SV544

SHOP MANUAL

SAKAI®

3498-6418C-1

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.

CONTENTS

3. ENGINE AND CONTROLS

4. HYDRAULIC SYSTEMS

5. ELECTRICAL SYSTEM

6. VIBRATORY DRUM • REAR AXLE

7. BRAKE

8. INSPECTION AND ADJUSTMENT

9. TROUBLESHOOTING

10. CABIN

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.

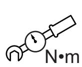
⚠WARNING: Indicates a potentially hazardous situation or condition which if not avoided can result in serious personal injury or death.

⚠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.

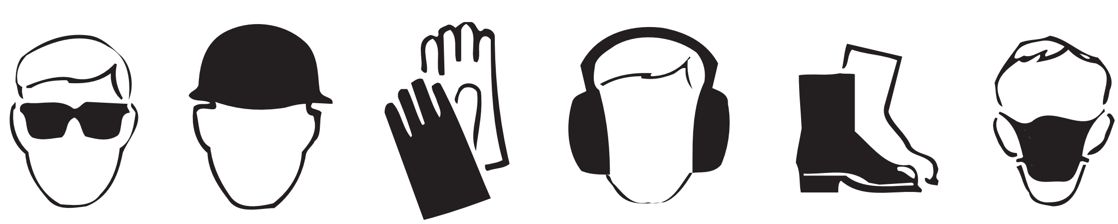
- The machine is designed specifically for the compaction of asphalt or soil road construction materials. Use of the machine for other purposes such as towing other equipment is considered contrary to the designated use. The manufacturer cannot be responsible or held liable for any damage resulting from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

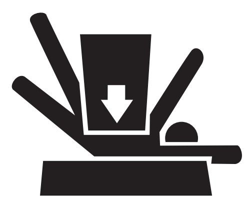
- Always park the machine in a safe area on solid and level ground. If this is not possible, always park at a right angle to the slope and block the drums or tires.
- Do not leave the operator's platform with the engine running. Always move the travel lever to neutral position and apply the parking brake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

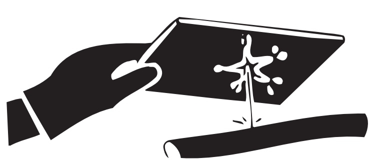


- Always use the proper tools and workshop equipment in good condition when performing maintenance or repairs on the machine.

- 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.

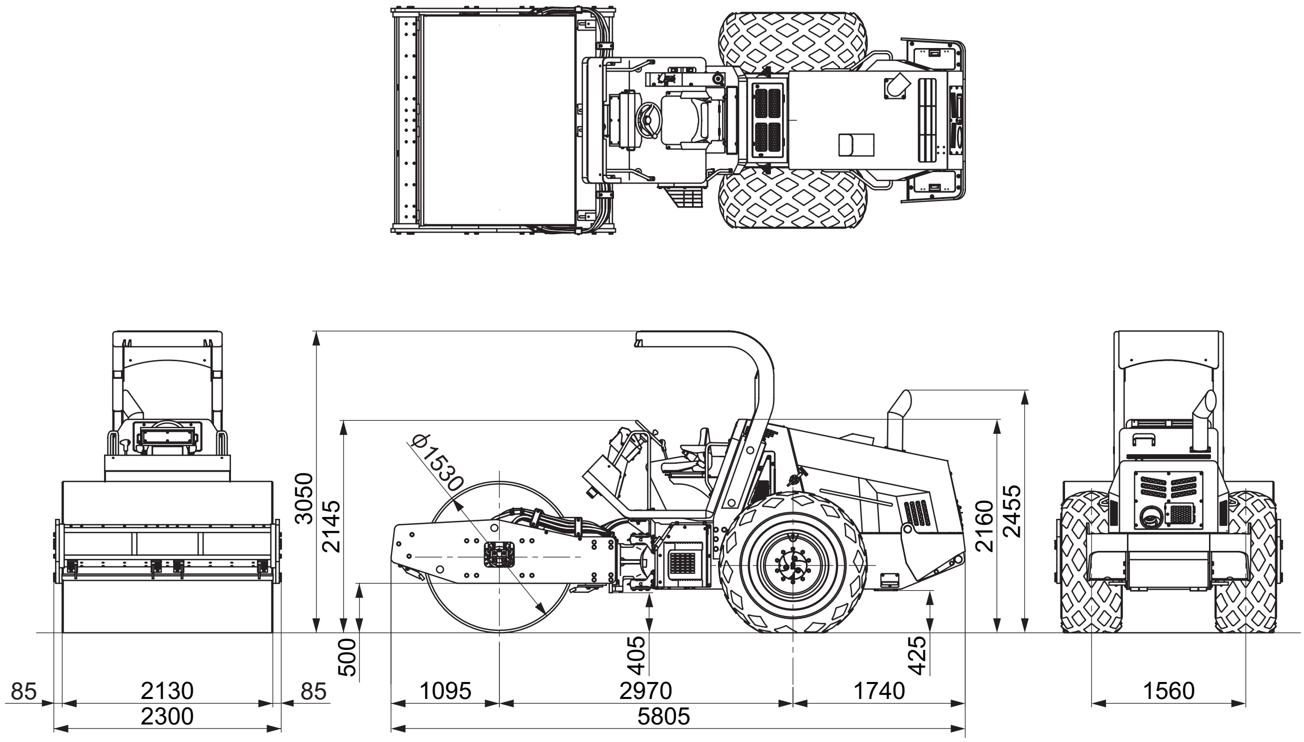
1-11. Transporting the Machine

- 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. SV544D

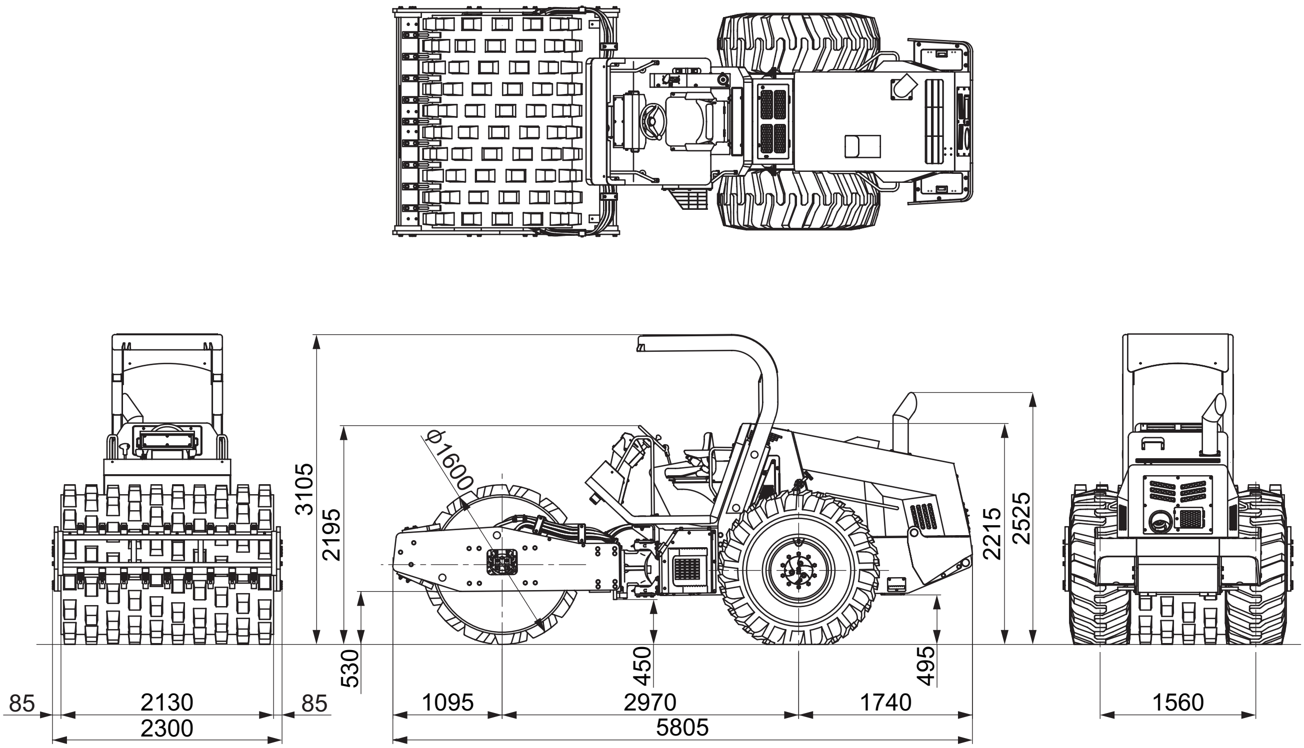


0418-99117-0-12914-0

Model & Type	Model		SAKAI SV544D with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	11,000 kg (24,250 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		11,090 kg (24,450 lbs.)
	Shipping weight	with ROPS	10,930 kg (24,095 lbs.)
		without ROPS	10,605 kg (23,380 lbs.)
	Load on front axle with operating weight		5,790 kg (12,765 lbs.)
	Load on rear axle with operating weight		5,210 kg (11,485 lbs.)
Dimensions	Overall length		5,805 mm (229 in.)
	Overall width		2,300 mm (91 in.)
	Overall height	with ROPS	3,050 mm (120 in.)
		without ROPS	2,455 mm (97 in.)
	Wheelbase		2,970 mm (117 in.)
	Compaction width		2,130 mm (84 in.)
	Front drum (outer shell)	width × dia. × thickness	2,130 mm × 1,530 mm × 25 mm (84 in. × 60 in. × 1.0 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	23.1-26-8PR (OR)
		Inflation pressure	137 kPa (20.0 psi)
	Ground clearance		405 mm (15.9 in.)
	Kerb clearance	Right	500 mm (19.7 in.)
		Left	500 mm (19.7 in.)
	Side clearance	Right	85.0 mm (3.3 in.)
		Left	85.0 mm (3.3 in.)
	Leveling blade width		N/A mm (N/A in.)

Performance	Vibrator system	Front	Centrifugal force	Low amplitude		146 kN	(32,820 lbf.)
				High amplitude		255 kN	(57,325 lbf.)
			Frequency	Low amplitude		33.3 Hz	(2,000 vpm)
				High amplitude		28.8 Hz	(1,730 vpm)
			Amplitude	Low amplitude		0.85 mm	(0.033 in.)
				High amplitude		2.01 mm	(0.079 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		276 N/cm	(155 lbf./in.)
			Rear drum	Operating weight		N/A N/cm	(N/A lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Low amplitude	952 N/cm	(545 lbf./in.)
					High amplitude	1,464 N/cm	(835 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				3 speed	
		Speed range		1st		0 to 4 km/h	(0 to 2.5 mile/h)
				2nd		0 to 6 km/h	(0 to 3.7 mile/h)
				3rd		0 to 10 km/h	(0 to 6.2 mile/h)
	Gradeability (without vibration)					63 %	(32 °)
	Turning radius	Machine clearance radius inside				3.3 m	(130 in.)
		Machine clearance radius outside				5.6 m	(221 in.)
		Turning radius inside compacted surface				3.4 m	(134 in.)
		Turning radius outside compacted surface				5.5 m	(217 in.)

1-2. SV544T

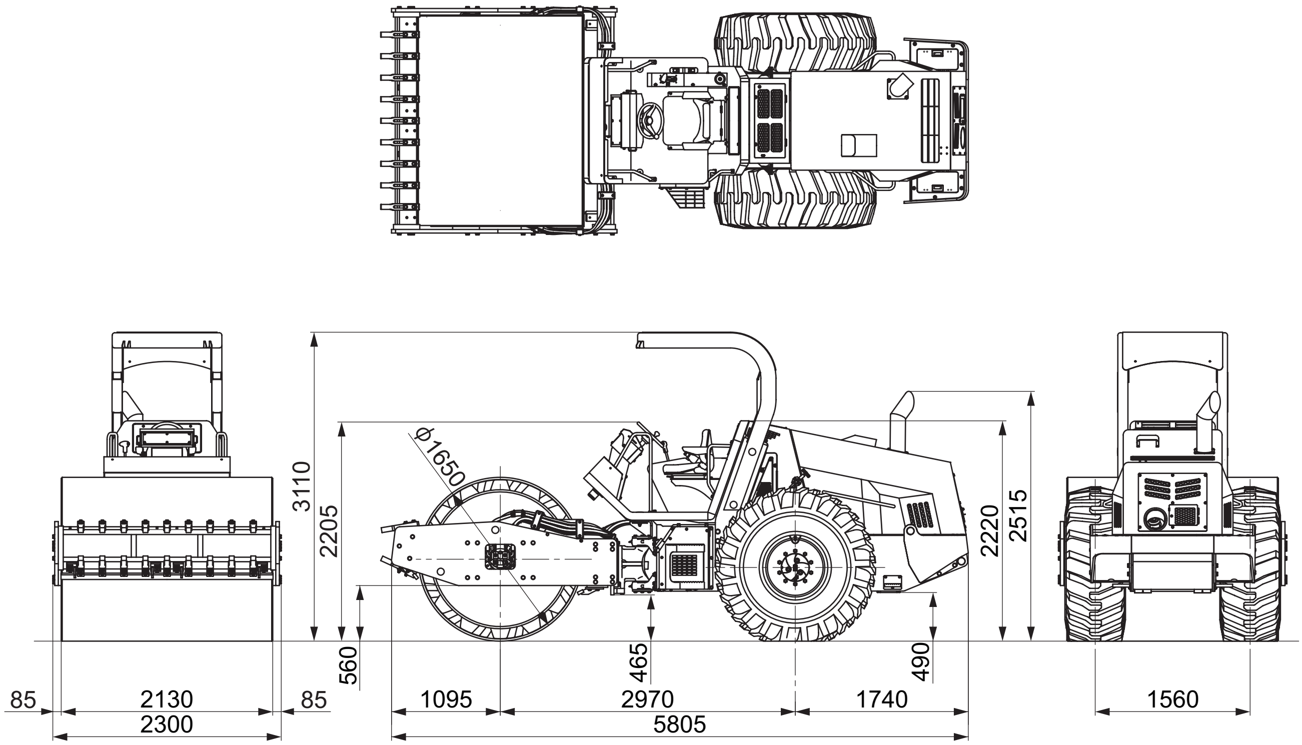


0418-99118-0-12915-0

Model & Type	Model		SAKAI SV544T with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	11,380 kg (25,090 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		11,470 kg (25,285 lbs.)
	Shipping weight	with ROPS	11,310 kg (24,935 lbs.)
		without ROPS	10,985 kg (24,215 lbs.)
	Load on front axle with operating weight		6,175 kg (13,615 lbs.)
	Load on rear axle with operating weight		5,205 kg (11,475 lbs.)
Dimensions	Overall length		5,805 mm (229 in.)
	Overall width		2,300 mm (91 in.)
	Overall height	with ROPS	3,105 mm (122 in.)
		without ROPS	2,525 mm (99 in.)
	Wheelbase		2,970 mm (117 in.)
	Compaction width		2,130 mm (84 in.)
	Front drum (outer shell)	width × dia. × thickness	N/A (N/A)
	Front drum (inner shell)	width × dia. × thickness	2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.)
	Front drum (pad foot)	height × dia. × pcs.	100 mm × 1,600 mm × 140 pcs. (3.9 in. × 63 in. × 140 pcs.)
	Rear tyers	Size	23.1-26-10PR (OR)
		Inflation pressure	137 kPa (20.0 psi)
	Ground clearance		450 mm (17.7 in.)
	Kerb clearance	Right	530 mm (20.9 in.)
		Left	530 mm (20.9 in.)
	Side clearance	Right	85.0 mm (3.3 in.)
		Left	85.0 mm (3.3 in.)
	Leveling blade width		N/A mm (N/A in.)

						Metric		Imperial	
Performance	Vibrator system	Front	Centrifugal force	Low amplitude		146	kN	32,820	lbf.
				High amplitude		255	kN	57,325	lbf.
			Frequency	Low amplitude		33.3	Hz	2,000	vpm
				High amplitude		28.8	Hz	1,730	vpm
			Amplitude	Low amplitude		0.80	mm	0.031	in.
				High amplitude		1.88	mm	0.074	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		285	N/cm	160	lbf./in.
			Rear drum	Operating weight		N/A	N/cm	N/A	lbf./in.
		Dynamic linear pressure	Front drum	Operating weight	Low amplitude	971	N/cm	555	lbf./in.
					High amplitude	1,483	N/cm	845	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				3	speed		
		Speed range		1st		0 to 4	km/h	0 to 2.5	mile/h
				2nd		0 to 6	km/h	0 to 3.7	mile/h
				3rd		0 to 10	km/h	0 to 6.2	mile/h
	Gradeability (without vibration)					63	%	32	°
	Turning radius	Machine clearance radius inside				3.3	m	130	in.
		Machine clearance radius outside				5.6	m	221	in.
		Turning radius inside compacted surface				3.4	m	134	in.
		Turning radius outside compacted surface				5.5	m	217	in.

1-3. SV544TF

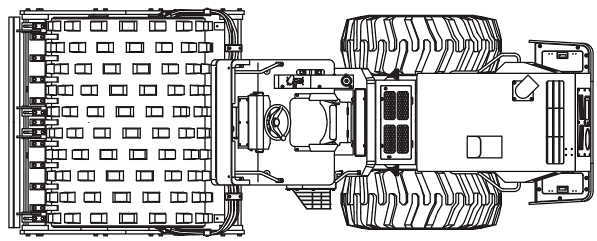


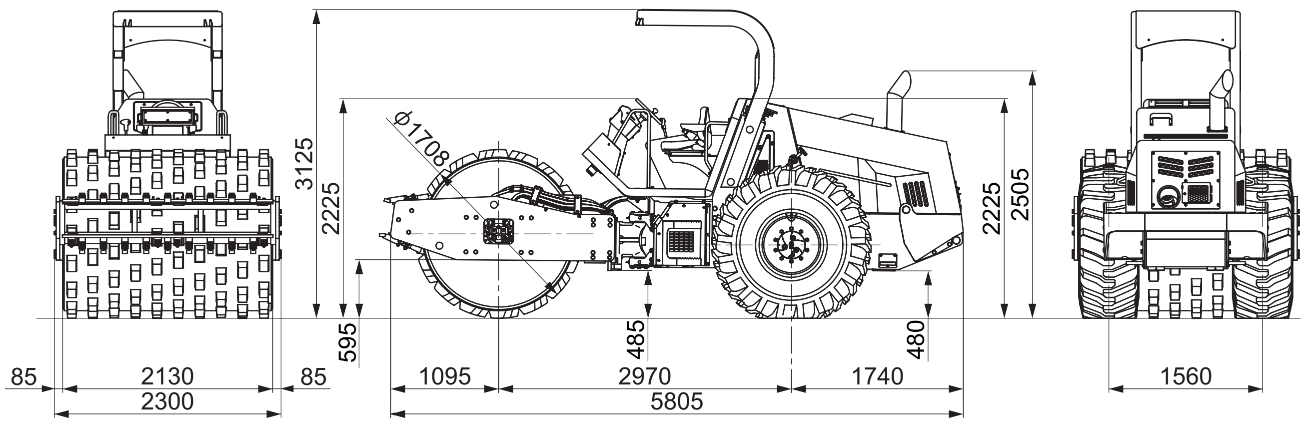
0418-99120-0-12927-0

Model & Type	Model		SAKAI SV544TF with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	13,650 kg (30,095 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		13,740 kg (30,290 lbs.)
	Shipping weight	with ROPS	13,580 kg (29,940 lbs.)
		without ROPS	13,255 kg (29,220 lbs.)
	Load on front axle with operating weight		8,460 kg (18,650 lbs.)
	Load on rear axle with operating weight		5,190 kg (11,440 lbs.)
Dimensions	Overall length		5,805 mm (229 in.)
	Overall width		2,300 mm (91 in.)
	Overall height	with ROPS	3,110 mm (122 in.)
		without ROPS	2,515 mm (99 in.)
	Wheelbase		2,970 mm (117 in.)
	Compaction width		2,130 mm (84 in.)
	Front drum (outer shell)	width × dia. × thickness	2,130 mm × 1,650 mm × 22 mm (84 in. × 65 in. × 0.9 in.)
	Front drum (inner shell)	width × dia. × thickness	2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.)
	Front drum (pad foot)	height × dia. × pcs.	100 mm × 1,600 mm × 140 pcs. (3.9 in. × 63 in. × 140 pcs.)
	Rear tyers	Size	23.1-26-10PR (OR)
		Inflation pressure	137 kPa (20.0 psi)
	Ground clearance		465 mm (18.3 in.)
	Kerb clearance	Right	560 mm (22.0 in.)
		Left	560 mm (22.0 in.)
	Side clearance	Right	85.0 mm (3.3 in.)
		Left	85.0 mm (3.3 in.)
	Leveling blade width		N/A mm (N/A in.)

Performance	Vibrator system	Front	Centrifugal force	Low amplitude		146 kN	(32,820 lbf.)
				High amplitude		255 kN	(57,325 lbf.)
			Frequency	Low amplitude		33.3 Hz	(2,000 vpm)
				High amplitude		28.8 Hz	(1,730 vpm)
			Amplitude	Low amplitude		0.52 mm	(0.020 in.)
				High amplitude		1.23 mm	(0.048 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		389 N/cm	(220 lbf./in.)
			Rear drum	Operating weight		N/A N/cm	(N/A lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Low amplitude	1,075 N/cm	(615 lbf./in.)
					High amplitude	1,587 N/cm	(905 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				3 speed	
		Speed range		1st		0 to 4 km/h	(0 to 2.5 mile/h)
				2nd		0 to 6 km/h	(0 to 3.7 mile/h)
				3rd		0 to 10 km/h	(0 to 6.2 mile/h)
	Gradeability (without vibration)					63 %	(32 °)
	Turning radius	Machine clearance radius inside				3.3 m	(130 in.)
		Machine clearance radius outside				5.6 m	(221 in.)
		Turning radius inside compacted surface				3.4 m	(134 in.)
		Turning radius outside compacted surface				5.5 m	(217 in.)

1-4. SV544DF



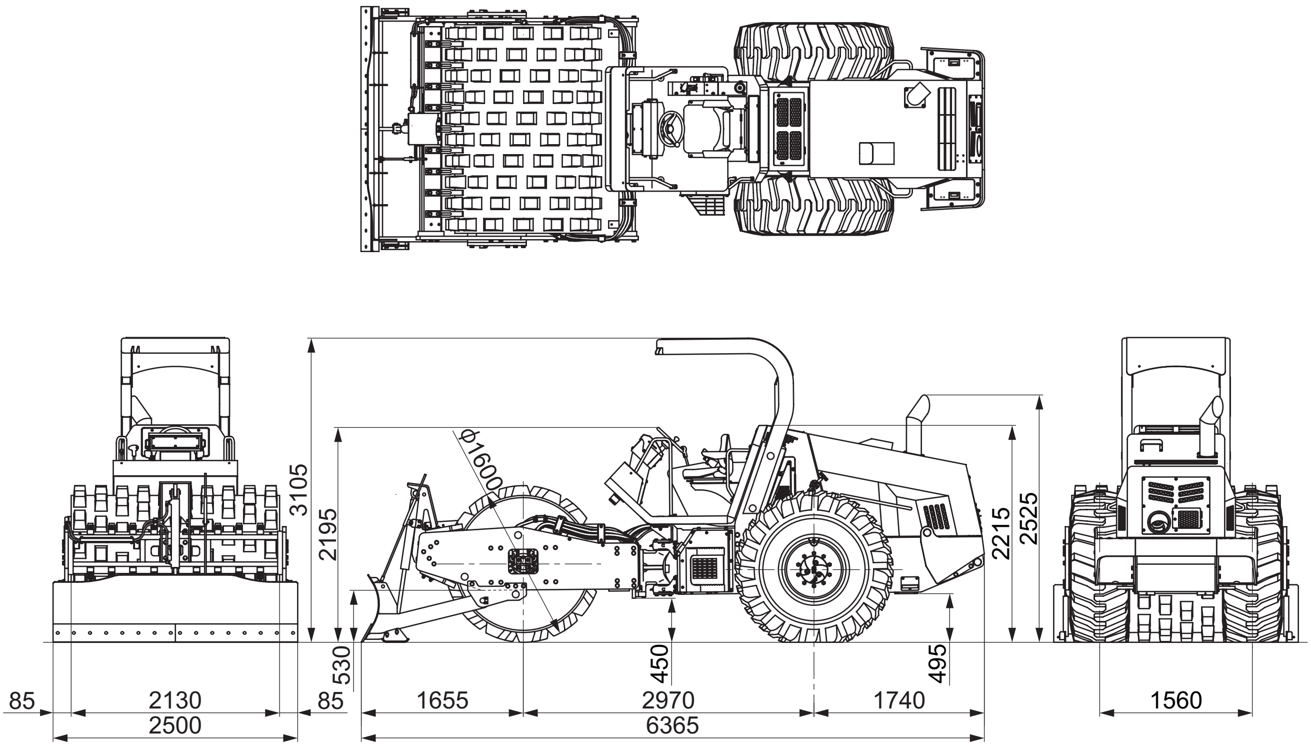


0418-99121-0-12928-0

Model & Type	Model		SAKAI SV544DF with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	12,680 kg (27,955 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		12,770 kg (28,150 lbs.)
	Shipping weight	with ROPS	12,610 kg (27,800 lbs.)
		without ROPS	12,285 kg (27,085 lbs.)
	Load on front axle with operating weight		7,545 kg (16,635 lbs.)
	Load on rear axle with operating weight		5,135 kg (11,320 lbs.)
Dimensions	Overall length		5,805 mm (229 in.)
	Overall width		2,300 mm (91 in.)
	Overall height	with ROPS	3,125 mm (123 in.)
		without ROPS	2,505 mm (99 in.)
	Wheelbase		2,970 mm (117 in.)
	Compaction width		2,130 mm (84 in.)
	Front drum (outer shell)	width × dia. × thickness	N/A (N/A)
	Front drum (inner shell)	width × dia. × thickness	2,130 mm × 1,530 mm × 25 mm (84 in. × 60 in. × 1.0 in.)
	Front drum (pad foot)	height × dia. × pcs.	81 mm × 1,708 mm × 80 pcs. (3.2 in. × 67 in. × 80 pcs.)
	Rear tyers	Size	23.1-26-10PR (OR)
		Inflation pressure	137 kPa (20.0 psi)
	Ground clearance		485 mm (19.1 in.)
	Kerb clearance	Right	595 mm (23.4 in.)
		Left	595 mm (23.4 in.)
	Side clearance	Right	85.0 mm (3.3 in.)
		Left	85.0 mm (3.3 in.)
	Leveling blade width		N/A mm (N/A in.)

Performance	Vibrator system	Front	Centrifugal force	Low amplitude		146 kN	(32,820 lbf.)
				High amplitude		255 kN	(57,325 lbf.)
			Frequency	Low amplitude		33.3 Hz	(2,000 vpm)
				High amplitude		28.8 Hz	(1,730 vpm)
			Amplitude	Low amplitude		0.62 mm	(0.024 in.)
				High amplitude		1.45 mm	(0.057 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		347 N/cm	(200 lbf./in.)
			Rear drum	Operating weight		N/A N/cm	(N/A lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Low amplitude	1,033 N/cm	(590 lbf./in.)
					High amplitude	1,545 N/cm	(880 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				3 speed	
		Speed range		1st		0 to 4 km/h	(0 to 2.5 mile/h)
				2nd		0 to 6 km/h	(0 to 3.7 mile/h)
				3rd		0 to 10 km/h	(0 to 6.2 mile/h)
	Gradeability (without vibration)					63 %	(32 °)
	Turning radius	Machine clearance radius inside				3.3 m	(130 in.)
		Machine clearance radius outside				5.6 m	(221 in.)
		Turning radius inside compacted surface				3.4 m	(134 in.)
		Turning radius outside compacted surface				5.5 m	(217 in.)

1-5. SV544TB

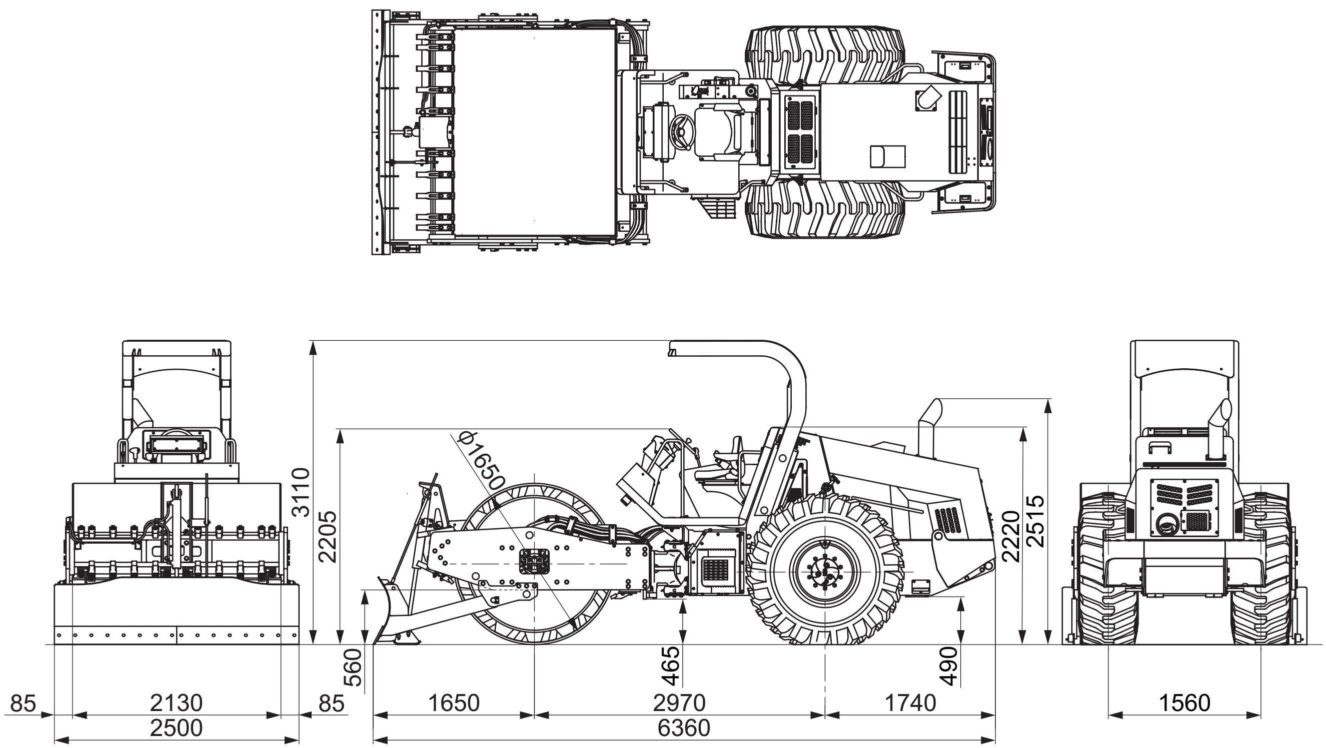


0418-99122-0-12929-0

Model & Type	Model		SAKAI SV544TB with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	12,140 kg (26,765 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		12,230 kg (26,960 lbs.)
	Shipping weight	with ROPS	12,070 kg (26,610 lbs.)
		without ROPS	11,745 kg (25,895 lbs.)
	Load on front axle with operating weight		7,270 kg (16,025 lbs.)
	Load on rear axle with operating weight		4,870 kg (10,735 lbs.)
Dimensions	Overall length		6,365 mm (251 in.)
	Overall width		2,500 mm (98 in.)
	Overall height	with ROPS	3,105 mm (122 in.)
		without ROPS	2,525 mm (99 in.)
	Wheelbase		2,970 mm (117 in.)
	Compaction width		2,130 mm (84 in.)
	Front drum (outer shell)	width × dia. × thickness	N/A (N/A)
	Front drum (inner shell)	width × dia. × thickness	2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.)
	Front drum (pad foot)	height × dia. × pcs.	100 mm × 1,600 mm × 140 pcs. (3.9 in. × 63 in. × 140 pcs.)
	Rear tyers	Size	23.1-26-10PR (OR)
		Inflation pressure	137 kPa (20.0 psi)
	Ground clearance		450 mm (17.7 in.)
	Kerb clearance	Right	530 mm (20.9 in.)
		Left	530 mm (20.9 in.)
	Side clearance	Right	85.0 mm (3.3 in.)
		Left	85.0 mm (3.3 in.)
	Leveling blade width		2,500 mm (98 in.)

Performance	Vibrator system	Front	Centrifugal force	Low amplitude		146 kN	(32,820 lbf.)
				High amplitude		255 kN	(57,325 lbf.)
			Frequency	Low amplitude		33.3 Hz	(2,000 vpm)
				High amplitude		28.8 Hz	(1,730 vpm)
			Amplitude	Low amplitude		0.80 mm	(0.031 in.)
				High amplitude		1.88 mm	(0.074 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		335 N/cm	(190 lbf./in.)
			Rear drum	Operating weight		N/A N/cm	(N/A lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight	Low amplitude	1,020 N/cm	(580 lbf./in.)
					High amplitude	1,532 N/cm	(875 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				3 speed	
		Speed range		1st		0 to 4 km/h	(0 to 2.5 mile/h)
				2nd		0 to 6 km/h	(0 to 3.7 mile/h)
				3rd		0 to 10 km/h	(0 to 6.2 mile/h)
	Gradeability (without vibration)					63 %	(32 °)
	Turning radius	Machine clearance radius inside				3.3 m	(130 in.)
		Machine clearance radius outside				5.6 m	(221 in.)
		Turning radius inside compacted surface				3.4 m	(134 in.)
		Turning radius outside compacted surface				5.5 m	(217 in.)

1-6. SV544FB



0418-99123-0-12930-0

Model & Type	Model		SAKAI SV544FB with ROPS
	Type		VIBRATORY SINGLE-DRUM ROLLER
Weight	Operating weight	without ballast	14,410 kg (31,770 lbs.)
		with ballast	N/A kg (N/A lbs.)
	Maximum weight		14,500 kg (31,965 lbs.)
	Shipping weight	with ROPS	14,340 kg (31,615 lbs.)
		without ROPS	14,015 kg (30,895 lbs.)
	Load on front axle with operating weight		9,555 kg (21,065 lbs.)
	Load on rear axle with operating weight		4,855 kg (10,705 lbs.)
Dimensions	Overall length		6,360 mm (250 in.)
	Overall width		2,500 mm (98 in.)
	Overall height	with ROPS	3,110 mm (122 in.)
		without ROPS	2,515 mm (99 in.)
	Wheelbase		2,970 mm (117 in.)
	Compaction width		2,130 mm (84 in.)
	Front drum (outer shell)	width × dia. × thickness	2,130 mm × 1,650 mm × 22 mm (84 in. × 65 in. × 0.9 in.)
	Front drum (inner shell)	width × dia. × thickness	2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.)
	Front drum (pad foot)	height × dia. × pcs.	100 mm × 1,600 mm × 140 pcs. (3.9 in. × 63 in. × 140 pcs.)
	Rear tyers	Size	23.1-26-10PR (OR)
		Inflation pressure	137 kPa (20.0 psi)
	Ground clearance		465 mm (18.3 in.)
	Kerb clearance	Right	560 mm (22.0 in.)
		Left	560 mm (22.0 in.)
	Side clearance	Right	85.0 mm (3.3 in.)
		Left	85.0 mm (3.3 in.)
	Leveling blade width		2,500 mm (98 in.)

Performance	Vibrator system	Front	Centrifugal force	Low amplitude	146 kN	(32,820 lbf.)
				High amplitude	255 kN	(57,325 lbf.)
			Frequency	Low amplitude	33.3 Hz	(2,000 vpm)
				High amplitude	28.8 Hz	(1,730 vpm)
			Amplitude	Low amplitude	0.52 mm	(0.020 in.)
				High amplitude	1.23 mm	(0.048 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	440 N/cm	(250 lbf./in.)
			Rear drum	Operating weight	N/A N/cm	(N/A lbf./in.)
		Dynamic linear pressure	Front drum	Operating weight — Low amplitude	1,125 N/cm	(640 lbf./in.)
				Operating weight — High amplitude	1,637 N/cm	(935 lbf./in.)
			Rear drum	Operating weight — Low amplitude	N/A N/cm	(N/A lbf./in.)
				Operating weight — High amplitude	N/A N/cm	(N/A lbf./in.)
	Traveling speed	Number of speed shift			3 speed	
		Speed range		1st	0 to 4 km/h	(0 to 2.5 mile/h)
				2nd	0 to 6 km/h	(0 to 3.7 mile/h)
				3rd	0 to 10 km/h	(0 to 6.2 mile/h)
	Gradeability (without vibration)				63 %	(32 °)
	Turning radius	Machine clearance radius inside			3.3 m	(130 in.)
		Machine clearance radius outside			5.7 m	(225 in.)
		Turning radius inside compacted surface			3.4 m	(134 in.)
		Turning radius outside compacted surface			5.5 m	(217 in.)

1-7. Common Specifications

Engine	Model		CUMMINS QSF 3.8 (Diesel, EPA-Tier 4)
	Type		4-cycle, water-cooled, 4-cylinder in-line, overhead valve, direct injection type, with turbo charger
	Cylinders - Bore × Stroke		102 mm × 115 mm (4.02 in. × 4.53 in.)
	Displacement		3.800 L (229.0 cu.in.)
	Performance	Rated speed	2,200 min^{-1}
		Rated output	97.0 kW (130 HP)
		Max. torque	488 N·m (360 lbf·ft) at 1,600 min^{-1}
		Fuel consumption rate	234 g/kW·h (0.385 lb/HP·h) at 2,200 min^{-1}
		Fuel consumption	13.7 L/h with full load (3.6 gal with full load)
	Fuel system	Fuel	Diesel (ASTM D975-2D)
		Fuel injection pump	Inline injection pump
		Fuel injection time regulator	All speed governor
	Lubrication system	Lubrication type	Full forced pressure feed
		Oil filter type	Full flow
		Oil cooler type	Integrated water cooled
	Air intake system	Air cleaner type	Dry
	Cooling system	Cooling type	Pressurized water forced circulation
		Cooling fan type	Inhale
	Electrical system	Alternator	24 V 90 A
		Starter	24 V 4.8 kW
		Battery	12 V (CCA651) × 2 pcs. (24 V)
	Dry weight		348 kg (767 lbs.)
Drive system	Transmission	Type	Hydrostatic
		Speed	3 speed shifts
	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		± 37°
	Oscillating angle		± 9°
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		CUMMINS QSF 3.8	
Rated output		97/2,200 kW/ min^{-1} (130/2,200 HP/ min^{-1})	
Max. rpm under no load		2,200 rpm	
Min. rpm under no load		900 rpm	
Cylinder head tightening torque	1st	90 N·m (66 lbf·ft)	
	2nd	90 N·m (66 lbf·ft)	
	3rd	Tighten additional 90°	
Intake manifold tightening torque		24 N·m (18 lbf·ft)	
Exhaust manifold tightening torque		43 N·m (32 lbf·ft)	
Valve clearance (intake)		0.254 mm (0.01 in.)	
Valve clearance (exhaust)		0.508 mm (0.02 in.)	
Crankcase blowby		101.6 mm of H_2O (4.0 in. of H_2O)	Use mano meter

2-2. Propulsion

Item		Standard value	Remarks
Travel speed (Forward/reverse)	1st	0 to 4 km/h (0 to 2.5 mile/h)	
	2nd	0 to 6 km/h (0 to 3.7 mile/h)	
	3rd	0 to 10 km/h (0 to 6.2 mile/h)	

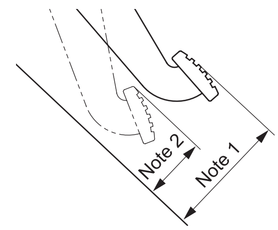
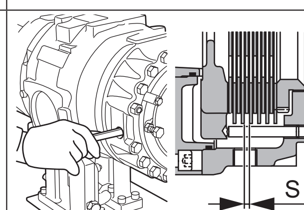
2-3. Hydraulic Systems

Item			Standard value	Remarks
Propulsion	High pressure relief valve setting		42.0 ± 1.0 MPa (6,090 ± 145 psi)	at 1,800 min^{-1}
	Charge relief valve setting		2.4 ± 0.2 MPa (348 ± 29 psi)	at 40 L/min
	Flushing valve setting	Motor (F)	1.6 MPa (232 psi)	at 10 L/min
		Motor (R)	2.67 MPa (387 psi)	at 19 L/min
	Case pressure	Pump	0.3 MPa (43.5 psi) or less	
		Motor (F)	0.3 MPa (43.5 psi) or less	
		Motor (R)	0.3 MPa (43.5 psi) or less	
	Brake release pressure	Gear box (F)	More than 1.8 MPa (261 psi)	
		Rear axle	1.5 to 3.0 MPa (218 to 435 psi)	
	Motor drainage	Motor (F)	8.3 L/min (2.2 gal./min)	3rd
		Motor (R)	6.1 L/min (1.6 gal./min)	
Vibration	High pressure relief valve setting		28.0 ± 1.0 MPa (4,060 ± 145 psi)	at 3.8 to 5.6 L/min
	Charge relief valve setting		2.4 ± 0.2 MPa (348 ± 29 psi)	at 18.9 L/min
	Case pressure	Pump	0.3 MPa (43.5 psi) or less	
		Motor	0.2 MPa (29.0 psi) or less	
	Motor drainage		7.7 L/min (2.0 gal./min)	
Steering oil pressure			16.4 ± 1.0 MPa (2,378 ± 145 psi)	(orbitroll relief pressure + charge relief pressure)

2-4. Steering

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

2-5. Brakes

Item	Standard value	Remarks
Brake pedal stopper bolts specified length	140 mm (5.5 in.) Note 1: See dimensions	 SV520-02001
	73 mm (2.9 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	12 L (3.2 gal.)	
Fuel tank	215 L (56.8 gal.)	
Coolant	16 L (4.2 gal.)	
Hydraulic oil tank	53 L (14.0 gal.)	
Vibrator case	34 L (9.0 gal.)	
Gear box (F)	3.0 L (0.8 gal.)	
Gear box (rear axle)	1.2 L (0.3 gal.)	
Center housing (rear axle)	11.0 L (2.9 gal.)	
Hub reduction gear case (rear left and right)	2.0 L × 2 (0.5 gal. × 2)	
DEF tank	19 L (5.0 gal.)	

3. FUEL AND LUBRICANTS SPECIFICATION

3-1. Rating

Lubricant	Service classification	Ambient temp. and applicable viscosity rating			Applicable Standards
		-15 to 30°C (5 to 86°F) Cold	0 to 40°C (32 to 104°F) Moderate	15 to 55°C (59 to 131°F) Tropical	
Engine oil	API grade CJ-4	SAE5W-40	SAE5W-40	SAE5W-40	MIL-L-2104B
Gear oil	API grade GL5	SAE80W-90	SAE90	SAE140	MIL-L-2105
Hydraulic oil	Anti wear	ISO-VG32 over VI 140	ISO-VG46 over VI 140	ISO-VG68 over VI 110	ISO-3448
Grease	Lithium type extreme pressure				NLGI-2
Fuel	Diesel oil				ASTM D975-2D
DEF	ISO 22241-1 and AUS32				

3-2. Recommended Lubricants

Lubricant / Oil company	Engine oil API-CJ4	Gear oil API GL 5	Hydraulic oil ISO-VG 46	Grease (NLGI-2)
CHEVRON	DELO 400 LE	RPM Universal Gear Lubricants	Rando HDZ 46	Multifak EP 2
BP	—	BP Energear HYPO-U	Bartran HV 46	BP Energrease LS-EP 2
CASTROL	Tection Extra	EPX 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 S2 V 46	Shell Alvania Grease EP 2

4. TIGHTENING TORQUE CHART

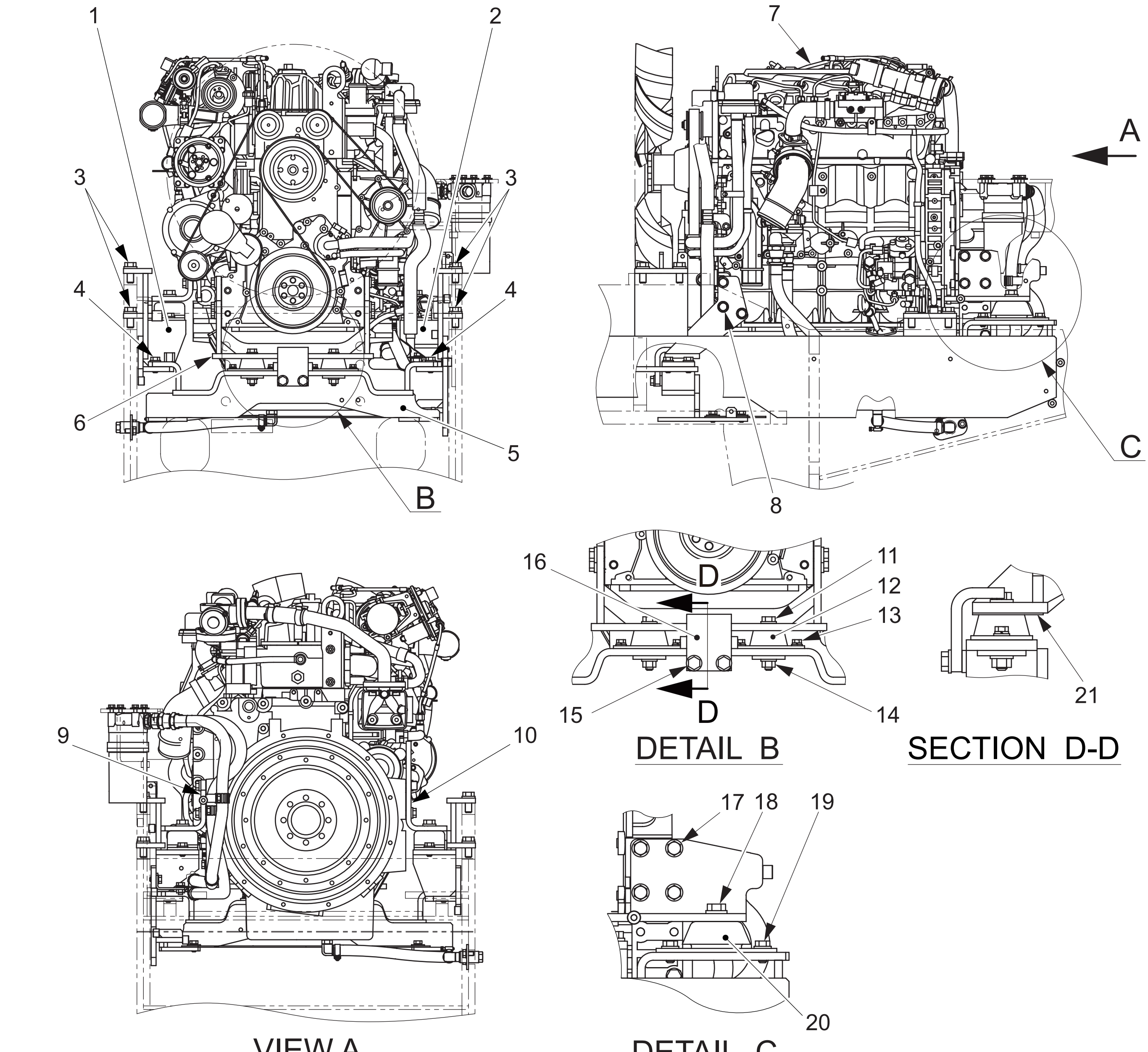
N·m	(lbf·ft)

	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



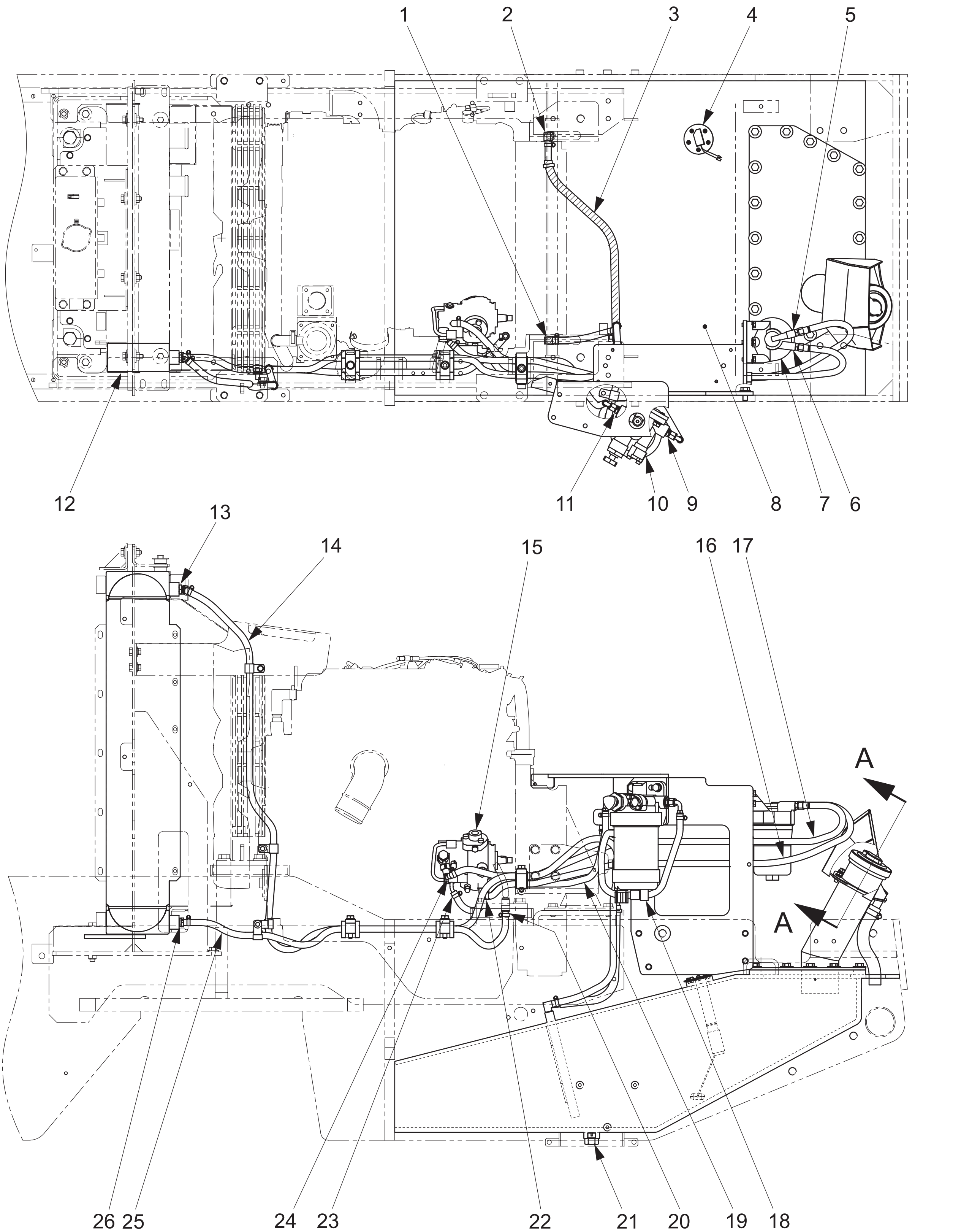
0418-01806-0-12225-A

(1)	Base		(8)	Bolt	: M12×35	(15)	Bolt	: M12×30
(2)	Base		(9)	Bracket		(16)	Bracket	
(3)	Bolt	: M16×40	(10)	Bracket		(17)	Bolt	: M12×40
(4)	Bolt	: M12×30	(11)	Bolt	: M12×80	(18)	Bolt	: M16×50
(5)	Bracket		(12)	Damper		(19)	Bolt	: M12×25
(6)	Bracket		(13)	Bolt	: M 8×80	(20)	Damper	
(7)	Engine		(14)	Nut	: M12	(21)	Shim	

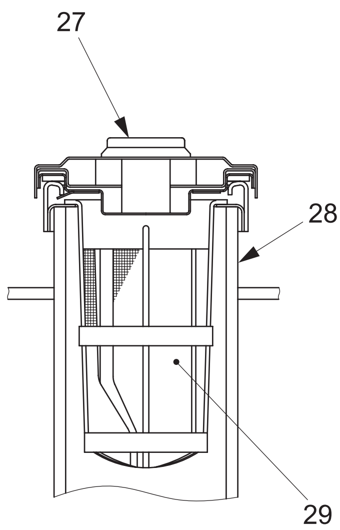
N•m

(3)	Bolt M16×40 : 265 N·m (195 lbf·ft)		(14)	Nut M12 : 108 N·m (80 lbf·ft)
(4)	Bolt M12×30 : 108 N·m (80 lbf·ft)		(17)	Bolt M12×40 : 108 N·m (80 lbf·ft)
(8)	Bolt M12×35 : 108 N·m (80 lbf·ft)		(18)	Bolt M16×50 : 265 N·m (195 lbf·ft)
(13)	Bolt M 8×20 : 31 N·m (23 lbf·ft)		(19)	Bolt M12×25 : 108 N·m (80 lbf·ft)

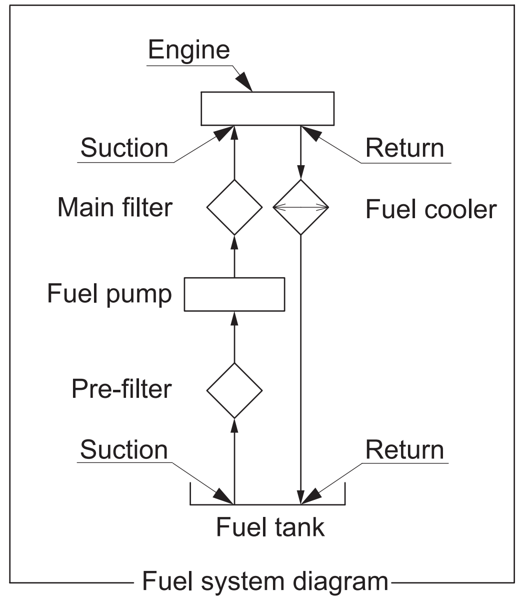
2. FUEL SYSTEM



0418-02808-0-12230-C



SECTION A-A

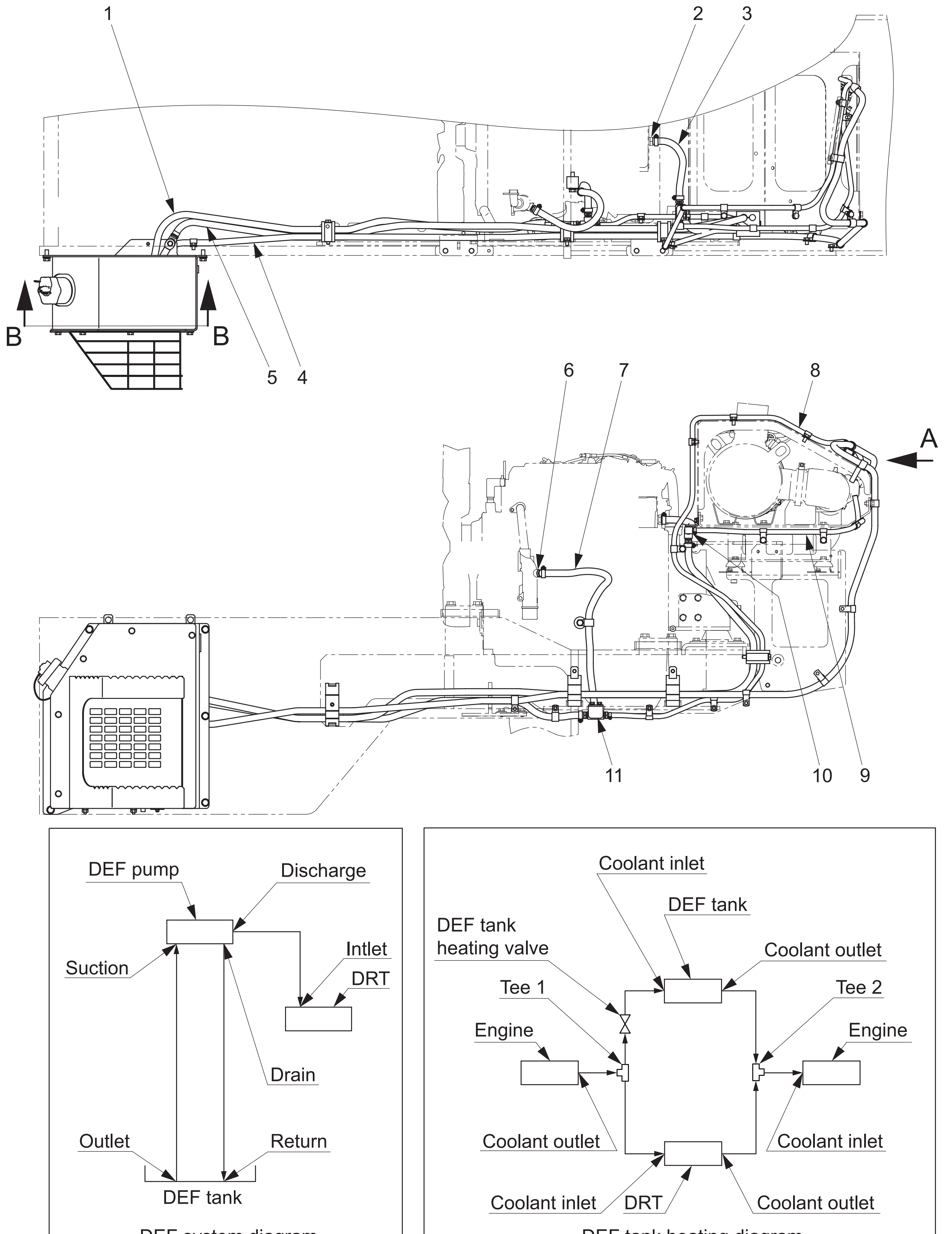


0418-02808-0-12230-C

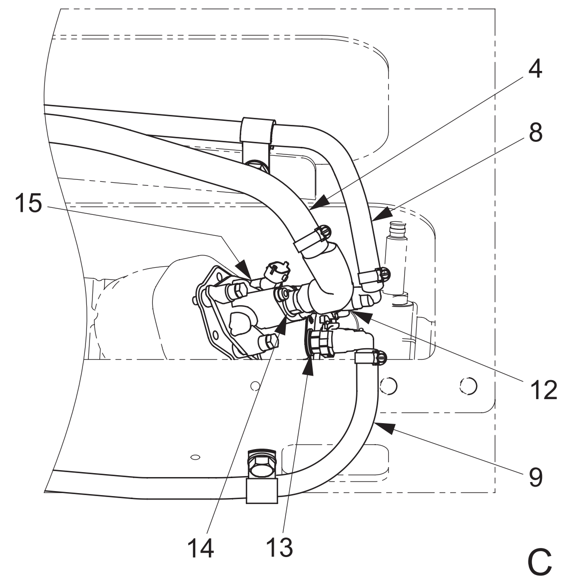
(1) Return (fuel tank)
(2) Suction (fuel tank)
(3) Hose (2 → 9)
(4) Fuel gauge unit
(5) OUT (main filter)
(6) IN (main filter)
(7) Main filter
(8) Fuel tank
(9) IN (pre-filter)
(10) Pre-filter
(11) OUT (pre-filter)
(12) Fuel cooler
(13) OUT (fuel cooler)
(14) Hose (13 → 1)
(15) Fuel pump
(16) Hose (5 → 22)
(17) Hose (24 → 6)
(18) WIF sensor
(19) Hose (11 → 23)
(20) Return (engine)
(21) Drain plug
(22) Suction (engine)
(23) IN (fuel pump)
(24) OUT (fuel pump)
(25) Hose (20 → 26)
(26) IN (fuel cooler)
(27) Filler cap
(28) Fuel supply port
(29) Filter

3. EXHAUST SYSTEM

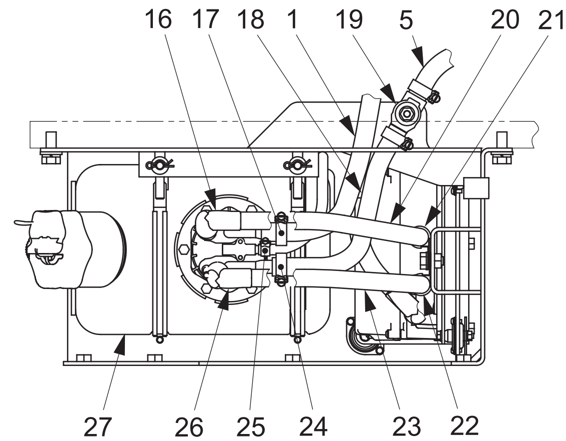
3-1. Urea System



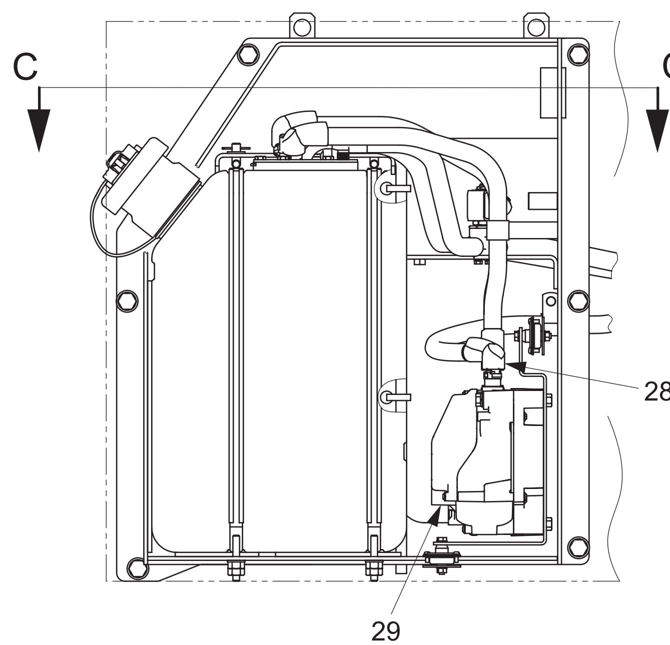
0418-05807-0-12853-B



VIEW A



SECTION C-C



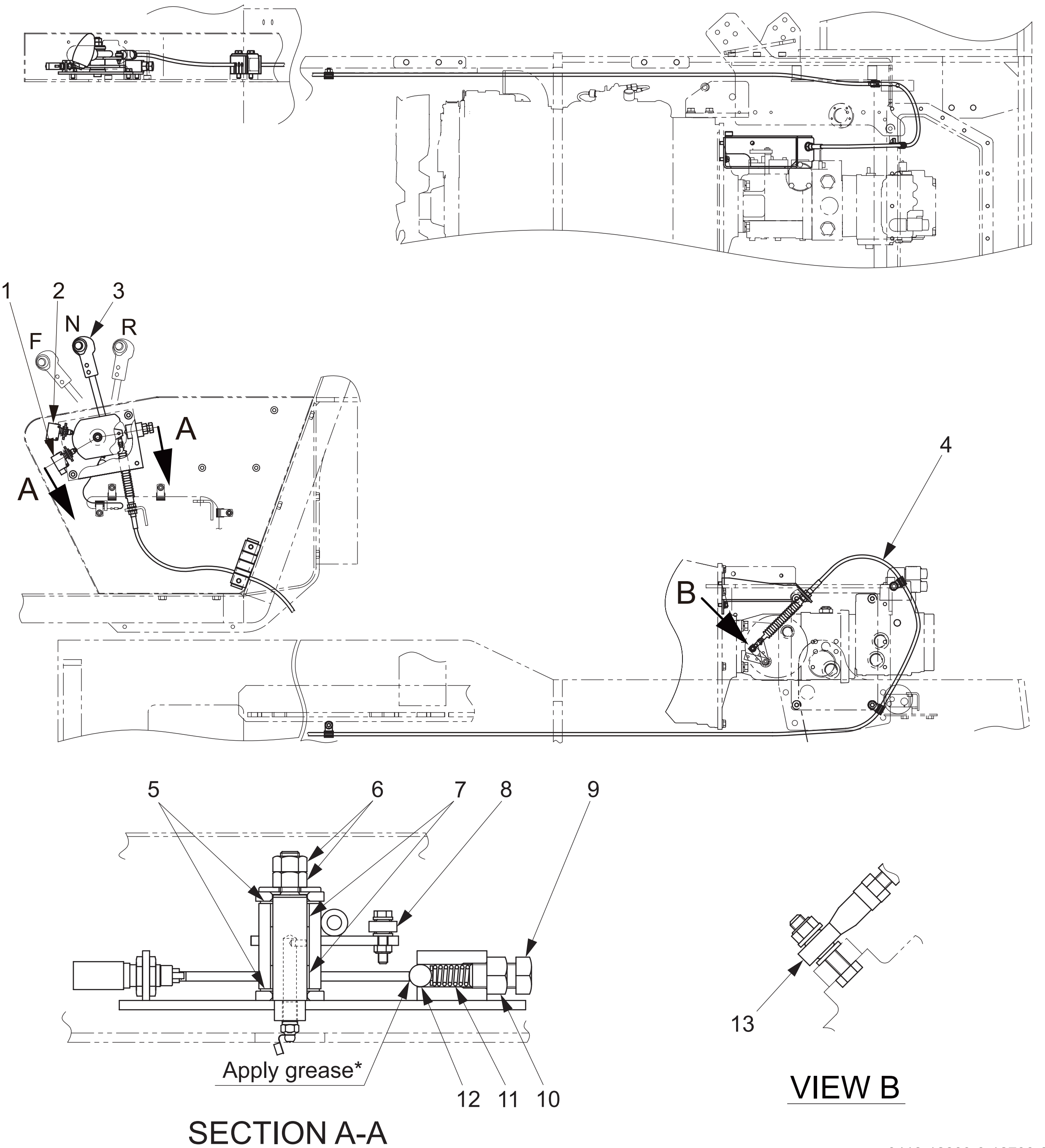
SECTION B-B

0418-05807-0-12853-B

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

4. CONTROL SYSTEM

4-1. Forward-reverse Control



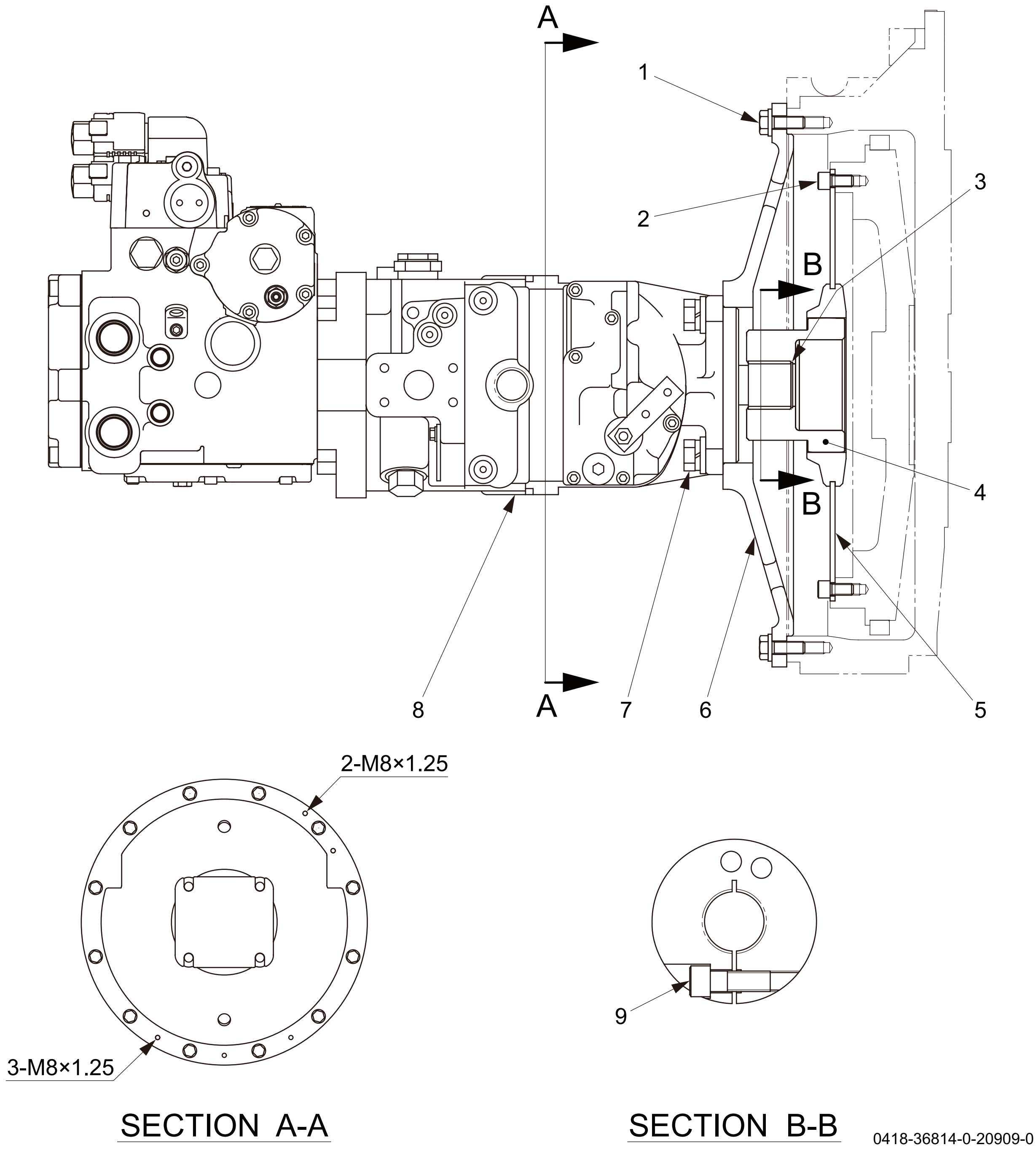
0418-12809-0-12700-0

(1) F-R lever switch
(2) Backup buzzer switch
(3) F-R lever
(4) Control cable
(5) Washer (Apply grease*)
(6) Nut : M12
(7) Bush (Apply grease*)
(8) Rod end (Apply grease*)
(9) Bolt : M16×30
(10) Nut : M16
(11) Spring (Fill grease)
(12) Steel ball
(13) Rod end (Apply grease*)

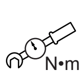
* : Lithium-based grease

5. PUMP MOUNT

5-1. Pump Mount



(1) Bolt	: M10×30	(6) Housing	
(2) Bolt	: 3/8-16UNC×22	(7) Bolt	: M14×45
(3) Retaining ring		(8) Pump	
(4) Hub		(9) Bolt	: M12×35
(5) Flange			



(1) Bolt M10×30	: 59 N·m (44 lbf·ft)	(7) Bolt M14×45	: 167 N·m (123 lbf·ft)
(2) Bolt 3/8-16UNC×22	: 69 N·m (51 lbf·ft)	(9) Bolt M12×35	: 86 N·m (63 lbf·ft)

5-1-1. Installation of pump

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

① Apply adequate amount of grease to pump (8) and hub (4) splines.

② Install retaining ring (3) of hub (4) to pump (8) and set to the specified dimension.

★ **Specified dimension a: 44 mm (1.7 in.)**

③ Secure hub (4) with bolts (9).

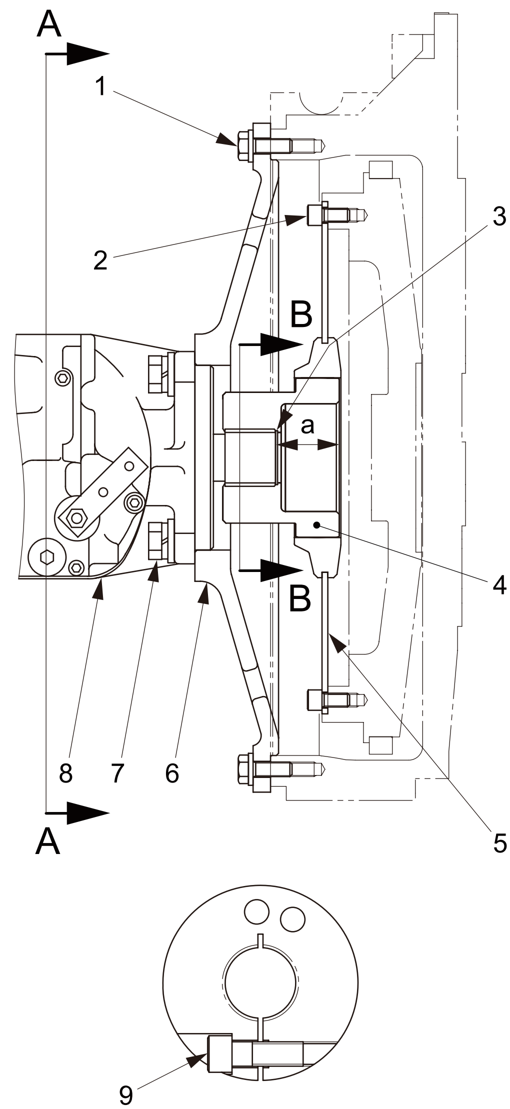
N•m (9) Bolt M12×35 : 86 N·m (63 lbf·ft)

④ Secure flange (5) to engine flywheel with eight bolts (2).

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

(NOTICE)

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



SECTION B-B

SV544-03001

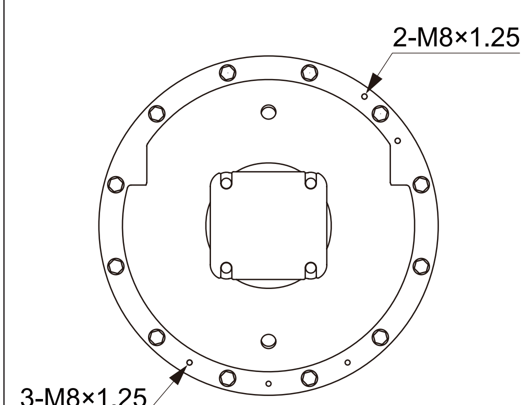
⑤ Position housing (6) as shown in the figure, and secure to flywheel housing with twelve bolts (1) and washers.

N•m (1) Bolt M10×30 : 59 N·m (44 lbf·ft)

⑥ Engage hub (4) with flange (5).

⑦ Secure pump (8) to housing (6) with four bolts (7), spring washers and washers.

N•m (7) Bolt M14×45 : 167 N·m (123 lbf·ft)



SECTION A-A

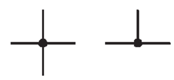
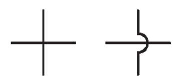
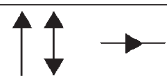
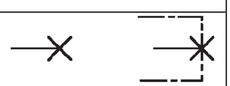
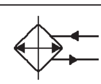
SV544-03002

HYDRAULIC SYSTEMS

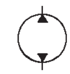
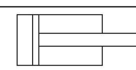
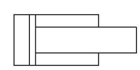
1. SYSTEM CIRCUIT DIAGRAM

1-1. Graphic Symbols for Hydraulic Circuits

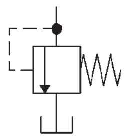
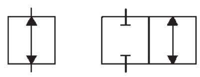
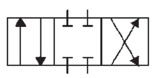
Basic Symbols

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.	  

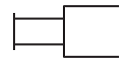
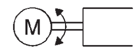
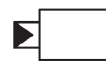
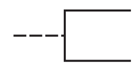
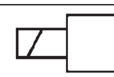
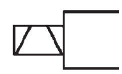
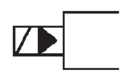
Pump, Motors and Cylinders

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

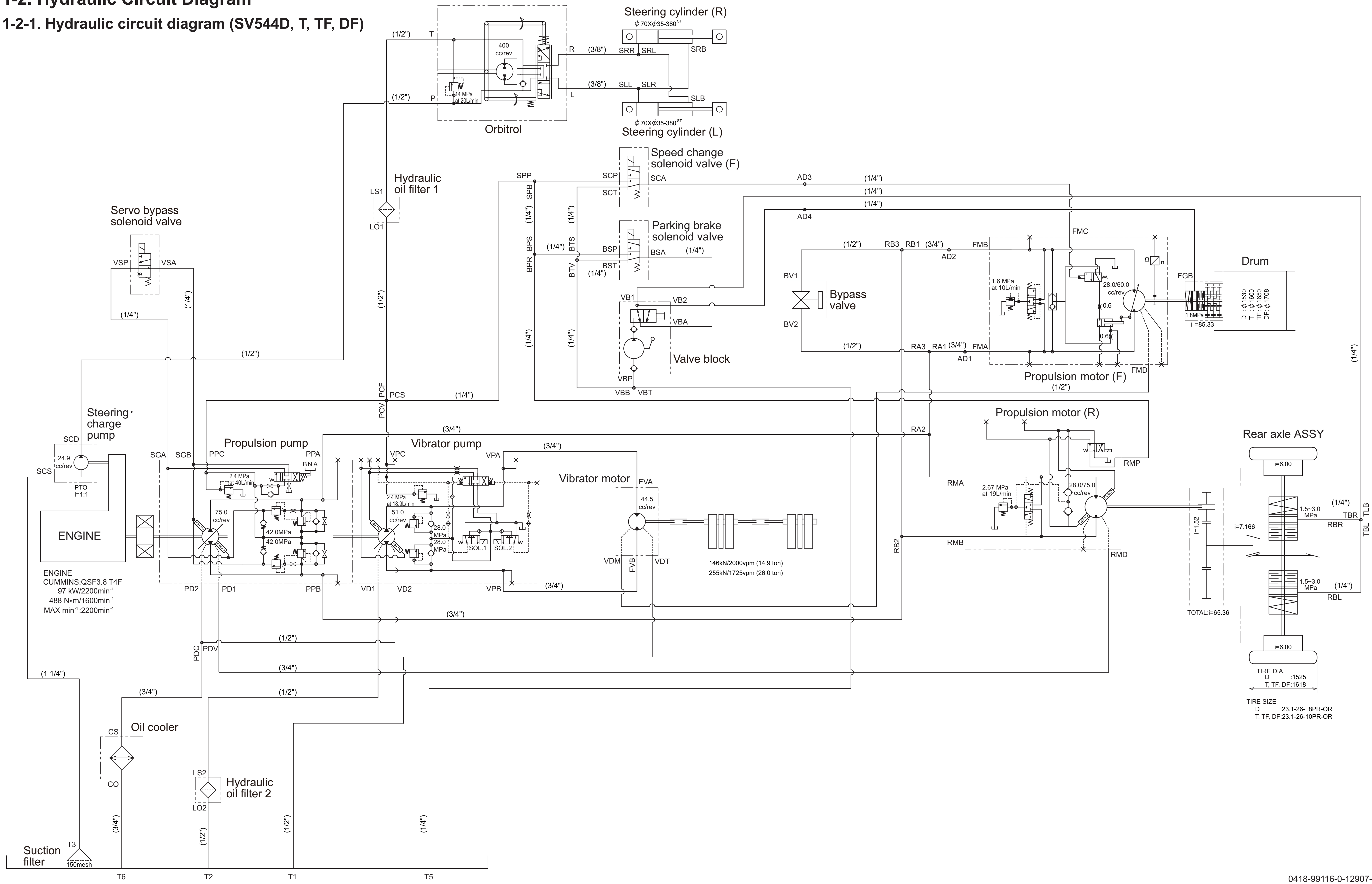
DESCRIPTION	SYMBOL
Check valve	
Manual shut off (On-Off)	
Pressure relief	
Flow control, adjustable	
Valve symbols: The basic valve symbol one or more squares with lines representing flow paths and flow conditions between ports.	
Multiple squares indicate a valve with as many distinct positions there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

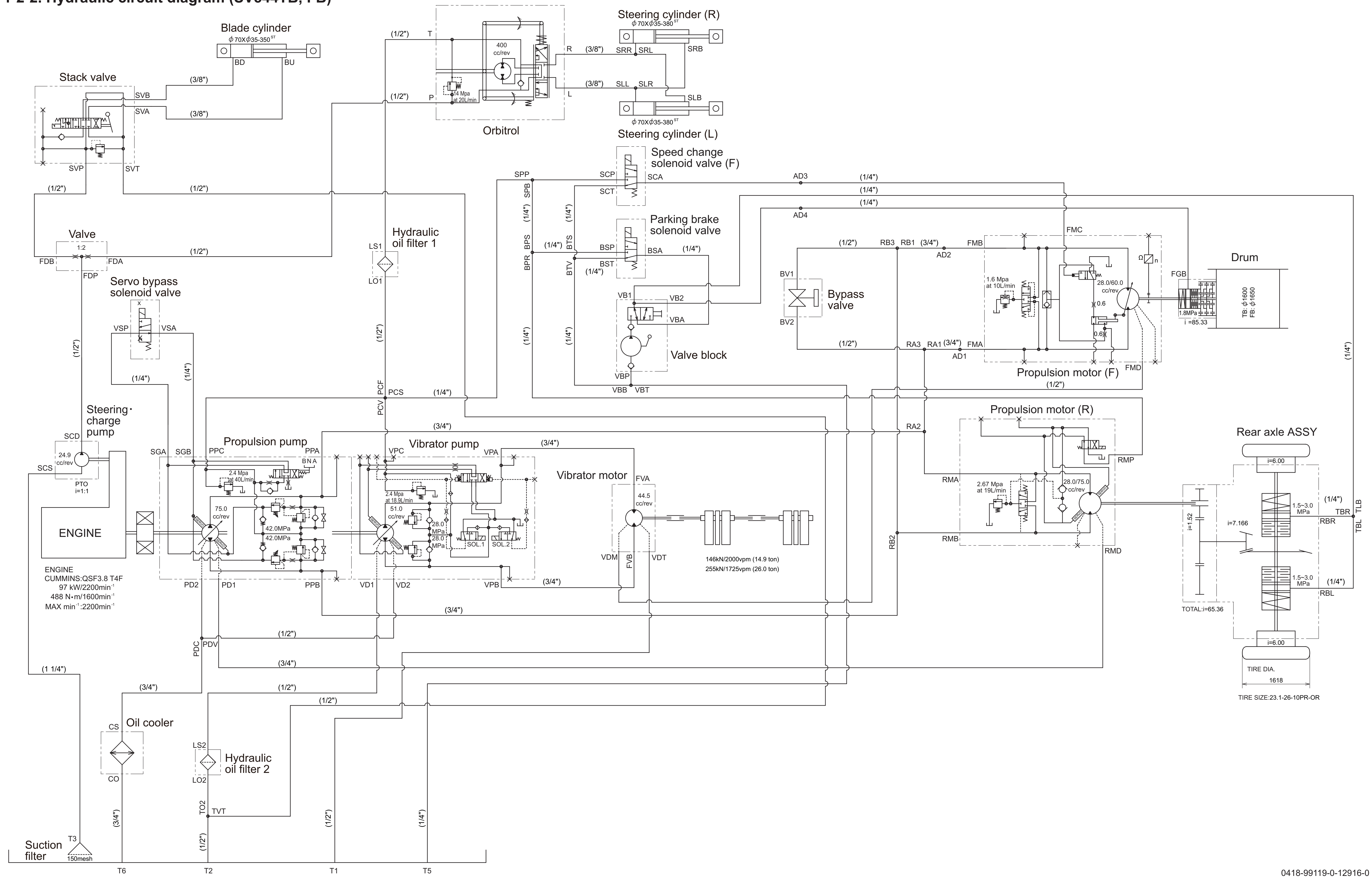
1-2. Hydraulic Circuit Diagram

1-2-1. Hydraulic circuit diagram (SV544D, T, TF, DF)



0418-99116-0-12907-0

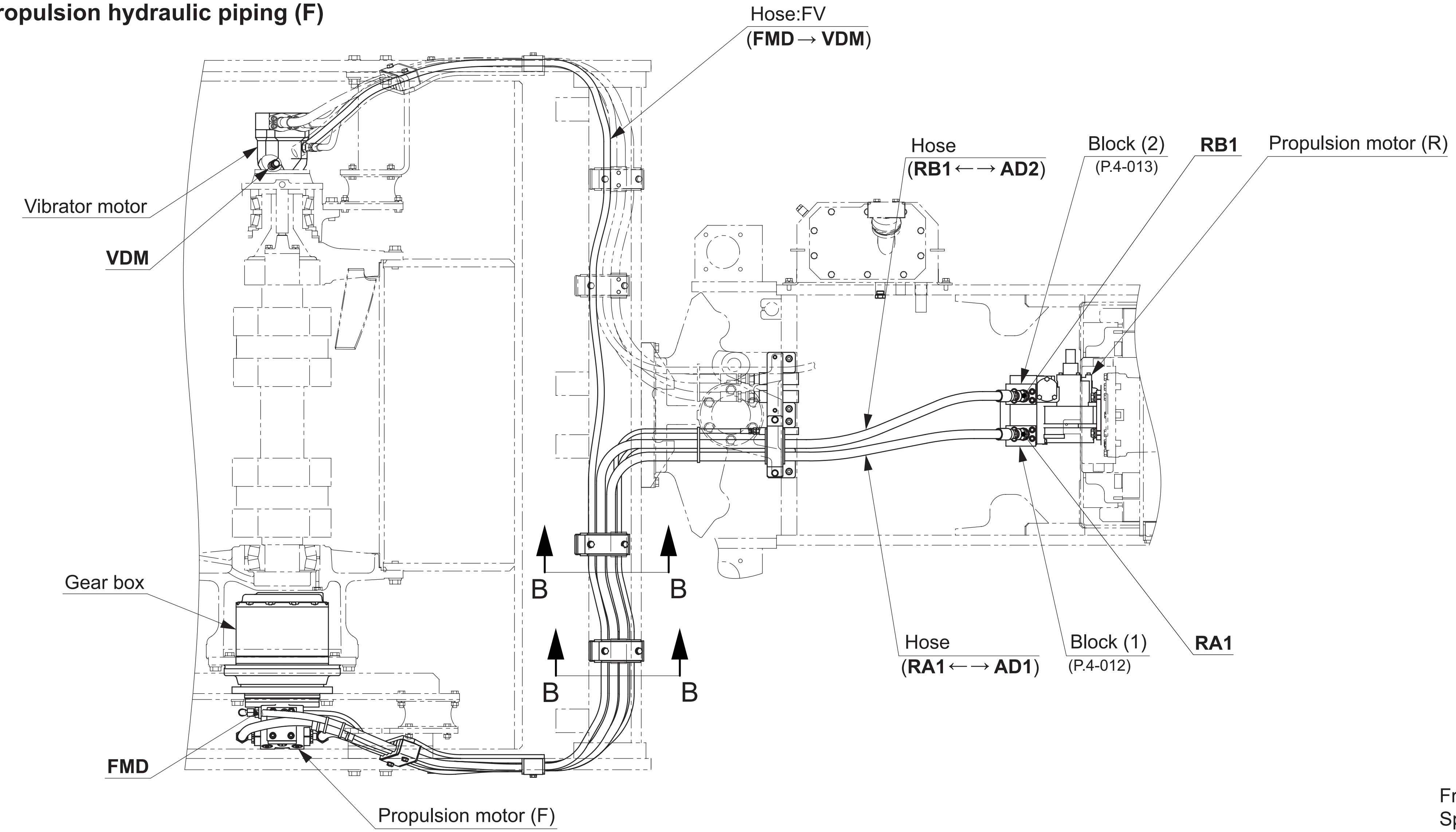
1-2-2. Hydraulic circuit diagram (SV544TB, FB)

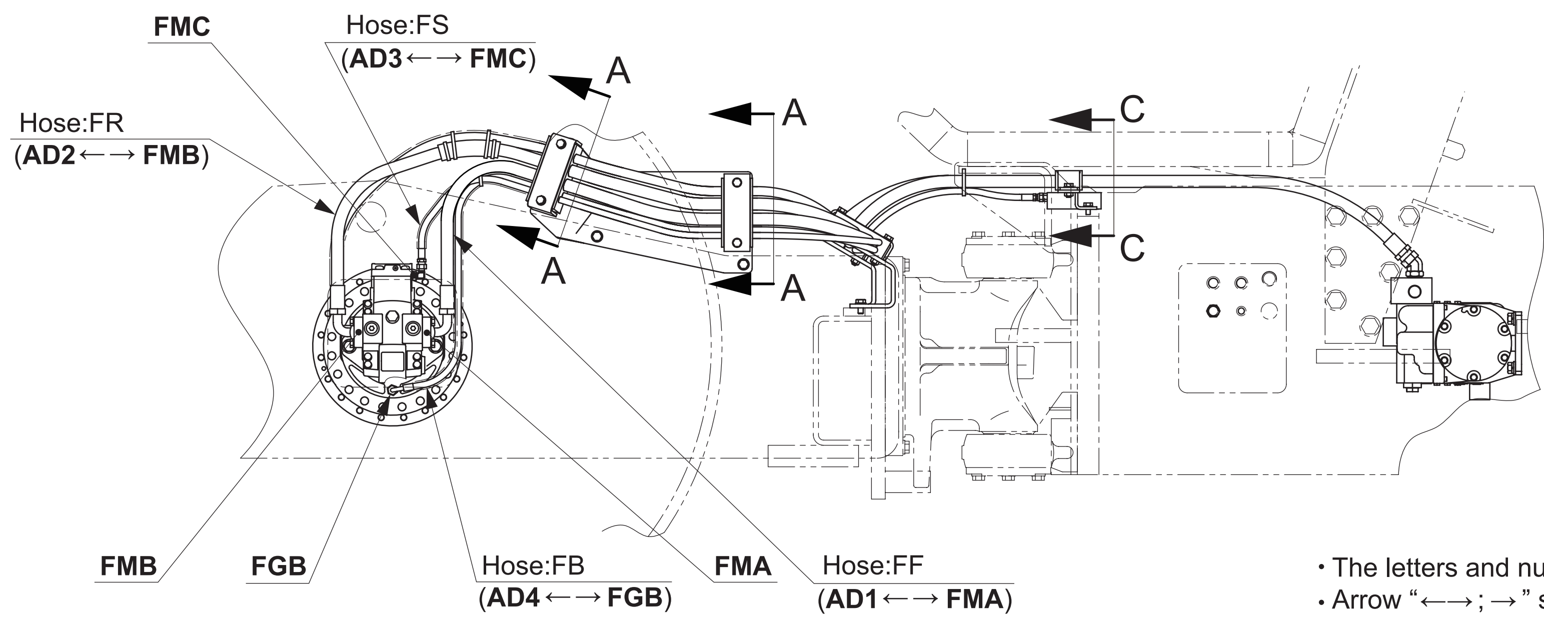


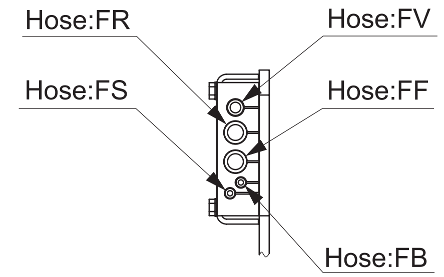
2. PROPULSION HYDRAULIC SYSTEM

2-1. Propulsion Hydraulic Piping

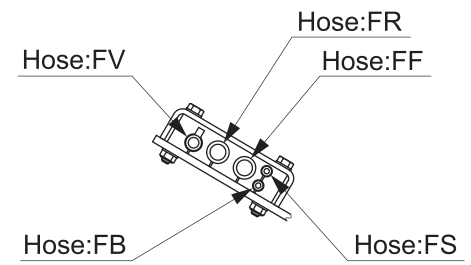
2-1-1. Propulsion hydraulic piping (F)



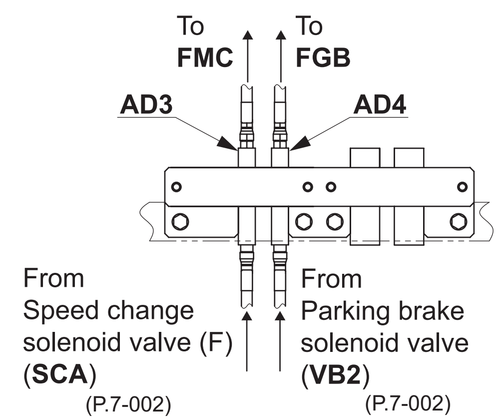




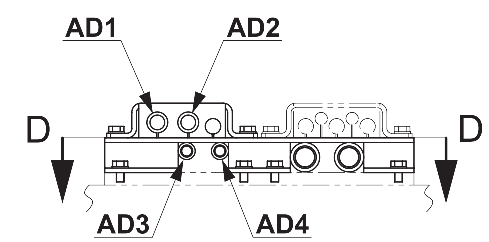
SECTION A-A



SECTION B-B



SECTION D-D

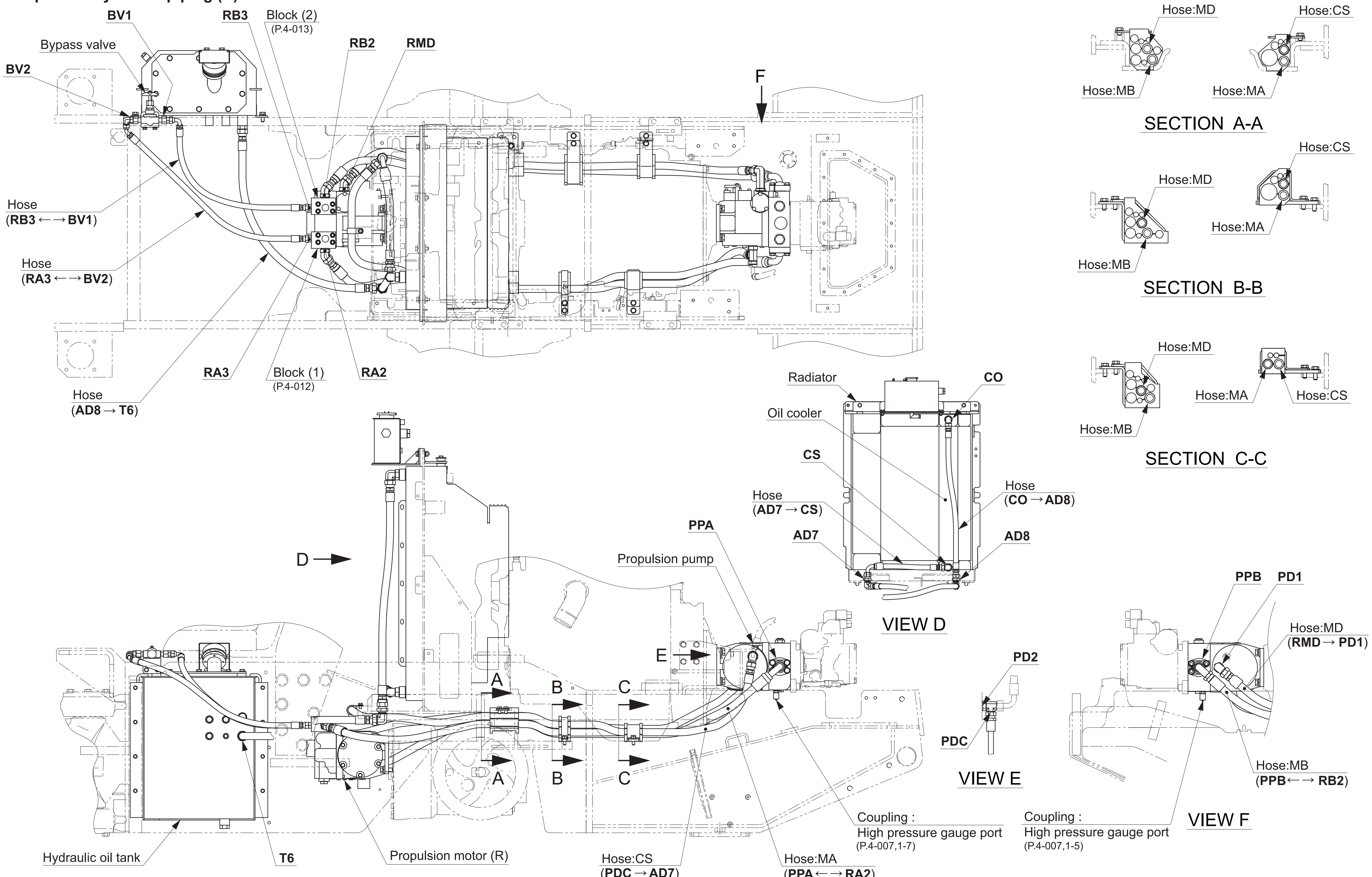


SECTION C-C

- The letters and numbers in the figure such as “AD1” and “FMA” show each port.
- Arrow “←→ ; →” symbols show the hose connection and the direction of the flow of the oil.

0418-36835-0-12701-C

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

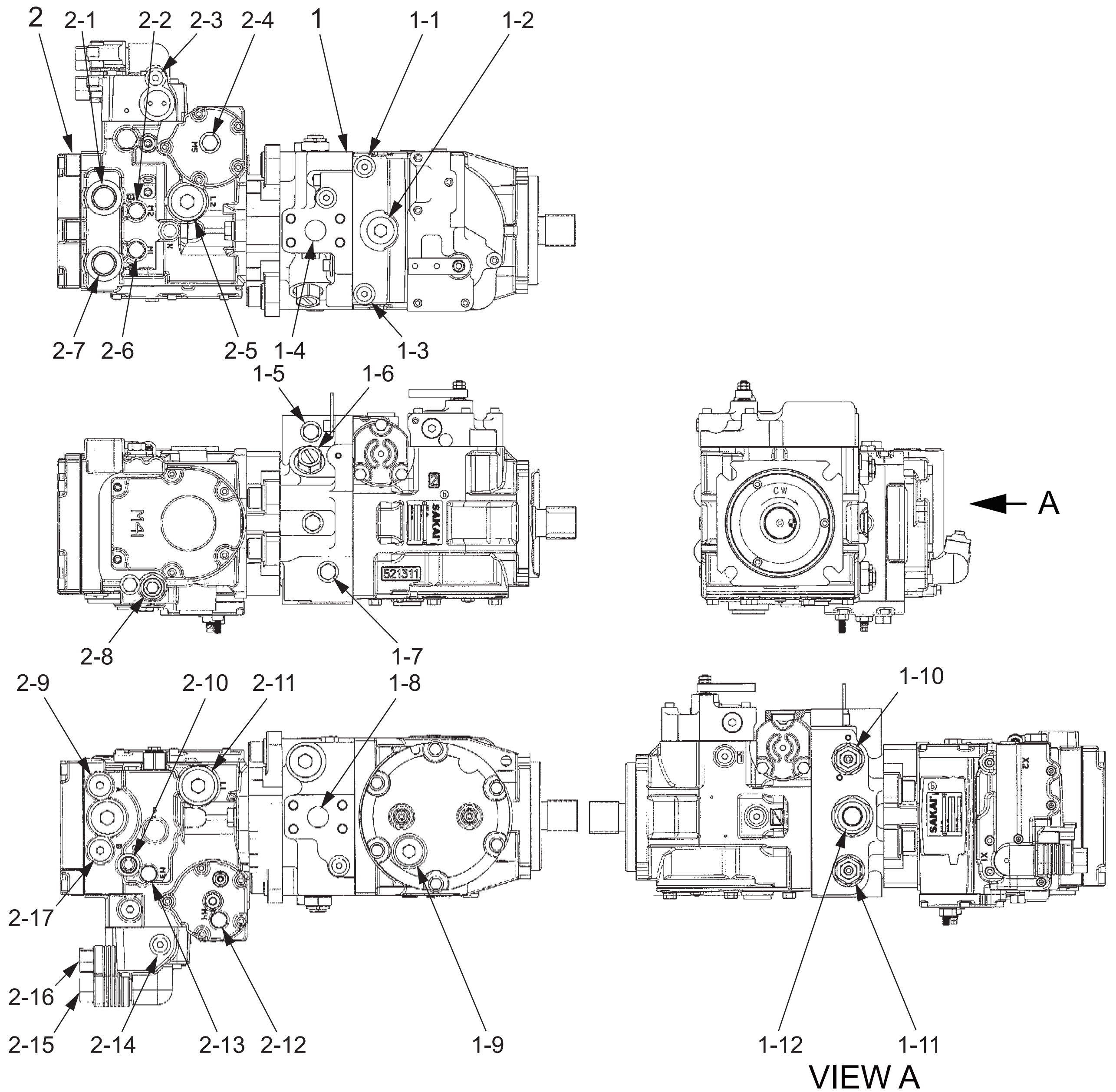


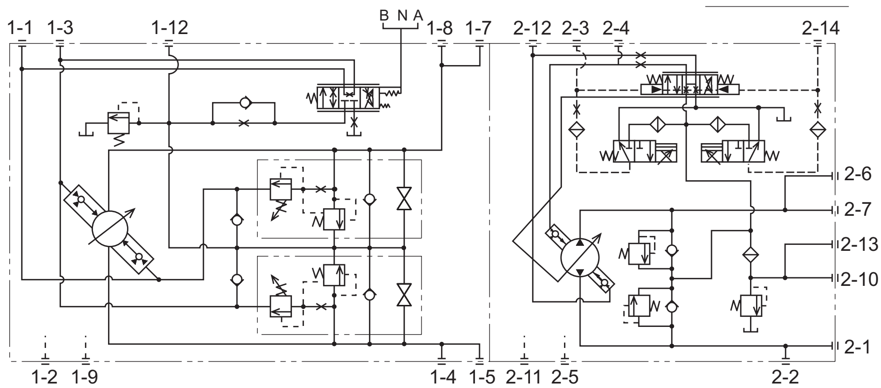
- The letters and numbers in the figure such as “PPA” and “RA2” show each port.
- Arrow “←→ ; →” symbols show the hose connection and the direction of the flow of the oil.

0418-36832-0-12255-A

2-2. Hydraulic Component Specifications

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





Pump circuit diagram

SV544-04001

(1) Propulsion pump

(1-1)	Servo pressure gauge port	**[SGA]**	: 9/16-18UNF
(1-2)	Drain port	**[PD1]**	: 1 1/16-12UN
(1-3)	Servo pressure gauge port	**[SGB]**	: 9/16-18UNF
(1-4)	Port B1 (Reverse)	**[PPB]**	: SAE 1”
(1-5)	High pressure gauge port (For port B1)		: 9/16-18UNF
(1-6)	Charge relief valve		
(1-7)	High pressure gauge port (For port A1)		: 9/16-18UNF
(1-8)	Port A1 (Forward)	**[PPA]**	: SAE 1”
(1-9)	Drain port	**[PD2]**	: 1 1/16-12UN
(1-10)	Multifunction valve (For port B1)		
(1-11)	Multifunction valve (For port A1)		
(1-12)	Charge supply port	**[PPC]**	: 7/ 8-14UNF

Specifications

- Displacement : 75 cm^3/rev (4.6 cu.in./rev)
- High pressure relief valve pressure setting : 42 MPa (6,090 psi) (at 1,800 min^{-1})
- Charge relief valve pressure setting : 2.4 MPa (348 psi) (at 40 L/min)

(2) Vibrator pump

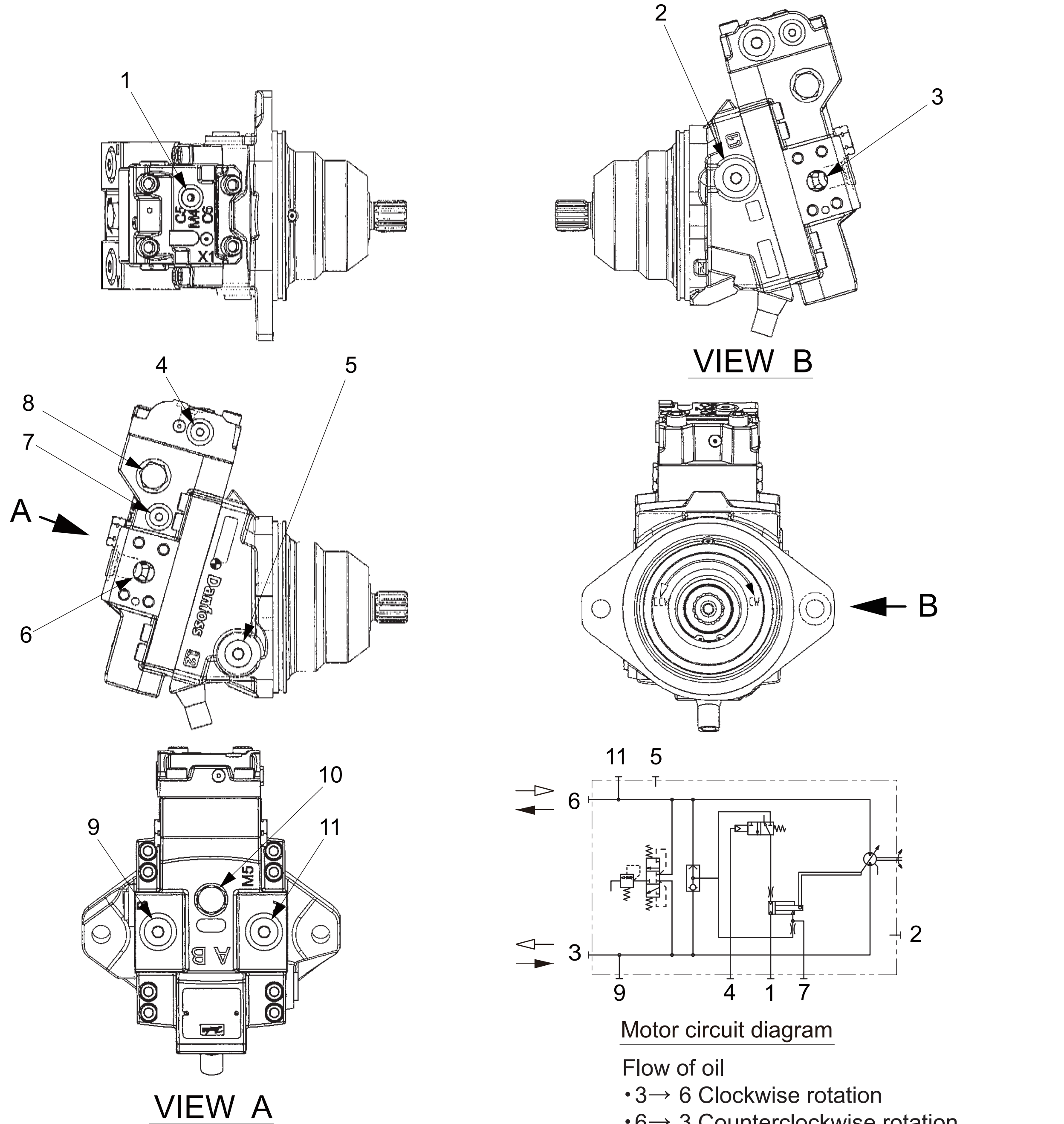
(2-1)	Port B2 (High amplitude)	**[VPB]**	: 1 1/16-12UN
(2-2)	High pressure gauge port (For port B2)		: 9/16-18UNF
(2-3)	Control pressure gauge port		: 9/16-18UNF
(2-4)	Servo pressure gauge port		: 9/16-18UNF
(2-5)	Drain port	**[VD1]**	: 1 5/16-12UN
(2-6)	High pressure relief valve (For port A2)		: 9/16-18UNF
(2-7)	Port A2 (Low amplitude)	**[VPA]**	: 1 1/16-12UN
(2-8)	Charge relief valve		
(2-9)	High pressure check relief valve (For port A2)		
(2-10)	Charge supply port	**[VPC]**	: 3/ 4-16UNF
(2-11)	Drain port	**[VD2]**	: 1 5/16-12UN
(2-12)	Servo pressure gauge port		: 9/16-18UNF
(2-13)	Charge pressure gauge port		: 9/16-18UNF
(2-14)	Control pressure gauge port		: 9/16-18UNF
(2-15)	Proportional solenoid valve 1 (Low amplitude)		
(2-16)	Proportional solenoid valve 2 (High amplitude)		
(2-17)	High pressure check relief valve (For port B2)		

Specifications

- Displacement (Low amplitude) : 51.0 cm^3/rev (3.1 cu.in./rev)
  (High amplitude) : 44.9 cm^3/rev (2.7 cu.in./rev)
- High pressure relief valve pressure setting : 28.0 MPa (4,060 psi) (at 3.8 to 5.6 L/min)
- Charge relief valve pressure setting : 2.4 MPa (348 psi) (at 18.9 L/min)

- Allowable pump case pressure : 0.3 MPa (43.5 psi) or less
- Pump ASSY weight : 100 kg (220 lbs.)

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



Motor circuit diagram

Flow of oil
・3→ 6 Clockwise rotation
・6→ 3 Counterclockwise rotation

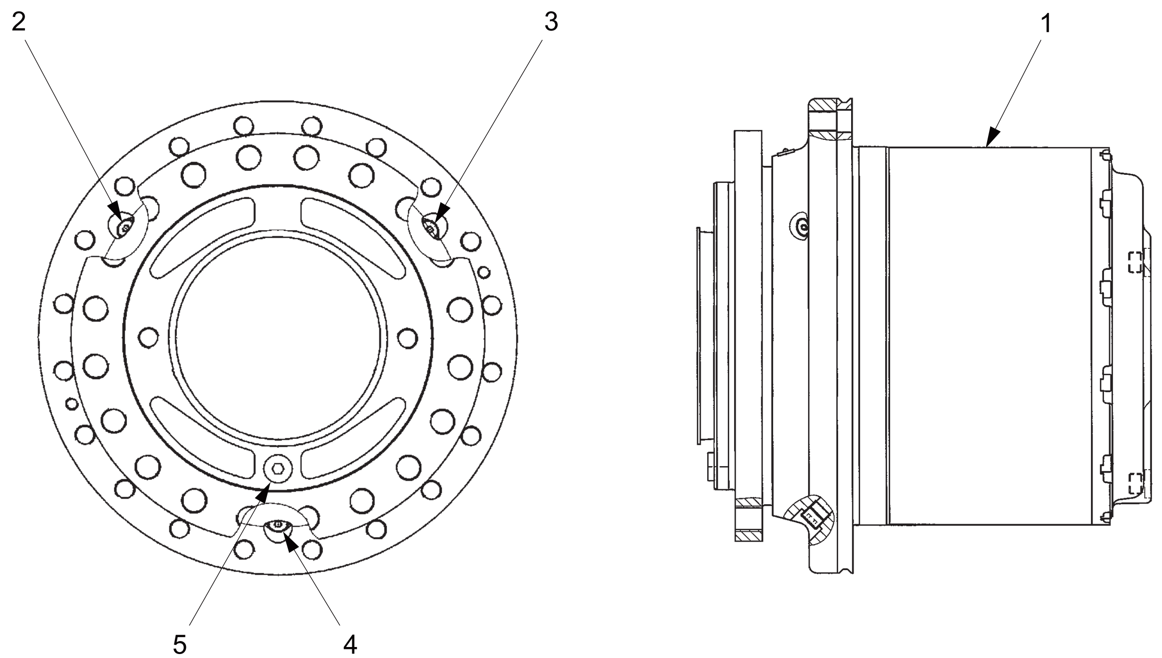
SV414-04001

(1)	Servo pressure gauge port (High)		: 9/16-18UNF	(7)	Servo pressure gauge port (Low)	:	9/16-18UNF
(2)	Drain port	**[FMD]**	: 7/ 8-14UNF	(8)	Loop flushing shuttle valve		
(3)	Port B (Reverse)	**[FMB]**	: SAE 3/4”	(9)	Gauge port (For Port B)	:	7/ 8-14UNF
(4)	Control pressure gauge port	**[FMC]**	: 9/16-18UNF	(10)	Loop flushing relief valve		
(5)	Drain port		: 7/ 8-14UNF	(11)	Gauge port (For Port A)	:	7/ 8-14UNF
(6)	Port A (Forward)	**[FMA]**	: SAE 3/4”				

Specifications

• Displacement (max.)	:	60.0 cm^3/rev	(3.66 cu.in./rev)
(min.)	:	28.0 cm^3/rev	(1.71 cu.in./rev)
• Loop flushing relief valve pressure setting	:	1.6 MPa	(232 psi)
• Allowable motor case pressure	:	0.3 MPa	(43.5 psi) or less
• Weight	:	28 kg	(62 lbs.)

2-2-3. Gear box



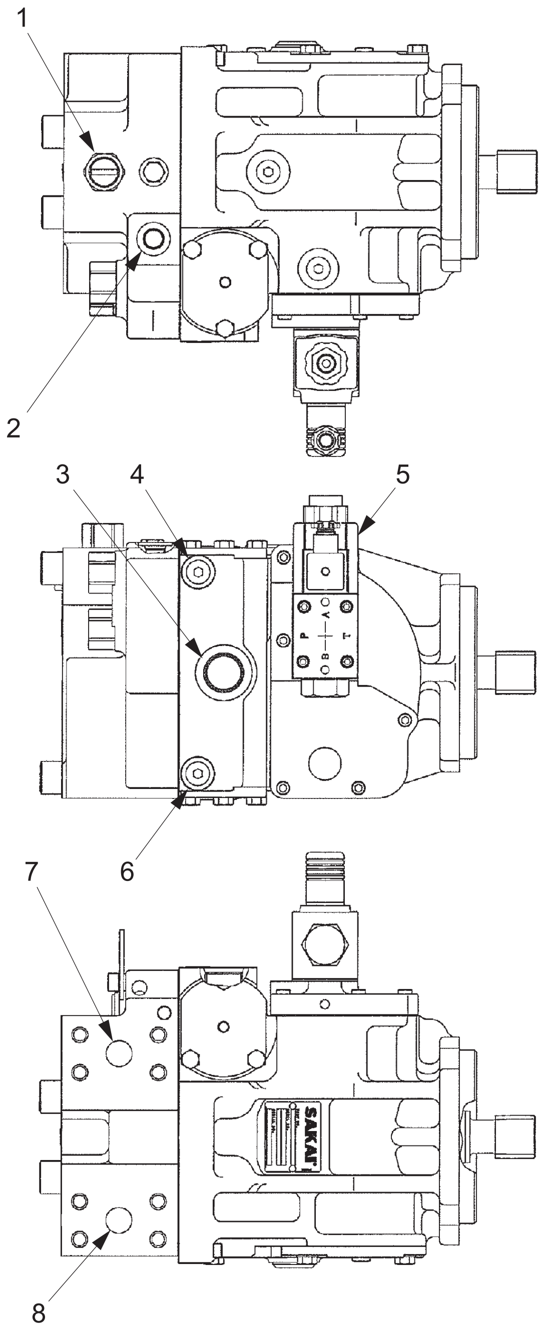
SV540-04002

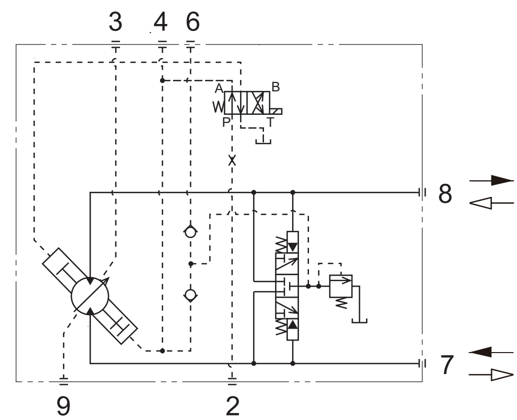
(1) Gear box	(4) Drain port : M16 P=1.5
(2) Oil filler port : M16 P=1.5	(5) Brake port **[FGB]** : M16 P=1.5
(3) Oil filler port : M16 P=1.5	

Specifications

- Reduction ratio : 1/85.33
- Brake release pressure : More than 1.8 MPa (261 psi)
- Oil capacity : 4.5 L (1.19 gal.)
- Weight : 121.1 kg (267 lbs.)

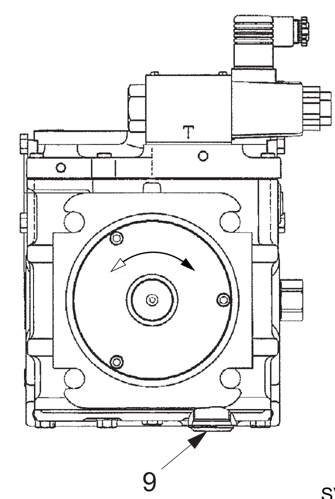
2-2-4. Propulsion hydraulic motor (R)





Motor circuit diagram

Flow of oil
・7→ 8 Clockwise rotation
・8→ 7 Counterclockwise rotation



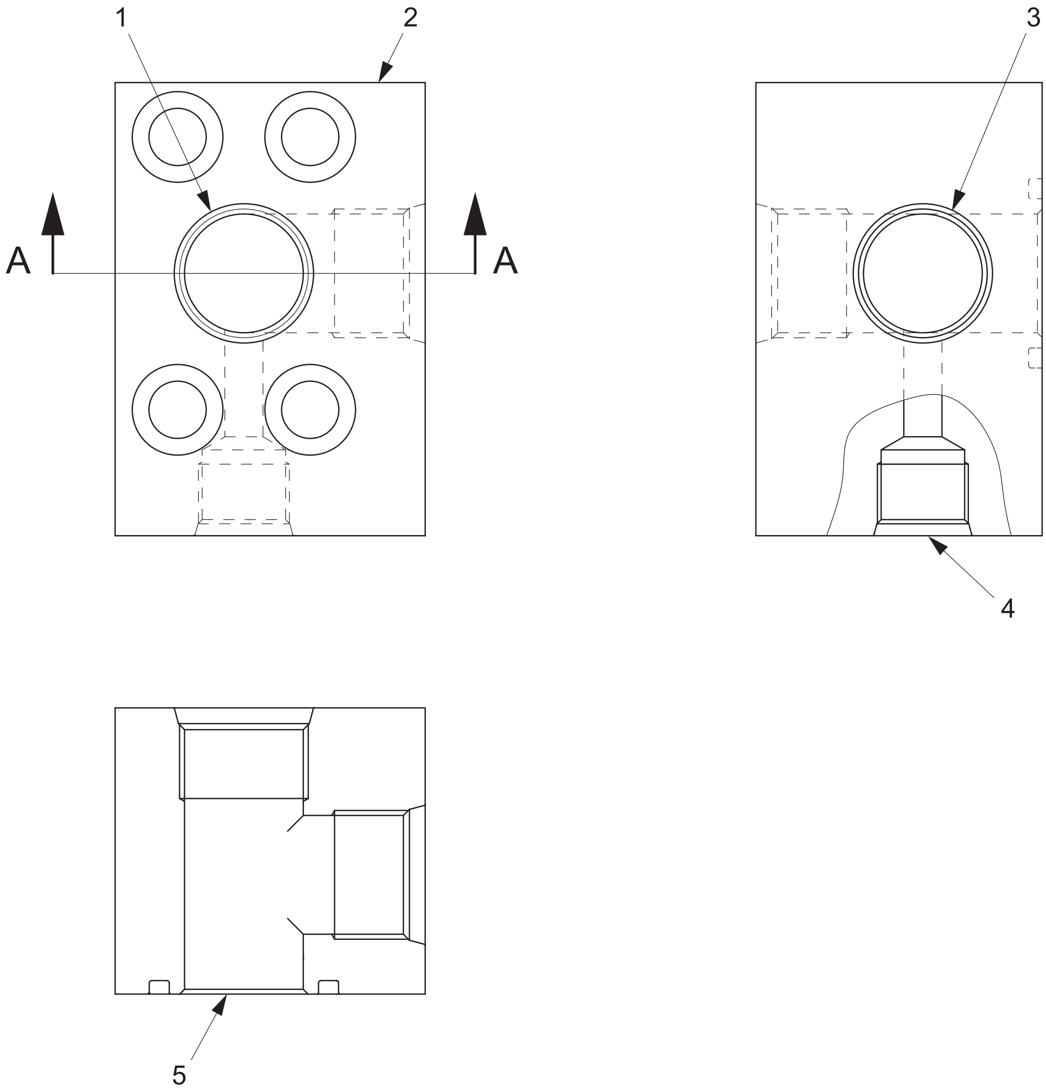
SV544-04002

(1) Charge relief valve				(6) Servo pressure gauge port		:	9/16-18UNF
(2) Pilot supply port	**[RMP]**	:	9/16-18UNF	(7) Port B (Reverse)	**[RMB]**	:	SAE 1”
(3) Drain port	**[RMD]**	:	1 1/16-12UN	(8) Port A (Forward)	**[RMA]**	:	SAE 1”
(4) Servo pressure gauge port		:	9/16-18UNF	(9) Drain port		:	1 1/16-12UN
(5) Speed change solenoid valve (R)							

Specifications

• Displacement (max.)	:	75	cm^3/rev	(4.58	cu.in./rev	)
(min.)	:	28	cm^3/rev	(1.71	cu.in./rev	)
• Flushing relief valve pressure setting	:	2.67	MPa	(387	psi	) (at 19 L/min)
• Allowable motor case pressure	:	0.3	MPa	(43.5	psi	) or less
• Weight	:	55	kg	(121	lbs.	)

2-2-5. Block (1)

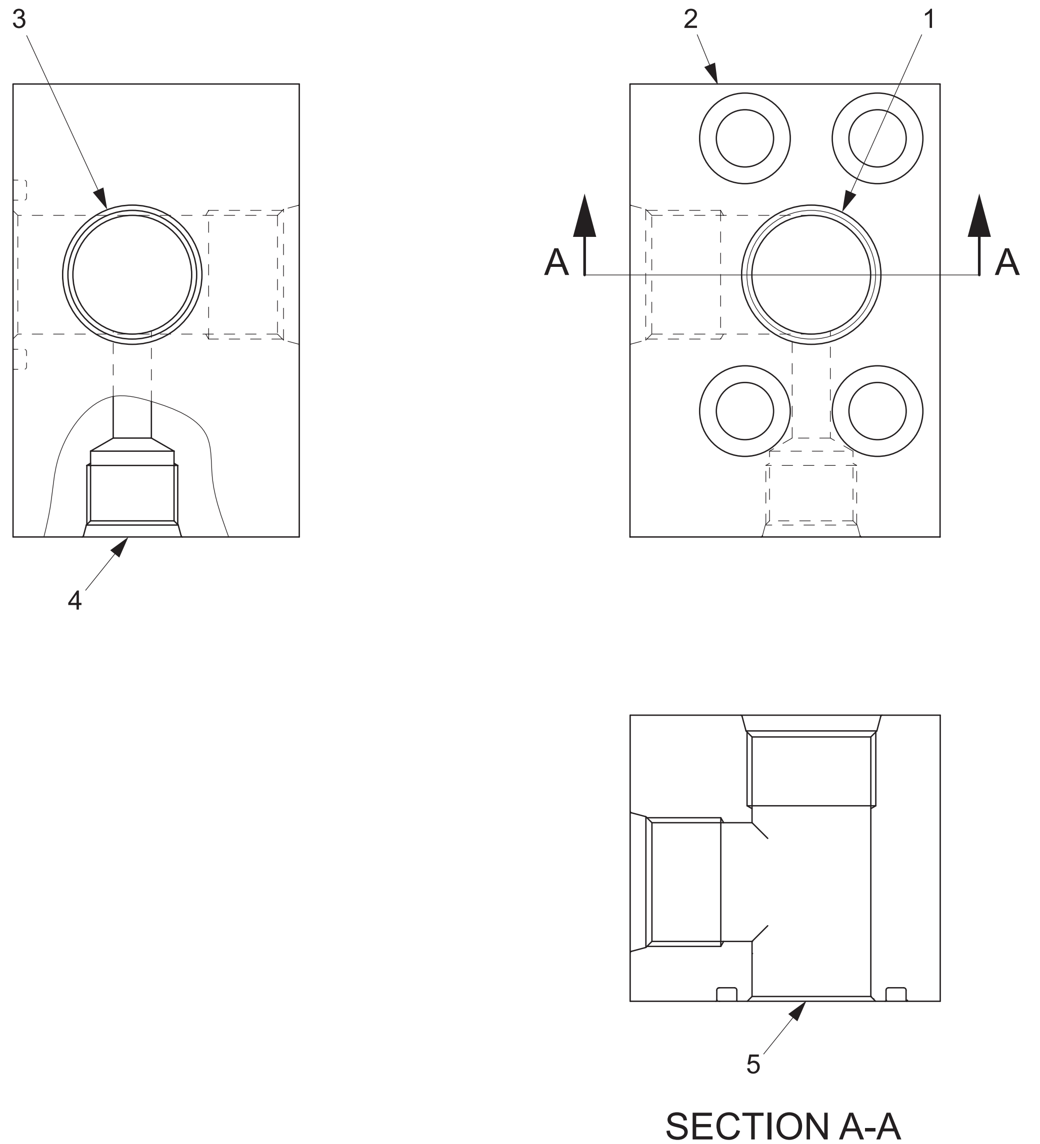


SECTION A-A

SV520-C-04002

(1) To propulsion motor (F) port A (**[FMA]**) **[RA1]** : 1 1/16-12UNF
(2) Body
(3) From propulsion pump port A (**[PPA]**) **[RA2]** : 1 1/16-12UNF
(4) To bypass valve (**[BV2]**) **[RA3]** : 3/ 4-16UNF
(5) To propulsion motor (R) port A (**[RMB]**) : ϕ24.9

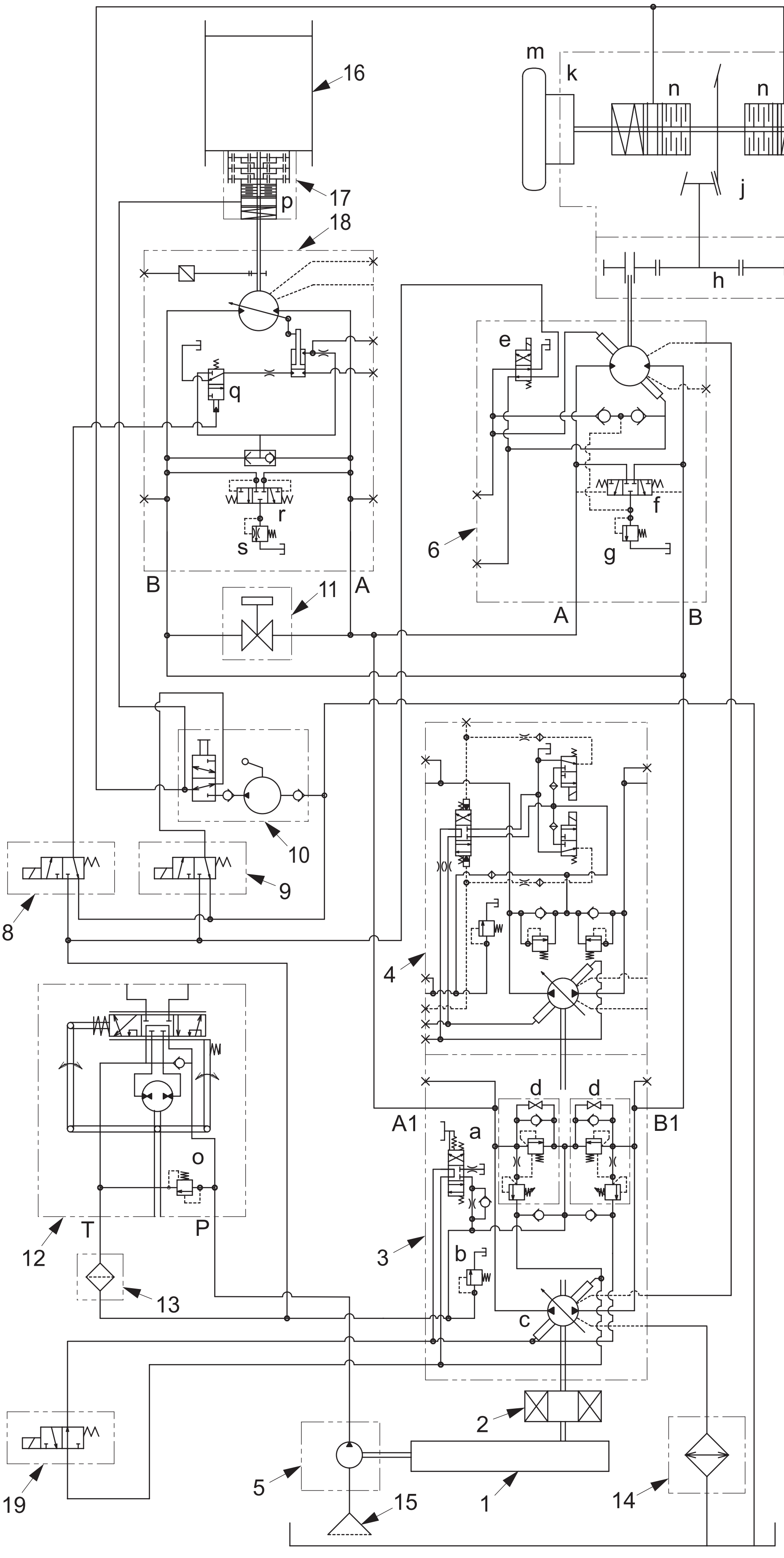
2-2-6. Block (2)



SV520-C-04003

(1) To propulsion motor (F) port B (**[FMB]**) **[RB1]** : 1 1/16-12UNF
(2) Body
(3) From propulsion pump port B (**[PPB]**) **[RB2]** : 1 1/16-12UNF
(4) To bypass valve (**[BV1]**) **[RB3]** : 3/ 4-16UNF
(5) To propulsion motor (R) port B (**[RMB]**) : ϕ24.9

Fig.: Propulsion circuit



1. Engine
2. Coupling
3. Propulsion pump
   a. Control valve (forward-reverse)
   b. Charge relief valve
   c. Servo piston
   d. Multifunction valves
4. Vibrator pump
5. Steering•charge pump
6. Propulsion motor (R)
   e. Speed change solenoid valve
   f. Flushing valve
   g. Flushing relief valve
7. Rear axle ASSY
   h. Gear box
   j. Differential
   k. Final drives
   m. Tires
   n. Brake
8. Speed change solenoid valve (F)
9. Parking brake solenoid valve
10. Valve block
11. Bypass valve
12. Orbitrol
   o. Relief valve
13. Hydraulic oil filter 1
14. Oil cooler
15. Suction filter
16. Drum
17. Gear box
   p. Brake
18. Propulsion motor (F)
   q. Speed change valve
   r. Loop flushing shuttle valve
   s. Loop flushing relief valve
19. Servo bypass solenoid valve

SV544-04003

2-3. Description and Operation of Propulsion System

Description

- Made up of propulsion pump (3), propulsion motor (R) (6), rear axle ASSY (7), propulsion motor (F) (18), drum (16), speed change solenoid valve (F) (8) and parking brake solenoid valve (9).
  Rear axle ASSY (7) includes gear box (h), differential (j), final drives (k), tires (m) and brake (n).

Basic function of propulsion pump and motor

Propulsion pump:

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

Propulsion motor:

- Piston motors are used. The motor is a variable displacement type which controls the piston stroke by varying the swashplate angle.

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

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

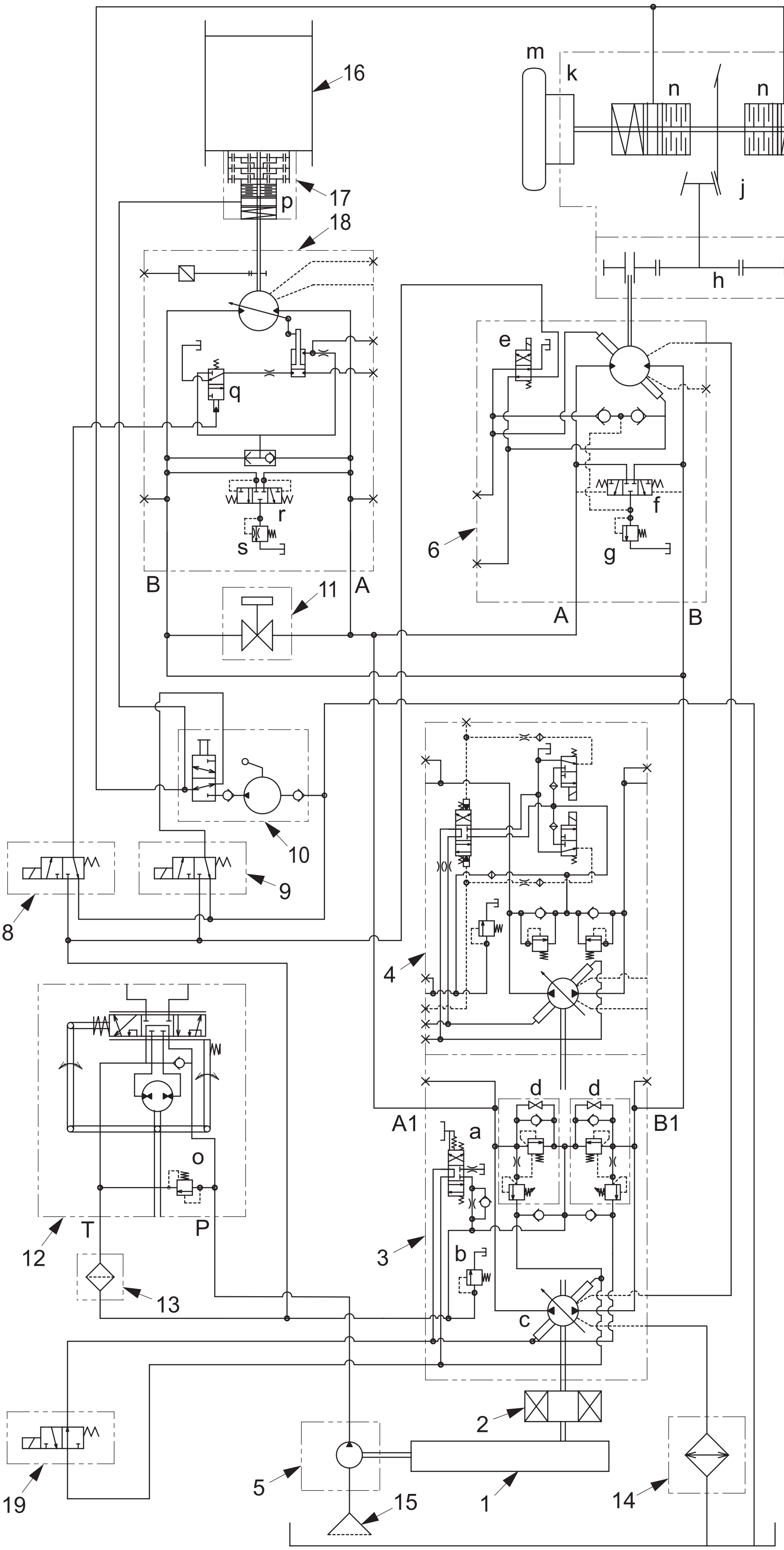
- Operation of the F-R lever forward puts pump control valve (a) into function. Servo piston (c) tilts the pump swashplate in the forward travel direction.
- Propulsion pump (3) discharges oil from its port A1. Then the oil flow branches into two lines; one line connecting to forward travel port (A) of propulsion motor (R) (6) and the other line to forward travel port (A) of propulsion motor (F) (18).
- The oil fed into the forward travel ports of the motors drives the motors, flowing out from the opposite side ports (port B in propulsion moto (F) and port B in propulsion motor (R)) and joins again to flow into suction port (B1) in propulsion pump (3). At the same time, part of oil is drained to the tank via flushing valve (f), flushing relief valve (g), and the motor casing

(NOTE)

- **Because the propulsion circuit is a closed circuit, the relationship between the suction port and discharge port is reversed when the travel direction is reversed.**

- The power from propulsion motor (R) (6) is delivered to tires (m) through reduction mechanism in gear box (h), differential (j) and final drives (k).
- The drive from propulsion motor (F) (18) is conveyed to drum (16) via gear box (17).

Fig.: Propulsion circuit



1. Engine
2. Coupling
3. Propulsion pump
   a. Control valve (forward-reverse)
   b. Charge relief valve
   c. Servo piston
   d. Multifunction valves
4. Vibrator pump
5. Steering•charge pump
6. Propulsion motor (R)
   e. Speed change solenoid valve
   f. Flushing valve
   g. Flushing relief valve
7. Rear axle ASSY
   h. Gear box
   j. Differential
   k. Final drives
   m. Tires
   n. Brake
8. Speed change solenoid valve (F)
9. Parking brake solenoid valve
10. Valve block
11. Bypass valve
12. Orbitrol
    o. Relief valve
13. Hydraulic oil filter 1
14. Oil cooler
15. Suction filter
16. Drum
17. Gear box
    p. Brake
18. Propulsion motor (F)
    q. Speed change valve
    r. Loop flushing shuttle valve
    s. Loop flushing relief valve
19. Servo bypass solenoid valve

SV544-04003

Two-step Speed selection (High-Low)

From Low to High:

- Speed change solenoid valve (F) (8) and propulsion motor (R) (6) is also equipped with speed change solenoid valve (e).
- When the changeover switch at the driver's seat is set in the (Rabbit) position, the oil is output from speed change solenoid valve (F) (8) to speed change valve (p) of propulsion motor (F) (18), moving the swash plate of the motor to the side where the piston stroke decreases.
- The charge circuit oil from hydraulic oil filter 1 (13) passes through speed change solenoid valve (e) of propulsion motor (R) (6), moving the swash plate of the motor to the side where the piston stroke decreases.
- Since the displacement per motor rotation decreases, the vehicle speed increases although the pump discharge does not change.

To release parking brake

- Rear axle ASSY (7) and gear box (17) contains brake (n), (p).
- Actuation of the brake switch on the instrument panel in the driver's station energizes parking brake solenoid valve (9). The oil under pressure is fed, via parking brake solenoid valve (9), into the brake cylinders.
- This moves the brake pistons against the compression spring load, releasing the brake.

Circuit protection against high pressure

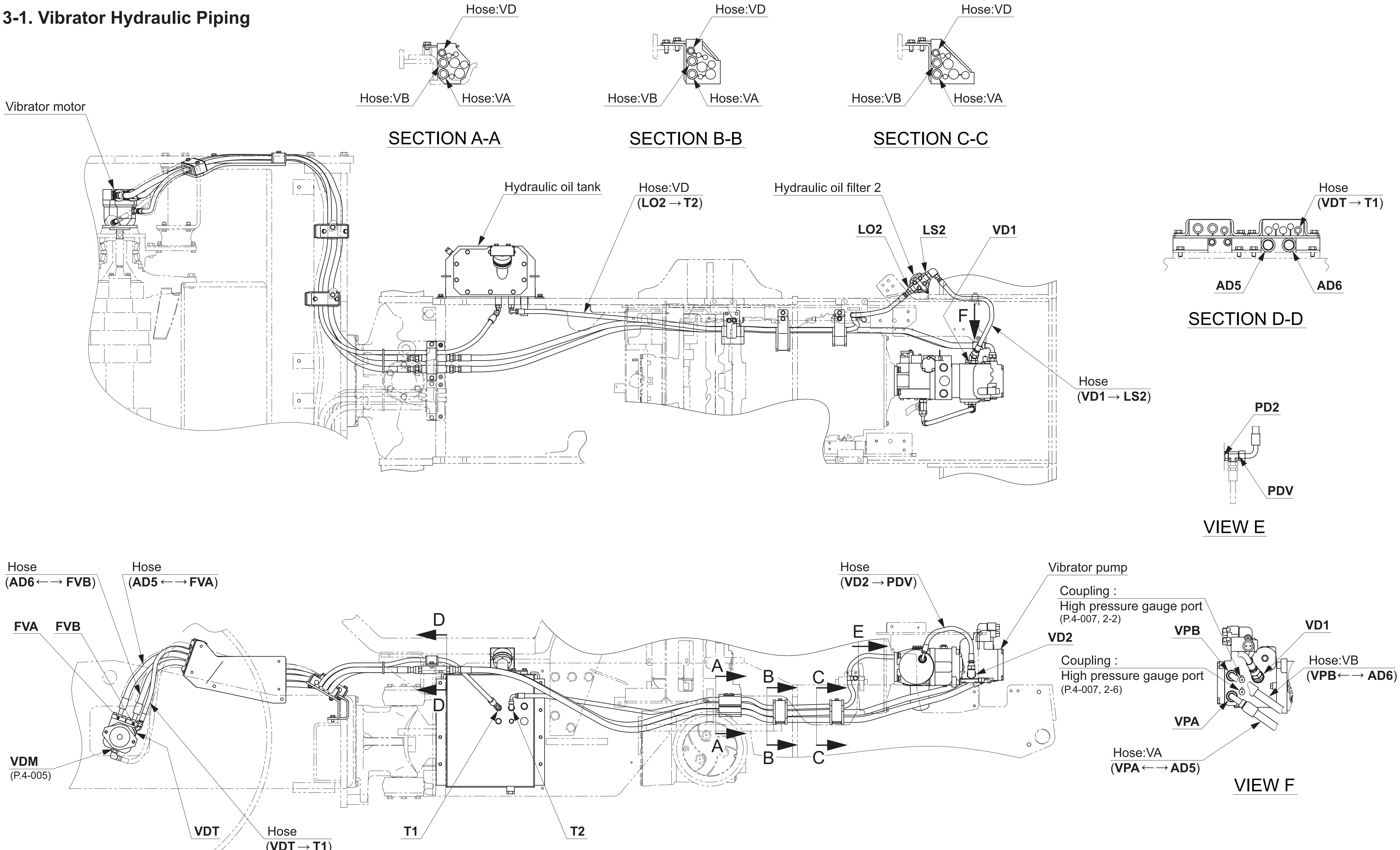
- Multifunction valves (d) built in propulsion pump (3) open to relieve the pressure if the system pressure exceeds the setting of the valves.

Charge circuit

- The propulsion circuit is of a closed circuit, which needs feeding of oil into it for making up deficiency.
- In the charge circuit, oil from steering • charge pump (5) flows into Orbitrol (12), then the whole amount of oil goes to propulsion pump (3) via hydraulic oil filter 1 (13) irrespective of the steering wheel operation.
- Charge relief valve (b) built in propulsion pump (3) maintains the pressure to operate the pump swashplate when the F-R lever is in the neutral position. When travelling, flushing relief valve (g) and loop flushing relief valve (s) built in propulsion motor (6), (18) performs oil renewal, cooling or removal of foreign material as well as keeping the necessary pressure to control the pump swashplate angle.
- For the "To disengage the brake when towing", refer to page 7-003.

3. VIBRATOR HYDRAULIC SYSTEM

3-1. Vibrator Hydraulic Piping

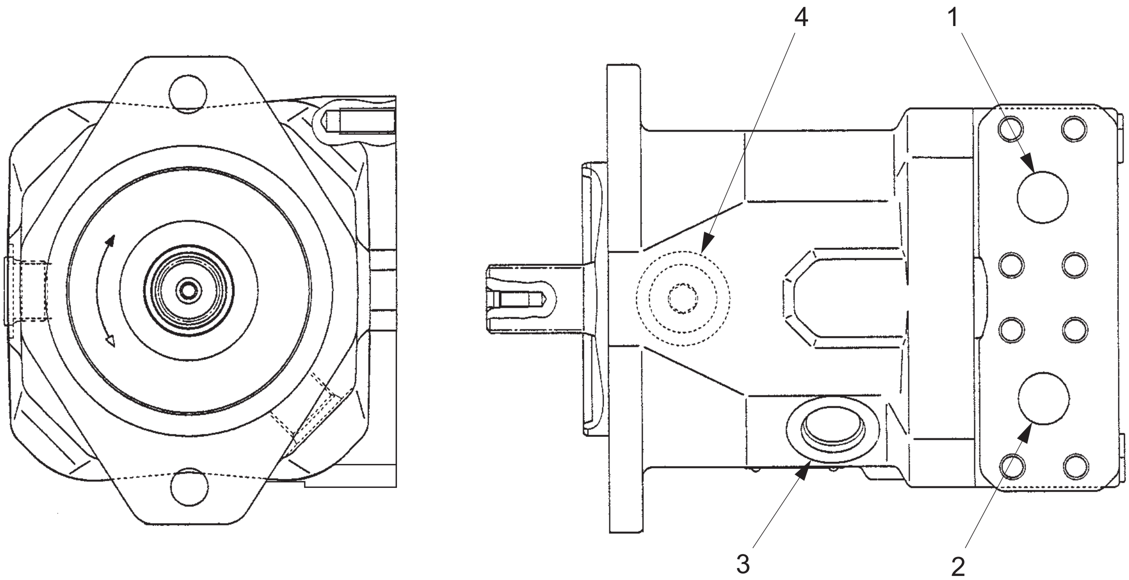


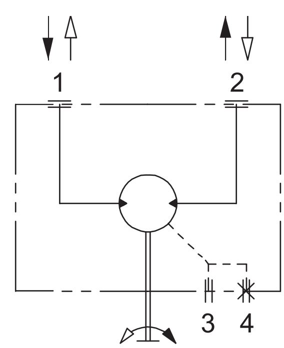
- The letters and numbers in the figure such as "AD5" and "FVA" show each port.
- Arrow "←→ ; →" symbols show the hose connection and the direction of the flow of the oil.

0418-49809-0-12727-B

3-2. Hydraulic Component Specifications

3-2-1. Vibrator hydraulic motor





Motor circuit diagram

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

SV510-Ⅲ-04008

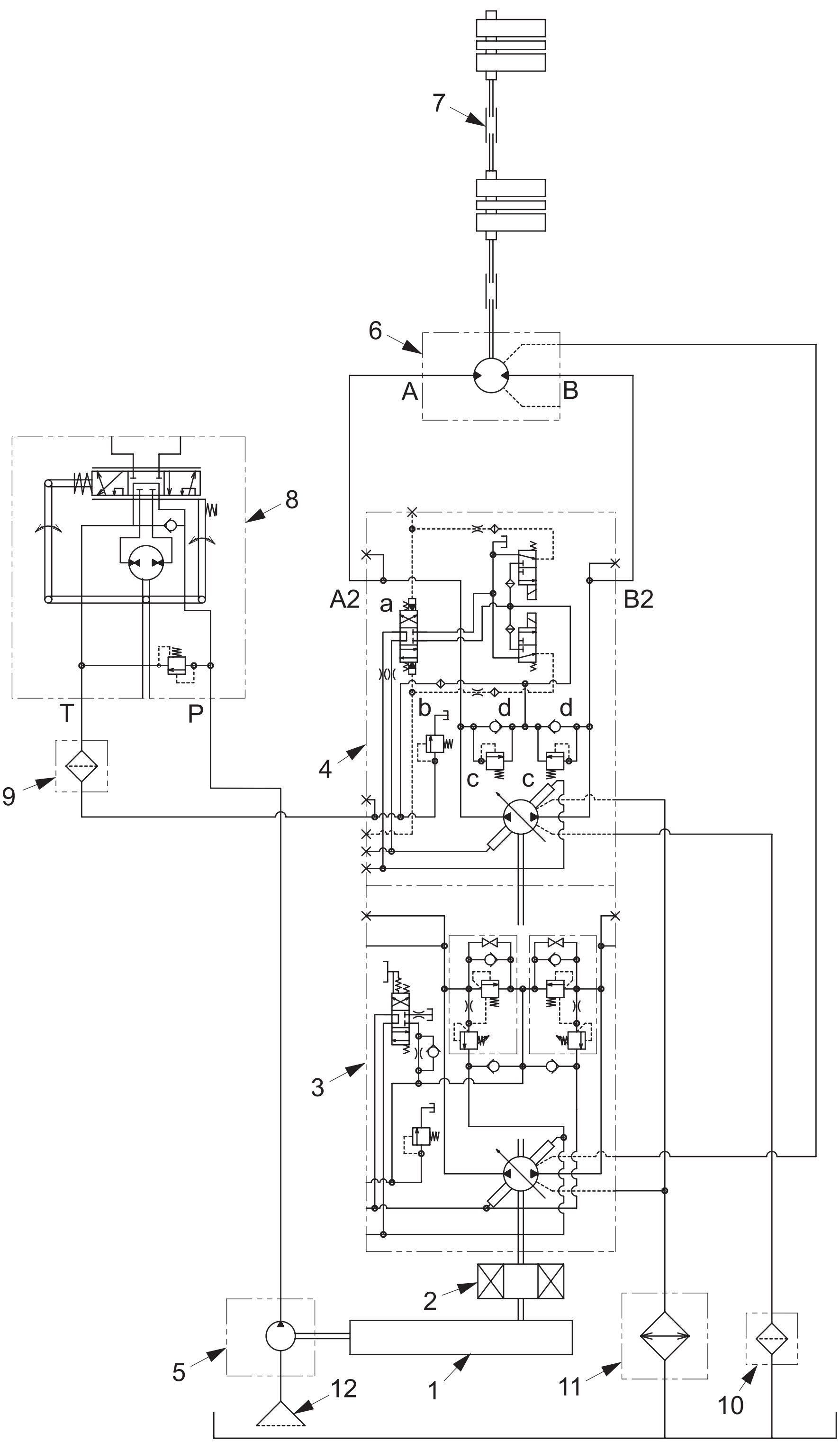
(1) Port A **[FVA]** : SAE 3/4''
(2) Port B **[FVB]** : SAE 3/4''
(3) Drain port (L) **[VDT]** : 7/8-14UNF
(4) Drain port (L1) **[VDM]** : 7/8-14UNF

Specifications

• Displacement	:	44.5 cm^3/rev	(2.7 cu.in.)
• Working pressure	:	28 MPa	(4,060 psi)
• Allowable motor case pressure	:	0.2 MPa	(29.0 psi)
• Weight	:	17 kg	(37.5 lbs.)

Fig.: Vibrator circuit

1. Engine
2. Coupling
3. Propulsion pump
4. Vibrator pump
   a. Amplitude select valve
   b. Charge relief valve
   c. High pressure relief valves
   d. Check valves
5. Steering•charge pump
6. Vibrator motor
7. Vibrator
8. Orbitrol
9. Hydraulic oil filter 1
10. Hydraulic oil filter 2
11. Oil cooler
12. Suction filter



SV544-04004

3-3. Description and Operation of Vibrator System

Description

- Made up of vibrator pump (4), vibrator motor (6) and vibrator (7).

Basic function of vibrator pump and motor

Vibrator pump:

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

Vibrator motor:

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

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

- The operation of the vibration select switch actuates amplitude select valve (a) built in vibrator pump (4) to discharge oil from the high amplitude port (port B2).
- Oil fed into the high amplitude port (port B) of the motor powers the motor and displaced from the opposite side port (port A), getting back to the pump suction port (port A2).

(NOTE)

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

Circuit protection against high pressure

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

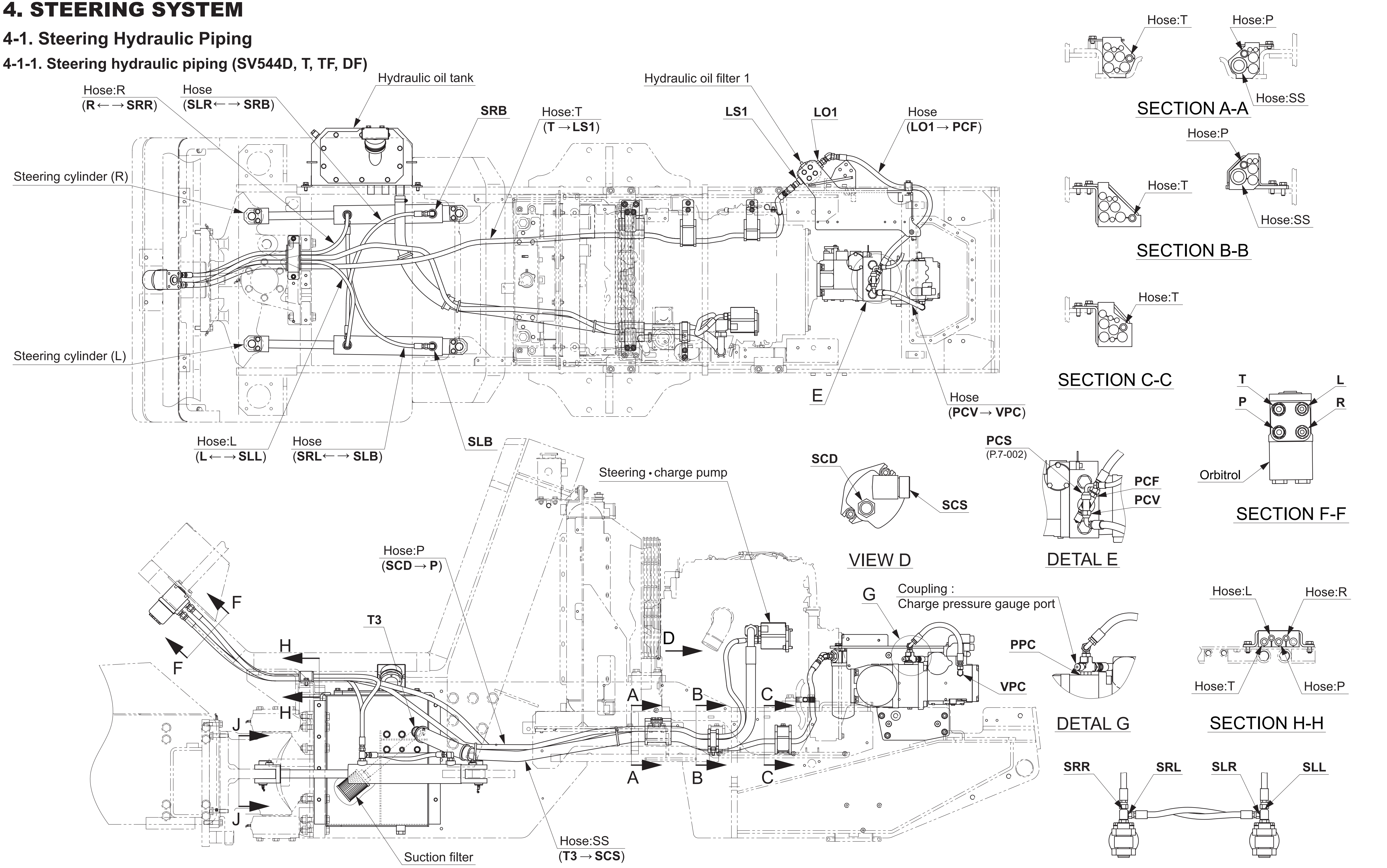
Charge circuit

- The vibrator circuit is also of a closed circuit, which needs feeding of oil into it for making up for deficiency and for other purposes.
- In the charge circuit, oil from steering • charge pump (5) flows into Orbitrol (8), then the whole amount of oil goes to vibrator pump (4) via hydraulic oil filter 1 (9) irrespective of the steering wheel operation.
- Charge relief valve (b) maintains the charge pressure when the machine is not in motion. When travelling, the charge pressure is kept by the flushing relief valve (g) and loop flushing relief valve (s).
- For the “2-3. Description and Operation of Propulsion System”, refer to page 4-015.

4. STEERING SYSTEM

4-1. Steering Hydraulic Piping

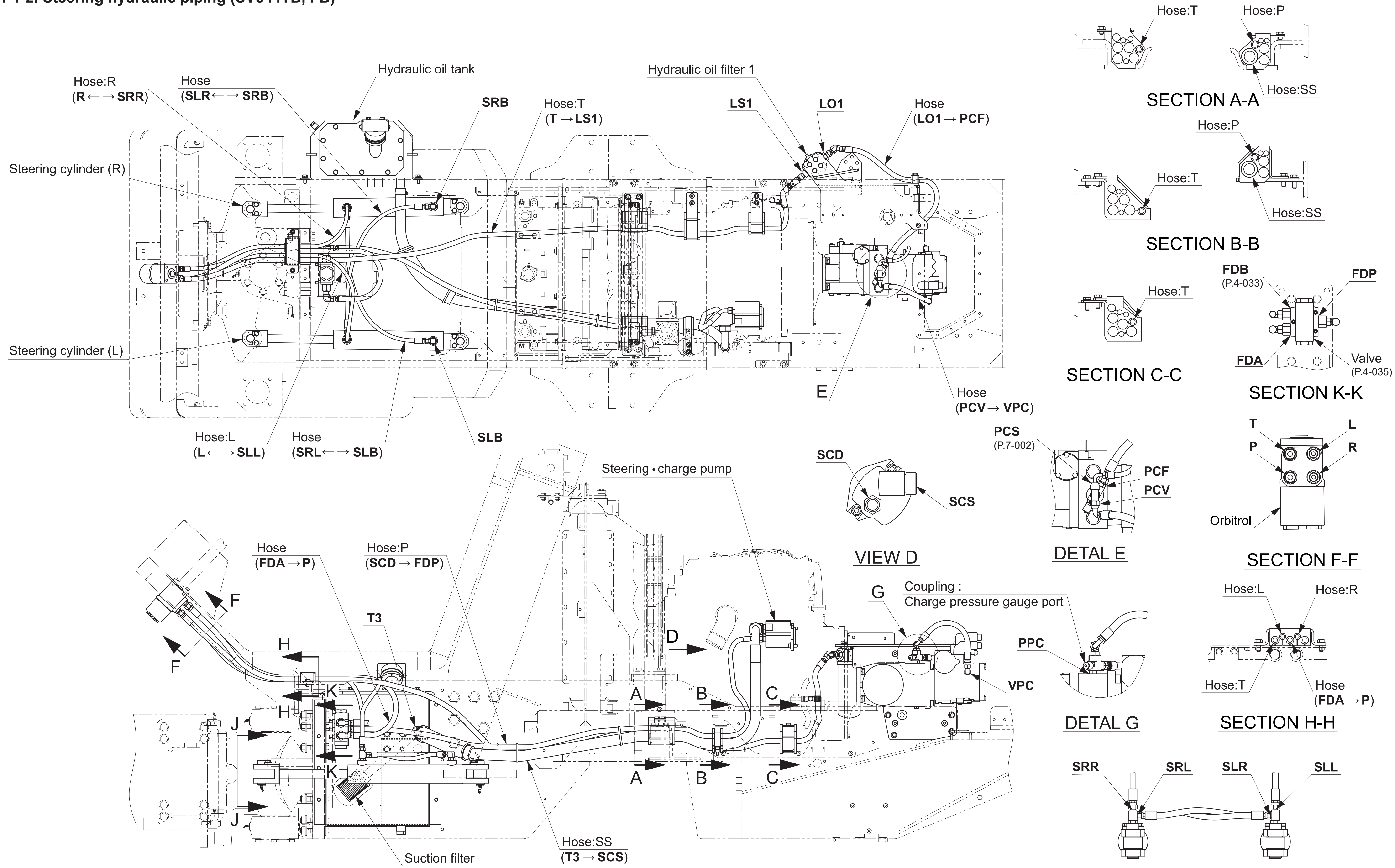
4-1-1. Steering hydraulic piping (SV544D, T, TF, DF)



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

0418-32812-0-12250-A

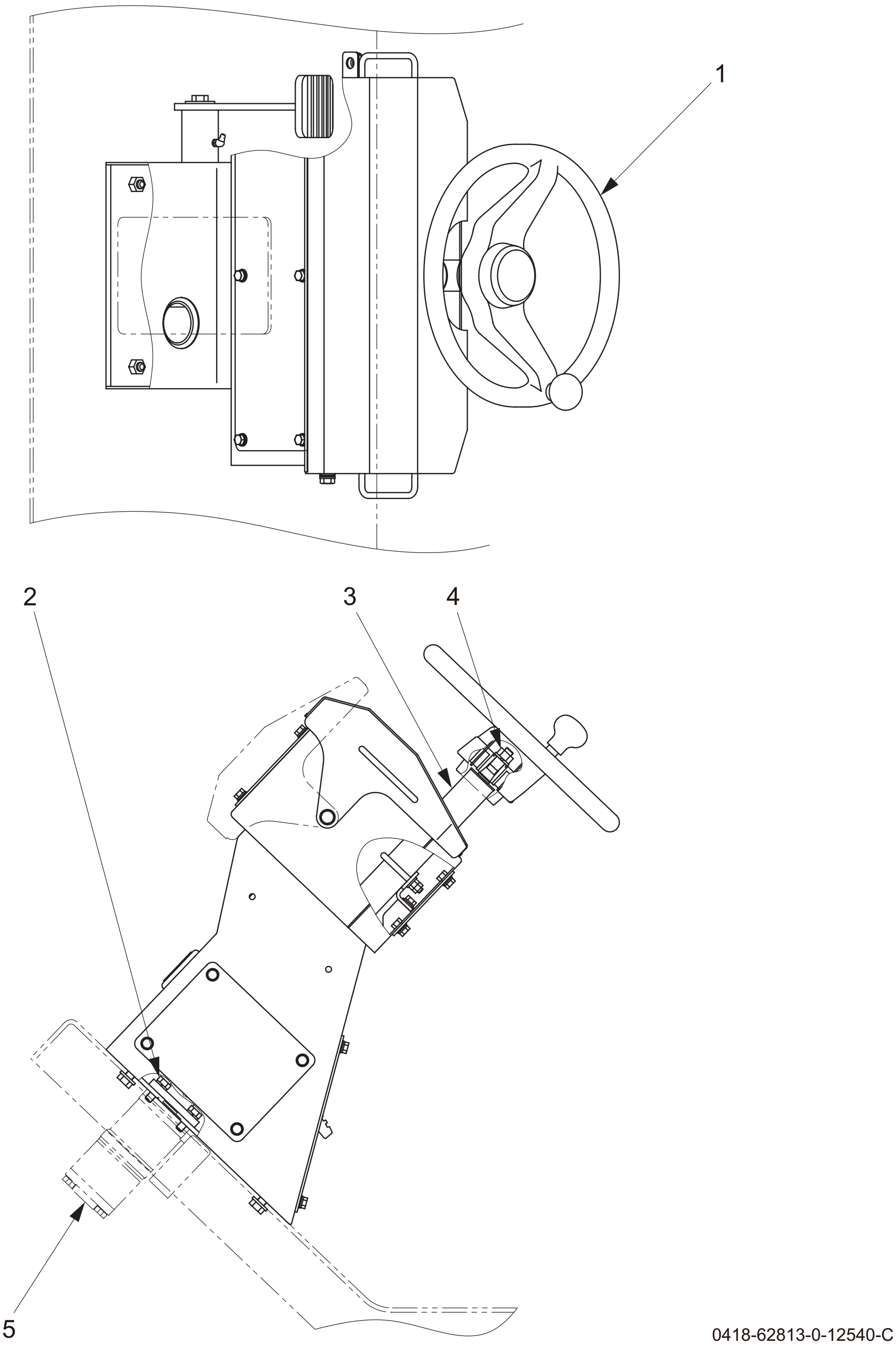
4-1-2. Steering hydraulic piping (SV544TB, FB)



・The letters and numbers in the figure such as "SRL" and "SRB" show each port.
・Arrow "←→ ; →" symbols show the hose connection and the direction of the flow of the oil.

0418-32814-0-12876-A

4-2. Steering Wheel

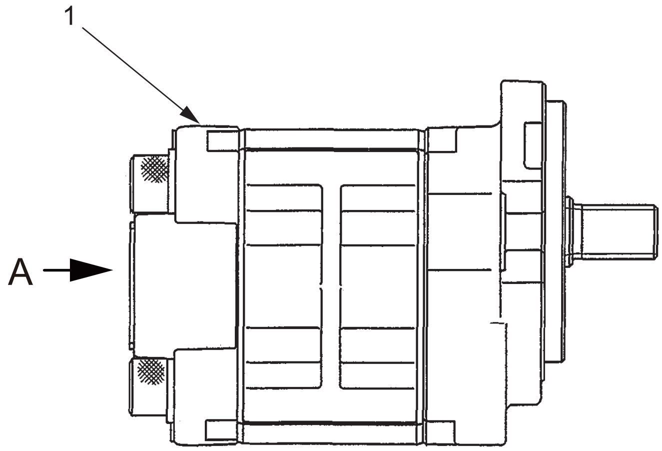


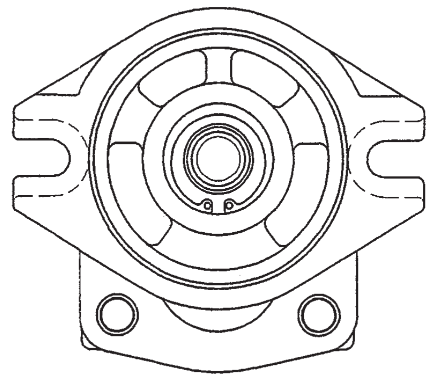
(1) Steering wheel	(4) Nut : M12 P=1.25
(2) Bolt : M10×30	(5) Orbitrol
(3) Column shaft	

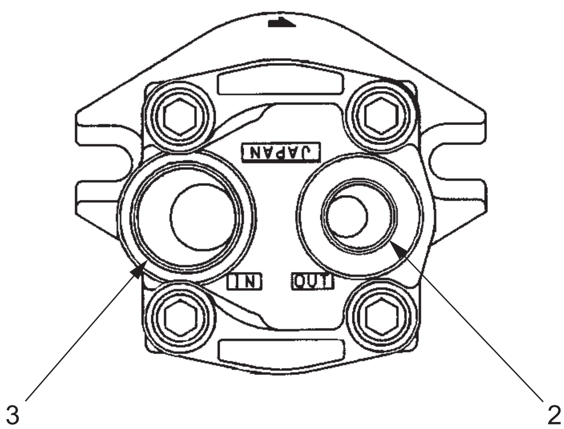
(2) Bolt M10×30 : 49 N·m (36 lbf·ft)
(4) Nut M12 P=1.25 : 35 N·m (26 lbf·ft)

4-3. Hydraulic Component Specifications

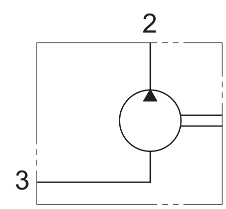
4-3-1. Steering • charge pump







VIEW A



Hydraulic circuit diagram

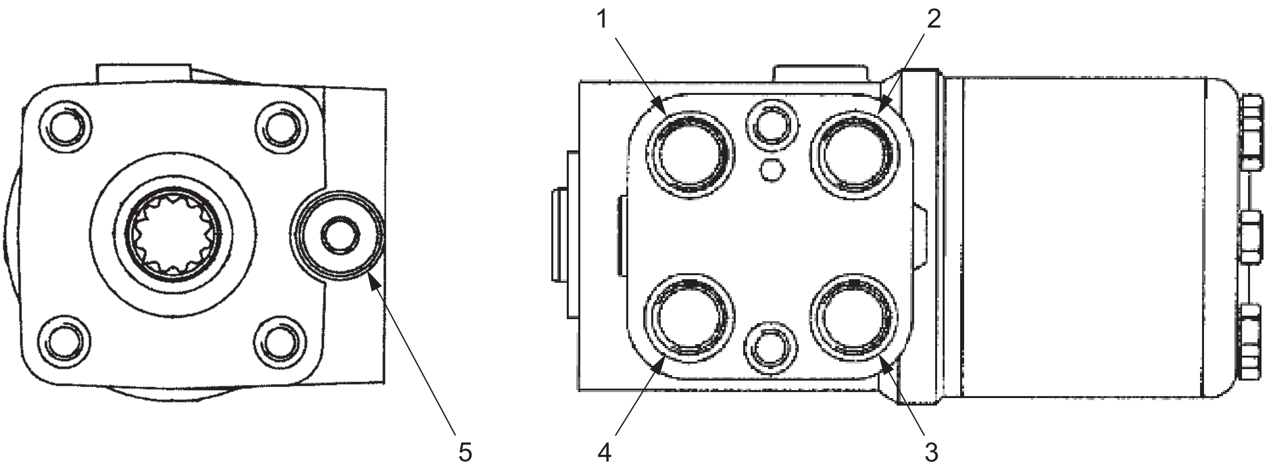
SV540-04004

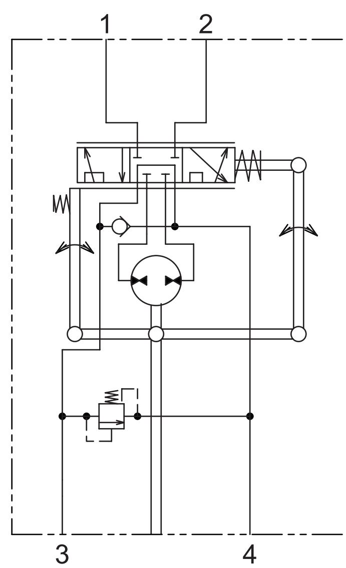
(1) Pump
(2) Outlet port **[SCD]** : 7/ 8-14UNF
(3) Inlet port **[SCS]** : 1 5/16-12UN

Specifications

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

4-3-2. Orbitrol





Hydraulic circuit diagram

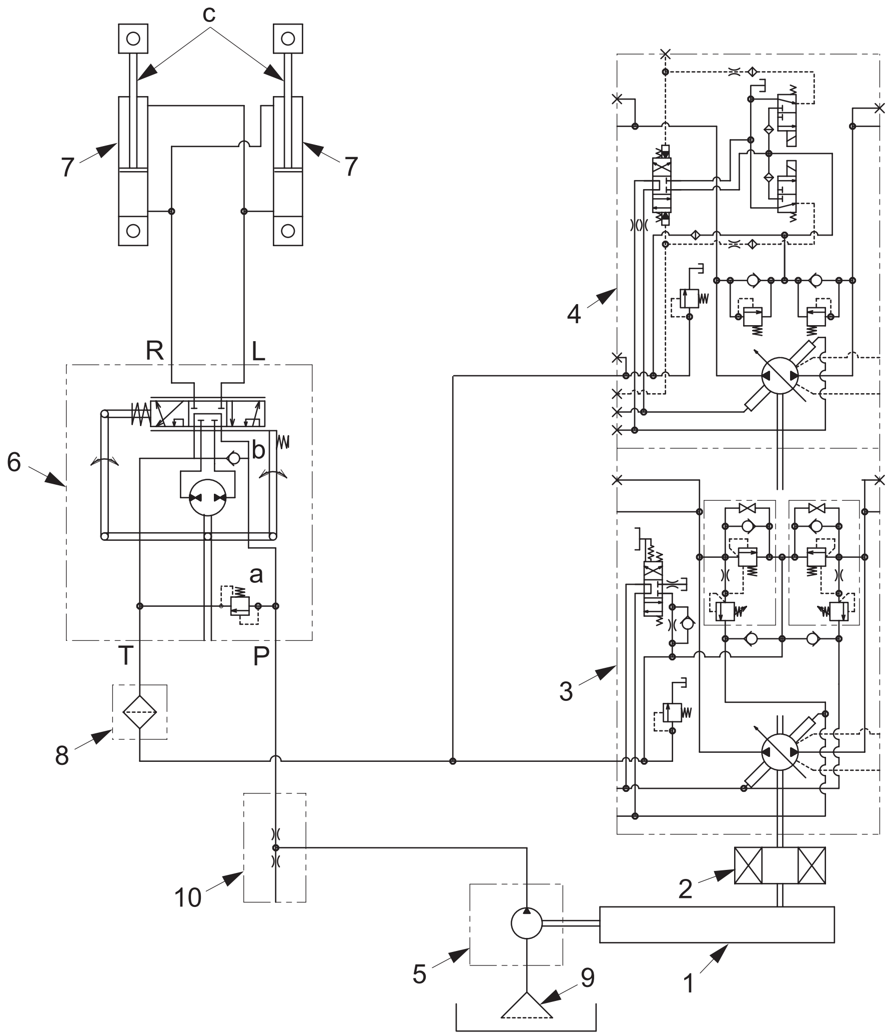
ORB-SD-04150

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

Specifications

- Displacement : 400 cm^3/rev (24.4 cu.in./rev)
- Relief valve pressure setting : 15.0 MPa (2,175 psi)
- Weight : 7 kg (15 lbs.)

Fig.: Steering circuit



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

SV544-04005

4-4. Description and Operation of Steering System

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

Description

- Made up of steering • charge pump (5), valve (10) (TB, FB type only), Orbitrol (6) steering cylinders (7) and hydraulic oil filter 1 (8).The steering mechanism is of an articulated type in which the machine frame is articulated at its center.

Operation

- The oil discharged from steering • charge pump (5) enters Orbitrol (6), and a certain quantity of oil that matches the handle turning direction and speed is supplied to steering cylinders (7).
- The oil that enters the steering cylinder shifts piston rod (c) to operate it, while the oil pushed out of the port on the opposite side returns to Orbitrol (6), flowing into the charge circuit of propulsion pump (3) and vibrator pump (4) through hydraulic oil filter 1 (8).

- For the “Charge circuit”, refer to page 4-018.
- Relief valve (a) built in Orbitrol (6) opens to relieve the pressure if the system pressure exceeds the setting of the valve, thus protecting the circuit.

4-4-2. Structure and operation of Orbitrol

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

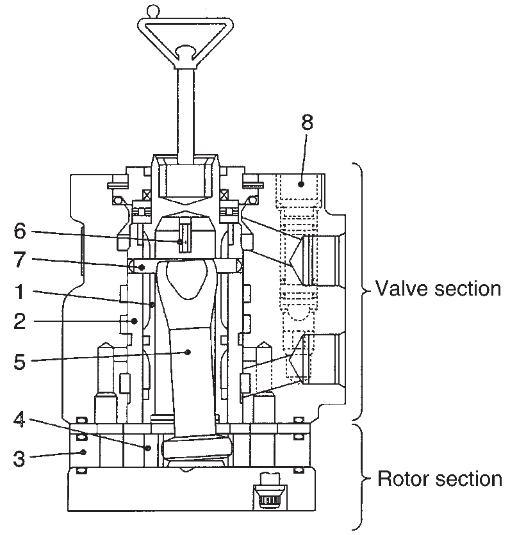
Structure

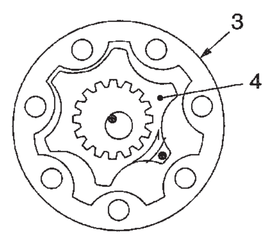
Valve section:

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

Rotor section:

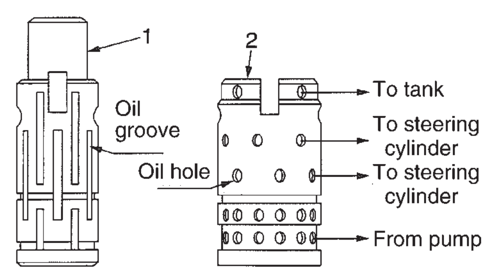
- The rotor is a kind of internal gear, functioning as a hydraulic motor when the valve section (spool and sleeve) opens.
- The rotation of rotor (4) is transmitted to the valve section by drive shaft (5), controlling the valve opening according to the steering wheel rotating speed.





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

SV414-04006



SV414-04007

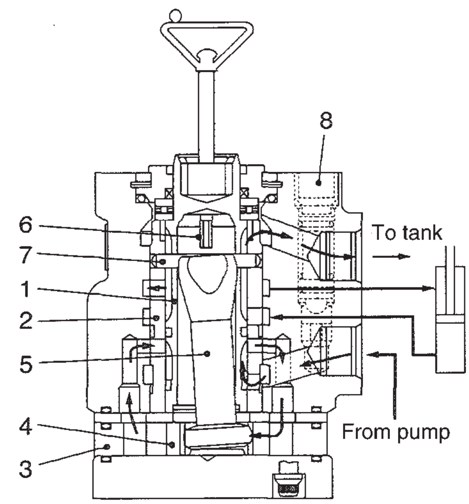
Operation

Neutral (when the steering wheel is not operated):

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

Swing (when the steering wheel is operated):

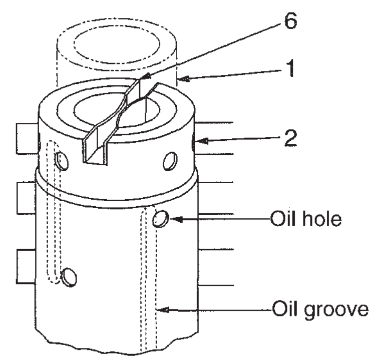
- All the ports of the valve section are closed when Orbitrol is in the neutral position. The oil in the rotor has been sealed up, and rotor (4) is fixed.
  Sleeve (2) is coupled with rotor (4) via cross pin (7) and drive shaft (5), and it is fixed also.
- When the steering wheel is operated, the turning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



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

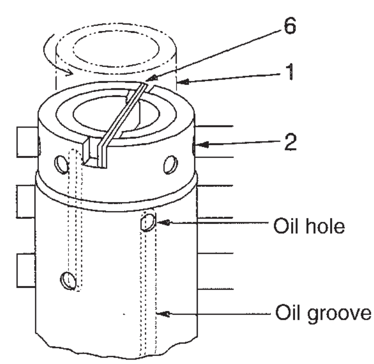
SV414-04009

Neutral



SV414-04008

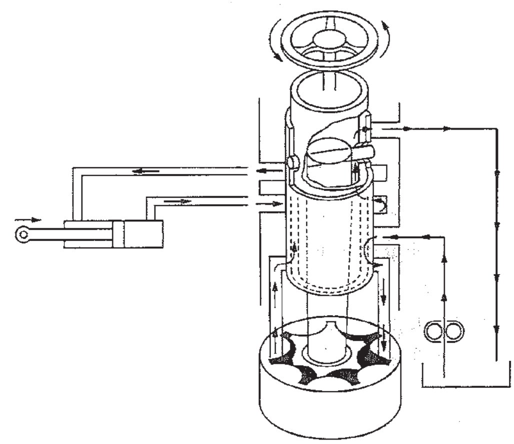
Swing



SV414-04010

Operation of feedback mechanism:

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



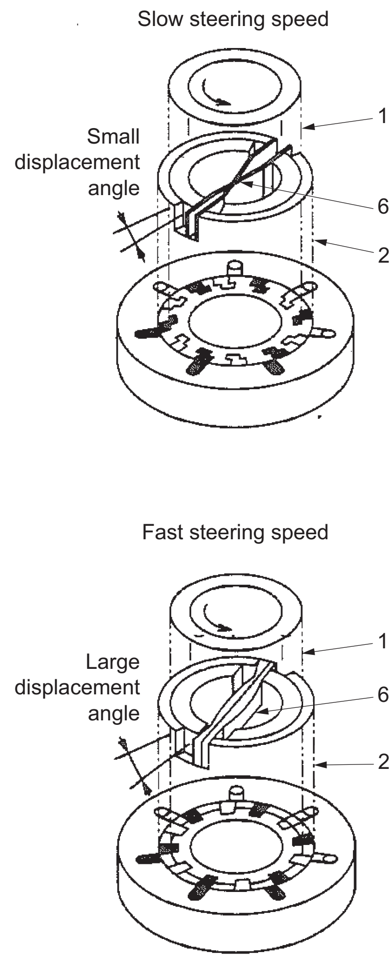
SV414-04011

Steering speed and flow control:

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

Hydraulic pump flow and operating force:

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

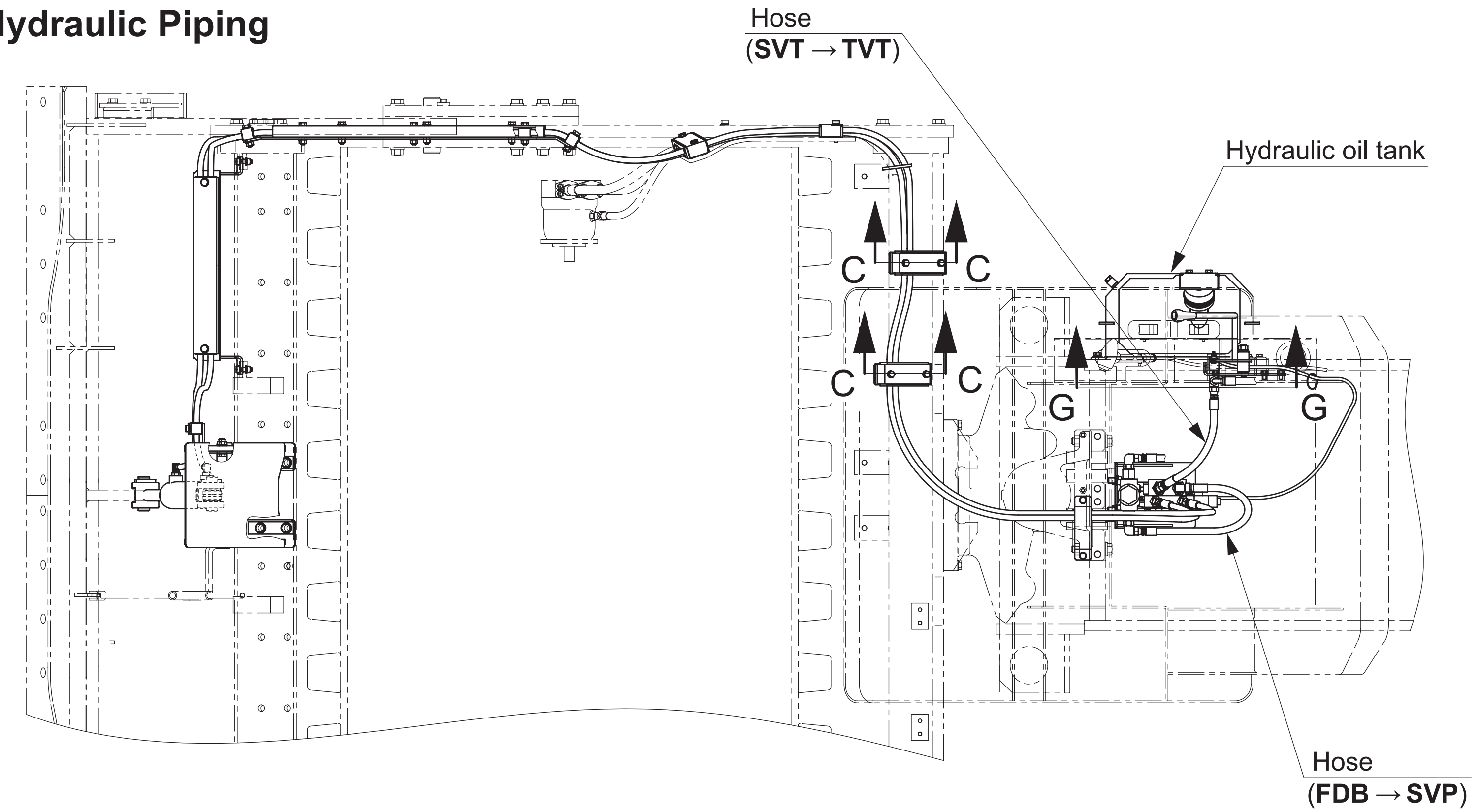


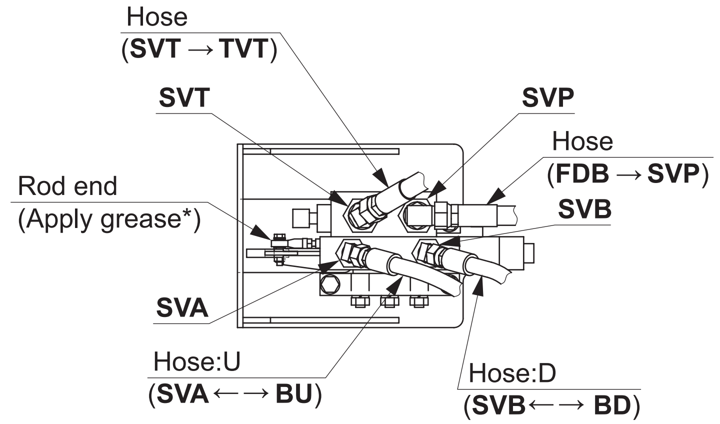
1. Spool
2. Sleeve
6. Centering spring

SV414-04012

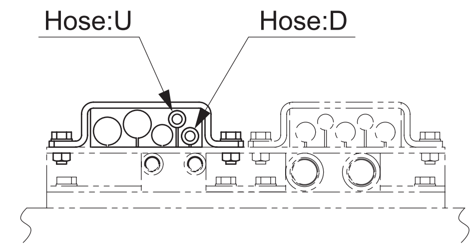
5. BLADE SYSTEM (SV544TB, FB)

5-1. Blade Hydraulic Piping

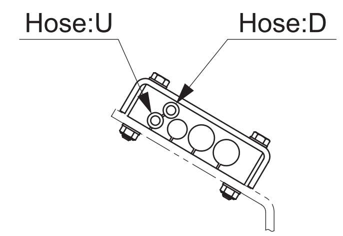




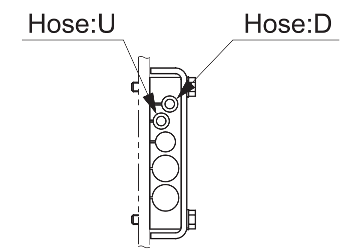
SECTION A-A



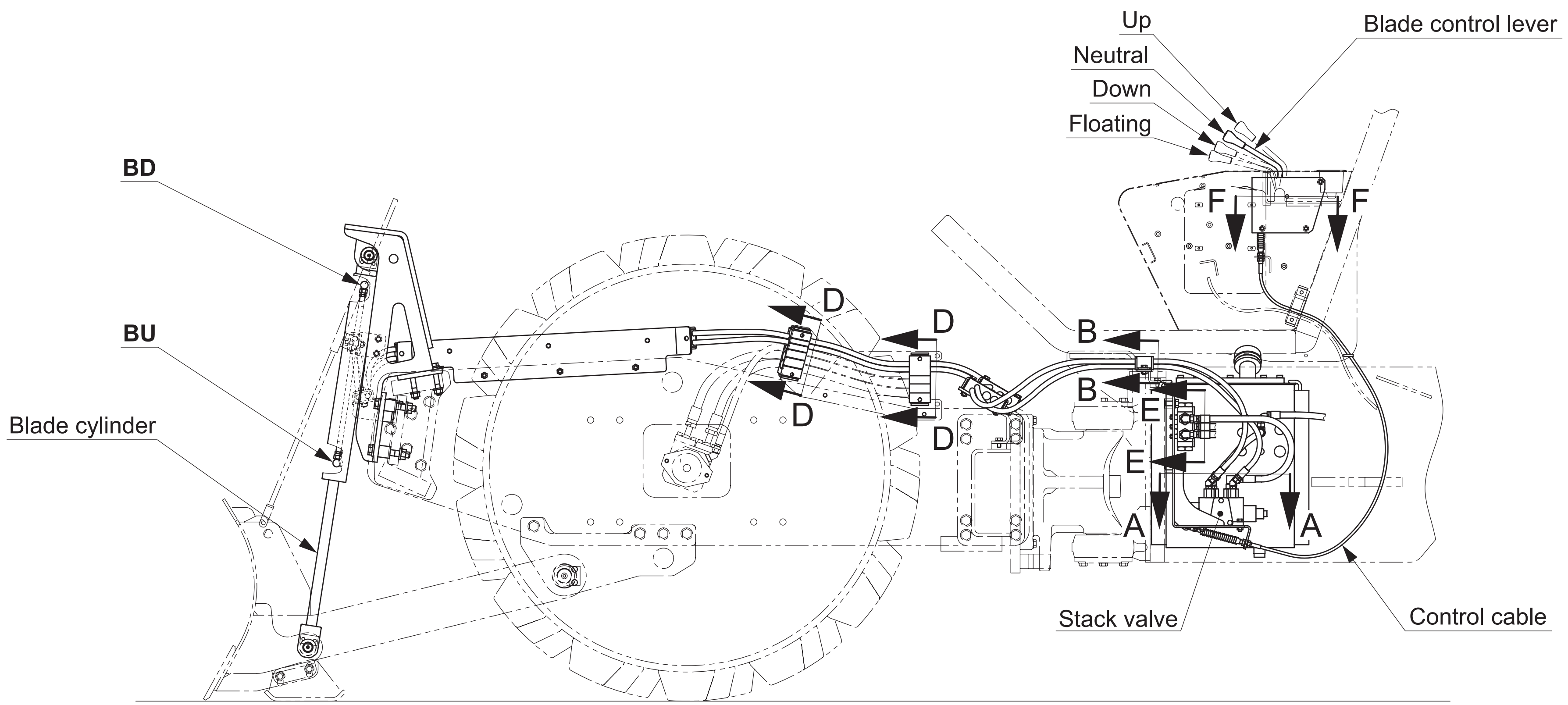
SECTION B-B

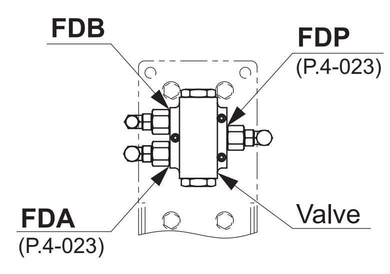


SECTION C-C

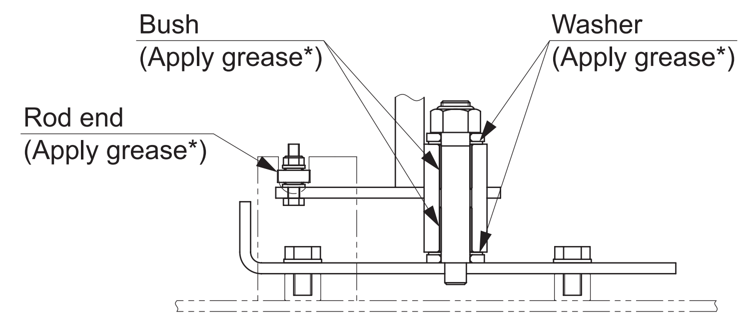


SECTION D-D

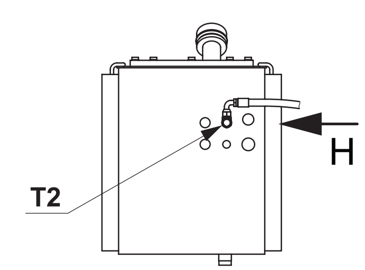




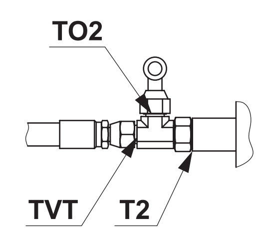
SECTION E-E



SECTION F-F



SECTION G-G



VIEW H

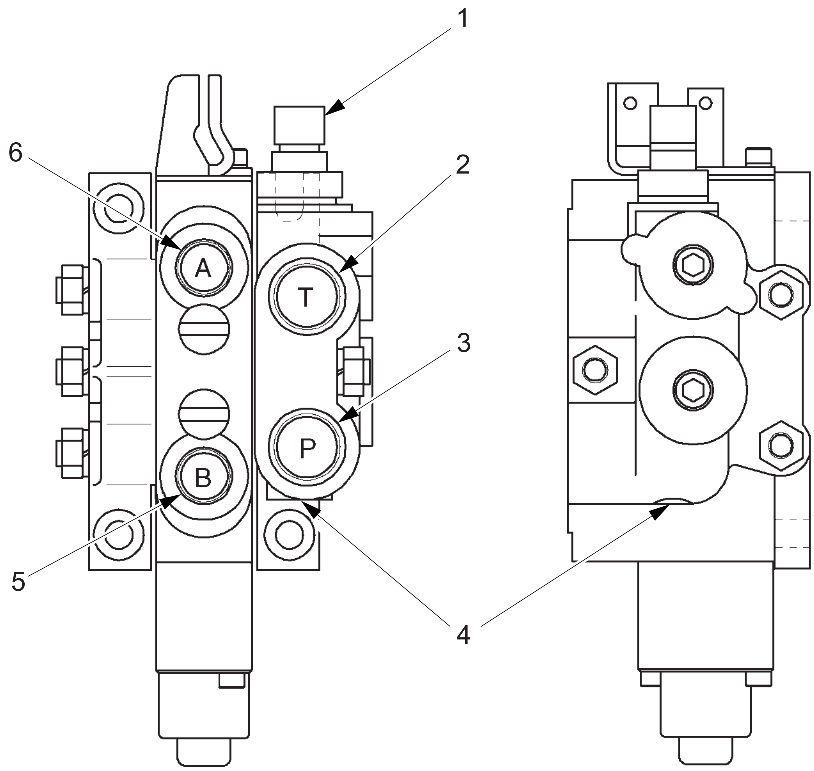
- The letters and numbers in the figure such as "SVA" and "BU" show each port.
- Arrow "←→ ; →" symbols show the hose connection and the direction of the flow of the oil.

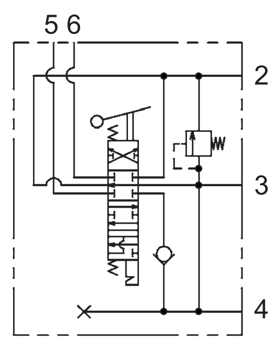
* : Lithium-based grease

0418-49810-0-12808-A
0418-49810-0-22810-0

5-2. Hydraulic Component Specification

5-2-1. Stack valve





Hydraulic circuit diagram

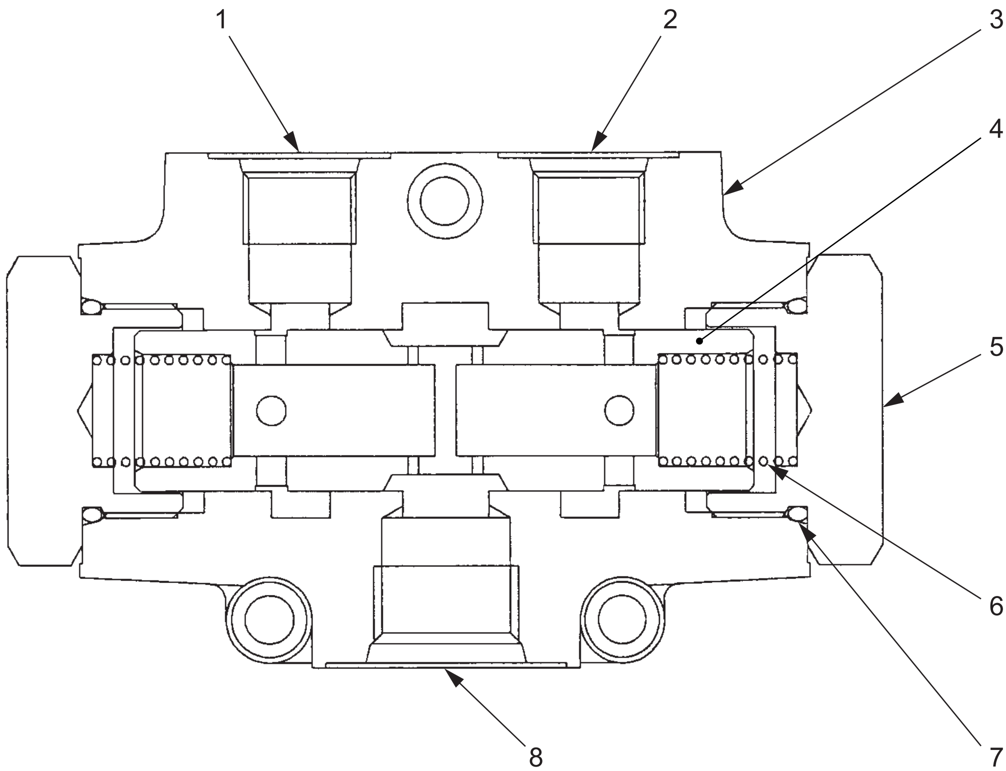
SV201-1-04010

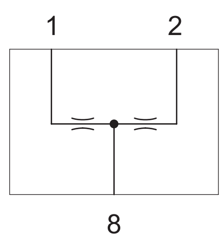
(1) Relief valve			
(2) Port T	**[SVT]**	:	G3/4
(3) Port P	**[SVP]**	:	G3/4
(4) Pressure gauge port		:	Rc 1/4
(5) Port B	**[SVB]**	:	G1/2
(6) Port A	**[SVA]**	:	G1/2

Specifications

- Rated flow : 70 L/min (18 gal./min)
- Maximum working pressure : 20.6 MPa (2,987 psi)
- Relief valve pressure setting : 13.7 MPa (1,987 psi) at 30 L/min (7.9 gal./min)
- Weight : 7.1 kg (15.7 lbs.)

5-2-2. Valve





Hydraulic circuit diagram

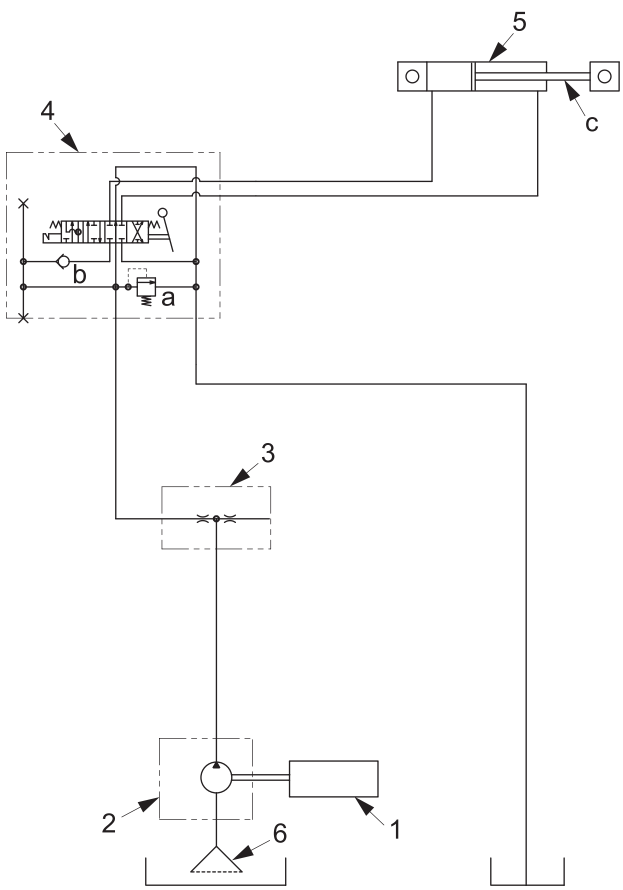
SV412-04003

(1) Port A **[FDA]** : G1/2
(2) Port B **[FDB]** : G1/2
(3) Body
(4) Spool
(5) Cover
(6) Spring
(7) O-ring (1BP 36)
(8) Port P **[FDP]** : G3/4

Specifications

- Standard flow : 60 L/min (16 gal./min)
- Rated pressure : 29.4 MPa (4,263 psi)
- Flow division ratio (A : B) : 2 : 1
- Weight : 5 kg (11 lbs.)

Fig.: Blade circuit



1. Engine
2. Steering•charge pump
3. Valve
4. Stack valve
   a. Relief valve
   b. Check valve
5. Blade cylinder
   c. Piston rod

SV544-04006

5-3. Description and Operation of Blade System

Description

- Made up of steering • charge pump (2), valve (3), stack valve (4) and blade cylinder (5).

Operation

- The oil discharged from steering • charge pump (2) enters stack valve (4), and a certain quantity of oil that matches the lever position is supplied to blade cylinder (5).
- The oil that enters the blade cylinder shifts piston rod (c) to operate it, while the oil pushed out of the port on the opposite side returns to hydraulic oil tank through the stack valve (4).

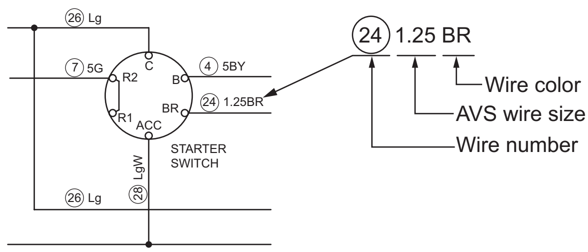
- Relief valve (a) built in stack valve (4) opens to relieve the pressure if the system pressure exceeds the setting of the valve, hus protecting the circuit.

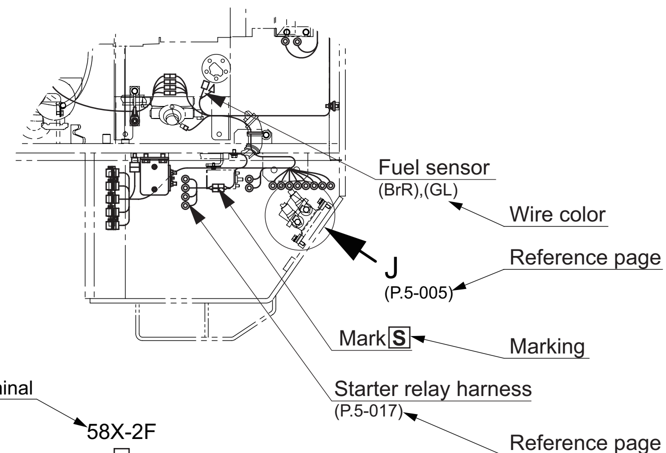
ELECTRICAL SYSTEM

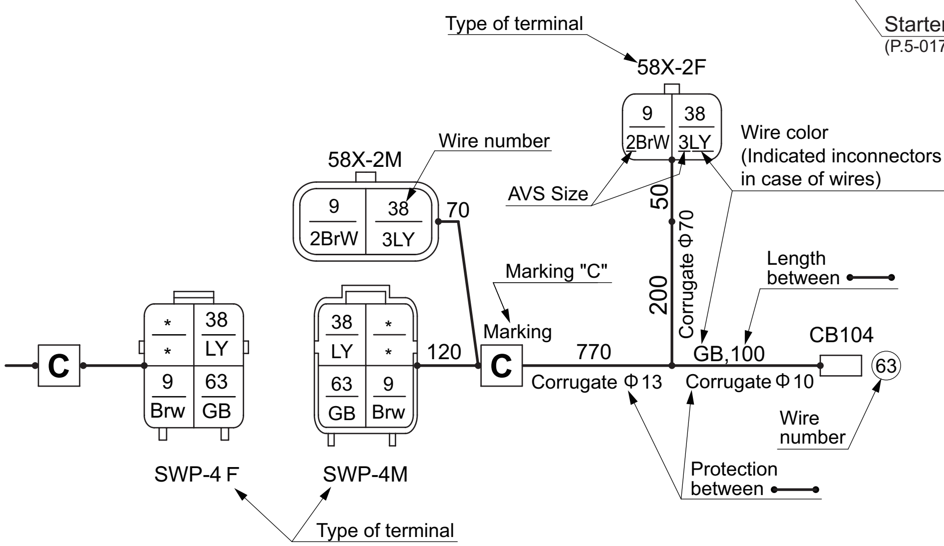
1. PRECAUTIONS FOR WORK

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

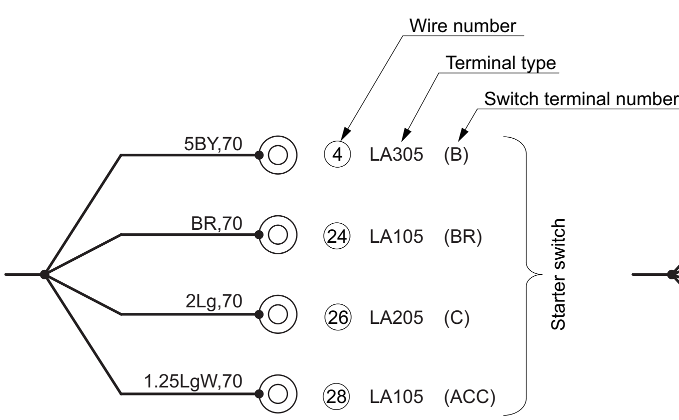
- Codes used in electrical circuit diagrams give the following information.
- The wire size is AVS 0.85 unless otherwise specified.

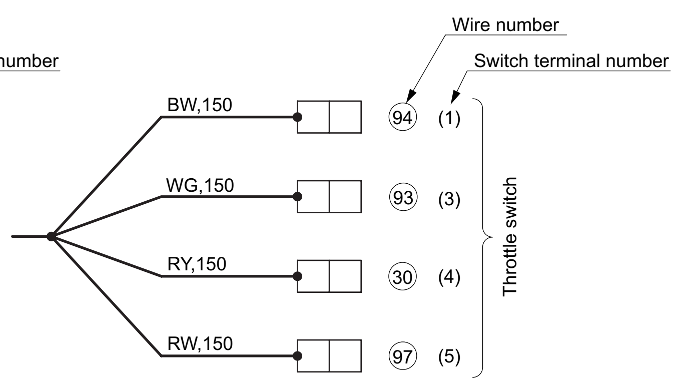






- The pin or socket layout of mating connectors are symmetrical, either vertically or horizontally. When the connector valves are connected, the pin and socket that have the same number are connected.



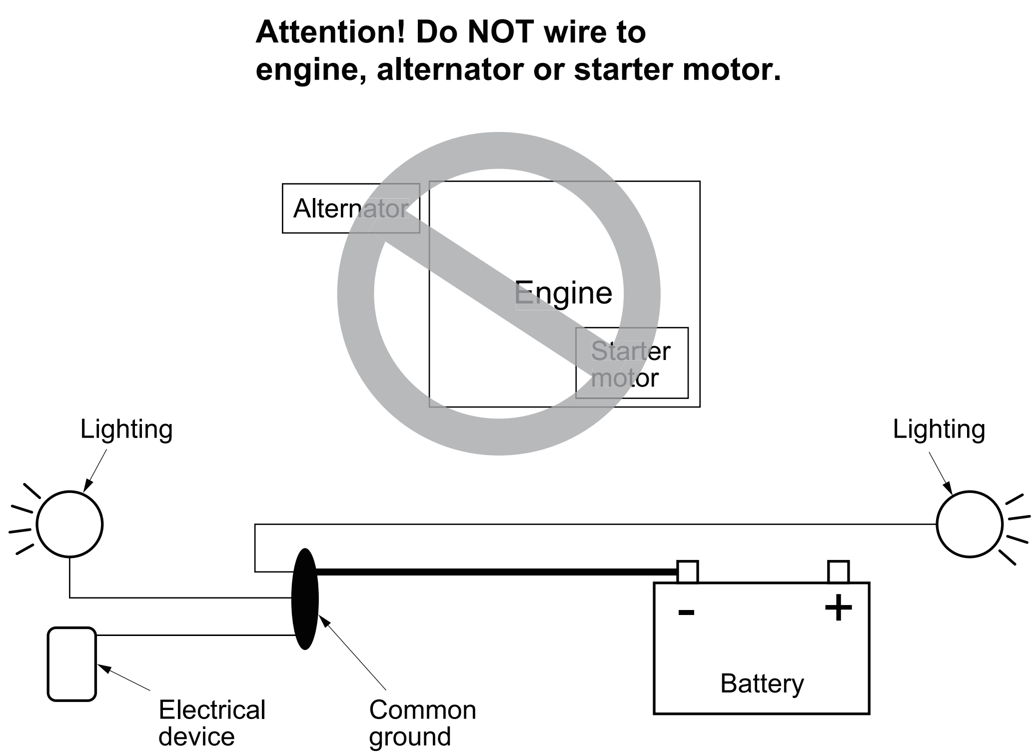


- Wire color code chart

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

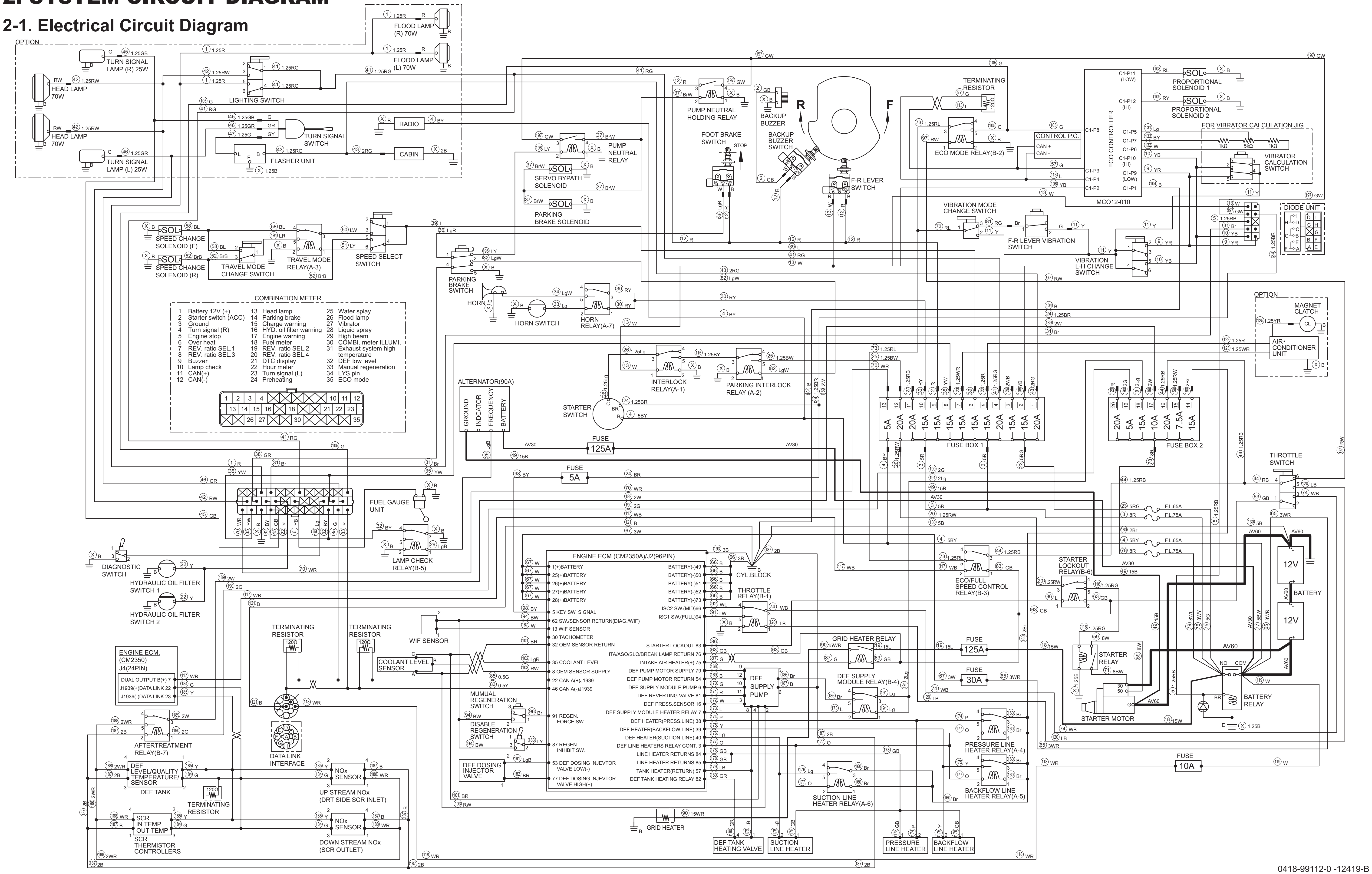
1-2. Electrical Equipment Installation

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



2. SYSTEM CIRCUIT DIAGRAM

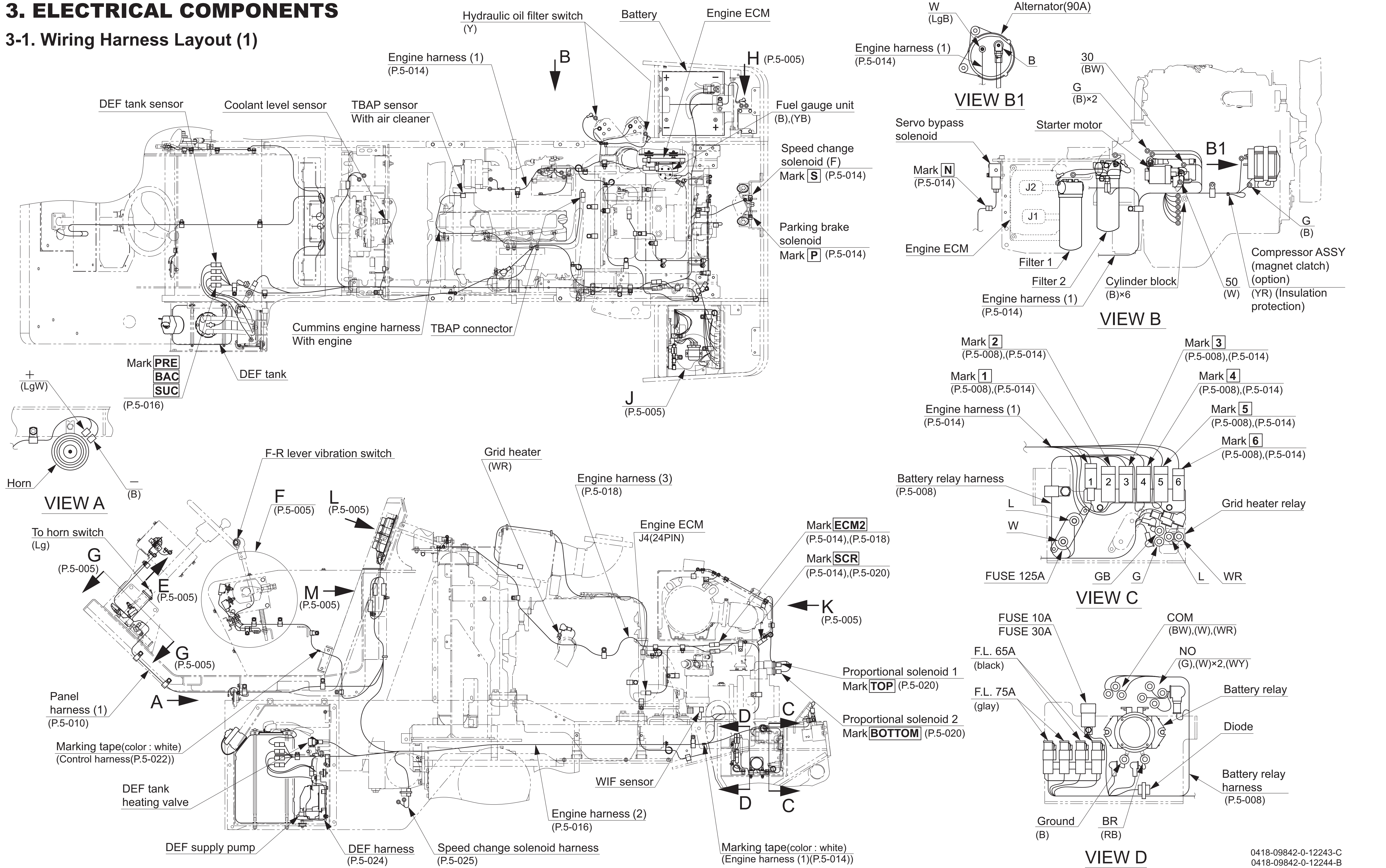
2-1. Electrical Circuit Diagram



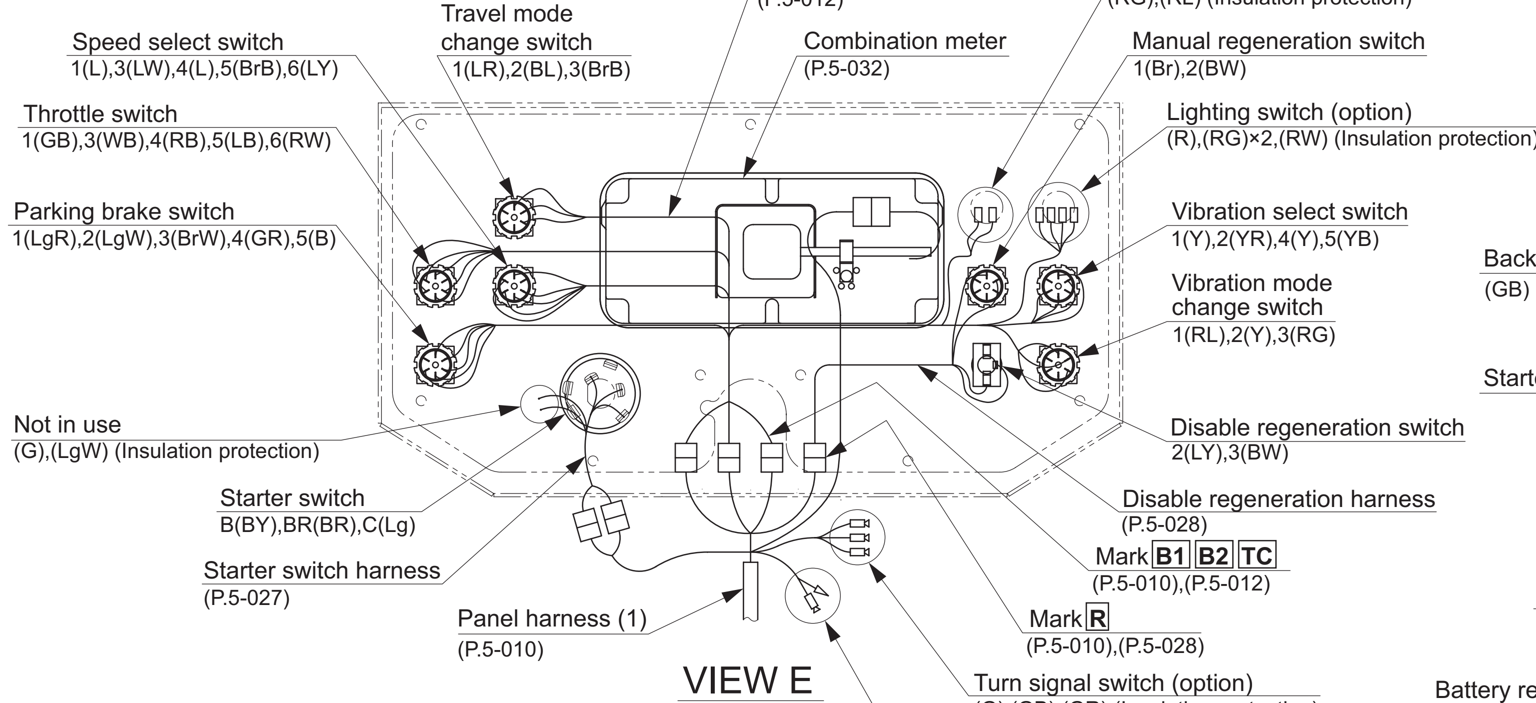
0418-99112-0 -12419-B

3. ELECTRICAL COMPONENTS

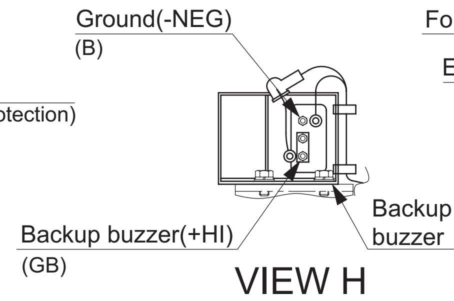
3-1. Wiring Harness Layout (1)



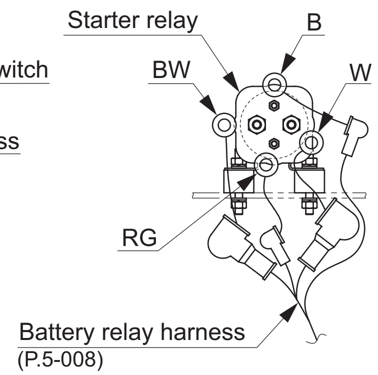
3-2. Wiring Harness Layout (2)



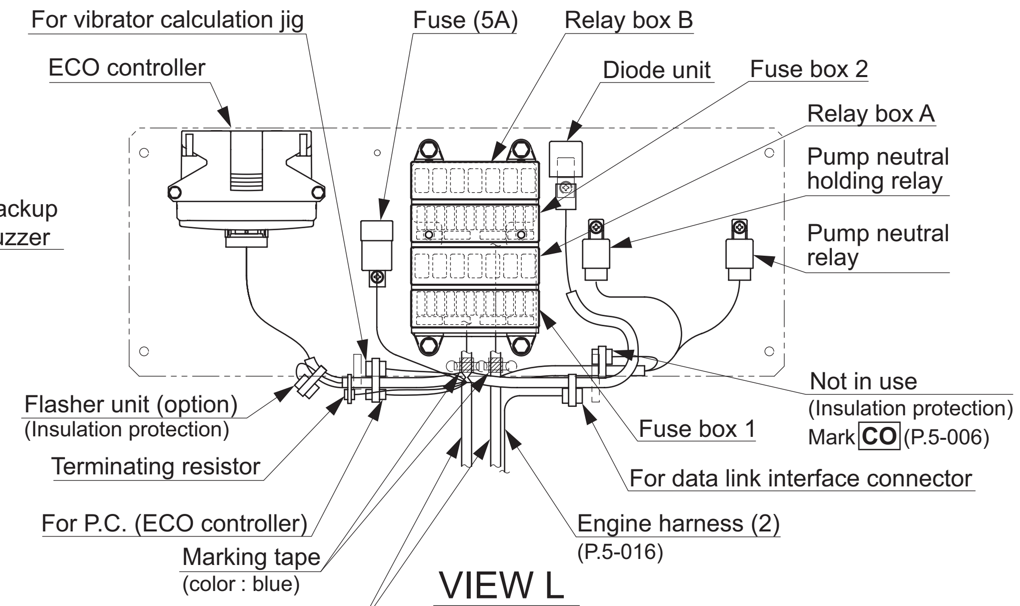
VIEW E



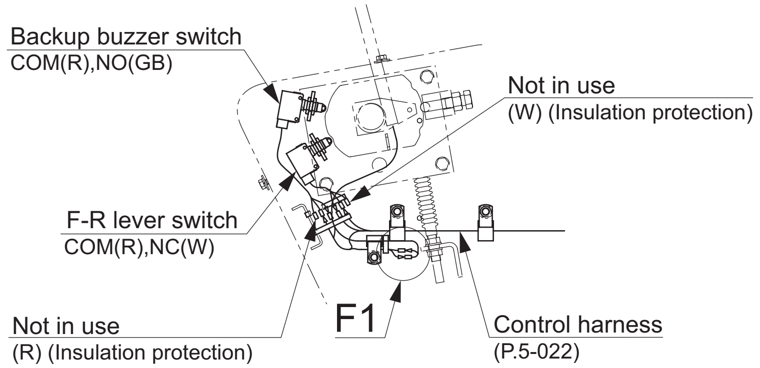
VIEW H



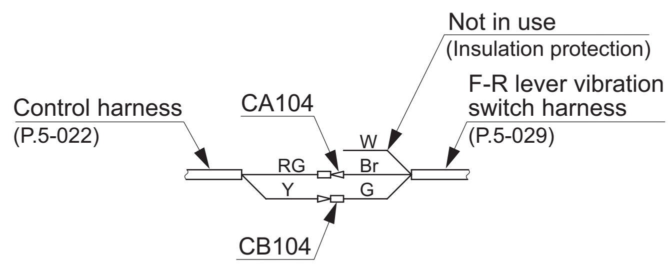
DETAIL J



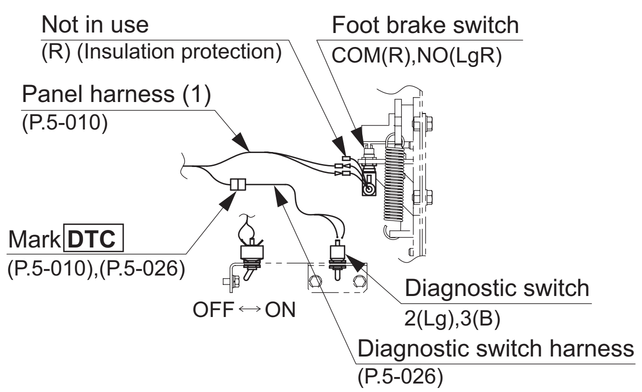
VIEW L



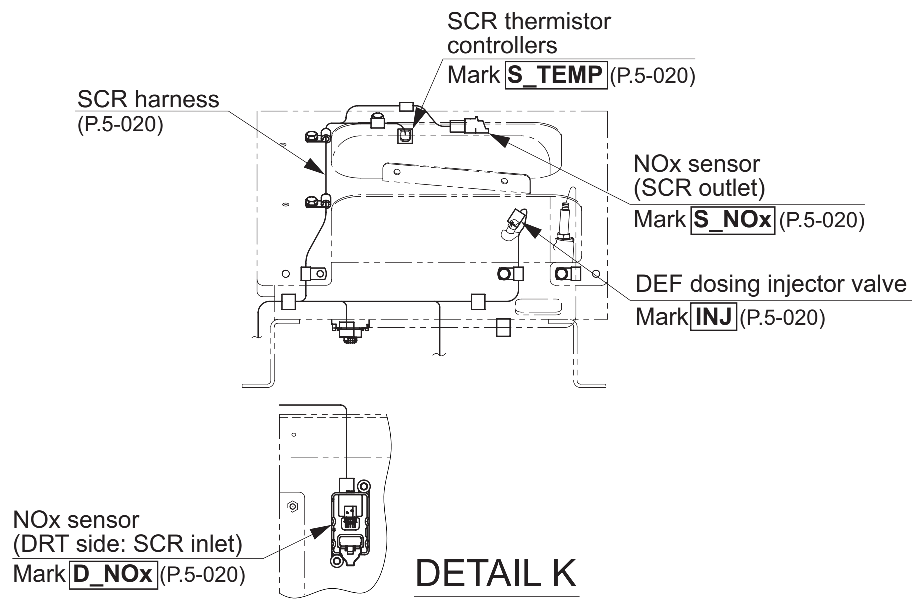
DETAIL F



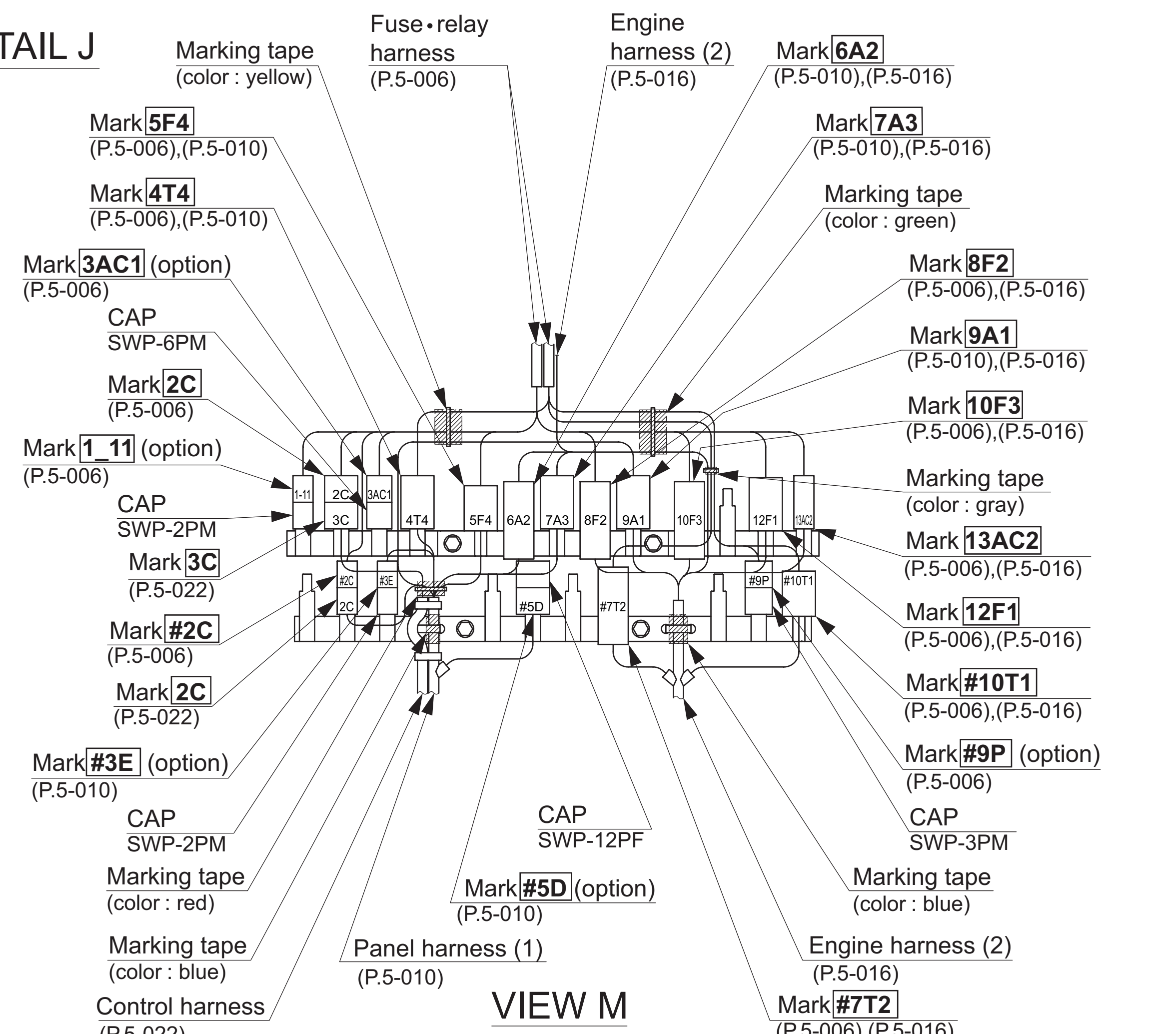
DETAIL F1



VIEW G-G



DETAIL K

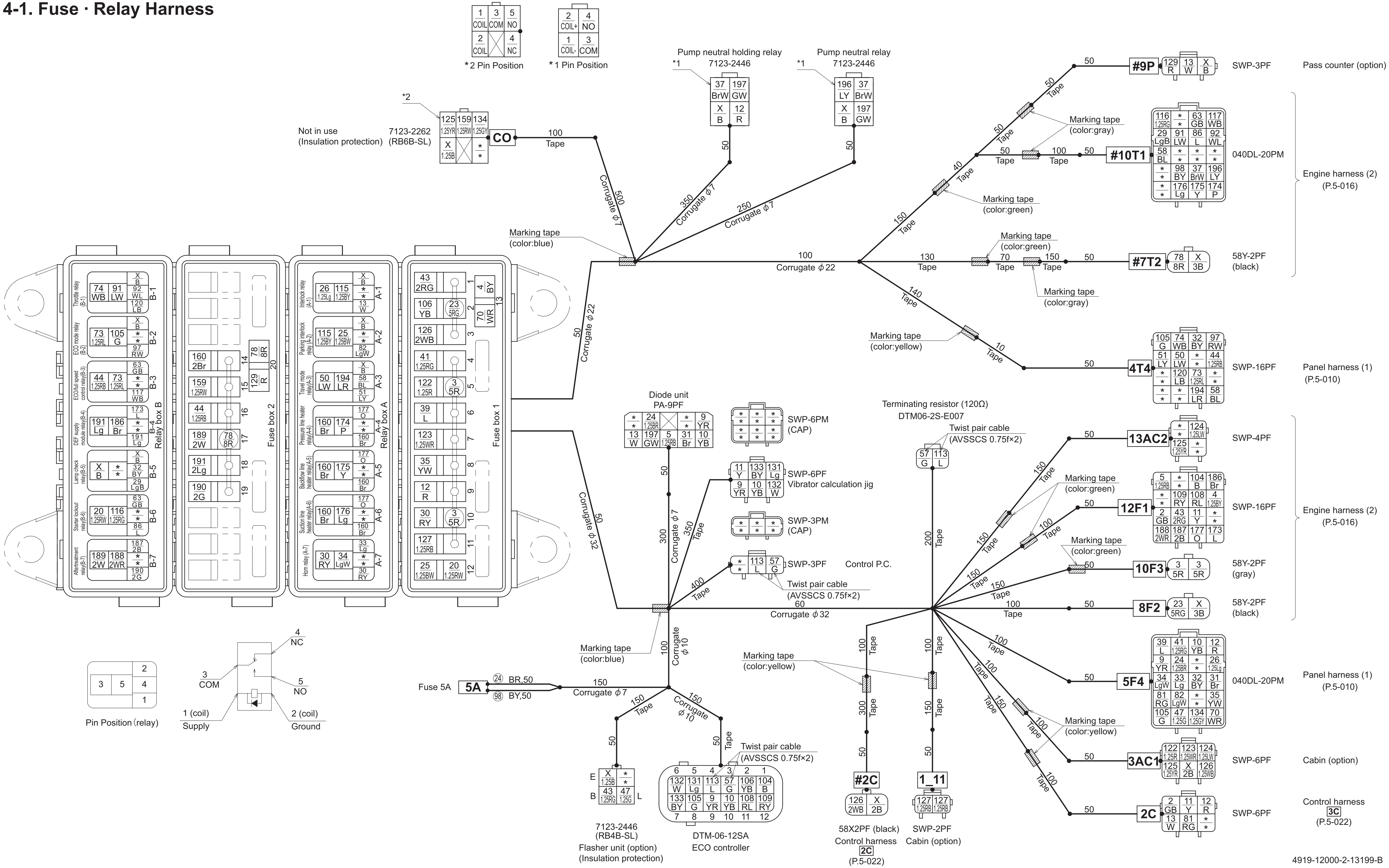


VIEW M

0418-09842-0-12243-C
0418-09842-0-12244-B

4. WIRING HARNESSES

4-1. Fuse · Relay Harness

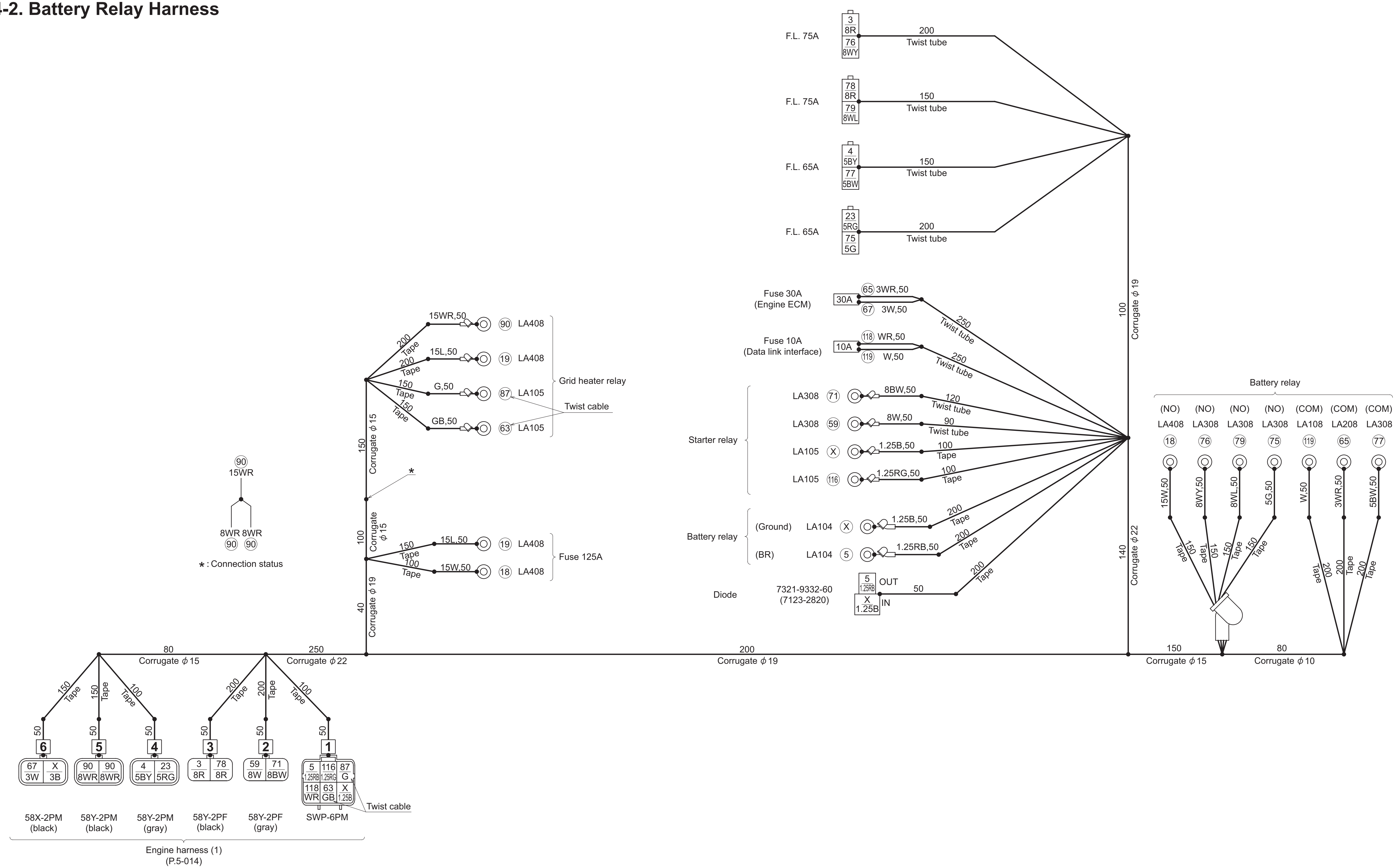


No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	B, 1.25B, 2B, 3B	16	3AC1, 8F2, #2C, #7T2, Pump neutral holding relay, Pump neutral relay, Relay box A-1, A-2, A-3, Relay box B-1, B-2, B-5 × 2, #9P (option), Flasher unit (option), CO (not in use)
2	GB	2	2C, 12F1
3	5R	4	10F3 × 2, Fuse box 1-5, 1-10
4	BY, 1.25BY	2	12F1, Fuse box 1-13
5	1.25RB	2	12F1, Diode unit
9	YR	4	5F4, Diode unit, ECO controller-9, Vibrator calculation jig
10	YB	4	5F4, Diode unit, ECO controller-10, Vibrator calculation jig
11	Y	3	2C, 12F1, Vibrator calculation jig
12	R	4	2C, 5F4, Fuse box 1-9, Pump neutral holding relay
13	W	4	2C, Diode unit, Relay box A-1, #9P (option)
20	1.25RW	2	Fuse box 1-12, Relay box B-6
23	5RG	2	8F2, Fuse box 1-2
24	BR, 1.25BR	3	5F4, Diode unit, Fuse 5A
25	1.25BW	2	Fuse box 1-12, Relay box A-2
26	1.25Lg	2	5F4, Relay box A-1
29	LgB	2	#10T1, Relay box B-5
30	RY	3	Fuse box 1-10, Relay box A-7 × 2
31	Br	2	5F4, Diode unit
32	BY	3	4T4, 5F4, Relay box B-5
33	Lg	2	5F4, Relay box A-7
34	LgW	2	5F4, Relay box A-7
35	YW	2	5F4, Fuse box 1-8
37	BrW	3	#10T1, Pump neutral holding relay, Pump neutral relay
39	L	2	5F4, Fuse box 1-6

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
41	1.25RG	2	5F4, Fuse box 1-4
43	1.25RG, 2RG	3	12F1, Fuse box 1-1, Flasher unit (option)
44	1.25RB	3	4T4, Fuse box 2-16, Relay box B-3
47	1.25G	2	5F4, Flasher unit (option)
50	LW	2	4T4, Relay box A-3
51	LY	2	4T4, Relay box A-3
57	G	3	Control P.C., ECO controller-3, Terminating resistor
58	BL	3	4T4, #10T1, Relay box A-3
63	GB	3	#10T1, Relay box B-3, B-6
70	WR	2	5F4, Fuse box 1-13
73	1.25RL	3	4T4, Relay box B-2, B-3
74	WB	2	4T4, Relay box B-1
78	8R	3	#7T2, Fuse box 2-17, 2-20
81	RG	2	2C, 5F4
82	LgW	2	5F4, Relay box A-2
86	L	2	#10T1, Relay box B-6
91	LW	2	#10T1, Relay box B-1
92	WL	2	#10T1, Relay box B-1
97	RW	2	4T4, Relay box B-2
98	BY	2	#10T1, Fuse 5A
104	B	2	12F1, ECO controller-1
105	G	4	4T4, 5F4, ECO controller-8, Relay box B-2
106	YB	2	ECO controller-2, Fuse box 1-2
108	RL	2	12F1, ECO controller-11
109	RY	2	12F1, ECO controller-12
113	L	3	Control P.C., ECO controller-4, Terminating resistor
115	1.25BY	2	Relay box A-1, A-2
116	1.25RG	2	#10T1, Relay box B-6

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
117	WB	2	#10T1, Relay box B-3
120	LB	2	4T4, Relay box B-1
122	1.25R	2	3AC1, Fuse box 1-5
123	1.25WR	2	3AC1, Fuse box 1-7
124	1.25LW	2	13AC2, 3AC1
125	1.25YR	3	13AC2, 3AC1, CO (not in use)
126	1.25WB, 2WB	3	3AC1, #2C, Fuse box 1-3
127	1.25RB	3	Fuse box 1-11, 1_11 (option) × 2
129	R	2	Fuse box 2-20, #9P (option)
131	Lg	2	ECO controller-5, Vibrator calculation jig
132	W	2	ECO controller-6, Vibrator calculation jig
133	BY	2	ECO controller-7, Vibrator calculation jig
134	1.25GY	2	5F4, CO (not in use)
159	1.25RW	2	Fuse box 2-15, CO (not in use)
160	Br, 2Br	7	Fuse box 2-14, Relay box A-4 × 2, A-5 × 2, A-6 × 2
173	L	2	12F1, Relay box B-4
174	P	2	#10T1, Relay box A-4
175	Y	2	#10T1, Relay box A-5
176	Lg	2	#10T1, Relay box A-6
177	O	4	12F1, Relay box A-4, A-5, A-6
186	Br	2	12F1, Relay box B-4
187	2B	2	12F1, Relay box B-7
188	2WR	2	12F1, Relay box B-7
189	2W	2	Fuse box 2-17, Relay box B-7
190	2G	2	Fuse box 2-19, Relay box B-7
191	Lg, 2Lg	3	Fuse box 2-18, Relay box B-4 × 2
194	LR	2	4T4, Relay box A-3
196	LY	2	#10T1, Pump neutral relay
197	GW	3	Diode unit, Pump neutral holding relay, Pump neutral relay

4-2. Battery Relay Harness

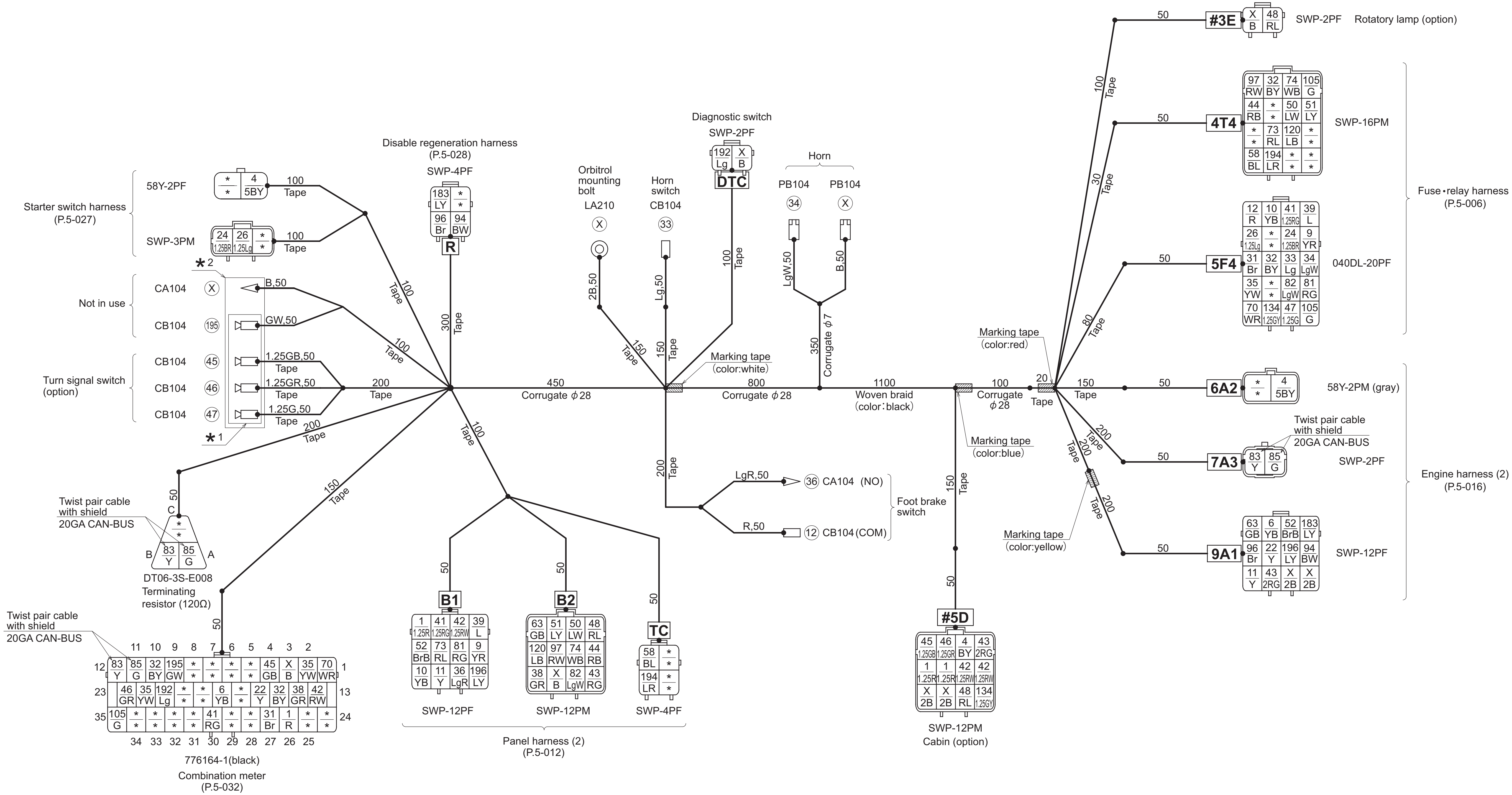


4919-14000-0-13201-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	1.25B, 3B	5	1, 6, Battery relay-Ground, Diode, Starter relay
3	8R	2	3, F.L. 75A
4	5BY	2	4, F.L. 65A
5	1.25RB	3	1, Battery relay-BR, Diode
18	15W	2	Battery relay-NO, Fuse 125A
19	15L	2	Fuse 125A, Grid heater relay
23	5RG	2	4, F.L. 65A
59	8W	2	2, Starter relay
63	GB	2	1, Grid heater relay
65	3WR	2	Battery relay-COM, Fuse 30A (Engine ECM)
67	3W	2	6, Fuse 30A (Engine ECM)

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
71	8BW	2	2, Starter relay
75	5G	2	Battery relay-NO, F.L. 65A
76	8WY	2	Battery relay-NO, F.L. 75A
77	5BW	2	Battery relay-COM, F.L. 65A
78	8R	2	3, F.L. 75A
79	8WL	2	Battery relay-NO, F.L. 75A
87	G	2	1, Grid heater relay
90	8WR, 15WR	3	5 × 2, Grid heater relay
116	1.25RG	2	1, Starter relay
118	WR	2	1, Fuse 10A (Data link interface)
119	W	2	Battery relay-COM, Fuse 10A (Data link interface)

4-3. Panel Harness (1)



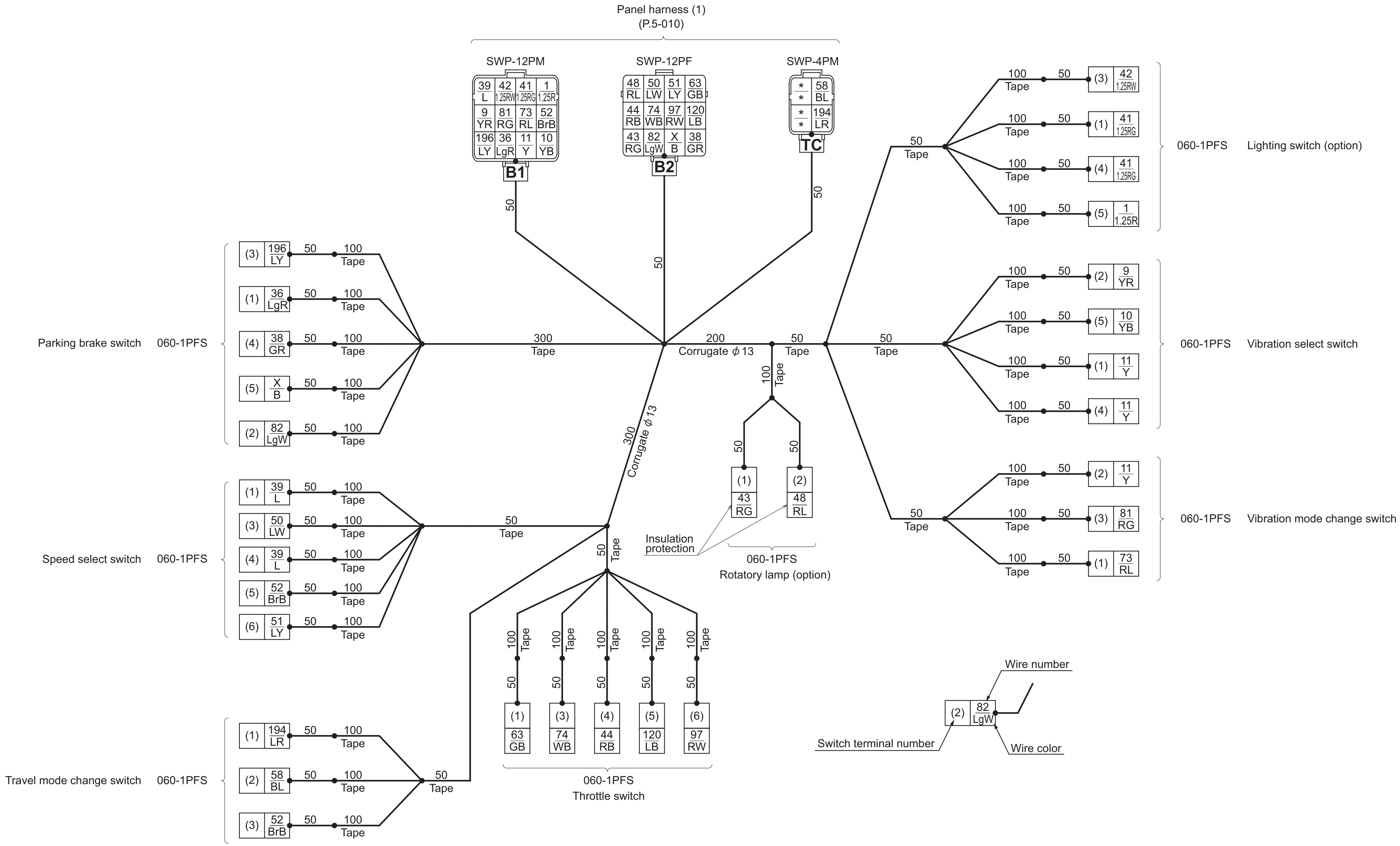
*1 : with plug and insulation protection
*2 : insulation protection

4919-60000-0-13247-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	B, 2B	11	9A1 × 2, B2, DTC, Combination meter-3, Horn, Orbitrol mounting bolt, #3E (option), #5D (option) × 2, CA104 (not in use)
1	R, 1.25R	4	B1, Combination meter-26, #5D (option) × 2
4	BY, 5BY	3	6A2, Starter switch harness, #5D (option)
6	YB	2	9A1, Combination meter-18
9	YR	2	5F4, B1
10	YB	2	5F4, B1
11	Y	2	9A1, B1
12	R	2	5F4, Foot brake switch-COM
22	Y	2	9A1, Combination meter-16
24	1.25BR	2	5F4, Starter switch harness
26	1.25Lg	2	5F4, Starter switch harness
31	Br	2	5F4, Combination meter-27
32	BY	4	4T4, 5F4, Combination meter-10, 15
33	Lg	2	5F4, Horn switch
34	LgW	2	5F4, Horn
35	YW	3	5F4, Combination meter-2, 22
36	LgR	2	B1, Foot brake switch-NO
38	GR	2	B2, Combination meter-14
39	L	2	5F4, B1
41	RG, 1.25RG	3	5F4, B1, Combination meter-30
42	RW, 1.25RW	4	B1, Combination meter-13, #5D (option) × 2
43	RG, 2RG	3	9A1, B2, #5D (option)
44	RB	2	4T4, B2
45	GB, 1.25GB	3	Combination meter-4, #5D (option), Turn signal switch (option)

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
46	GR, 1.25GR	3	Combination meter-23, #5D (option), Turn signal switch (option)
47	1.25G	2	5F4, Turn signal switch (option)
48	RL	3	B2, #3E (option), #5D (option)
50	LW	2	4T4, B2
51	LY	2	4T4, B2
52	BrB	2	9A1, B1
58	BL	2	4T4, TC
63	GB	2	9A1, B2
70	WR	2	5F4, Combination meter-1
73	RL	2	4T4, B1
74	WB	2	4T4, B2
81	RG	2	5F4, B1
82	LgW	2	5F4, B2
83	Y	3	7A3, Combination meter-12, Terminating resistor-B
85	G	3	7A3, Combination meter-11, Terminating resistor-A
94	BW	2	9A1, R
96	Br	2	9A1, R
97	RW	2	4T4, B2
105	G	3	4T4, 5F4, Combination meter-35
120	LB	2	4T4, B2
134	1.25GY	2	5F4, #5D (option)
183	LY	2	9A1, R
192	Lg	2	DTC, Combination meter-21
194	LR	2	4T4, TC
195	GW	2	Combination meter-9, CB104 (not in use)
196	LY	2	9A1, B1

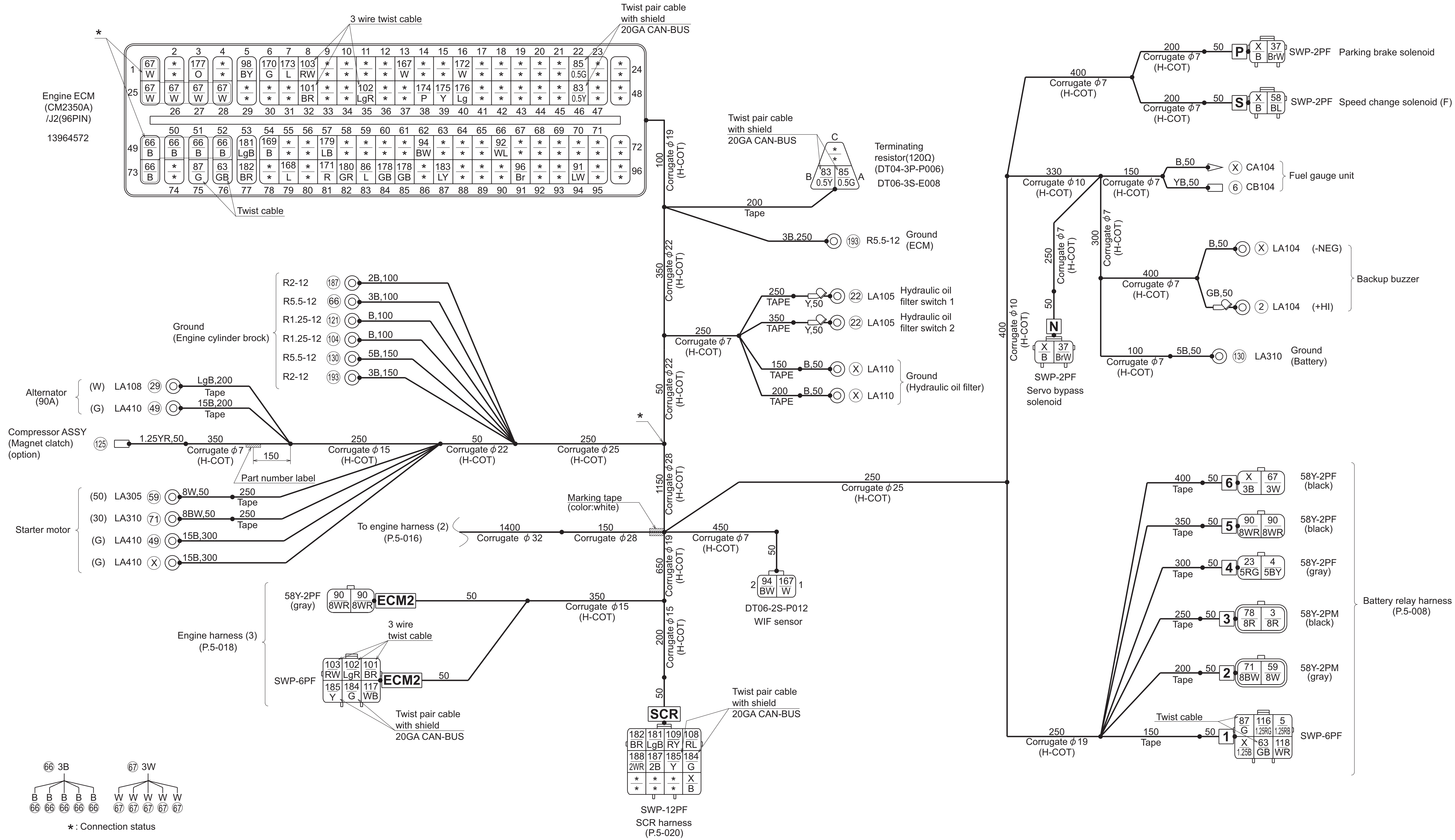
4-4. Panel Harness (2)



No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	B	2	B2, Parking brake switch-5
1	1.25R	2	B1, Lighting switch-5 (option)
9	YR	2	B1, Vibration select switch-2
10	YB	2	B1, Vibration select switch-5
11	Y	4	B1, Vibration mode change switch-2, Vibration select switch-1, 4
36	LgR	2	B1, Parking brake switch-1
38	GR	2	B2, Parking brake switch-4
39	L	3	B1, Speed select switch-1, 4
41	1.25RG	3	B1, Lighting switch-1, 4 (option)
42	1.25RW	2	B1, Lighting switch-3 (option)
43	RG	2	B2, Rotatory lamp-1 (option)
44	RB	2	B2, Throttle switch-4
48	RL	2	B2, Rotatory lamp-2 (option)

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
50	LW	2	B2, Speed select switch-3
51	LY	2	B2, Speed select switch-6
52	BrB	3	B1, Speed select switch-5, Travel mode change switch-3
58	BL	2	TC, Travel mode change switch-2
63	GB	2	B2, Throttle switch-1
73	RL	2	B1, Vibration mode change switch-1
74	WB	2	B2, Throttle switch-3
81	RG	2	B1, Vibration mode change switch-3
82	LgW	2	B2, Parking brake switch-2
97	RW	2	B2, Throttle switch-6
120	LB	2	B2, Throttle switch-5
194	LR	2	TC, Travel mode change switch-1
196	LY	2	B1, Parking brake switch-3

4-5. Engine Harness (1)



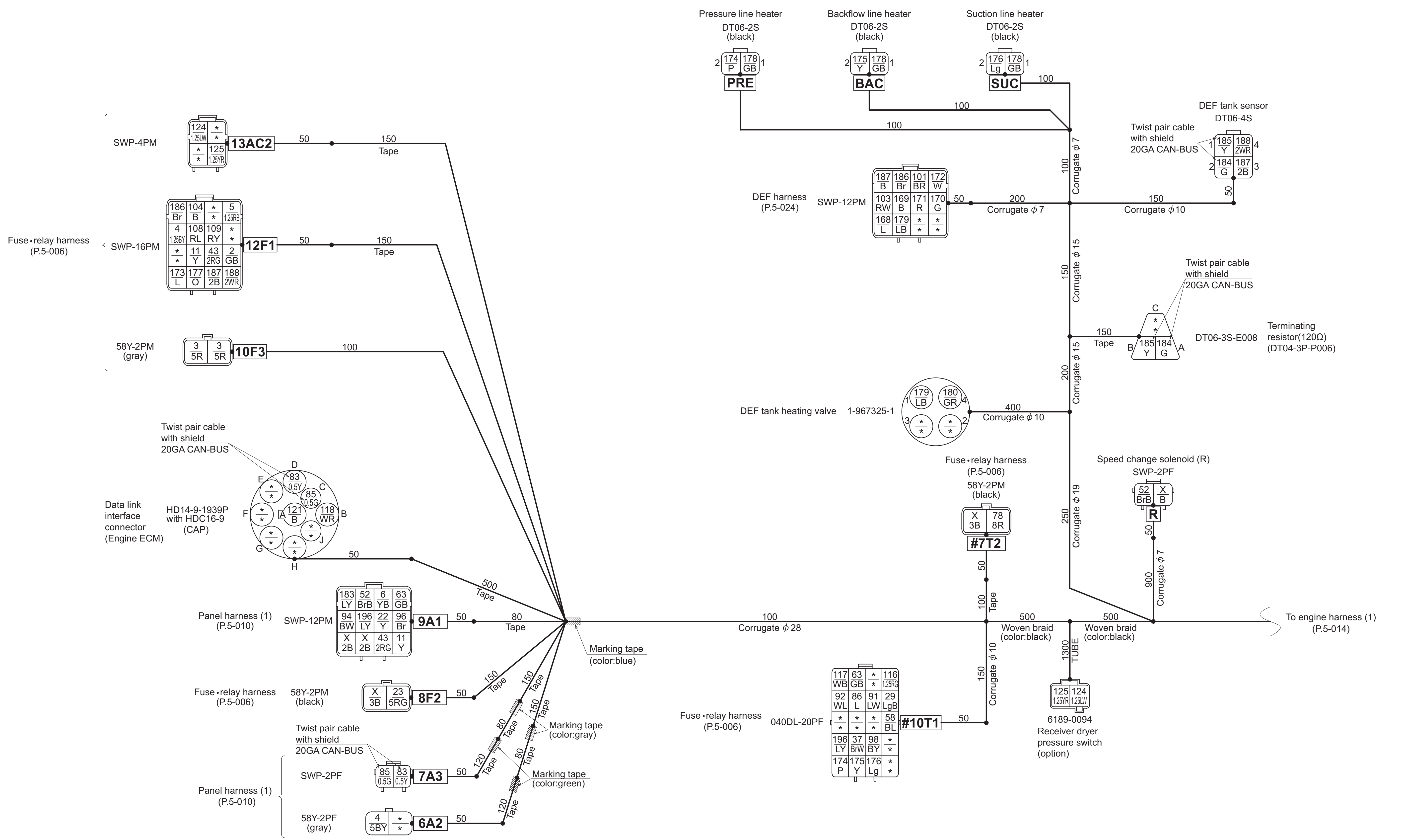
4919-23000-2-13210-C

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINYS		
			Engine Harness (1)		(2)
X	B, 1.25B, 2B, 3B, 15B	16	1, 6, N, P, S, SCR, Backup buzzer, Fuel gauge unit, Ground (Hydraulic oil filter) × 2, Starter motor-G	11	5
2	GB	2	Backup buzzer	1	1
3	5R, 8R	3	3	1	2
4	1.25BY, 5BY	3	4	1	2
5	1.25RB	2	1	1	1
6	YB	2	Fuel gauge unit	1	1
11	Y	2			2
22	Y	3	Hydraulic oil filter switch 1, 2	2	1
23	5RG	2	4	1	1
29	LgB	2	Alternator-W	1	1
37	BrW	3	N, P	2	1
43	2RG	2			2
49	15B	2	Alternator-G, Starter motor-G	2	
52	BrB	2			2
58	BL	2	S	1	1
59	8W	2	2, Starter motor-50	2	
63	GB	4	1, Engine ECM-76	2	2
66	B, 3B	6	Engine ECM-49, 50, 51, 52, 73, Ground (Engine cylinder brock)	6	
67	W, 3W	6	6, Engine ECM-1, 25, 26, 27, 28	6	
71	8BW	2	2, Starter motor-30	2	
78	8R	2	3	1	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINYS		
			Engine Harness (1)		(2)
83	0.5Y	4	Engine ECM-46, Terminating resistor-B	2	2
85	0.5G	4	Engine ECM-22, Terminating resistor-A	2	2
86	L	2	Engine ECM-83	1	1
87	G	2	1, Engine ECM-75	2	
90	8WR	4	5 × 2, ECM2 × 2	4	
91	LW	2	Engine ECM-94	1	1
92	WL	2	Engine ECM-66	1	1
94	BW	3	Engine ECM-62, WIF Sensor	2	1
96	Br	2	Engine ECM-91	1	1
98	BY	2	Engine ECM-5	1	1
101	BR	3	ECM2, Engine ECM-32	2	1
102	LgR	2	ECM2, Engine ECM-35	2	
103	RW	3	ECM2, Engine ECM-8	2	1
104	B	2	Ground (Engine cylinder brock)	1	1
108	RL	2	SCR	1	1
109	RY	2	SCR	1	1
116	1.25RG	2	1	1	1
117	WB	2	ECM2	1	1
118	WR	2	1	1	1
121	B	2	Ground (Engine cylinder brock)	1	1
124	1.25LW	2			2
125	1.25YR	3	Compressor ASSY (Magnet clatch) (option)	1	2
130	5B	2	Ground (Battery), (Engine cylinder brock)	2	

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINYS		
			Engine Harness (1)		(2)
167	W	2	Engine ECM-13, WIF Sensor	2	
168	L	2	Engine ECM-79	1	1
169	B	2	Engine ECM-54	1	1
170	G	2	Engine ECM-6	1	1
171	R	2	Engine ECM-81	1	1
172	W	2	Engine ECM-16	1	1
173	L	2	Engine ECM-7	1	1
174	P	3	Engine ECM-38	1	2
175	Y	3	Engine ECM-39	1	2
176	Lg	3	Engine ECM-40	1	2
177	O	2	Engine ECM-3	1	1
178	GB	5	Engine ECM-84, 85	2	3
179	LB	3	Engine ECM-57	1	2
180	GR	2	Engine ECM-82	1	1
181	LgB	2	SCR, Engine ECM-53	2	
182	BR	2	SCR, Engine ECM-77	2	
183	LY	2	Engine ECM-87	1	1
184	G	4	ECM2, SCR	2	2
185	Y	4	ECM2, SCR	2	2
186	Br	2			2
187	B, 2B	5	SCR, Ground (Engine cylinder brock)	2	3
188	2WR	3	SCR	1	2
193	3B	2	Ground (ECM), (Engine cylinder brock)	2	
196	LY	2			2

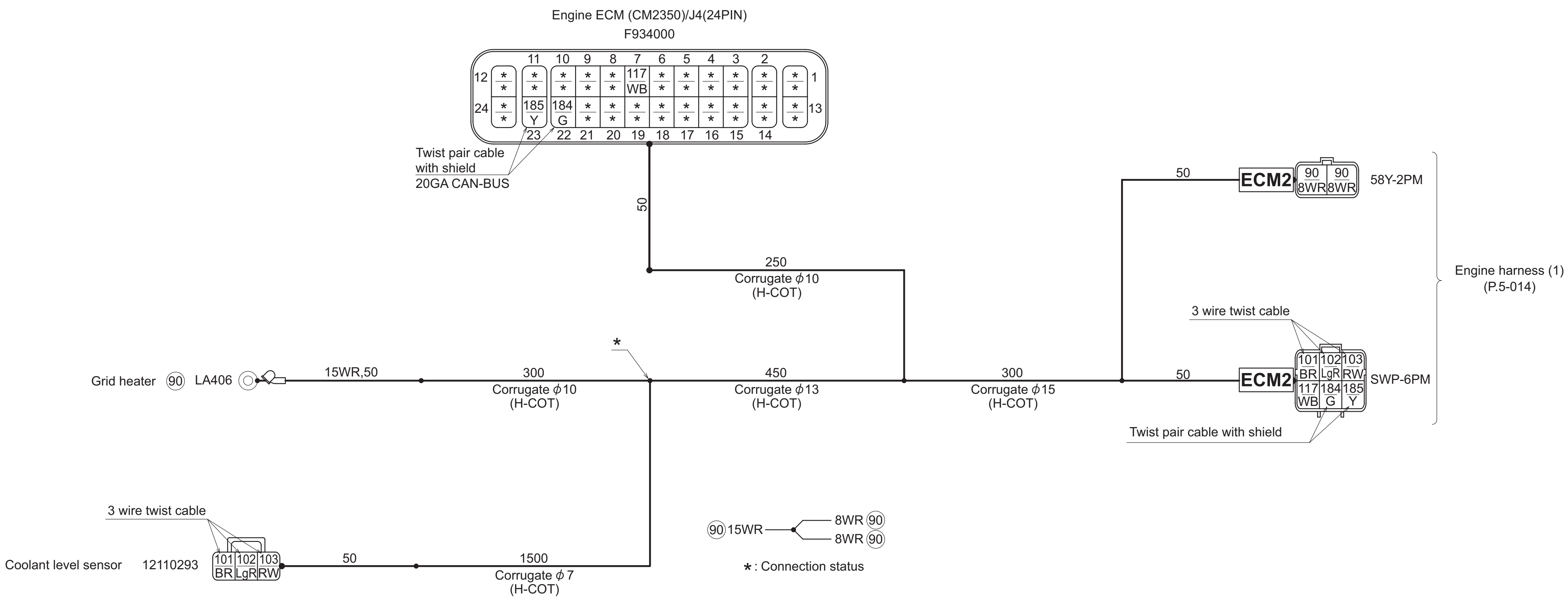
4-6. Engine Harness (2)



4919-23000-2-13210-C

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINYS		
			(1)	Engine Harness (2)	
X	B, 1.25B, 2B, 3B, 15B	16	11	8F2, 9A1 × 2, #7T2, R	5
2	GB	2	1	12F1	1
3	5R, 8R	3	1	10F3 × 2	2
4	1.25BY, 5BY	3	1	6A2, 12F1	2
5	1.25RB	2	1	12F1	1
6	YB	2	1	9A1	1
11	Y	2		9A1, 12F1	2
22	Y	3	2	9A1	1
23	5RG	2	1	8F2	1
29	LgB	2	1	#10T1	1
37	BrW	3	2	#10T1	1
43	2RG	2		9A1, 12F1	2
49	15B	2	2		
52	BrB	2		9A1, R	2
58	BL	2	1	#10T1	1
59	8W	2	2		
63	GB	4	2	9A1, #10T1	2
66	B, 3B	6	6		
67	W, 3W	6	6		
71	8BW	2	2		
78	8R	2	1	#7T2	1
83	0.5Y	4	2	7A3, Data link interface connector-D	2
85	0.5G	4	2	7A3, Data link interface connector-C	2
86	L	2	1	#10T1	1
87	G	2	2		
90	8WR	4	4		
91	LW	2	1	#10T1	1
92	WL	2	1	#10T1	1
94	BW	3	2	9A1	1
96	Br	2	1	9A1	1
98	BY	2	1	#10T1	1
101	BR	3	2	DEF harness	1
102	LgR	2	2		
103	RW	3	2	DEF harness	1
104	B	2	1	12F1	1
108	RL	2	1	12F1	1
109	RY	2	1	12F1	1
116	1.25RG	2	1	#10T1	1
117	WB	2	1	#10T1	1
118	WR	2	1	Data link interface connector-B	1
121	B	2	1	Data link interface connector-A	1
124	1.25LW	2		13AC2, Receiver dryer pressure switch (option)	2
125	1.25YR	3	1	13AC2, Receiver dryer pressure switch (option)	2
130	5B	2	2		
167	W	2	2		
168	L	2	1	DEF harness	1
169	B	2	1	DEF harness	1
170	G	2	1	DEF harness	1
171	R	2	1	DEF harness	1
172	W	2	1	DEF harness	1
173	L	2	1	12F1	1
174	P	3	1	#10T1, PRE	2
175	Y	3	1	#10T1, BAC	2
176	Lg	3	1	#10T1, SUC	2
177	O	2	1	12F1	1
178	GB	5	2	BAC, PRE, SUC	3
179	LB	3	1	DEF harness, DEF tank heating valve	2
180	GR	2	1	DEF tank heating valve	1
181	LgB	2	2		
182	BR	2	2		
183	LY	2	1	9A1	1
184	G	4	2	Terminating resistor, DEF tank sensor	2
185	Y	4	2	Terminating resistor, DEF tank sensor	2
186	Br	2		12F1, DEF harness	2
187	B, 2B	5	2	12F1, DEF harness, DEF tank sensor	3
188	2WR	3	1	12F1, DEF tank sensor	2
193	3B	2	2		
196	LY	2		9A1, #10T1	2

4-7. Engine Harness (3)

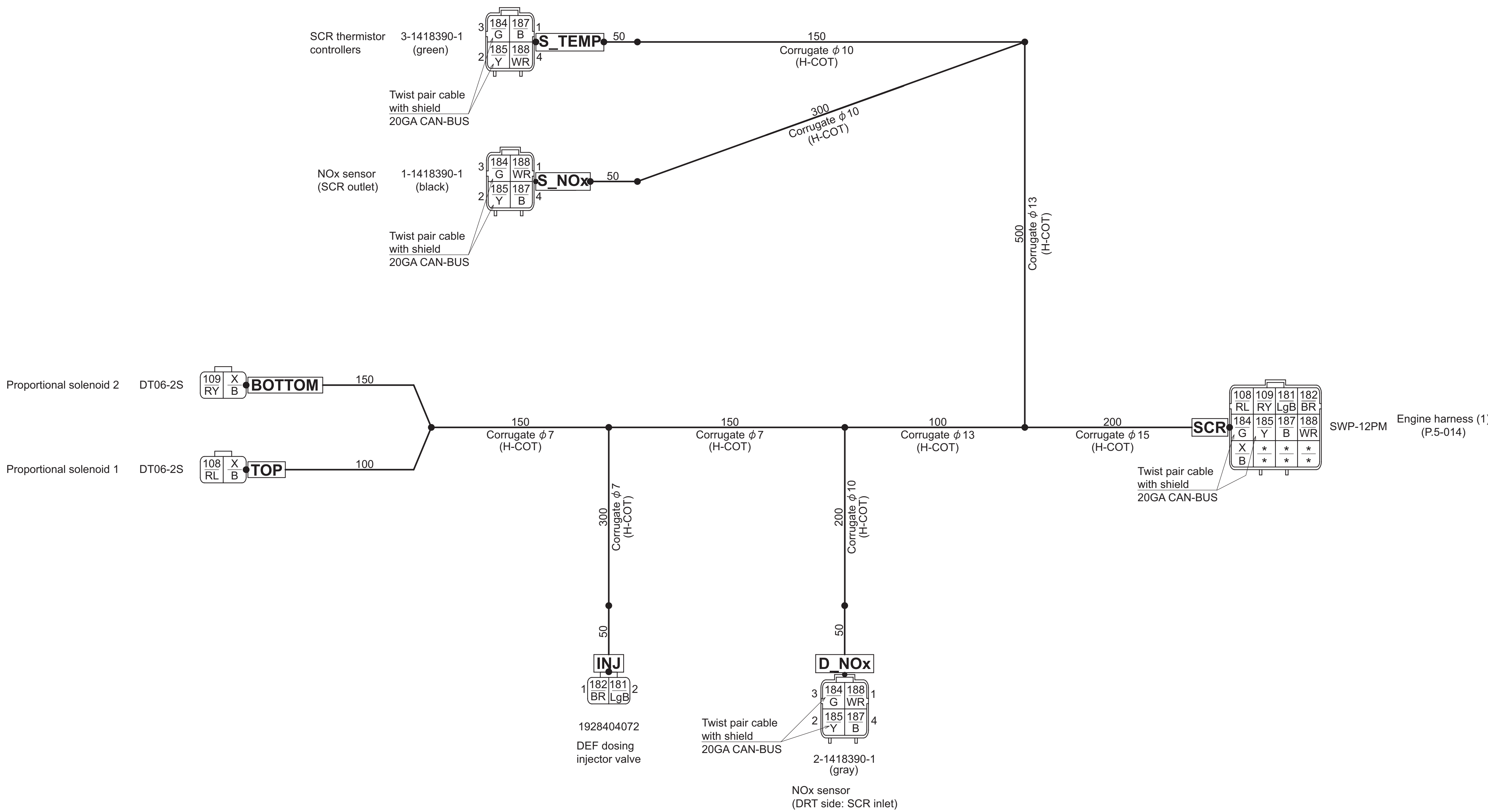


4919-16000-0-33203-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
90	8WR, 15WR	3	**ECM2** × 2, Grid heater
101	BR	2	**ECM2**, Coolant level sensor
102	LgR	2	**ECM2**, Coolant level sensor
103	RW	2	**ECM2**, Coolant level sensor

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
117	WB	2	**ECM2**, Engine ECM-7
184	G	2	**ECM2**, Engine ECM-22
185	Y	2	**ECM2**, Engine ECM-23

4-8. SCR Harness

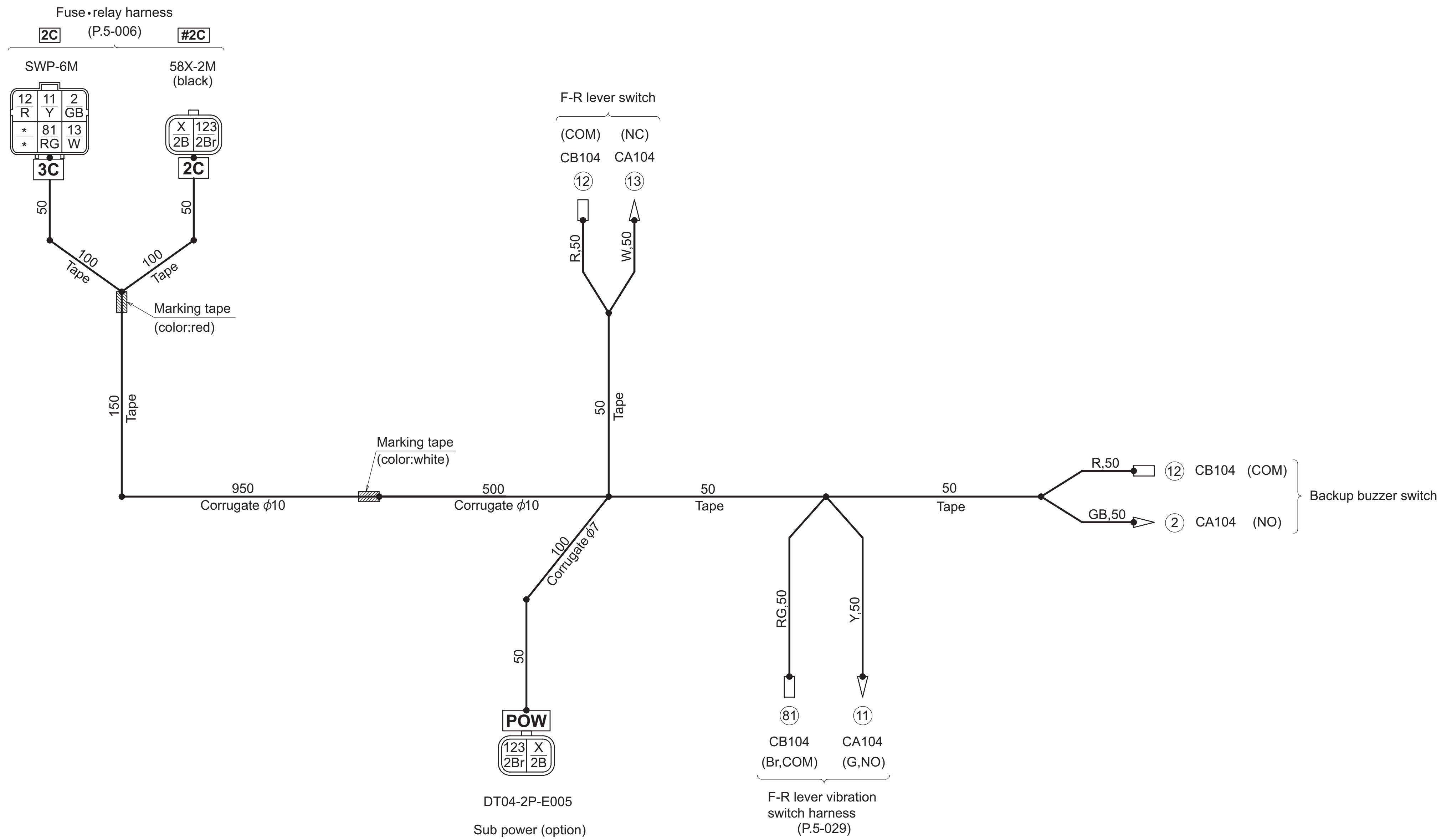


4919-17000-0-23204-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	B	3	BOTTOM, SCR, TOP
108	RL	2	SCR, TOP
109	RY	2	BOTTOM, SCR
181	LgB	2	INJ, SCR
182	BR	2	INJ, SCR

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
184	G	4	D_NOx, S_NOx, S_TEMP, SCR
185	Y	4	D_NOx, S_NOx, S_TEMP, SCR
187	B	4	D_NOx, S_NOx, S_TEMP, SCR
188	WR	4	D_NOx, S_NOx, S_TEMP, SCR

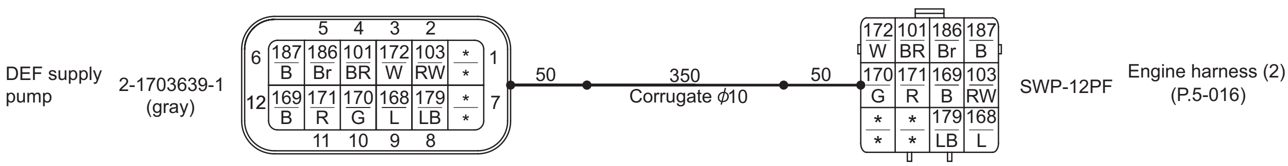
4-9. Control Harness



1421-09043-1-20244-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
Ⓧ	2B	2	**2C**, **POW** (option)
②	GB	2	**3C**, Backup buzzer switch-NO
⑪	Y	2	**3C**, F-R lever vibration switch harness-NO
⑫	R	3	**3C**, Backup buzzer switch-COM, F-R lever switch-COM
⑬	W	2	**3C**, F-R lever switch-NC
(81)	RG	2	**3C**, F-R lever vibration switch harness-COM
(123)	2Br	2	**2C**, **POW** (option)

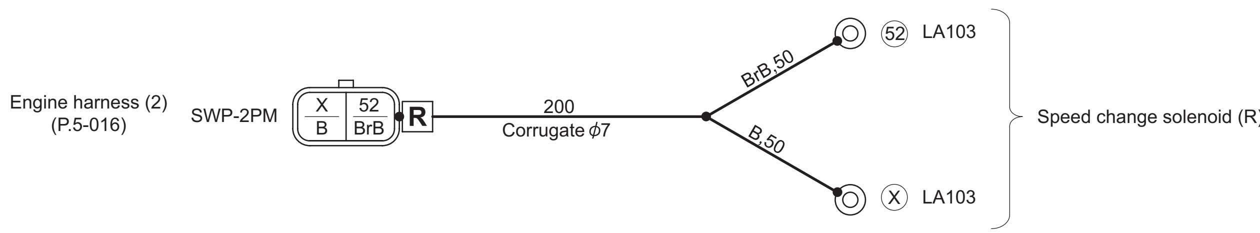
4-10. DEF Harness



4919-34000-1-33221-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
101	BR	2	DEF supply pump-4, Engine harness (2)
103	RW	2	DEF supply pump-2, Engine harness (2)
168	L	2	DEF supply pump-9, Engine harness (2)
169	B	2	DEF supply pump-12, Engine harness (2)
170	G	2	DEF supply pump-10, Engine harness (2)
171	R	2	DEF supply pump-11, Engine harness (2)
172	W	2	DEF supply pump-3, Engine harness (2)
179	LB	2	DEF supply pump-8, Engine harness (2)
186	Br	2	DEF supply pump-5, Engine harness (2)
187	B	2	DEF supply pump-6, Engine harness (2)

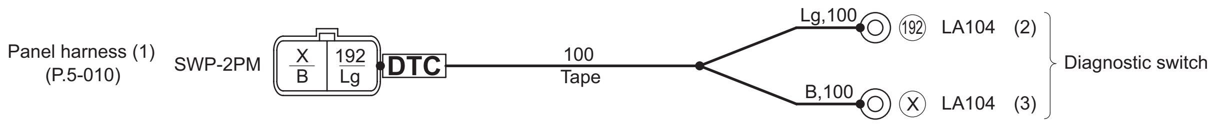
4-11. Speed Change Solenoid Harness



1411-09029-0-30335-0

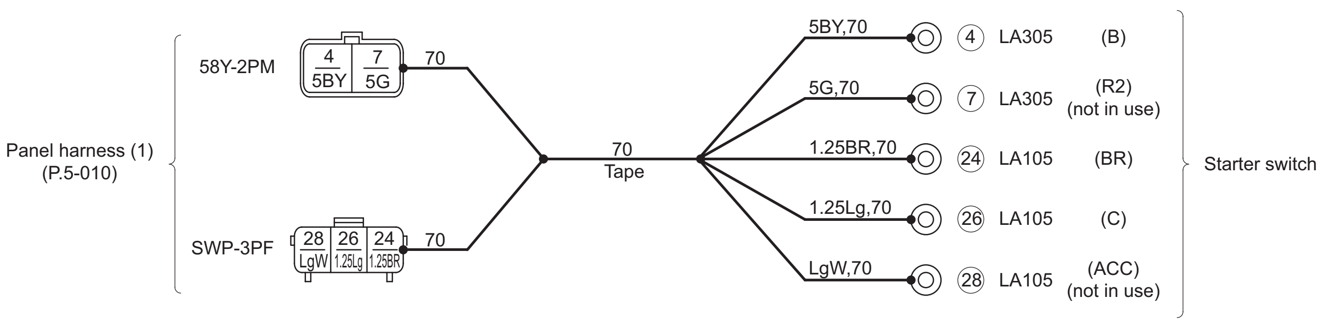
No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	B	2	R, Speed change solenoid (R)
52	BrB	2	R, Speed change solenoid (R)

4-12. Diagnostic Switch Harness



No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	B	2	DTC, Diagnostic switch -3
192	Lg	2	DTC, Diagnostic switch -2

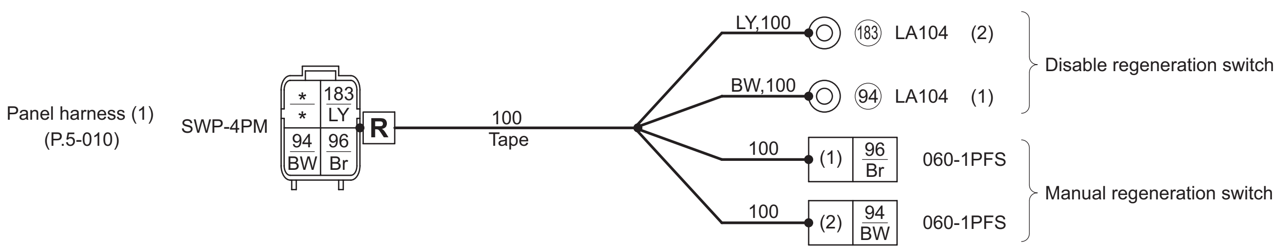
4-13. Stater Switch Harness



4916-23000-0-92910-0

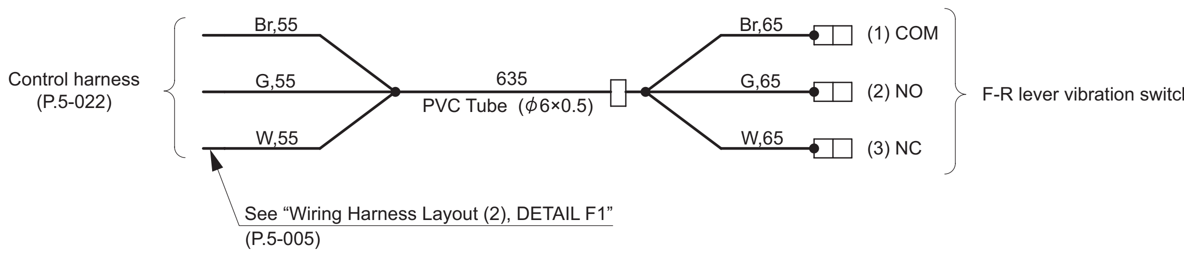
No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
4	5BY	2	Panel harness (1), Starter switch-B
7	5G	2	Panel harness (1), Starter switch-R2 (not in use)
24	1.25BR	2	Panel harness (1), Starter switch-BR
26	1.25Lg	3	Panel harness (1), Starter switch-C
28	LgW	2	Panel harness (1), Starter switch-ACC (not in use)

4-14. Disable Regeneration Harness



No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
94	BW	3	R, Disable regeneration switch-1, Manual regeneration switch-2
96	Br	2	R, Manual regeneration switch-1
183	LY	2	R, Disable regeneration switch-2

4-15. F-R Lever Vibration Switch Harness

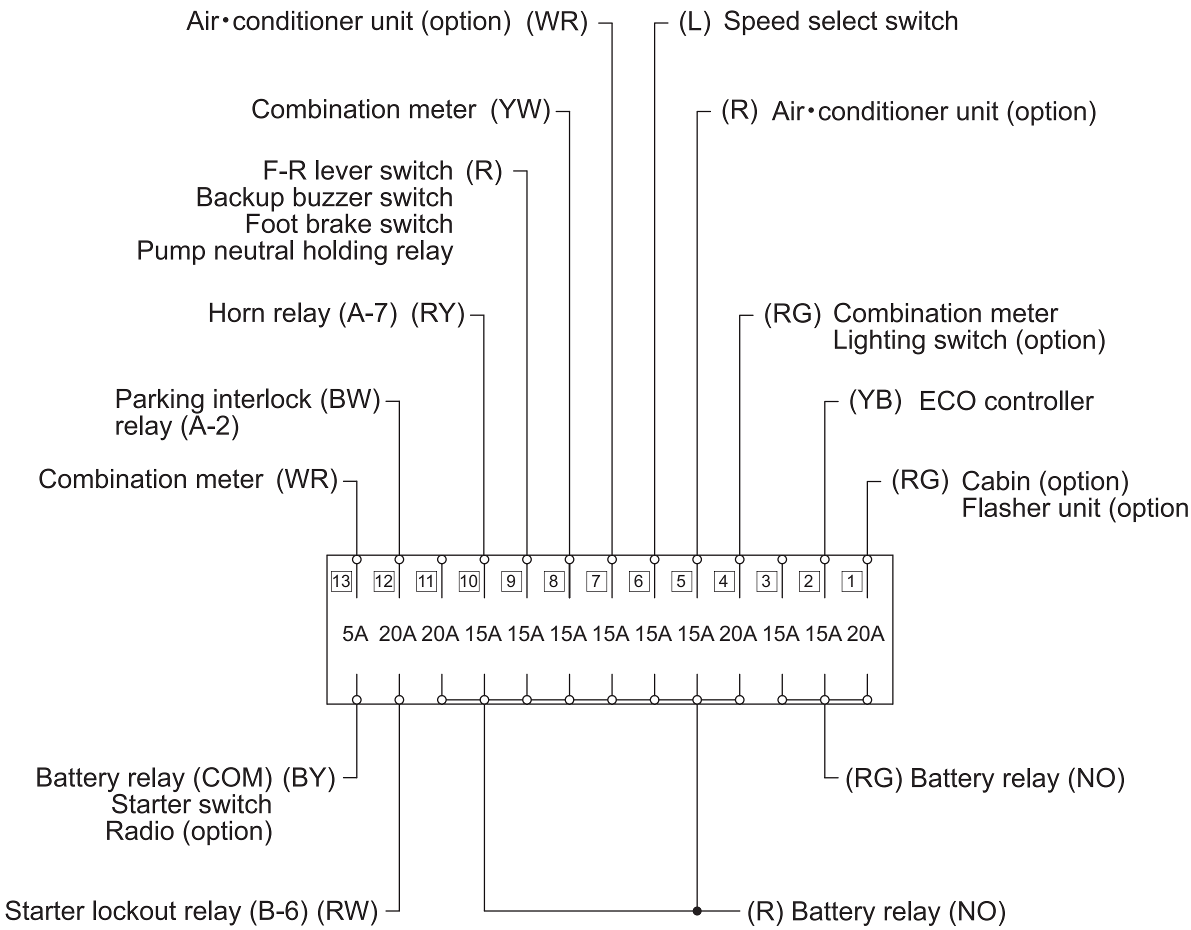


1539-12013-0-30226-0

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

5. ELECTRICAL COMPONENT SPECIFICATIONS

5-1. Fuse Box (1)

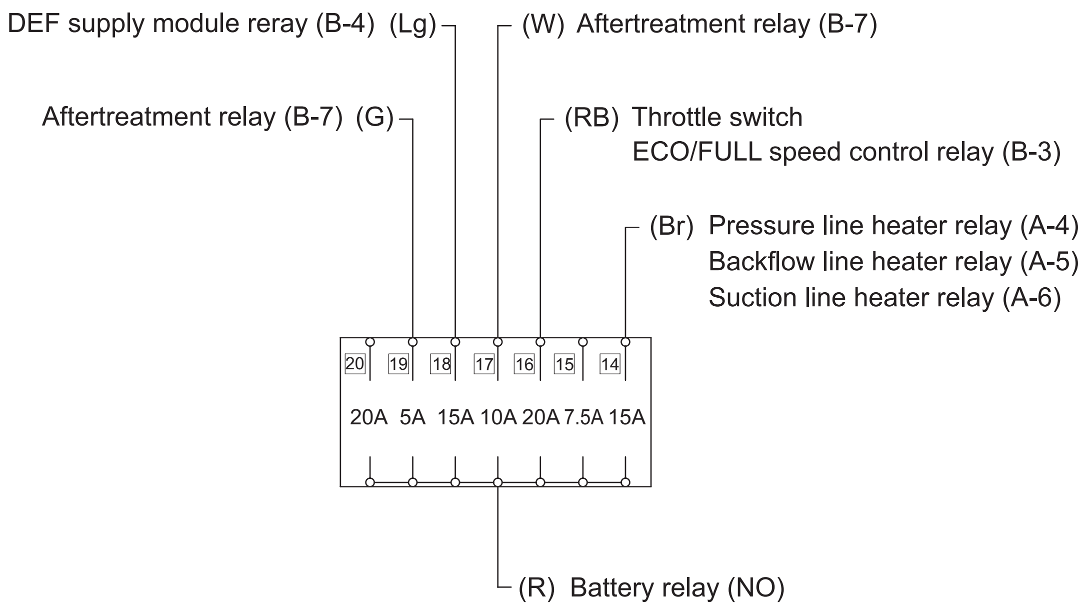


SV544-05001

Harness color codes

R	: Red	RW	: Red/White stripe
L	: Blue	RY	: Red/Yellow stripe
BW	: Black/White stripe	RG	: Red/Green stripe
BY	: Black/Yellow stripe	YB	: Yellow/Black stripe
WR	: White/Red stripe	YW	: Yellow/White stripe

5-2. Fuse Box (2)

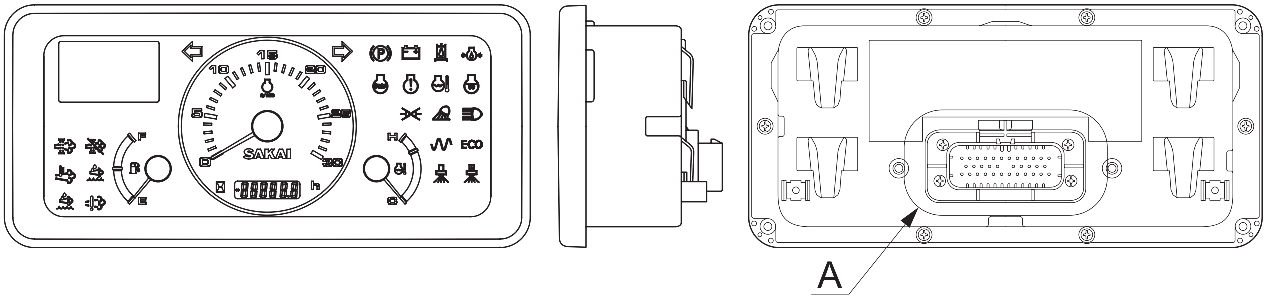


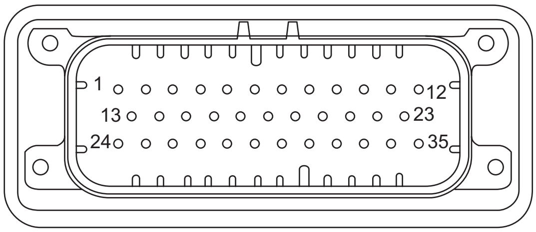
SV544-05002

Harness color codes

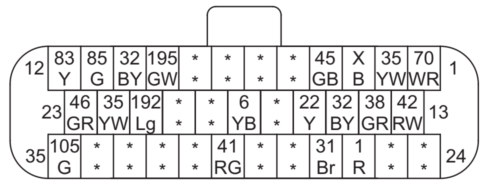
W	: White	Br	: Brown
R	: Red	Lg	: Light green
G	: Green	RB	: Red/Black stripe

5-3. Combination Meter

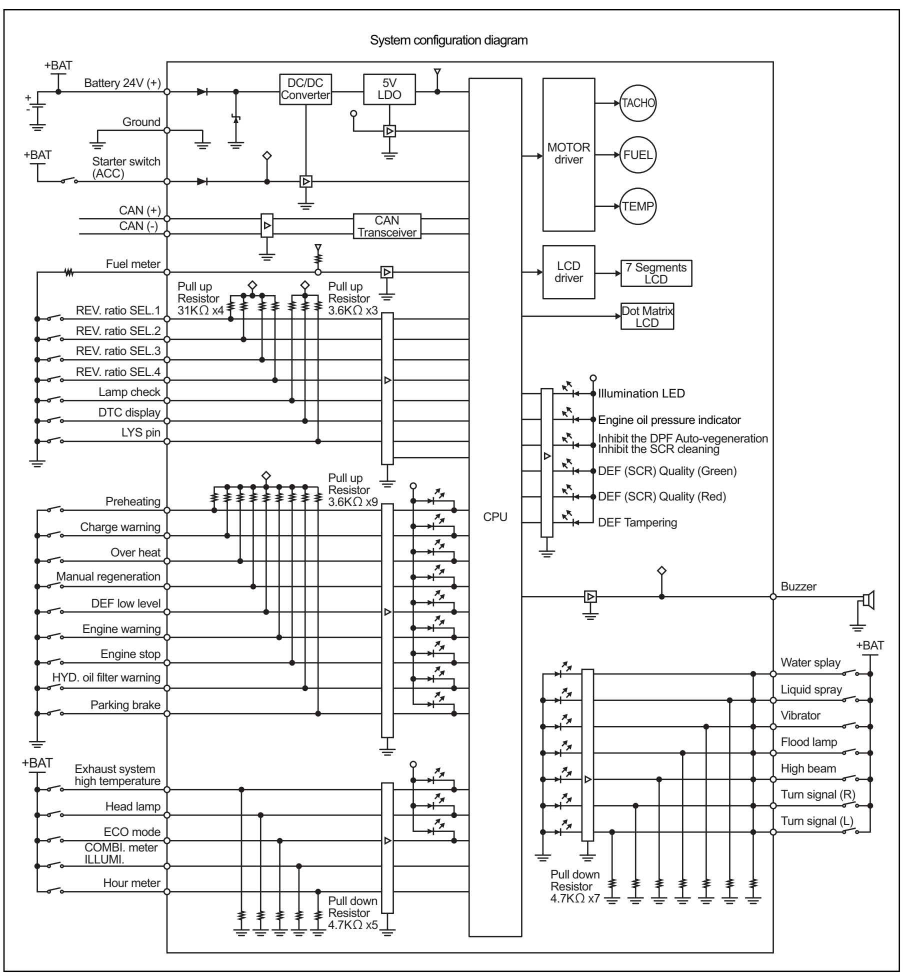




DETAIL A



Harness side



PIN	DESCRIPTION	NO.
1	Battery 24V (+)	70
2	Starter switch (ACC)	35
3	Ground	X
4	Turn signal (R)	45
5	Engine stop	
6	Over heat	
7	REV. ratio SEL.1	
8	REV. ratio SEL.3	
9	Buzzer	195
10	Lamp check	32
11	CAN(+)	85
12	CAN(-)	83
13	Head lamp	42
14	Parking brake	38
15	Charge warning	32
16	HYD. oil filter warning	22
17	Engine warning	
18	Fuel meter	6
19	REV. ratio SEL.2	
20	REV. ratio SEL.4	
21	DTC display	192
22	Hour meter	35
23	Turn signal (L)	46
24	Preheating	
25	Water splay	
26	Flood lamp	1
27	Vibrator	31
28	Liquid spray	
29	High beam	
30	COMBI. meter ILLUMI.	41
31	Exhaust system high temperature	
32	DEF low level	
33	Manual regeneration	
34	LYS pin	
35	ECO mode	105

SV544-05003

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

3) Precautions when work is completed

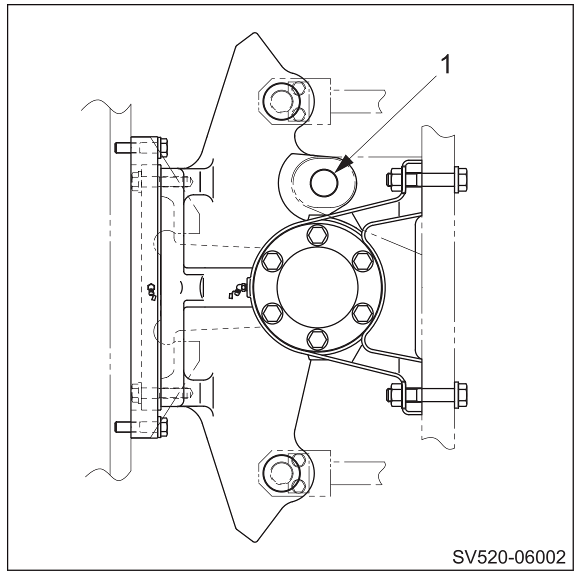
- If coolant has been drained, securely retighten the drain valve and fill with coolant (mixing in long-life coolant) to the specified level. Start the engine and allow the coolant to circulate through the piping. Then add coolant again to the specified level.
- If hydraulic equipment has been removed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

2. VIBRATORY DRUM

2-1. Removal and Installation of Vibratory Drum

2-1-1. Removal of vibratory drum

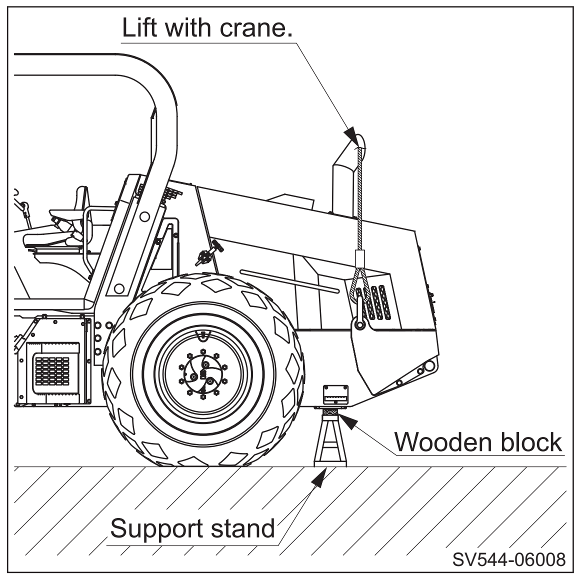
1) Securing machine
   - Hold drum with chocks.
   - Joint front frame and rear frame with lock pin (1).



⚠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) Supporting rear frame
   - Lift rear frame with a crane.
   - Place support stands under rear frame when rear wheel tires is slightly off ground to support machine body.



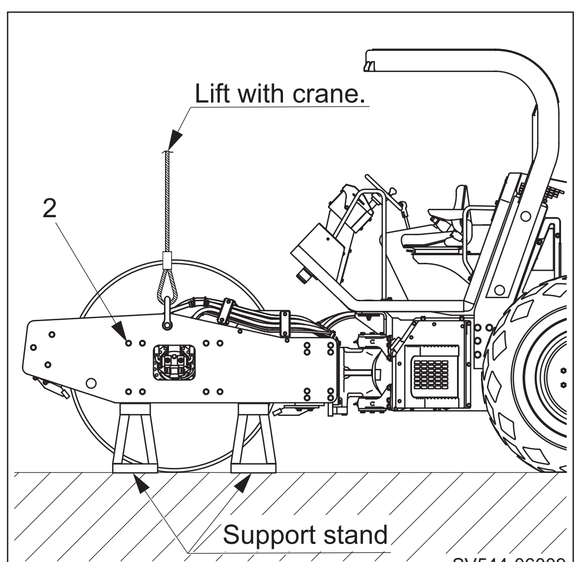
kg Rear axle weight

SV544D	: 5,210 kg (11,485 lbs.)
SV544T	: 5,205 kg (11,475 lbs.)
SV544TF	: 5,190 kg (11,440 lbs.)
SV544DF	: 5,135 kg (11,320 lbs.)
SV544TB	: 4,870 kg (10,735 lbs.)
SV544FB	: 4,855 kg (10,705 lbs.)

(NOTICE)

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

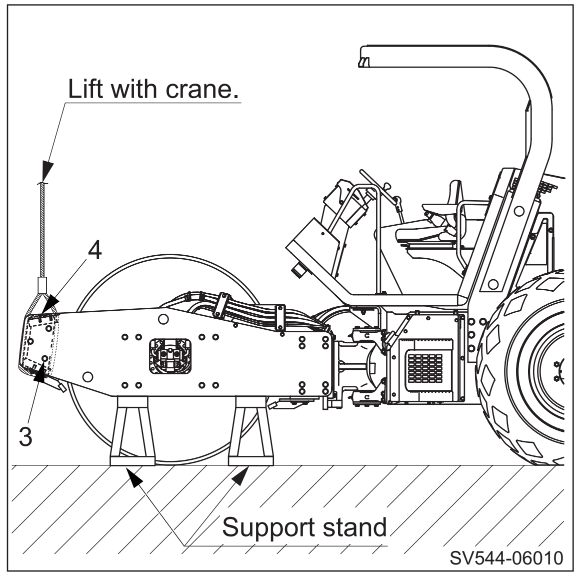
3) Lift front frame with a crane.
   - Ensuring that no load is applied to bolts (2) (left and right sides), place support stands at right and left sides of front frame. Firmly secure machine body.



kg Front axle weight

SV544D	: 5,790 kg (12,765 lbs.)
SV544T	: 6,175 kg (13,615 lbs.)
SV544TF	: 8,460 kg (18,650 lbs.)
SV544DF	: 7,545 kg (16,635 lbs.)
SV544TB	: 7,270 kg (16,025 lbs.)
SV544FB	: 9,555 kg (21,065 lbs.)

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

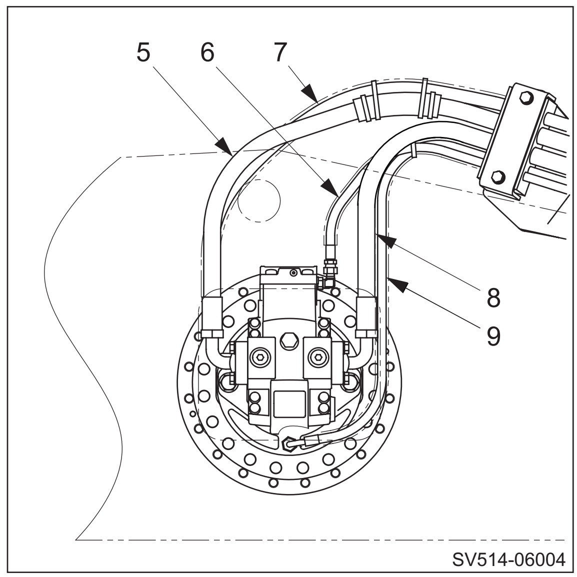


Cross member

SV544D	: 455 kg (1,003 lbs.)
SV544T	: 560 kg (1,235 lbs.)
SV544TF	: 605 kg (1,334 lbs.)
SV544DF	: 580 kg (1,279 lbs.)
SV544TB	: 590 kg (1,301 lbs.)
SV544FB	: 635 kg (1,400 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.



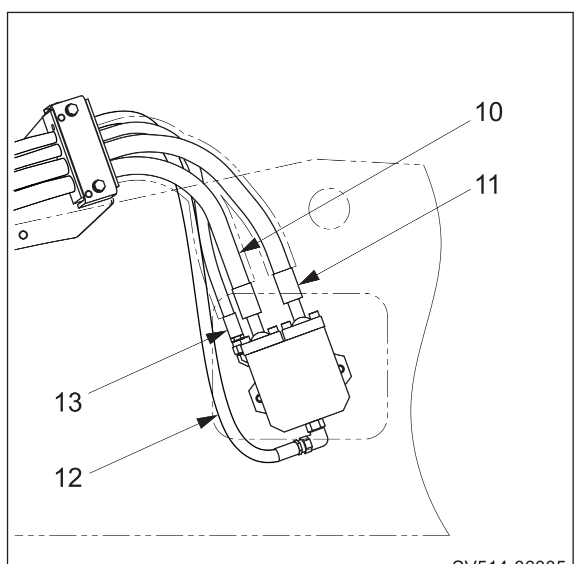
5) Disconnecting piping

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

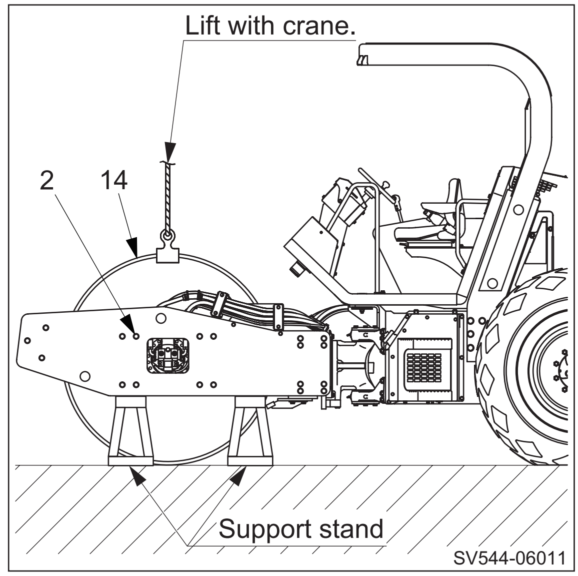
(NOTICE)
- **Plug both ends of the disconnected hoses or implement other actions to prevent entry of foreign matter.**

5-2) Vibrator motor piping
 - Disconnect hydraulic hoses (9), (10), (11) and (12) connecting to vibrator motor.

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



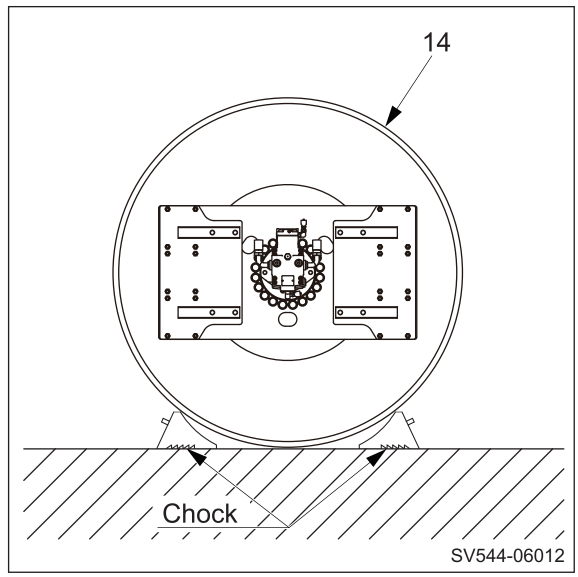
5-3) Remove vibratory drum ASSY
- Lift off vibratory drum ASSY (13) from frame.
- Remove bolts (2).
- Remove vibratory drum ASSY.



kg Vibratory drum ASSY

SV544D	: 4,455 kg (9,821 lbs.)
SV544T	: 4,780 kg (10,538 lbs.)
SV544TF	: 7,185 kg (15,840 lbs.)
SV544DF	: 6,140 kg (13,536 lbs.)
SV544TB	: 4,780 kg (10,538 lbs.)
SV544FB	: 7,185 kg (15,840 lbs.)

6) Put chocks or the like under removed drum (13) 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.

     N•m (2) Bolts M20×120 : 539 N·m (398 lbf·ft)
     (Vibratory drum : propulsion motor side)

     (2) Bolts M20×90 : 539 N·m (398 lbf·ft)
     (Vibratory drum : vibrator motor side)

     (3) Bolts M20×80 : 539 N·m (398 lbf·ft)
     (Cross member)

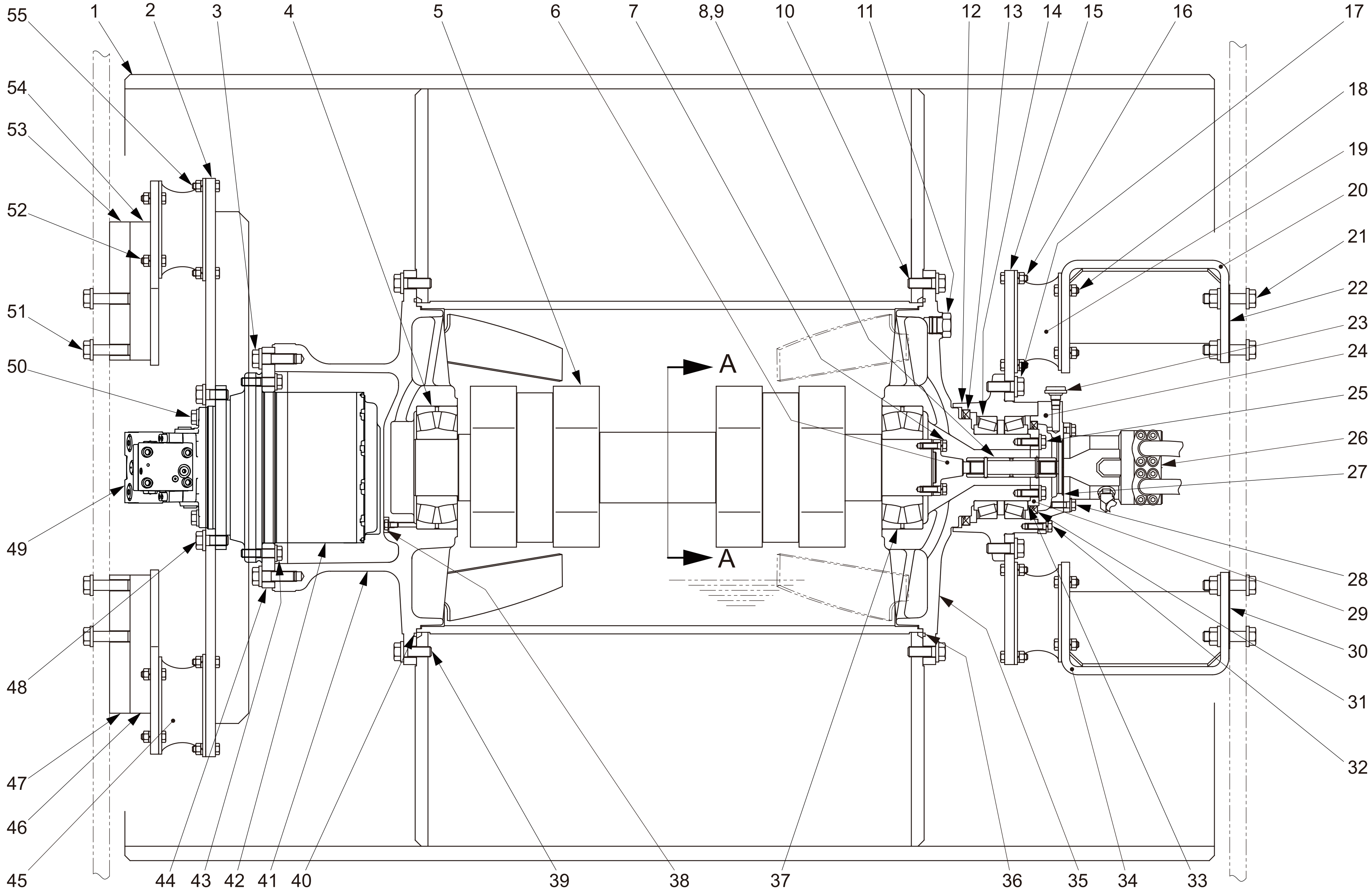
2) Upon installing vibratory drum, pay particular attention to items mentioned below.
   - Fill hydraulic oil tank to specified level to make up for any oil leakage.
   - Start engine and circulate oil through piping. Then check oil level again, ensuring that the oil is at specified level.

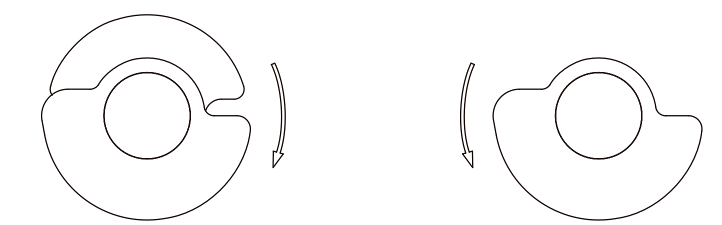
(NOTICE)

- **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.**

3. VIBRATORY DRUM ASSY

3-1. Vibratory Drum ASSY

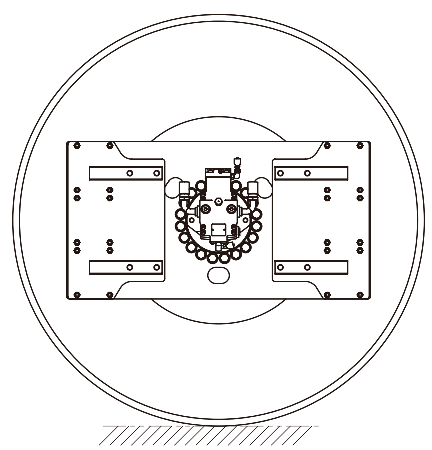




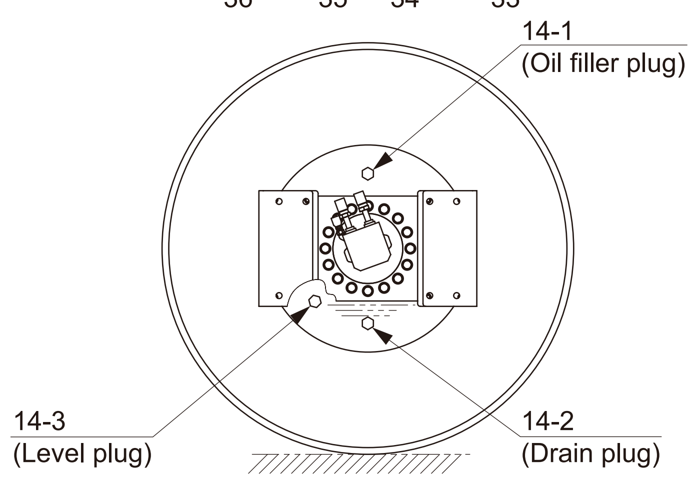
Vibration mode: Low
Motor clockwise rotation

Vibration mode: High
Motor counterclockwise rotation

SECTION A-A



Propulsion motor side



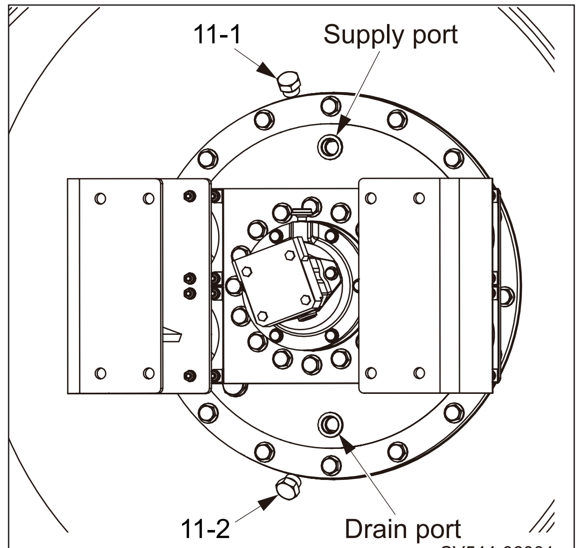
Vibrator motor side

0418-43834-0-12630-0

- (1) Drum
- (2) Disc
- (3) Bolt : M20×70
- (4) Vibrator bearing
- (5) Eccentric shaft
- (6) Shaft
- (7) Bolt : M12×40
- (8) Sleeve
- (9) Spring pin
- (10) Bolt : M20×60
- (11) Plug
- (12) Housing
- (13) Oil seal
- (14) Roller bearing
- (15) Disc
- (16) Bolt : M12×45
- (17) Bolt : M20×60
- (18) Bolt : M12×40
- (19) Damper
- (20) Holder
- (21) Bolt : M20×90
- (22) Plate
- (23) Breather
- (24) Cover
- (25) Bolt : M14×40
- (26) Vibrator motor
- (27) O-ring
- (28) Bolt : M12×40
- (29) Cover
- (30) Plate
- (31) Oil seal
- (32) Bolt : M12×40
- (33) Shim
- (34) Holder
- (35) Axle shaft
- (36) O-ring
- (37) Vibrator bearing
- (38) Bolt : M10×20
- (39) Bolt : M20×60
- (40) O-ring
- (41) Axle shaft
- (42) Gear box
- (43) Bolt : M16×70 P=1.5
- (44) Ring
- (45) Damper
- (46) Holder
- (47) Spacer
- (48) Bolt : M20×50 P=1.5
- (49) Propulsion motor
- (50) Bolt : M16× 40
- (51) Bolt : M20×120
- (52) Bolt : M12× 40
- (53) Spacer
- (54) Holder
- (55) Bolt : M12×45

3-2. Disassembly and Reassembly of Vibratory Drum

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



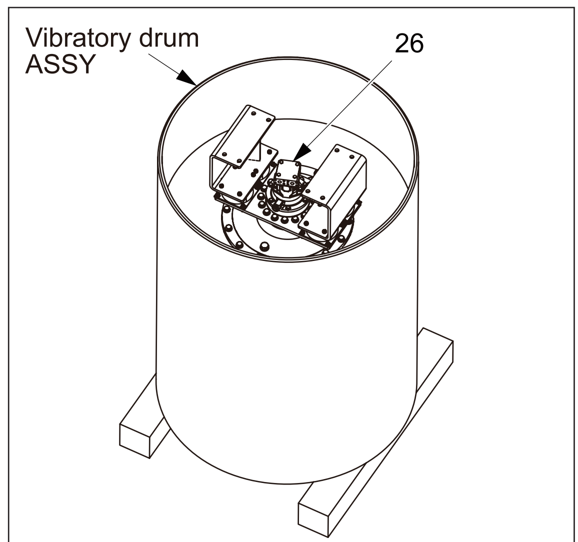
SV544-06001

3-2-1. Disassembly of vibratory drum

1) Remove plugs (11-1) and (11-2).
   - Drain gear oil in vibrator case.
     - Quantity of gear oil : 34 L (9.0 gal.)
   - Install plug (11-1) and drain plug (11-2).

⚠WARNING

- **When standing the vibratory 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.**

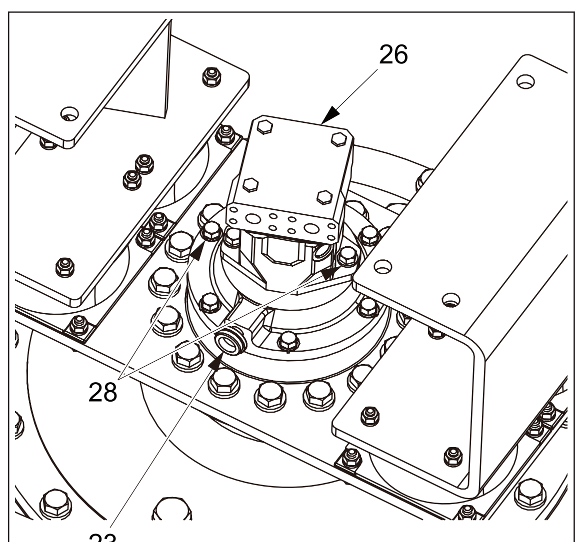


SV544-06002

2) Lift vibratory drum ASSY with a crane and stand it with its vibrator motor (26) side facing up as shown on the right.

kg Vibratory drum ASSY

SV544D	: 4,425 kg (9,755 lbs.)
SV544T	: 4,750 kg (10,472 lbs.)
SV544TF	: 7,155 kg (15,774 lbs.)
SV544DF	: 6,110 kg (13,470 lbs.)
SV544TB	: 4,750 kg (10,472 lbs.)
SV544FB	: 7,155 kg (15,774 lbs.)



SV544-06003

3) Remove bolts (28).
   - Remove Vibrator motor (26).

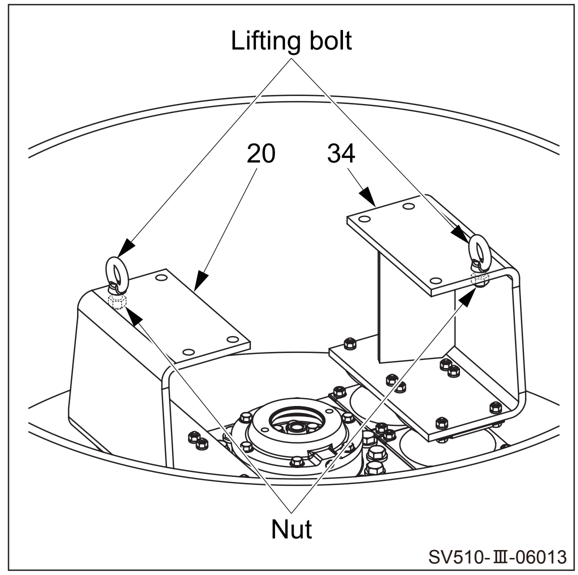
     kg (26) Vibrator motor : 20 kg (44 lbs.)

   - Remove breather (23).

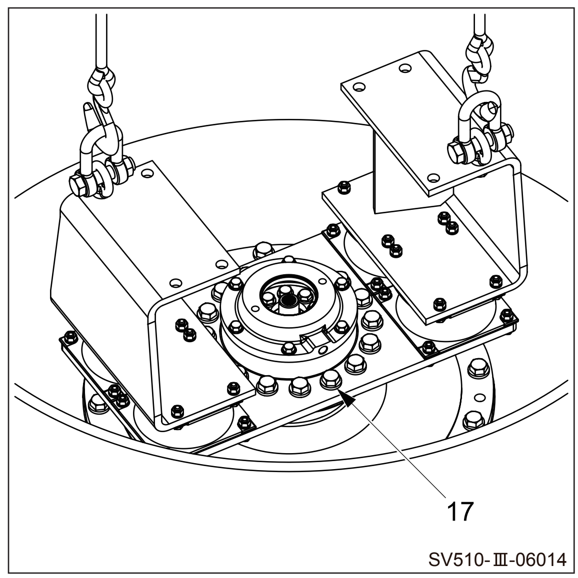
⚠WARNING

When installing lifting bolts, secure them with nuts.

4) Install lifting bolts (M20) and nuts to holders (20) and (34).

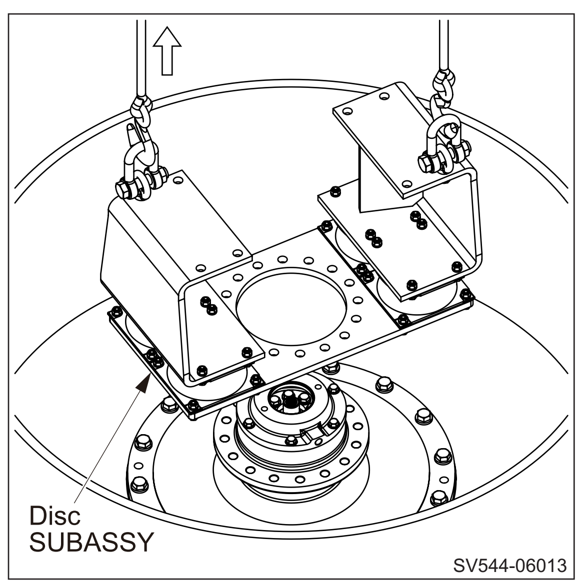


5) Remove bolts (17).

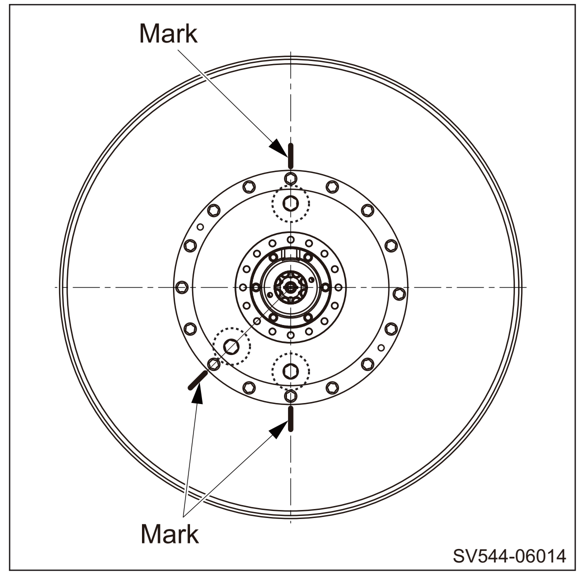


6) Remove disc SUBASSY.

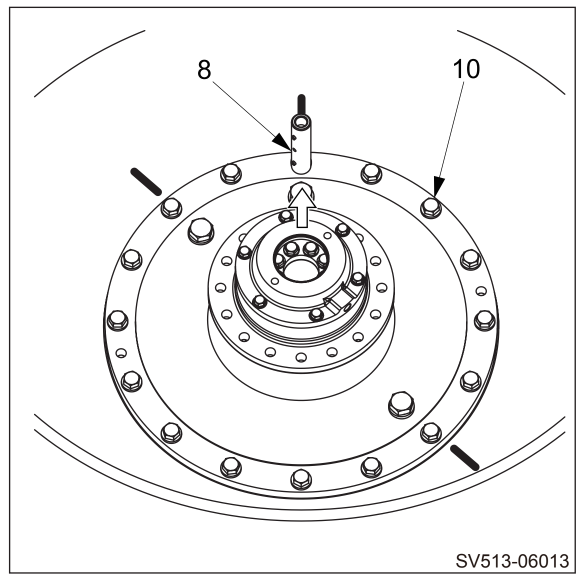
kg Disc SUBASSY : 155 kg (342 lbs.)



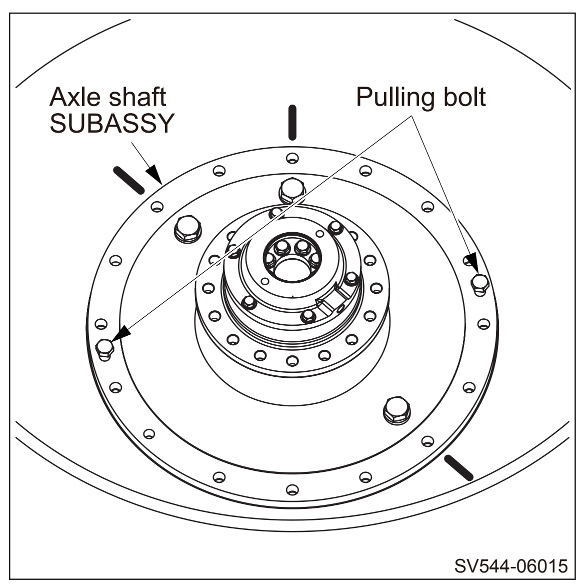
7) Making marks on drum as shown.



8) Remove sleeve (8).
- Remove bolts (10).



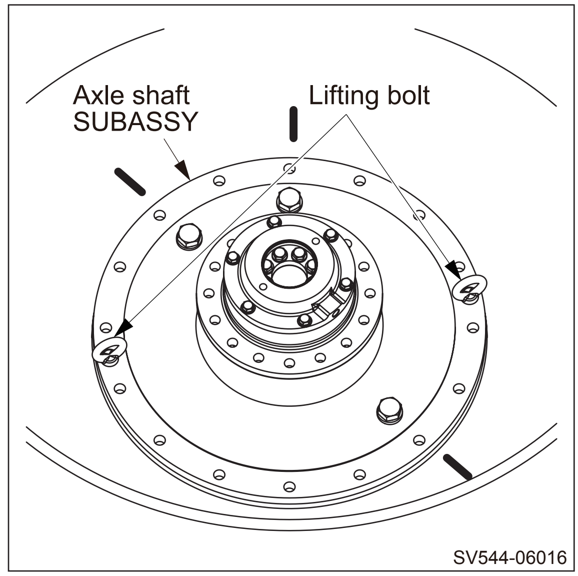
9) Lift axle shaft SUBASSY using two pulling bolts (M20×60).



⚠WARNING

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

10) Install lifting bolts (M20) to axle shaft SUBASSY.

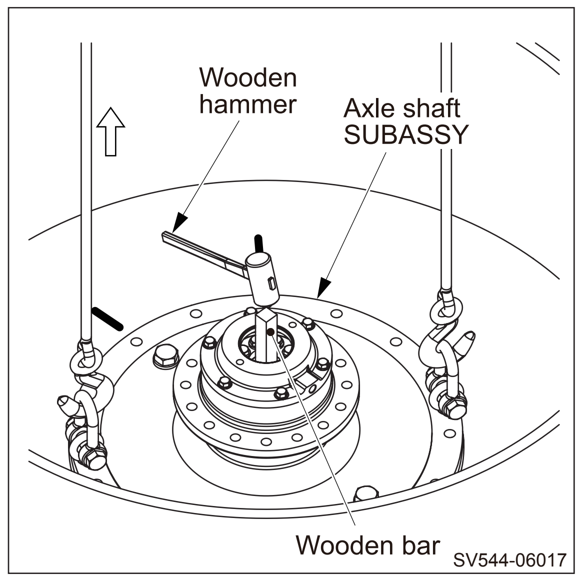


11) Remove axle shaft SUBASSY.

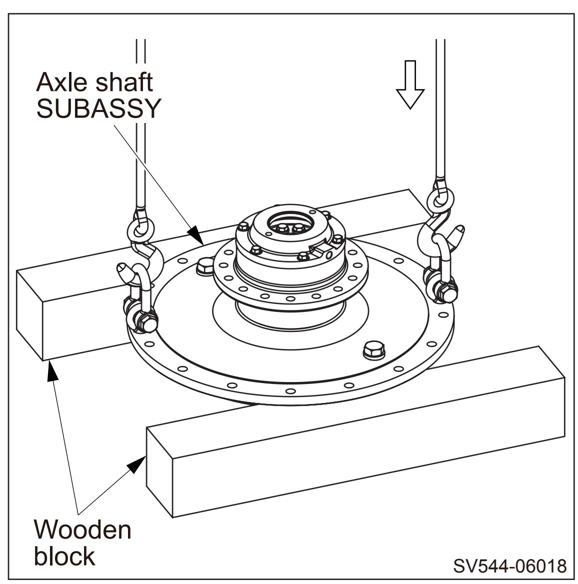
(NOTICE)

- **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.**

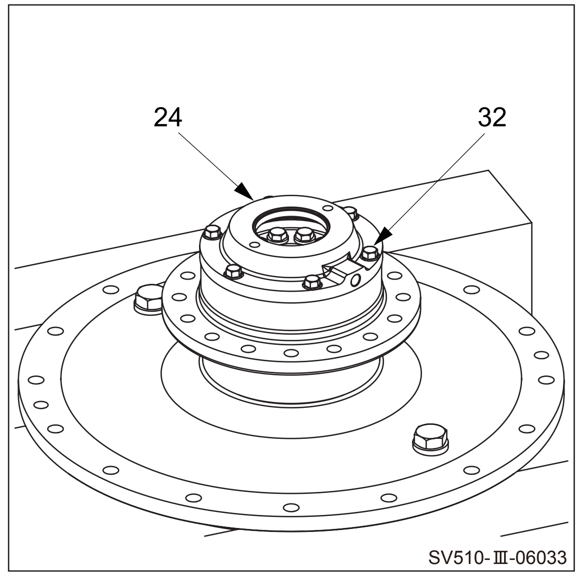
kg Axle shaft SUBASSY : 240 kg (529 lbs.)



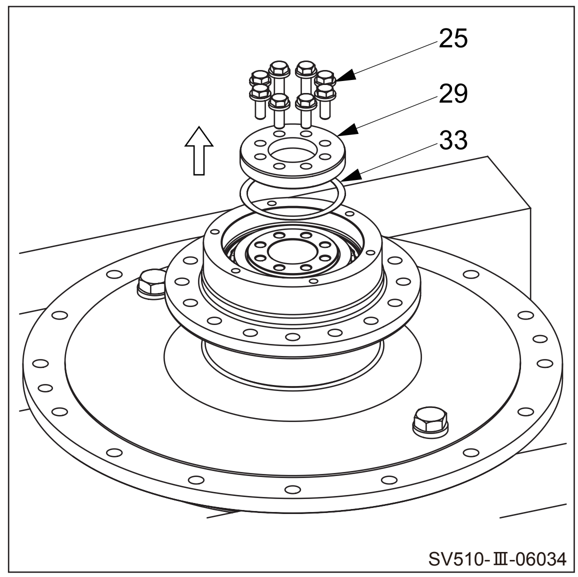
12) Put axle shaft SUBASSY on wooden blocks.



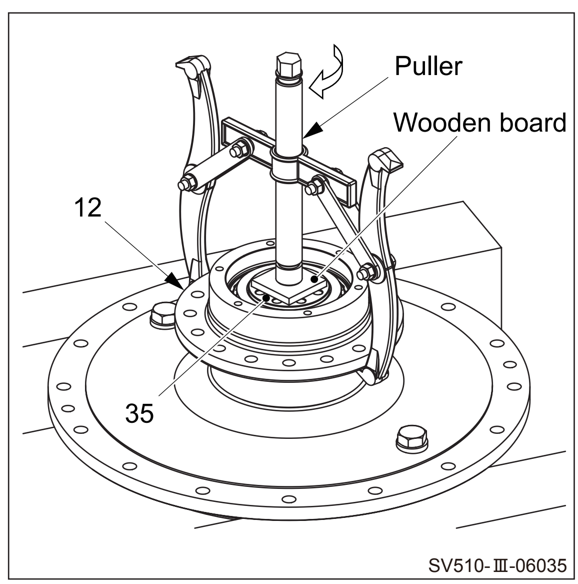
13) Remove bolts (32).
   • Remove cover (24).



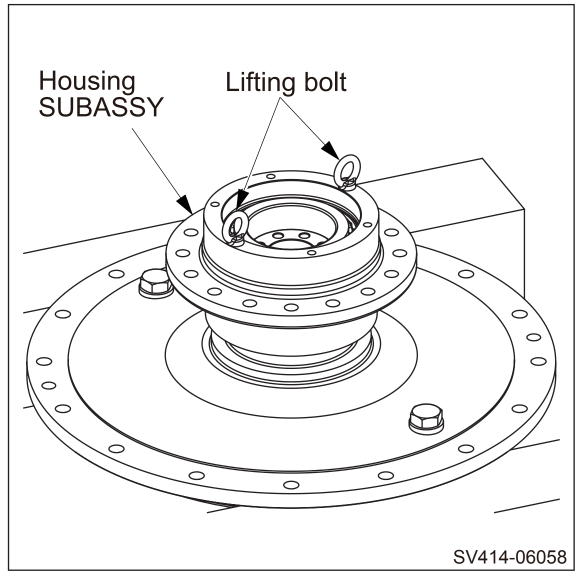
14) Remove bolts (25).
   • Remove cover (29).
   • Remove shim (33).



15) Put a piece of wooden board on the end of axle shaft (35) and set a puller on housing (12).
   • Separate housing SUBASSY together with roller bearing from axle shaft SUBASSY.

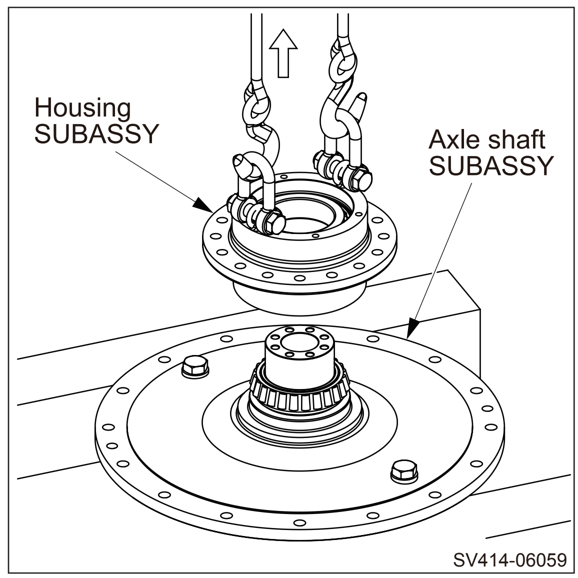


16) Install lifting bolts (M12) to housing SUBASSY.

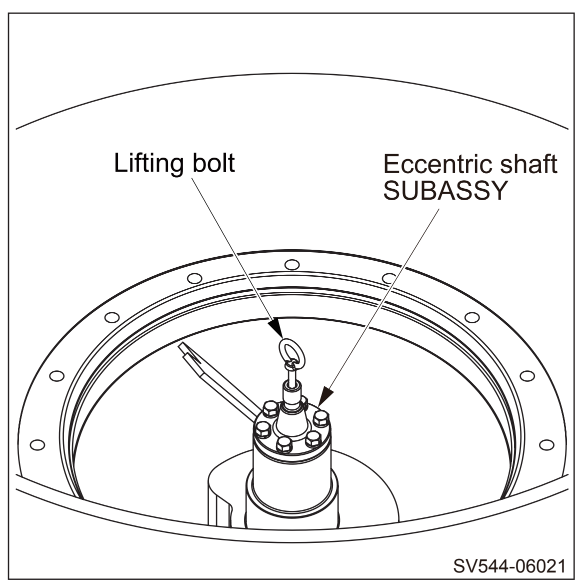


17) Remove housing SUBASSY.

Housing SUBASSY : 45 kg (99 lbs.)



18) Install a lifting bolt (M10) to eccentric shaft SUBASSY.



⚠WARNING

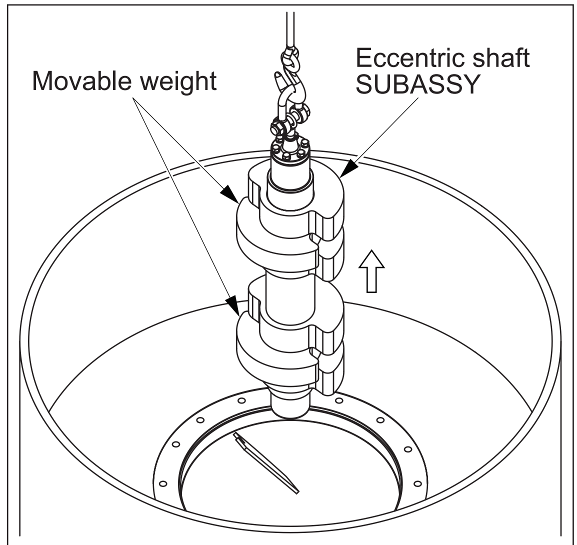
Take care not to get your fingers caught in movable weights.

19) Remove eccentric shaft SUBASSY.

Eccentric shaft SUBASSY : 280 kg (617 lbs.)

(NOTICE)

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



SV544-06022

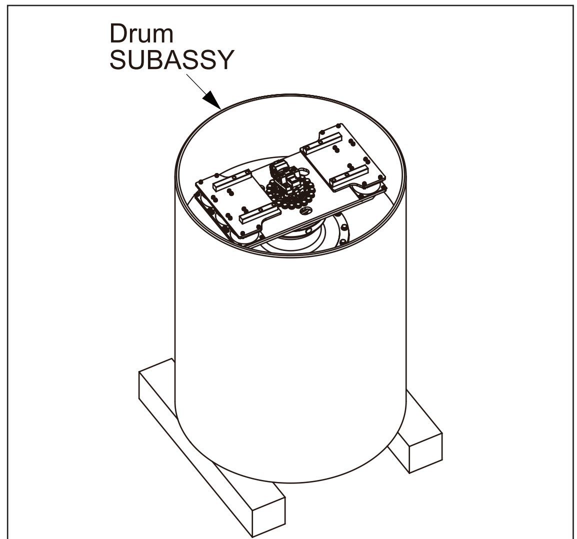
⚠WARNING

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

20) Reverse drum SUBASSY.

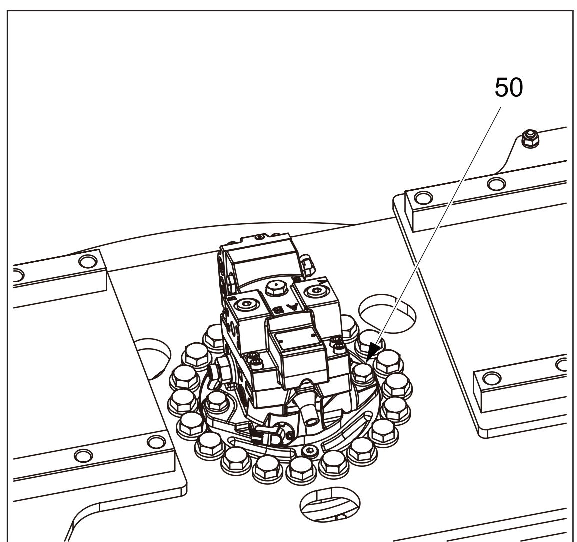
Drum SUBASSY

SV544D	: 3,720 kg (8,201 lbs.)
SV544T	: 4,045 kg (8,918 lbs.)
SV544TF	: 6,450 kg (14,220 lbs.)
SV544DF	: 5,405 kg (11,916 lbs.)
SV544TB	: 4,045 kg (8,918 lbs.)
SV544FB	: 6,450 kg (14,220 lbs.)



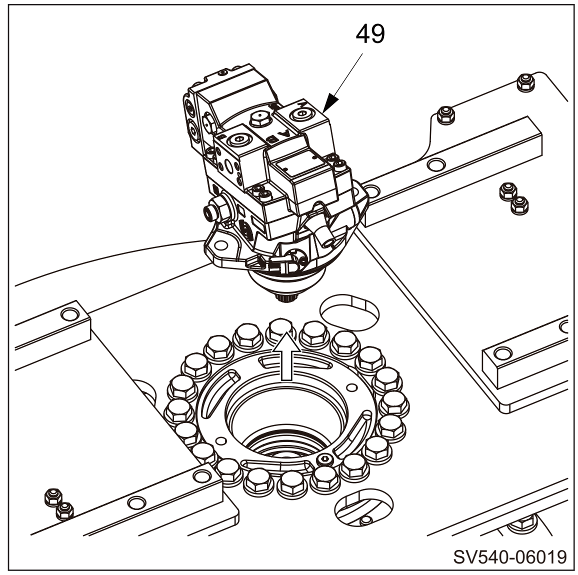
SV544-06023

21) Remove bolts (50).



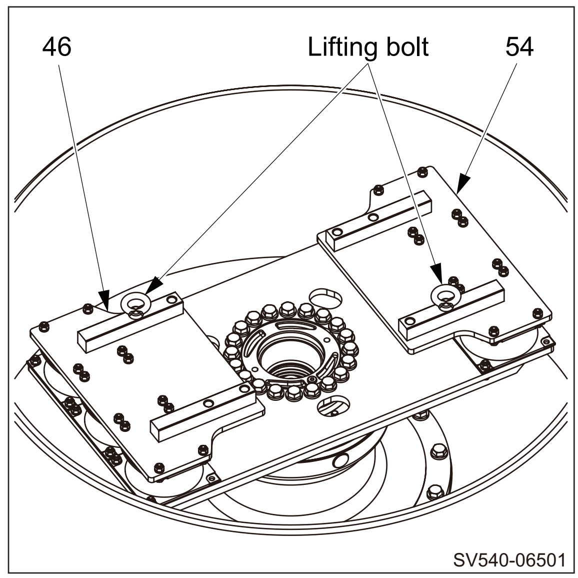
SV540-06020

22) Remove propulsion motor (49).

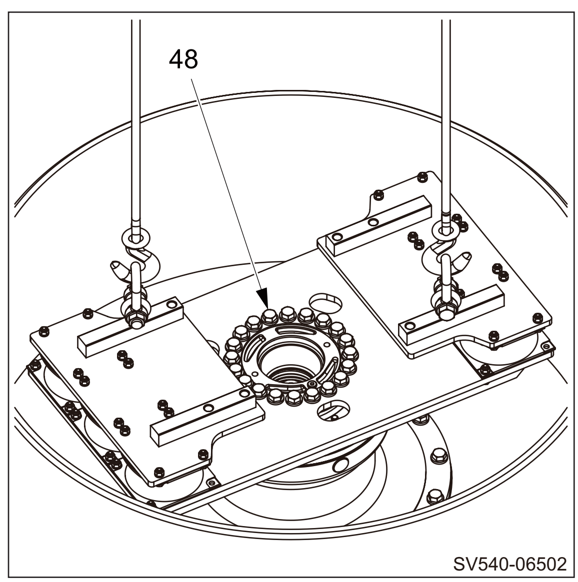


(49) Propulsion motor : 30 kg (66 lbs.)

23) Install lifting bolts (M20) to holders (46) and (54).

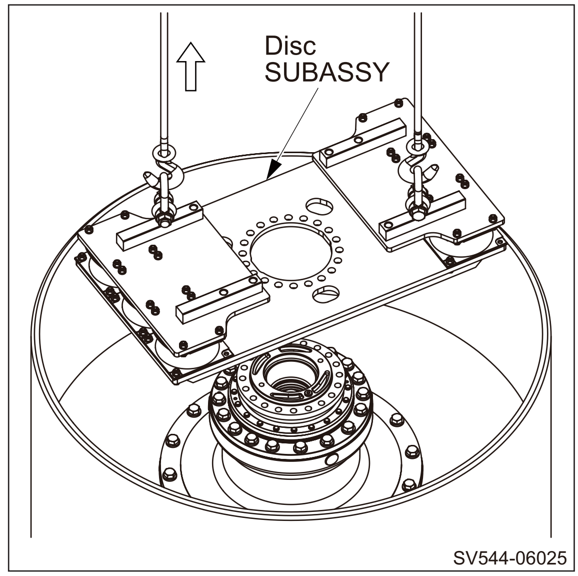


24) Remove bolts (48).

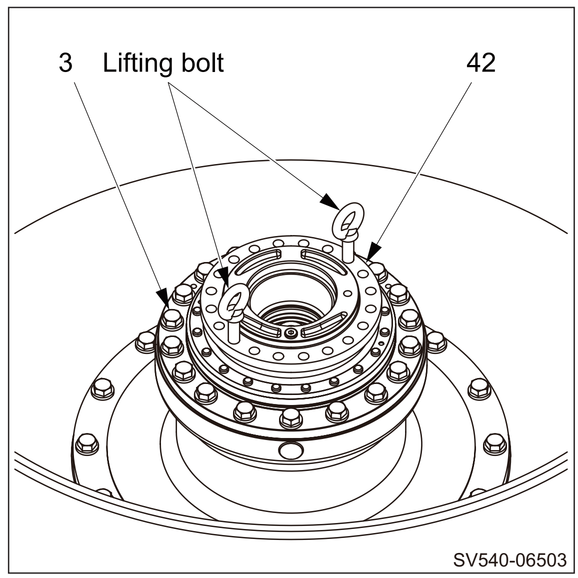


25) Remove disc SUBASSY.

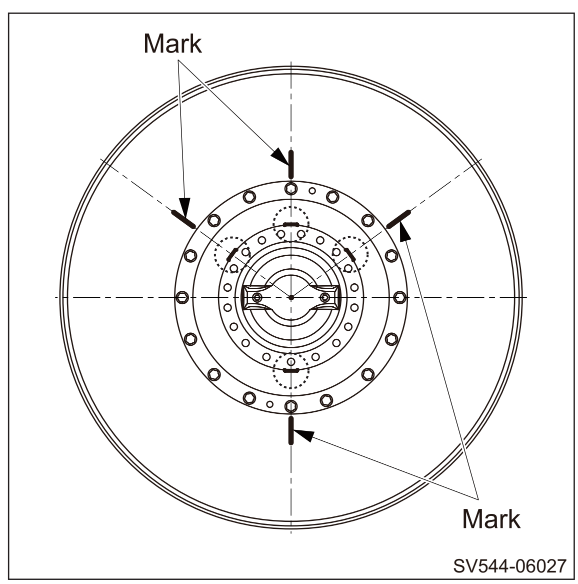
kg Disc SUBASSY : 220 kg (485 lbs.)



26) Install lifting bolts (M20) to gear box (42).
- Remove bolts (3).

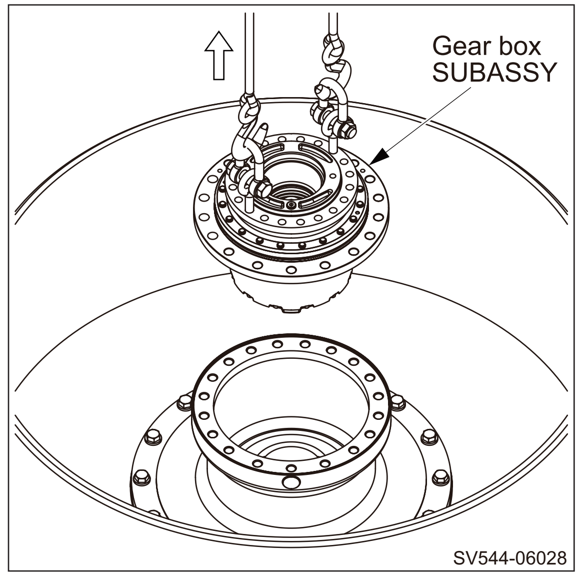


27) Making marks on drum as shown.

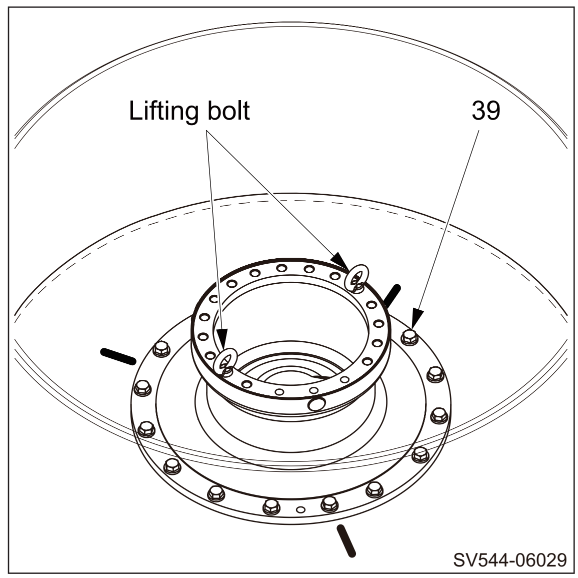


28) Remove gear box SUBASSY.

Gear box SUBASSY : 160 kg (353 lbs.)

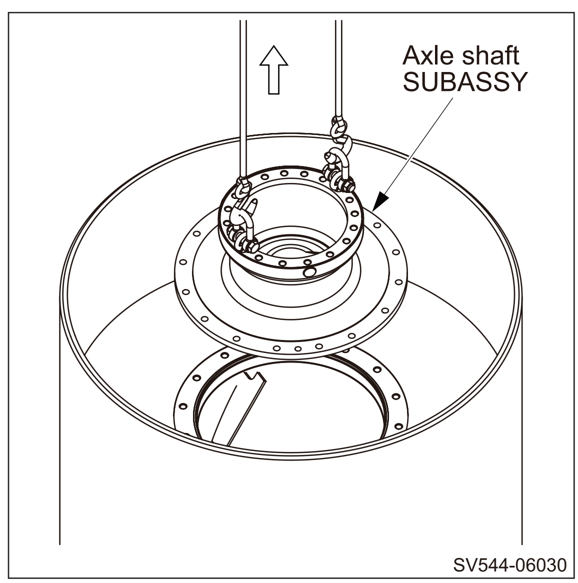


29) Install lifting bolts (M20) to axle shaft SUBASSY.
- Remove bolts (39).

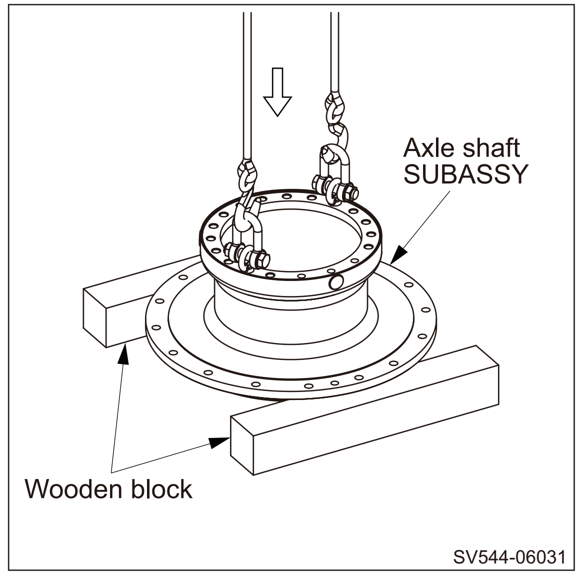


30) Remove axle shaft SUBASSY.

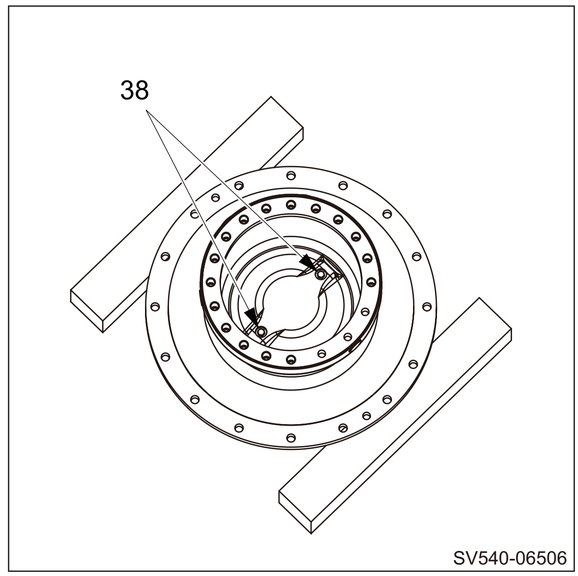
Axle shaft SUBASSY : 230 kg (507 lbs.)



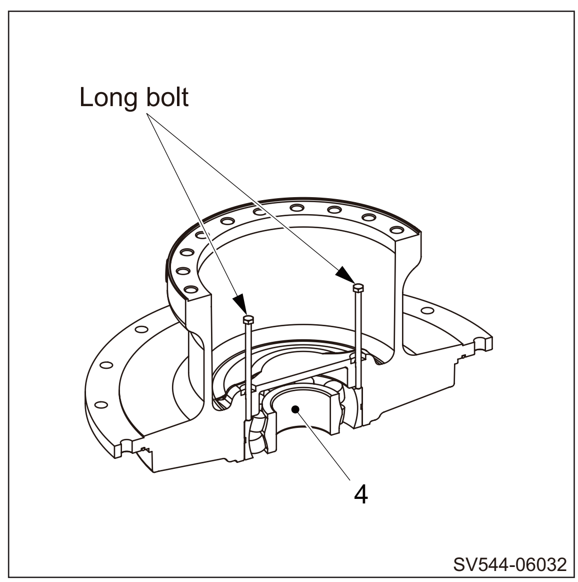
31) Put axle shaft SUBASSY on wooden blocks.



32) Remove bolts (38) and seal washers.



33) Remove vibrator bearing (4) using long bolts (M10).

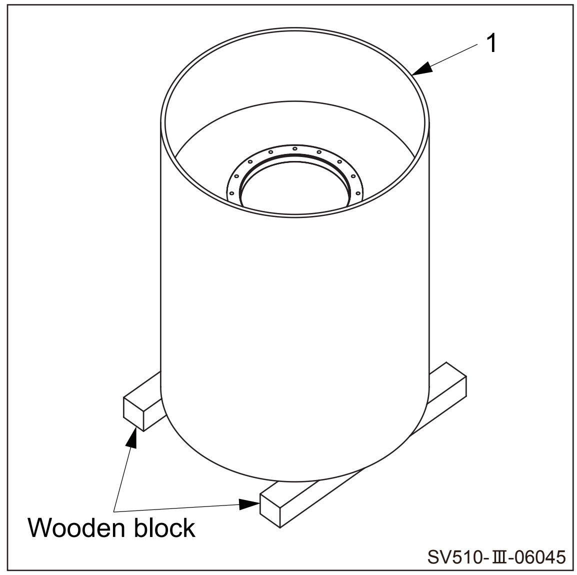


3-2-2. Reassembly of vibratory drum

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

WARNING

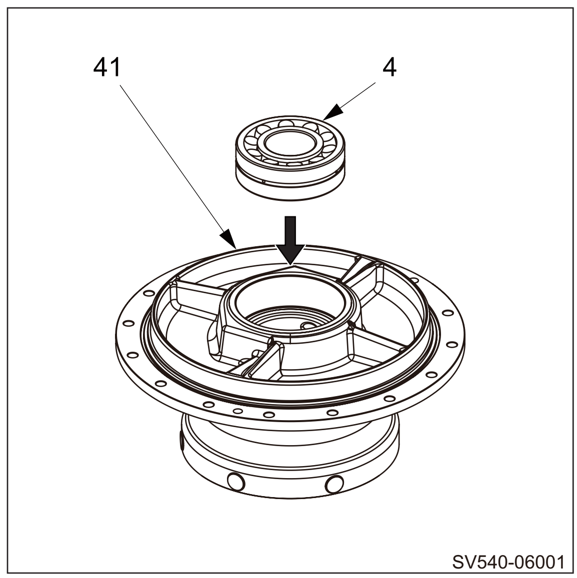
- **When standing the drum, use wooden blocks of sufficient strength to securely support the drum.**
- **Carry out the work in an unstrained posture using a work stool or the like.**



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

kg (1) Drum

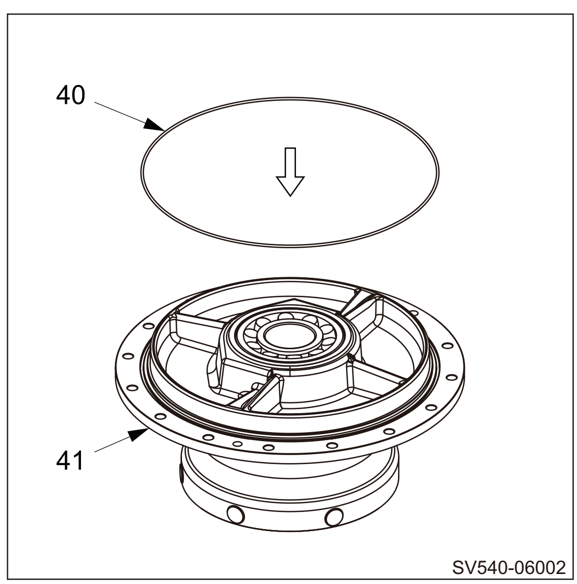
SV544D	: 3,065 kg (6,757 lbs.)
SV544T	: 3,385 kg (7,463 lbs.)
SV544TF	: 5,790 kg (12,765 lbs.)
SV544DF	: 4,745 kg (10,461 lbs.)
SV544TB	: 3,385 kg (7,463 lbs.)
SV544FB	: 5,790 kg (12,765 lbs.)



2) Apply a coat of gear oil to vibrator bearing (4) mounting surface of axle shaft (41).
   - Drive vibrator bearing into axle shaft.

(NOTICE)

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

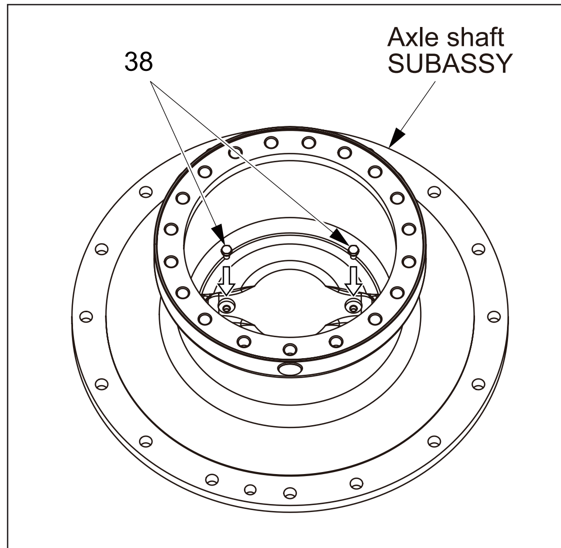


3) Apply grease to O-ring (40).
   - Install O-ring to axle shaft (41).

4) Reverse axle shaft SUBASSY.

Kg Axle shaft SUBASSY : 230 kg (507 lbs.)

- Install bolts (38) and seal washers to axle shaft SUBASSY.



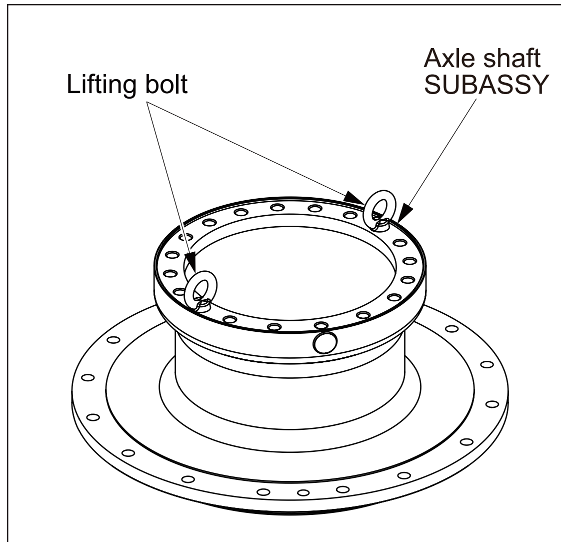
SV544-06033

⚠WARNING

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

5) Install lifting bolts (M20) to axle shaft SUBASSY.
- Lift axle shaft SUBASSY.

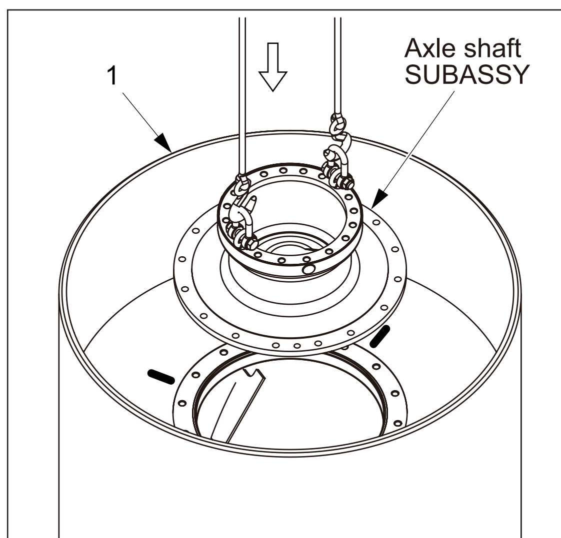
Kg Axle shaft SUBASSY : 230 kg (507 lbs.)



SV544-06034

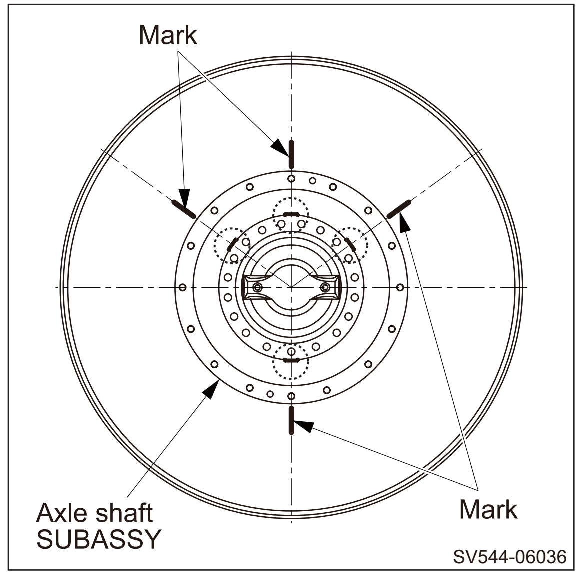
6) Lower axle shaft SUBASSY on mounting surface of drum (1).

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



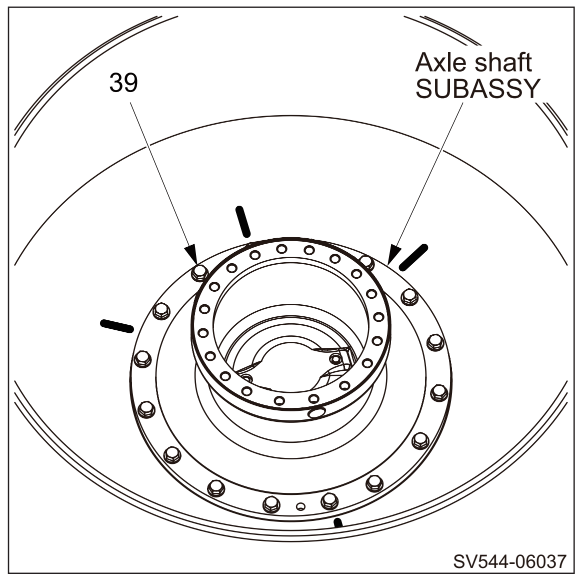
SV544-06035

7) Position axle shaft SUBASSY as shown right.



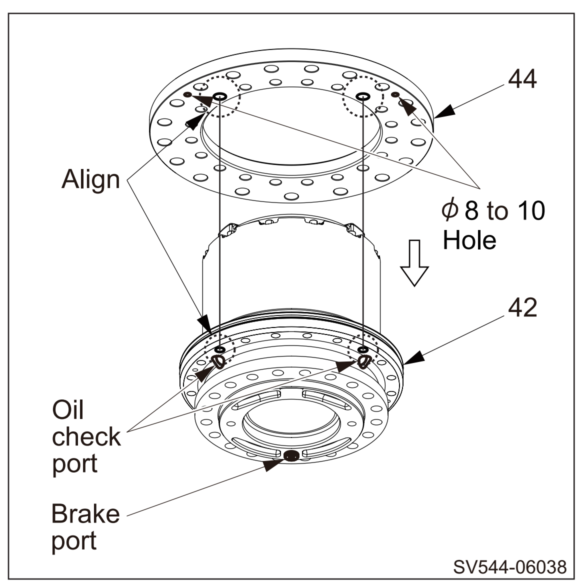
8) Secure axle shaft SUBASSY with sixteen bolts (39) and washers.

N•m (39) Bolts M20×60 : 539 N·m (398 lbf·ft)



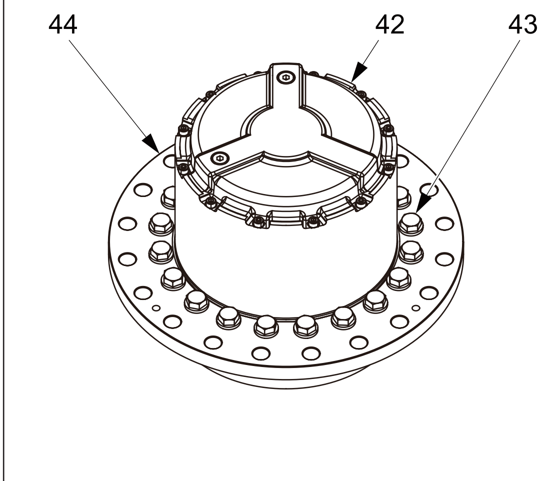
9) Reassembly of gear box SUBASSY.
- Install ring (44) to mounting surface of gear box (42).

(NOTICE)
- **Align ϕ 8 to 10 hole to oil check port.**



10) Secure ring (44) to gear box (42) with twenty bolts (43) and washers.

N•m (43) Bolts M16×70 P=1.5 : 284 N·m (209 lbf·ft)

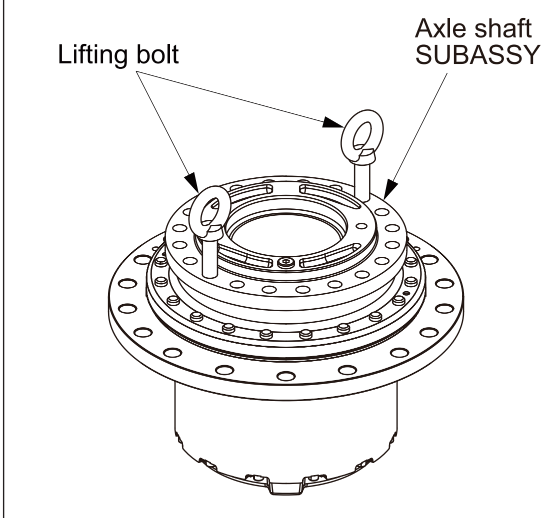


SV540-06009

11) Reverse gear box SUBASSY.

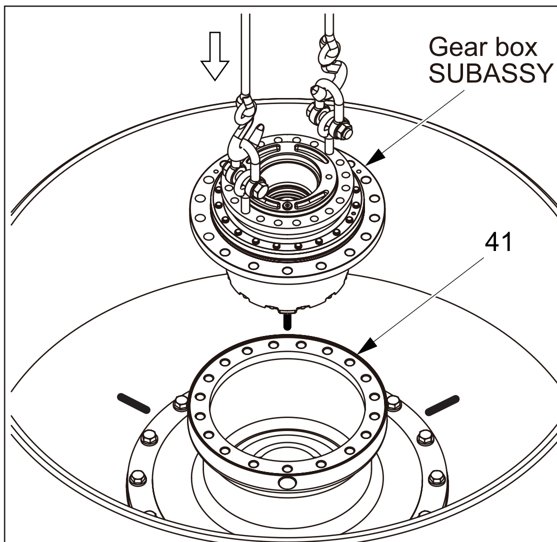
kg Gear box SUBASSY : 160 kg (353 lbs.)

- Install lifting bolts (M20) to gear box (42).



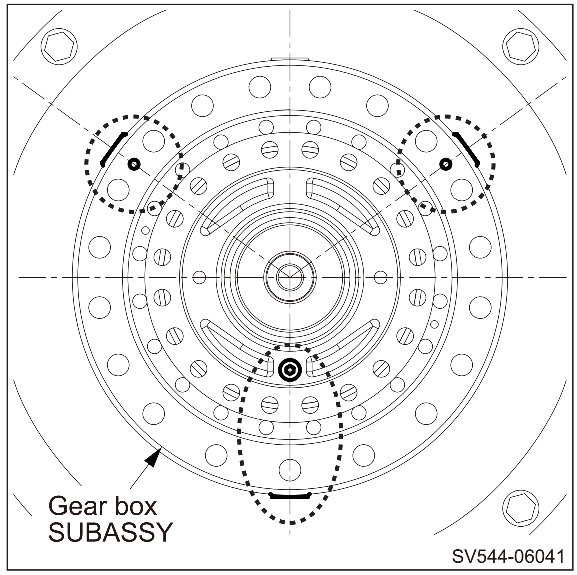
SV544-06039

12) Lower gear box SUBASSY on mounting surface of axle shaft (41).



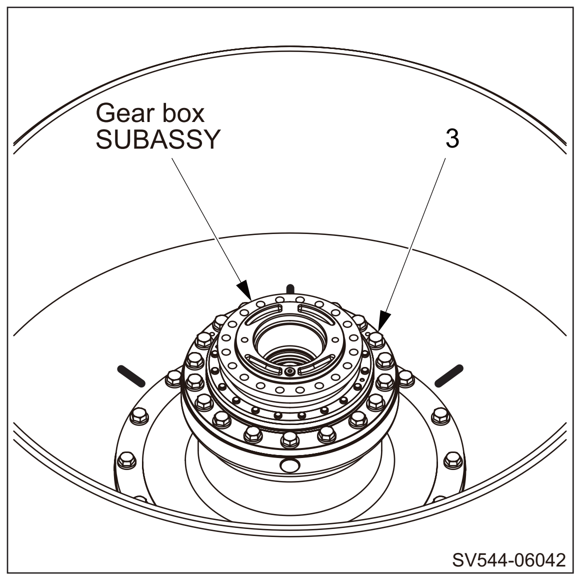
SV544-06040

13) Gear box SUBASSY must be arranged as shown on the right.



14) Secure gear box SUBASSY with nineteen bolts (3) and washers.

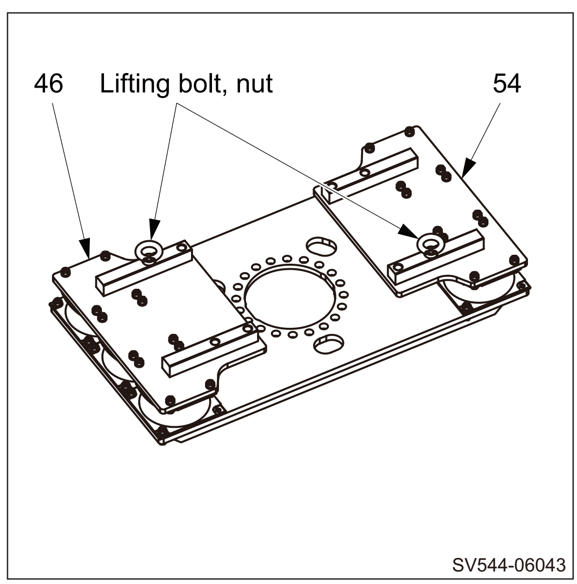
N•m (3) Bolts M20×70 : 539 N·m (398 lbf·ft)



⚠WARNING

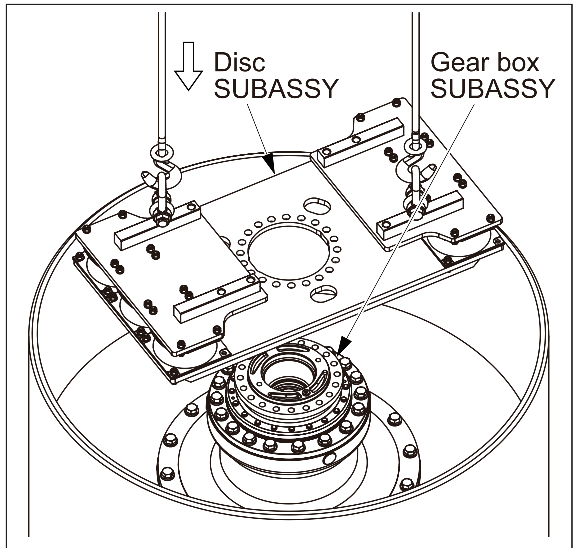
When installing lifting bolts, secure them with nuts.

15) Install lifting bolts and nuts (M20) to holders (46) and (54).



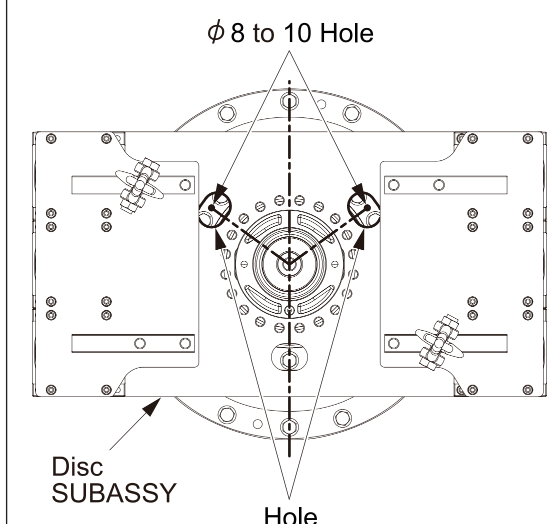
16) Lower disc SUBASSY on mounting surface of gear box SUBASSY.

Disc SUBASSY : 220 kg (485 lbs.)



SV544-06044

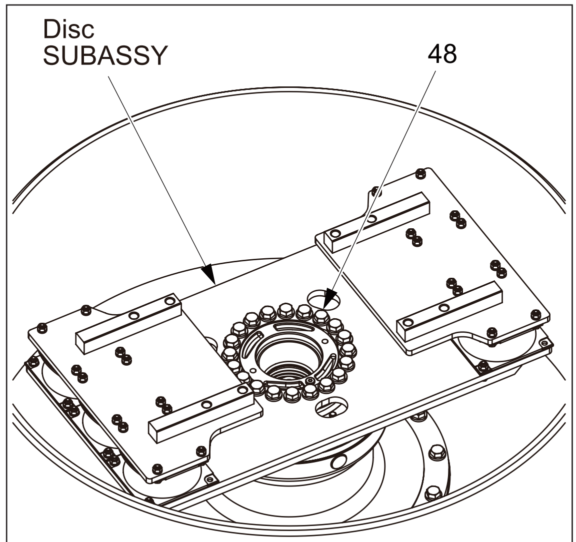
17) Disc SUBASSY must be arranged as shown on the right.



SV544-06045

18) Secure disc SUBASSY with twenty bolts (48) and washers.

(48) Bolts M20×50 P=1.5 : 588 N·m (434 lbf·ft)



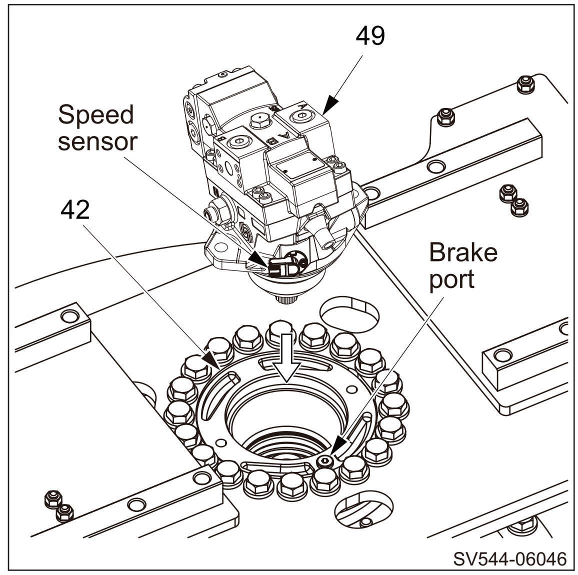
SV544-06068

19) Install propulsion motor (49) to gear box (42).

(49) Propulsion motor : 30 kg (66 lbs.)

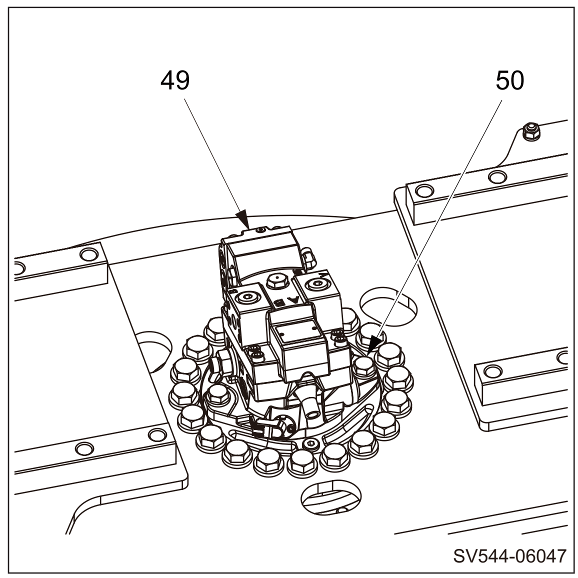
(NOTICE)

- **When installing, face the speed sensor on the propulsion motor in the same direction as the brake port.**



20) Secure propulsion motor (49) with two bolts (50) and washers.

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



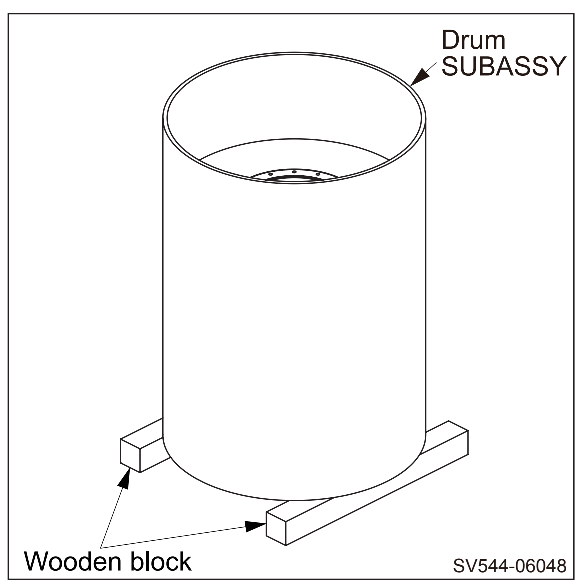
WARNING

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

21) Reverse drum SUBASSY.

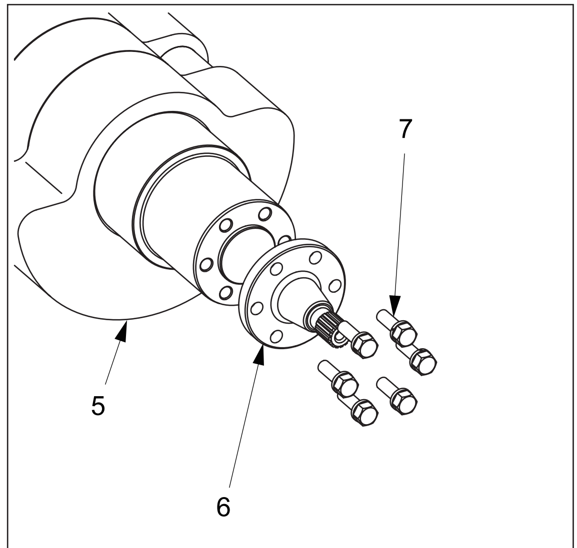
Drum SUBASSY

SV544D	: 3,720 kg (8,201 lbs.)
SV544T	: 4,045 kg (8,918 lbs.)
SV544TF	: 6,450 kg (14,220 lbs.)
SV544DF	: 5,405 kg (11,916 lbs.)
SV544TB	: 4,045 kg (8,918 lbs.)
SV544FB	: 6,450 kg (14,220 lbs.)



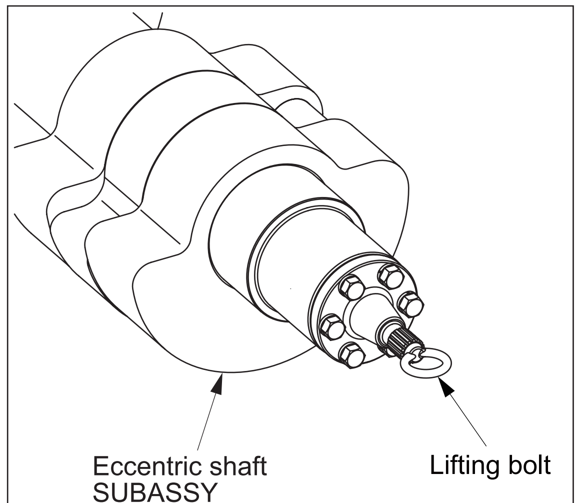
22) Secure shaft (6) to eccentric shaft (5) with six bolts (7) and spring washers.

N•m (7) Bolts M12×40 : 108 N·m (80 lbf·ft)



SV505- I -06032

23) Install a lifting bolt (M10) to eccentric shaft SUBASSY.



SV544-06049

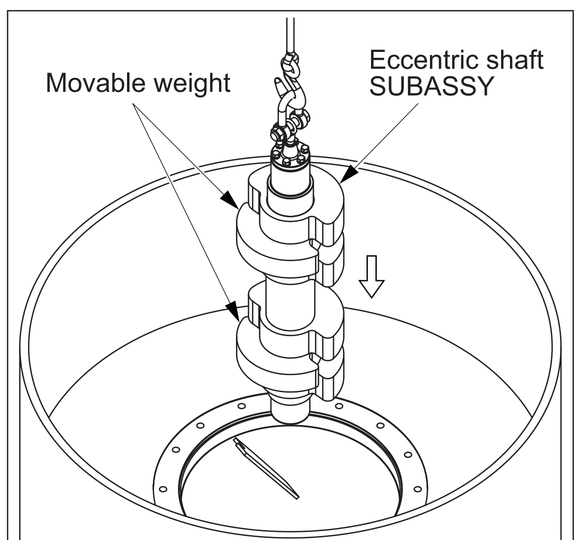
⚠WARNING

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

24) Apply a coat of gear oil to bearing mounting surface of eccentric shaft SUBASSY.
- Install eccentric shaft SUBASSY to drum SUBASSY.

kg Eccentric shaft SUBASSY : 280 kg (617 lbs.)

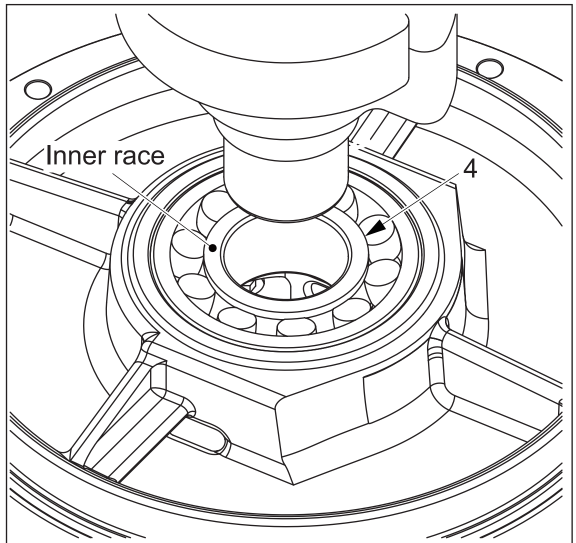
(NOTICE)
- **Put the movable weight at its outmost position.**



SV544-06050

(NOTICE)

- **Insert eccentric shaft SUBASSY into vibrator bearing (4) while taking care not to tilt the bearing inner race.**



SV544-06051

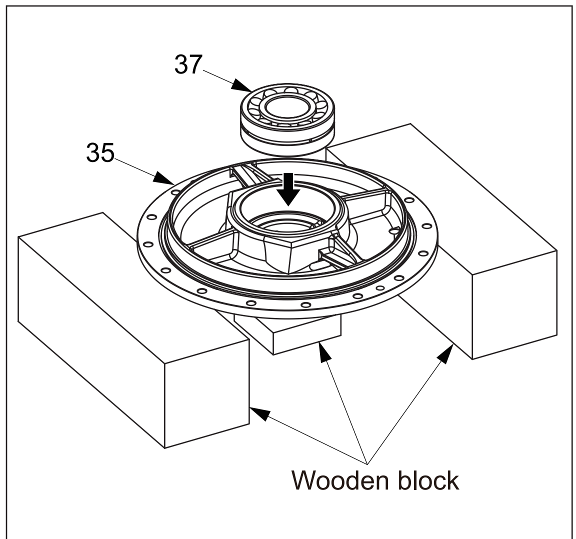
25) Reassembly of axle shaft SUBASSY

25-1) Apply a coat of gear oil to vibrator bearing (37) mounting surface of axle shaft (35).

- Drive vibrator bearing into axle shaft.

(NOTICE)

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

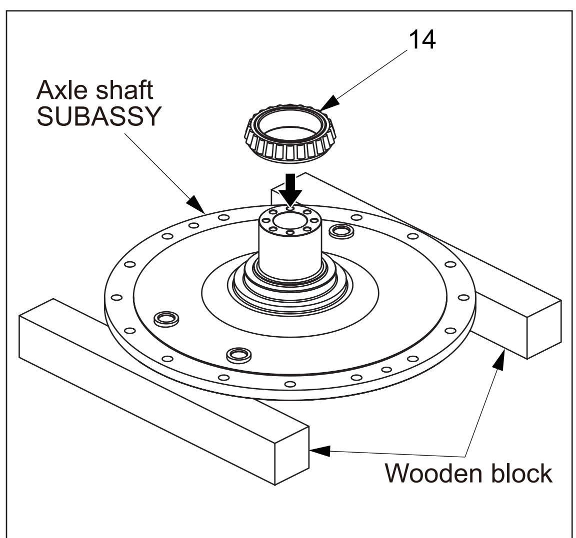


SV544-06052

25-2) Reverse axle shaft SUBASSY.

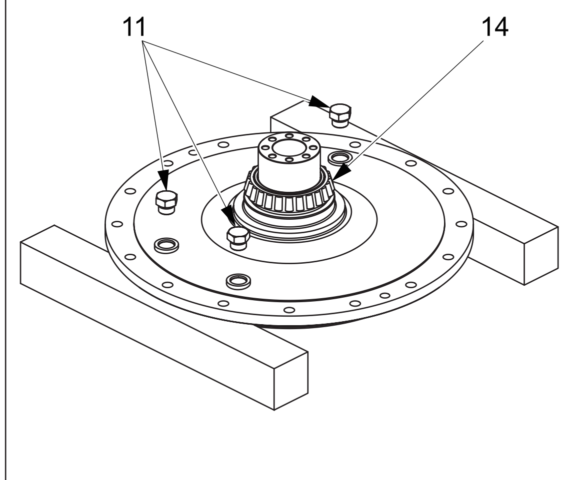
kg Axle shaft SUBASSY : 180 kg (397 lbs.)

- Apply a coat of gear oil to roller bearing (14) inner race mounting surface of axle shaft (35).
- Drive roller bearing inner race into axle shaft.



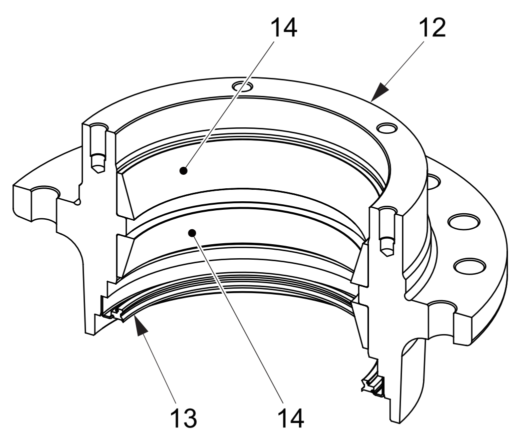
SV544-06053

25-3) Apply grease to O-rings for plugs (11).
- Install plugs.
- Apply sufficient amount of lithium-based grease to rollers of roller bearing (14) inner race.



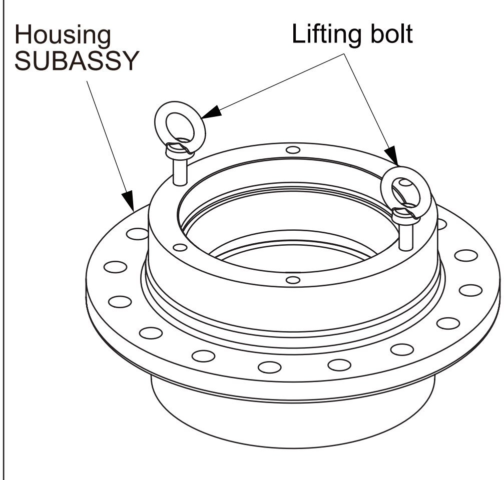
SV510-Ⅲ-06060

25-4) Apply a coat of gear oil to roller bearings (14) outer race mounting surface of housing (12).
- Drive roller bearing outer races into housing.
- Apply liquid packing to periphery of oil seal (13).
- Drive oil seal into housing.
- Apply grease to lip of oil seal.



SV510-Ⅲ-06061

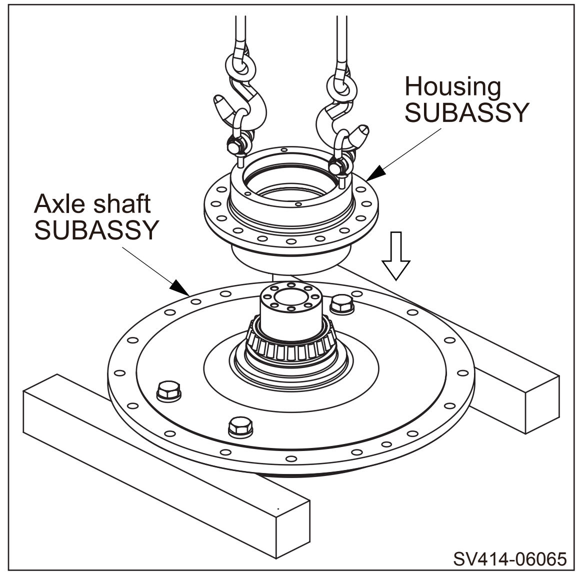
25-5) Install lifting bolts (M12) to housing SUBASSY.



SV414-06064

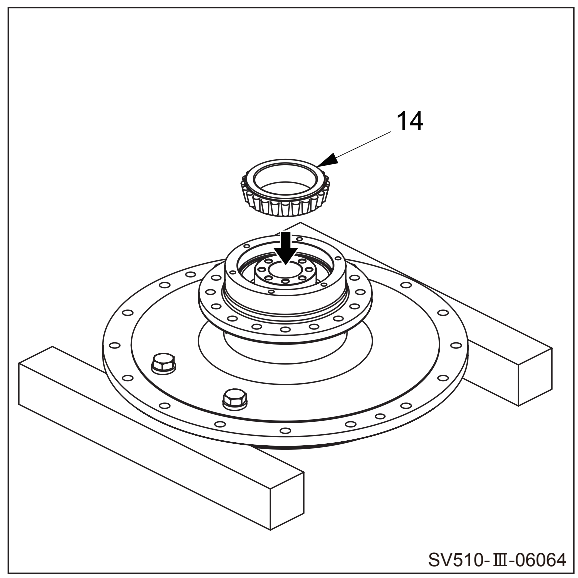
25-6) Install housing SUBASSY to axle shaft SUBASSY.

Housing SUBASSY : 40 kg (88 lbs.)



25-7) Apply a coat of gear oil to roller bearing (14) outer race mounting surface of axle shaft.

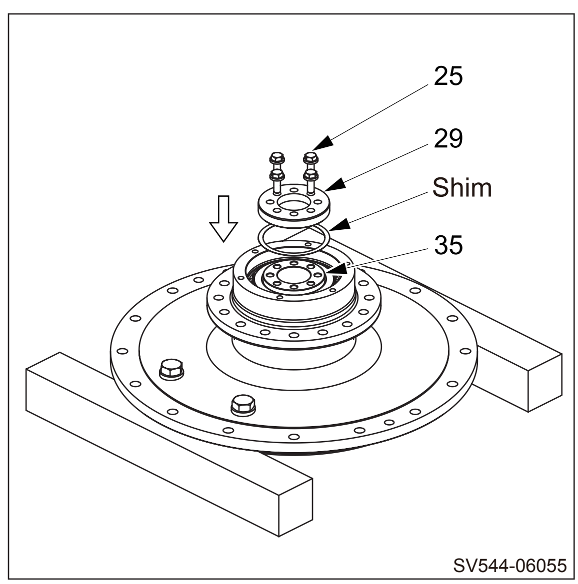
- Apply sufficient amount of lithium-based grease to rollers of roller bearing inner race.
- Drive in roller bearing inner race until rollers come in contact with outer race.



25-8) Preload adjustment of roller bearing

① Install a shim of about 1 mm (0.04 in.).

- Secure cover (29) to axle shaft (35) with four bolts (25) and washers.

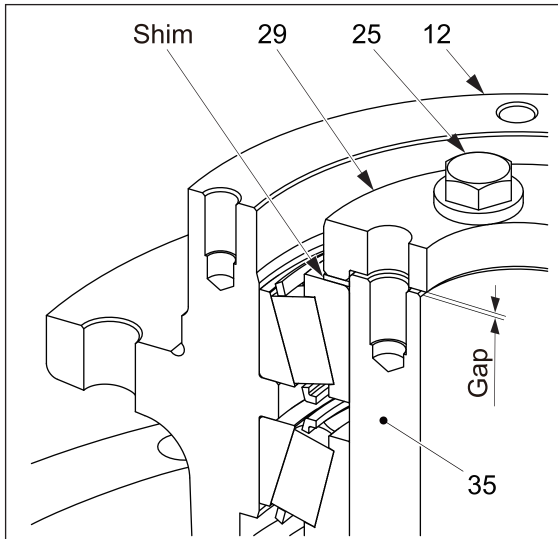


② A gap will remain between end of axle shaft (35) and inside of cover (29).

- Tighten four bolts (25) to a torque of 108 N·m (80 lbf·ft).
- Give housing (12) two to three turns.
- Tighten bolts to a torque of 108 N·m (80 lbf·ft) again.
- Repeat this work several times until tightening torque of bolts no longer fluctuates.

(NOTICE)

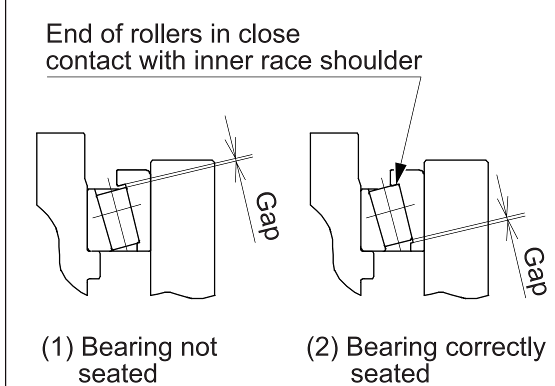
- **Tighten the bolts alternately in diagonal directions.**



SV544-06056

(NOTICE)

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



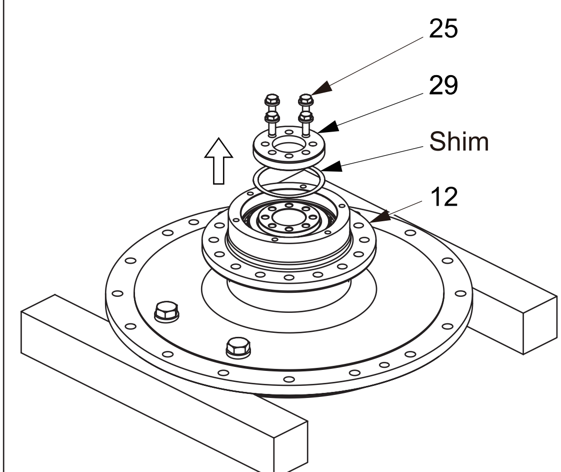
PLA-06001

③ Remove bolts (25).

- Remove cover (29).
- Remove shim.

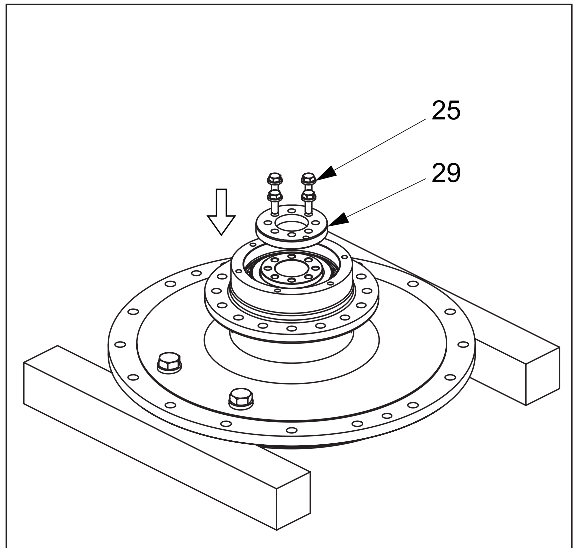
(NOTICE)

- **Do not turn the housing (12) after the cover is removed.**



SV544-06057

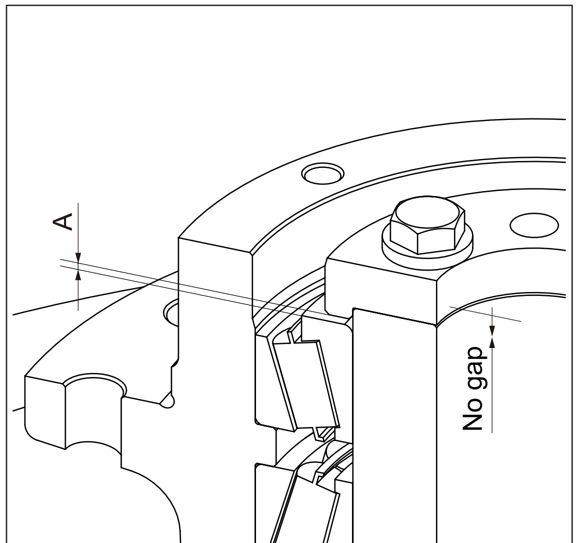
④ Without inserting shim, install cover (29) with four bolts (25) and washers.



SV514-06016

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

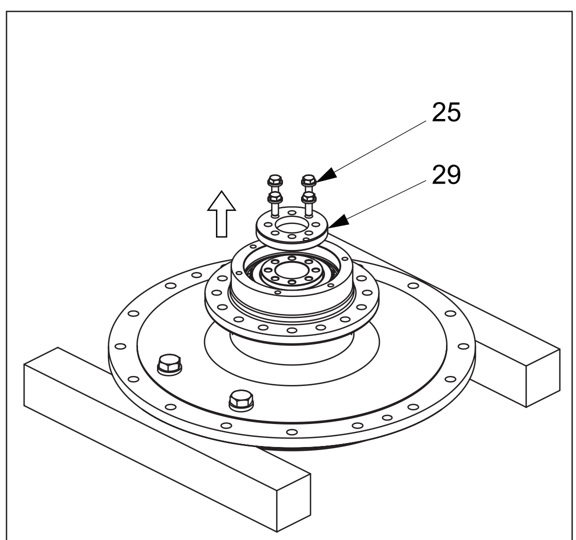
★ **Preload adjusting shim thickness** **= A + 0.1 mm (0.004 in.)**



SV414-06071

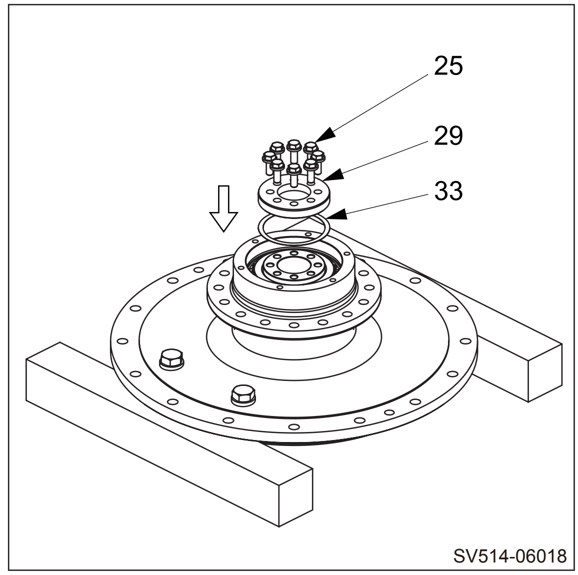
⑥ Remove bolts (25).

- Remove cover (29).



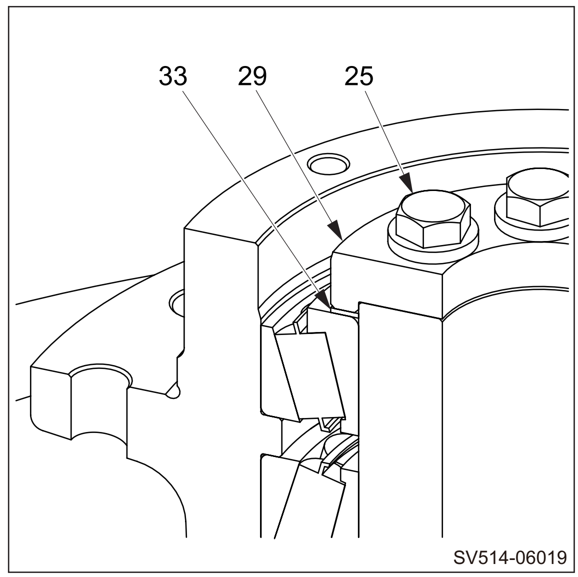
SV514-06017

⑦ Install shim (33) of preload adjusting shim thickness = “A + 0.1 mm (0.004 in.)” and cover (29) with eight bolts (25) and washers.

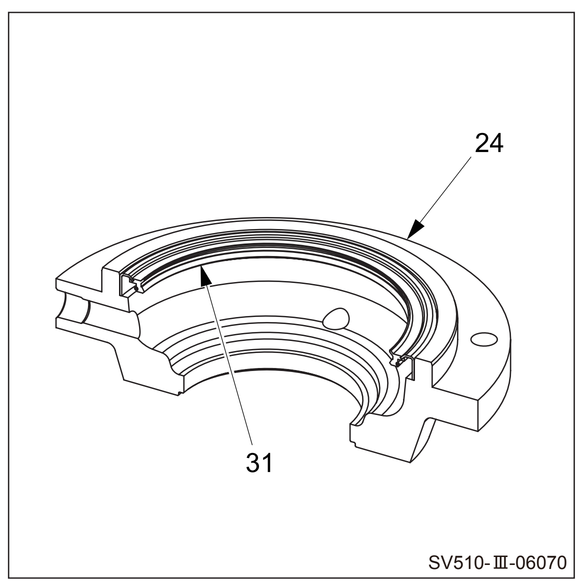


⑧ Tighten bolts with tightening torque.

N•m (25) Bolts M14×40 : 167 N·m (123 lbf·ft)

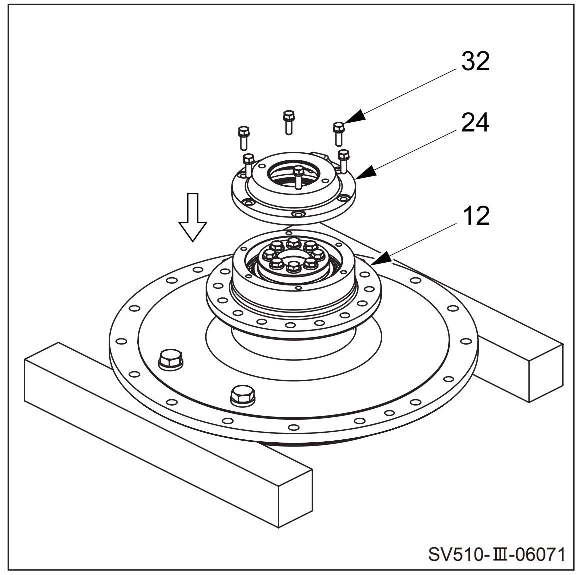


25-9) Apply liquid packing to periphery of oil seal (31).
- Drive oil seal into cover (24).
- Apply grease to lip of oil seal.



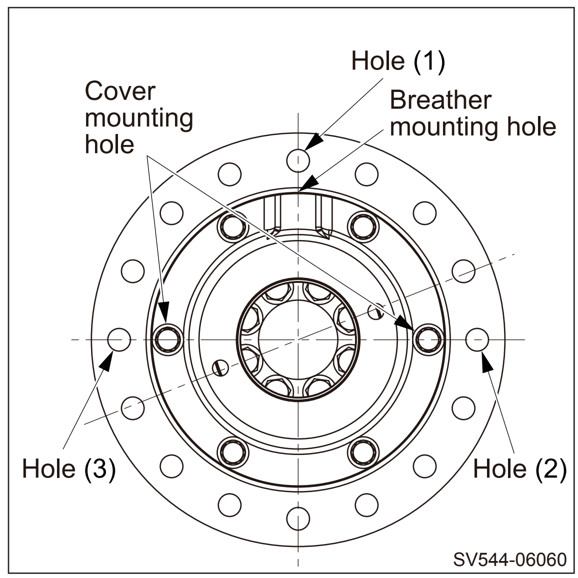
25-10) Secure cover (24) to housing (12) with six bolts (32) and spring washers.

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

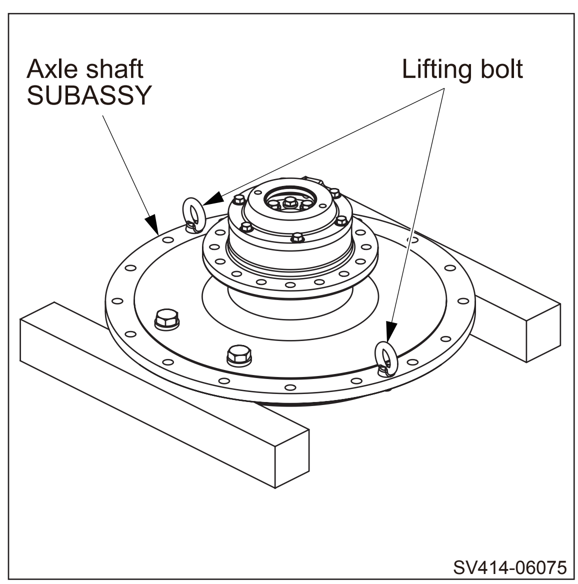


(NOTICE)

- **The hole (1) in housing and breather mounting hole in cover, holes (2), (3) in housing and two cover mounting holes must be arranged as shown on the right.**



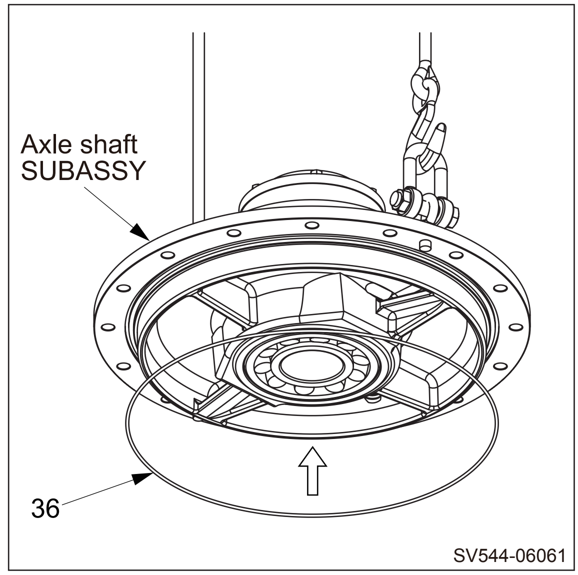
26) Install lifting bolts (M20) to axle shaft SUBASSY.



27) Lift axle shaft SUBASSY.

Axle shaft SUBASSY : 240 kg (529 lbs.)

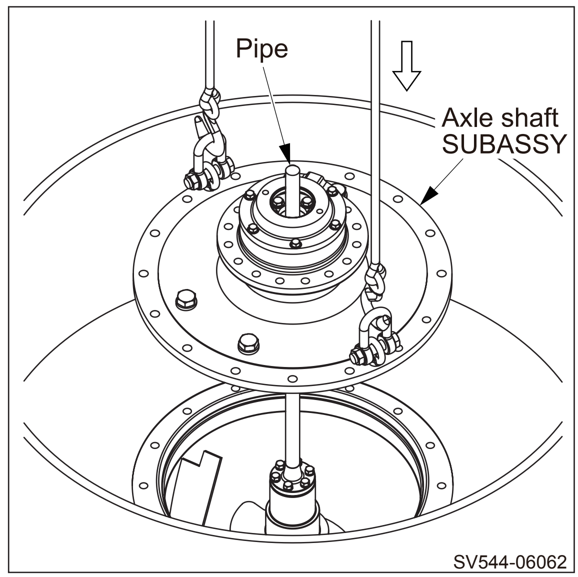
- Apply grease to O-ring (36).
- Install O-ring to axle shaft (35).



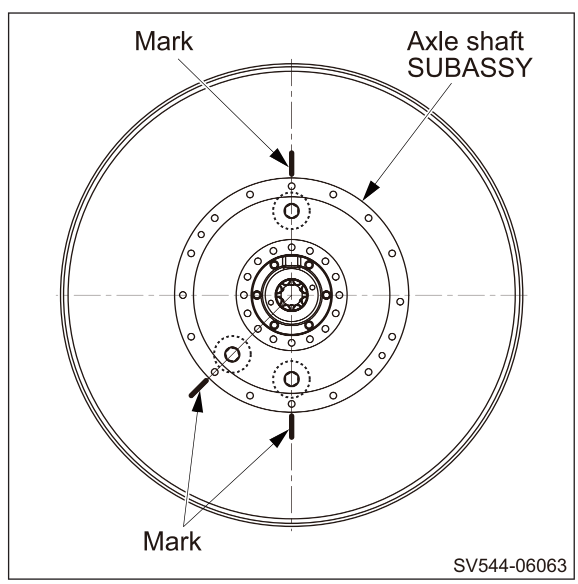
28) Lower axle shaft SUBASSY on mounting surface of drum (1).

(NOTICE)

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

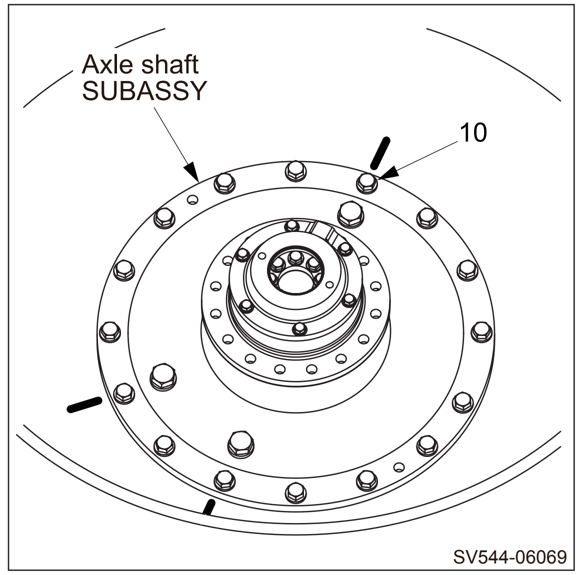


29) Axle shaft SUBASSY must be arranged as shown on the right.

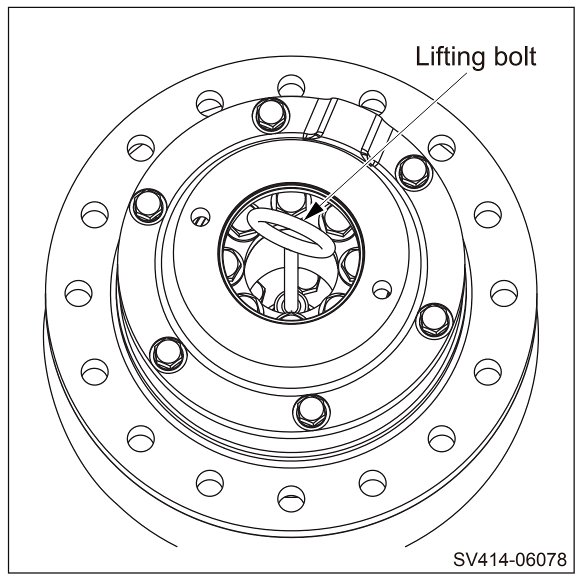


30) Secure axle shaft SUBASSY with sixteen bolts (10) and washers.

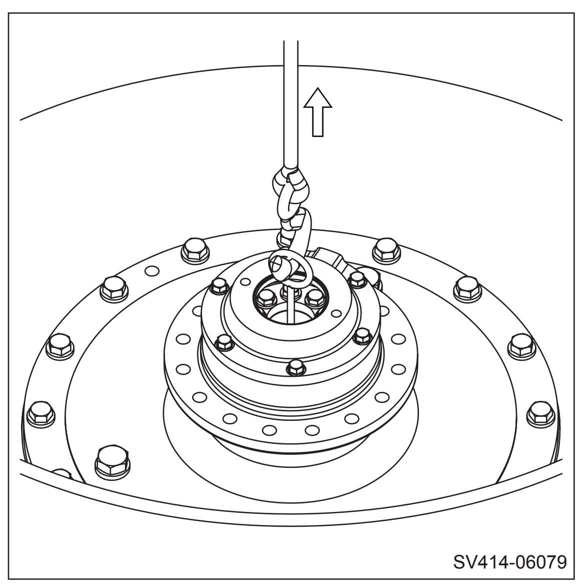
N•m (10) Bolts M20×60 : 539 N·m (398 lbf·ft)



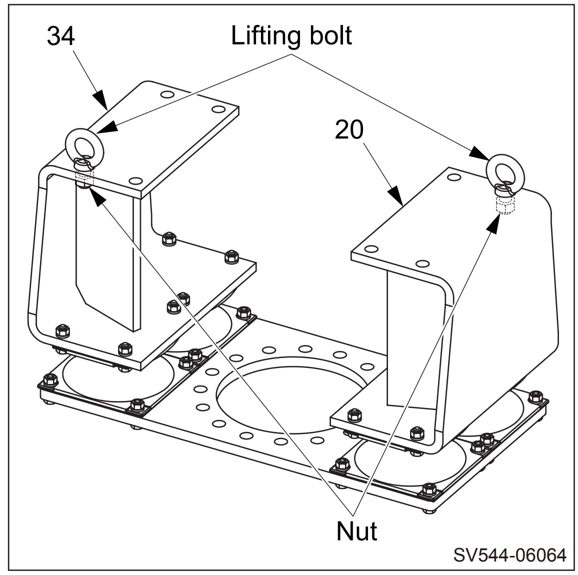
31) Install a lifting bolt (M10) on shaft end of eccentric shaft SUBASSY.



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

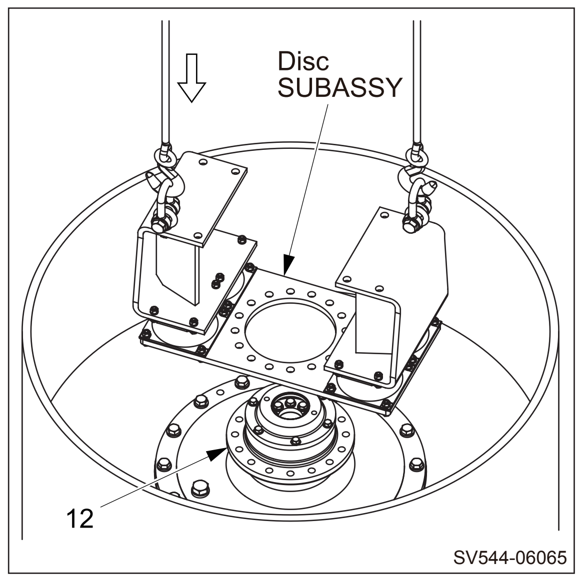


33) Install lifting bolts and nuts (M20) to holders (20) and (34).



34) Lower disc SUBASSY on mounting surface of housing (12).

Disc SUBASSY : 155 kg (342 lbs.)

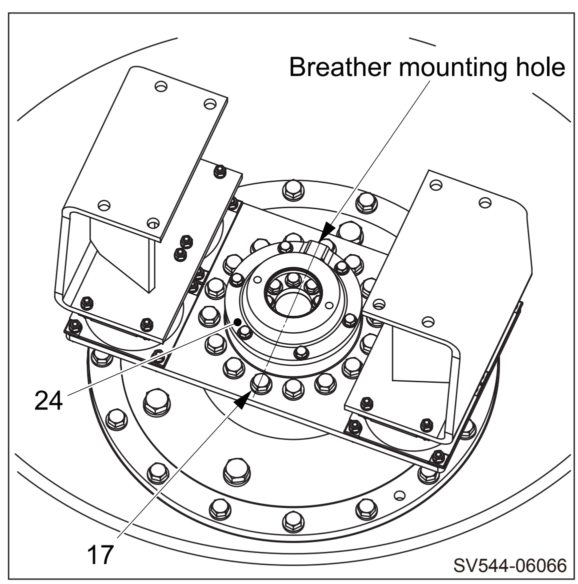


35) Secure disc SUBASSY with sixteen bolts (17) and washers.

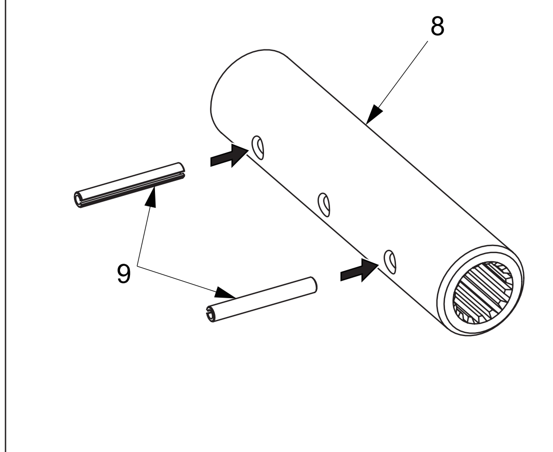
N•m (17) Bolts M20×60 : 539 N·m (398 lbf·ft)

(NOTICE)

- **When installing the disc SUBASSY, the breather mounting hole in cover (24) must be perpendicular to the longer edge of the disc.**

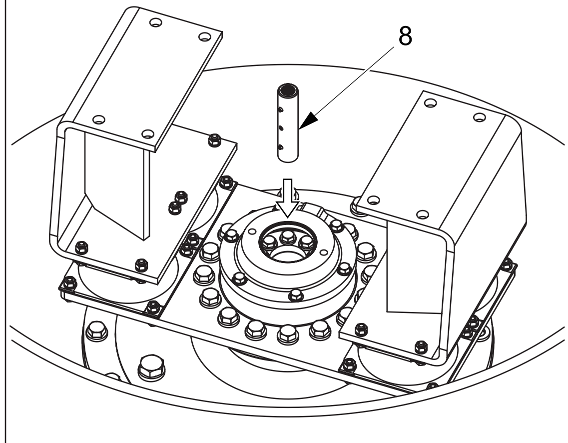


36) Drive two spring pins (9) into sleeve (8).



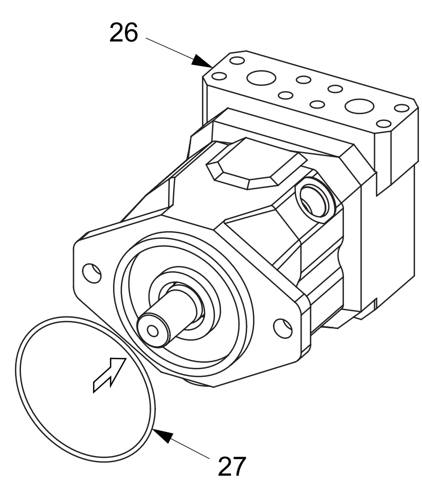
SV510-Ⅲ-06086

37) Apply lithium-based grease to splined portion of sleeve (8).
- Fit sleeve to splined portion on eccentric shaft SUBASSY end.



SV510-Ⅲ-06087

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



SV510-Ⅲ-06088

39) Secure vibrator motor (26) to cover (24) with two bolts (28) and washers.

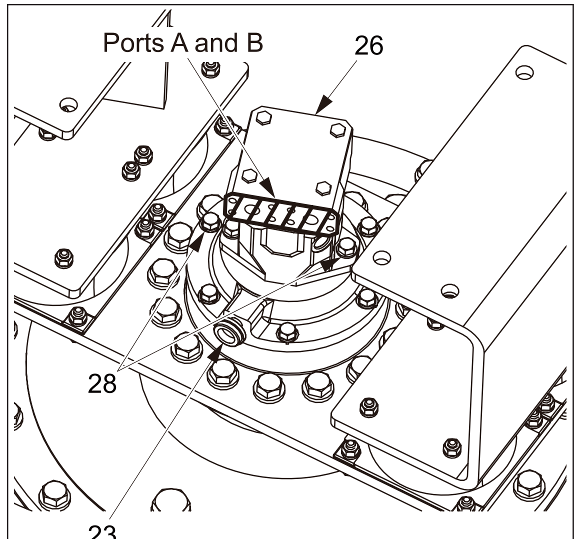
(26) Vibrator motor : 20 kg (44 lbs.)

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

- Wind seal tape around to threaded portion of breather (23).
- Install breather to cover.

(NOTICE)

- **The vibrator motor which have ports A and B must face the same direction as the side of the breather (26).**
- **Take care not to let O-ring to protrude from its groove.**

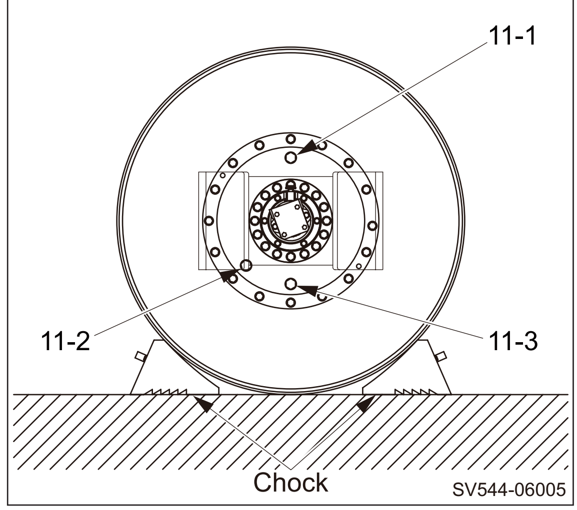


SV544-06004

40) Lay vibratory drum ASSY with plugs (11-1), (11-2), and (11-3) positioned as shown on the right.
- Hold with chocks.

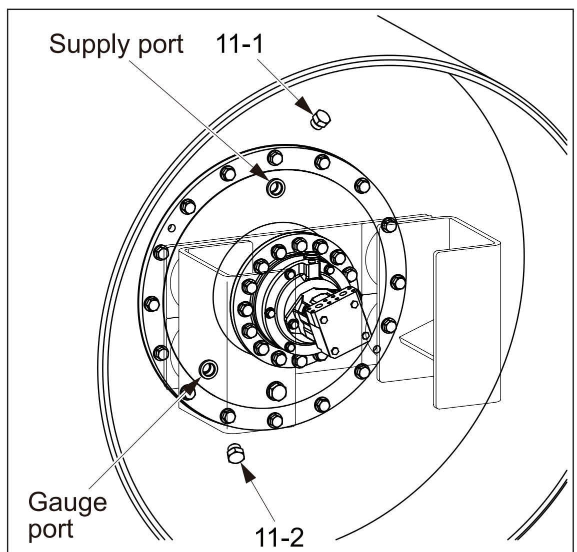
Vibratory drum ASSY

SV544D	: 4,425 kg (9,755 lbs.)
SV544T	: 4,750 kg (10,472 lbs.)
SV544TF	: 7,155 kg (15,774 lbs.)
SV544DF	: 6,110 kg (13,470 lbs.)
SV544TB	: 4,750 kg (10,472 lbs.)
SV544FB	: 7,155 kg (15,774 lbs.)



SV544-06005

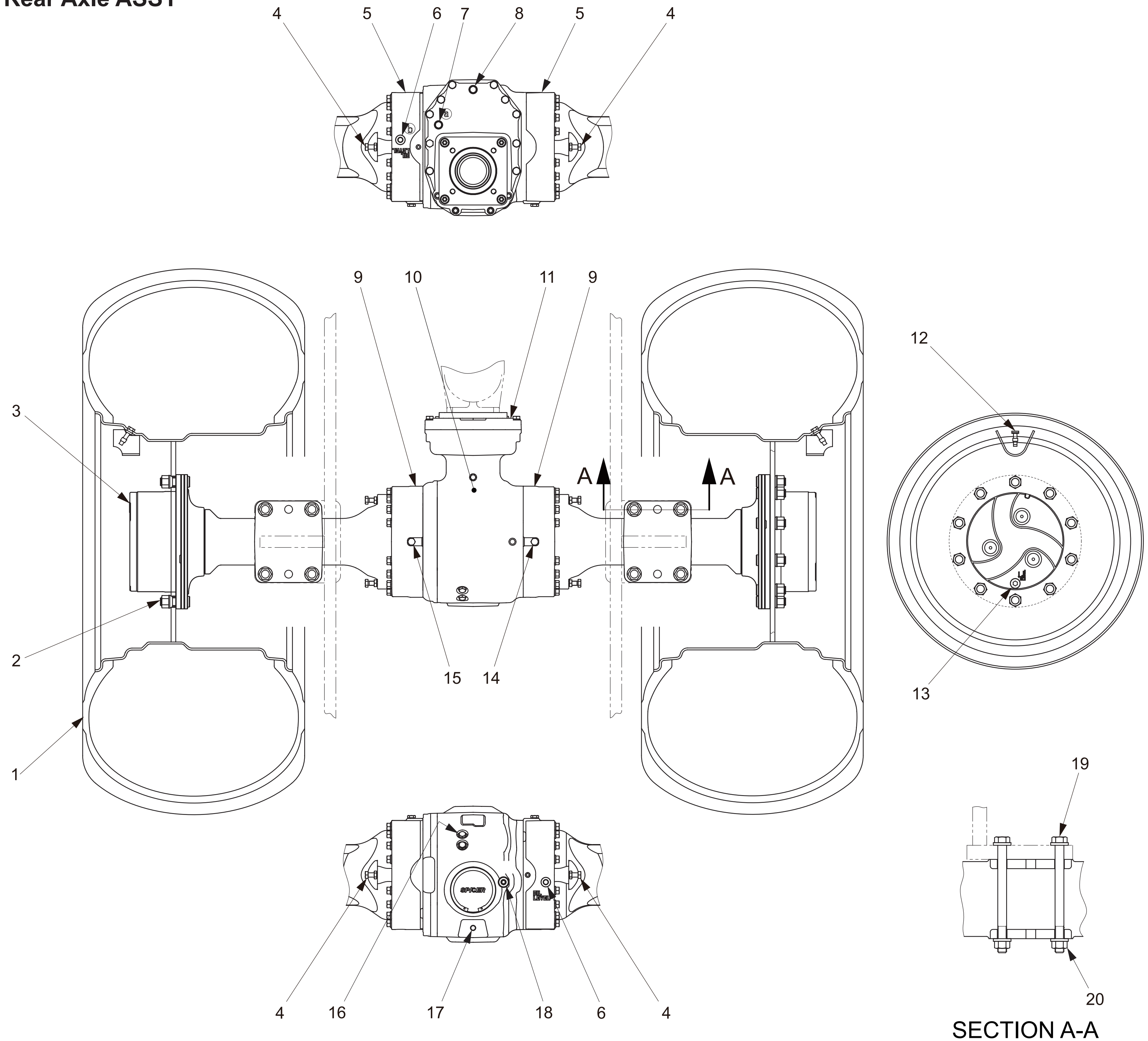
41) Remove plugs (11-1) and (11-3).
- Supply gear oil from oil supply port.
- Check that oil drips from gauge port.
  - Quantity of gear oil : 34 L (9.0 gal.)
- Reinstall plugs (11-1) and (11-3).



SV544-06006

4. REAR AXLE

4-1. Rear Axle ASSY



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

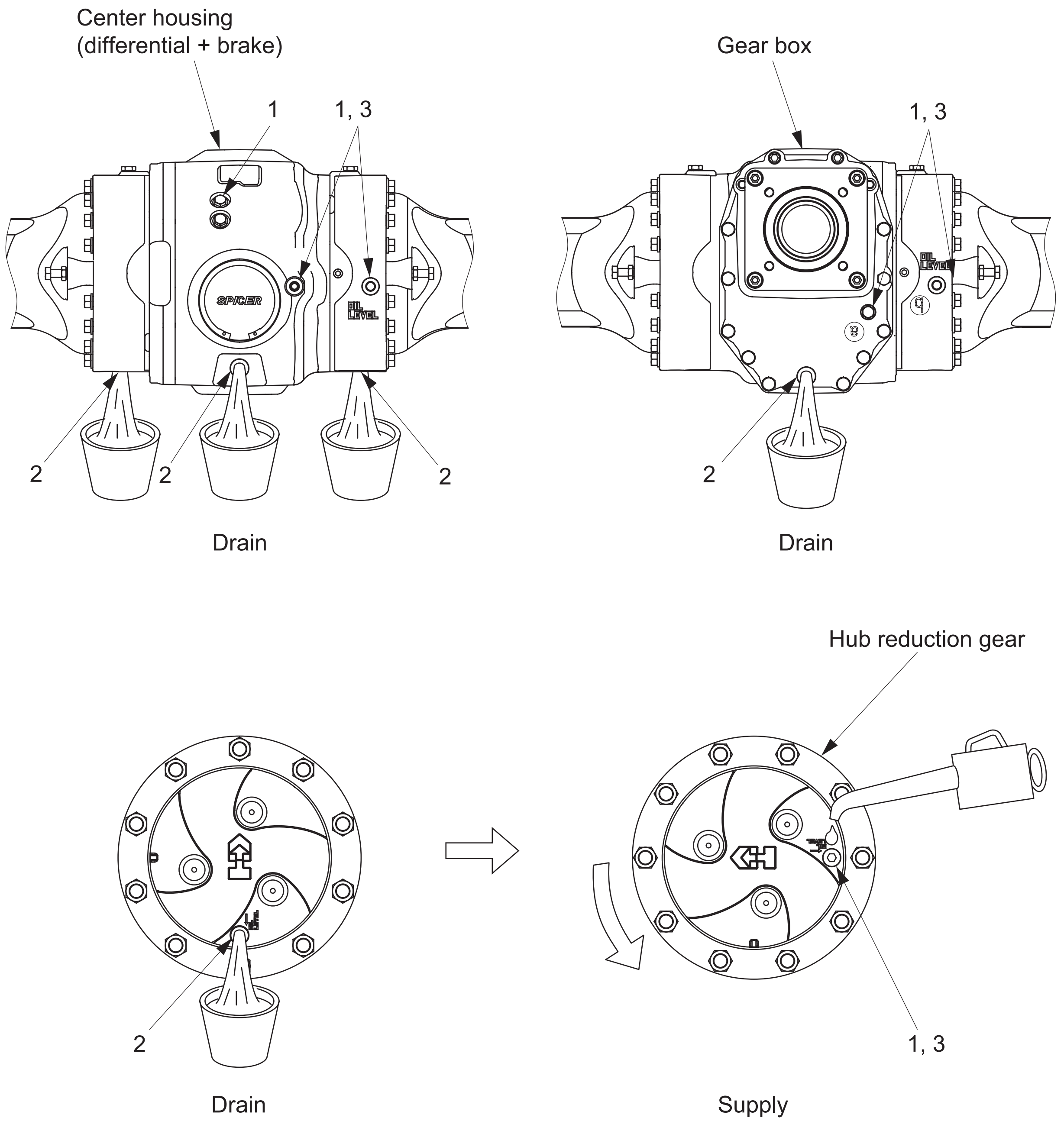
N•m
(2) Nut M22 P=1.5 : 785 N·m (579 lbf·ft)
(20) Nut M20 : 540 N·m (398 lbf·ft)

Specifications

Tire size	D type	:	23.1 - 26 - 8PR
	Except D type	:	23.1 - 26 - 10PR
Tire inflation pressure		:	137 kPa (20.0 psi)
Tire ASSY weight	D type	:	215 kg (474 lbs.)
	Except D type	:	245 kg (540 lbs.)
Rear axle ASSY weight	D type	:	940 kg (2,072 lbs.)
	Except D type	:	1,010 kg (2,227 lbs.)

0411-27802-0-10066-C

4-2. Rear Axle Lubrication



SV544-06067

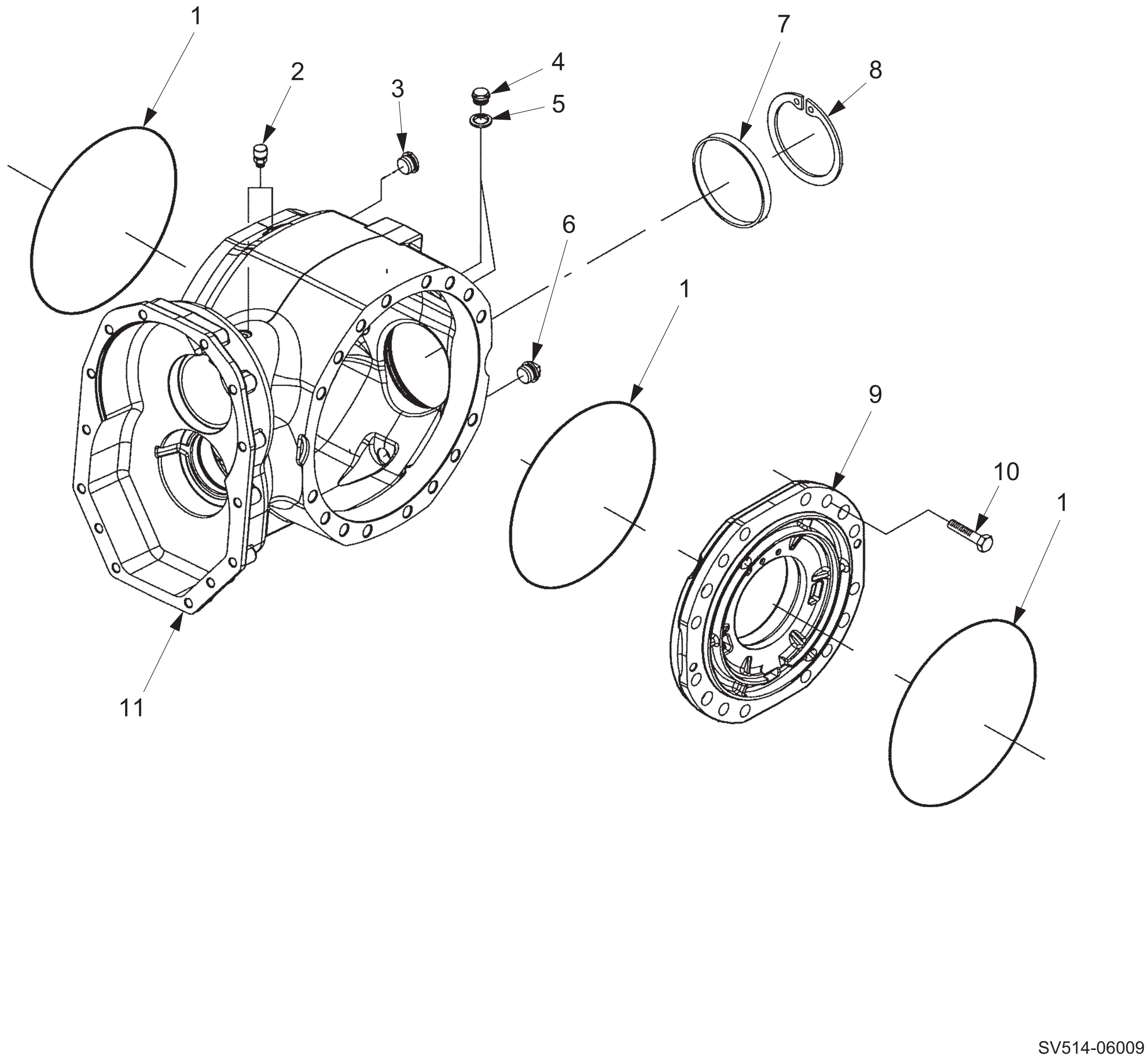
(1) Filler port
(2) Drain port
(3) Level gauge

- Change oil : Gear oil API-grade GL5 SAE90 (See recommended lubrication.)
- Change oil quantity

Gear box	:	1.2 L	(0.3 gal.)
Center housing	:	11.0 L	(2.90 gal.)
Hub reduction gear	:	2.0 L×2	(0.53 gal.×2)

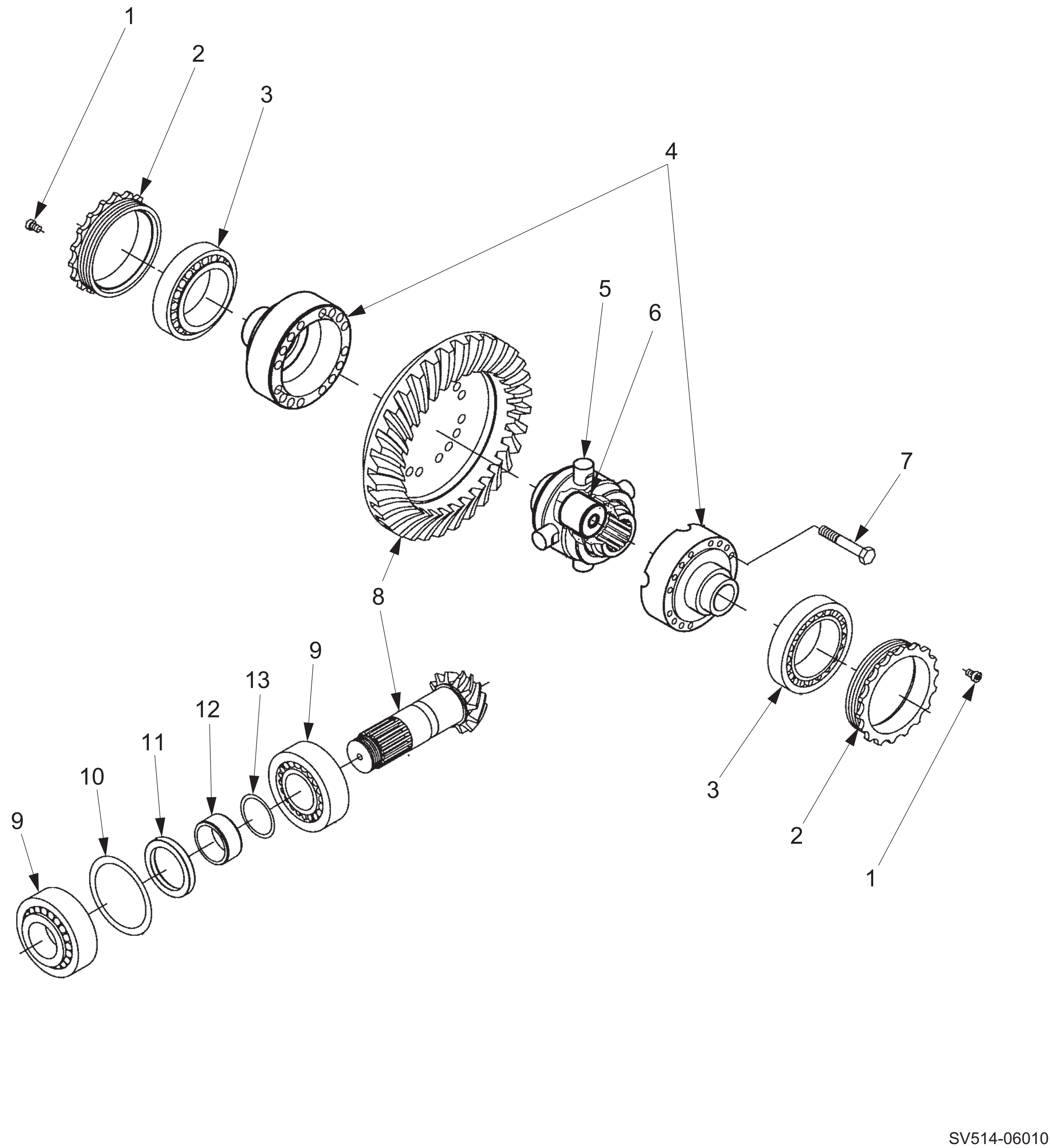
4-3. Rear Axle Structure

4-3-1. Center housing



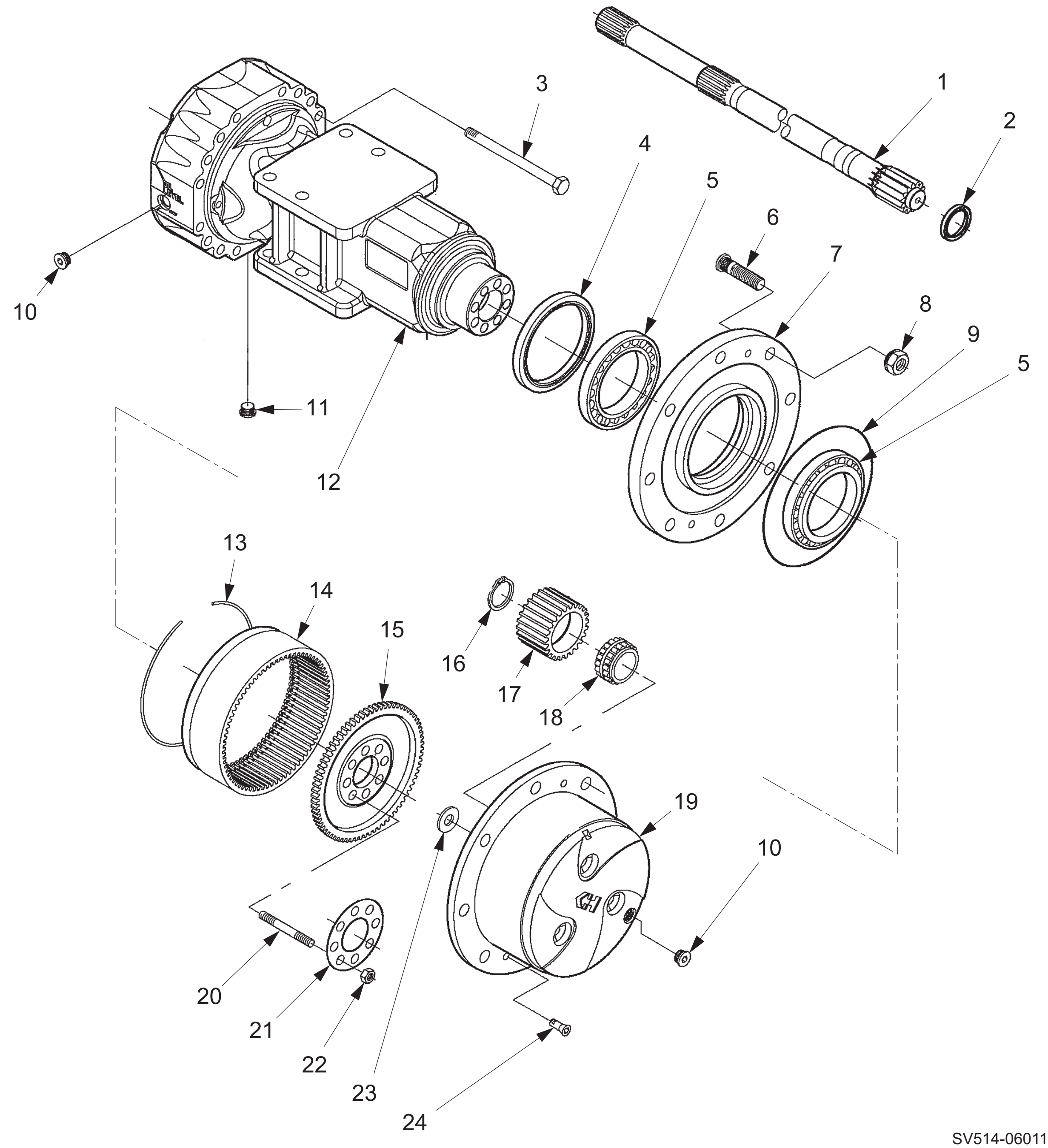
(1) O-ring	(5) Seal washer	(9) Cover
(2) Plug	(6) Magnet plug	(10) Bolt
(3) Plug	(7) Plug	(11) Housing
(4) Bolt	(8) Snap ring	

4-3-2. Differential



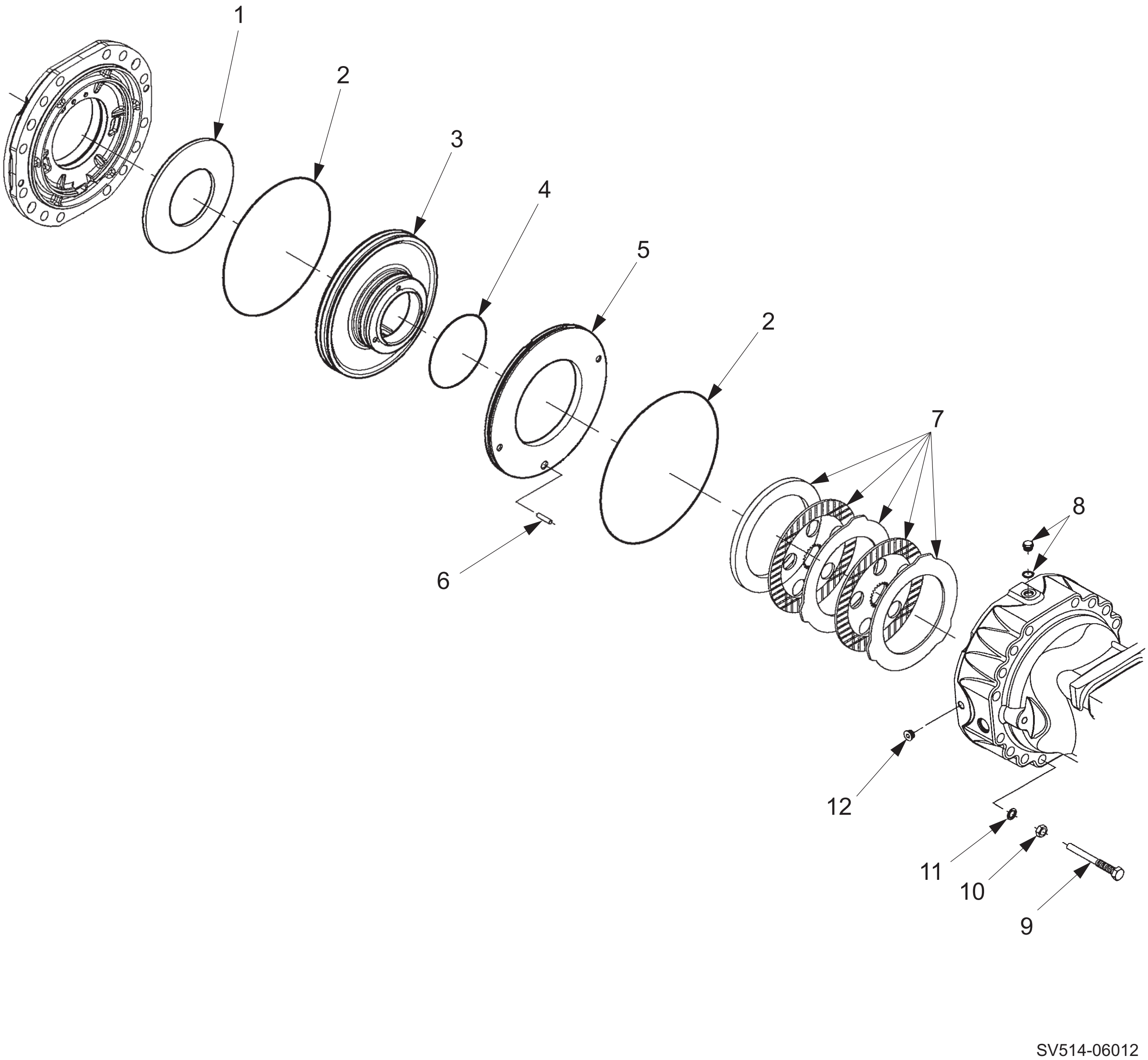
(1) Bolt	(6) Spacer	(10) Shim
(2) Ring nut	(7) Bolt	(11) Seal
(3) Taper roller bearing	(8) Bevel gear set	(12) Spacer
(4) Differential carrier	(9) Taper roller bearing	(13) Shim
(5) No spin differential		

4-3-3. Hub reduction gear



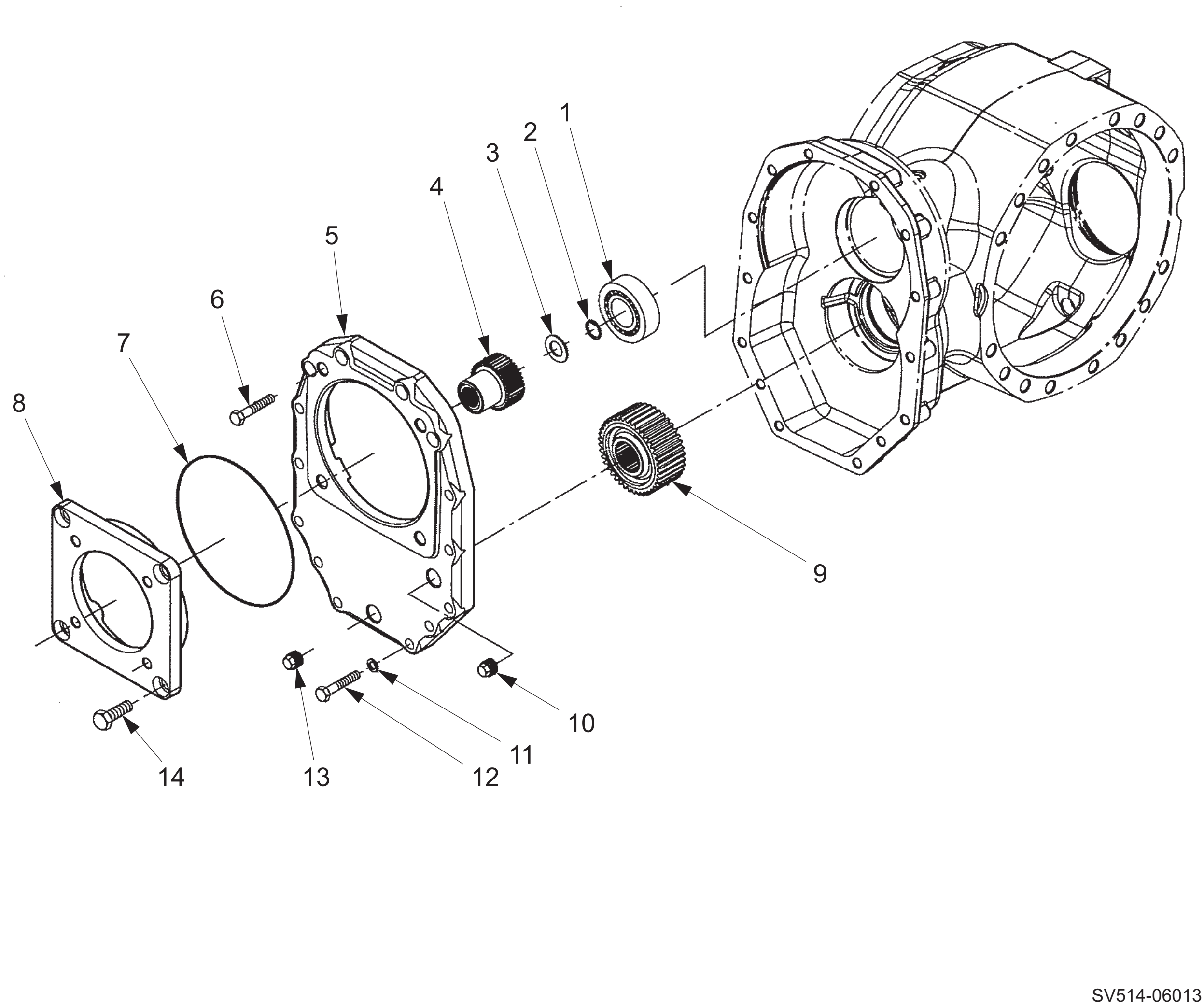
(1) Half shaft	(9) O-ring	(17) Planet gear
(2) Seal	(10) Plug	(18) Bearing
(3) Bolt	(11) Magnet plug	(19) Planet gear carrier
(4) Seal	(12) Axle case	(20) Stud
(5) Taper roller bearing	(13) Circlip	(21) Locking plate
(6) Wheel stad	(14) Ring gear	(22) Nut
(7) Wheel hub	(15) Ring gear support	(23) Friction washer
(8) Wheel nut	(16) Snap ring	(24) Countersunk bolt

4-3-4. Brake



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

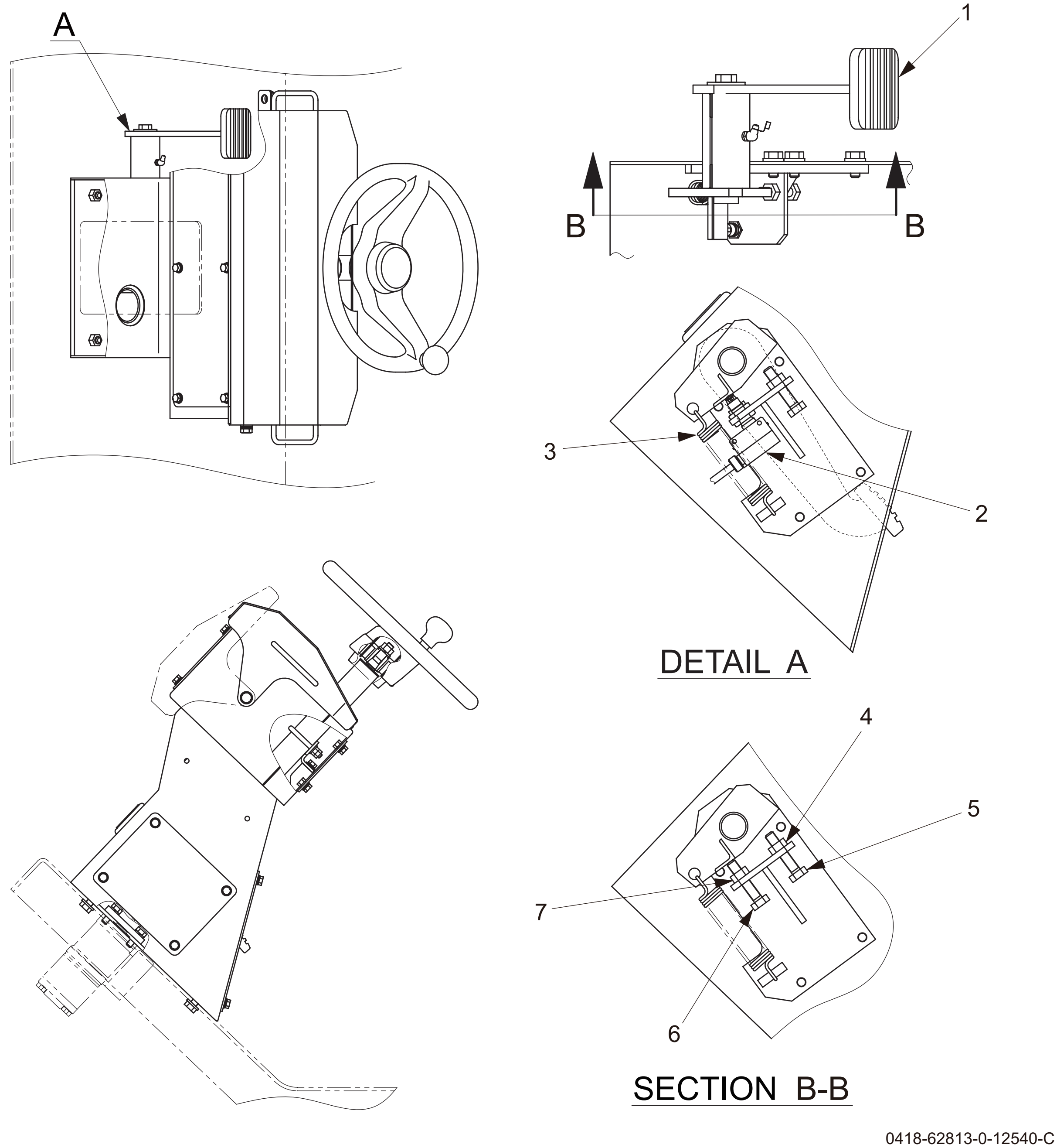
4-3-5. Gearbox



(1) Ball bearing	(6) Cylinder bolt	(11) Spring washer
(2) Circlip	(7) O-ring	(12) Bolt
(3) Spacer	(8) Intermediate cover	(13) Magnet plug
(4) Gear	(9) Gear	(14) Cylinder bolt
(5) Cover	(10) Plug	

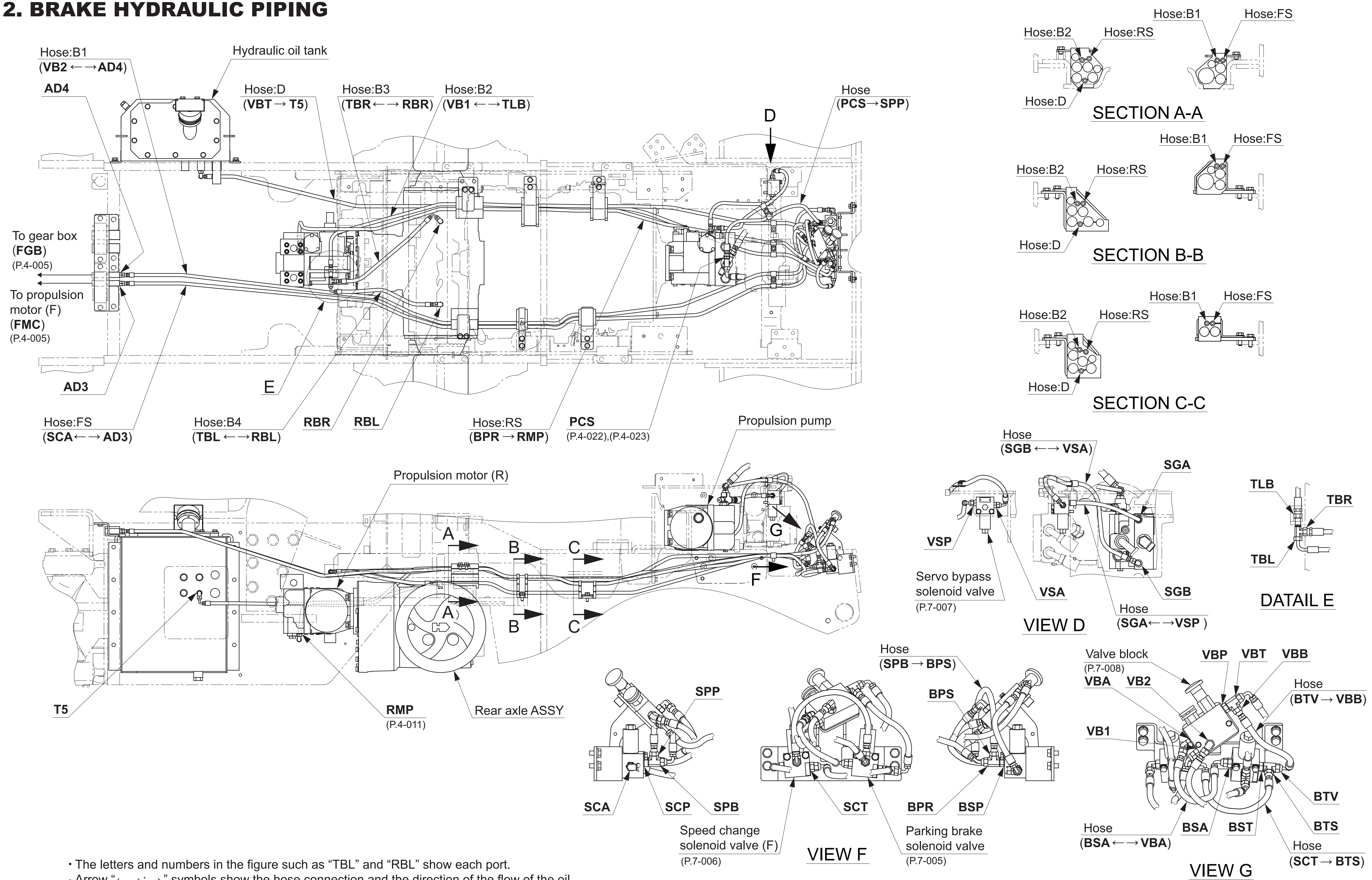
BRAKE

1. BRAKE PEDAL



(1) Brake pedal
(2) Foot brake switch
(3) Spring
(4) Nut : M10
(5) Stopper bolt : M10×50
(6) Stopper bolt : M10×50
(7) Nut : M10

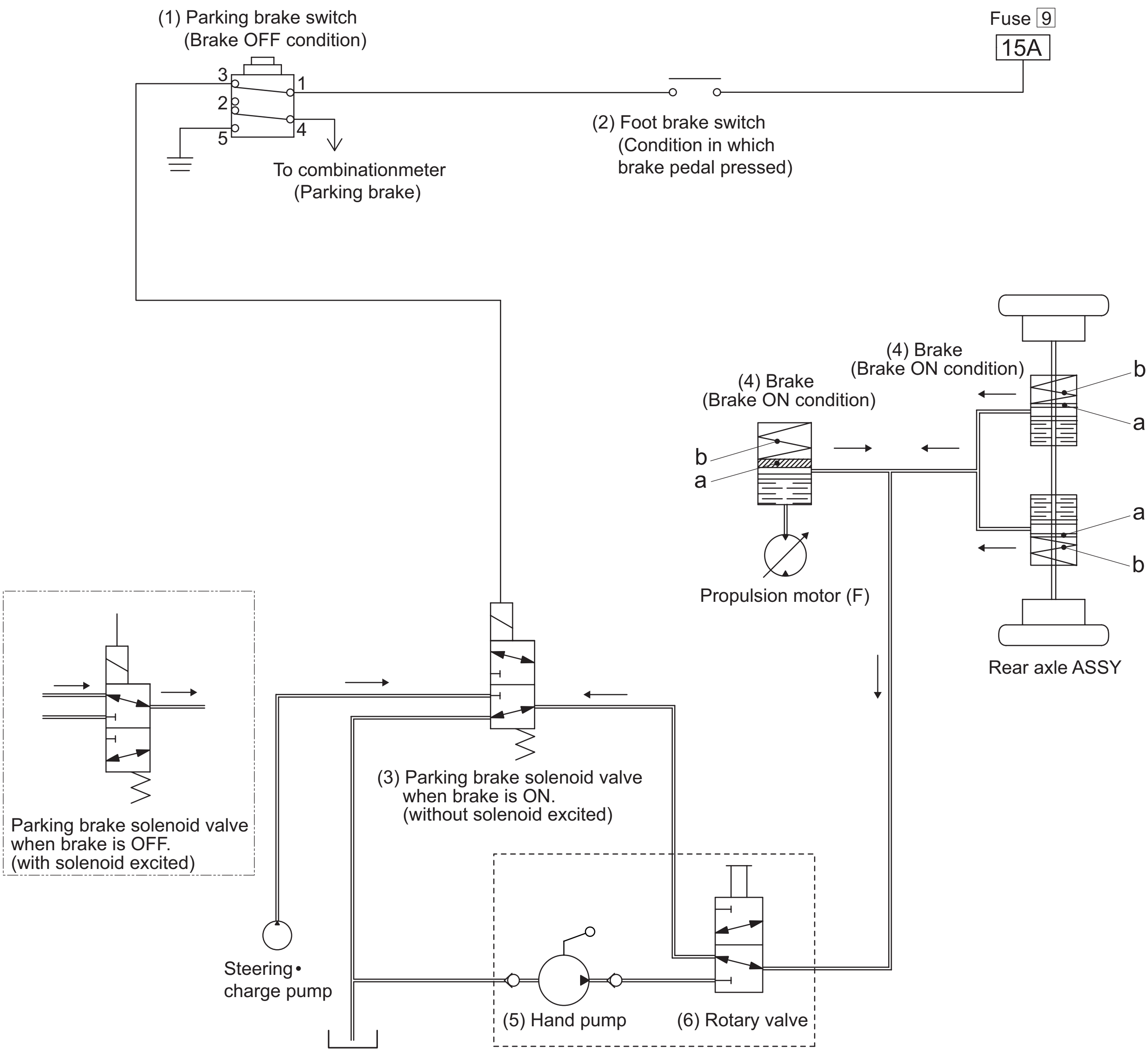
2. BRAKE HYDRAULIC PIPING



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

0418-36831-0-12253-A

Fig.: Brake circuit



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

SV544-07002

3. BRAKE SYSTEM

3-1. Description and Operation of Brake Circuit

Description

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

Operation

To release parking brake:

- When parking brake switch (1) is set to the OFF position, the contacts of parking brake switch (1) close the circuit to parking brake solenoid valve (3) and breaks the circuit to the brake indicator lamp.
- This leads the pressurized fluid through parking brake solenoid valve (3) to pistons (a) of brake (4) to compress springs (b). Brake is freed.

To apply parking brake (Brake pedal not depressed):

- If parking brake switch (1) is put in the ON position, the contacts of parking brake switch (1) break the circuit to parking brake solenoid valve (3) and close the brake indicator lamp circuit.
- This stops feeding the fluid from parking brake solenoid valve (3) to brake (4). Springs (b) move pistons (a) toward the brake discs and plates so that they make a close contact with each other. The brake is applied.The indicator lamp comes on simultaneously.

When brake pedal is pushed down on:

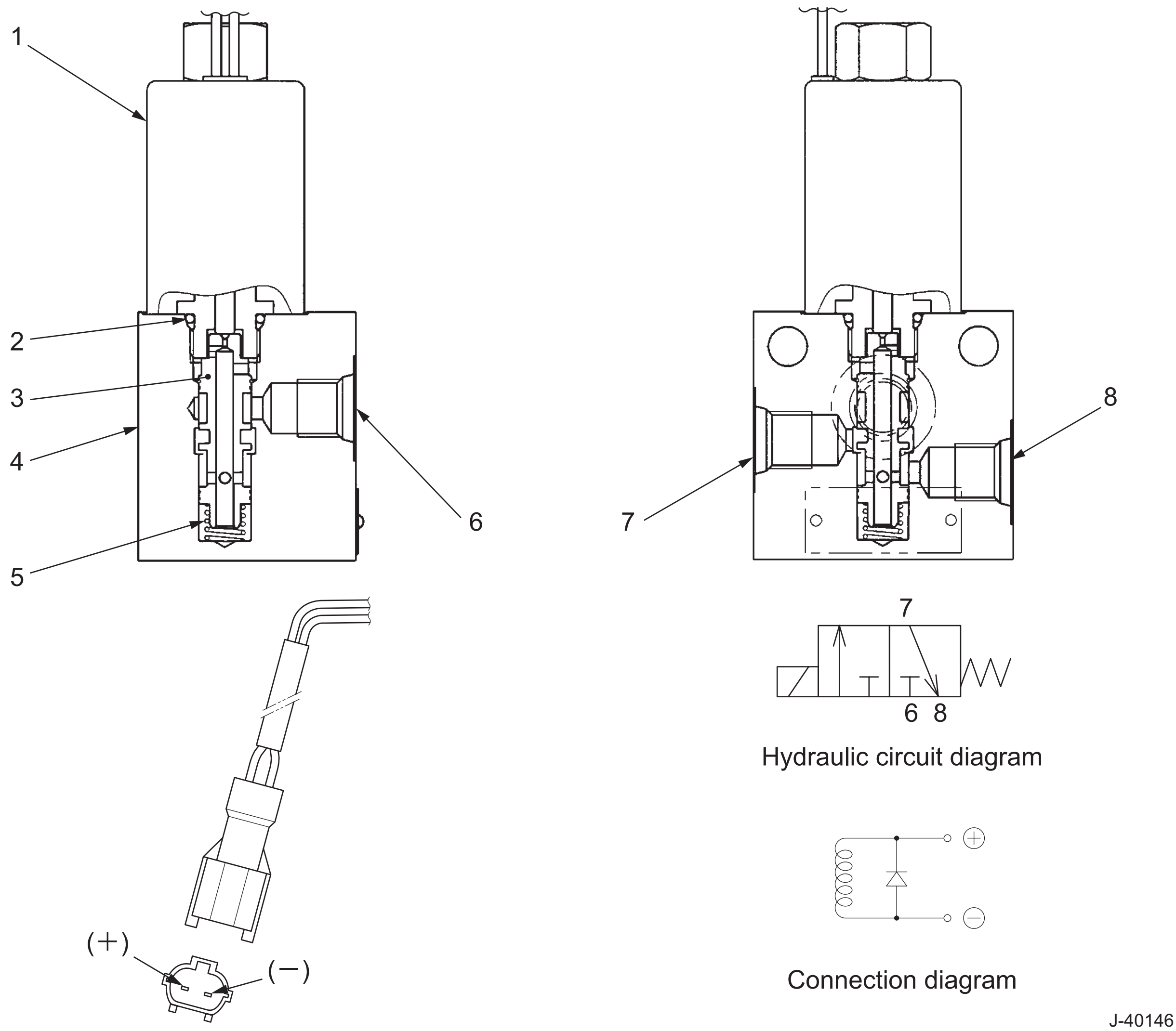
- If brake pedal is depressed, foot brake switch (2) is switched off to break the circuit to parking brake switch (1). This applies the brake even if parking brake switch is in the OFF position.

To disengage the brake when towing:

- Loosen lock ring of rotary valve (6) counterclockwise. And turn rotary valve counterclockwise.
- Turn the bypass valve counterclockwise to release it.
- Pull up and press the knob of the hand pump (5) slowly. The brake can be released by pressing it about 35 times. When the operation force is felt heavy, the brake is released. Stop the operation at that time. Continued oparation may cause damage to the machine.
- Turn the bypass valve clockwise to engage the drive.
- After towing is completed, turn rotary valve (6) clockwise until it stops. And fix rotary valve with the lock ring.
- For the bypass valve location refer to page 4-006.
- For the lock ring location refer to page 7-008.

4. HYDRAULIC COMPONENT SPECIFICATIONS

4-1. Parking Brake Solenoid Valve

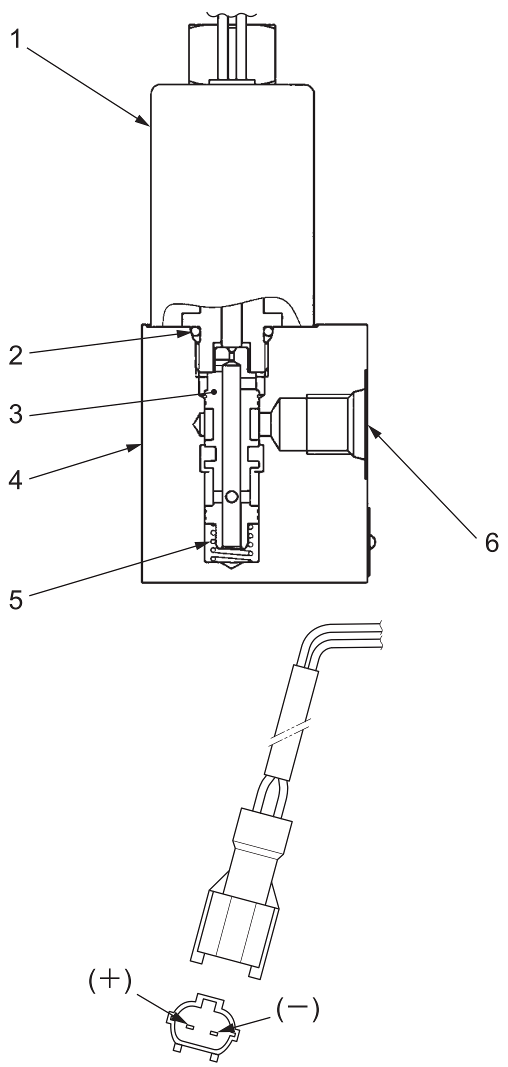


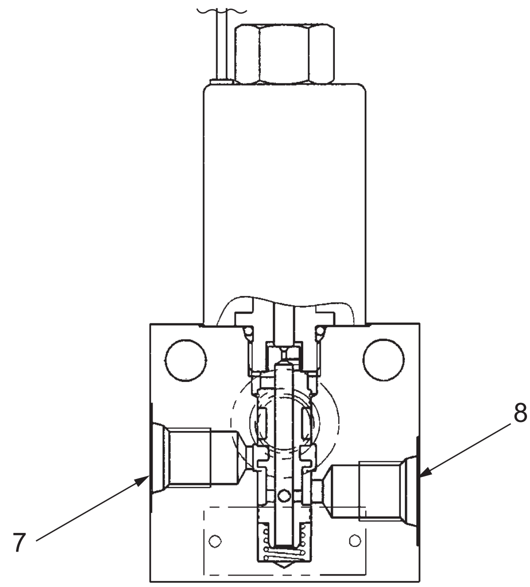
(1) Solenoid
(2) O-ring (1B P14)
(3) Spool (J)
(4) Body
(5) Spring
(6) Port P **[BSP]** : 9/16-18UNF-2B
(7) Port A **[BSA]** : 9/16-18UNF-2B
(8) Port T **[BST]** : 9/16-18UNF-2B

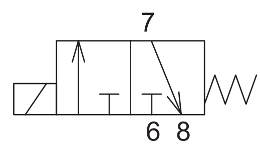
Specifications

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

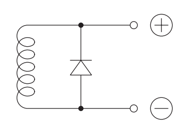
4-2. Speed change Solenoid Valve (F)







Hydraulic circuit diagram



Connection diagram

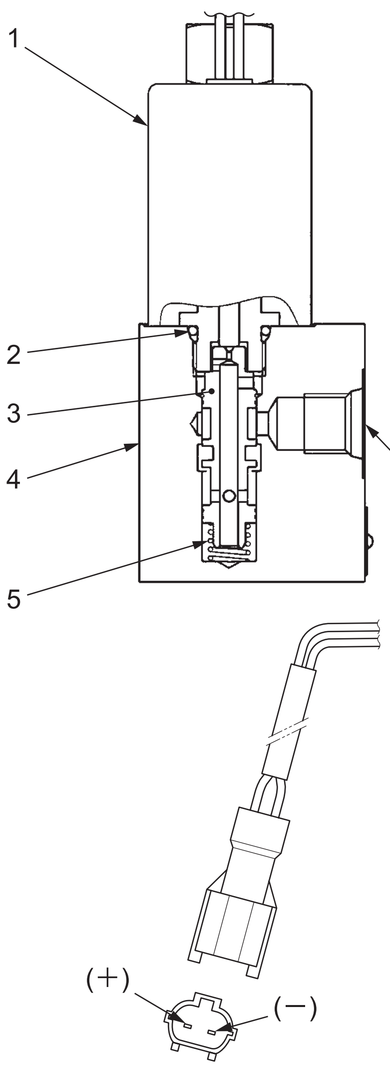
J-40146

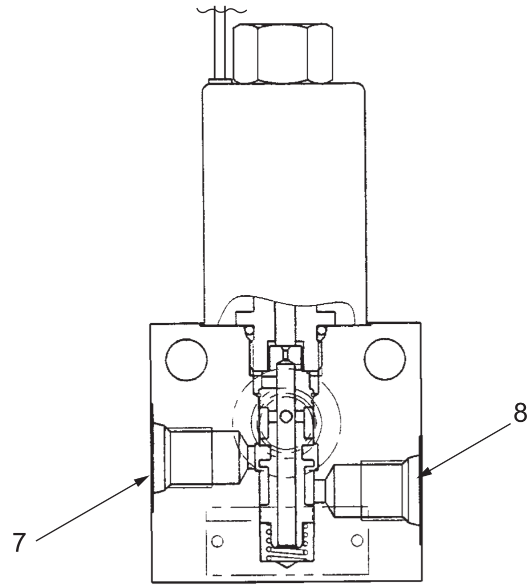
(1) Solenoid
(2) O-ring (1B P14)
(3) Spool (J)
(4) Body
(5) Spring
(6) Port P **[SCP]** : 9/16-18UNF-2B
(7) Port A **[SCA]** : 9/16-18UNF-2B
(8) Port T **[SCT]** : 9/16-18UNF-2B

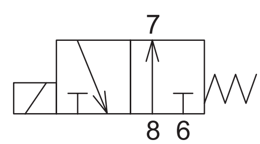
Specifications

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

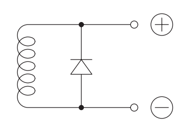
4-3. Servo Bypass Solenoid Valve







Hydraulic circuit diagram



Connection diagram

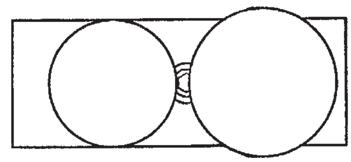
K-40026

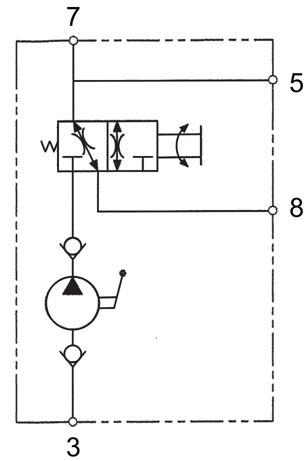
(1) Solenoid
(2) O-ring (1B P14)
(3) Spool (K)
(4) Body
(5) Spring
(6) Port T : G1/4
(7) Port A **[VSA]** : G1/4
(8) Port P **[VSP]** : G1/4

Specifications

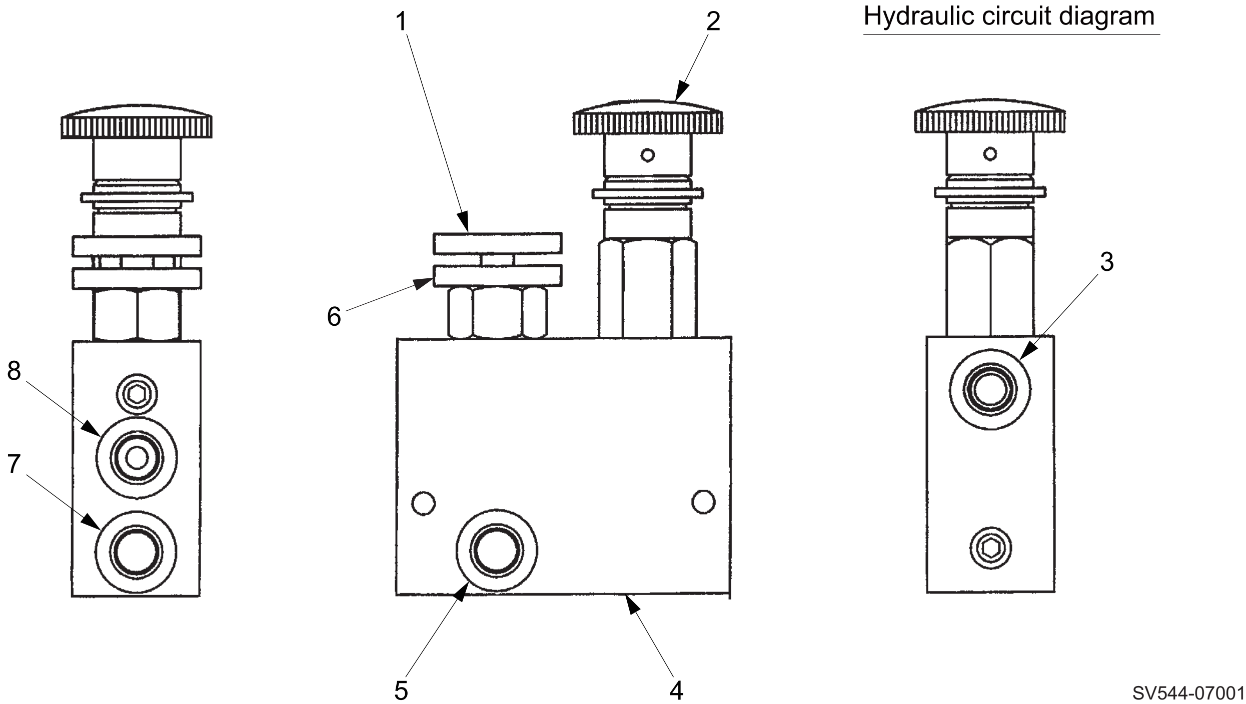
- Rated flow : 30 L/min (7.9 gal./min)
- Rated pressure : 4.9 MPa (710 psi) (7, 8)
  : 0.5 MPa (72.5 psi) (6)
- Weight : 1.5 kg (3.3 lbs.)

4-4. Valve Block





Hydraulic circuit diagram



(1) Rotary valve
(2) Hand pump
(3) Port P **[VBP]** : 9/16-18UNF
(4) System block
(5) Port B2 **[VB2]** : 9/16-18UNF
(6) Lock ring
(7) Port B1 **[VB1]** : 9/16-18UNF
(8) Port A **[VBA]** : 9/16-18UNF

N•m

(1) Rotary valve : 70 N·m (52 lbf·ft)
(2) Hand pump : 70 N·m (52 lbf·ft)

Specifications
- Maximum flow : 5 L/min (1.3 gal./min)
- Maximum working pressure : 1.8 MPa (261 psi)
- Hand pump displacement : 5.7 mL/stroke (0.0015 gal./stroke)

INSPECTION AND ADJUSTMENT

1. INSPECTION AND ADJUSTMENT

1-1. Safety Precautions for Inspection and Adjustment

⚠ WARNING

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

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

⚠ CAUTION

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

⚠ WARNING

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

⚠ CAUTION

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

1-2. Preparation for Inspection and Adjustment

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

1-3. Precautions for Inspection and Adjustment

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

1-4. Warm-up

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

1-5. Inspection and Adjustment of Engine Related Items

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

2. MEASUREMENT AND ADJUSTMENT OF PROPULSION CIRCUIT PRESSURE

2-1. Measurement

⚠WARNING

Confirm that the parking brake works properly before measurement.

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

① Remove plugs from couplings (1) and (2) of 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
- High pressure gauge port (Forward) : (2)
- High pressure gauge port (Reverse) : (1)
- Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

④ Set speed select switch to “ 1 ”.

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

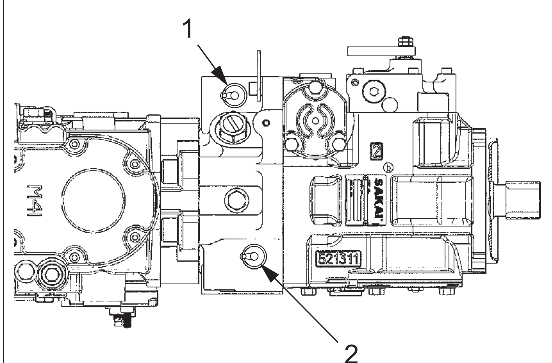
⑥ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

⑦ With propulsion load at maximum, slowly move F-R lever to the side to be measured.

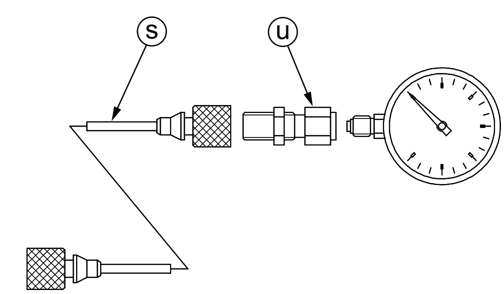
⑧ Read pressure indicated by pressure gauge.

⑨ After measuring, promptly return F-R lever to “N”.

★ **Maximum circuit pressure (high pressure relief valve setting)**
: 42.0 ± 1.0 MPa (6,090 ± 145 psi)



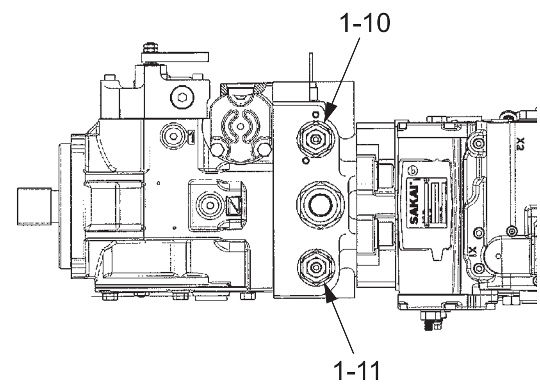
SV520-08001



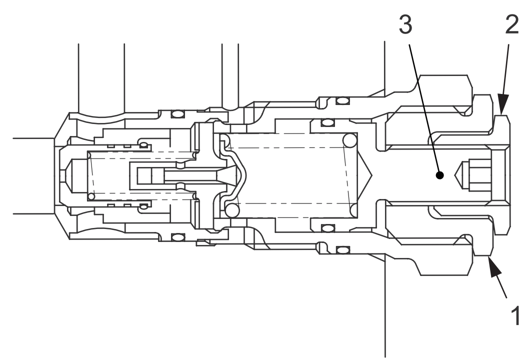
PG003163

2-2. Adjustment

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



SV520-08002



RLV-DD-001

① Check nut (2) of multifunction valve (1-10) or (1-11) for evidence of having loosened.
- Multifunction valve (Forward) : (1-11)
- Multifunction valve (Reverse) : (1-10)

② If there is evidence of nut having loosened, adjust multifunction valve so that pressure becomes within maximum circuit pressure range while watching pressure gauge.

- To adjust pressure, loosen nut and turn adjustment screw (3).

Adjustment screw turned clockwise
: Pressure rise
Adjustment screw turned counterclockwise
: Pressure drop
Pressure change rate : 9 MPa/turn (1,305 psi/turn)

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

④ Check removed multifunction valve for trapped dirt and scratches on its seat.

⑤ If trapped dirt is present, disassemble and clean multifunction valve.

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

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

N•m

(1)	Nut	: 41 N·m (30 lbf·ft)
(2)	Nut	: 20 N·m (16 lbf·ft)
(1-10) (1-11)	Multifunction valve	: 89 N·m (66 lbf·ft)

(NOTICE)

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

- The numbers “1-10” and “1-11” appearing in above illustrations are consistent with lead line numbers shown in illustration of pump ASSY in “2-2. Hydraulic Component Specifications” (P. 4-007).

3. MEASUREMENT AND ADJUSTMENT OF PROPULSION CHARGE CIRCUIT PRESSURE

- Since oil in charge circuit is supplied from steering circuit, confirm that steering operation is normal before measurement.
- Propulsion charge circuits and vibration charge circuits consist of parallel circuits. Thus, in order to measure whether propulsion charge circuit pressure is within standard value, use following operation to ensure that oil does not escape to the charge relief valve on vibrator pump side.

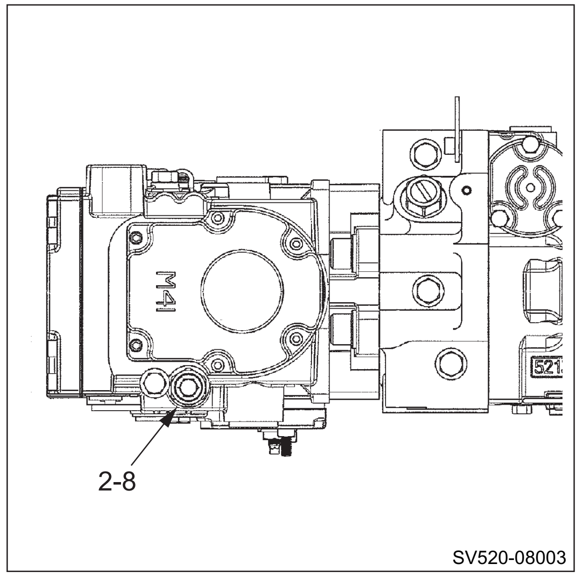
① Loosen nut (1) from charge relief valve (2-8) on vibrator pump side.

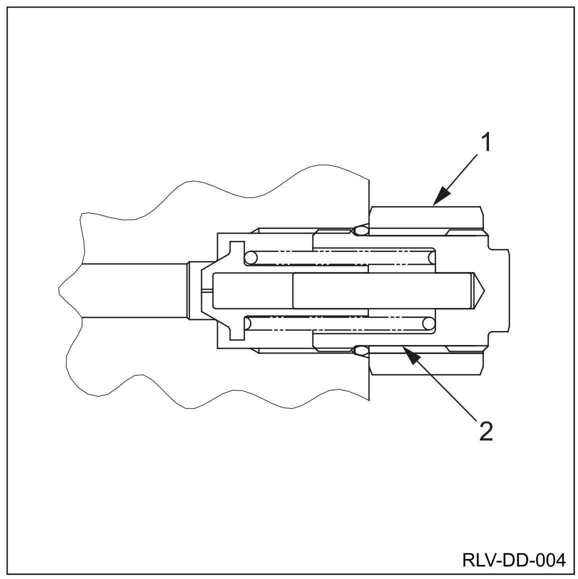
② Tighten adjustment screw (2) by 2 complete turns.

Adjustment screw turned clockwise
: Pressure rise

Adjustment screw turned counterclockwise
: Pressure drop

Pressure change rate
: 0.56 MPa/ turn (81.2 psi/ turn)





- The number “2-8” appearing in above illustrations is consistent with lead line numbers shown in illustration of pump ASSY in “2-2. Hydraulic Component Specifications” (P. 4-007).

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 ⓤ .

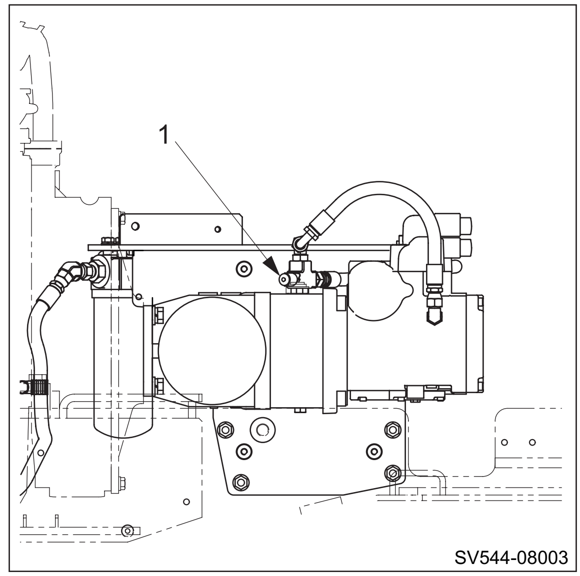
- Coupling : 9/16-18UNF×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ : M16×G3/8
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

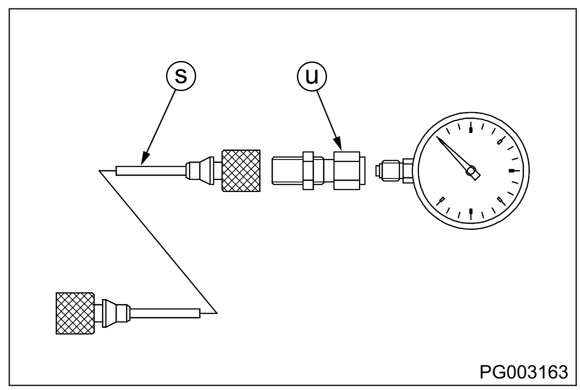
② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

④ Start the engine and set throttle switch 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 (3) of charge relief valve (1-6) 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 (4).

  Adjustment screw turned clockwise
  : Pressure rise

  Adjustment screw turned counterclockwise
  : Pressure drop

  Pressure change rate : 0.39 MPa/turn (57 psi/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.

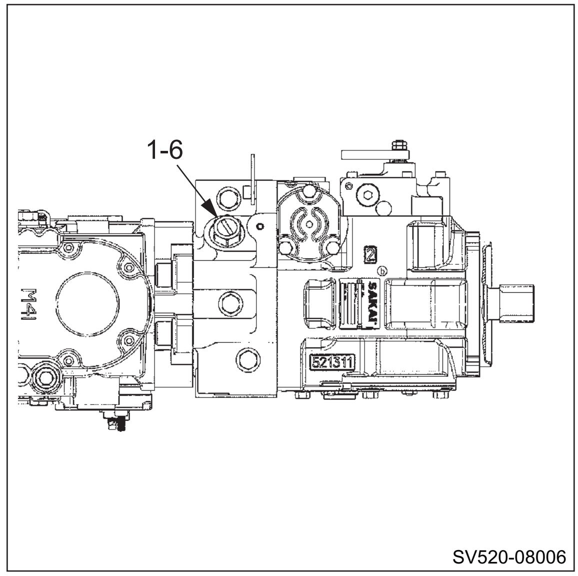
⑥ If a scratch is found on seat, replace charge relief valve.

⑦ After adjustment, measure pressure again and check that pressure reaches standard charge relief valve setting range.

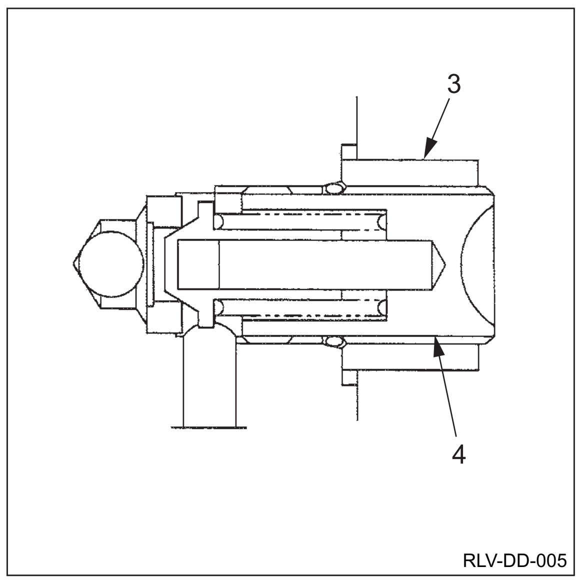
N•m (3) Nut : 52 N·m (38 lbf·ft)

(NOTICE)

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



SV520-08006



RLV-DD-005

- The number “1-6” appearing in above illustrations is consistent with lead line numbers shown in illustration of pump ASSY in “2-2. Hydraulic Component Specifications” (P. 4-007).

4. MEASUREMENT OF MACHINE HIGH/LOW SPEED CHANGE CIRCUIT PRESSURE

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

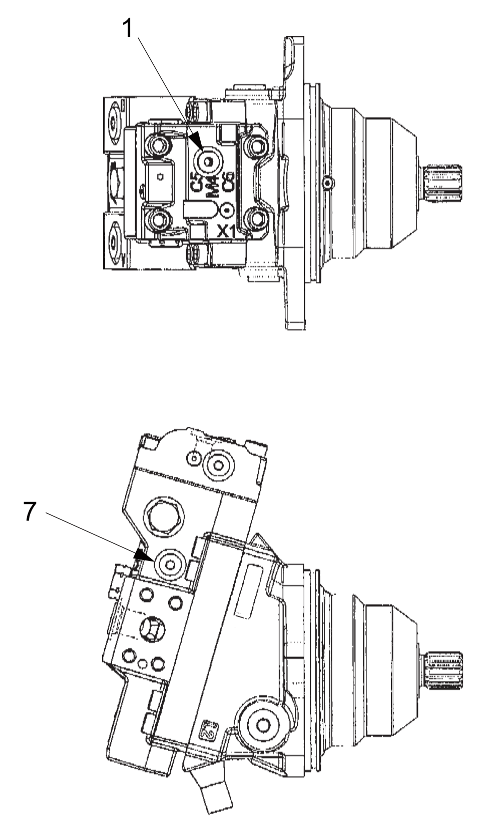
4-1. Measurement of Propulsion Motor (F)

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

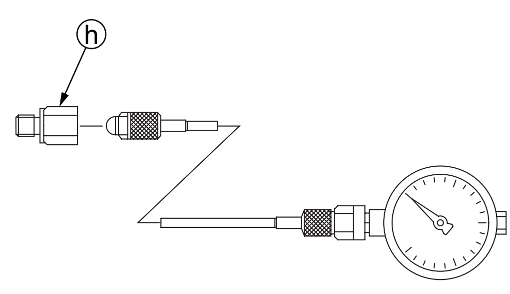
① Remove plugs from propulsion motor (F) gauge ports (1) and (7). Attach pressure gauge with the adapter ⓗ .
  - Adapter ⓗ : 9/16-18UNF
  - Servo pressure gauge port (High) : (1)
  - Servo pressure gauge port (Low) : (7)
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is “N”.
③ Apply parking brake by pressing parking brake switch button.
④ Set speed select switch to “ 1 ”, “ 2 ” or “ 3 ”.
⑤ Start the engine and set throttle switch to “FULL”.
⑥ Read pressure indicated by pressure gauge.

★ Standard flushing relief valve setting
: 1.6 ± 0.2 MPa (232 ± 29 psi)



SV414-08005



PG001014

- The numbers “1” and “7” appearing in above illustrations are consistent with lead line numbers shown in illustration of propulsion motor (F) in “2-2-2. Propulsion hydraulic motor (F)” (P. 4-009).

4-2. Measurement of Propulsion Motor (R)

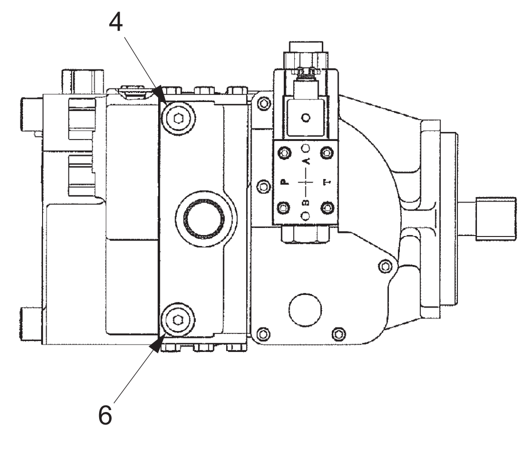
- Oil temperature during measurement : 50 ± 5°C (122 ± 9°F)

① Remove plugs from propulsion motor (R) gauge ports (4) and (6). Attach pressure gauge with the adapter ⓗ .
- Adapter ⓗ : 9/16-18UNF
- Servo pressure gauge port (Low) : (4)
- Servo pressure gauge port (High) : (6)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

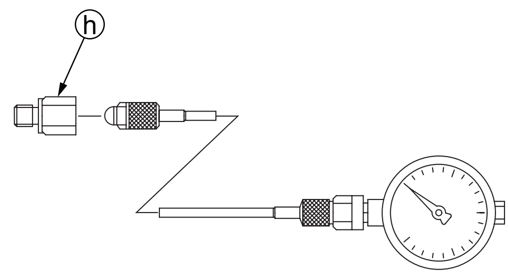
② Confirm that F-R lever is "N".
③ Apply parking brake by pressing parking brake switch button.
④ Set speed select switch to " 1 ", " 2 " or " 3 ".
⑤ Start the engine and set throttle switch to "FULL".
⑥ Read pressure indicated by pressure gauge.

★ **Standard flushing relief valve setting**

: 2.67 ± 0.2 MPa (387 ± 29 psi)



SV514-09002



PG001014

- The numbers "4" and "6" appearing in above illustrations are consistent with lead line numbers shown in illustration of propulsion motor (R) in "2-2-4. Propulsion hydraulic motor (R)" (P. 4-011).

5. MEASUREMENT OF PARKING BRAKE RELEASE PRESSURE

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

5-1. Measurement

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

① Disconnect the hose (1) or (2) from valve block. Attach pressure gauge through adapter ⓦ .
  - Adapter ⓦ : 4-4LOHL6G5TP (Parker part number)
  - Hose (gearbox (F)) : (2)
  - Hose (rear axle) : (1)
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is "N".

③ Apply parking brake by pressing parking brake switch button.

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

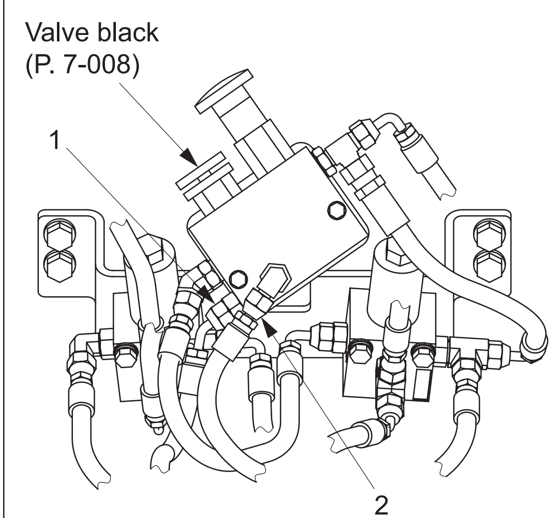
⑤ Release parking brake by pressing parking brake switch button.

⑥ Read brake release pressure indicated by pressure gauge.

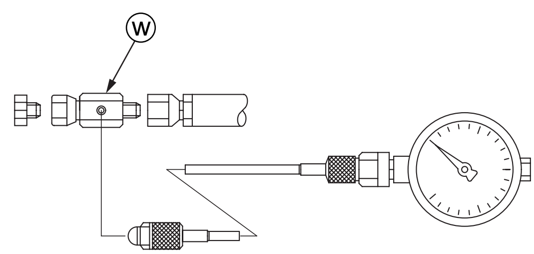
★ Brake release pressure

Gear box (F) : More than 1.8 MPa (261 psi)

Rear axle ASSY : 1.5 to 3.0 MPa (218 to 435 psi)



SV544-08001



PG002060

6. MEASUREMENT AND INSPECTION OF VIBRATOR CIRCUIT PRESSURE

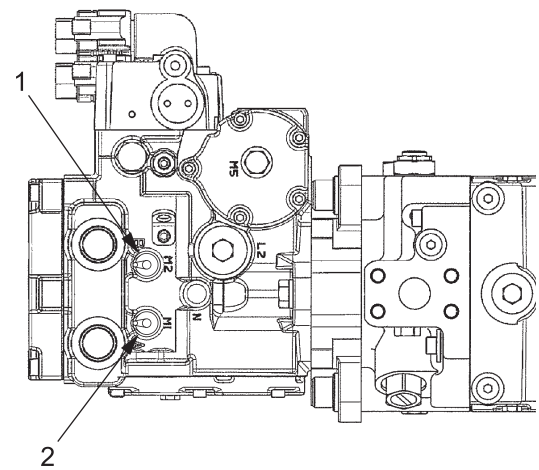
6-1. Measurement

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

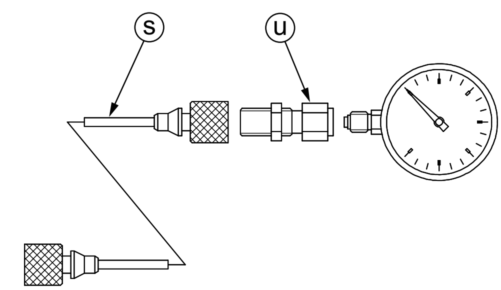
- Oil temperature during measurement : 50 $\pm$ 5°C (122 $\pm$ 9°F)

① Remove plugs from couplings (1) and (2) of vibrator 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
- High pressure gauge port (Low amplitude) : (2)
- High pressure gauge port (High amplitude) : (1)
- Pressure gauge : 0 to 50 MPa (0 to 7,250 psi)



SV520-08010



PG003163

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

④ Set vibration mode change switch to “ ”.

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

⑥ Press F-R lever vibration switch ON.

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

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

★ **Maximum circuit pressure (high pressure relief valve setting)**
: 28.0 $\pm$ 1.0 MPa (4,060 $\pm$ 145 psi)

6-2. Inspection

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

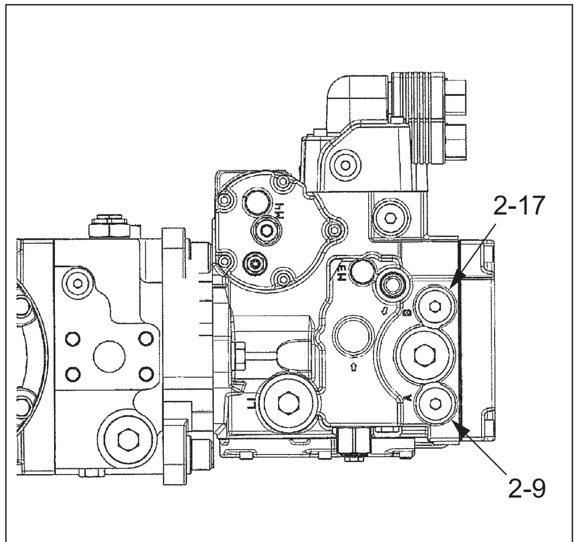
① Remove plug (3) and valve from high pressure relief valve port (2-9) or (2-17) of vibrator pump.
  - High pressure relief valve port : (2-9) (Low amplitude)
  - High pressure relief valve port : (2-17) (High amplitude)

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.

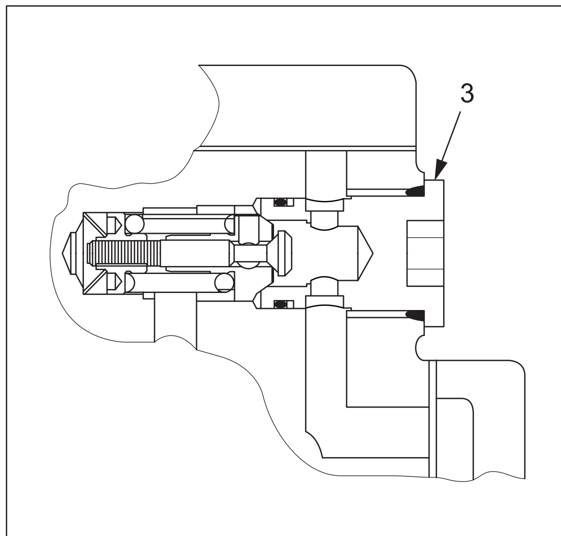


SV520-08011

N•m (3) Plug : 70 N·m (52 lbf·ft)

(NOTICE)

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



RLV-DD-003

- The numbers “2-9” and “2-17” appearing in above illustrations are consistent with lead line numbers shown in illustration of pump ASSY in “2-2. Hydraulic Component Specifications” (P. 4-007).

7. MEASUREMENT AND ADJUSTMENT OF VIBRATOR CHARGE CIRCUIT PRESSURE

- Since oil in charge circuit is supplied from steering circuit, confirm that steering operation is normal before measurement.
- Propulsion charge circuits and vibration charge circuits consist of parallel circuits. Thus, in order to measure whether vibrator charge circuit pressure is within standard value, use following operation to ensure that oil does not escape to the charge relief valve on propulsion pump side.

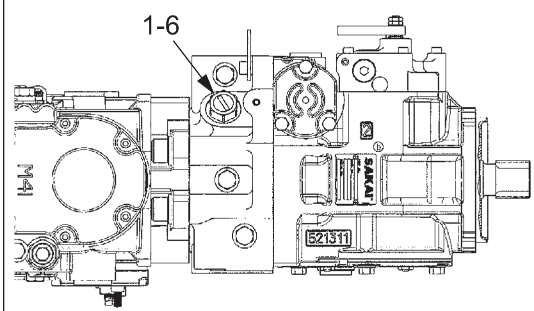
① Loosen nut (3) from charge relief valve (1-6) on propulsion pump side.

② Tighten adjustment screw (4) by two complete turns.

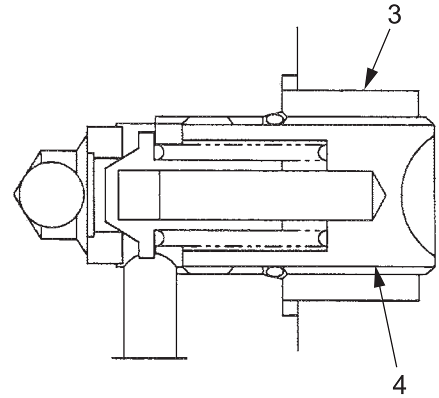
Adjustment screw turned clockwise
: Pressure rise

Adjustment screw turned counterclockwise
: Pressure drop

Pressure change rate : 0.39 MPa/turn (57 psi/turn)



SV520-08006



RLV-DD-005

- The number “1-6” appearing in above illustrations is consistent with lead line numbers shown in illustration of pump ASSY in “2-2. Hydraulic Component Specifications” (P. 4-007).

7-1. Measurement

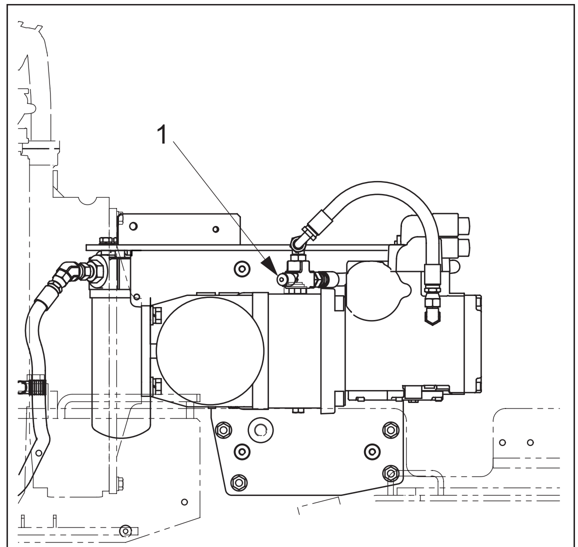
- Oil temperature during measurement : 50 ± 5°C (122 ± 9°F)

① Remove plug from coupling (1) of propulsion pump.
Attach pressure gauge with hose ⓢ and connector ⓤ .

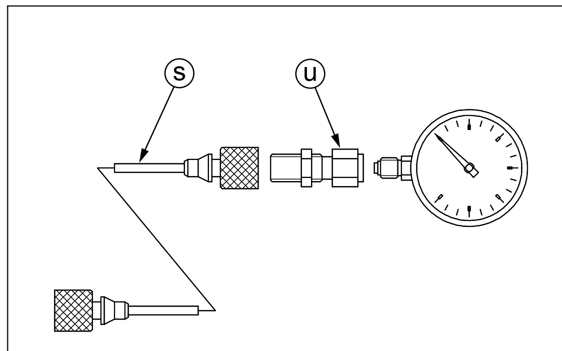
- Coupling : 9/16-18UNF×M16
- Adapter for hose ⓢ : M16 P=2.0
- Pressure gauge connector ⓤ : M16×G3/8
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

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 switch to “FULL”.
⑤ Read pressure indicated by pressure gauge.

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



SV544-08003



PG003163

7-2. Adjustment

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

① Check nut (1) of charge relief valve (2-8) 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
  : 0.56 MPa/ turn (81.2 psi/ 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.

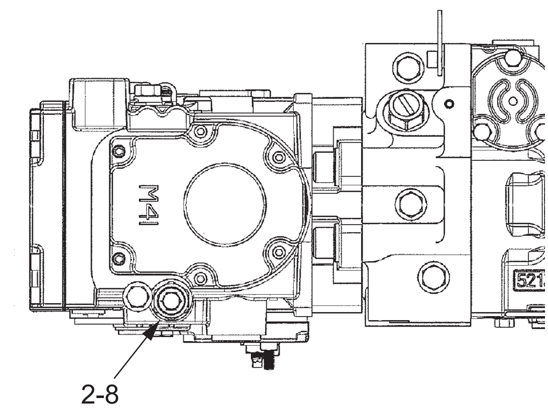
⑥ If a scratch is found on seat, replace charge relief valve.

⑦ After adjustment, measure pressure again and check that pressure reaches standard charge relief valve setting range.

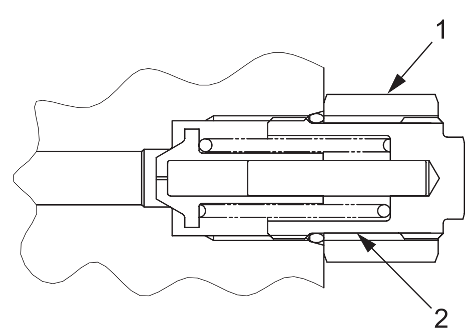
N•m (1) Nut : 40 N·m (30 lbf·ft)

(NOTICE)

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



SV520-08003



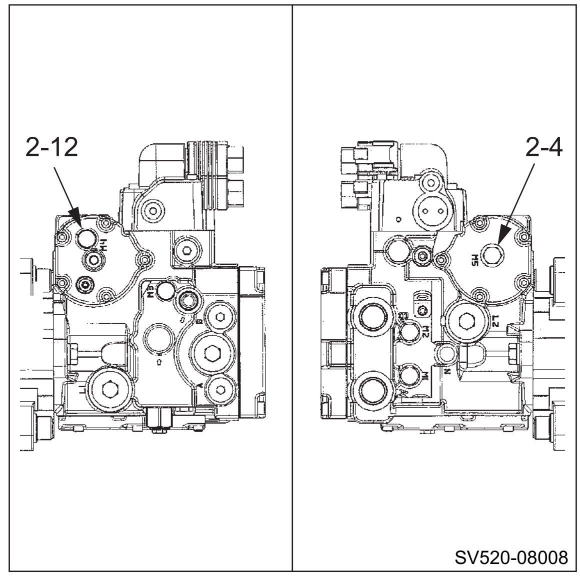
RLV-DD-004

- The number “2-8” appearing in above illustrations is consistent with lead line numbers shown in illustration of pump ASSY in “2-2. Hydraulic Component Specifications” (P. 4-007).

8. MEASUREMENT OF VIBRATOR HIGH/LOW CHANGE CIRCUIT PRESSURE

8-1. Measurement

- Oil temperature during measurement : 50 $\pm$ 5°C (122 $\pm$ 9°F)



① Remove plugs from servo pressure gauge ports (2-4) and (2-12). Attach pressure gauge with the adapter ⓗ .
- Adapter ⓗ : 9/16-18UNF
- Servo pressure gauge port (Low) : (2-4)
- Servo pressure gauge port (High) : (2-12)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

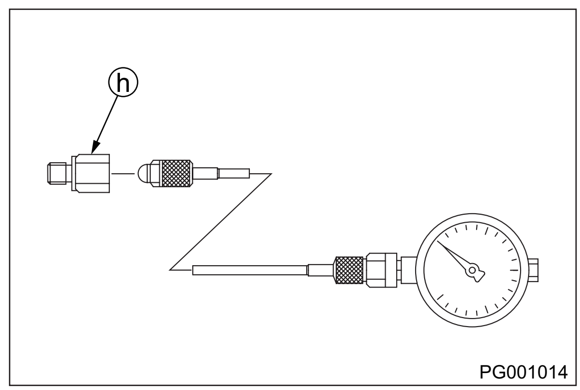
② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

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

⑤ Set vibration select switch and then read pressure indicated by pressure gauge.

- With vibration select switch is “◯”, measured pressures of (2-4) and (2-12) are same.
- With vibration select switch is “ ” or “ ”, measured pressures of (2-4) and (2-12) are different.



★ **Standard charge relief valve setting**
: 2.4 $^{\pm 0.2}$ MPa (348 $^{\pm 29}$ psi)

- The numbers “2-4” and “2-12” appearing in above illustrations are consistent with lead line numbers shown in illustration of pump ASSY in “2-2. Hydraulic Component Specifications” (P. 4-007).

9. MEASUREMENT AND INSPECTION OF STEERING CIRCUIT PRESSURE

9-1. Measurement

⚠WARNING

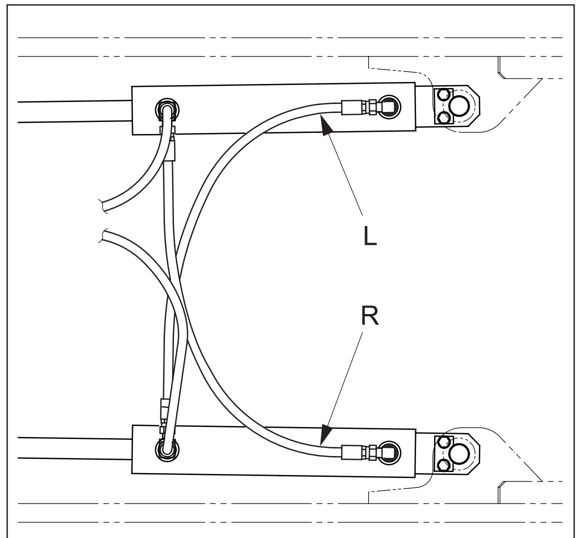
Make sure that there is no person around the articulated portion of the machine before operating the steering wheel.

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

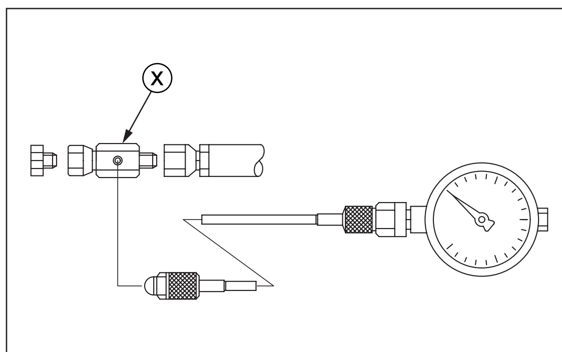
① Disconnect the hose (L) or (R) from steering cylinder. Attach pressure gauge through adapter ⓧ .
- Adapter ⓧ : 6-4LOHL6G5TP (Parker part number)
- Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

② Confirm that F-R lever is "N".
③ Apply parking brake by pressing parking brake switch button.
④ Start the engine and set throttle switch to "FULL".
⑤ Turn steering wheel to operate relief valve.
⑥ Read pressure indicated by pressure gauge.

★ Standard maximum circuit pressure (orbitroll relief pressure + charge relief pressure) : 16.4 ± 1.0 MPa (2,378 ± 145 psi)



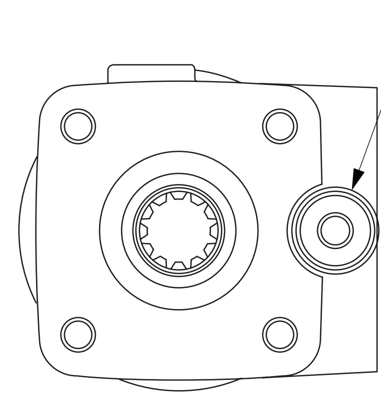
SV514-09005



PG002090

9-2. Inspection

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



ORB-SD-09150

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.**

10. MEASUREMENT AND INSPECTION OF BLADE CIRCUIT PRESSURE (SV544TB, FB)

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

10-1. 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) or (2) from blade cylinder. Attach pressure gauge through the adapter ⓧ .
  - Adapter ⓧ : 6-4LOHL6G5TP (Parker part number)
  - Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)

② Confirm that F-R lever is “N”.

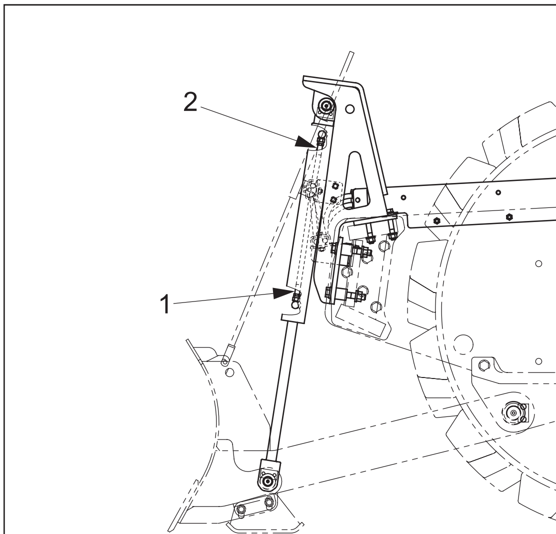
③ Apply parking brake by pressing parking brake switch button.

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

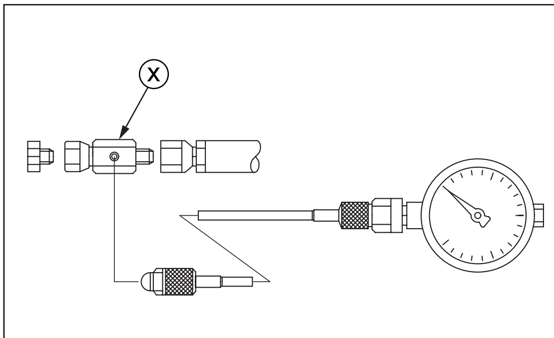
⑤ Move blade control lever to operate relief valve.

⑥ Read pressure indicated by pressure gauge.

★ **Standard maximum circuit pressure (stack valve relief pressure)**
: 13.7 ± 1.0 MPa (1,987 ± 145 psi)



SV544-08002



PG002090

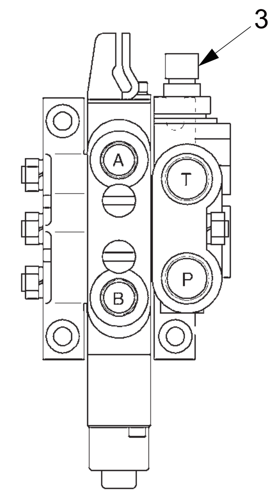
10-2. Inspection

- 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.**



SV201-1-08009

11. MEASUREMENT OF HYDRAULIC PUMP CASE PRESSURE

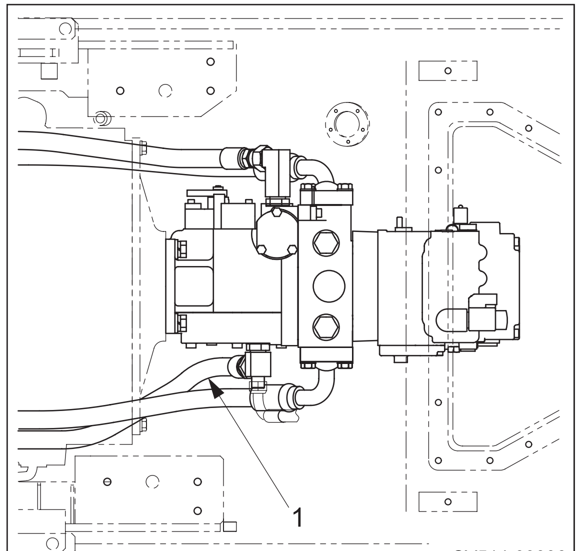
11-1. Measurement of Propulsion Pump Case Pressure

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

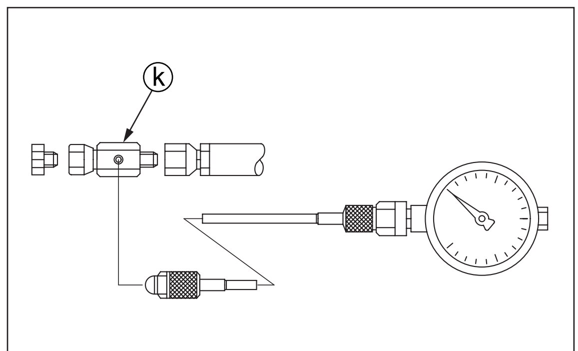
① Disconnect hose (1) from propulsion pump. Attach pressure gauge through adapter ⓚ .
- Adapter ⓚ : 12-4LOHL6G5TF (Parker part number)
- Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is "N".
③ Apply parking brake by pressing parking brake switch button.
④ Set propulsion speed select switch to " 1 ".
⑤ Start the engine and set throttle switch to "FULL".
⑥ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)
⑦ With propulsion load at maximum, measure pressure when speed select switch is " 1 ", " 2 " and " 3 " and F-R lever is "N", "F", and "R", respectively.

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



SV514-09006



PG002190

11-2. Measurement of Vibrator Pump Case Pressure

⚠CAUTION

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

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

① Disconnect hose (1) from hydraulic oil filter 2. Attach pressure gauge through adapter ⓥ.
  - Adapter ⓥ : 8-4LOHL6G5TP (Parker part number)
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is "N".

③ Apply parking brake by pressing parking brake switch button.

④ Set vibration mode change switch to " ".

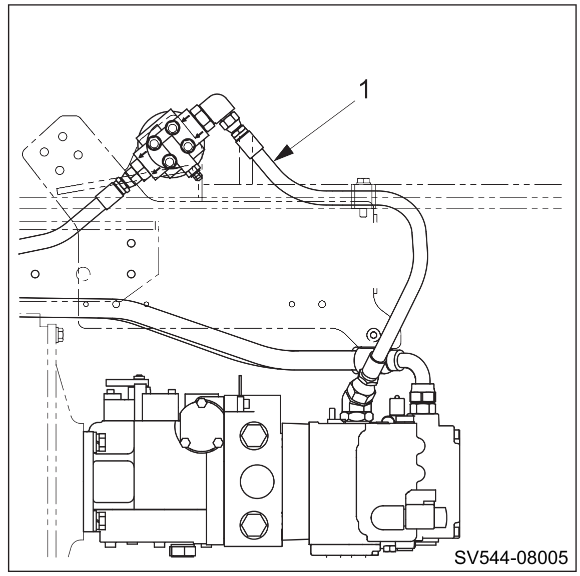
⑤ Start the engine and set throttle lever to "FULL".

⑥ Press F-R lever vibration switch ON.

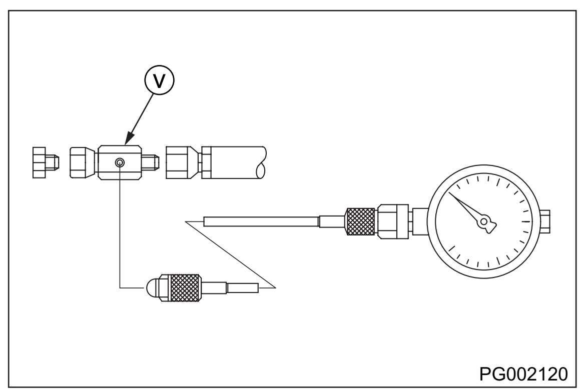
⑦ Measure pressure when vibration select switch is in " " and " ", respectively.

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

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



SV544-08005



PG002120

12. MEASUREMENT OF PROPULSION MOTOR CASE PRESSURE

12-1. 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 and adapter ⓙ .
  - Adapter ⓙ : 7/8-14UNF
  - Pressure gauge : 0 to 5 MPa (0 to 725 psi)

② Confirm that F-R lever is "N".

③ Apply parking brake by pressing parking brake switch button.

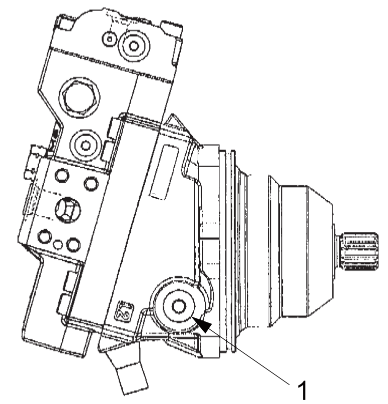
④ Set propulsion speed select switch to " 1 ".

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

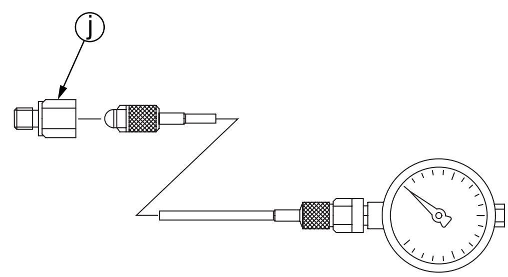
⑥ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

⑦ With propulsion load at maximum, measure pressure when speed select switch is " 1 ", " 2 " and " 3 " and travel mode change switch is "  " and F-R lever is "N", "F", and "R", respectively.

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



SV414-08011



PG001022

12-2. Measurement of Propulsion Motor (R)

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

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

② Confirm that F-R lever is "N".

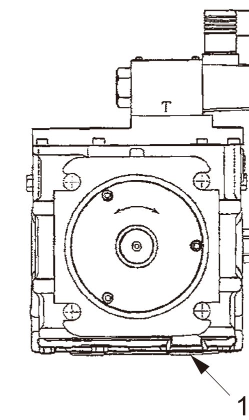
③ Apply parking brake by pressing parking brake switch button.

④ Set propulsion speed select switch to " 1 ".

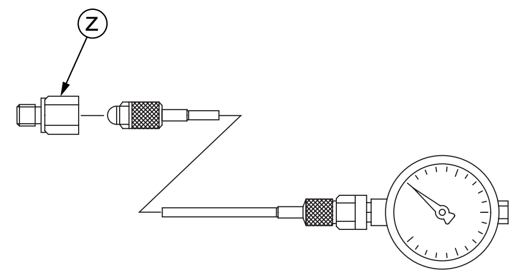
⑤ Start the engine and set throttle switch to "FULL".

⑥ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

⑦ With propulsion load at maximum, measure pressure when speed select switch is " 1 ", " 2 " and " 3 " and travel mode change switch is " " and F-R lever is "N", "F", and "R", respectively.



SV505- I -08005



PG001027

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

13. MEASUREMENT OF VIBRATOR MOTOR CASE PRESSURE

13-1. Measurement

⚠CAUTION

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

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

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

② Confirm that F-R lever is “N”.

③ Apply parking brake by pressing parking brake switch button.

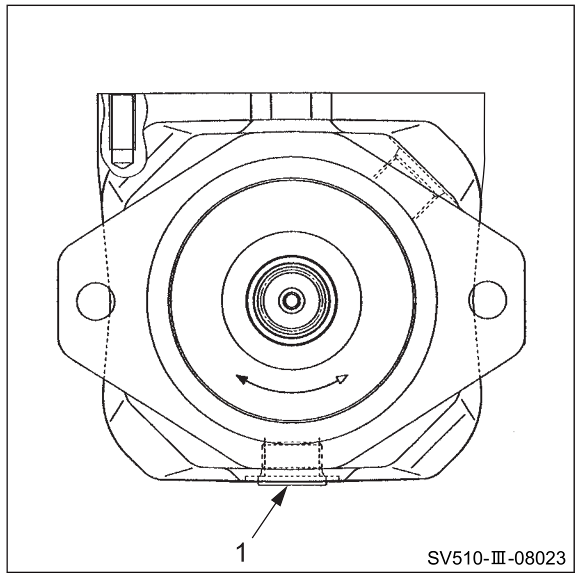
④ Set vibration mode change switch to “ ”.

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

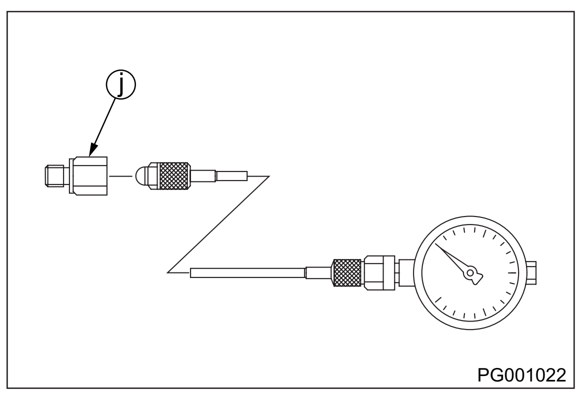
⑥ Press F-R lever vibration switch ON.

⑦ Measure pressure when vibration select switch is “ ” and “ ”, respectively.

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



★ **Allowable motor case pressure**
: 0.2 MPa (29 psi) or less



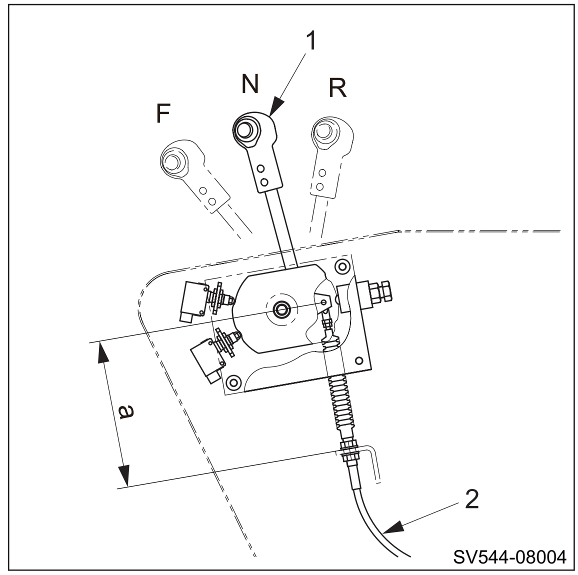
14. ADJUSTMENT OF F-R LEVER LINKAGE

14-1. Adjustment

- In cases such as propulsion 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.

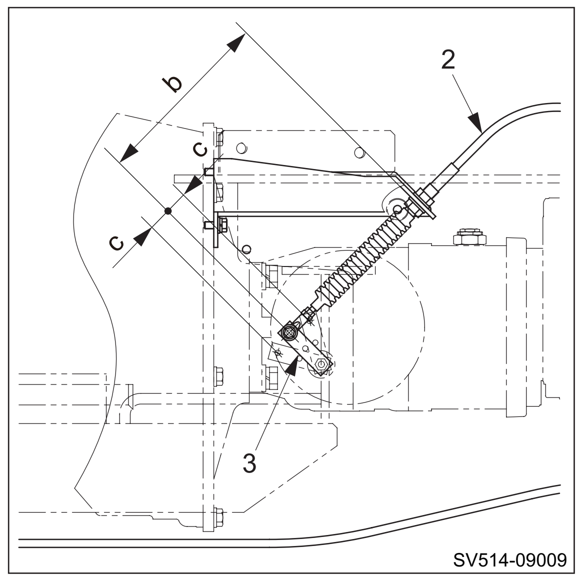
① Set F-R lever in “N”.
② Attach both ends of control cable (2).

★ **Specified dimension a : 210 mm (8.27 in.)**



③ Confirm the strokes of propulsion pump control lever (3).

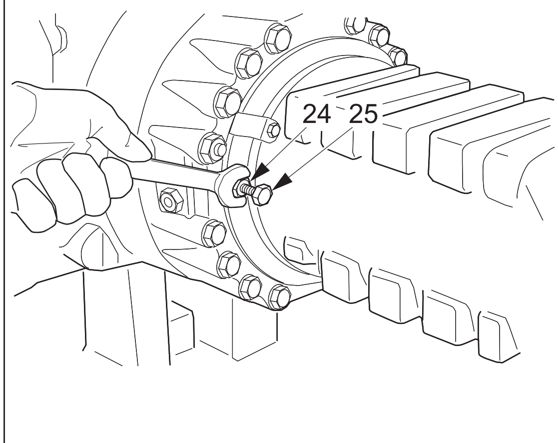
★ **Specified dimension b : 205 mm (8.07 in.)**
c : 25 mm (0.98 in.)



15. BRAKE ADJUSTMENT

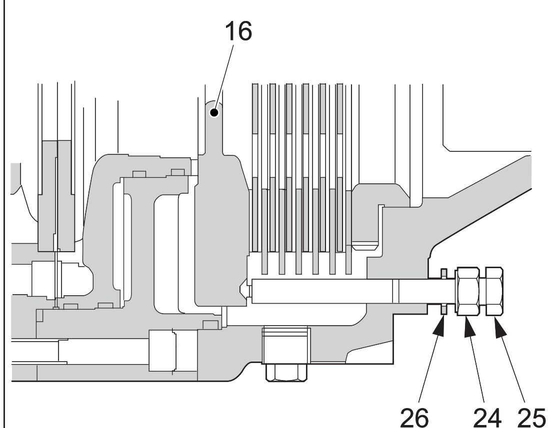
15-1. Manually Releasing the Brake

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



SV510-Ⅲ-08027

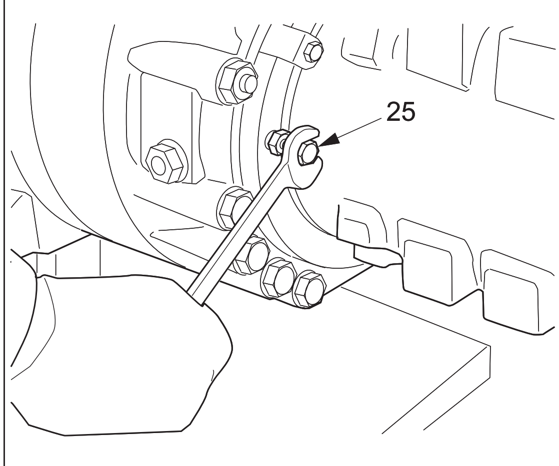
2) Tighten bolt (25), and press it into disc (16).
   • Do the same with bolt on the opposite side.



SV510-Ⅲ-08028

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

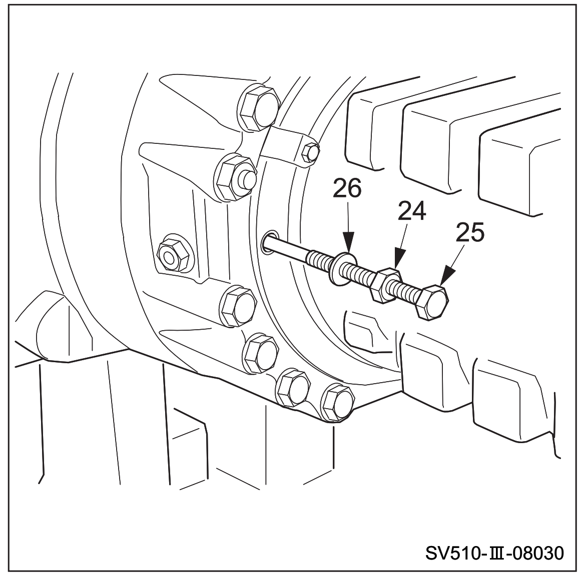
★ **After bolt end makes contact with disc (16), strictly observe not tightening bolt (25) more than one complete turn.**



SV510-Ⅲ-08029

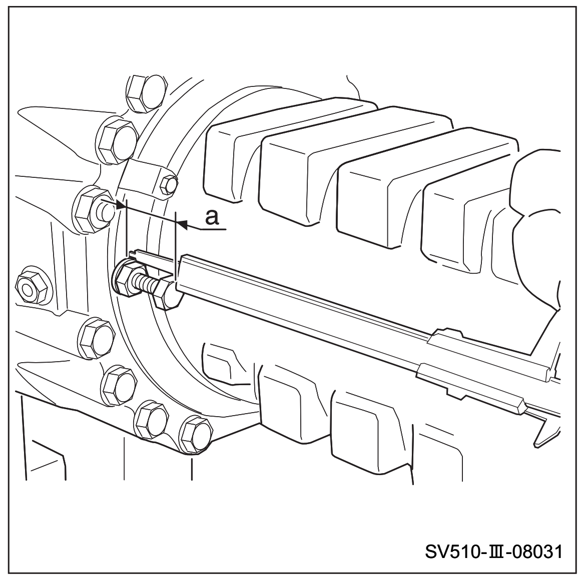
15-2. Adjustment after Manual Release of Brake

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).



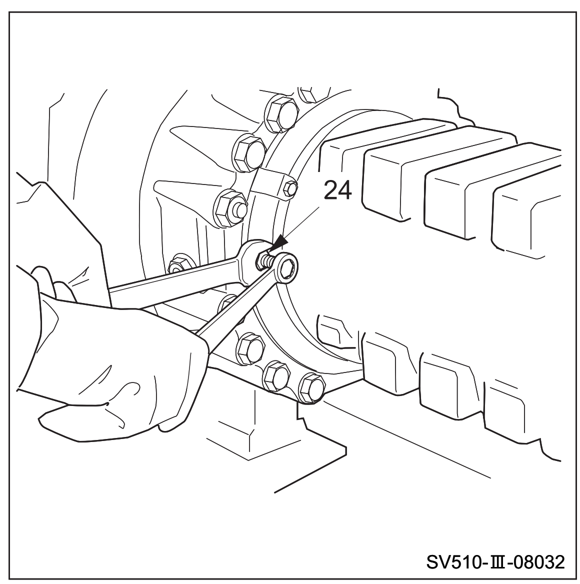
⑤ Adjust bolt (25) to the dimensions as shown on the right.
- Similarly, adjust the bolt on the opposite side.

★ **Specified dimension a: 34 $^{+0.5}_{0}$ mm (1.34 $^{+0.02}_{0}$ in.)**



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.**



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

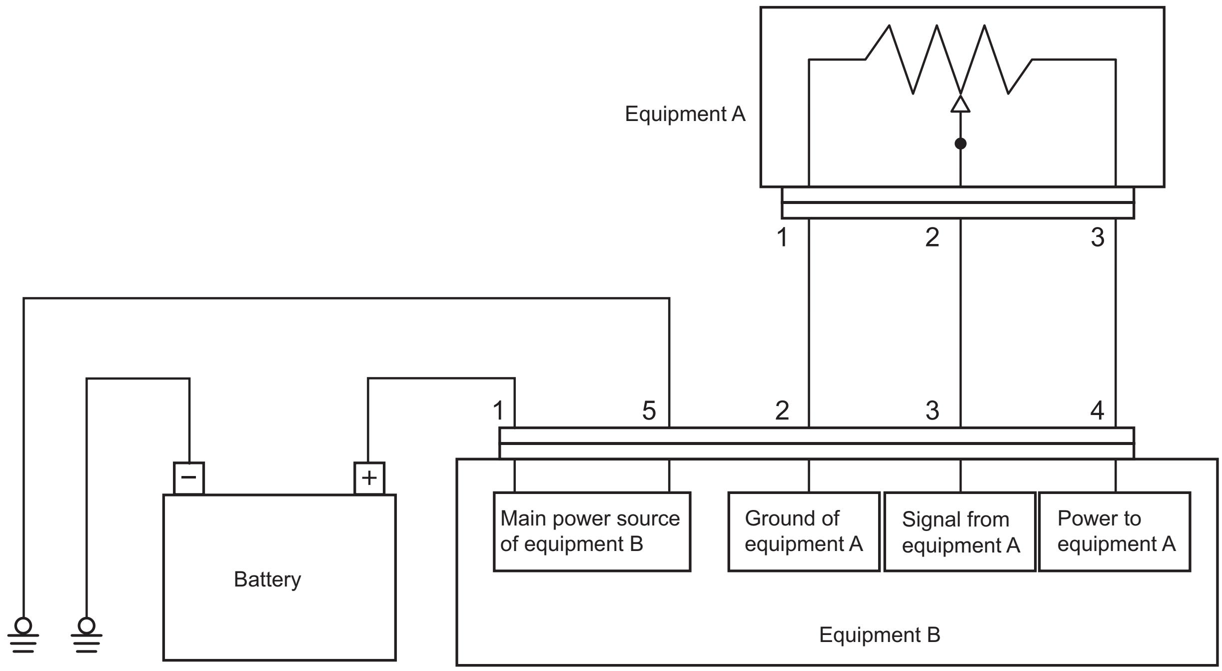
Be very careful because equipment can return to normal during an inspection and suddenly operate properly when a failure occurs due to a faulty contact or other such cause.

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

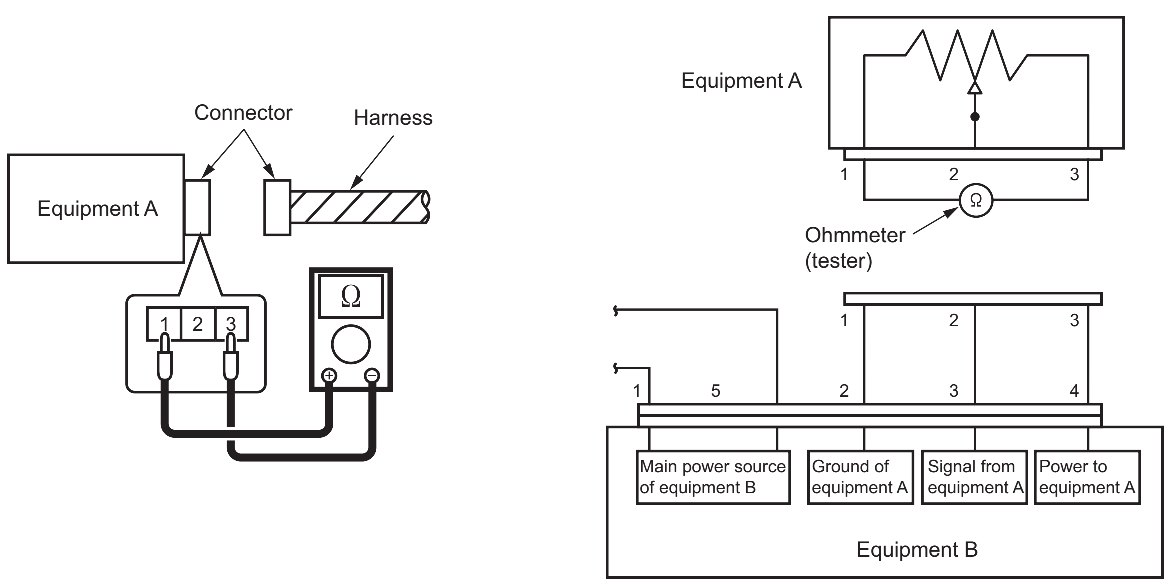
Some of the various inspection procedures are presented here for reference, using a sample circuit below.



TS-10001

1) Measuring resistance using tester

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



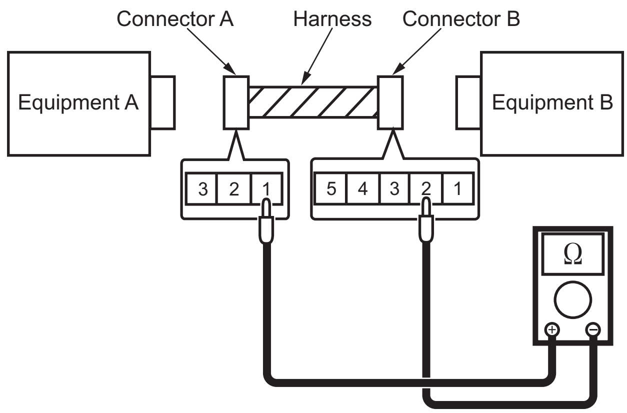
TS-10002

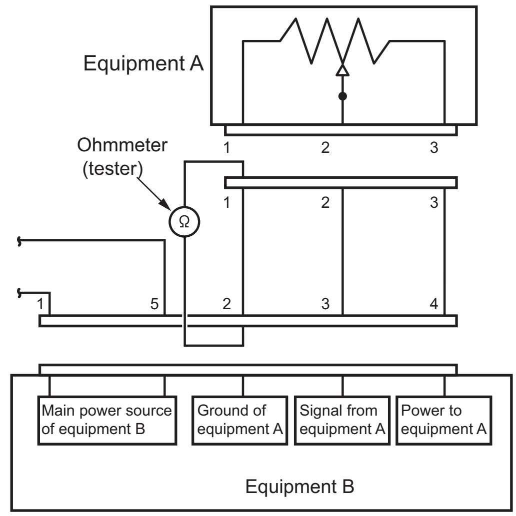
Inspection procedure

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)





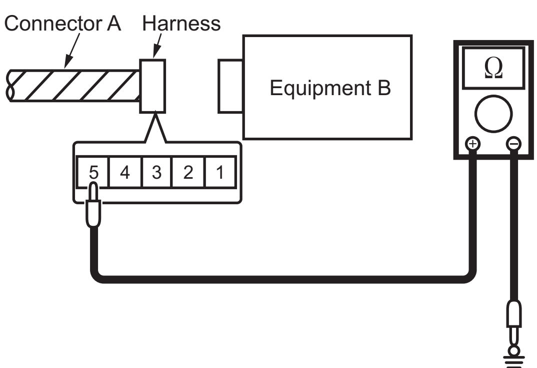
TS-10003

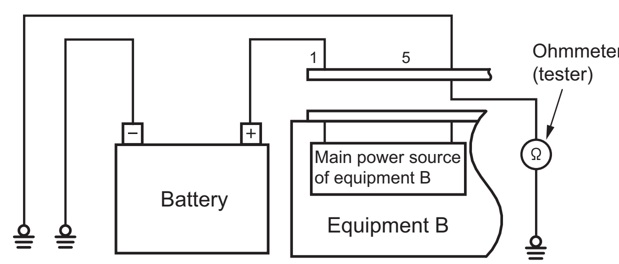
Inspection procedure

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

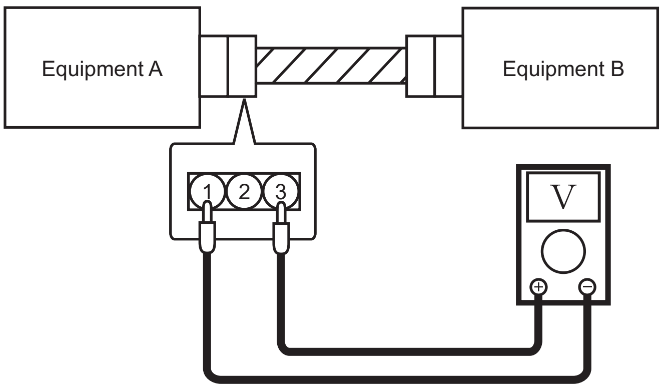
① Disconnect the connector of equipment B.
② Connect the test probe (+) to connector terminal 5 of equipment B and the test probe (-) to a machine ground point (the bolt fastening the ground terminal or an unpainted portion on the body) and measure the resistance. At this time, reversing the connector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

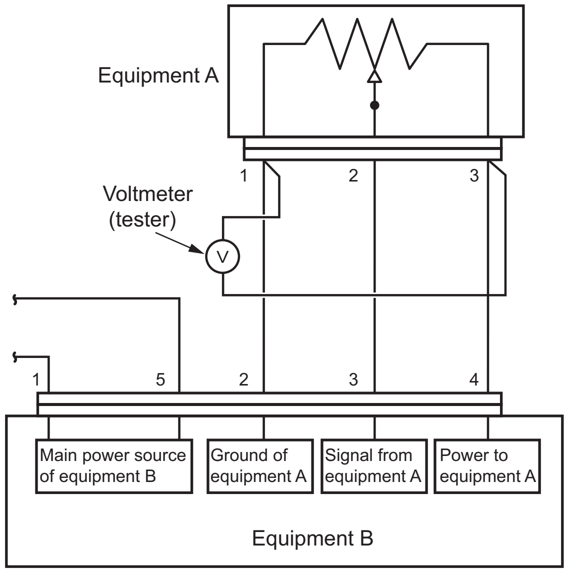
(NOTICE)

- **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)





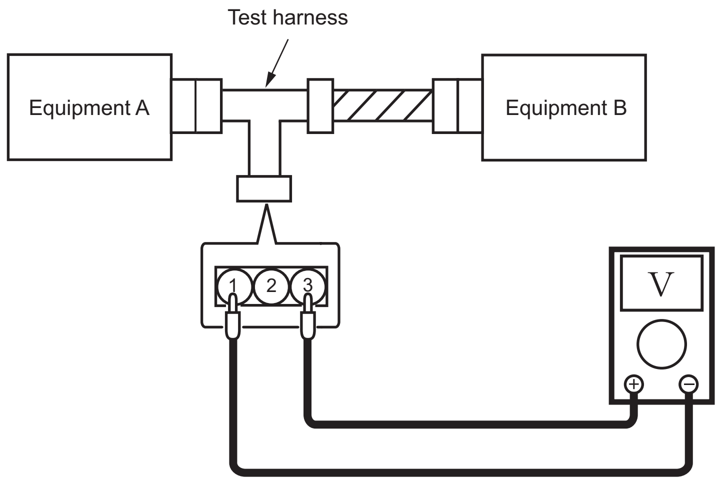
TS-10005

Inspection procedure

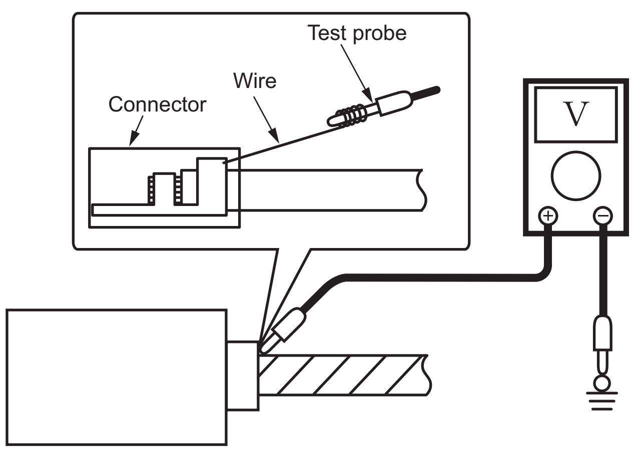
① Connect the connectors of equipment A and that of equipment B.

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.

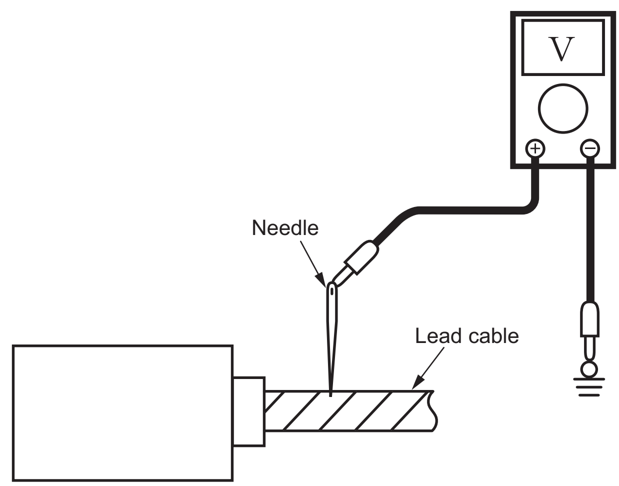
• Measurement using a test harness



• Measurement from the backside of connector



• Measurement on a lead cable



TS-10006

Measurement method

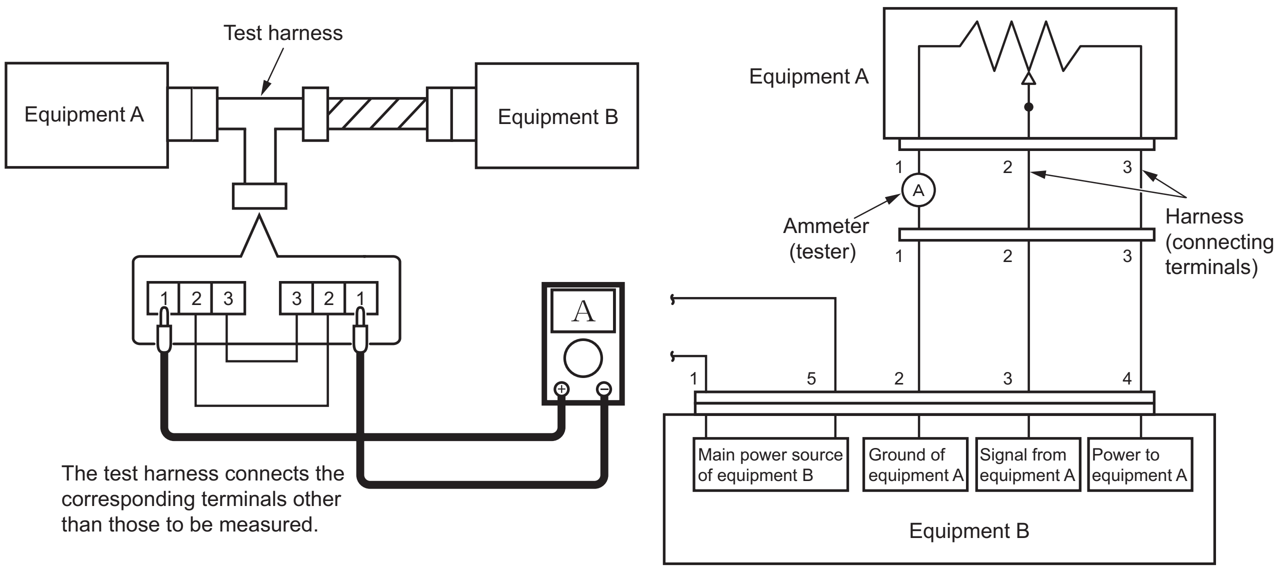
For measurement of voltage, connect the tester probes in parallel to the portion to be measured. Because the voltage can be measured only when the connector is connected in position, contact the tester probes to the terminals without disconnecting the connector. The following methods are available:

- 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.

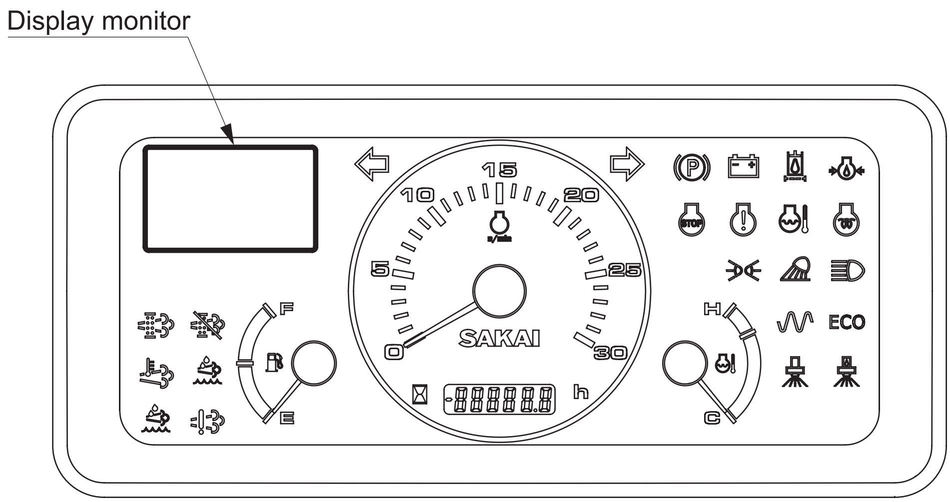
6) Harness check

- 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

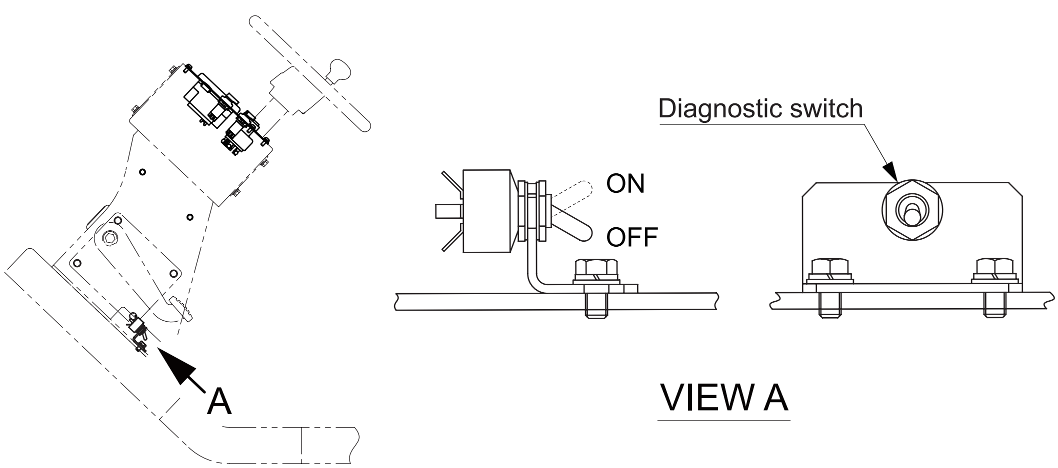
2-2-1. Description of fault code (SPN,FMI)

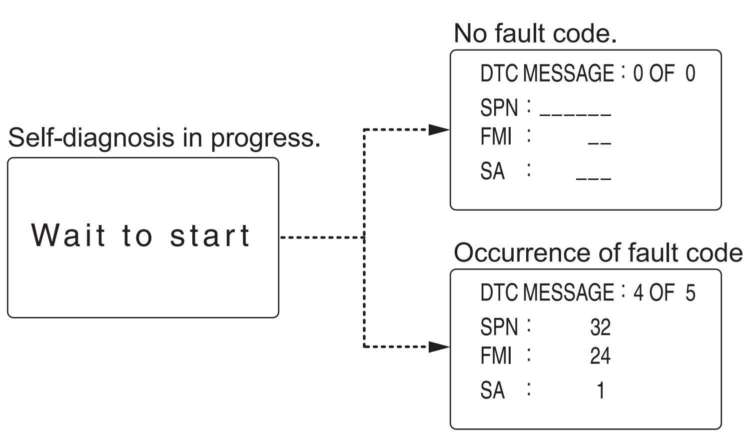
- When a fault code (SPN,FMI) occurs, display a fault code on the display monitor in the combination meter.



SV544-09001

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





SV544-09002

2-2-2. Fault code list

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(NOTICE)

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

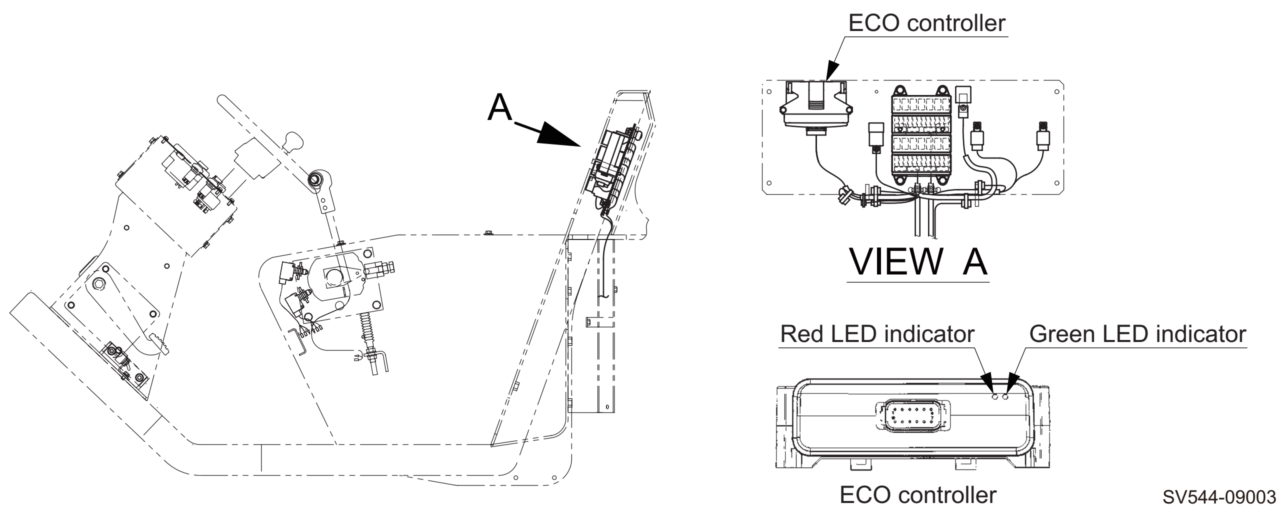
2-3. Error Codes

The ECO controller processes signals from the vibration select switch and the throttle switch to control the discharge rate and direction of the vibrator pump. The ECO controller monitors the state of the motor rotation sensors (front and rear) that are connected to the T/C controller via CAN, in order to control the torque in accordance with the road surface condition. (Anti-spin control)

The ECO controller has safeguard features (error detection, error display and error bypass action) and displays each status with LED indicators.

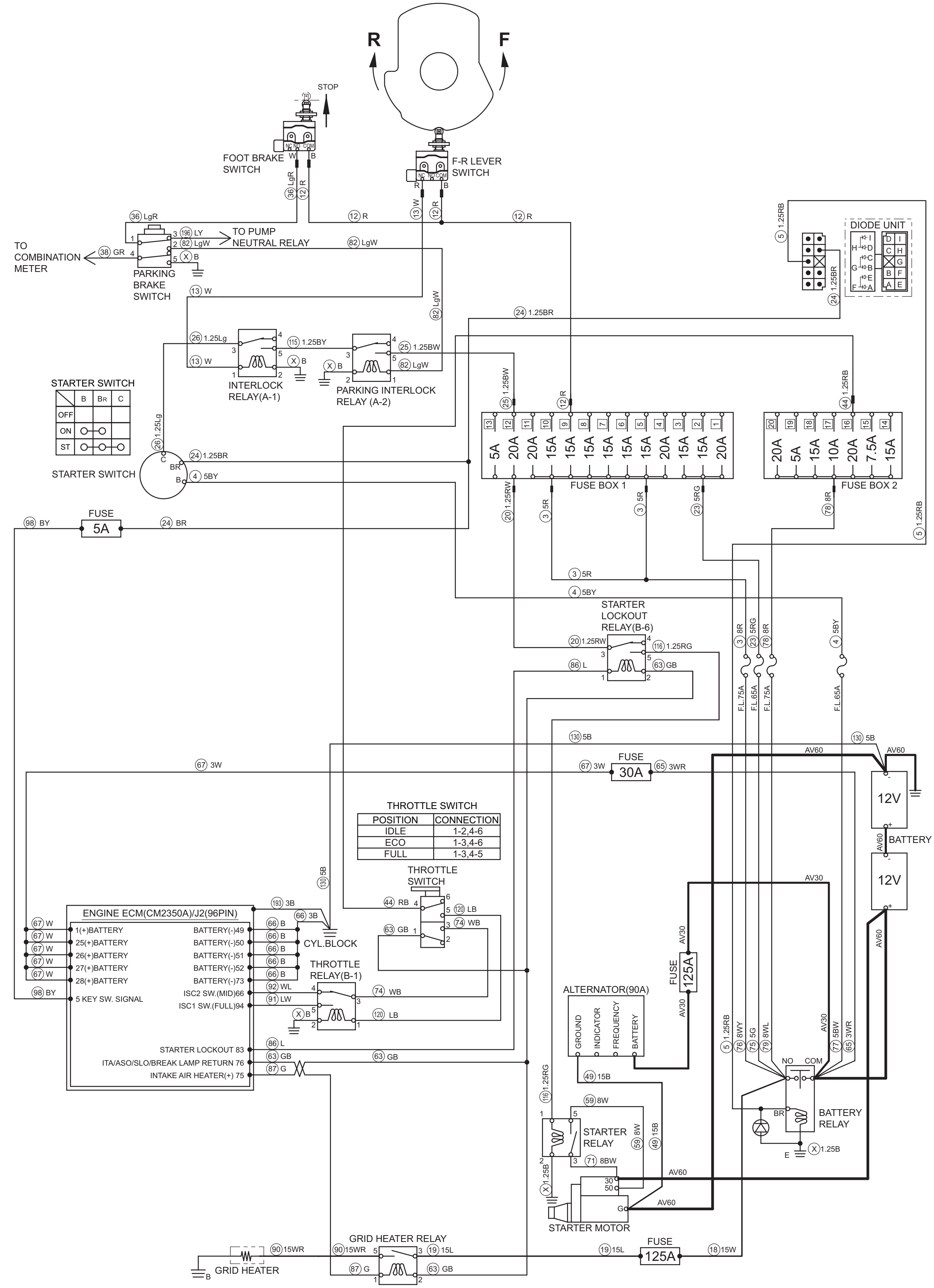
Normal : Red LED OFF, green LED ON

Abnormal : An error code depending on the error type is indicated by a combination of long and short red LED blinks. (Error code can be viewed when using the service tool) If more than one error occur at the same time, the sum of the error codes is output.



Number of red LED blinks	Error occurred at	Description	Error code	Error bypass action
1 long, 1 short	Speed change solenoid (F)	Signal wire short-circuited	1	Speed is changed to 1st immediately.
1 long, 2 short		Signal wire open-circuited	2	
1 long, 3 short	Speed change solenoid (R)	Signal wire short-circuited	1	
1 long, 4 short		Signal wire open-circuited	2	
1 long, 7 short	ECU tachometer sensor	Engine rotation speed is lowered	-	
2 long, 1 short	Vibrator proportional solenoid 1 for low amplitude	Signal wire short-circuited	1	Both solenoids 1 and 2 stop the current output immediately.
2 long, 2 short	Vibrator proportional solenoid 1 for low amplitude	Signal wire open-circuited	2	
2 long, 3 short	Vibrator proportional solenoid 2 for high amplitude	Signal wire short-circuited	1	
2 long, 4 short	Vibrator proportional solenoid 2 for high amplitude	Signal wire open-circuited	2	

Fig.: 2-4-1



SV544-09004

2-4. 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.

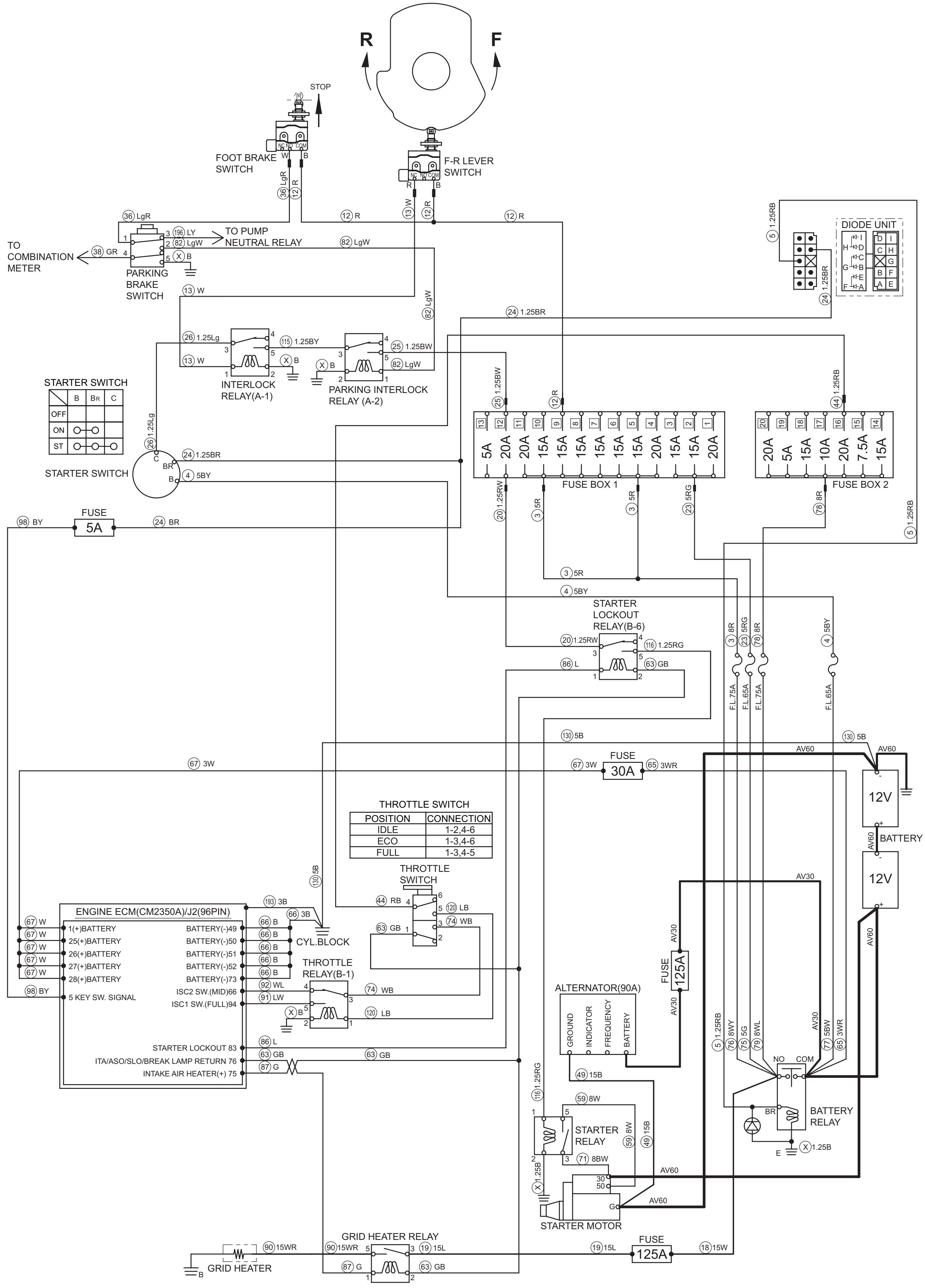
2-4-1. Engine will not start (Starter motor does not run) 1/3

- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Brake pedal is not depressed.

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Battery	• Measure battery voltage or specific gravity. Standard voltage : 24 V or more Standard gravity : 1.26 or more • If value is below standard, battery capacity is insufficient.	Charge or replace battery.
2. Starter Switch	• Check continuity between O-O according to starter switch connection table. Switch is OK if there is continuity between connection O-O. • If there is no continuity, starter switch is faulty.	Replace starter switch.
3. Starter Motor	(1) When starter switch is ON, measure voltage between starter motor terminal 30 and chassis ground. Standard voltage : 24 V or more (2) When starter switch is START, measure voltage between starter motor terminal 50 and chassis ground. Standard voltage : 24 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. Diode Unit	(1) When starter switch is ON, measure voltage between diode unit terminal C inlet wire BR and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between diode unit terminal G outlet wire RB and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, diode unit is faulty.	Replace starter relay.
5. Battery Relay	(1) When starter switch is OFF, measure voltage between battery relay primary terminal COM and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between battery relay coil terminal BR inlet wire RB and coil ground terminal E. Standard voltage : 24 V or more (3) When starter switch is ON, measure voltage between battery relay secondary terminal NO and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, battery relay is faulty.	Replace battery relay.

Fig.: 2-4-1



SV544-09004

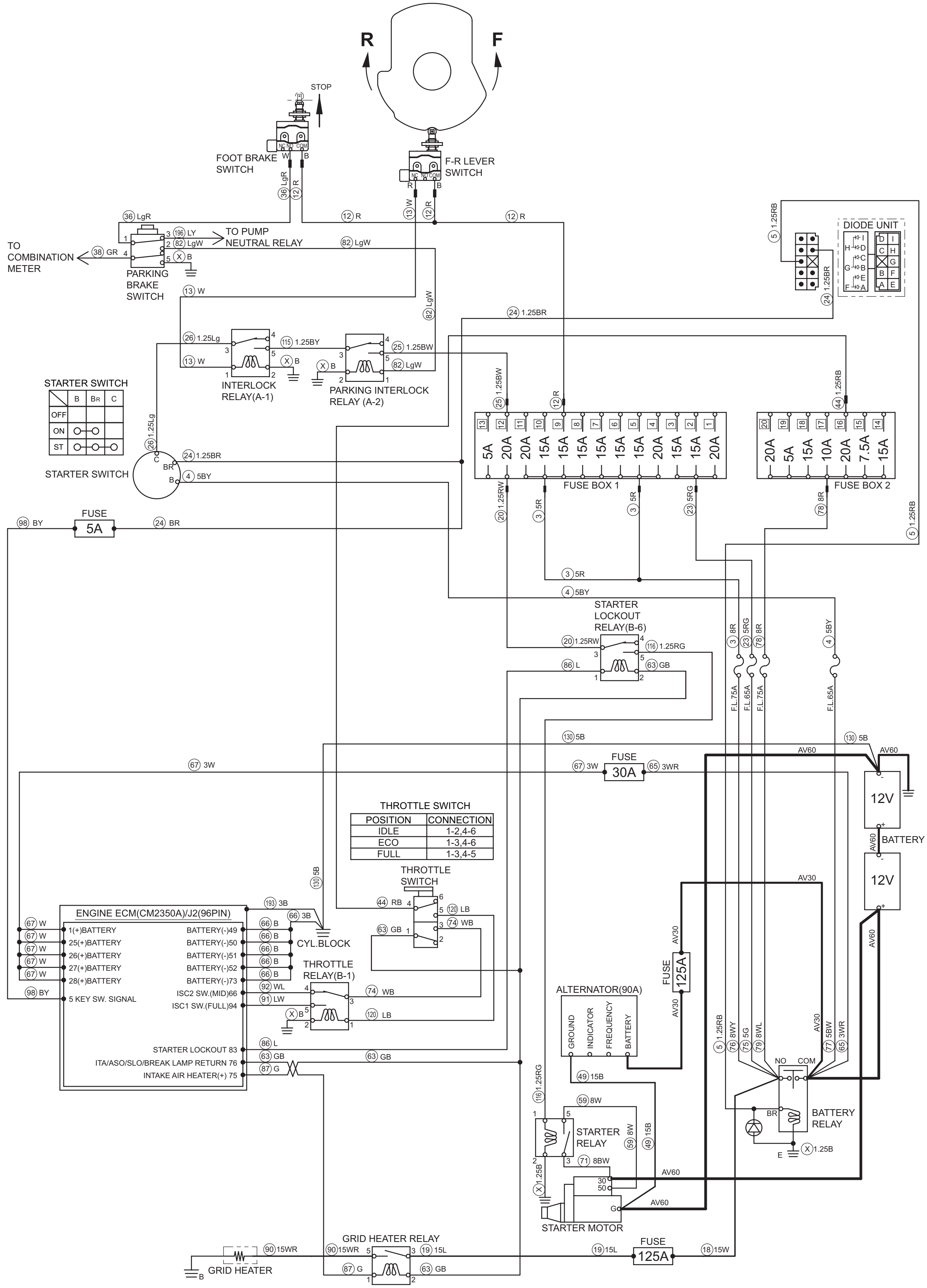
2-4-1. Engine will not start (Starter motor does not run) 2/3

- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Brake pedal is not depressed.

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
6. Starter Lockout Relay (B-6)	(1) When starter switch is ON, measure voltage between starter lockout relay terminal 1 inlet wire L and chassis ground. Standard voltage : 24 V or more (2) When starter switch is START, measure voltage between starter lockout relay terminal 3 inlet wire RW and chassis ground. Standard voltage : 24 V or more (3) When starter switch is START, measure voltage between starter lockout relay terminal 5 outlet wire RG and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, starter lockout relay is faulty.	Replace starter lockout relay (B-6).
7. Starter Relay	(1) When starter switch is START, measure voltage between starter relay terminal 1 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between starter relay terminal 3 inlet wire BW and chassis ground. Standard voltage : 24 V or more (3) When starter switch is START, measure voltage between starter relay terminal 5 outlet wire W and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, starter relay is faulty.	Replace Starter Relay.
8. F-R Lever Switch	(1) When starter switch is ON, measure voltage between F-R lever switch terminal COM inlet wire R and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between F-R lever switch terminal NC outlet wire W and chassis ground. Standard voltage : 24 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.
9. Foot Brake Switch	(1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire R and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between foot brake switch terminal NO outlet wire LgR and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, foot brake switch is faulty.	Replace foot brake switch.

Fig.: 2-4-1



SV544-09004

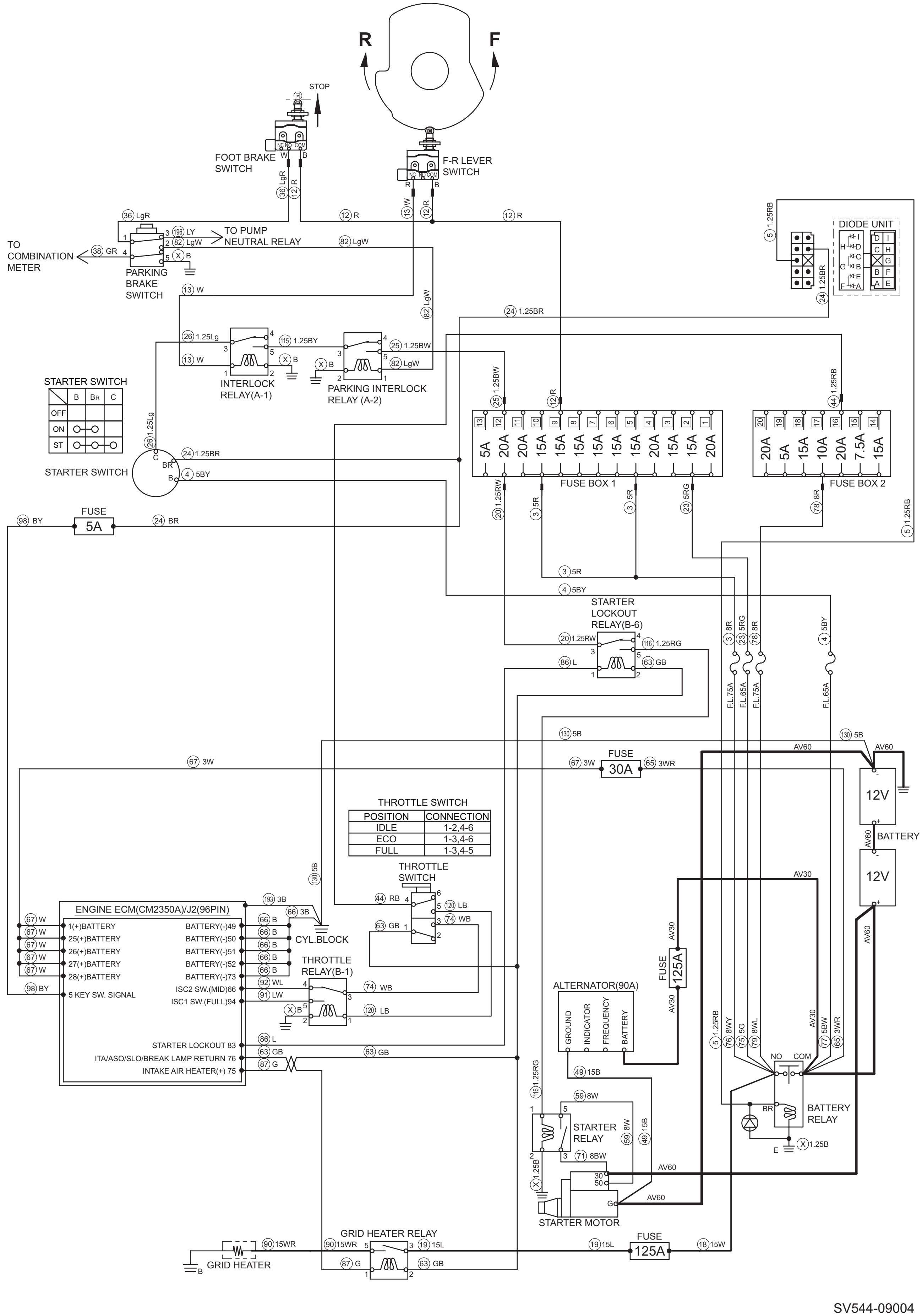
2-4-1. Engine will not start (Starter motor does not run) 3/3

- F-R lever must be in “N”.
- Parking brake switch must be applied.
- Brake pedal is not depressed.

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
10. Parking Brake Switch	(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire LgR and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between parking brake switch terminal 2 outlet wire LgW and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, parking brake switch is faulty.	Replace parking brake switch.
11. Interlock Relay (A-1)	(1) When starter switch is ON, measure voltage between interlock relay terminal 1 inlet wire W and chassis ground. Standard voltage : 24 V or more (2) When starter switch is START, measure voltage between interlock relay terminal 3 inlet wire Lg and chassis ground. Standard voltage : 24 V or more (3) When starter switch is START, measure voltage between interlock relay terminal 5 outlet wire BY and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, interlock relay is faulty.	Replace interlock relay (A-1).
12. Parking Interlock Relay (A-2)	(1) When starter switch is ON, measure voltage between parking interlock relay terminal 1 inlet wire LgW and chassis ground. Standard voltage : 24 V or more (2) When starter switch is START, measure voltage between parking interlock relay terminal 3 inlet wire BY and chassis ground. Standard voltage : 24 V or more (3) When starter switch is START, measure voltage between parking interlock relay terminal 5 outlet wire BW and chassis ground. Standard voltage : 24 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 (A-2).
13. 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



	B	BR	C
OFF			
ON	○	○	
ST	○	○	○

THROTTLE SWITCH

POSITION	CONNECTION
IDLE	1-2,4-6
ECO	1-3,4-6
FULL	1-3,4-5

2-4-2. No charging

Reference Fig.: 2-4-1

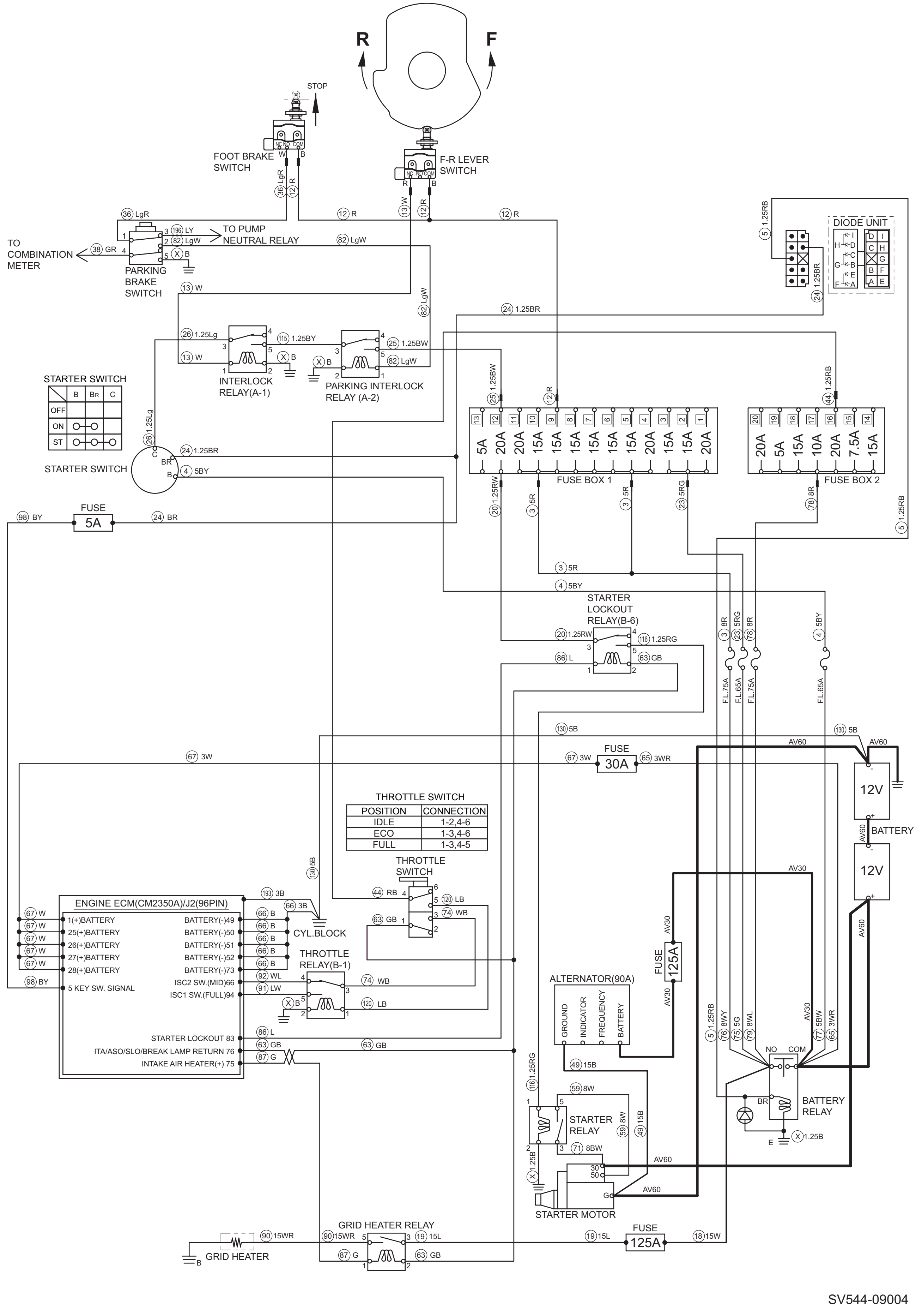
Check point	Check/Cause	Action
1. Alternator	• After starting engine, measure voltage between alternator terminal BATTERY and chassis ground. Standard voltage : At least intermediate engine speed, 27 to 29 V • If voltage is lower than standard, alternator is faulty. • If voltage is normal and battery is not charged, battery is faulty.	Replace alternator or battery.

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

Reference Fig. : 2-4-1

Check point	Check/Cause	Action
1. Grid Heater	• When starter switch is ON, measure voltage between grid heater inlet wire WR and chassis ground. Standard voltage : 24 V or more • If voltage is normal, grid heater is faulty.	Replace grid heater.
2. Grid Heater Relay	(1) When starter switch is ON, measure voltage between grid heater relay terminal 2 inlet wire GB and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between grid heater relay terminal 3 inlet wire L and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON, measure voltage between grid heater relay terminal 5 outlet wire WR and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, grid heater relay is faulty.	Replace grid heater relay.
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty. **(NOTICE)** **• If any abnormality is found in shielded twisted wires, repair is not approved. Be sure to replace them.**	Repair or replace harness.

Fig.: 2-4-1



SV544-09004

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

Reference Fig. : 2-4-1

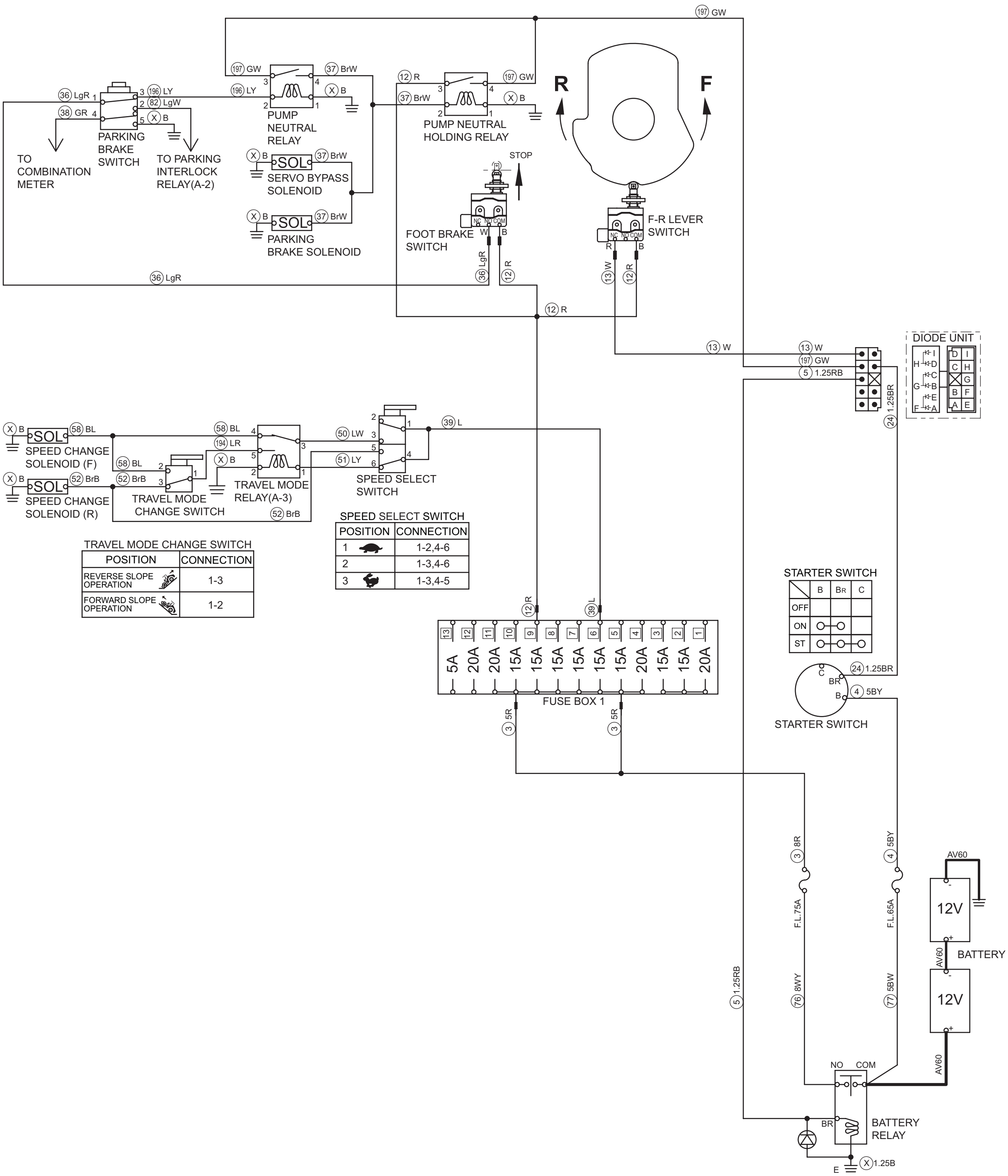
Check point	Check/Cause	Action
1. F-R Lever Switch	• When F-R lever is "F" or "R", check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition. • If there is continuity, F-R lever switch is faulty.	Replace F-R lever switch.
2. Parking Brake Switch	• When parking brake switch is released position, check continuity between parking brake switch terminal 1 and 2. There is no continuity in normal condition. • If there is continuity, parking brake switch is faulty.	Replace parking brake switch.

2-4-5. Engine speed cannot be switched

Reference Fig. : 2-4-1

Check point	Check/Cause	Action
1. Throttle Switch	(1) When throttle switch is "IDLE", check continuity between throttle switch terminals 1 and 2, 4 and 6. There is continuity in normal condition. (2) When throttle switch is "ECO", check continuity between throttle switch terminals 1 and 3, 4 and 6. There is continuity in normal condition. (3) When throttle switch is "FULL", check continuity between throttle switch terminals 1 and 3, 4 and 5. There is continuity in normal condition. • If above item (1), (2) or (3) is NG, throttle switch is faulty.	Replace throttle switch.
2. Throttle Relay (B-1)	(1) When starter switch is ON and throttle switch is "FULL", measure voltage between throttle relay terminal 1 inlet wire LB and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and throttle switch is "FULL" or "ECO", measure voltage between throttle relay terminal 3 inlet wire WB and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and throttle switch is "FULL", measure voltage between throttle relay terminal 5 outlet wire LW and chassis ground. There is electricity in normal condition. (4) When starter switch is ON and throttle switch is "ECO", measure voltage between throttle relay terminal 4 outlet wire WL and chassis ground. There is electricity in normal condition. • If above items (1) and (2) are OK and item (3) or (4) is NG, throttle relay is faulty.	Replace throttle relay (B-1).
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



TRAVEL MODE CHANGE SWITCH

POSITION	CONNECTION
REVERSE SLOPE OPERATION	1-3
FORWARD SLOPE OPERATION	1-2

SPEED SELECT SWITCH

POSITION	CONNECTION
1	1-2,4-6
2	1-3,4-6
3	1-3,4-5

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

SV544-09005

2-5. Propulsion

Check following items before troubleshooting.

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

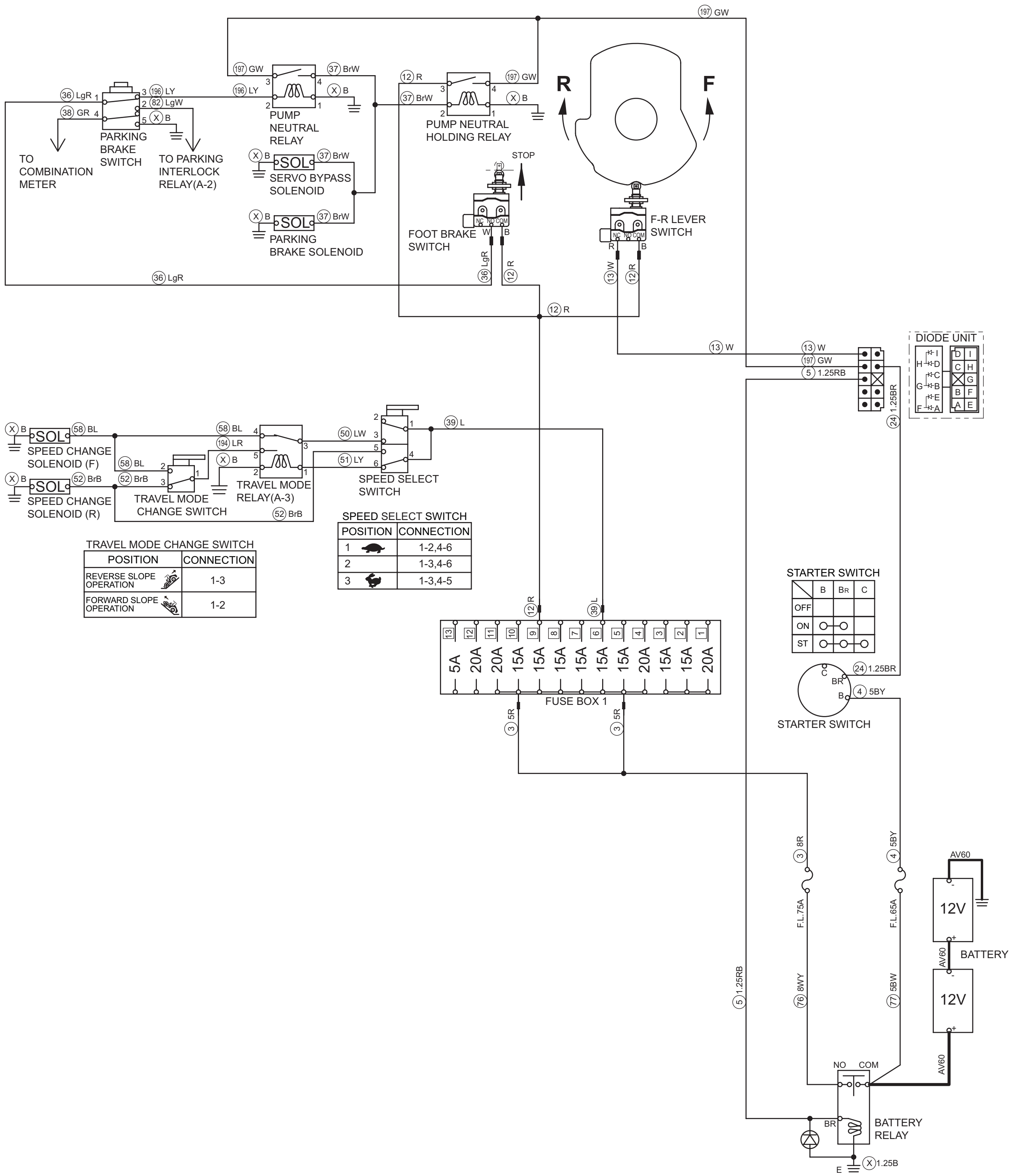
2-5-1. Machine moves neither forward nor backward 1/3

- Parking brake switch must be released.
- Brake pedal is not depressed.
- F-R lever must be in “N”.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Parking Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance : 45 ± 4.5 Ω • If measured resistance is abnormal, parking brake solenoid is faulty.	Replace parking brake solenoid.
2. Servo Bypass Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance : 45 ± 4.5 Ω • If measured resistance is abnormal, servo bypass solenoid is faulty.	Replace servo bypass solenoid.
3. Foot Brake Switch	(1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire R and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between foot brake switch terminal NO outlet wire LgR and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, foot brake switch is faulty.	Replace foot brake switch.
4. Parking Brake Switch	(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire LgR and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire LY and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, parking brake switch is faulty.	Replace parking brake switch.

Fig.: 2-5-1



TRAVEL MODE CHANGE SWITCH	
POSITION	CONNECTION
REVERSE SLOPE OPERATION	1-3
FORWARD SLOPE OPERATION	1-2

SPEED SELECT SWITCH	
POSITION	CONNECTION
1	1-2,4-6
2	1-3,4-6
3	1-3,4-5

STARTER SWITCH	B	BR	C
OFF			
ON	○	○	
ST	○	○	○

SV544-09005

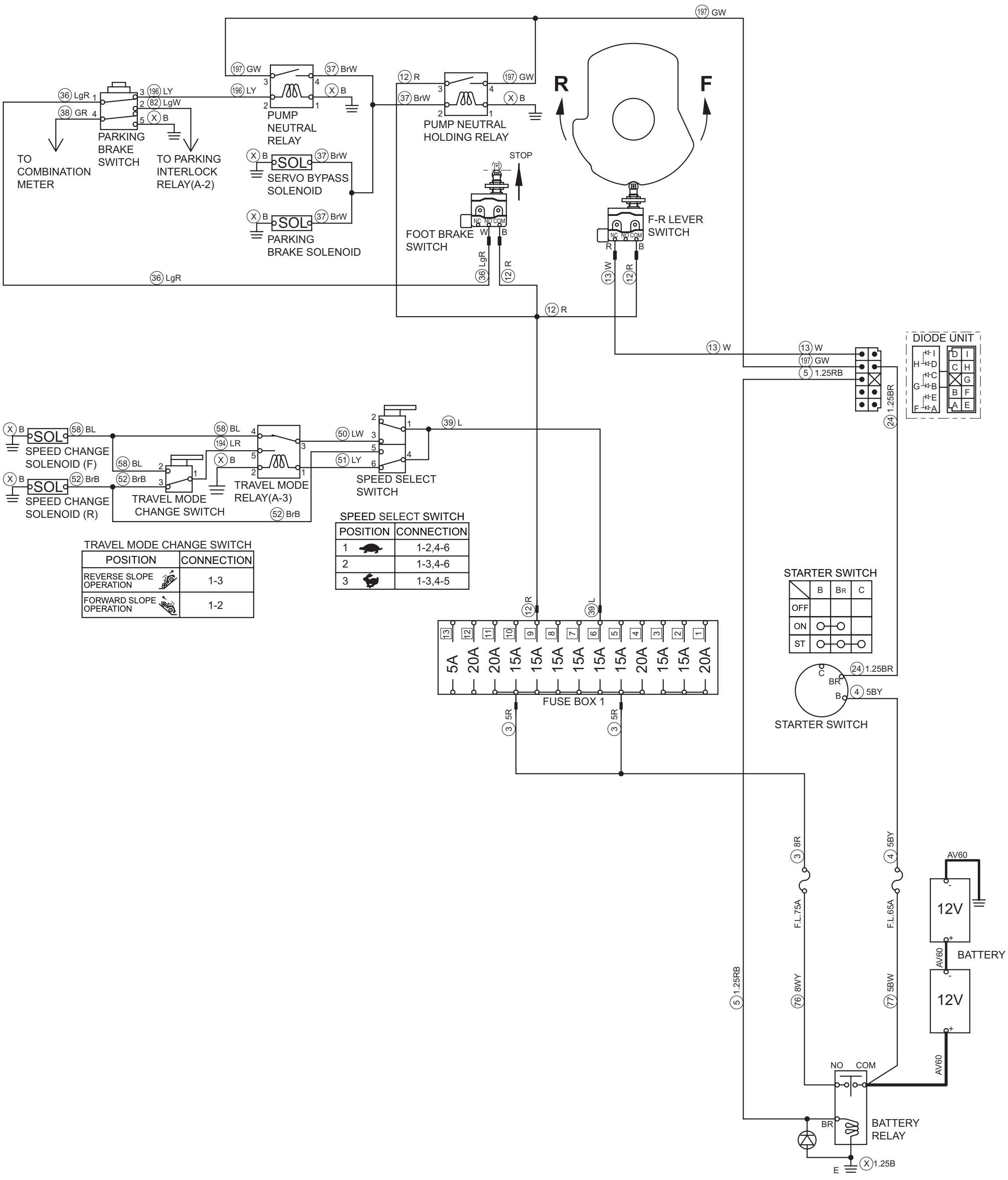
2-5-1. Machine moves neither forward nor backward 2/3

- Parking brake switch must be released.
- Brake pedal is not depressed.
- F-R lever must be in “N”.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
5. Pump Neutral Relay	(1) When starter switch is ON, measure voltage between pump neutral relay terminal 2 inlet wire LY and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and F-R lever is “F” or “R”, measure voltage between pump neutral relay terminal 3 inlet wire GW and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and F-R lever is “F” or “R”, measure voltage between pump neutral relay terminal 4 outlet wire BrW and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, pump neutral relay is faulty.	Replace pump neutral relay.
6. Pump Neutral Holding Relay	(1) When starter switch is ON, measure voltage between pump neutral holding relay terminal 2 inlet wire BrW and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between pump neutral holding relay terminal 3 inlet wire R and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON, measure voltage between pump neutral holding relay terminal 4 outlet wire GW and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, pump neutral holding relay is faulty.	Replace pump neutral holding relay.
7. Diode Unit	(1) When starter switch is ON, measure voltage between diode unit terminal I inlet wire W and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between diode unit terminal H outlet wire GW and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, diode unit is faulty.	Replace diode unit.
8. F-R Lever Switch	(1) When starter switch is ON, measure voltage between F-R lever switch terminal COM inlet wire R and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between F-R lever switch terminal NC outlet wire W and chassis ground. Standard voltage : 24 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.

Fig.: 2-5-1



SPEED SELECT SWITCH

POSITION	CONNECTION
1	1-2,4-6
2	1-3,4-6
3	1-3,4-5

TRAVEL MODE CHANGE SWITCH

POSITION	CONNECTION
REVERSE SLOPE OPERATION	1-3
FORWARD SLOPE OPERATION	1-2

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

SV544-09005

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

- Parking brake switch must be released.
- Brake pedal is not depressed.
- F-R lever must be in “N”.

Reference Fig.: 2-5-1

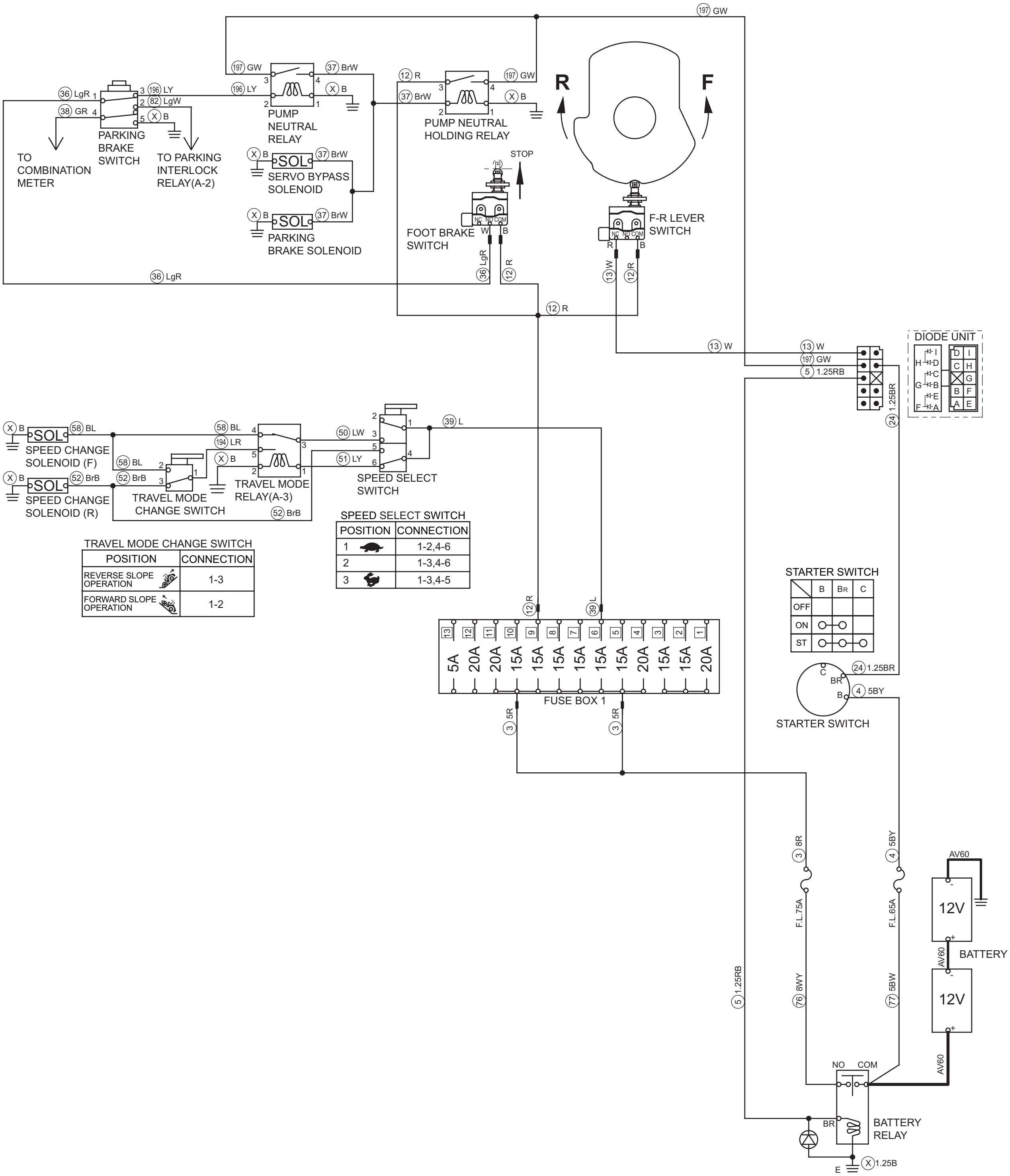
Check point	Check/Cause	Action
9. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

2-5-2. Machine speed cannot be changed

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Speed Change Solenoid (F)	• Disconnect harness and measure resistance of coil. Standard resistance : 45 $\pm$ 4.5 Ω • If measured resistance is abnormal, speed change solenoid (F) is faulty.	Replace speed change solenoid (F).
2. Speed Change Solenoid (R)	• Disconnect harness and measure resistance of coil. Standard resistance : 20 Ω • If measured resistance is abnormal, speed change solenoid (R) is faulty.	Replace speed change solenoid (R).
3. Speed Select Switch	(1) When starter switch is ON, measure voltage between speed select switch terminal 1, 4 inlet wire L and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and speed select switch is “2”, measure voltage between speed select switch terminal wires and chassis ground. • Speed select switch terminal 3 outlet wire LW and chassis ground. • Speed select switch terminal 6 outlet wire LY and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and speed select switch is “  ”, measure voltage between speed select switch terminal wires and chassis ground. • Speed select switch terminal 3 outlet wire LW and chassis ground. • Speed select switch terminal 5 outlet wire BrB and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) or (3) is NG, speed select switch is faulty.	Replace speed select switch.
4. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



SPEED SELECT SWITCH

POSITION	CONNECTION
1	1-2,4-6
2	1-3,4-6
3	1-3,4-5

TRAVEL MODE CHANGE SWITCH

POSITION	CONNECTION
REVERSE SLOPE OPERATION	1-3
FORWARD SLOPE OPERATION	1-2

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

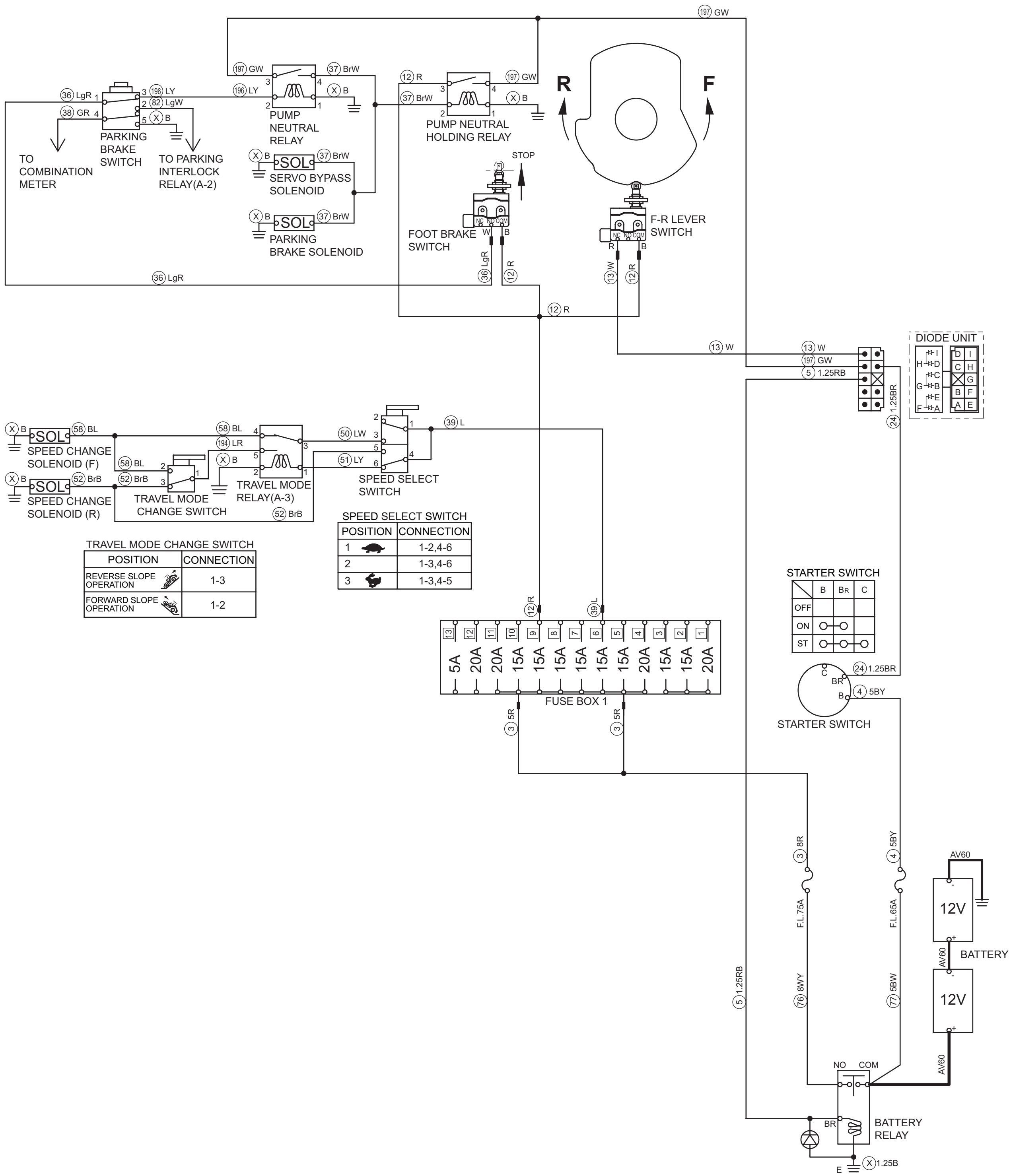
SV544-09005

2-5-3. Travel mode cannot be changed 1/2

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Speed Change Solenoid (F)	• Disconnect harness and measure resistance of coil. Standard resistance : 45 ± 4.5 Ω • If measured resistance is abnormal, speed change solenoid (F) is faulty.	Replace speed change solenoid (F).
2. Speed Change Solenoid (R)	• Disconnect harness and measure resistance of coil. Standard resistance : 20 Ω • If measured resistance is abnormal, speed change solenoid (R) is faulty.	Replace speed change solenoid (R).
3. Speed Select Switch	(1) When starter switch is ON, measure voltage between speed select switch terminal 1, 4 inlet wire L and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and speed select switch is "  ", measure voltage between speed select switch terminal 6 outlet wire LY wires and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and speed select switch is "2", measure voltage between speed select switch terminal wires and chassis ground. • Speed select switch terminal 3 outlet wire LW and chassis ground. • Speed select switch terminal 6 outlet wire LY and chassis ground. Standard voltage : 24 V or more (4) When starter switch is ON and speed select switch is "  ", measure voltage between speed select switch terminal wires and chassis ground. • Speed select switch terminal 3 outlet wire LW and chassis ground. • Speed select switch terminal 5 outlet wire BrB and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2), (3) or (4) is NG, speed select switch is faulty.	Replace speed select switch.
4. Travel Mode Relay (A-3)	(1) When starter switch is ON and travel mode change switch is "2", measure voltage between travel mode relay terminal 1 inlet wire LY and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and travel mode change switch is "2", measure voltage between travel mode relay terminal 3 inlet wire LW and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and travel mode change switch is "2", measure voltage between travel mode relay terminal 5 outlet wire LR and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, travel mode relay is faulty.	Replace travel mode relay (A-3).

Fig.: 2-5-1



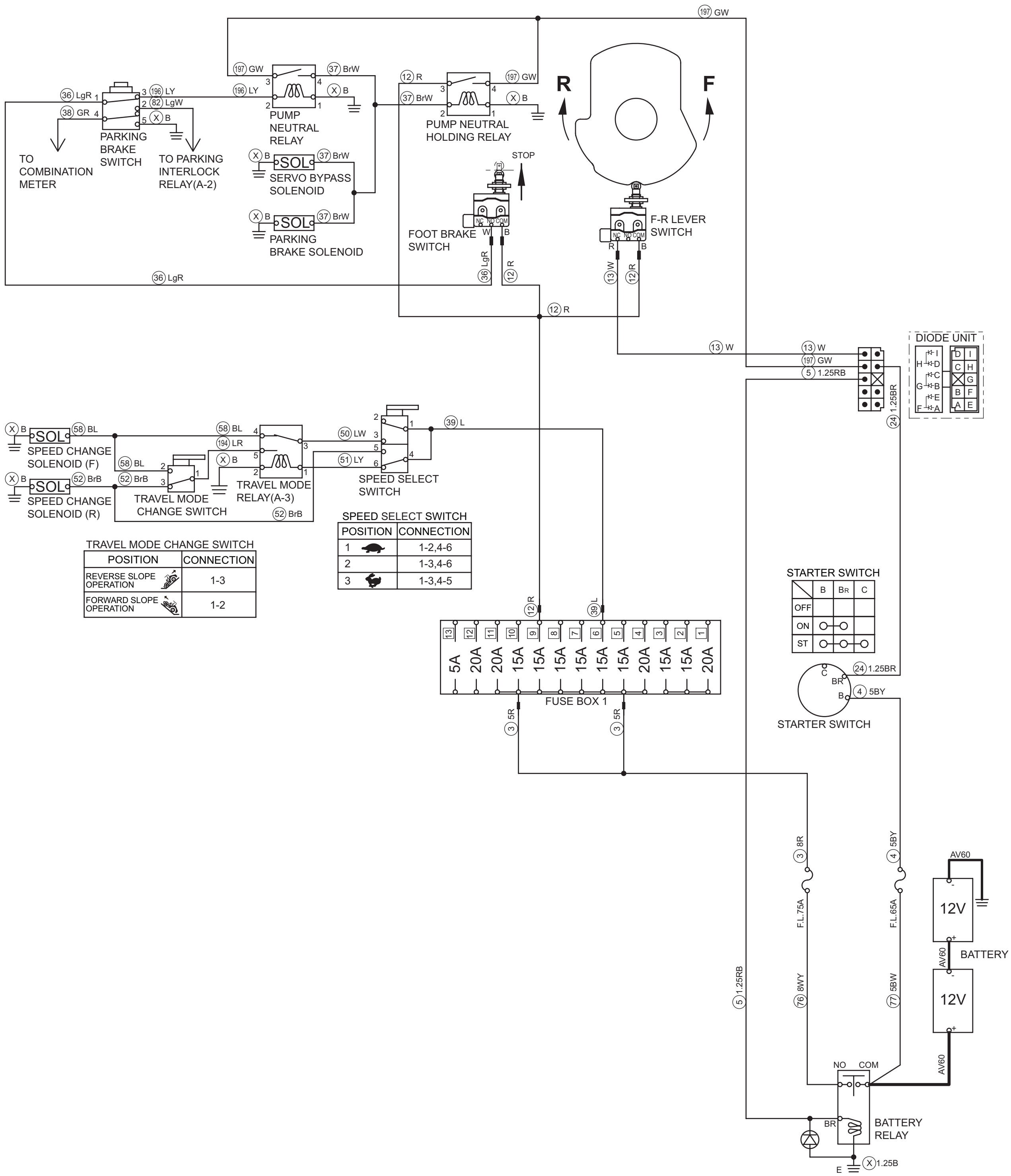
SV544-09005

2-5-3. Travel mode cannot be changed 2/2

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
5. Travel Mode Change Switch	(1) When starter switch is ON and travel mode change switch is “2”, measure voltage between travel mode change switch terminal 1 inlet wire LR and chasiss ground. Standard voltage : 24 V or more (2) When starter switch is ON and travel mode change switch is “  ”, measure voltage between travel mode change switch terminal 3 inlet wire BrB and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and travel mode change switch is “  ”, measure voltage between travel mode change switch terminal 2 inlet wire BL and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) or (3) is NG, travel mode change switch is faulty.	Replace travel mode change switch.
6. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



TRAVEL MODE CHANGE SWITCH

POSITION	CONNECTION
REVERSE SLOPE OPERATION	1-3
FORWARD SLOPE OPERATION	1-2

SPEED SELECT SWITCH

POSITION		CONNECTION
1	(turtle)	1-2,4-6
2		1-3,4-6
3	(rabbit)	1-3,4-5

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

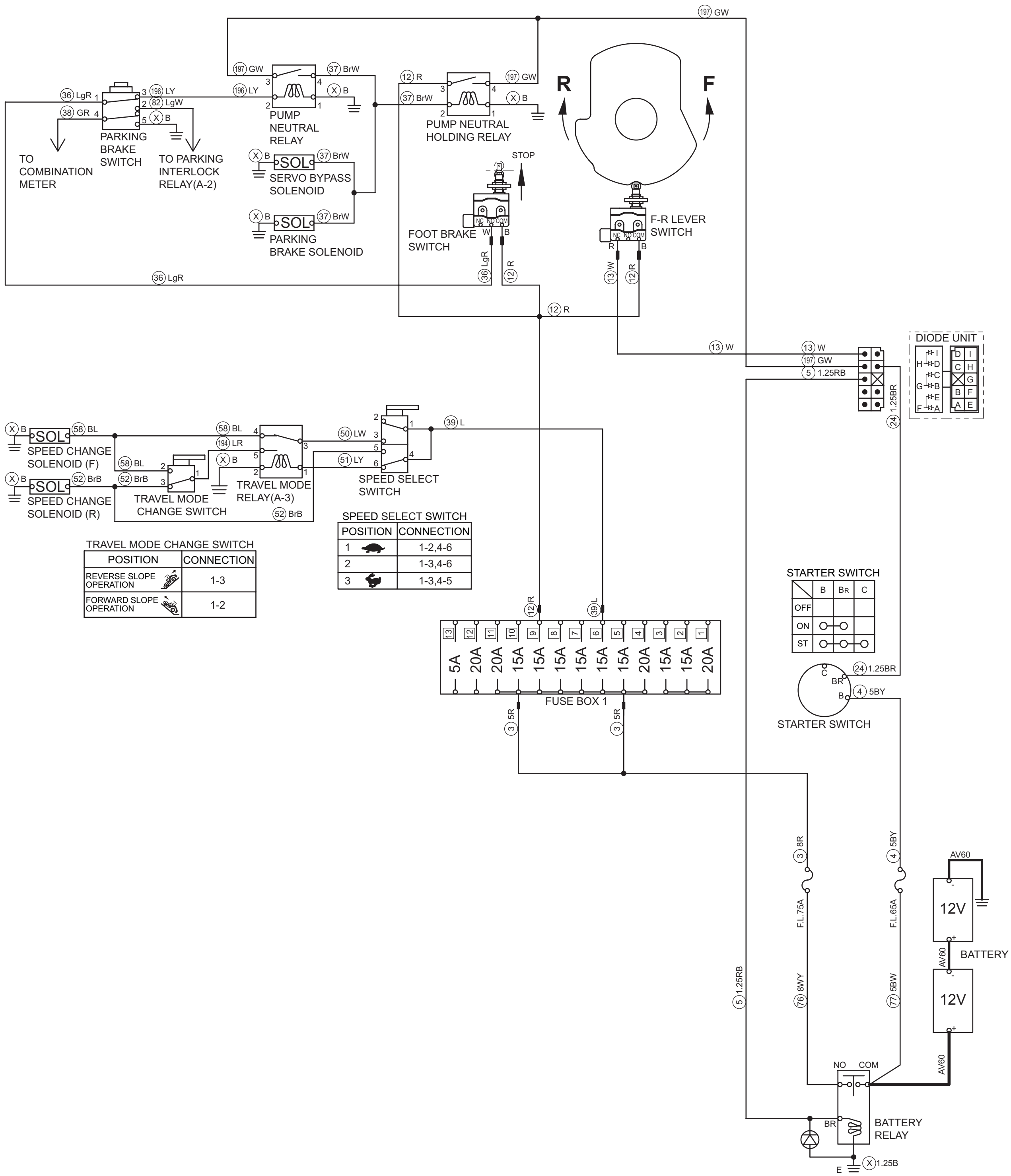
2-5-4. Brake cannot be released 1/2

- Parking brake switch must be released.
- Brake pedal is not depressed.
- F-R lever must be in “N”.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Parking Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance : 45 $\pm$ 4.5 Ω • If measured resistance is abnormal, parking brake solenoid is faulty.	Replace parking brake solenoid.
2. Foot Brake Switch	(1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire R and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between foot brake switch terminal NO outlet wire LgR and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, foot brake switch is faulty.	Replace foot brake switch.
3. Parking Brake Switch	(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire LgR and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire LY and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, parking brake switch is faulty.	Replace parking brake switch.
4. Pump Neutral Relay	(1) When starter switch is ON, measure voltage between pump neutral relay terminal 2 inlet wire LY and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and F-R lever is “F” or “R”, measure voltage between pump neutral relay terminal 3 inlet wire GW and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and F-R lever is “F” or “R”, measure voltage between pump neutral relay terminal 4 outlet wire BrW and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, pump neutral relay is faulty.	Replace pump neutral relay.

Fig.: 2-5-1



SPEED SELECT SWITCH

POSITION	CONNECTION
1	1-2,4-6
2	1-3,4-6
3	1-3,4-5

TRAVEL MODE CHANGE SWITCH

POSITION	CONNECTION
REVERSE SLOPE OPERATION	1-3
FORWARD SLOPE OPERATION	1-2

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

SV544-09005

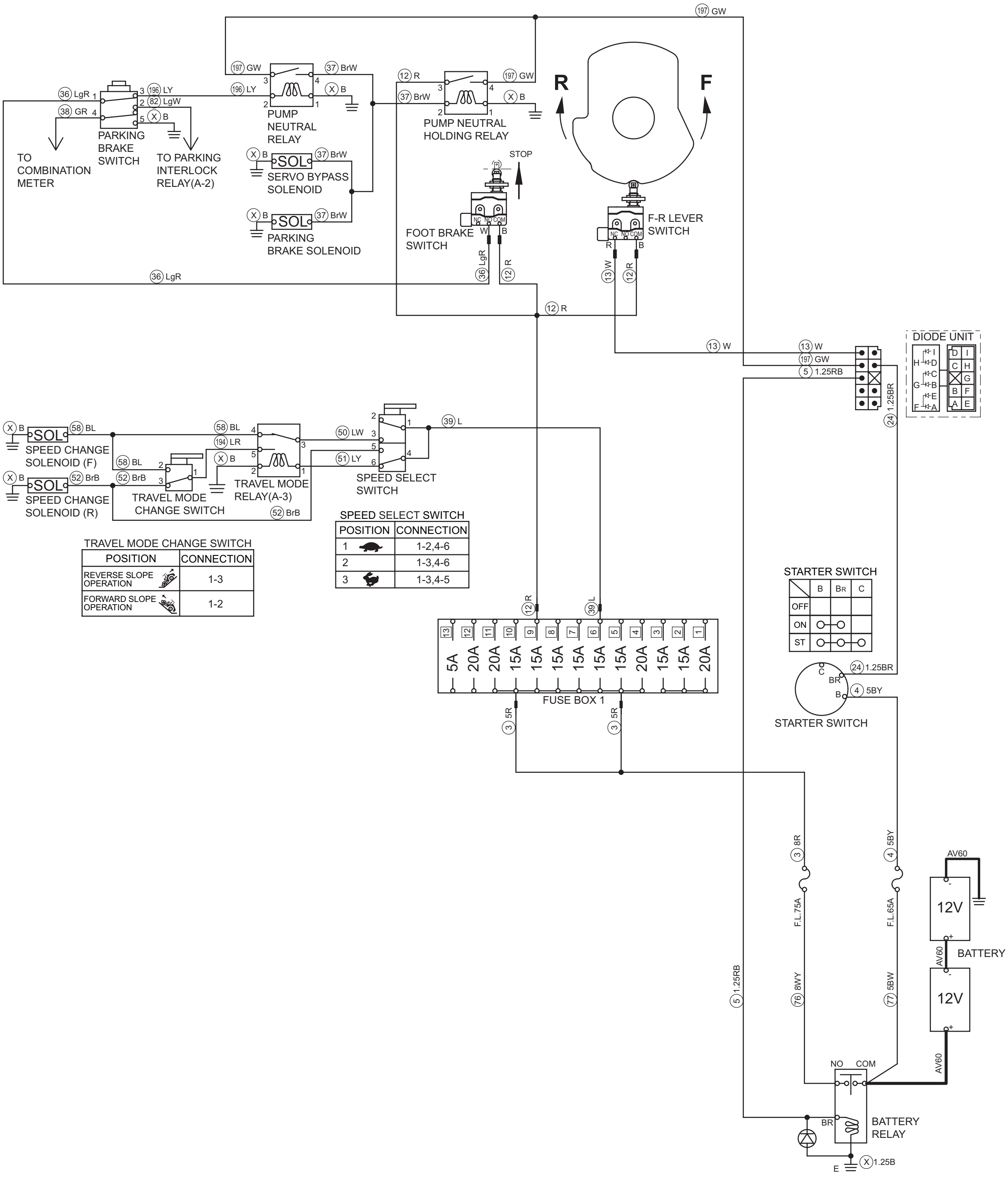
2-5-4. Brake cannot be released 2/2

- Parking brake switch must be released.
- Brake pedal is not depressed.
- F-R lever must be in “N”.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
5. Pump Neutral Holding Relay	(1) When starter switch is ON, measure voltage between pump neutral holding relay terminal 2 inlet wire BrW and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between pump neutral holding relay terminal 3 inlet wire R and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON, measure voltage between pump neutral holding relay terminal 4 outlet wire GW and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, pump neutral holding relay is faulty.	Replace pump neutral holding relay.
6. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-5-1



SPEED SELECT SWITCH

POSITION	CONNECTION
1	1-2,4-6
2	1-3,4-6
3	1-3,4-5

TRAVEL MODE CHANGE SWITCH

POSITION	CONNECTION
REVERSE SLOPE OPERATION	1-3
FORWARD SLOPE OPERATION	1-2

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

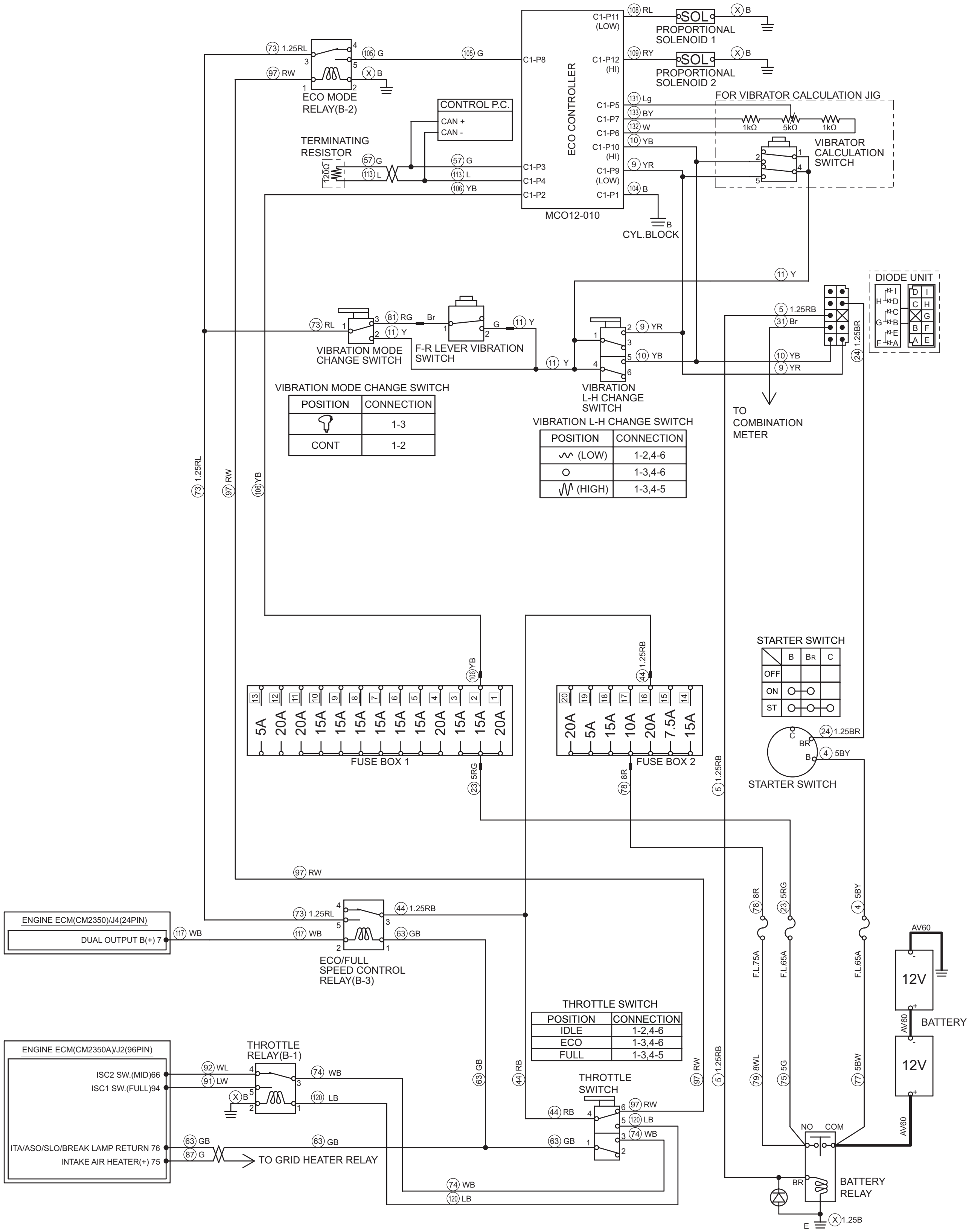
2-5-5. Brake does not work

- Parking brake switch must be applied.
- Brake pedal is depressed.
- F-R lever must be in “N”.

Reference Fig.: 2-5-1

Check point	Check/Cause	Action
1. Parking Brake Solenoid	• Disconnect harness and measure resistance of coil. Standard resistance : 45 ± 4.5 Ω • If measured resistance is abnormal, parking brake solenoid is faulty.	Replace parking brake solenoid.
2. Parking Brake Switch	• When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire LY and chassis ground. There is no electricity in normal condition. • If there is electricity, parking brake switch is faulty.	Replace parking brake switch.
3. Foot Brake Switch	• When starter switch is ON, measure voltage between foot brake switch terminal NO outlet wire LgR and chassis ground. There is no electricity in normal condition. • If there is electricity, foot brake switch is faulty.	Replace foot brake switch.
4. Pump Neutral Relay	(1) When starter switch is ON, measure voltage between pump neutral relay terminal 2 inlet wire LY and chassis ground. There is no electricity in normal condition. (2) When starter switch is ON, measure voltage between pump neutral relay terminal 4 outlet wire BrW and chassis ground. There is no electricity in normal condition. • If above items (1) is OK and item (2) is NG, pump neutral relay is faulty.	Replace pump neutral relay.
5. Pump Neutral Holding Relay	(1) When starter switch is ON, measure voltage between pump neutral holding relay terminal 2 inlet wire BrW and chassis ground. There is no electricity in normal condition. (2) When starter switch is ON, measure voltage between pump neutral holding relay terminal 4 outlet wire GW and chassis ground. There is no electricity in normal condition. • If above items (1) is OK and item (2) is NG, pump neutral holding relay is faulty.	Replace pump neutral holding relay.
6. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-6-1



SV544-09006

2-6. Vibration

Check following items before troubleshooting.

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

2-6-1. No vibration occurs 1/3

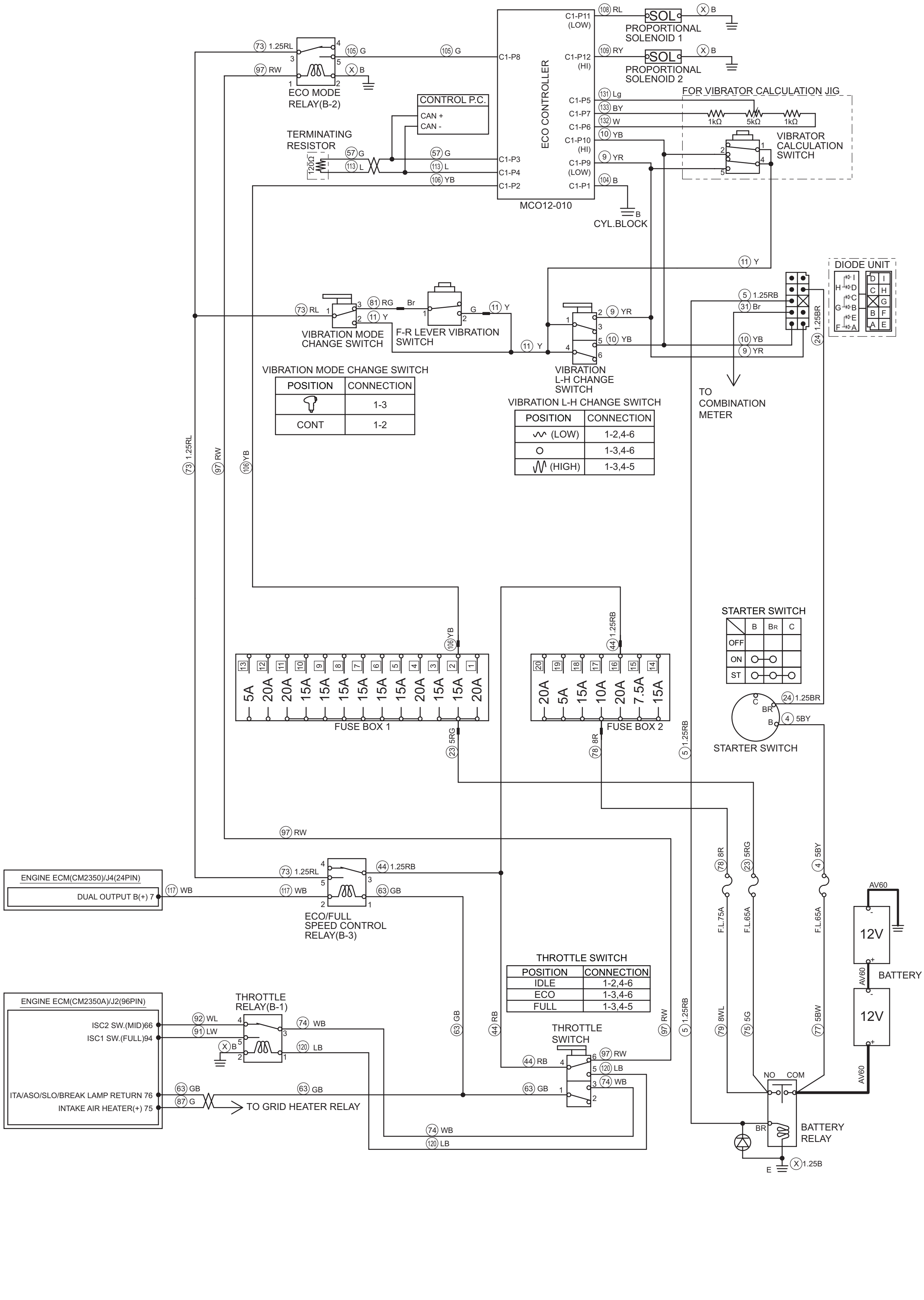
- Vibration mode change switch must be “CONT”.
- Vibration L-H change switch must not be “○”.

1) When red LED shows no blink.

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
1. Proportional Solenoid 1	• Disconnect harness and measure resistance of coil. Standard resistance : 36 Ω • If resistance is abnormal, proportional solenoid 1 is faulty.	Replace Proportional Solenoid 1.
2. Proportional Solenoid 2	• Disconnect harness and measure resistance of coil. Standard resistance : 36 Ω • If resistance is abnormal, proportional solenoid 2 is faulty.	Replace Proportional Solenoid 2.
3. Vibration L-H Change Switch	(1) When starter switch is ON, measure voltage between vibration L-H change switch terminal 1, 4 inlet wire Y and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and vibration L-H change switch is “ ”, measure voltage between vibration L-H change switch terminal 2 outlet wire YR and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and vibration L-H change switch is “ ”, measure voltage between vibration L-H change switch terminal 5 outlet wire YB and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) or (3) is NG, vibration L-H change switch is faulty.	Replace vibration L-H change switch.
4. Vibration Mode Change Switch	(1) When starter switch is ON, measure voltage between vibration mode change switch terminal 1 inlet wire RL and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between vibration mode change switch terminal 2 outlet wire Y and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, vibration mode change switch is faulty.	Replace vibration mode change switch.

Fig.: 2-6-1



VIBRATION MODE CHANGE SWITCH

POSITION	CONNECTION
(symbol)	1-3
CONT	1-2

VIBRATION L-H CHANGE SWITCH

POSITION	CONNECTION
(LOW)	1-2,4-6
O	1-3,4-6
(HIGH)	1-3,4-5

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

THROTTLE SWITCH

POSITION	CONNECTION
IDLE	1-2,4-6
ECO	1-3,4-6
FULL	1-3,4-5

SV544-09006

2-6-1. No vibration occurs 2/3

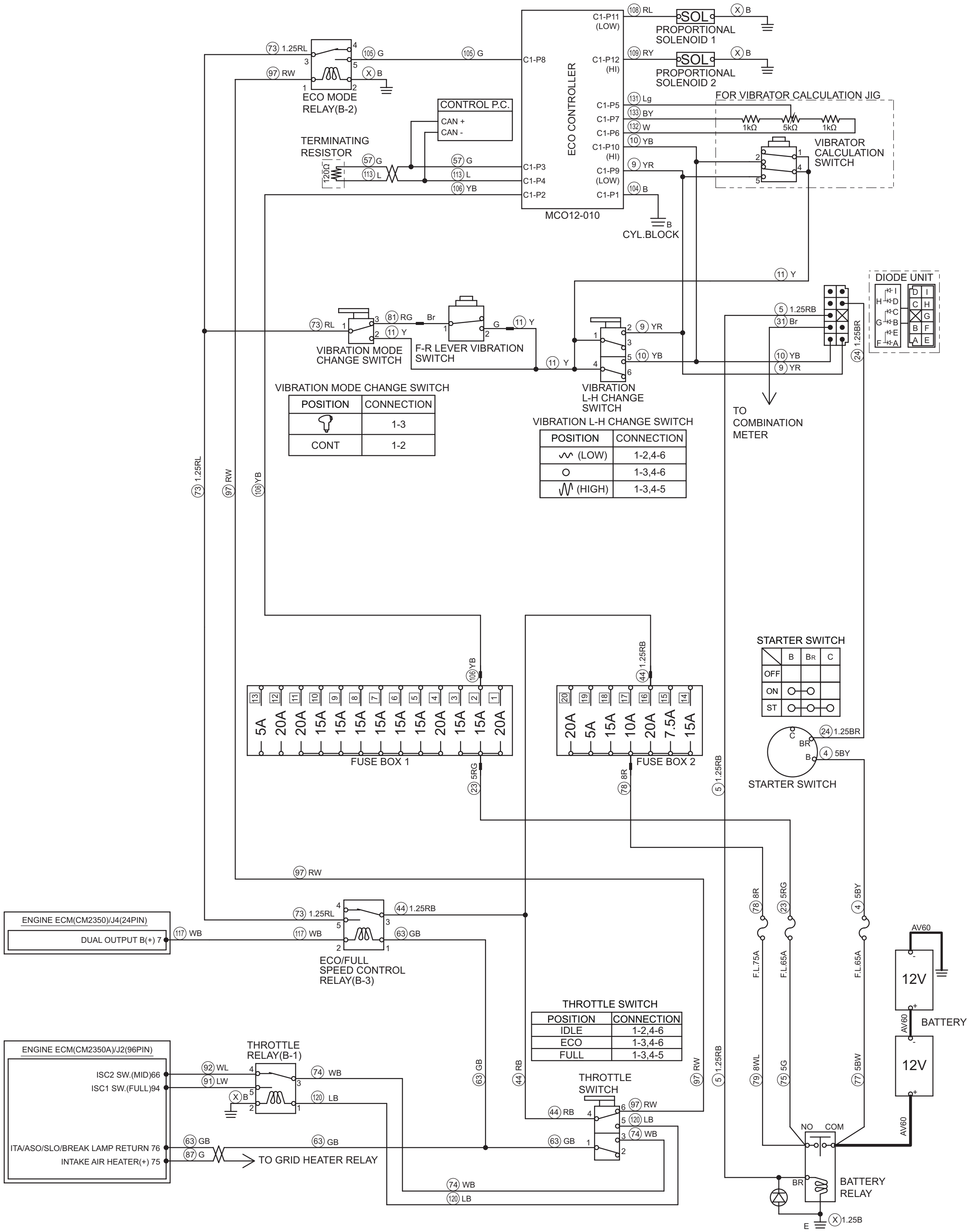
- Vibration mode change switch must be “CONT”.
- Vibration L-H change switch must not be “◯”.

1) When red LED shows no blink.

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
5. ECO/FULL Speed Control Relay (B-3)	(1) When starter switch is ON, measure voltage between ECO/FULL speed control relay terminal 2 inlet wire WB and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between ECO/FULL speed control relay terminal 3 inlet wire RB and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and throttle switch is “ECO”, measure voltage between ECO/FULL speed control relay terminal 5 outlet wire RL and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, ECO/FULL speed control relay is faulty.	Replace ECO/FULL speed control relay (B-3).
6. ECO Controller	(1) When starter switch is ON, measure voltage between ECO controller terminal C1-P2 inlet wire YB and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and vibration L-H change switch is “ ” or “ ”, measure voltage between ECO controller terminal wires and chassis ground. “ ” : ECO controller terminal C1-P9 inlet wire YR and chassis ground. “ ” : ECO controller terminal C1-P10 inlet wire YB and chassis ground. Standard voltage : 24 V or more (3) Check ECO controller terminal C1-P1 wire B is grounded. (4) When starter switch is ON and vibration L-H change switch is “ ” or “ ”, measure current between ECO controller terminal wires and chassis ground. “ ” : ECO controller terminal C1-P11 outlet wire RL and chassis ground. Standard current : 450 mA (at throttle switch is “ECO”) : 340 mA (at throttle switch is “FULL”) “ ” : ECO controller terminal C1-P12 outlet wire RY and chassis ground. Standard current : 450 mA (at throttle switch is “ECO”) : 330 mA (at throttle switch is “FULL”) • If above items (1), (2) and (3) are OK and item (4) is NG, ECO controller is faulty. **(NOTICE)** **• Since current value is output in PWM, standard value shown above represent a maximum instaneous value.**	• Replace ECO controller.

Fig.: 2-6-1



VIBRATION MODE CHANGE SWITCH

POSITION	CONNECTION
(symbol)	1-3
CONT	1-2

VIBRATION L-H CHANGE SWITCH

POSITION	CONNECTION
(LOW)	1-2,4-6
O	1-3,4-6
(HIGH)	1-3,4-5

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

THROTTLE SWITCH

POSITION	CONNECTION
IDLE	1-2,4-6
ECO	1-3,4-6
FULL	1-3,4-5

SV544-09006

2-6-1. No vibration occurs 3/3

- Vibration mode change switch must be “CONT”.
- Vibration L-H change switch must not be “◯”.

1) When red LED shows no blink.

Reference Fig.: 2-6-1

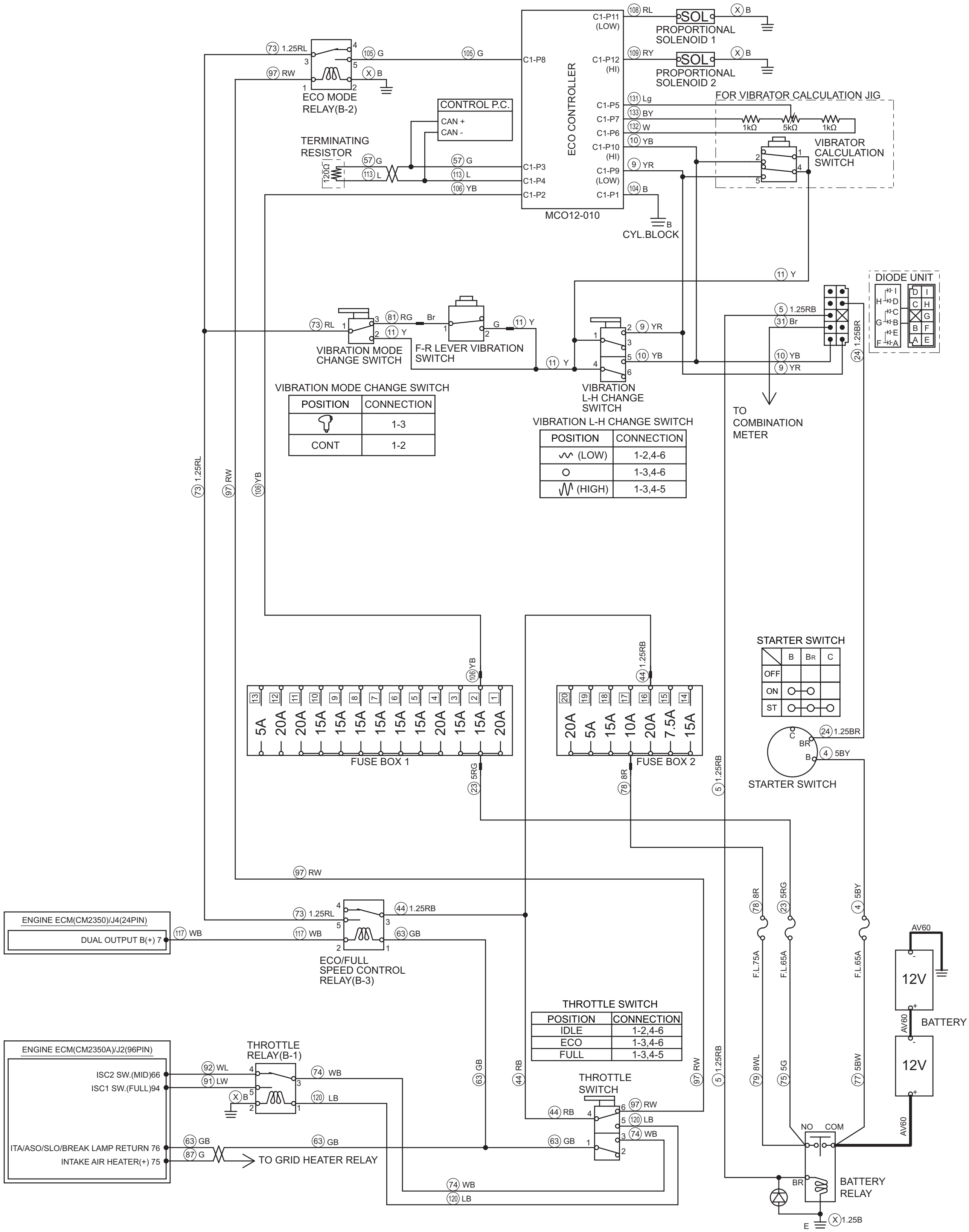
Check point	Check/Cause	Action
7. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

2) When red LED shows any blink.

Reference Fig.: 2-6-1

Number of red LED blinks	Check point	Check/Cause	Action
2 long, 1 short or 2 long 2 short	1. Connector	• Check proportional solenoid 1 connector and ECO controller (terminal C1-P11) for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between proportional solenoid 1 terminal wire RL and ECO controller terminal C1-P11 wire RL. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2 long, 3 short or 2 long 4 short	1. Connector	• Check proportional solenoid 2 connector and ECO controller (terminal C1-P12) for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
	2. Harness	• Measure resistances between proportional solenoid 2 terminal wire RY and ECO controller terminal C1-P12 wire RL. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-6-1



SV544-09006

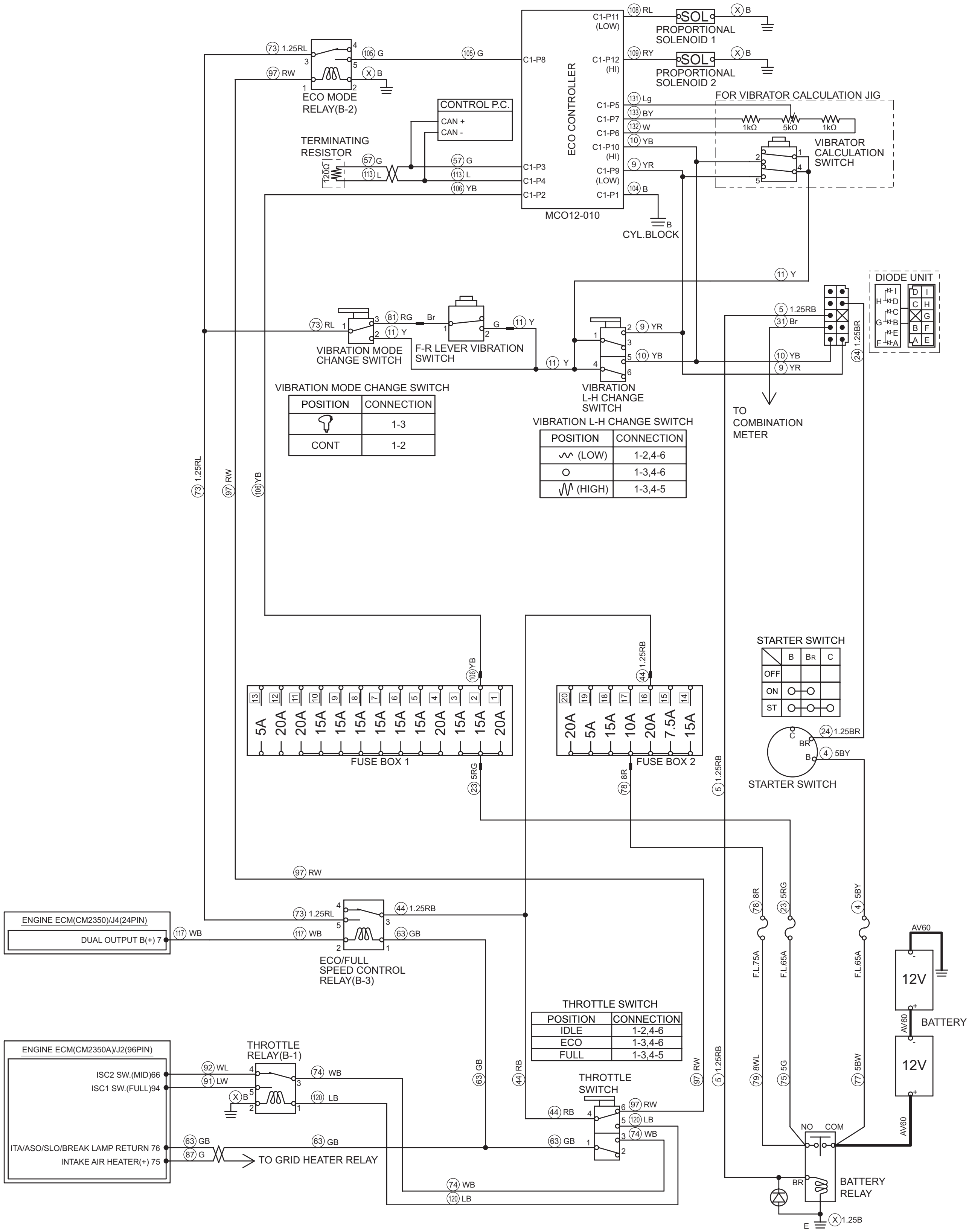
2-6-2. Amplitude does not change (Remains either Low or High) 1/3

- Vibration mode change switch must be “CONT”.

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
1. Proportional Solenoid 1	• Disconnect harness and measure resistance of coil. Standard resistance : 36 Ω • If resistance is abnormal, proportional solenoid 1 is faulty.	Replace Proportional Solenoid 1.
2. Proportional Solenoid 2	• Disconnect harness and measure resistance of coil. Standard resistance : 36 Ω • If resistance is abnormal, proportional solenoid 2 is faulty.	Replace Proportional Solenoid 2.
3. Vibration L-H Change Switch	(1) When starter switch is ON, measure voltage between vibration L-H change switch terminal 1, 4 inlet wire Y and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and vibration L-H change switch is “○”, measure voltage vibration L-H change switch terminal wires and chassis ground. • Vibration L-H change switch terminal 2 outlet wire YR and chassis ground. • Vibration L-H change switch terminal 5 outlet wire YB and chassis ground. There is no electricity in normal condition. (3) When starter switch is ON and vibration L-H change switch is “ ”, measure voltage between vibration L-H change switch terminal 2 outlet wire YR and chassis ground. Standard voltage : 24 V or more. (4) When starter switch is ON and vibration L-H change switch is “ ” measure voltage between vibration L-H change switch terminal 5 outlet wire YB and chassis ground. Standard voltage : 24 V or more. • If above item (1) is OK and item (2), (3) or (4) is NG, vibration L-H change switch is faulty.	Replace vibration L-H change switch.

Fig.: 2-6-1



VIBRATION MODE CHANGE SWITCH

POSITION	CONNECTION
(symbol)	1-3
CONT	1-2

VIBRATION L-H CHANGE SWITCH

POSITION	CONNECTION
(LOW)	1-2,4-6
O	1-3,4-6
(HIGH)	1-3,4-5

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

THROTTLE SWITCH

POSITION	CONNECTION
IDLE	1-2,4-6
ECO	1-3,4-6
FULL	1-3,4-5

SV544-09006

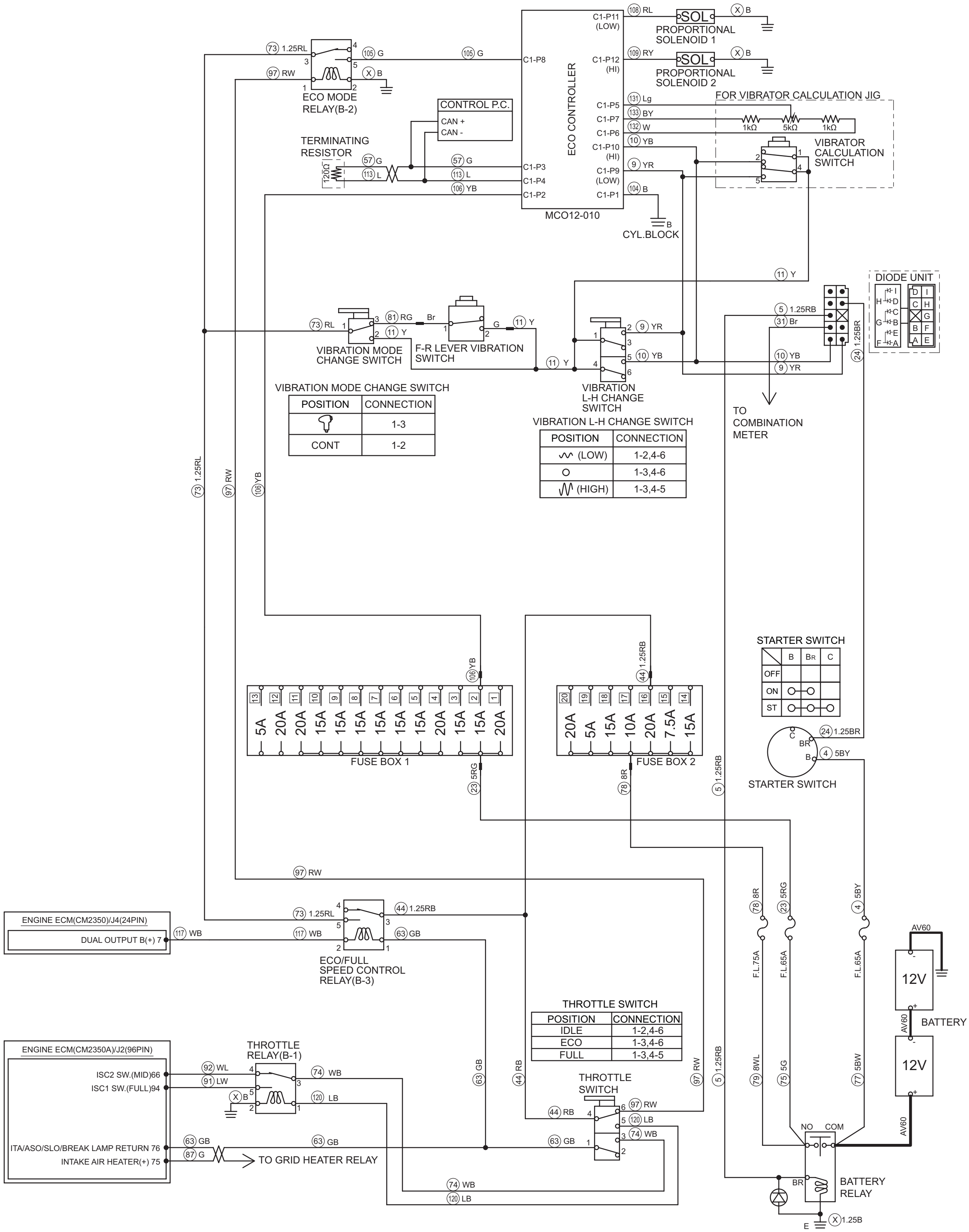
2-6-2. Amplitude does not change (Remains either Low or High) 2/3

- Vibration mode change switch must be "CONT".

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
4. Throttle Switch	(1) When starter switch is ON, measure voltage between throttle switch terminal 1 inlet wire GB and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between throttle switch terminal 4 inlet wire RB and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and throttle switch is "ECO", measure voltage between throttle switch terminal wires and chassis ground. • Throttle switch terminal 3 outlet wire WB and chassis ground. • Throttle switch terminal 6 outlet wire RW and chassis ground. Standard voltage : 24 V or more (4) When starter switch is ON and throttle switch is "FULL", measure voltage between throttle switch terminal wires and chassis ground. • Throttle switch terminal 3 outlet wire WB and chassis ground. • Throttle switch terminal 5 outlet wire LB and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) or (4) is NG, throttle switch is faulty.	Replace throttle switch.
5. ECO Mode Relay (B-2)	(1) When starter switch is ON and throttle switch is "ECO", measure voltage between ECO mode relay terminal 1 inlet wire RW and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and throttle switch is "ECO", measure voltage between ECO mode relay terminal 3 inlet wire RL and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and throttle switch is "ECO", measure voltage between ECO mode relay terminal 5 outlet wire G and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, ECO mode relay is faulty.	Replace ECO mode relay (B-2).

Fig.: 2-6-1



VIBRATION MODE CHANGE SWITCH

POSITION	CONNECTION
(symbol)	1-3
CONT	1-2

VIBRATION L-H CHANGE SWITCH

POSITION	CONNECTION
(LOW)	1-2,4-6
O	1-3,4-6
(HIGH)	1-3,4-5

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

THROTTLE SWITCH

POSITION	CONNECTION
IDLE	1-2,4-6
ECO	1-3,4-6
FULL	1-3,4-5

SV544-09006

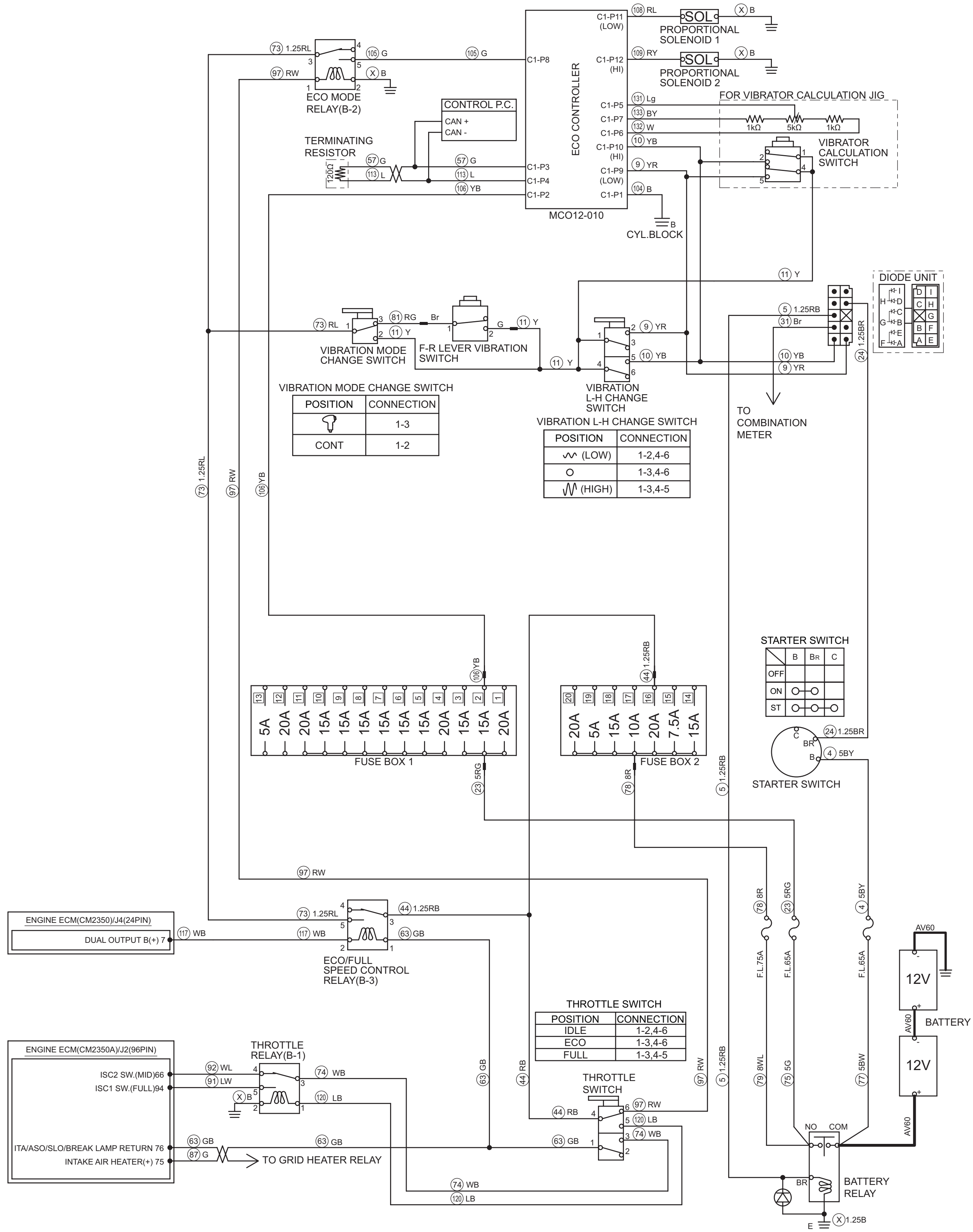
2-6-2. Amplitude does not change (Remains either Low or High) 3/3

- Vibration mode change switch must be “CONT”.

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
6. ECO Controller	(1) When starter switch is ON, measure voltage between ECO controller terminal C1-P2 inlet wire YB and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and vibration L-H change switch is “ ” or “ ”, measure voltage between ECO controller terminal wires and chassis ground. “ ” : ECO controller terminal C1-P9 inlet wire YR and chassis ground. “ ” : ECO controller terminal C1-P10 inlet wire YB and chassis ground. Standard voltage : 24 V or more (3) Check ECO controller terminal C1-P1 wire B is grounded. (4) When starter switch is ON and throttle switch is “ECO”, measure voltage between ECO controller terminal C1-P8 outlet wire G and chassis ground. Standard voltage : 24 V or more (5) When starter switch is ON and vibration L-H change switch is “ ” or “ ”, measure current between ECO controller terminal wires and chassis ground. “ ” : ECO controller terminal C1-P11 outlet wire RL and chassis ground. Standard current : 450 mA (at throttle switch is “ECO”) : 340 mA (at throttle switch is “FULL”) “ ” : ECO controller terminal C1-P12 outlet wire RY and chassis ground. Standard current : 450 mA (at throttle switch is “ECO”) : 330 mA (at throttle switch is “FULL”) • If above items (1), (2), (3) and (4) are OK and item (5) is NG, ECO controller is faulty. **(NOTICE)** **• Since current value is output in PWM, standard value shown above represent a maximum instaneous value.**	• Replace ECO controller.
7. 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



VIBRATION MODE CHANGE SWITCH

POSITION	CONNECTION
(symbol)	1-3
CONT	1-2

VIBRATION L-H CHANGE SWITCH

POSITION	CONNECTION
(LOW)	1-2,4-6
O	1-3,4-6
(HIGH)	1-3,4-5

THROTTLE SWITCH

POSITION	CONNECTION
IDLE	1-2,4-6
ECO	1-3,4-6
FULL	1-3,4-5

SV544-09006

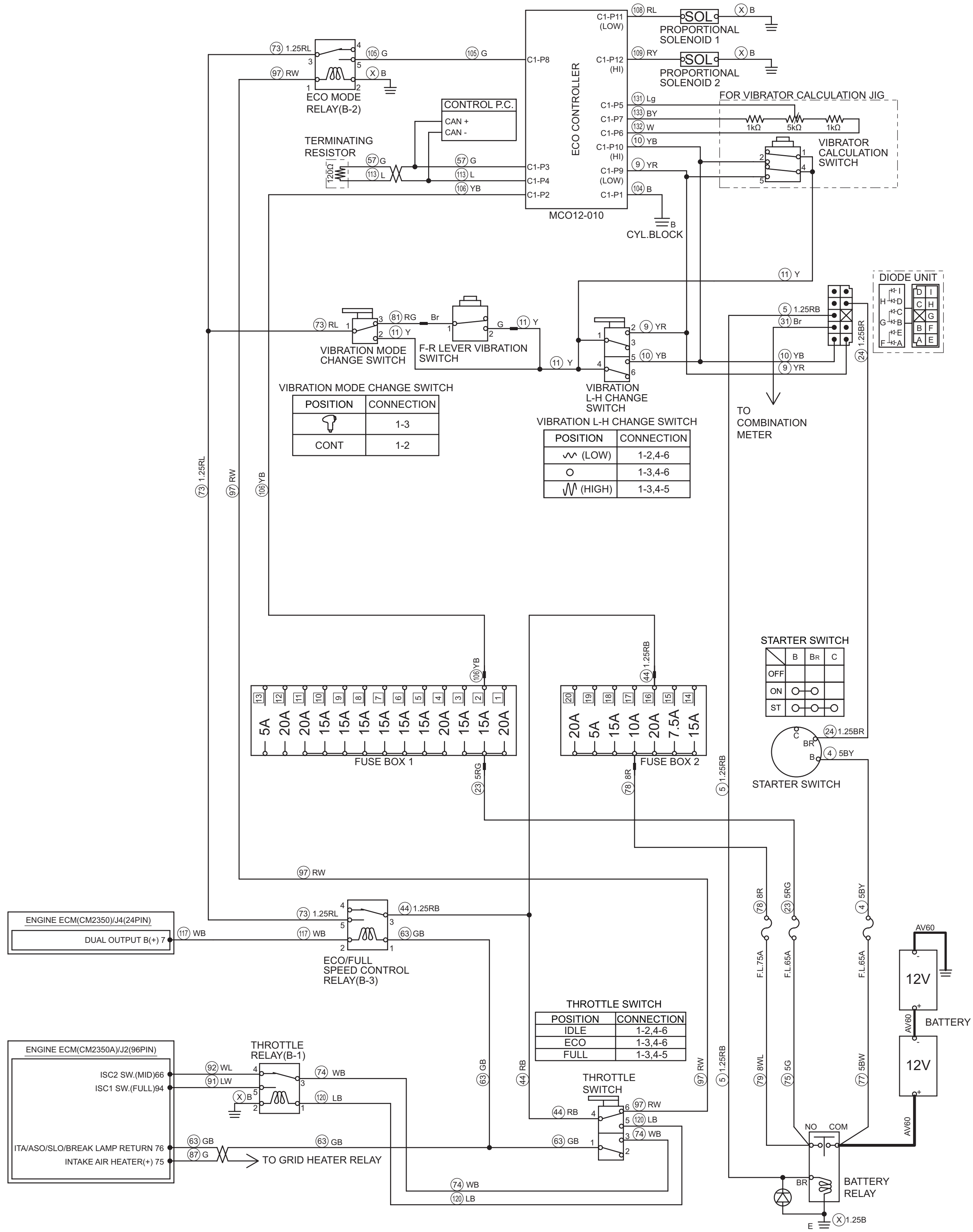
2-6-3. Vibration mode cannot be switched (F-R lever vibration switch does not work)

- Vibration mode change switch must be "  " (manual mode).
- Vibration L-H change switch must not be "◯".

Reference Fig.: 2-6-1

Check point	Check/Cause	Action
1. ECO/FULL Speed Control Relay (B-3)	(1) When starter switch is ON, measure voltage between ECO/FULL speed control relay terminal 2 inlet wire WB and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between ECO/FULL speed control relay terminal 3 inlet wire RB and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON and throttle switch is "ECO", measure voltage between ECO/FULL speed control relay terminal 5 outlet wire RL and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, ECO/FULL speed control relay is faulty.	Replace ECO/FULL speed control relay (B-3).
2. Vibration Mode Change Switch	(1) When starter switch is ON, measure voltage between vibration mode change switch terminal 1 inlet wire RL and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between vibration mode change switch terminal 3 outlet wire RG and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, vibration mode change switch is faulty.	Replace vibration mode change switch.
3. F-R Lever Vibration Switch	(1) When starter switch is ON, measure voltage between F-R lever vibration switch terminal 1 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and F-R lever vibration switch is pressed once, measure voltage between F-R lever vibration switch terminal 2 outlet wire Y and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, F-R lever vibration 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



VIBRATION MODE CHANGE SWITCH

POSITION	CONNECTION
(symbol)	1-3
CONT	1-2

VIBRATION L-H CHANGE SWITCH

POSITION	CONNECTION
(LOW)	1-2,4-6
O	1-3,4-6
(HIGH)	1-3,4-5

STARTER SWITCH

	B	BR	C
OFF			
ON	O	O	
ST	O	O	O

THROTTLE SWITCH

POSITION	CONNECTION
IDLE	1-2,4-6
ECO	1-3,4-6
FULL	1-3,4-5

SV544-09006

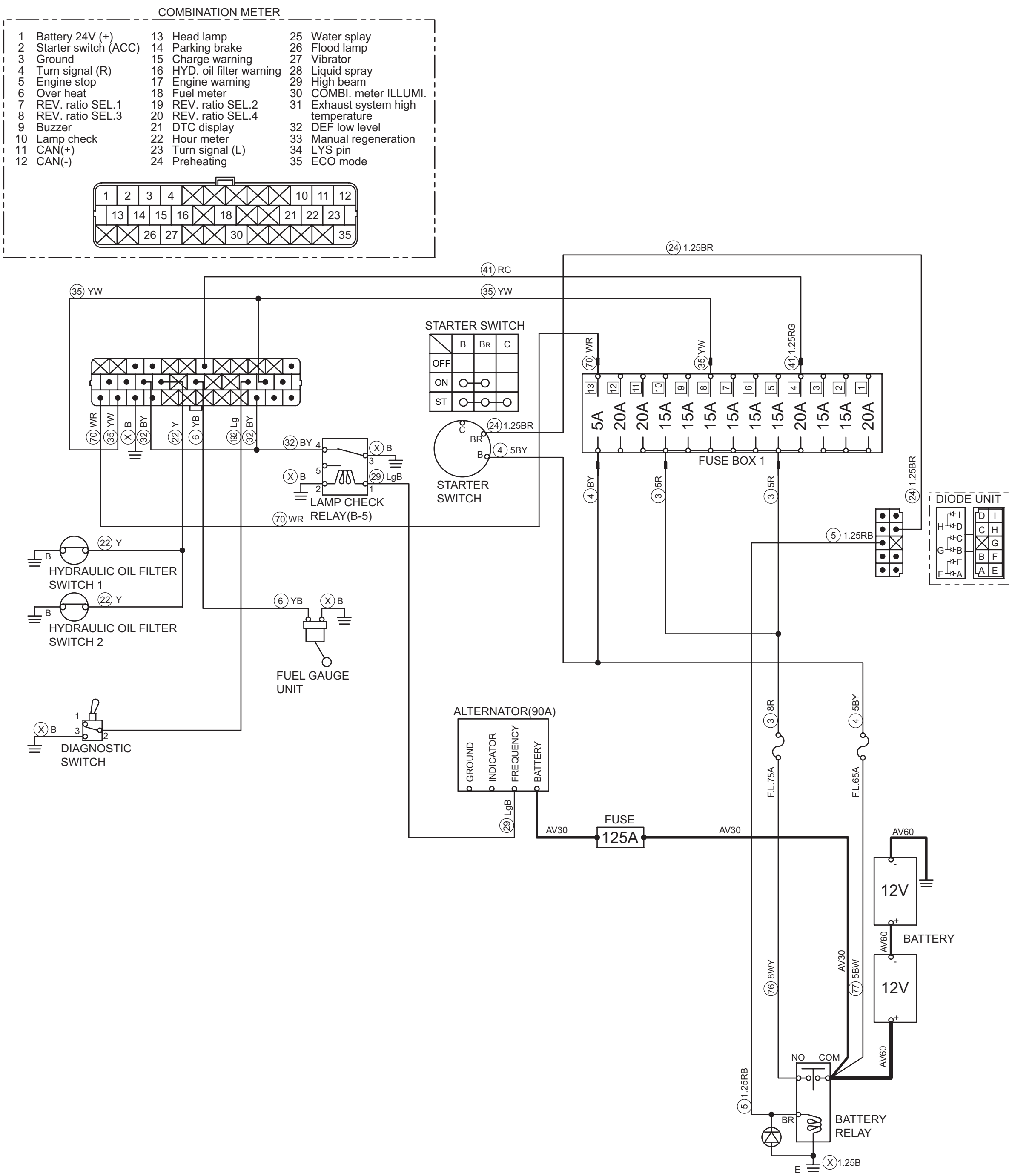
2-6-4. Vibrator force is low in ECO mode

- Vibration mode change switch must be “CONT” (continuous mode).
- Vibration select switch must not be “○”.
- Throttle lever must be “ECO”.
- ECO lamp is ON.

Reference Fig. : 2-6-1

Check point	Check/Cause	Action
1. Connector	• Check ECO mode relay (B-2) (terminal 5) connector and ECO controller (terminal C1-P8) for corrosion, breakage, bending and looseness. • If any abnormality is found, connector is faulty.	Replace connector or terminal.
2. Harness	• Measure resistances between ECO mode relay (B-2) terminal 5 wire G and ECO controller terminal C1-P8 wire G. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
3. ECO Controller	(1) When starter switch is ON, measure voltage between ECO controller terminal C1-P2 inlet wire YB and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and vibration L-H change switch is “ ” or “ ”, measure voltage between ECO controller terminal wires and chassis ground. “ ” : ECO controller terminal C1-P9 inlet wire YR and chassis ground. “ ” : ECO controller terminal C1-P10 inlet wire YB and chassis ground. Standard voltage : 24 V or more (3) Check ECO controller terminal C1-P1 wire B is grounded. (4) When starter switch is ON and throttle switch is “ECO”, measure voltage between ECO controller terminal C1-P8 outlet wire G and chassis ground. Standard voltage : 24 V or more (5) When starter switch is ON and vibration L-H change switch is “ ” or “ ”, measure current between ECO controller terminal wires and chassis ground. “ ” : ECO controller terminal C1-P11 outlet wire RL and chassis ground. Standard current : 450 mA (at throttle switch is “ECO”) : 340 mA (at throttle switch is “FULL”) “ ” : ECO controller terminal C1-P12 outlet wire RY and chassis ground. Standard current : 450 mA (at throttle switch is “ECO”) : 330 mA (at throttle switch is “FULL”) • If above items (1), (2), (3)and (4) are OK and item (5) is NG, ECO controller is faulty. **(NOTICE)** **• Since current value is output in PWM, standard value shown above represent a maximum instaneous value.**	• Replace ECO controller.
4. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 2-7-1



SV544-09007

2-7. Lighting

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.

2-7-1. Illumination of combination meter does not light

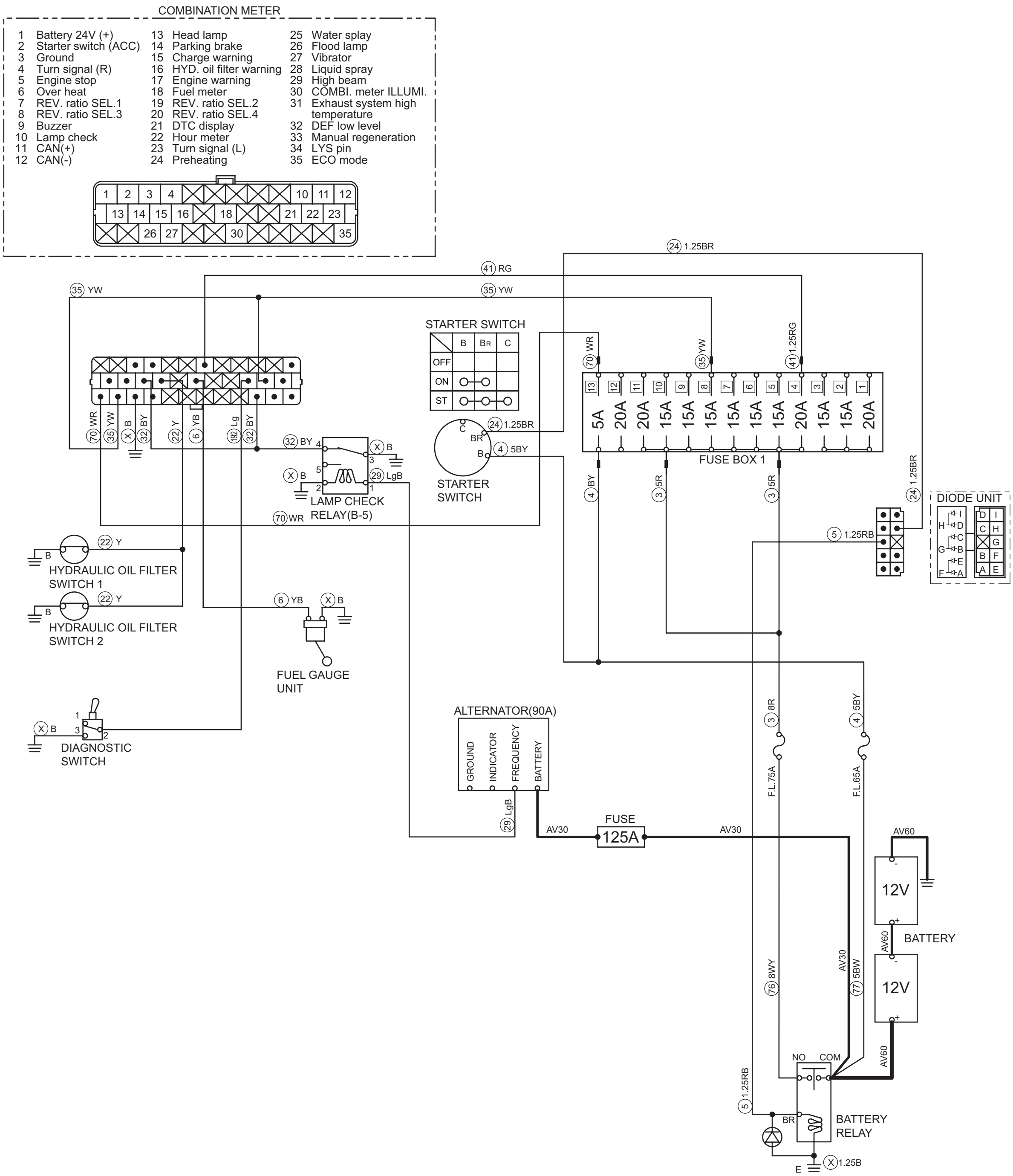
Reference Fig. : 2-7-1

Check point	Check/Cause	Action

1. Harness	• Disconnect connectors and fuses between combination meter, fuse 20A, fusible link 75A, battery relay.
	• Measure resistance between terminals and chassis ground.
	  • Combination meter connector terminal wire No.41 wire RG and chassis ground
	  • Fuse box 1 terminal wire No.3 inlet wire R and chassis ground
	  • Fuseble link 75A wire WY and chassis ground
	    Standard resistance: 100 kΩ or more
	• If resistance is abnormal, harness is faulty.
		Repair or replace harness.

2. Combination Meter (Combination meter illumination)	• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.
	  • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B
	  • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B
	  • Combination meter combination meter illumination terminal wire No.41 inlet wire RG and chassis ground
	    Standard voltage : 24 V or more
	• If above items are OK and combination meter illumination does not turn on, combination meter is faulty.
		Replace combination meter.

Fig.: 2-7-1



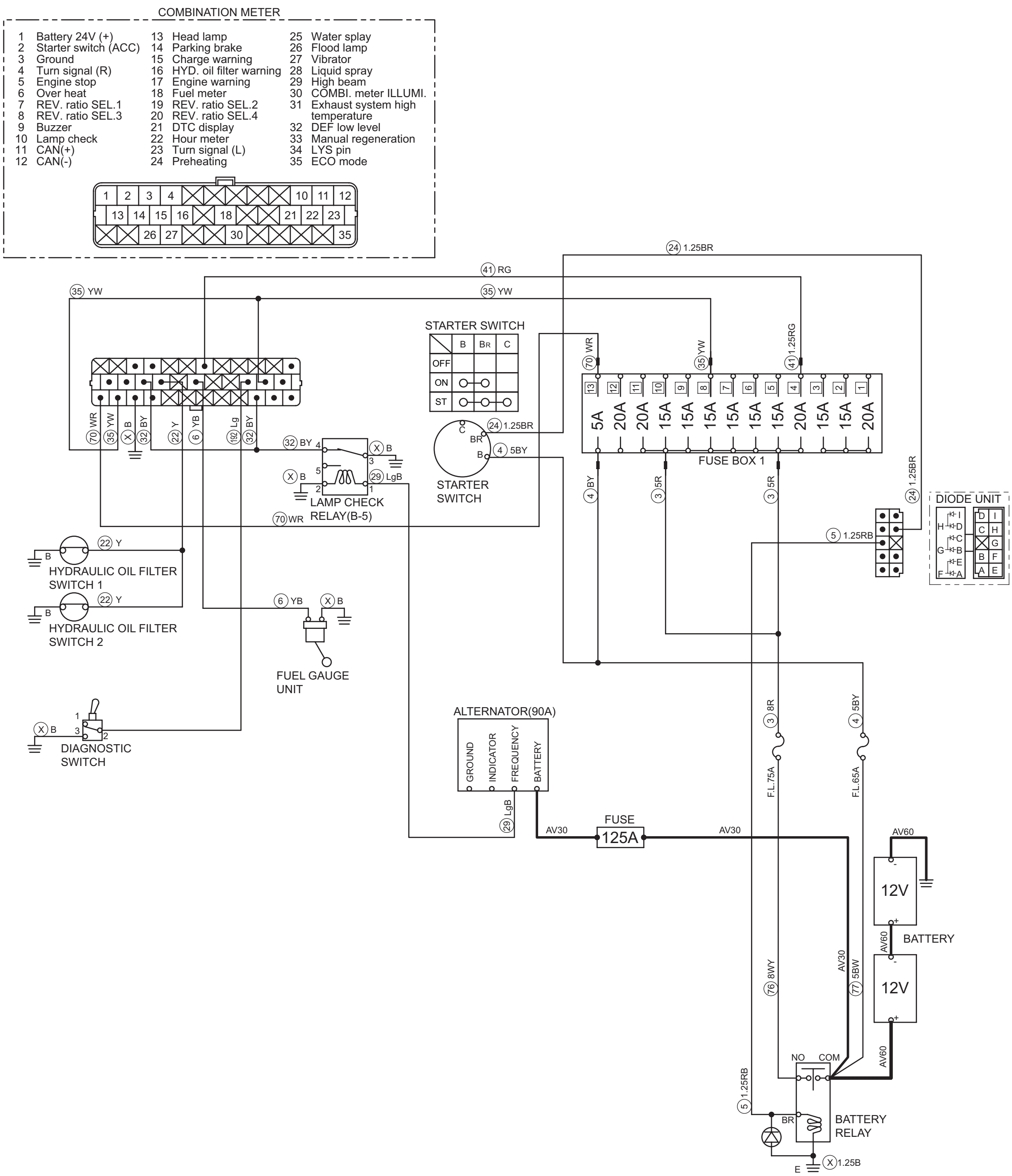
SV544-09007

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

Reference Fig. : 2-7-1

Check point	Check/Cause	Action
1. Harness	• Disconnect connectors between combination meter and lamp check relay (B-5). • Measure resistance between terminals and chassis ground. • Combination meter connector terminal wire No. 32 wire BY and chassis ground • Lamp check relay (B-5) terminal 4 wire BY and chassis ground Standard resistance: 100 kΩ or more • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Lamp Check Relay (B-5)	(1) After starting engine, measure voltage between lamp check relay terminal 1 outlet wire LgB and chassis ground. Standard voltage : 24 V or more (2) After starting engine, measure voltage between lamp check relay terminal 4 inlet wire BY and terminal 3 outlet wire B. There is no continuity in normal condition. • If above item (1) is OK and item (2) is NG, lamp check relay is faulty. • If above item (1) is NG, alternator is faulty.	Repair or replace lamp check relay (B-5) or alternator.
3. Combination Meter (Lamp check)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B Standard voltage : 24 V or more (2) When starter switch is ON, check that parking brake indicator lamp, hydraulic oil filter 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.: 2-7-1



SV544-09007

2-7-3. Hour meter is abnormal

Reference Fig. : 2-7-1

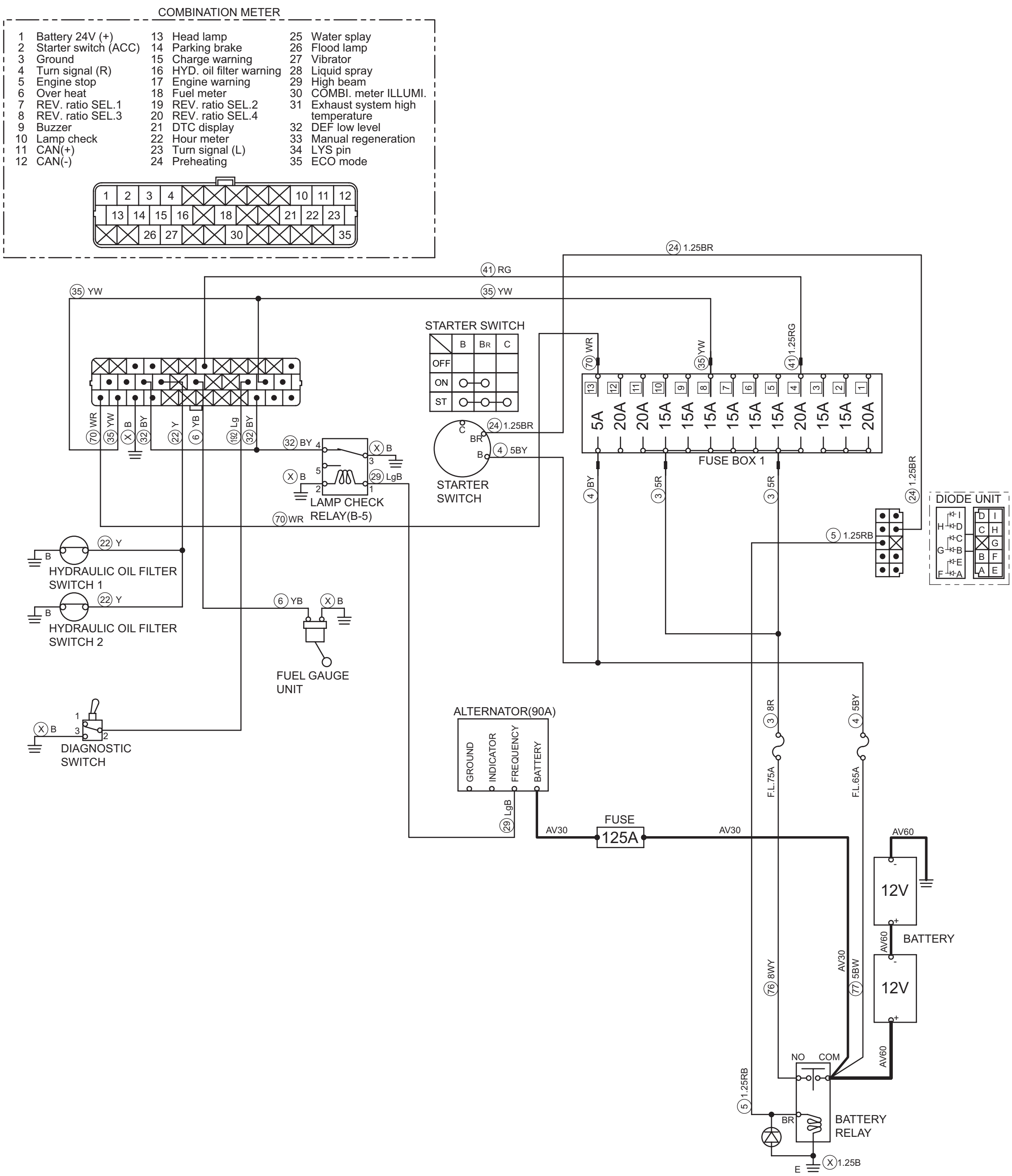
Check point	Check/Cause	Action
1. Combination Meter (Hour meter)	• When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B Standard voltage : 24 V or more • If no abnormality is found, combination meter is faulty.	Replace combination meter.

2-7-4. Fuel meter is abnormal

Reference Fig. : 2-7-1

Check point	Check/Cause	Action
1. Fuel Gauge Unit	• Disconnect harness and measure resistance of fuel gauge unit. Standard resistance : 10.0 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 (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B Standard voltage : 24 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.: 2-7-1



SV544-09007

2-7-5. Hydraulic oil filter warning lamp remains ON

Reference Fig. : 2-7-1

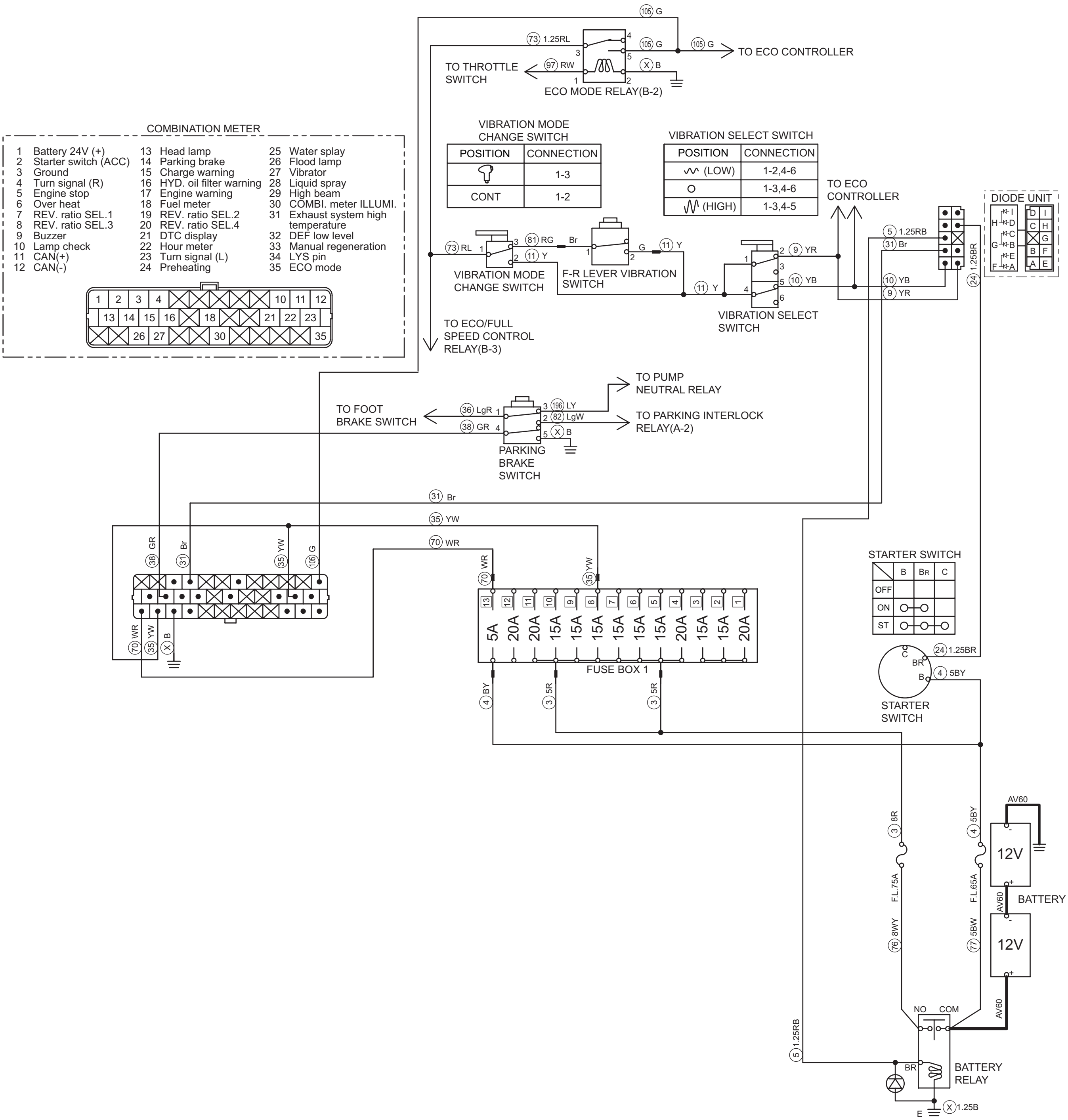
Check point	Check/Cause	Action

1. Harness	• Disconnect connectors between hydraulic oil filter switch 1, 2 and combination meter.
	• Measure resistance between terminal and chassis ground.
	  • Hydraulic oil filter switch 1 or 2 terminal wire Y and chassis ground.
	  • Combination meter connector terminal wire No. 22 wire Y and chassis ground.
	    Standard resistance : 100 kΩ or more
	• If resistance is abnormal, harness is faulty.
		Repair or replace harness.

2. Hydraulic Oil Filter Switch 1 or 2	• When starter switch is OFF, check continuity between hydraulic oil filter switch 1 or 2 terminal inlet wire Y and chassis ground. There is no continuity in normal condition. • If there is continuity, hydraulic oil filter switch 1 or 2 is faulty.	Replace hydraulic oil filter switch 1 or 2.

3. Combination Meter (Hydraulic oil filter warning)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire.
	  • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B
	  • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B
	    Standard voltage : 24 V or more
	(2) When starter switch is ON, measure voltage between combination meter hydraulic filter terminal outlet wire No.22 wire Y and chassis ground.
	    Standard voltage : 24 V or more
	• If above items (1) and (2) are OK but hydraulic oil filter warning lamp remains on after starting engine, combination meter is faulty.
		Replace combination meter.

Fig.: 2-7-2



SV544-09008

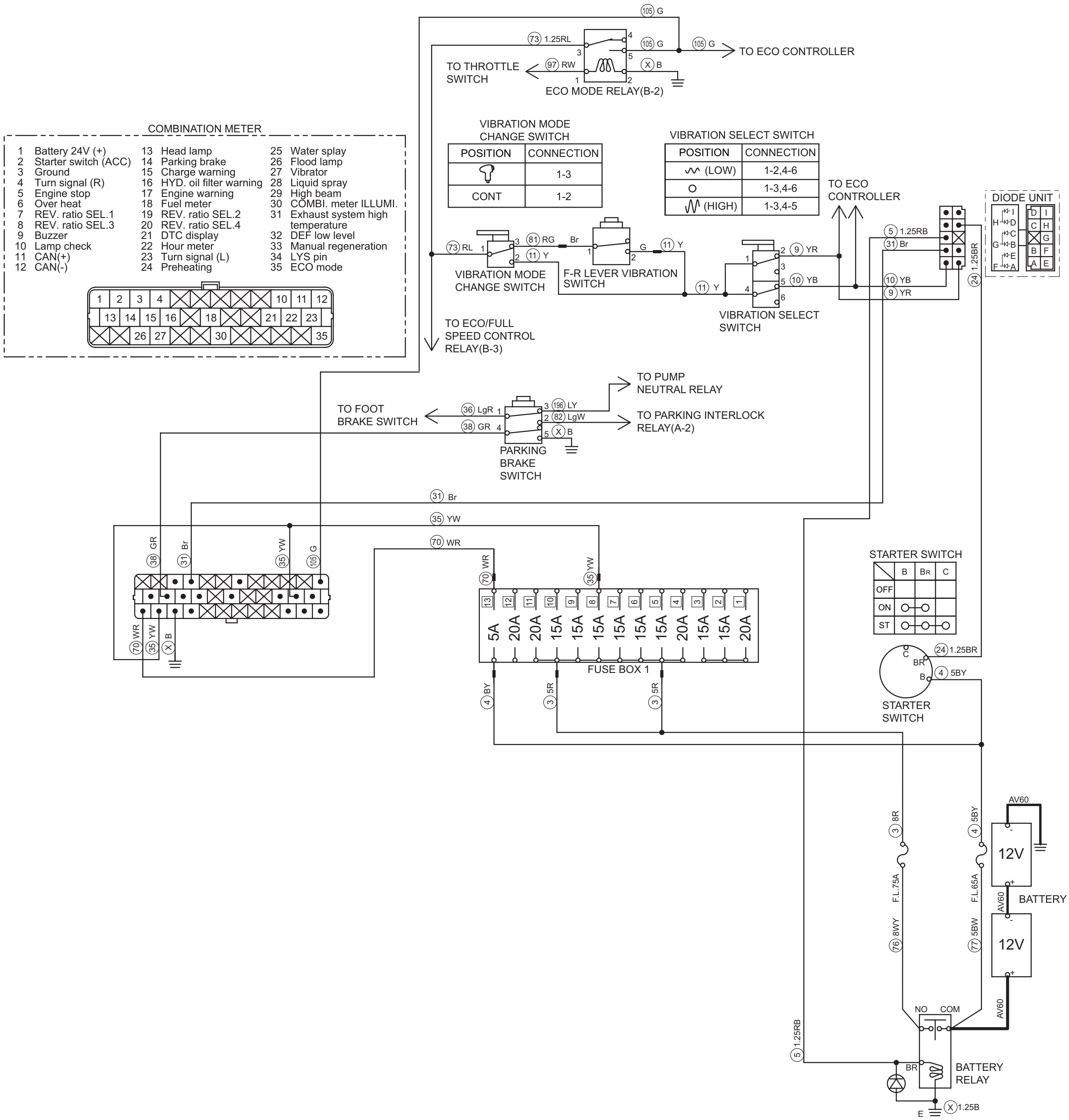
2-7-6. Vibration indicator lamp does not light

- Check that vibrator can be operated.

Reference Fig. : 2-7-2

Check point	Check/Cause	Action
1. Harness	(1) Measure resistance between vibration select switch terminal 2 wire YR and diode unit terminal A wire YR. Standard resistance : 10 Ω or less (2) Measure resistance between vibration select switch terminal 5 wire YB and diode unit terminal E wire YB. Standard resistance : 10 Ω or less (3) Measure resistance between diode unit terminal F wire Br and combination meter connector terminal wire No. 31 wire Br. Standard resistance : 10 Ω or less • If above item (1), (2) or (3) is NG, harness is faulty.	Repair or replace harness.
2. Diode Unit	(1) When starter switch is ON and vibration select switch is “ ”, measure voltage between diode unit terminal A inlet wire YR and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and vibration select switch is “ ”, measure voltage between diode unit terminal E inlet wire YB and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON, measure voltage between diode unit terminal F outlet wire Br and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, diode unit is faulty.	Replace diode unit.
3. Combination Meter (Vibration indicator lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B Standard voltage : 24 V or more (2) When starter switch is ON and vibration mode change switch is “CONT” and vibration select switch is not “○“, measure voltage between combination meter vibration terminal wire No.31 inlet wire Br and chassis ground. Standard voltage : 24 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.: 2-7-2


TO ECO CONTROLLER
TO THROTTLE SWITCH
ECO MODE RELAY(B-2)
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
VIBRATION MODE CHANGE SWITCH
POSITION | CONNECTION
1-3
CONT | 1-2
VIBRATION SELECT SWITCH
POSITION | CONNECTION
(LOW) | 1-2,4-6
1-3,4-6
(HIGH) | 1-3,4-5
TO ECO CONTROLLER
DIODE UNIT
VIBRATION MODE CHANGE SWITCH
F-R LEVER VIBRATION SWITCH
VIBRATION SELECT SWITCH
TO ECO/FULL SPEED CONTROL RELAY(B-3)
TO PUMP NEUTRAL RELAY
TO FOOT BRAKE SWITCH
TO PARKING INTERLOCK RELAY(A-2)
PARKING BRAKE SWITCH
STARTER SWITCH
B | BR | C
OFF
ON
ST
5A 20A 20A 15A 15A 15A 15A 15A 15A 20A 15A 15A 20A
FUSE BOX 1
STARTER SWITCH
F.L.75A
F.L.65A
12V
12V
BATTERY
NO COM
BATTERY RELAY
AV60
SV544-09008

2-7-7. ECO mode indicator lamp does not light

- Check that vibrator can be operated.
- Vibration mode change switch must be "CONT".
- Vibration L-H change switch must not be "◯".
- Throttle switch must be "ECO".

Reference Fig. : 2-7-2

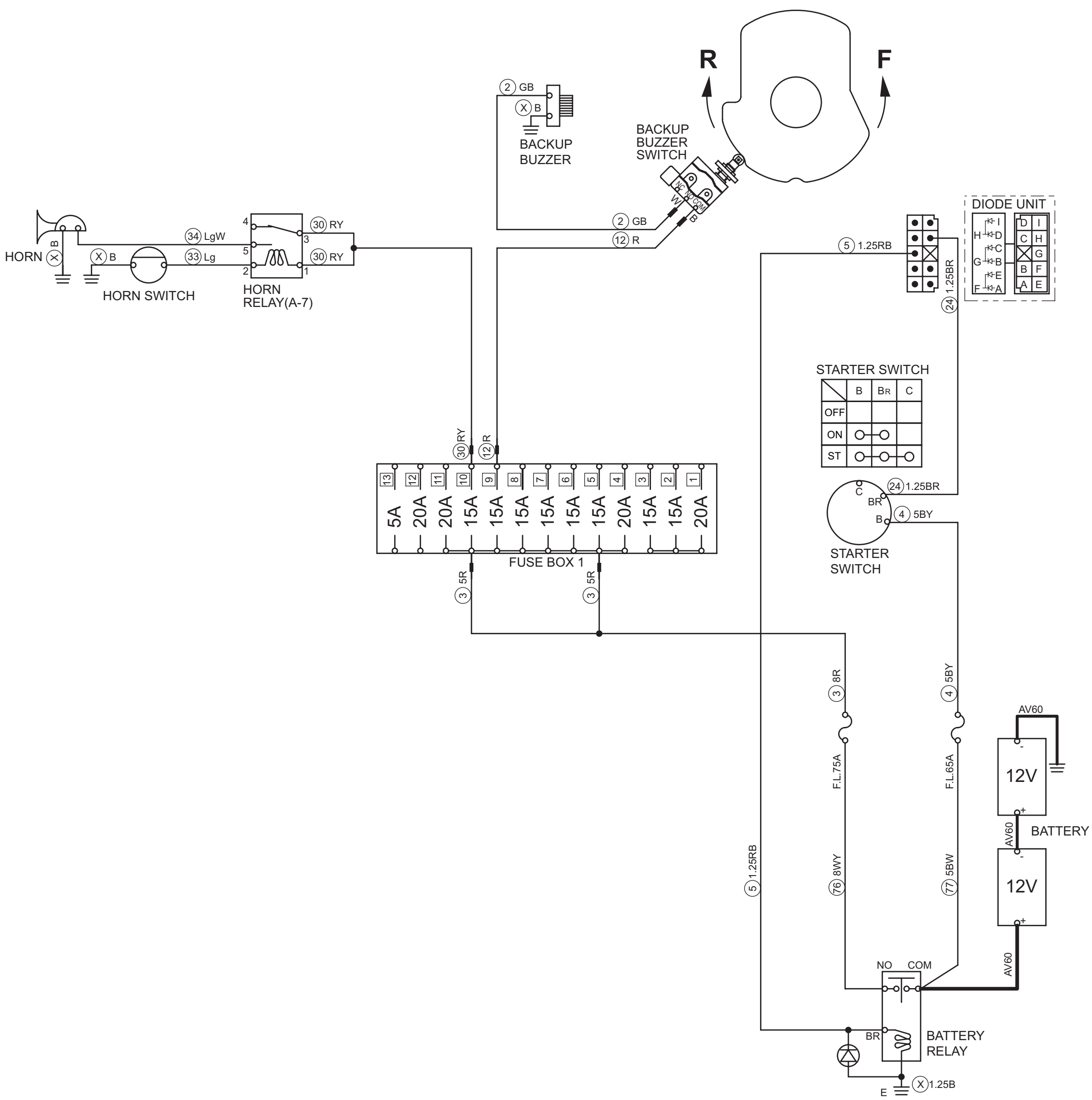
Check point	Check/Cause	Action
1. Harness	• Measure resistance between ECO mode relay (B-2) terminal wire No.105 wire G and combination meter connector terminal wire No.105 wire G. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Combination Meter (ECO lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between combination meter vibration terminal wire No.105 inlet wire G and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and ECO lamp does not light, combination meter is faulty.	Replace combination meter.

2-7-8. Parking brake indicator lamp does not light

Reference Fig. : 2-7-2

Check point	Check/Cause	Action
1. Harness	• Measure resistance between parking brake switch terminal 4 wire GR and combination meter connector terminal wire No.38 wire GR. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Parking Brake Switch	• When parking brake is applied, check continuity between parking brake switch terminal 4 and 5. There is continuity in normal condition. • If there is no continuity, parking brake switch is faulty.	Replace parking brake switch.
3. Combination Meter (Parking brake indicator lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B • Starter switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B Standard voltage : 24 V or more (2) When starter switch is ON and parking brake is applied, check continuity between combination meter parking brake terminal wire No.38 inlet wire GR 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.: 2-7-3



SV544-09009

2-7-9. Horn does not sound

Reference Fig. : 2-7-3

Check point	Check/Cause	Action
1. Horn	• Disconnect horn and directly connect battery positive terminal to horn terminal wire LgW side and negative terminal to horn terminal wire B side. • If horn does not sound, horn is faulty.	Replace horn.
2. Horn Relay (A-7)	(1) When starter switch is ON, measure voltage between horn relay terminal 1, 3 inlet wire RY and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and horn switch pressed, measure voltage between horn relay terminal 5 outlet wire LgW and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, horn relay is faulty.	Replace horn relay (A-7).
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.

2-7-10. Backup buzzer does not sound

Reference Fig. : 2-7-3

Check point	Check/Cause	Action
1. Backup Buzzer	• Disconnect backup buzzer and directly connect battery positive terminal to backup buzzer terminal wire GB 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 : 24 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 : 24 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 steering • charge pump discharge.	Repair steering • charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Parking brake solenoid valve • Speed change solenoid valve (F)	• 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. Servo Bypass Solenoid Valve	If spool of servo bypass solenoid valve is stuck, pressure in both sides of servo cylinder chamber is equalized. This causes propulsion pump unable to discharge oil.	• Measure pressure in servo cylinder chambers. • If pressure is equal in both chambers, repair servo bypass solenoid valve or replace it if necessary.
6. Suction Filter for Steering • Charge Pump	Steering • charge pump flow is reduced due to clogged filter.	Clean suction filter or replace it if necessary.
7. Propulsion Circuit Pressure	Circuit does not obtain required pressure because setting pressure of high pressure relief is low.	• Measure propulsion circuit pressure. • If low, check and adjust multifunction valve or replace it if necessary.
8. Propulsion Motor	Propulsion circuit pressure is not held in propulsion motor case.	If pressure in propulsion motor case is not within allowable range, repair propulsion motor or replace it if necessary.
	Internal leakage of propulsion motor.	• Measure drain quantity from propulsion motor. • If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary.
9. Gear Box (F)	Sticking of brake discs causes brakes to remain applied.	Replace brake discs.

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

Check point	Cause	Check/Action
10. 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.	If pressure in propulsion pump case is not within allowable range, repair propulsion pump or replace it if necessary.
11. 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.
12. Brake Inlet Pressure	Brake cannot be released because brake inlet pressure is low.	• Measure brake release pressure. • If low, repair or replace gear box (F).
13. Rear Axle	Sticking of disc brakes causes brakes to remain applied.	Replace disc brakes.
14. 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. Multifunction Valve	Low circuit pressure due to incorrect high pressure relief setting or internal leakage of multifunction valve.	• Interchange two multifunction valves. • If faulty condition is accordingly reversed, check and adjust multifunction 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 steering • charge pump discharge.	Repair steering • charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Parking brake solenoid valve • Speed change solenoid valve (F)	• 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. Suction Filter for Steering • Charge Pump	Flow rate of steering • charge pump decreases as well as charge pressure decreases due to clogged filter.	Clean suction filter or replace it if necessary.

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

Check point	Cause	Check/Action
5. Propulsion Motor	Propulsion motor inlet pressure is low.	• Measure propulsion motor inlet pressure. • If low, check and adjust multifunction valve or replace it if necessary.
	Propulsion circuit pressure is not held in propulsion motor case.	If pressure in propulsion motor case is not within allowable range, repair propulsion motor or replace it if necessary.
	Output of propulsion motor decreases and number of revolutions decreases due to internal leakage of propulsion motor.	• Measure drain quantity from propulsion motor. • If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary.
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.	If pressure in propulsion pump case is not within allowable range, repair propulsion pump or replace it if necessary.

3-2-4. Machine speed cannot be switched

Check point	Cause	Check/Action
1. Charge Circuit Pressure	Insufficient steering • charge pump discharge.	Repair steering • charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Parking brake solenoid valve • Speed change solenoid valve (F)	• 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.
2. Speed Change Solenoid Valve (F)	Machine speed does not change because spool of speed change solenoid valve (F) does not change.	Repair speed change solenoid valve (F) or replace it if necessary.
3. Propulsion Motor Swash Plate Stroke Cylinder	Faulty propulsion motor swash plate stroke cylinder.	Repair propulsion motor or replace it if necessary.

3-2-5. Machine does not stop completely with F-R lever in “N”

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

3-2-6. Propulsion system is overheating

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Oil Cooler	Cooling efficiency is reduced due to clogged oil cooler fins.	Clean oil cooler fins.
3. Flushing Valve	Hydraulic oil in propulsion closed circuit is insufficiently cooled due to flushing valve shuttle spool sticking.	Repair flushing valve or replace it if necessary.
	Hydraulic oil in propulsion closed circuit is insufficiently cooled because flushing valve relief setting pressure is excessively high.	Check dust or damage in flushing relief valve and replace it if necessary.
	Hydraulic oil in propulsion closed circuit is insufficiently cooled due to flushing valve relief valve poppet sticking.	Clean flushing relief valve or replace it if necessary.
4. Propulsion Circuit Pressure	If circuit pressure setting is excessively low, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	• Measure propulsion circuit pressure. • If low, increase relief setting pressure.
	If load is excessively heavy, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	• Measure propulsion circuit pressure. • If high, decrease propulsion load.
5. Suction Filter for Steering • Charge Pump	Load of steering • charge pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean suction filter or replace it if necessary.
6. Hydraulic Oil Filter 1	Charge circuit pressure increases due to clogged filter.	Clean hydraulic oil filter 1 or replace it if necessary.

3-2-7. 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. Suction Filter for Steering • Charge Pump	Cavitation is occurring in steering • charge pump due to clogged filter.	Clean suction filter or replace it if necessary.
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. Charge Circuit Pressure	Vibrator pump does not discharge oil due to low charge pressure.	• Measure charge pressure. • If low, check and adjust charge relief valve or replace it if necessary.
	Insufficient steering • charge pump discharge.	Repair steering • charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Parking brake solenoid valve • Speed change solenoid valve (F)	• When solenoid is energized, check if oil flows in return circuit to tank. • If oil is flowing, repair solenoid valve or replace it if necessary.
3. Vibrator Solenoid Valve	Vibrator pump cannot discharge oil because spool of vibrator solenoid valve does not shift.	Repair vibrator solenoid valve or replace them if necessary.
4. Suction Filter for Steering • Charge Pump	Steering • charge pump flow is reduced due to clogged filler.	Clean suction filter or replace it if necessary.
5. Vibrator Circuit Pressure	Circuit does not obtain required pressure because setting pressure of high pressure relief is low.	• Measure vibrator circuit pressure. • If low, check and clean high pressure relief valve or replace it if necessary.
6. Vibrator Motor	Vibrator circuit pressure is not held in vibrator motor case.	If pressure in vibrator motor case is not within allowable range, repair vibrator motor or replace it if necessary.
	Internal leakage of vibrator motor.	• Measure drain quantity from vibrator motor. • If drain quantity is larger than standard value, repair vibrator motor or replace it if necessary.
	Output torque is not transmitted due to worn spline of vibrator motor output shaft.	Replace vibrator motor.
7. Vibrator Pump	Insufficient discharge rate from vibrator pump due to reduced efficiency of vibrator pump.	• Measure discharge flow rate of vibrator pump with flow meter. • If discharge flow rate is not within specified range, repair vibrator pump or replace it if necessary.
	Insufficient pump discharge due to wear of vibrator pump drive shaft spline.	Replace vibrator pump.
	Vibrator circuit pressure is not held in vibrator pump case.	If pressure in vibrator pump case is not within allowable range, repair vibrator pump or replace it if necessary.

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. Charge Circuit Pressure	Stroke of vibrator pump swash plate is small because charge pressure is low, decreasing discharge rate of vibrator pump.	• Measure charge pressure. • If low, check and adjust charge relief valve or replace it if necessary.
	Insufficient steering • charge pump discharge.	Repair steering • charge pump or replace it if necessary.
	Charge pressure decreases due to internal leakage of solenoid valve connecting oil supply circuit with charge circuit. • Parking brake solenoid valve • Speed change solenoid valve (F)	• When solenoid is energized, check if oil flows in return circuit to tank. • If oil is flowing, repair solenoid valve or replace it if necessary.
3. Suction Filter for Steering • charge Pump	Flow rate of steering • charge pump decreases as well as charge pressure decreases due to clogged filter.	Clean suction filter or replace it if necessary.
4. Vibrator Motor	Vibrator motor inlet pressure is low.	• Measure vibrator motor inlet pressure. • If low, check and clean high pressure relief valve or replace it if necessary.
	Vibrator circuit pressure is not held in vibrator motor case.	If pressure in vibrator motor case is not within allowable range, repair vibrator motor or replace it if necessary.
	Decrease in vibrator motor rpm due to internal leakage in vibrator motor.	• Measure drain quantity from vibrator motor. • 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.
	Vibrator circuit pressure is not held in vibrator pump case.	If pressure in vibrator pump case is not within allowable range, repair vibrator pump or replace it if necessary.

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

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibrator solenoid valve spool shifts only in one direction.	Repair vibrator solenoid valve or replace it if necessary.
2. Servo Control Valve	Servo control valve spool shifts only in one direction.	Repair servo control valve spool or replace it if necessary.

3-3-4. Vibrator does not stop

Check point	Cause	Check/Action
1. Servo Control Valve	Servo control valve spool does not return to neutral position.	Repair servo control valve or replace it if necessary.
2. Vibrator Pump	Vibrator pump swash place does not return to neutral position.	Repair vibrator pump or replace it if necessary.

3-3-5. 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 circuit pressure setting is excessively low, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	• Measure vibrator circuit pressure. • If low, check and clean relief valve or replace it if necessary.
	If load is excessively heavy, relief valve opens, causing temperature of hydraulic oil in circuit to rise.	• Measure vibrator circuit pressure. • If high, decrease vibration load.
4. Suction Filter for Steering • Charge Pump	Load of steering • charge pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean suction filter or replace it if necessary.
5. Hydraulic Oil Filter 1	Charge circuit pressure increases due to clogged filter.	Clean hydraulic oil filter 1 or replace it if necessary.

3-3-6. Abnormal noise from vibrator system

Check point	Cause	Check/Action
1. Vibrator Bearings	Vibrator bearings supporting eccentric shaft are damaged.	Replace vibrator bearings.
2. Hydraulic Hose Clamp	Vibrator sound of hydraulic hose is generated because clamp securing hydraulic hose is loose.	Tighten bolts of loose hydraulic hose clamp to specified torque.
3. Suction Filter for Steering • Charge Pump	Cavitation is occurring in steering • charge pump due to clogged filter.	Clean suction filter or replace it if necessary.
4. Vibrator Motor	Internal bearing of vibrator motor is damaged.	Repair vibrator motor or replace it if necessary.

3-4. Steering System

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

(NOTICE)

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

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

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Orbitrol	Relief valve is open or setting pressure is low.	• Measure steering circuit pressure. • If low, check and clean relief valve or replace it if necessary.
	Flow to steering cylinder circuit is insufficient due to leakage from check valve.	Check and clean check valve or replace it if necessary.
	Spool and sleeve of orbitrol are contaminated or clearance is incorrect.	Check and clean orbitrol or replace it if necessary.
3. Steering Circuit Pressure	Pressure in return circuit from orbitrol increases due to clogged charging hydraulic oil filter 1.	Clean hydraulic oil filter 1 or replace it if necessary.
4. Steering Cylinder	Cylinder thrust decreases due to internal leakage of steering cylinder.	Repair steering cylinder or replace it if necessary.
5. Suction Filter for Steering • Charge Pump	Steering • charge pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
6. Steering • Charge Pump	Discharging pressure is insufficient due to efficiency degradation of steering • charge pump.	• Measure steering circuit pressure. • If low, replace steering • charge pump.
7. Steering Column	Column shaft and orbitrol shaft center are misaligned.	Align column shaft with orbitrol shaft center or replace it if necessary.
	Column shaft bearing is worn or damaged.	Repair column shaft or replace it if necessary.

3-4-2. Steering response is slow

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Orbitrol	Oil is bypassing because relief valve is open.	• Measure steering circuit pressure. • If low, check and clean relief valve or replace it if necessary.
3. Steering Cylinder	Internal leakage of steering cylinder.	Repair steering cylinder or replace it if necessary.
4. Suction Filter for Steering • Charge Pump	Steering • charge pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
5. Steering • Charge Pump	Discharging pressure is insufficient due to efficiency degradation of steering • charge pump.	• Measure steering circuit pressure. • If low, replace steering • charge pump.

3-4-3. Steering wheel backlash or play is large

Check point	Cause	Check/Action
1. Steering Column	Spline of column shaft or orbitrol is worn.	Replace column shaft or orbitrol.
	Column shaft bearings are worn.	Replace column shaft bearings.
2. Steering Wheel	Serration (spline) of wheel or column shaft is worn.	Replace wheel or column shaft.

3-4-4. Steering system is overheating

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Oil Cooler	Cooling efficiency is reduced due to clogged oil cooler fins.	Clean oil cooler fins.
3. Steering Circuit Pressure	If circuit pressure setting is excessively low, relief valve is open, causing temperature of hydraulic oil in circuit to rise.	• Measure steering circuit pressure. • If low, replace relief valve.
	If load is excessively heavy, relief valve is open, causing temperature of hydraulic oil in circuit to rise.	• Measure steering circuit pressure. • If high, decrease steering load.
4. Suction Filter for Steering • Charge Pump	Load of steering • charge pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean suction filter or replace it if necessary.

3-4-5. Abnormal noise from steering system

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Pump suction pressure is high because oil level of hydraulic oil tank is low, causing cavitation in steering circuit system.	Fill tank until correct oil level is obtained.
2. Steering Circuit	Cavitation is caused by air in circuit.	Bleed circuit.
3. Hydraulic Hose Clamp	Vibrator sound of hydraulic hose is generated because clamp securing hydraulic hose is loose.	Tighten bolts of loose hydraulic hose clamp to specified torque.
4. Suction Filter for Steering • Charge Pump	Cavitation is occurring in steering • charge pump due to clogged filter.	Clean suction filter or replace it if necessary.

3-5. Blade (SV544TB, FB)

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. Flow Dividing Valve (Steering Blade) for Separation	Oil flow is not divided because spool is stuck on one side, interrupting hydraulic circuit.	Clean spool or replace it if necessary.
3. 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.
4. 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.
5. Blade Cylinder	Cylinder thrust decreases due to internal leakage of blade cylinder.	Repair blade cylinder or replace it if necessary.
6. Suction Filter for Steering • Charge Pump	Steering • charge pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
7. Steering • Charge Pump	Discharging pressure is insufficient due to efficiency degradation of steering • charge 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 • Charge Pump	Steering • charge pump discharge rate decreases due to clogged filter.	Clean suction filter or replace it if necessary.
5. Steering • Charge Pump	Discharge rate is insufficient due to efficiency degradation of steering • charge pump.	• Measure the steering circuit pressure. • If low, replace steering • charge pump.

3-5-3. Blade floating operation not possible

Check point	Cause	Check/Action
1. 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 • Charge Pump	Load of steering • charge pump increases due to clogged filter, causing temperature of hydraulic oil in circuit to rise.	Clean suction filter or replace it if necessary.

3-5-5. 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 • Charge Pump	Cavitation results at steering • charge pump due to clogged filter.	Clean suction filter or replace it if necessary.

SV544

SHOP MANUAL

SAKAI HEAVY INDUSTRIES, LTD.

Head office: Seiwa Bldg., 4-8, Shibadaimon 1-chome,
Minato-ku, Tokyo, Japan
Telephone: +81-3-3434-3401

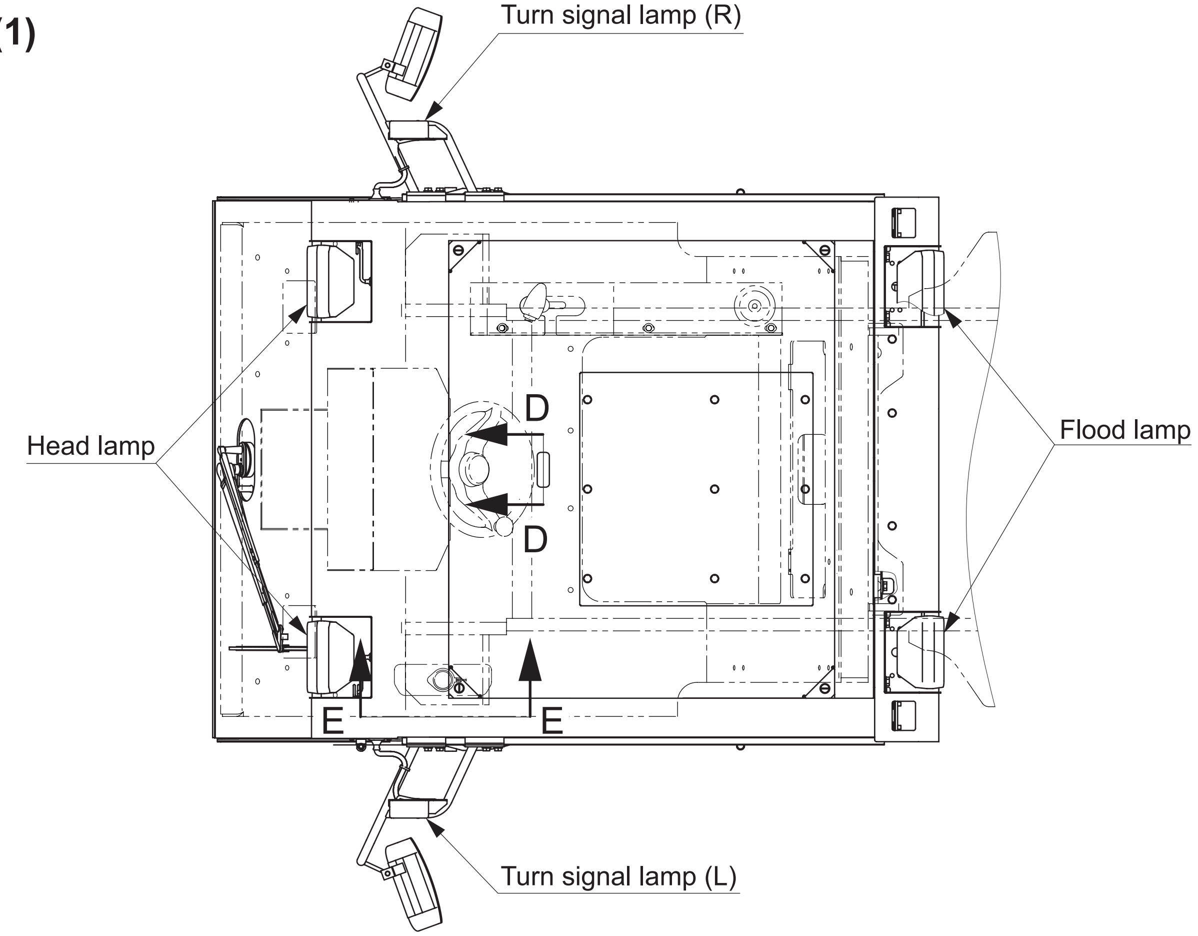
Global Service Division: 2500 Takayanagi, Kuki-shi, Saitama, Japan
Telephone: +81-480-52-1111

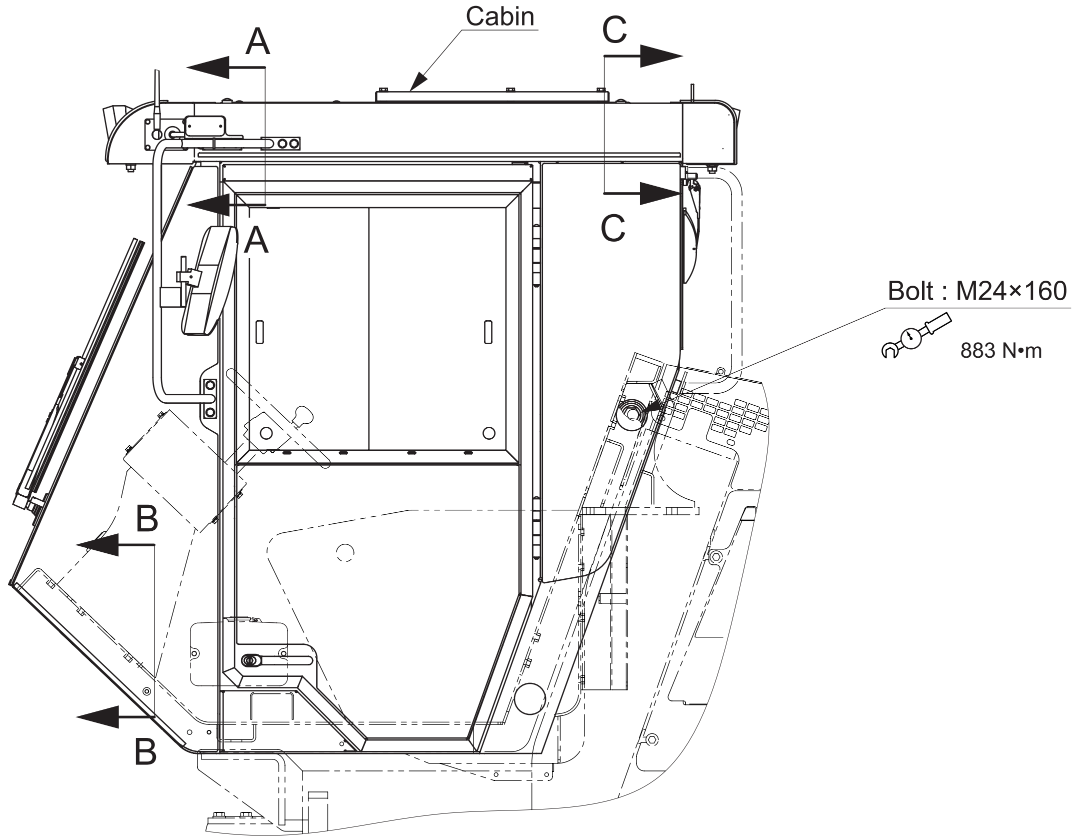
Printed in Japan 2018.09.10 ⓪ K.P
0418-99124-0-33015-0

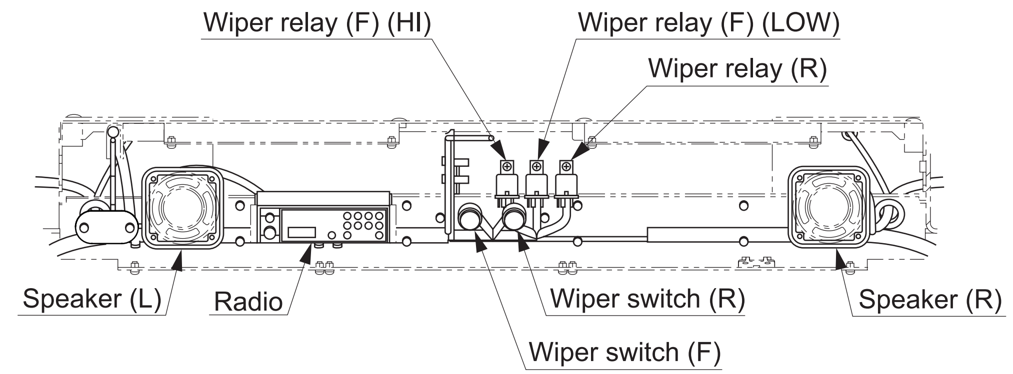
CABIN

1. CABIN

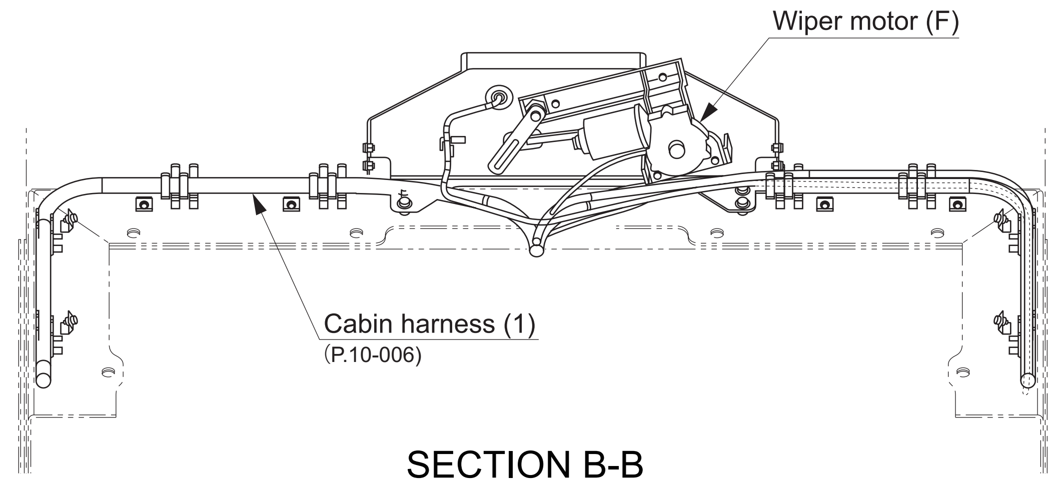
1-1. Cabin (1)



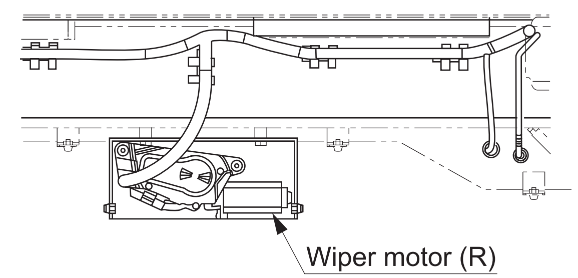




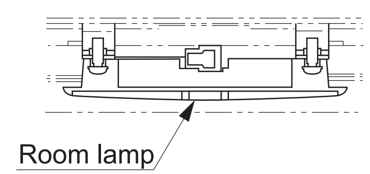
SECTION A-A



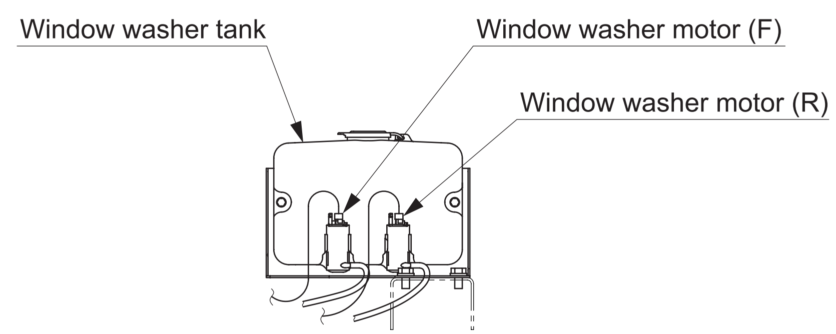
SECTION B-B



SECTION C-C



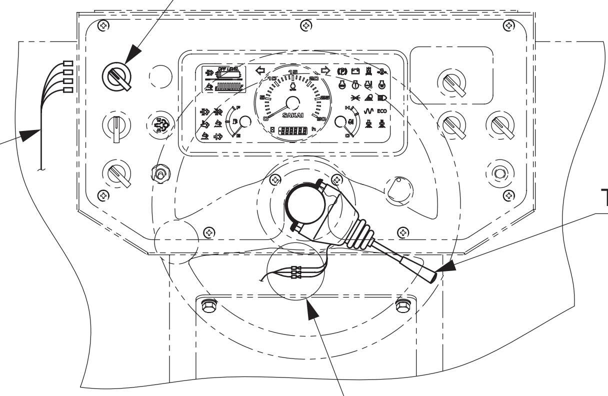
SECTION D-D



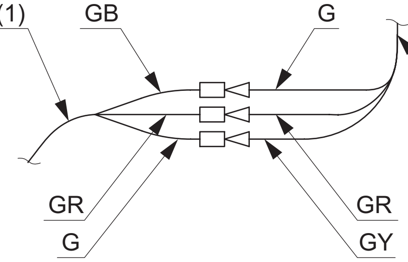
SECTION E-E

0418-33833-0-12778-A

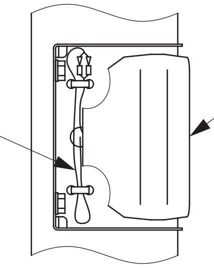
1-2. Cabin (2)



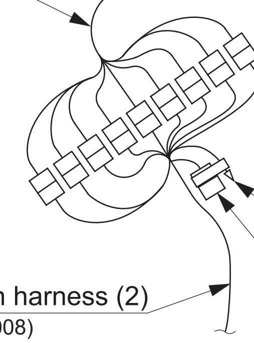
VIEW A



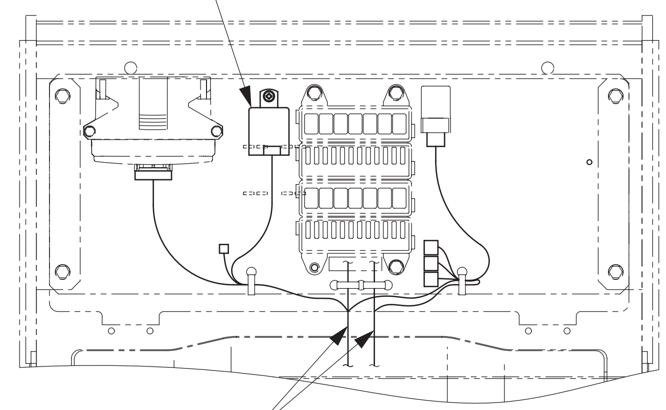
DETAL B



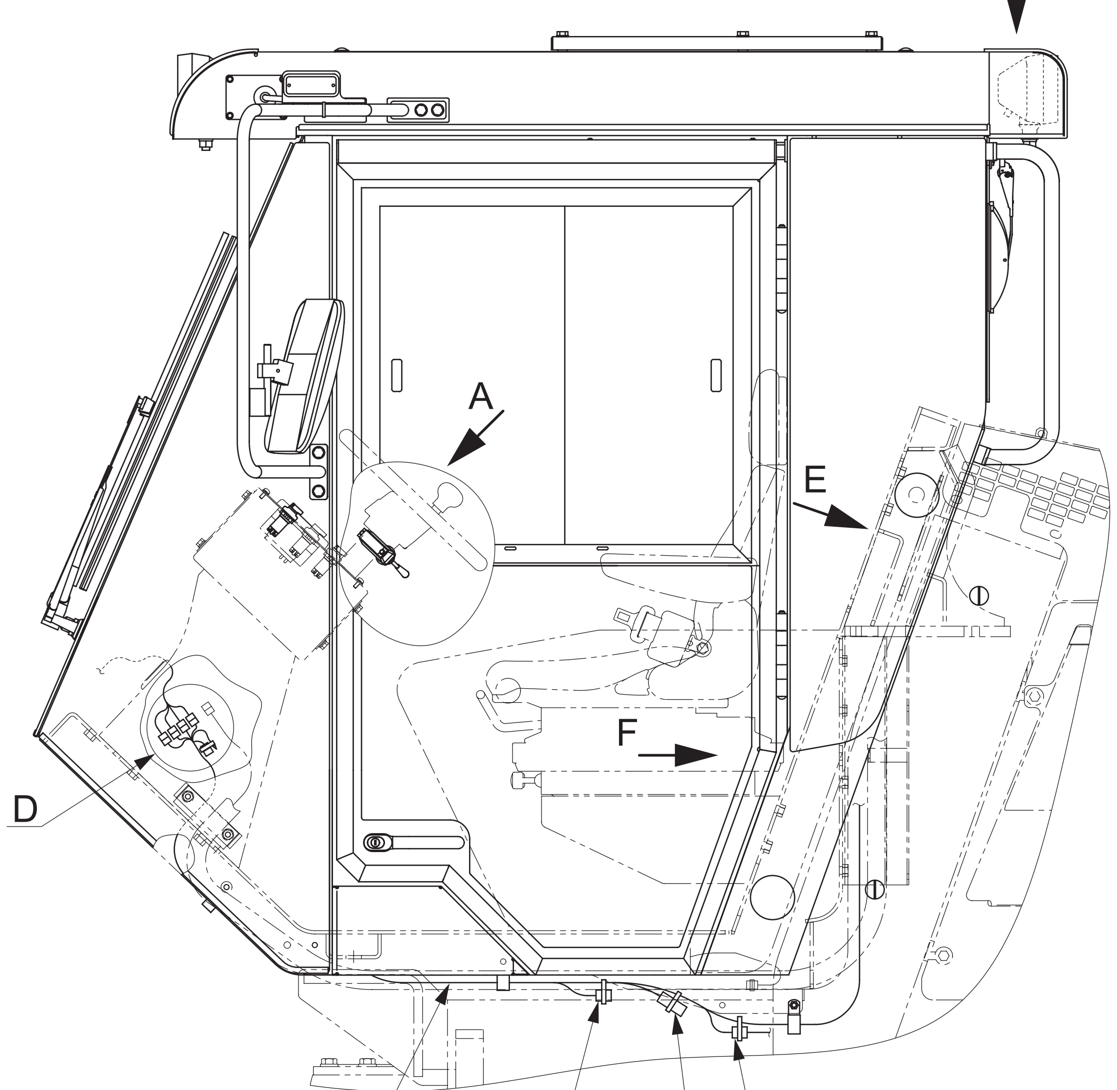
VIEW C

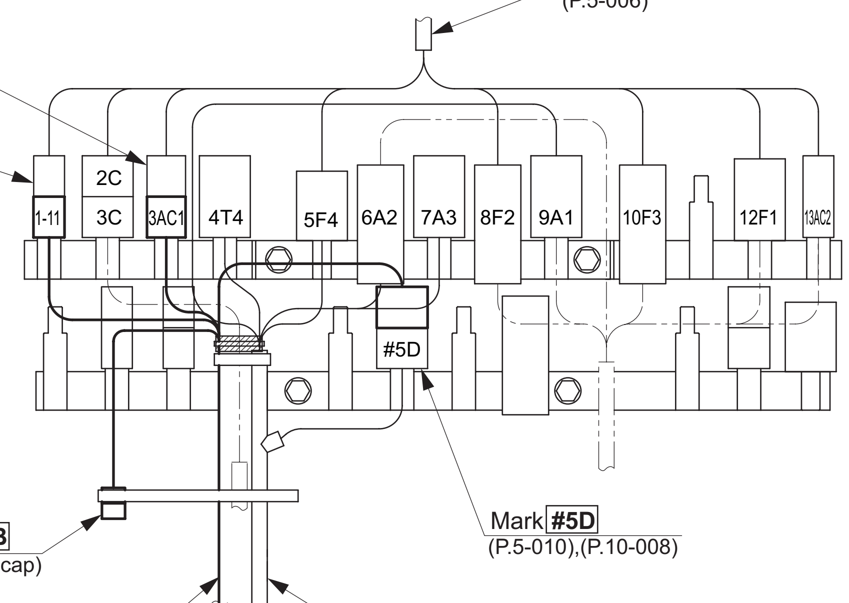


DETAL D



VIEW E

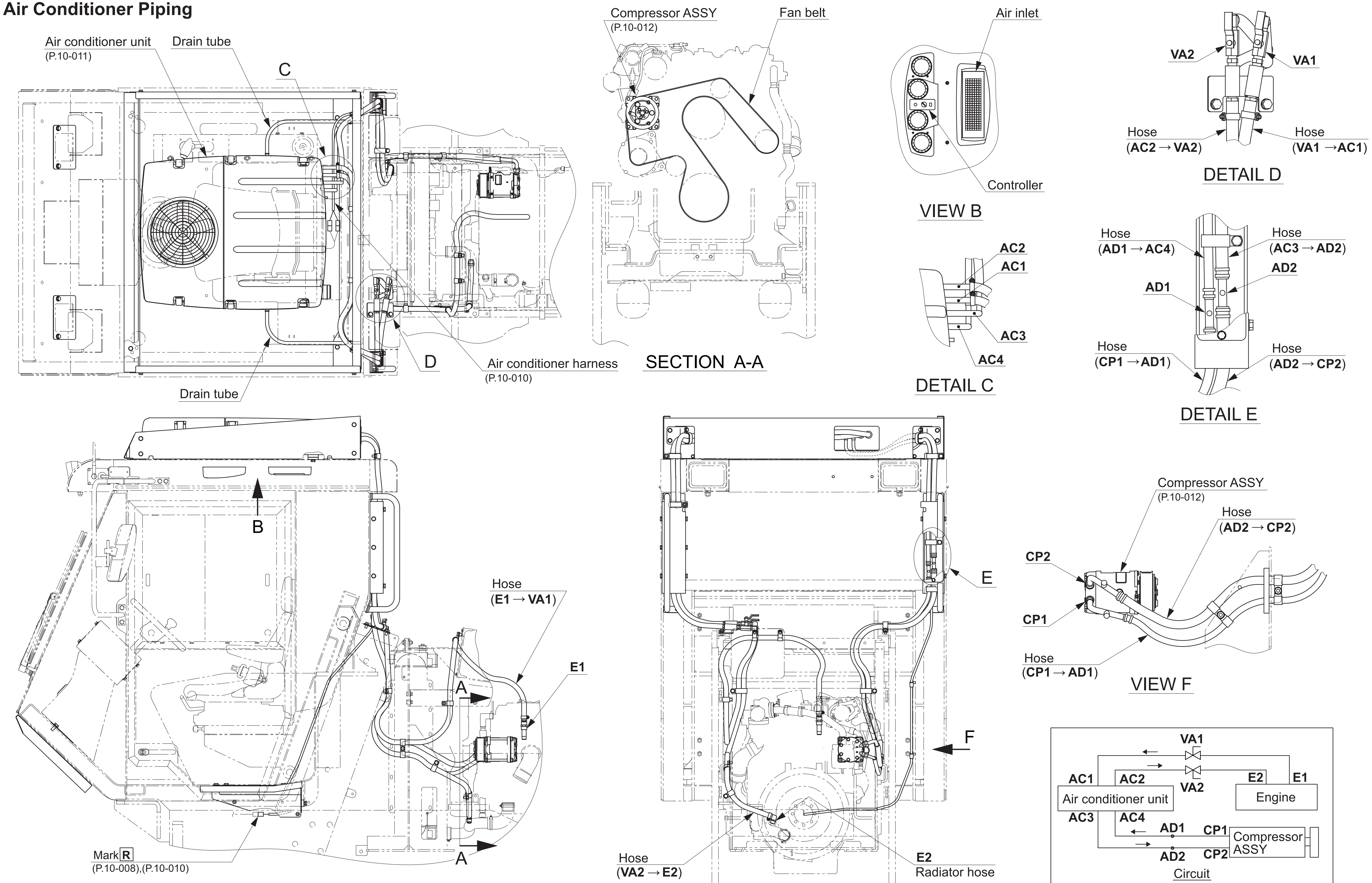




VIEW F

0418-33833-0-12871-A

1-3. Air Conditioner Piping

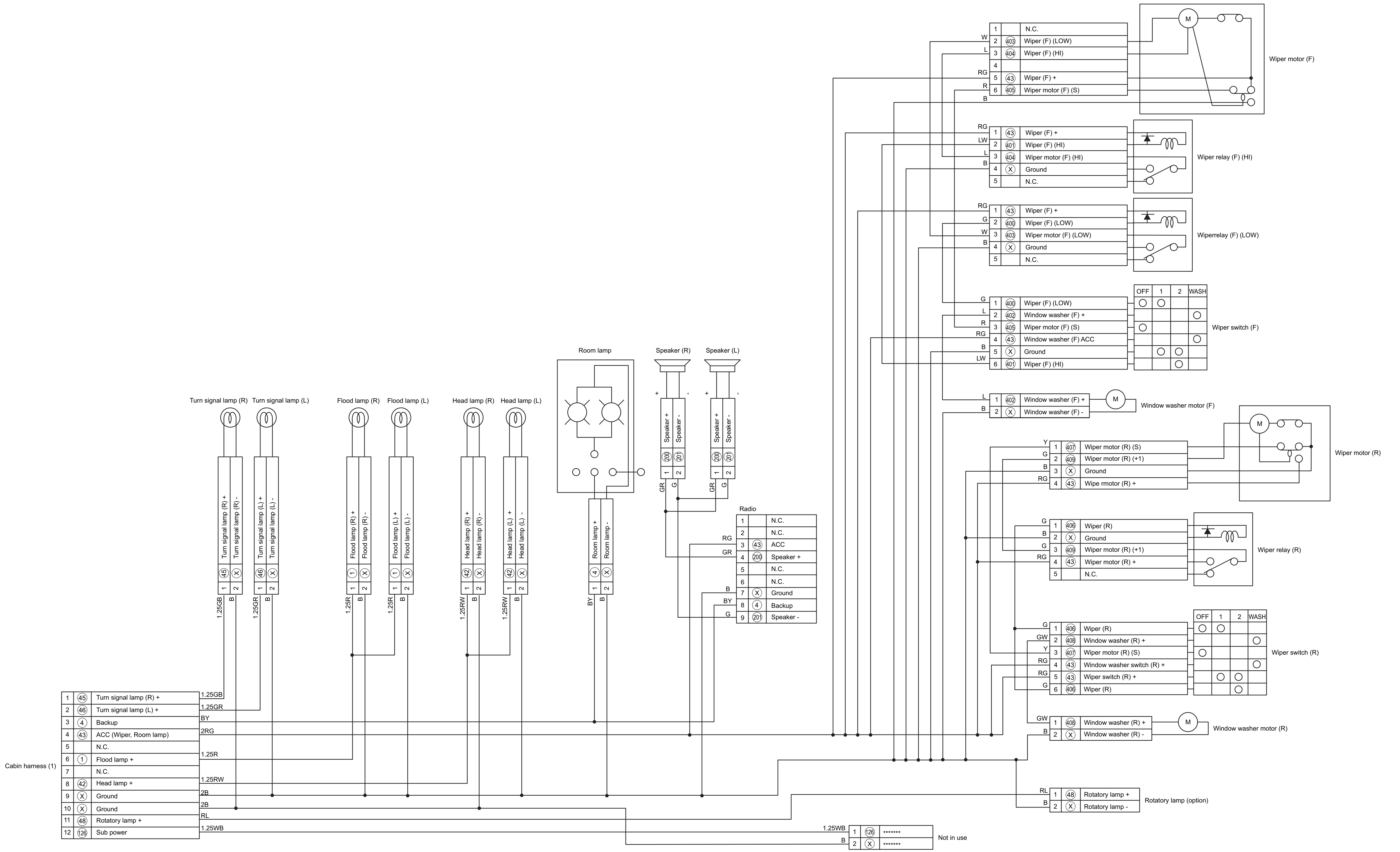


• The letters and numbers in the figure such as “CP1” and “AD1” show each port.
• Arrow symbols “→” show the hose connection and the direction of the flow of refrigerant or water.

0418-33834-0-12860-A
0418-33834-0-12913-A

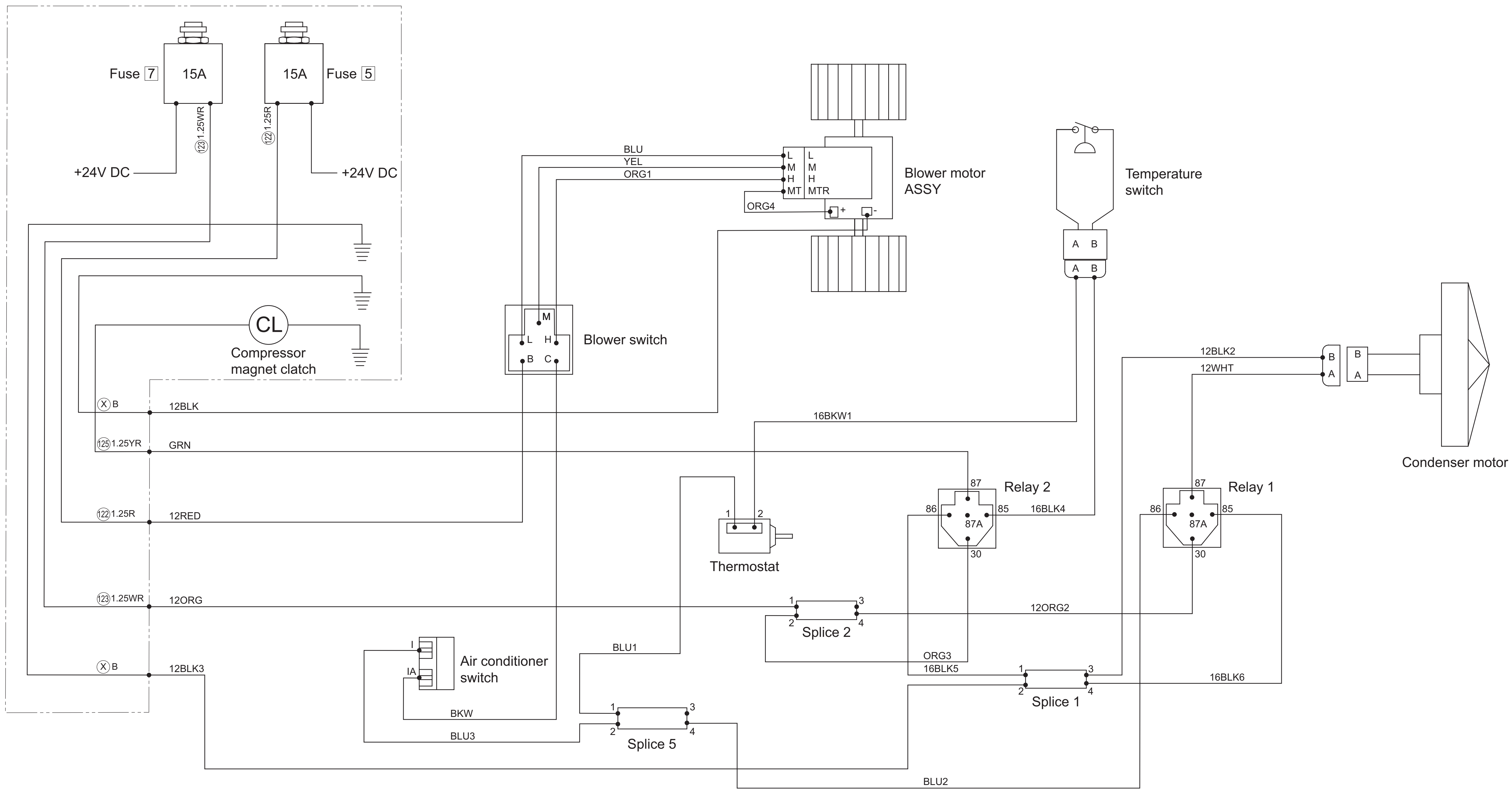
2. ELECTRICAL COMPONENTS

2-1. Cabin Wiring Connections



• The indication method of harness wire numbers, size and wire color is mentioned according to the “ELECTRICAL SYSTEM” (P.5-001).

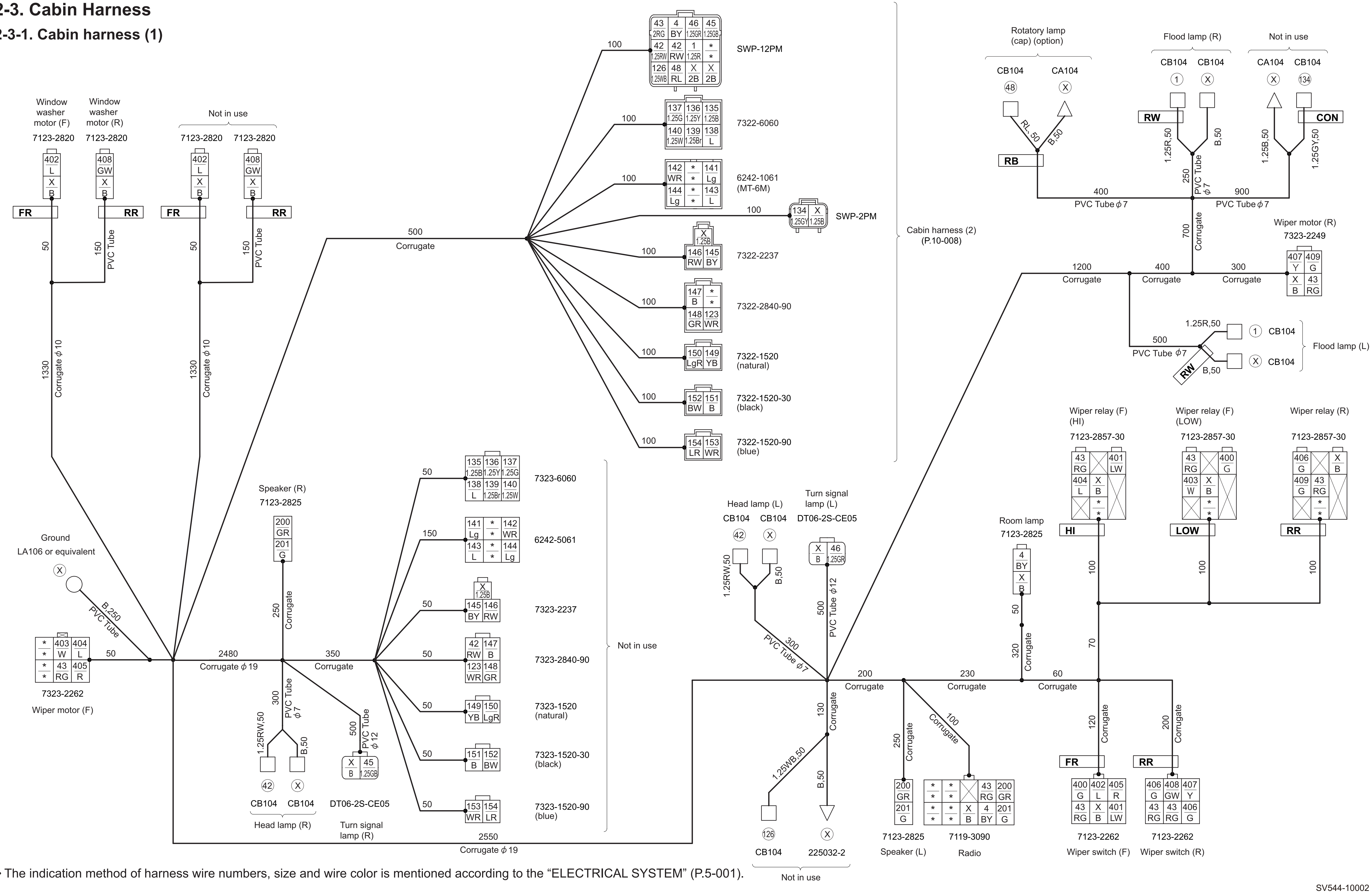
2-2. Air Conditioner Wiring Connections



SV544-10003

2-3. Cabin Harness

2-3-1. Cabin harness (1)

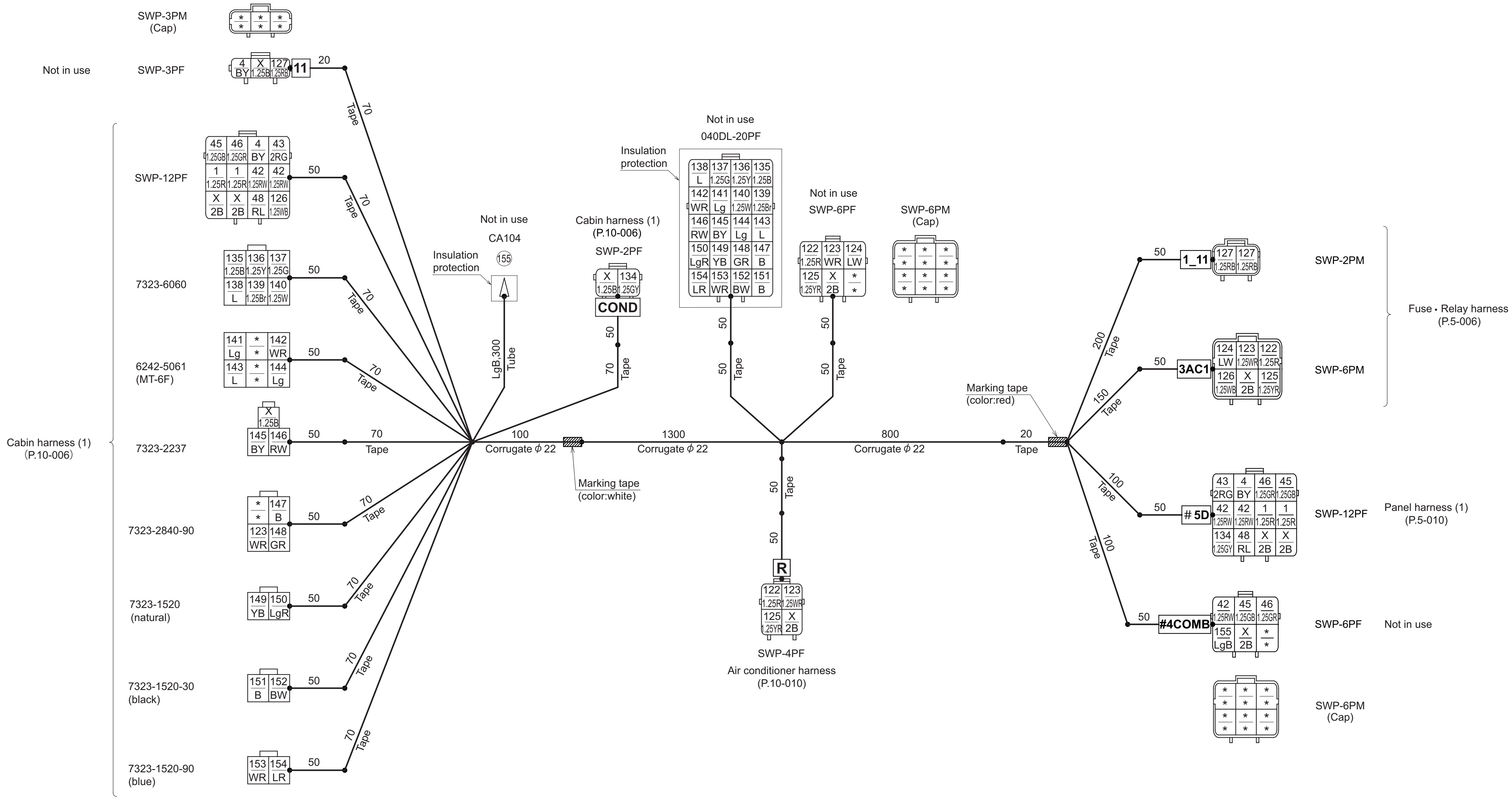


・The indication method of harness wire numbers, size and wire color is mentioned according to the “ELECTRICAL SYSTEM” (P.5-001).

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	B, 1.25B, 2B	26	Cabin harness (2)-12PM × 2, -2237, -2PM, Flood lamp (L), (R), Ground, Head lamp (L), (R), Radio, Room lamp, Turn signal lamp (L), (R), Window washer motor (F), (R), Wiper motor (R), Wiper relay (F) (HI), (F) (LOW), (R), Wiper switch (F), Rotatory lamp (option), 225032-2 (not in use), 7123-2820 (not in use) × 2, 7322-2237 (not in use), CB104 (not in use)
1	1.25R	3	Cabin harness (2)-12PM, Flood lamp (L), (R)
4	BY	3	Cabin harness (2)-12PM, Radio, Room lamp
42	RW, 1.25RW	5	Cabin harness (2)-12PM × 2, Head lamp (L), (R), 2840 (not in use)
43	RG, 2RG	10	Cabin harness (2)-12PM, Radio, Wiper switch (F), (R) × 2, Wiper motor (F), (R), Wiper relay (F) (HI), (F) (LOW), (R)
45	1.25GB	2	Cabin harness (2)-12PM, Turn signal lamp (R)
46	1.25GR	2	Cabin harness (2)-12PM, Turn signal lamp (L)
48	RL	2	Cabin harness (2)-12PM, Rotatory lamp (option)
123	WR	2	Cabin harness (2)-2840, 2840 (not in use)
126	1.25WB	2	Cabin harness (2)-12PM, CB104 (not in use)
134	1.25GY	2	Cabin harness (2)-2PM, CB104 (not in use)
135	1.25B	2	Cabin harness (2)-6060, 6060 (not in use)
136	1.25Y	2	Cabin harness (2)-6060, 6060 (not in use)
137	1.25G	2	Cabin harness (2)-6060, 6060 (not in use)
138	L	2	Cabin harness (2)-6060, 6060 (not in use)
139	1.25Br	2	Cabin harness (2)-6060, 6060 (not in use)
140	1.25W	2	Cabin harness (2)-6060, 6060 (not in use)
141	Lg	2	Cabin harness (2)-6M, 5061 (not in use)
142	WR	2	Cabin harness (2)-6M, 5061 (not in use)

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
143	L	2	Cabin harness (2)-6M, 5061 (not in use)
144	Lg	2	Cabin harness (2)-6M, 5061 (not in use)
145	BY	2	Cabin harness (2)-2237, 2237 (not in use)
146	RW	2	Cabin harness (2)-2237, 2237 (not in use)
147	B	2	Cabin harness (2)-2840, 2840 (not in use)
148	GR	2	Cabin harness (2)-2840, 2840 (not in use)
149	YB	2	Cabin harness (2)-1520, 1520 (not in use)
150	LgR	2	Cabin harness (2)-1520, 1520 (not in use)
151	B	2	Cabin harness (2)-1520-30, 1520-30 (not in use)
152	BW	2	Cabin harness (2)-1520-30, 1520-30 (not in use)
153	WR	2	Cabin harness (2)-1520-90, 1520-90 (not in use)
154	LR	2	Cabin harness (2)-1520-90, 1520-90 (not in use)
200	GR	3	Radio, Speaker (L), (R)
201	G	3	Radio, Speaker (L), (R)
400	G	2	Wiper switch (F), Wiper relay (F) (LOW)
401	LW	2	Wiper switch (F), Wiper relay (F) (HI)
402	L	3	Window washer motor (F), Wiper switch (F), 7123-2820 (not in use)
403	W	2	Wiper motor (F), Wiper relay (F) (LOW)
404	L	2	Wiper motor (F), Wiper relay (F) (HI)
405	R	2	Wiper switch (F), Wiper motor (F)
406	G	3	Wiper switch (R) × 2, Wiper relay (R)
407	Y	2	Wiper switch (R), Wiper motor (R)
408	GW	3	Window washer motor (R), Wiper switch (R), 7123-2820 (not in use)
409	G	2	Wiper motor (R), Wiper relay (R)

2-3-2. Cabin harness (2)



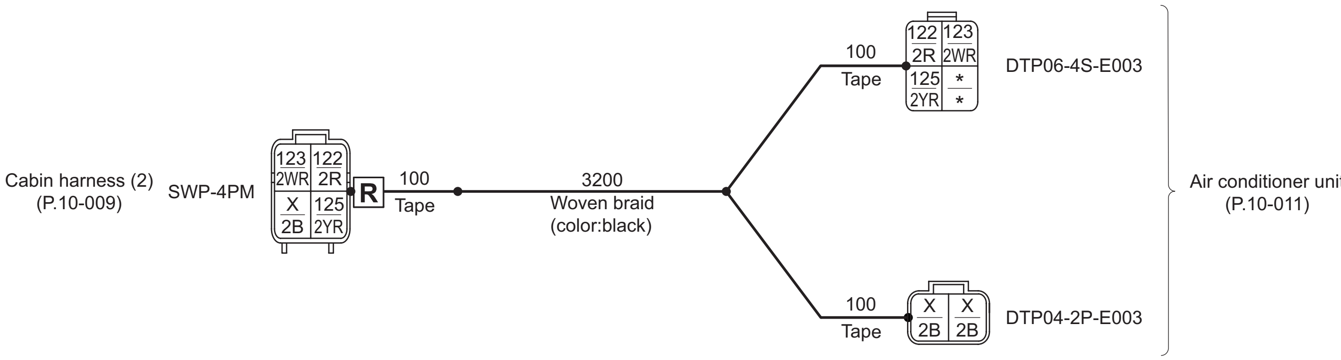
• The indication method of harness wire numbers, size and wire color is mentioned according to the “ELECTRICAL SYSTEM” (P.5-001).

4919-21000-1-13208-A

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	1.25B, 2B	11	3AC1, #5D × 2, COND, R, Cabin harness (1)-12PF × 2, -2237, 11 (not in use), #4COMB (not in use), SWP-6PF (not in use)
1	1.25R	4	#5D × 2, Cabin harness (1)-12PF × 2
4	BY	3	#5D, Cabin harness (1)-12PF, 11 (not in use)
42	1.25RW	5	#5D × 2, Cabin harness (1)-12PF × 2, #4COMB (not in use)
43	2RG	2	#5D, Cabin harness (1)-12PF
45	1.25GB	3	#5D, Cabin harness (1)-12PF, #4COMB (not in use)
46	1.25GR	3	#5D, Cabin harness (1)-12PF, #4COMB (not in use)
48	RL	2	#5D, Cabin harness (1)-12PF
122	1.25R	3	3AC1, R, SWP-6PF (not in use)
123	WR, 1.25WR	4	3AC1, R, Cabin harness (1)-2840-90, SWP-6PF (not in use)
124	LW	2	3AC1, SWP-6PF (not in use)
125	1.25YR	3	3AC1, R, SWP-6PF (not in use)
126	1.25WB	2	3AC1, Cabin harness (1)-12PF
127	1.25RB	3	11, 1_11 × 2
134	1.25GY	2	#5D, COND
135	1.25B	2	Cabin harness (1)-6060, 040DL-20PF (not in use)
136	1.25Y	2	Cabin harness (1)-6060, 040DL-20PF (not in use)
137	1.25G	2	Cabin harness (1)-6060, 040DL-20PF (not in use)

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
138	L	2	Cabin harness (1)-6060, 040DL-20PF (not in use)
139	1.25Br	2	Cabin harness (1)-6060, 040DL-20PF (not in use)
140	1.25W	2	Cabin harness (1)-6060, 040DL-20PF (not in use)
141	Lg	2	Cabin harness (1)-5061, 040DL-20PF (not in use)
142	WR	2	Cabin harness (1)-5061, 040DL-20PF (not in use)
143	L	2	Cabin harness (1)-5061, 040DL-20PF (not in use)
144	Lg	2	Cabin harness (1)-5061, 040DL-20PF (not in use)
145	BY	2	Cabin harness (1)-2237, 040DL-20PF (not in use)
146	RW	2	Cabin harness (1)-2237, 040DL-20PF (not in use)
147	B	2	Cabin harness (1)-2840-90, 040DL-20PF (not in use)
148	GR	2	Cabin harness (1)-2840-90, 040DL-20PF (not in use)
149	YB	2	Cabin harness (1)-1520, 040DL-20PF (not in use)
150	LgR	2	Cabin harness (1)-1520, 040DL-20PF (not in use)
151	B	2	Cabin harness (1)-1520-30, 040DL-20PF (not in use)
152	BW	2	Cabin harness (1)-1520-30, 040DL-20PF (not in use)
153	WR	2	Cabin harness (1)-1520-90, 040DL-20PF (not in use)
154	LR	2	Cabin harness (1)-1520-90, 040DL-20PF (not in use)
155	LgB	2	#4COMB (not in use), CA104 (not in use)

2-3-3. Air conditioner harness

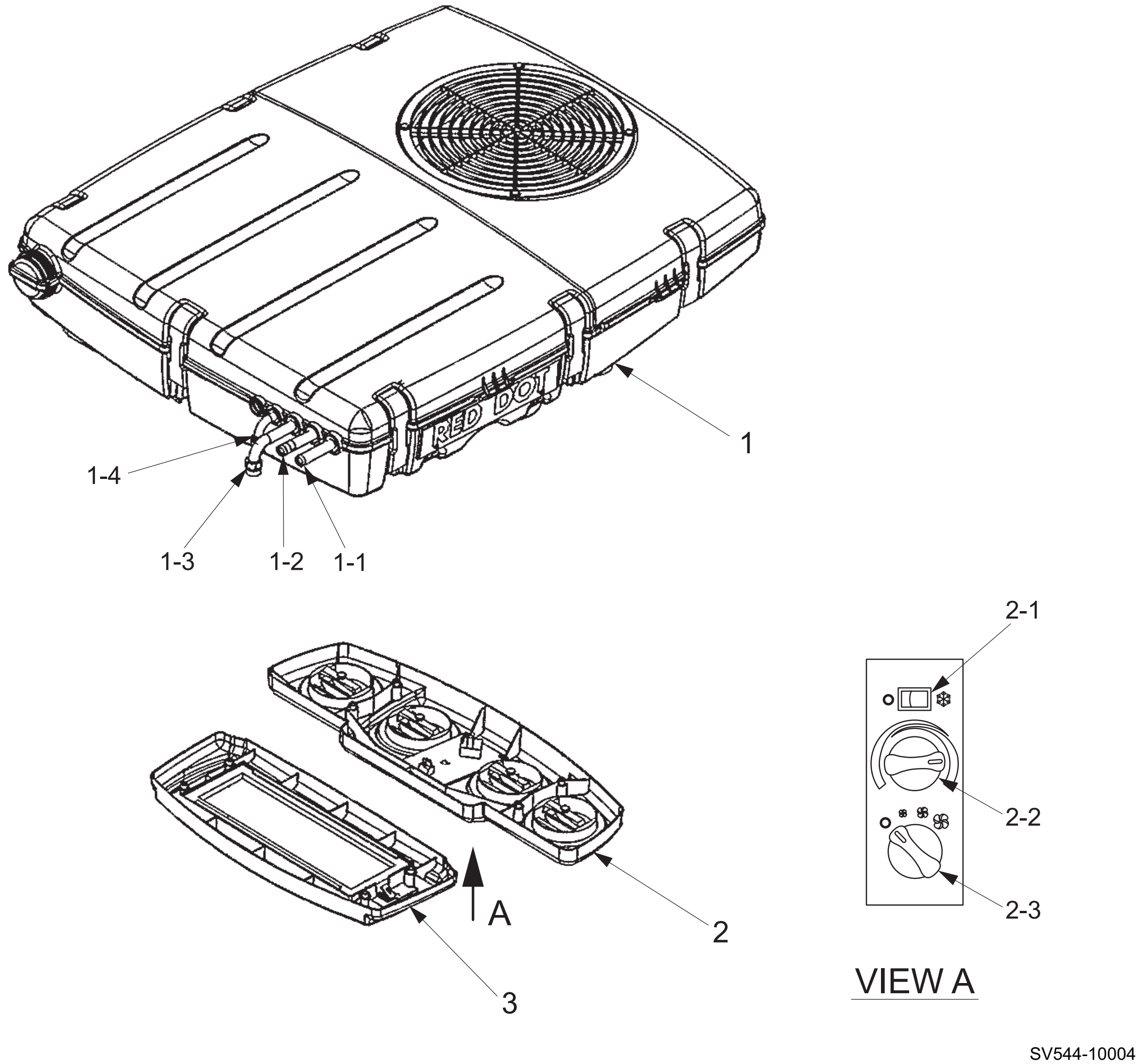


4919-20000-0-33207-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
X	2B	3	R, Air conditioner unit × 2
122	2R	2	R, Air conditioner unit
123	2RW	2	R, Air conditioner unit
125	2YR	2	R, Air conditioner unit

3. ELECTRICAL COMPONENT SPECIFICATIONS

3-1. Air Conditioner Unit



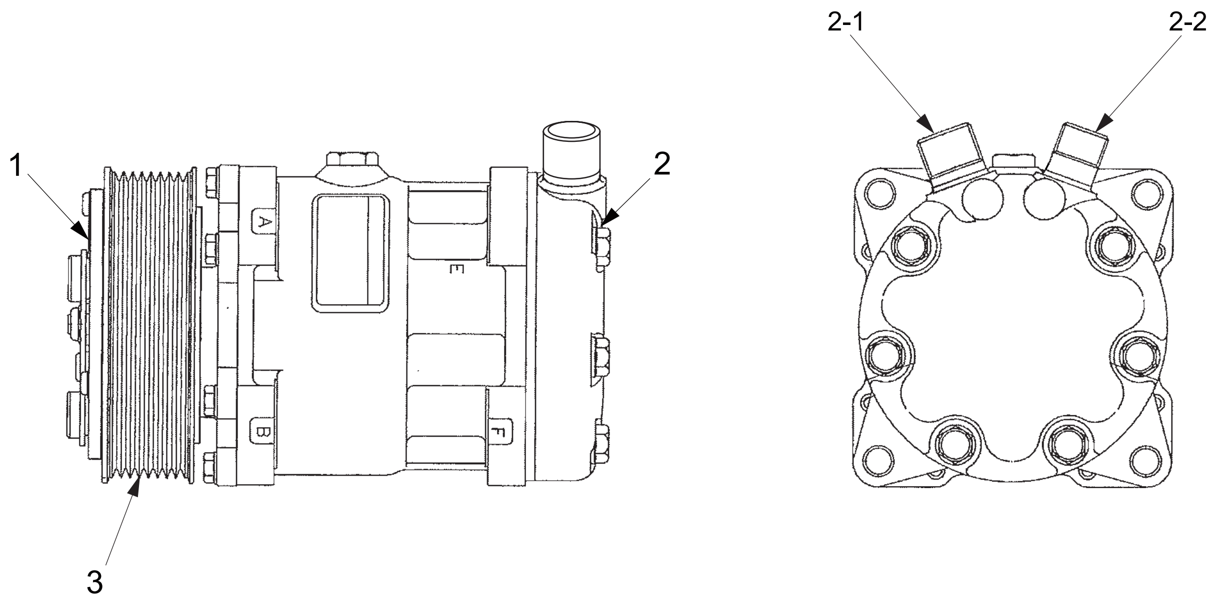
(1) Air conditioner unit ASSY
- (1-1) Port **[AC2]**
- (1-2) Port **[AC1]**
- (1-3) Port **[AC3]**
- (1-4) Port **[AC4]**

(2) Controller/blowout port panel
- (2-1) Air conditioner switch
- (2-2) Temperature switch
- (2-3) Blower switch

(3) Inlet port panel

Specifications
- Rated voltage : 24 V
- Weight : 29.5 kg (65 lbs.)

3-2. Compressor ASSY



SV514-08006

(1) Magnet clutch
(2) Compressor
(2-1) Suction port **[CP2]** : ϕ14.7
(2-2) Discharge port **[CP1]** : ϕ11.8
(3) Pully

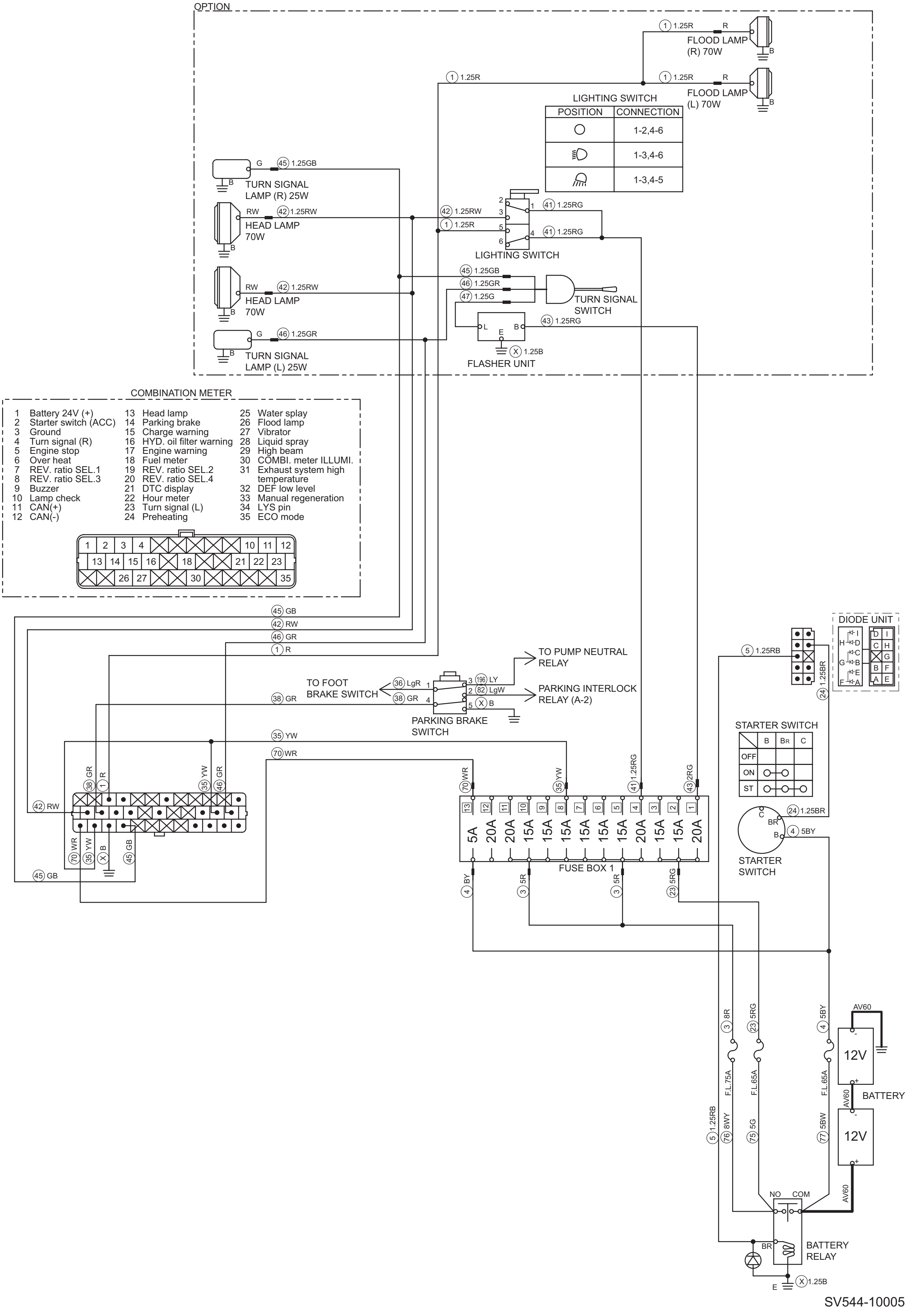
Compressor specifications

- Displacement : 154.9 cm^3/rev (9.5 cu.in./rev)
- Refrigerant : R-134a
- Oil capacity : 175 cm^3 (0.05 gal.)

Magnet clutch specifications

- Maximum allowable belt tension : 120 kgf (242 lbf)
- Pully diameter : 125 mm (4.9 in.)

Fig.: 4-1-1


OPTION
FLOOD LAMP (R) 70W
FLOOD LAMP (L) 70W
LIGHTING SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
TURN SIGNAL LAMP (R) 25W
HEAD LAMP 70W
HEAD LAMP 70W
TURN SIGNAL LAMP (L) 25W
LIGHTING SWITCH
TURN SIGNAL SWITCH
FLASHER UNIT
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO PUMP NEUTRAL RELAY
TO FOOT BRAKE SWITCH
PARKING INTERLOCK RELAY (A-2)
PARKING BRAKE SWITCH
DIODE UNIT
STARTER SWITCH
OFF
ON
ST
FUSE BOX 1
5A 20A 20A 15A 15A 15A 15A 15A 15A 20A 15A 20A
STARTER SWITCH
BATTERY
12V
12V
BATTERY RELAY
SV544-10005

4. TROUBLESHOOTING

4-1. Lighting

Check following items before troubleshooting.

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

4-1-1. Head lamp does not light

- Starter switch must be ON.
- Lighting switch must be “ ”.

Reference Fig.: 4-1-1

Check point	Check/Cause	Action
1. Each Bulb	• Check that none of lamp bulbs is burned out or has a contact failure. • Bulb is faulty or poorly connected.	Replace each bulb.
2. Lighting Switch	(1) Measure voltage between lighting switch terminal 1 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) Measure voltage between lighting switch terminal 3 inlet wire RW and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, lighting switch is faulty.	Replace lighting switch.
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, the harness is faulty.	Repair or replace harness.

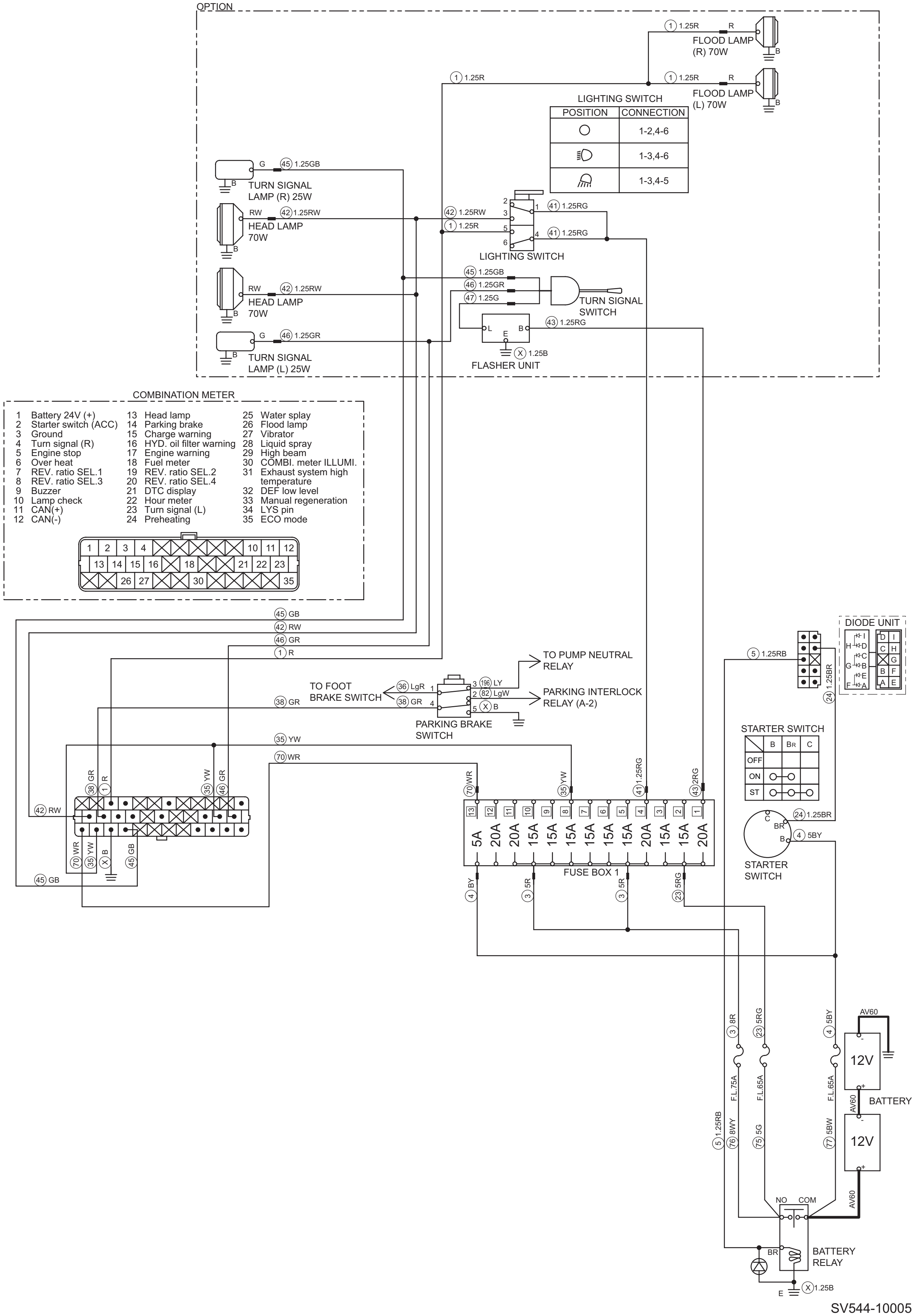
4-1-2. Flood lamp does not light

- Starter switch must be ON.
- Lighting switch must be “ ”.

Reference Fig.: 4-1-1

Check point	Check/Cause	Action
1. Each Bulb	• Check that none of lamp bulbs is burned out or has a contact failure. • Bulb is faulty or poorly connected.	Replace each bulb.
2. Lighting Switch	(1) Measure voltage between lighting switch terminal 4 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) Measure voltage between lighting switch terminal 5 inlet wire R and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, lighting switch is faulty.	Replace lighting switch.
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, the harness is faulty.	Repair or replace harness.

Fig.: 4-1-1

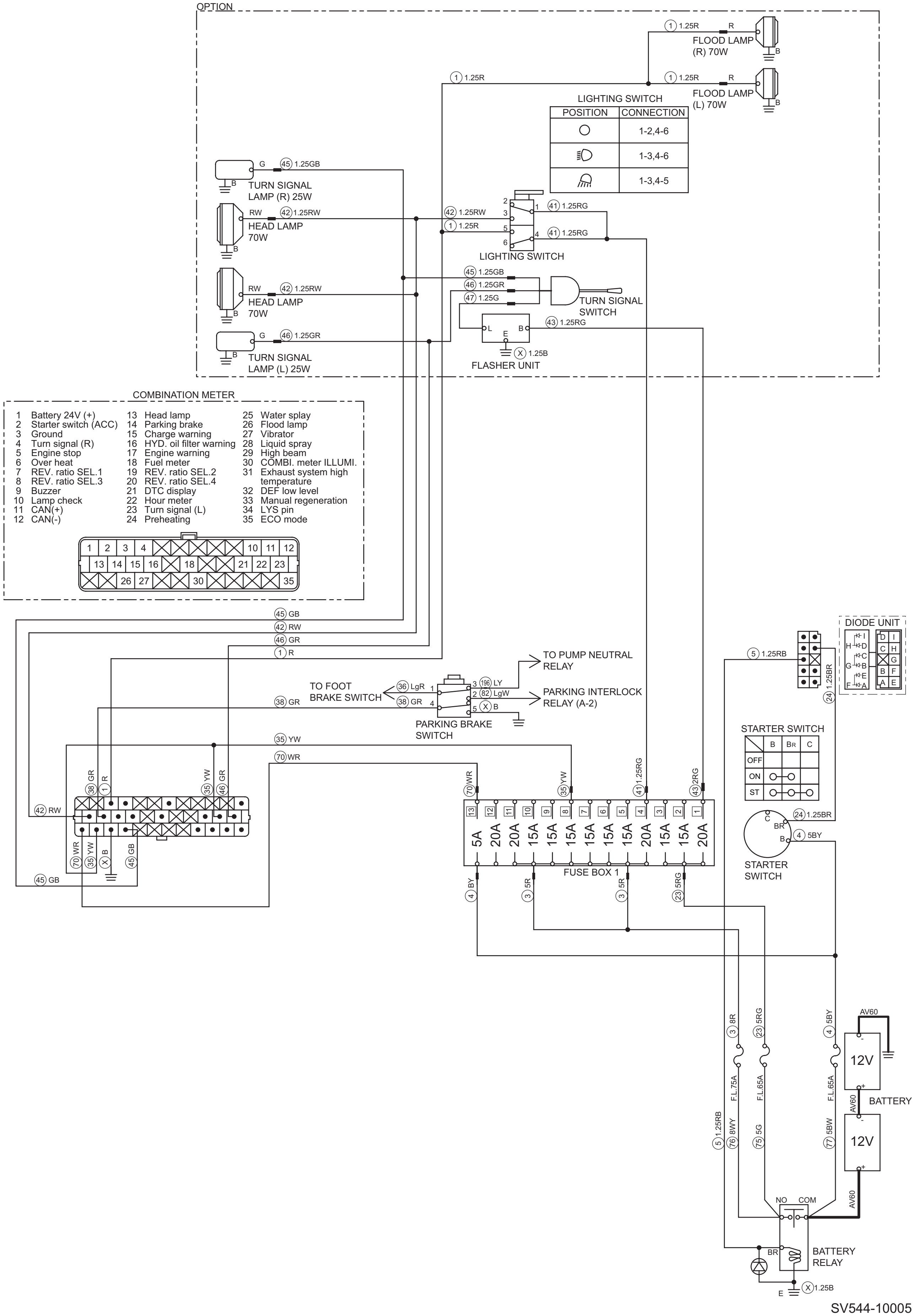

OPTION
FLOOD LAMP (R) 70W
FLOOD LAMP (L) 70W
LIGHTING SWITCH
POSITION CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
TURN SIGNAL LAMP (R) 25W
HEAD LAMP 70W
HEAD LAMP 70W
TURN SIGNAL LAMP (L) 25W
LIGHTING SWITCH
TURN SIGNAL SWITCH
FLASHER UNIT
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO FOOT BRAKE SWITCH
TO PUMP NEUTRAL RELAY
PARKING INTERLOCK RELAY (A-2)
PARKING BRAKE SWITCH
DIODE UNIT
STARTER SWITCH
OFF
ON
ST
STARTER SWITCH
FUSE BOX 1
5A 20A 20A 15A 15A 15A 15A 15A 15A 20A 15A 15A 20A
F.L.75A
F.L.65A
F.L.65A
12V
12V
BATTERY
AV60
NO COM
BATTERY RELAY
SV544-10005

4-1-3. Turn signal lamp does not light

Reference Fig. : 4-1-1

Check point	Check/Cause	Action
1. Each Bulb	• Check that none of lamp bulbs is burned out or has a contact failure. • Bulb is faulty or poorly connected.	Replace each bulb.
2. Flasher Unit	(1) When starter switch is ON, measure voltage between flasher unit terminal B inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON and turn signal switch lever is moved, measure voltage between flasher unit terminal L inlet wire G and chassis ground. Standard voltage : 24 V or more with constant intervals • If above item (1) is OK and item (2) is NG, flasher unit is faulty.	Replace flasher unit.
3. Turn Signal Switch	(1) When starter switch is ON and turn signal switch lever is moved, measure voltage between turn signal switch terminal inlet wire G and chassis ground. Standard voltage : 24 V or more with constant intervals (2) When starter switch is ON and turn signal switch lever is moved, measure voltage between turn signal switch terminal wires and chassis ground. Turn signal (R) : Outlet wire GB Turn signal (L) : Outlet wire GR Standard voltage : 24 V or more with constant intervals • If above item (1) is OK and item (2) is NG, turn signal switch is faulty.	Replace turn signal switch.
4. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, the harness is faulty.	Repair or replace harness.

Fig.: 4-1-1


OPTION
FLOOD LAMP (R) 70W
FLOOD LAMP (L) 70W
LIGHTING SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
TURN SIGNAL LAMP (R) 25W
HEAD LAMP 70W
HEAD LAMP 70W
TURN SIGNAL LAMP (L) 25W
LIGHTING SWITCH
TURN SIGNAL SWITCH
FLASHER UNIT
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO FOOT BRAKE SWITCH
PARKING BRAKE SWITCH
TO PUMP NEUTRAL RELAY
PARKING INTERLOCK RELAY (A-2)
DIODE UNIT
STARTER SWITCH
OFF
ON
ST
FUSE BOX 1
5A 20A 20A 15A 15A 15A 15A 15A 15A 20A 15A 15A 20A
STARTER SWITCH
F.L.75A
F.L.65A
F.L.65A
12V
12V
BATTERY
NO COM
BATTERY RELAY
SV544-10005

4-1-4. Head lamp indicator lamp does not light

- Check that head lamp lights.

Reference Fig. : 4-1-1

Check point	Check/Cause	Action
1. Harness	• Measure resistance between lighting switch terminal 3 wire RW and combination meter connector terminal wire No.42 wire RW. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Combination Meter (Head lamp indicator lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B Standard voltage : 24 V or more (2) When starter switch is ON and lighting switch is “ ”, measure voltage between combination meter head lamp terminal wire No.42 inlet wire RW and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and head lamp indicator lamp does not light, combination meter is faulty.	Replace combination meter.

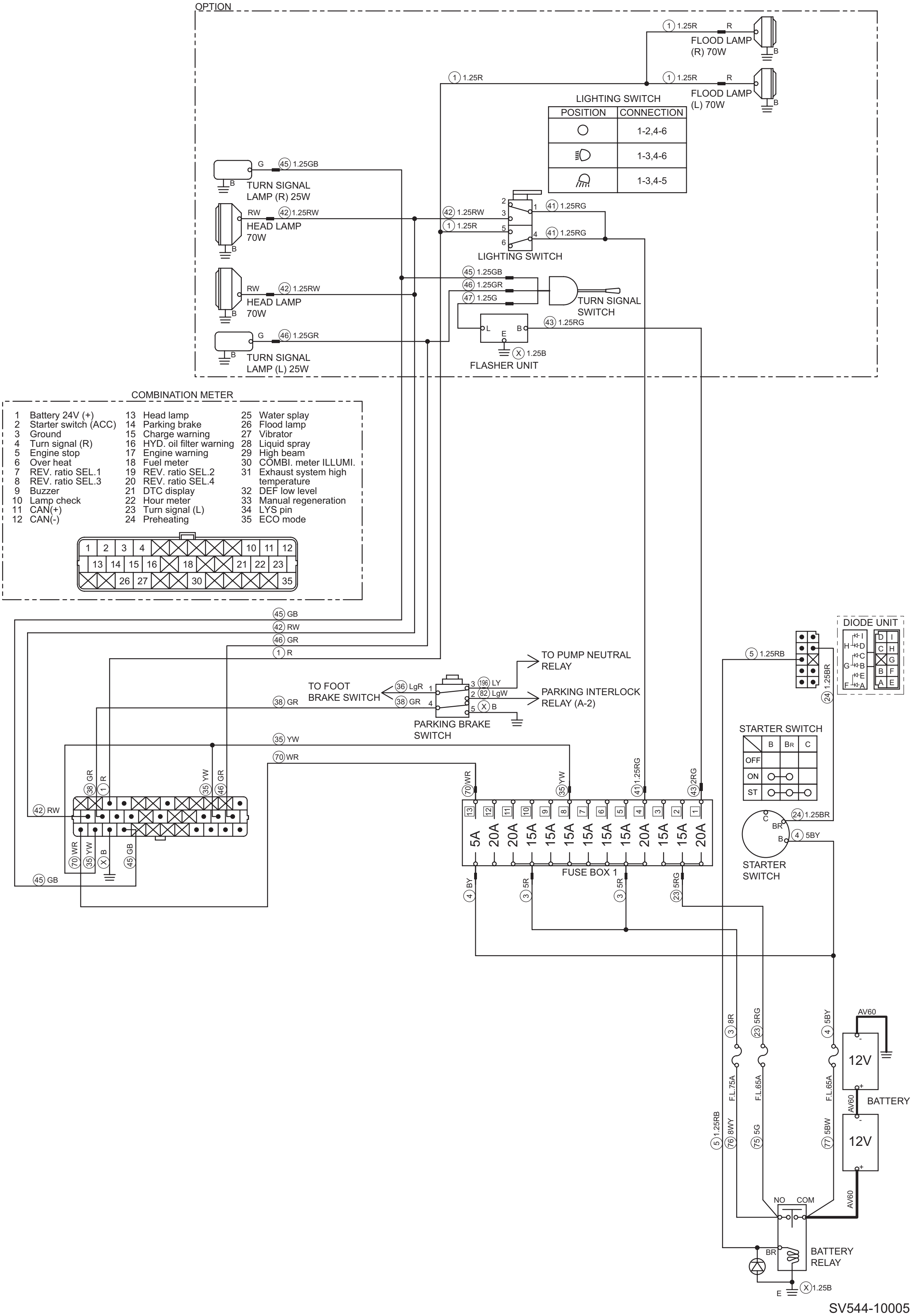
4-1-5. Flood lamp indicator lamp does not light

- Check that flood lamp lights.

Reference Fig. : 4-1-1

Check point	Check/Cause	Action
1. Harness	• Measure resistance between lighting switch terminal 5 wire R and combination meter connector terminal wire No.1 wire R. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.
2. Combination Meter (flood lamp indicator lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B Standard voltage : 24 V or more (2) When starter switch is ON and lighting switch is “ ”, measure voltage between combination meter flood lamp terminal wire No.1 inlet wire R and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and flood lamp indicator lamp does not light, combination meter is faulty.	Replace combination meter.

Fig.: 4-1-1


OPTION
FLOOD LAMP (R) 70W
FLOOD LAMP (L) 70W
LIGHTING SWITCH
POSITION
CONNECTION
1-2,4-6
1-3,4-6
1-3,4-5
TURN SIGNAL LAMP (R) 25W
HEAD LAMP 70W
HEAD LAMP 70W
TURN SIGNAL LAMP (L) 25W
LIGHTING SWITCH
TURN SIGNAL SWITCH
FLASHER UNIT
COMBINATION METER
1 Battery 24V (+)
2 Starter switch (ACC)
3 Ground
4 Turn signal (R)
5 Engine stop
6 Over heat
7 REV. ratio SEL.1
8 REV. ratio SEL.3
9 Buzzer
10 Lamp check
11 CAN(+)
12 CAN(-)
13 Head lamp
14 Parking brake
15 Charge warning
16 HYD. oil filter warning
17 Engine warning
18 Fuel meter
19 REV. ratio SEL.2
20 REV. ratio SEL.4
21 DTC display
22 Hour meter
23 Turn signal (L)
24 Preheating
25 Water splay
26 Flood lamp
27 Vibrator
28 Liquid spray
29 High beam
30 COMBI. meter ILLUMI.
31 Exhaust system high temperature
32 DEF low level
33 Manual regeneration
34 LYS pin
35 ECO mode
TO PUMP NEUTRAL RELAY
TO FOOT BRAKE SWITCH
PARKING INTERLOCK RELAY (A-2)
PARKING BRAKE SWITCH
DIODE UNIT
STARTER SWITCH
OFF
ON
ST
FUSE BOX 1
5A 20A 20A 15A 15A 15A 15A 15A 20A 15A 20A
STARTER SWITCH
F.L.75A
F.L.65A
F.L.65A
12V
12V
BATTERY
NO COM
BATTERY RELAY
SV544-10005

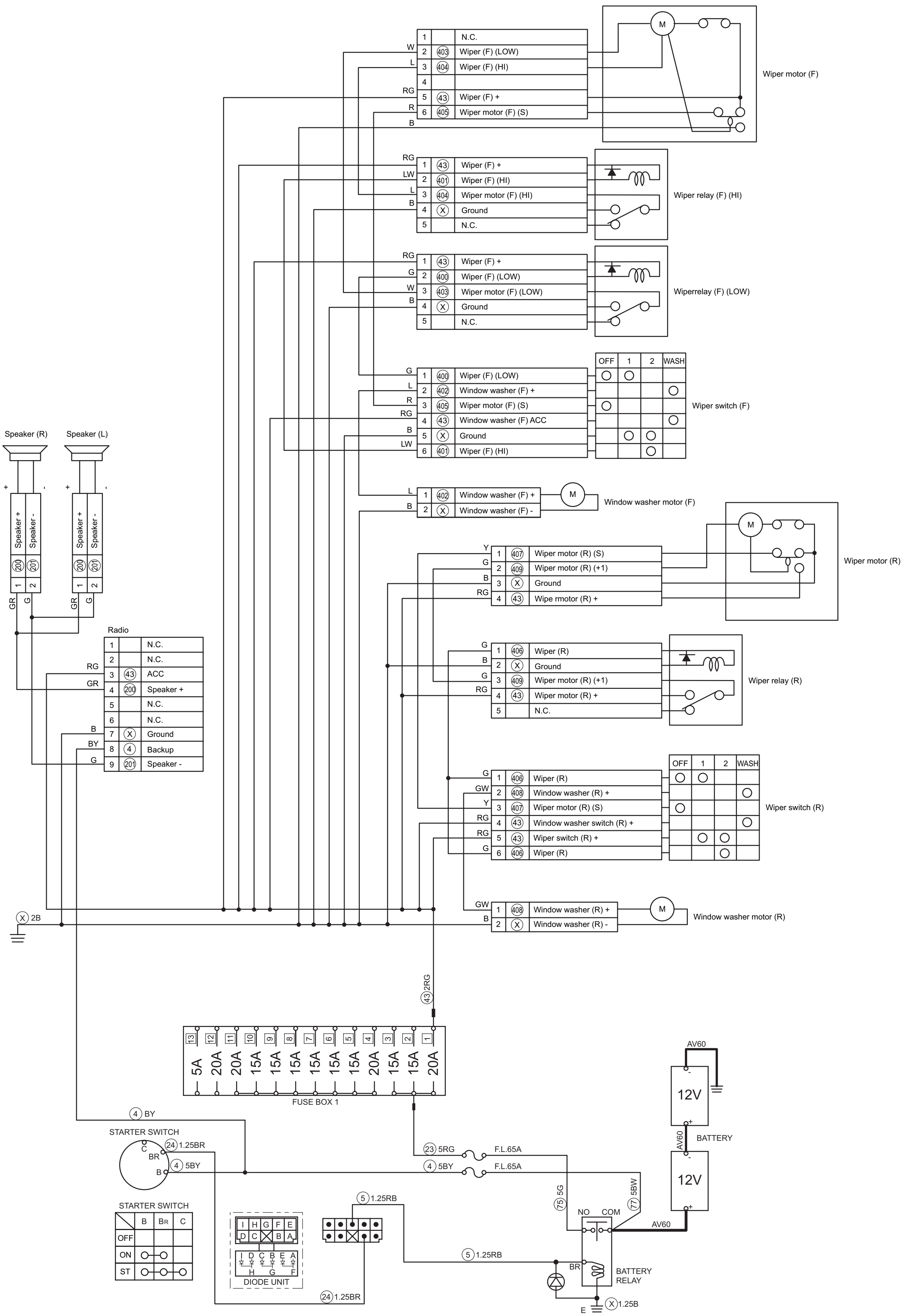
4-1-6. Turn signal indicator lamp does not light

- Check that turn signal lamp blinks.

Reference Fig. : 4-1-1

Check point	Check/Cause	Action
1. Harness	(1) Measure resistance between turn signal switch terminal wire GR (left side) and combination meter connector terminal wire No.46 wire GR. Standard resistance : 10 Ω or less (2) Measure resistance between turn signal switch terminal wire GB (right side) and combination meter connector terminal wire No.45 wire GB. Standard resistance : 10 Ω or less • If above item (1) or (2) is NG, harness is faulty.	Repair or replace harness.
2. Combination Meter (Turn signal indicator lamp)	(1) When starter switch is ON, measure voltage between combination meter terminal wires and ground terminal wire. • Battery (24V) terminal wire No.70 inlet wire WR and ground terminal wire No.X wire B • Stater switch terminal wire No.35 inlet wire YW and ground terminal wire No.X wire B Standard voltage : 24 V or more (2) When starter switch is ON and turn signal switch is moved, measure voltage between combination meter terminal wires and chassis ground. • Turn signal (L) terminal wire No.46 inlet wire GR and chassis ground • Turn signal (R) terminal wire No.45 inlet wire GB and chassis ground Standard voltage : 24 V or more with constant intervals • If above items (1) and (2) are OK and turn signal indicator lamp does not light, combination meter is faulty.	Replace combination meter.

Fig.: 4-2-1



SV544-10006

4-2. Cabin

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.

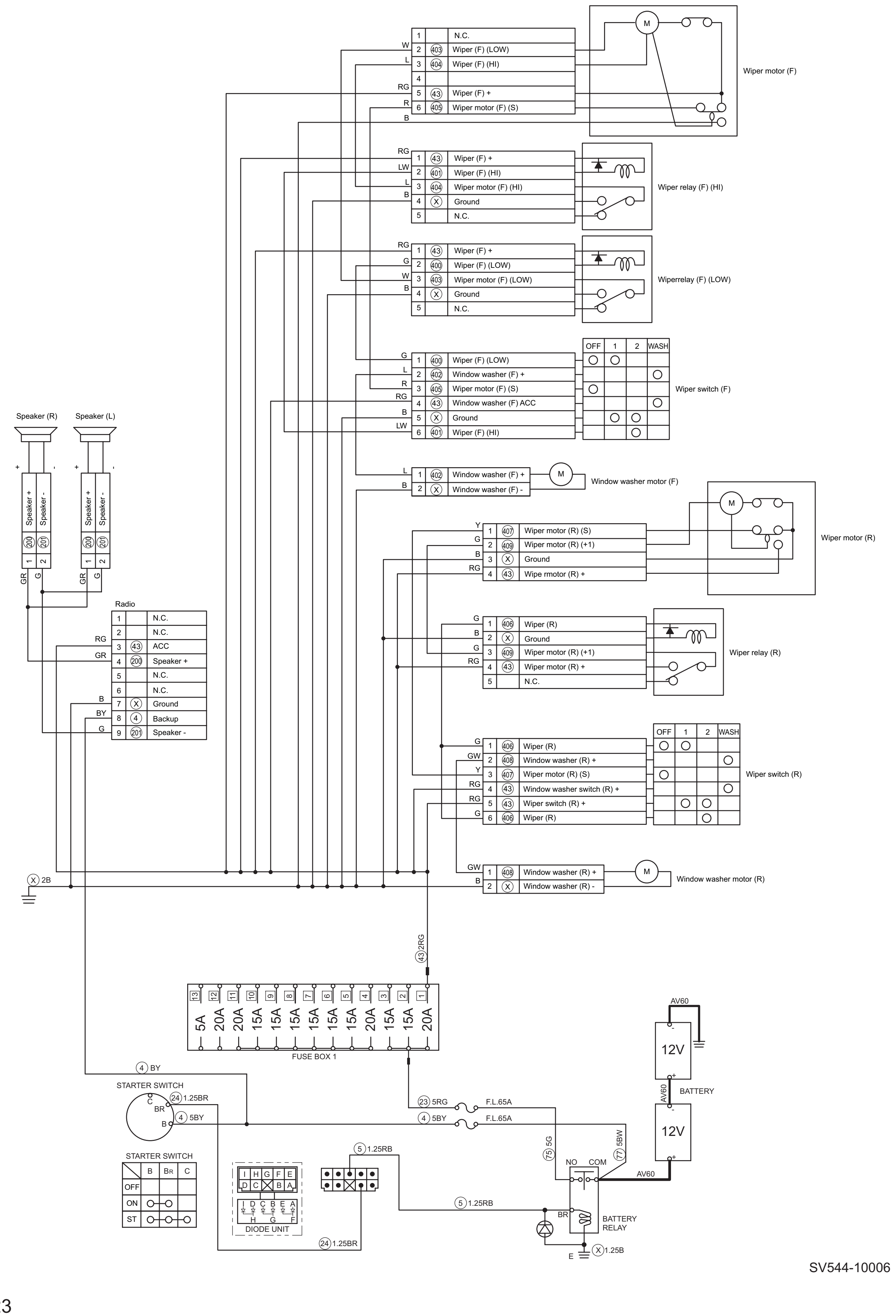
4-2-1. Radio does not listen

- Radio switch must be ON.
- Volume must not be set to minimum.

Reference Fig. : 4-2-1

Check point	Check/Cause	Action
1. Radio	• When starter switch is ON, measure voltage between radio terminals and chassis ground. • Starter switch terminal wire No. 43 inlet wire RG and chassis ground • Battery terminal wire No. 4 inlet wire BY and chassis ground Standard voltage : 24 V or more • If above item is OK and radio does not operate, radio is faulty.	Replace radio.
2. Speaker	• Check speaker edge and cone for tear and damage. • If speaker is damaged, speaker is faulty.	Replace speaker.
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.: 4-2-1



SV544-10006

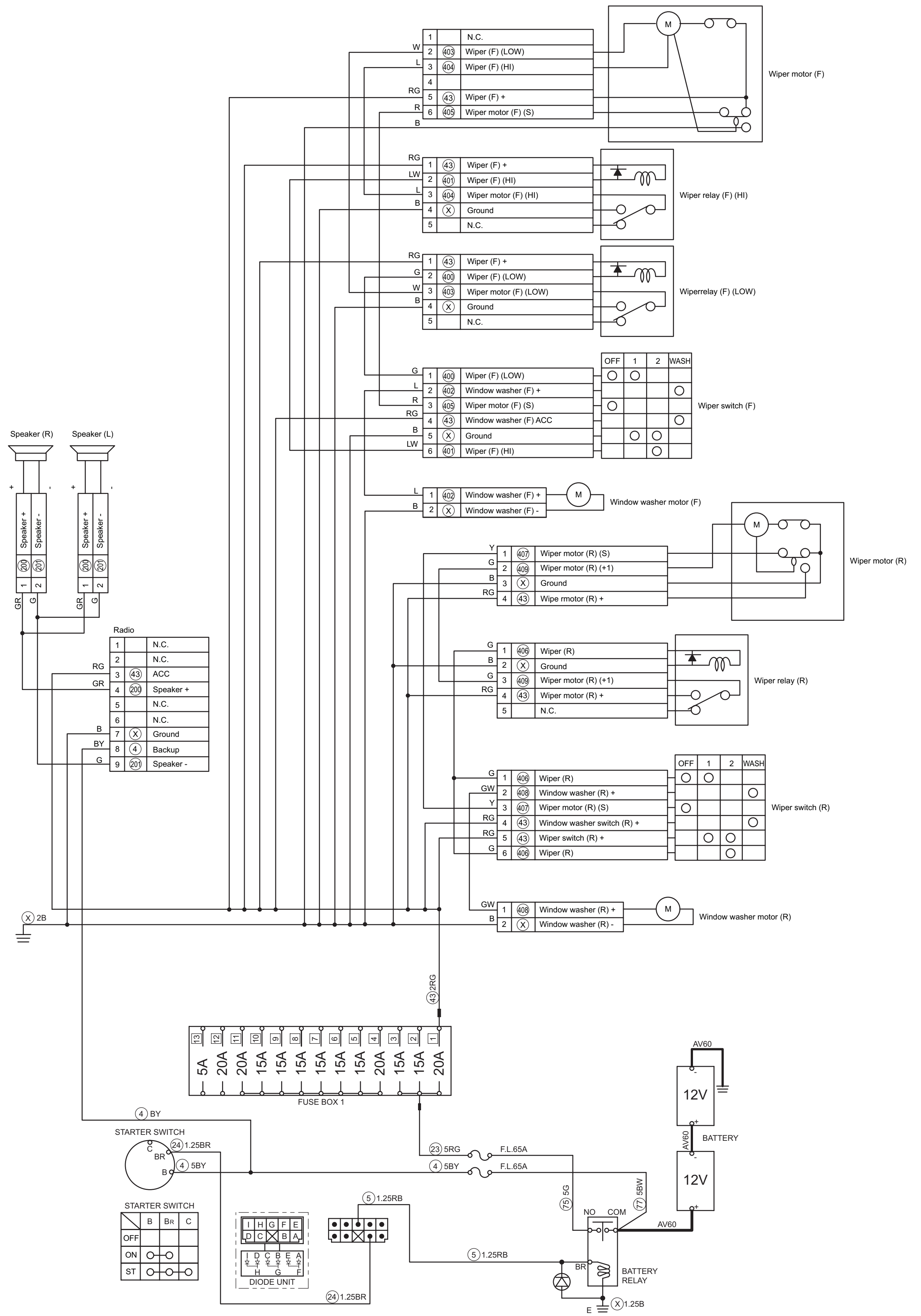
4-2-2. Wiper (F) (LOW) does not work

- Wiper switch (F) must be “I”.

Reference Fig. : 4-2-1

Check point	Check/Cause	Action
1. Wiper Motor (F)	(1) When starter switch is ON, measure voltage between wiper motor (F) terminal 5 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, check continuity between wiper motor (F) terminal 2 outlet wire W and chassis ground. There is continuity in normal condition. • If above items (1) and (2) are OK and wiper motor (F) (LOW) does not operate, wiper motor (F) is faulty.	Replace wiper motor (F).
2. Wiper Relay (F) (LOW)	(1) When starter switch is ON, measure voltage between wiper relay (F) (LOW) terminal 1 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) Check continuity between wiper relay (F) (LOW) terminal 3 wire W and terminal 4 wire B. There is continuity in normal condition. • If above item (1) is OK and item (2) is NG, wiper relay (F) (LOW) is faulty.	Replace wiper relay (F) (LOW).
3. Wiper Switch (F)	• Check continuity between wiper switch (F) terminal 1 wire G and terminal 5 wire B. There is continuity in normal condition. • If resistance is abnormal, wiper switch (F) is faulty.	Replace wiper switch (F).
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.: 4-2-1


Wiper motor (F)
Wiper relay (F) (HI)
Wiperrelay (F) (LOW)
Wiper switch (F)
Window washer motor (F)
Wiper motor (R)
Wiper relay (R)
Wiper switch (R)
Window washer motor (R)
Speaker (R)
Speaker (L)
Radio
FUSE BOX 1
STARTER SWITCH
BATTERY
BATTERY RELAY
DIODE UNIT
12V
F.L.65A
SV544-10006

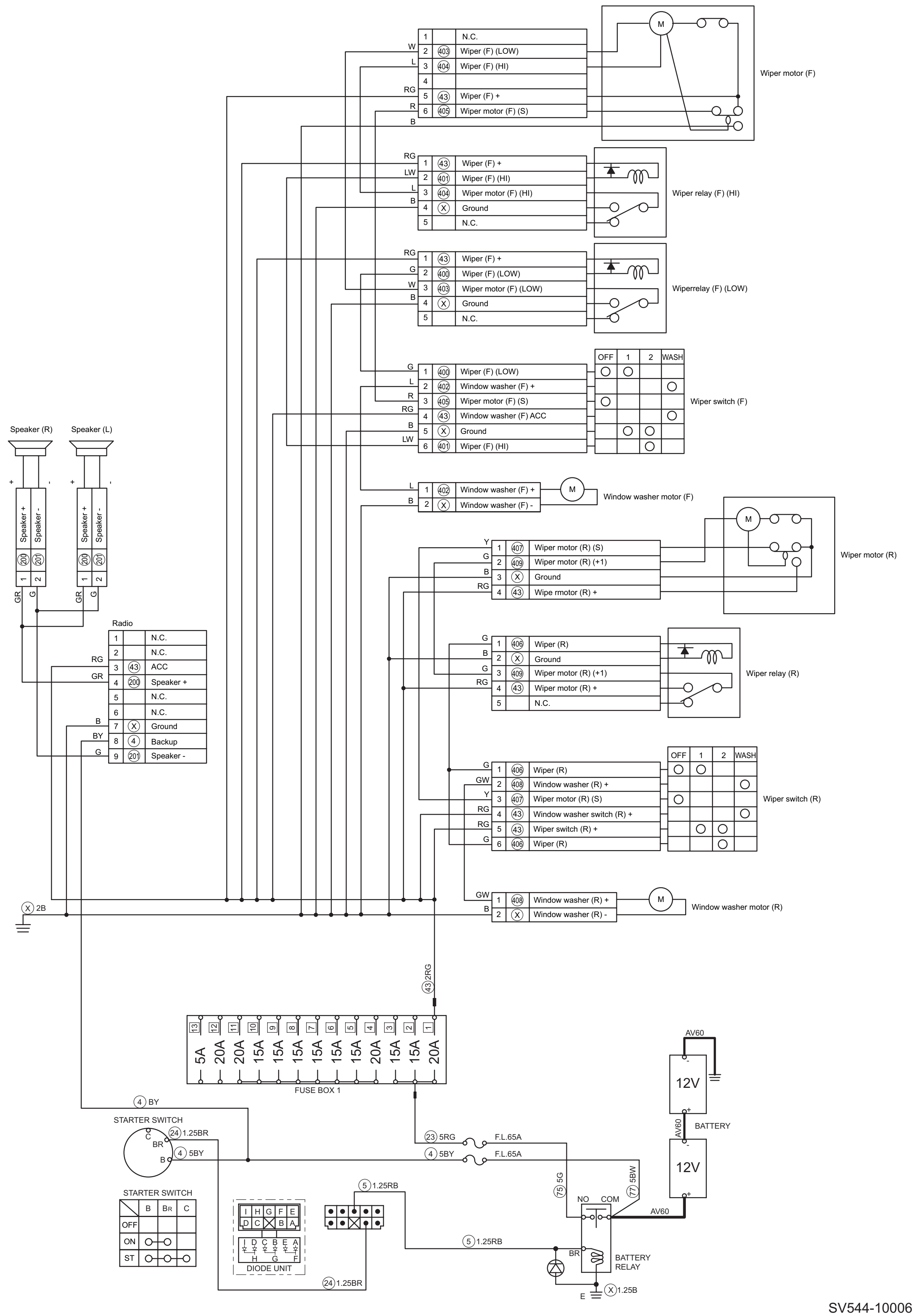
4-2-3. Wiper (F) (HI) does not work

- Wiper switch (F) must be “II”.

Reference Fig. : 4-2-1

Check point	Check/Cause	Action
1. Wiper Motor (F)	(1) When starter switch is ON, measure voltage between wiper motor (F) terminal 5 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, check continuity between wiper motor (F) terminal 3 outlet wire L and chassis ground. There is continuity in normal condition. • If above items (1) and (2) are OK and wiper motor (F) (HI) does not operate, wiper motor (F) is faulty.	Replace wiper motor (F).
2. Wiper Relay (F) (HI)	(1) When starter switch is ON, measure voltage between wiper relay (F) (HI) terminal 1 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) Check continuity between wiper relay (F) (HI) terminal 3 wire L and terminal 4 wire B. There is continuity in normal condition. • If above item (1) is OK and item (2) is NG, wiper relay (F) (HI) is faulty.	Replace wiper relay (F) (HI).
3. Wiper Switch (F)	• Check continuity between wiper switch (F) terminal 6 wire LW and terminal 5 wire B. There is continuity in normal condition. • If resistance is abnormal, wiper switch (F) is faulty.	Replace wiper switch (F).
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.: 4-2-1



Wiper motor (F)
N.C.
Wiper (F) (LOW)
Wiper (F) (HI)
Wiper (F) +
Wiper motor (F) (S)
Wiper relay (F) (HI)
Wiper (F) +
Wiper (F) (HI)
Wiper motor (F) (HI)
Ground
N.C.
Wiperrelay (F) (LOW)
Wiper (F) +
Wiper (F) (LOW)
Wiper motor (F) (LOW)
Ground
N.C.
Wiper switch (F)
OFF 1 2 WASH
Wiper (F) (LOW)
Window washer (F) +
Wiper motor (F) (S)
Window washer (F) ACC
Ground
Wiper (F) (HI)
Window washer (F) +
Window washer (F) -
Window washer motor (F)
Speaker (R)
Speaker (L)
Speaker +
Speaker -
Wiper motor (R)
Wiper motor (R) (S)
Wiper motor (R) (+1)
Ground
Wipe rmotor (R) +
Wiper relay (R)
Wiper (R)
Ground
Wiper motor (R) (+1)
Wiper motor (R) +
N.C.
Radio
N.C.
N.C.
ACC
Speaker +
N.C.
N.C.
Ground
Backup
Speaker -
Wiper switch (R)
OFF 1 2 WASH
Wiper (R)
Window washer (R) +
Wiper motor (R) (S)
Window washer switch (R) +
Wiper switch (R) +
Wiper (R)
Window washer (R) +
Window washer (R) -
Window washer motor (R)
2B
43 2RG
5A 20A 20A 15A 15A 15A 15A 15A 15A 20A 15A 15A 20A
FUSE BOX 1
AV60
12V
BATTERY
AV60
12V
4 BY
STARTER SWITCH
24 1.25BR
4 5BY
23 5RG
F.L.65A
4 5BY
F.L.65A
75 5G
77 5BW
NO COM
AV60
5 1.25RB
5 1.25RB
BATTERY RELAY
STARTER SWITCH
B BR C
OFF
ON
ST
DIODE UNIT
24 1.25BR
1.25B
E
SV544-10006

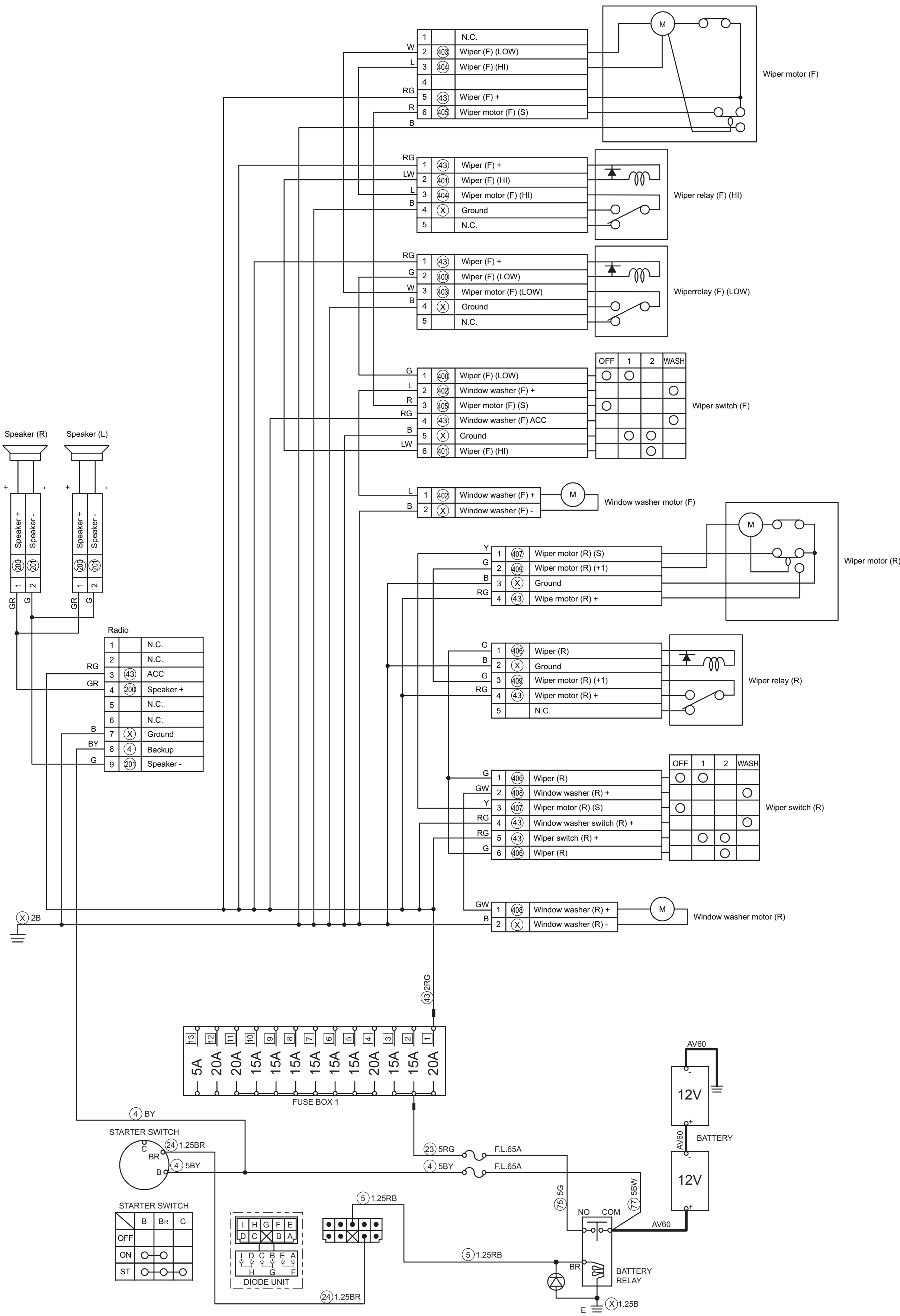
4-2-4. Wiper (R) does not work

- Wiper switch (R) must be “I”.

Reference Fig. : 4-2-1

Check point	Check/Cause	Action
1. Wiper Motor (R)	(1) When starter switch is ON, measure voltage between wiper motor (R) terminal 2 inlet wire G and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, check continuity between wiper motor (R) terminal 3 outlet wire B and chassis ground. There is continuity in normal condition. • If above items (1) and (2) are OK and wiper motor (R) does not operate, wiper motor (R) is faulty.	Replace wiper motor (R).
2. Wiper Relay (R)	(1) When starter switch is ON, measure voltage between wiper relay (R) terminal 1 inlet wire G and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between wiper relay (R) terminal 4 inlet wire RG and chassis ground. Standard voltage : 24 V or more (3) When starter switch is ON, measure voltage between wiper relay (R) terminal 3 outlet wire G and chassis ground. Standard voltage : 24 V or more • If above items (1) and (2) are OK and item (3) is NG, wiper relay (R) is faulty.	Replace wiper relay (R).
3. Wiper Switch (R)	(1) When starter switch is ON, measure voltage between wiper switch (R) terminal 5 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between wiper switch (R) terminal 1 outlet wire G and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, wiper switch (R) is faulty.	Replace wiper switch (R).
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.: 4-2-1



SV544-10006

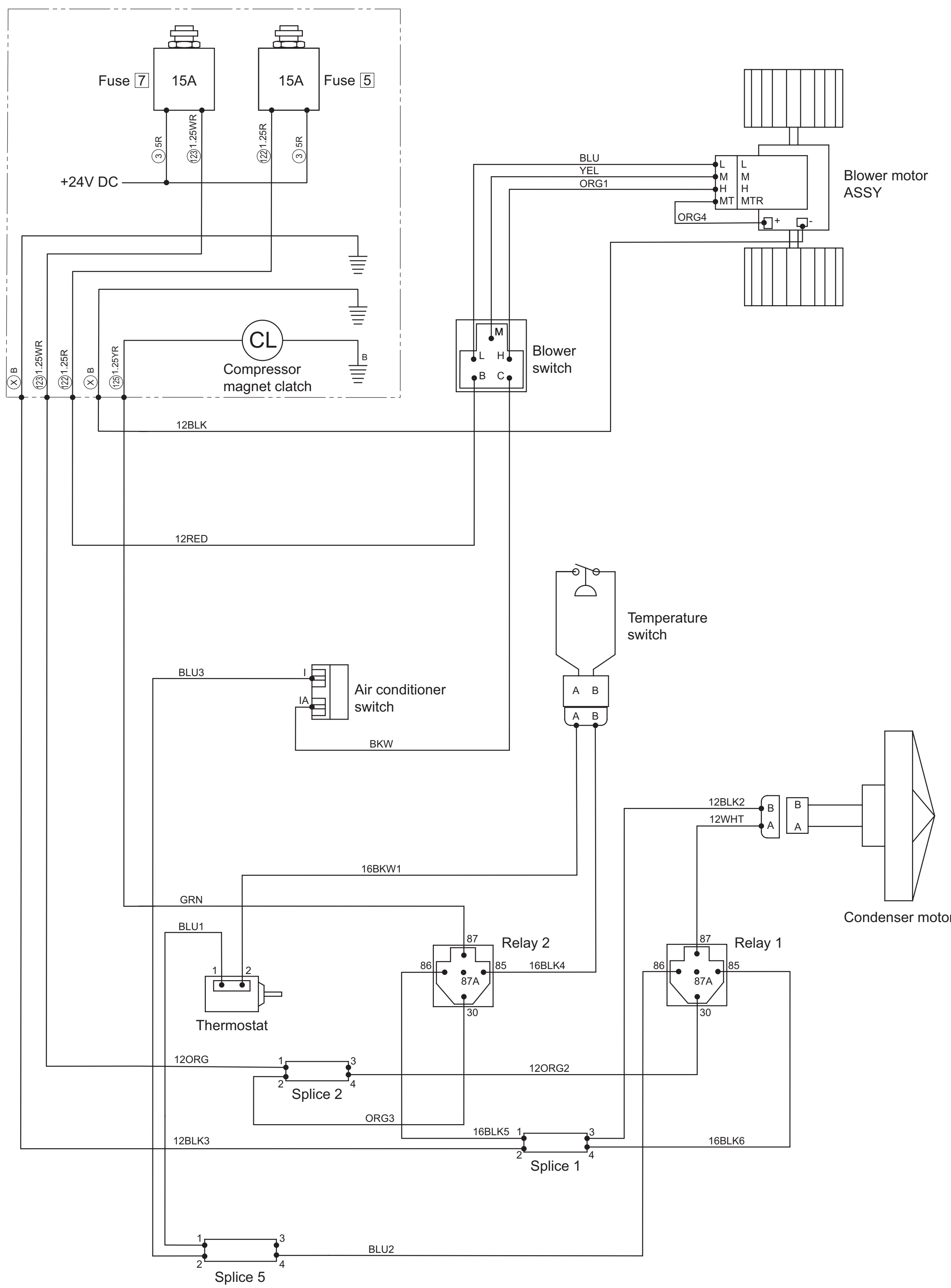
4-2-5. Window washer does not work

- Wiper switch (F) must be pressed and held.
- Wiper switch (R) must be pressed and held.

Reference Fig. : 4-2-1

Check point	Check/Cause	Action
1. Window Washer Motor (F)	(1) When starter switch is ON, measure voltage between window washer motor (F) terminal 1 inlet wire L and chassis ground. Standard voltage : 24 V or more (2) Check continuity between window washer motor (F) terminal 2 wire B and chassis ground. There is continuity in normal condition. • If above items (1) and (2) are OK and window washer motor (F) does not operate, window washer motor (F) is faulty.	Replace window washer motor (F).
2. Window Washer Motor (R)	(1) When starter switch is ON, measure voltage between window washer motor (R) terminal 1 inlet wire GW and chassis ground. Standard voltage : 24 V or more (2) Check continuity between window washer motor (R) terminal 2 wire B and chassis ground. There is continuity in normal condition. • If above items (1) and (2) are OK and window washer motor (R) does not operate, window washer motor (R) is faulty.	Replace window washer motor (R).
3. Wiper Switch (F)	(1) When starter switch is ON, measure voltage between wiper switch (F) terminal 4 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between wiper switch (F) terminal 2 outlet wire L and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, wiper switch (F) is faulty.	Replace wiper switch (F).
4. Wiper Switch (R)	(1) When starter switch is ON, measure voltage between wiper switch (R) terminal 4 inlet wire RG and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between wiper switch (R) terminal 2 outlet wire GW and chassis ground. Standard voltage : 24 V or more • If above item (1) is OK and item (2) is NG, wiper switch (R) is faulty.	Replace wiper switch (R).
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.: 4-3-1



SV544-10007

4-3. Air Conditioner

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.
- Check blower and duct for clogging with foreign matter.

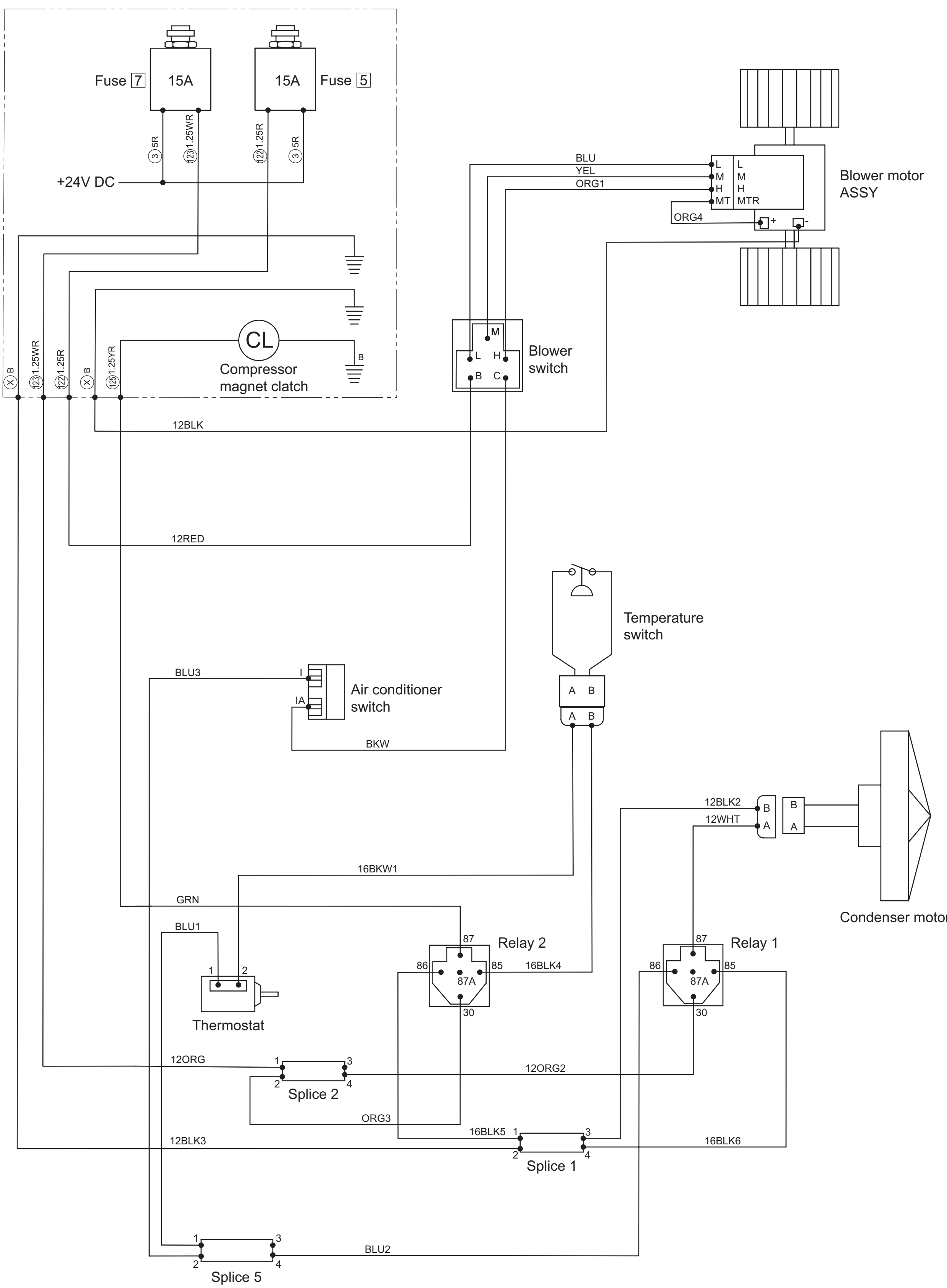
4-3-1. Air does not blow, air flow does not change

- Blower switch must not be “0”.

Reference Fig. : 4-3-1

Check point	Check/Cause	Action
1. Air Conditioner Unit	(1) When starter switch is ON, measure voltage between air conditioner unit terminal wire No.122 inlet wire R and chassis ground. Standard voltage : 24 V or more (2) Check continuity between air conditioner unit terminal wire No.X wire B and chassis ground. There is continuity in normal condition. • If above items (1) and (2) are OK and air conditioner unit does not operate, air conditioner unit is faulty.	Replace air conditioner unit.
2. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

Fig.: 4-3-1



SV544-10007

4-3-2. It does not blow cold air

- Air conditioner switch must be ON.
- Blower switch must not be “0”.
- Thermo volume must be set to minimum cold side.
- Check air conditioner piping for abnormal bend and collapse.
- Check compressor belt for looseness and damage.

Reference Fig. : 4-3-1

Check point	Check/Cause	Action
1. Compressor Magnet Clatch	(1) When starter switch is ON, measure voltage between compressor magnet clatch terminal wire No.125 wire YR and chassis ground Standard voltage : 24 V or more (2) Check continuity between compressor magnet clatch terminal wire B and chassis ground There is continuity in normal condition. • If above items (1) and (2) are OK and compressor magnet clatch not operate, compressor magnet clatch is faulty.	Replace compressor magnet clatch.
2. Air Conditioner Unit	(1) When starter switch is ON, measure voltage between air conditioner unit terminal wire No.122 inlet wire R and chassis ground. Standard voltage : 24 V or more (2) When starter switch is ON, measure voltage between air conditioner unit terminal wire No.123 inlet wire WR and chassis ground. Standard voltage : 24 V or more (3) Check continuity between air conditioner unit terminal wire No.X wire B and chassis ground. There is continuity in normal condition. • If above items (1), (2) and (3) are OK and air conditioner unit does not operate, air conditioner unit is faulty.	Replace air conditioner unit.
3. Harness Connecting Between Terminals	• Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty.	Repair or replace harness.

4-3-3. It does not blow hot air

- Blower switch must not be “0”.
- Thermo volume must be set to maximum hot side.

Reference Fig. : 4-3-1

Check point	Check/Cause	Action
1. Air Conditioner Unit	(1) When starter switch is ON, measure voltage between air conditioner unit terminal wire No.122 inlet wire R and chassis ground. Standard voltage : 24 V or more (2) Check continuity between air conditioner unit terminal wire No.X wire B and chassis ground. There is continuity in normal condition. • If above items (1) and (2) are OK and air conditioner unit does not operate, air conditioner unit is faulty.	Replace air conditioner unit.
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.

SV544

SHOP MANUAL

SAKAI HEAVY INDUSTRIES, LTD.

Head office: Seiwa Bldg., 4-8, Shibadaimon 1-chome, Minato-ku, Tokyo, Japan
Telephone: +81-3-3434-3401

Global Service Division: 2500 Takayanagi, Kuki-shi, Saitama, Japan
Telephone: +81-480-52-1111

Printed in Japan 2018.10.10 ① K.P
0418-99124-0-33015-A