SV204

SHOP MANUAL

SAKAI®

3498-6406A-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.

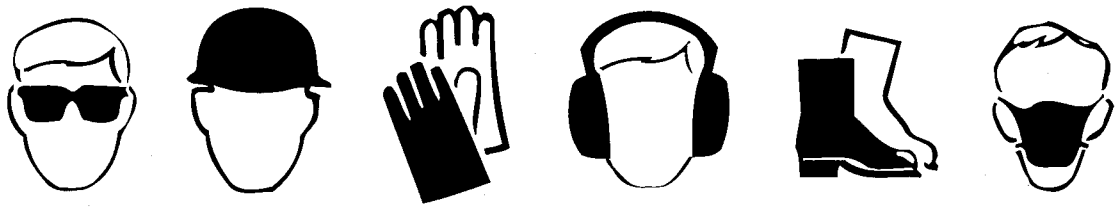
- The machine is designed specifically for the compaction of asphalt or soil road construction materials. Use of the machine for other purposes such as towing other equipment is considered contrary to the designated use. The manufacturer cannot be responsible or held liable for any damage resulting from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

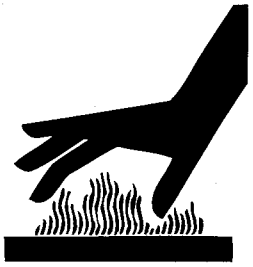
1-9. Stopping

- 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.

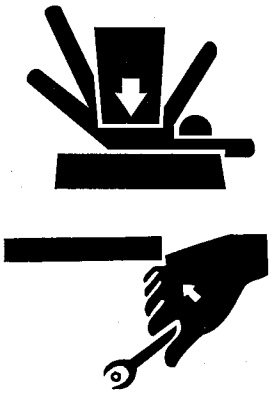
1-10. Maintenance

- 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.



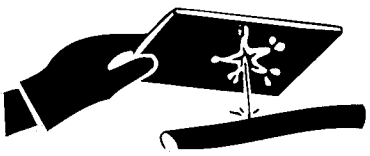
- Use care when attaching and securing lifting tackle to individual parts and large assemblies being removed or repositioned for repair purposes to avoid the risk of accident. Use lifting devices that are in perfect condition and of sufficient lifting capacity. Never stand under suspended loads.
- Always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



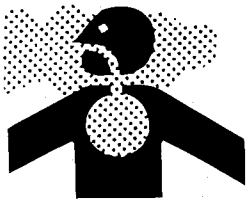
- Keep all steps, handles, handrails, platforms and ladders free from mud, dirt, grease, ice or snow.
- Clean the machine, especially threaded connections of any traces of oil or fuel before carrying out any maintenance or repairs. Never use aggressive detergents. Use lint free cleaning rags.
- Examine 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.



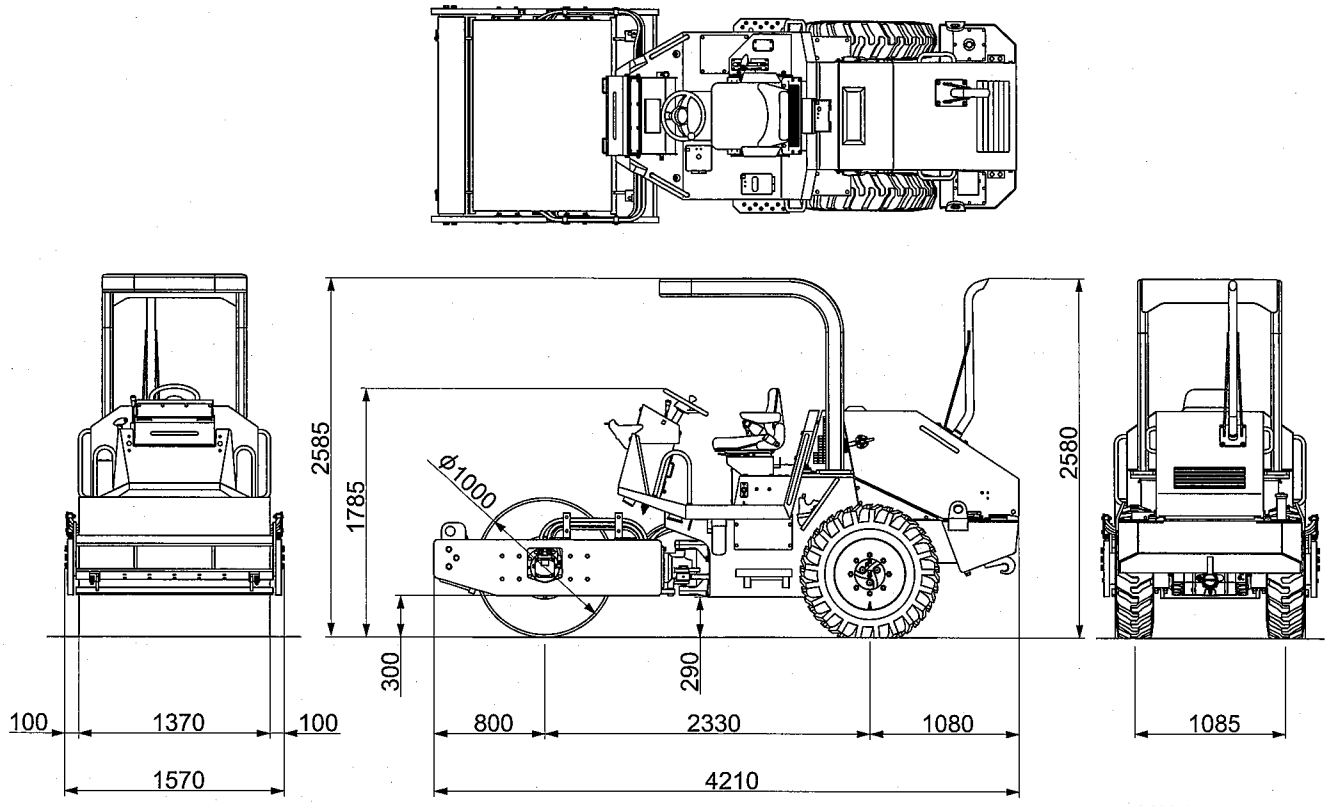
1-11. Transporting the Machine

- 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. SV204D



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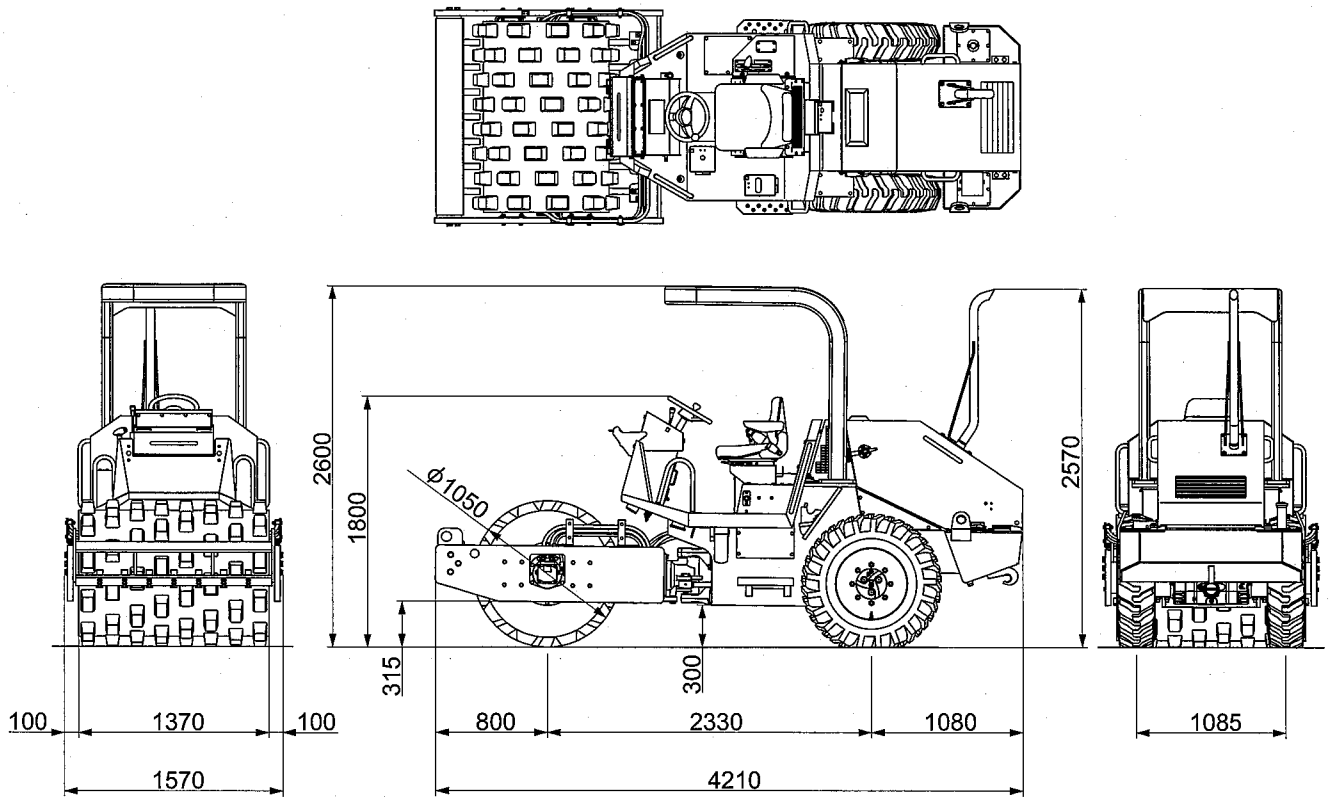
Model & Type	Model		SAKAI SV204D with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	4,635 kg (10,220 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		4,675 kg (10,305 lbs.)
	Shipping weight	with ROPS	4,530 kg (9,985 lbs.)
		without ROPS	4,320 kg (9,525 lbs.)
	Load on front axle with operating weight		2,175 kg (4,795 lbs.)
	Load on rear axle with operating weight		2,460 kg (5,425 lbs.)
Dimensions	Overall length		4,210 mm (166 in.)
	Overall width		1,570 mm (62 in.)
	Overall height	with ROPS	2,585 mm (102 in.)
		without ROPS	1,785 mm (70 in.)
	Wheelbase		2,330 mm (92 in.)
	Compaction width		1,370 mm (54 in.)
	Front drum (outer shell)	width × dia. × thickness	1,370 mm × 1,000 mm × 19 mm (54 in. × 39 in. × 0.7 in.)
	Front drum (inner shell)	width × dia. × thickness	N/A (N/A)
	Front drum (pad foot)	height × dia. × pcs.	N/A (N/A)
	Rear tyers	Size	11.2-20-6PR
		Inflation pressure	177 kPa (25.7 psi)
	Ground clearance		290 mm (11.4 in.)
	Kerb clearance	Right	300 mm (11.8 in.)
		Left	300 mm (11.8 in.)
	Side clearance	Right	100.0 mm (3.9 in.)
		Left	100.0 mm (3.9 in.)
	Leveling blade width		N/A mm (N/A in.)

Performance	Vibrator system	Front	Centrifugal force	Low amplitude		74 kN	(16,635 lbf.)
				High amplitude		N/A kN	(N/A lbf.)
			Frequency	Low amplitude		30.0 Hz	(1,800 vpm)
				High amplitude		N/A Hz	(N/A vpm)
			Amplitude	Low amplitude		1.65 mm	(0.065 in.)
				High amplitude		N/A mm	(N/A in.)
		Rear	Centrifugal force	Low amplitude		N/A kN	(N/A lbf.)
				High amplitude		N/A kN	(N/A lbf.)
			Frequency	Low amplitude		N/A Hz	(N/A vpm)
				High amplitude		N/A Hz	(N/A vpm)
			Amplitude	Low amplitude		N/A mm	(N/A in.)
				High amplitude		N/A mm	(N/A in.)
	Linear pressure	Static linear pressure	Front drum	Operating weight		156 N/cm	(90 lbf./in.)
			Rear drum	Operating weight		N/A N/cm	(N/A lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Low amplitude	696 N/cm	(395 lbf./in.)
					High amplitude	N/A N/cm	(N/A lbf./in.)
			Rear drum	Operating weight	Low amplitude	N/A N/cm	(N/A lbf./in.)
					High amplitude	N/A N/cm	(N/A lbf./in.)
	Traveling speed	Number of speed shift				1 speed	
		Speed range		1st		0 to 7.4 km/h	(0 to 4.6 mile/h)
	Gradeability (without vibration)					52 %	(27 °)
	Turning radius	Machine clearance radius inside				2.4 m	(95 in.)
		Machine clearance radius outside				4.1 m	(162 in.)
		Turning radius inside compacted surface				2.5 m	(99 in.)
		Turning radius outside compacted surface				4.0 m	(158 in.)

1-2. SV204T



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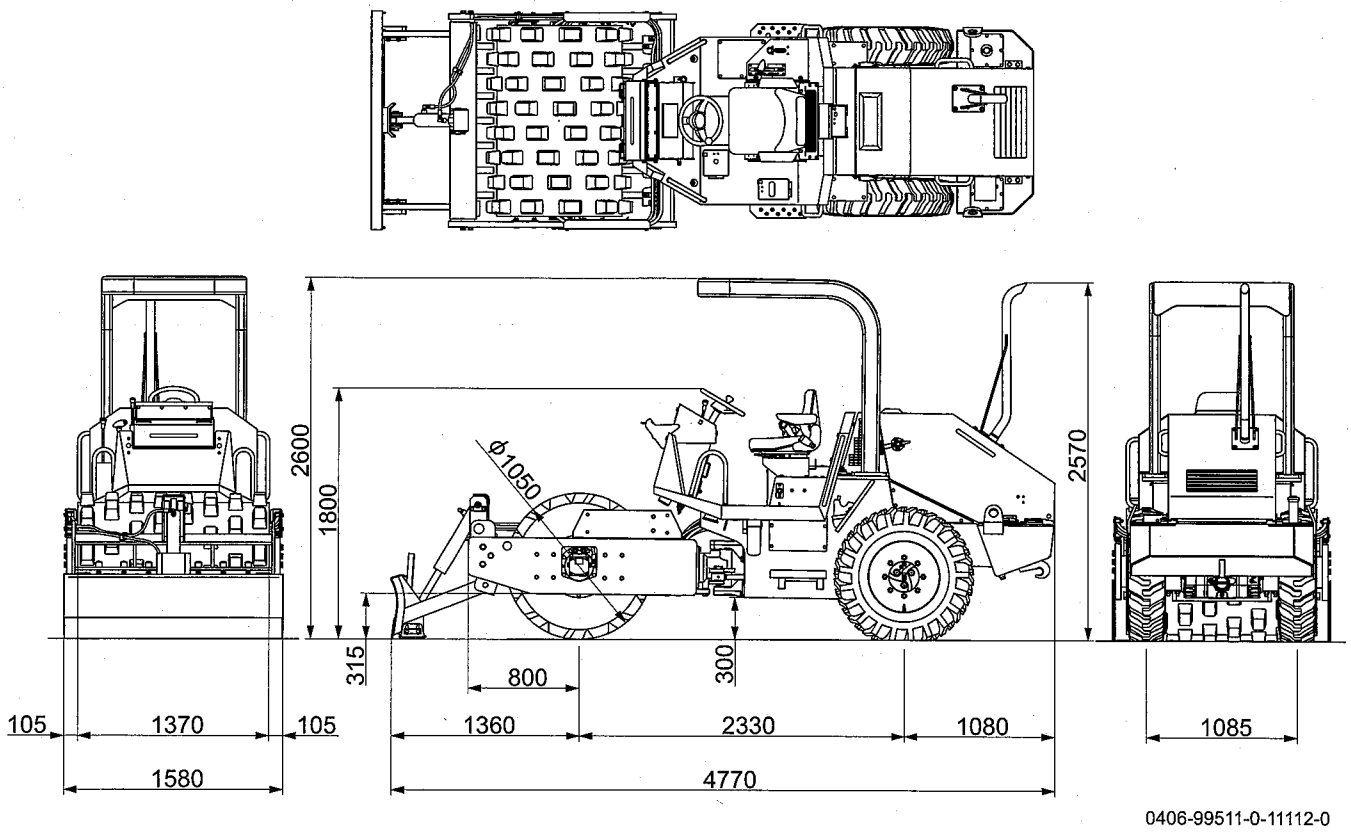
Model & Type	Model		SAKAI SV204T with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	4,735 kg (10,440 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		4,775 kg (10,525 lbs.)
	Shipping weight	with ROPS	4,630 kg (10,205 lbs.)
		without ROPS	4,420 kg (9,745 lbs.)
	Load on front axle with operating weight		2,275 kg (5,015 lbs.)
	Load on rear axle with operating weight		2,460 kg (5,425 lbs.)
Dimensions	Overall length		4,210 mm (166 in.)
	Overall width		1,570 mm (62 in.)
	Overall height	with ROPS	2,600 mm (102 in.)
		without ROPS	1,800 mm (71 in.)
	Wheelbase		2,330 mm (92 in.)
	Compaction width		1,370 mm (54 in.)
	Front drum (outer shell)	width × dia. × thickness	N/A (N/A)
	Front drum (inner shell)	width × dia. × thickness	1,370 mm × 910 mm × 19 mm (54 in. × 35.8 in. × 0.7 in.)
	Front drum (pad foot)	height × dia. × pcs.	70 mm × 1,050 mm × 80 pcs. (2.8 in. × 41 in. × 80 pcs.)
	Rear tyers	Size	11.2-20-6PR
		Inflation pressure	177 kPa (25.7 psi)
	Ground clearance		300 mm (11.8 in.)
	Kerb clearance	Right	315 mm (12.4 in.)
		Left	315 mm (12.4 in.)
	Side clearance	Right	100.0 mm (3.9 in.)
		Left	100.0 mm (3.9 in.)
	Leveling blade width		N/A mm (N/A in.)

Performance	Vibrator system	Front	Centrifugal force	Low amplitude		74 kN	(16,635 lbf.)
				High amplitude		N/A kN	(N/A lbf.)
			Frequency	Low amplitude		30.0 Hz	(1,800 vpm)
				High amplitude		N/A Hz	(N/A vpm)
			Amplitude	Low amplitude		1.52 mm	(0.060 in.)
				High amplitude		N/A mm	(N/A in.)
		Rear	Centrifugal force	Low amplitude		N/A kN	(N/A lbf.)
				High amplitude		N/A kN	(N/A lbf.)
			Frequency	Low amplitude		N/A Hz	(N/A vpm)
				High amplitude		N/A Hz	(N/A vpm)
			Amplitude	Low amplitude		N/A mm	(N/A in.)
				High amplitude		N/A mm	(N/A in.)
	Linear pressure	Static linear pressure	Front drum	Operating weight		N/A N/cm	(N/A lbf./in.)
			Rear drum	Operating weight		N/A N/cm	(N/A lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Low amplitude	N/A N/cm	(N/A lbf./in.)
					High amplitude	N/A N/cm	(N/A lbf./in.)
			Rear drum	Operating weight	Low amplitude	N/A N/cm	(N/A lbf./in.)
					High amplitude	N/A N/cm	(N/A lbf./in.)
	Traveling speed	Number of speed shift				1 speed	
		Speed range		1st		0 to 7.5 km/h	(0 to 4.7 mile/h)
	Gradeability (without vibration)					49 %	(26 °)
	Turning radius	Machine clearance radius inside				2.4 m	(95 in.)
		Machine clearance radius outside				4.1 m	(162 in.)
		Turning radius inside compacted surface				2.5 m	(99 in.)
		Turning radius outside compacted surface				4.0 m	(158 in.)

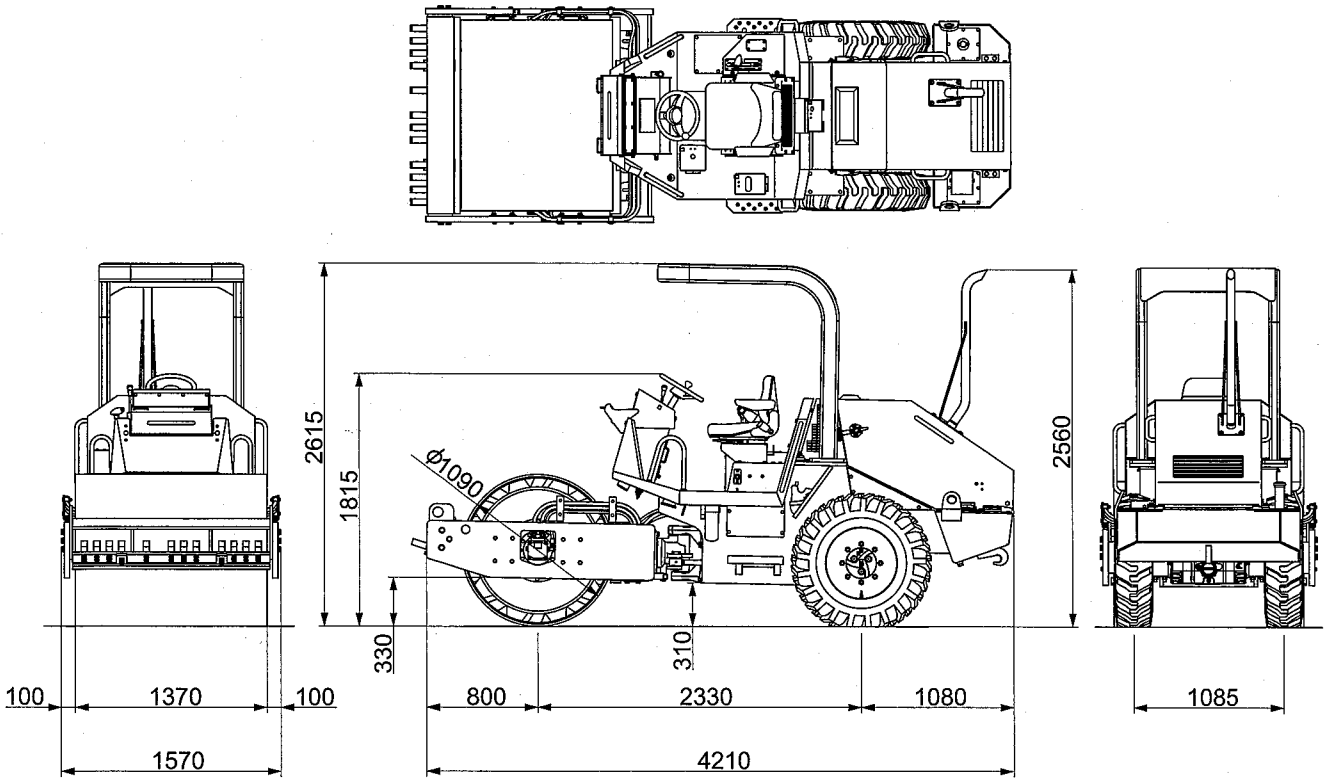
1-3. SV204TB



Model & Type	Model		SAKAI SV204TB with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	5,035 kg (11,100 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		5,075 kg (11,190 lbs.)
	Shipping weight	with ROPS	4,930 kg (10,870 lbs.)
		without ROPS	4,720 kg (10,405 lbs.)
	Load on front axle with operating weight		2,625 kg (5,785 lbs.)
	Load on rear axle with operating weight		2,410 kg (5,315 lbs.)
Dimensions	Overall length		4,770 mm (188 in.)
	Overall width		1,580 mm (62 in.)
	Overall height	with ROPS	2,600 mm (102 in.)
		without ROPS	1,800 mm (71 in.)
	Wheelbase		2,330 mm (92 in.)
	Compaction width		1,370 mm (54 in.)
	Front drum (outer shell)	width × dia. × thickness	N/A (N/A)
	Front drum (inner shell)	width × dia. × thickness	1,370 mm × 910 mm × 19 mm (54 in. × 35.8 in. × 0.7 in.)
	Front drum (pad foot)	height × dia. × pcs.	70 mm × 1,050 mm × 80 pcs. (2.8 in. × 41 in. × 80 pcs.)
	Rear tyers	Size	11.2-20-6PR
		Inflation pressure	177 kPa (25.7 psi)
	Ground clearance		300 mm (11.8 in.)
	Kerb clearance	Right	315 mm (12.4 in.)
		Left	315 mm (12.4 in.)
	Side clearance	Right	105.0 mm (4.1 in.)
		Left	105.0 mm (4.1 in.)
	Leveling blade width		1,580 mm (62 in.)

Performance	Vibrator system	Front	Centrifugal force	Low amplitude		74 kN	(16,635 lbf.)
				High amplitude		N/A kN	(N/A lbf.)
			Frequency	Low amplitude		30.0 Hz	(1,800 vpm)
				High amplitude		N/A Hz	(N/A vpm)
			Amplitude	Low amplitude		1.52 mm	(0.060 in.)
				High amplitude		N/A mm	(N/A in.)
		Rear	Centrifugal force	Low amplitude		N/A kN	(N/A lbf.)
				High amplitude		N/A kN	(N/A lbf.)
			Frequency	Low amplitude		N/A Hz	(N/A vpm)
				High amplitude		N/A Hz	(N/A vpm)
			Amplitude	Low amplitude		N/A mm	(N/A in.)
				High amplitude		N/A mm	(N/A in.)
	Linear pressure	Static linear pressure	Front drum	Operating weight		N/A N/cm	(N/A lbf./in.)
			Rear drum	Operating weight		N/A N/cm	(N/A lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Low amplitude	N/A N/cm	(N/A lbf./in.)
					High amplitude	N/A N/cm	(N/A lbf./in.)
			Rear drum	Operating weight	Low amplitude	N/A N/cm	(N/A lbf./in.)
					High amplitude	N/A N/cm	(N/A lbf./in.)
	Traveling speed	Number of speed shift				1 speed	
		Speed range		1st		0 to 7.5 km/h	(0 to 4.7 mile/h)
	Gradeability (without vibration)					46 %	(24 °)
	Turning radius	Machine clearance radius inside				2.4 m	(95 in.)
		Machine clearance radius outside				4.3 m	(170 in.)
		Turning radius inside compacted surface				2.5 m	(99 in.)
		Turning radius outside compacted surface				4.0 m	(158 in.)

1-4. SV204TF



0406-99512-0-11113-0

Model & Type	Model		SAKAI SV204TF with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	5,435 kg (11,980 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		5,475 kg (12,070 lbs.)
	Shipping weight	with ROPS	5,330 kg (11,750 lbs.)
		without ROPS	5,120 kg (11,285 lbs.)
	Load on front axle with operating weight		2,975 kg (6,560 lbs.)
	Load on rear axle with operating weight		2,460 kg (5,425 lbs.)
Dimensions	Overall length		4,210 mm (166 in.)
	Overall width		1,570 mm (62 in.)
	Overall height	with ROPS	2,615 mm (103 in.)
		without ROPS	1,815 mm (71 in.)
	Wheelbase		2,330 mm (92 in.)
	Compaction width		1,370 mm (54 in.)
	Front drum (outer shell)	width × dia. × thickness	1,370 mm × 1,090 mm × 16 mm (54 in. × 43 in. × 0.6 in.)
	Front drum (inner shell)	width × dia. × thickness	1,370 mm × 910 mm × 19 mm (54 in. × 35.8 in. × 0.7 in.)
	Front drum (pad foot)	height × dia. × pcs.	70 mm × 1,050 mm × 80 pcs. (2.8 in. × 41 in. × 80 pcs.)
	Rear tyers	Size	11.2-20-6PR
		Inflation pressure	177 kPa (25.7 psi)
	Ground clearance		300 mm (11.8 in.)
	Kerb clearance	Right	330 mm (13.0 in.)
		Left	330 mm (13.0 in.)
	Side clearance	Right	100.0 mm (3.9 in.)
		Left	100.0 mm (3.9 in.)
	Leveling blade width		N/A mm (N/A in.)

Performance	Vibrator system	Front	Centrifugal force	Low amplitude		72 kN	(16,185 lbf.)
				High amplitude		N/A kN	(N/A lbf.)
			Frequency	Low amplitude		30.0 Hz	(1,800 vpm)
				High amplitude		N/A Hz	(N/A vpm)
			Amplitude	Low amplitude		1.00 mm	(0.039 in.)
				High amplitude		N/A mm	(N/A in.)
		Rear	Centrifugal force	Low amplitude		N/A kN	(N/A lbf.)
				High amplitude		N/A kN	(N/A lbf.)
			Frequency	Low amplitude		N/A Hz	(N/A vpm)
				High amplitude		N/A Hz	(N/A vpm)
			Amplitude	Low amplitude		N/A mm	(N/A in.)
				High amplitude		N/A mm	(N/A in.)
	Linear pressure	Static linear pressure	Front drum	Operating weight		213 N/cm	(120 lbf./in.)
			Rear drum	Operating weight		N/A N/cm	(N/A lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Low amplitude	739 N/cm	(420 lbf./in.)
					High amplitude	N/A N/cm	(N/A lbf./in.)
			Rear drum	Operating weight	Low amplitude	N/A N/cm	(N/A lbf./in.)
					High amplitude	N/A N/cm	(N/A lbf./in.)
	Traveling speed	Number of speed shift				1 speed	
		Speed range		1st		0 to 7.6 km/h	(0 to 4.7 mile/h)
	Gradeability (without vibration)					41 %	(22 °)
	Turning radius	Machine clearance radius inside				2.4 m	(95 in.)
		Machine clearance radius outside				4.1 m	(162 in.)
		Turning radius inside compacted surface				2.5 m	(99 in.)
		Turning radius outside compacted surface				4.0 m	(158 in.)

1-5. Common Specifications

Engine	Model		KUBOTA V3307-CR-T-EF05 (Diesel, EPA-Tier 4)
	Type		4-cycle, water-cooled, 4-cylinder in-line, overhead valve, direct injection type, with turbo charger
	Cylinders - Bore × Stroke		94 mm × 120 mm (3.70 in. × 4.72 in.)
	Displacement		3.331 L (203.3 cu.in.)
	Performance	Rated speed	2,200 min^{-1}
		Rated output	54.6 kW (73 HP)
		Max. torque	261 N·m (193 lbf·ft) at 2,000 min^{-1}
		Fuel consumption rate	229 g/kW·h (0.376 lb/HP·h) at 2,100 min^{-1}
		Fuel consumption	15 L/h with full load (4.0 gal with full load)
	Fuel system	Fuel	Diesel (ASTM D975-2D)
		Fuel injection pump	High pressure commonrail
		Fuel injection time regulator	Electric speed control
	Lubrication system	Lubrication type	Full forced pressure feed
		Oil filter type	Full flow plastic fiber element
		Oil cooler type	Integrated water cooled
	Air intake system	Air cleaner type	Dry
	Cooling system	Cooling type	Pressurized water forced circulation
		Cooling fan type	Inhale
	Electrical system	Alternator	12 V 90 A
		Starter	12 V 3.0 kW
		Battery	12 V (72 Ah, CCA750A) × 1 pcs. (12 V)
	Dry weight		311 kg (686 lbs.)
Drive system	Transmission	Type	Hydrostatic
		Speed	Single speed
	Reverser		Switching the direction of flow delivered from the variable pump
	Differential type	Front	N/A
		Rear	Non-spin
	Final drive	Front	Planetary gear
		Rear	Planetary gear
Vibration system	Power transmission type		Hydraulic
	Vibrator type		Single eccentric shaft
Brake system	Service brake		Dynamic braking through hydrostatic drive system (F-N-R lever)
	Secondary brake (Emergency brake)		Hydrostatic + spring applied hydraulically released type (Brake pedal)
	Parking brake		Spring applied hydraulically released type (Panel button)
Steering system	Power transmission type		Hydraulic
	Steering type		Articulated
	Steering angle		± 40°
	Oscillating angle		± 10°
Drum and tyres	Use	Front	Steel drum / Vibrate and drive / 1pc.
		Rear	Rubber tyre / Drive / 2pcs.
	Suspension type	Front	Rubber isolation
		Rear	Rigid
Sprinkler system	Water spray type		N/A
	Liquid spray type		N/A

2. TABLE OF STANDARD VALUES

2-1. Engine

Item		Standard value	Remarks
Engine model		KUBOTA V3307-CR-TE4B	
Rated output		53.8/2,200 kW/min^{-1} (72/2,200 HP/min^{-1})	Net (with fan)
Max. rpm under no load		2,400 ±50 min^{-1}	
Min. rpm under no load		1,000 ±50 min^{-1}	
Cylinder head tightening torque		187 to 196 N·m (138 to 145 lbf·ft)	
Intake manifold tightening torque		18 to 20 N·m (13 to 15 lbf·ft)	
Exhaust manifold tightening torque		30 to 34 N·m (22 to 25 lbf·ft)	
Fan belt tension		10 to 12 mm (0.39 to 0.47 in.)	When midpoint of belt pressed at 98 N (22 lbf)
Valve clearance (intake)		0.13 to 0.17 mm (0.005 to 0.007 in.)	
Valve clearance (exhaust)		0.13 to 0.17 mm (0.005 to 0.007 in.)	
Compression pressure	Standard value	3.92 MPa (568 psi)	250 min^{-1}
	Allowable limit	2.90 MPa (421 psi)	250 min^{-1}

2-2. Propulsion

Item	Standard value	Remarks
Travel speed (Forward/reverse)	0 to $7.4^{+0.2}_{0}$ km/h (0 to $4.6^{+0.1}_{0}$ mile/h)	

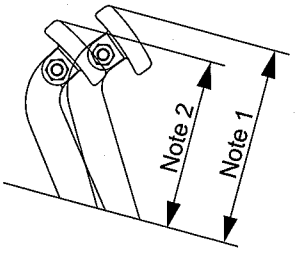
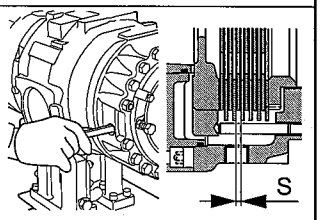
2-3. Hydraulic System

Item			Standard value	Remarks
Propulsion	High pressure relief valve setting		28.0 ±1.0 MPa (4,060 ±145 psi)	At 3.8 to 5.6 L/min
	Cut off valve setting		—	
	Charge relief valve setting		2.4 ±0.2 MPa (348 ± 29 psi)	At 1,800 min^{-1}
	Case pressure	Pump	0.25 MPa (36.3 psi) or less	
		Front motor	0.3 MPa (43.5 psi) or less	
		Rear motor	0.2 MPa (29.0 psi) or less	
	Brake release pressure		1.5 to 3.0 MPa (218 to 435 psi)	
	Motor drainage	Front motor	$3.3^{0}_{-0.2}$ L/min ($0.9^{0}_{-0.1}$ gal./min)	
		Rear motor	$3.9^{+0.1}_{0}$ L/min ($1.0^{+0.1}_{0}$ gal./min)	
Vibration	High pressure relief valve setting		—	
	Cut off valve setting		—	
	Charge relief valve setting		—	
	Relief valve setting		17.2 ±1.0 MPa (2,494 ±145 psi)	
	Case pressure	Pump	—	
		Motor	0.1 MPa (14.5 psi) or less	
	Motor drainage		4.2 L/min (1.1 gal./min)	
Steering oil pressure			11.8 ±1.0 MPa (1,711 ±145 psi)	(Orbitroll relief pressure)

2-4. Steering

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

2-5. Brakes

Item	Standard value	Remarks
Clearance between brake pedal and floorboard (as released)	178 mm (7.0 in.) Note 1: See dimensions	 SV700-02001
Clearance between brake pedal and floorboard (when pressed down)	143 mm (5.6 in.) Note 2: See dimensions	
Brake disc wear limit	4.5 mm (0.18 in.) (S)	 SV700-02003

2-6. Capacities

Item	Standard value	Remarks
Engine oil pan	11 L (3.0 gal.)	
Fuel tank	100 L (26.4 gal.)	
Coolant	7 L (1.8 gal.)	
Gear box (front)	1.6 L (0.42 gal.)	
Center housing (rear axle)	8 L (2.2 gal.)	
Hub reduction gear case (rear left and right)	0.9 L × 2 (0.24 gal. × 2)	
Hydraulic oil tank	38 L (10.0 gal.)	
Vibrator case (front)	4 L (1.1 gal.)	

3. FUEL AND LUBRICANTS SPECIFICATION

3-1. Rating

Lubricant	Service classification	Ambient temp. and applicable viscosity rating			Applicable Standards
		-15 to 30°C (5 to 86°F) Cold	0 to 40°C (32 to 104°F) Moderate	15 to 55°C (59 to 131°F) Tropical	
Engine oil	API grade CJ4 JASO DH-2	SAE10W-30	SAE30	SAE40	MIL-L-2104D
Gear oil	API grade GL5	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 fuel				ASTM D975 No.2-D S15

3-2. Recommended Lubricants

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

4. TIGHTENING TORQUE CHART

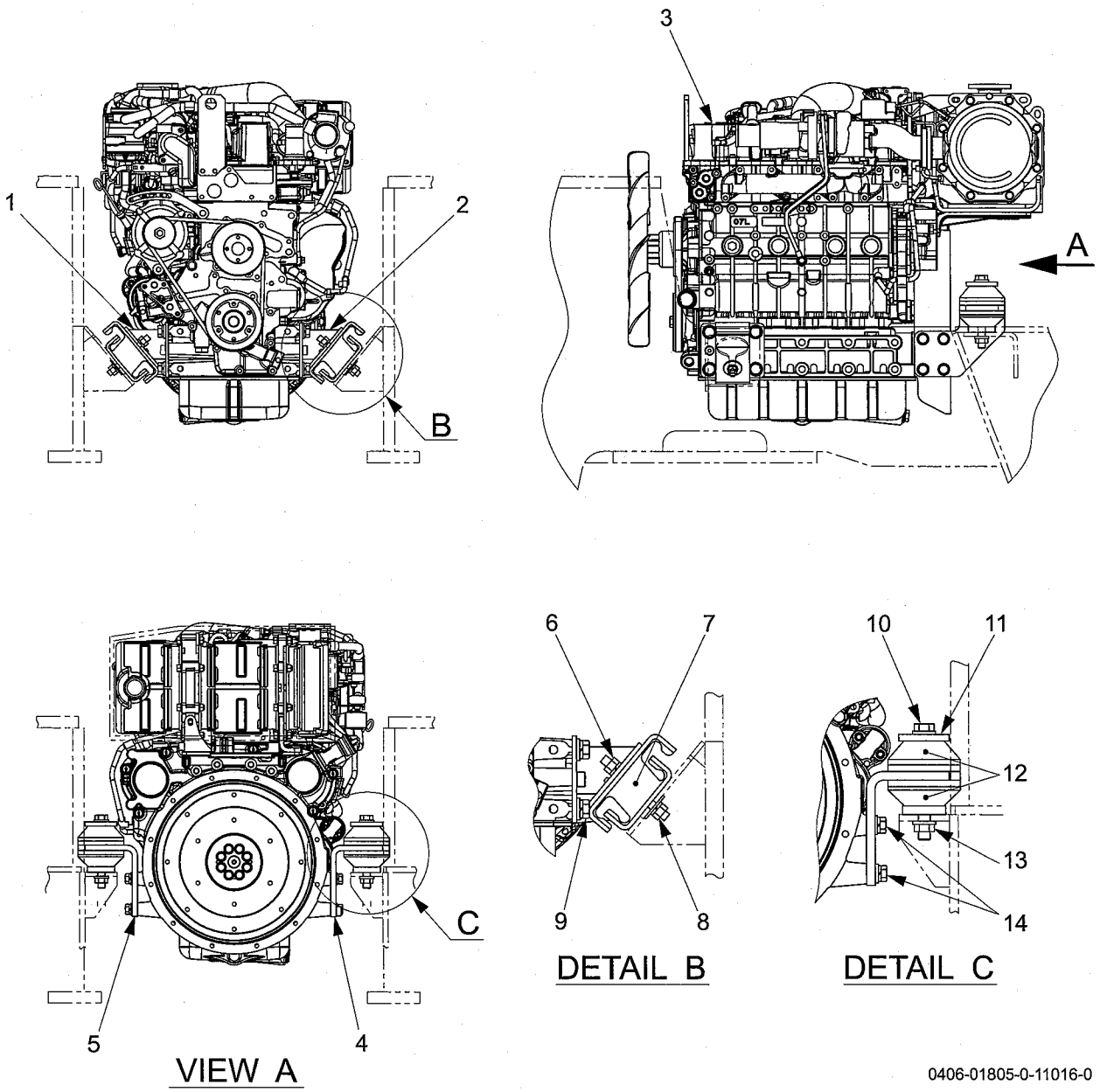
N·m	(lbf·ft)

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

ENGINE AND CONTROLS

1. ENGINE

1-1. Engine Mount



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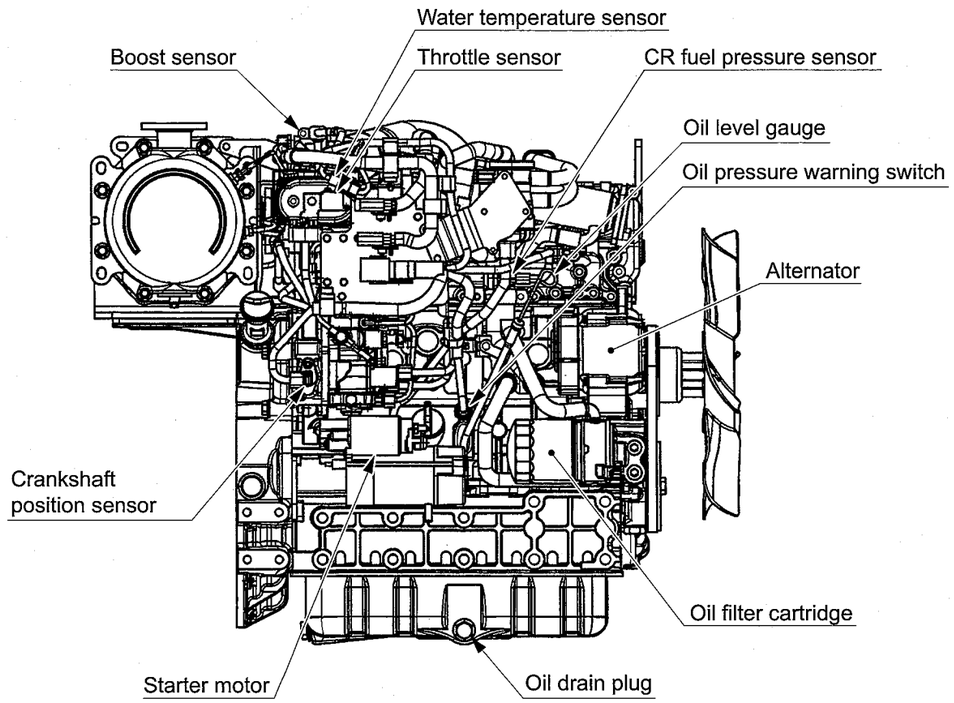
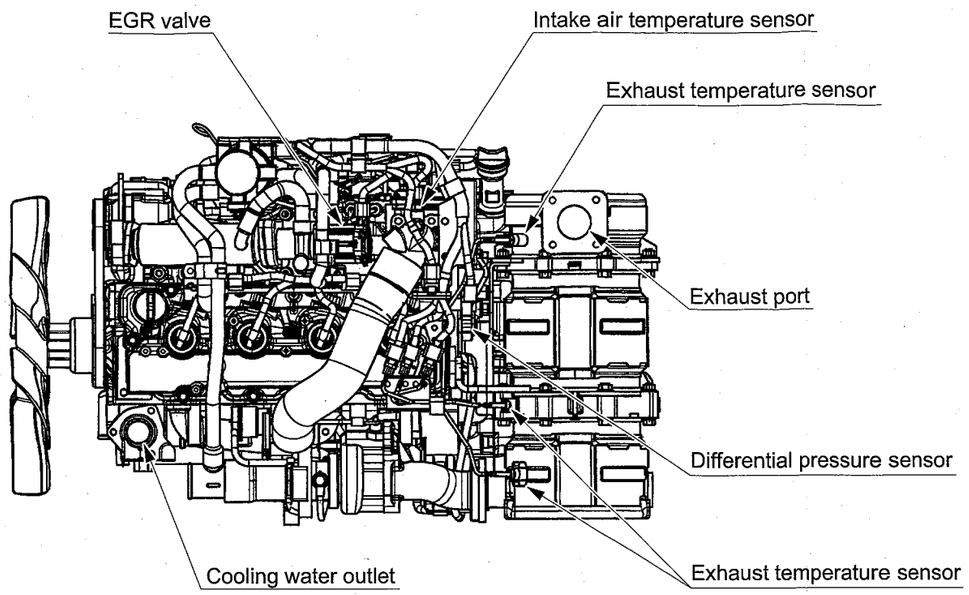
(1) Bracket	(6) Nut : M12 P=1.25	(11) Plate	
(2) Bracket	(7) Damper	(12) Damper	
(3) Engine	(8) Nut : M12 P=1.25	(13) Nut : M16	
(4) Bracket	(9) Bolt : M14× 35 P=1.5	(14) Bolt : M12×35 P=1.25	
(5) Bracket	(10) Bolt : M16×150		

N·m

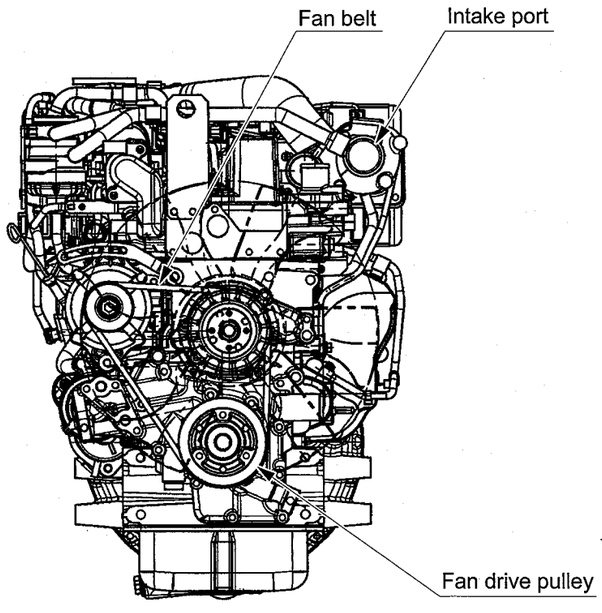
(6) Nut M12 P=1.25 : 78 N·m (58 lbf·ft)	(10) Bolt M16×150 : 186 N·m (137 lbf·ft)
(8) Nut M12 P=1.25 : 78 N·m (58 lbf·ft)	(14) Bolt M12× 35 P=1.25 : 118 N·m (87 lbf·ft)
(9) Bolt M14×35 P=1.5 : 186 N·m (137 lbf·ft)	

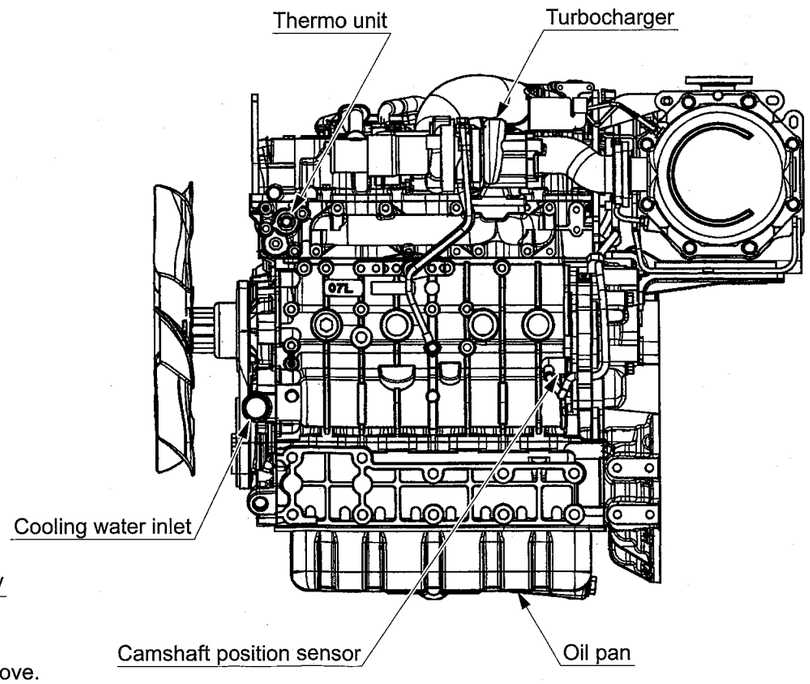
1-2. Engine Exterior

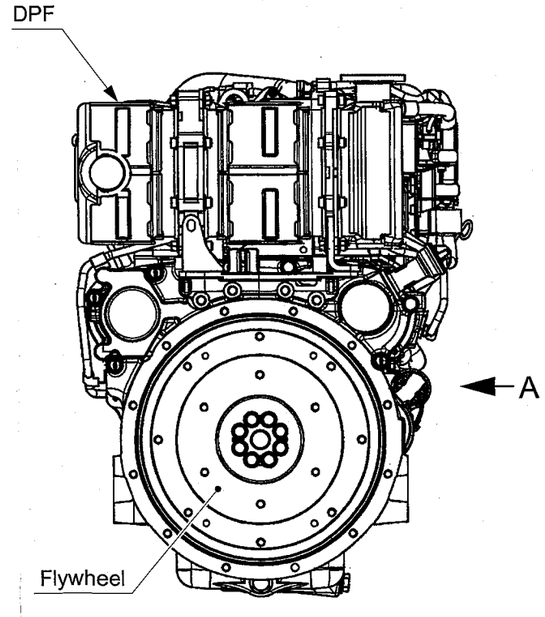




VIEW A

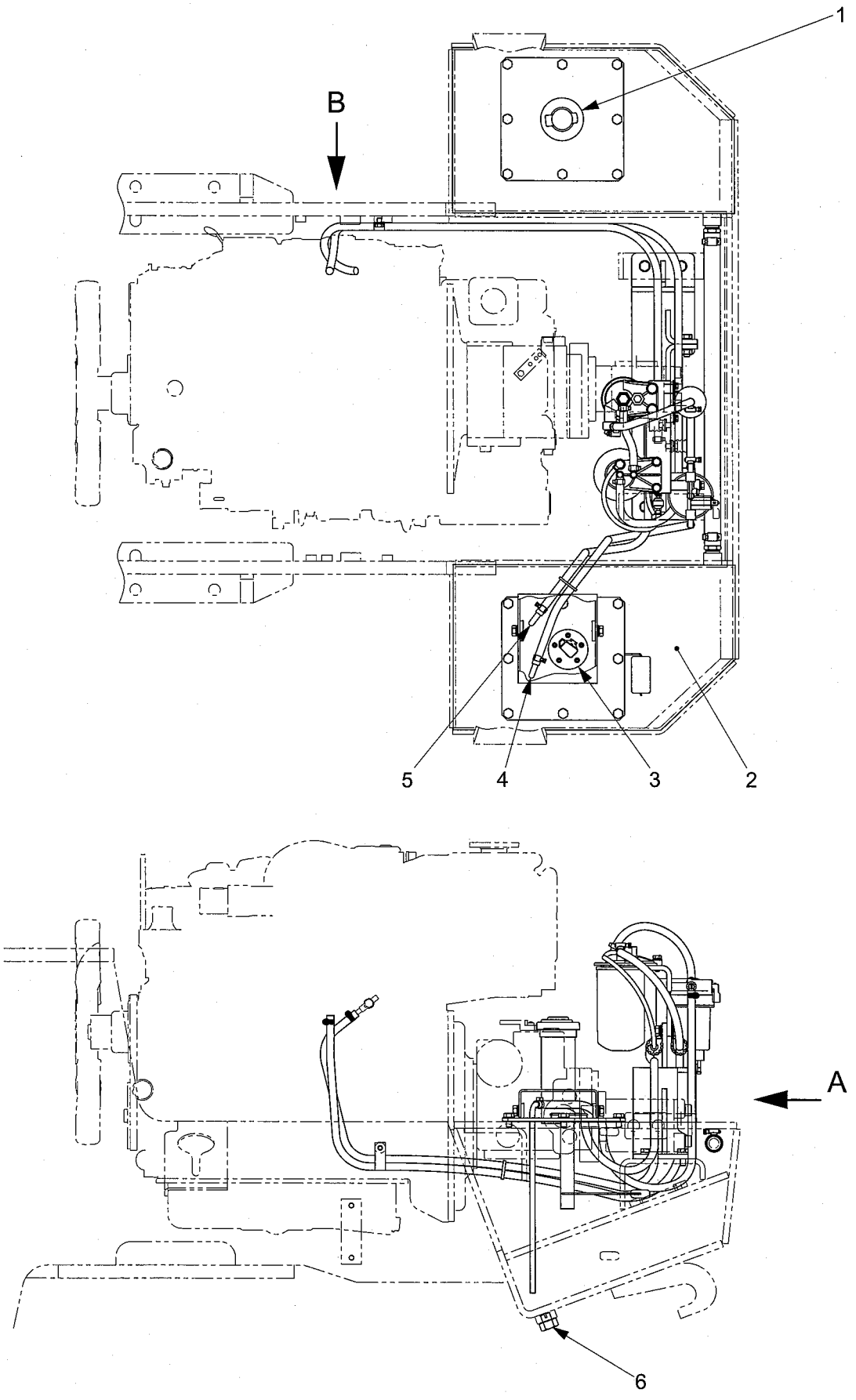






* The actual equipment may differ from that shown above.

2. FUEL SYSTEM



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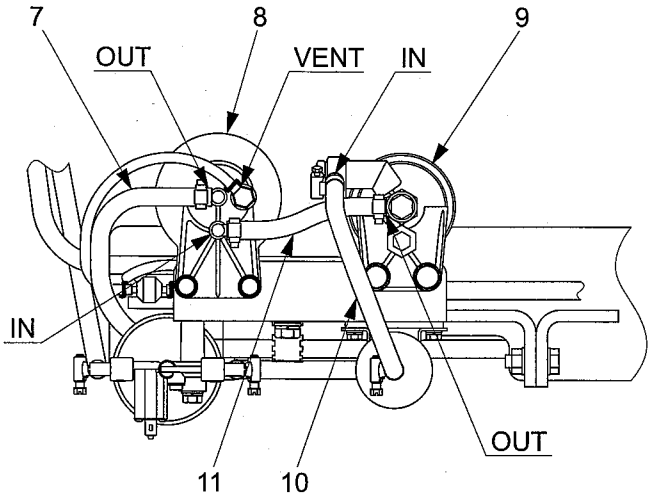
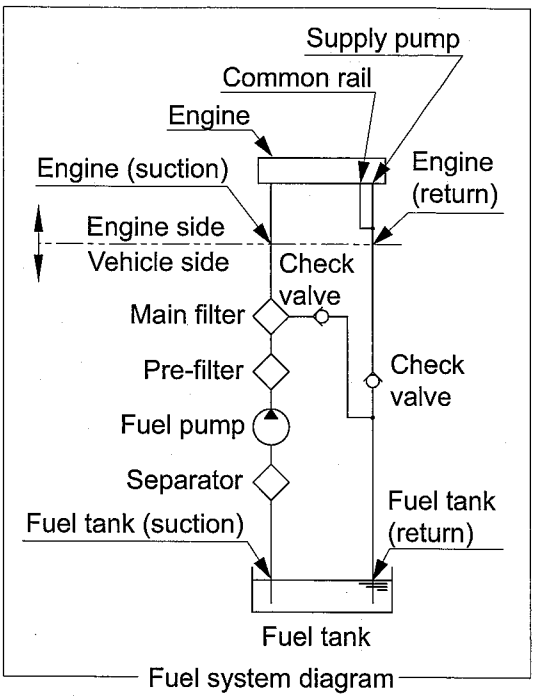
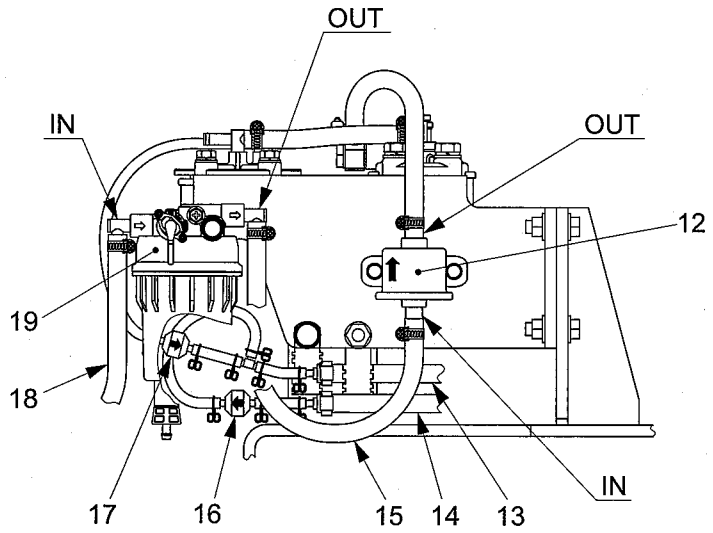
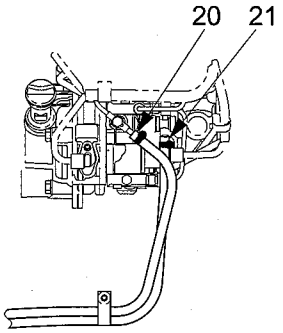




Fuel system diagram



VIEW A



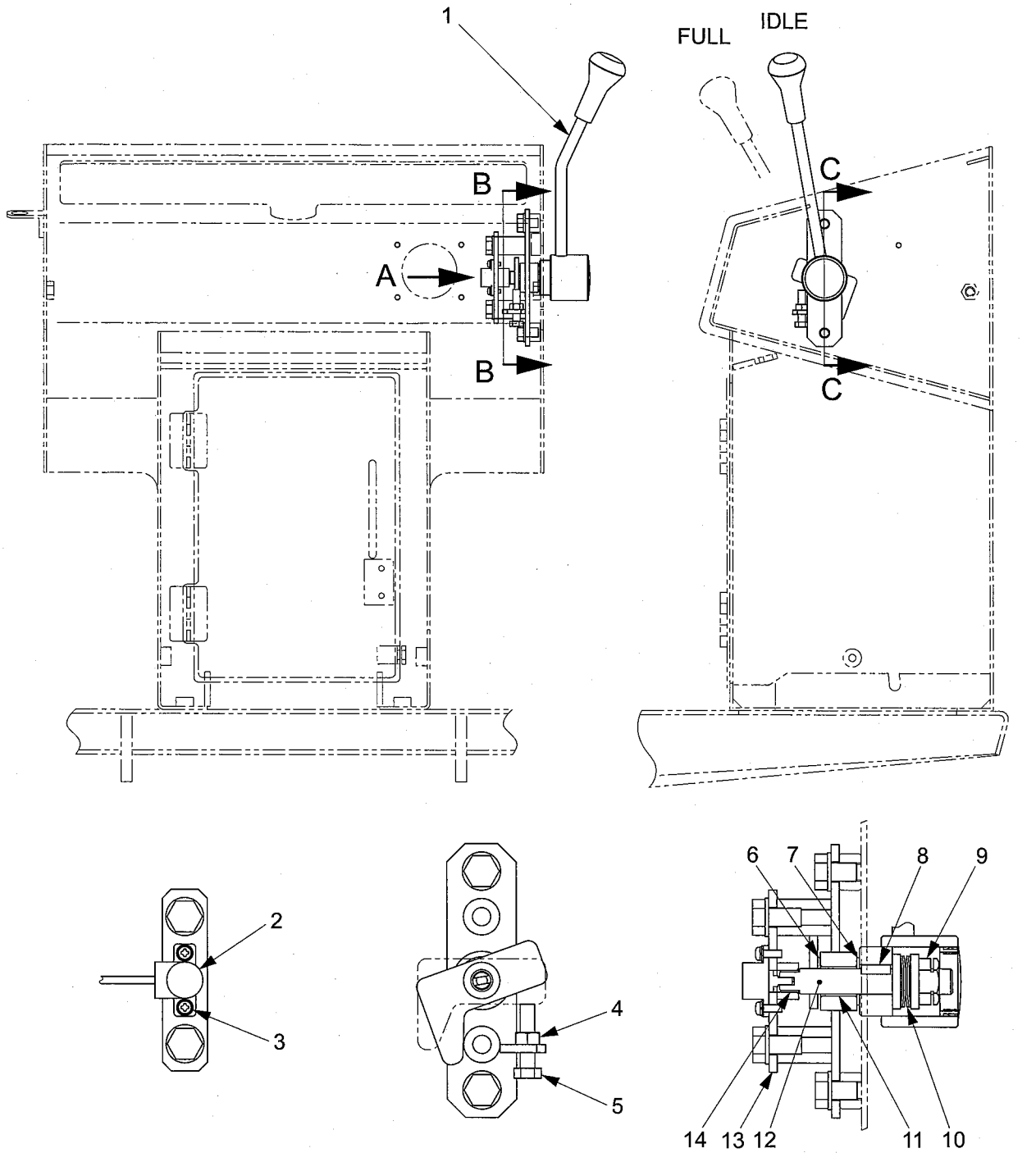
VIEW B

0406-02804-0-11053-0

(1) Fuel supply port
(2) Fuel tank
(3) Fuel gauge unit
(4) Fuel tank (suction)
(5) Fuel tank (return)
(6) Drain plug
(7) Hose (Main filter OUT → Engine (suction))
(8) Main filter
(9) Pre-filter
(10) Hose (Fuel pump OUT → Pre-filter IN)
(11) Hose (Pre-filter OUT → Main filter IN)
(12) Fuel pump
(13) Hose (Check valve → Fuel tank (return))
(14) Hose (Engine (return) → Check valve)
(15) Hose (Separator OUT → Fuel pump IN)
(16) Check valve
(17) Check valve
(18) Hose (Fuel tank (suction) → Separator IN)
(19) Separator
(20) Engine (return)
(21) Engine (suction)

3. CONTROL SYSTEM

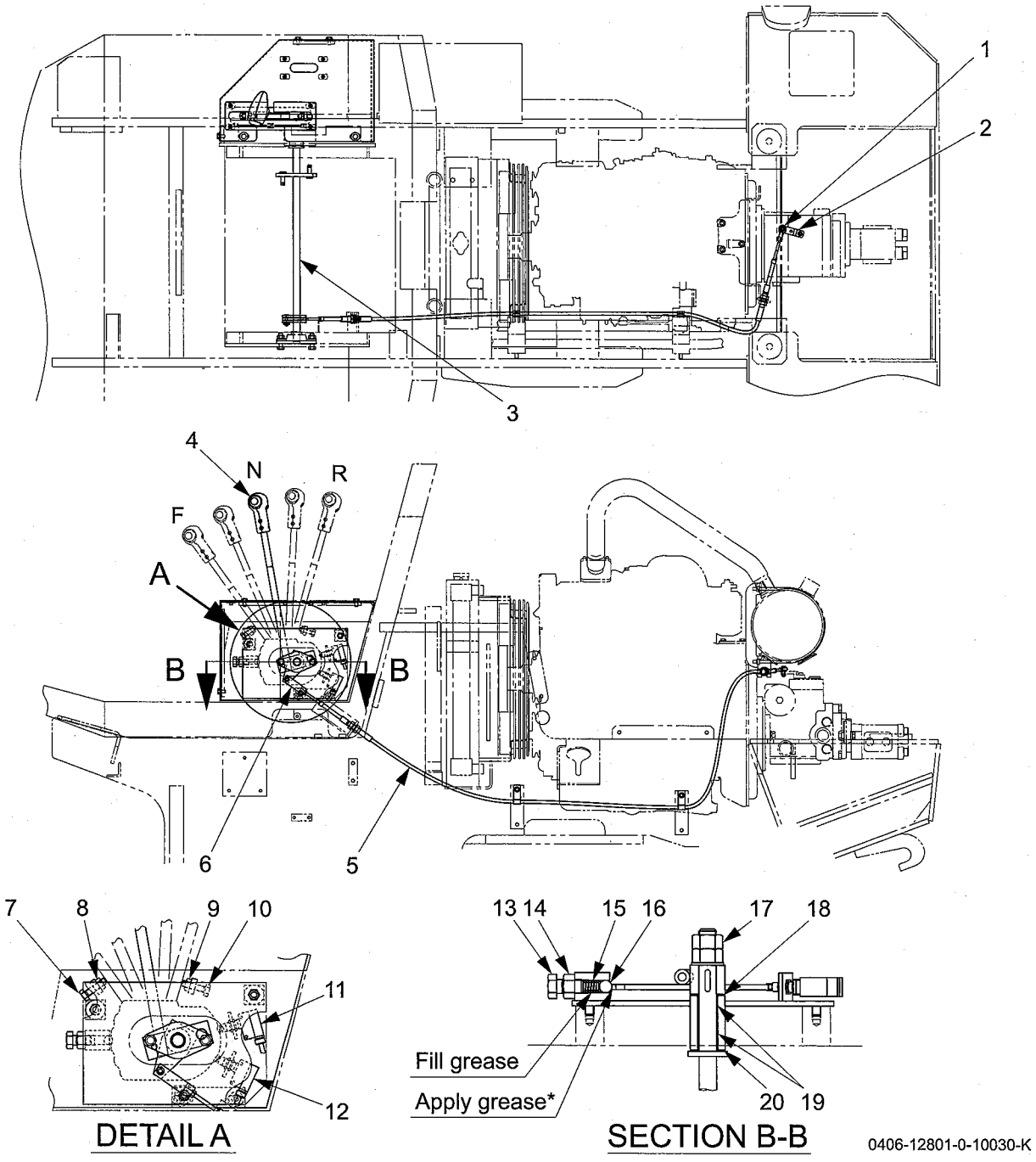
3-1. Throttle Control



0406-12804-0-11042-0

(1) Throttle lever
(2) Potentiometer
(3) Screw : M4×12
(4) Lock nut : M8
(5) Stopper bolt (FULL) : M8×35
(6) Washer (Apply grease)
(7) Washer (Apply grease)
(8) Key
(9) Nut : M14
(10) Disc spring
(11) Bush (Apply grease)
(12) Shaft
(13) Base
(14) Bush (Apply grease)

3-2. Forward-reverse Control

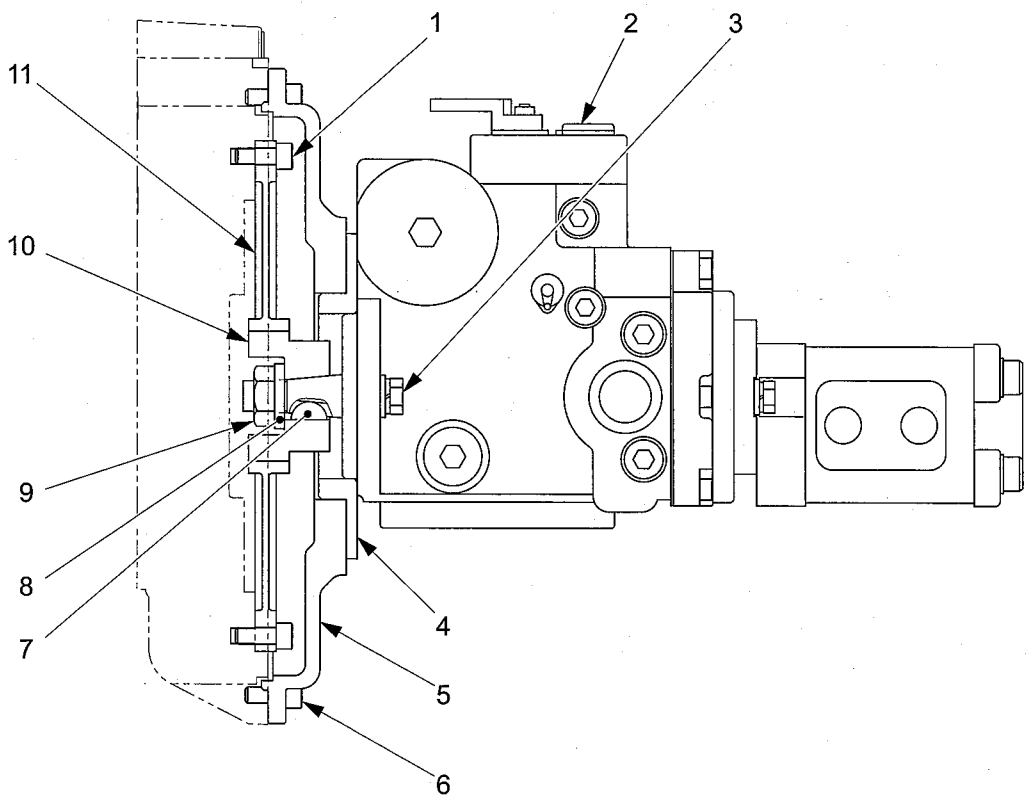


(1) Rod end
(2) Bracket
(3) Shaft
(4) F-R lever
(5) Control cable
(6) Clevis
(7) Stopper bolt (Forward) : M8×40
(8) Lock nut : M8
(9) Lock nut : M8
(10) Stopper bolt (Reverse) : M8×40
(11) F-R lever switch
(12) Backup buzzer switch
(13) Bolt : M16×30
(14) Nut : M16
(15) Spring
(16) Steel ball
(17) Nut : M20
(18) Washer (Apply grease)
(19) Bush
(20) Washer (Apply grease)

* : Lithium-based grease

4. PUMP MOUNT

4-1. Pump Mount



0406-36811-0-21085-0

(1) Bolt : M10×25 P=1.25
(2) Pump
(3) Bolt : M12×45
(4) Spacer
(5) Housing
(6) Bolt : M10×25 P=1.25
(7) Sunk key
(8) Washer
(9) Nut : 3/4-16UNF
(10) Hub
(11) Flange

N·m

(1) Bolt M10×25 P=1.25 : 69 N·m (51 lbf·ft)
(3) Bolt M12×45 : 78 N·m (58 lbf·ft)
(6) Bolt M10×25 P=1.25 : 69 N·m (51 lbf·ft)
(9) Nut 3/4-16UNF : 196 N·m (145 lbf·ft)

4-1-1. 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 Set sunk key (7) to pump (2) shaft.
② Secure hub (10) with nut (9) and washer (8).

(9) Nut 3/4-16UNF : 196 N·m (145 lbf·ft)

③ Secure flange (11) to engine flywheel with eight bolts (1).

(1) Bolt M10×25 P=1.25 : 69 N·m (51 lbf·ft)

④ Secure housing (5) to flywheel housing with twelve bolts (6).

(6) Bolt M10×25 P=1.25 : 69 N·m (51 lbf·ft)

⑤ Set spacer (4) on housing (5).
⑥ Engage hub (10) of pump SUB ASSY with flange (11) splines.
⑦ Secure pump SUB ASSY to housing (5) with two bolts (3), spring washers and washers.

(3) Bolt M12×45 : 78 N·m (58 lbf·ft)

(NOTICE)

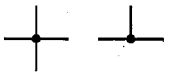
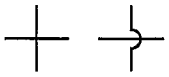
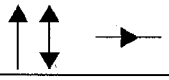
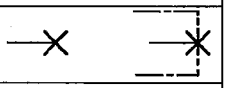
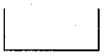
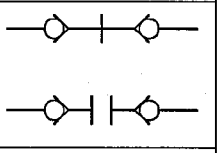
- **Bolts (1) is treated with thread-locking fluid. Use new thread-locking fluid treated bolts for installation.**

HYDRAULIC SYSTEMS

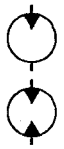
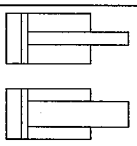
1. SYSTEM CIRCUIT DIAGRAM

1-1. Graphic Symbols for Hydraulic Circuits

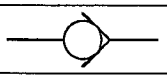
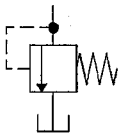
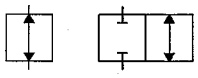
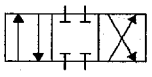
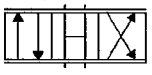
Basic Symbols

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

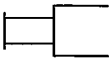
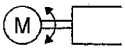
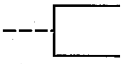
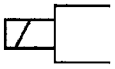
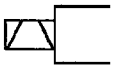
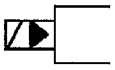
Pump, Motors and Cylinders

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

Valves

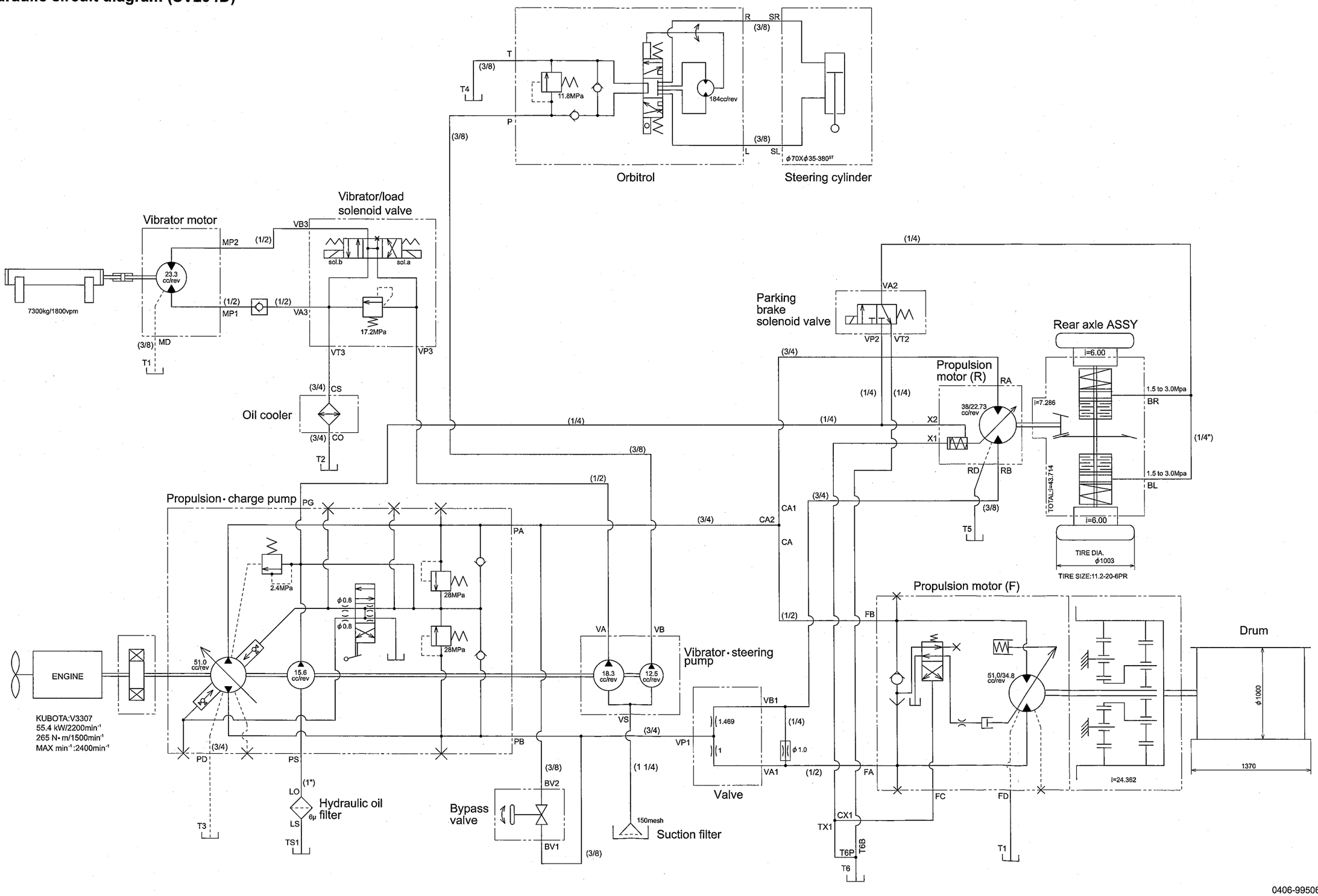
DESCRIPTION	SYMBOL
Check valve	
Manual shut off (On-Off)	
Pressure relief	
Flow control, adjustable	
Valve symbols: The basic valve symbol one or more squares with lines representing flow paths and flow conditions between ports.	
Multiple squares indicate a valve with as many distinct positions there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

Methods of Operation

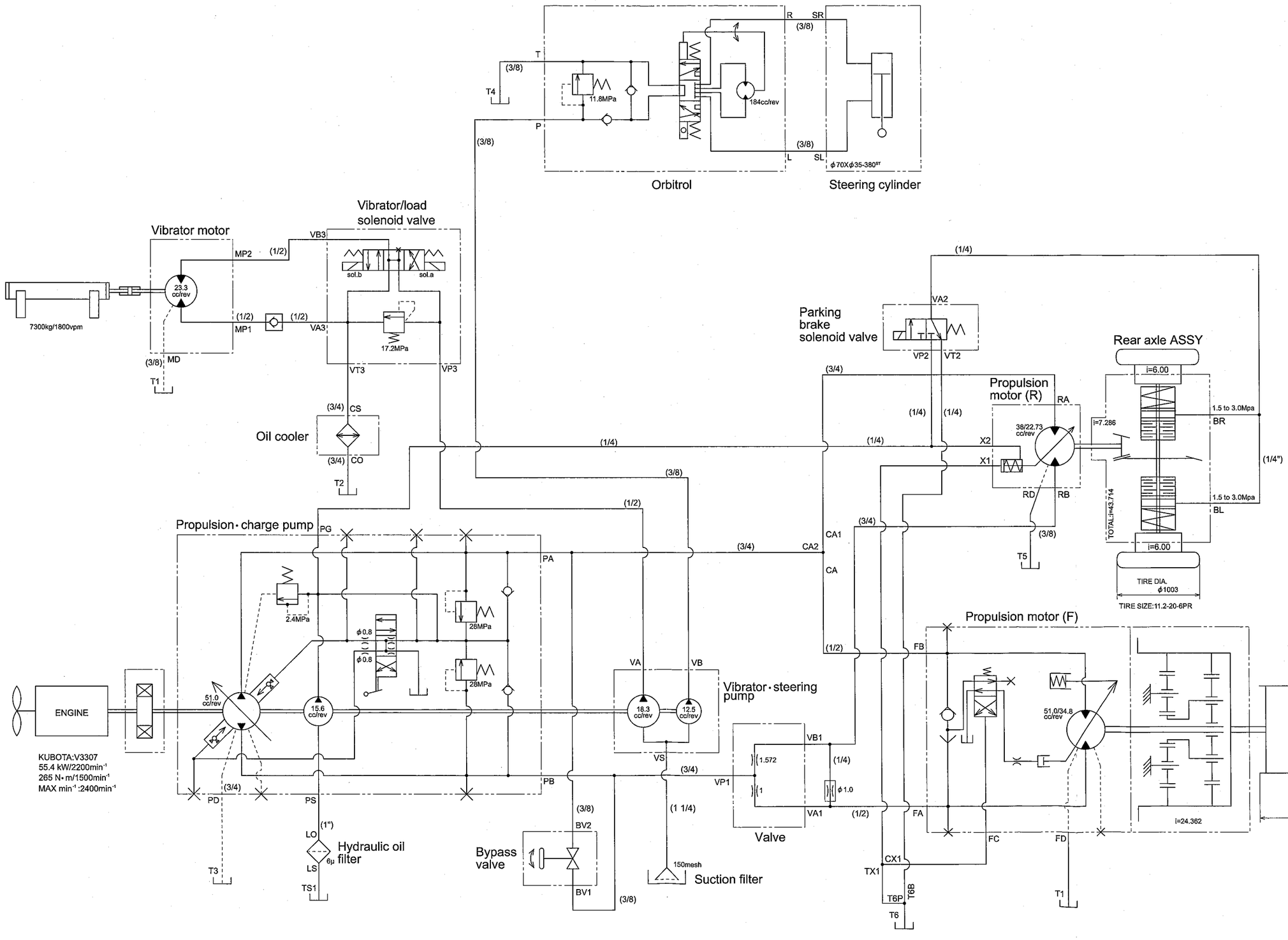
DESCRIPTION	SYMBOL
Spring	
Manual	
Pressure compensated	
Reversing motor	
Pilot pressure: Internal supply	
Remote supply	
Solenoid: Single winding	
Two windings operating in opposite directions.	
Pilot directional valve is actuated by the solenoid.	

1-2. Hydraulic Circuit Diagram

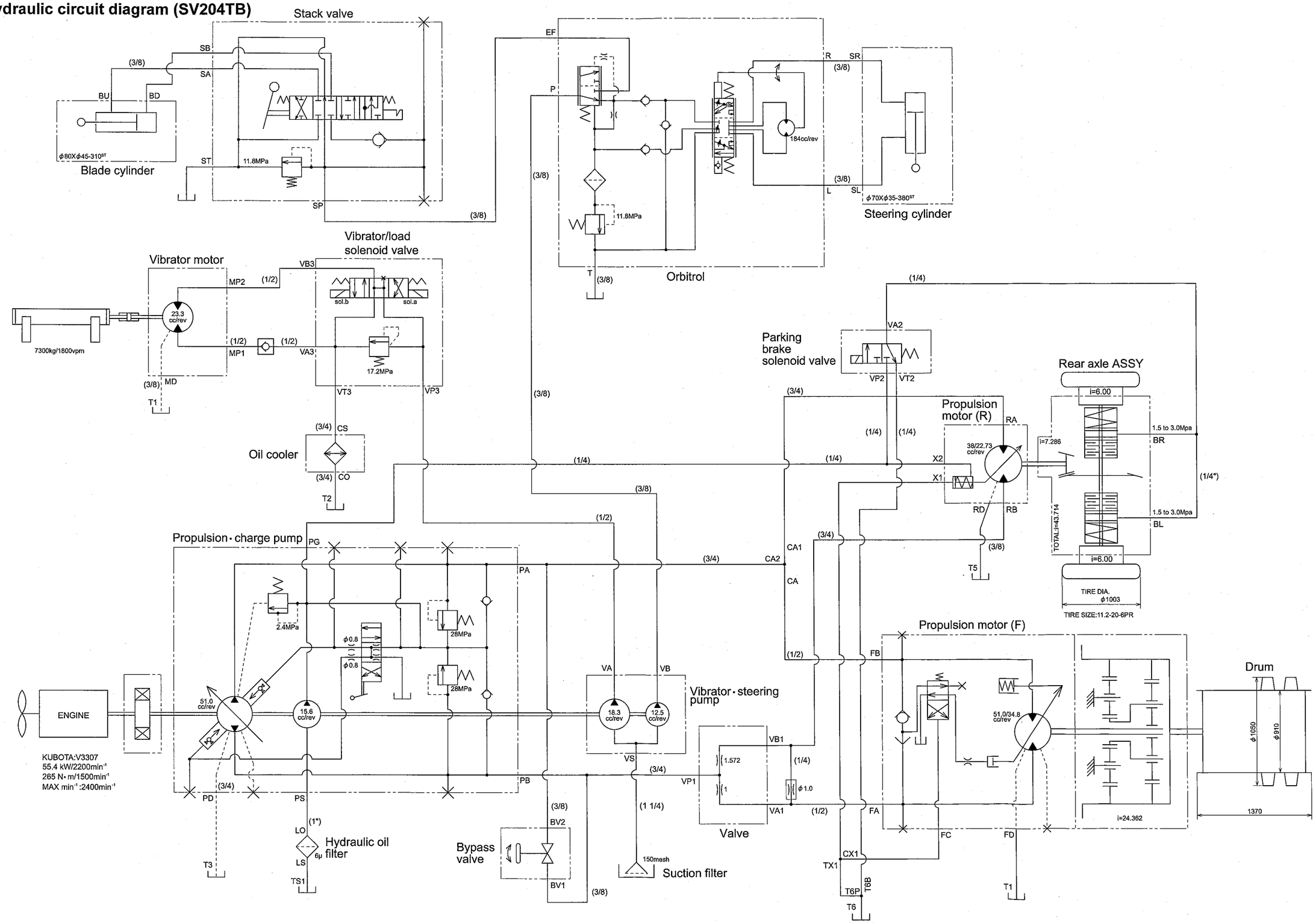
1-2-1. Hydraulic circuit diagram (SV204D)



1-2-2. Hydraulic circuit diagram (SV204T, TF)



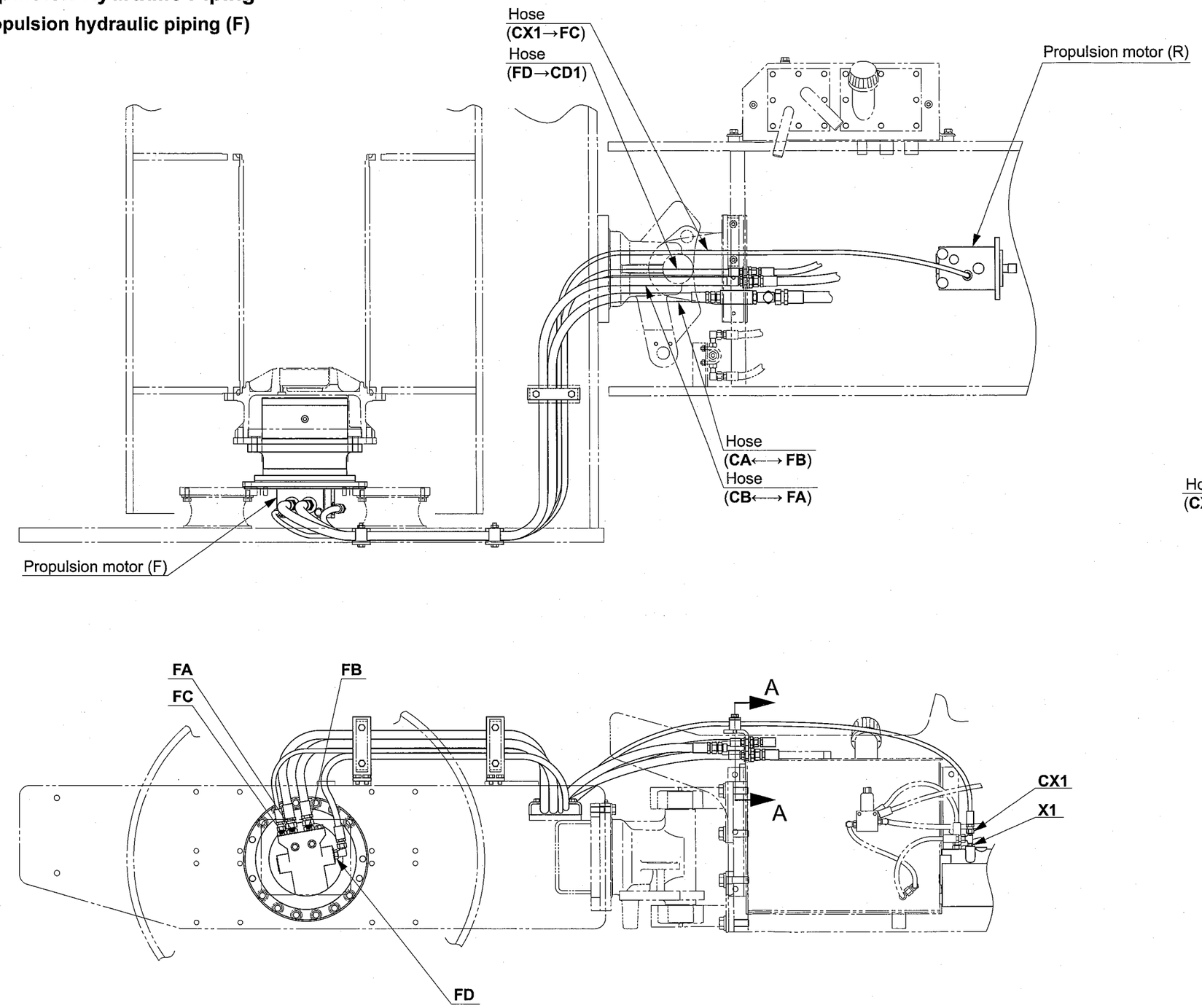
1-2-3. Hydraulic circuit diagram (SV204TB)

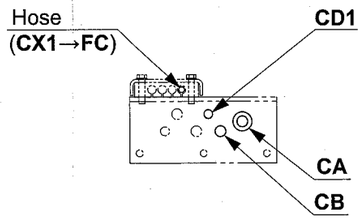


2. PROPULSION HYDRAULIC SYSTEM

2-1. Propulsion Hydraulic Piping

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



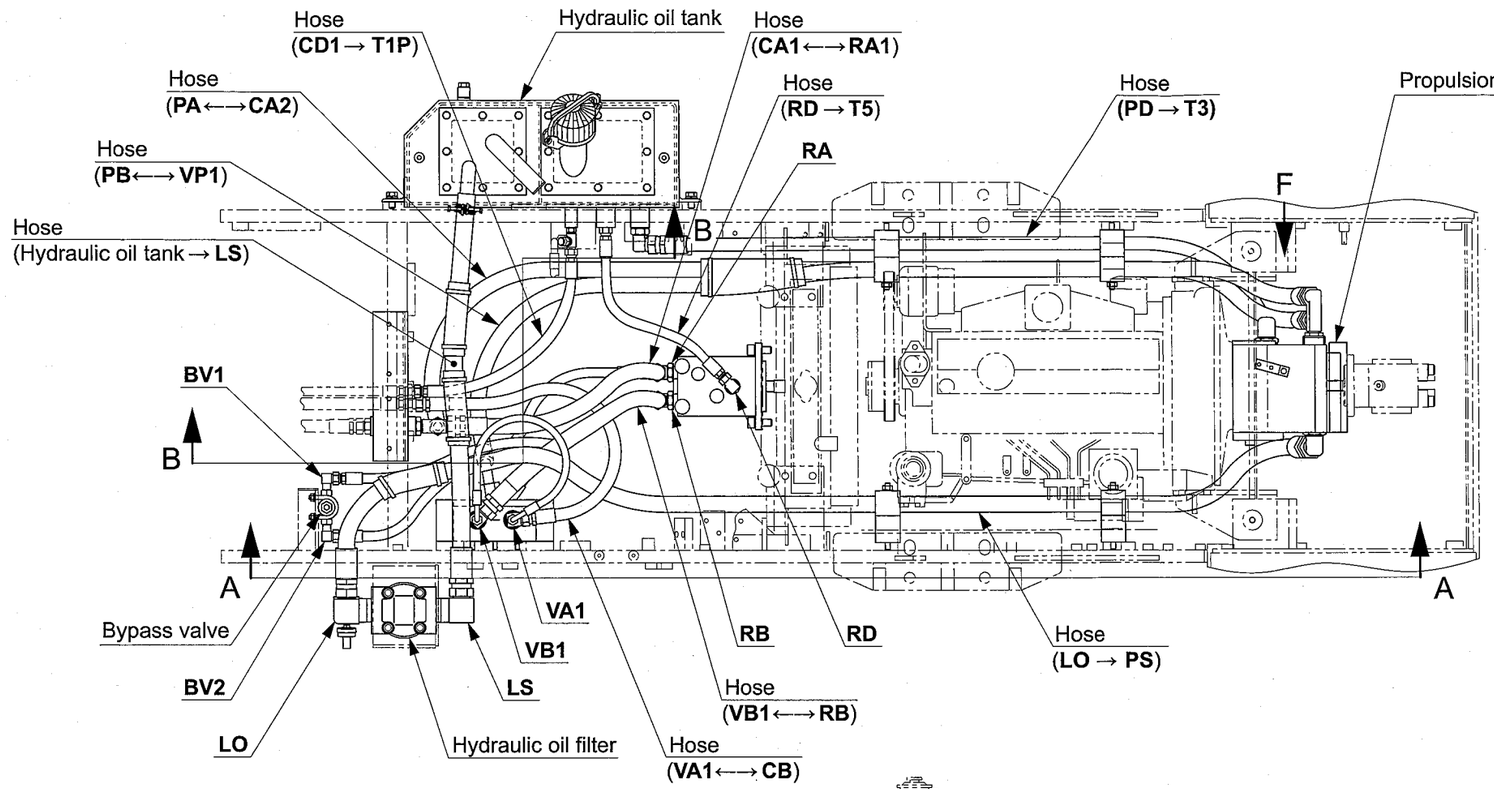


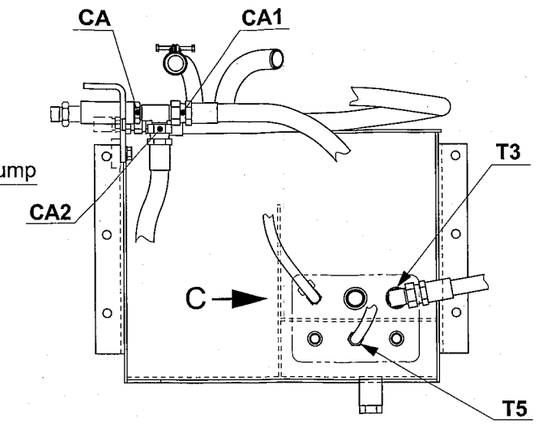
SECTION A-A

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

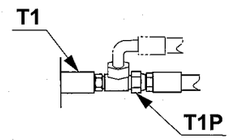
0406-36801-0-10065-G

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

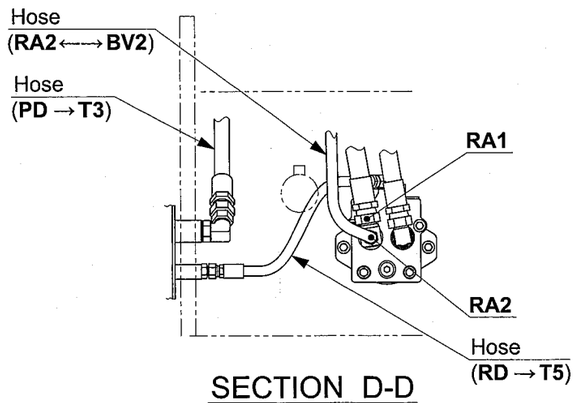




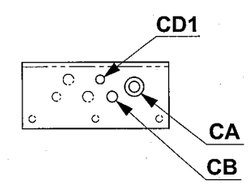
SECTION B-B



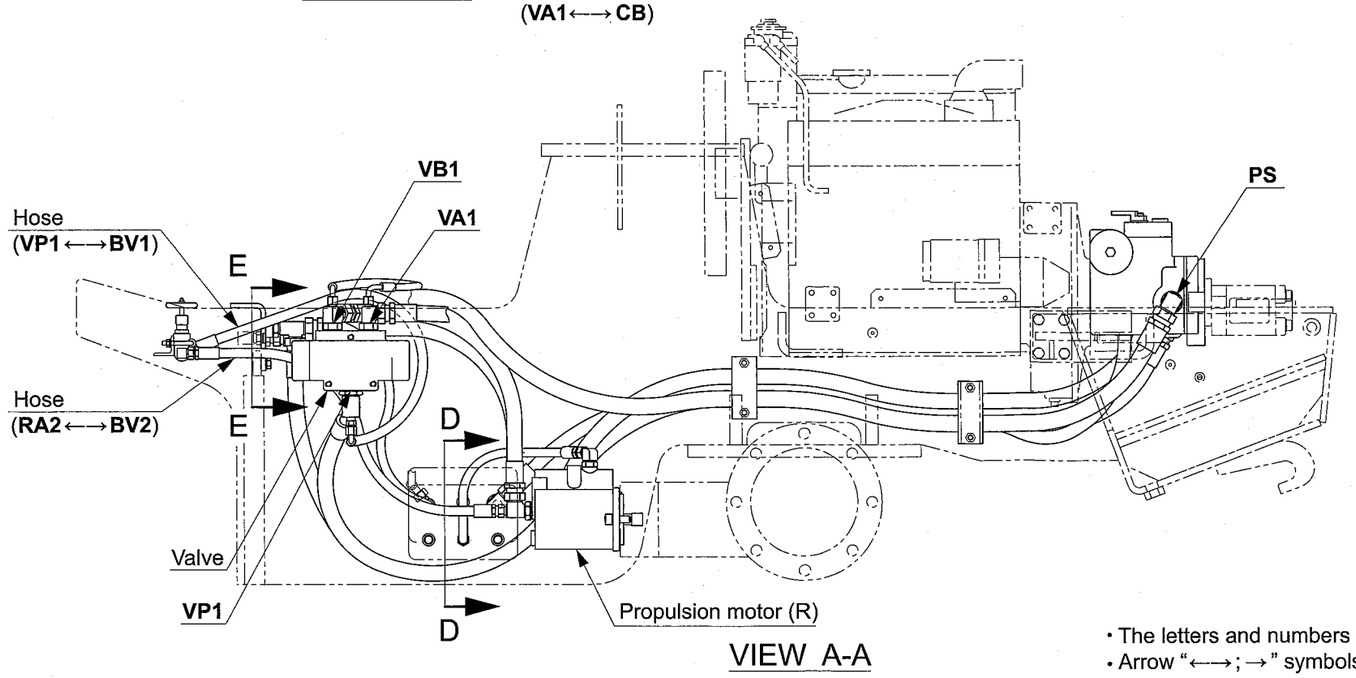
VIEW C



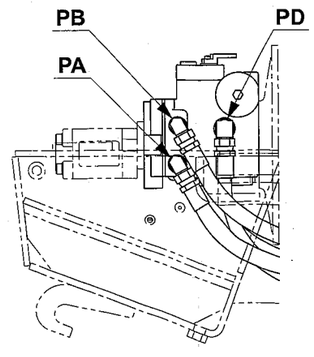
SECTION D-D



SECTION E-E



VIEW A-A

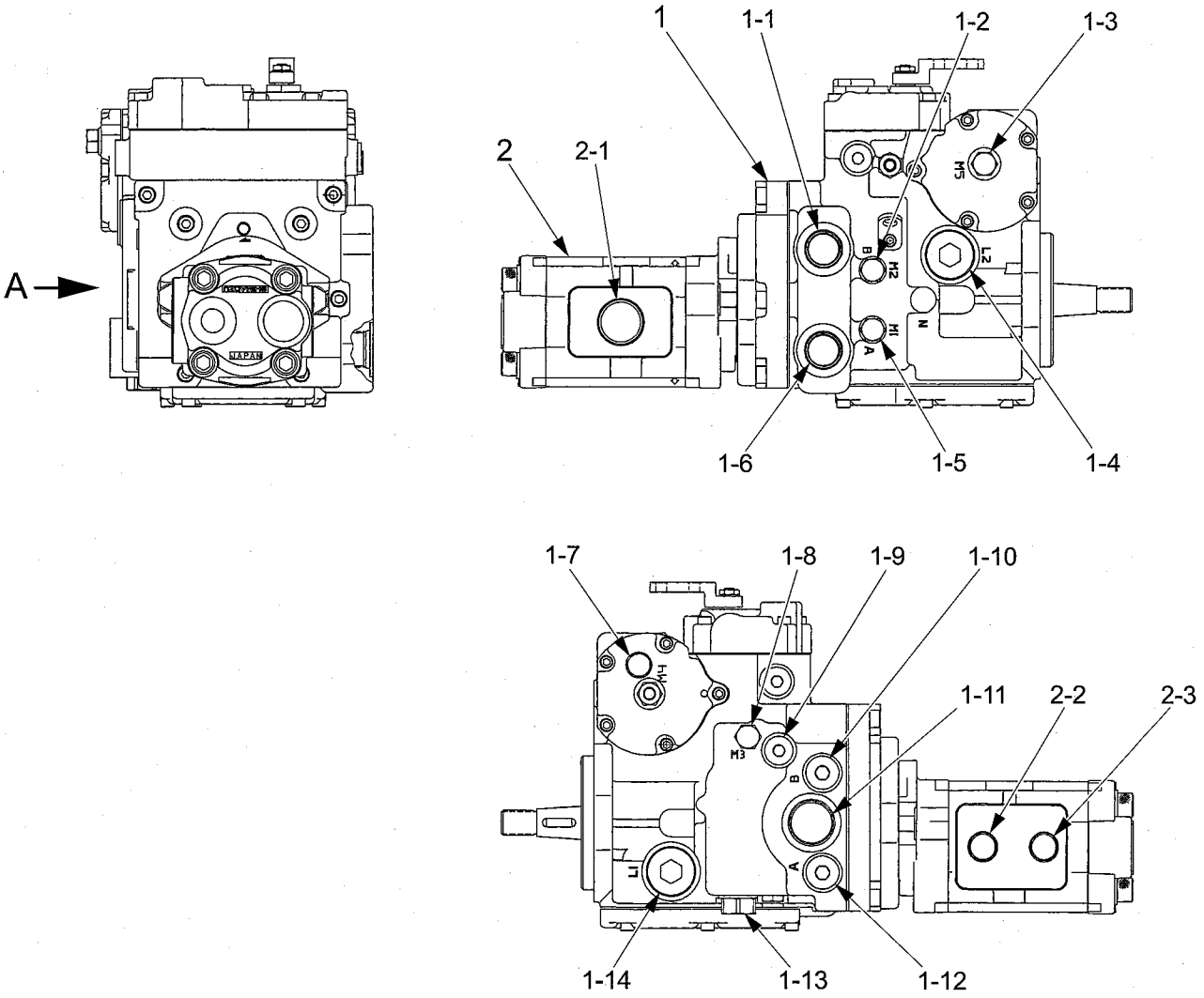


VIEW F

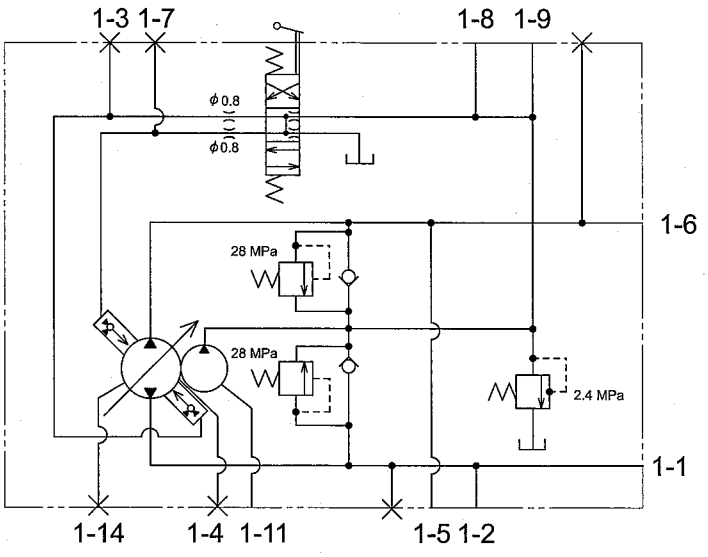
- The letters and numbers in the figure such as “PA” and “PB” show each port.
- Arrow “⟷; →” symbols show the hose connection and the direction of the flow of the oil.

2-2. Hydraulic Component Specifications

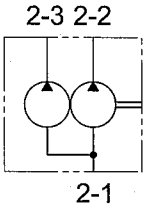
2-2-1. Hydraulic pump ASSY (propulsion + vibrator • steering)



VIEW A



Propulsion pump circuit diagram



Vibrator·steering pump circuit diagram

SV201-1-04001

(1) Propulsion pump

(1-1)	Port B (Reverse)	**[PB]**	: 1 1/16-12UN
(1-2)	High pressure gauge port (For port B)		: 9/16-18UNF
(1-3)	Servo pressure gauge port		: 9/16-18UNF
(1-4)	Drain port	**[PD]**	: 1 5/16-12UN
(1-5)	High pressure gauge port (For port A)		: 9/16-18UNF
(1-6)	Port A (Forward)	**[PA]**	: 1 1/16-12UN
(1-7)	Servo pressure gauge port		: 9/16-18UNF
(1-8)	Charge pressure gauge port		: 9/16-18UNF
(1-9)	Charge pressure gauge port	**[PG]**	: 3/ 4-16UNF
(1-10)	*High pressure relief valve (For port B)		
(1-11)	Charge pump suction port	**[PS]**	: 1 5/16-12UN
(1-12)	*High pressure relief valve (For port A)		
(1-13)	Charge relief valve		
(1-14)	Drain port		: 1 5/16-12UN

Specifications

• Displacement	:	51 cm^3/rev	(3.1 cu.in./rev)	
• Displacement (Charge pump)	:	15.6 cm^3/rev	(1.0 cu.in./rev)	
• High pressure relief valve pressure setting	:	28.0 MPa	(4,060 psi)	
• Charge relief valve pressure setting	:	2.4 MPa	(348 psi)	
• Allowable pump case pressure	:	0.25 MPa	(36.3 psi)	or less
• Pump weight	:	42 kg	(93 lbs.)	

(2) Vibrator • steering pump

(2-1)	Suction port	**[VS]**	: G1
(2-2)	Port 1	**[VA]**	: G1/2
(2-3)	Port 2	**[VB]**	: G1/2

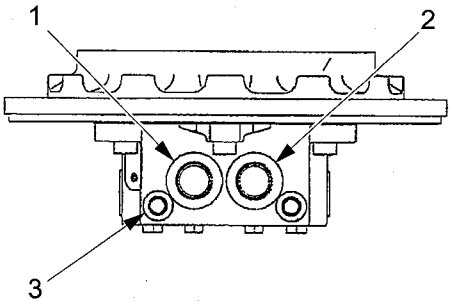
Specifications

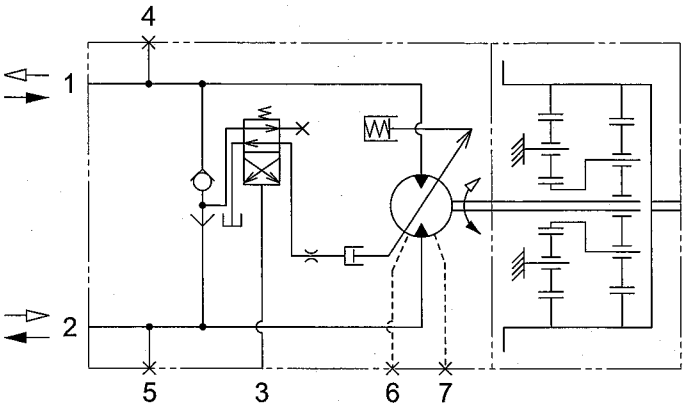
• Displacement (Port 1)	:	18.3 cm^3/rev	(1.1 cu.in./rev)
• Displacement (Port 2)	:	12.5 cm^3/rev	(0.8 cu.in./rev)
• Pump weight	:	7.4 kg	(16 lbs.)

• Pump ASSY weight	:	49.4 kg	(109 lbs.)

* High pressure relief valve = S.C.R. (System Check Relief) valve for charge check and high pressure relief.

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

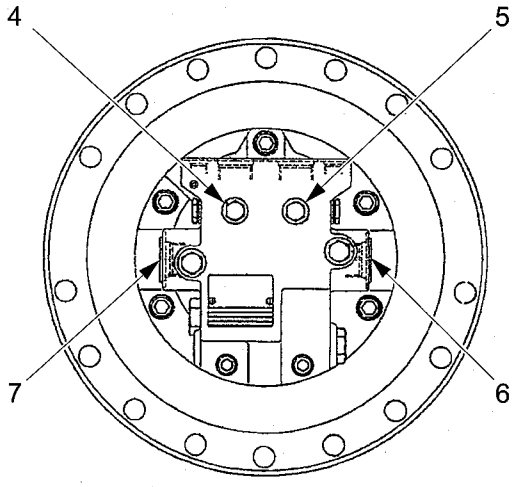


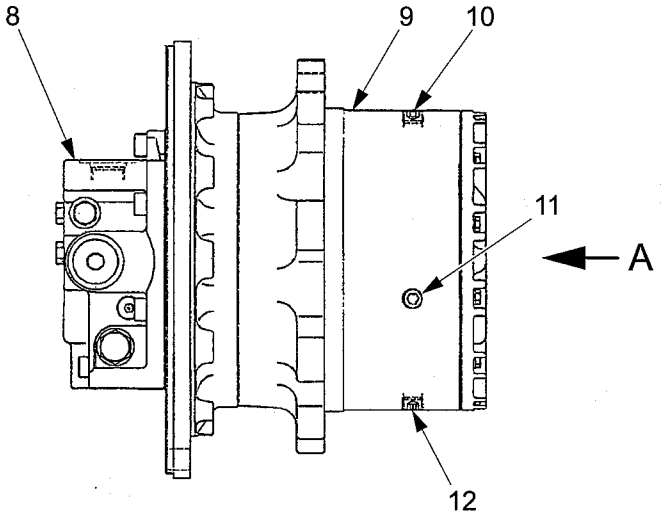


Flow of oil (Rotation direction is when viewed in direction of arrow A.)

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

Motor circuit diagram





SV201-1-04002

(1)	Port A	**[FA]** : G3/4	(7)	Drain port	: G3/4
(2)	Port B	**[FB]** : G3/4	(8)	Motor	
(3)	Hi-Lo change port	**[FC]** : G1/4	(9)	Reduction gear	
(4)	High pressure gauge port (For port A)	: 7/16-20UNF	(10)	Filler/Drain port a	: Rc 3/8
(5)	High pressure gauge port (For port B)	: 7/16-20UNF	(11)	Filler/Drain port b	: Rc 3/8
(6)	Drain port	**[FD]** : G3/4	(12)	Filler/Drain port c	: Rc 3/8

Motor specifications

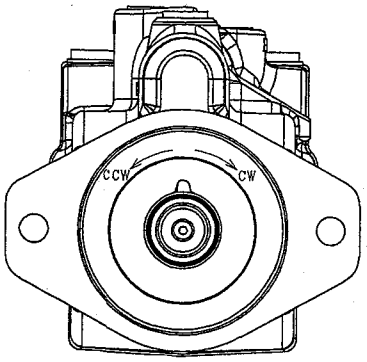
- Displacement (Lo) : 51 cm^3/rev (3.1 cu.in./rev)
  (Hi) : 34.8 cm^3/rev (2.1 cu.in./rev)
- Maximum working pressure : 34.3 MPa (4,974 psi)
- Allowable motor case pressure : 0.3 MPa (43.5 psi) or less
- Speed change pressure (Lo) : 0.3 MPa (43.5 psi) or less
  (Hi) : 1.5 to 5.0 MPa (218 to 725 psi)

Reduction gear specifications

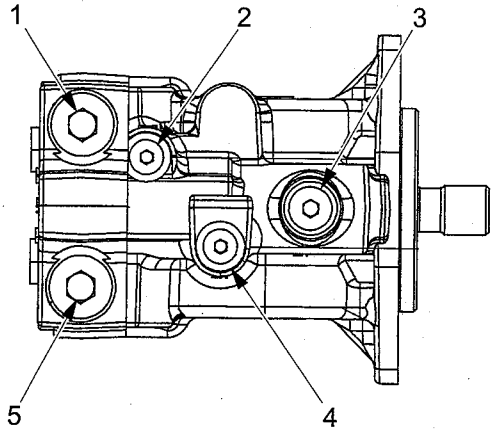
- Reduction ratio : 1/24.362

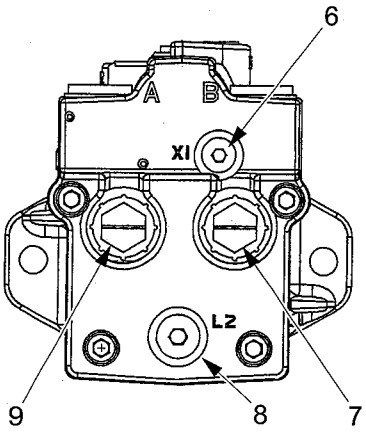
- Weight : 86 kg (190 lbs.)

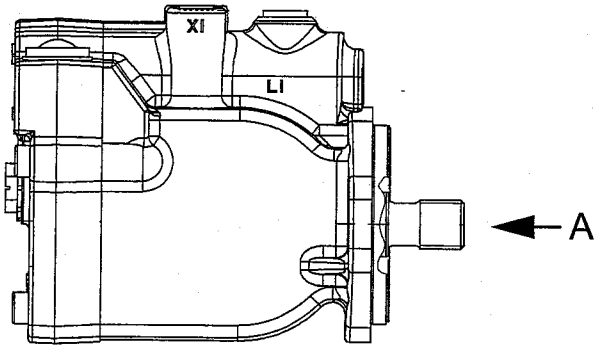
2-2-3. Propulsion hydraulic motor (R)

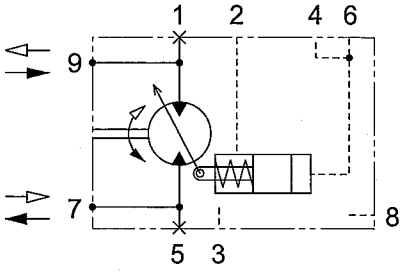


VIEW A









Flow of oil
- 7→9 Clockwise rotation
- 9→7 Counterclockwise rotation

Motor ciruit diagram

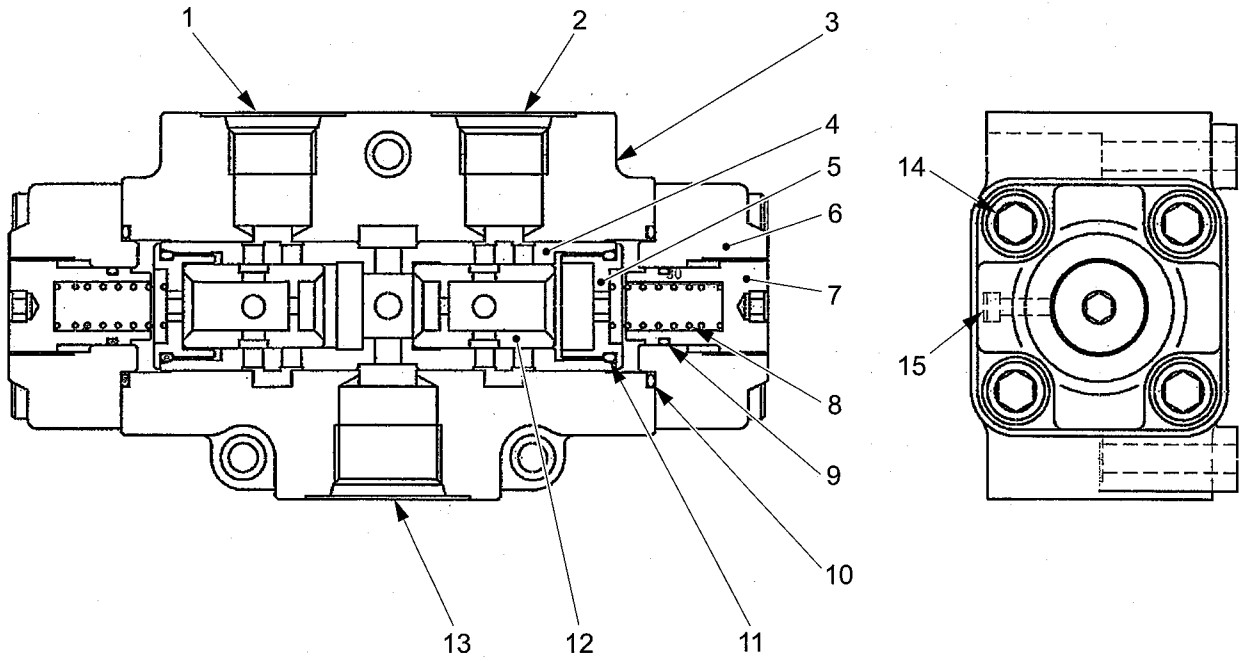
SV201-1-04003

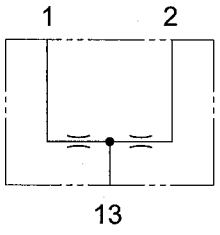
(1) System pressure port		:	1 1/16-12UN	(6) 2 speed control port (Min)		:	9/16-18UNF
(2) 2 speed control port (Max)	**[X2]**	:	9/16-18UNF	(7) Port B	**[RB]**	:	1 1/16-12UN
(3) Drain port	**[RD]**	:	3/ 4-16UNF	(8) Drain port		:	3/ 4-16UNF
(4) 2 speed control port (Min)	**[X1]**	:	9/16-18UNF	(9) Port A	**[RA]**	:	1 1/16-12UN
(5) System pressure port		:	1 1/16-12UN				

Motor specifications

• Displacement (Max)	:	38 cm^3/rev	(2.3 cu.in./rev)
(Min)	:	22.7 cm^3/rev	(1.4 cu.in./rev)
• Maximum working pressure	:	21.0 MPa	(3,045 psi)
• Allowable motor case pressure	:	0.2 MPa	(29 psi) or less
• Speed change pressure	:	1.4 to 3.5 MPa	(203 to 507.5 psi)
• Weight	:	15.4 kg	(34 lbs.)

2-2-4. Valve





Hydraulic circuit diagram

SV201-1-04004

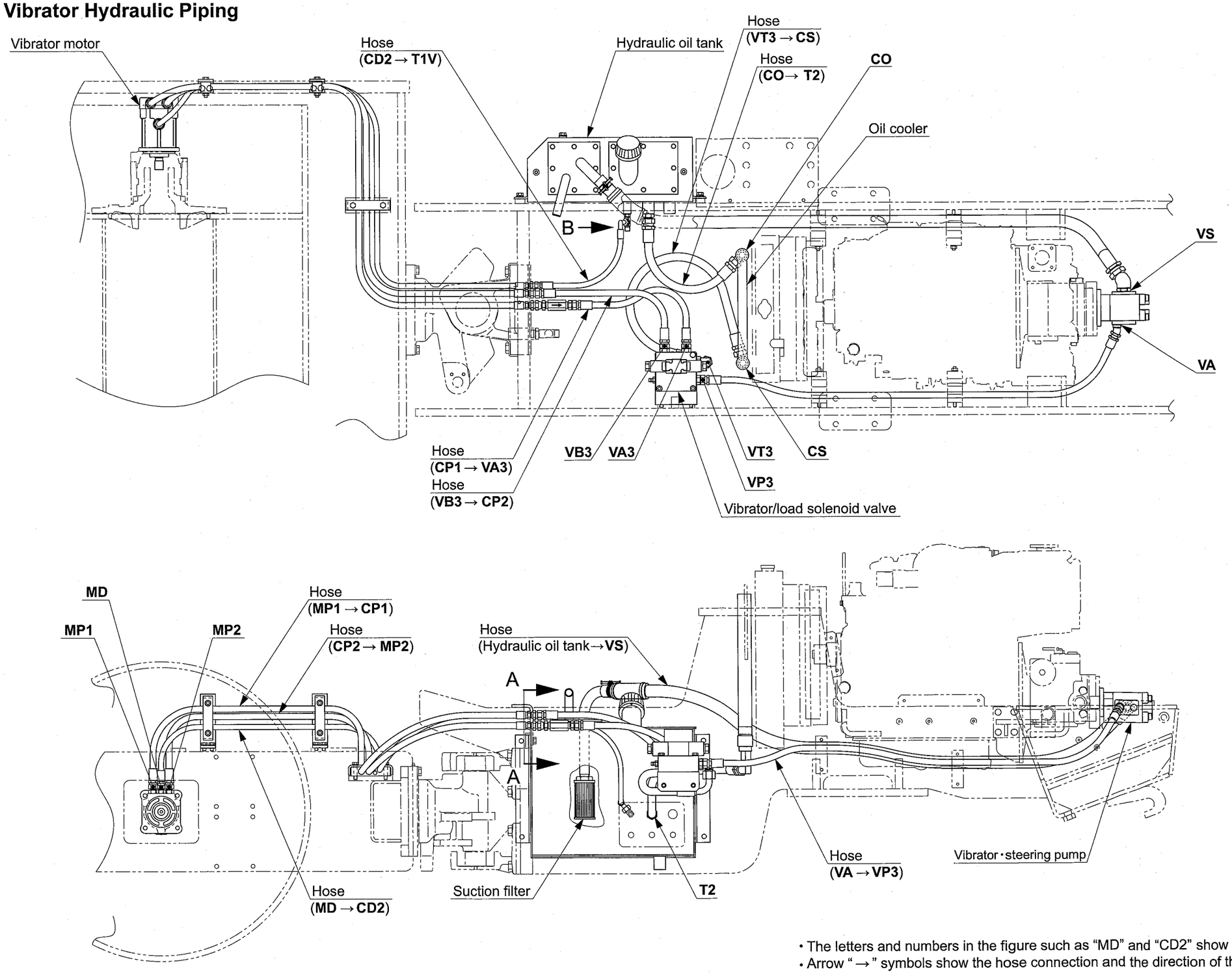
(1) Port A **[VA1]** : G3/4
(2) Port B **[VB1]** : G3/4
(3) Body
(4) Spool
(5) Spool plug
(6) Cover
(7) Bolt
(8) Spring
(9) O-ring
(10) O-ring
(11) O-ring
(12) Sub spool
(13) Port P **[VPB][VBP]** : G1
(14) Bolt : M12×40
(15) Bolt : M 5×20

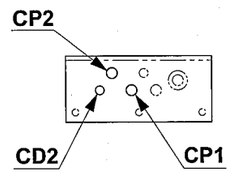
Specifications

- Standard flow : 100 L/min (26 gal./min)
- Rated pressure : 30 MPa (4,350 psi)
- Flow division ratio (A : B) : 1 : 1.47 SV204D
  : 1 : 1.57 SV204T, TF, TB
- Weight : 11 kg (24 lbs.)

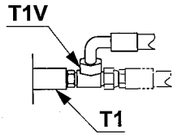
3. VIBRATOR HYDRAULIC SYSTEM

3-1. Vibrator Hydraulic Piping





SECTION A-A

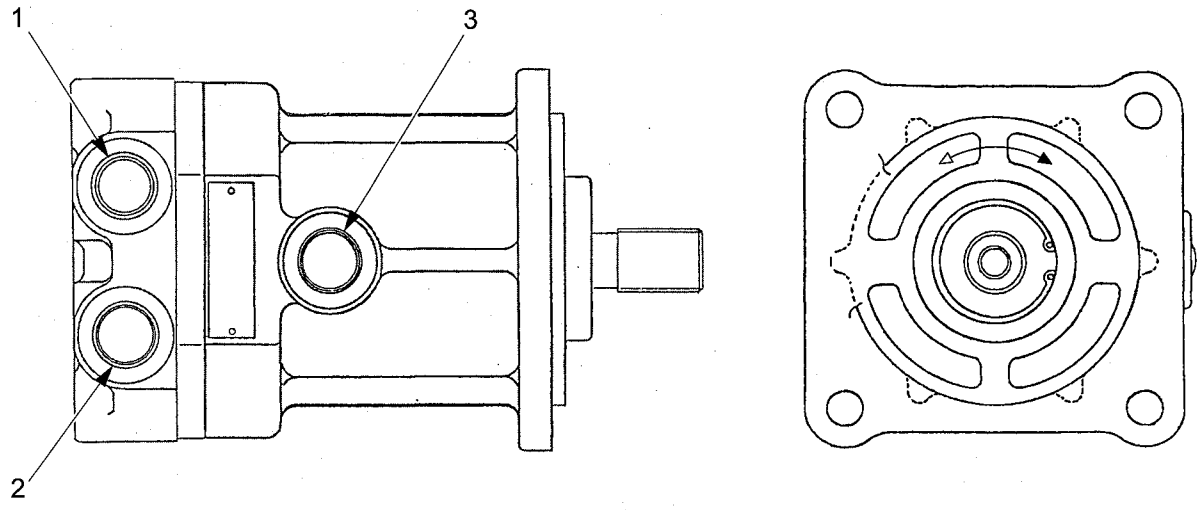


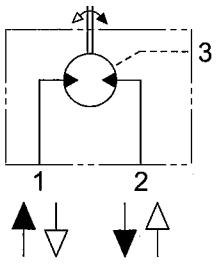
VIEW B

- The letters and numbers in the figure such as “MD” and “CD2” show each port.
- Arrow “ → ” symbols show the hose connection and the direction of the flow of the oil.

3-2. Hydraulic Component Specifications

3-2-1. Vibrator hydraulic motor





Hydraulic circuit diagram

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

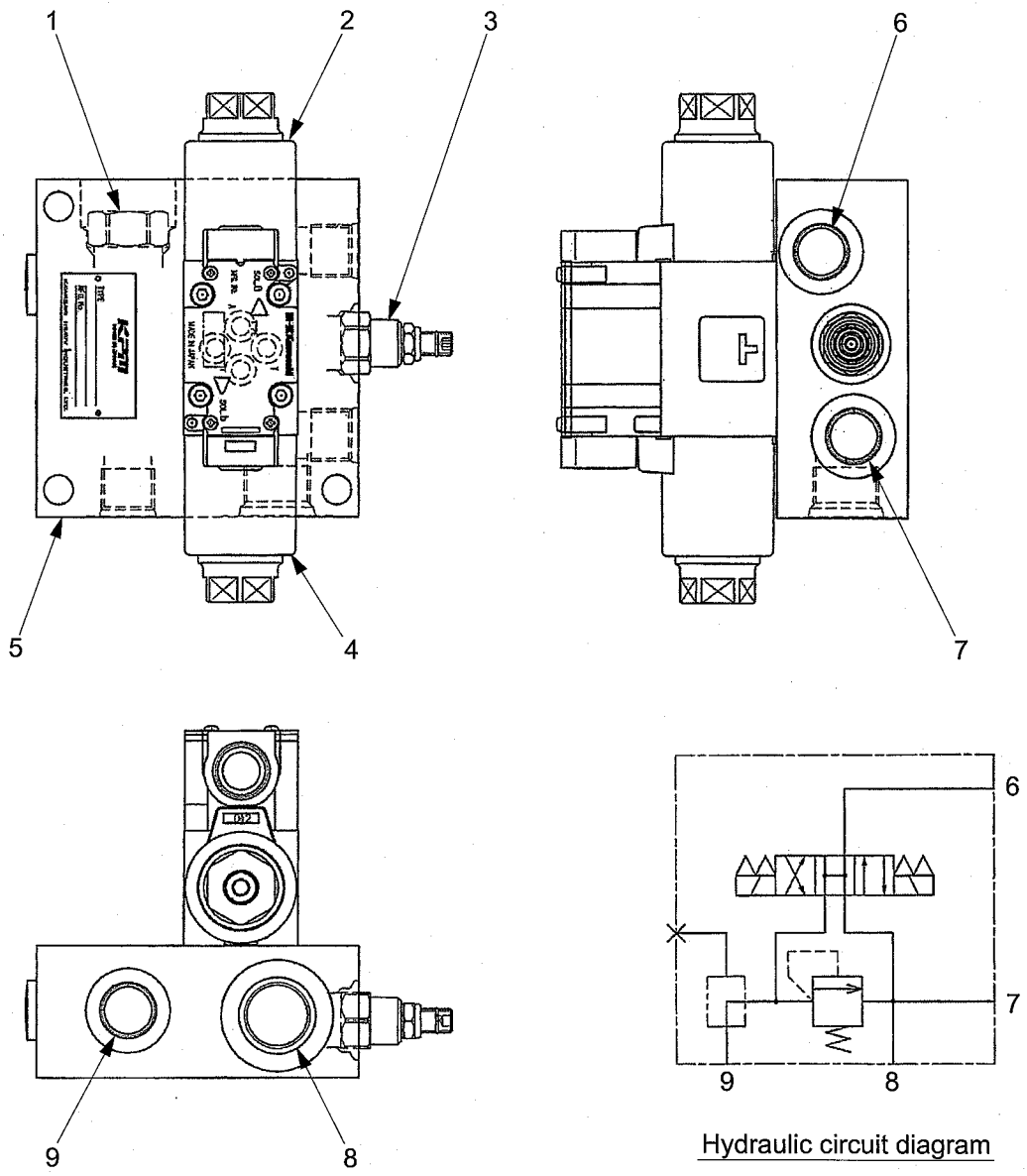
SV201-1-04005

(1) Port P2	**[MP2]**	:	G1/2
(2) Port P1	**[MP1]**	:	G1/2
(3) Drain port	**[MD]**	:	G1/2

Specifications

• Displacement	:	23.3 cm^3/rev	(1.42 cu.in./rev)
• Maximum working pressure	:	20.6 MPa	(2,987 psi)
• Allowable motor case pressure	:	0.1 MPa	(16 psi)
• Weight	:	11 kg	(24 lbs.)

3-2-2. Vibrator/load solenoid valve



Hydraulic circuit diagram

SV204-04006

(1) Cavity plug
(2) Vibrator solenoid valve (sol.a)
(3) Relief valve
(4) Load solenoid valve (sol.b)
(5) Manifold
(6) Port B **[VB3]** : G1/2
(7) Port A **[VA3]** : G1/2
(8) Port T **[VT3]** : G3/4
(9) Port P **[VP3]** : G1/2

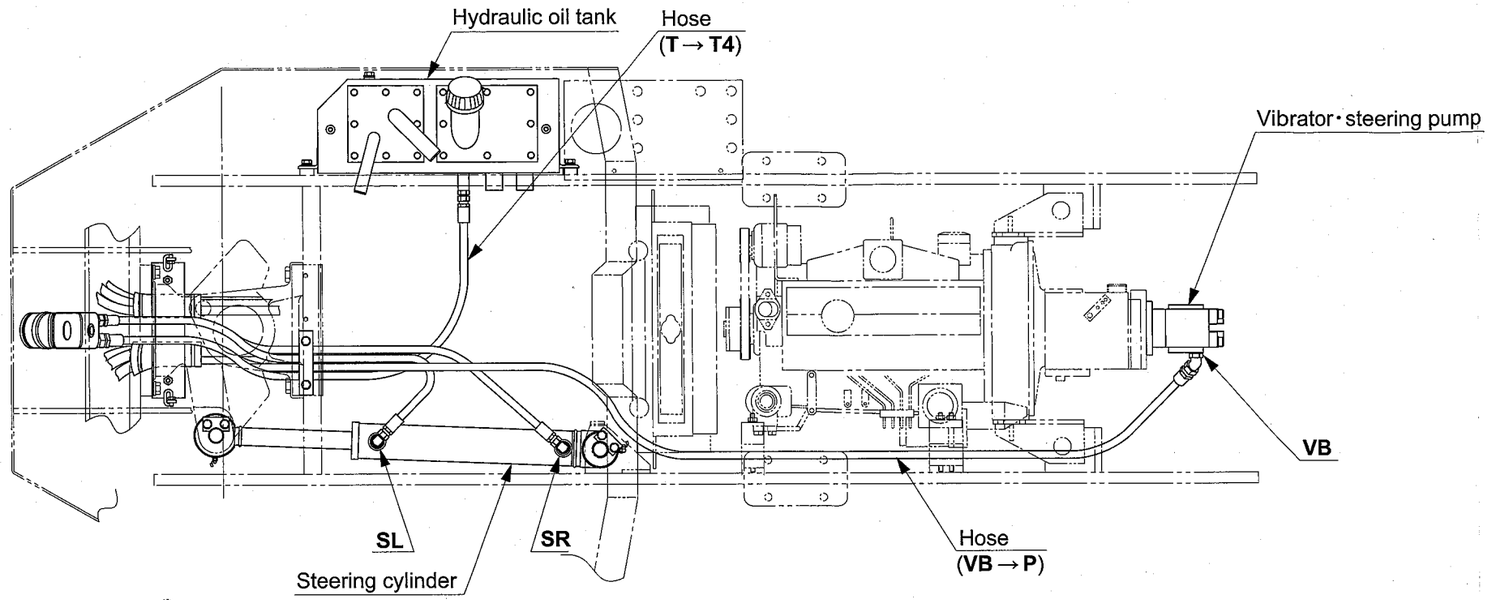
Specifications

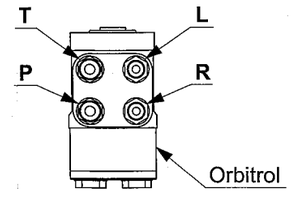
- Maximum flow : 70 L/min (18.5 gal./min)
- Maximum working pressure : 30.9 MPa (4,480 psi)
- Relief valve pressure setting : 17.2 MPa (2,494 psi)
- Weight : 7 kg (15.4 lbs.)

4. STEERING SYSTEM

4-1. Steering Hydraulic Piping

4-1-1. Steering hydraulic piping (SV204D, T, TF)

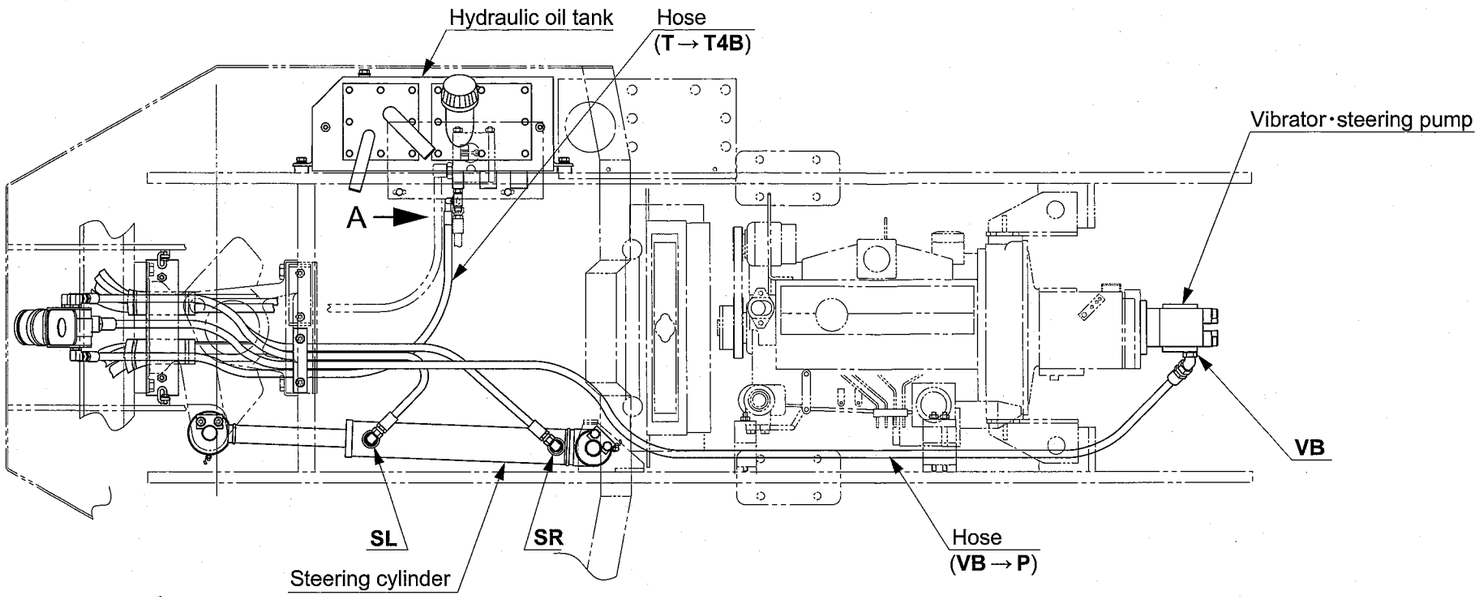


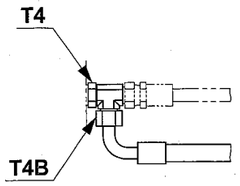


SECTION A-A

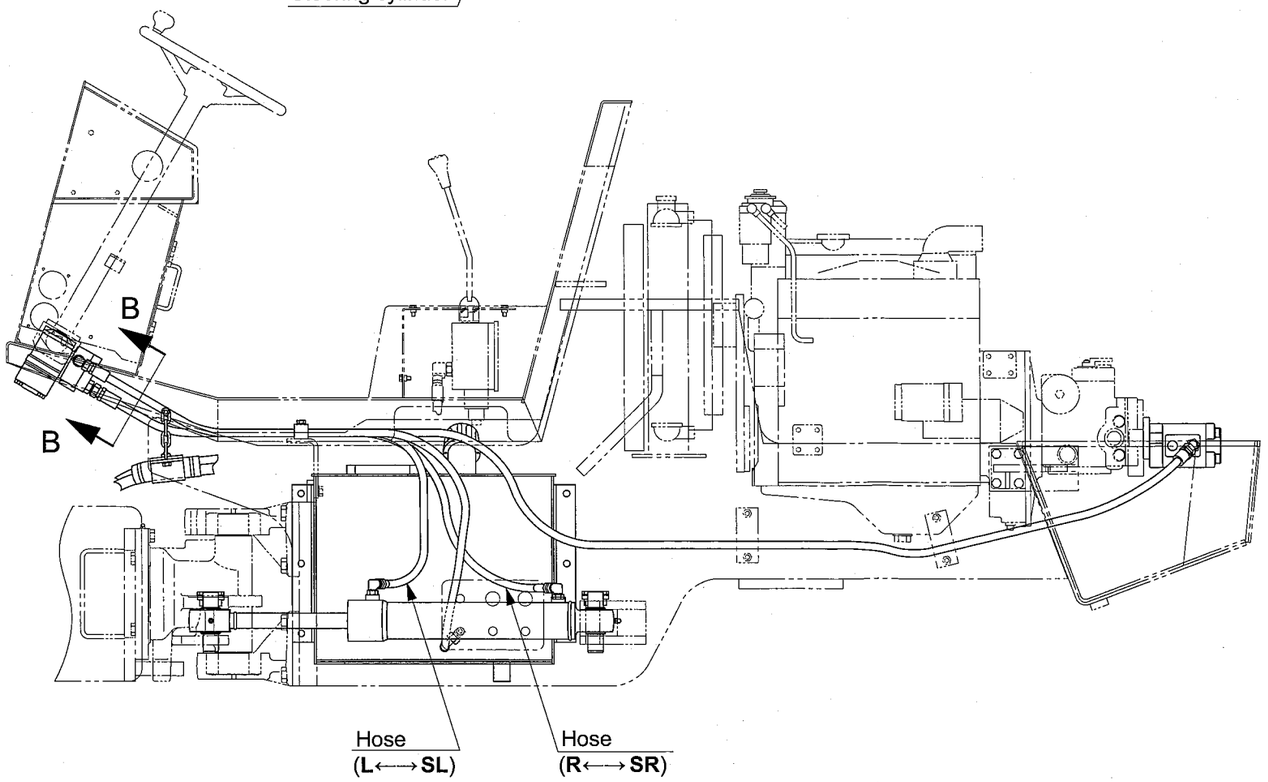
• The letters and numbers in the figure such as “R” and “SR” show each port.
• Arrow “⟷; →” symbols show the hose connection and the direction of the flow of the oil.

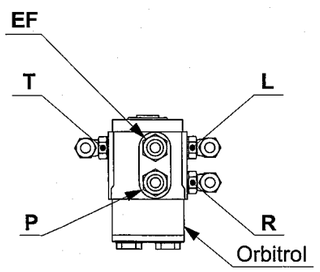
4-1-2. Steering hydraulic piping (SV204TB)





VIEW A

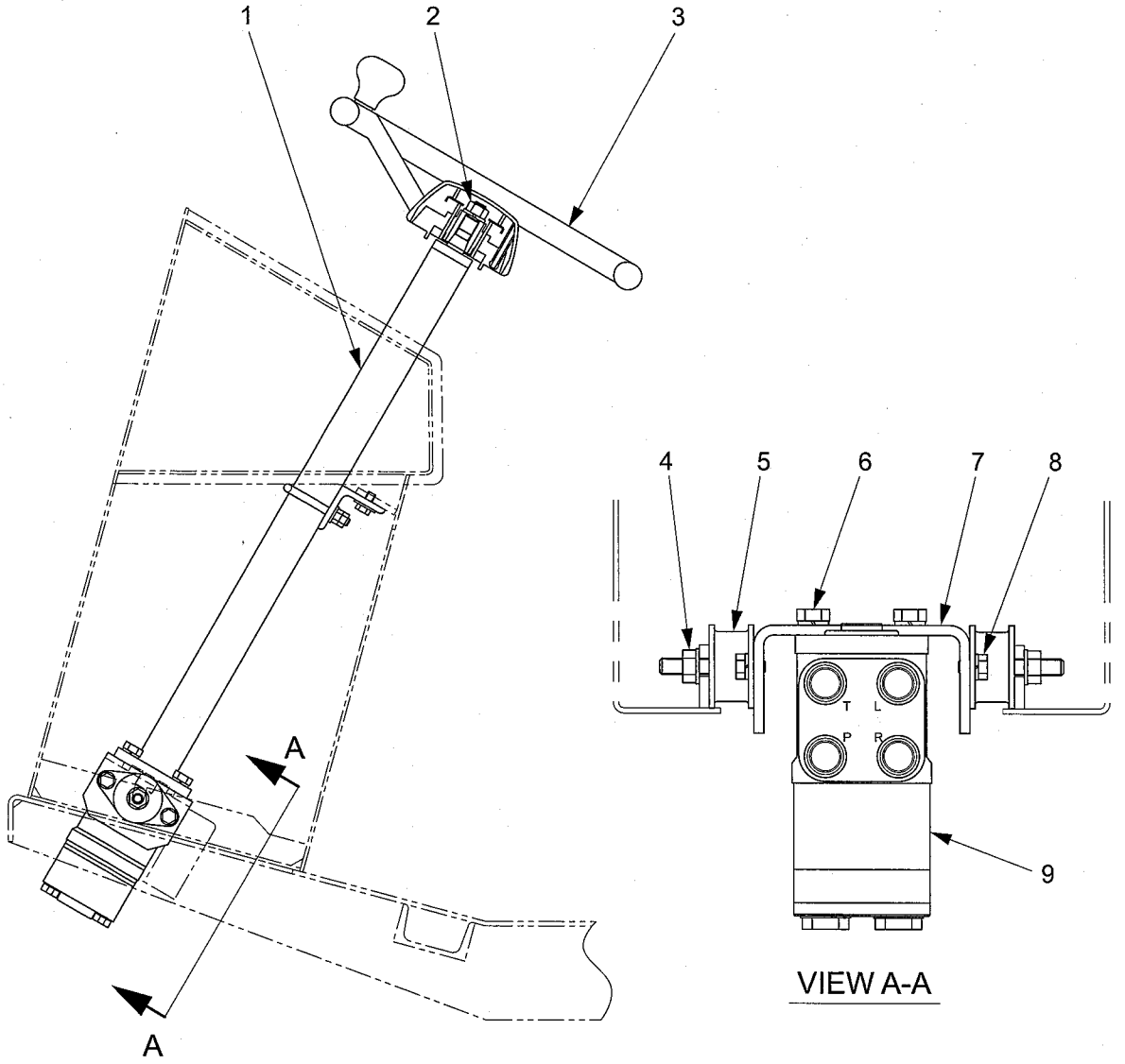




SECTION B-B

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

4-2. Steering Wheel



0404-32804-021754-A

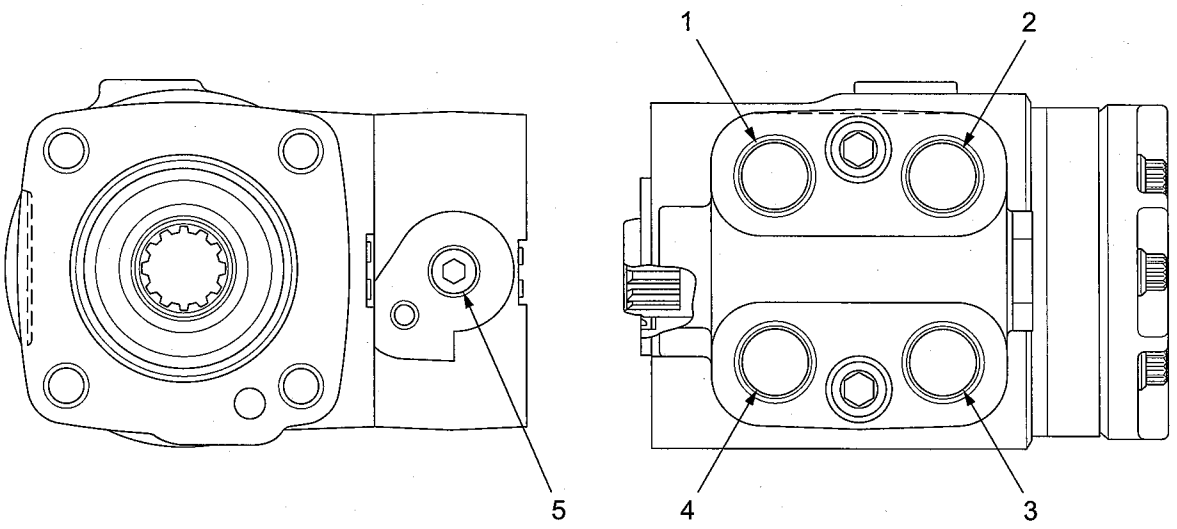
(1) Column shaft
(2) Nut : M12 P=1.25
(3) Steering wheel
(4) Nut : M10
(5) Damper
(6) Bolt : M10×30
(7) Bracket
(8) Bolt : M 8×12
(9) Orbitrol

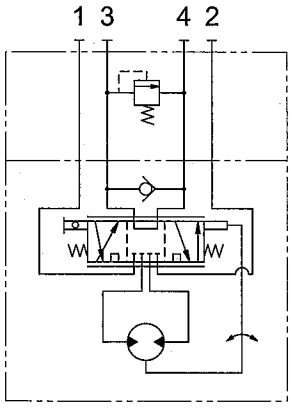
N·m

(2) Nut M12 P=1.25 : 35 N·m (26 lbf·ft)
(4) Nut M10 : 49 N·m (36 lbf·ft)
(6) Bolt M10×30 : 49 N·m (36 lbf·ft)
(8) Bolt M 8×12 : 23 N·m (17 lbf·ft)

4-3. Hydraulic Component Specifications

4-3-1. Orbitrol (SV204D, T, TF)





Hydraulic circuit diagram

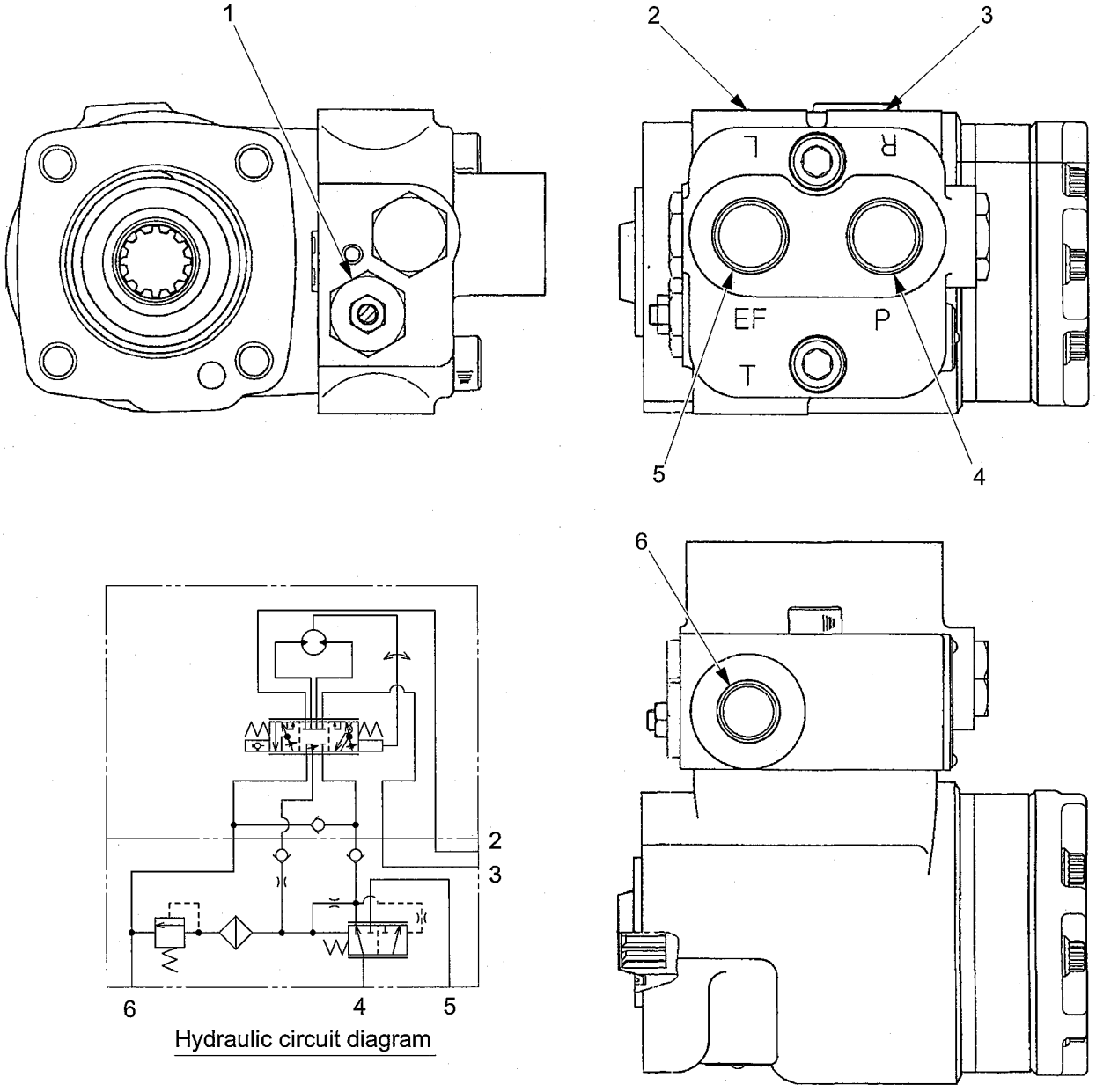
ORB-ET-04150

(1) Port L **[L]** : G3/8
(2) Port R **[R]** : G3/8
(3) Port P **[P]** : G3/8
(4) Port T **[T]** : G3/8
(5) Relief valve

Specifications

- Displacement : 184 cm^3/rev (11.2 cu.in./rev)
- Relief valve pressure setting : 11.8 MPa (1,711 psi)
- Weight : 7.5 kg (16.5 lbs.)

4-3-2. Orbitrol (SV204TB)



Hydraulic circuit diagram

ORB-ET-04110

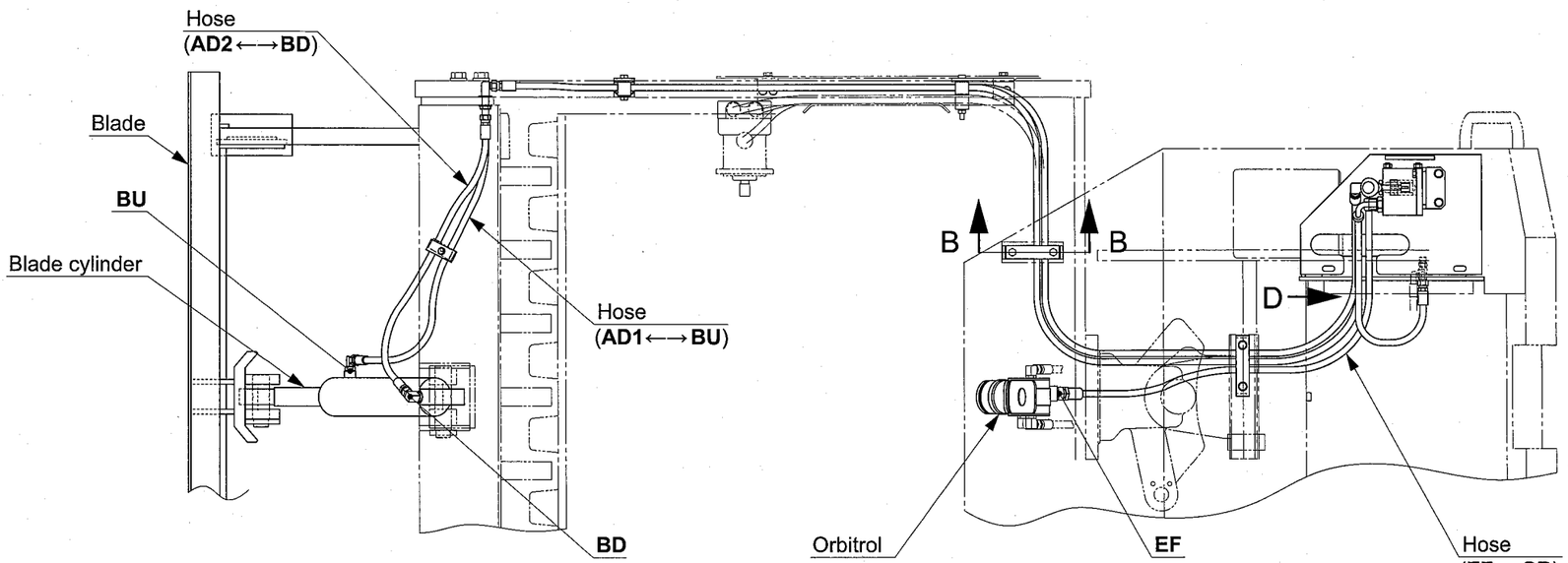
(1) Relief valve
(2) Port L **[L]** : G3/8
(3) Port R **[R]** : G3/8
(4) Port P **[P]** : G1/2
(5) Port EF **[EF]** : G1/2
(6) Port T **[T]** : G3/8

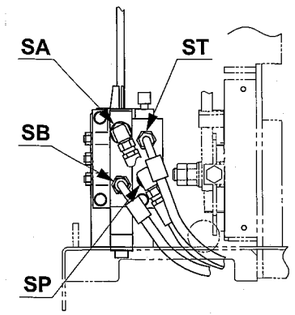
Specifications

- Displacement : 184 cm^3/rev (11.2 cu.in./rev)
- Relief valve pressure setting : 11.8 MPa (1,711 psi)
- Weight : 8.3 kg (18.3 lbs.)

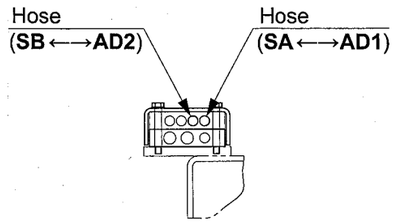
5. BLADE SYSTEM

5-1. Blade Hydraulic Piping

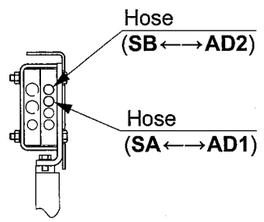




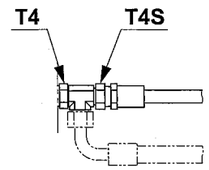
VIEW A



SECTION B-B



SECTION C-C

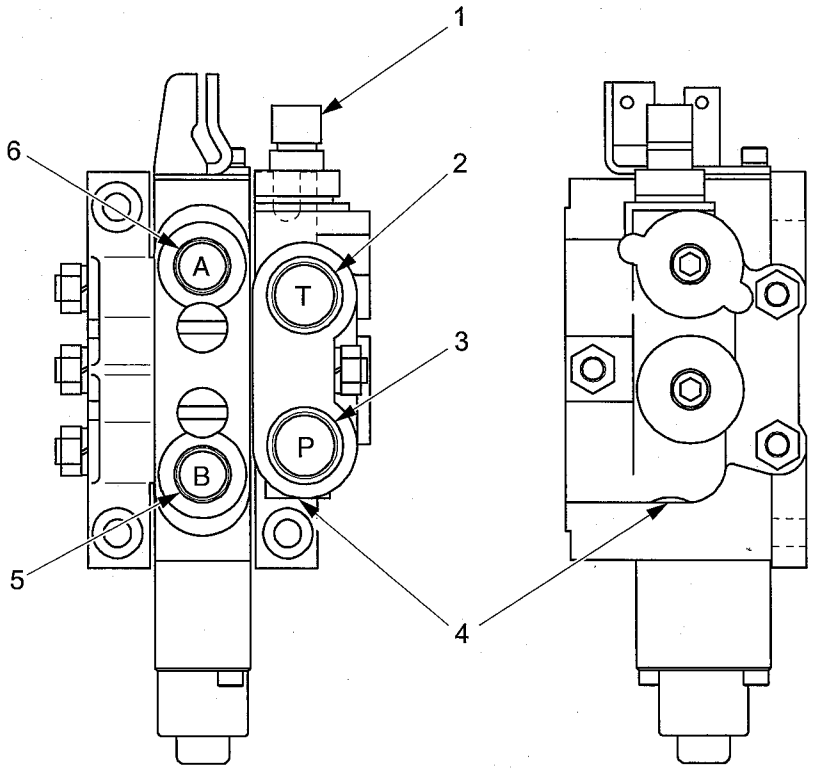


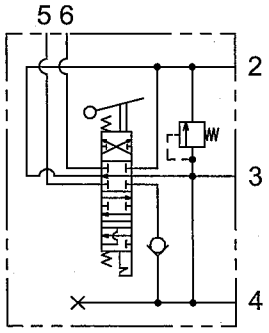
VIEW D

• The letters and numbers in the figure such as “AD2” and “SB” show each port.
• Arrow “←→; →” symbols show the hose connection and the direction of the flow of the oil.

5-2. Hydraulic Component Specifications

5-2-1. Stack valve





Hydraulic circuit diagram

SV201-1-04010

(1) Relief valve
(2) Port T **[ST]** : G3/4
(3) Port P **[SP]** : G3/4
(4) Pressure gauge port : Rc 1/4
(5) Port B **[SB]** : G1/2
(6) Port A **[SA]** : G1/2

Specifications

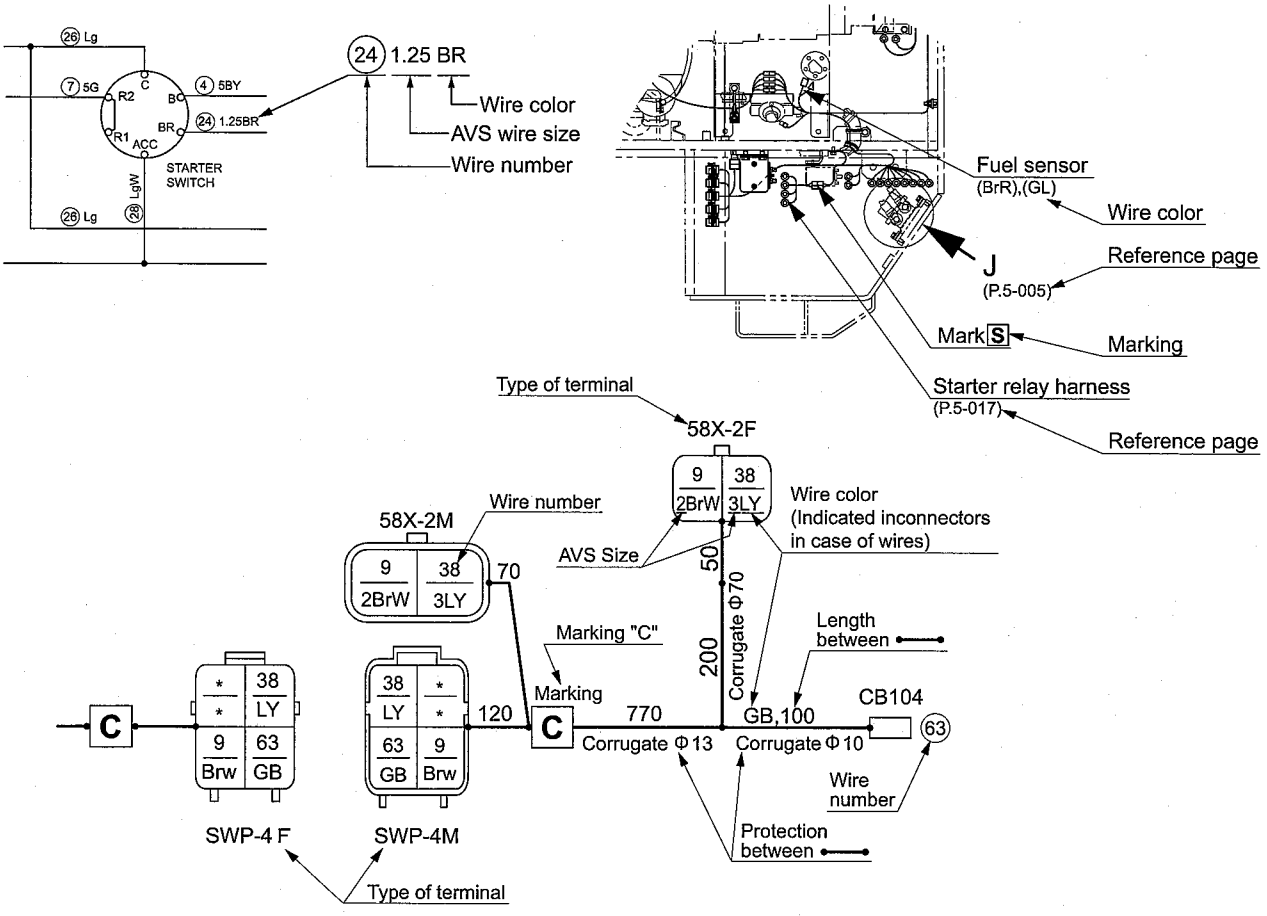
- Rated flow : 70 L/min (18 gal./min)
- Maximum working pressure : 20.6 MPa (2,987 psi)
- Relief valve pressure setting : 11.8 MPa (1,711 psi) at 30 L/min (7.9 gal./min)
- Weight : 7.1 kg (15.7 lbs.)

ELECTRICAL SYSTEM

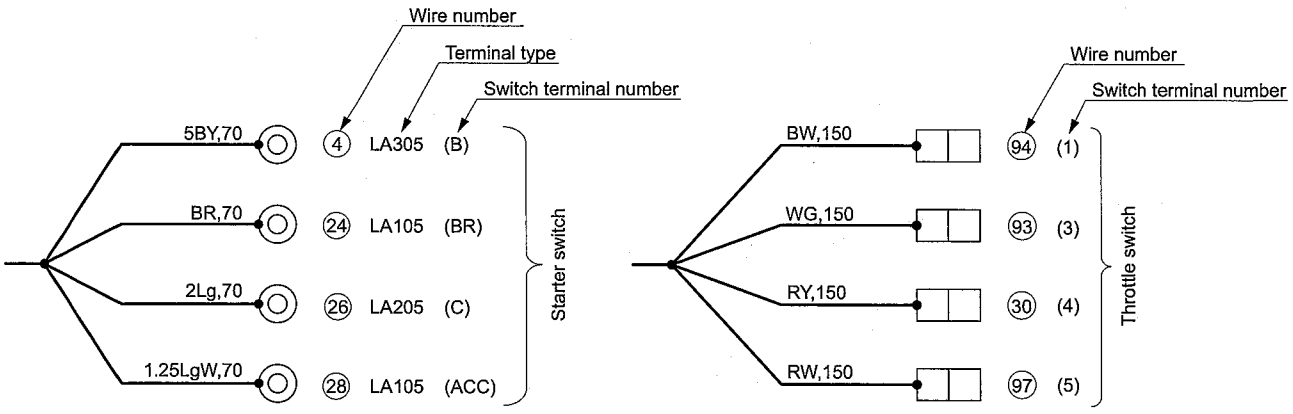
1. PRECAUTIONS FOR WORK

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

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



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



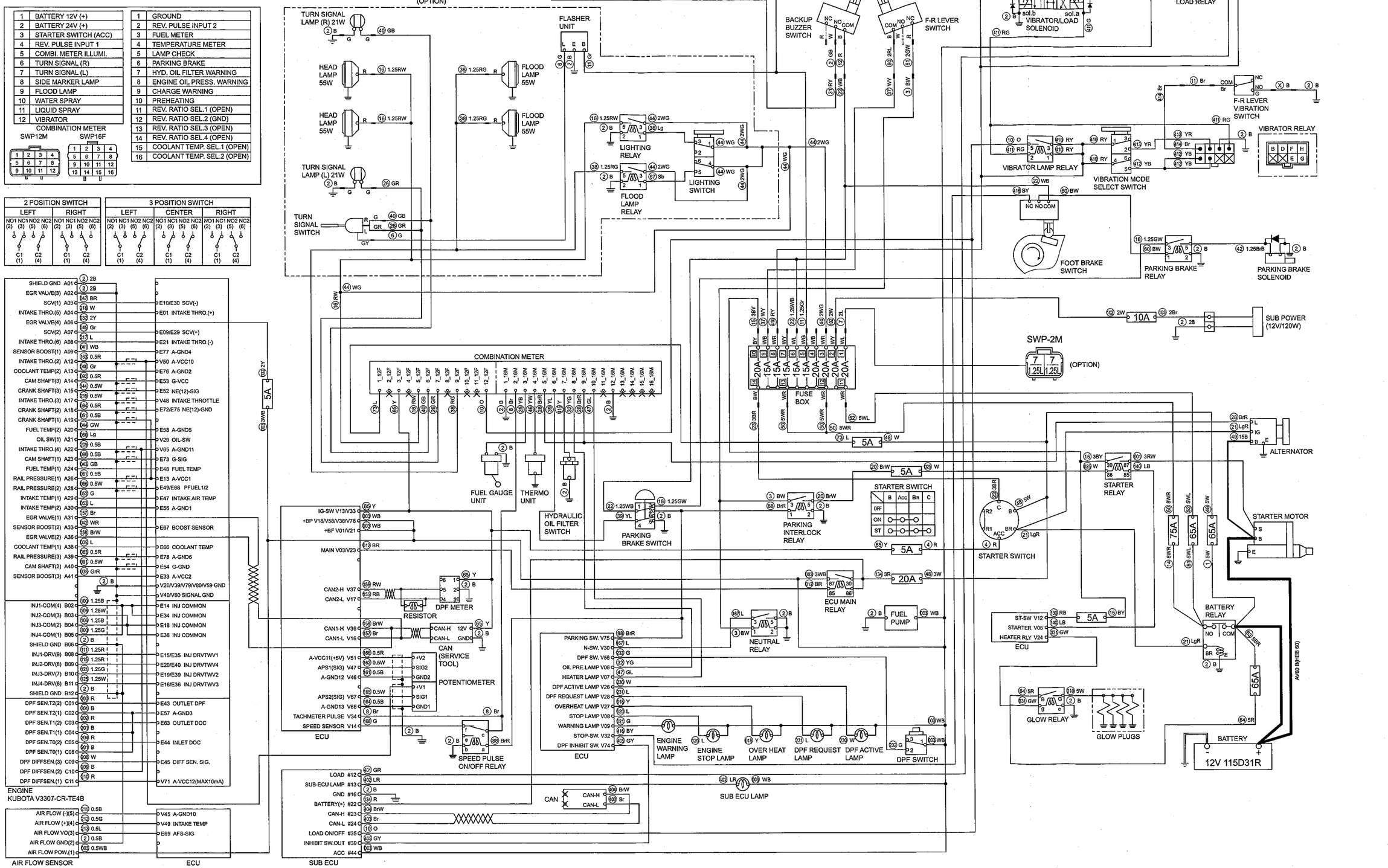
- Wire color code chart

B	Black	BW	Black/ White stripe	BY	Black/ Yellow stripe	BR	Black/ Red stripe	BG	Black/ Green stripe	BL	Black/ Blue stripe		
W	White	WR	White/ Red stripe	WB	White/ Black stripe	WL	White/ Blue stripe	WY	White/ Yellow stripe	WG	White/ Green stripe		
R	Red	RW	Red /White stripe	RB	Red/ Black stripe	RY	Red/ Yellow stripe	RG	Red/ Green stripe	RL	Red/ Blue stripe		
G	Green	GW	Green/ White stripe	GR	Green/ Red stripe	GY	Green/ Yellow stripe	GB	Green/ Black stripe	GL	Green/ Blue stripe		
Y	Yellow	YR	Yellow/ Red stripe	YB	Yellow/ Black stripe	YG	Yellow/ Green stripe	YL	Yellow/ Blue stripe	YW	Yellow/ White stripe		
Br	Brown	BrW	Brown/ White stripe	BrR	Brown/ Red stripe	BrY	Brown/ Yellow stripe	BrB	Brown/ Black stripe	BrG	Brown/ Green stripe	BrL	Brown/ Blue stripe
L	Blue	LW	Blue/ White stripe	LR	Blue/ Red stripe	LY	Blue/ Yellow stripe	LB	Blue/ Black stripe	LG	Blue/ Green stripe		
Lg	Light green	LgR	Light green/ Red stripe	LgY	Light green/ Yellow stripe	LgB	Light green/ Black stripe	LgW	Light green/ White stripe	LgL	Light green/ Blue stripe		

O	Orange	YO	Yellow/ Orange stripe	OW	Orange/ White stripe
		LO	Blue/ Orange stripe	OB	Orange/ Black stripe
		GO	Green/ Orange stripe	OG	Orange/ Green stripe
Gy (Gr)	Gray	GyR	Gray/ Red stripe	GrW	Gray/ White stripe
		GyL	Gray/ Blue stripe	GrY	Gray/ Yellow stripe
Sb	Sky blue			GrB	Gray/ Black stripe
P	Pink	PB	Pink/ Black stripe	PG	Pink/ Green stripe
Pu	Purple			PL	Pink/ Blue stripe

2. SYSTEM CIRCUIT DIAGRAM

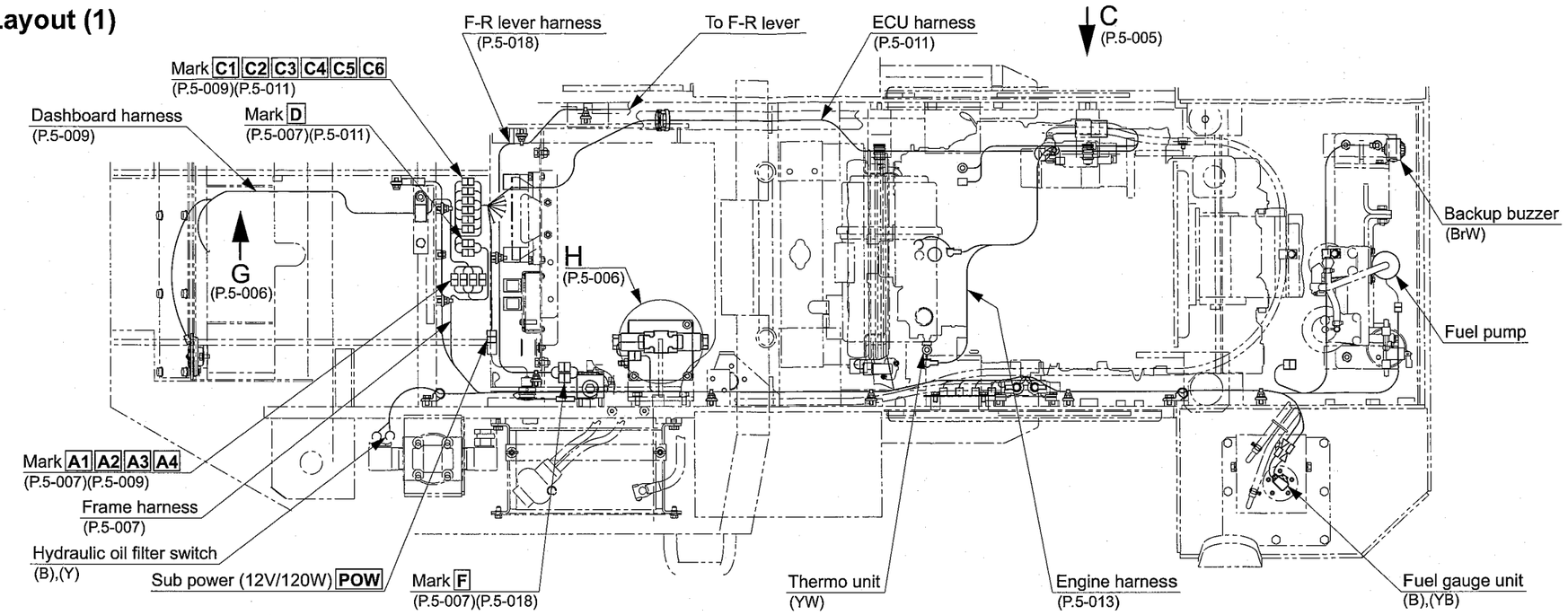
2-1. Electrical Circuit Diagram



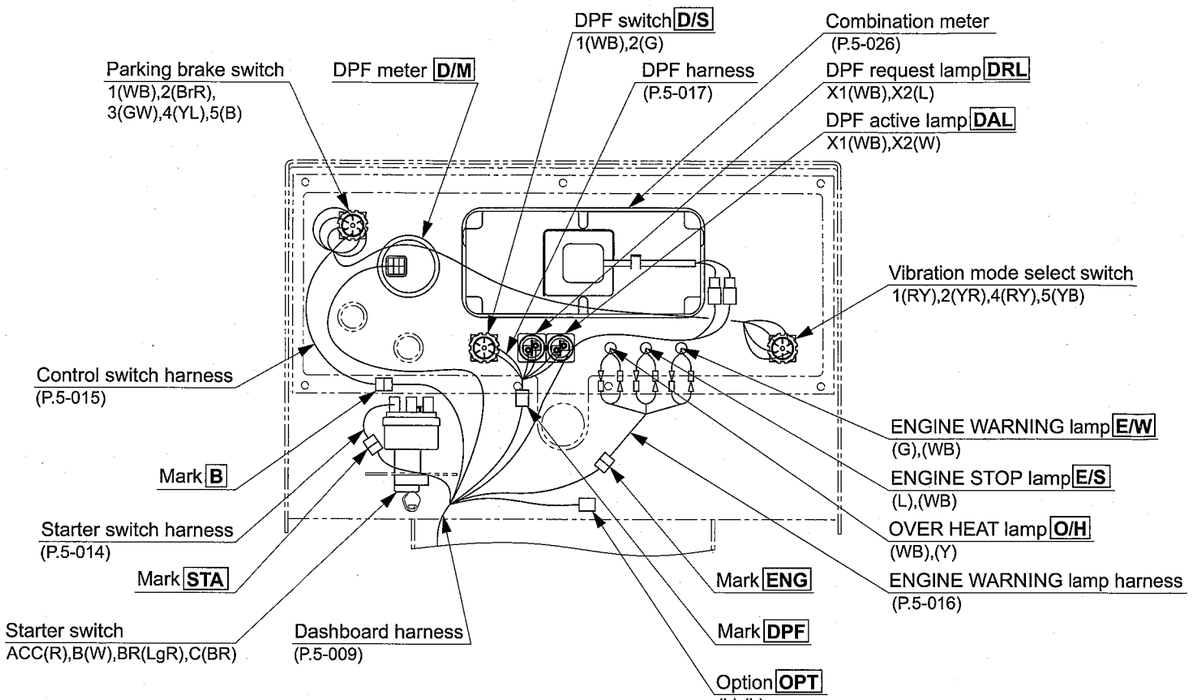
0406-99508-0-11109-A

3. ELECTRICAL COMPONENTS

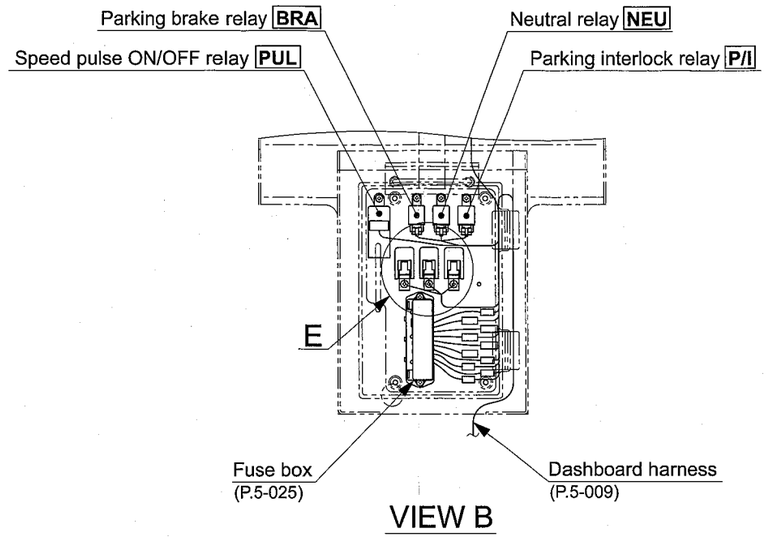
3-1. Wiring Harness Layout (1)



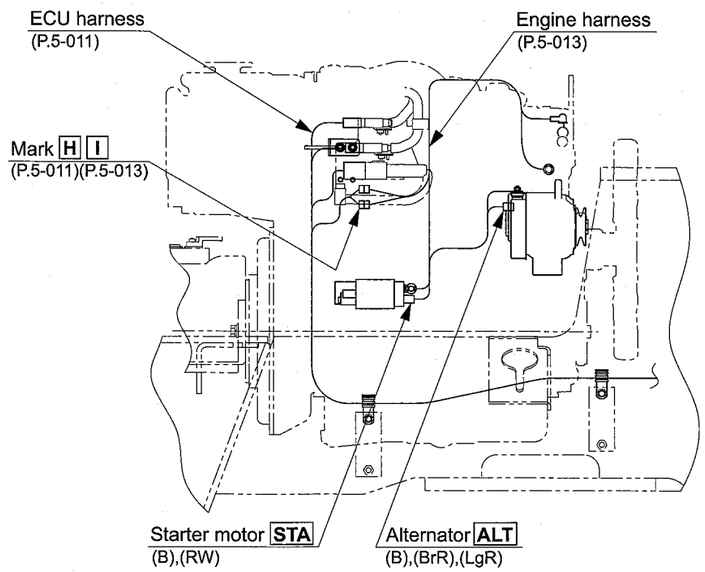
3-2. Wiring Harness Layout (2)



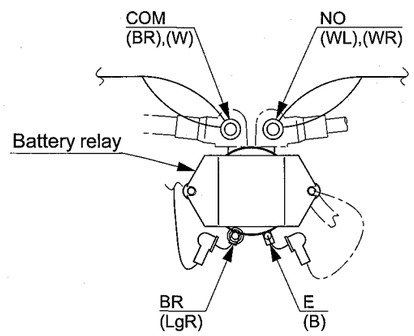
VIEW A



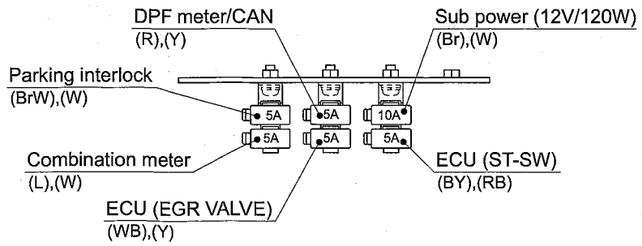
VIEW B



VIEW C

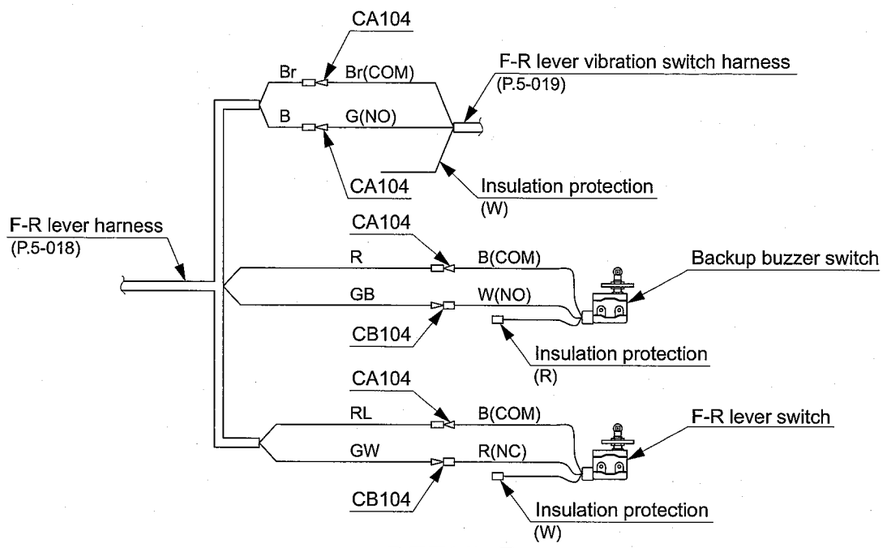


DETAIL D

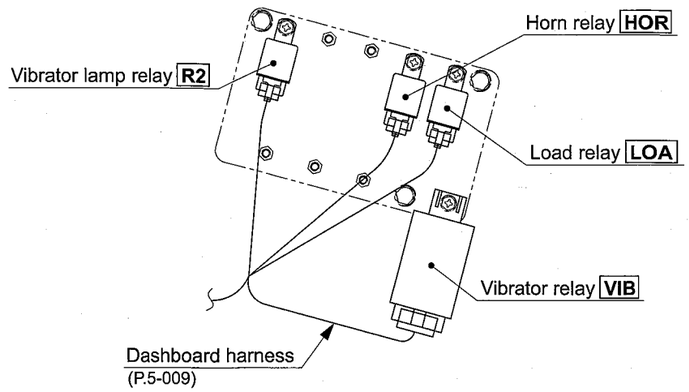


DETAIL E
(Line fuse)

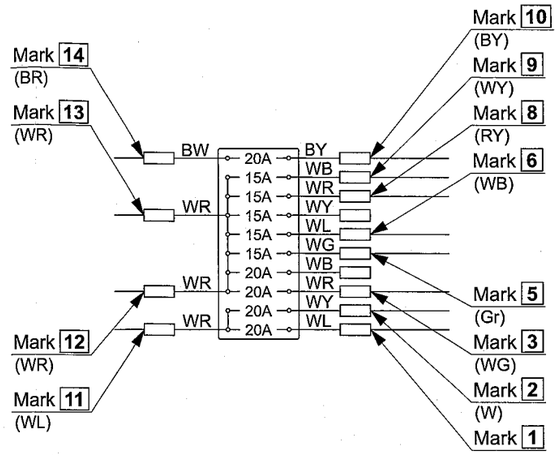
3-3. Wiring Harness Layout (3)



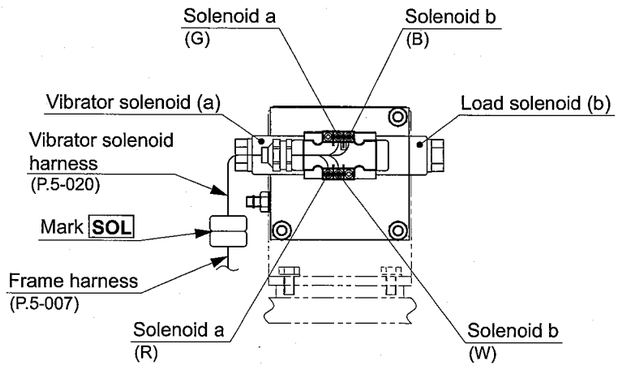
DETAIL F



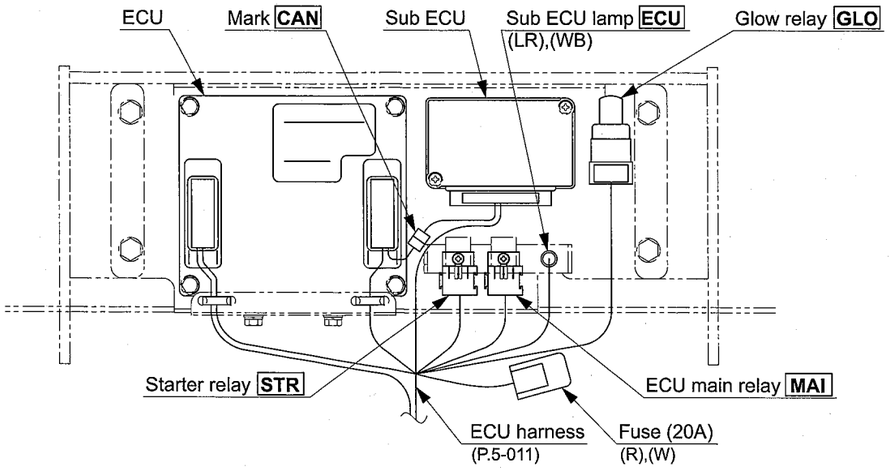
VIEW G



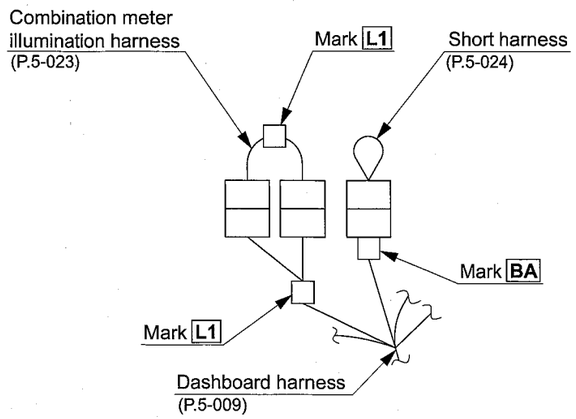
DETAIL FUSE BOX



DETAIL H



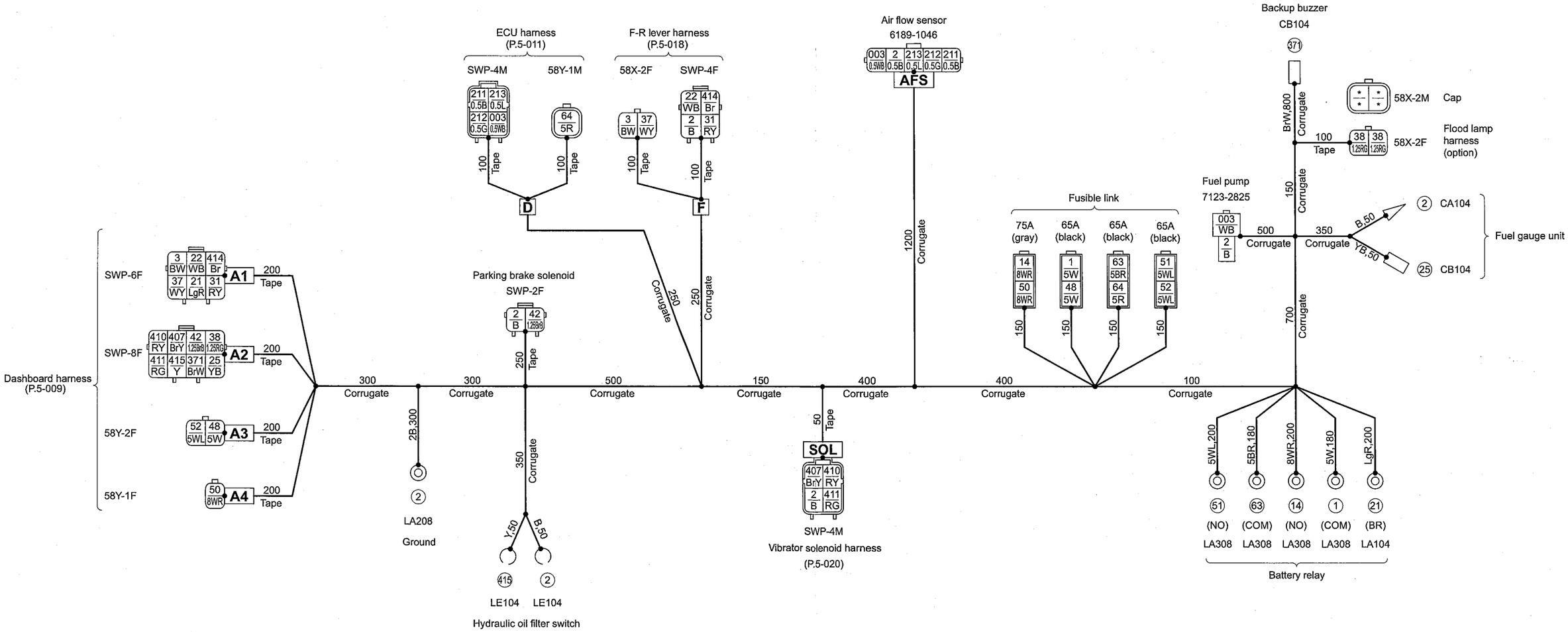
VIEW J



DETAIL K

4. WIRING HARNESSES

4-1. Frame Harness

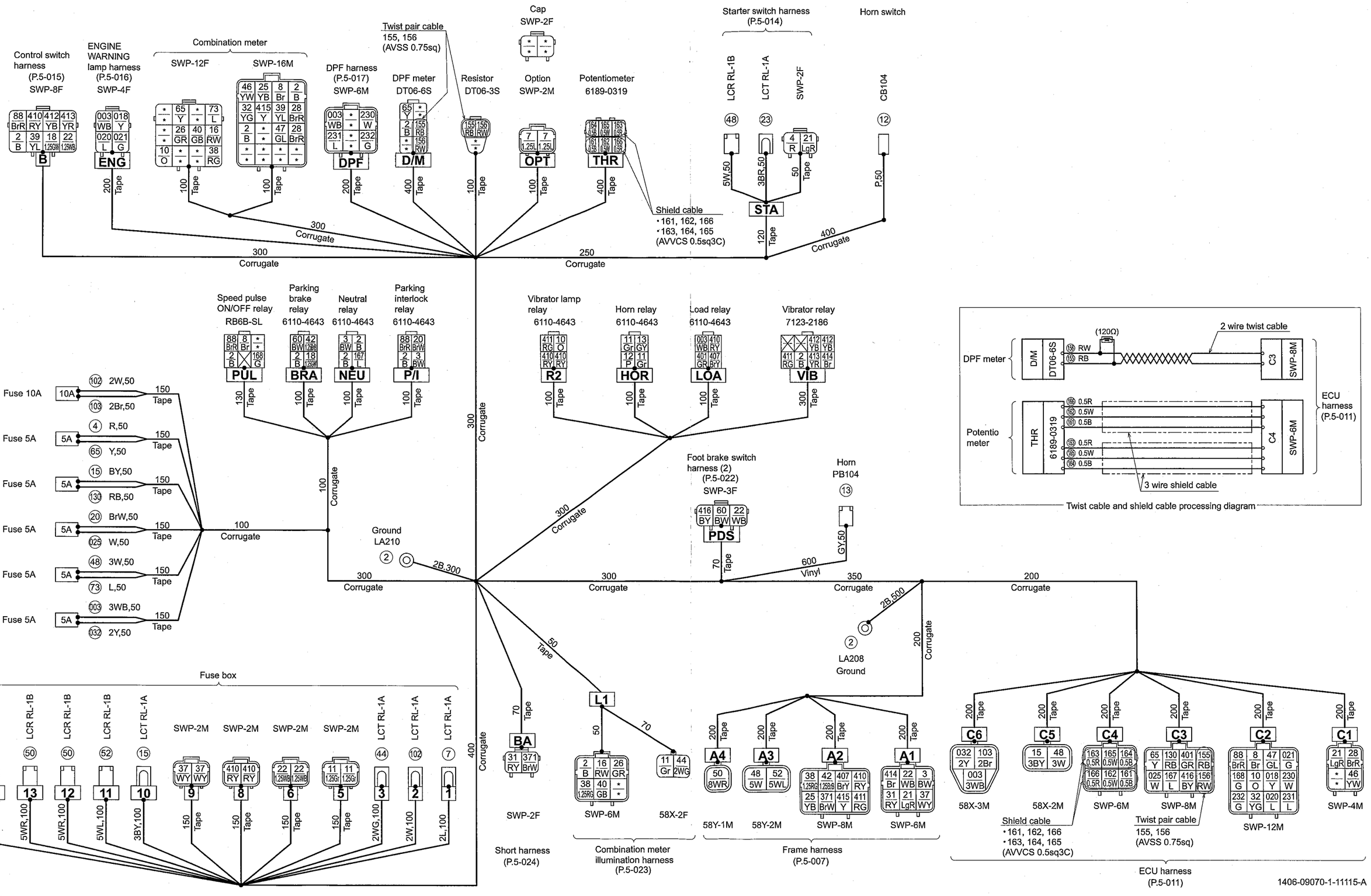


1406-09059-1-10997-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
①	5W	2	Battery relay -COM, Fusible link 65A
②	0.5B,B,2B	8	AFS, F, SOL, Fuel gauge unit, Fuel pump, Ground, Hydraulic oil filter switch, Parking brake solenoid
③	BW	2	A1, F
⑭	8WR	2	Battery relay -NO, Fusible link 75A
㉑	LgR	2	A1, Battery relay -BR
㉒	WB	2	A1, F
㉕	YB	2	A2, Fuel gauge unit
㉛	RY	2	A1, F
㊲	WY	2	A1, F
㊳	1.25RG	3	A2, Flood lamp harness (option) × 2
㊷	1.25BrB	2	A2, Parking brake solenoid
㊽	5W	2	A3, Fusible link 65A
㊿	8WR	2	A4, Fusible link 75A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
㊶	5WL	2	Battery relay -NO, Fusible link 65A
㊷	5WL	2	A3, Fusible link 65A
㊸	5BR	2	Battery relay -COM, Fusible link 65A
㊹	5R	2	D, Fusible link 65A
㉑①	0.5B	2	AFS, D
㉑②	0.5G	2	AFS, D
㉑③	0.5L	2	AFS, D
㊼①	BrW	2	A2, Backup buzzer
㊼②	BrY	2	A2, SOL
㊼③	RY	2	A2, SOL
㊼④	RG	2	A2, SOL
㊼⑤	Br	2	A1, F
㊼⑥	Y	2	A2, Hydraulic oil filter switch
⓪③	0.5WB,WB	3	AFS, D, Fuel pump

4-2. Dashboard Harness

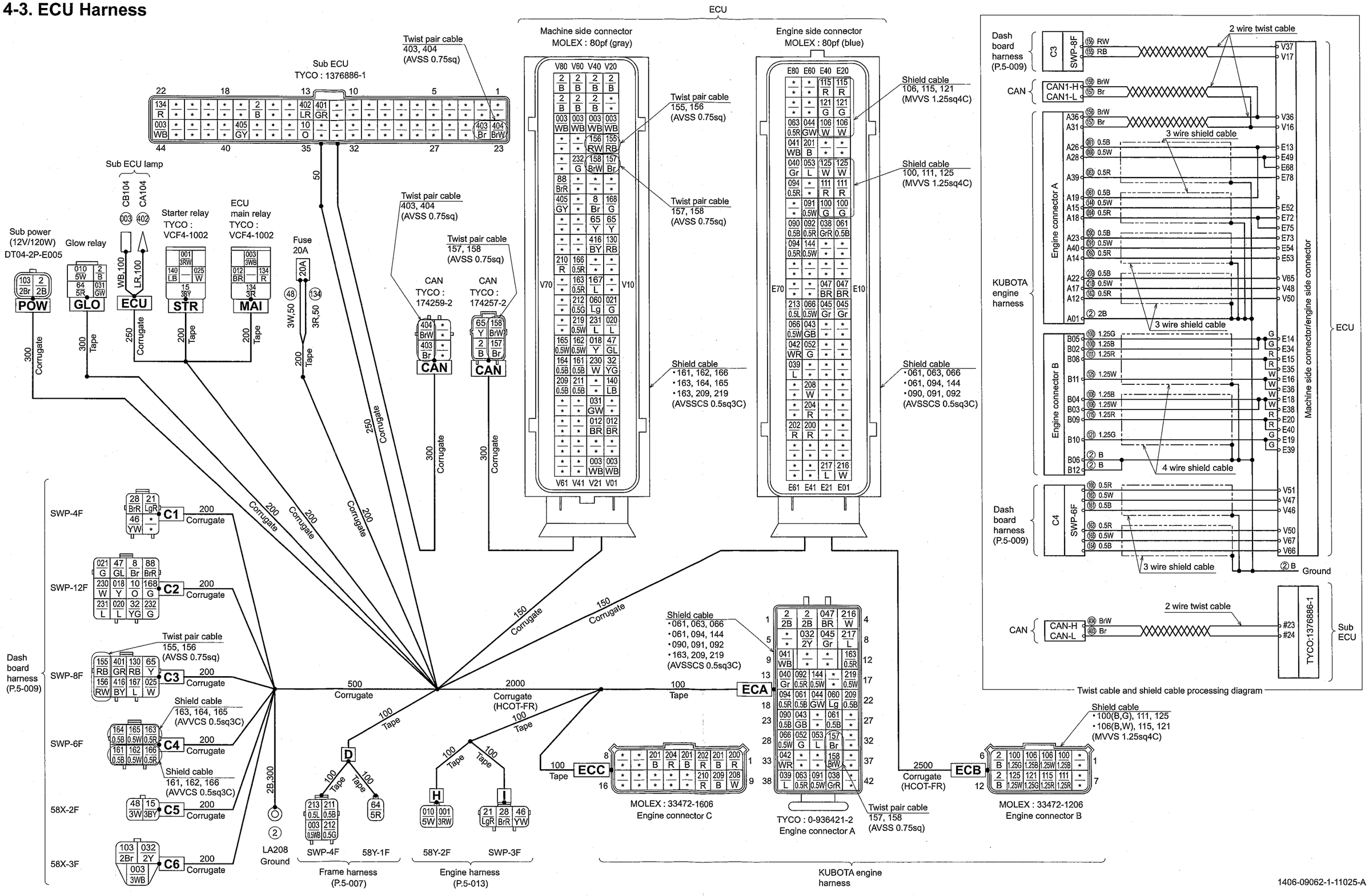


Twist cable and shield cable processing diagram

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
②	B,2B	13	B, BRA, D/M, L1, NEU × 2, P/I, PUL, VIB, Combination meter (16M) × 2, Ground × 2
③	BW	3	A1, NEU, P/I
④	R	2	STA, Fuse 5A
⑦	1.25L,2L	3	1, OPT × 2
⑧	Br	3	C2, PUL, Combination meter (16M)
⑩	O	3	C2, R2, Combination meter (12F)
⑪	Gr,1.25Gr	5	5 × 2, HOR × 2, L1
⑫	P	2	HOR, Horn switch
⑬	GY	2	HOR, Horn
⑮	BY,3BY	3	10, C5, Fuse 5A
⑯	RW	2	L1, Combination meter (12F)
⑱	1.25GW	2	B, BRA
⑳	BrW	2	P/I, Fuse 5A
㉑	LgR	3	A1, C1, STA
㉒	WB,1.25WB	5	6 × 2, A1, B, PDS
㉓	3BR	2	14, STA
㉕	YB	2	A2, Combination meter (16M)
㉖	GR	2	L1, Combination meter (12F)
㉘	BrR	3	C1, Combination meter (16M) × 2
㉛	RY	2	A1, BA
㉜	YG	2	C2, Combination meter (16M)
㊲	WY	3	9 × 2, A1
㊳	RG,1.25RG	3	A2, L1, Combination meter (12F)
㊴	YL	2	B, Combination meter (16M)
㊵	GB	2	L1, Combination meter (12F)
㊷	1.25BrB	2	A2, BRA
㊹	2WG	2	3, L1
㊻	YW	2	C1, Combination meter (16M)
㊼	GL	2	C2, Combination meter (16M)
㊽	3W,5W	4	A3, C5, STA, Fuse 5A
㊿	5WR,8WR	3	12, 13, A4
(52)	5WL	2	11, A3
(60)	BW	2	BRA, PDS

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(65)	Y	4	C3, D/M, Combination meter (12F), Fuse 5A
(73)	L	2	Combination meter (12F), Fuse 5A
(88)	BrR	4	B, C2, P/I, PUL
(102)	2W	2	2, Fuse 10A
(103)	2Br	2	C6, Fuse 10A
(130)	RB	2	C3, Fuse 5A
(155)	RB	3	C3, D/M, Resistor
(156)	RW	3	C3, D/M, Resistor
(161)	0.5B	2	C4, THR
(162)	0.5W	2	C4, THR
(163)	0.5R	2	C4, THR
(164)	0.5B	2	C4, THR
(165)	0.5W	2	C4, THR
(166)	0.5R	2	C4, THR
(167)	L	2	C3, NEU
(168)	G	2	C2, PUL
(230)	W	2	C2, DPF
(231)	L	2	C2, DPF
(232)	G	2	C2, DPF
(371)	BrW	2	A2, BA
(401)	GR	2	C3, LOA
(407)	BrY	2	A2, LOA
(410)	RY	7	8 × 2, A2, B, LOA, R2 × 2
(411)	RG	3	A2, R2, VIB
(412)	YB	3	B, VIB × 2
(413)	YR	2	B, VIB
(414)	Br	2	A1, VIB
(415)	Y	2	A2, Combination meter (16M)
(416)	BY	2	C3, PDS
(003)	WB,3WB	5	C6, DPF, ENG, LOA, Fuse 5A
(018)	Y	2	C2, ENG
(020)	L	2	C2, ENG
(021)	G	2	C2, ENG
(025)	W	2	C3, Fuse 5A
(032)	2Y	2	C6, Fuse 5A

4-3. ECU Harness

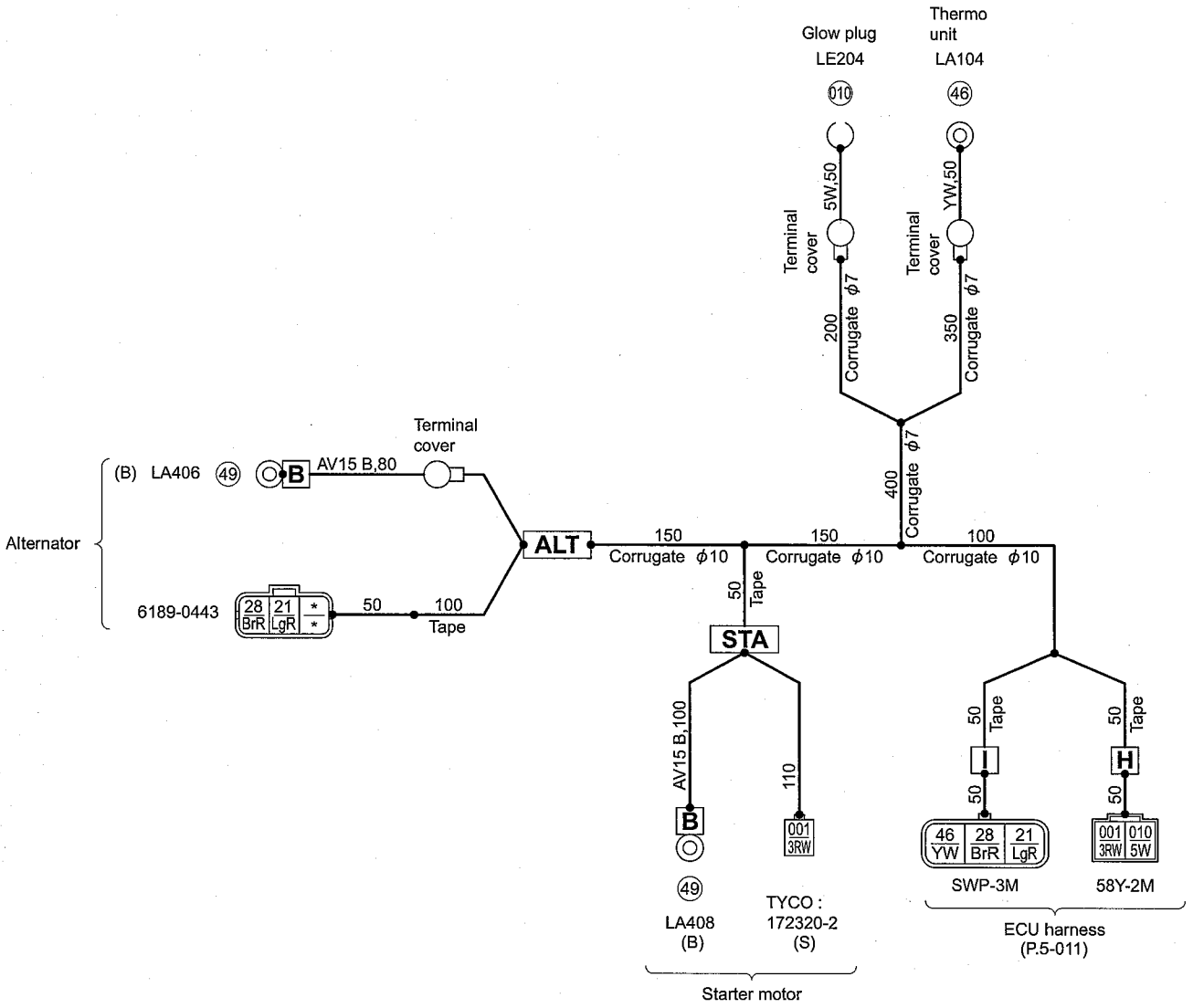


No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
②	B,2B	16	CAN, ECA -1, 2, ECB -6, 12, GLO, POW, ECU-V20, V39, V40, V59, V60, V79, V80, Ground, Sub ECU-16
⑧	Br	2	C2, ECU-V34
⑩	O	2	C2, Sub ECU-35
⑮	3BY	2	C5, STR
㉑	LgR	2	C1, I
㉘	BrR	2	C1, I
㉜	YG	2	C2, ECU-V6
㊻	YW	2	C1, I
㊼	GL	2	C2, ECU-V7
㊽	3W	2	C2, Fuse 20A
㊹	5R	2	D, GLO
㊺	Y	4	C3, CAN, ECU-V13, V33
㊽	BrR	2	C2, ECU-V75
⑩⓪	1.25B	1	ECB -2
⑩⓪	G,1.25G	3	ECB -5, ECU-E14, E34
⑩③	2Br	2	C6, POW
⑩⑥	1.25B	1	ECB -4
⑩⑥	W,1.25W	3	ECB -3, ECU-E18, E38
⑪①	R,1.25R	3	ECB -8, ECU-E15, E35
⑪⑤	R,1.25R	3	ECB -9, ECU-E20, E40
⑫①	G,1.25G	3	ECB -10, ECU-E19, E39
⑫⑤	W,1.25W	3	ECB -11, ECU-E16, E36
⑬⓪	RB	2	C3, ECU-V12
⑬④	R,3R	4	MAI × 2, Fuse 20A, Sub ECU-22
⑭⓪	LB	2	STR, ECU-V05
⑭④	0.5W	2	ECA -15, ECU-E52
⑮⑤	RB	2	C3, ECU-V17
⑮⑥	RW	2	C3, ECU-V37
⑮⑦	Br	3	CAN, ECA -31, ECU-V16

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑮⑧	BrW	3	CAN, ECA -36, ECU-V36
⑯①	0.5B	2	C4, ECU-V46
⑯②	0.5W	2	C4, ECU-V47
⑯③	0.5R	3	C4, ECA -12, ECU-V50
⑯④	0.5B	2	C4, ECU-V66
⑯⑤	0.5W	2	C4, ECU-V67
⑯⑥	0.5R	2	C4, ECU-V51
⑯⑦	L	2	C3, ECU-V30
⑯⑧	G	2	C2, ECU-V14
②⓪⓪	R	2	ECC -1, ECU-E43
②⓪①	B	4	ECC -2, 4, 6, ECU-E57
②⓪②	R	2	ECC -3, ECU-E63
②⓪④	R	2	ECC -5, ECU-E44
②⓪⑧	W	2	ECC -9, ECU-E45
②⓪⑨	0.5B,B	3	ECA -22, ECC -10, ECU-V65
②①⓪	R	2	ECC -11, ECU-V71
②①①	0.5B	2	D, ECU-V45
②①②	0.5G	2	D, ECU-V49
②①③	0.5L	2	D, ECU-E69
②①⑥	W	2	ECA -4, ECU-E01
②①⑦	L	2	ECA -8, ECU-E21
②①⑨	0.5W	2	ECA -17, ECU-V48
②③⓪	W	2	C2, ECU-V26
②③①	L	2	C2, ECU-V28
②③②	G	2	C2, ECU-V56
④⓪①	GR	2	C3, Sub ECU-12
④⓪②	LR	2	ECU , Sub ECU-13
④⓪③	Br	2	CAN , Sub ECU-24
④⓪④	BrW	2	CAN , Sub ECU-23
④⓪⑤	GY	2	ECU-V74. Sub ECU-39

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
④①⑥	BY	2	C3, ECU-V32
⓪⓪①	3RW	2	H, STR
⓪⓪③	0.5WB,WB, 3WB	11	C6, D, ECU, MAI, ECU-V01, V18, V21, V38, V58, V78, Sub ECU-44
⓪①⓪	5W	2	GLO, H
⓪①②	BR	3	MAI, ECU-V03, V23
⓪①⑧	Y	2	C2, ECU-V27
⓪②⓪	L	2	C2, ECU-V08
⓪②①	G	2	C2, ECU-V09
⓪②⑤	W	2	C3, STR
⓪③①	GW	2	GLO, ECU-V24
⓪③②	2Y	2	C6, ECA -6
⓪③⑧	GrR	2	ECA -41, ECU-E33
⓪③⑨	L	2	ECA -38, ECU-E66
⓪④⓪	Gr	2	ECA -13, ECU-E76
⓪④①	WB	2	ECA -9, ECU-E77
⓪④②	WR	2	ECA -33, ECU-E67
⓪④③	GB	2	ECA -24, ECU-E48
⓪④④	GW	2	ECA -20, ECU-E58
⓪④⑤	Gr	3	ECA -7, ECU-E09, E29
⓪④⑦	BR	3	ECA -3, ECU-E10, E30
⓪⑤②	G	2	ECA -29, ECU-E47
⓪⑤③	L	2	ECA -30, ECU-E56
⓪⑥⓪	Lg	2	ECA -21, ECU-V29
⓪⑥①	0.5B	3	ECA -19, 26, ECU-E13
⓪⑥③	0.5R	2	ECA -39, ECU-E78
⓪⑥⑥	0.5W	3	ECA -28, ECU-E49, E68
⓪⑨⓪	0.5B	2	ECA -23, ECU-E73
⓪⑨①	0.5W	2	ECA -40, ECU-E54
⓪⑨②	0.5R	2	ECA -14, ECU-E53
⓪⑨④	0.5R	3	ECA -18, ECU-E72, E75

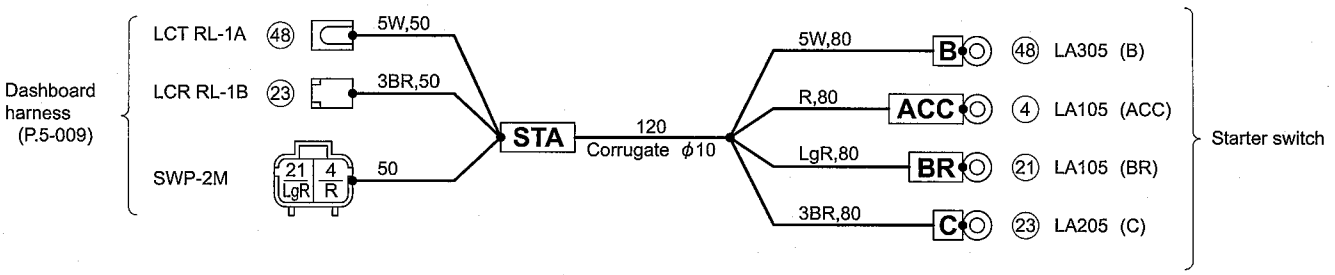
4-4. Engine Harness



1634-09119-2-21489-B

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
㉑	LgR	2	ALT, I
㉘	BrR	2	ALT, I
㊻	YW	2	I, Thermo unit
㊾	B	2	ALT-B, STA-B
⑪	3RW	2	H, STA
⑩	5W	2	H, Glow plug

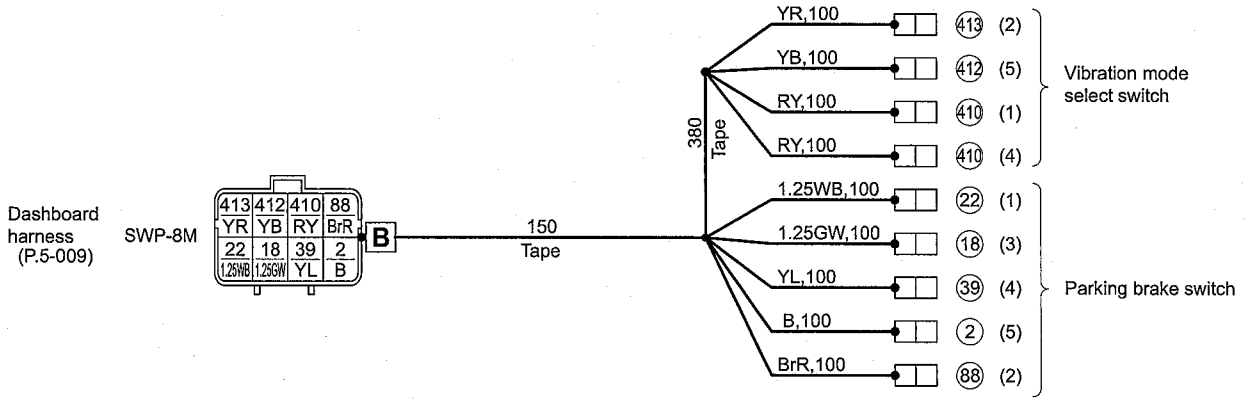
4-5. Starter Switch Harness



1310-09006-0-30165-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
④	R	2	STA, ACC
㉑	LgR	2	STA, BR
㉓	3BR	2	STA, C
㊽	5W	2	STA, B

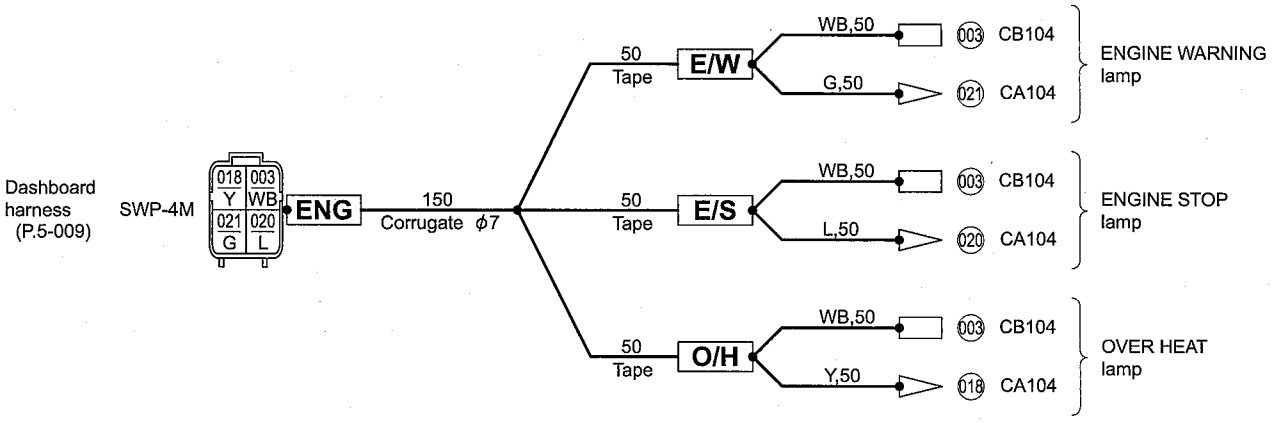
4-6. Control Switch Harness



1406-09069-0-31059-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
②	B	2	B, Parking brake switch -5
⑱	1.25GW	2	B, Parking brake switch -3
㉒	1.25WB	2	B, Parking brake switch -1
㊴	YL	2	B, Parking brake switch -4
㊽	BrR	2	B, Parking brake switch -2
㊵	RY	3	B, Vibration mode change switch -1, -4
㊷	YB	2	B, Vibration mode change switch -5
㊸	YR	2	B, Vibration mode change switch -2

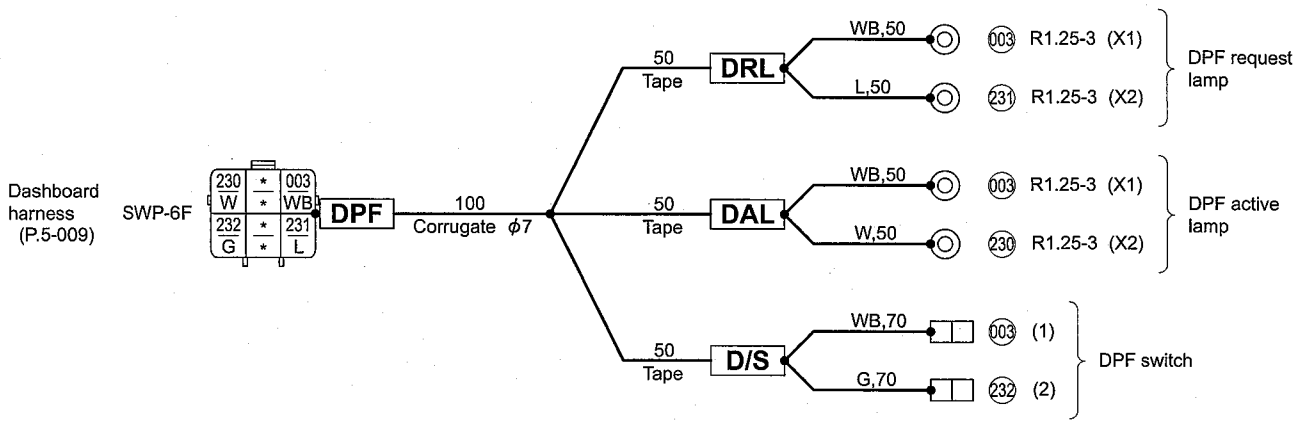
4-7. ENGINE WARING Lamp Harness



1634-09123-0-31493-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
003	WB	4	ENG, E/S, E/W, O/H
018	Y	2	ENG, O/H
020	L	2	ENG, E/S
021	G	2	ENG, E/W

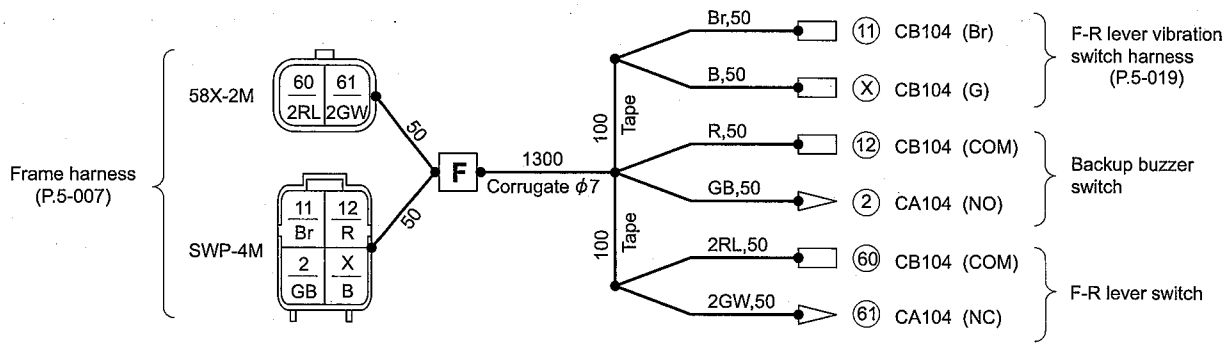
4-8. DPF Harness



1310-09008-0-30167-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
230	W	2	DPF, DAL
231	L	2	DPF, DRL
232	G	2	DPF, D/S
003	WB	4	DPF, D/S, DAL, DRL

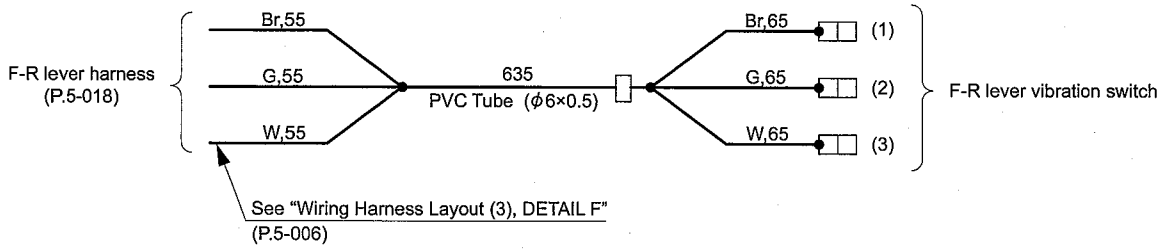
4-9. F-R Lever Harness



1406-09048-0-30928-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
Ⓧ	B	2	F, F-R lever vibration switch harness-G
②	GB	2	F, Backup buzzer switch-NO
⑪	Br	2	F, F-R lever vibration switch harness-Br
⑫	R	2	F, Backup buzzer switch-COM
⑥⓪	2RL	2	F, F-R lever switch-COM
⑥①	2GW	2	F, F-R lever switch-NC

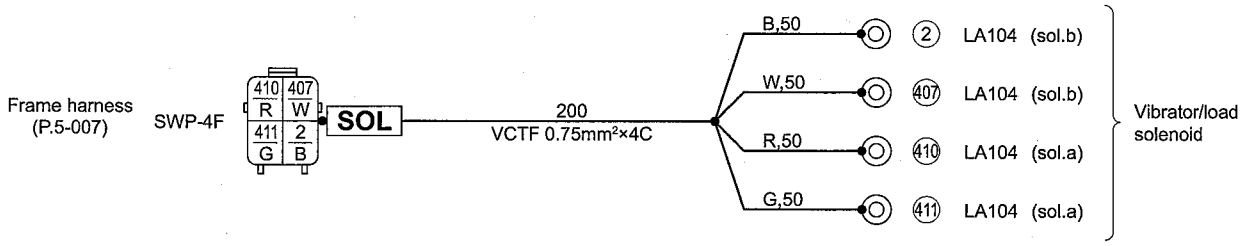
4-10. F-R Lever Vibration Switch Harness



1539-12013-0-30226-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
–	Br	2	F-R lever harness, F-R lever vibration switch-1
–	G	2	F-R lever harness, F-R lever vibration switch-2
–	W	2	F-R lever harness, F-R lever vibration switch-3

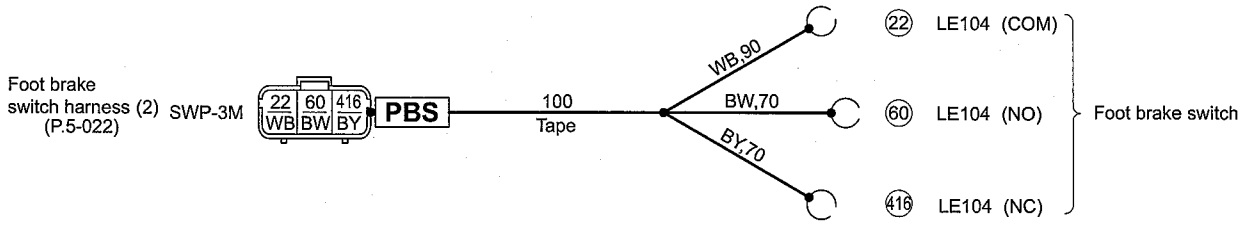
4-11. Vibrator Solenoid Harness



1406-09054-0-30990-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
②	B	2	SOL, Load solenoid -sol.b
㊼	W	2	SOL, Load solenoid -sol.b
㊿	R	2	SOL, Vibrator solenoid -sol.a
㊶	G	2	SOL, Vibrator solenoid -sol.a

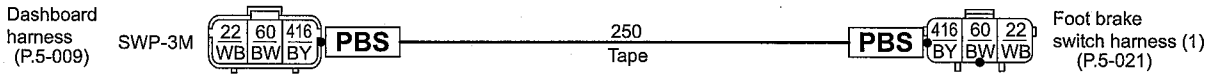
4-12. Foot Brake Switch Harness (1)



1406-09055-0-30991-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
22	WB	2	PBS, Foot brake switch -COM
60	BW	2	PBS, Foot brake switch -NO
416	BY	2	PBS, Foot brake switch -NC

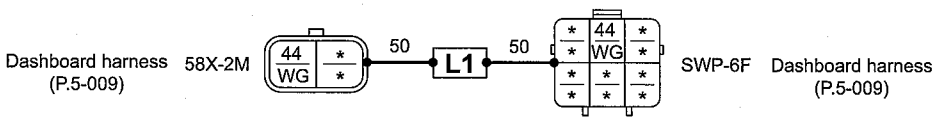
4-13. Foot Brake Switch Harness (2)



1406-09074-0-31128-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
㉒	WB	2	PBS ×2
㊿	BW	2	PBS ×2
㊱	BY	2	PBS ×2

4-14. Combination Meter Illumination Harness



1406-09071-0-41117-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
㊹	WG	2	L1 ×2

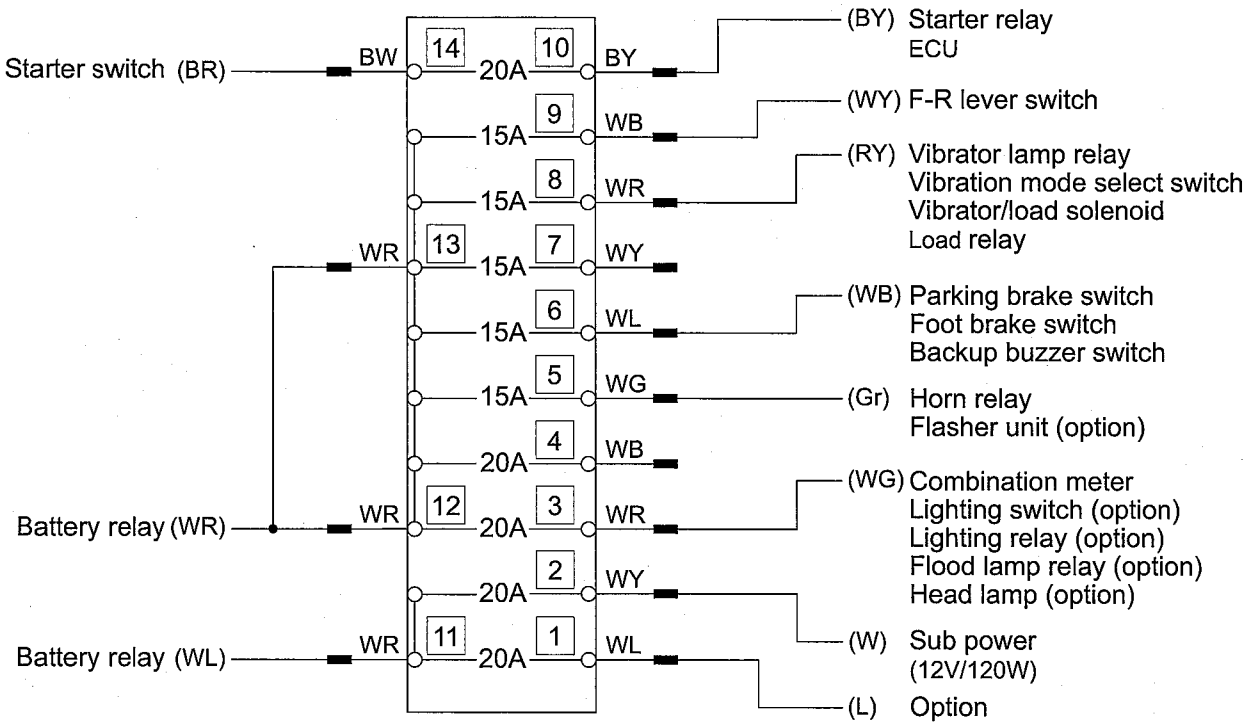
4-15. Short Harness

1406-09072-0-41118-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
㉛	RY	2	Dashboard harness ×2

5. ELECTRICAL COMPONENT SPECIFICATIONS

5-1. Fuse Box

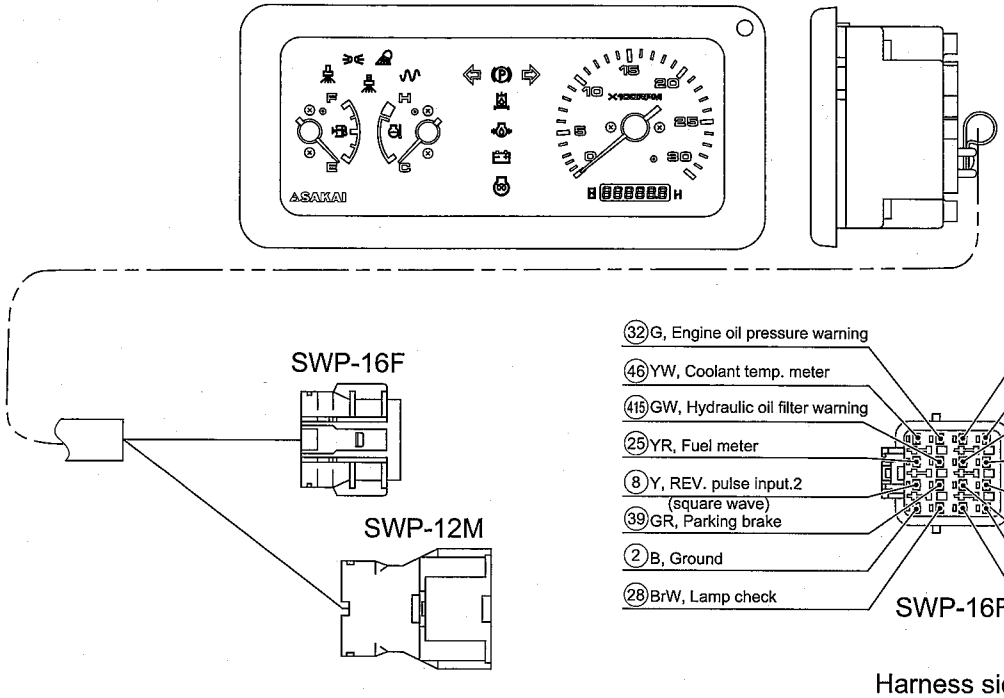


SV204-05001

Harness color codes

W	: White	WL	: White/Blue stripe
L	: Blue	WY	: White/Yellow stripe
BY	: Black/Yellow stripe	WG	: White/Green stripe
BR	: Black/Red stripe	RY	: Red/Yellow stripe
WR	: White/Red stripe	RG	: Red/Green stripe
WB	: White/Black stripe	Gr	: Gray

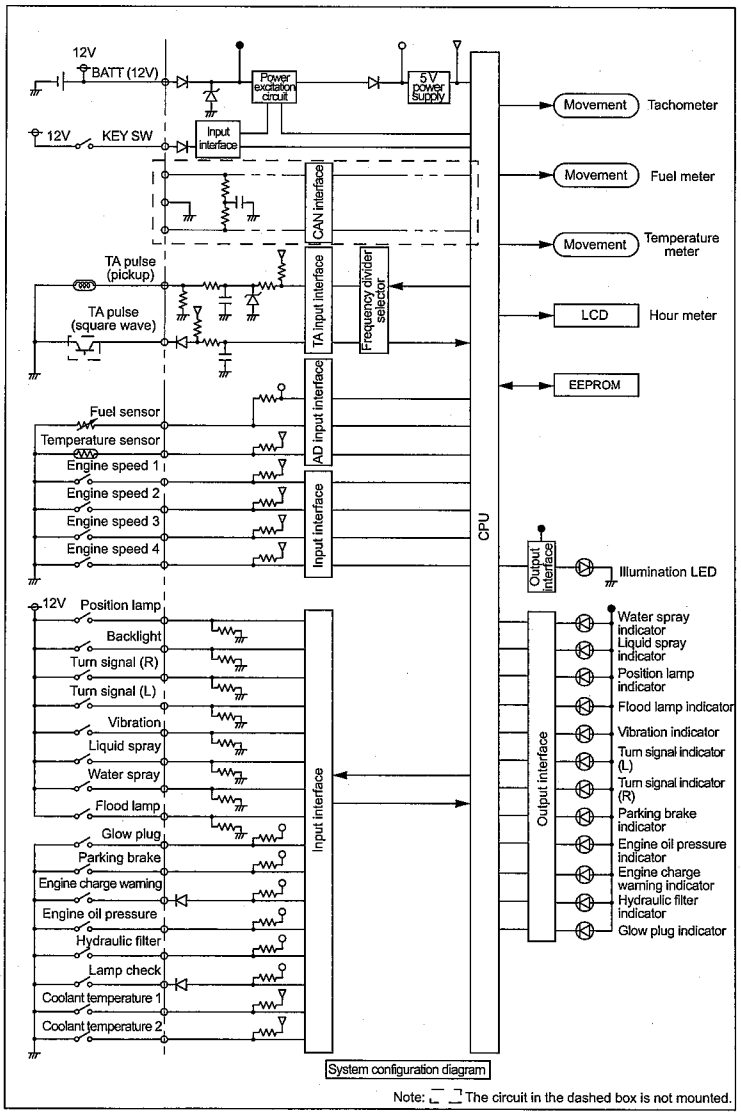
5-2. Combination Meter

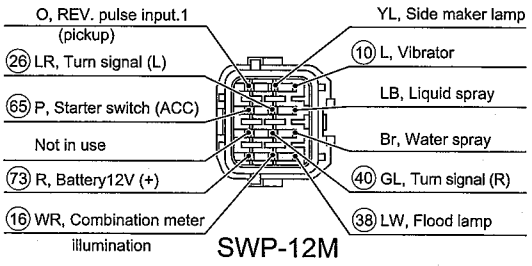


Harness side

2 B	28 BrR	28 BrR	* *
8 Br	39 YL	47 GL	* *
25 YB	415 Y	* *	* *
46 YW	32 YG	2 B	* *

SWP-16M





Harness side

73 L	16 RW	38 RG
* *	40 GB	* *
65 Y	26 GR	* *
* *	* *	10 O

SWP-12F

SV204-05002

VIBRATORY DRUM • REAR AXLE

1. PRECAUTIONS FOR DISASSEMBLY AND REASSEMBLY

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

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

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

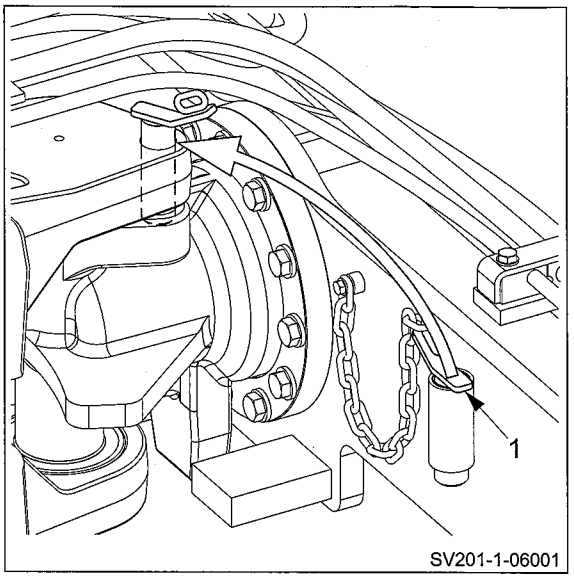
3) Precautions when work is completed
- If coolant has been drained, securely retighten the drain cock and fill with coolant (mixing in long-life coolant) to the specified level. Start the engine and allow the coolant to circulate through the piping. Then add coolant again to the specified level.
- If 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. VIBRATORY DRUM

2-1. Removal and Installation of Vibratory Drum

2-1-1. Removal of vibratory drum

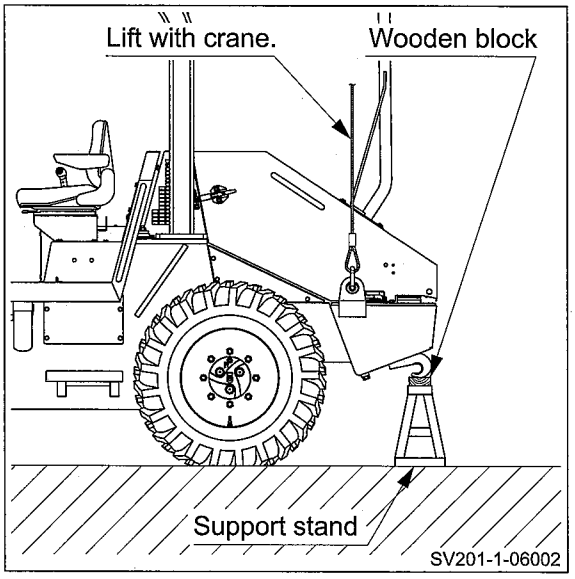
1) Joint front frame and rear frame with lock pin (1).



⚠WARNING

When lifting the machine 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 machine body, use a support stand of sufficient strength.

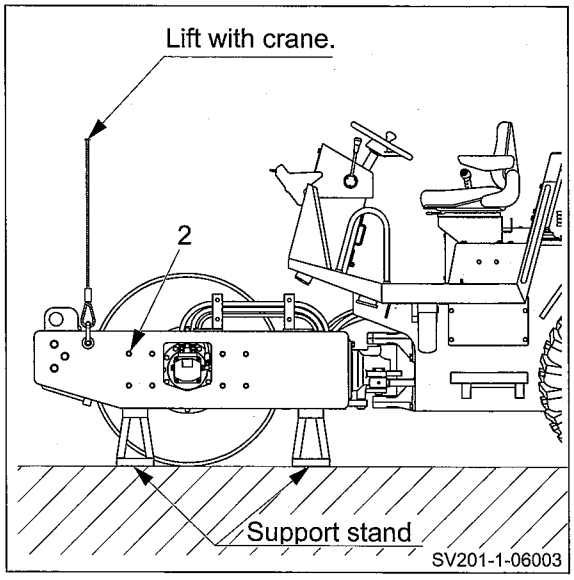
2) Lift rear frame with a crane.
   - Firmly secure machine body by placing support stands and/or wooden blocks at rear end of rear frame.



(NOTICE)
- **Do not allow rear wheel tires to leave the ground. (The tires must support the machine's body weight, too.)**

Rear axle weight
SV204D : 2,460 kg (5,425 lbs.)
SV204T : 2,460 kg (5,425 lbs.)
SV204TB: 2,410 kg (5,315 lbs.)
SV204TF : 2,460 kg (5,425 lbs.)

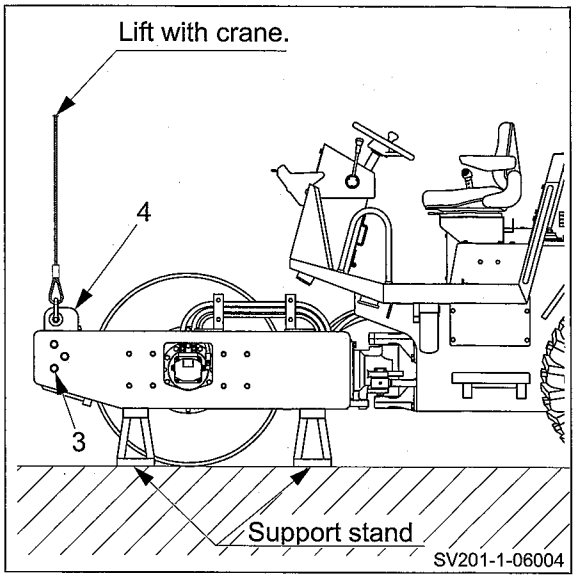
3) Lift front frame with a crane.
   - Ensuring that no load is applied to eight bolts (2) (left and right sides), place support stands at right and left sides of front frame. Firmly secure machine body.



Front axle weight
SV204D : 2,175 kg (4,795 lbs.)
SV204T : 2,275 kg (5,015 lbs.)
SV204TB: 2,625 kg (5,785 lbs.)
SV204TF : 2,975 kg (6,560 lbs.)

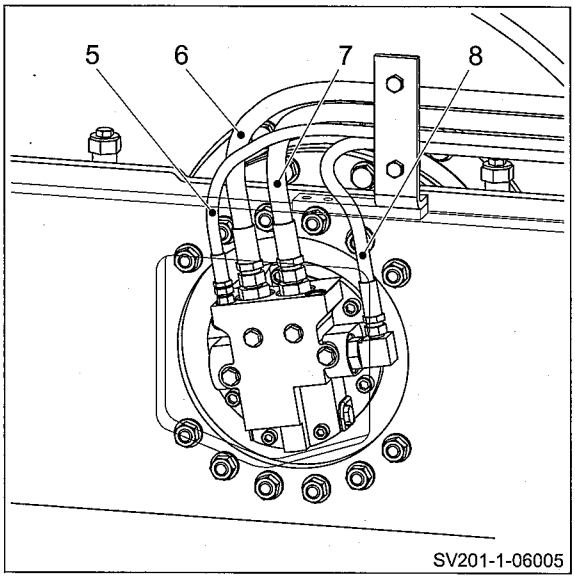
4) Lift cross member (4) with a crane and hold it.
- Remove bolts (3) (left and right sides).
- Lift cross member (4) and remove it from frame.

Cross member
SV204D : 155 kg(342 lbs.)
SV204T : 160 kg(353 lbs.)
SV204TB: 390 kg(860 lbs.)
SV204TF : 205 kg(452 lbs.)



⚠WARNING

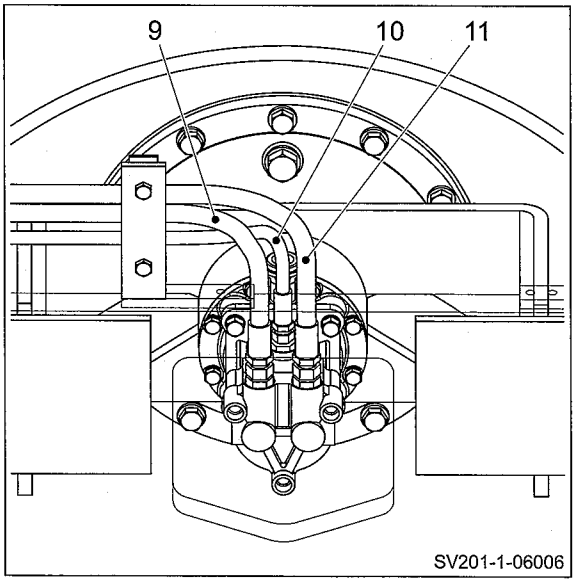
The hydraulic oil in the machine is hot and compressed immediately after the machine is stopped. Disconnecting the hydraulic hoses in this condition can cause burns. Wait for the hydraulic oil to cool down before starting the work.



5) Disconnecting piping

5-1) Propulsion motor piping
- Disconnect hydraulic hoses (5), (6), (7) and (8) connecting to propulsion motor.

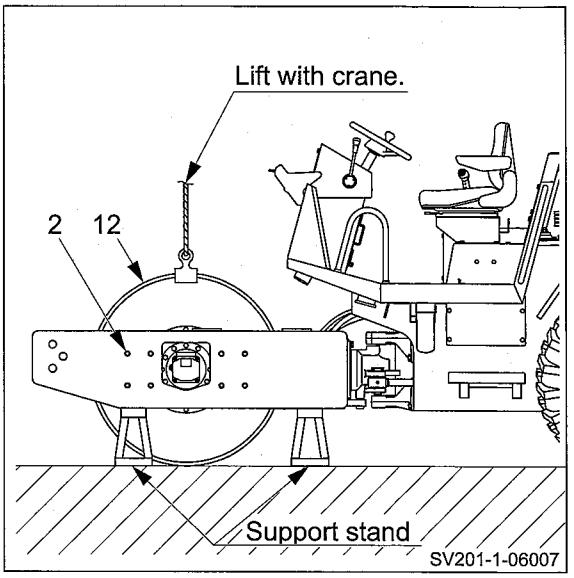
(NOTICE)
- **Plug both ends of the disconnected hoses or implement other actions to prevent entry of foreign matter.**



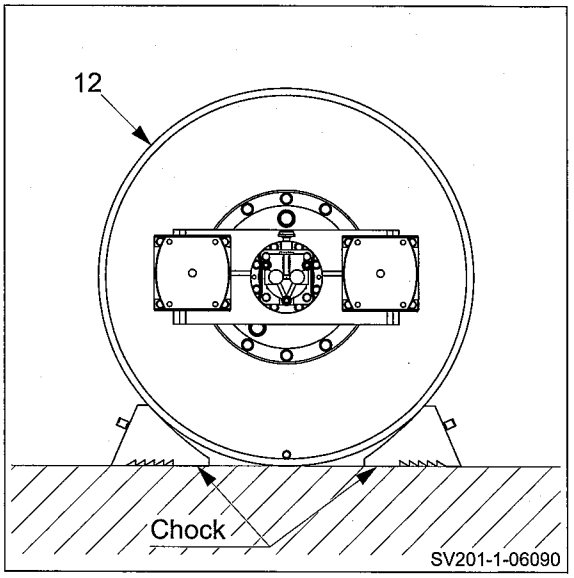
5-2) Vibrator motor piping
- Disconnect hydraulic hoses (9), (10) and (11) connecting to vibrator motor.

6) Remove bolts (2) (left and right sides).
   • Lift off vibratory drum (12) from frame.

   Vibratory drum ASSY
   SV204D : 1,415 kg (3,120 lbs.)
   SV204T : 1,550 kg (3,417 lbs.)
   SV204TB: 1,550 kg (3,417 lbs.)
   SV204TF : 2,265 kg (4,993 lbs.)



7) Put chocks or the like under removed vibratory drum (12) to prevent it from moving.



2-1-2. Installation of vibratory drum

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

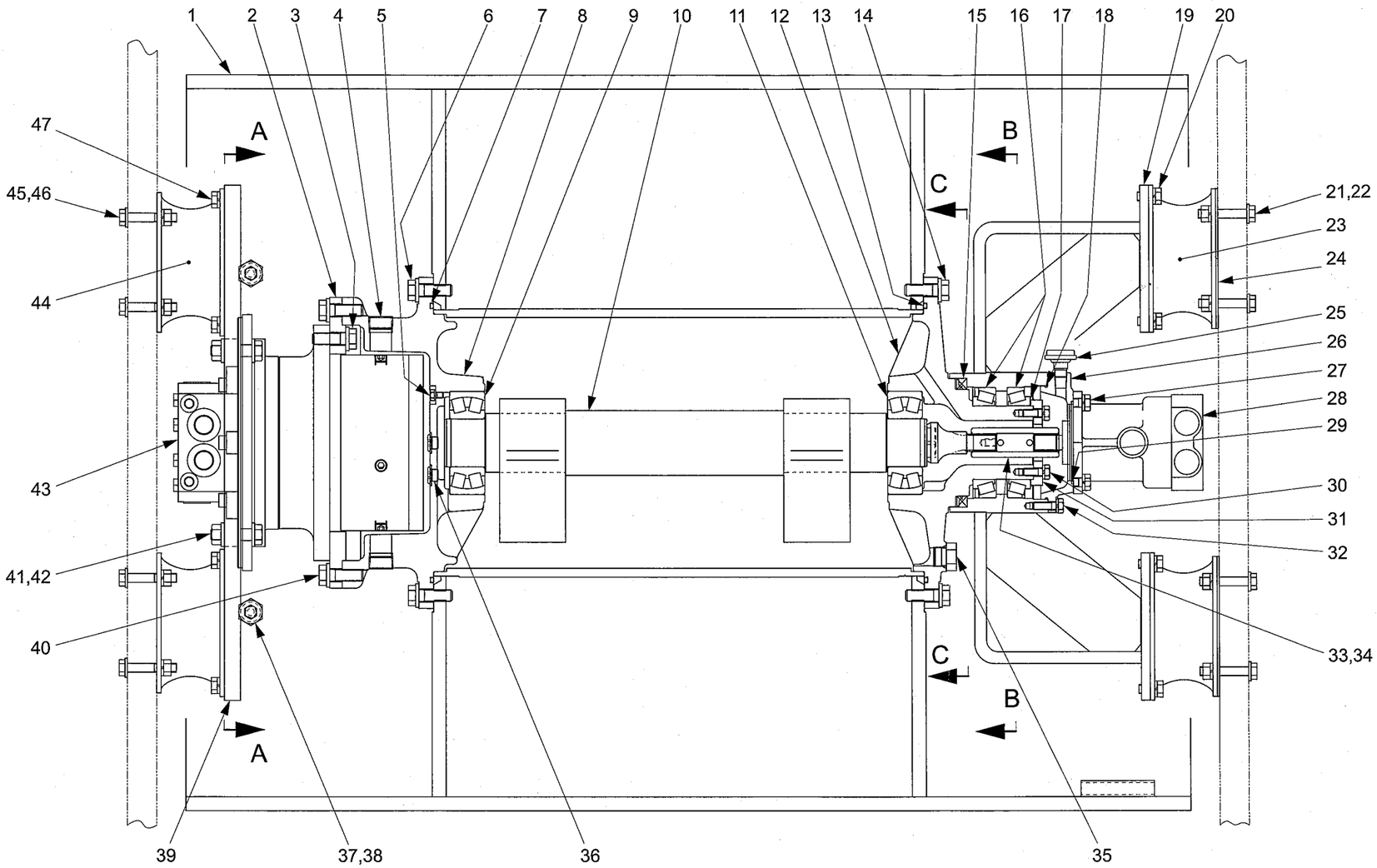
(2) Bolts M12×70 : 108 N·m (80 lbf·ft)
(Vibratory drum)
(3) Bolts M20×100 : 539 N·m (398 lbf·ft)
(Cross member)

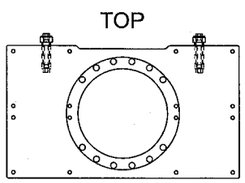
2) Upon installing vibratory drum, pay particular attention to items mentioned below.
   - Fill hydraulic oil tank to specified level to make up for any oil leakage.
   - Start engine and circulate oil through piping. Then check oil level again, ensuring that the oil is at specified level.

(NOTICE)

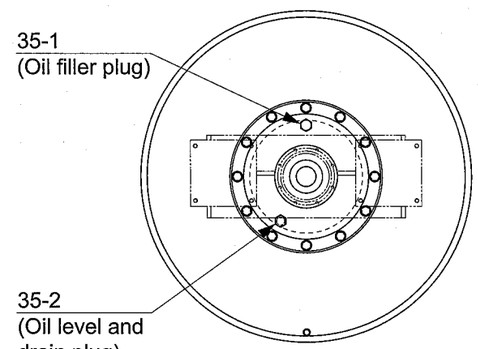
- **If the engine is run at high speed or the cylinder is operated to full stroke when the engine is started for the first time after the work is completed, the piston packing or other items may be damaged by air entering into the cylinder.**

2-2. Vibratory Drum ASSY

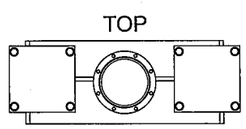




SECTION A-A



SECTION C-C



SECTION B-B

(1) Drum
(2) Ring
(3) Bolt : M16×50
(4) Plug
(5) Bolt : M 8×16
(6) Bolt : M16×50
(7) O-ring
(8) Holder
(9) Vibrator bearing
(10) Eccentric shaft
(11) Vibrator bearing
(12) Axle shaft
(13) O-ring
(14) Bolt : M16×50
(15) Oil seal
(16) Roller bearing
(17) Shim
(18) O-ring
(19) Axle
(20) Bolt : M12×25
(21) Bolt : M12×70
(22) Nut : M12
(23) Damper
(24) Spacer
(25) Breather
(26) Flange
(27) Bolt : M12×35
(28) Vibrator motor
(29) O-ring
(30) Bolt : M10×30
(31) Cover
(32) Bolt : M10×35
(33) Sleeve
(34) Spring pin
(35) Plug
(36) Plug
(37) Bolt : M10×110
(38) Pipe
(39) Disc
(40) Bolt : M16×50
(41) Bolt : M16×60
(42) Nut : M16
(43) Propulsion motor
(44) Damper
(45) Bolt : M12×70
(46) Nut : M12
(47) Bolt : M12×25

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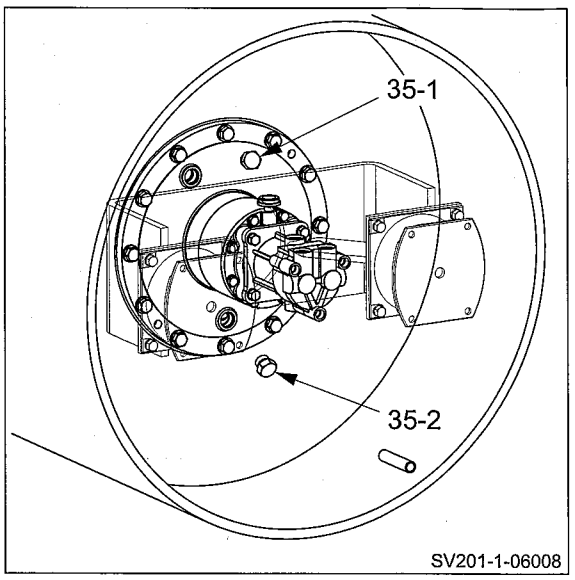
2-3. Disassembly and Reassembly of Vibratory Drum

- Lead line numbers shown in illustrations for the following vibratory drum disassembly and reassembly procedures are constant with part numbers of vibratory drum ASSY shown on page 6-007.

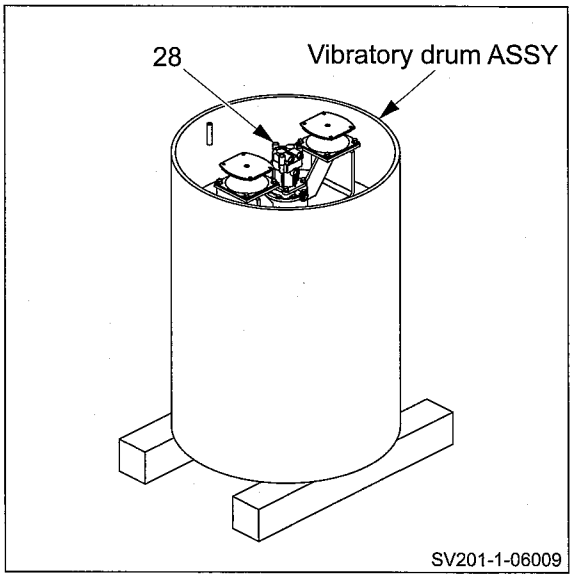


2-3-1. Disassembly of vibratory drum

1) Remove plugs (35-1) and (35-2).
   - Drain gear oil.
     - Quantity of gear oil : 4.0 L (1.0 gal.)

⚠WARNING

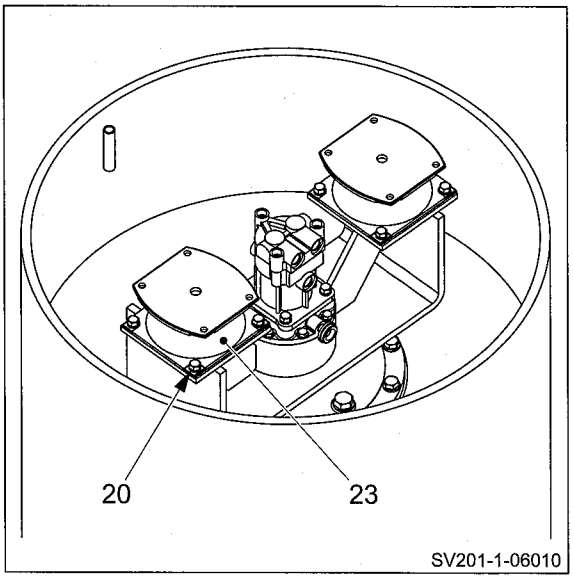
- **When standing the vibratory drum, use wooden blocks of sufficient strength to securely support the vibratory drum.**
- **Carry out the work in an unstrained posture using a work stool or the like.**



2) Stand vibratory drum ASSY with its vibrator motor (28) side facing up.

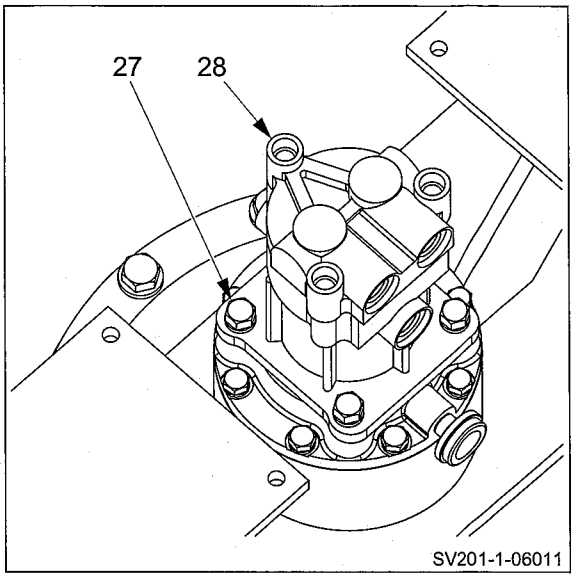
   Vibratory drum ASSY
   - SV204D : 1,410 kg (3,108 lbs.)
   - SV204T : 1,545 kg (3,406 lbs.)
   - SV204TB : 1,545 kg (3,406 lbs.)
   - SV204TF : 2,260 kg (4,982 lbs.)

3) Remove bolts (20).
   - Remove dampers (23).

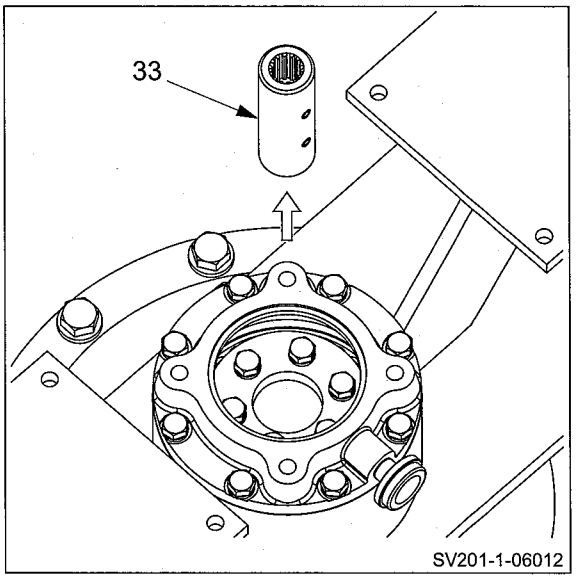


4) Remove bolts (27).
   • Remove vibrator motor (28).

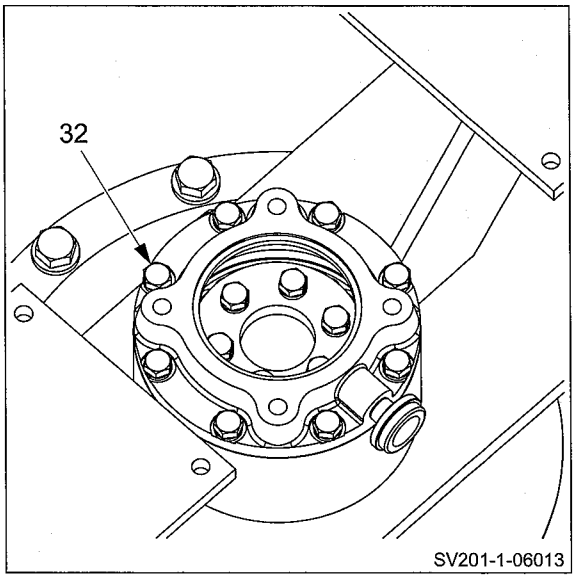
   Vibrator motor : 15 kg (33 lbs.)



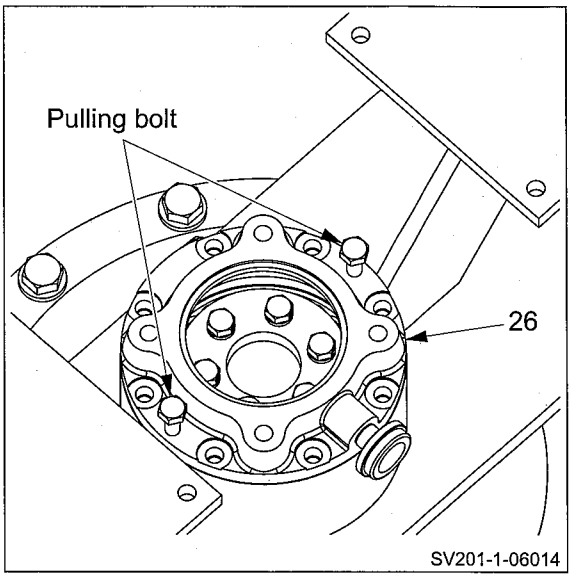
5) Remove sleeve (33).



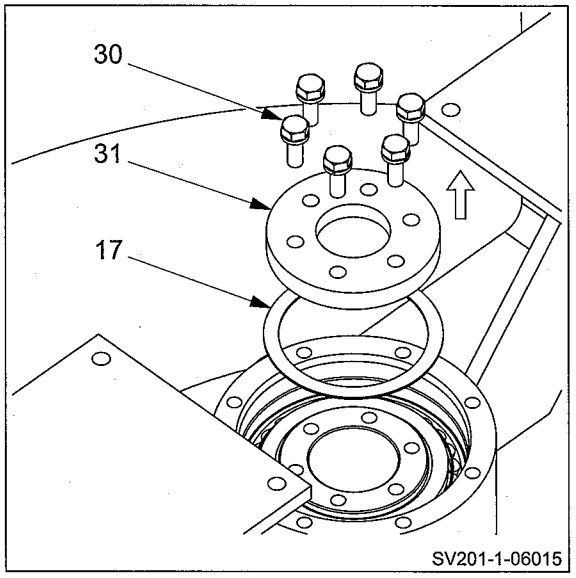
6) Remove bolts (32).



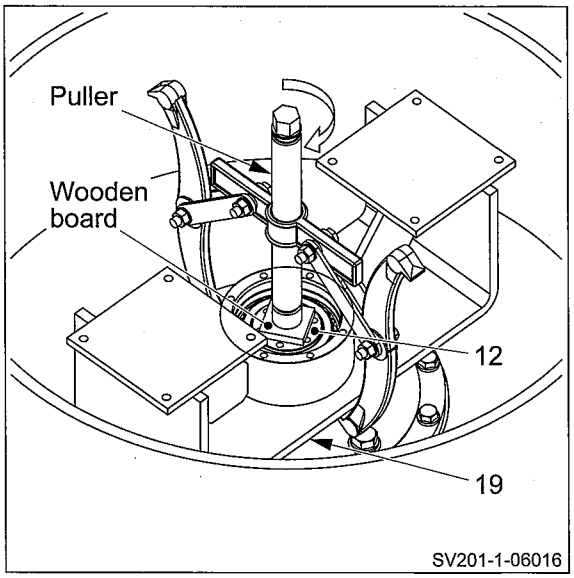
7) Lift flange (26) using two pulling bolts (M10×35).
   • Remove flange.



8) Remove bolts (30).
   • Remove cover (31).
   • Remove shim (17).



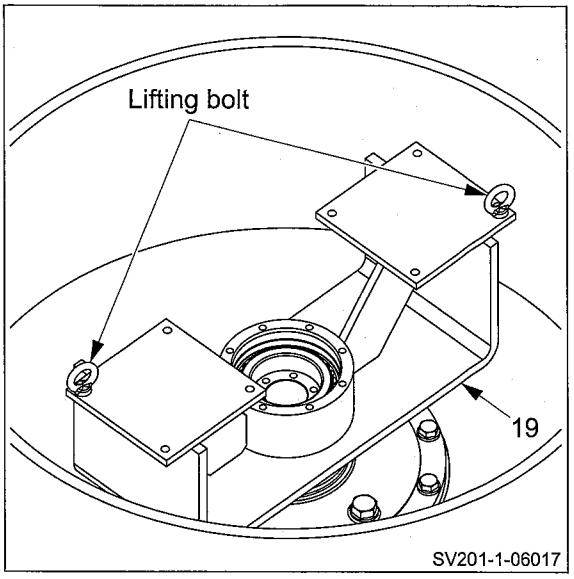
9) Put a piece of wooden board on end of axle shaft (12).
   • Set a puller on axle (19).
   • Remove axle SUBASSY with roller bearing from axle shaft SUBASSY.



⚠WARNING

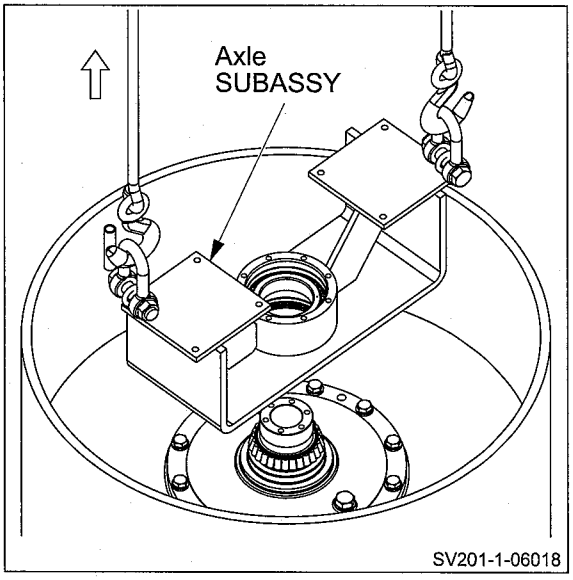
When installing lifting bolts, screw in the threads fully before using.

10) Install lifting bolts (M12) to axle (19).

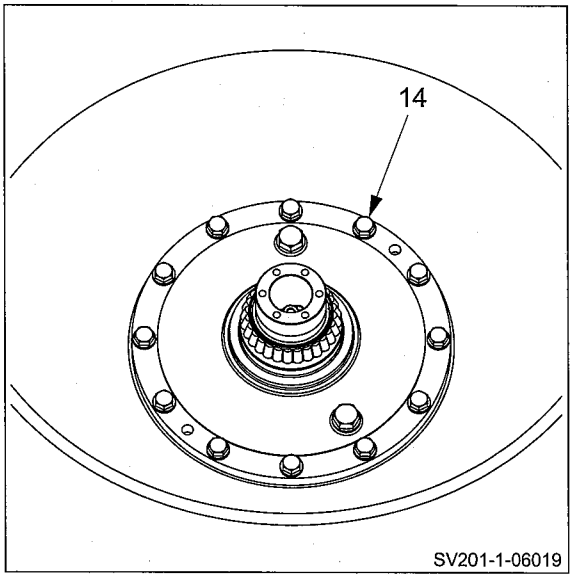


11) Remove axle SUBASSY.

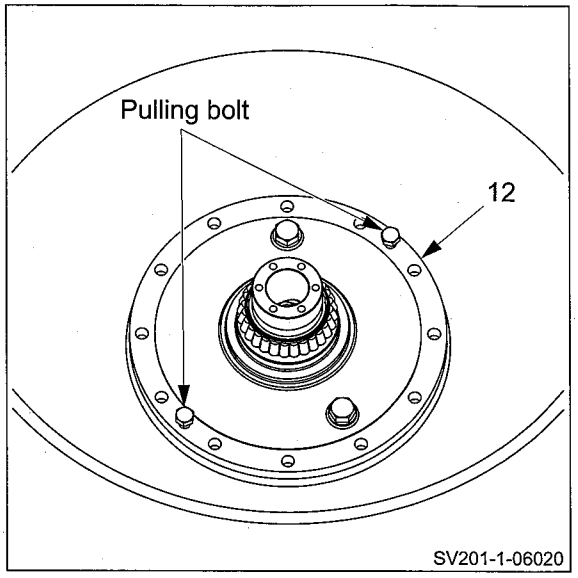
Axle SUBASSY : 60 kg (132 lbs.)



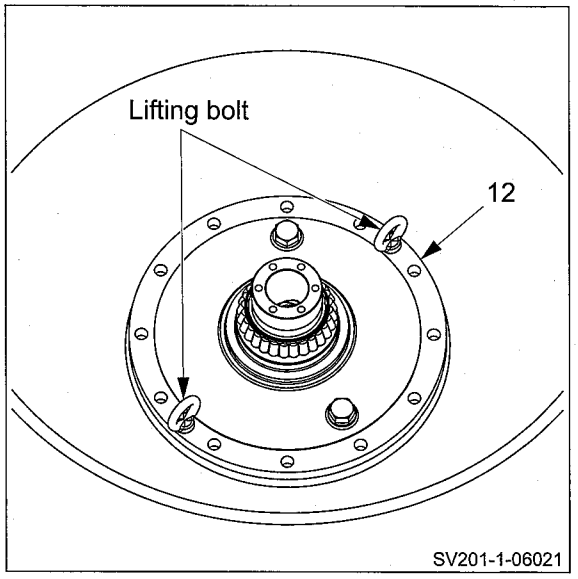
12) Remove bolts (14).



13) Lift axle shaft (12) using two pulling bolts (M16×50).



14) Install lifting bolts (M16) to axle shaft (12).

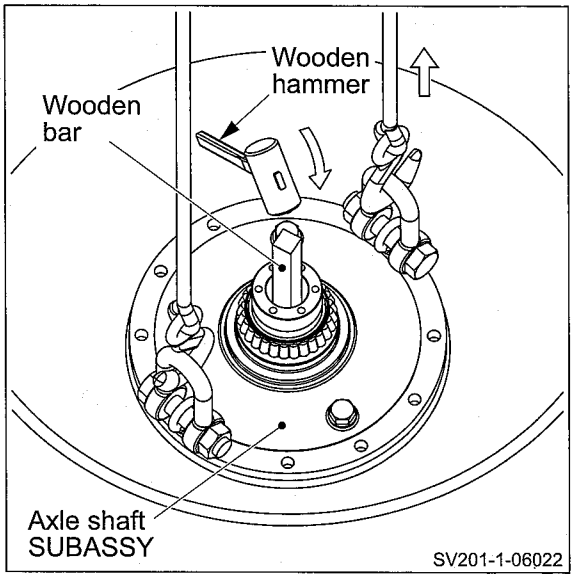


15) Remove axle shaft SUBASSY.

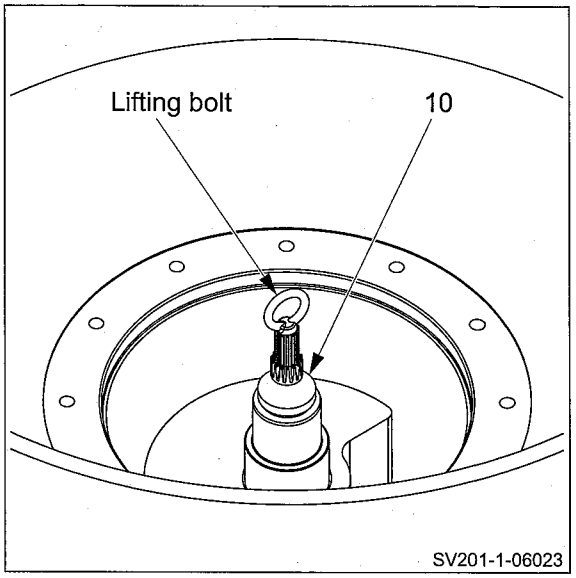
(NOTICE)

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

kg Axle shaft SUBASSY : 45 kg (99 lbs.)

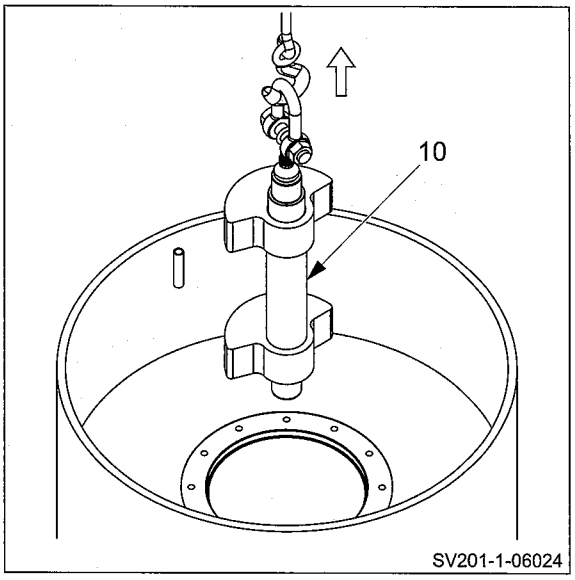


16) Install lifting bolts (M10) to eccentric shaft (10).



17) Remove eccentric shaft (10).

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

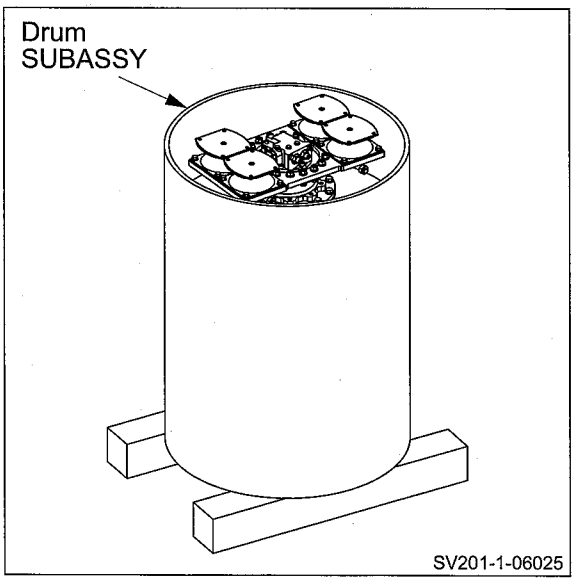


⚠WARNING

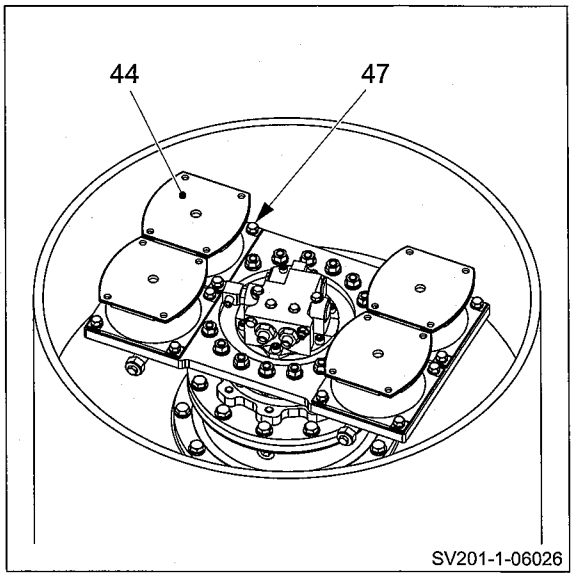
Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

18) Reverse drum SUBASSY.

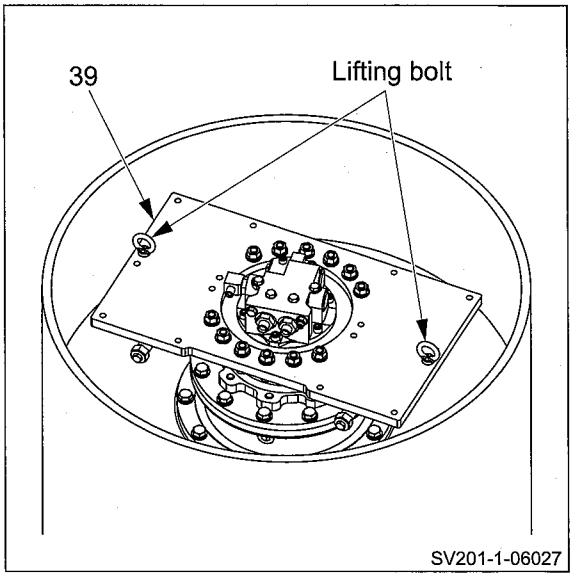
Drum SUBASSY
SV204D : 1,210 kg (2,668 lbs.)
SV204T : 1,340 kg (2,954 lbs.)
SV204TB : 1,340 kg (2,954 lbs.)
SV204TF : 2,060 kg (4,541 lbs.)



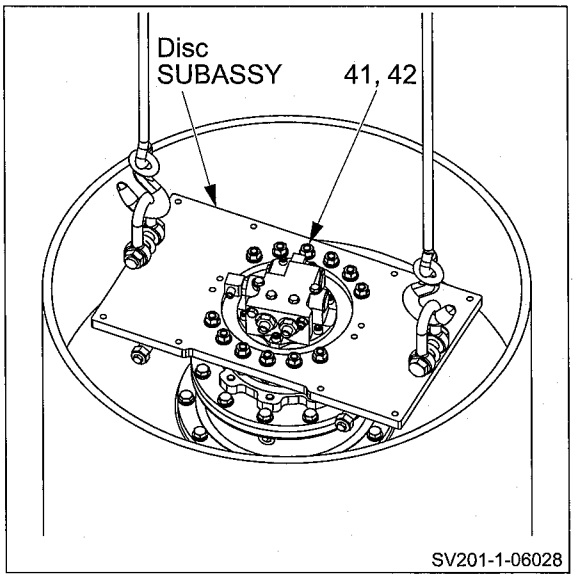
19) Remove bolts (47).
- Remove dampers (44).



20) Install lifting bolts (M12) to disc (39).

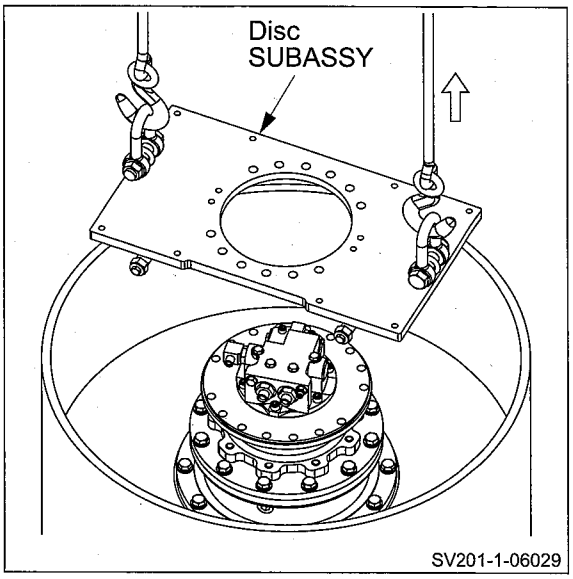


21) Lift disc SUBASSY.
- Remove bolts (41) and nuts (42).

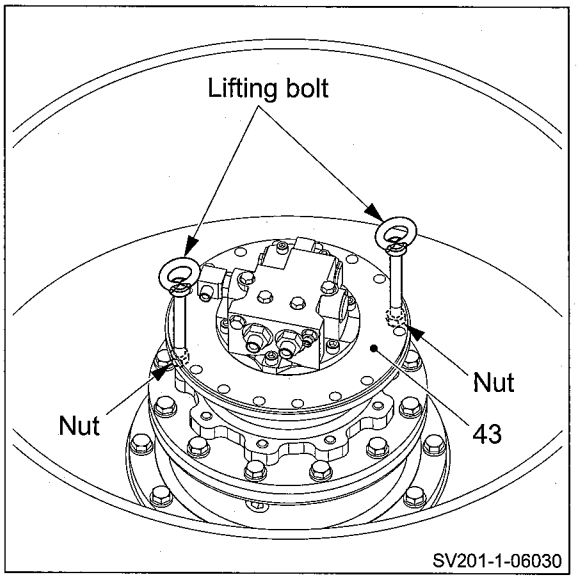


22) Remove disc SUBASSY.

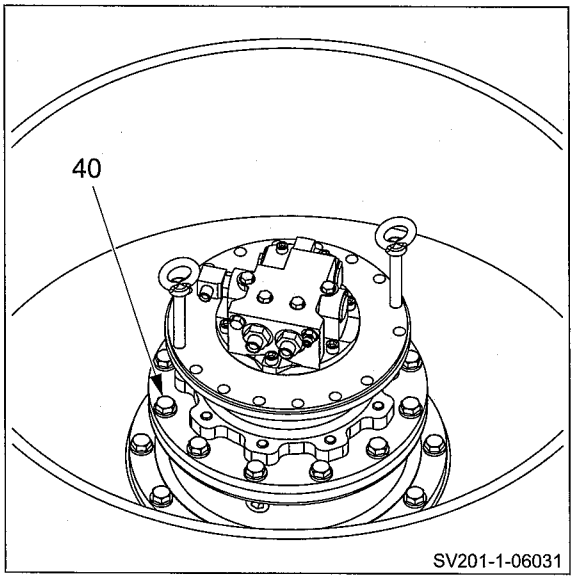
Disc SUBASSY : 40 kg (88 lbs.)



23) Install lifting bolts (M16) and nuts to propulsion motor (43).

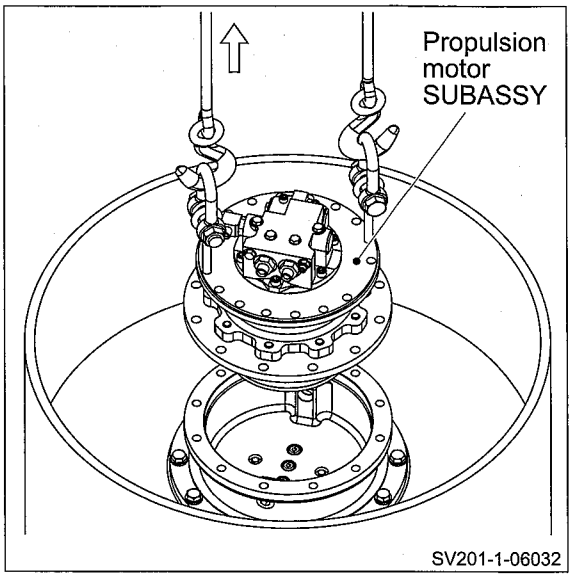


24) Remove bolts (40).



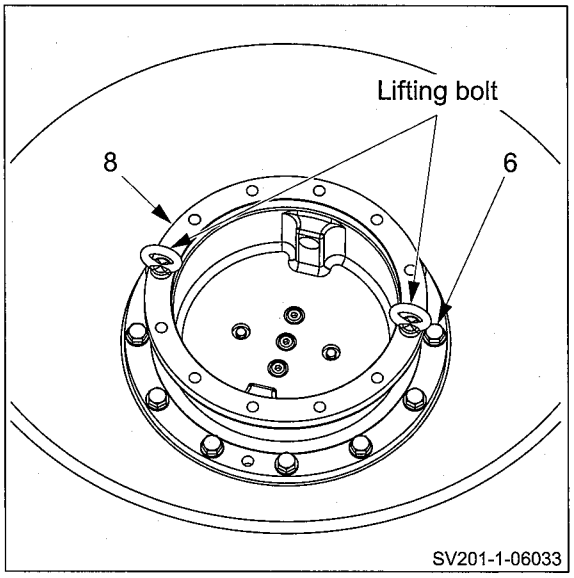
25) Remove propulsion motor SUBASSY.

Propulsion motor SUBASSY : 105 kg (231 lbs.)

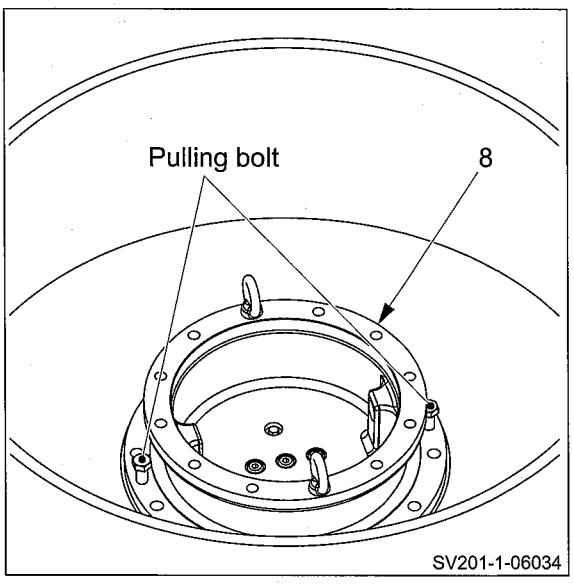


26) Install lifting bolts (M16) to holder (8).

- Remove bolts (6).

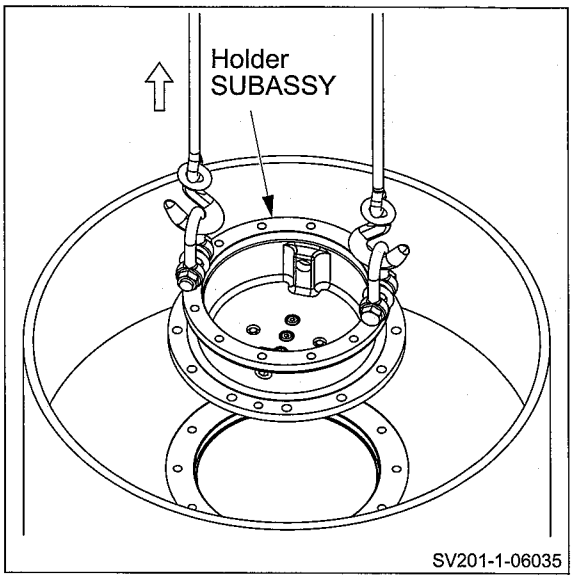


27) Lift holder (8) using two pulling bolts (M16×50).

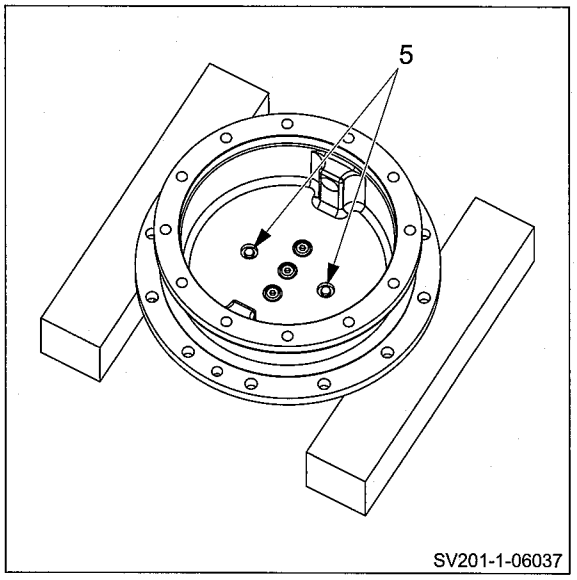


28) Remove holder SUBASSY.

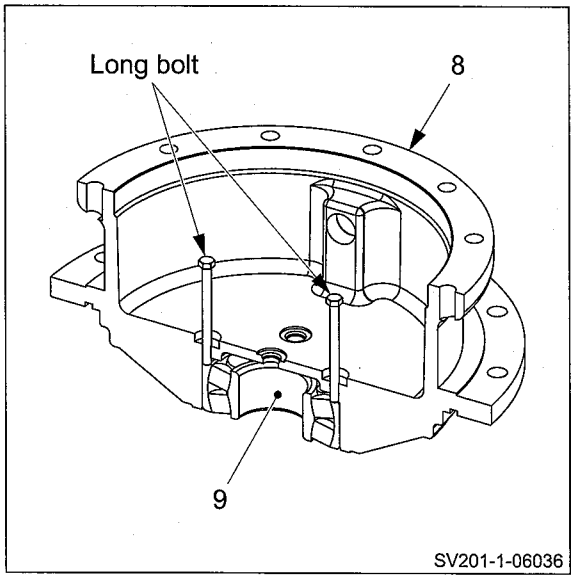
Holder SUBASSY : 65 kg (143 lbs.)



29) Remove bolts (5).



30) Remove vibrator bearing (9) from holder (8) using long bolts (M8).



2-3-2. Reassembly of vibratory drum

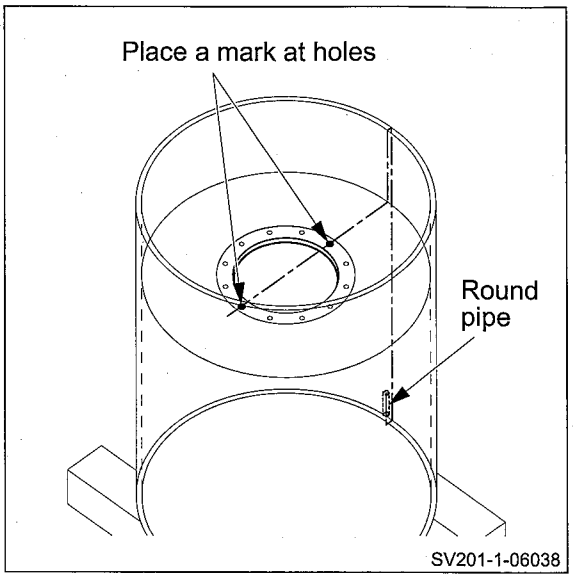
- Before reassembling, clean disassembled parts well and check that there is no abnormality.

⚠WARNING

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

1) Stand drum (1) with side without round pipe facing up.
   - Place marks to upper side of drum at holes on extended line from round pipe.

   kg (1) Drum
   SV204D : 970 kg (2,138 lbs.)
   SV204T : 1,105 kg (2,436 lbs.)
   SV204TB : 1,105 kg (2,436 lbs.)
   SV204TF : 1,825 kg (4,023 lbs.)

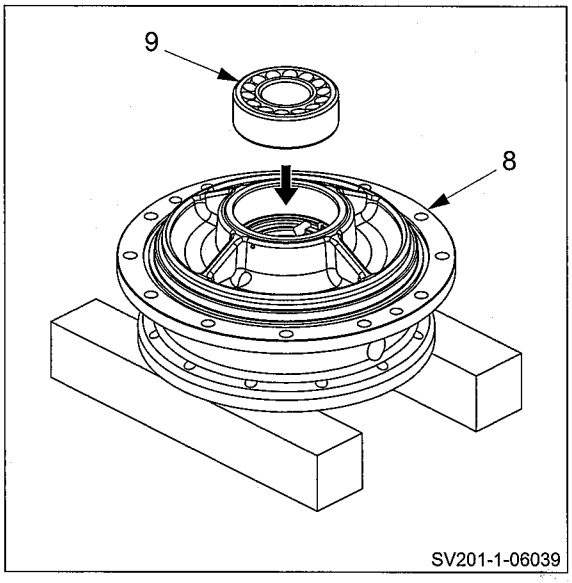


2) Reassembly of holder SUBASSY

2-1) Apply a coat of gear oil to holder (8) at where bearing will be press-fitted.
   - Drive in vibrator bearing (9).

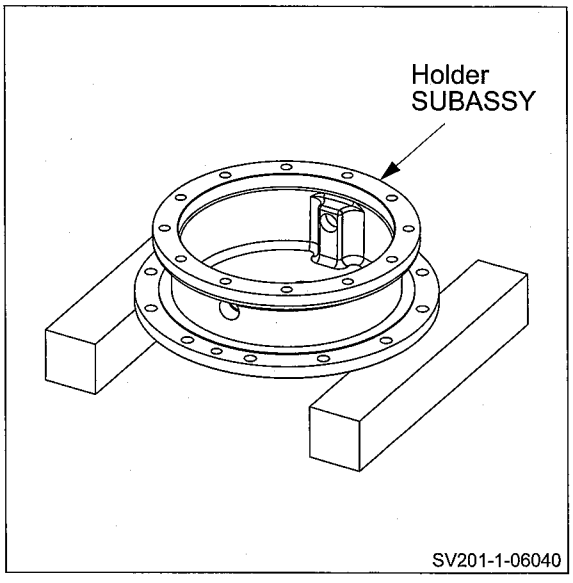
(NOTICE)

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

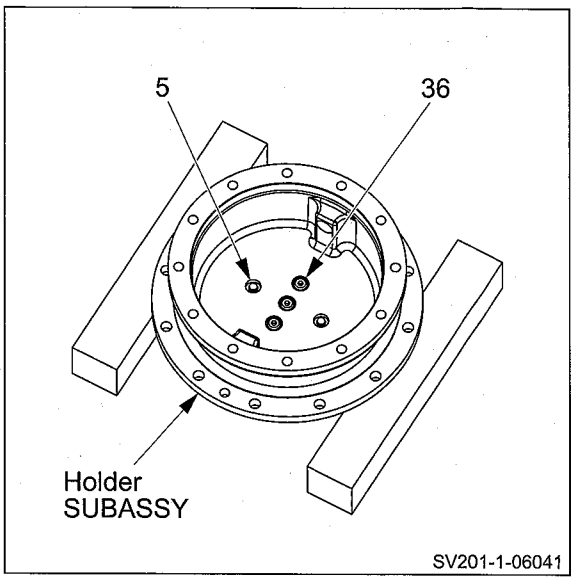


2-2) Reverse holder SUBASSY.

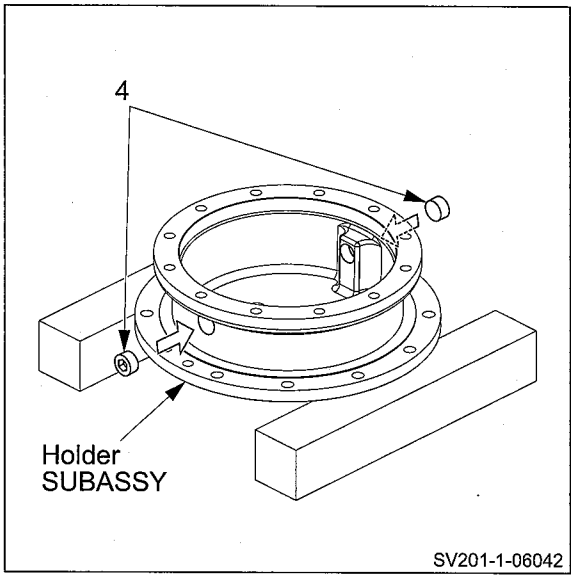
kg Holder SUBASSY : 65 kg (143 lbs.)



2-3) Apply grease to O-rings for plugs (36).
- Install plugs to holder SUBASSY.
- Install bolts (5) and seal washers to holder SUBASSY.



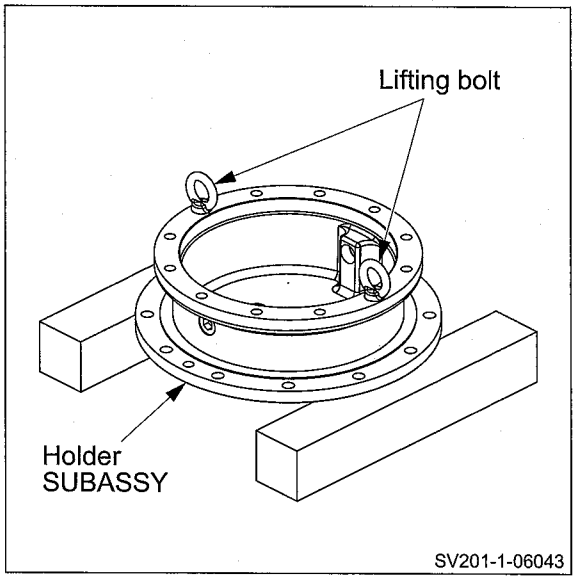
2-4) Apply screw locking agent to plugs (4).
- Install plugs to holder SUBASSY.



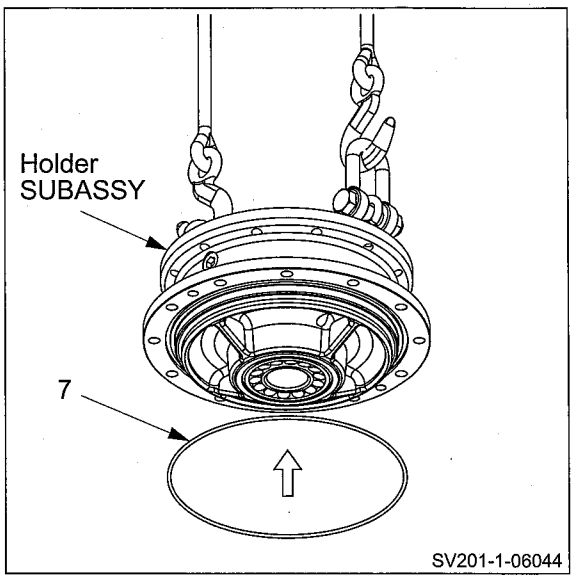
⚠WARNING

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

3) Install lifting bolts (M16) to holder SUBASSY.



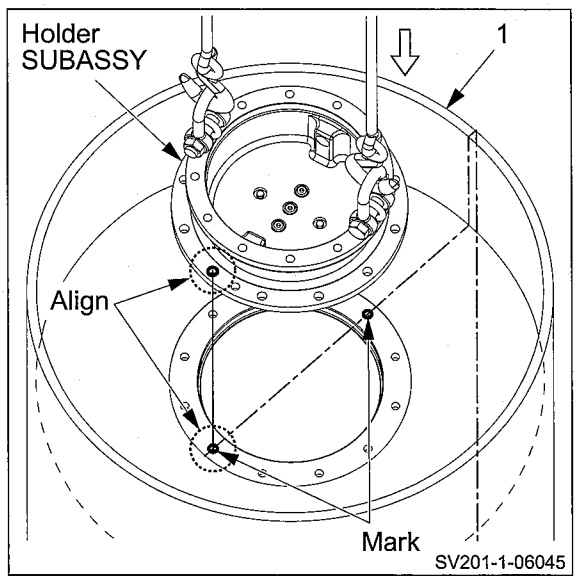
4) Lift holder SUBASSY.
   - Apply grease to O-ring (7).
   - Install O-ring to holder SUBASSY.



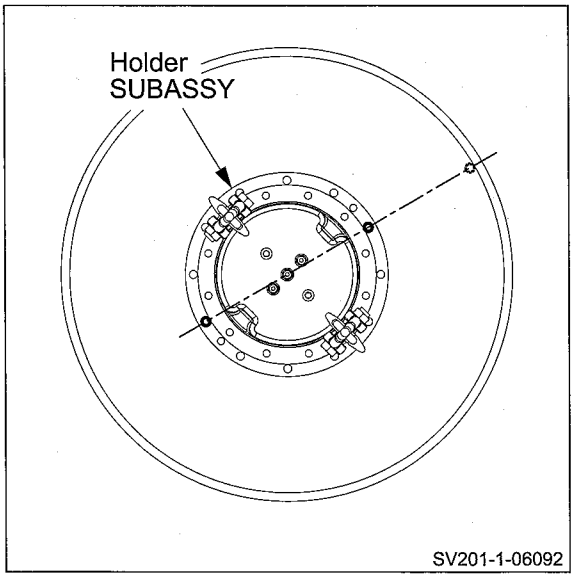
5) Lower holder SUBASSY on mounting surface of drum (1).

   Holder SUBASSY : 65 kg (143 lbs.)

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

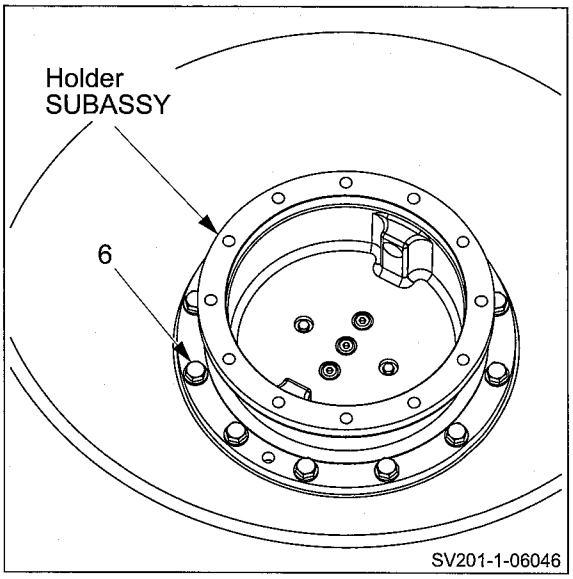


6) Position holder SUBASSY as shown right.

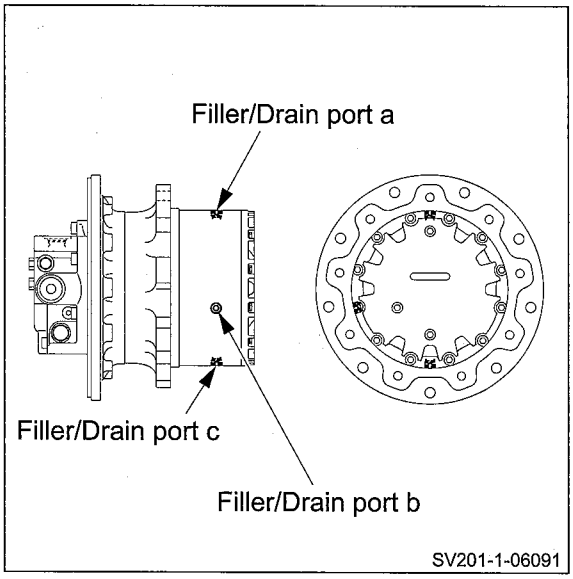


7) Secure holder SUBASSY to drum (1) with twelve bolts (6) and washers.

N•m (6) Bolt M16×50 : 265 N·m (195 lbf·ft)



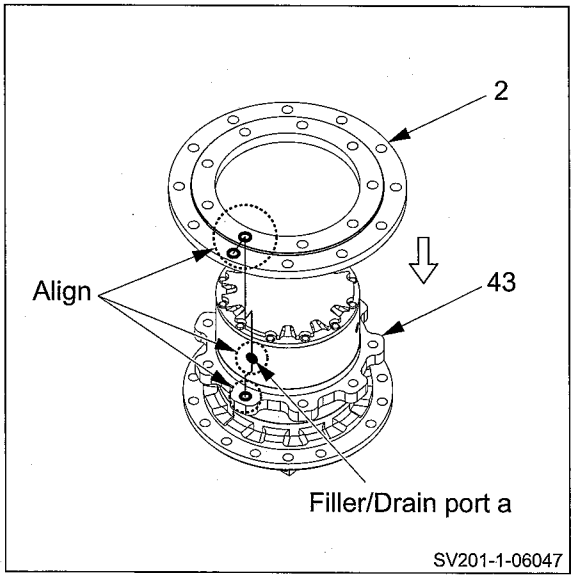
8) Reassembly of propulsion motor SUBASSY



8-1) Install ring (2) to mounting surface of propulsion motor (43).

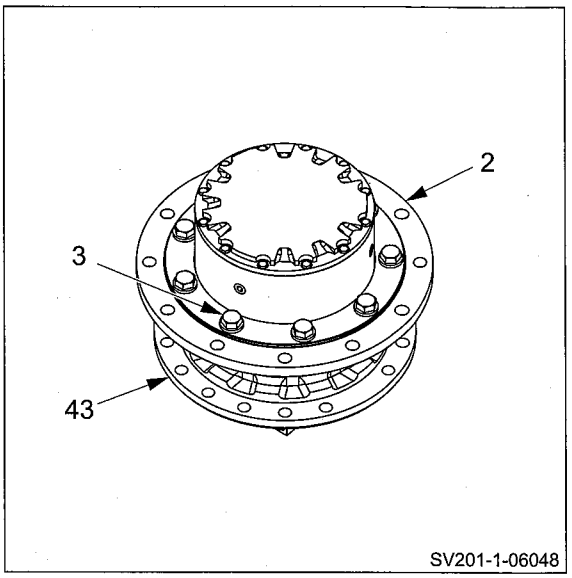
(NOTICE)

- **Align holes with filler/drain port "a" as shown.**



8-2) Secure ring (2) to propulsion motor (43) with nine bolts (3) and washers.

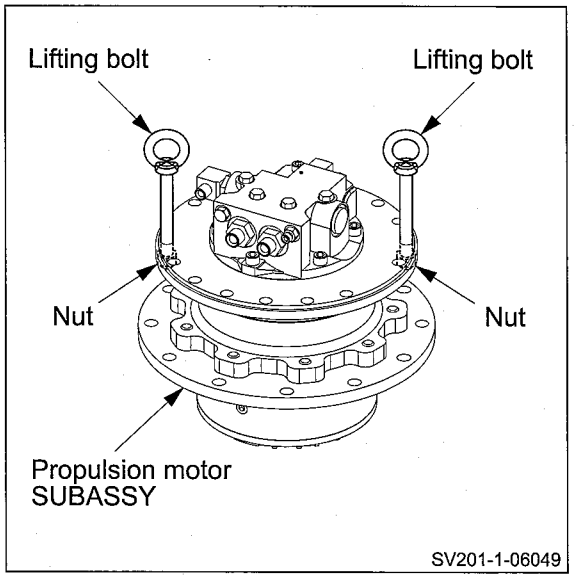
N•m (3) Bolt M16×50 : 265 N·m (195 lbf·ft)



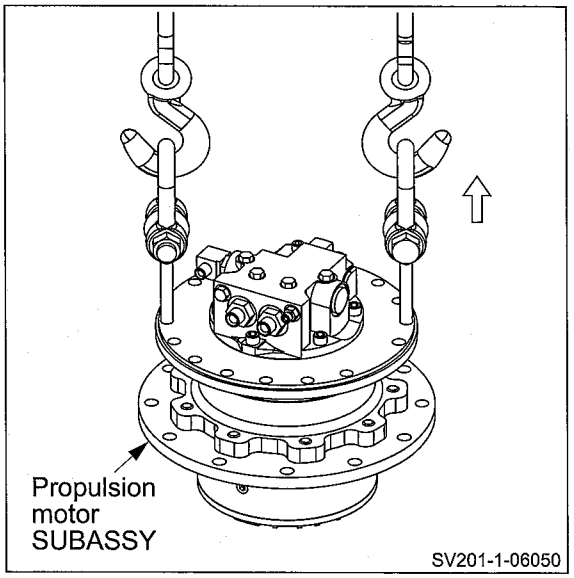
9) Reverse propulsion motor SUBASSY.

kg Propulsion motor SUBASSY : 105 kg (231 lbs.)

- Install lifting bolts and nuts (M16) to propulsion motor SUBASSY.



10) Lift propulsion motor SUBASSY.

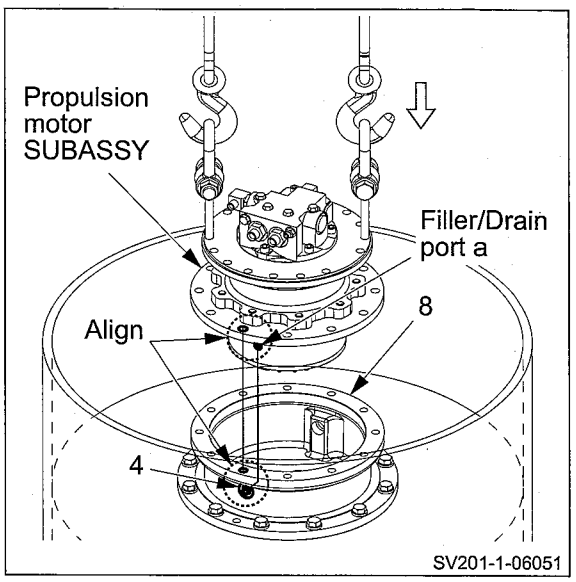


11) Lower propulsion motor SUBASSY on mounting surface of holder (8).

Propulsion motor SUBASSY : 105 kg (231 lbs.)

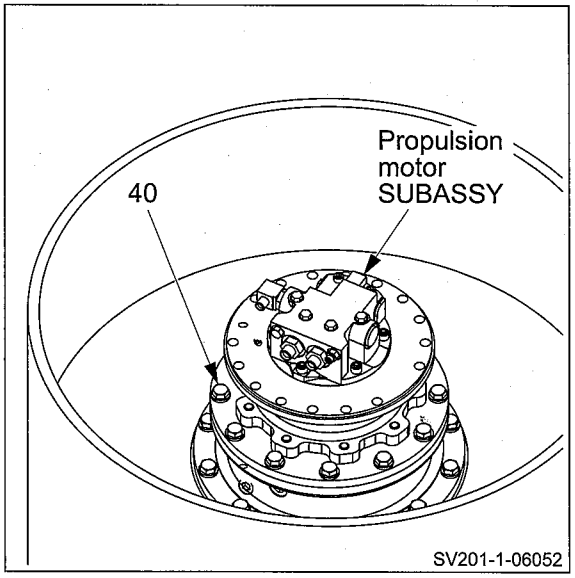
(NOTICE)

- **Align filler/drain port "a" with plug (4).**



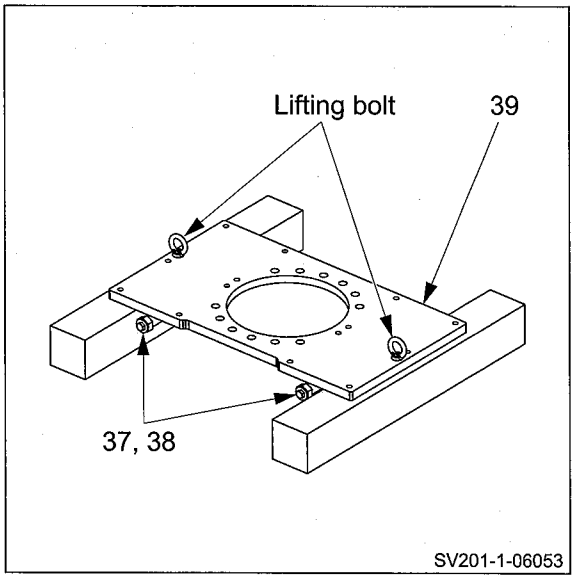
12) Secure propulsion motor SUBASSY to holder (8) with twelve bolts (40) and washers.

(40) Bolt M16×50 : 265 N·m (195 lbf·ft)

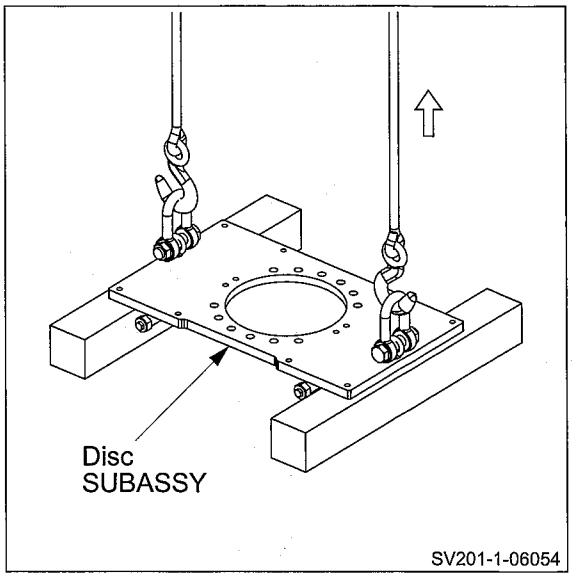


13) Secure two pipes (38) to disc (39) with two bolts (37) and washers.

- Install lifting bolts (M12) to disc.

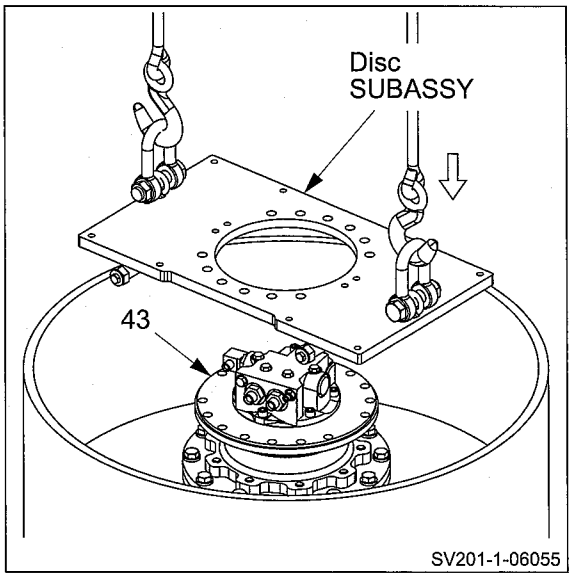


14) Lift disc SUBASSY.

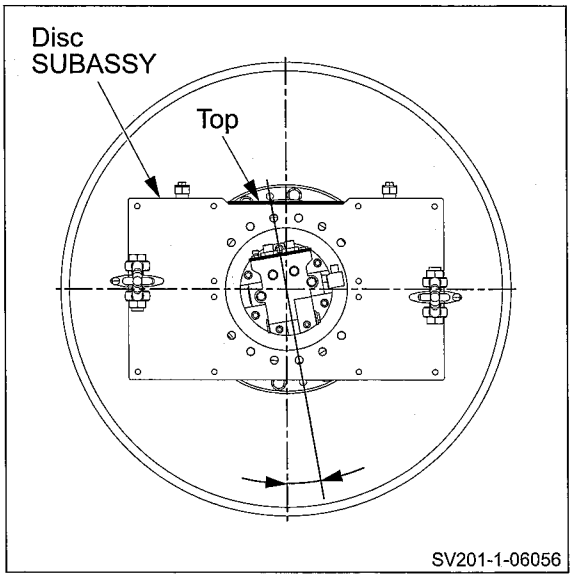


15) Lower disc SUBASSY on mounting surface of propulsion motor (43).

Disc SUBASSY : 40 kg (88 lbs.)

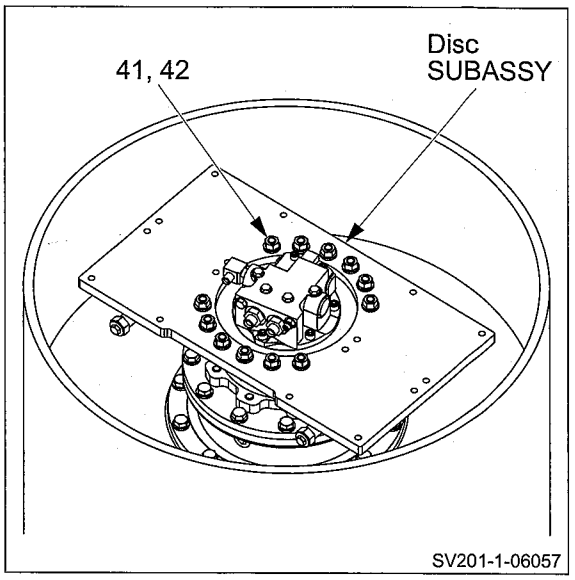


16) Position disc SUBASSY as shown right.



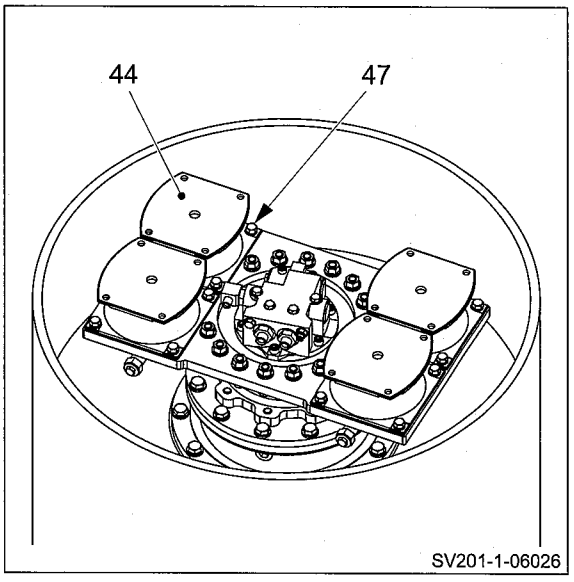
17) Secure disc SUBASSY to propulsion motor (43) with twelve bolts (41), twelve nuts (42) and washers.

N•m (42) Nut M16 : 265 N·m (195 lbf·ft)



18) Secure four dampers (44) to disc (39) with sixteen bolts (47) and spring washers.

N•m (47) Bolt M12×25 : 108 N·m (80 lbf·ft)

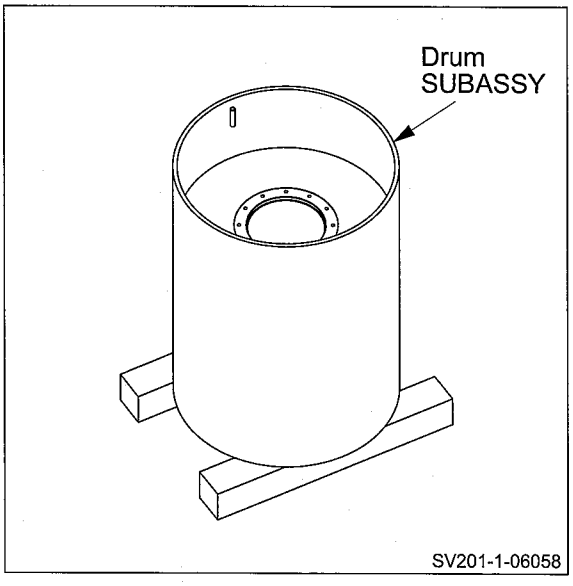


⚠WARNING

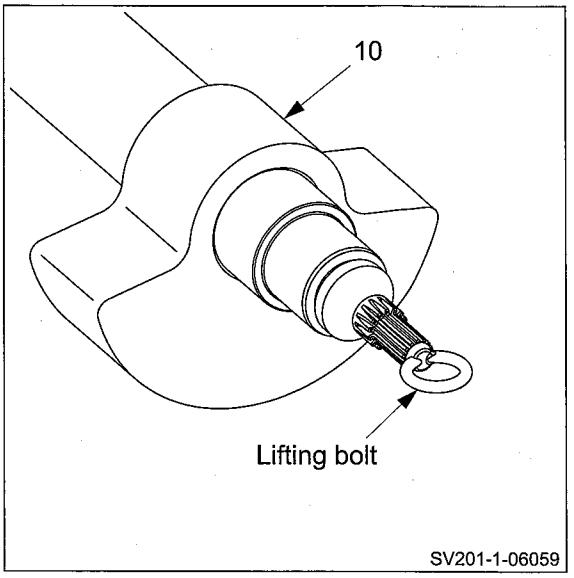
Be careful because reversing the drum involves risk. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

19) Reverse drum SUBASSY.

kg Drum SUBASSY
SV204D : 1,210 kg (2,668 lbs.)
SV204T : 1,340 kg (2,954 lbs.)
SV204TB : 1,340 kg (2,954 lbs.)
SV204TF : 2,060 kg (4,541 lbs.)

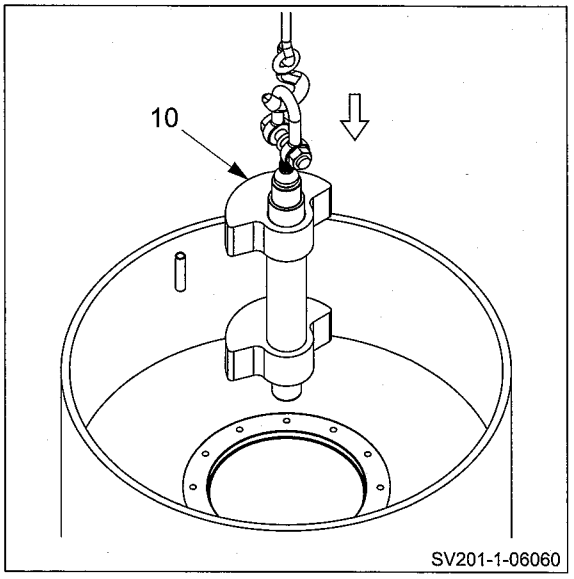


20) Install lifting bolts (M10) to eccentric shaft (10).

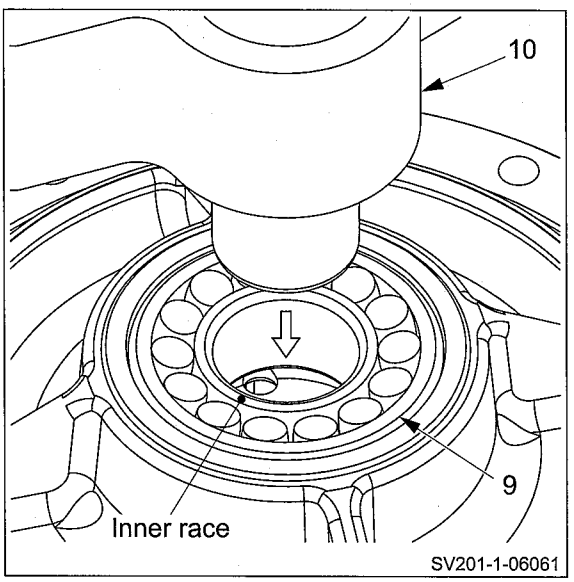


21) Apply a coat of gear oil to bearing mounting surface of eccentric shaft (10).
- Lower eccentric shaft.

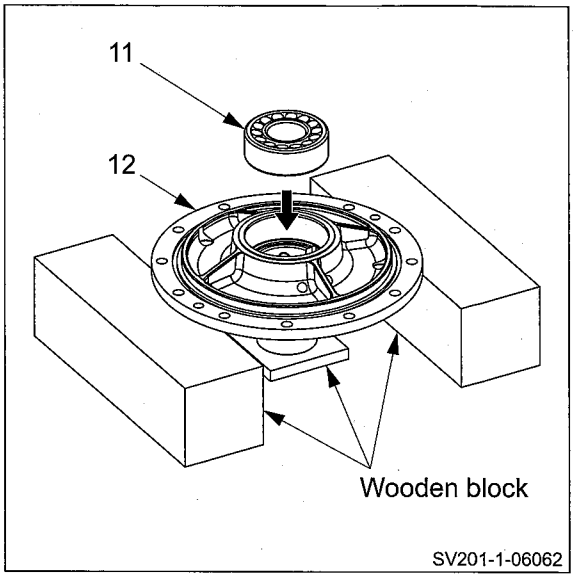
(10) Eccentric shaft : 70 kg (154 lbs.)



22) Insert eccentric shaft (10) into vibrator bearing (9) while taking care not to tilt vibrator bearing inner race.



23) Reassembly of axle shaft SUBASSY
- Apply a coat of gear oil to axle shaft (12) at where bearing will be press-fitted.
- Drive in vibrator bearing (11).



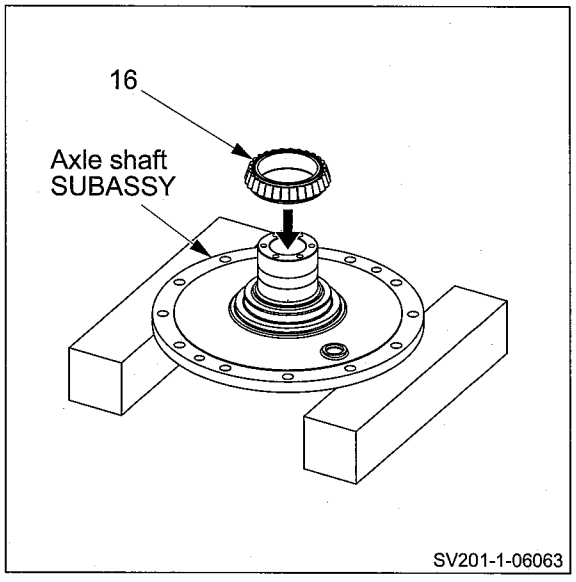
⚠WARNING

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

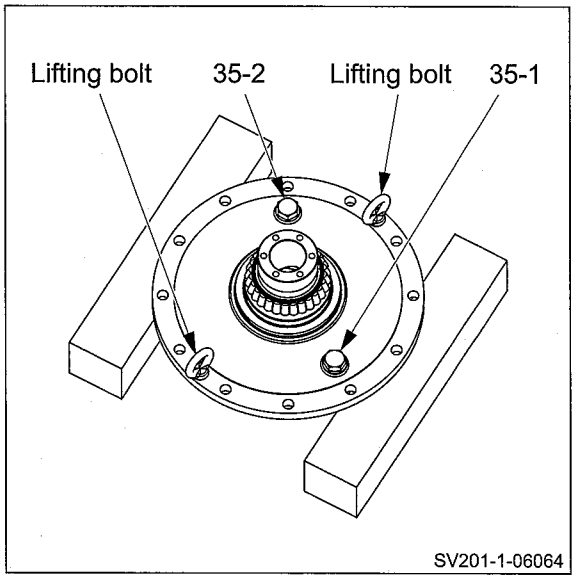
24) Reverse axle shaft SUBASSY.

Axle shaft SUBASSY : 45 kg (99 lbs.)

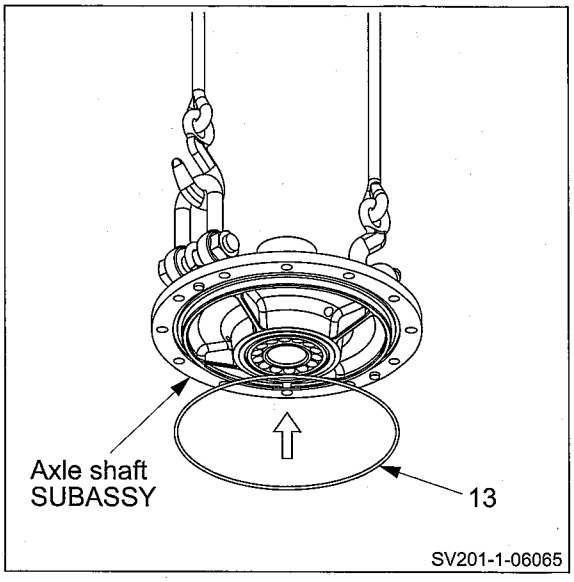
- Heat up roller bearing (16) inner race by using a ring heater or the like.
- Apply a coat of gear oil to axle shaft (12) at where bearing inner race will be press-fitted.
- Drive in heated roller bearing inner race.



25) Apply grease to O-rings for plugs (35-1) and (35-2).
- Reinstall plugs.
- Install lifting bolts (M16) to axle shaft SUBASSY.



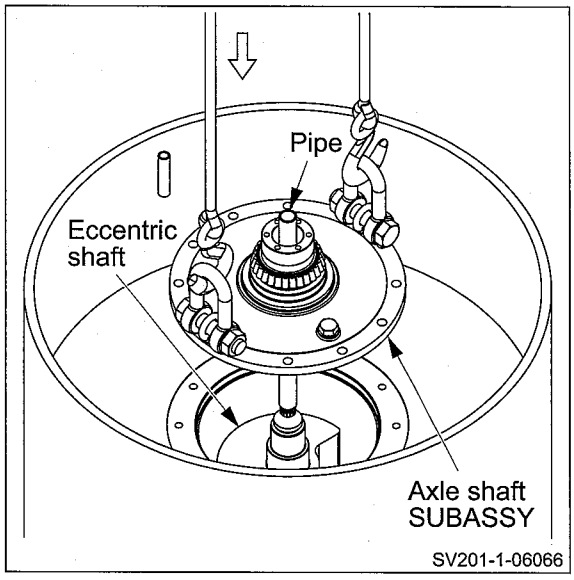
26) Lift axle shaft SUBASSY.
- Apply grease to O-ring (13).
- Install O-ring to axle shaft (12).



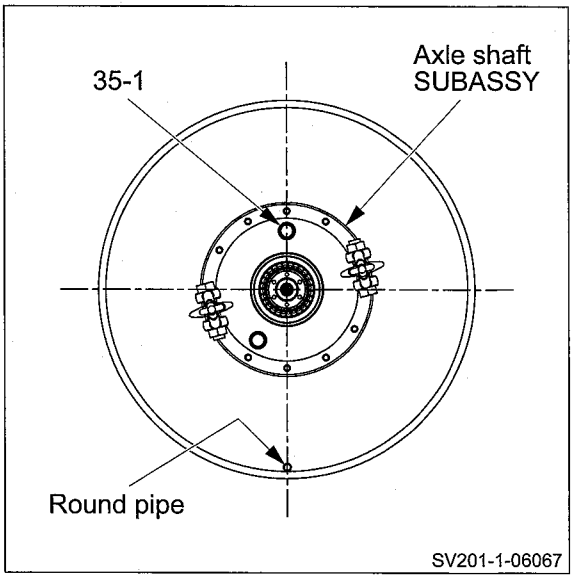
27) Lower axle shaft SUBASSY on mounting surface of drum slowly.

Axle shaft SUBASSY : 45 kg (99 lbs.)

(NOTICE)
- **Support the eccentric shaft with a pipe or the like, to prevent tilting of the vibrator bearing inner race during installation.**

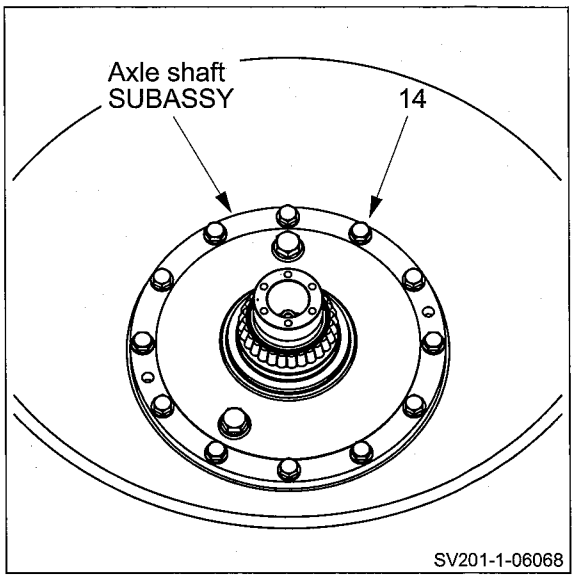


(NOTICE)
- **Position the axle shaft SUBASSY so that plug (35-1) is aligned with the round pipe at the opposite side of the shaft center as shown right.**

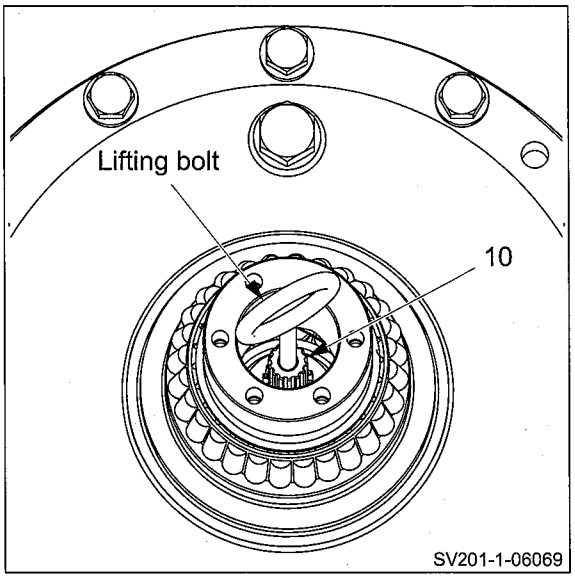


28) Secure axle shaft SUBASSY with twelve bolts (14) and washers.

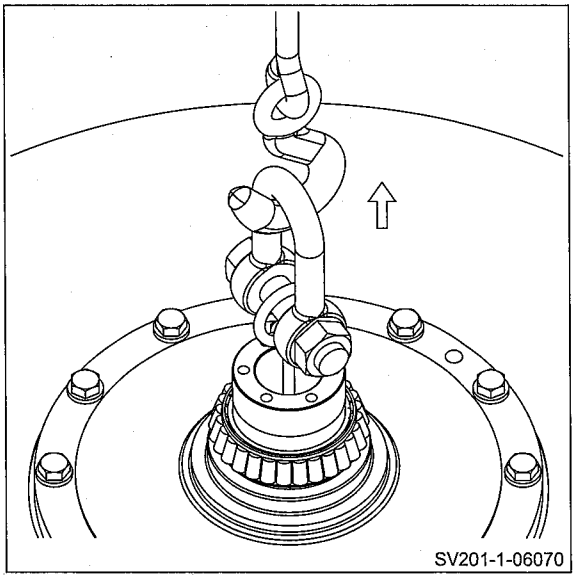
N•m (14) Bolt M16×50 : 265 N·m (195 lbf·ft)



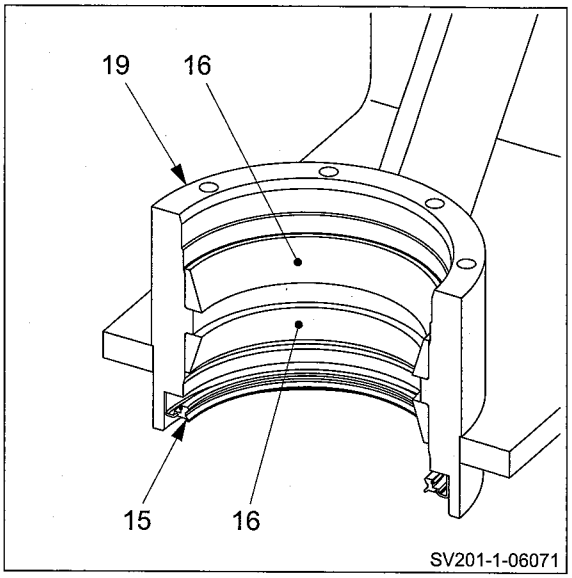
29) Install lifting bolt (M10) to end of eccentric shaft (10).



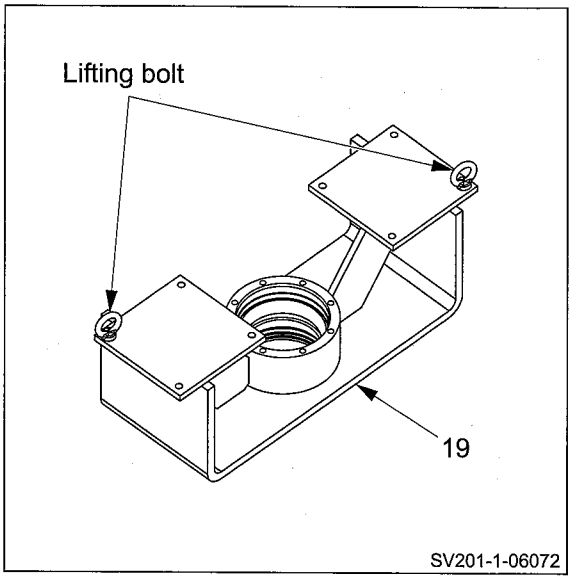
30) Slowly lift eccentric shaft with a crane and check that there is an axial play of 1 to 3 mm (0.04 to 0.12 in.).



31) Apply a coat of gear oil to axle (19) at where bearing outer race will be press-fitted.
- Drive roller bearing (16) outer races into axle.
- Apply liquid packing to periphery of oil seal (15).
- Drive in oil seal.
- Apply lithium-based grease to lip of oil seal.

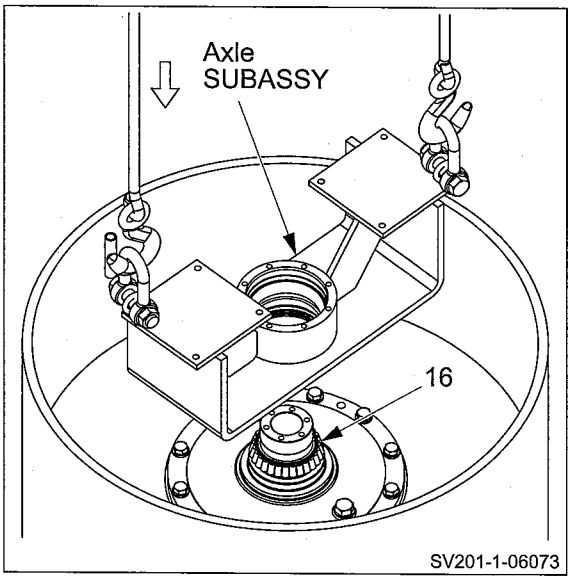


32) Install lifting bolts (M12) to axle (19).

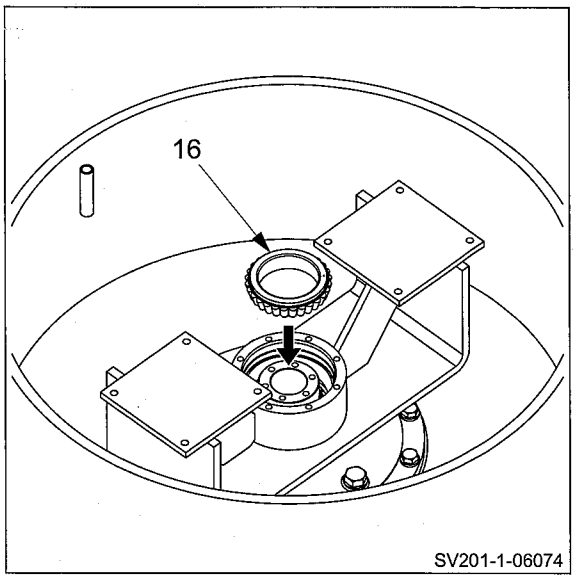


33) Apply sufficient amount of lithium-based grease to rollers of roller bearing (16) inner race.
- Lower axle SUBASSY.

60 kg Axle SUBASSY : 60 kg (132 lbs.)

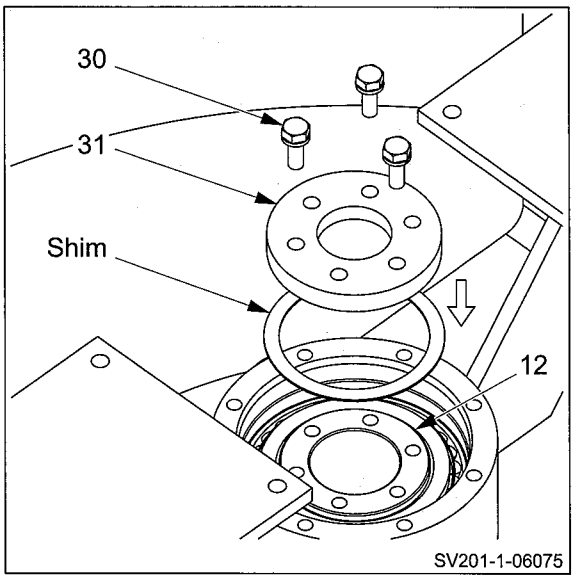


34) Apply sufficient amount of lithium-based grease to rollers of roller bearing (16) inner race.
- Drive in roller bearing inner race until rollers come in contact with outer race.

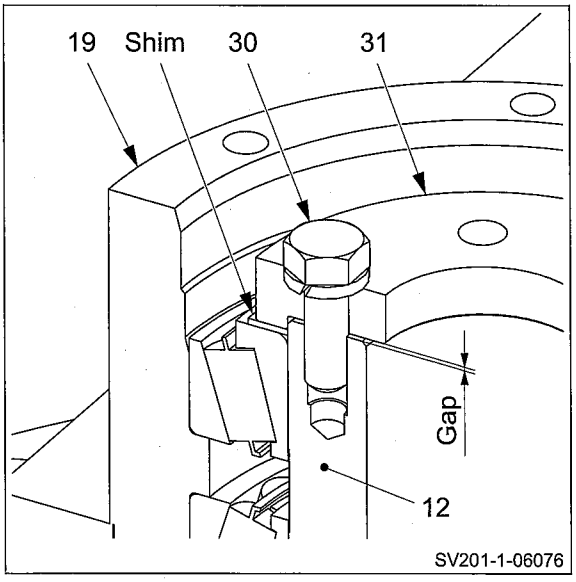


35) Preload adjustment of roller bearing

① Install a shim of about 1 mm (0.04 in.) and secure cover (31) to axle shaft (12) with three bolts (30) and spring washers.

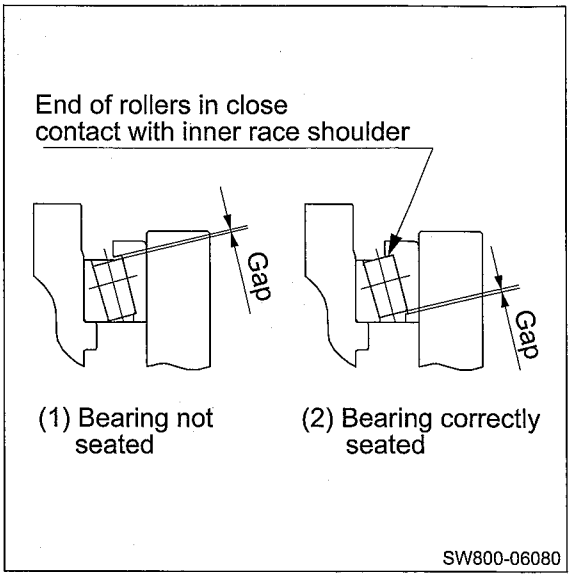


② A gap will remain between end of axle shaft (12) and inside of cover (31).
- Tighten bolts (30) to a torque of 29 N·m (21 lbf·ft).
- Give axle (19) two to three turns.
- Tighten bolts to a torque of 29 N·m (21 lbf·ft) again.
- Repeat this work several times until tightening torque of bolts no longer fluctuates.



(NOTICE)

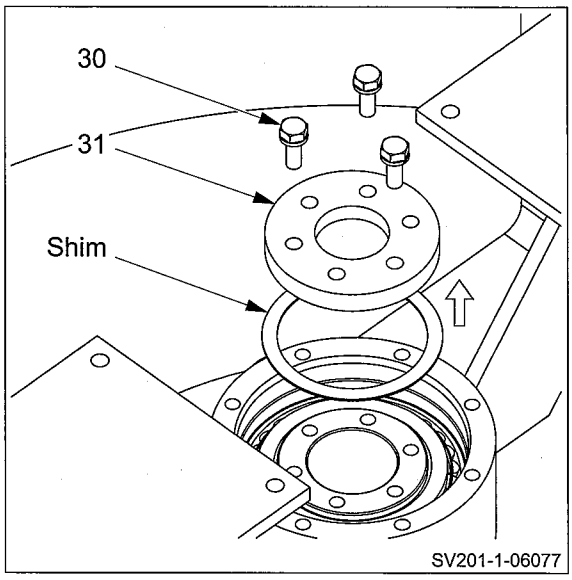
- **It is necessary to rotate the bearing to lift the rollers while pressing in the inner race. Otherwise the bearing will not seat no matter how forcibly the inner race is pressed.**



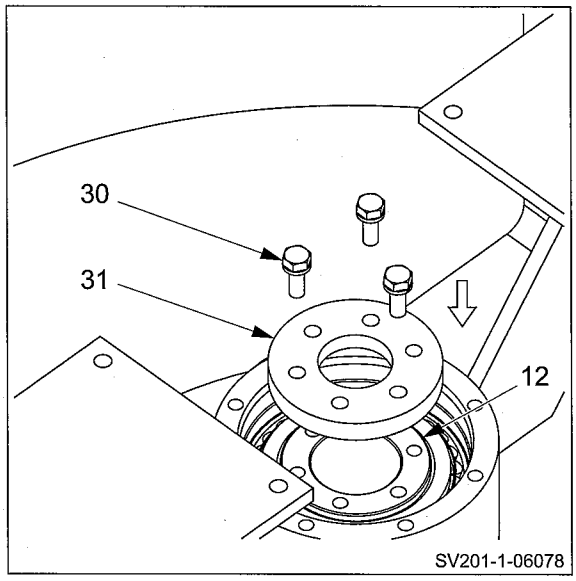
③ Remove bolts (30).
- Remove cover (31).
- Remove shim.

(NOTICE)

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

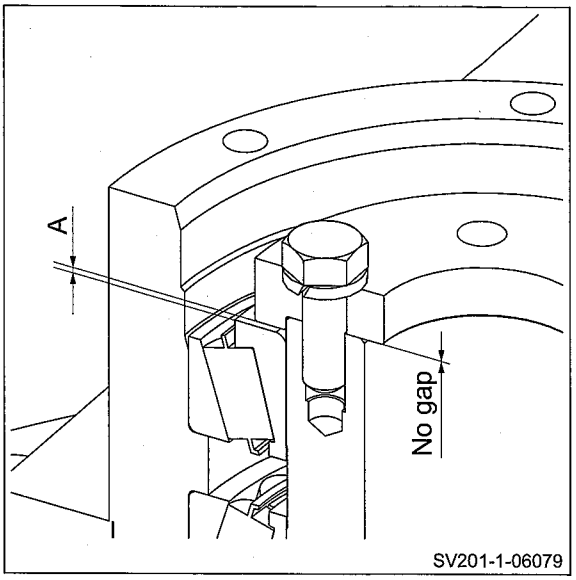


④ Without inserting shim, install cover (31) to axle shaft (12) with three bolts (30) and spring washers.

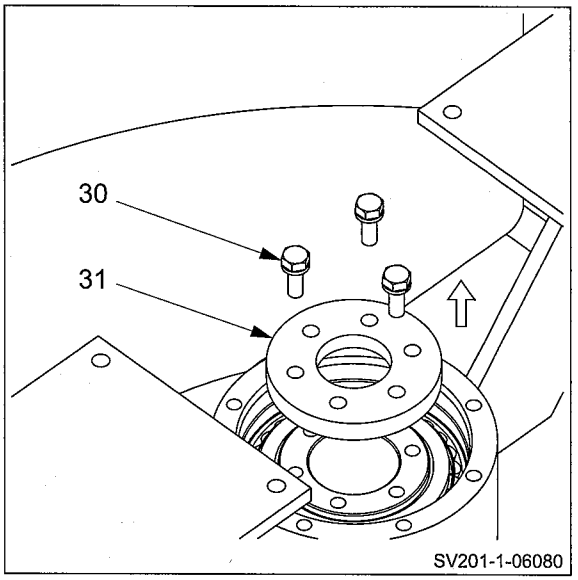


⑤ Using a thickness gauge, measure clearance "A".

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

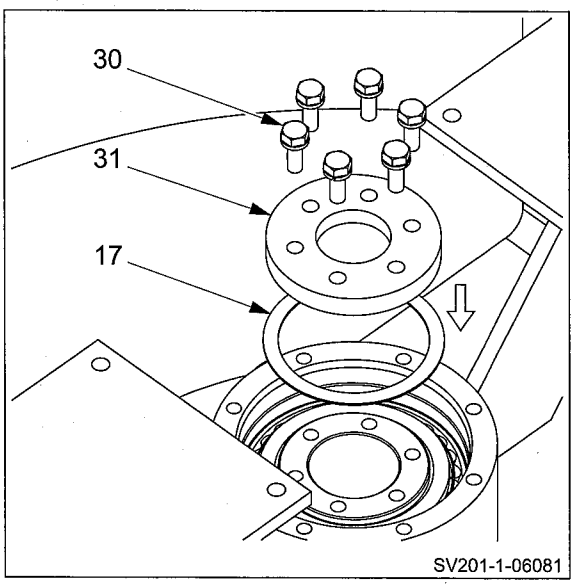


⑥ Remove bolts (30).
- Remove cover (31).

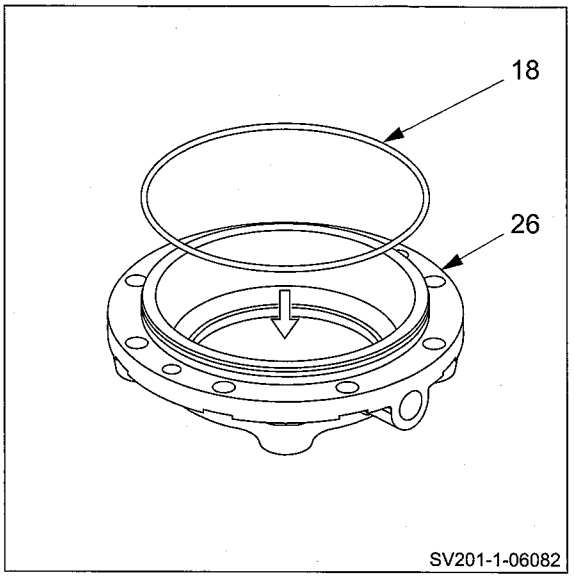


⑦ Install shim (17) of preload adjusting shim thickness = A + 0.1 mm (0.004 in.).
- Secure cover (31) to axle shaft (12) with six bolts (30) and spring washers.

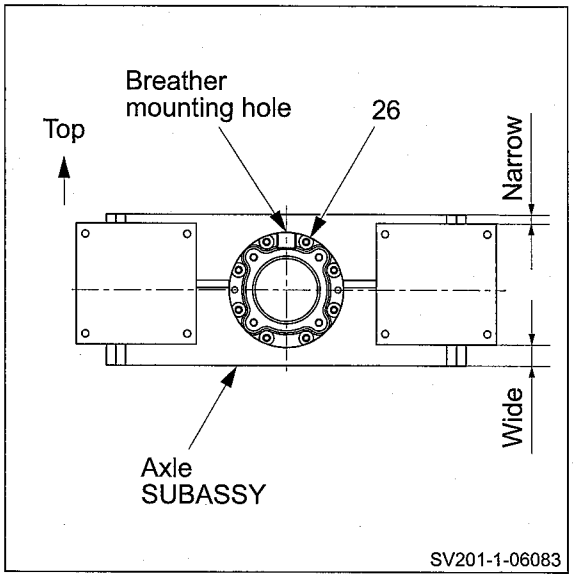
N•m (30) Bolt M10×30 : 59 N·m (44 lbf·ft)



36) Apply grease to O-ring (18).
- Install O-ring to flange (26).

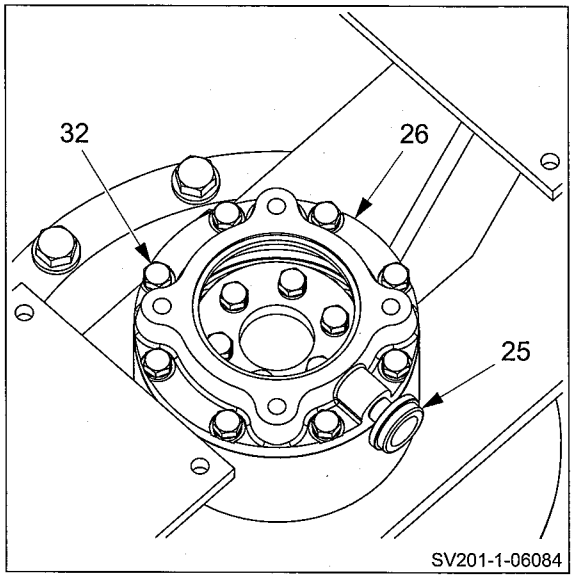


37) Bring breather mounting hole in flange (26) to top as shown right.

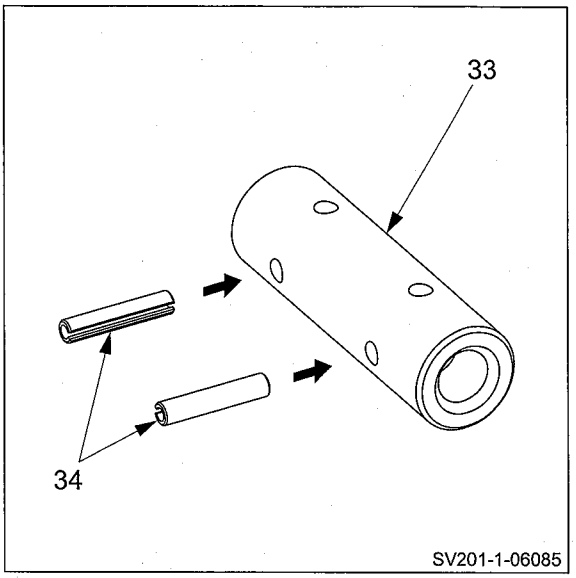


38) Apply thread-locking fluid to breather (25) threads.
- Install breather.
- Secure flange (26) to axle SUBASSY with eight bolts (32) and spring washers.

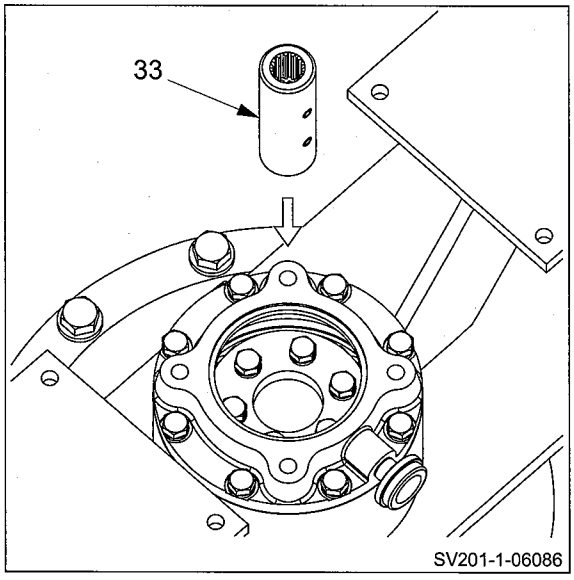
N•m (32) Bolt M10×35: 59 N·m (44 lbf·ft)



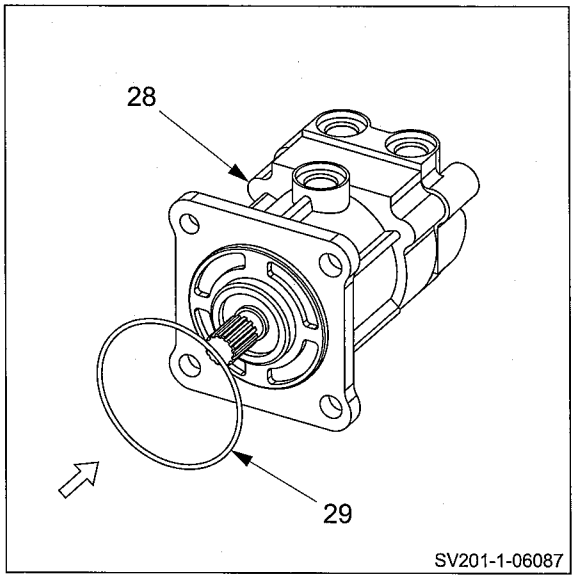
39) Drive two spring pins (34) into sleeve (33).



40) Apply molybdenum-based grease to splined portion of sleeve (33).
- Fit sleeve to splined portion on eccentric shaft end.



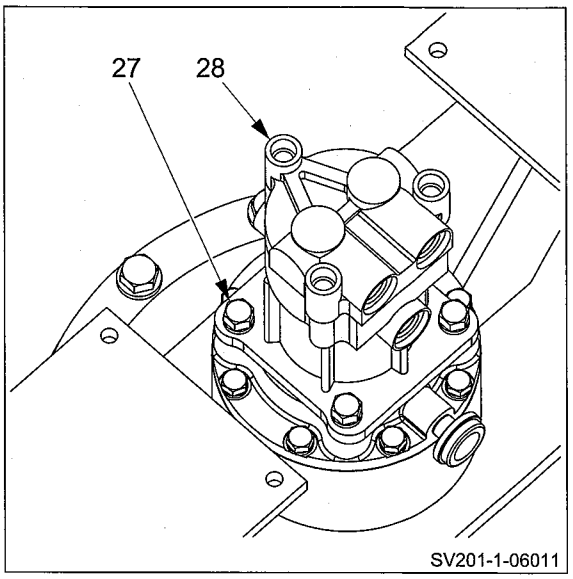
41) Apply grease to O-ring (29).
- Install O-ring to vibrator motor (28).



42) Secure vibrator motor (28) to flange (26) with four bolts (27) and spring washers.

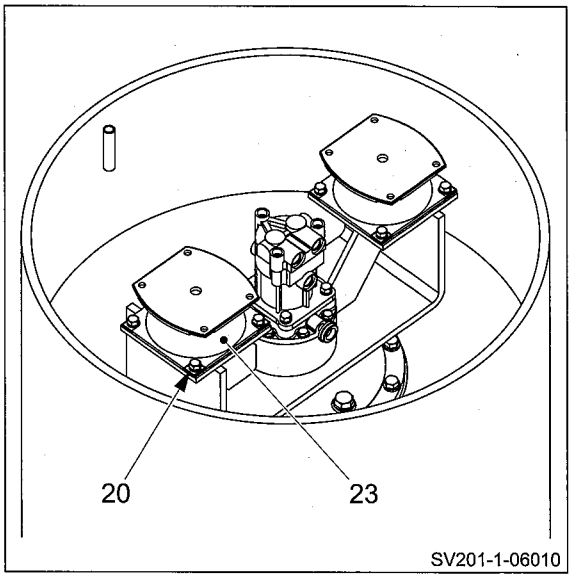
kg Vibrator motor : 15 kg (33 lbs.)

N•m (27) Bolt M12×35 : 108 N·m (80 lbf·ft)



43) Secure two dampers (23) to axle (19) with eight bolts (20) and spring washers.

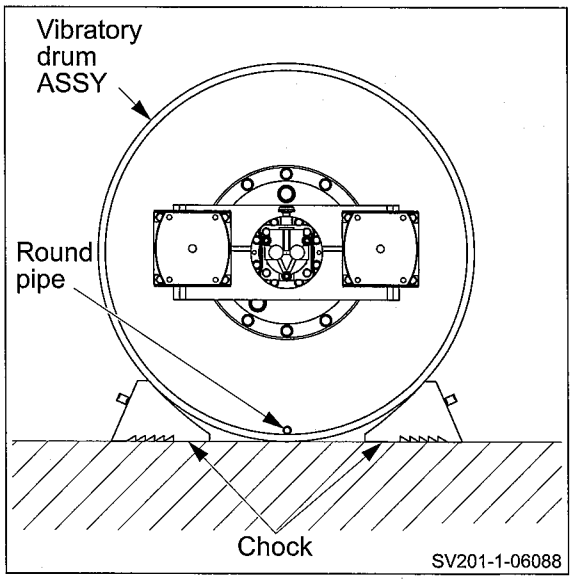
N•m (20) Bolt M12×25 : 108 N·m (80 lbf·ft)



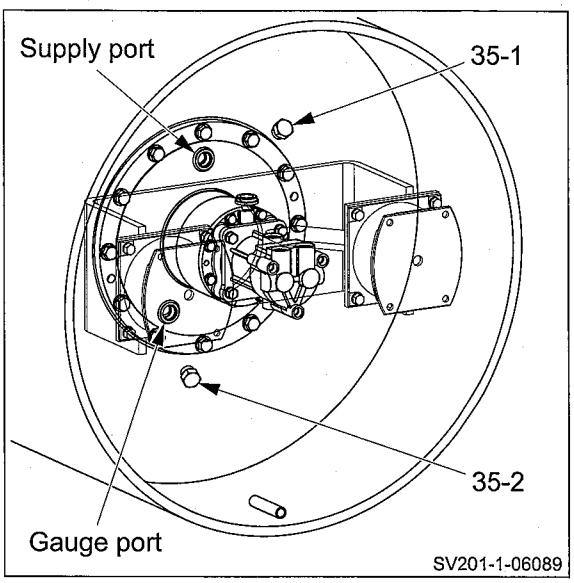
44) Lay vibratory drum ASSY on its side with round pipe at bottom.

- Hold with chocks.

kg Vibratory drum ASSY
SV204D : 1,410 kg (3,108 lbs.)
SV204T : 1,545 kg (3,406 lbs.)
SV204TB : 1,545 kg (3,406 lbs.)
SV204TF : 2,260 kg (4,982 lbs.)

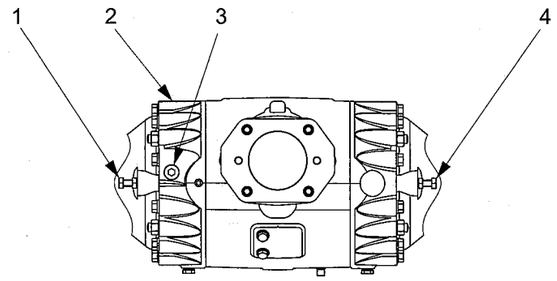


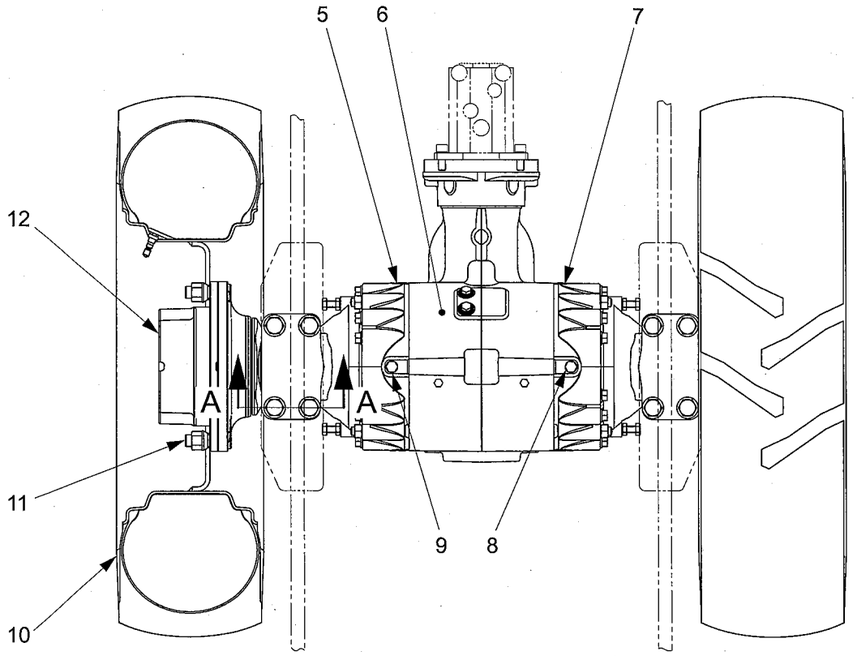
45) Remove plugs (35-1) and (35-2).
- Supply gear oil from oil supply port.
- Check that oil drips from gauge port.
  - Quantity of gear oil : 4.0 L (1.1 gal.)
- Reinstall plugs.

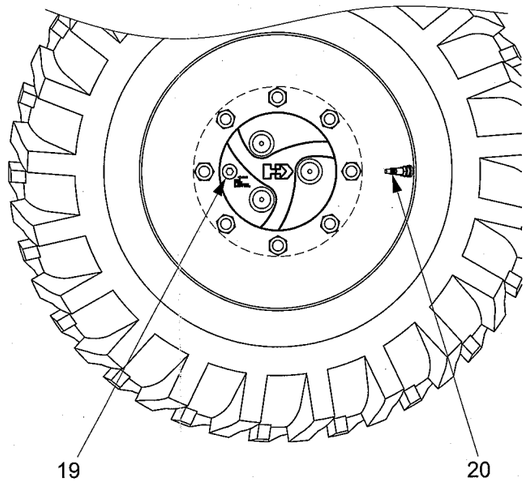


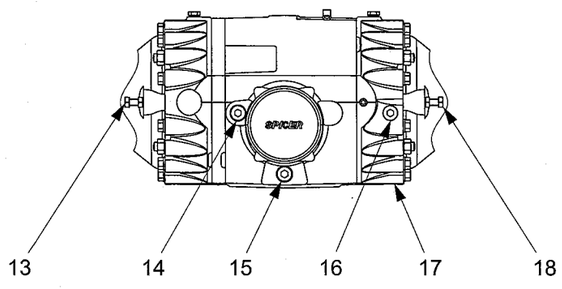
3. REAR AXLE

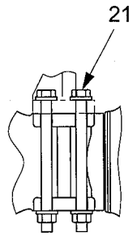
3-1. Rear Axle ASSY











SECTION A-A

(1) Bolt (brake release)
(2) Plug (brake drain)
(3) Plug (brake filler and level gauge)
(4) Bolt (brake release)
(5) Brake
(6) Differential
(7) Brake
(8) Parking brake release port **[BR]** : M14 P=1.5
(9) Parking brake release port **[BL]** : M14 P=1.5
(10) Tire
(11) Hub nut : M22 P=1.5
(12) Hub reduction gear
(13) Bolt (brake release)
(14) Plug (differential filler and level gauge)
(15) Plug (differential drain)
(16) Plug (brake filler and level gauge)
(17) Plug (brake drain)
(18) Bolt (brake release)
(19) Plug (hub reduction gear filler, level gauge and drain)
(20) Valve
(21) Bolt : M20×250

N·m
(11) Hub nut M22 P=1.5 : 630 N·m (465 lbf·ft)
(21) Bolt M20×250 : 539 N·m (398 lbf·ft)

Specifications
- Tire inflation pressure : 176.5 kPa (26 psi)
- Tire ASSY weight : 60 kg (132 lbs.)
- Rear axle ASSY weight : 330 kg (728 lbs.)

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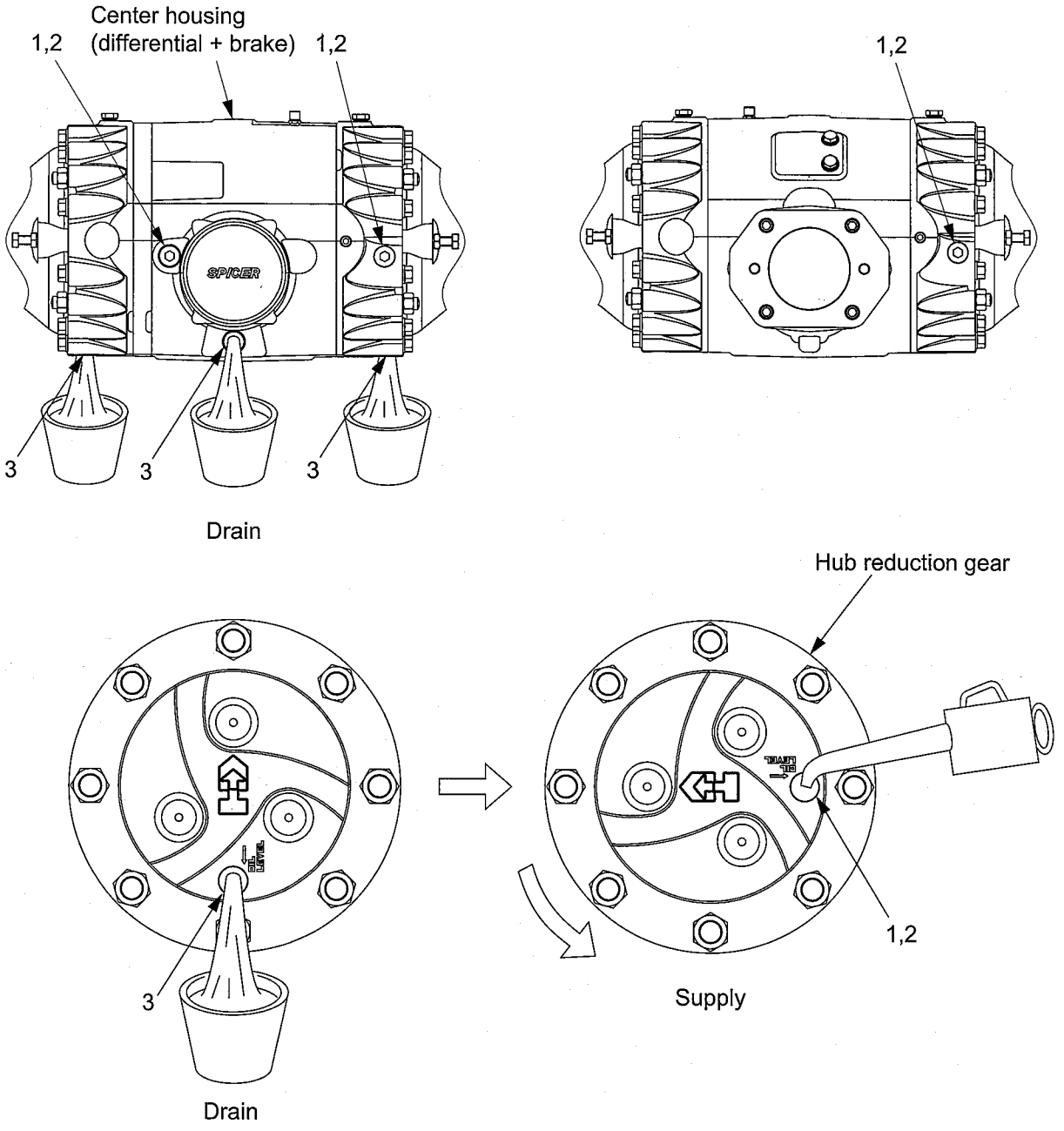
3-2. Rear Axle Lubrication



SV201-1K-06001

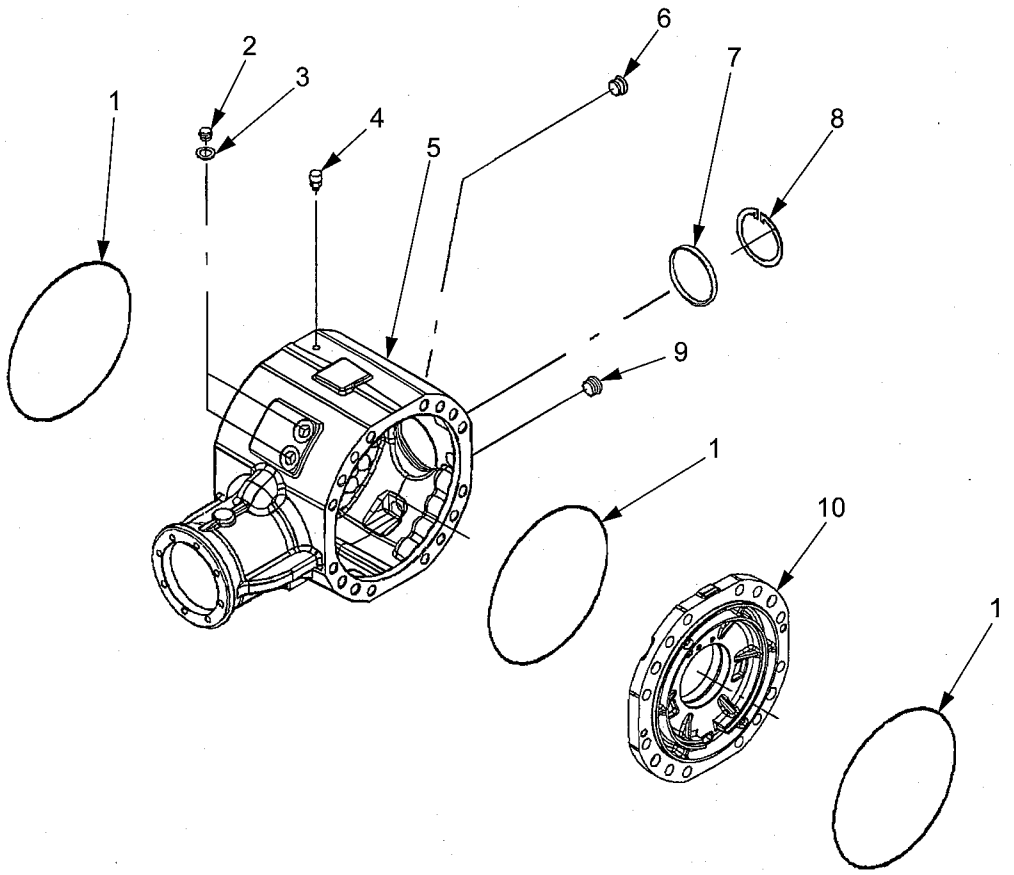
(1) Filler port
(2) Level gauge
(3) Drain port

- Change oil : Gear oil API-grade GL4 SAE90 (See recommended lubrication.)
- Change oil quantity

Center housing	:	8 L	(2.2 gal.)
Hub reduction gear	:	0.9 L×2	(0.22 gal.×2)

3-3. Rear Axle Structure

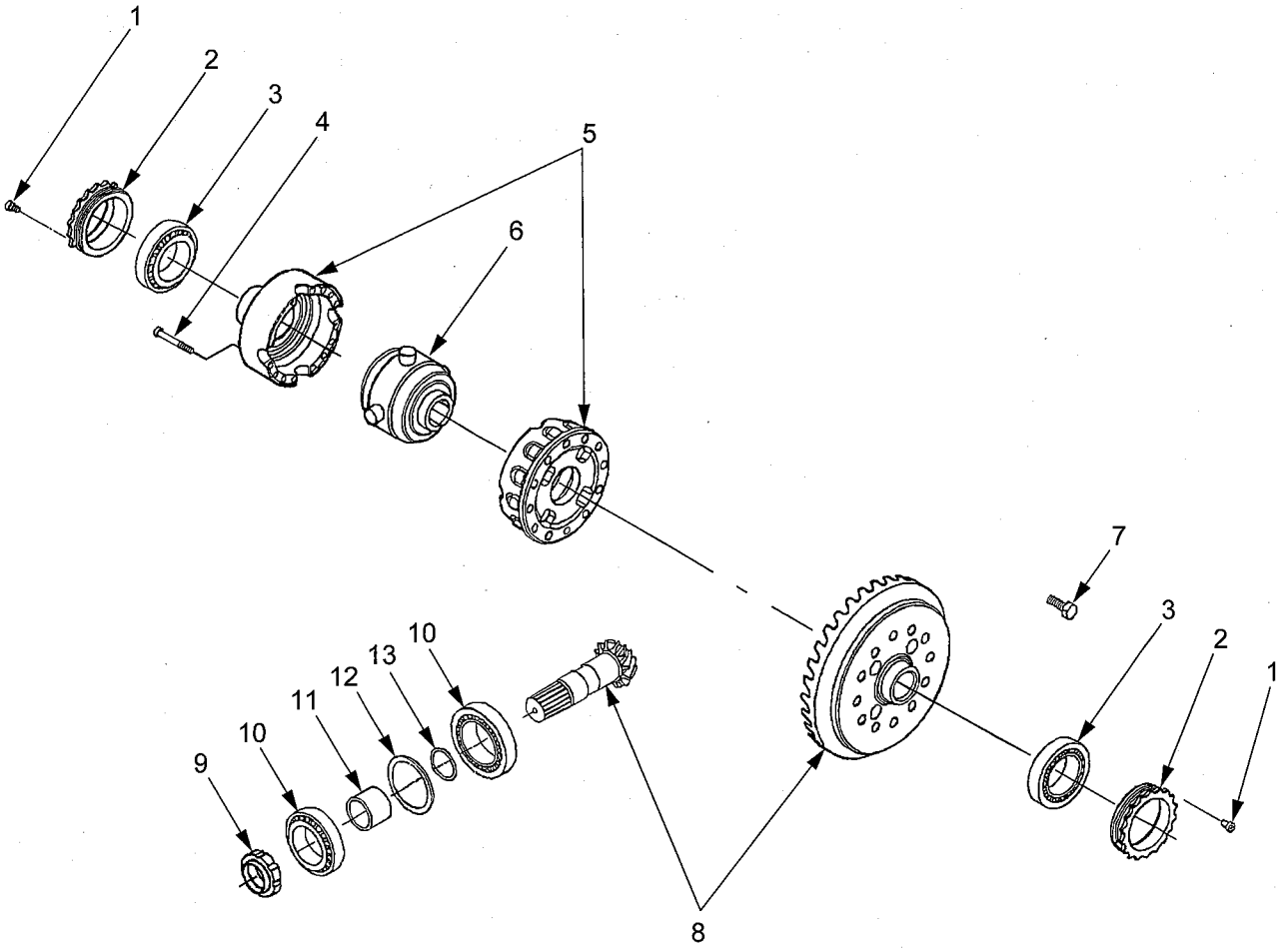
3-3-1. Center housing



SV201-1K-06002

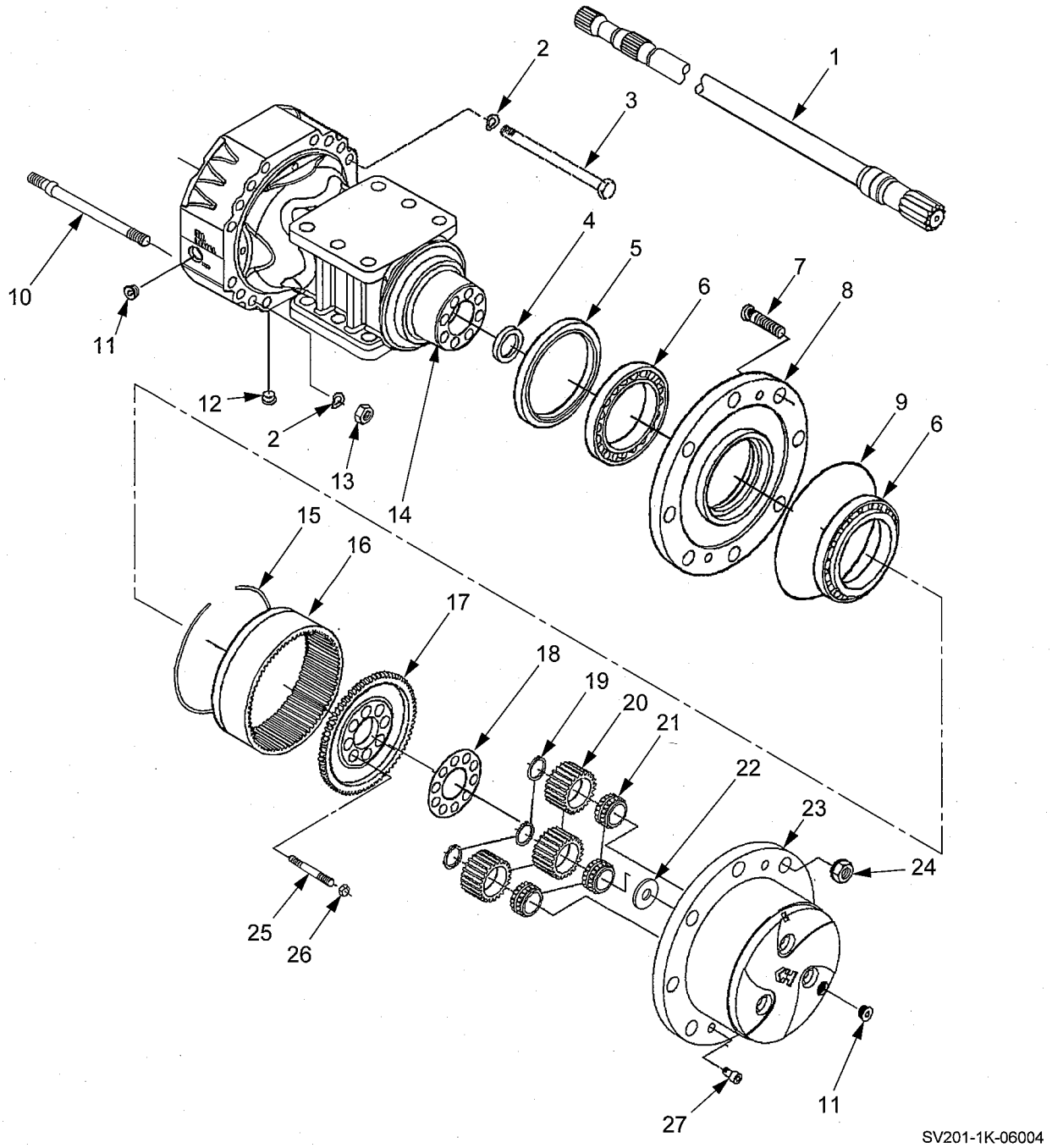
(1) O-ring
(2) Bolt
(3) Seal washer
(4) Vent
(5) Housing
(6) Plug
(7) Plug
(8) Snap ring
(9) Magnet plug
(10) Cover

3-3-2. Differential



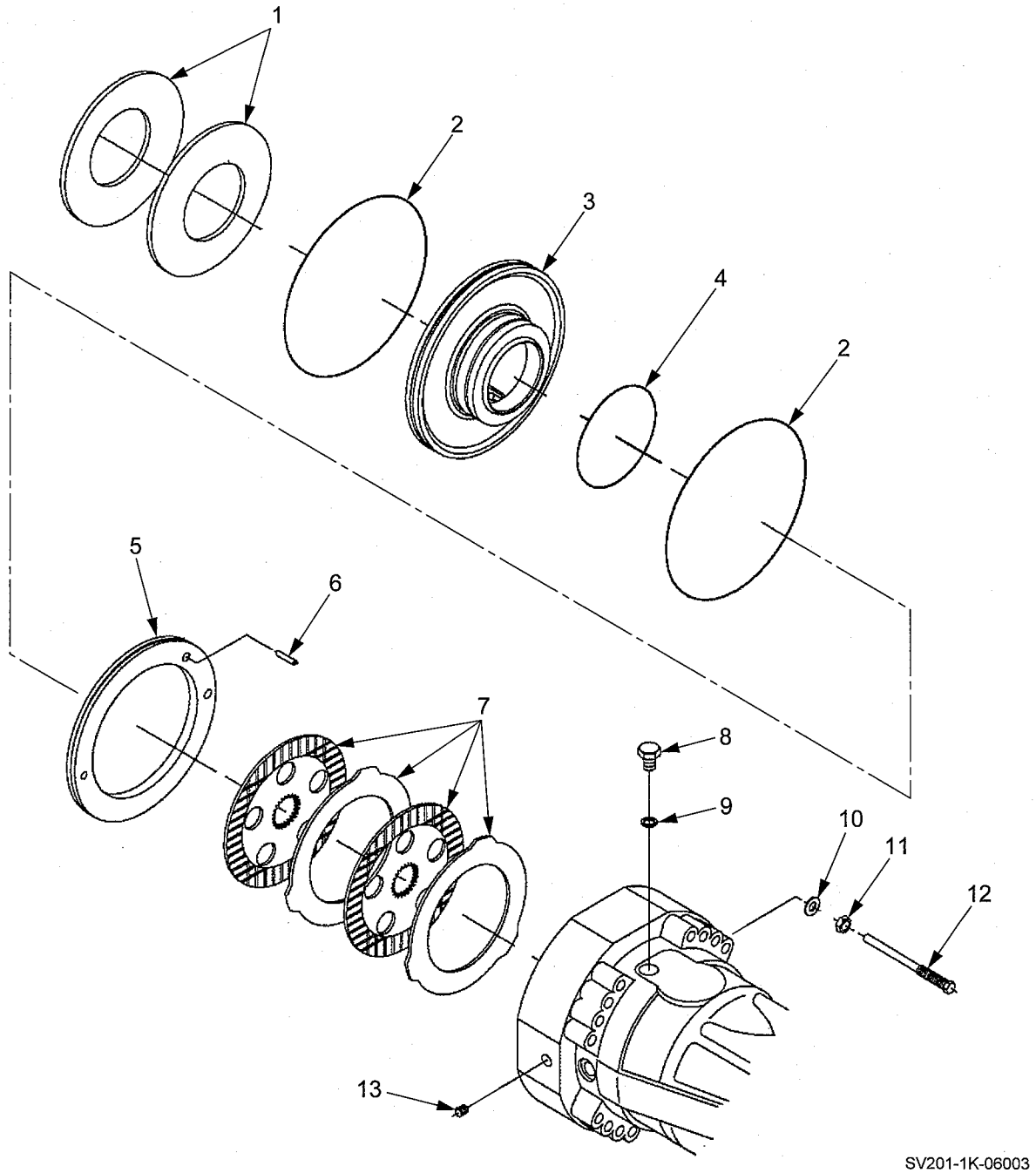
(1) Bolt
(2) Ring nut
(3) Taper roller bearing
(4) Bolt
(5) Differential carrier
(6) No spin differential
(7) Bolt
(8) Bevel gear set
(9) Ring nut
(10) Bearing
(11) Spacer
(12) Shim
(13) Shim

3-3-3. Hub reduction gear



(1) Axle shaft
(2) Spring washer
(3) Bolt
(4) Seal
(5) Seal
(6) Bearing
(7) Hub bolt
(8) Wheel hub
(9) O-ring
(10) Stud bolt
(11) Plug
(12) Magnet plug
(13) Nut
(14) Axle case
(15) Circlip
(16) Ring gear
(17) Ring gear support
(18) Lock plate
(19) Circlip
(20) Planetary gear
(21) Bearing
(22) Friction washer
(23) Planetary gear carrier
(24) Hub nut
(25) Stud bolt
(26) Nut
(27) Countersunk bolt

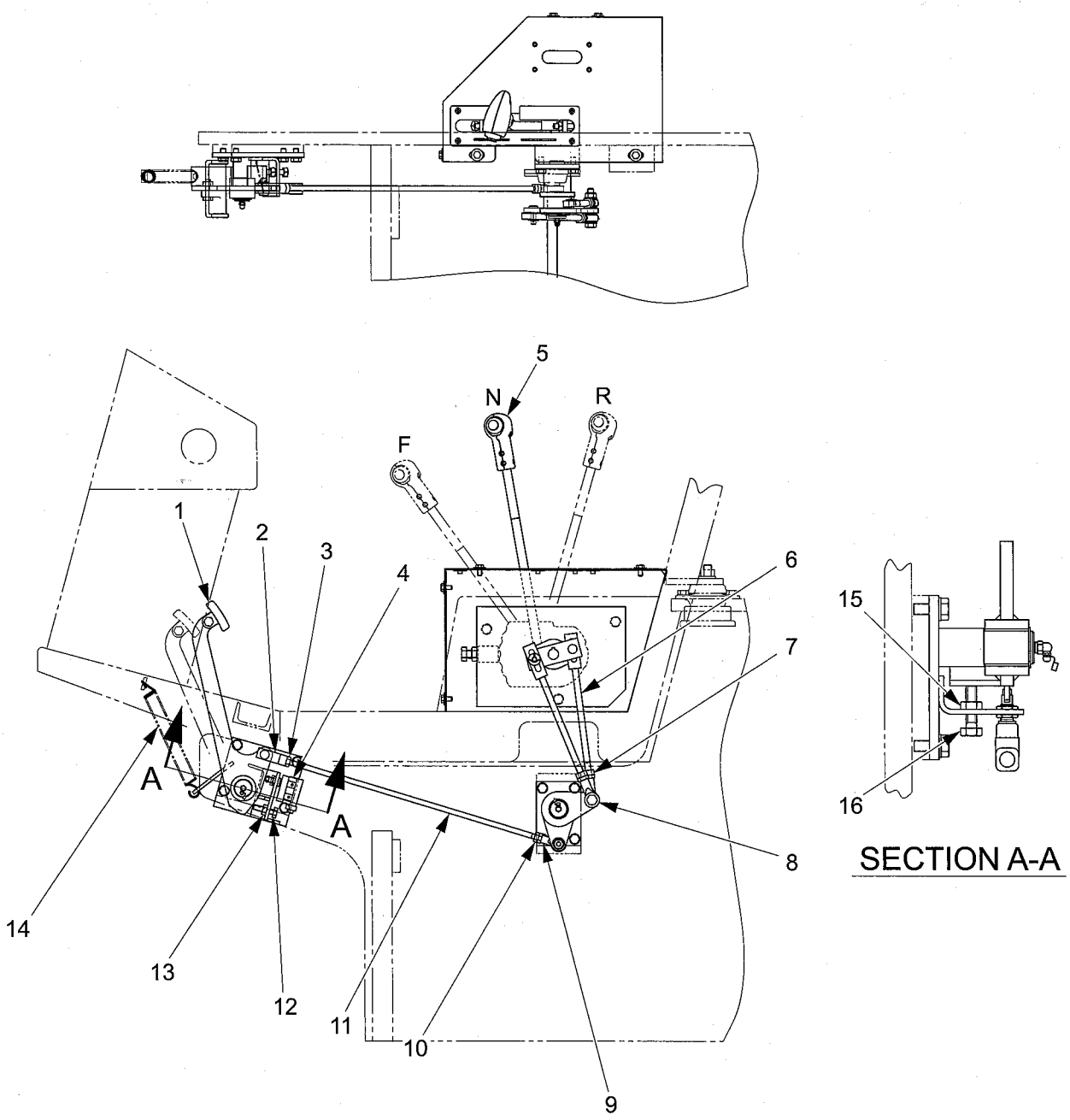
3-3-4. Brake



(1) Spring
(2) O-ring
(3) Piston
(4) O-ring
(5) Ring
(6) Dowel
(7) Brake disc
(8) Plug
(9) Seal washer
(10) Lock washer
(11) Nut
(12) Bolt
(13) Plug

BRAKE

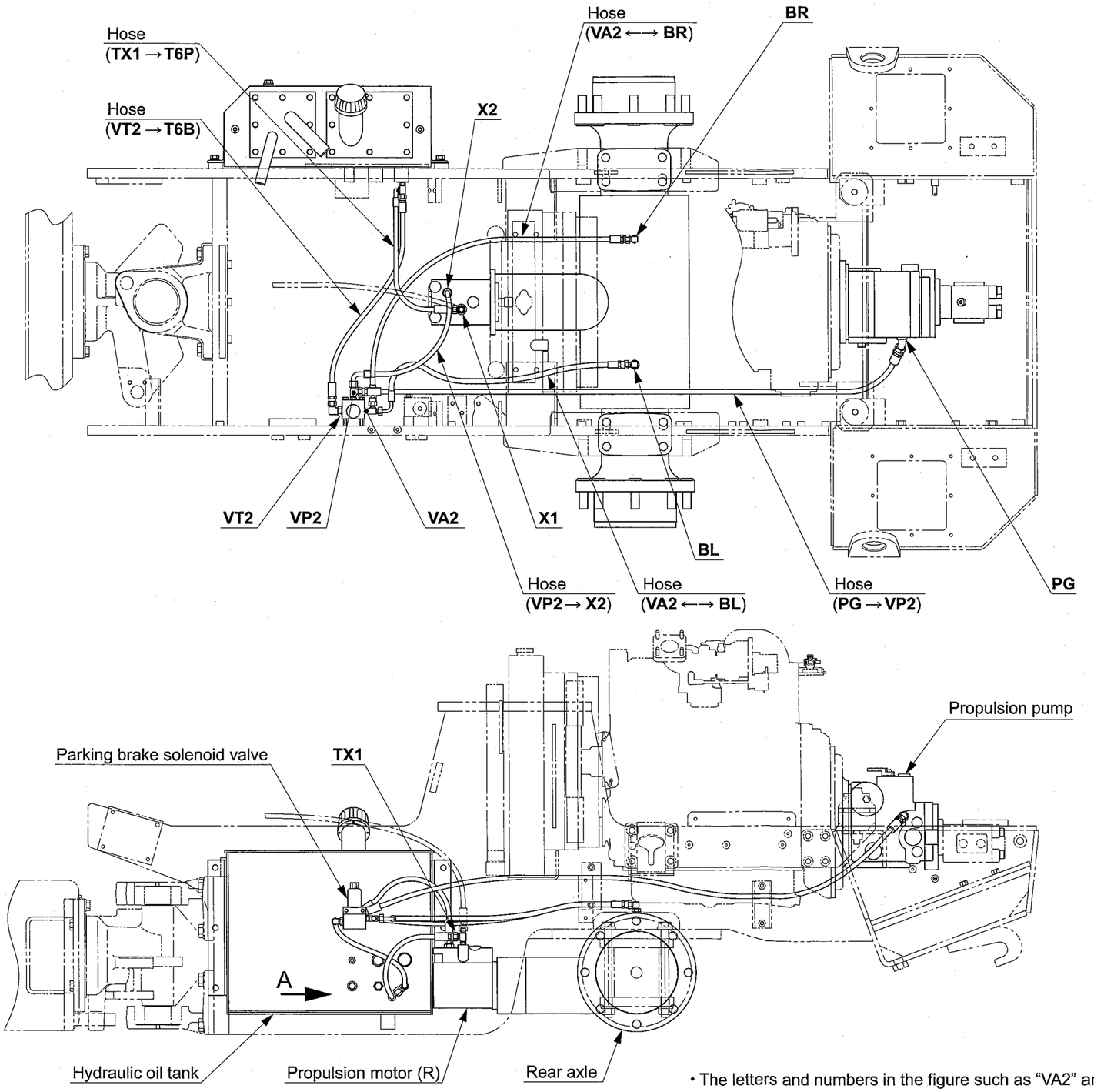
1. BRAKE PEDAL

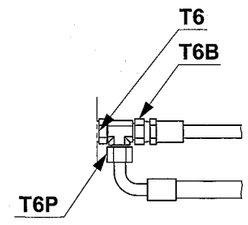


0406-51801-0-10139-C

(1) Brake pedal
(2) Clevis
(3) Nut : M10
(4) Foot brake switch
(5) F-R lever
(6) Rod
(7) Nut : M12
(8) Rod end
(9) Rod end (Left-hand thread)
(10) Nut : M10 (Left-hand thread)
(11) Rod
(12) Stopper bolt : M10×40
(13) Nut : M10
(14) Return spring
(15) Nut : M10
(16) Stopper bolt : M10×40

2. BRAKE HYDRAULIC PIPING





VIEW A

• The letters and numbers in the figure such as “VA2” and “VP2” show each port.
• Arrow “⟷; →” symbols show the hose connection and the direction of the flow of the oil.

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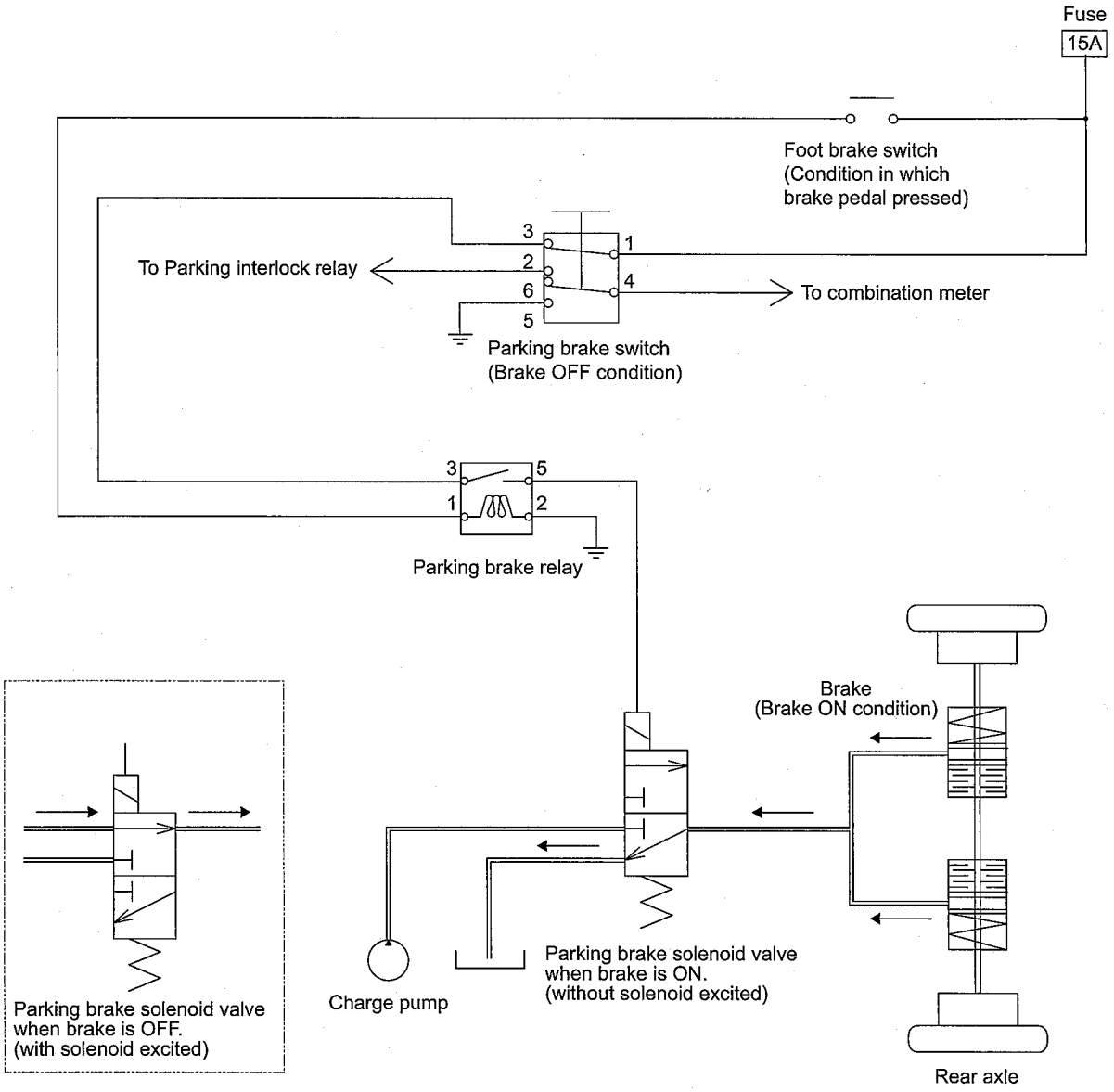
3. BRAKE SYSTEM

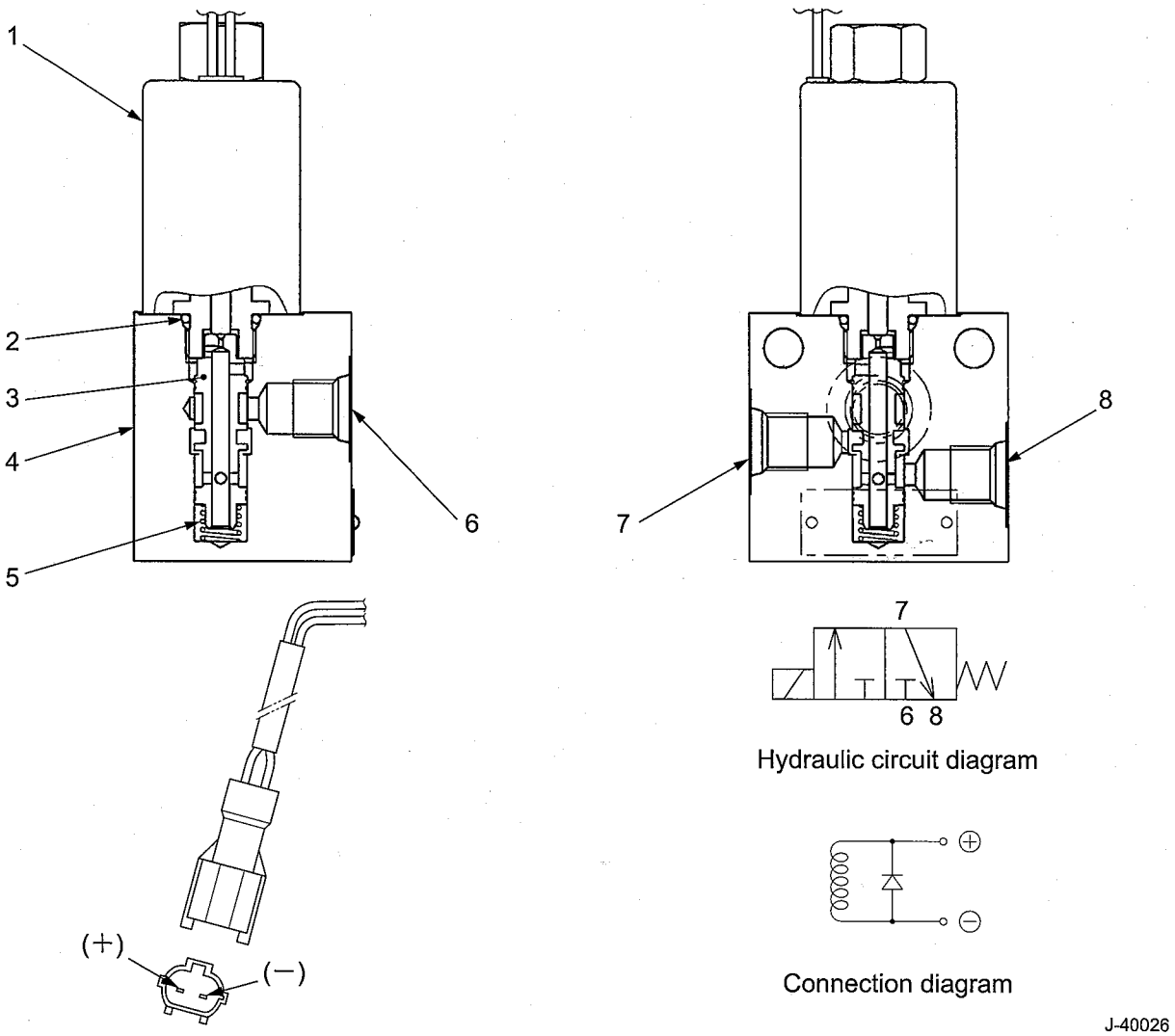


•The arrow (→) symbol shows the direction of the hydraulic oil flow.

SV204-07001

4. HYDRAULIC COMPONENT SPECIFICATIONS

4-1. Brake Solenoid Valve



(1) Solenoid
(2) O-ring (1B P14)
(3) Spool (J)
(4) Body
(5) Spring
(6) Port P **[VP2]** : G1/4
(7) Port A **[VA2]** : G1/4
(8) Port T **[VT2]** : G1/4

Specifications

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

INSPECTION AND ADJUSTMENT

1. INSPECTION AND ADJUSTMENT

1-1. Safety Precautions for Inspection and Adjustment

⚠ WARNING

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

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

⚠ CAUTION

Do not work on the hydraulic system while the engine is running and the system is hot and under pressure. Do not disconnect hydraulic hoses or fittings until the system has cooled and pressure has been properly relieved.
Before removing any plugs from the pressure measurement ports, always release any residual pressure from the piping and open the cap of the fluid tank to release and pressure.

⚠ WARNING

Inadvertent starting the engine may cause a serious accident.
When inspecting the engine, make sure to exchange the appropriate cues and hand signal with the person at the operator station to avoid any accidents.

⚠ CAUTION

Before inspecting inside of the engine compartment, always stop the engine.
Contact with the fan, V-belt or exhaust system parts while the engine is running may cause serious injury.

1-2. Preparation for Inspection and Adjustment

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

1-3. Precautions for Inspection and Adjustment

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

1-4. Warm-up

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

1-5. Inspection and Adjustment of Engine Related Items

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

2. MEASUREMENT AND INSPECTION OF PROPULSION CIRCUIT PRESSURE

2-1. Measurement

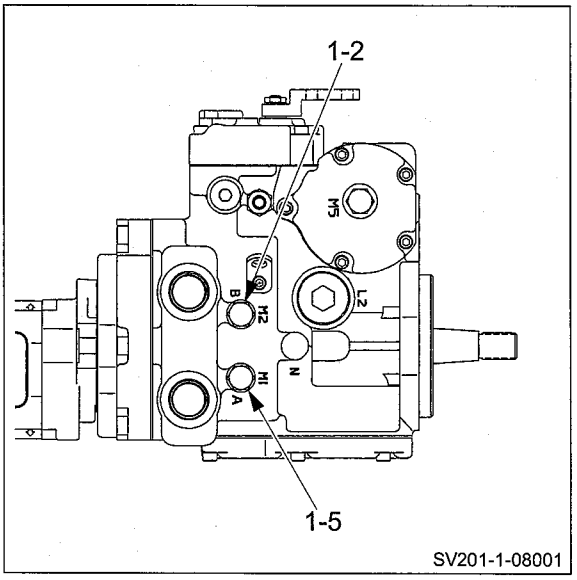
⚠WARNING

Confirm that the parking brake works properly before measurement.

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

① Remove plugs from high pressure gauge ports, (1-2) and (1-5) of propulsion pump. Attach pressure gauge with adapter ⓗ .
- Adapter ⓗ : 9/16-18UNF
- High pressure gauge port (Reverse) : (1-2)
- High pressure gauge port (Forward) : (1-5)
- Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)

② Confirm that F-R lever is "N".
③ Apply parking brake by pressing parking brake switch button.
④ Start the engine and set throttle lever to "FULL".
⑤ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)
⑥ With propulsion load at maximum, slowly move F-R lever to the side to be measured.
⑦ Read pressure indicated by pressure gauge.
⑧ After measuring, promptly return F-R lever to "N".



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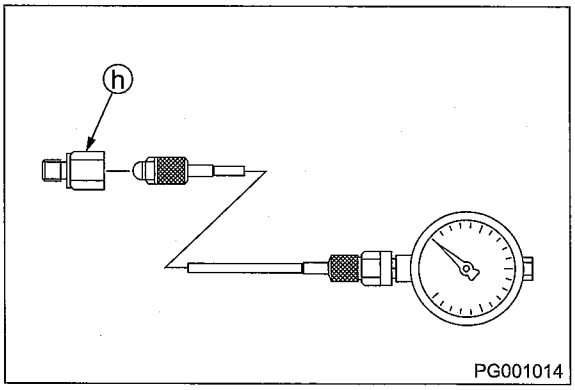


PG001014

★ Maximum circuit pressure
(high pressure relief valve setting)
: 28.0 ± 1.0 MPa (4,060 ± 145 psi)

- The numbers "1-2" and "1-5" appearing in above illustrations are consistent with lead line numbers shown in illustration of hydraulic pump ASSY in "2-2. Hydraulic Component Specifications" (P. 4-008).

2-2. Inspection

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

① Remove plug and valve from high pressure check relief valve port (1-10) or (1-12) of vibrator pump.
- *High pressure relief valve (Reverse) : (1-10)
- *High pressure relief valve (Forward) : (1-12)

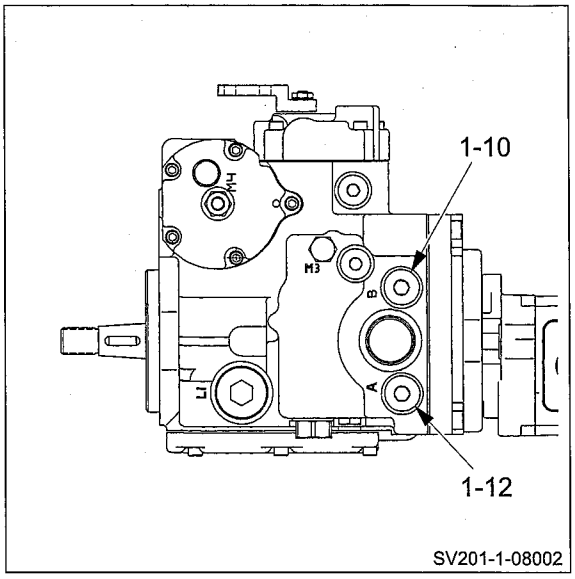
② Check removed high pressure relief valve for trapped dirt and other abnormalities.

③ If trapped dirt is present, disassemble and clean high pressure relief valve.

④ If pressure still deviates from maximum circuit pressure range after valve is disassembled and cleaned, replace high pressure relief valve.

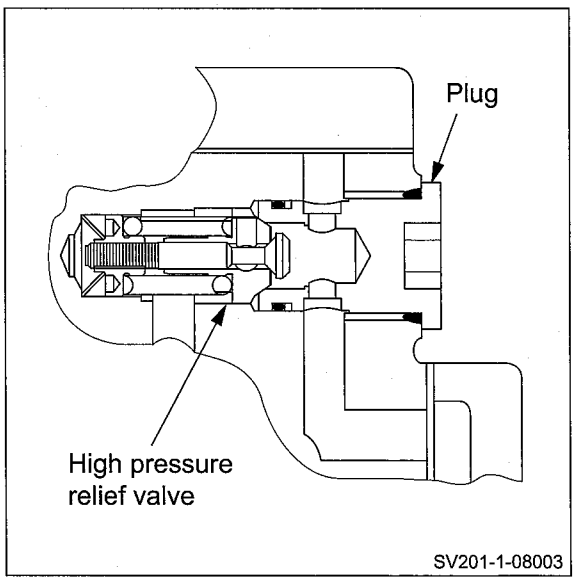
⑤ After inspection, measure pressure again and check that pressure reaches maximum circuit pressure range.

N•m Plug : 70 N·m (52 lbf·ft)



(NOTICE)

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



* High pressure relief valve = S.C.R. (System Check Relief) valve for charge check and high pressure relief.

- The numbers "1-10" and "1-12" appearing in above illustrations are consistent with lead line numbers shown in illustration of hydraulic pump ASSY in "2-2. Hydraulic Component Specifications" (P. 4-008).

3. MEASUREMENT AND ADJUSTMENT OF PROPULSION CHARGE CIRCUIT PRESSURE

- Ensure that neutral positions of F-R lever and hydraulic pump are aligned.

3-1. Measurement

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

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

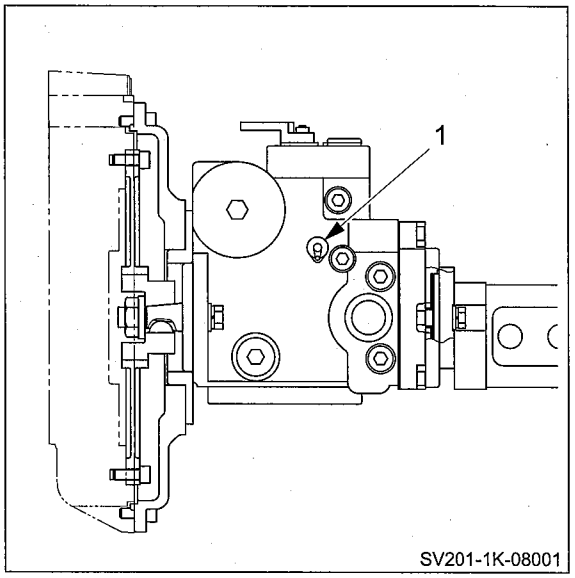
② Confirm that F-R lever is "N".

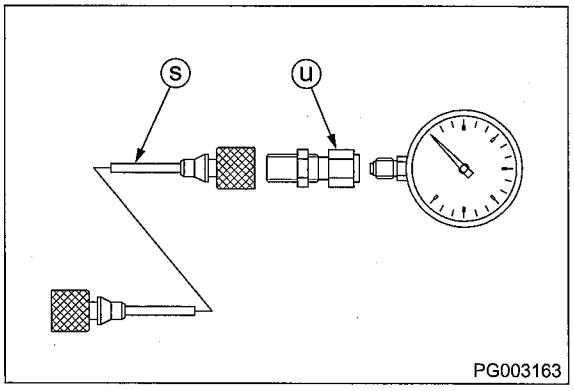
③ Apply parking brake by pressing parking brake switch button.

④ Start the engine and set throttle lever to "FULL".

⑤ Read pressure indicated by pressure gauge.

★ Standard charge relief valve setting
: 2.4 ± 0.2 MPa (348 ± 29 psi)





3-2. Adjustment

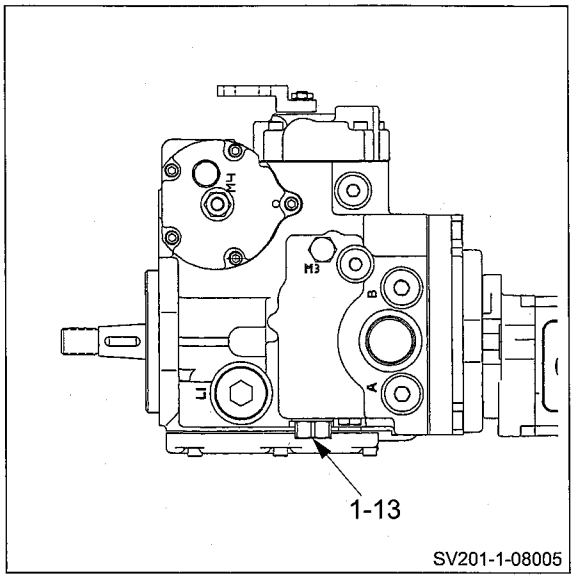
- If measurement results indicate the pressure deviating from standard charge relief pressure setting range, make an adjustment in accordance with procedure described below.

① Check nut (1) of charge relief valve (1-13) for evidence of having loosened.
② If there is evidence of nut having loosened, adjust charge relief valve so that pressure becomes within standard charge relief valve pressure setting range while watching pressure gauge.
- To adjust pressure, loosen nut and turn adjustment screw (2).

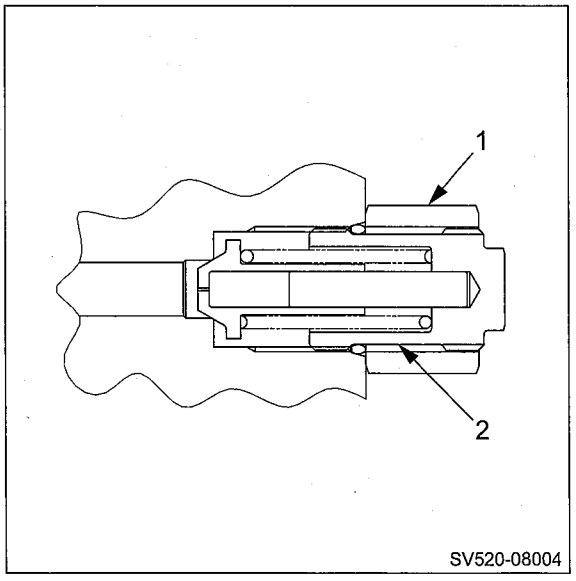
Adjustment screw turned clockwise
: Pressure rise
Adjustment screw turned counterclockwise
: Pressure drop
Pressure change rate : 0.27 MPa/ 1/4 turn
(39.2 psi/ 1/4 turn)

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

N•m (1) Nut : 40 N·m (30 lbf·ft)



SV201-1-08005



SV520-08004

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

- The number "1-13" appearing in above illustrations is consistent with lead line numbers shown in illustration of hydraulic pump ASSY in "2-2. Hydraulic Component Specifications" (P. 4-008).

4. MEASUREMENT OF PARKING BRAKE RELEASE PRESSURE

4-1. Measurement

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

① Disconnect hose (1) from brake solenoid valve. Attach pressure gauge through adapter ⓜ .
- Adapter ⓜ : G1/4
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is "N".

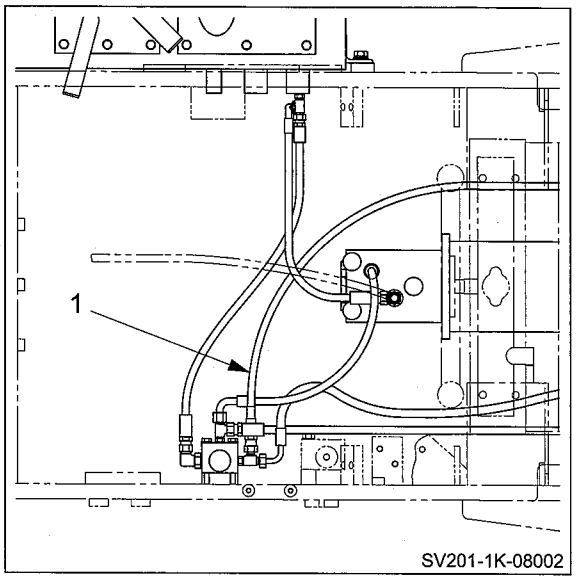
③ Apply parking brake by pressing parking brake switch button.

④ Start the engine and set throttle lever to "FULL".

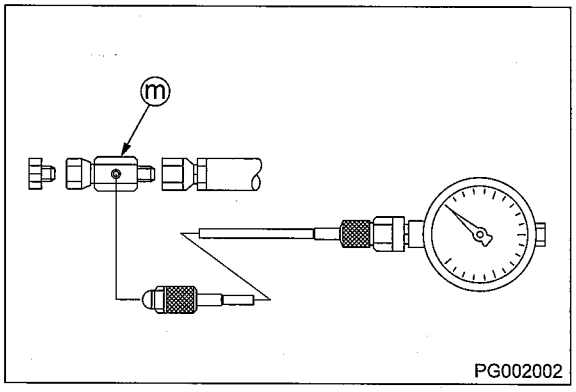
⑤ Release parking brake by pressing parking brake switch button.

⑥ Read brake release pressure indicated by pressure gauge.

★ Brake release pressure : 1.5 to 3.0 MPa (218 to 435 psi)



SV201-1K-08002



PG002002

5. MEASUREMENT OF VIBRATOR CIRCUIT PRESSURE

5-1. Measurement

⚠CAUTION

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

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

① Disconnect hose (1) from vibrator·steering pump. Attach pressure gauge through adapter Ⓟ.
- Adapter Ⓟ : G1/2
- Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)

② Confirm that F-R lever is "N".

③ Apply parking brake by pressing parking brake switch button.

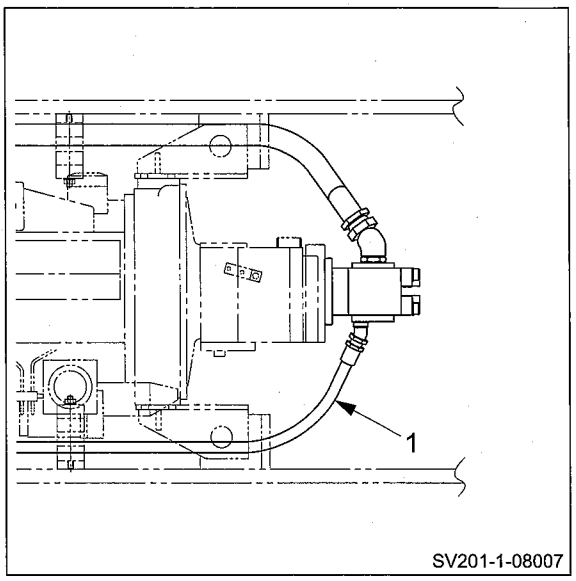
④ Set vibration mode select switch to " ".

⑤ Start the engine and set throttle lever to "FULL".

⑥ Keep pressing F-R lever vibration switch (ON).

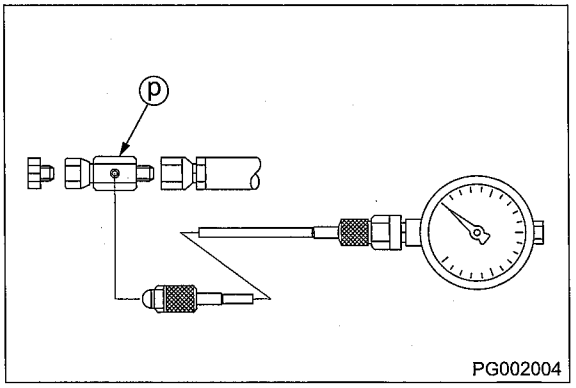
⑦ Read pressure gauge for maximum value of vibrator circuit pressure.

⑧ Release F-R lever vibration switch (OFF) as soon as measurement is finished.



SV201-1-08007

★ Maximum circuit pressure
(relief valve pressure setting)
: 17.2 ± 1.0 MPa (2,494 ± 145 psi)



PG002004

6. MEASUREMENT AND INSPECTION OF STEERING CIRCUIT PRESSURE

6-1. Measurement

⚠WARNING

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

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

① Disconnect hose (1) from vibrator·steering pump. Attach pressure gauge through the adapter ⓝ .
- Adapter ⓝ : G3/8
- Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

② Confirm that F-R lever is "N".

③ Apply parking brake by pressing parking brake switch button.

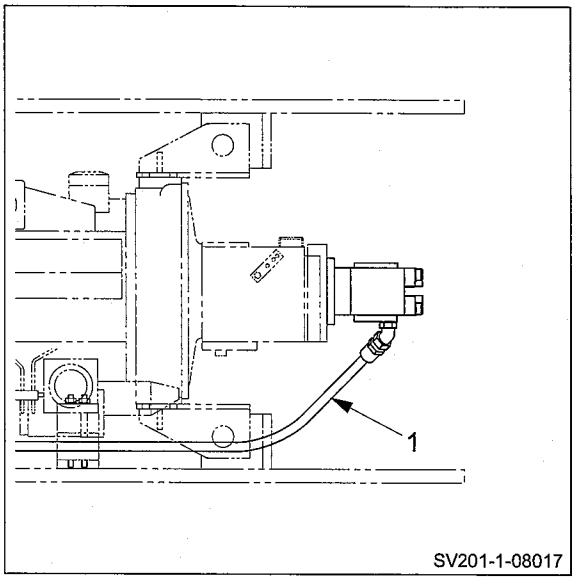
④ Start the engine and set throttle lever to "FULL".

⑤ Turn steering wheel to operate relief valve.

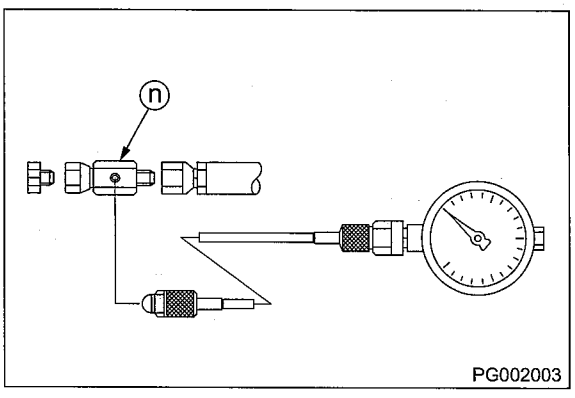
⑥ Read pressure indicated by pressure gauge.

★ Standard maximum circuit pressure (orbitroll relief pressure)

: 11.8 ± 1.0 MPa (1,711 ± 145 psi)



SV201-1-08017



PG002003

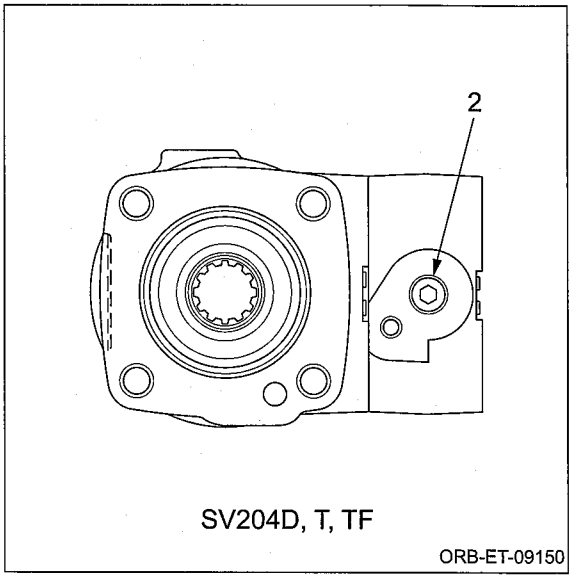
6-2. Inspection

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

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

(NOTICE)

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



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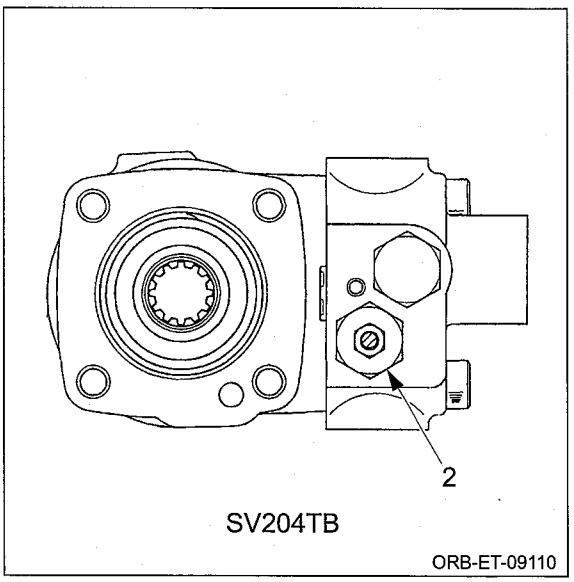
ORB-ET-09150



SV204TB

ORB-ET-09110

7. MEASUREMENT AND INSPECTION OF BLADE CIRCUIT PRESSURE (SV204TB)

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

7-1. Measurement

⚠WARNING

Make sure that there is no person around the blade portion of the machine before operating the blade control lever.

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

① Disconnect hose (1) from vibrator·steering pump. Attach pressure gauge through the adapter ⓝ.
- Adapter ⓝ : G3/8
- Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

② Confirm that F-R lever is "N".

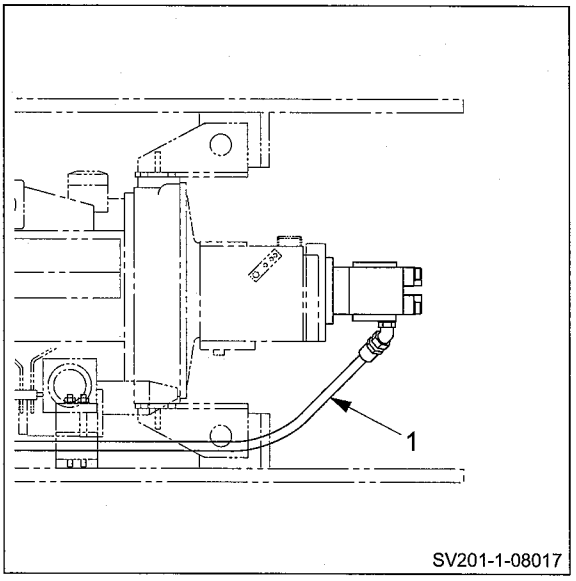
③ Apply parking brake by pressing parking brake switch button.

④ Start the engine and set throttle lever to "FULL".

⑤ Move blade control lever to operate relief valve.

⑥ Read pressure indicated by pressure gauge.

★ Standard maximum circuit pressure (stack valve relief pressure)
: 11.8 ±1.0 MPa (1,711 ±145 psi)



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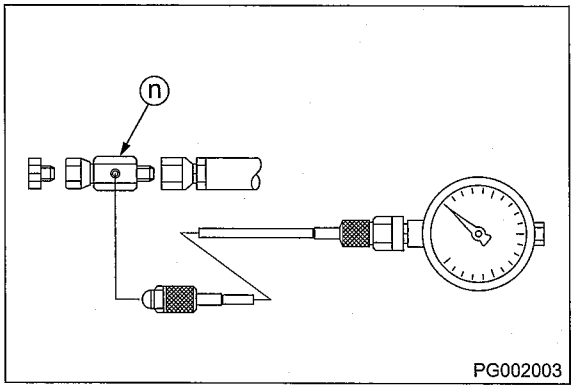


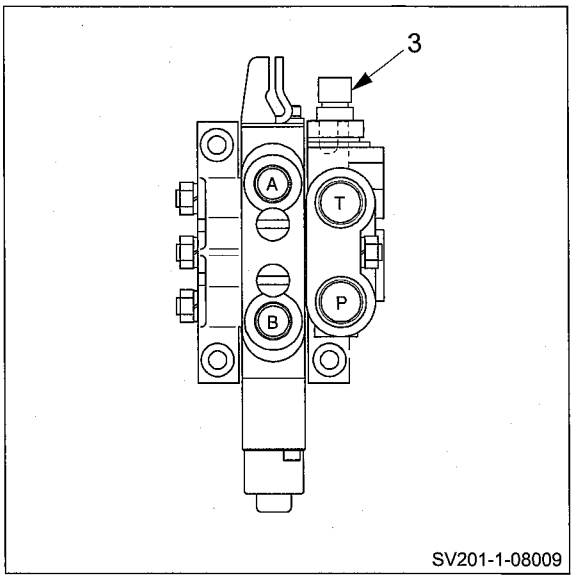
PG002003

7-2. Inspection

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

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

N·m (3) Relief valve : 39.2 ±4 N·m (28.9 ±3 lbf·ft)



(NOTICE)

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

8. MEASUREMENT OF PROPULSION PUMP CASE PRESSURE

8-1. Measurement

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

① Remove plug from drain port (1-14). Attach pressure gauge with adapter ⓣ.
- Adapter ⓣ : 1 5/16-12UN
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

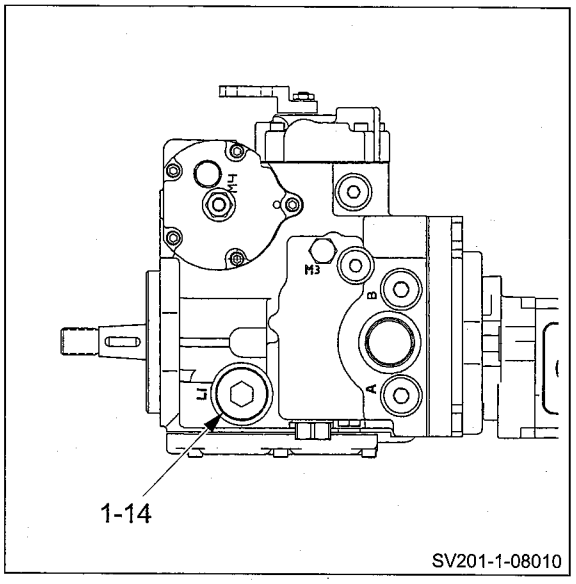
② Confirm that F-R lever is "N".

③ Apply parking brake by pressing parking brake switch button.

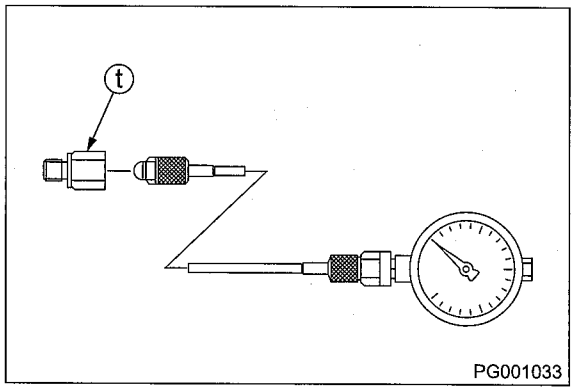
④ Start the engine and set throttle lever to "FULL".

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

⑥ With propulsion load at maximum, measure pressure when F-R lever is "N", "F", and "R", respectively.



★ Pump case pressure : 0.25 MPa (36.3 psi) or less



- The number "1-14" appearing in above illustrations is consistent with lead line numbers shown in illustration of hydraulic pump ASSY in "2-2. Hydraulic Component Specifications" (P. 4-008).

9. MEASUREMENT OF PROPULSION MOTOR CASE PRESSURE

9-1. Measurement of Propulsion Motor (F)

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

① Remove plug from drain port (1). Attach pressure gauge with adapter ⓔ.
- Adapter ⓔ : G3/4
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

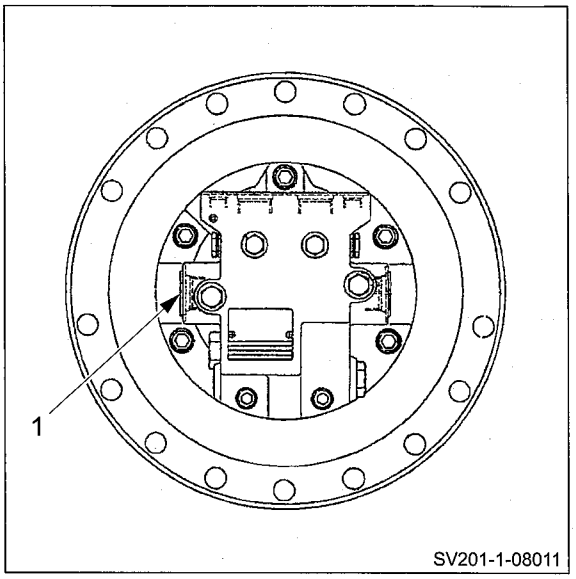
② Confirm that F-R lever is "N".

③ Apply parking brake by pressing parking brake switch button.

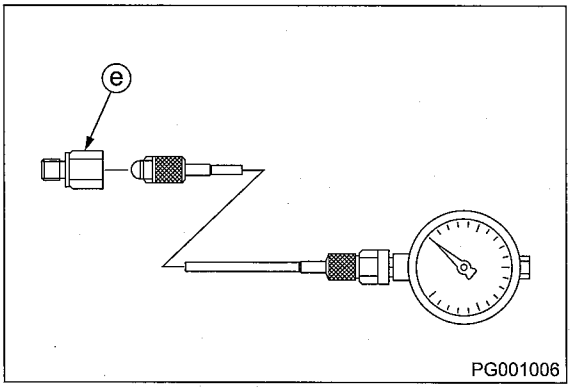
④ Start the engine and set throttle lever to "FULL".

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

⑥ With propulsion load at maximum, measure pressure when F-R lever is "N", "F", and "R", respectively.



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



9-2. Measurement of Propulsion Motor (R)

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

① Remove plug from drain port (2). Attach pressure gauge with adapter ⓘ.
- Adapter ⓘ : 3/4-16UNF
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is "N".

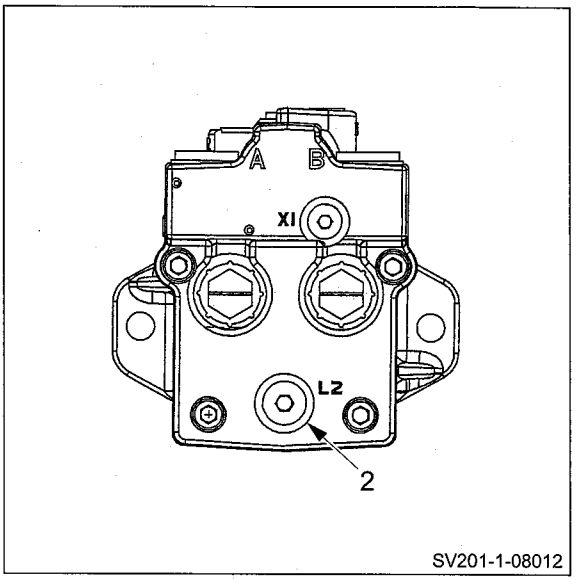
③ Apply parking brake by pressin parking brake switch button.

④ Start the engine and set throttle lever to "FULL".

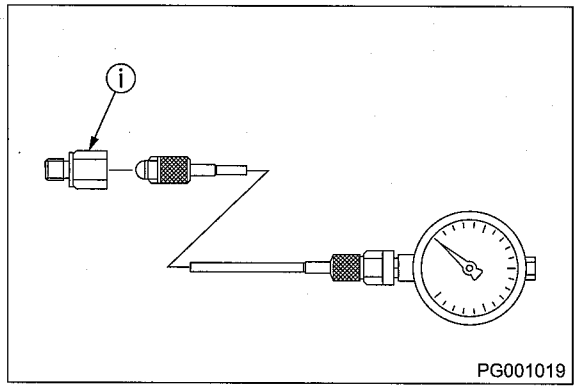
⑤ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

⑥ With propulsion load at maximum, measure pressure when F-R lever is "N", "F", and "R", respectively.

★ Motor case pressure : 0.2 MPa (29.0 psi) or less



SV201-1-08012



PG001019

10. ADJUSTMENT OF THROTTLE LEVER

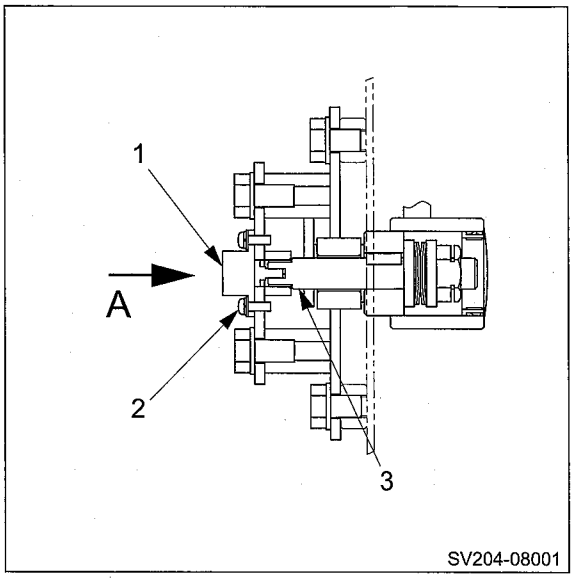
10-1. Adjustment of Potentiometer

- If potentiometer (1) is replaced, make following adjustments.
- Make adjustments after amply warmed engine.
- Oil temperature during measurement : 50 ±5°C (122 ±9°F)

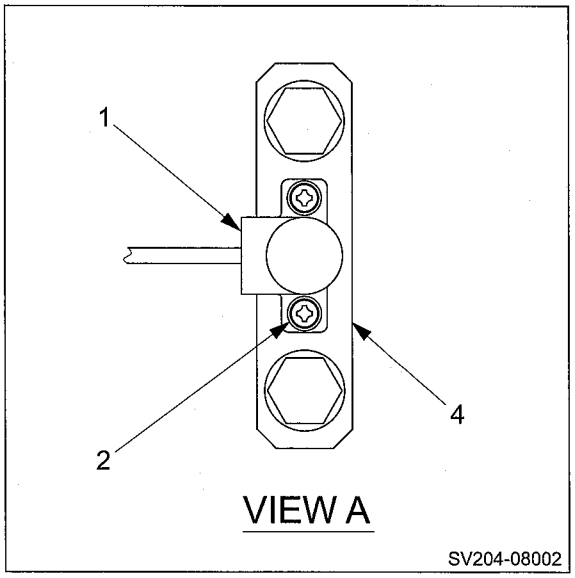
① Insert potentiometer shaft in the groove on shaft (3), and fix it with two screws (2).

(NOTICE)

- **When fixing potentiometer (1), mounting the potentiometer parallel to the base (4).**
- **Apply thread-locked liquid to screws (2).**



SV204-08001



SV204-08002

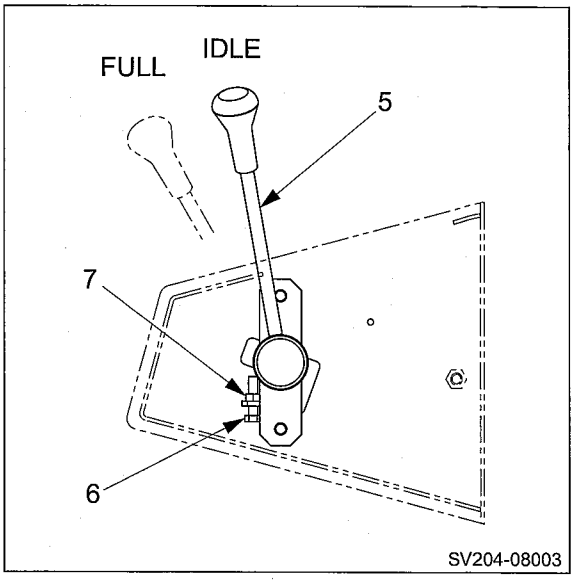
② Set throttle lever (5) to "IDOL".
③ Adjust engine rotational speed to standard value.

★ Engine rotational speed : 1,000 $^{0}_{-50}$ min^{-1}

④ Set throttle lever to "FULL".
⑤ Loosen lock nut (7), and adjust engine rotational speed to standard value with stopper bolt (6).

★ Engine rotational speed : 2,400 ± 50 min^{-1}

- After adjustment, fix stopper bolt (6) with lock nut (7).



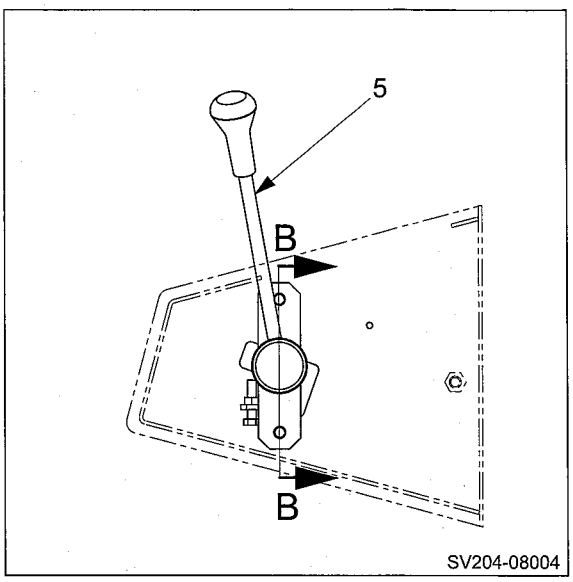
10-2. Adjustment of Operating Force

① Tighten nut (8) and set operating force at center of throttle lever (5) knob to standard operating force. Do not turn nut to the loosening direction.

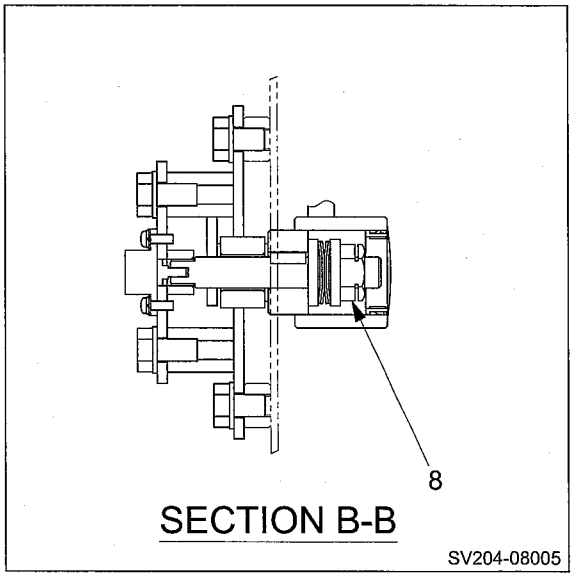
★ Standard operating force : 45 ± 10 N (10 ± 2 lbf)

(NOTICE)

- **In case of loosen nut (8), replace it with a new one.**



SV204-08004



SV204-08005

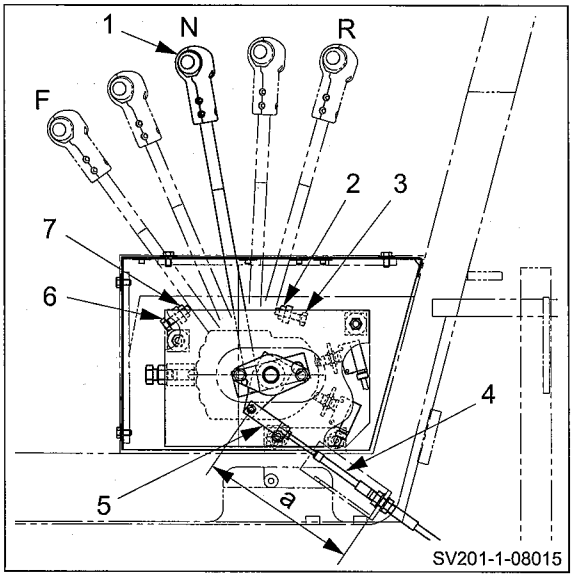
11. ADJUSTMENT OF F-R LEVER LINKAGE

11-1. Adjustment

- In cases such as propulsion hydraulic pump is replaced, control cable is replaced, or F-R lever does not move smoothly, make an adjustment in accordance with procedure described below.
- "N", maximum "F", and maximum "R" positions of F-R lever (1) are positioned by notches.

① Set F-R lever in "N".
② Attach control cable (4) to clevis (5).

★ Specified dimension a: 233 mm (9.17 in.)

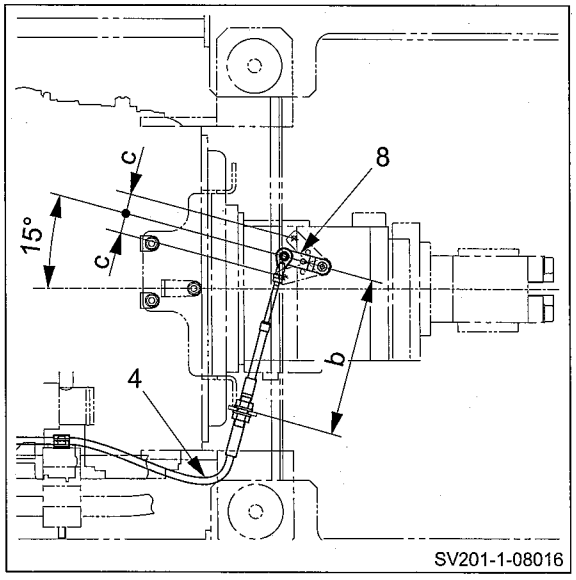


③ Attach control cable to propulsion pump control lever (8).

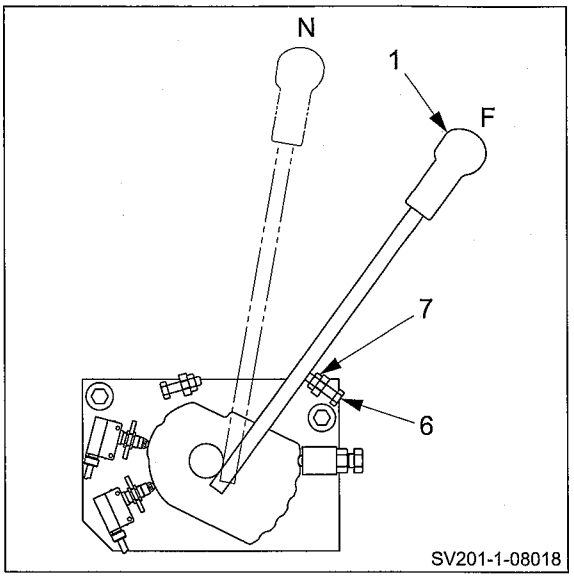
★ Specified dimension b: 209 mm (8.23 in.)

④ Confirm the strokes of propulsion pump control lever (8).

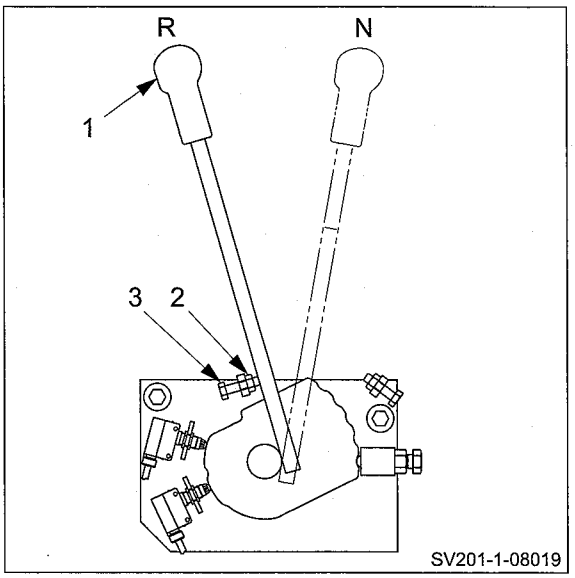
★ Specified dimension c: 26 mm (1.0 in.)



⑤ Set F-R lever in “F”.
⑥ Loosen lock nut (7).
⑦ Bring bolt (6) into contact with F-R lever.
⑧ Using lock nut (7), firmly secure stopper bolt (6).



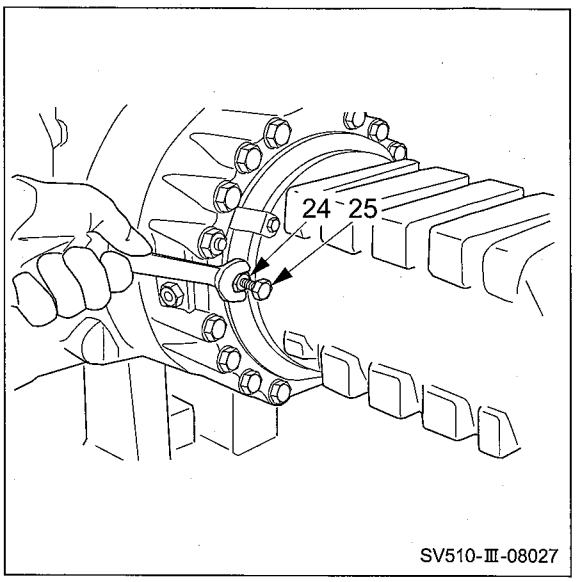
⑨ Set F-R lever in “R”.
⑩ Loosen lock nut (2).
⑪ Bring bolt (3) into contact with F-R lever.
⑫ Using lock nut (2), firmly secure stopper bolt (3).



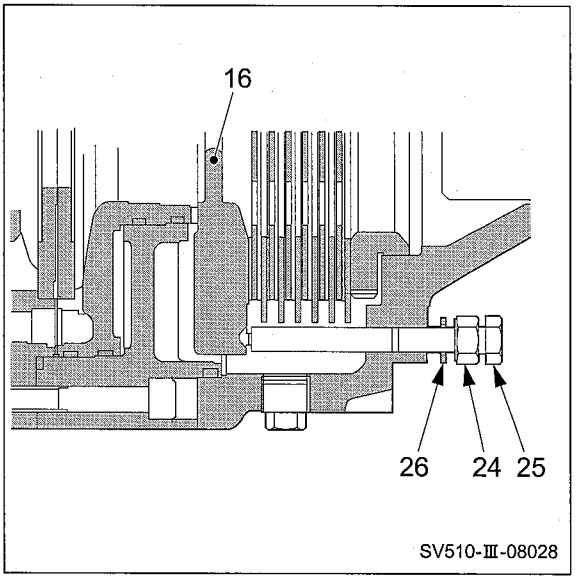
12. BRAKE ADJUSTMENT

12-1. Manually Releasing the Brake

1) Loosen nut (24) of bolt (25).
   • Loosen nut on the opposite side.

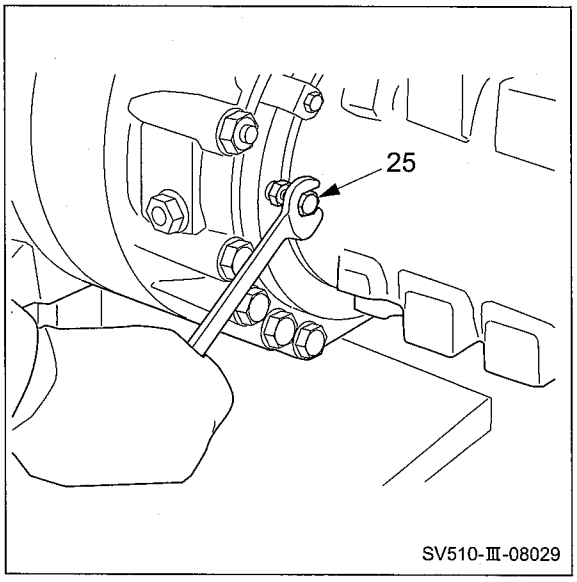


2) Tighten bolt (25), and press it into disc (16).
   • Do the same with bolt on the opposite side.



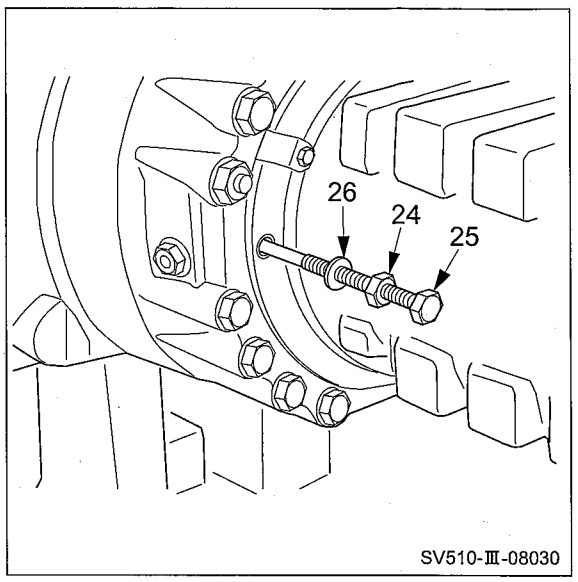
3) Alternately tighten bolts (25) 1/4 turn each, and release brake disc.

★ After bolt end makes contact with disc (16), strictly observe not tightening bolt (25) more than one complete turn.



12-2. Adjustment after Manual Release of Brake

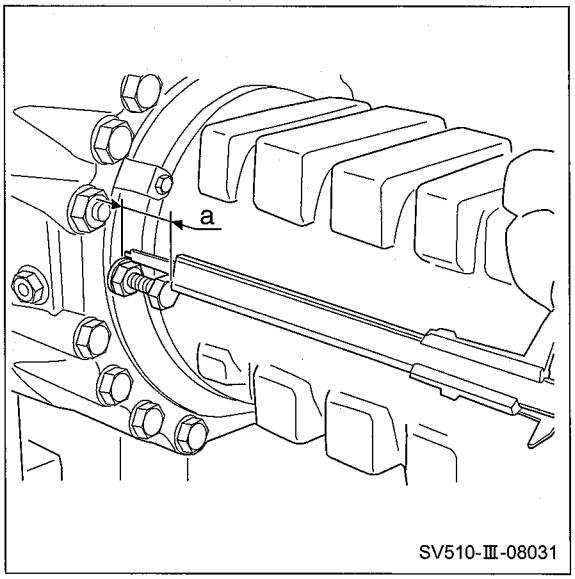
① Remove bolt (25), nut (24), and seal washer (26).
② Replace seal washer (26) with a new one.
③ Apply grease to bolt (25) threads.
④ As shown on the right, install bolt (25), nut (24), and seal washer (26).



SV510-Ⅲ-08030

⑤ Adjust bolt (25) to the dimensions as shown on the right.
• Similarly, adjust the bolt on the opposite side.

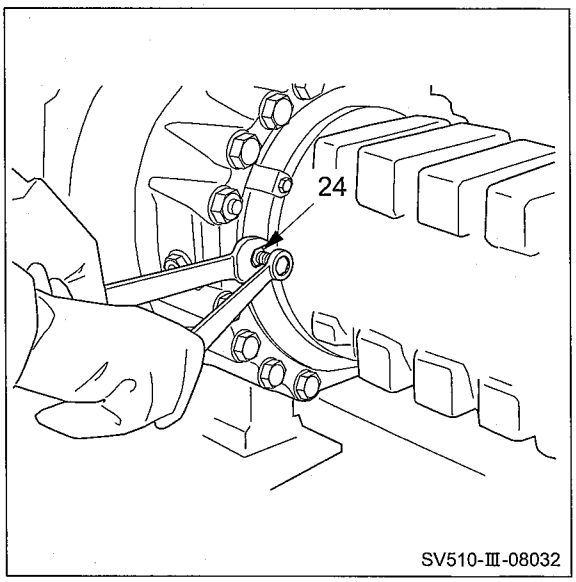
★ Specified dimension a: 34 mm (1.34 in.)



SV510-Ⅲ-08031

⑥ Tighten nut (24), and firmly secure bolt (25).

★ When tightening nut (24), make sure that bolt (25) does not move. After securing bolt, check the dimensions of bolt again.



SV510-Ⅲ-08032

TROUBLESHOOTING

1. TROUBLESHOOTING

1-1. Safety Precautions for Troubleshooting

⚠ WARNING

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

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

⚠ CAUTION

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

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

⚠ WARNING

Inadvertent starting the engine may cause a serious accident.

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

⚠ CAUTION

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

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

1-2. Important Information for Troubleshooting

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

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

1-3. Before Starting

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

The following steps are recommended:

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

2. ELECTRICAL SYSTEM TROUBLESHOOTING

2-1. When Performing Electrical System Fault Diagnosis

⚠ WARNING

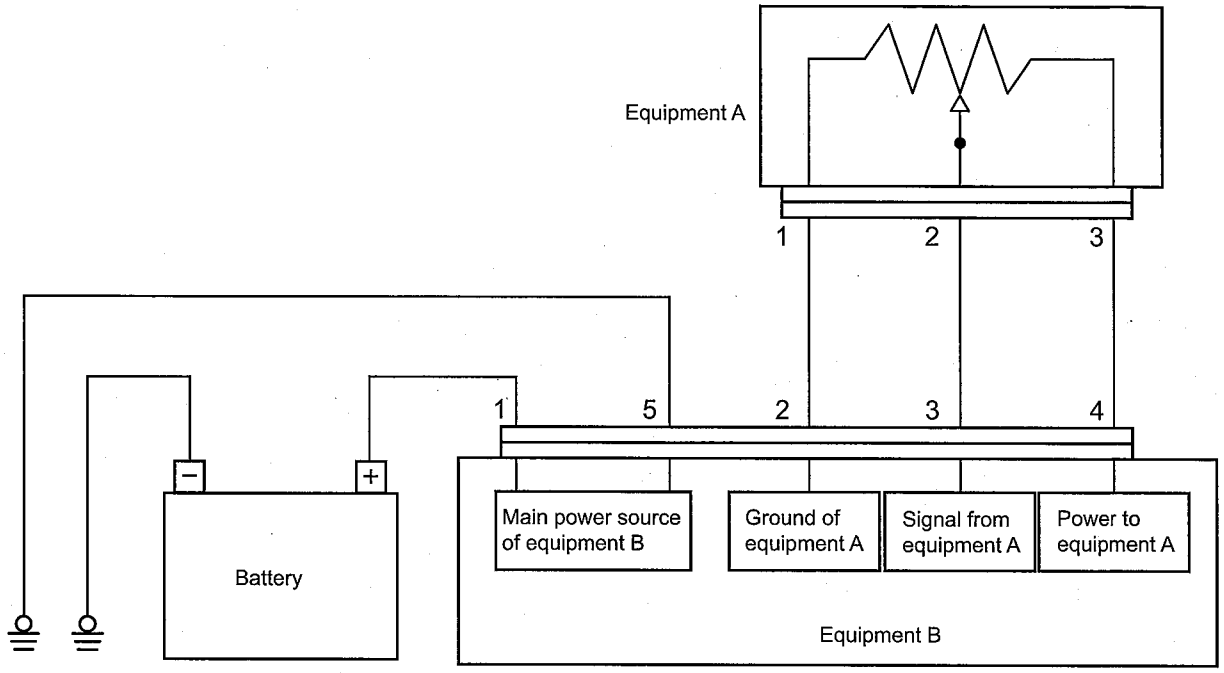
Be very careful because equipment can return to normal during an inspection and suddenly operate properly when a failure occurs due to a faulty contact or other such cause.

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

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

2-1-2. Inspection procedures using a tester

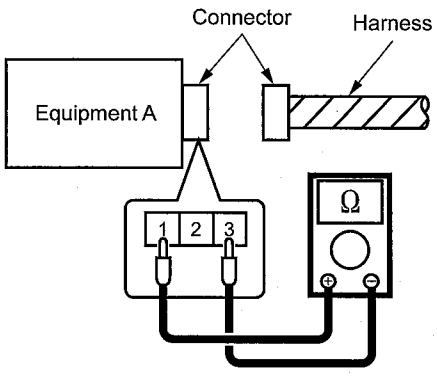
Some of the various inspection procedures are presented here for reference, using a sample circuit below.

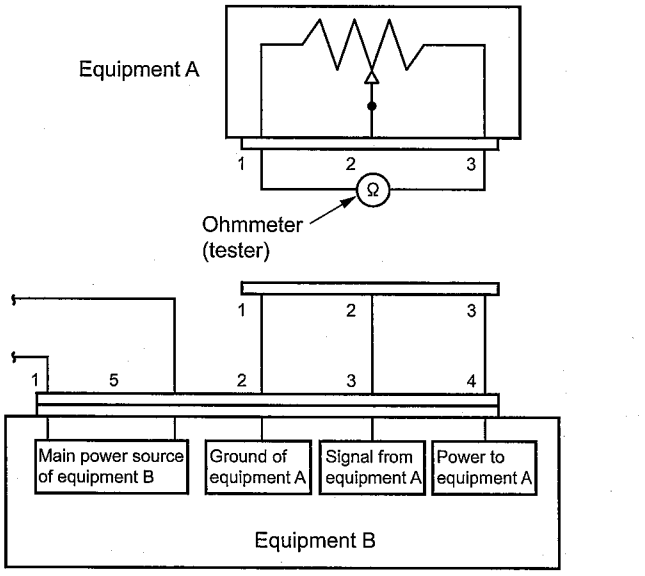


TS-10001

1) Measuring resistance using tester

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





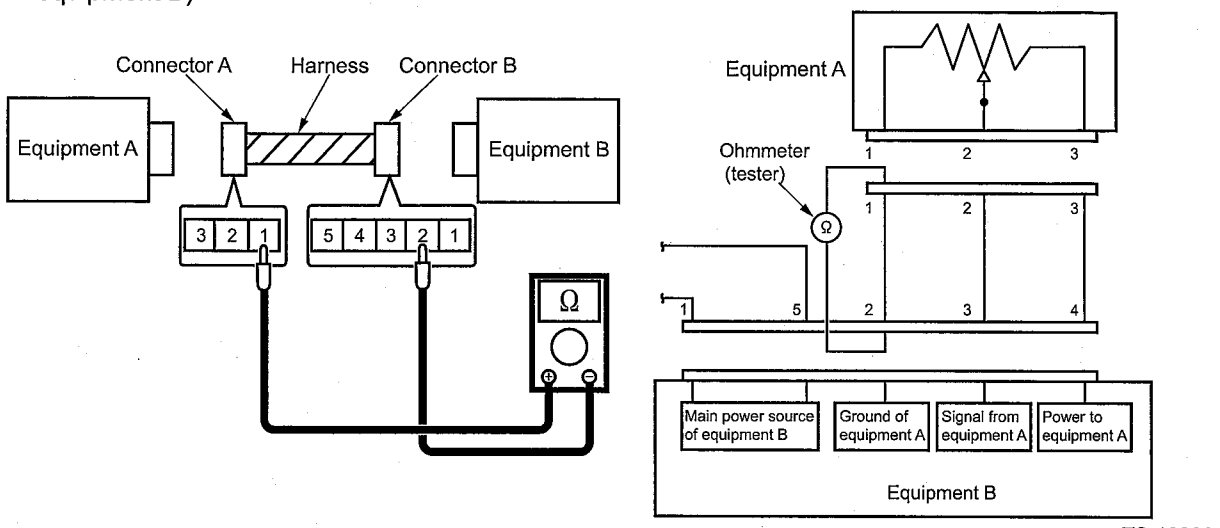
TS-10002

Inspection procedure

① Disconnect the connector of equipment A.

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

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



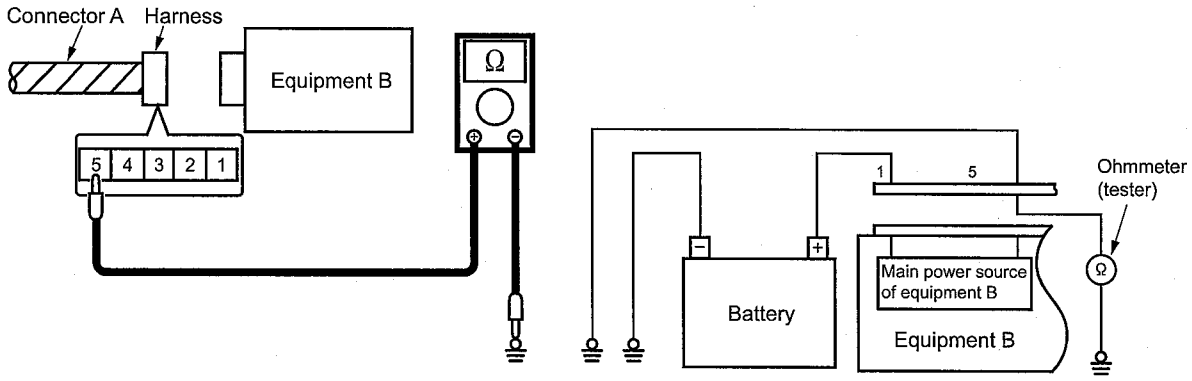
TS-10003

Inspection procedure

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

Criteria for harness defects
When there is no abnormality in the harness: Less than 10 Ω (measured value)
If there is any abnormality in the harness such as broken wire: 10 Ω or higher (measured value)

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



TS-10004

Inspection procedure

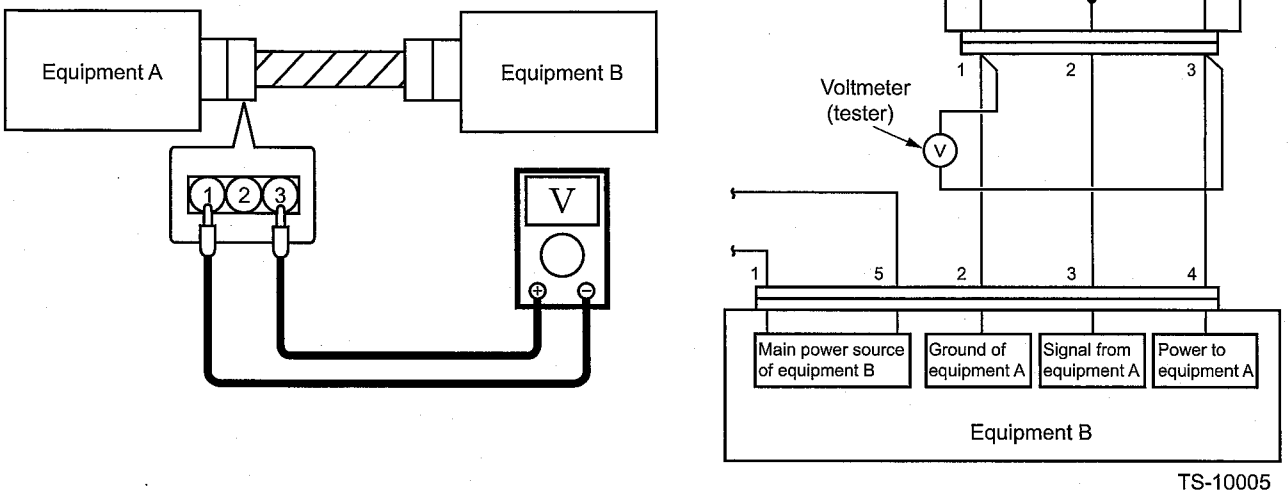
① Disconnect the connector of equipment B.
② Connect the test probe (+) to connector terminal 5 of equipment B and the test probe (-) to a machine ground point (the bolt fastening the ground terminal or an unpainted portion on the body) and measure the resistance. At this time, reversing the connector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

(NOTICE)

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

2) Measuring voltage and current flowing using tester

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



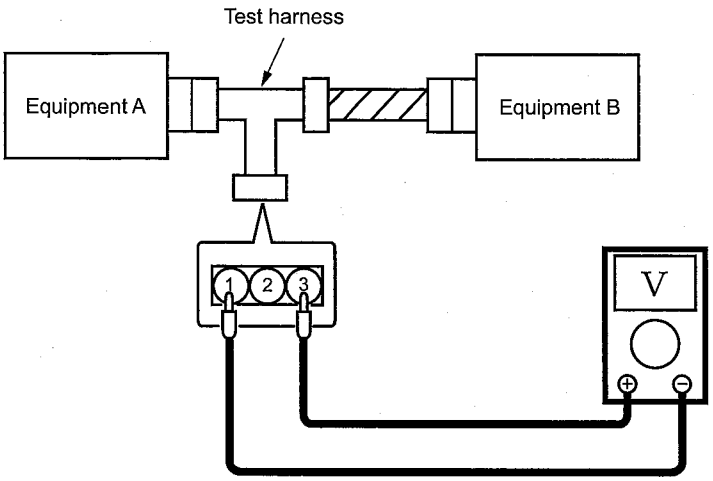
TS-10005

Inspection procedure

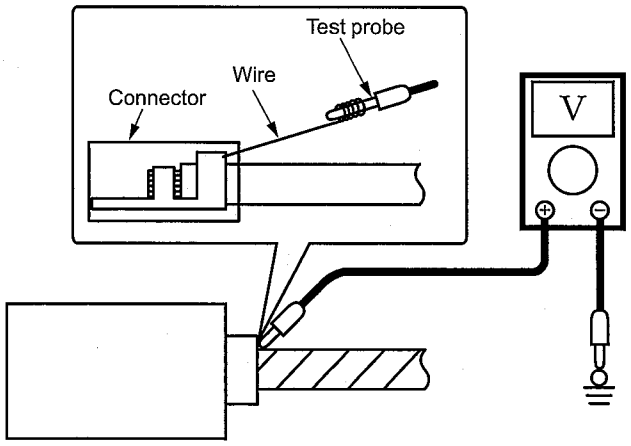
① Connect the connectors of equipment A and that of equipment B.

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

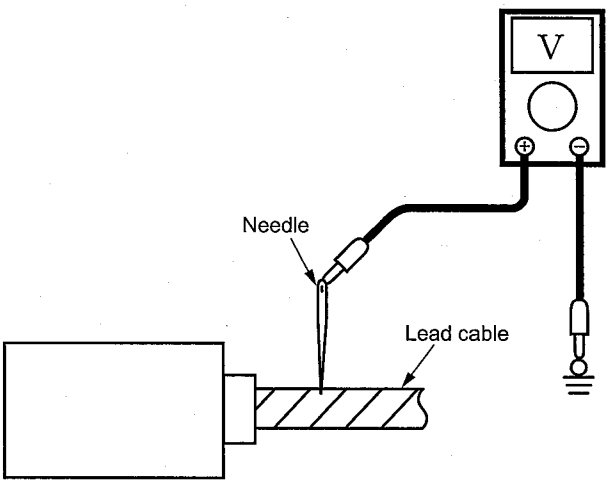
• Measurement using a test harness



• Measurement from the backside of connector



• Measurement on a lead cable



TS-10006

Measurement method

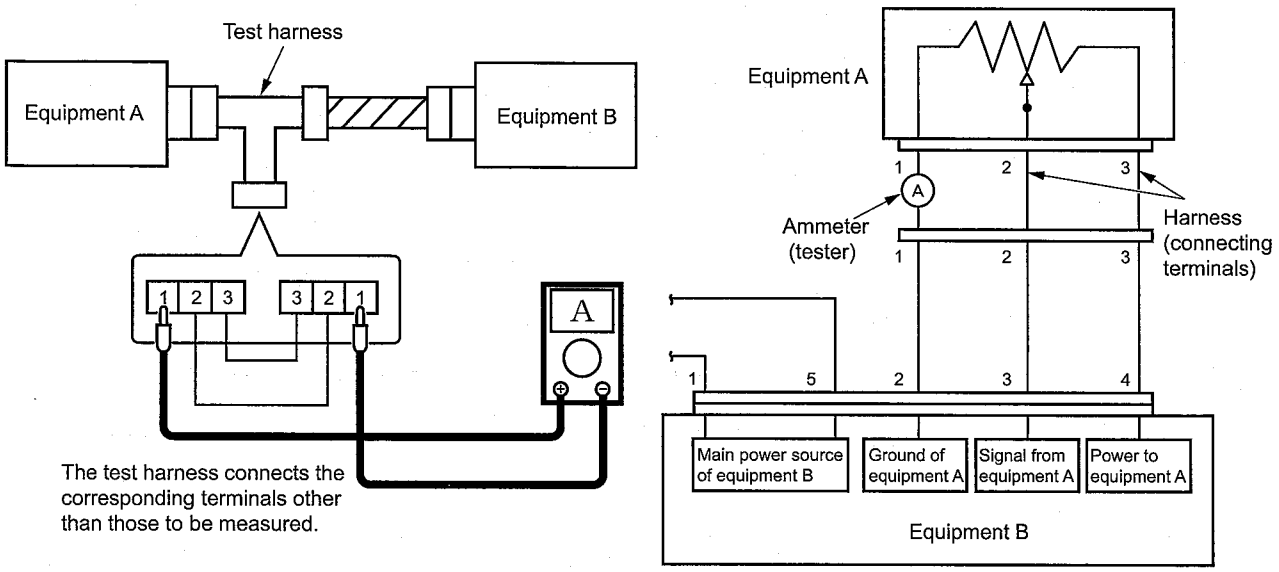
For measurement of voltage, connect the tester probes in parallel to the portion to be measured. Because the voltage can be measured only when the connector is connected in position, contact the tester probes to the terminals without disconnecting the connector. The following methods are available:

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

(NOTICE)

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

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



TS-10007

Inspection procedure

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

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

Measurement method

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

2-1-3. Inspection of electrical system

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

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

2) Fuse inspection

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

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

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

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

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

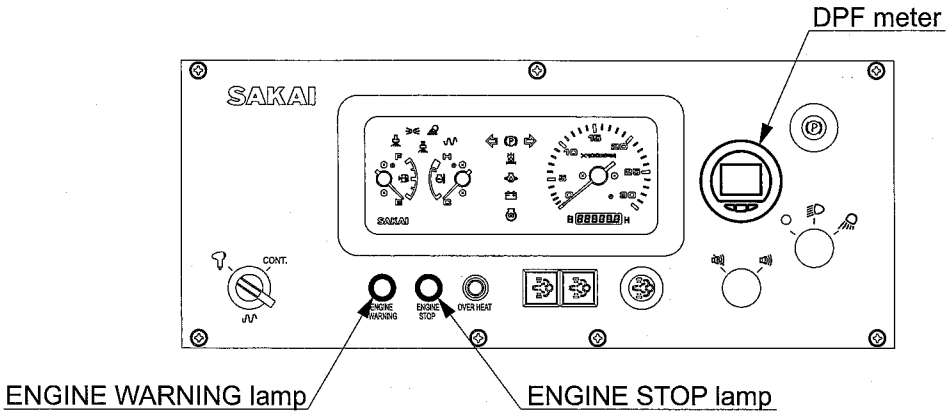
5) Solenoid valve inspection (Check ON/OFF operation by sound.)
- Conduct without running the engine. (If you run the engine, you cannot hear the sound of operation.)
  Sound heard : The electrical system is normal.
  No sound heard : Check with a tester.
  Continuity : ① Turn the starter switch OFF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

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

2-2. Engine Diagnosis Trouble Code

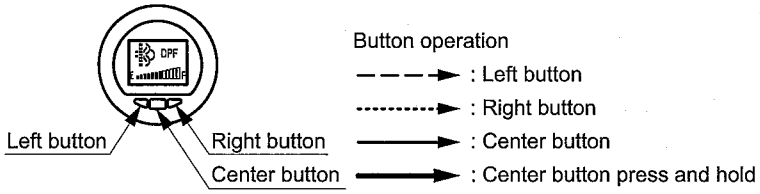
2-2-1. Description of diagnostic trouble code (DTC)

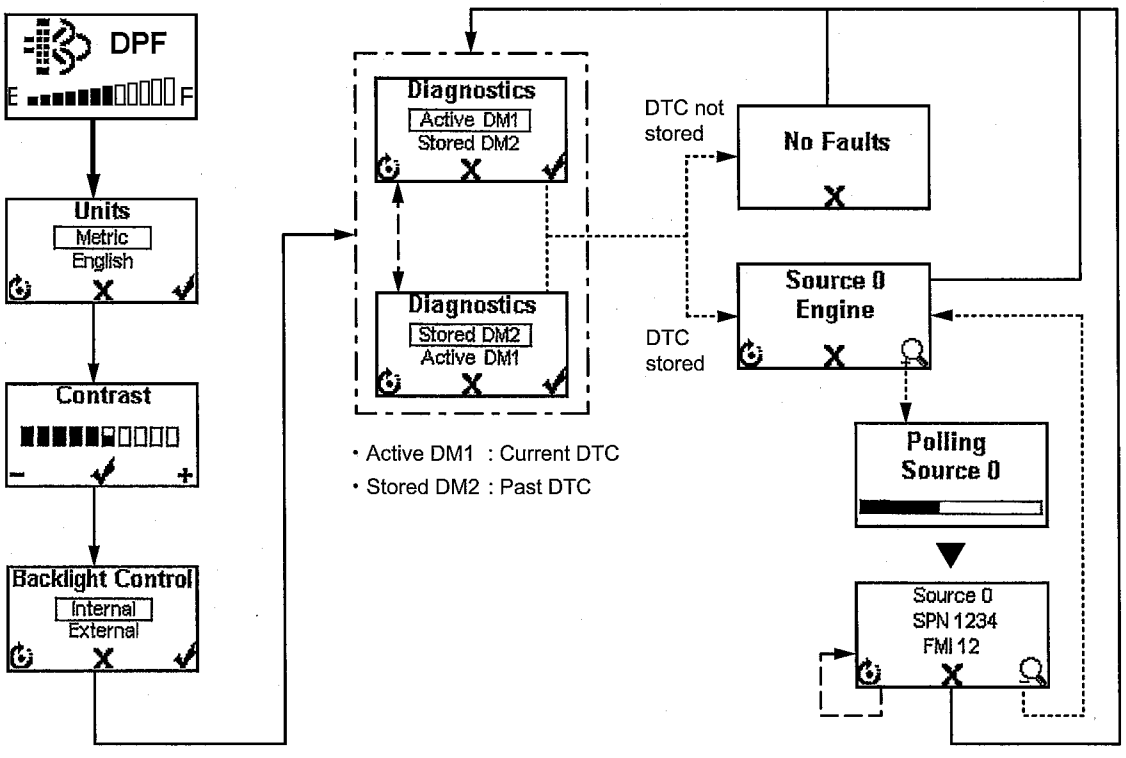
- When the engine warning lamp or engine stop lamp illuminates, the DPF meter is used to display a DTC (diagnostic trouble code).



SV204-09001

1) DTC display procedure using the DPF meter
   - A current or past DTC stored in the engine control unit (ECU) is displayed on the DPF meter by switching its display as described in the diagram below.





*Pressing and holding the center button returns any display back to the DPF meter.

DPF-10010

2-2-2. Table of the diagnostic trouble code (DTC)

J1939-73		Description	DTC Description	Diagnosis
SPN	FMI			
29	3	Accelerator pedal or lever position sensor-2 abnormal	Accelerator sensor-2 High	• Short circuit in sensor/harness power supply
	4		Accelerator sensor-2 Low	• Open circuit in sensor/harness, ground fault
91	2	Accelerator pedal or lever position sensor property abnormal	Accelerator pedal sensor property abnormal	• Sensor output of two systems excessively different
	3	Accelerator pedal or lever position sensor-1 abnormal	Accelerator sensor-1 High	• Short circuit in sensor/harness power supply
	4		Accelerator sensor-1 Low	• Open circuit in sensor/harness, ground fault
100	1	Oil pressure decrease	Engine oil pressure decrease	• Engine oil pressure switch activated
102	3	Boost pressure sensor abnormal	Boost pressure sensor High	• Open circuit in sensor/harness, +B short-circuited • Sensor failure
	4		Boost pressure sensor Low	• Short circuit in sensor/harness ground • Sensor failure
108	3	Atmospheric pressure sensor abnormal	Atmospheric pressure sensor High	• Short circuit in sensor/ECU internal circuit +B
	4		Atmospheric pressure sensor Low	• Short circuit in sensor/ECU internal circuit ground
110	0	Overheat	Engine overheat	• Engine water temperature abnormally high
	3	Water temperature sensor abnormal	Water temperature sensor High	• Open circuit in sensor/harness, +B short-circuited
	4		Water temperature sensor Low	• Short circuit in sensor/harness ground
132	1	Intake air shortage (Turbo blower IN hose disconnected)	Intake air shortage (Turbo blower IN hose disconnected)	• Intake air shortage (Turbo blower IN hose disconnected)
	3	Mass air flow (MAF) sensor abnormal	Mass air flow (MAF) sensor High	• Short circuit in sensor/harness +B
	4		Mass air flow (MAF) sensor Low	• Open circuit in sensor/harness, ground fault
	15	Turbo boost increase insufficient (Blow out: Hose between intake flanges disconnected)	Turbo boost increase insufficient (Blow out: Hose between intake flanges disconnected)	• Turbo blow out: Hose between intake flanges disconnected (abnormal)
157	0	Rail pressure abnormally high	Rail pressure abnormally high	• Actual pressure exceeds command pressure. (When detected high pressure exceeding specified pressure range)
	3	Rail pressure sensor abnormal	Rail pressure sensor High	• Open circuit in sensor/harness, +B short-circuited • Sensor failure
	4		Rail pressure sensor Low	• Short circuit in sensor/harness ground • Sensor failure

J1939-73		Description	DTC Description	Diagnosis
SPN	FMI			
168	3	Battery voltage abnormal	Battery voltage High	• Open circuit, short circuit, or breakage in harness • Battery abnormal
	4		Battery voltage Low	• Open circuit, short circuit, or breakage in harness • Battery abnormal
171	3	Intake air temperature sensor (with built-in mass air flow sensor) abnormal	Intake air temperature sensor (with built-in mass air flow sensor) High	• Open circuit in sensor/harness, +B short-circuited
	4		Intake air temperature sensor (with built-in mass air flow sensor) Low	• Short circuit in sensor/harness ground
172	0	Intake air temperature abnormally high (Intercooler model only)	Intake air temperature abnormally high	• Intake air temperature abnormally high
	3	Intake air temperature sensor abnormal	Intake air temperature sensor High	• Open circuit in sensor/harness, +B short-circuited
	4		Intake air temperature sensor Low	• Short circuit in sensor/harness ground
174	0	Fuel temperature abnormally high	Fuel temperature abnormally high	• Fuel temperature abnormally high
	3	Fuel temperature sensor abnormal	Fuel temperature sensor High	• Open circuit in sensor/harness, +B short-circuited
	4		Fuel temperature sensor Low	• Short circuit in sensor/harness ground
190	0	Overrun	Engine overrun	• Engine speed exceeds specified speed
628	2	ECU flash ROM and CPU abnormal	ECU flash ROM abnormal	• Monitoring of unauthorized alteration of internal flash ROM
633	7	Pressure limiter valve opening abnormal	Pressure limiter valve opening abnormal	• Pressure limiter valve opening abnormal
636	2	Crankshaft position sensor (NE sensor) abnormal	NE sensor pulse count abnormal	• Open circuit in sensor/harness, short-circuited • Sensor failure
	7	NE-G phase shift	NE-G phase shift failure	• Phase shift between NE pulse and G pulse excessive
	8	Crankshaft position sensor (NE sensor) abnormal	NE sensor pulse not inputted	• Open circuit in sensor/harness, short-circuited • Sensor failure
651	3	Open circuit in TWV driving system	Injector of 1st engine cylinder (TWV1): Open circuit in harness/coil	• Open circuit in harness • Open circuit in injector coil
652	3		Injector of 2nd engine cylinder (TWV4): Open circuit in harness/coil	
653	3		Injector of 3rd engine cylinder (TWV2): Open circuit in harness/coil	
654	3		Injector of 4th engine cylinder (TWV3): Open circuit in harness/coil	

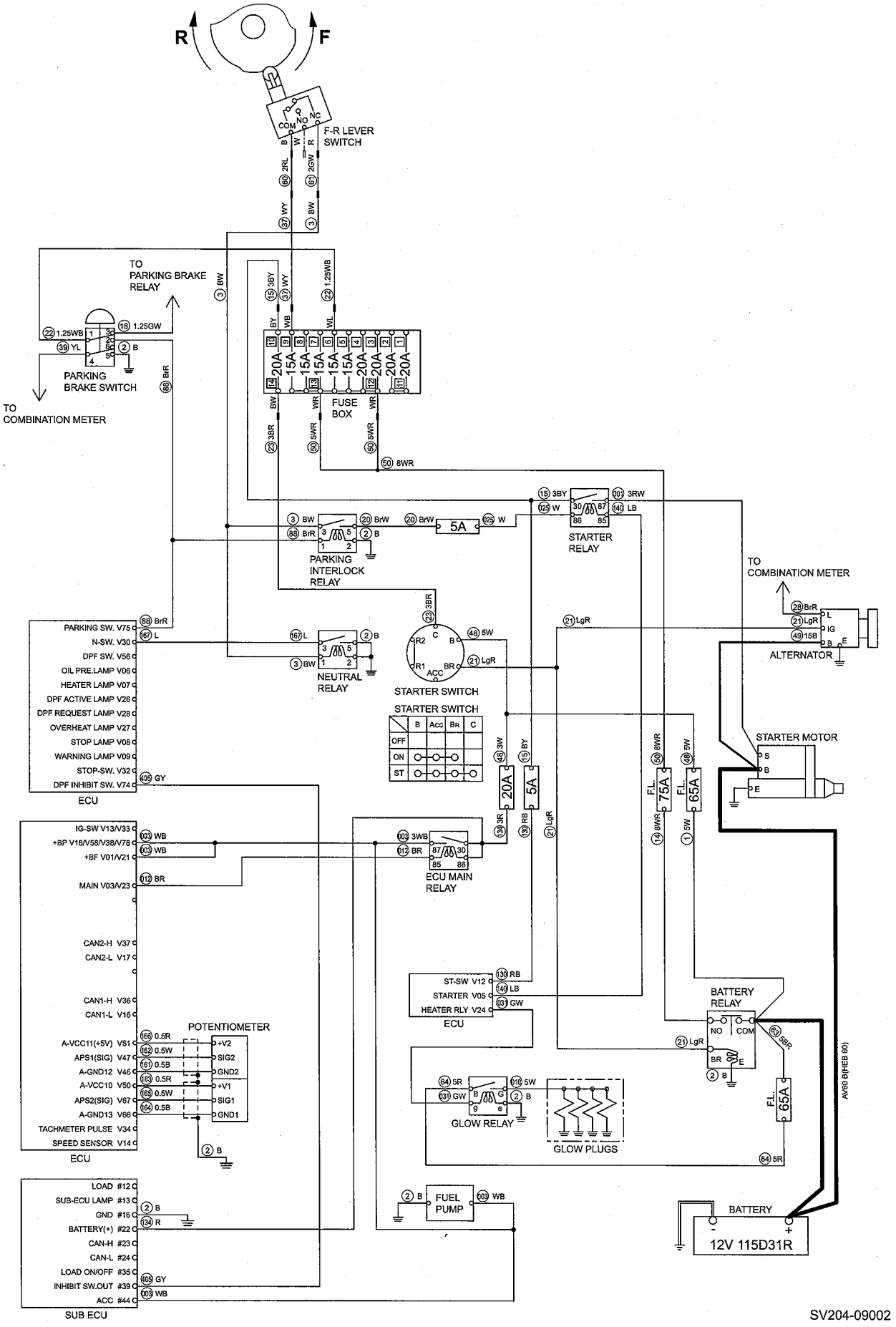
J1939-73		Description	DTC Description	Diagnosis
SPN	FMI			
723	2	Camshaft position sensor (G sensor) abnormal	G sensor pulse count abnormal	• Open circuit in sensor/harness, short-circuited • Sensor failure
	8		G sensor pulse not inputted	
1077	2	ECU flash ROM and CPU abnormal	ECU CPU abnormal (main IC abnormal)	• CPU failure
1239	1	Fuel leakage (high pressure fuel system)	Fuel leakage (high pressure fuel system)	• Fuel leakage from high pressure fuel system (when detected excessive fuel consumption, calculating from difference of fuel rail pressure before and after fuel injection)
1347	3	SCV abnormal	SCV +B short-circuit	• Short circuit in SCV +B
	4		SCV driving system abnormal	• Open circuit in SCV, ground fault
	7	SCV sticking	SCV sticking diagnosis	• SCV sticks while open (when detected condition that actual rail pressure constantly exceeds command rail pressure)
1485	2	Main relay abnormal	Main relay abnormal	• Main relay failure
3242	0	Exhaust temperature rise abnormal T1	Exhaust temperature rise abnormal T1	• DPF inlet temperature (T1) abnormally high
	3	Exhaust temperature sensor 1 (T1: DOC outlet) abnormal	Exhaust temperature sensor 1 (T1: DOC outlet) High	• Open circuit in sensor/harness, +B short-circuited
	4		Exhaust temperature sensor 1 (T1: DOC outlet) Low	• Short circuit in sensor/harness ground
3246	0	Exhaust temperature rise abnormal T2	Exhaust temperature rise abnormal T2	• DPF outlet temperature (T2) abnormally high
	3	Exhaust temperature sensor 2 (T2: DPF outlet) abnormal	Exhaust temperature sensor 2 (T2: DPF outlet) High	• Open circuit in sensor/harness, +B short-circuited
	4		Exhaust temperature sensor 2 (T2: DPF outlet) Low	• Short circuit in sensor/harness ground
3251	3	Differential pressure sensor abnormal	Differential pressure sensor abnormal High	• Open circuit in sensor/harness, +B short-circuited
	4		Differential pressure sensor abnormal Low	• Short circuit in sensor/harness ground
3252	0	DOC reaction abnormal (exhaust gas abnormal)	DOC reaction abnormal (exhaust gas abnormal)	• DOC temperature abnormally high due to unburned gas
3509	3	Sensor voltage 1 abnormal	Sensor supply voltage 1 High	• Sensor supply voltage 1 abnormal or recognition abnormal
	4		Sensor supply voltage 1 Low	
3510	3	Sensor supply voltage 2 abnormal	Sensor supply voltage 2 High	• Sensor supply voltage 2 abnormal or recognition abnormal
	4		Sensor supply voltage 2 Low	
3701	0	PM accumulation abnormal level 5	PM accumulation abnormal level 5	• PM (estimated) accumulation quantity excessive level 5
	15	PM accumulation abnormal level 3	PM accumulation abnormal level 3	• PM (estimated) accumulation quantity excessive level 3
	16	PM accumulation abnormal level 4	PM accumulation abnormal level 4	• PM (estimated) accumulation quantity excessive level 4

J1939-73		Description	DTC Description	Diagnosis
SPN	FMI			
4765	0	Exhaust temperature rise abnormal T0	Exhaust temperature rise abnormal T0	• DOC inlet temperature (T0) abnormally high
	3	Exhaust temperature sensor 0 (T0 : DOC inlet) abnormal	Exhaust temperature sensor 0 (T0 : DOC inlet) High	• Open circuit in sensor/harness, +B short-circuited
	4		Exhaust temperature sensor 0 (T0 : DOC inlet) Low	• Short circuit in sensor/harness ground
523523	2	Open circuit in common 1 system	Open circuit in injector driving circuit: Common 1 system, or TWV 1 and 3 (1st and 4th cylinders) simultaneously	• Open circuit in harness
	3	Short circuit in common 1 TWV driving system	Short circuit in battery: Injector driving circuit at ECU side (Common 1 system), or 1st and 4th cylinders at INJ side simultaneously	• Short circuit in harness +B
	4		Short circuit in GND: Injector driving circuit at ECU side (Common 1 system), or 1st and 4th cylinders at INJ side simultaneously	• Short circuit in harness ground
523524	2	Open circuit in common 2 system	Open circuit in injector driving circuit: Common 2 system, or TWV 2 and 4 (3rd and 2nd cylinders) simultaneously	• Open circuit in harness
	3	Short circuit in common 2 TWV driving system	Short circuit in battery: Injector driving circuit at ECU side (Common 2 system), or 2nd and 3rd cylinders at INJ side simultaneously	• Short circuit in harness +B
	4		Short circuit in GND: Injector driving circuit at ECU side (Common 2 system), or 2nd and 3rd cylinders at INJ side simultaneously	• Short circuit in harness ground
523525	1	Injector charge voltage abnormal	ECU injector charge voltage insufficient	• Injector charge voltage insufficient • ECU charge circuit failure
523527	2	ECU flash ROM and CPU abnormal	ECU CPU abnormal (watching IC abnormal)	• CPU-watching IC failure
523535	0	Overcharge	ECU injector charge voltage excessively high	• ECU injector charge voltage excessively high (ECU charge circuit failure)
523538	2	QR abnormal	QR data abnormal	• QR code correction data abnormal
	7		QR data writing abnormal	• QR code correction data unwritten
523539	2	Pump seizure	Pump seizure 1	• Pressure abnormally high 1
523540	2		Pump seizure 2	• Pressure abnormally high 2
523543	2	Accelerator pedal or lever position sensor abnormal (via CAN)	Accelerator sensor at machine body abnormal	• Abnormal message from machine body received

J1939-73		Description	DTC Description	Diagnosis
SPN	FMI			
523544	3	Air heater relay drive abnormal	Short circuit in air heater relay driving circuit +B	• Short circuit in air heater relay driving circuit +B
	4		Short circuit in air heater relay driving circuit GND	• Open circuit in air heater relay driving circuit, ground fault
523547	2	CAN2 bus off	CAN2 bus off	• Short circuit in CAN2 +B/GND or traffic abnormally high
523548	2	Open circuit in CAN2 frame	Open circuit in CAN_KBT original frame	• Open circuit in CAN_KBT original frame
523572	4	EGR motor abnormal	EGR position sensor abnormal	• EGR position sensor abnormal
523574	3		Open circuit in EGR motor	• Open circuit in EGR motor coil
	4		Short circuit in EGR motor	• Short circuit in EGR motor coil
523575	7	EGR (DC motor) abnormal	EGR valve sticking (FB abnormal)	• EGR valve sticking
523576	2		EGR motor ambient temperature abnormal	• EGR motor temperature abnormally high
523577	2		EGR thermistor sensor with built-in valve abnormal	• EGR motor temperature sensor abnormal
523578	2	Open circuit in CAN_ EGR control line	Disconnection (open circuit) in EGR control line communication	• CAN communication with EGR
523580	2	Intake throttle FB (feed back) abnormal	Intake throttle FB (feed back) abnormal	• Intake throttle DC motor feed back abnormal
523582	3	Intake throttle lift sensor abnormal	Intake throttle lift sensor abnormal (High)	• Intake throttle lift sensor High
	4		Intake throttle lift sensor abnormal (Low)	• Intake throttle lift sensor Low
523589	17	Water temperature rise during manual regeneration insufficient	Water temperature rise during manual regeneration insufficient	• While regenerating, conditions required for warming up the engine not established (Insufficient water temperature rise)
523590	16	Manual regeneration process time-up abnormal	Manual regeneration process time-up abnormal	• Regeneration process not end due to insufficient DPF temperature rise (Regeneration time)
523591	2	Open circuit in CAN2 frame	CAN_CCVS communication disruption	• CAN_CCVS communication disruption
523592	2		CAN_CM1 communication disruption	• CAN_CM1 communication disruption
523593	2		CAN_DDC1 communication disruption	• CAN_DDC1 communication disruption
523594	2		CAN_ETC2 communication disruption	• CAN_ETC2 communication disruption
523595	2		CAN_ETC5 communication disruption	• CAN_ETC5 communication disruption
523596	2		CAN_TSC1 communication disruption	• CAN_TSC1 communication disruption
523598	2		CAN_EBC1 communication disruption	• CAN_EBC1 communication disruption

J1939-73		Description	DTC Description	Diagnosis
SPN	FMI			
523599	0	Simultaneous open circuit in all exhaust temperature sensors	Simultaneous open circuit in all exhaust temperature sensors	• Simultaneous open circuit in all exhaust temperature sensors
523600	0	Warning on incomplete learning of individual difference of pumps	Warning on incomplete learning of individual difference of pumps	• Pump learning history
523601	0	Exhaust temperature continuously abnormal (Starter relay drive prohibit warning)	Exhaust temperature continuously abnormal (Starter relay drive prohibit warning)	• Exhaust temperature when abnormally high temperature generated
523602	0	Regeneration frequency abnormally high	Regeneration frequency abnormally high	• Abnormal interval between end of regeneration process and trigger for next regeneration
523603	15	Warning on High. Temp_AECD operation	Warning on High.Temp_AECD operation	• High Temperature AECD_EGR valve limiting state warning
523604	2	CAN1 bus off	CAN1 bus off	• Short circuit in CAN1 +B/GND or traffic abnormally high
523700	13	EEPROM checksum not coincident	KBT area EEPROM checksum not coincident	• KBT area EEPROM checksum not coincident
523701	13		DST1 area EEPROM checksum not coincident	• DST1 area EEPROM checksum not coincident
523702	13		DST2 area EEPROM checksum not coincident	• DST2 area EEPROM checksum not coincident

Fig.: 2-3-1


R
F
F-R LEVER SWITCH
TO PARKING BRAKE RELAY
PARKING BRAKE SWITCH
TO COMBINATION METER
FUSE BOX
PARKING INTERLOCK RELAY
STARTER RELAY
NEUTRAL RELAY
STARTER SWITCH
ECU
ECU MAIN RELAY
ALTERNATOR
STARTER MOTOR
BATTERY RELAY
GLOW RELAY
GLOW PLUGS
FUEL PUMP
BATTERY
12V 115D31R
POTENTIOMETER
SUB ECU
SV204-09002

2-3. Engine

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.
- Check any ground circuit which belongs to components to be checked.
- Engine warning lamp or engine stop lamp must not be lighting. If engine warning lamp or engine stop lamp lights, refer to troubleshooting of engine manufacturer.

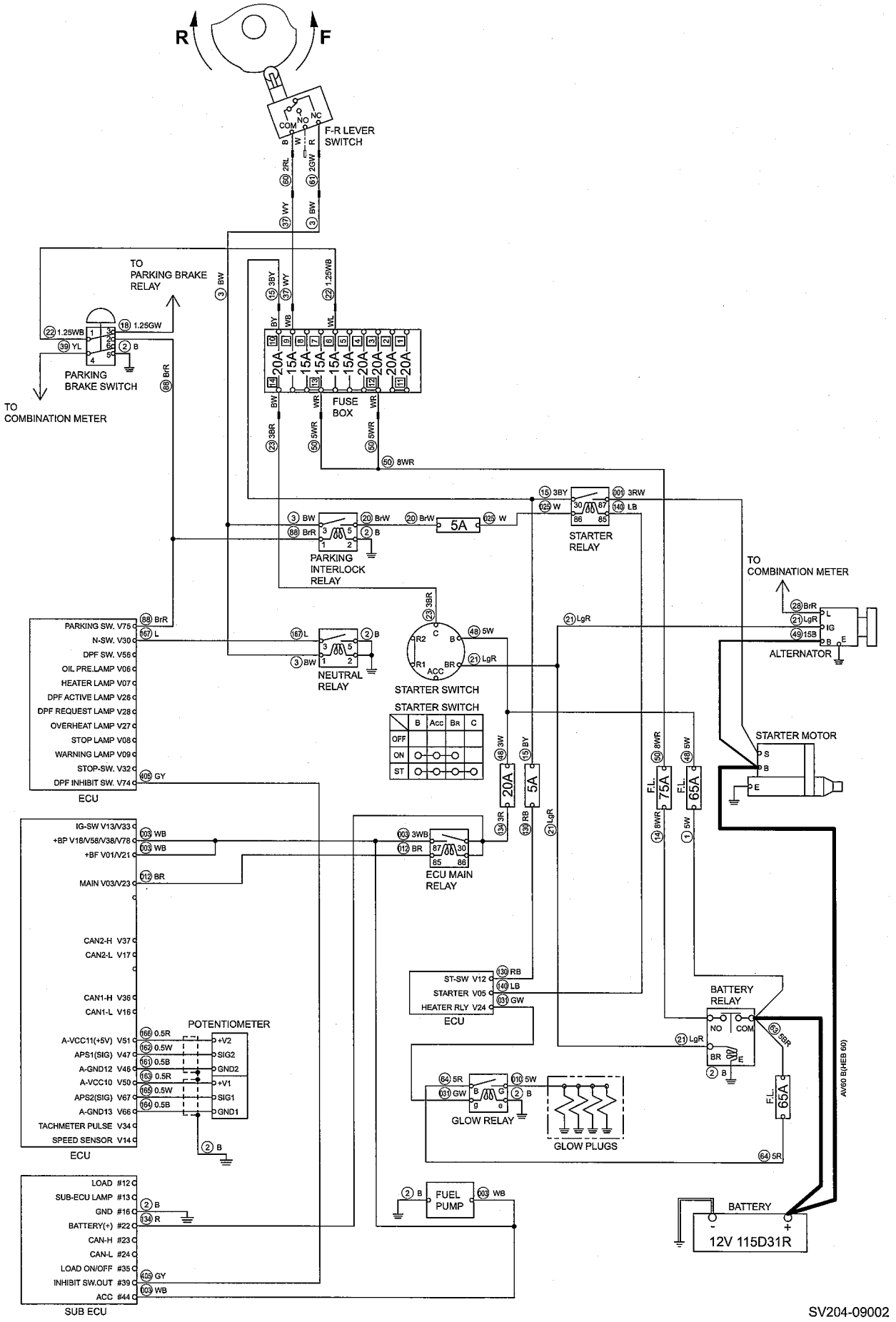
2-3-1. Engine will not start (Starter motor does not run) 1/2

- F-R lever must be in "N".
- Parking brake switch must be applied.

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 value is below standard, battery capacity is insufficient.	Charge or replace battery.
2. Starter Switch	• Check continuity between O-O according to starter switch connection table. Switch is OK if there is continuity between connection O-O. • If there is no continuity, starter switch is faulty.	Replace starter switch.
3. Starter Motor	(1) When starter switch is ON, measure voltage between starter motor terminal B and chassis ground. Standard voltage : 12 V or more (2) When starter switch is START, measure voltage between starter motor terminal S and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and starter motor does not run, starter motor is faulty.	Replace starter motor.
4. Starter Relay	(1) When starter switch is ON, measure voltage between starter relay terminal 86 inlet wire W and chassis ground. Standard voltage : 12 V or more (2) When starter switch is START, measure voltage between starter relay terminal 30 inlet wire BY and chassis ground. Standard voltage : 12 V or more (3) When starter switch is START, measure voltage between starter relay terminal 87 outlet wire RW and chassis ground Standard voltage : 12 V or more • If above items (1) and (2) are OK and item (3) is NG, starter relay is faulty.	Replace starter relay.

Fig.: 2-3-1



SV204-09002

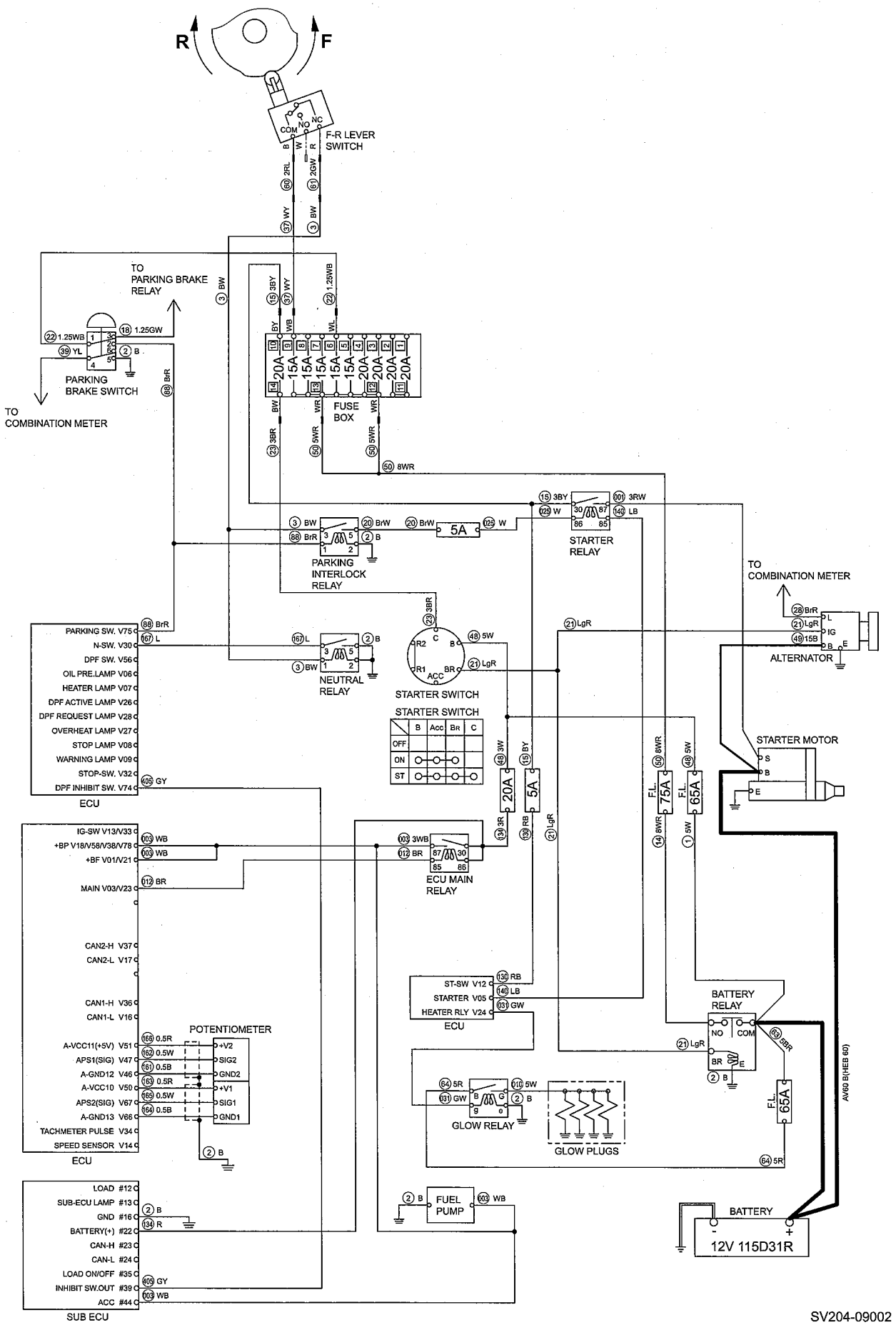
2-3-1. Engine will not start (Starter motor does not run) 2/2

- F-R lever must be in "N".
- Parking brake switch must be applied.

Reference Fig.: 2-3-1

Check point	Check/Cause	Action
5. 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 LgR 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.
6. F-R Lever Switch	(1) When starter switch is ON, measure voltage between F-R lever switch terminal COM inlet wire RL and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between F-R lever switch terminal NC outlet wire GW and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, F-R lever switch is faulty.	Replace F-R lever switch.
7. Parking Interlock Relay	(1) When starter switch is ON, measure voltage between parking interlock relay terminal 1 inlet wire BrR and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between parking interlock relay terminal 3 inlet wire BW and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between parking interlock relay terminal 5 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, parking interlock relay is faulty.	Replace parking interlock relay.
8. Parking Brake Switch	(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire WB and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between parking brake switch terminal 2 outlet wire BrR 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.
9. 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


R
F
COM
NO
NC
F-R LEVER SWITCH
TO PARKING BRAKE RELAY
PARKING BRAKE SWITCH
TO COMBINATION METER
FUSE BOX
20A
15A
STARTER RELAY
PARKING INTERLOCK RELAY
5A
NEUTRAL RELAY
STARTER SWITCH
TO COMBINATION METER
ALTERNATOR
STARTER MOTOR
PARKING SW. V75
N-SW. V30
DPF SW. V56
OIL PRE.LAMP V08
HEATER LAMP V07
DPF ACTIVE LAMP V26
DPF REQUEST LAMP V28
OVERHEAT LAMP V27
STOP LAMP V08
WARNING LAMP V09
STOP-SW. V32
DPF INHIBIT SW. V74
ECU
IG-SW V13/V33
+BP V18/V58/V38/V78
+BF V01/V21
MAIN V03/V23
ECU MAIN RELAY
CAN2-H V37
CAN2-L V17
CAN1-H V36
CAN1-L V16
POTENTIOMETER
A-VCC11(+5V) V51
APS1(SIG) V47
A-GND12 V46
A-VCC10 V50
APS2(SIG) V67
A-GND13 V66
TACHMETER PULSE V34
SPEED SENSOR V14
ECU
ST-SW V12
STARTER V05
HEATER RLY V24
ECU
BATTERY RELAY
GLOW RELAY
GLOW PLUGS
FUEL PUMP
LOAD #12
SUB-ECU LAMP #13
GND #16
BATTERY(+) #22
CAN-H #23
CAN-L #24
LOAD ON/OFF #35
INHIBIT SW.OUT #39
ACC #44
SUB ECU
BATTERY
12V 115D31R
AV60 B(HEB 60)
SV204-09002

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.: 2-3-1

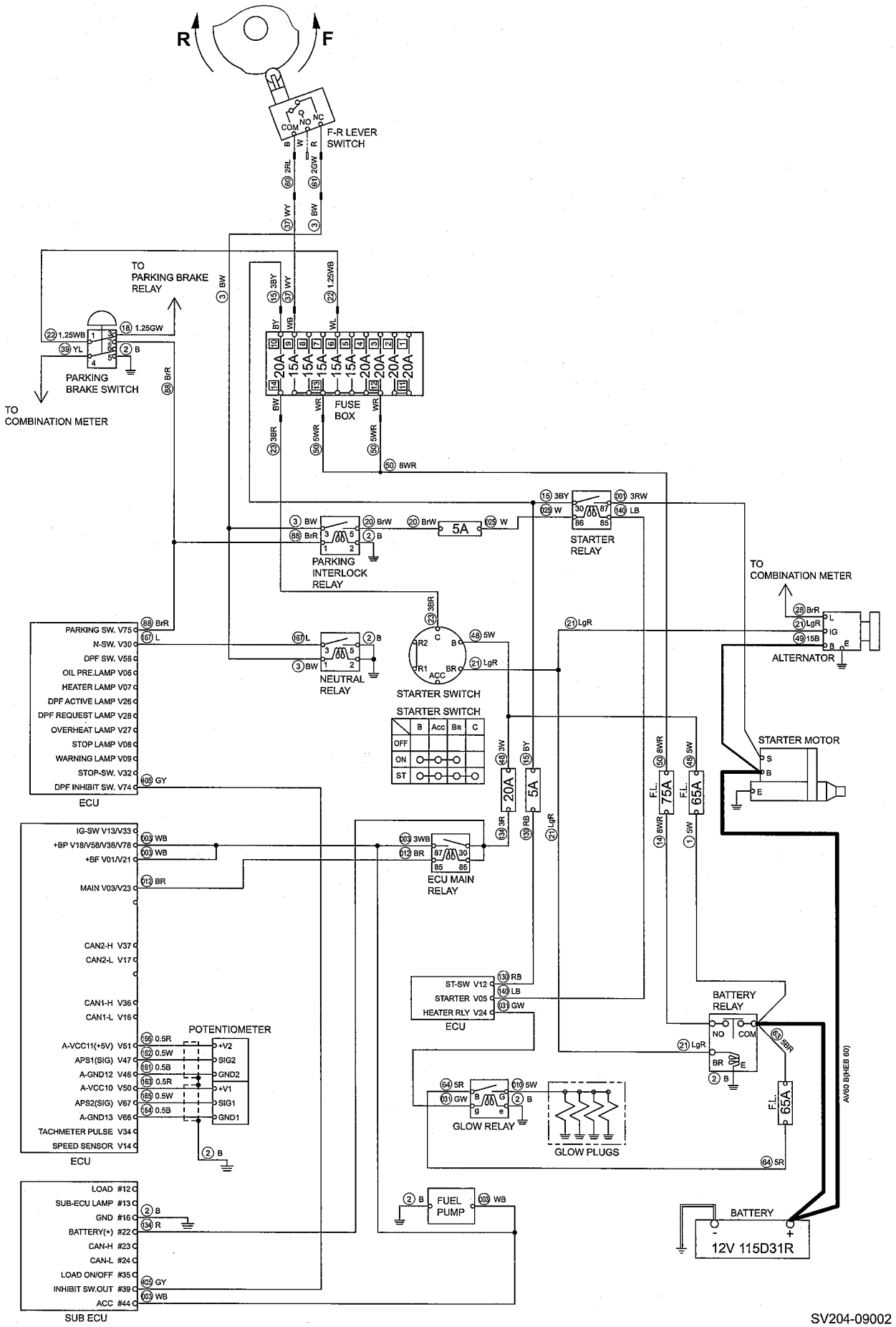
Check point	Check/Cause	Action
1. Fuel Pump	• When starter switch is ON, measure voltage between fuel pump terminal inlet wire WB and chassis ground. Standard voltage : 12 V or more • If above item is OK and fuel pump does not operate, fuel pump is faulty.	Repair or replace fuel pump.
2. ECU Main Relay	(1) Measure voltage between ECU main relay terminal 86 inlet wire R and chassis ground. Standard voltage : 12 V or more (2) Measure voltage between ECU main relay terminal 30 inlet wire R and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between ECU main relay terminal 87 outlet wire WB and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and item (3) is NG, ECU main relay is faulty.	Replace ECU main relay.
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.

2-3-3. No charging

Reference Fig.: 2-3-1

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

Fig.: 2-3-1



SV204-09002

2-3-4. Glow plug is not heated (Engine starting performance is bad in cold weather)

Reference Fig. : 2-3-1

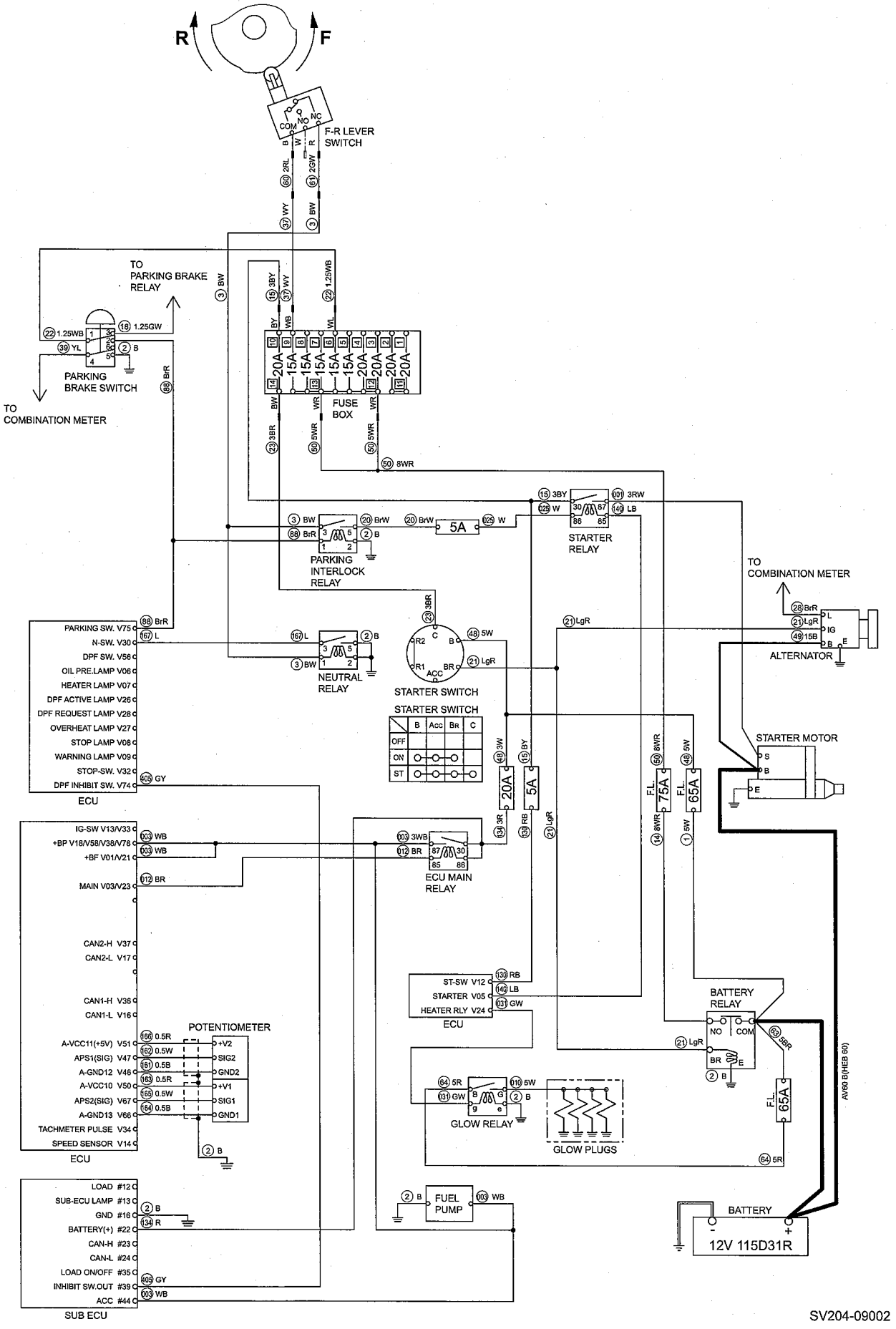
Check point	Check/Cause	Action
1. Glow Plug	• When starter switch is ON, measure voltage between glow plug terminal inlet wire W and chassis ground. Standard voltage : 12 V or more • If voltage is OK, glow plug is faulty.	Replace glow plug.
2. Glow Relay	(1) When starter switch is ON, measure voltage between glow relay terminal g inlet wire GW and chassis ground. Standard voltage : 12 V or more (2) Measure voltage between glow relay terminal B inlet wire R and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between glow relay terminal G outlet wire W and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and item (3) is NG, glow relay is faulty.	Replace glow relay.
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.

2-3-5. Starter motor runs even when F-R lever is not at "N"

Reference Fig. : 2-3-1

Check point	Check/Cause	Action
1. F-R Lever Switch	• When starter switch is OFF and F-R lever is "F" or "R", check continuity between F-R lever switch terminal COM wire RL and terminal NC wire GW. There is no continuity in normal condition. • If there is continuity, F-R lever switch is faulty.	Replace F-R lever switch.

Fig.: 2-3-1


R
F
F-R LEVER SWITCH
TO PARKING BRAKE RELAY
PARKING BRAKE SWITCH
TO COMBINATION METER
FUSE BOX
PARKING INTERLOCK RELAY
STARTER RELAY
NEUTRAL RELAY
STARTER SWITCH
ECU
ECU MAIN RELAY
ALTERNATOR
STARTER MOTOR
BATTERY RELAY
GLOW RELAY
GLOW PLUGS
FUEL PUMP
BATTERY
12V 115D31R
POTENTIOMETER
SUB ECU
SV204-09002

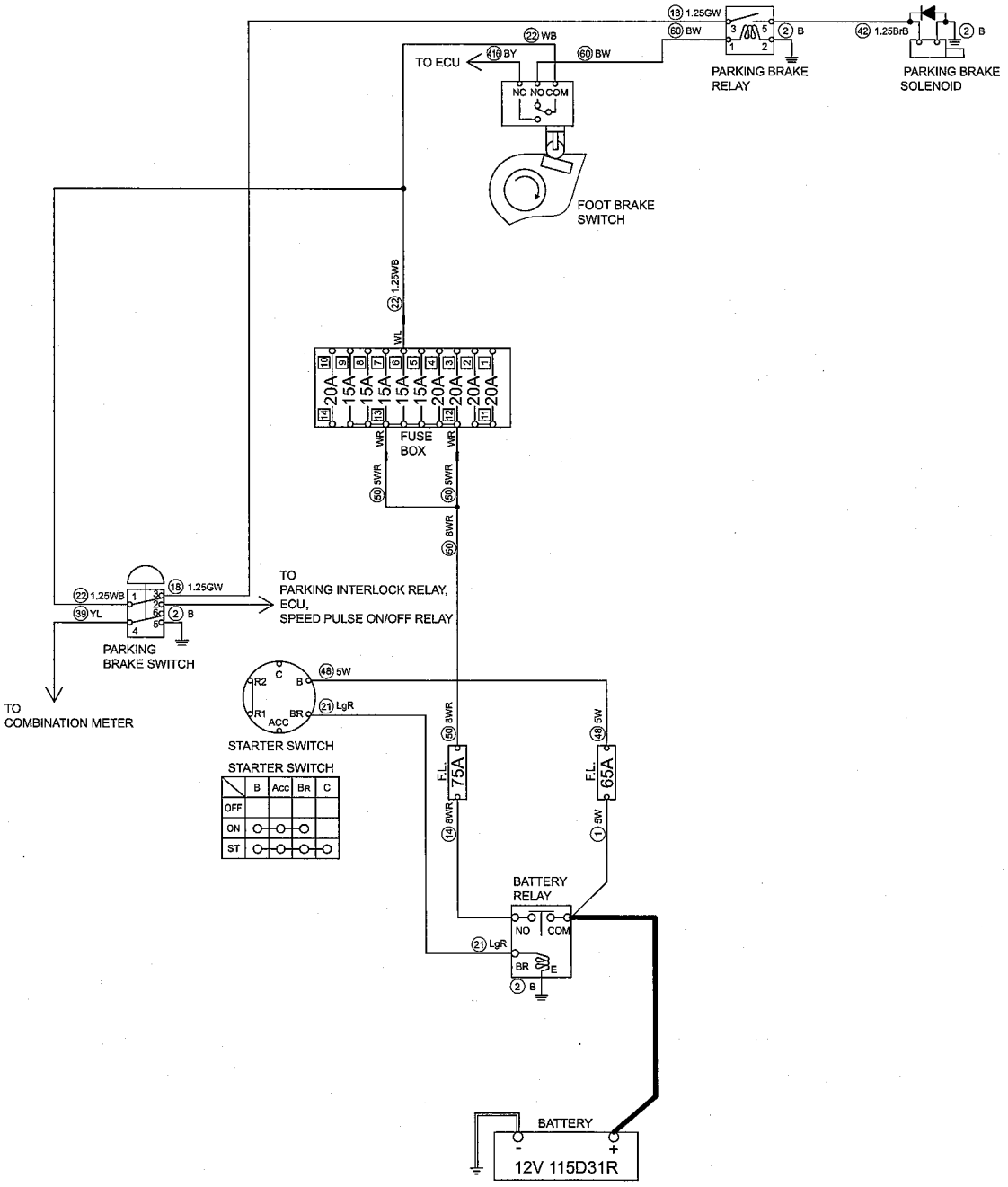
2-3-6. Engine speed does not change when operating throttle lever

- Engine warning lamp must not be lighting.
- Refer to voltage measurement method when voltage is to be measured without disconnecting connector.

Reference Fig. : 2-3-1

Check point	Check/Cause	Action
1. Connector	• Check for corrosion, break, bend, or loosening on potentiometer connector terminals. • If there are any above mentioned abnormalities, the connector is faulty.	Replace connector or terminal.
2. Potentiometer	(1) When starter switch is ON, measure voltage between potentiometer terminal +V1 wire R and potentiometer terminal GND1 wire B. Standard voltage : 5 ±0.5 V (2) When starter switch is ON, measure voltage between potentiometer terminal +V2 wire R and potentiometer terminal GND2 wire B. Standard voltage : 5 ±0.5 V (3) When starter switch is ON, measure voltage between potentiometer terminal SIG1 wire W and potentiometer terminal GND1 wire B. When throttle lever is at IDLE position Standard voltage : 0.5 to 1.0 V When throttle lever is at FULL position Standard voltage : 4.0 to 4.5 V (4) When starter switch is ON, measure voltage between potentiometer terminal SIG2 wire W and potentiometer terminal GND2 wire B. When throttle lever is at IDLE position Standard voltage : 4.0 to 4.5 V When throttle lever is at FULL position Standard voltage : 0.5 to 1.0 V • If above items (1) and (2) are OK and item (3) or (4) is NG, potentiometer is faulty.	Replace potentiometer.
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty. **(NOTICE)** • **Because three-wire shield cable is used between potentiometer and ECU, it is impossible to repair it. It must be replaced.**	Repair or replace harness.

Fig.: 2-4-1



SV204-09003

2-4. Propulsion

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.
- When measuring voltage and current without disconnecting connectors, refer to "Measuring voltage and current flowing using tester" (P.9-006 to P.9-008).
- Check any ground circuit which belongs to components to be checked.

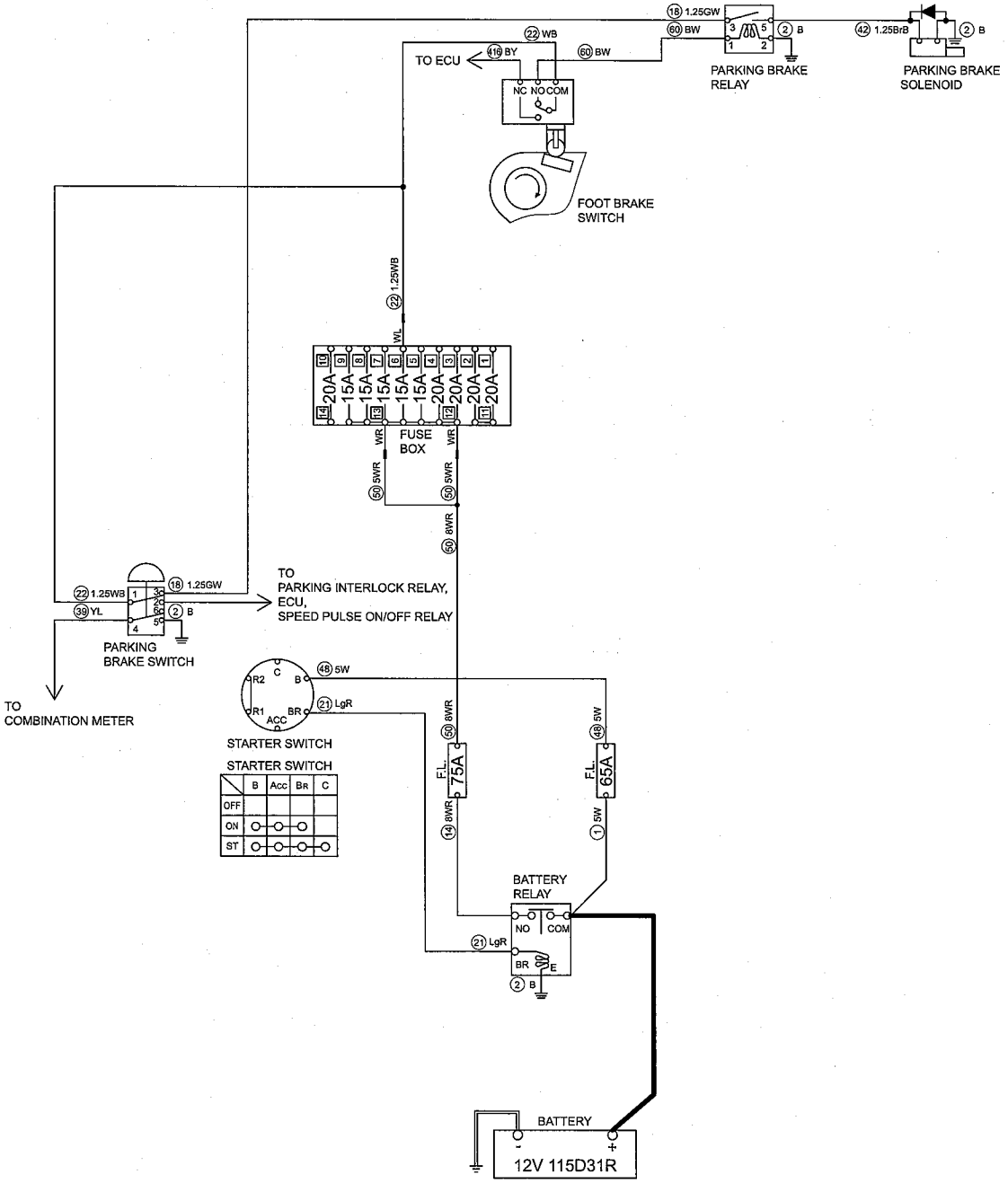
2-4-1. Machine moves neither forward nor backward

- Parking brake switch must be released.
- Brake pedal is not depressed.

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Parking Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance : 12.3 ± 1.2 Ω • If measured resistance is abnormal, parking brake solenoid is faulty.	Replace parking brake solenoid.
2. Parking Brake Relay	(1) When starter switch is ON, measure voltage between parking brake relay terminal 1 inlet wire BW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between parking brake relay terminal 3 inlet wire GW and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between parking brake relay terminal 5 outlet wire BrB and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and item (3) is NG, parking brake relay is faulty.	Replace parking brake relay.
3. Parking Brake Switch	(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire WB 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 GW 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.
4. Foot Brake Switch	(1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire WB and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between foot brake switch terminal NO outlet wire BW and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, foot brake switch is faulty.	Replace foot brake switch.
5. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-4-1



SV204-09003

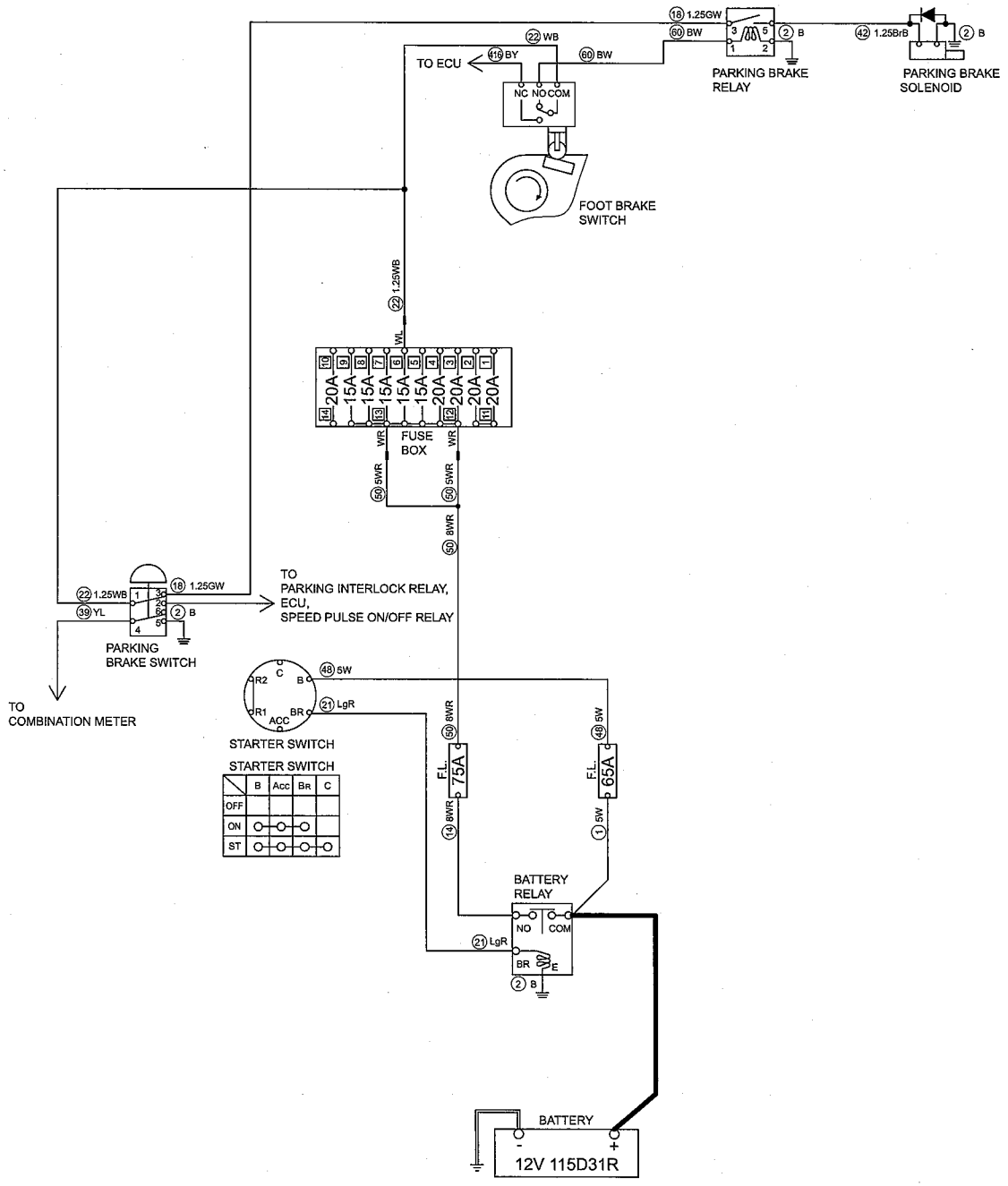
2-4-2. Brake cannot be released

- Parking brake switch must be released.
- Brake pedal is not depressed.

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Parking Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance : 12.3 ± 1.2 Ω • If measured resistance is abnormal, parking brake solenoid is faulty.	Replace parking brake solenoid.
2. Parking Brake Relay	(1) When starter switch is ON, measure voltage between parking brake relay terminal 1 inlet wire BW and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between parking brake relay terminal 3 inlet wire GW and chassis ground. Standard voltage : 12 V or more (3) When starter switch is ON, measure voltage between parking brake relay terminal 5 outlet wire BrB and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and item (3) is NG, parking brake relay is faulty.	Replace parking brake relay.
3. Parking Brake Switch	(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire WB 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 GW 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.
4. Foot Brake Switch	(1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire WB and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between foot brake switch terminal NO outlet wire BW and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, foot brake switch is faulty.	Replace foot brake switch.
5. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-4-1



SV204-09003

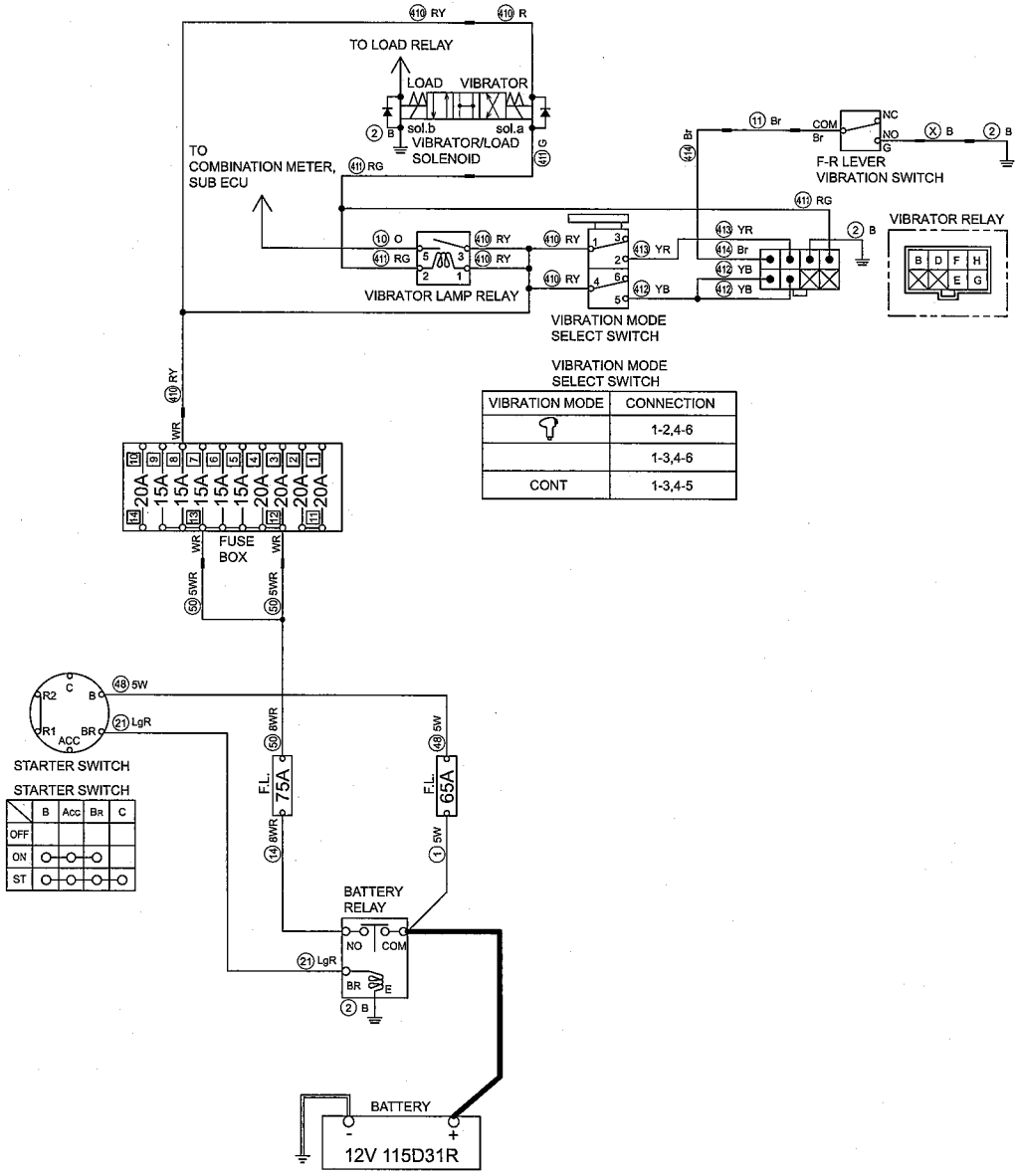
2-4-3. Brake does not work

- Parking brake switch must be applied.
- Brake pedal is depressed.

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Parking Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance : 12.3 ± 1.2 Ω • If measured resistance is abnormal, parking brake solenoid is faulty.	Replace parking brake solenoid.
2. Parking Brake Relay	(1) When starter switch is ON, measure voltage between parking brake relay terminal 1 inlet wire BW and chassis ground. There is no electricity in normal condition. (2) When starter switch is ON, measure voltage between parking brake relay terminal 5 outlet wire BrB and chassis ground. There is no electricity in normal condition. • If above items (1) is OK and item (2) is NG, parking brake relay is faulty.	Replace parking brake relay.
3. Parking Brake Switch	• When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire GW and chassis ground. There is no electricity in normal condition. • If there is electricity, parking brake switch is faulty.	Replace parking brake switch.
4. Foot Brake Switch	• When starter switch is ON, measure voltage between foot brake switch terminal NO outlet wire BW and chassis ground. There is no electricity in normal condition. • If there is electricity, foot brake switch is faulty.	Replace foot brake switch.
5. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



VIBRATION MODE SELECT SWITCH

VIBRATION MODE	CONNECTION
	1-2,4-6
	1-3,4-6
CONT	1-3,4-5

SV204-09004

2-5. Vibration

Check following items before troubleshooting.

- No blown fuses and power is applied up to fuses.
- Throttle switch must be "FULL".
- Check any ground circuit which belongs to components to be checked.

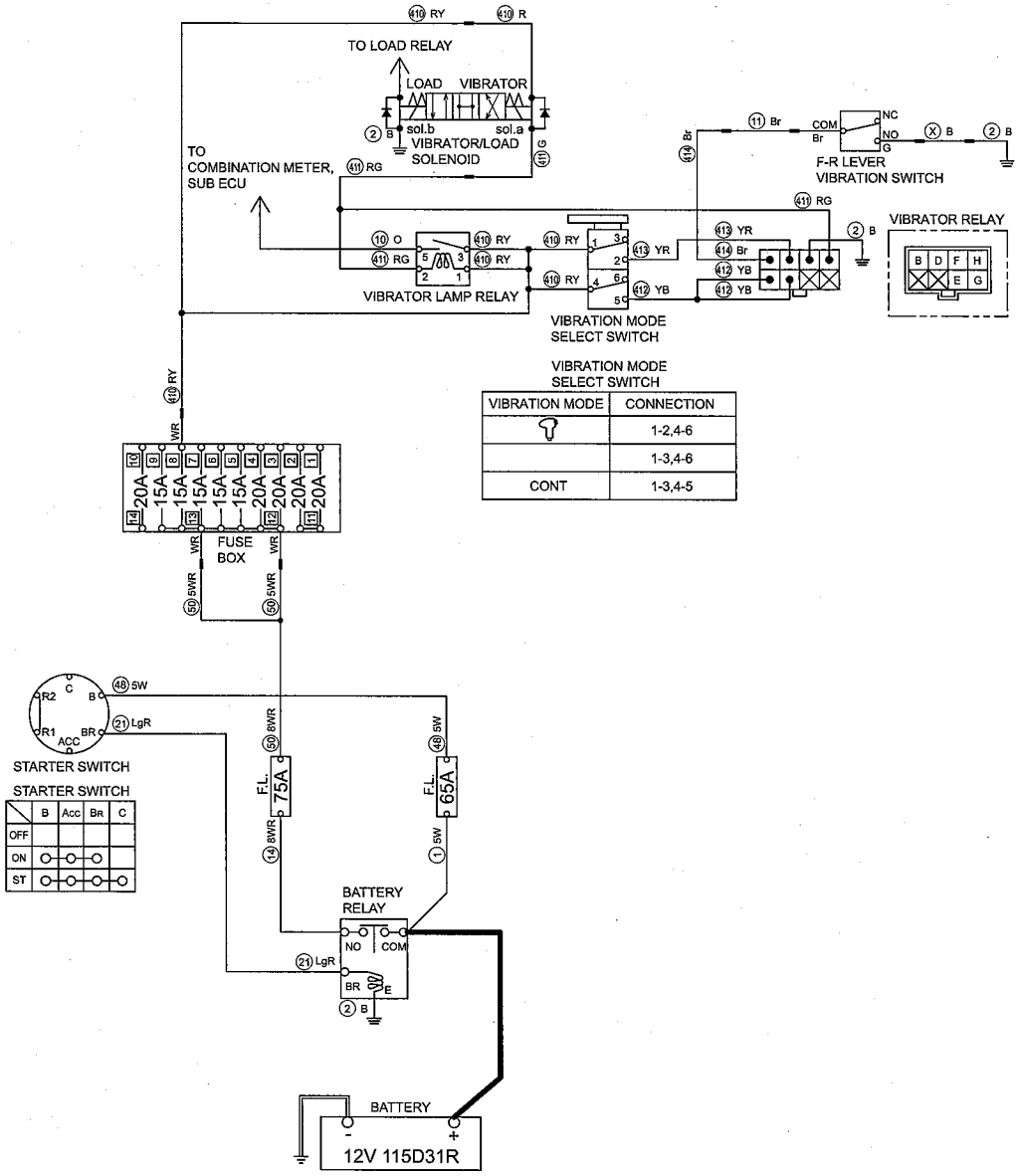
2-5-1. No vibration occurs

- Vibration mode select switch must be "CONT".

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Vibrator/Load Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance : 5.8 Ω • If measured resistance is abnormal, vibrator/load solenoid is faulty.	Replace vibrator/load solenoid.
2. Vibration Mode Select Switch	(1) When starter switch is ON, measure voltage between vibration mode select switch terminal 4 inlet wire RY and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between vibration mode select switch terminal 5 outlet wire YB and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, vibration mode select switch is faulty.	Replace vibration mode select switch.
3. Vibrator Relay	(1) When starter switch is ON, measure voltage between vibrator relay terminal E and G inlet wire YB and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, check continuity between vibrator relay terminal B inlet wire RG and terminal D outlet wire B. There is continuity in normal condition. • If above item (1) is OK and item (2) is NG, vibrator relay is faulty.	Replace vibrator relay.
4. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



VIBRATION MODE SELECT SWITCH

VIBRATION MODE	CONNECTION
	1-2,4-6
	1-3,4-6
CONT	1-3,4-5

STARTER SWITCH

	B	Acc	Br	C
OFF				
ON	o	o		
ST	o	o	o	o

SV204-09004

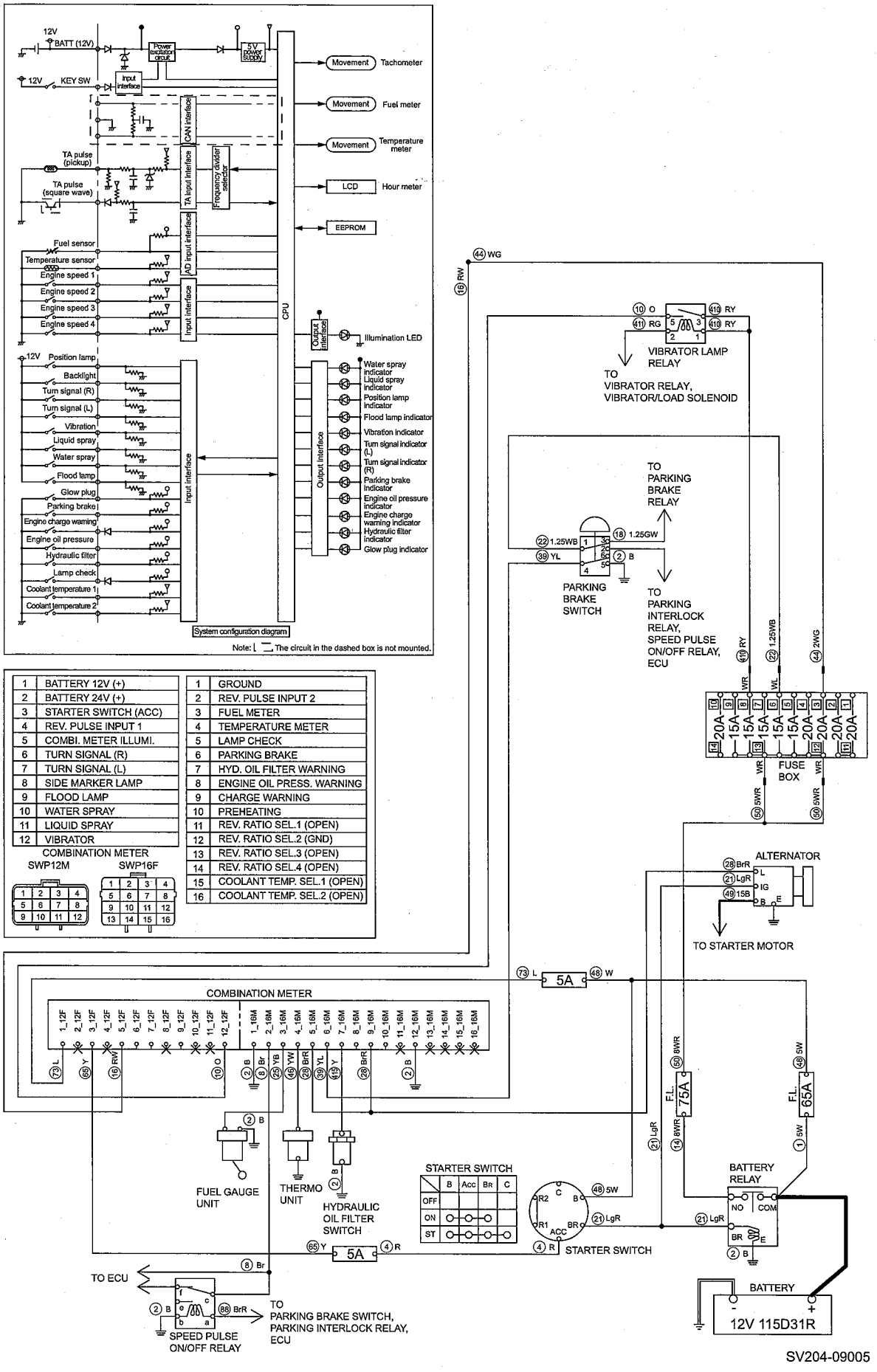
2-5-2. Vibration mode cannot be switched (F-R lever vibration switch does not work)

• Vibration mode select switch must be " " (manual mode).

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Vibration Mode Select Switch	(1) When starter switch is ON, measure voltage between vibration mode select switch terminal 1 inlet wire RY and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between vibration mode select switch terminal 2 outlet wire YR and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, vibration mode select switch is faulty.	Replace vibration mode select switch.
2. Vibrator Relay	(1) When starter switch is ON, measure voltage between vibrator relay terminal F inlet wire YR and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and F-R lever vibration switch pressed, check continuity between vibrator relay terminal H inlet wire Br and chassis ground. There is continuity in normal condition. (3) When starter switch is ON and F-R lever vibration switch pressed, check continuity between vibrator relay terminal B inlet wire RG and terminal D outlet wire B. There is continuity in normal condition. • If above items (1) and (2) are OK and item (3) is NG, vibrator relay is faulty.	Replace vibrator relay.
3. F-R Lever Vibration Switch	• Check continuity between F-R lever vibration switch terminals. • Terminal COM and terminal NC • Terminal COM and terminal NO • If continuity is made and broken when switch is operated, it is normal. If not, switch is faulty.	Replace F-R lever vibration 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.: 2-6-1



1	BATTERY 12V (+)
2	BATTERY 24V (+)
3	STARTER SWITCH (ACC)
4	REV. PULSE INPUT 1
5	COMBI. METER ILLUMI.
6	TURN SIGNAL (R)
7	TURN SIGNAL (L)
8	SIDE MARKER LAMP
9	FLOOD LAMP
10	WATER SPRAY
11	LIQUID SPRAY
12	VIBRATOR

COMBINATION METER
SWP12M

1	2	3	4
5	6	7	8
9	10	11	12

SWP16F

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1	GROUND
2	REV. PULSE INPUT 2
3	FUEL METER
4	TEMPERATURE METER
5	LAMP CHECK
6	PARKING BRAKE
7	HYD. OIL FILTER WARNING
8	ENGINE OIL PRESS. WARNING
9	CHARGE WARNING
10	PREHEATING
11	REV. RATIO SEL.1 (OPEN)
12	REV. RATIO SEL.2 (GND)
13	REV. RATIO SEL.3 (OPEN)
14	REV. RATIO SEL.4 (OPEN)
15	COOLANT TEMP. SEL.1 (OPEN)
16	COOLANT TEMP. SEL.2 (OPEN)

2-6. Lighting

Check following items before troubleshooting.

- No blown fuse and power is applied up to fuses.

2-6-1. Illumination of combination meter does not light

Reference Fig. : 2-6-1

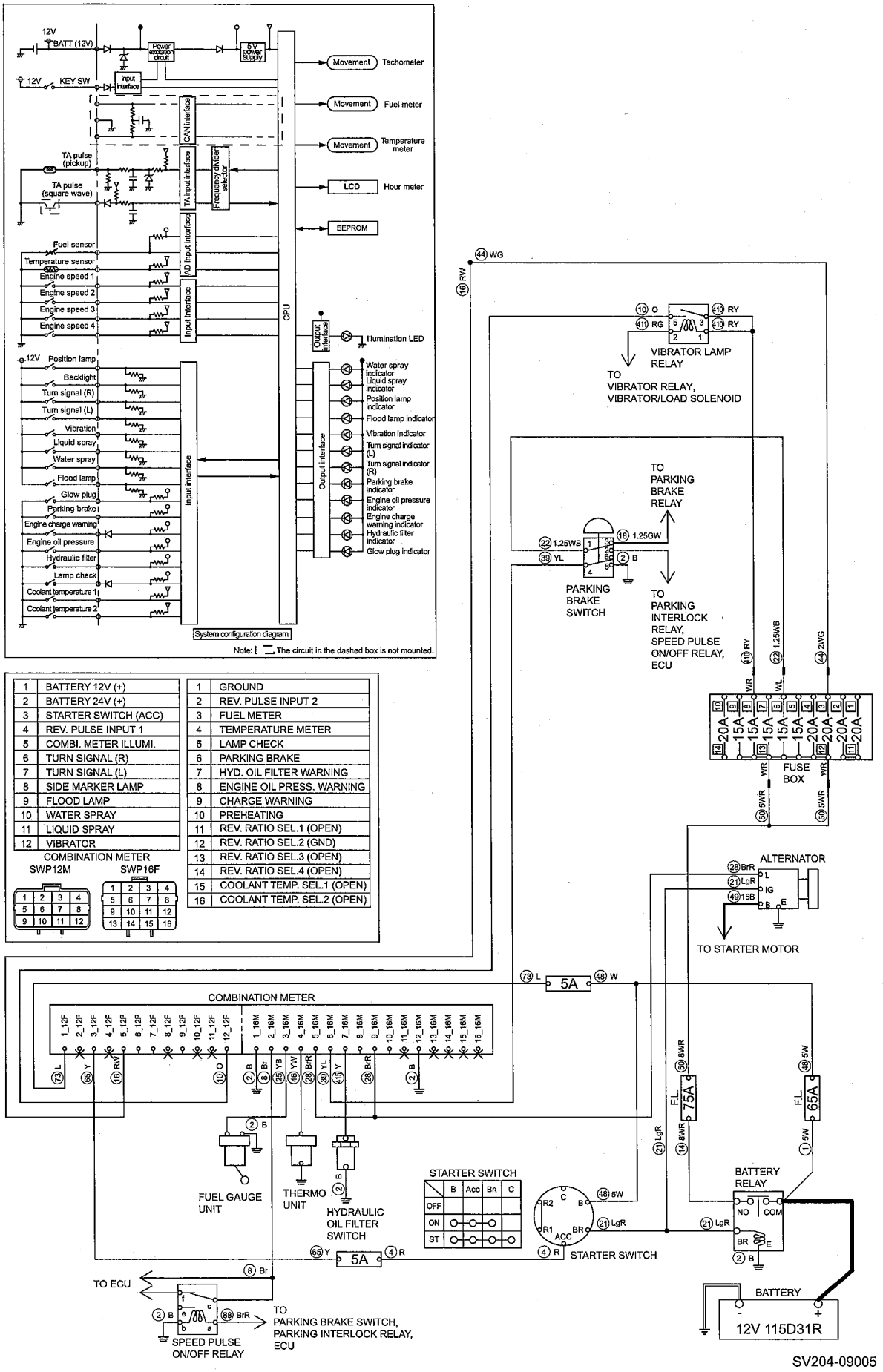
Check point	Check/Cause	Action
1. Harness	• Measure resistance between battery relay terminal NO wire WR and combination meter connector terminal wire No.16 wire RW. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Combination Meter (Combination meter illumination)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery 12 V (+) terminal wire No.73 inlet wire L and ground terminal wire No.2 wire B • Starter switch (ACC) terminal wire No.65 inlet wire Y and ground terminal wire No.2 wire B Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between combination meter illumination terminal wire No.16 inlet wire RW and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and combination meter does not turn on, combination meter is faulty.	Replace combination meter.

2-6-2. Combination meter warning lamp or indicator lamp is abnormal

Reference Fig. : 2-6-1

Check point	Check/Cause	Action
1. Combination Meter (Lamp check)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery 12 V (+) terminal wire No.73 inlet wire L and ground terminal wire No.2 wire B • Starter switch (ACC) terminal wire No.65 inlet wire Y and ground terminal wire No.2 wire B Standard voltage : 12 V or more (2) When starter switch is ON, check that parking brake indicator lamp, hydraulic oil filter warning lamp, engine 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. **(NOTICE)** • **Since engine cannot start unless parking brake switch is applied, parking brake indicator lamp does not go out even after starting engine.**	Replace combination meter.

Fig.: 2-6-1



1	BATTERY 12V (+)
2	BATTERY 24V (+)
3	STARTER SWITCH (ACC)
4	REV. PULSE INPUT 1
5	COMBI. METER ILLUMI.
6	TURN SIGNAL (R)
7	TURN SIGNAL (L)
8	SIDE MARKER LAMP
9	FLOOD LAMP
10	WATER SPRAY
11	LIQUID SPRAY
12	VIBRATOR

1	GROUND
2	REV. PULSE INPUT 2
3	FUEL METER
4	TEMPERATURE METER
5	LAMP CHECK
6	PARKING BRAKE
7	HYD. OIL FILTER WARNING
8	ENGINE OIL PRESS. WARNING
9	CHARGE WARNING
10	PREHEATING
11	REV. RATIO SEL.1 (OPEN)
12	REV. RATIO SEL.2 (GND)
13	REV. RATIO SEL.3 (OPEN)
14	REV. RATIO SEL.4 (OPEN)
15	COOLANT TEMP. SEL.1 (OPEN)
16	COOLANT TEMP. SEL.2 (OPEN)

COMBINATION METER

SWP12M

1	2	3	4
5	6	7	8
9	10	11	12

SWP16F

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

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2-6-3. Tachometer reading is abnormal

Reference Fig. : 2-6-1

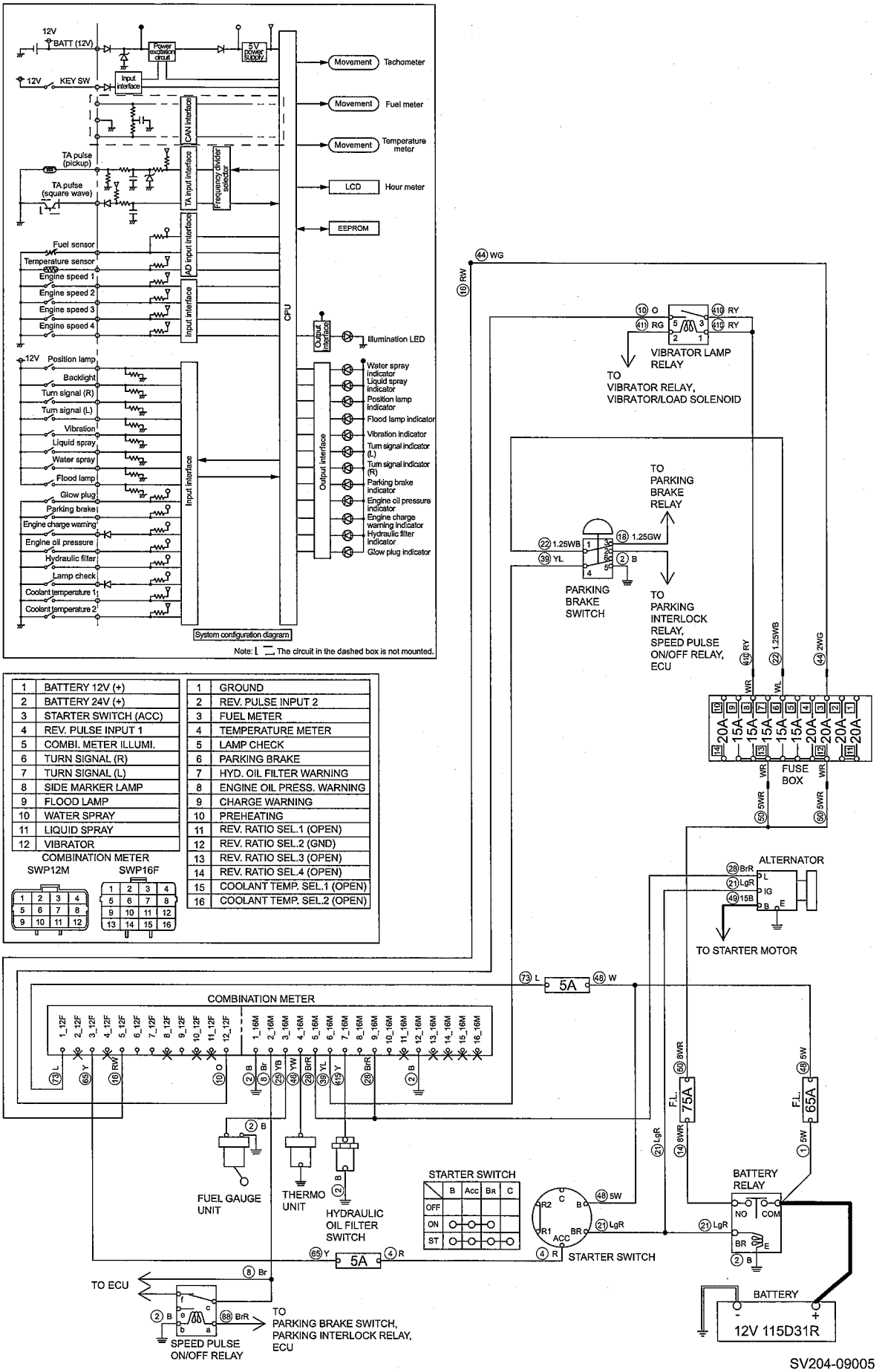
Check point	Check/Cause	Action
1. Combination Meter (Tachometer)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery 12 V (+) terminal wire No.73 inlet wire L and ground terminal wire No.2 wire B • Starter switch (ACC) terminal wire No.65 inlet wire Y and ground terminal wire No.2 wire B Standard voltage : 12 V or more (2) Check that combination meter REV. ratio SEL.2 (GND) terminal wire No.2 wire B is grounded. (3) Start engine and measure pulse between combination meter REV. pulse input.2 terminal wire No.8 wire Br and chassis ground. Standard pulse : 3 pulses/rotation of engine • If above item is OK and tachometer reading 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.

2-6-4. Hour meter is abnormal

Reference Fig. : 2-6-1

Check point	Check/Cause	Action
1. Combination Meter (Hour meter)	• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery 12 V (+) terminal wire No.73 inlet wire L and ground terminal wire No.2 wire B • Starter switch (ACC) terminal wire No.65 inlet wire Y and ground terminal wire No.2 wire B Standard voltage : 12 V or more • If no abnormality is found, combination meter is faulty.	Replace combination meter.

Fig.: 2-6-1



1	BATTERY 12V (+)
2	BATTERY 24V (+)
3	STARTER SWITCH (ACC)
4	REV. PULSE INPUT 1
5	COMBI. METER ILLUMI.
6	TURN SIGNAL (R)
7	TURN SIGNAL (L)
8	SIDE MARKER LAMP
9	FLOOD LAMP
10	WATER SPRAY
11	LIQUID SPRAY
12	VIBRATOR

COMBINATION METER

SWP12M

1	2	3	4
5	6	7	8
9	10	11	12

SWP16F

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1	GROUND
2	REV. PULSE INPUT 2
3	FUEL METER
4	TEMPERATURE METER
5	LAMP CHECK
6	PARKING BRAKE
7	HYD. OIL FILTER WARNING
8	ENGINE OIL PRESS. WARNING
9	CHARGE WARNING
10	PREHEATING
11	REV. RATIO SEL.1 (OPEN)
12	REV. RATIO SEL.2 (GND)
13	REV. RATIO SEL.3 (OPEN)
14	REV. RATIO SEL.4 (OPEN)
15	COOLANT TEMP. SEL.1 (OPEN)
16	COOLANT TEMP. SEL.2 (OPEN)

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2-6-5. Temperature meter is abnormal

Reference Fig. : 2-6-1

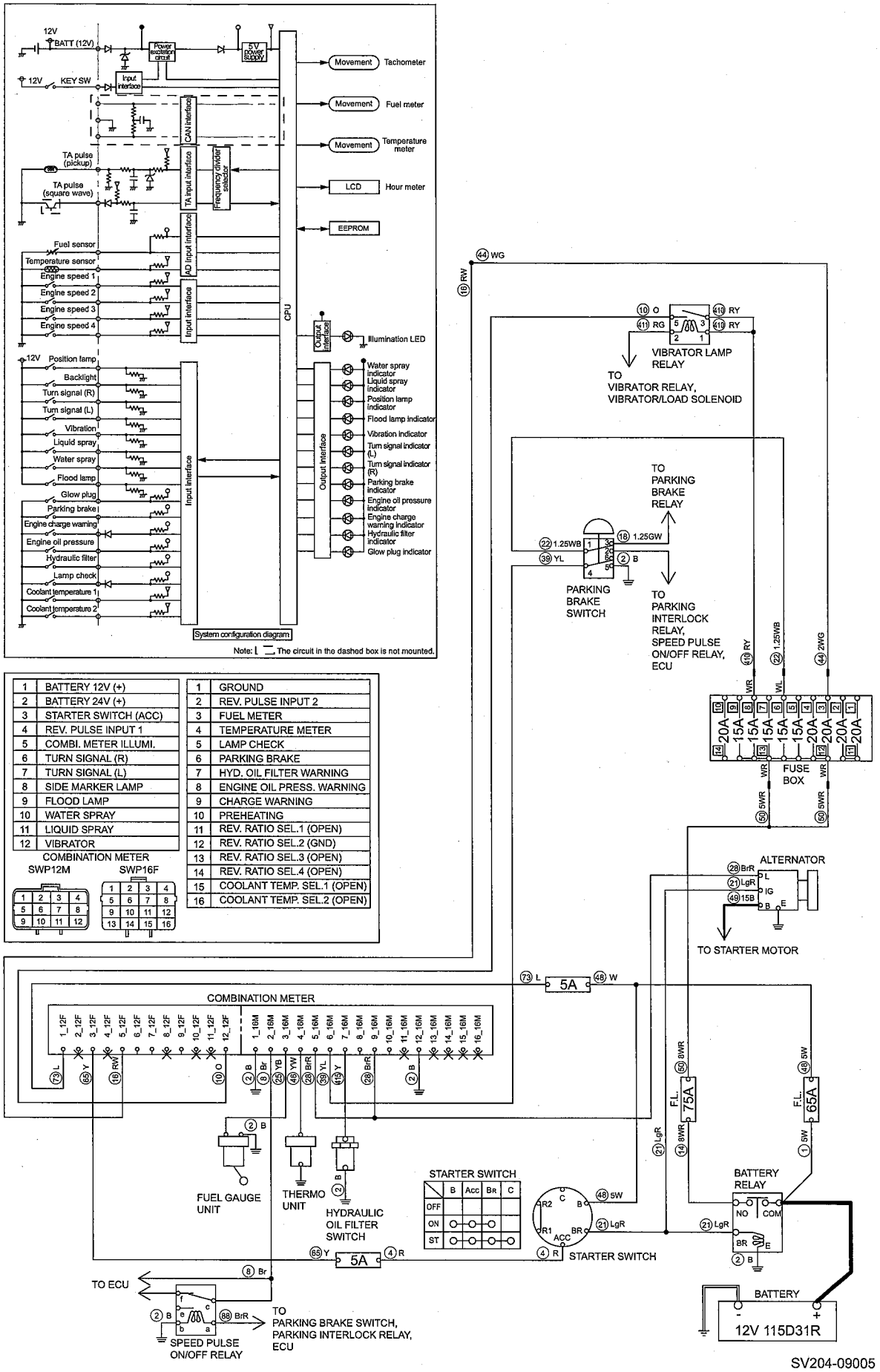
Check point	Check/Cause	Action
1. Thermo Unit	• Disconnect harness and measure resistance of thermo unit. Standard resistance : 164.6 Ω (at unit temperature of 50°C) 26.44 Ω (at unit temperature of 103°C) • If resistance is abnormal, thermo unit is faulty.	Replace thermo unit.
2. Combination Meter (Temperature meter)	• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery 12 V (+) terminal wire No.73 inlet wire L and ground terminal wire No.2 wire B • Starter switch (ACC) terminal wire No.65 inlet wire Y and ground terminal wire No.2 wire B Standard voltage : 12 V or more • If no abnormality is found, combination meter is faulty.	Replace combination meter.
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

2-6-6. Fuel meter is abnormal

Reference Fig. : 2-6-1

Check point	Check/Cause	Action
1. Fuel Gauge Unit	• Disconnect harness and measure resistance of fuel gauge unit. Standard resistance : 13.5 Ω (with float in "F") 80.0 Ω (with float in "E") • If resistance is abnormal, fuel gauge unit is faulty.	Replace fuel gauge unit.
2. Combination Meter (Fuel meter)	• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery 12 V (+) terminal wire No.73 inlet wire L and ground terminal wire No.2 wire B. • Starter switch (ACC) terminal wire No.65 inlet wire Y and ground terminal wire No.2 wire B. Standard voltage : 12 V or more • If no abnormality is found, combination meter is faulty.	Replace combination meter.
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-6-1



1	BATTERY 12V (+)
2	BATTERY 24V (+)
3	STARTER SWITCH (ACC)
4	REV. PULSE INPUT 1
5	COMBI. METER ILLUMI.
6	TURN SIGNAL (R)
7	TURN SIGNAL (L)
8	SIDE MARKER LAMP
9	FLOOD LAMP
10	WATER SPRAY
11	LIQUID SPRAY
12	VIBRATOR

COMBINATION METER

SWP12M

1	2	3	4
5	6	7	8
9	10	11	12

SWP16F

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1	GROUND
2	REV. PULSE INPUT 2
3	FUEL METER
4	TEMPERATURE METER
5	LAMP CHECK
6	PARKING BRAKE
7	HYD. OIL FILTER WARNING
8	ENGINE OIL PRESS. WARNING
9	CHARGE WARNING
10	PREHEATING
11	REV. RATIO SEL.1 (OPEN)
12	REV. RATIO SEL.2 (GND)
13	REV. RATIO SEL.3 (OPEN)
14	REV. RATIO SEL.4 (OPEN)
15	COOLANT TEMP. SEL.1 (OPEN)
16	COOLANT TEMP. SEL.2 (OPEN)

2-6-7. Hydraulic oil filter warning lamp remains ON

Reference Fig. : 2-6-1

Check point	Check/Cause	Action

1. Harness	• Disconnect connectors between combination meter and hydraulic oil filter switch.
	• Measure resistance between terminals and chassis ground.
	  • Hydraulic oil filter switch terminal wire Y and chassis ground.
	  • Combination meter connector terminal wire No.415 wire Y and chassis ground.
	  Standard resistance : 100k Ω or more
	• If resistance is abnormal, harness is faulty.
		Repair or replace harness.

2. Hydraulic Oil Filter Switch	• When starter switch is OFF, check continuity between hydraulic oil filter switch inlet terminal wire Y 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.

3. Combination Meter (Hydraulic oil filter warning)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.
	  • Battery 12 V (+) terminal wire No.73 inlet wire L and ground terminal wire No.2 wire B.
	  • Starter switch (ACC) terminal wire No.65 inlet wire Y and ground terminal wire No.2 wire B.
	  Standard voltage : 12 V or more
	(2) When starter switch is ON, measure voltage between combination meter hydraulic oil filter warning terminal outlet wire No.415 wire Y and chassis ground.
	  Standard voltage : 12 V or more
	• If above items (1) and (2) are OK but hydraulic oil filter warning lamp remains on after starting engine, combination meter is faulty.
		Replace combination meter.

2-6-8. Charge warning lamp remains ON

• Check with engine running.

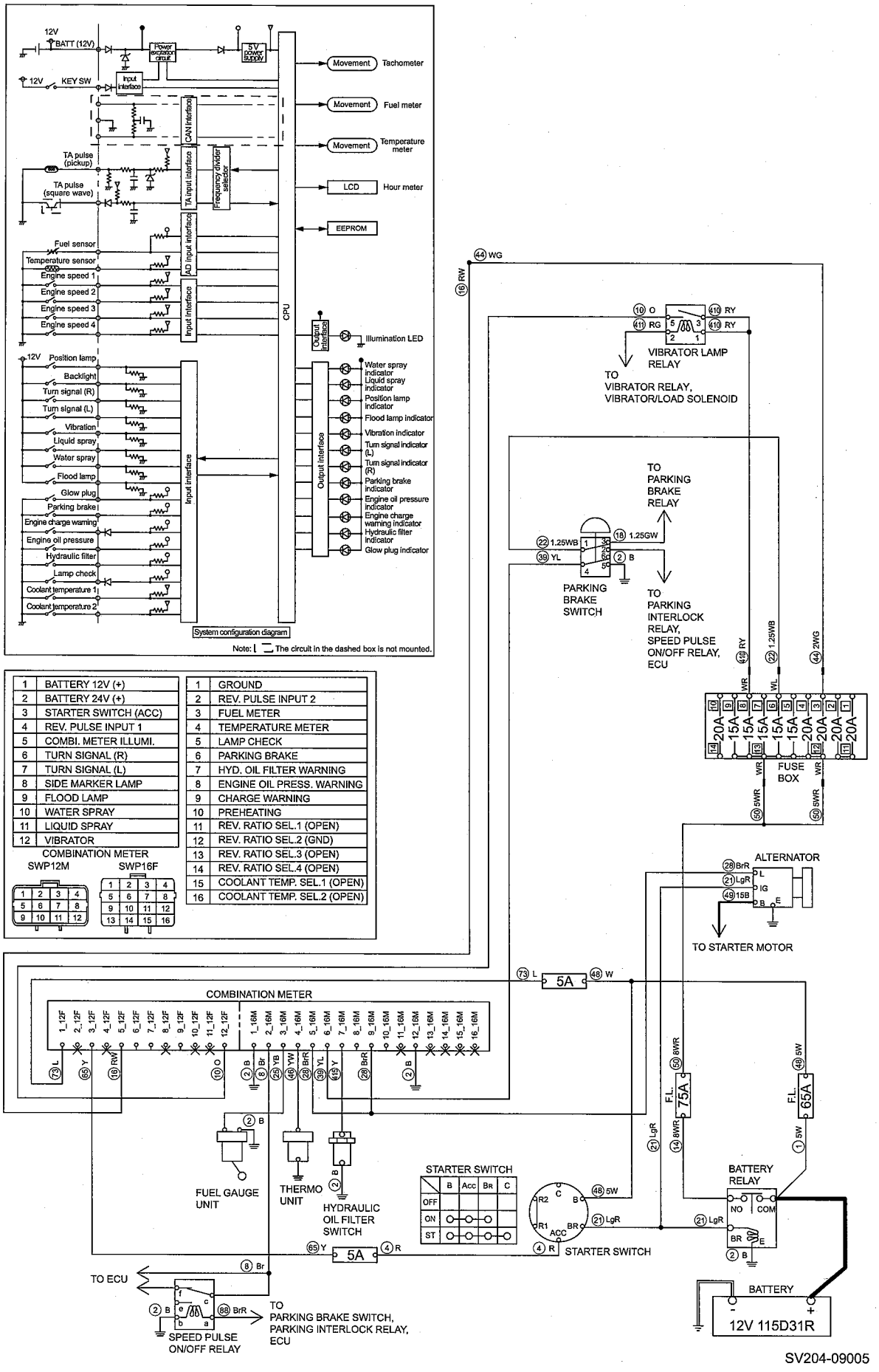
Reference Fig. : 2-6-1

Check point	Check/Cause	Action

1. Harness	• Disconnect connectors between combination meter and alternator terminal L.
	• Measure resistance between terminals and chassis ground.
	  • Combination meter connector terminal wire No.28 wire BrR and chassis ground.
	  • Alternator terminal L wire BrR and chassis ground
	  Standard resistance : 100k Ω or more
	• If resistance is abnormal, harness is faulty.
		Repair or replace harness.

2. Combination Meter (Charge warning lamp)	• Measure voltage between combination meter charge warning terminal wire No.28 outlet wire BrR and chassis ground. Standard voltage : 12 V or more • If no abnormality is found, combination meter is faulty.	Replace combination meter.

Fig.: 2-6-1


12V
BATT (12V)
Power accessory circuit
5 V power supply
12V
KEY SW
Input interface
CAN interface
TA pulse (pickup)
TA pulse (square wave)
TA input interface
Frequency divider selector
AD input interface
Input interface
CPU
Output interface
Movement
Tachometer
Movement
Fuel meter
Movement
Temperature meter
LCD
Hour meter
EEPROM
Fuel sensor
Temperature sensor
Engine speed 1
Engine speed 2
Engine speed 3
Engine speed 4
Illumination LED
12V
Position lamp
Backlight
Turn signal (R)
Turn signal (L)
Vibration
Liquid spray
Water spray
Flood lamp
Glow plug
Parking brake
Engine charge warning
Engine oil pressure
Hydraulic filter
Lamp check
Coolant temperature 1
Coolant temperature 2
Input interface
Water spray indicator
Liquid spray indicator
Position lamp indicator
Flood lamp indicator
Vibration indicator
Turn signal indicator (L)
Turn signal indicator (R)
Parking brake indicator
Engine oil pressure indicator
Engine charge warning indicator
Hydraulic filter indicator
Glow plug indicator
Output interface
System configuration diagram
Note: The circuit in the dashed box is not mounted.
1 BATTERY 12V (+)
2 BATTERY 24V (+)
3 STARTER SWITCH (ACC)
4 REV. PULSE INPUT 1
5 COMBI. METER ILLUMI.
6 TURN SIGNAL (R)
7 TURN SIGNAL (L)
8 SIDE MARKER LAMP
9 FLOOD LAMP
10 WATER SPRAY
11 LIQUID SPRAY
12 VIBRATOR
COMBINATION METER
SWP12M
SWP16F
1 GROUND
2 REV. PULSE INPUT 2
3 FUEL METER
4 TEMPERATURE METER
5 LAMP CHECK
6 PARKING BRAKE
7 HYD. OIL FILTER WARNING
8 ENGINE OIL PRESS. WARNING
9 CHARGE WARNING
10 PREHEATING
11 REV. RATIO SEL.1 (OPEN)
12 REV. RATIO SEL.2 (GND)
13 REV. RATIO SEL.3 (OPEN)
14 REV. RATIO SEL.4 (OPEN)
15 COOLANT TEMP. SEL.1 (OPEN)
16 COOLANT TEMP. SEL.2 (OPEN)
44 WG
16 RW
10 O
410 RY
411 RG
410 RY
VIBRATOR LAMP RELAY
TO VIBRATOR RELAY, VIBRATOR/LOAD SOLENOID
TO PARKING BRAKE RELAY
22 1.25WB
18 1.25GW
39 YL
2 B
PARKING BRAKE SWITCH
TO PARKING INTERLOCK RELAY, SPEED PULSE ON/OFF RELAY, ECU
410 RY
22 1.25WB
44 2WG
WR
WL
20A
15A
15A
15A
15A
20A
20A
20A
20A
FUSE BOX
50 5WR
50 5WR
ALTERNATOR
28 BrR
21 LgR
49 15B
L
IG
E
B
TO STARTER MOTOR
73 L
5A
48 W
COMBINATION METER
1_12F
2_12F
3_12F
4_12F
5_12F
6_12F
7_12F
8_12F
9_12F
10_12F
11_12F
12_12F
1_16M
2_16M
3_16M
4_16M
5_16M
6_16M
7_16M
8_16M
9_16M
10_16M
11_16M
12_16M
13_16M
14_16M
15_16M
16_16M
73 L
65 Y
16 RW
10 O
2 B
8 Br
25 YB
46 YW
28 BrR
39 YL
15 Y
28 BrR
2 B
2 B
FUEL GAUGE UNIT
THERMO UNIT
2 B
HYDRAULIC OIL FILTER SWITCH
STARTER SWITCH
B
Acc
Br
C
OFF
ON
ST
R2
R1
C
B
ACC
BR
48 5W
21 LgR
4 R
STARTER SWITCH
50 8WR
F.L. 75A
14 8WR
21 LgR
48 5W
F.L. 65A
1 5W
BATTERY RELAY
NO
COM
BR
E
2 B
65 Y
5A
4 R
8 Br
TO ECU
2 B
88 BrR
TO PARKING BRAKE SWITCH, PARKING INTERLOCK RELAY, ECU
SPEED PULSE ON/OFF RELAY
BATTERY
-
+
12V 115D31R
SV204-09005

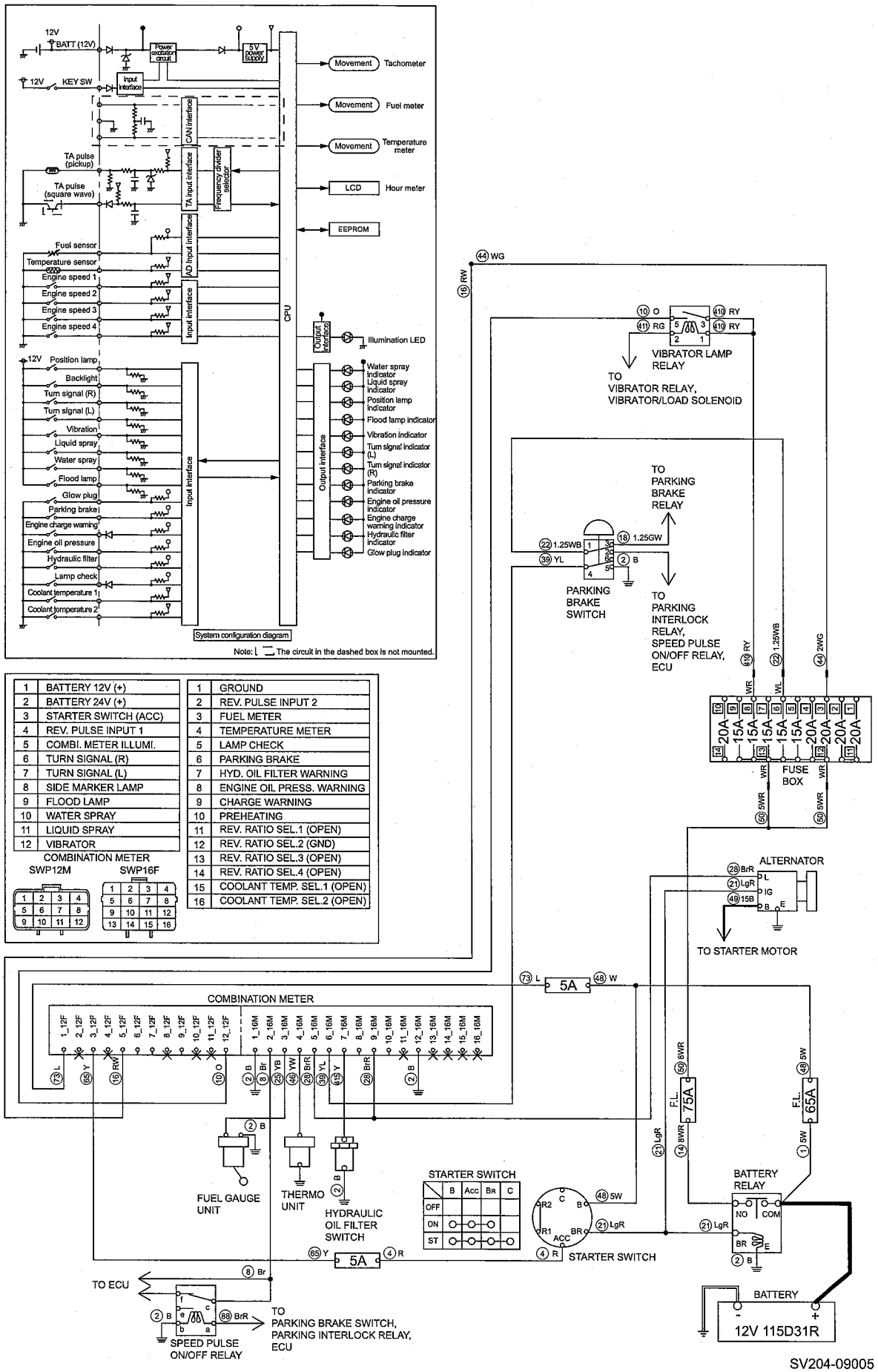
2-6-9. Vibration indicator lamp does not light

• Check that vibrator can be operated.

Reference Fig. : 2-6-1

Check point	Check/Cause	Action
1. Harness	• Measure resistance between vibrator lamp relay terminal 5 wire O and combination meter connector terminal wire No.10 wire O. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Vibrator Lamp Relay	(1) When starter switch is ON, measure voltage between vibrator lamp relay terminal 1 and 3 inlet wire RY and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between vibrator lamp relay terminal 5 outlet wire O and chassis ground. Standard voltage : 12 V or more • If above item (1) is OK and item (2) is NG, vibrator lamp relay is faulty.	Replace vibrator lamp relay.
3. Combination Meter (Vibration indicator lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery 12 V (+) terminal wire No.73 inlet wire L and ground terminal wire No.2 wire B • Starter switch (ACC) terminal wire No.65 inlet wire Y and ground terminal wire No.2 wire B Standard voltage : 12 V or more (2) When starter switch is ON, measure voltage between combination meter vibration terminal wire No.10 inlet wire O and chassis ground. Standard voltage : 12 V or more • If above items (1) and (2) are OK and vibration indicator lamp does not light, combination meter is faulty.	Replace combination meter.

Fig.: 2-6-1

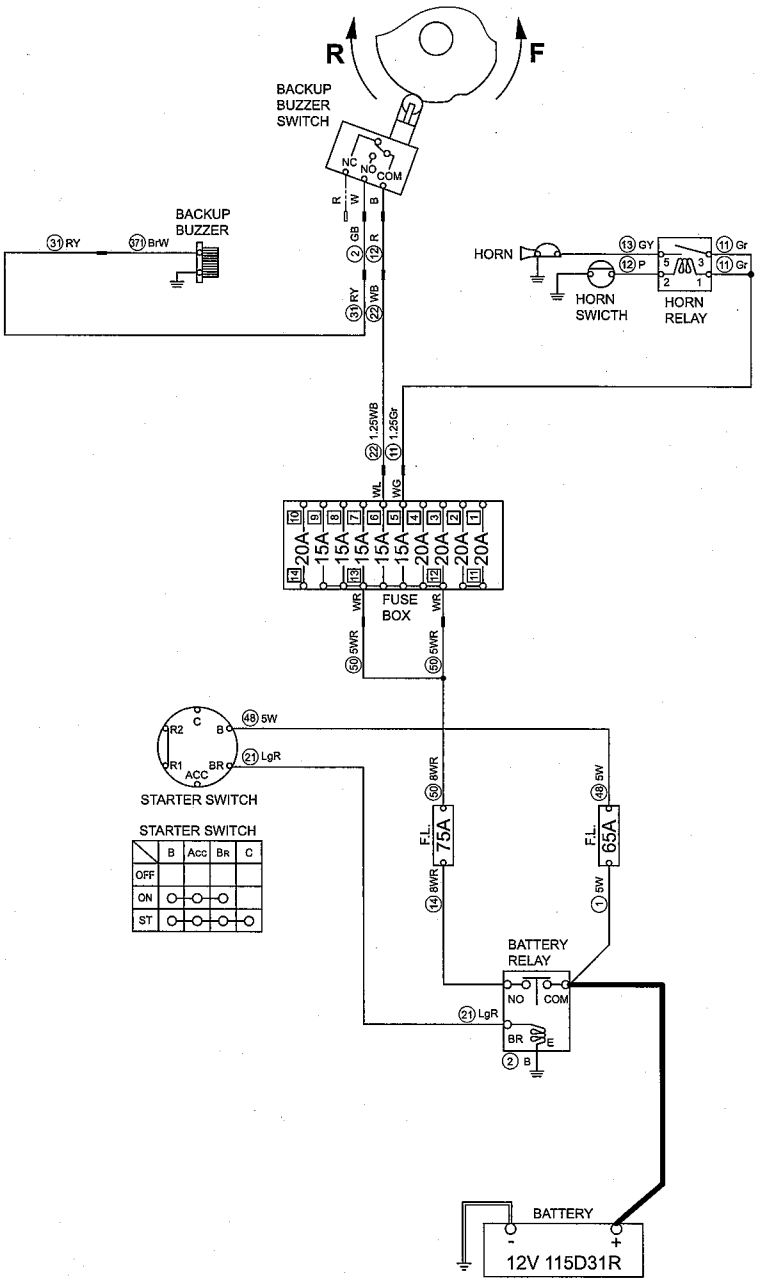

12V
BATT (12V)
Power source circuit
5 V power supply
12V
KEY SW
Input interface
CAN interface
TA pulse (pickup)
TA pulse (square wave)
TA input interface
Frequency divider selector
Movement
Tachometer
Movement
Fuel meter
Movement
Temperature meter
LCD
Hour meter
EEPROM
Fuel sensor
Temperature sensor
Engine speed 1
Engine speed 2
Engine speed 3
Engine speed 4
AD input interface
Input interface
CPU
Output interface
Illumination LED
12V
Position lamp
Backlight
Turn signal (R)
Turn signal (L)
Vibration
Liquid spray
Water spray
Flood lamp
Glow plug
Parking brake
Engine charge warning
Engine oil pressure
Hydraulic filter
Lamp check
Coolant temperature 1
Coolant temperature 2
Input interface
Output interface
Water spray indicator
Liquid spray indicator
Position lamp indicator
Flood lamp indicator
Vibration indicator
Turn signal indicator (L)
Turn signal indicator (R)
Parking brake indicator
Engine oil pressure indicator
Engine charge warning indicator
Hydraulic filter indicator
Glow plug indicator
System configuration diagram
Note: The circuit in the dashed box is not mounted.
44 WG
16 RW
10 O
411 RG
410 RY
410 RY
VIBRATOR LAMP RELAY
TO VIBRATOR RELAY, VIBRATOR/LOAD SOLENOID
TO PARKING BRAKE RELAY
22 1.25WB
39 YL
18 1.25GW
2 B
PARKING BRAKE SWITCH
TO PARKING INTERLOCK RELAY, SPEED PULSE ON/OFF RELAY, ECU
410 RY
22 1.25WB
44 2WG
WR
WL
20A
15A
FUSE BOX
50 5WR
50 5WR
ALTERNATOR
28 BrR
21 LgR
49 15B
L
IG
B
E
TO STARTER MOTOR
73 L
5A
48 W
COMBINATION METER
1 BATTERY 12V (+)
2 BATTERY 24V (+)
3 STARTER SWITCH (ACC)
4 REV. PULSE INPUT 1
5 COMBI. METER ILLUMI.
6 TURN SIGNAL (R)
7 TURN SIGNAL (L)
8 SIDE MARKER LAMP
9 FLOOD LAMP
10 WATER SPRAY
11 LIQUID SPRAY
12 VIBRATOR
1 GROUND
2 REV. PULSE INPUT 2
3 FUEL METER
4 TEMPERATURE METER
5 LAMP CHECK
6 PARKING BRAKE
7 HYD. OIL FILTER WARNING
8 ENGINE OIL PRESS. WARNING
9 CHARGE WARNING
10 PREHEATING
11 REV. RATIO SEL.1 (OPEN)
12 REV. RATIO SEL.2 (GND)
13 REV. RATIO SEL.3 (OPEN)
14 REV. RATIO SEL.4 (OPEN)
15 COOLANT TEMP. SEL.1 (OPEN)
16 COOLANT TEMP. SEL.2 (OPEN)
COMBINATION METER
SWP12M
SWP16F
COMBINATION METER
1_12F
2_12F
3_12F
4_12F
5_12F
6_12F
7_12F
8_12F
9_12F
10_12F
11_12F
12_12F
1_16M
2_16M
3_16M
4_16M
5_16M
6_16M
7_16M
8_16M
9_16M
10_16M
11_16M
12_16M
13_16M
14_16M
15_16M
16_16M
73 L
65 Y
16 RW
10 O
2 B
8 Br
25 YB
46 YW
28 BrR
39 YL
15 Y
28 BrR
2 B
2 B
FUEL GAUGE UNIT
THERMO UNIT
2 B
HYDRAULIC OIL FILTER SWITCH
STARTER SWITCH
B
Acc
Br
C
OFF
ON
ST
48 5W
R2
C
B
R1
BR
ACC
21 LgR
4 R
STARTER SWITCH
65 Y
5A
4 R
8 Br
TO ECU
2 B
88 BrR
TO PARKING BRAKE SWITCH, PARKING INTERLOCK RELAY, ECU
SPEED PULSE ON/OFF RELAY
50 8WR
F.L.
75A
48 5W
F.L.
65A
21 LgR
14 8WR
1 5W
21 LgR
BATTERY RELAY
NO
COM
BR
E
2 B
BATTERY
-
+
12V 115D31R
SV204-09005

2-6-10. Parking brake indicator lamp does not light

Reference Fig. : 2-6-1

Check point	Check/Cause	Action
1. Harness	• Measure resistance between parking brake switch terminal 4 wire YL and combination meter connector terminal wire No.39 wire YL. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Parking Brake Switch	• When parking brake switch is applied, check continuity between parking brake switch terminal 4 wire YL and terminal 5 wire B. There is continuity in normal condition. • If there is no continuity, parking brake switch is faulty.	Replace parking brake switch.
3. Combination Meter (Parking brake indicator lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery 12 V (+) terminal wire No.73 inlet wire L and ground terminal wire No.2 wire B • Starter switch (ACC) terminal wire No.65 inlet wire Y and ground terminal wire No.2 wire B Standard voltage : 12 V or more (2) When parking brake switch is applied and starter switch is ON, check continuity between combination meter parking brake terminal wire No.39 inlet wire YL and chassis ground. There is continuity in normal condition. • If above items (1) and (2) are OK and parking brake indicator lamp does not light, combination meter is faulty.	Replace combination meter.

Fig.: 2-6-2



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2-6-11. Horn does not sound

Reference Fig. : 2-6-2

Check point	Check/Cause	Action
1. Horn	• Disconnect horn and directly connect battery positive terminal to horn terminal wire GY 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, measure voltage between horn relay terminal 1 and 3 inlet wire Gr and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and horn switch pressed, measure voltage between horn relay terminal 5 outlet wire GY 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 ON, check continuity between horn switch terminals. There is continuity in normal condition. • If there is no continuity, 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.

2-6-12. Backup buzzer does not sound

Reference Fig. : 2-6-2

Check point	Check/Cause	Action
1. Backup Buzzer	• Disconnect backup buzzer and directly connect battery positive terminal to backup buzzer terminal wire BrW 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 R and chassis ground. Standard voltage : 12 V or more (2) When starter switch is ON and F-R lever is "R" , measure voltage between backup buzzer switch terminal NO outlet wire GB 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 System

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

(NOTICE)

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

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

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Bypass Valve	Bypass valve is open.	Close bypass valve.
3. F-R Lever Linkage	F-R lever linkage is faulty.	Check and adjust F-R lever linkage or replace it if necessary.
4. 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.
	Insufficient charge pump discharge.	Repair charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Parking brake solenoid valve	• When solenoid is energized, check if oil flows in return circuit to tank. • If oil is flowing, repair solenoid valve or replace it if necessary.
5. Hydraulic Oil Filter	Charge pump flow is reduced due to clogged filter.	Clean hydraulic oil filter or replace it if necessary.
6. Propulsion Circuit Pressure	Circuit does not obtain required pressure because setting pressure of high pressure relief is low.	• Measure propulsion circuit pressure. • If low, inspect high pressure relief valve or replace it if necessary.
7. Propulsion Motor	Propulsion circuit pressure is not held in propulsion motor case.	• Measure propulsion motor case pressure. • If case pressure is not within allowable pressure, repair propulsion motor or replace it if necessary.
	Internal leakage of propulsion motor.	• Measure drain quantity from propulsion motor. • If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary.
8. Propulsion Pump	Discharge flow rate is insufficient due to efficiency degradation of propulsion pump.	• Measure discharge flow rate of propulsion pump with flow meter. • If discharge flow rate is not within specified range, repair propulsion pump or replace it if necessary.
	Discharge flow rate is insufficient due to wear of propulsion pump drive shaft splines.	Replace propulsion pump.
	Propulsion circuit pressure is not held in propulsion pump case.	• Measure propulsion pump case pressure. • If case pressure is not within allowable pressure, repair propulsion pump or replace it if necessary.
9. Parking Brake Solenoid Valve	Brake remains applied because spool of parking brake solenoid valve does not shift.	Repair parking brake solenoid valve or replace it if necessary.

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

Check point	Cause	Check/Action
10. Brake Inlet Pressure	Brake cannot be released because brake inlet pressure is low.	• Measure brake release pressure. • If low, repair or replace rear axle.
11. Rear Axle	Sticking of disc brakes causes brakes to remain applied.	Replace disc brakes.
12. Flange	Drive torque is not transmitted to pump due to faulty flange.	Replace flange.

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

Check point	Cause	Check/Action
1. 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 of high pressure relief valve.	• Interchange two high pressure relief valves. • If faulty condition is accordingly reversed, inspect high pressure relief valve or replace it if necessary.

3-2-3. Slow machine speed or small drive force 1/2

Check point	Cause	Check/Action
1. Bypass Valve	Bypass valve is slightly open.	Close bypass valve completely.
2. 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 charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Parking brake solenoid valve	• When solenoid is energized, check if oil flows in return circuit to tank. • If oil is flowing, repair solenoid valve or replace it if necessary.
4. Hydraulic Oil Filter	Flow rate of charge pump decreases as well as charge pressure decreases due to clogged filter.	Clean hydraulic oil filter or replace it if necessary.
5. Propulsion Motor	Propulsion motor inlet pressure is low.	• Measure propulsion motor inlet pressure. • If low, inspect high pressure relief valve or replace it if necessary.
	Propulsion circuit pressure is not held in propulsion motor case.	• Measure propulsion motor case pressure. • If case pressure is not within allowable pressure, repair propulsion motor or replace it if necessary.
	Output of propulsion motor decreases and number of revolutions decreases due to internal leakage of propulsion motor.	• Measure drain quantity from propulsion motor. • If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary.

3-2-3. Slow machine speed or small drive force 2/2

Check point	Cause	Check/Action
6. Propulsion Pump	Discharge flow rate is insufficient due to efficiency degradation of propulsion pump.	• Measure discharge flow rate of propulsion pump with flow meter. • If discharge flow rate is not within specified range, repair propulsion pump or replace it if necessary.
	Discharge flow rate is insufficient due to wear of propulsion pump drive shaft splines.	Replace propulsion pump.
	Propulsion circuit pressure is not held in propulsion pump case.	• Measure propulsion pump case pressure. • If case pressure is not within allowable pressure, repair propulsion pump or replace it if necessary.

3-2-4. Machine does not stop completely with F-R lever in "N"

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. Servo Control Valve	Servo control valve neutral position adjustment failure.	Check and adjust servo control valve or replace it if necessary.
3. 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. Propulsion Circuit Pressure	If circuit pressure setting is excessively low, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	• Measure propulsion circuit pressure. • If low, inspect relief valve or replace it if necessary.
	If load is excessively heavy, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	• Measure propulsion circuit pressure. • If high, decrease propulsion load.
4. Hydraulic Oil Filter	Load of charge pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean hydraulic oil filter or replace it if necessary.
	Charge circuit pressure increases due to clogged filter.	Clean hydraulic oil filter or replace it if necessary.

3-2-6. Abnormal noise from propulsion system

Check point	Cause	Check/Action
1. Roller Bearings	Roller bearings supporting front drum are damaged.	Replace roller bearings.
2. Gear box (F)	Reduction gear of gear box is damaged.	Replace reduction gear.
3. Rear Axle	Rear axle gear is damaged.	Replace rear axle gear.
4. 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.
5. Hydraulic Oil Filter	Cavitation is occurring in charge pump due to clogged filter.	Clean hydraulic oil filter or replace it if necessary.
6. 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.
7. 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	Vibrator pump flow is reduced due to clogged filler.	Clean suction filter or replace it if necessary.
3. Vibrator Solenoid Valve	Vibrator pump cannot discharge oil because spool of vibrator solenoid valve does not shift.	Repair vibrator solenoid valve or replace it if necessary.
4. 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.
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.

3-3-2. 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 Circuit Pressure	Circuit does not obtain required pressure because setting pressure of relief valve is low.	• Measure vibrator circuit pressure. • If low, check relief valve or replace it if necessary.
3. Suction Filter for Vibrator Pump	Flow rate of vibrator pump decreases as well as pressure decreases due to clogged filter.	Clean suction filter or replace it if necessary.
4. 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	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.

3-3-3. Vibrator does not stop

Check point	Cause	Check/Action
Vibrator Solenoid Valve	Vibrator solenoid valve spool does not return to neutral position.	Repair vibrator solenoid valve or replace it if necessary.

3-3-4. 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 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.

3-3-5. 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 System

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

(NOTICE)

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

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

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Orbitrol	Relief valve is open or setting pressure is low.	• Measure steering circuit pressure. • 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 Cylinder	Cylinder thrust decreases due to 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.
6. 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, inspect 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. Steering Circuit Pressure	If circuit pressure setting is excessively low, relief valve is open, causing temperature of hydraulic oil in circuit to rise.	• Measure steering circuit pressure. • If low, replace relief valve.
	If load is excessively heavy, relief valve is open, causing temperature of hydraulic oil in circuit to rise.	• Measure steering circuit pressure. • If high, decrease steering load.
3. 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. 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.

3-5. Blade (SV204TB)

If a problem occurs in the blade control system, 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.**

3-5-1. Blade up/down operation not possible

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. Blade Circuit Pressure	Circuit does not obtain required pressure because setting pressure of stack valve relief valve is low.	• Measure blade circuit pressure. • If low, inspect stack valve relief valve or replace it if necessary.
3. Stack Valve	Blade cylinder does not operate because stack valve spool does not change.	If stack valve lever does not move, check and clean spool, or replace stack valve.
4. Blade Cylinder	Cylinder thrust decreases due to internal leakage of blade cylinder.	Repair blade cylinder or replace it if necessary.
5. Suction Filter for Steering Pump (also used for blade circuit)	Steering pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
6. Steering Pump (also used for blade circuit)	Discharging pressure is insufficient due to efficiency degradation of steering pump.	• Measure the steering circuit pressure. • If low, replace steering pump.

3-5-2. Blade movement is slow or force is small

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. Stack Valve	Oil bypassing because relief valve is open.	• Measure blade circuit pressure. • If low, inspect relief valve or replace it if necessary.
3. Blade Cylinder	Internal leakage of blade cylinder	Repair blade cylinder or replace it if necessary.
4. Suction Filter for Steering Pump (also used for blade circuit)	Steering pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
5. Steering Pump (also used for blade circuit)	Discharge rate is insufficient due to efficiency degradation of steering pump.	• Measure the steering circuit pressure. • If low, replace steering pump.

3-5-3. Blade floating operation not possible

Check point	Cause	Check/Action
Stack Valve	Blade floating operation is not possible because stack valve spool does not change.	If stack valve lever does not move, check and clean spool, or replace stack valve.

3-5-4. Blade hydraulic 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. Blade Circuit Setting Pressure	If circuit pressure setting is excessively low, relief valve is open, causing temperature of hydraulic oil in circuit to rise.	• Measure blade 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 blade circuit pressure. • If high, decrease blade load.
3. Suction Filter for Steering Pump (also used for blade circuit)	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.

3-5-5. Abnormal noise from blade hydraulic 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 the blade system circuit.	Fill tank until the correct oil level is obtained.
2. Blade 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 (also used for blade circuit)	Cavitation results at steering pump due to clogged filter.	Clean suction filter or replace it if necessary.

SV204

SHOP MANUAL

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