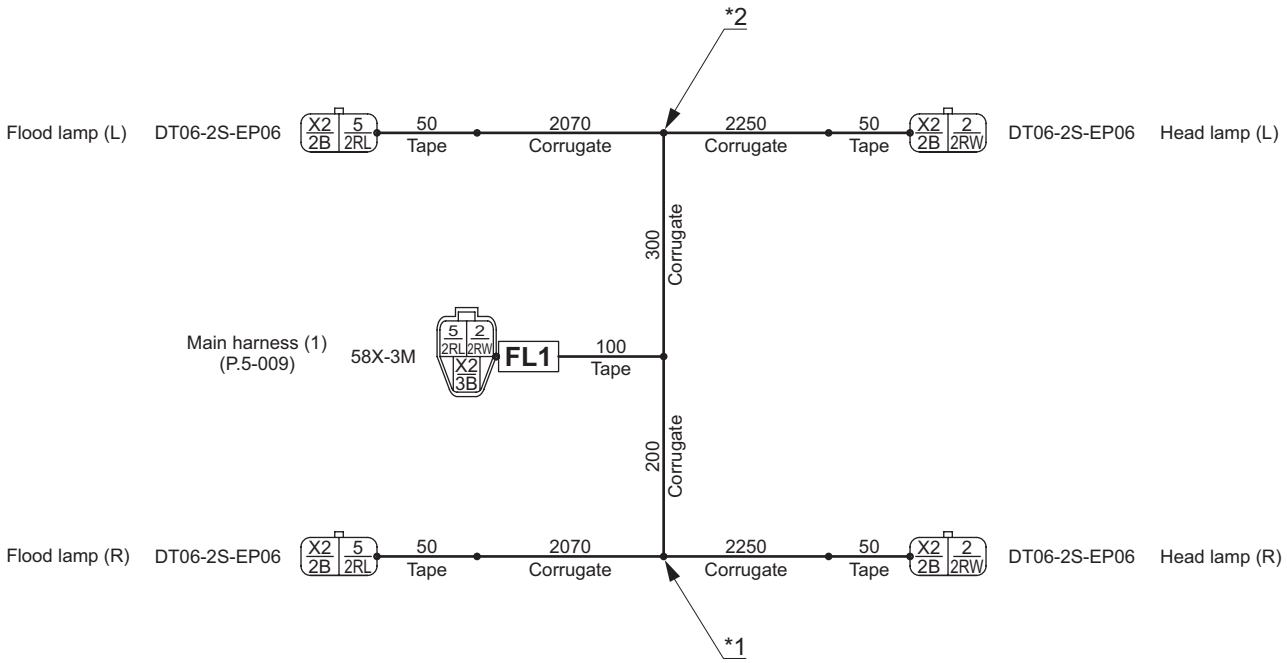
4-11. Frame (F) Harness



1568-09285-1-22235-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X1	5B, 2B	4	**2B1**, **2B2**, **E**, **HORN**
8	Lg	2	**FP**, **HORN**
81	2G	2	**FP**, **FP1**
82	2GW	2	**FP**, **FP2**

4-12. Floor Board Harness

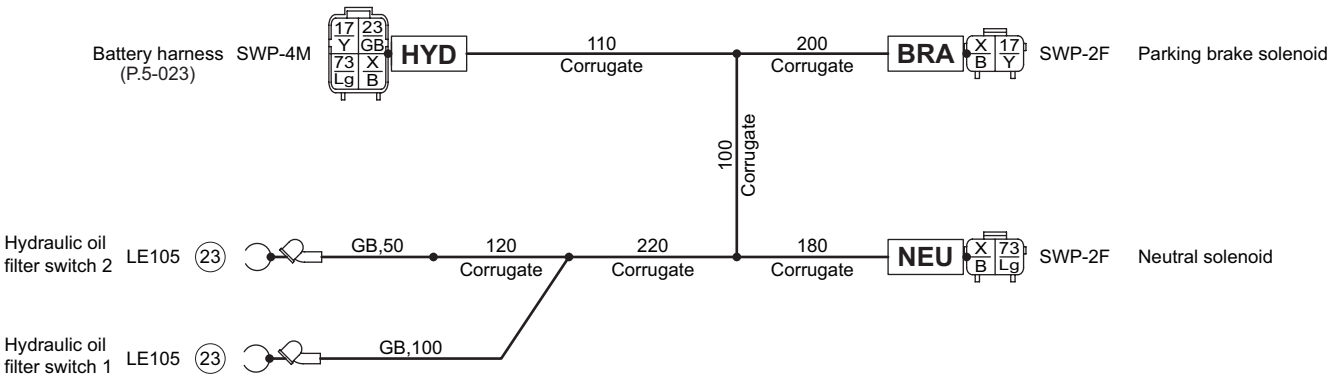


· The earth wire "X2" between "*1" and "*2" use "AVS3".

1568-09274-0-22057-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ2	2B	5	**FL1**, Flood lamp (L), (R), Head lamp (L), (R)
②	2RW	3	**FL1**, Head lamp (L), (R)
⑤	2RL	3	**FL1**, Flood lamp (L), (R)

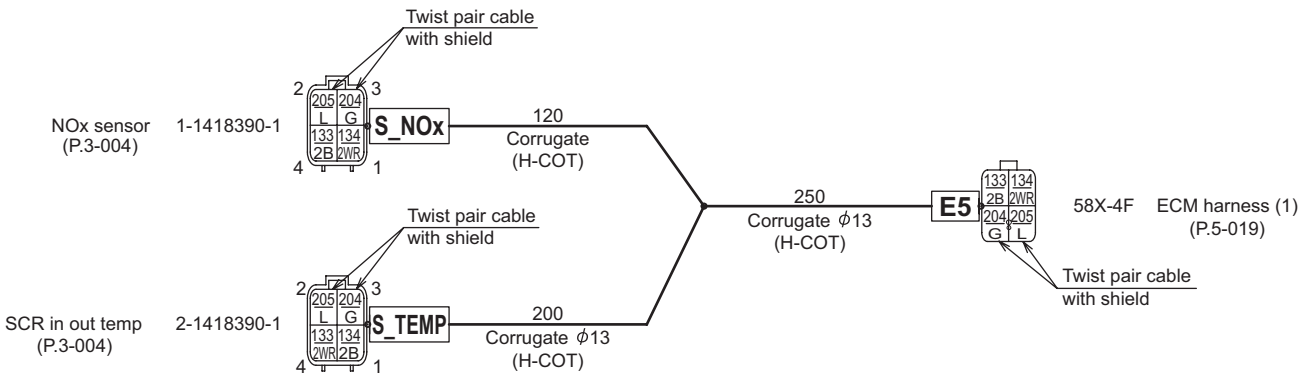
4-13. Solenoid Harness



1568-09286-1-32236-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
Ⓧ	B	3	**HYD**, **BRA**, **NEU**
⑰	Y	2	**HYD**, **BRA**
㉓	GB	3	**HYD**, Hydraulic oil filter switch1, 2
㉝	Lg	2	**HYD**, **NEU**

4-14. SCR Harness

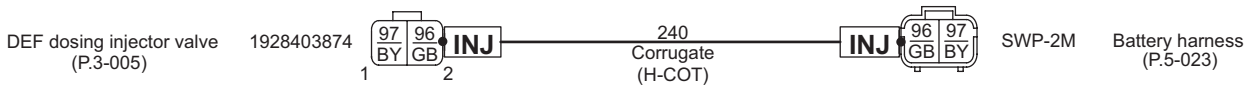


· Make use of heat resistannce wire "AEX" equivalency product.

1568-09294-1-32246-B

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(133)	2B	3	**S_NOx**-4, **S_TEMP**-4, **E5**
(134)	2WR	3	**S_NOx**-1, **S_TEMP**-1, **E5**
(204)	G	3	**S_NOx**-3, **S_TEMP**-3, **E5**
(205)	L	3	**S_NOx**-2, **S_TEMP**-2, **E5**

4-15. DRT Harness

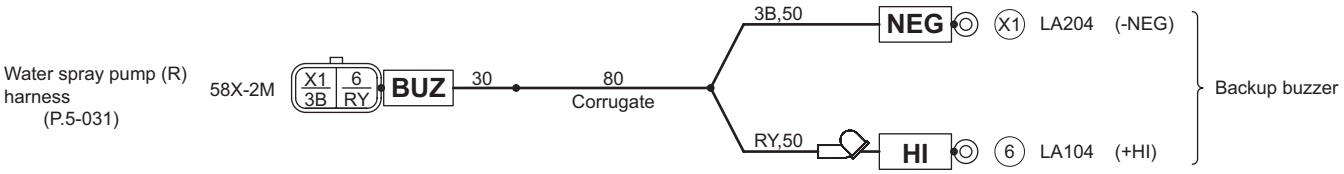


· Make use of heat resistannce wire "AEX" equivalency product.

1568-09293-0-32245-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑯	GB	2	**INJ**-2, **INJ** (SWP)
⑰	BY	2	**INJ**-1, **INJ** (SWP)

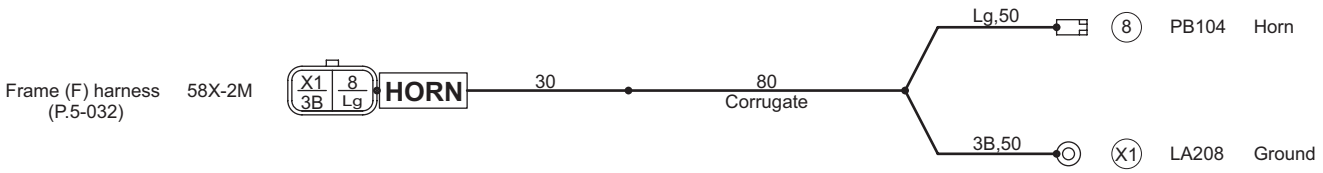
4-16. Backup Buzzer Harness



1568-09272-0-32053-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X1	3B	2	**BUZ**, **NEG**
6	RY	2	**BUZ**, **HI**

4-17. Horn Harness

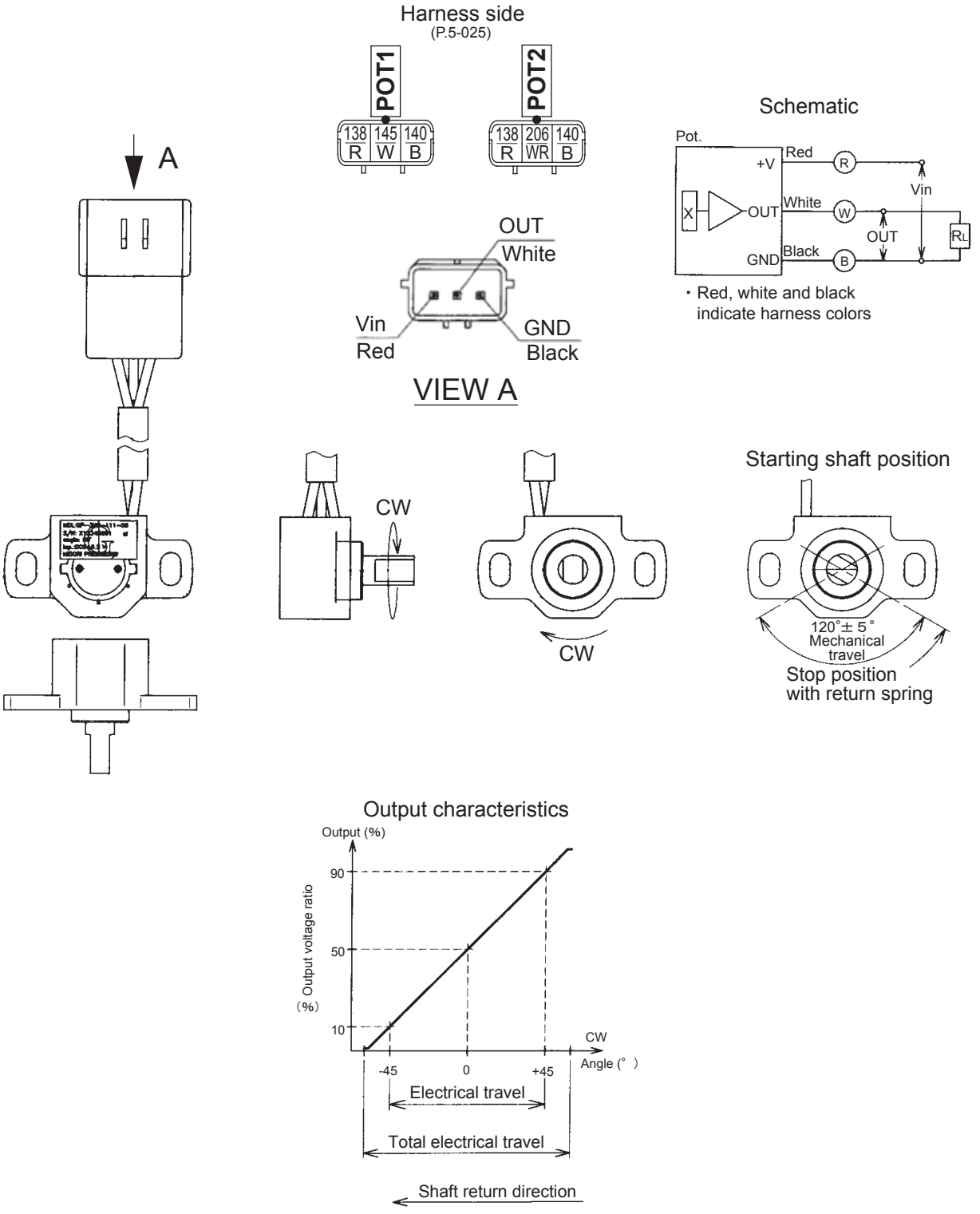


1568-09271-0-32052-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X1	3B	2	**HORN**, Ground
8	Lg	2	**HORN**, Horn

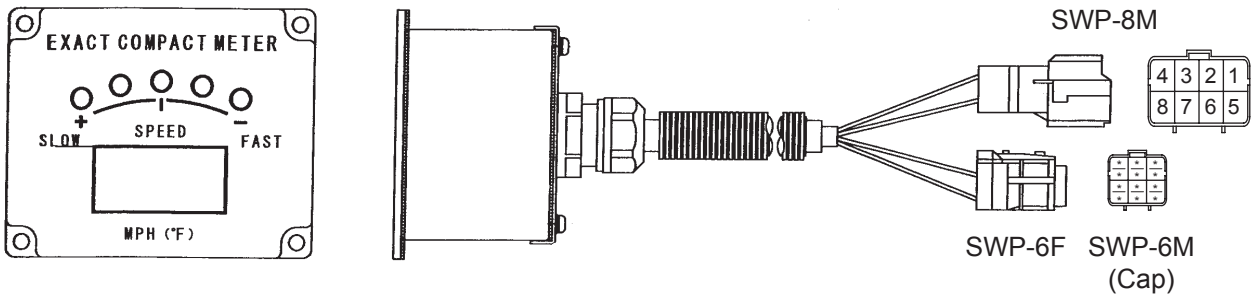
5. ELECTRICAL COMPONENT SPECIFICATIONS

5-1. Potentiometer

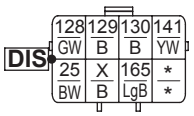


SW880-1-05018

5-2. Exact Meter



Harness side
(P.5-011)

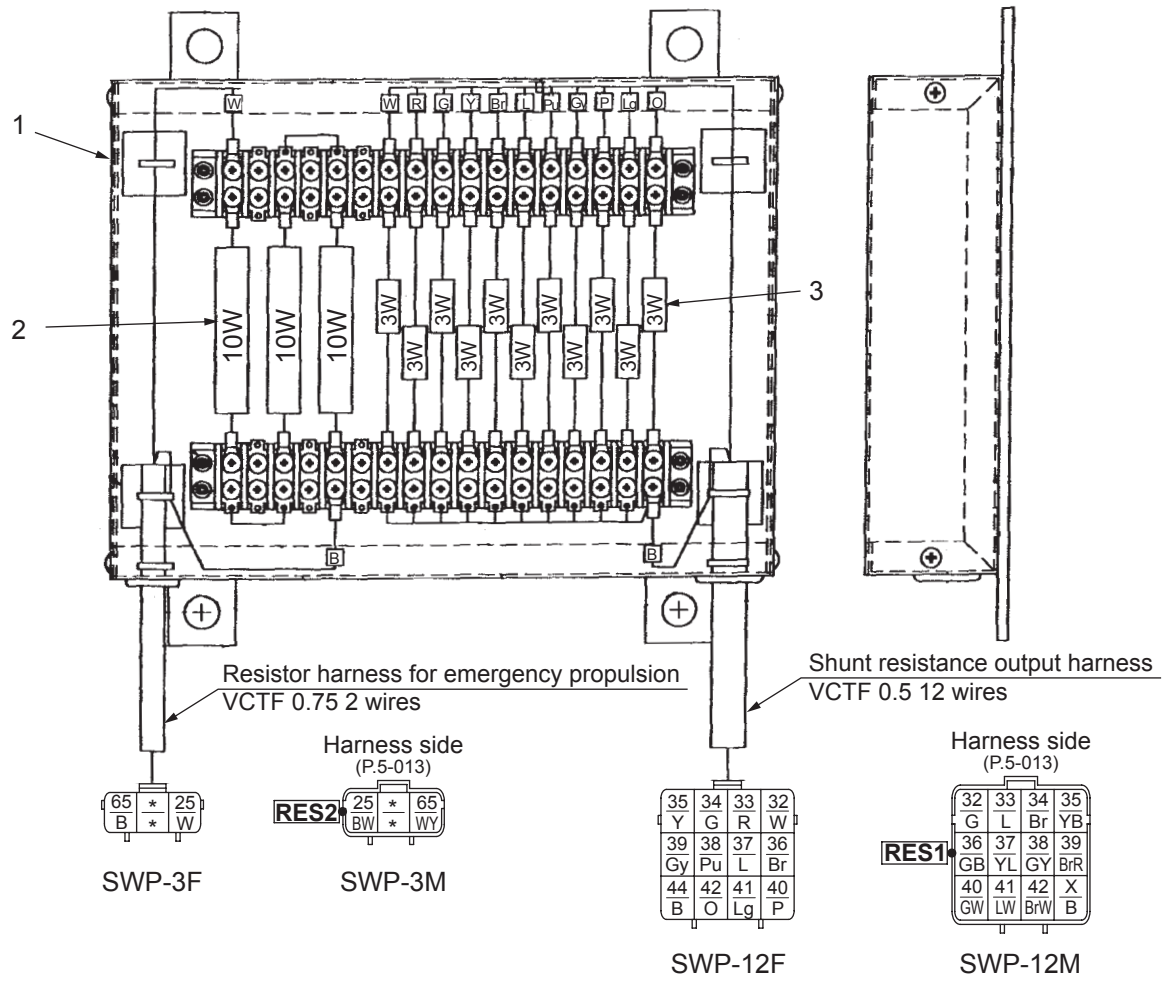


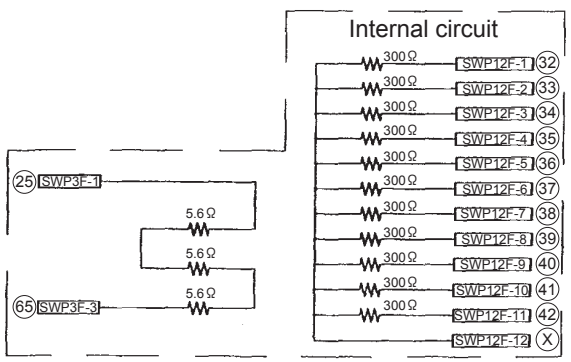
SWP-8F

SW884-05003

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	(X)	GND
7	(165)	Exact meter relay
8	—	—

5-3. Resistor Unit

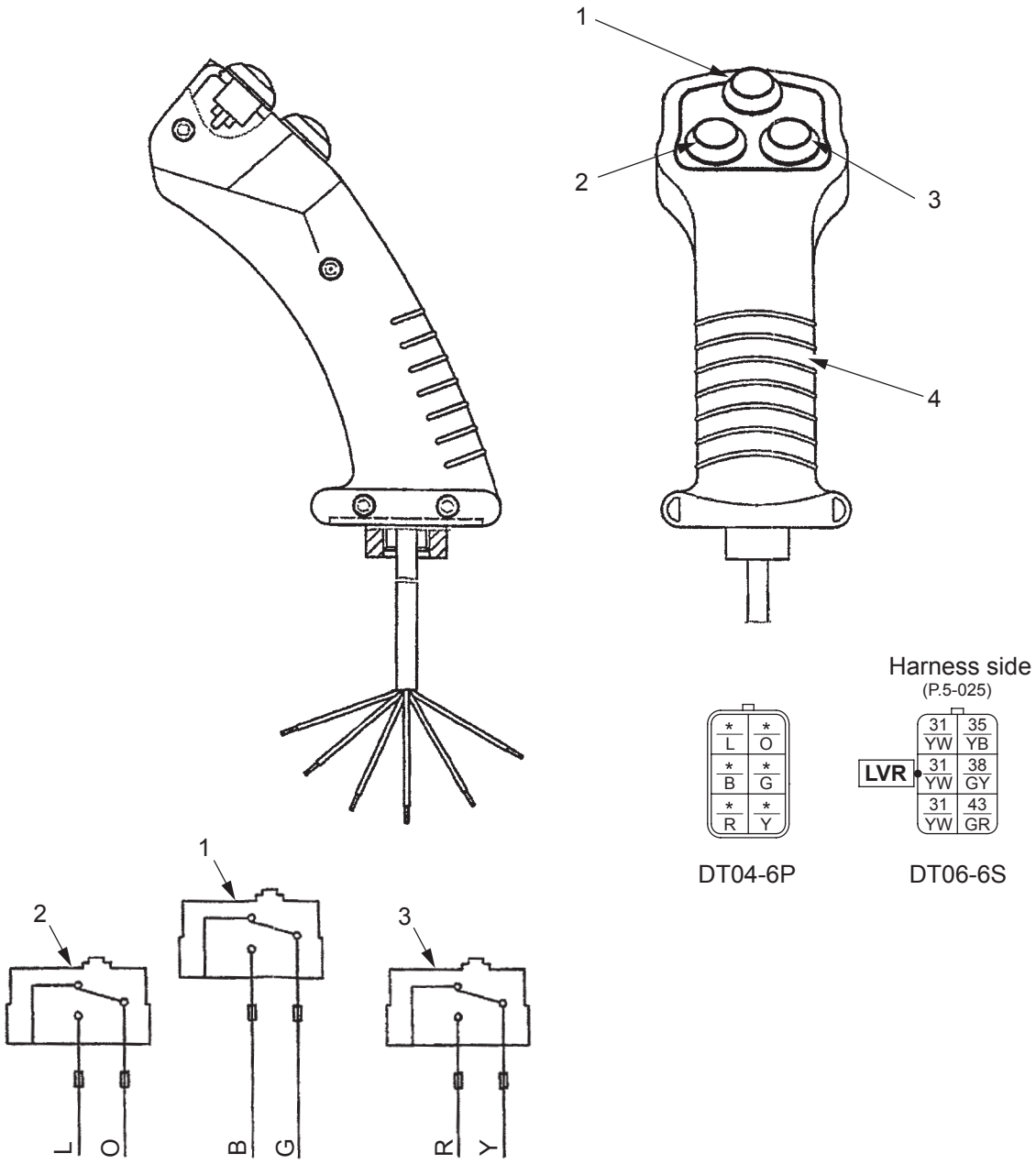




SW884-05004

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

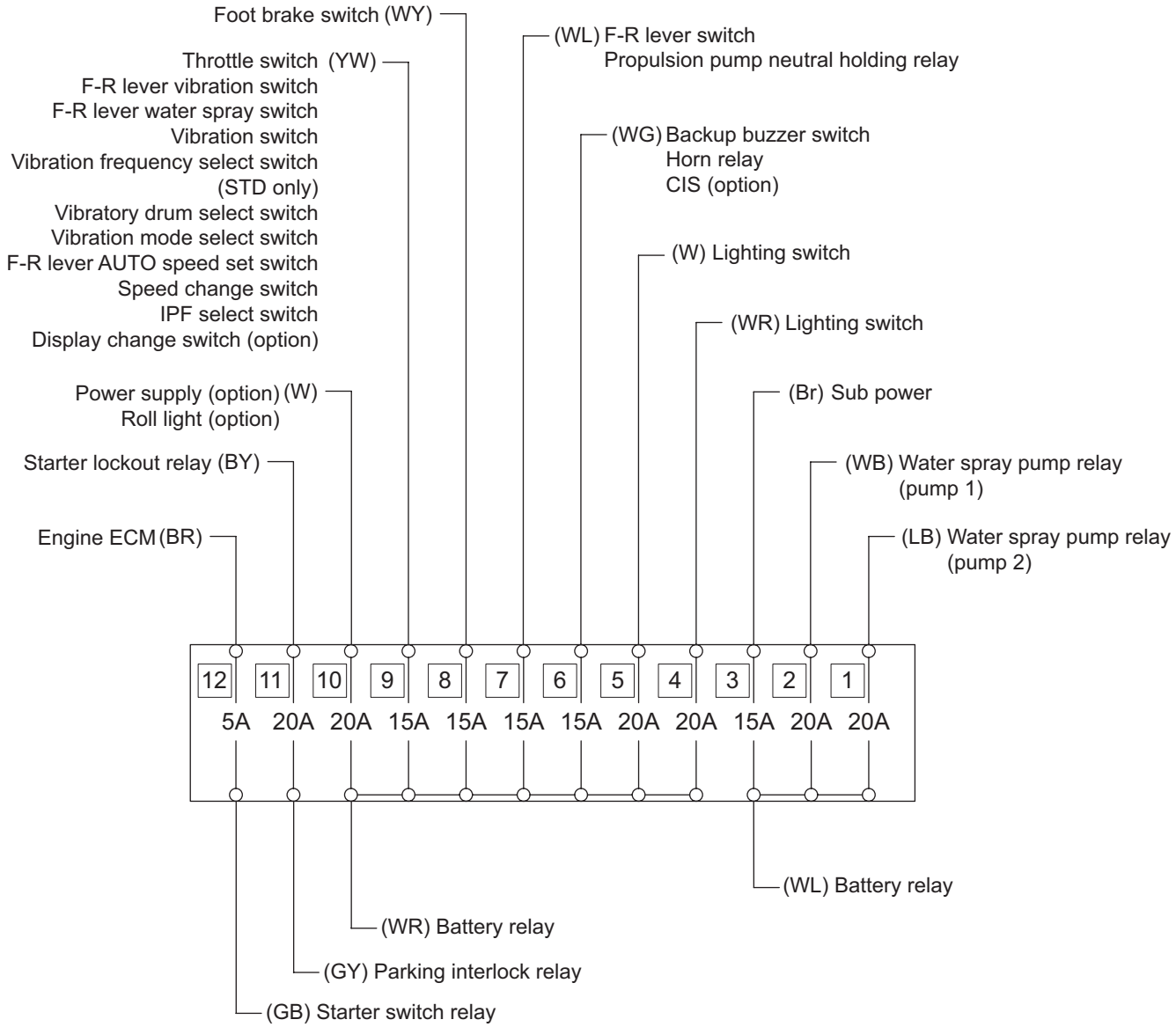
5-4. Lever Switch



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 (1)



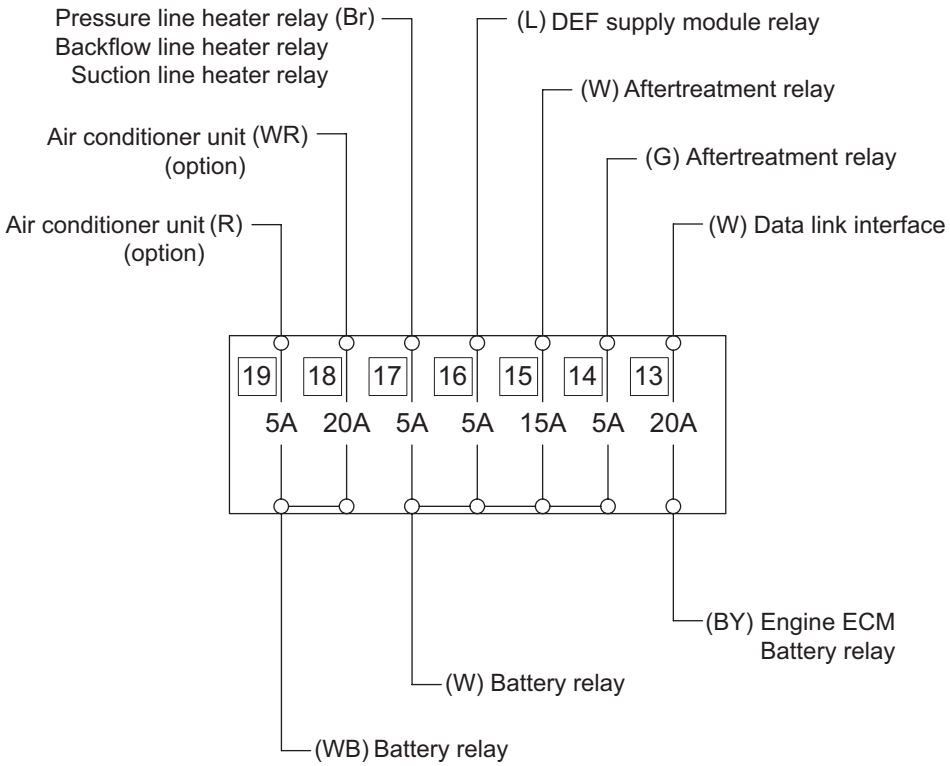
· For the relay box, refer to “4-2. Fuse · Relay Harness” (P.5-015).

SW884-05001

Harness color codes

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

5-6. Fuse Box (2)



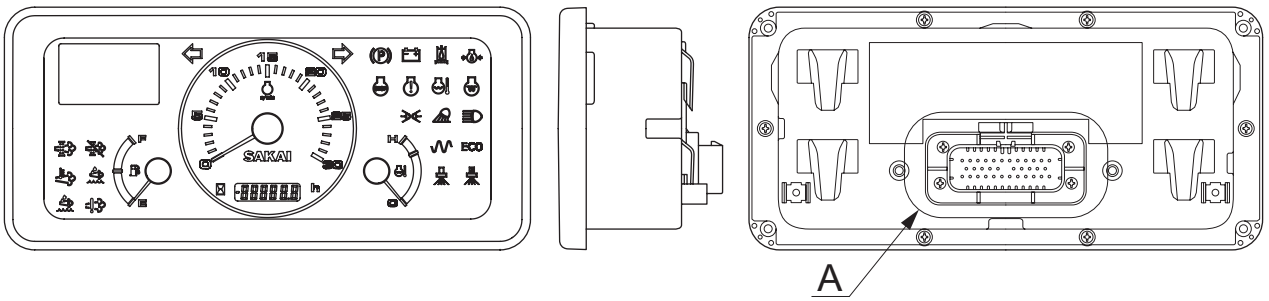
· For the relay box, refer to “4-2. Fuse · Relay Harness” (P.5-015).

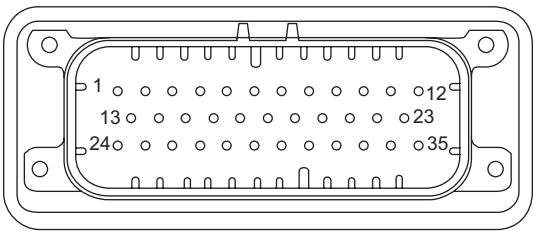
SW884-05002

Harness color codes

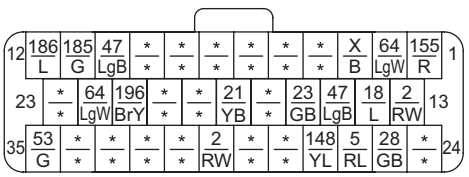
W	: White	L	: Blue
R	: Red	BY	: Black/Yellow stripe
G	: Green	WR	: White/Red stripe
Br	: Brown	WB	: White/Black stripe

5-7. Combination Meter

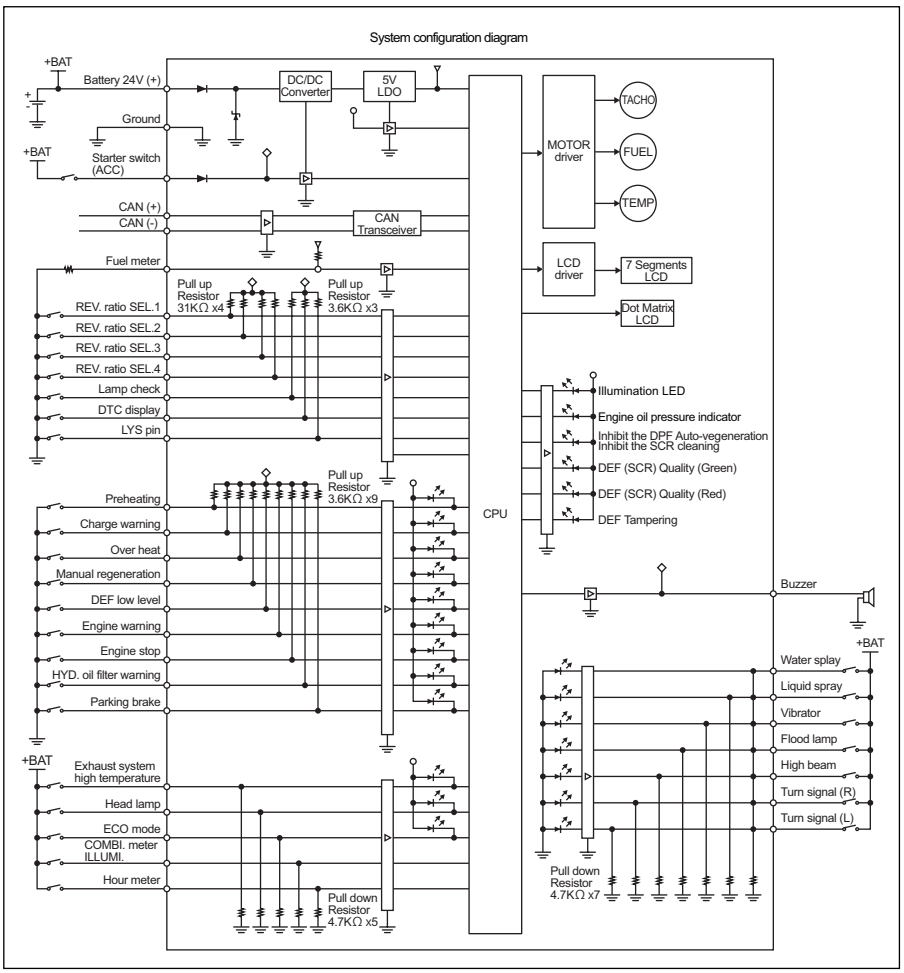




DETAIL A



Harness side
(P.5-011)



PIN	DESCRIPTION	NO.
1	Battery 24V (+)	(155)
2	Starter switch (ACC)	(64)
3	Ground	(X)
4	Turn signal (R)	
5	Engine stop	
6	Over heat	
7	REV. ratio SEL.1	
8	REV. ratio SEL.3	
9	Buzzer	
10	Lamp check	(47)
11	CAN(+)	(185)
12	CAN(-)	(186)
13	Head lamp	(2)
14	Parking brake	(18)
15	Charge warning	(47)
16	HYD. oil filter warning	(23)
17	Engine warning	
18	Fuel meter	(21)
19	REV. ratio SEL.2	
20	REV. ratio SEL.4	
21	DTC display	(196)
22	Hour meter	(64)
23	Turn signal (L)	
24	Preheating	
25	Water splay	(28)
26	Flood lamp	(5)
27	Vibrator	(148)
28	Liquid spray	
29	High beam	
30	COMBI. meter ILLUMI.	(2)
31	Exhaust system high temperature	
32	DEF low level	
33	Manual regeneration	
34	LYS pin	
35	ECO mode	(53)

SW884-05005

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 pins, and lock plates with new parts.
- Properly bend split pins and lock plates.
- When applying an adhesive, first clean and remove oil/grease from the surfaces properly. Then apply two or three drops to the threaded areas.
- When applying a liquid gasket, first clean and remove oil/grease from the application surface properly, and confirm that the surface is free of dust and damage. Then apply the product evenly.
- Clean parts well. Repair scratches, dents, burrs, rust, etc.
- Apply grease to rotating and sliding components.
- Apply gear oil to the surfaces of press-fit parts.
- After installing snap rings, confirm that they are properly seated in the grooves.
- Connect wiring connectors securely after cleaning off adhering oil, dust and water.
- Use lifting bolts that are not fatigued or deformed. Screw them in fully.
- When tightening a split flange, tighten screws alternately to prevent uneven tightening.
- Before installing hydraulic parts, confirm that they are free of damage and dust, etc.

3) Precautions when work is completed

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

2. VIBRATORY DRUM

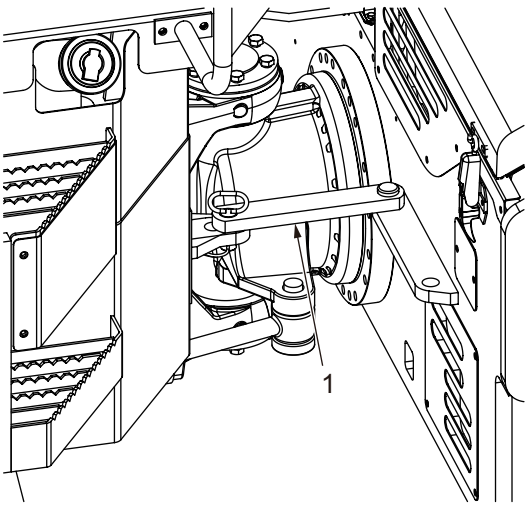
2-1. Removal and Installation of Vibratory Drum

2-1-1. Removal of vibratory drum

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

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

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

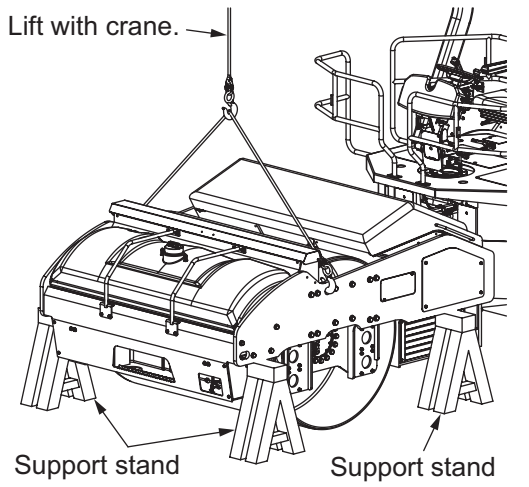


SW880-06001

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

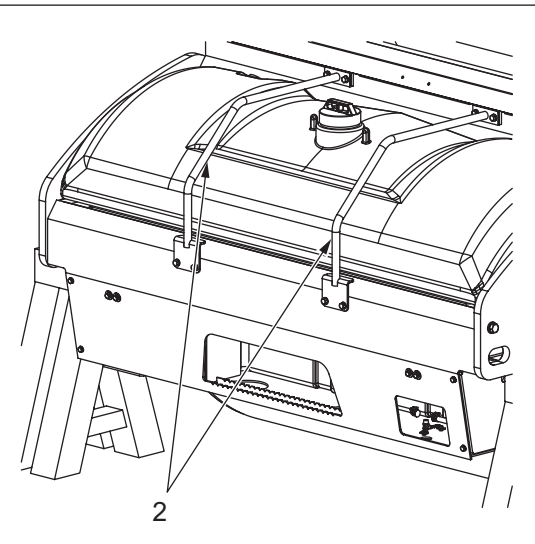


SW880-06002

kg

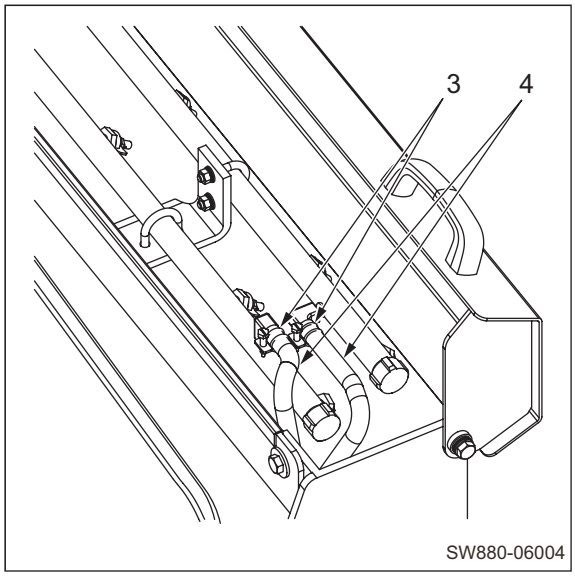
	Front frame	Rear frame
SW884	: 6,350 kg (14,000 lbs.)	6,540 kg (14,420 lbs.)
SW994	: 6,530 kg (14,395 lbs.)	6,740 kg (14,860 lbs.)
SW884ND	: 6,520 kg (14,375 lbs.)	6,710 kg (14,795 lbs.)
SW994ND	: 6,690 kg (14,750 lbs.)	6,900 kg (15,210 lbs.)

4) Remove guard pipes (2).

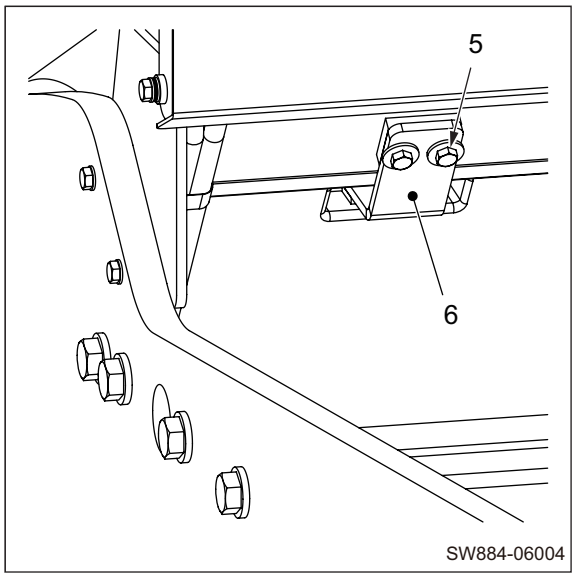


SW880-06003

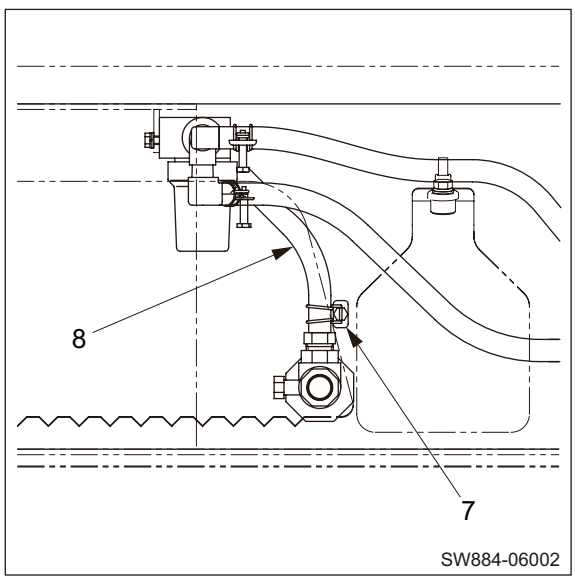
5) Loosen hose clamps (3) and remove water spray hoses (4).



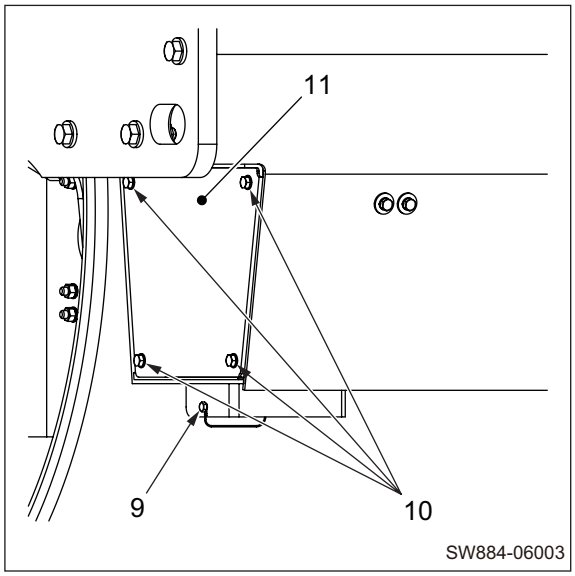
6) Remove two bolts (5) (left and right).
   • Pull out tank stoppers (6) (left and right).



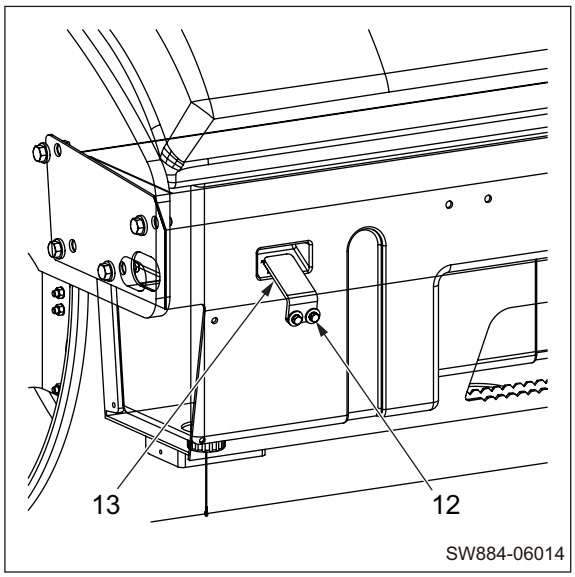
7) Loosen hose clamp (7) at outlet of water tank.
   • Disconnect water spray hose (8).



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



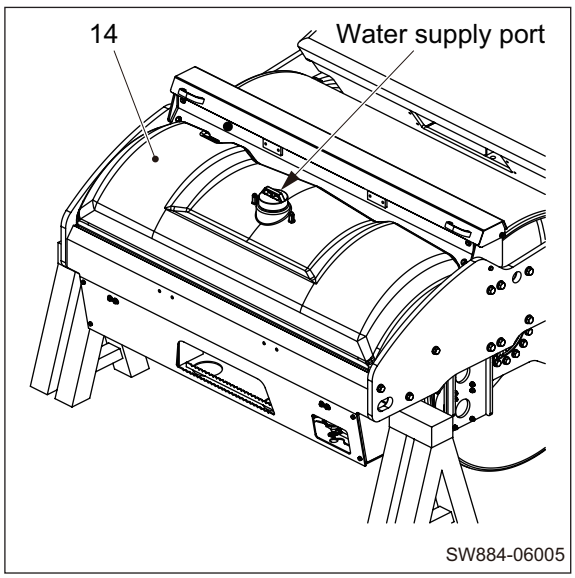
9) Remove two bolts (12) (left and right).
   - Pull out tank stoppers (13) (left and right).



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

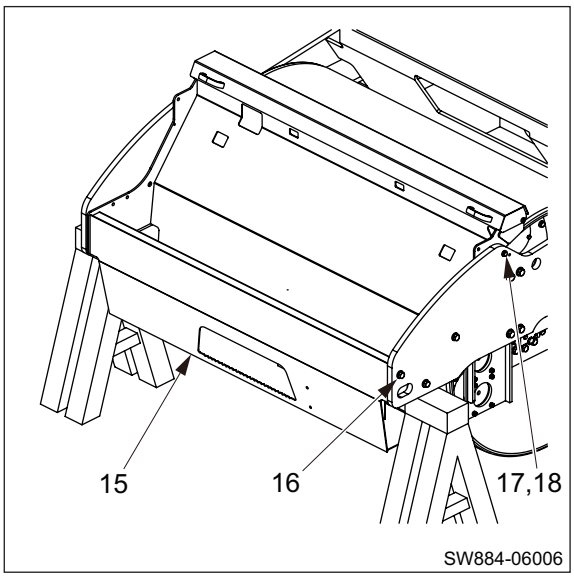
(NOTICE)
- **Lift the water tank at the water supply port so as not to damage the tank.**

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



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

(15) Cross member
SW884/884ND : 295 kg (650 lbs.)
SW994/994ND : 345 kg (761 lbs.)

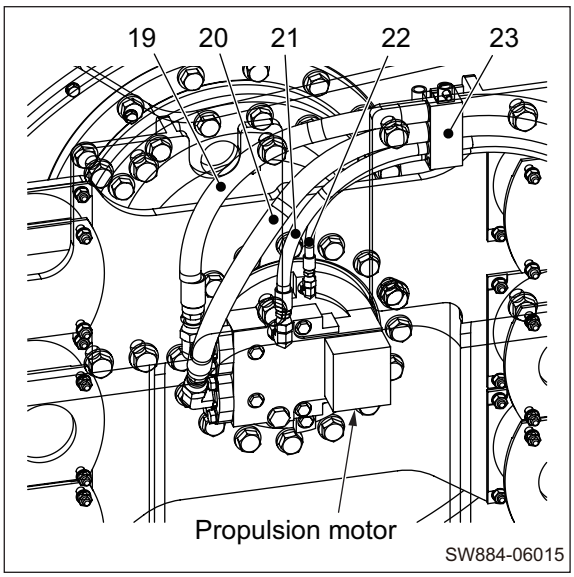


⚠WARNING

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

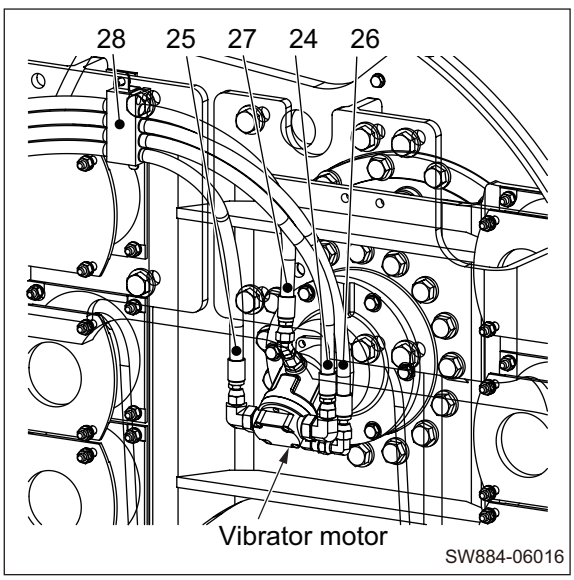
12) Disconnection of piping

① Propulsion motor piping
- Remove hydraulic hose clamp (23).
- Disconnect four hydraulic hoses (19), (20), (21) and (22) connecting to propulsion motor.



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

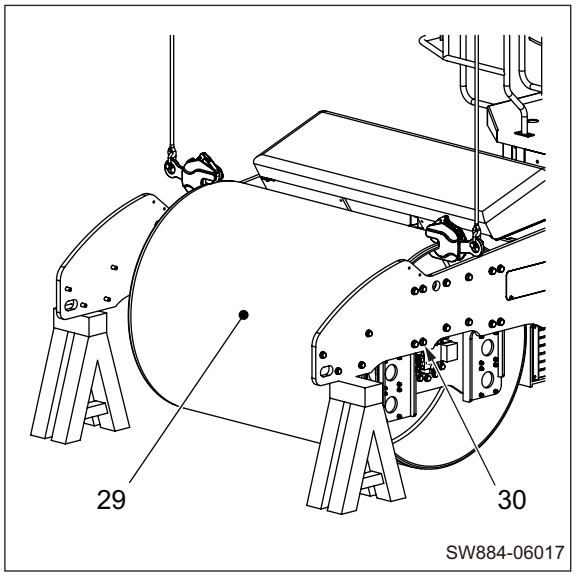
② Vibrator motor piping
- Remove hydraulic hose clamp (28).
- Disconnect four hydraulic hoses (24), (25), (26) and (27) connecting to the vibrator motor.



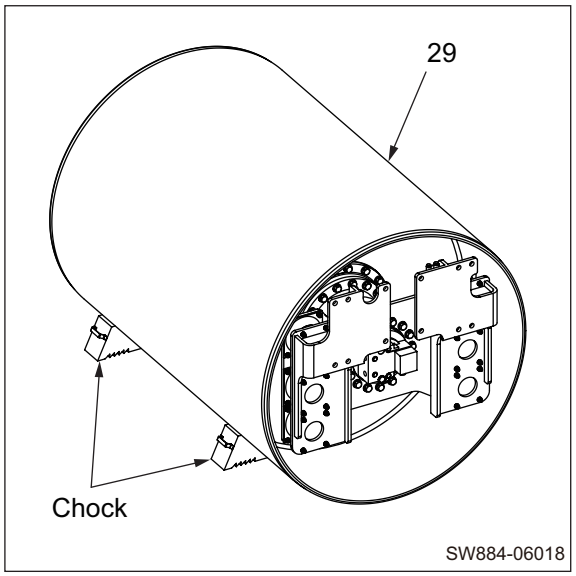
(NOTICE)
- **Plug both ends of the disconnected hoses or implement other actions to prevent entry of foreign matter.**

13) Remove twelve bolts (30).
- Lift off vibratory drum (29) from frame.

(29) Drum
SW884 : 3,380 kg (7,452 lbs.)
SW994 : 3,505 kg (7,727 lbs.)
SW884ND : 3,640 kg (8,025 lbs.)
SW994ND : 3,755 kg (8,278 lbs.)



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



2-1-2. Installation of vibratory drum

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

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

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

⚠WARNING

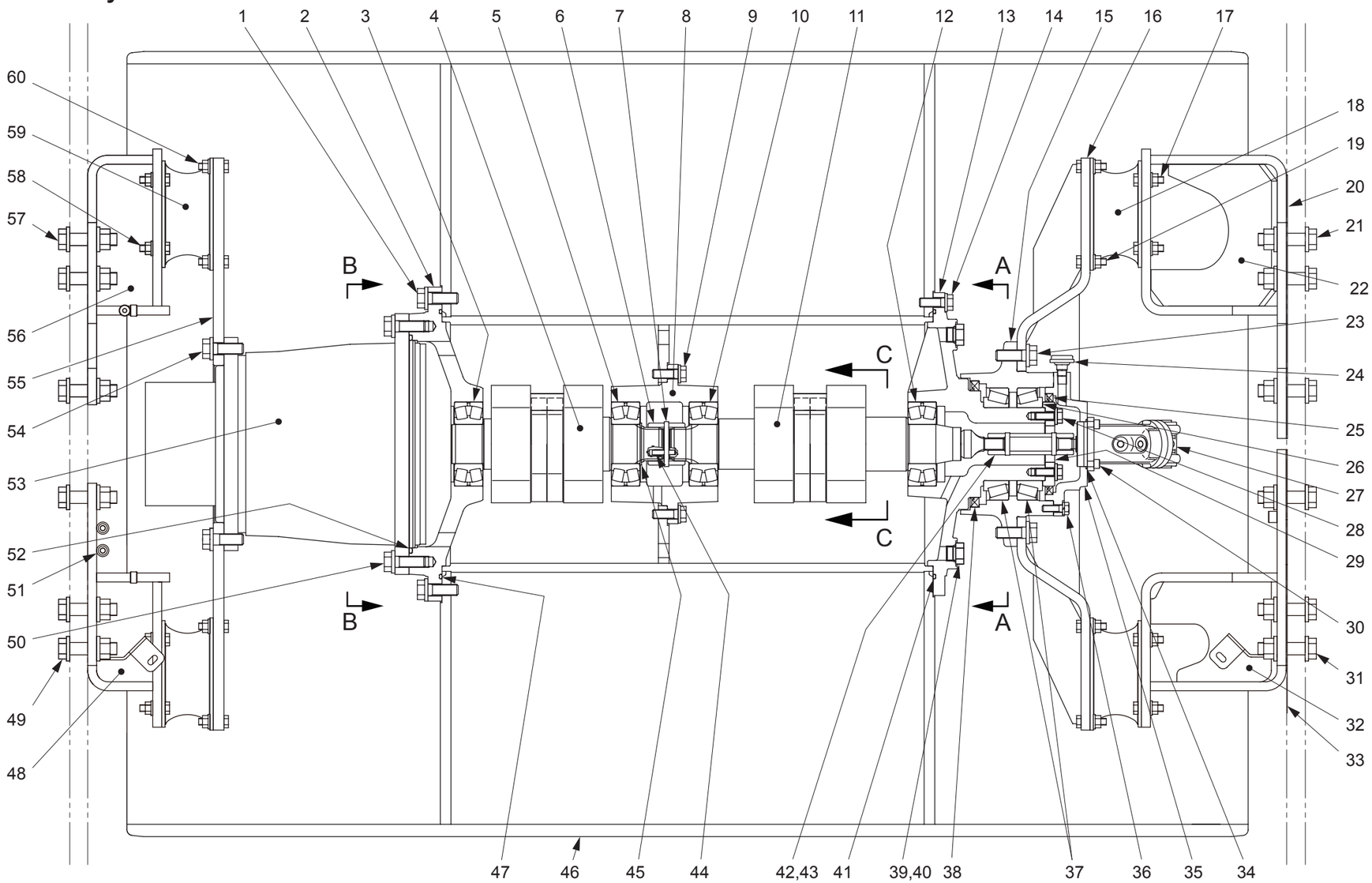
If the engine is run at high speed or the cylinder is operated to full stroke when the engine is started for the first time after the work is completed, the piston packing or other items may be damaged by air entering into the cylinder.

(NOTICE)

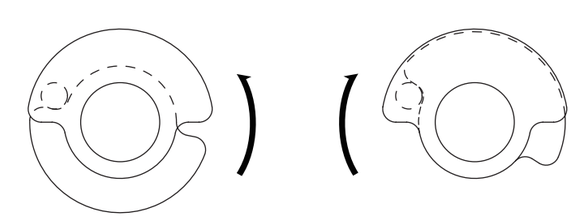
- **Fill the hydraulic oil tank to the specified level to make up for any oil leakage.**
- **Start the engine and circulate the oil through the piping. Then check the oil level again, ensuring that the oil is at the specified level.**

3. VIBRATORY DRUM ASSY (SW884/994)

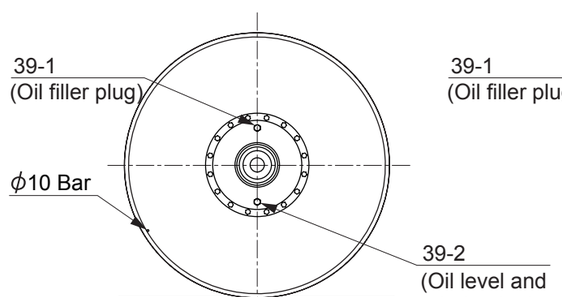
3-1. Vibratory Drum ASSY



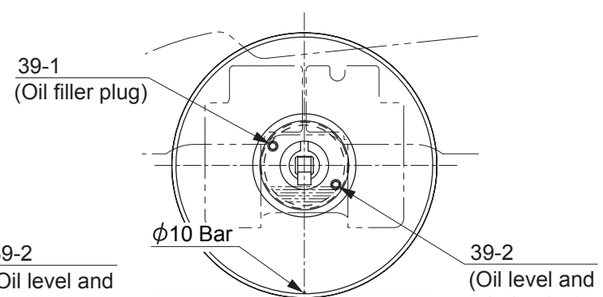
(1)	Bolt	:M20×60	(31)	Bolt	:M22×90
(2)	Housing		(32)	Bracket	
(3)	Vibrator bearing		(33)	Shim	
(4)	Eccentric shaft		(34)	O-ring	
(5)	Vibrator bearing		(35)	Cover	
(6)	Sleeve		(36)	Bolt	:M12×40
(7)	Spring pin		(37)	Roller bearing	
(8)	Housing		(38)	Oil seal	
(9)	Bolt	:M16×50	(39)	Plug	
(10)	Vibrator bearing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



SECTION C-C



SECTION B-B

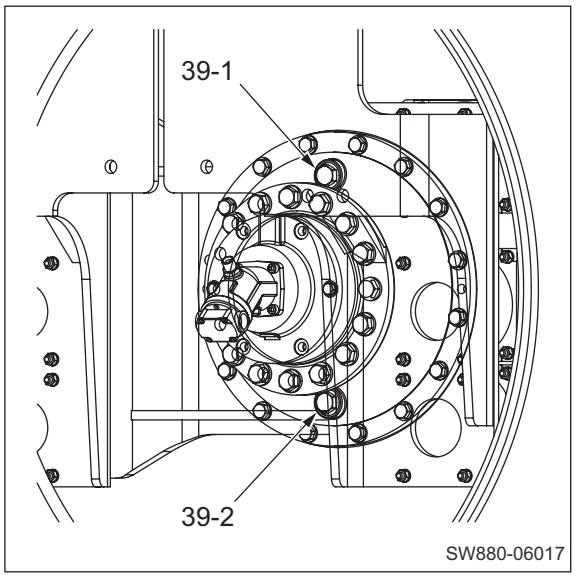


SECTION A-A

0568-43808-0-11410-E

3-2. Disassembly and Reassembly of Vibratory Drum

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



3-2-1. Disassembly of vibratory drum

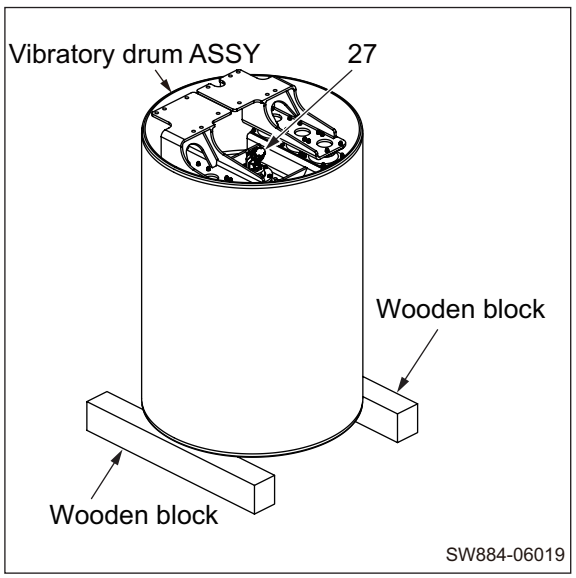
1) Remove plugs (39-1) and (39-2).
   - Drain gear oil.
     - Quantity of gear oil : 22 L (5.8 gal.)
   - Install plugs.

⚠WARNING

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

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

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

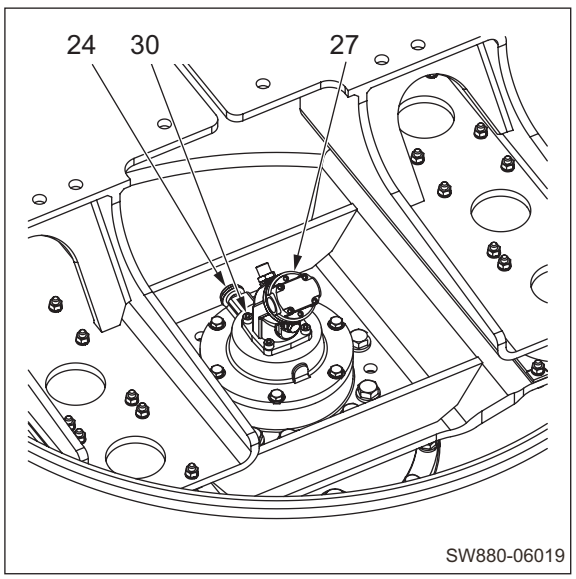


⚠WARNING

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

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

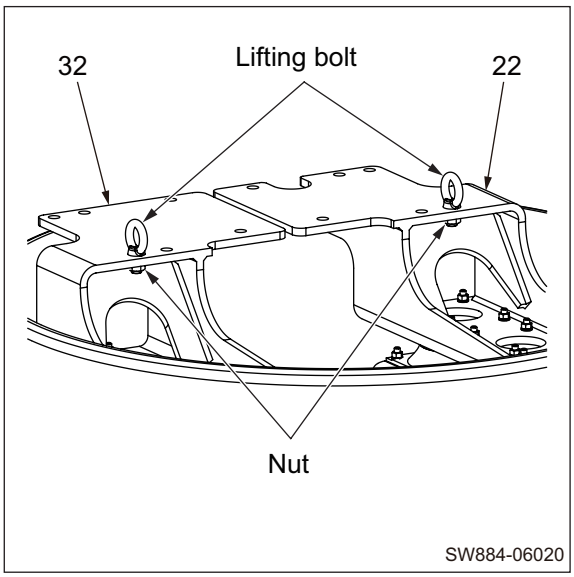
   (27) Vibrator motor : 6 kg (13 lbs.)



⚠WARNING

When installing lifting bolts, screw them with nuts.

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

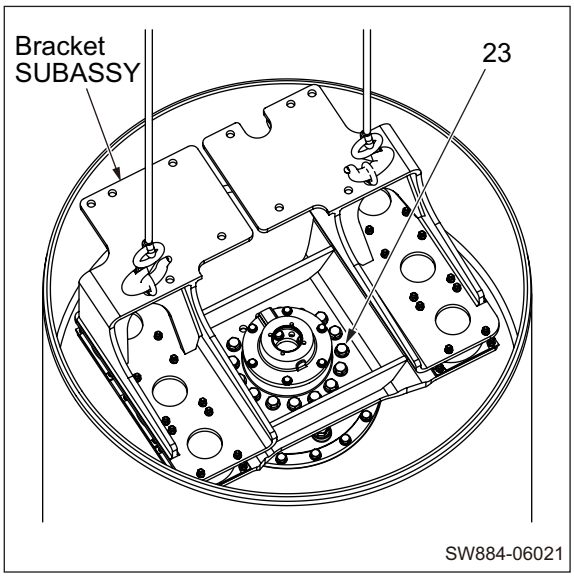


5) Remove bolts (23).
   • Remove bracket SUBASSY.

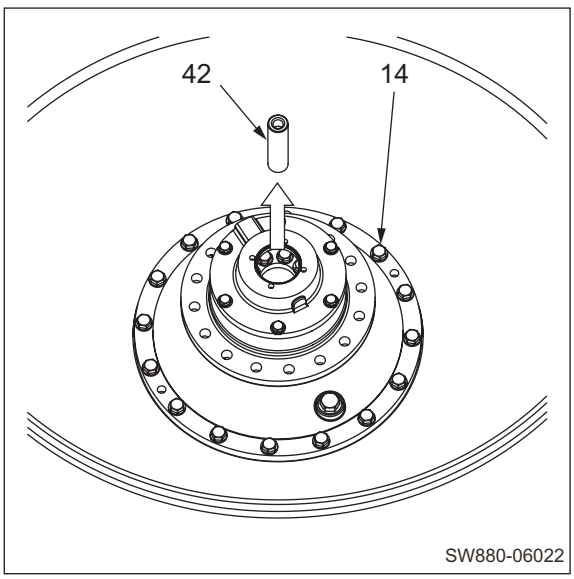
(NOTICE)

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

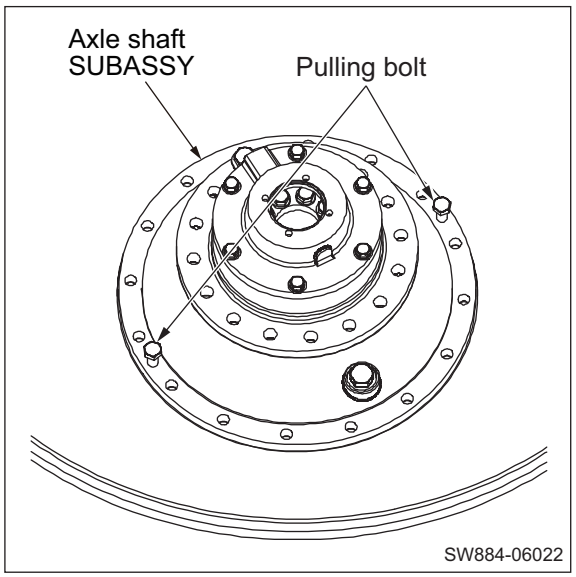
Bracket SUBASSY
SW884 : 285 kg (628 lbs.)
SW994 : 290 kg (639 lbs.)



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



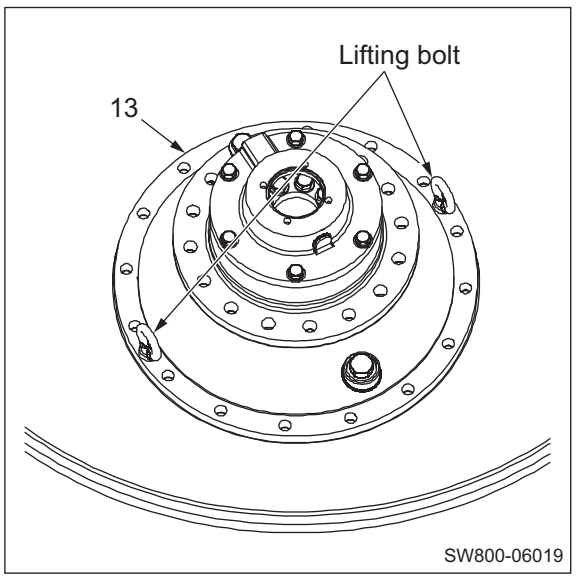
7) Lift axle shaft SUBASSY using two pulling bolts (M16×50).



⚠WARNING

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

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



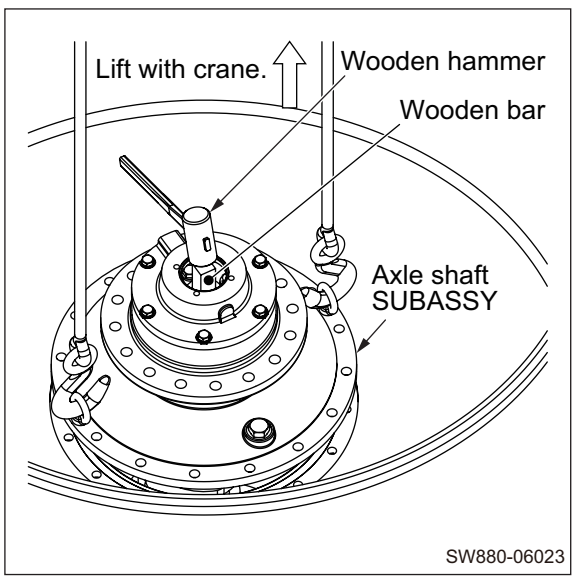
9) Remove axle shaft SUBASSY.

Axle shaft SUBASSY : 135 kg (298 lbs.)

(NOTICE)

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

(To step 25))



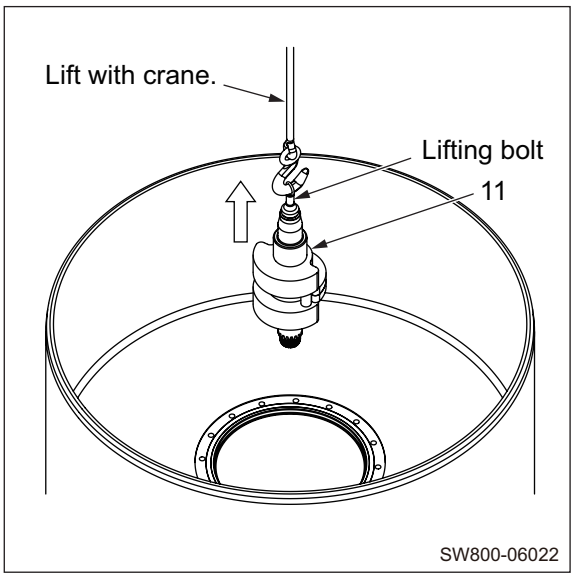
⚠WARNING

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

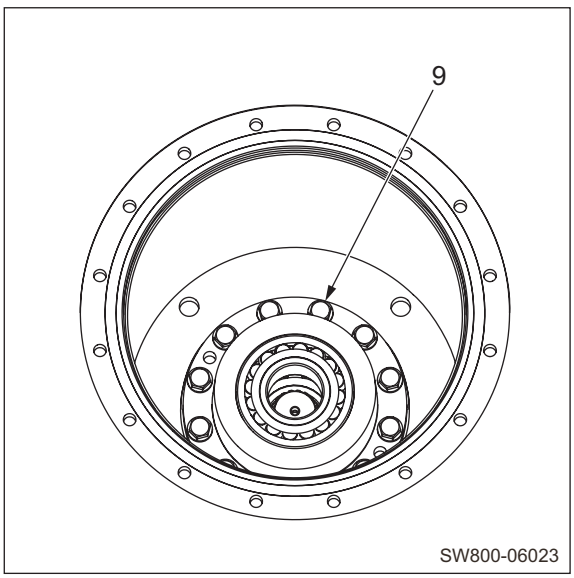
10) Install a lifting bolt (M8) to eccentric shaft (11).
- Remove eccentric shaft.

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

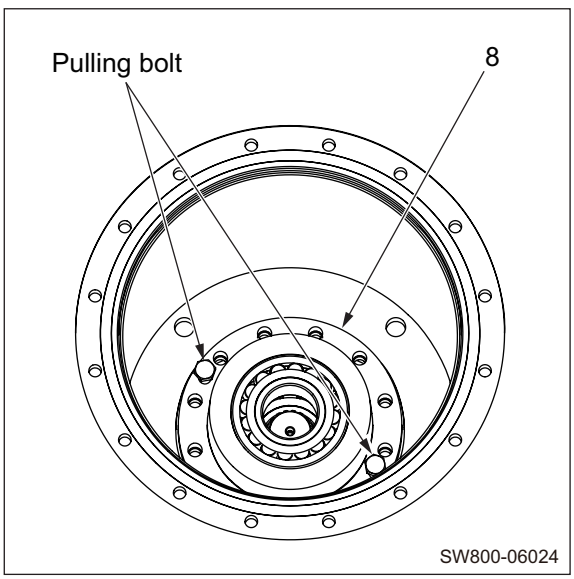
(NOTICE)
- **Put the movable weight at its outmost position.**



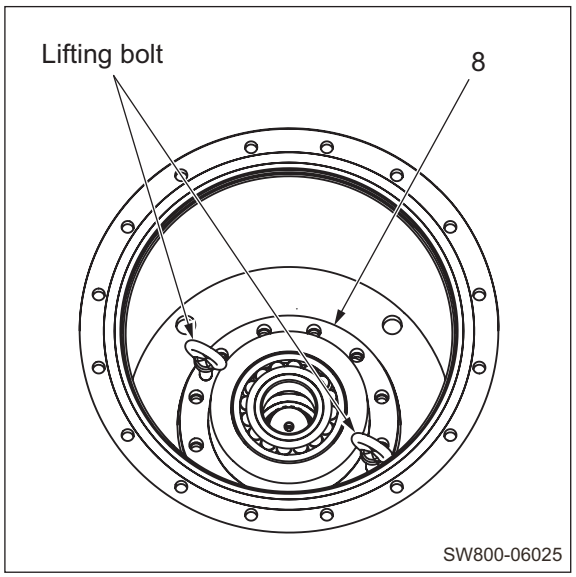
11) Remove bolts (9).



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



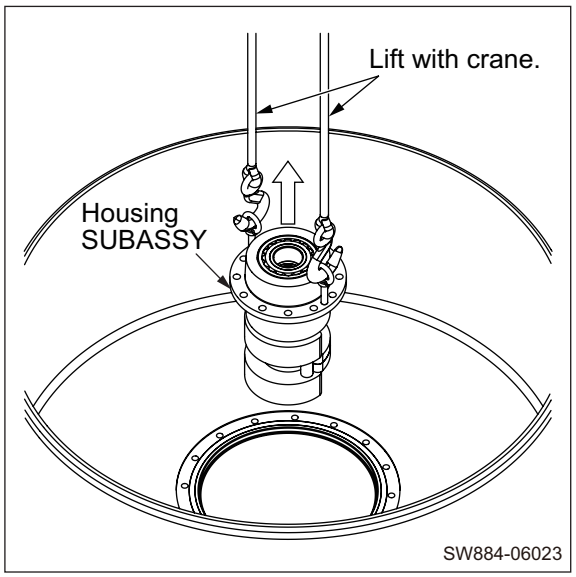
13) Install lifting bolts (M16) to housing (8).



14) Remove housing SUBASSY.

Housing SUBASSY : 90 kg (198 lbs.)

(To step 30))

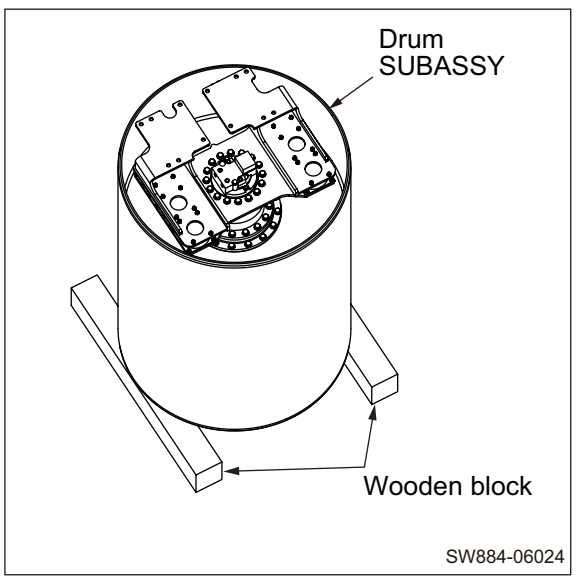


WARNING

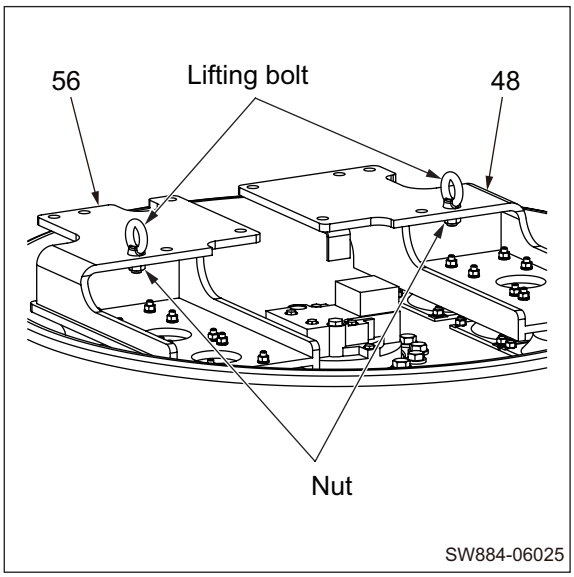
Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

15) Reverse drum SUBASSY.

Drum SUBASSY
SW884 : 2,780 kg (6,129 lbs.)
SW994 : 2,900 kg (6,393 lbs.)



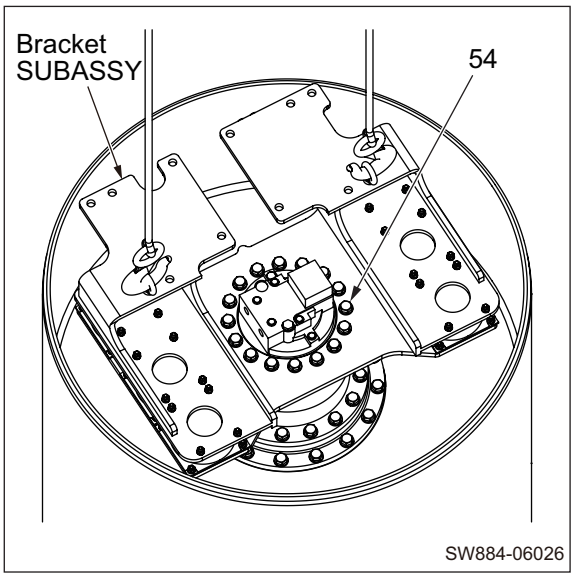
16) Install lifting bolts (M22) to brackets (48) and (56) with nuts.



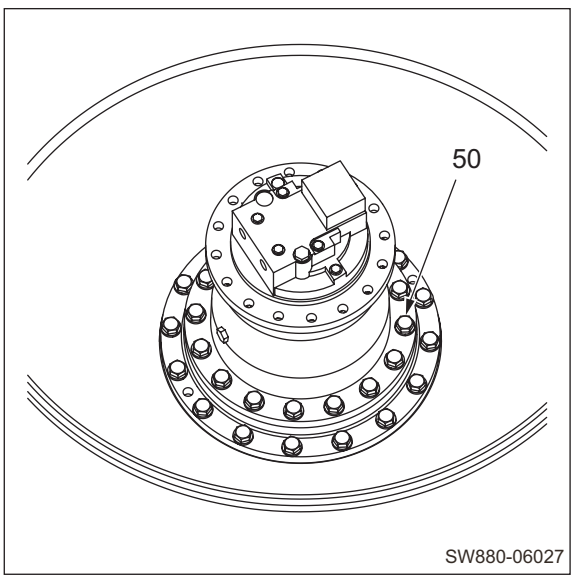
17) Remove bolts (54).
- Remove bracket SUBASSY.

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

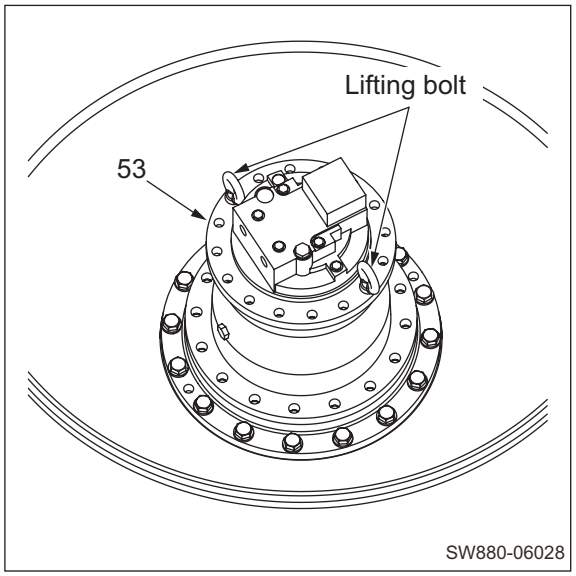
kg Bracket SUBASSY
SW884 : 230 kg (507 lbs.)
SW994 : 240 kg (529 lbs.)



18) Remove bolts (50).

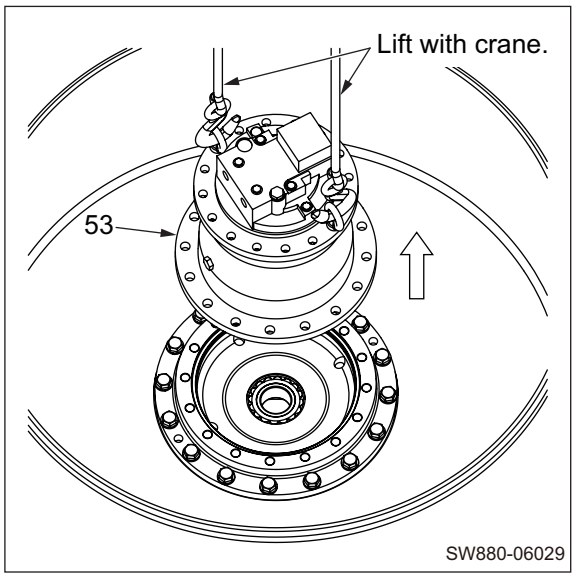


19) Install lifting bolts (M20) to propulsion motor (53).

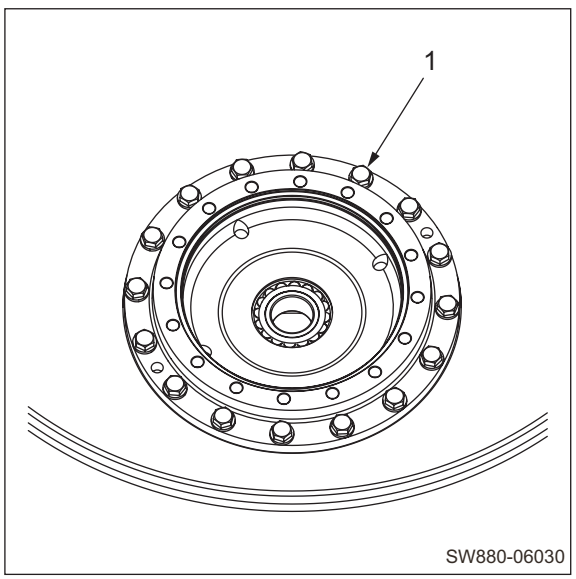


20) Remove propulsion motor (53).

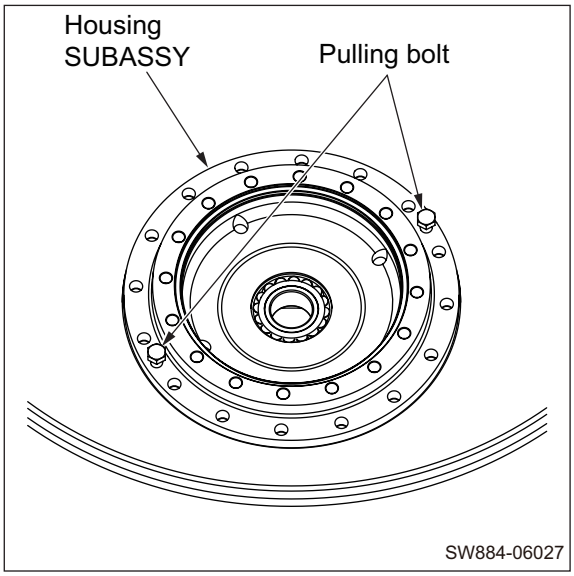
(53) Propulsion motor : 215 kg (474 lbs.)



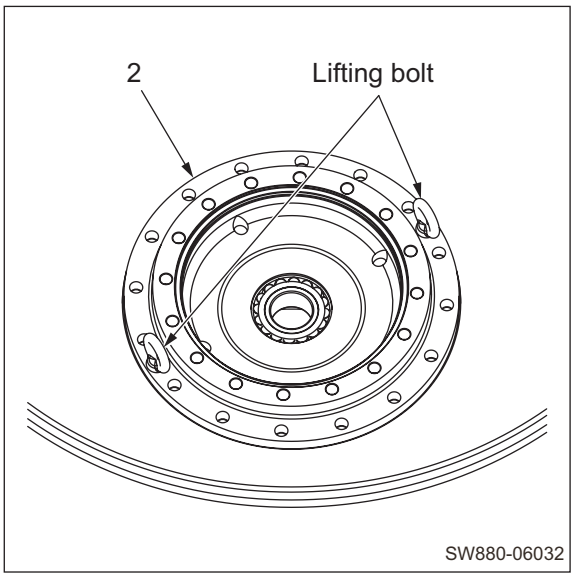
21) Remove bolts (1).



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

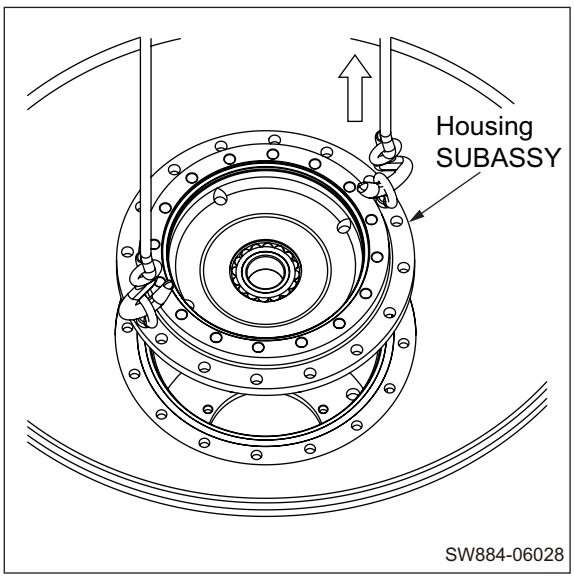


23) Install lifting bolts (M20) to housing (2).

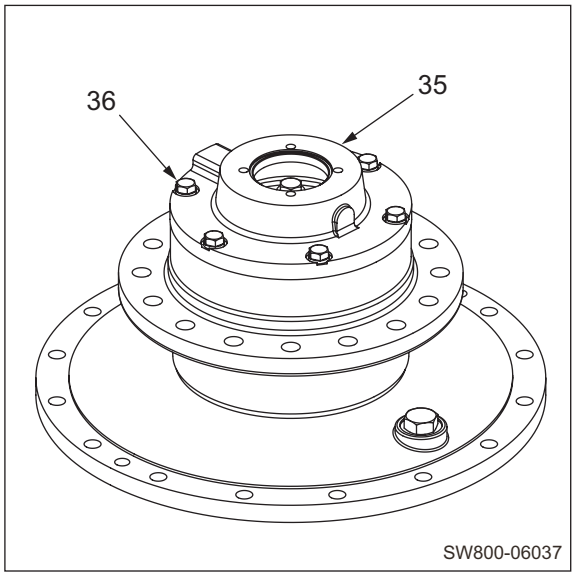


24) Remove housing SUBASSY.

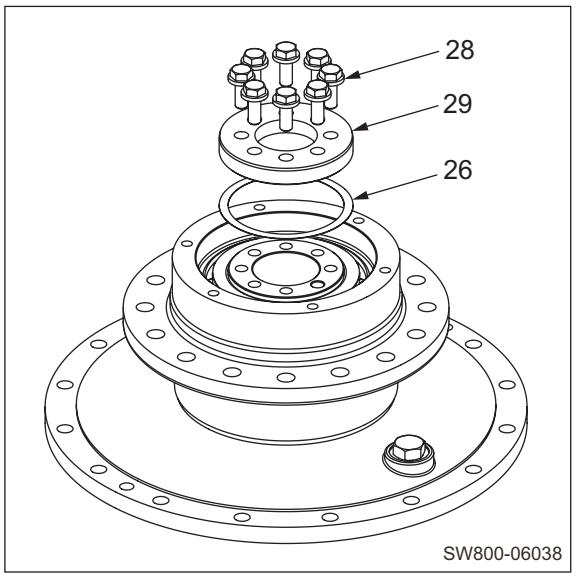
Housing SUBASSY : 75 kg (165 lbs.)



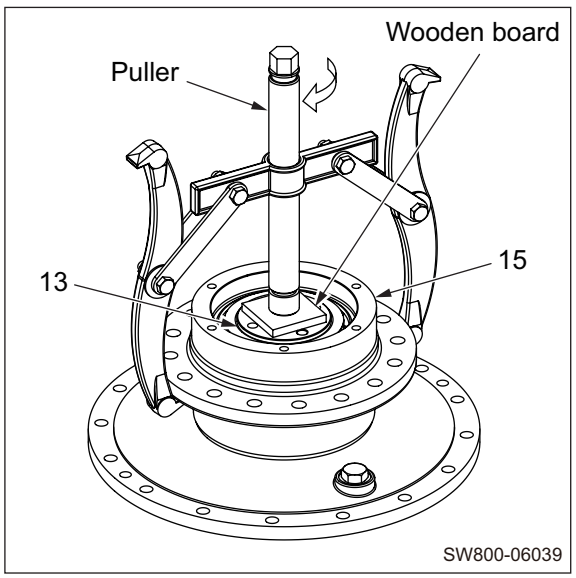
25) Disassembly of axle shaft SUBASSY
(From step 9))
- Remove bolts (36).
- Remove cover (35).



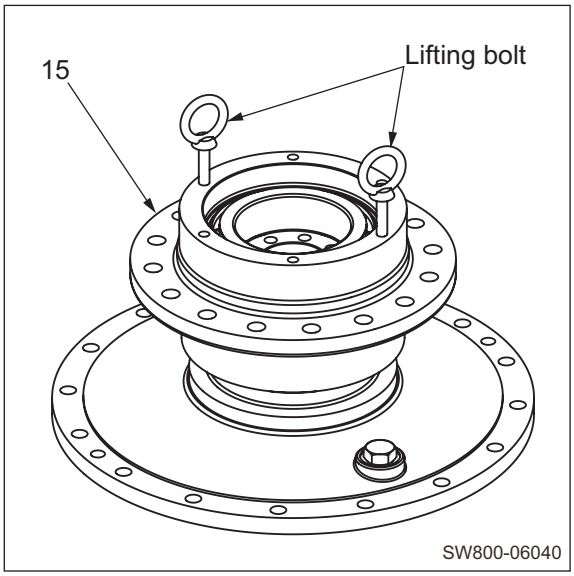
26) Remove bolts (28).
- Remove cover (29).
- Remove shim (26).



27) Put a piece of wooden board on end of axle shaft (13).
- Set a puller on housing (15).
- Remove housing SUBASSY with roller bearing from axle shaft SUBASSY.

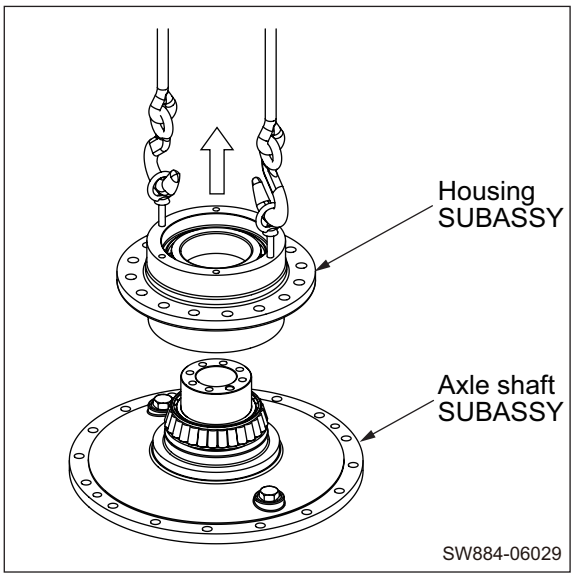


28) Install lifting bolts (M12) to housing (15).



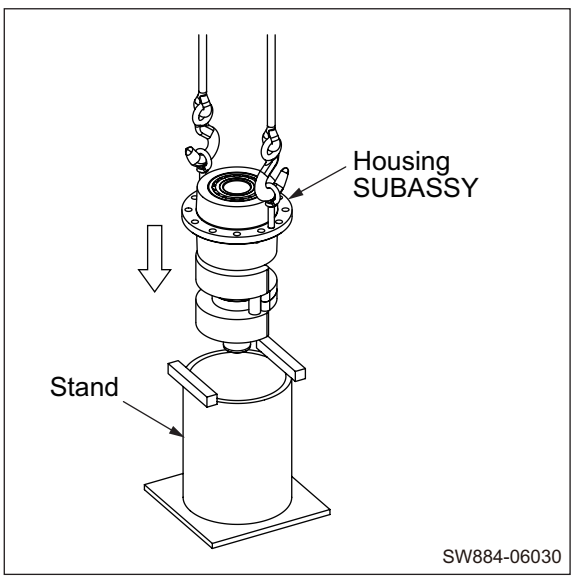
29) Remove housing SUBASSY from axle shaft SUBASSY.

kg Housing SUBASSY : 45 kg (99 lbs.)

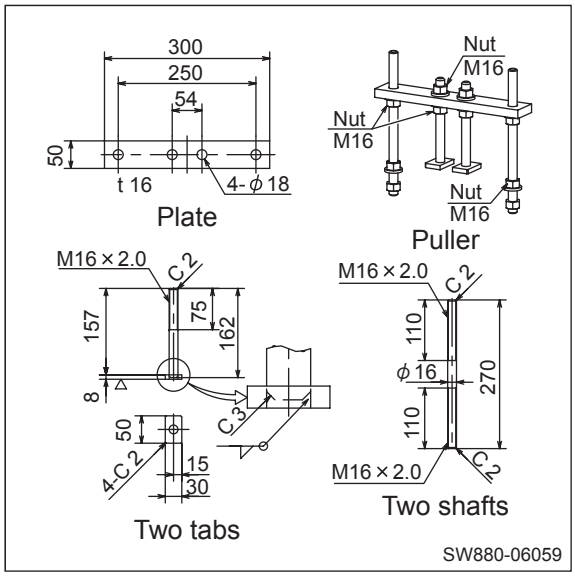


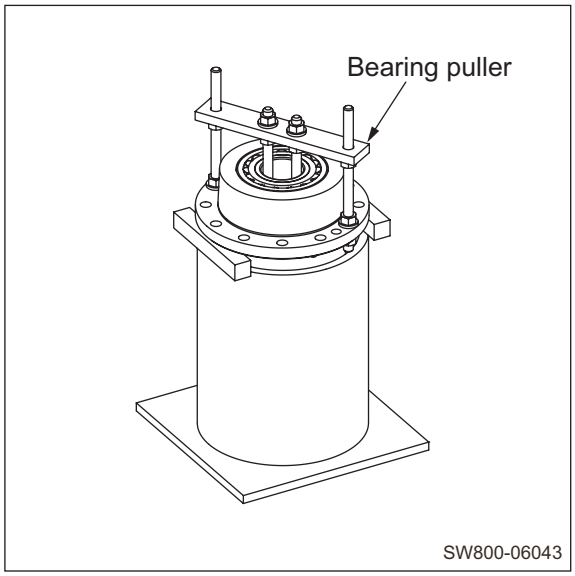
30) Put housing SUBASSY on a stand as shown.
(From step 14))

kg Housing SUBASSY : 90 kg (198 lbs.)



31) Set up a bearing puller.

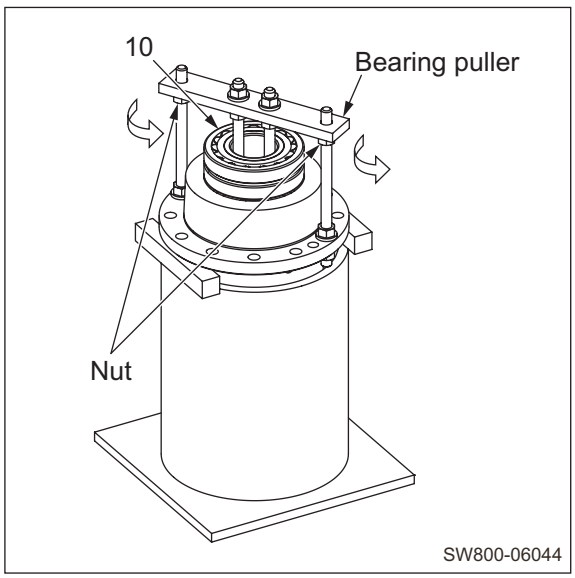




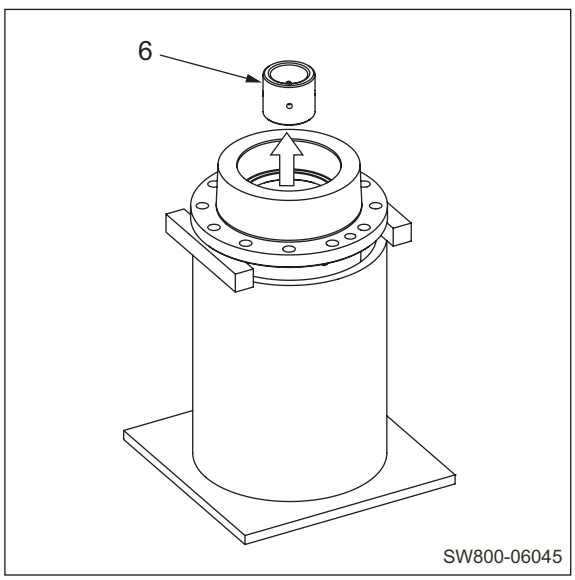
32) Turn nuts of bearing puller counterclockwise to remove vibrator bearing (10).

(NOTICE)

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

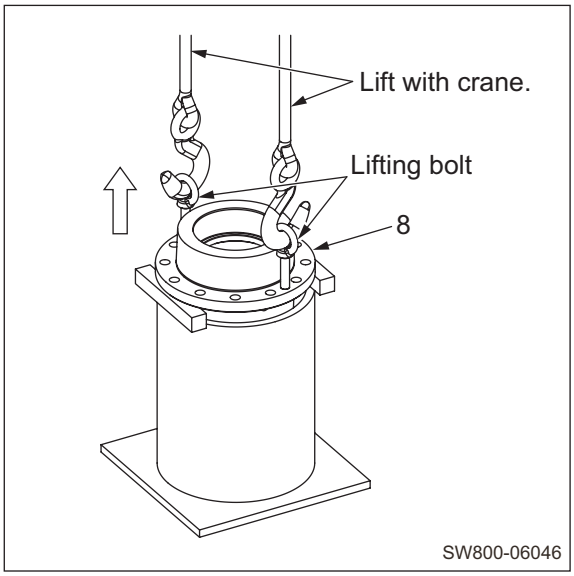


33) Remove sleeve (6).

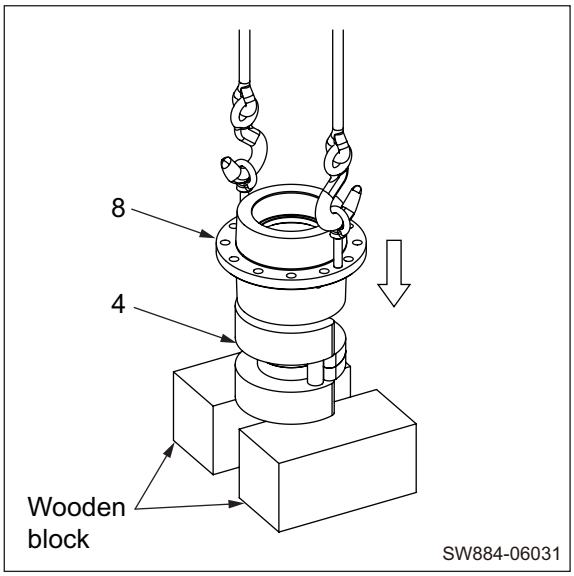


34) Install lifting bolts (M16) to housing (8).
- Remove housing.

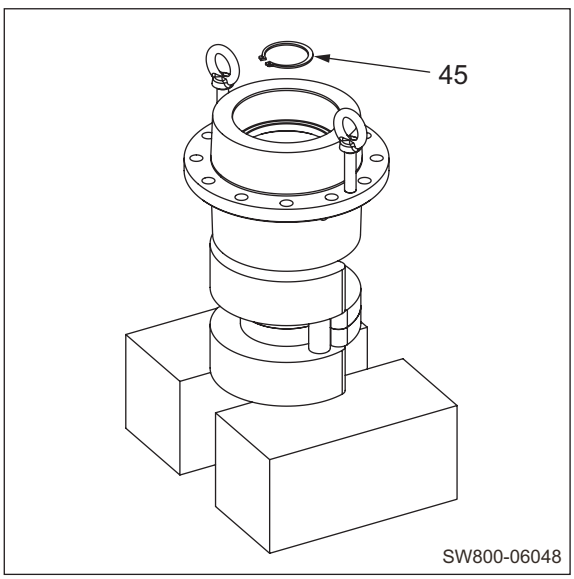
(8) Housing : 85 kg (187 lbs.)



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

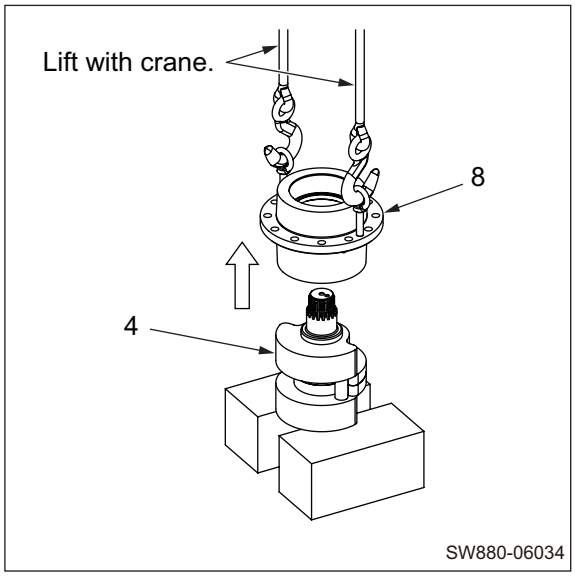


36) Remove retaining ring (45).

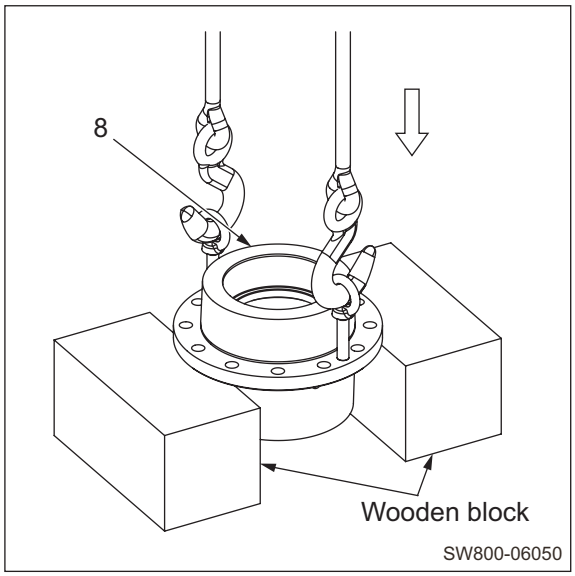


37) Remove housing (8) from eccentric shaft (4).

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



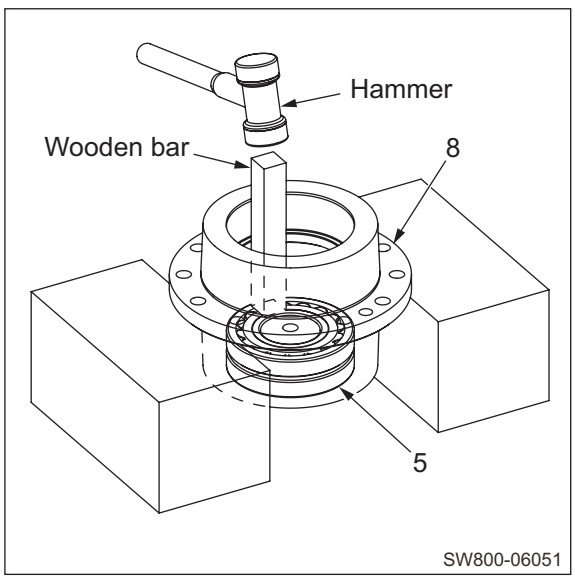
38) Put housing (8) on wooden blocks.



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

(NOTICE)

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



3-2-2. Reassembly of vibratory drum

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

⚠WARNING

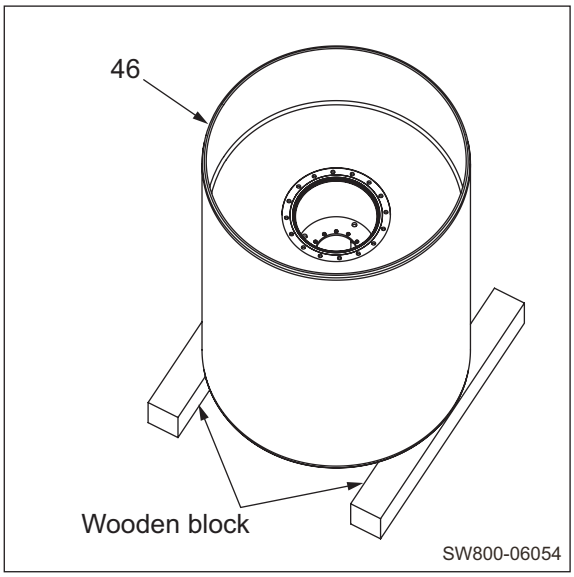
- **When standing the drum, use wooden blocks of sufficient strength to securely support the drum.**
- **Carry out the work in an unstrained posture using a work stool or the like.**

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

(NOTICE)

- **The side on which no ϕ10 round bar is installed is the propulsion motor side.**

kg (46) Drum
SW884 : 2,245 kg (4,949 lbs.)
SW994 : 2,355 kg (5,192 lbs.)

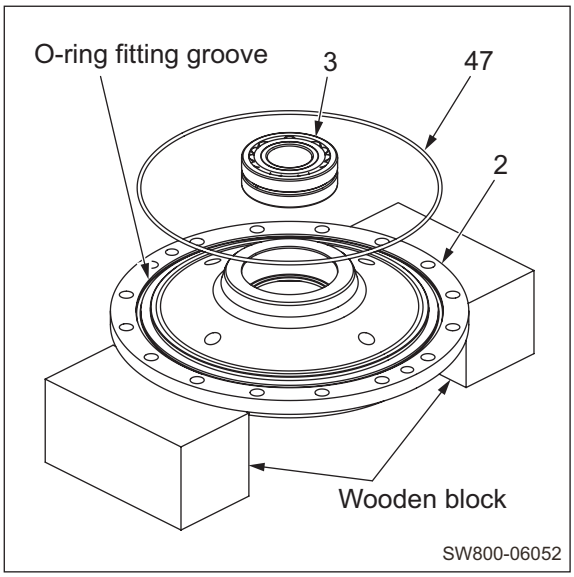


2) Reassembly of housing SUBASSY
- Apply a coat of gear oil to housing (2) at where vibrator bearing will be press-fitted.
- Drive vibrator bearing (3).

(NOTICE)

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

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



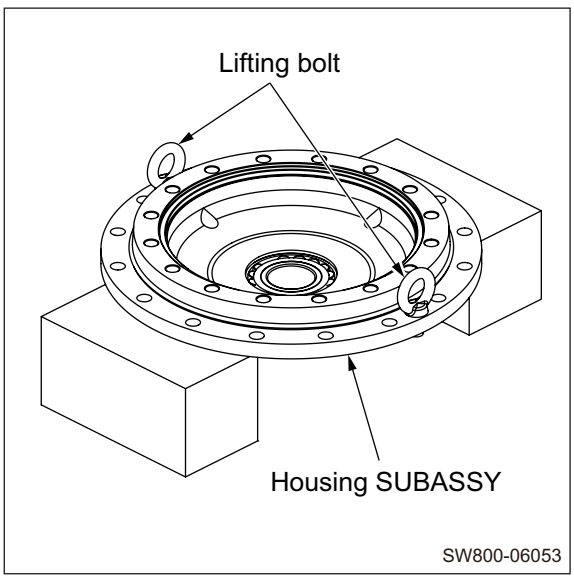
⚠WARNING

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

- Reverse housing SUBASSY.

kg Housing SUBASSY : 75 kg (165 lbs.)

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

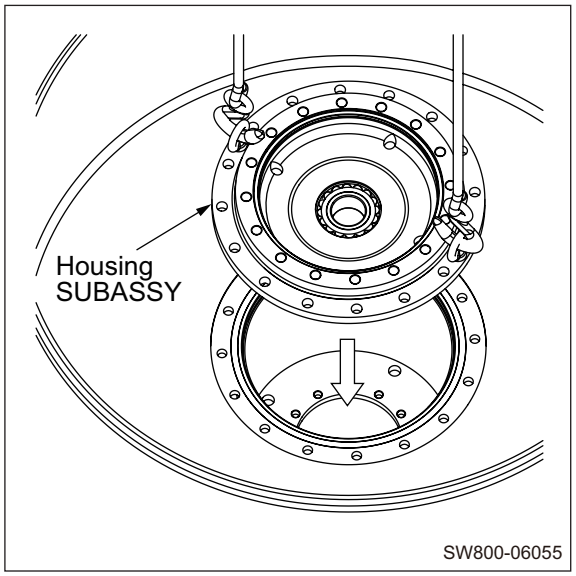


3) Install housing SUBASSY.

Housing SUBASSY : 75 kg (165 lbs.)

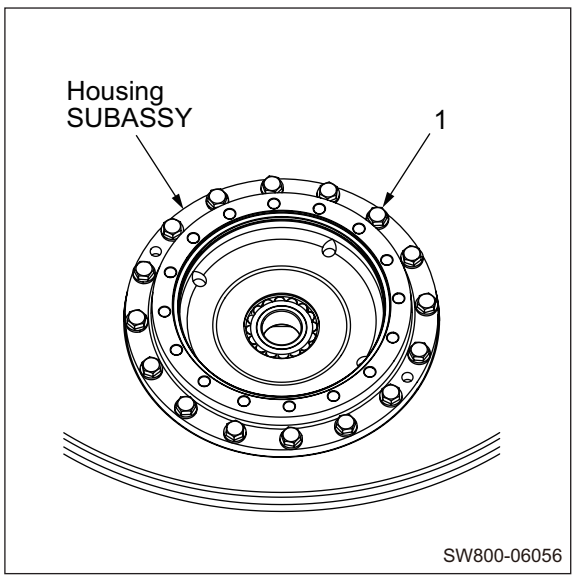
(NOTICE)

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

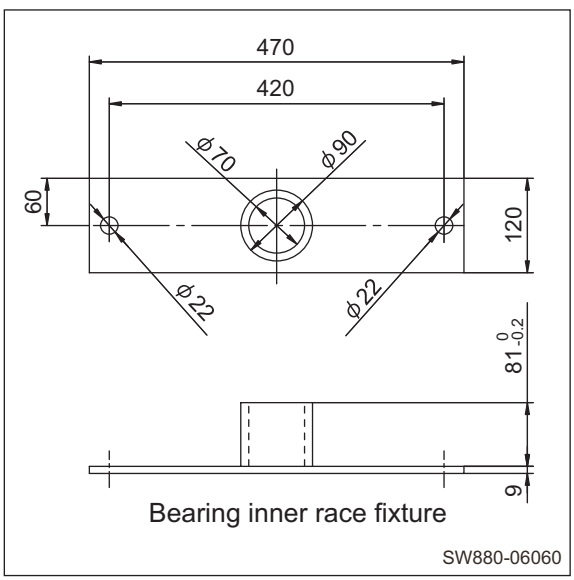


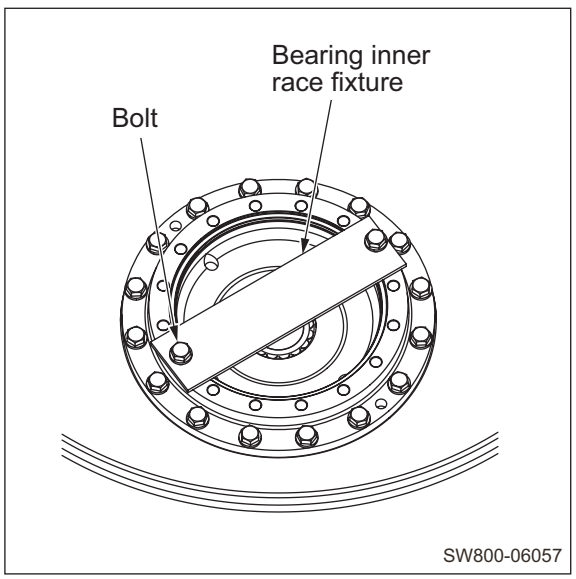
4) Secure housing SUBASSY with sixteen bolts (1) and washers.

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

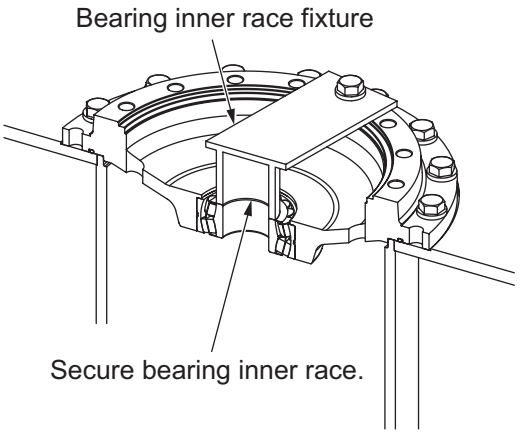


5) Attach a bearing inner race fixture to housing SUBASSY with two bolts (M20×35) and washers.





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



SW800-06058

⚠WARNING

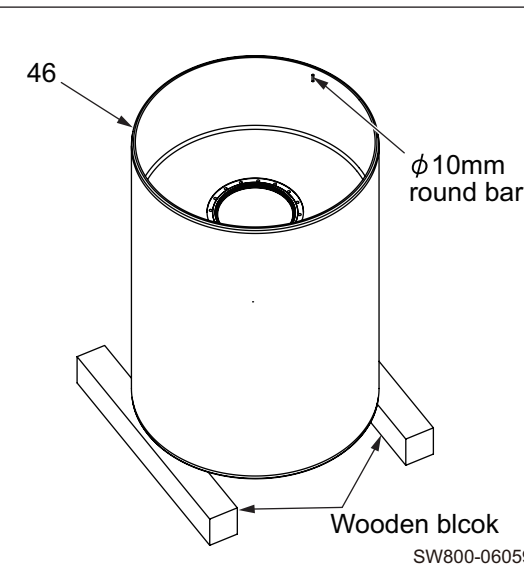
Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

7) Reverse drum SUBASSY.

(NOTICE)

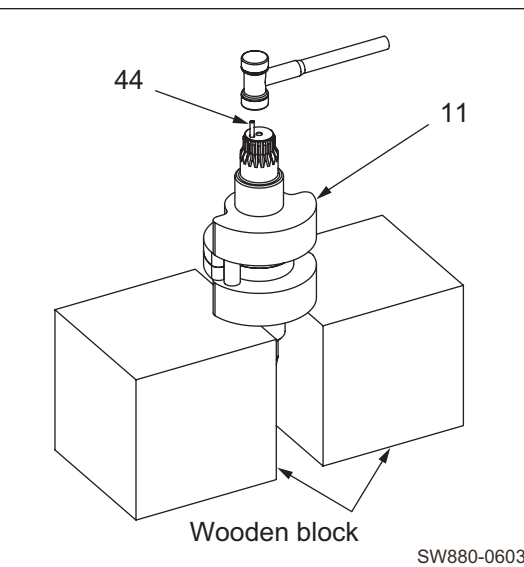
- **The side on which a ϕ10 round bar is installed is the vibrator motor side.**

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



SW800-06059

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



SW880-06035

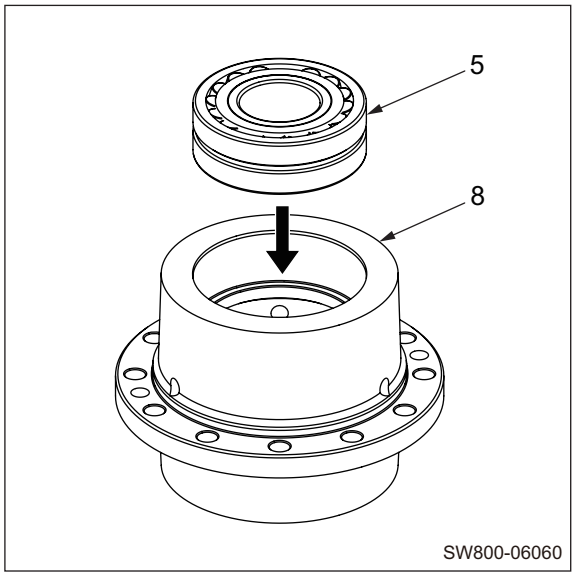
9) Reassembly of eccentric shaft SUBASSY

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

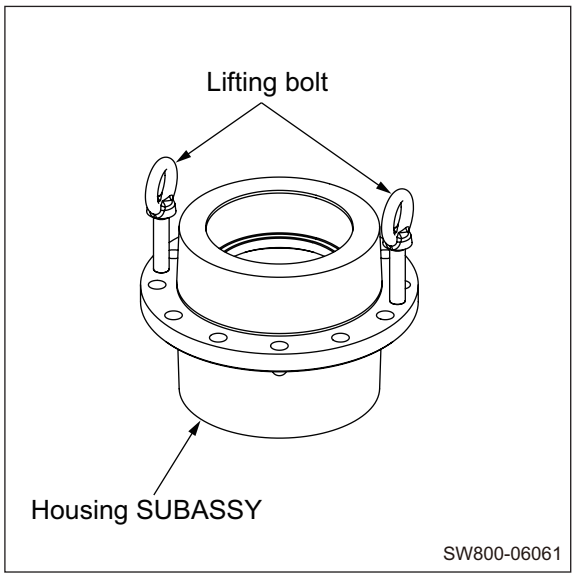
- Drive vibrator bearing (5).
- Apply a coat of gear oil to inner surface of vibrator bearing.

(NOTICE)

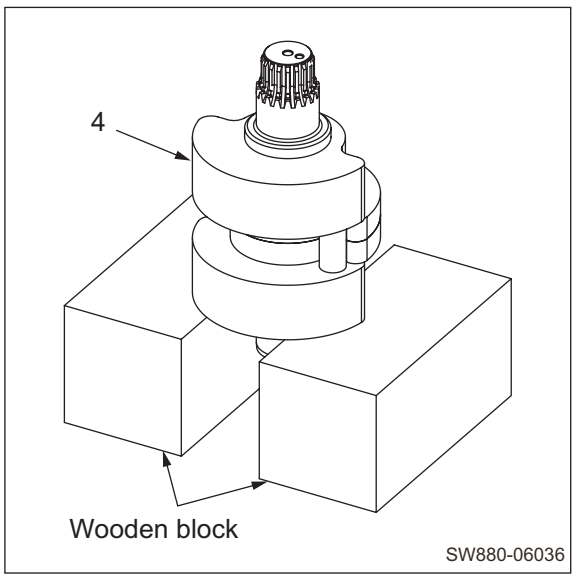
- **Take care not to damage the bearing when installing it.**



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



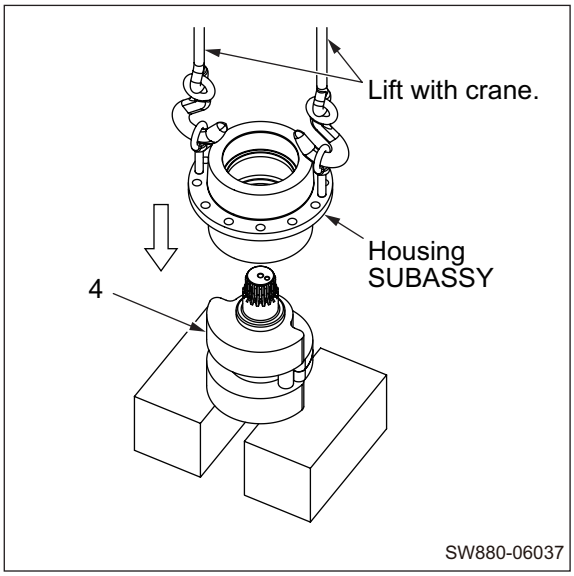
③ Put eccentric shaft (4) (propulsion motor side) on wooden blocks with its splined position facing up.



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

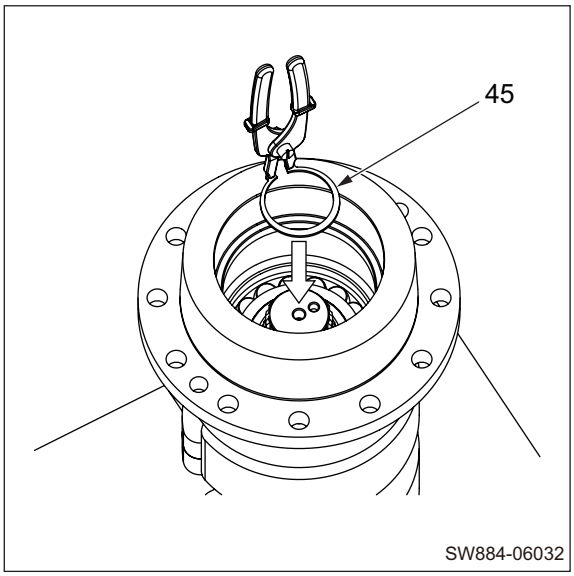
(NOTICE)
- **Install the housing SUBASSY taking care not to tilt the vibrator bearing inner race.**

Housing SUBASSY : 40 kg (88 lbs.)



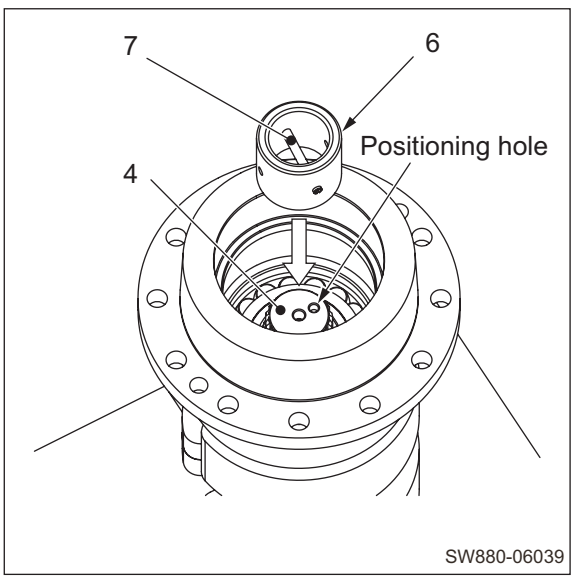
⑤ Install retaining ring (45).

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



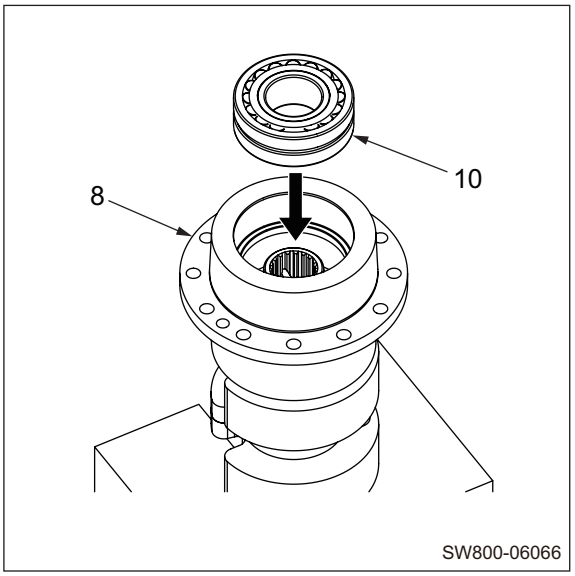
⑥ Drive spring pin (7) into sleeve (6).
- Apply gear oil to inner surface of sleeve.
- Apply gear oil to splined portion of eccentric shaft (4).
- Install sleeve.

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



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

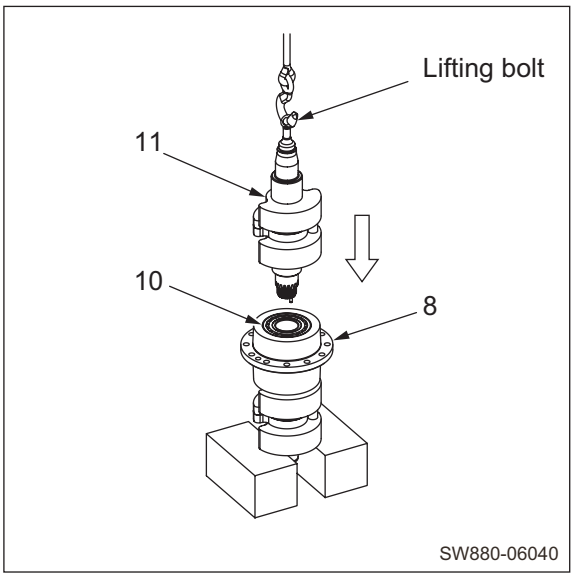
(NOTICE)
- **Take care not to damage the bearing when installing it.**



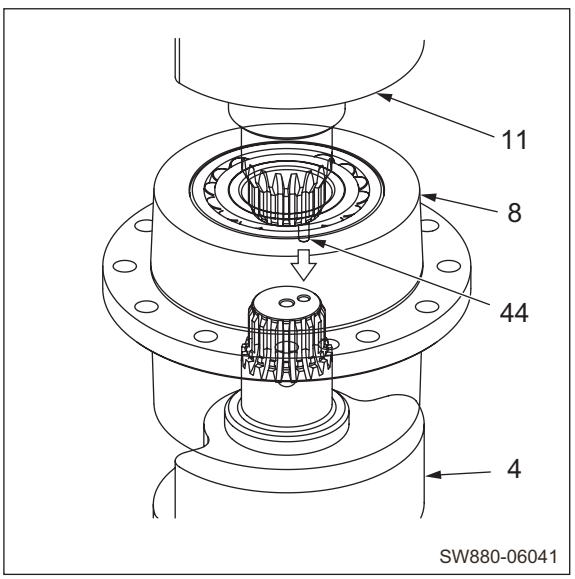
⑧ Install a lifting bolt (M8) to eccentric shaft (11).
- Apply a coat of gear oil to eccentric shaft at where bearing will be installed.
- Install eccentric shaft.

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

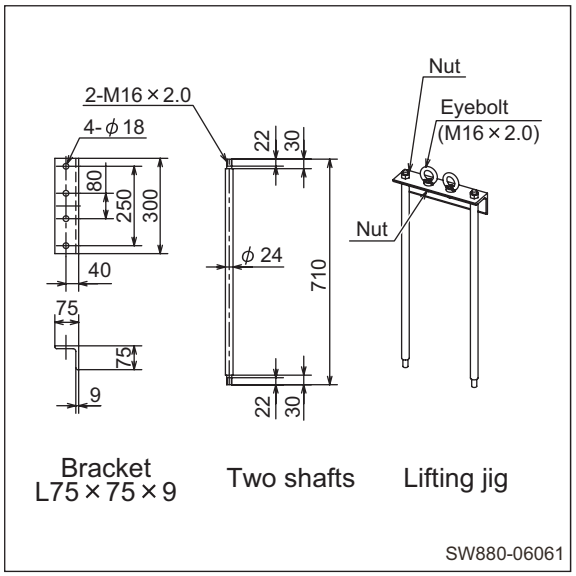
(11) Eccentric shaft : 55 kg (121 lbs.)

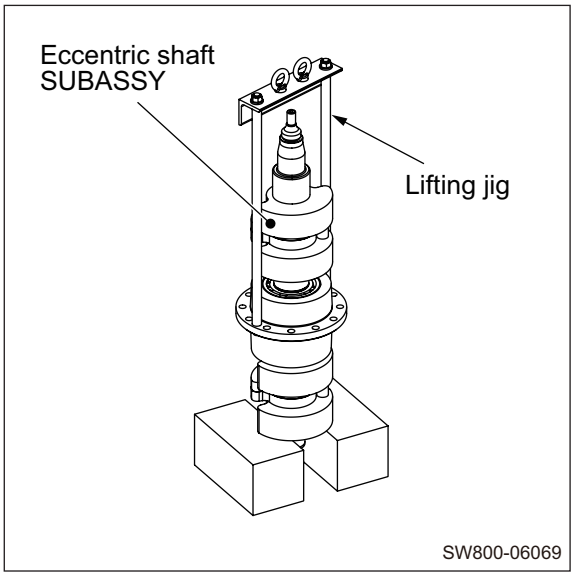


⑨ When installing eccentric shaft (11) in housing (8), insert spring pin (44) on shaft into positioning hole in eccentric shaft (4).



10) Attach a lifting jig to eccentric shaft SUBASSY.

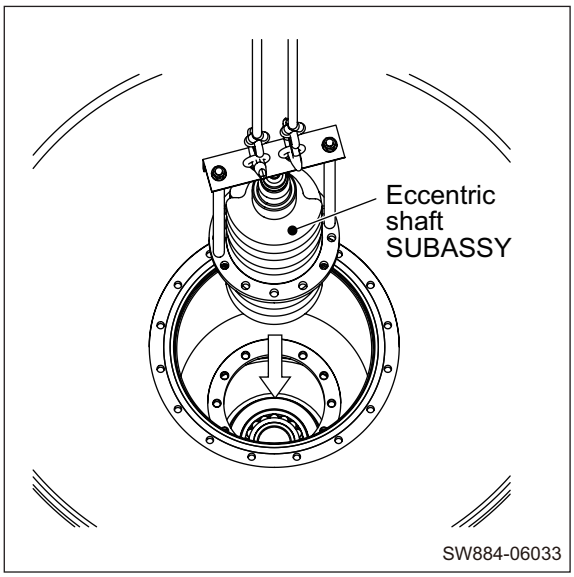




11) Apply a coat of gear oil to eccentric shaft SUBASSY at where bearing will be installed.

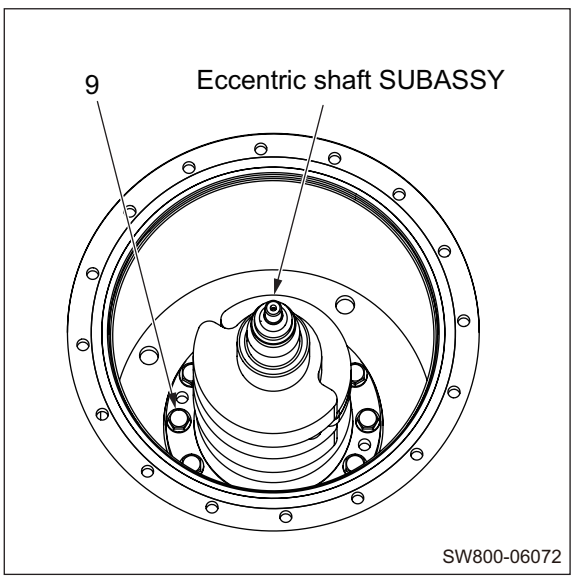
- Slowly lift eccentric shaft SUBASSY with a crane and install it to drum SUBASSY.

Eccentric shaft SUBASSY : 155 kg (342 lbs.)



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

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



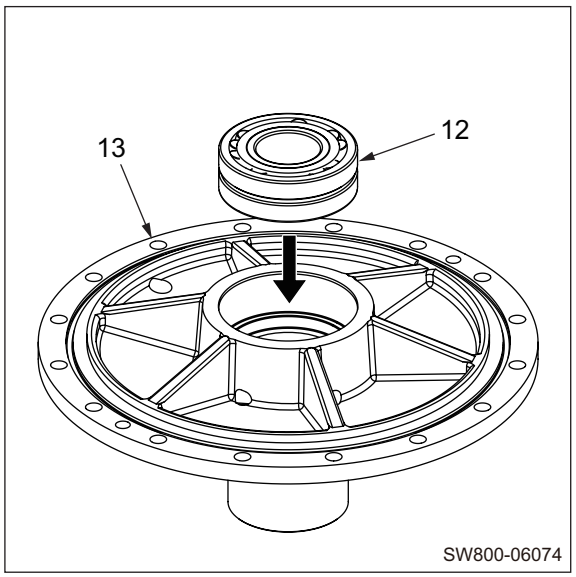
13) Reassembly of axle shaft SUBASSY

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

- Drive vibrator bearing (12).

(NOTICE)

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



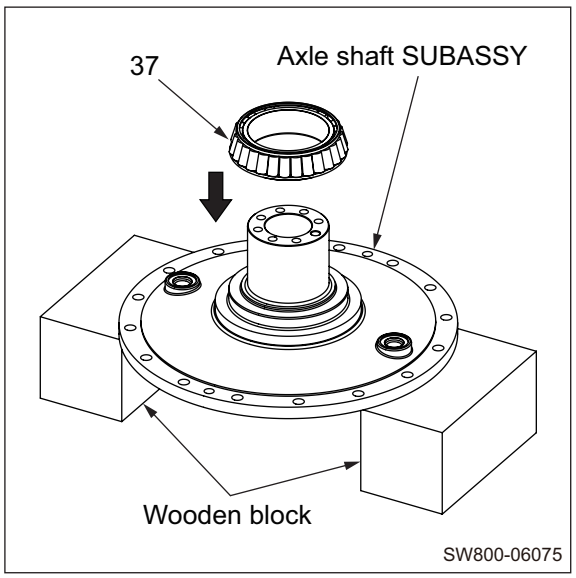
⚠WARNING

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

13-2) Reverse axle shaft SUBASSY.

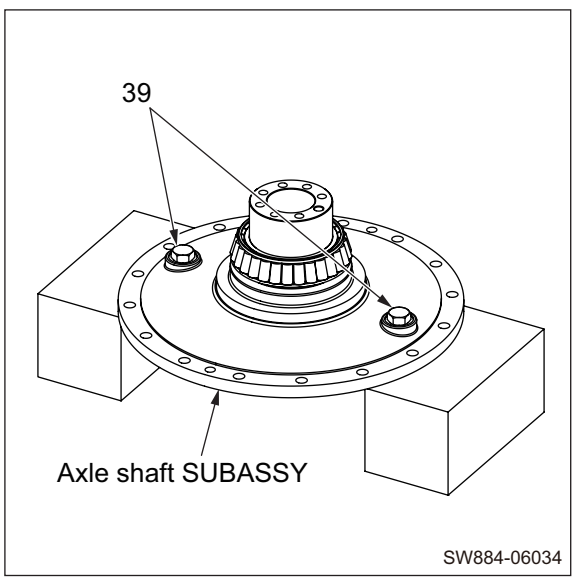
Axle shaft SUBASSY : 75 kg (165 lbs.)

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

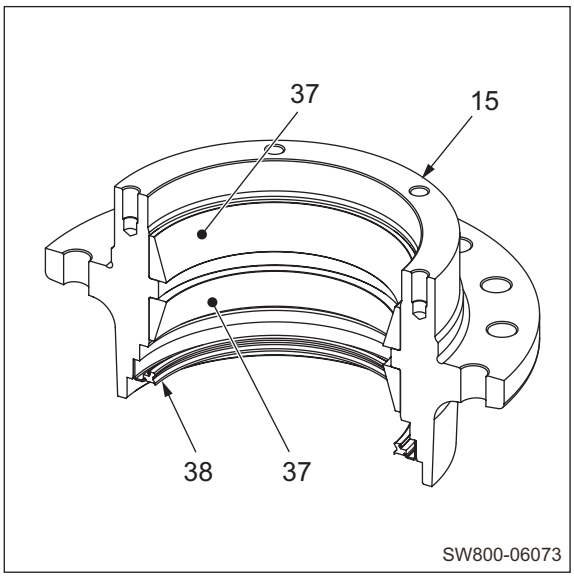


13-3) Apply grease to O-rings for plugs (39).

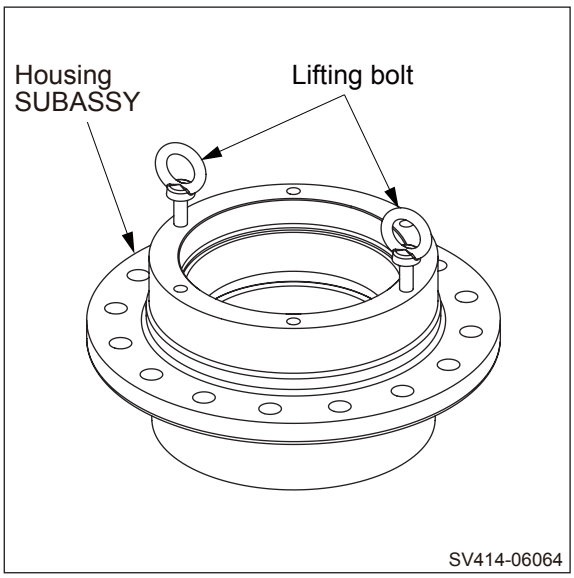
- Install plugs.



13-4) Apply a coat of gear oil to roller bearings (37) outer race mounting surface of housing (15).
- Drive roller bearing outer races.
- Apply liquid packing to periphery of oil seal (38).
- Drive oil seal.
- Apply grease to lip of oil seal.

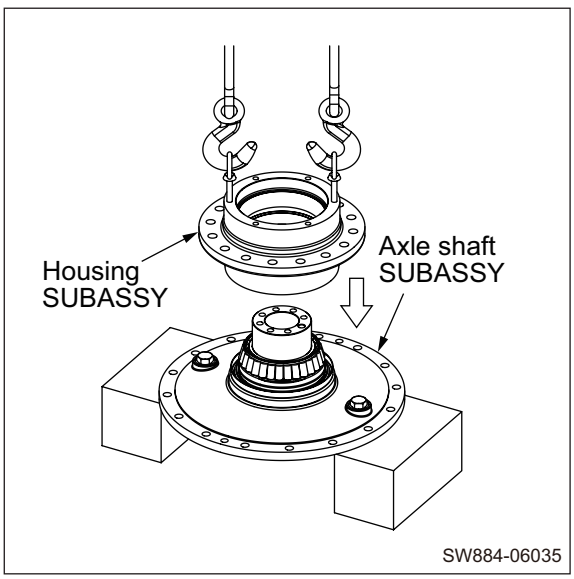


13-5) Install lifting bolts (M12).

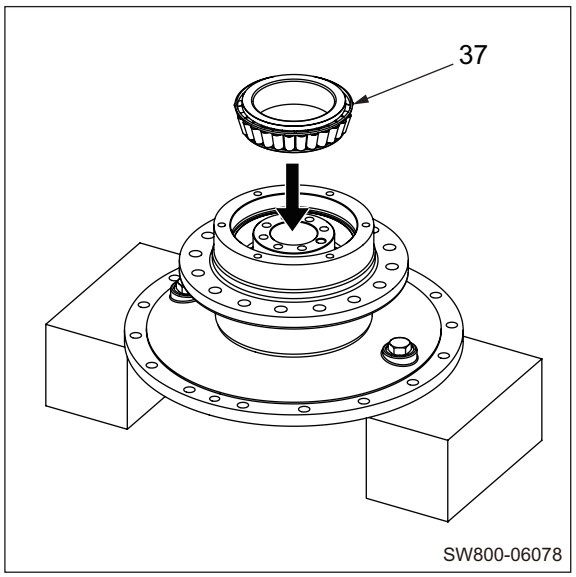


13-6) Install housing SUBASSY to axle shaft SUBASSY.

Housing SUBASSY : 40 kg (88 lbs.)

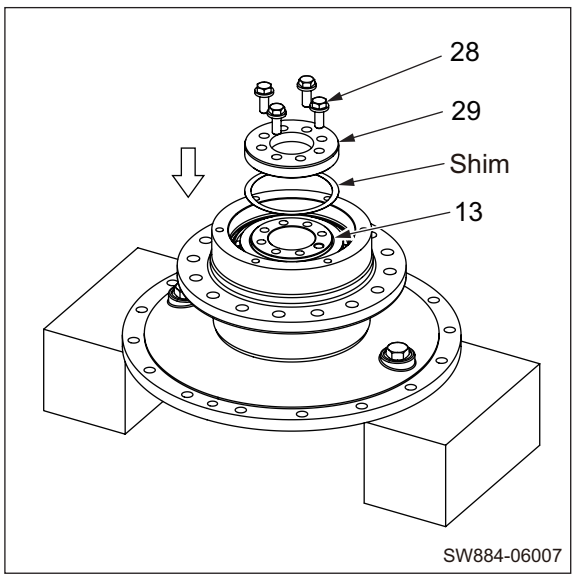


13-7) Apply sufficient amount of lithium-based grease to rollers of roller bearing (37) inner race.
- Drive in roller bearing inner race until rollers come in contact with outer race.



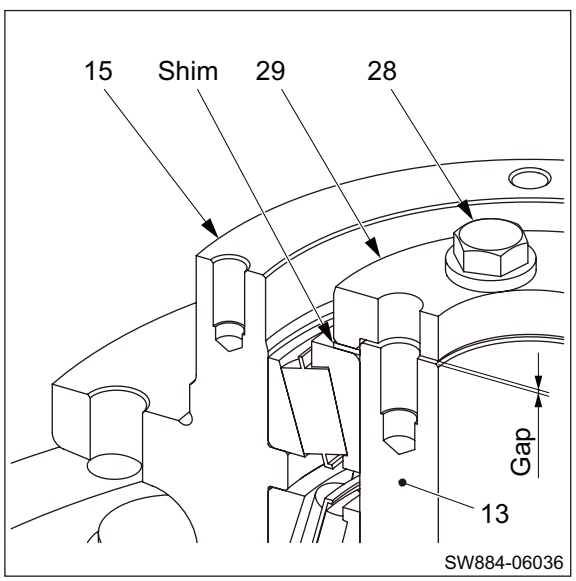
13-8) Preload adjustment of roller bearing

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



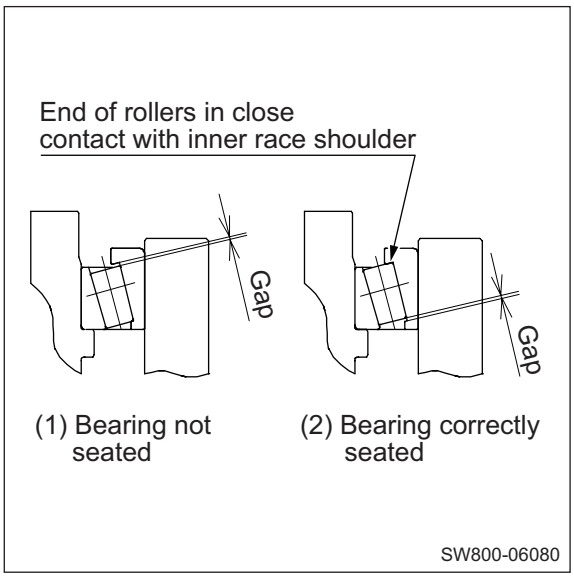
② A gap will remain between end of axle shaft (13) and inside of cover (29).
- Tighten bolts (28) to a torque of 30 N·m (22 lbf·ft).
- Give housing (15) two to three turns.
- Tighten bolts to a torque of 30 N·m (22 lbf·ft) again.
- Repeat this work several times until tightening torque of bolts no longer fluctuates.

(NOTICE)
- **Tighten the bolts alternately in diagonal directions.**



(NOTICE)

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

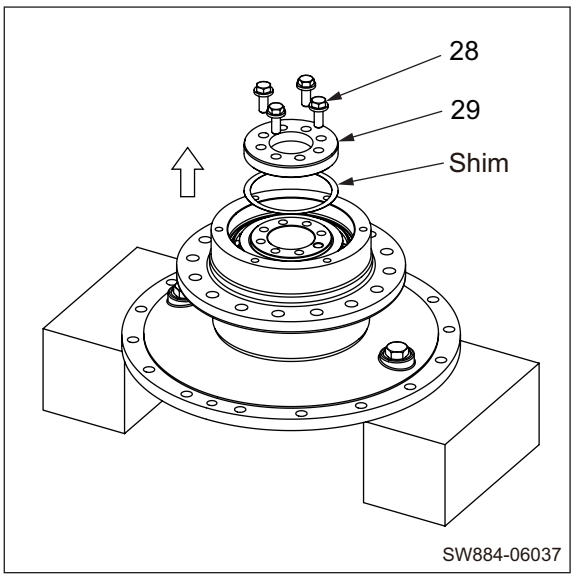


③ Remove bolts (28).

- Remove cover (29).
- Remove shim.

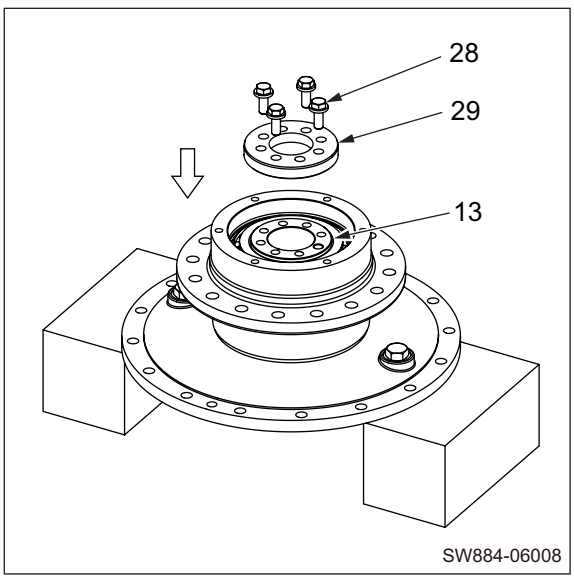
(NOTICE)

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



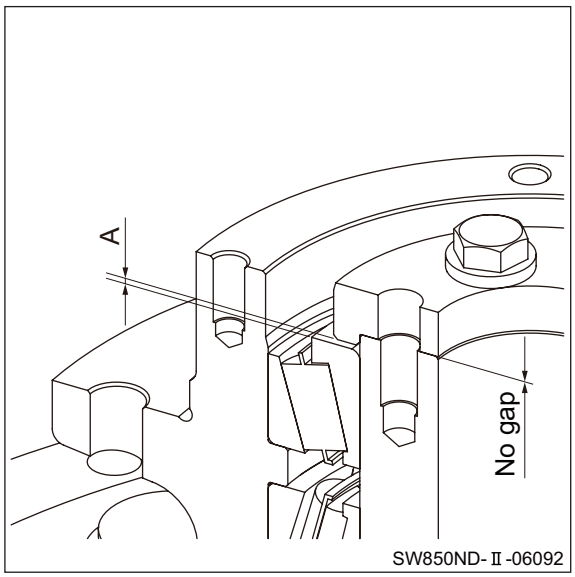
④ Without inserting shim, install cover (29).

- Install washers to four bolts (28) and tighten.

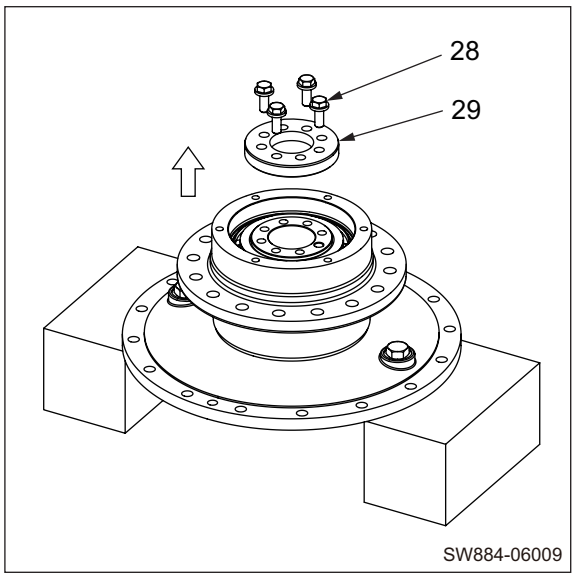


⑤ Using a thickness gauge, measure clearance “A”.

★ **Preload adjusting shim thickness** **= A + 0.2 mm (0.008 in.)**

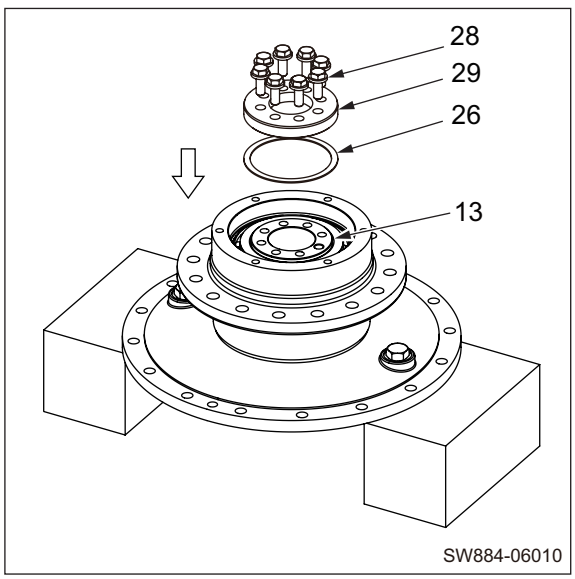


⑥ Remove bolts (28).
- Remove cover (29).

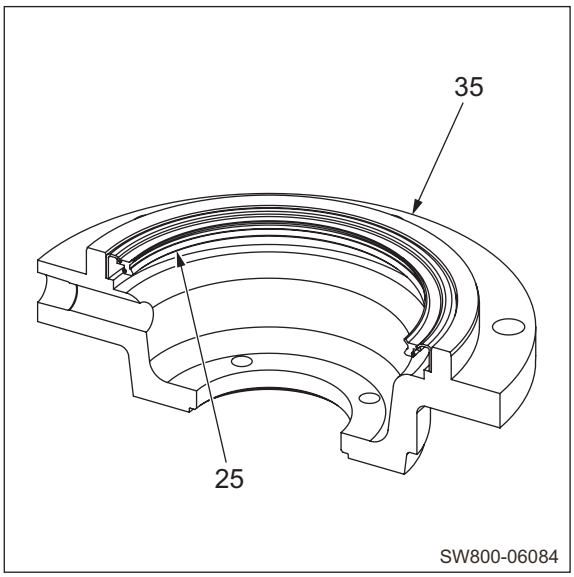


⑦ Install shim (26) of preload adjusting shim thickness = “A + 0.2 mm (0.008 in.)”.
- Secure cover (29) to axle shaft (13) with eight bolts (28) and washers.

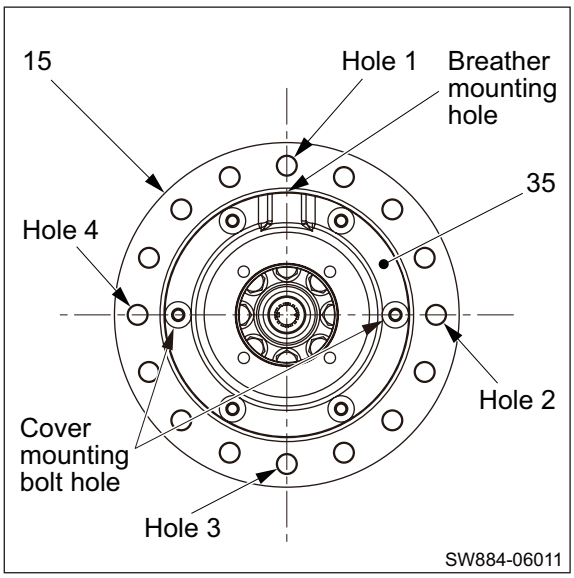
N•m (28) Bolts M14×40 : 170 N·m (125 lbf·ft)



13-9) Apply liquid packing to periphery of oil seal (25).
- Drive in oil seal to cover (35).
- Apply grease to lip of oil seal.

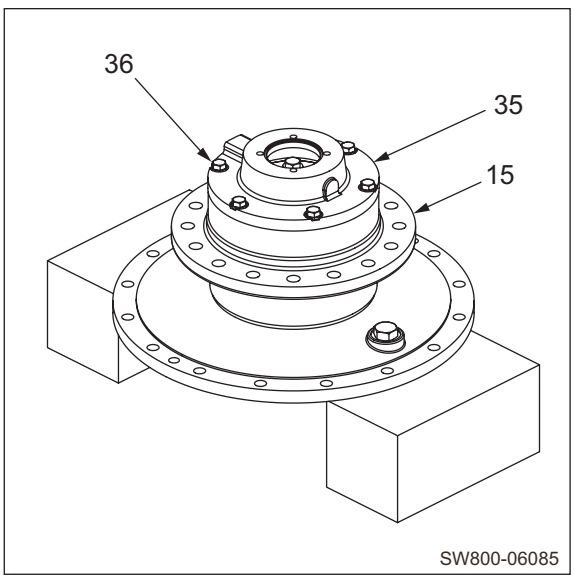


(NOTICE)
- **The four holes in housing (15), breather mounting hole in cover (35), and cover mounting bolt holes must be arranged as shown on the right.**

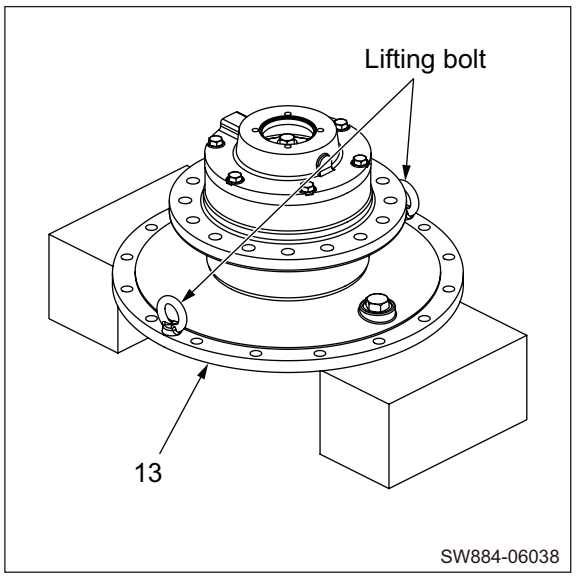


13-10) Apply a coat liquid packing to housing (15) at where cover (35) will be installed.
- Secure cover to housing with six bolts (36) and spring washers.

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



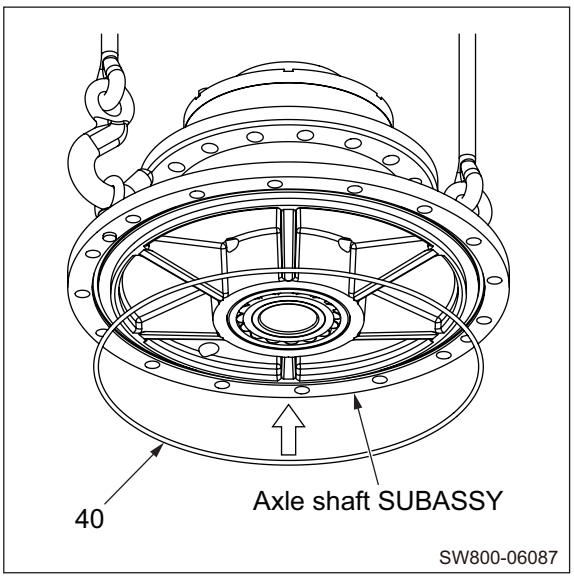
14) Install lifting bolts (M16) to axle shaft (13).



15) Lift axle shaft SUBASSY.

Axle shaft SUBASSY : 135 kg (298 lbs.)

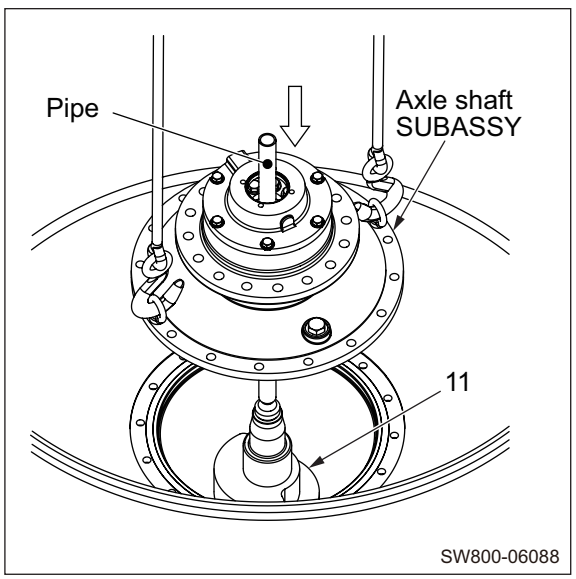
- Apply grease to O-ring (40).
- Install O-ring.



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

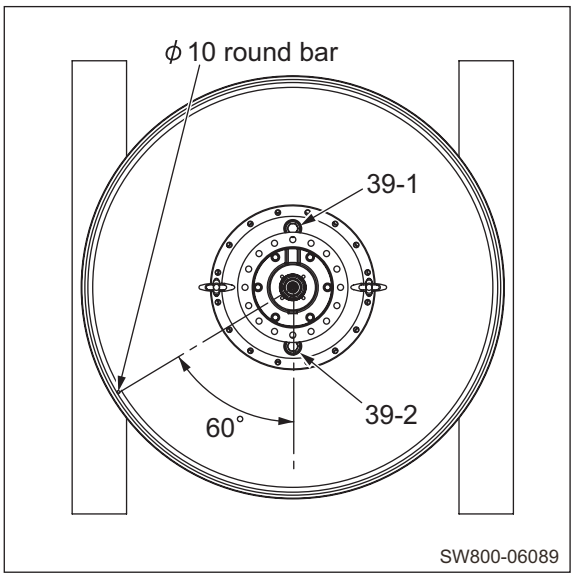
(NOTICE)

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



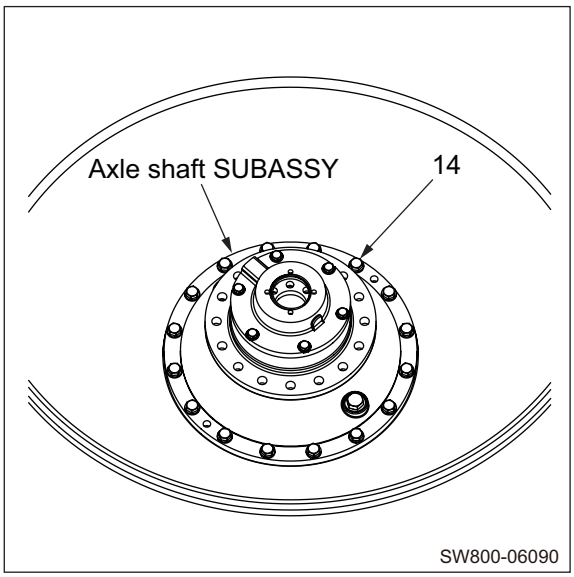
(NOTICE)

- **When installing the axle shaft SUBASSY, pay attention to the positional relationship between the ϕ10 round bar on the drum and the plugs (39-1) and (39-2).**

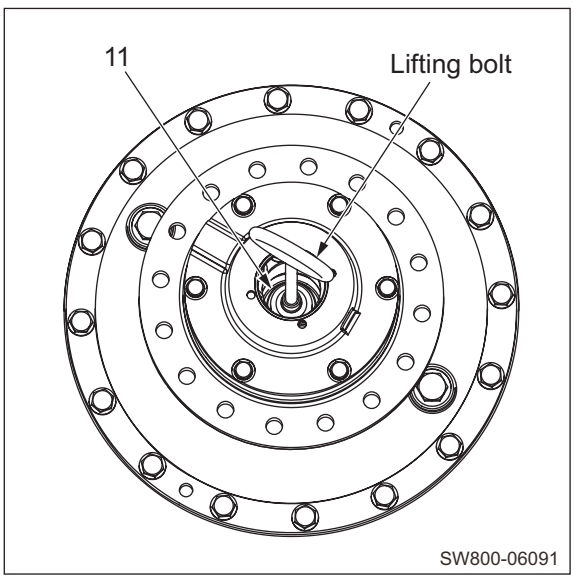


17) Secure axle shaft SUBASSY with sixteen bolts (14) and washers.

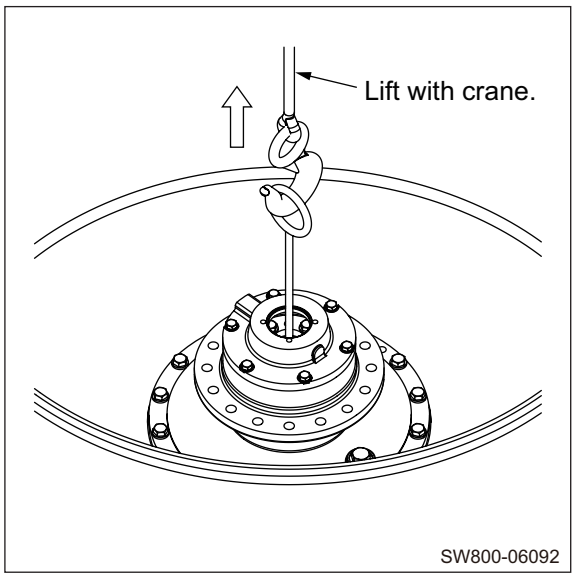
N•m (14) Bolts M16×50 : 265 N·m (195 lbf·ft)



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



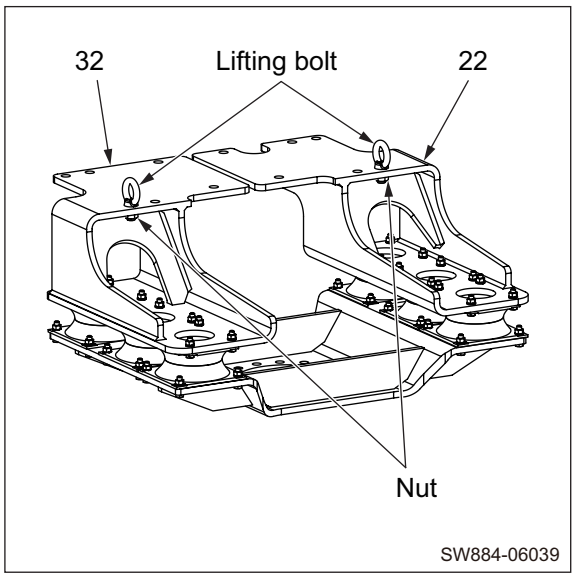
19) Slowly lift eccentric shaft with a crane and check that there is an axial play of 1 to 2 mm (0.04 to 0.08 in.).



⚠WARNING

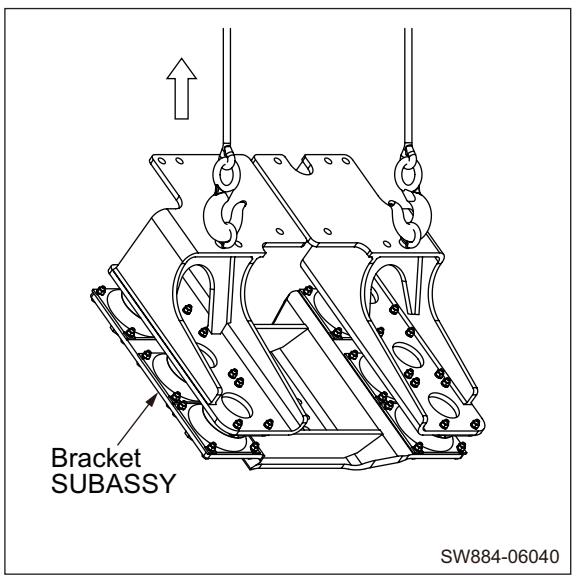
When installing lifting bolts, screw them with nuts.

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



21) Lift bracket SUBASSY.

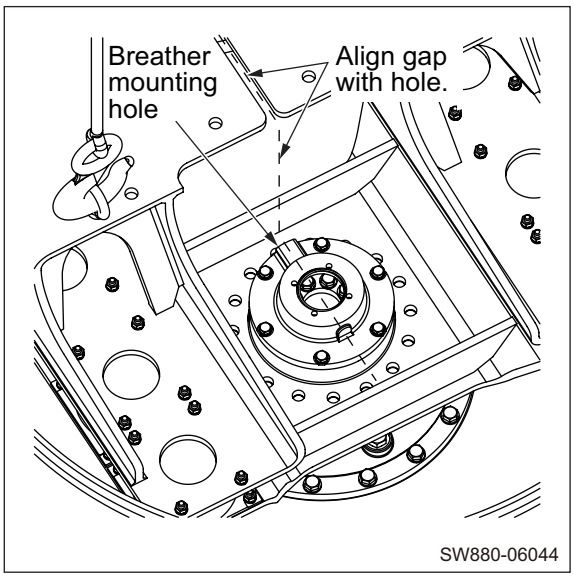
Bracket SUBASSY
SW884 : 285 kg (628 lbs.)
SW994 : 290 kg (639 lbs.)



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

(NOTICE)

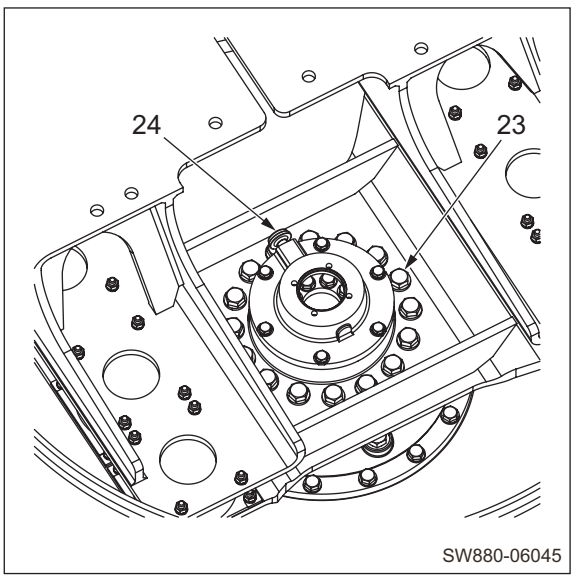
- **Since the bracket SUBASSY cannot be lowered in a level position, lower them using a support or like.**
- **Be sure to install the bracket SUBASSY correctly in relation to the position of the breather mounting hole in the cover.**



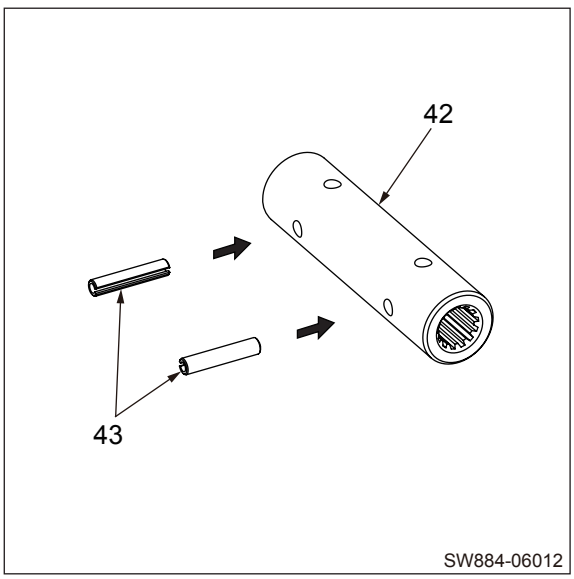
23) Secure bracket SUBASSY with sixteen bolts (23) and washers.

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

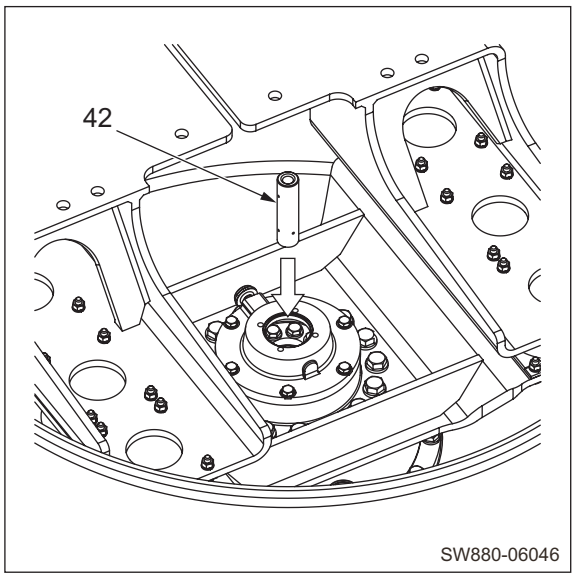
- Wind seal tape around threaded portion of breather (24).
- Install breather.



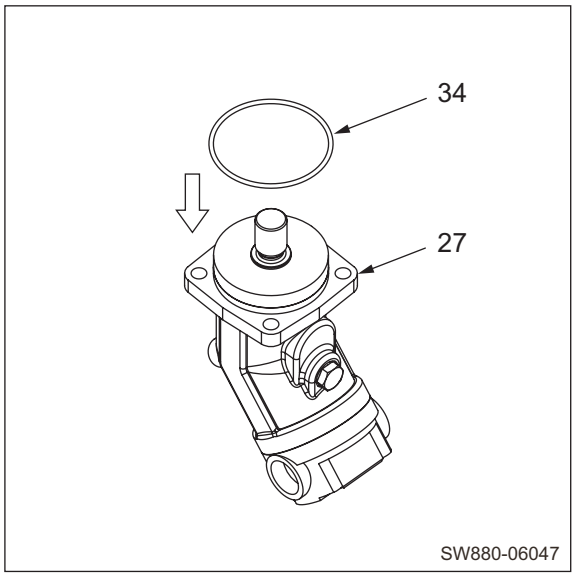
24) Drive two spring pins (43) into sleeve (42).



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



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

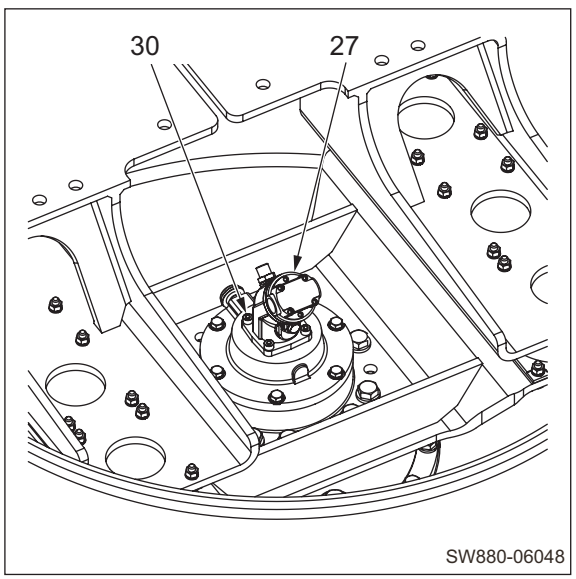


27) Secure vibrator motor (27) to cover (29) with four bolts (30).

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

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

(NOTICE)
- **Take care not to let O-ring to protrude from its groove.**

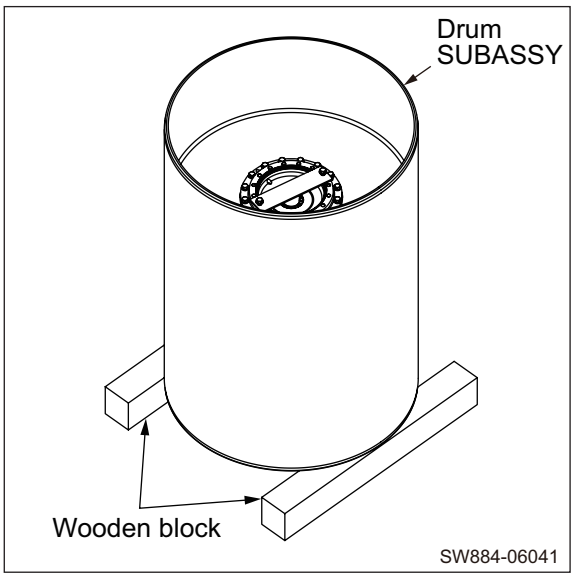


⚠WARNING

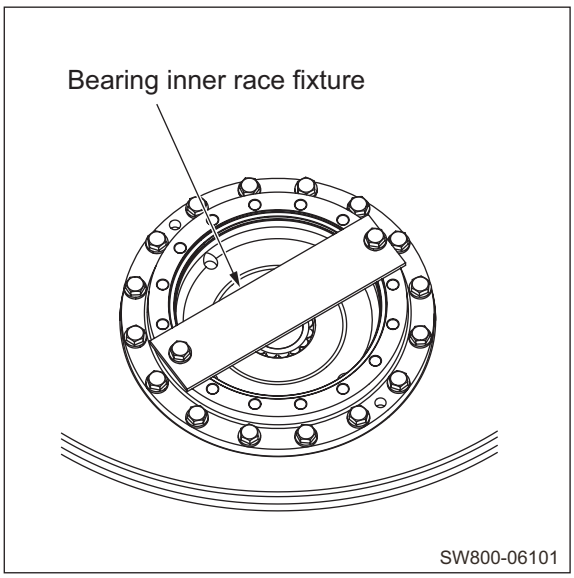
Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

28) Reverse drum SUBASSY.

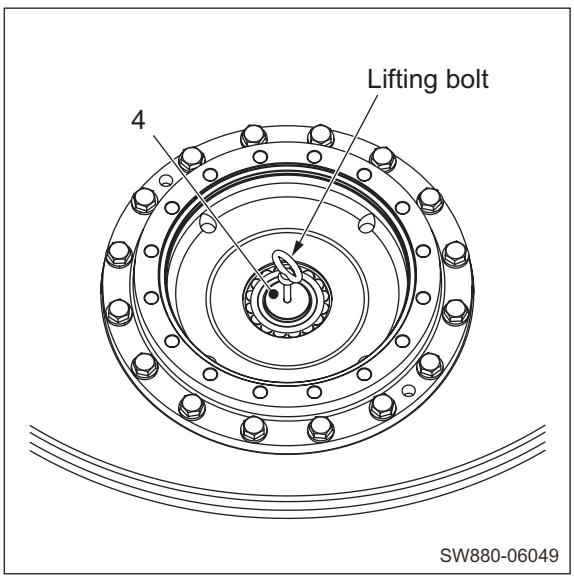
Drum SUBASSY
SW884 : 2,910 kg (6,415 lbs.)
SW994 : 3,025 kg (6,669 lbs.)



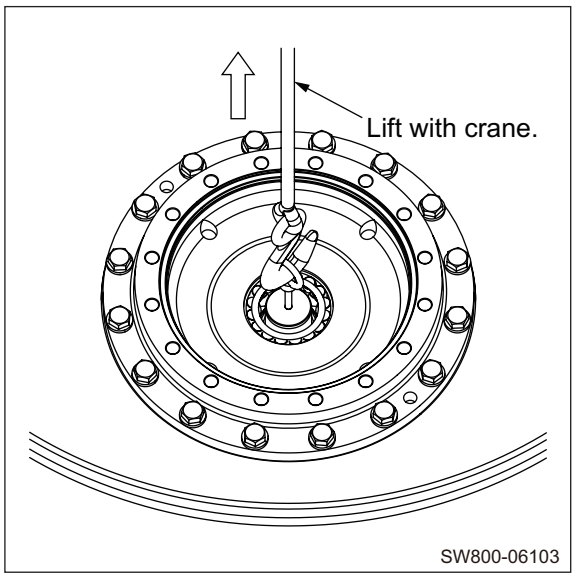
29) Remove bearing inner race fixture.



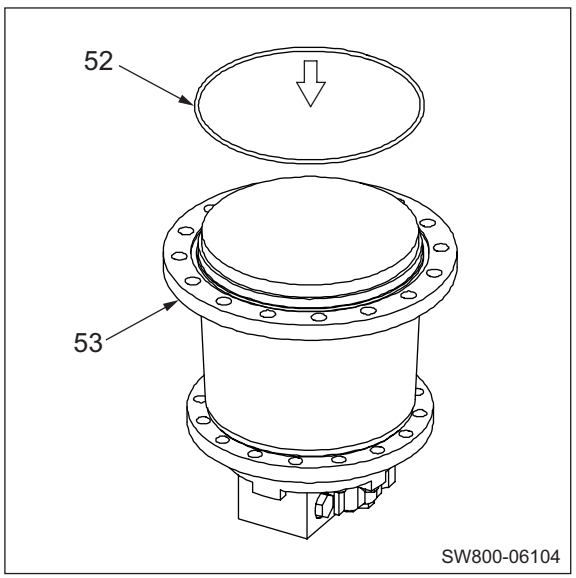
30) Install a lifting bolt (M10) to end of eccentric shaft (4).



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



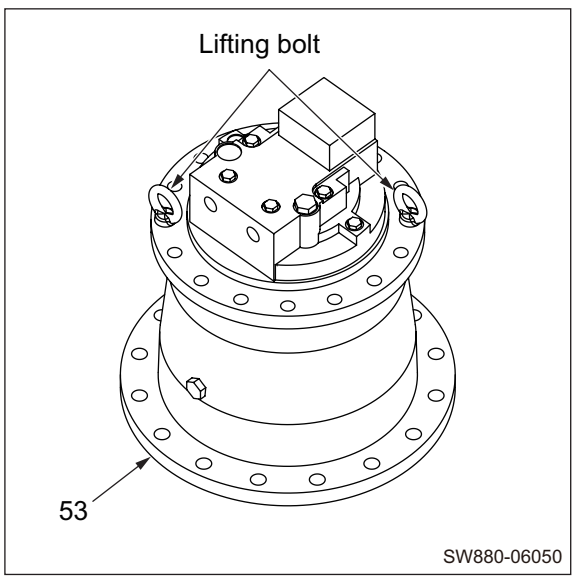
32) Apply grease to O-ring (52).
- Install O-ring to propulsion motor (53).



33) Reverse propulsion motor (53).

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

- Install lifting bolts (M20).

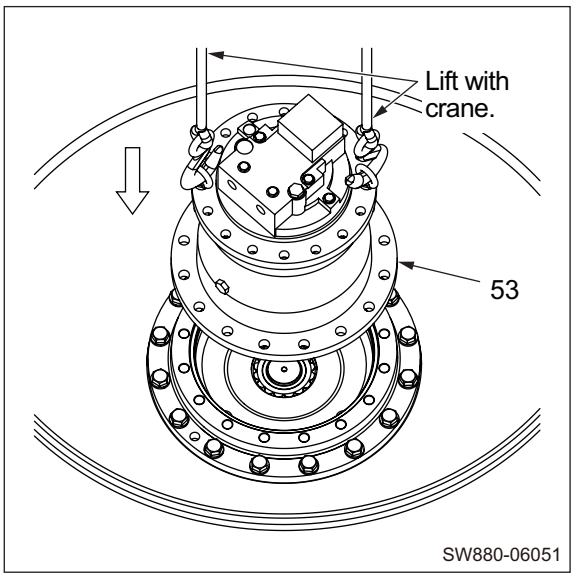


34) Install propulsion motor (53).

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

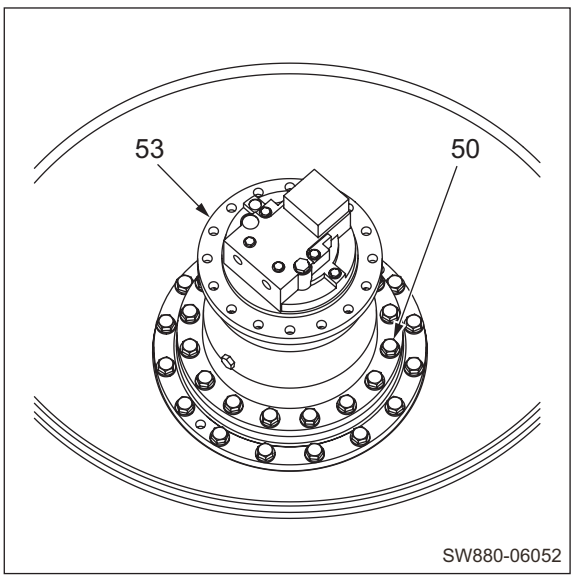
(NOTICE)

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

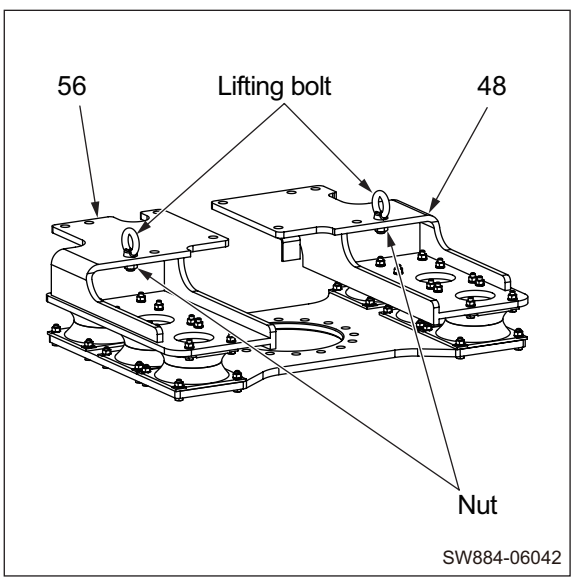


35) Secure propulsion motor (53) with sixteen bolts (50) and washers.

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

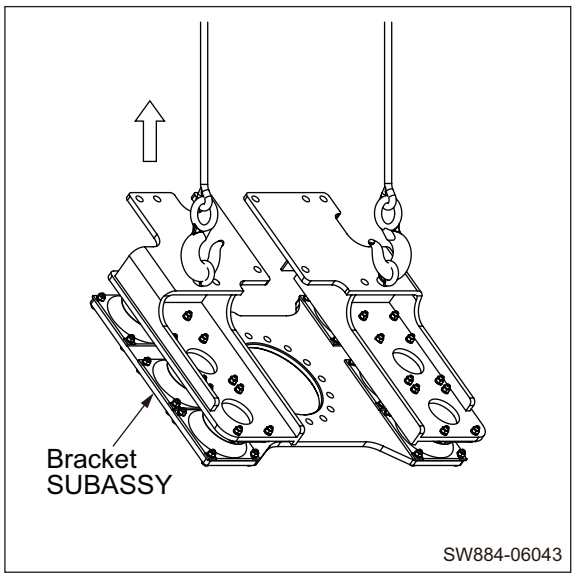


36) Install lifting bolts (M22) to brackets (48) and (56) with nuts.



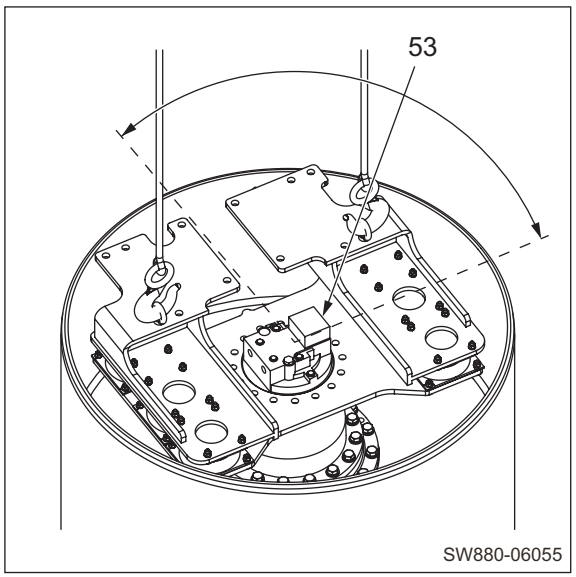
37) Lift bracket SUBASSY.

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



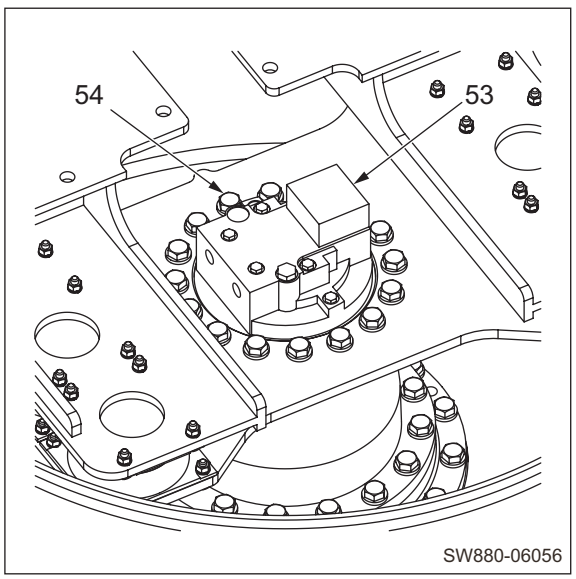
38) Lower bracket SUBASSY while keeping it level and install it on spigot joint of propulsion motor (53).

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



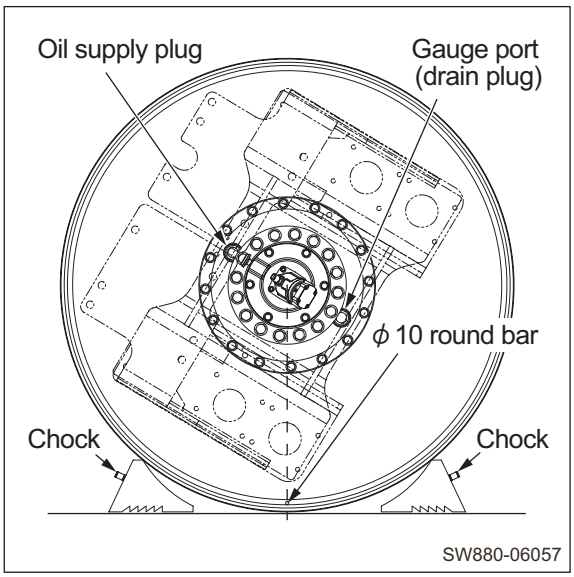
39) Secure bracket SUBASSY with sixteen bolts (54) and washers.

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

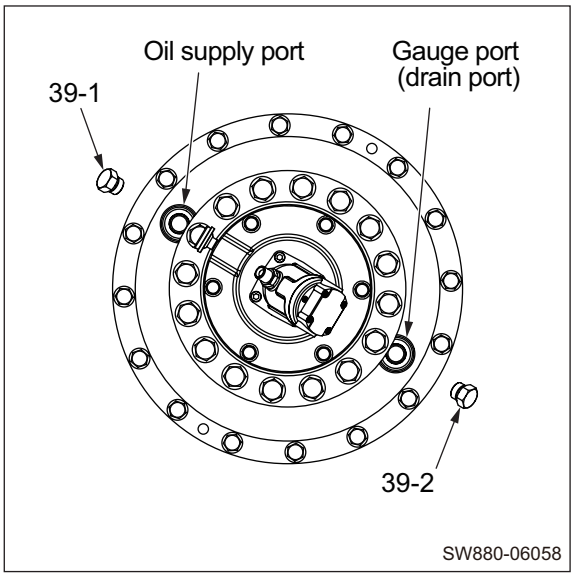


40) Lift vibratory drum ASSY with a crane and lay it with ϕ10 round bar on vibrator motor side facing down.
- Hold with chocks.

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

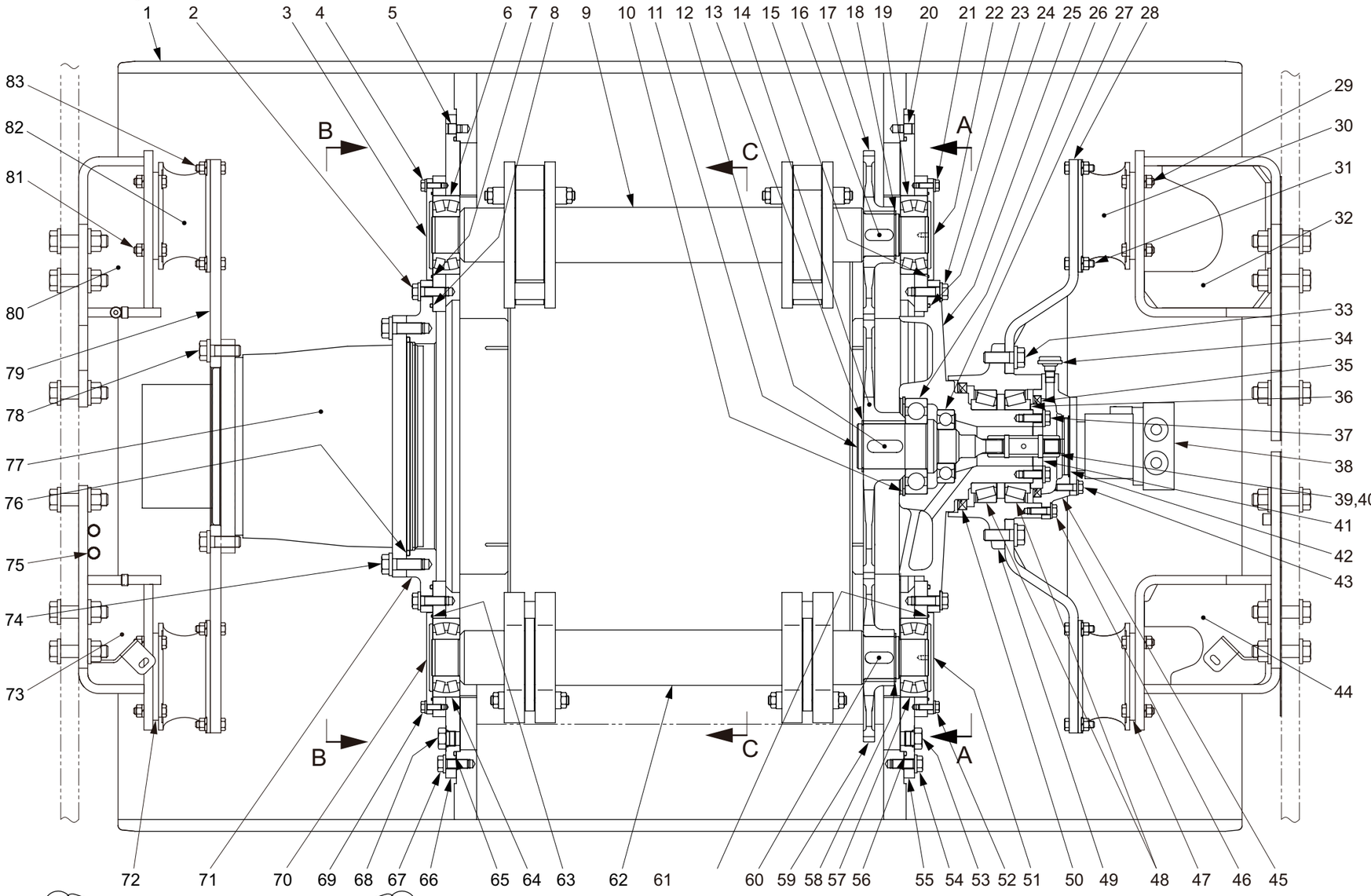


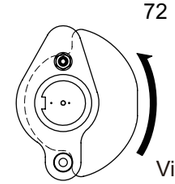
41) Remove plugs (39-1) and (39-2).
- Supply gear oil from oil supply port.
- Check that oil drips from gauge port.
  - Gear oil : 22 L (5.8 gal.)
- Install plugs.

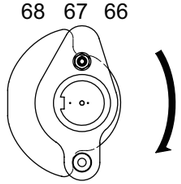


4. VIBRATORY DRUM ASSY (SW884ND/994ND)

4-1. Vibratory Drum ASSY

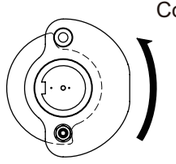




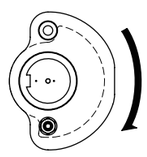


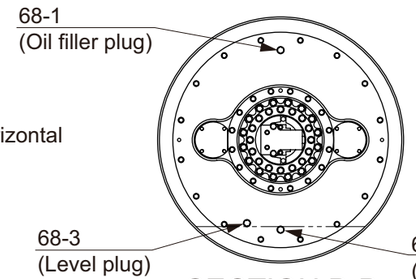
Vibration mode: Normal
Counterclockwise rotation

Vibration mode: Horizontal
Clockwise rotation

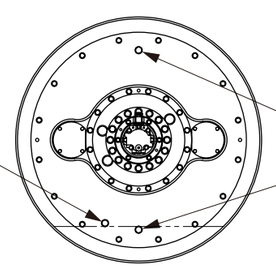


SECTION C-C





SECTION B-B



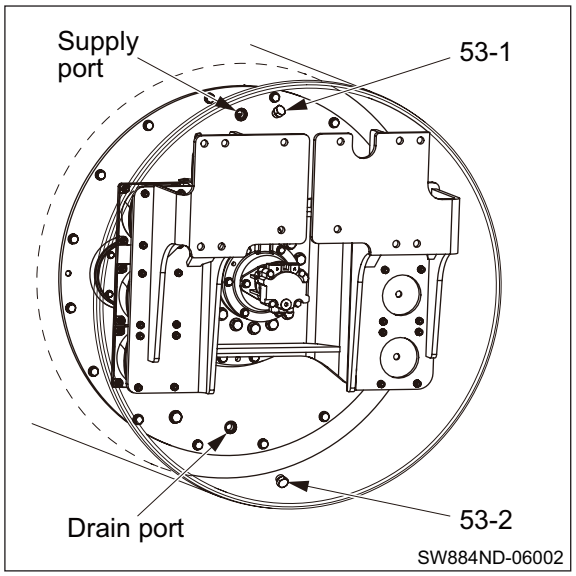
SECTION A-A

0568-43810-0-11872-D

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

4-2. Disassembly and Reassembly of Vibratory Drum

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



4-2-1. Disassembly of vibratory drum

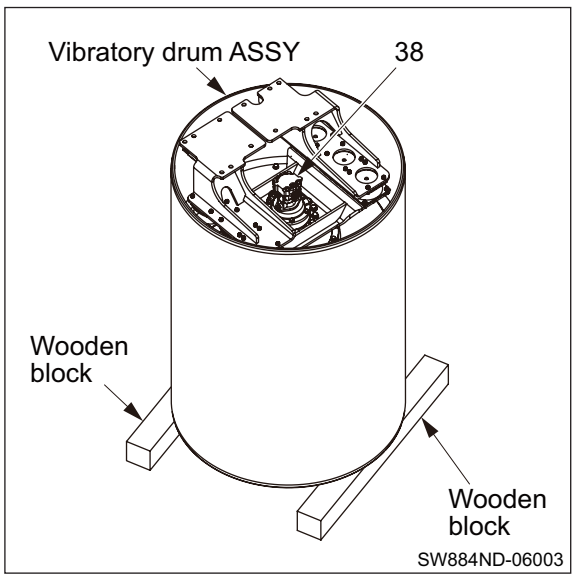
1) Remove plugs (53-1) and (53-2).
   - Drain gear oil.
     - Quantity of gear oil : 75 L (19.8 gal.)
   - Install plugs.

⚠WARNING

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

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

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

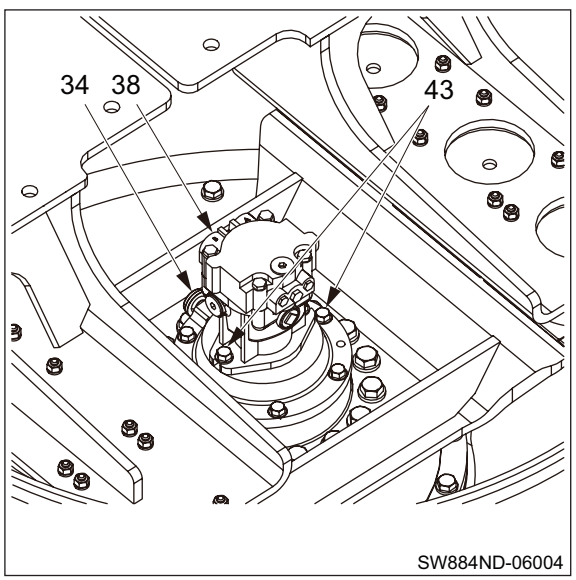


⚠WARNING

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

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

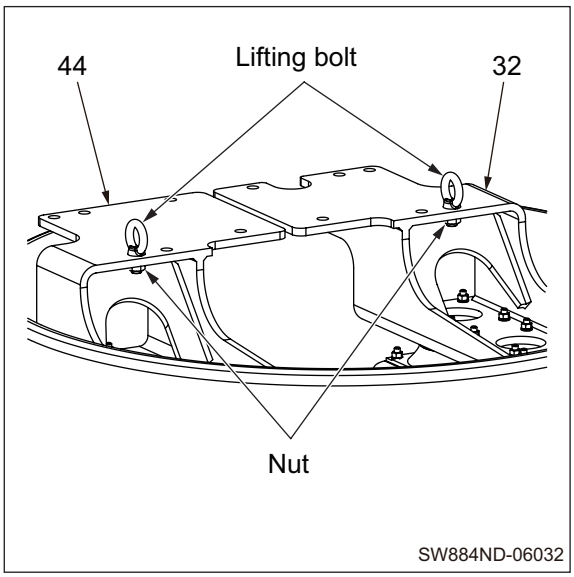
   (38) Vibrator motor : 15 kg (33 lbs.)



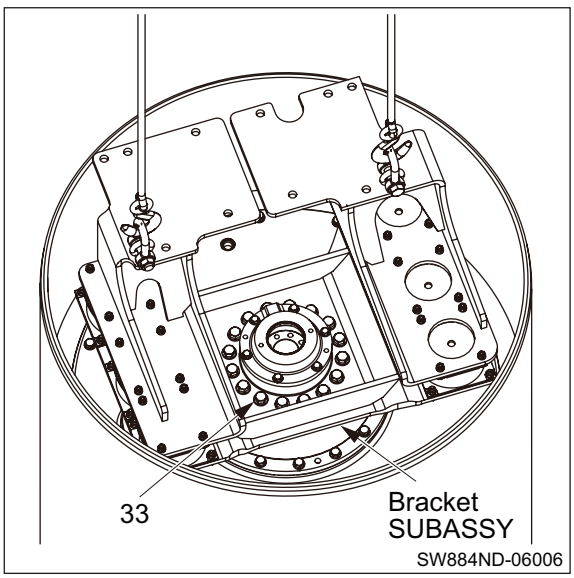
⚠WARNING

When installing lifting bolts, screw them with nuts.

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



5) Remove bolts (33).

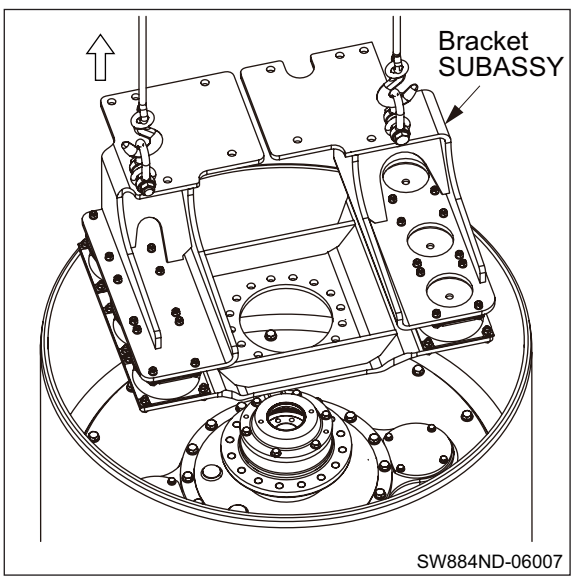


6) Remove bracket SUBASSY.

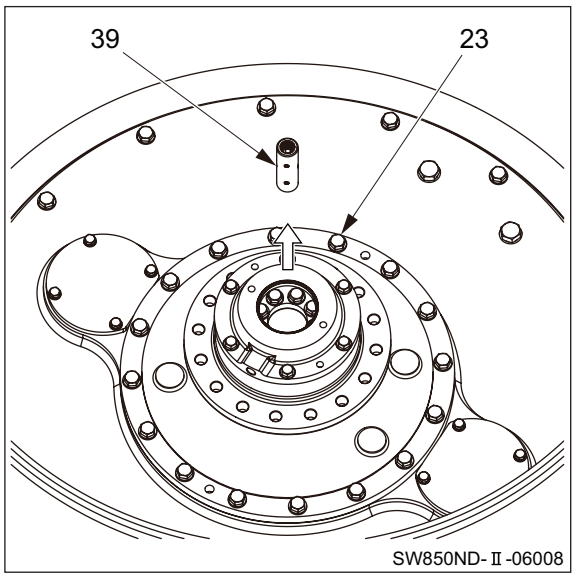
(NOTICE)

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

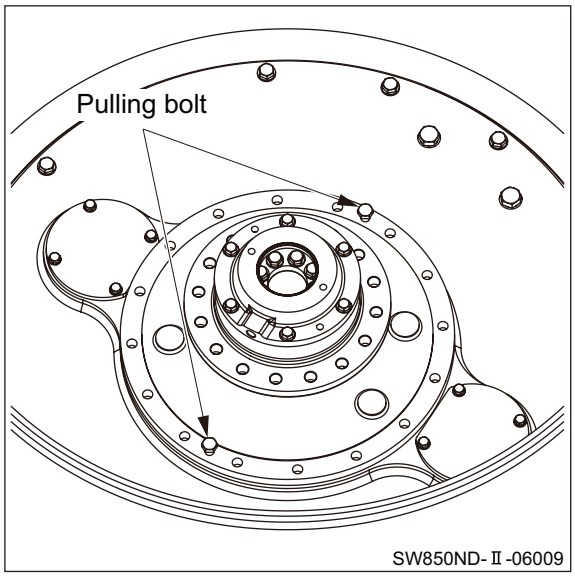
ℑkg Bracket SUBASSY
SW884ND : 290 kg (639 lbs.)
SW994ND : 295 kg (650 lbs.)



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



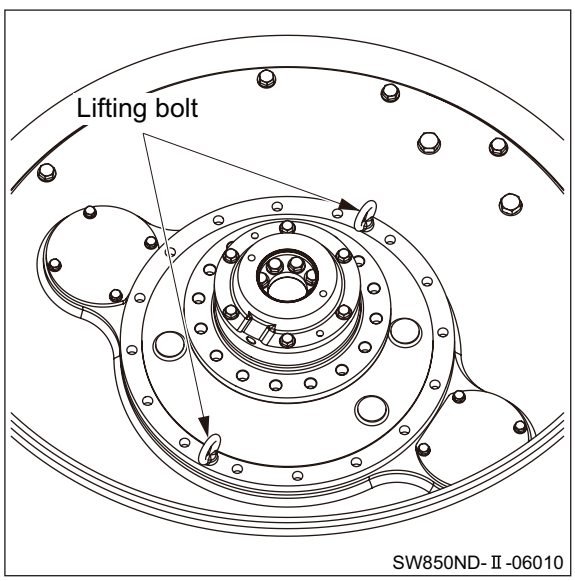
8) Lift axle shaft SUBASSY using two pulling bolts (M16×50).



⚠WARNING

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

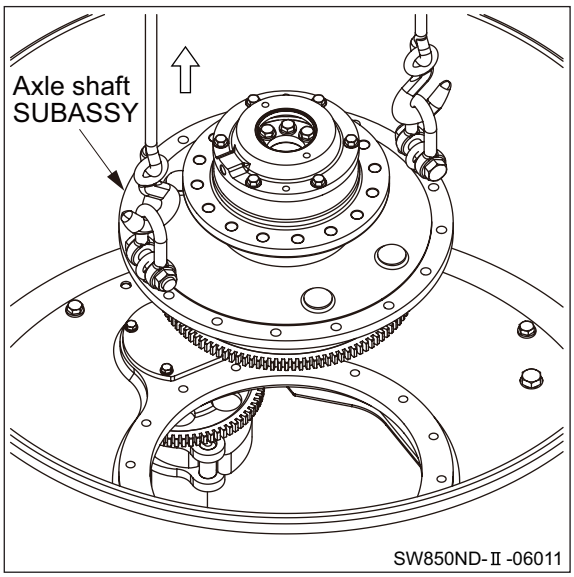
9) Install lifting bolts (M16).



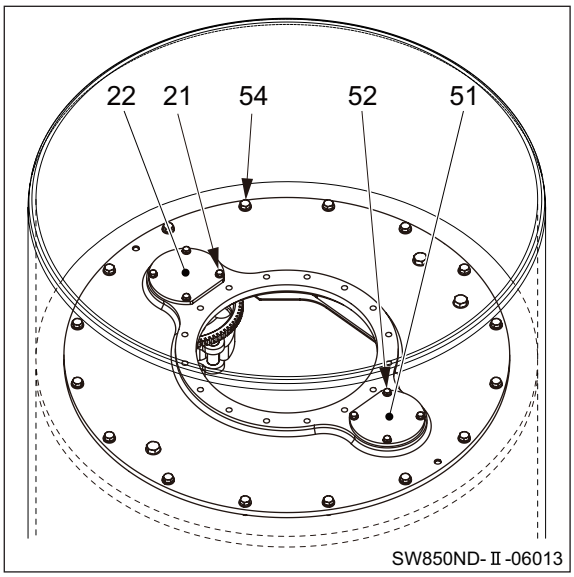
10) Remove axle shaft SUBASSY.

Axle shaft SUBASSY : 185 kg (408 lbs.)

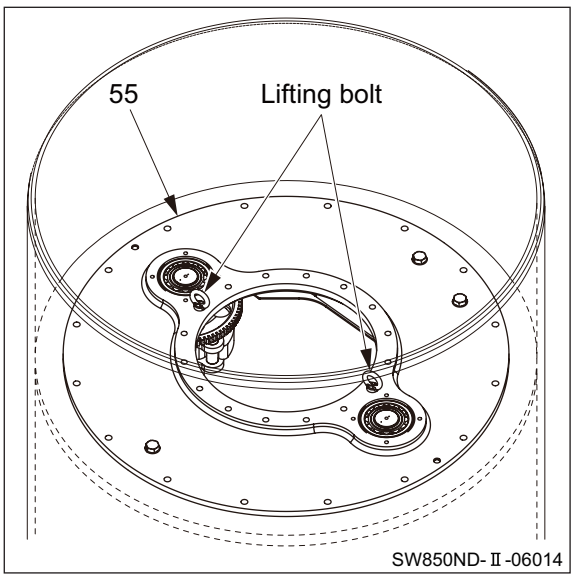
(To step 26))



11) Remove bolts (21) and (52).
- Remove covers (22) and (51).
- Remove bolts (54).



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

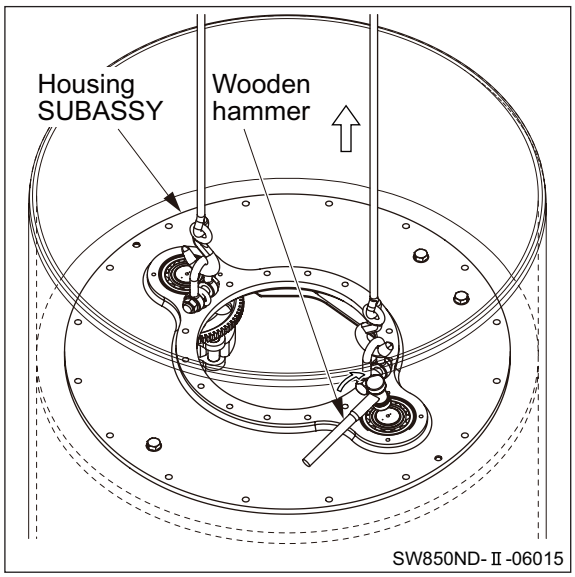


13) Remove housing SUBASSY.

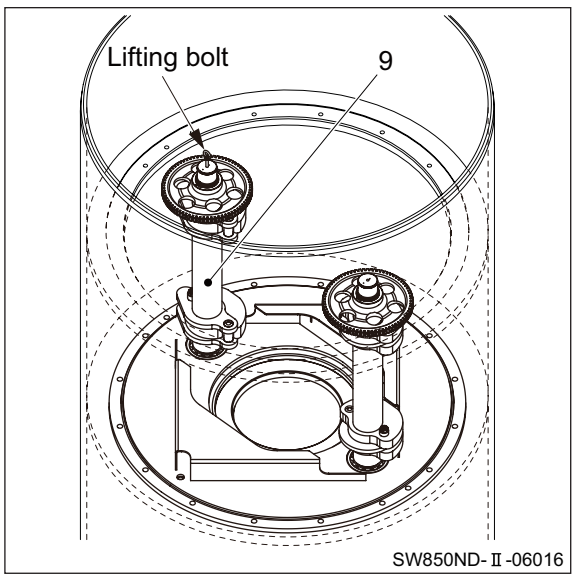
Housing SUBASSY : 220 kg (485 lbs.)

(NOTICE)

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



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



⚠WARNING

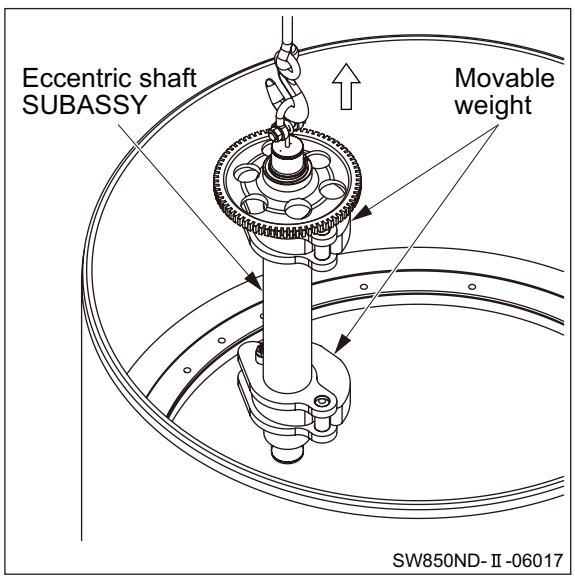
Take care not to get your fingers caught in movable weights.

15) Remove eccentric shaft SUBASSY.

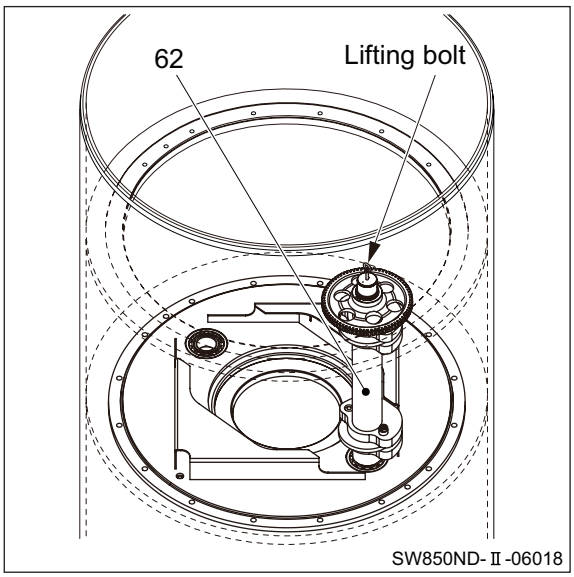
Eccentric shaft SUBASSY : 95 kg (209 lbs.)

(NOTICE)

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



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

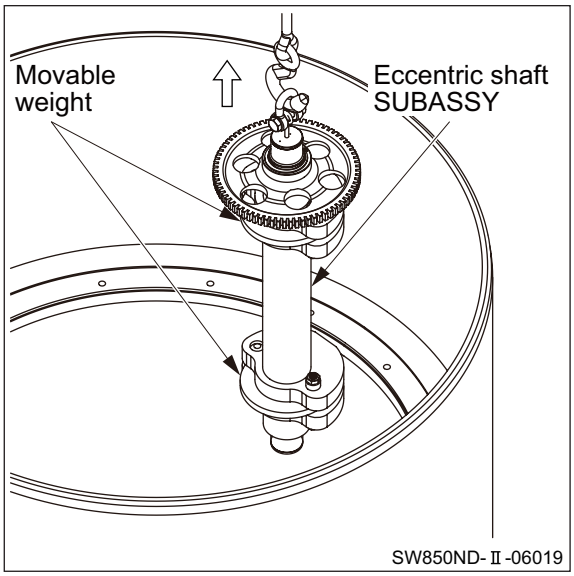


17) Remove eccentric shaft SUBASSY.

Eccentric shaft SUBASSY : 95 kg (209 lbs.)

(NOTICE)

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

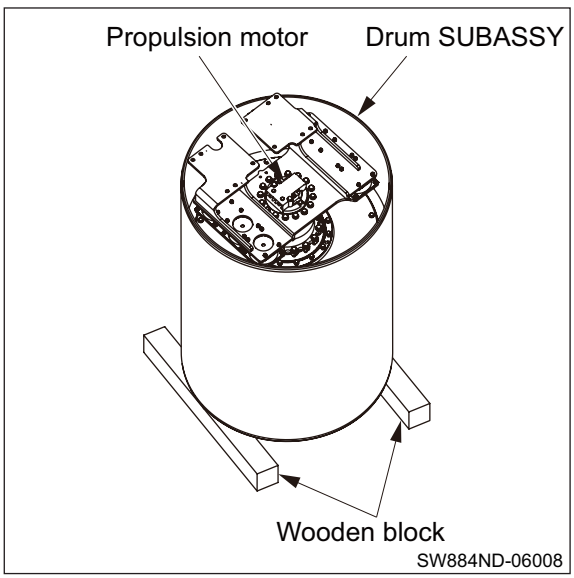


⚠WARNING

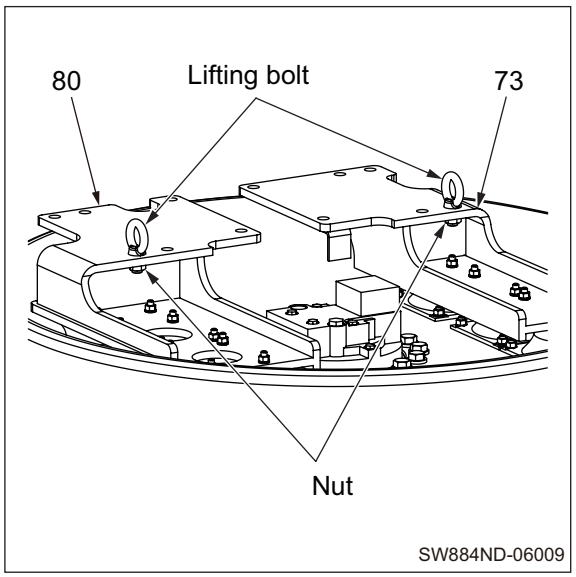
Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

18) Reverse drum SUBASSY.

Drum SUBASSY
SW884ND : 2,575 kg (5,677 lbs.)
SW994ND : 2,685 kg (5,919 lbs.)

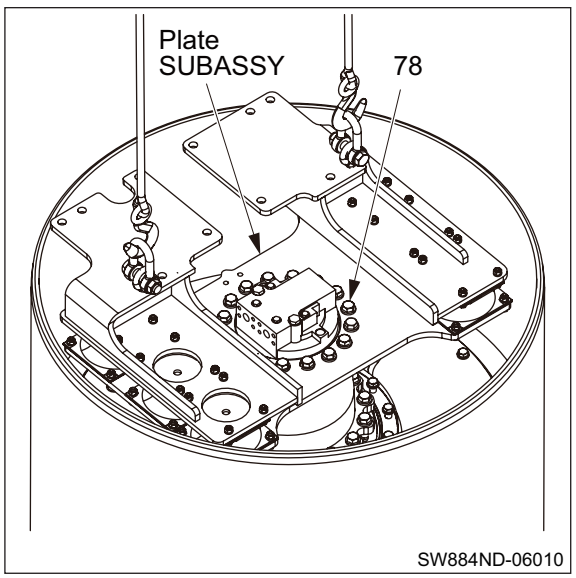


19) Install lifting bolts (M22) to brackets (73) and (80) with nuts.



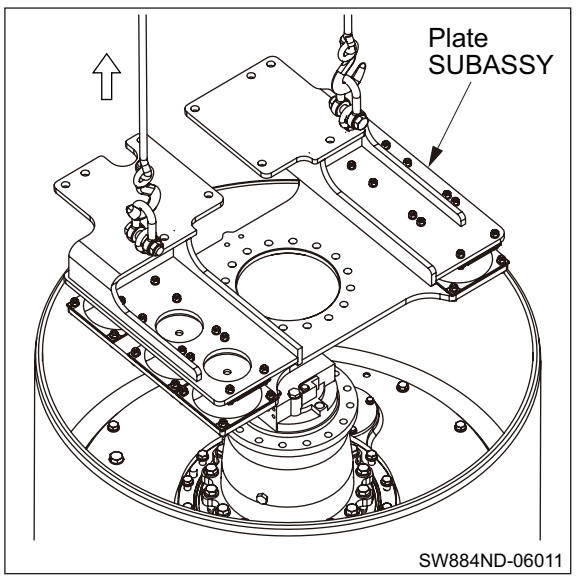
20) Lift plate SUBASSY.
- Remove bolts (78).

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

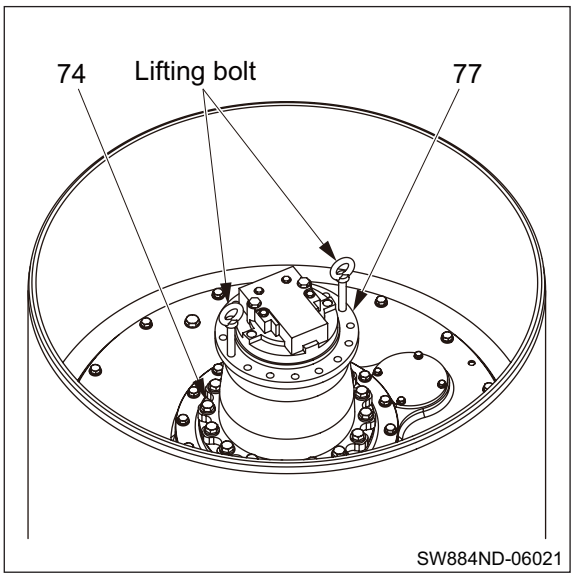


21) Remove plate SUBASSY.

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

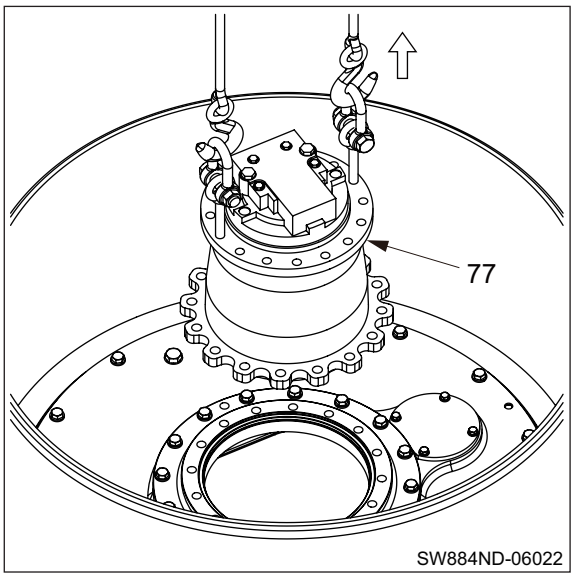


22) Install lifting bolts (M20) to propulsion motor (77).
- Remove bolts (74).

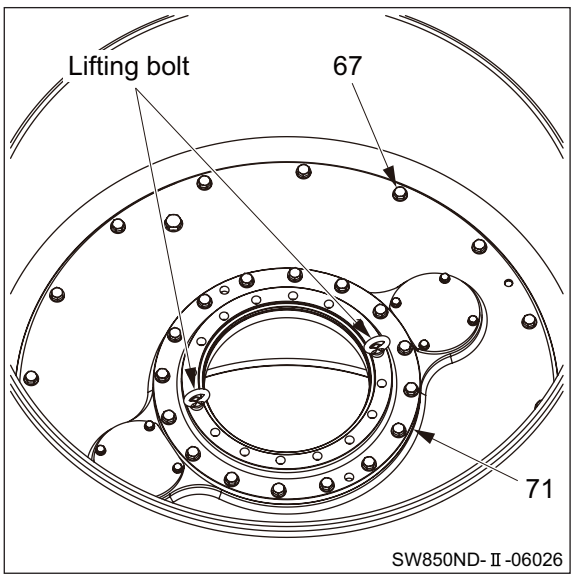


23) Remove propulsion motor (77).

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

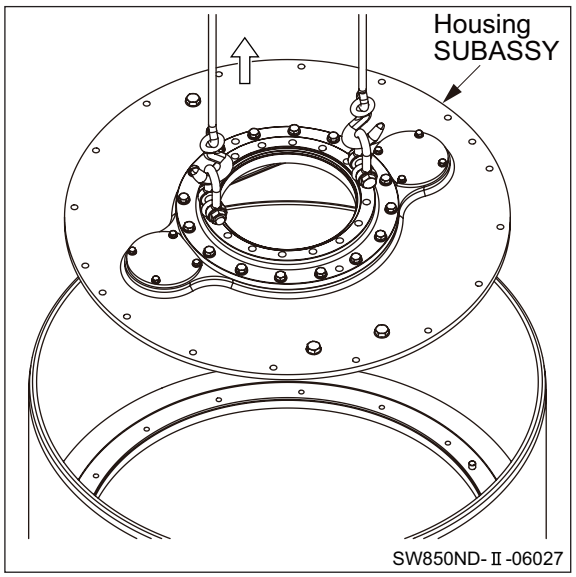


24) Install lifting bolts (M20) to housing (71).
- Remove bolts (67).

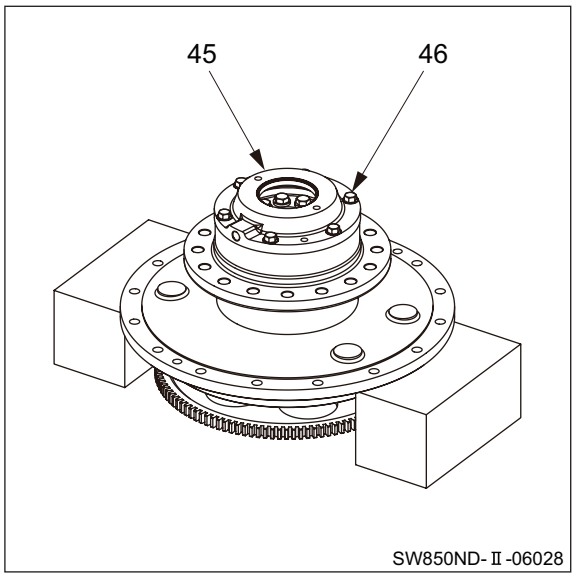


25) Remove housing SUBASSY.

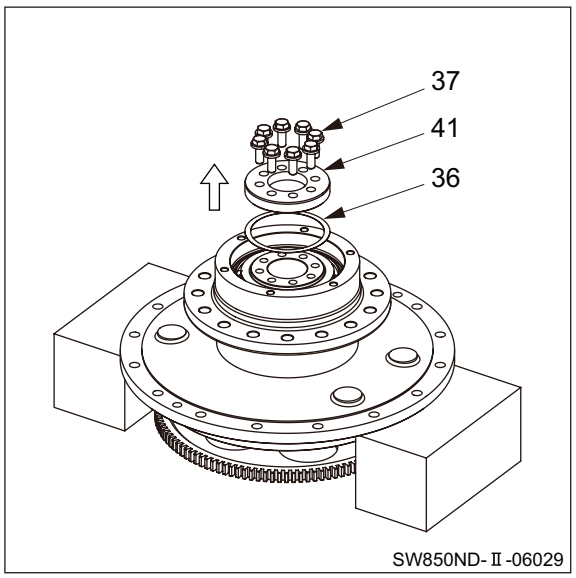
Housing SUBASSY : 280 kg (617 lbs.)



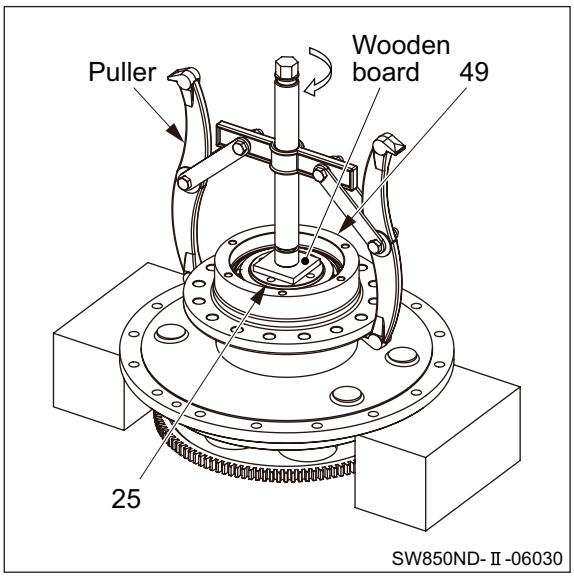
26) Disassembly of axle shaft SUBASSY
(From step 10))
- Remove bolts (46).
- Remove cover (45).



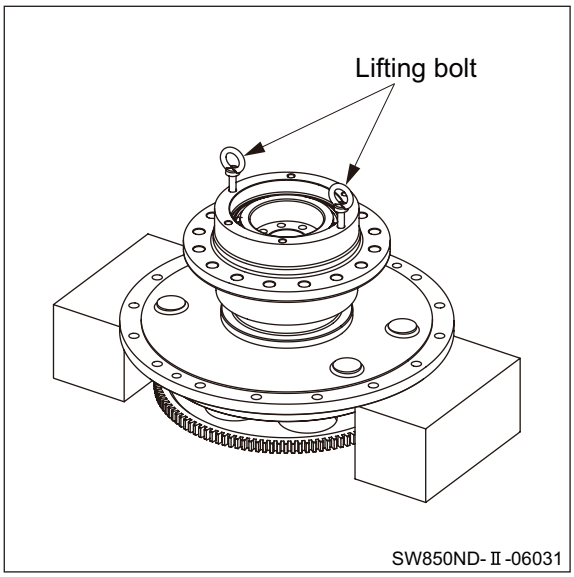
27) Remove bolts (37).
- Remove cover (41).
- Remove shim (36).



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

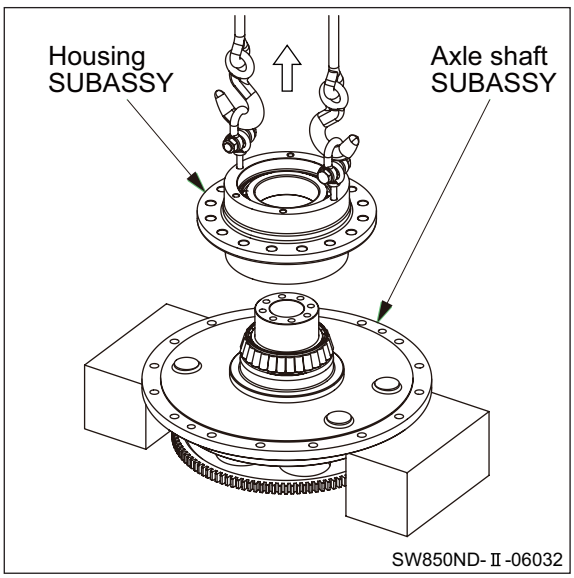


29) Install lifting bolts (M12).

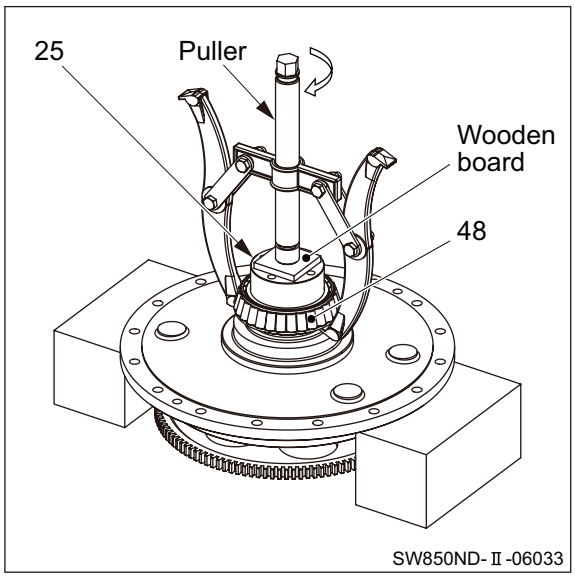


30) Remove housing SUBASSY from axle shaft SUBASSY.

Housing SUBASSY : 45 kg (99 lbs.)

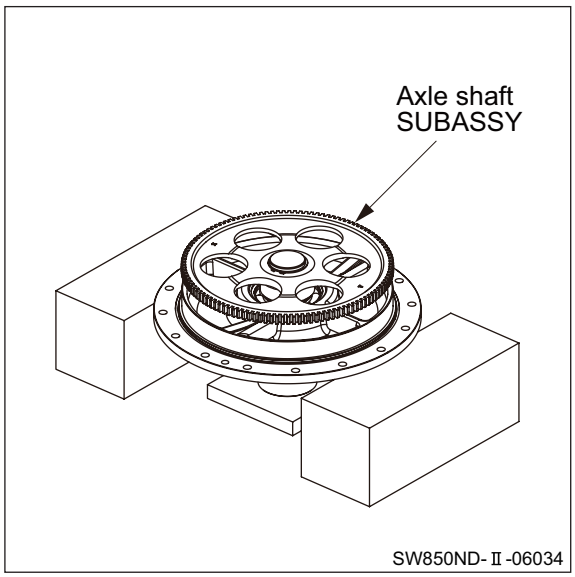


31) Put a piece of wooden board on end of axle shaft (25).
- Set a puller on roller bearing (48) inner race.
- Remove roller bearing inner race from axle shaft SUBASSY.

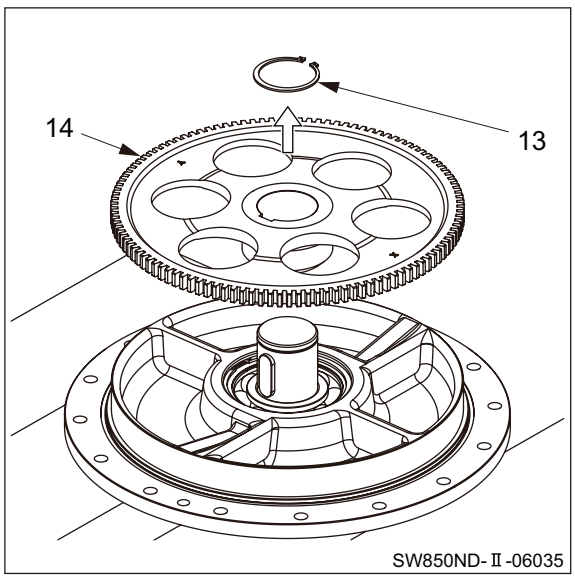


32) Reverse axle shaft SUBASSY.

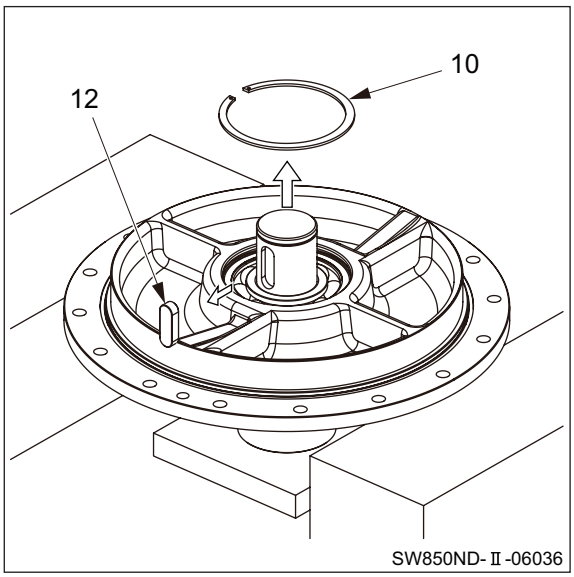
Axle shaft SUBASSY : 125 kg (276 lbs.)



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

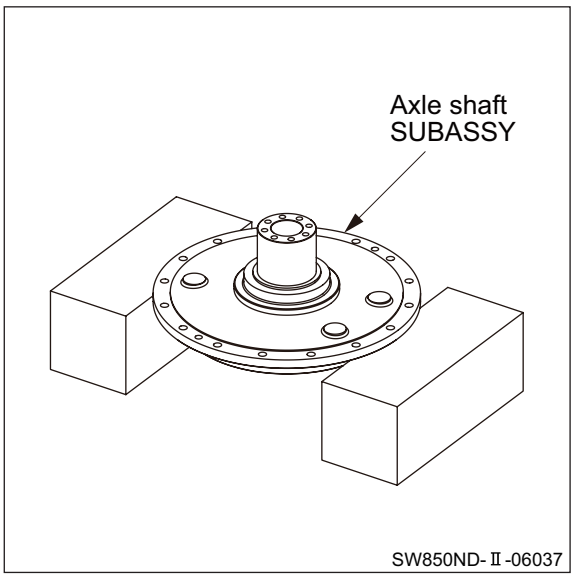


34) Remove sunk key (12).
- Remove retaining ring (10).

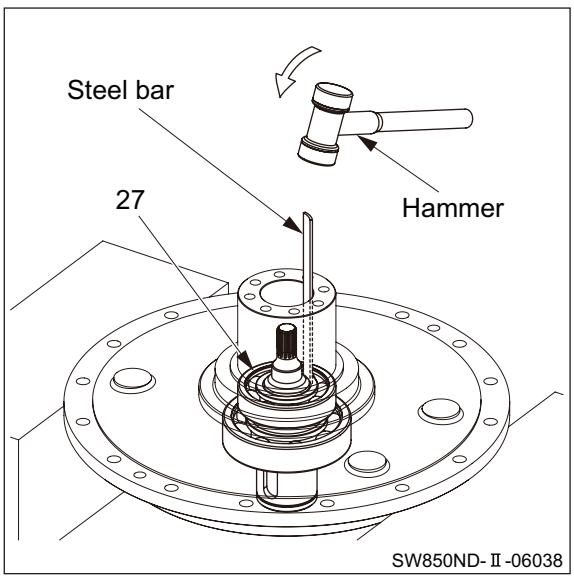


35) Reverse axle shaft SUBASSY.

Axle shaft SUBASSY : 105 kg (231 lbs.)



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



4-2-2. Reassembly of vibratory drum

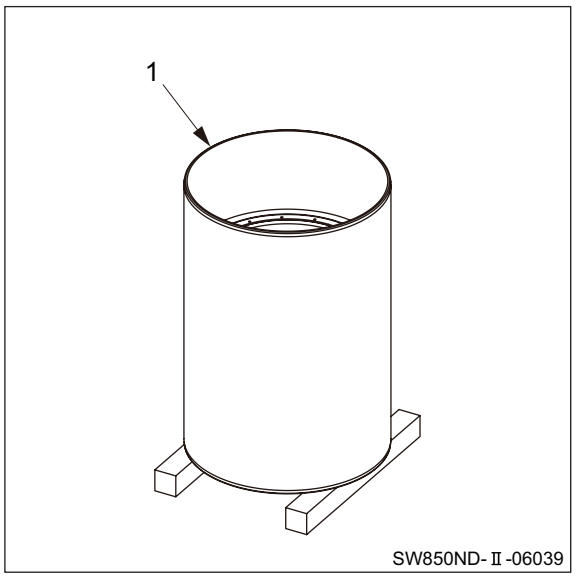
- Before reassembling, clean disassembled parts well and check that there is no abnormality.

⚠WARNING

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

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

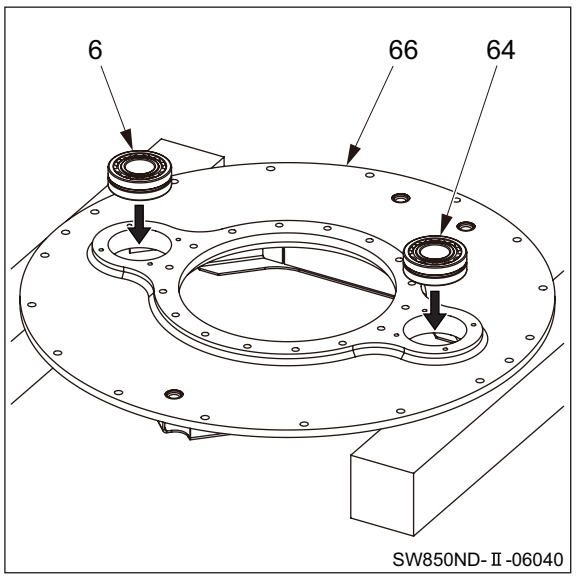
(1) Drum
SW884ND : 1,840 kg (4,056 lbs.)
SW994ND : 1,940 kg (4,277 lbs.)



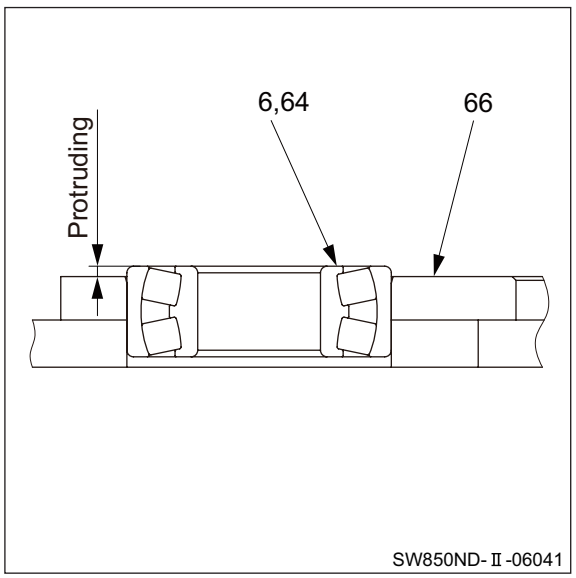
2) Reassembly of housing SUBASSY

2-1) Apply a coat of gear oil to housing (66) at where vibrator bearings will be press-fitted.
- Drive vibrator bearings (6) and (64).

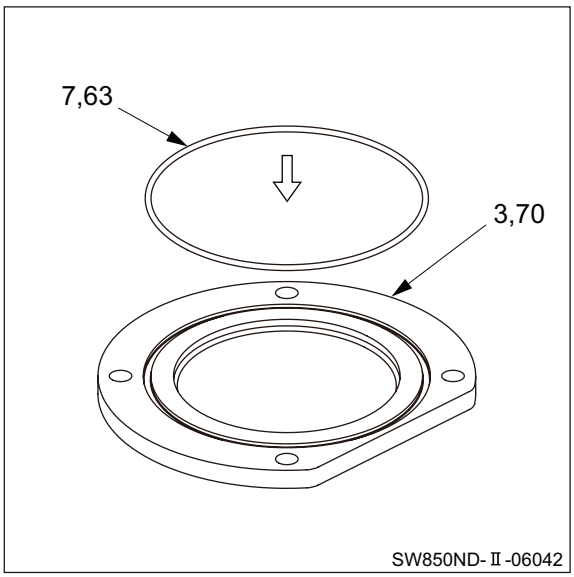
(NOTICE)
- **Take care not to damage the bearings when installing them.**



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

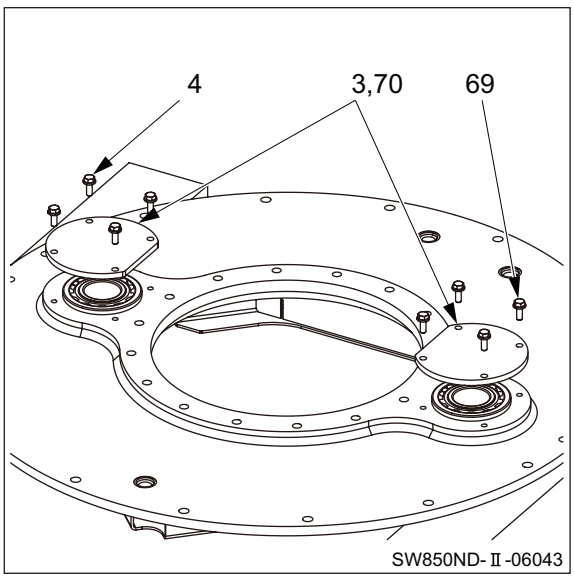


2-3) Apply grease to O-rings (7) and (63).
- Install O-rings to covers (3) and (70).



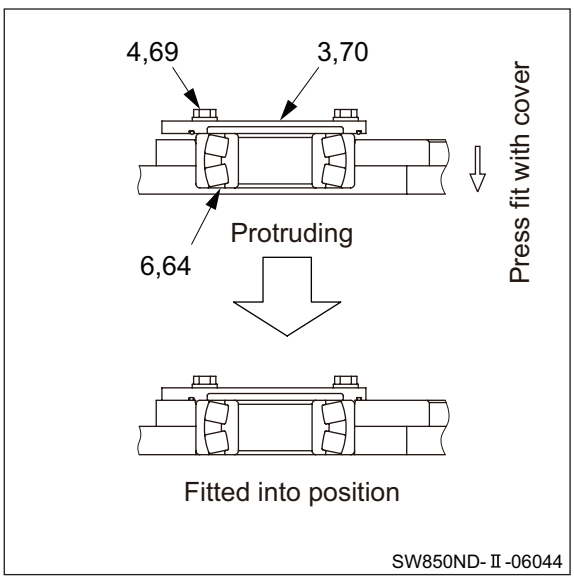
2-4) Apply a coat liquid packing to housing SUBASSY at where covers (3) and (70) will be installed.
- Place covers while making sure to orient them in the correct direction.
- Install four bolts (4), (69) to press in bearings.

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



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

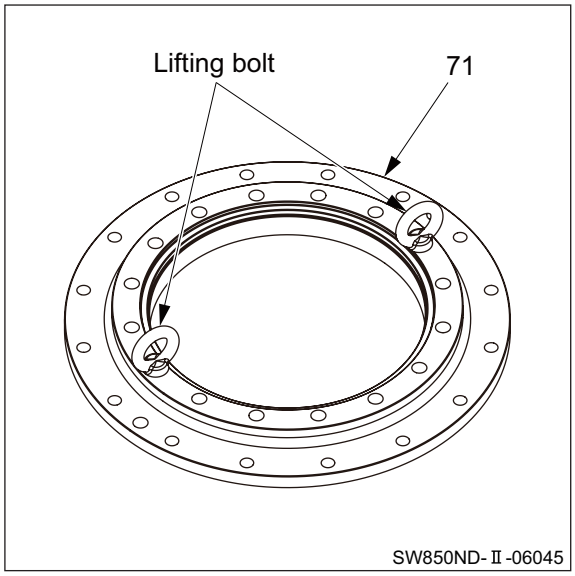
N•m (4) and (69) Bolts M10×30 : 59 N·m (44 lbf·ft)



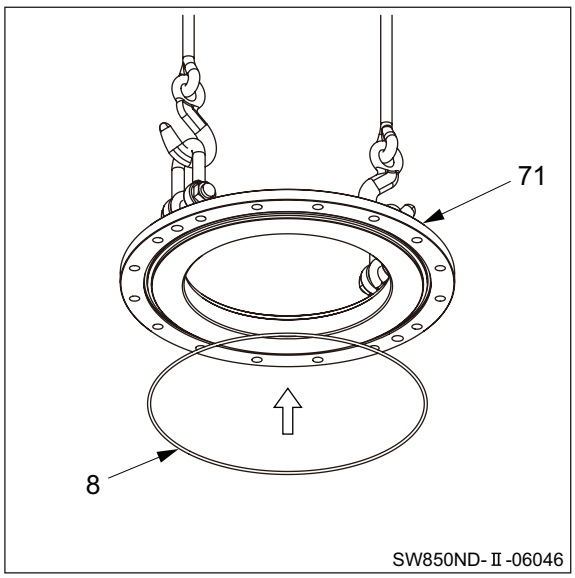
⚠WARNING

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

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



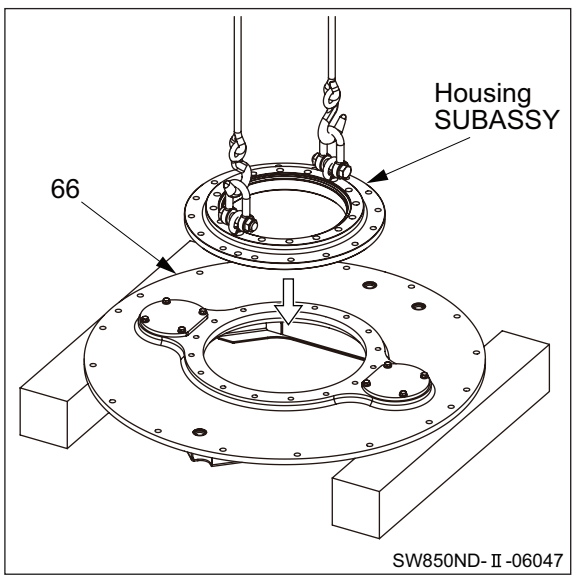
2-7) Lift housing (71).
- Apply grease to O-ring (8).
- Install O-ring to housing.



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

Housing SUBASSY : 45 kg (99 lbs.)

(NOTICE)
- **Take care not to let O-ring to protrude from its groove.**

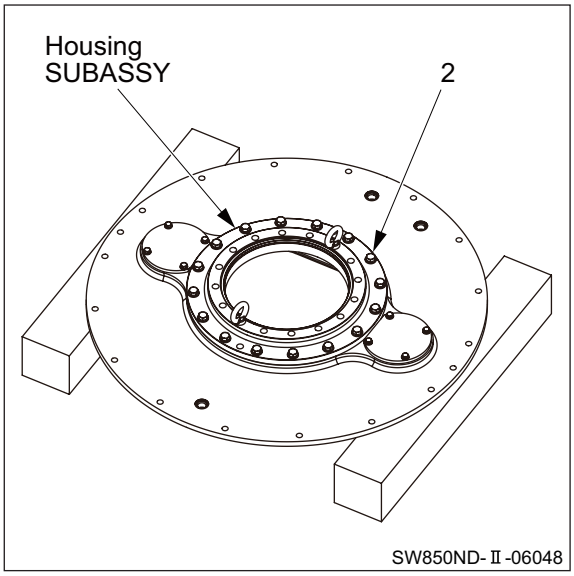


2-9) Secure housing SUBASSY with sixteen bolts (2) and washers.

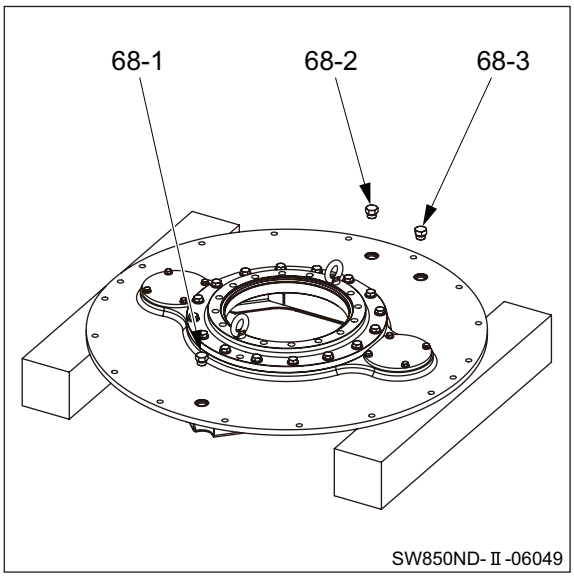
N•m (2) Bolts M16×50 : 265 N·m (195 lbf·ft)

(NOTICE)

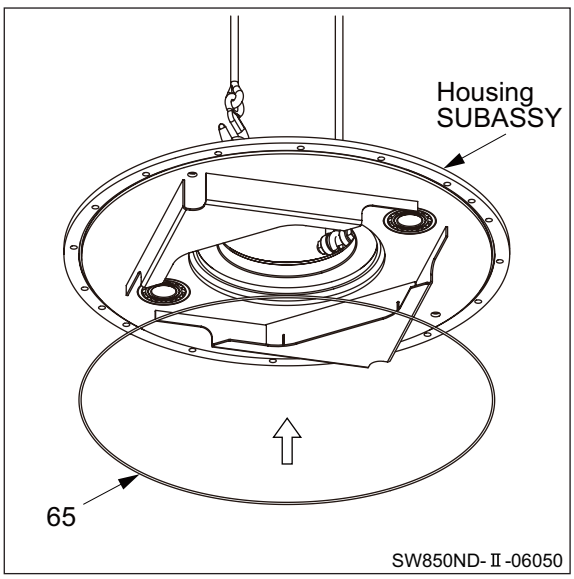
- **Bolts are treated with thread-locking fluid. Use new thread-locking fluid treated bolts for installation.**



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



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

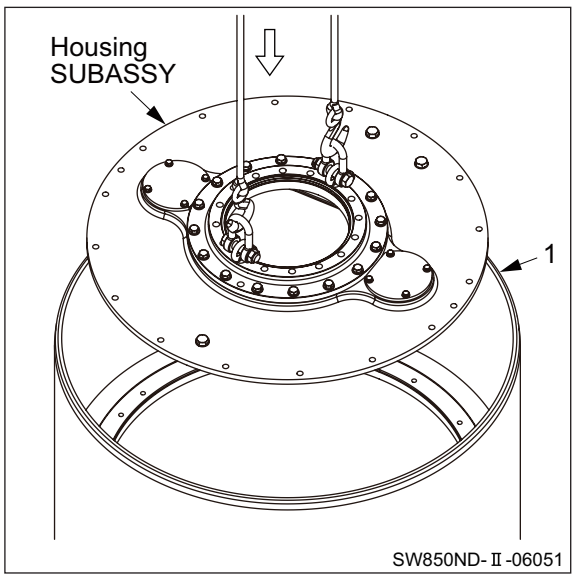


5) Install housing SUBASSY.

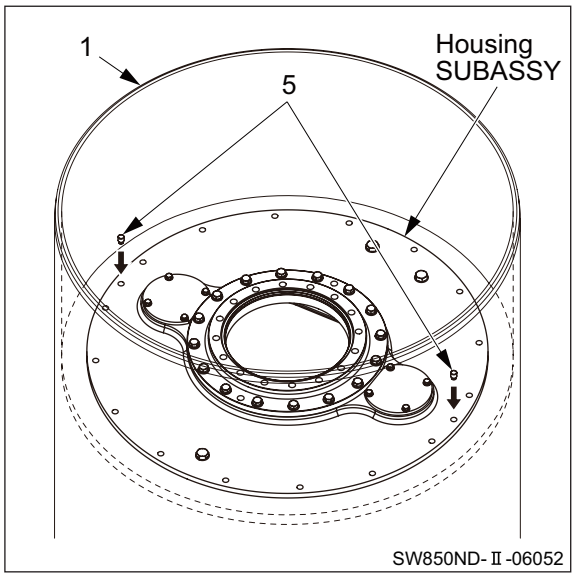
Housing SUBASSY : 275 kg (606 lbs.)

(NOTICE)

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



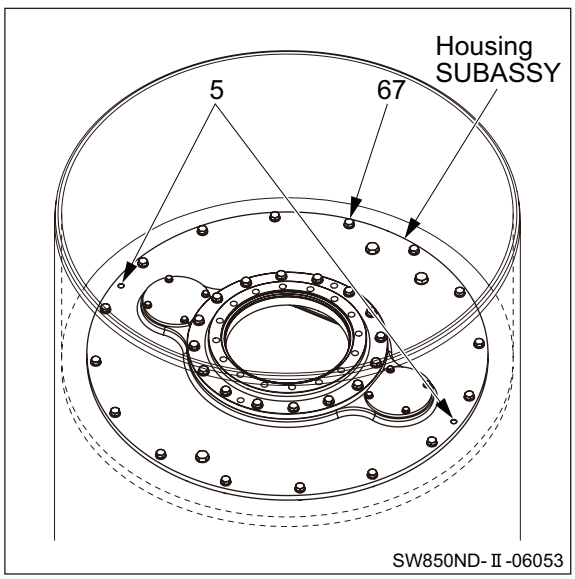
6) Drive in two locating pins (5) for housing SUBASSY and drum (1) temporarily.



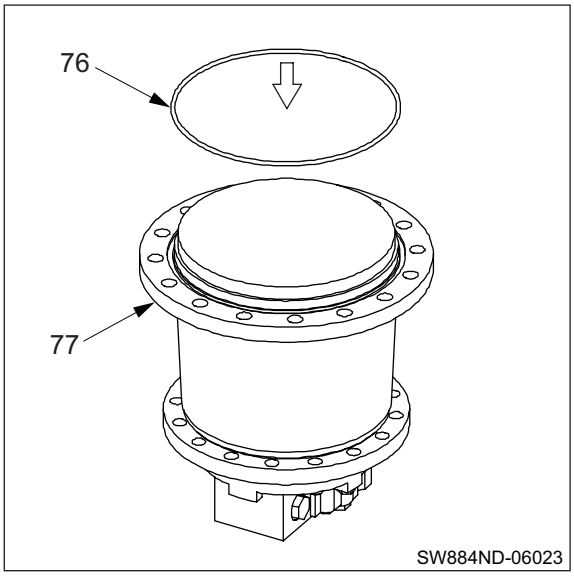
7) Secure housing SUBASSY with sixteen bolts (67) and washers.

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

- Drive in locating pins (5) again.



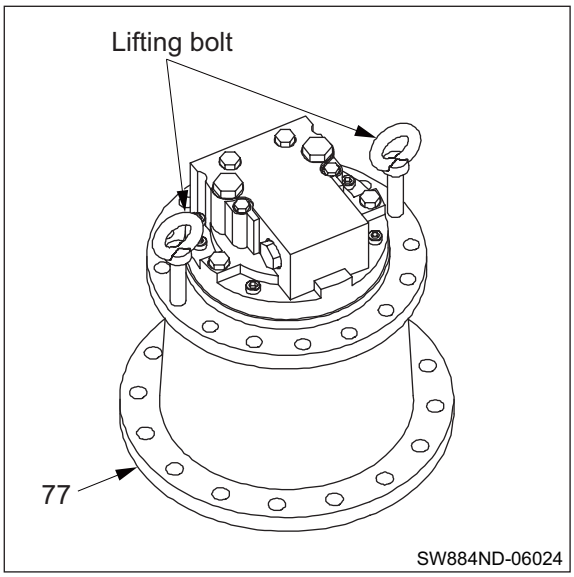
8) Apply grease to O-ring (76).
- Install O-ring to propulsion motor (77).



9) Reverse propulsion motor (77).

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

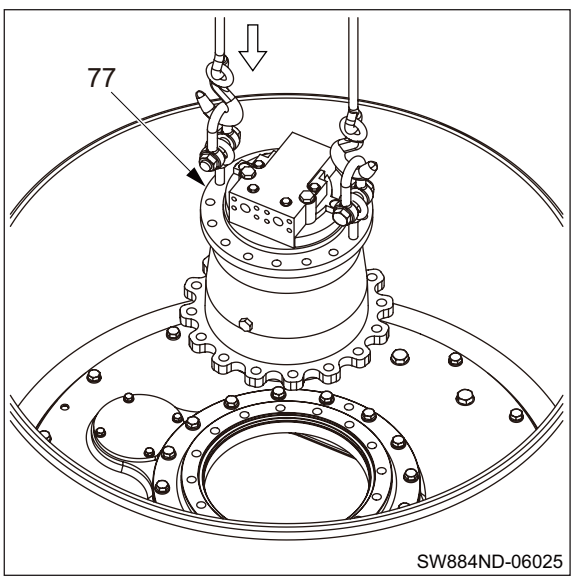
- Install lifting bolts (M20).



10) Install propulsion motor (77).

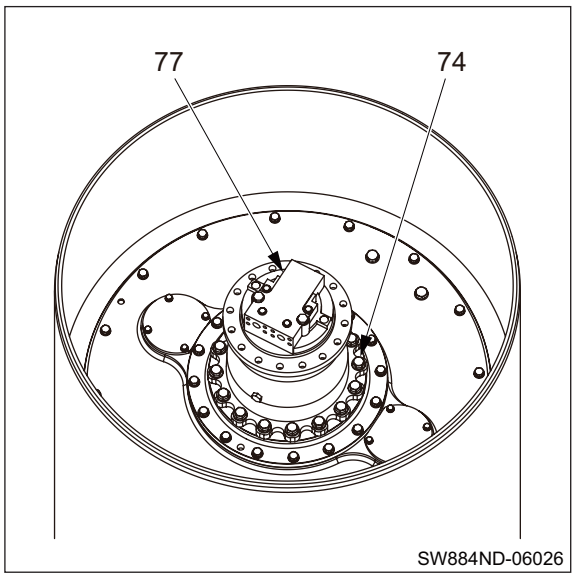
(77) Propulsion motor : 215 kg (474 lbs.)

(NOTICE)
- **Take care not to let O-ring to protrude from its groove.**



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

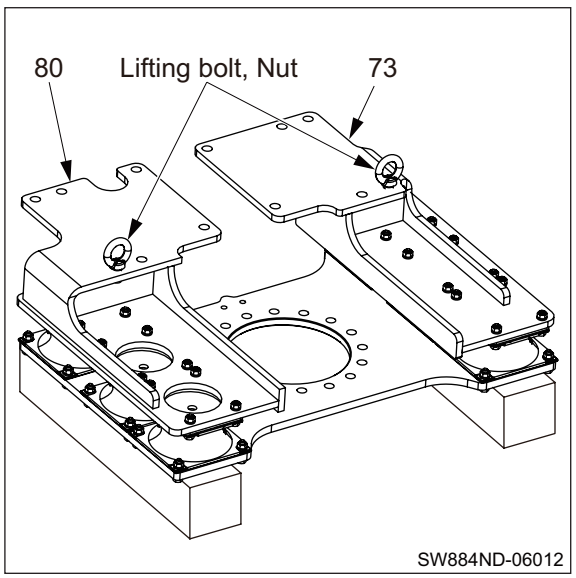
N•m (74) Bolts M20×60 : 539 N·m (398 lbf·ft)



WARNING

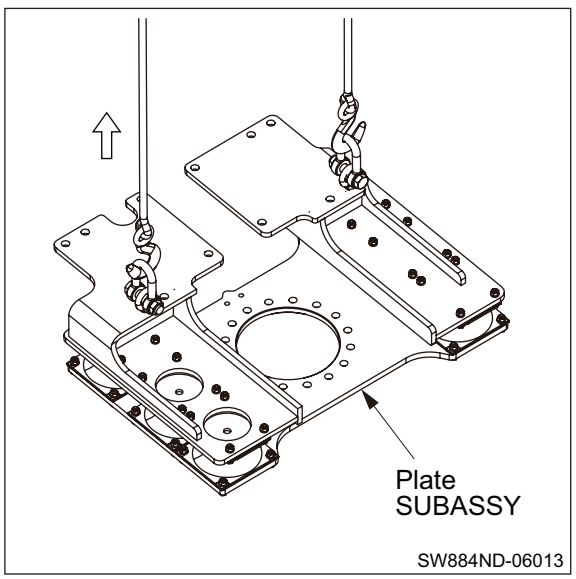
When installing lifting bolts, screw them with nuts.

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



13) Lift plate SUBASSY.

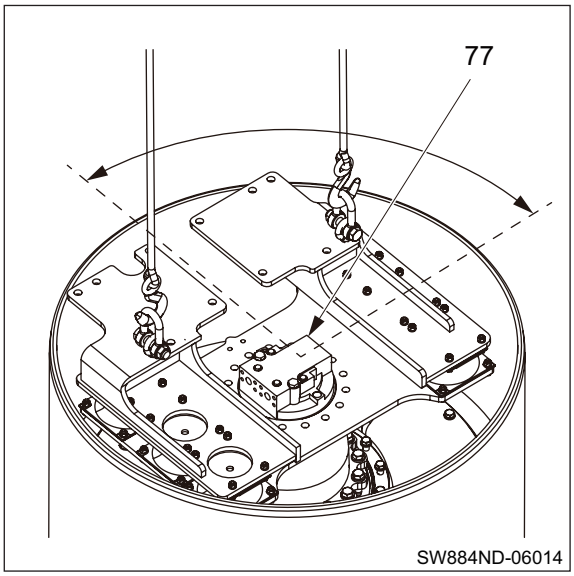
kg Plate SUBASSY
SW884ND : 230 kg (507 lbs.)
SW994ND : 240 kg (529 lbs.)



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

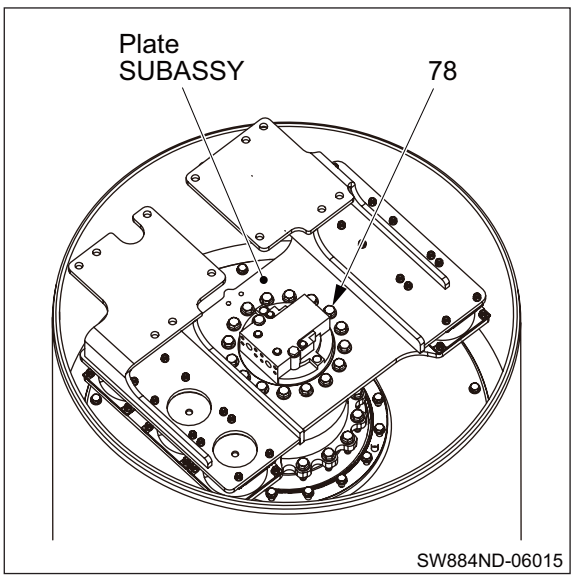
(NOTICE)

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



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

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

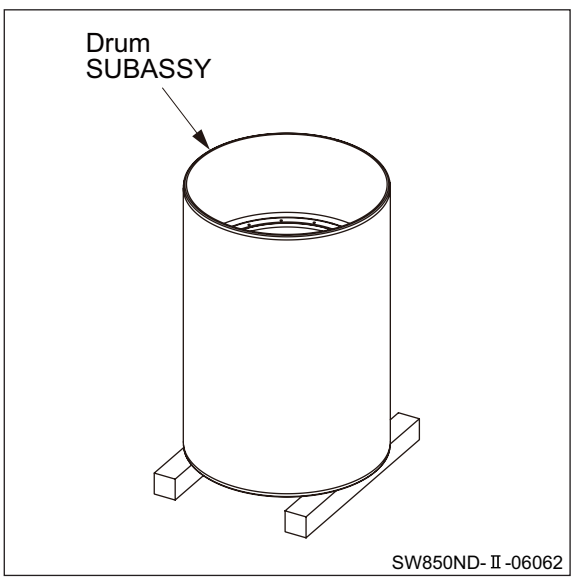


⚠WARNING

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

16) Reverse drum SUBASSY.

kg Drum SUBASSY
SW884ND : 2,575 kg (5,677 lbs.)
SW994ND : 2,685 kg (5,919 lbs.)

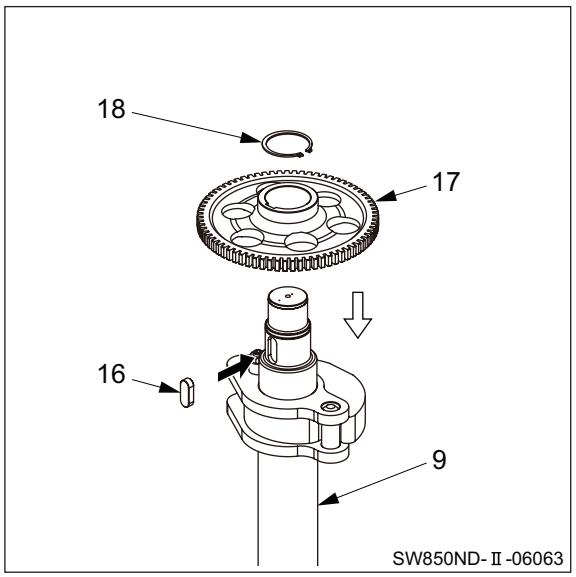


⚠WARNING

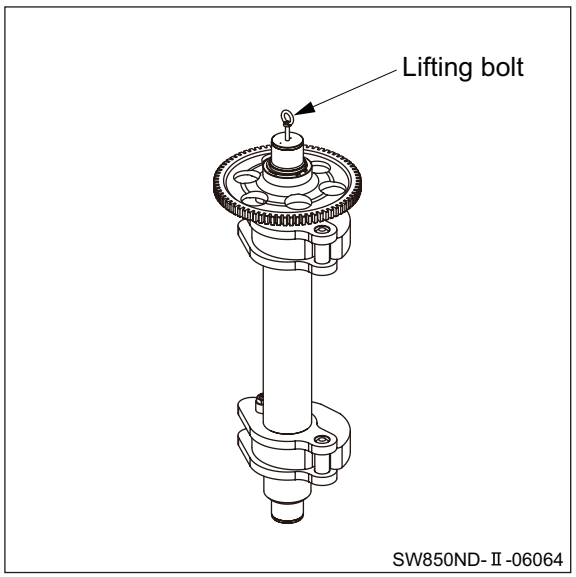
Wear heat resistant gloves when handling heated parts to avoid burns.

17) Heat up gear (17) by using a ring heater or the like.
- Drive sunk key (16) into eccentric shaft (9).
- Install heated gear.
- Install retaining ring (18).

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



18) Install a lifting bolt (M8).



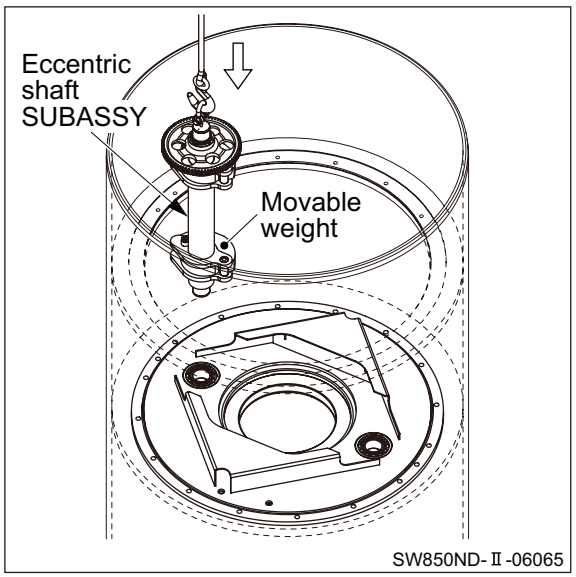
⚠WARNING

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

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

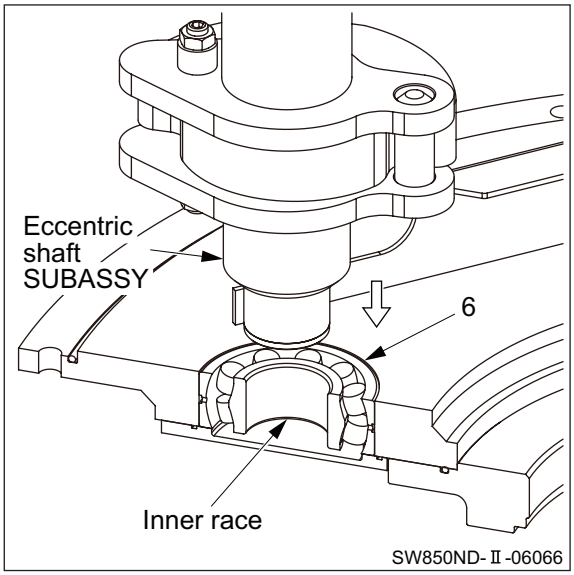
Eccentric shaft SUBASSY : 95 kg (209 lbs.)

(NOTICE)
- **Put the movable weight at its outmost position.**



(NOTICE)

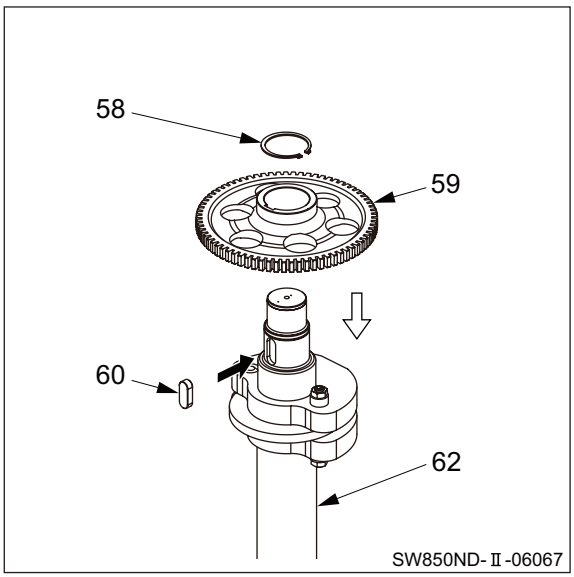
- **Insert eccentric shaft SUBASSY into vibrator bearing (6) while taking care not to tilt vibrator bearing inner race.**
- **After inserting the eccentric shaft SUBASSY into the bearing, lay the eccentric shaft SUBASSY against the inner wall of the drum so that it will not fall down.**



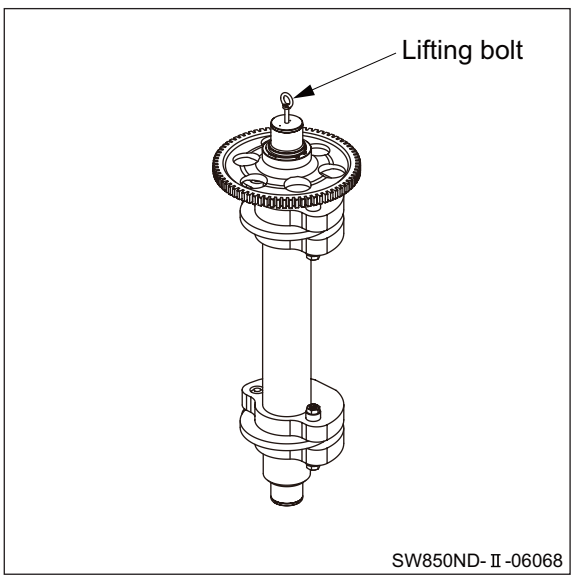
20) Heat up gear (59) by using a ring heater or the like.
- Drive sunk key (60) into eccentric shaft (62).
- Install heated gear.
- Install retaining ring (58).

(NOTICE)

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



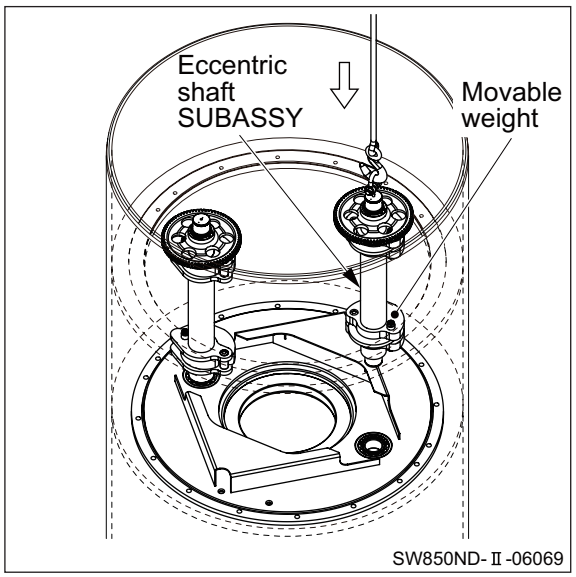
21) Install a lifting bolt (M8).



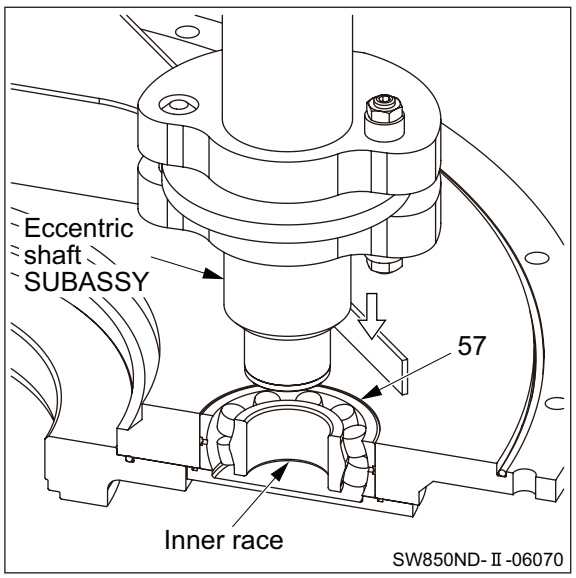
22) Apply a coat of gear oil to eccentric shaft SUBASSY at where bearing will be installed.
- Install eccentric shaft SUBASSY to drum SUBASSY.

Eccentric shaft SUBASSY : 95 kg (209 lbs.)

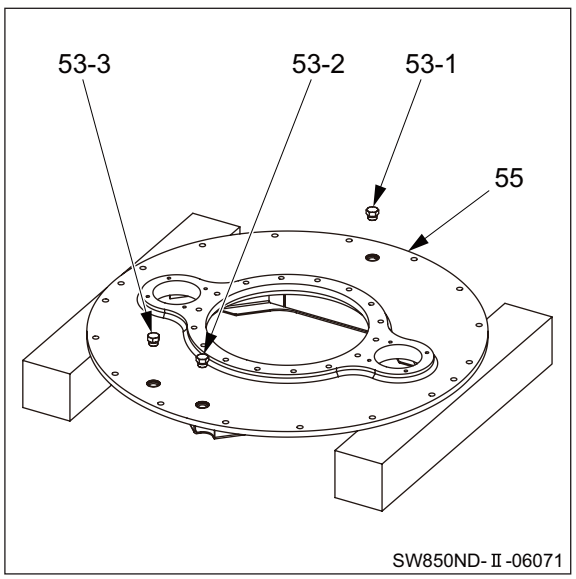
(NOTICE)
- **Put the movable weight at its outmost position.**



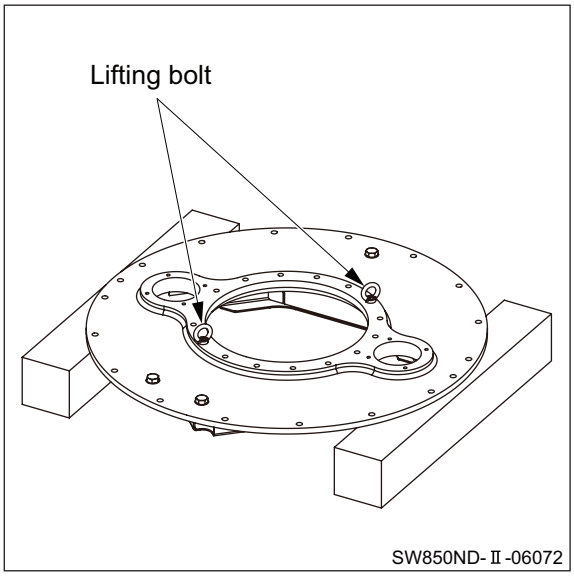
(NOTICE)
- **Insert eccentric shaft SUBASSY into vibrator bearing (57) while taking care not to tilt vibrator bearing inner race.**
- **After inserting the eccentric shaft SUBASSY into the vibrator bearing, lay the eccentric shaft SUBASSY against the inner wall of the drum so that it will not fall down.**



23) Apply grease to O-rings for plugs (53-1), (53-2), and (53-3).
- Install plugs to housing (55).



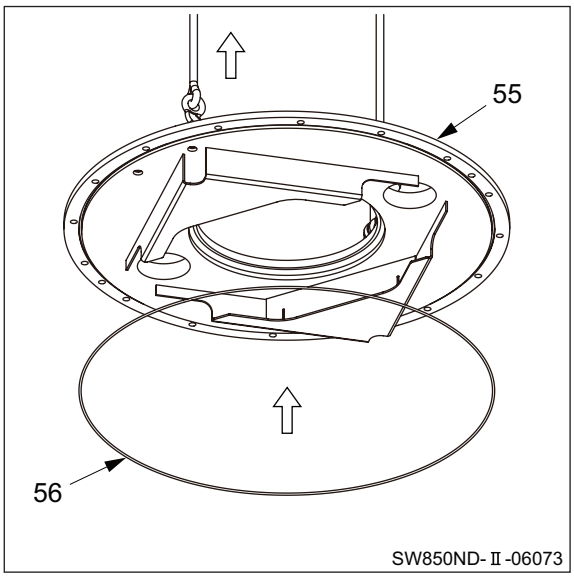
24) Install lifting bolts (M10).



25) Lift housing (55).

(55) Housing : 215 kg (474 lbs.)

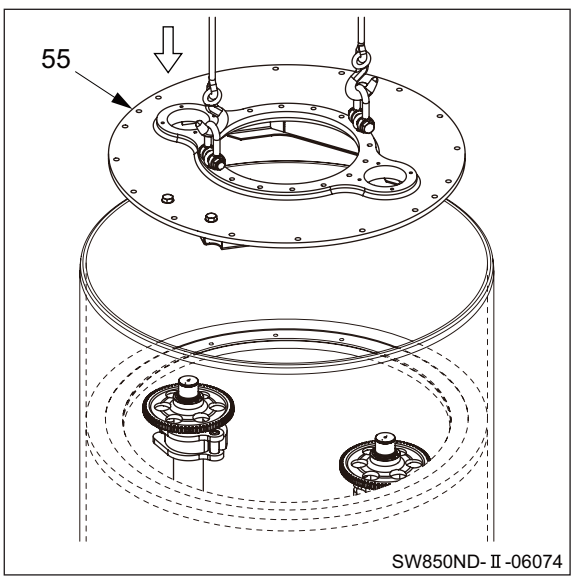
- Apply grease to O-ring (56).
- Install O-ring to housing.



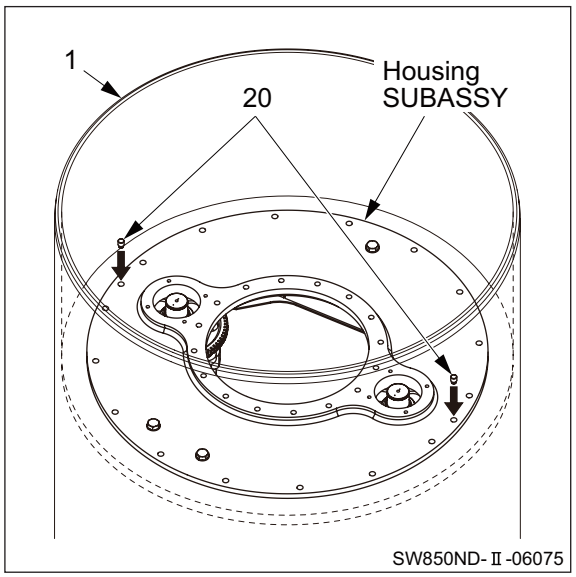
26) Install housing (55).

(NOTICE)

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



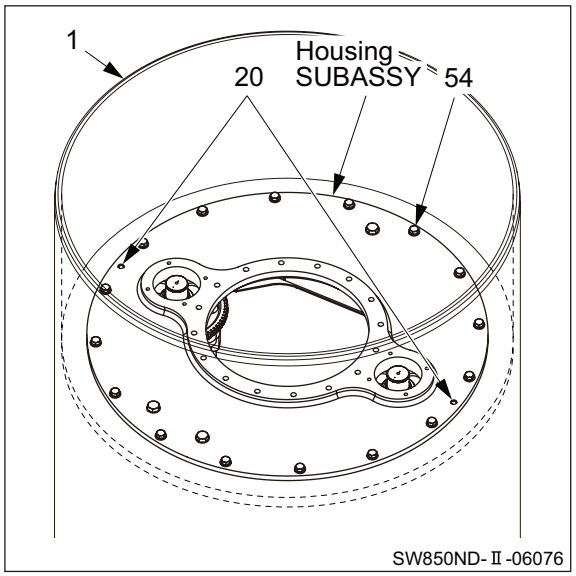
27) Drive in two locating pins (20) for housing SUBASSY and drum (1) temporarily.



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

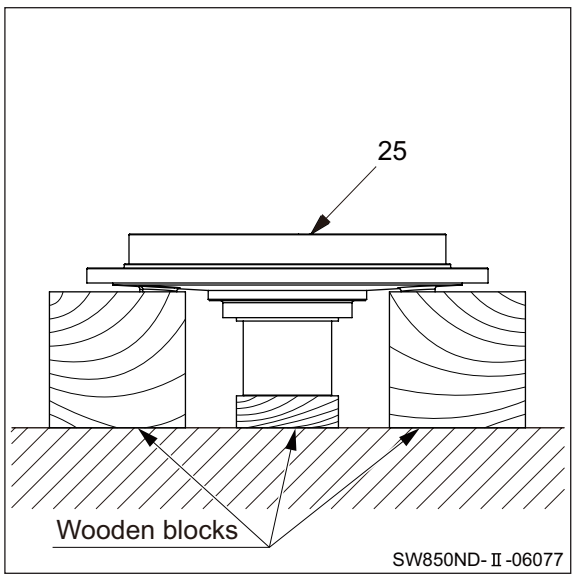
N•m (54) Bolts M16×45 : 265 N·m (195 lbf·ft)

- Drive in locating pins (20) again.

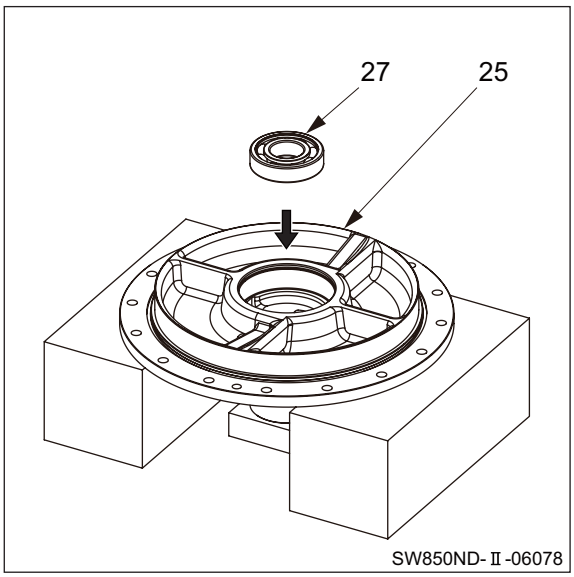


29) Reassembly of axle shaft SUBASSY

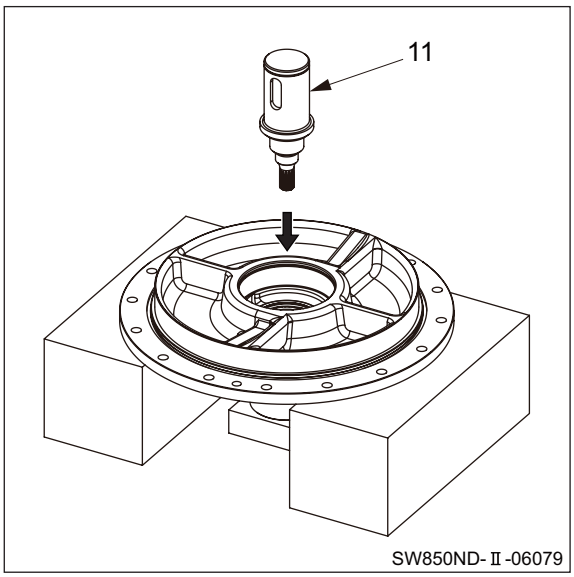
29-1) Fix axle shaft (25) with wooden blocks.



29-2) Apply a coat of gear oil to axle shaft (25) at where bearing will be press-fitted.
- Drive ball bearing (27).

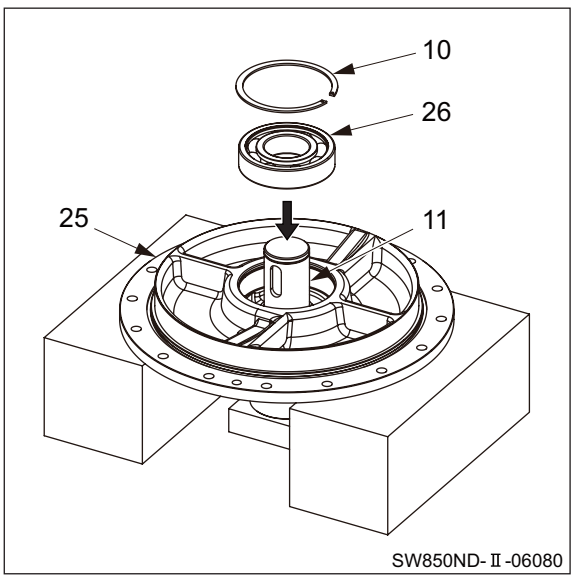


29-3) Apply a coat of gear oil to bearing mounting surface of shaft (11).
- Drive in shaft.



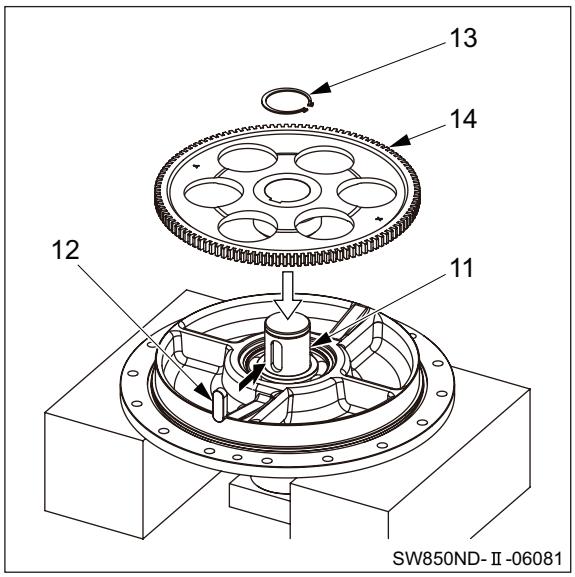
29-4) Apply a coat of gear oil to axle shaft (25) at where bearing will be press-fitted and to drive shaft (11) at where bearing will be installed.
- Drive ball bearing (26).
- Install retaining ring (10).

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



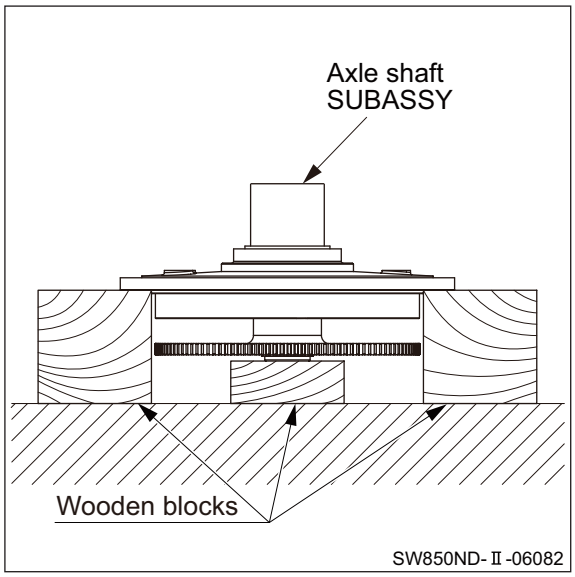
29-5) Heat up gear (14) by using a ring heater or the like.
- Drive sunk key (12) to shaft (11).
- Install heated gear.
- Install retaining ring (13).

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

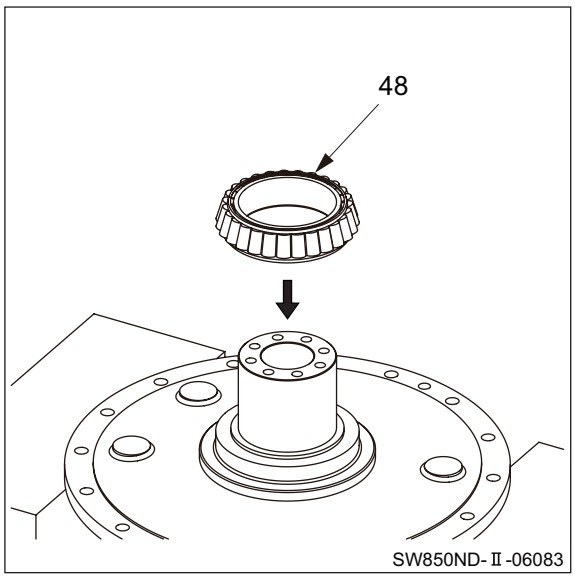


29-6) Reverse axle shaft SUBASSY.

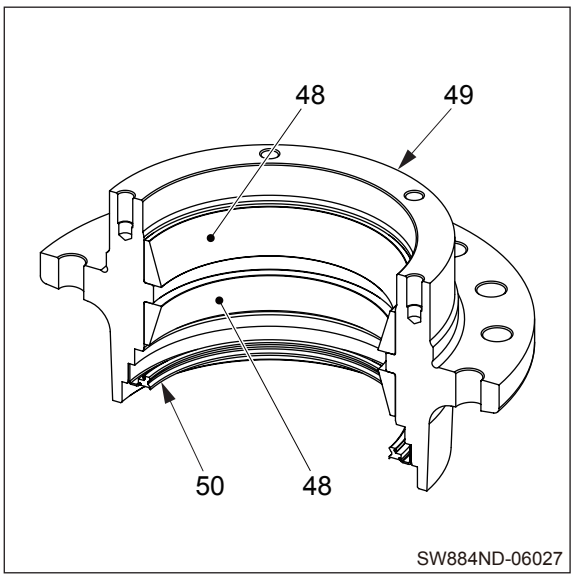
Axle shaft SUBASSY : 125 kg (276 lbs.)



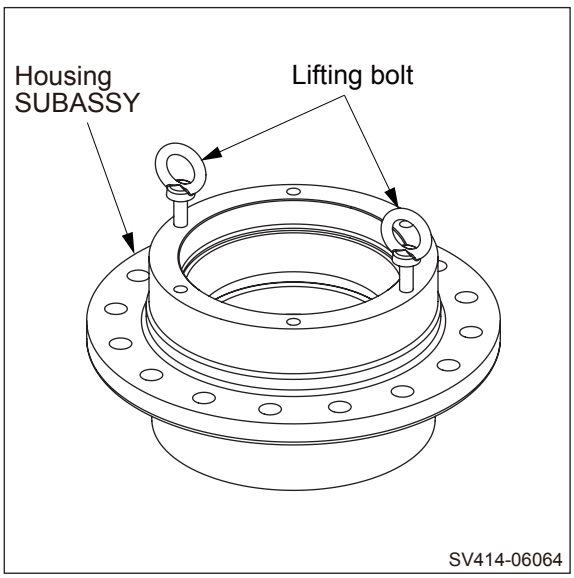
29-7) Heat up roller bearing (48) inner race by using a ring heater or the like.
- Apply a coat of gear oil to axle shaft at where bearing inner race will be press-fitted.
- Drive in heated roller bearing inner race.
- Apply sufficient amount of lithium-based grease to rollers of roller bearing inner race.



29-8) Apply a coat of gear oil to roller bearings (48) outer race mounting surface of housing (49).
- Drive roller bearing outer races.
- Apply liquid packing to periphery of oil seal (50).
- Drive oil seal.
- Apply grease to lip of oil seal.

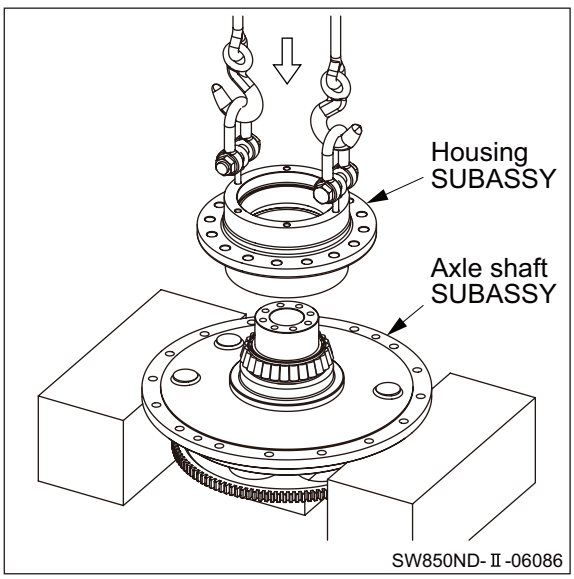


29-9) Install lifting bolts (M12).

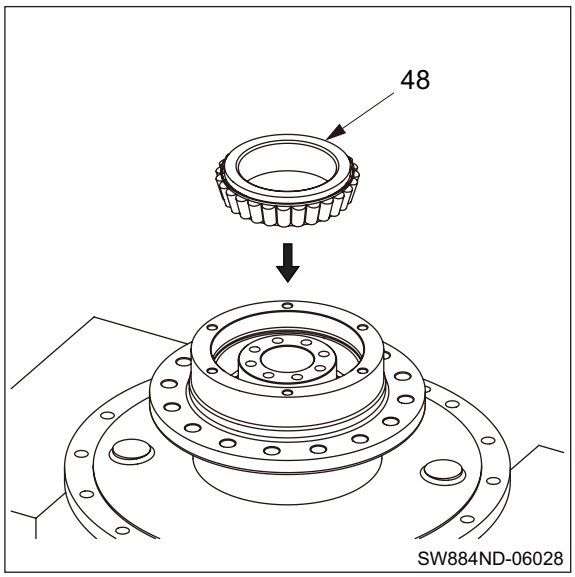


29-10) Install housing SUBASSY to axle shaft SUBASSY.

Housing SUBASSY : 40kg (88 lbs.)

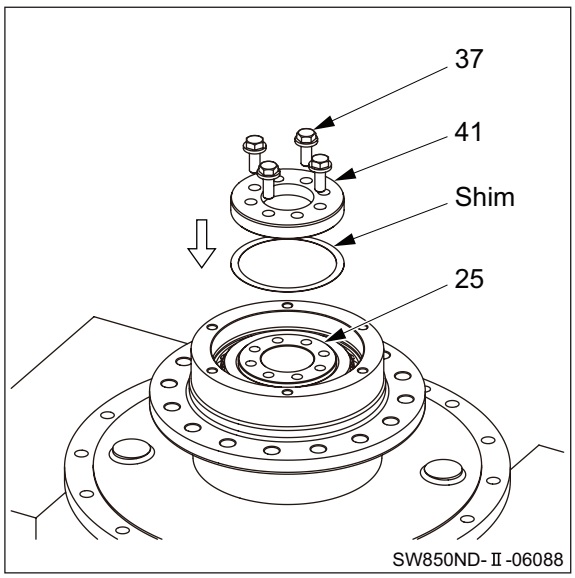


29-11) Apply sufficient amount of lithium-based grease to rollers of roller bearing (48) inner race.
- Drive in roller bearing inner race until rollers come in contact with outer race.



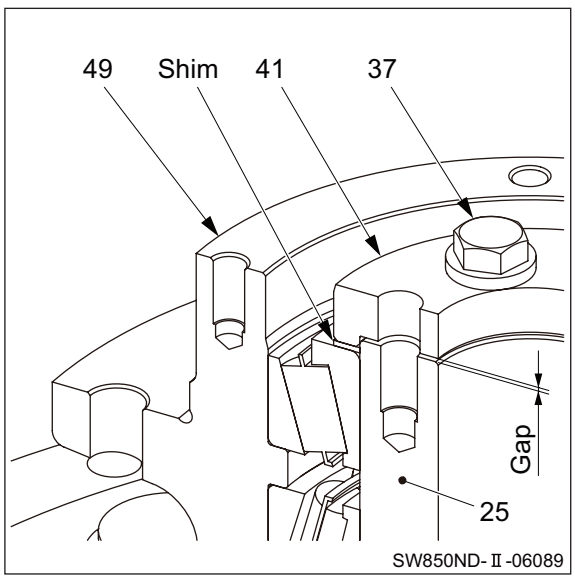
29-12) Preload adjustment of roller bearing

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



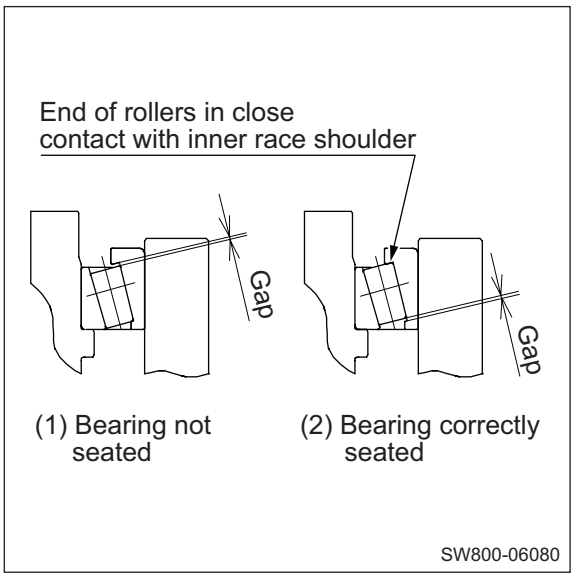
② A gap will remain between end of axle shaft (25) and inside of cover (41).
- Tighten bolts (37) to a torque of 30 N·m (22 lbf·ft).
- Give housing (49) two to three turns.
- Tighten bolts to a torque of 30 N·m (22 lbf·ft) again.
- Repeat this work several times until tightening torque of bolts no longer fluctuates.

(NOTICE)
- **Tighten the bolts alternately in diagonal directions.**



(NOTICE)

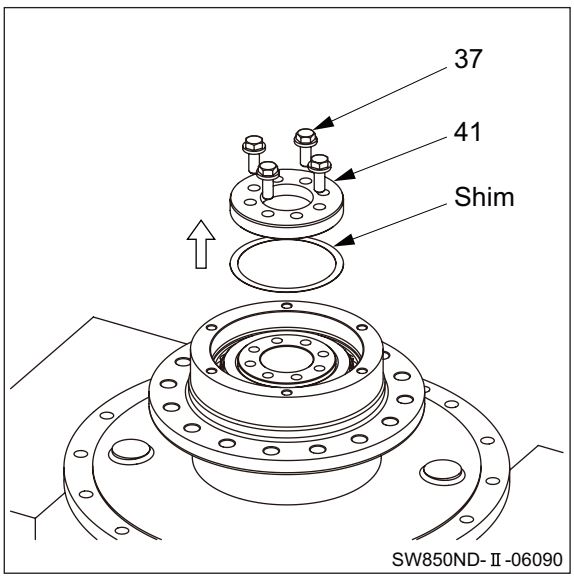
- **Push in the inner race while rotating the bearing. Otherwise, even strongly trying to push the inner race, the bearing rollers will not be pushed up and therefore bearing will not be seated.**



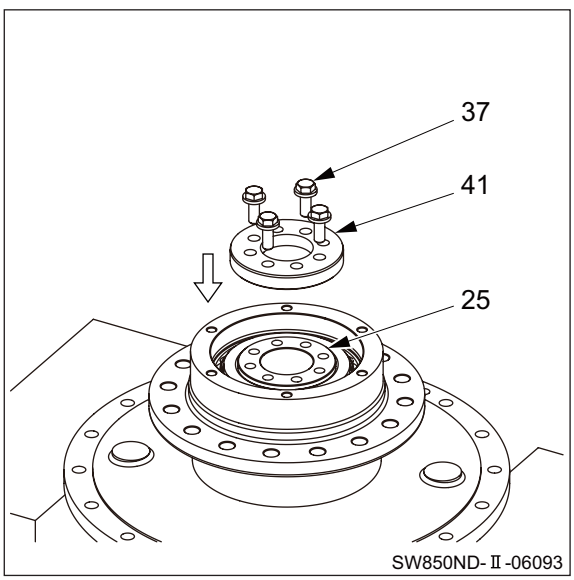
③ Remove bolts (37).
- Remove cover (41).
- Remove shim.

(NOTICE)

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

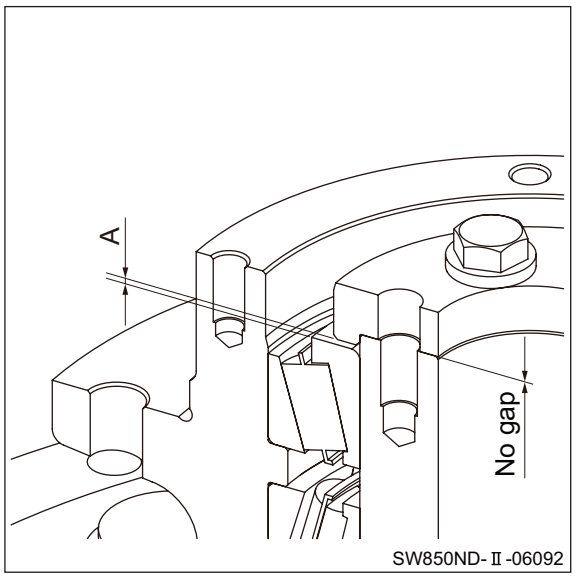


④ Without inserting shim, install cover (41).
- Install washers to four bolts (37) and tighten.

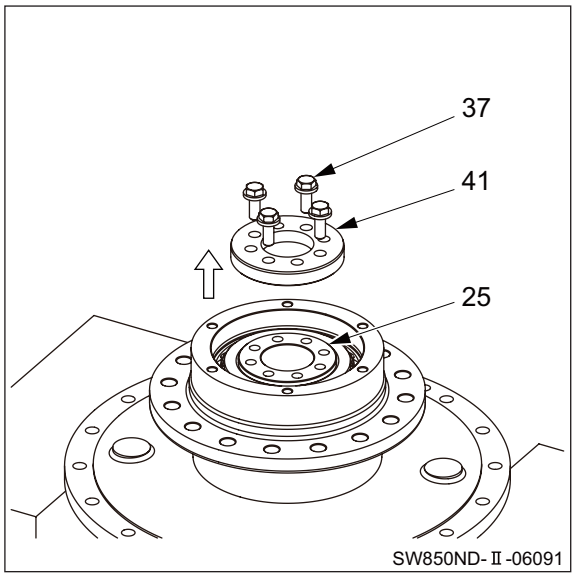


⑤ Using a thickness gauge, measure clearance “A”.

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

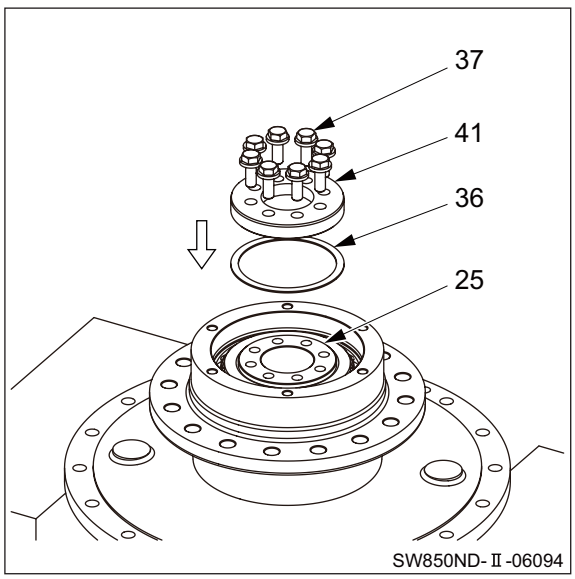


⑥ Remove bolts (37).
- Remove cover (41).

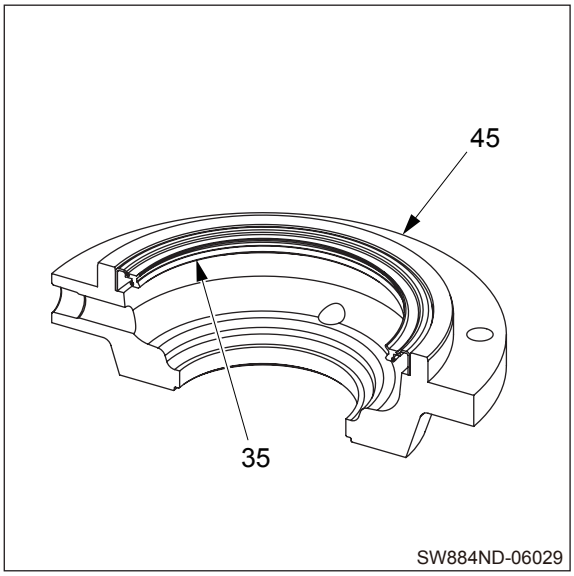


⑦ Install shim (36) of preload adjusting shim thickness = “A + 0.1 mm (0.004 in.)”.
- Secure cover (41) to axle shaft (25) with eight bolts (37) and washers.

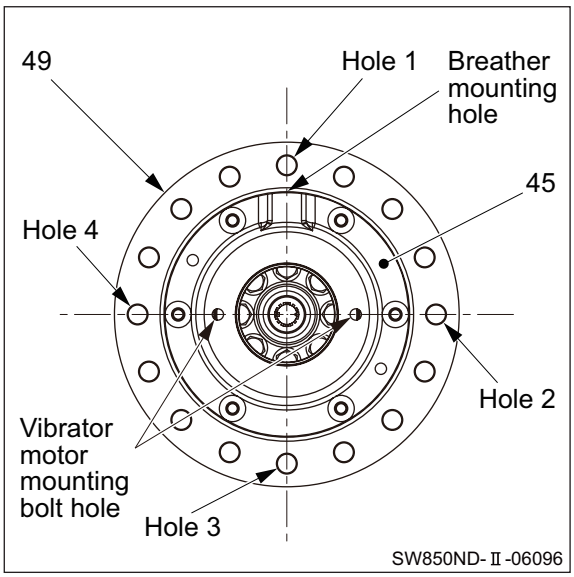
N•m (37) Bolts M14×40 : 170 N·m (125 lbf·ft)



29-13) Apply liquid packing to periphery of oil seal (35).
- Drive in oil seal to cover (45).
- Apply grease to lip of oil seal.

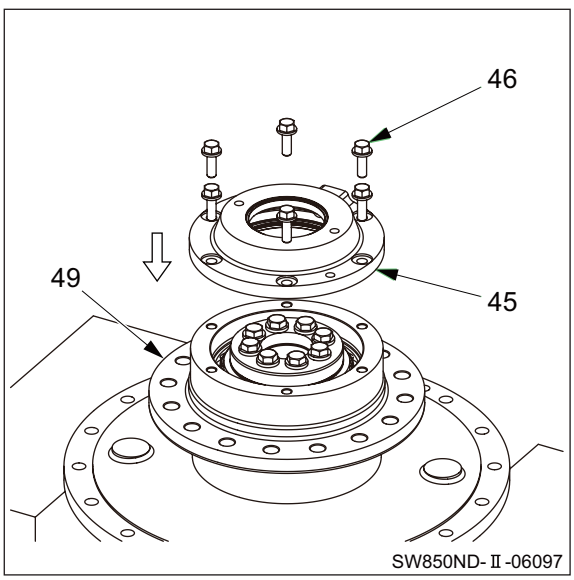


(NOTICE)
- **The four holes in housing (49), breather mounting hole in cover (45), and vibrator motor mounting bolt holes must be arranged as shown on the right.**

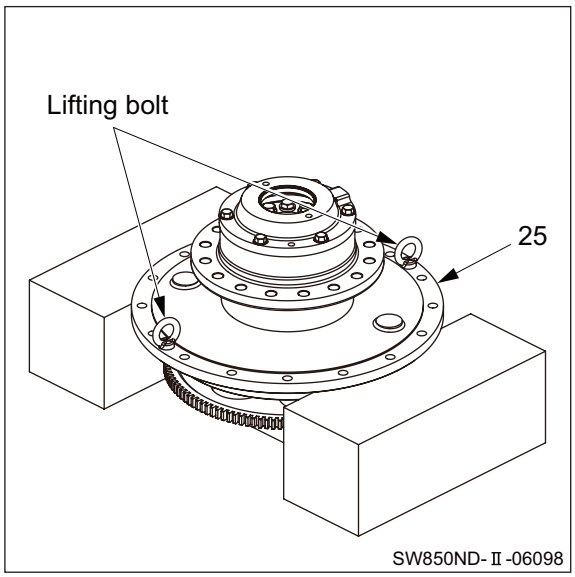


29-14) Apply a coat liquid packing to housing (49) at where cover (45) will be installed.
- Secure cover to housing with six bolts (46) and washers.

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



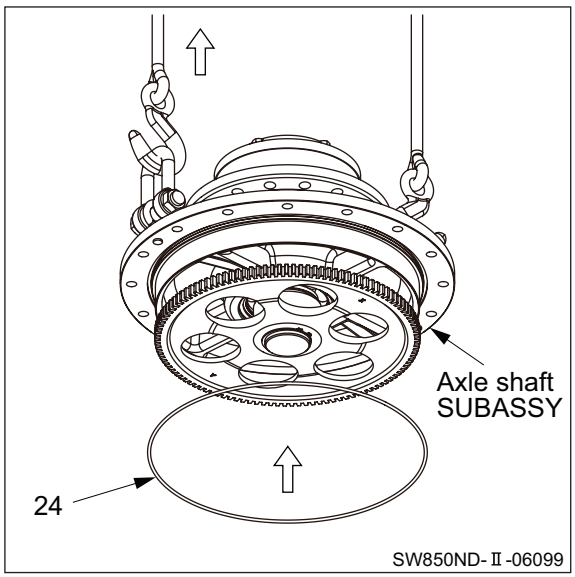
30) Install lifting bolts (M16) to axle shaft (25).



31) Lift axle shaft SUBASSY.

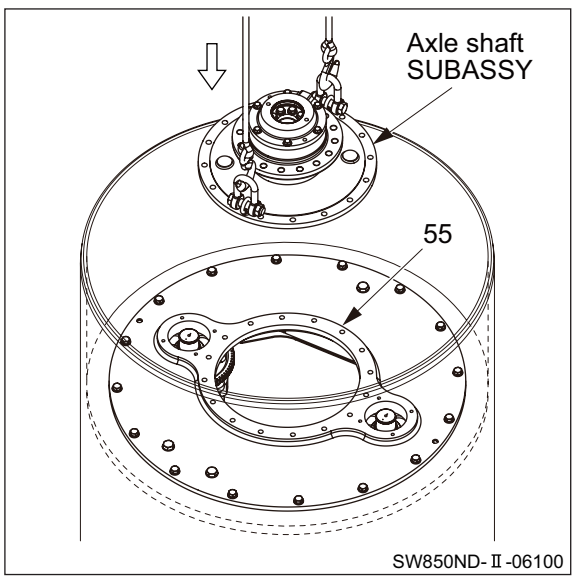
kg Axle shaft SUBASSY : 185 kg (408 lbs.)

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



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

(NOTICE)
- **Take care not to let O-ring to protrude from its groove.**

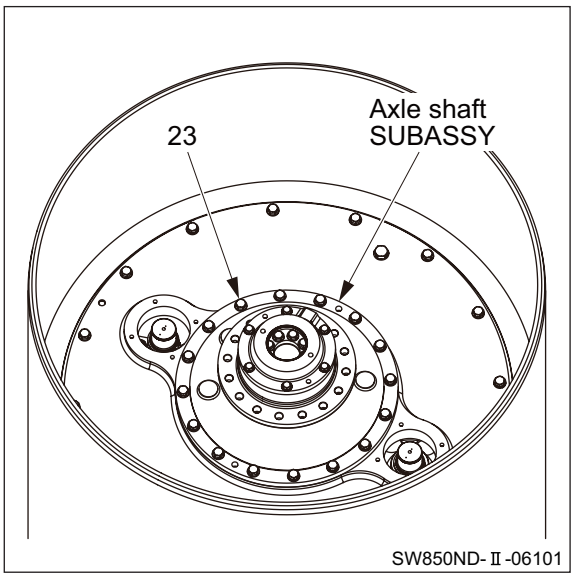


33) Secure axle shaft SUBASSY with sixteen bolts (23) and washers.

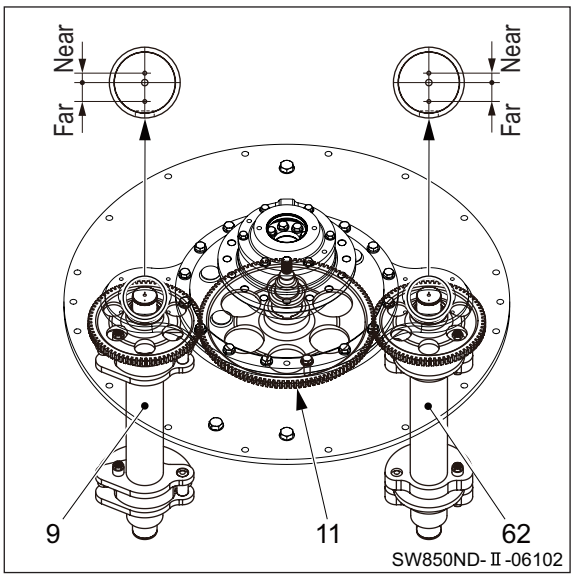
N•m (23) Bolts M16×50 : 265 N·m (195 lbf·ft)

(NOTICE)

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



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

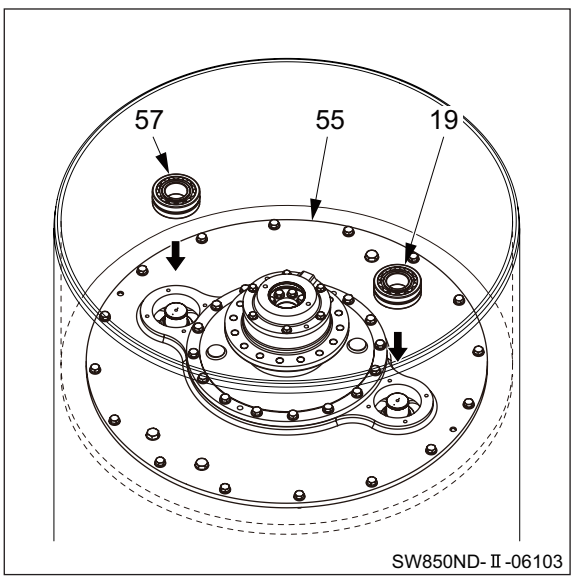


35) Apply a coat of gear oil to housing (55) at where bearings will be press-fitted and to eccentric shafts at where bearings will be installed.

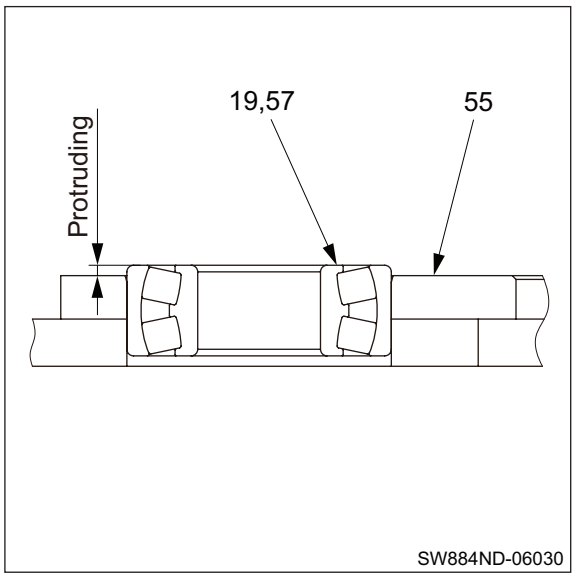
- Drive in vibrator bearings (19) and (57).

(NOTICE)

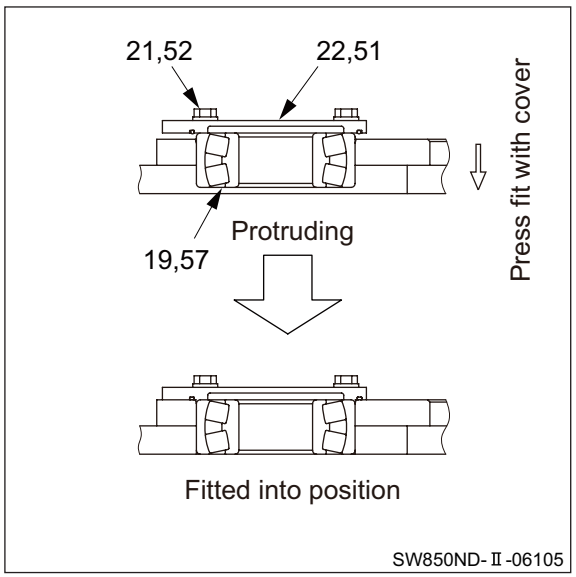
- **Take care not to damage the bearings when installing them.**



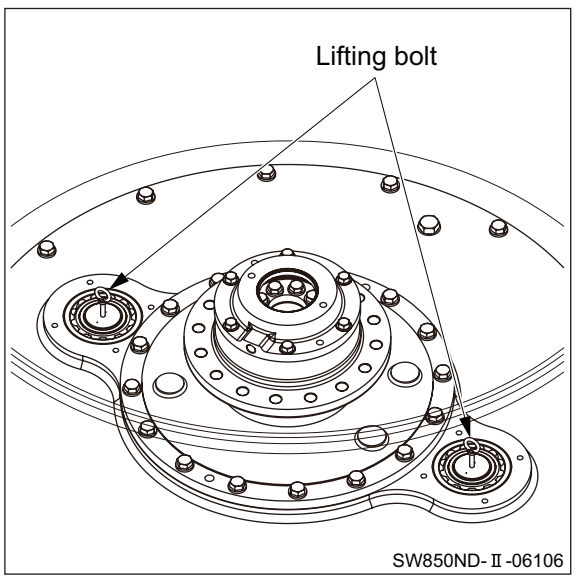
36) Stop driving in vibrator bearings (19) and (57) when they come to a position slightly protruding from the boss surface of housing (55) to avoid driving in too much.



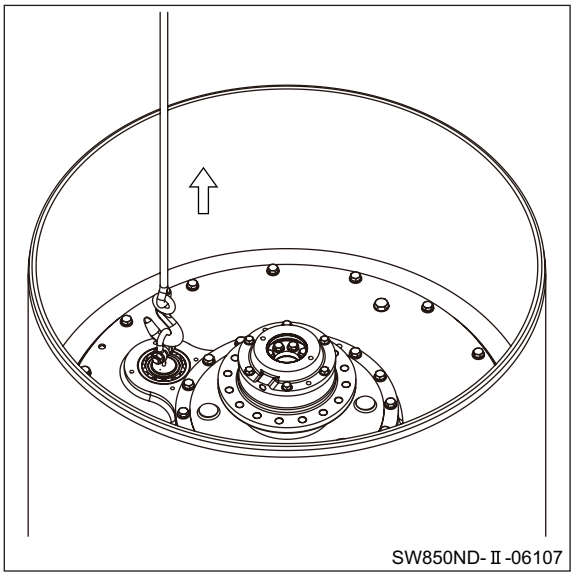
37) Press fit slightly protruding vibrator bearings (19) and (57) into place by securing covers (22) and (51) with four bolts (21), (52), and washers.
- After press fitting, remove covers to make sure that vibrator bearings are not protruding.



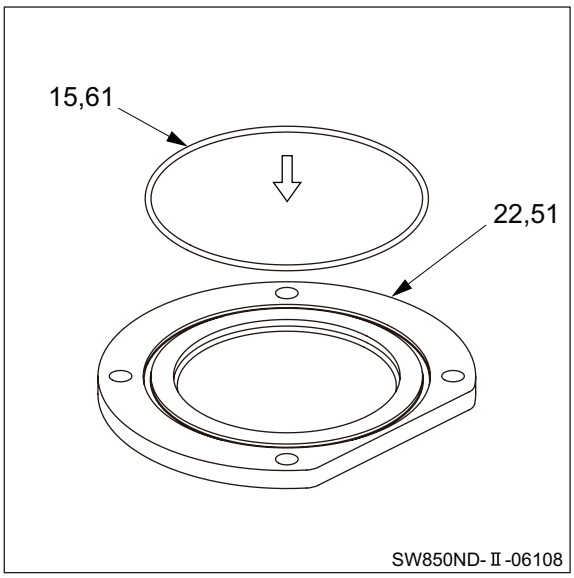
38) Install lifting bolts (M8) to end of eccentric shafts.



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


SW850ND-Ⅱ-06107

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

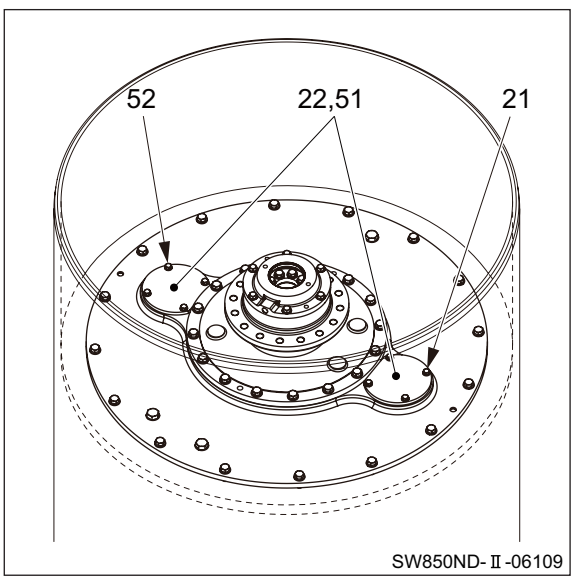


SW850ND-Ⅱ-06108

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

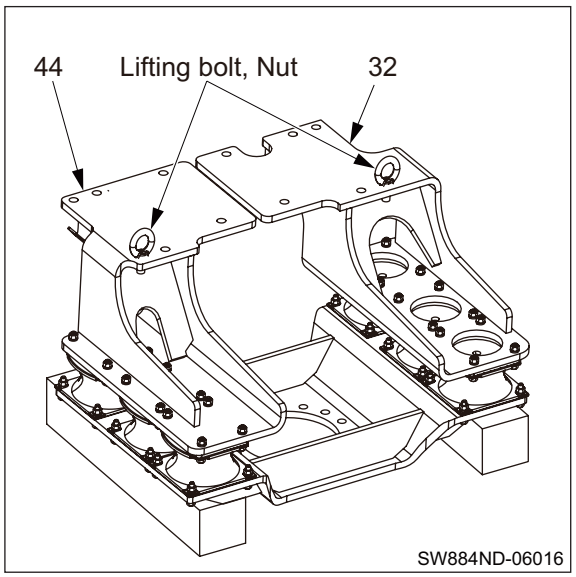
N•m (21) and (52) Bolts M10×30 : 59 N·m (44 lbf·ft)

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



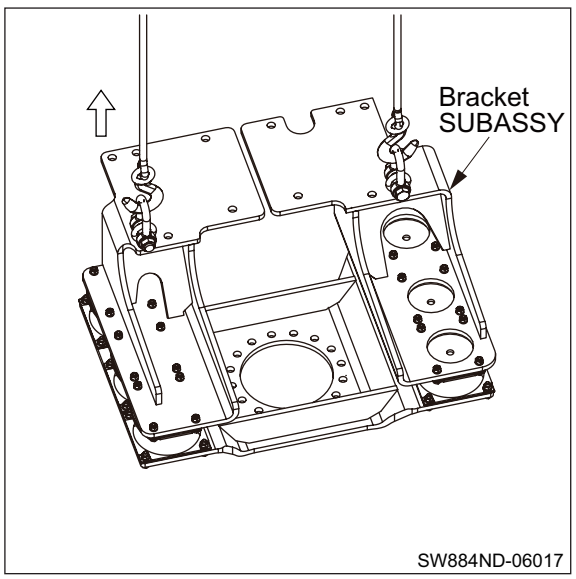
SW850ND-Ⅱ-06109

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



43) Lift bracket SUBASSY.

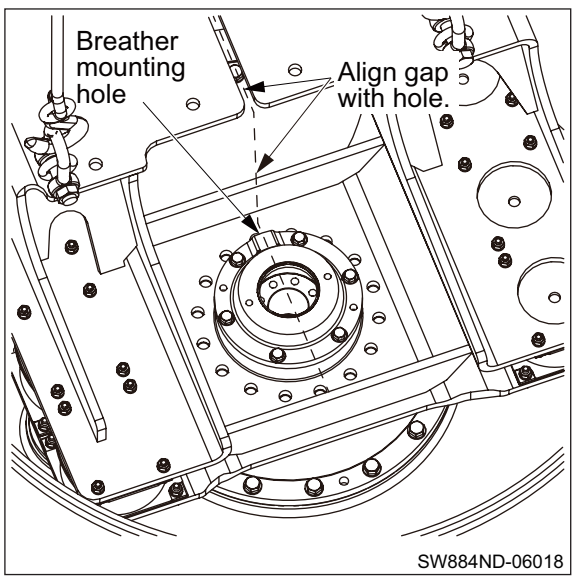
Bracket SUBASSY
SW884ND : 290 kg (639 lbs.)
SW994ND : 295 kg (650 lbs.)



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

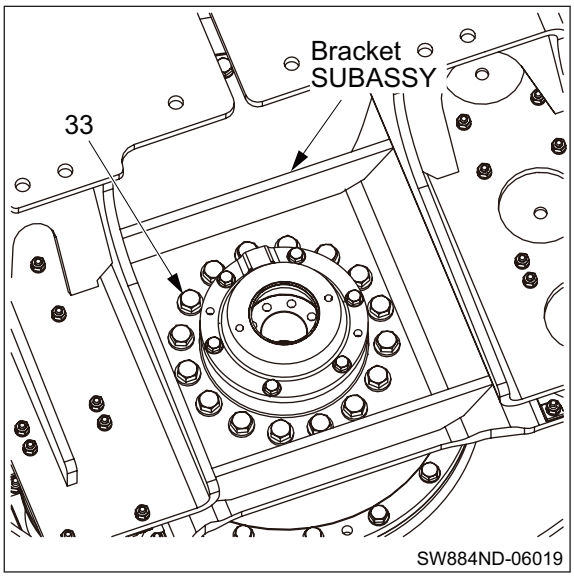
(NOTICE)

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

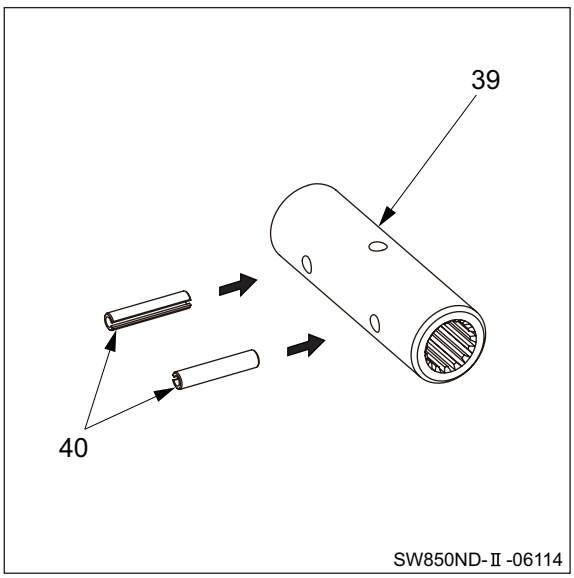


45) Secure bracket SUBASSY with sixteen bolts (33) and washers.

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

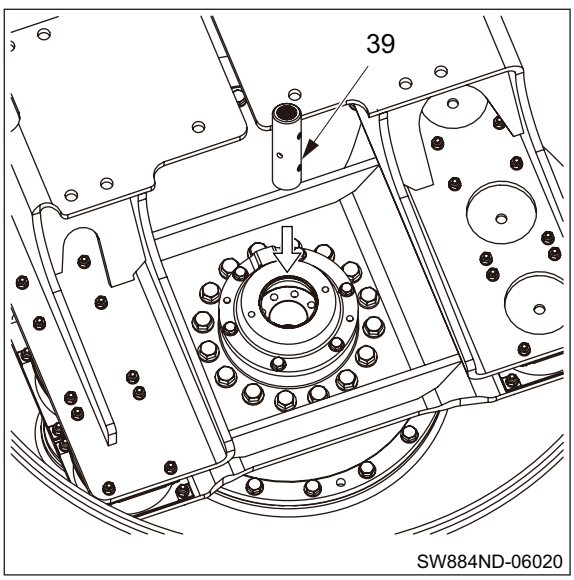


46) Drive two spring pins (40) into sleeve (39).

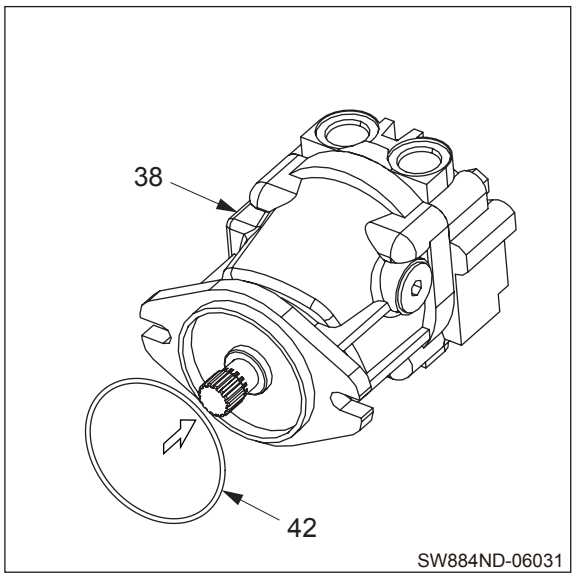


47) Apply molybdenum-based grease to splined portion of sleeve (39).

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



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

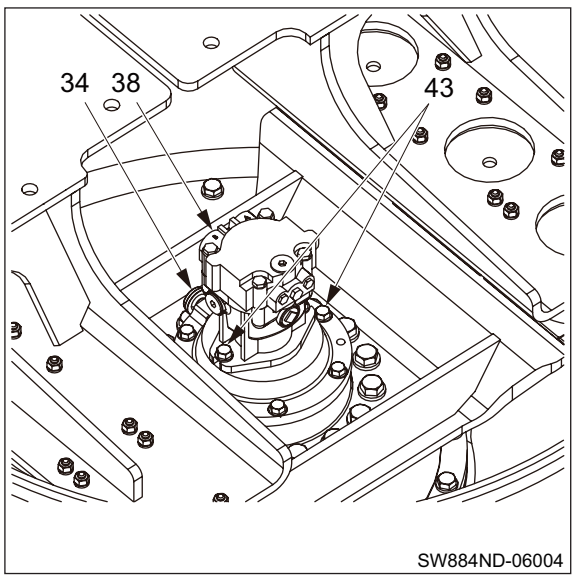


49) Wind seal tape around threaded portion of breather (34).
- Install breather.
- Secure vibrator motor (38) to cover (45) with two bolts (43) and washers.

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

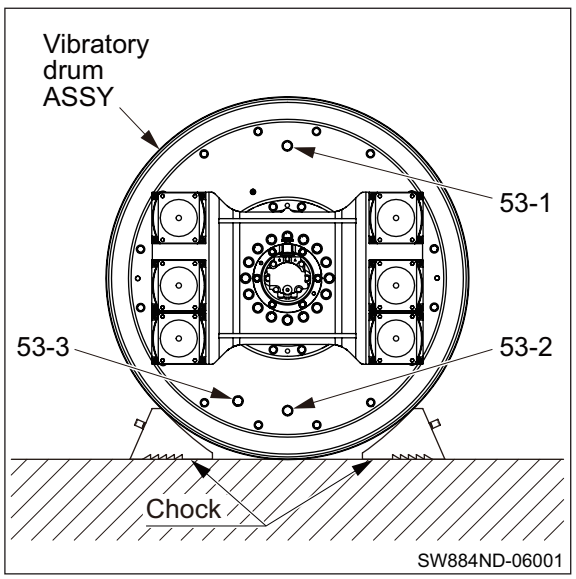
(43) Bolts M12×40 : 108 N·m (80 lbf·ft)

(NOTICE)
- **Take care not to let O-ring to protrude from its groove.**

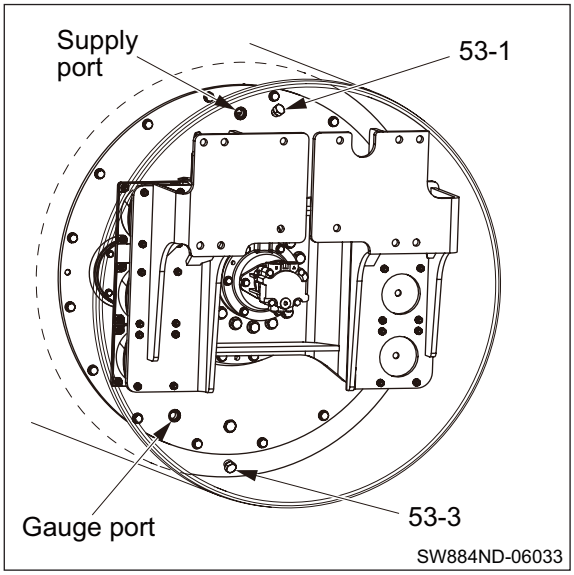


50) Lay vibratory drum ASSY with plugs (53-1), (53-2), and (53-3) positioned as shown on the right.
- Hold with chocks.

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

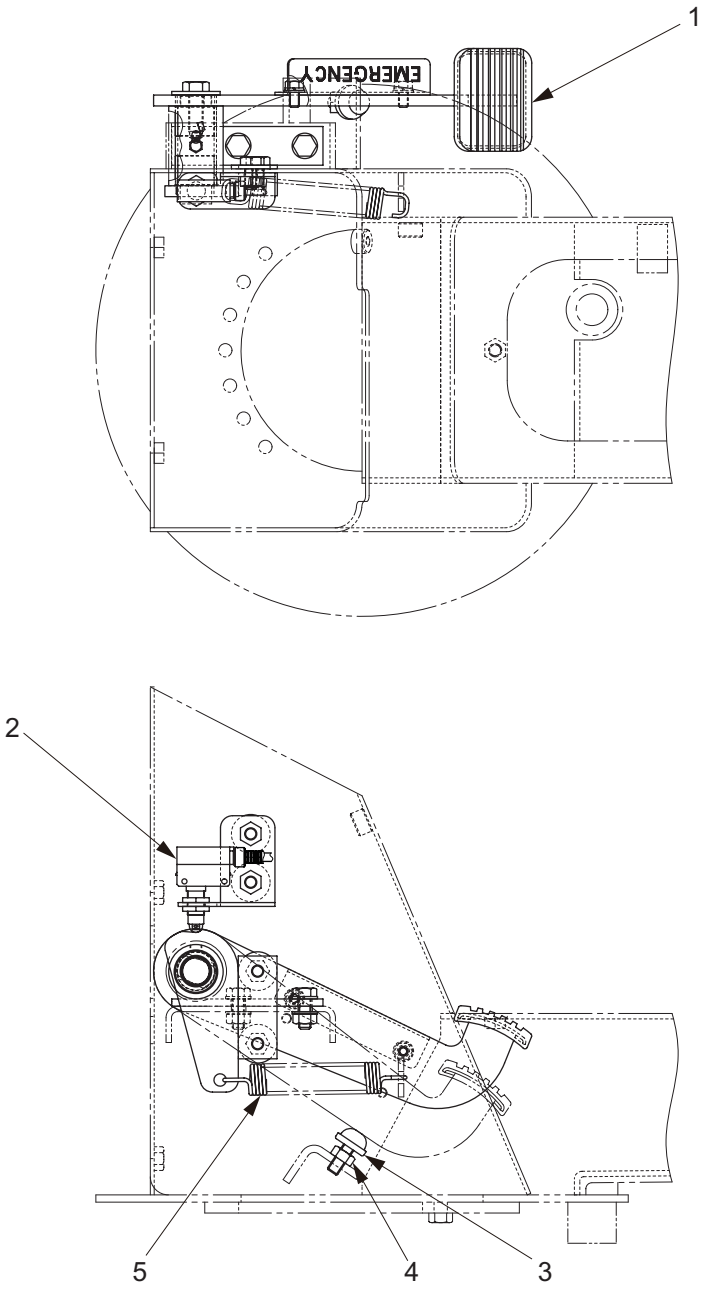


51) Remove plugs (53-1) and (53-3).
- Supply gear oil from oil supply port.
- Check that oil drips from gauge port.
  - Quantity of gear oil : 75 L (19.8 gal.)
- Install plugs.



BRAKE

1. BRAKE PEDAL



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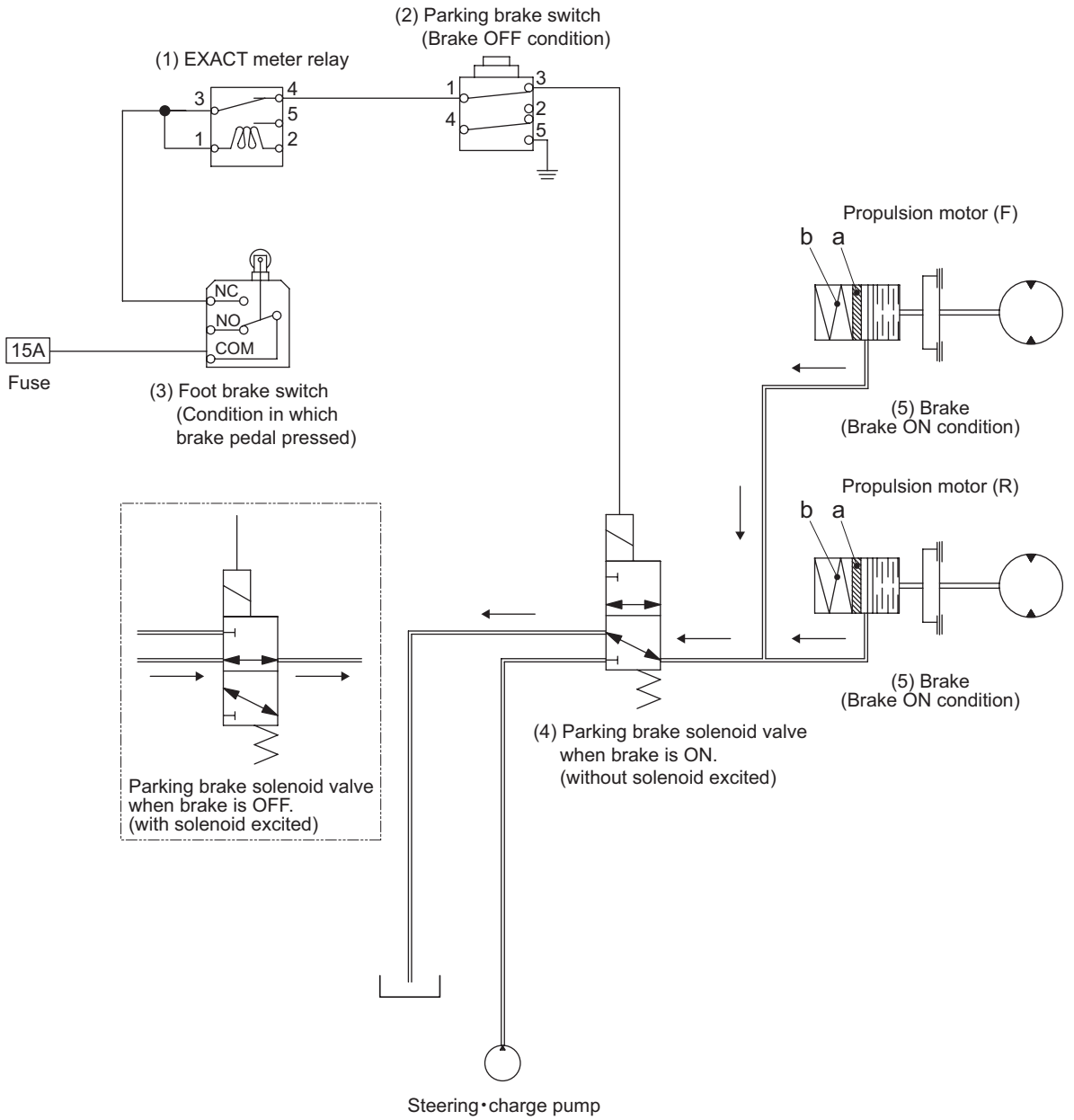
(1) Brake pedal
(2) Foot brake switch
(3) Stopper bolt : M10×25 P=1.25
(4) Nut : M10 P=1.25
(5) Return spring

Fig.: Brake circuit



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

SW880-1-07001

2. BRAKE SYSTEM

2-1. Description and Operation of Brake Circuit

Description

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

Operation

To release parking brake:

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

To apply parking brake (Brake pedal not depressed):

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

When brake pedal is pushed down on:

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

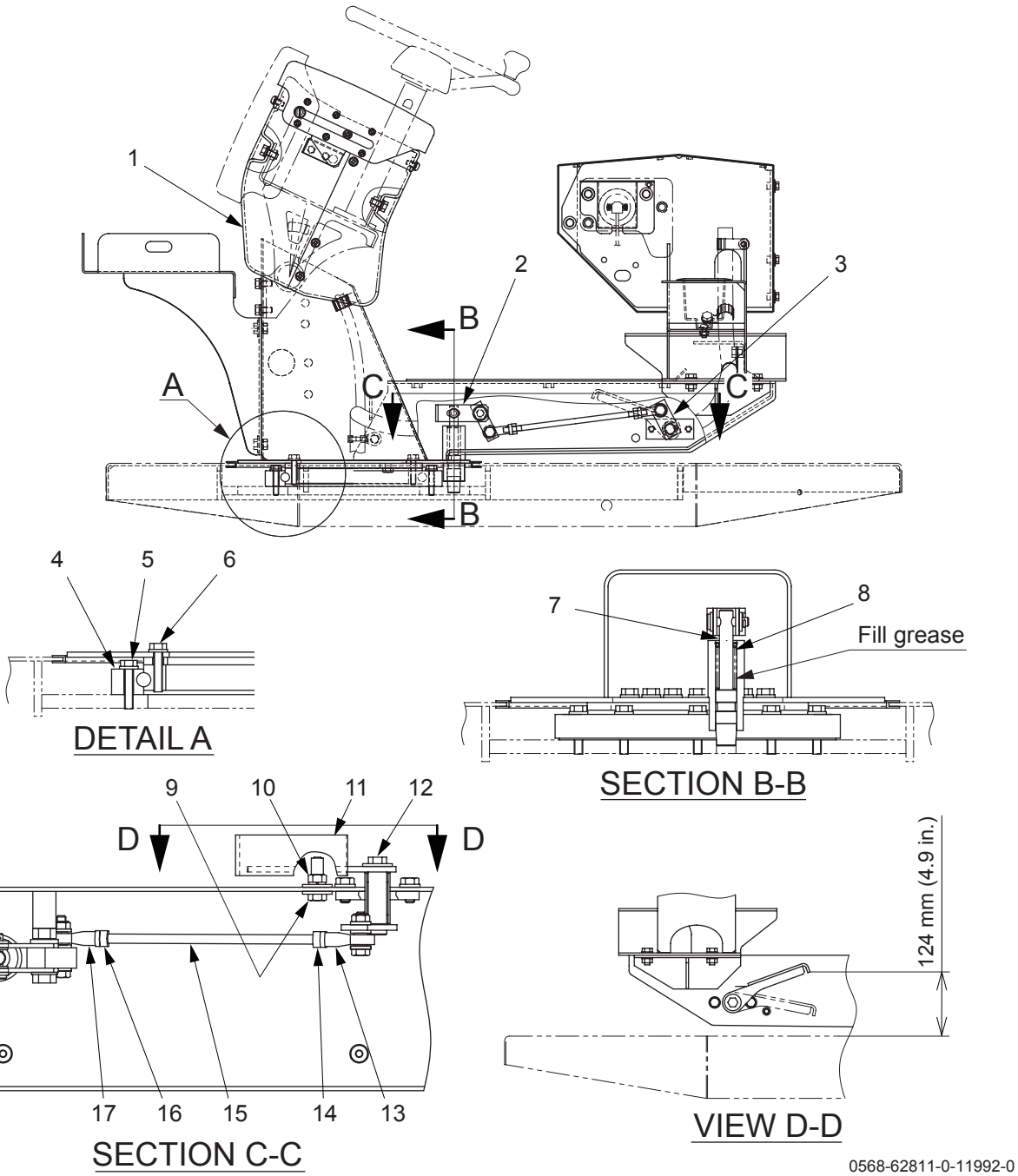
To disengage the brake when towing:

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

OPERATOR STATION

1. FLOORBOARD

1-1. Structure of Operator Station



(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

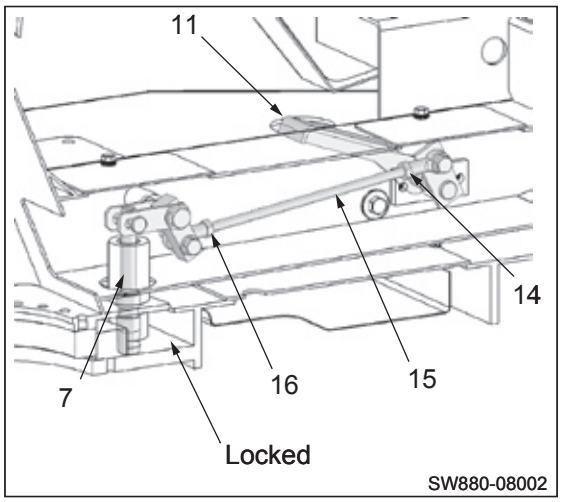
N•m

(12) Bolt M10×20 : 49 N·m (36 lbf·ft)

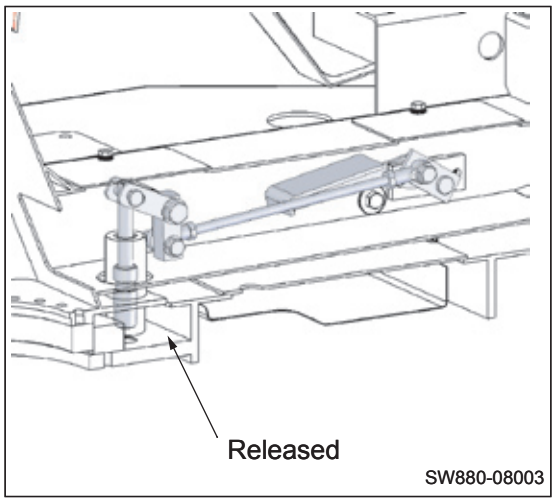
(10) Nut : M10
(11) Pedal
(12) Bolt : M10×20
(13) Rod end : M10 (left-hand thread)
(14) Nut : M10 (left-hand thread)
(15) Rod
(16) Nut : M10
(17) Rod end : M10

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

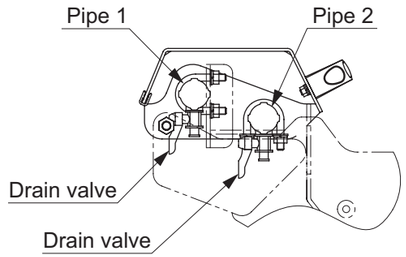


Pedal depressed

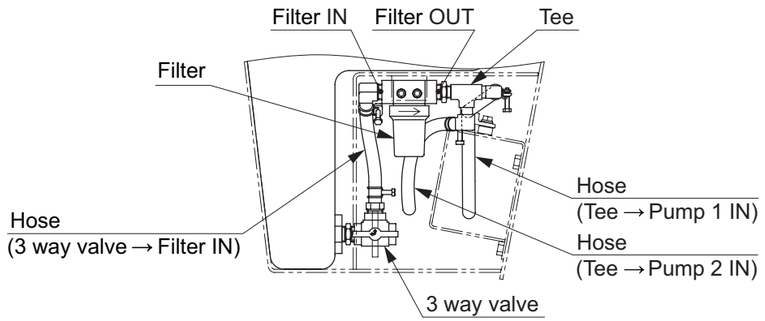
- The numbers in parentheses that appear in the above sentences and the numbers in the above illustrations are consistent with the lead line numbers shown in “1-1. Structure of Operator Station” (page 8-001).

WATER SPRAY SYSTEM

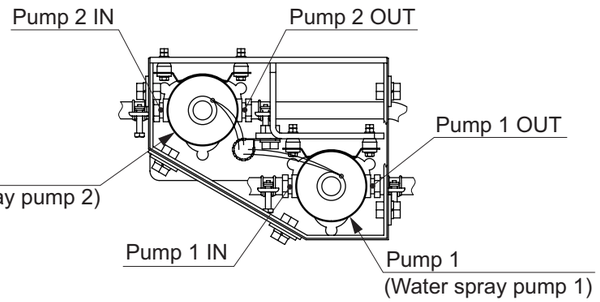
1. WATER SPRAY PIPING

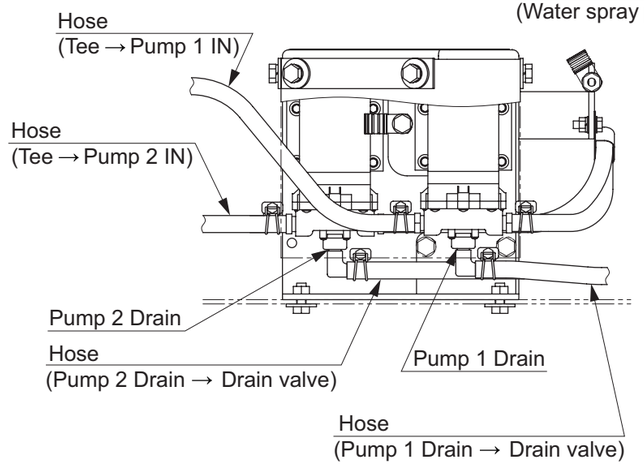


VIEW A-A

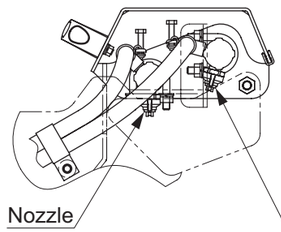


VIEW B

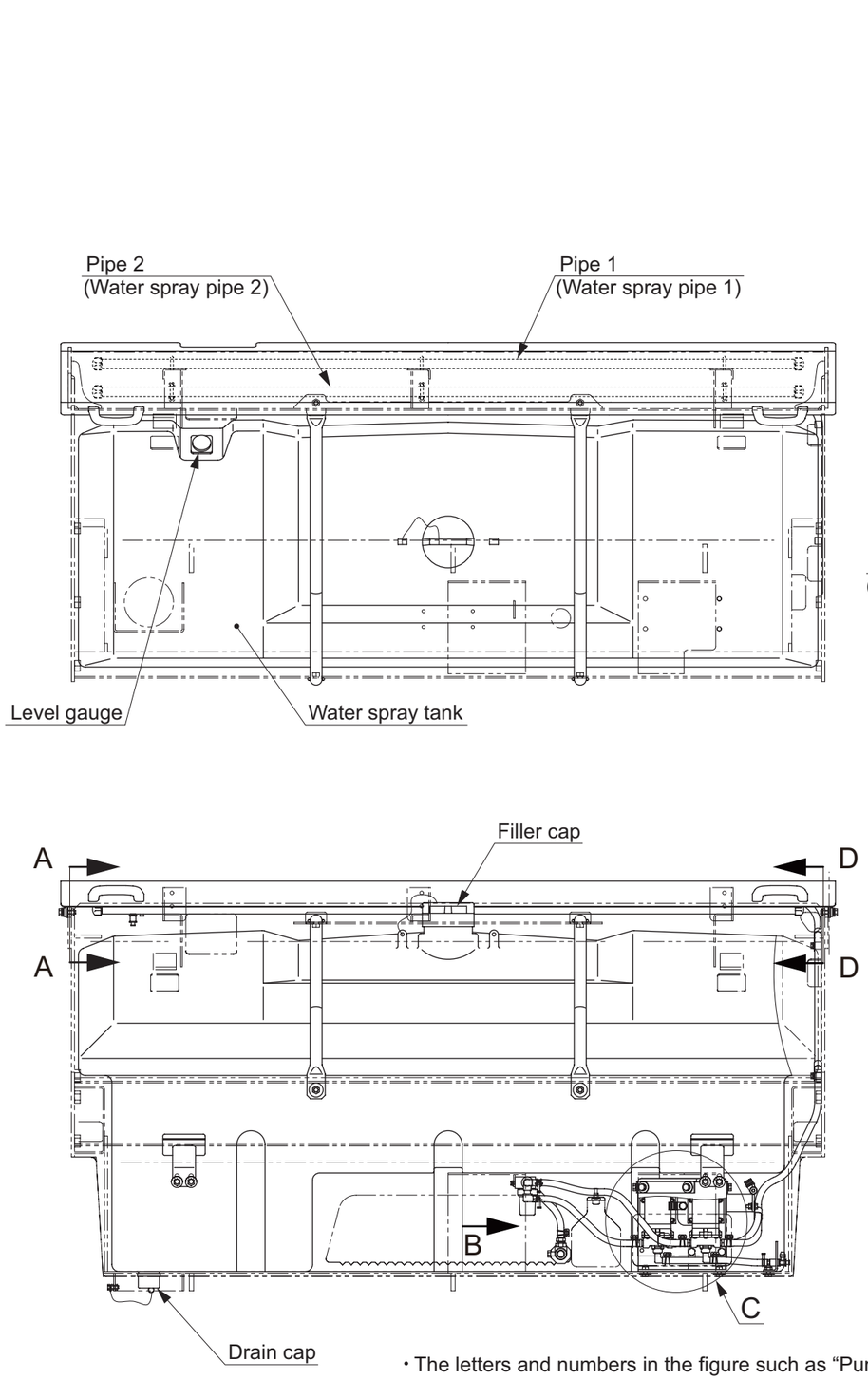


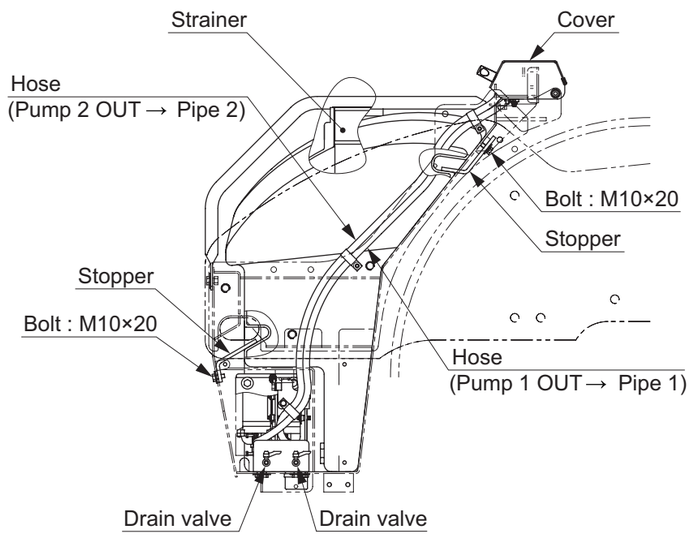


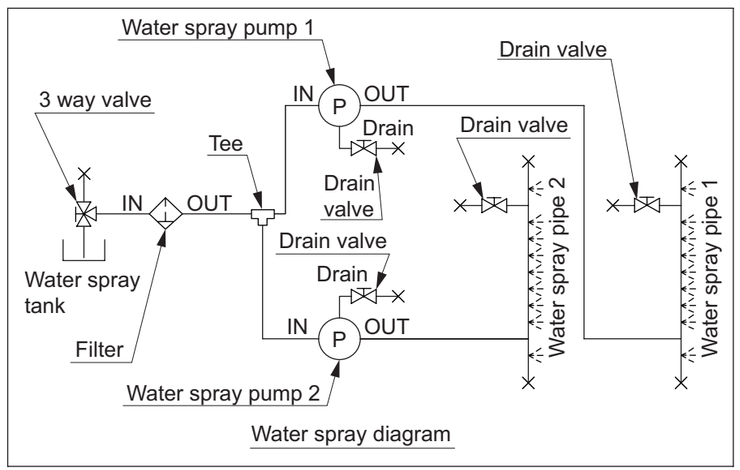
DETAIL C



VIEW D-D







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

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INSPECTION AND ADJUSTMENT

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). Attach pressure gauge with hose ⓢ and connector ⓤ .
- Coupling : 7/16-20UNF×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ : M16×G3/8
- High pressure gauge port (Forward) : (2)
- High pressure gauge port (Reverse) : (1)
- Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

④ Set propulsion speed change switch to “🐢”.

⑤ Set vibration frequency select switch to “2,500 vpm”.

⑥ Start the engine and set throttle switch to “Full”.

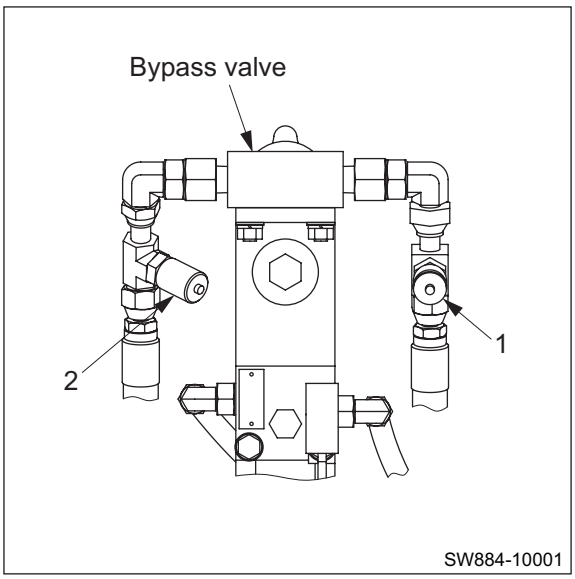
⑦ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

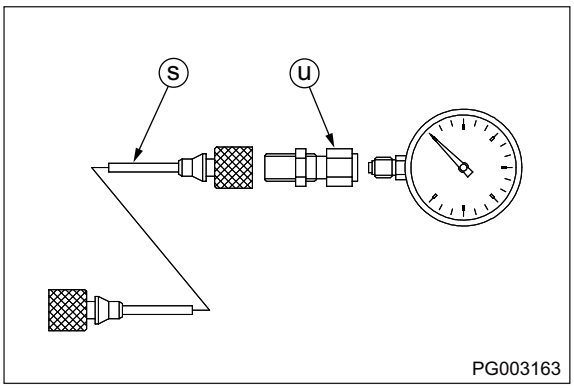
⑧ With propulsion load at maximum, slowly move F-R lever to the side to be measured.

⑨ Read pressure indicated by pressure gauge.

⑩ After measuring, promptly return F-R lever to “N”.

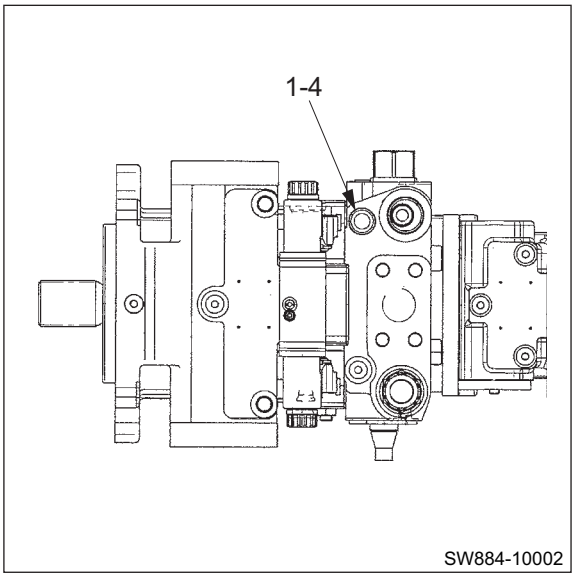
★ Maximum circuit pressure (cut off valve setting)
: 40.2 ± 1.0 MPa (5,829 ± 145 psi)





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)

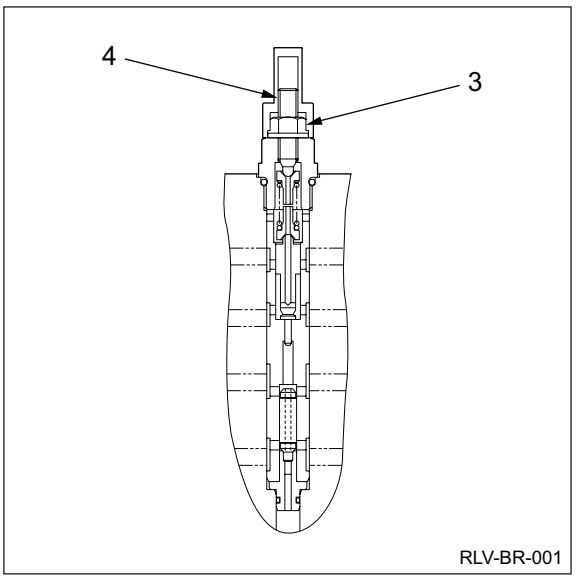
③ If there is no evidence of nut having loosened, remove cut off valve.

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)

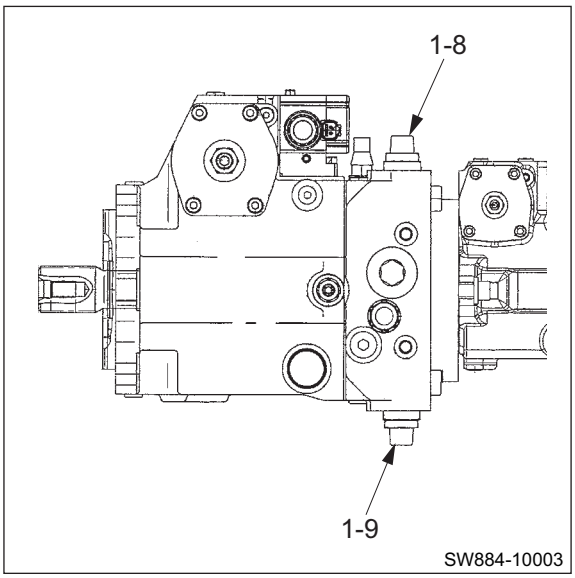
- **Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.**

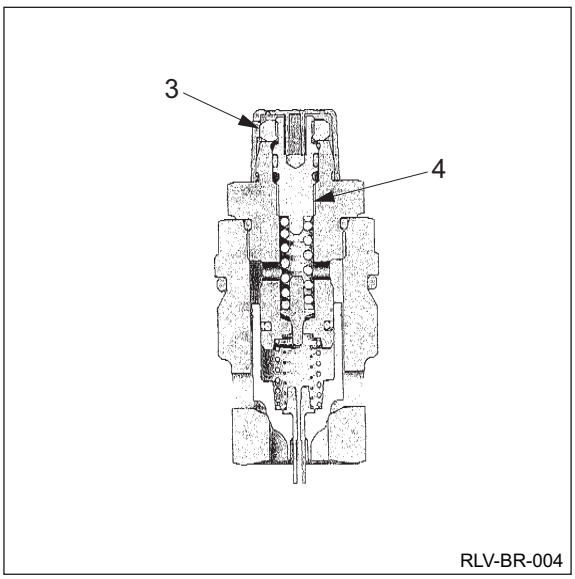
- The number “1-4” appearing in above illustrations is consistent with lead line numbers shown in illustration of hydraulic pump assembly in “2-2. Hydraulic Component Specifications” (P.4-007).

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

① Check high pressure relief valve (1-8) or (1-9) for evidence of having loosened.
- High pressure relief valve (Forward) : (1-8)
- High pressure relief valve (Reverse) : (1-9)

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





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

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

- The number “1-8” and “1-9” appearing in above illustrations are consistent with lead line numbers shown in illustration of hydraulic pump assembly in “2-2. Hydraulic Component Specifications” (P.4-007).

3. MEASUREMENT AND ADJUSTMENT OF PROPULSION CHARGE CIRCUIT PRESSURE

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

3-1. Measurement

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

① Remove plug from coupling (1). Attach pressure gauge with hose ⓢ and connector ⓤ .
- Coupling : 7/16-20UNF×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ : M16×G3/8
- Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

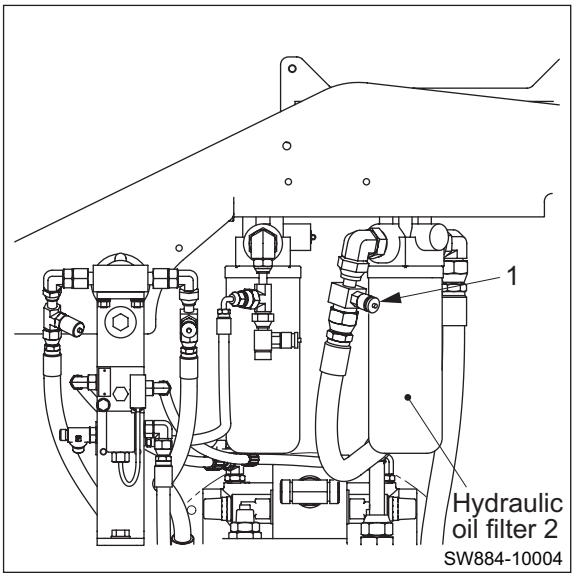
② Confirm that F-R lever is “N”.

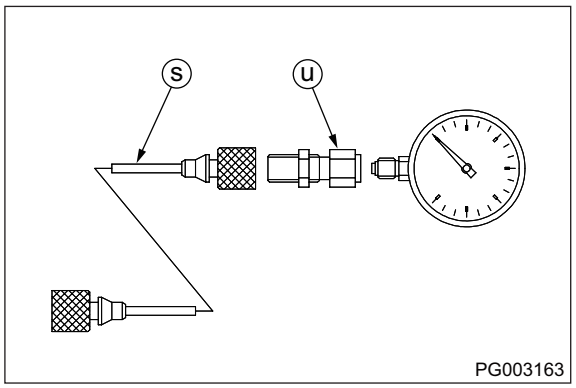
③ Apply parking brake by pressing parking brake switch button.

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

⑤ Read pressure indicated by pressure gauge.

★ Standard charge relief valve setting
: 2.5 ± 0.2 MPa (363 ± 29 psi)





3-2. Adjustment

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

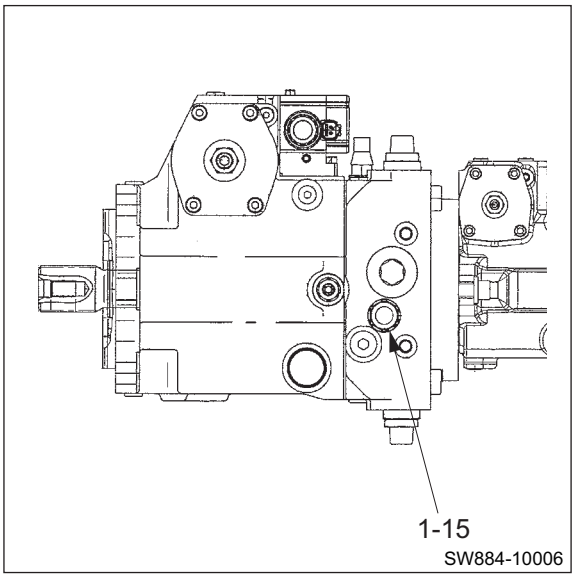
① Check nut (1) of charge relief valve (1-15) for evidence of having loosened.
② If there is evidence of nut having loosened, adjust charge relief valve so that pressure becomes within standard charge relief valve setting range while watching pressure gauge.
- To adjust pressure, loosen nut and turn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

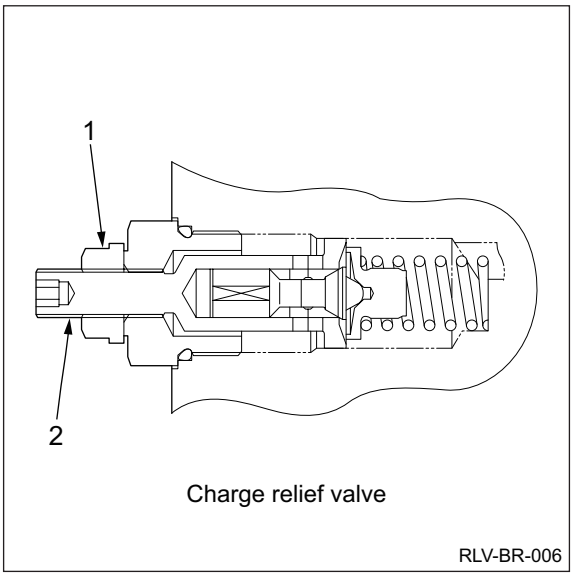
Adjustment screw turned clockwise
: Pressure rise
Adjustment screw turned counterclockwise
: Pressure drop
Pressure change rate : 0.4 MPa/turn (58 psi/turn)

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

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.**





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

4. MEASUREMENT OF PROPULSION SERVO CIRCUIT PRESSURE

4-1. Measurement

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

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

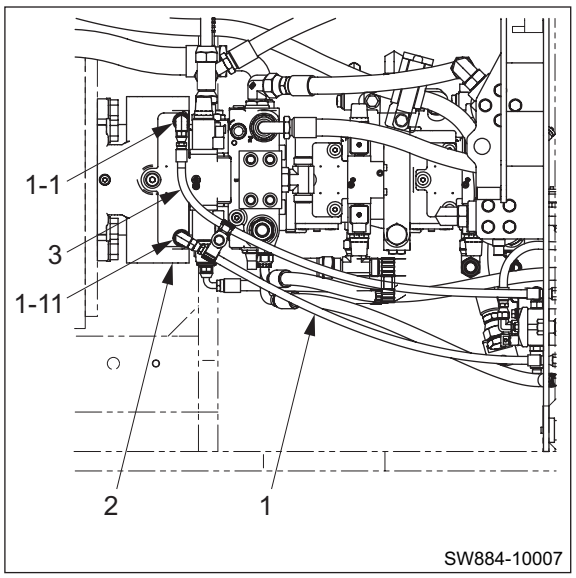
② Confirm that F-R lever is “N”.

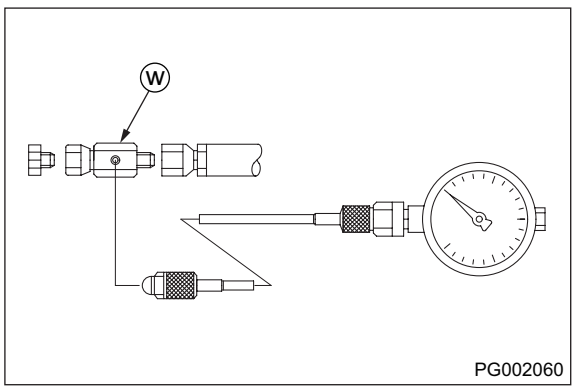
③ Apply parking brake by pressing parking brake switch button.

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

⑤ Operate F-R lever and then read pressure indicated by pressure gauge.
- With parking brake applied (ON), measured pressures of (1-1) and (1-11) are same.
- With parking brake released (OFF), measured pressures of (1-1) and (1-11) are different.

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





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

5. MEASUREMENT OF PARKING BRAKE RELEASE PRESSURE

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

5-1. Measurement

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

① Disconnect 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 “N”.

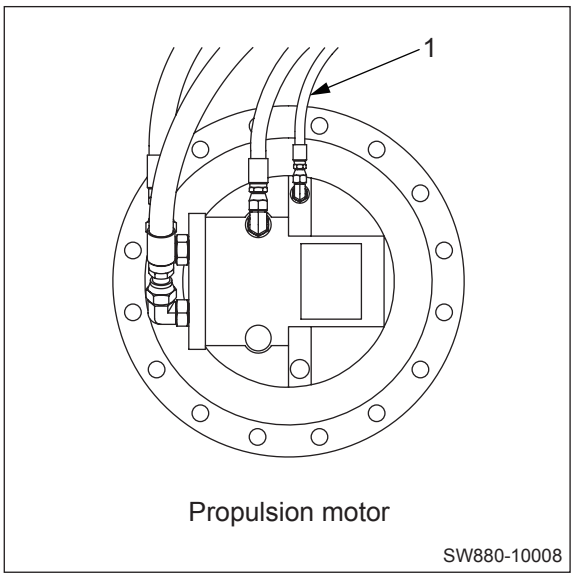
③ Apply parking brake by pressing parking brake switch button.

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

⑤ Release parking brake by pressing parking brake switch button.

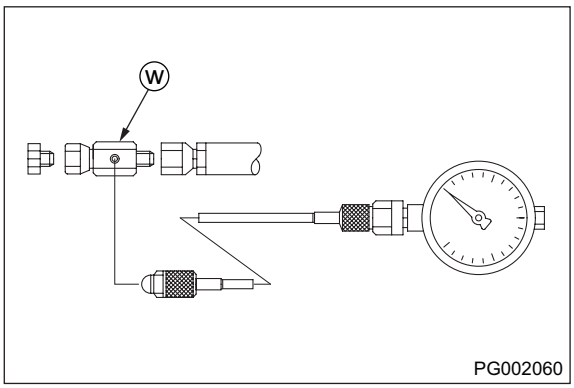
⑥ Read brake release pressure indicated by pressure gauge.

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



Propulsion motor

SW880-10008



PG002060

6. MEASUREMENT AND ADJUSTMENT OF VIBRATOR CIRCUIT PRESSURE

6-1. Measurement

⚠CAUTION

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

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

① Remove plugs from high pressure gauge port (2-3),(2-11),(3-3) and (3-11) of vibrator pump (F),(R). Attach pressure gauge with adapter ⓨ .
- Adapter ⓨ : 7/16-20UNF
- High pressure gauge port : (2-3),(3-3) (Low amplitude/Oscillation)
- High pressure gauge port : (2-11),(3-11) (High amplitude/Normal)
- Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

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

⑤ Set vibration mode change switch to “ ”.

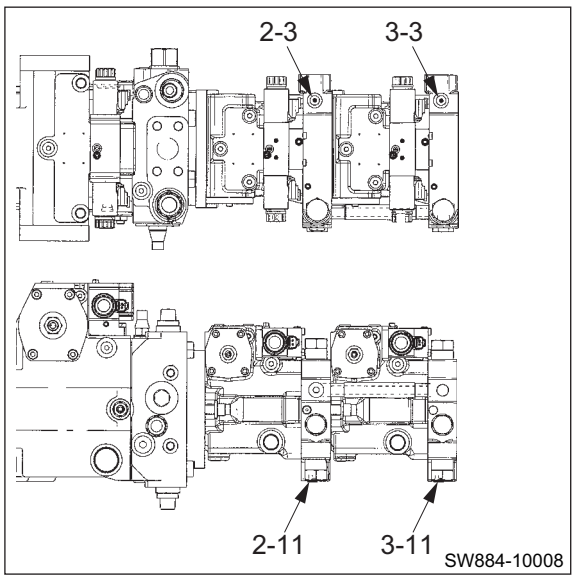
⑥ Start the engine and set throttle switch to “Full”.

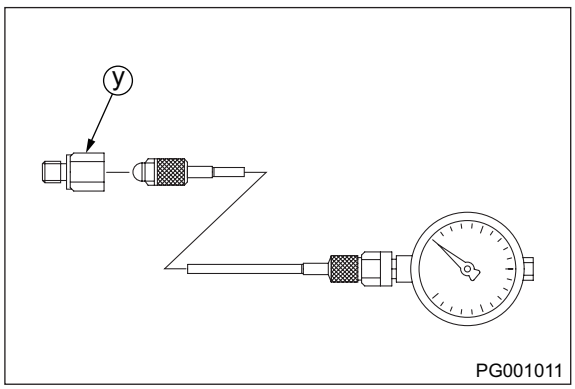
⑦ Press F-R lever vibration switch ON.

⑧ Read pressure gauge for maximum value of vibrator circuit pressure.

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

★ Maximum circuit pressure (cut off valve setting)
: 31.5 ± 1.0 MPa (4,568 ± 145 psi)





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

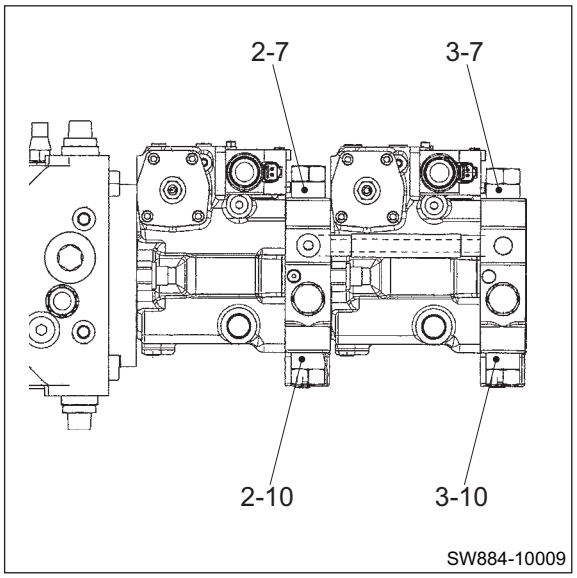
6-2. Adjustment

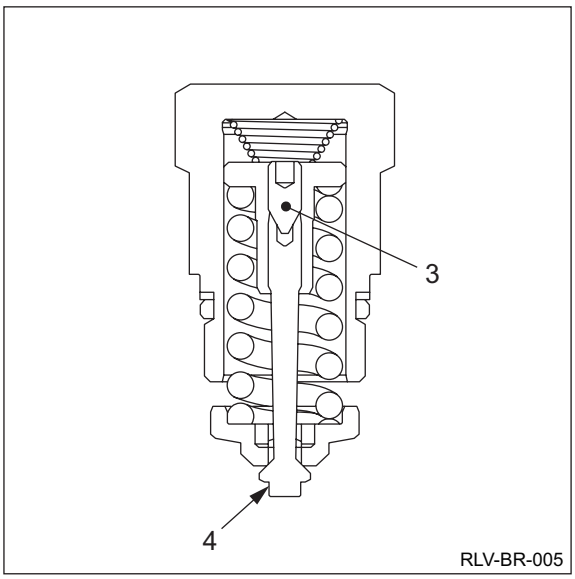
- If measurement results indicate the pressure deviating from maximum circuit pressure range, make an adjustment in accordance with procedure described below.

① Check high pressure relief valve (2-7), (2-10), (3-7), or (3-10) for evidence of having loosened.
- High pressure relief valve : (2-7),(3-7)
  (High amplitude/Normal)
- High pressure relief valve : (2-10),(3-10)
  (Low amplitude/Oscillation)

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

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





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

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

7. MEASUREMENT AND ADJUSTMENT OF VIBRATOR CHARGE CIRCUIT PRESSURE

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

7-1. Measurement

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

① Remove plug from coupling (1). 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
- Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

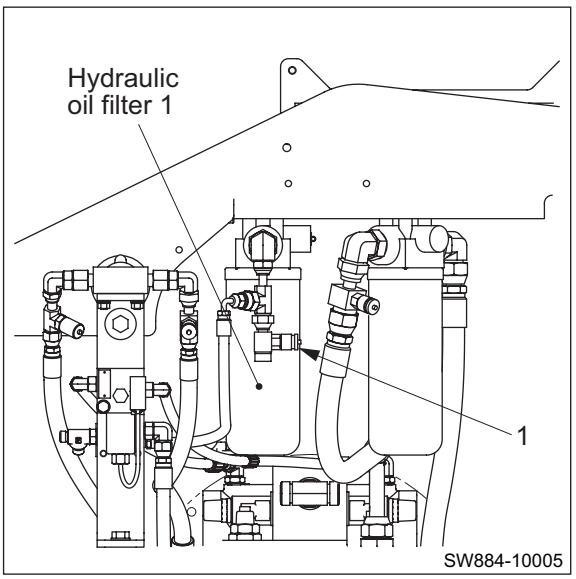
② Confirm that F-R lever is “N”.

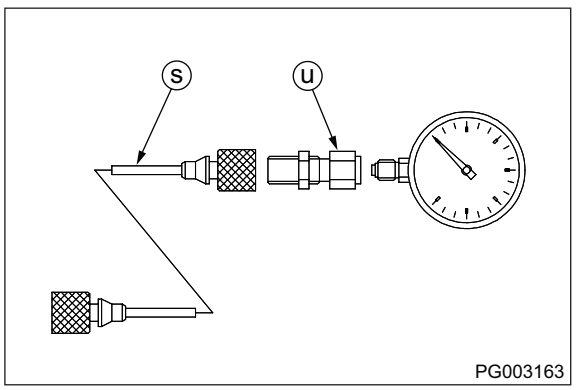
③ Apply parking brake by pressing parking brake switch button.

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

⑤ Read pressure indicated by pressure gauge.

★ Standard charge relief valve setting
: 2.5 ± 0.2 MPa (363 ± 29 psi)



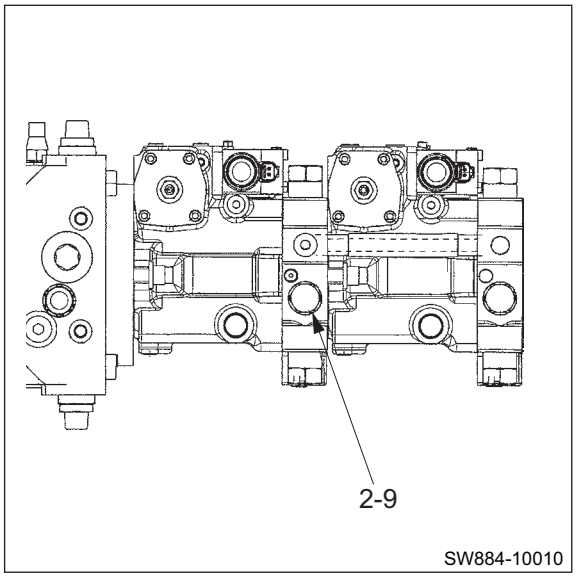


7-2. Adjustment

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

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

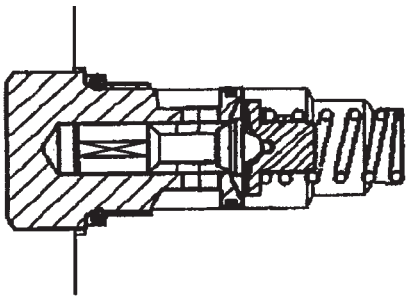
N•m (2-9) Charge relief valve : 90 N·m (66 lbf·ft)



SW884-10010

(NOTICE)

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


Charge relief valve

RLV-BR-007

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

8. MEASUREMENT AND INSPECTION OF STEERING CIRCUIT PRESSURE

8-1. Measurement

⚠WARNING

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

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

① Disconnect the hose (1) or (2) from steering 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”.

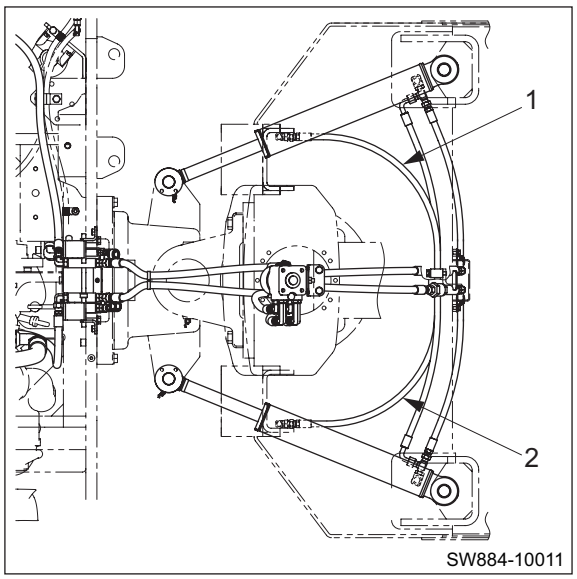
③ Apply parking brake by pressing parking brake switch button.

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

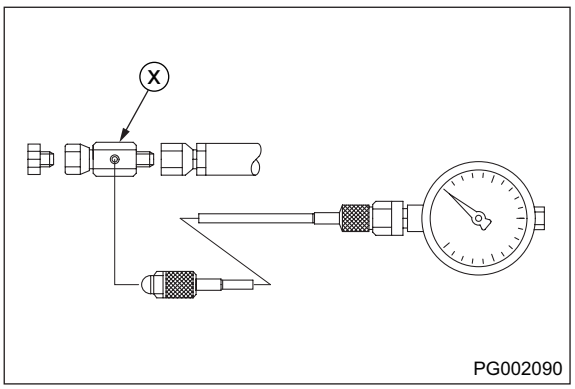
⑤ Turn steering wheel to operate relief valve.

⑥ Read pressure indicated by pressure gauge.

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



SW884-10011

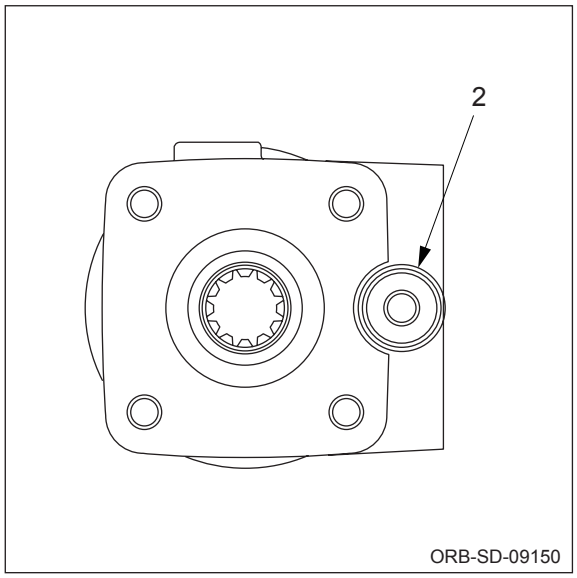


PG002090

8-2. Inspection

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

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



(NOTICE)

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

9. MEASUREMENT OF HYDRAULIC PUMP CASE PRESSURE

9-1. Measurement of Propulsion Pump Case Pressure

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

① Disconnect hose (2) from propulsion pump (1) drain port (1-3). Attach pressure gauge through adapter ⓚ .
- Adapter ⓚ : 12-4LOHL6G5TF (Parker part number)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

④ Set speed change switch to “ ”.

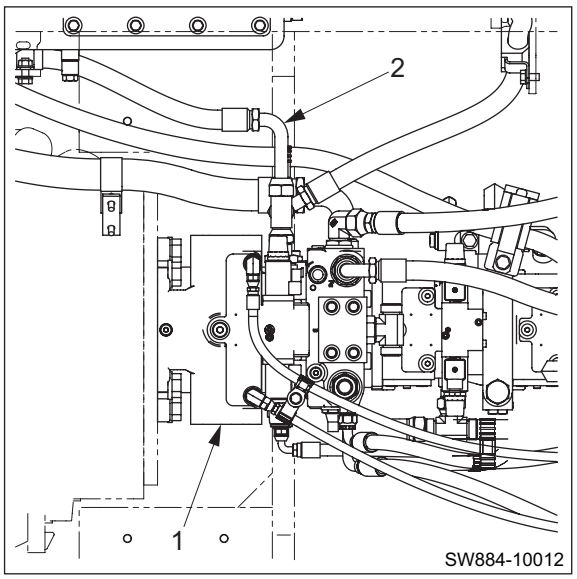
⑤ SW884/994 : Set vibration frequency select switch to “2,500 vpm”.

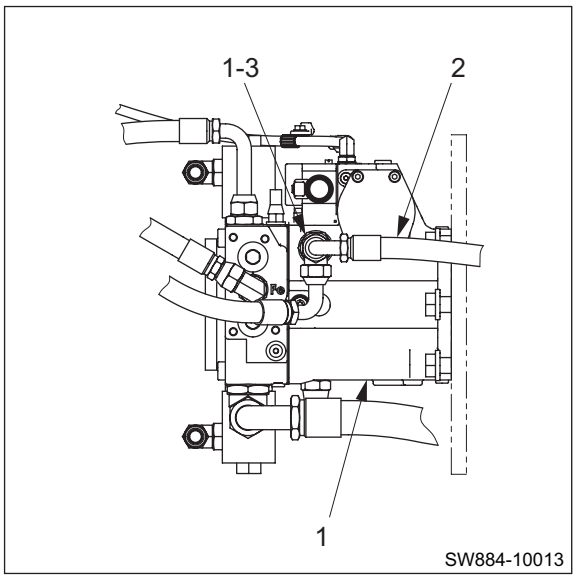
⑥ Start the engine and set throttle switch to “Full”.

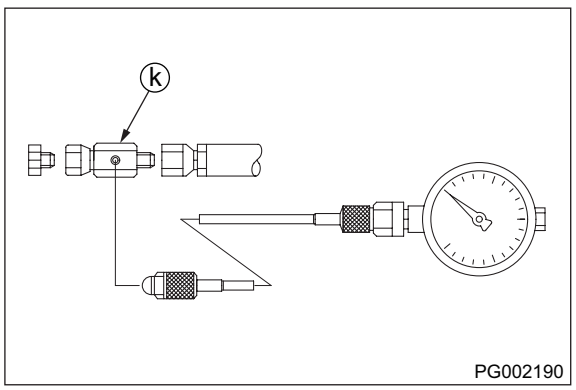
⑦ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

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

★ Allowable pump case pressure
: 0.4 MPa (58.0 psi) or less







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

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

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

① Disconnect hose (2) from vibrator pump (F) (1) drain port (3-12). Attach pressure gauge through adapter ⓚ .
- Adapter ⓚ : 12-4LOHL6G5TF (Parker part number)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

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

⑤ Set vibration mode select switch to “ ”.

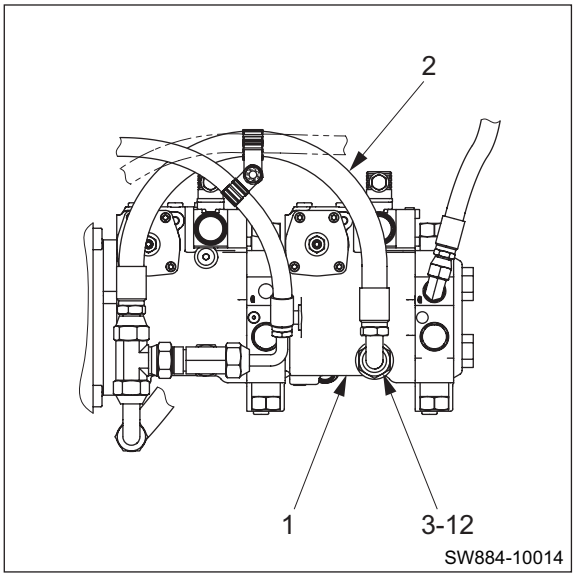
⑥ Start the engine and set throttle switch to “Full”.

⑦ Press F-R lever vibration switch ON.

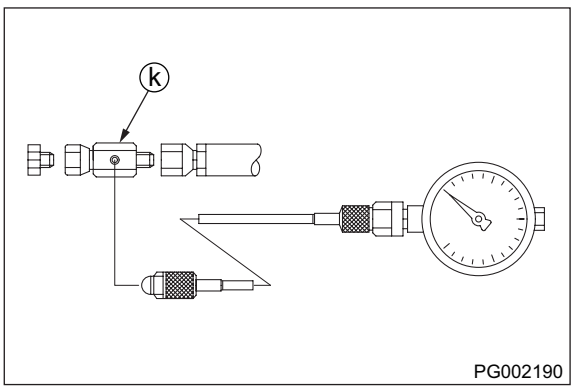
⑧ • SW884/994 : Measure pressure when vibration switch is “” and “” and vibration frequency select switch “2,500”, “3,000”, and “4,000”, respectively.
• SW884ND/994ND : Measure pressure when vibration switch is “ ”and “ ”, respectively.

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

★ Allowable pump case pressure
: 0.4 MPa (58.0 psi) or less



SW884-10014



PG002190

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

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

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

① Remove plug from vibrator pump (R) (1) drain port (2-15). Attach pressure gauge with adapter ⓙ . Attach pressure gauge with adapter ⓙ .
- Adapter ⓙ : 7/8-14UNF
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

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

⑤ Set vibration mode select switch to “ ”.

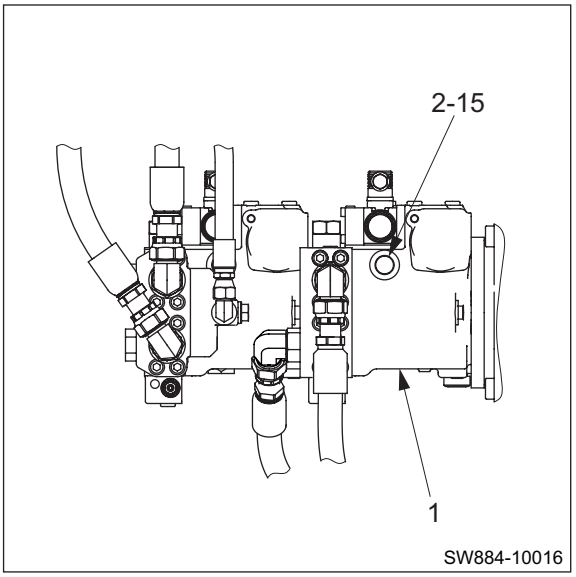
⑥ Start the engine and set throttle switch to “Full”.

⑦ Press F-R lever vibration switch ON.

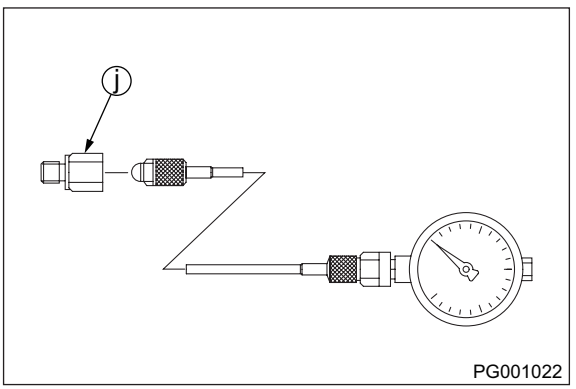
⑧ • SW884/994 : Measure pressure when vibration switch is “” and “” and vibration frequency select switch “2,500”, “3,000”, and “4,000”, respectively.
• SW884ND/994ND : Measure pressure when vibration switch is “ ”and “ ”, respectively.

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

★ Allowable pump case pressure
: 0.4 MPa (58.0 psi) or less



SW884-10016



PG001022

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

10. MEASUREMENT OF PROPULSION MOTOR CASE PRESSURE

10-1. Measurement

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

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

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

④ Set speed change switch to “  ”.

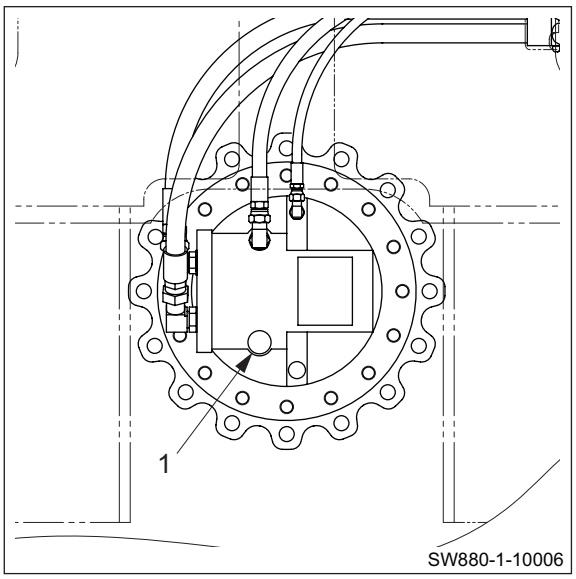
⑤ SW884/994 : Set vibration frequency select switch to “2,500 vpm”.

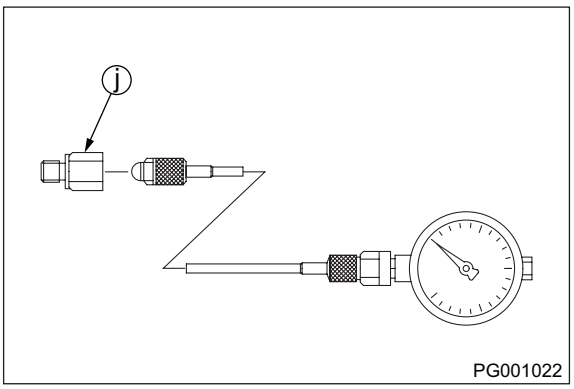
⑥ Start the engine and set throttle switch to “Full”.

⑦ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

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

★ Allowable motor case pressure
: 0.3 MPa (43.5 psi) or less





11. MEASUREMENT OF VIBRATOR MOTOR CASE PRESSURE

11-1. Measurement (SW884/994)

⚠CAUTION

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

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

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

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

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

⑤ Set vibration mode change switch to “ ”.

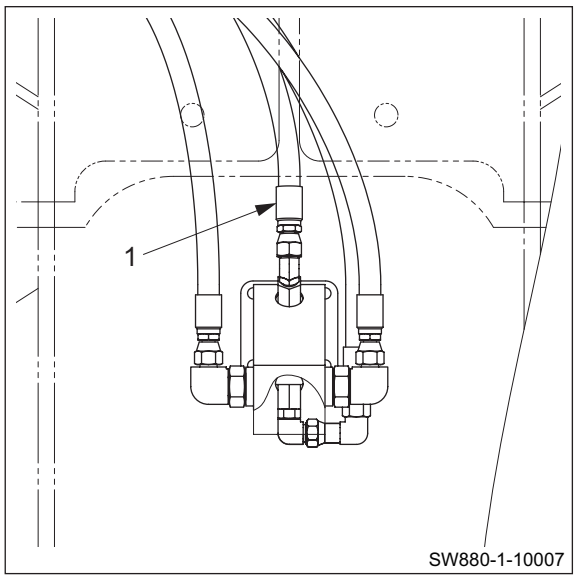
⑥ Start the engine and set throttle switch to “Full”.

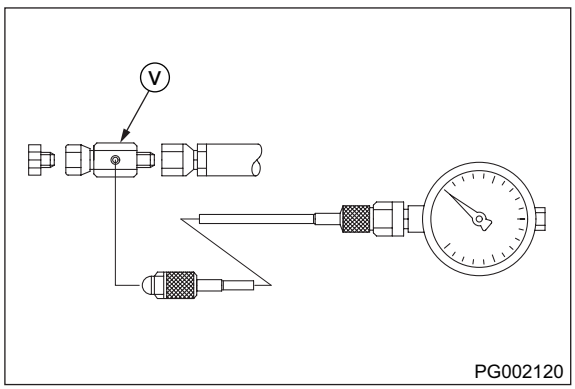
⑦ Press F-R lever vibration switch ON.

⑧ Measure pressure when vibration switch is “⋀⋀” and “⋀⋀” and vibration frequency select switch “2,500”, “3,000”, and “4,000”, respectively.

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

★ Allowable motor case pressure
: 0.15 MPa (21.6 psi) or less





11-2. Measurement (SW884ND/994ND)

⚠CAUTION

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

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

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

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

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

⑤ Set vibration mode change switch to “  ”.

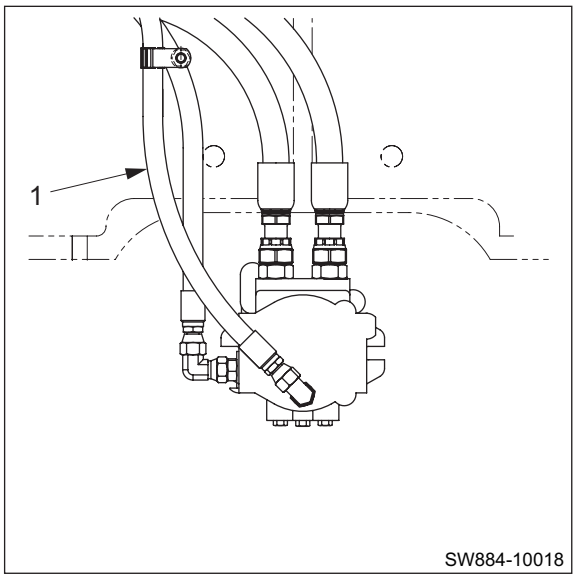
⑥ Start the engine and set throttle switch to “Full”.

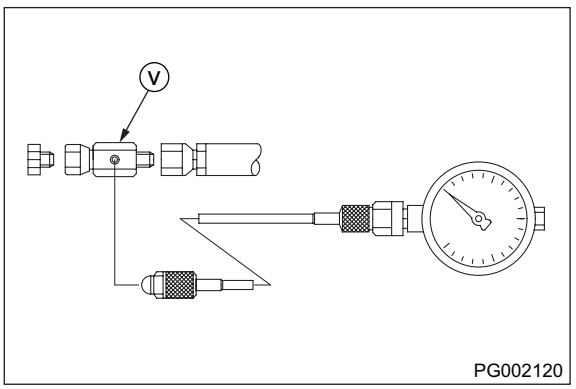
⑦ Press F-R lever vibration switch ON.

⑧ Measure pressure when vibration switch is “  ” and “  ”, respectively.

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

★ Allowable motor case pressure
: 0.15 MPa (21.6 psi) or less





12. ADJUSTMENT OF F-R LEVER POTENTIOMETER

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

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

(NOTICE)

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

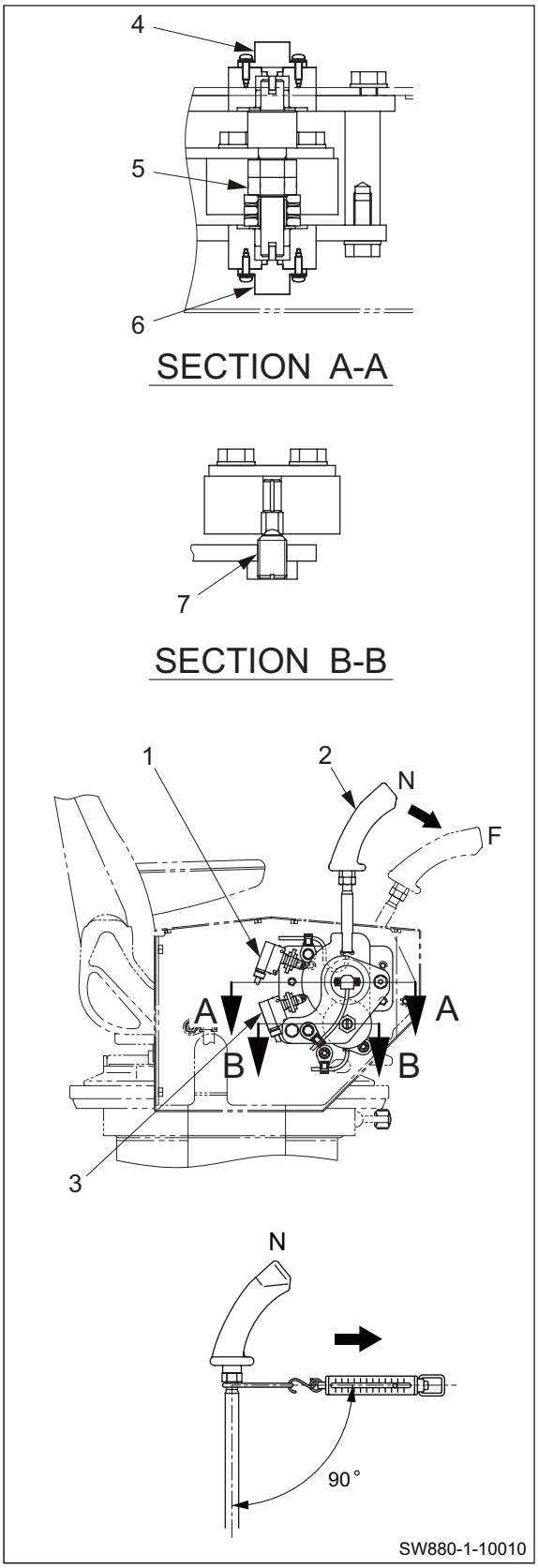
12-1-1. Adjustment of disc spring tension

(NOTICE)

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

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

★ F-R lever operating force standard value
: 1.0 ± 0.2 N (0.22 ± 0.05 lbf)



12-1-2. Adjustment of steel ball thrust

(NOTICE)

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

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

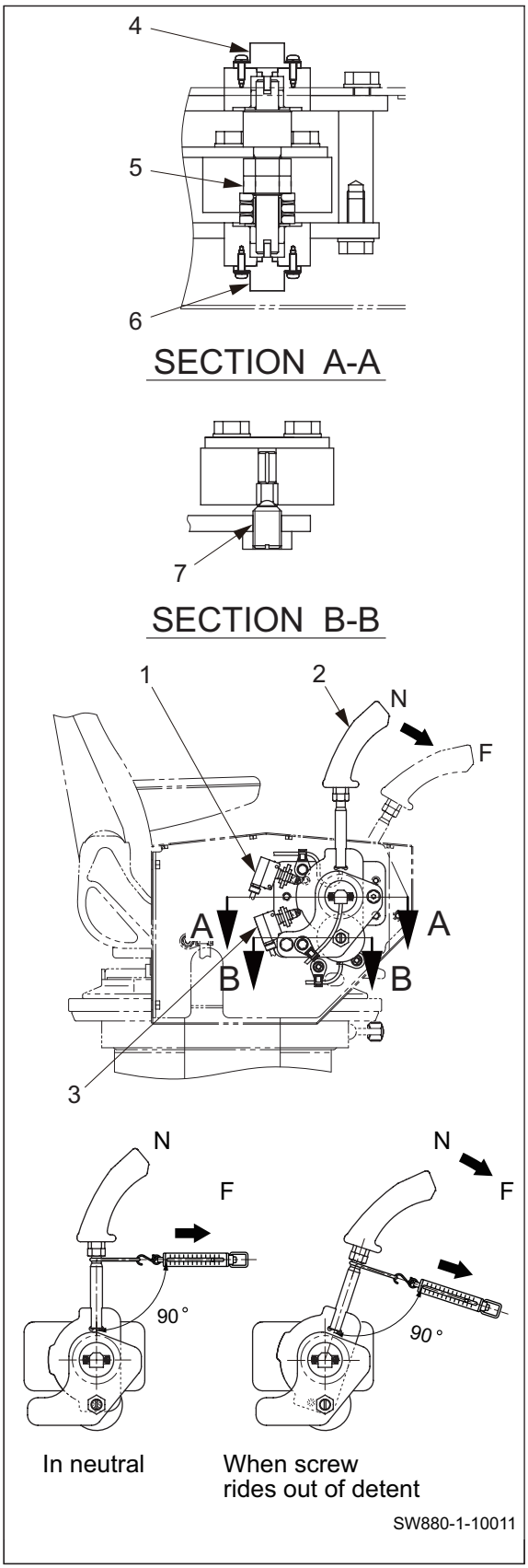
★ F-R lever operating force standard value when steel ball rides out of detent:

40.0 ± 0.2 N (9.0 ± 0.05 lbf)

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

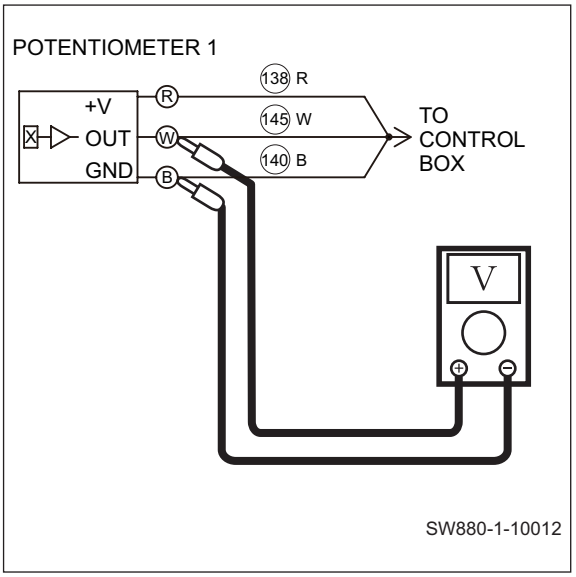
★ F-R lever operating force standard value

: 18.0 ± 2 N (4.0 ± 0.45 lbf)



12-2. Adjustment of Potentiometer

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



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

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

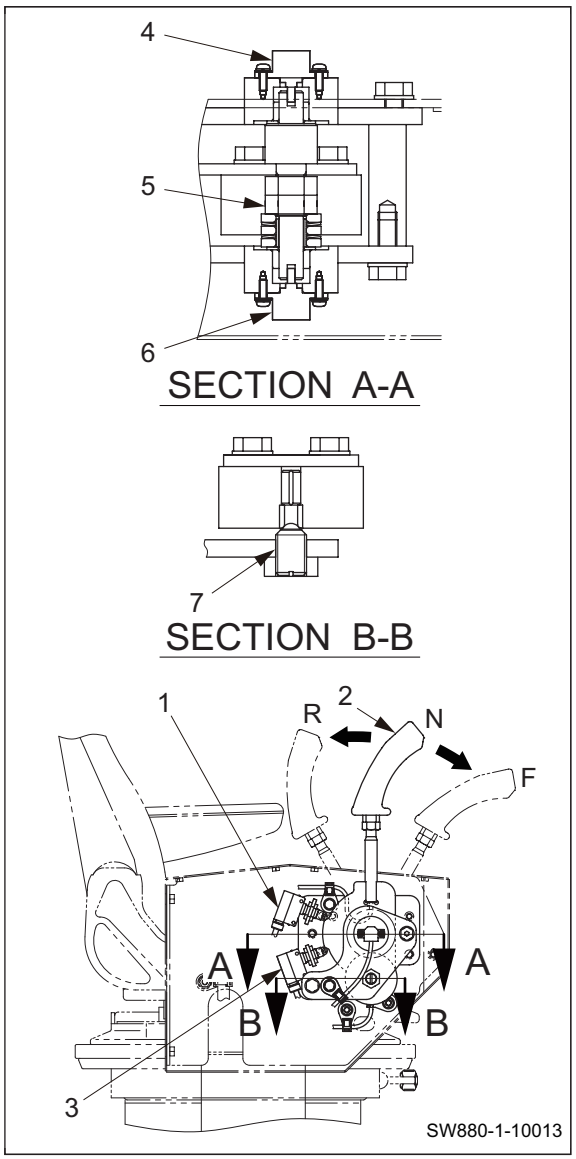
① Set starter switch to ON.
② Operate F-R lever as follows and then take a measurement of voltage at potentiometer 1 when F-R lever is placed in “N”.
  - Move F-R lever in both directions to its full stroke positions and then quickly return lever to “N”.
  - Move F-R lever toward reverse until screw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

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

Middle value : (2.505 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 F-R lever switch operates

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

① Set starter switch to ON.
② Move F-R lever (2) in forward direction.
③ Adjust with nut (8) of F-R lever switch (1) so that water spray indicator lamp in combination meter illuminates when voltage reaches a value 0.080 V higher than middle value measured in 12-2-1.

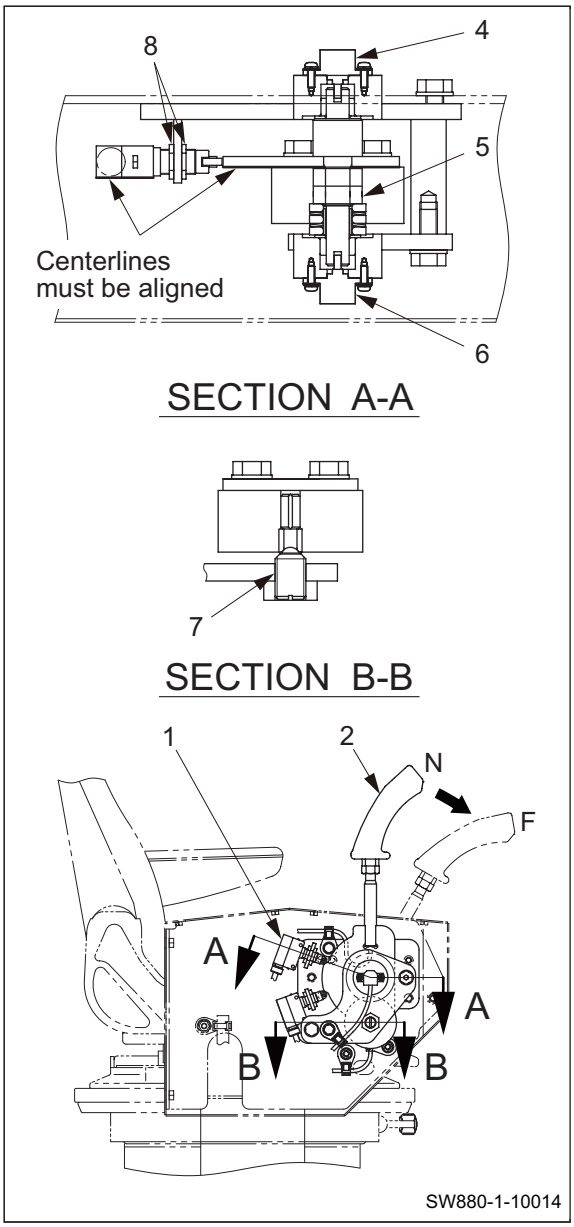
Example:

Middle value	: 2.500 V
Voltage when F-R lever switch operates	: 2.500 – 0.080 = 2.420 V

(NOTICE)

- **Acceptable range for voltage when F-R lever switch operates is 2.415 to 2.425 V.**
- **F-R lever switch must be installed with its centerline aligned with centerline of F-R lever cam.**

④ After adjustments are made, make sure about following points.
  - F-R lever cam must not push in F-R lever switch until it bottoms when F-R lever is moved toward forward position.
  - F-R lever must automatically return to neutral when F-R lever is released at a position slightly beyond F-R lever switch operating point. If lever does not return automatically, make an adjustment by loosening disc spring tension adjusting nut (5) and tightening screw (7). F-R lever operating force must not deviate from standard value.



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

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

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

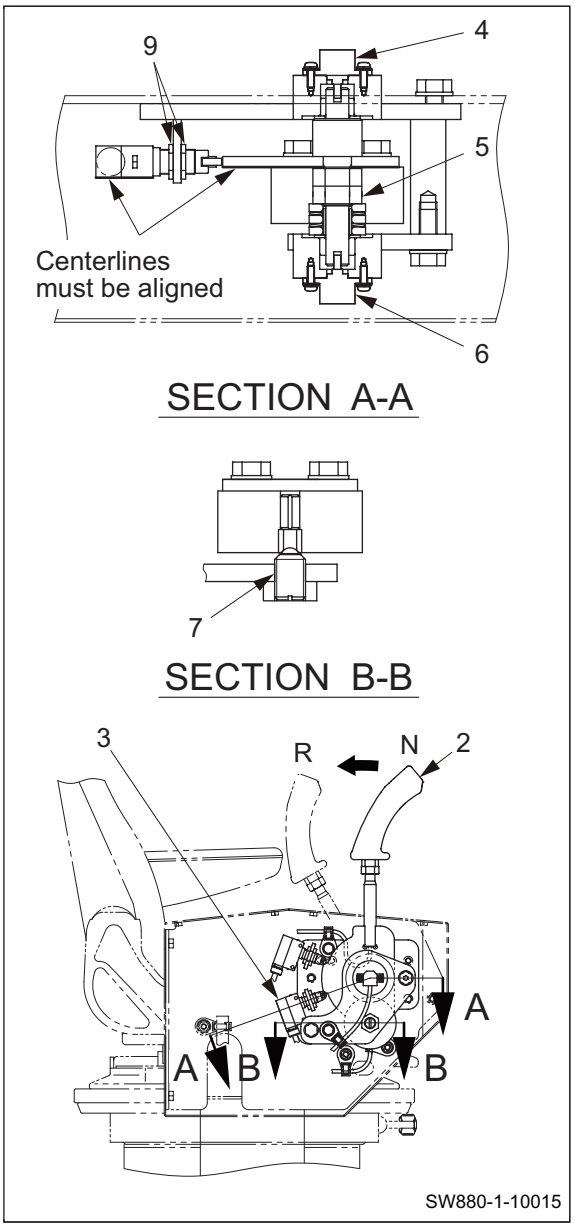
Example:

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

(NOTICE)

- **Acceptable range for voltage when backup buzzer switch operates is 2.575 to 2.585 V.**
- **Backup buzzer switch must be installed with its centerline aligned with centerline of F-R lever cam.**

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



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.

2. ELECTRICAL SYSTEM TROUBLESHOOTING

2-1. When Performing Electrical System Fault Diagnosis

⚠ WARNING

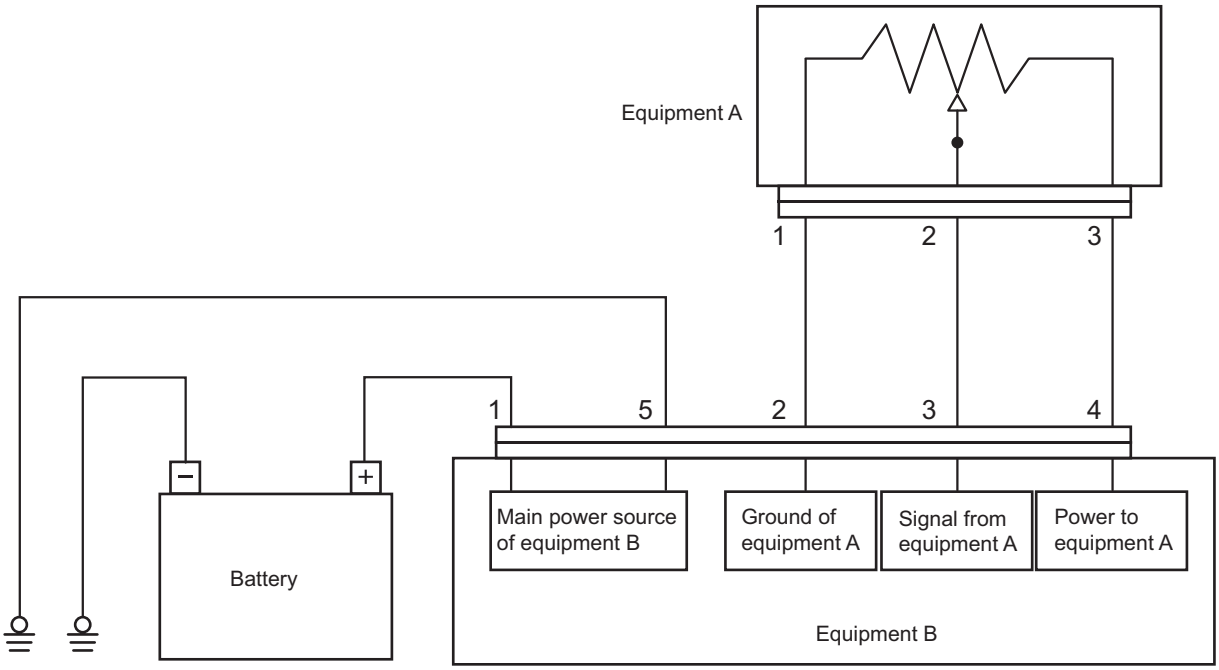
Be very careful because equipment can return to normal during an inspection and suddenly operate properly when a failure occurs due to a faulty contact or other such cause.

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

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

2-1-2. Inspection procedures using a tester

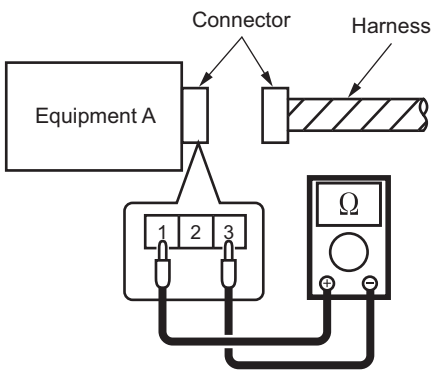
Some of the various inspection procedures are presented here for reference, using a sample circuit below.

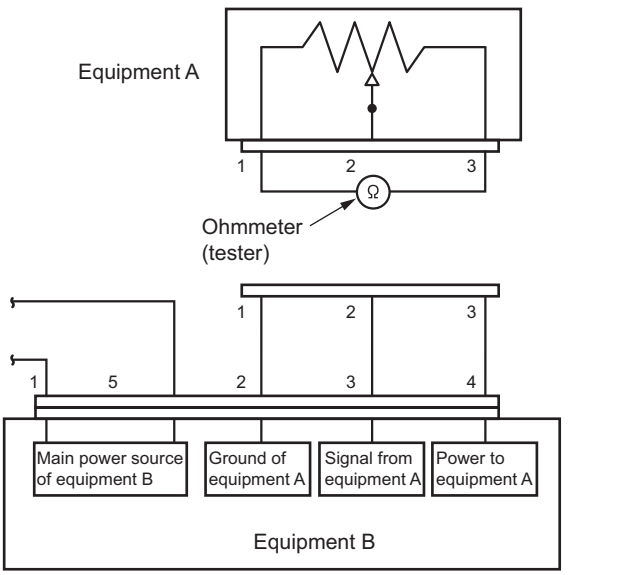


TS-10001

1) Measuring resistance using tester

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





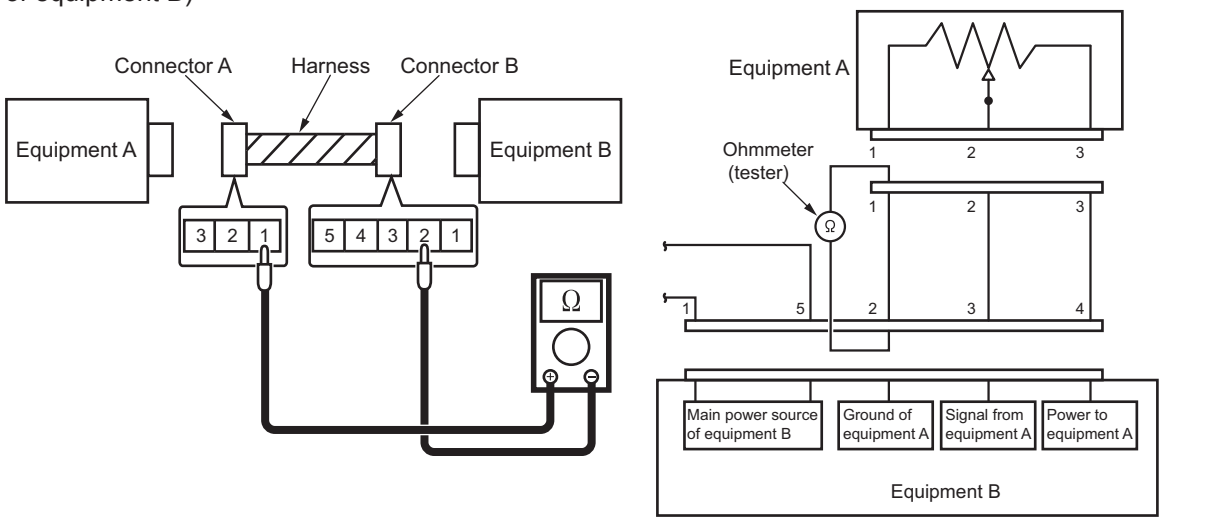
TS-10002

Inspection procedure

① Disconnect the connector of equipment A.

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

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



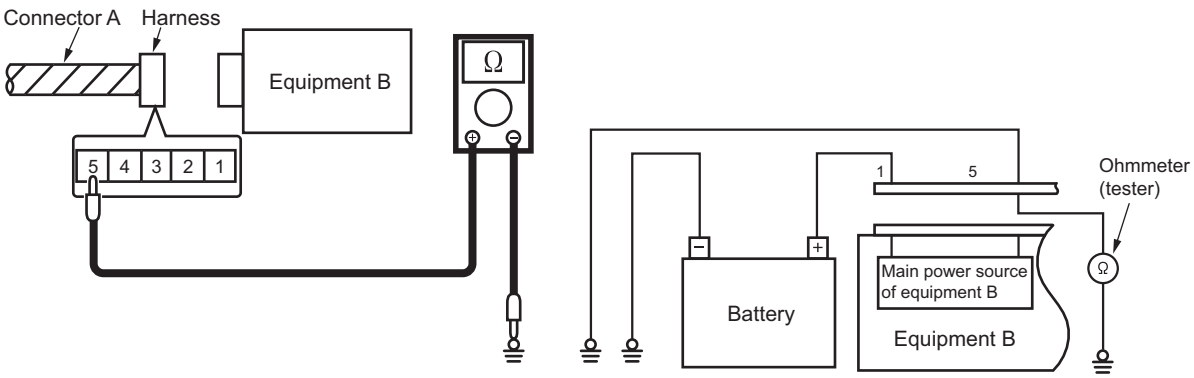
TS-10003

Inspection procedure

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

Criteria for harness defects
When there is no abnormality in the harness: Less than 10 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

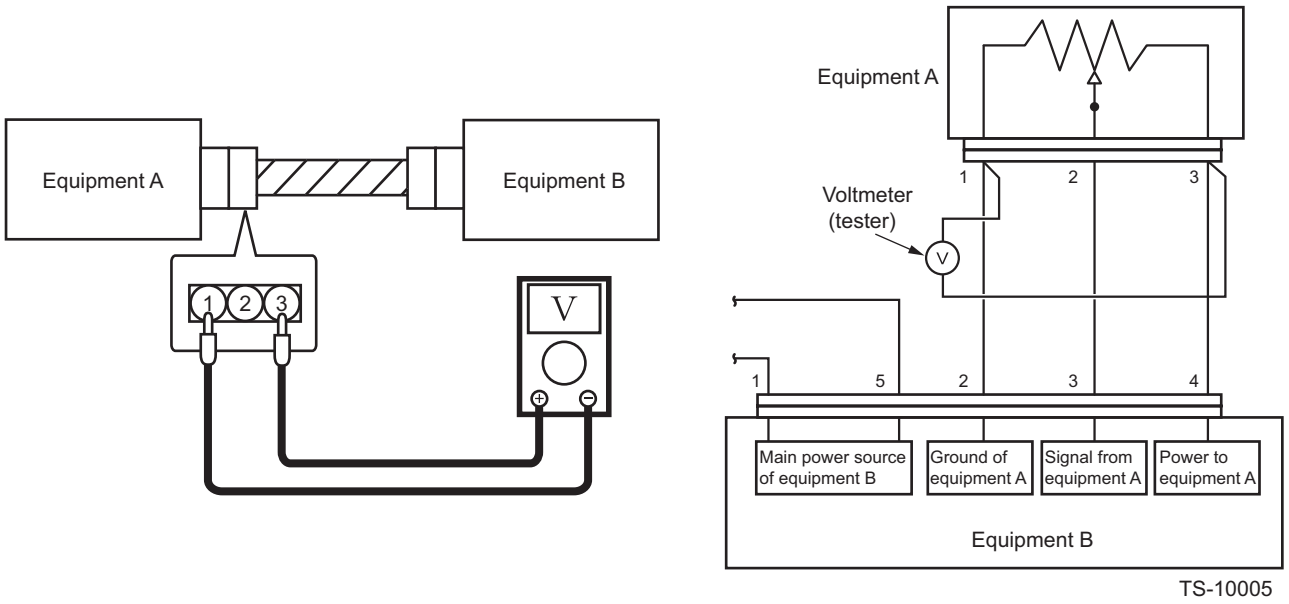
① Disconnect the connector of equipment B.
② Connect the test probe (+) to connector terminal 5 of equipment B and the test probe (-) to a machine ground point (the bolt fastening the ground terminal or an unpainted portion on the body) and measure the resistance. At this time, reversing the connector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



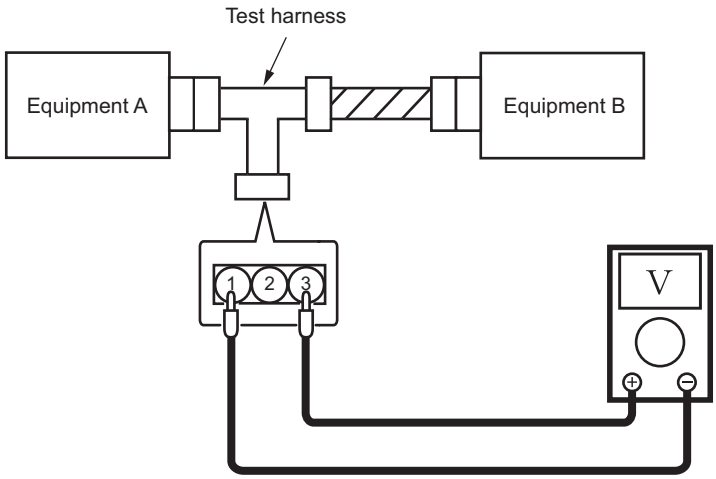
TS-10005

Inspection procedure

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

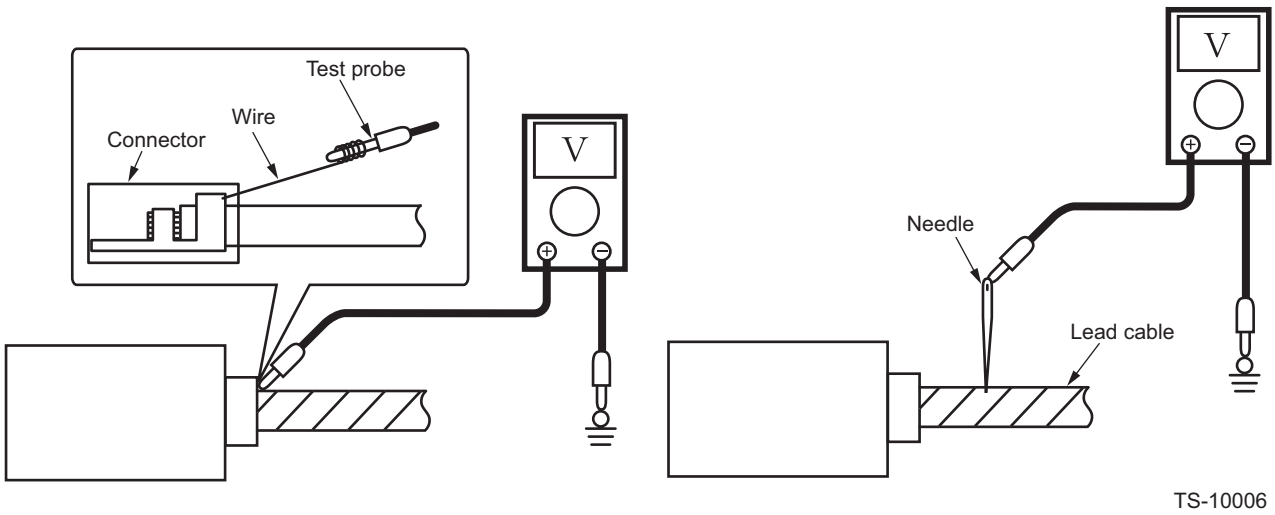
② Connect the test probe (+) to connector terminal 3 of equipment A and the test probe (-) to connector terminal 1 of equipment A and measure the voltage. Note that reversing the connector terminals between the probes (+) and (-) changes the result of the measurement. Be sure to connect the probe (+)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

・Measurement using a test harness



・Measurement from the backside of connector

・Measurement on a lead cable



Measurement method

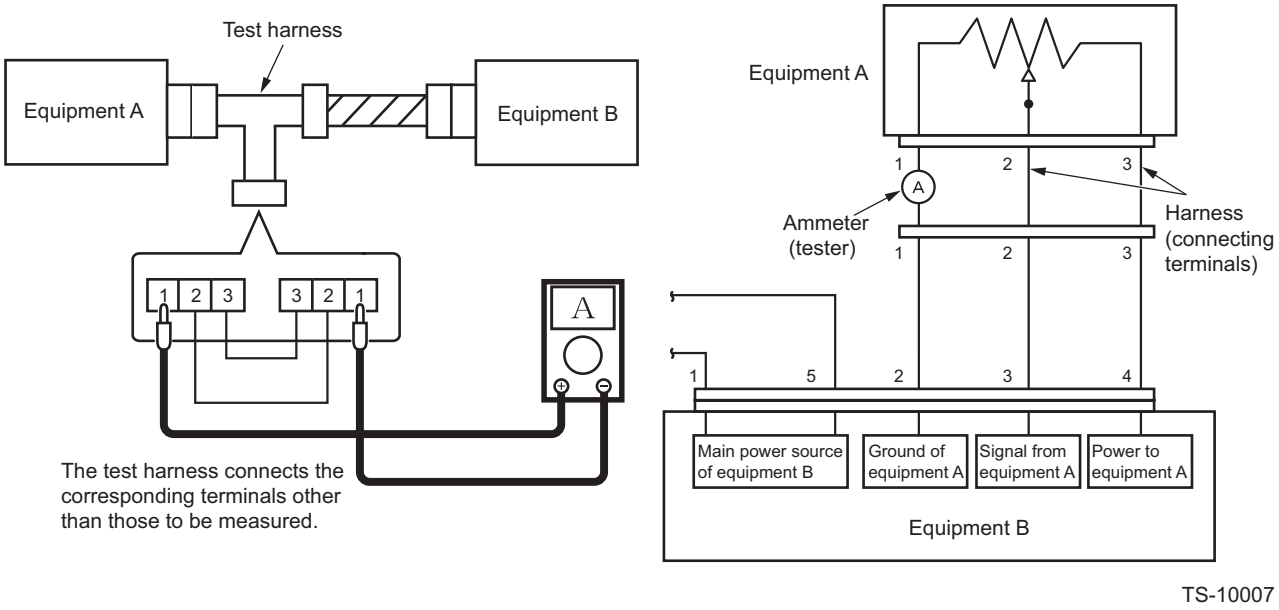
For measurement of voltage, connect the tester probes in parallel to the portion to be measured. Because the voltage can be measured only when the connector is connected in position, contact the tester probes to the terminals without disconnecting the connector. The following methods are available:

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

(NOTICE)

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

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



TS-10007

Inspection procedure

① Disconnect the connector of equipment A and connect the test harness.

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

Measurement method

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

2-1-3. Inspection of electrical system

Operate the applicable switches and turn the relays ON and OFF. Ultimately, if the solenoid valve operates (makes a sound) and the pump runs, the electrical system is OK.
If there is a failure (fault), narrow the range of the inspection to the six broad steps described below.

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

2) Fuse inspection

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

2-2) If a fuse is blown
Check whether a pump or valve (that is supposed to be protected by a blown fuse) burned, and whether there is a burning odor.
Especially if the pump and valve are not burned, check the harness for signs of burning. If it is burned, replace it.
If a fuse is blown and a relay along the pathway has failed, replace it. And if there is a timer, replace the timer, too. If a switch visually appears to be unsatisfactory (burned, melted, etc.) even though it operates, replace it.
- Simply replacing a fuse may not eliminate the true cause of a problem, and over current may flow again. Also, if over current secondarily causes an electrical path to fail (such as a wiring meltdown inside a solenoid valve), current will not flow. Thus, a fuse may not be blown out, but it also will not operate. If you do not know the location of burning or of an odor, investigate as described follows.

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

3) Connector inspection
- Is a connector disconnected or loose?
- Check that pins are not snapped or corroded.
- If faulty contact is suspected
  Turn the starter switch OFF. Then disconnect and check the connectors (including relay and switch sockets).
  If the terminal has no luster, faulty contact due to oxidation can be suspected. Therefore, polish the terminal by inserting and removing the connector (relay, switch) repeatedly at least five times. (Luster will return.)

4) Relay inspection (Check ON/OFF operation by sound.)
- Conduct without running the engine. (If you run the engine, you cannot hear the sound of operation.)
  Sound heard : A relay failure occurred.
  No sound heard : Using a tester, check the harness.
  Sound heard : A relay failure occurred.
  Still no sound : Using a tester, check the harness.
  Continuity : Turn the starter switch OFF temporarily, disconnect the relay and check for continuity between the harness-side grounding terminal (color: black) and vehicle body ground. (If there is none, replace the harness.)
  Voltage : With the relay disconnected, turn the starter switch ON and turn the operating switch ON. 24 V (or 12 V) (between vehicle body ground) should not reach the relay coil input terminal. Confirm this. Identify the location (section) to which 24 V (or 12 V) reaches. Then replace the harness or take other action.

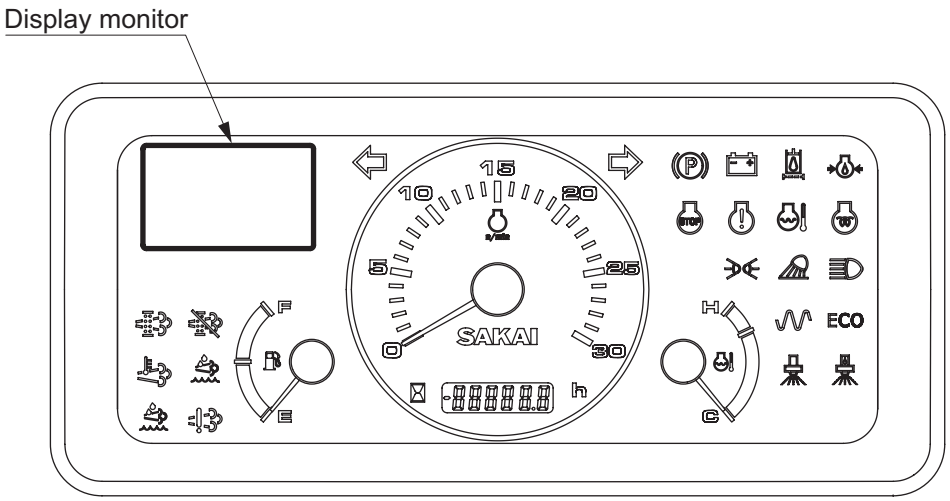
5) Solenoid valve inspection (Check ON/OFF operation by sound.)
- Conduct without running the engine. (If you run the engine, you cannot hear the sound of operation.)
  Sound heard : The electrical system is normal.
  No sound heard : Check with a tester.
  Continuity : ① Turn the starter switch OFF temporarily, disconnect the connector and check for continuity between the harness-side grounding terminal (color: black) and vehicle body ground. (If there is none, replace the harness.)
  : ② Is the solenoid valve coil burnt?
  (Turn the starter switch OFF, disconnect the connector and check the resistance between the solenoid valve terminals.)
  Voltage : With the connector disconnected, turn the starter switch ON and check whether 24 V (or 12 V) exists between the harness-side connector and vehicle body ground.
  If YES : Replace the valve.
  If NO : Investigate and identify the location (section) to which 24 V (or 12 V) reaches. Then replace the harness or take other action.

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

2-2. Engine Diagnosis Trouble Code

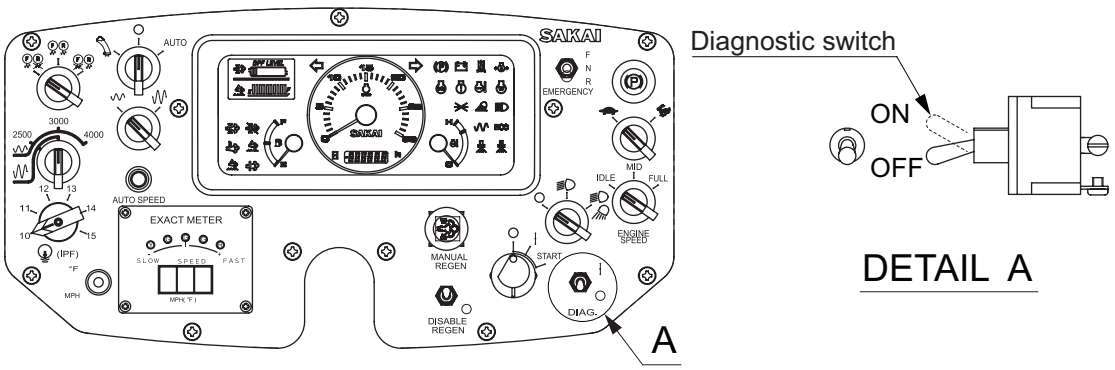
2-2-1. Description of fault code (SPN,FMI)

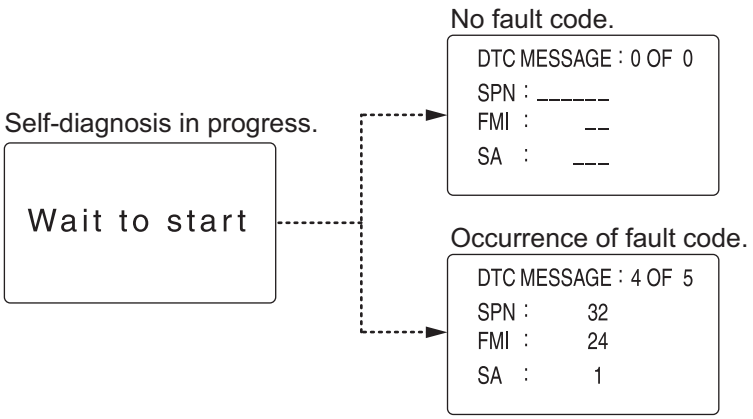
- When a fault code (SPN,FMI) occurs, display a fault code on the display monitor in the combination meter.



SV544-09001

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





SW884-11010

2-2-2. Fault code list

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

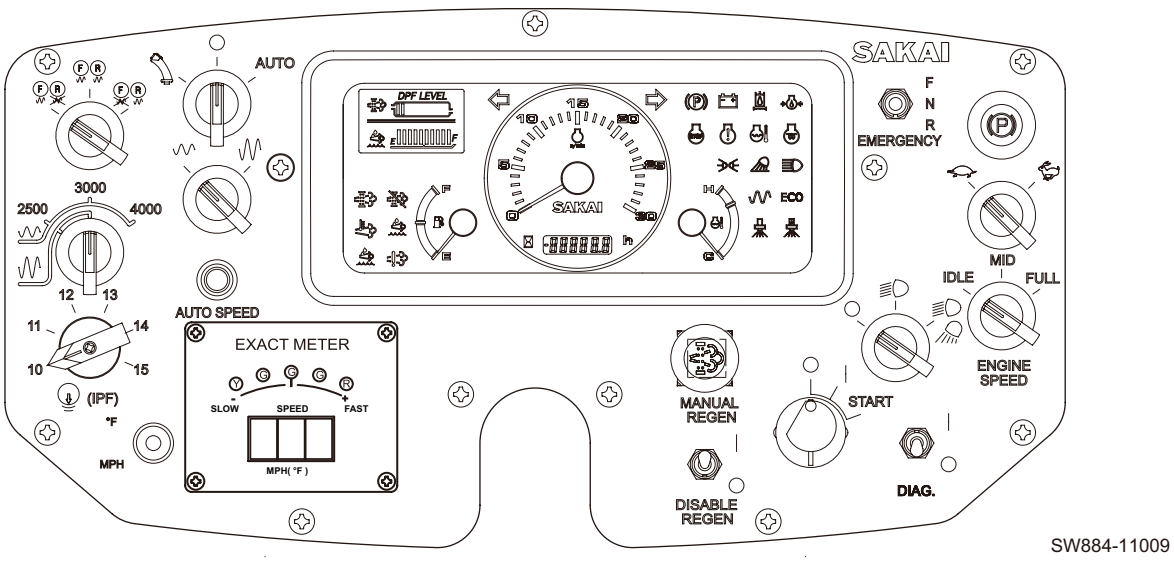
(NOTICE)

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

2-3. Error Codes

2-3-1. Description of error codes

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



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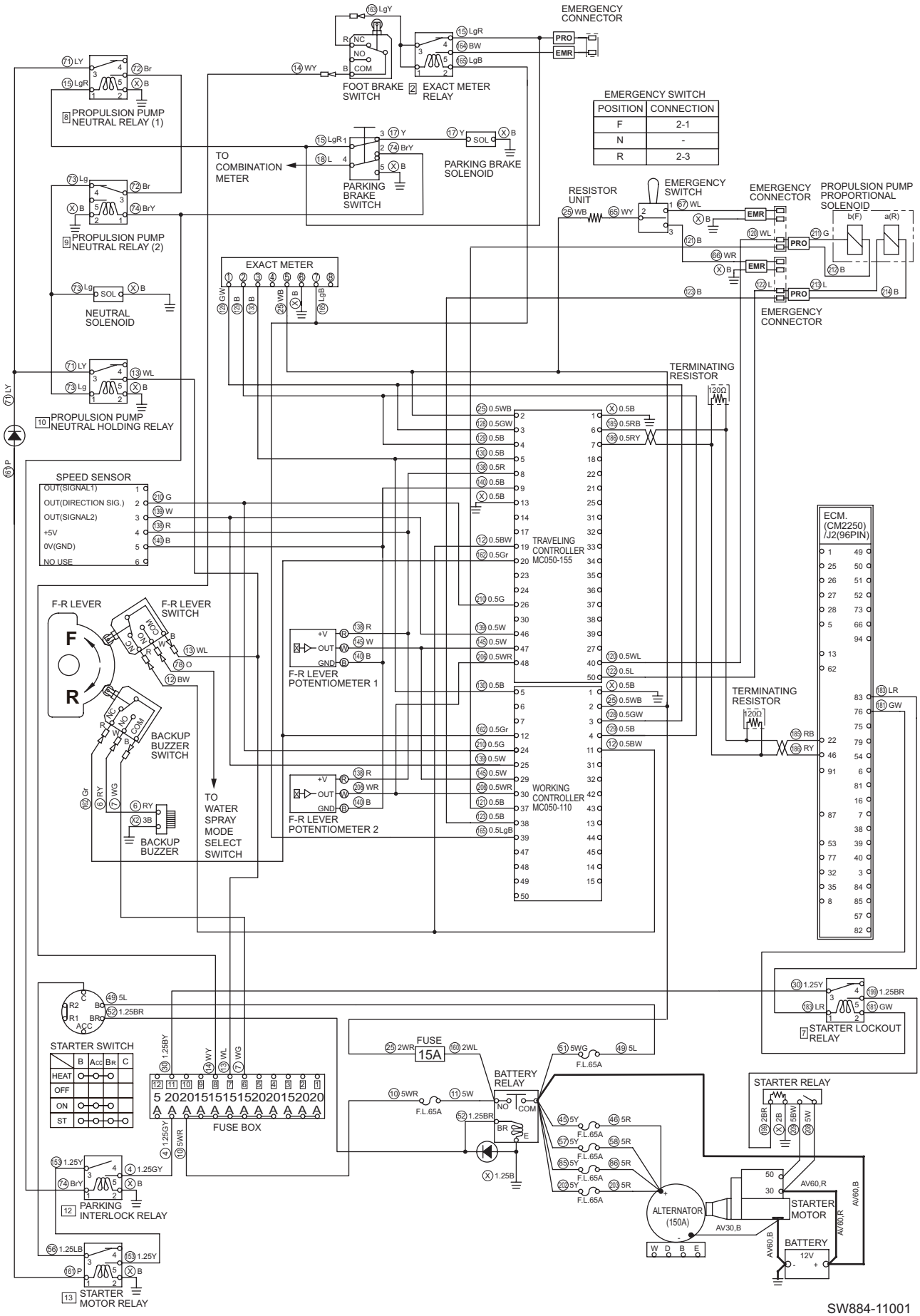
2-3-2. Error code list

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

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

Fig.: 2-4-1



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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) 1/15

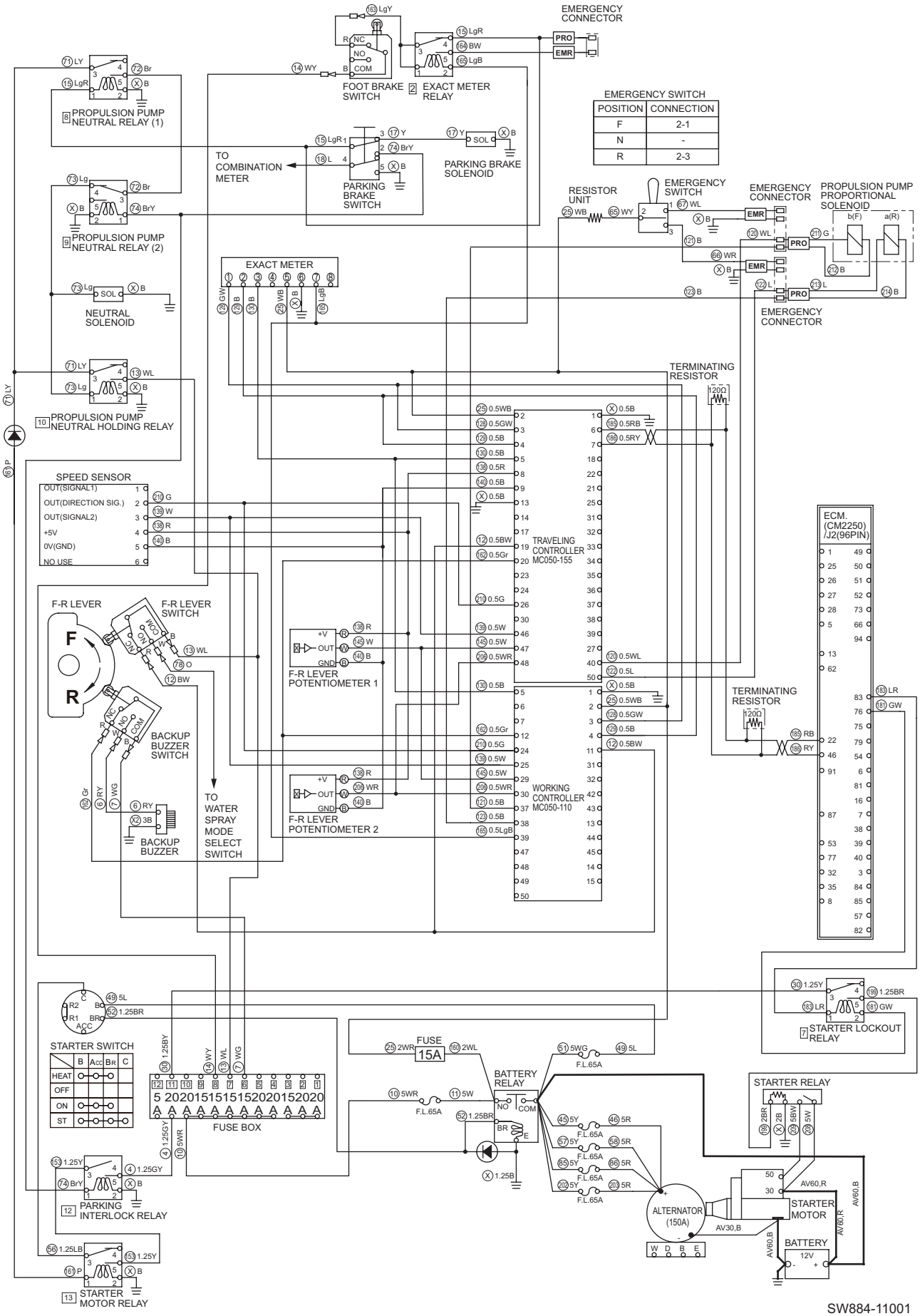
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
Pon	1. Connector	• Check F-R lever switch connector, buckup buzzer switch connector and traveling controller connector terminal 19, 20, working controller connector terminal 11, 12 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistances between switches and traveling controller terminal wires. • F-R lever switch terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW • Buckup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller terminal 12 wire Gr Standard resistance : 10 Ω or less (2) Measure resistances between switches and fuse box terminal wires. • F-R lever switch terminal COM wire WL and fuse box terminal 7 wire WL • Buckup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. F-R lever switch	• When starter switch is OFF, check continuity between F-R lever switch terminal COM and terminal NC. There is continuity in normal condition. • If there is no continuity, F-R lever switch is faulty.	Replace F-R lever switch.
	4. Buckup buzzer switch	• When starter switch is OFF, check continuity between buckup buzzer switch terminal COM and terminal NC. There is continuity in normal condition. • If there is no continuity, buckup buzzer switch is faulty.	Replace buckup buzzer switch.

Fig.: 2-4-1



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

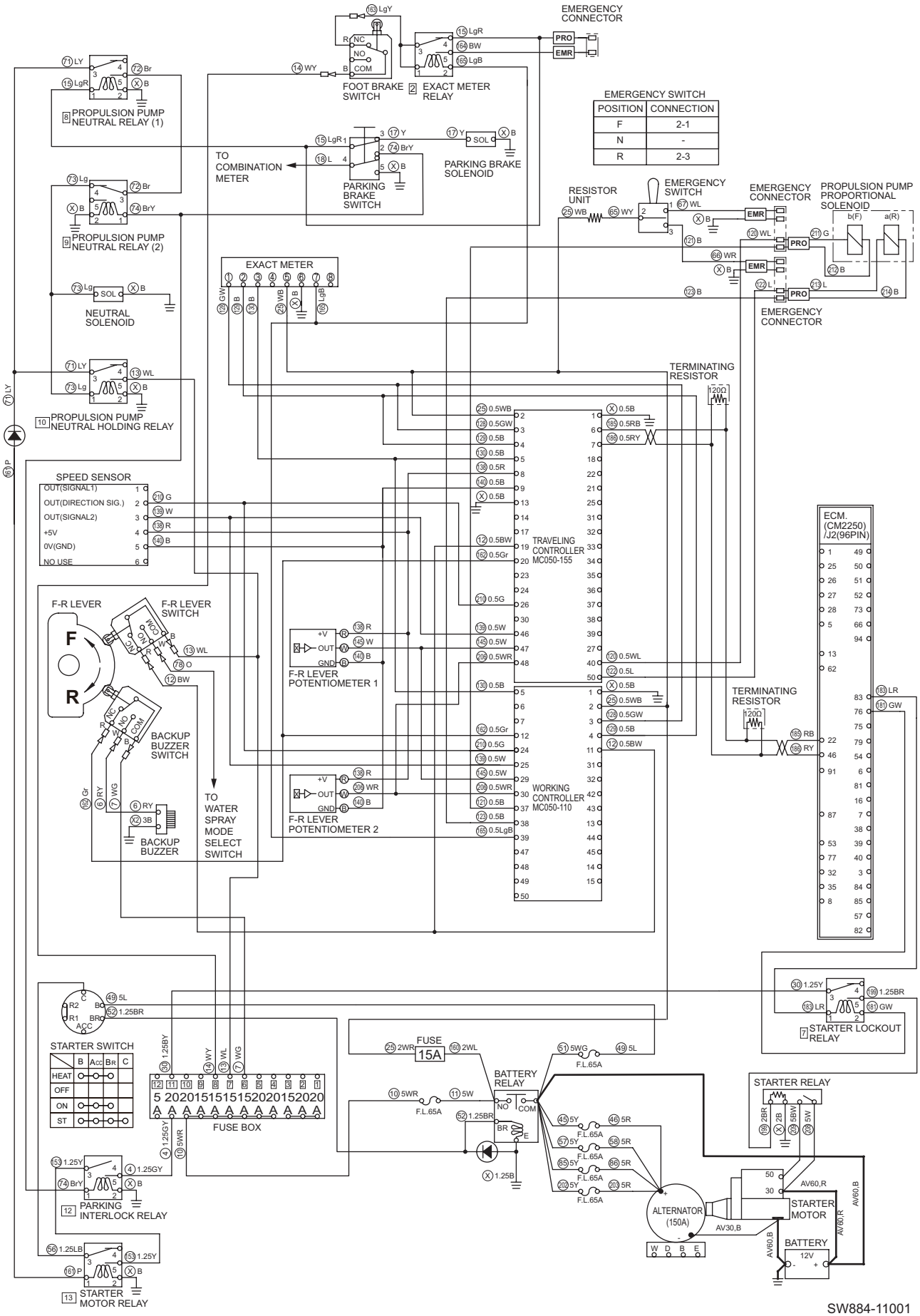
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
Pon	5. Traveling/ Working Controller	• If error code Pon is displayed and no abnormality is found in connector, harness, F-R lever switch and buckup buzzer 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”. ② Set starter switch to ON. ③ When F-R lever is “F” or “N”, traveling/working controller cannot be initialized. Exact meter will continuously display Pon. ④ Return F-R lever to “N”. 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



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

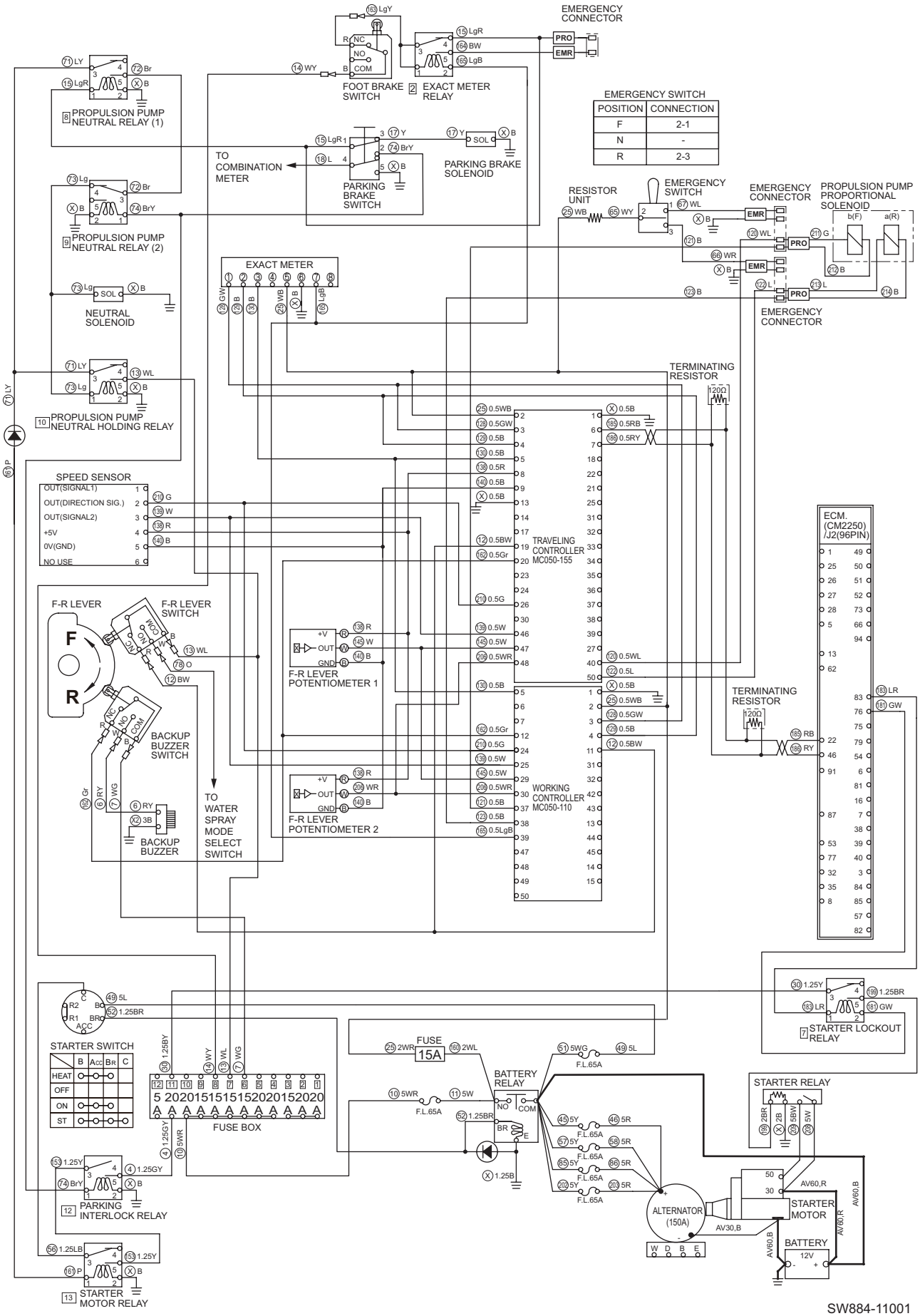
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E01 or E02	1. Connector	• Check F-R lever potentiometer 1, 2 connector and traveling controller connector terminal 8, 9, 47, 48, working controller connector terminal 29, 30 for corrosion, breakage, bending and looseness. • 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. • F-R lever potentiometer 1 terminal wire R and traveling controller terminal 8 wire R • F-R lever potentiometer 1 terminal wire W and traveling controller terminal 47 wire W, working controller terminal 29 wire W • F-R lever potentiometer 1 terminal wire B and traveling controller terminal 9 wire B • F-R lever potentiometer 2 terminal wire R and traveling controller terminal 8 wire R • F-R lever potentiometer 2 terminal wire WR and traveling controller terminal 48 wire WR, working controller terminal 30 wire WR • F-R lever potentiometer 2 terminal wire B and traveling controller terminal 9 wire B Standard resistance : 10 Ω or less • 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 wire B. Standard voltage : 5 ± 0.5 V (2) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal outlet wire W and ground terminal wire B. ① When F-R lever is “N” Standard voltage : 2.5 ± 0.015 V ② When F-R lever is “F” Standard voltage : 1.2 ± 0.02 V ③ When F-R lever is “R” Standard voltage : 3.8 ± 0.02 V • 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



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

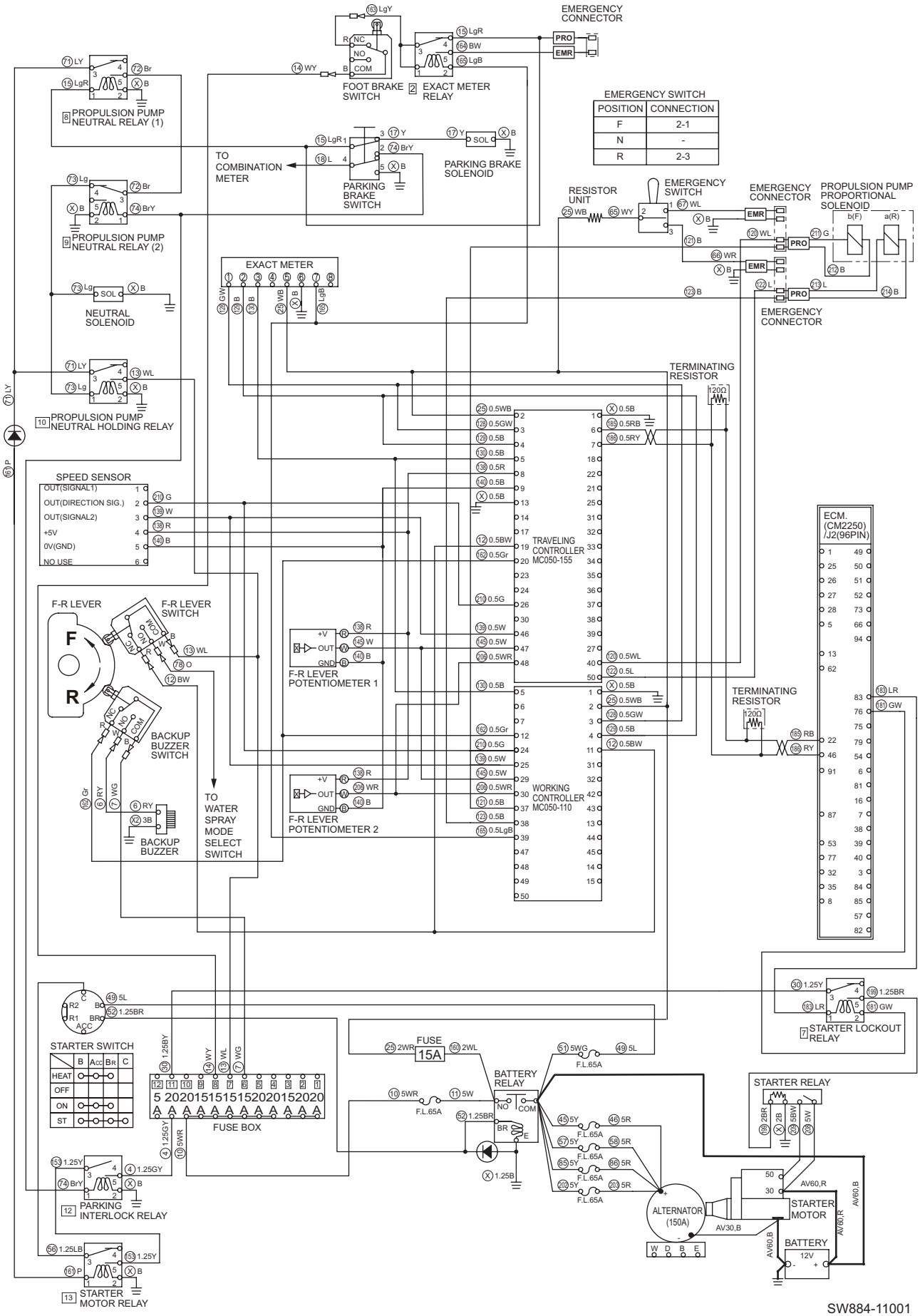
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E01 or E02	4. F-R Lever Potentiometer 2	(1) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal inlet wire R and ground terminal wire B. Standard voltage : 5 ± 0.5 V (2) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal outlet wire WR and ground terminal wire B. ① When F-R lever is “N” Standard voltage : 2.5 ± 0.015 V ② When F-R lever is “F” Standard voltage : 3.8 ± 0.02 V ③ When F-R lever is “R” Standard voltage : 1.2 ± 0.02 V • 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 wire B. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between traveling controller terminal 8 outlet wire R (positive side) and 9 wire B (ground side). Standard voltage : 5 ± 0.5 V • 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. ② Place F-R lever “N”. ③ Exact meter will display vehicle speed (0.0). If E01 or E02 is displayed, check above items again. ④ Place F-R lever “F” or “N”. ⑤ Exact meter will still display vehicle speed (0.0). Machine is in normal state. If display changes to E01 or E02, check above items again.	

Fig.: 2-4-1



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

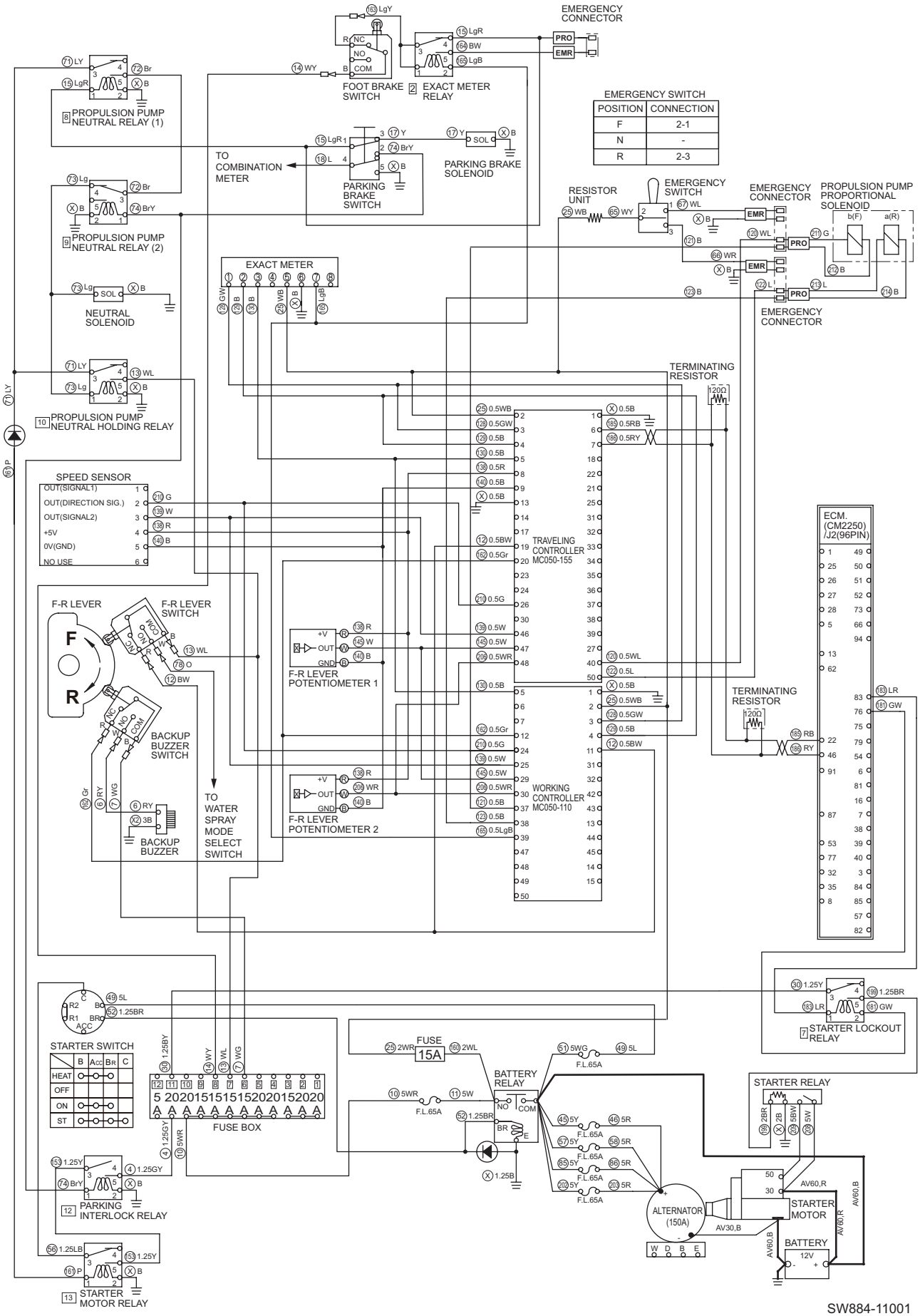
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E03 or E04	1. Connector	• Check F-R lever switch connector and traveling controller connector terminal 19, working controller connector terminal 11 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistance between F-R lever switch connector terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW. Standard resistance : 10 Ω or less (2) Measure resistance between F-R lever switch connector terminal COM wire WL and fuse box terminal 7 wire WL. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. F-R lever switch	(1) When starter switch is OFF, check continuity between F-R lever switch terminal COM and terminal NC. There is continuity in normal condition. (2) When starter switch is OFF and F-R lever is “F”, check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition. • If above item (1) or (2) is NG, F-R lever switch is faulty.	Replace F-R lever 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. ② Exact meter will display E03 or E04. When E03 is displayed: ③ Move F-R lever in “F”. Exact meter display will change from E03 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again. ④ Return F-R lever to “N”. Machine is in normal state. When E04 is displayed: ③ Place F-R lever “N”. Exact meter display will change from E04 to vehicle speed (0.0). Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1



SW884-11001

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

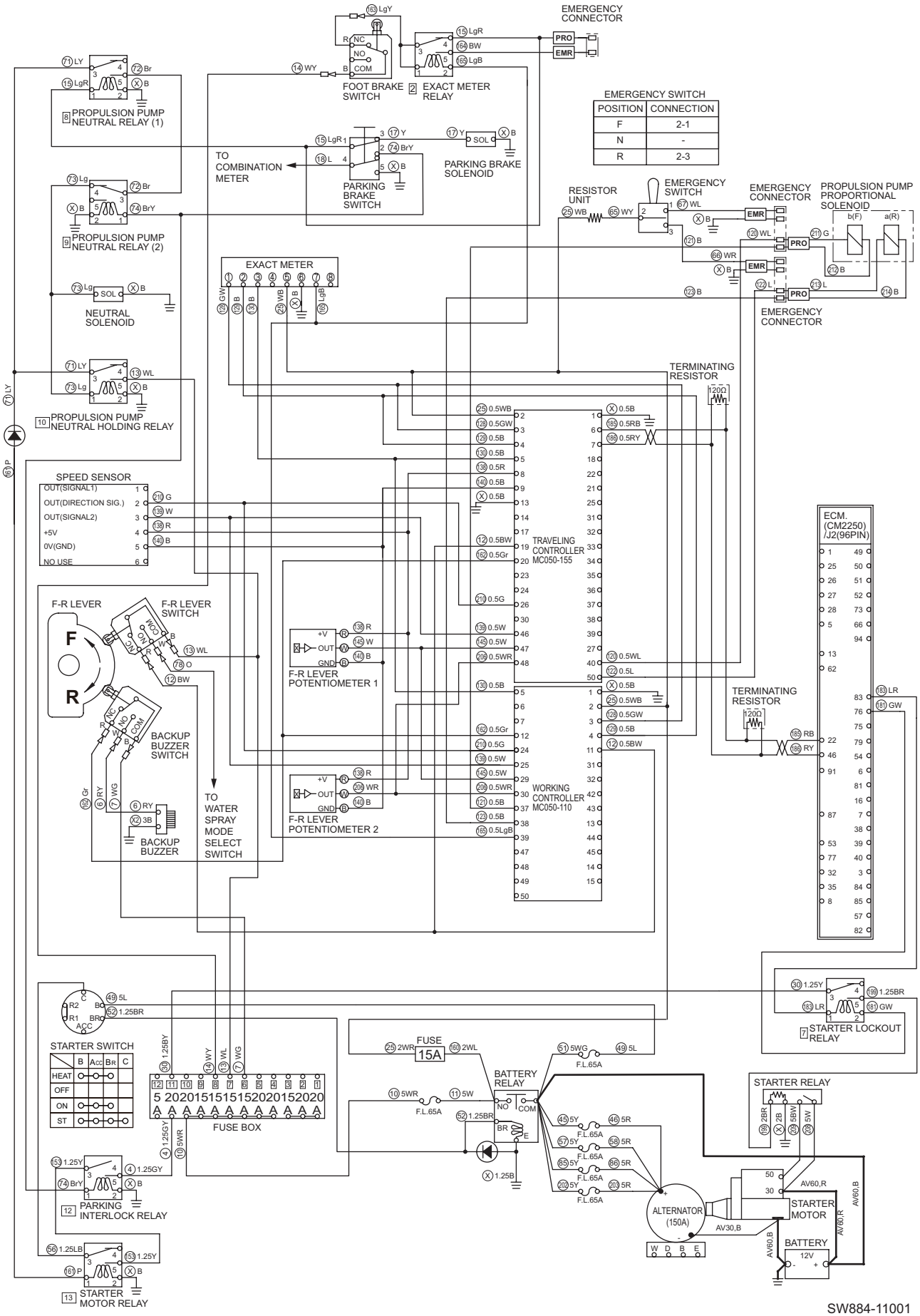
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E05 or E06	1. Connector	• Check buckup buzzer switch connector and traveling controller connector terminal 20, working controller connector terminal 12 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistance between buckup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller terminal 12 wire Gr. Standard resistance : 10 Ω or less (2) Measure resistance between buckup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. Buckup buzzer switch	(1) When starter switch is OFF, check continuity between buckup buzzer switch terminal COM and terminal NC. There is continuity in normal condition. (2) When starter switch is OFF and F-R lever is “R”, check continuity between buckup buzzer switch terminal COM and terminal NC. There is no continuity in normal condition. • If above item (1) or (2) is NG, buckup buzzer switch is faulty.	Replace buckup buzzer switch.
	4. Traveling/ Working Controller	• If error code E05 or E06 is displayed and no abnormality is found in connector, harness and buckup buzzer 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. ② Exact meter will display E05 or E06. When E05 is displayed: ③ Place F-R lever “N”. Exact meter display will change from E05 to vehicle speed (0.0). Machine is in normal state. If display does not change to vehicle speed, check above items again. When E06 is displayed: ③ Move F-R lever in “R”. Exact meter display will change from E06 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again. ④ Return F-R lever to “N”. Machine is in normal state.	

Fig.: 2-4-1


EMERGENCY CONNECTOR
FOOT BRAKE SWITCH
EXACT METER RELAY
EMERGENCY SWITCH
POSITION | CONNECTION
F | 2-1
N | -
R | 2-3
8 PROPULSION PUMP NEUTRAL RELAY (1)
9 PROPULSION PUMP NEUTRAL RELAY (2)
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
RESISTOR UNIT
EMERGENCY SWITCH
EMERGENCY CONNECTOR
PROPULSION PUMP PROPORTIONAL SOLENOID
EXACT METER
NEUTRAL SOLENOID
10 PROPULSION PUMP NEUTRAL HOLDING RELAY
TERMINATING RESISTOR
120Ω
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
ECM. (CM2250) /J2(96PIN)
F-R LEVER
F-R LEVER SWITCH
F-R LEVER POTENTIOMETER 1
F-R LEVER POTENTIOMETER 2
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
STARTER SWITCH
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
BATTERY RELAY
STARTER RELAY
7 STARTER LOCKOUT RELAY
12 PARKING INTERLOCK RELAY
13 STARTER MOTOR RELAY
ALTERNATOR (150A)
STARTER MOTOR
BATTERY 12V
SW884-11001

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

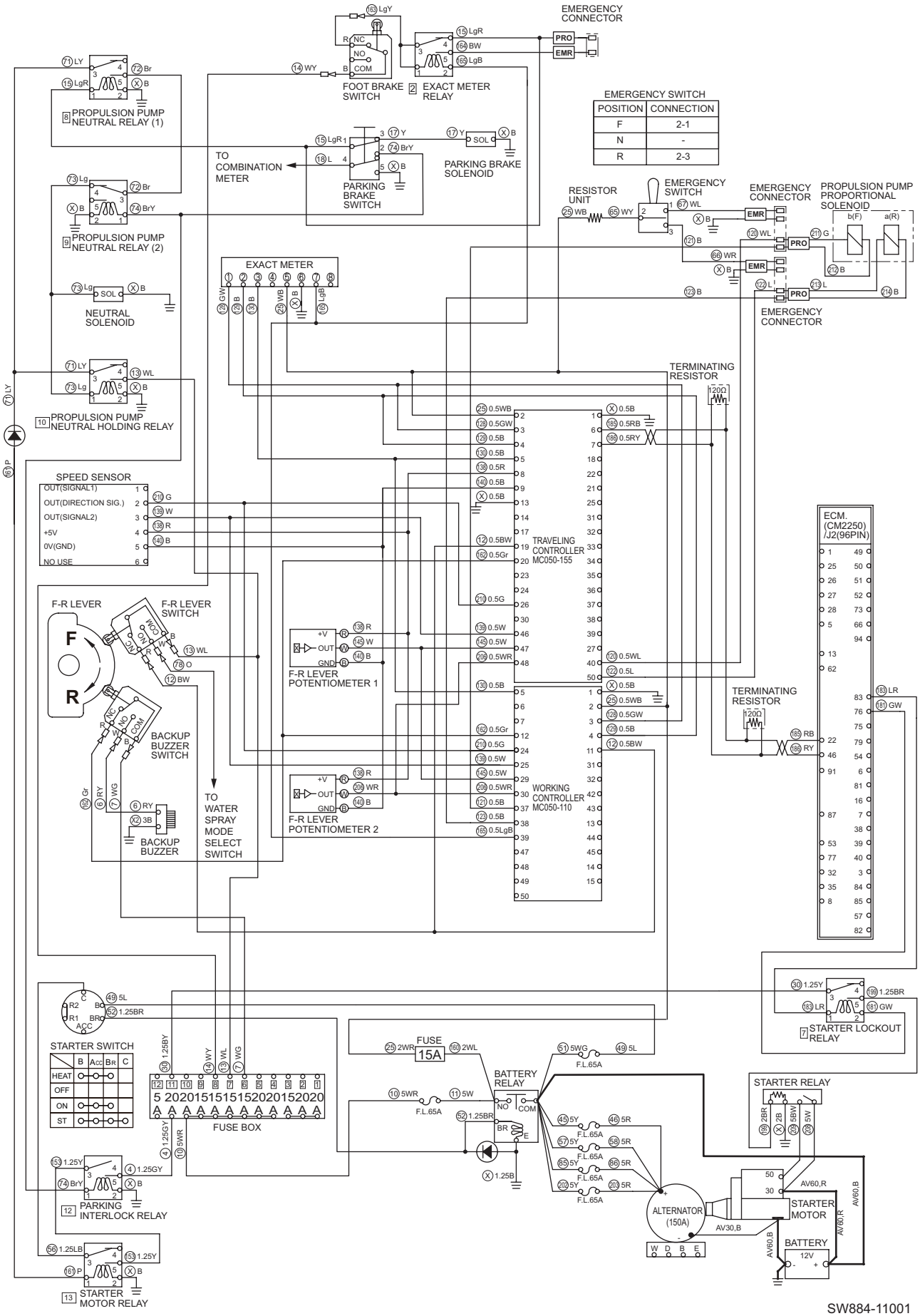
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E31 or E32	1. Connector	• Check propulsion pump proportional solenoid connector and traveling controller connector terminal 40, 50, working controller connector terminal 37, 38 for corrosion, breakage, bending and looseness. • 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. • Propulsion pump proportional solenoid b wire G and traveling controller terminal 40 wire G • Propulsion pump proportional solenoid a wire L and traveling controller terminal 50 wire L • Propulsion pump proportional solenoid a, b wire B and working controller terminal 37 and 38 wires B Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty. • Disconnect connectors and check continuity between propulsion pump proportional solenoid terminal wires. • Terminal wire No.120 wire G and terminal wire No.121 wire B • Terminal wire No.122 wire L and terminal wire No.123 wire B • 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. Standard resistance: 5.5 Ω • 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
FOOT BRAKE SWITCH
EXACT METER RELAY
EMERGENCY SWITCH
POSITION | CONNECTION
F | 2-1
N | -
R | 2-3
8 PROPULSION PUMP NEUTRAL RELAY (1)
9 PROPULSION PUMP NEUTRAL RELAY (2)
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
RESISTOR UNIT
EMERGENCY SWITCH
EMERGENCY CONNECTOR
PROPULSION PUMP PROPORTIONAL SOLENOID
EXACT METER
NEUTRAL SOLENOID
10 PROPULSION PUMP NEUTRAL HOLDING RELAY
TERMINATING RESISTOR
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
ECM. (CM2250) /J2(96PIN)
F-R LEVER
F-R LEVER SWITCH
F-R LEVER POTENTIOMETER 1
F-R LEVER POTENTIOMETER 2
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
STARTER RELAY
7 STARTER LOCKOUT RELAY
12 PARKING INTERLOCK RELAY
13 STARTER MOTOR RELAY
ALTERNATOR (150A)
STARTER MOTOR
BATTERY 12V
SW884-11001

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

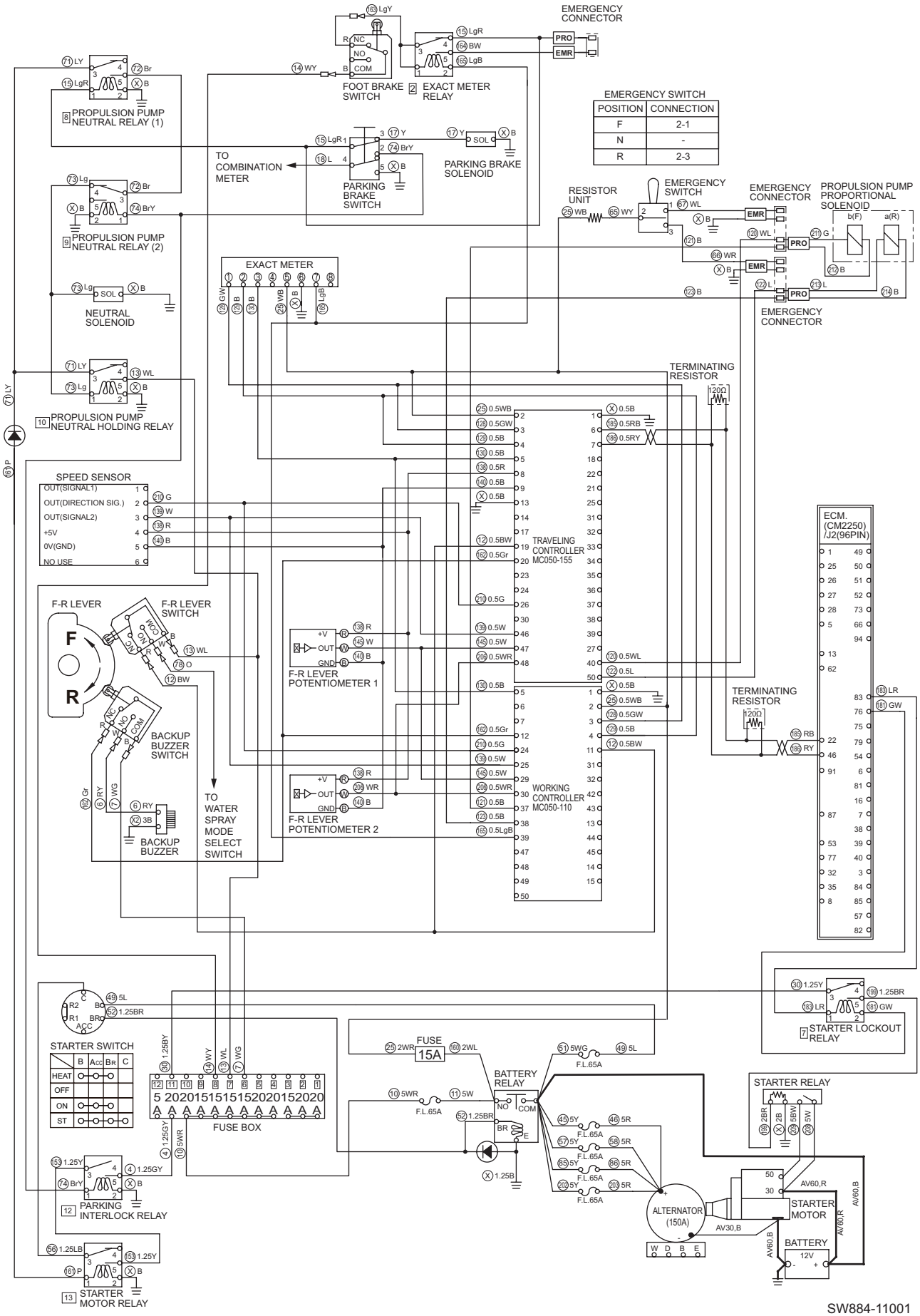
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

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

Fig.: 2-4-1


EMERGENCY CONNECTOR
FOOT BRAKE SWITCH
EXACT METER RELAY
EMERGENCY SWITCH
POSITION | CONNECTION
F | 2-1
N | -
R | 2-3
8 PROPULSION PUMP NEUTRAL RELAY (1)
9 PROPULSION PUMP NEUTRAL RELAY (2)
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
RESISTOR UNIT
EMERGENCY SWITCH
EMERGENCY CONNECTOR
PROPULSION PUMP PROPORTIONAL SOLENOID
EXACT METER
NEUTRAL SOLENOID
EMERGENCY CONNECTOR
TERMINATING RESISTOR
10 PROPULSION PUMP NEUTRAL HOLDING RELAY
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
ECM. (CM2250) /J2(96PIN)
F-R LEVER
F-R LEVER SWITCH
F-R LEVER POTENTIOMETER 1
F-R LEVER POTENTIOMETER 2
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
TERMINATING RESISTOR
7 STARTER LOCKOUT RELAY
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
STARTER RELAY
12 PARKING INTERLOCK RELAY
13 STARTER MOTOR RELAY
ALTERNATOR (150A)
STARTER MOTOR
BATTERY 12V
SW884-11001

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

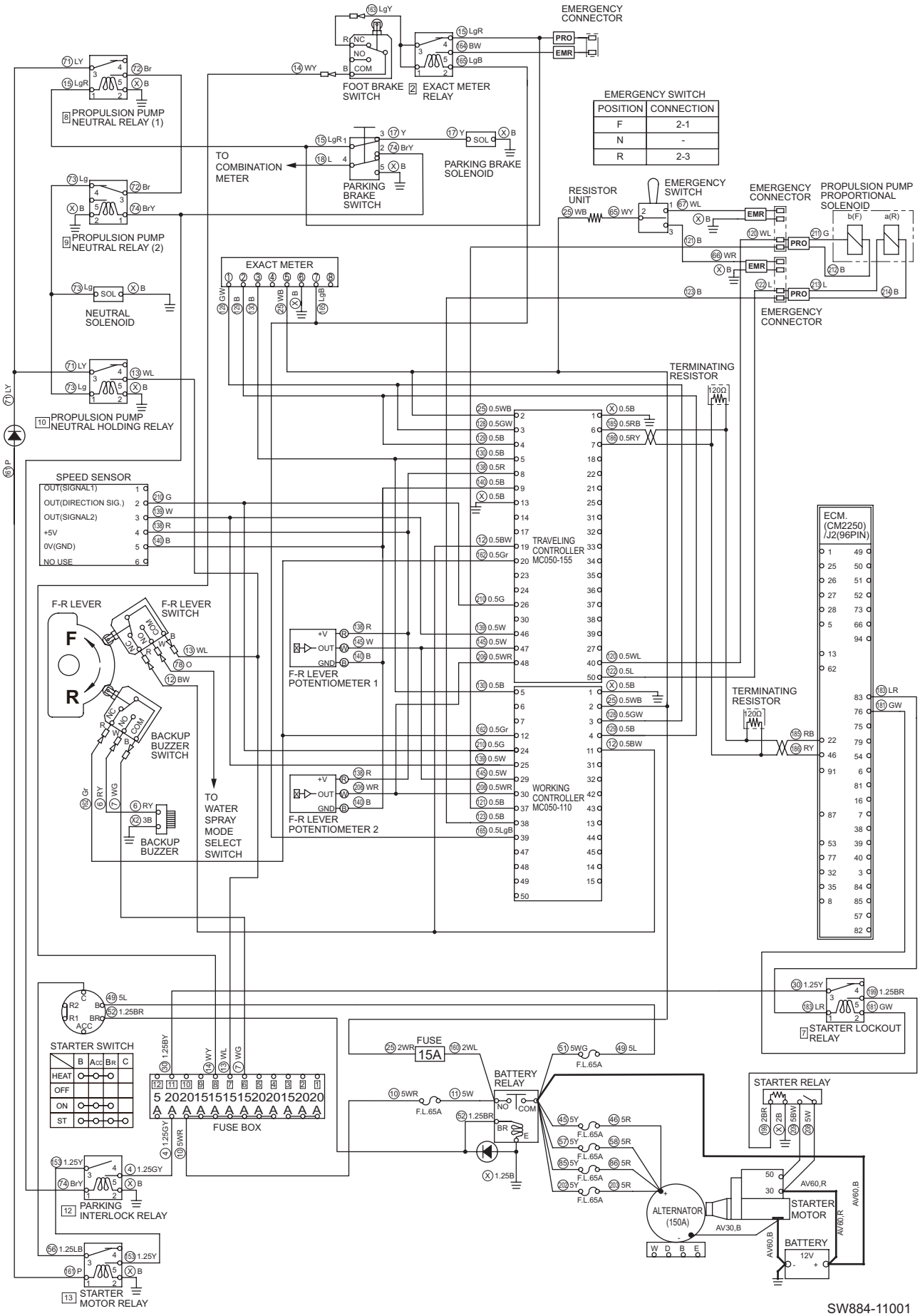
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E42	1. Connector	• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between exact meter and traveling controller terminal wires. • Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW • Exact meter terminal 2 wire B and traveling controller terminal 4 wire B • Exact meter terminal 3 wire B and traveling controller terminal 5 wire B Standard resistance : 10 Ω or less • 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 wire B. Standard voltage : 12 V or more • If voltage is normal, 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. • 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. ② Place F-R lever “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1



SW884-11001

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

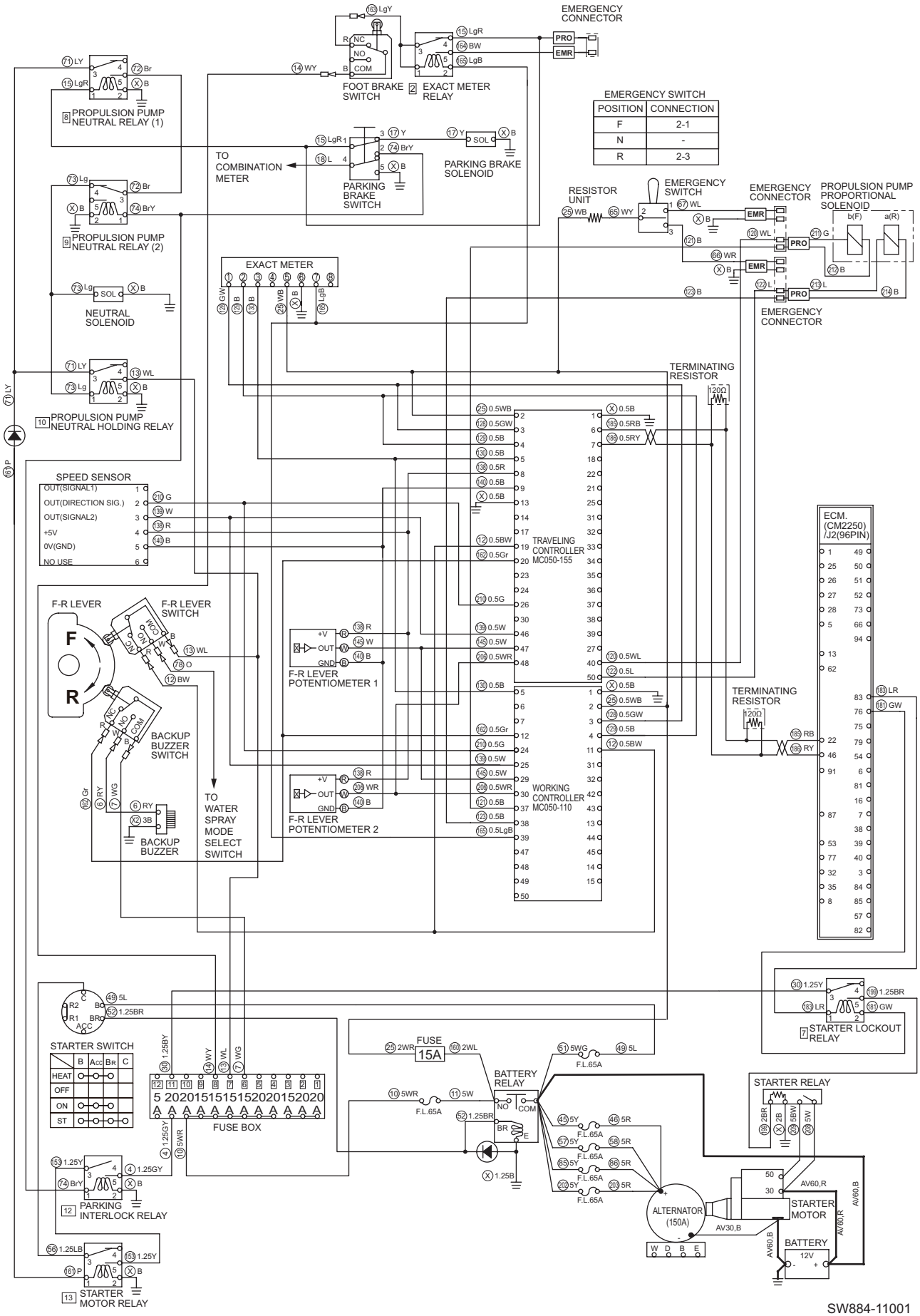
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E43	1. Connector	• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between exact meter and traveling controller terminal wires. • Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW • Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B • Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Replace harness.
	3. Exact Meter	• When starter switch is ON, measure voltage between exact meter terminal 5 inlet wire WB and ground terminal 6 wire B. Standard voltage : 12 V or more • If voltage is normal, 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. • 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. ② Place F-R lever “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1


EMERGENCY CONNECTOR
FOOT BRAKE SWITCH
EXACT METER RELAY
EMERGENCY SWITCH
POSITION | CONNECTION
F | 2-1
N | -
R | 2-3
8 PROPULSION PUMP NEUTRAL RELAY (1)
9 PROPULSION PUMP NEUTRAL RELAY (2)
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
RESISTOR UNIT
EMERGENCY SWITCH
EMERGENCY CONNECTOR
PROPULSION PUMP PROPORTIONAL SOLENOID
EXACT METER
NEUTRAL SOLENOID
EMERGENCY CONNECTOR
TERMINATING RESISTOR
10 PROPULSION PUMP NEUTRAL HOLDING RELAY
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
ECM. (CM2250) /J2(96PIN)
F-R LEVER
F-R LEVER SWITCH
F-R LEVER POTENTIOMETER 1
F-R LEVER POTENTIOMETER 2
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
TERMINATING RESISTOR
7 STARTER LOCKOUT RELAY
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
STARTER RELAY
12 PARKING INTERLOCK RELAY
13 STARTER MOTOR RELAY
ALTERNATOR (150A)
STARTER MOTOR
BATTERY 12V
SW884-11001

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

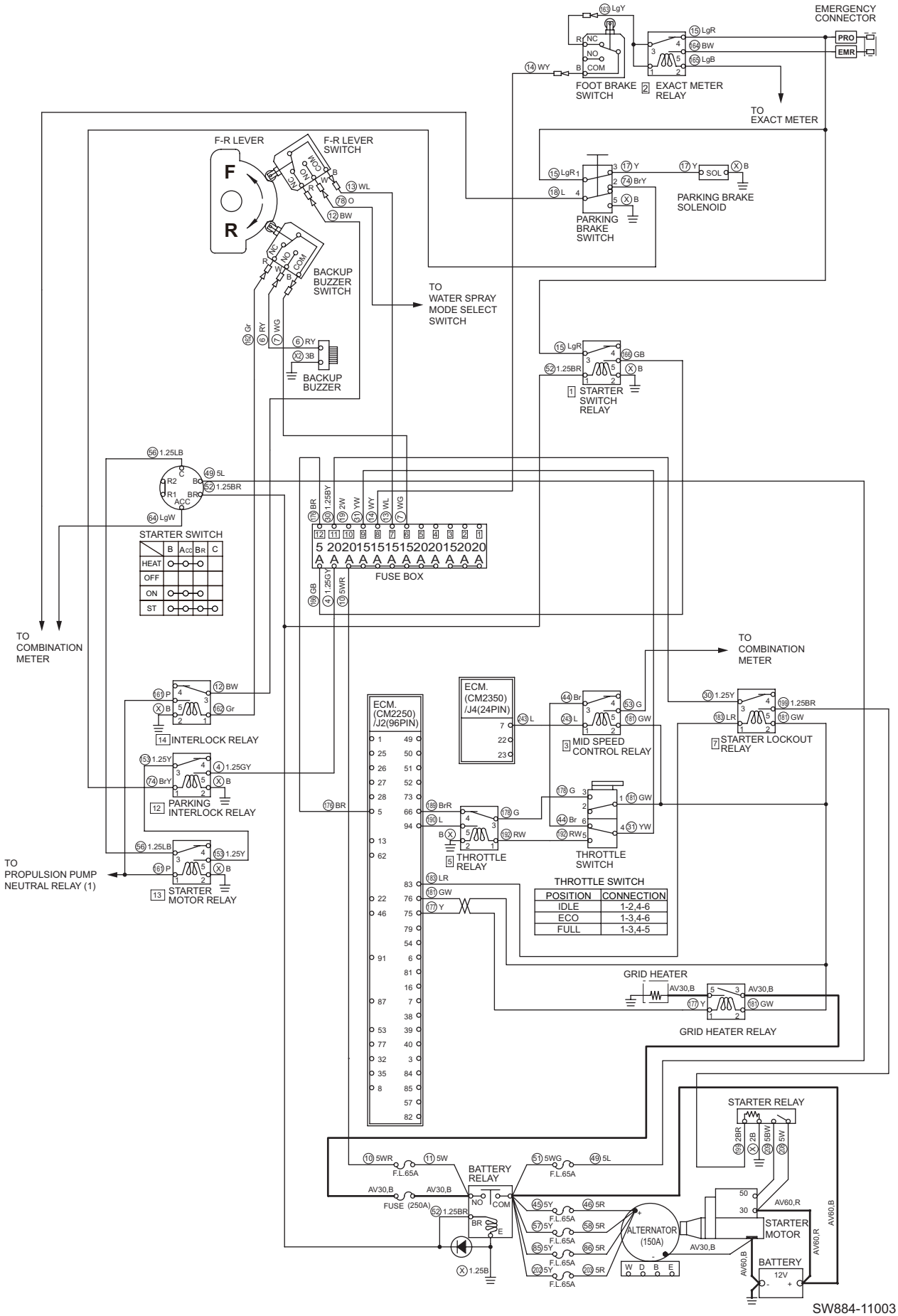
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E44, E45	1. Connector	• Check exact meter connector terminal 1, 2, 7 and working controller connector terminal 3, 4, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between exact meter and working controller terminal wires. • Exact meter terminal 1 wire GW and working controller terminal 3 wire GW • Exact meter terminal 2 wire B and working controller terminal 4 wire B • Exact meter terminal 3 wire B and working controller terminal 5 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Replace harness.
	3. Working Controller	(1) When starter switch is ON, measure voltage between working controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between working controller terminal 39 inlet wire LgB and working controller ground terminal 1 wire B. Standard voltage : 12 V or more • If above items (1) is OK and (2) is NG, working controller 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. • 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. ② Place F-R lever “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-2


EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO EXACT METER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
STARTER SWITCH RELAY
STARTER SWITCH
HEAT
OFF
ON
ST
FUSE BOX
TO COMBINATION METER
INTERLOCK RELAY
PARKING INTERLOCK RELAY
STARTER MOTOR RELAY
TO PROPULSION PUMP NEUTRAL RELAY (1)
ECM. (CM2350) /J4(24PIN)
ECM. (CM2250) /J2(96PIN)
MID SPEED CONTROL RELAY
STARTER LOCKOUT RELAY
THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
POSITION | CONNECTION
IDLE | 1-2,4-6
ECO | 1-3,4-6
FULL | 1-3,4-5
GRID HEATER
GRID HEATER RELAY
STARTER RELAY
BATTERY RELAY
FUSE (250A)
ALTERNATOR (150A)
STARTER MOTOR
BATTERY
12V
SW884-11003

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

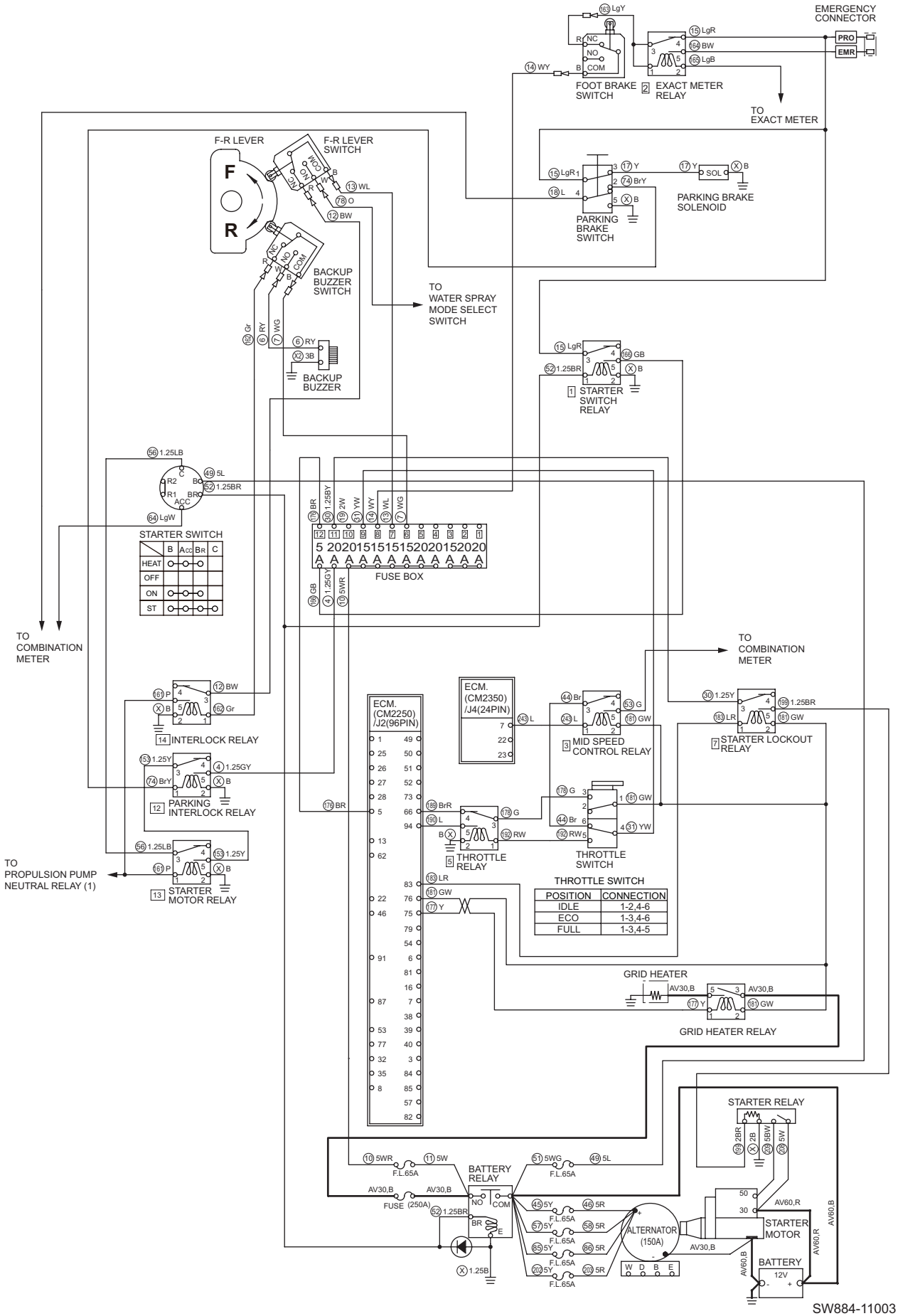
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

Reference Fig.: 2-4-2

Check point	Check/Cause	Action
1. Battery	• Measure battery voltage or specific gravity. Standard voltage : 12 V or more Standard gravity : 1.26 or more • 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. Switch is OK if there is continuity between connection O-O. • 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. Standard voltage : 12 V or more (2) When starter switch is START, measure voltage between starter motor terminal 50 and chassis ground. Standard voltage : 12 V or more • 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. Standard resistance : 12 V or more (2) When starter switch is ON, measure voltage between battery relay coil terminal BR inlet wire BR and coil ground terminal E. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between battery relay secondary terminal NO and chassis ground. Standard voltage : 12 V or more • 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. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between starter relay terminal inlet wire W and chassis ground. Standard voltage : 12 V or more (3) When starter switch is START, measure voltage between starter relay terminal outlet wire BW and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and item (3) is NG, starter relay is faulty.	Replace starter relay.

Fig.: 2-4-2


EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO EXACT METER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
STARTER SWITCH RELAY
STARTER SWITCH
HEAT
OFF
ON
ST
FUSE BOX
TO COMBINATION METER
INTERLOCK RELAY
PARKING INTERLOCK RELAY
STARTER MOTOR RELAY
TO PROPULSION PUMP NEUTRAL RELAY (1)
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
MID SPEED CONTROL RELAY
STARTER LOCKOUT RELAY
THROTTLE RELAY
THROTTLE SWITCH
POSITION
CONNECTION
IDLE
1-2,4-6
ECO
1-3,4-6
FULL
1-3,4-5
GRID HEATER
GRID HEATER RELAY
STARTER RELAY
BATTERY RELAY
FUSE (250A)
ALTERNATOR (150A)
STARTER MOTOR
BATTERY
12V
SW884-11003

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

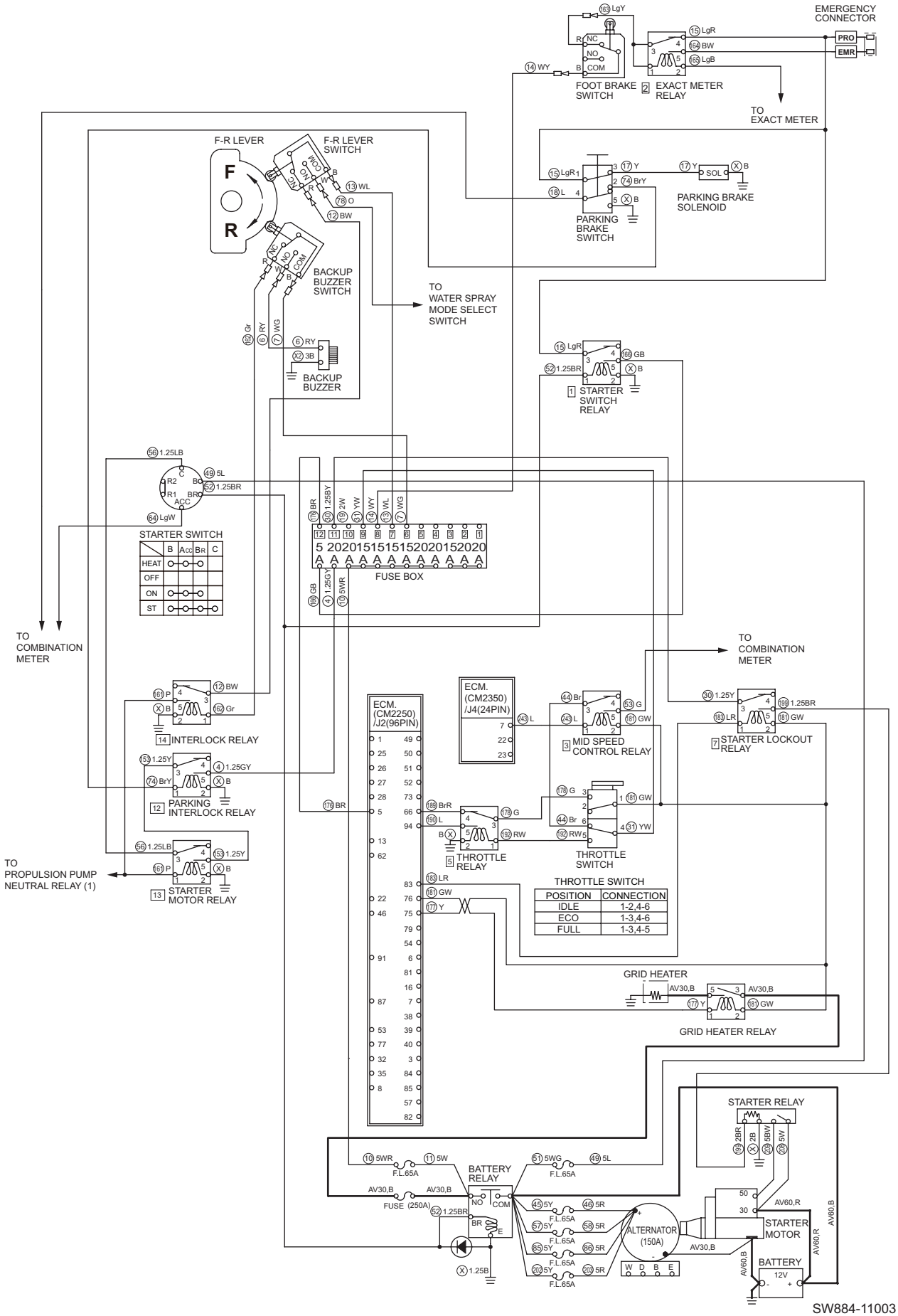
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

Reference Fig.: 2-4-2

Check point	Check/Cause	Action
6. F-R lever switch	(1) When starter switch is ON, measure voltage between F-R lever switch terminal COM inlet wire WL and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between F-R lever switch terminal NC outlet wire BW and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, F-R lever switch is faulty.	Replace F-R lever switch.
7. Buckup buzzer switch	(1) When starter switch is ON, measure voltage between buckup buzzer switch terminal COM inlet wire WG and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between buckup buzzer switch terminal NC outlet wire Gr and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, buckup buzzer switch is faulty.	Replace buckup buzzer switch.
8. 14 Interlock Relay	(1) When starter switch is ON, measure voltage between interlock relay terminal 1 inlet wire Gr and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between interlock relay terminal 3 inlet wire BW and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between interlock relay terminal 5 outlet wire P and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and item (3) is NG, interlock relay is faulty.	Replace interlock relay.
9. 13 Starter Motor Relay	(1) When starter switch is ON, measure voltage between starter motor relay terminal 1 inlet wire P and chassis ground. Standard voltage : 12 V or more (2) When starter switch is START, measure voltage between Starter motor relay terminal 3 inlet wire LB and chassis ground. Standard voltage : 12 V or more (3) When starter switch is START, measure voltage between starter motor relay terminal 5 outlet wire Y and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and item (3) is NG, starter motor relay is faulty.	Replace starter motor relay.

Fig.: 2-4-2


EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
2 EXACT METER RELAY
TO EXACT METER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
1 STARTER SWITCH RELAY
STARTER SWITCH
FUSE BOX
TO COMBINATION METER
TO COMBINATION METER
14 INTERLOCK RELAY
12 PARKING INTERLOCK RELAY
13 STARTER MOTOR RELAY
TO PROPULSION PUMP NEUTRAL RELAY (1)
ECM. (CM2350) /J4(24PIN)
ECM. (CM2250) /J2(96PIN)
3 MID SPEED CONTROL RELAY
7 STARTER LOCKOUT RELAY
5 THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
POSITION | CONNECTION
IDLE | 1-2,4-6
ECO | 1-3,4-6
FULL | 1-3,4-5
GRID HEATER
GRID HEATER RELAY
STARTER RELAY
BATTERY RELAY
FUSE (250A)
ALTERNATOR (150A)
STARTER MOTOR
BATTERY
12V
SW884-11003

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

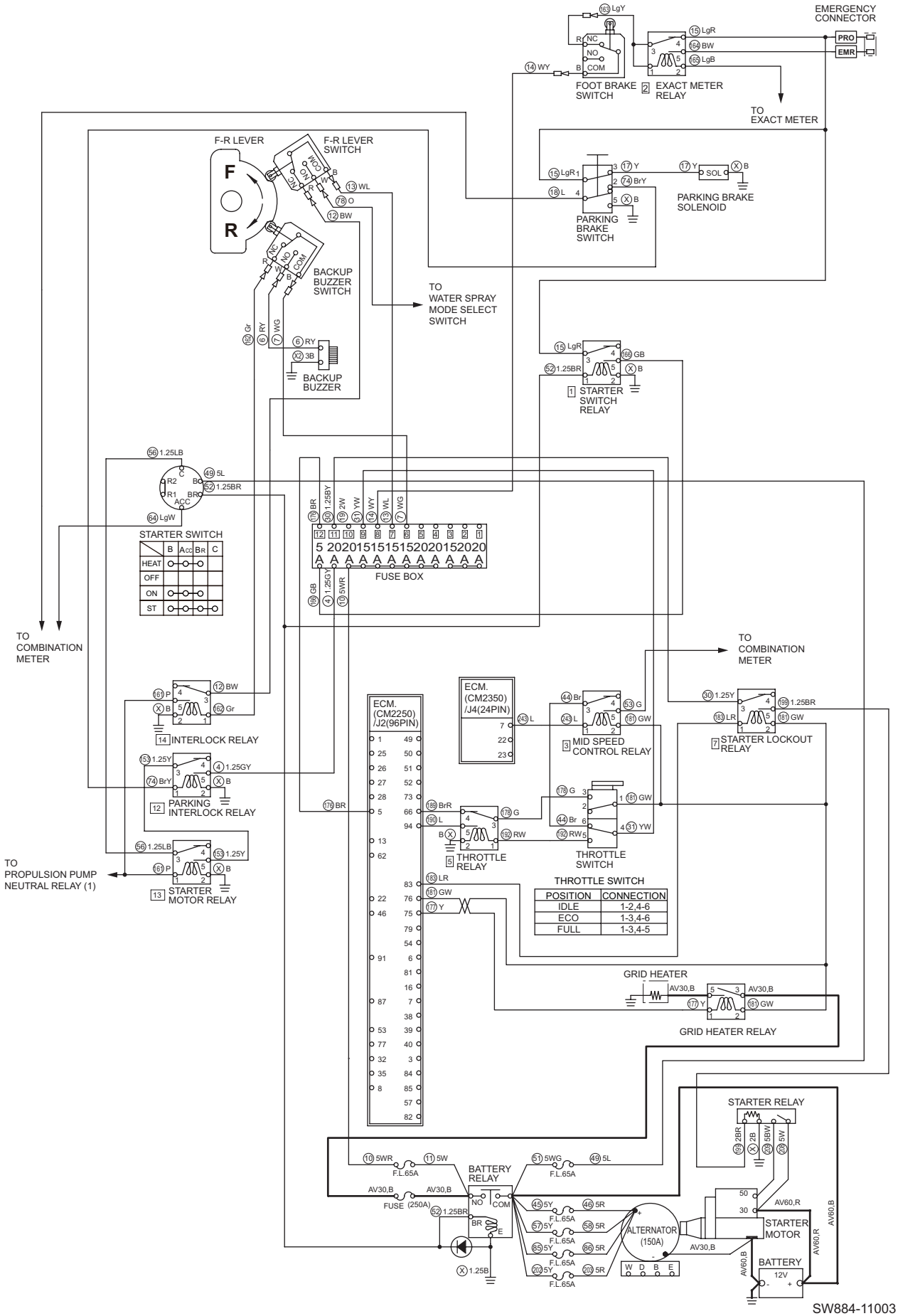
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

Reference Fig.: 2-4-2

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

Fig.: 2-4-2


EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO EXACT METER
F-R LEVER
F-R LEVER SWITCH
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
STARTER SWITCH RELAY
STARTER SWITCH
FUSE BOX
TO COMBINATION METER
INTERLOCK RELAY
PARKING INTERLOCK RELAY
STARTER MOTOR RELAY
TO PROPULSION PUMP NEUTRAL RELAY (1)
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
MID SPEED CONTROL RELAY
STARTER LOCKOUT RELAY
THROTTLE RELAY
THROTTLE SWITCH
POSITION CONNECTION
IDLE 1-2,4-6
ECO 1-3,4-6
FULL 1-3,4-5
GRID HEATER
GRID HEATER RELAY
STARTER RELAY
BATTERY RELAY
FUSE (250A)
ALTERNATOR (150A)
STARTER MOTOR
BATTERY 12V
SW884-11003

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

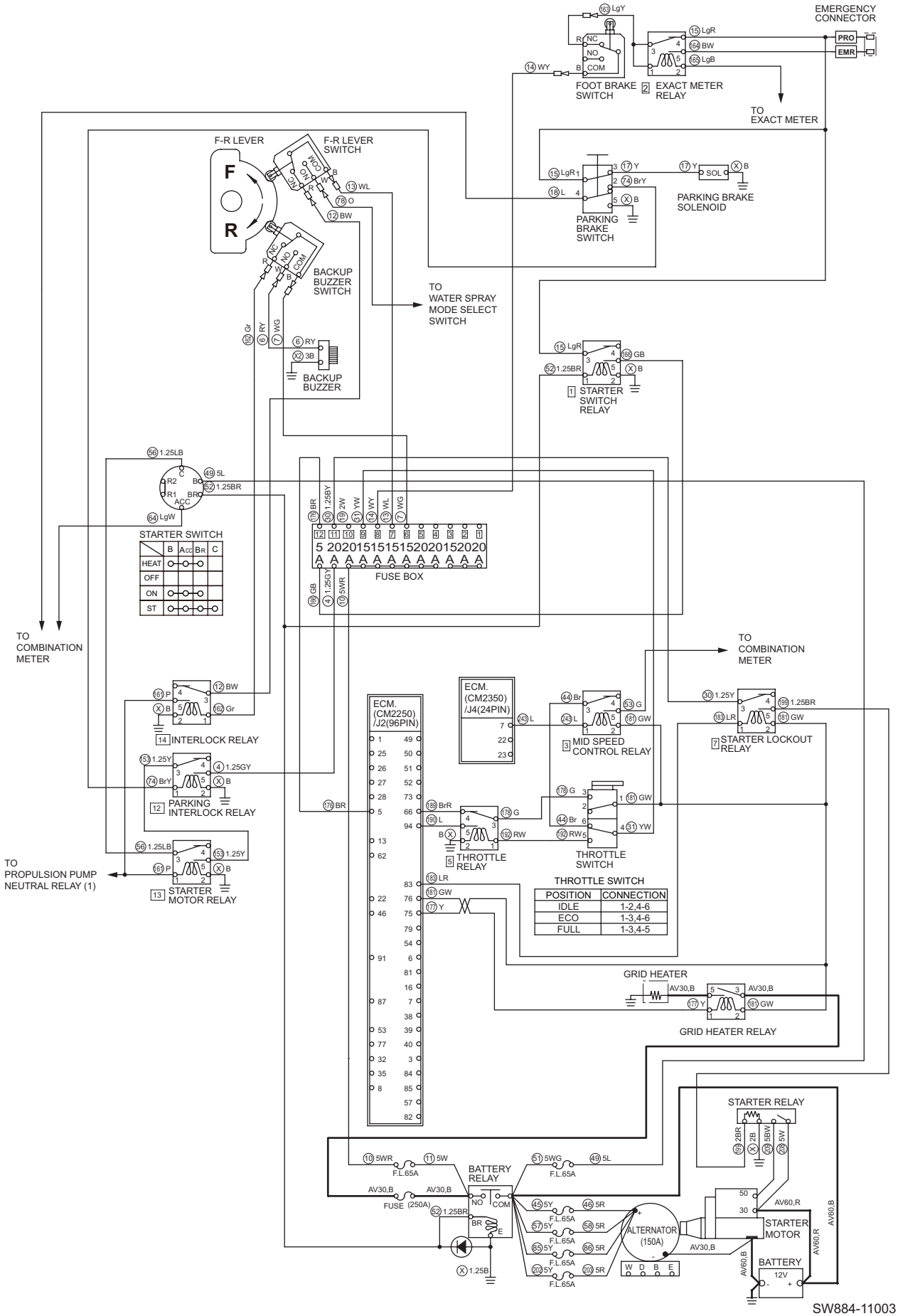
- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

Reference Fig.: 2-4-2

Check point	Check/Cause	Action
14. [7] Starter Lockout Relay	(1) When starter switch is ON, measure voltage between starter lockout relay terminal 1 inlet wire LR and 2 outlet wire GW. Standard voltage : 12 V or more (2) When starter switch is START, measure voltage between starter lockout relay terminal 3 inlet wire Y and chassis ground. Standard voltage : 12 V or more (3) When starter switch is START, measure voltage between starter lockout relay terminal 5 outlet wire BR and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and item (3) is NG, starter lockout relay is faulty.	Replace starter switch relay.
15. [1] Starter Switch Relay	(1) When starter switch is ON, measure voltage between starter switch relay terminal 1 inlet wire BR and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between starter switch relay terminal 3 inlet wire LgR and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between starter switch relay terminal 5 outlet wire GB and chassis ground. Standard voltage : 12 V or more • 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. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-4-2


EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
2 EXACT METER RELAY
TO EXACT METER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
1 STARTER SWITCH RELAY
STARTER SWITCH
FUSE BOX
TO COMBINATION METER
TO COMBINATION METER
14 INTERLOCK RELAY
12 PARKING INTERLOCK RELAY
13 STARTER MOTOR RELAY
TO PROPULSION PUMP NEUTRAL RELAY (1)
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
3 MID SPEED CONTROL RELAY
7 STARTER LOCKOUT RELAY
5 THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
POSITION | CONNECTION
IDLE | 1-2,4-6
ECO | 1-3,4-6
FULL | 1-3,4-5
GRID HEATER
GRID HEATER RELAY
STARTER RELAY
BATTERY RELAY
FUSE (250A)
ALTERNATOR (150A)
STARTER MOTOR
BATTERY
12V
SW884-11003

2-4-2. No charging

Reference Fig.: 2-4-2

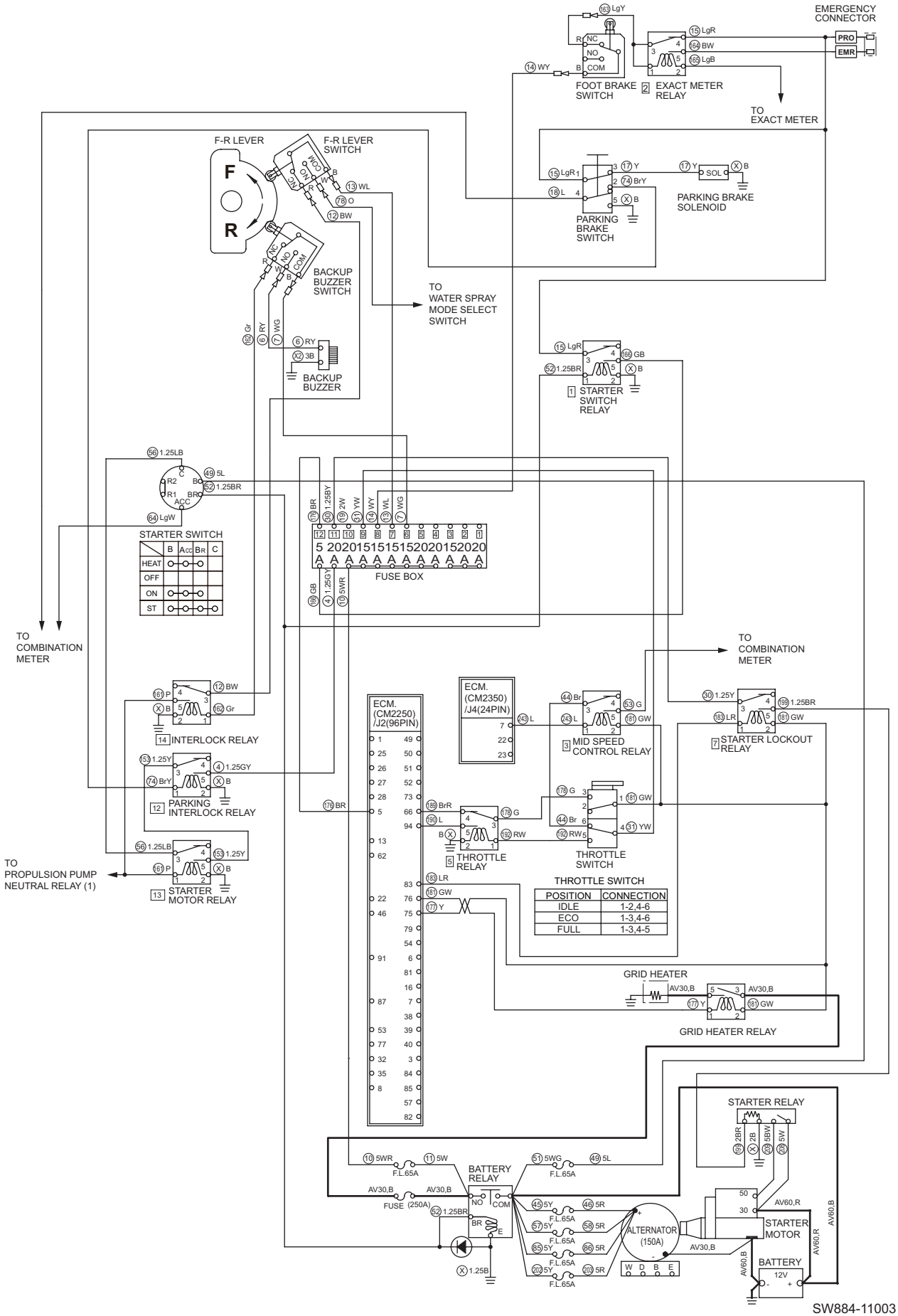
Check point	Check/Cause	Action
1. Alternator	• After starting engine, measure voltage between alternator terminal + wire R and chassis ground. Standard voltage : At least intermediate engine speed, 14 V or more • If voltage is lower than standard, alternator is faulty. • If voltage is normal and battery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

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

Reference Fig. : 2-4-2

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

Fig.: 2-4-2

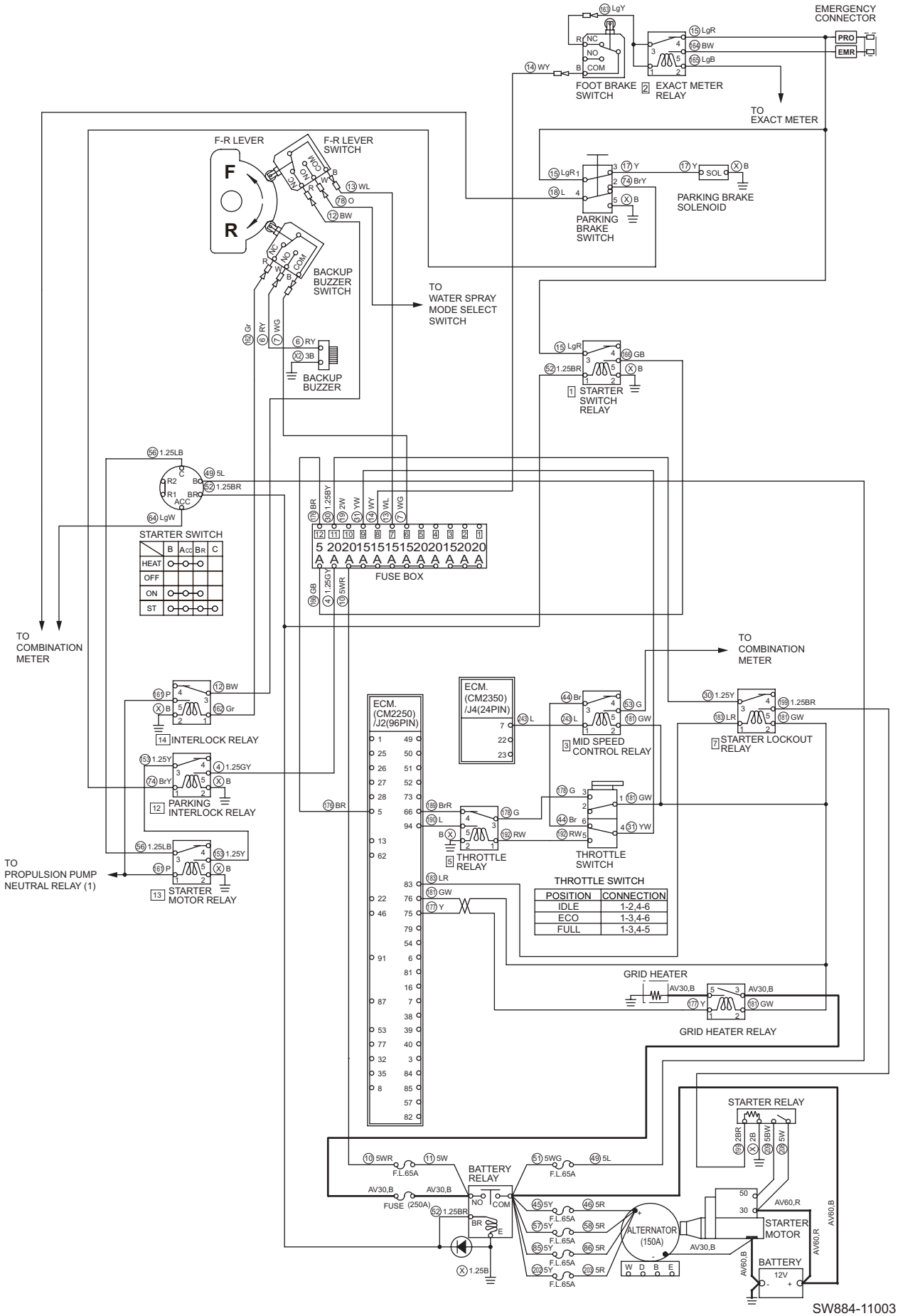

EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO EXACT METER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
TO WATER SPRAY MODE SELECT SWITCH
BACKUP BUZZER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
STARTER SWITCH RELAY
STARTER SWITCH
HEAT
OFF
ON
ST
FUSE BOX
TO COMBINATION METER
INTERLOCK RELAY
PARKING INTERLOCK RELAY
STARTER MOTOR RELAY
TO PROPULSION PUMP NEUTRAL RELAY (1)
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
MID SPEED CONTROL RELAY
STARTER LOCKOUT RELAY
THROTTLE RELAY
THROTTLE SWITCH
POSITION
CONNECTION
IDLE
1-2,4-6
ECO
1-3,4-6
FULL
1-3,4-5
GRID HEATER
GRID HEATER RELAY
STARTER RELAY
BATTERY RELAY
FUSE (250A)
ALTERNATOR (150A)
STARTER MOTOR
BATTERY
12V
SW884-11003

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

Reference Fig.: 2-4-2

Check point	Check/Cause	Action
1. F-R lever switch	• When starter switch is OFF and F-R lever is “F”, check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition. • If there is continuity, F-R lever switch is faulty.	Replace F-R lever switch.
2. Buckup buzzer switch	• When starter switch is OFF and F-R lever is “R”, check continuity between buckup buzzer switch terminal COM and terminal NC. There is no continuity in normal condition. • If there is continuity, buckup buzzer switch is faulty.	Replace buckup buzzer 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. There is no continuity in normal condition. • If there is continuity, parking brake switch is faulty.	Replace parking brake switch.

Fig.: 2-4-2

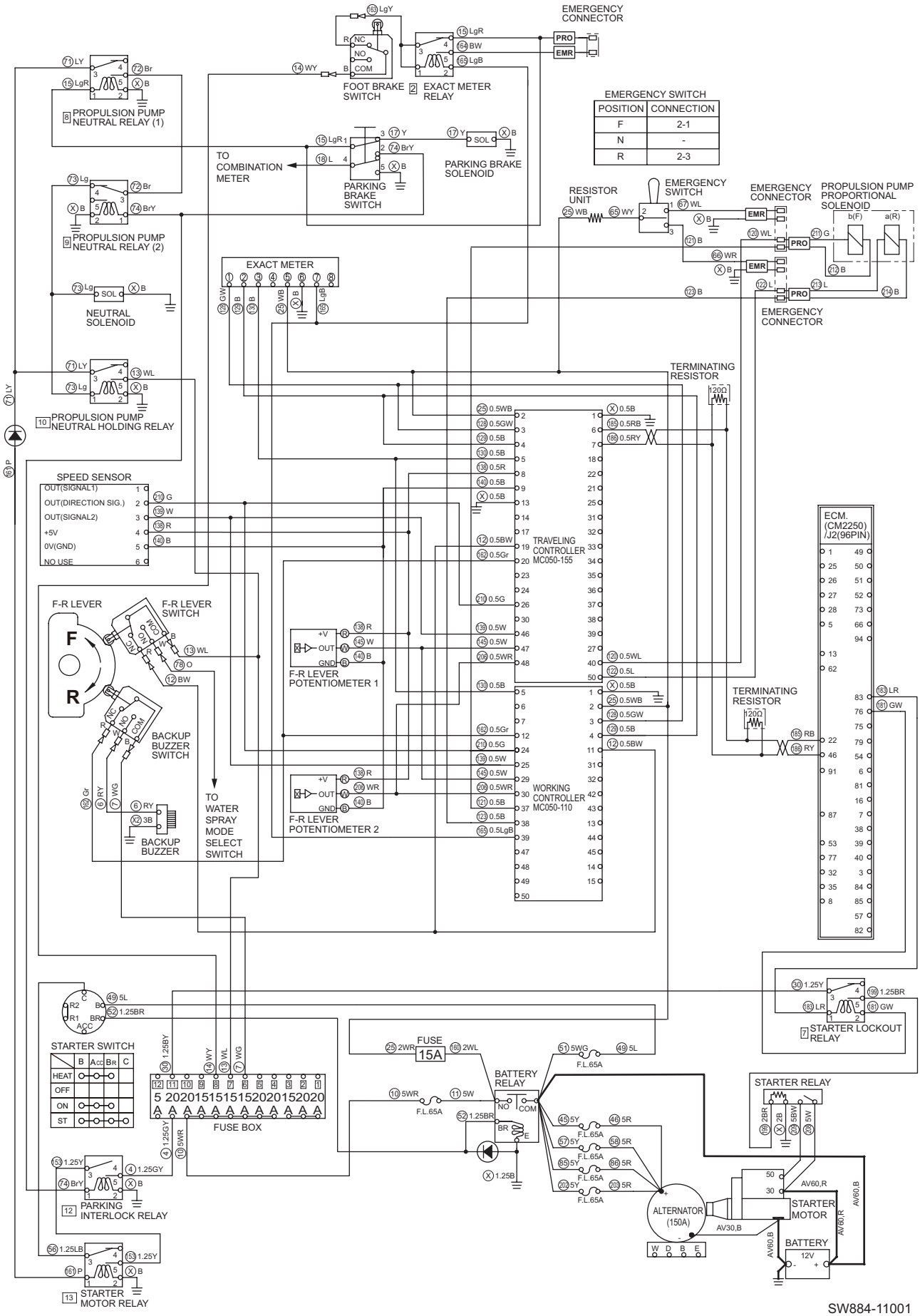

EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO EXACT METER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
STARTER SWITCH RELAY
STARTER SWITCH
HEAT
OFF
ON
ST
FUSE BOX
TO COMBINATION METER
INTERLOCK RELAY
PARKING INTERLOCK RELAY
STARTER MOTOR RELAY
TO PROPULSION PUMP NEUTRAL RELAY (1)
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
MID SPEED CONTROL RELAY
STARTER LOCKOUT RELAY
THROTTLE RELAY
THROTTLE SWITCH
POSITION
CONNECTION
IDLE
1-2,4-6
ECO
1-3,4-6
FULL
1-3,4-5
GRID HEATER
GRID HEATER RELAY
STARTER RELAY
BATTERY RELAY
FUSE (250A)
ALTERNATOR (150A)
STARTER MOTOR
BATTERY
12V
SW884-11003

2-4-5. Engine speed cannot be switched

Reference Fig. : 2-4-2

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. There is continuity in normal condition. (2) When throttle switch is “MID”, check continuity between throttle switch terminals 1 and 3, 4 and 6. There is continuity in normal condition. (3) When throttle switch is “FULL”, check continuity between throttle switch terminals 1 and 3, 4 and 5. There is continuity in normal condition. • If above item (1), (2) or (3) is NG, throttle switch is faulty.	Replace throttle switch.
2. [5] Throttle Relay	(1) When starter switch is ON, measure voltage between throttle relay terminal 1 inlet wire RW and terminal 2 outlet wire B. There is no electricity in normal condition. (2) When starter switch is ON, check continuity between throttle relay terminal 3 and terminal 4. There is continuity in normal condition. • If above item (1) is OK and item (2) is NG, throttle relay is faulty.	Replace throttle relay.
3. [3] Mid Speed Control Relay	(1) When starter switch is ON, measure voltage between mid speed control relay terminal 1 inlet wire L and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and throttle switch is “ECO”, check continuity between throttle relay terminal 3 and terminal 5. There is continuity in normal condition. • If above item (1) is OK and item (2) is NG, throttle relay is faulty.	Replace mid speed control relay.
4. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-4-1



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2-5. Propulsion

Check following items before troubleshooting.

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

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

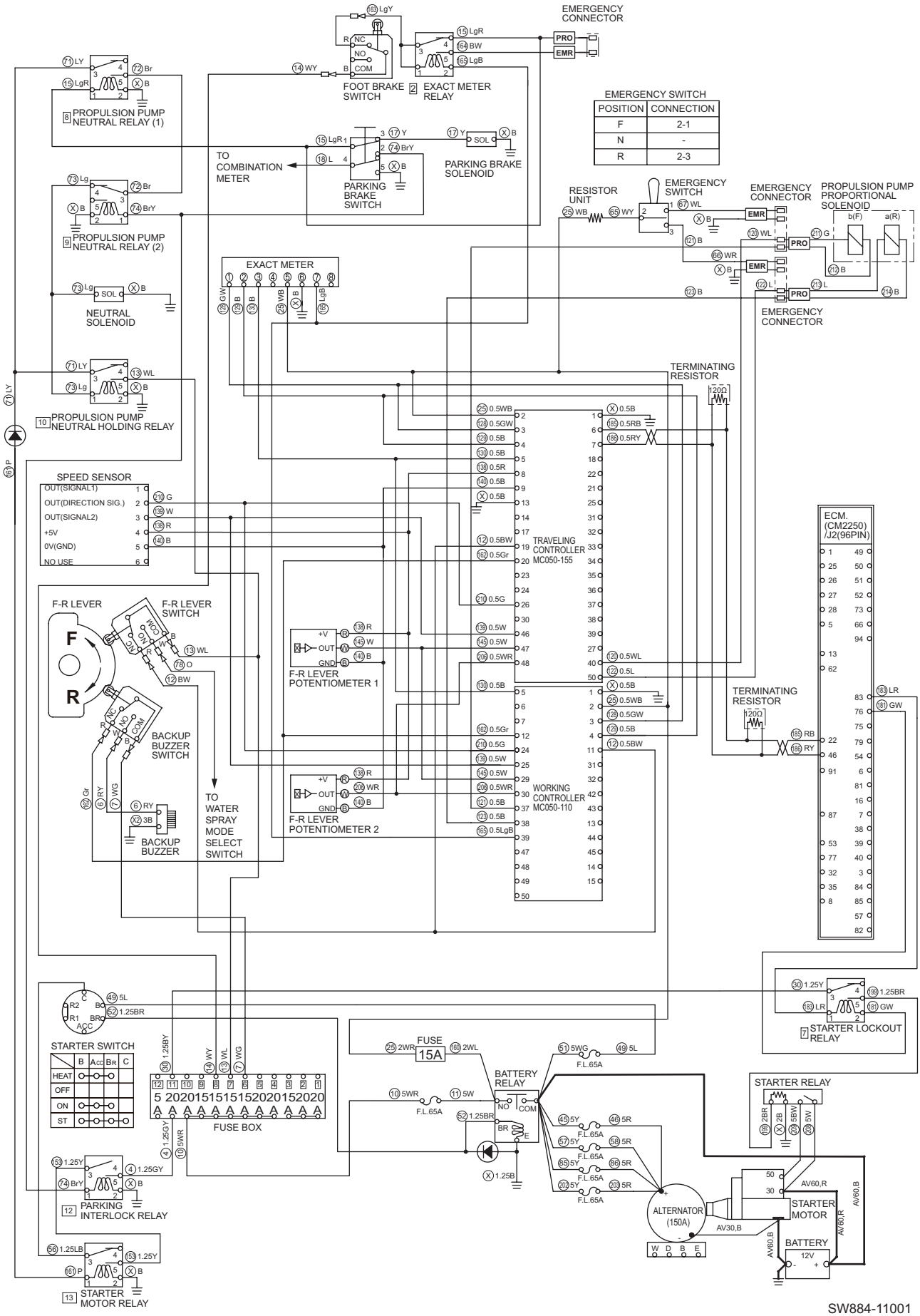
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E01 or E02	1. Connector	• Check F-R lever potentiometer 1, 2 connector and traveling controller connector terminal 8, 9, 47, 48, working controller connector terminal 29, 30 for corrosion, breakage, bending and looseness. • 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. • F-R lever potentiometer 1 terminal wire R and traveling controller terminal 8 wire R • F-R lever potentiometer 1 terminal wire W and traveling controller terminal 47 wire W, working controller terminal 29 wire W • F-R lever potentiometer 1 terminal wire B and traveling controller terminal 9 wire B • F-R lever potentiometer 2 terminal wire R and traveling controller terminal 8 wire R • F-R lever potentiometer 2 terminal wire WR and traveling controller terminal 48 wire WR, working controller terminal 30 wire WR • F-R lever potentiometer 2 terminal wire B and traveling controller terminal 9 wire B Standard resistance : 10 Ω or less • 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 wire B. Standard voltage : 5 ± 0.5 V (2) When starter switch is ON, measure voltage between F-R lever potentiometer 1 terminal outlet wire W and ground terminal wire B. ① When F-R lever is “N” Standard voltage : 2.5 ± 0.015 V ② When F-R lever is “F” Standard voltage : 1.2 ± 0.02 V ③ When F-R lever is “R” Standard voltage : 3.8 ± 0.02 V • 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



SW884-11001

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

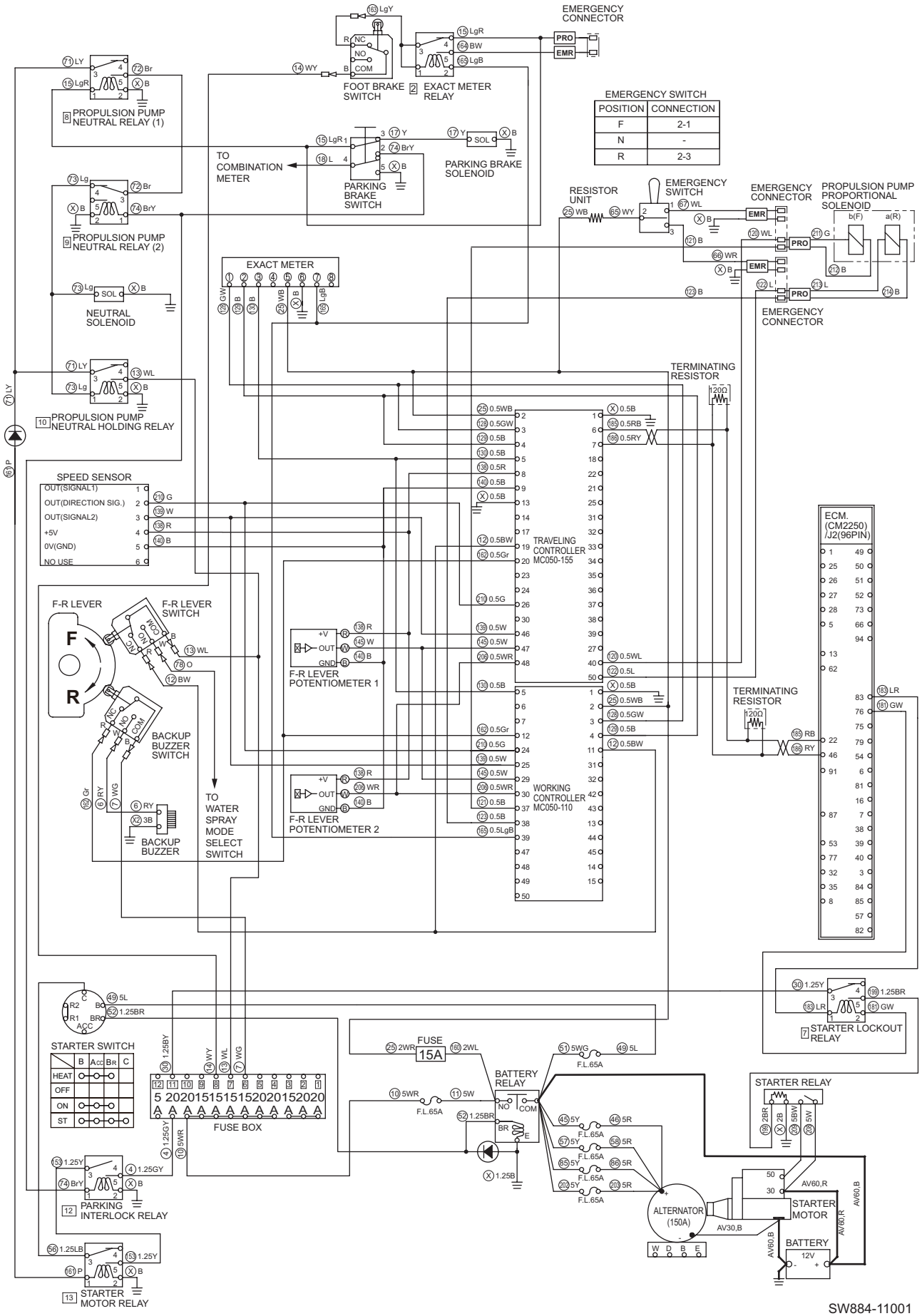
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E01 or E02	4. F-R Lever Potentiometer 2	(1) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal inlet wire R and ground terminal wire B. Standard voltage : 5 ± 0.5 V (2) When starter switch is ON, measure voltage between F-R lever potentiometer 2 terminal outlet wire WR and ground terminal wire B. ① When F-R lever is “N” Standard voltage : 2.5 ± 0.015 V ② When F-R lever is “F” Standard voltage : 3.8 ± 0.02 V ③ When F-R lever is “R” Standard voltage : 1.2 ± 0.02 V • 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 wire B. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between traveling controller terminal 8 outlet wire R (positive side) and 9 wire B (ground side). Standard voltage : 5 ± 0.5 V • 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. ② Place F-R lever “N”. ③ Exact meter will display vehicle speed (0.0). If E01 or E02 is displayed, check above items again. ④ Place F-R lever “F” or “N”. ⑤ Exact meter will still display vehicle speed (0.0). Machine is in normal state. If display changes to E01 or E02, check above items again.	

Fig.: 2-4-1



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

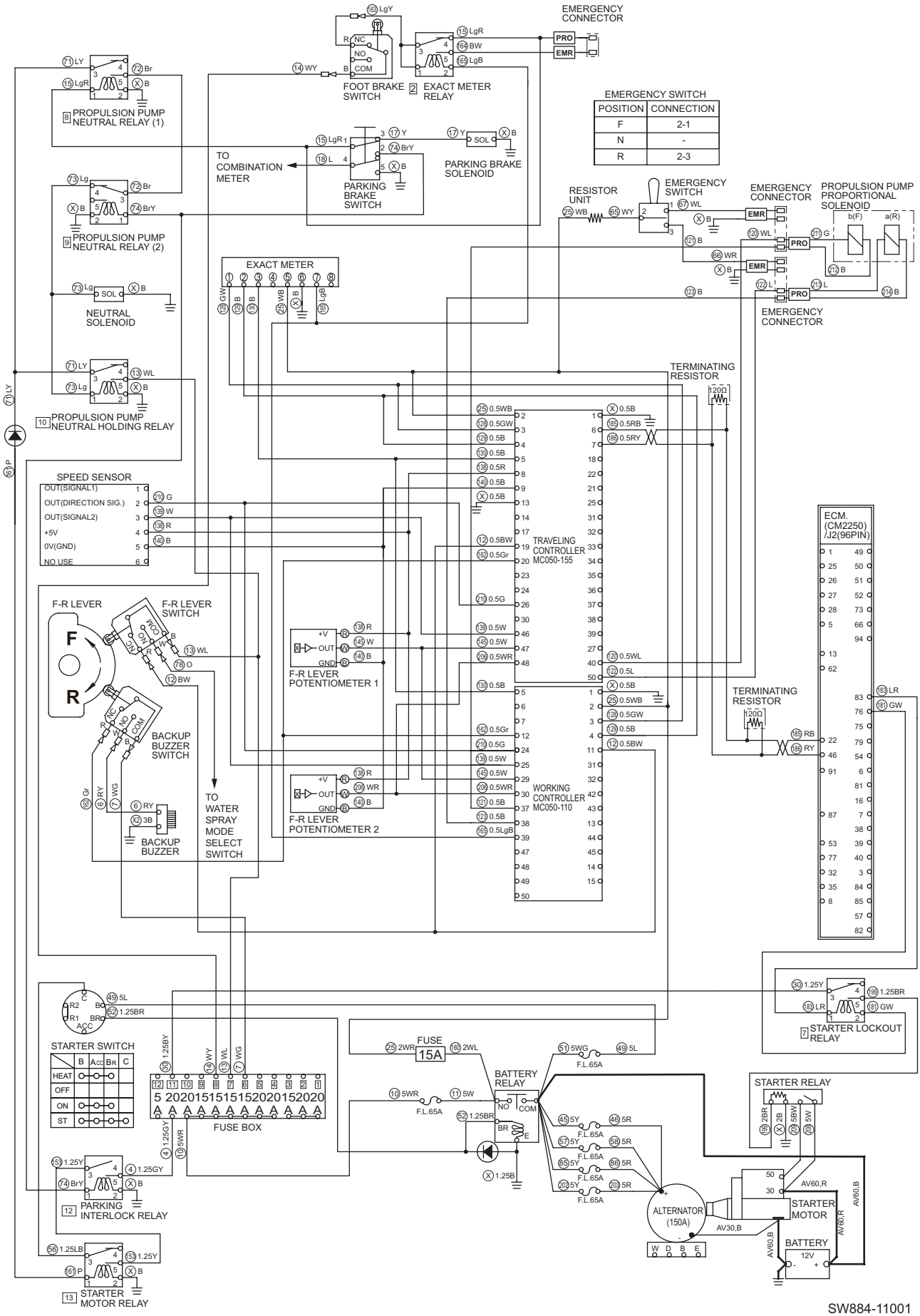
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E03 or E04	1. Connector	• Check F-R lever switch connector and traveling controller connector terminal 19, working controller connector terminal 11 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistance between F-R lever switch connector terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW. Standard resistance : 10 Ω or less (2) Measure resistance between F-R lever switch connector terminal COM wire WL and fuse box terminal 7 wire WL. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. F-R lever switch	(1) When starter switch is OFF and F-R lever is “N”, check continuity between F-R lever switch terminal COM and terminal NC. There is continuity in normal condition. (2) When starter switch is OFF and F-R lever is “F”, check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition. • If above item (1) or (2) is NG, F-R lever switch is faulty.	Replace F-R lever 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. ② Exact meter will display E03 or E04. When E03 is displayed: ③ Move F-R lever in “F”. Exact meter display will change from E03 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again. ④ Return F-R lever to “N”. Machine is in normal state. When E04 is displayed: ③ Place F-R lever “N”. Exact meter display will change from E04 to vehicle speed (0.0). Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1



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

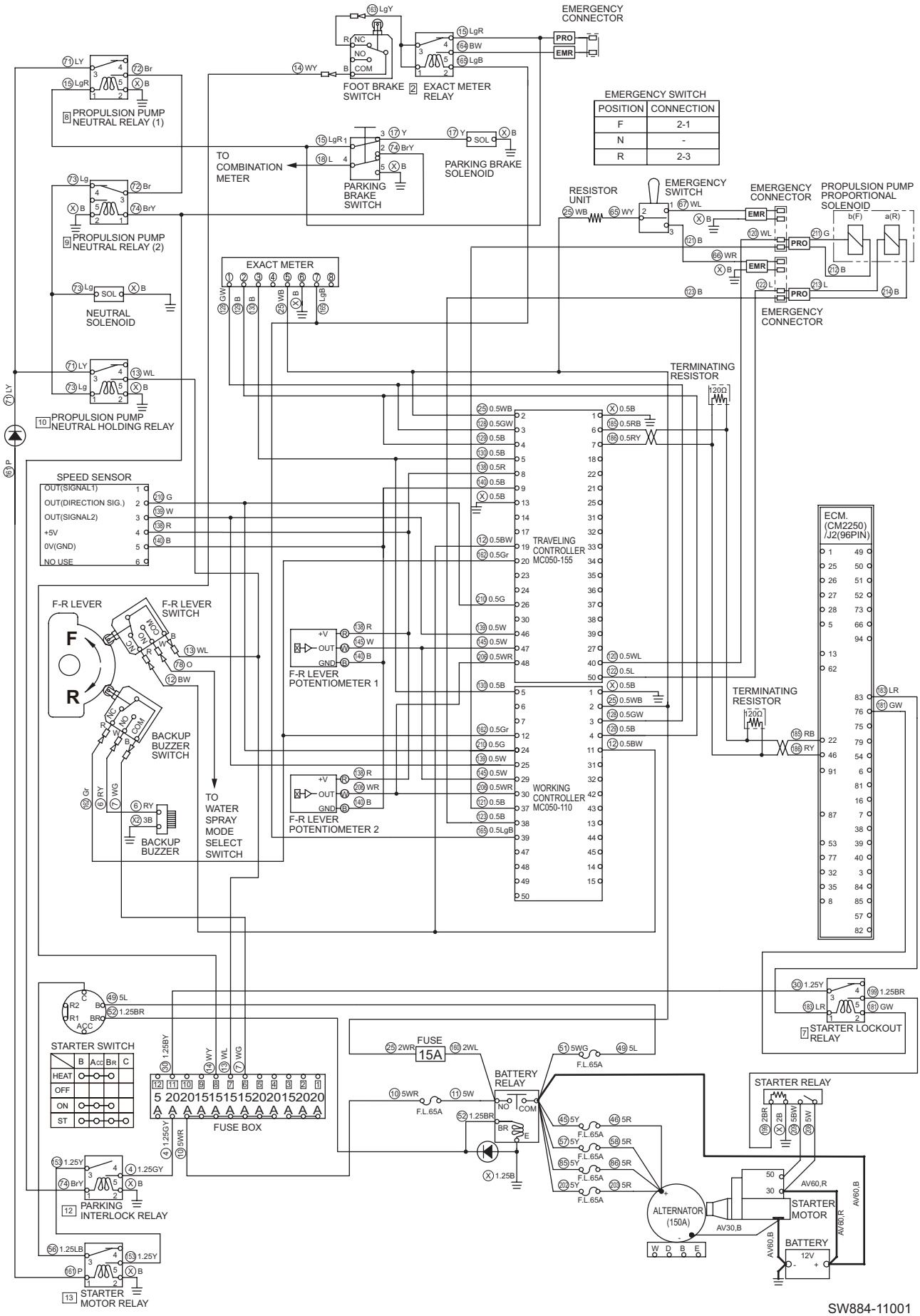
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E05 or E06	1. Connector	• Check buckup buzzer switch connector and traveling controller connector terminal 20, working controller connector terminal 12 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistance between buckup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller terminal 12 wire Gr. Standard resistance : 10 Ω or less (2) Measure resistance between buckup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. Buckup buzzer switch	(1) When starter switch is OFF and F-R lever is “N”, check continuity between buckup buzzer switch terminal COM and terminal NC. There is continuity in normal condition. (2) When starter switch is OFF and F-R lever is “R”, check continuity between buckup buzzer switch terminal COM and terminal NC. There is no continuity in normal condition. • If above item (1) or (2) is NG, buckup buzzer switch is faulty.	Replace buckup buzzer switch.
	4. Traveling/ Working Controller	• If error code E05 or E06 is displayed and no abnormality is found in connector, harness and buckup buzzer 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. ② Exact meter will display E05 or E06. When E05 is displayed: ③ Place F-R lever “N”. Exact meter display will change from E05 to vehicle speed (0.0). Machine is in normal state. If display does not change to vehicle speed, check above items again. When E06 is displayed: ③ Move F-R lever in “R”. Exact meter display will change from E06 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again. ④ Return F-R lever to “N”. Machine is in normal state.	

Fig.: 2-4-1


EMERGENCY CONNECTOR
FOOT BRAKE SWITCH
2 EXACT METER RELAY
EMERGENCY SWITCH
POSITION | CONNECTION
F | 2-1
N | -
R | 2-3
8 PROPULSION PUMP NEUTRAL RELAY (1)
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
9 PROPULSION PUMP NEUTRAL RELAY (2)
RESISTOR UNIT
EMERGENCY SWITCH
EMERGENCY CONNECTOR
PROPULSION PUMP PROPORTIONAL SOLENOID
EXACT METER
NEUTRAL SOLENOID
EMERGENCY CONNECTOR
TERMINATING RESISTOR
10 PROPULSION PUMP NEUTRAL HOLDING RELAY
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
ECM. (CM2250) /J2(96PIN)
F-R LEVER
F-R LEVER SWITCH
F-R LEVER POTENTIOMETER 1
F-R LEVER POTENTIOMETER 2
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
TERMINATING RESISTOR
7 STARTER LOCKOUT RELAY
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
STARTER RELAY
12 PARKING INTERLOCK RELAY
13 STARTER MOTOR RELAY
ALTERNATOR (150A)
STARTER MOTOR
BATTERY 12V
SW884-11001

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

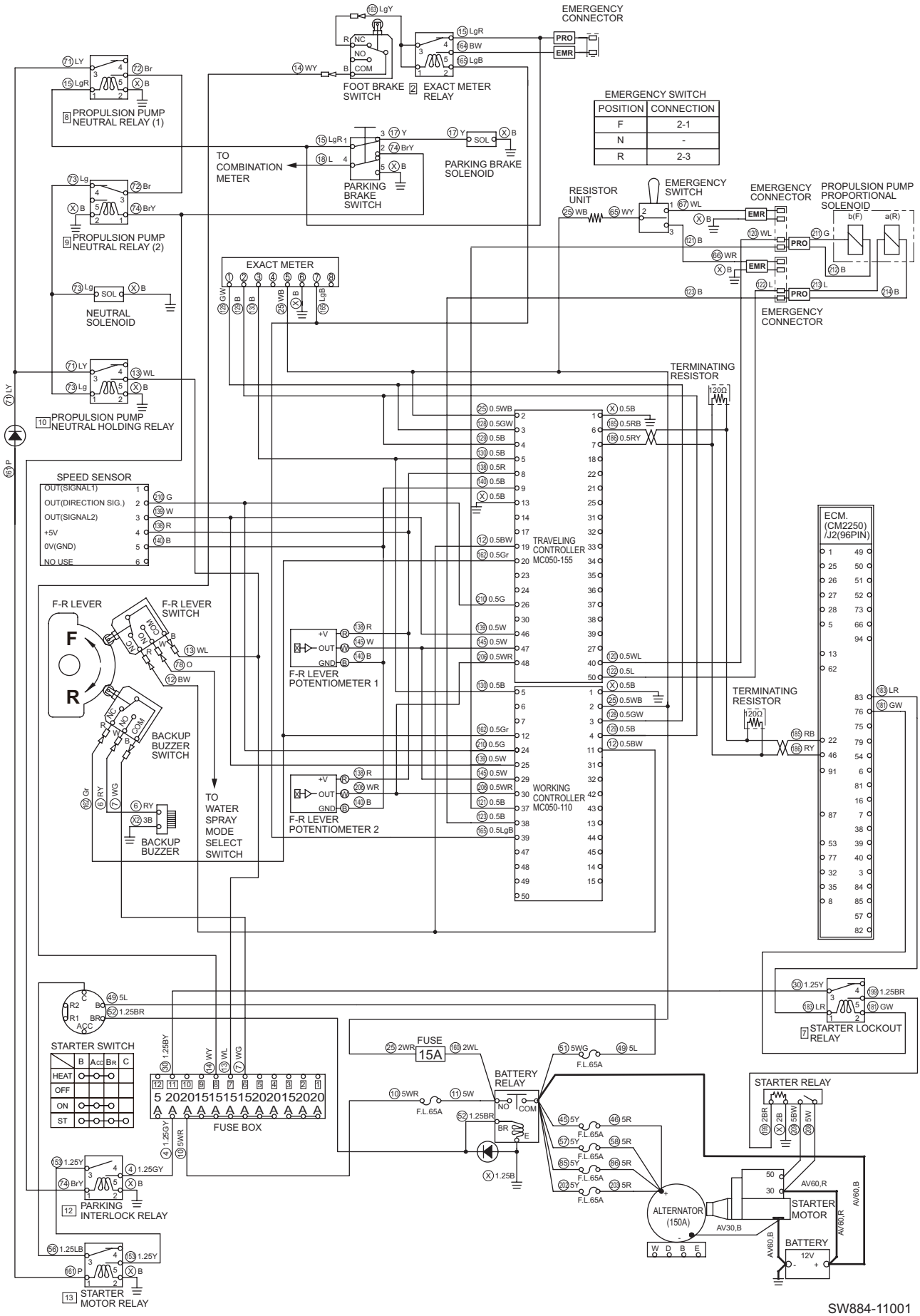
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E31 or E32	1. Connector	• Check propulsion pump proportional solenoid connector and traveling controller connector terminal 40, 50, working controller connector terminal 37, 38 for corrosion, breakage, bending and looseness. • 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. • Propulsion pump proportional solenoid b wire G and traveling controller terminal 40 wire G • Propulsion pump proportional solenoid a wire L and traveling controller terminal 50 wire L • Propulsion pump proportional solenoid a, b wire B and working controller terminal 37 and 38 wires B Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty. • Disconnect connectors and check continuity between propulsion pump proportional solenoid terminal wires. • Terminal wire No.120 wire G and terminal wire No.121 wire B • Terminal wire No.122 wire L and terminal wire No.123 wire B • 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. Standard resistance: 5.5 Ω • If resistance is abnormal, propulsion pump proportional solenoid a (R) or b (F) is faulty.	Replace propulsion pump proportional solenoid.

Fig.: 2-4-1



SW884-11001

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

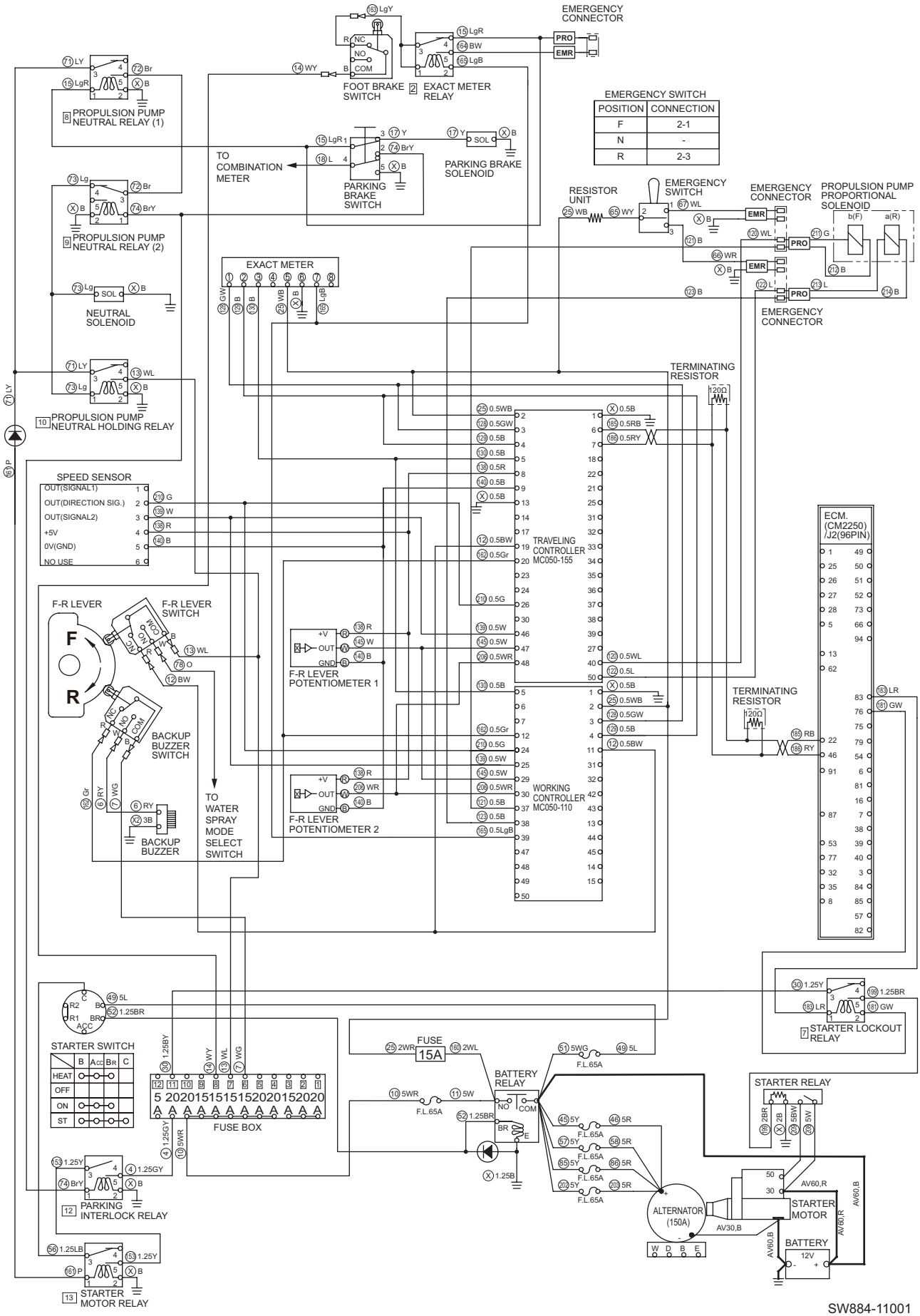
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

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

Fig.: 2-4-1



SW884-11001

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

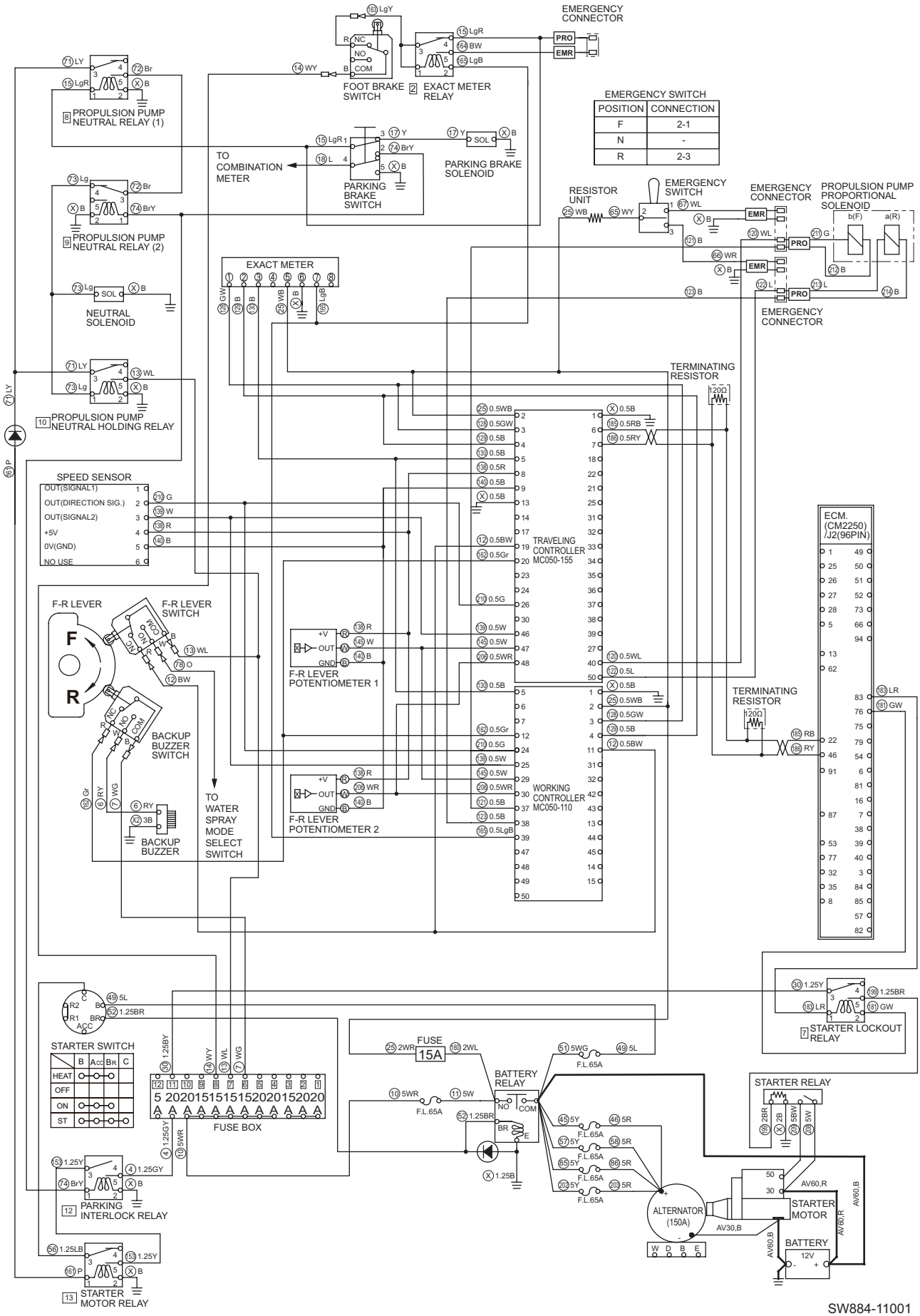
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E42	1. Connector	• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between exact meter and traveling controller terminal wires. • Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW • Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B • Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • 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 wire B. Standard voltage : 12 V or more • 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. • 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. ② Place F-R lever “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1


EMERGENCY CONNECTOR
FOOT BRAKE SWITCH
2 EXACT METER RELAY
EMERGENCY SWITCH
POSITION | CONNECTION
F | 2-1
N | -
R | 2-3
8 PROPULSION PUMP NEUTRAL RELAY (1)
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
9 PROPULSION PUMP NEUTRAL RELAY (2)
RESISTOR UNIT
EMERGENCY SWITCH
EMERGENCY CONNECTOR
PROPULSION PUMP PROPORTIONAL SOLENOID
EXACT METER
NEUTRAL SOLENOID
TERMINATING RESISTOR
10 PROPULSION PUMP NEUTRAL HOLDING RELAY
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
ECM. (CM2250) /J2(96PIN)
F-R LEVER
F-R LEVER SWITCH
F-R LEVER POTENTIOMETER 1
F-R LEVER POTENTIOMETER 2
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
TERMINATING RESISTOR
7 STARTER LOCKOUT RELAY
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
STARTER RELAY
12 PARKING INTERLOCK RELAY
13 STARTER MOTOR RELAY
ALTERNATOR (150A)
STARTER MOTOR
BATTERY 12V
SW884-11001

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

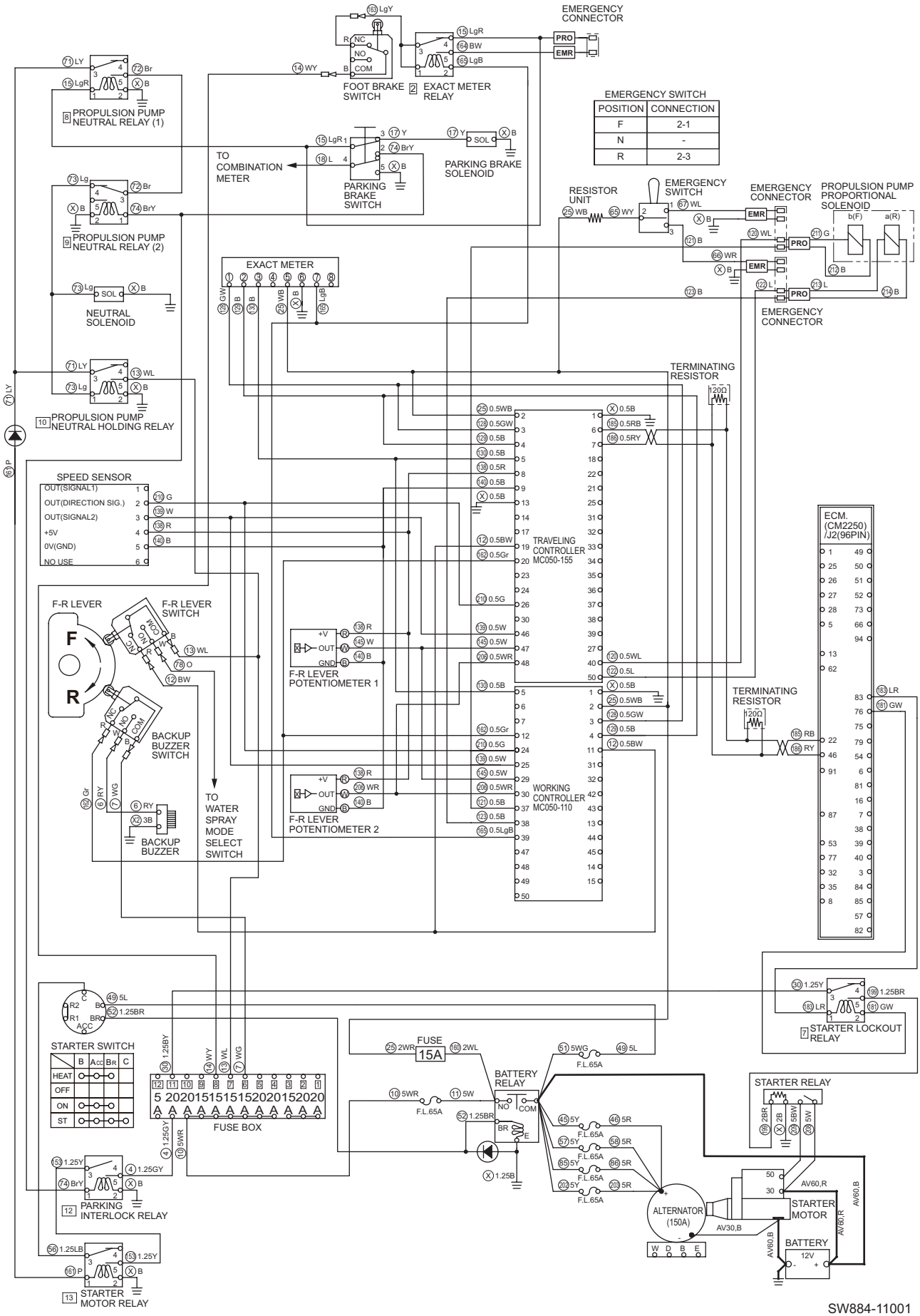
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E43	1. Connector	• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between exact meter and traveling controller terminal wires. • Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW • Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B • Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Replace harness.
	3. Exact Meter	• When starter switch is ON, measure voltage between exact meter terminal 5 inlet wire WB and ground terminal 6 wire B. Standard voltage : 12 V or more • 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. • 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. ② Place F-R lever “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1



SW884-11001

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

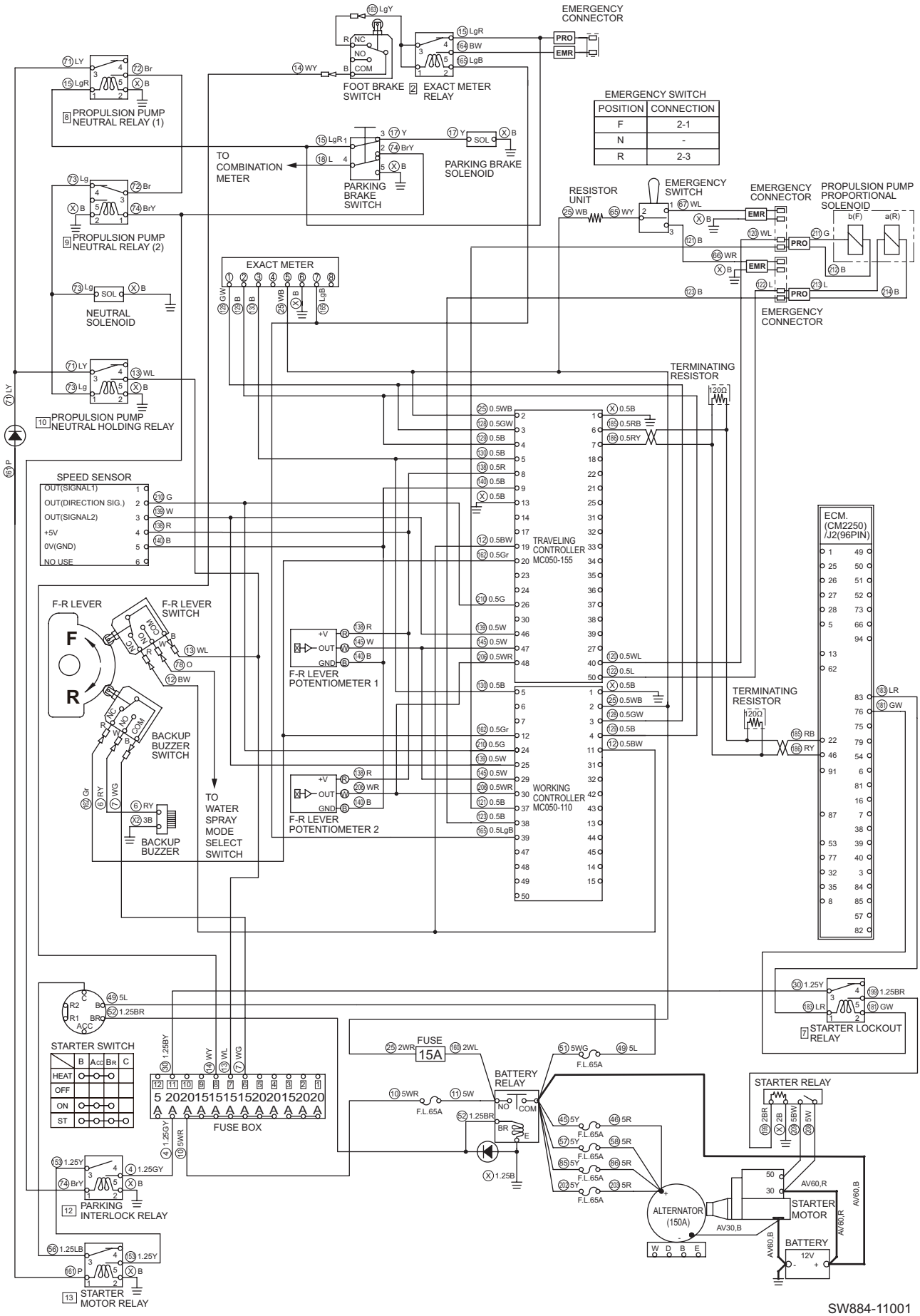
- Starter motor runs for only 2 seconds when starter switch is turned to START.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E44, E45	1. Connector	• Check exact meter connector terminal 1, 2, 7 and working controller connector terminal 3, 4, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between exact meter and working controller terminal wires. • Exact meter terminal 1 wire GW and working controller terminal 3 wire GW • Exact meter terminal 2 wire B and working controller terminal 4 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Replace harness.
	3. Working Controller	(1) When starter switch is ON, measure voltage between working controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more • If above item (1) is OK and (2) is NG, working controller is faulty. (2) When starter switch is ON, measure voltage between working controller terminal 39 inlet wire LgB and working controller ground terminal 1 wire B. Standard voltage : 12 V or more • If above items (1) is OK and (2) is NG, working controller 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. • 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. ② Place F-R lever “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1



SW884-11001

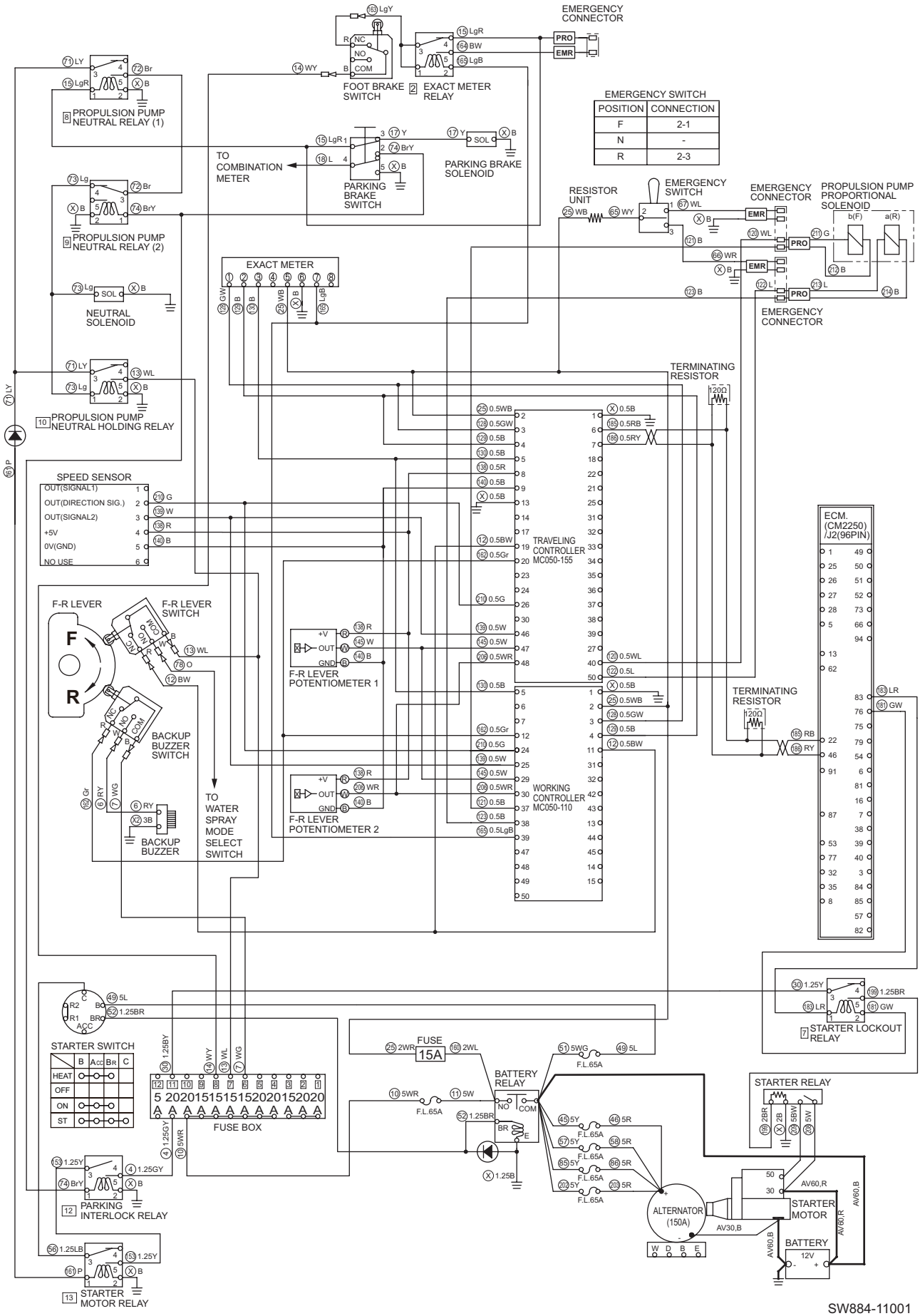
2-5-2. Machine and engine suddenly stops in automatic speed mode 1/2

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

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E11	1. Connector	• Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller connector terminal 24, 25 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between speed sensor and traveling controller terminal wires. • Speed sensor terminal 2 wire G and traveling controller terminal 26 wire G, working controller terminal 24 wire G • Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller terminal 25 wire W • Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R • Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B Standard resistance : 10 Ω or less • 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 wire B. Standard voltage : 5 ± 0.25 V (2) Start engine and rotate vibratory drum. Measure pulse between speed sensor terminal 3 outlet wire W and ground terminal 5 wire B with a pulse meter. Standard pulse : 21 pulses/rotation • 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. ② Exact meter will display E11. ③ Move F-R lever “F” or “R” and run machine. ④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1



SW884-11001

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

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

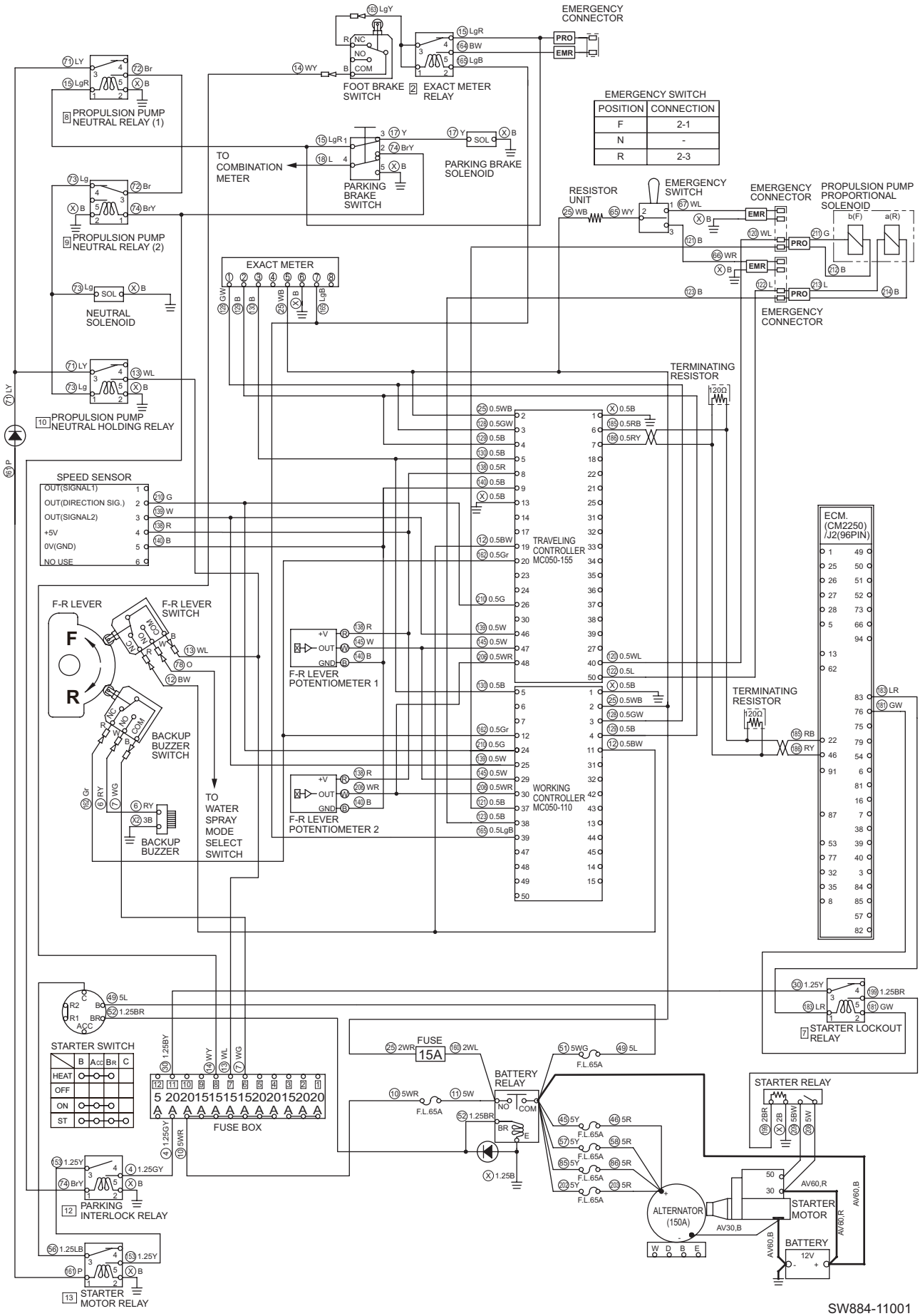
Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E41	1. Connector	• Check engine ECM connector terminal 22, 46 and traveling controller connector terminal 6, 7 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.

	2. Harness	• Measure resistances between engine ECM and traveling controller terminal wires.
		  • Engine ECM terminal 22 wire RB and traveling controller terminal 6 wire RB
		  • Engine ECM terminal 46 wire RY and traveling controller terminal 7 wire RY
		  Standard resistance : 10 Ω or less
		• If resistance is abnormal, harness is faulty.
		
		(NOTICE)
		• 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. **(NOTICE)** **• 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. ② Place F-R lever “N”. ③ Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-4-1



SW884-11001

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

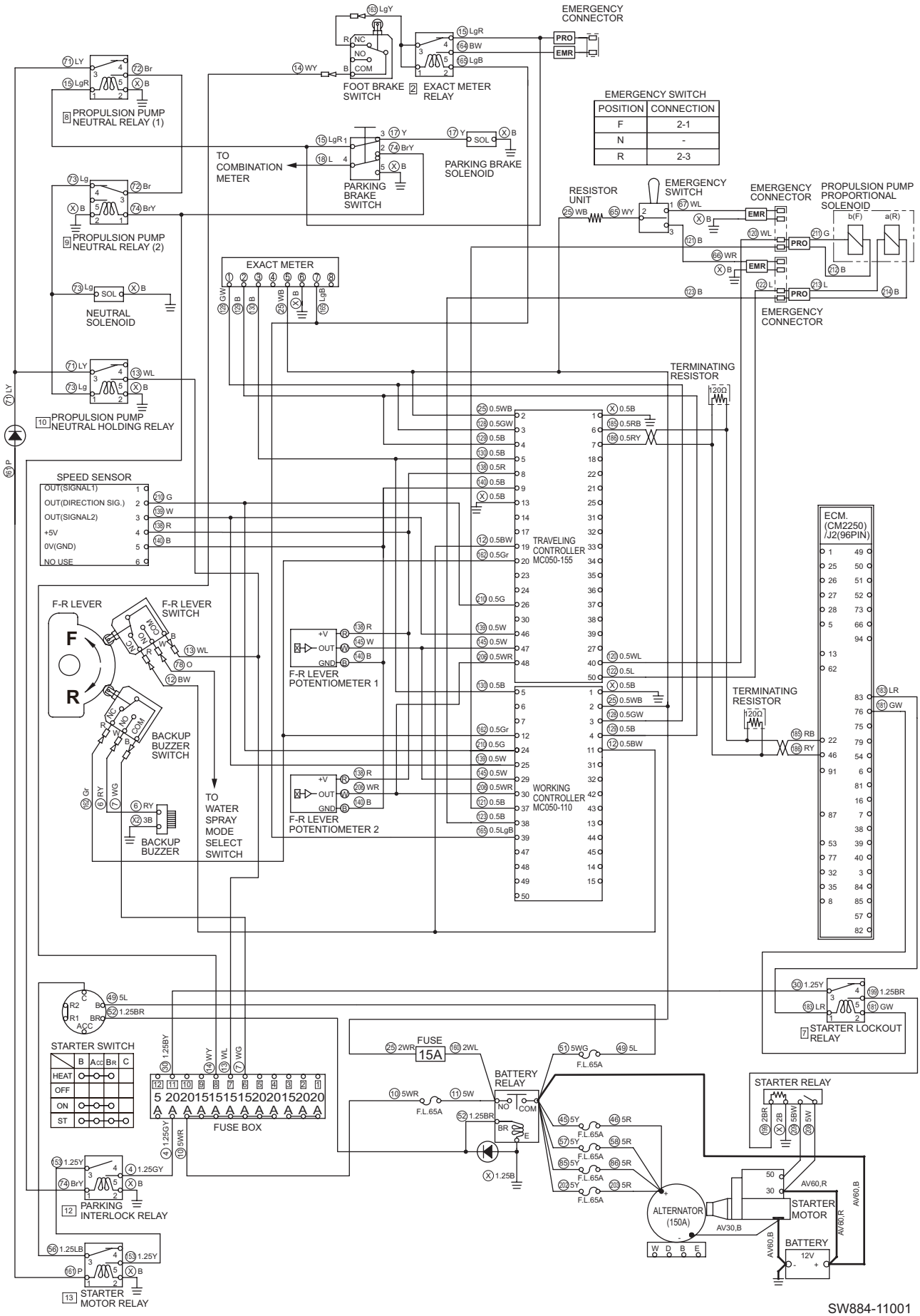
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
Pon	1. Connector	• Check F-R lever switch connector, buckup buzzer switch connector and traveling controller connector terminal 19, 20, working controller connector terminal 11, 12 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistances between switches and traveling controller terminal wires. • F-R lever switch terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW • Buckup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr, working controller terminal 12 wire Gr Standard resistance : 10 Ω or less (2) Measure resistances between switches and fuse box terminal wires. • F-R lever switch terminal COM wire WL and fuse box terminal 7 wire WL • Buckup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. F-R lever switch	• When starter switch is OFF and F-R lever is “N”, check continuity between F-R lever switch terminal COM and terminal NC. There is continuity in normal condition. • If there is no continuity, F-R lever switch is faulty.	Replace F-R lever switch.
	4. Buckup buzzer switch	• When starter switch is OFF and F-R lever is “N”, check continuity between buckup buzzer switch terminal COM and terminal NC. There is continuity in normal condition. • If there is no continuity, buckup buzzer switch is faulty.	Replace buckup buzzer switch.
	5. Traveling/ Working Controller	• If error code Pon is displayed and no abnormality is found in connector, harness, F-R lever switch and buckup buzzer 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”. ② Set starter switch to ON. ③ When F-R lever is “F” or “N”, traveling/working controller cannot be initialized. Exact meter will continuously display Pon. ④ Return F-R lever to “N”. 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 CONNECTOR
FOOT BRAKE SWITCH
EXACT METER RELAY
EMERGENCY SWITCH
POSITION | CONNECTION
F | 2-1
N | -
R | 2-3
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
PROPULSION PUMP NEUTRAL RELAY (1)
PROPULSION PUMP NEUTRAL RELAY (2)
NEUTRAL SOLENOID
PROPULSION PUMP NEUTRAL HOLDING RELAY
RESISTOR UNIT
EMERGENCY SWITCH
EMERGENCY CONNECTOR
PROPULSION PUMP PROPORTIONAL SOLENOID
EXACT METER
TERMINATING RESISTOR
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
ECM. (CM2250) /J2(96PIN)
F-R LEVER
F-R LEVER SWITCH
F-R LEVER POTENTIOMETER 1
F-R LEVER POTENTIOMETER 2
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
STARTER SWITCH
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
BATTERY RELAY
STARTER LOCKOUT RELAY
STARTER RELAY
PARKING INTERLOCK RELAY
STARTER MOTOR RELAY
ALTERNATOR (150A)
STARTER MOTOR
BATTERY 12V
SW884-11001

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

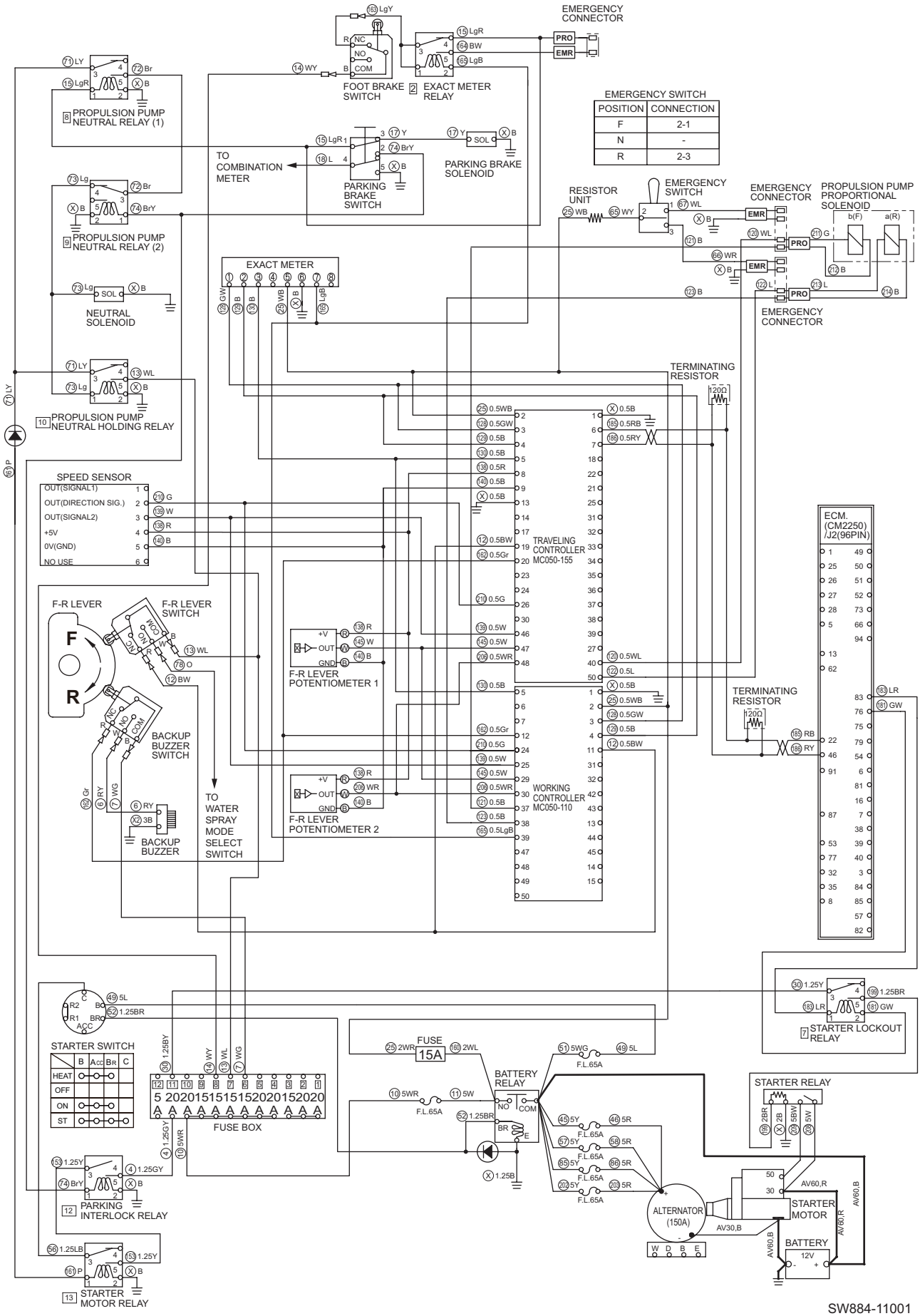
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E03	1. Connector	• Check F-R lever switch connector and traveling controller connector terminal 19, working controller connector terminal 11 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistance between F-R lever switch connector terminal NC wire BW and traveling controller terminal 19 wire BW, working controller terminal 11 wire BW. Standard resistance : 10 Ω or less (2) Measure resistance between F-R lever switch connector terminal COM wire WL and fuse box terminal 7 wire WL. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. F-R lever switch	(1) When starter switch is OFF and F-R lever is “N”, check continuity between F-R lever switch terminal COM and terminal NC. There is continuity in normal condition. (2) When starter switch is OFF and F-R lever is “F”, check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition. • If above item (1) or (2) is NG, F-R lever switch is faulty.	Replace F-R lever 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. ② Exact meter will display E03. ③ Move F-R lever in “F”. Exact meter display will change from E03 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again. ④ Return F-R lever to “N”. Machine is in normal state.	

Fig.: 2-4-1



SW884-11001

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

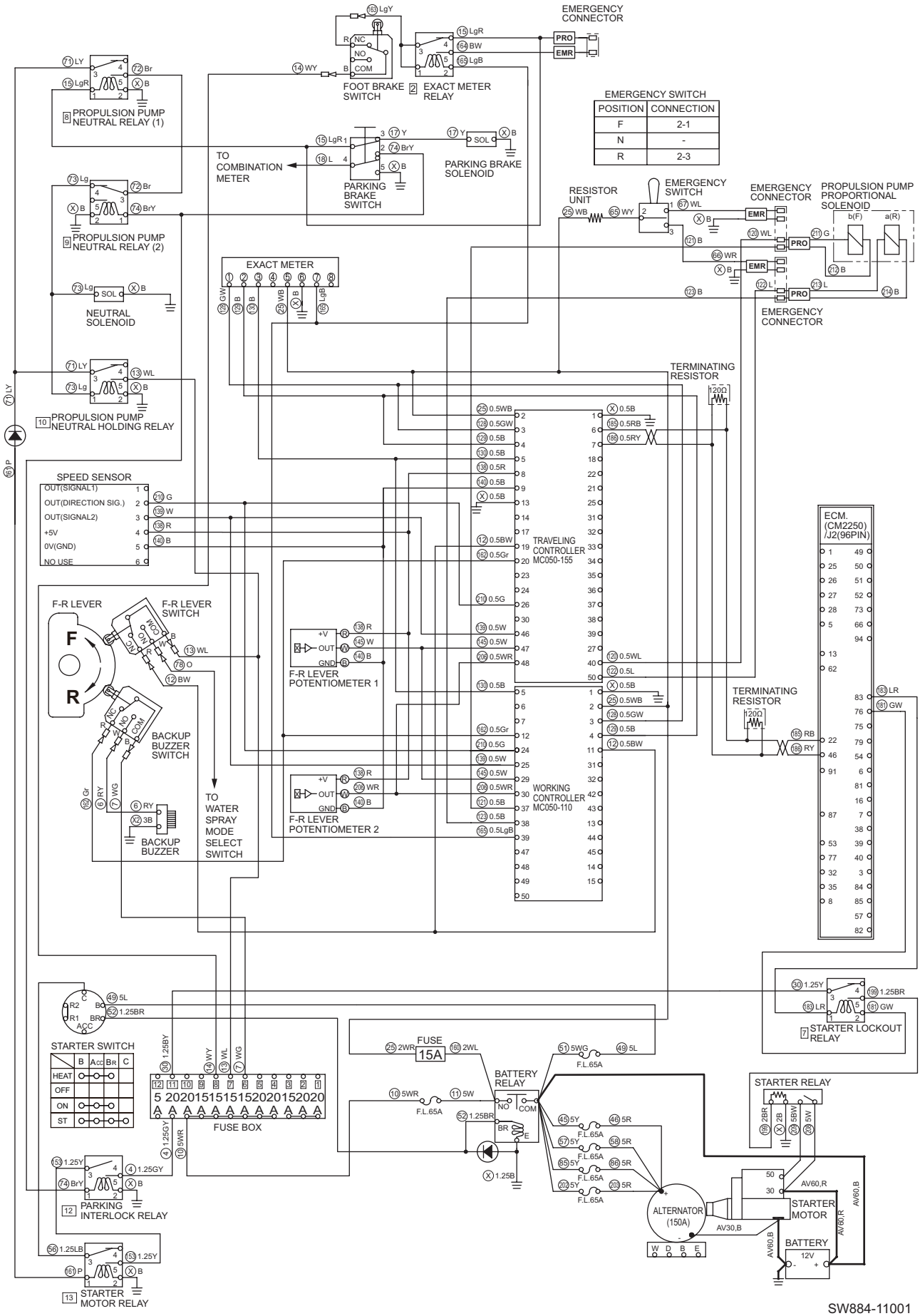
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E06	1. Connector	• Check buckup buzzer switch connector and traveling controller connector terminal 20, working controller connector terminal 12 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistance between buckup buzzer switch terminal NC wire Gr and traveling controller terminal 20 wire Gr. Standard resistance : 10 Ω or less (2) Measure resistance between buckup buzzer switch terminal COM wire WG and fuse box terminal 6 wire WG. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. Buckup buzzer switch	(1) When starter switch is OFF and F-R lever is “N”, check continuity between buckup buzzer switch terminal COM and terminal NC. There is continuity in normal condition. (2) When starter switch is OFF and F-R lever is “F”, check continuity between buckup buzzer switch terminal COM and terminal NC. There is no continuity in normal condition. • If above item (1) or (2) is NG, buckup buzzer switch is faulty.	Replace buckup buzzer switch.
	4. Traveling/ Working Controller	• If error code E06 is displayed and no abnormality is found in connector, harness and buckup buzzer 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. ② Exact meter will display E06. ③ Move F-R lever in “R”. Exact meter display will change from E06 to vehicle speed (0.0). If display does not change to vehicle speed, check above items again. ④ Return F-R lever to “N”. Machine is in normal state.	

Fig.: 2-4-1



SW884-11001

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

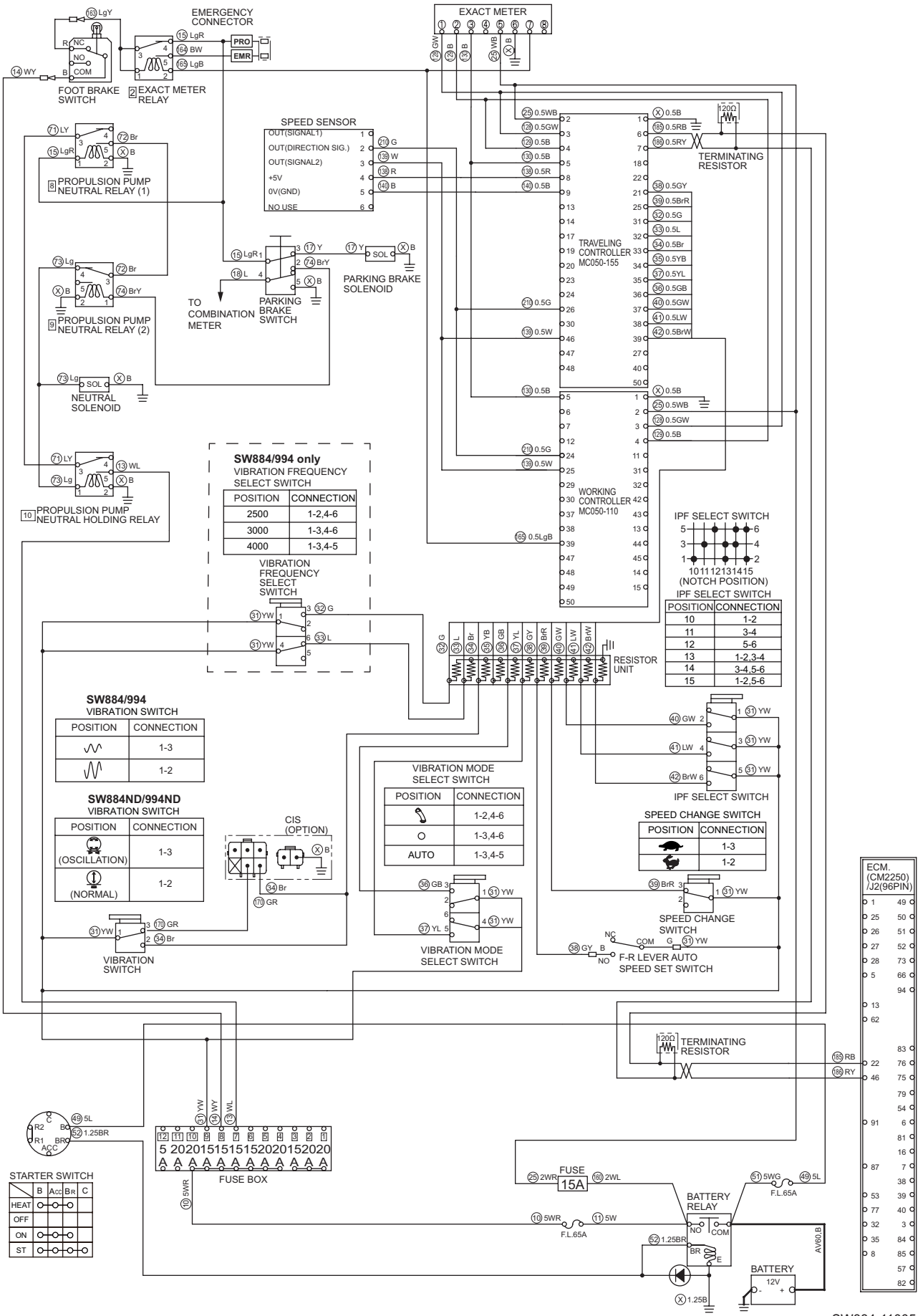
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-4-1

Error code	Check point	Check/Cause	Action
E43	1. Connector	• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between exact meter and traveling controller terminal wires. • Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW • Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B • Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Replace harness.
	3. Exact Meter	• When starter switch is ON, measure voltage between exact meter terminal 5 inlet wire WB and ground terminal 6 wire B. Standard voltage : 12 V or more • 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. • 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. ② Place F-R lever in “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-5-1



SW884-11005

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

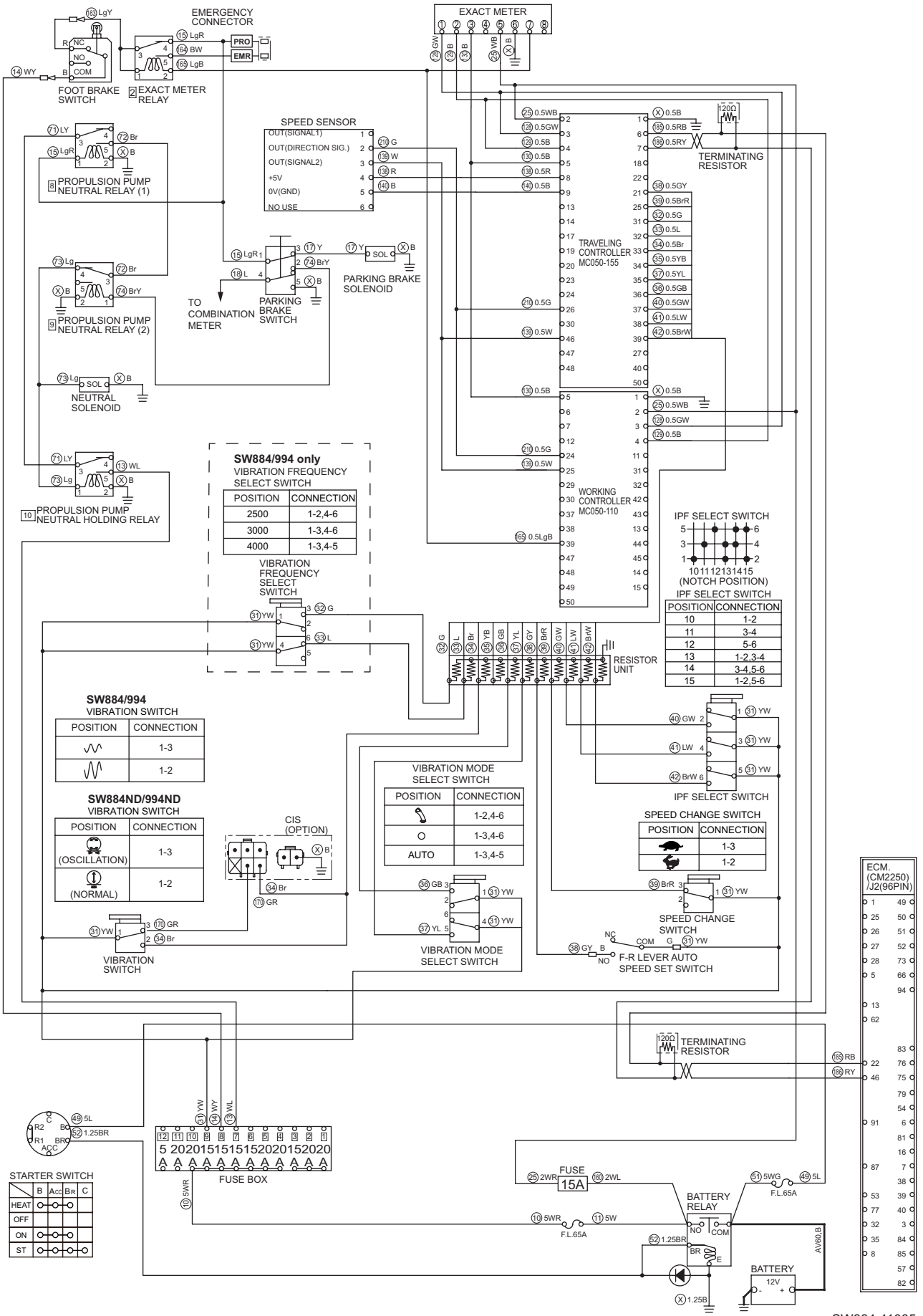
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows any error code.

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. Standard resistance : 12.3 Ω • If resistance is abnormal, neutral solenoid is faulty.	Replace neutral solenoid.
2. 8 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. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between propulsion pump neutral relay (1) terminal 3 inlet wire LY and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between propulsion pump neutral relay (1) terminal 5 outlet wire Br and chassis ground. Standard voltage : 12 V or more • 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. 9 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. There is no current in normal condition. (2) When starter switch is ON, measure voltage between propulsion pump neutral relay (2) terminal 3 inlet wire Br and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between propulsion pump neutral relay (2) terminal 4 outlet wire Lg and chassis ground. Standard voltage : 12 V or more • 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. 10 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. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 5 inlet wire WL and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 3 outlet wire LY and chassis ground. Standard voltage : 12 V or more • 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



SW884-11005

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

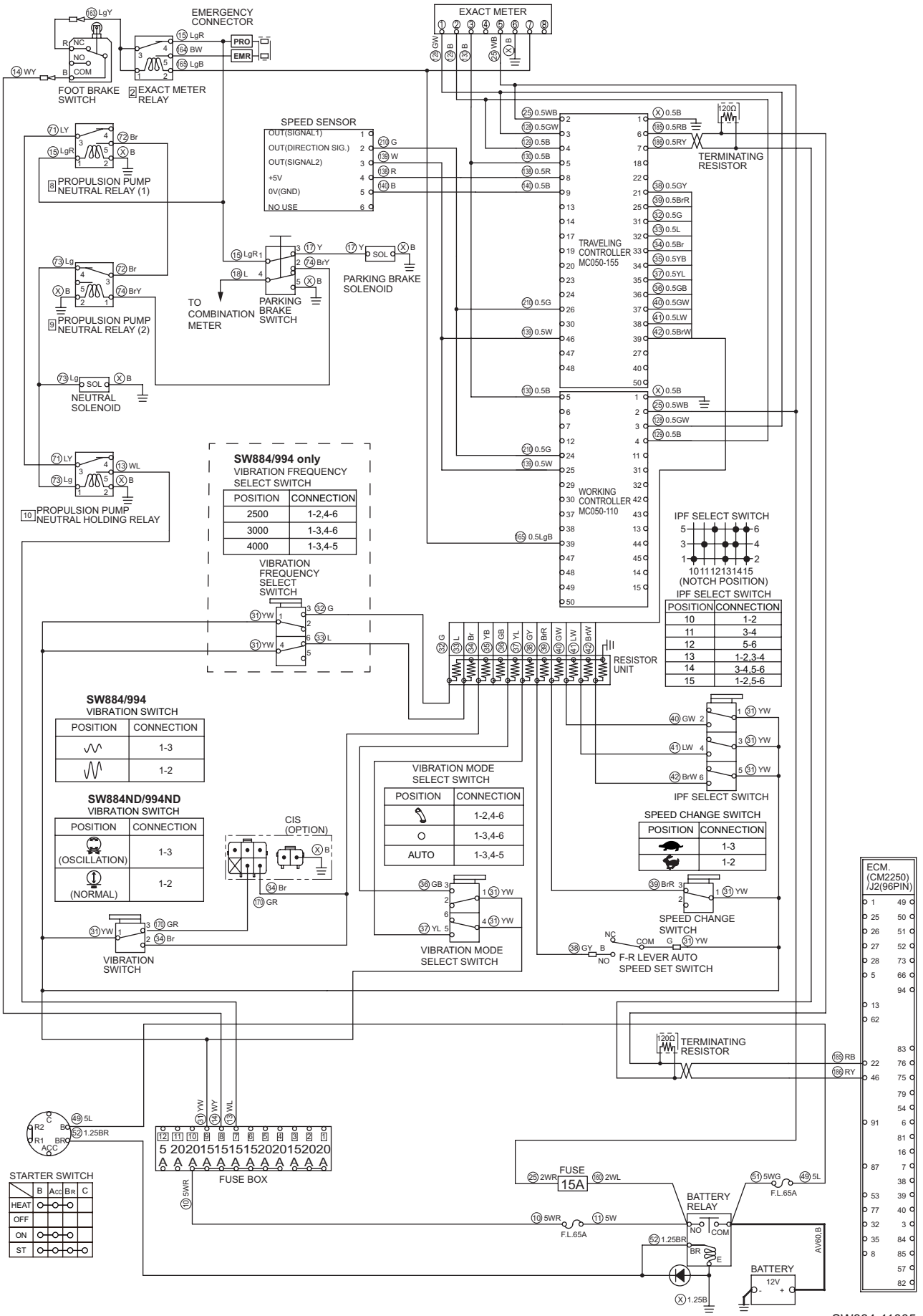
Reference Fig.: 2-5-1

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. • Exact meter on transmission side or traveling/working controller is faulty. **(NOTICE)** **• 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. Standard resistance : 10 Ω or less • 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



SW884-11005

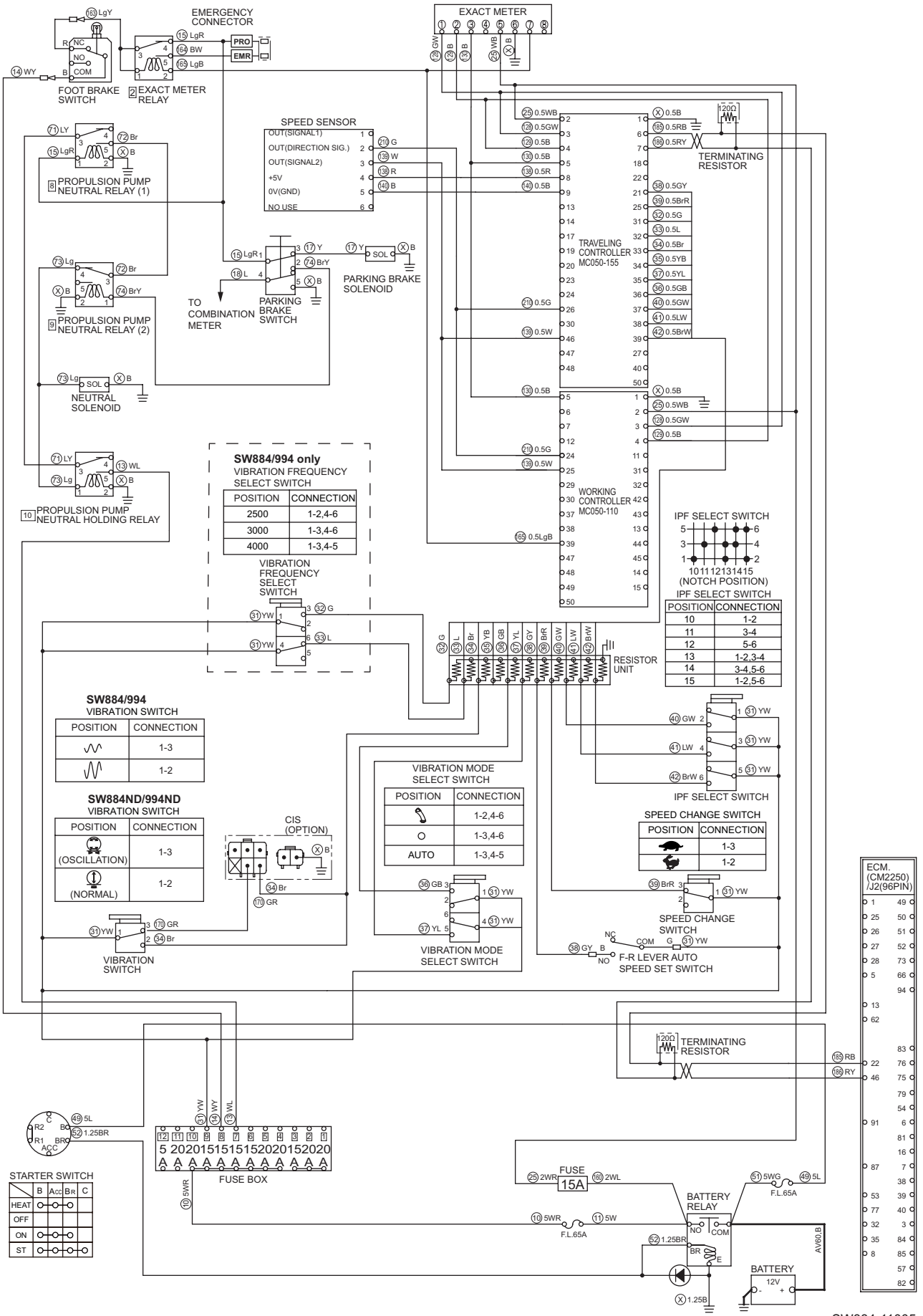
2-5-4. Machine speed cannot be changed

- 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. Standard voltage : 12 V or more (2) When starter switch is ON and speed change switch is "🐢", measure voltage between speed change switch terminal 3 outlet wire BrR and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and speed change switch is "🐇", measure voltage between speed change switch terminal 3 outlet wire BrR and chassis ground. There is no electricity in normal condition. • 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. Standard resistance : 300 Ω • If resistance is abnormal, resistor unit is faulty. **(NOTICE)** **• 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. Standard voltage : 12 V or more (2) When starter switch is ON and speed change switch is "🐢", measure voltage between traveling controller terminal 25 inlet wire BrR and ground terminal 1 wire B. Standard voltage : 12 V or more • 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. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1


EMERGENCY CONNECTOR
EXACT METER
FOOT BRAKE SWITCH
EXACT METER RELAY
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
PROPULSION PUMP NEUTRAL RELAY (1)
PROPULSION PUMP NEUTRAL RELAY (2)
PROPULSION PUMP NEUTRAL HOLDING RELAY
NEUTRAL SOLENOID
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
TERMINATING RESISTOR
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
POSITION 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
RESISTOR UNIT
SW884/994
VIBRATION SWITCH
POSITION CONNECTION
1-3
1-2
SW884ND/994ND
VIBRATION SWITCH
POSITION CONNECTION
(OSCILLATION) 1-3
(NORMAL) 1-2
CIS (OPTION)
VIBRATION MODE SELECT SWITCH
POSITION CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
SPEED CHANGE SWITCH
POSITION CONNECTION
1-3
1-2
F-R LEVER AUTO SPEED SET SWITCH
STARTER SWITCH
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
ECM. (CM2250) /J2(96PIN)
SW884-11005

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

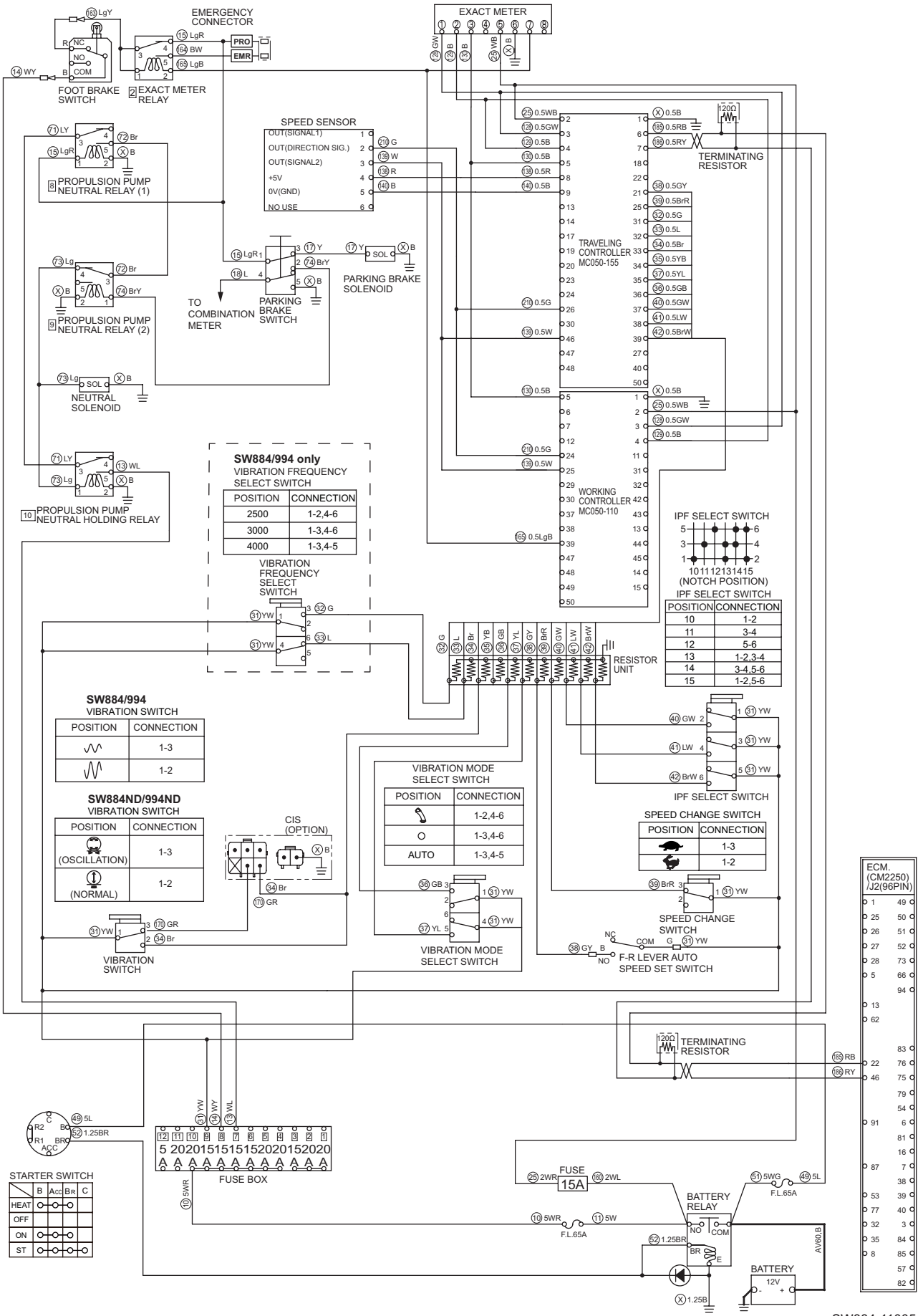
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢")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

1) When display shows any error code

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E11	1. Connector	• Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller connector terminal 24, 25 for corrosion, breakage, bending and looseness. • 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. • Speed sensor terminal 2 wire G and traveling controller terminal 26 wire G, working controller terminal 24 wire G • Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller terminal 25 wire W • Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R • Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B Standard resistance : 10 Ω or less • 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 wire B. Standard voltage : 5 ± 0.25 V (2) Start engine and rotate vibratory drum. Measure pulse between speed sensor terminal 3 outlet wire W and ground terminal 5 wire B with a pulse meter. Standard pulse : 21 pulses/rotation • 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. ② Exact meter will display E11. ③ Move F-R lever "F" or "R" and run machine. ④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-5-1



SW884-11005

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

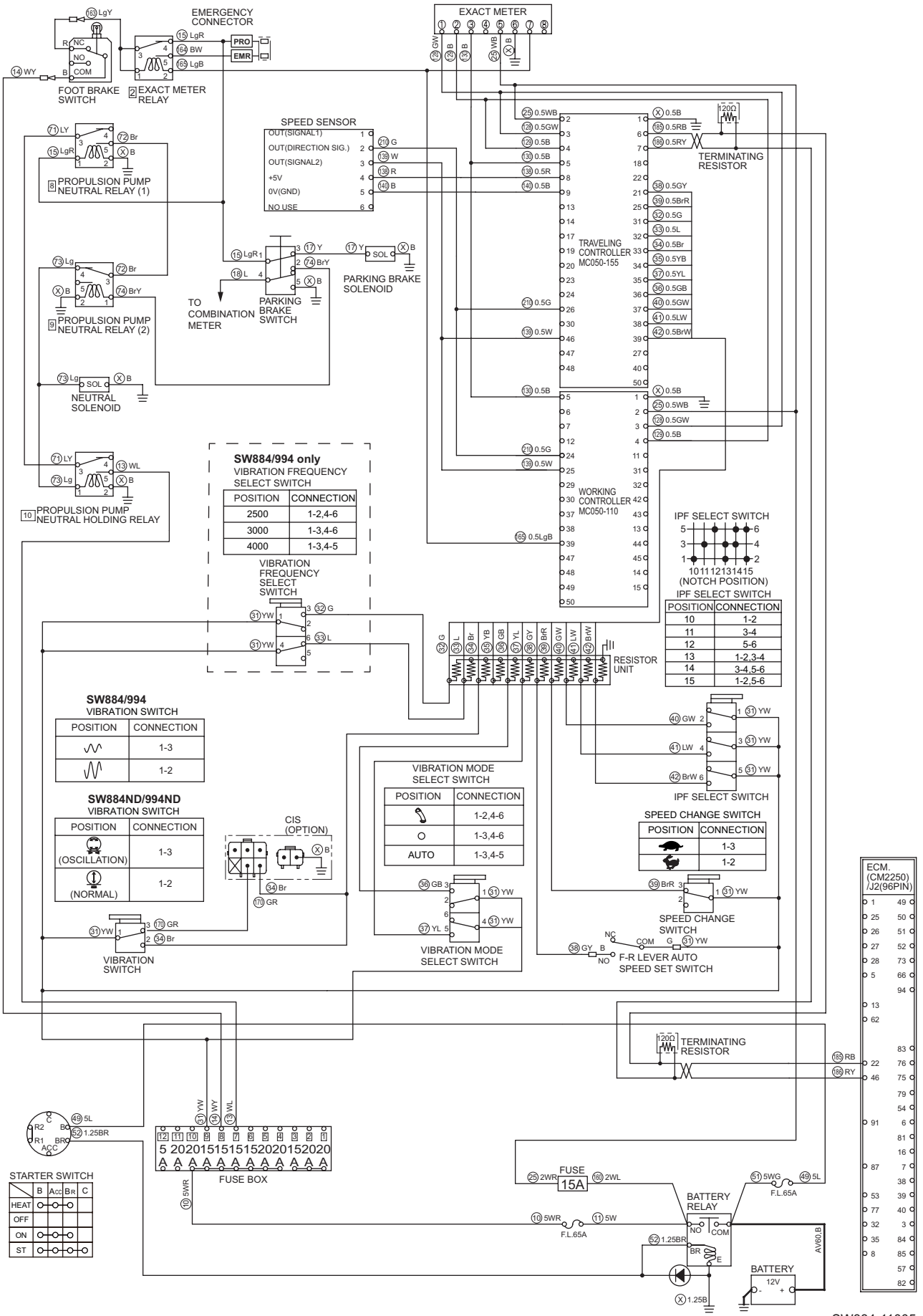
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢")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

1) When display shows any error code

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E21	1. Connector	• Check vibration frequency select switch, vibration switch and traveling controller connector terminal 31, 32, 33 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistances between switches and traveling controller terminal wires. • Vibration frequency select switch terminal 3 wire G and traveling controller terminal 31 wire G • Vibration frequency select switch terminal 6 wire L and traveling controller terminal 32 wire L • Vibration switch terminal 2 wire Br and traveling controller terminal 33 wire Br Standard resistance : 10 Ω or less (2) Measure resistances between switches and fuse box terminal wires. • Vibration frequency select switch terminal 1, 4 wires YW and fuse box terminal 9 wire YW • Vibration switch terminal 1 wire YW and fuse box terminal 9 wire YW Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. Vibration Frequency Select Switch (SW884/994 only)	(1) When starter switch is ON, measure voltage between vibration frequency select switch terminal 1, 4 inlet wires YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and vibration frequency select switch is "2500", measure voltage between vibration frequency select switch terminal 6 outlet wire L and chassis ground. Standard voltage : 12 V or more (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. • Vibration frequency select switch terminal 3 outlet wire G and chassis ground • Vibration frequency select switch terminal 6 outlet wire L and chassis ground Standard voltage : 12 V or more (4) When starter switch is ON and vibration frequency select switch is "4000", measure voltage between vibration frequency select switch terminal 3 outlet wire G and chassis ground. Standard voltage : 12 V or more • 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



SW884-11005

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

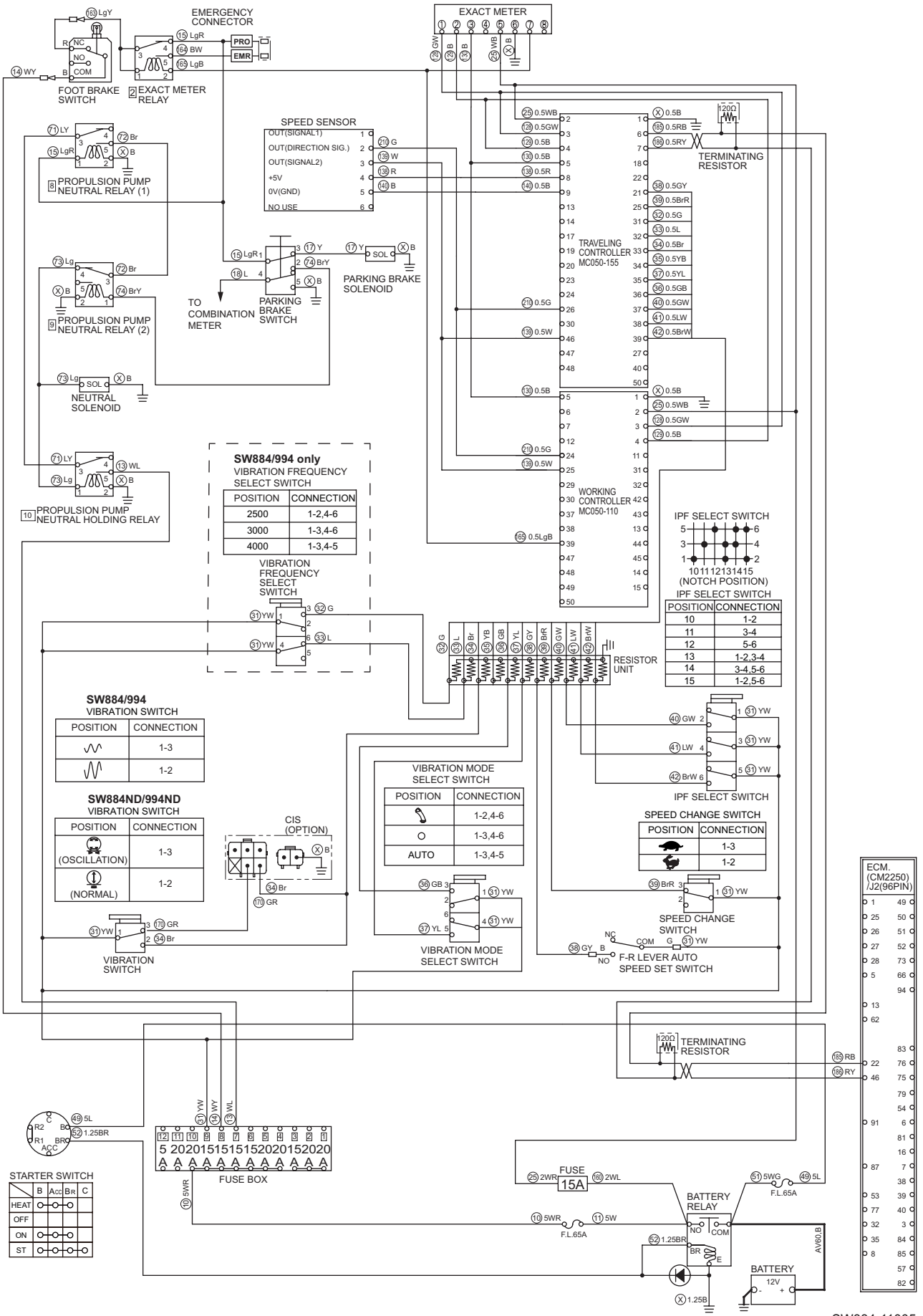
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢")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

1) When display shows any error code

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E21	4. Vibration Switch (SW884/994)	(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and vibration switch is " ⩘ ", measure voltage between vibration switch terminal 3 outlet wire GR and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and vibration switch is " ⩘ ", measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) or (3) is NG, vibration switch is faulty.	Replace vibration switch.
	5. Vibration Switch (SW884ND/ 994ND)	(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and vibration switch is " 🚘 ", measure voltage between vibration switch terminal 3 outlet wire GR and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and vibration switch is " 🚘 ", measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) or (3) is NG, vibration switch is faulty.	Replace vibration switch.
	6. Resistor Unit	• Measure resistances between resistor unit wires and ground wire. • Resistor unit wire No. 32 wire G and ground wire (SW884/994 only) • Resistor unit wire No. 33 wire L and ground wire (SW884/994 only) • Resistor unit wire No. 34 wire Br and ground wire Standard resistance : 300 Ω • If resistance is abnormal, resistor unit is faulty. **(NOTICE)** **• Resistor unit is used to stabilize contact of switch.**	Replace resistor unit.

Fig.: 2-5-1



SW884-11005

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

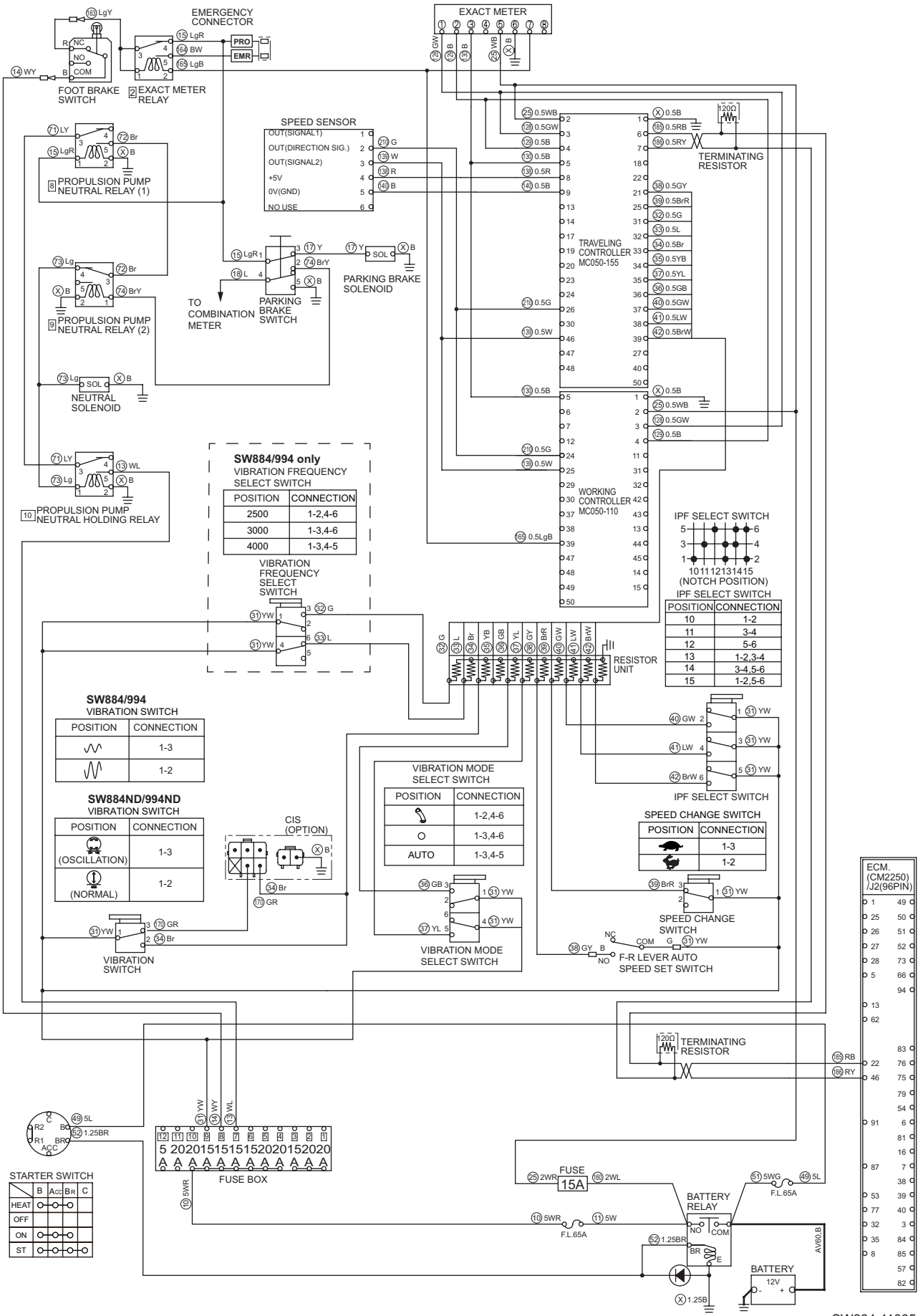
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to “ ”.
  (Automatic speed function is disabled when speed change switch is “ ”.)
- Check that speed can be changed by speed change switch between operation speed (“ ”) and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

1) When display shows any error code

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E21	7. Traveling Controller (SW884/994)	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between traveling controller terminal 32 inlet wire L and ground terminal 1 wire B. Standard voltage : 12 V or more (3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between traveling controller terminal wires. • Traveling controller terminal 31 inlet wire G and ground terminal 1 wire B • Traveling controller terminal 32 inlet wire L and ground terminal 1 wire B Standard voltage : 12 V or more (4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between traveling controller terminal 31 inlet wire G and ground terminal 1 wire B. Standard voltage : 12 V or more (5) When starter switch is ON and vibration switch is “ ”, measure voltage between traveling controller terminal 33 inlet wire Br and ground terminal 1 wire B. Standard voltage : 12 V or more • If above items (1), (2), (3), (4) and (5) are OK, traveling controller is faulty.	Replace traveling controller.

Fig.: 2-5-1



SW884-11005

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

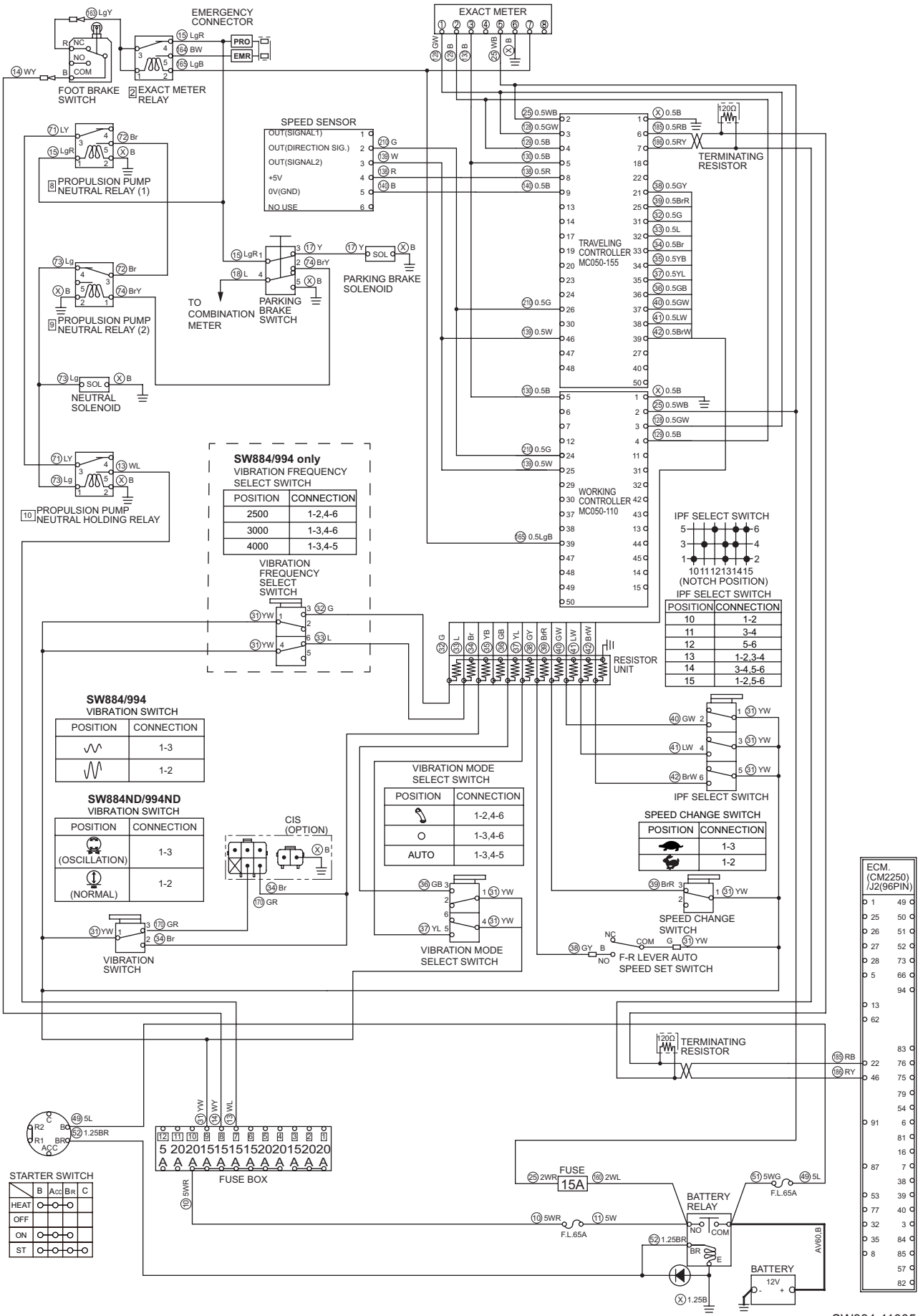
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢")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

1) When display shows any error code

Reference Fig.: 2-5-1

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

Fig.: 2-5-1



SW884-11005

2-5-5. Auto speed function does not work 6/10

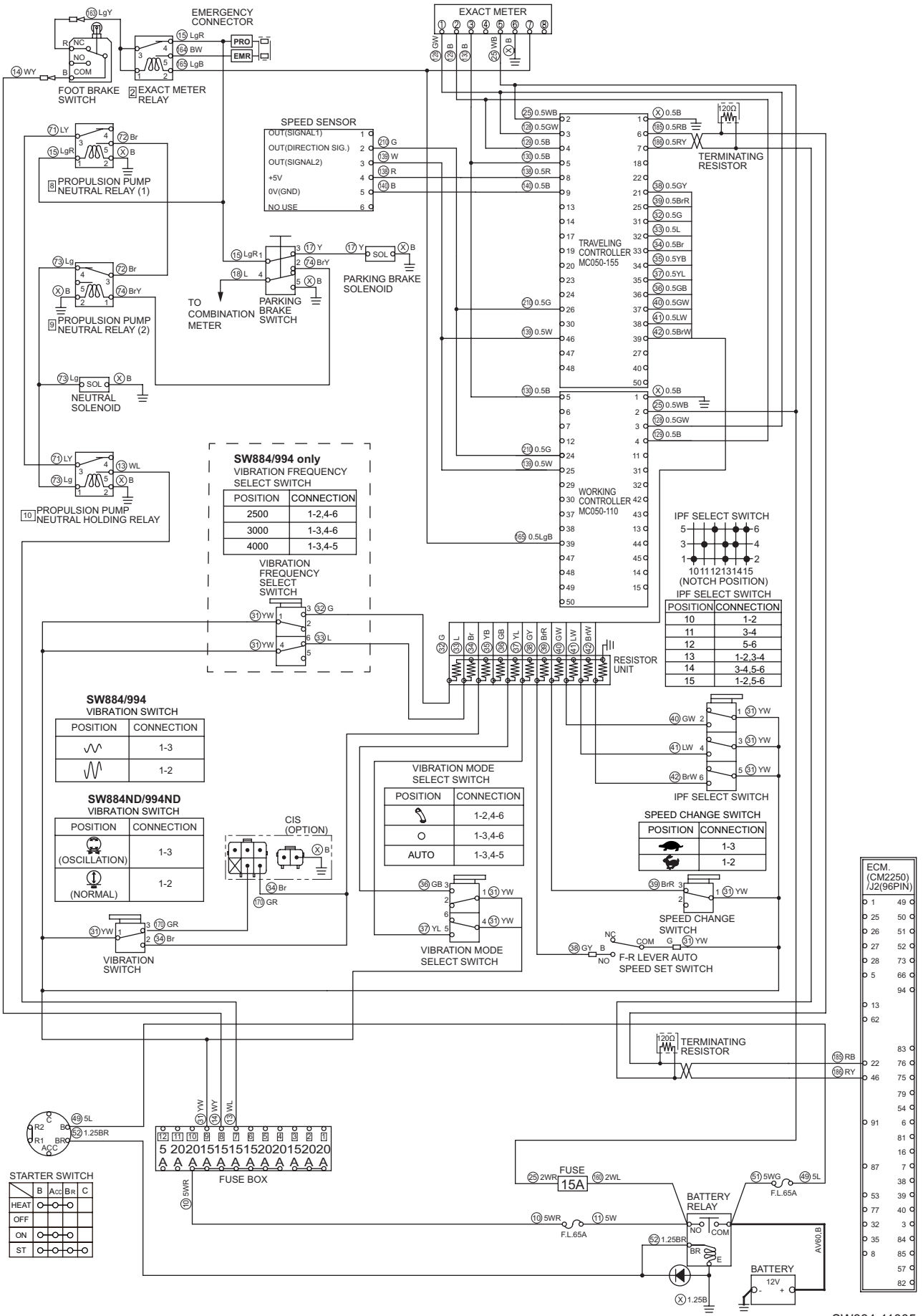
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢")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

1) When display shows any error code

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E22	1. Connector	• Check IPF select switch connector and traveling controller connector terminal 37, 38, 39 for corrosion, breakage, bending and looseness. • 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. • IPF select switch terminal 2 wire GW and traveling controller terminal 37 wire GW • IPF select switch terminal 4 wire LW and traveling controller terminal 38 wire LW • IPF select switch terminal 6 wire BrW and traveling controller terminal 39 wire BrW Standard resistance : 10 Ω or less (2) Measure resistances between IPF select switch terminal 1, 3, 5 wires YW and fuse box terminal 9 wire YW. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



SW884-11005

2-5-5. Auto speed function does not work 7/10

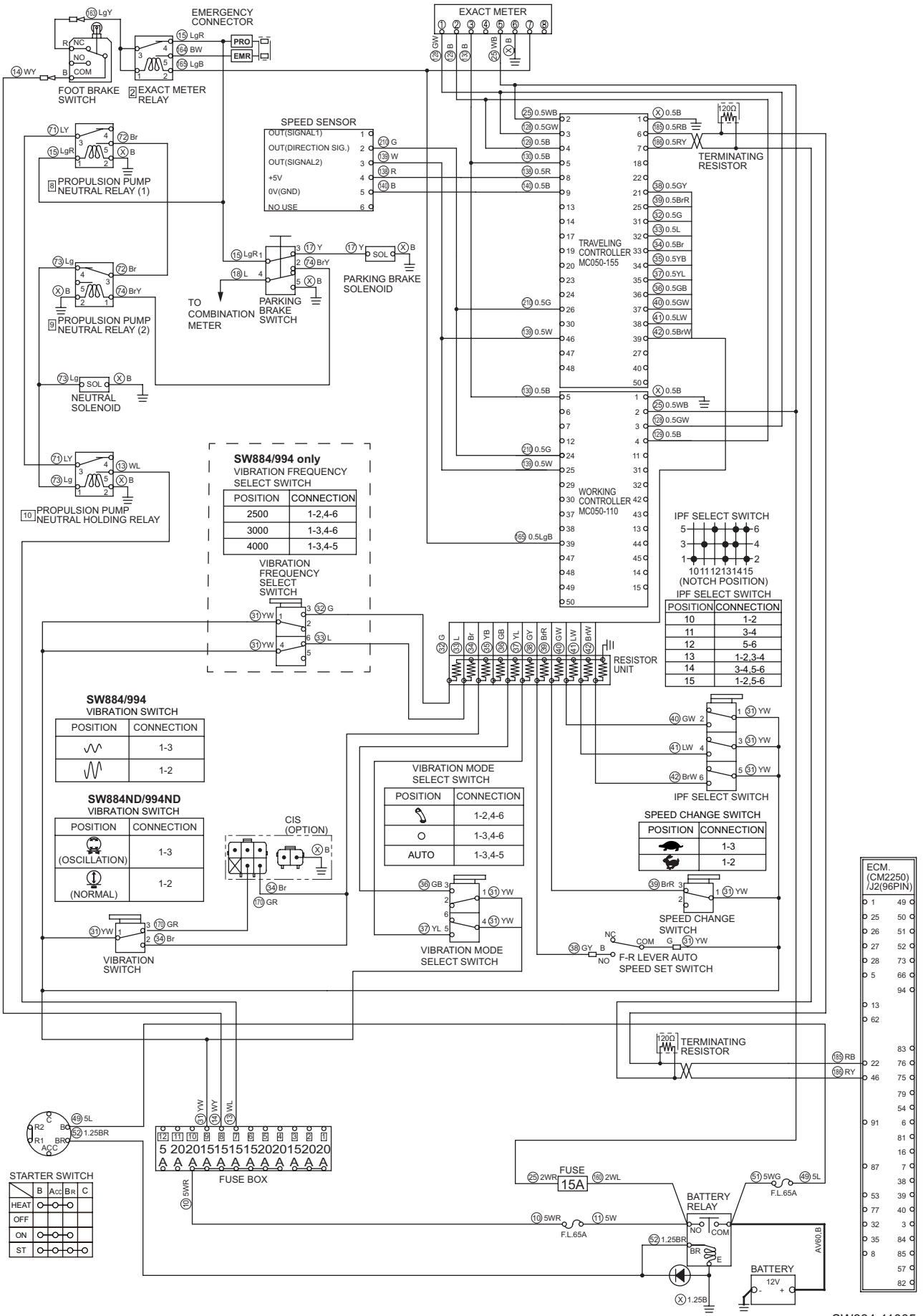
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to "🐢".
  (Automatic speed function is disabled when speed change switch is " 🐇 ".)
- Check that speed can be changed by speed change switch between operation speed ("🐢")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

1) When display shows any error code

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E22	3. IPF Select Switch	(1) When starter switch is ON, measure voltage between IPF select switch terminal 1, 3, 5 inlet wires YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and IPF select switch is "10", measure voltage between IPF select switch terminal 2 outlet wire GW and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and IPF select switch is "11", measure voltage between IPF select switch terminal 4 outlet wire LW and chassis ground. Standard voltage : 12 V or more (4) When starter switch is ON and IPF select switch is "12", measure voltage between IPF select switch terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more (5) When starter switch is ON and IPF select switch is "13", measure voltage between IPF select switch terminal 2 outlet wire GW, terminal 4 outlet wire LW and chassis ground. Standard voltage : 12 V or more (6) When starter switch is ON and IPF select switch is "14", measure voltage between IPF select switch terminal 4 outlet wire LW, terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more (7) When starter switch is ON and IPF select switch is "15", measure voltage between IPF select switch terminal 2 outlet wire GW, terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more • 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. • Resistor unit wire No.40 wire GW and ground wire • Resistor unit wire No.41 wire LW and ground wire • Resistor unit wire No.42 wire BrW and ground wire Standard resistance : 300 Ω • If resistance is abnormal, resistor unit is faulty. **(NOTICE)** **• Resistor unit is used to stabilize contact of switch.**	Replace resistor unit.

Fig.: 2-5-1



SW884-11005

2-5-5. Auto speed function does not work 8/10

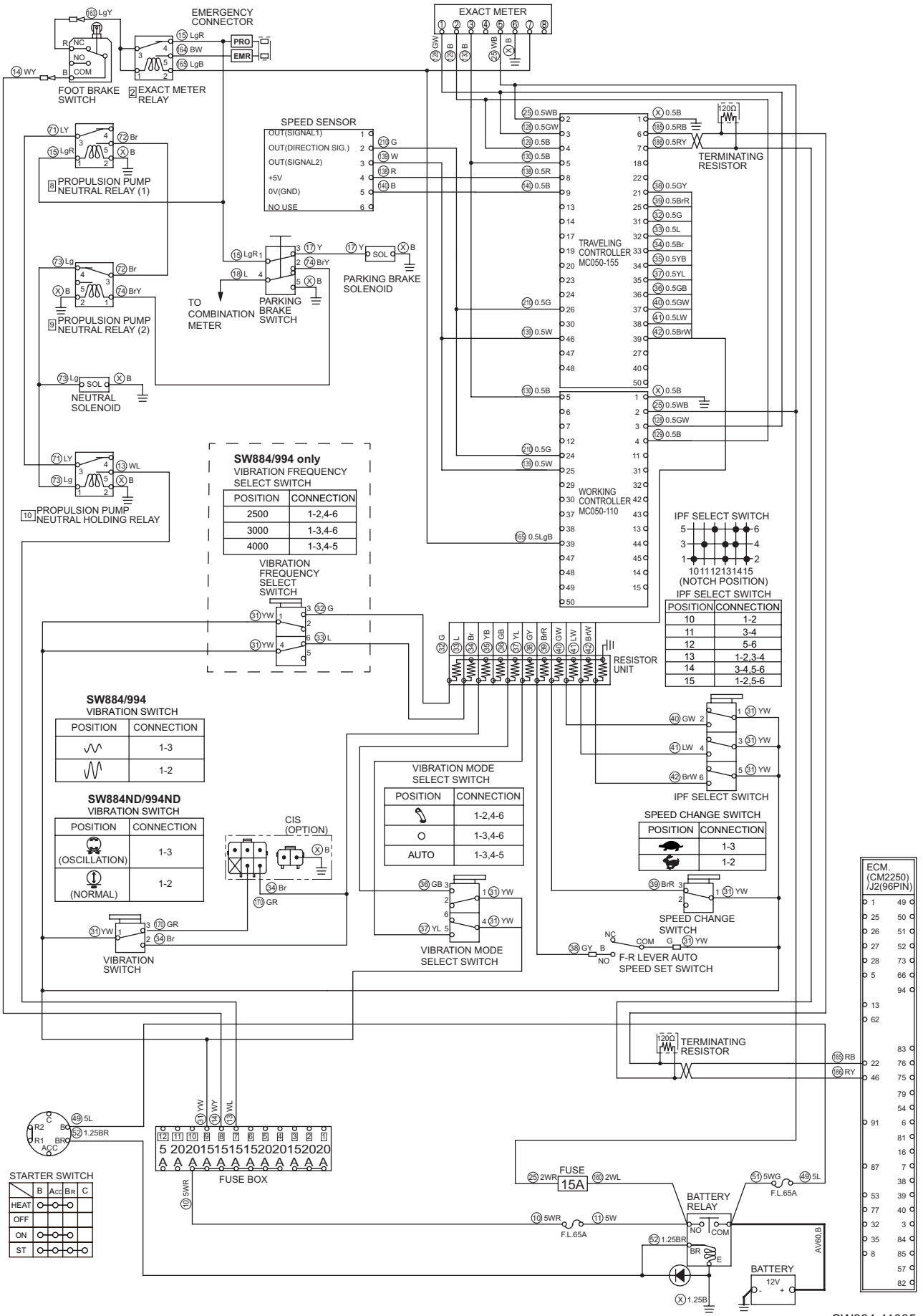
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to “  ”.
  (Automatic speed function is disabled when speed change switch is “  ”.)
- Check that speed can be changed by speed change switch between operation speed (“  ”)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

1) When display shows any error code

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E22	5. Traveling Controller	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and IPF select switch is “10”, measure voltage between traveling controller terminal 37 inlet wire GW and ground terminal 1 wire B. Standard voltage : 12 V or more (3) When starter switch is ON and IPF select switch is “11”, measure voltage between traveling controller terminal 38 inlet wire LW and ground terminal 1 wire B. Standard voltage : 12 V or more (4) When starter switch is ON and IPF select switch is “12”, measure voltage between traveling controller terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more (5) When starter switch is ON and IPF select switch is “13”, measure voltage between traveling controller terminal 37 inlet wire GW, terminal 38 inlet wire LW and ground terminal 1 wire B. Standard voltage : 12 V or more (6) When starter switch is ON and IPF select switch is “14”, measure voltage between traveling controller terminal 38 inlet wire LW, terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more (7) When starter switch is ON and IPF select switch is “15”, measure voltage between traveling controller terminal 37 inlet wire GW, terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more • If all of items (1) through (7) are OK, traveling controller is faulty.	Replace traveling controller.
	6. Clearing Error Code and Judging OK/NG after Repair	① When repair is complete, set starter switch to ON. ② Exact meter will display vehicle speed. ③ Check all positions of IPF select switch. Exact meter will still display vehicle speed. Machine is in normal state. If display changes form vehicle speed to E22, check above items again.	

Fig.: 2-5-1



SW884-11005

2-5-5. Auto speed function does not work 9/10

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

1) When display shows any error code

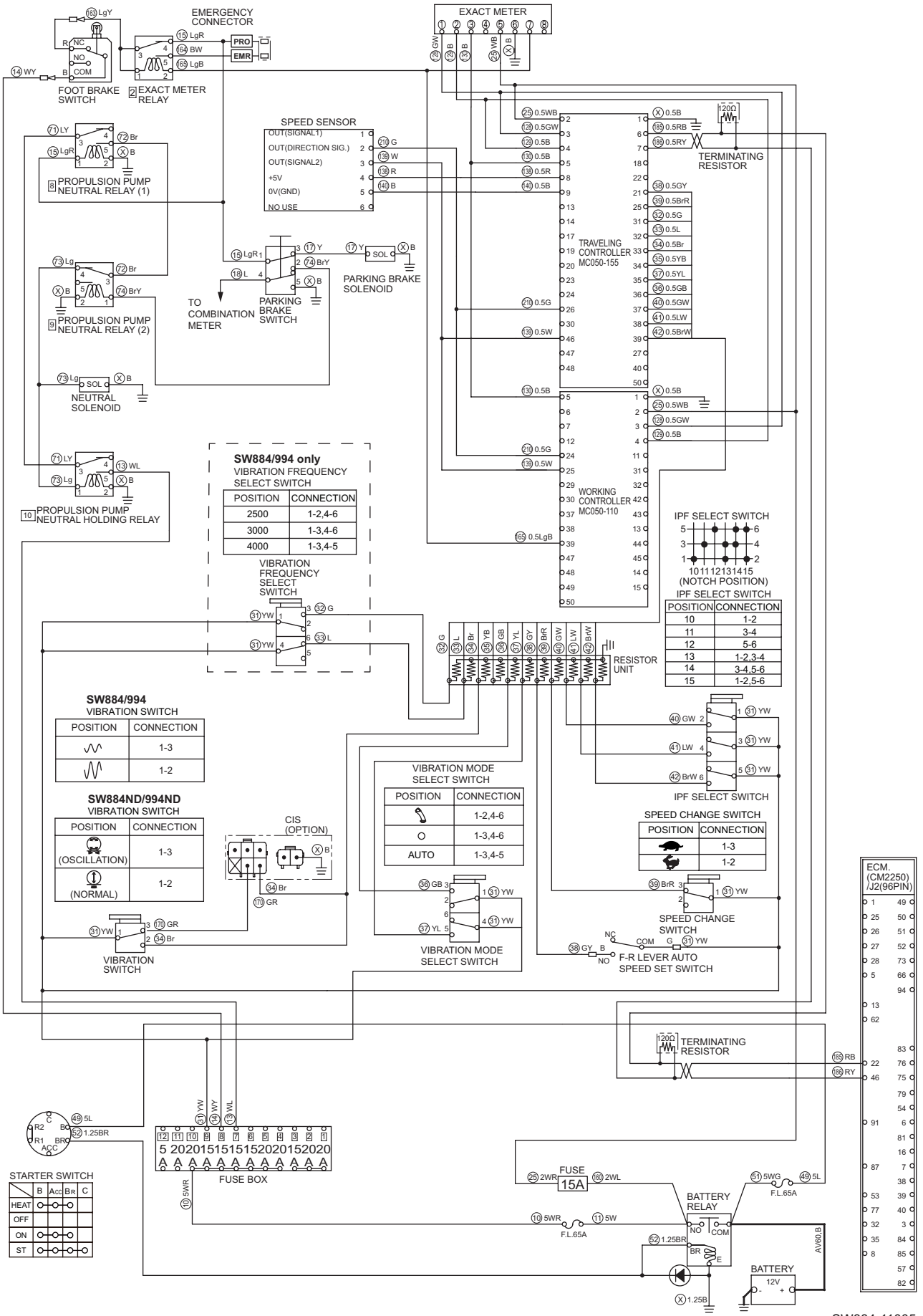
Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E41	1. Connector	• Check engine ECM connector terminal 22, 46 and traveling controller connector terminal 6, 7 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.

	2. Harness	• Measure resistances between engine ECM and traveling controller terminal wires.
		  • Engine ECM terminal 22 wire RB and traveling controller terminal 6 wire RB
		  • Engine ECM terminal 46 wire RY and traveling controller terminal 7 wire RY
		  Standard resistance : 10 Ω or less
		• If resistance is abnormal, harness is faulty.
		
		(NOTICE)
		• 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. **(NOTICE)** **• 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. ② Place F-R lever “N”. ③ Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-5-1



SW884-11005

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

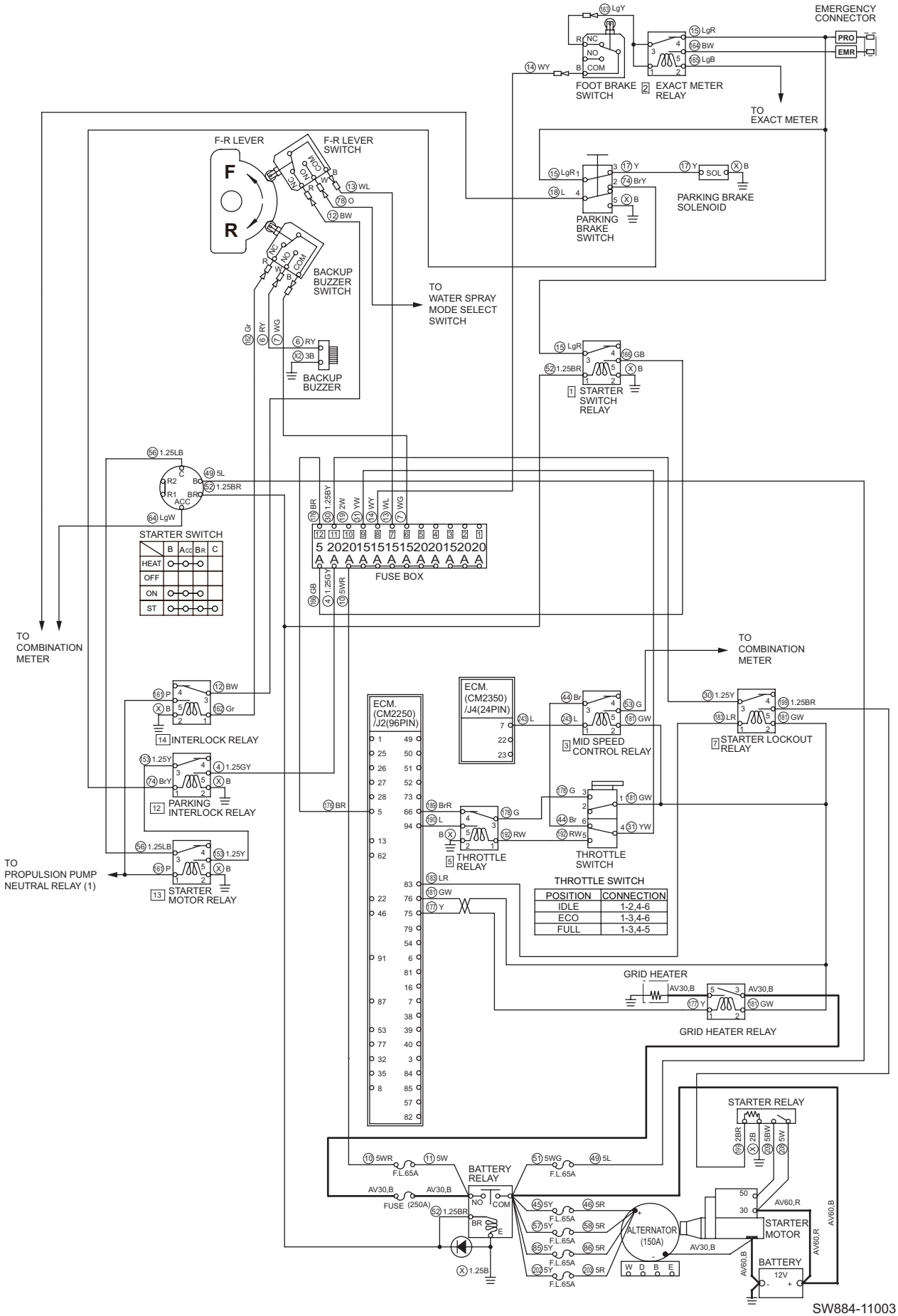
- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Set speed change switch to “  ”.
  (Automatic speed function is disabled when speed change switch is “  ”.)
- Check that speed can be changed by speed change switch between operation speed (“  ”)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

2) When display shows no error code

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. F-R Lever Auto Speed Set Switch	(1) When starter switch is ON, measure voltage between F-R lever auto speed set switch terminal COM inlet wire YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and F-R lever auto speed set switch is ON, measure voltage between F-R lever auto speed set switch terminal NO outlet wire GY and chassis ground. Standard voltage : 12 V or more • 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. Standard resistance : 300 Ω • If resistance is abnormal, resistor unit is faulty. **(NOTICE)** **• 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. Standard voltage : 12 V or more (2) When starter switch is ON and F-R lever auto speed set switch is ON, measure voltage between traveling controller terminal 21 inlet wire GY and ground terminal 1 wire B. Standard voltage : 12 V or more • 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. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-4-2


EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO EXACT METER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
STARTER SWITCH RELAY
STARTER SWITCH
HEAT
OFF
ON
ST
FUSE BOX
TO COMBINATION METER
INTERLOCK RELAY
PARKING INTERLOCK RELAY
STARTER MOTOR RELAY
TO PROPULSION PUMP NEUTRAL RELAY (1)
ECM. (CM2350) /J4(24PIN)
ECM. (CM2250) /J2(96PIN)
MID SPEED CONTROL RELAY
STARTER LOCKOUT RELAY
THROTTLE RELAY
THROTTLE SWITCH
POSITION
CONNECTION
IDLE
1-2,4-6
ECO
1-3,4-6
FULL
1-3,4-5
GRID HEATER
GRID HEATER RELAY
STARTER RELAY
BATTERY RELAY
FUSE (250A)
ALTERNATOR (150A)
STARTER MOTOR
BATTERY
12V
SW884-11003

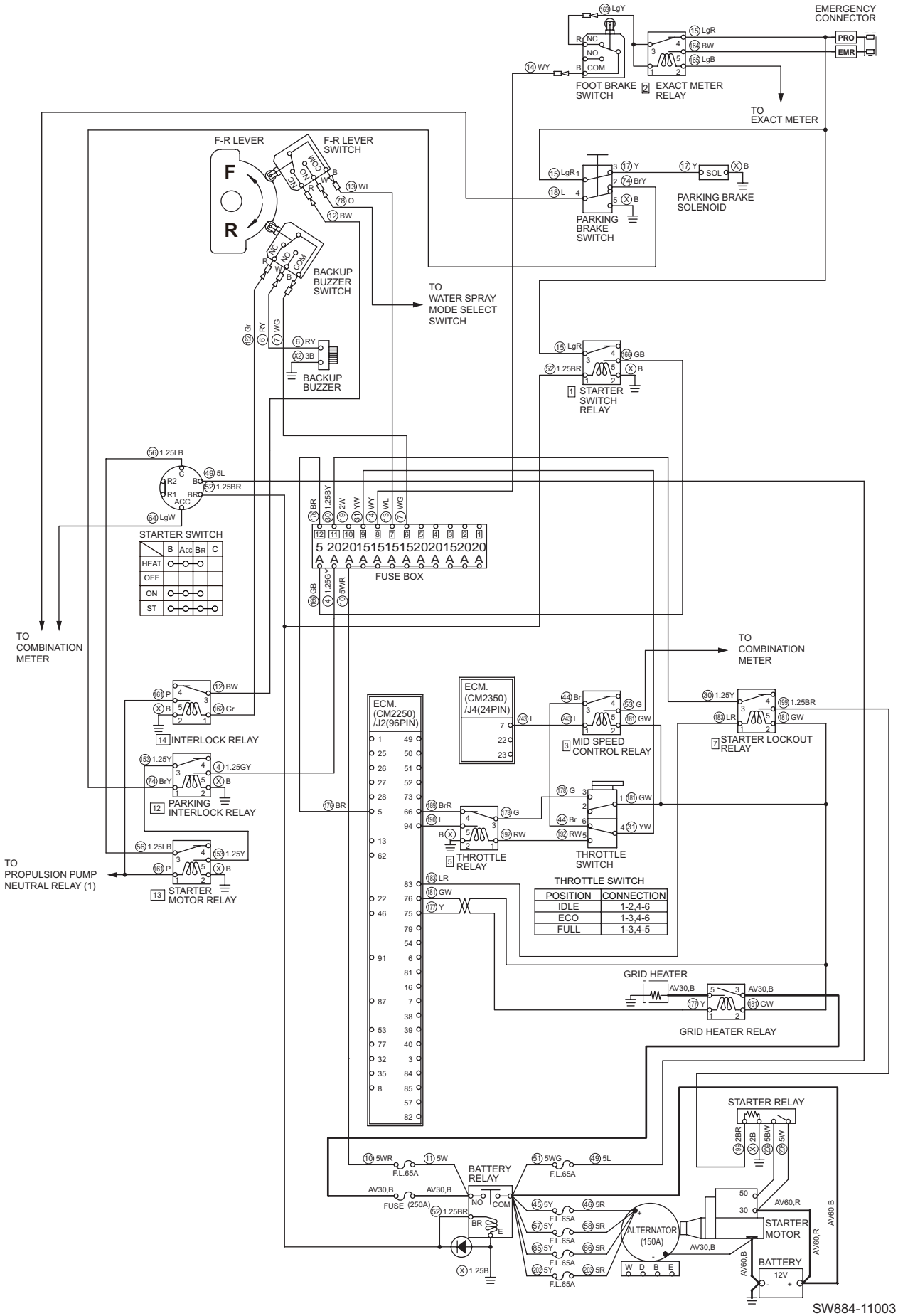
2-5-6. Brake cannot be released

- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- Check whether exact meter multiple display shows no error code.

Reference Fig.: 2-4-2

Check point	Check/Cause	Action
1. Parking Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard voltage : 12.3 Ω • 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. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire Y and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, parking brake switch is faulty.	Replace parking brake switch.
3. 2 Exact Meter Relay	(1) When starter switch is ON, measure voltage between exact meter relay terminal 1, 3 inlet wire LgY and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage of coil between exact meter relay terminal 1 and terminal 2. There is no electricity in normal condition. (3) When starter switch is ON, measure voltage between exact meter relay terminal 4 outlet wire LgR and chassis ground. Standard voltage : 12 V or more • 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. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between foot brake switch terminal NC outlet wire LgY and chassis ground. Standard voltage : 12 V or more • 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. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-4-2


EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
2 EXACT METER RELAY
TO EXACT METER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
1 STARTER SWITCH RELAY
STARTER SWITCH
FUSE BOX
TO COMBINATION METER
TO COMBINATION METER
14 INTERLOCK RELAY
12 PARKING INTERLOCK RELAY
13 STARTER MOTOR RELAY
TO PROPULSION PUMP NEUTRAL RELAY (1)
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
3 MID SPEED CONTROL RELAY
7 STARTER LOCKOUT RELAY
5 THROTTLE RELAY
THROTTLE SWITCH
POSITION CONNECTION
IDLE 1-2,4-6
ECO 1-3,4-6
FULL 1-3,4-5
GRID HEATER
GRID HEATER RELAY
STARTER RELAY
BATTERY RELAY
FUSE (250A)
ALTERNATOR (150A)
STARTER MOTOR
BATTERY 12V
SW884-11003

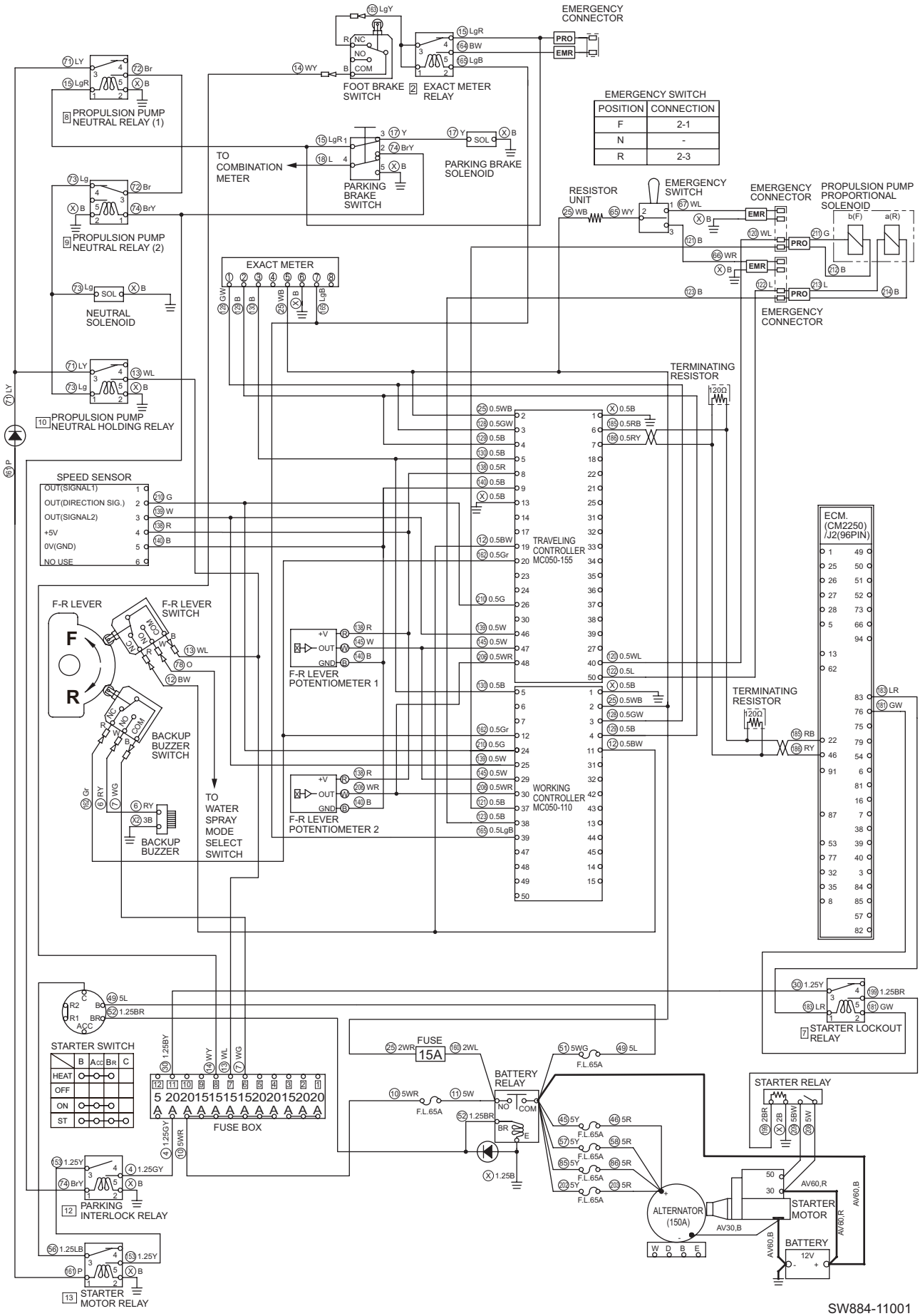
2-5-7. Brake does not work

- Parking brake switch must be applied.
- Foot brake switch must be OFF (Brake pedal is depressed)
- Check whether exact meter multiple display shows no error code.

Reference Fig.: 2-4-2

Check point	Check/Cause	Action
1. Parking Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard voltage : 12.3 Ω • 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. There is no electricity in normal condition. • 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. There is no electricity in normal condition. • 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. There is no electricity in normal condition. • If there is electricity, foot brake switch is faulty.	Replace foot brake switch.
5. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-4-1



SW884-11001

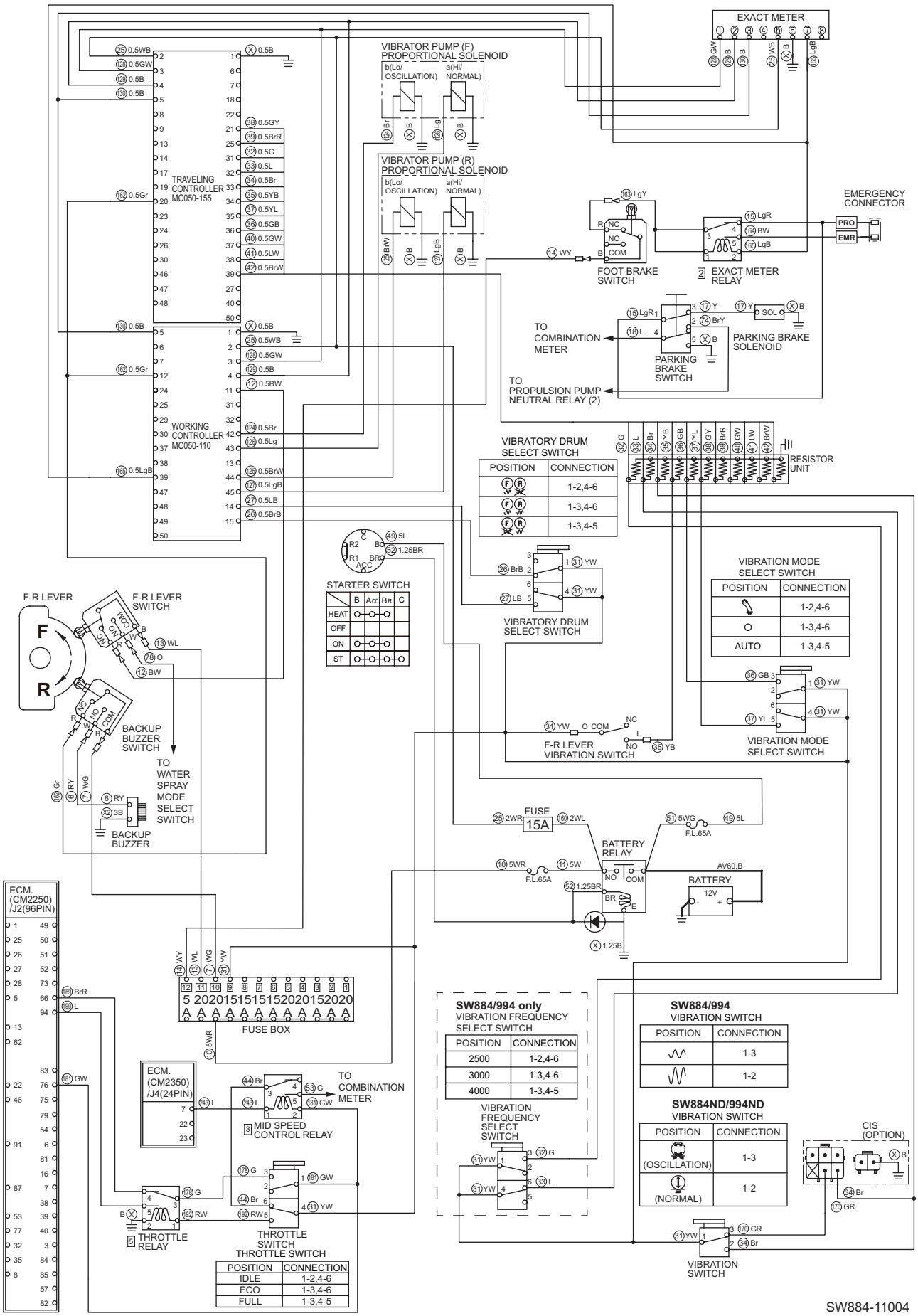
2-5-8. Emergency exit propulsion switch does not work

• Disconnect SWP-6F PRO (P.5-005, 006) connector from engine harness side and connect emergency switch connector SWP-6F EMR (P.5-005, 006).

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Propulsion Pump Proportional Solenoid a (R) or b (F)	• Disconnect harness for propulsion pump proportional solenoid a (R) or b (F) and measure resistance of coils. Standard voltage : 5.5 Ω • 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. Standard voltage : 12 V or more (2) When starter switch is ON and emergency switch is “F”, measure voltage between emergency switch terminal 1 outlet wire WL and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and emergency switch is “R”, measure voltage between emergency switch terminal 3 outlet wire WR and chassis ground. Standard voltage : 12 V or more • 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. Standard resistance : 15 Ω • If resistance is abnormal, resistor unit is faulty.	Replace resistor unit.
4. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-6-1


EXACT METER
VIBRATOR PUMP (F)
PROPORTIONAL SOLENOID
b(Lo/ OSCILLATION)
a(Hi/ NORMAL)
VIBRATOR PUMP (R)
PROPORTIONAL SOLENOID
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
TO PROPULSION PUMP NEUTRAL RELAY (2)
VIBRATORY DRUM SELECT SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
RESISTOR UNIT
STARTER SWITCH
HEAT
OFF
ON
ST
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
TO WATER SPRAY MODE SELECT SWITCH
BACKUP BUZZER
VIBRATION MODE SELECT SWITCH
AUTO
F-R LEVER VIBRATION SWITCH
FUSE
15A
BATTERY RELAY
BATTERY
12V
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
FUSE BOX
MID SPEED CONTROL RELAY
THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
IDLE
ECO
FULL
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
2500
3000
4000
VIBRATION FREQUENCY SELECT SWITCH
SW884/994
VIBRATION SWITCH
SW884ND/994ND
VIBRATION SWITCH
(OSCILLATION)
(NORMAL)
CIS (OPTION)
VIBRATION SWITCH
SW884-11004

2-6. Vibration

Check following items before troubleshooting.

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

2-6-1. No vibration occurs 1/5

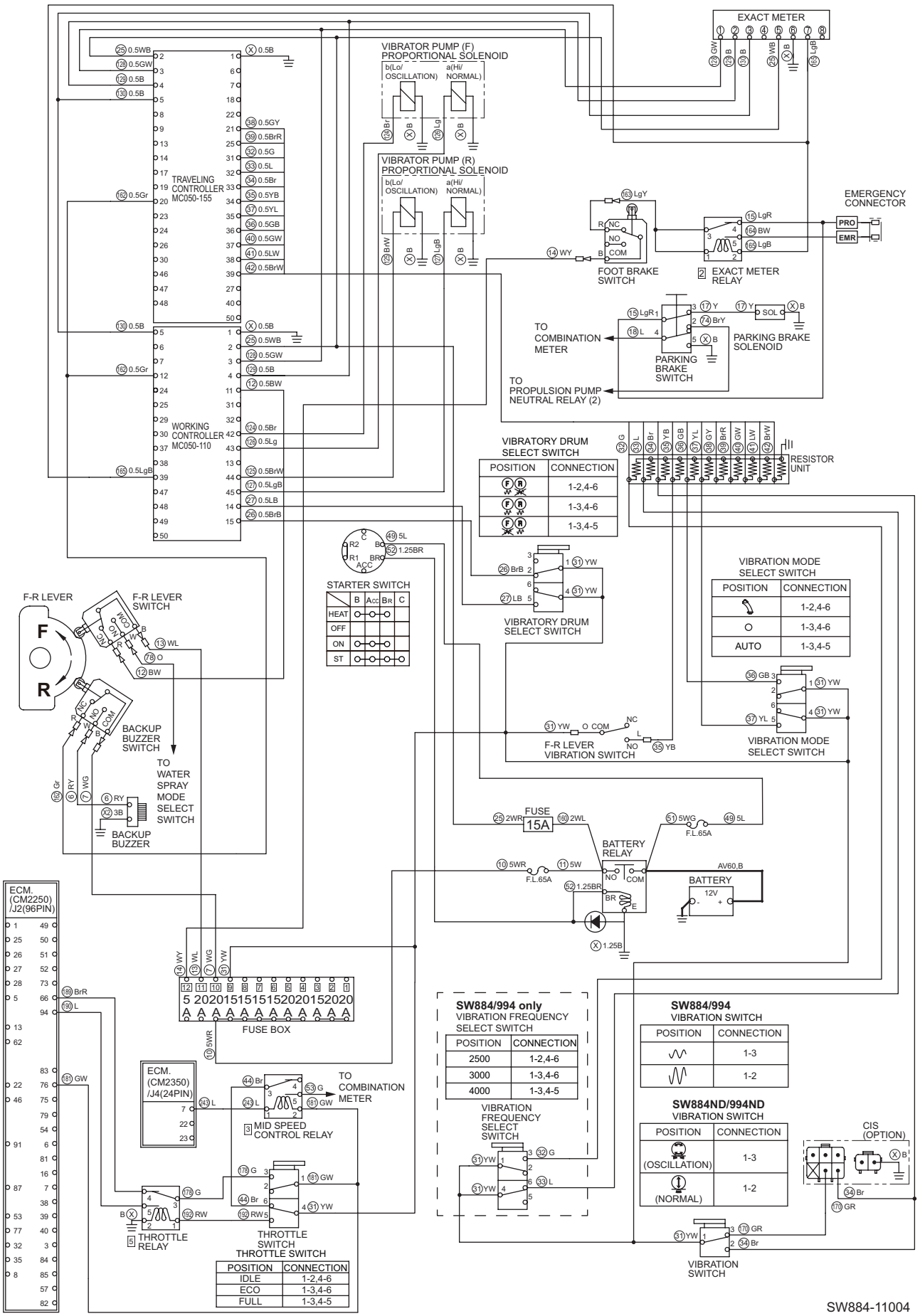
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Vibration mode select switch to “  ” (continuous mode).
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-6-1

Error code	Check point	Check/Cause	Action
E33, E34, E35 or E36	1. Connector	• Check vibrator pump (F) proportional solenoid connector, vibrator pump (R) proportional solenoid connector and working controller connector terminal 42, 43, 44, 45, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between vibrator pump (F) proportional solenoid, vibrator pump (R) proportional solenoid and working controller terminal wires. • Vibrator pump (F) proportional solenoid b (Lo) wire Br and working controller terminal 42 wire Br • Vibrator pump (F) proportional solenoid a (Hi) wire Lg and working controller terminal 43 wire Lg • Vibrator pump (R) proportional solenoid b (Lo) wire BrW and working controller terminal 44 wire BrW • Vibrator pump (R) proportional solenoid a (Hi) wire LgB and working controller terminal 45 wire LgB Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Replace harness.
	3. Vibrator Pump (F) Proportional Solenoid a (Hi), b (Lo)	(1) Disconnect harness and measure resistance of coils. Standard resistance: 5.5 Ω (2) Check vibrator pump (F) proportional solenoid a (Hi) and b (Lo) terminal wire B is grounded. • If above item (1) or (2) is NG, vibrator pump (F) proportional solenoid a (Hi) or b (Lo) is faulty.	Replace vibrator pump (F) proportional solenoid
	4. Vibrator Pump (R) Proportional Solenoid a (Hi), b (Lo)	(1) Disconnect harness and measure resistance of coils. Standard resistance: 5.5 Ω (2) Check vibrator pump (R) proportional solenoid a (Hi) and b (Lo) terminal wire B is grounded. • If above item (1) or (2) is NG, vibrator pump (R) proportional solenoid a (Hi) or b (Lo) is faulty.	Replace vibrator pump (R) proportional solenoid

Fig.: 2-6-1


EXACT METER
VIBRATOR PUMP (F)
PROPORTIONAL SOLENOID
b(Lo/ OSCILLATION)
a(Hi/ NORMAL)
VIBRATOR PUMP (R)
PROPORTIONAL SOLENOID
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
TO PROPULSION PUMP NEUTRAL RELAY (2)
VIBRATORY DRUM SELECT SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
RESISTOR UNIT
STARTER SWITCH
HEAT
OFF
ON
ST
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
TO WATER SPRAY MODE SELECT SWITCH
BACKUP BUZZER
VIBRATION MODE SELECT SWITCH
AUTO
F-R LEVER VIBRATION SWITCH
FUSE
15A
BATTERY RELAY
BATTERY
12V
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
FUSE BOX
MID SPEED CONTROL RELAY
THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
IDLE
ECO
FULL
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
2500
3000
4000
VIBRATION FREQUENCY SELECT SWITCH
SW884/994
VIBRATION SWITCH
SW884ND/994ND
VIBRATION SWITCH
(OSCILLATION)
(NORMAL)
CIS (OPTION)
VIBRATION SWITCH
SW884-11004

2-6-1. No vibration occurs 2/5

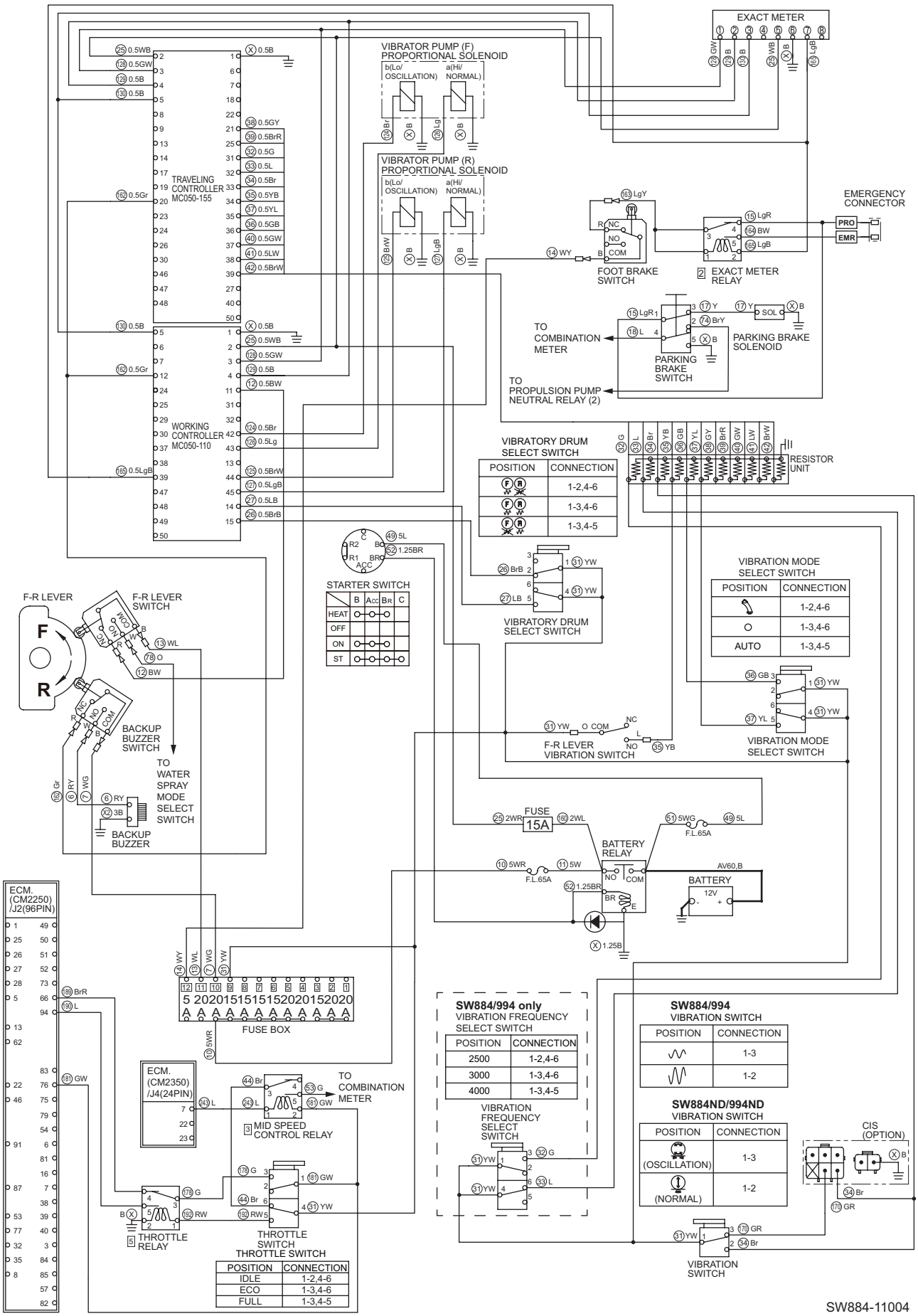
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-6-1

Error code	Check point	Check/Cause	Action
E33, E34, E35 or E36	5. Traveling/ Working Controller (SW884/994)	(1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wire. • Traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B • Working controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B Standard voltage : 12 V or more (2) When starter switch is ON and measure current between vibrator pump (F)/(R) proportional solenoid terminal wires (positive side) and B (ground side). • Vibrator pump (F) proportional solenoid a (Hi) wire Lg (positive side) and wire B (ground side) • Vibrator pump (F) proportional solenoid b (Lo) wire Br (positive side) and wire B (ground side) • Vibrator pump (R) proportional solenoid a (Hi) wire LgB (positive side) and wire B (ground side) • Vibrator pump (R) proportional solenoid b (Lo) wire BrW (positive side) and wire B (ground side) While measuring current, operate vibration frequency select switch, vibration mode select switch and vibration switch as below. • 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 switch is “ ”. Standard current: Solenoid a (Hi): 960 mA Solenoid b (Lo): 200 mA • 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 switch is “ ”. Standard current: Solenoid a (Hi): 200 mA Solenoid b (Lo): 1150 mA • Vibration mode select switch is “ ◯ ” (Vibration is OFF). Standard current: Solenoid a (Hi): 200 mA Solenoid b (Lo): 200 mA • If item (1) is OK and item (2) is NG, traveling/working controller is faulty. **(NOTICE)** **• Since current value is output in PWM, standard value shown above represent a maximum instantaneous value.**	Replace traveling/ working controller.

Fig.: 2-6-1


EXACT METER
VIBRATOR PUMP (F)
PROPORTIONAL SOLENOID
b(Lo/ OSCILLATION)
a(Hi/ NORMAL)
VIBRATOR PUMP (R)
PROPORTIONAL SOLENOID
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
TO PROPULSION PUMP NEUTRAL RELAY (2)
VIBRATORY DRUM SELECT SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
RESISTOR UNIT
STARTER SWITCH
HEAT
OFF
ON
ST
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
TO WATER SPRAY MODE SELECT SWITCH
BACKUP BUZZER
VIBRATION MODE SELECT SWITCH
AUTO
F-R LEVER VIBRATION SWITCH
FUSE
15A
BATTERY RELAY
BATTERY
12V
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
FUSE BOX
MID SPEED CONTROL RELAY
THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
IDLE
ECO
FULL
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
2500
3000
4000
VIBRATION FREQUENCY SELECT SWITCH
SW884/994
VIBRATION SWITCH
SW884ND/994ND
VIBRATION SWITCH
(OSCILLATION)
(NORMAL)
CIS (OPTION)
VIBRATION SWITCH
SW884-11004

2-6-1. No vibration occurs 3/5

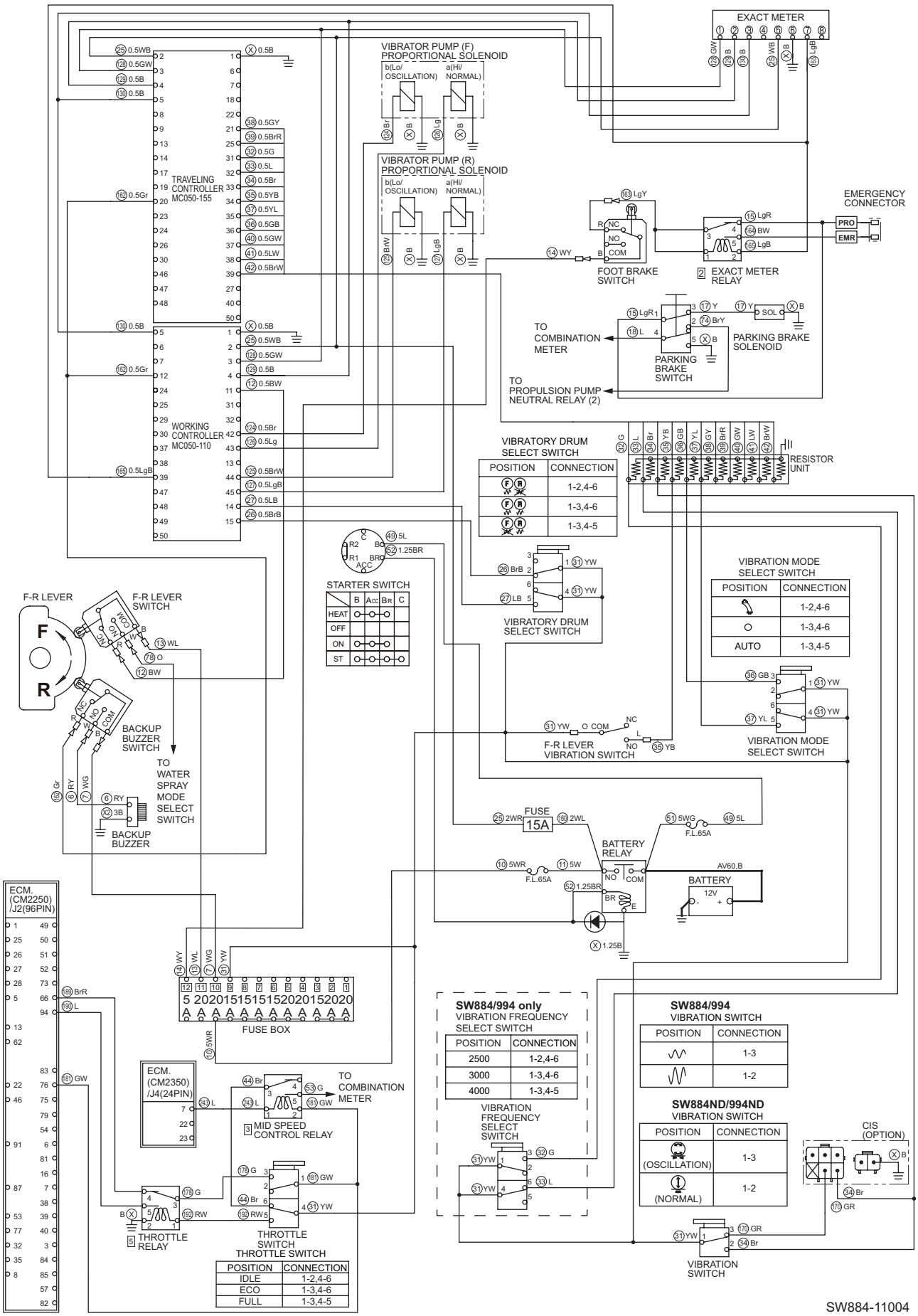
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-6-1

Error code	Check point	Check/Cause	Action
E33, E34, E35 or E36	5. Traveling/ Working Controller (SW884ND/ 994ND)	(1) When starter switch is ON, measure voltage between traveling/working controller terminal wires and ground terminal wire. • Traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B • Working controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B Standard voltage : 12 V or more (2) When starter switch is ON and measure current between vibrator pump (F)/(R) proportional solenoid terminal wires (positive side) and B (ground side). • Vibrator pump (F) proportional solenoid a (NORMAL) wire Lg (positive side) and wire B (ground side) • Vibrator pump (F) proportional solenoid b (OSCILLATION) wire Br (positive side) and wire B (ground side) • Vibrator pump (R) proportional solenoid a (NORMAL) wire LgB (positive side) and wire B (ground side) • Vibrator pump (R) proportional solenoid b (OSCILLATION) wire BrW (positive side) and wire B (ground side) While measuring current, operate vibration mode select switch and vibration switch as below. • Vibration mode select switch is “ ” (continuous mode) and depress F-R lever vibration switch more than 0.05 second and vibration switch is “ ”. Standard current: Solenoid a (NORMAL): 960 mA Solenoid b (OSCILLATION): 200 mA • Vibration mode select switch is “ ” (continuous mode) and depress F-R lever vibration switch more than 0.05 second and vibration switch is “ ”. Standard current: Solenoid a (NORMAL): 200 mA Solenoid b (OSCILLATION): 1150 mA • Vibration mode select switch is “ ” (Vibration is OFF) Standard current: Solenoid a (NORMAL): 200 mA Solenoid b (OSCILLATION): 200 mA • If item (1) is OK and item (2) is NG, traveling/working controller is faulty. **(NOTICE)** **• Since current value is output in PWM, standard value shown above represent a maximum instantaneous value.**	Replace traveling/ working controller.

Fig.: 2-6-1


EXACT METER
VIBRATOR PUMP (F)
PROPORTIONAL SOLENOID
b(Lo/ OSCILLATION)
a(Hi/ NORMAL)
VIBRATOR PUMP (R)
PROPORTIONAL SOLENOID
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
TO PROPULSION PUMP NEUTRAL RELAY (2)
VIBRATORY DRUM SELECT SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
RESISTOR UNIT
STARTER SWITCH
HEAT
OFF
ON
ST
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
TO WATER SPRAY MODE SELECT SWITCH
BACKUP BUZZER
VIBRATION MODE SELECT SWITCH
AUTO
F-R LEVER VIBRATION SWITCH
FUSE
15A
BATTERY RELAY
BATTERY
12V
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
FUSE BOX
MID SPEED CONTROL RELAY
THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
IDLE
ECO
FULL
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
2500
3000
4000
VIBRATION FREQUENCY SELECT SWITCH
SW884/994
VIBRATION SWITCH
SW884ND/994ND
VIBRATION SWITCH
(OSCILLATION)
(NORMAL)
CIS (OPTION)
VIBRATION SWITCH
SW884-11004

2-6-1. No vibration occurs 4/5

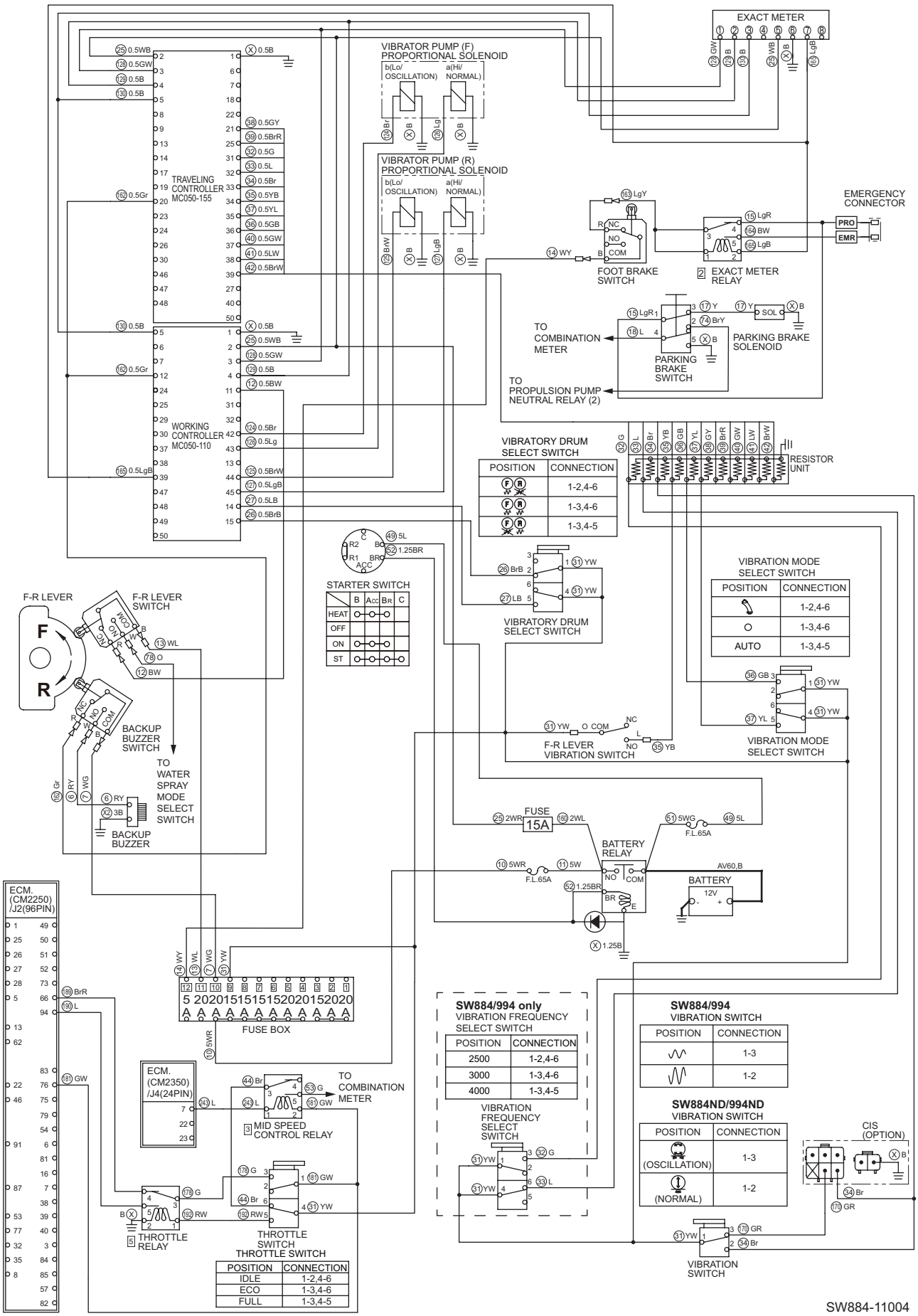
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig.: 2-6-1

Error code	Check point	Check/Cause	Action
E33, E34, E35 or E36	6. Clearing Error Code and Judging OK/NG after Repair	① When repair is complete, set starter switch to ON. ② Place F-R lever “N”. ③ Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-6-1


EXACT METER
VIBRATOR PUMP (F)
PROPORTIONAL SOLENOID
b(Lo/ OSCILLATION)
a(Hi/ NORMAL)
VIBRATOR PUMP (R)
PROPORTIONAL SOLENOID
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
2 EXACT METER RELAY
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
TO PROPULSION PUMP NEUTRAL RELAY (2)
VIBRATORY DRUM SELECT SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
RESISTOR UNIT
STARTER SWITCH
HEAT
OFF
ON
ST
VIBRATION MODE SELECT SWITCH
AUTO
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
F-R LEVER VIBRATION SWITCH
FUSE
15A
BATTERY RELAY
BATTERY
12V
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
FUSE BOX
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
2500
3000
4000
SW884/994
VIBRATION SWITCH
SW884ND/994ND
VIBRATION SWITCH
(OSCILLATION)
(NORMAL)
CIS (OPTION)
MID SPEED CONTROL RELAY
THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
IDLE
ECO
FULL
VIBRATION SWITCH
SW884-11004

2-6-1. No vibration occurs 5/5

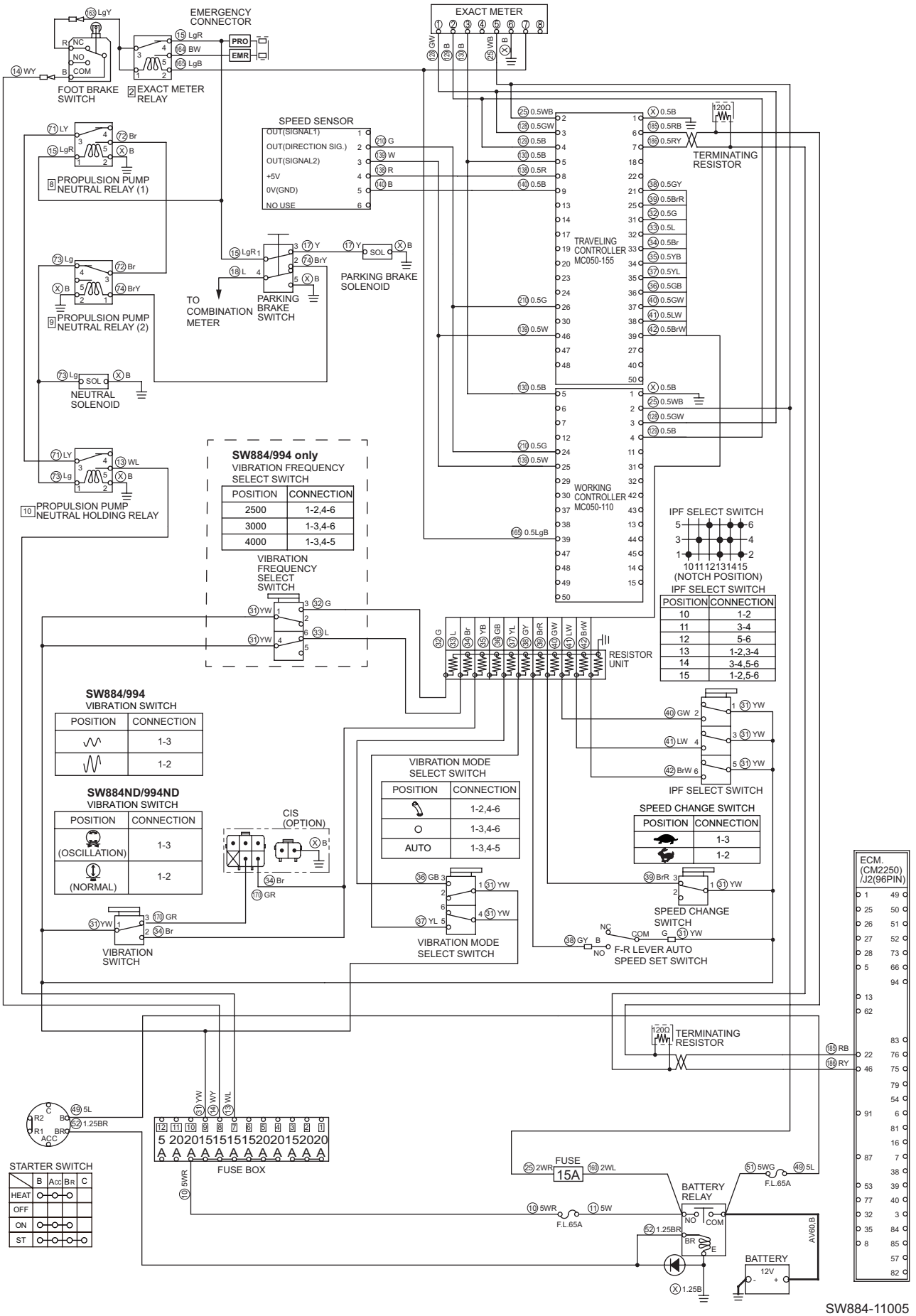
- F-R lever must be in “N”.
- Parking brake switch must be released.
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
1. Vibration Mode Select Switch	(1) When starter switch is ON, measure voltage between vibration mode select switch terminal 1, 4 inlet wires YW and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON and vibration mode select switch to “  ” (continuous mode), measure voltage between vibration mode select switch terminal wires and chassis ground. • Vibration mode select switch terminal 3 outlet wire GB and chassis ground • Vibration mode select switch terminal 5 outlet wire YL and chassis ground There is no electricity in normal condition. • 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. There is continuity in normal condition. • If there is no continuity, F-R lever vibration switch is faulty. **(NOTICE)** **• 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. Standard resistance: 300 Ω • If resistance is abnormal, the resistor unit is faulty. **(NOTICE)** **• 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 ground terminal 1 wire B. Standard voltage: 12 V or more • 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. Standard resistance: 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



SW884-11005

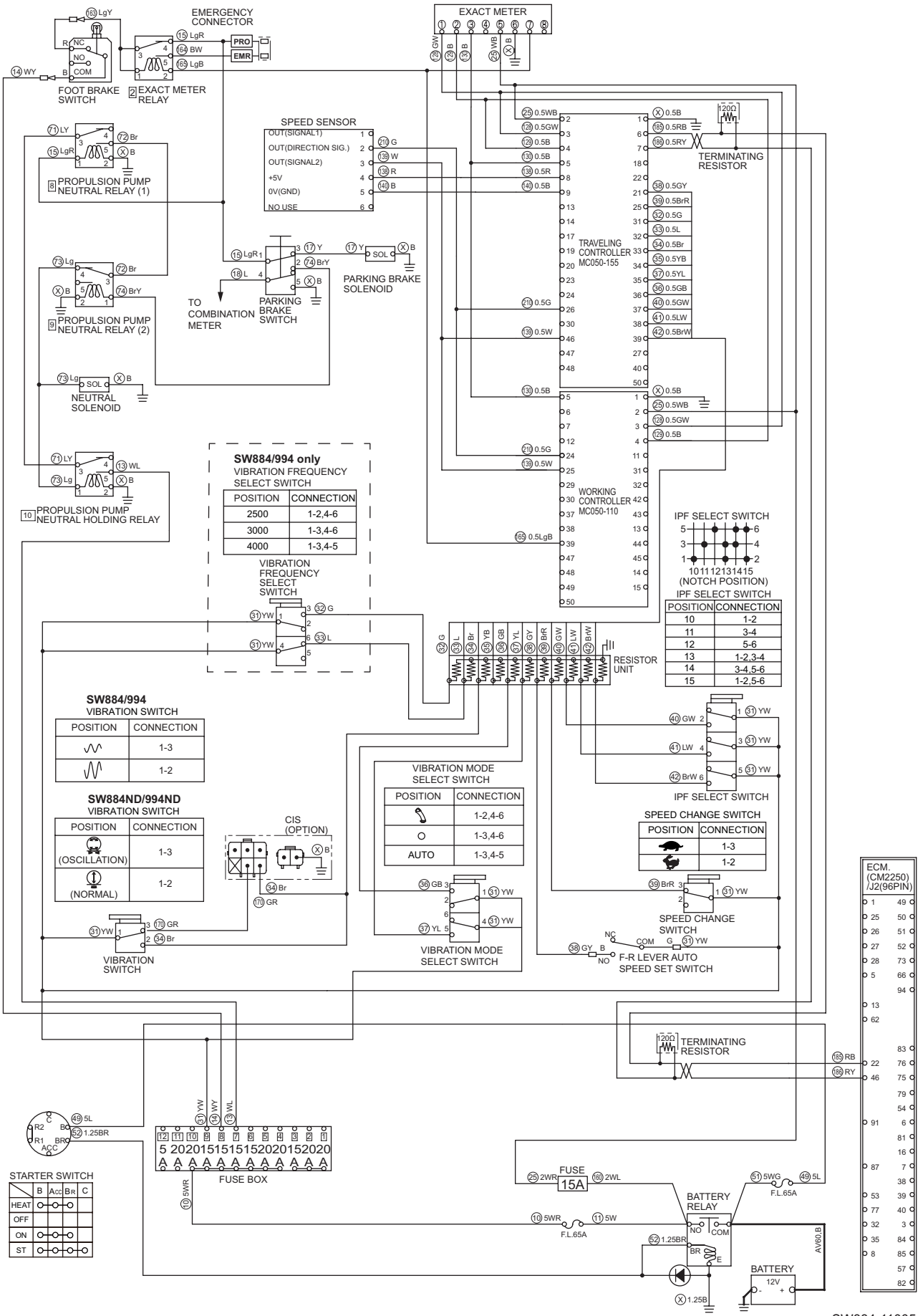
2-6-2. Vibration frequency cannot be switched (SW884/994) 1/3

- Set vibration mode select switch to “  ” (continuous mode).
- Vibration frequency select switch is fixed at 4000 vpm, vibration switch is “ ⋀⋀ ” when frequency cannot be switched.
- Check whether exact meter multiple display shows any error code.

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E21	1. Connector	• Check vibration frequency select switch, vibration switch and traveling controller connector terminal 31, 32, 33 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistances between switches and traveling controller terminal wires. • Vibration frequency select switch terminal 3 wire G and traveling controller terminal 31 wire G • Vibration frequency select switch terminal 6 wire L and traveling controller terminal 32 wire L • Vibration switch terminal 2 wire Br and traveling controller terminal 33 wire Br Standard resistance : 10 Ω or less (2) Measure resistances between switches and fuse box terminal wires. • Vibration frequency select switch terminal 1, 4 wires YW, vibration switch terminal 1 wire YW and fuse box terminal 9 wire YW Standard resistance : 10 Ω or less • 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. Standard voltage : 12 V or more (2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between vibration frequency select switch terminal 6 outlet wire L and chassis ground. Standard voltage : 12 V or more (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. • Vibration frequency select switch terminal 3 outlet wire G and chassis ground • Vibration frequency select switch terminal 6 outlet wire L and chassis ground Standard voltage : 12 V or more (4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between vibration frequency select switch terminal 3 outlet wire G and chassis ground. Standard voltage : 12 V or more • 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.: 2-5-1



SW884-11005

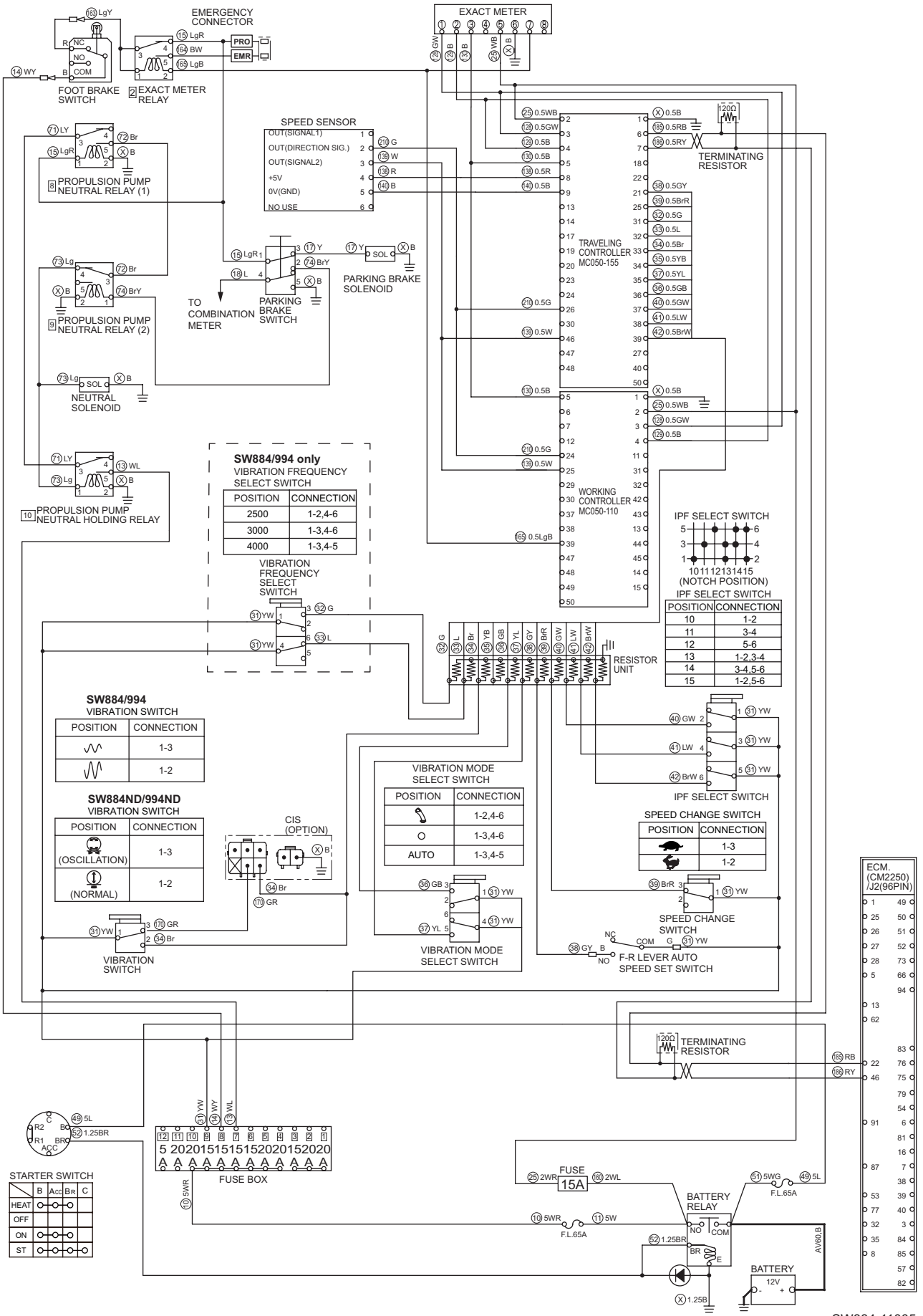
2-6-2. Vibration frequency cannot be switched (SW884/994) 2/3

- Set vibration mode select switch to “  ” (continuous mode).
- Vibration frequency select switch is fixed at 4000 vpm, vibration switch is “  ” when frequency cannot be switched.
- Check whether exact meter multiple display shows any error code.

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E21	4. Vibration switch	(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and vibration switch is “  ”, measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, vibration switch is faulty.	Replace vibration switch
	5. Resistor Unit	• Measure resistance between resistor unit wires and ground wire. • Resistor unit wire No.32 wire G and ground wire • Resistor unit wire No.33 wire L and ground wire • Resistor unit wire No.34 wire Br and ground wire Standard resistance : 300 Ω • If resistance is abnormal, resistor unit is faulty. **(NOTICE)** **• Resistor unit is used to stabilize contact of switch.**	Replace resistor unit.

Fig.: 2-5-1


EMERGENCY CONNECTOR
EXACT METER
FOOT BRAKE SWITCH
EXACT METER RELAY
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
TERMINATING RESISTOR
PROPULSION PUMP NEUTRAL RELAY (1)
PROPULSION PUMP NEUTRAL RELAY (2)
PROPULSION PUMP NEUTRAL HOLDING RELAY
NEUTRAL SOLENOID
PARKING BRAKE SOLENOID
PARKING BRAKE SWITCH
TO COMBINATION METER
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
POSITION CONNECTION
2500 1-2,4-6
3000 1-3,4-6
4000 1-3,4-5
VIBRATION FREQUENCY SELECT SWITCH
RESISTOR UNIT
IPF SELECT SWITCH
(NOTCH POSITION)
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
SW884/994
VIBRATION SWITCH
POSITION CONNECTION
1-3
1-2
SW884ND/994ND
VIBRATION SWITCH
POSITION CONNECTION
(OSCILLATION) 1-3
(NORMAL) 1-2
CIS (OPTION)
VIBRATION SWITCH
VIBRATION MODE SELECT SWITCH
POSITION CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
VIBRATION MODE SELECT SWITCH
SPEED CHANGE SWITCH
POSITION CONNECTION
1-3
1-2
SPEED CHANGE SWITCH
F-R LEVER AUTO SPEED SET SWITCH
IPF SELECT SWITCH
ECM. (CM2250) /J2(96PIN)
TERMINATING RESISTOR
STARTER SWITCH
B Acc BR C
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
F.L.65A
AV60.B
SW884-11005

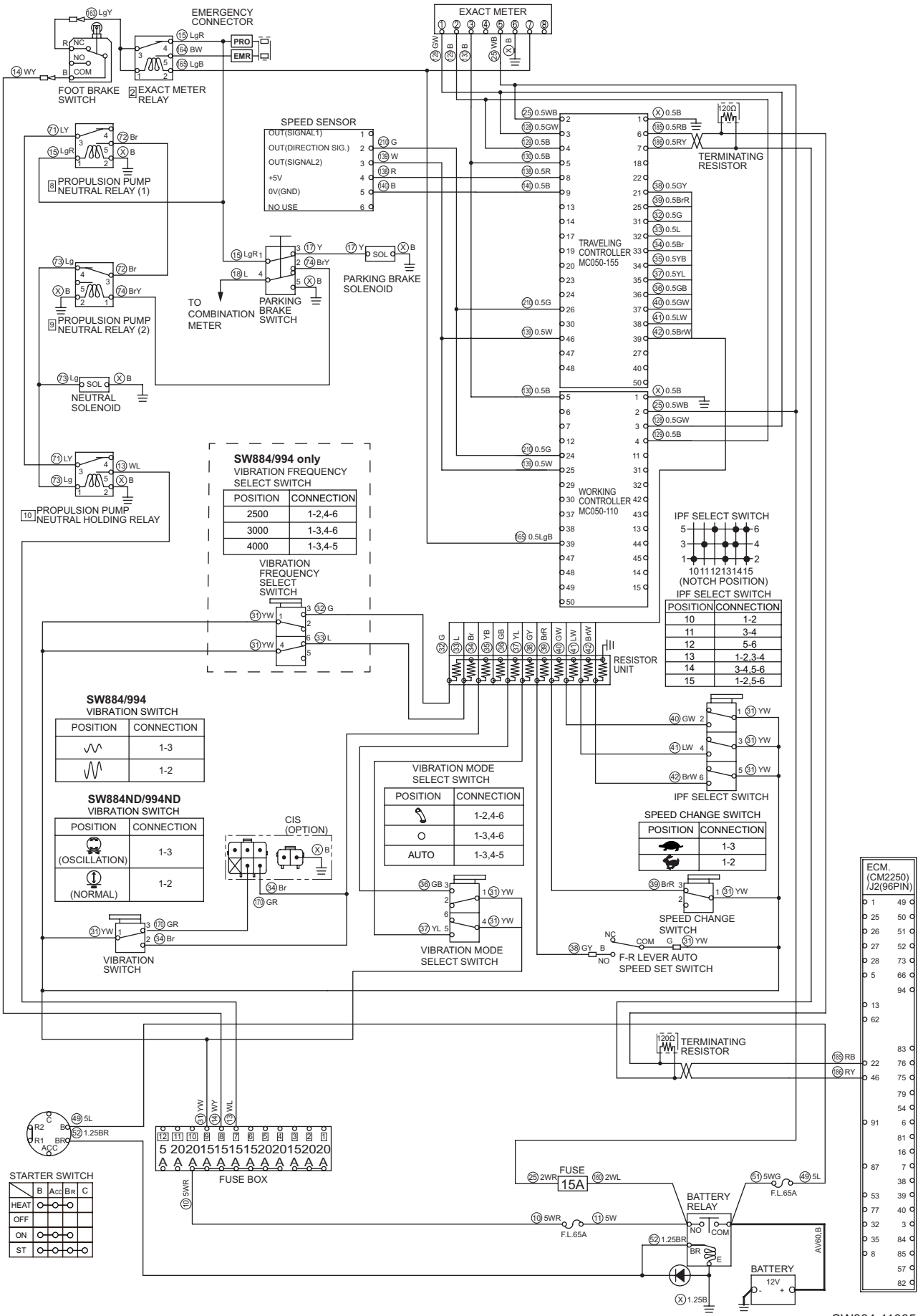
2-6-2. Vibration frequency cannot be switched (SW884/994) 3/3

- Set vibration mode select switch to “  ” (continuous mode).
- Vibration frequency select switch is fixed at 4000 vpm, vibration switch is “  ” when frequency cannot be switched.
- Check whether exact meter multiple display shows any error code.

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E21	6. Traveling Controller	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between traveling controller terminal 32 inlet wire L and ground terminal 1 wire B. Standard voltage : 12 V or more (3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between traveling controller terminal wires. • Traveling controller terminal 31 inlet wire G and ground terminal 1 wire B • Traveling controller terminal 32 inlet wire L and ground terminal 1 wire B Standard voltage : 12 V or more (4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between traveling controller terminal 31 inlet wire G and ground terminal 1 wire B. Standard voltage : 12 V or more (5) When starter switch is ON and vibration switch is “  ”, measure voltage between traveling controller terminal 33 inlet wire Br and ground terminal 1 wire B. Standard voltage : 12 V or more • 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. ② Exact meter will display vehicle speed. ③ Check all combinations of vibration frequency select switch and vibration switch positions. Exact meter will still display vehicle speed. Machine is normal state. If display changes form vehicle speed to E21, check above items again.	

Fig.: 2-5-1



SW884-11005

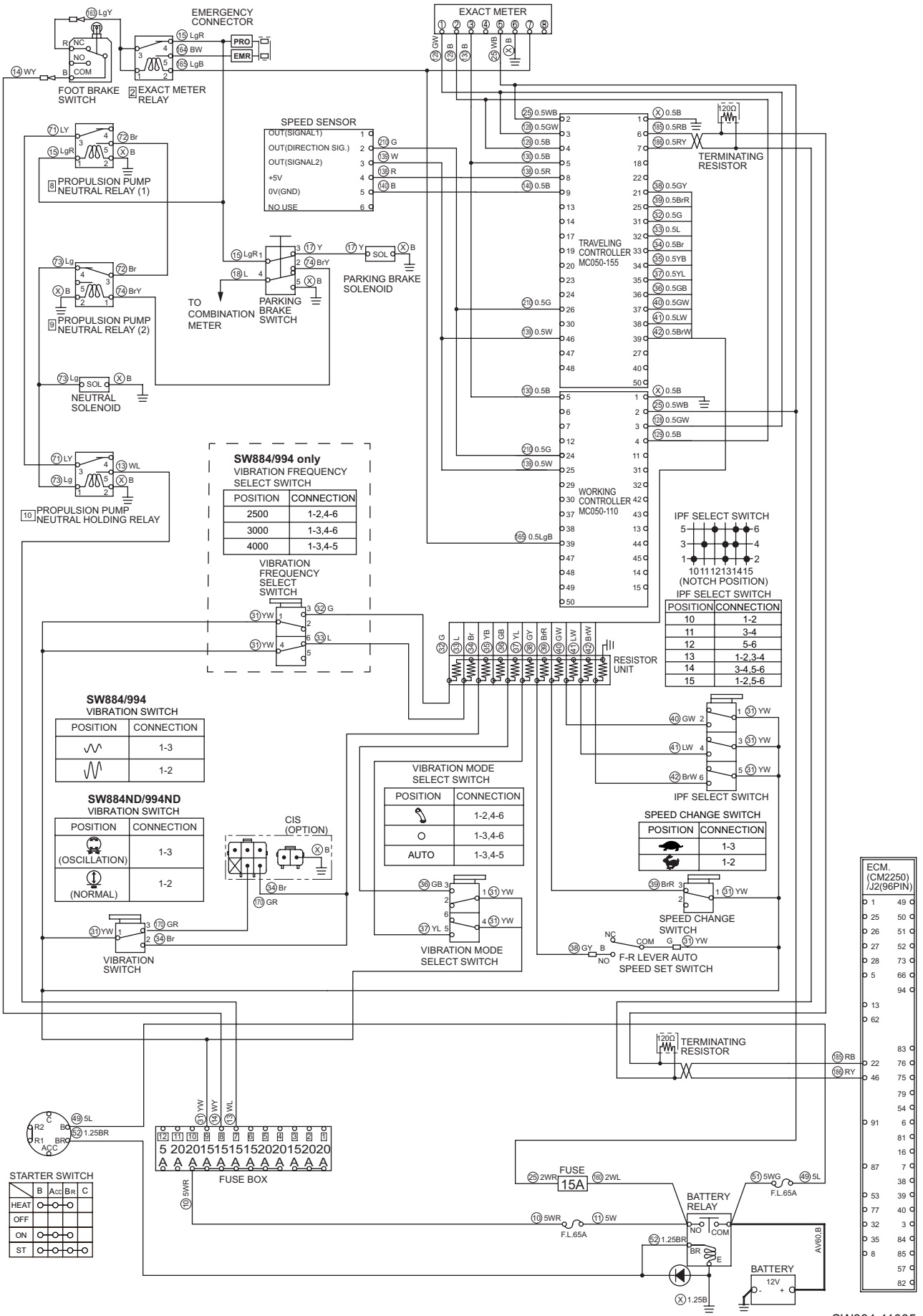
2-6-3. Vibration type cannot be switched (SW884ND/994ND) 1/2

- Set vibration mode select switch to "  " (continuous mode).
- Vibration switch is "  " when vibration type cannot be switched.
- Check whether exact meter multiple display shows any error code.

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E21	1. Connector	• Check vibration frequency select switch, vibration switch and traveling controller connector terminal 33 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistances between switches and traveling controller terminal wires. • Vibration switch terminal 2 wire Br and traveling controller terminal 33 wire Br Standard resistance : 10 Ω or less (2) Measure resistances between switches and fuse box terminal wires. • Vibration switch terminal 1 wire YW and fuse box terminal 9 wire YW Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	4. Vibration switch	(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and vibration switch is "  ", measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, vibration switch is faulty.	Replace vibration switch
	5. Resistor Unit	• Measure resistance between resistor unit wire No.34 wire Br and ground wire. Standard resistance : 300 Ω • If resistance is abnormal, resistor unit is faulty. **(NOTICE)** **• Resistor unit is used to stabilize contact of switch.**	Replace resistor unit.

Fig.: 2-5-1



SW884-11005

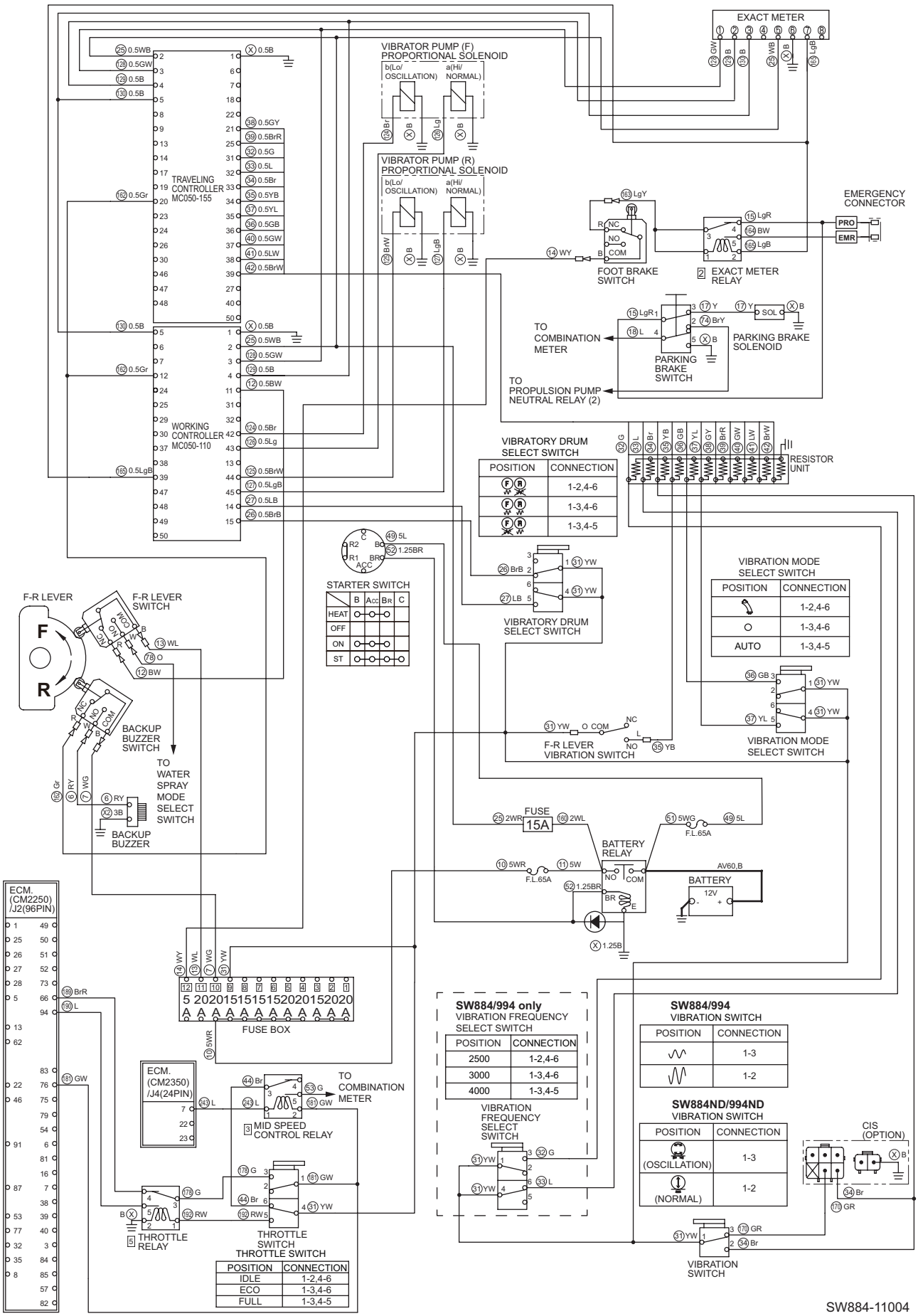
2-6-3. Vibration type cannot be switched (SW884ND/994ND) 2/2

- Set vibration mode select switch to "  " (continuous mode).
- Vibration switch is "  " when vibration type cannot be switched.
- Check whether exact meter multiple display shows any error code.

Reference Fig.: 2-5-1

Error code	Check point	Check/Cause	Action
E21	6. Traveling Controller	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and vibration switch is "  ", measure voltage between traveling controller terminal 33 inlet wire Br and ground terminal 1 wire B. Standard voltage : 12 V or more • If above items (1) and (2) are OK, traveling controller is faulty.	Replace traveling controller.
	7. Clearing Error Code and Judging OK/NG after Repair	① When repair is complete, set starter switch to ON. ② Exact meter will display vehicle speed. ③ Check all combinations of vibration frequency select switch and vibration switch positions. Exact meter will still display vehicle speed. Machine is normal state. If display changes form vehicle speed to E21, check above items again.	

Fig.: 2-6-1

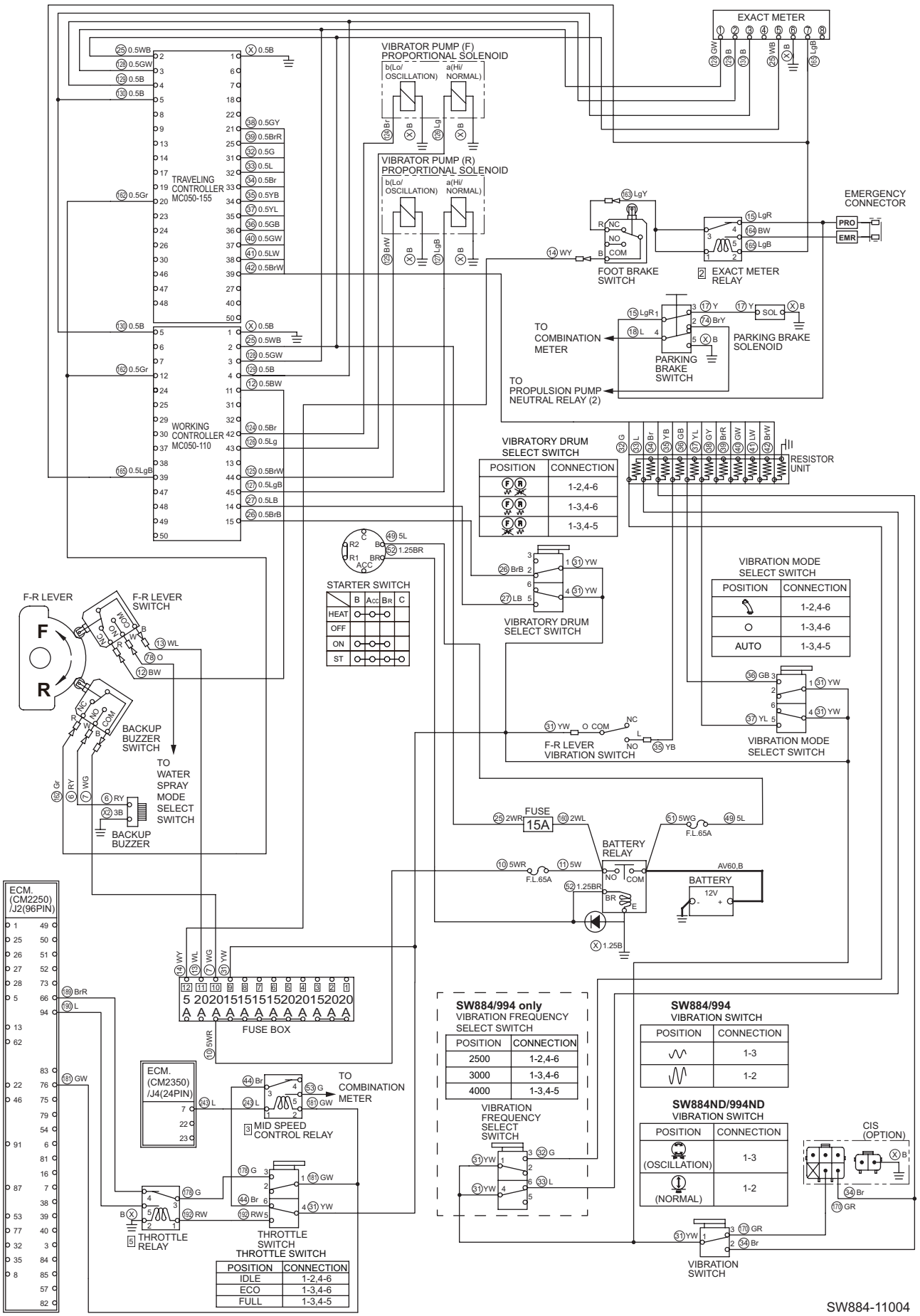

EXACT METER
VIBRATOR PUMP (F)
PROPORTIONAL SOLENOID
b(Lo/ OSCILLATION)
a(Hi/ NORMAL)
VIBRATOR PUMP (R)
PROPORTIONAL SOLENOID
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
TO PROPULSION PUMP NEUTRAL RELAY (2)
VIBRATORY DRUM SELECT SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
RESISTOR UNIT
STARTER SWITCH
HEAT
OFF
ON
ST
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
TO WATER SPRAY MODE SELECT SWITCH
BACKUP BUZZER
VIBRATION MODE SELECT SWITCH
AUTO
F-R LEVER VIBRATION SWITCH
FUSE
15A
BATTERY RELAY
BATTERY
12V
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
FUSE BOX
MID SPEED CONTROL RELAY
THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
IDLE
ECO
FULL
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
2500
3000
4000
VIBRATION FREQUENCY SELECT SWITCH
SW884/994
VIBRATION SWITCH
SW884ND/994ND
VIBRATION SWITCH
(OSCILLATION)
(NORMAL)
CIS (OPTION)
VIBRATION SWITCH
SW884-11004

2-6-4. Continuous/automatic vibration mode cannot be switched 1/2

Reference Fig. : 2-6-1

Check point	Check/Cause	Action
1. Vibration Mode Select Switch	(1) When starter switch is ON and vibration mode select switch is “  ”, measure voltage between vibration mode select switch terminal 1, 4 inlet wires YW and chassis ground. Standard voltage : 12 V (2) When starter switch is ON and vibration mode select switch is “  ”, measure voltage between vibration mode select switch terminal wires and chassis ground. • Vibration mode select switch terminal 3 outlet wire GB and chassis ground • Vibration mode select switch terminal 5 outlet wire YL and chassis ground There is no electricity in normal condition. (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. • Vibration mode select switch terminal 3 outlet wire GB and chassis ground • Vibration mode select switch terminal 5 outlet wire YL and chassis ground Standard voltage : 12 V • 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. • Resistor unit wire No.36 inlet wire GB and ground wire • Resistor unit wire No.37 wire YL and ground wire Standard resistance : 300 Ω • If resistance is abnormal, resistor unit is faulty. **(NOTICE)** **• Resistor unit is used to stabilize contact of switch.**	Replace resistor unit.

Fig.: 2-6-1

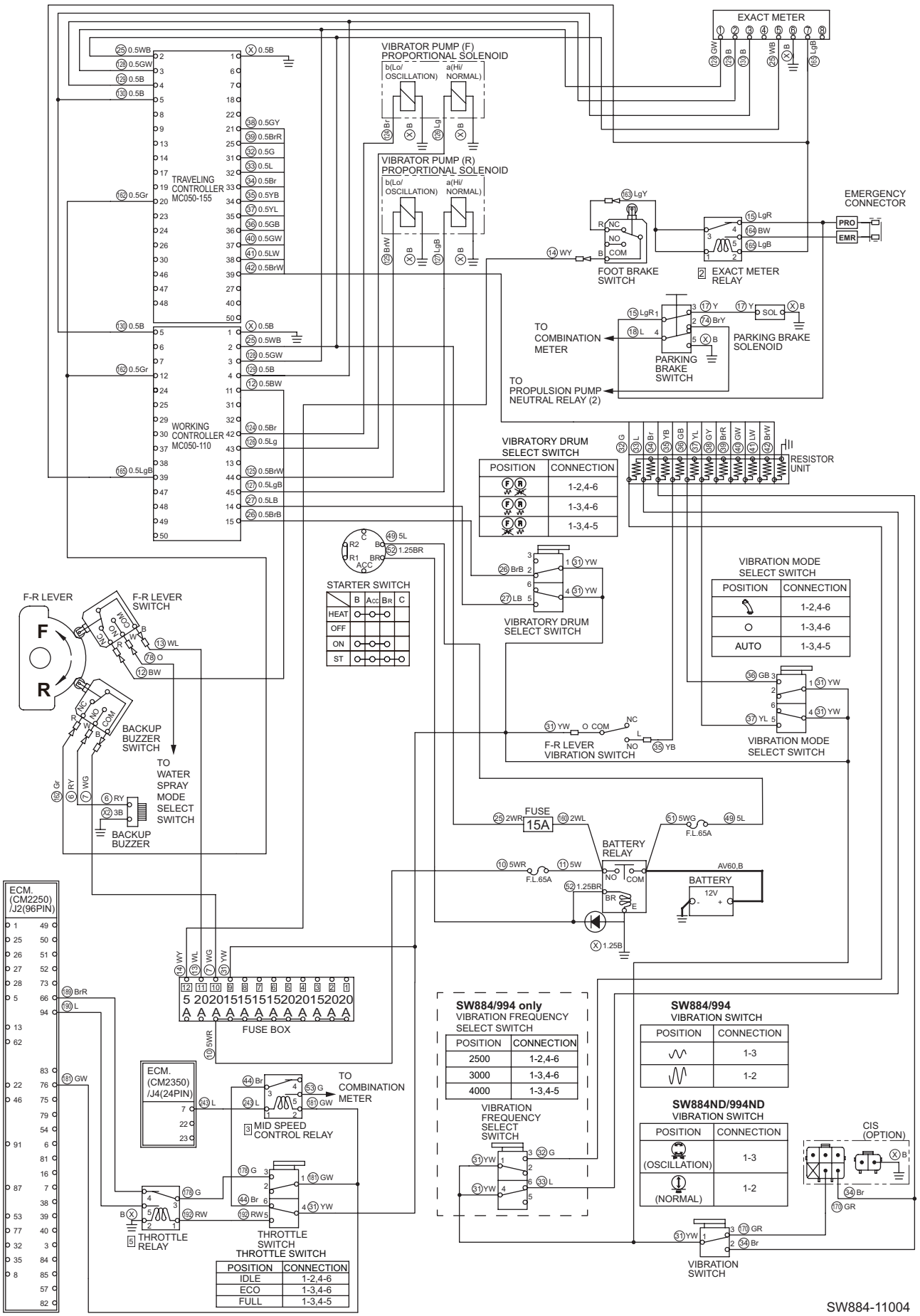

EXACT METER
VIBRATOR PUMP (F)
PROPORTIONAL SOLENOID
b(Lo/ OSCILLATION)
a(Hi/ NORMAL)
VIBRATOR PUMP (R)
PROPORTIONAL SOLENOID
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
EXACT METER RELAY
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
TO PROPULSION PUMP NEUTRAL RELAY (2)
VIBRATORY DRUM SELECT SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
RESISTOR UNIT
STARTER SWITCH
HEAT
OFF
ON
ST
VIBRATION MODE SELECT SWITCH
AUTO
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
F-R LEVER VIBRATION SWITCH
FUSE
15A
BATTERY RELAY
BATTERY
12V
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
FUSE BOX
MID SPEED CONTROL RELAY
THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
IDLE
ECO
FULL
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
2500
3000
4000
VIBRATION FREQUENCY SELECT SWITCH
SW884/994
VIBRATION SWITCH
SW884ND/994ND
VIBRATION SWITCH
(OSCILLATION)
(NORMAL)
CIS (OPTION)
VIBRATION SWITCH
SW884-11004

2-6-4. Continuous/automatic vibration mode cannot be switched 2/2

Reference Fig. : 2-6-1

Check point	Check/Cause	Action
3. Traveling Controller	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and vibration mode select switch is “  ”, measure voltage between traveling controller terminal wires and ground terminal 1 wire B. • Traveling controller terminal 36 inlet wire GB and ground terminal 1 wire B • Traveling controller terminal 35 inlet wire YL and ground terminal 1 wire B There is no electricity in normal condition. (3) When starter switch is ON and vibration mode select switch is “AUTO”, measure voltage between traveling controller terminal wires and ground terminal 1 wire B. • Traveling controller terminal 36 inlet wire GB and ground terminal 1 wire B • Traveling controller terminal 35 inlet wire YL and ground terminal 1 wire B Standard voltage : 12 V or more • 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. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-6-1

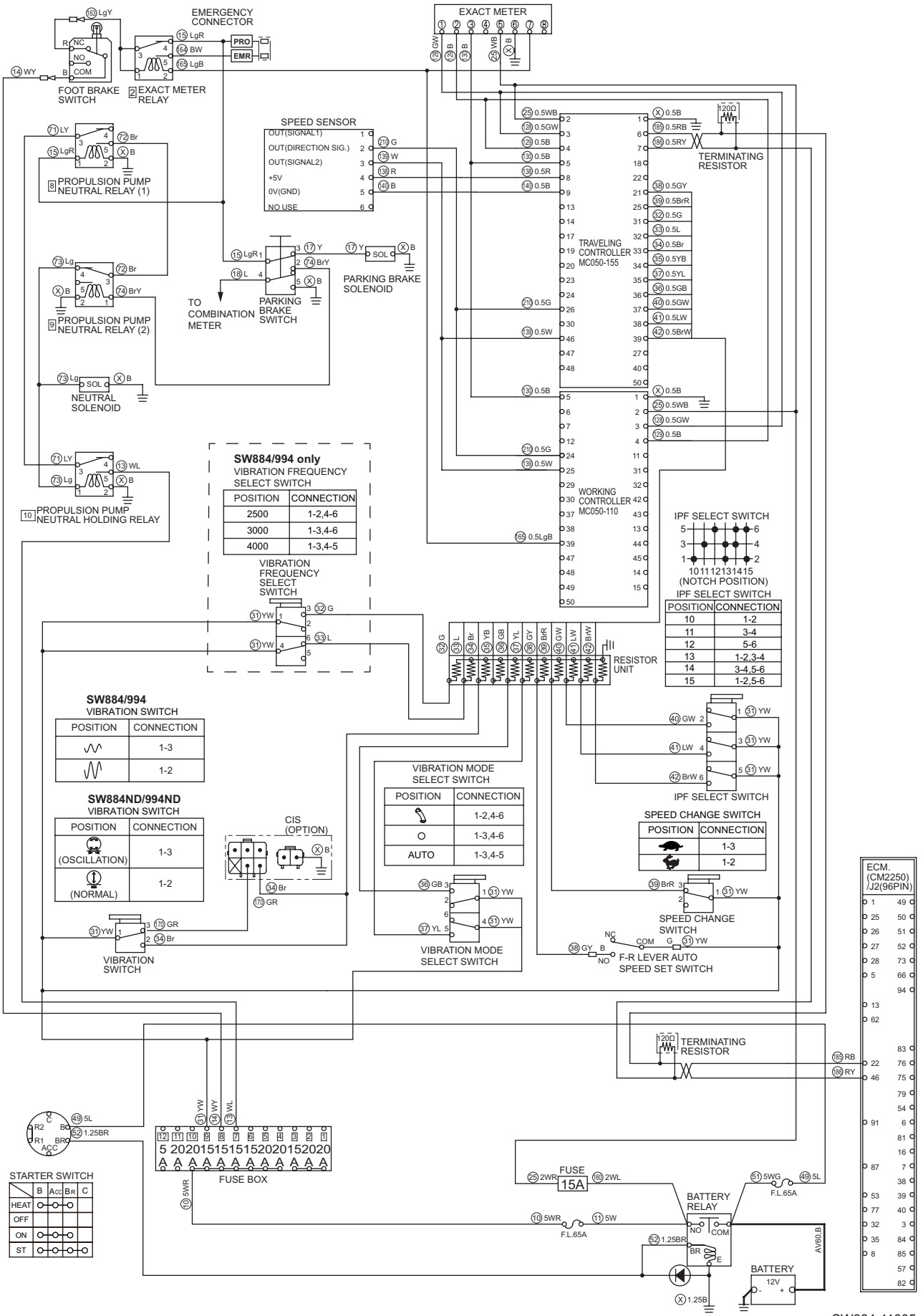

EXACT METER
VIBRATOR PUMP (F)
PROPORTIONAL SOLENOID
b(Lo/ OSCILLATION)
a(Hi/ NORMAL)
VIBRATOR PUMP (R)
PROPORTIONAL SOLENOID
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
EMERGENCY CONNECTOR
PRO
EMR
FOOT BRAKE SWITCH
2 EXACT METER RELAY
TO COMBINATION METER
PARKING BRAKE SWITCH
PARKING BRAKE SOLENOID
TO PROPULSION PUMP NEUTRAL RELAY (2)
VIBRATORY DRUM SELECT SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
RESISTOR UNIT
STARTER SWITCH
HEAT
OFF
ON
ST
VIBRATION MODE SELECT SWITCH
AUTO
F-R LEVER
F-R LEVER SWITCH
F-R LEVER VIBRATION SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TO WATER SPRAY MODE SELECT SWITCH
FUSE
15A
BATTERY RELAY
BATTERY
12V
ECM. (CM2250) /J2(96PIN)
ECM. (CM2350) /J4(24PIN)
FUSE BOX
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
2500
3000
4000
SW884/994
VIBRATION SWITCH
SW884ND/994ND
(OSCILLATION)
(NORMAL)
CIS (OPTION)
TO COMBINATION METER
3 MID SPEED CONTROL RELAY
5 THROTTLE RELAY
THROTTLE SWITCH
THROTTLE SWITCH
IDLE
ECO
FULL
SW884-11004

2-6-5. Front and rear vibratory drums cannot perform one-drum vibration

Reference Fig. : 2-6-1

Check point	Check/Cause	Action
1. Vibratory Drum Select Switch	(1) When starter switch is ON, measure voltage between vibratory drum select switch terminal 1, 4 inlet wires YW and chassis ground. Standard voltage: 12 V (2) When starter switch is ON and vibratory drum select switch is " Ⓕ Ⓡ ", measure voltage between vibratory drum select switch terminal wires and chassis ground. • Vibratory drum select switch terminal 2 outlet wire BrB and chassis ground • Vibratory drum select switch terminal 5 outlet wire LB and chassis ground There is no electricity in normal condition. (3) When starter switch is ON and vibratory drum select switch is " Ⓕ Ⓡ ", measure voltage between vibratory drum select switch terminal 2 outlet wire BrB and chassis ground. Standard voltage : 12 V (4) When starter switch is ON and vibratory drum select switch is " Ⓕ Ⓡ ", measure voltage between vibratory drum select switch terminal 5 outlet wire LB and chassis ground. Standard voltage : 12 V • 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.
2. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



SW884-11005

2-7. Exact Meter

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.

(NOTICE)

- **If any abnormality is found in shielded twisted wires, be sure to replace them.**

2-7-1. Exact meter indicator lamp does not illuminate while driving 1/10

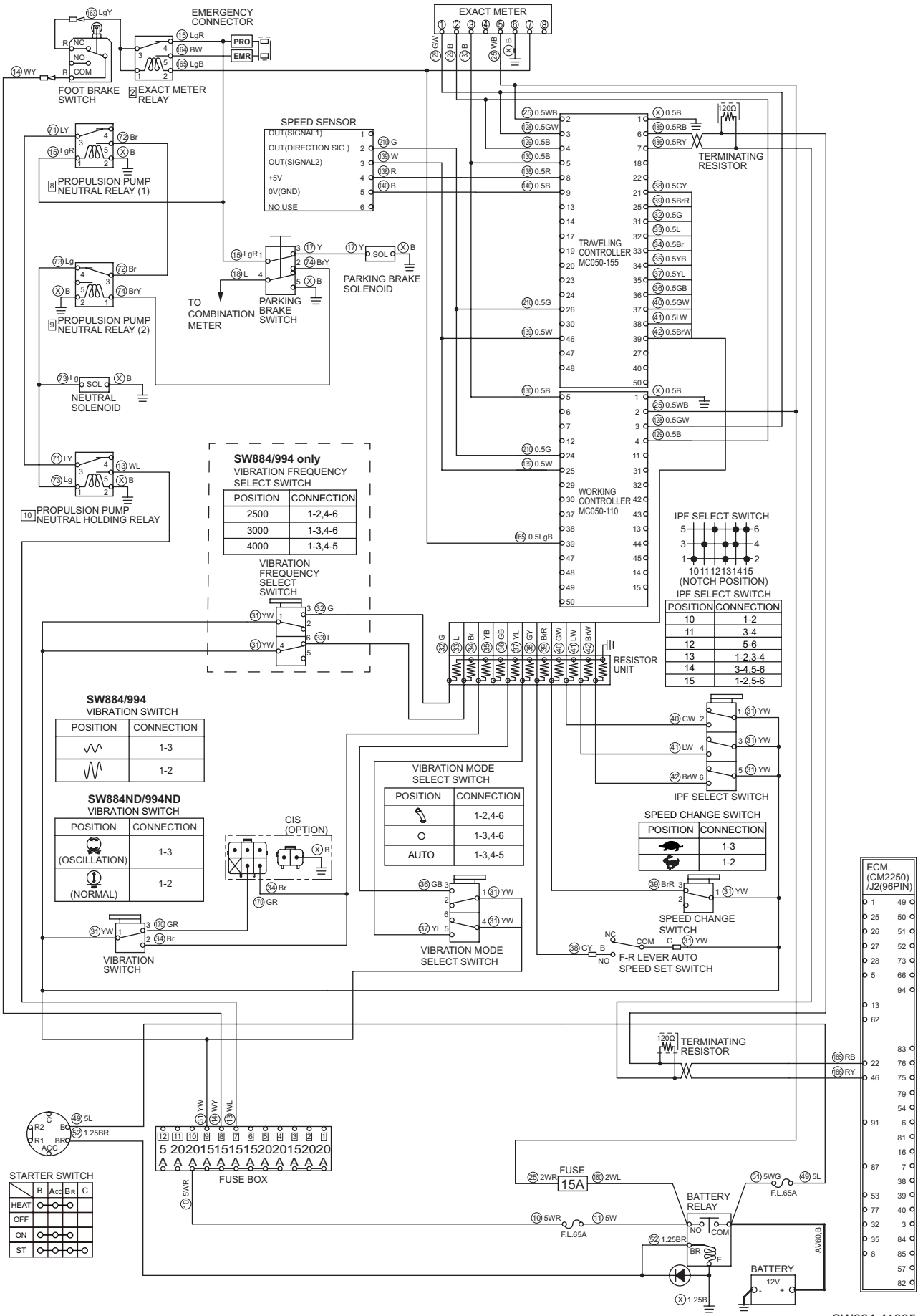
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E11	1. Connector	• Check speed sensor connector and traveling controller connector terminal 8, 9, 26, 46, working controller connector terminal 24, 25 for corrosion, breakage, bending and looseness. • 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. • Speed sensor terminal 2 wire G and traveling controller terminal 26 wire G, working controller terminal 24 wire G • Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller terminal 25 wire W • Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R • Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B Standard resistance : 10 Ω or less • 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 wire B. Standard voltage : 5 ± 0.25 V (2) Start engine and rotate vibratory drum. Measure pulse between speed sensor terminal 3 outlet wire W and ground terminal 5 wire B with a pulse meter. Standard pulse : 21 pulses/rotation • 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. ② Exact meter will display E11. ③ Move F-R lever “F” or “R” and run machine. ④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-5-1



SW884-11005

2-7-1. Exact meter indicator lamp does not illuminate while driving 2/10

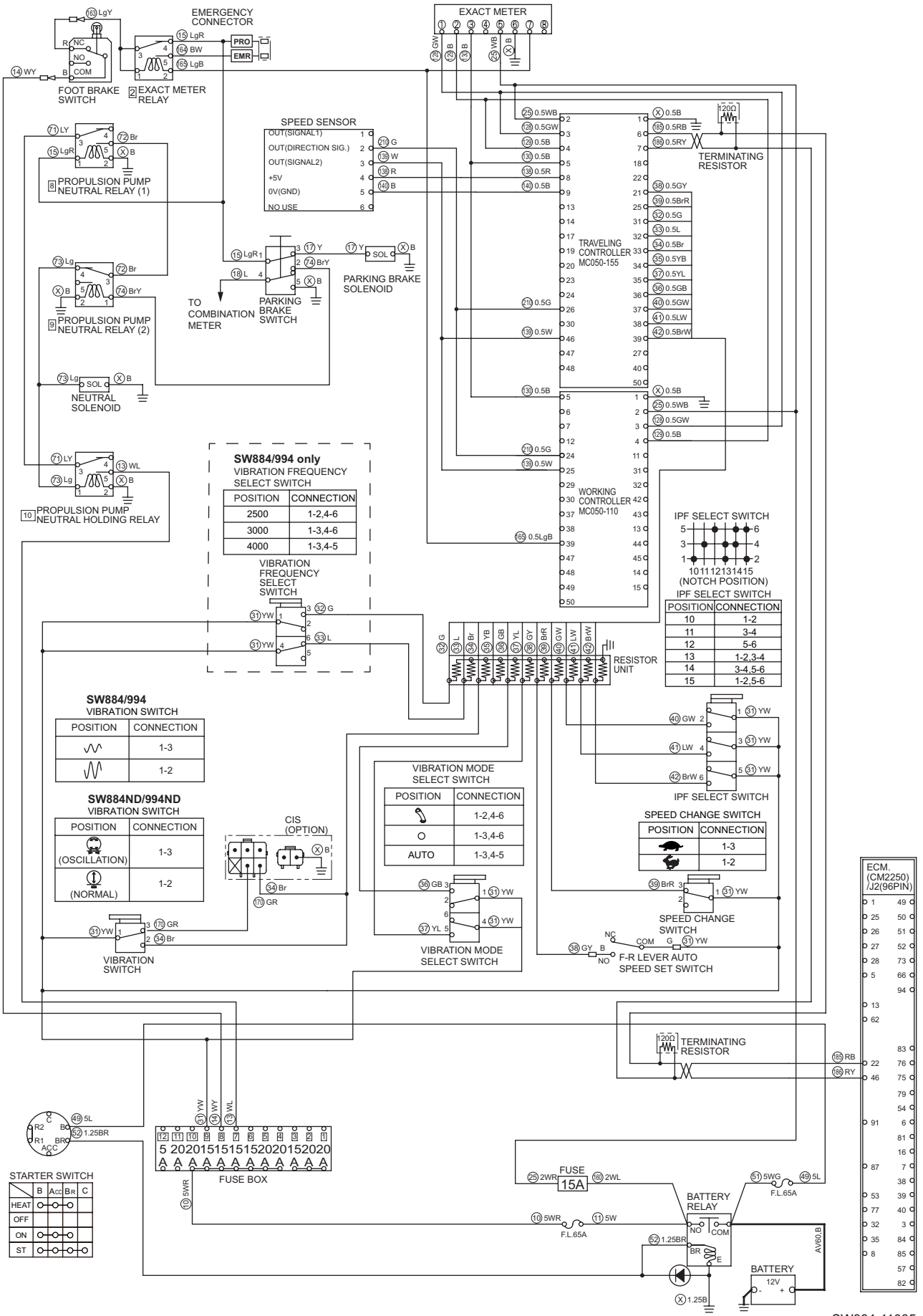
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E21	1. Connector	• Check vibration frequency select switch, vibration switch and traveling controller connector terminal 31, 32, 33 for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	(1) Measure resistances between switches and traveling controller terminal wires. • Vibration frequency select switch terminal 3 wire G and traveling controller terminal 31 wire G (SW884/994 only) • Vibration frequency select switch terminal 6 wire L and traveling controller terminal 32 wire L (SW884/994 only) • Vibration switch terminal 2 wire Br and traveling controller terminal 33 wire Br Standard resistance : 10 Ω or less (2) Measure resistances between switches and fuse box terminal wires. • Vibration frequency select switch terminal 1, 4 wires YW and fuse box terminal 9 wire YW (SW884/994 only) • Vibration switch terminal 1 wire YW and fuse box terminal 9 wire YW Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
	3. Vibration Frequency Select Switch (SW884/994 only)	(1) When starter switch is ON, measure voltage between vibration frequency select switch terminal 1, 4 inlet wires YW and chassis ground. Standard voltage : 12 V or more (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. Standard voltage : 12 V or more (3) When starter switch is ON, vibration frequency select switch is “3000”, measure voltage between vibration frequency select switch terminal wires and chassis ground. • Vibration frequency select switch terminal 3 outlet wire G and chassis ground • Vibration frequency select switch terminal 6 outlet wire L and chassis ground Standard voltage : 12 V or more (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. Standard voltage : 12 V or more • 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



SW884-11005

2-7-1. Exact meter indicator lamp does not illuminate while driving 3/10

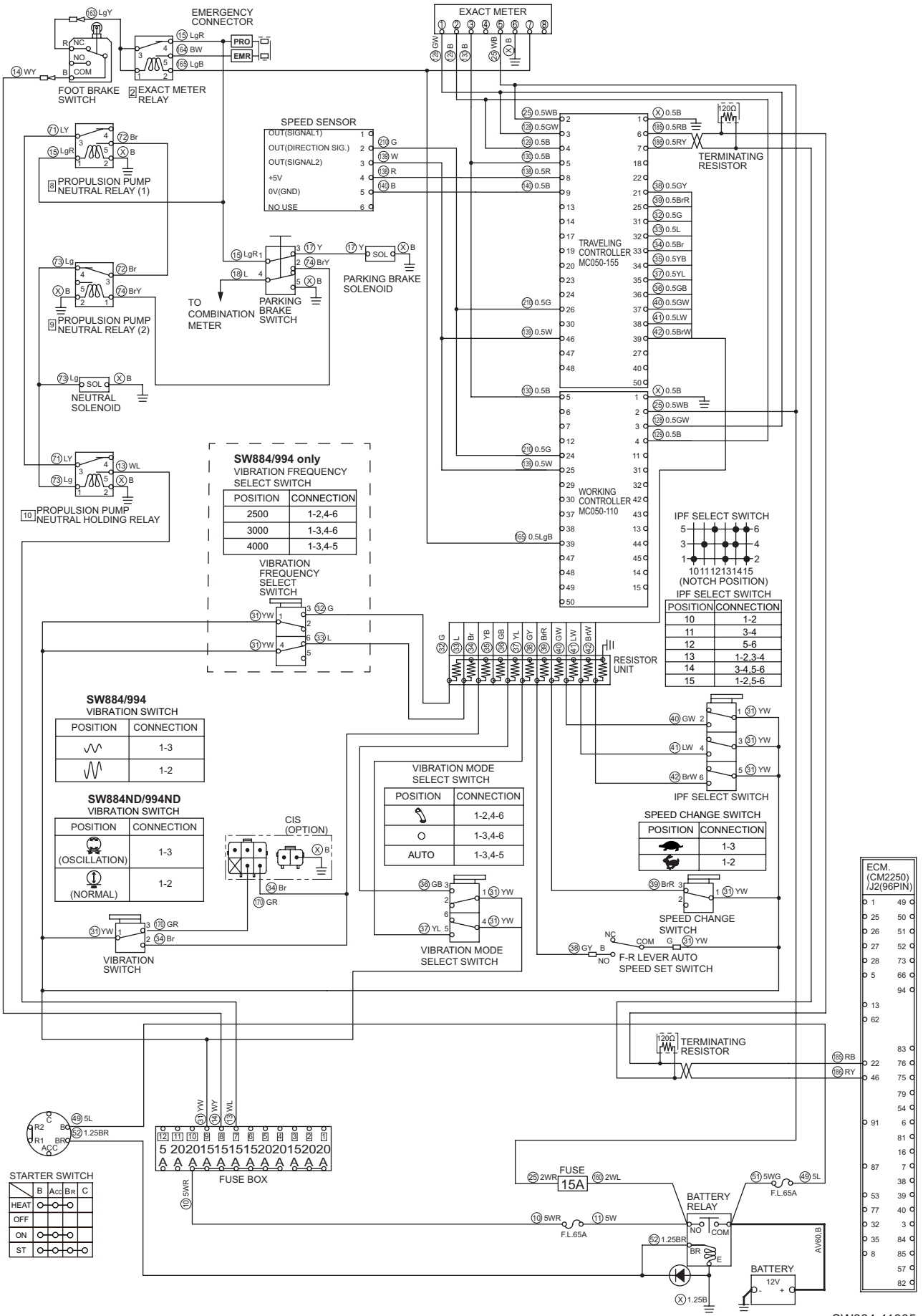
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E21	4. Vibration Switch (SW884/994)	(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and vibration switch is “ ∿ ”, measure voltage between vibration switch terminal 3 outlet wire GR and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and vibration switch is “ ⩘ ”, measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) or (3) is NG, vibration switch is faulty.	Replace vibration switch.
	5. Vibration Switch (SW884ND/ 994ND)	(1) When starter switch is ON, measure voltage between vibration switch terminal 1 inlet wire YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and vibration switch is “ 🚗 ”, measure voltage between vibration switch terminal 3 outlet wire GR and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and vibration switch is “ ⓘ ”, measure voltage between vibration switch terminal 2 outlet wire Br and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) or (3) is NG, vibration switch is faulty.	Replace vibration switch.
	6. Resistor Unit	• Measure resistances between resistor unit wires and ground wire. • Resistor unit wire No. 32 wire G and ground wire (SW884/994 only) • Resistor unit wire No. 33 wire L and ground wire (SW884/994 only) • Resistor unit wire No. 34 wire Br and ground wire Standard resistance : 300 Ω • If resistance is abnormal, resistor unit is faulty. **(NOTICE)** **• Resistor unit is used to stabilize contact of switch.**	Replace resistor unit.

Fig.: 2-5-1



SW884-11005

2-7-1. Exact meter indicator lamp does not illuminate while driving 4/10

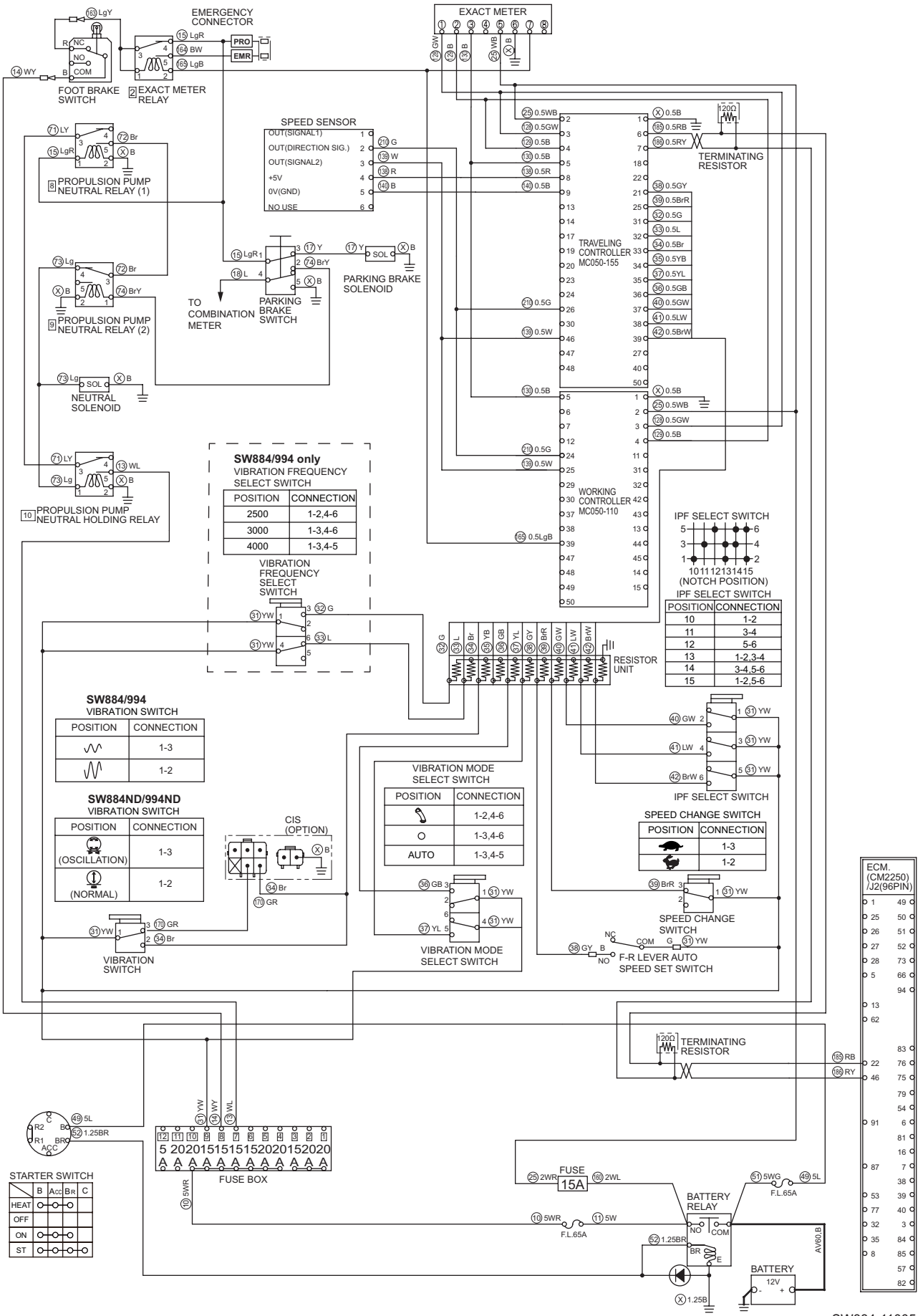
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E21	6. Traveling Controller (SW884/994)	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and vibration frequency select switch is “2500”, measure voltage between traveling controller terminal 32 inlet wire L and ground terminal 1 wire B. Standard voltage : 12 V or more (3) When starter switch is ON and vibration frequency select switch is “3000”, measure voltage between traveling controller terminal wires. • Traveling controller terminal 31 inlet wire G and ground terminal 1 wire B • Traveling controller terminal 32 inlet wire L and ground terminal 1 wire B Standard voltage : 12 V or more (4) When starter switch is ON and vibration frequency select switch is “4000”, measure voltage between traveling controller terminal 31 inlet wire G and ground terminal 1 wire B. Standard voltage : 12 V or more (5) When starter switch is ON and vibration switch is “  ” measure voltage between traveling controller terminal 33 inlet wire Br and ground terminal 1 wire B. Standard voltage : 12 V or more • If above items (1), (2), (3), (4) and (5) are OK, traveling controller is faulty.	Replace traveling controller.

Fig.: 2-5-1



SW884-11005

2-7-1. Exact meter indicator lamp does not illuminate while driving 5/10

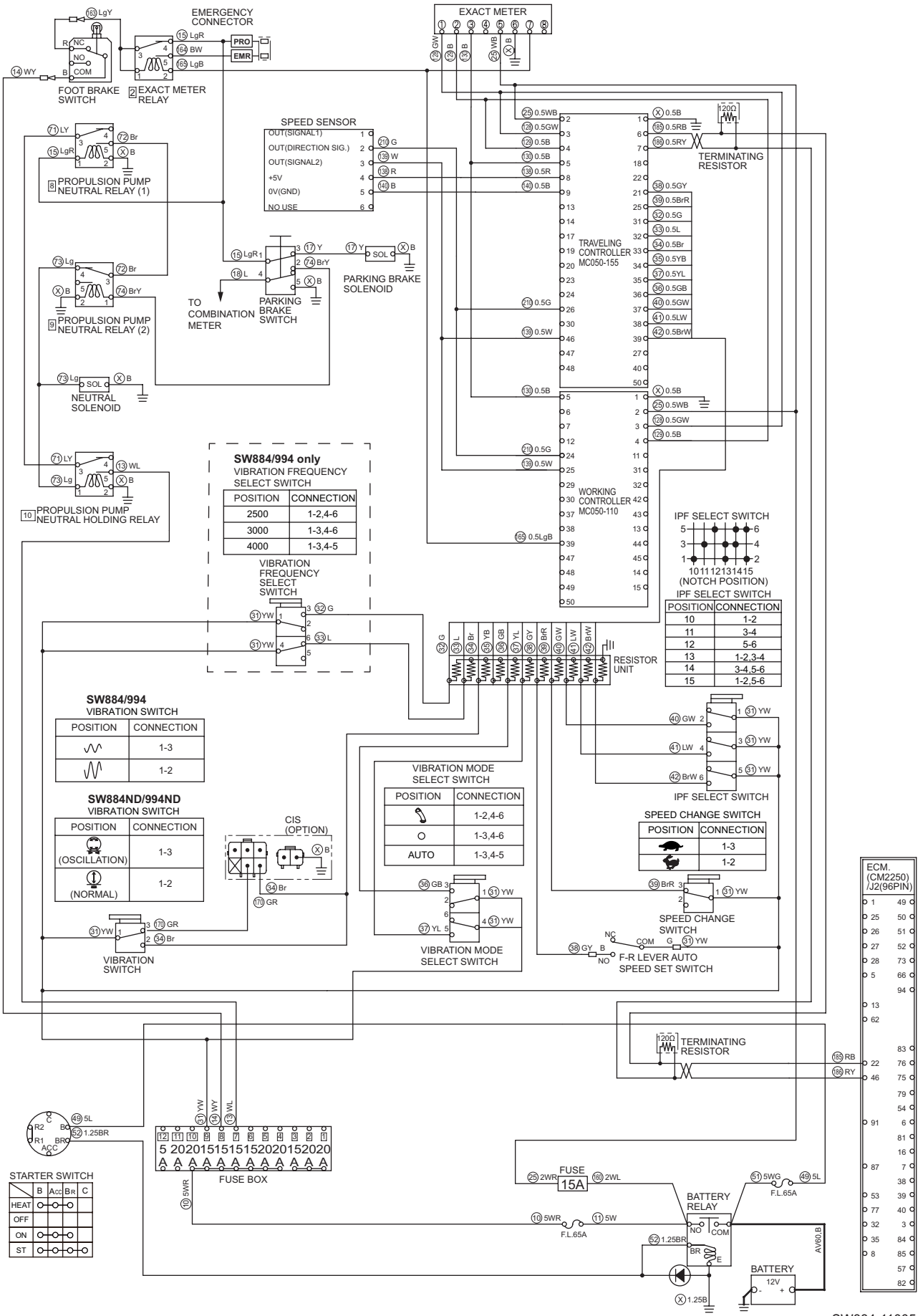
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

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

Fig.: 2-5-1



SW884-11005

2-7-1. Exact meter indicator lamp does not illuminate while driving 6/10

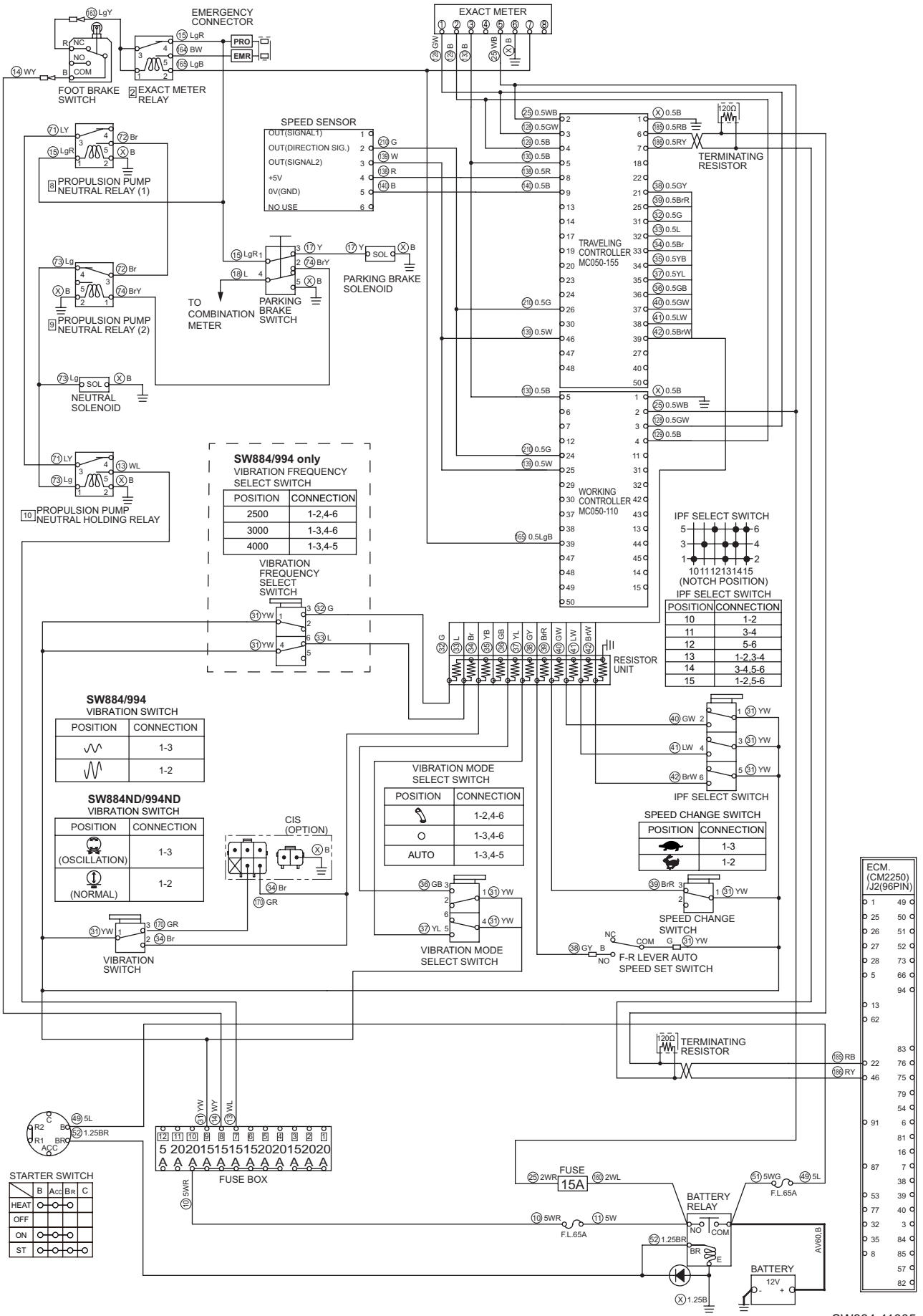
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E22	1. Connector	• Check IPF select switch connector and traveling controller connector terminal 37, 38, 39 for corrosion, breakage, bending and looseness. • 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. • IPF select switch terminal 2 wire GW and traveling controller terminal 37 wire GW • IPF select switch terminal 4 wire LW and traveling controller terminal 38 wire LW • IPF select switch terminal 6 wire BrW and traveling controller terminal 39 wire BrW Standard resistance : 10 Ω or less (2) Measure resistances between IPF select switch terminal 1, 3, 5 wires YW and fuse box terminal 9 wire YW. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



SW884-11005

2-7-1. Exact meter indicator lamp does not illuminate while driving 7/10

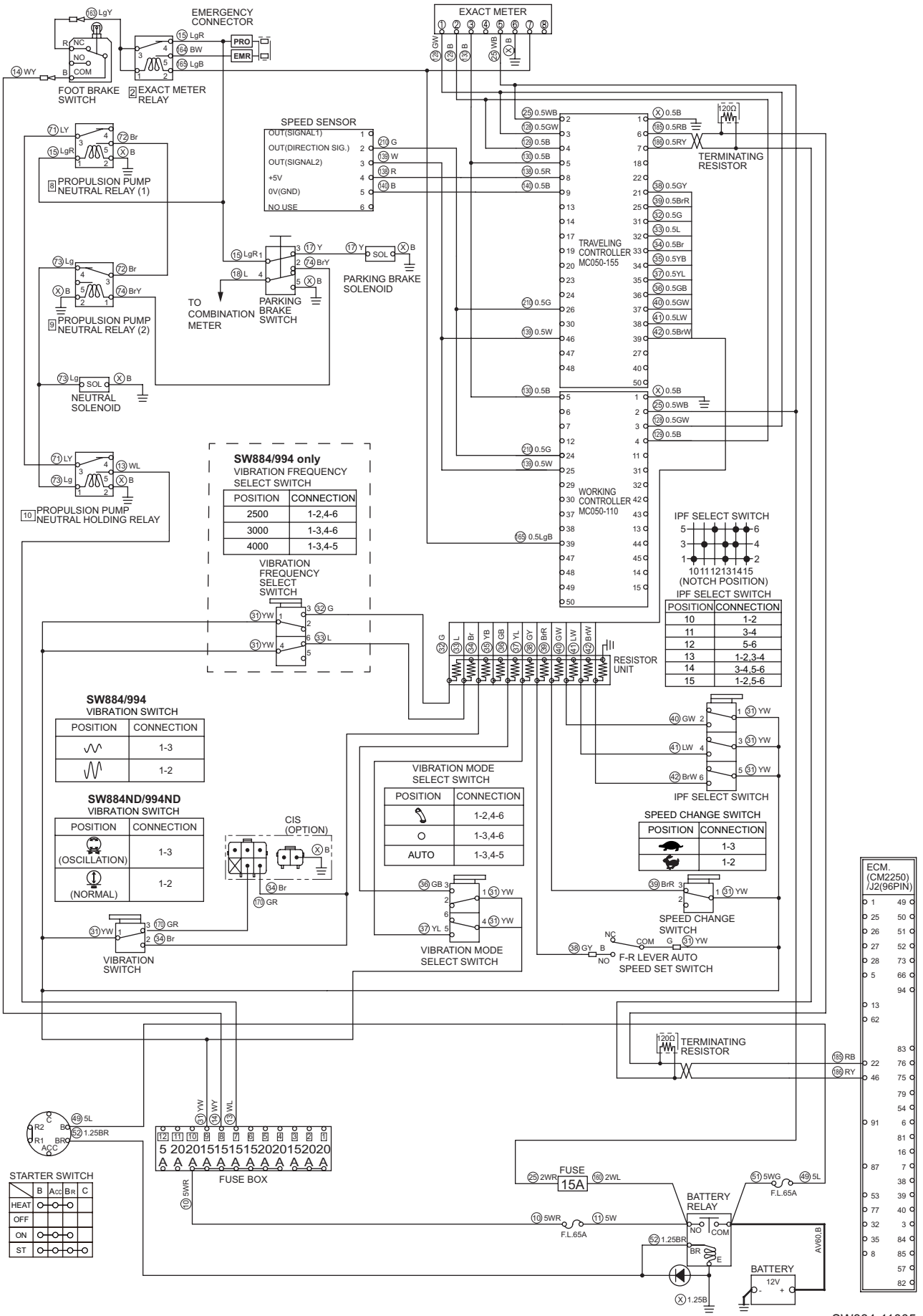
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E22	3. IPF Select Switch	(1) When starter switch is ON, measure voltage between IPF select switch terminal 1, 3, 5 inlet wires YW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and IPF select switch is “10”, measure voltage between IPF select switch terminal 2 outlet wire GW and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and IPF select switch is “11”, measure voltage between IPF select switch terminal 4 outlet wire LW and chassis ground. Standard voltage : 12 V or more (4) When starter switch is ON and IPF select switch is “12”, measure voltage between IPF select switch terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more (5) When starter switch is ON and IPF select switch is “13”, measure voltage between IPF select switch terminal 2 outlet wire GW, terminal 4 outlet wire LW and chassis ground. Standard voltage : 12 V or more (6) When starter switch is ON and IPF select switch is “14”, measure voltage between IPF select switch terminal 4 outlet wire LW, terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more (7) When starter switch is ON and IPF select switch is “15”, measure voltage between IPF select switch terminal 2 outlet wire GW, terminal 6 outlet wire BrW and chassis ground. Standard voltage : 12 V or more • 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. • Resistor unit wire No.40 wire GW and ground wire • Resistor unit wire No.41 wire LW and ground wire • Resistor unit wire No.42 wire BrW and ground wire Standard resistance : 300 Ω • If resistance is abnormal, resistor unit is faulty. **(NOTICE)** **• Resistor unit is used to stabilize contact of switch.**	Replace resistor unit.

Fig.: 2-5-1



SW884-11005

2-7-1. Exact meter indicator lamp does not illuminate while driving 8/10

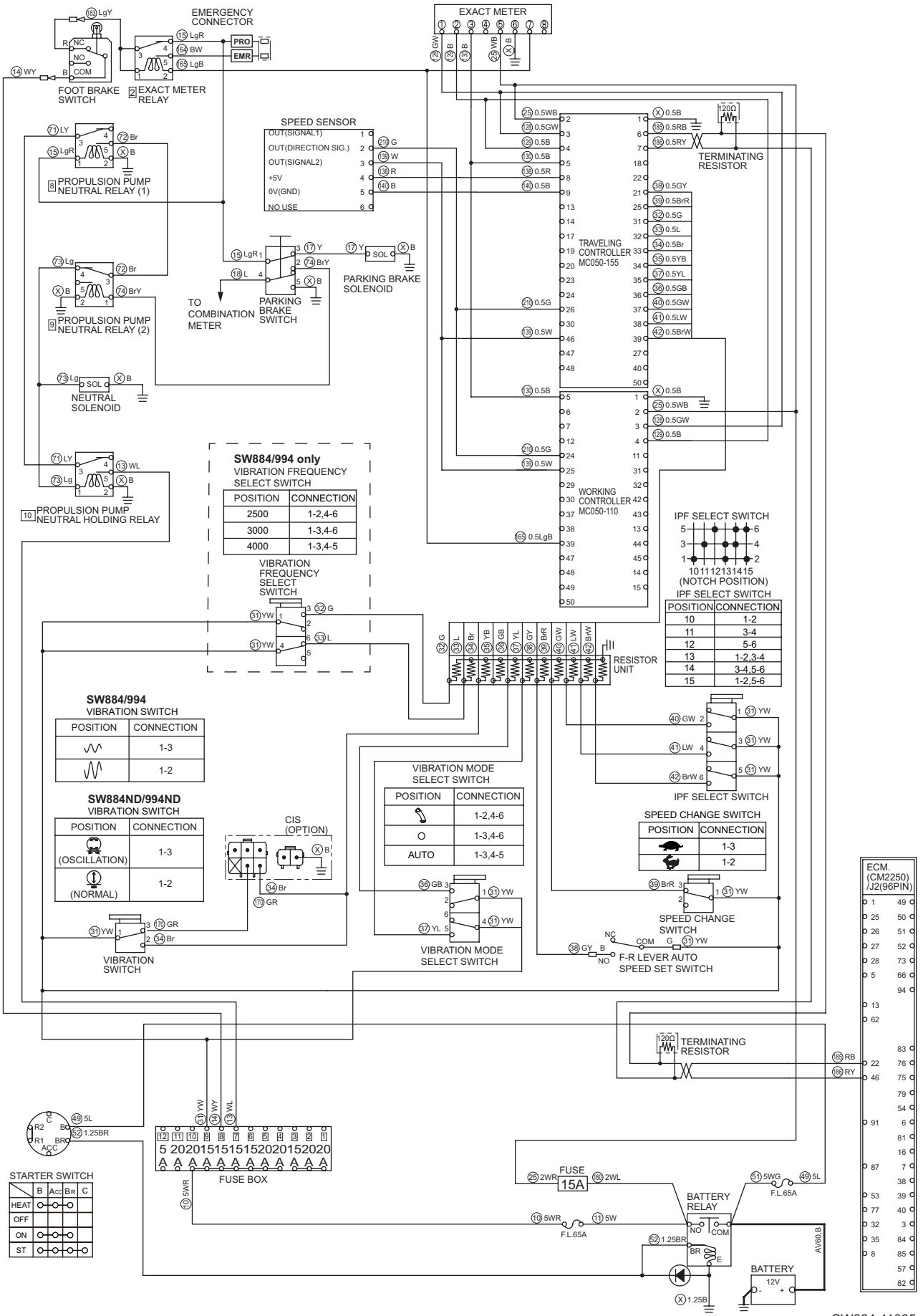
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E22	5. Traveling Controller	(1) When starter switch is ON, measure voltage between traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and IPF select switch is “10”, measure voltage between traveling controller terminal 37 inlet wire GW and ground terminal 1 wire B. Standard voltage : 12 V or more (3) When starter switch is ON and IPF select switch is “11”, measure voltage between traveling controller terminal 38 inlet wire LW and ground terminal 1 wire B. Standard voltage : 12 V or more (4) When starter switch is ON and IPF select switch is “12”, measure voltage between traveling controller terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more (5) When starter switch is ON and IPF select switch is “13”, measure voltage between traveling controller terminal 37 inlet wire GW, terminal 38 inlet wire LW and ground terminal 1 wire B. Standard voltage : 12 V or more (6) When starter switch is ON and IPF select switch is “14”, measure voltage between traveling controller terminal 38 inlet wire LW, terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more (7) When starter switch is ON and IPF select switch is “15”, measure voltage between traveling controller terminal 37 inlet wire GW, terminal 39 inlet wire BrW and ground terminal 1 wire B. Standard voltage : 12 V or more • If all of items (1) through (7) are OK, traveling controller is faulty.	Replace traveling controller.
	6. Clearing Error Code and Judging OK/NG after Repair	① When repair is complete, set starter switch to ON. ② Exact meter will display vehicle speed. ③ Check all positions of IPF select switch. Exact meter will still display vehicle speed. Machine is in normal state. If display changes form vehicle speed to E22, check above items again.	

Fig.: 2-5-1


EMERGENCY CONNECTOR
EXACT METER
FOOT BRAKE SWITCH
EXACT METER RELAY
SPEED SENSOR
OUT(SIGNAL1)
OUT(DIRECTION SIG.)
OUT(SIGNAL2)
+5V
0V(GND)
NO USE
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
TERMINATING RESISTOR
PROPULSION PUMP NEUTRAL RELAY (1)
PROPULSION PUMP NEUTRAL RELAY (2)
PROPULSION PUMP NEUTRAL HOLDING RELAY
NEUTRAL SOLENOID
PARKING BRAKE SOLENOID
PARKING BRAKE SWITCH
TO COMBINATION METER
SW884/994 only
VIBRATION FREQUENCY SELECT SWITCH
POSITION CONNECTION
2500 1-2,4-6
3000 1-3,4-6
4000 1-3,4-5
IPF SELECT SWITCH
(NOTCH POSITION)
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
RESISTOR UNIT
SW884/994
VIBRATION SWITCH
POSITION CONNECTION
1-3
1-2
SW884ND/994ND
VIBRATION SWITCH
POSITION CONNECTION
(OSCILLATION) 1-3
(NORMAL) 1-2
CIS (OPTION)
VIBRATION SWITCH
VIBRATION MODE SELECT SWITCH
POSITION CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
SPEED CHANGE SWITCH
POSITION CONNECTION
1-3
1-2
F-R LEVER AUTO SPEED SET SWITCH
STARTER SWITCH
B Acc BR C
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
ECM. (CM2250) /J2(96PIN)
SW884-11005

2-7-1. Exact meter indicator lamp does not illuminate while driving 9/10

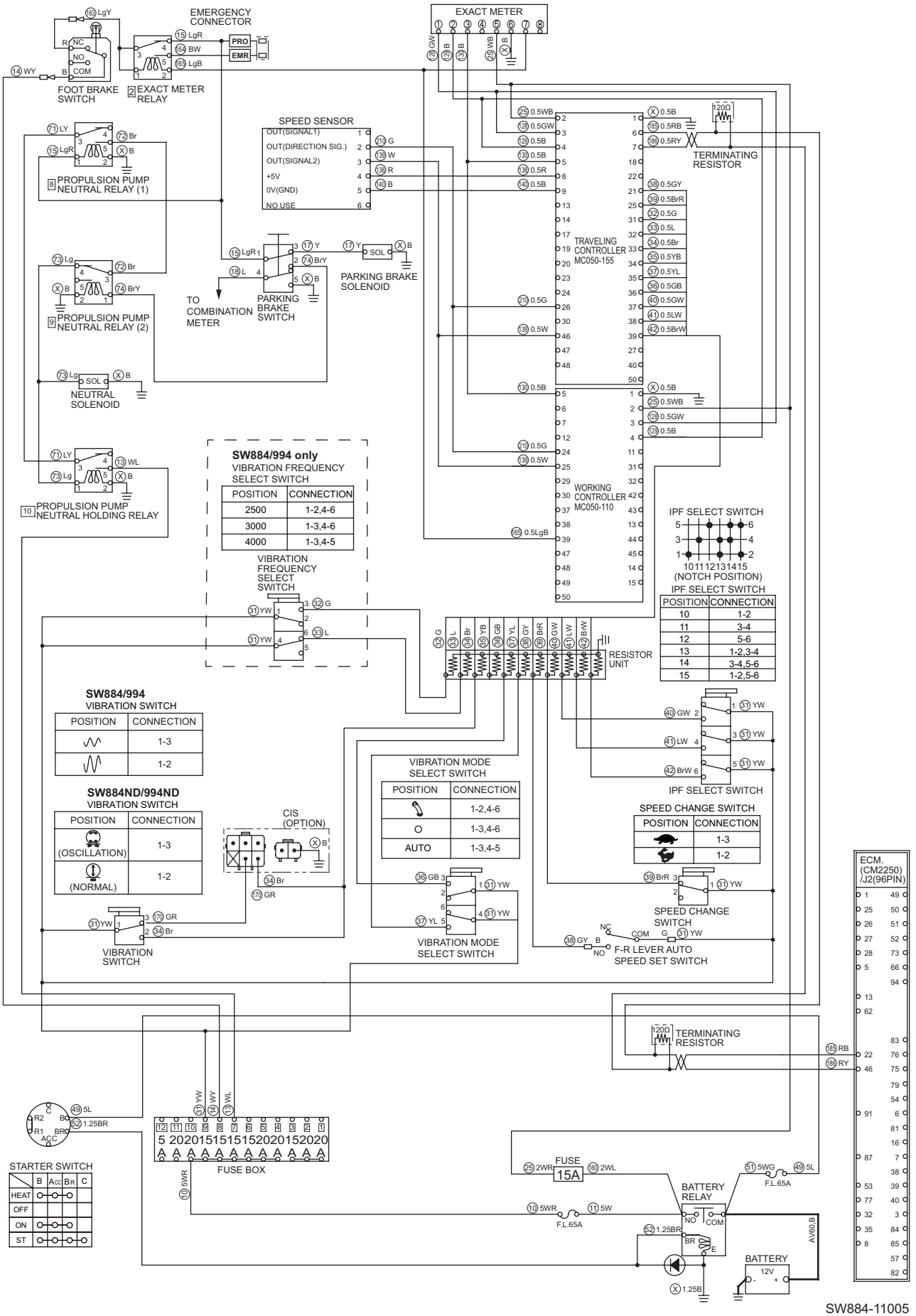
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

Error code	Check point	Check/Cause	Action
E43	1. Connector	• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between exact meter and traveling controller terminal wires. • Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW • Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B • Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Replace harness.
	3. Exact Meter	• When starter switch is ON, measure voltage between exact meter terminal 5 inlet wire WB and ground terminal 6 wire B. Standard voltage : 12 V or more • 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. • 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. ② Place F-R lever “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-5-1



SW884-11005

2-7-1. Exact meter indicator lamp does not illuminate while driving 10/10

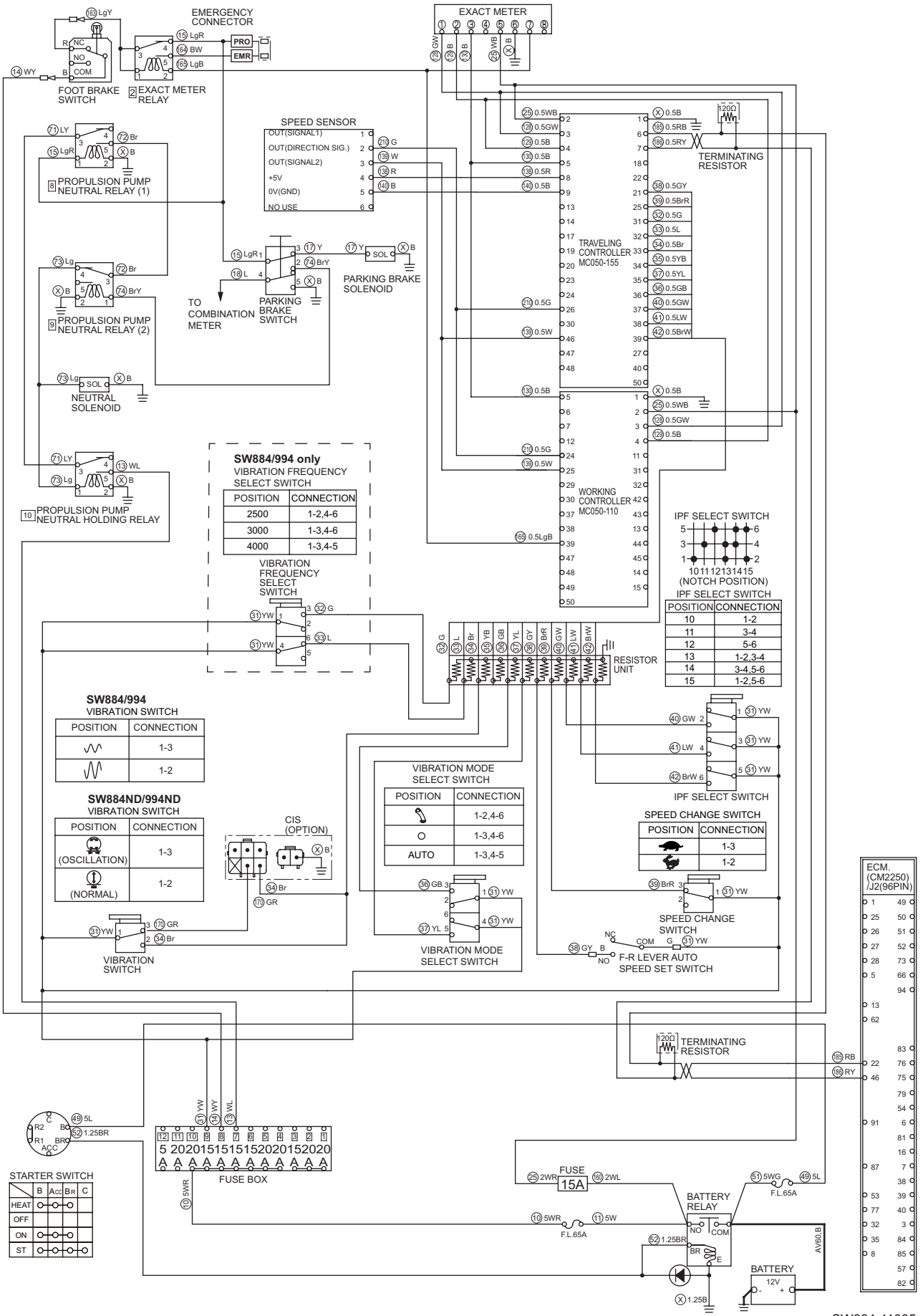
- Exact meter indicator lamp illuminates only while vibration is activated.
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

Reference Fig. : 2-5-1

Check point	Check/Cause	Action
1. Connector	• Check exact meter connector terminal 1, 2, 3, 7 and traveling controller connector terminal 3, 4, 5, working controller connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
2. Harness	• Measure resistances between exact meter and traveling controller terminal wires. • Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW • Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B • Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • 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.: 2-5-1



SW884-11005

2-7-2. No vehicle speed indication on display 1/3

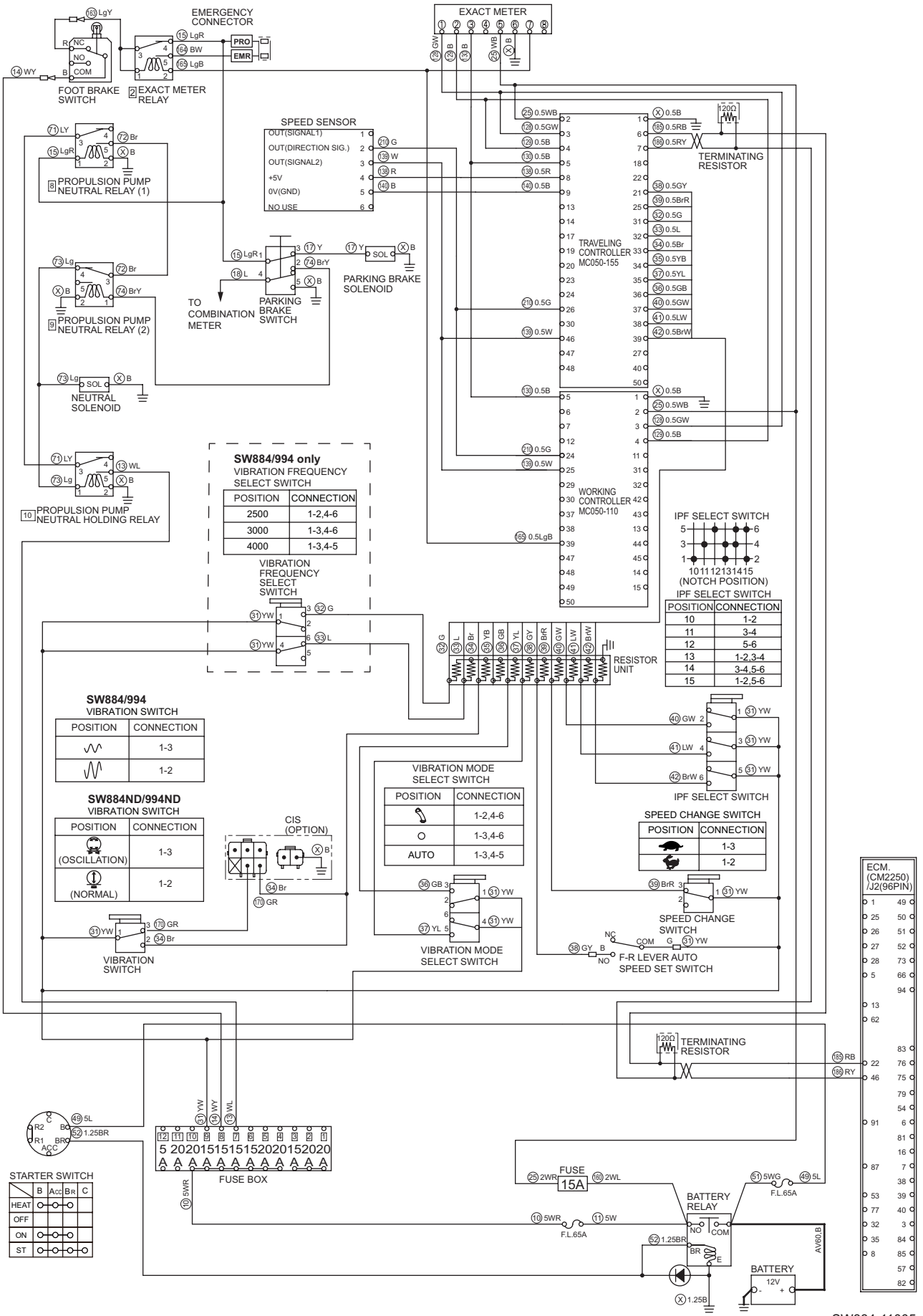
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

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 connector terminal 24, 25 for corrosion, breakage, bending and looseness. • 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. • Speed sensor terminal 2 wire G and traveling controller terminal 26 wire G, working controller terminal 24 wire G • Speed sensor terminal 3 wire W and traveling controller terminal 46 wire W, working controller terminal 25 wire W • Speed sensor terminal 4 wire R and traveling controller terminal 8 wire R • Speed sensor terminal 5 wire B and traveling controller terminal 9 wire B Standard resistance : 10 Ω or less • 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. Standard voltage : 5 ± 0.25 V (2) Start engine and rotate vibratory drum. Measure pulse between speed sensor terminal 3 outlet wire W and terminal 5 outlet wire B with a pulse meter. Standard pulse : 21 pulses/rotation • 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. ② Exact meter will display E11. ③ Move F-R lever “F” or “R” and run machine. ④ Exact meter display will change from E11 to vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-5-1



SW884-11005

2-7-2. No vehicle speed indication on display 2/3

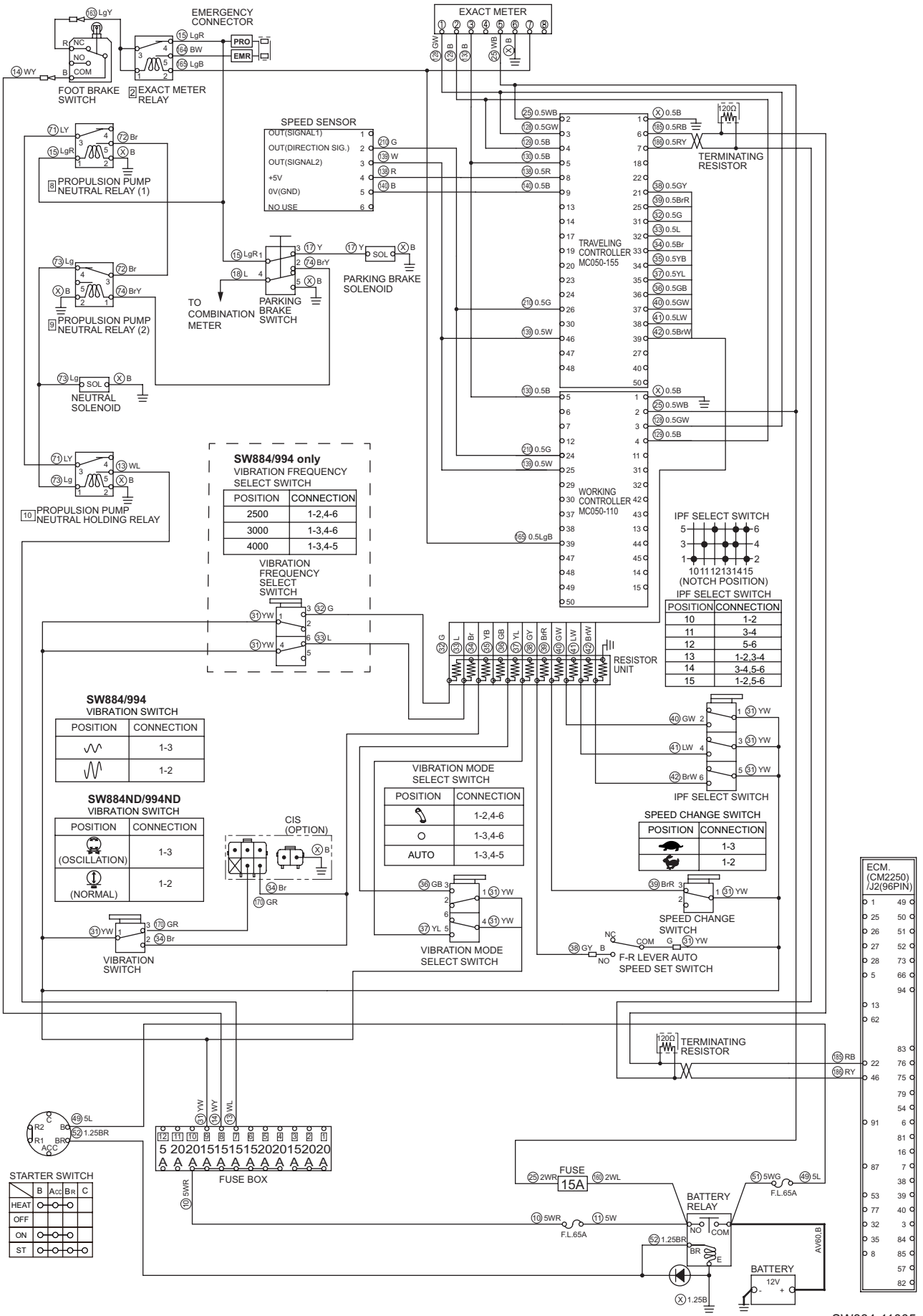
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

1) When display shows any error code

Reference Fig. : 2-5-1

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 connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between exact meter and traveling controller terminal wires. • Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW • Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B • Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • 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. Standard voltage : 12 V or more • 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. • 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. ② Place F-R lever “N”. Exact meter will display vehicle speed. Machine is in normal state. If display does not change to vehicle speed, check above items again.	

Fig.: 2-5-1



SW884-11005

2-7-2. No vehicle speed indication on display 3/3

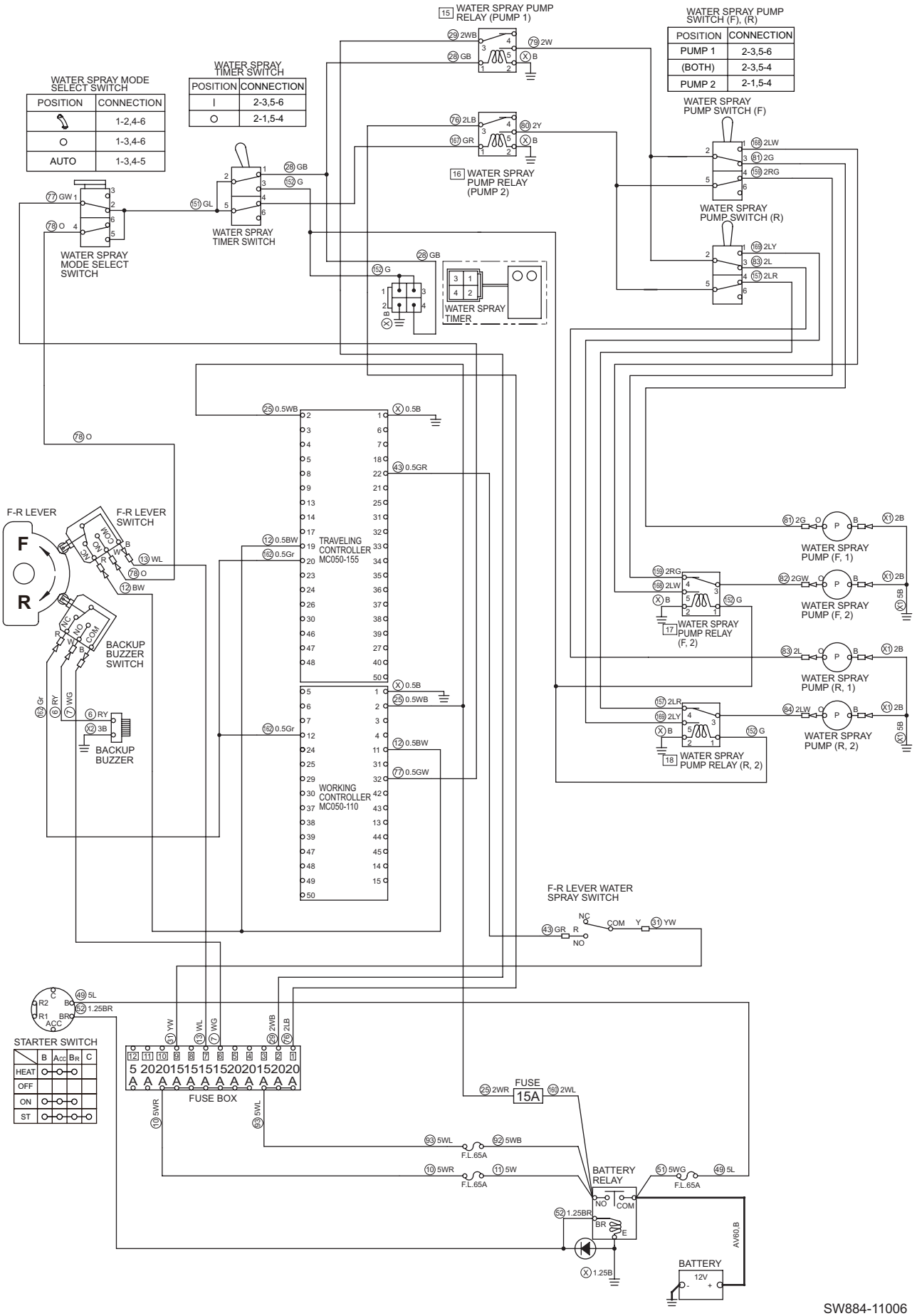
- Set engine throttle switch to “FULL”.
- Check whether exact meter multiple display shows any error code.

2) When display shows no error code

Reference Fig. : 2-5-1

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 connector terminal 3, 4, 5, 39, for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
2. Harness	• Measure resistances between exact meter and traveling controller terminal wires. • Exact meter terminal 1 wire GW and traveling controller terminal 3 wire GW, working controller terminal 3 wire GW • Exact meter terminal 2 wire B and traveling controller terminal 4 wire B, working controller terminal 4 wire B • Exact meter terminal 3 wire B and traveling controller terminal 5 wire B, working controller terminal 5 wire B • Exact meter terminal 7 wire LgB and working controller terminal 39 wire LgB Standard resistance : 10 Ω or less • 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


15 WATER SPRAY PUMP RELAY (PUMP 1)
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
I | 2-3,5-6
O | 2-1,5-4
WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
O | 1-3,4-6
AUTO | 1-3,4-5
WATER SPRAY PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
16 WATER SPRAY PUMP RELAY (PUMP 2)
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY TIMER
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
WATER SPRAY PUMP (F, 1)
WATER SPRAY PUMP (F, 2)
WATER SPRAY PUMP (R, 1)
WATER SPRAY PUMP (R, 2)
17 WATER SPRAY PUMP RELAY (F, 2)
18 WATER SPRAY PUMP RELAY (R, 2)
F-R LEVER WATER SPRAY SWITCH
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
F.L.65A
SW884-11006

2-8. Water Spray

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.

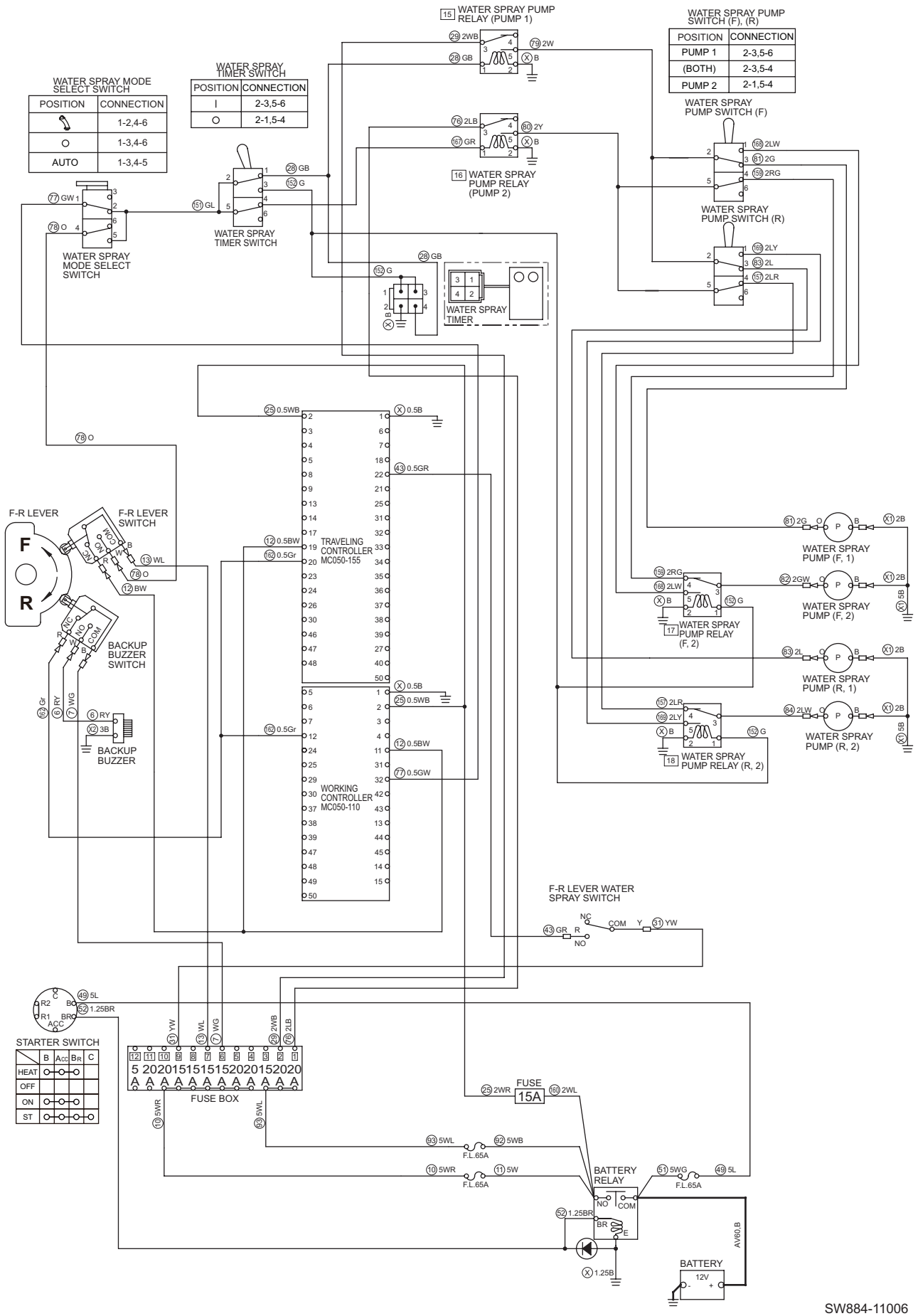
2-8-1. Continuous water spray does not operate 1/4

- 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. • Water spray pump (F, 1) inlet wire: G • Water spray pump (F, 2) inlet wire: GW • Water spray pump (R,1) inlet wire: L • Water spray pump (R,2) inlet wire: LW Standard voltage: 12 V or more (2) Check if grounding of each water spray pump is normal. • If above items (1) and (2) are OK and water spray pump does not operate, water spray pump is faulty. **(NOTICE)** **• There are a total of four water spray pumps, two each for front and rear drums.** **• 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. There is continuity in normal condition. • If there is no continuity, F-R lever water spray switch is faulty. **(NOTICE)** **• 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. Standard voltage : 12 V (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. Standard voltage : 12 V • 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
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
15 WATER SPRAY PUMP RELAY (PUMP 1)
16 WATER SPRAY PUMP RELAY (PUMP 2)
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 PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY TIMER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
WATER SPRAY PUMP (F, 1)
WATER SPRAY PUMP (F, 2)
WATER SPRAY PUMP (R, 1)
WATER SPRAY PUMP (R, 2)
17 WATER SPRAY PUMP RELAY (F, 2)
18 WATER SPRAY PUMP RELAY (R, 2)
F-R LEVER WATER SPRAY SWITCH
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
F.L.65A
SW884-11006

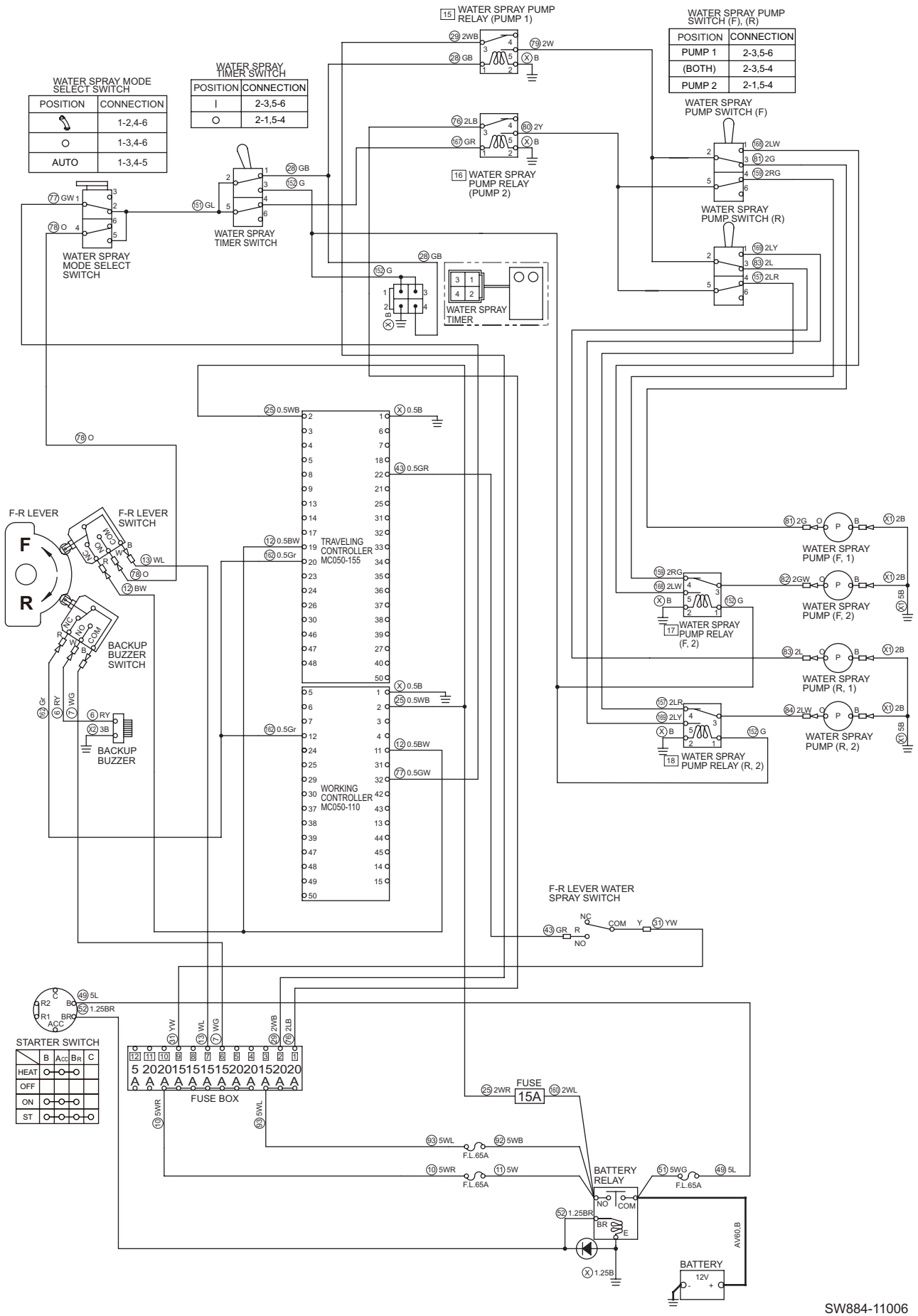
2-8-1. Continuous water spray does not operate 2/4

- 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. Standard voltage : 12 V (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer switch terminal 1 outlet wire GB and chassis ground. Standard voltage : 12 V (3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer switch terminal 4 outlet wire GR and chassis ground. Standard voltage: 12 V • 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. 15 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. Standard voltage : 12 V (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 1) terminal 3 inlet wire WB and chassis ground. Standard voltage : 12 V (3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 1) terminal 5 outlet wire W and chassis ground. Standard voltage : 12 V • 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. 16 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. Standard voltage : 12 V (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 2) terminal 3 inlet wire LB and chassis ground. Standard voltage : 12 V (3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (pump 2) terminal 5 outlet wire Y and chassis ground. Standard voltage : 12 V • 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
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
15 WATER SPRAY PUMP RELAY (PUMP 1)
16 WATER SPRAY PUMP RELAY (PUMP 2)
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 PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY TIMER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
WATER SPRAY PUMP (F, 1)
WATER SPRAY PUMP (F, 2)
WATER SPRAY PUMP (R, 1)
WATER SPRAY PUMP (R, 2)
17 WATER SPRAY PUMP RELAY (F, 2)
18 WATER SPRAY PUMP RELAY (R, 2)
F-R LEVER WATER SPRAY SWITCH
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
F.L.65A
SW884-11006

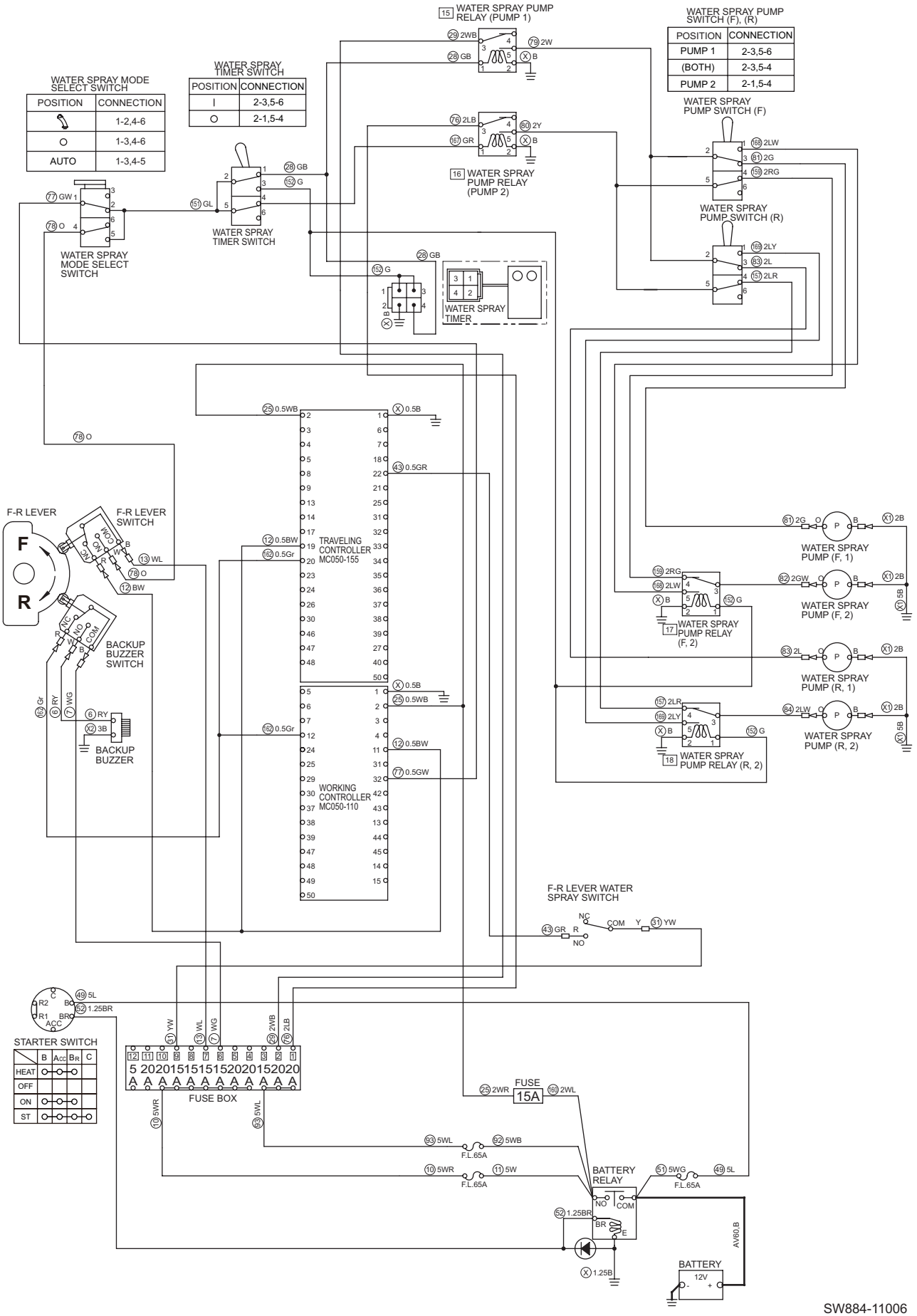
2-8-1. Continuous water spray does not operate 3/4

- 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. Standard voltage : 12 V (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. • Center position (both pumps) Water spray pump switch (F) terminal 3 outlet wire G and chassis ground Water spray pump switch (F) terminal 4 outlet wire RG and chassis ground Standard voltage : 12 V • 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. Standard voltage : 12 V (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. • Center position (both pumps) Water spray pump switch (R) terminal 3 outlet wire L and chassis ground Water spray pump switch (R) terminal 4 outlet wire LR and chassis ground Standard voltage : 12 V • 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. 17 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. Standard voltage : 12 V or more (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump (F, 2) relay terminal 3 outlet wire GW and chassis ground. Standard voltage : 12 V or more • 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
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
15 WATER SPRAY PUMP RELAY (PUMP 1)
16 WATER SPRAY PUMP RELAY (PUMP 2)
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 PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY TIMER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
WATER SPRAY PUMP (F, 1)
WATER SPRAY PUMP (F, 2)
WATER SPRAY PUMP (R, 1)
WATER SPRAY PUMP (R, 2)
17 WATER SPRAY PUMP RELAY (F, 2)
18 WATER SPRAY PUMP RELAY (R, 2)
F-R LEVER WATER SPRAY SWITCH
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
F.L.65A
SW884-11006

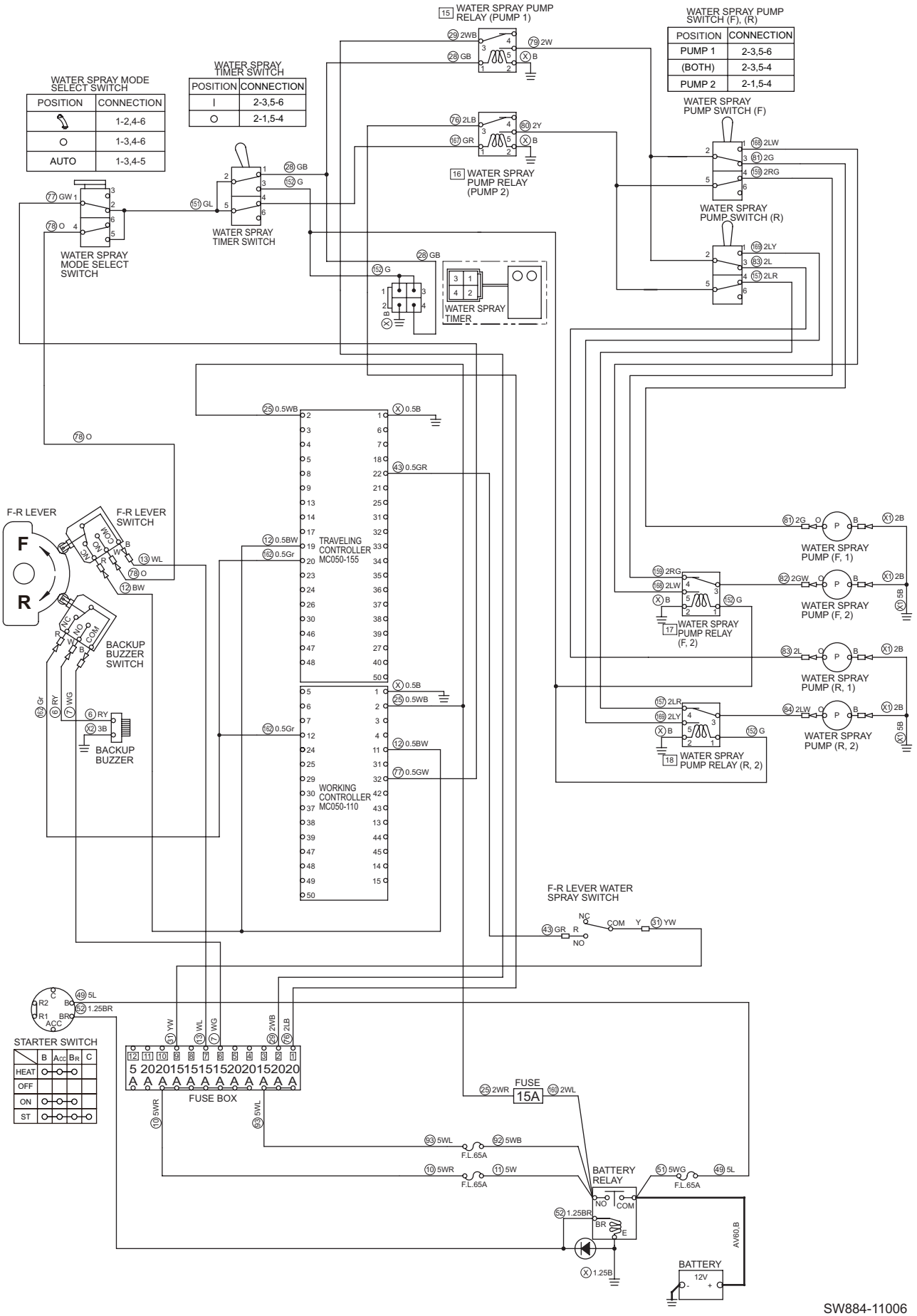
2-8-1. Continuous water spray does not operate 4/4

- 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. 18 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. Standard voltage : 12 V or more (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (R, 2) terminal 3 outlet wire LW and chassis ground. Standard voltage : 12 V or more • 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. • Traveling controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. • Working controller power supply terminal 2 inlet wire WB and ground terminal 1 wire B. Standard voltage : 12 V or more (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between traveling controller terminal 22 inlet wire GR and chassis ground. Standard voltage : 12 V (3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between working controller terminal 32 outlet wire GW and chassis ground. Standard voltage : 12 V • 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. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-8-1


WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
15 WATER SPRAY PUMP RELAY (PUMP 1)
16 WATER SPRAY PUMP RELAY (PUMP 2)
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 PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY TIMER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
WATER SPRAY PUMP (F, 1)
WATER SPRAY PUMP (F, 2)
WATER SPRAY PUMP (R, 1)
WATER SPRAY PUMP (R, 2)
17 WATER SPRAY PUMP RELAY (F, 2)
18 WATER SPRAY PUMP RELAY (R, 2)
F-R LEVER WATER SPRAY SWITCH
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
F.L.65A
SW884-11006

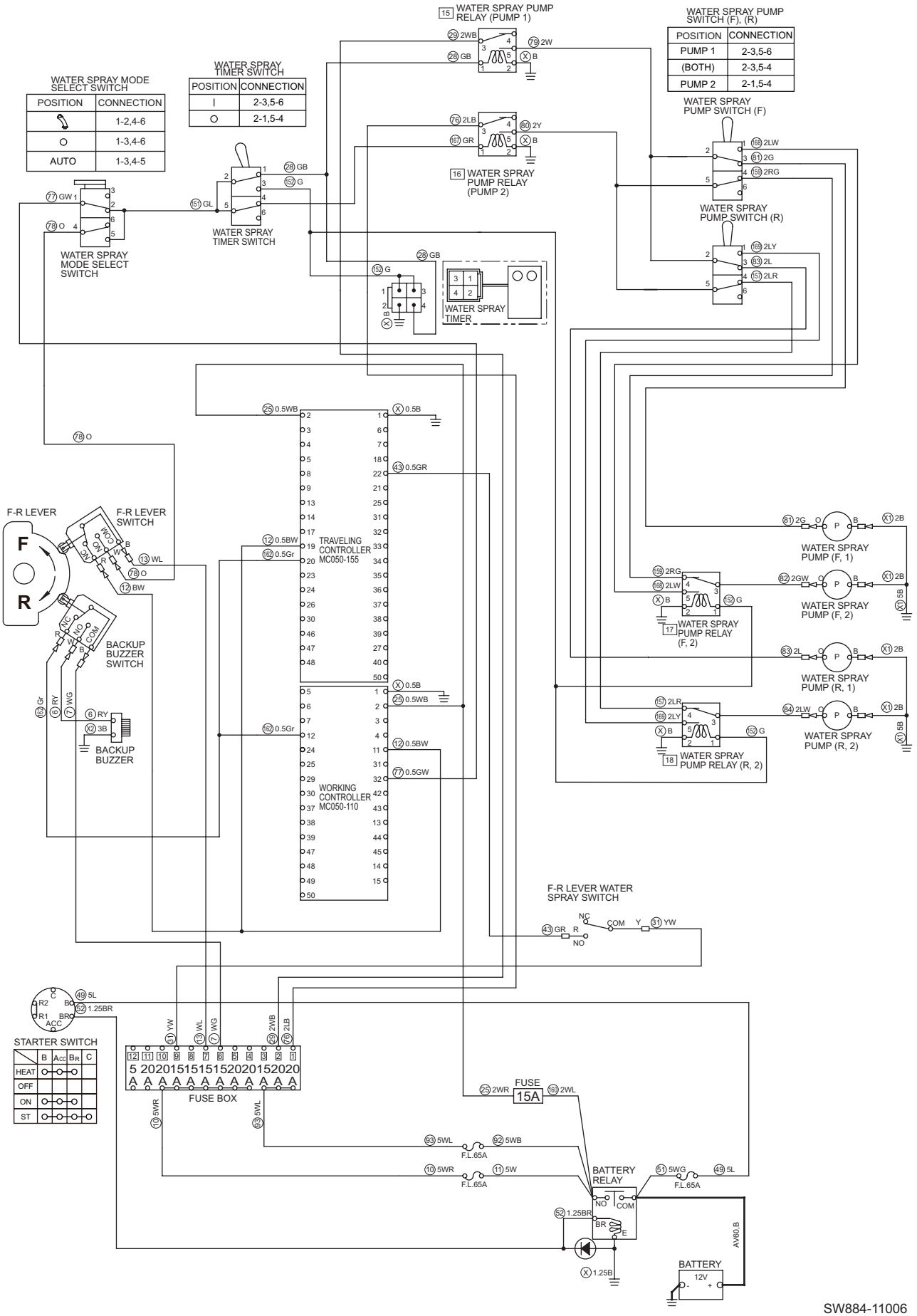
2-8-2. Continuous water spray works, but intermittent water spray does not operate 1/2

- 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. Standard voltage : 12 V or more (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer terminal 4 outlet wire GB and chassis ground. Standard voltage : 12 V or more • 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. Standard voltage : 12 V or more (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray timer switch terminal 3 outlet wire G and chassis ground. Standard voltage : 12 V or more • 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. Standard voltage : 12 V or more (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (F, 2) terminal 5 inlet wire LW and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (F, 2) terminal 3 outlet wire GW and chassis ground. Standard voltage : 12 V or more • 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
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
15 WATER SPRAY PUMP RELAY (PUMP 1)
16 WATER SPRAY PUMP RELAY (PUMP 2)
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 PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY TIMER
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
WATER SPRAY PUMP (F, 1)
WATER SPRAY PUMP (F, 2)
WATER SPRAY PUMP (R, 1)
WATER SPRAY PUMP (R, 2)
17 WATER SPRAY PUMP RELAY (F, 2)
18 WATER SPRAY PUMP RELAY (R, 2)
F-R LEVER WATER SPRAY SWITCH
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
F.L.65A
SW884-11006

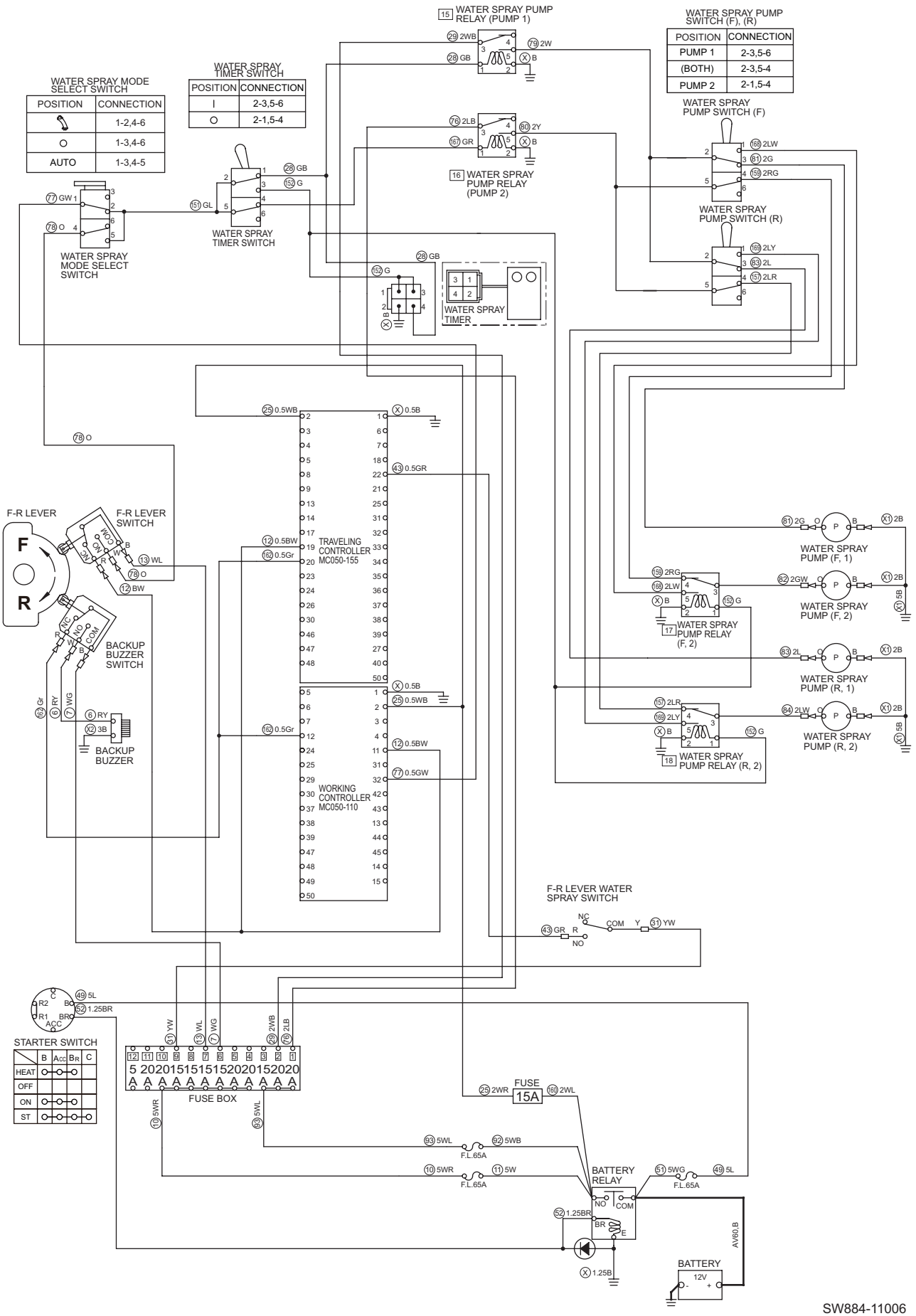
2-8-2. Continuous water spray works, but intermittent water spray does not operate 2/2

- 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. Standard voltage: 12 V or more (2) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (R, 2) terminal 5 inlet wire LY and chassis ground. Standard voltage: 12 V or more (3) When starter switch is ON and depress F-R lever water spray switch once, measure voltage between water spray pump relay (R, 2) terminal 3 outlet wire LW and chassis ground. Standard voltage: 12 V or more • 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. Standard resistance: 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-8-1


15 WATER SPRAY PUMP RELAY (PUMP 1)
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
I | 2-3,5-6
O | 2-1,5-4
WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
O | 1-3,4-6
AUTO | 1-3,4-5
WATER SPRAY PUMP SWITCH (F)
WATER SPRAY PUMP SWITCH (R)
16 WATER SPRAY PUMP RELAY (PUMP 2)
WATER SPRAY MODE SELECT SWITCH
WATER SPRAY TIMER SWITCH
WATER SPRAY TIMER
TRAVELING CONTROLLER MC050-155
WORKING CONTROLLER MC050-110
F-R LEVER
F-R LEVER SWITCH
BACKUP BUZZER SWITCH
BACKUP BUZZER
WATER SPRAY PUMP (F, 1)
WATER SPRAY PUMP (F, 2)
WATER SPRAY PUMP (R, 1)
WATER SPRAY PUMP (R, 2)
17 WATER SPRAY PUMP RELAY (F, 2)
18 WATER SPRAY PUMP RELAY (R, 2)
F-R LEVER WATER SPRAY SWITCH
STARTER SWITCH
FUSE BOX
FUSE 15A
BATTERY RELAY
BATTERY 12V
F.L.65A
SW884-11006

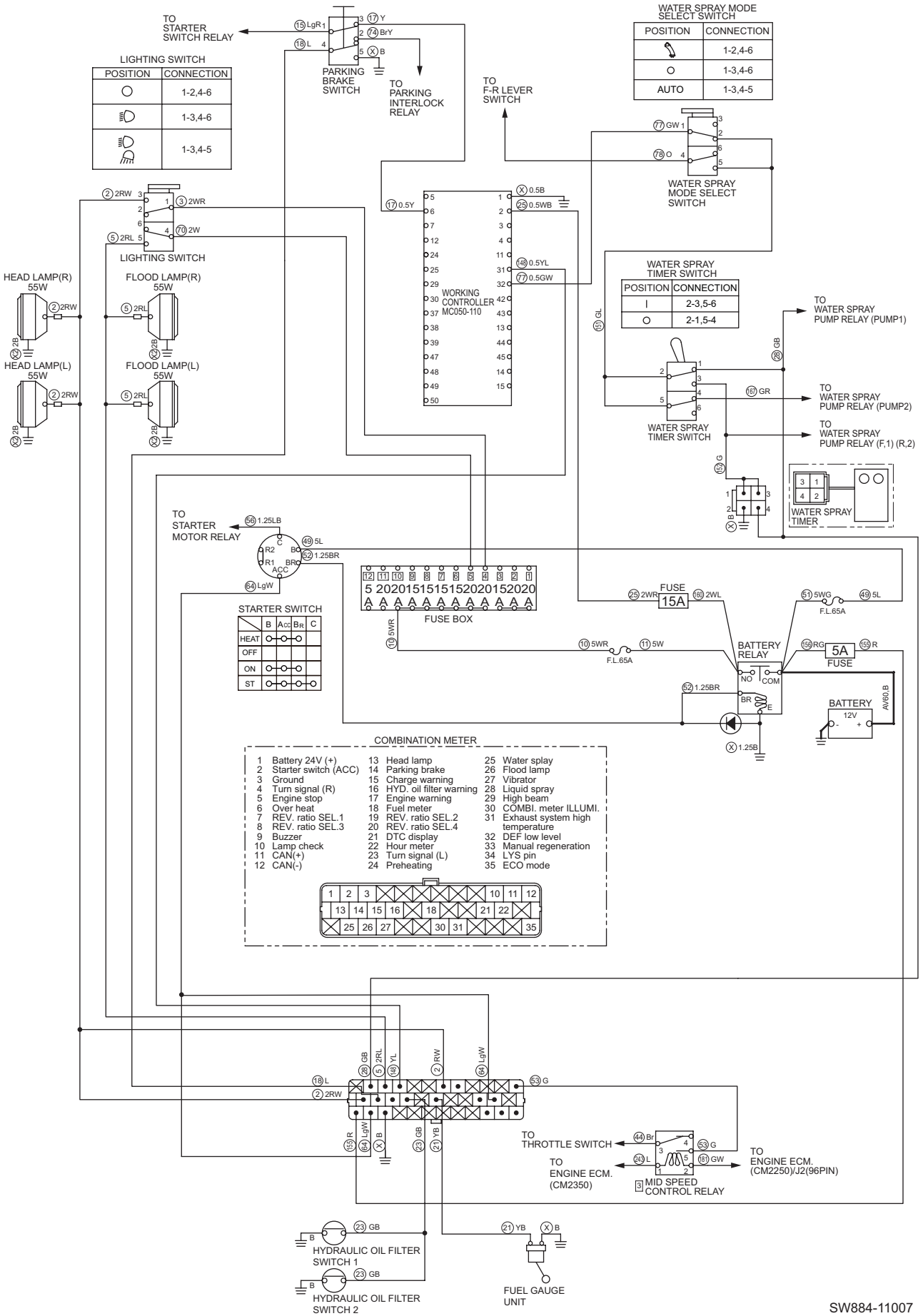
2-8-3. Continuous water spray works, but automatic water spray does not operate

- 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. F-R lever switch	(1) When starter switch is OFF and F-R lever is “N”, check continuity between F-R lever switch terminal COM and NC. There is continuity in normal condition. (2) When starter switch is OFF and F-R lever is “F”, check continuity between F-R lever switch terminal COM and NO. There is continuity in normal condition. • If above item (1) or (2) is NG, F-R lever switch is faulty.	Replace F-R lever switch.
2. Buckup buzzer switch	(1) When starter switch is OFF and F-R lever is “N”, check continuity between buckup buzzer switch terminal COM and NC. There is continuity in normal condition. (2) When starter switch is OFF and F-R lever is “R”, check continuity between buckup buzzer switch terminal COM and NO. There is continuity in normal condition • If above item (1) or (2) is NG, buckup buzzer switch is faulty.	Replace buckup buzzer 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. Standard voltage : 12 V (2) When starter switch is ON and F-R lever is “F” or “R”, measure voltage between water spray mode select switch terminal 5 outlet wire GL and chassis ground. Standard voltage : 12 V or more • 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. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-9-1


TO STARTER SWITCH RELAY
PARKING BRAKE SWITCH
TO PARKING INTERLOCK RELAY
TO F-R LEVER SWITCH
LIGHTING SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY MODE SELECT SWITCH
WORKING CONTROLLER MC050-110
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
WATER SPRAY TIMER SWITCH
TO WATER SPRAY PUMP RELAY (PUMP1)
TO WATER SPRAY PUMP RELAY (PUMP2)
TO WATER SPRAY PUMP RELAY (F,1) (R,2)
WATER SPRAY TIMER
HEAD LAMP(R) 55W
FLOOD LAMP(R) 55W
HEAD LAMP(L) 55W
FLOOD LAMP(L) 55W
TO STARTER MOTOR RELAY
STARTER SWITCH
B Acc BR C
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
F.L.65A
BATTERY RELAY
NO COM
BR E
5A FUSE
BATTERY 12V
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO THROTTLE SWITCH
TO ENGINE ECM. (CM2350)
TO ENGINE ECM. (CM2250)/J2(96PIN)
MID SPEED CONTROL RELAY
HYDRAULIC OIL FILTER SWITCH 1
HYDRAULIC OIL FILTER SWITCH 2
FUEL GAUGE UNIT
SW884-11007

2-9. Lighting

Check following items before troubleshooting.

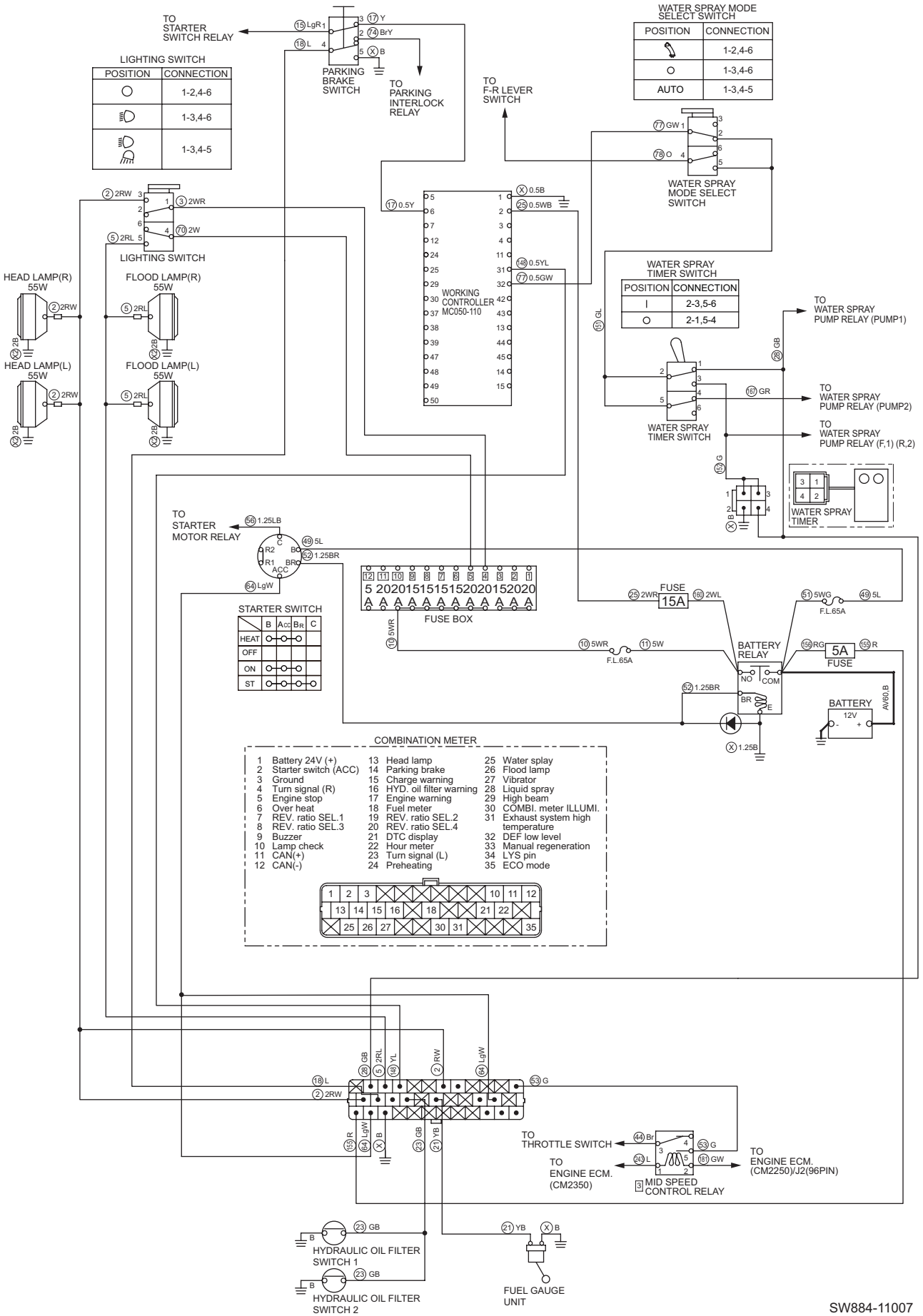
- No blown fuse and power is applied up to fuses.
- When measuring voltage and current without disconnecting connectors, refer to “measuring voltage and current following using tester” (P. 11-006 to P. 11-008).
- Check any ground circuit which belongs to components to be checked.

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. • 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. Standard voltage : 12 V or more (2) When starter switch is ON and lighting switch is “  ”, measure voltage between lighting switch terminal 3 outlet wire RW and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON and lighting switch is “  ”, measure voltage between lighting switch terminal 5 outlet wire RL and chassis ground. Standard voltage : 12 V or more • 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. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-9-1


TO STARTER SWITCH RELAY
PARKING BRAKE SWITCH
TO PARKING INTERLOCK RELAY
TO F-R LEVER SWITCH
LIGHTING SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY MODE SELECT SWITCH
WORKING CONTROLLER MC050-110
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
WATER SPRAY TIMER SWITCH
TO WATER SPRAY PUMP RELAY (PUMP1)
TO WATER SPRAY PUMP RELAY (PUMP2)
TO WATER SPRAY PUMP RELAY (F,1) (R,2)
WATER SPRAY TIMER
HEAD LAMP(R) 55W
FLOOD LAMP(R) 55W
HEAD LAMP(L) 55W
FLOOD LAMP(L) 55W
TO STARTER MOTOR RELAY
STARTER SWITCH
B Acc BR C
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
F.L.65A
BATTERY RELAY
NO COM
BR E
5A FUSE
BATTERY 12V
AV60.B
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO THROTTLE SWITCH
TO ENGINE ECM. (CM2350)
TO ENGINE ECM. (CM2250)/J2(96PIN)
MID SPEED CONTROL RELAY
HYDRAULIC OIL FILTER SWITCH 1
HYDRAULIC OIL FILTER SWITCH 2
FUEL GAUGE UNIT
SW884-11007

2-9-2. Illumination of combination meter does not light

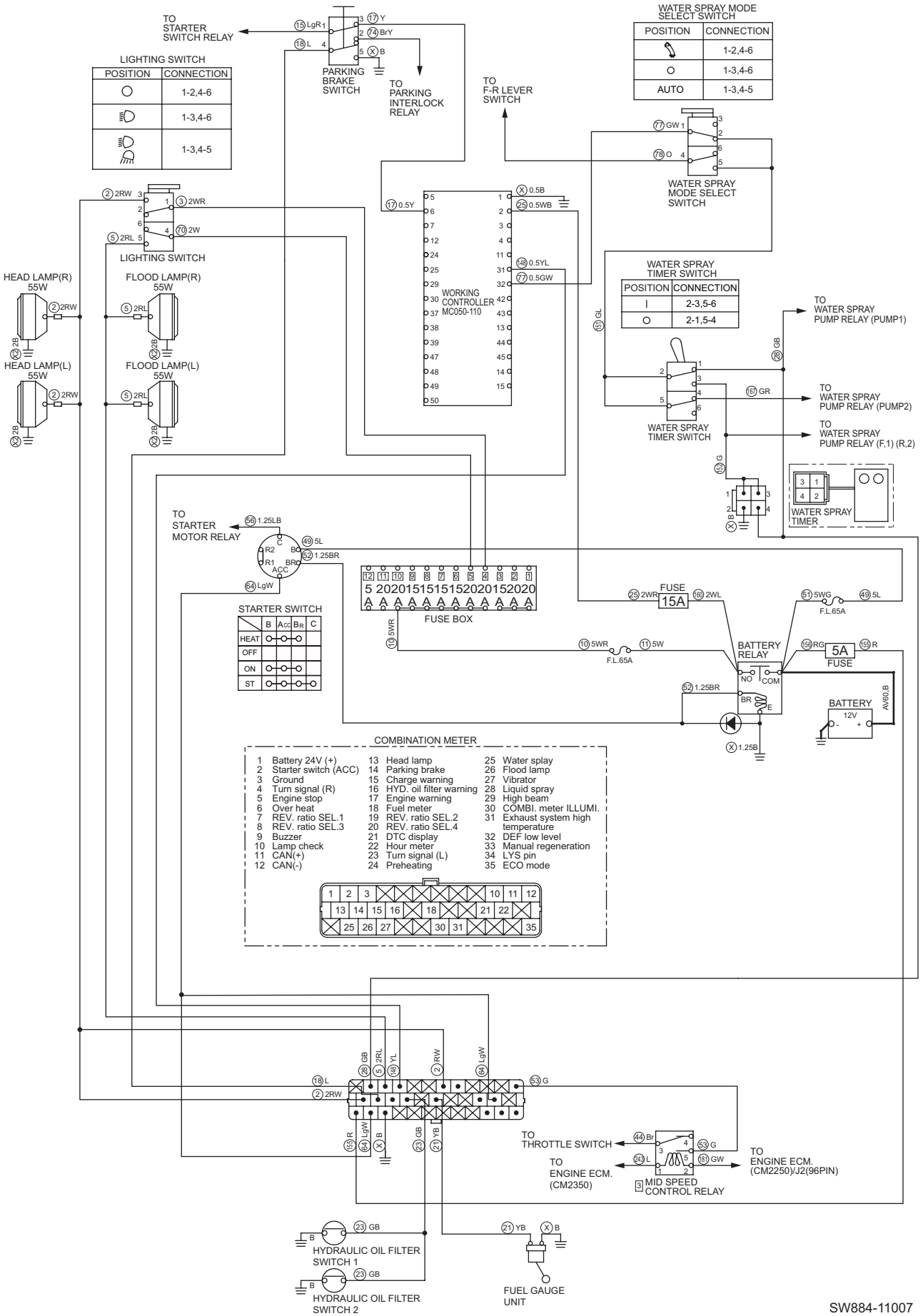
Reference Fig. : 2-9-1

Check point	Check/Cause	Action

1. Harness	• Disconnect connectors between combination meter and lighting switch.
	• Measure resistance between terminals and chassis ground.
	  • Combination meter connector terminal wire No.2 wire RW and chassis ground
	  Standard resistance: 100 kΩ or more
	• If resistance is abnormal, harness is faulty.
		Repair or replace harness.

2. Combination Meter (Combination meter illumination)	• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.
	  • Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B
	  • Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B
	  • Combination meter combination meter illumination terminal wire No.2 inlet wire RW and chassis ground
	  Standard voltage : 12 V or more
	• If above items are OK and combination meter illumination does not turn on, combination meter is faulty.
		Replace combination meter.

Fig.: 2-9-1


TO STARTER SWITCH RELAY
PARKING BRAKE SWITCH
TO PARKING INTERLOCK RELAY
TO F-R LEVER SWITCH
LIGHTING SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY MODE SELECT SWITCH
WORKING CONTROLLER MC050-110
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
TO WATER SPRAY PUMP RELAY (PUMP1)
TO WATER SPRAY PUMP RELAY (PUMP2)
TO WATER SPRAY PUMP RELAY (F,1) (R,2)
WATER SPRAY TIMER
HEAD LAMP(R) 55W
FLOOD LAMP(R) 55W
HEAD LAMP(L) 55W
FLOOD LAMP(L) 55W
TO STARTER MOTOR RELAY
STARTER SWITCH
B Acc BR C
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
BATTERY RELAY
5A FUSE
BATTERY 12V
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO THROTTLE SWITCH
TO ENGINE ECM. (CM2350)
TO ENGINE ECM. (CM2250)/J2(96PIN)
MID SPEED CONTROL RELAY
HYDRAULIC OIL FILTER SWITCH 1
HYDRAULIC OIL FILTER SWITCH 2
FUEL GAUGE UNIT
SW884-11007

2-9-3. Hour meter is abnormal

Reference Fig. : 2-9-1

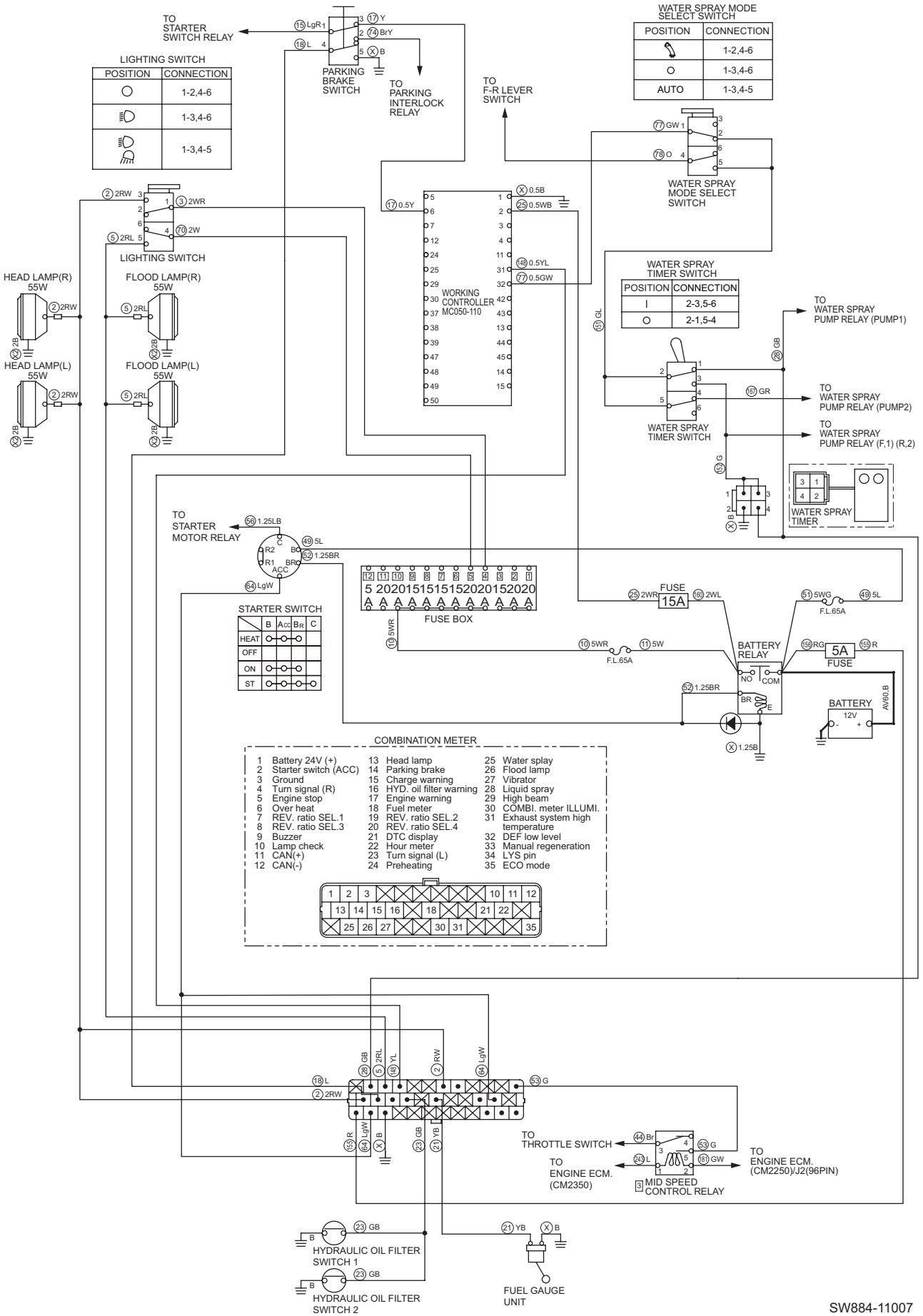
Check point	Check/Cause	Action
1. Combination Meter (Hour meter)	• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B • Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B Standard voltage : 12 V or more • If no abnormality is found, combination meter is faulty.	Replace combination meter.

2-9-4. Fuel meter is abnormal

Reference Fig. : 2-9-1

Check point	Check/Cause	Action
1. Fuel Gauge Unit	• Disconnect harness and measure resistance of fuel gauge unit. Standard resistance : 13.5 Ω (with float in “F”) 80 Ω (with float in “E”) • If resistance is abnormal, fuel gauge unit is faulty.	Replace fuel gauge unit.
2. Combination Meter (Fuel meter)	• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B • Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B Standard voltage : 12 V or more • If no abnormality is found, combination meter is faulty.	Replace combination meter.
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-9-1


TO STARTER SWITCH RELAY
PARKING BRAKE SWITCH
TO PARKING INTERLOCK RELAY
TO F-R LEVER SWITCH
LIGHTING SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY MODE SELECT SWITCH
WORKING CONTROLLER MC050-110
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
WATER SPRAY TIMER SWITCH
TO WATER SPRAY PUMP RELAY (PUMP1)
TO WATER SPRAY PUMP RELAY (PUMP2)
TO WATER SPRAY PUMP RELAY (F,1) (R,2)
WATER SPRAY TIMER
HEAD LAMP(R) 55W
HEAD LAMP(L) 55W
FLOOD LAMP(R) 55W
FLOOD LAMP(L) 55W
TO STARTER MOTOR RELAY
STARTER SWITCH
FUSE BOX
FUSE 15A
F.L.65A
BATTERY RELAY
5A FUSE
BATTERY 12V
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO THROTTLE SWITCH
TO ENGINE ECM. (CM2350)
TO ENGINE ECM. (CM2250)/J2(96PIN)
MID SPEED CONTROL RELAY
HYDRAULIC OIL FILTER SWITCH 1
HYDRAULIC OIL FILTER SWITCH 2
FUEL GAUGE UNIT
SW884-11007

2-9-5. Hydraulic oil filter warning lamp remains ON

Reference Fig. : 2-9-1

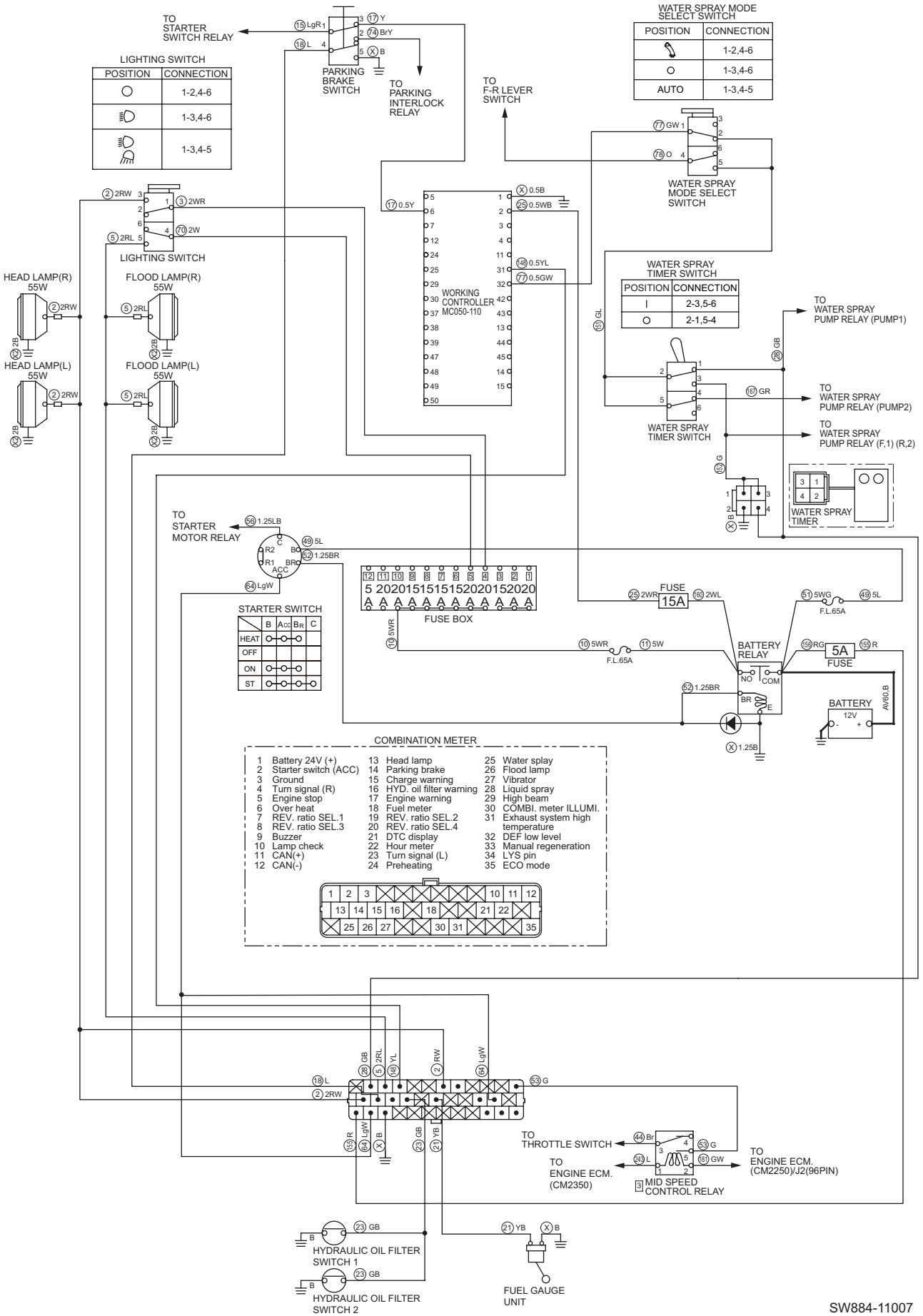
Check point	Check/Cause	Action

1. Harness	• Disconnect connectors between hydraulic oil filter switch 1, 2 and combination meter.
	• Measure resistance between terminal and chassis ground.
	  • Hydraulic oil filter switch 1 or 2 terminal wire GB and chassis ground
	  • Combination meter connector terminal wire No. 23 wire GB and chassis ground
	  Standard resistance : 100 kΩ or more
	• 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 terminal inlet wire GB and chassis ground. There is no continuity in normal condition. • 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)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.
	  • Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B
	  • Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B
	  Standard voltage : 12 V or more
	(2) When starter switch is ON, measure voltage between combination meter hydraulic filter terminal outlet wire No.23 wire GB and chassis ground.
	  Standard voltage : 12 V or more
	• If above items (1) and (2) are OK but hydraulic oil filter warning lamp remains on after starting engine, combination meter is faulty.
		Replace combination meter.

Fig.: 2-9-1


TO STARTER SWITCH RELAY
PARKING BRAKE SWITCH
TO PARKING INTERLOCK RELAY
TO F-R LEVER SWITCH
LIGHTING SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY MODE SELECT SWITCH
WORKING CONTROLLER MC050-110
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
WATER SPRAY TIMER SWITCH
TO WATER SPRAY PUMP RELAY (PUMP1)
TO WATER SPRAY PUMP RELAY (PUMP2)
TO WATER SPRAY PUMP RELAY (F,1) (R,2)
WATER SPRAY TIMER
HEAD LAMP(R) 55W
FLOOD LAMP(R) 55W
HEAD LAMP(L) 55W
FLOOD LAMP(L) 55W
LIGHTING SWITCH
TO STARTER MOTOR RELAY
STARTER SWITCH
B Acc BR C
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
F.L.65A
BATTERY RELAY
NO COM
BR E
5A FUSE
BATTERY 12V
AV60.B
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO THROTTLE SWITCH
TO ENGINE ECM. (CM2350)
TO ENGINE ECM. (CM2250)/J2(96PIN)
MID SPEED CONTROL RELAY
HYDRAULIC OIL FILTER SWITCH 1
HYDRAULIC OIL FILTER SWITCH 2
FUEL GAUGE UNIT
SW884-11007

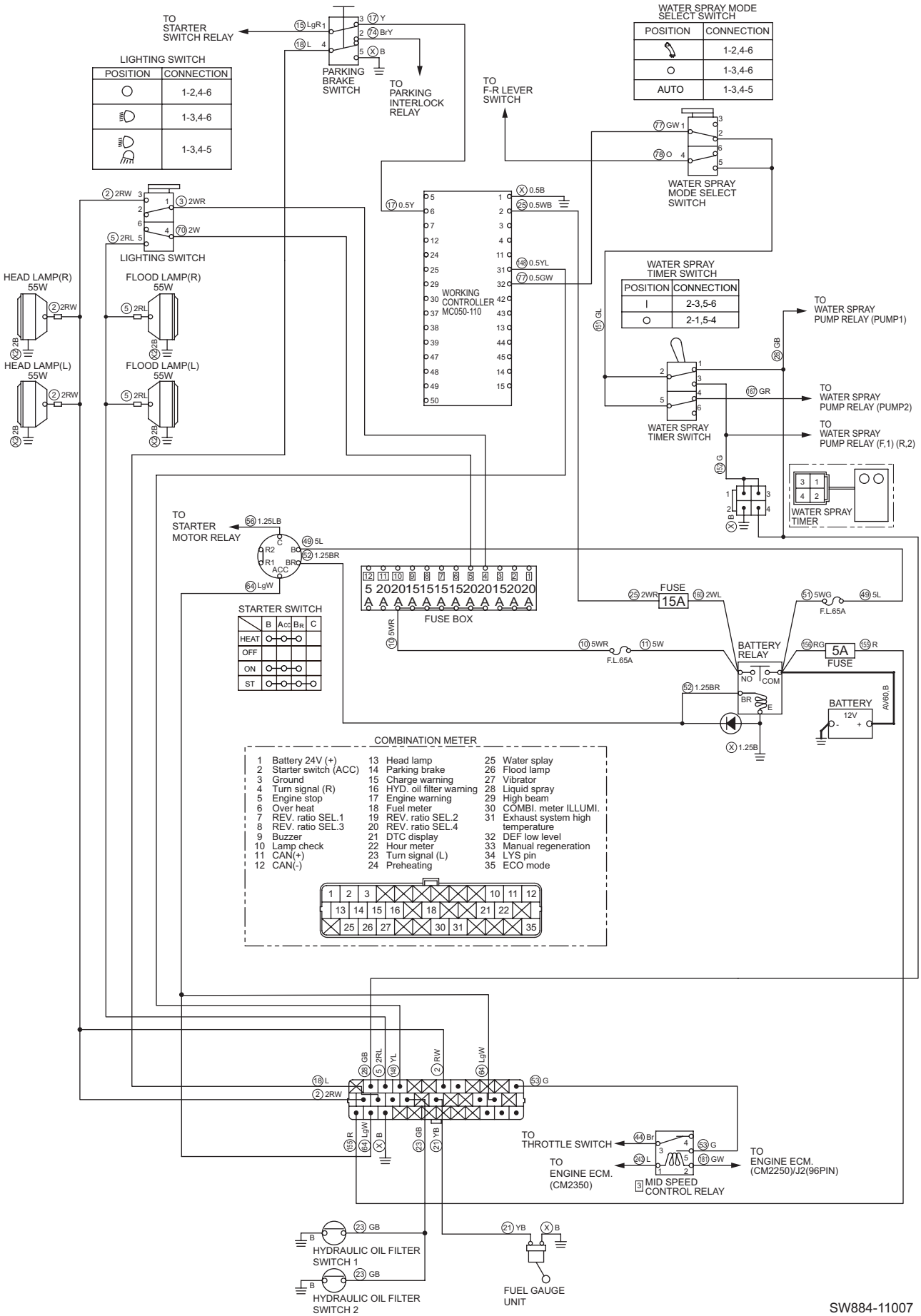
2-9-6. Vibration indicator lamp does not light

• Check that vibrator can be operated.

Reference Fig. : 2-9-1

Check point	Check/Cause	Action
1. Harness	• Measure resistance between working controller terminal 31 wire YL and combination meter connector terminal wire No. 148 wire YL. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Combination Meter (Vibration indicator lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B • Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B Standard voltage : 12 V or more (2) When starter switch is ON and vibration mode change switch is “CONT” and vibration select switch is not “◯“, measure voltage between combination meter vibration terminal wire No.148 inlet wire YL and chassis ground. Standard voltage : 12 V or more • 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


TO STARTER SWITCH RELAY
PARKING BRAKE SWITCH
TO PARKING INTERLOCK RELAY
TO F-R LEVER SWITCH
LIGHTING SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY MODE SELECT SWITCH
WORKING CONTROLLER MC050-110
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
WATER SPRAY TIMER SWITCH
TO WATER SPRAY PUMP RELAY (PUMP1)
TO WATER SPRAY PUMP RELAY (PUMP2)
TO WATER SPRAY PUMP RELAY (F,1) (R,2)
WATER SPRAY TIMER
HEAD LAMP(R) 55W
FLOOD LAMP(R) 55W
HEAD LAMP(L) 55W
FLOOD LAMP(L) 55W
TO STARTER MOTOR RELAY
STARTER SWITCH
B Acc BR C
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
F.L.65A
BATTERY RELAY
NO COM
BR E
5A FUSE
BATTERY 12V
AV60.B
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO THROTTLE SWITCH
TO ENGINE ECM. (CM2350)
TO ENGINE ECM. (CM2250)/J2(96PIN)
MID SPEED CONTROL RELAY
HYDRAULIC OIL FILTER SWITCH 1
HYDRAULIC OIL FILTER SWITCH 2
FUEL GAUGE UNIT
SW884-11007

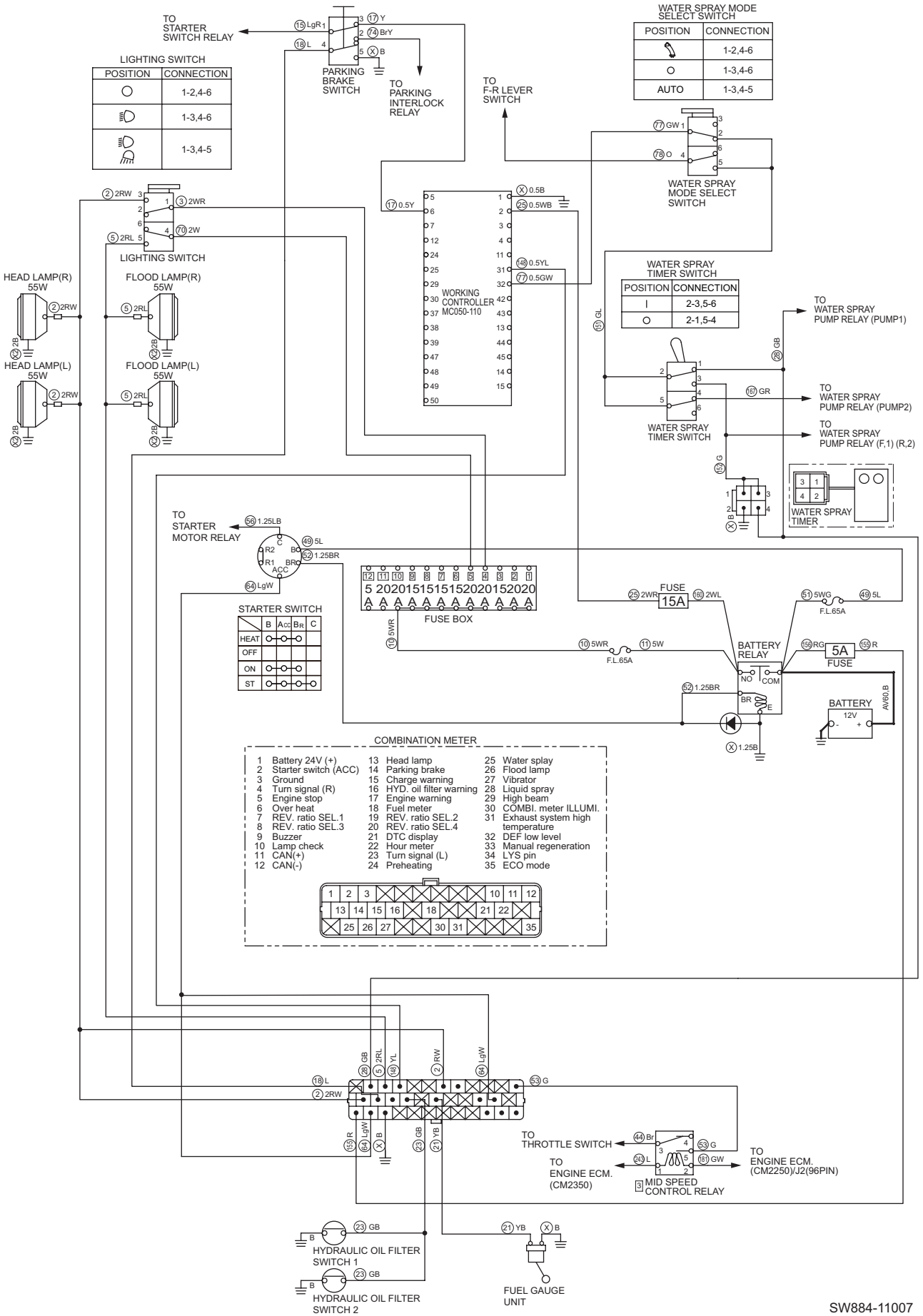
2-9-7. Water spray indicator lamp does not light

• Check that water spray pump can be operated.

Reference Fig. : 2-9-1

Check point	Check/Cause	Action
1. Harness	• Measure resistance between water spray timer switch terminal 1 wire GB and combination meter connector terminal wire No. 28 wire GB. Standard resistance : 10 Ω or less • 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. Standard resistance : 10 Ω or less • 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. • Battery terminal wire No. 155 inlet wire R and ground terminal wire B • Starter switch terminal wire No. 64 inlet wire LgW and ground terminal wire B Standard voltage : 12 V or more (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. Standard voltage : 12 V or more • If above items (1) and (2) are OK, combination meter is faulty.	Replace combination meter.

Fig.: 2-9-1


LIGHTING SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
TO STARTER SWITCH RELAY
PARKING BRAKE SWITCH
TO PARKING INTERLOCK RELAY
TO F-R LEVER SWITCH
WATER SPRAY MODE SELECT SWITCH
POSITION | CONNECTION
1-2,4-6
1-3,4-6
AUTO 1-3,4-5
WATER SPRAY MODE SELECT SWITCH
WORKING CONTROLLER MC050-110
WATER SPRAY TIMER SWITCH
POSITION | CONNECTION
I 2-3,5-6
O 2-1,5-4
TO WATER SPRAY PUMP RELAY (PUMP1)
TO WATER SPRAY PUMP RELAY (PUMP2)
TO WATER SPRAY PUMP RELAY (F,1) (R,2)
WATER SPRAY TIMER
HEAD LAMP(R) 55W
FLOOD LAMP(R) 55W
HEAD LAMP(L) 55W
FLOOD LAMP(L) 55W
TO STARTER MOTOR RELAY
STARTER SWITCH
B Acc BR C
HEAT
OFF
ON
ST
FUSE BOX
FUSE 15A
F.L.65A
BATTERY RELAY
NO COM
BR E
5A FUSE
BATTERY 12V
AV60.B
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO THROTTLE SWITCH
TO ENGINE ECM. (CM2350)
TO ENGINE ECM. (CM2250)/J2(96PIN)
MID SPEED CONTROL RELAY
HYDRAULIC OIL FILTER SWITCH 1
HYDRAULIC OIL FILTER SWITCH 2
FUEL GAUGE UNIT
SW884-11007

2-9-8. ECO mode indicator lamp does not light

- Check that vibrator can be operated.
- Vibration mode change switch must be “CONT”.
- Vibration L-H change switch must not be “◯”.
- Throttle switch must be “ECO”.

Reference Fig. : 2-9-1

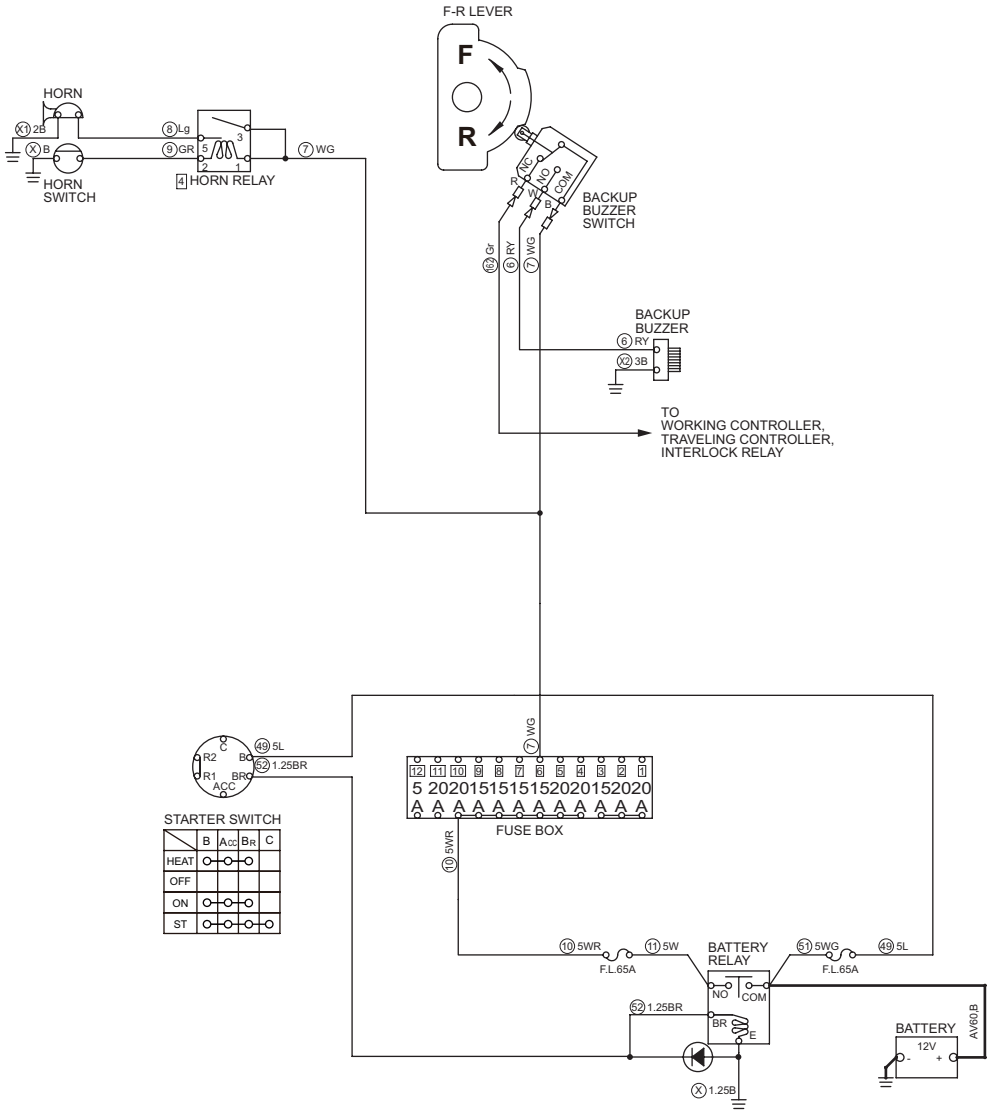
Check point	Check/Cause	Action
1. Harness	• Measure resistance between Mid speed control relay terminal 5 wire G and combination meter connector terminal wire No.53 wire G. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Combination Meter (ECO lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B • Stater switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between combination meter vibration terminal wire No.53 inlet wire G and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and ECO lamp does not light, combination meter is faulty.	Replace combination meter.

2-9-9. Parking brake indicator lamp does not light

Reference Fig. : 2-9-1

Check point	Check/Cause	Action
1. Harness	• Measure resistance between parking brake switch terminal 4 wire L and combination meter connector terminal wire No.18 wire L. Standard resistance : 10 Ω or less • 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. There is continuity in normal condition. • 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. • Battery terminal wire No.155 inlet wire R and ground terminal wire No.X wire B • Starter switch terminal wire No.64 inlet wire LgW and ground terminal wire No.X wire B Standard voltage : 12 V or more (2) When starter switch is ON and parking brake is applied, check continuity between combination meter parking brake terminal wire No.18 inlet wire L and chassis ground. There is continuity in normal condition. • If above items (1) and (2) are OK and parking brake indicator lamp does not light, combination meter is faulty.	Replace combination meter.

Fig.: 2-9-2



SW884-11008

2-9-10. Horn does not sound

Reference Fig. : 2-9-2

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. • If horn does not sound, horn is faulty.	Replace horn.
2. Horn Switch	• When horn switch is pressed, check continuity between horn switch terminals. There is continuity is normal condition. • 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. Standard voltage : 12 V or more (2) When starter switch is ON and horn switch is pressed, measure voltage between horn relay terminal 5 outlet wire Lg and chassis ground. Standard voltage : 12 V or more • 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. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

2-9-11. Backup buzzer does not sound

Reference Fig. : 2-9-2

Check point	Check/Cause	Action
1. Backup Buzzer	• 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. • If backup buzzer does not sound, backup buzzer is faulty.	Replace backup buzzer.
2. Buckup buzzer switch	(1) When starter switch is ON, measure voltage between buckup buzzer switch terminal COM inlet wire WG and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and F-R lever is “R”, measure voltage between buckup buzzer switch terminal NO outlet wire RY and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, buckup buzzer switch is faulty.	Replace buckup buzzer switch.
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • 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. Charge Circuit Pressure	Propulsion pump does not discharge oil because charge pressure is low.	• Measure charge pressure. • If low, check and adjust charge relief valve or replace it if necessary.
	Charge pressure decreases due to pressure leakage from cut off valve.	Check and adjust cut off valve or replace it if necessary.
	Insufficient propulsion charge pump discharge.	Repair propulsione charge pump or replace it if necessary.
4. Propulsion Pump Proportional Solenoid Valve	Propulsion pump cannot discharge oil because oil does not flow into servo cylinder chamber due to faulty propulsion pump proportional solenoid valve.	• 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 servo bypass 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 servo bypass solenoid valve or replace it if necessary.
6. Suction Filter for Propulsion Charge Pump	Propulsion charge pump flow is reduced due to clogged filter.	Clean suction filter or replace it if necessary.
7. Propulsion Circuit Pressure	Pump does not discharge oil because setting pressure of cut off valve is low.	• Measure propulsion circuit pressure. • If low, check and adjust 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. • If low, check and adjust high pressure relief valve or replace it if necessary.
8. Propulsion Motor	Propulsion circuit pressure is not held in propulsion motor case.	• Measure propulsion motor case pressure. • If case pressure is not within allowable pressure, repair propulsion motor or replace it if necessary.
	Internal leakage of propulsion motor.	• Measure drain quantity from propulsion motor. • If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary.
	Sticking of disc brakes causes brakes to remain applied.	• Replace disc brakes.

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. • 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.	• Measure propulsion pump case pressure. • If case pressure is not within allowable pressure, 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. • 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
1. 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. • 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. 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. • If low, check and adjust charge relief valve or replace it if necessary.
	Insufficient propulsion charge pump discharge.	Repair propulsion charge pump or replace it if necessary.
3. Suction Filter for Propulsion Charge Pump	Flow rate of propulsion charge pump decreases as well as charge pressure decreases due to clogged filter.	Clean suction filter or replace it if necessary.

3-2-3. Slow machine speed or small drive force 2/2

Check point	Cause	Check/Action
4. Propulsion Motor	Propulsion motor inlet pressure is low.	• Measure propulsion motor inlet pressure. • If low, check and adjust high pressure relief valve or replace it if necessary.
	Propulsion circuit pressure is not held in propulsion motor case.	• Measure propulsion motor case pressure. • If case pressure is not within allowable pressure, 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. • 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. • 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.	• Measure propulsion pump case pressure. • If case pressure is not within allowable pressure, repair propulsion pump or replace it if necessary.

3-2-4. Machine speed cannot be switched

Check point	Cause	Check/Action
1. Propulsion Pump Swash Plate Stroke Cylinder	Faulty propulsion pump swash plate stroke cylinder.	Repair propulsion pump or replace it if necessary.

3-2-5. Machine does not stop completely with F-R lever in “N”

Check point	Cause	Check/Action
1. Servo Control Valve	Servo control valve neutral position adjustment failure.	Check and adjust servo control valve or replace it if necessary.
2. Propulsion Pump Servo Cylinder	Faulty propulsion pump servo cylinder or faulty pump swash plate setting.	Repair propulsion pump or replace it if necessary.

3-2-6. Propulsion system is overheating

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Oil Cooler	Cooling efficiency is reduced due to clogged oil cooler fins.	Clean oil cooler fins.
3. Flushing Valve	Hydraulic oil in propulsion closed circuit is insufficiently cooled due to flushing valve shuttle spool sticking.	Repair flushing valve or replace it if necessary.
	Hydraulic oil in propulsion closed circuit is insufficiently cooled because flushing valve relief setting pressure is excessively high.	Check dust or damage in flushing relief valve and replace it if necessary.
	Hydraulic oil in propulsion closed circuit is insufficiently cooled due to flushing valve relief valve poppet sticking.	Clean flushing relief valve or replace it if necessary.
4. Propulsion Circuit Pressure	If circuit pressure setting is excessively low, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	• Measure propulsion circuit pressure. • 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. • If high, decrease propulsion load.
5. Suction Filter for Propulsion Charge Pump	Load of propulsion charge pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean suction filter or replace it if necessary.
6. Hydraulic Oil Filter 2	Charge circuit pressure increases due to clogged filter.	Clean hydraulic oil filter 2 or replace it if necessary.

3-2-7. Abnormal noise from propulsion system

Check point	Cause	Check/Action
1. Roller Bearings	Roller bearings supporting front and rear drums are damaged.	Replace roller bearings.
2. Hydraulic Hose Clamp	Vibrator sound of hydraulic hose is generated because clamp securing hydraulic hose is loose.	Tighten bolts of loose hydraulic hose clamp to specified torque.
3. Suction Filter for Propulsion Charge Pump	Cavitation is occurring in propulsion charge pump due to clogged filter.	Clean suction filter or replace it if necessary.
4. Charge Circuit Pressure	If charge pressure is low, brake cannot be released completely, which causes brake drag.	• Measure charge pressure. • 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. • 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. • Parking brake solenoid valve	• When solenoid is energized, check if oil flows in return circuit to tank. • If oil is flowing, repair solenoid valve or replace it if necessary.
3. Suction Filter for Steering • Charge Pump	Steering • charge pump flow is reduced due to clogged filler.	Clean suction filter or replace it if necessary.
4. Vibrator Circuit Pressure	Circuit does not obtain required pressure because setting pressure of high pressure relief is low.	• Measure vibrator circuit pressure. • If low, check and adjust high pressure relief valve or replace them if necessary.
5. Vibrator Solenoid Valve	Vibrator pump cannot discharge oil because spool of vibrator solenoid valve does not shift.	Repair vibrator solenoid valve or replace it if necessary.
6. Vibrator Motor	Vibrator circuit pressure is not held in vibrator motor case.	• Measure vibrator motor case pressure. • If case pressure is not within allowable pressure, repair vibrator motor or replace it if necessary.
	Internal leakage of vibrator motor.	• Measure drain quantity from vibrator motor. • 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.
7. 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. • 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.	• Measure vibrator pump case pressure. • If case pressure is not within allowable pressure, repair vibrator pump or replace it if necessary.

3-3-2. Vibration wheel does not switch

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibrator pressure is bypassed because vibrator solenoid valve spool does not switch.	If the vibrator solenoid valve spool does not switch, repair vibrator solenoid valve or replace it if necessary.
2. Vibrator Motor	Vibrator circuit pressure is not held in vibrator motor case.	If pressure in vibrator motor case is not within allowable range, repair vibrator motor or replace it if necessary.
	Internal leakage of vibrator motor.	• Measure drain quantity from vibrator motor. • 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 1/2

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Charge Circuit Pressure	Stroke of vibrator pump swash plate is small because charge pressure is low, decreasing discharge rate of vibrator pump.	• Measure charge pressure. • 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. • Parking brake solenoid valve	• When solenoid is energized, check if oil flows in return circuit to tank. • If oil is flowing, repair solenoid valve or replace it if necessary.
3. Vibrator Solenoid Valve	Vibrator pressure is bypassed due to internal leakage of vibrator solenoid valve.	Repair vibrator solenoid valve or replace it if necessary.
4. Suction Filter for Steering • Charge Pump	Flow rate of steering • charge pump decreases as well as charge pressure decreases due to clogged filter.	Clean suction filter or replace it if necessary.
5. Vibrator Motor	Vibrator motor inlet pressure is low.	• Measure vibrator motor inlet pressure. • If low, check and adjust high pressure relief valve or replace it if necessary.
	Vibrator circuit pressure is not held in vibrator motor case.	• Measure vibrator motor case pressure. • If case pressure is not within allowable pressure, 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. • If drain quantity is larger than standard value, repair vibrator motor or replace it if necessary.

3-3-3. Vibrator frequency is too low 2/2

Check point	Cause	Check/Action
6. Vibrator Pump	Insufficient discharge rate from vibrator pump due to reduced efficiency of vibrator pump.	• Measure discharge flow rate of vibrator pump with flow meter. • 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.	• Measure vibrator pump case pressure. • If case pressure is not within allowable pressure, repair vibrator pump or replace it if necessary.

3-3-4. Vibration mode does not switch

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibrator solenoid valve spool shifts only in one direction.	Repair vibrator solenoid valve or replace it if necessary.

3-3-5. Vibratory drum does not changeover vibrating

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibratory drum does not changeover vibrating because spool of vibrator solenoid valve does not change.	Repair vibrator solenoid valve or replace it if necessary.

3-3-6. Vibrator does not stop

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibrator solenoid valve spool does not return to neutral position.	Repair vibrator solenoid valve or replace it if necessary.
2. Vibrator Pump	Vibrator pump swash plate does not return to neutral position.	Repair or replace vibrator pump or replace it if necessary.

3-3-7. Vibrator system is overheating

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Oil Cooler	Cooling efficiency is reduced due to clogged oil cooler fins.	Clean oil cooler fins.
3. Flushing Valve	Hydraulic oil in vibrator closed circuit is insufficiently cooled due to flushing valve shuttle spool sticking.	Repair flushing valve or replace it if necessary.
	Hydraulic oil in vibrator closed circuit is insufficiently cooled because flushing valve relief setting pressure is excessively high.	Check dust or damage in flushing relief valve and replace it if necessary.
	Hydraulic oil in vibrator closed circuit is insufficiently cooled due to flushing valve relief valve poppet sticking.	Clean flushing relief valve or replace it if necessary.
4. Vibrator Circuit Pressure	If circuit pressure setting is excessively low, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	• Measure vibrator circuit pressure. • If low, increase relief setting pressure.
	If load is excessively heavy, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	• Measure vibrator circuit pressure. • If high, decrease vibration 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.

3-3-8. Abnormal noise from vibrator system

Check point	Cause	Check/Action
1. Vibrator Bearings	Vibrator bearings supporting eccentric shaft are damaged.	Replace vibrator bearings.
2. Hydraulic Hose Clamp	Vibrator sound of hydraulic hose is generated because clamp securing hydraulic hose is loose.	Tighten bolts of loose hydraulic hose clamp to specified torque.
3. Suction Filter for Steering • Charge Pump	Cavitation is occurring in steering • charge pump due to clogged filter.	Clean suction filter or replace it if necessary.
4. Vibrator Motor	Internal bearing of vibrator motor is damaged.	Repair vibrator motor or replace it if necessary.

3-4. Steering System

If a problem occurs in the steering systems such as the steering • charge pump and orbitrol, determine the cause and carry out action as required, according to the following general troubleshooting items.

(NOTICE)

- **When checking whether or not the pressure is correct, refer to the pressure standard value for each hydraulic circuit.**

3-4-1. Steering wheel is hard to turn

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Orbitrol	Relief valve is open or setting pressure is low.	• Measure steering circuit pressure. • 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. • 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. • If low, check and clean 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. • 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. • 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. • 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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SHOP MANUAL

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