SW800-Ⅱ/850-Ⅱ
SHOP MANUAL

SAKAI®

3498-65547-0

Introduction

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

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

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

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

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SAFETY

1. GENERAL SAFETY

1-1. Understanding the Safety Symbols and Words

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

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

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

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

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

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

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

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

1-2. General

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

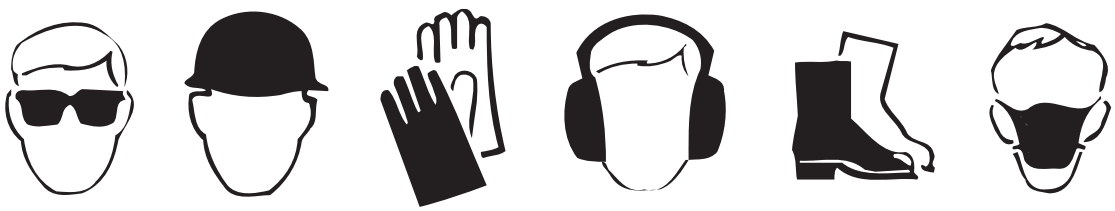
- The machine is designed specifically for the compaction of asphalt or soil road construction materials. Use of the machine for other purposes such as towing other equipment is considered contrary to the designated use. The manufacturer cannot be responsible or held liable for any damage resulting from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

1-3. Qualifications of Operators and Maintenance Personnel

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

1-4. Safety Practices and Policies

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



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

1-5. Pre Start Inspection

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

1-6. Safety Instructions

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

1-7. Starting

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

1-8. Operating

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

1-9. Stopping

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

• Park behind a safe barrier, use proper flags, and warning devices, especially when parking in areas of heavy traffic.

1-10. Maintenance

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

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

• Use care when attaching and securing lifting tackle to individual parts and large assemblies being removed or repositioned for repair purposes to avoid the risk of accident. Use lifting devices that are in perfect condition and of sufficient lifting capacity. Never stand under suspended loads.
• Always use the proper tools and workshop equipment in good condition when performing maintenance or repairs on the machine.
• Always use specially designed safety ladders and working platforms when working above floor level. Never use machine parts as a climbing aid.

• Keep all steps, handles, handrails, platforms and ladders free from mud, dirt, grease, ice or snow.
• Clean the machine, especially threaded connections of any traces of oil or fuel before carrying out any maintenance or repairs. Never use aggressive detergents. Use lint free cleaning rags.
• Examine all fuel, lubricant and hydraulic fluid lines and connectors for leaks, loose connections chafe marks or damage after cleaning.
• Repair or replace defective parts immediately.
• Whenever possible, avoid servicing or maintenance when the engine is running unless the drums or tires are adequately blocked, the articulation lock bar is in the locked position and the parking brake is applied.

- Never fill the fuel tank with the engine running, while near an open flame or while smoking. Always clean up any spilled fuel.
- Ensure safe operation, optimum performance of the machine and its warranty by using only genuine SAKAI replacement parts.
- Use only the specified fluids and lubricants. Substitute only products known to be equivalent from reputable manufacturers.
- Disconnect the battery cables when working on the electrical system or when welding on the compactor.

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

- Get immediate medical attention if fluid has been injected under your skin. Fluid penetration from a pin hole leak can cause severe injury or death.
- Ensure that hydraulic lines and hoses are routed and fitted properly. Ensure that no connections are interchanged. All fittings, lengths and specifications of hoses must comply with the technical requirements.

- Observe all product safety regulations when handling fuel, oils, grease, engine coolant and other chemical substances. Be careful especially when these items are hot as there is a risk of burning or scalding.
- Operate internal combustion engines and fuel operated heating systems only in adequately ventilated premises. Before starting the engine in an enclosed area, make sure there is sufficient ventilation.

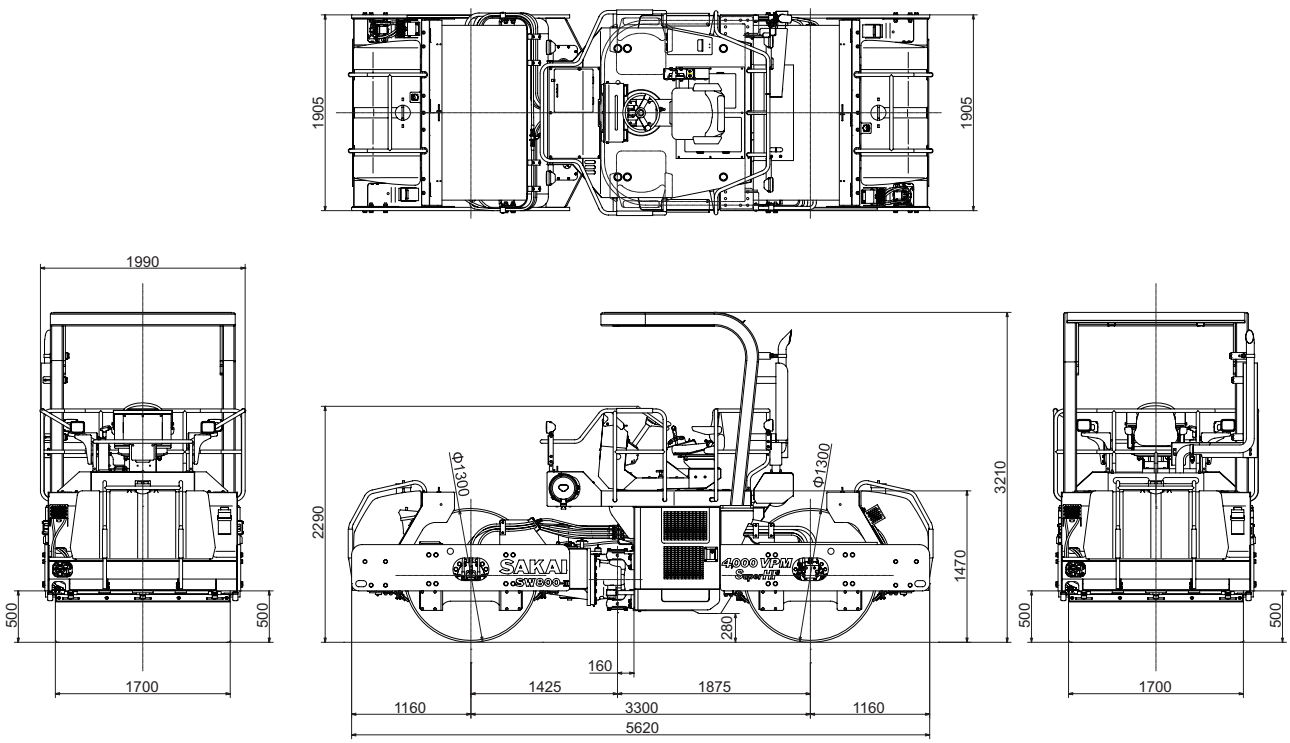
1-11. Transporting the Machine

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

SPECIFICATIONS

1. SPECIFICATION DATA

1-1. SW800-Ⅱ



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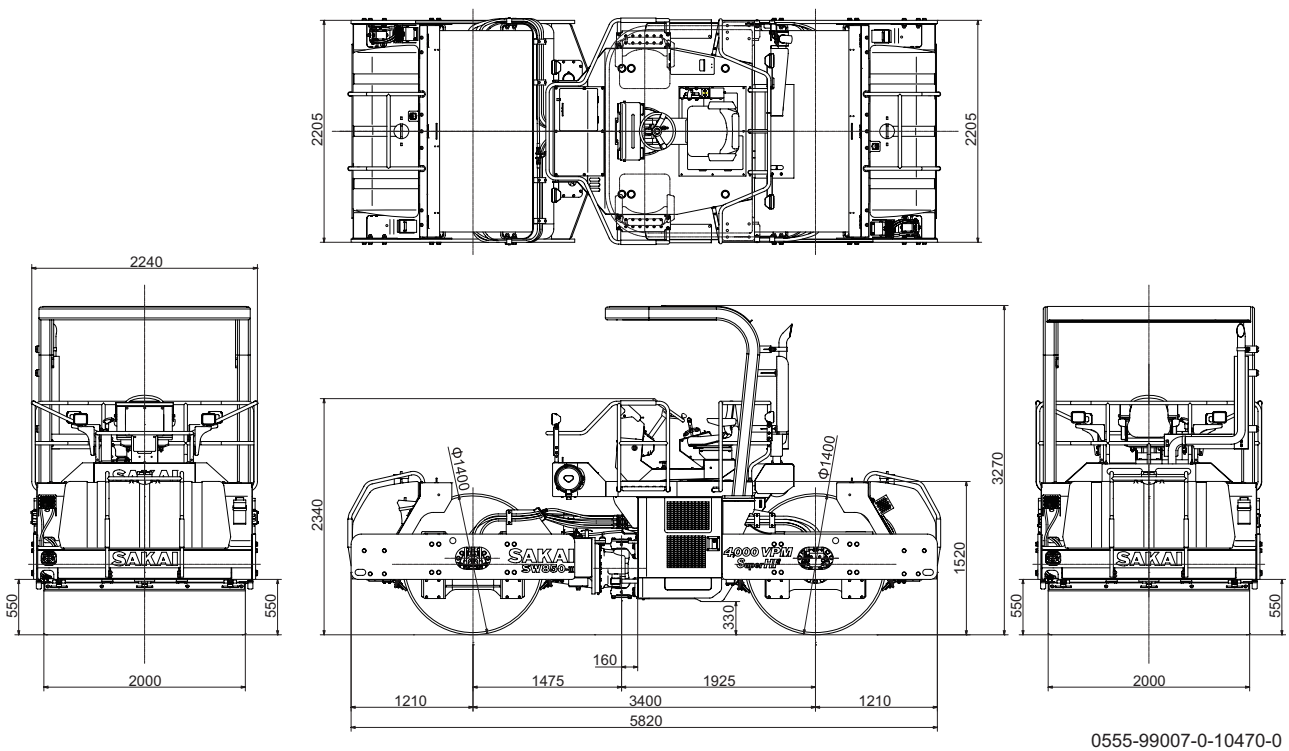
Model					SW800-Ⅱ with ROPS		
Weight	Operating weight				10,900 kg	(24,030 lbs.)	
	Front axle				5,250 kg	(11,575 lbs.)	
	Rear axle				5,650 kg	(12,455 lbs.)	
Dimensions	Overall length	Frame			5,620 mm	(221 in.)	
	Overall width	Frame			1,905 mm	(75 in.)	
	Overall height	Steering wheel			2,290 mm	(90 in.)	
		ROPS			3,210 mm	(126 in.)	
	Wheelbase				3,300 mm	(130 in.)	
	Compaction width				1,700 mm	(67 in.)	
	Minimum height above ground				280 mm	(11 in.)	
	Curb clearance				500 mm	(20 in.)	
Drive speed	Forward/reverse		1st		0 to 7.5 km/h	(0 to 4.7 mph)	
			2nd		0 to 12.5 km/h	(0 to 7.8 mph)	
Vibration performance	Frequency	Low amplitude		1	67 Hz	(4,000 vpm)	
				2	50 Hz	(3,000 vpm)	
				3	42 Hz	(2,500 vpm)	
		High amplitude		1	50 Hz	(3,000 vpm)	
				2	42 Hz	(2,500 vpm)	
	Centrifugal force	Low amplitude		1	121 kN	(27,120 lbs.)	
				2	68 kN	(15,210 lbs.)	
				3	47 kN	(10,580 lbs.)	
		High amplitude		1	108 kN	(24,250 lbs.)	
				2	76 kN	(16,980 lbs.)	
	Amplitude	Low amplitude			0.33 mm	(0.013 in.)	
		High amplitude			0.55 mm	(0.022 in.)	
Minimum turning radius					6.0 m	(236 in.)	
Gradability *1					33 %	(18.3 °)	

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

Engine	Name		DEUTZ TCD2012L04 2V Diesel engine (EPA Tier3)
	Model		Water-cooled, 4-cycle, 4-cylinder, in-line, with turbocharger
	Number of cylinders - Bore × Stroke		4-101 mm × 126 mm (4-3.976 in. × 4.960 in.)
	Displacement		4.038 L (246 cu.in)
	Performance	Rated speed	2,300 min^{-1} (2,300 rpm)
		Rated output	95 kW (127.4 HP)
		Max. torque	495 N·m (365 lbf·ft) at 1,600 min^{-1}
		Fuel consumption	236 g/kW·h (0.388 lb/HP·h)
	Governor		Full electronic control type
	Lubrication system		Pressure lubrication by gear pump
	Oil filter		Full-flow, paper
	Air cleaner		Dry type
	Cooling system		Centrifugal pump forced feeding system (pressure type)
	Cooling fan		Exhaling type
	Electrical system	Alternator	14 V 95 A
		Starter	12 V 3.0 kW
		Battery	12 V CCA 760 × 2 pcs. (12 V)
Power line	Transmission type		Hydraulic transmission
	Reverser		Switching the direction of flow delivered from the variable pump
	Final drive		Planetary gear
Vibrating system	Transmission		Hydraulic transmission
	Vibrator		Eccentric shaft type
Braking device	Service brake		Hydraulic and mechanical, multi-wet disc type
	Parking brake		Mechanical, multi-wet disc type
Steering system	Steering control type		Hydraulic type (articulated type)
	Steering control angle		± 37 °
	Oscillation angle		± 6.5 °
Drums	Use	Front	Vibration and driving
		Rear	Vibration and driving
	Dimension (width × dia.)	Front	1,700 mm × 1,300 mm (67 in. × 51 in.)
		Rear	1,700 mm × 1,300 mm (67 in. × 51 in.)
	Suspension system	Front	Rubber damper type
		Rear	Rubber damper type
Water spray system			Pressurized type
Fluid capacity	Cooling water		17 L (4.5 gal.)
	Fuel tank		220 L (58 gal.)
	Engine oil pan		10 L (2.6 gal.)
	Vibrator case		19 L ×2 (5.0 gal. ×2)
	Hydraulic oil tank		80 L (21 gal.)
	Water spray tank		500 L ×2 (132 gal. ×2)
Others	Electrical components and instruments		1 set

1-2. SW850-Ⅱ



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Model				SW850-Ⅱ with ROPS
Weight	Operating weight			13,170 kg (29,030 lbs.)
	Front axle			6,340 kg (13,975 lbs.)
	Rear axle			6,830 kg (15,055 lbs.)
Dimensions	Overall length	Frame		5,820 mm (229 in.)
	Overall width	Frame		2,205 mm (87 in.)
	Overall height	Steering wheel		2,340 mm (92 in.)
		ROPS		3,270 mm (129 in.)
	Wheelbase			3,400 mm (134 in.)
	Compaction width			2,000 mm (79 in.)
	Minimum height above ground			330 mm (13 in.)
	Curb clearance			550 mm (21.5 in.)
Drive speed	Forward/reverse		1st	0 to 7.0 km/h (0 to 4.3 mph)
			2nd	0 to 11.0 km/h (0 to 6.8 mph)
Vibration performance	Frequency	Low amplitude	1	67 Hz (4,000 vpm)
			2	50 Hz (3,000 vpm)
			3	42 Hz (2,500 vpm)
		High amplitude	1	50 Hz (3,000 vpm)
			2	42 Hz (2,500 vpm)
	Centrifugal force	Low amplitude	1	148 kN (33,290 lbs.)
			2	82 kN (18,520 lbs.)
			3	58 kN (13,010 lbs.)
		High amplitude	1	141 kN (31,750 lbs.)
			2	100 kN (22,490 lbs.)
	Amplitude	Low amplitude		0.33 mm (0.013 in.)
		High amplitude		0.55 mm (0.022 in.)
Minimum turning radius				6.3 m (248 in.)
Gradability *1				31 % (17.2 °)

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

Engine	Name		DEUTZ TCD2012L04 2V Diesel engine (EPA Tier3)
	Model		Water-cooled, 4-cycle, 4-cylinder, in-line, with turbocharger
	Number of cylinders - Bore × Stroke		4-101 mm × 126 mm (4-3.976 in. × 4.960 in.)
	Displacement		4.038 L (246 cu.in.)
	Performance	Rated speed	2,300 min^{-1} (2,300 rpm)
		Rated output	95 kW (127.4 HP)
		Max. torque	495 N·m (365 lbf·ft) at 1,600 min^{-1}
		Fuel consumption	236 g/kW·h (0.388 lb/HP·h)
	Governor		Full electronic control type
	Lubrication system		Pressure lubrication by gear pump
	Oil filter		Full-flow, paper
	Air cleaner		Dry type
	Cooling system		Centrifugal pump forced feeding system (pressure type)
	Cooling fan		Exhaling type
	Electrical system	Alternator	14 V 95A
		Starter	12 V 3.0 kW
		Battery	12 V CCA 760 × 2 pcs. (12 V)
Power line	Transmission type		Hydraulic transmission
	Reverser		Switching the direction of flow delivered from the variable pump
	Final drive		Planetary gear
Vibrating system	Transmission		Hydraulic transmission
	Vibrator		Eccentric shaft type
Braking device	Service brake		Hydraulic and mechanical, multi-wet disc type
	Parking brake		Mechanical, multi-wet disc type
Steering system	Steering control type		Hydraulic type (articulated type)
	Steering control angle		± 37 °
	Oscillation angle		± 6.5 °
Drums	Use	Front	Vibration and driving
		Rear	Vibration and driving
	Dimension (width × dia.)	Front	2,000 mm × 1,400 mm (79 in. × 55 in.)
		Rear	2,000 mm × 1,400 mm (79 in. × 55 in.)
	Suspension system	Front	Rubber damper type
		Rear	Rubber damper type
Water spray system			Pressurized type
Fluid capacity	Cooling water		17 L (4.5 gal.)
	Fuel tank		250 L (66 gal.)
	Engine oil pan		10 L (2.6 gal.)
	Vibrator case		22 L ×2 (5.8 gal. ×2)
	Hydraulic oil tank		80 L (21 gal.)
	Water spray tank		600 L ×2 (159 gal. ×2)
Others	Electrical components and instruments		1 set

2. TABLE OF STANDARD VALUES

2-1. Engine

Classification	Item		Standard value	Remarks
Engine	Engine model		DEUTZ TCD2012L04 2V	
	Rated output		95.0/2,300 kW/rpm (127/2,300 HP/rpm)	
	Max. rpm under no load		2,300 rpm	
	Min. rpm under no load		950 rpm	
	Cylinder head tightening torque	1st	30 N·m (22.1 lbf·ft)	
		2nd	80 N·m (59.0 lbf·ft)	
		3rd	Tighten additional 90°	
	Intake manifold tightening torque		30 N·m (22.1 lbf·ft)	
	Exhaust manifold tightening torque		25 N·m (18.4 lbf·ft)	
	Fan belt tension		New/used	*1 Use V-belt tension gauge
			*1 650/400 ± 50 N (146/90 ± 11 lbf.)	
	Valve clearance (intake)		75°	
	Valve clearance (exhaust)		120°	
	Compression pressure		3.0 to 3.8 MPa (435 to 479 psi)	
	Injection pressure		16 MPa (2,320 psi)	
	Fuel consumption rate		236 g/kW·h (0.388 lb/HP·h)	Engine rotation: 1,600 rpm
	Engine dry mass		410 kg (904 lb.)	

Refer to shop manual of engine manufacturer for engine details.

2-2. Propulsion

Classification	Item		Standard value		Remarks
			SW800-Ⅱ	SW850-Ⅱ	
Propulsion	Speed (forward and reverse)	1st	0 to 7.5 km/h (0 to 4.7 mph)	0 to 7.0 km/h (0 to 4.3 mph)	
		2nd	0 to 12.5 km/h (0 to 7.8 mph)	0 to 11.0 km/h (0 to 6.8 mph)	

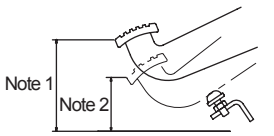
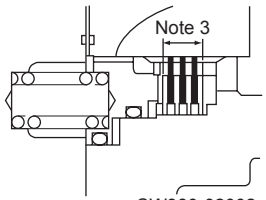
2-3. Hydraulic System

Classification	Item		Standard value	Remarks
Hydraulic system	Propulsion oil pressure	High pressure relief valve setting	40.2 ± 0.8 MPa (5,829 ± 116 psi)	Effective differential pressure
		Cut-off valve setting	37.3 ± 0.8 MPa (5,409 ± 116 psi)	Effective differential pressure
		Charge relief valve setting	2.7 ± 1.0 MPa (392 ± 145 psi)	
		Propulsion motor drainage (front and rear drum)	10.0 L/min (2.6 gal./min) or less	
	Propulsion motor brake release pressure		1.5 to 3.9 MPa (218 to 566 psi)	
	Vibration oil pressure	Main relief valve setting	22.5 ± 1.0 MPa (3,263 ± 145 psi)	
		Port relief valve setting	24.0 ± 1.0 MPa (3,480 ± 145 psi)	
		Vibration motor drainage (front and rear drum)	6.4 L/min (1.7 gal./min) or less	
	Steering oil pressure (orbit roll relief pressure + charge relief pressure)		17.9 ± 1.0 MPa (2,596 ± 145 psi) or less	

2-4. Steering

Classi-fication	Item	Standard value	Remarks
Steering	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

Classi-fication	Item	Standard value	Remarks
Brakes	Clearance between brake pedal and floorboard (as installed)	136 mm (5.4 in.) Note 1: See dimensions	 SW880-02001
	Clearance between brake pedal and floorboard (when pressed down)	80 mm (3.1 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. Water System

Classi-fication	Item	Standard value	Remarks
Water system	Water spray pump discharge pressure	0.26 MPa (38 psi)	

2-7. Oil and Grease Capacity

Classi-fication	Item	Standard value		Remarks
		SW800-Ⅱ	SW850-Ⅱ	
Oil / Grease capacity	Engine oil	10 L (2.6 gal.)		
	Coolant (engine + radiator)	17.0 L (4.5 gal.)		
	Propulsion motor gear oil (front and rear)	3.2 L (0.85 gal.)	3.6 L (0.95 gal.)	
	Vibrator case gear oil (front and rear)	19 L ×2 (5.0 gal. ×2)	22 L ×2 (5.8 gal. ×2)	
	Hydraulic oil tank	80 L (21 gal.)		
	Fuel tank	220 L (58 gal.)	250 L (66 gal.)	
	Water spray tank	500 L ×2 (132 gal. ×2)	600 L ×2 (159 gal. ×2)	

3. FUEL AND LUBRICANTS SPECIFICATION

3-1. Rating

Lubricant	Service classification	Ambient temp. and applicable viscosity rating			Applicable Standards
		-15 to 30°C (5 to 86°F) Cold	0 to 40°C (32 to 104°F) Moderate	15 to 55°C (59 to 131°F) Tropical	
Engine oil	API grade CH-4	SAE10W-30	SAE30	SAE40	MIL-L-2104D
Gear oil	API grade GL4	SAE80W-90	SAE90	SAE140	MIL-L-2105
Hydraulic oil	Wear resistant	ISO-VG32 Over VI 140	ISO-VG46 Over VI 140	ISO-VG68 Over VI 110	ISO-3448
Grease	Lithium type extreme pressure				NLGI-2
Fuel	Diesel oil				ASTM D975-2D

3-2. Recommended Lubricants

Lubricant / Oil company	Engine oil API CH-4	Gear oil API GL 4	Hydraulic oil VG 46	Grease NLGI-2
CALTEX	DELO 400 oil	Universal Thuban 90	Rando Oil HD 46	Martifack EP 2
BP	BP Vanellus MG	BP Gear Oil EP 90	BP Energol HLP 46	BP Energrease LP-EP 2
ESSO	Esso Lube XD-3extra	Esso Gear Oil GP 90	Nuto H 46	Beacon EP 2
MOBIL	Mobil Delvac 1300 super	Mobil Pegasus Gear Oil 90	Nuto Oil 25	Beacon EP 25
SHELL	Shell Rotella T	Shell Spirax 90 EP	Shell Tellus Oil 46	Shell Alvania EP Grease 2
CASTROL	Castrol Elexion	Castrol Hypoy 90	Hyspin AWS 46	Spherrol ELP 2

4. TIGHTENING TORQUE CHART

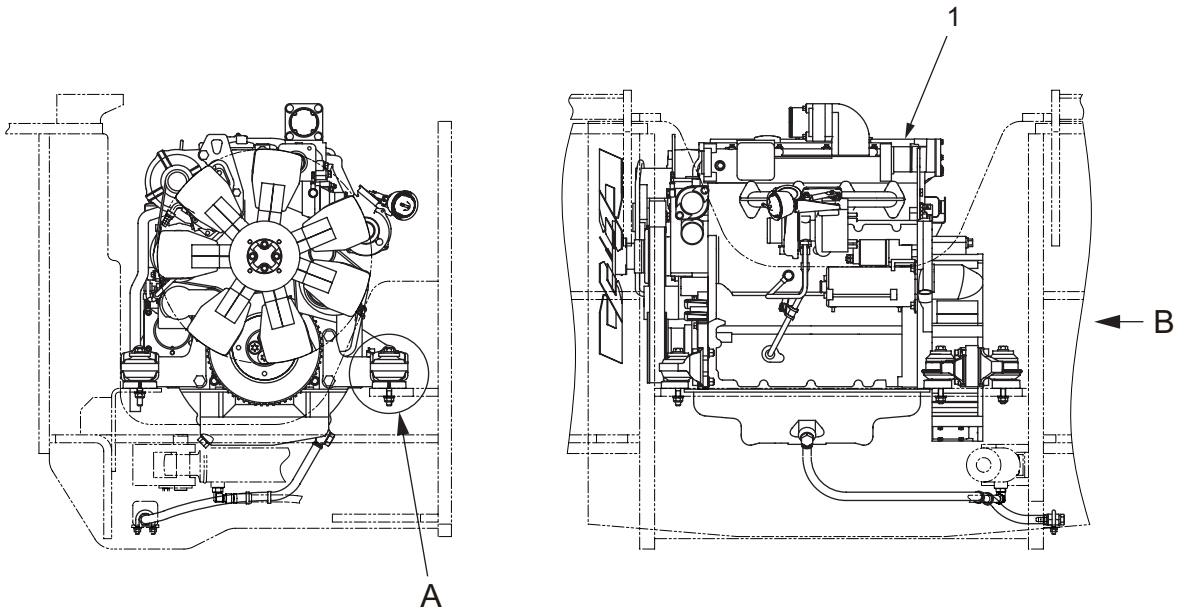
N·m	(lbf·ft)

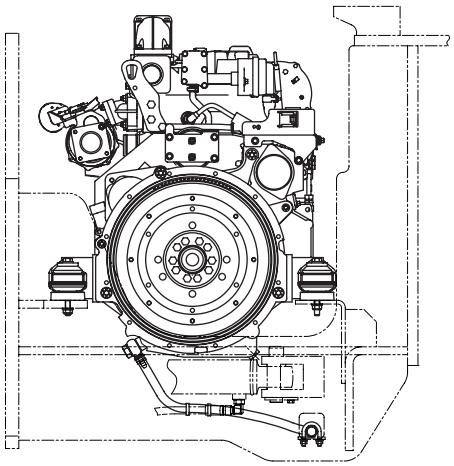
	Nominal Dia.	Pitch	Strength Classification							
			6.8		8.8		10.9		12.9	
Metric coarse screw	5	0.8	4.9	(3.6)	5.9	(4.4)	7.8	(5.8)	7.8	(5.8)
	6	1.0	7.8	(5.8)	9.8	(7.2)	13	(9.6)	13	(9.6)
	8	1.25	17	(13)	23	(17)	31	(23)	31	(23)
	10	1.5	39	(29)	49	(36)	59	(44)	59	(44)
	12	1.75	69	(51)	78	(58)	108	(80)	108	(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

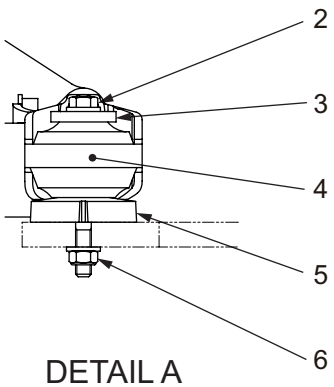
1. ENGINE

1-1. Engine Mount





VIEW B



DETAIL A

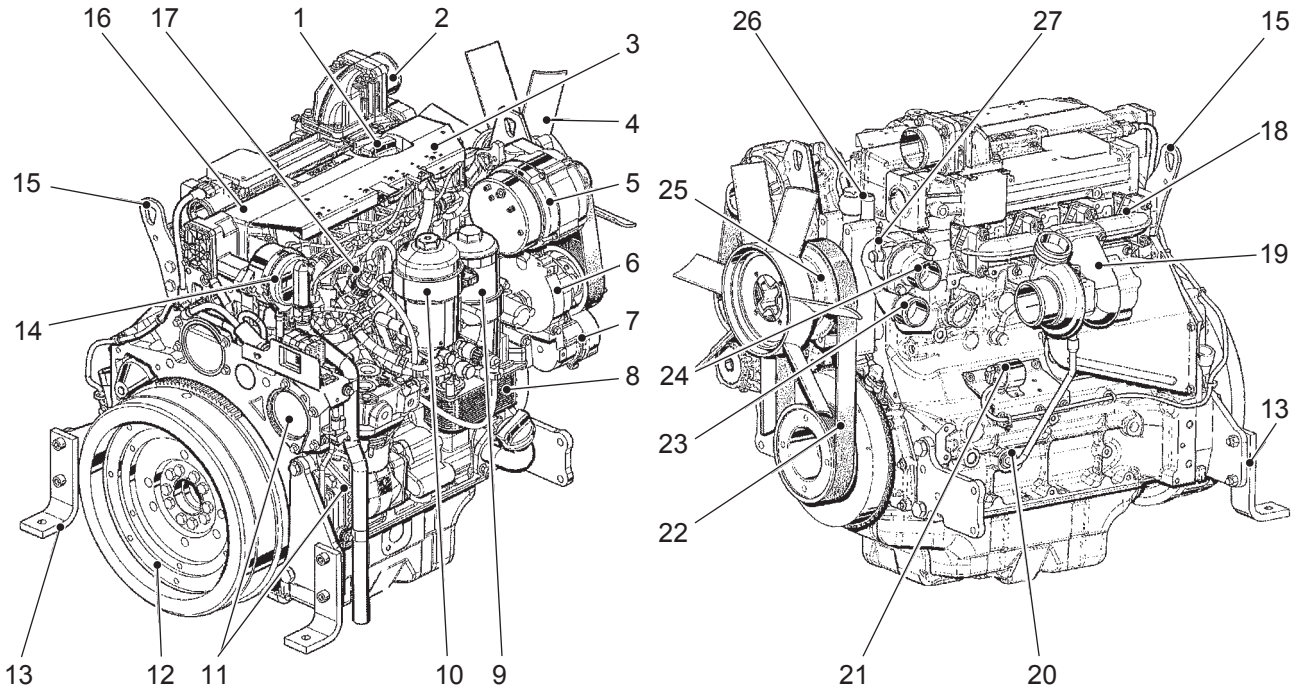
0554-01803-0-11053-B

(1) Engine
(2) Bolt : M12×130
(3) Washer
(4) Damper
(5) Base
(6) Nut : M12

N・m

(6) Nut M12 : 108 N·m (80 lbf·ft)

1-2. Engine Exterior



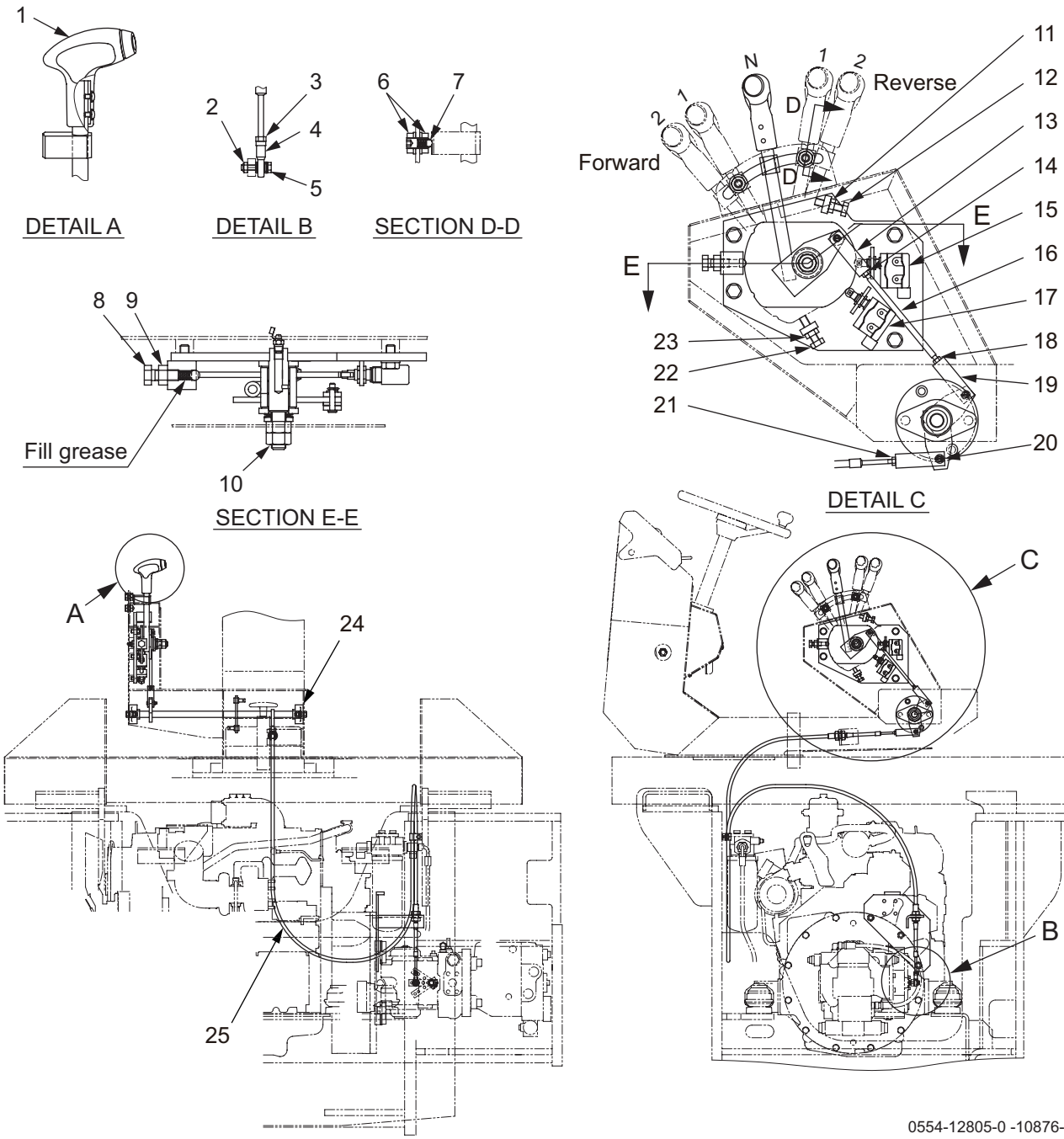
SW880-03001

* The actual equipment may differ from that shown above.

(1) Lubricating of filling
(2) Combustion air inlet
(3) Cover for cable harness mount
(4) Fan
(5) Alternator
(6) Coolant pump
(7) Tension pulley
(8) Lube oil cooler
(9) Lubricating oil filter
(10) Fuel filter
(11) Hydraulic pump or compressor mounting (optional)
(12) Flywheel
(13) Transport bracket (only for transport)
(14) Crankcase ventilation valve
(15) Transport device
(16) Cylinder head cover
(17) Control block FCU (Fuel Control Unit)
(18) Exhaust manifold line
(19) Turbocharger
(20) Lubricating oil return line from exhaust turbocharger
(21) Starter motor relay
(22) V-rib belt
(23) Coolant inlet
(24) Coolant outlet
(25) Fan mounting
(26) Compensation line connection to tank
(27) Ventilation line connection

2. CONTROL SYSTEM

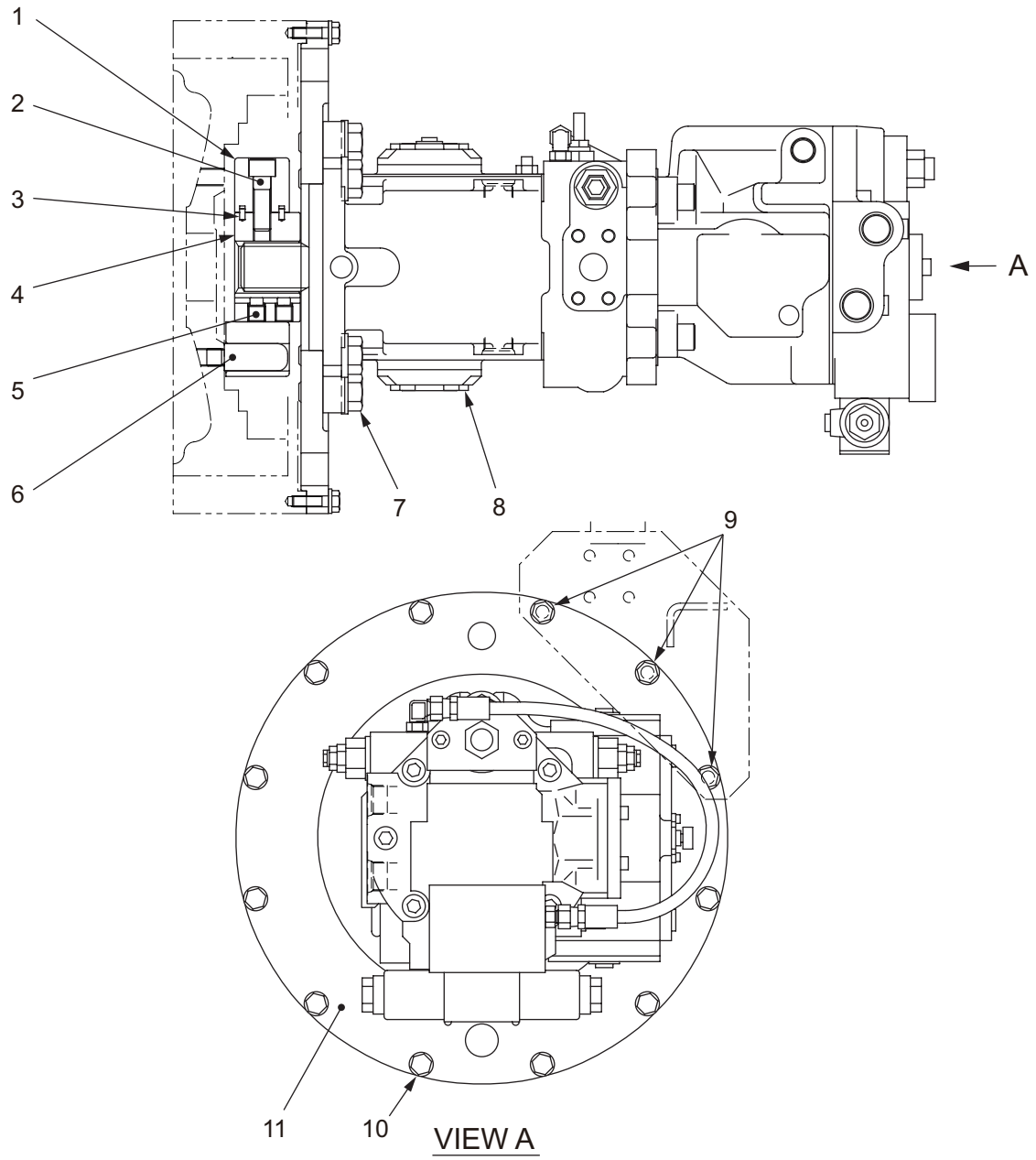
2-1. Forward-reverse Control



(1)	Forward-reverse lever		(10)	Nut	: M16	(18)	Nut	: M6 (Left-hand thread)
(2)	Nut	: M6	(11)	Nut	: M10	(19)	Clevis	: M6 (Left-hand thread)
(3)	Nut	: M6	(12)	Bolt	: M10×40	(20)	Clevis	: M6
(4)	Rod end		(13)	Clevis	: M6	(21)	Nut	: M6
(5)	Bolt	: M6×30	(14)	Nut	: M6	(22)	Bolt	: M10×40
(6)	Nut	: M12	(15)	F-R lever switch		(23)	Nut	: M10
(7)	Plunger		(16)	Rod		(24)	Bearing unit	
(8)	Bolt	: M12×30	(17)	Backup buzzer switch		(25)	Control cable	
(9)	Nut	: M12						

3. PUMP MOUNT

3-1. Pump Mount



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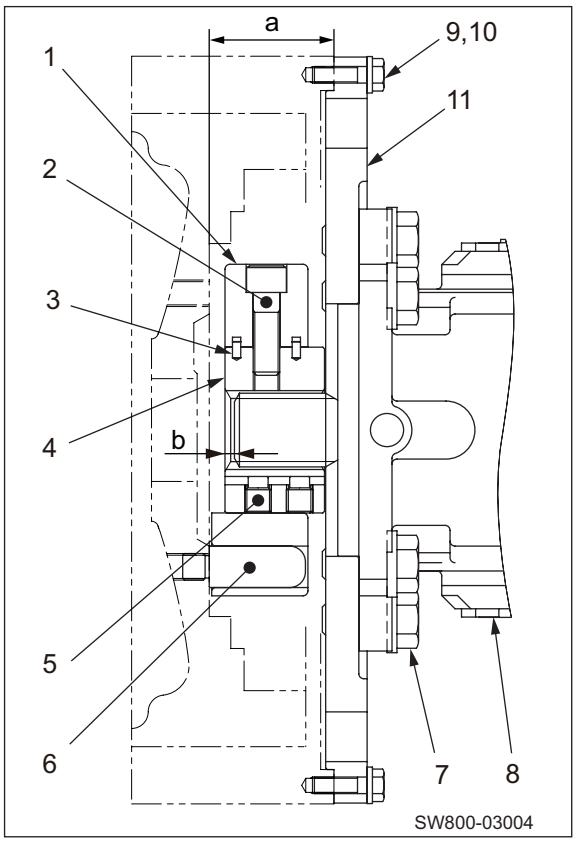
(1)	Coupling		(5) Set screw	: M16×22	(9) Bolt : M10×40
(2)	Bolt	: M16×50	(6) S bolt	: M16	(10) Bolt : M10×35
(3)	Spring pin		(7) Bolt	: M20×45	(11) Housing
(4)	Hub		(8) Pump		

N·m

(2)	Bolt	M16×50	:	210 to 230	N·m	(155 to 170	lbf·ft)
(5)	Set screw	M16×22	:	100 to 120	N·m	(74 to 89	lbf·ft)
(6)	S bolt	M16	:	210 to 230	N·m	(155 to 170	lbf·ft)
(7)	Bolt	M20×45	:	539	N·m	(398	lbf·ft)
(9)	Bolt	M10×40	:	49	N·m	(36	lbf·ft)
(10)	Bolt	M10×35	:	49	N·m	(36	lbf·ft)

3-1-1. Installation of pump



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

① Install eight locating spring pins (3) to hub (4).
② Apply adequate amount of lithium-based grease to pump (8) and hub (4) splines.
③ Install hub (4) to pump (8) and set to the specified dimension.

★ Specified dimension a: 75.2 mm (2.96 in.)
b: 5.7 $^{0}_{-0.5}$ mm (0.23 $^{0}_{-0.02}$ in.)

④ Tighten two set screws (5) to fix.

N・m
(5) Set screw M16×22: 100 to 120 N·m (74 to 89 lbf·ft)

⑤ Install housing (11) to pump (8) and fix with six bolts (7) and washers.

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

⑥ Install rubber body of coupling (1) to hub (4) by locating with spring pins (3).
⑦ Tighten four bolts (2) to fix.

N・m
(2) Bolt M16×50: 210 to 230 N·m (155 to 170 lbf·ft)

⑧ Install four S bolts (6) to engine flywheel.

N・m
(6) S bolt M16: 210 to 230 N·m (155 to 170 lbf·ft)

⑨ Align S bolts (6) with coupling (1) holes on the pump side, and install pump subassembly to engine.
⑩ Fix with three bolts (9), nine bolts (10) and washers.

N・m
(9) Bolt M10×40: 49 N·m (36 lbf·ft)
(10) Bolt M10×35: 49 N·m (36 lbf·ft)

(NOTICE)

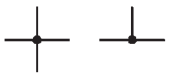
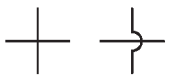
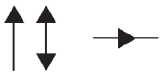
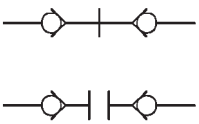
• **Bolts (2) and S bolts (6) are treated with thread-locking fluid. When removed, replace with new bolts.**

HYDRAULIC SYSTEMS

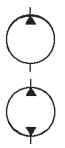
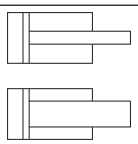
1. SYSTEM CIRCUIT DIAGRAM

1-1. Graphic Symbols for Hydraulic Circuits

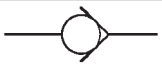
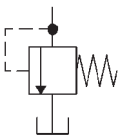
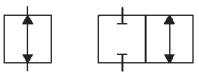
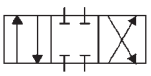
Basic Symbols

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.	

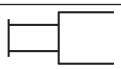
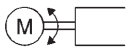
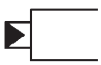
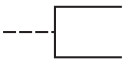
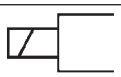
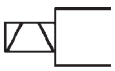
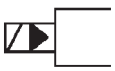
Pump, Motors and Cylinders

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	

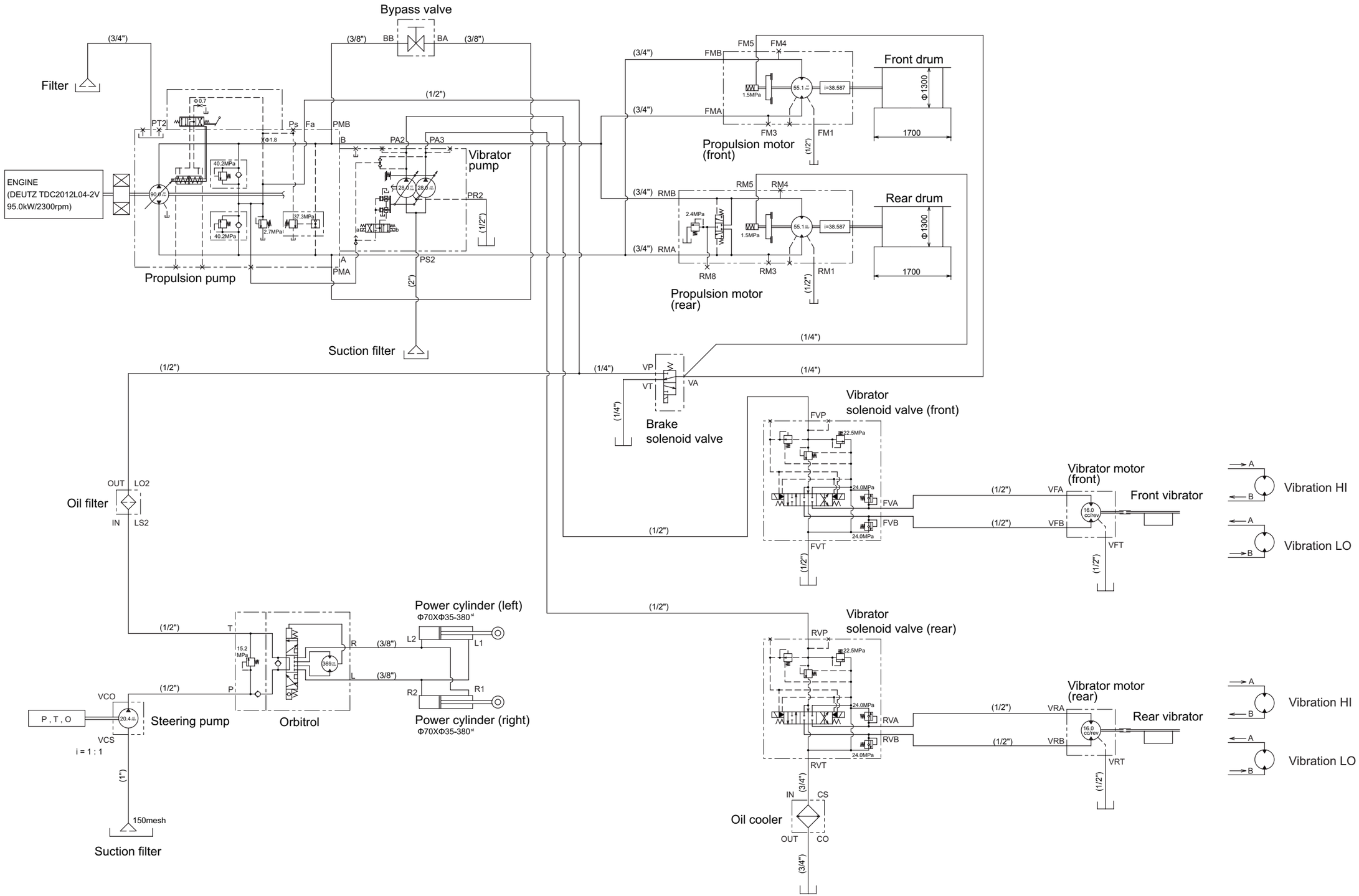
Valves

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 (SW800-Ⅱ)



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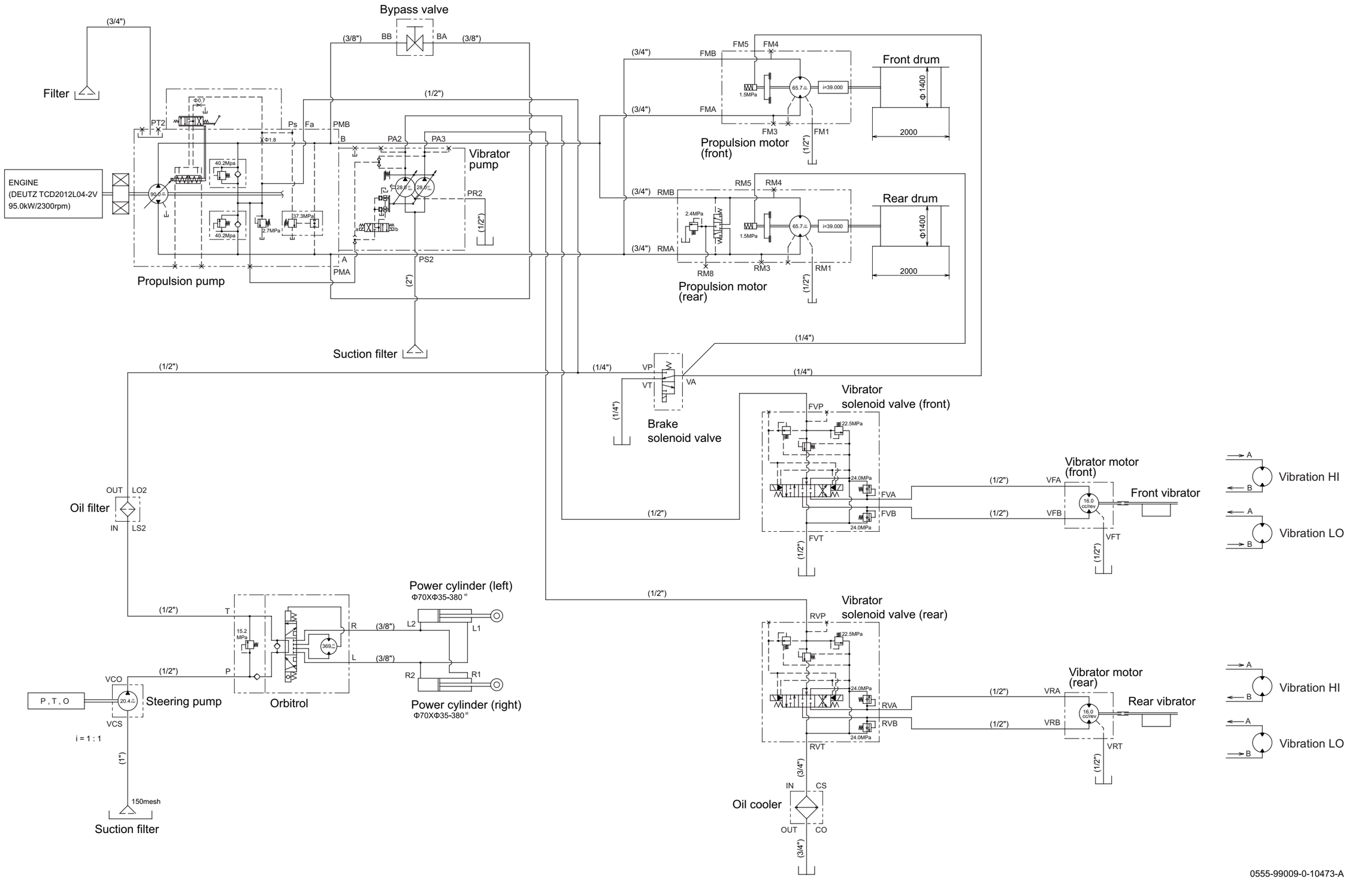
1-3. Hydraulic Circuit Diagram (SW850-Ⅱ)



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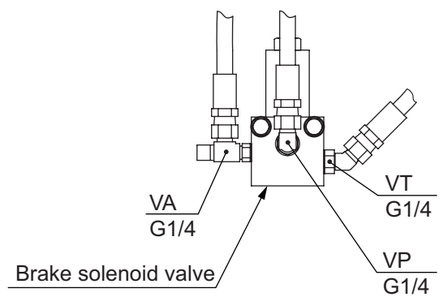
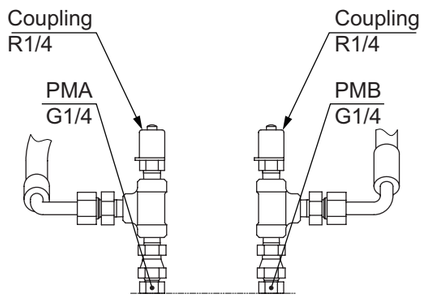
2. PROPULSION HYDRAULIC SYSTEM

2-1. Propulsion Hydraulic Piping

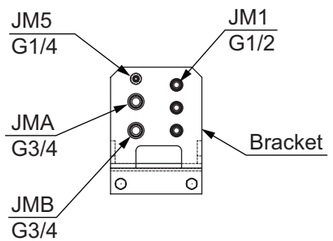
2-1-1. Propulsion hydraulic piping (1)



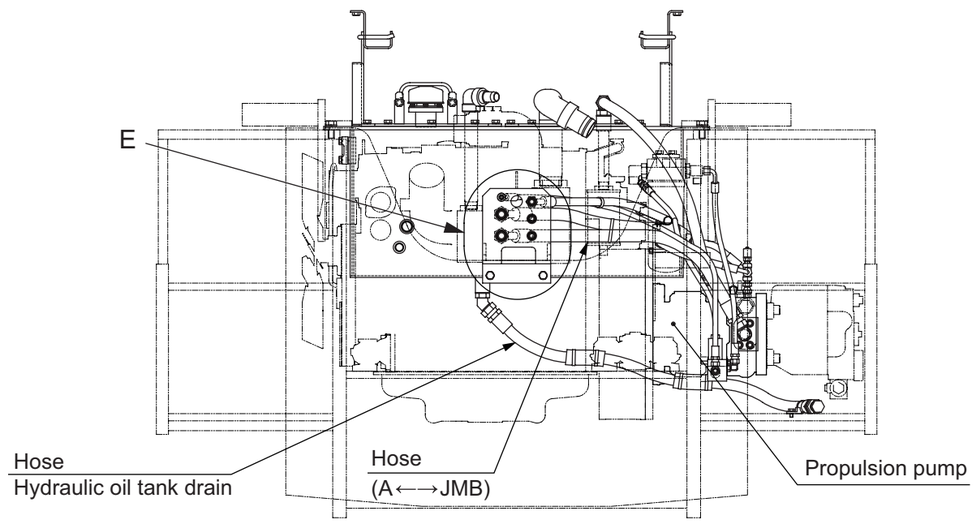
DETAIL C

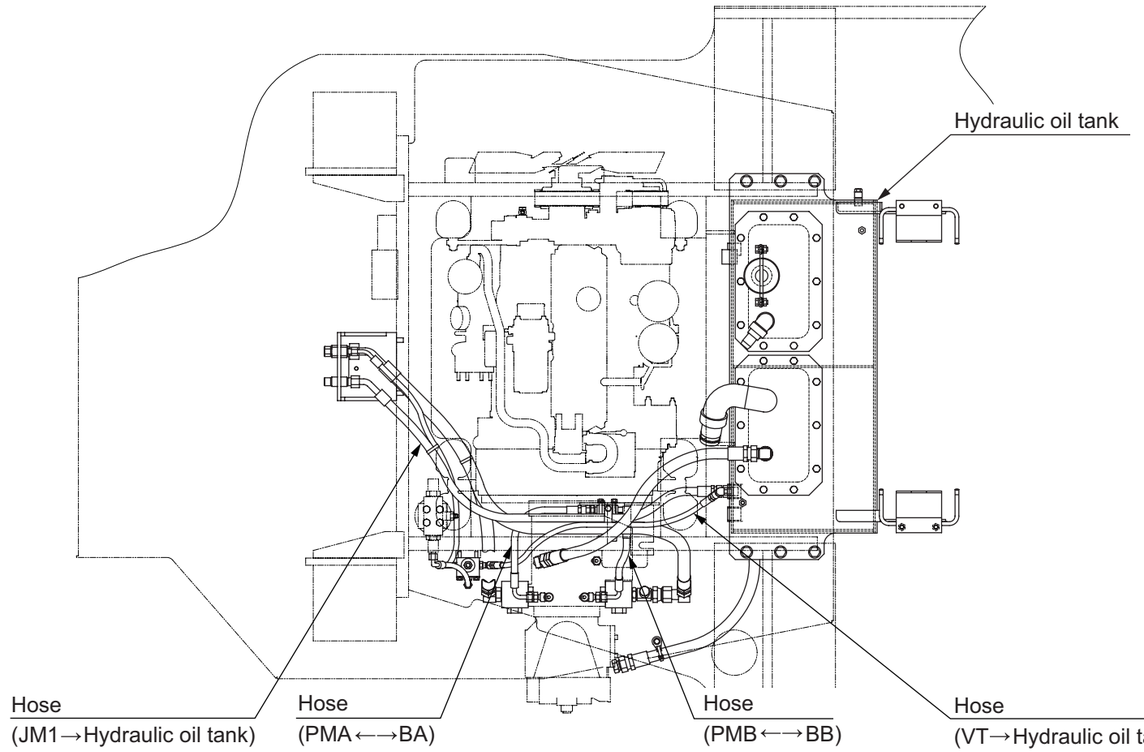


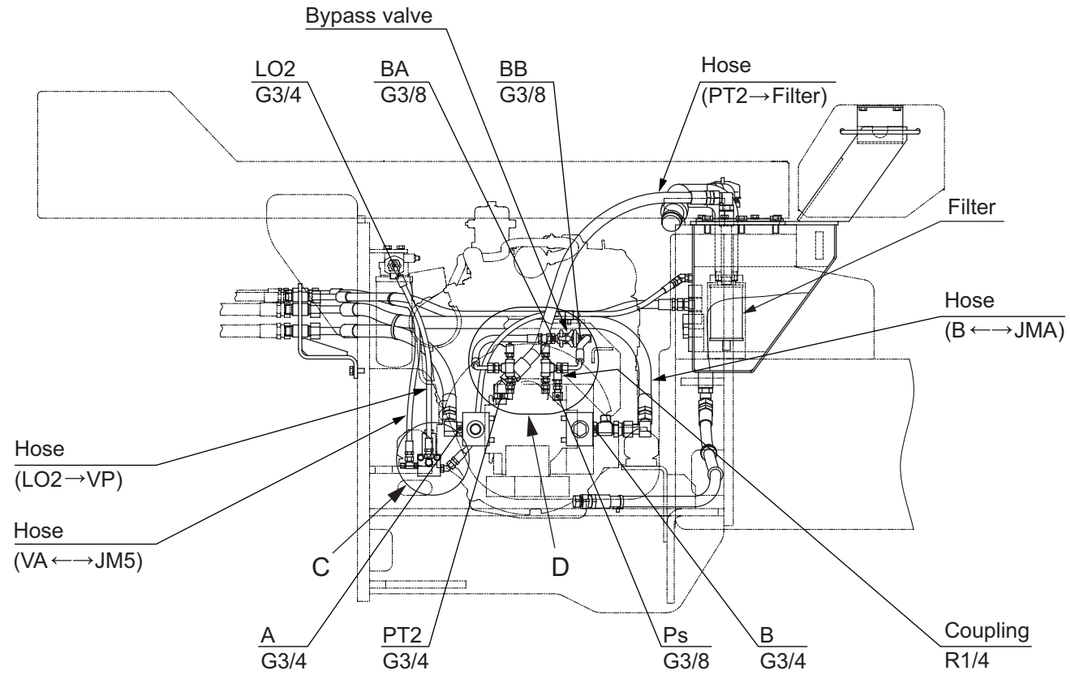
DETAIL D



DETAIL E







• The letters and figures (such as VA and JM5) show each port and the arrow (←→;→) symbols show the hose connection and the direction of the flow of the oil.

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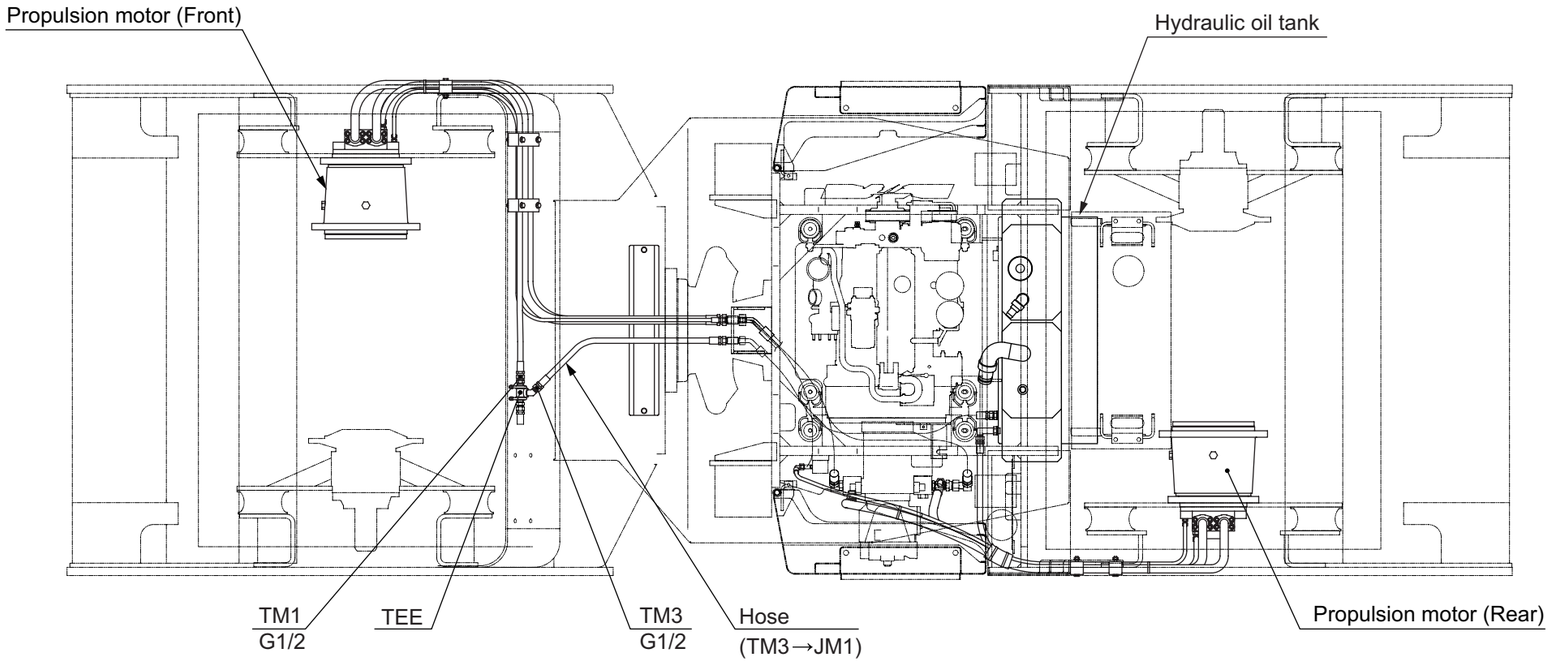
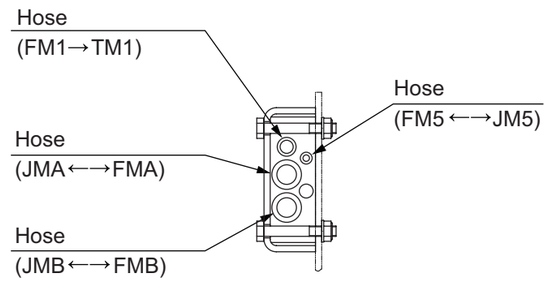
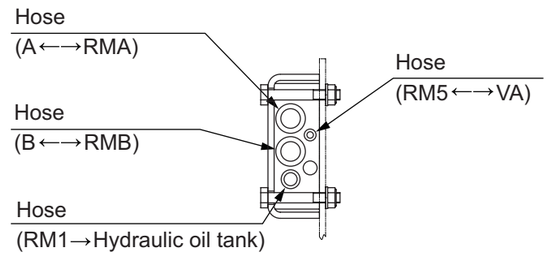
2-1-2. Propulsion hydraulic piping (2)

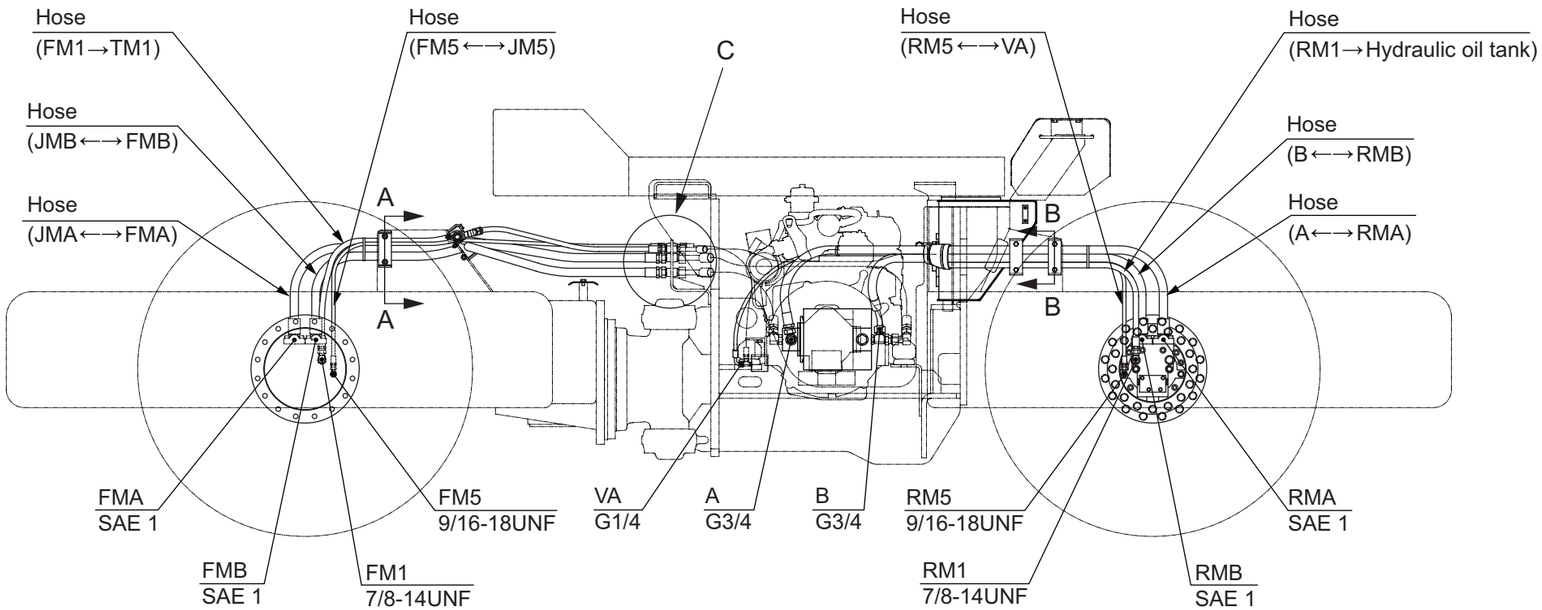


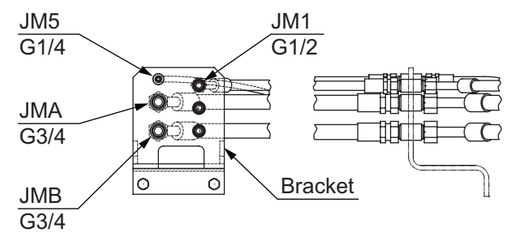


SECTION A-A



SECTION B-B





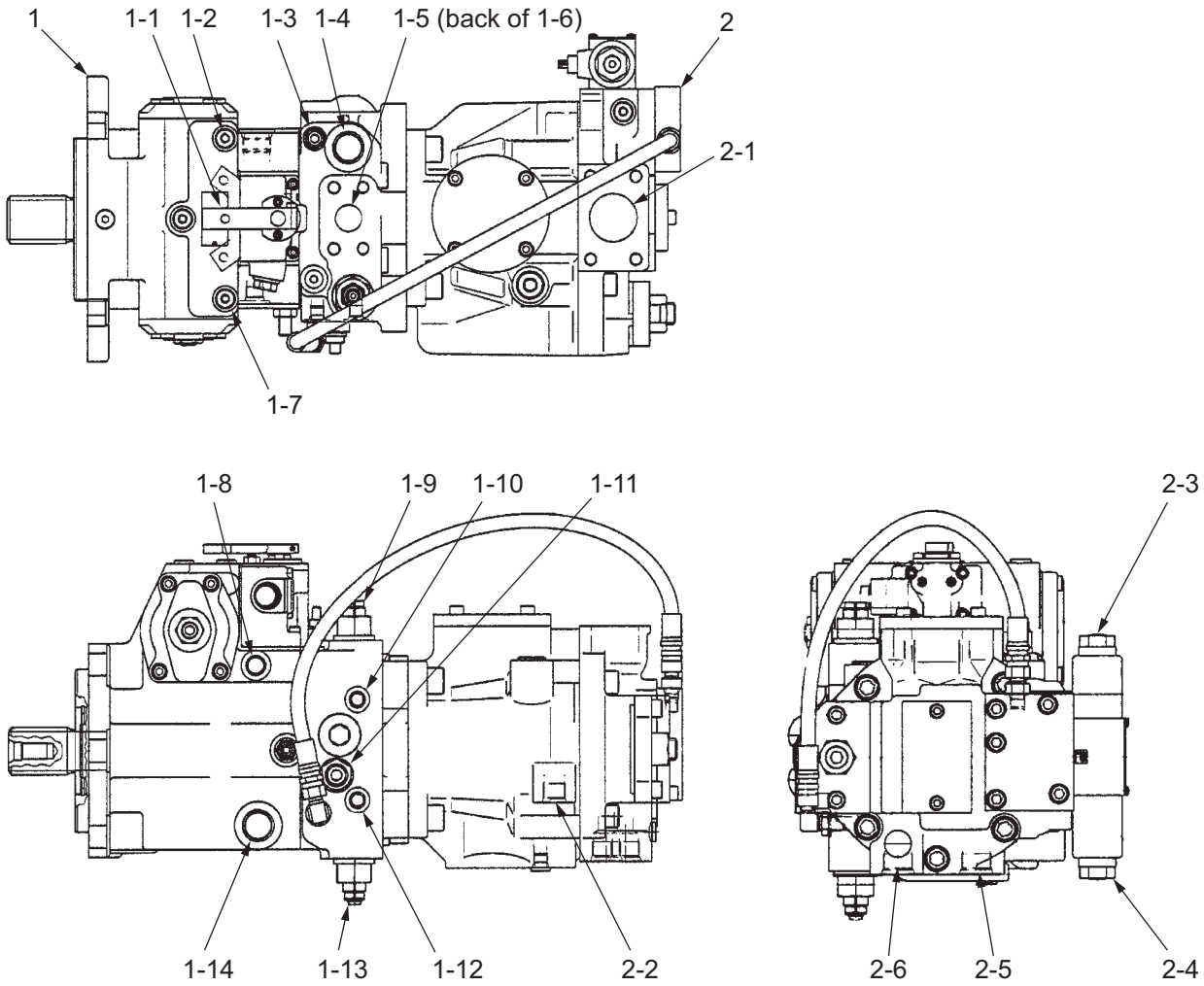
DETAIL C

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

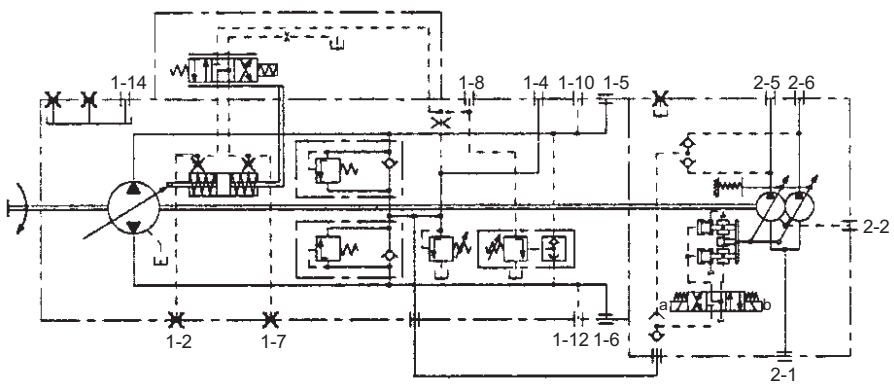
0554-36806-0-10878-C

2-2. Hydraulic Component Specifications

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



SW800-Ⅱ-04001



Pump circuit diagram

SW800-Ⅱ-04002

(1) Propulsion pump

(1-1)	Forward-reverse lever		
(1-2)	Servo pressure gauge port		: G1/4
(1-3)	Cut-off valve		
(1-4)	Charge supply port	**[Fa]**	: G3/4
(1-5)	Port B (Forward)	**[B]**	: SAE 1”
(1-6)	Port A (Reverse)	**[A]**	: SAE 1”
(1-7)	Servo pressure gauge port		: G1/4
(1-8)	Control pressure port	**[Ps]**	: G3/8
(1-9)	High-pressure relief valve (For Port B)		
(1-10)	High-pressure gauge port (For Port B)	**[PMB]**	: G1/4
(1-11)	Charge relief valve		
(1-12)	High-pressure gauge port (For Port A)	**[PMA]**	: G1/4
(1-13)	High-pressure relief valve (For Port A)		
(1-14)	Drain port	**[PT2]**	: G3/4

Specifications

- Displacement : 90 cm^3/rev (5.49 cu.in./rev)
- High pressure relief valve pressure setting : 40.2 ± 0.8 MPa (5,829 ± 116 psi)
- Charge relief valve pressure setting : 2.7 ± 0.1 MPa (392 ± 14.5 psi)
- Cut-off valve pressure setting : 37.3 ± 0.8 MPa (5,409 ± 116 psi)

(2) Vibrator pump

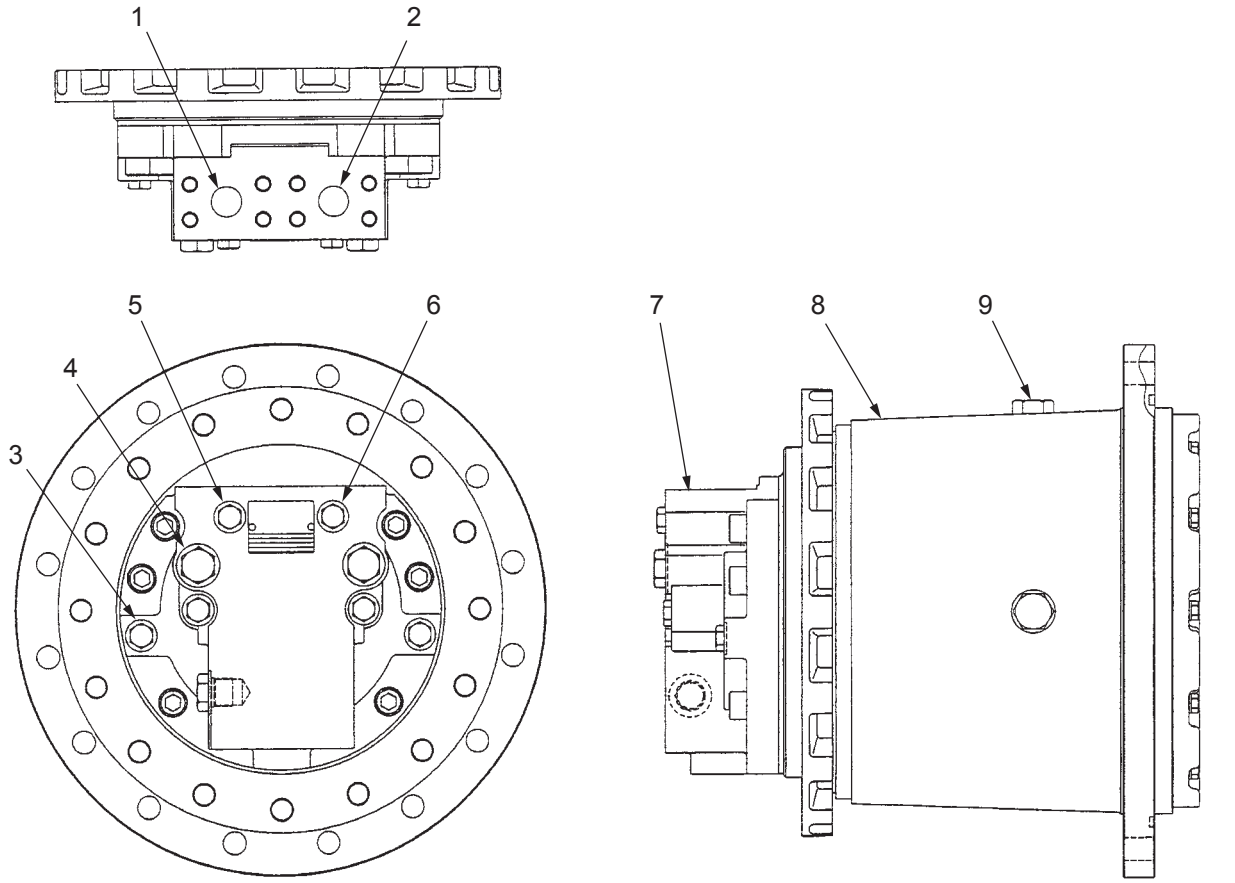
(2-1)	Charge supply port	**[PS2]**	: SAE 2”
(2-2)	Drain port	**[PR2]**	: G1/2
(2-3)	Solenoid valve a (High amplitude)		
(2-4)	Solenoid valve b (Low amplitude)		
(2-5)	Port A2	**[PA2]**	: G3/4
(2-6)	Port A3	**[PA3]**	: G3/4

Specifications

- Displacement : 56 cm^3/rev (3.42 cu.in./rev)

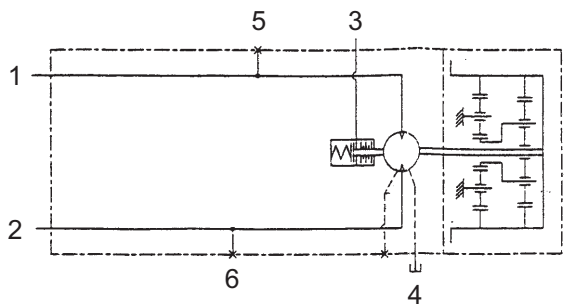
- Propulsion and vibrator pump assembly weight : 107 kg (236 lbs.)

2-2-2. Propulsion hydraulic motor (front) (SW800-Ⅱ)



SW800-04005

(1) Port B (Reverse)	**[FMB]**	: SAE 1”	(7) Motor	
(2) Port A (Forward)	**[FMA]**	: SAE 1”	(8) Reduction gear	
(3) Parking brake pilot port	**[FM5]**	: 9/16-18UNF	(9) Filler cap	: 7/8-14UNF
(4) Drain port	**[FM1]**	: 7/8-14UNF		
(5) High-pressure gauge port (For Port B)	**[FM4]**	: 9/16-18UNF		
(6) High-pressure gauge port (For Port A)	**[FM3]**	: 9/16-18UNF		



Pump circuit diagram

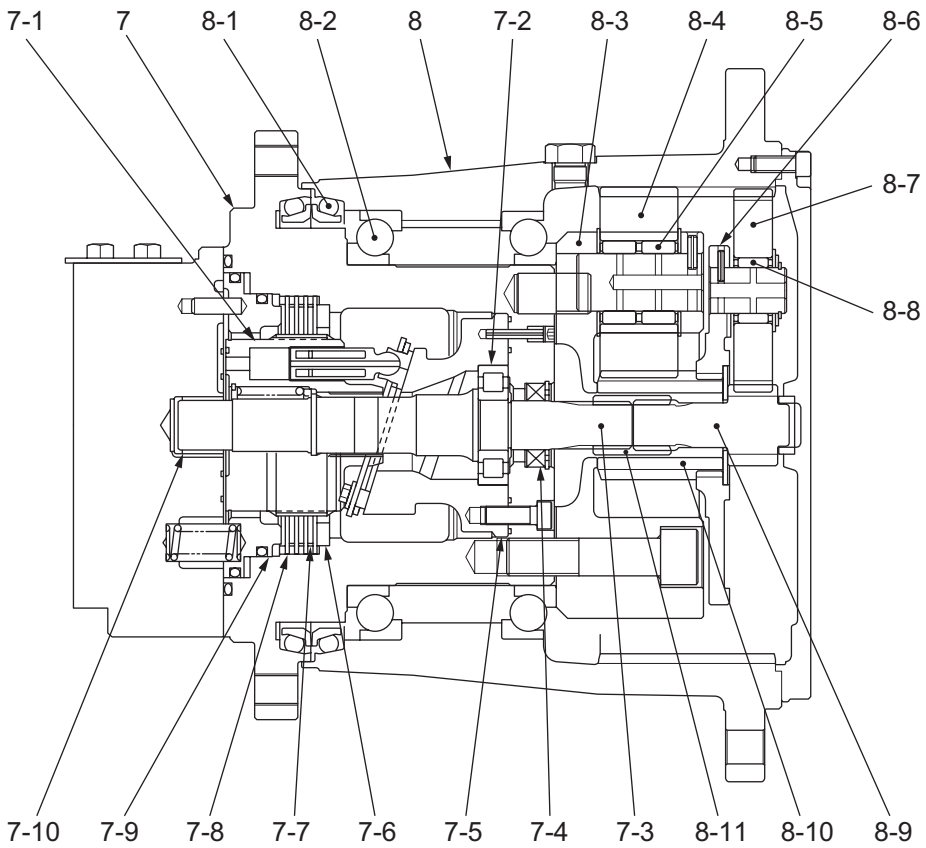
SW800-04006

Motor specifications
- Displacement : 55.1 cm^3/rev (3.6 cu.in./rev)
- Maximum working pressure : 41.8 MPa (6,061 psi)

Reduction gear specifications
- Reduction ratio : 1/38.587

- Propulsion hydraulic motor weight : 167 kg (368 lbs.)

1) Internal structure of propulsion hydraulic motor (front) (SW800-Ⅱ)

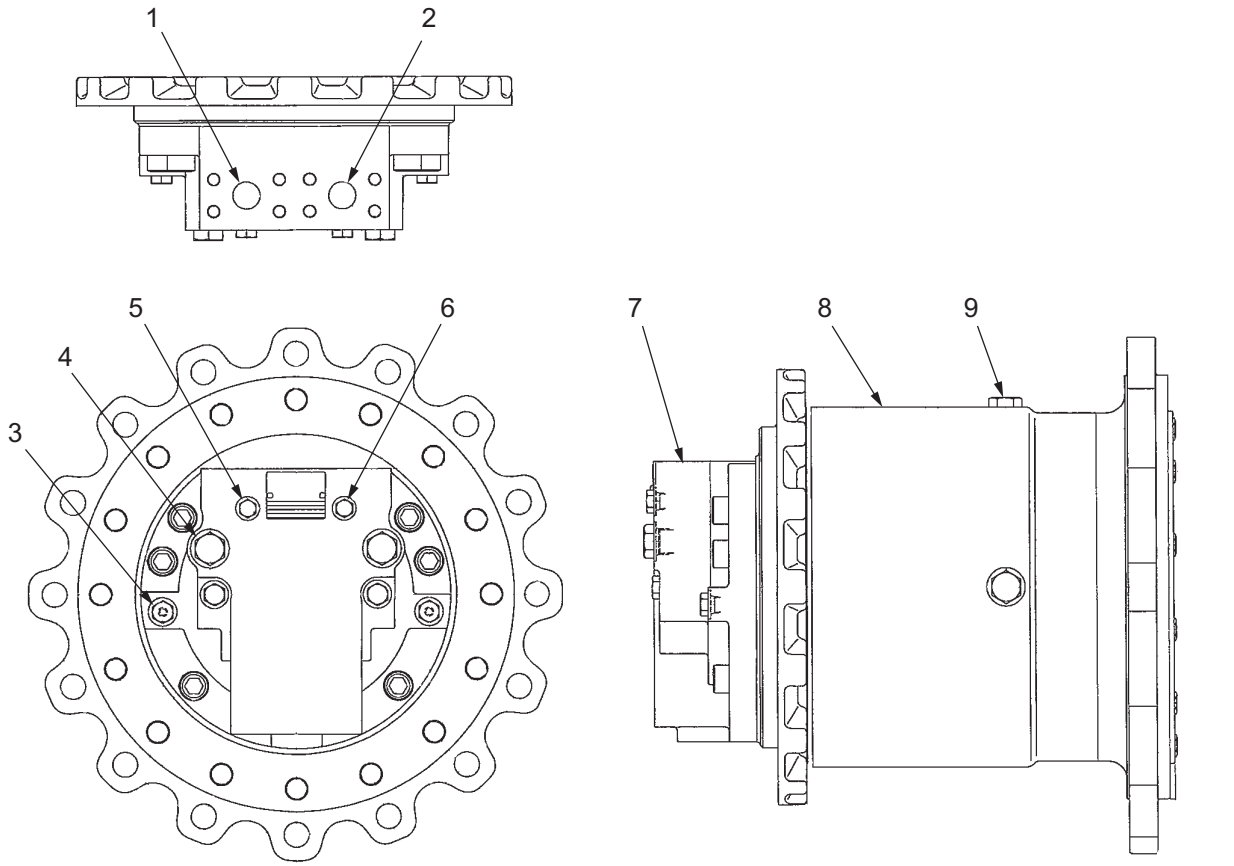


SW800-04007

(7) Motor
(7-1) Cylinder block kit
(7-2) Roller bearing
(7-3) Shaft
(7-4) Oil seal
(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

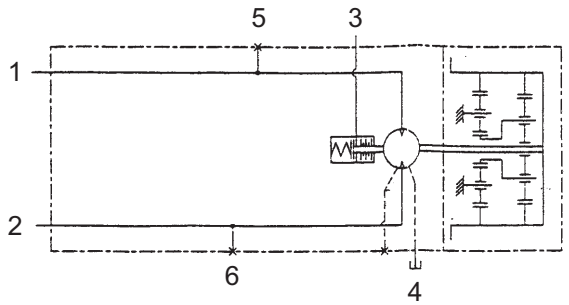
(8) Reduction gear
(8-1) Floating seal kit
(8-2) Angular bearing
(8-3) Carrier B
(8-4) Planetary gear B
(8-5) Needle roller
(8-6) Carrier A
(8-7) Planetary gear A
(8-8) Needle roller
(8-9) Sun gear A
(8-10) Sun gear B
(8-11) Coupling

2-2-3. Propulsion hydraulic motor (front) (SW850-Ⅱ)



SW800-Ⅱ-04003

(1)	Port B (Reverse)	**[FMB]** : SAE 1”	(7)	Motor	
(2)	Port A (Forward)	**[FMA]** : SAE 1”	(8)	Reduction gear	
(3)	Parking brake pilot port	**[FM5]** : 9/16-18UNF	(9)	Filler cap	: 7/8-14UNF
(4)	Drain port	**[FM1]** : 7/8-14UNF			
(5)	High-pressure gauge port (For Port B)	**[FM4]** : 9/16-18UNF			
(6)	High-pressure gauge port (For Port A)	**[FM3]** : 9/16-18UNF			



Pump circuit diagram

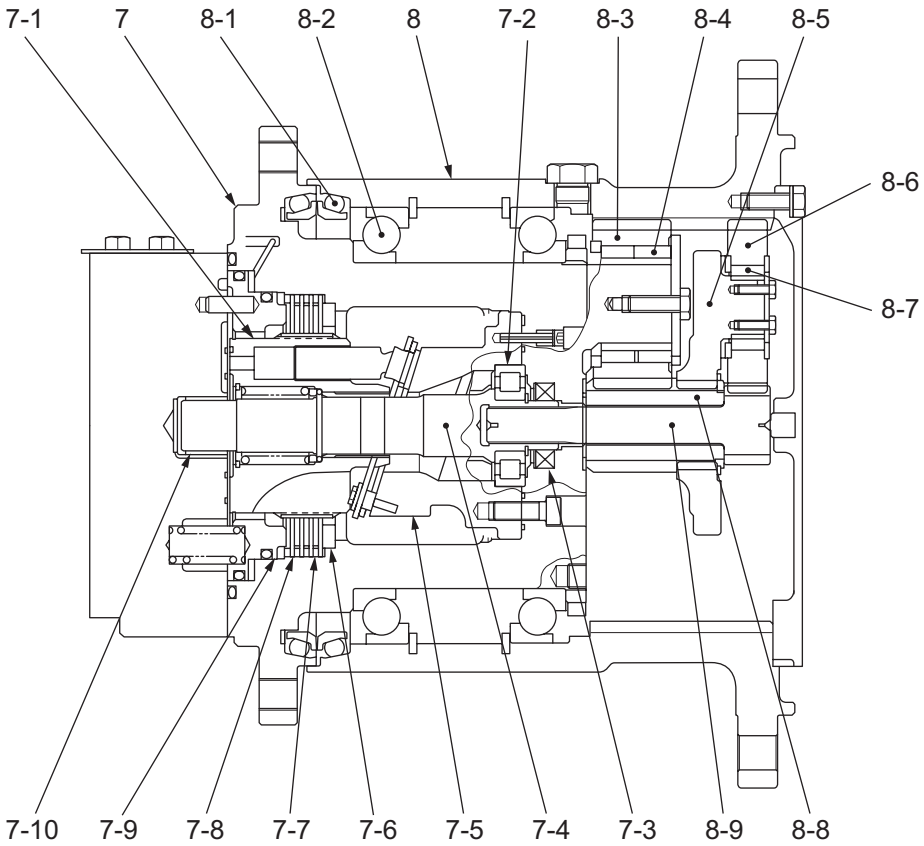
SW800-04006

Motor specifications
- Displacement : 65.7 cm^3/rev (4.0 cu.in./rev)
- Maximum working pressure : 41.8 MPa (6,061 psi)

Reduction gear specifications
- Reduction ratio : 1/39.000

- Propulsion hydraulic motor weight : 190 kg (419 lbs.)

1) Internal structure of propulsion hydraulic motor (front) (SW850-Ⅱ)

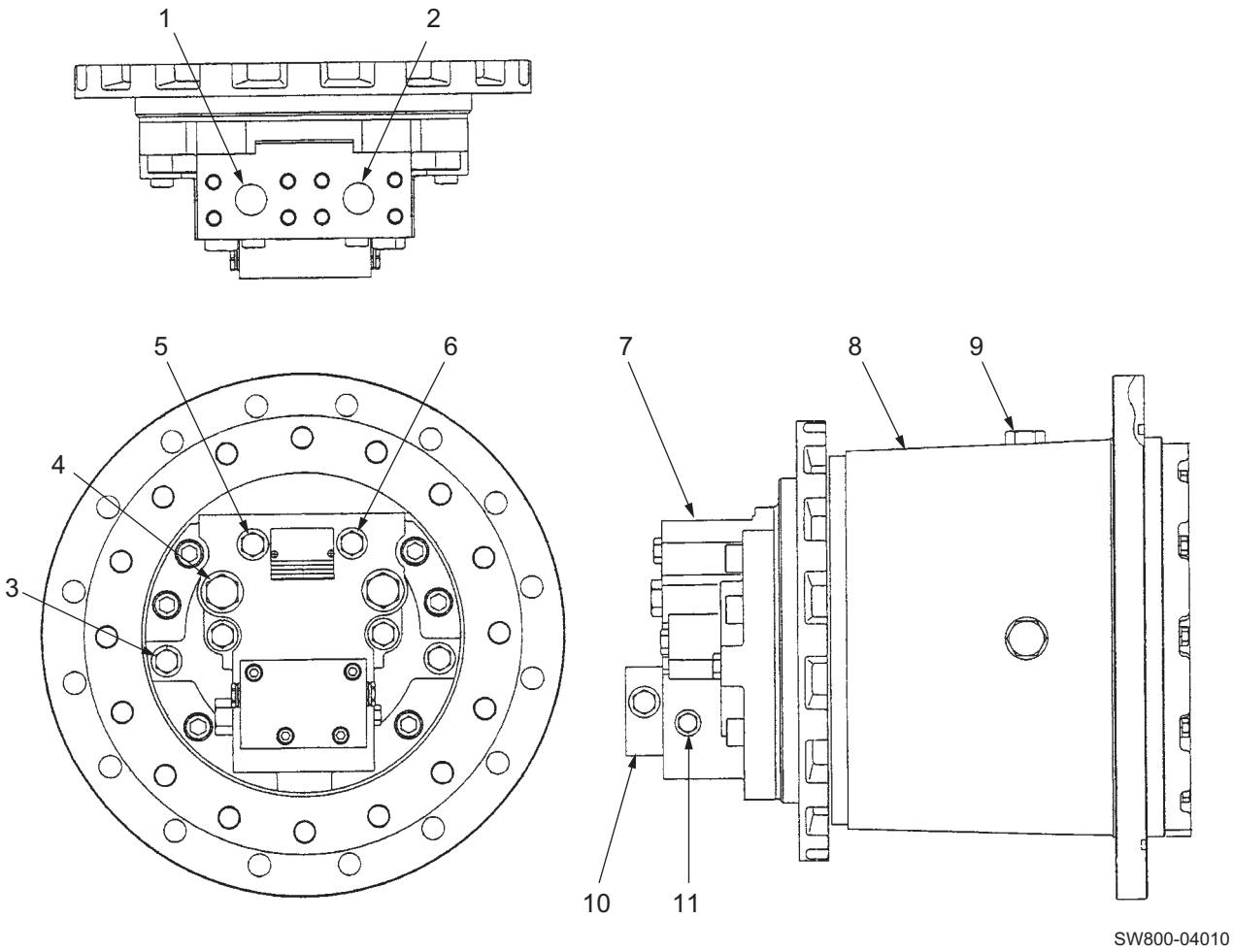


SW800-Ⅱ-04004

(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

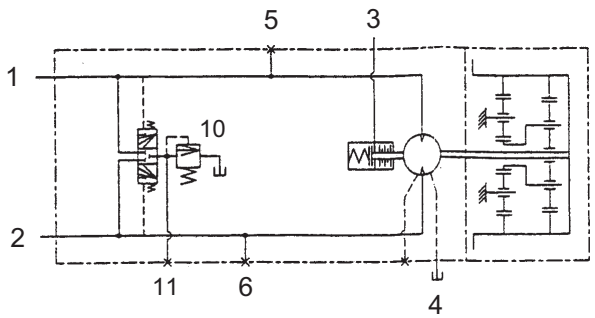
(8) Reduction gear
(8-1) Floating seal kit
(8-2) Angular bearing
(8-3) Planetary gear 2nd
(8-4) Needle roller
(8-5) Carrier
(8-6) Planetary gear 1st
(8-7) Needle roller
(8-8) Sun gear 2nd
(8-9) Sun gear 1st

2-2-4. Propulsion hydraulic motor (rear) (SW800-Ⅱ)



SW800-04010

(1) Port B (Forward)	**[RMB]** : SAE 1”	(7) Motor	
(2) Port A (Reverse)	**[RMA]** : SAE 1”	(8) Reduction gear	
(3) Parking brake pilot port	**[RM5]** : 9/16-18UNF	(9) Filler cap	: 7/8-14UNF
(4) Drain port	**[RM1]** : 7/8-14UNF	(10) Shuttle valve housing	
(5) High-pressure gauge port (For Port B)	**[RM4]** : 9/16-18UNF	(11) Charge pressure gauge port	**[RM8]** : 7/16-20UNF
(6) High-pressure gauge port (For Port A)	**[RM3]** : 9/16-18UNF		



Pump circuit diagram

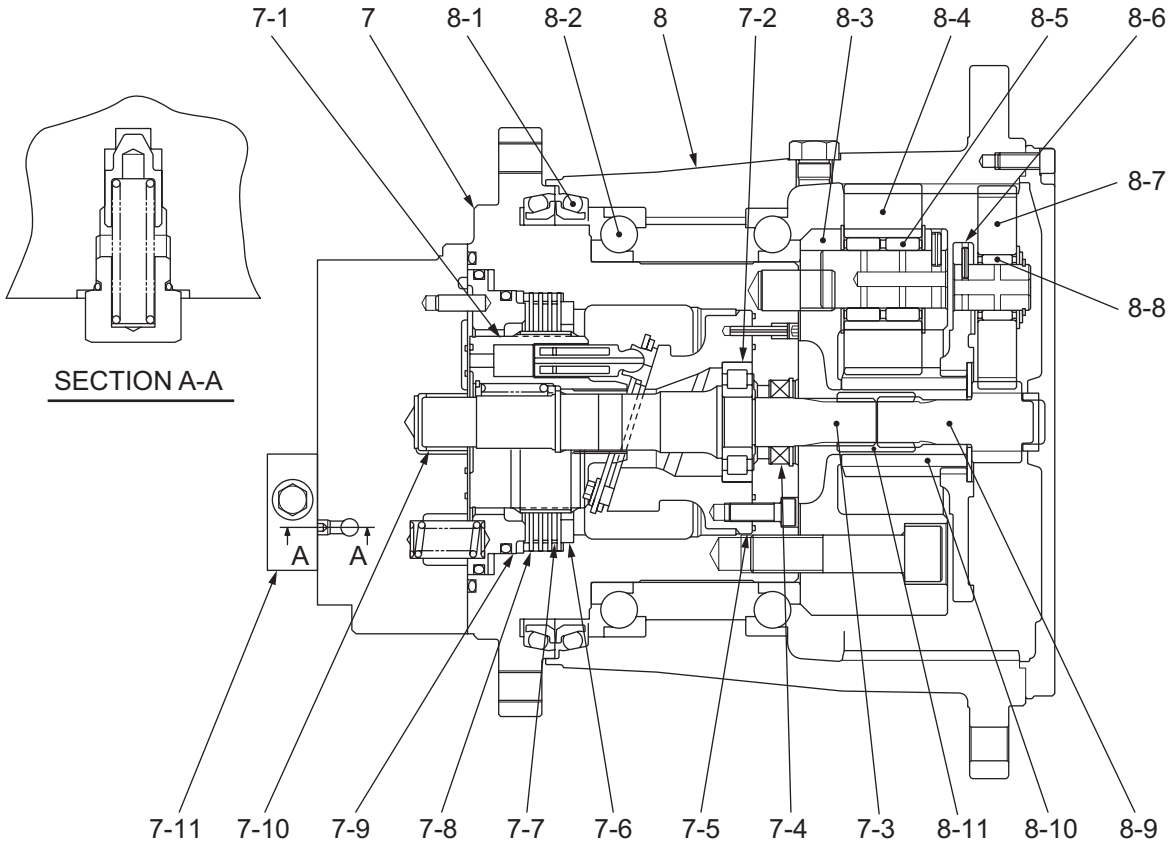
SW800-04021

Motor specifications
- Displacement : 55.1 cm^3/rev (3.4 cu.in./rev)
- Maximum working pressure : 41.8 MPa (6,063 psi)

Reduction gear specifications
- Reduction ratio : 1/38.587

- Propulsion hydraulic motor weight : 170 kg (375 lbs.)

1) Internal structure of propulsion hydraulic motor (rear) (SW800-Ⅱ)

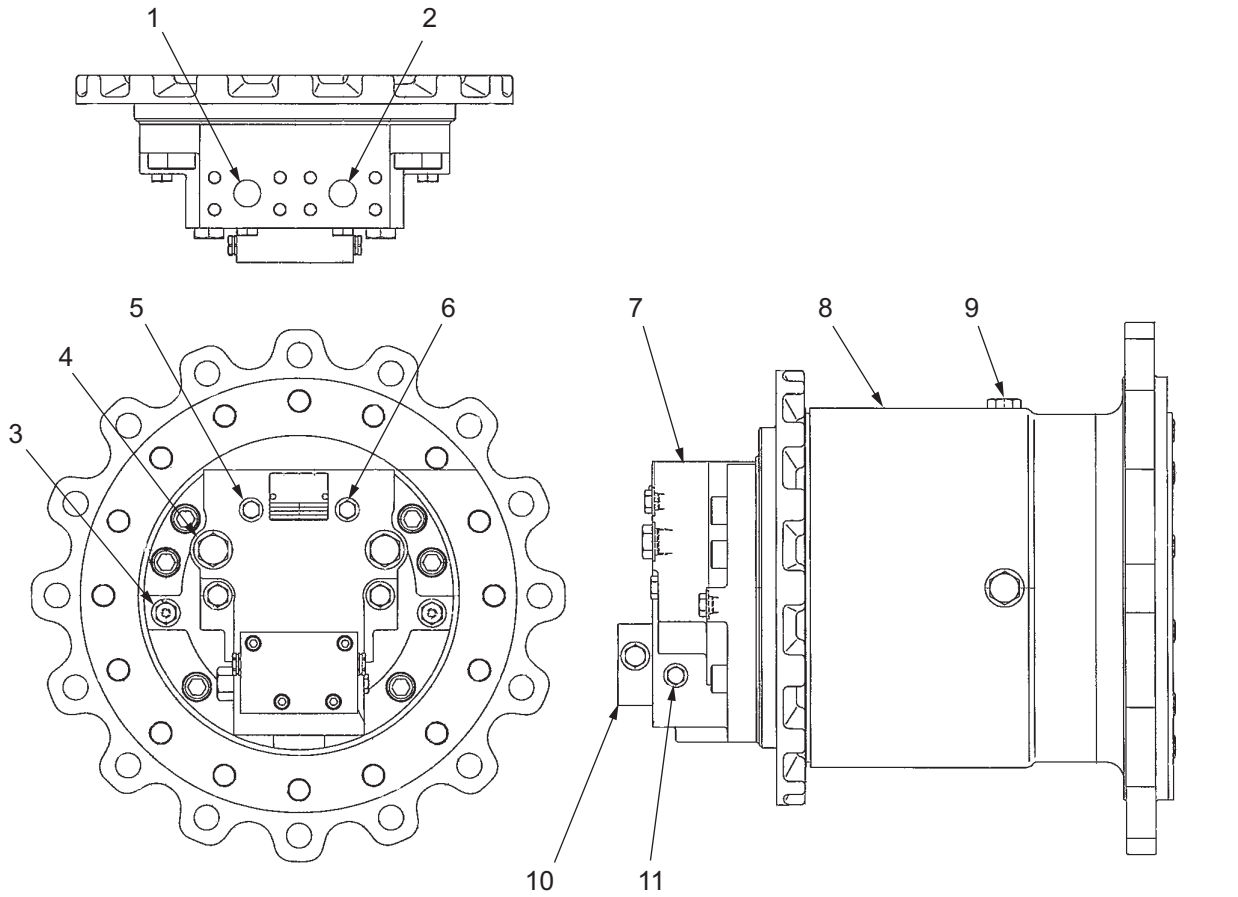


SW800-04011

(7) Motor
(7-1) Cylinder block kit
(7-2) Roller bearing
(7-3) Shaft
(7-4) Oil seal
(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

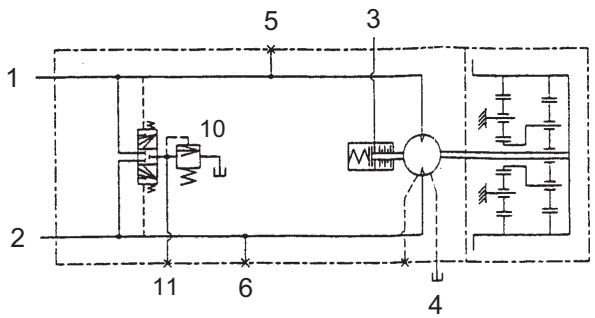
(8) Reduction gear
(8-1) Floating seal kit
(8-2) Angular bearing
(8-3) Carrier B
(8-4) Planetary gear B
(8-5) Needle roller
(8-6) Carrier A
(8-7) Planetary gear A
(8-8) Needle roller
(8-9) Sun gear A
(8-10) Sun gear B
(8-11) Coupling

2-2-5. Propulsion hydraulic motor (rear) (SW850-Ⅱ)



SW800-Ⅱ-04005

(1)	Port B (Forward)	**[RMB]** : SAE 1”	(7)	Motor	
(2)	Port A (Reverse)	**[RMA]** : SAE 1”	(8)	Reduction gear	
(3)	Parking brake pilot port	**[RM5]** : 9/16-18UNF	(9)	Filler cap	: 7/8-14UNF
(4)	Drain port	**[RM1]** : 7/8-14UNF	(10)	Shuttle valve housing	
(5)	High-pressure gauge port (For Port B)	**[RM4]** : 9/16-18UNF	(11)	Charge pressure gauge port	**[RM8]** : 7/16-20UNF
(6)	High-pressure gauge port (For Port A)	**[RM3]** : 9/16-18UNF			



Pump circuit diagram

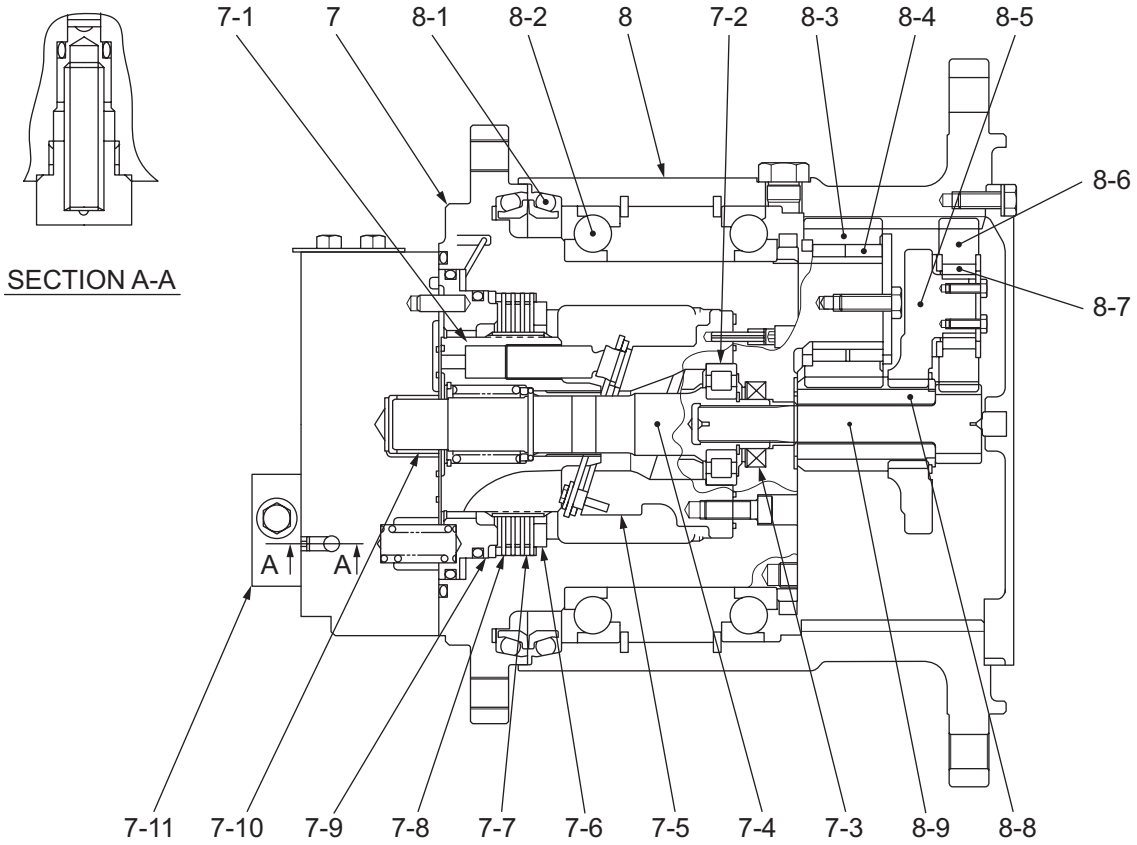
SW800-04021

Motor specifications
- Displacement : 65.7 cm^3/rev (4.0 cu.in./rev)
- Maximum working pressure : 41.8 MPa (6,063 psi)

Reduction gear specifications
- Reduction ratio : 1/39.000

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

1) Internal structure of propulsion hydraulic motor (rear) (SW850-Ⅱ)



SW800-Ⅱ-04006

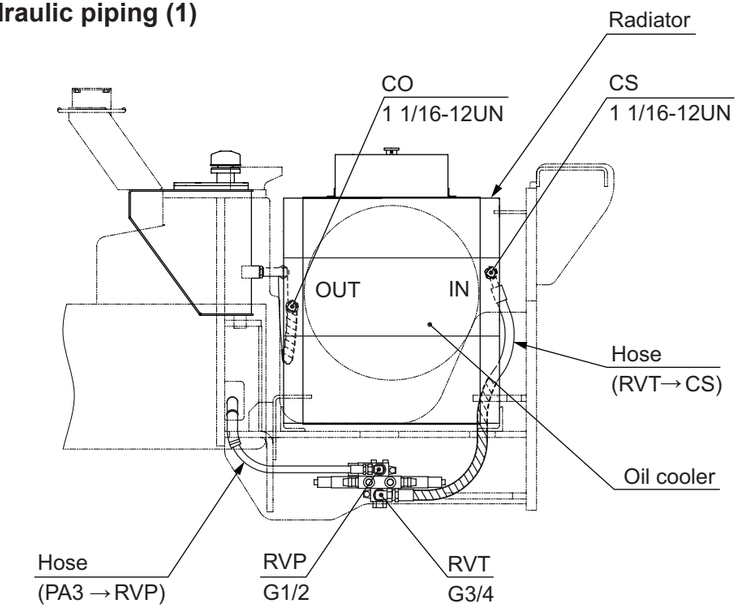
(7) Motor
(7-1) Cylinder block kit
(7-2) Bearing
(7-3) Oil seal
(7-4) Shaft
(7-5) Swash plate assembly
(7-6) Brake stopper
(7-7) Friction plate
(7-8) Separate plate
(7-9) Piston brake
(7-10) Journal bearing
(7-11) Shuttle valve

(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

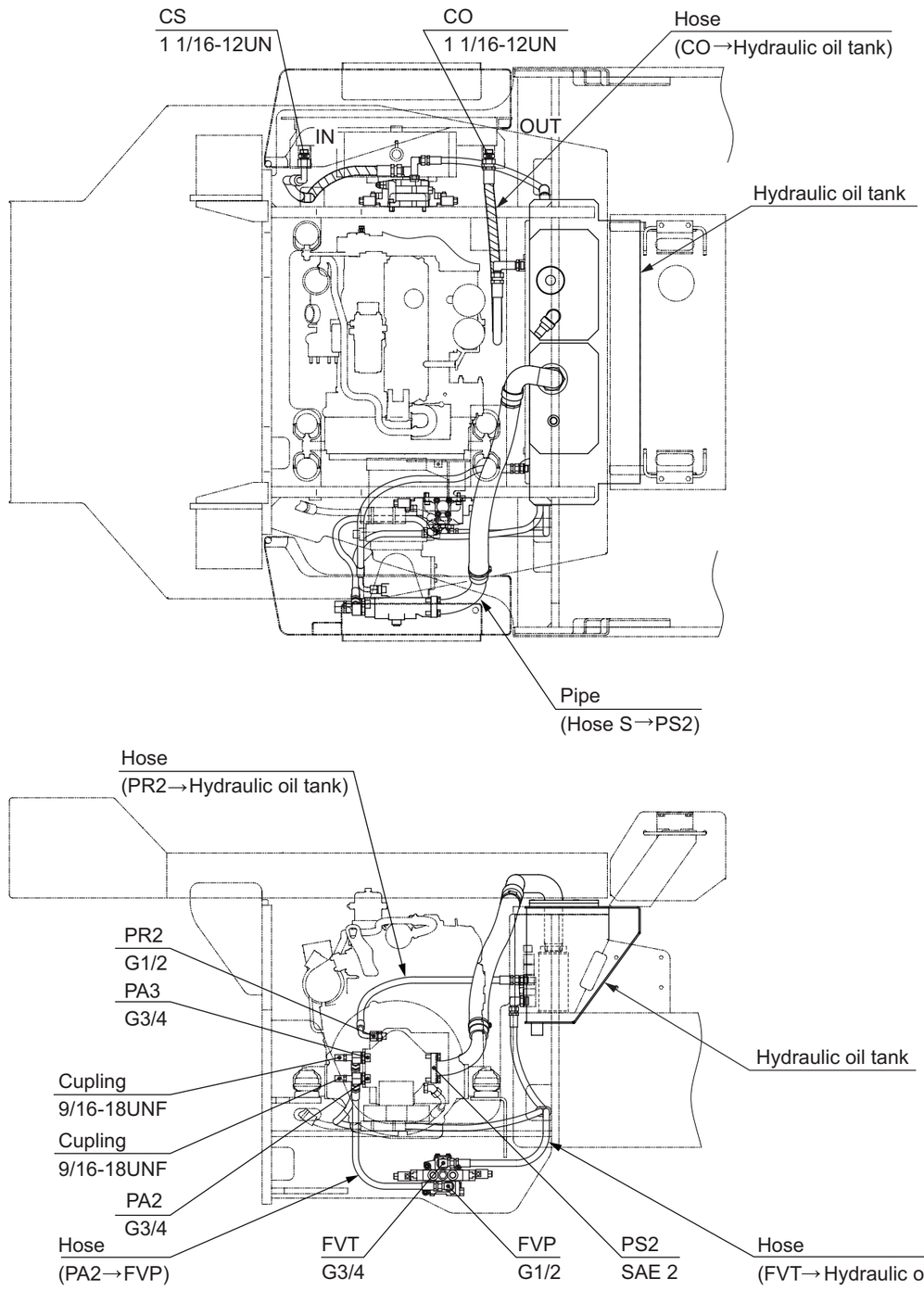
3. VIBRATOR HYDRAULIC SYSTEM

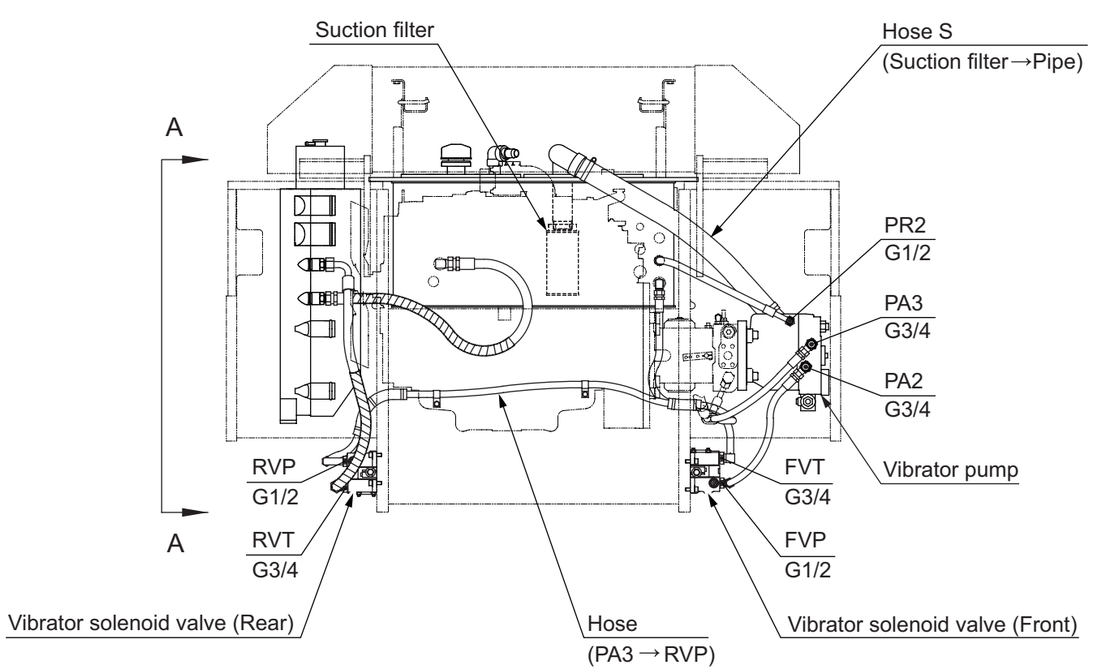
3-1. Vibrator Hydraulic Piping

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



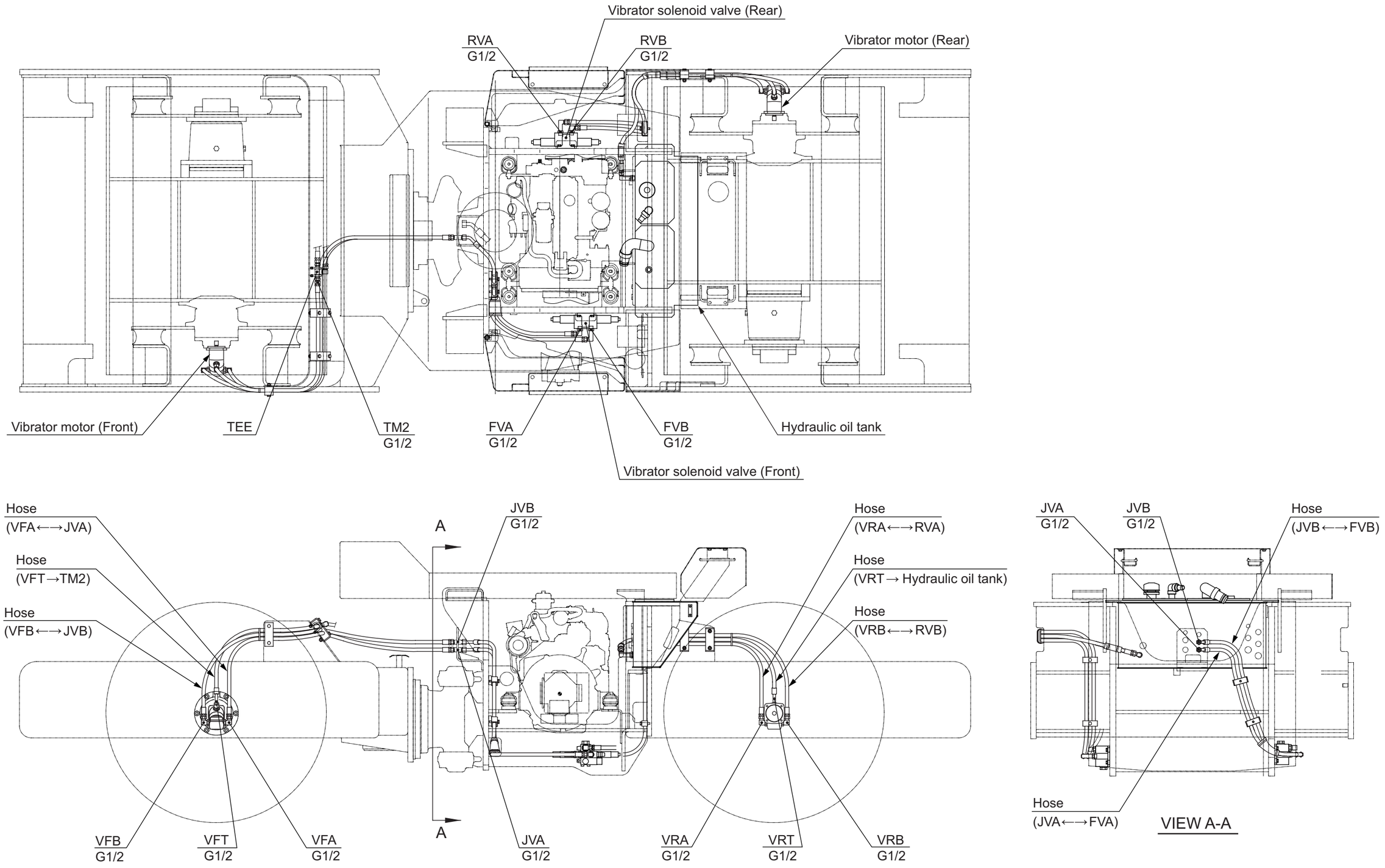
VIEW A-A





• The letters and figures (such as PA2 and FVP) show each port and the arrow (←→;→) symbols show the hose connection and the direction of the flow of the oil.

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

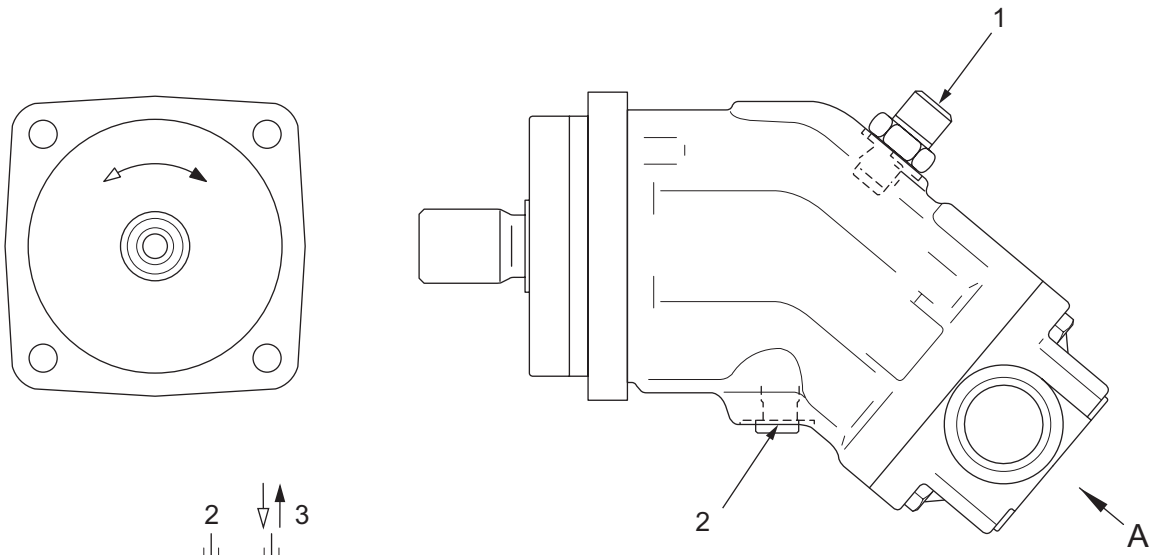


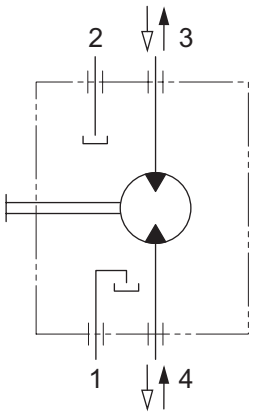
• The letters and figures (such as VRB and RVB) show each port and the arrow (←→;→) symbols show the hose connection and the direction of the flow of the oil.

0554-49804-0-10879-B

3-2. Hydraulic Component Specifications

3-2-1. Vibrator hydraulic motor

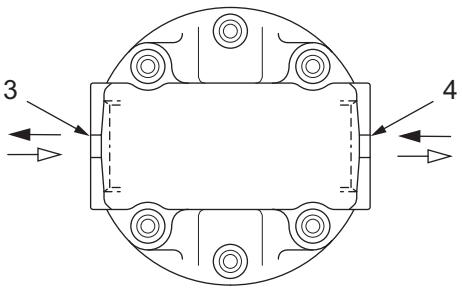




Hydraulic circuit diagram

Flow of oil

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



VIEW A

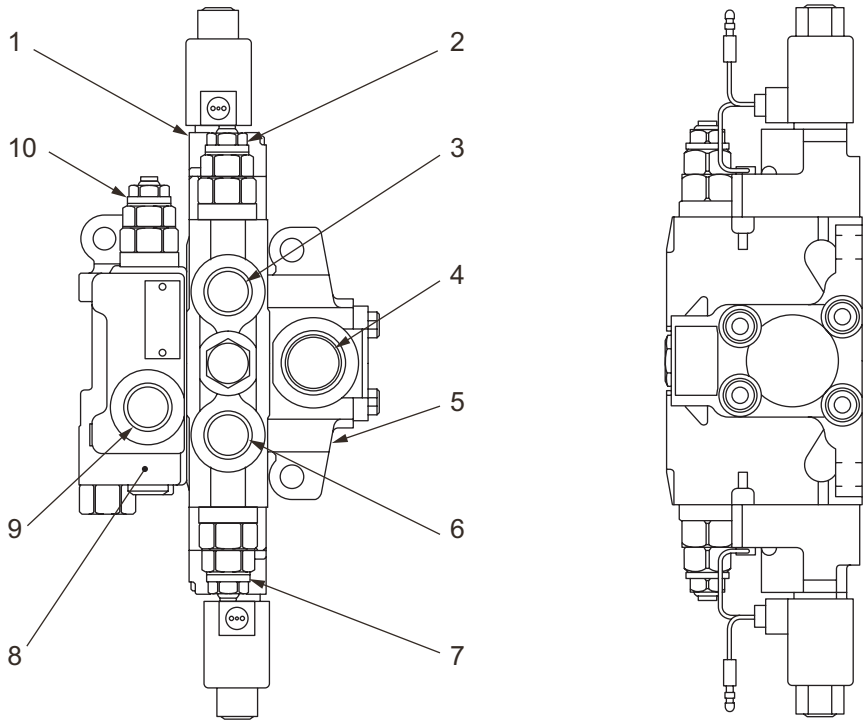
SW800-04015

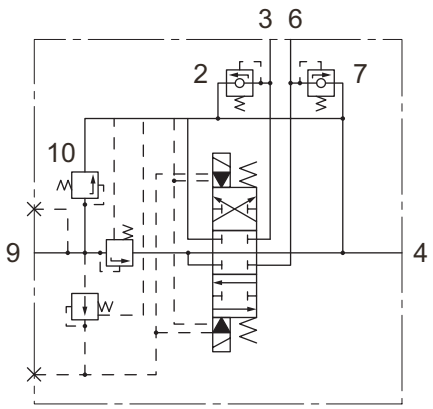
(1) Drain port (T1)	**[VFT, VRT]**	:	G1/2
(2) Drain port (T2)		:	M12×1.5
(3) Port B	**[VFB, VRB]**	:	1 1/16-12UN-2B
(4) Port A	**[VFA, VRA]**	:	1 1/16-12UN-2B

Specifications

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

3-2-2. Vibrator solenoid valve





Hydraulic circuit diagram

SW800-Ⅱ-04007

(1) Body
(2) High-pressure relief valve (PR1)
(3) Port A **[FVA, RVA]** : G1/2
(4) Port T **[FVT, RVT]** : G3/4
(5) Outlet cover
(6) Port B **[FVB, RVB]** : G1/2
(7) High-pressure relief valve (PR2)
(8) Inlet cover
(9) Port P **[FVP, RVP]** : G1/2
(10) High-pressure relief valve (R1)

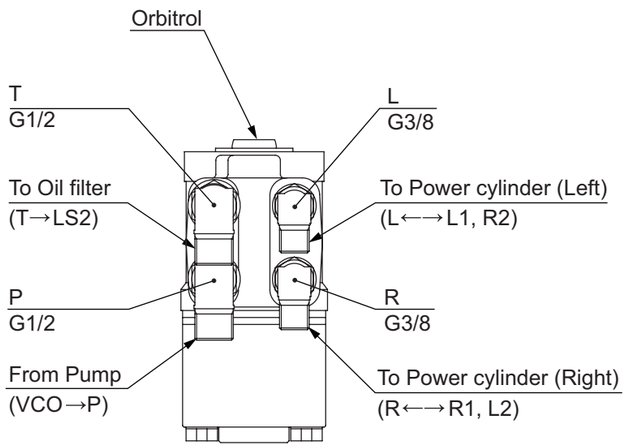
Specifications

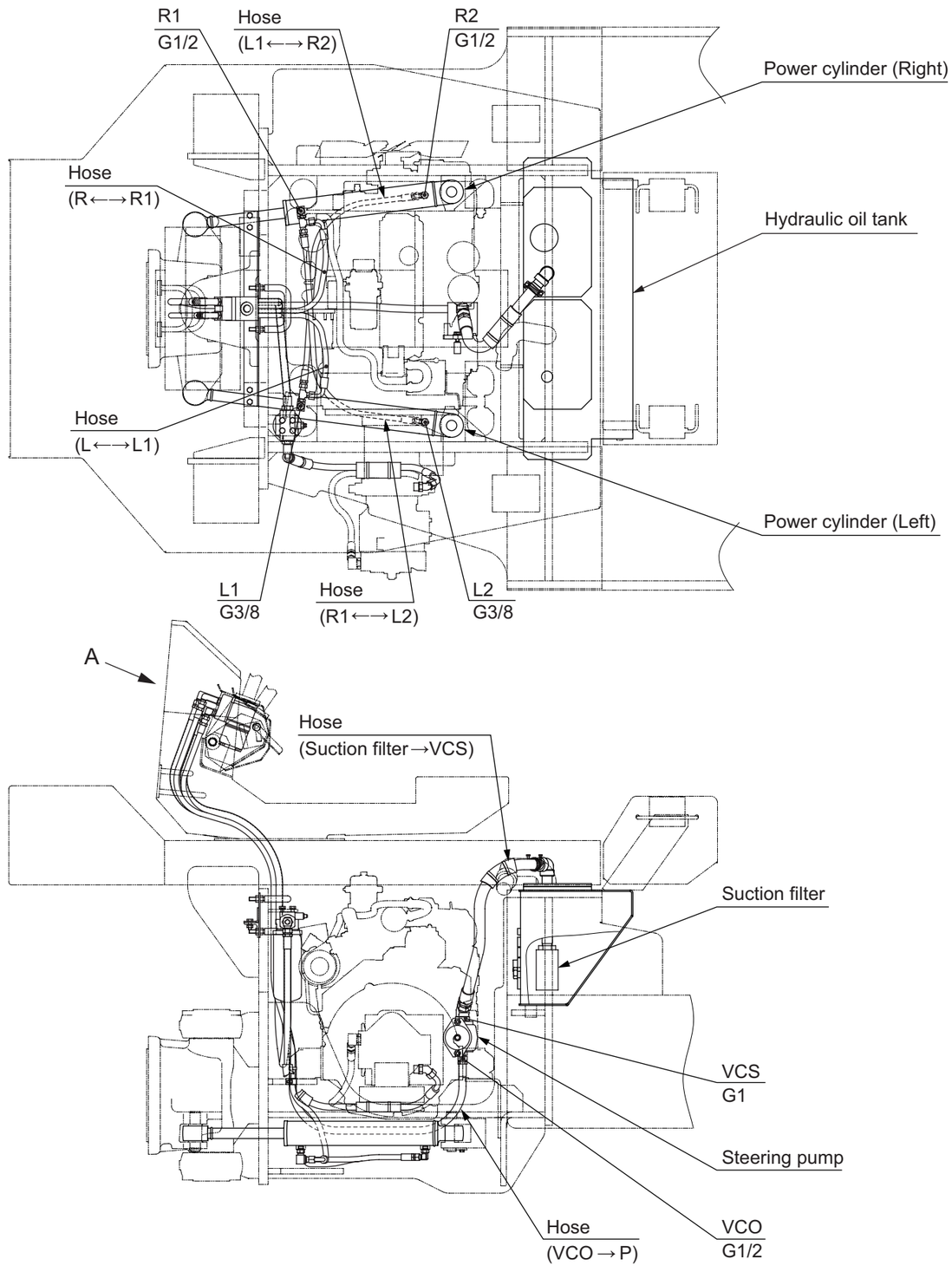
• Rated pressure	: 25.0 MPa (Ports A, B and P)	(3,625 psi)
	: 1.5 MPa (Port T)	(218 psi)
• Rated flow	: 70 L/min	(18.5 gal./min)
• Relief valve setting pressure	: 22.5 MPa (R1)	(3,263 psi)
	: 24.0 MPa (PR1, PR2)	(3,480 psi)
• Weight	: 8 kg	(17.6 lbs.)

4. STEERING SYSTEM

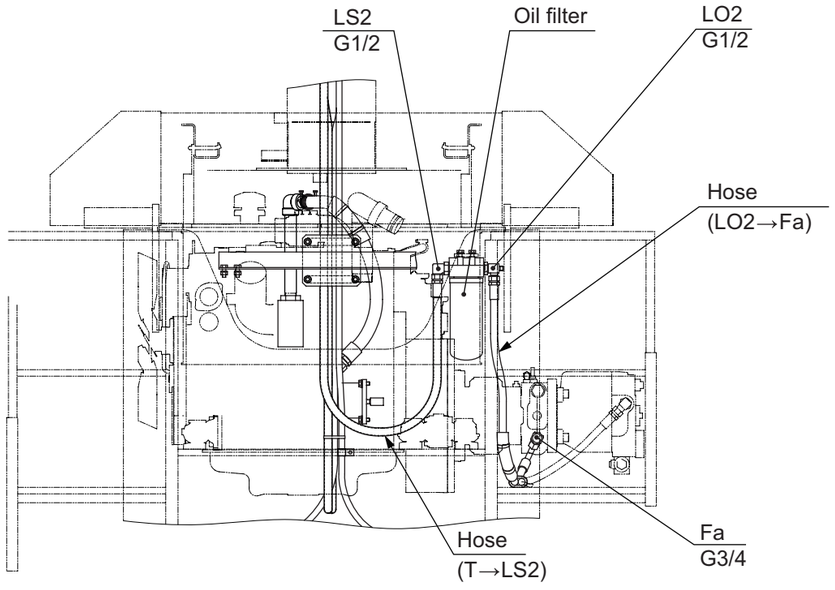
4-1. Steering Hydraulic Piping

4-1-1. Steering hydraulic piping





VIEW A

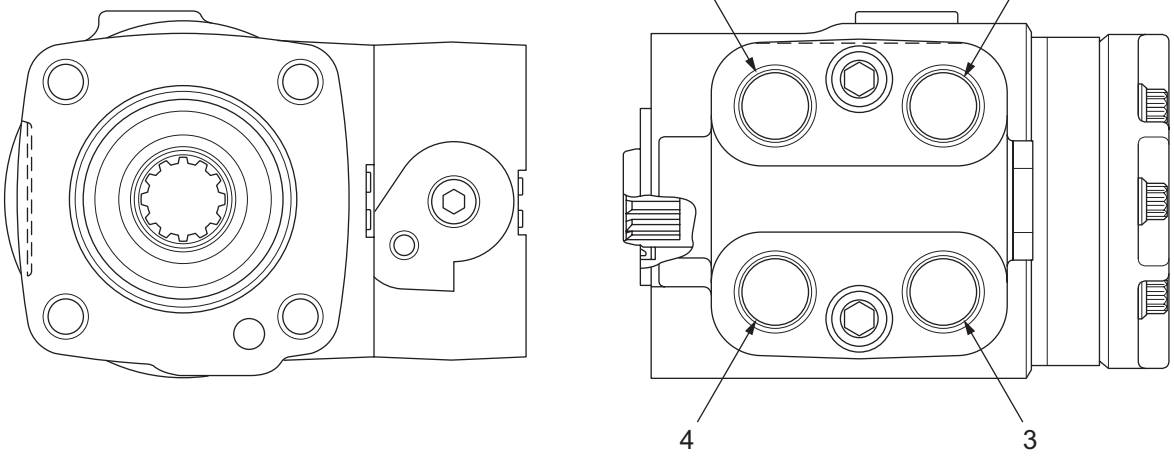


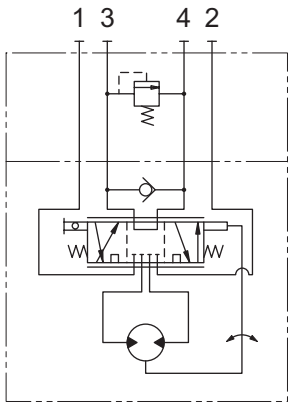
• The letters and figures (such as LO2 and Fa) show each port and the arrow (←→;→) symbols show the hose connection and the direction of the flow of the oil.

0554-32806-0-11155-A

4-2. Hydraulic Component Specifications

4-2-1. Orbitrol





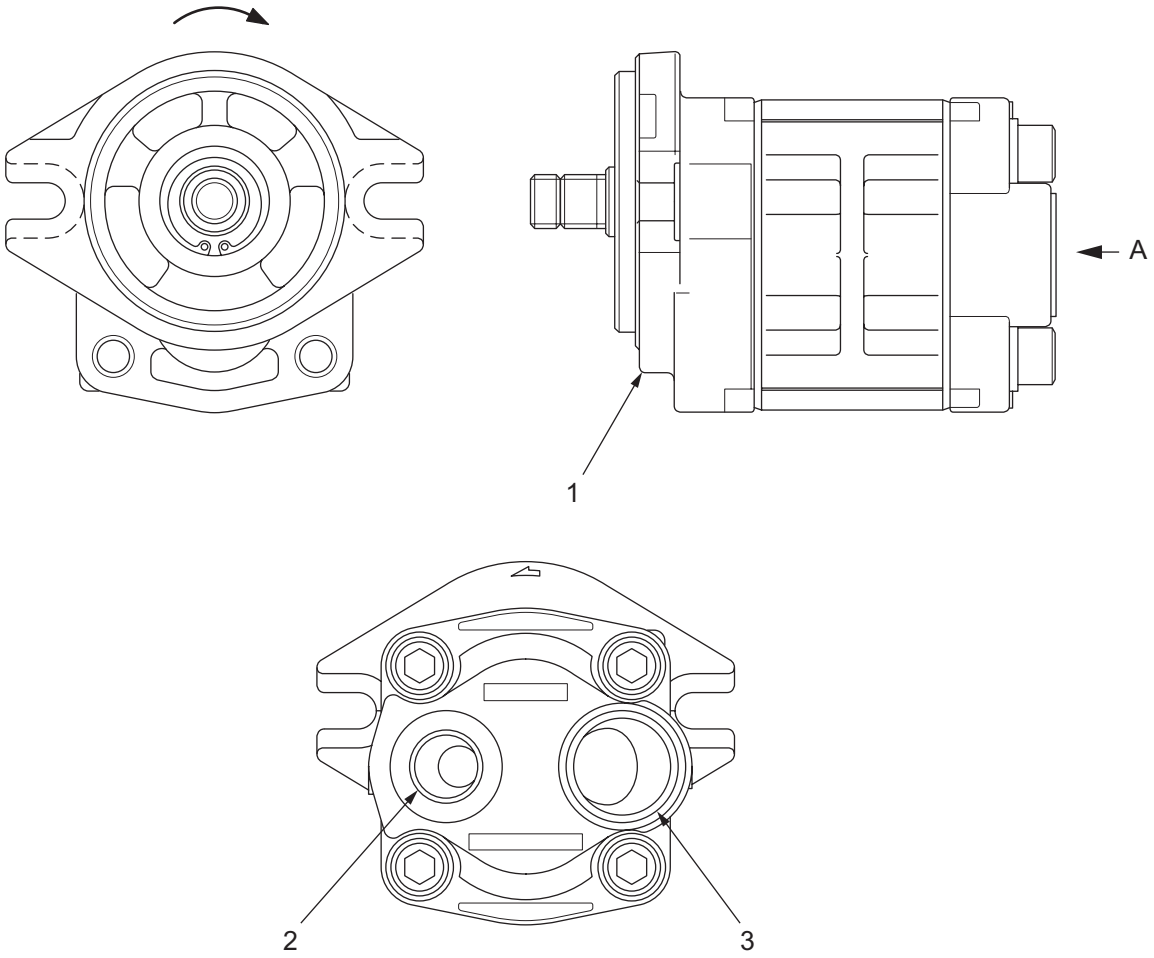
Hydraulic circuit diagram

SW800-04018

(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

Specifications
- Displacement : 369 cm^3/rev (22.5 cu.in./rev)
- Relief pressure setting : 15.2 MPa (2,204 psi)
- Weight : 6.6 kg (14.6 lbs.)

4-2-2. Steering pump



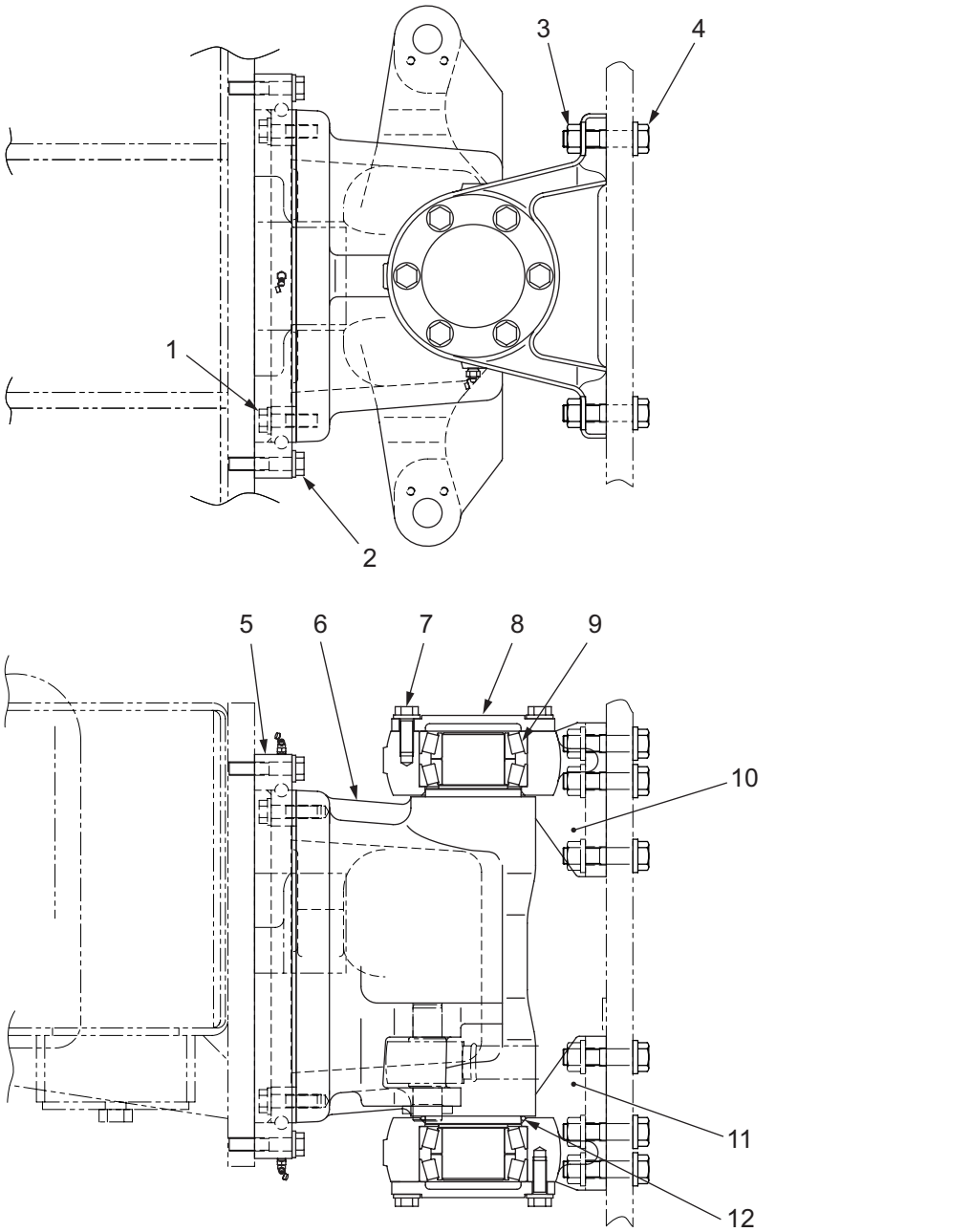
VIEW A

SW800-04019

(1) Pump
(2) Outlet port **[VCO]** : G1/2
(3) Inlet port **[VCS]** : G1

Specifications
- Displacement : 23.3 cm^3/rev (1.42 cu.in./rev)
- Rated pressure : 20.6 MPa (2,987 psi)
- Weight : 3.7 kg (8.6 lbs.)

4-3. Frame (Center Pin)



0554-61805-0-10490-E

(1) Bolt : M16×60
(2) Bolt : M16×80
(3) Nut : M20
(4) Bolt : M20×90
(5) Swing bearing
(6) Yoke
(7) Bolt : M16×45
(8) Cover
(9) Roller bearing
(10) Bracket (upper)
(11) Bracket (lower)
(12) O-ring

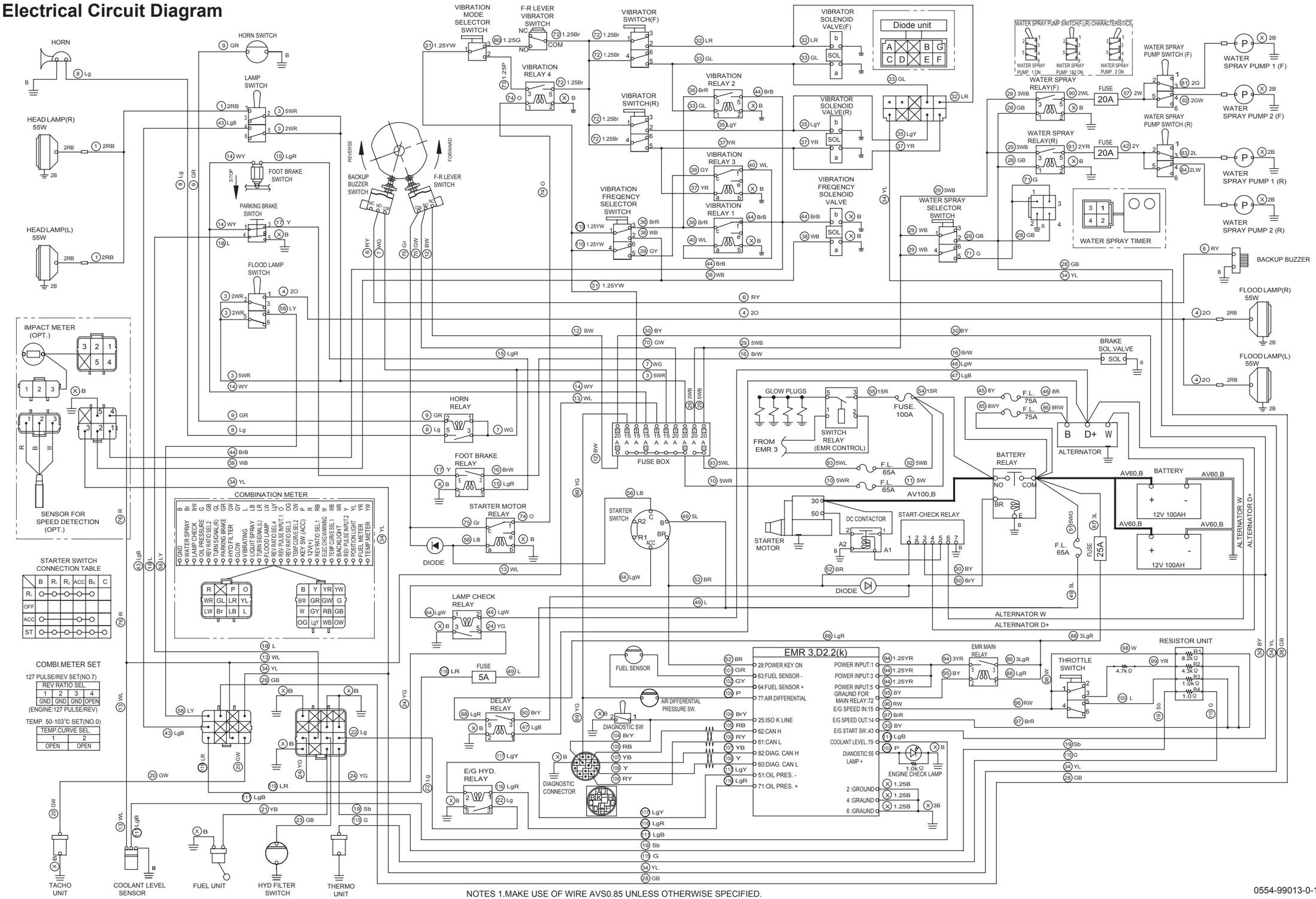
N・m

(1) Bolt M16×60 : 265 N·m (195 lbf·ft)
(2) Bolt M16×80 : 265 N·m (195 lbf·ft)
(3) Nut M20 : 540 N·m (398 lbf·ft)
(7) Bolt M16×45 : 265 N·m (195 lbf·ft)

ELECTRICAL SYSTEM

1. ELECTRICAL CIRCUIT

1-1. Electrical Circuit Diagram

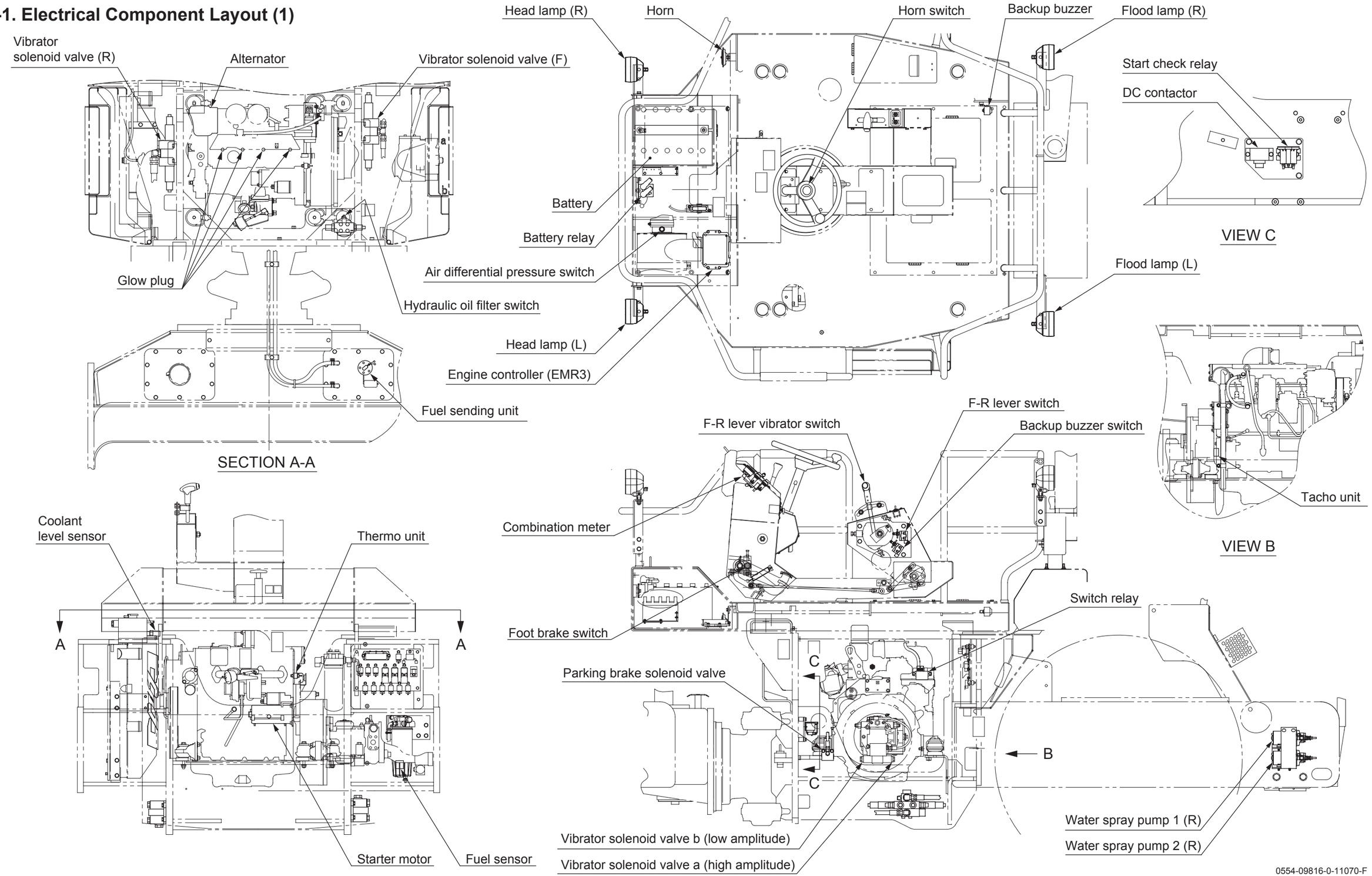


NOTES 1.MAKE USE OF WIRE AVS0.85 UNLESS OTHERWISE SPECIFIED.

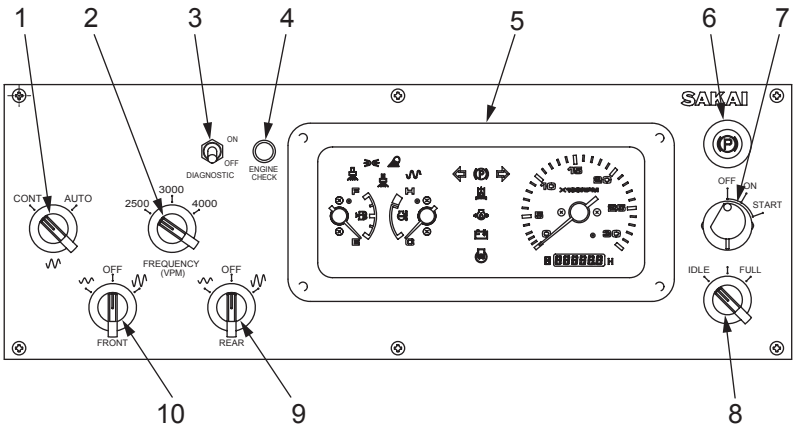
0554-99013-0-11072-F

2. ELECTRICAL COMPONENTS

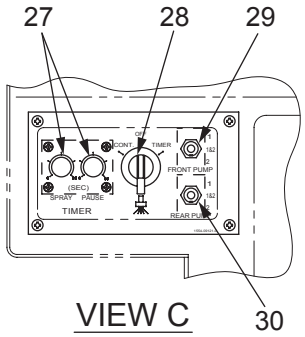
2-1. Electrical Component Layout (1)



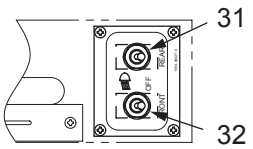
2-2. Electrical Component Layout (2)



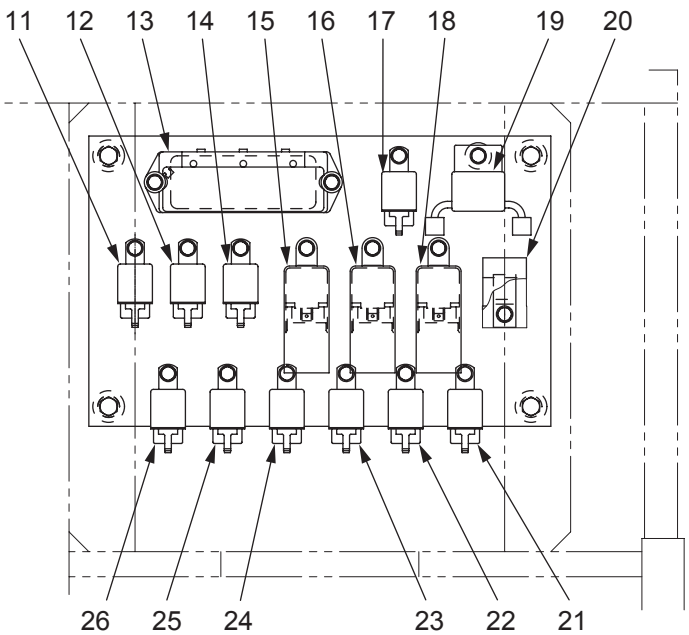
VIEW A



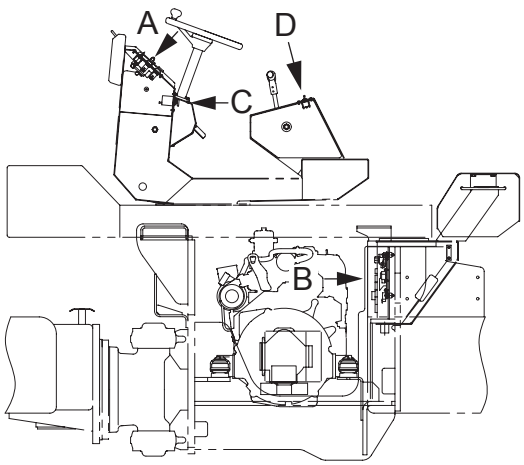
VIEW C



VIEW D



VIEW B

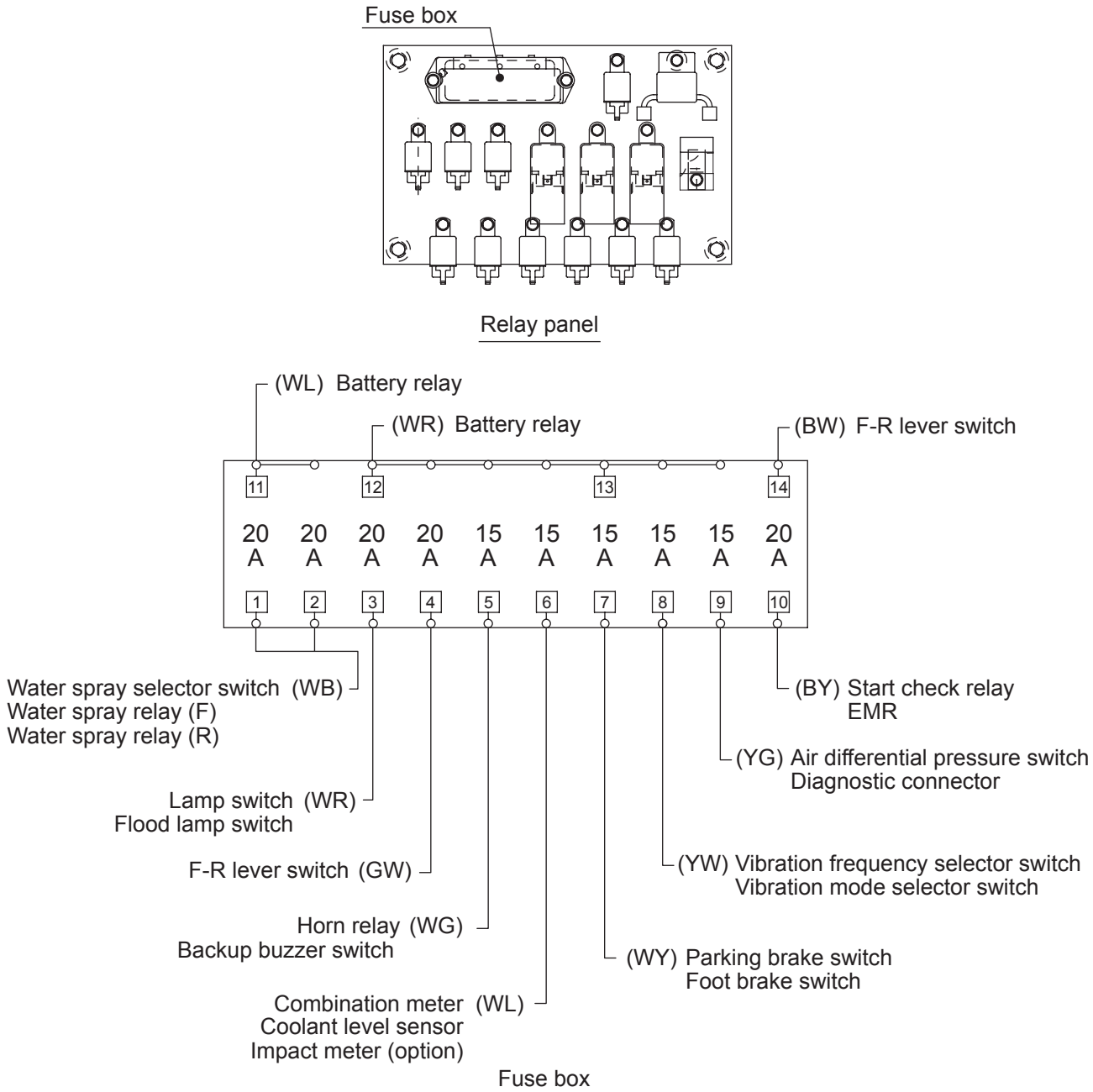


0554-09814-0-11068-B

(1) Vibration mode selector switch
(2) Vibration frequency selector switch
(3) Diagnostic switch
(4) Engine check lamp
(5) Combination meter
(6) Parking brake switch
(7) Starter switch
(8) Throttle switch
(9) Vibrator switch (R)
(10) Vibrator switch (F)
(11) Vibration relay 4
(12) Vibration relay 2
(13) Fuse box
(14) Lamp check relay
(15) Starter motor relay
(16) Vibration relay 1
(17) Engine hydraulic relay
(18) Vibration relay 3
(19) Resistor unit
(20) Diode unit
(21) Water spray relay (F)
(22) Water spray relay (R)
(23) Horn relay
(24) Foot brake relay
(25) Delay relay
(26) EMR main relay
(27) Water spray timer
(28) Water spray selector switch
(29) Water spray pump switch (F)
(30) Water spray pump switch (R)
(31) Flood lamp switch
(32) Lamp switch

3. ELECTRICAL COMPONENT SPECIFICATIONS

3-1. Fuse Box

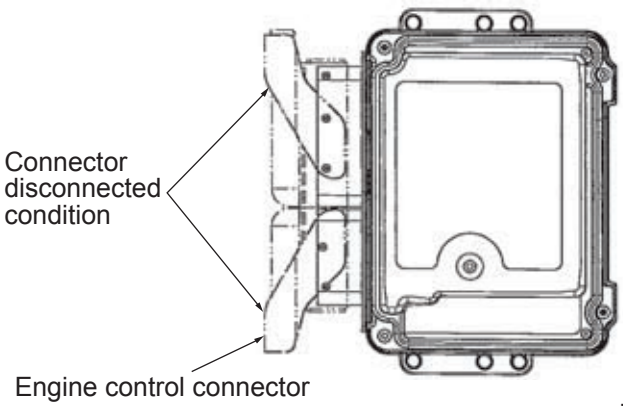


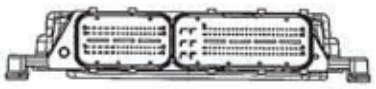
SW800-Ⅱ-05001

Harness color codes

WR : White/Red stripe	BW : Black/White stripe
WL : White/Blue stripe	BY : Black/Yellow stripe
WB : White/Black stripe	GW : Green/White stripe
WY : White/Yellow stripe	YW : Yellow/White stripe
WG : White/Green stripe	YG : Yellow/Green stripe

3-2. Control Box (EMR3)



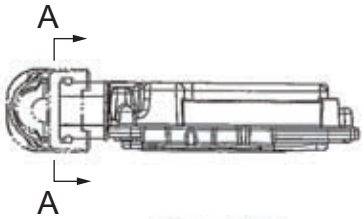


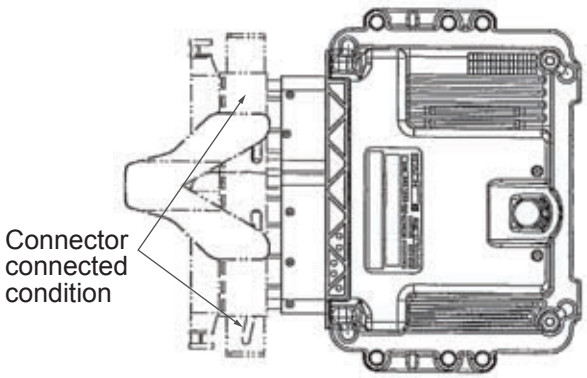
VIEW A-A

EMR CONNECTOR																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
94 1.25YR	X 1.25B	94 1.25YR	X 1.25B	94 1.25YR	X 1.25B	-	-	-	-	-	-	-	97 BrR	96 R	-	-	-	-	-
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
-	-	-	-	104 BrY	-	-	52 BR	-	-	-	-	-	-	-	-	-	-	-	-
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
-	-	30 BY	-	-	-	-	-	-	-	117 LgY	-	-	-	103 LR	-	-	-	-	108 Y
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
106 RY	105 RB	101 GR	102 GY	-	-	-	-	-	-	116 LgR	95 BY	-	-	-	-	109 P	-	111 LgB	-
81	82	83	84	85	86	87	88	89	90	91	92	93	94						
-	107 YB	-	-	-	-	-	-	-	-	-	-	-	-						

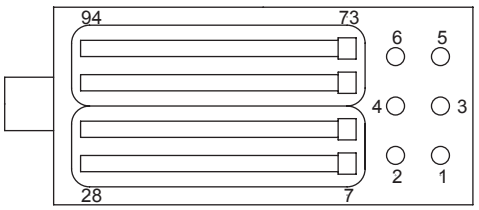
TWIST CABLE

TWIST CABLE

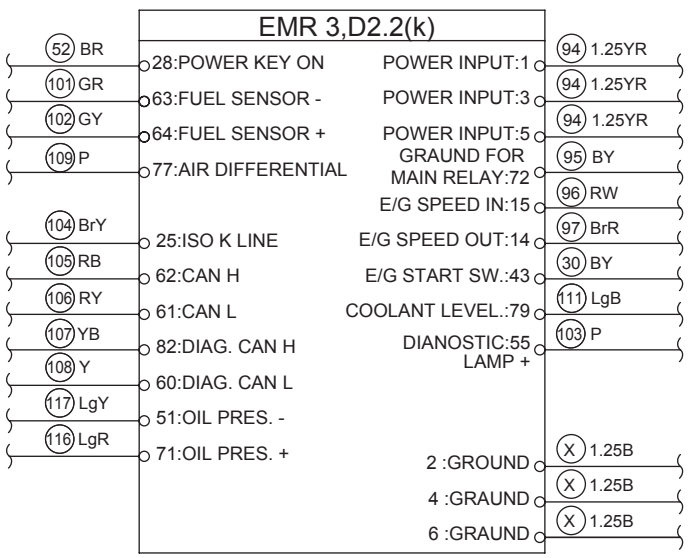




Harness side

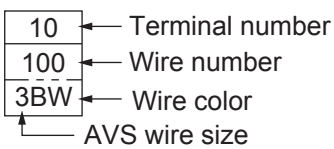


Internal circuit



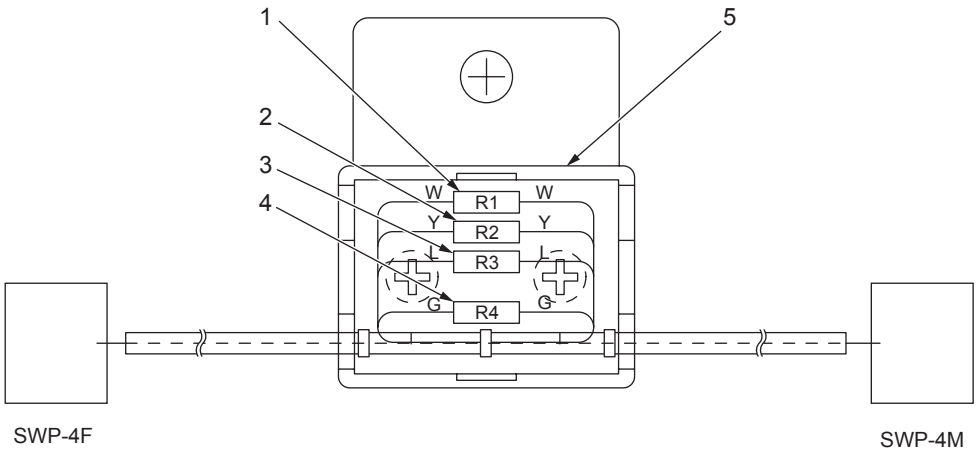
Wire color and number
(Refer to "1-4 Wire Color Code and number" of TROUBLESHOOTING.)

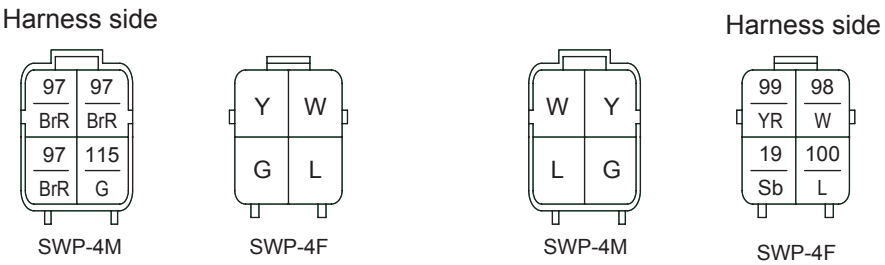
- The arrangement of connector terminals shown below is that of connecting surfaces on the connector side.

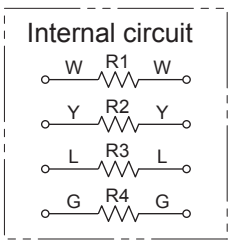


SW800-Ⅱ-05002

3-3. Resistor

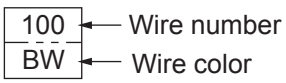






Wire color and number
(Refer to "1-4 Wire Color Code and number" of TROUBLESHOOTING.)

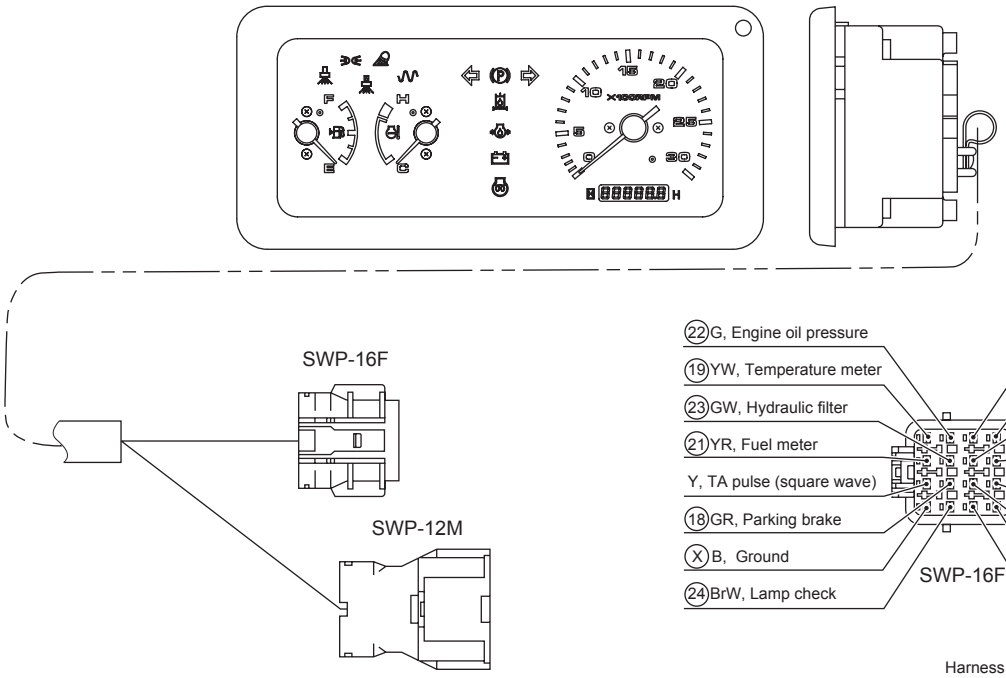
- The arrangement of connector terminals shown below is that of connecting surfaces on the connector side.

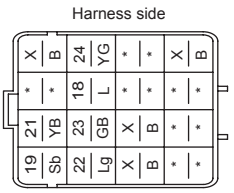


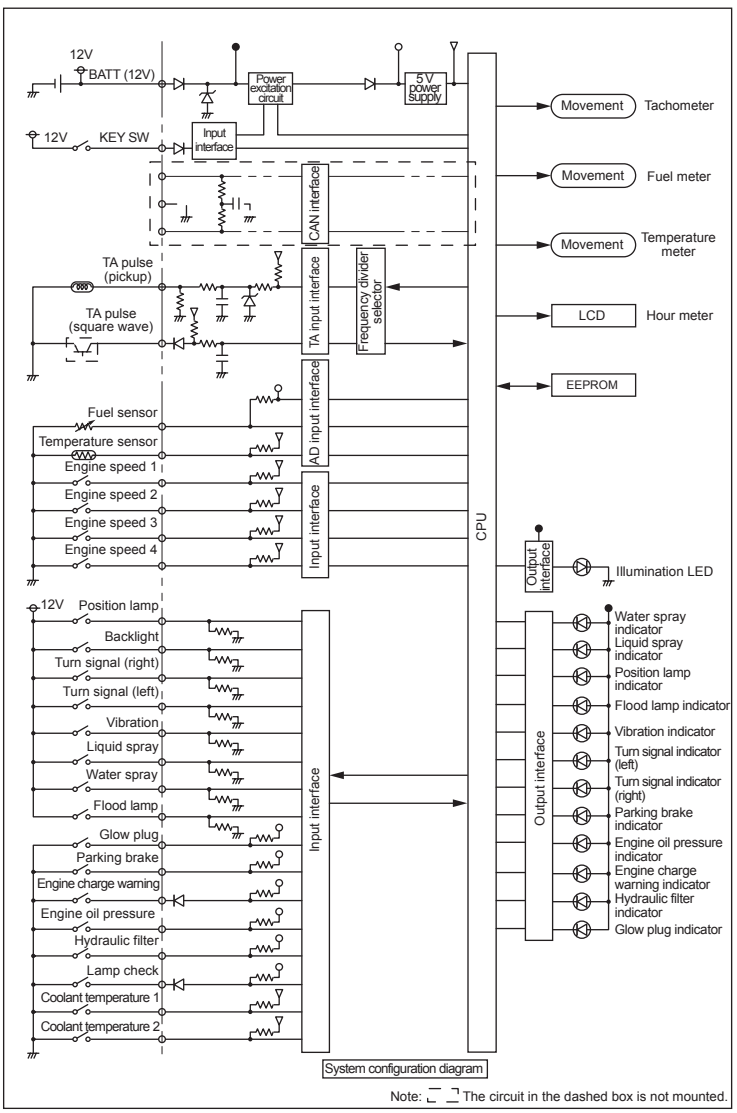
SW800-Ⅱ-05003

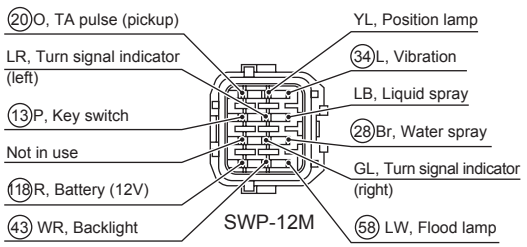
(1) Resistor: 8.2 kΩ
(2) Resistor: 4.3 kΩ
(3) Resistor: 1.0 kΩ
(4) Resistor: 1.0 Ω
(5) Case

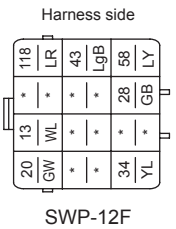
3-4. Combination Meter





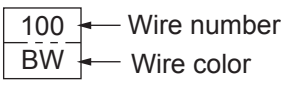






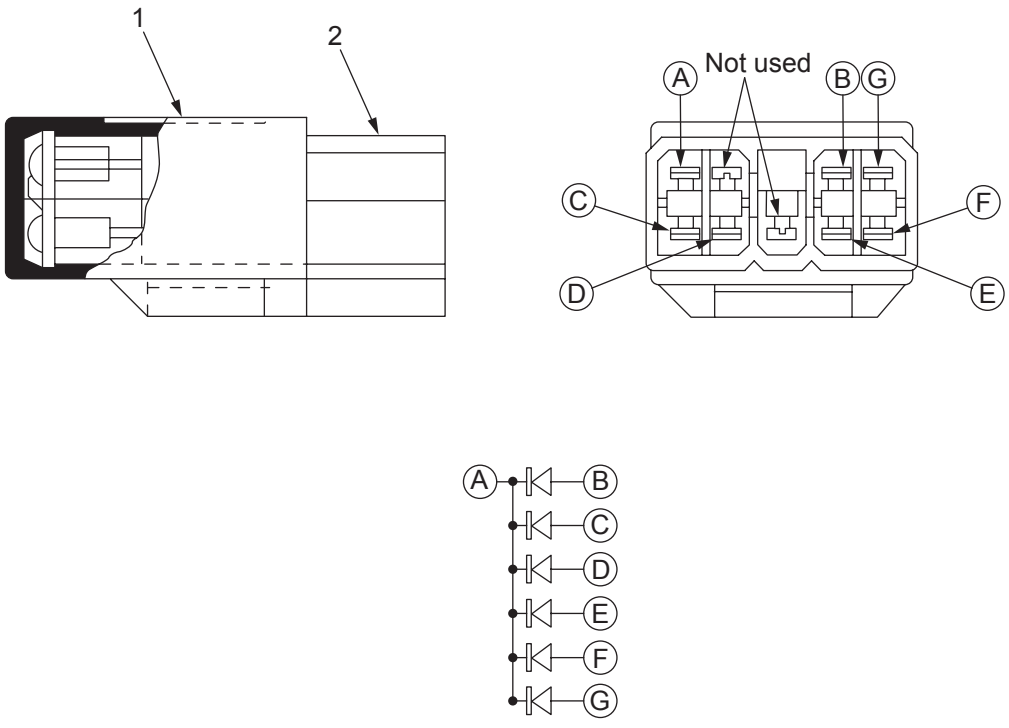
Wire color and number
(Refer to "1-4 Wire Color Code and number" of TROUBLESHOOTING.)

- The arrangement of connector terminals shown below is that of connecting surfaces on the connector side.



SW800-Ⅱ-05004

3-5. Diode Unit



Schematic diagram

SW800-05003

(1) Cover
(2) Connector COMP

Specifications

- Maximum peak inverse withstand voltage : 100 V
- Maximum mean rectified current : 1 A
- Maximum surge current : 50 A
- Insulation resistance : At least 3 MΩ with a 500 VM insulation tester between each connector terminal and cover
- Storage/operating temperature : -30°C to 75°C (-22°F to 167°F)

VIBRATORY DRUM

1. PRECAUTIONS FOR DISASSEMBLY AND REASSEMBLY

• When removing, installing, disassembling or reassembling the unit, observe the general precautions described below.

1) Precautions for removal work
- Coolant that contains antifreeze should be treated as a chemical, and must not be drained carelessly on the ground.
- To prevent dust from getting into disconnected hoses and tubes, cover them with a plug or similar means.
- When draining oil, use a receptacle with sufficient capacity to receive it.
- Before proceeding with the work, look for matchmarks that show the installation location. For reassembly, place matchmarks in the required locations to prevent errors. Then remove.
- When disconnecting wiring connectors, hold the connector components so that unreasonable force is not applied to the wires.
- Label wires and hoses to ensure correct installation location.
- Confirm the number and thickness of shims prior to storage.
- When lifting parts, use lifting equipment of sufficient capacity.
- When separating parts by using pull bolts, tighten the bolts alternately.
- Before removing a unit, clean its surrounding area. Then after removal, cover it to prevent dust and other substances from getting in.
- Before removing piping for hydraulic oil or coolant, or removing related parts, satisfactorily release internal pressure.

2) Precautions for installation work
- Tighten bolts and nuts (sleeve nuts) to the specified torque (screw tightening torque table).
- When installing hoses, do not twist them or allow them to interfere with other parts.
- Replace gaskets, O-rings, split cotter pins, and lock plates with new parts.
- Properly bend split cotter pins and lock plates.
- When applying an adhesive, first clean and remove oil/grease from the surfaces properly. Then apply two or three drops to the threaded areas.
- When applying a liquid gasket, first clean and remove oil/grease from the application surface properly, and confirm that the surface is free of dust and damage. Then apply the product evenly.
- Clean parts well. Repair scratches, dents, burrs, rust, etc.
- Apply gear oil to rotating and sliding components.
- Apply grease 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 cock and fill with coolant (mixing in long-life coolant) to the specified level. Start the engine and allow the coolant to circulate through the piping. Then add coolant again to the specified level.
- If hydraulic equipment has been removed and reinstalled, fill with hydraulic oil to the specified level. Start the engine and allow the oil to circulate through the piping. Then add oil again to the specified level.

2. REMOVAL AND INSTALLATION OF VIBRATORY DRUM

2-1. Removal of Vibratory Drum

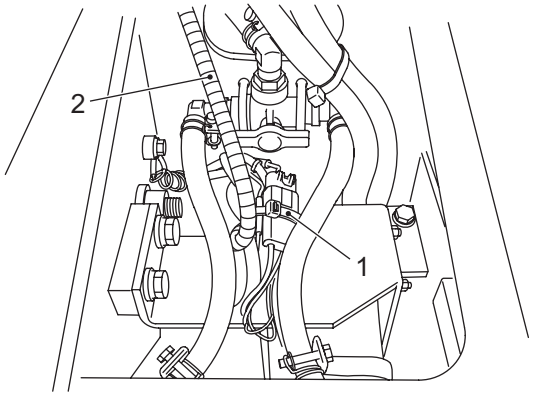
1) Prior to disassembly of vibratory drum, completely drain water spray tank and fuel tank.

Water spray tank

SW800-Ⅱ: 500 L×2 (132 gal.×2)
SW850-Ⅱ: 600 L×2 (159 gal.×2)

Fuel tank

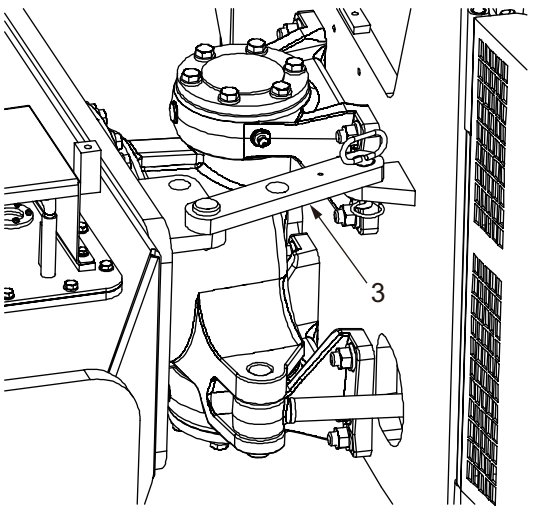
SW800-Ⅱ: 220 L (58 gal.)
SW850-Ⅱ: 250 L (66 gal.)



SW800-06001

2) Cut cable tie (1) binding wiring harnesses which are connected to water spray pump.
- Remove wiring harness (2) from pump.

3) Joint front frame and rear frame with steering lock bar (3).

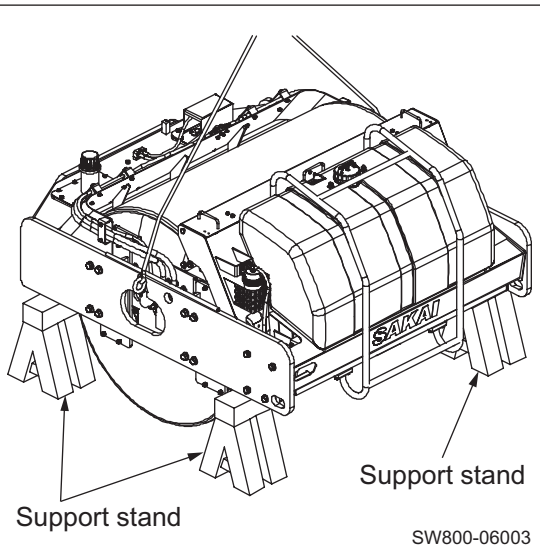


SW800-06002

⚠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.

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



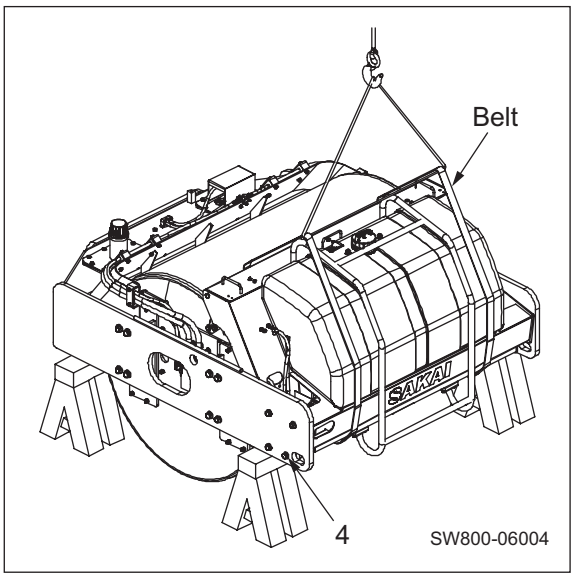
SW800-06003

kg

	Front frame	Rear frame
SW800-Ⅱ:	4,750 kg (10,470 lbs.)	5,150 kg (11,355 lbs.)
SW850-Ⅱ:	5,740 kg (12,655 lbs.)	6,230 kg (13,735 lbs.)

5) Using belts, sling water spray tank and cross member together on a crane hook.
   • Slightly lift the crane to apply tension on belts.
6) Remove bolts (4) from left and right sides of frame (four bolts per side).
7) Lift off entire spray system from frame. (front and rear)

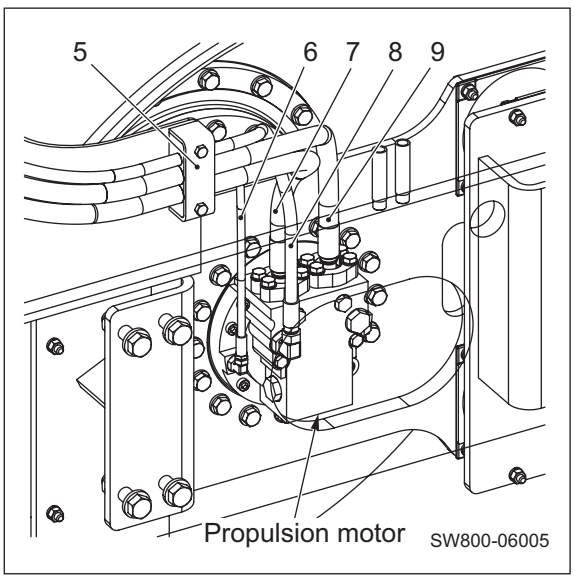
Weight of parts: 270 kg (595 lbs.)



⚠WARNING

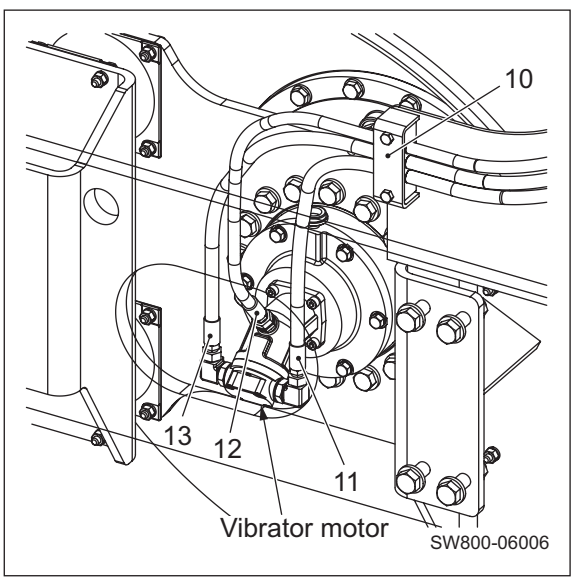
The hydraulic oil in the vehicle is hot and compressed immediately after the vehicle is stopped. Disconnecting the hydraulic hoses in this condition can cause burns. Wait for the hydraulic oil to cool down before starting the work.

8) Disconnection of piping
① Propulsion motor piping
   • Remove the hydraulic hose clamp (5).
   • Disconnect the four hydraulic hoses (6), (7), (8) and (9) connecting to the propulsion motor.



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

② Vibrator motor piping
   • Remove the hydraulic hose clamp (10).
   • Disconnect the four hydraulic hoses (11), (12) and (13) connecting to the vibrator motor.

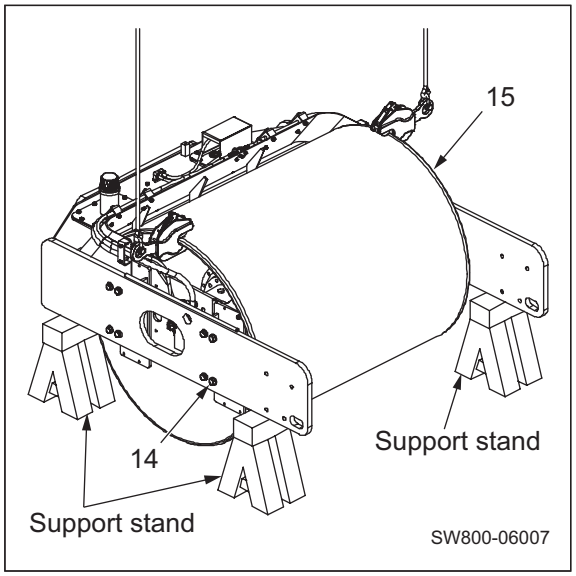


(NOTICE)
- **Plug both ends of the disconnected hoses or implement other actions to prevent entry of foreign matter.**

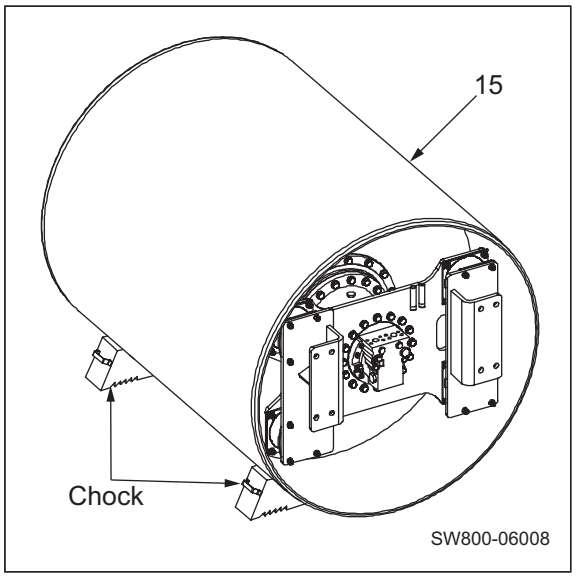
9) Remove sixteen bolts (14).
10) Lift off vibratory drum from frame.

Drum (15)

SW800-Ⅱ: 2,280 kg (5,026 lbs.)
SW850-Ⅱ: 3,080 kg (6,790 lbs.)



11) Put chocks or the like under the removed drum (15) to prevent it from moving.



2-2. Installation of Vibratory Drum

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

Bolt (4) M20×80 : 540 N·m (398 lbf·ft)
Cross member

Bolt (14) M22×90 : 685 N·m (506 lbf·ft)
Vibratory drum

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

⚠CAUTION

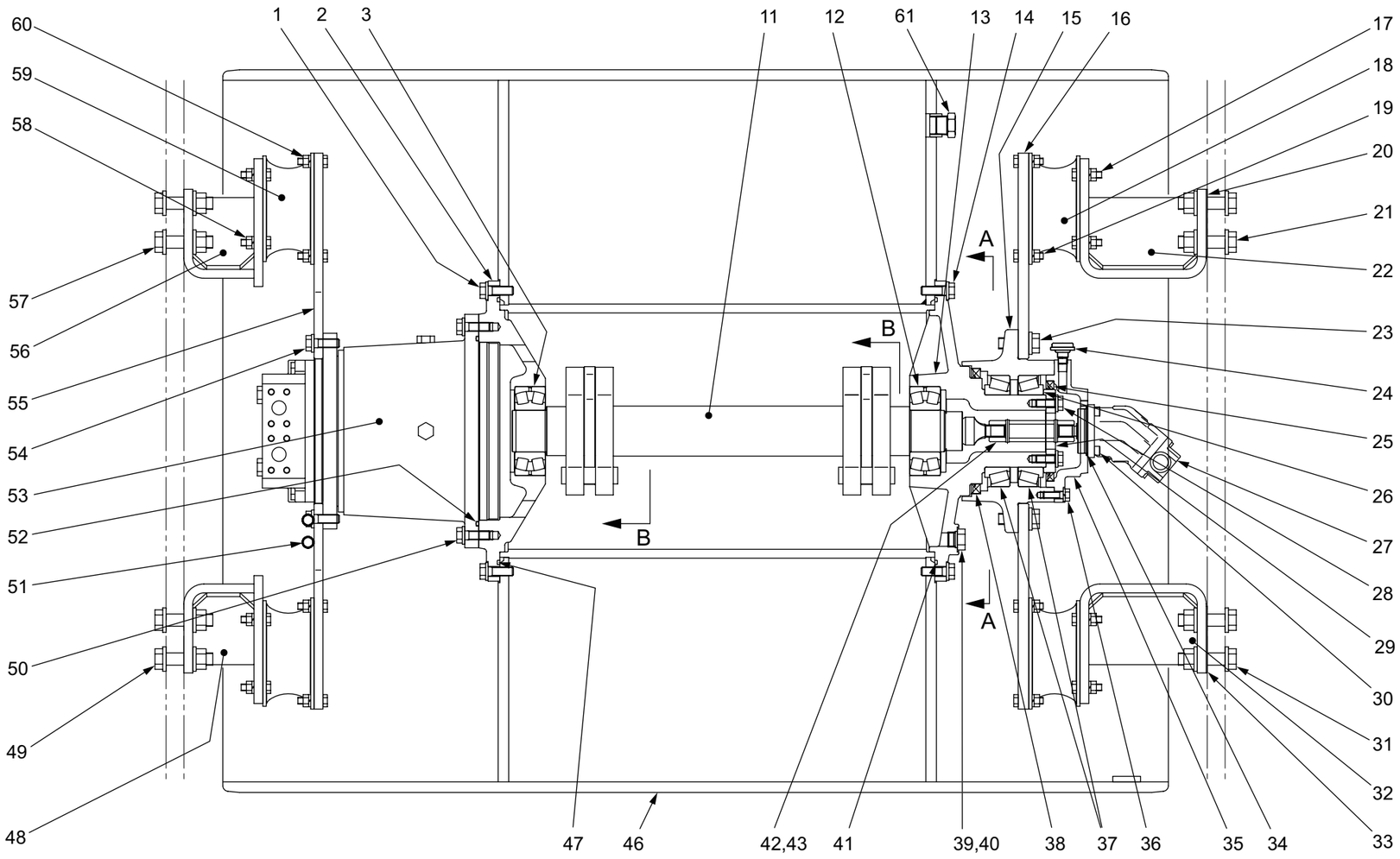
If the engine is run at high speed or the cylinder is operated to full stroke when the engine is started for the first time after the work is completed, the piston packing or other items may be damaged by air entering into the cylinder.

(NOTICE)

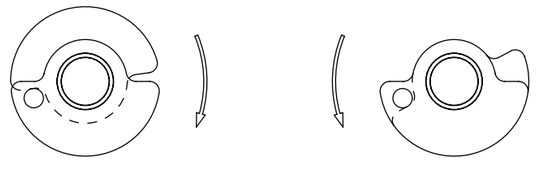
- **Fill the hydraulic oil tank to the specified level to make up for any oil leakage.**
- **Start the engine and circulate the oil through the piping. Then check the oil level again, ensuring that the oil is at the specified level.**

3. VIBRATORY DRUM ASSEMBLY

3-1. Vibratory Drum Assembly (SW800-Ⅱ)



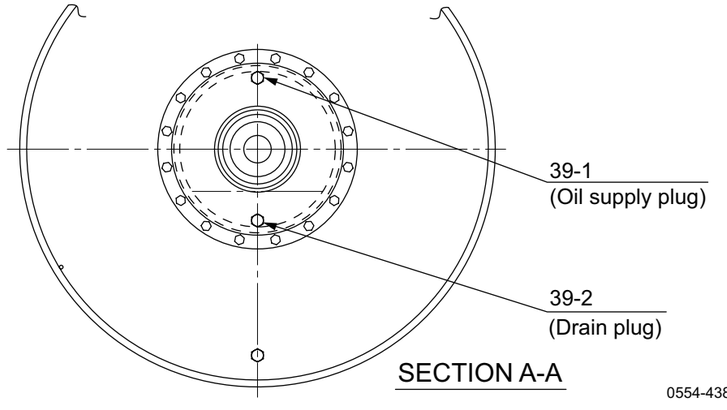
(1) Bolt (M16×50)
(2) Housing
(3) Vibrator bearing
(11) Eccentric shaft
(12) Vibrator bearing
(13) Axle shaft
(14) Bolt (M16×50)
(15) Housing
(16) Bracket
(17) Bolt (M12×45)
(18) Damper
(19) Bolt (M12×45)
(20) Shim
(21) Bolt (M22×90)
(22) Bracket
(23) Bolt (M20×60)
(24) Breather
(25) Oil seal
(26) Shim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



Vibration mode: Low
Motor counterclockwise rotation

Vibration mode: High
Motor clockwise rotation

VIEW B

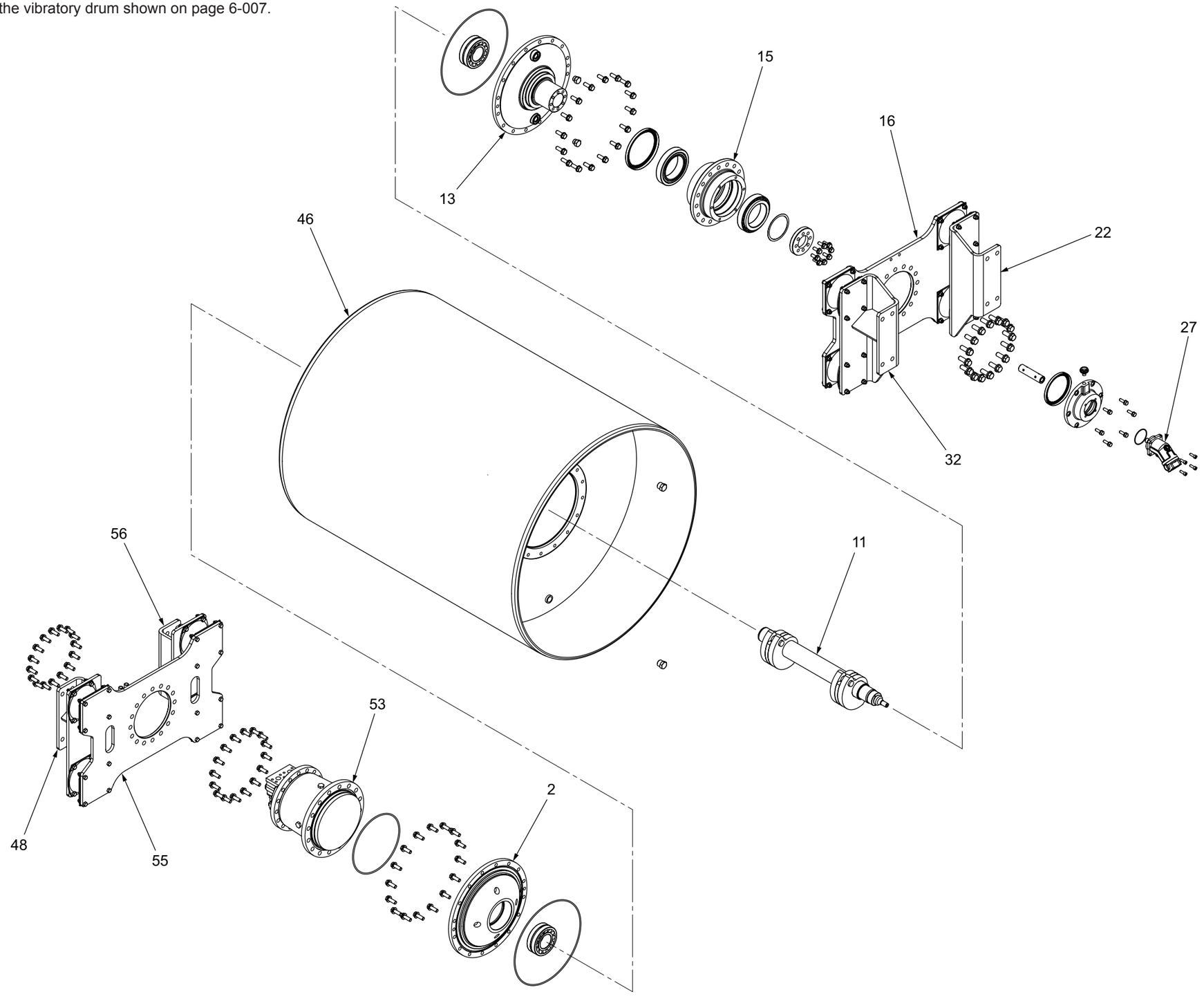


SECTION A-A

0554-43802-0-10024-K

3-1-1. Vibratory drum exploded diagram

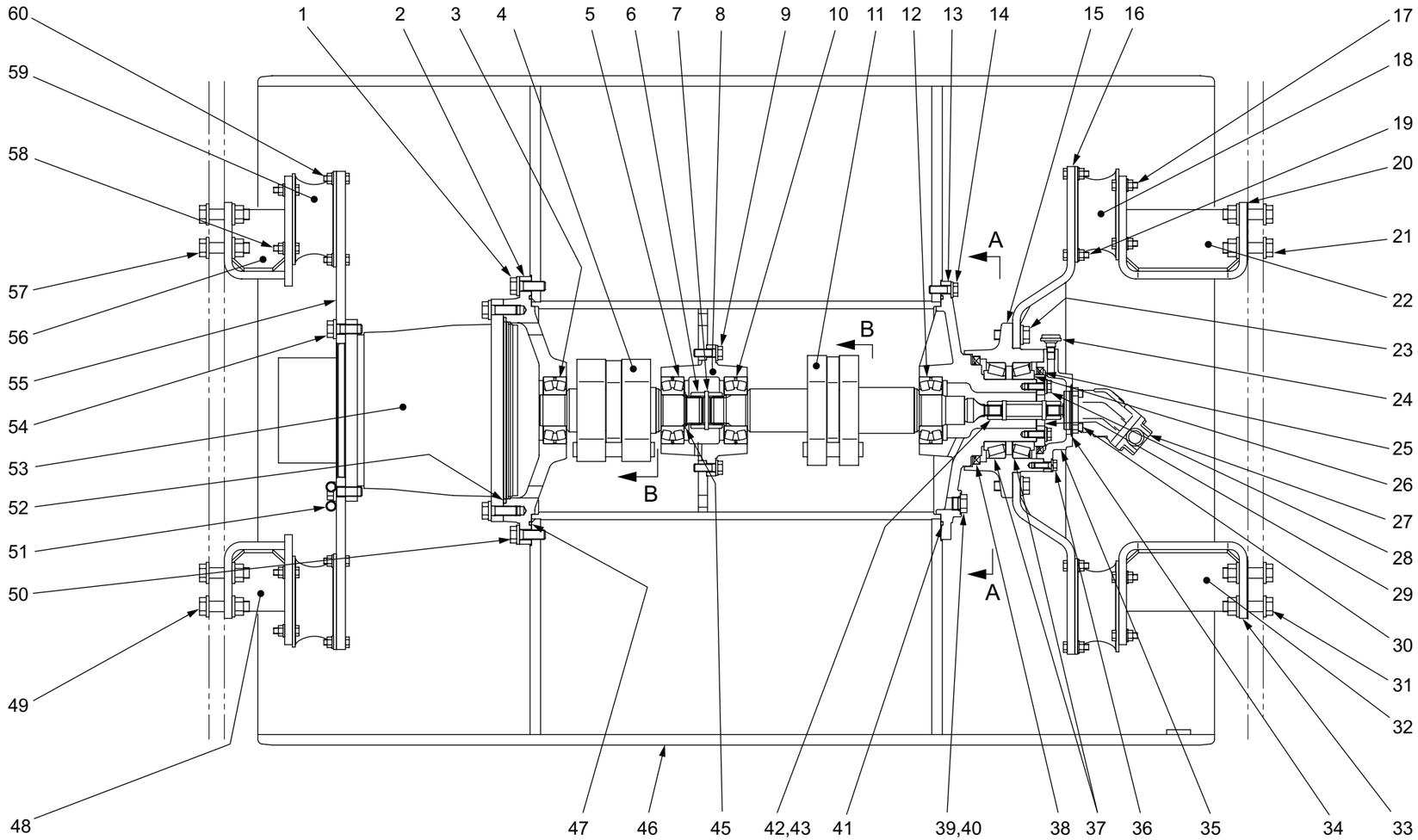
- The lead line numbers shown in the illustration are consistent with the part numbers of the vibratory drum shown on page 6-007.



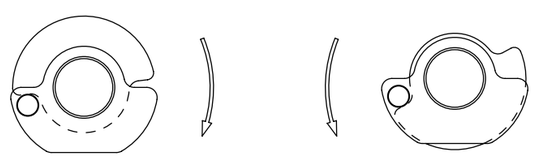
(2) Housing
(11) Eccentric shaft
(13) Axle shaft
(15) Housing
(16) Bracket
(22) Bracket
(27) Vibrator motor
(32) Bracket
(46) Drum
(48) Bracket
(53) Propulsion motor
(55) Plate
(56) Bracket

SW800-06010

3-2. Vibratory Drum Assembly (SW850-Ⅱ)



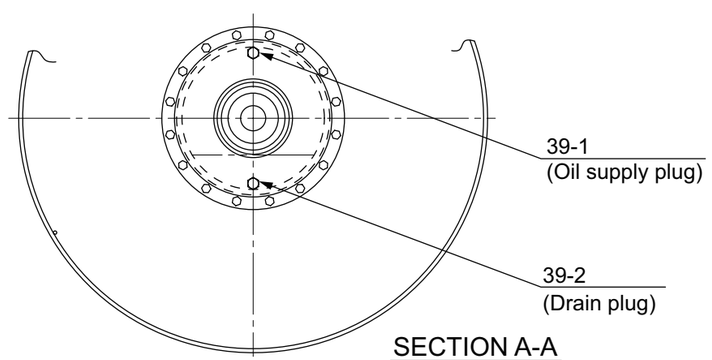
(1) Bolt (M20×60)
(2) Housing
(3) Vibrator bearing
(4) Eccentric shaft
(5) Vibrator bearing
(6) Sleeve
(7) Spring pin
(8) Housing
(9) Bolt (M16×50)
(10) Vibrator bearing
(11) Eccentric shaft
(12) Vibrator bearing
(13) Axle shaft
(14) Bolt (M16×50)
(15) Housing
(16) Bracket
(17) Bolt (M12×45)
(18) Damper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



Vibration mode: Low
Motor counterclockwise rotation

Vibration mode: High
Motor clockwise rotation

VIEW B

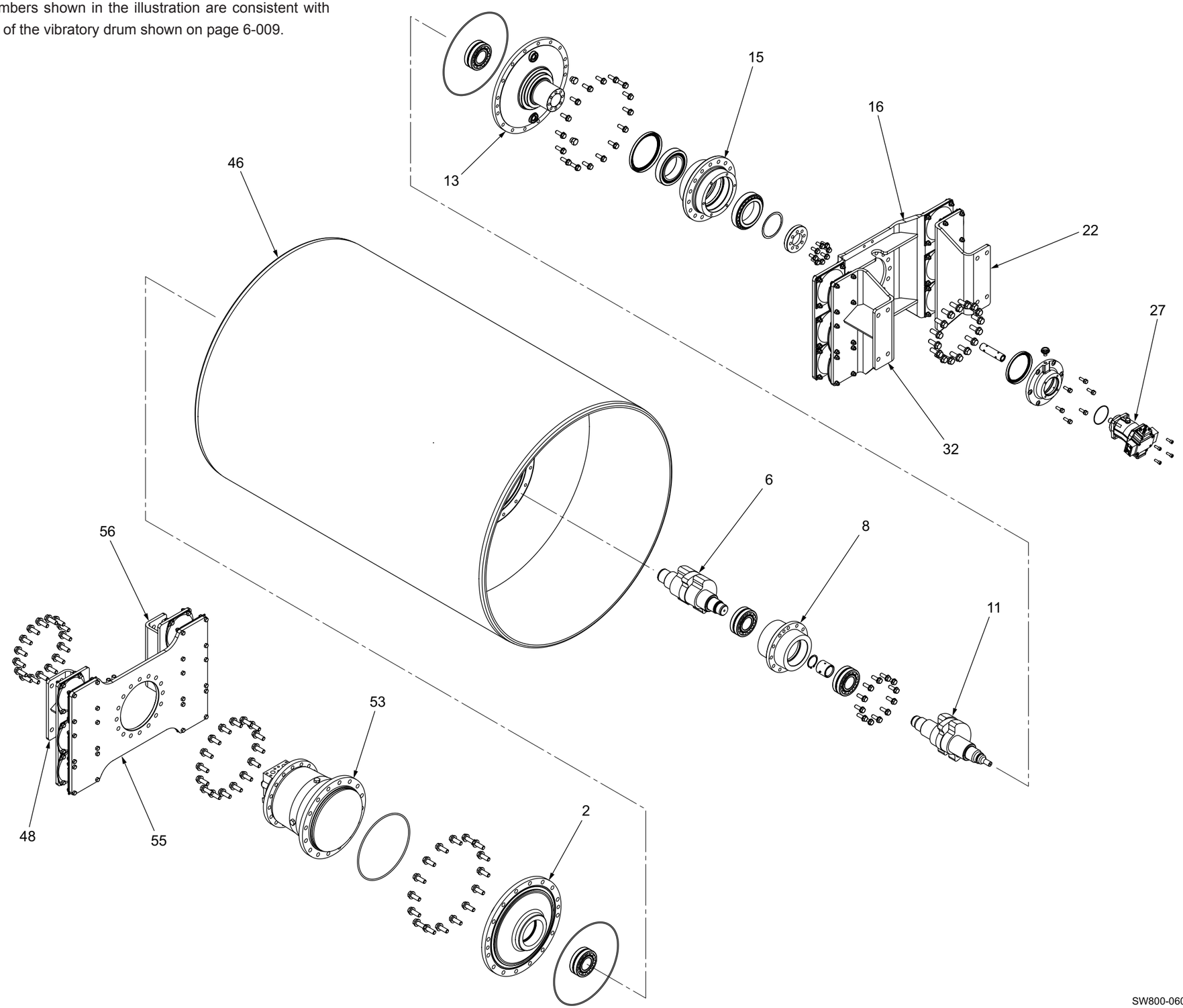


SECTION A-A

0555-43801-0-10001-M

3-2-1. Vibratory drum exploded diagram

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



(2) Housing
(11) Eccentric shaft
(13) Axle shaft
(15) Housing
(16) Bracket
(22) Bracket
(27) Vibrator motor
(32) Bracket
(46) Drum
(48) Bracket
(53) Propulsion motor
(55) Plate
(56) Bracket

SW800-06011

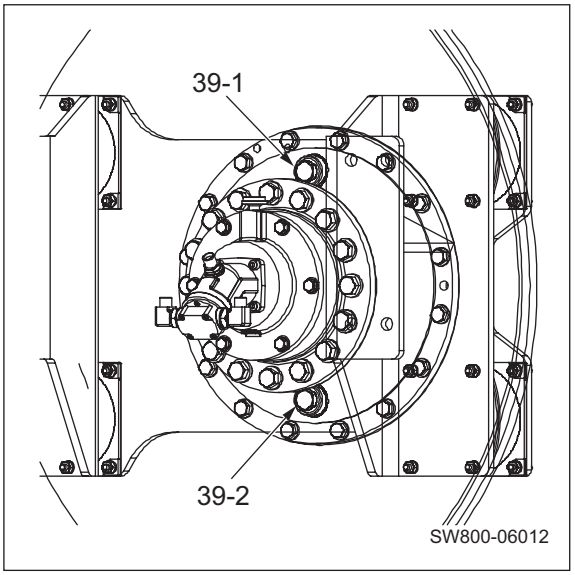
4. DISASSEMBLY AND REASSEMBLY OF VIBRATORY DRUM

• The lead line numbers shown in the illustrations below are consistent with the part numbers of the vibratory drum shown on page 6-007 and 6-009.

4-1. Disassembly of Vibratory Drum

1) Remove the plugs (39-1) and (39-2).
   • Drain the gear oil in the vibrator case.

   Quantity of gear oil
   SW800-Ⅱ: 19 L (5.0 gal.)
   SW850-Ⅱ: 22 L (5.8 gal.)

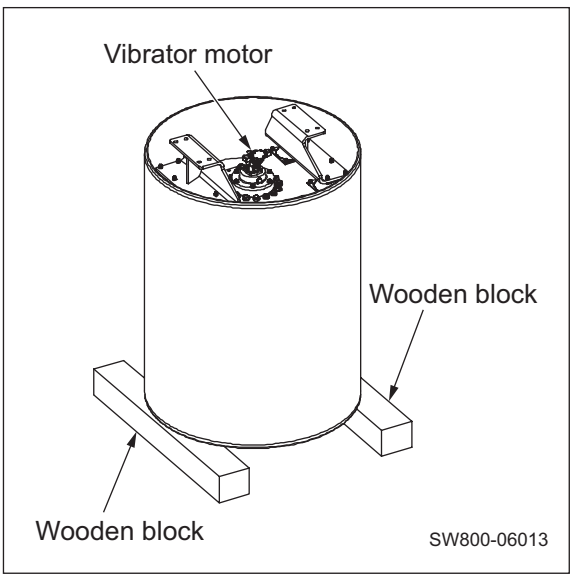


⚠WARNING

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

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

   Vibratory drum assembly
   SW800-Ⅱ: 2,280 kg (5,026 lbs.)
   SW850-Ⅱ: 3,080 kg (6,790 lbs.)

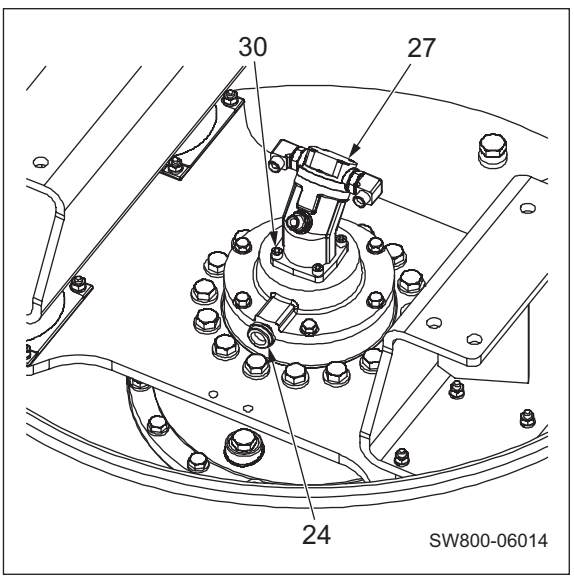


⚠WARNING

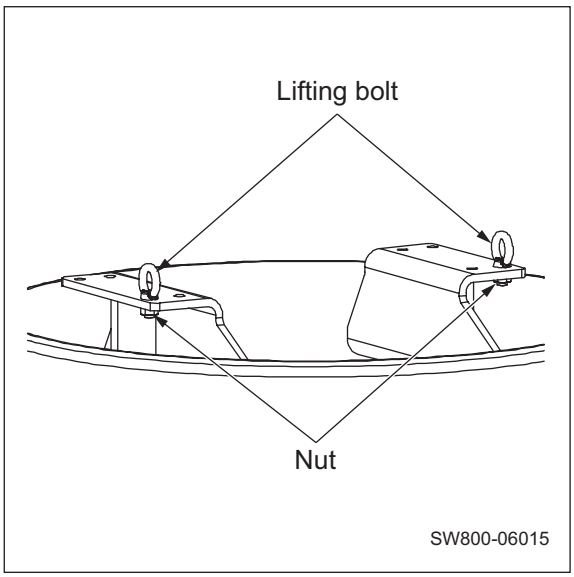
Carry out the work in an unstrained posture using a work stool or the like.

3) Remove the four bolts (30).
   • Remove the vibratory motor (27).
   • Remove the breather (24).

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



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



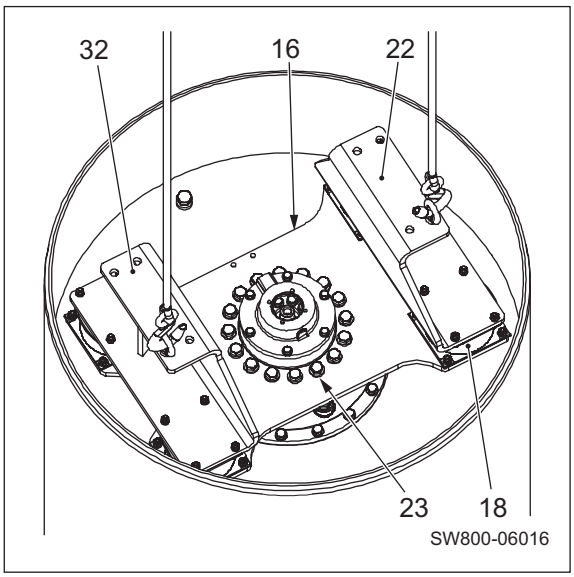
5) Remove the sixteen bolts (23).
   • Lift the brackets (22) and (32), damper (18) and bracket (16) together with a crane and remove them.

(NOTICE)

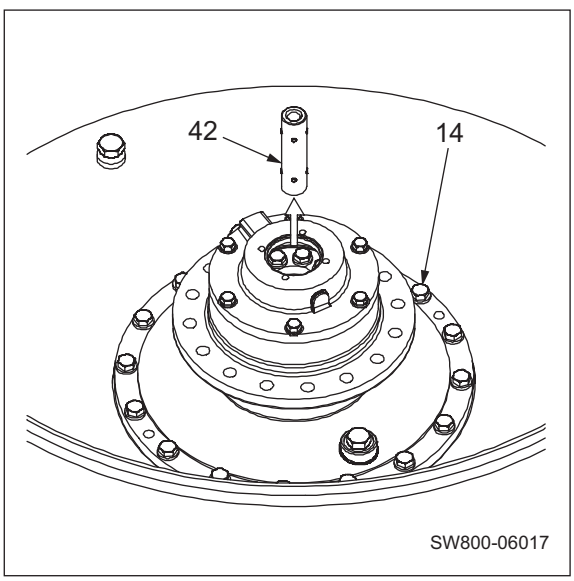
- **Since the parts cannot be lifted in a level position in the illustrated state, lift them using a support or the like until the spigot joint of the housing is disengaged.**

Total weight of parts to be lifted (16), (18), (22) and (32)

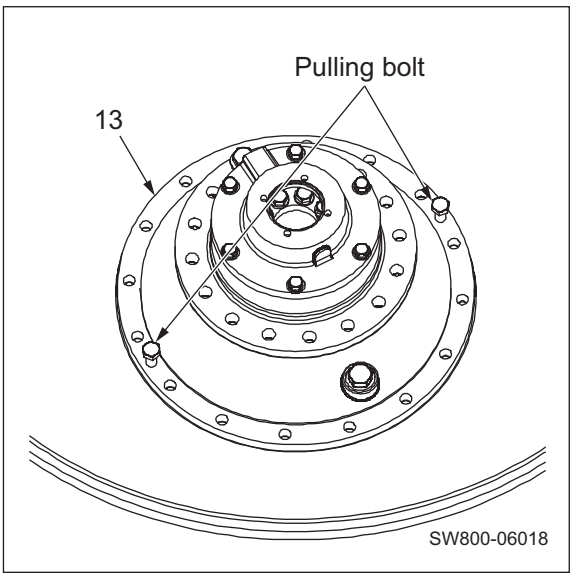
SW800-Ⅱ: 170 kg (375 lbs.)
SW850-Ⅱ: 230 kg (507 lbs.)



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



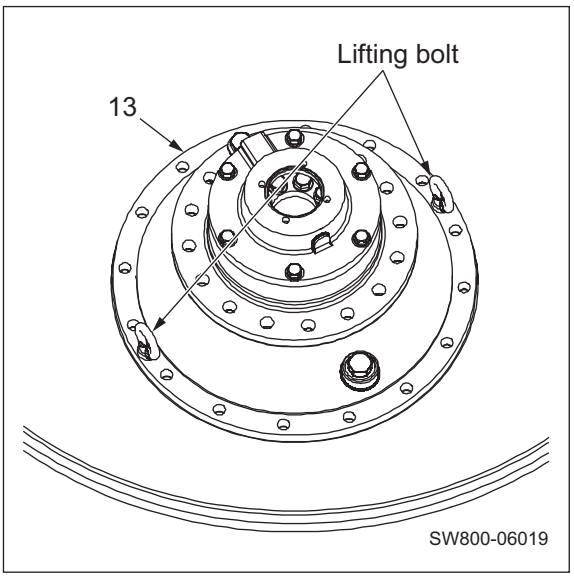
7) Using the two pulling bolts (M16×50), lift the axle shaft (13).



⚠WARNING

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

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

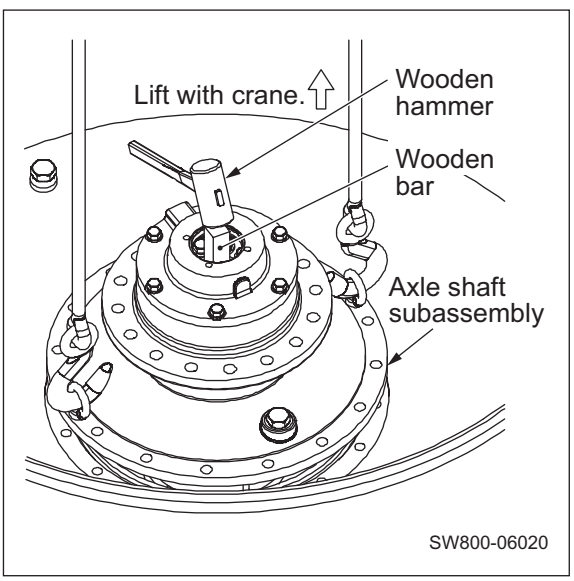


9) Slowly lift the axle shaft subassembly with a crane to remove it.

(NOTICE)

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

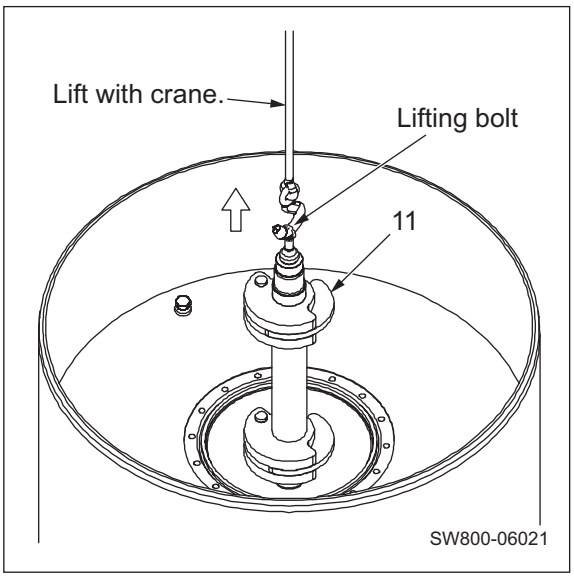
Axle shaft subassembly : 130 kg (287 lbs.)



10) **SW800-Ⅱ:**

- Attach a lifting bolt (M8) to the end of the eccentric shaft (11).
- Lift the eccentric shaft (11) to remove it.

Eccentric shaft (11) : 70 kg (154 lbs.)

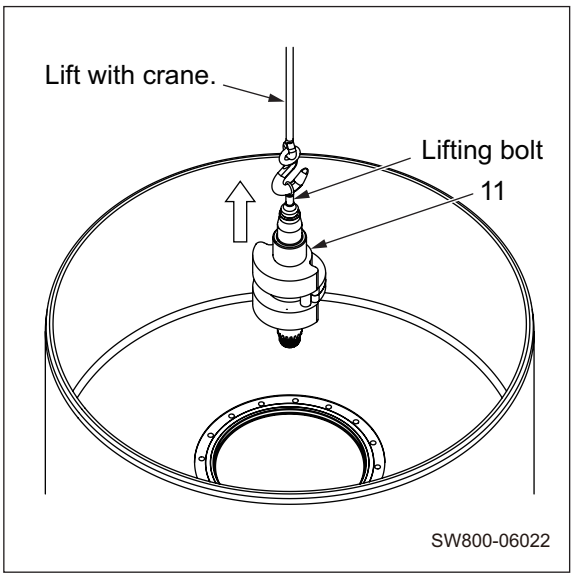


For machines with SW800-Ⅱ, skip steps 11) to 15).

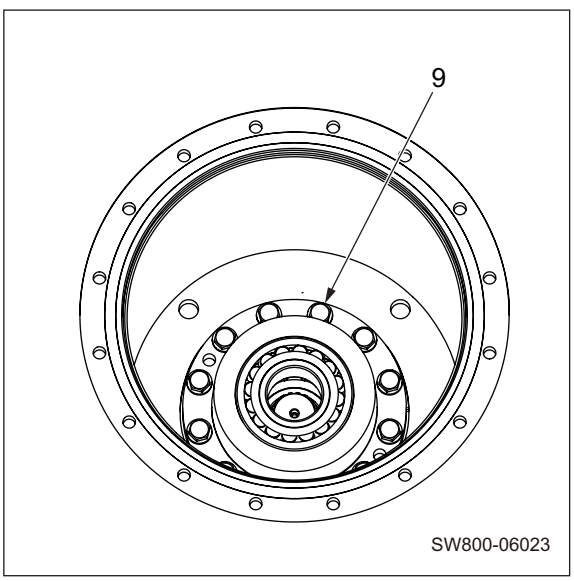
11) **SW850-Ⅱ:**

- Attach a lifting bolt (M8) to the end of the eccentric shaft.
- Lift the eccentric shaft (11) to remove it.

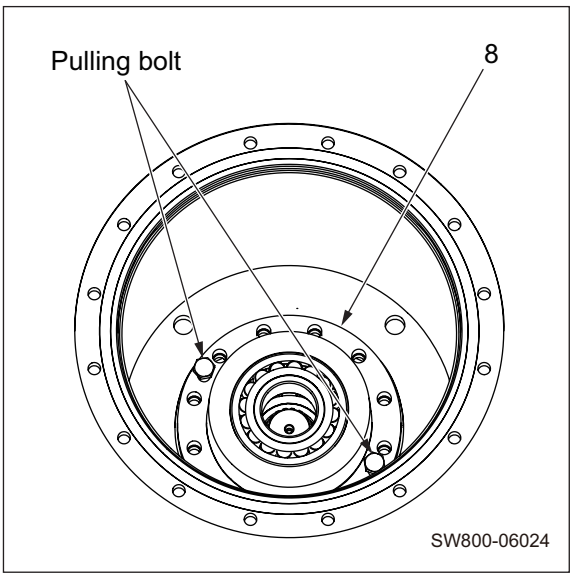
Eccentric shaft (11): 45 kg (99 lbs.)



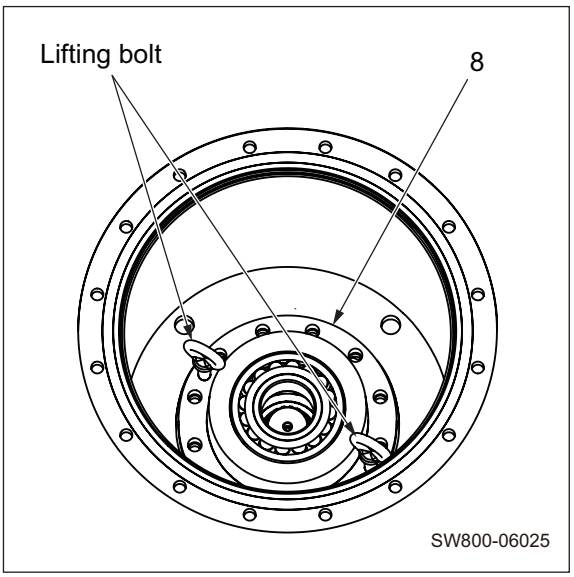
12) Remove the twelve bolts (9).



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

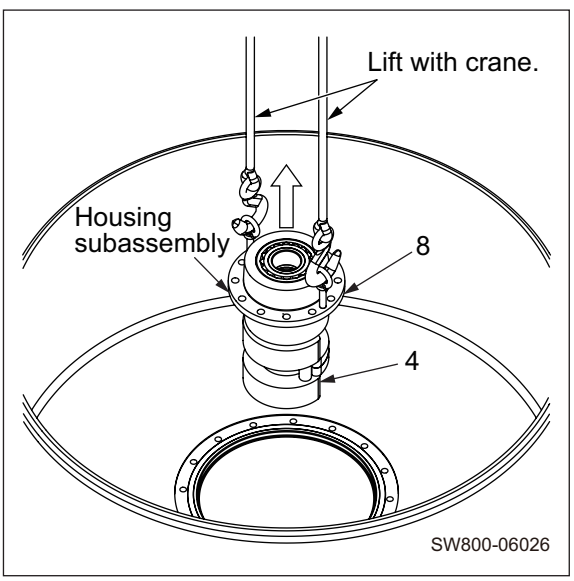


14) Install lifting bolts (M16) on the housing (8).



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

Total weight of parts to be lifted (8) and (4)
: 70 kg (154 lbs.)

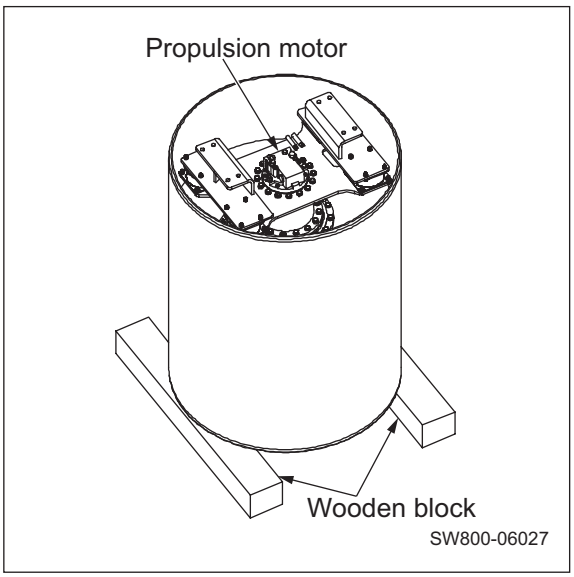


⚠WARNING

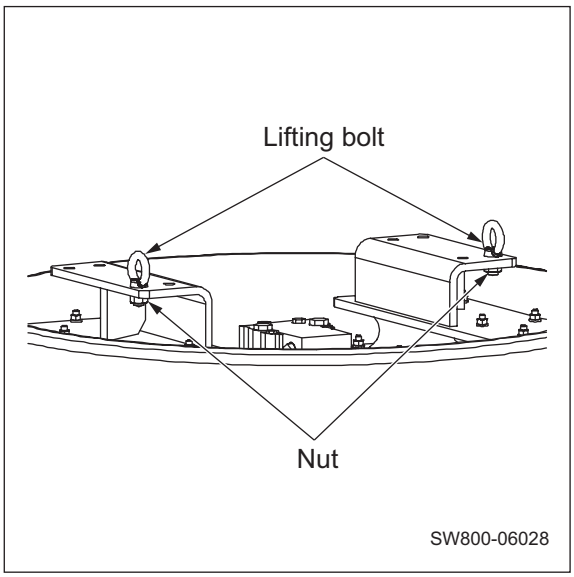
Be careful because reversing the vibratory drum is dangerous work. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

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

Weight of vibratory drum
in the illustrated condition
SW800-Ⅱ: 1,940 kg (4,277 lbs.)
SW850-Ⅱ: 2,650 kg (5,842 lbs.)



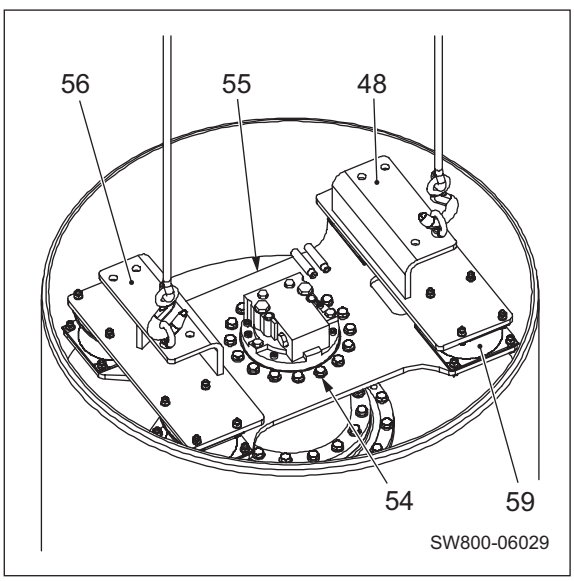
17) Install lifting bolts and nuts (M22) as shown on the right.



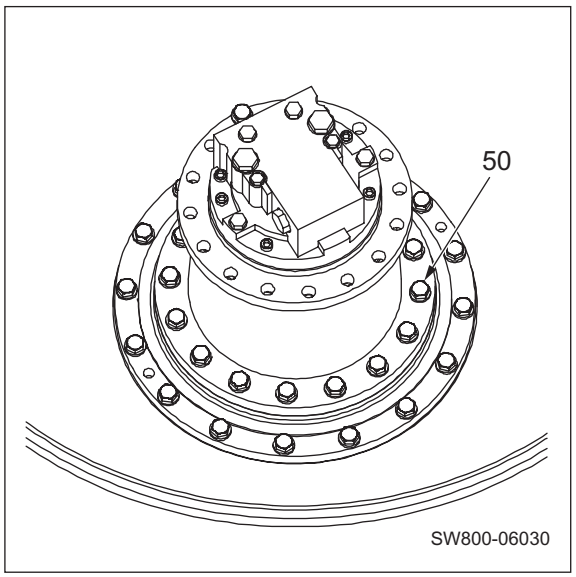
18) Remove the sixteen bolts (54).
- Lift the brackets (48) and (56), damper (59) and plate (55) together with a crane to remove them.

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

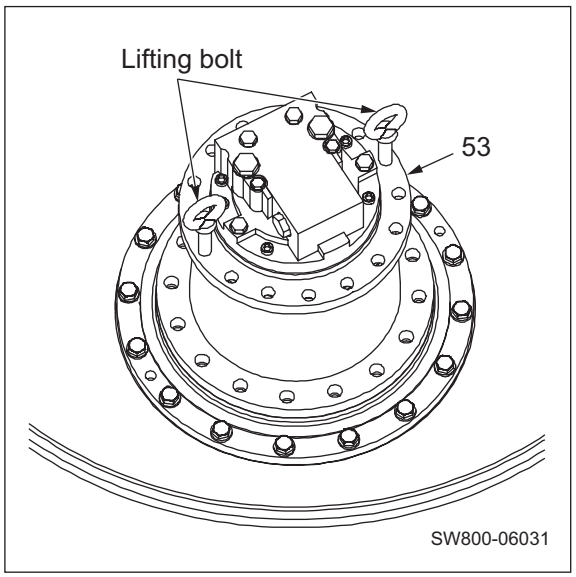
Total weight of parts to be lifted (48), (55), (56) and (59)
SW800-Ⅱ: 170 kg (375 lbs.)
SW850-Ⅱ: 200 kg (441 lbs.)



19) Remove the sixteen bolts (50).



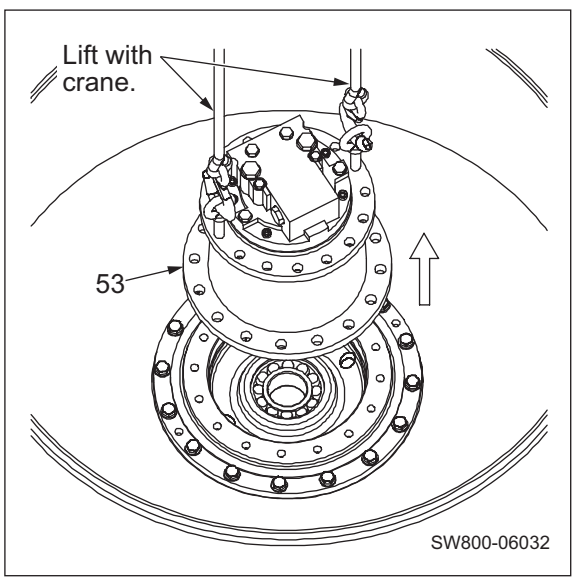
20) Install lifting bolts (M20) on the propulsion motor (53).



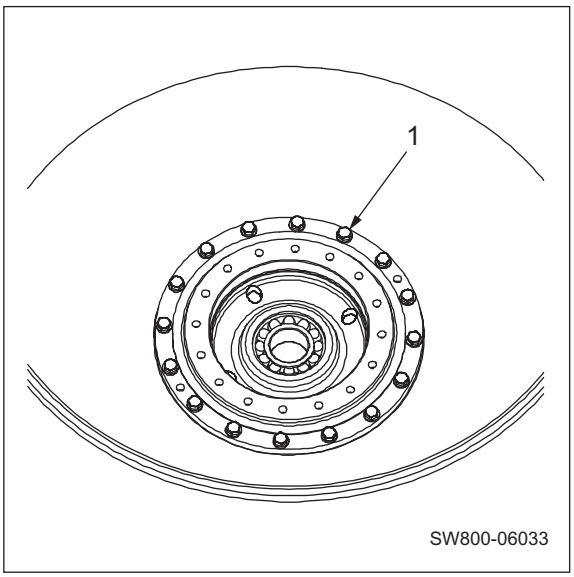
21) Lift the propulsion motor (53) with a crane to remove it.

Propulsion motor (53)

SW800-Ⅱ: 185 kg (408 lbs.)
SW850-Ⅱ: 210 kg (463 lbs.)



22) Remove the sixteen bolts (1).

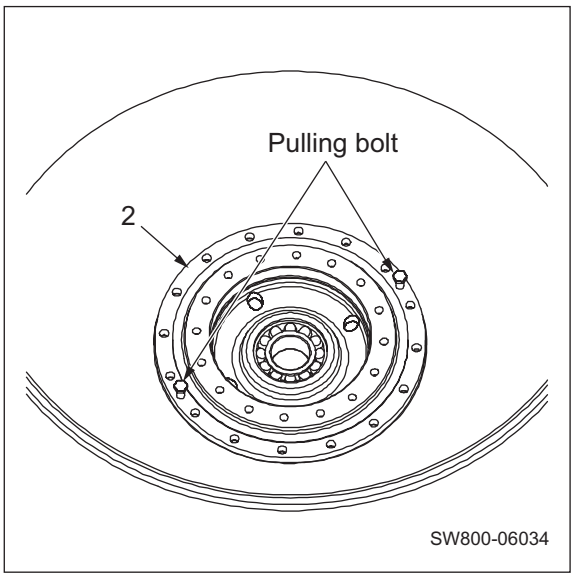


23) Using two pulling bolts, lift the housing (2).

Pulling bolt:

SW800-Ⅱ: M16×50

SW850-Ⅱ: M20×60

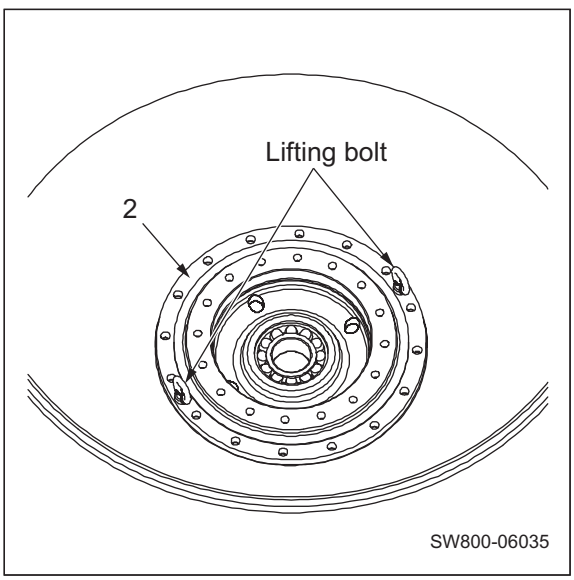


24) Install lifting bolts on the housing (2).

Lifting bolt:

SW800-Ⅱ: M16

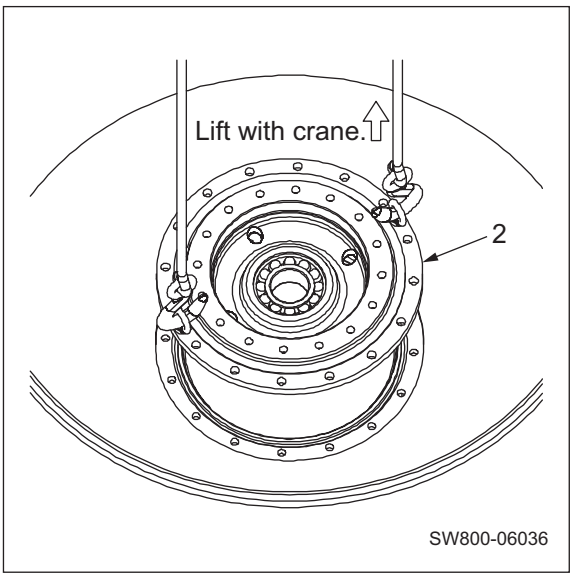
SW850-Ⅱ: M20



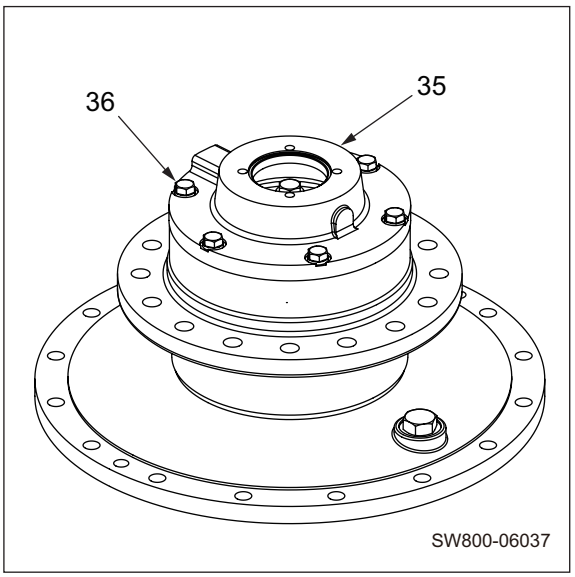
25) Lift the housing (2) with a crane to remove it.

Housing (2)

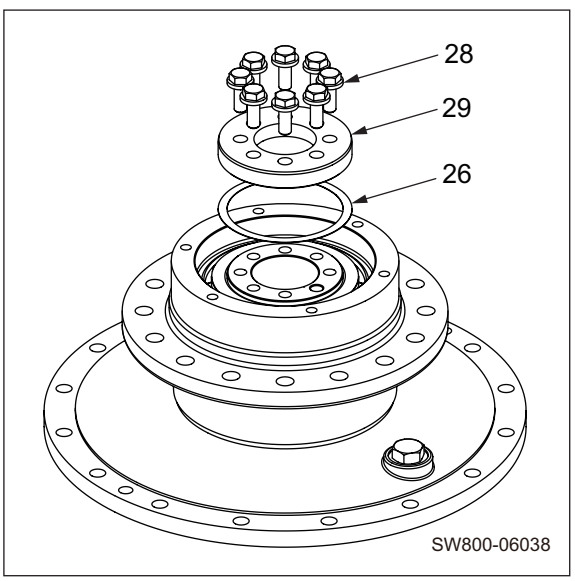
SW800-Ⅱ: 60 kg (132 lbs.)
SW850-Ⅱ: 75 kg (165 lbs.)



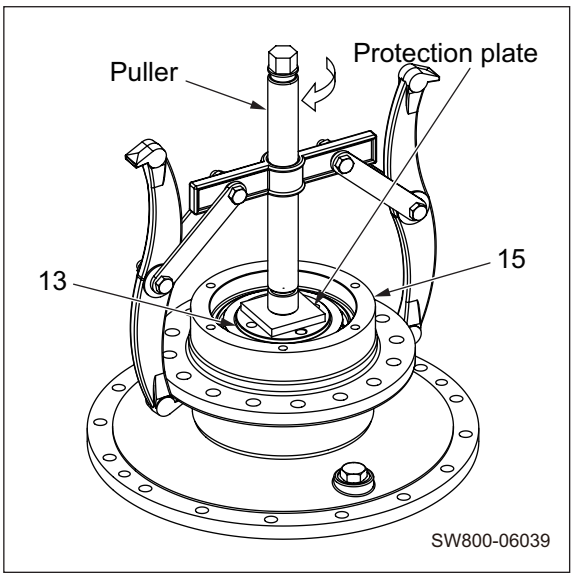
26) Shown on the right is the axle shaft subassembly removed from the vibratory drum.
- Remove the six bolts (36).
- Remove the cover (35).



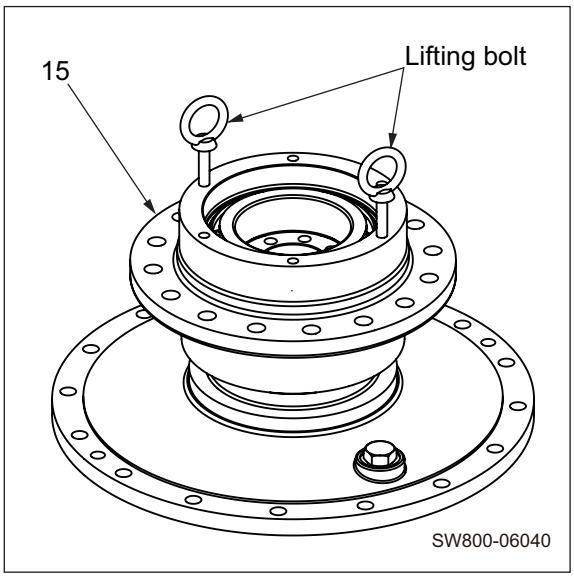
27) Remove the eight bolts (28).
- Remove the cover (29) and shim (26).



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

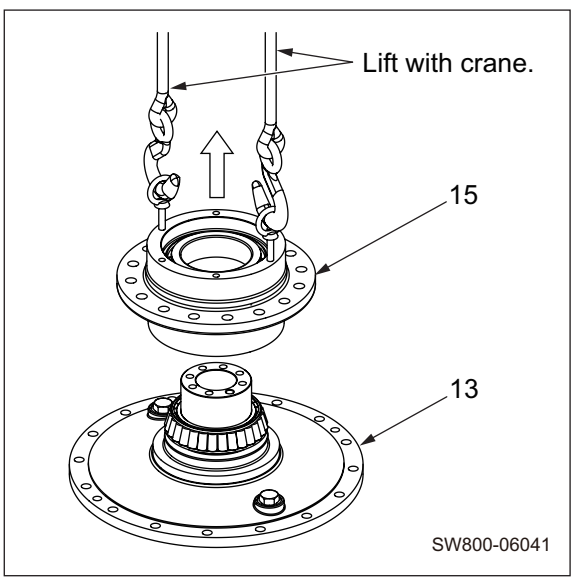


29) Install lifting bolts (M12) on the housing (13).



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

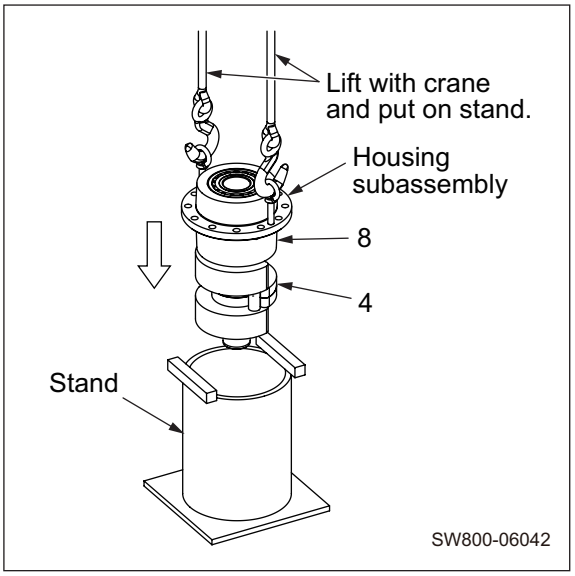
Housing (15) : 45 kg (99 lbs.)



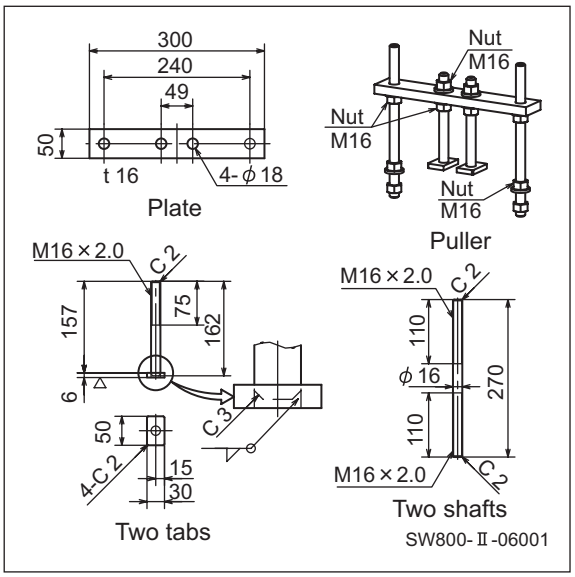
For machines with SW800-Ⅱ, skip steps 31) to 40).

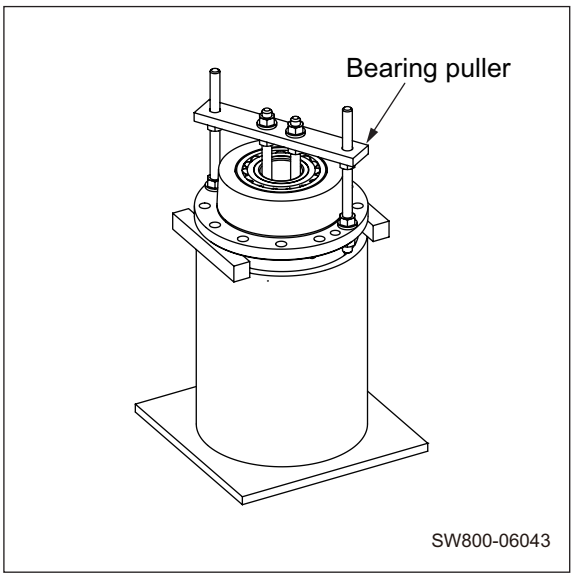
31) Put the housing subassembly on a stand as shown.

Total weight of parts to be lifted (8) and (4)
: 70 kg (154 lbs.)



32) Set up a bearing puller on the stand.

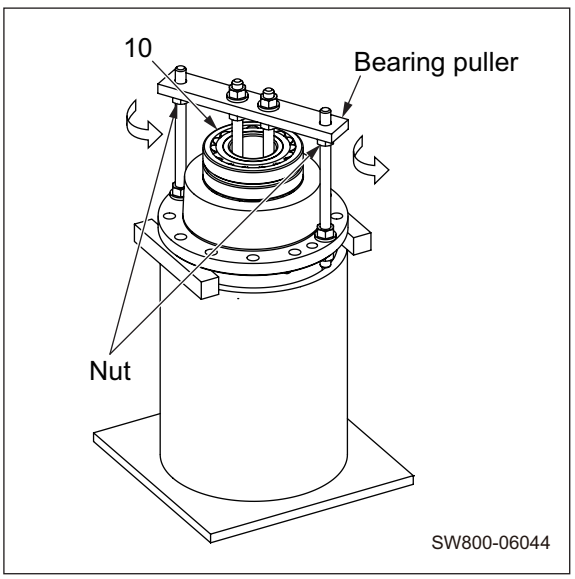




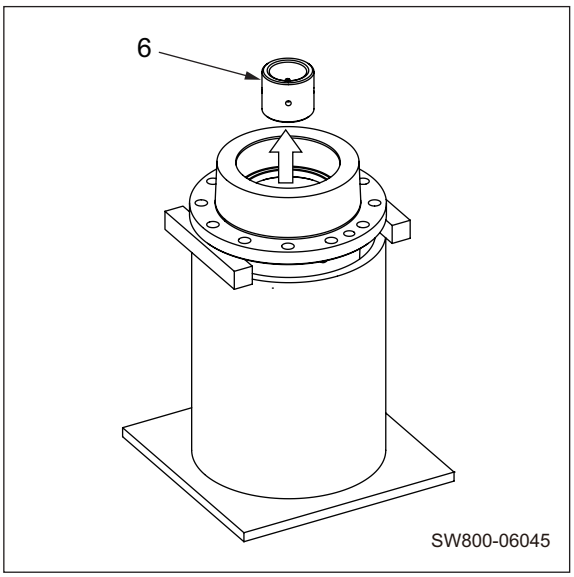
33) Turn the nuts of the bearing puller counterclockwise to remove the vibrator bearing (10).

(NOTICE)

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

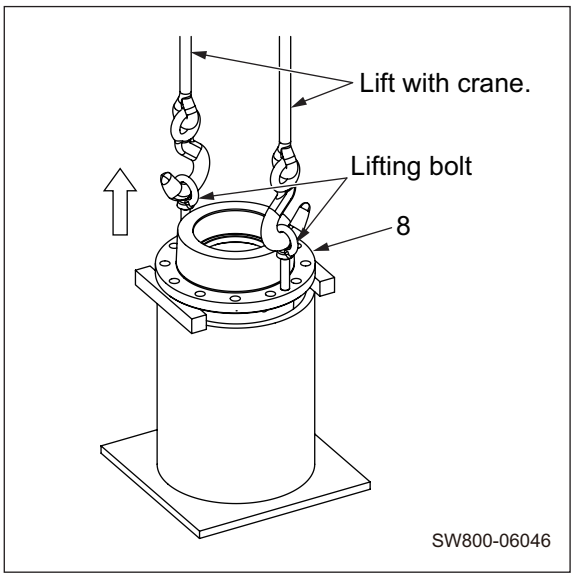


34) Remove the sleeve (6).

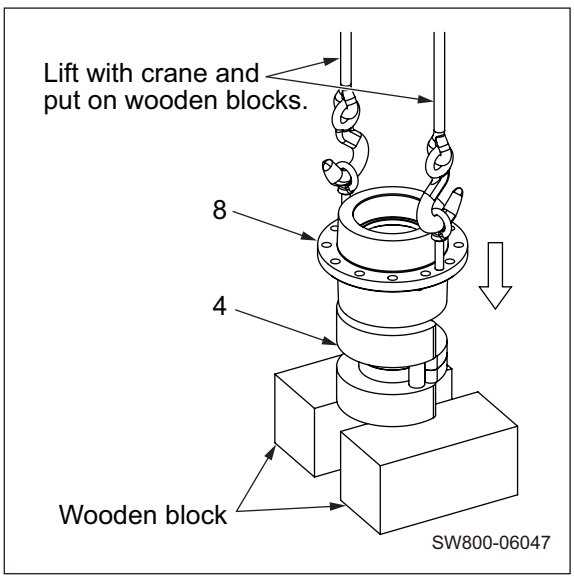


35) Install lifting bolts (M16) and lift the housing (8) with a crane.

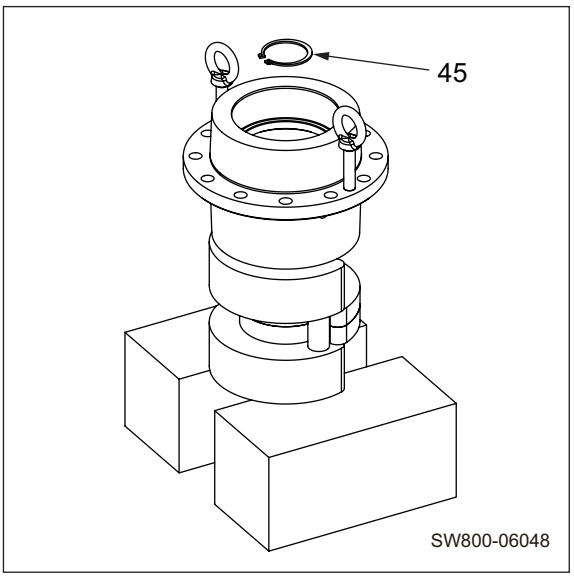
Housing (8): 60 kg (132 lbs.)



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

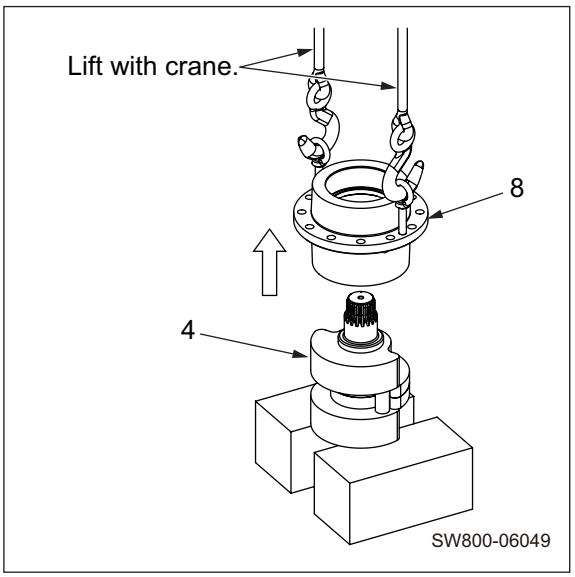


37) Remove the retaining ring (45).

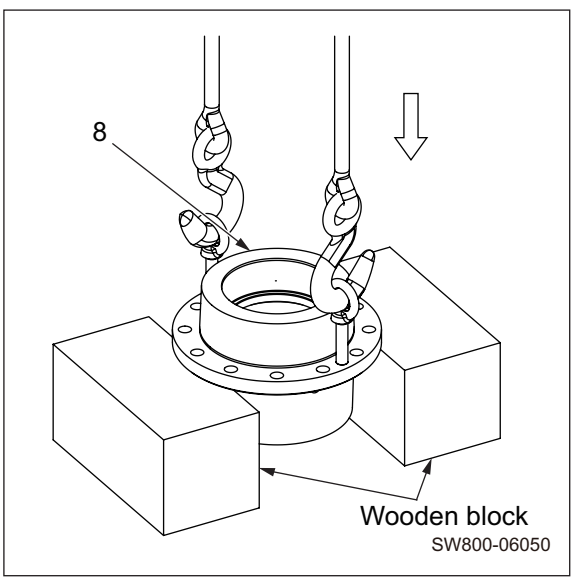


38) Lift the housing (8) with a crane to separate it from the eccentric shaft (4).

Housing (8): 30 kg (66 lbs.)



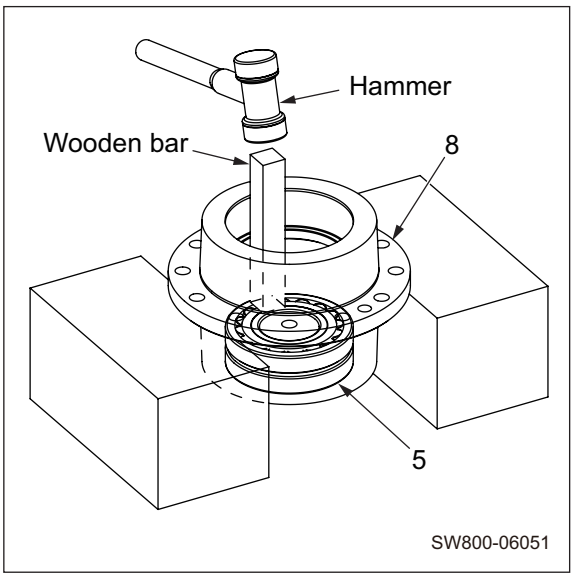
39) Put the housing (8) on wooden blocks.



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

(NOTICE)

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



4-2. Reassembly of Vibratory Drum

(NOTICE)

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

1) Housing subassembly

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

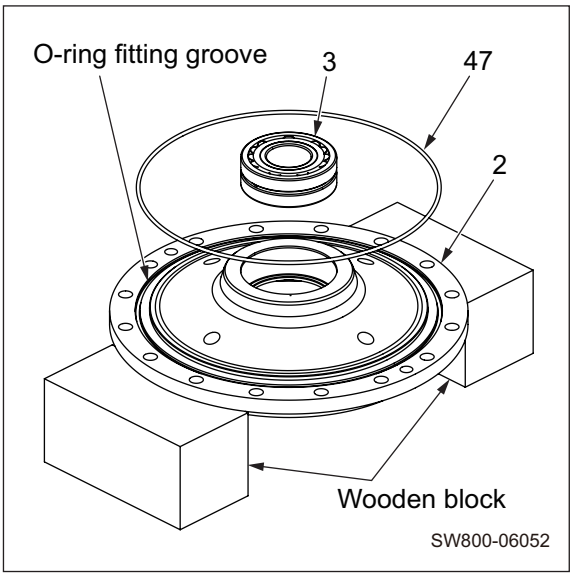
- Drive the vibrator bearing (3) into the housing (2).

(NOTICE)

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

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

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



⚠WARNING

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

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

- Install lifting bolts.

  Lifting bolt:

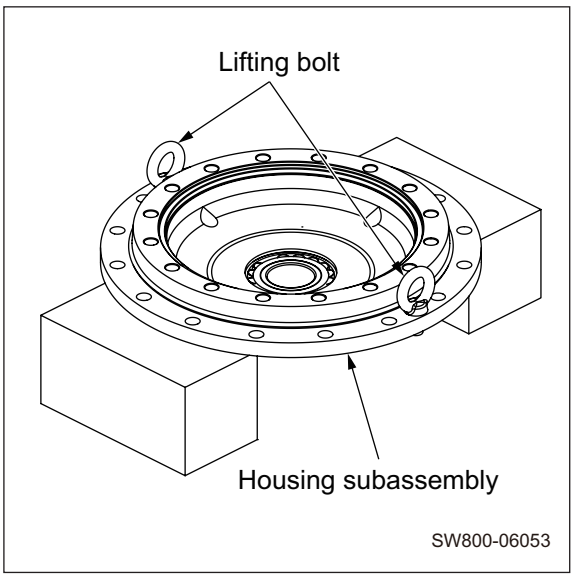
  SW800-Ⅱ: M16

  SW850-Ⅱ: M20

Housing subassembly

SW800-Ⅱ: 60 kg (132 lbs.)

SW850-Ⅱ: 75 kg (165 lbs.)



⚠WARNING

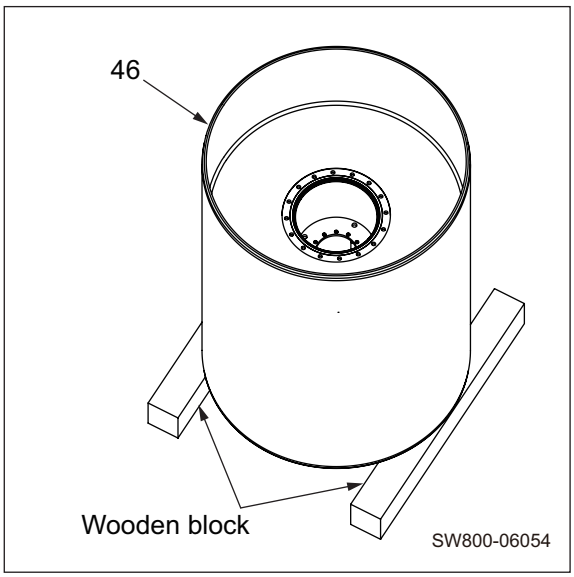
When standing the drum, use wooden blocks of sufficient strength to securely support the drum.

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

(NOTICE)
- **The side on which no ø10 round bar is installed is the propulsion motor side.**

kg Drum (46)

SW800-Ⅱ: 1,500 kg (3,307 lbs.)
SW850-Ⅱ: 2,100 kg (4,630 lbs.)

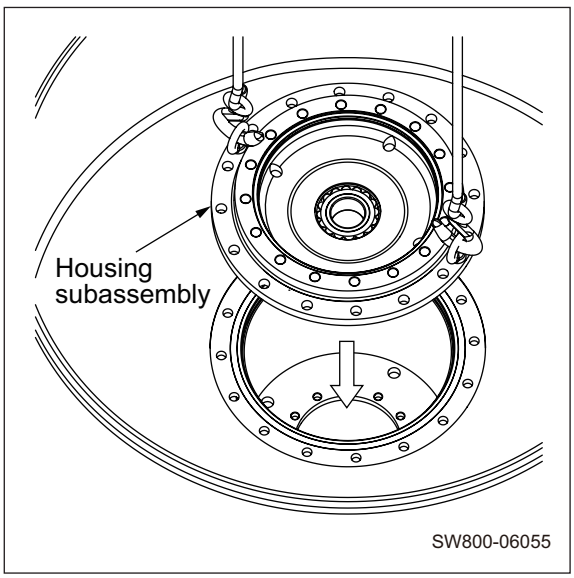


3) Lift the housing subassembly with a crane and install it in the vibratory drum.

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

kg Housing subassembly

SW800-Ⅱ: 60 kg (132 lbs.)
SW850-Ⅱ: 75 kg (165 lbs.)



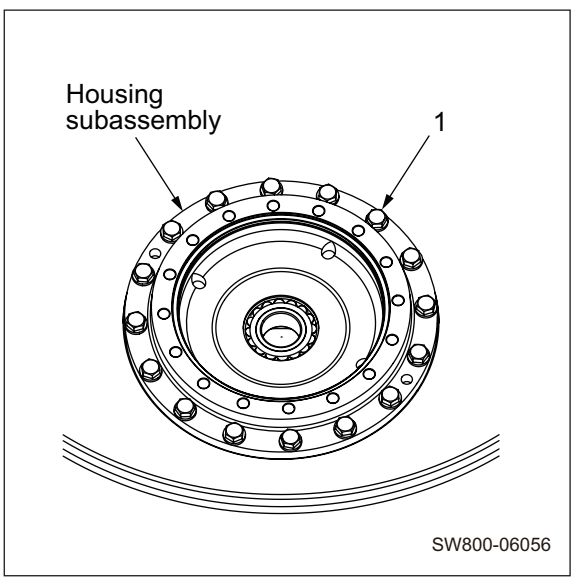
⚠WARNING

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

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

N·m Bolts (1)

SW800-Ⅱ M16×50: 265 N·m (196 lbf·ft)
SW850-Ⅱ M20×60: 540 N·m (398 lbf·ft)

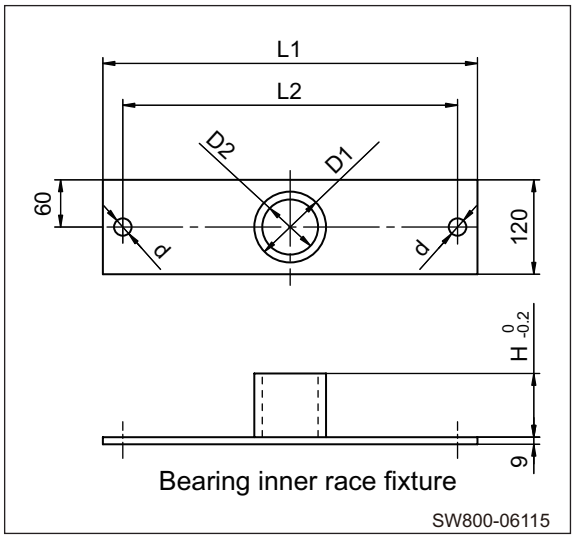


5) Attach a bearing inner race fixture to the housing subassembly with two bolts and washers.

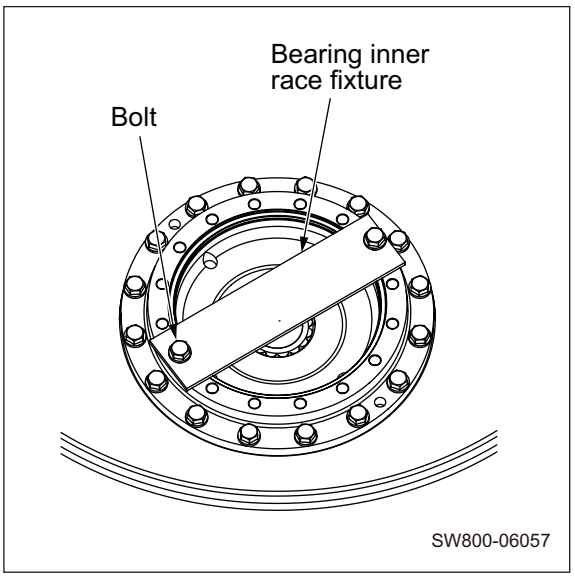
Bolts:

SW800-Ⅱ: M16×35

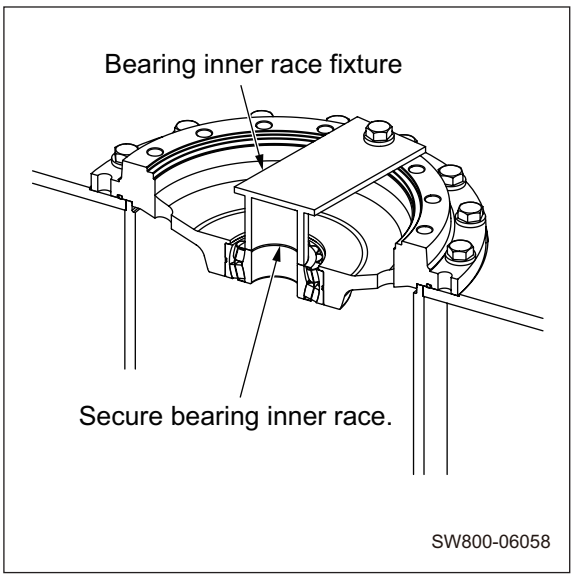
SW850-Ⅱ: M20×35



	SW800-Ⅱ	SW850-Ⅱ
L1	375	420
L2	425	470
d	18	22
H	49	84
D1	60	65
D2	78	82



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



⚠WARNING

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

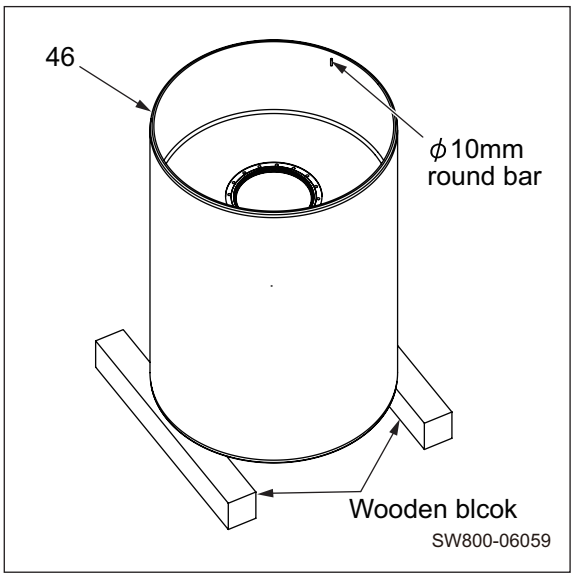
7) Lift the drum (46) with a crane and reverse it. Then, stand the drum with its vibrator motor side facing up.

(NOTICE)

- **The side on which a ø10 round bar is installed is the vibrator motor side.**

Drum (46)

SW800-Ⅱ: 1,580 kg (3,483 lbs.)
SW850-Ⅱ: 2,200 kg (4,850 lbs.)



For machines with SW800-Ⅱ, skip steps 8) and 11).

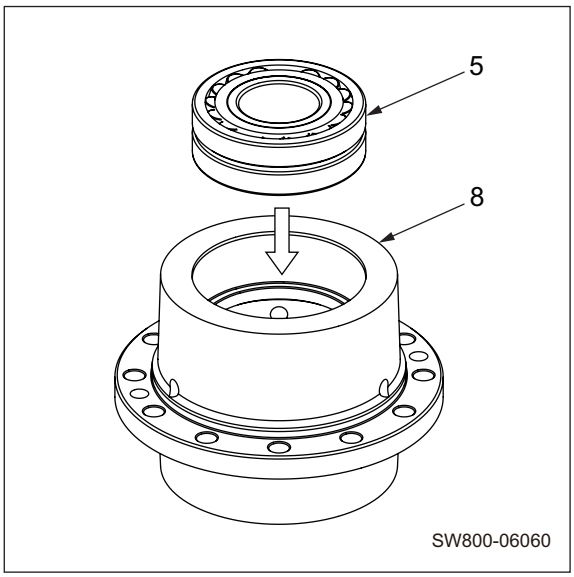
8) Eccentric shaft subassembly

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

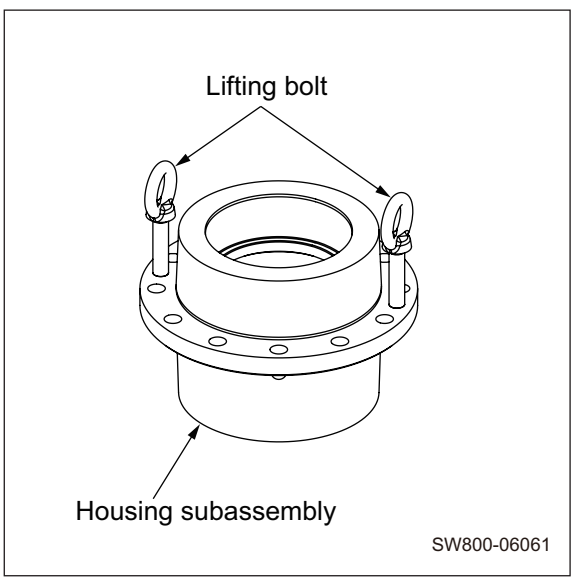
- Drive the vibrator bearing (5) into the housing (8).
- Apply a thin coat of gear oil to the inner surface of the bearing (5).

(NOTICE)

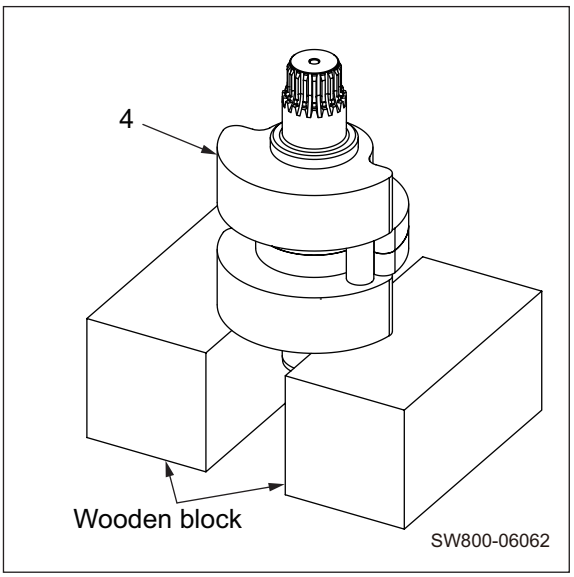
- **Take care not to damage the bearing when installing it.**



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



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



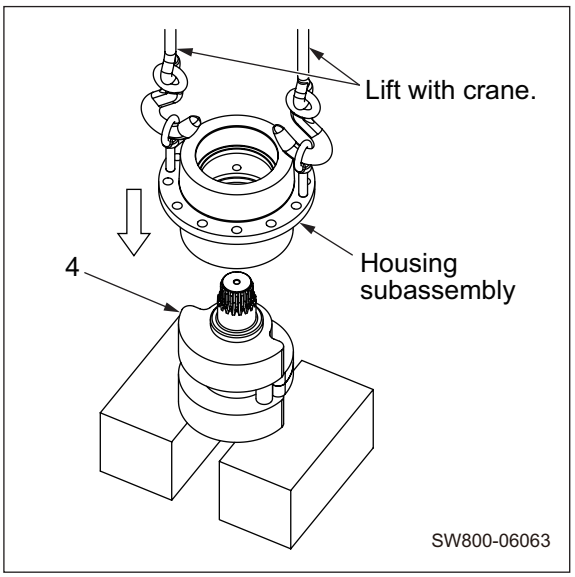
④ Apply a thin coat of gear oil to the bearing mounting surface of the eccentric shaft (4).

- Lift the housing subassembly with a crane and install it on the eccentric shaft (4).

(NOTICE)

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

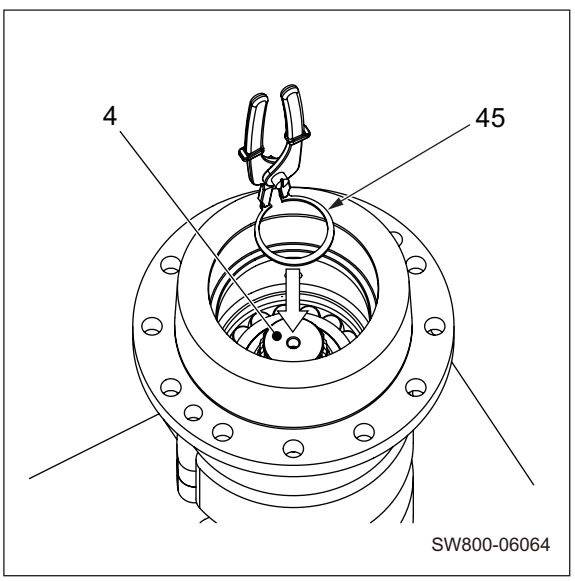
Housing subassembly: 30 kg (66 lbs.)



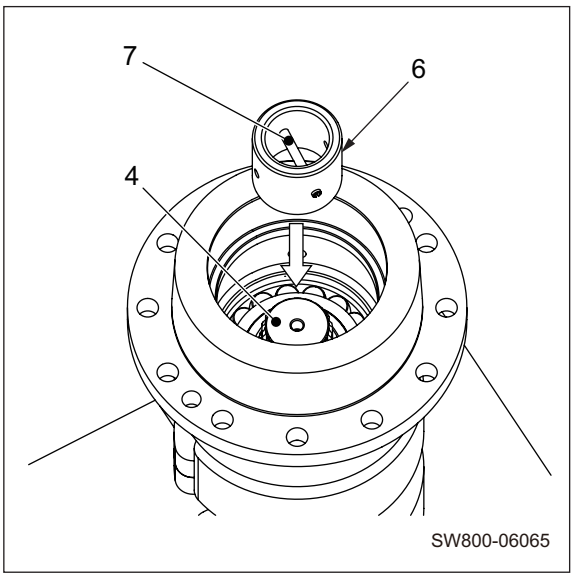
⑤ Install the retaining ring (45) on the eccentric shaft (4).

(NOTICE)

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

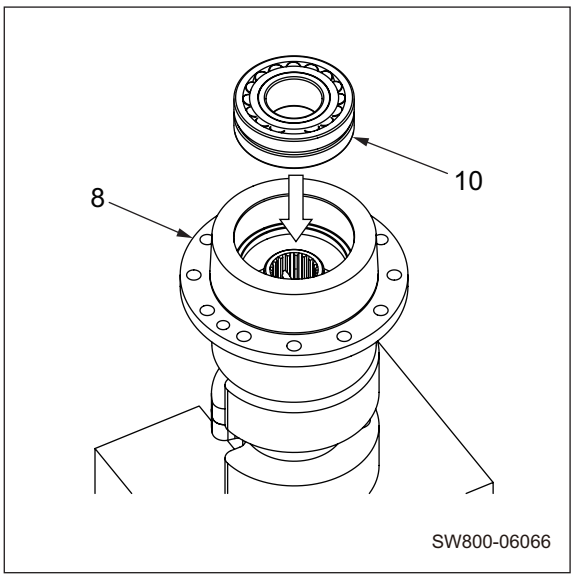


⑥ Drive the spring pin (7) into the sleeve (6).
- Apply gear oil to the inner surface of the sleeve (6) and the splined portion of the eccentric shaft (4).
- Install the sleeve (6) on the eccentric shaft (4).



⑦ Apply a thin coat of gear oil to the surface to which the vibrator bearing (10) will be press-fitted.
- Drive the vibrator bearing (10) into the housing (8).

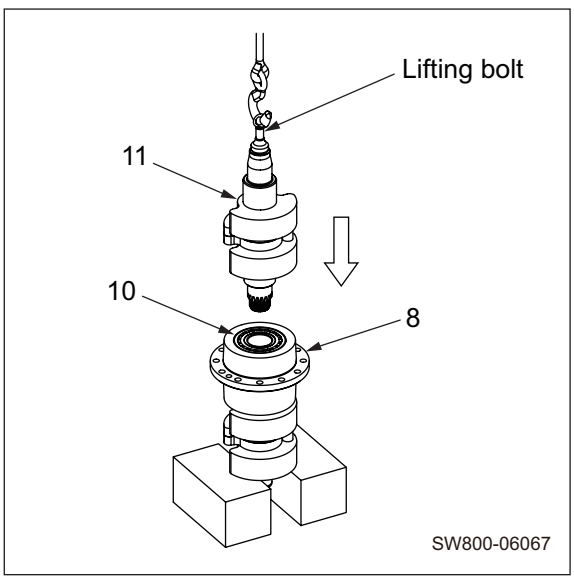
(NOTICE)
- **Take care not to damage the bearing when installing it.**



⑧ Install a lifting bolt (M8) on the shaft end of the eccentric shaft (11).
- Apply a thin coat of gear oil to the inner surface of the vibrator bearing (10) and the bearing mounting surface of the eccentric shaft (11).
- Slowly lower the eccentric shaft (11) with a crane and install it in the housing (8).

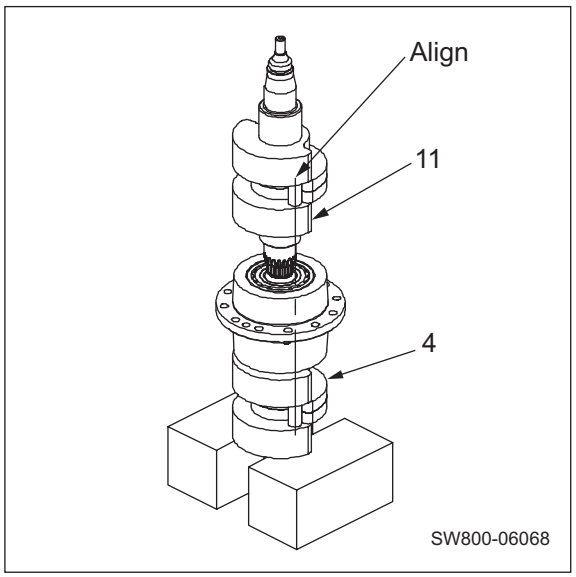
(NOTICE)
- **Install the eccentric shaft taking care not to tilt the vibrator bearing inner race.**

Eccentric shaft (11) : 45 kg (99 lbs.)

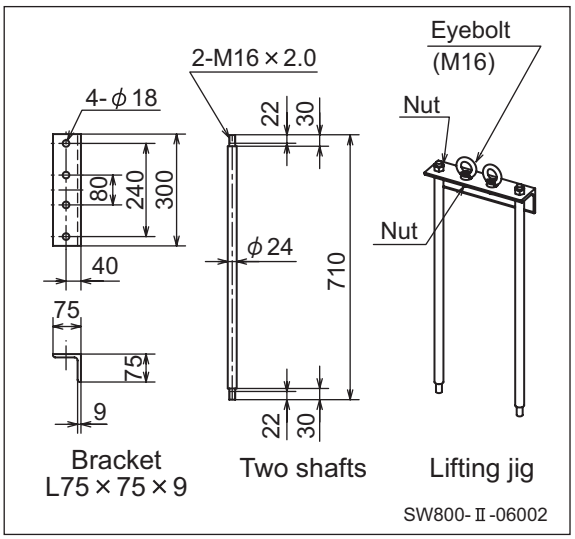


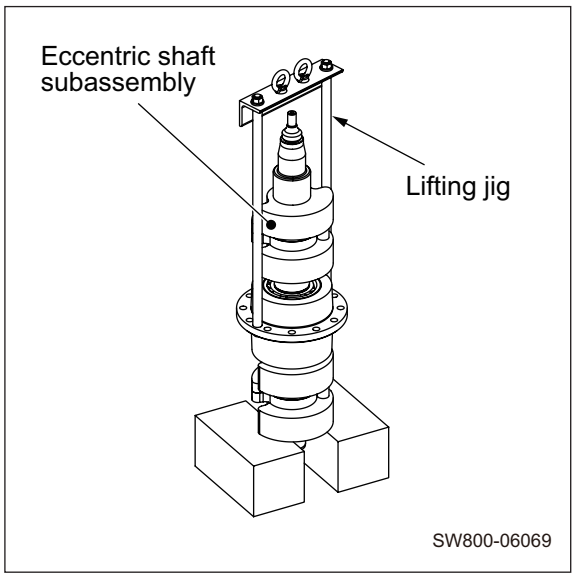
(NOTICE)

- **When connecting eccentric shafts (11) and (4) together, be sure to match phases of eccentric weight on each shaft.**



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

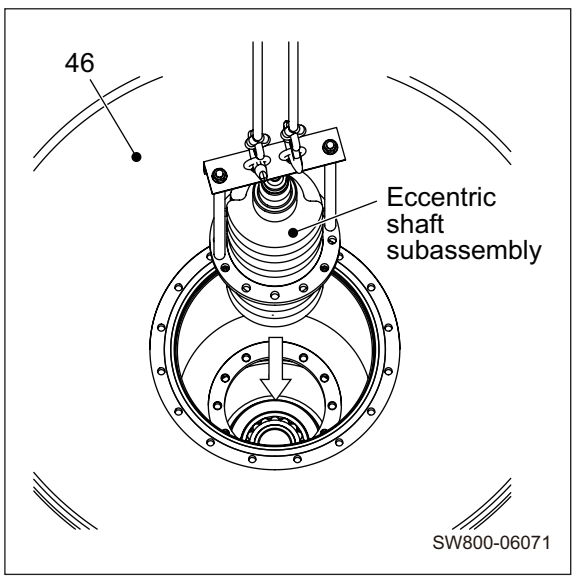




10) Apply gear oil to the bearing mounting surface of the eccentric shaft.

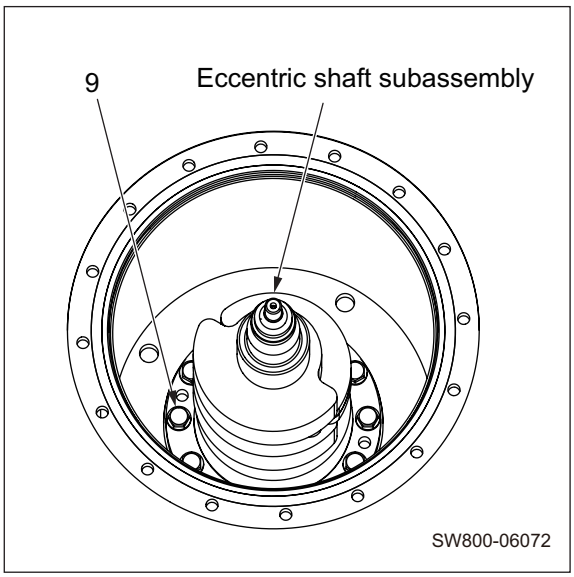
- Slowly lift the eccentric shaft subassembly with a crane and install it in the drum (46).

Eccentric shaft subassembly and lifting jig
: 130 kg (287 lbs.)



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

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

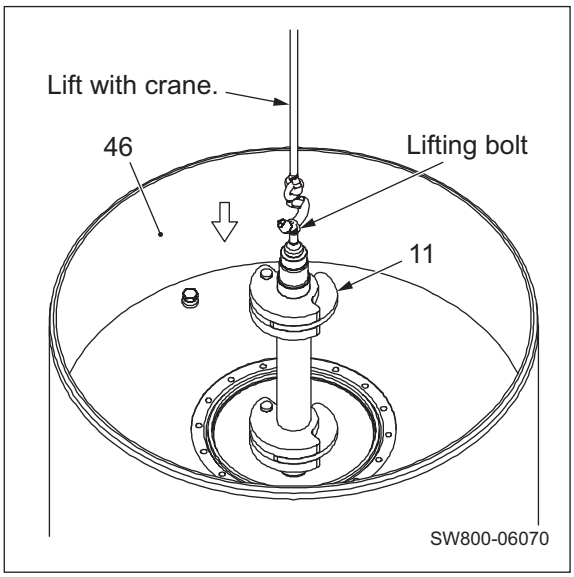


SW800-Ⅱ:

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

- Slowly lift the eccentric shaft (11) with a crane and install it in the drum (46).

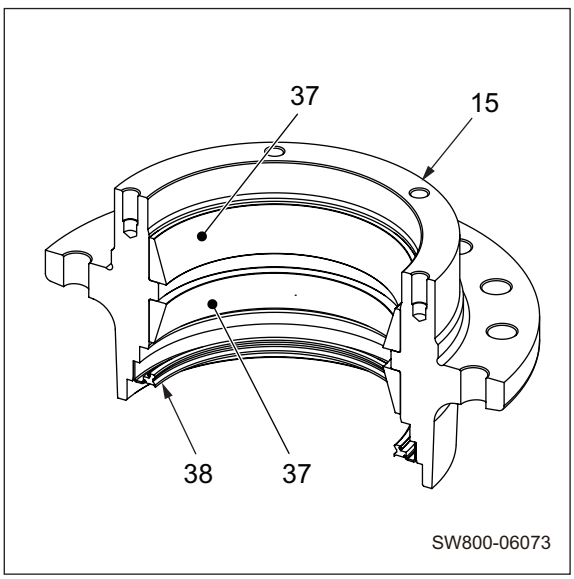
kg Eccentric shaft subassembly : 70 kg (154 lbs.)



13) Axle shaft subassembly

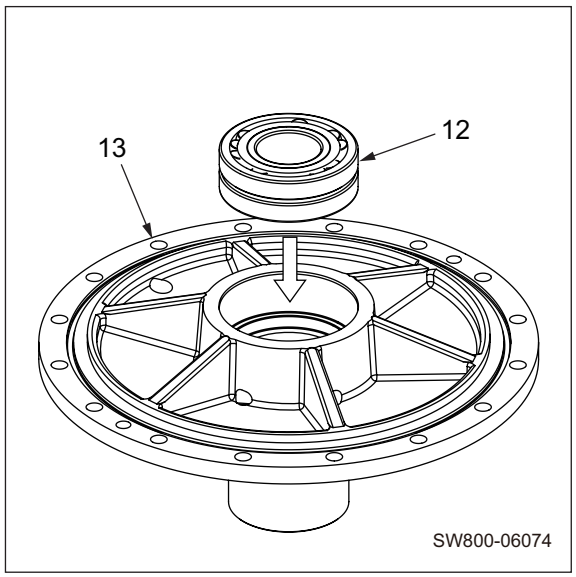
13-1) Apply a thin coat of gear oil to the surface of the outer race of the roller bearing (37) to be press-fitted.

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



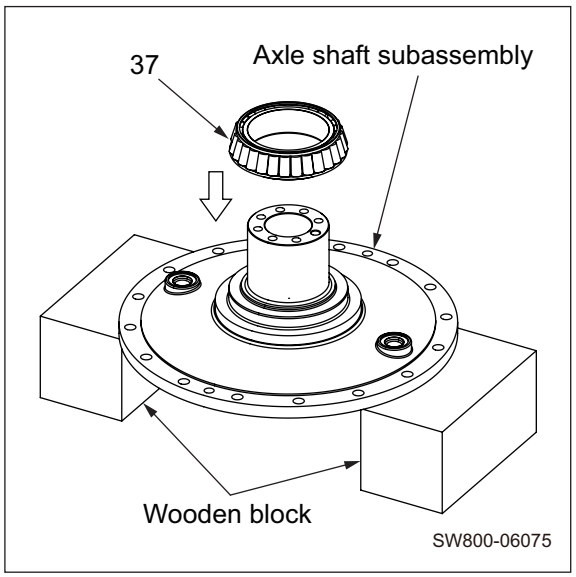
13-2) Apply a thin coat of gear oil to the surface of the vibrator bearing (12) to be press-fitted.
- Drive the vibrator bearing (12) into the axle shaft (13).

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

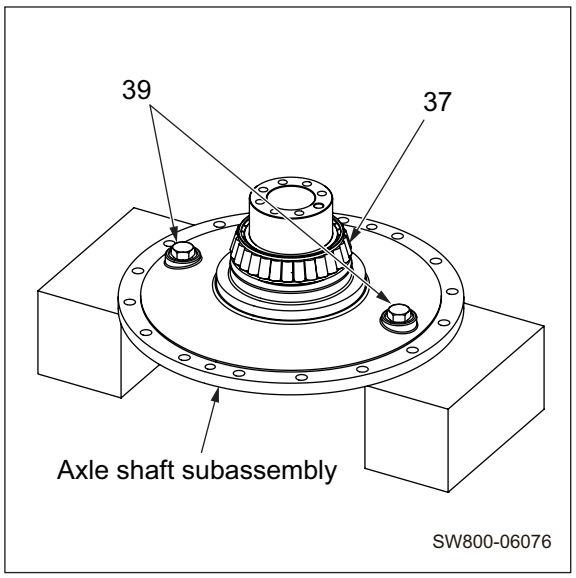


13-3) Lift the axle shaft subassembly with a crane and reverse it.
- Apply a thin coat of gear oil to the surface of the inner race of the roller bearing (37) to be press-fitted.
- Install the inner race of the roller bearing (37).

Axle shaft subassembly : 75 kg (165 lbs.)

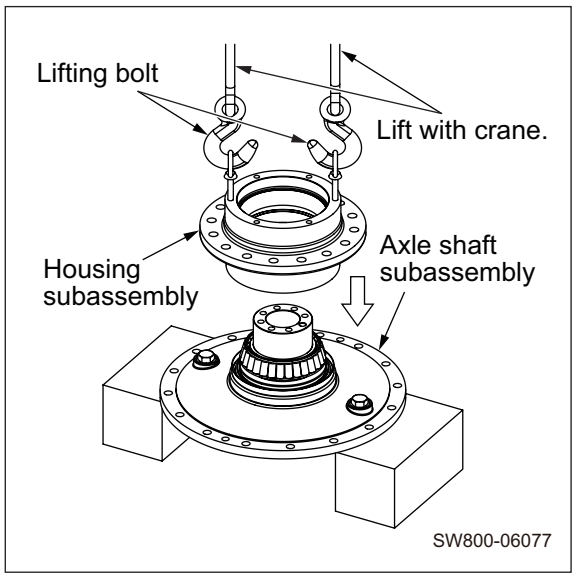


13-4) Install the plugs (39) on the axle shaft subassembly.
- Apply sufficient amount of lithium-based grease to the roller surface of the roller bearing (37).



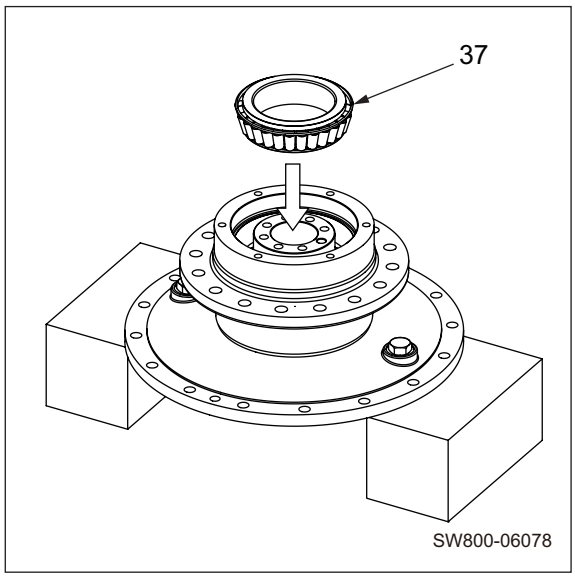
13-5) Install lifting bolts (M12) on the housing subassembly and lift it with a crane to joint it with the axle shaft subassembly.

Housing subassembly : 42 kg (93 lbs.)



13-6) Apply sufficient amount of lithium-based grease to the roller surface of the inner race of the roller bearing (37).

- Drive the roller bearing (37) into the housing subassembly until the roller surface of its inner race comes into contact with the outer race.



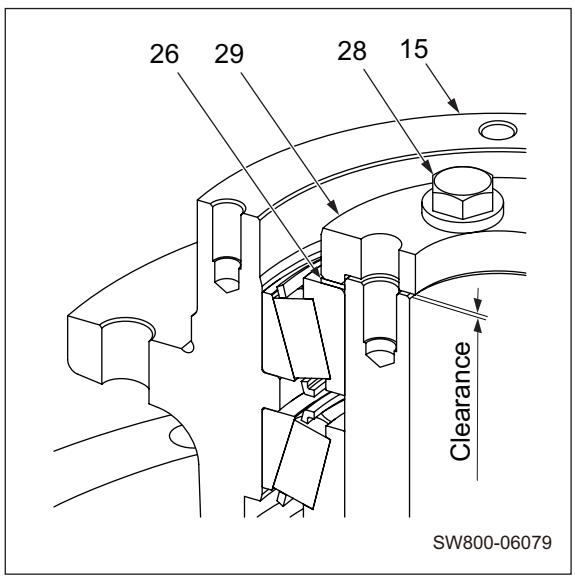
13-7) Preload adjustment of roller bearing

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

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

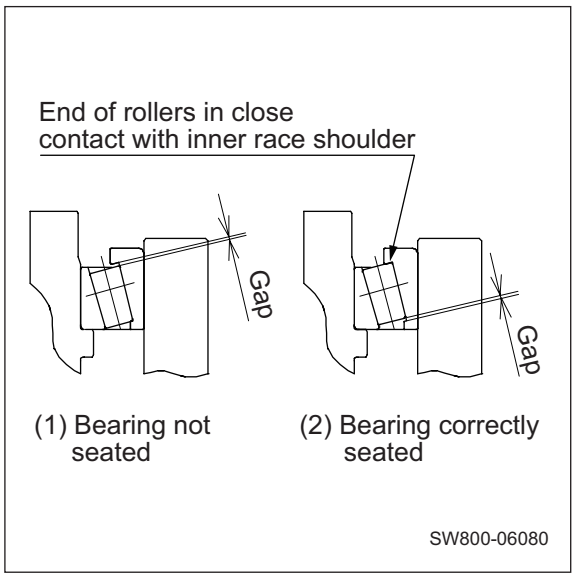
(NOTICE)

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



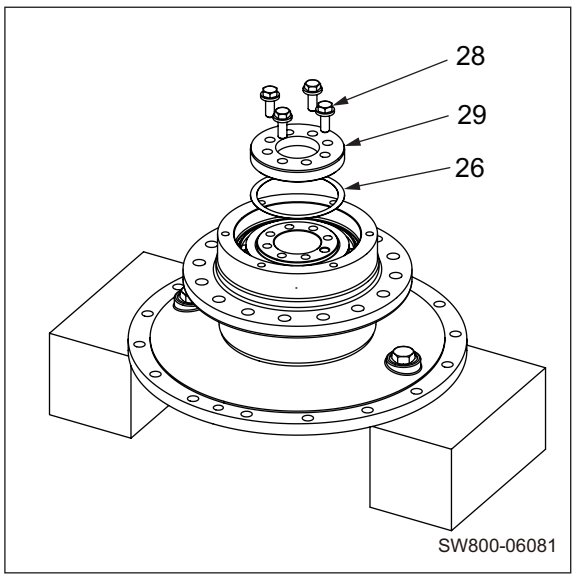
(NOTICE)

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



② Remove the four bolts (28).

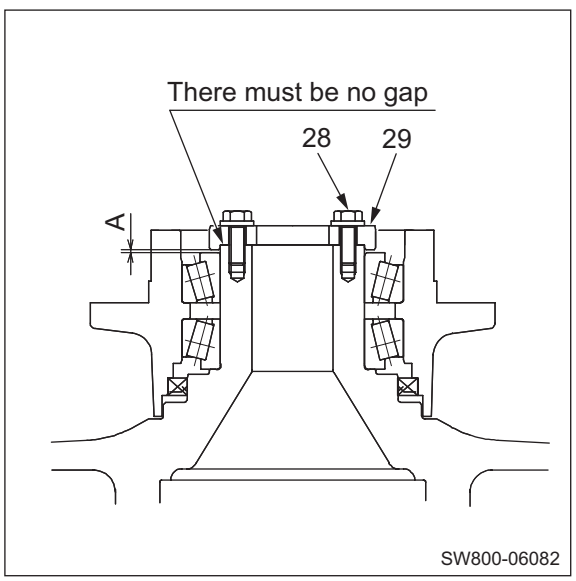
- Remove the cover (29) and shim (26).



③ Without inserting shim, install the cover (29).

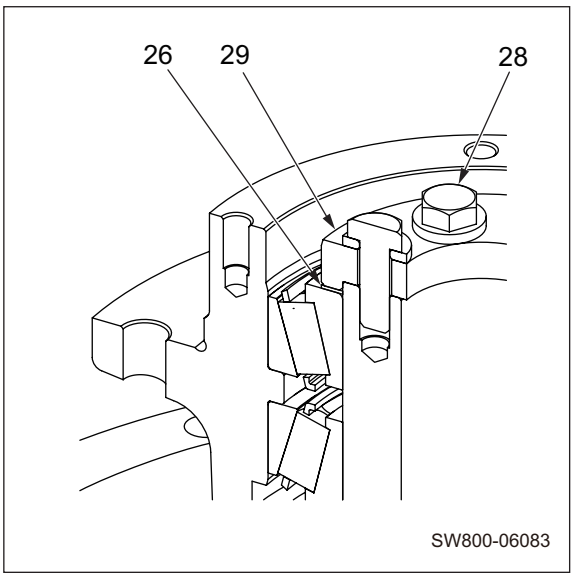
- Install washers to the four bolts (28) and tighten.
- Using a thickness gauge, measure the gap at dimension "A".

★ **Preload adjusting shim thickness** **= A + 0.2 mm (0.08 in.)**

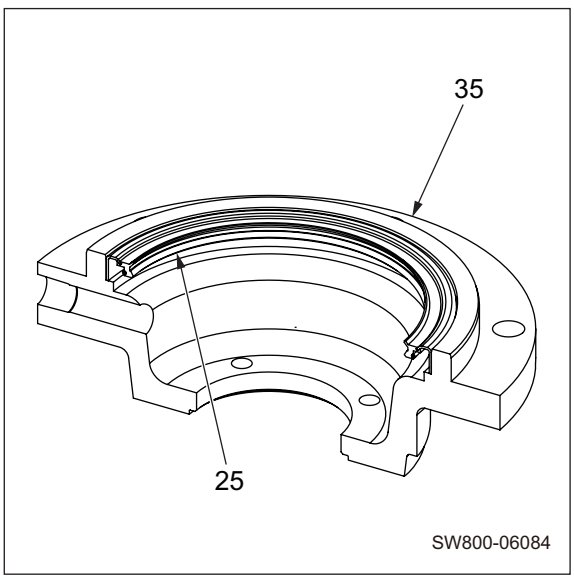


④ Remove the four bolts (28).
- Remove the cover (29).
- Install a shim (26) of the preload adjusting shim amount “A + 0.2 mm (0.08 in.)” and reinstall the cover (29).
- Secure the cover with the eight bolts (28) with washers.

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

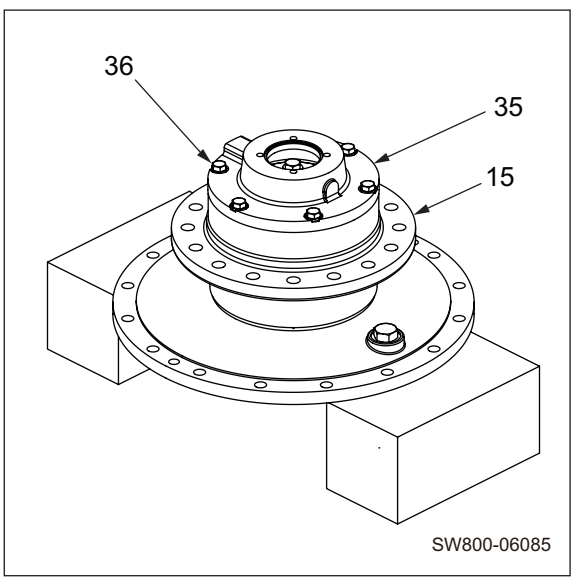


⑤ Install the oil seal (25) on the cover (35).
- Apply a thin coat of grease to the lip surface of the oil seal (25).
- Apply liquid packing to the mounting surface.

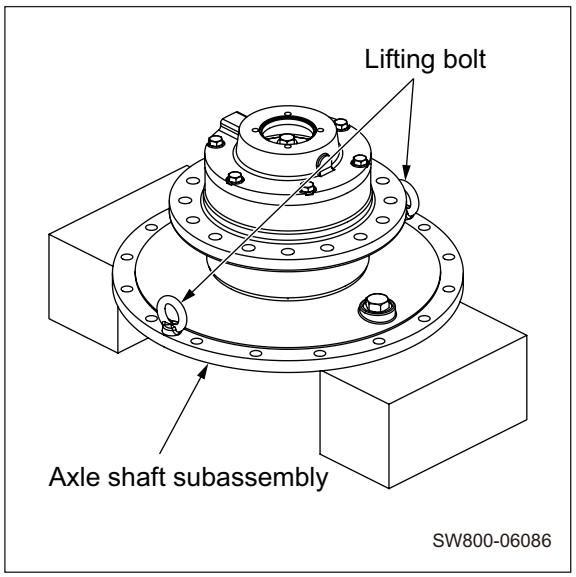


⑥ Secure the cover (35) to the housing (15) with the six bolts (36) and spring washers.

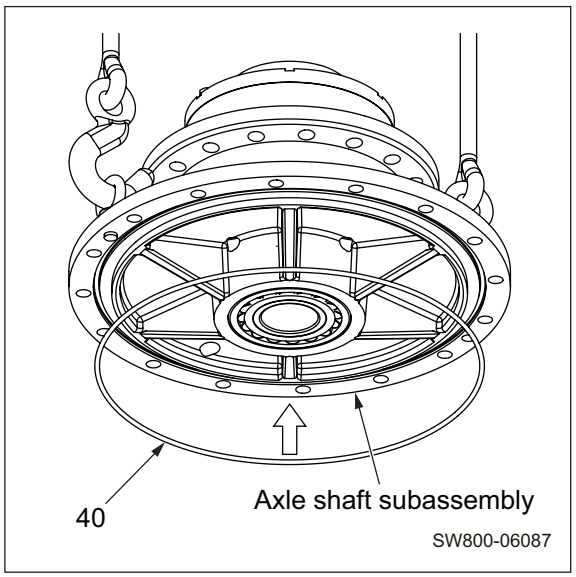
N・m Bolts (36) M12×40 : 108 N·m (80 lbf·ft)



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



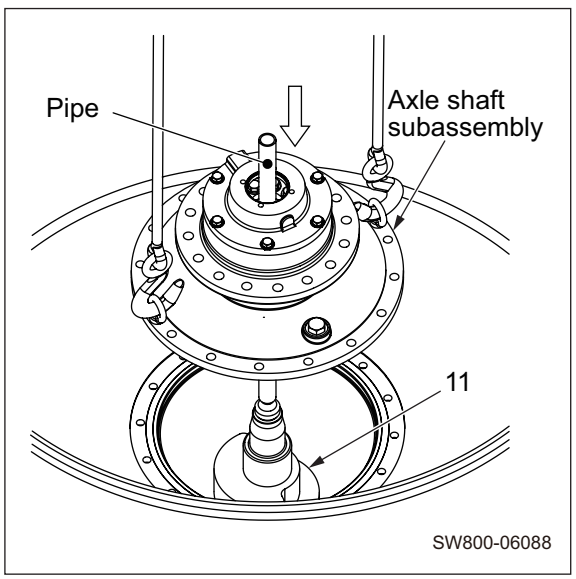
15) Apply a thin coat of grease to the entire periphery of the O-ring (40).
- Install the O-ring (40) on the axle shaft subassembly.



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

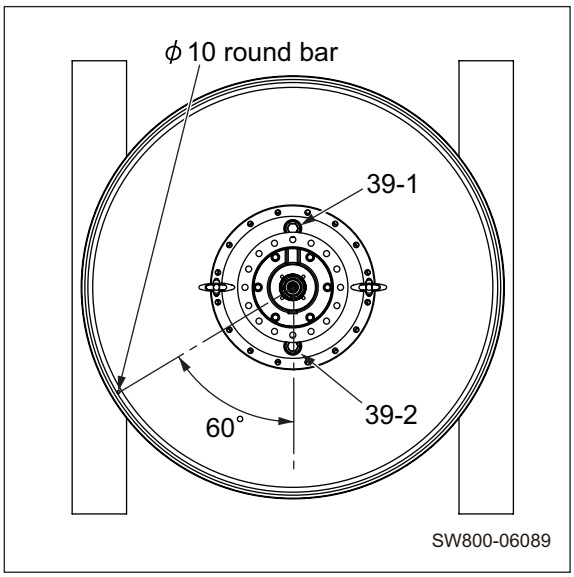
(NOTICE)
- **Install the axle shaft taking care not to tilt the vibrator bearing.**
- **When installing the axle shaft, take care not to allow the O-ring to protrude from the fitting groove.**

Axle shaft subassembly : 145 kg (320 lbs.)



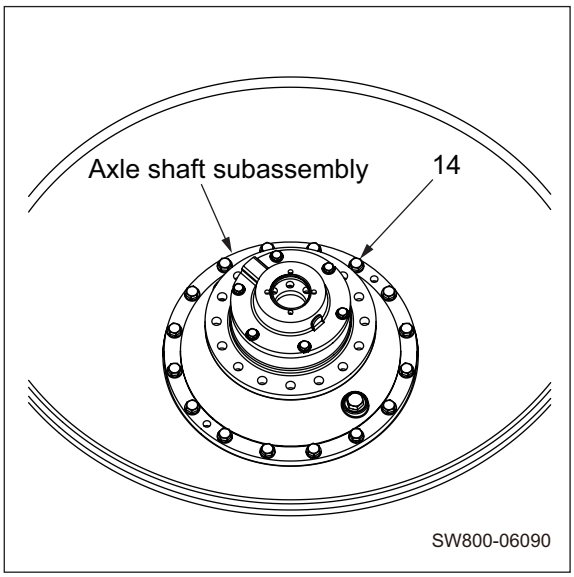
(NOTICE)

- **When installing the axle shaft subassembly, pay attention to the positional relationship between the ø10 round bar on the drum and the plugs (39-1) and (39-2).**

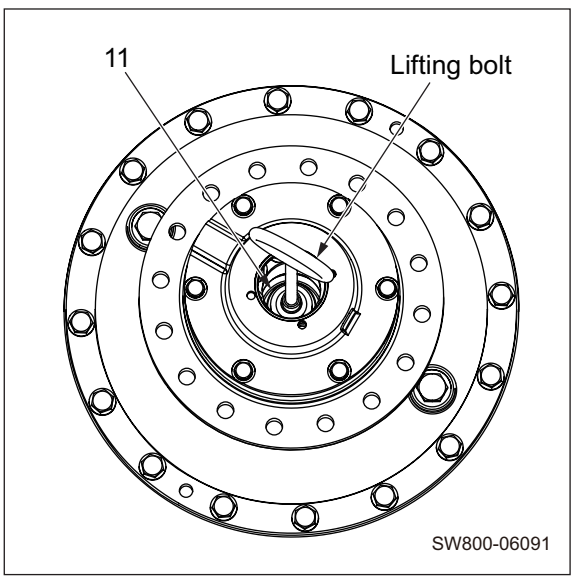


17) Secure the axle shaft subassembly to the drum with the sixteen bolts (14).

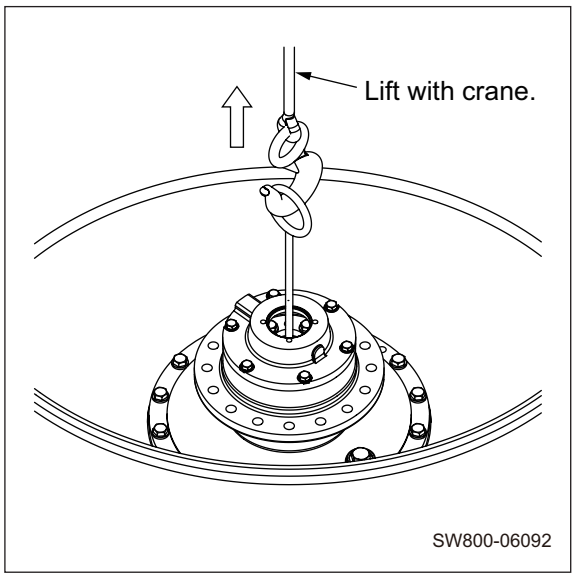
N·m Bolts (14) M16×50 : 265 N·m (195 lbf·ft)



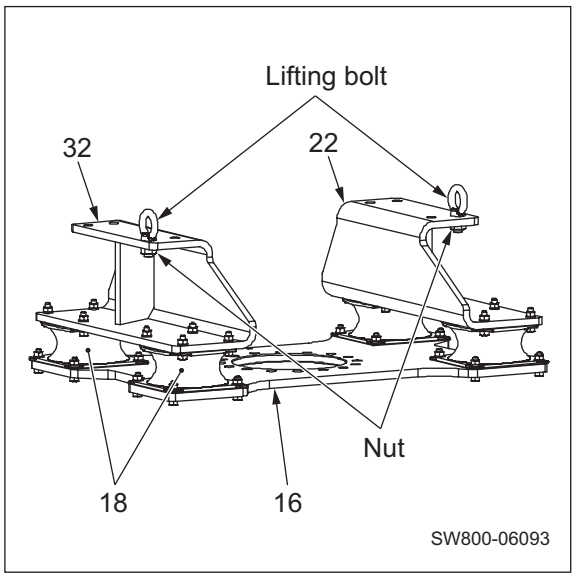
18) Install a lifting bolt (M8) on the shaft end of the eccentric shaft (11).



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



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

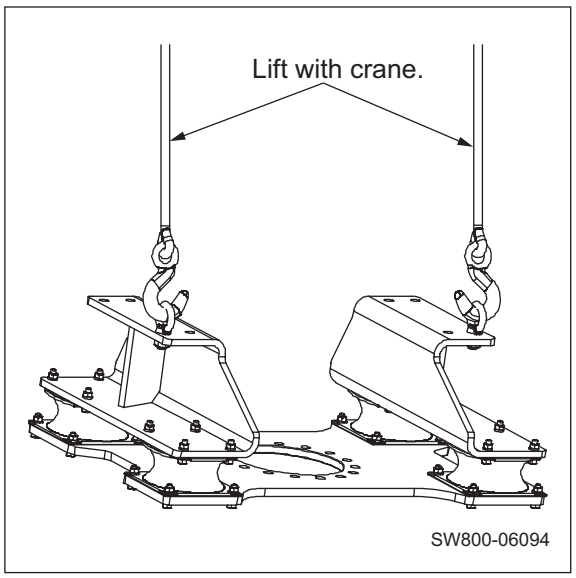


21) Lift the bracket subassembly with a crane.

Bracket subassembly

SW800-Ⅱ: 170 kg (375 lbs.)

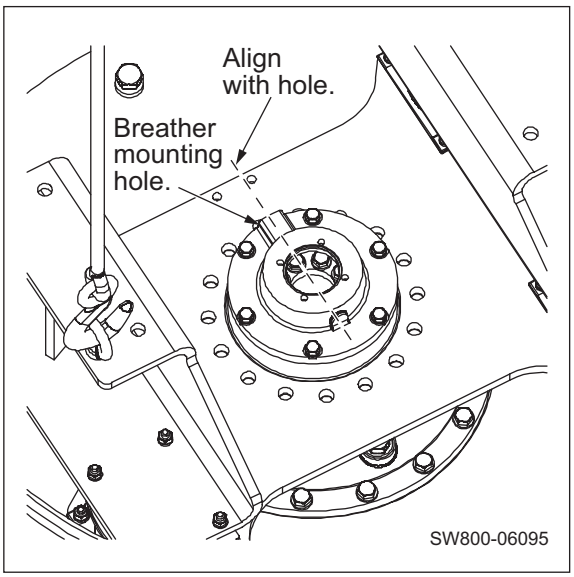
SW850-Ⅱ: 230 kg (507 lbs.)



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

(NOTICE)

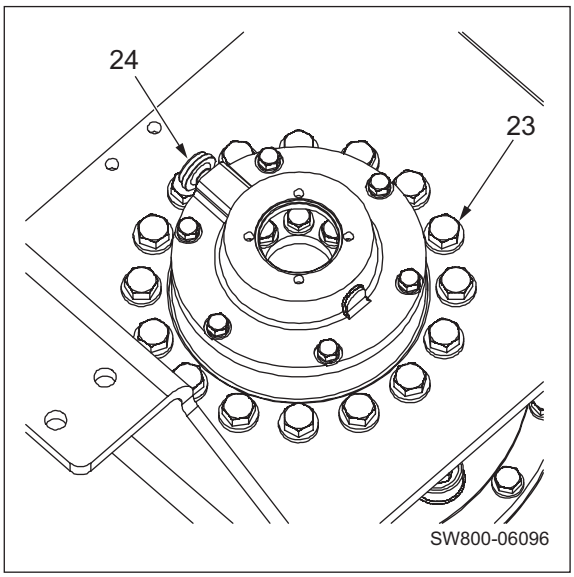
- **Be sure to install the bracket subassembly correctly in relation to the position of the breather mounting hole in the housing.**



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

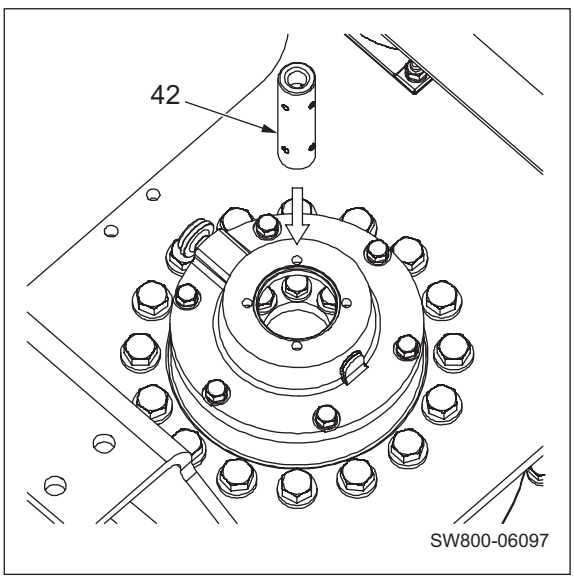
N · m Bolts (23) M20×60 : 540 N·m (400 lbf·ft)

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

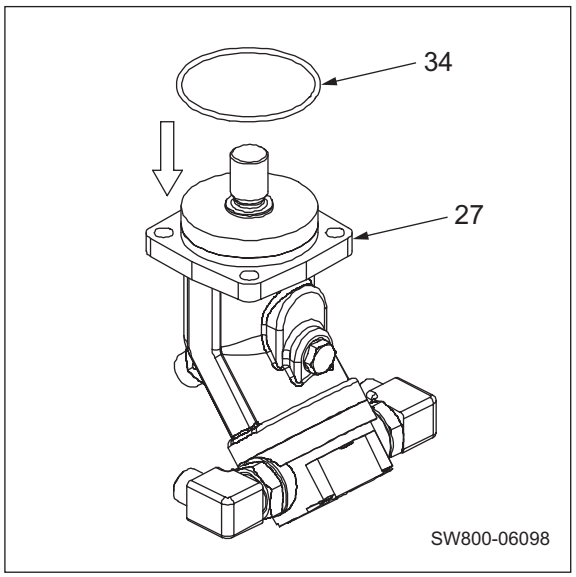


24) Apply molybdenum-based grease to the splined portion of the sleeve (42).

- Fit the sleeve (42) to the splined shaft on the eccentric shaft end.



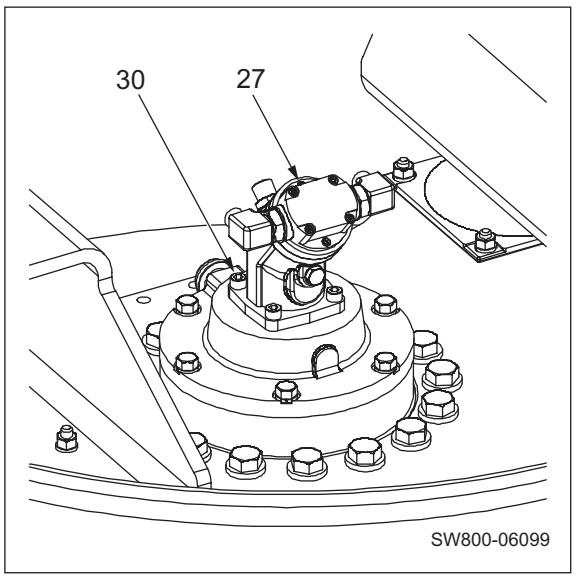
25) Apply a thin coat of grease to the O-ring (34).
- Install the O-ring (34) on the vibrator motor (27).



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

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

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



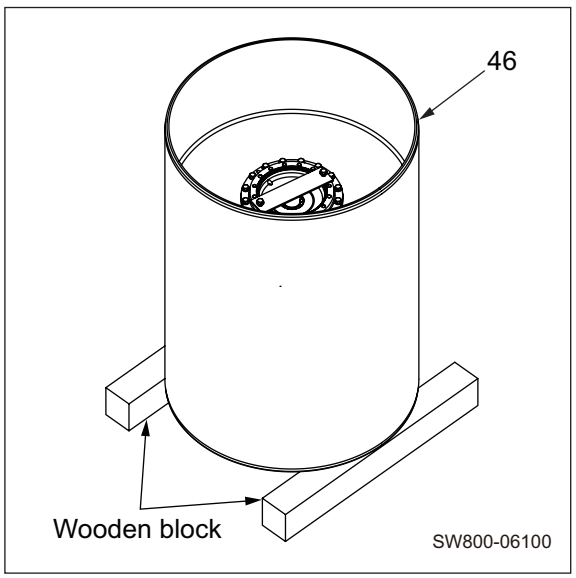
⚠WARNING

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

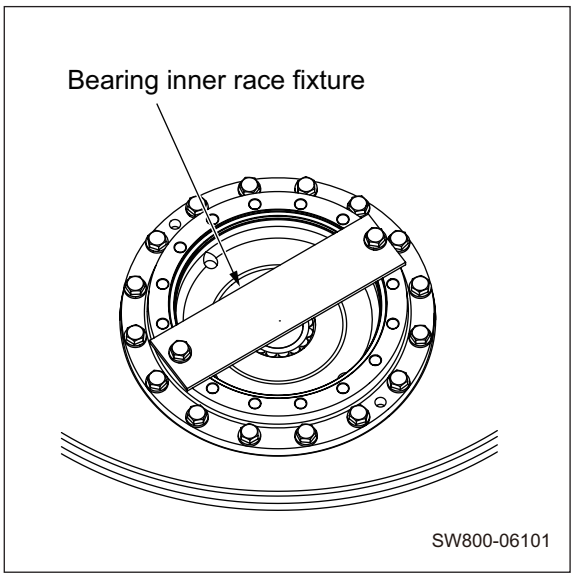
27) Lift the drum (46) with a crane and reverse it. Then, stand the drum with the propulsion motor side facing up.

kg Drum (46)

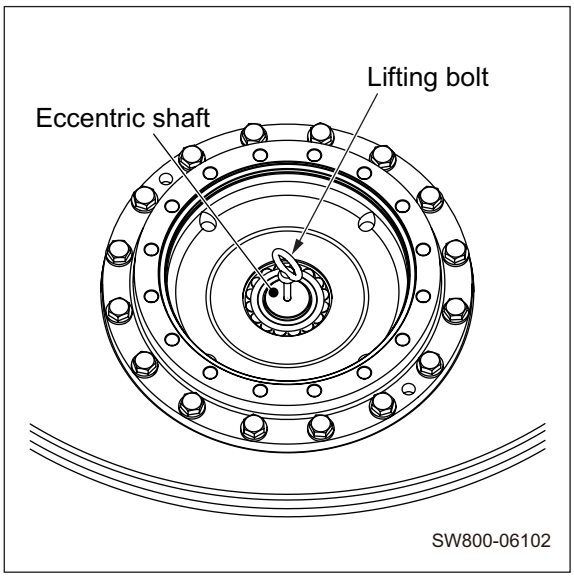
SW800-Ⅱ: 1,980 kg (4,365 lbs.)
SW850-Ⅱ: 2,670 kg (5,886 lbs.)



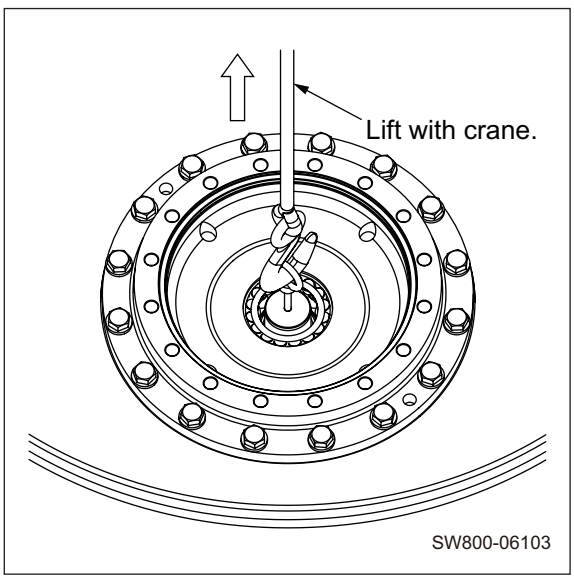
28) Remove the bearing inner race fixture.



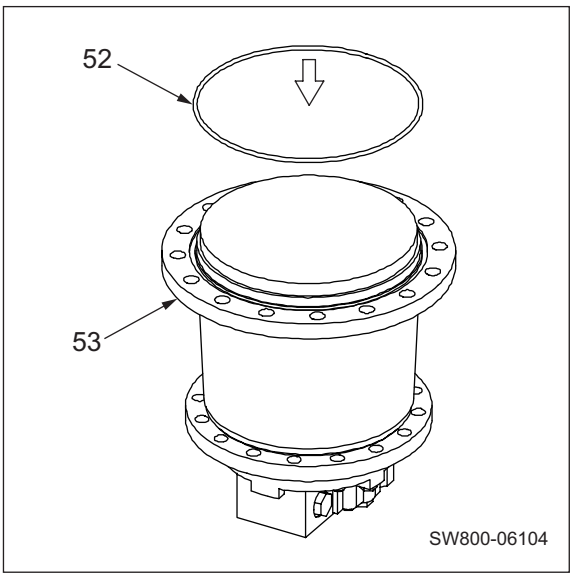
29) Install a lifting bolt (M10) on the shaft end of the eccentric shaft.



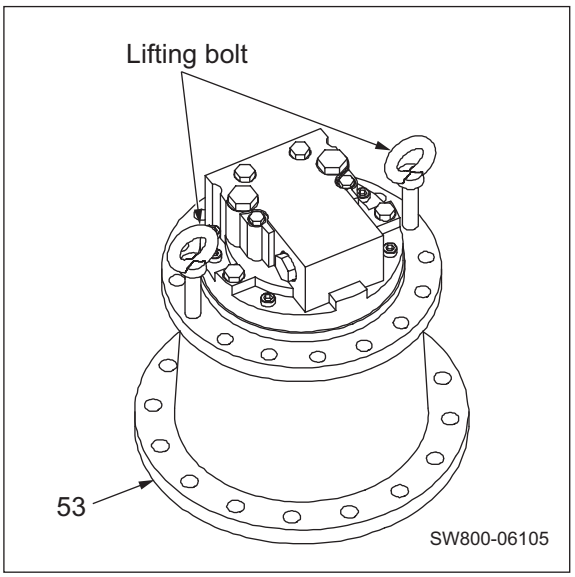
30) Slowly lift the eccentric shaft with a crane and check that there is an axial play of 1 to 2 mm (0.04 to 0.08 in.).



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



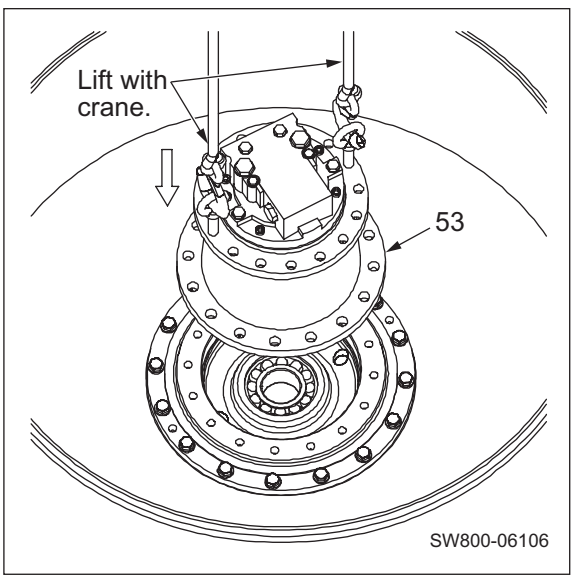
32) Install lifting bolts on the propulsion motor (53).
Lifting bolt:
SW800-Ⅱ: M16
SW850-Ⅱ: M20



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

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

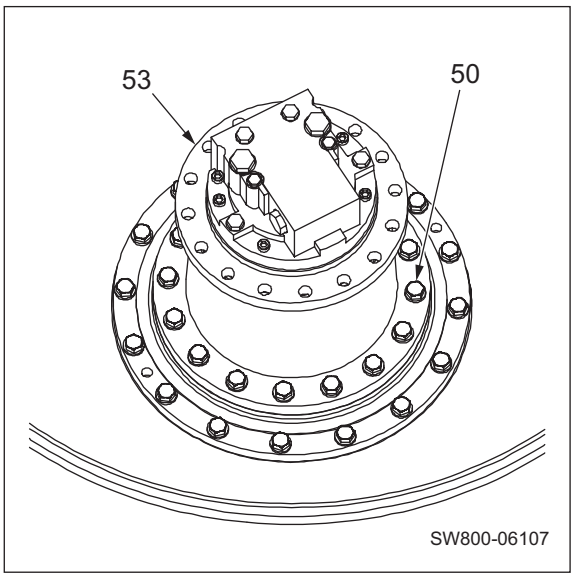
Propulsion motor (53)
SW800-Ⅱ: 185 kg (408 lbs.)
SW850-Ⅱ: 210 kg (463 lbs.)



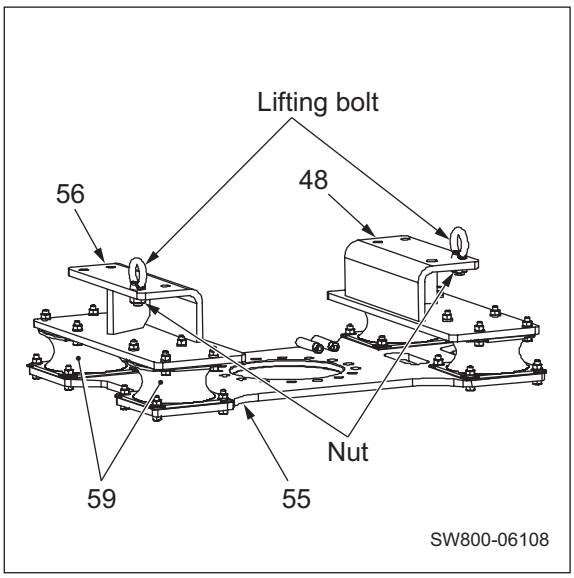
34) Secure the propulsion motor (53) with the bolts (50) and washers.

N·m Bolts (50)

SW800-Ⅱ M16×50: 265 N·m (196 lbf·ft)
SW850-Ⅱ M20×60: 540 N·m (398 lbf·ft)



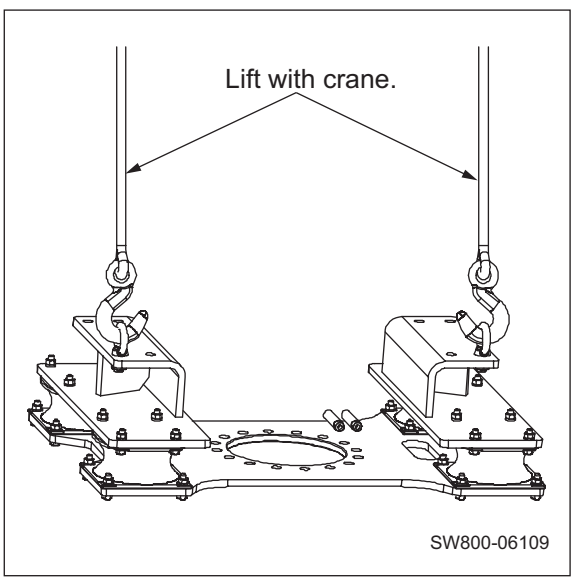
35) Install lifting bolts and nuts (M22) on a subassembly of the brackets (48) and (56), plate (55) and dampers (59) as shown on the right.



36) Lift the bracket subassembly with a crane.

kg Bracket subassembly

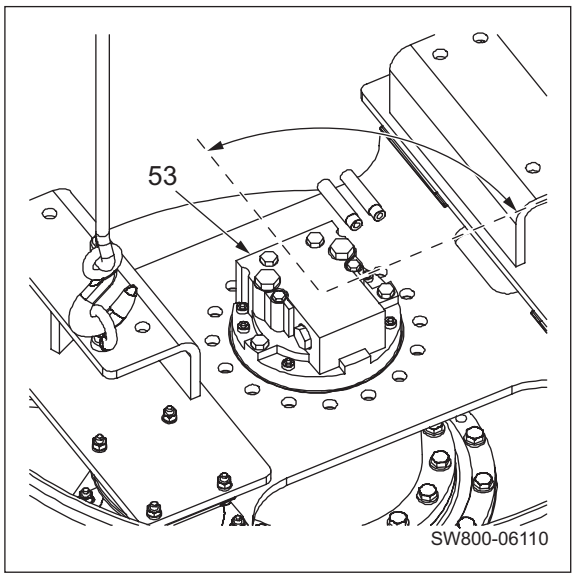
SW800-Ⅱ: 170 kg (375 lbs.)
SW850-Ⅱ: 200 kg (441 lbs.)



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

(NOTICE)

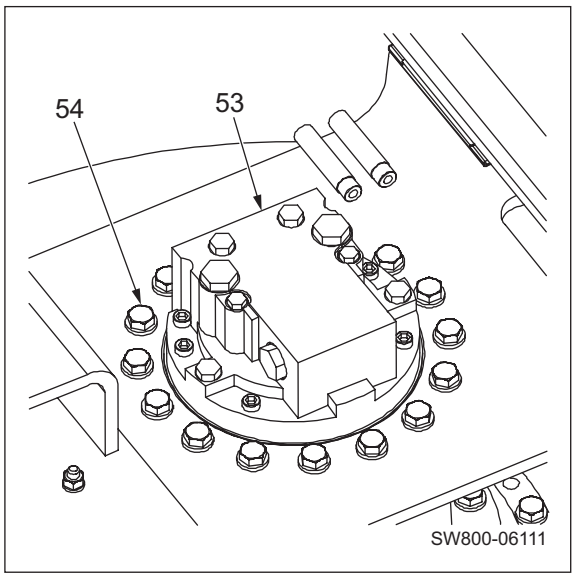
- **Be sure to install the bracket subassembly correctly in relation to the position of the propulsion motor (53).**



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

N·m Bolts (54)

SW800-Ⅱ M16×50: 265 N·m (196 lbf·ft)
SW850-Ⅱ M20×60: 540 N·m (398 lbf·ft)

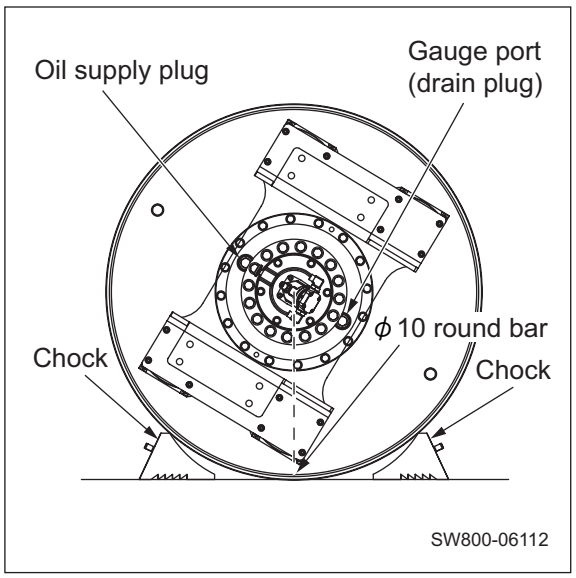


39) Lift the assembled drum assembly with a crane and lay it with the ø10 round bar on the vibrator motor side facing down.

- Hold the drum assembly in place with chocks.

kg Drum assembly

SW800-Ⅱ: 2,280 kg (5,026 lbs.)
SW850-Ⅱ: 3,080 kg (6,790 lbs.)



40) Remove the plugs (39-1) and (39-2).

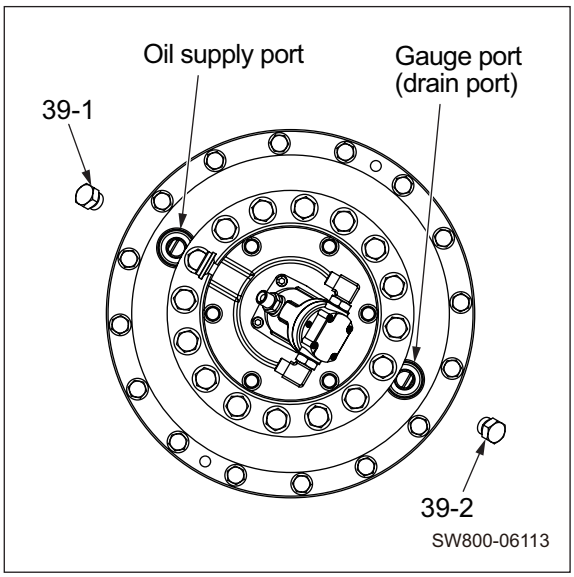
- Supply gear oil from the oil supply port and check that the oil drips from the gauge port.

  Gear oil

  SW800-Ⅱ: 19 L (5.0 gal.)

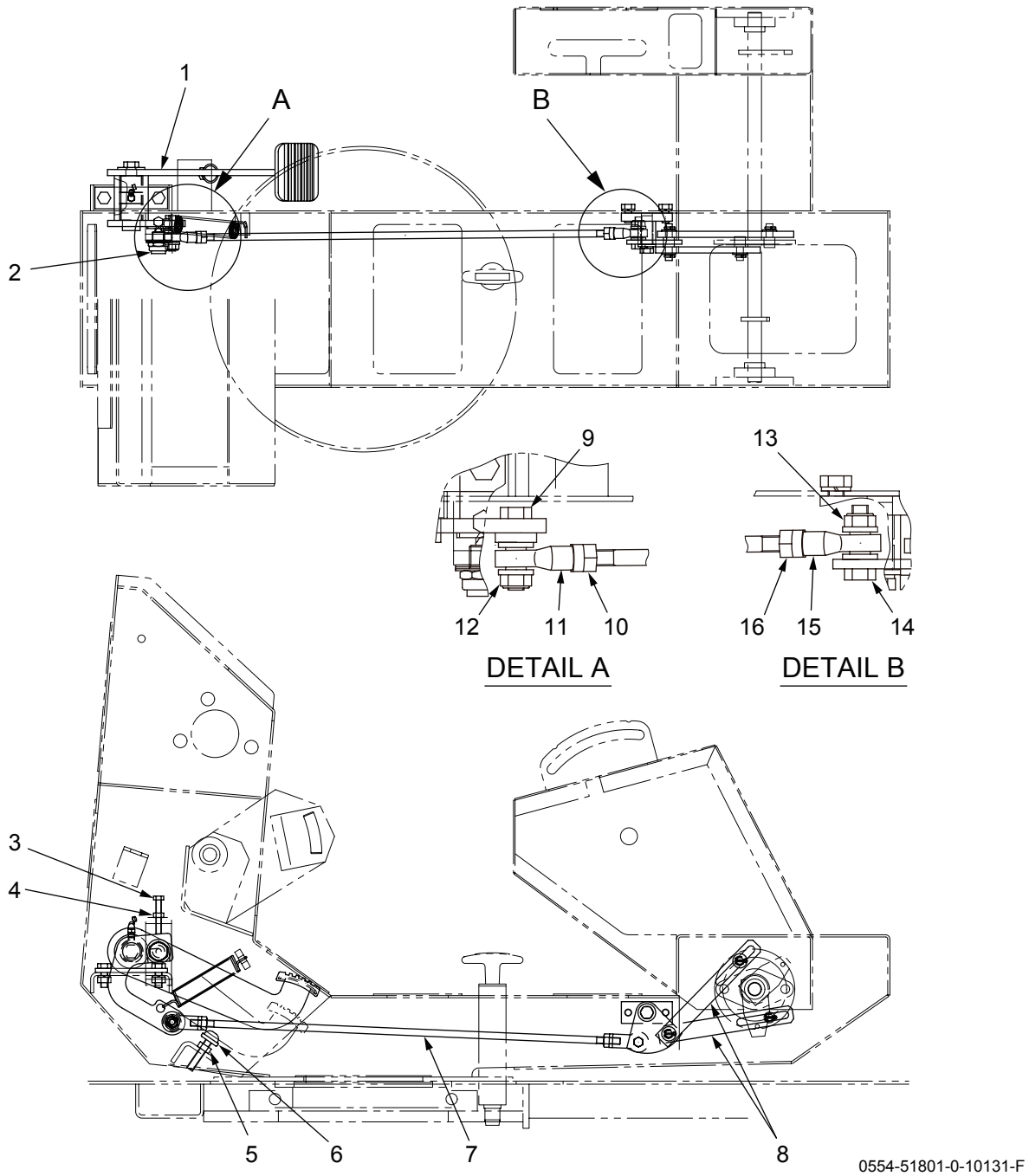
  SW850-Ⅱ: 22 L (5.8 gal.)

- Reinstall the plugs (39-1) and (39-2).



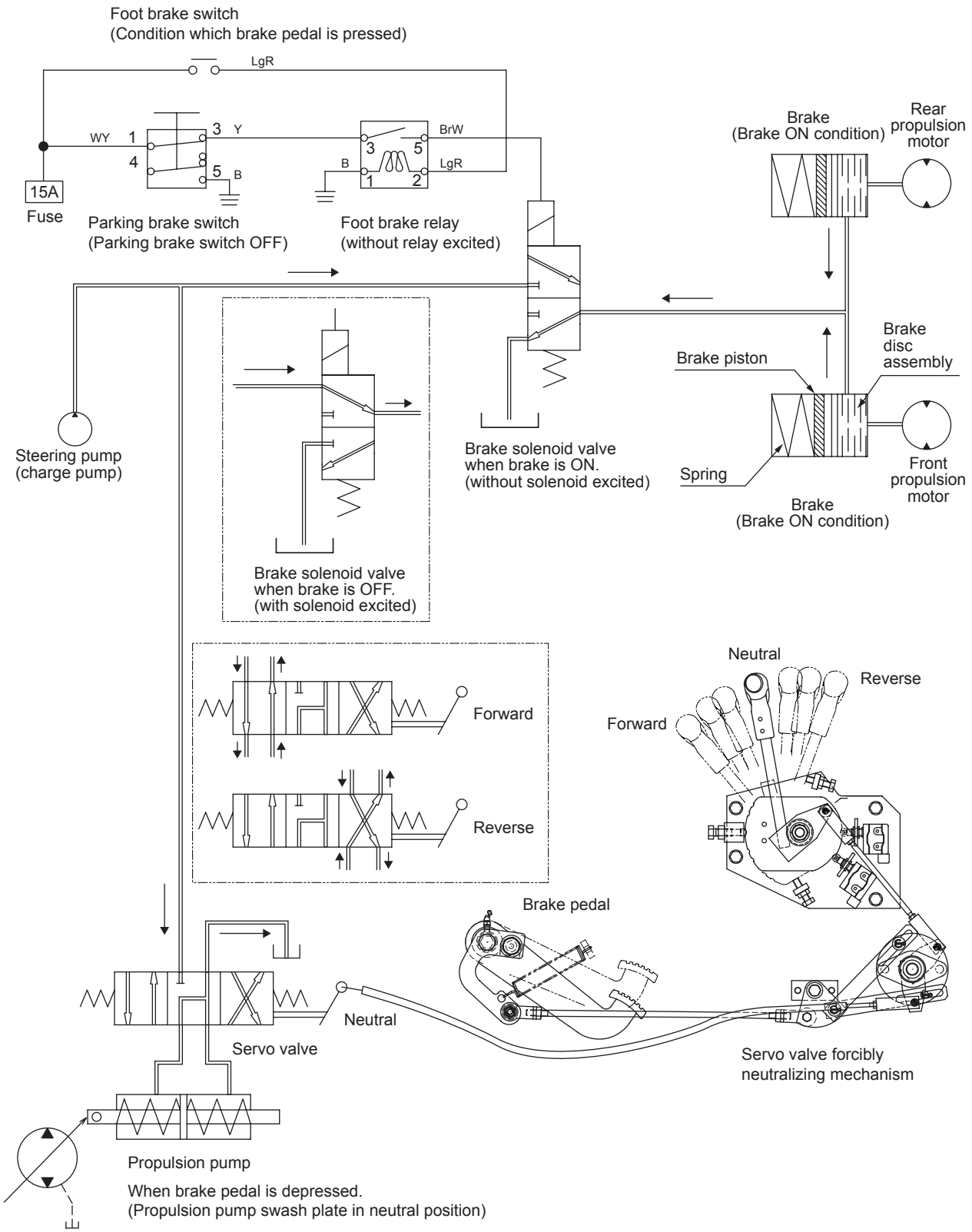
BRAKE

1. BRAKE PEDAL



(1)	Brake pedal				
(2)	Foot brake switch				
(3)	Bolt	: M8×50			
(4)	Nut	: M8			
(5)	Nut	: M10	P=1.25		
(6)	Stopper bolt	: M10×50	P=1.25		
(7)	Rod				
(8)	Lever				
(9)	Bolt	: M10×45			
(10)	Nut	: M10			
(11)	Rod end	: M10			
(12)	Nut	: M10			
(13)	Nut	: M10			
(14)	Bolt	: M10×40			
(15)	Rod end	: M10 (Left-hand thread)			
(16)	Nut	: M10 (Left-hand thread)			

2. BRAKE CIRCUIT CONFIGURATION

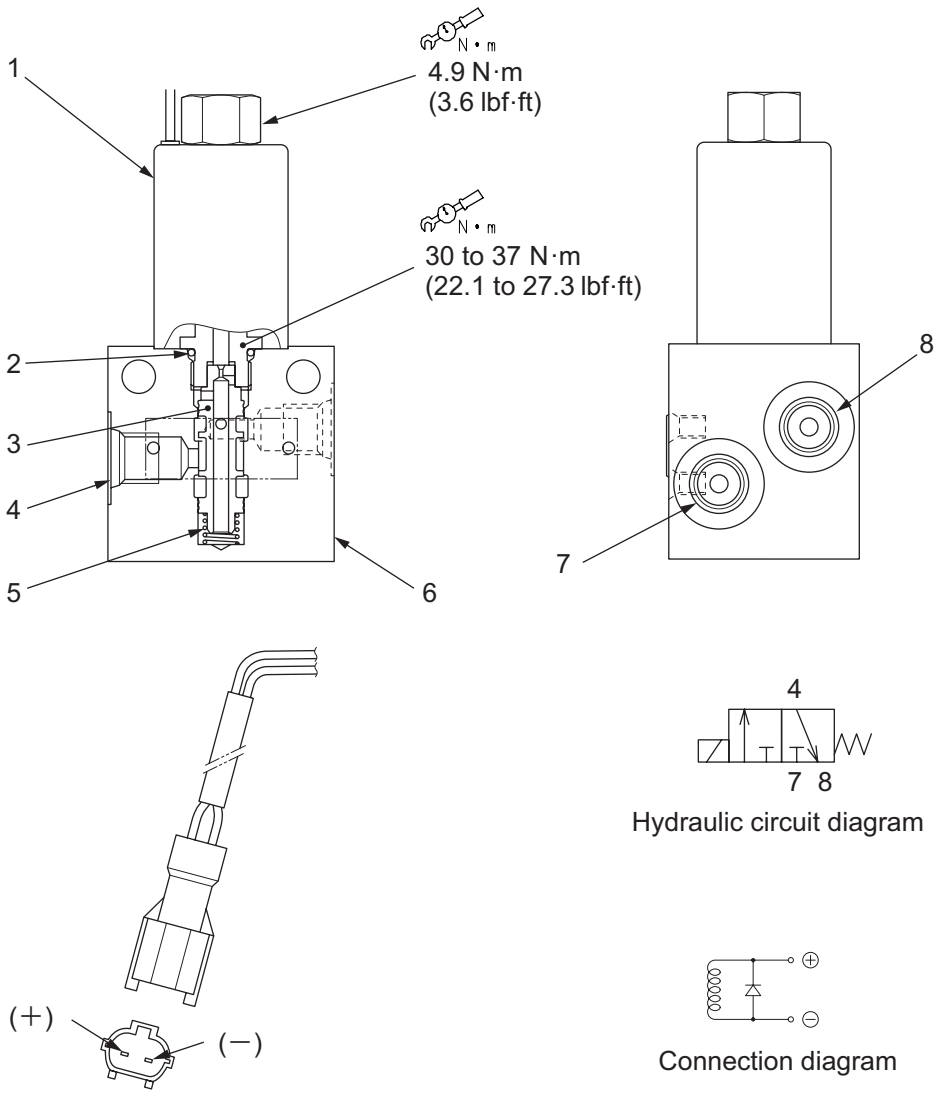


・The arrow (⟶) symbol shows the direction of the hydraulic oil flow.

SW800-07001

3. HYDRAULIC COMPONENT SPECIFICATIONS

3-1. Valve



SW800-07002

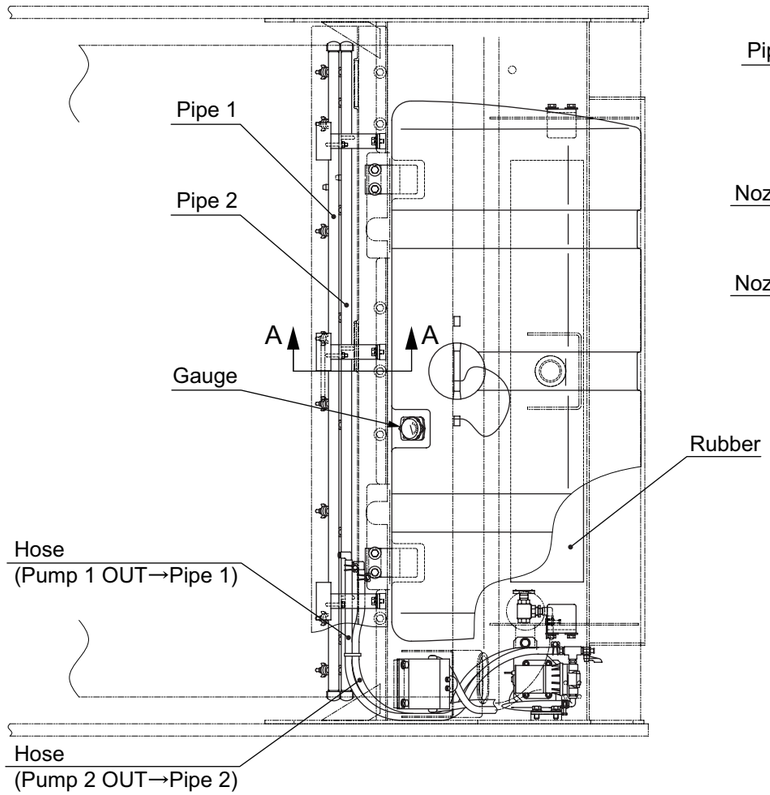
(1) Solenoid valve
(2) O-ring (1B P14)
(3) Spool
(4) Port A **[VA]** : G1/4
(5) Spring
(6) Body
(7) Port P **[VP]** : G1/4
(8) Port T **[VT]** : G1/4

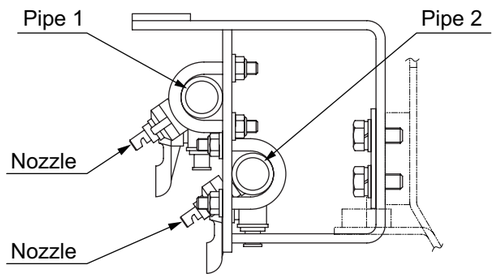
Specifications

- Rated pressure : 4.9 MPa (ports P, A) (710 psi)
  : 0.5 MPa (ports T) (72.5 psi)
- Rated flow : 30 L/min (7.9 gal./min)
- Weight : 1.5 kg (3.3 lb.)

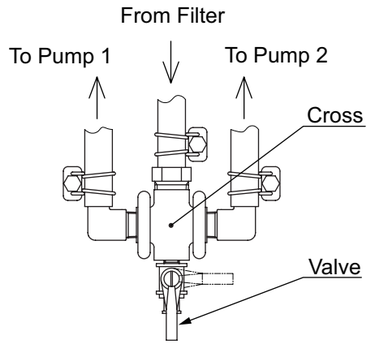
WATER SPRAY SYSTEM

1. WATER SPRAY PIPING

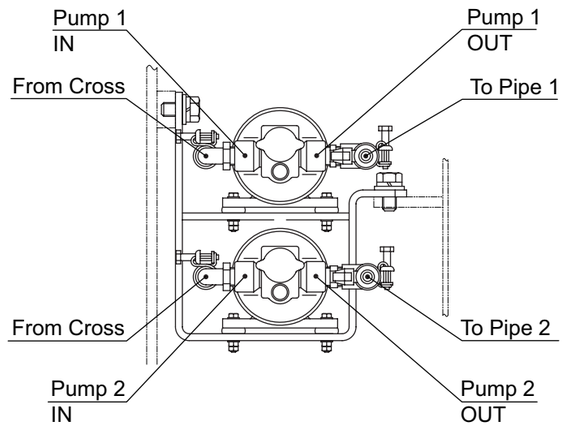




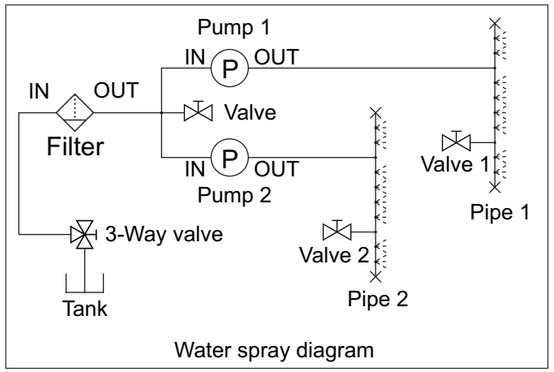
SECTION A-A



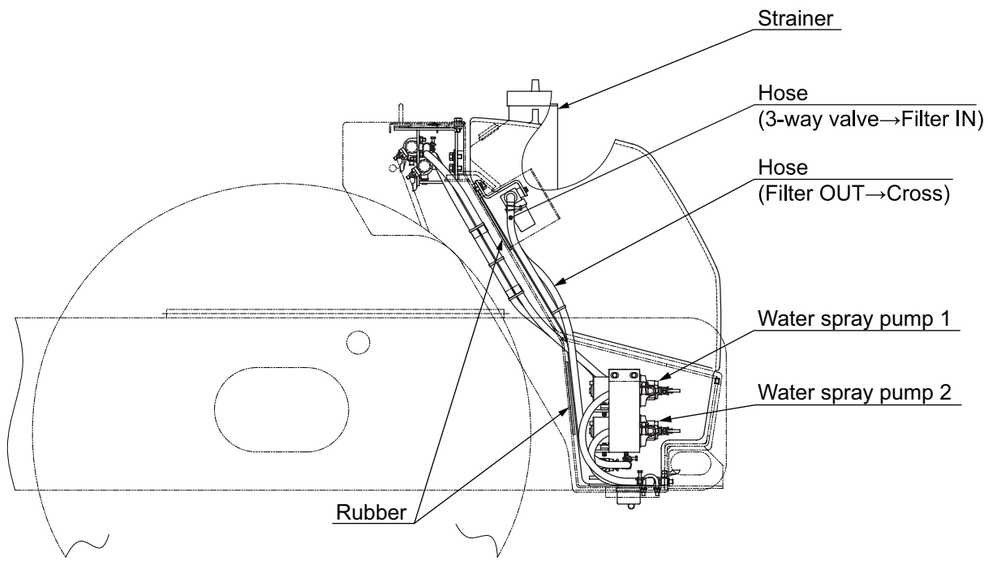
SECTION B-B

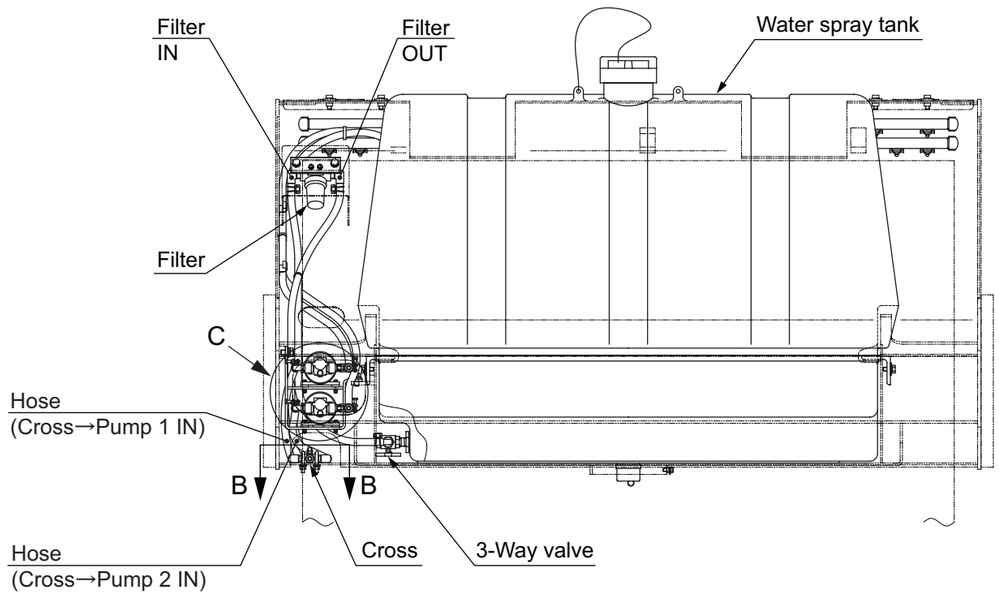


DETAIL C



Water spray diagram

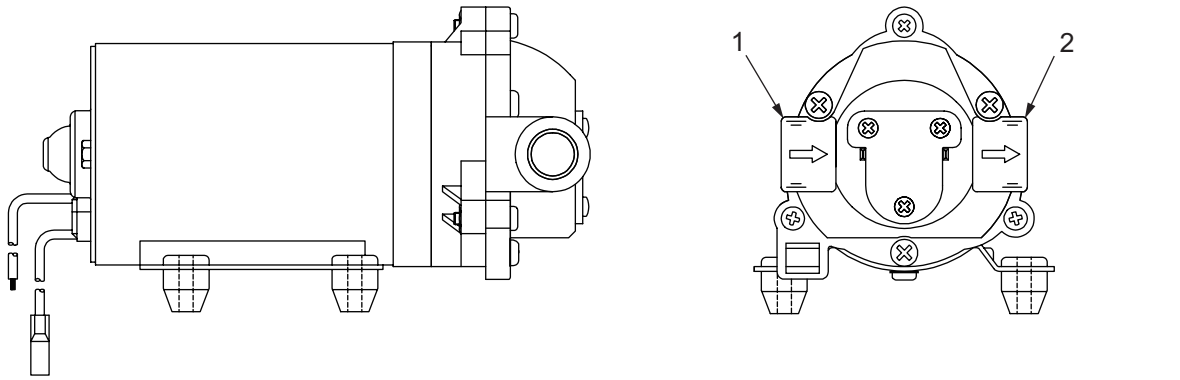




0554-75808-0-11129-0

2. WATER SPRAY COMPONENT SPECIFICATION

2-1. Water Spray Pump



SW800-Ⅱ-08001

(1) IN
(2) OUT

Specifications

- Discharge rate : 3.0 L/min (0.79 gal./min)
- Discharge pressure : 0.26 MPa (38 psi)
- Weight : 1.8 kg (4.0 lbs.)

INSPECTION AND ADJUSTMENT

1. INSPECTION AND ADJUSTMENT

1-1. Safety Precautions for Inspection and Adjustment

⚠ WARNING

Unexpected vehicle 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 ± 41°F)

① Remove the plugs from the couplings (1) and (2). Attach the pressure gauge through the hose ⓢ and the adapter ⓤ.

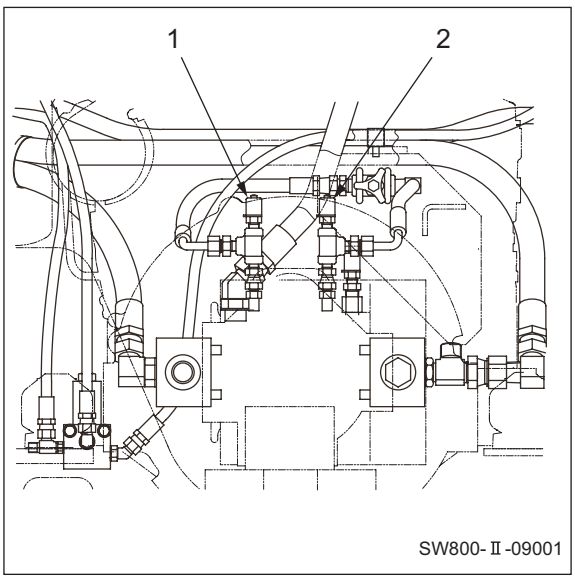
- Coupling : R1/4×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ : M16×G3/8
- Forward-side gauge port : (2)
- Reverse-side gauge port : (1)
- Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)

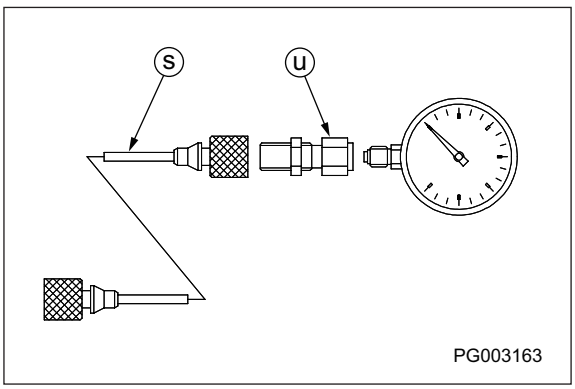
② Start the engine and set the throttle switch to the “Full” position.

③ Establish a condition in which the vehicle propulsion load becomes maximal.
(Pressure does not build up unless propulsion load is applied.)

④ With the propulsion load at maximum, slowly move the forward-reverse lever to the side to be measured. Then, read the pressure indicated by the pressure gauge.

⑤ After measuring, promptly return the forward-reverse lever to “Neutral” position.





★ Maximum circuit pressure
(pressure cut-off valve setting)
: 37.3 ± 0.8 MPa (5,409 ± 116 psi)

2-2. Adjustment

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

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

① Check the locknut (3) of the cut-off valve (1-3) for evidence of having loosened.

② If there is evidence of the locknut having loosened, adjust the cut-off valve so that the pressure becomes within the maximum circuit pressure range while watching the pressure gauge.

• To adjust the pressure, loosen the locknut (3) and turn the 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 the locknut having loosened, remove the cut-off valve (1-3).

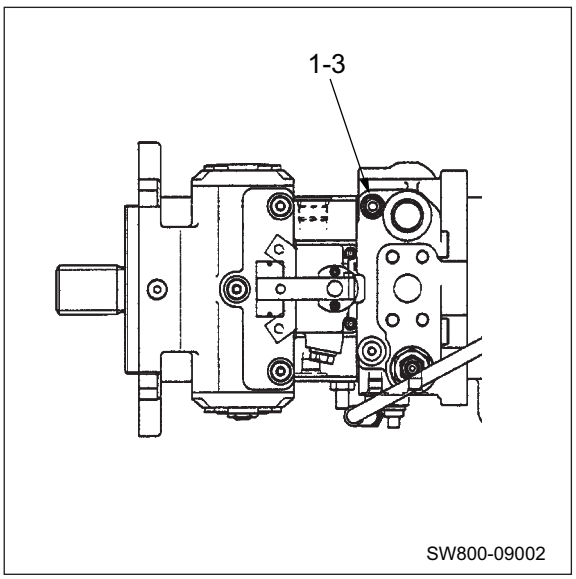
④ Check the removed cut-off valve for trapped dirt and scratches on its seat.

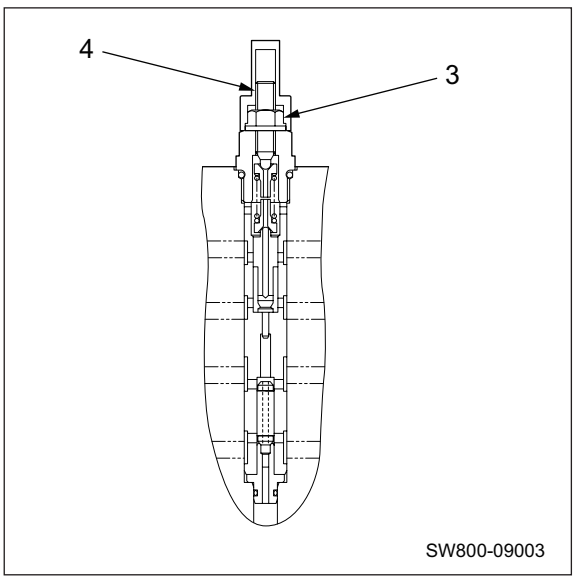
⑤ If trapped dirt is present, disassemble and clean the cut-off valve.

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

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

(3) Locknut : 22 N·m (16 lbf·ft)
(1-3) 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 numbers such as “1-3” appearing in the above illustrations are consistent with the lead line numbers shown in the illustration of the propulsion pump in “2-2. Hydraulic Component Specifications” (page 4-007 and 4-008).

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

① Check the locknut (5) of the high-pressure relief valve (1-9) or (1-13) for evidence of having loosened.
- High-pressure relief valve (1-9) : Forward side
- High-pressure relief valve (1-13) : Reverse side

② If there is evidence of the locknut having loosened, adjust the high-pressure relief valve so that the pressure becomes within the maximum circuit pressure range while watching the pressure gauge.
- To adjust the pressure, loosen the locknut (5) and turn the adjustment screw (6).

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

③ If there is no evidence of the locknut having loosened, remove the high-pressure relief valve (1-9) or (1-13).

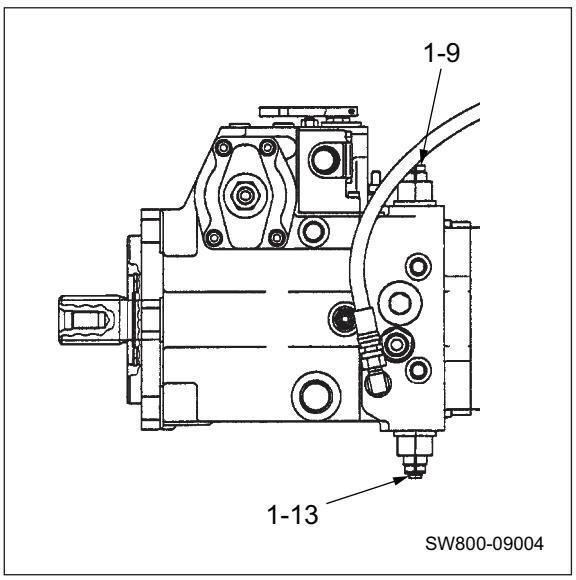
④ Check the removed high-pressure relief valve for trapped dirt and scratches on its seat.

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

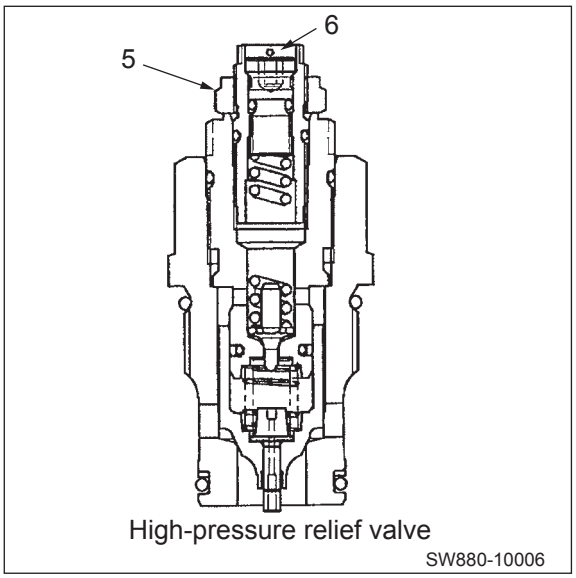
⑥ If a scratch is found on the seat, replace the high-pressure relief valve.

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

(5)	Locknut	: 20 N·m (15 lbf·ft)
(1-9) and (1-13)	High-pressure relief valve	: 150 N·m (111 lbf·ft)



SW800-09004



High-pressure relief valve
SW880-10006

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

- The numbers such as “1-9” and “1-13” appearing in the above illustrations are consistent with the lead line numbers shown in the illustration of the propulsion pump in “2-2. Hydraulic Component Specifications” (page 4-007 and 4-008).

3. MEASUREMENT AND ADJUSTMENT OF PROPULSION CHARGE CIRCUIT PRESSURE

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

3-1. Measurement

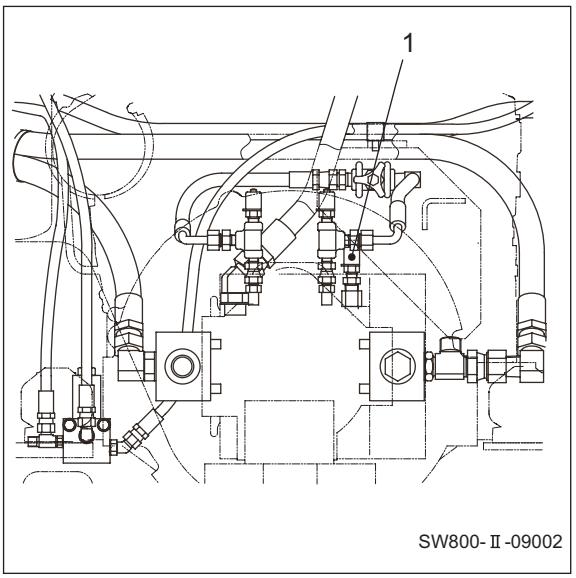
- Oil temperature during measurement: 50 ± 5°C (122 ± 41°F)

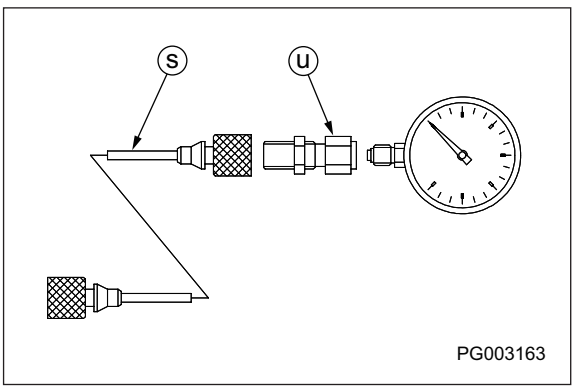
① Remove the plug from the coupling (1). Attach the pressure gauge through the hose ⓢ and the adapter ⓤ.
- Coupling : R1/4×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ: M16×G3/8
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Apply the parking brake by pressing the parking brake switch button.

③ Start the engine and set the throttle switch to the “Full” position. Then, read the pressure indicated by the pressure gauge.

★ Standard charge relief pressure setting
: 2.7 ± 0.1 MPa (392 ± 14.5 psi)





3-2. Adjustment

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

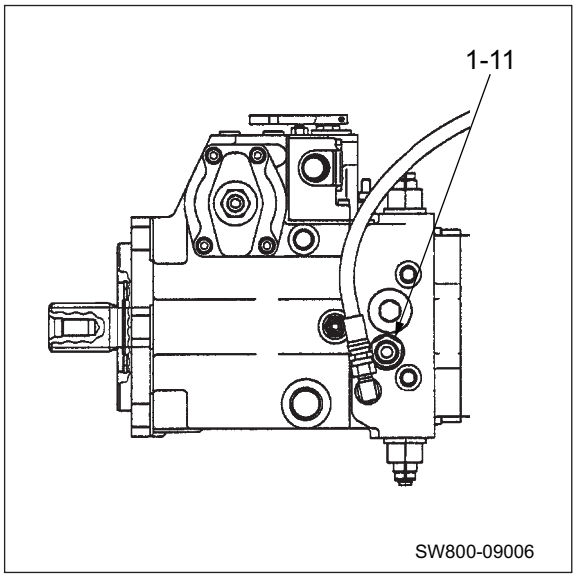
① Check the locknut (1) of the charge relief valve (1-11) for evidence of having loosened.
② If there is evidence of the locknut having loosened, adjust the charge relief valve so that the pressure becomes within the standard charge relief valve pressure setting range while watching the pressure gauge.
- To adjust the pressure, loosen the locknut (1) and turn the adjustment screw (2).

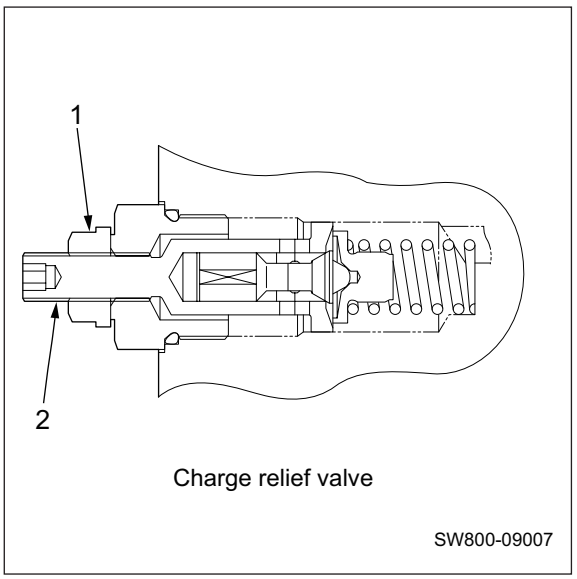
Adjustment screw turned clockwise
: Pressure rise
Adjustment screw turned counterclockwise
: Pressure drop
Pressure change rate : 0.4 MPa/turn (58 psi/turn)

③ If there is no evidence of the locknut having loosened, remove the charge relief valve (1-11).
④ Check the removed charge relief valve for trapped dirt and scratches on its seat.
⑤ If trapped dirt is present, disassemble and clean the charge relief valve.
⑥ If a scratch is found on the seat, replace the charge relief valve.
⑦ After adjustment, measure the pressure again and check that the pressure reaches the standard charge relief valve pressure setting range.

N・m

(1) Locknut : 44 N·m (32 lbf·ft)
(1-11) 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 “1-11” appearing in the above illustrations is consistent with the lead line numbers shown in the illustration of the propulsion pump in “2-2. Hydraulic Component Specifications” (page 4-007 and 4-008).

4. MEASUREMENT OF PROPULSION SERVO CIRCUIT PRESSURE

4-1. Measurement

- Oil temperature during measurement: 50 ± 5°C (122 ± 41°F)

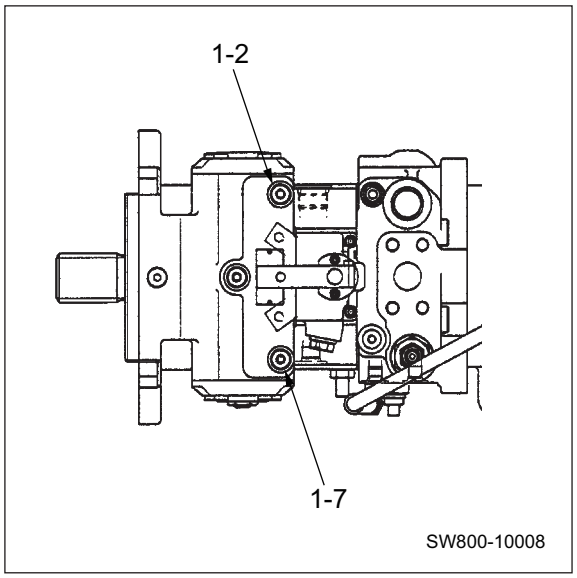
① Remove the plugs from the servo pressure gauge port (1-2) and (1-7). Attach the pressure gauge through the adapter ⓑ.
- Gauge port : G1/4
- Pressure gauge: 0 to 5 MPa (0 to 725 psi)

② Apply the parking brake by pressing the parking brake switch button.

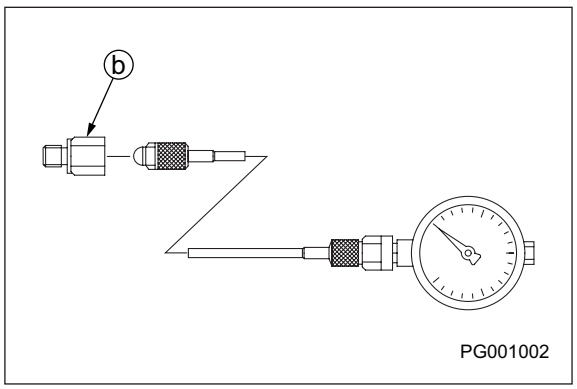
③ Start the engine and set the throttle switch to the “Full” position.

④ Operate forward-reverse lever and perform pressure setting.

- When forward-reverse lever is in “Neutral” position, pressure reading at (1-2) and (1-7) should be the same.
- When forward-reverse lever is moved to either direction, pressure readings will be different.



★ Standard charge relief pressure setting
: 2.7 ± 0.1 MPa (392 ± 14.5 psi)



- The number “1-2” and “1-7” appearing in the above illustrations are consistent with the lead line numbers shown in the illustration of the propulsion pump in “2-2. Hydraulic Component Specifications” (page 4-007 and 4-008).

5. MEASUREMENT OF PARKING BRAKE RELEASE PRESSURE

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

5-1. Measurement

• Oil temperature during measurement: 50 ± 5°C (122 ± 41°F)

① Disconnect the brake release hose (1) from propulsion motor. Attach the pressure gauge through the adapter ⓜ .
  • Adapter ⓜ : G1/4
  • Pressure gauge : 0 to 5 MPa (0 to 725 psi)

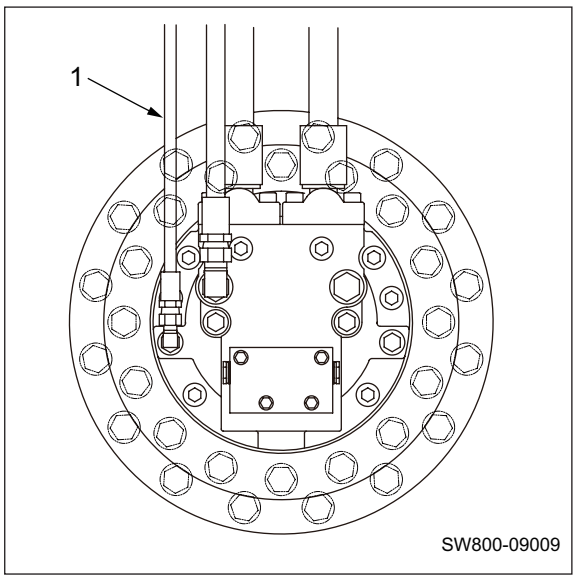
② Confirm that the forward-reverse lever is in the “Neutral” position.

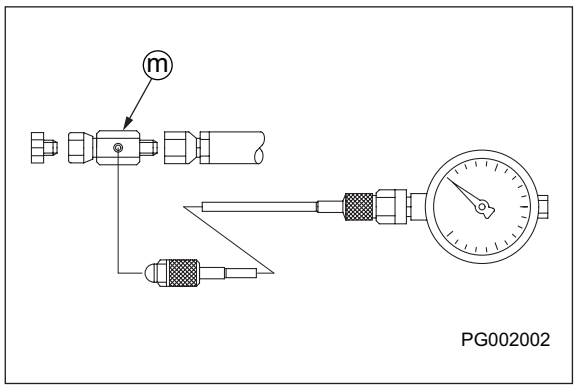
③ Apply the parking brake by pressing the parking brake switch button.

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

⑤ Set the parking brake switch to “Release” position and read the brake release pressure indicated by the pressure gauge.

★ Brake release pressure : 1.5 to 3.9 MPa (218 to 566 psi)





6. MEASUREMENT AND ADJUSTMENT OF VIBRATOR CIRCUIT PRESSURE

6-1. Measurement

6-1-1. Measurement of main relief pressure

- Oil temperature during measurement: 50 ± 5°C (122 ± 41°F)

① Remove the plugs from the couplings (1) and (2). Attach the pressure gauge through the hose ⓢ and the adapter ⓤ.

- Coupling : 9/16-18UNF×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ : M16×G3/8
- Front drum gauge port : (1)
- Rear drum gauge port : (2)
- Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

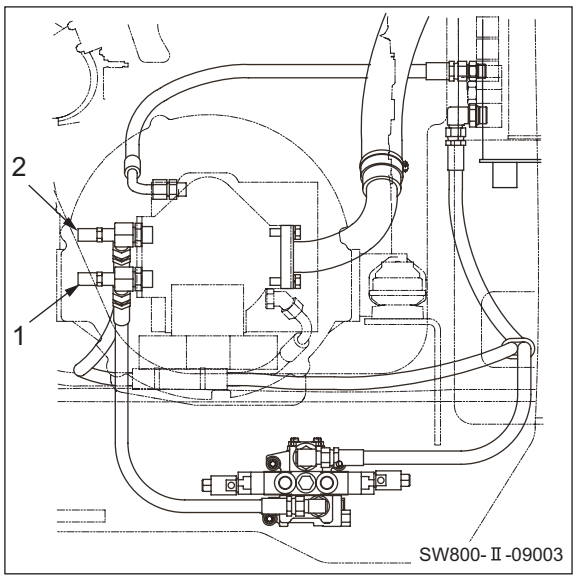
② Apply the parking brake by pressing the parking brake switch button.

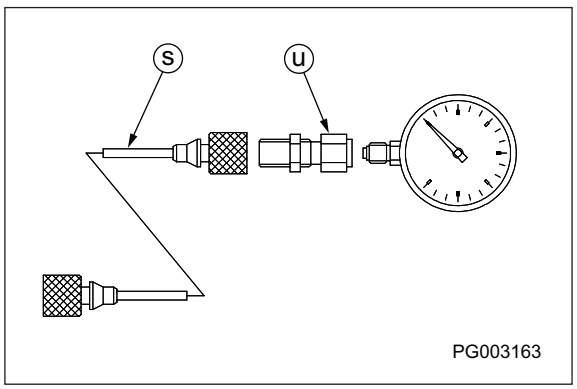
③ Set the vibration mode (continuous/automatic) selector switch to the “Continuous” position.

④ Set the vibrator switches to the “LOW” position and the vibration frequency selector to the “3,000 vpm” position respectively.

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

⑥ Press the F-R lever vibrator switch to turn the vibrator drum “ON”. Then, read the pressure gauge for the maximum value of the vibrator circuit pressure.





(NOTICE)

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

⑦ Turn the vibrator drum “OFF” as soon as the measurement is finished.

★ Standard main relief pressure setting

: 22.5 ± 1.0 MPa (3,263 ± 145 psi)

6-1-2. Measurement of port relief pressure

① Disconnect the hose (1), (2), (3) and (4) from the vibrator solenoid valve. Attach the pressure gauge through the adapter ⓟ .
- Adapter ⓟ : G1/2
- Front drum low-amplitude side port : (1)
- Front drum high-amplitude side port : (2)
- Rear drum high-amplitude side port : (3)
- Rear drum low-amplitude side port : (4)
- Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

② Apply the parking brake by pressing the parking brake switch button.

③ Set the vibration mode (continuous/automatic) selector switch to the “Continuous” position.

④ Set the vibration frequency selector to the “3,000 vpm” position.

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

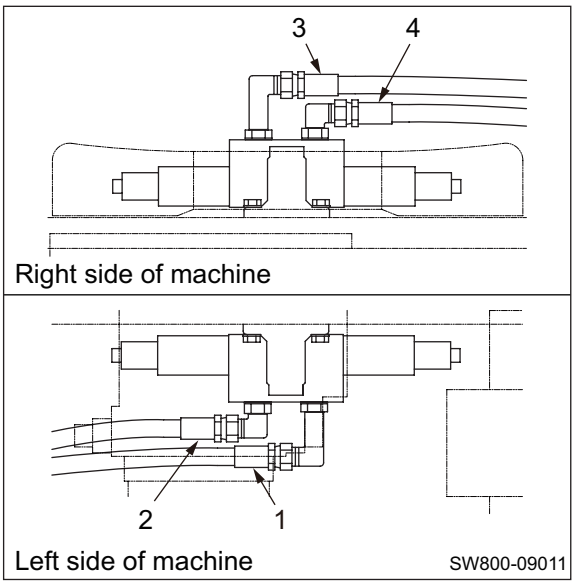
⑥ Set the vibrator switches to the “HIGH” or “LOW” position respectively.

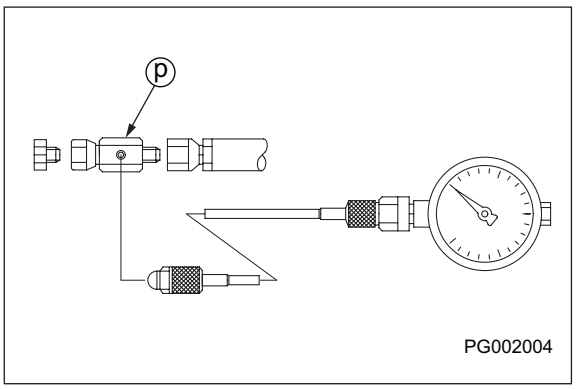
⑦ Press the F-R lever vibrator switch to turn the vibrator drum “ON”. Then, read the pressure gauge for the maximum value of the high or low-amplitude side port vibrator circuit pressure.

(NOTICE)
- **Take care not to operate the vibratory drum for a longer period of time than necessary with the vehicle stationary. Otherwise, the vibrator bearing could be seized.**

⑧ Turn the vibrator drum “OFF” as soon as the measurement is finished.

★ Standard port relief pressure setting
: 24.0 ± 1.0 MPa (3,480 ± 145 psi)





6-2. Adjustment

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

6-2-1. Adjustment of the main relief valves

① Check the locknut (8) of the main relief valves (5) or (6) for evidence of having loosened.
- Main relief valve (5): Front drum side
- Main relief valve (6): Rear drum side

② If there is evidence of the locknut having loosened, adjust the main relief valve so that the pressure becomes within the standard pressure range while watching the pressure gauge.
- To adjust the pressure, loosen the locknut (8) and turn the adjustment screw (7).

Adjustment screw turned clockwise
: Pressure rise
Adjustment screw turned counterclockwise
: Pressure drop
Pressure change rate : 12.9 MPa/turn
(1,870 psi/turn)

③ If there is no evidence of the locknut having loosened, remove the main relief valve (5) or (6).

④ Check the removed main relief valve for trapped dirt and scratches on its seat.

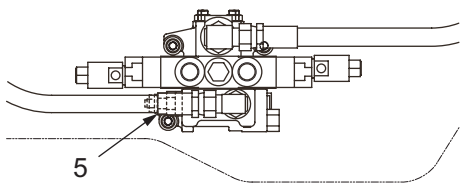
⑤ If trapped dirt is present, disassemble and clean the main relief valve.

⑥ If a scratch is found on the seat, replace the main relief valve.

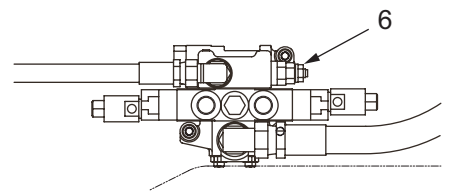
⑦ After adjustment, measure the pressure again and check that the pressure reaches the standard pressure range.

N・m

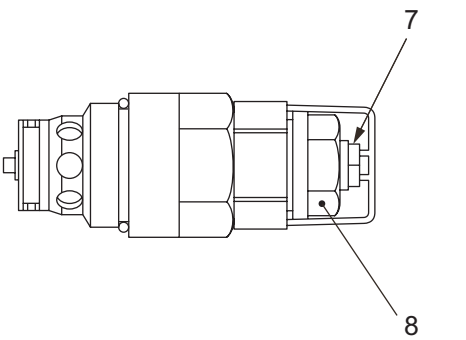
(8) Locknut : 9.8 ± 0.5 N·m (7.2 ± 0.37 lbf·ft)
(5) and (6) Main relief valve : 78 to 88 N·m (58 to 65 lbf·ft)



Left side of machine



Right side of machine SW800-Ⅱ-09004



SW800-Ⅱ-09009

(NOTICE)

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

6-2-2. Adjustment of the port relief valves

① Check the locknut (13) of the port relief valves (9), (10), (11) or (12) for evidence of having loosened.
- Port relief valve (9) : Front drum high-amplitude side
- Port relief valve (10) : Front drum low-amplitude side
- Port relief valve (11) : Rear drum low-amplitude side
- Port relief valve (12) : Rear drum high-amplitude side

② If there is evidence of the locknut having loosened, adjust the port relief valve so that the pressure becomes within the standard pressure range while watching the pressure gauge.
- To adjust the pressure, loosen the locknut (13) and turn the adjustment screw (14).

Adjustment screw turned clockwise
: Pressure rise
Adjustment screw turned counterclockwise
: Pressure drop
Pressure change rate : 12.9 MPa/turn
(1,870 psi/turn)

③ If there is no evidence of the locknut having loosened, remove the port relief valve (9), (10), (11) or (12).

④ Check the removed port relief valve for trapped dirt and scratches on its seat.

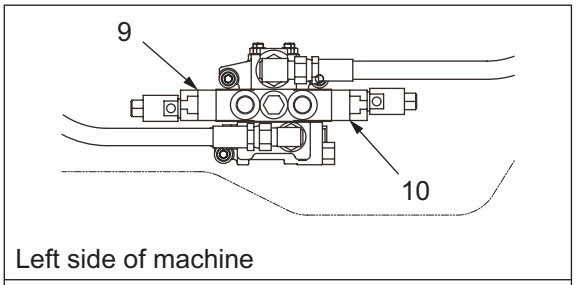
⑤ If trapped dirt is present, disassemble and clean the port relief valve.

⑥ If a scratch is found on the seat, replace the port relief valve.

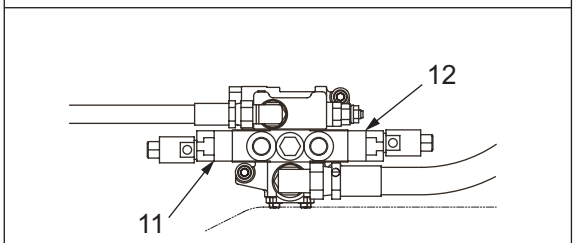
⑦ After adjustment, measure the pressure again and check that the pressure reaches the standard pressure range.

(13)	Locknut	:	19.6 to 29.4 N·m (14 to 22 lbf·ft)
(9)(10)(11) and (12)	Port relief valve	:	60 to 80 N·m (44 to 59 lbf·ft)

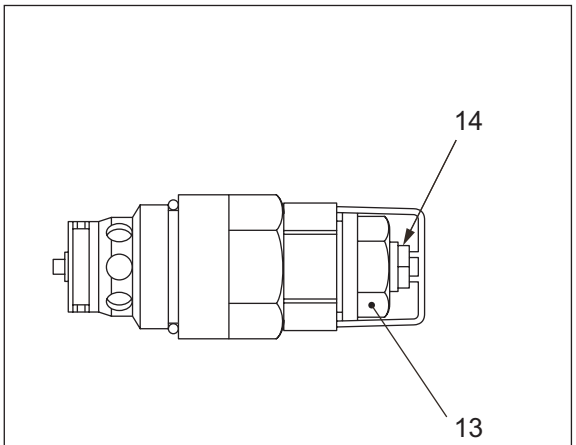
(NOTICE)
- **Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.**



Left side of machine



Right side of machine SW800-Ⅱ-09005



SW800-Ⅱ-09010

7. MEASUREMENT AND INSPECTION OF STEERING CIRCUIT PRESSURE

7-1. Measurement

⚠WARNING

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

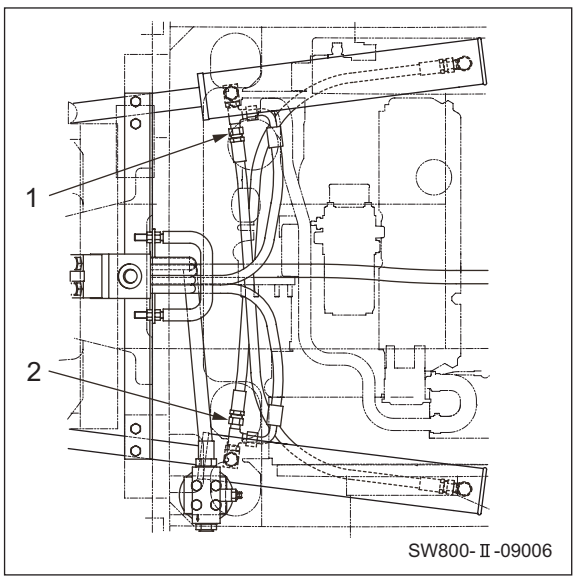
- Oil temperature during measurement: 50 ± 5°C (122 ± 41°F)

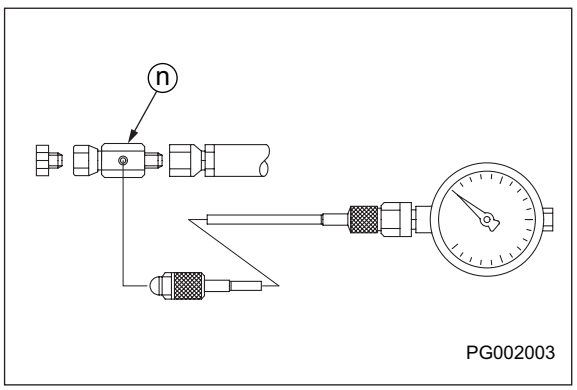
① Disconnect the hose (1) or (2) from the power cylinder. Attach the pressure gauge through the adapter ⓝ .
- Adapter ⓝ : G3/8
- Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

② Confirm that the forward-reverse lever is in the neutral position properly.

③ Start the engine and set the throttle switch to the “Full” position. Turn the steering wheel to operate the relief valve and read the pressure indicated by the pressure gauge.

★ Standard maximum circuit pressure
: 17.9 ± 1.0 MPa (2,596 ± 145 psi)

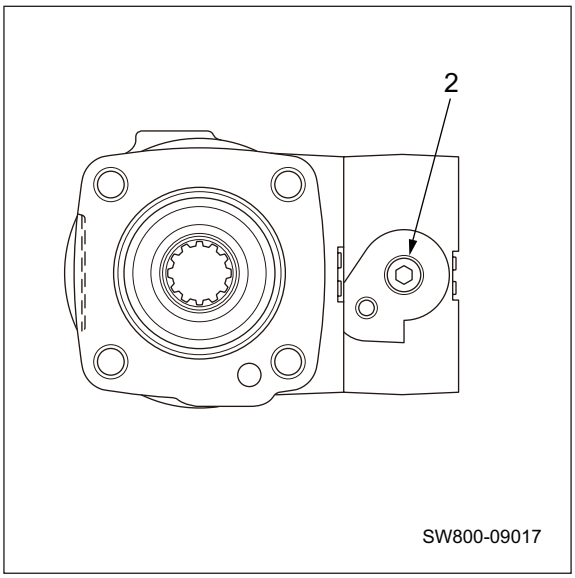




7-2. Inspection

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

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



(NOTICE)

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

8. ADJUSTMENT OF FORWARD-REVERSE LEVER LINKAGE

8-1. Adjustment

- If the forward-reverse lever linkage was replaced, make an adjustment in accordance with the procedure described below.
- The neutral position of the forward-reverse lever (1) and the maximum stroke on the forward and reverse side are positioned by notches.

① Firmly secure the forward-reverse lever (1) in the neutral position.

② Firmly secure both ends of the control cable (5) and rod (3).

★ Specified dimension of rod (3)
a: 290 mm (11.4 in.)

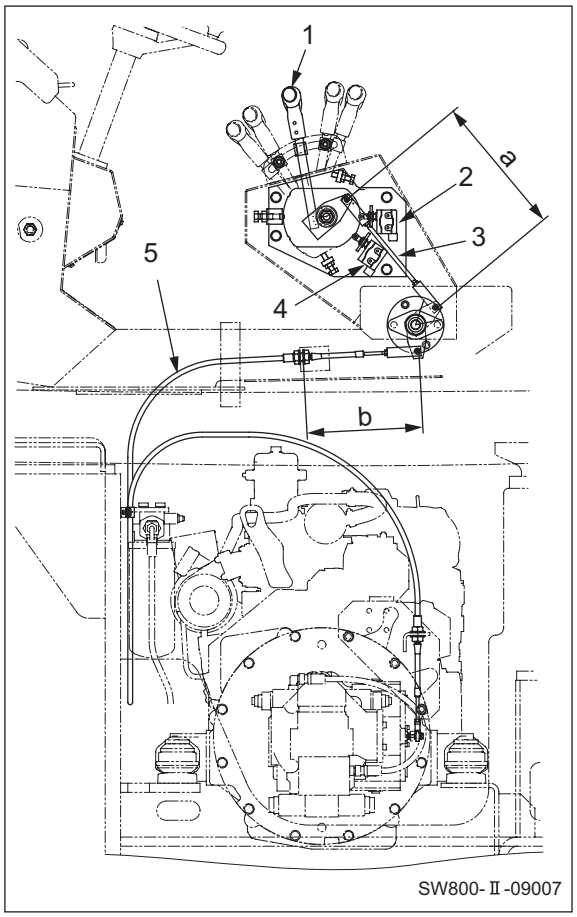
★ Specified dimensions of control cable (5) ends
b: 238 mm (9.37 in.)
c: 209 mm (8.23 in.)

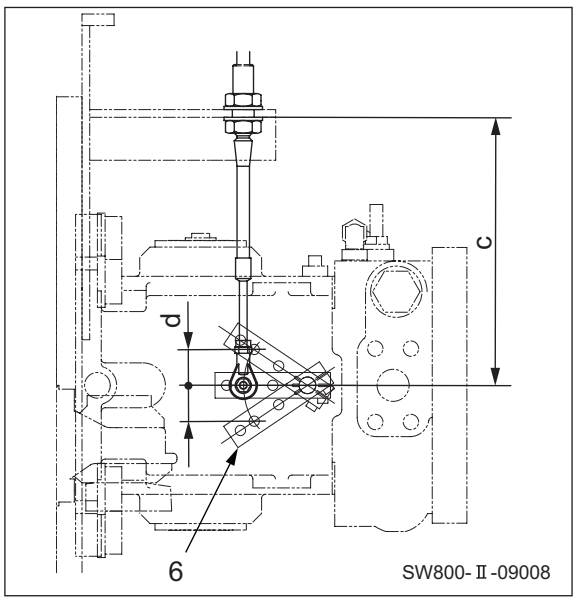
③ Confirm the stroke of the control lever (6) on the propulsion pump side.

★ Specified dimension of control lever (6)
d: 28 mm (1.1 in.)

④ After the work is completed, confirm the following items:

- The forward-reverse lever operates smoothly.
- The stroke of the control lever (6) on the propulsion pump side is the specified dimension.
- The F-R lever switch (2) should not operate with the forward-reverse lever in the neutral range.
- The backup buzzer switch (4) should operate when the forward-reverse lever is shifted into the reverse side.





TROUBLESHOOTING

1. TROUBLESHOOTING

1-1. Safety Precautions for Troubleshooting

⚠ WARNING

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

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

⚠ CAUTION

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

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

⚠ WARNING

Inadvertent starting the engine may cause a serious accident.

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

⚠ CAUTION

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

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

1-2. Important Information for Troubleshooting

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

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

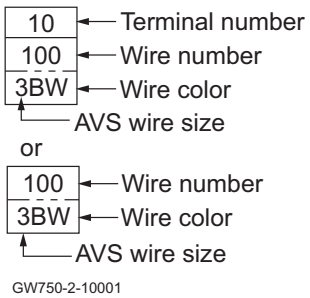
1-3. Before Starting

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

The following steps are recommended:

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

1-4. Wire Color Code and Number



GW750-2-10001

- The arrangement of connector terminals shown above is that of connecting surfaces on the connector side.

B	Black	BrY	Brown/ Yellow stripe	L	Blue	LgY	Light green/ Yellow stripe	W	White	YL	Yellow/ Blue stripe
BR	Black/ Red stripe	G	Green	LR	Blue/ Red stripe	R	Red	WB	White/ Black stripe	YR	Yellow/ Red stripe
BW	Black/ White stripe	GB	Green/ Black stripe	LW	Blue/ White stripe	RB	Red/ Black stripe	WL	White/ Blue stripe	YW	Yellow/ White stripe
BY	Black/ Yellow stripe	GL	Green/ Blue stripe	LY	Blue/ Yellow stripe	RG	Red/ Green stripe	WR	White/ Red stripe	Gy	Gray
Br	Brown	GR	Green/ Red stripe	Lg	Light green	RL	Red/ Blue stripe	WY	White/ Yellow stripe	O	Orange
BrB	Brown/ Black stripe	GW	Green/ White stripe	LgB	Light green/ Black stripe	RW	Red/ White stripe	Y	Yellow	Sb	Sky blue
BrR	Brown/ Red stripe	GY	Green/ Yellow stripe	LgR	Light green/ Red stripe	RY	Red/ Yellow stripe	YB	Yellow/ Black stripe	P	Pink
BrW	Brown/ White stripe			LgW	Light green/ White stripe			YG	Yellow/ Green stripe	Pu	Purple

2. ELECTRICAL SYSTEM TROUBLESHOOTING

2-1. When Performing Electrical System Fault Diagnosis

⚠ WARNING

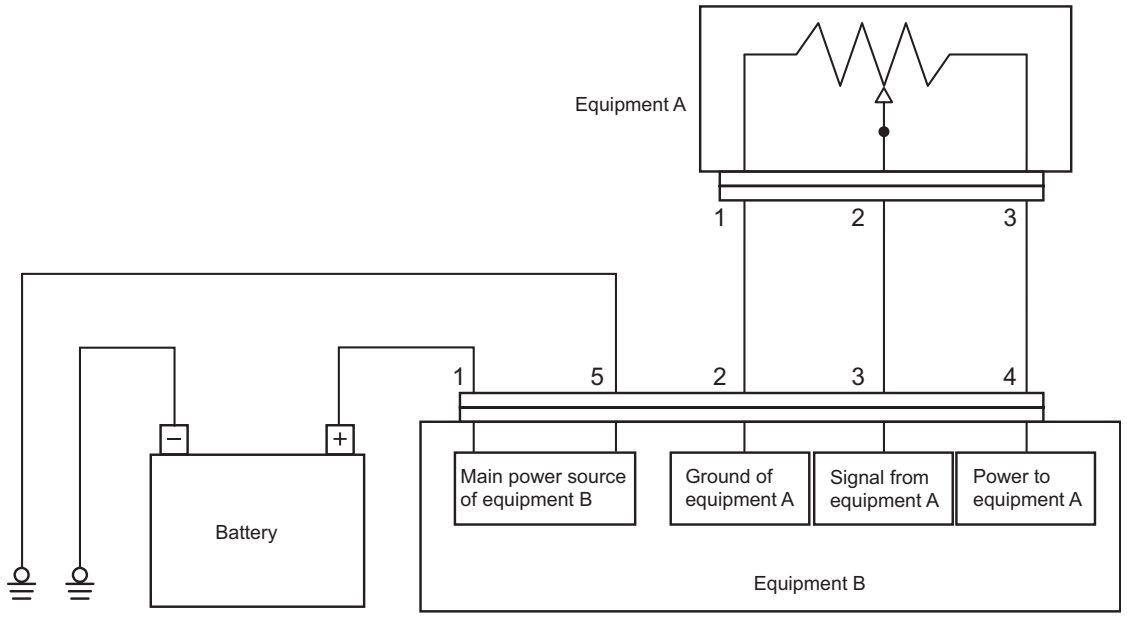
Be very careful because equipment can return to normal during an inspection and suddenly operate properly when a failure occurs due to a faulty contact or other such cause.

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

- When disconnecting or connecting a connector, be sure to turn the power supply OFF. (Electronic control parts such as the engine control unit, in particular, could be damaged internally.)
- Since connectors are not numbered, be sure to affix alignment marks so that you can restore them to their original condition.
- Before making a diagnosis, check related connectors for faulty connections. (Check by disconnecting and reconnecting related connectors several times.)
- Before proceeding to the next step, be sure to return the disconnected connectors to their original condition.
- When diagnosing a circuit (measuring the voltage, resistance, continuity and current), move related wiring and connectors several times, and check whether the tester's numerical values change. (If values change, faulty contact in the circuit is possible.)
- Do not ground the circuit of the control unit or apply voltage to it unless otherwise specified.

2-1-2. Inspection procedures using a tester

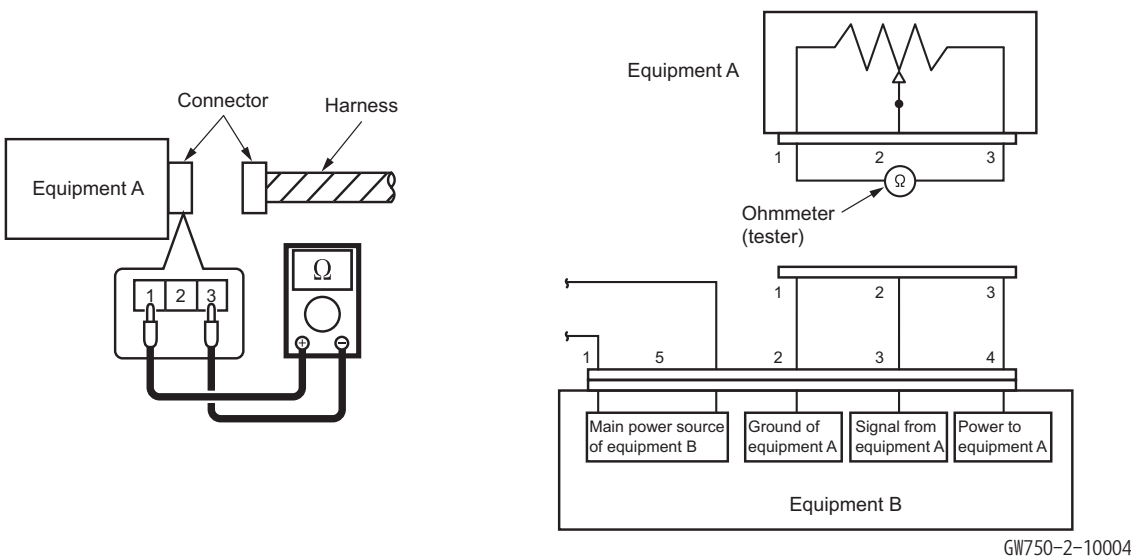
Some of the various inspection procedures are presented here for reference, using a sample circuit below.



GW750-2-10003

1) Measuring resistance using tester

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



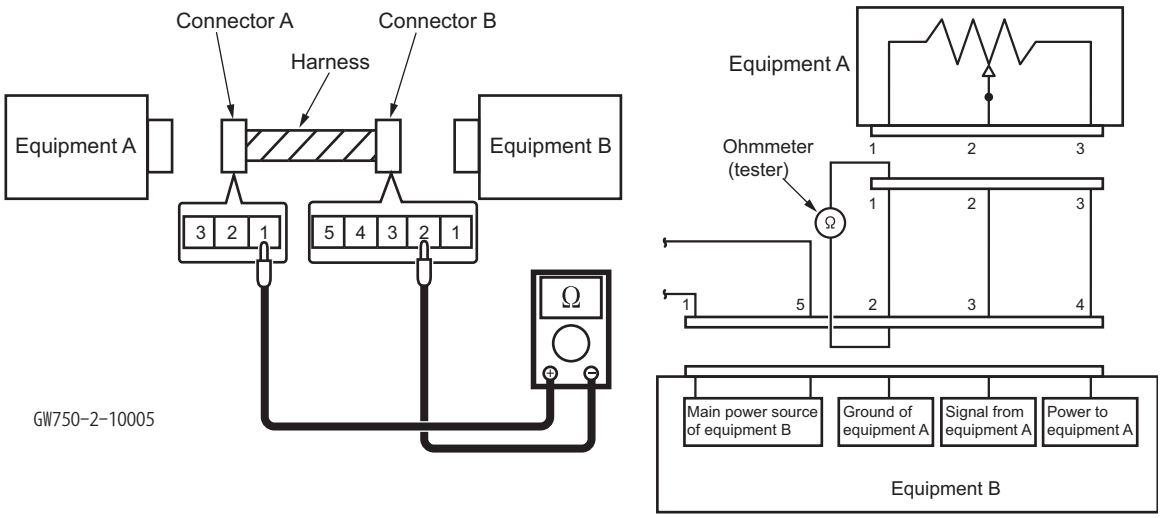
GW750-2-10004

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)



Inspection procedure

① Disconnect the connectors of equipment A and equipment B.

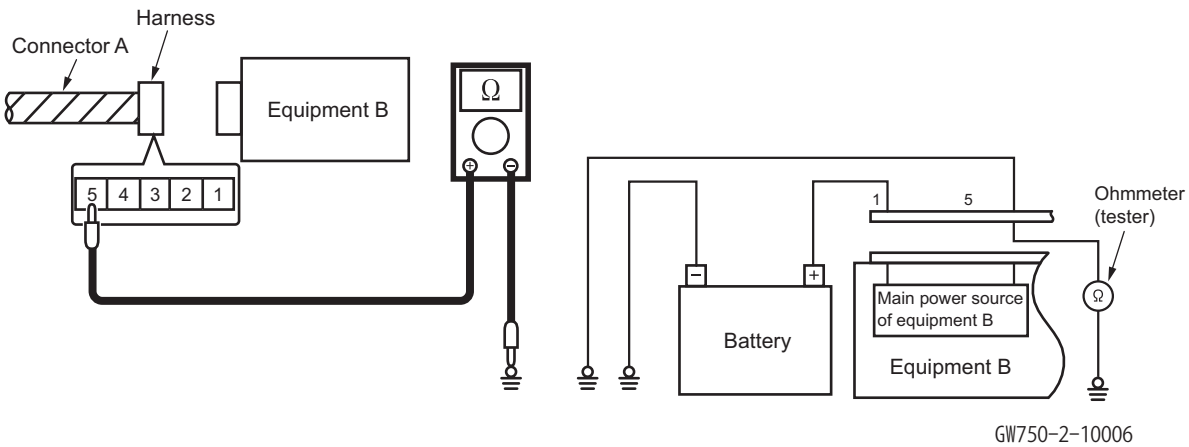
② Connect the test probe (+) to connector terminal 1 of equipment A and the test probe (-) to connector terminal 2 of equipment B and measure the resistance. At this time, reversing the connector terminals between the probes (+) and (-) does not make any difference in the measurement.

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)



Inspection procedure

① Disconnect the connector of equipment B.

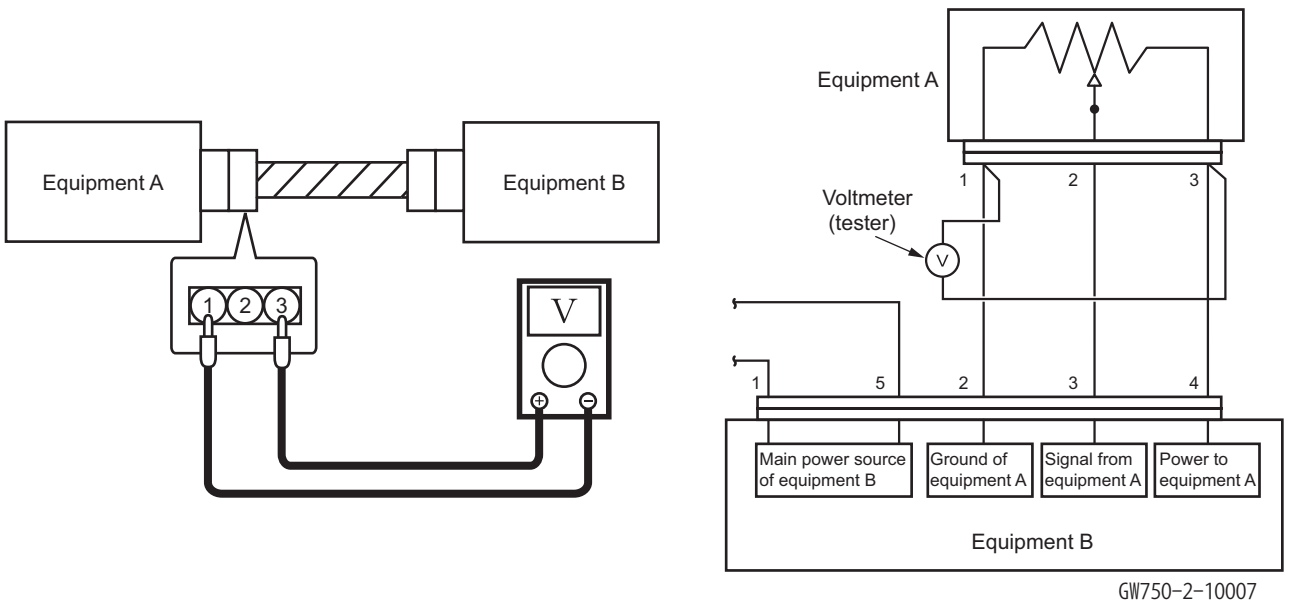
② Connect the test probe (+) to connector terminal 5 of equipment B and the test probe (-) to a vehicle ground point (the bolt fastening the ground terminal or an unpainted portion on the body) and measure the resistance. At this time, reversing the connector terminals between the probes (+) and (-)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

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



Inspection procedure

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

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

Measurement 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:

① Prepare the test harness for the measurement.

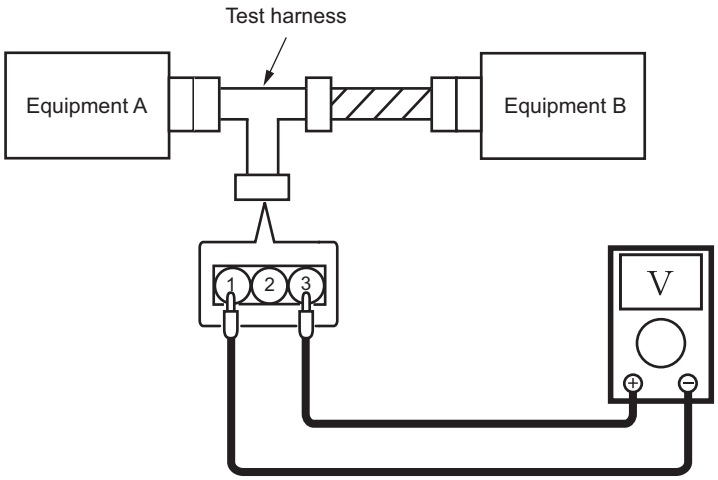
② Insert a wire from the backside of the connector.

③ Remove the bundling tape from the harness to separate each cable, and stick the needle into the relevant cable.

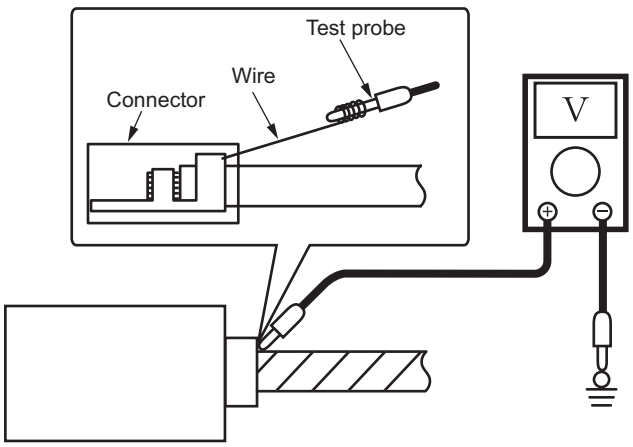
(NOTICE)

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

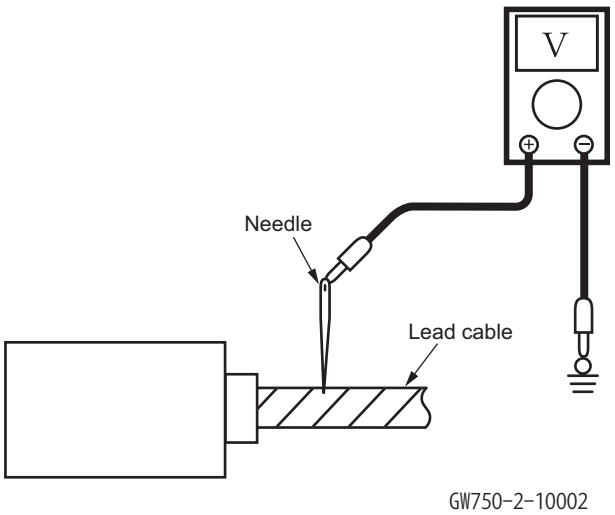
<Measurement using a test harness>



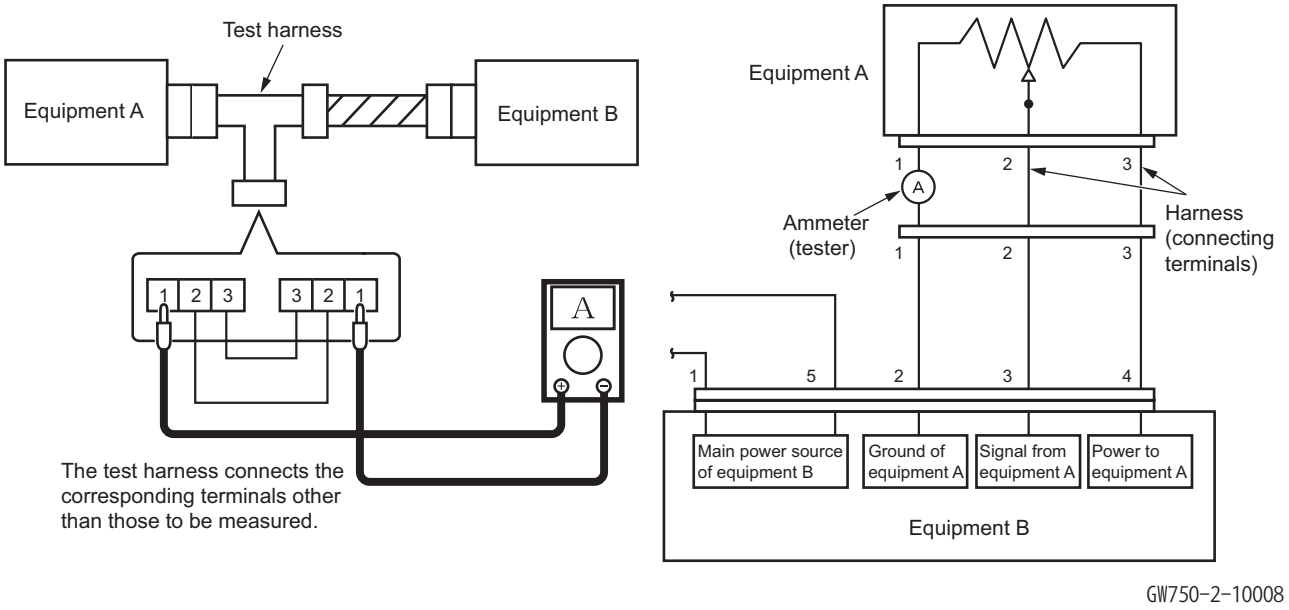
<Measurement from the backside of connector>



<Measurement on a lead cable>



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)



GW750-2-10008

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.

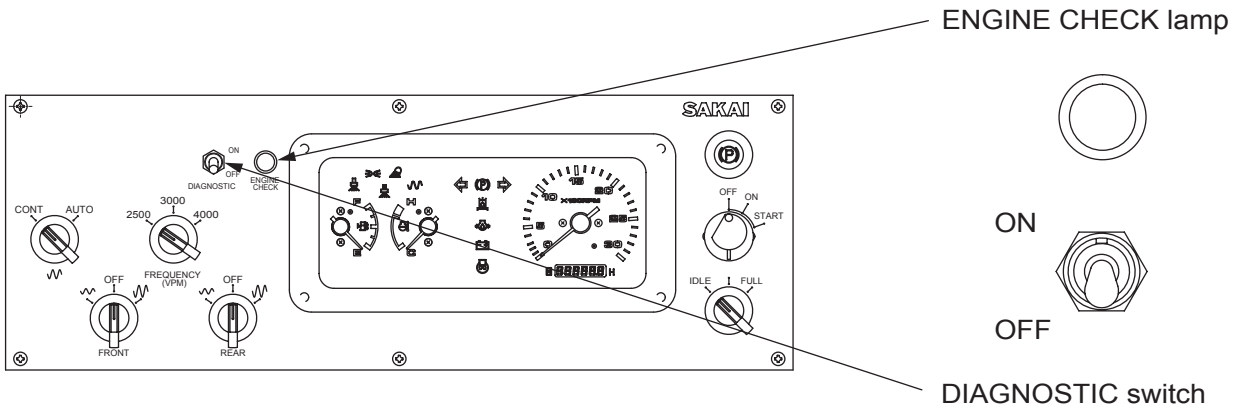
  If NO : Investigate and identify the location (section) to which 24 V (or 12 V) reaches. Then replace the harness or take other action.

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. Blink Codes

2-2-1. Description of blink codes

- The engine control unit constantly monitors the input and output status to control each system.
- The engine control unit performs the system diagnostics function. When any system problem is detected, it illuminates the warning lamp and stores the blink code in memory.
- The statuses are displayed by the engine check lamp.



SW800-Ⅱ-10001

With the DIAGNOSTIC switch, the fault can be read out as a blink code. The DIAGNOSTIC switch and the ENGINE CHECK lamp can be found on the instrument panel.
Faults are indicated by a blinking or continuous illumination of the ENGINE CHECK lamp.
More precise information regarding all existing faults can be read out in the form of a blink code, only when the engine is not running, in the following manner:
After actuating the DIAGNOSTIC switch for at least two second, the ENGINE CHECK lamp goes out and the first faults is output after releasing the DIAGNOSTIC switch displayed as a blink code. Analyse the blink code as per the table on the engine manual. After the fault blink code has been displayed, the ENGINE CHECK lamp goes out for five seconds.
Then the next existing fault (i.e. the following one in the fault memory) can be shown by actuating the DIAGNOSTIC switch again. If the last existing fault has been shown, by actuating the DIAGNOSTIC switch once more the first fault will be shown again.

Examples

Blink code	Function/Component	Service
1-3-6	Monitoring air filter	Clean or replace element
2-2-8	Monitoring fuel filter water level	Drain water
2-3-5	Monitoring coolant state	Add coolant necessary

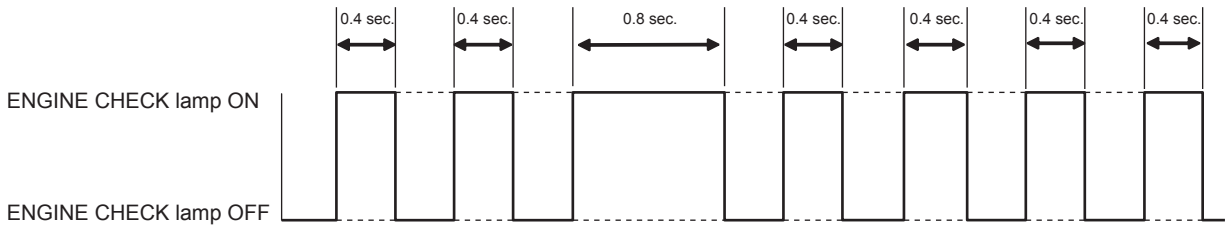
The blink code values in the first column indicate the number of preliminary short blink signals (illuminated duration approx. 0.4s), the number of subsequent long blink signals (illuminated duration approx. 0.8s) as well as the number of concluding short blink signals. The code 1-3-6 for the fault “ Monitoring air filter” is made up of one short, three long and six short blink signals, for example.

Other possible blink codes, their meaning and measures for correcting faults can be found in the table on the engine manual.
If a fault cannot be corrected by the measures given in the table, please contacts your service representative responsible.

Example of blink code display

Example: Blink code 2-1-4

The lamp lights up 0.4 second twice, 0.8 second once and then 0.4 seconds four times.



SW880-11008

2-2-2. Blink code list

Blink code			Description
Short (0.4 sec.)	Long (0.8 sec.)	Short (0.4 sec.)	
1	1	1	• CAN message, missing (message “RxCCVS”= cruise control).
1	1	2	• CAN message, missing (message “RxEngTemp”= engine temperature).
1	1	5	• CAN message, missing (message “SwtOut”= switch outputs).
1	1	6	• CAN message, missing (message “TCO1”= Speed signal).
1	1	8	• CAN message, missing (message “TSC1-AE”, “TSC1-DE”, “TSC1-PE", “TSC1-TE” or “TSC1-VE”).
1	1	9	• CAN message, missing (message “TSC1-AR”, “TSC1-DR”, “TSC1-TR” or “TSC1-VR”).
1	2	3	• Coolant temperature warning lamp, cable break or short circuit.
1	2	6	• Hand throttle, cable break, short circuit or signal implausible compared to signal of idle sensor.
1	2	8	• Charge air temperature sensor, cable break or short circuit.
1	3	3	• Sensor 1, cable break, short circuit or outside target range with system reaction (temperature 1).
1	3	4	• Rail pressure, positive or negative deviation (speed or flow dependent) outside target range, pressure above target range or implausible (leakage, injector needle blocked in open position).
1	3	5	• Metering unit valve, flow rate outside target range, not connected or output disable or short circuit to Ubatt or ground. • Oil pressure warning lamp, cable break or short circuit.
1	3	6	• Air filter condition, pressure loss above target range with system reaction.
1	3	7	• Main relay, short circuit to Ubatt (relay 1).
1	3	8	• Main relay, short circuit to ground (relay 1).
1	3	9	• EMR internal error, watchdog counter exceeds maximum.
1	4	2	• Engine operating signal lamp, cable break or EMR internal error.

Blink code			Description
Short (0.4 sec.)	Long (0.8 sec.)	Short (0.4 sec.)	
1	4	3	• Multi state switch, cable break, short circuit or input voltage outside target range (switch 1, 2, 3)
1	4	4	• Oil temperature sensor, cable break, short circuit or below target range with system reaction.
1	4	5	• Override switch, switch hangs.
1	4	6	• Rail pressure limiting valve, opening failure or failure with system reaction.
1	4	7	• Rail pressure sensor, cable break, short circuit, deviation of signal during start or after-run above target range.
1	4	9	• EMR internal error, redundant shut-off conditions detected.
1	5	1	• Multiple injectors, cable break or short circuit (cylinder bank 1).
1	5	2	• Multiple injectors, cable break or short circuit (cylinder bank 2).
1	5	3	• EMR internal error, injector power stage A or B.
1	5	4	• Single injector, cable break or short circuit (injector 1).
1	5	5	• Single injector, cable break or short circuit (injector 2).
1	5	6	• Single injector, cable break or short circuit (injector 3).
1	6	1	• Single injector, cable break or short circuit (injector 4).
1	6	2	• Single injector, cable break or short circuit (injector 5).
1	6	3	• Single injector, cable break or short circuit (injector 6).
1	6	4	• Single injector, cable break or short circuit (injector 7).
1	6	5	• Single injector, cable break or short circuit (injector 8).
2	1	2	• Engine speed sensor, engine running with cam-shaft speed signal only or speed signal from cam-shaft or crank-shaft is bad or missing.
2	1	3	• Engine speed sensor, speed signals of crank-shaft and cam-shaft are phase-shifted.
2	1	4	• Overspeed, engine overspeed with system reaction. • Overrun condition, overrun conditions with system reaction.
2	1	6	• Fuel low pressure, below target range with system reaction. • Fuel low pressure sensor, cable break or short circuit.
2	1	9	• Fuel low pressure sensor, cable break or short circuit.
2	2	2	• Accelerator pedal, cable break, short circuit, bad PWM signal range or frequency (digital pedal) or bad PWM pulse-width repetition rate (digital pedal).
2	2	3	• Charge air pressure sensor, cable break or short circuit. • Charge air pressure, outside target range with system reaction.
2	2	4	• Oil pressure sensor, cable break or short circuit.
2	2	5	• Coolant temperature sensor, cable break or short circuit.
2	2	6	• Accelerator pedal, cable break, short circuit, or signal implausible compared to signal of idle sensor (analog pedal).
2	2	7	• Fuel temperature sensor, cable break or short circuit.
2	2	8	• Fuel filter water level sensor, cable break or short circuit. • Water level in fuel filter, above target range.

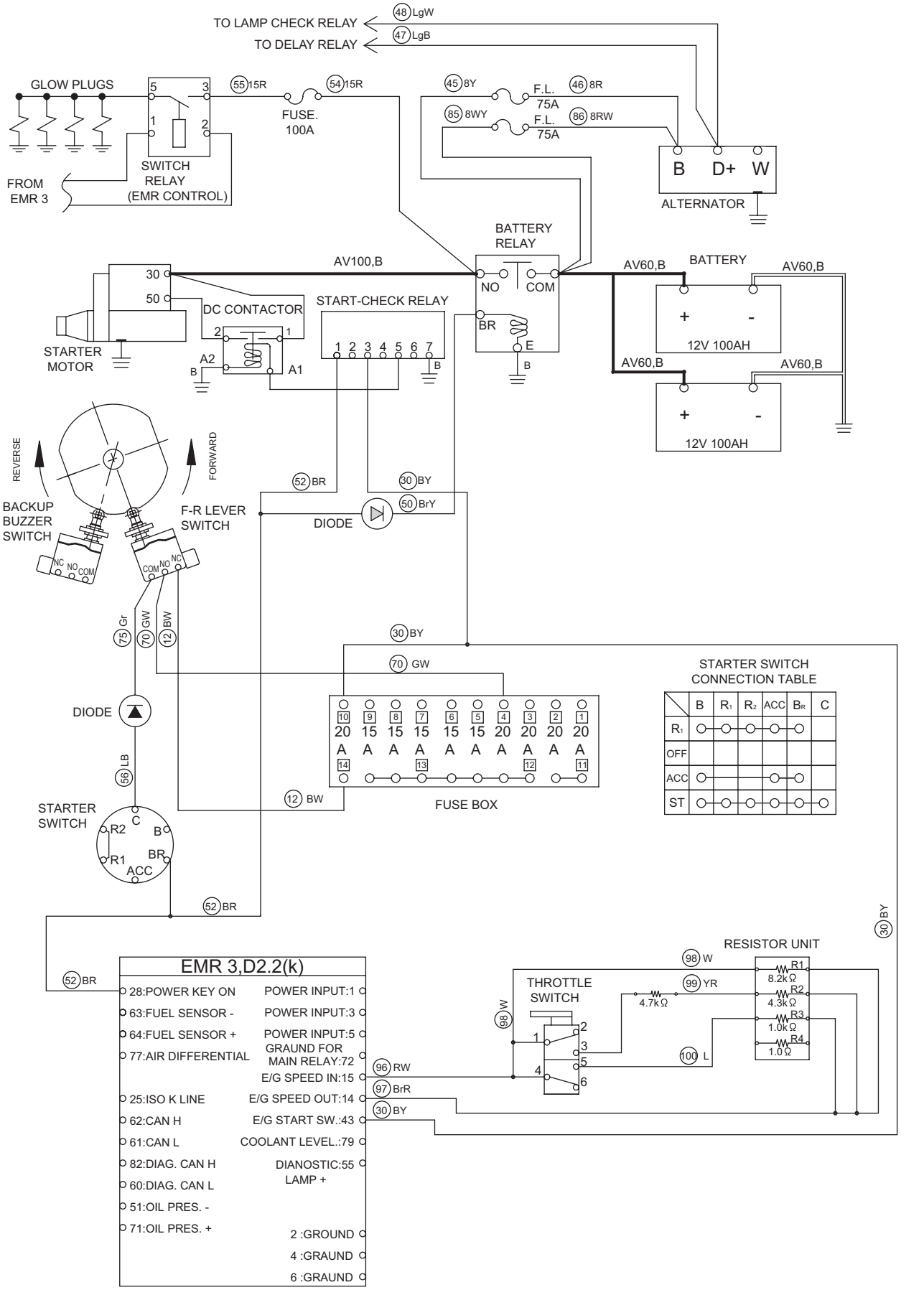
Blink code			Description
Short (0.4 sec.)	Long (0.8 sec.)	Short (0.4 sec.)	
2	3	1	• Oil pressure sensor, pressure value implausible low. • Oil pressure, above or below target range.
2	3	2	• Coolant temperature, outside target range with system reaction.
2	3	3	• Charge air temperature, above target range with system reaction.
2	3	5	• Coolant level, outside target range with system reaction.
2	3	7	• Fuel temperature, above target range with system reaction.
2	3	8	• Fan speed, above target range with system reaction. • Fan actuator, cable break or short circuit.
2	4	1	• Misfire, misfire detected with system reaction or multiple/ single cylinder, misfire detected (cylinder 1 to 8).
2	6	1	• Main relay, short circuit to ground or emergency shut-off (relay 2 to 3).
2	6	3	• Air heater magnetic valve, cable break or short circuit. • Air heater relay, cable break, short circuit, wrong connection or inoperable during shut-off.
2	7	1	• CAN message, time-out of at least one sent message. • CAN bus off-state, cable break, short circuit or off-state (CAN bus A to C).
2	8	1	• ECU internal error, EEPROM memory access.
2	8	2	• ECU internal error, wrong voltage of internal 5 V reference source 1 to 3.
2	9	2	• ECU internal error, ambient pressure sensor defective.
3	1	4	• Sensor 2, cable break, short circuit or outside target range with system reaction (temperature 2).
3	1	8	• Battery, voltage below target range or above target range with system reaction.
3	2	8	• Preheating signal lamp, cable break or short circuit.
3	3	3	• CAN message, missing (message “EngPrt”= engine protection).
3	3	7	• CAN message, missing (message “PreHtEnCmd”= preheat and engine command).
3	4	1	• Shut-off request, shut-off request ignored by operator.
4	1	4	• EGR actuator (external), short circuit to Ubatt or ground.
4	1	5	• EGR actuator (external), cable break or ECU internal error.
4	1	6	• EGR actuator (external), cable break or short circuit.
5	1	2	• Start relay, short circuit (high side) or cable break, short circuit or disabled by ECU (low side).
5	1	3	• Diagnostic lamp, cable break, short circuit or disabled by ECU.
5	1	4	• Terminal 15, ignition ON not detected.
5	1	5	• Terminal 50, engine start switch hangs.
5	2	1	• Vehicle speed signal, speed above target range, signal missing or implausible.
5	2	6	• CAN message, missing or value above target range (message “DecV1”= pseudo pedal).

Blink code			Description
Short (0.4 sec.)	Long (0.8 sec.)	Short (0.4 sec.)	
5	2	7	• CAN message, missing (message “FuncModCtl”= function mode control).
5	2	8	• Engine brake (internal), cable break or short circuit.
5	3	1	• Begin of injection period, outside target range or missing (cylinder 1).
5	3	2	• Begin of injection period, outside target range or missing (cylinder 2).
5	3	3	• Begin of injection period, outside target range or missing (cylinder 3).
5	3	4	• Begin of injection period, outside target range or missing (cylinder 4).
5	3	5	• Begin of injection period, outside target range or missing (cylinder 5).
5	3	6	• Begin of injection period, outside target range or missing (cylinder 6).
5	3	7	• Begin of injection period, outside target range or missing (cylinder 7).
5	3	8	• Begin of injection period, outside target range or missing (cylinder 8).
5	5	5	• Engine power output, cable break or short circuit. • Rail pressure, rail-pressure monitoring is going to be disabled. • ECU internal error, communication with chip CJ940 disturbed, time processing unit defective or serial communication interface defective. • ECU internal hardware monitoring, recovery occurred (stored as protected, not stored or error memory), overvoltage or undervoltage.

(NOTICE)

- **For details, refer to “Troubleshooting” in Shop Manual of engine manufacturer.**

Fig.: 2-3-1



SW800-Ⅱ-10002

2-3. Engine

Check following items before troubleshooting.

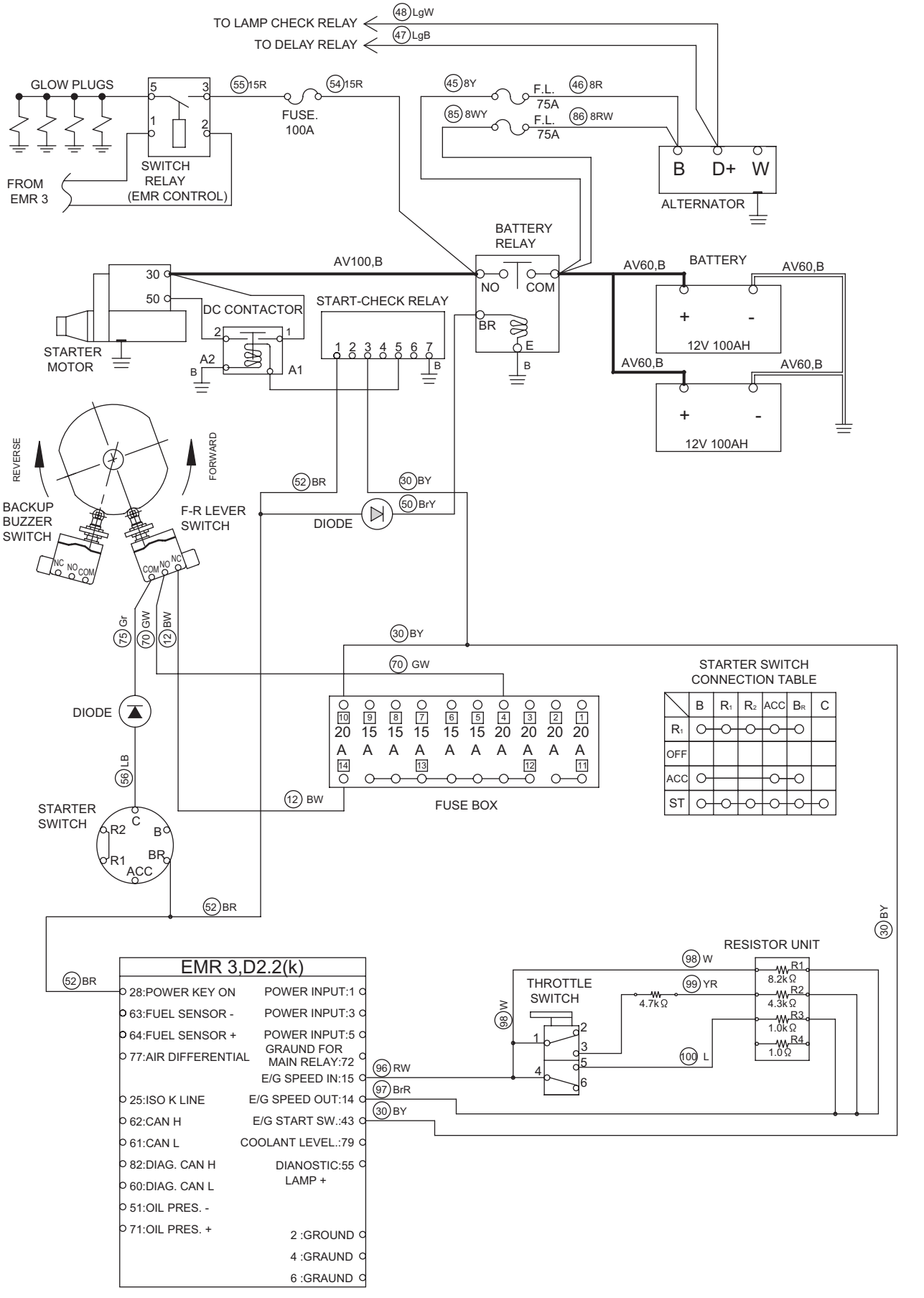
- No blown fuses.
- F-R lever must be in neutral position.
- Parking brake switch must be applied.
- Check any ground circuit which belongs to components to be checked.
- Engine check lamp must not be lighting or blinking. If engine check lamp lights or blinks, refer to “Troubleshooting” in shop manual of engine manufacturer.

2-3-1. Engine will not start (starter motor does not run) 1/2

Reference Fig.: 2-3-1

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 measured 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 START, 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 voltage: 12 V or more (2) When starter switch is ON, measure voltage between battery relay coil terminal BR inlet wire BrY 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.

Fig.: 2-3-1



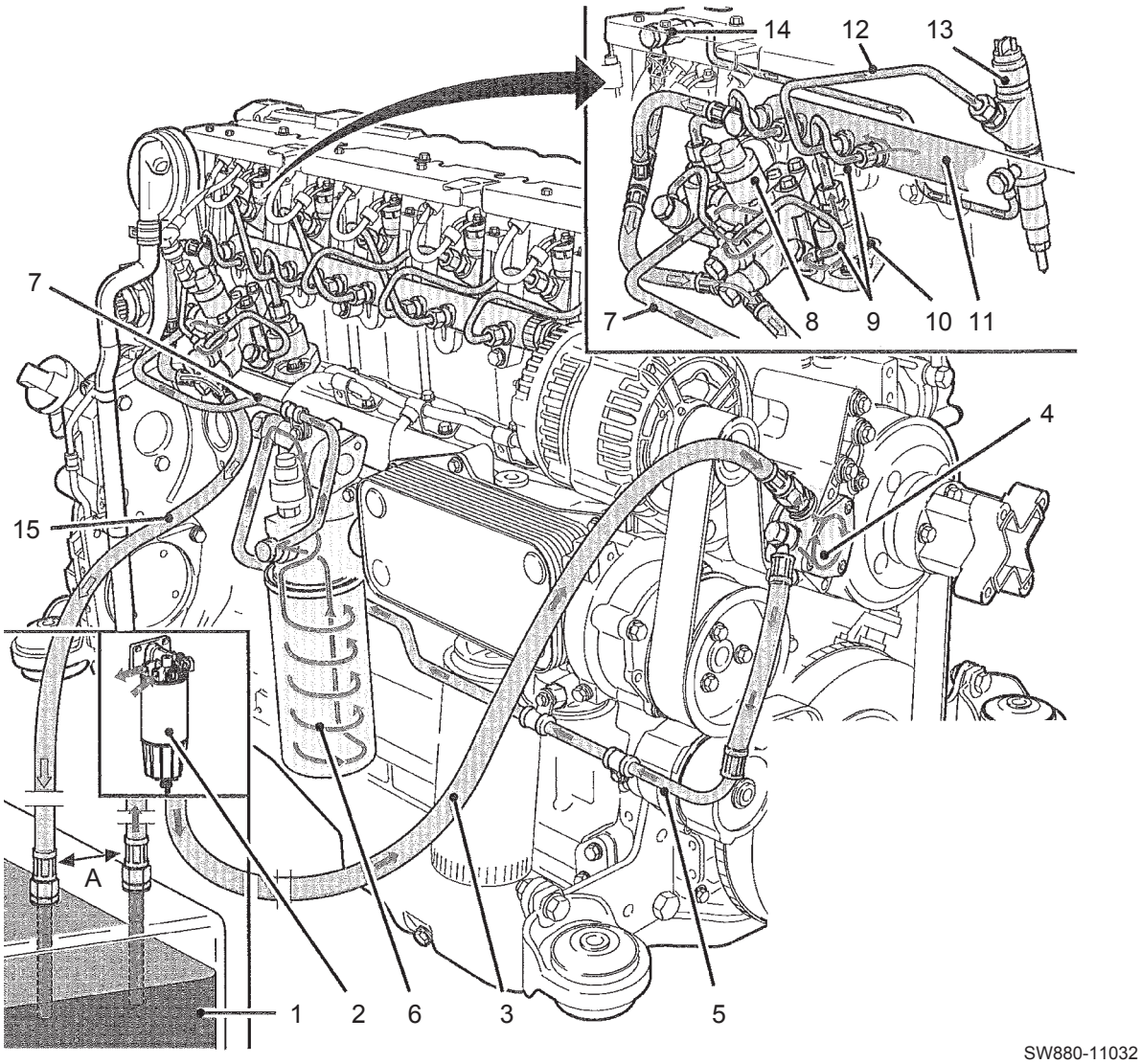
SW800-Ⅱ-10002

2-3-1. Engine will not start (starter motor does not run) 2/2

Reference Fig.: 2-3-1

Check point	Check/Cause	Action
5. DC Contactor	(1) When starter switch is ON, measure voltage between DC contactor terminal 1 inlet wire and chassis ground. Standard voltage: 12 V or more (2) When starter switch is START, measure voltage between DC contactor terminal A1 inlet wire and chassis ground. Standard voltage: 12 V or more (3) When starter switch is ON, measure voltage between DC contactor terminal 2 outlet wire and chassis ground. Standard voltage: 12 V or more • If above items (1) and (2) are OK and item (3) is NG, DC contactor is faulty.	Replace DC contactor.
6. Start Check Relay	(1) When starter switch is ON, measure voltage between start check relay terminal 1 inlet wire BR and chassis ground. Standard voltage: 12 V or more (2) When starter switch is START, measure voltage between start check relay terminal 3 inlet wire BY and chassis ground. Standard voltage: 12 V or more (3) When starter switch is START, measure voltage between start check relay terminal 5 outlet wire and chassis ground. Standard voltage: 12 V or more • If above items (1) and (2) are OK and item (3) is NG, start check relay is faulty.	Replace start check relay.
7. F-R Lever Switch	• Check continuity between F-R lever switch terminal COM and NC with F-R lever in neutral and starter switch OFF. Switch is OK if there is continuity. • If there is no continuity, F-R lever switch is faulty.	Replace F-R lever switch.
8. 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.: 2-3-2



Fuel schematic

1 Fuel container
A= minimum distance 500 mm
2 Fuel pre-filter with manual supply pump for filling low-pressure area (mounted on device side)
3 Line to fuel supply pump
4 Fuel supply pump
5 Line to spin-on fuel filter
6 Exchangeable fuel filter
7 Fuel line to control block
8 Control block FCU (Fuel Control Unit)
9 Fuel line from control block to high-pressure pumps and rail
10 High-pressure pump
11 Rail
12 Fuel line to injector
13 Injector
14 Fuel return line at cylinder head
15 Fuel return to fuel tank

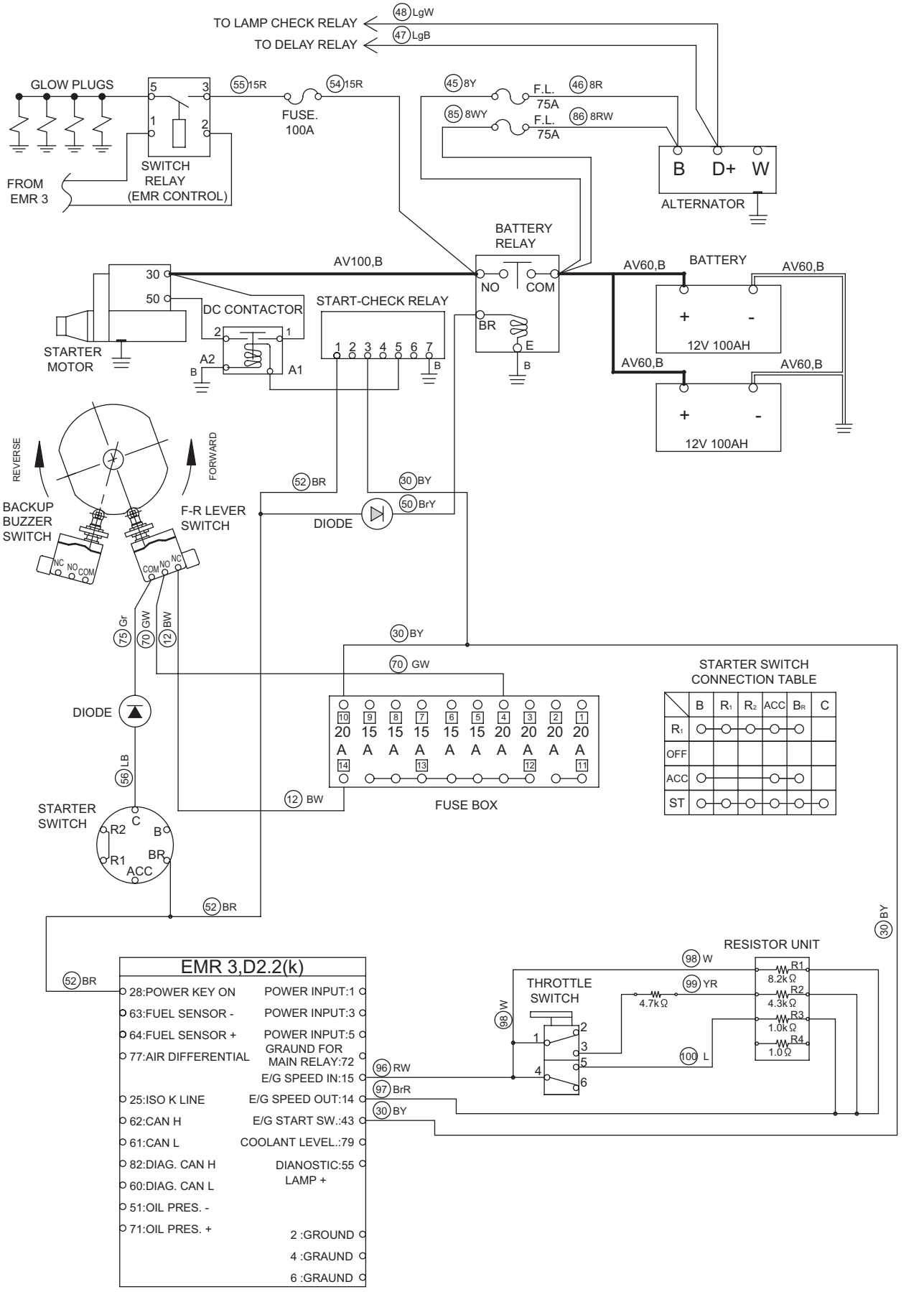
2-3-2. Engine will not start (But starter motor runs)

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

Reference Fig.: 2-3-2

Check point	Check/Cause	Action
1. Fuel Tank	• Check that fuel tank is filled with diesel oil. • If quantity is low, fuel is not delivered to fuel system.	Fill tank with fuel.
	• Check that there is no water has entered fuel tank. • If water has entered tank, engine does not start.	Drain water from tank.
	• Check that quality of diesel oil is sufficient. • If oil does not meet standard, engine may fail.	Replace fuel in tank with an appropriate one.
2. Fuel Prefilter (with sedimenter), Fuel Filter	• Check that water in sedimenter is not above upper limit. • If amount of water exceeds limit, engine does not start.	Drain water.
	• Check filter for clogging. • Insufficient supply of proper fuel due to clogging of filter. **(NOTICE)** **• Air bleeding should be performed whenever filter is replaced.**	• Replace filter. • Bleed filter.
3. Fuel Supply Pump	• Disconnect hose connecting to fuel supply pump and check that fuel flows out of pump. • If fuel does not flow out of pump, it is not delivered to fuel system. **(NOTICE)** **• Air bleeding should be performed whenever fuel supply pump is replaced.**	• Replace fuel supply pump. • Bleed pump.
4. Hoses Connecting Between Parts	• Check hose between fuel tank and fuel filter for fuel leakage and clogging. • Hose failure due to deterioration **(NOTICE)** **• Air bleeding should be performed whenever fuel hose is replaced.**	Replace hose.

Fig.: 2-3-1



SW800-Ⅱ-10002

2-3-3. No charging

Reference Fig.: 2-3-1

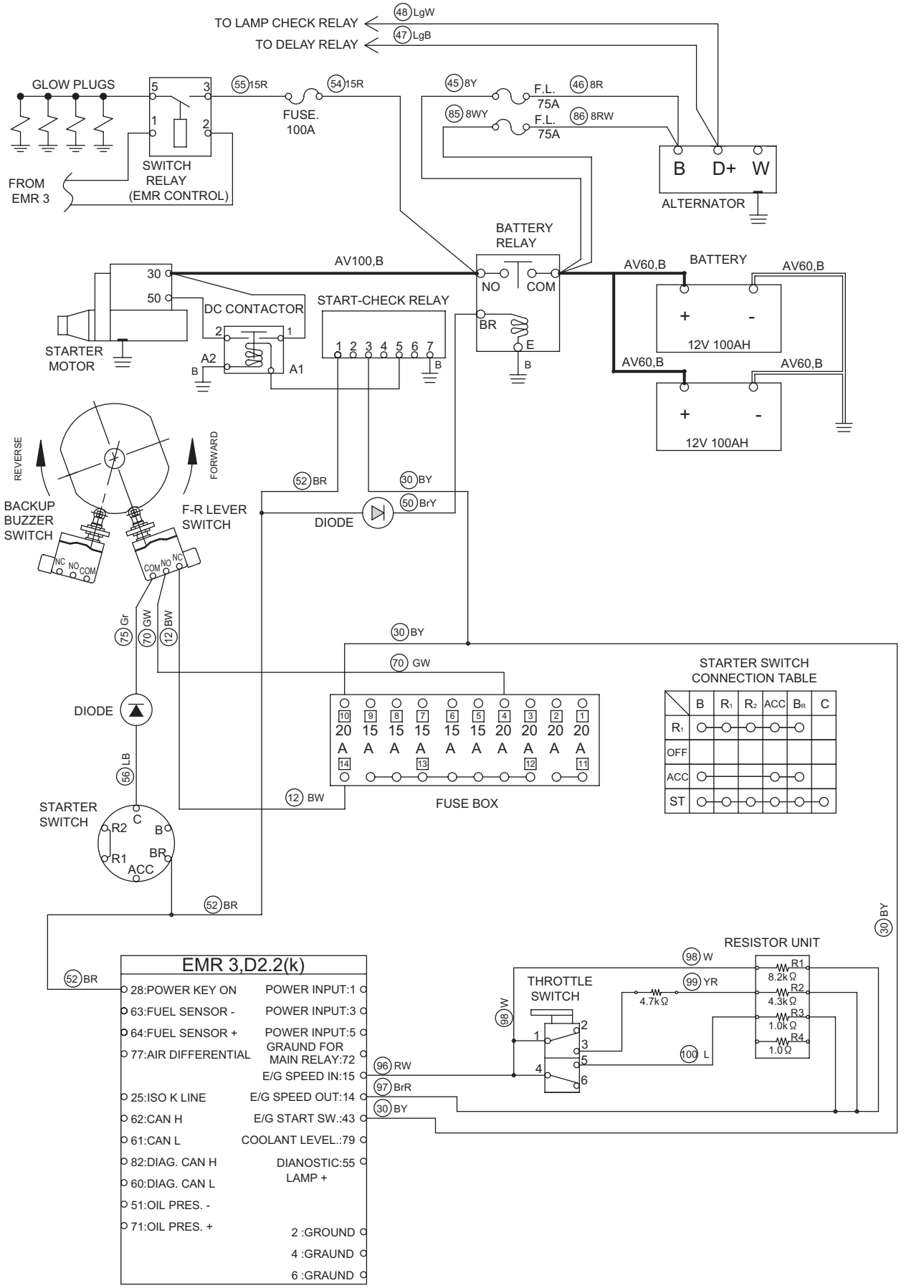
Check point	Check/Cause	Action
1. Alternator	(1) After starting engine, measure voltage between alternator terminal B wire and chassis ground. Standard voltage: At least intermediate engine speed, 13 V or more (2) After starting engine, measure voltage between alternator terminal D+ wire and chassis ground. Standard voltage: 12 V or more • If above item (1) is NG, alternator is faulty. • If above item (1) is OK and item (2) is NG, regulator is faulty. • If above items (1) and (2) are OK and battery is not charged, battery is faulty.	Replace alternator. Replace regulator. Replace battery.

2-3-4. Engine speed cannot be switched

Reference Fig. : 2-3-1

Check point	Check/Cause	Action
1. Throttle Switch	(1) Disconnect throttle switch terminal wires 1 through 6. When throttle switch is in IDLE position, check continuity between throttle switch terminal 1 and 2 and between 4 and 6. There is continuity in normal condition. (2) When throttle switch is in MID position, check continuity between throttle switch terminal 1 and 3 and between 4 and 6. There is continuity in normal condition. (3) When throttle switch is in FULL position, check continuity between throttle switch terminal 1 and 3 and between 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. Resister Unit	(1) Remove 4P connector at both ends of resistor unit and measure resistance between resistor unit (R1) wire W and wire BrR. Standard resistance: 8.2 kΩ (2) Measure resistance between resistor unit (R2) wire YR and wire BrR. Standard resistance: 4.3 kΩ (3) Measure resistance between resistor unit (R3) wire L and wire BrR. Standard resistance: 1.0 kΩ • If above item (1), (2) or (3) is NG, resistor unit is faulty.	Replace resistor unit.
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.: 2-3-1



SW800-Ⅱ-10002

2-3-5. Glow plug is not heated (Engine starting performance is bad in cold weather)

Reference Fig.: 2-3-1

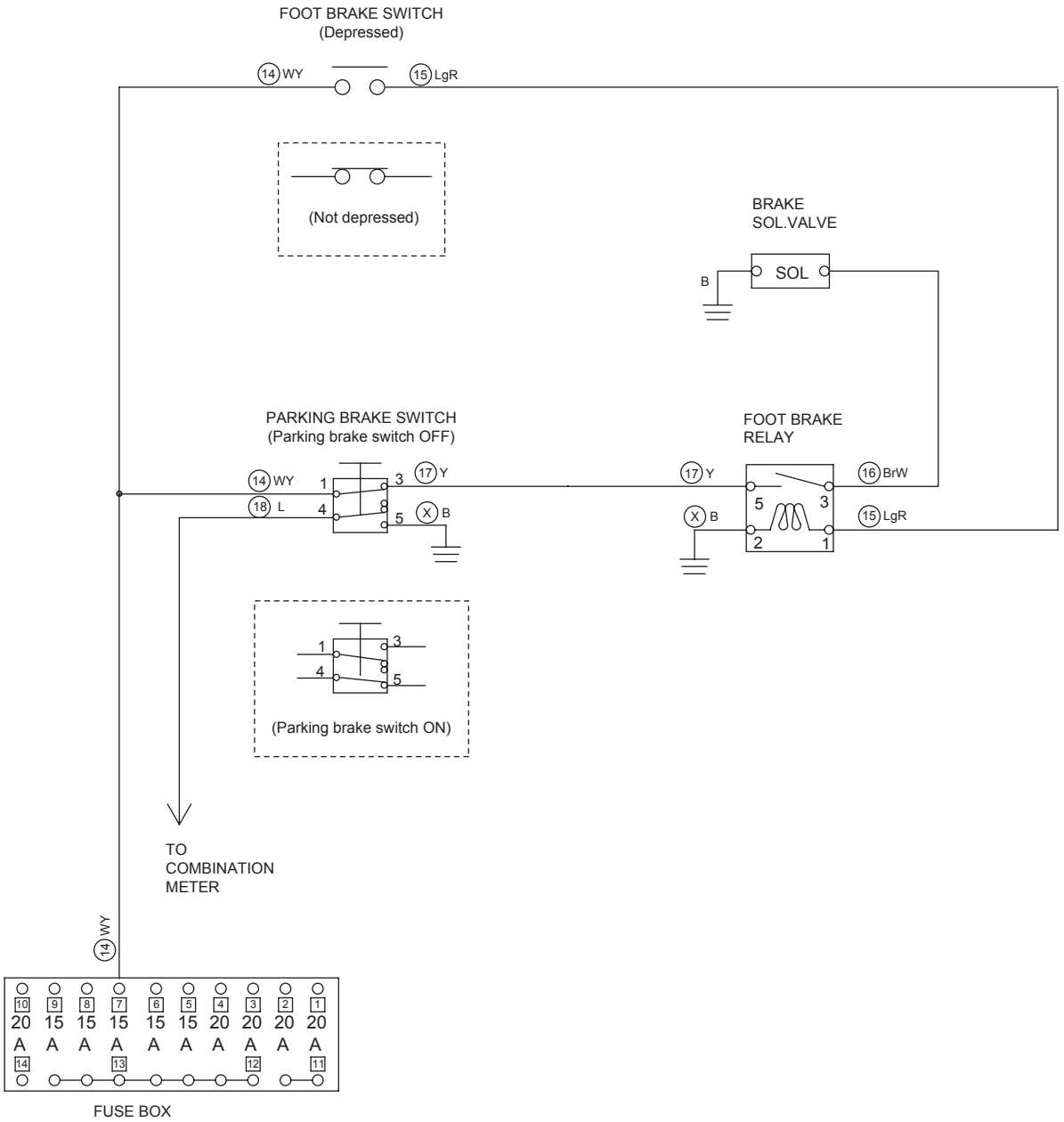
Check point	Check/Cause	Action
1. Glow Plug	• When starter switch is START, measure voltage between glow plug inlet wire and chassis ground. Standard voltage: 12 V or more • If measurement is within standard range, glow plug is faulty.	Replace glow plug.
2. Switch Relay	(1) When starter switch is START, measure voltage between switch relay terminals 1, 2 and 3 and chassis ground. Standard voltage: 12 V or more (2) When starter switch is START, measure voltage between switch relay terminal 5 wire and chassis ground. Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, switch relay or EMR 3 is faulty.	Replace switch relay.

2-3-6. Starter motor runs even when F-R lever is not at neutral position

Reference Fig.: 2-3-1

Check point	Check/Cause	Action
1. F-R Lever Switch	• When shifting F-R lever to forward or reverse position with starter switch OFF, check continuity between F-R lever switch terminal COM and terminal NC. Switch is OK if there is no continuity. • If there is continuity, F-R lever switch is faulty.	Replace F-R lever switch.

Fig.: 2-4-1



SW800-Ⅱ-10003

2-4. Propulsion

Check following items before troubleshooting.

- No blown fuses.
- F-R lever must be in neutral position.

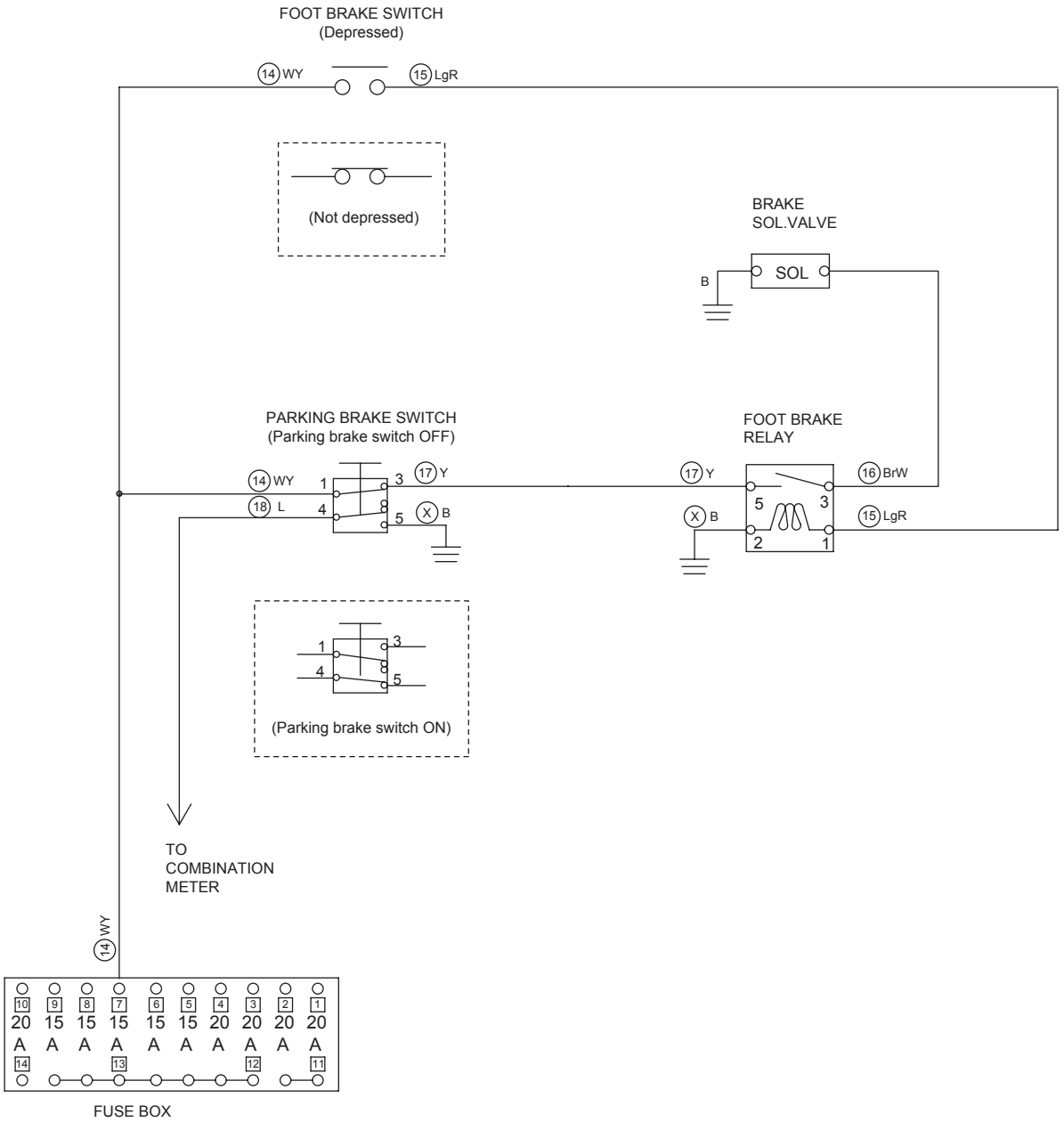
2-4-1. Vehicle moves neither forward nor backward

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

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance: 12.3 ± 1.2 Ω • If measured resistance is abnormal, brake solenoid is faulty.	Replace brake solenoid.
2. Foot Brake Relay	(1) When starter switch is ON, measure voltage between foot brake relay terminal 1 inlet wire LgR and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between foot brake relay terminal 5 inlet wire Y and chassis ground. Standard voltage: 12 V or more (3) When starter switch is ON, measure voltage between foot brake relay terminal 3 outlet wire BrW and chassis ground. Standard voltage: 12 V or more • If above items (1) and (2) are OK and item (3) is NG, foot brake relay is faulty.	Replace foot brake relay.
3. Foot Brake Switch	(1) When starter switch is ON, measure voltage between foot brake switch inlet wire WY and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between foot brake switch outlet wire LgR 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.
4. Parking Brake Switch	(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire WY 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.
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



SW800-Ⅱ-10003

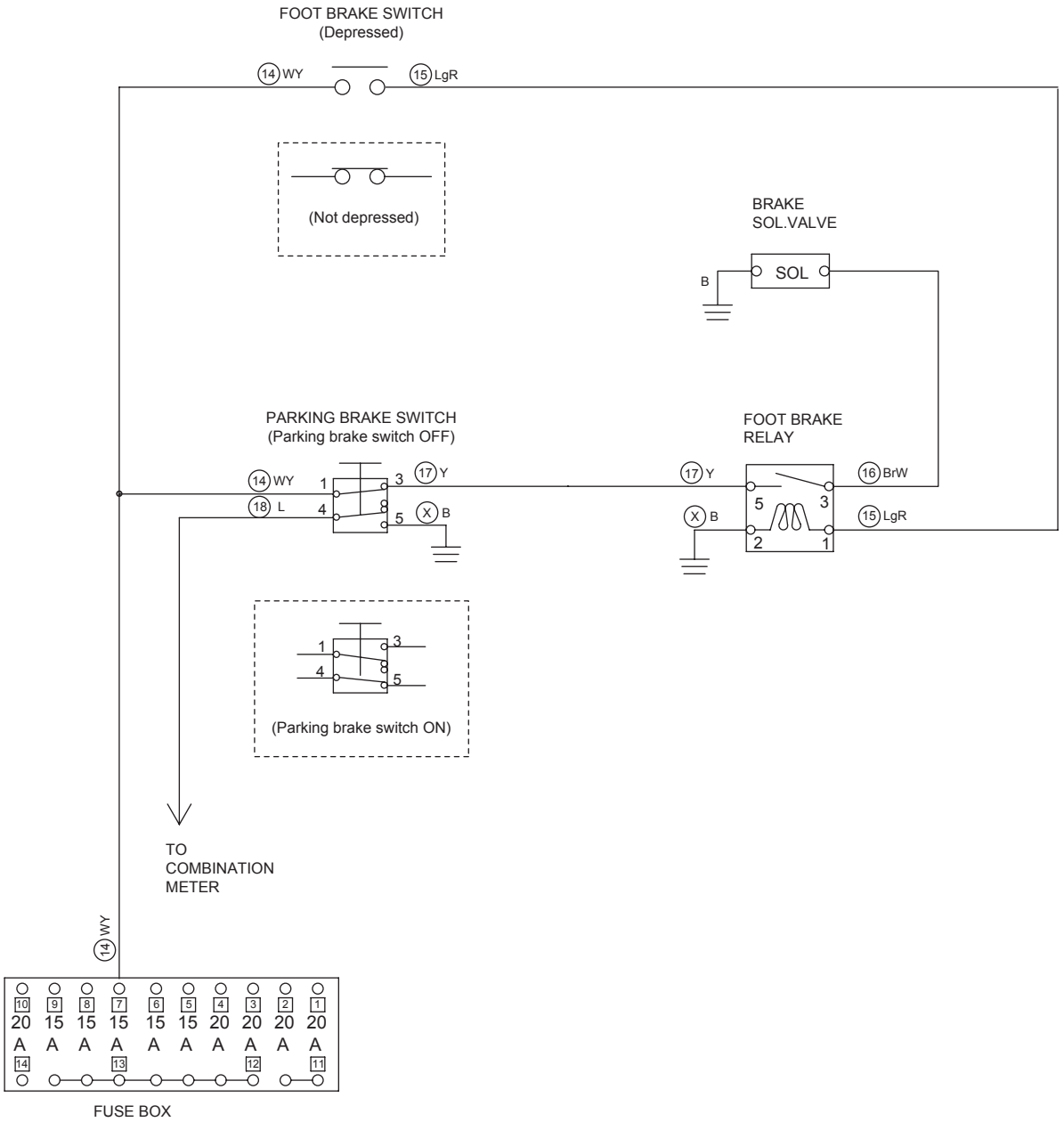
2-4-2. Brake cannot be released

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

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance: 12.3 ± 1.2 Ω • If measured resistance is abnormal, brake solenoid is faulty.	Replace brake solenoid.
2. Foot Brake Relay	(1) When starter switch is ON, measure voltage between foot brake relay terminal 1 inlet wire LgR and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between foot brake relay terminal 5 inlet wire Y and chassis ground. Standard voltage: 12 V or more (3) When starter switch is ON, measure voltage between foot brake relay terminal 3 outlet wire BrW and chassis ground. Standard voltage: 12 V or more • If above items (1) and (2) are OK and item (3) is NG, foot brake relay is faulty.	Replace foot brake relay.
3. Foot Brake Switch	(1) When starter switch is ON, measure voltage between foot brake switch inlet wire WY and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between foot brake switch outlet wire LgR 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.
4. Parking Brake Switch	(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire WY 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.
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



SW800-Ⅱ-10003

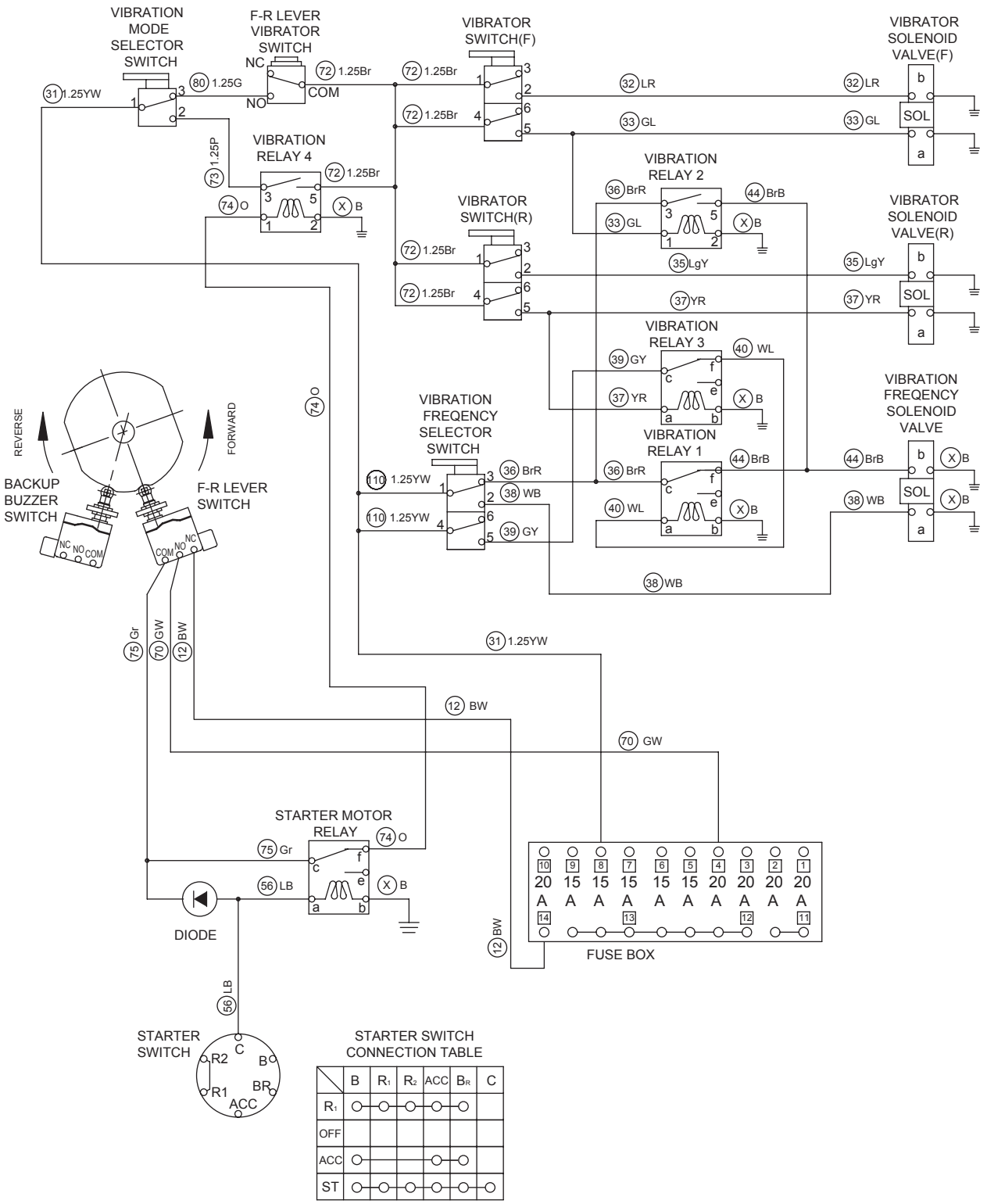
2-4-3. Brake does not operate

- Parking brake switch must be applied (brake ON).
- Foot brake switch must be OFF (Brake pedal is depressed).

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance: 12.3 ± 1.2 Ω • If measured resistance is abnormal, brake solenoid is faulty.	Replace brake solenoid.
2. Foot Brake Relay	• When starter switch is ON, measure voltage between foot brake relay terminal 3 outlet wire BrW and chassis ground. There is no electricity in normal condition. • If electricity flows, foot brake relay is faulty.	Replace foot brake relay.
3. Foot Brake Switch	• When starter switch is ON, measure voltage between foot brake switch outlet wire LgR and chassis ground. There is no electricity in normal condition. • If electricity flows, foot brake switch is faulty.	Replace foot brake switch.
4. 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 electricity flows, parking brake switch is faulty.	Replace parking 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.: 2-5-1



SW800-Ⅱ-10004

2-5. Vibrator

Check following items before troubleshooting.

- No blown fuses.
- Set throttle switch to “FULL” position.
- Vibrator switch (F) and (R) on control panel must not be OFF.

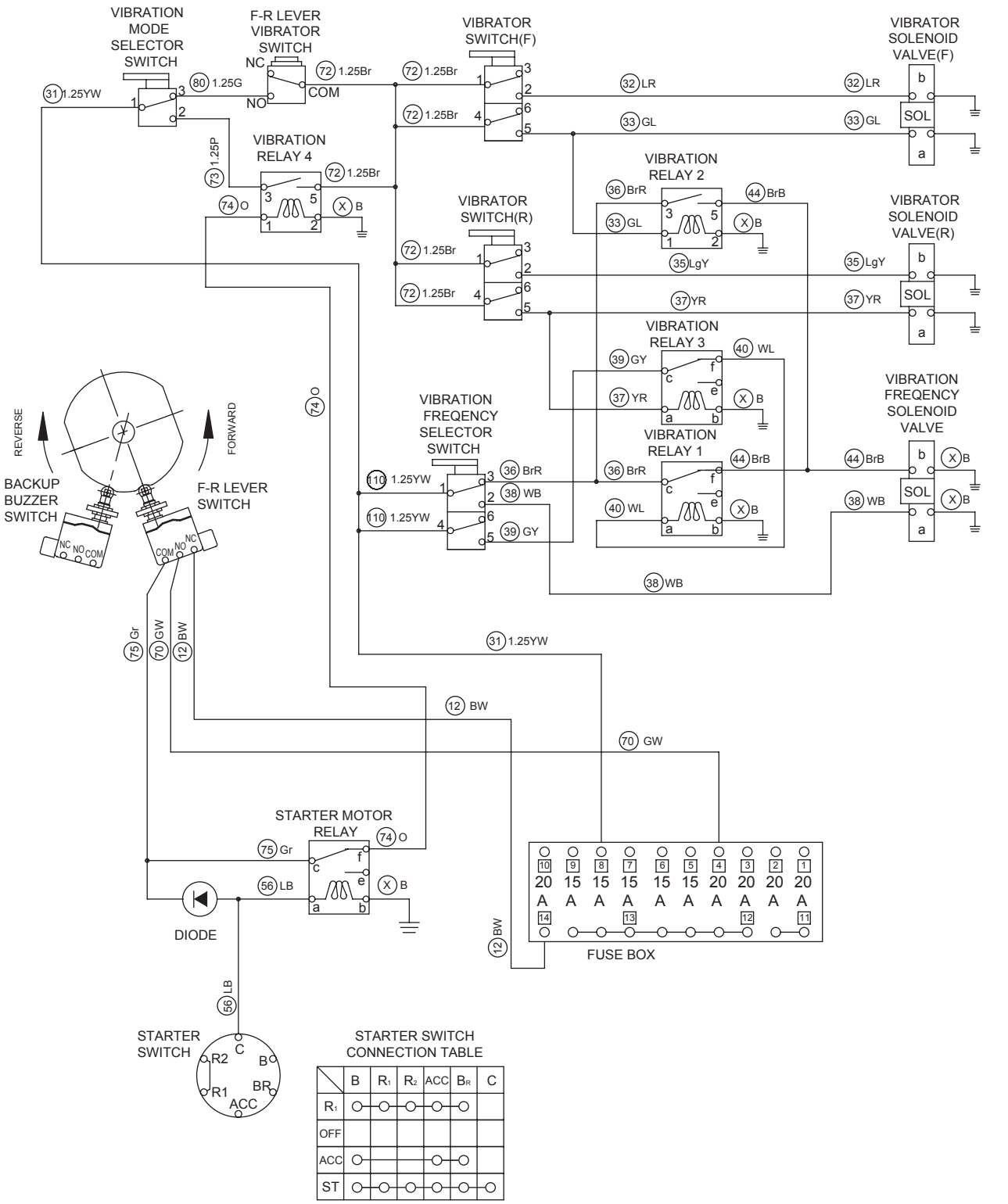
2-5-1. No vibration occurs

- F-R lever vibrator switch must be ON.
- Vibration mode selector switch must be CONT.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Vibrator Solenoid (F) and (R)	• Disconnect harness and measure resistance of coil. Standard resistance: 10.3 ± 0.52 Ω • If measured resistance is abnormal, vibrator solenoid is faulty.	Replace vibrator solenoid (F) or (R).
2. Vibrator Switch (F) and (R)	(1) When starter switch is ON, measure voltage between vibrator switches terminal 1 or 4 inlet wire Br and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibrator switches terminal 2 or 5 outlet wire and chassis ground. Vibrator switch terminal 2 Front side: LR, Rear side: LgY Vibrator switch terminal 5 Front side: GL, Rear side: YR Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, vibrator switch is faulty.	Replace vibrator switch (F) or (R).
3. F-R Lever Vibrator Switch	(1) When starter switch is ON, measure voltage between F-R lever vibrator switch terminal NO inlet wire G and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between F-R lever vibrator switch terminal COM outlet wire Br and chassis ground. Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, F-R lever vibrator switch is faulty.	Replace F-R lever vibrator switch.
4. Vibration Mode Selector Switch	(1) When starter switch is ON, measure voltage between vibration mode selector switch terminal 1 inlet wire YW and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibration mode selector 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, vibration mode selector switch is faulty.	Replace vibration mode selector 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.: 2-5-1



SW800-Ⅱ-10004

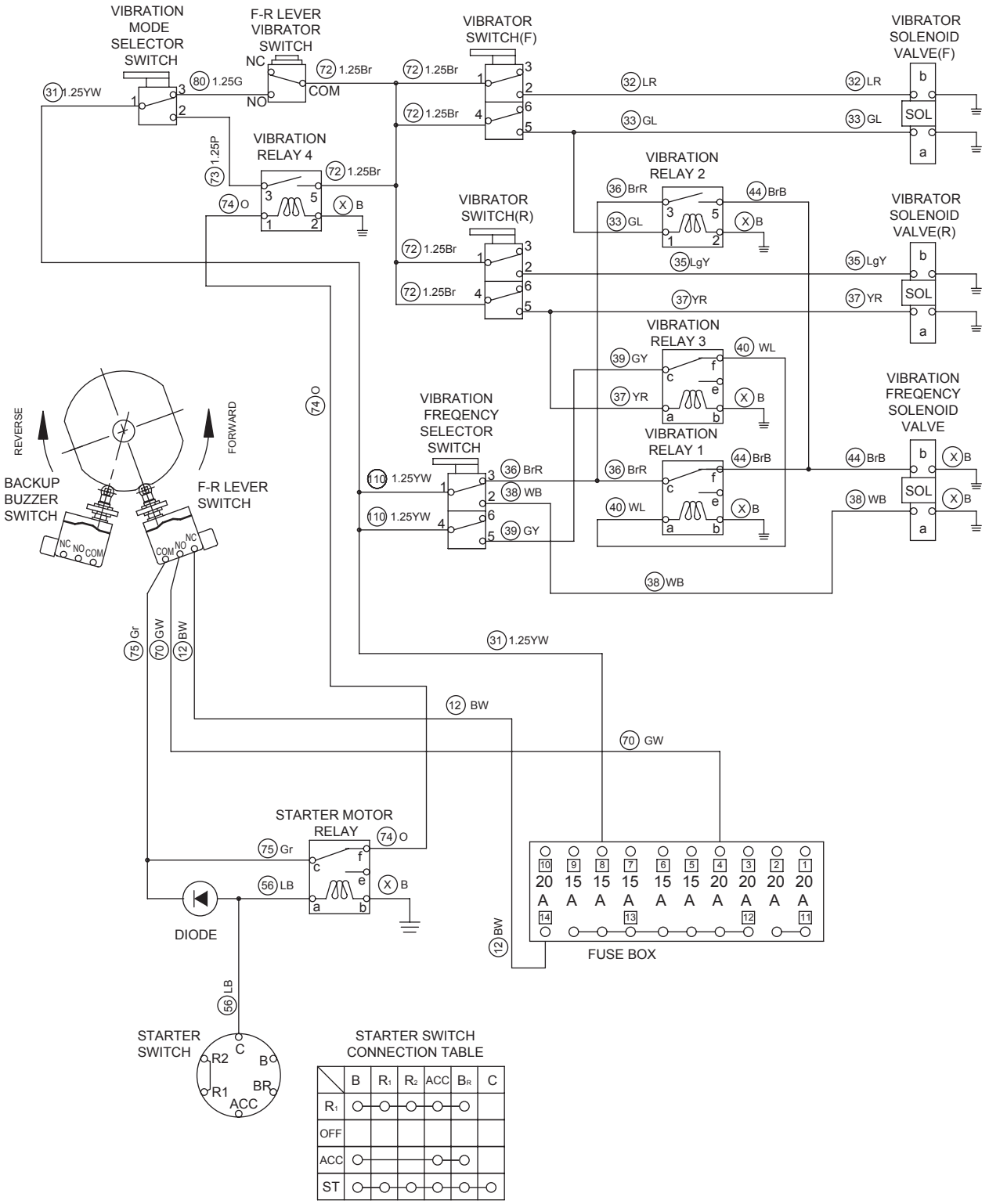
2-5-2. Amplitude does not change (Remains either Low or High)

- F-R lever vibrator switch must be ON.
- Vibration mode selector switch must be CONT.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Vibrator Solenoid (F) and (R)	• Disconnect harness and measure resistance of coil. Standard resistance: 10.3 ± 0.52 Ω • If measured resistance is abnormal, vibrator solenoid is faulty.	Replace vibrator solenoid (F) or (R).
2. Vibrator Switch (F) and (R)	(1) When starter switch is ON, measure voltage between vibrator switches terminal 1 or 4 inlet wire Br and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibrator switches terminal 2 or 5 outlet wire and chassis ground. Vibrator switch terminal 2 (Low amplitude) Front side: LR, Rear side: LgY Vibrator switch terminal 5 (High amplitude) Front side: GL, Rear side: YR Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, vibrator switch is faulty.	Replace vibrator switch (F) or (R).
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.: 2-5-1



SW800-Ⅱ-10004

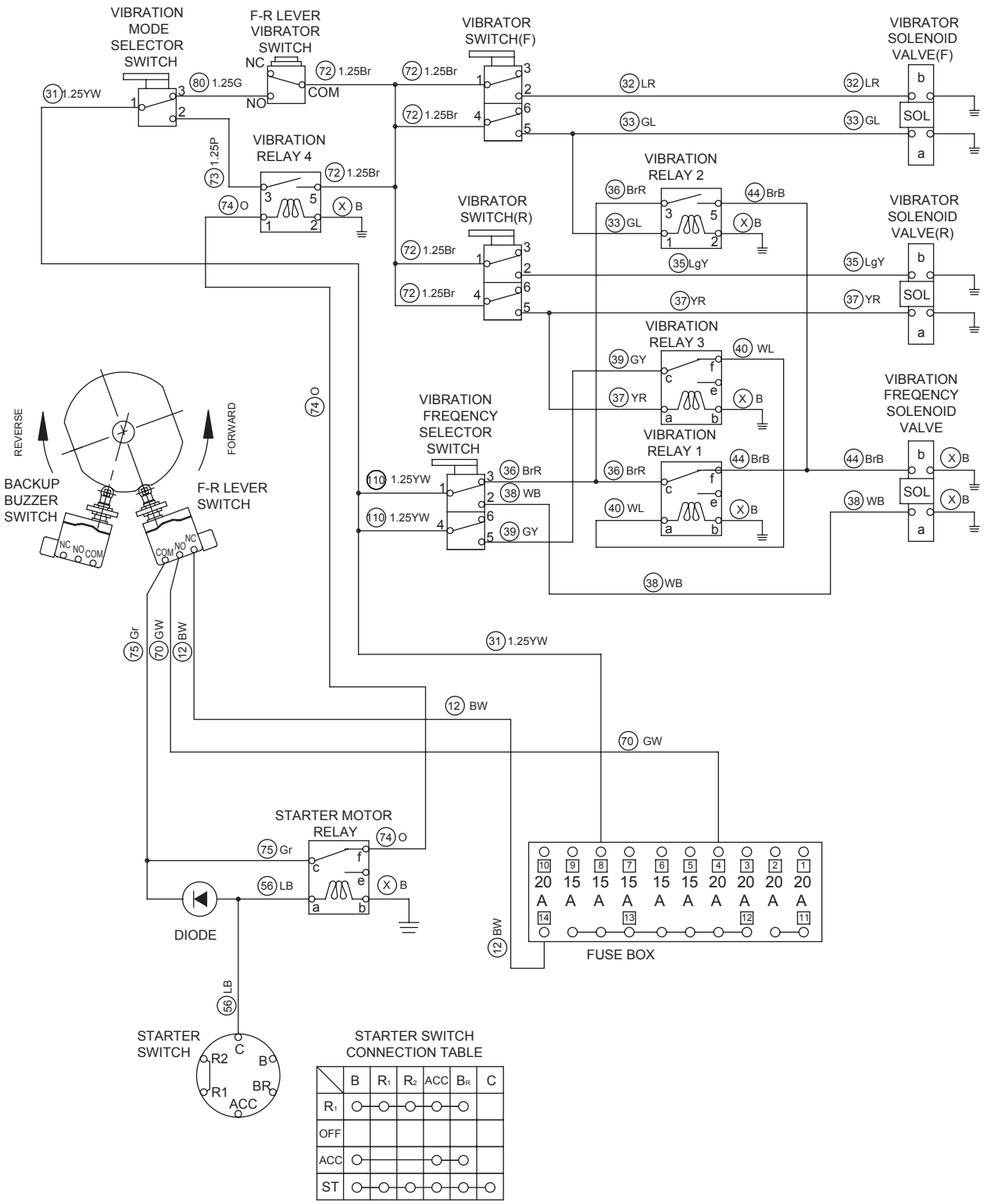
2-5-3. Vibration frequency does not change 1/4

- F-R lever vibrator switch must be ON.
- Vibration mode selector switch must be CONT.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Vibration Frequency Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance: 6.3 ± 0.6 Ω • If measured resistance is abnormal, vibration frequency solenoid is faulty.	Replace vibration frequency solenoid.
2. Vibration Frequency Selector Switch	(1) When starter switch is ON, measure voltage between vibration frequency selector switch terminal 1 or 4 inlet wire YW and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibration frequency selector switch terminal outlet wires and chassis ground. Switch is in 2500 position: Terminal 2 outlet wire WB 3000 position: Terminal 3 outlet wire BrR 4000 position: Terminal 3 outlet wire BrR and Terminal 5 outlet wire GY Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, vibration frequency selector switch is faulty.	Replace vibration frequency selector switch.
3. Vibration Relay 1	Vibration frequency selector switch is in 3000 and vibrator switches are in High or Low. (1) When starter switch is ON, measure voltage between vibration relay 1 terminal c inlet wire BrR and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibration relay 1 terminal f outlet wire BrB and chassis ground. Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, vibration relay 1 is faulty.	Replace vibration relay 1.
	Vibration frequency selector switch is in 4000 with front and rear vibrator switches are in Low. (1) When starter switch is ON, measure voltage between vibration relay 1 terminal c inlet wire BrR and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibration relay 1 terminal a inlet wire WL and chassis ground. Standard voltage: 12 V or more (3) When starter switch is ON, measure voltage between vibration relay 1 terminal f outlet wire BrB and chassis ground. There is no electricity in normal condition. • If above items (1) and (2) are OK and item (3) is NG, vibration relay 1 is faulty.	

Fig.: 2-5-1



SW800-Ⅱ-10004

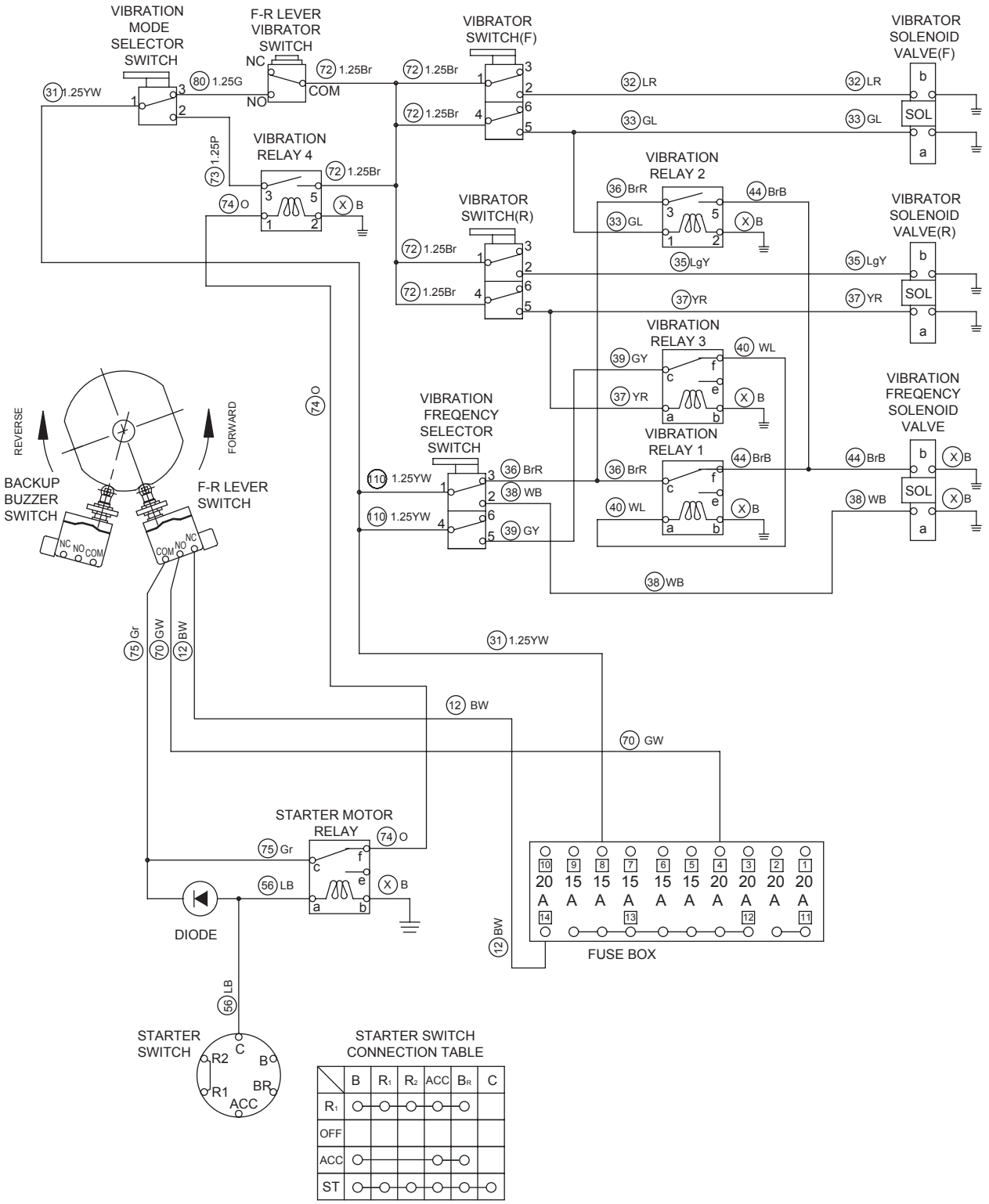
2-5-3. Vibration frequency does not change 2/4

- F-R lever vibrator switch must be ON.
- Vibration mode selector switch must be CONT.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
3. Vibration Relay 1	Vibration frequency selector switch is in 4000 without front and rear vibrator switches are in Low. (1) When starter switch is ON, measure voltage between vibration relay 1 terminal c inlet wire BrR and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibration relay 1 terminal a inlet wire WL and chassis ground. • There is no electricity in normal condition with vibrator switch (F) is either High or Low and vibrator switch (R) is High. • Standard voltage: 12 V or more with vibrator switch (F) is either High or Low and vibrator switch (R) is Low. (3) When starter switch is ON, measure voltage between vibration relay 1 terminal f outlet wire BrB and chassis ground. • Standard voltage: 12 V or more with vibrator switch (F) is either High or Low and vibrator switch (R) is High. • Standard voltage: 12 V or more with vibrator switch (F) is High and vibrator switch (R) is Low. **(NOTICE)** **When vibrator switch (F) is in High and vibrator switch (R) is in Low, current does not flow from vibration relay 1 terminal c to terminal f, while current flows from vibration relay 2 terminal 5.** • If above items (1) and (2) are OK and item (3) is NG, vibration relay 1 is faulty.	Replace vibration relay 1.

Fig.: 2-5-1



SW800-Ⅱ-10004

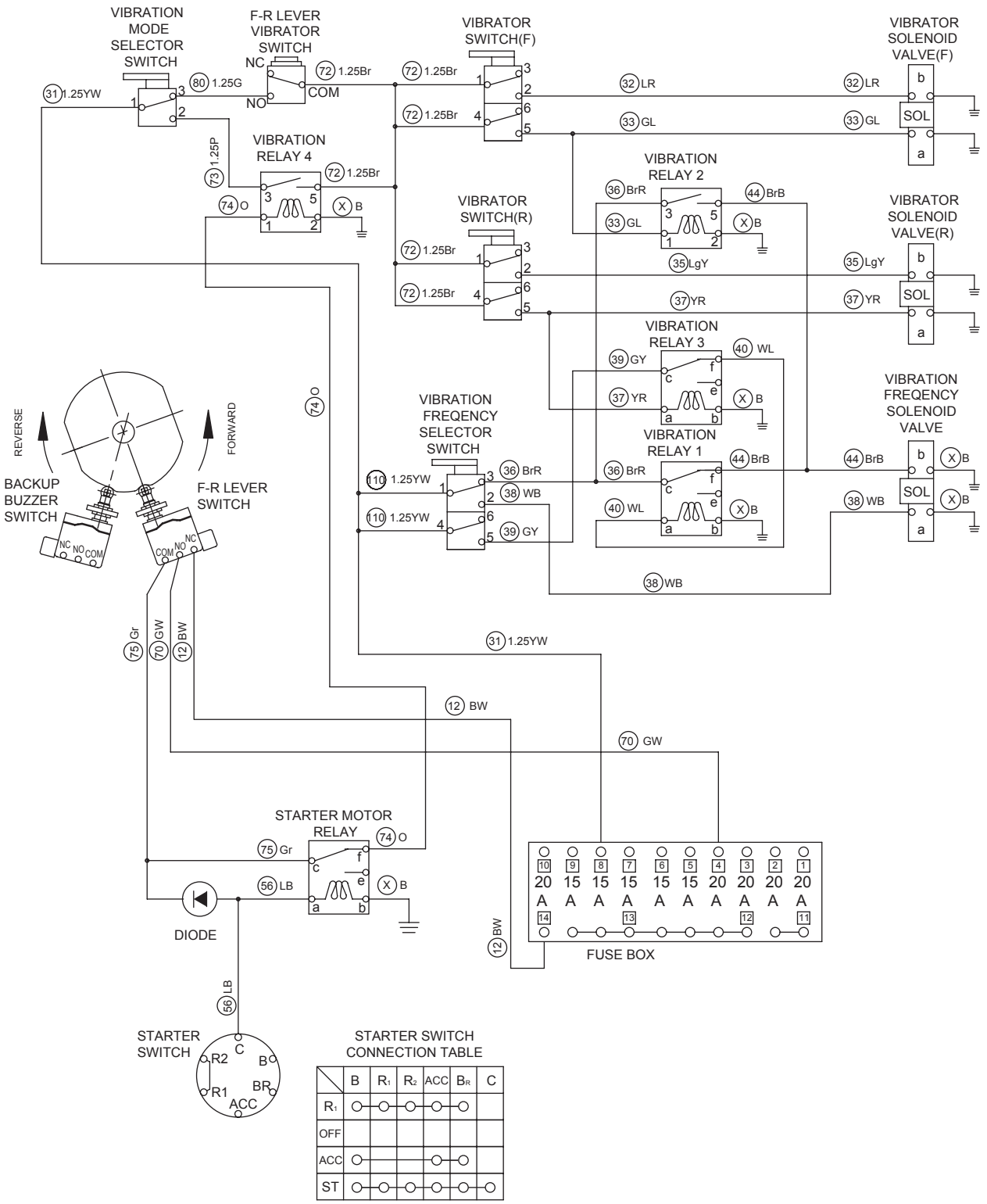
2-5-3. Vibration frequency does not change 3/4

- F-R lever vibrator switch must be ON.
- Vibration mode selector switch must be CONT.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
4. Vibration Relay 2	Vibration frequency selector switch is in 3000 or 4000. (1) When starter switch is ON, measure voltage between vibration relay 2 terminal 3 inlet wire BrR and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibration relay 2 terminal 1 inlet wire GL and chassis ground. • There is no electricity in normal condition with vibrator switch (F) is Low and vibrator switch (R) is either High or Low. • Standard voltage: 12 V or more with vibrator switch (F) is High and vibrator switch (R) is either High or Low. (3) When starter switch is ON, measure voltage between vibration relay 2 terminal 5 outlet wire BrB and chassis ground. • There is no electricity in normal condition with vibrator switch (F) is Low and vibrator switch (R) is either High or Low. • Standard voltage: 12 V or more with vibrator switch (F) is High and vibrator switch (R) is either High or Low. • If above items (1) and (2) are OK and item (3) is NG, vibration relay 2 is faulty.	Replace vibration relay 2.

Fig.: 2-5-1



SW800-Ⅱ-10004

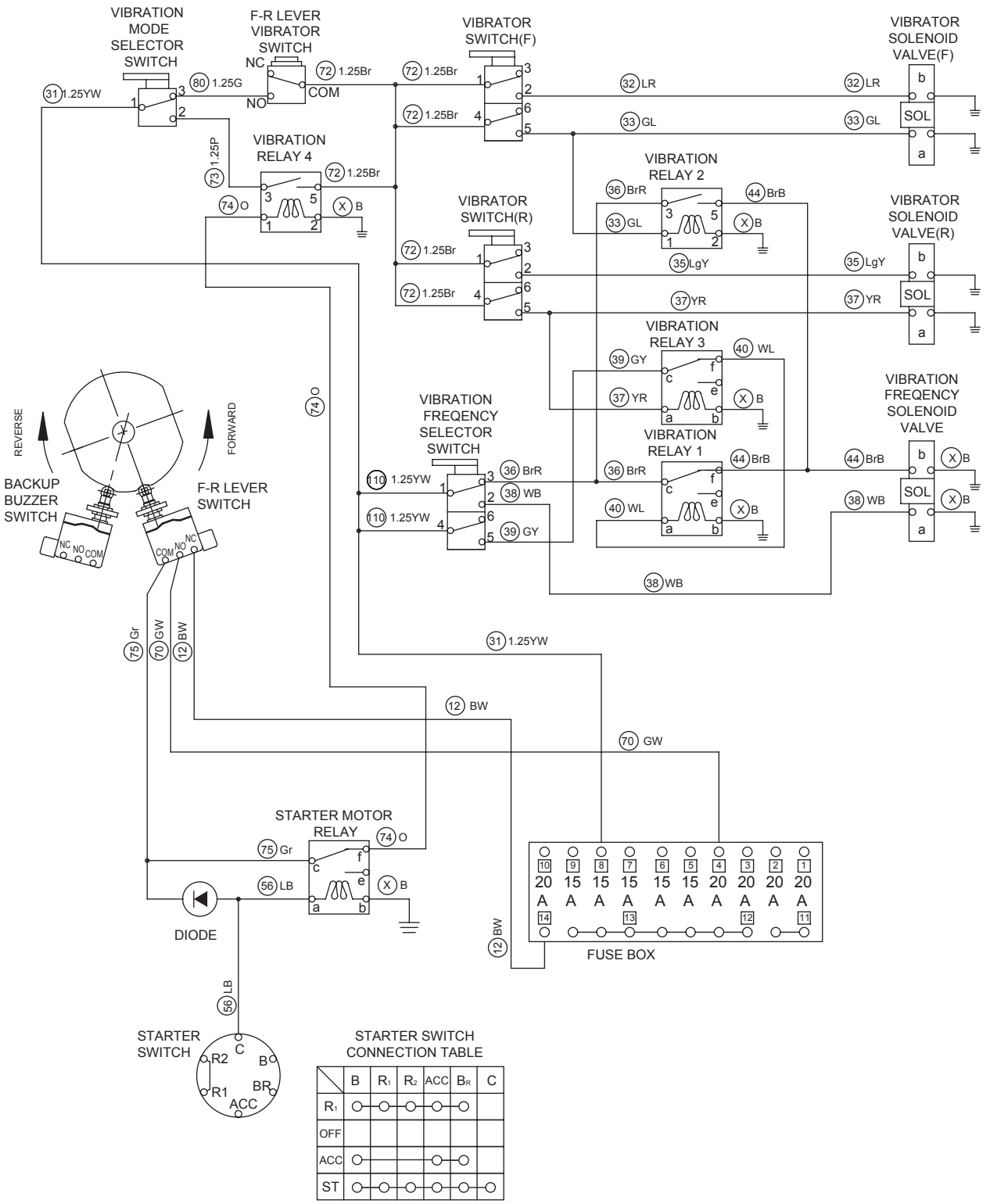
2-5-3. Vibration frequency does not change 4/4

- F-R lever vibrator switch must be ON.
- Vibration mode selector switch must be CONT.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
5. Vibration Relay 3	Vibration frequency selector switch is in 4000. (1) When starter switch is ON, measure voltage between vibration relay 3 terminal c inlet wire GY and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibration relay 3 terminal a inlet wire YR and chassis ground. • There is no electricity in normal condition when vibrator switch (F) is either High or Low and vibrator switch (R) is Low. • Standard voltage: 12 V or more when vibrator switch (F) is either High or Low and vibrator switch (R) is High. (3) When starter switch is ON, measure voltage between vibration relay 3 terminal f outlet wire WL and chassis ground. • There is no electricity in normal condition when vibrator switch (F) is either High or Low and vibrator switch (R) is High. • Standard voltage: 12 V or more when vibrator switch (F) is either High or Low and vibrator switch (R) is Low. • If above items (1) and (2) are OK and item (3) is NG, vibration relay 3 is faulty.	Replace vibration relay 3.
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.

Fig.: 2-5-1



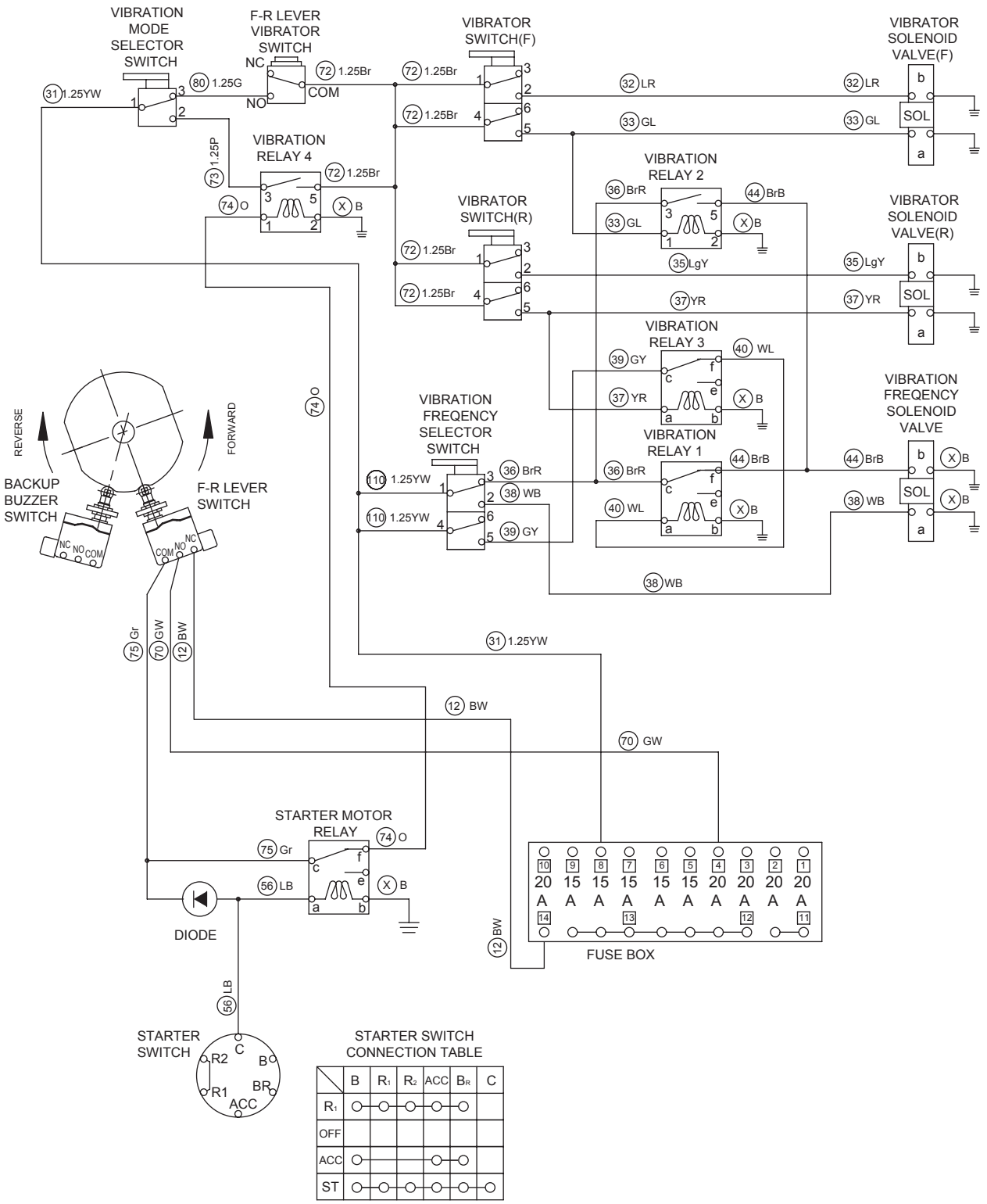
SW800-Ⅱ-10004

2-5-4. Continuous/automatic-vibration mode does not change

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Vibration Mode Selector Switch	(1) When starter switch is ON, measure voltage between vibration mode selector switch terminal 1 inlet wire YW and chassis ground. Standard voltage: 12 V or more (2) When vibration mode selector switch is CONT and starter switch is ON, measure voltage between vibration mode selector switch terminal 3 outlet wire G and chassis ground. Standard voltage: 12 V or more (3) When vibration mode selector switch is AUTO and starter switch is ON, measure voltage between vibration mode selector switch terminal 2 outlet wire P and chassis ground. Standard voltage: 12 V or more • If above item (1) is OK and item (2) or item (3) is NG, vibration mode selector switch is faulty.	Replace vibration mode selector 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



	B	R_1	R_2	ACC	B_R	C
R_1	○	○	○	○	○	
OFF						
ACC	○			○	○	
ST	○	○	○	○	○	○

SW800-Ⅱ-10004

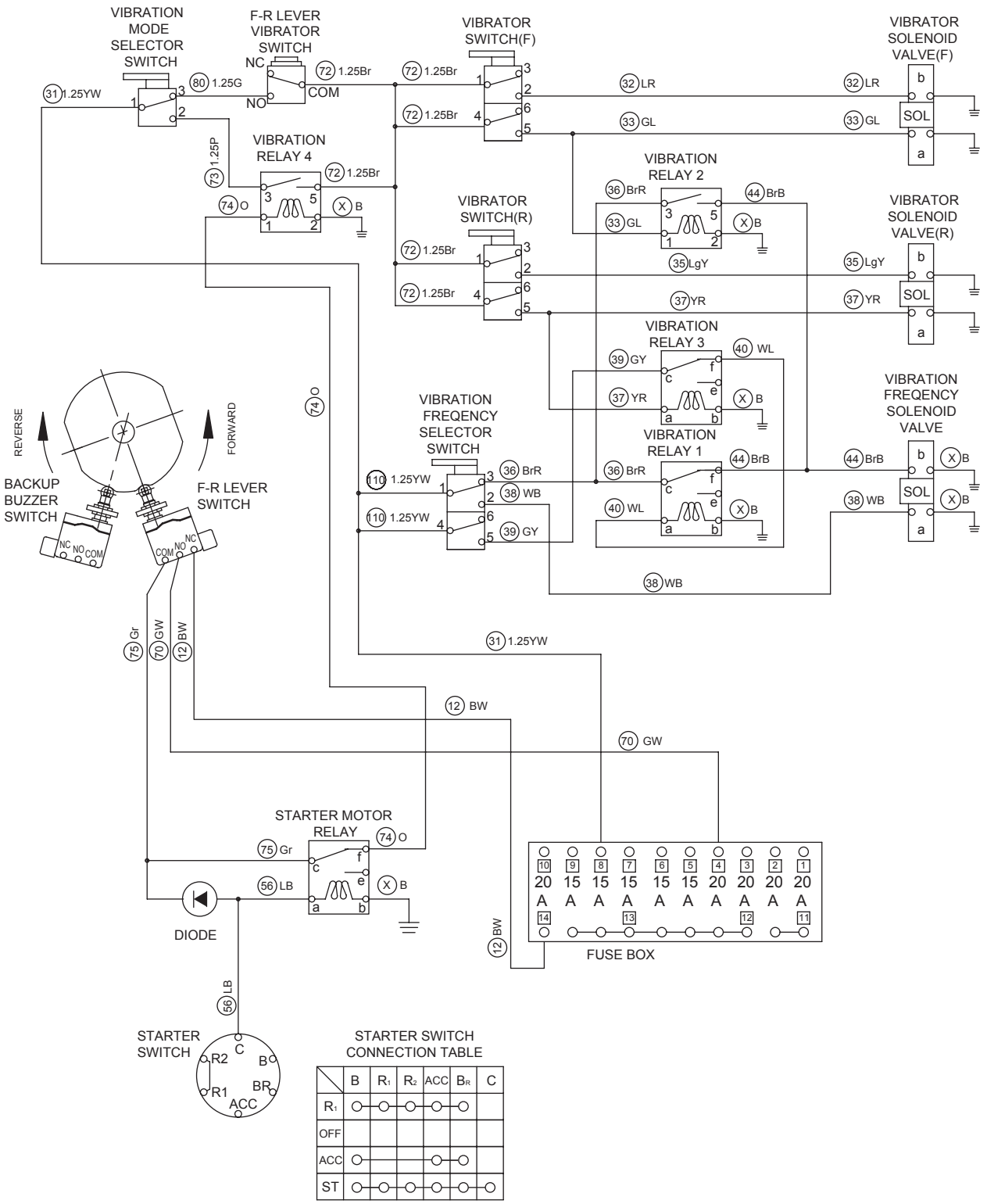
2-5-5. Automatic-vibration mode does not work 1/2

• Vibration mode selector switch must be AUTO.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Vibration Relay 4	(1) When starter switch is ON, measure voltage between vibration relay 4 terminal 3 inlet wire P and chassis ground. Standard voltage: 12 V or more (2) When F-R lever is in either forward or backward and starter switch is ON, measure voltage between vibration relay 4 terminal 1 inlet wire O and chassis ground. Standard voltage: 12 V or more (3) When starter switch is ON, measure voltage between vibration relay 4 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, vibration relay 4 is faulty.	Replace vibration relay 4.
2. Vibration Mode Selector Switch	(1) When starter switch is ON, measure voltage between vibration mode selector switch terminal 1 inlet wire YW and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between vibration mode selector switch terminal 2 outlet wire P and chassis ground. Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, vibration mode selector switch is faulty.	Replace vibration mode selector switch.

Fig.: 2-5-1



SW800-Ⅱ-10004

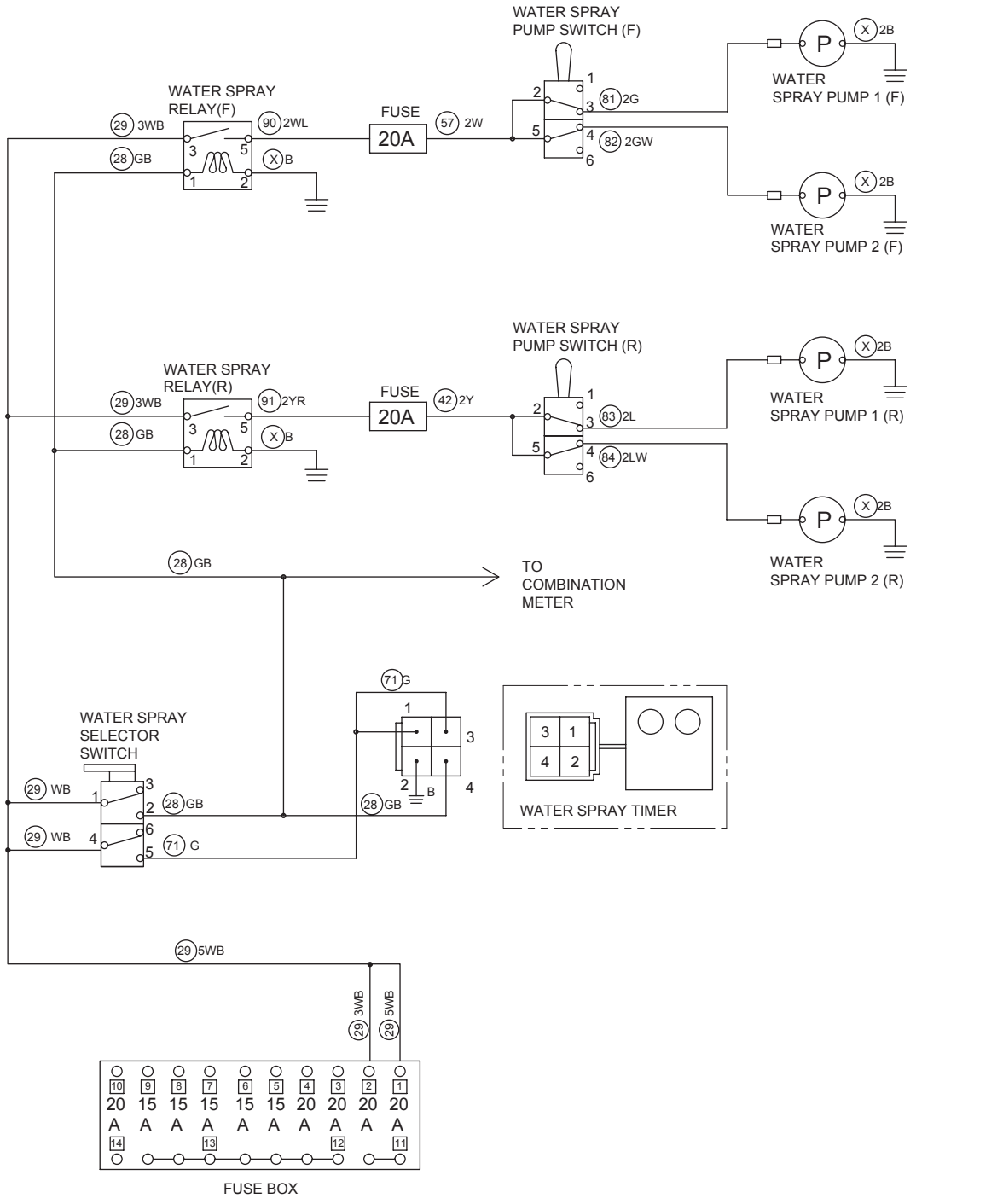
2-5-5. Automatic-vibration mode does not work 2/2

• Vibration mode selector switch must be AUTO.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
3. Starter Motor Relay	(1) When F-R lever is in either forward or backward and starter switch is ON, measure voltage between starter motor relay terminal c inlet wire Gr and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between starter motor relay terminal a inlet wire LB and chassis ground. There is no electricity in normal condition. (3) When F-R lever is in either forward or backward and starter switch is ON, measure voltage between starter motor relay terminal f inlet wire O 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.
4. F-R Lever Switch	(1) When F-R lever is in either forward or backward and starter switch is ON, measure voltage between F-R lever switch terminal NO inlet wire GW and chassis ground. Standard voltage: 12 V or more (2) When F-R lever is in either forward or backward and starter switch is ON, measure voltage between F-R lever switch terminal COM outlet wire Gr 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.
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.: 2-6-1



SW800-Ⅱ-10005

2-6. Water Spray

Check following item before troubleshooting.

- No blown fuses.

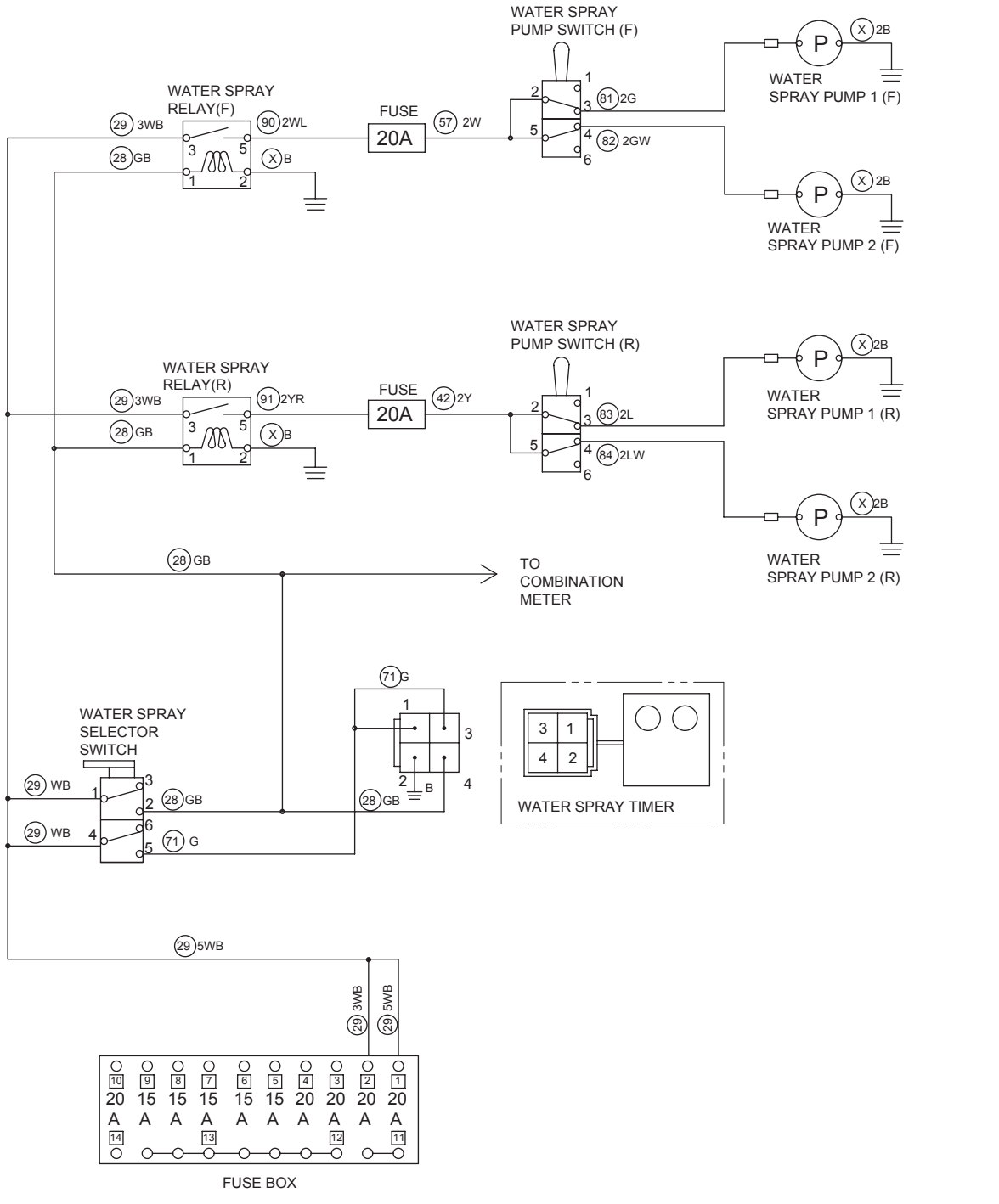
2-6-1. Continuous water spray does not operate 1/2

- Water spray selector switch must be CONT.
- Set water spray pump switch to simultaneous spray position.
- Water spray timer must be OFF.

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
1. Water Spray Pump 1 (F) and 2 (F), 1 (R) and 2 (R)	(1) When starter switch is ON, measure voltage between water spray pumps terminal inlet wires and chassis ground. Water spray pump 1 (F) inlet wire: G Water spray pump 2 (F) inlet wire: GW Water spray pump 1 (R) inlet wire: L Water spray pump 2 (R) inlet wire: LW Standard voltage: 12 V or more (2) Check if grounding of water spray pumps are normal. • If above items (1) and (2) are OK and water spray pump does not operate, water spray pump is faulty.	Replace water spray pump 1 (F) or 2 (F), 1 (R) or 2 (R).
2. Water Spray Pump Switch (F) and (R)	(1) When starter switch is ON, measure voltage between water spray pump switches terminal 2 or 5 inlet wire and chassis ground. Water spray pump switch (F) inlet wire: W Water spray pump switch (R) inlet wire: Y Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between water spray pump switches terminal 3 or 4 outlet wire and chassis ground. Water spray pump switch terminal 3 Front side : G, Rear side: L Water spray pump switch terminal 4 Front side : GW, Rear side: LW Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, water spray selector switch is faulty.	Replace water spray pump switch (F) or (R).
3. Water Spray Relay (F) and (R)	(1) When starter switch is ON, measure voltage between water spray relays terminal 1 inlet wire GB and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between water spray relays terminal 3 inlet wire WB and chassis ground. Standard voltage: 12 V or more (3) When starter switch is ON, measure voltage between water spray relays terminal 5 outlet wire and chassis ground. Water spray relay (F): WL Water spray relay (R): YR Standard voltage: 12 V or more • If above items (1) and (2) are OK and item (3) is NG, water spray relay is faulty.	Replace water spray relay (F) or (R).

Fig.: 2-6-1



SW800-Ⅱ-10005

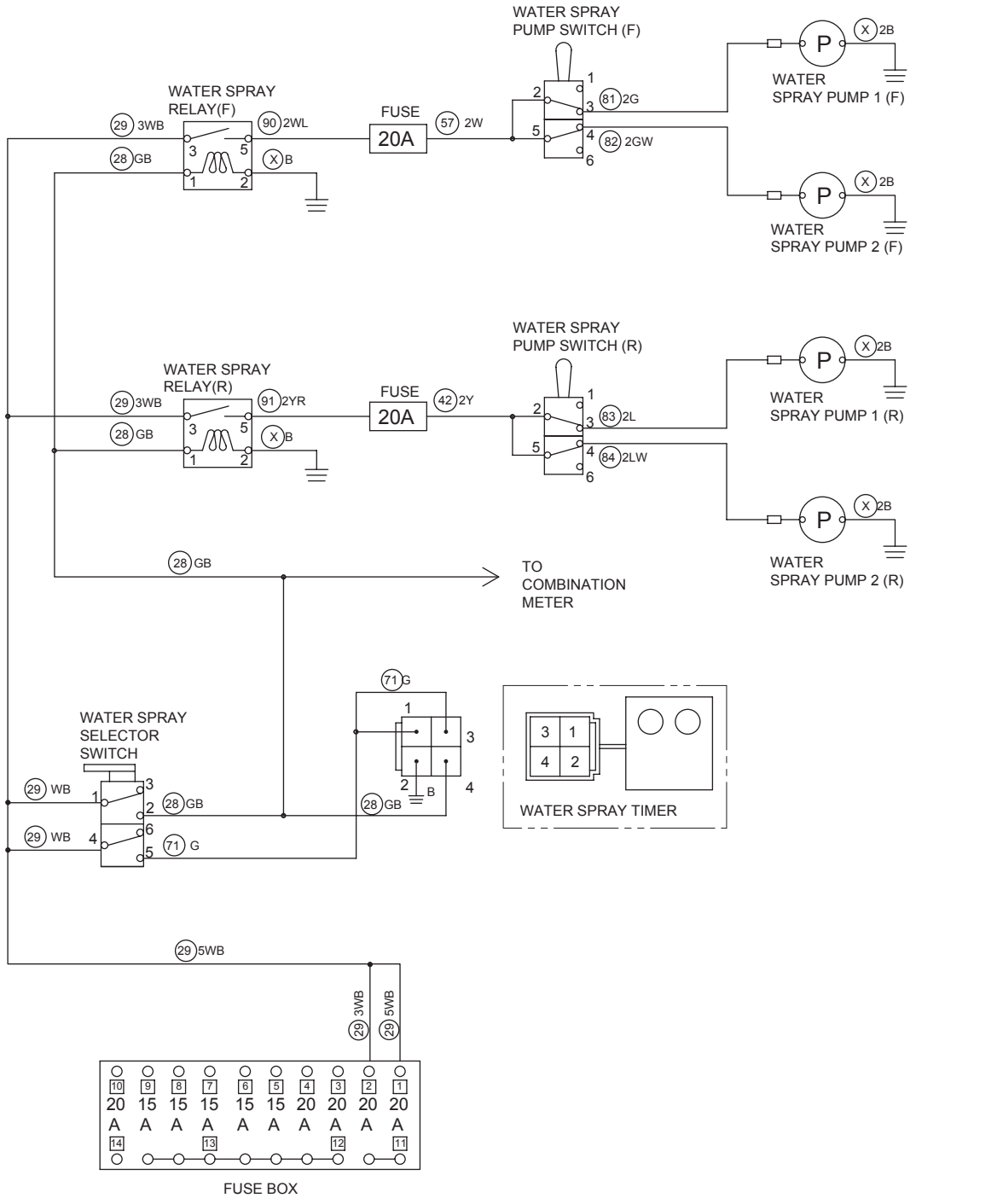
2-6-1. Continuous water spray does not operate 2/2

- Water spray selector switch must be CONT.
- Set water spray pump switch to simultaneous spray position.
- Water spray timer must be OFF.

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
4. Water Spray Selector Switch	(1) When starter switch is ON, measure voltage between water spray selector switch terminal 1 inlet wire WB and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between water spray selector switch terminal 2 outlet wire GB and chassis ground. Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, water spray selector switch is faulty.	Replace water spray selector 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.: 2-6-1



SW800-Ⅱ-10005

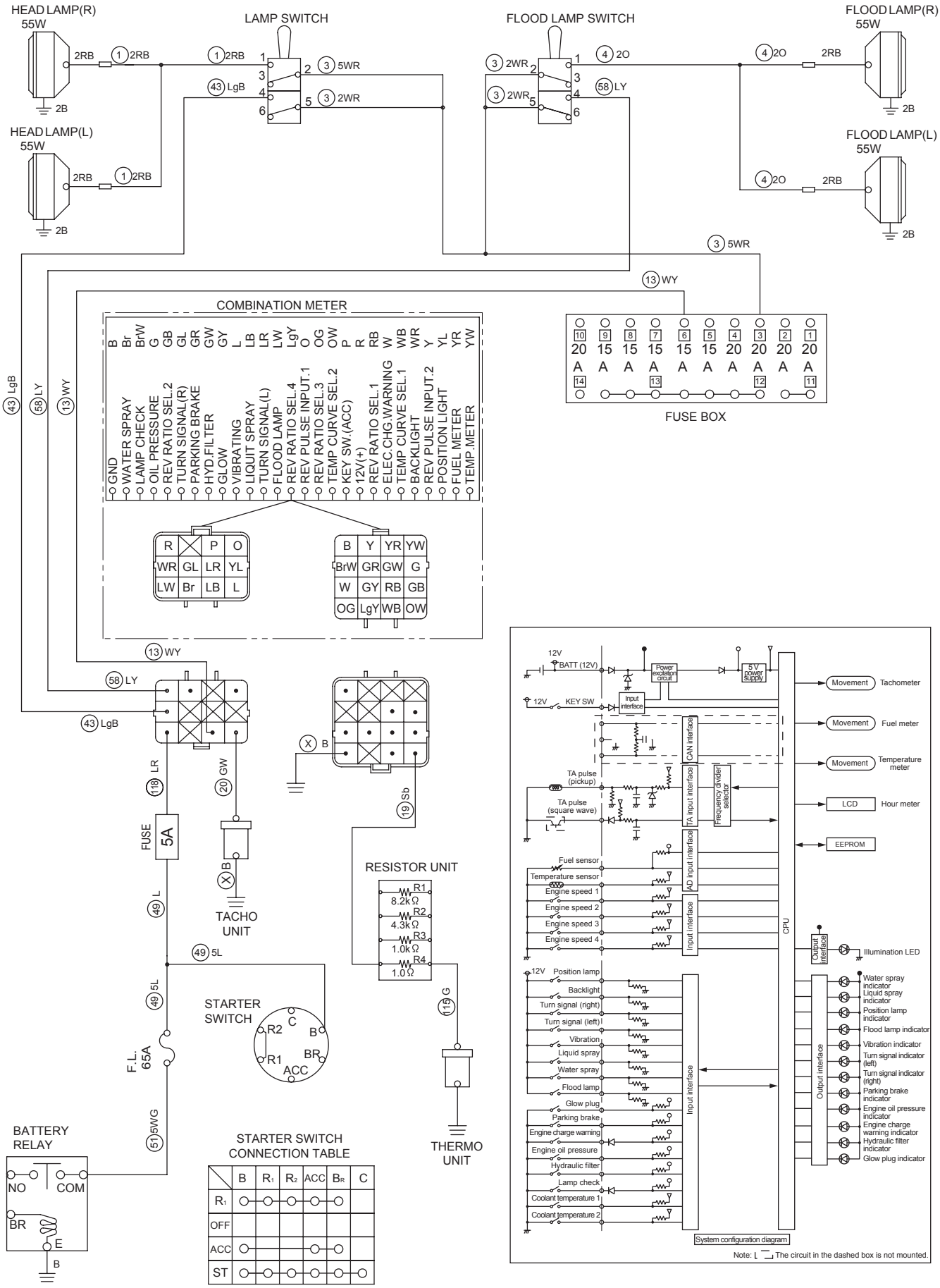
2-6-2. Continuous water spray works, but intermittent water spray does not operate

- Water spray selector switch must be TIMER.
- Water spray timer must be ON.

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
1. Water Spray Timer	(1) When starter switch is ON, measure voltage between water spray timer terminal 1 and 3 inlet wire G and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, 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 unit, water spray timer is faulty.	Replace water spray timer.
2. Water Spray Selector Switch	(1) When starter switch is ON, measure voltage between water spray selector switch terminal 4 inlet wire WB and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between water spray selector switch terminal 5 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 selector switch is faulty.	Replace water spray selector 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.: 2-7-1



SW800-Ⅱ-10006

2-7. Lighting

Check following item before troubleshooting.

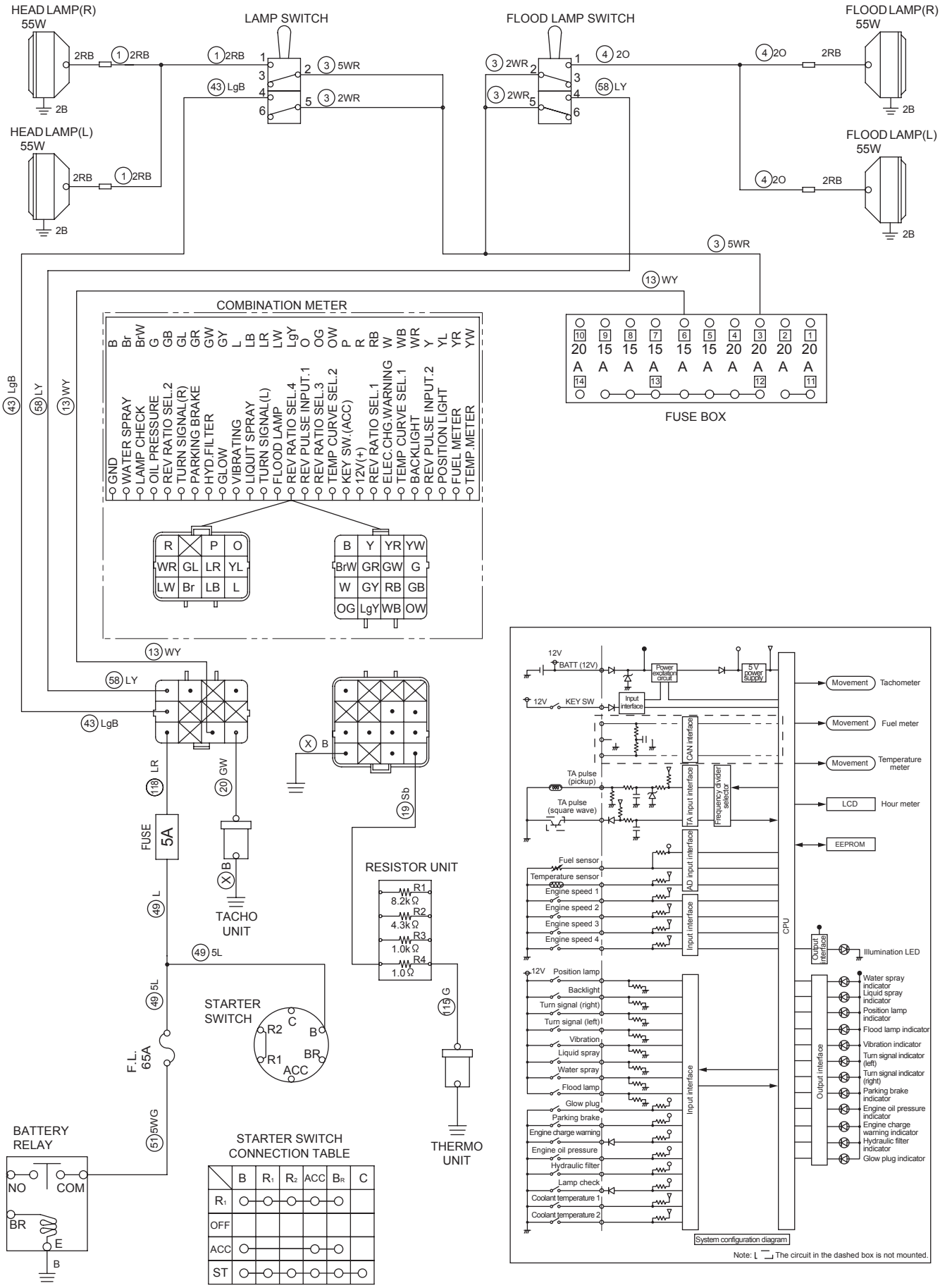
- No blown fuses.

2-7-1. Headlamps or flood lamps do not light

Reference Fig.: 2-7-1

Check point	Check/Cause	Action
1. Each Bulb	• Check that none of lamp bulbs is burned out or has a contact failure. • Bulb is faulty or poorly connected.	Replace each bulb.
2. Lamp Switch	(1) When starter switch is ON, measure voltage between lamp switch terminal 2 or 5 inlet wire WR and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON and lamp switch is ON, measure voltage between lamp switch terminal 1 or 4 outlet wire and chassis ground. Terminal 1 outlet wire RB Terminal 4 outlet wire LgB Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, lamp switch is faulty.	Replace lamp switch.
3. Flood Lamp Switch	(1) When starter switch is ON, measure voltage between flood lamp switch terminal 2 or 5 inlet wire WR and chassis ground. Standard voltage: 12 V or more (2) When starter switch is ON and flood lamp switch is ON, measure voltage between flood lamp switch terminal 1 or 4 outlet wire and chassis ground. Terminal 1 outlet wire O Terminal 4 outlet wire LY Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, flood lamp switch is faulty.	Replace flood lamp 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.: 2-7-1



SW800-Ⅱ-10006

2-7-2. Illumination of combination meter does not turn on

• Check that headlamps turn on.

Reference Fig.: 2-7-1

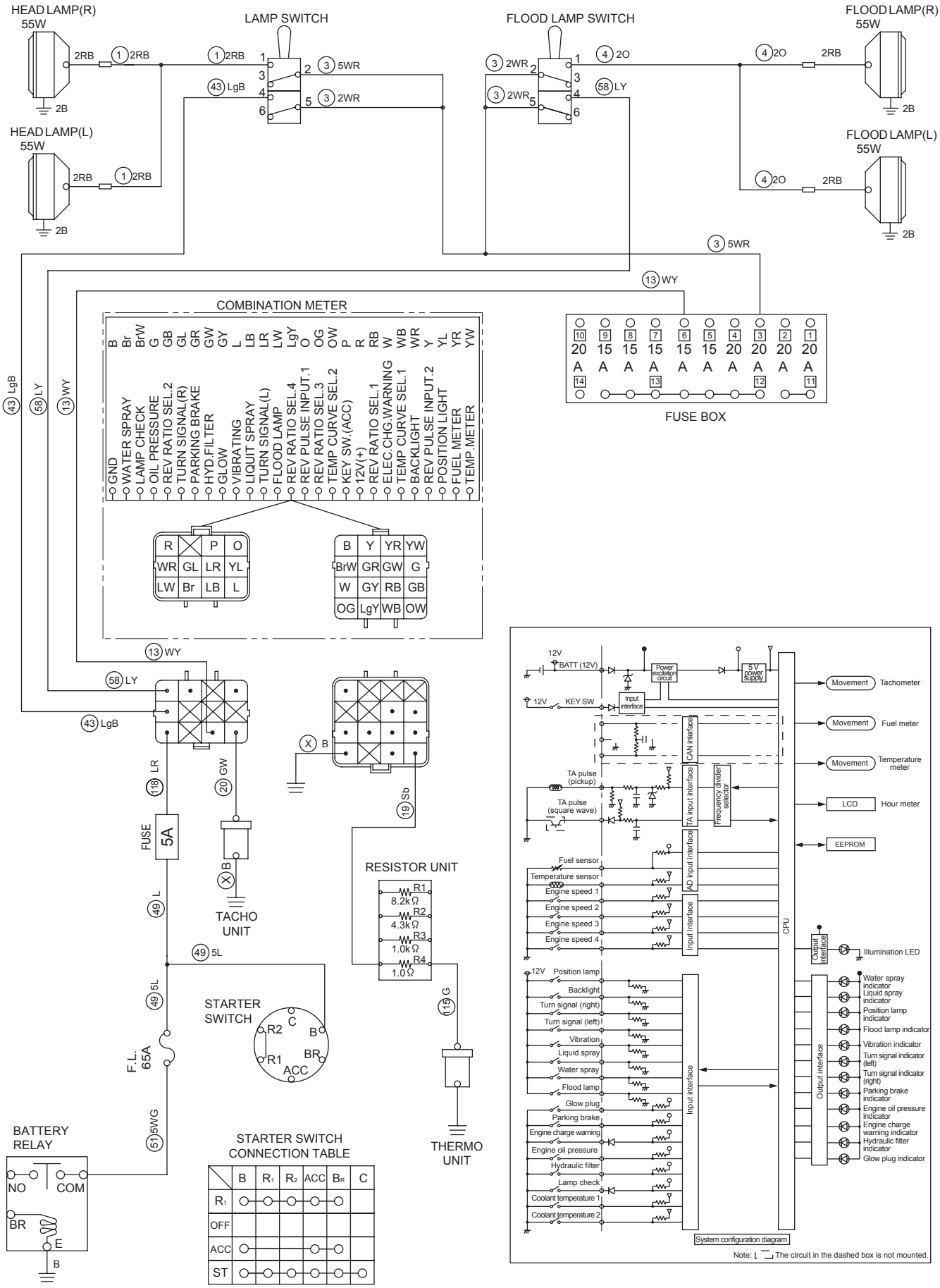
Check point	Check/Cause	Action
1. Harness	• Measure resistance between lamp switch terminal 4 outlet wire LgB and combination meter connector terminal wire No.43 LgB. Standard resistance: 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) Standard voltage: 12 V or more (2) When starter switch is ON and lighting switch is ON, measure voltage between combination meter terminal wire WR (backlight terminal) and chassis ground. Standard voltage: 12 V or more • If above items (1) and (2) are OK and combination meter lamp does not turn on, combination meter is faulty.	Replace combination meter.

2-7-3. Combination meter warning lamp or indicator lamp is abnormal

Reference Fig. : 2-7-1

Check point	Check/Cause	Action
1. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) Standard voltage: 12 V or more (2) When starter switch is ON, check that parking brake indicator lamp, hydraulic filter warning lamp, oil pressure warning lamp and charge warning lamp illuminate and then go out after starting engine. • If above item (1) is OK and item (2) is NG, combination meter is faulty.	Replace combination meter.

Fig.: 2-7-1



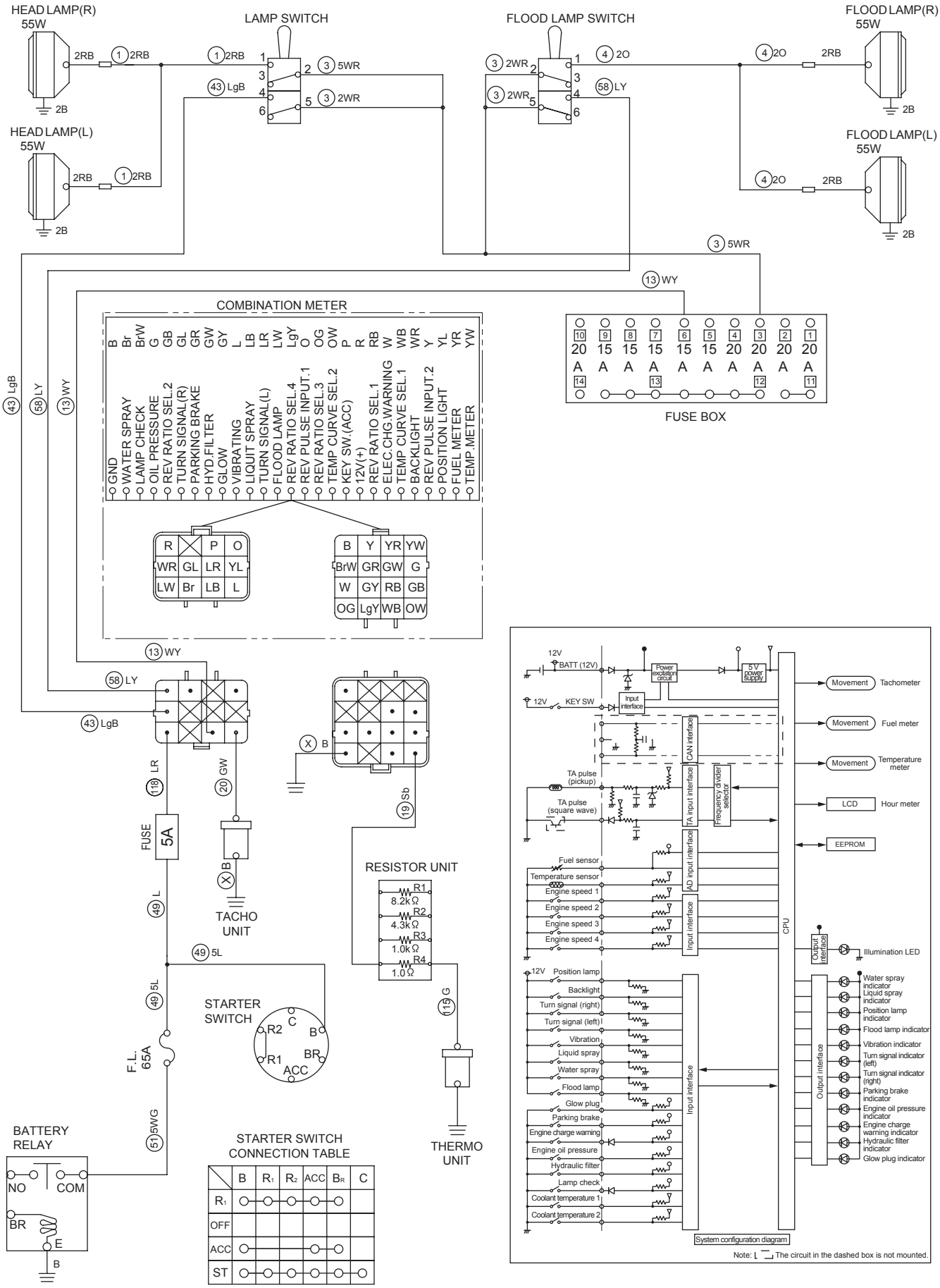
SW800-Ⅱ-10006

2-7-4. Tachometer reading is abnormal

Reference Fig.: 2-7-1

Check point	Check/Cause	Action
1. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) Standard voltage: 12 V or more (2) Check that combination meter terminal RB, GB and OG wires (Engine speed 1 to 3) are grounded. (3) Start engine and measure pulse between combination meter terminal O wire (TA pulse terminal) and chassis ground. Standard pulse: 127 pulses/rotation of engine • If above items (1) and (2) are OK and item (3) is NG, combination meter is faulty.	Replace combination meter.
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.: 2-7-1



SW800-Ⅱ-10006

2-7-5. Hour meter is abnormal

Reference Fig.: 2-7-1

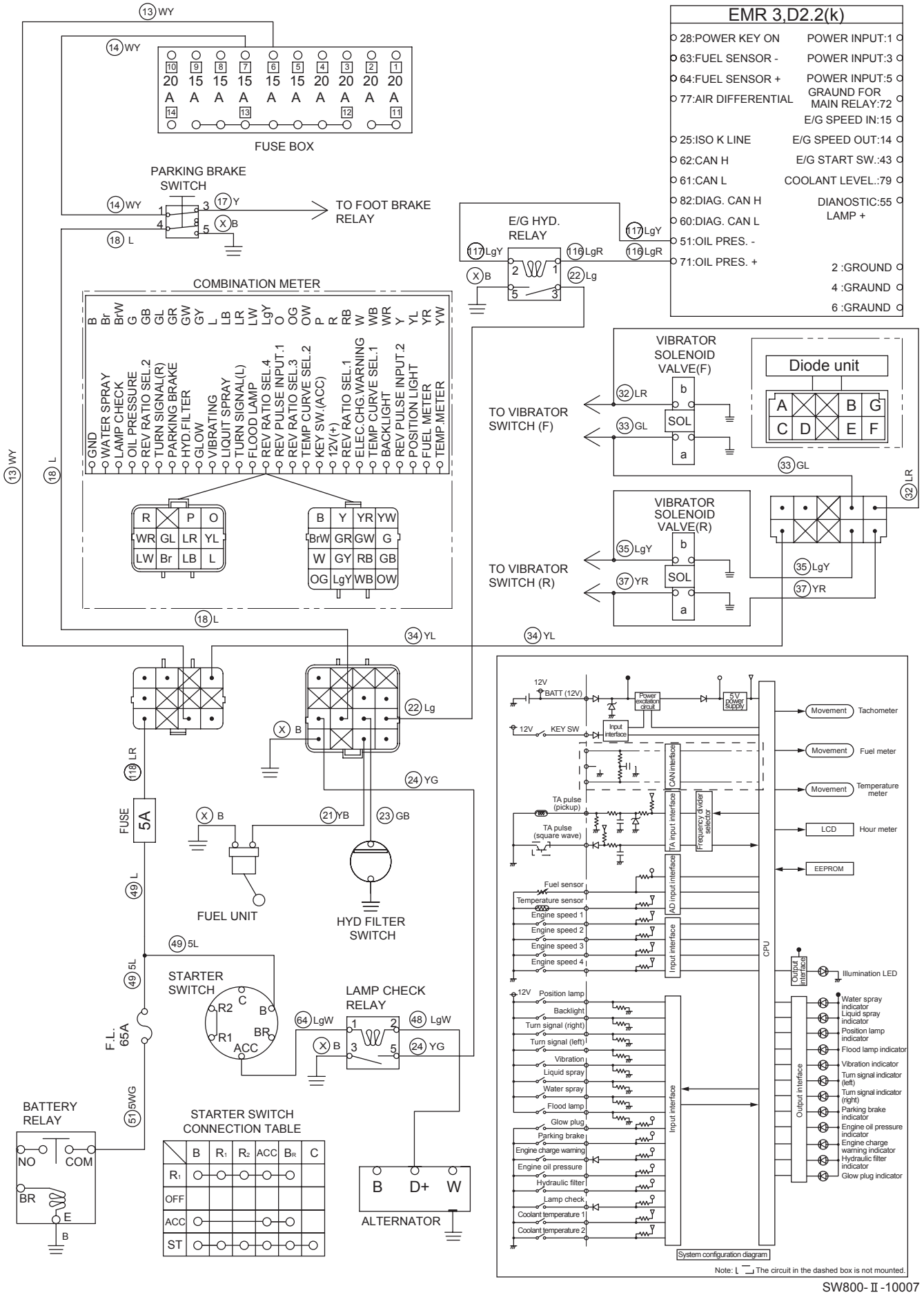
Check point	Check/Cause	Action
1. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) Standard voltage: 12 V or more • If no abnormality is found, combination meter is faulty.	Replace combination meter.

2-7-6. Temperature gauge is abnormal

Reference Fig.: 2-7-1

Check point	Check/Cause	Action
1. Thermo Unit	• Disconnect harness and measure resistance of thermo unit. Standard resistance: 164.6 Ω [(at unit temperature of 50°C (122°F)] 26.44 Ω [(at unit temperature of 103°C (217°F)] • If resistance is abnormal, thermo unit is faulty.	Replace thermo unit.
2. Resistor Unit	• Measure resistance between resistor unit (R4) wire G and wire Sb. Standard resistance: 1 Ω • If resistance is abnormal, resistor unit is faulty.	Replace resistor unit.
3. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) Standard voltage: 12 V or more • If above item is OK and no abnormality is found in thermo unit and resistor unit, combination meter is faulty.	Replace combination meter.
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.: 2-7-2



SW800-Ⅱ-10007

2-7-7. Fuel gauge is abnormal

Reference Fig.: 2-7-2

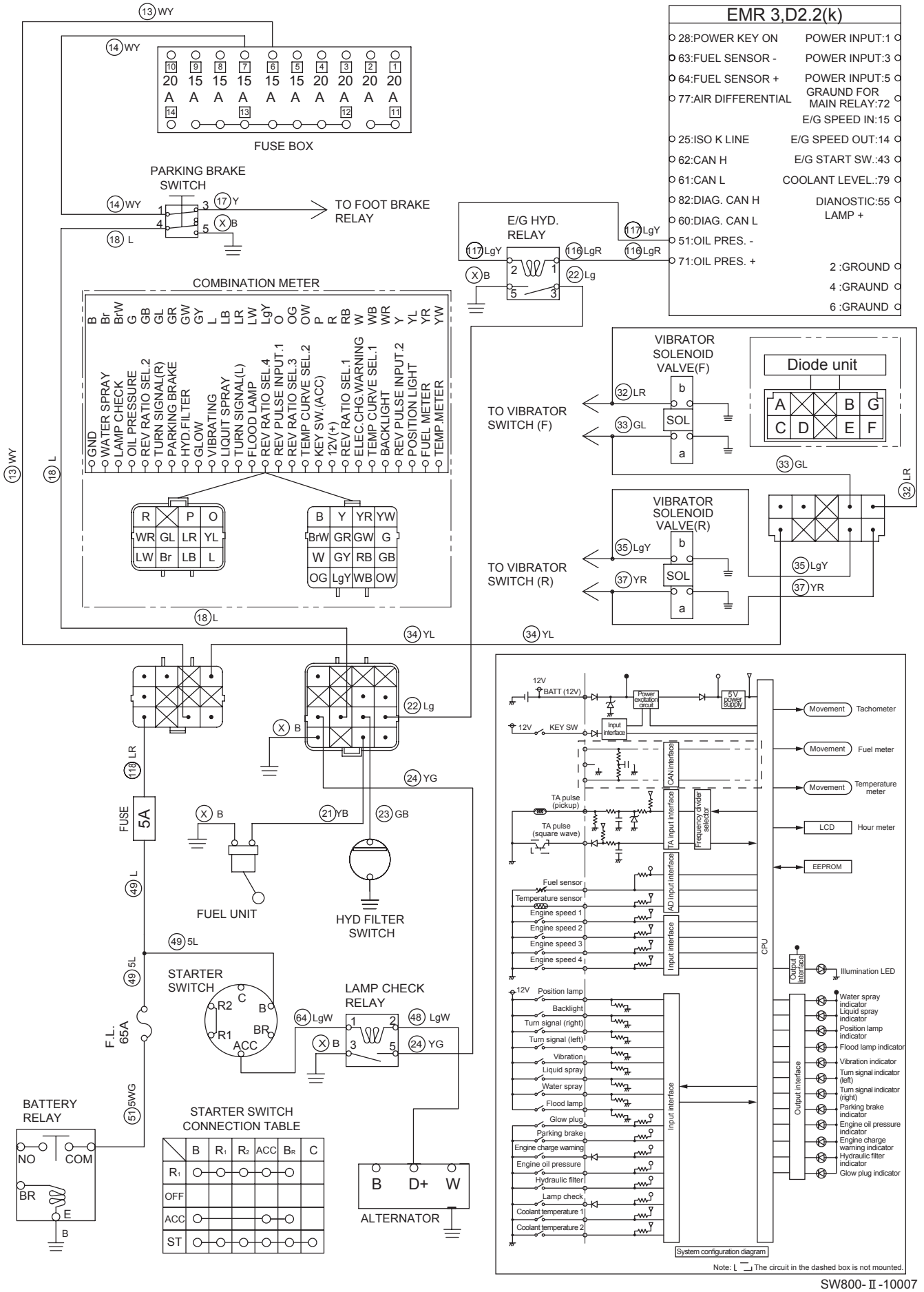
Check point	Check/Cause	Action
1. Fuel Unit	• Disconnect harness and measure resistance of fuel unit. Standard resistance: 13.5 Ω (with float in Full position) 80.0 Ω (with float in Empty position) • If resistance is abnormal, fuel unit is faulty.	Replace fuel unit.
2. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) Standard voltage: 12 V or more • If above item is OK and no abnormality is found in fuel unit, 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.

2-7-8. Hydraulic oil filter warning lamp remains ON

Reference Fig.: 2-7-2

Check point	Check/Cause	Action
1. Hydraulic Oil Filter Switch	• When engine is not running, check continuity between hydraulic oil filter switch terminal and chassis ground. There is no continuity in normal condition. • If there is continuity, hydraulic oil filter switch is faulty.	Replace hydraulic oil filter switch.

Fig.: 2-7-2



SW800-Ⅱ-10007

2-7-9. Charge warning lamp remains ON

• Start the engine.

Reference Fig.: 2-7-2

Check point	Check/Cause	Action
1. Harness	• Disconnect alternator terminal D+ and lamp check relay terminal 2. • Measure resistance between terminals and chassis ground. Alternator terminal D+ and chassis ground Lamp check relay terminal 2 and chassis ground Standard resistance: 100 kΩ or more • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Lamp Check Relay	(1) Measure voltage between lamp check relay terminal 2 wire LgW and chassis ground. Standard voltage: 12 V or more (2) Measure voltage between lamp check relay terminal 3 wire B and chassis ground. There is no electricity in normal condition. • If above item (1) is OK and item (2) is NG, lamp check relay is faulty.	Replace lamp check relay.

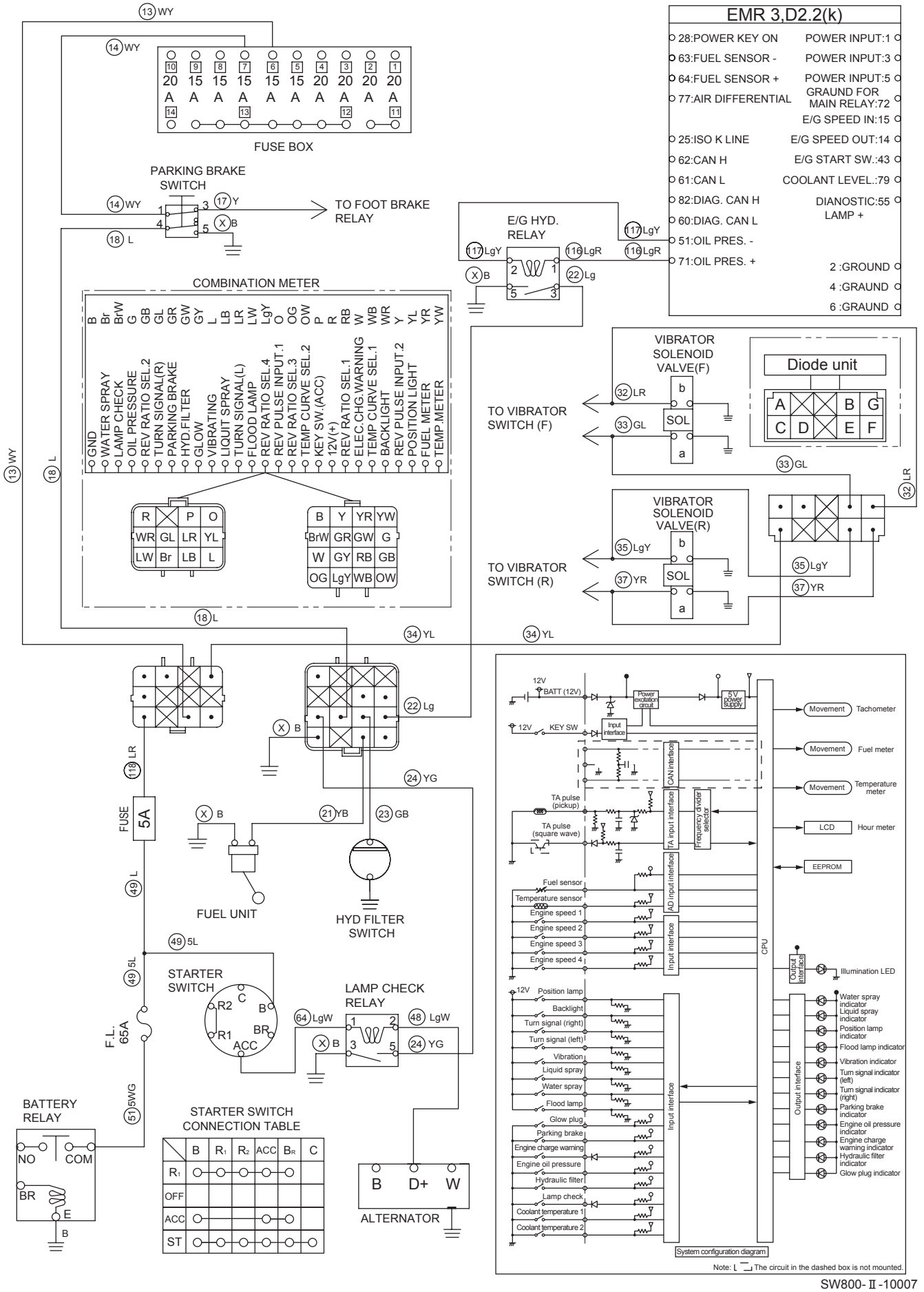
2-7-10. Vibrator indicator lamp does not light 1/2

• Check that vibration can be activated.

Reference Fig.: 2-7-2

Check point	Check/Cause	Action
1. Diode Unit	(1) When starter switch is ON, measure voltage between diode unit terminals and chassis ground. Vibrator switch (F) is High: Terminal E inlet wire GL Low : Terminal F inlet wire LR Vibrator switch (R) is High: Terminal G inlet wire YR Low : Terminal B inlet wire LgY Standard voltage: 12 V or more (2) When starter switch is ON, measure voltage between diode unit terminal A outlet wire YL and chassis ground. Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, diode unit is faulty.	Replace diode unit.
2. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) Standard voltage: 12 V or more (2) When starter switch is turned ON, measure voltage between combination meter terminal L (vibrator lamp terminal) wire YL 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.: 2-7-2



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2-7-10. Vibrator indicator lamp does not light 2/2

• Check that vibration can be activated.

Reference Fig.: 2-7-2

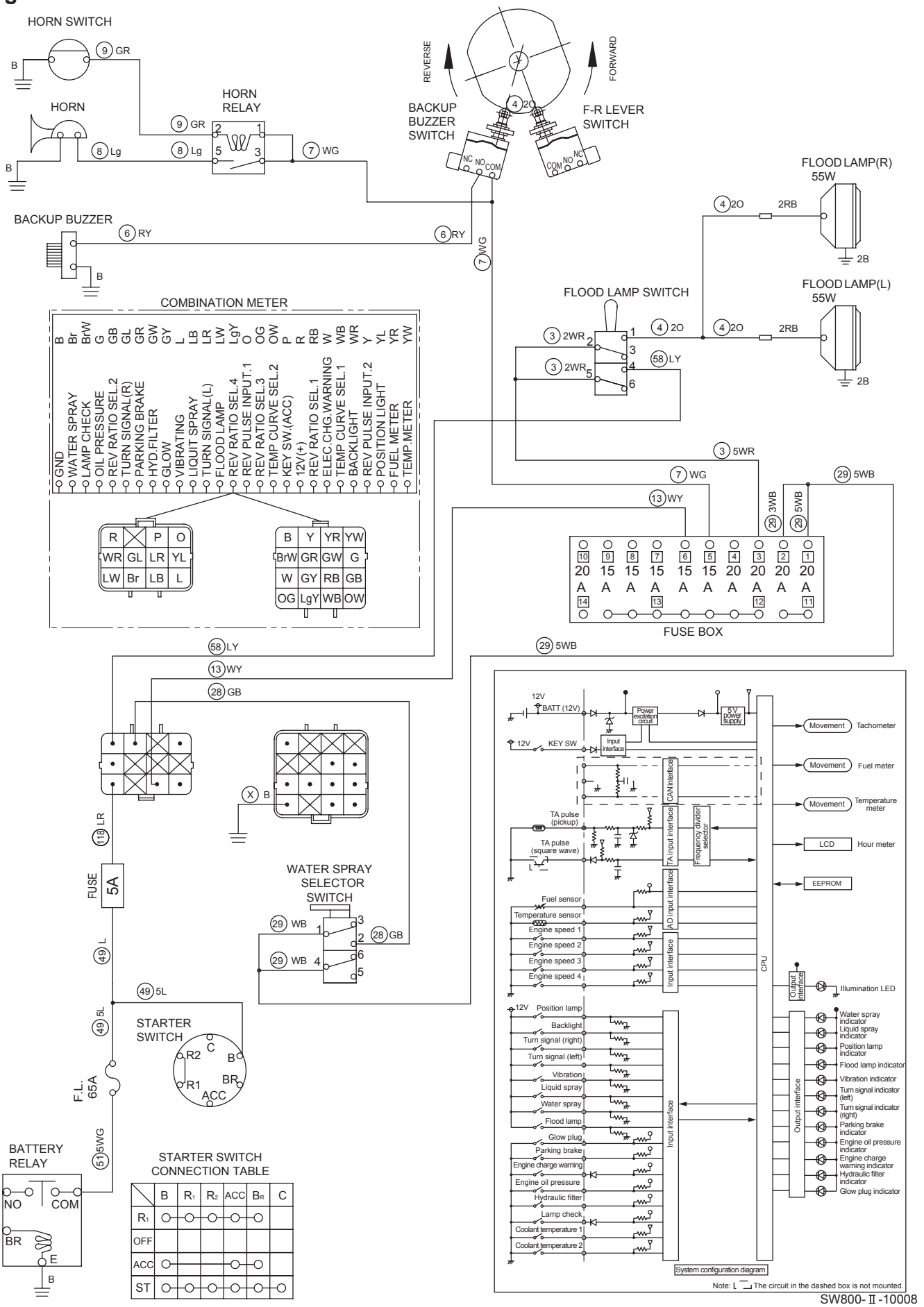
Check point	Check/Cause	Action
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance: 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

2-7-11. Parking brake indicator lamp does not light

Reference Fig.: 2-7-2

Check point	Check/Cause	Action
1. Parking Brake Switch	• When starter switch is ON, measure voltage between parking brake switch terminal 4 inlet wire L and chassis ground. Standard voltage: 12 V or more • If above measurement is OK and parking brake indicator lamp does not light even though parking brake switch is applied/release, parking brake switch is faulty.	Replace parking brake switch.
2. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) (2) When starter switch is ON, measure voltage between combination meter terminal GR (parking brake terminal) wire L and chassis ground. Standard voltage: 12 V or more • If above item (1) is OK and item (2) is NG, 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.: 2-7-3



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2-7-12. Water spray indicator lamp does not light

• Check that water spray pumps can be activated.

Reference Fig.: 2-7-3

Check point	Check/Cause	Action
1. Harness	• Measure resistance between water spray selector switch terminal 2 outlet wire GB and combination meter terminal wire Br. Standard resistance: 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) Standard voltage: 12 V or more (2) When starter switch is ON and water spray selector switch is CONT or TIMER, measure voltage between combination meter terminal wire Br (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.

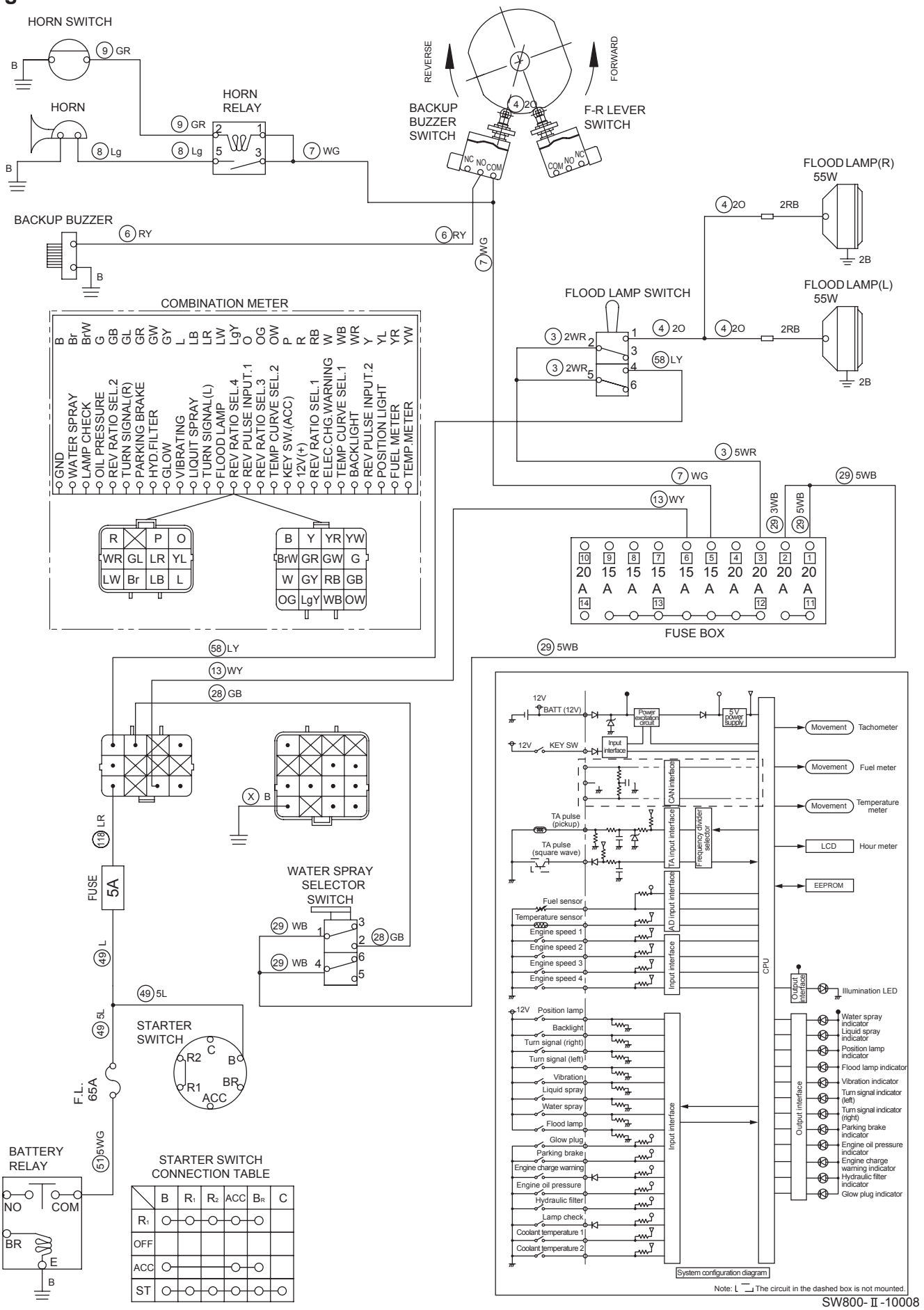
2-7-13. Flood lamp indicator lamp does not light

• Check that flood lamps can be turned on.

Reference Fig.: 2-7-3

Check point	Check/Cause	Action
1. Harness	• Measure resistance between flood lamp switch terminal 4 outlet wire LY and combination meter terminal wire LW. Standard resistance: 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Combination Meter	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. Terminal wire R (battery terminal) and terminal wire B (ground terminal) Terminal wire P (starter switch terminal) and terminal wire B (ground terminal) Standard voltage: 12 V or more (2) When starter switch is ON and flood lamp switch is ON, measure voltage between combination meter terminal wire LW (flood lamp 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.: 2-7-3



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2-7-14. Horn does not sound

Reference Fig.: 2-7-3

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 Relay	(1) When starter switch is ON and horn switch is pressed, measure voltage between horn relay terminal 2 outlet wire GR 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.
3. Horn Switch	• When horn switch is OFF, measure resistance between horn switch terminals. Standard resistance: 100 Ω or more • If resistance is abnormal, horn switch is faulty.	Replace horn 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.

2-7-15. Backup buzzer does not sound

Reference Fig.: 2-7-3

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. Backup Buzzer Switch	(1) When starter switch is ON, measure voltage between backup buzzer switch terminal COM inlet wire WG and chassis ground. Standard voltage: 12 V or more (2) When F-R lever is in reverse position and starter switch is ON, measure voltage between backup 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, backup buzzer switch is faulty.	Replace backup 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

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. Vehicle 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. F-R Lever Linkage	F-R lever linkage is faulty.	Check and adjust F-R lever linkage or replace it if necessary.
4. Propulsion 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. *1
	Charge pressure decreases due to pressure leakage from pressure override valve (cut-off valve).	Check and adjust pressure override valve or replace it if necessary.
	Insufficient propulsion charge pump discharge.	Repair propulsion charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Brake release solenoid valve	When solenoid is energized, check if oil flows in return circuit to tank. If so, carry out following action. • Repair or replace brake solenoid valve.
5. Propulsion Servo Circuit Pressure	Propulsion pump can not discharge oil because oil does not flow into servo cylinder chamber due to a faulty control valve or linkage.	Measure servo circuit pressure. If low, repair control valve and linkage or replace them if necessary.
6. Suction Filter for Charge Pump	Charge pump flow is reduced due to clogged filter.	Clean suction filter or replace it if necessary.
7. Propulsion Circuit Pressure	Pump does not discharge oil because setting pressure of pressure override valve (cut-off valve) is low.	Measure propulsion circuit pressure. If low, check and adjust pressure override valve or replace it if necessary.
	Circuit does not obtain required pressure because setting pressure of high-pressure relief valve is low.	Measure propulsion circuit pressure. If low, check and adjust high-pressure relief valve or replace it if necessary.
8. Propulsion Motor	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.

*1: Relief valve for charge circuit is located in propulsion pump.

3-2-1. Vehicle moves neither forward nor backward 2/2

Check point	Cause	Check/Action
9. Brake Solenoid Valve	Brake remains applied because spool of brake solenoid valve does not shift.	Repair or replace brake solenoid valve.
10. Brake	Brake cannot be disengaged because brake discs in propulsion motor are stuck.	Measure brake release pressure. If high, repair brake discs in propulsion motor or replace it if necessary.
11. Coupling	Drive torque is not transmitted to pump due to faulty coupling.	Replace coupling.

3-2-2. Vehicle moves in one direction only (forward or backward)

Check point	Cause	Check/Action
1. F-R Lever Linkage	F-R lever linkage is faulty.	Check and adjust F-R lever linkage or replace it if necessary.
2. High-pressure Relief Valve	Low circuit pressure due to incorrect high-pressure relief setting or internal leakage.	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 vehicle speed or small drive force

Check point	Cause	Check/Action
1. Bypass Valve	Bypass valve is slightly open.	Close bypass valve completely.
2. F-R Lever Linkage	F-R lever linkage is faulty.	Check and adjust F-R lever linkage or replace it if necessary.
3. 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 charge pump discharge.	Repair or replace charge pump.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Brake solenoid valve	When solenoid is energized, check if oil flows in return circuit to tank. If so, carry out following action. • Repair or replace brake solenoid valve.
4. Suction Filter for Charge Pump	Flow rate of charge pump decreases as well as charge pressure decreases due to clogged filter.	Clean or replace suction filter.
5. Propulsion Motor Inlet Pressure	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.
6. Internal Leakage of Propulsion Motor	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.
7. 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.

3-2-4. Vehicle does not stop completely with forward-reverse lever in neutral position

Check point	Cause	Check/Action
1. Propulsion Pump Servo Cylinder	Faulty propulsion pump servo cylinder or faulty pump swash plate setting.	Repair propulsion pump or replace it if necessary.

3-2-5. Propulsion system is overheating

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Oil Cooler	Cooling efficiency is reduced due to clogged oil cooler fins.	Clean oil cooler fins.
3. Flushing Valve	Hydraulic oil in propulsion closed circuit is insufficiently cooled due to flushing valve shuttle spool sticking.	Repair flushing valve or replace it if necessary.
	Hydraulic oil in propulsion closed circuit is insufficiently cooled because flushing valve relief setting pressure is excessively high.	Adjust flushing valve relief setting pressure or replace it if necessary.
4. Propulsion Circuit Setting 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 Charge Pump	Load of 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. Charge Line Filter	Charge circuit pressure increases due to clogged filter.	Clean line filter or replace it if necessary.

3-2-6. Abnormal noise from propulsion system

Check point	Cause	Check/Action
1. Axle Bearings	Axle bearings supporting front drum and rear drum are damaged.	Replace axle bearings.
2. Hydraulic Hose Clamp	Vibrator sound of hydraulic hose is generated because clamp securing hydraulic hose is loose.	Tighten bolts of loose hydraulic hose clamp to specified torque.
3. Suction Filter for Charge Pump	Cavitation is occurring in 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. Suction Filter for Vibrator Pump	Flow rate of vibrator pump decreases due to clogged filter.	Clean suction filter or replace it if necessary.
3. Vibrator Circuit Pressure	Necessary circuit pressure cannot be obtained because setting pressure of main relief valve or port relief valve is too low.	Measure vibrator circuit pressure. If low, check and adjust main relief valve or port relief valve or replace them if necessary.
4. Vibrator Solenoid Valve (for Bypassing)	Vibrator circuit pressure is bypassed because sequence valve is stuck.	Measure vibrator circuit pressure. If normal, clean or replace vibrator solenoid valve.
	Vibrator pressure is bypassed because vibrator solenoid valve spool does not switch.	If vibrator solenoid valve spool does not switch, repair vibrator solenoid valve or replace it if necessary.
5. 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.
6. Vibrator Motor	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.

3-3-2. Vibrator frequency does not change

Check point	Cause	Check/Action
1. Vibration Frequency Solenoid Valve	Vibrator pump swash plate does not move because vibration frequency solenoid valve spool is stuck.	Check and clean spool of vibration frequency solenoid valve or replace it if necessary.
2. Vibrator Pump	Faulty vibrator pump servo cylinder.	Replace vibrator pump.

3-3-3. Vibrator frequency is too low

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Vibrator Solenoid Valve (for Bypassing)	Vibrator pressure is bypassed due to internal leakage of vibrator solenoid valve.	Repair vibrator solenoid valve or replace it if necessary.
3. Vibrator Circuit Pressure	Decrease in circuit pressure due to internal leakage in main relief valve or port relief valve.	Measure vibrator circuit pressure. If low, check and adjust main relief valve or port relief valve or replace them if necessary.
4. Internal Leakage in Vibrator Motor	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.
5. Vibrator Pump	Decrease in discharge rate from vibrator pump due to reduced vibrator pump efficiency.	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.

3-3-4. Amplitude does not switch between high and low

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Rotation direction of eccentric shaft limited to either direction with no switching of vibrator motor due to faulty vibrator solenoid valve.	Repair vibrator solenoid valve or replace it if necessary.

3-3-5. Vibrator does not stop

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibrator solenoid spool does not return to neutral (vibration is OFF) position.	If vibrator solenoid valve does not return to neutral (vibration is OFF) position, repair vibrator solenoid valve or replace it if necessary.

3-3-6. Vibrator system is overheating

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Oil Cooler	Cooling efficiency is reduced due to clogged oil cooler fins.	Clean oil cooler fins.
3. Vibrator Circuit Setting 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.
4. Suction Filter for Vibrator Pump	Load of vibrator pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean suction filter or replace it if necessary.

3-3-7. Abnormal noise from vibrator system

Check point	Cause	Check/Action
1. Vibrator Bearings	Vibrator bearings supporting eccentric shaft are damaged.	Replace vibrator bearings.
2. Hydraulic Hose Clamp	Vibrator sound of hydraulic hose is generated because clamp securing hydraulic hose is loose.	Tighten bolts of loose hydraulic hose clamp to specified torque.
3. Suction Filter for Vibrator Pump	Cavitation is occurring in vibrator 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

If a problem occurs in the steering systems such as the steering pump and orbitrol, determine the cause and carry out action as required, according to the following general troubleshooting items.

(NOTICE)

- **When checking whether or not the pressure is correct, refer to the pressure standard value for each hydraulic circuit.**

3-4-1. Steering wheel is hard to turn

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Orbitrol	Relief valve is open or setting pressure is low.	Measure steering circuit pressure. 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 line filter.	Clean line filter 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 Pump	Steering pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
6. Steering Pump	Discharging pressure is insufficient due to efficiency degradation of steering pump.	Measure steering circuit pressure. If low, replace steering 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 adjust relief valve or replace it if necessary.
3. Steering Cylinder	Internal leakage of steering cylinder	Repair steering cylinder or replace it if necessary.
4. Suction Filter for Steering Pump	Steering pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
5. Steering Pump	Discharging pressure is insufficient due to efficiency degradation of steering pump.	Measure steering circuit pressure. If low, replace steering 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 Setting 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 Pump	Load of steering 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. Air in 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 Pump	Cavitation is occurring in steering pump due to clogged filter.	Clean suction filter or replace it if necessary.

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